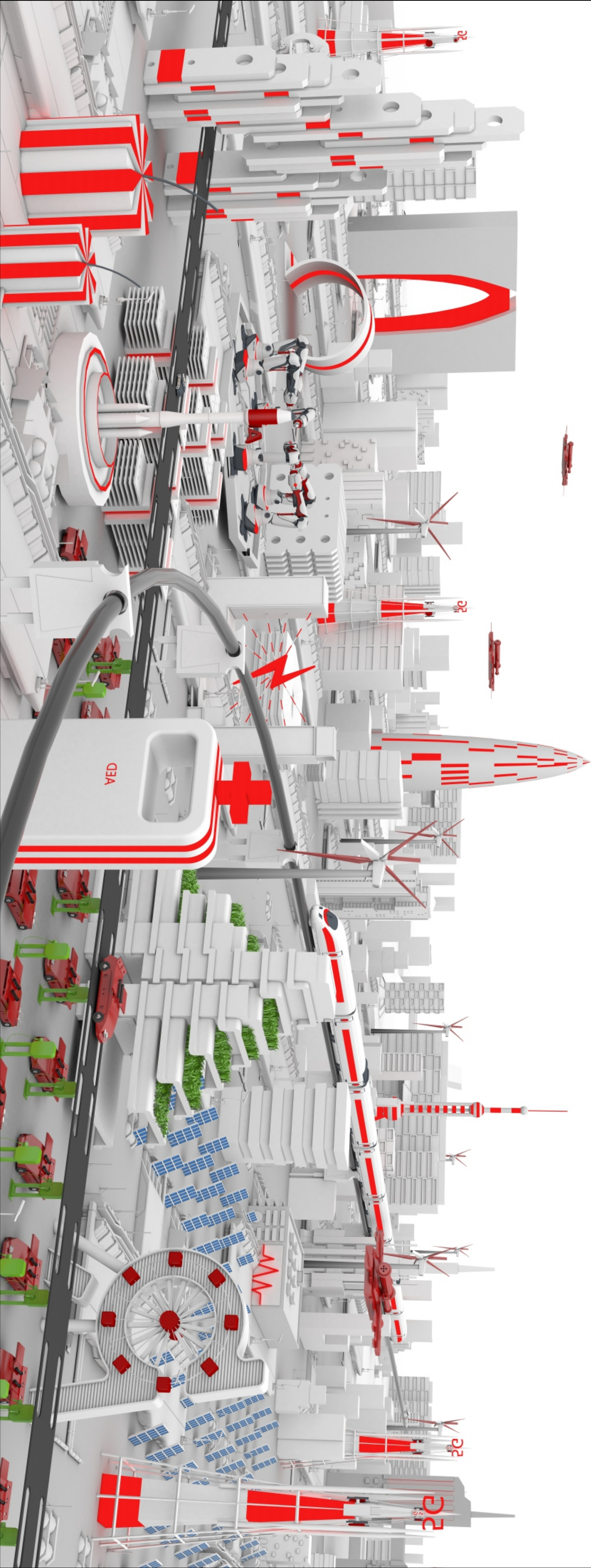


睿思

Current Sensing

RESISTOR

PRODUCT CATALOG

R E S I

I C&B Electronics

C&B Electronics is a world-class innovative enterprise that provides from passive components to module. Since founded in 2006, C&B Electronics has gradually formed a "non-traditional" manufacturing enterprise with a vertical industrial chain covering R&D and manufacturing of high-end raw materials, core EB welding equipment, electronic components, module level current sensors and heating parts, serving various industries of high-end manufacturing worldwide.

I RESI

Founded in 2006, it is a high-end resistor brand under C&B Electronics, representing "quality" and "service". C&B is committed to building a domestic resistor benchmark enterprise and providing resistor products with high quality, reasonable price, and stable delivery to global engineers.

Qualifications

National Level Specialization and Special New Small Giants

National High-Tech Enterprise

Guangdong Provincial Automotive High Precision Resistor Engineering Research Center

ISO9001
ISO45001
ISO14001
ISO27001

National Standard Drafting Unit

All four factories in Shenzhen, Changsha, Suzhou, Guilin have passed the IATF16949 certified by TUV.

Laboratory accreditation certificate of China National Accreditation Committee for Conformity Assessment

Automotive current sensors with functional safety have passed ISO 26262:2018; ASIL C, certified by UL.

DUNS Registration

Company Distribution

Shenzhen
5000 m^2

Sales & Technical Supports
Advanced Measurement Center
RESI MALL E-Commerce Platform

Shanghai
8000 m^2

Alloy Raw Materials

Guilin
15000 m^2

EB Welding Equipment
Incoming Processing Services

Suzhou
13000 m^2

Intelligent Manufacturing Factory

Changsha
8000 m^2

AEC-Q Laboratory
R&D & Manufacturing

Hong Kong

Logistics Center

Catalogue

PCSR2512 Molded Alloy Current Sensing Resistor Resistance:5mΩ~100mΩ Tolerance:±0.1% TCR:±15ppm/℃ 02-13

PCSK2512 Molded Alloy Current Sensing Resistor Resistance:5mΩ~100mΩ Tolerance:±0.5% TCR:±25ppm/℃ 14-24

EBWM2512 Alloy Current Sensing Resistor Resistance:0.3mΩ~1mΩ Tolerance:±0.5% TCR:±200ppm/℃ 25-34

EBWK2512 Alloy Current Sensing Resistor Resistance:2mΩ~5mΩ Tolerance:±0.5% TCR:±100ppm/℃ 35-44

PEWF2512 Alloy Current Sensing Resistor Resistance:1.5mΩ~5mΩ Tolerance:±0.5% TCR:±50ppm/℃ 45-54

SEWF2512 Alloy Current Sensing Resistor Resistance:3mΩ~5mΩ Tolerance:±0.5% TCR:±25ppm/℃ 55-64

PEWM3920 Alloy Current Sensing Resistor Resistance:0.2mΩ~1mΩ Tolerance:±0.5% TCR:±100~±150ppm/℃ 65-74

PEWK3920 Alloy Current Sensing Resistor Resistance:1mΩ~5mΩ Tolerance:±0.5% TCR:±50ppm/℃ 75-84

SEWF3920 Alloy Current Sensing Resistor Resistance:1mΩ~5mΩ Tolerance:±0.5% TCR:±25ppm/℃ 85-94

PEWM5930 Alloy Current Sensing Resistor Resistance:0.2mΩ~1mΩ Tolerance:±0.5% TCR:±100ppm/℃ 95-104

SEWF5930 Alloy Current Sensing Resistor Resistance:1mΩ~3mΩ Tolerance:±0.5% TCR:±25ppm/℃ 105-114

SEWF3951 Alloy Current Sensing Resistor Resistance:0.25mΩ~0.8mΩ Tolerance:±0.5% TCR:±25ppm/℃ 115-124

EOAR Alloy Current Sensing Resistor Resistance:25mΩ Tolerance:±0.5% TCR:±40ppm/℃ 125-132

PEWM4026 PEWF4026 PEWM2726 PEWF2726 PEWM1216 133

ARCS 134

RTCS RTBS 135

CB350 136-157

CB600 158-178

CB1000 179-196

PCBS6918 197-204

PCBS8518 205-212

PCBS8436 213-220

PCBS8536 221-228

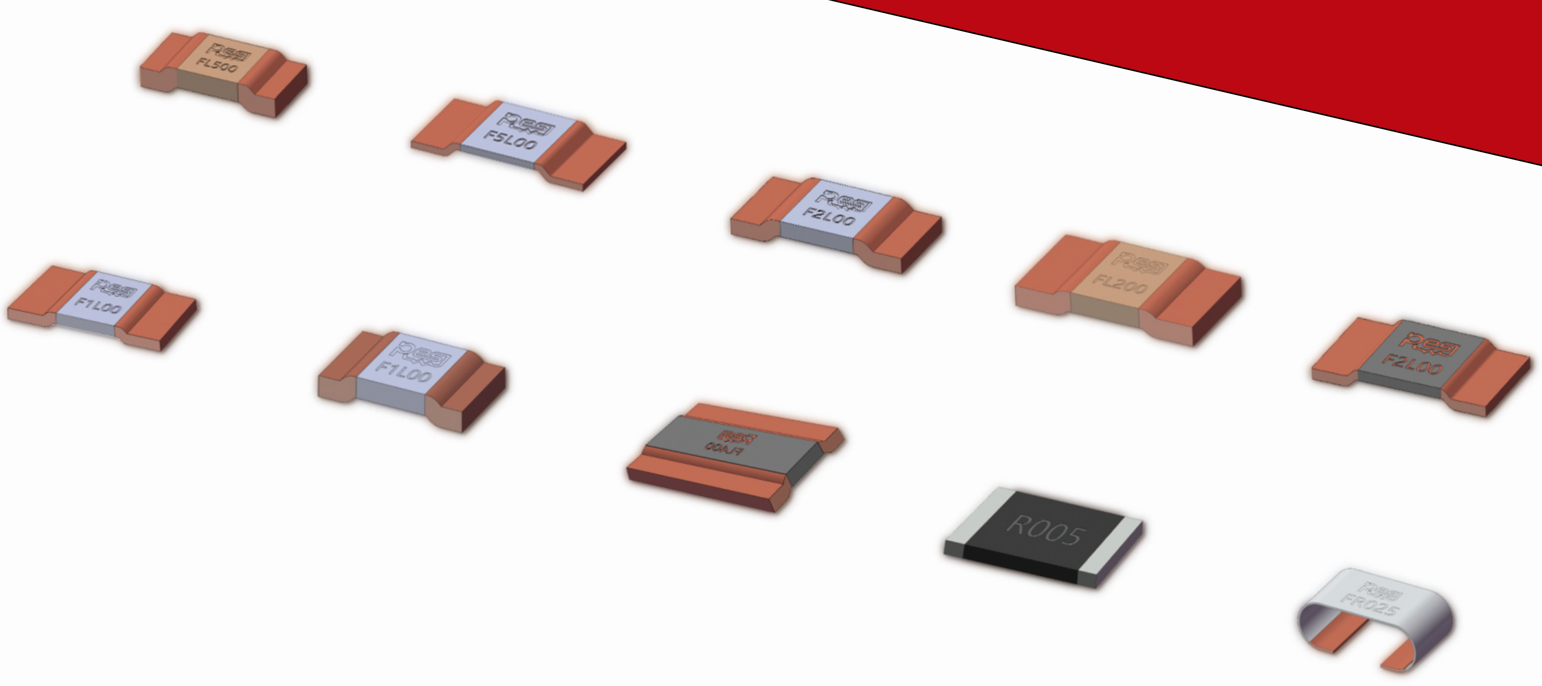
Current Sensing Resistor

Characteristics

- High-Precision
- Low-TCR
- Low Inductance and Thermal Resistance
- Excellent Long-Term Stability

Applications

- Automotive Electronics
- Industrial Control Equipment
- Precision Power Supply
- Formation & Sorting of Battery
- Current Measurement



DataSheet No：C16009

Version:V4

Date:2024/03/24

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PCSR2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Resistance	5mΩ～100mΩ
Tolerance	±0.1%
TCR	±15ppm/°C
Rated Current	3A~14A

Applications

Automotive Electronics

Precision Power Supply

Instrumentation

Formation & Sorting of Battery

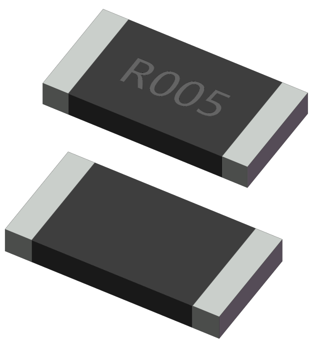
Medical Equipment

Better Solution for Sustainable High End Manufacturing

PCSR2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Tolerance of ±0.1% and TCR of ±15ppm
High Reliability and Stability



Introduction

High-precision low-TCR molded alloy current sensing resistor adopts a resistive alloy independently developed by C&B Electronics, which undergoes precision processing, then is welded by a dedicated electron beam welding equipment independently designed and manufactured by C&B Electronics to achieve continuous welding, and then is shaped by precision stamping. Based on the control ability of the resistance alloy's consistency, precision processing ability, process control ability, and precision welding ability, the product can achieve a maximum target tolerance of ± 0.1% after precision trimming. Finally, the product is encapsulated through precision molding.

The resistance range of PCSR2512 series of products is 5mΩ~100mΩ. TCR of PCSR2512 series is ≤±15ppm/°C within the operating temperature range from -55°C to +125°C. By controlling the resistive alloy materials, precision electron beam welding processes and subsequent processes, the thermal EMF is significantly reduced, while significantly improving its long-term stability.

PCSR2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in testing and measurement, power equipment, medical equipment, precision power supply, automotive electronics, formation & sorting of battery.

Electrical Parameters

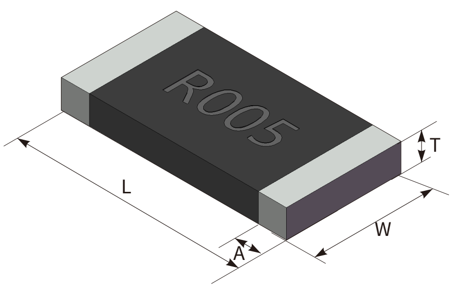
Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Tolerance %
PCSR2512	5mΩ~9mΩ	1W	10A~14A	-55°C~+170°C	±15(-55°C~+125°C)	±0.1 ±0.5 ±1.0 ±5.0
PCSR2512	10mΩ~100mΩ	1W	3A~10A	-55°C~+170°C	±15(-55°C~+125°C)	±0.1 ±0.5 ±1.0 ±5.0

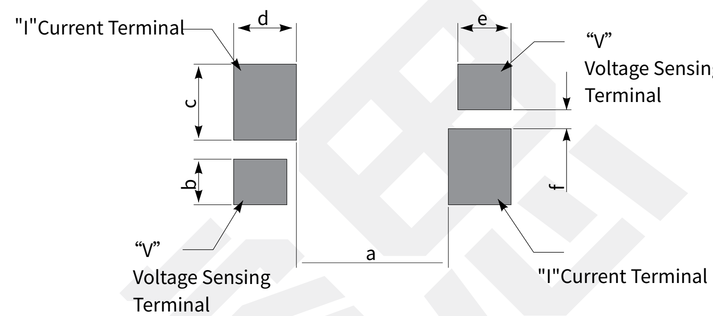
Applications

PCSR series is applicable to AC, DC, high and low-frequency sampling circuits.

Dimensions

Resistor **Land Pattern** **Unit: mm**





Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	a	b
5mΩ~100mΩ	6.4±0.2	3.2±0.2	0.8±0.2	0.8±0.1	4.0	1.2

c	d	e	f	Packaging	Quantity Per Reel	Net Weight g
2.0	1.65	1.4	0.5	Tape & Reel	4000pcs	0.07±0.02

Part Number Information

Example: PCSR2512BR005M9 (PCSR 2512 ±0.1% 5mΩ ±15ppm/°C Marked)

P	C	S	R	2	5	1	2	B	R	0	0	5	M	9

Series	Size	Tolerance	Resistance[1,2]	TCR	Packaging
PCSR	2512	B=±0.1%	R005=5mΩ	M=±15ppm/°C	9=Marked
		D=±0.5%	R010=10mΩ		6=Unmarked
		F=±1.0%	R100=100mΩ		
		J=±5.0%			

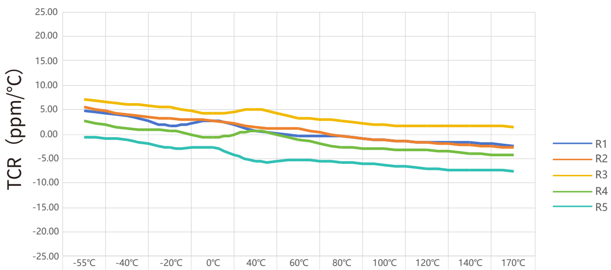
1. There are situations where the expression of resistance value exceeds four digits. 49.9mohm expresses as R0499, and 49.99mohm expresses as R04999, etc.
2. For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.1%	△R≤±0.3%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.3%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.05%	△R≤±0.2%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.02%	△R≤±0.05%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.02%	△R≤±0.05%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.05%	△R≤±0.1%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +125°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 15ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.02%	△R≤±0.05%

Temperature Coefficient of Resistance Test Curve

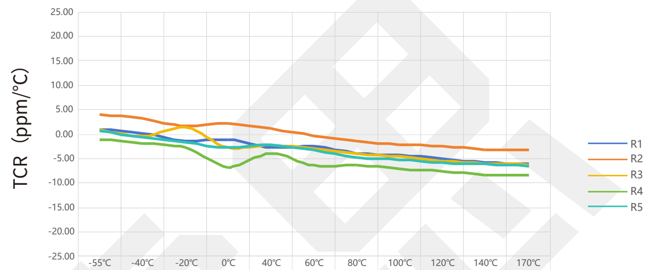
TCR Test Curve - PCSR2512 5mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	4.92	3.79	1.78	2.84	0.71	-0.36	-0.47	-1.24	-1.70	-1.78	-2.37
R2	5.50	4.03	3.20	2.84	1.42	1.07	-0.47	-1.24	-1.71	-2.25	-2.65
R3	7.15	6.15	5.45	4.19	5.03	3.35	2.79	1.89	1.68	1.82	1.56
R4	2.65	1.18	0.71	-0.71	0.71	-1.07	-2.61	-3.02	-3.27	-3.91	-4.36
R5	-0.55	-1.16	-2.77	-2.77	-5.55	-5.20	-5.78	-6.24	-7.08	-7.28	-7.49

Temperature (°C)

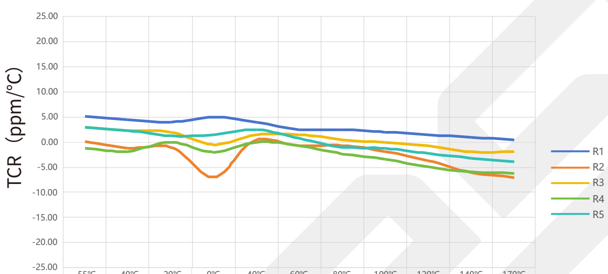
TCR Test Curve - PCSR2512 9mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	1.03	0.18	-1.38	-1.11	-2.76	-2.49	-3.87	-4.28	-4.97	-5.80	-5.97
R2	4.12	3.13	1.66	2.21	1.10	-0.28	-1.47	-2.07	-2.43	-3.13	-3.24
R3	0.88	-0.37	1.38	-2.76	-2.21	-3.04	-4.06	-4.56	-5.42	-5.99	-6.19
R4	-1.04	-1.86	-2.79	-6.69	-3.91	-6.42	-6.32	-7.11	-7.59	-8.28	-8.41
R5	0.59	-0.55	-1.66	-2.76	-2.21	-3.31	-4.78	-5.24	-5.85	-6.16	-6.48

Temperature (°C)

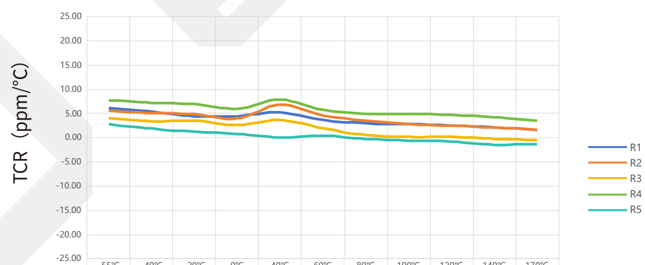
TCR Test Curve - PCSR2512 10mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	5.05	4.49	3.99	4.98	3.99	2.49	2.49	1.99	1.50	0.91	0.50
R2	0.13	-1.16	-1.00	-6.98	0.50	-0.75	-0.66	-1.87	-3.69	-6.06	-7.05
R3	2.93	2.33	2.00	-0.50	1.50	1.50	0.50	-0.12	-0.80	-1.91	-1.93
R4	-1.20	-1.83	0.00	-1.99	0.00	-0.75	-2.32	-3.36	-4.98	-5.89	-6.19
R5	2.90	2.30	1.23	1.48	2.47	0.74	-0.99	-1.23	-2.27	-3.21	-3.88

Temperature (°C)

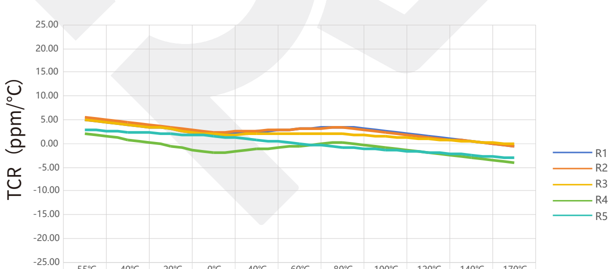
TCR Test Curve - PCSR2512 20mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	6.06	5.40	4.44	4.44	5.23	3.66	2.96	2.81	2.51	2.13	1.67
R2	5.61	5.08	4.86	3.94	6.83	4.60	3.50	2.76	2.47	2.10	1.65
R3	4.02	3.38	3.51	2.60	3.64	1.95	0.52	0.13	0.16	-0.26	-0.49
R4	7.73	7.22	6.92	6.01	7.83	5.74	4.96	4.90	4.70	4.26	3.52
R5	2.77	1.87	1.20	0.80	0.00	0.40	-0.27	-0.60	-0.80	-1.47	-1.28

Temperature (°C)

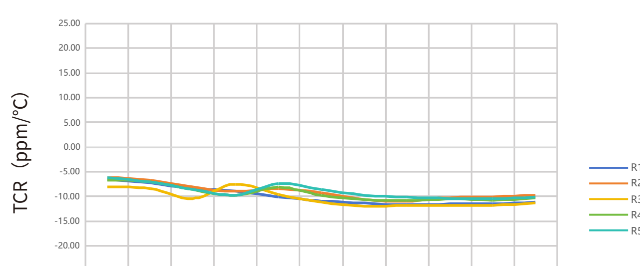
TCR Test Curve - PCSR2512 50mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	5.07	4.03	3.00	1.97	2.48	3.00	3.52	2.52	1.52	0.53	-0.47
R2	5.60	4.55	3.50	2.45	2.72	3.00	3.27	2.30	1.33	0.36	-0.61
R3	5.08	4.04	3.01	1.97	1.99	2.01	2.02	1.49	0.96	0.42	-0.11
R4	2.14	0.82	-0.50	-1.82	-1.16	-0.50	0.16	-0.88	-1.91	-2.95	-3.98
R5	2.93	2.46	2.00	1.53	0.77	0.00	-0.77	-1.33	-1.90	-2.47	-3.04

Temperature (°C)

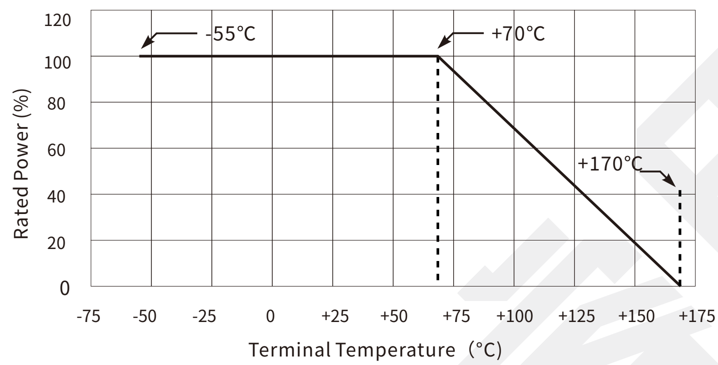
TCR Test Curve - PCSR2512 100mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	-6.54	-7.25	-8.37	-8.92	-10.04	-10.88	-11.34	-11.71	-11.49	-11.43	-11.15
R2	-6.12	-6.72	-8.12	-8.96	-8.40	-9.24	-10.64	-10.92	-10.19	-10.08	-9.70
R3	-8.10	-8.35	-10.39	-7.46	-9.59	-11.19	-11.90	-11.85	-11.83	-11.81	-11.29
R4	-6.62	-7.02	-8.64	-9.72	-8.10	-9.72	-10.62	-10.80	-10.47	-10.71	-10.29
R5	-6.23	-7.03	-8.55	-9.69	-7.41	-8.55	-9.69	-10.12	-10.37	-10.45	-10.11

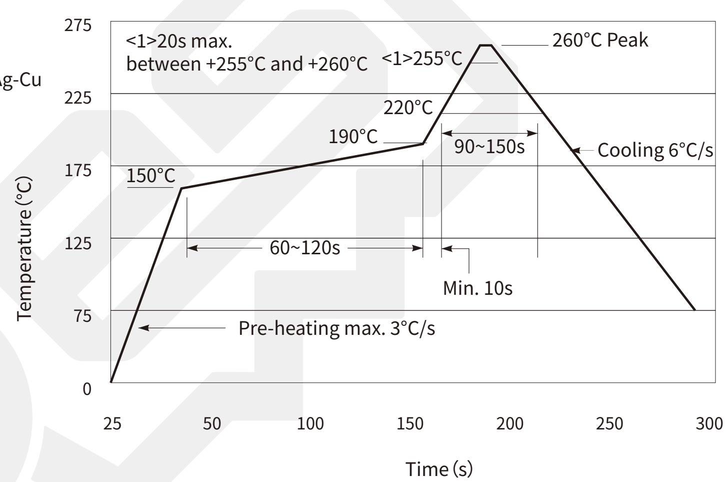
Temperature (°C)

Derating Curve

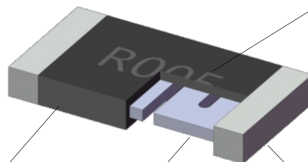


Reflow Soldering Profile

Resistor Surface Temperature：
Pre-Heat:+150°C~+190°C，60~120sec.
Reflow: Above +220°C，90~150sec.
Applicable Solder Composition: Sn-Ag-Cu

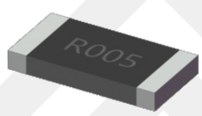


Construction



Marking

Marking: Resistance

Size	Illustration	Demonstration
2512		R005=5mΩ R100=100mΩ

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ⩽ rated power to avoid resistance drift caused by long-term overload.

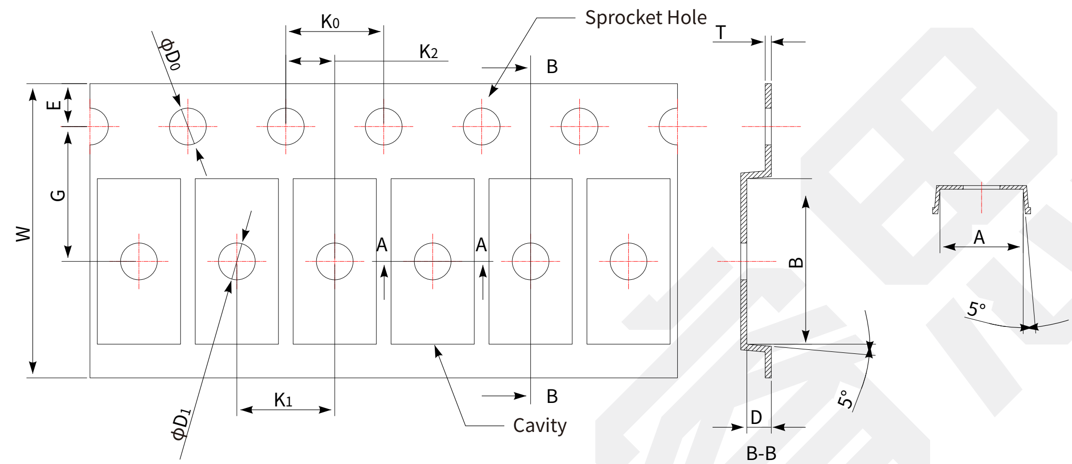
(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

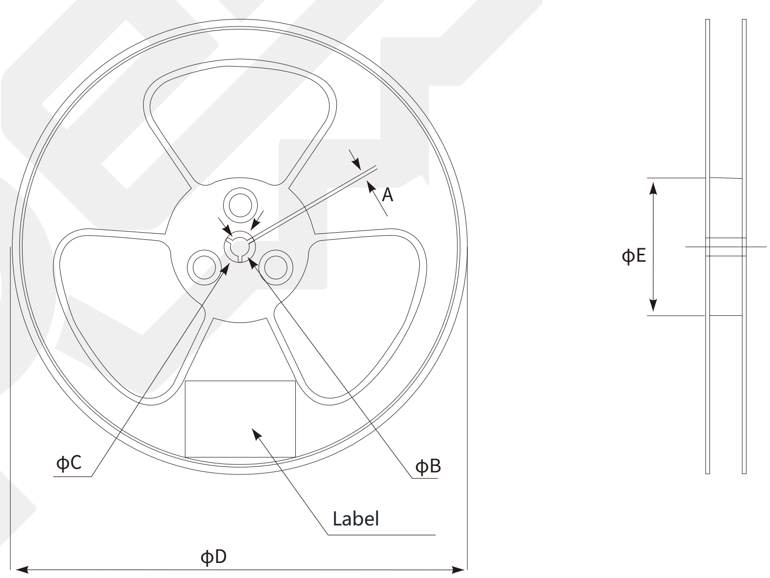
Packaging

Tape Specifications **Unit: mm**



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
5mΩ-100mΩ	3.40±0.2	6.75±0.2	1.5±0.1	1.5±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.75±0.1	5.5±0.1	12.0±0.3	1.0±0.1	0.25±0.05

Reel Specifications **Unit: mm**



A	ΦB	ΦC	ΦD	ΦE
1.5 min.	13.5 +0.5/-0.2	20.2 Min.	178±2	60±2

C&B Electronics Shenzhen CO., LTD. | www.resistor.today | resi@cbeureka.com | Tel:0755-82899519

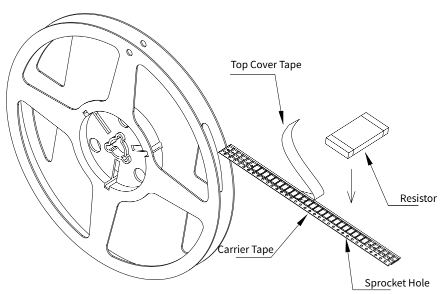
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

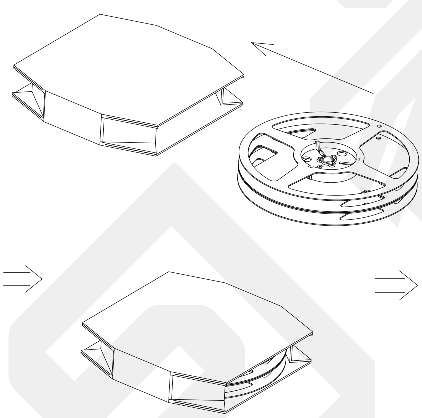
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 180mm*180mm*35mm;

(3) Place every 8 cases into a box (64000 pcs. / box);

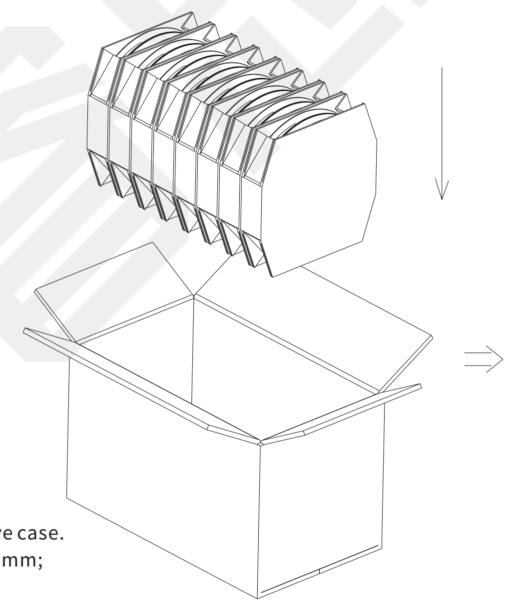
(4) Box size: 330mm*195mm*200mm.



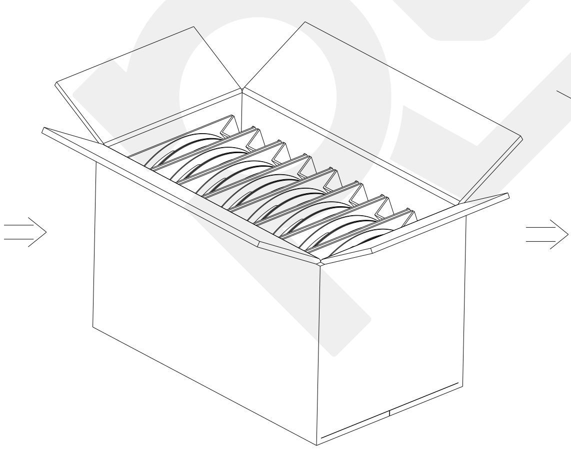
1. 4000 pcs. resistors are packed in a tape and wrapped in a reel.



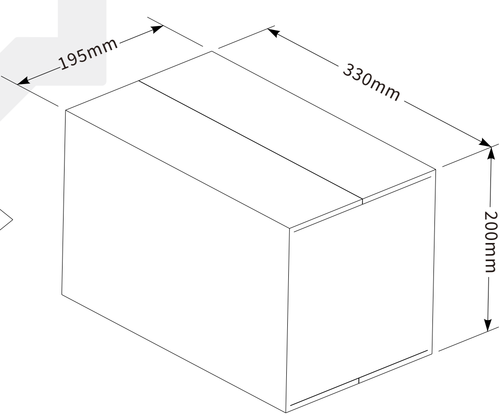
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 180mm*180mm*35mm;



3. Place every 8 cases into a box (64000 pcs. / box).



4.For the last box, 8 cardboard sleeve cases should be placed regardless of quantity of the product, preventing shaking.



5. Box size: 330mm*195mm*200mm

PCSR2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	Marking	TCR	Power	Max. Operating Current
PCSR2512BR005M9	2512	±0.1%	5.0mΩ	Marked	±15ppm/°C	1W	14A
PCSR2512DR005M9	2512	±0.5%	5.0mΩ	Marked	±15ppm/°C	1W	14A
PCSR2512FR005M9	2512	±1.0%	5.0mΩ	Marked	±15ppm/°C	1W	14A
PCSR2512JR005M9	2512	±5.0%	5.0mΩ	Marked	±15ppm/°C	1W	14A
PCSR2512BR006M9	2512	±0.1%	6.0mΩ	Marked	±15ppm/°C	1W	12A
PCSR2512DR006M9	2512	±0.5%	6.0mΩ	Marked	±15ppm/°C	1W	12A
PCSR2512FR006M9	2512	±1.0%	6.0mΩ	Marked	±15ppm/°C	1W	12A
PCSR2512JR006M9	2512	±5.0%	6.0mΩ	Marked	±15ppm/°C	1W	12A
PCSR2512BR007M9	2512	±0.1%	7.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512DR007M9	2512	±0.5%	7.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512FR007M9	2512	±1.0%	7.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512JR007M9	2512	±5.0%	7.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512BR008M9	2512	±0.1%	8.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512DR008M9	2512	±0.5%	8.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512FR008M9	2512	±1.0%	8.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512JR008M9	2512	±5.0%	8.0mΩ	Marked	±15ppm/°C	1W	11A
PCSR2512BR009M9	2512	±0.1%	9.0mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512DR009M9	2512	±0.5%	9.0mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512FR009M9	2512	±1.0%	9.0mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512JR009M9	2512	±5.0%	9.0mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512BR010M9	2512	±0.1%	10mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512DR010M9	2512	±0.5%	10mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512FR010M9	2512	±1.0%	10mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512JR010M9	2512	±5.0%	10mΩ	Marked	±15ppm/°C	1W	10A
PCSR2512BR015M9	2512	±0.1%	15mΩ	Marked	±15ppm/°C	1W	8A
PCSR2512DR015M9	2512	±0.5%	15mΩ	Marked	±15ppm/°C	1W	8A
PCSR2512FR015M9	2512	±1.0%	15mΩ	Marked	±15ppm/°C	1W	8A
PCSR2512JR015M9	2512	±5.0%	15mΩ	Marked	±15ppm/°C	1W	8A
PCSR2512BR018M9	2512	±0.1%	18mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512DR018M9	2512	±0.5%	18mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512FR018M9	2512	±1.0%	18mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512JR018M9	2512	±5.0%	18mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512BR020M9	2512	±0.1%	20mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512DR020M9	2512	±0.5%	20mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512FR020M9	2512	±1.0%	20mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512JR020M9	2512	±5.0%	20mΩ	Marked	±15ppm/°C	1W	7A
PCSR2512BR025M9	2512	±0.1%	25mΩ	Marked	±15ppm/°C	1W	6A
PCSR2512DR025M9	2512	±0.5%	25mΩ	Marked	±15ppm/°C	1W	6A
PCSR2512FR025M9	2512	±1.0%	25mΩ	Marked	±15ppm/°C	1W	6A
PCSR2512JR025M9	2512	±5.0%	25mΩ	Marked	±15ppm/°C	1W	6A
PCSR2512BR030M9	2512	±0.1%	30mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512DR030M9	2512	±0.5%	30mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512FR030M9	2512	±1.0%	30mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512JR030M9	2512	±5.0%	30mΩ	Marked	±15ppm/°C	1W	5A

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	Marking	TCR	Power	Max. Operating Current
PCSR2512BR033M9	2512	±0.1%	33mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512DR033M9	2512	±0.5%	33mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512FR033M9	2512	±1.0%	33mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512JR033M9	2512	±5.0%	33mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512BR040M9	2512	±0.1%	40mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512DR040M9	2512	±0.5%	40mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512FR040M9	2512	±1.0%	40mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512JR040M9	2512	±5.0%	40mΩ	Marked	±15ppm/°C	1W	5A
PCSR2512BR047M9	2512	±0.1%	47mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512DR047M9	2512	±0.5%	47mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512FR047M9	2512	±1.0%	47mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512JR047M9	2512	±5.0%	47mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512BR050M9	2512	±0.1%	50mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512DR050M9	2512	±0.5%	50mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512FR050M9	2512	±1.0%	50mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512JR050M9	2512	±5.0%	50mΩ	Marked	±15ppm/°C	1W	4A
PCSR2512BR100M9	2512	±0.1%	100mΩ	Marked	±15ppm/°C	1W	3A
PCSR2512DR100M9	2512	±0.5%	100mΩ	Marked	±15ppm/°C	1W	3A
PCSR2512FR100M9	2512	±1.0%	100mΩ	Marked	±15ppm/°C	1W	3A
PCSR2512JR100M9	2512	±5.0%	100mΩ	Marked	±15ppm/°C	1W	3A
PCSR2512BR005M6	2512	±0.1%	5.0mΩ	Unmarked	±15ppm/°C	1W	14A
PCSR2512DR005M6	2512	±0.5%	5.0mΩ	Unmarked	±15ppm/°C	1W	14A
PCSR2512FR005M6	2512	±1.0%	5.0mΩ	Unmarked	±15ppm/°C	1W	14A
PCSR2512JR005M6	2512	±5.0%	5.0mΩ	Unmarked	±15ppm/°C	1W	14A
PCSR2512BR006M6	2512	±0.1%	6.0mΩ	Unmarked	±15ppm/°C	1W	12A
PCSR2512DR006M6	2512	±0.5%	6.0mΩ	Unmarked	±15ppm/°C	1W	12A
PCSR2512FR006M6	2512	±1.0%	6.0mΩ	Unmarked	±15ppm/°C	1W	12A
PCSR2512JR006M6	2512	±5.0%	6.0mΩ	Unmarked	±15ppm/°C	1W	12A
PCSR2512BR007M6	2512	±0.1%	7.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512DR007M6	2512	±0.5%	7.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512FR007M6	2512	±1.0%	7.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512JR007M6	2512	±5.0%	7.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512BR008M6	2512	±0.1%	8.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512DR008M6	2512	±0.5%	8.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512FR008M6	2512	±1.0%	8.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512JR008M6	2512	±5.0%	8.0mΩ	Unmarked	±15ppm/°C	1W	11A
PCSR2512BR009M6	2512	±0.1%	9.0mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512DR009M6	2512	±0.5%	9.0mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512FR009M6	2512	±1.0%	9.0mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512JR009M6	2512	±5.0%	9.0mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512BR010M6	2512	±0.1%	10mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512DR010M6	2512	±0.5%	10mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512FR010M6	2512	±1.0%	10mΩ	Unmarked	±15ppm/°C	1W	10A
PCSR2512JR010M6	2512	±5.0%	10mΩ	Unmarked	±15ppm/°C	1W	10A

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	Marking	TCR	Power	Max. Operating Current
PCSR2512BR015M6	2512	±0.1%	15mΩ	Unmarked	±15ppm/°C	1W	8A
PCSR2512DR015M6	2512	±0.5%	15mΩ	Unmarked	±15ppm/°C	1W	8A
PCSR2512FR015M6	2512	±1.0%	15mΩ	Unmarked	±15ppm/°C	1W	8A
PCSR2512JR015M6	2512	±5.0%	15mΩ	Unmarked	±15ppm/°C	1W	8A
PCSR2512BR018M6	2512	±0.1%	18mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512DR018M6	2512	±0.5%	18mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512FR018M6	2512	±1.0%	18mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512JR018M6	2512	±5.0%	18mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512BR020M6	2512	±0.1%	20mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512DR020M6	2512	±0.5%	20mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512FR020M6	2512	±1.0%	20mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512JR020M6	2512	±5.0%	20mΩ	Unmarked	±15ppm/°C	1W	7A
PCSR2512BR025M6	2512	±0.1%	25mΩ	Unmarked	±15ppm/°C	1W	6A
PCSR2512DR025M6	2512	±0.5%	25mΩ	Unmarked	±15ppm/°C	1W	6A
PCSR2512FR025M6	2512	±1.0%	25mΩ	Unmarked	±15ppm/°C	1W	6A
PCSR2512JR025M6	2512	±5.0%	25mΩ	Unmarked	±15ppm/°C	1W	6A
PCSR2512BR030M6	2512	±0.1%	30mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512DR030M6	2512	±0.5%	30mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512FR030M6	2512	±1.0%	30mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512JR030M6	2512	±5.0%	30mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512BR033M6	2512	±0.1%	33mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512DR033M6	2512	±0.5%	33mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512FR033M6	2512	±1.0%	33mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512JR033M6	2512	±5.0%	33mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512BR040M6	2512	±0.1%	40mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512DR040M6	2512	±0.5%	40mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512FR040M6	2512	±1.0%	40mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512JR040M6	2512	±5.0%	40mΩ	Unmarked	±15ppm/°C	1W	5A
PCSR2512BR047M6	2512	±0.1%	47mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512DR047M6	2512	±0.5%	47mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512FR047M6	2512	±1.0%	47mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512JR047M6	2512	±5.0%	47mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512BR050M6	2512	±0.1%	50mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512DR050M6	2512	±0.5%	50mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512FR050M6	2512	±1.0%	50mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512JR050M6	2512	±5.0%	50mΩ	Unmarked	±15ppm/°C	1W	4A
PCSR2512BR100M6	2512	±0.1%	100mΩ	Unmarked	±15ppm/°C	1W	3A
PCSR2512DR100M6	2512	±0.5%	100mΩ	Unmarked	±15ppm/°C	1W	3A
PCSR2512FR100M6	2512	±1.0%	100mΩ	Unmarked	±15ppm/°C	1W	3A
PCSR2512JR100M6	2512	±5.0%	100mΩ	Unmarked	±15ppm/°C	1W	3A

DataSheet No：E16015

Version：V2

Date：2024/03/24

睿思

PCSK2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Resistance	5mΩ～100mΩ
Tolerance	±0.5%
TCR	±25ppm/℃
Rated Current	3A~14A

Applications

Automotive Electronics

Precision Power Supply

Instrumentation

Formation & Sorting of Battery

Medical Equipment

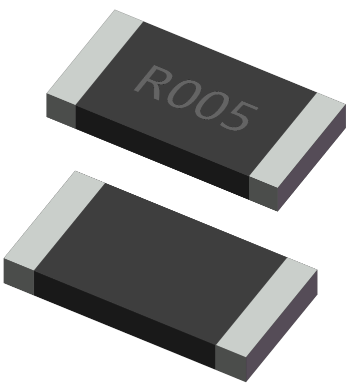
Better Solution for Sustainable High End Manufacturing

PCSK2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Tolerance of ±0.5% and TCR of ±25ppm

High Reliability and Stability



Introduction

High-precision low-TCR molded alloy current sensing resistor adopts a resistive alloy independently developed by C&B Electronics, which undergoes precision processing, then is welded by a dedicated electron beam welding equipment independently designed and manufactured by C&B Electronics to achieve continuous welding, and then is shaped by precision stamping. Based on the control ability of the resistance alloy's consistency, precision processing ability, process control ability, and precision welding ability, the product can achieve a maximum target tolerance of ± 0.5% after precision trimming. Finally, the product is encapsulated through precision molding.

The resistance range of PCSK2512 series of products is 5mΩ~100mΩ. TCR of PCSK2512 series is ⩽±25ppm/°C within the operating temperature range from -55°C to +125°C. By controlling the resistive alloy materials, precision electron beam welding processes and subsequent processes, the thermal EMF is significantly reduced, while significantly improving its long-term stability.

PCSK2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in testing and measurement, power equipment, medical equipment, precision power supply, automotive electronics, formation & sorting of battery.

Electrical Parameters

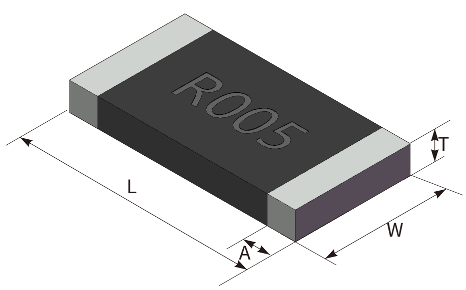
Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Tolerance %
PCSK2512	5mΩ~9mΩ	1W	10A~14A	-55°C~+170°C	±25(-55°C~+125°C)	±0.5 ±1.0 ±5.0
PCSK2512	10mΩ~100mΩ	1W	3A~10A	-55°C~+170°C	±25(-55°C~+125°C)	±0.5 ±1.0 ±5.0

Applications

PCSK series is applicable to AC, DC, high and low-frequency sampling circuits.

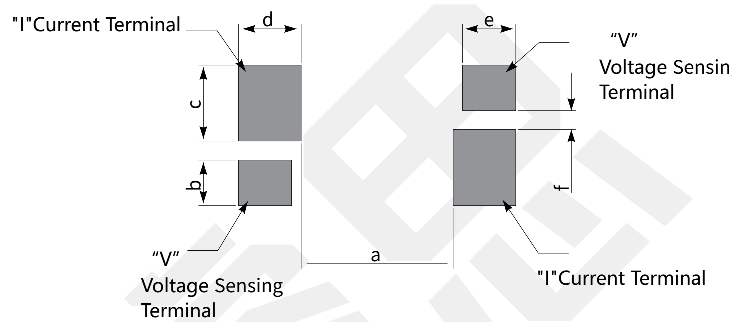
Dimensions

Resistor



Land Pattern

Unit：mm



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	a	b
5mΩ~100mΩ	6.4±0.2	3.2±0.2	0.8±0.2	0.8±0.1	4.0	1.2
c	**d**	**e**	**f**	**Packaging**	**Quantity** Per Reel	**Net Weight** g
2.0	1.65	1.4	0.5	Tape & Reel	4000pcs	0.07±0.02

Part Number Information

Example: PCSK2512DR005P9 (PCSK 2512 ±0.5% 5mΩ ±25ppm/°C Marked)

P	C	S	K	2	5	1	2	D	R	0	0	5	P	9

Series	Size	Tolerance	Resistance[1,2]	TCR	Packaging
PCSK	2512	D=±0.5%	R005=5mΩ	P=±25ppm/°C	9=Marked
		F=±1.0%	R010=10mΩ		6=Unmarked
		J=±5.0%	R100=100mΩ		

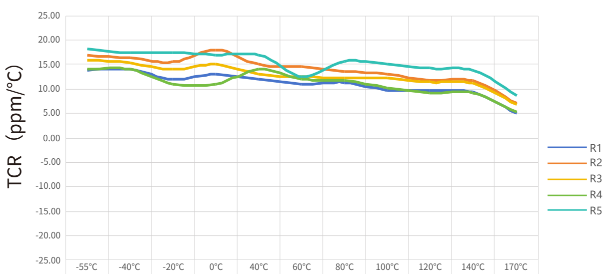
1. There are situations where the expression of resistance value exceeds four digits. 49.9mohm expresses as R0499, and 49.99mohm expresses as R04999, etc.
2. For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.1%	△R≤±0.5%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.05%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.02%	△R≤±0.05%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.02%	△R≤±0.05%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.05%	△R≤±0.1%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +125°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 25ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.02%	△R≤±0.2%

Temperature Coefficient of Resistance Test Curve

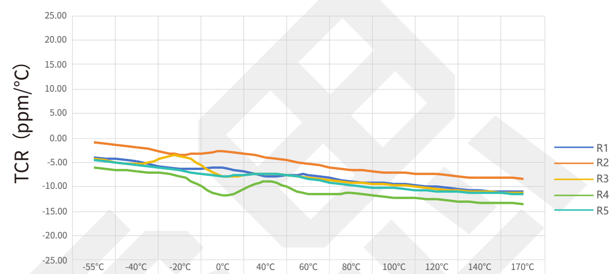
TCR Test Curve - PCSK2512 5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	13.89	14.02	12.02	13.02	12.02	11.01	11.35	9.76	9.61	9.35	5.07
R2	16.82	16.35	15.52	18.02	15.02	14.51	13.68	13.01	11.81	11.68	7.07
R3	16.01	15.35	14.01	15.01	13.01	12.51	12.34	12.26	11.41	11.18	6.94
R4	14.15	14.02	11.01	11.01	14.02	12.02	11.68	10.26	9.21	9.18	5.34
R5	18.17	17.36	17.53	17.03	17.03	12.52	15.70	15.03	14.23	13.86	8.68

Temperature(°C)

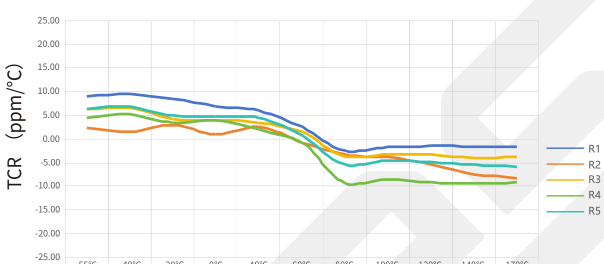
TCR Test Curve - PCSK2512 9mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-3.97	-4.82	-6.38	-6.11	-7.76	-7.49	-8.87	-9.28	-9.97	-10.80	-10.97
R2	-0.88	-1.87	-3.34	-2.79	-3.90	-5.28	-6.47	-7.07	-7.43	-8.13	-8.24
R3	-4.12	-5.37	-3.62	-7.76	-7.21	-8.04	-9.06	-9.56	-10.42	-10.99	-11.19
R4	-6.04	-6.86	-7.79	-11.69	-8.91	-11.42	-11.32	-12.11	-12.59	-13.28	-13.41
R5	-4.41	-5.55	-6.66	-7.76	-7.21	-8.31	-9.78	-10.24	-10.85	-11.16	-11.48

Temperature(°C)

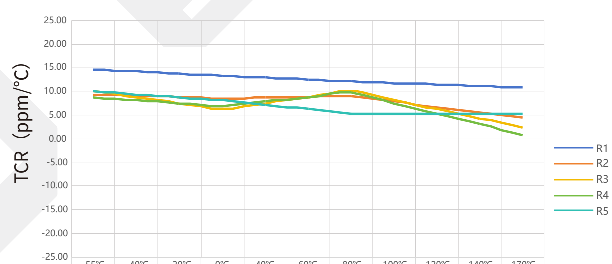
TCR Test Curve - PCSK2512 10mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	9.04	9.47	8.46	6.93	5.99	2.49	-2.49	-1.74	-1.49	-1.58	-1.64
R2	2.26	1.49	2.99	1.00	2.50	-0.75	-3.32	-3.86	-5.28	-7.39	-8.19
R3	6.26	6.49	4.24	3.99	3.50	1.50	-3.66	-3.25	-3.30	-4.00	-3.71
R4	4.38	5.15	3.46	3.92	2.00	-0.75	-9.29	-8.59	-9.16	-9.38	-9.18
R5	6.45	6.74	4.90	4.81	4.47	0.74	-5.43	-4.57	-4.94	-5.43	-5.78

Temperature(°C)

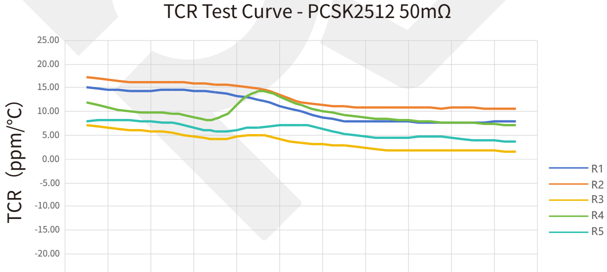
TCR Test Curve - PCSK2512 20mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	14.65	14.20	13.74	13.28	12.88	12.49	12.09	11.76	11.42	11.08	10.74
R2	9.36	9.07	8.78	8.48	8.63	8.78	8.92	7.80	6.69	5.57	4.45
R3	10.01	8.76	7.51	6.26	7.51	8.76	10.01	8.10	6.20	4.29	2.38
R4	8.67	8.09	7.50	6.92	7.84	8.76	9.67	7.46	5.24	3.03	0.81
R5	9.96	9.34	8.71	8.09	7.16	6.22	5.29	5.25	5.22	5.18	5.14

Temperature(°C)

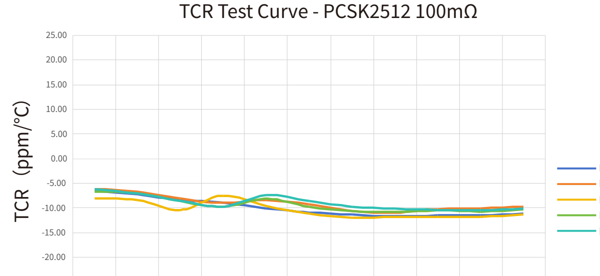
TCR Test Curve - PCSK2512 50mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	15.01	14.34	14.48	14.07	12.41	9.92	7.98	7.84	7.76	7.70	7.92
R2	17.18	16.24	16.11	15.69	14.86	11.96	11.00	10.93	10.72	10.72	10.44
R3	7.15	6.15	5.45	4.19	5.03	3.35	2.79	1.89	1.68	1.82	1.56
R4	11.84	10.05	9.63	8.38	14.24	11.31	9.21	8.38	7.87	7.54	7.04
R5	8.05	8.11	7.55	5.87	6.71	7.13	5.31	4.40	4.70	4.05	3.69

Temperature(°C)

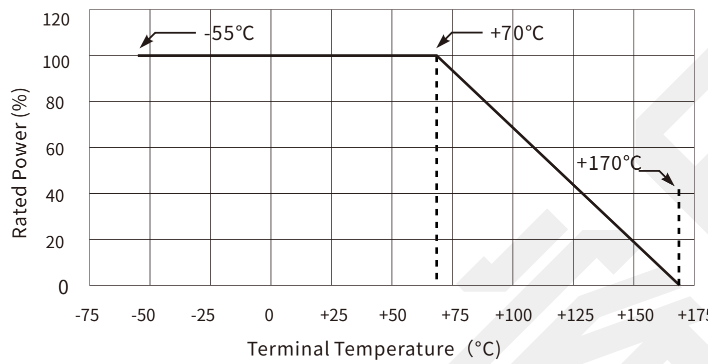
TCR Test Curve - PCSK2512 100mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-6.54	-7.25	-8.37	-8.92	-10.04	-10.88	-11.34	-11.71	-11.49	-11.43	-11.15
R2	-6.12	-6.72	-8.12	-8.96	-8.40	-9.24	-10.64	-10.92	-10.19	-10.08	-9.70
R3	-8.10	-8.35	-10.39	-7.46	-9.59	-11.19	-11.90	-11.85	-11.83	-11.81	-11.29
R4	-6.62	-7.02	-8.64	-9.72	-8.10	-9.72	-10.62	-10.80	-10.47	-10.71	-10.29
R5	-6.23	-7.03	-8.55	-9.69	-7.41	-8.55	-9.69	-10.12	-10.37	-10.45	-10.11

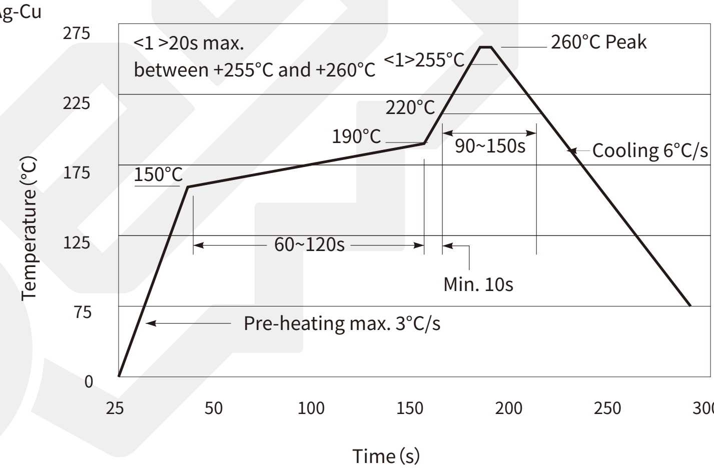
Temperature(°C)

Derating Curve

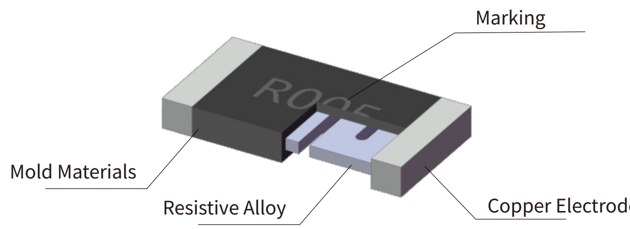


Reflow Soldering Profile

Resistor Surface Temperature:
Pre-Heat:+150°C~+190°C, 60~120sec.
Reflow: Above+220°C, 90~150sec.
Applicable Solder Composition: Sn-Ag-Cu

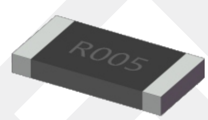


Construction



Marking

Marking: Resistance

Size	Illustration	Demonstration
2512		R005：Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ⩽ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

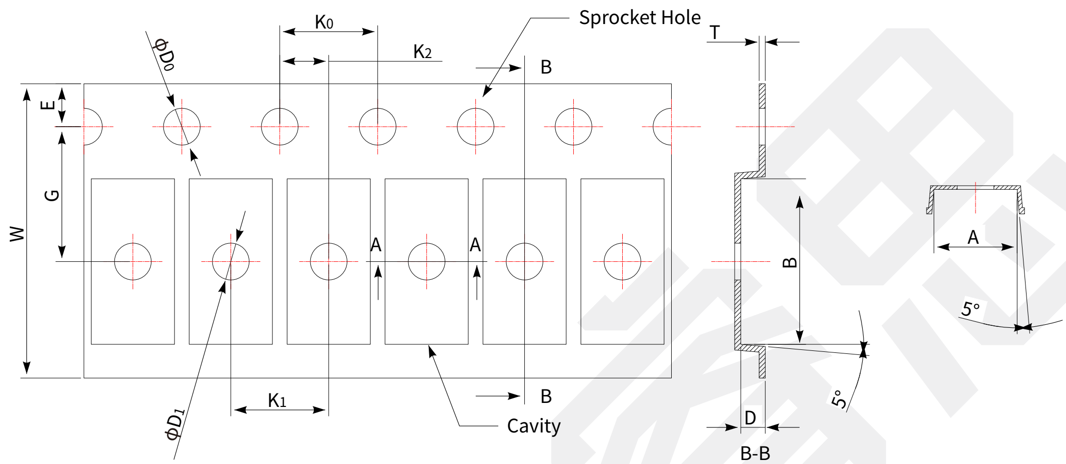
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

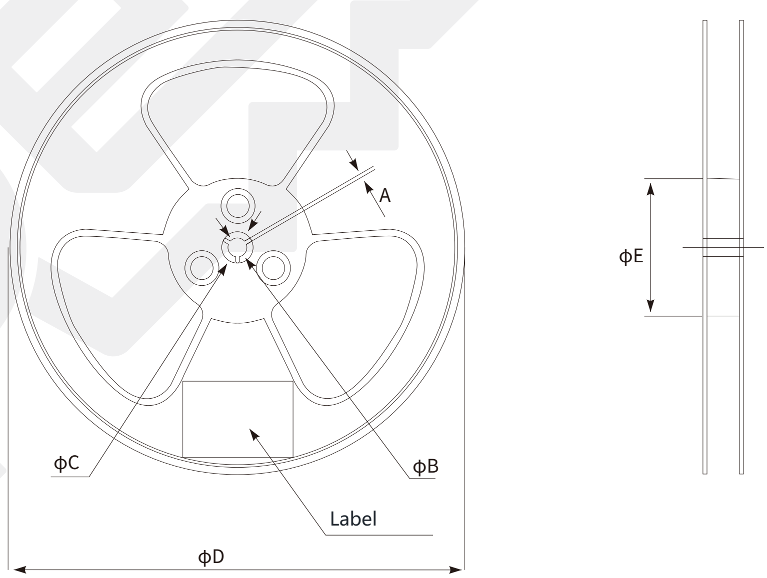
Unit: mm



Resistance	A	B	ϕD_0	ϕD_1	K_0	K_1	K_2	E	G	W	D	T
5mΩ-100mΩ	3.40±0.2	6.75±0.2	1.5±0.1	1.5±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.75±0.1	5.5±0.1	12.0±0.3	1.0±0.1	0.25±0.05

Reel Specifications

Unit: mm



A	ϕB	ϕC	ϕD	ϕE
1.5 min.	13.5 +0.5/-0.2	20.2 Min.	178±2	60±2

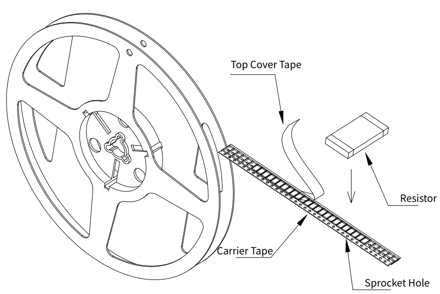
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

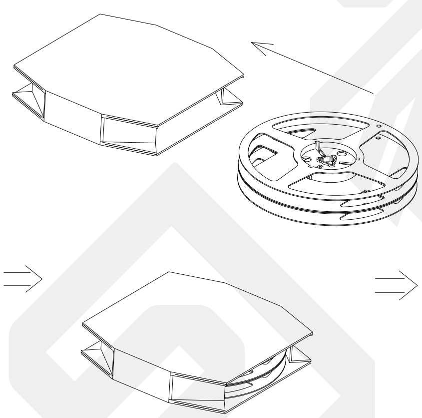
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 180mm*180mm*35mm;

(3) Place every 8 cases into a box (64000 pcs. / box);

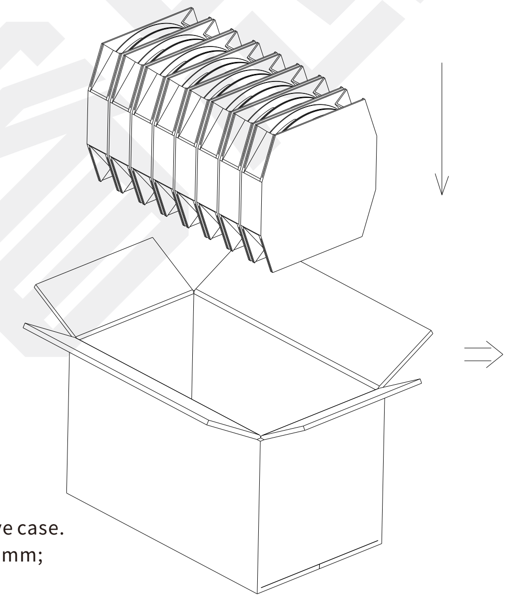
(4) Box size: 330mm*195mm*200mm.



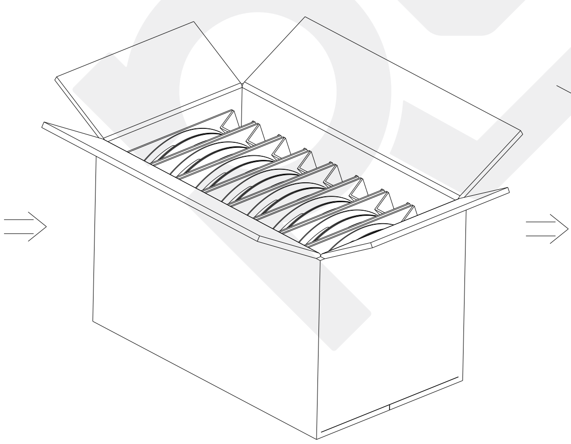
1. 4000 pcs. resistors are packed in a tape and wrapped in a reel.



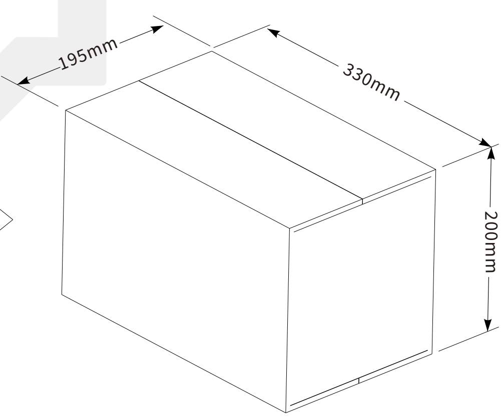
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 180mm*180mm*35mm;



3. Place every 8 cases into a box (64000 pcs. / box).



4.For the last box, 8 cardboard sleeve cases should be placed regardless of quantity of the product, preventing shaking.



5. Box size: 330mm*195mm*200mm

PCSK2512

High-Precision Low-TCR Molded Alloy Current Sensing Resistor

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	Marking	TCR	Power	Max. Operating Current
PCSK2512DR005P9	2512	±0.5%	5.0mΩ	Marked	±25ppm/°C	1W	14A
PCSK2512FR005P9	2512	±1.0%	5.0mΩ	Marked	±25ppm/°C	1W	14A
PCSK2512JR005P9	2512	±5.0%	5.0mΩ	Marked	±25ppm/°C	1W	14A
PCSK2512DR006P9	2512	±0.5%	6.0mΩ	Marked	±25ppm/°C	1W	12A
PCSK2512FR006P9	2512	±1.0%	6.0mΩ	Marked	±25ppm/°C	1W	12A
PCSK2512JR006P9	2512	±5.0%	6.0mΩ	Marked	±25ppm/°C	1W	12A
PCSK2512DR007P9	2512	±0.5%	7.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512FR007P9	2512	±1.0%	7.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512JR007P9	2512	±5.0%	7.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512DR008P9	2512	±0.5%	8.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512FR008P9	2512	±1.0%	8.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512JR008P9	2512	±5.0%	8.0mΩ	Marked	±25ppm/°C	1W	11A
PCSK2512DR009P9	2512	±0.5%	9.0mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512FR009P9	2512	±1.0%	9.0mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512JR009P9	2512	±5.0%	9.0mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512DR010P9	2512	±0.5%	10mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512FR010P9	2512	±1.0%	10mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512JR010P9	2512	±5.0%	10mΩ	Marked	±25ppm/°C	1W	10A
PCSK2512DR015P9	2512	±0.5%	15mΩ	Marked	±25ppm/°C	1W	8A
PCSK2512FR015P9	2512	±1.0%	15mΩ	Marked	±25ppm/°C	1W	8A
PCSK2512JR015P9	2512	±5.0%	15mΩ	Marked	±25ppm/°C	1W	8A
PCSK2512DR018P9	2512	±0.5%	18mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512FR018P9	2512	±1.0%	18mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512JR018P9	2512	±5.0%	18mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512DR020P9	2512	±0.5%	20mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512FR020P9	2512	±1.0%	20mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512JR020P9	2512	±5.0%	20mΩ	Marked	±25ppm/°C	1W	7A
PCSK2512DR025P9	2512	±0.5%	25mΩ	Marked	±25ppm/°C	1W	6A
PCSK2512FR025P9	2512	±1.0%	25mΩ	Marked	±25ppm/°C	1W	6A
PCSK2512JR025P9	2512	±5.0%	25mΩ	Marked	±25ppm/°C	1W	6A
PCSK2512DR030P9	2512	±0.5%	30mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512FR030P9	2512	±1.0%	30mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512JR030P9	2512	±5.0%	30mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512DR033P9	2512	±0.5%	33mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512FR033P9	2512	±1.0%	33mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512JR033P9	2512	±5.0%	33mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512DR040P9	2512	±0.5%	40mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512FR040P9	2512	±1.0%	40mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512JR040P9	2512	±5.0%	40mΩ	Marked	±25ppm/°C	1W	5A
PCSK2512DR047P9	2512	±0.5%	47mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512FR047P9	2512	±1.0%	47mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512JR047P9	2512	±5.0%	47mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512DR050P9	2512	±0.5%	50mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512FR050P9	2512	±1.0%	50mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512JR050P9	2512	±5.0%	50mΩ	Marked	±25ppm/°C	1W	4A
PCSK2512DR100P9	2512	±0.5%	100mΩ	Marked	±25ppm/°C	1W	3A
PCSK2512FR100P9	2512	±1.0%	100mΩ	Marked	±25ppm/°C	1W	3A
PCSK2512JR100P9	2512	±5.0%	100mΩ	Marked	±25ppm/°C	1W	3A

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	Marking	TCR	Power	Max. Operating Current
PCSK2512DR005P6	2512	±0.5%	5.0mΩ	Unmarked	±25ppm/°C	1W	14A
PCSK2512FR005P6	2512	±1.0%	5.0mΩ	Unmarked	±25ppm/°C	1W	14A
PCSK2512JR005P6	2512	±5.0%	5.0mΩ	Unmarked	±25ppm/°C	1W	14A
PCSK2512DR006P6	2512	±0.5%	6.0mΩ	Unmarked	±25ppm/°C	1W	12A
PCSK2512FR006P6	2512	±1.0%	6.0mΩ	Unmarked	±25ppm/°C	1W	12A
PCSK2512JR006P6	2512	±5.0%	6.0mΩ	Unmarked	±25ppm/°C	1W	12A
PCSK2512DR007P6	2512	±0.5%	7.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512FR007P6	2512	±1.0%	7.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512JR007P6	2512	±5.0%	7.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512DR008P6	2512	±0.5%	8.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512FR008P6	2512	±1.0%	8.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512JR008P6	2512	±5.0%	8.0mΩ	Unmarked	±25ppm/°C	1W	11A
PCSK2512DR009P6	2512	±0.5%	9.0mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512FR009P6	2512	±1.0%	9.0mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512JR009P6	2512	±5.0%	9.0mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512DR010P6	2512	±0.5%	10mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512FR010P6	2512	±1.0%	10mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512JR010P6	2512	±5.0%	10mΩ	Unmarked	±25ppm/°C	1W	10A
PCSK2512DR015P6	2512	±0.5%	15mΩ	Unmarked	±25ppm/°C	1W	8A
PCSK2512FR015P6	2512	±1.0%	15mΩ	Unmarked	±25ppm/°C	1W	8A
PCSK2512JR015P6	2512	±5.0%	15mΩ	Unmarked	±25ppm/°C	1W	8A
PCSK2512DR018P6	2512	±0.5%	18mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512FR018P6	2512	±1.0%	18mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512JR018P6	2512	±5.0%	18mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512DR020P6	2512	±0.5%	20mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512FR020P6	2512	±1.0%	20mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512JR020P6	2512	±5.0%	20mΩ	Unmarked	±25ppm/°C	1W	7A
PCSK2512DR025P6	2512	±0.5%	25mΩ	Unmarked	±25ppm/°C	1W	6A
PCSK2512FR025P6	2512	±1.0%	25mΩ	Unmarked	±25ppm/°C	1W	6A
PCSK2512JR025P6	2512	±5.0%	25mΩ	Unmarked	±25ppm/°C	1W	6A
PCSK2512DR030P6	2512	±0.5%	30mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512FR030P6	2512	±1.0%	30mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512JR030P6	2512	±5.0%	30mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512DR033P6	2512	±0.5%	33mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512FR033P6	2512	±1.0%	33mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512JR033P6	2512	±5.0%	33mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512DR040P6	2512	±0.5%	40mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512FR040P6	2512	±1.0%	40mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512JR040P6	2512	±5.0%	40mΩ	Unmarked	±25ppm/°C	1W	5A
PCSK2512DR047P6	2512	±0.5%	47mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512FR047P6	2512	±1.0%	47mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512JR047P6	2512	±5.0%	47mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512DR050P6	2512	±0.5%	50mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512FR050P6	2512	±1.0%	50mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512JR050P6	2512	±5.0%	50mΩ	Unmarked	±25ppm/°C	1W	4A
PCSK2512DR100P6	2512	±0.5%	100mΩ	Unmarked	±25ppm/°C	1W	3A
PCSK2512FR100P6	2512	±1.0%	100mΩ	Unmarked	±25ppm/°C	1W	3A
PCSK2512JR100P6	2512	±5.0%	100mΩ	Unmarked	±25ppm/°C	1W	3A

Data Sheet No:E05014
Version:V3
Date:2024/03/09

Resi 睿思

EBWM2512

High-Precision Low-Inductance Alloy Current Sensing Resistor

Resistance	0.3mΩ~1mΩ
Tolerance	±0.5%
TCR	±200ppm/℃
Rated Current	77A~140A

Applications

Automotive Electronics

Precision Power Supply

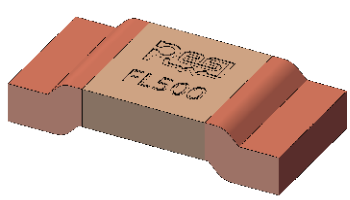
Formation & Sorting of Battery

Electric Tools

Medical Equipment

Better Solution for Sustainable High End Manufacturing

Low-Inductance Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Reliability



Introduction

EBWM2512 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, EBWM2512 achieves a maximum target tolerance of ± 0.5% after stamping without trimming. TCR of EBWM2512 series within the temperature range of -55 °C to +170 °C is ≤ ±200ppm/°C. Inductance is < 3nH.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

EBWM2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

AEC-Q200

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
EBWM2512	0.3mΩ	6W	140A	-55°C~+170°C	±200(-55°C~+170°C)	4.1°C/W	±0.5 ±1.0 ±5.0
EBWM2512	0.5mΩ	6W	109A	-55°C~+170°C	±200(-55°C~+170°C)	5.1°C/W	±0.5 ±1.0 ±5.0
EBWM2512	1.0mΩ	6W	77A	-55°C~+170°C	±200(-55°C~+170°C)	11.1°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

Inductance of EBWM2512 current sensing resistors is less than 3nH, suitable for AC, DC low and high frequency sampling circuits.

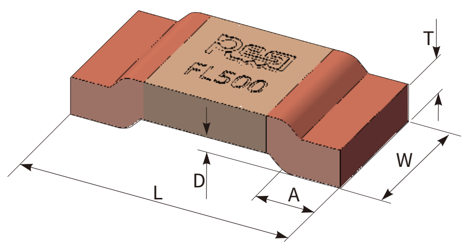
EBWM2512

High-Precision Low-Inductance Alloy Current Sensing Resistor

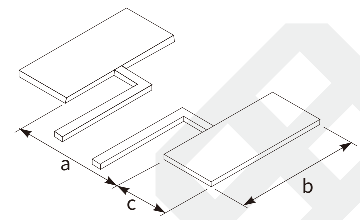
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
0.3mΩ	6.3±0.3	3.0±0.3	1.3±0.3	1.0±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.17±0.05
0.5mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.9±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.16±0.05
1.0mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.4±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.07±0.03

Part Number Information

Example：EBWM2512FL500S9 (EBWM 2512 ±1.0% 0.5mΩ ±200ppm/°C Standard)

E	B	W	M	2	5	1	2	F	L	5	0	0	S	9

Series	Size	Tolerance	Resistance	TCR	Code
EBWM	2512	D=±0.5%	L300=0.3mΩ	S=±200ppm/°C	9=Standard
		F=±1.0%	L500=0.5mΩ		
		J=±5.0%	1L00=1.0mΩ		

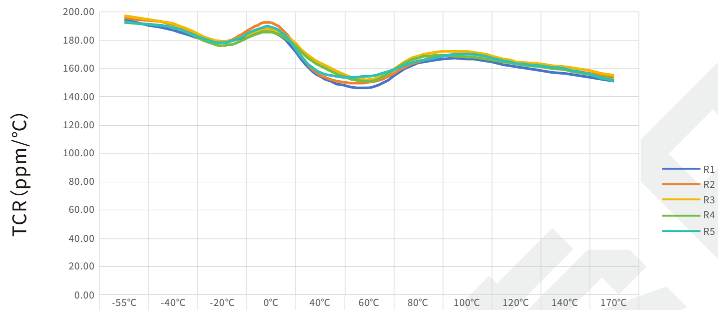
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ ±200ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

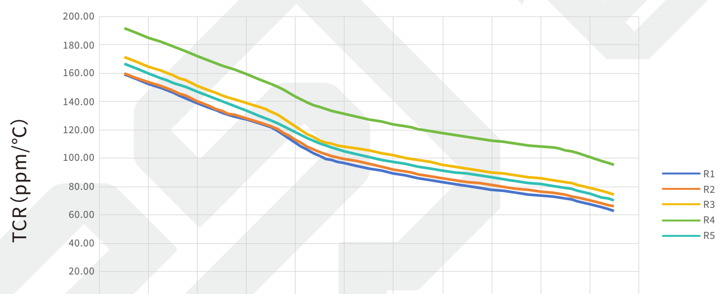
TCR Test Curve - EBWM2512 0.3mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	194.38	187.04	178.84	186.47	154.26	146.64	163.87	166.98	161.38	156.24	150.99
R2	195.82	191.32	178.94	192.44	155.31	150.24	164.87	170.50	164.08	159.53	153.96
R3	197.05	191.64	179.24	187.69	164.02	152.18	169.09	172.05	165.03	161.20	155.11
R4	192.65	189.05	176.39	185.67	162.04	151.07	167.67	168.37	163.39	158.95	152.14
R5	192.94	188.77	178.34	189.33	157.21	154.68	165.10	170.31	163.64	159.75	151.24

Temperature (°C)

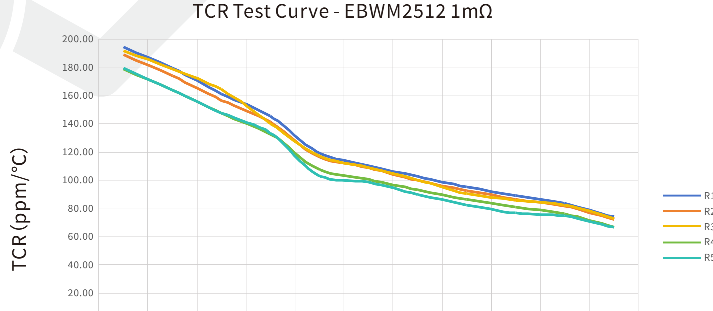
TCR Test Curve - EBWM2512 0.5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	159.15	146.14	132.34	121.61	101.17	93.00	86.18	80.48	75.62	71.71	63.09
R2	159.80	147.68	133.22	122.50	104.13	95.96	88.81	83.45	78.61	74.18	65.88
R3	171.40	158.49	144.46	132.81	112.53	105.43	98.68	92.76	87.79	83.30	74.34
R4	191.85	178.75	165.71	152.33	135.86	127.63	120.77	115.28	110.13	105.84	95.10
R5	166.81	153.42	140.41	126.73	110.51	100.87	94.28	88.96	83.74	79.08	70.16

Temperature (°C)

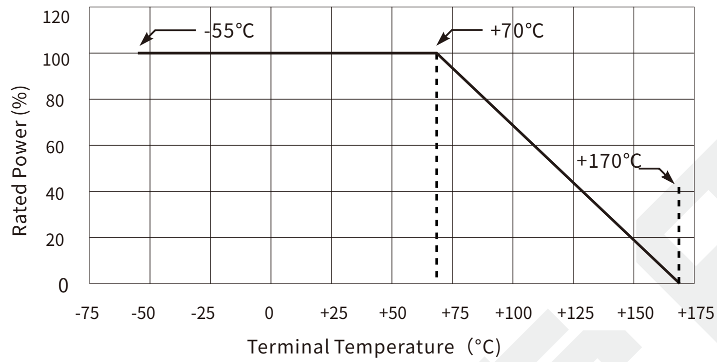
TCR Test Curve - EBWM2512 1mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	194.58	179.58	161.37	145.33	119.27	110.25	102.74	95.34	89.00	83.53	73.97
R2	189.18	174.02	156.82	141.29	116.24	108.97	99.87	92.81	86.58	81.83	71.95
R3	192.17	178.77	164.38	140.39	117.16	109.08	100.33	90.39	85.95	82.40	73.06
R4	178.93	163.87	147.43	132.81	107.54	100.60	93.17	86.35	80.97	76.07	66.80
R5	179.52	164.00	147.90	133.64	103.11	98.60	89.93	82.71	76.68	74.66	66.60

Temperature (°C)

Derating Curve



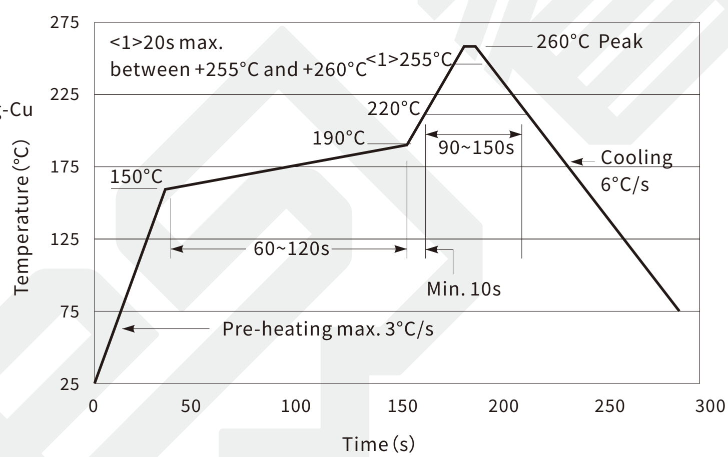
Reflow Soldering Profile

Resistor Surface Temperature:

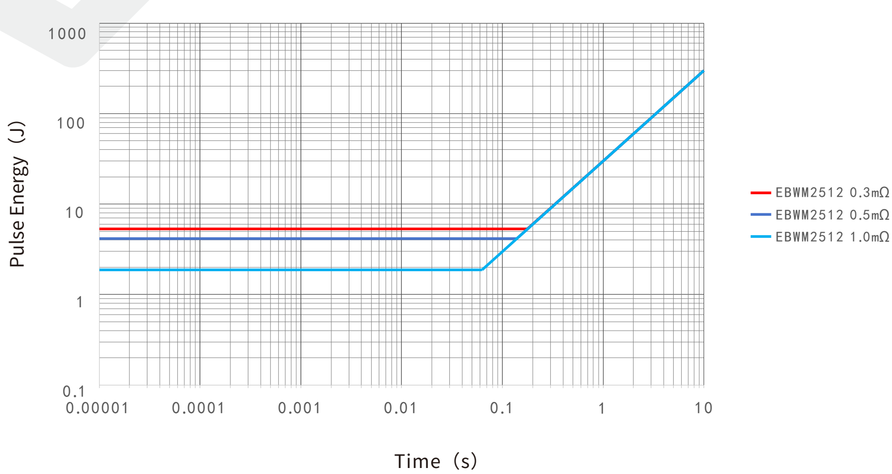
Pre-Heat: +150°C~+190°C, 60~120sec.

Reflow: Above +220°C, 90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



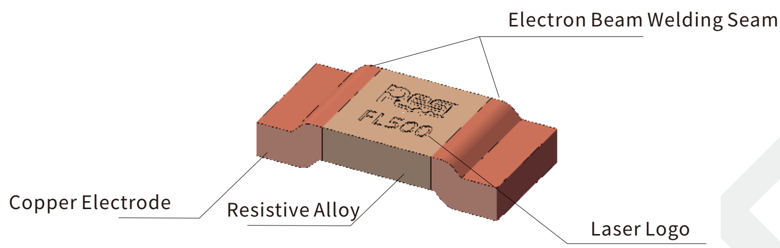
Maximum Pulse Energy Curve



EBWM2512

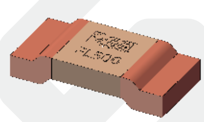
High-Precision Low-Inductance Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
2512		RESI：Brand F：Tolerance L500：Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be less than the rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

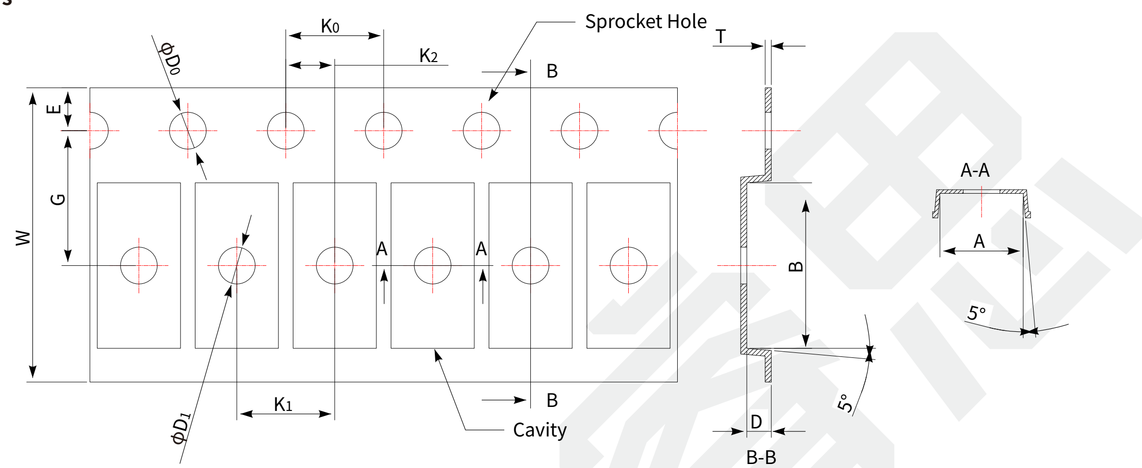
(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor solderability caused by oxidation of the resistor.

C&B Electronics Shenzhen CO., LTD. | www.resistor.today | resi@cbeureka.com | Tel:0755-82899519

Packaging

Tape Specifications

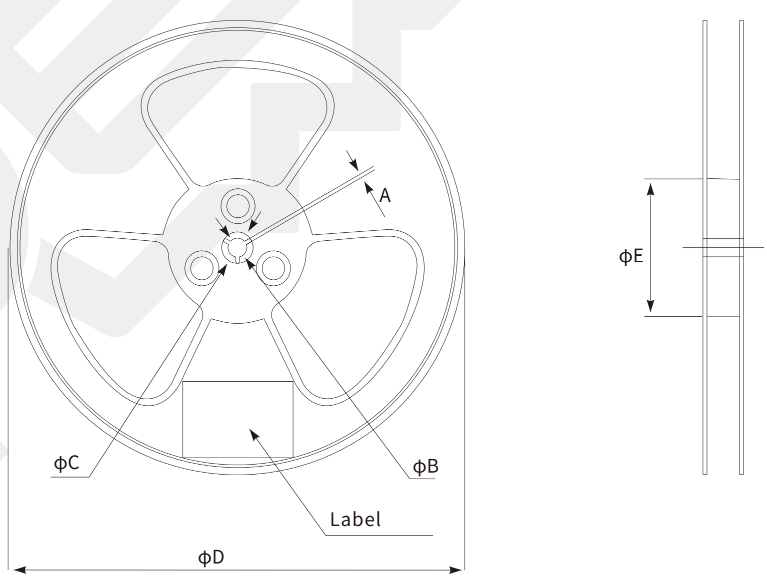
Unit：mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
0.3mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	1.50±0.1	0.25±0.05
0.5mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	1.50±0.1	0.25±0.05
1.0mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.90±0.1	0.23±0.05

Reel Specifications

Unit：mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

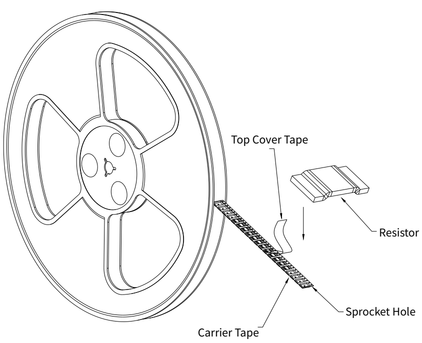
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (24000 pcs. / box);

(4) Box size: 350mm*370mm*165mm.



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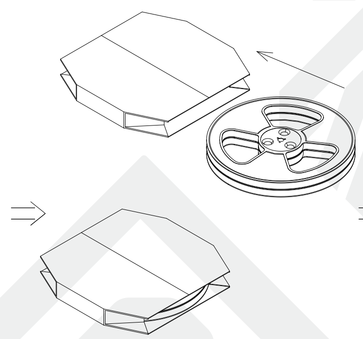
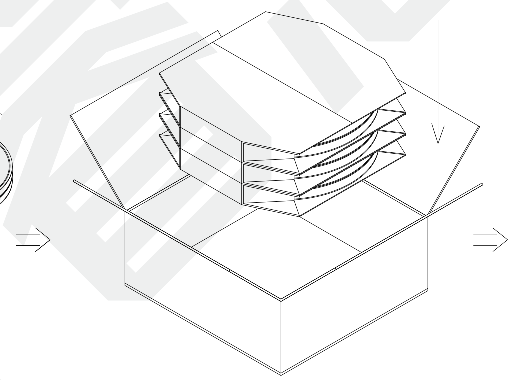
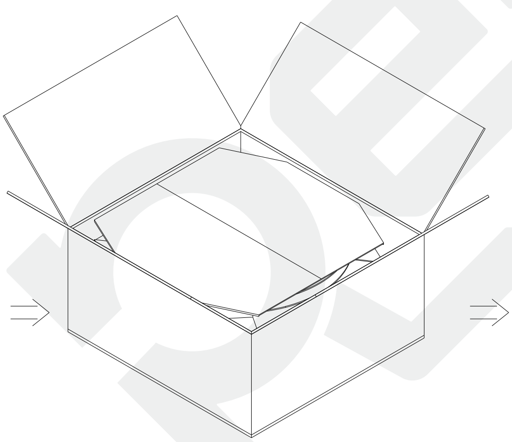


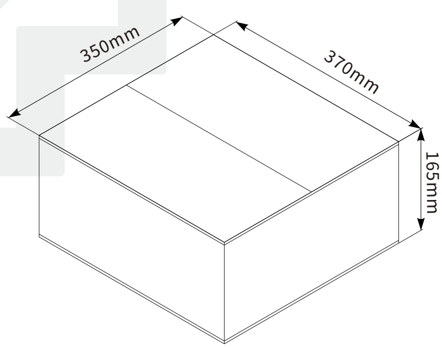
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. Place every 3 cases into a box (24000 pcs. / box).



4. bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350*370*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
EBWM2512DL300S9	2512	±0.5%	0.3mΩ	±200ppm/°C	6W	140A
EBWM2512FL300S9	2512	±1.0%	0.3mΩ	±200ppm/°C	6W	140A
EBWM2512JL300S9	2512	±5.0%	0.3mΩ	±200ppm/°C	6W	140A
EBWM2512DL500S9	2512	±0.5%	0.5mΩ	±200ppm/°C	6W	109A
EBWM2512FL500S9	2512	±1.0%	0.5mΩ	±200ppm/°C	6W	109A
EBWM2512JL500S9	2512	±5.0%	0.5mΩ	±200ppm/°C	6W	109A
EBWM2512D1L00S9	2512	±0.5%	1.0mΩ	±200ppm/°C	6W	77A
EBWM2512F1L00S9	2512	±1.0%	1.0mΩ	±200ppm/°C	6W	77A
EBWM2512J1L00S9	2512	±5.0%	1.0mΩ	±200ppm/°C	6W	77A

Data Sheet No：E05015

Version：V3

Date：2024/03/14

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EBWK2512

High-Precision Low-Inductance Alloy Current Sensing Resistor

Resistance	2mΩ~5mΩ
Tolerance	±0.5%
TCR	±100ppm/℃
Rated Current	22A~50A

Applications

Automotive Electronics

Precision Power Supply

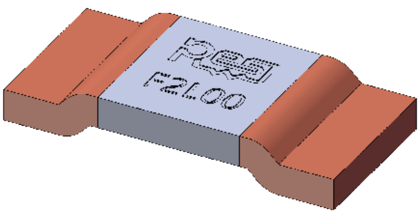
Instrumentation

Testing & Measurement Equipment

Medical Equipment

Better Solution for Sustainable High End Manufacturing

Low-Inductance Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Reliability



Introduction

EBWK2512 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, EBWK2512 achieves a maximum target tolerance of ± 0.5% after stamping without trimming. TCR of EBWK2512 series within the temperature range of -55 °C to +170 °C is ⩽ ±100ppm/°C. Inductance is < 3nH.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

RoHS AEC-Q200 3D

EBWK2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°CRef)	Thermal Resistance*	Tolerance %
EBWK2512	2mΩ	5W	50A	-55°C~+170°C	±100(-55°C~+170°C)	13.2°C/W	±0.5 ±1.0 ±5.0
EBWK2512	3mΩ	4W	36A	-55°C~+170°C	±100(-55°C~+170°C)	19.8°C/W	±0.5 ±1.0 ±5.0
EBWK2512	4mΩ	3W	27A	-55°C~+170°C	±100(-55°C~+170°C)	24.3°C/W	±0.5 ±1.0 ±5.0
EBWK2512	5mΩ	2.5W	22A	-55°C~+170°C	±100(-55°C~+170°C)	31.1°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

Inductance of EBWK2512 current sensing resistors is less than 3nH, suitable for AC, DC low and high frequency sampling circuits.

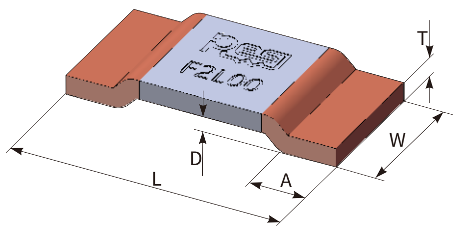
EBWK2512

High-Precision Low-Inductance Alloy Current Sensing Resistor

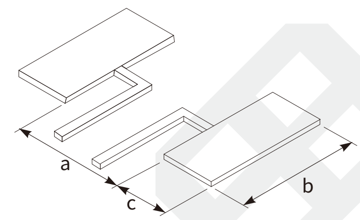
Dimensions

Unit: mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
2mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.6±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.11±0.05
3mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.4±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.07±0.05
4mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.33±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.06±0.05
5mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.25±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.05±0.05

Part Number Information

Example: EBWK2512F2L00K9 (EBWK 2512 ±1.0% 2mΩ ±100ppm/°C Standard)

E	B	W	K	2	5	1	2	F	2	L	0	0	K	9

Series	Size	Tolerance	Resistance	TCR	Code
EBWK	2512	D=±0.5% F=±1.0% J=±5.0%	2L00=2mΩ 3L00=3mΩ 4L00=4mΩ 5L00=5mΩ	K=±100ppm/°C	9=Standard

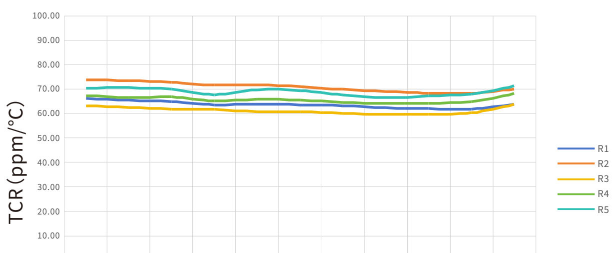
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ ±100ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

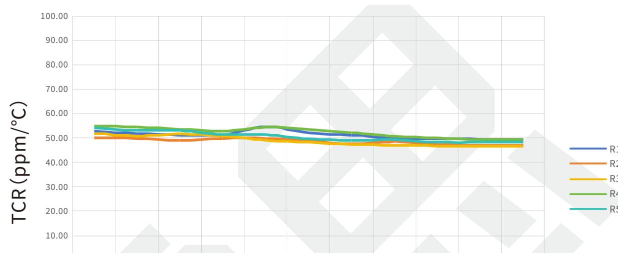
TCR Test Curve -EBWK2512 2mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	66.23	65.50	64.97	63.66	63.93	63.66	63.32	62.42	62.04	61.87	63.78
R2	73.88	73.50	72.85	71.67	71.93	71.02	69.94	69.20	68.44	68.33	70.07
R3	63.24	62.55	61.94	61.68	60.90	60.90	60.21	59.67	59.87	60.30	63.79
R4	67.44	66.62	66.88	65.32	65.84	65.58	64.62	64.14	64.27	64.97	68.27
R5	70.50	70.64	69.99	67.79	69.86	69.47	67.70	66.49	67.32	68.05	71.31

Temperature (℃)

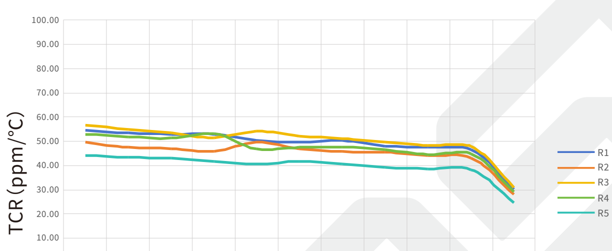
TCR Test Curve -EBWK2512 3mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	52.89	51.86	51.29	51.29	54.71	52.15	51.29	50.01	49.92	49.58	49.58
R2	50.01	49.89	49.03	49.89	49.88	49.02	47.59	48.59	47.47	47.02	46.93
R3	51.99	50.86	51.71	50.86	49.16	48.32	47.47	47.05	46.79	46.62	46.74
R4	54.97	54.51	53.66	52.81	54.51	53.66	52.24	50.68	50.08	49.40	49.40
R5	54.37	53.11	53.11	51.40	51.39	49.68	49.11	49.25	48.31	48.25	48.46

Temperature (℃)

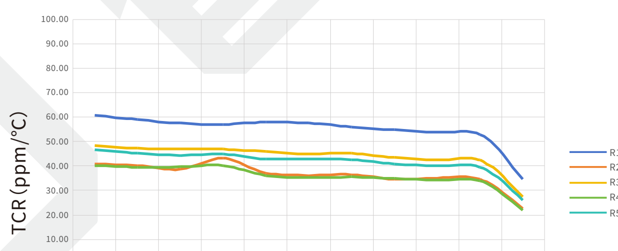
TCR Test Curve -EBWK2512 4mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	54.43	53.40	52.97	52.97	50.38	49.74	50.38	48.12	47.54	46.72	30.14
R2	49.55	47.51	47.09	45.82	49.64	47.09	45.82	45.50	44.29	43.27	28.00
R3	56.74	55.02	53.51	51.58	54.16	52.22	51.15	49.64	48.23	47.92	30.95
R4	53.02	51.92	51.29	53.19	46.86	47.49	47.70	46.54	44.58	44.96	29.04
R5	44.22	43.46	43.04	41.77	40.51	41.77	40.51	39.24	38.73	38.40	24.64

Temperature (℃)

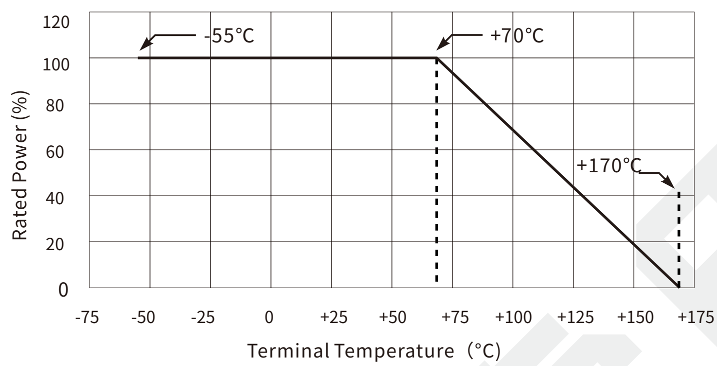
TCR Test Curve -EBWK2512 5mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	60.84	59.04	57.54	57.04	58.04	57.54	56.04	54.79	53.84	53.04	34.56
R2	40.98	40.18	38.67	43.19	37.16	36.16	36.49	34.65	35.15	34.65	22.77
R3	48.45	47.25	46.92	46.92	45.92	44.92	45.25	43.42	42.52	42.42	27.55
R4	40.19	39.52	39.69	40.19	36.17	35.17	35.50	34.92	34.16	34.00	21.97
R5	46.55	45.22	44.39	44.89	42.89	42.89	42.56	40.90	40.10	39.57	26.20

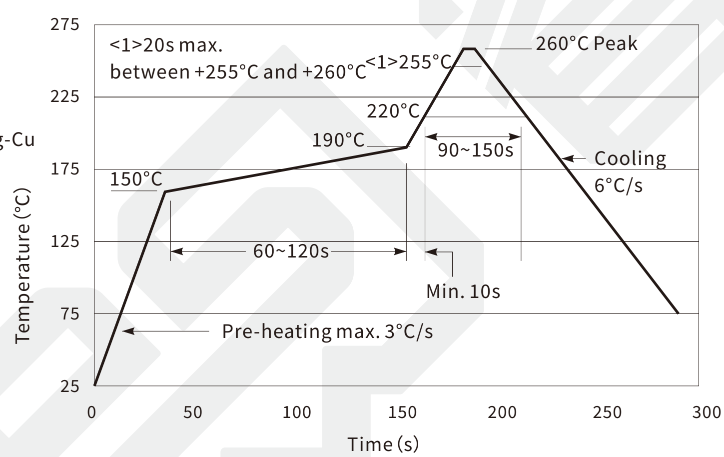
Temperature (℃)

Derating Curve

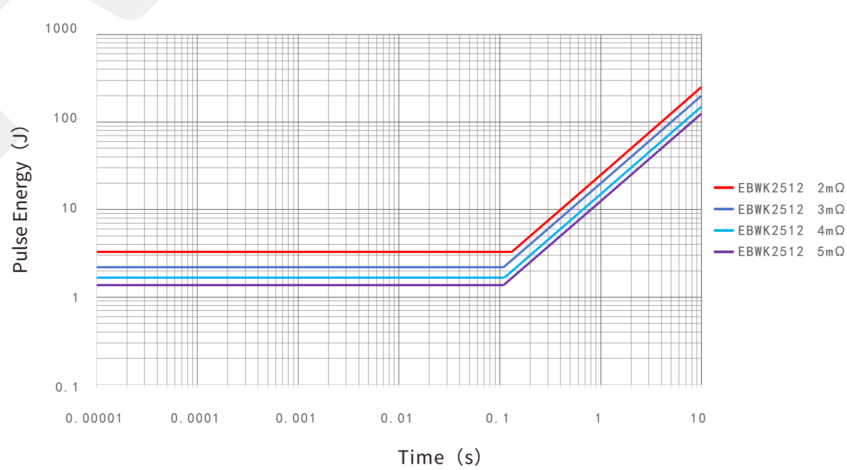


Reflow Soldering Profile

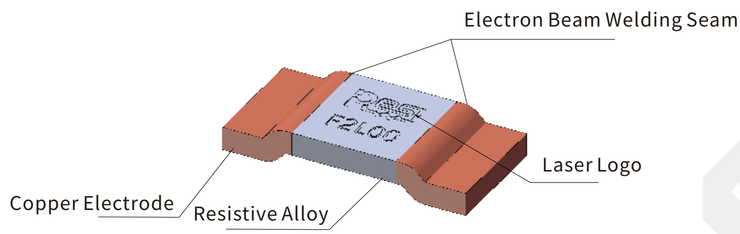
Resistor Surface Temperature：
Pre-Heat: +150℃~+190℃, 60~120sec.
Reflow: Above +220℃, 90~150sec.
Applicable Solder Composition: Sn-Ag-Cu



Maximum Pulse Energy Curve

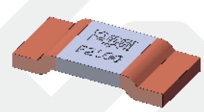


Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
2512		RESI:Brand F:Tolerance 2L00:Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be less than the rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

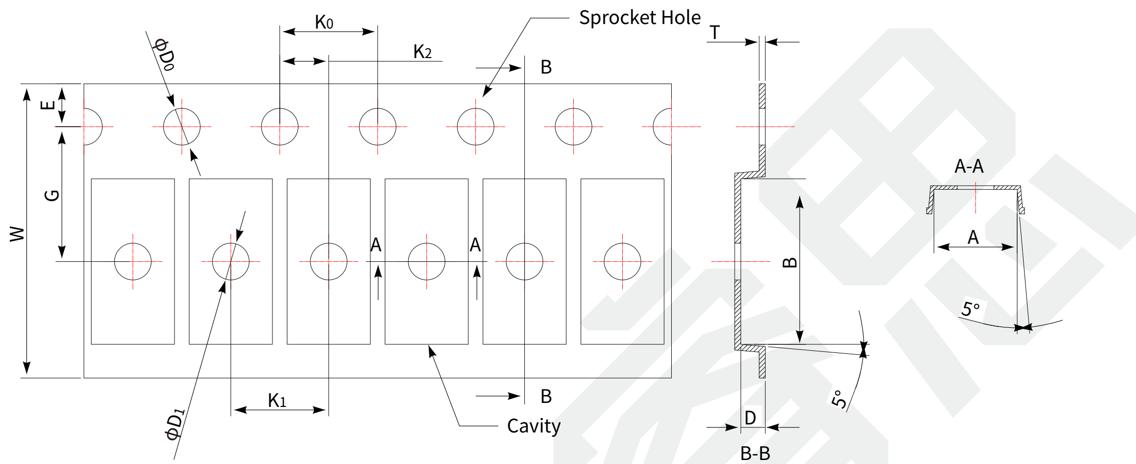
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor solderability caused by oxidation of the resistor.

Packaging

Tape Specifications

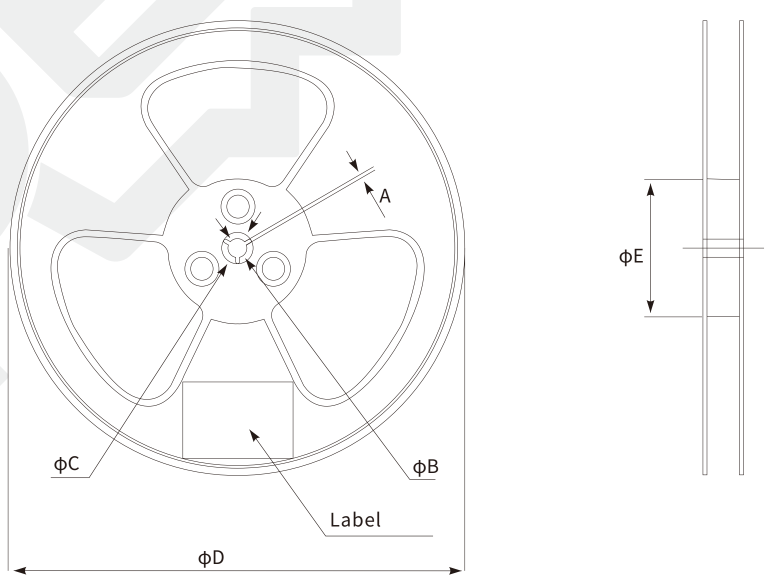
Unit：mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
2mΩ	3.40±0.2	6.75±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	1.00±0.1	0.23±0.05
3mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.90±0.1	0.23±0.05
4mΩ	3.20±0.2	6.50±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.73±0.1	0.23±0.05
5mΩ	3.20±0.2	6.50±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.73±0.1	0.23±0.05

Reel Specifications

Unit：mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

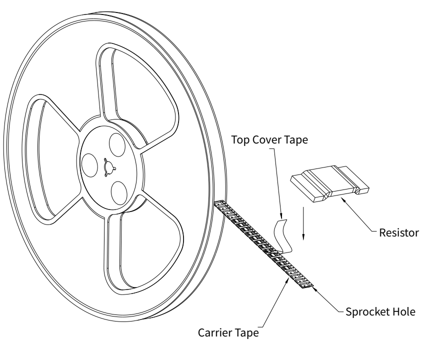
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

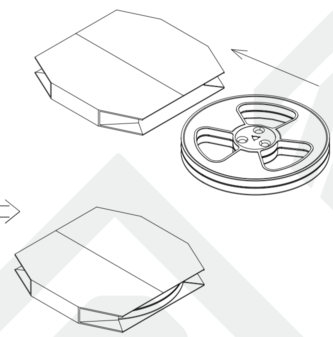
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (24000 pcs. / box);

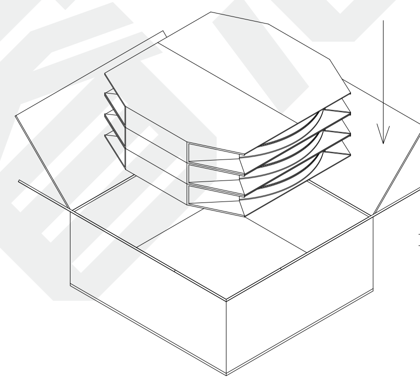
(4) Box size: 350mm*370mm*165mm.



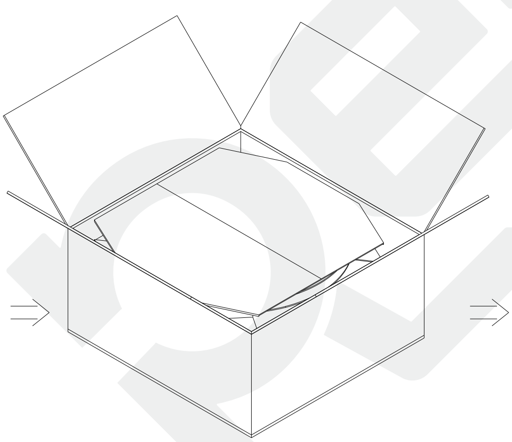
1. 4000 pcs. resistors are packed in a tape and wrapped in a reel.



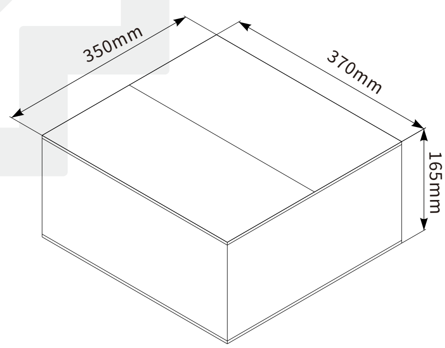
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. Place every 3 cases into a box (24000 pcs. / box).



4. For the last box which is less than 24000 pcs., bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
EBWK2512J2L00K9	2512	±5.0%	2mΩ	±100ppm/°C	5W	50A
EBWK2512F2L00K9	2512	±1.0%	2mΩ	±100ppm/°C	5W	50A
EBWK2512D2L00K9	2512	±0.5%	2mΩ	±100ppm/°C	5W	50A
EBWK2512J3L00K9	2512	±5.0%	3mΩ	±100ppm/°C	4W	36A
EBWK2512F3L00K9	2512	±1.0%	3mΩ	±100ppm/°C	4W	36A
EBWK2512D3L00K9	2512	±0.5%	3mΩ	±100ppm/°C	4W	36A
EBWK2512J4L00K9	2512	±5.0%	4mΩ	±100ppm/°C	3W	27A
EBWK2512F4L00K9	2512	±1.0%	4mΩ	±100ppm/°C	3W	27A
EBWK2512D4L00K9	2512	±0.5%	4mΩ	±100ppm/°C	3W	27A
EBWK2512J5L00K9	2512	±5.0%	5mΩ	±100ppm/°C	2.5W	22A
EBWK2512F5L00K9	2512	±1.0%	5mΩ	±100ppm/°C	2.5W	22A
EBWK2512D5L00K9	2512	±0.5%	5mΩ	±100ppm/°C	2.5W	22A

Data Sheet No:E16014

Version:V3

Date:2024/03/14

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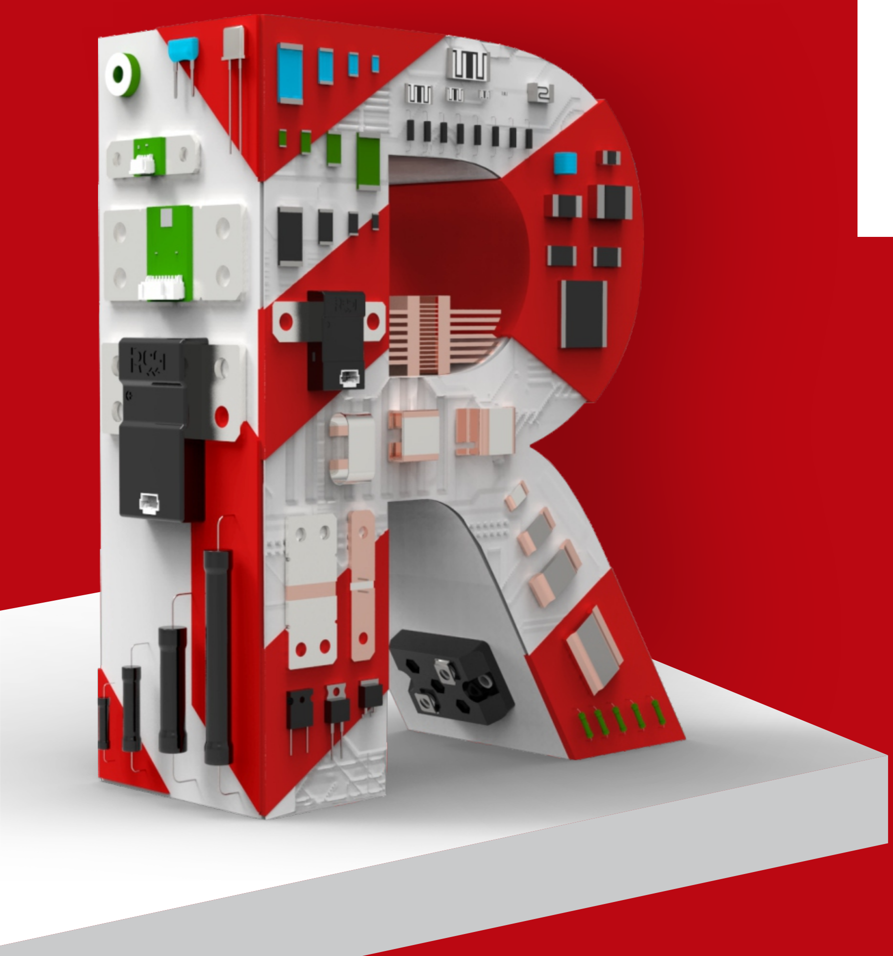
PEWF2512

High-Precision Low-TCR Alloy Current Sensing Resistor

Resistance	1.5mΩ~5mΩ
Tolerance	±0.5%
TCR	±50ppm/℃
Rated Current	22A~57A



Applications

Automotive Electronics

Precision Power Supply

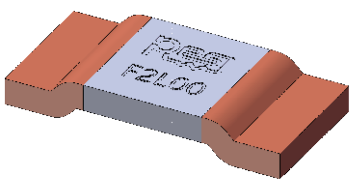
Instrumentation

Formation & Sorting of Battery

Medical Equipment

Better Solution for Sustainable High End Manufacturing

Low-TCR Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision & Reliability



Introduction

PEWF2512 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, PEWF2512 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of PEWF2512 series within the temperature range of -55 °C to +170 °C is ⩽ ±50ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

PEWF2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
PEWF2512	1.5mΩ	5W	57A	-55°C~+170°C	±50(-55°C~+170°C)	9.7°C/W	±0.5 ±1.0 ±5.0
PEWF2512	2mΩ	5W	50A	-55°C~+170°C	±50(-55°C~+170°C)	13.4°C/W	±0.5 ±1.0 ±5.0
PEWF2512	3mΩ	4W	36A	-55°C~+170°C	±50(-55°C~+170°C)	19.8°C/W	±0.5 ±1.0 ±5.0
PEWF2512	4mΩ	3W	27A	-55°C~+170°C	±50(-55°C~+170°C)	26.9°C/W	±0.5 ±1.0 ±5.0
PEWF2512	5mΩ	2.5W	22A	-55°C~+170°C	±50(-55°C~+170°C)	33.6°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

PEWF2512 is only suitable for DC low-frequency sampling circuits. Please contact us if you need AC or high-frequency working conditions.

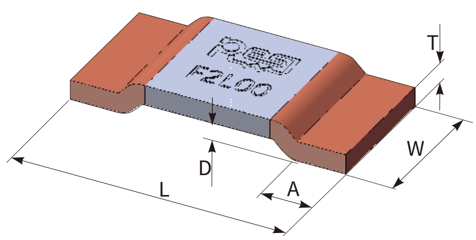
PEWF2512

High-Precision Low-TCR Alloy Current Sensing Resistor

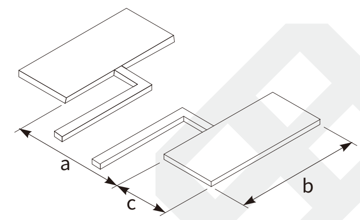
Dimensions

Unit: mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
1.5mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.90±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.14±0.04
2mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.65±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.10±0.03
3mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.45±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.07±0.03
4mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.33±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.06±0.02
5mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.27±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.04±0.02

Part Number Information

Example: PEWF2512F2L00Q9 (PEWF 2512 ±1.0% 2mΩ ±50ppm/°C Standard)

P	E	W	F	2	5	1	2	F	2	L	0	0	Q	9

Series	Size	Tolerance	Resistance	TCR	Code
PEWF	2512	D=±0.5% F=±1.0% J=±5.0%	1L50=1.5mΩ 2L00=2mΩ 3L00=3mΩ 4L00=4mΩ 5L00=5mΩ	Q=±50ppm/°C	9=Standard

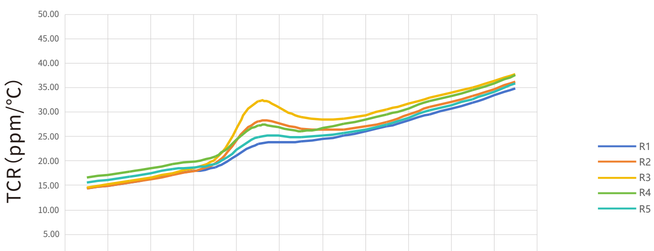
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ ±50ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

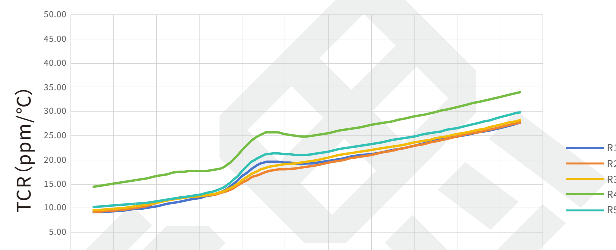
TCR Test Curve - PEWF2512 1.5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	14.44	15.52	17.33	18.77	23.47	24.01	25.15	27.08	29.61	31.95	34.95
R2	14.33	15.66	17.09	19.58	28.12	26.70	26.46	28.03	31.04	33.28	36.26
R3	14.52	16.00	17.55	20.42	32.24	29.02	28.66	30.54	32.96	35.11	37.83
R4	16.61	17.81	19.35	21.01	27.27	26.17	27.64	29.48	32.21	34.46	37.54
R5	15.64	16.74	18.33	19.42	24.92	24.92	25.78	27.49	30.35	32.68	35.92

Temperature (°C)

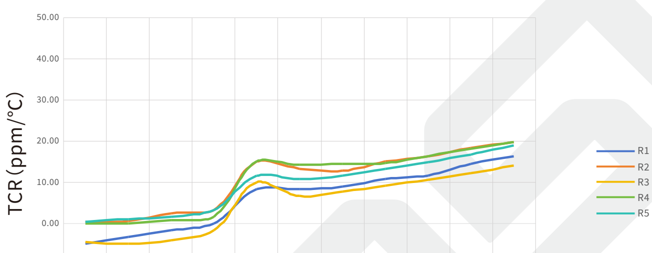
TCR Test Curve - PEWF2512 2mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	85°C	100°C	120°C	140°C	170°C
R1	9.11	9.81	11.29	13.40	19.44	19.17	20.57	22.00	23.95	25.61	27.69
R2	9.12	9.99	12.10	13.15	17.36	18.54	20.25	21.90	23.83	25.77	27.80
R3	9.45	10.33	11.98	13.28	18.23	19.53	21.36	22.72	24.43	26.18	28.24
R4	14.47	15.76	17.46	18.26	25.52	24.85	26.41	28.00	29.87	31.96	33.96
R5	10.14	10.90	12.10	14.10	21.01	21.01	22.61	24.07	25.69	27.61	29.90

Temperature (°C)

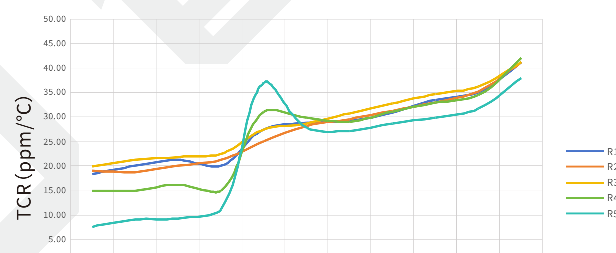
TCR Test Curve - PEWF2512 3mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	85°C	100°C	120°C	140°C	170°C
R1	-4.90	-3.34	-1.67	0.00	8.36	8.36	8.92	10.87	11.70	14.49	16.24
R2	0.44	0.56	2.50	3.34	15.01	13.34	12.79	15.01	16.34	18.35	19.78
R3	-4.44	-5.00	-4.17	-1.67	10.00	6.67	7.78	9.17	10.67	12.22	14.05
R4	0.00	0.00	0.84	1.67	15.07	14.23	14.51	14.65	16.41	18.14	19.85
R5	0.44	1.10	1.66	3.31	11.59	10.76	11.59	13.25	14.91	16.84	18.93

Temperature (°C)

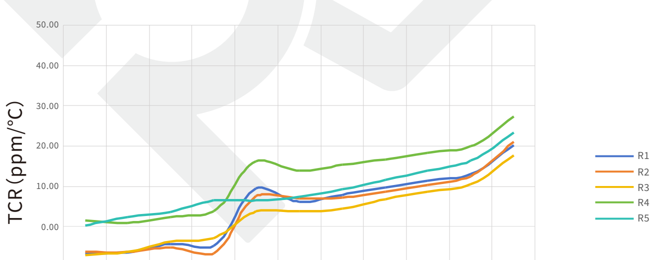
TCR Test Curve - PEWF2512 4mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	85°C	100°C	120°C	140°C	170°C
R1	18.35	20.02	21.27	20.02	27.52	28.78	29.19	30.96	33.53	35.03	41.20
R2	19.02	18.77	20.02	21.28	25.03	28.16	29.62	31.29	33.04	35.25	41.22
R3	19.97	21.22	21.85	22.47	27.46	28.71	30.79	32.77	34.70	36.20	41.28
R4	14.95	14.95	16.20	14.95	31.15	29.90	29.07	31.15	32.89	34.47	42.03
R5	7.58	9.06	9.27	11.12	37.06	27.80	27.18	28.72	29.90	31.71	38.05

Temperature (°C)

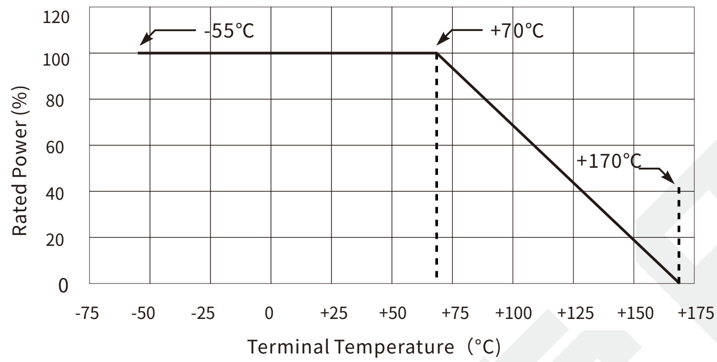
TCR Test Curve - PEWF2512 5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	85°C	100°C	120°C	140°C	170°C
R1	-6.59	-6.34	-4.28	-4.75	9.50	6.18	7.92	9.74	11.40	12.99	20.15
R2	-6.27	-6.27	-5.17	-6.58	7.52	7.05	7.21	8.70	10.34	12.54	21.07
R3	-7.01	-6.26	-3.76	-2.82	3.76	3.76	4.38	6.81	8.64	10.49	17.66
R4	1.53	0.96	2.39	3.82	16.26	13.87	15.30	16.73	18.36	19.92	27.28
R5	0.25	2.47	3.70	6.48	6.48	7.40	9.25	11.57	13.88	16.35	23.32

Temperature (°C)

Derating Curve



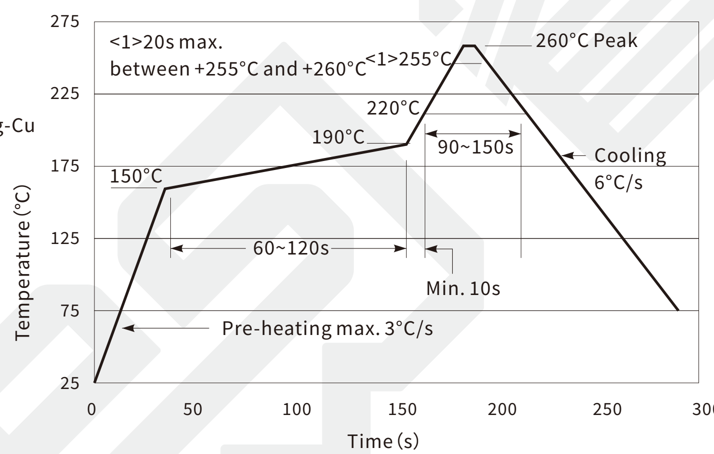
Reflow Soldering Profile

Resistor Surface Temperature：

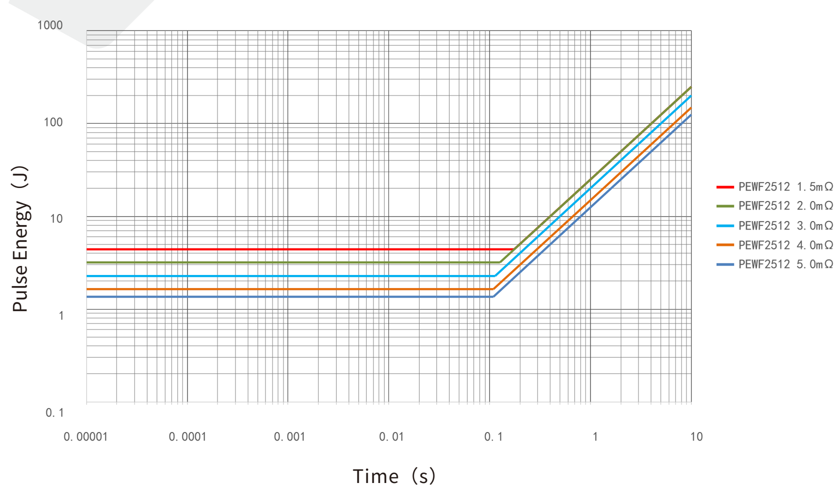
Pre-Heat: +150°C~+190°C, 60~120sec.

Reflow: Above +220°C, 90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



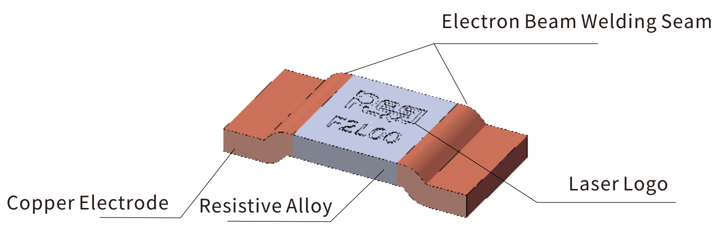
Maximum Pulse Energy Curve



PEWF2512

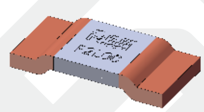
High-Precision Low-TCR Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
2512		RESI: Brand F: Tolerance 2L00: Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be less than the rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

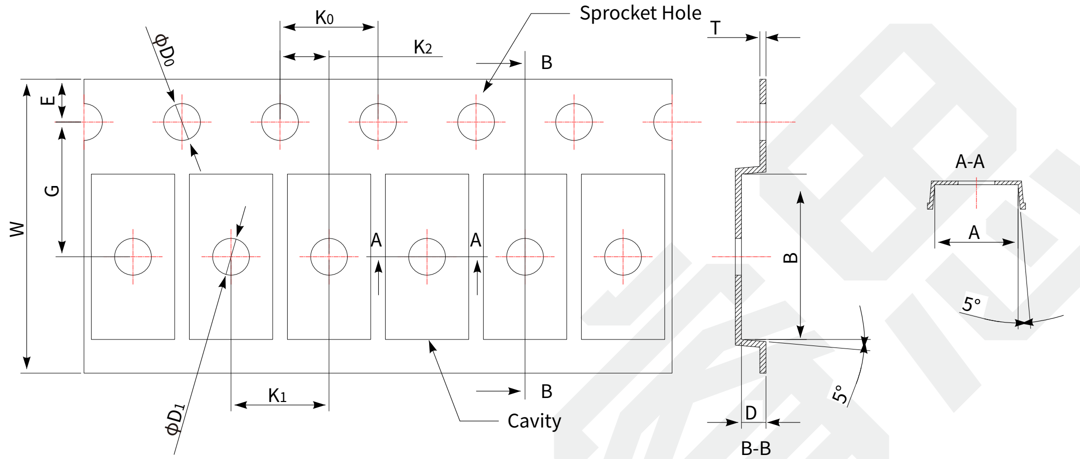
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor solderability caused by oxidation of the resistor.

Packaging

Tape Specifications

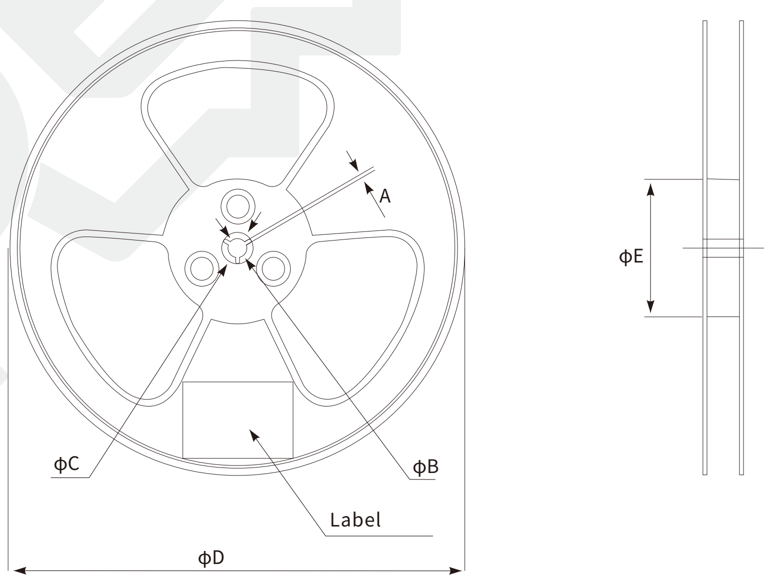
Unit：mm



Resistance	A	B	ϕD_0	ϕD_1	K_0	K_1	K_2	E	G	W	D	T
1.5mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.3	1.50±0.1	0.25±0.05
2mΩ	3.40±0.2	6.75±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.3	1.00±0.1	0.23±0.05
3mΩ	3.30±0.2	6.60±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.3	0.90±0.1	0.23±0.05
4mΩ	3.20±0.2	6.50±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.3	0.73±0.1	0.23±0.05
5mΩ	3.20±0.2	6.50±0.2	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.3	0.73±0.1	0.23±0.05

Reel Specifications

Unit：mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

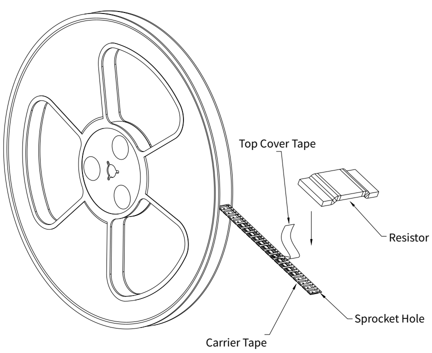
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

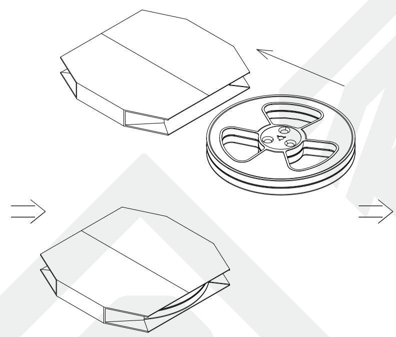
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (24000 pcs. / box);

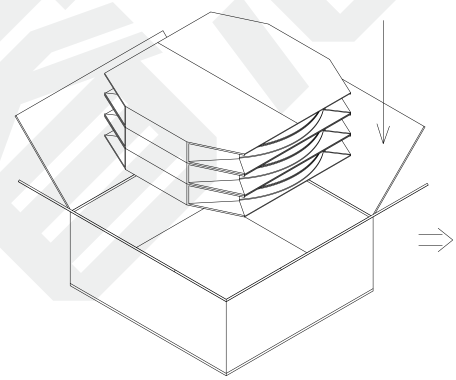
(4) Box size: 350mm*370mm*165mm.



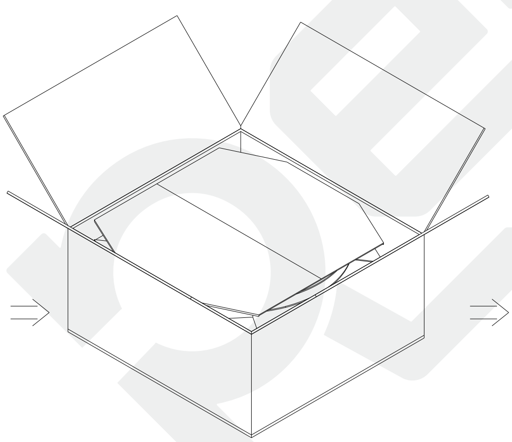
1. 4000 pcs. resistors are packed in a tape and wrapped in a reel.



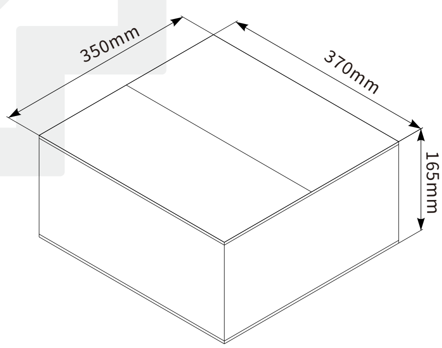
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. Place every 3 cases into a box (24000 pcs. / box).



4. Bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
PEWF2512D1L50Q9	2512	±0.5%	1.5mΩ	±50ppm/°C	5W	57A
PEWF2512F1L50Q9	2512	±1.0%	1.5mΩ	±50ppm/°C	5W	57A
PEWF2512J1L50Q9	2512	±5.0%	1.5mΩ	±50ppm/°C	5W	57A
PEWF2512D2L00Q9	2512	±0.5%	2mΩ	±50ppm/°C	5W	50A
PEWF2512F2L00Q9	2512	±1.0%	2mΩ	±50ppm/°C	5W	50A
PEWF2512J2L00Q9	2512	±5.0%	2mΩ	±50ppm/°C	5W	50A
PEWF2512D3L00Q9	2512	±0.5%	3mΩ	±50ppm/°C	4W	36A
PEWF2512F3L00Q9	2512	±1.0%	3mΩ	±50ppm/°C	4W	36A
PEWF2512J3L00Q9	2512	±5.0%	3mΩ	±50ppm/°C	4W	36A
PEWF2512D4L00Q9	2512	±0.5%	4mΩ	±50ppm/°C	3W	27A
PEWF2512F4L00Q9	2512	±1.0%	4mΩ	±50ppm/°C	3W	27A
PEWF2512J4L00Q9	2512	±5.0%	4mΩ	±50ppm/°C	3W	27A
PEWF2512D5L00Q9	2512	±0.5%	5mΩ	±50ppm/°C	2.5W	22A
PEWF2512F5L00Q9	2512	±1.0%	5mΩ	±50ppm/°C	2.5W	22A
PEWF2512J5L00Q9	2512	±5.0%	5mΩ	±50ppm/°C	2.5W	22A

DataSheet No.: E19016

Version: V2

Date: 2024/03/09

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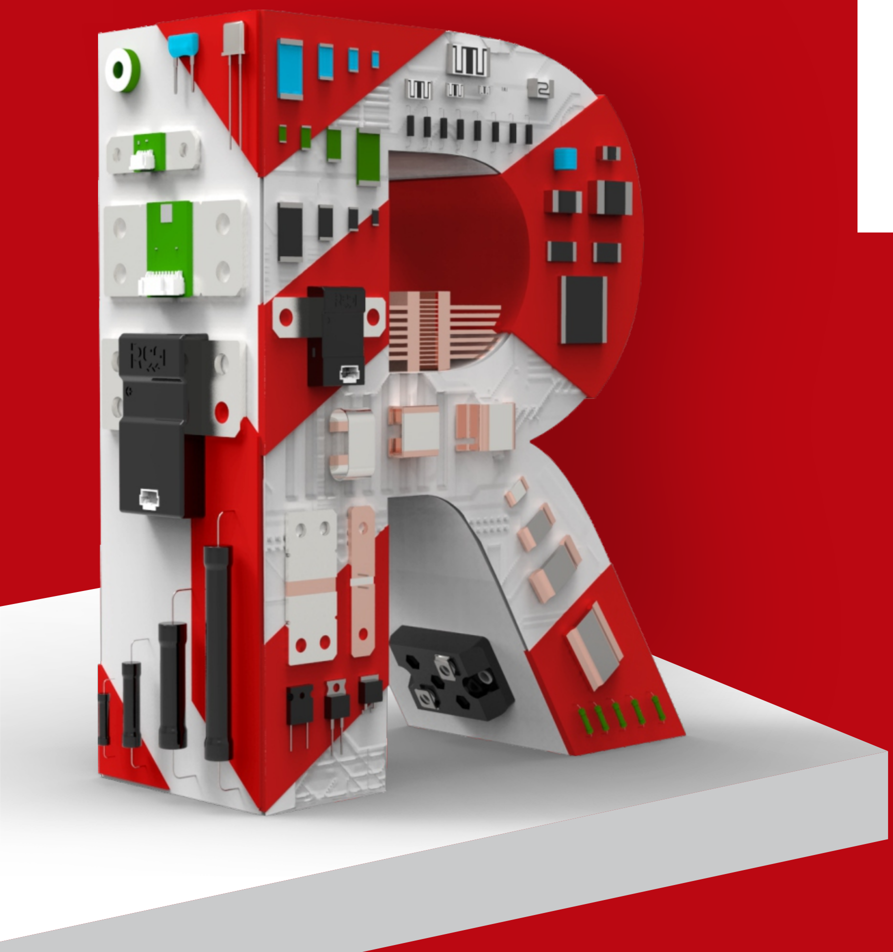
SEWF2512

High-Precision Low-TCR Alloy Current Sensing Resistor

Resistance	3mΩ, 5mΩ
Tolerance	±0.5%
TCR	±25ppm/℃
Rated Current	22A~50A



Applications

Automotive Electronics

Precision Power Supply

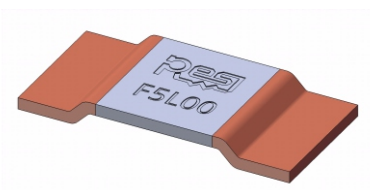
Instrumentation

Formation & Sorting of Battery

Medical Equipment

Better Solution for Sustainable High End Manufacturing

High-Precision Low-TCR Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Reliability



AEC-Q200

Introduction

SEWF2512 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, SEWF2512 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of SEWF2512 series within the temperature range of -55 °C to +125 °C is ≤ ±25ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

SEWF2512 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
SEWF2512	3mΩ	4W	36A	-55°C~+170°C	±25(-55°C~+125°C)	19.7°C/W	±0.5 ±1.0 ±5.0
SEWF2512	5mΩ	2.5W	22A	-55°C~+170°C	±25(-55°C~+125°C)	31.1°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refers to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

SEWF2512 series is only applicable to DC low-frequency sampling circuit. If needs of AC or high-frequency applications are present, please contact us.

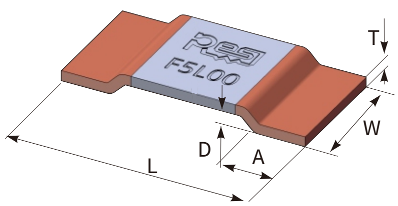
SEWF2512

High-Precision Low-TCR Alloy Current Sensing Resistor

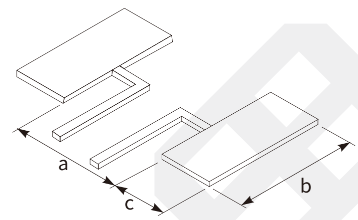
Dimensions

Unit: mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
3mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.45±0.2	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.07±0.03
5mΩ	6.3±0.3	3.0±0.3	1.3±0.3	0.27±0.15	0.35±0.2	3.9±0.2	3.4±0.25	1.8±0.25	Tape&Reel	4000pcs	0.04±0.02

Part Number Information

Example: SEWF2512F5L00P9 (SEWF 2512 ±1.0% 5mΩ ±25ppm/°C Standard)

S	E	W	F	2	5	1	2	F	5	L	0	0	P	9

Series	Size	Tolerance	Resistance	TCR	Code
SEWF	2512	D=±0.5% F=±1.0% J=±5.0%	3L00=3mΩ 5L00=5mΩ	P=±25ppm/°C	9=Standard

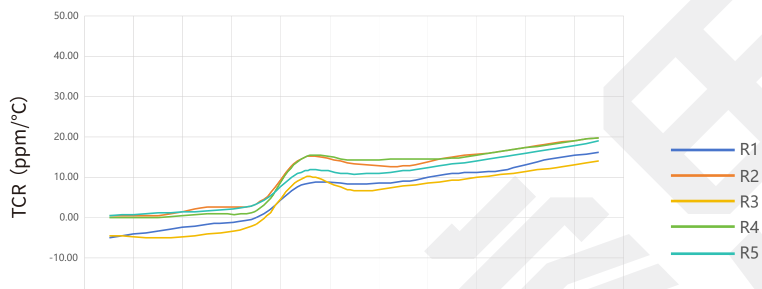
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+235°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +125°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 25ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

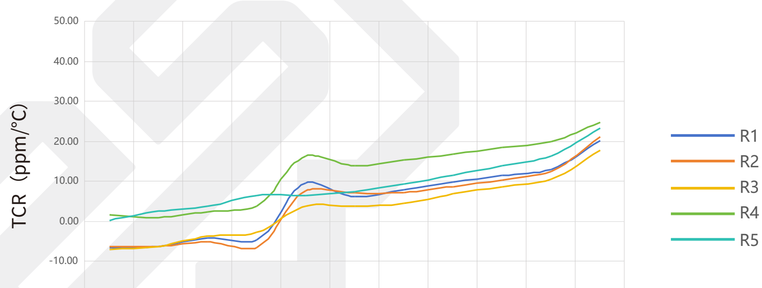
TCR Test Curve - SEWF2512 3mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	-4.90	-3.34	-1.67	0.00	8.36	8.36	8.92	10.87	11.70	14.49	16.24
R2	0.44	0.56	2.50	3.34	15.01	13.34	12.79	15.01	16.34	18.35	19.78
R3	-4.44	-5.00	-4.17	-1.67	10.00	6.67	7.78	9.17	10.67	12.22	14.05
R4	0.00	0.00	0.84	1.67	15.07	14.23	14.51	14.65	16.41	18.14	19.85
R5	0.44	1.10	1.66	3.31	11.59	10.76	11.59	13.25	14.91	16.84	18.93

Temperature (°C)

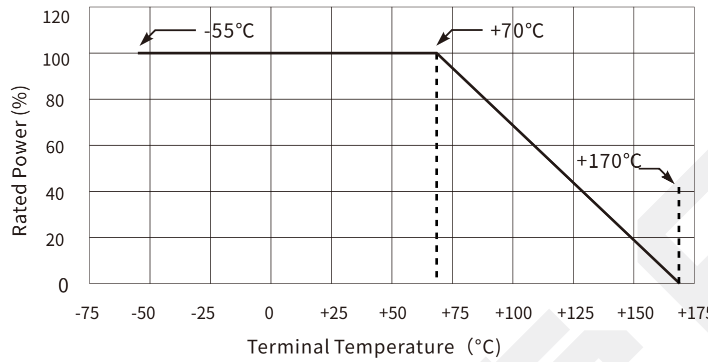
TCR Test Curve - SEWF2512 5mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	-6.59	-6.34	-4.28	-4.75	9.50	6.18	7.92	9.74	11.40	12.99	20.15
R2	-6.27	-6.27	-5.17	-6.58	7.52	7.05	7.21	8.70	10.34	12.54	21.07
R3	-7.01	-6.26	-3.76	-2.82	3.76	3.76	4.38	6.81	8.64	10.49	17.66
R4	1.53	0.96	2.39	3.82	16.26	13.87	15.30	16.73	18.36	19.92	24.73
R5	0.25	2.47	3.70	6.48	6.48	7.40	9.25	11.57	13.88	16.35	23.32

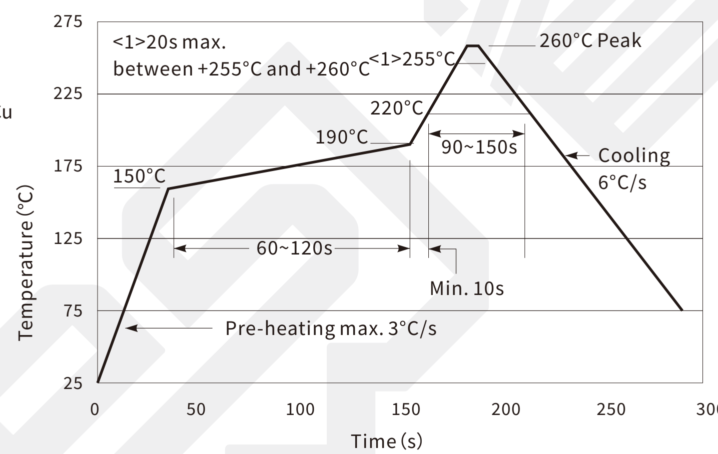
Temperature (°C)

Derating Curve

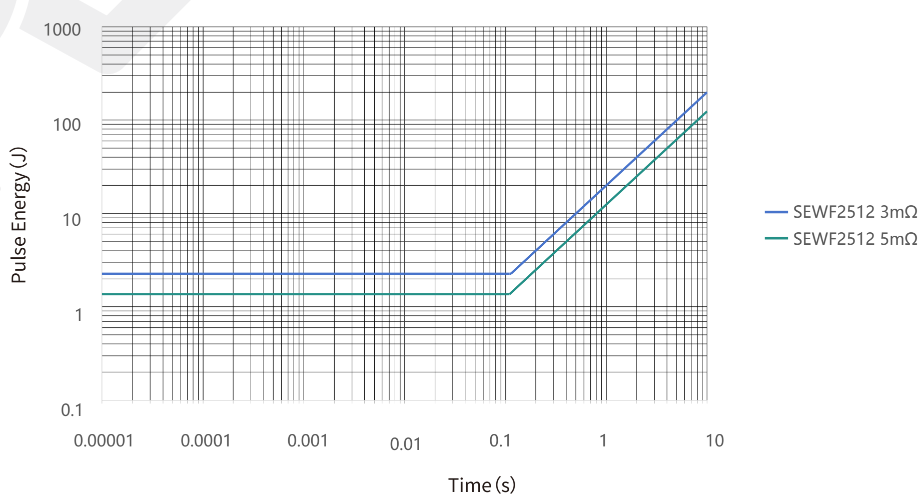


Reflow Soldering Profile

Resistor Surface Temperature：
Pre-Heat: +150 °C~+190°C,60~120sec.
Reflow: Above +220°C,90~150sec.
Applicable Solder Composition: Sn-Ag-Cu



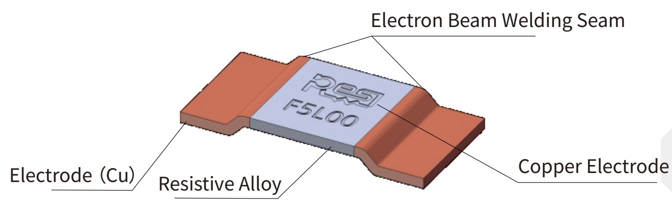
Maximum Pulse Energy Curve



SEWF2512

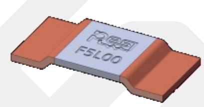
High-Precision Low-TCR Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
2512		RESI：Brand F：Tolerance 5L00：Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ≤ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

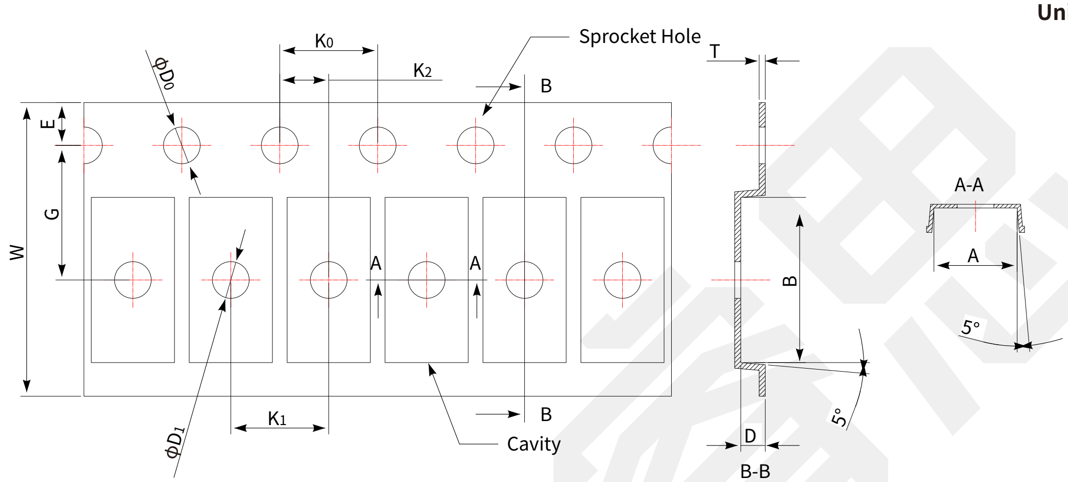
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

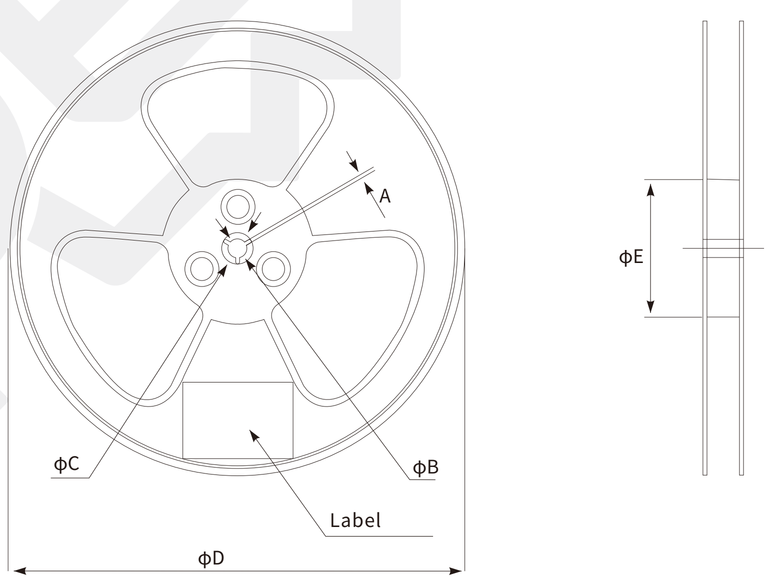
Unit: mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
3mΩ	3.30±0.1	6.60±0.1	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.90±0.1	0.23±0.05
5mΩ	3.20±0.1	6.50±0.1	1.5±0.1	1.5±0.1	4.00±0.1	4.00±0.1	2.00±0.1	1.75±0.1	5.50±0.05	12.00±0.2	0.73±0.1	0.23±0.05

Reel Specifications

Unit: mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

SEWF2512

High-Precision Low-TCR Alloy Current Sensing Resistor

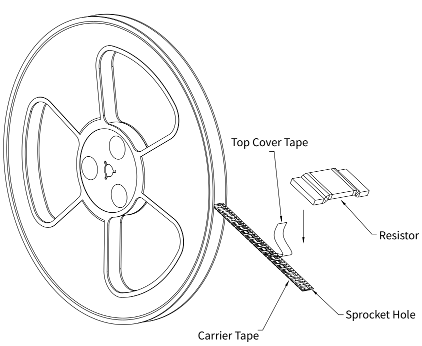
Packaging

(1) 4000 pcs. resistors are packed in a tape and wrapped in a reel;

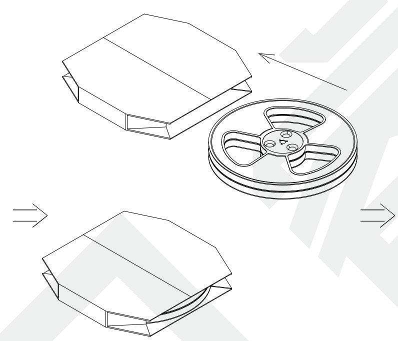
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (12000 pcs. / box);

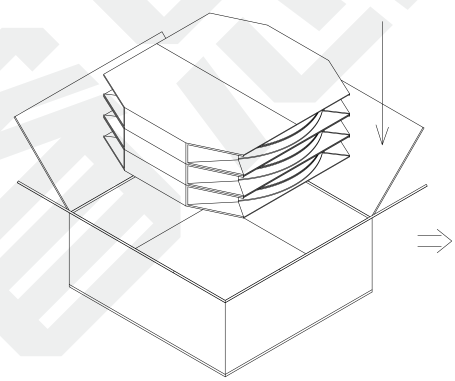
(4) Box size: 350mm*370mm*165mm.



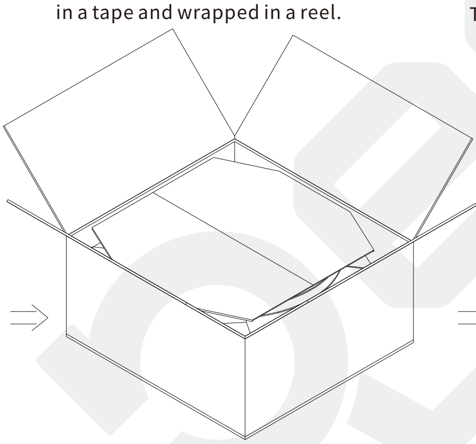
1. 4000 pcs. resistors are packed in a tape and wrapped in a reel.



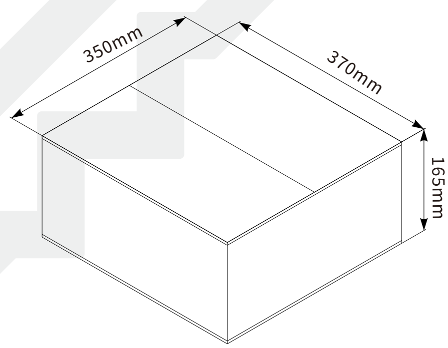
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm.



3. Place every 3 cases into a box (12000 pcs. / box).



4. For the last box which is less than 12000 pcs., bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
SEWF2512J3L00P9	2512	±5.0%	3mΩ	±25ppm/°C	4W	36A
SEWF2512F3L00P9	2512	±1.0%	3mΩ	±25ppm/°C	4W	36A
SEWF2512D3L00P9	2512	±0.5%	3mΩ	±25ppm/°C	4W	36A
SEWF2512J5L00P9	2512	±5.0%	5mΩ	±25ppm/°C	2.5W	22A
SEWF2512F5L00P9	2512	±1.0%	5mΩ	±25ppm/°C	2.5W	22A
SEWF2512D5L00P9	2512	±0.5%	5mΩ	±25ppm/°C	2.5W	22A

DataSheet No:E16012

Version:V3

Date:2024/03/17

Resi 睿思

PEWM3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

Resistance	0.2mΩ~1.0mΩ
Tolerance	±0.5%
TCR	±100~±150ppm/℃
Rated Current	89A~244A

Applications

Automotive Electronics

Precision Power Supply

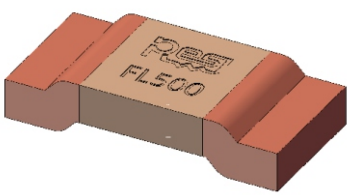
Sorting & Formation of Battery

Electric Tools

Medical Equipment

Better Solution for Sustainable High End Manufacturing

Low-Inductance Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Reliability



Introduction

PEWM3920 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, PEWM3920 achieves a maximum target tolerance of ± 0.5% after stamping without trimming. TCR of PEWM3920 series 0.3~1mΩ within the temperature range of +20 ℃ to +170 ℃ is ⩽ ±100ppm/℃, 0.2mΩ TCR is within ±150ppm/℃. Inductance is < 3nH.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

PEWM3920 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70℃)	Max. Operating Current	Operating Temperature	TCR ppm/℃ (+20℃ Ref)	Thermal Resistance*	Tolerance %
PEWM3920	0.2mΩ	12W	244A	-55℃~+170℃	±150 (+20℃~+170℃)	3.6℃/W	±0.5 ±1.0 ±5.0
PEWM3920	0.3mΩ	10W	182A	-55℃~+170℃	±100 (+20℃~+170℃)	3.8℃/W	±0.5 ±1.0 ±5.0
PEWM3920	0.5mΩ	9W	134A	-55℃~+170℃	±100 (+20℃~+170℃)	6.3℃/W	±0.5 ±1.0 ±5.0
PEWM3920	1.0mΩ	8W	89A	-55℃~+170℃	±100 (+20℃~+170℃)	12.6℃/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

Inductance of PEWM3920 current sensing resistors is less than 3nH, suitable for AC, DC low and high frequency sampling circuits.

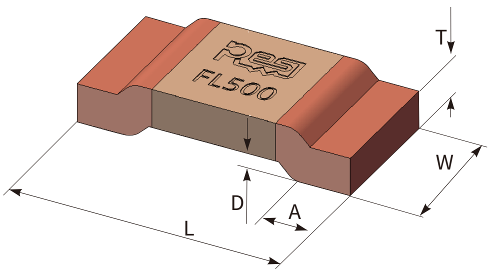
PEWM3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

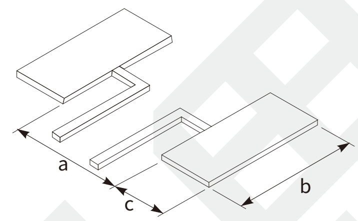
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
0.2mΩ	10.0±0.3	5.2±0.3	2.0±0.3	1.4±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.65±0.1
0.3mΩ	10.0±0.3	5.2±0.3	2.0±0.3	1.3±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.59±0.1
0.5mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.8±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.36±0.1
1.0mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.4±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.18±0.05

Part Number Information

Example: PEWM3920FL500K9 (PEWM 3920 ±1.0% 0.5mΩ ±100ppm/°C Standard)

P	E	W	M	3	9	2	0	F	L	5	0	0	K	9

Series	Size	Tolerance	Resistance	TCR	Code
PEWM	3920	D=±0.5% F=±1.0% J=±5.0%	L200=0.2mΩ L300=0.3mΩ L500=0.5mΩ 1L00=1.0mΩ	K=±100ppm/°C R=±150ppm/°C	9=Standard 0-8=Custom

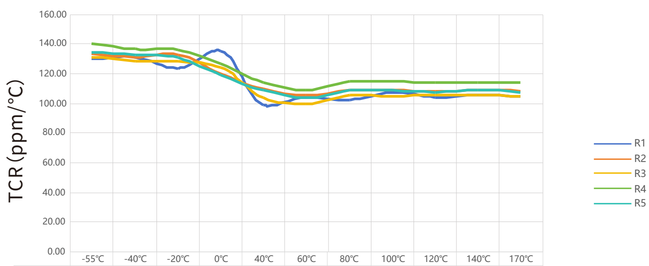
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	+20°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, 0.2mΩ: max. value ≤ 150ppm/°C 0.3~1mΩ: max. value ≤ 100ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

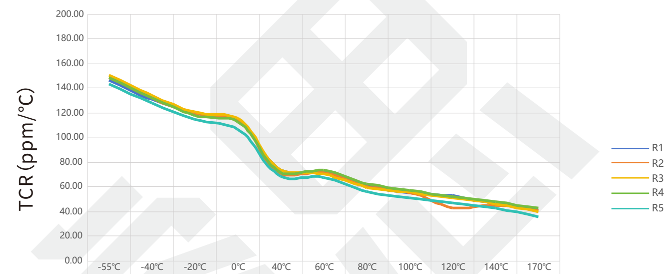
TCR Test Curve - PEWM3920 0.2mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	129.95	131.17	123.78	135.51	99.03	104.24	102.50	107.49	104.24	105.54	104.58
R2	133.54	131.27	133.01	119.97	109.54	105.63	108.67	108.89	107.98	109.11	108.50
R3	131.32	128.72	128.29	124.40	103.67	99.78	105.40	104.97	105.74	105.83	104.71
R4	140.34	136.54	136.11	127.04	114.07	108.89	114.94	114.72	114.07	114.50	113.73
R5	134.65	132.93	130.77	119.12	108.76	103.58	108.76	108.76	107.72	109.19	107.72

Temperature (°C)

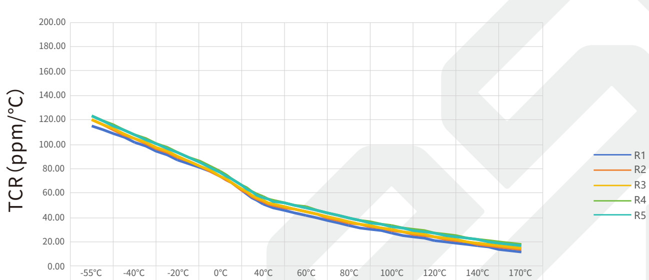
TCR Test Curve - PEWM3920 0.3mΩ



	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	146.28	130.45	119.58	113.72	73.59	71.08	60.76	54.77	52.51	45.71	41.03
R2	148.54	131.75	119.24	113.41	70.04	71.71	60.04	55.45	43.03	45.03	40.47
R3	150.50	133.58	120.22	115.21	73.47	70.13	59.55	55.52	51.09	46.20	39.85
R4	148.57	132.10	117.73	112.75	71.30	72.96	62.46	56.79	52.07	47.53	42.67
R5	143.47	127.70	114.93	106.60	68.29	67.46	56.08	50.80	46.64	42.20	35.76

Temperature (°C)

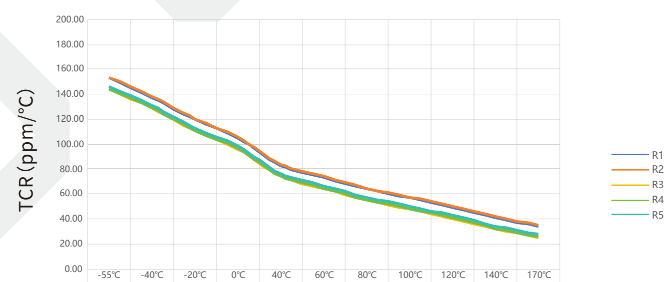
TCR Test Curve - PEWM3920 0.5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	115.57	102.11	87.17	73.87	51.22	41.37	33.49	27.33	21.27	16.58	12.24
R2	119.72	104.23	89.69	73.52	52.93	44.60	35.94	29.41	23.72	18.46	14.28
R3	120.45	104.96	90.42	74.25	53.66	45.33	36.67	30.14	24.45	19.19	15.01
R4	123.61	108.12	93.58	77.41	56.82	48.49	39.83	33.30	27.61	22.35	18.14
R5	123.07	107.58	93.04	76.87	56.28	47.95	39.29	32.76	27.07	21.81	17.29

Temperature (°C)

TCR Test Curve - PEWM3920 1mΩ



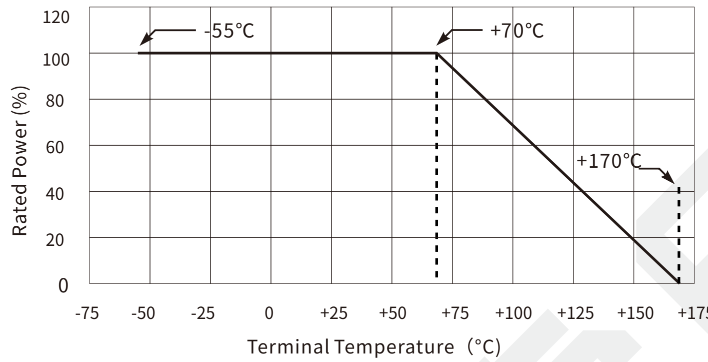
	-55℃	-40℃	-20℃	0℃	40℃	60℃	80℃	100℃	120℃	140℃	170℃
R1	152.80	137.43	119.54	104.82	82.86	73.12	63.89	56.78	49.31	40.93	34.08
R2	153.58	138.21	120.32	105.60	83.64	73.90	64.67	57.56	50.09	41.71	34.86
R3	143.85	128.48	110.59	95.87	73.91	64.17	54.94	47.83	40.36	31.98	25.13
R4	144.27	128.90	111.01	96.29	74.33	64.59	55.36	48.25	40.78	32.40	25.55
R5	146.25	130.88	112.99	98.27	76.31	66.57	57.34	50.23	42.76	34.38	27.53

Temperature (°C)

PEWM3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

Derating Curve



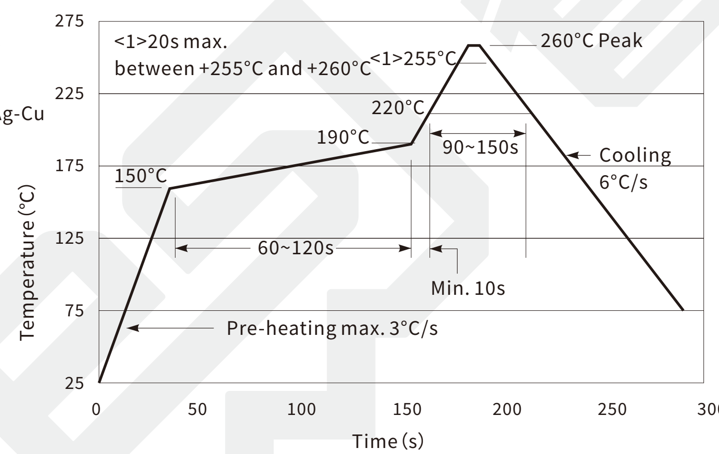
Reflow Soldering Profile

Resistor Surface Temperature：

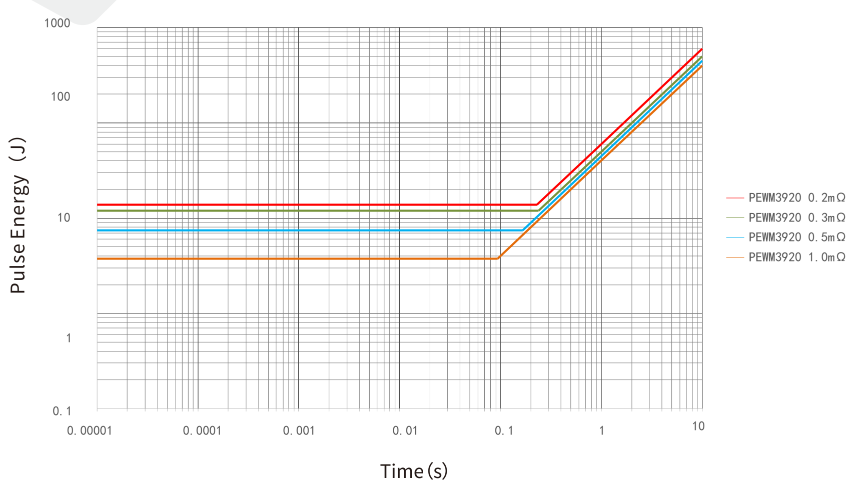
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



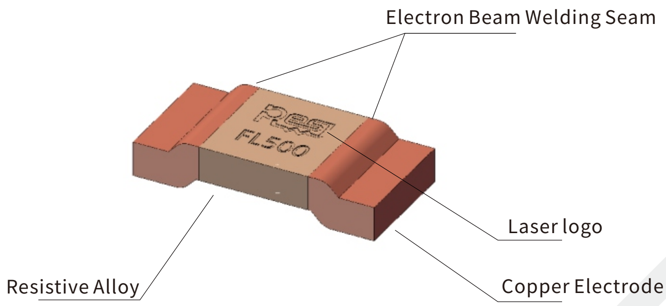
Maximum Pulse Energy Curve



PEWM3920

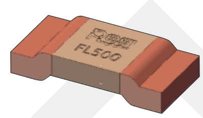
High-Precision Low-Inductance Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
3920		RESI:Brand F:Tolerance L500:Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ⩽ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

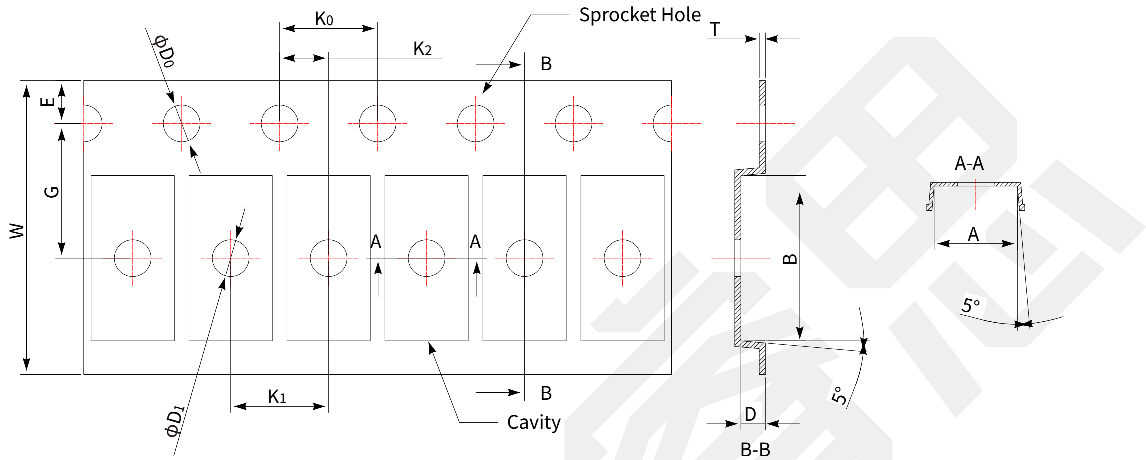
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

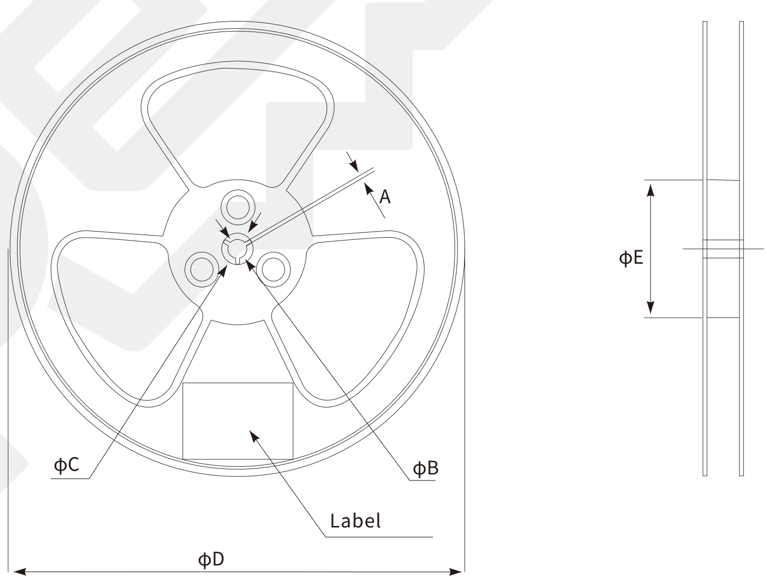
Unit：mm



Resistance	A	B	ϕD0	ϕD1	K0	K1	K2	E	G	W	D	T
0.2mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	2.7±0.1	0.3±0.05
0.3mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	2.1±0.1	0.3±0.05
0.5mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.5±0.1	0.3±0.05
1.0mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.5±0.1	0.3±0.05

Reel Specifications

Unit：mm



A	ϕB	ϕC	ϕD	ϕE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

PEWM3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

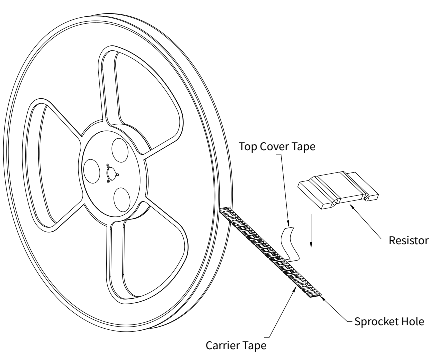
Packaging

(1) 2000 pcs. resistors are packed in a tape and wrapped in a reel;

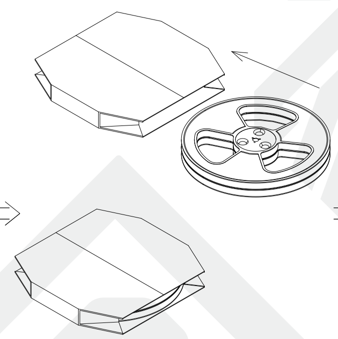
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (12000 pcs. / box);

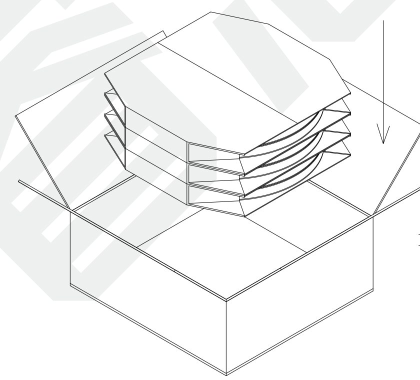
(4) Box size: 350mm*370mm*165mm.



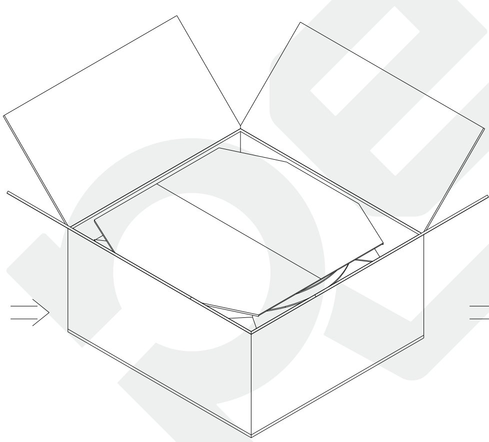
1. 2000 pcs. resistors are packed in a tape and wrapped in a reel.



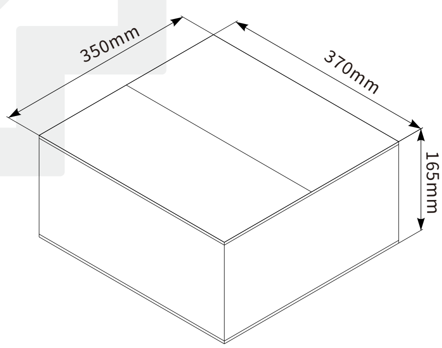
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. Place every 3 cases into a box (12000 pcs. / box).



4. Bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
PEWM3920DL200R9	3920	±0.5%	0.2mΩ	≤±150ppm/°C	12.0W	244A
PEWM3920DL300K9	3920	±0.5%	0.3mΩ	≤±100ppm/°C	10.0W	182A
PEWM3920DL500K9	3920	±0.5%	0.5mΩ	≤±100ppm/°C	9.0W	134A
PEWM3920D1L00K9	3920	±0.5%	1.0mΩ	≤±100ppm/°C	8.0W	89A
PEWM3920FL200R9	3920	±1.0%	0.2mΩ	≤±150ppm/°C	12.0W	244A
PEWM3920FL300K9	3920	±1.0%	0.3mΩ	≤±100ppm/°C	10.0W	182A
PEWM3920FL500K9	3920	±1.0%	0.5mΩ	≤±100ppm/°C	9.0W	134A
PEWM3920F1L00K9	3920	±1.0%	1.0mΩ	≤±100ppm/°C	8.0W	89A
PEWM3920JL200R9	3920	±5.0%	0.2mΩ	≤±150ppm/°C	12.0W	244A
PEWM3920JL300K9	3920	±5.0%	0.3mΩ	≤±100ppm/°C	10.0W	182A
PEWM3920JL500K9	3920	±5.0%	0.5mΩ	≤±100ppm/°C	9.0W	134A
PEWM3920J1L00K9	3920	±5.0%	1.0mΩ	≤±100ppm/°C	8.0W	89A

Data Sheet No:E16013

Version:V4

Date:2024/03/09

PEWK3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

Resistance	1mΩ～5mΩ
Tolerance	±0.5%
TCR	±50ppm/℃
Rated Current	24A~89A

Applications

Automotive Electronics

Precision Power Supply

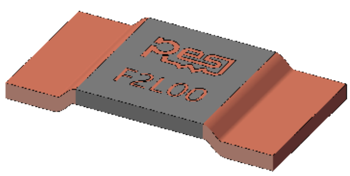
Instrumentation

Testing & Measurement Equipment

Medical Equipment

Better Solution for Sustainable High End Manufacturing

Low-Inductance Alloy Current Sensing Resistor
“ Trimming Free” Technology, High Precision, Reliability



Introduction

PEWK3920 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, PEWK3920 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of PEWK3920 series within the temperature range of -55 °C to +170 °C is ⩽ ±50ppm/°C. Inductance is < 3nH.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

PEWK3920 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
PEWK3920	1mΩ	8W	89A	-55°C~+170°C	±50 (-55°C~+170°C)	7.6°C/W	±0.5 ±1.0 ±5.0
PEWK3920	2mΩ	6W	54A	-55°C~+170°C	±50 (-55°C~+170°C)	15.4°C/W	±0.5 ±1.0 ±5.0
PEWK3920	3mΩ	5W	40A	-55°C~+170°C	±50 (-55°C~+170°C)	23.1°C/W	±0.5 ±1.0 ±5.0
PEWK3920	4mΩ	4W	30A	-55°C~+170°C	±50 (-55°C~+170°C)	28.9°C/W	±0.5 ±1.0 ±5.0
PEWK3920	5mΩ	3W	24A	-55°C~+170°C	±50 (-55°C~+170°C)	36.5°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

Inductance of PEWK3920 current sensing resistors is less than 3nH, suitable for AC, DC low and high frequency sampling circuits.

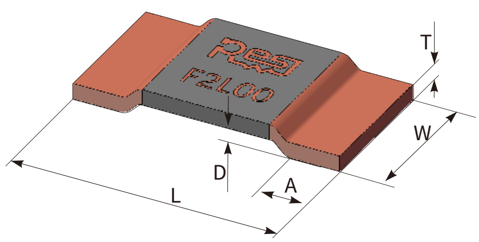
PEWK3920

High-Precision Low-Inductance Alloy Current Sensing Resistor

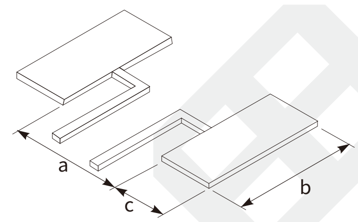
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
1mΩ	10.0±0.3	5.2±0.3	2.0±0.3	1.3±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.59±0.1
2mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.6±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.27±0.1
3mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.4±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.18±0.1
4mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.33±0.15	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.15±0.1
5mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.25±0.15	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.11±0.1

Part Number Information

Example：PEWK3920F2L00Q9 (PEWK 3920 ±1.0% 2.0mΩ ±50ppm/℃ Standard)

P	E	W	K	3	9	2	0	F	2	L	0	0	Q	9

Series	Size	Tolerance	Resistance	TCR	Code
PEWK	3920	D=±0.5% F=±1.0% J=±5.0%	1L00=1mΩ 2L00=2mΩ 3L00=3mΩ 4L00=4mΩ 5L00=5mΩ	Q=±50ppm/℃	9=Standard 0-8=Custom

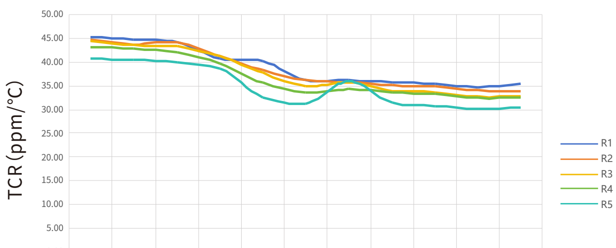
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ ±50ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

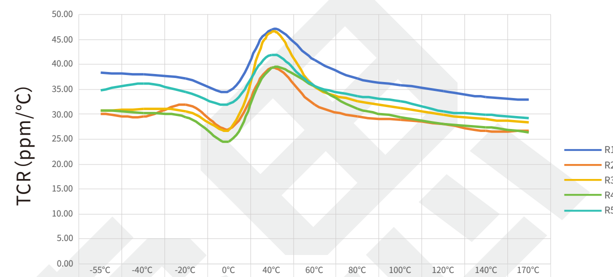
TCR Test Curve -PEWK3920 1.0mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	45.23	44.66	44.16	40.65	40.15	36.13	36.13	35.76	35.43	34.71	35.40
R2	44.70	43.65	44.14	41.17	38.19	36.21	35.71	35.09	34.82	33.97	33.79
R3	44.34	43.54	43.21	41.20	37.68	34.92	35.67	33.91	33.66	32.66	32.89
R4	43.17	42.77	42.10	39.60	35.59	33.58	34.25	33.58	33.18	32.41	32.48
R5	40.63	40.43	39.85	38.59	32.58	31.33	35.92	31.45	30.77	30.07	30.47

Temperature (°C)

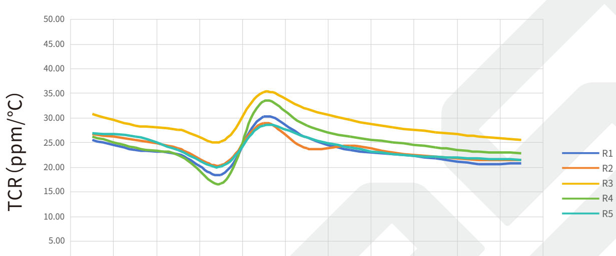
TCR Test Curve -PEWK3920 2.0mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	38.27	37.94	37.12	34.64	47.02	40.83	37.12	35.88	34.64	33.41	32.88
R2	30.13	29.48	31.93	27.02	39.30	31.93	29.48	28.86	28.00	26.61	26.67
R3	30.69	31.01	30.61	26.93	46.52	35.50	32.65	31.22	29.87	28.97	28.33
R4	30.78	30.29	29.47	24.56	39.30	35.61	31.11	29.47	28.00	27.43	26.31
R5	34.82	36.14	34.49	32.03	41.88	35.72	33.67	32.65	30.55	29.98	29.21

Temperature (°C)

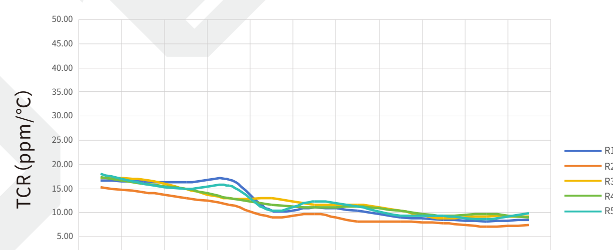
TCR Test Curve -PEWK3920 3.0mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	25.55	23.53	22.69	18.49	30.26	26.06	23.53	22.69	21.85	20.73	20.89
R2	26.80	25.55	23.85	20.44	28.96	23.85	24.41	22.99	22.14	21.57	21.41
R3	30.86	28.52	27.68	25.16	35.23	31.87	29.63	28.10	27.17	26.28	25.64
R4	26.30	23.96	22.57	16.72	33.43	28.42	26.19	25.07	24.07	23.12	22.92
R5	26.85	26.29	23.50	20.14	28.53	26.01	24.06	22.66	22.15	21.82	21.58

Temperature (°C)

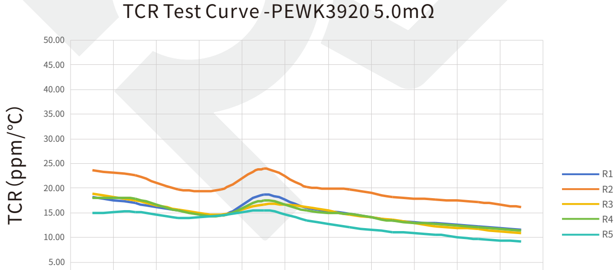
TCR Test Curve -PEWK3920 4.0mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	16.63	16.45	16.24	16.89	10.39	11.04	10.39	9.09	8.57	8.23	8.49
R2	15.23	14.28	12.98	11.68	9.09	9.73	8.22	8.11	7.79	7.14	7.44
R3	17.24	16.81	14.87	12.93	12.93	11.64	11.64	10.35	8.79	9.27	9.14
R4	17.31	16.01	14.93	12.98	11.68	11.03	11.25	10.38	9.35	9.74	9.00
R5	18.00	16.01	14.93	15.57	10.38	12.33	11.25	9.41	9.34	8.65	9.86

Temperature (°C)

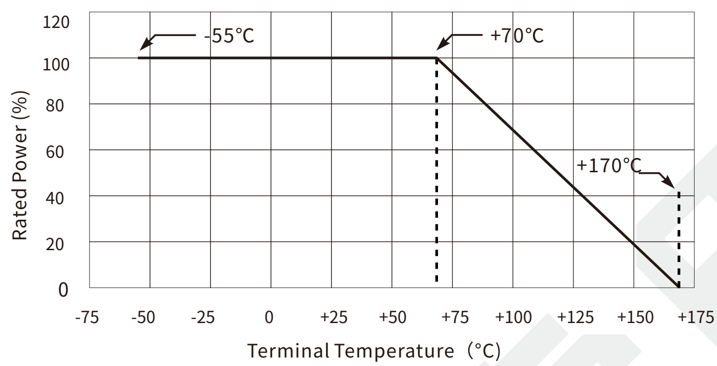
TCR Test Curve -PEWK3920 5.0mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	18.24	16.92	15.54	14.51	18.65	16.06	14.85	13.47	12.85	12.26	11.61
R2	23.60	22.56	19.78	19.78	23.95	20.30	19.78	18.22	17.70	17.18	16.10
R3	18.93	17.51	15.66	14.62	16.71	16.18	14.62	13.57	12.32	11.66	10.86
R4	18.08	17.80	15.41	14.38	17.46	15.41	14.72	13.35	12.74	12.15	11.37
R5	14.92	15.19	13.98	14.50	15.54	13.47	12.08	11.14	10.57	9.67	9.25

Temperature (°C)

Derating Curve



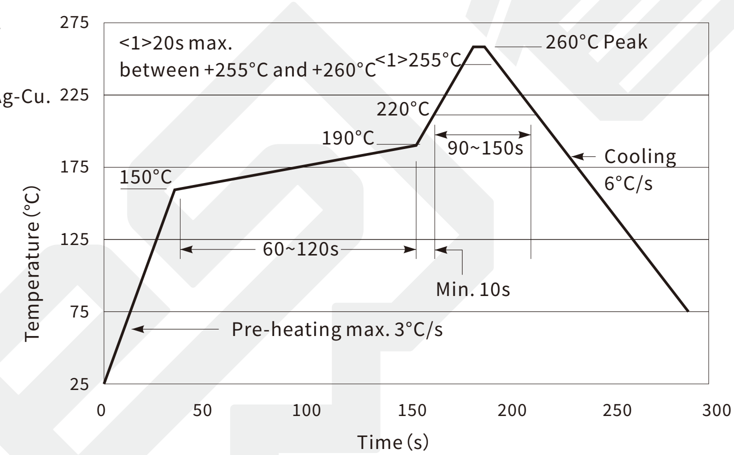
Reflow Soldering Profile

Resistor Surface Temperature：

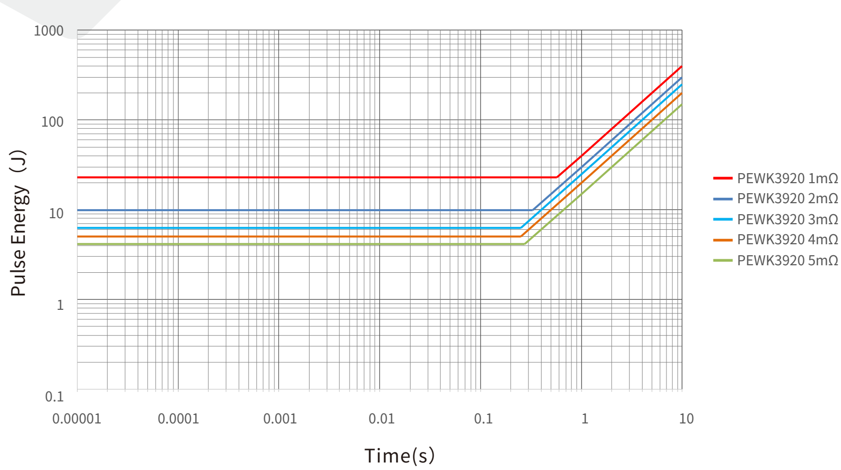
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec

Applicable Solder Composition: Sn-Ag-Cu.



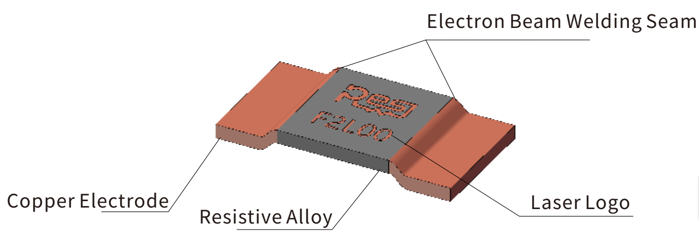
Maximum Pulse Energy Curve



PEWK3920

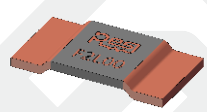
High-Precision Low-Inductance Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
3920		RESI：Brand F：Tolerance 2L00：Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be less than the rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

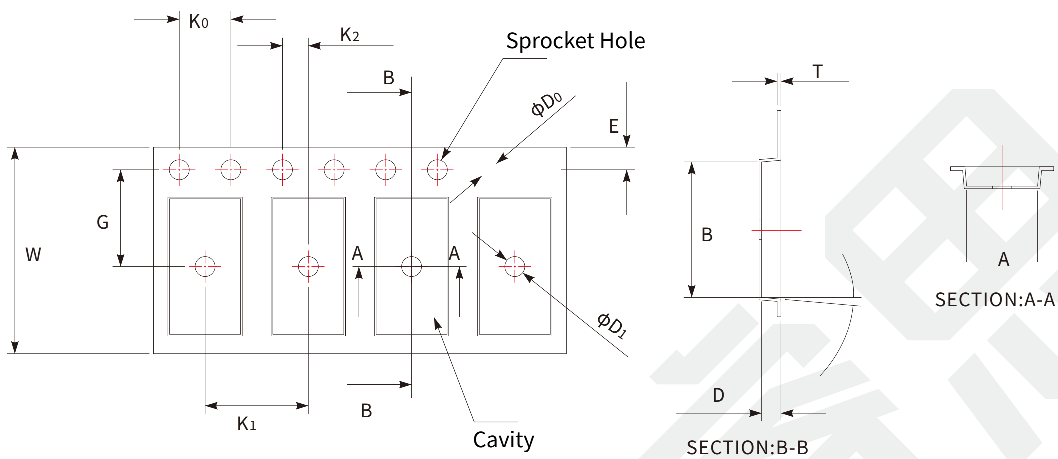
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor solderability caused by oxidation of the resistor.

Packaging

Tape Specifications

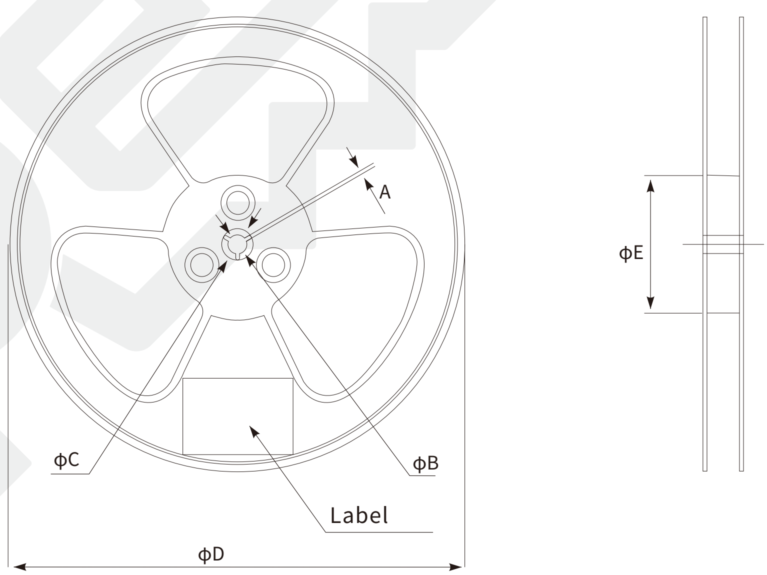
Unit：mm



Resistance	A	B	ϕD_0	ϕD_1	K_0	K_1	K_2	E	G	W	D	T
1.0mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	1.75±0.1	7.5±0.1	16.0±0.3	2.1±0.1	0.3±0.05
2.0mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	1.75±0.1	7.5±0.1	16.0±0.3	1.5±0.1	0.3±0.05
3.0mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	1.75±0.1	7.5±0.1	16.0±0.3	1.5±0.1	0.3±0.05
4.0mΩ	5.65±0.2	10.41±0.2	1.5±0.1	1.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	1.75±0.1	7.5±0.1	16.0±0.3	1.14±0.1	0.4±0.05
5.0mΩ	5.65±0.2	10.41±0.2	1.5±0.1	1.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	1.75±0.1	7.5±0.1	16.0±0.3	1.14±0.1	0.4±0.05

Reel Specifications

Unit：mm



A	ϕB	ϕC	ϕD	ϕE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

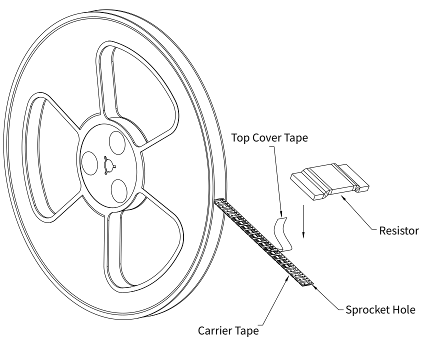
Packaging

(1) 2000 pcs. resistors are packed in a tape and wrapped in a reel;

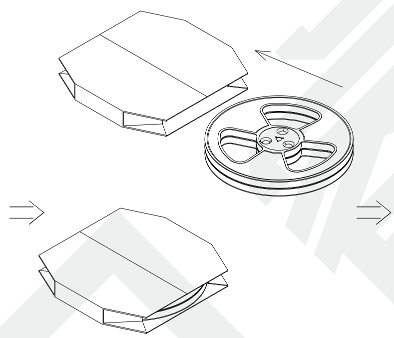
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (12000 pcs. / box);

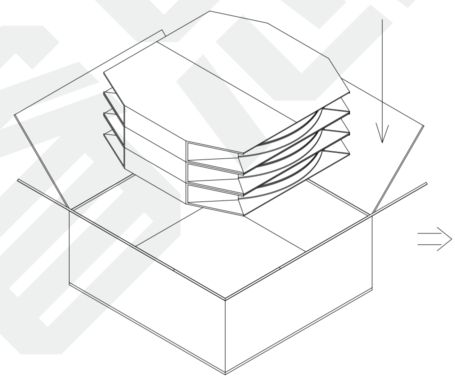
(4) Box size: 350mm*370mm*165mm.



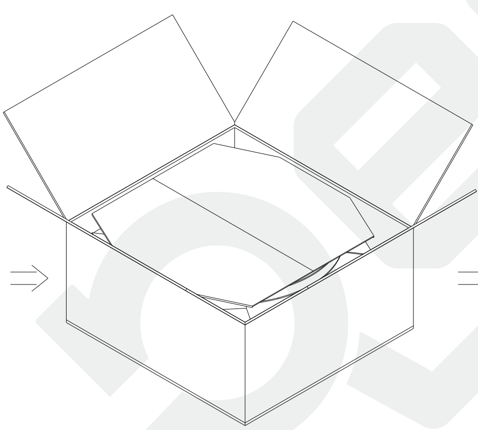
1. 2000 pcs. resistors are packed in a tape and wrapped in a reel.



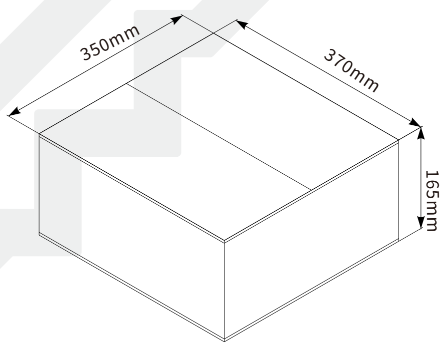
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm.



3. Place every 3 cases into a box (12000 pcs. / box).



4. For the last box which is less than 12000 pcs., bubble wraps or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
PEWK3920D1L00Q9	3920	±0.5%	1.0mΩ	±50ppm/°C	8W	89A
PEWK3920F1L00Q9	3920	±1.0%	1.0mΩ	±50ppm/°C	8W	89A
PEWK3920J1L00Q9	3920	±5.0%	1.0mΩ	±50ppm/°C	8W	89A
PEWK3920D2L00Q9	3920	±0.5%	2.0mΩ	±50ppm/°C	6W	54A
PEWK3920F2L00Q9	3920	±1.0%	2.0mΩ	±50ppm/°C	6W	54A
PEWK3920J2L00Q9	3920	±5.0%	2.0mΩ	±50ppm/°C	6W	54A
PEWK3920D3L00Q9	3920	±0.5%	3.0mΩ	±50ppm/°C	5W	40A
PEWK3920F3L00Q9	3920	±1.0%	3.0mΩ	±50ppm/°C	5W	40A
PEWK3920J3L00Q9	3920	±5.0%	3.0mΩ	±50ppm/°C	5W	40A
PEWK3920D4L00Q9	3920	±0.5%	4.0mΩ	±50ppm/°C	4W	30A
PEWK3920F4L00Q9	3920	±1.0%	4.0mΩ	±50ppm/°C	4W	30A
PEWK3920J4L00Q9	3920	±5.0%	4.0mΩ	±50ppm/°C	4W	30A
PEWK3920D5L00Q9	3920	±0.5%	5.0mΩ	±50ppm/°C	3W	24A
PEWK3920F5L00Q9	3920	±1.0%	5.0mΩ	±50ppm/°C	3W	24A
PEWK3920J5L00Q9	3920	±5.0%	5.0mΩ	±50ppm/°C	3W	24A

DataSheet No.:E19015

Version:V4

Date:2024/03/09

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SEWF3920

High-Precision Low-TCR Alloy Current Sensing Resistor

Resistance	1.0mΩ～5.0mΩ
Tolerance	±0.5%
TCR	≤±25ppm/℃
Rated Current	25A~89A

Applications

Automotive Electronics

Precision Power Supply

Instrumentation

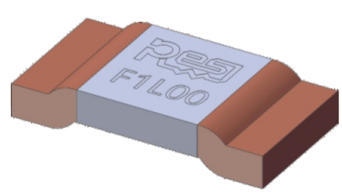
Formation & Sorting of Battery

Medical Equipment

Better Solution for Sustainable High End Manufacturing

High-Precision Low-TCR Alloy Current Sensing Resistor

“Trimming Free” Technology, High Precision, Low TCR, Reliability



AEC-Q200

Introduction

SEWF3920 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, SEWF3920 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of SEWF3920 series within the temperature range of -55 °C to +170 °C is ≤ ±25ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

SEWF3920 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70℃)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
SEWF3920	1mΩ	8W	89A	-55°C~+170°C	±25 (-55°C~+170°C)	7.8°C/W	±0.5 ±1.0 ±5.0
SEWF3920	2mΩ	6W	55A	-55°C~+170°C	±25 (-55°C~+170°C)	15.4°C/W	±0.5 ±1.0 ±5.0
SEWF3920	3mΩ	5W	41A	-55°C~+170°C	±25 (-55°C~+170°C)	23°C/W	±0.5 ±1.0 ±5.0
SEWF3920	4mΩ	4W	32A	-55°C~+170°C	±25 (-55°C~+170°C)	31.1°C/W	±0.5 ±1.0 ±5.0
SEWF3920	5mΩ	3W	25A	-55°C~+170°C	±25 (-55°C~+170°C)	38.4°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refers to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

SEWF3920 series is only applicable to DC low-frequency sampling circuit. If needs of AC or high-frequency applications are present, please contact us.

SEWF3920

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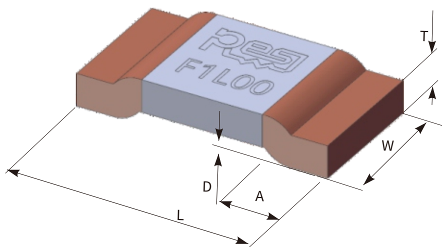
High-Precision Low-TCR Alloy Current Sensing Resistor

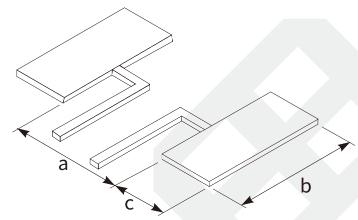
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
1mΩ	10.0±0.3	5.2±0.3	2.0±0.3	1.3±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.56±0.1
2mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.65±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.28±0.1
3mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.45±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.20±0.1
4mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.33±0.15	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.15±0.1
5mΩ	10.0±0.3	5.2±0.3	2.0±0.3	0.27±0.15	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2	Tape&Reel	2000pcs	0.12±0.05

Part Number Information

Example：SEWF3920F1L00P9 (SEWF 3920 ±1.0% 1.0mΩ ±25ppm/°C Standard)

S	E	W	F	3	9	2	0	F	1	L	0	0	P	9

Series	Size	Tolerance	Resistance	TCR	Code
SEWF	3920	D=±0.5% F=±1.0% J=±5.0%	1L00=1.0mΩ 2L00=2.0mΩ 3L00=3.0mΩ 4L00=4.0mΩ 5L00=5.0mΩ	P=±25ppm/°C	9=Standard 0-8=Custom

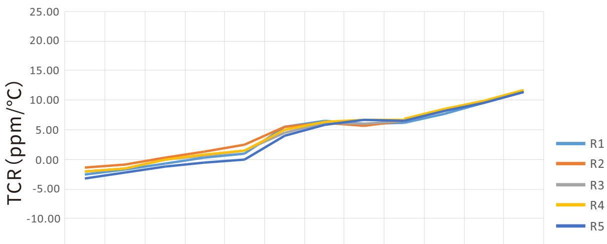
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on，30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+235°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 25ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%
Low Temperature Operating	-55°C, unpowered for 1h, load rated power for 45min, unpowered for 15min	IEC 60068-2-1 4.36	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

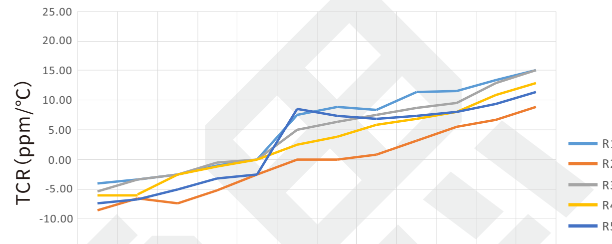
TCR Test Curve - SEWF3920 1mΩ



	-55	-40	-20	-10	0	40	60	80	100	120	140	170
R1	-2.64	-1.65	-0.74	0.24	0.99	5.44	6.42	5.93	6.18	7.71	9.47	11.29
R2	-1.45	-0.82	0.25	1.27	2.47	5.42	6.16	5.59	6.53	8.18	9.70	11.55
R3	-2.11	-1.48	0.00	0.57	1.48	4.45	6.17	5.93	6.55	8.10	9.63	11.57
R4	-2.10	-1.48	0.00	0.86	1.48	4.92	6.39	6.72	6.88	8.56	9.92	11.66
R5	-3.16	-2.30	-1.23	-0.52	0.00	3.94	5.92	6.74	6.53	8.18	9.53	11.41

Temperature (°C)

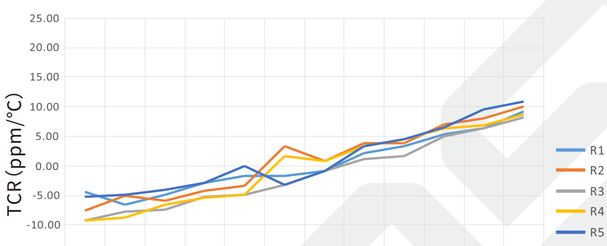
TCR Test Curve - SEWF3920 2mΩ



	-55	-40	-20	-10	0	40	60	80	100	120	140	170
R1	-4.02	-3.35	-2.51	-1.05	0.00	7.54	8.79	8.37	11.30	11.55	13.40	15.07
R2	-8.65	-6.65	-7.48	-5.24	-2.49	0.00	0.00	0.83	3.12	5.49	6.65	8.91
R3	-5.34	-3.34	-2.50	-0.56	0.00	5.00	6.25	7.51	8.76	9.51	12.93	15.01
R4	-6.03	-5.86	-2.51	-1.28	0.00	2.51	3.77	5.86	6.91	8.04	10.89	12.92
R5	-7.37	-6.70	-5.03	-3.26	-2.51	8.57	7.31	6.89	7.31	8.07	9.41	11.44

Temperature (°C)

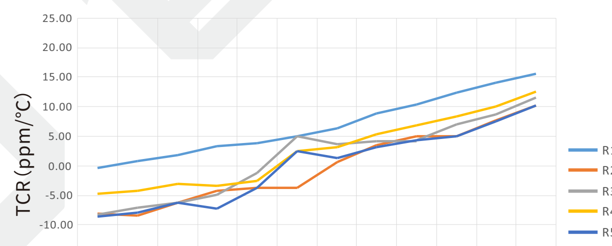
TCR Test Curve - SEWF3920 3mΩ



	-55	-40	-20	-10	0	40	60	80	100	120	140	170
R1	-4.43	-6.64	-4.98	-2.85	-1.66	-1.66	-0.81	2.21	3.32	5.31	6.36	9.25
R2	-7.57	-5.01	-5.84	-4.28	-3.34	3.34	0.83	3.89	3.76	7.01	8.07	10.02
R3	-9.25	-7.71	-7.43	-5.21	-4.95	-3.30	-0.83	1.10	1.65	4.95	6.33	8.26
R4	-9.22	-8.78	-6.58	-5.33	-4.94	1.65	0.82	3.29	4.53	6.25	6.86	8.70
R5	-5.19	-4.87	-4.06	-2.87	0.00	-3.25	-0.81	3.25	4.46	6.49	9.47	10.89

Temperature (°C)

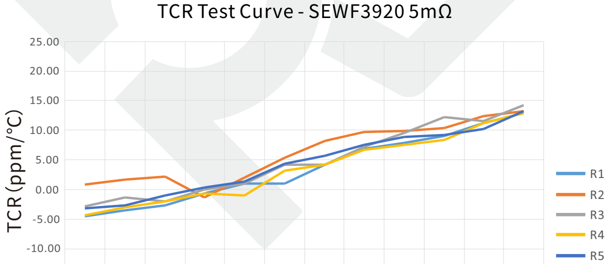
TCR Test Curve - SEWF3920 4mΩ



	-55	-40	-20	-10	0	40	60	85	100	120	140	170
R1	-0.34	0.84	1.89	3.35	3.77	5.03	6.29	8.90	10.37	12.32	14.04	15.59
R2	-8.01	-8.35	-6.26	-4.17	-3.76	-3.76	0.63	3.47	5.01	5.01	7.72	10.18
R3	-8.29	-7.05	-6.22	-4.97	-1.24	4.97	3.73	4.21	4.35	6.96	8.70	11.61
R4	-4.68	-4.18	-3.13	-3.34	-2.51	2.51	3.13	5.40	6.89	8.27	10.03	12.53
R5	-8.65	-7.91	-6.24	-7.32	-3.74	2.50	1.25	3.07	4.37	4.99	7.49	10.15

Temperature (°C)

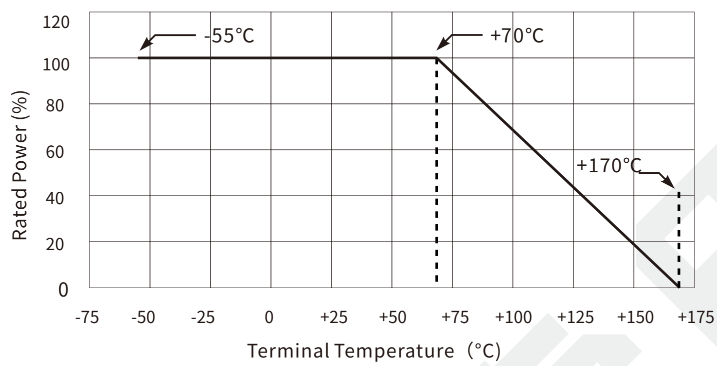
TCR Test Curve - SEWF3920 5mΩ



	-55	-40	-20	-10	0	40	60	85	100	120	140	170
R1	-4.48	-3.50	-2.63	-0.70	1.05	1.05	4.20	6.79	7.88	9.03	11.20	12.88
R2	0.82	1.71	2.10	-1.37	2.07	5.27	8.27	9.62	9.88	10.32	12.40	13.28
R3	-2.81	-1.41	-2.11	0.00	1.06	4.22	4.22	7.14	9.50	12.24	11.61	14.21
R4	-4.44	-3.12	-2.08	-0.69	-1.04	3.12	4.17	6.73	7.55	8.33	11.28	12.91
R5	-3.27	-2.75	-1.07	0.28	1.32	4.39	5.72	7.53	8.88	9.27	10.24	13.29

Temperature (°C)

Derating Curve



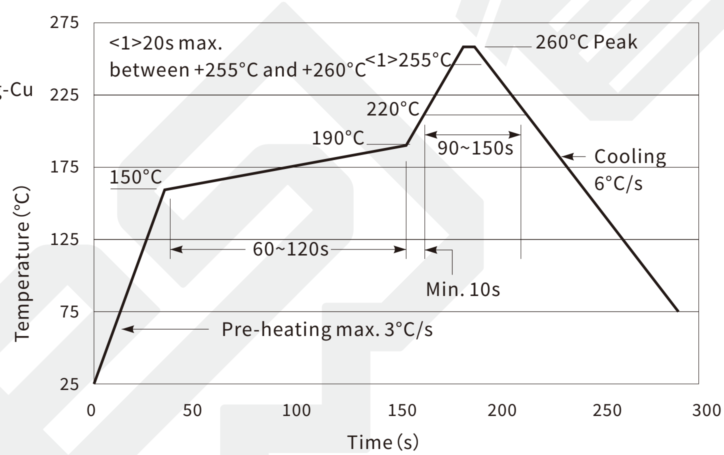
Reflow Soldering Profile

Resistor Surface Temperature:

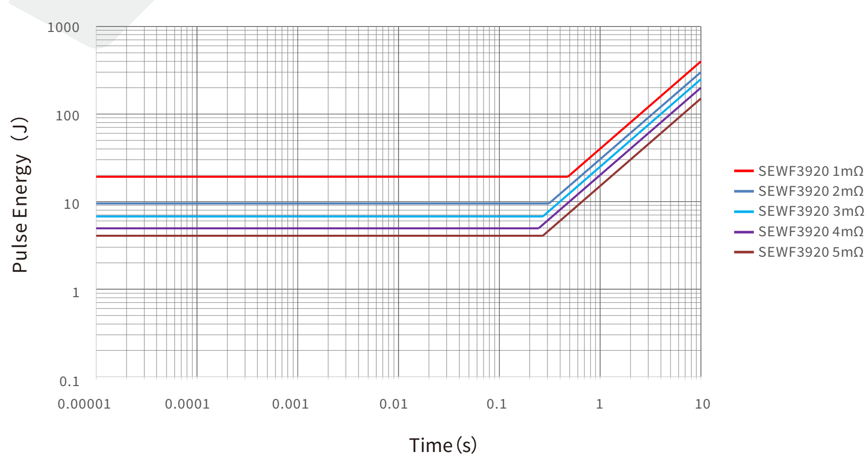
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



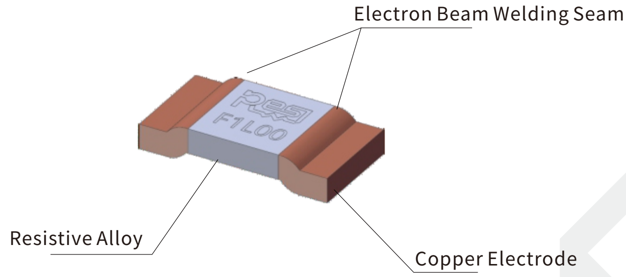
Maximum Pulse Energy Curve



SEWF3920

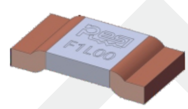
High-Precision Low-TCR Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
3920		RESI: Brand F: Tolerance 1L00: Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ≤ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

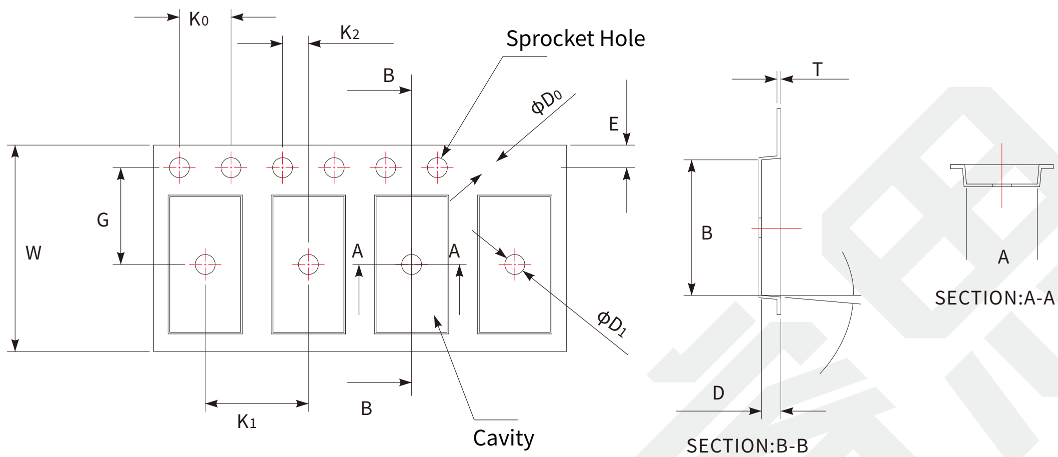
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

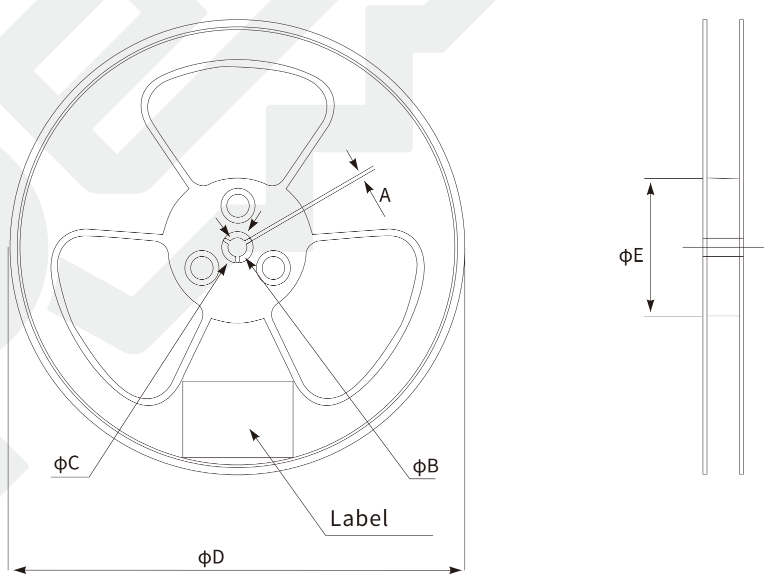
Unit：mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
1mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	2.1±0.1	0.3±0.05
2mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.5±0.1	0.3±0.05
3mΩ	5.5±0.2	10.5±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.5±0.1	0.3±0.05
4mΩ	5.65±0.2	10.41±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.14±0.1	0.4±0.05
5mΩ	5.65±0.2	10.41±0.2	1.5±0.1	1.5±0.1	4.00±0.1	8.00±0.1	2.00±0.1	1.75±0.1	7.50±0.1	16.00±0.3	1.14±0.1	0.4±0.05

Reel Specifications

Unit：mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

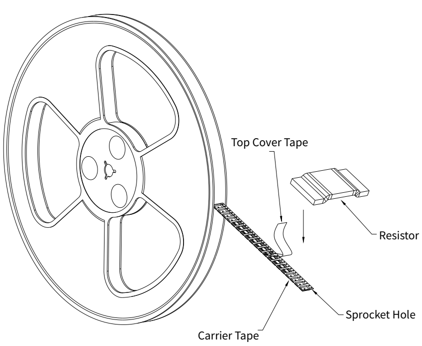
Packaging

(1) 2000 pcs. resistors are packed in a tape and wrapped in a reel;

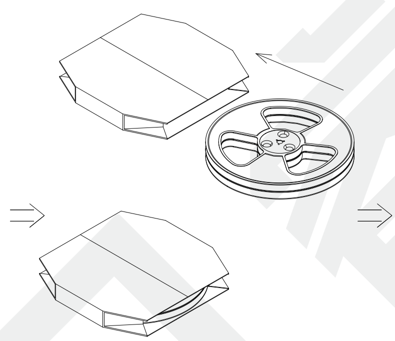
(2) Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (12000 pcs. / box);

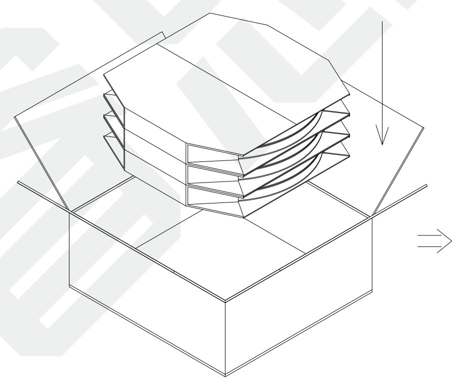
(4) Box size: 350mm*370mm*165mm.



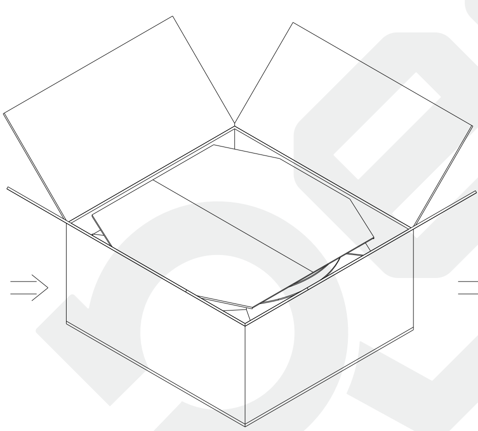
1. 2000 pcs. resistors are packed in a tape and wrapped in a reel.



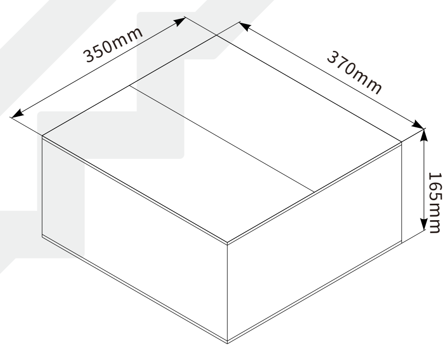
2. Every 2 reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm.



3. Place every 3 cases into a box (12000 pcs. / box).



4. For the last box which is less than 12000 pcs., bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
SEWF3920D1L00P9	3920	±0.5%	1.0mΩ	≤±25ppm/°C	8.0W	89A
SEWF3920F1L00P9	3920	±1.0%	1.0mΩ	≤±25ppm/°C	8.0W	89A
SEWF3920J1L00P9	3920	±5.0%	1.0mΩ	≤±25ppm/°C	8.0W	89A
SEWF3920D2L00P9	3920	±0.5%	2.0mΩ	≤±25ppm/°C	6.0W	55A
SEWF3920F2L00P9	3920	±1.0%	2.0mΩ	≤±25ppm/°C	6.0W	55A
SEWF3920J2L00P9	3920	±5.0%	2.0mΩ	≤±25ppm/°C	6.0W	55A
SEWF3920D3L00P9	3920	±0.5%	3.0mΩ	≤±25ppm/°C	5.0W	41A
SEWF3920F3L00P9	3920	±1.0%	3.0mΩ	≤±25ppm/°C	5.0W	41A
SEWF3920J3L00P9	3920	±5.0%	3.0mΩ	≤±25ppm/°C	5.0W	41A
SEWF3920D4L00P9	3920	±0.5%	4.0mΩ	≤±25ppm/°C	4.0W	32A
SEWF3920F4L00P9	3920	±1.0%	4.0mΩ	≤±25ppm/°C	4.0W	32A
SEWF3920J4L00P9	3920	±5.0%	4.0mΩ	≤±25ppm/°C	4.0W	32A
SEWF3920D5L00P9	3920	±0.5%	5.0mΩ	≤±25ppm/°C	3.0W	25A
SEWF3920F5L00P9	3920	±1.0%	5.0mΩ	≤±25ppm/°C	3.0W	25A
SEWF3920J5L00P9	3920	±5.0%	5.0mΩ	≤±25ppm/°C	3.0W	25A

Data Sheet No:E16017

Version:V2

Date:2024/04/07

睿思

PEWM5930

High-Precision Low-Inductance Alloy Current Sensing Resistor

Resistance	0.2mΩ~1.0mΩ
Tolerance	±0.5%
TCR	±100ppm/℃
Rated Current	94A~273A

Applications

Automotive Electronics

Precision Power Supply

Formation & Sorting of Battery

Electric Tools

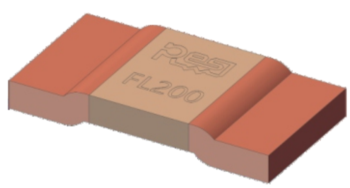
Medical Equipment

Better Solution for Sustainable High End Manufacturing

PEWM5930

High-Precision Low-Inductance Alloy Current Sensing Resistor

Low-Inductance Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Reliability



Introduction

PEWM5930 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, PEWM5930 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of PEWM5930 series within the temperature range of +20 °C to +170 °C is ⩽ ±100ppm/°C. Inductance is < 3nH.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

PEWM5930 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

RoHS AEC-Q200 3D

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C(+20°C Ref)	Thermal Resistance*	Tolerance %
PEWM5930	0.2mΩ	15W	273A	-55°C~+170°C	±100(+20°C~+170°C)	2.6°C/W	±0.5 ±1.0 ±5.0
PEWM5930	0.5mΩ	10W	142A	-55°C~+170°C	±100(+20°C~+170°C)	6.5°C/W	±0.5 ±1.0 ±5.0
PEWM5930	0.8mΩ	9W	105A	-55°C~+170°C	±100(+20°C~+170°C)	9.3°C/W	±0.5 ±1.0 ±5.0
PEWM5930	1.0mΩ	9W	94A	-55°C~+170°C	±100(+20°C~+170°C)	11.4°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refer to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

Inductance of PEWM5930 current sensing resistors is less than 3nH, suitable for AC, DC low and high frequency sampling circuits.

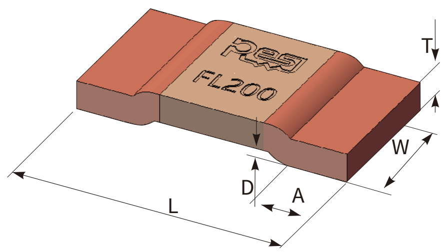
PEWM5930

High-Precision Low-Inductance Alloy Current Sensing Resistor

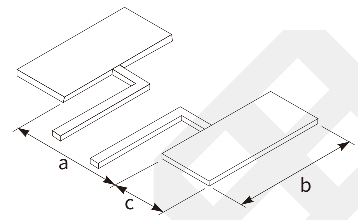
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
0.2mΩ	15.0±0.3	7.75±0.3	3.8±0.3	1.6±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.1	Tape&Reel	2000pcs	1.68±0.3
0.5mΩ	15.0±0.3	7.75±0.3	3.8±0.3	0.65±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.1	Tape&Reel	2000pcs	0.69±0.2
0.8mΩ	15.0±0.3	7.75±0.3	3.8±0.3	0.47±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.1	Tape&Reel	2000pcs	0.50±0.2
1.0mΩ	15.0±0.3	7.75±0.3	3.8±0.3	0.38±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.1	Tape&Reel	2000pcs	0.40±0.2

Part Number Information

Example：PEWM5930FL200K9 (PEWM 5930 ±1.0% 0.2mΩ ±100ppm/°C Standard)

P	E	W	M	5	9	3	0	F	L	2	0	0	K	9

Series	Size	Tolerance	Resistance	TCR	Code
PEWM	5930	D=±0.5% F=±1.0% J=±5.0%	L200=0.2mΩ L500=0.5mΩ L800=0.8mΩ 1L00=1.0mΩ	K=±100ppm/°C	9=Standard 0-8=Custom

For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

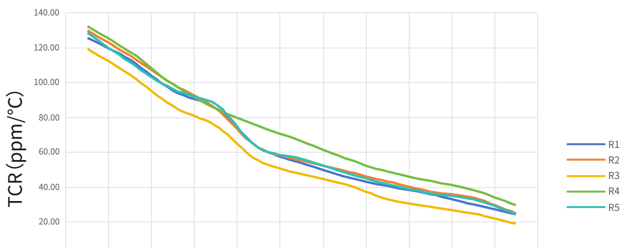
Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.05%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.05%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	+20°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ ±100ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

PEWM5930

High-Precision Low-Inductance Alloy Current Sensing Resistor

Temperature Coefficient of Resistance Test Curve

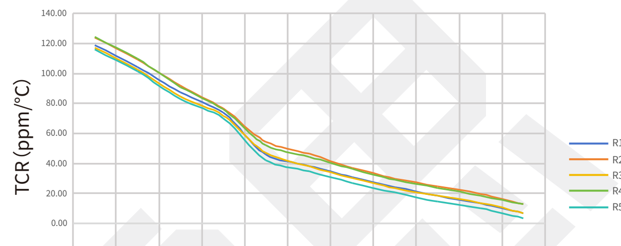
TCR Test Curve - PEWM5930 0.2mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	125.71	112.84	95.29	85.26	62.69	53.91	45.97	40.75	36.11	30.09	24.41
R2	129.71	115.33	99.04	85.25	62.68	55.16	49.31	43.25	37.61	33.85	25.07
R3	119.48	104.30	86.36	75.09	55.07	47.56	41.72	33.17	28.54	25.03	19.02
R4	132.13	117.62	98.85	85.09	75.08	66.32	56.72	48.80	43.54	38.37	29.70
R5	128.52	111.54	96.14	87.40	62.43	56.19	48.28	41.83	36.46	32.88	24.64

Temperature (°C)

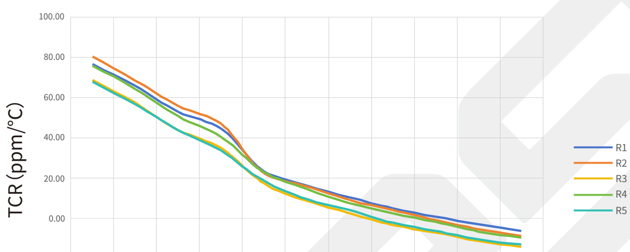
TCR Test Curve - PEWM5930 0.5mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	118.91	104.41	87.29	73.82	45.89	38.41	30.92	24.44	18.35	13.47	7.05
R2	123.95	109.23	91.76	76.63	54.45	46.38	37.31	30.00	24.80	19.83	12.91
R3	117.20	102.55	84.91	71.92	46.95	37.96	30.30	23.47	18.38	13.82	6.93
R4	124.30	109.70	91.03	76.02	52.02	44.51	36.34	29.01	23.81	18.51	12.94
R5	115.90	101.38	82.81	70.26	42.16	34.63	27.10	20.58	14.65	10.20	3.61

Temperature (°C)

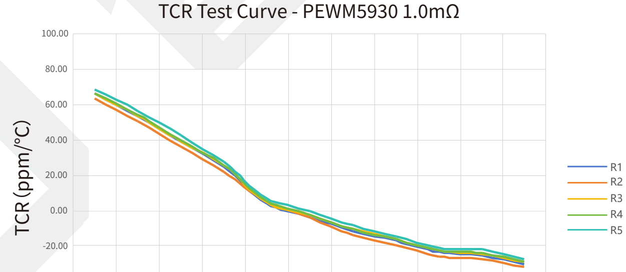
TCR Test Curve - PEWM5930 0.8mΩ



	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	76.67	65.82	53.09	44.71	23.60	16.46	10.56	5.28	0.99	-2.69	-6.21
R2	80.34	68.56	55.98	47.17	22.64	16.04	9.23	4.25	-0.75	-5.14	-8.47
R3	68.72	57.41	43.99	34.94	17.47	8.74	2.70	-3.12	-6.86	-11.02	-13.98
R4	76.00	64.44	50.82	40.53	23.07	14.65	7.69	2.65	-1.62	-6.34	-9.48
R5	67.83	56.73	43.95	33.66	18.70	9.66	4.16	-2.03	-6.11	-10.39	-12.88

Temperature (°C)

TCR Test Curve - PEWM5930 1.0mΩ

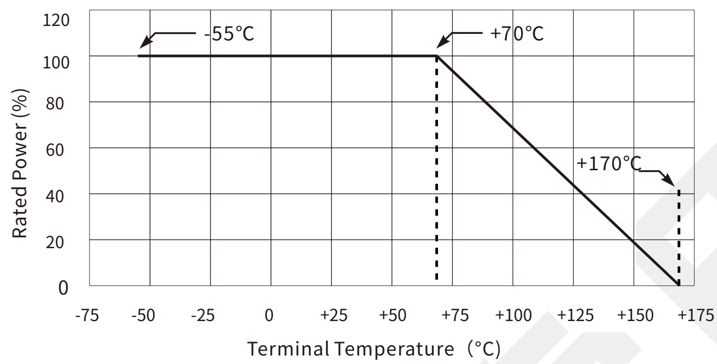


	-55°C	-40°C	-20°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	65.97	53.16	39.26	24.69	3.95	-3.70	-11.52	-17.04	-23.50	-25.43	-30.15
R2	62.97	50.33	35.89	21.78	4.95	-4.21	-13.70	-19.31	-25.84	-27.48	-32.15
R3	66.07	53.47	38.99	25.67	4.44	-2.71	-10.53	-16.29	-22.70	-24.51	-29.22
R4	66.24	54.05	39.68	25.63	5.42	-2.46	-10.68	-16.26	-22.47	-24.07	-29.18
R5	68.54	56.46	42.34	27.24	6.93	-0.25	-8.42	-14.49	-21.20	-21.96	-27.34

Temperature (°C)

C&B Electronics Shenzhen CO., LTD. | www.resistor.today | resi@cbeureka.com | Tel:0755-82899519

Derating Curve



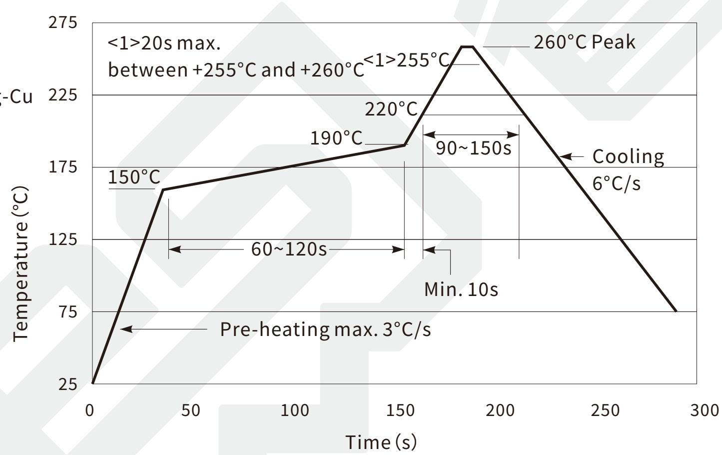
Reflow Soldering Profile

Resistor Surface Temperature:

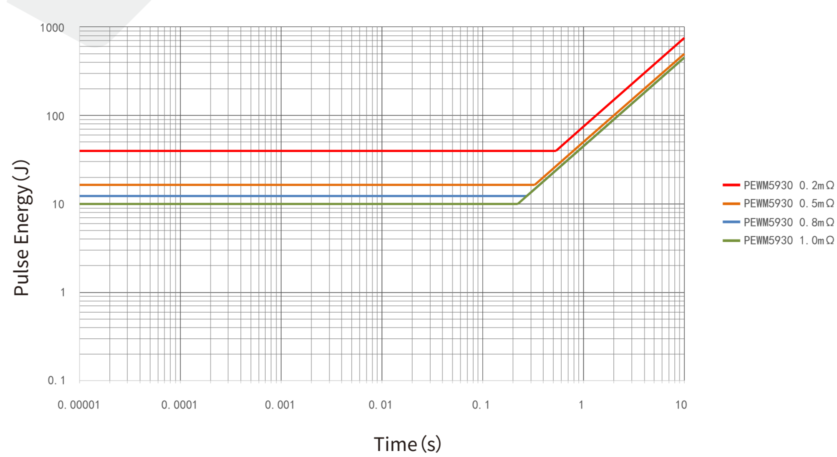
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



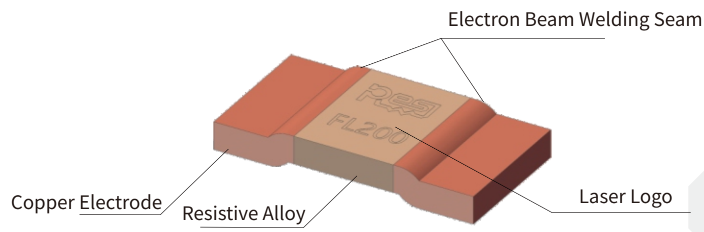
Maximum Pulse Energy Curve



PEWM5930

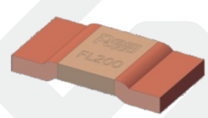
High-Precision Low-Inductance Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
5930		RESI：Brand F：Tolerance L200：Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be less than the rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

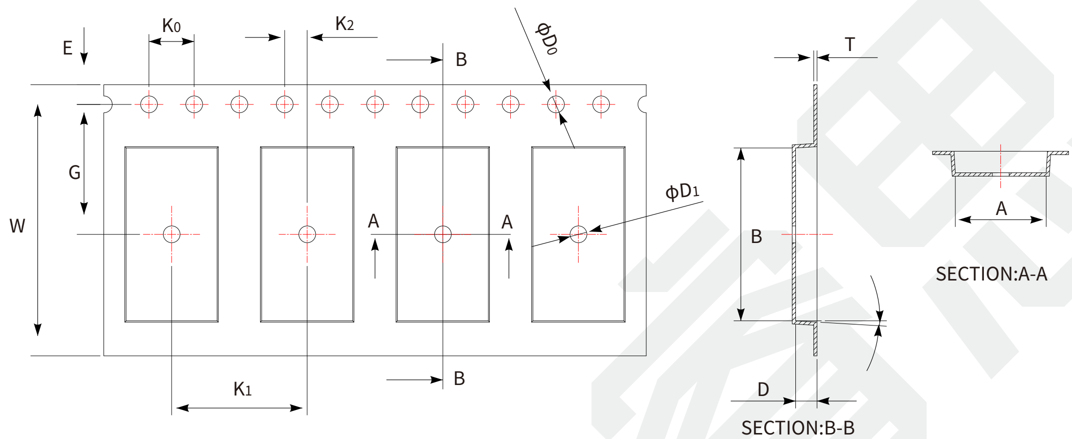
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor solderability caused by oxidation of the resistor.

Packaging

Tape Specifications

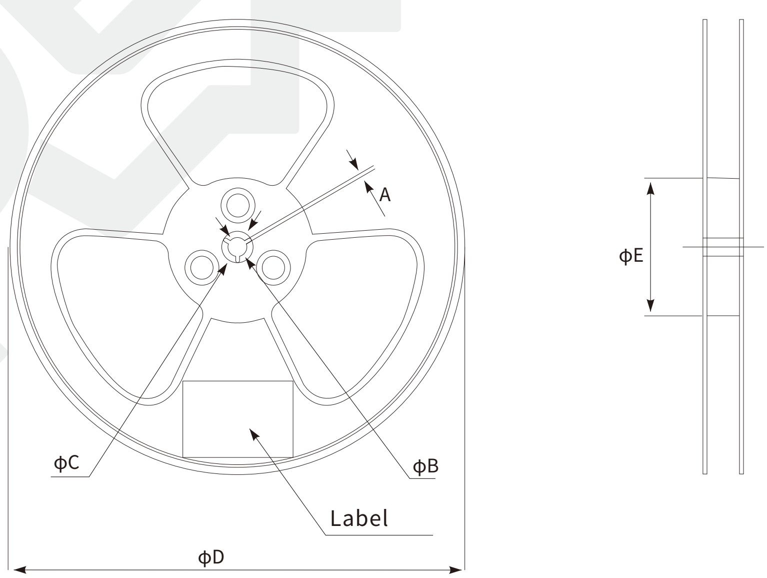
Unit: mm



Resistance	A	B	ϕD0	ϕD1	K0	K1	K2	E	G	W	D	T
0.2mΩ	8.03±0.2	15.6±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.1	24.0±0.3	2.35±0.1	0.3±0.05
0.5mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.1	24.0±0.3	1.3±0.1	0.3±0.05
0.8mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.1	24.0±0.3	1.3±0.1	0.3±0.05
1.0mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.1	24.0±0.3	1.3±0.1	0.3±0.05

Reel Specifications

Unit: mm



A	ϕB	ϕC	ϕD	ϕE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

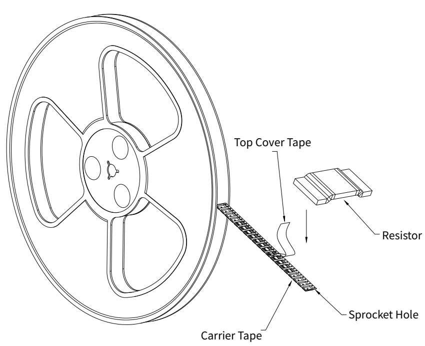
Packaging

(1) 2000 pcs. resistors are packed in a tape and wrapped in a reel;

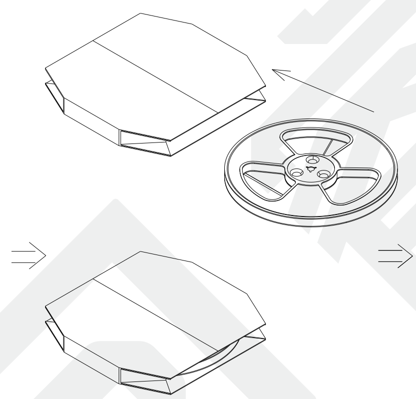
(2) Every reel is packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box (6000 pcs. / box);

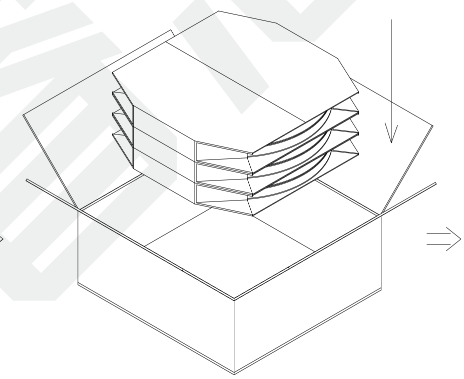
(4) Box size: 350mm*370mm*165mm.



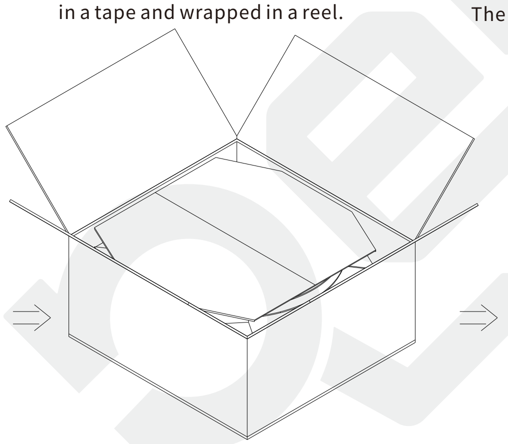
1. 2000 pcs. resistors are packed in a tape and wrapped in a reel.



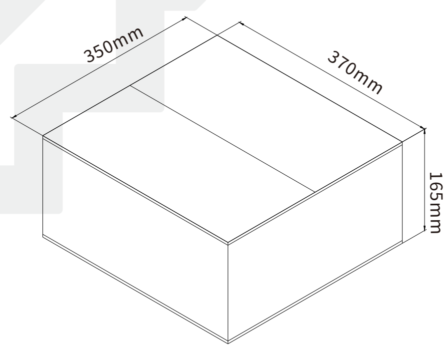
2. Every reel is packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm.



3. Place every 3 cases into a box (6000 pcs. / box).



4. Bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
PEWM5930DL200K9	5930	±0.5%	0.2mΩ	±100ppm/°C	15W	273A
PEWM5930FL200K9	5930	±1.0%	0.2mΩ	±100ppm/°C	15W	273A
PEWM5930JL200K9	5930	±5.0%	0.2mΩ	±100ppm/°C	15W	273A
PEWM5930DL500K9	5930	±0.5%	0.5mΩ	±100ppm/°C	10W	142A
PEWM5930FL500K9	5930	±1.0%	0.5mΩ	±100ppm/°C	10W	142A
PEWM5930JL500K9	5930	±5.0%	0.5mΩ	±100ppm/°C	10W	142A
PEWM5930DL800K9	5930	±0.5%	0.8mΩ	±100ppm/°C	9W	105A
PEWM5930FL800K9	5930	±1.0%	0.8mΩ	±100ppm/°C	9W	105A
PEWM5930JL800K9	5930	±5.0%	0.8mΩ	±100ppm/°C	9W	105A
PEWM5930D1L00K9	5930	±0.5%	1.0mΩ	±100ppm/°C	9W	94A
PEWM5930F1L00K9	5930	±1.0%	1.0mΩ	±100ppm/°C	9W	94A
PEWM5930J1L00K9	5930	±5.0%	1.0mΩ	±100ppm/°C	9W	94A

DataSheet No.:E19017
Version:V2
Date:2024/03/13

Resi 睿思

SEWF5930

High-Precision Low-TCR Alloy Current Sensing Resistor

Resistance	1mΩ~3mΩ
Tolerance	±0.5%
TCR	±25ppm/℃
Rated Current	45A~100A

Applications

Automotive Electronics

Precision Power Supply

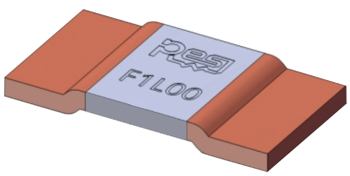
Instrumentation

Sorting & Formation of Battery

Medical Equipment

Better Solution for Sustainable High End Manufacturing

High-Precision Low-TCR Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Low TCR, Reliability



AEC-Q200

Introduction

SEWF5930 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, SEWF5930 achieves a maximum target tolerance of ± 0.5% after stamping without trimming. TCR of SEWF5930 series within the temperature range of -55 °C to +170 °C is ⩽ ± 25ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

SEWF5930 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, sorting & formation of battery, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Voltage	Operating Temperature	TCR ppm/°C (+20°C Ref)	Thermal Resistance	Tolerance %
SEWF5930	1.0mΩ	10W	100A	-55°C~+170°C	±25 (-55°C~+170°C)	6.4°C/W	±0.5 ±1.0 ±5.0
SEWF5930	2.0mΩ	8W	63A	-55°C~+170°C	±25 (-55°C~+170°C)	12.6°C/W	±0.5 ±1.0 ±5.0
SEWF5930	3.0mΩ	6W	45A	-55°C~+170°C	±25 (-55°C~+170°C)	19.1°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refers to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Application

SEWF5930 series is only applicable to DC sampling circuits. If you have AC sampling demands, please contact us.

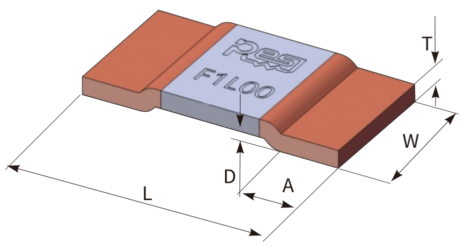
SEWF5930

High-Precision Low-TCR Alloy Current Sensing Resistor

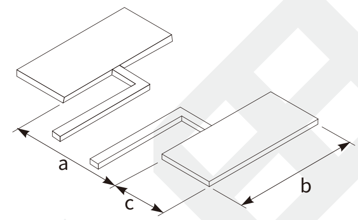
Dimensions

Unit：mm

Resistor



Land Pattern



Not following the recommended land pattern design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
1.0mΩ	15.0±0.3	7.75±0.3	3.8±0.3	1.05±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.2	Tape&Reel	2000pcs	1.01±0.1
2.0mΩ	15.0±0.3	7.75±0.3	3.8±0.3	0.53±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.2	Tape&Reel	2000pcs	0.51±0.1
3.0mΩ	15.0±0.3	7.75±0.3	3.8±0.3	0.35±0.2	0.5±0.2	5.6±0.1	8.75±0.2	5.2±0.2	Tape&Reel	2000pcs	0.34±0.1

Part Number Information

Example: SEWF5930F1L00P9 (SEWF 5930 ±1.0% 1.0mΩ ±25ppm/°C Standard)

S	E	W	F	5	9	3	0	F	1	L	0	0	P	9

Series	Size	Tolerance	Resistance	TCR	Code
SEWF	5930	D=±0.5% F=±1.0% J=±5.0%	1L00=1.0mΩ 2L00=2.0mΩ 3L00=3.0mΩ	P=±25ppm/°C	9=Standard 0-8=Custom

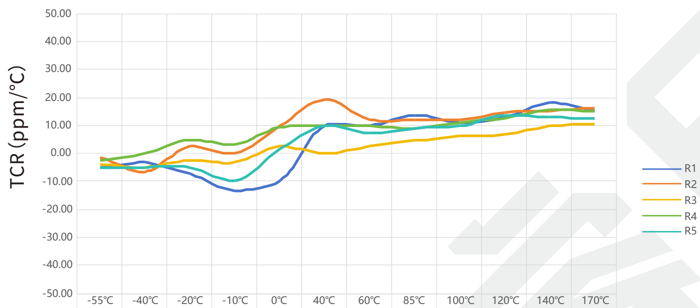
For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.2%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.2%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	-55°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 25ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

Temperature Coefficient of Resistance Test Curve

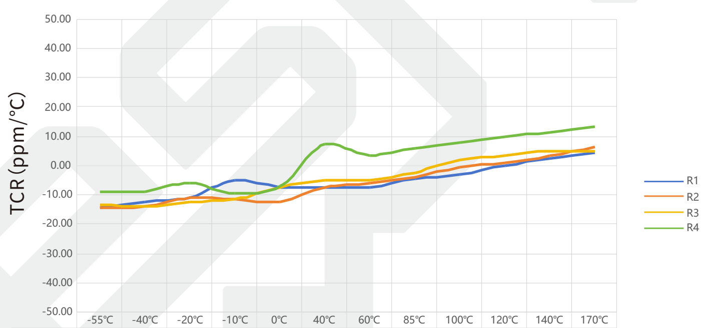
TCR Test Curve - SEWF5930 1mΩ



	-55℃	-40℃	-20℃	-10℃	0℃	40℃	60℃	85℃	100℃	120℃	140℃	170℃
R1	-5.26	-3.28	-7.39	-13.14	-9.85	9.85	9.85	13.64	11.09	12.81	18.07	15.11
R2	-1.29	-6.47	2.43	0.00	9.70	19.41	12.13	11.94	12.13	14.56	15.36	16.17
R3	-3.90	-4.88	-2.44	-3.25	2.44	0.00	2.44	4.50	6.10	6.83	9.76	10.41
R4	-2.61	0.00	4.90	3.26	9.30	9.79	9.79	9.04	11.02	12.73	15.51	15.02
R5	-5.20	-4.88	-4.88	-9.76	1.46	9.76	7.32	9.01	9.76	13.66	13.01	12.36

Temperature (°C)

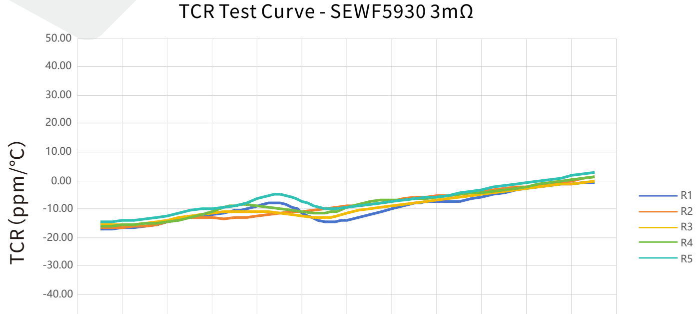
TCR Test Curve - SEWF5930 2mΩ



	-55℃	-40℃	-20℃	-10℃	0℃	40℃	60℃	85℃	100℃	120℃	140℃	170℃
R1	-14.40	-12.28	-11.05	-4.91	-7.37	-7.37	-7.37	-4.53	-3.07	0.00	2.46	4.26
R2	-14.40	-13.91	-11.05	-11.46	-12.27	-7.36	-6.14	-3.78	-0.61	0.98	3.27	6.22
R3	-13.20	-14.03	-12.38	-11.55	-7.43	-4.95	-4.95	-2.29	1.86	3.47	4.95	4.95
R4	-8.94	-8.78	-5.98	-9.57	-7.18	7.18	3.59	5.89	7.78	10.05	11.17	13.40

Temperature (°C)

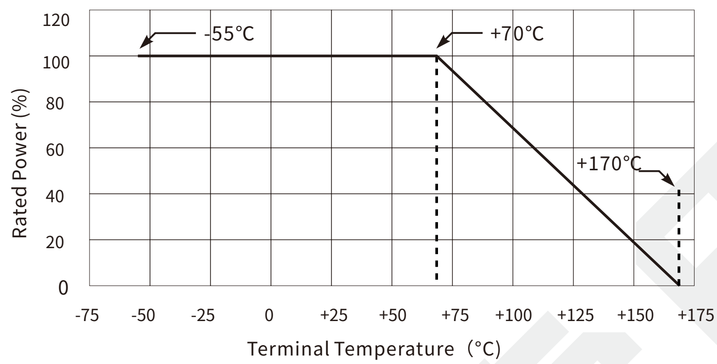
TCR Test Curve - SEWF5930 3mΩ



	-55℃	-40℃	-20℃	-10℃	0℃	40℃	60℃	85℃	100℃	120℃	140℃	170℃
R1	-17.15	-16.08	-12.86	-10.72	-8.04	-14.47	-12.06	-7.92	-7.24	-4.18	-1.88	-0.64
R2	-16.77	-16.00	-13.24	-13.24	-11.59	-9.93	-8.28	-6.11	-4.97	-2.65	-1.38	1.54
R3	-15.72	-15.28	-12.28	-10.92	-11.46	-13.10	-9.82	-8.06	-5.73	-3.93	-1.91	-0.44
R4	-16.18	-15.31	-13.12	-8.75	-9.84	-11.48	-7.38	-6.56	-4.92	-3.28	-0.82	1.31
R5	-14.48	-13.72	-10.70	-8.78	-4.94	-9.88	-8.23	-6.58	-4.53	-1.65	0.27	3.07

Temperature (°C)

Derating Curve



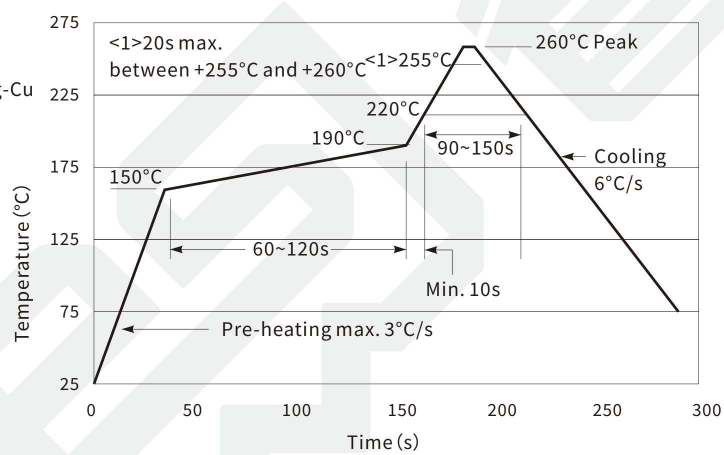
Reflow Soldering Profile

Resistor Surface Temperature：

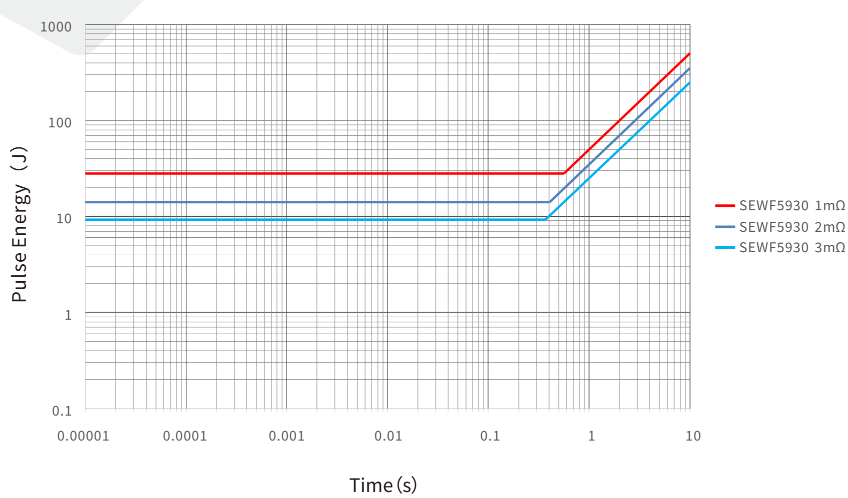
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



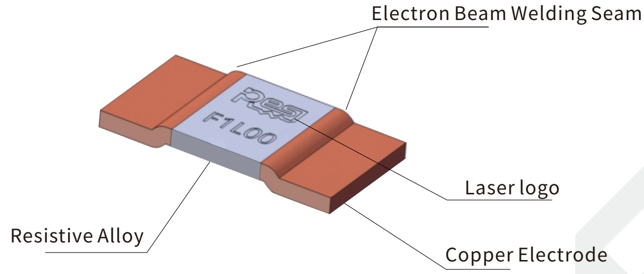
Maximum Pulse Energy Curve



SEWF5930

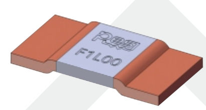
High-Precision Low-TCR Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
5930		RESI:Brand F:Tolerance 1L00:Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ⩽ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

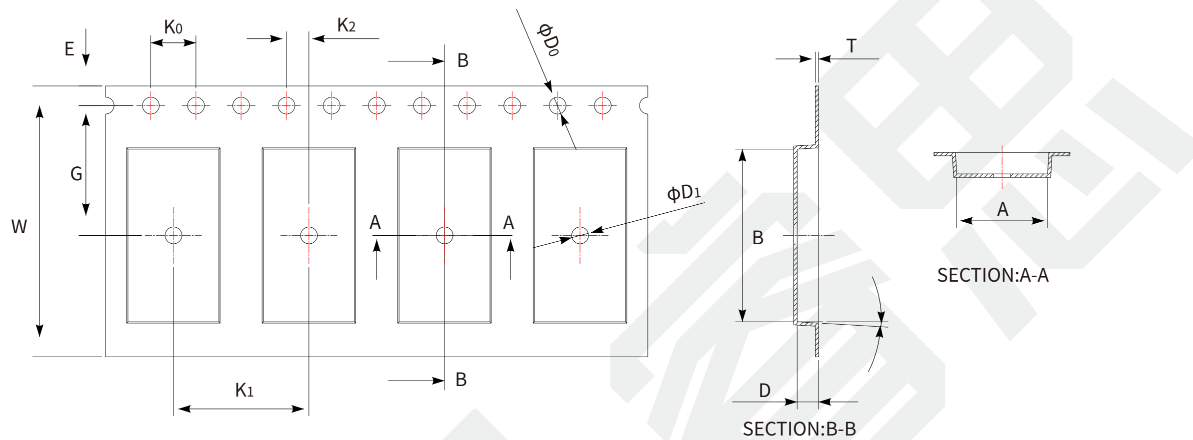
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

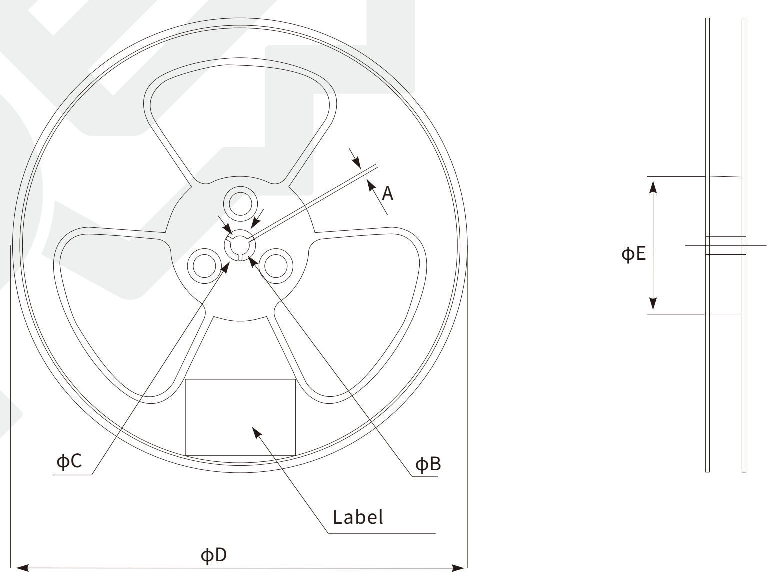
Unit：mm



Resistance	A	B	ϕD_0	ϕD_1	K_0	K_1	K_2	E	G	W	D	T
1.0mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.05	24.0±0.3	1.9±0.1	0.3±0.05
2.0mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.05	24.0±0.3	1.3±0.1	0.3±0.05
3.0mΩ	8.05±0.2	15.3±0.2	1.5±0.1	1.5±0.1	4.0±0.1	12.0±0.1	2.0±0.1	1.75±0.1	11.5±0.05	24.0±0.3	1.3±0.1	0.3±0.05

Reel Specifications

Unit：mm



A	ϕB	ϕC	ϕD	ϕE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

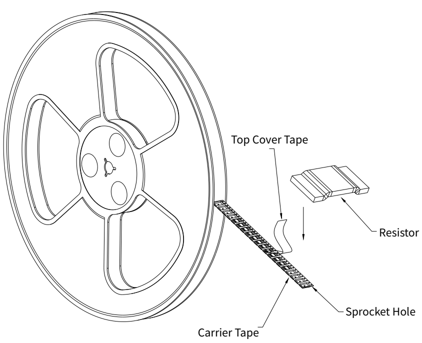
Packaging

(1) 2000 pcs. resistors are packed in a tape and wrapped in a reel;

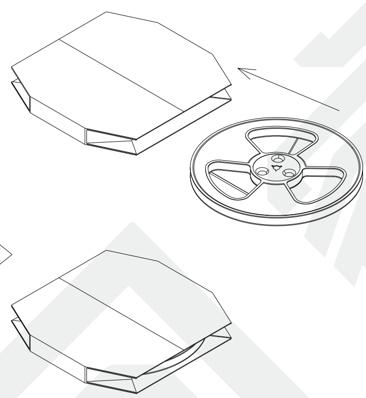
(2) Every reel are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box(6000 pcs./box);

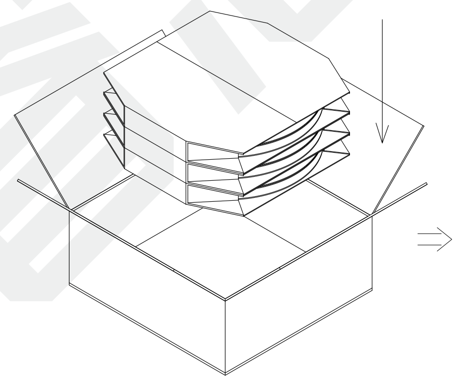
(4) Box size: 350mm*370mm*165mm.



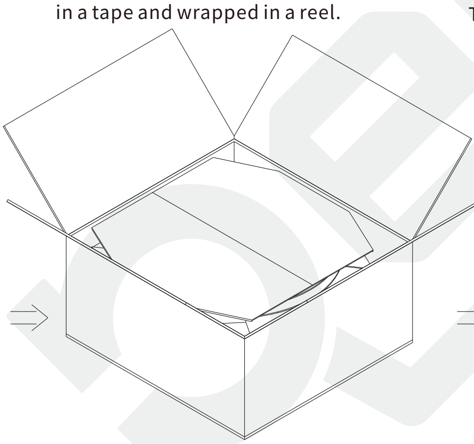
1. 2000 pcs. resistors are packed in a tape and wrapped in a reel.



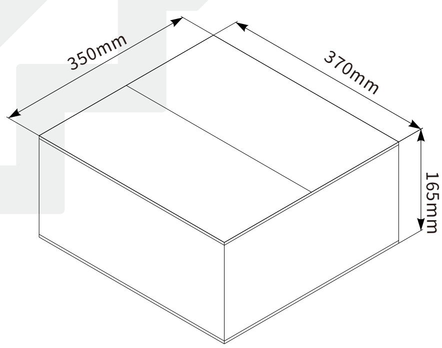
2. .Every reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. .Place every 3 cases into a box (6000 pcs. / box).



4. Bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
SEWF5930D1L00P9	5930	±0.5%	1.0mΩ	≤±25ppm/°C	10W	100A
SEWF5930D2L00P9	5930	±0.5%	2.0mΩ	≤±25ppm/°C	8W	63A
SEWF5930D3L00P9	5930	±0.5%	3.0mΩ	≤±25ppm/°C	6W	45A
SEWF5930F1L00P9	5930	±1.0%	1.0mΩ	≤±25ppm/°C	10W	100A
SEWF5930F2L00P9	5930	±1.0%	2.0mΩ	≤±25ppm/°C	8W	63A
SEWF5930F3L00P9	5930	±1.0%	3.0mΩ	≤±25ppm/°C	6W	45A
SEWF5930J1L00P9	5930	±5.0%	1.0mΩ	≤±25ppm/°C	10W	100A
SEWF5930J2L00P9	5930	±5.0%	2.0mΩ	≤±25ppm/°C	8W	63A
SEWF5930J3L00P9	5930	±5.0%	3.0mΩ	≤±25ppm/°C	6W	45A

DataSheet No.:E19018
Version:V1
Date:2024/03/13

SEWF3951

High-Precision Low-TCR Alloy Current Sensing Resistor

Resistance	0.25~0.8mΩ
Tolerance	±0.5%
TCR	±25ppm/℃
Rated Current	110A~240A

Applications

Automotive Electronics

Precision Power Supply

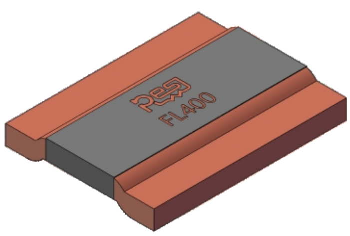
Instrumentation

Formation & Sorting of Battery

Medical Equipment

Better Solution for Sustainable High End Manufacturing

High-Precision Low-TCR Alloy Current Sensing Resistor
“Trimming Free” Technology, High Precision, Low TCR, Reliability



Introduction

SEWF3951 series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, SEWF3951 achieves a maximum target tolerance of ±0.5% after stamping without trimming. TCR of SEWF3951 series within the temperature range of +20 °C to +120 °C is ⩽ ±25ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

SEWF3951 series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation. Resi is committed to providing the best precision resistor solutions to meet the needs of customers in instrumentation, medical equipment, automotive electronics, precision power supplies, formation & sorting of battery, testing and measurement equipment and other fields.

Electrical Parameters

Size	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C (+20°C Ref)	Thermal Resistance*	Tolerance %
SEWF3951	0.25mΩ	15W	240A	-55°C~+170°C	±25 (+20°C~+120°C)	2.0°C/W	±0.5 ±1.0 ±5.0
SEWF3951	0.3mΩ	15W	220A	-55°C~+170°C	±25 (+20°C~+120°C)	2.3°C/W	±0.5 ±1.0 ±5.0
SEWF3951	0.4mΩ	15W	190A	-55°C~+170°C	±25 (+20°C~+120°C)	3.2°C/W	±0.5 ±1.0 ±5.0
SEWF3951	0.8mΩ	10W	110A	-55°C~+170°C	±25 (+20°C~+120°C)	6.1°C/W	±0.5 ±1.0 ±5.0

* Thermal Resistance: Refers to the internal thermal resistance between the center of the resistive alloy and the copper electrode.
As the heat dissipation efficiency is influenced by operating environment, copper bus bars, PCB design, etc., this parameter is only for reference.

Applications

SEWF3951 series is only applicable to DC low-frequency sampling circuit. If needs of AC or high-frequency applications are present, please contact us.

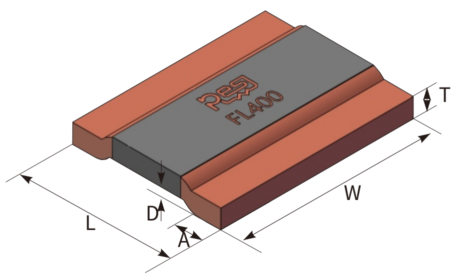
SEWF3951

High-Precision Low-TCR Alloy Current Sensing Resistor

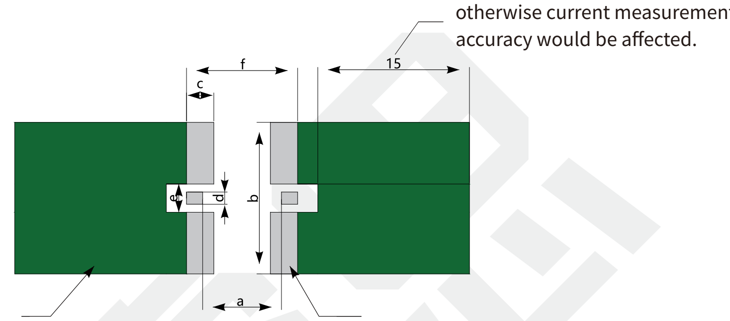
Dimensions

Unit：mm

Resistor



Land Patten



Not following the recommended solder pad design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	T	D	a	b	c	d	e	f	Quantity Per reel
0.25mΩ	10.0±0.3	13.0±0.5	2.0±0.3	2.0±0.2	0.5±0.2	8.6±0.1	15±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11±0.2	1200pcs
0.3mΩ	10.0±0.3	13.0±0.5	2.0±0.3	1.7±0.2	0.5±0.2	8.6±0.1	15±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11±0.2	1200pcs
0.4mΩ	10.0±0.3	13.0±0.5	2.0±0.3	1.3±0.2	0.5±0.2	8.6±0.1	15±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11±0.2	1200pcs
0.8mΩ	10.0±0.3	13.0±0.5	2.0±0.3	0.65±0.2	0.5±0.2	8.6±0.1	15±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11±0.2	1200pcs

Part Number Information

Example：SEWF3951FL400P9 (SEWF 3951 ±1.0% 0.4mΩ ±25ppm/°C Standard)

S	E	W	F	3	9	5	1	F	L	4	0	0	P	9

Series	Size	Tolerance	Resistance	TCR	Code
SEWF	3951	D=±0.5% F=±1.0% J=±5.0%	L250=0.25mΩ L300=0.3mΩ L400=0.4mΩ L800=0.8mΩ	P=±25ppm/°C	9=Standard 0-8=Custom

For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

Performance

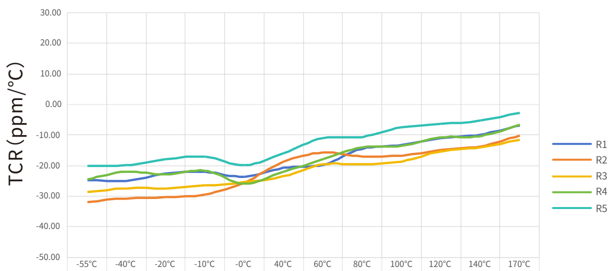
Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.1%	△R≤±0.5%
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.1%	△R≤±0.5%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.1%	△R≤±0.5%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	+20°C and +120°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 25ppm/°C	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	△R≤±0.1%	△R≤±0.5%
Short Time Overload	5x rated power, 5s	IEC 60115-1 4.13	△R≤±0.1%	△R≤±0.5%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	△R≤±0.1%	△R≤±0.5%

SEWF3951

High-Precision Low-TCR Alloy Current Sensing Resistor

Temperature Coefficient of Resistance Test Curve

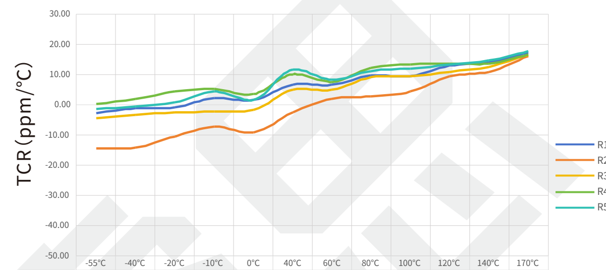
TCR Test Curve - SEWF3951 0.25mΩ



	-55°C	-40°C	-20°C	-10°C	-0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-24.69	-24.95	-22.65	-22.06	-23.64	-20.76	-19.70	-14.44	-13.29	-11.03	-9.85	-6.83
R2	-31.86	-30.69	-30.36	-29.47	-25.46	-18.75	-15.67	-16.98	-16.65	-14.89	-13.71	-10.19
R3	-28.71	-27.41	-27.41	-26.54	-25.45	-23.49	-19.58	-19.58	-18.60	-15.27	-14.03	-11.49
R4	-24.50	-21.97	-22.97	-21.62	-25.97	-21.98	-17.98	-13.98	-13.48	-10.79	-10.32	-6.66
R5	-20.14	-19.87	-17.88	-17.05	-19.87	-15.96	-10.93	-10.60	-7.45	-6.36	-5.30	-2.65

Temperature (°C)

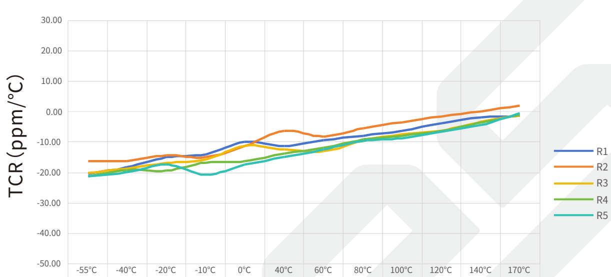
TCR Test Curve - SEWF3951 0.3mΩ



	-55°C	-40°C	-20°C	-10°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-2.66	-1.11	-0.83	2.21	1.66	6.64	6.64	9.71	9.55	12.96	14.12	17.28
R2	-14.46	-14.18	-10.41	-7.20	-9.13	-2.55	2.06	2.81	4.37	9.51	10.98	16.14
R3	-4.40	-3.30	-2.48	-2.20	-1.65	4.95	4.95	9.15	9.50	10.90	12.66	16.52
R4	0.34	1.88	4.35	5.18	3.53	10.12	7.65	12.27	13.41	13.74	13.69	16.60
R5	-1.33	-0.55	0.83	4.44	1.66	11.65	8.32	11.26	12.06	13.31	14.70	17.75

Temperature (°C)

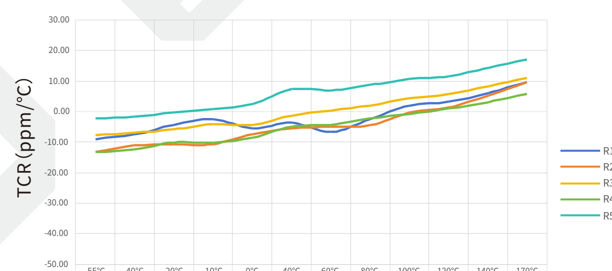
TCR Test Curve - SEWF3951 0.4mΩ



	-55°C	-40°C	-20°C	-10°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-20.29	-18.29	-14.97	-13.95	-9.98	-11.22	-9.35	-7.90	-6.24	-3.74	-1.87	-1.33
R2	-16.29	-16.21	-14.34	-14.96	-11.22	-6.23	-8.10	-5.40	-3.43	-1.50	0.21	1.99
R3	-20.18	-18.60	-16.86	-15.71	-11.16	-12.40	-13.02	-9.51	-7.44	-6.20	-3.31	-1.16
R4	-21.34	-19.17	-19.38	-16.67	-16.25	-13.75	-11.88	-9.17	-7.81	-6.25	-3.54	-1.00
R5	-21.21	-19.88	-17.40	-20.71	-17.40	-14.91	-12.43	-9.53	-8.70	-6.46	-4.35	-0.50

Temperature (°C)

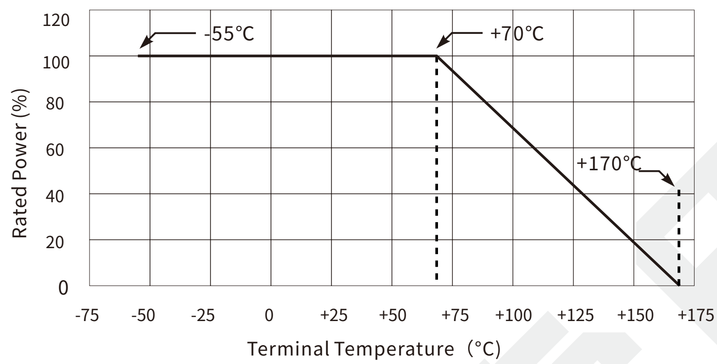
TCR Test Curve - SEWF3951 0.8mΩ



	-55°C	-40°C	-20°C	-10°C	0°C	40°C	60°C	80°C	100°C	120°C	140°C	170°C
R1	-8.96	-7.53	-4.28	-2.44	-5.50	-3.66	-6.72	-2.44	1.98	3.18	6.11	9.77
R2	-13.31	-11.09	-10.78	-10.68	-7.39	-5.54	-4.93	-4.52	-0.31	1.36	5.34	9.69
R3	-7.70	-6.97	-5.84	-4.10	-4.30	-1.23	0.31	2.05	4.30	5.65	8.30	11.06
R4	-13.25	-12.47	-10.12	-10.23	-8.59	-4.91	-4.29	-2.25	-0.77	0.98	3.17	5.89
R5	-2.27	-1.62	-0.30	0.81	2.44	7.31	7.01	8.73	10.66	11.58	14.32	17.14

Temperature (°C)

Derating Curve



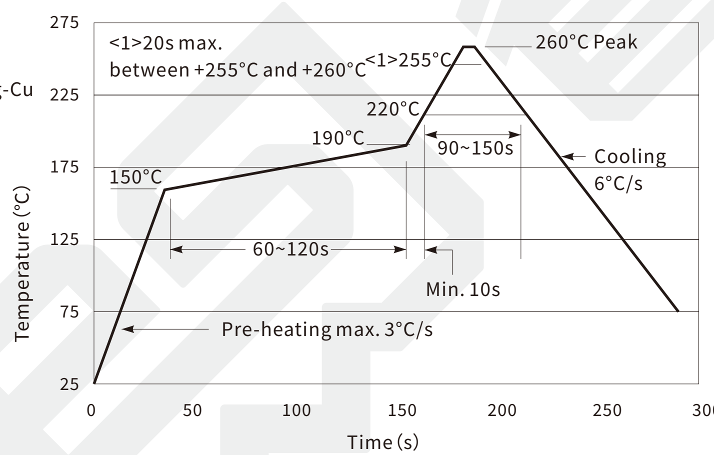
Reflow Soldering Profile

Resistor Surface Temperature:

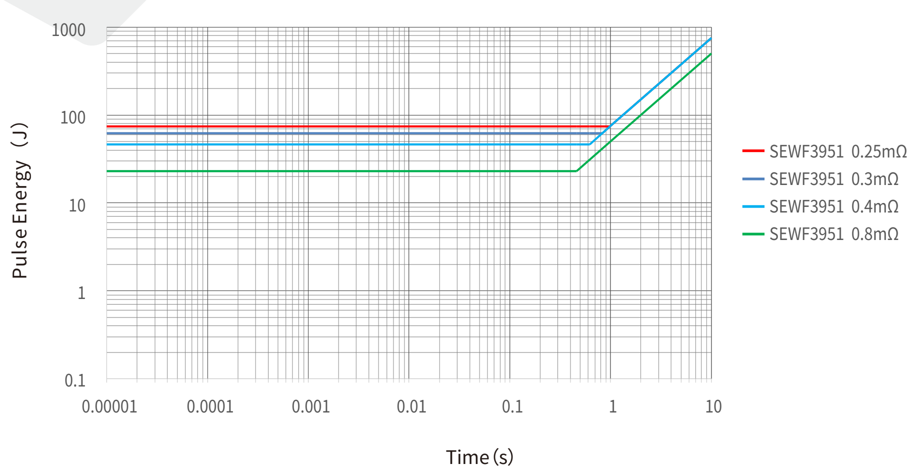
Pre-Heat: +150℃~+190℃,60~120sec.

Reflow: Above +220℃,90~150sec.

Applicable Solder Composition: Sn-Ag-Cu



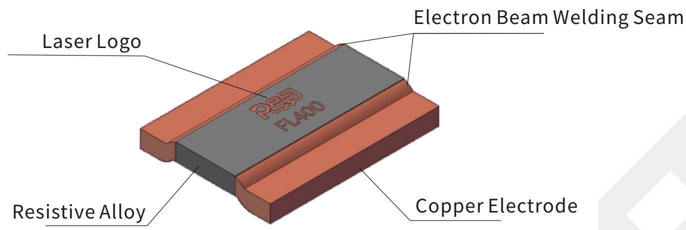
Maximum Pulse Energy Curve



SEWF3951

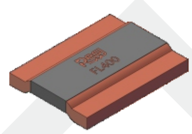
High-Precision Low-TCR Alloy Current Sensing Resistor

Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Size	Illustration	Demonstration
3951		RESI:Brand F:Tolerance L400:Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ≤ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

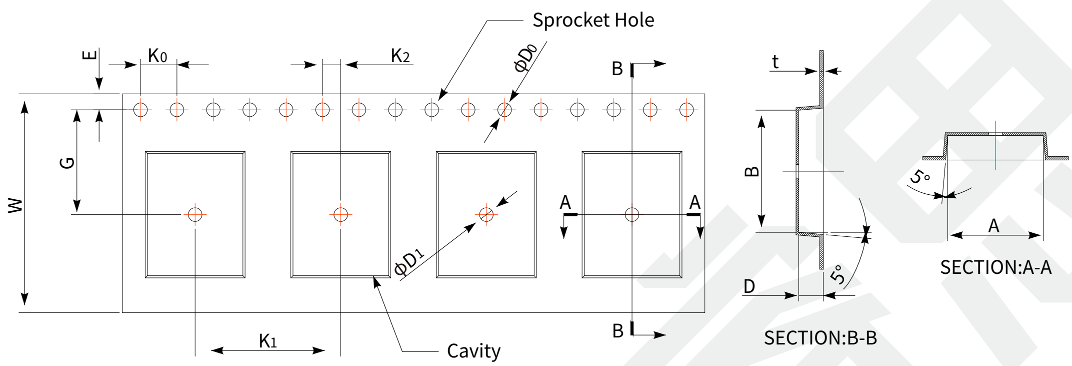
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

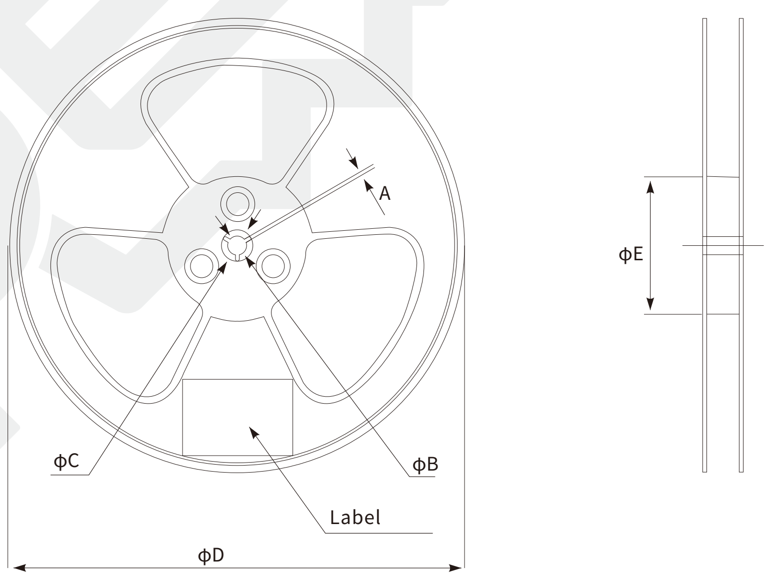
Unit : mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	t
0.25mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4±0.1	16±0.1	2±0.1	1.75±0.1	11.5±0.1	24±0.3	2.7±0.1	0.4±0.05
0.3mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4±0.1	16±0.1	2±0.1	1.75±0.1	11.5±0.1	24±0.3	2.7±0.1	0.4±0.05
0.4mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4±0.1	16±0.1	2±0.1	1.75±0.1	11.5±0.1	24±0.3	2.7±0.1	0.4±0.05
0.8mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4±0.1	16±0.1	2±0.1	1.75±0.1	11.5±0.1	24±0.3	2.7±0.1	0.4±0.05

Reel Specifications

Unit : mm



A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

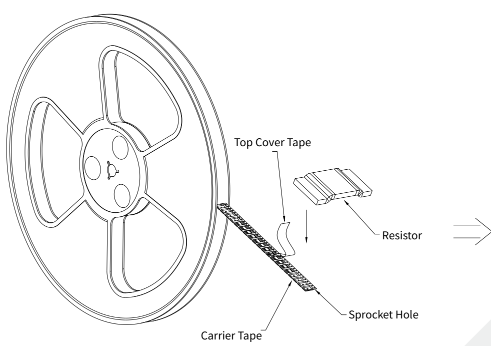
Packaging

(1) 1200 pcs. resistors are packed in a tape and wrapped in a reel;

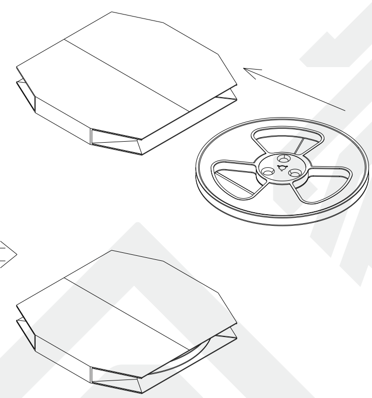
(2) Every reel are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;

(3) Place every 3 cases into a box(3600 pcs./box);

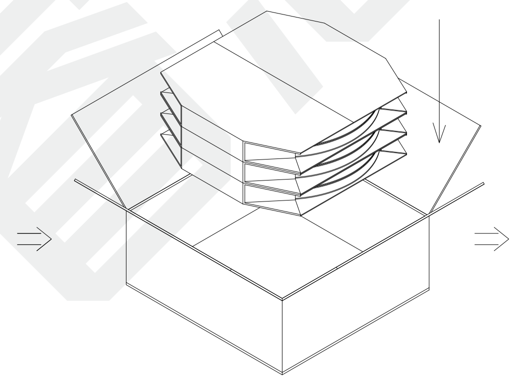
(4) Box size: 350mm*370mm*165mm.



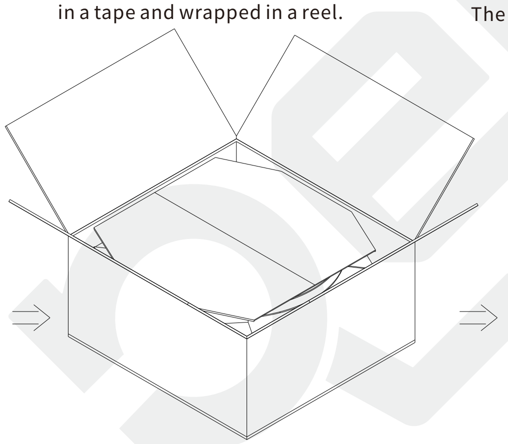
1. 1200 pcs. resistors are packed in a tape and wrapped in a reel.



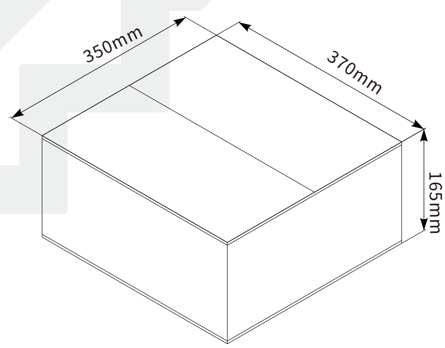
2. .Every reels are packed by a cardboard sleeve case. The size of the cardboard is 335mm*340mm*37mm;



3. Place every 3 cases into a box (3600 pcs. / box).



4. Bubble wrap or EPE should be placed to prevent products from shaking or vibration.



5. Box size: 350mm*370mm*165mm

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Current
SEWF3951DL250P9	3951	±0.5%	0.25mΩ	±25ppm/°C	15W	240A
SEWF3951FL250P9	3951	±1.0%	0.25mΩ	±25ppm/°C	15W	240A
SEWF3951JL250P9	3951	±5.0%	0.25mΩ	±25ppm/°C	15W	240A
SEWF3951DL300P9	3951	±0.5%	0.3mΩ	±25ppm/°C	15W	220A
SEWF3951FL300P9	3951	±1.0%	0.3mΩ	±25ppm/°C	15W	220A
SEWF3951JL300P9	3951	±5.0%	0.3mΩ	±25ppm/°C	15W	220A
SEWF3951DL400P9	3951	±0.5%	0.4mΩ	±25ppm/°C	15W	190A
SEWF3951FL400P9	3951	±1.0%	0.4mΩ	±25ppm/°C	15W	190A
SEWF3951JL400P9	3951	±5.0%	0.4mΩ	±25ppm/°C	15W	190A
SEWF3951DL800P9	3951	±0.5%	0.8mΩ	±25ppm/°C	10W	110A
SEWF3951FL800P9	3951	±1.0%	0.8mΩ	±25ppm/°C	10W	110A
SEWF3951JL800P9	3951	±5.0%	0.8mΩ	±25ppm/°C	10W	110A

Data Sheet No.:E05016

Version:V1

Date:2024/03/09

睿思

EOAR

High Precision Alloy Current Sensing Resistor

Resistance	25mΩ
Tolerance	±0.5%
TCR	±40ppm/℃
Rated Current	14A

Applications

Automotive Electronics

Precision Power Supply

Instrumentation

Battery Sorting & Formation

Medical Equipment

Better Solution for Sustainable High End Manufacturing

High Precision, High Reliability & High Stability

RoHS AEC-Q200 3D

Introduction

EOAR series is based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, EOAR achieves a maximum target tolerance of ± 0.5% after stamping without trimming. TCR of EOAR series within the temperature range of +20 °C to +170 °C is ⩽ ± 40ppm/°C.

"Trimming Free" technology avoids the loss of rated current caused by trimming and also avoids current accumulation hotspots caused by trimmed notch, greatly improving the reliability of the product. Meanwhile, due to the improvement of welding quality, thermal EMF of the product is significantly reduced, improving its long-term stability.

EOAR series, from raw materials, core equipment, to core processes, achieves independent and controllable production, stable quality, and timely delivery. If the standard specifications cannot meet your needs, please contact our sales for consultation.

Electrical Parameters

Series	Resistance	Rated Power (+70°C)	Max. Operating Current	Operating Temperature	TCR ppm/°C (+20°C Ref)	Tolerance %
EOAR	25mΩ	5W	14A	-55°C~+170°C	±40 (+20°C~+170°C)	±0.5 ±1.0 ±5.0

Applications

EOAR series is only applicable to DC low-frequency sampling circuit. If needs of AC or high-frequency applications are present, please contact us.

Part Number Information

Example：EOAR0005FR025H9 (EOAR 5W ±1.0% 25mΩ ±40ppm/°C Standard)

E	O	A	R	0	0	0	5	F	R	0	2	5	H	9

Series	Power	Tolerance	Resistance	TCR	Code
EOAR	5W	D=±0.5% F=±1.0% J=±5.0%	R025=25mΩ	H=±40ppm/°C	9=Standard 0-8=Custom

For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us.

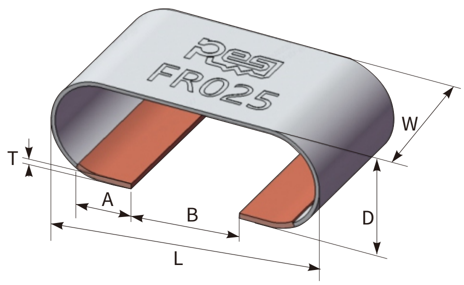
EOAR

High Precision Alloy Current Sensing Resistor

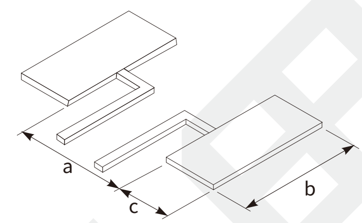
Dimensions

Unit：mm

Resistor



Land Patten



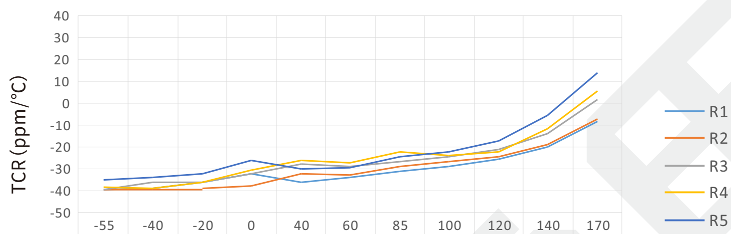
Not following the recommended solder pad design can seriously affect the temperature coefficient measurement results and current sensing accuracy!

Resistance	L	W	A	B	T	D	a	b	c	Packaging	Quantity Per Reel	Net Weight g
25mΩ	12±0.38	6.35±0.38	2.36±0.25	4.83±0.76	0.25	4.5±0.76	3.23	7.24	3.18	Tape&Reel	1200pcs	0.22±0.1

Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, no load	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+155°C, 15min, 1000 Cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R≤±0.2%	△R≤±0.75%
Bias Humidity	+85°C, 85%RH, load 10% rated power, 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R≤±0.2%	△R≤±0.5%
Load Life	2000h @ +70°C, rated power, 90min on, 30min off +70°C refers to terminal temperature	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R≤±0.5%	△R≤±1.0%
Resistance to Solvent	Immerse in solvent for 3 min and wipe 10 times. Three cycles of three solvents. Dry at ambient temperature after cleaning	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage	
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R≤±0.01%	△R≤±0.5%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R≤±0.01%	△R≤±0.5%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R≤±0.2%	△R≤±0.5%
Solderability	+235°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage	
TCR	+20°C and +170°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Refer to tested curve, max. value ≤ 40ppm/°C	
Short Time Overload	5 times rated power, 5s	IEC 60115-1 4.13	△R≤±0.2%	△R≤±1.0%
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	△R≤±0.1%	△R≤±0.5%

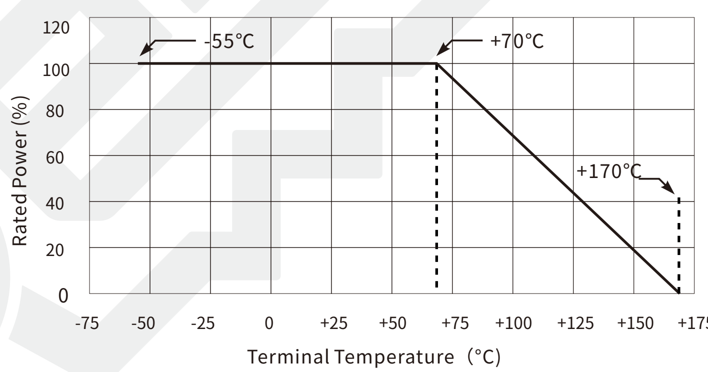
Temperature Coefficient of Resistance Test Curve



	-55	-40	-20	0	40	60	85	100	120	140	170
R1	-39.55	-38.75	-36.07	-32.07	-36.07	-34.07	-30.83	-28.56	-25.25	-20.04	-8.55
R2	-39.41	-39.27	-38.94	-37.94	-31.95	-32.95	-28.88	-26.46	-24.36	-18.97	-7.46
R3	-39.44	-35.98	-35.98	-31.98	-27.98	-28.98	-26.44	-24.48	-20.79	-13.99	1.6
R4	-38.14	-38.94	-36.26	-30.28	-26.19	-27.19	-22.31	-23.67	-22.4	-11.41	5.37
R5	-34.89	-33.55	-32.20	-26.17	-30.19	-29.19	-24.15	-22.14	-17.31	-5.70	13.96

Temperature (°C)

Derating Curve



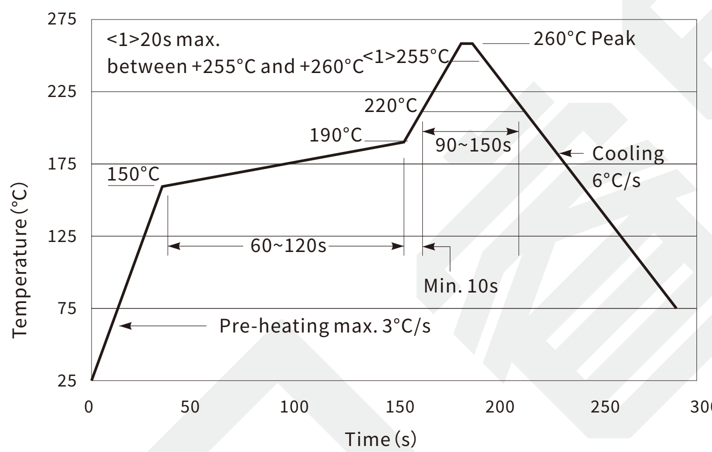
Reflow Soldering Profile

Resistor Surface Temperature:

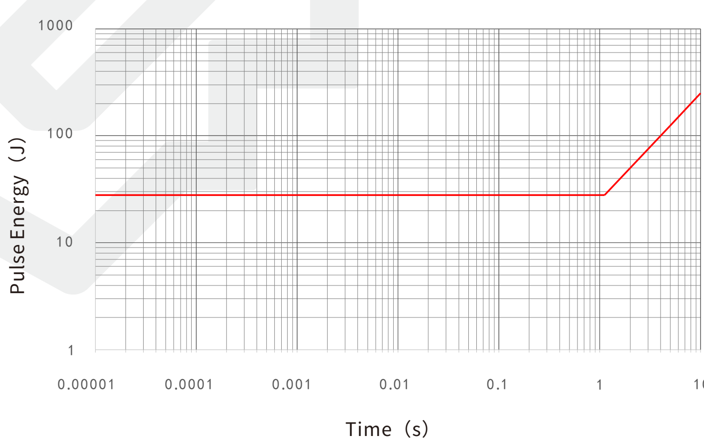
Pre-Heat:+150°C~+190°C, 60~120sec.

Reflow:Above +220°C, 90~150sec.

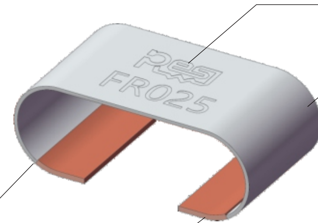
Applicable Solder Composition:Sn-Ag-Cu.



Maximum Pulse Energy Curve



Construction



Marking

The first line (four digits) represents brand. The second line (five digits) represents tolerance and resistance.

Series	Illustration	Demonstration
EOAR		RESI:Brand F:Tolerance R025:Resistance

Storage Instructions

(1) Resistors should be stored at a temperature of 5 to 35 °C, with a humidity of<60% RH. The humidity should be kept as low as possible.

(2) Resistors should be protected from direct sunlight.

(3) Resistors should be stored in a clean and dry environment free of harmful gases (HCl, Sulfuric acid, H_2S, etc.)

(4) Do not move the resistor from the packaging unless use it.

(5) Under the above storage conditions, the resistor can be stored for at least 1 year.

Usage Suggestions

(1) Please protect the surface of the resistor during use. Prevent defects such as scratches, bumps, and oil stains on the surface.

(2) Do not use sharp tweezers to move the resistor. Scratches on the surface can cause resistance drift and resistor failure.

(3) When installing and using resistors, avoid the impact of mechanical stress on the resistor.

(4) The long-term operating power of resistors should be ⩽ rated power to avoid resistance drift caused by long-term overload.

(5) Please refer to the derating curve when operating under high temperature conditions or poor heat dissipation environment.

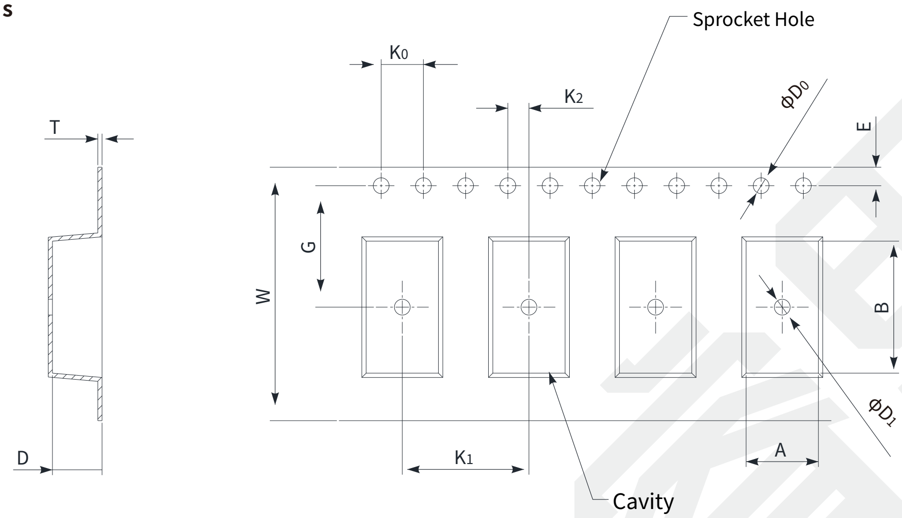
(6) If the operating conditions exceed the pulse specified in the pulse curve, a systematic evaluation is required.

(7) If the resistor is not used after being moved from the packaging, it should be stored under vacuum to avoid risks such as poor welding caused by oxidation of the resistor.

Packaging

Tape Specifications

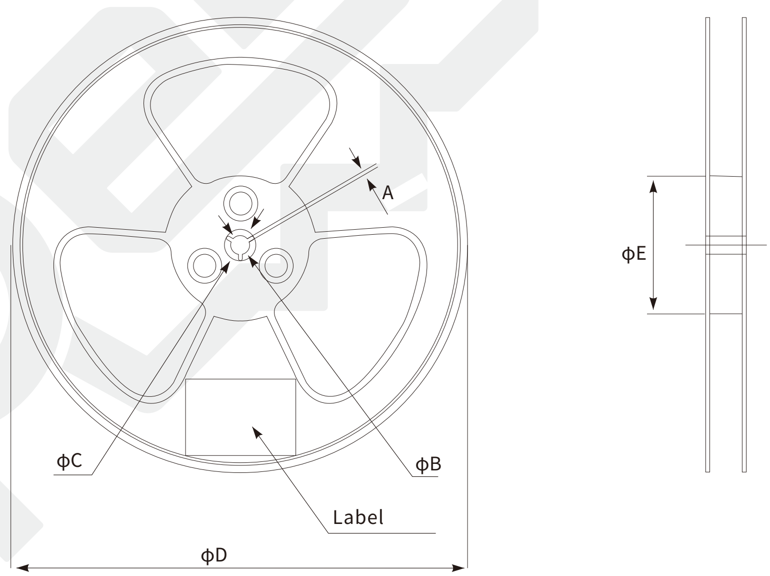
Unit：mm



Resistance	A	B	ΦD0	ΦD1	K0	K1	K2	E	G	W	D	T
25mΩ	6.85±0.1	12.50±0.1	1.5+0.1/-0	1.5+0.1/-0	4.00±0.1	12.00±0.1	2.00±0.1	1.75±0.1	11.50±0.1	24.00±0.3	4.7±0.1	0.4±0.05

Reel Specifications

Unit：mm

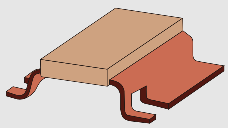
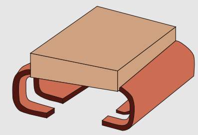
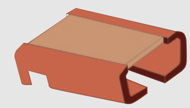


A	ΦB	ΦC	ΦD	ΦE
1.5 Min.	13.0 +0.5/-0.2	20.2 Min.	330±2	100±2

Popular Part Numbers

Part Number	Tolerance	Resistance	TCR	Power	Max. Operating Current
EOAR0005DR025H9	±0.5%	25mΩ	±40ppm/°C	5W	14A
EOAR0005FR025H9	±1%	25mΩ	±40ppm/°C	5W	14A
EOAR0005JR025H9	±5%	25mΩ	±40ppm/°C	5W	14A

Trimming Free Technology

Product Images	 4026		 2726		 1216
Series	PEWF4026	PEWM4026	PEWF2726	PEWM2726	PEWM1216
Materials	FeCrAl	MnCu	FeCrAl	MnCu	FeCrAl
TCR	±50ppm/°C	±100ppm/°C	±50ppm/°C	±100ppm/°C	±100ppm/°C
Resistance Range	1~5mΩ	0.3~1mΩ	1~5mΩ	0.2~1mΩ	0.5mΩ
Tightest Tolerance	±0.5%	±0.5%	±0.5%	±0.5%	±0.1%
Rated Power	3W-7W	7W-12W	3W-7W	7W-12W	9W

These series are based on a precision resistive alloy, welded by a specialized electron beam welding equipment. Both resistive alloy and welding equipment are independently designed and manufactured by C&B Electronics. Because of controlling the consistency of resistive alloys, precision processing ability and efficient welding, these series achieve a tight target tolerance after stamping without trimming.

ARCS

Trimming Free Technology

Automotive-Grade Precision Shunt

ARCS series is an economical Mn-Cu shunt, which adopts a four-terminal Kelvin connection, electron beam welding process, and trimming free technology. It has the characteristics of low thermal EMF, low power coefficient, and low inductance.

Structure

Pin, M3 Hole, Standard

Surface Treatment

Non-Plating
Overall Nickel Plating
Partial Nickel Plating
Partial Nickel-Tin Plating

Size

5218 6918 7727 7736
8420 8436 8518 8536

Resistance

25μΩ 50μΩ 100μΩ 200μΩ

Rated Current

500A~1410A

Tolerance

±0.5%

TCR

±50ppm/°C~±150ppm/°C

Output Voltage

35mV~60mV

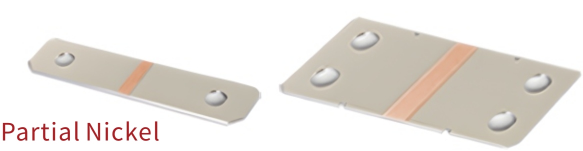
Applications

Battery Management System

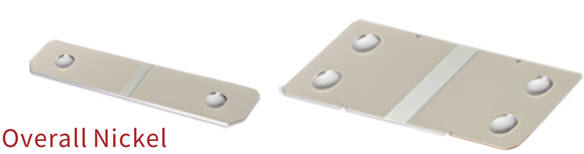
Power Equipment

Current Sensing

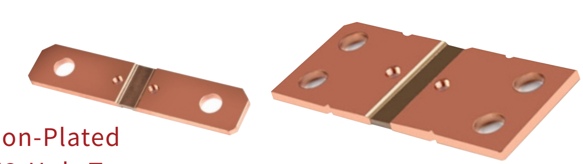
Frequency Converter



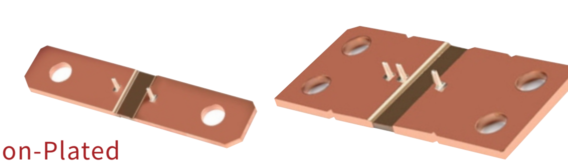
Partial Nickel Plated Standard Type



Overall Nickel Plated Standard Type



Non-Plated M3-Hole Type



Non-Plated Pin Type

Precision Shunt

Precision shunt adopts Mn-Cu alloy resistive technology and has two installation methods: base installation (RTBS) and bolt fixing (RTCS). The sensing tolerance can reach ±0.1% and the thermal EMF is less than 0.05μV/°C. The shunt has good long-term stability.

RTBS

(Wooden Base)

Rated Current

10A~300A

Tolerance

±0.1%

TCR

±20ppm/°C

Resistance Range

0.167mΩ~7.5mΩ

Output Voltage

50mV~75mV

RTCS

Rated Current

50A~20000A

Tolerance

±0.1%

TCR

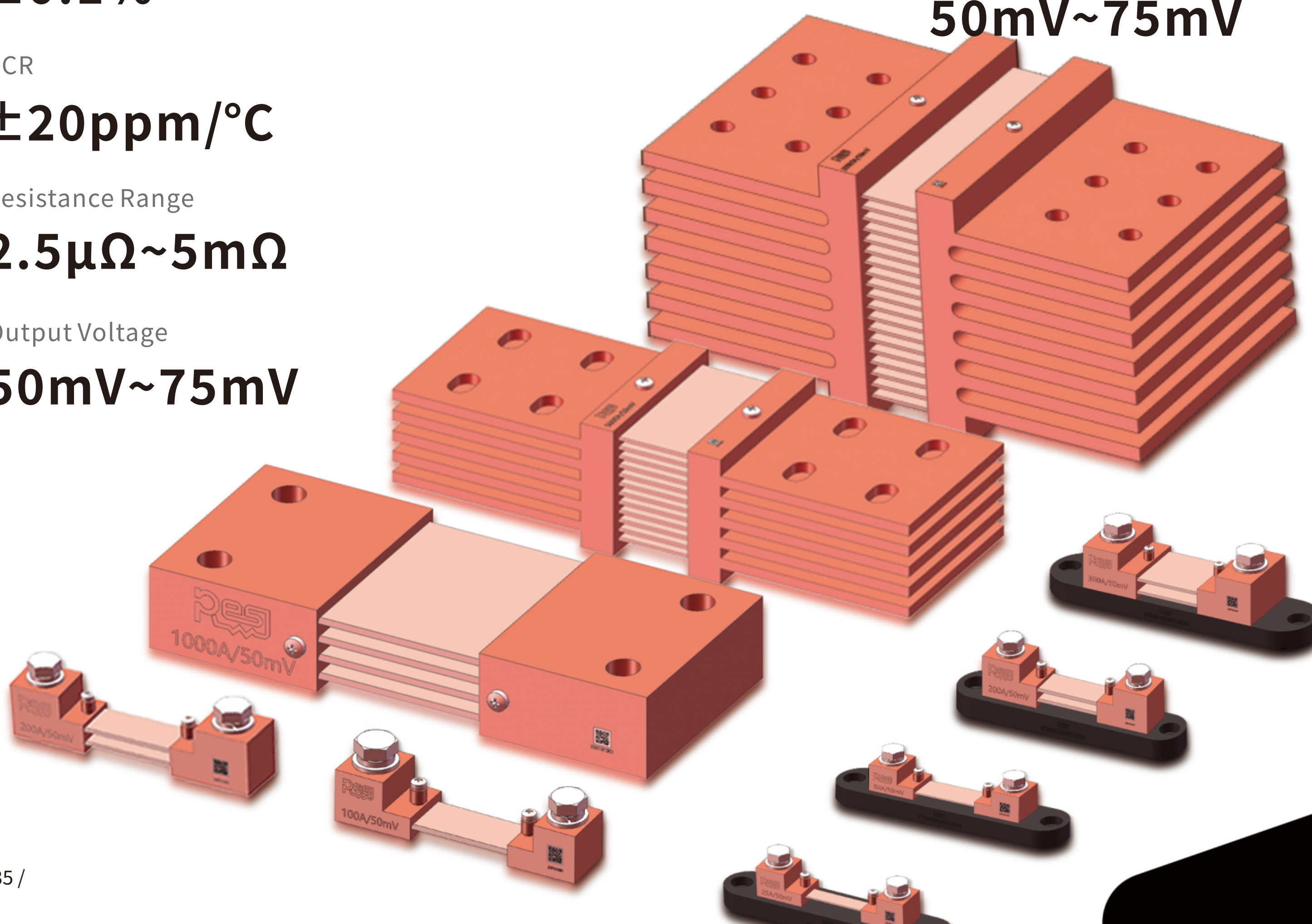
±20ppm/°C

Resistance Range

2.5μΩ~5mΩ

Output Voltage

50mV~75mV



CB350M6918A Series, Automotive, 0.5% Tolerance Operating Temperature -40℃~+105℃ Shunt Based Current Sensor

1、Characteristics

- Current Sensing: Measurement Range：-8000A~+8000A
  - Continuous Operating Range：-350A~+350A
  - Measurement Accuracy：±0.5%(MAX)
  - Resolution: 10mA
- Temperature Sensing: Measurement Range: -50℃~+150℃
  - Measurement Error: ±3℃ (MAX)
  - Resolution: 0.1℃
- Communication Protocol：CAN2.0 A/B
  - Selectable Data Format
  - Configurable CAN ID
  - Configurable CAN Speed：250Kbps-1Mbps
- Supply Voltage：6VDC~18VDC
- Operating Temperature Range：-40℃~+105℃
- Power Consumption：≤216mW @12VDC
- Galvanic Isolation：3000VAC
- The product design is based on ISO 26262 and it is ASIL C compliant.

2、Applications

- Automotive Current Monitor
- Grid Energy Storage
- UPS
- Charging Station

3、Introduction

CB350M6918A current sensor is an automotive current sensing module, which can be used to measure bidirectional DC current. Featuring high accuracy, low power consumption, wide operating temperature range, excellent response speed, temperature stability and anti-interference ability.

The sensor is designed based on low-TCR shunt, adopts high-precision ADC, communicates through CAN2.0 A/B protocol, and has large ranges of current and temperature measurement capabilities, and current compensation at whole temperature range.

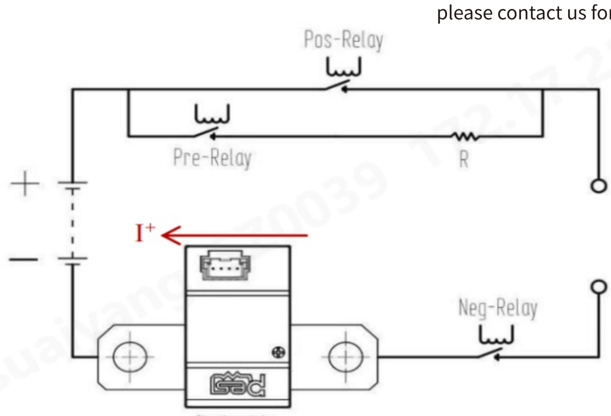
The sensor meets the operating temperature range of -40℃~+105℃, can apply to the continuous operating current of -350A~+350A at the whole temperature range, and the current measurement accuracy is no more than ± 0.5% in the range of +20A~+350A or -350A~-20A.

Power supply of CB350M6918A current sensor is from 6VDC to 18VDC. Its power consumption is controlled below 216mW (12VDC), and it can realize complete high-low voltage isolation, which can be applied to the main positive electrode or the main negative electrode of the battery system.

Sensor Information

Part Number	Shunt Thickness	Resistance	Terminal Resistor
CB350M6918A1SS00	3mm	50μΩ	Yes
CB350M6918A1SN00	3mm	50μΩ	No

[1] For part numbers not included in the table, please contact us for technical support.



Typical Application

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4、 Revision

Date	Revised Content	Note
2023.02	/	A0
2023.04.06	Flat washer is removed in Copper Bar Connection Diagram	A1
2023.08.29	Change the product packaging	A2
2023.09.14	Modify limit parameters of CAN, format B of data frame, order of connector pin and start-up time test curve	A3
2024.11.06	Add ASIL C compliance	A4
2024.12.05	Update the examples of Format B message frame	A5

5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Supply Voltage				30	VDC
Current Measurement Range	±1400A			10	s
	±8000A			50	ms
CAN Interface	Configured 120Ω Terminal Resistor (Continuous Power Supply)			6	V
	ESD			8	KV
Operating Temperature		-40		105	℃
Storage Temperature		-40		125	℃
Humidity				95	%RH

5.2 General Parameters

Test Conditions: Ambient Temperature 25 °C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Power Supply					
Supply Voltage		6	12	18	VDC
Operating Current	6V	10	14	18	mA
	12V	10	14	18	mA
	18V	10	14	18	mA
Power Consumption	6V	60	85	108	mW
	12V	120	170	216	mW
	18V	180	250	324	mW
Start-Up Time	Required time from power-on to sending the first frame valid message	100	130	150	ms
Current Measurement (-40℃~+105℃)					
Accuracy	-20A~+20A		±50	±100	mA
	+20A~+350A or -350A~-20A			±0.5	%
	+350A~+1000A or -1000A~-350A		±0.5	±1	%
	+1000A~+8000A or -8000A~-1000A		±1	±5	%
Duration	-350A~+350A		Continuous		
	±600A			5	min
	±1400A			5	s
	±8000A			40	ms
Resolution	-350A~+350A		10		mA
	>+350A or <-350A		60		mA
Linearity	-350A~+350A		±0.02		%
	>+350A or <-350A		±0.2		%

Test Conditions: Ambient Temperature 25 °C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Temperature Measurement					
Measurement Range		-50		+150	℃
Measurement Error	-50℃~ +150℃	-3		+3	℃
Resolution			0.1		℃
Power & Temperature Rise					
D C Impedance		45	50	55	μΩ
Inductance				3	nH
Temperature Rise	±350A@85℃ Copper Bus Bar 20mm*3mm, 15Nm			60	℃
	±350A@85℃ Copper Bus Bar 20mm*3mm, 15Nm			60	℃
Communication					
Protocol	CA N 2.0 A/B				
Communication Speed		250	500	1000	Kbps
Terminal Resistor	With Terminal Resistor	108	120	132	Ω
	Without Terminal Resistor				
Output Rate of Current Message		10	10	1000	ms
Output Rate of Temperature Message		10	100	1000	ms
Isolation					
Galvanic Isolation			3000		VAC
Creepage Distance			5.5		mm
Clearance			4.1		mm

5.3 Typical Characteristic Curve

5.3.1 S

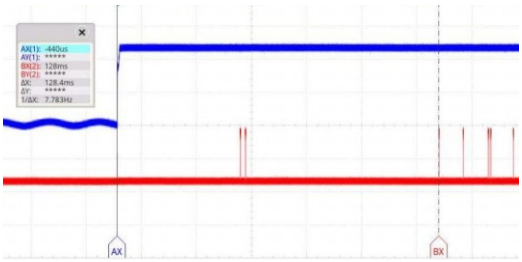


Figure 5-1 Sample1 Start-Up Time Test Curve

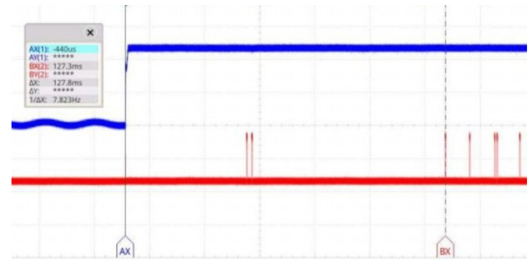


Figure 5-2 Sample2 Start-Up Time Test Curve

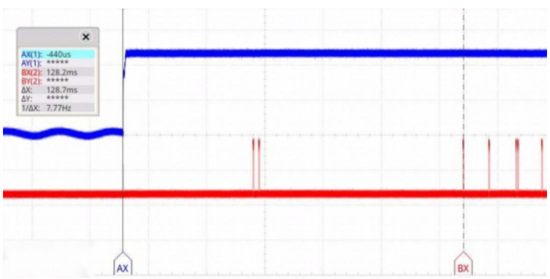


Figure 5-3 Sample3 Start-Up Time Test Curve

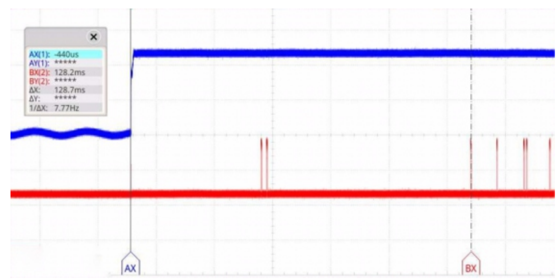


Figure 5-4 Sample4 Start-Up Time Test Curve

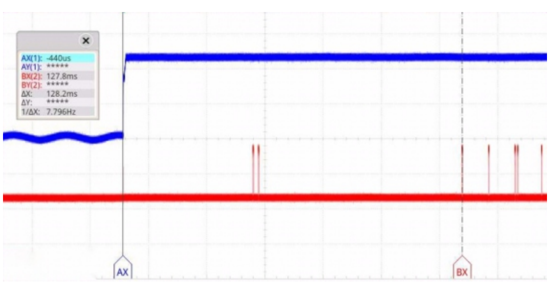


Figure 5-5 Sample5 Start-Up Time Test Curve

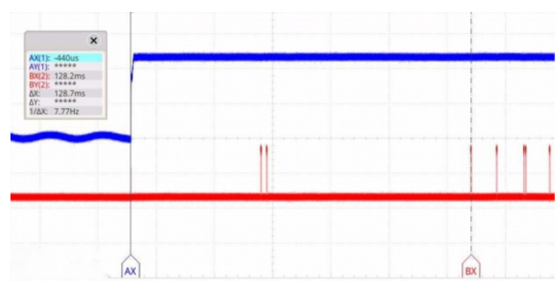


Figure 5-6 Sample6 Start-Up Time Test Curve

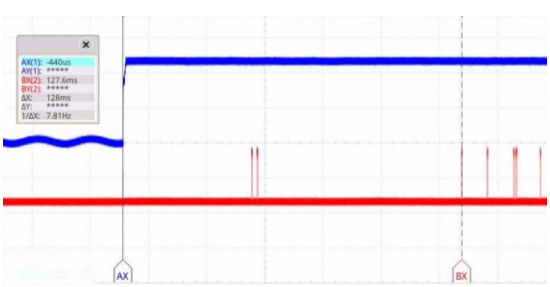


Figure 5-7 Sample7 Start-Up Time Test Curve

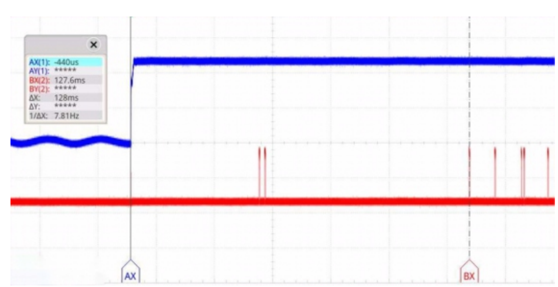


Figure 5-8 Sample8 Start-Up Time Test Curve

[1] A channel acquires data of power supply, VCC and GND.
[2] B channel acquires data of CAN differential signal, CAN_H and CAN_L.
[3] ΔX is the time interval from power-on to sending the first frame valid message

5.3.2 Current Consumption Test Curve

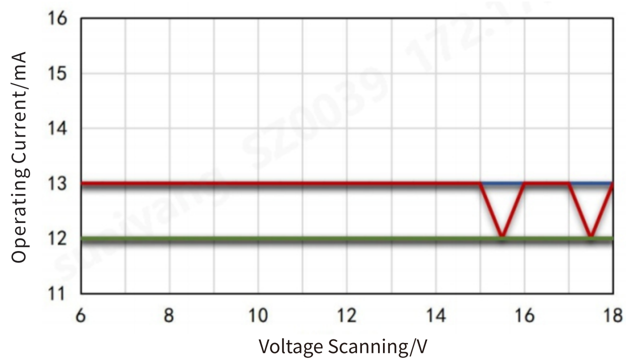


Figure 5-9 -40°C Current Consumption Test Curve

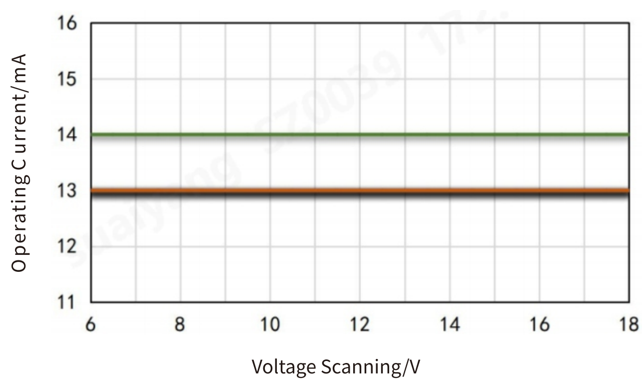


Figure 5-10 +25°C Current Consumption Curve

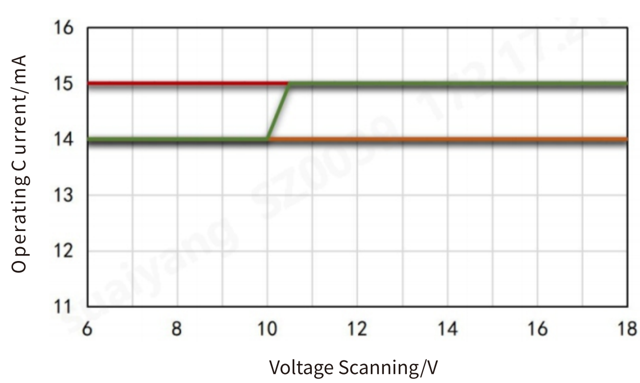


Figure 5-11 +105°C Current Consumption Curve

5.3.3 Low-Current Accuracy Test Curve

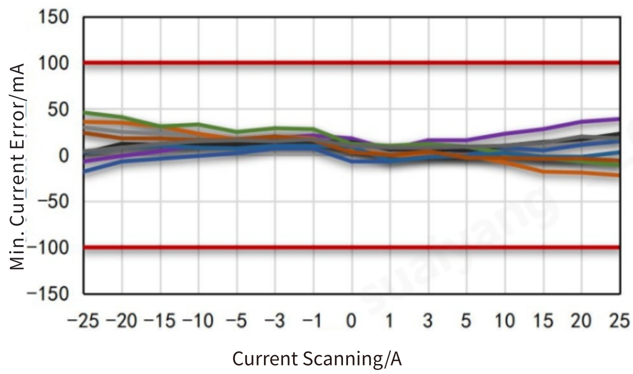


Figure 5-12 - 40℃ Low-Current Test Accuracy@Min. Current Error

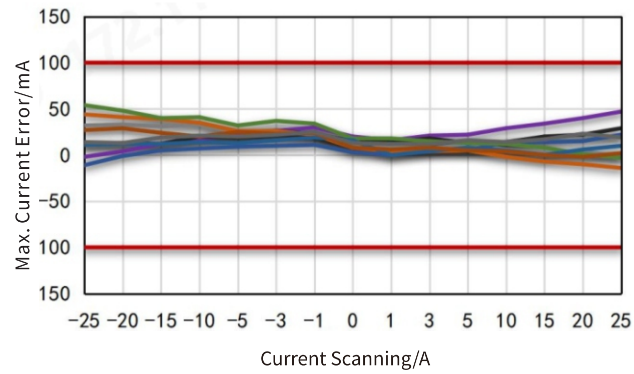


Figure 5-13 - 40℃ Low-Current Test Accuracy@Max. Current Error

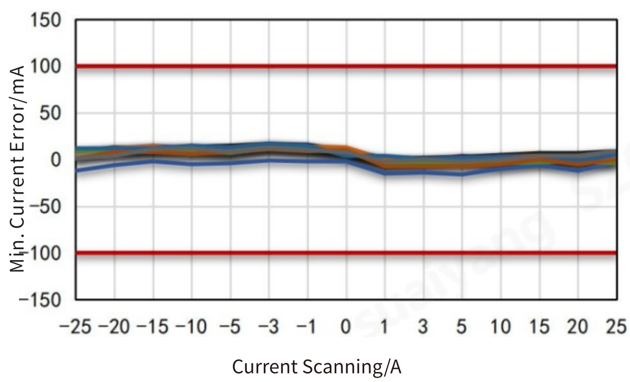


Figure 5-14 + 25℃ Low-Current Test Accuracy@Min. Current Error

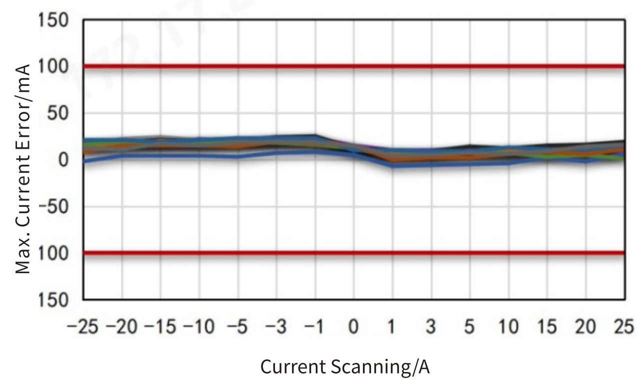


Figure 5-15 + 25℃ Low-Current Test Accuracy@Max. Current Error

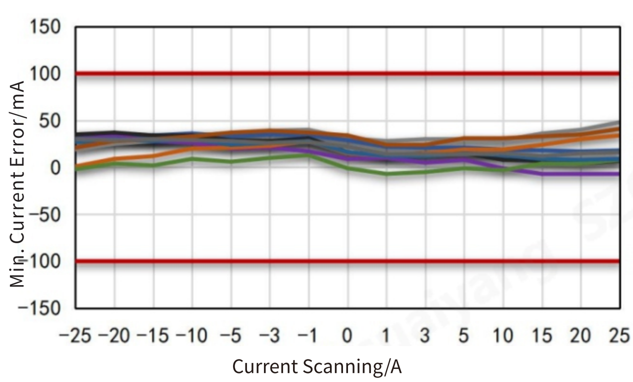


Figure 5-16 + 105℃ Low-Current Test Accuracy@Min. Current Error

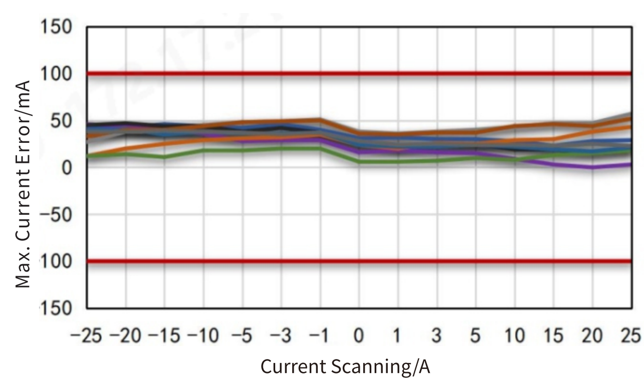


Figure 5-17 + 105℃ Low-Current Test Accuracy@Max. Current Error

5.3.4 High-Current Accuracy Test Curve

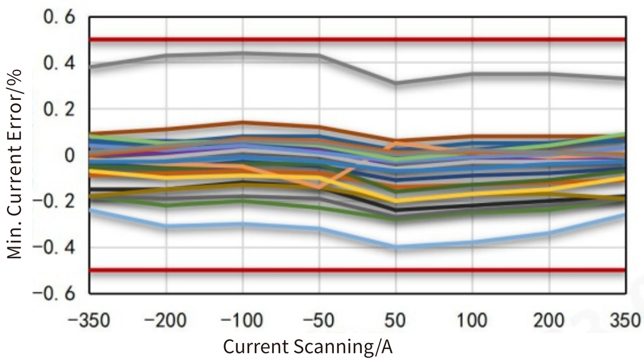


Figure 5-18 -40℃ High-Current Test Accuracy@Min. Current Error

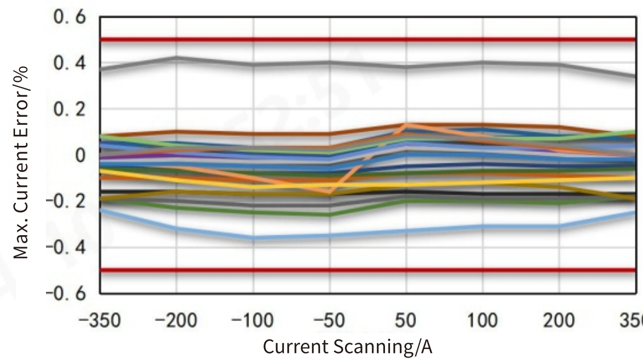


Figure 5-19 -40℃ High-Current Test Accuracy@Max. Current Error

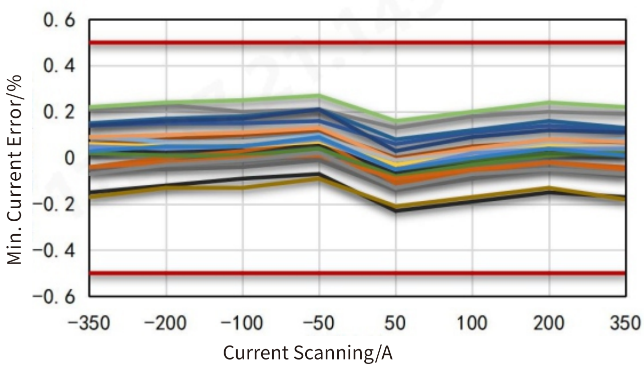


Figure 5-20 +25℃ High-Current Test Accuracy@Min. Current Error

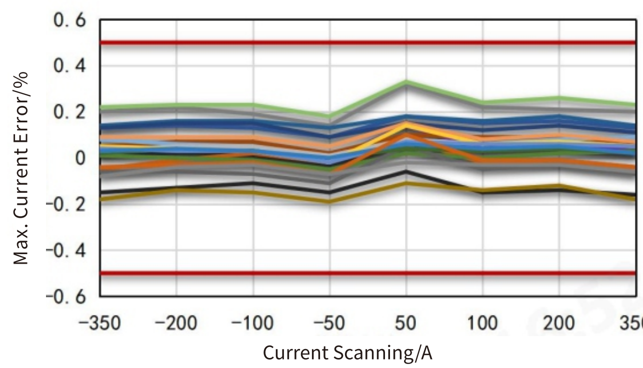


Figure 5-21 +25℃ High-Current Test Accuracy@Max. Current Error

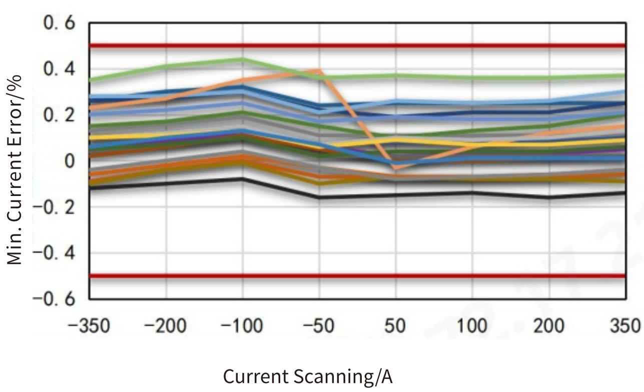


Figure 5-22 +85℃ High-Current Test Accuracy@Min. Current Error

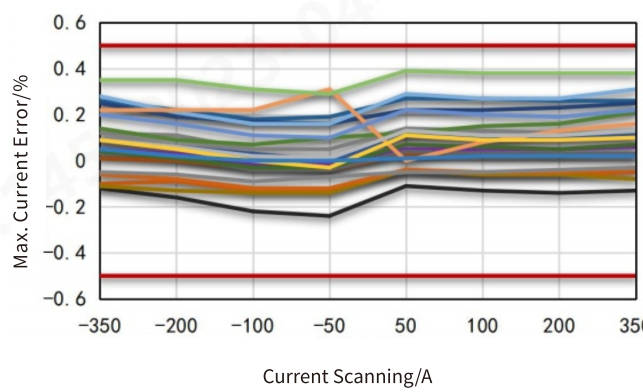


Figure 5-23 +85℃ High-Current Test Accuracy@Max. Current Error

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Function Check
Electrical loads		
5	VW 80000	E-01 Long-term overvoltage
6	VW 80000	E-02 Transient overvoltage
7	VW 80000	E-03 Transient undervoltage
8	VW 80000	E-04 Jump start
9	VW 80000	E-05 Load dump
10	VW 80000	E-06 Ripple voltage
11	VW 80000	E-07 Slow decrease and increase of the supply voltage
12	VW 80000	E-08 Slow decrease, quick increase of the supply voltage
13	VW 80000	E-09 Reset behavior
14	VW 80000	E-10 Brief interruptions
15	VW 80000	E-11 Start pulses
16	VW 80000	E-12 Voltage curve with vehicle electrical system control
17	VW 80000	E-13 Pin interruption
18	VW 80000	E-14 Connector interruption
19	VW 80000	E-15 Reverse polarity
20	VW 80000	E-16 Ground potential difference
21	VW 80000	E-17 Short circuit in signal cable and load circuits ..
22	VW 80000	E-18 Insulation resistance
23	VW 80000	E-19 Quiescent current
24	VW 80000	E-20 Dielectric strength
25	/	Continuous power test
26	ISO 7637-2:2011	CI pulse 1
27	ISO 7637-2:2011	CI pulse 2a / 2b
28	ISO 7637-2:2011	CI pulse 3a / 3b
29	ISO 7637-2:2011	CI pulse 4
30	ISO 7637-2:2011	CI pulse 5b
31	ISO 10605:2008	ESD
32	CISRP 25	Radiated emissions
33	CISRP 25	Conducted emissions
34	ISO 11452-2	Radiated immunity
35	ISO 11452-4	Bulk current injection

Test No.	Test Standards	Test Items
Climatic loads		
36	VW 80000	K-01 High-/low-temperature aging
37	VW 80000	K-02 Incremental temperature test
38	VW 80000	K-03 Low-temperature operation
39	VW 80000	K-05 Thermal shock (component).
40	VW 80000	K-14 Damp heat, constant
41	VW 80000	L-02 Service life test - high-temperature durability testing
42	VW 80000	L-03 Service life test – Temperature cycle durability testing
43	IEC 60068-2-30	Dew test
44	GB/T 2423.34	Composite temeperature & humidity cyclic test
Mechanical loads		
45	VW 80000	M-01 Free fall
46	VW 80000	M-04 Vibration test
47	VW 80000	M-05 Mechanical shock
48	VW 80000	M-08 Protection against foreign bodies - IP0x to IP4x, A, B, C, D
Regulation Validation		
49	GB/T 30512-2014	Requirements for prohibited substances on automobiles
50	UL-94:2016	Vertical Burning Test

7、Communication

7.1 CAN Protocol

CB350M6918A applies CAN2.0 A/B communication protocol and communicates through data frame. The data length of message frame is between 1-8 bytes. The default CAN speed is 500Kbps. 1Mbps/250Kbps are also available. There are two kinds of data frame, standard frame and extended frame, as shown in Figure 7-1 and Figure 7-2. Standard frame has an ID of 11 bytes, and the extended frame has an ID of 29 bytes. The defaulted data frame is standard frame, which can be adjusted to the extended frame. The defaulted data format is Motorola, which can be adjusted to Intel.

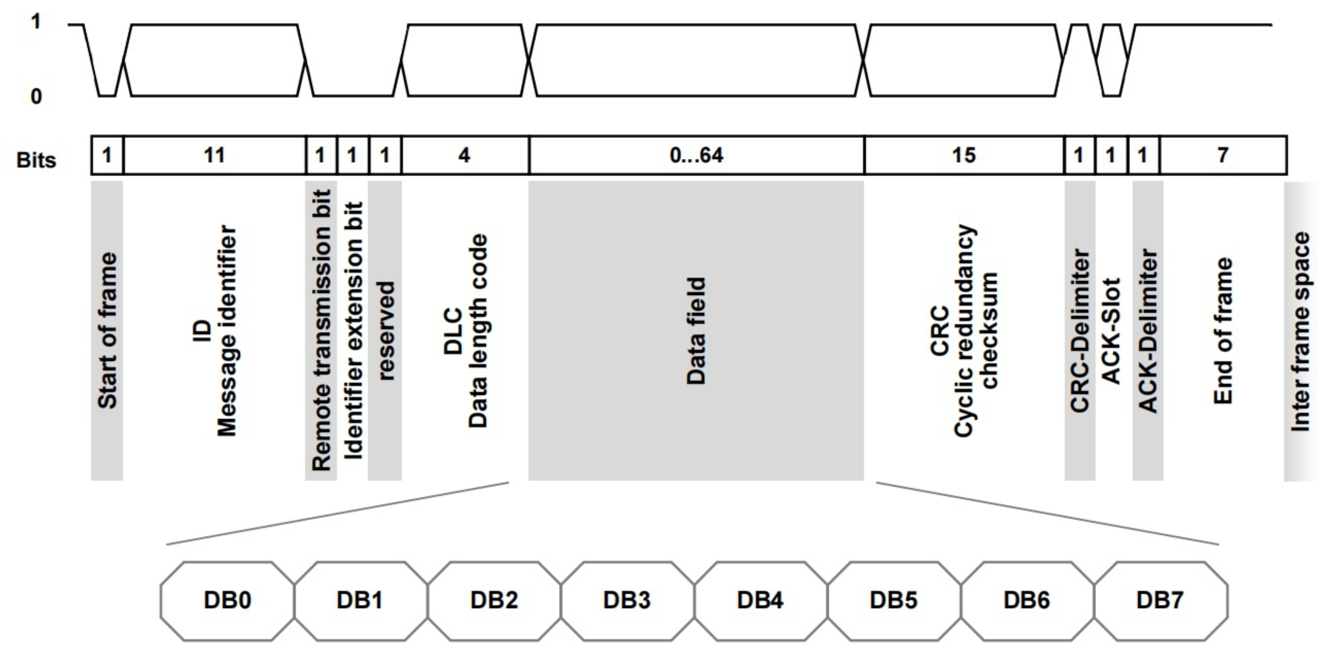


Figure 7-1 Standard Frame

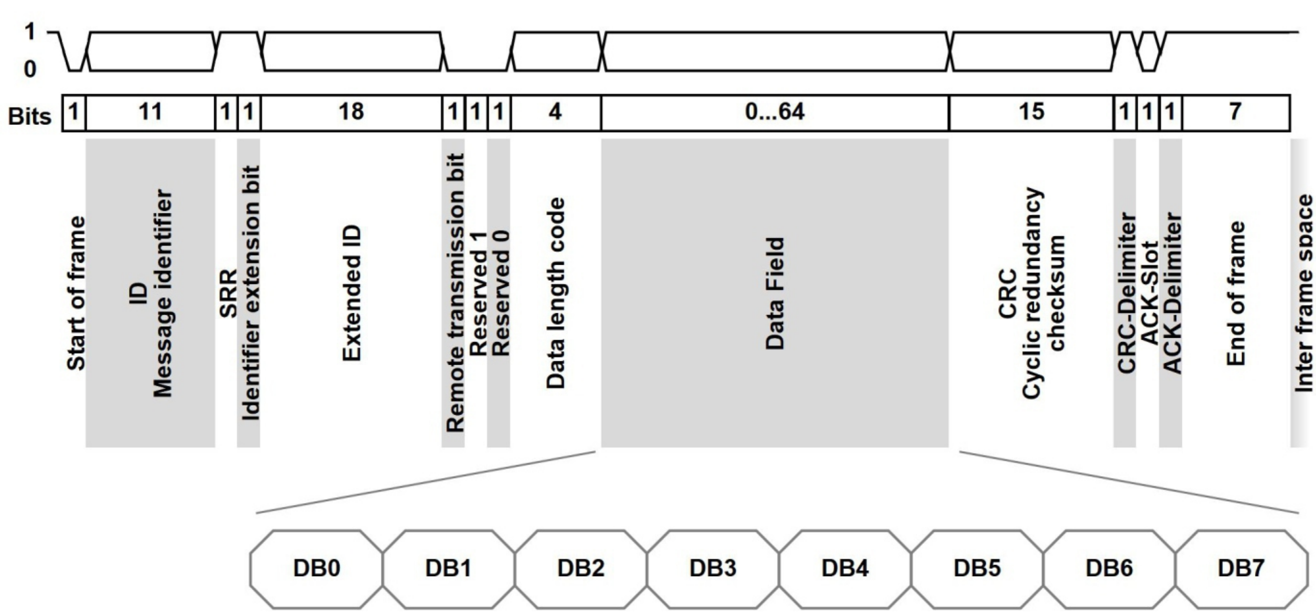


Figure 7-2 Extended Frame

7.2 Data Frame

The data frame of CB350M6918A can apply multiple data formats, as shown in Table 7-1. Among them, both formats A and B are composed of two frames of messages, which transmit real-time current and real-time temperature. Both formats C and D are composed of one frame of message. Format C transmits real-time current and real-time temperature in one frame of message. Format D only transmits real-time current. The data frame format defaults to format A.

Table 7-1. Message Frame Data Format

Data Format Type	Data Frame Content	CAN ID[1]	Data Length	Characteristics
Format A	Real-Time Current	0x0301	6	32-bit current value is a signed integer. Available Unit: mA/µA
	Real-Time Temperature	0x0325	6	32-bit temperature value is a signed integer, in 0.1°C
Format B	Real-Time Current	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA
	Real-Time Temperature	0x06C2	8	8-bit NTC temperature value is a signed short integer, in °C 8-bit MCU temperature value is a signed short integer, in °C
Format C	Real-Time Current & Temperature	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA 16-bit temperature value is a signed short integer. Unit: 0.1 °C
Format D	Real-Time Current	0x03C0	8	32-bit current value is an unsigned integer with offset 0x80000000, in mA

[1] The CAN ID in the above table are default and can be modified by commands (refer to the relevant application documents for details)

7.2.1 Format A

Format A consists of current data frame and temperature data frame, each with a 4-bit cyclic counter and a 2-bit module exception flag. In addition, the current data frame has an 8-bit current channel flag, a 32-bit current value, a 1-bit unit selection and a 1-bit reserved bit. The temperature data frame has an 8-bit temperature channel flag, a 32-bit temperature value and a 2-bit reserved bit. The details of the message are shown in Table 7-2, Examples of message and decoding information are shown in Table 7-3 and Table 7-4.

Table 7-2. Format A Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5
Current (mA/µA)	0x0301	6	0x00[1]	B[7]: Reserved Bit[2] B[6]: Current Unit[3] B[5]: Measurement Error Flag[4] B[4]: Overcurrent Flag[5] B[3:0]: Cyclic Counter[6]	32-bit Signed Current Value[7]			
Temperature (0.1°C)	0x0325	6	0x04[8]	B[7:6]: Reserved Bit[2] B[5]: Overtemperature Flag of Shunt[9] B[4]: Overtemperature Flag of PCBA[10] B[3:0]: Cyclic Counter[6]	32-bit Signed Temperature Value[11]			

[1] Current Channel Flag.
[2] Reserved bit, default is 0.
[3] Current Unit, 0: mA; 1: µA
[4] Measurement error flag, active when the ADC fault is detected, indicates that the current value is invalid. When alarming, the current sensor still sends and receives data messages, but the current value in the message is invalid. The measurement deviation may exceed the range specified in the technical specification.
[5] Overcurrent error flag. Default is inactive. It can be defined by the user.
[6] Cyclic Counter, 0x0-0xF cycle count value.
[7] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer.
[8] Temperature Channel Flag.
[9] Overtemperature Flag of Shunt, active when the shunt temperature is detected to be more than 150 °C, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature for a long time, the performance of current sensor can be damaged. At this time, it is recommended to limit the output power of BMS.
[10] Overtemperature Flag of PCBA, active when the board temperature is detected to be more than 125 °C, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature lasts for a long time, the performance of current sensor can be damaged. Then, it is recommended to limit the output power of BMS.
[11] 32-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: 0.1 °C

Table 7-3. Examples of Format A Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5
1	0x00	0x00	0x00	0x00	0x03	0xE8
2	0x00	0x00	0xFF	0xFF	0xFC	0x18
3	0x04	0x00	0x00	0x00	0x01	0x0A
4	0x04	0x00	0xFF	0xFF	0xFE	0xF6

Table 7-4. Decoding Information of Table 7-3 Examples

Example	Byte	Value	Message
1	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0x000003E8	Current: 1000mA, i.e. 1A
2	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0xFFFFFC18	Current: -1000mA, i.e. -1A
3	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0x0000010A	The Temperature is + 26.6 °C
4	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0xFFFFFEF6	The Temperature is - 26.6 °C

7.2.2 Format B

Format B consists of current data frame and temperature data frame, each with a 4-bit cyclic counter. In addition, the current data frame has a 24-bit current value, a 2-bit flag bit, an 8-bit software version, an 8-bit check bit and an 18-bit reserved bit. The temperature data frame has an 8-bit temperature value, a 4-bit status bit, an 8-bit check bit and a 32-bit reserved bit. The details of the message are shown in Table 7-5, Examples of message and decoding information are shown in Table 7-6 and Table 7-7.

Table 7-5. Format B Message

<table>
<tr><th>Frame Type</th><th>CAN ID</th><th>Length</th><th>byte0</th><th>byte1</th><th>byte2</th><th>byte3</th><th>byte4</th><th>byte5</th><th>byte6</th><th>byte7</th></tr>
<tr><td>Current (mA)</td><td>0x03C2</td><td>8</td><td>B[7:4]: Cyclic Counter[1]
B[3:2]: Reserved Bit [2]
B[1]: Hardware Fault Flag[3]
B[0]: ADC Conversion Error[4]</td><td colspan="3">24-bit Unsigned Current Value Offset 0x800000[5]</td><td colspan="2">Reserved Bit[2]</td><td>Software Version</td><td>CRC-8 Check SAE J1850[6]</td></tr>
<tr><td>Temperature (°C)</td><td>0x06C2</td><td>8</td><td>B[7:4]: Cyclic Counter[1]
B[3]: SHUNT Over Temperature Flag[7]
B[2]: PCBA Over Temperature Flag[8]
B[1]: SHUNT Temperature measurement Error Flag. [9]
B[0]: PCBA Temperature measurement Error Flag[10]</td><td>SHUNT (°C)[11]</td><td>PCBA (°C)[12]</td><td colspan="4">Reserved Bit[2]</td><td>CRC-8 Check SAE J1850[6]</td></tr>
</table>

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Reserved bit, default is 0.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4]ADC conversion error flag. When ADC sampling timeout exceeded, indicating the present current value is invalid. When flag occurs, the sensor can still receive and send message, but the current value of the message is invalid. The measured value may be out of the specifications range.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unflaged integer. Unit: mA
The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] CRC-8 Check generates a check code for the first 7 bytes of data.
[7] SHUNT over temperature flag. When measured temperature of SHUNT is over 150℃, it will be no message or measurement accuracy decreased. When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal. If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[8] PCBA over temperature flag. When measured temperature of PCBA is over 125℃, it will be no message or measurement accuracy decreased. When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal.
If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[9] SHUNT temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[10] PCBA temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[11] SHUNT temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.
[12] PCBA temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.

Table 7-6. Examples of Format B Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x00	0x00	0x64	0x83
2	0x00	0x7F	0xFC	0x18	0x00	0x00	0x64	0xAB
3	0x00	0x50	0x50	0x00	0x00	0x00	0x00	0x3F
4	0x00	0x1E	0x1E	0x00	0x00	0x00	0x00	0x65

Table 7-7. Decoding Information of Table 7-6 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x8003E8	Current: 1000mA, i.e. + 1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0x83	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0xAB	CRC-8 Check Value
3	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0x50	SHUNT : + 25℃
	DB2	0x50	PCBA : + 25℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0x3F	CRC-8 Check Value
4	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0x1E	SHUNT : - 25℃
	DB2	0x1E	PCBA : - 25℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0x65	CRC-8 Check Value

7.2.3 Format C

Format C consists of one frame of message, including a 24-bit current value, an 16-bit temperature value, a 4-bit cyclic counter, a 2-bit status bit, a 1-bit flag bit, an 8-bit check bit and a 9-bit reserved bit. The details of the message are shown in Table 7-8, Examples of message and decoding information are shown in Table 7-9 and Table 7-10.

Table 7-8. Format C Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA) Temperature (0.1°C)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]: Malfunction Status[2] B[1]: Hardware Fault Flag[3] B[0]: Reserved Bit [4]	24-bit Unsigned Current Value Offset 0x800000[5]			16-bit Signed Temperature Value[6]		Reserved Bit[4]	CRC-8 Check SAE J1850[7]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Malfunction Status, '0': Normal; '1': ADC Conversion Error; '2': Current exceeds 1550A; '3': Shunt temperature exceeds 150 °C or PCBA temperature exceeds 125 °C.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4] Reserved bit, default is 0.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA
The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] 16-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: °C.
[7] CRC-8 Check generates a check code for the first 7 bytes of data.

Table 7-9. Examples of Format C Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x01	0x0A	0x00	0x2E
2	0x00	0x7F	0xFC	0x18	0xFE	0xF6	0x00	0x9D

Table 7-10. Decoding Information of Table 7-9 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x8003E8	Current: 1000mA , i.e. +1A
	DB4-DB5	0x010A	The temperature is +26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x2E	CRC- 8 Check Value
2	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0xFEF6	The temperature is -26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x9D	CRC- 8 Check Value

7.2.4 Format D

Format D consists of one frame of message, including a 32-bit current value, a 1-bit flag bit, a 7-bit status bit, an 8-bit software version, a 16-bit reserved byte and no temperature value. The details of the message are shown in Table 7-11, Examples of message and decoding information are shown in Table 7-12 and Table 7-13.

Table 7-11. Format D Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C0	8	32-bit Unsigned Current Value Offset 0x80000000[1]				B[0]: Error Flag [2] B[7:1]: Error Status[3]	Reserved Bit[4]		Software Version

[1] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA. The actual value is expressed as V=D-0x80000000. D is the value in the message.
[2] Error Flag, '0': Normal; '1': Error;
[3] Error Status, 0x64: no error; 0x50: ADC hardware error; 0x51: ADC conversion error; 0x60: Temperature exceeds the limit (current value remains measured).
[4] Reserved bit, default is 0.

Table 7-12. Examples of Format D Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x080	0x00	0x03	0xE8	0xC8	0x00	0x00	0x64
2	0x7F	0xFF	0xFC	0x18	0xC8	0x00	0x00	0x64

Table 7-13. Decoding Information of Table 7-12 Examples

Example	Byte	Value	Message
1	DB0-DB3	0x800003E8	Current: 1000mA, i.e. 1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved bit 0
	DB7	0x64	Software version is V 1.00
2	DB0-DB3	0x7FFFFC18	Current: -1000mA, i.e. -1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved byte 0
	DB7	0x64	Software version is V 1.00

7.3 Bus Topology

CB350M6918A can be applied to a bus-type topology and transmits network information to each node through the bus, as shown in Figure 7-3.

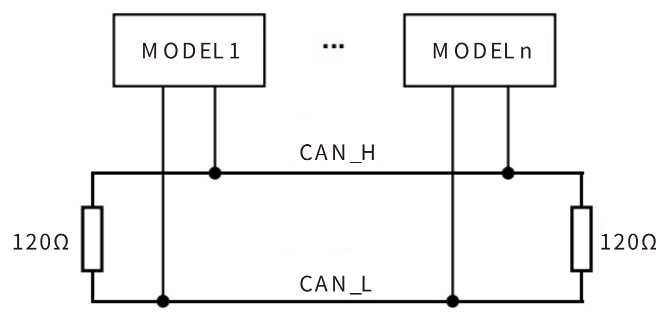


Figure 7-3 CAN Bus Topology

7.4 Measuring Mode

7.4.1 Time Interval + Command Trigger Mode

The sensor samples data at a fixed time interval set by the system and sends message to the CAN bus. At the same time, It can also respond to the trigger command. In the sampling period, the measurement will be active immediately when the trigger command is received and sends message to CAN bus. No need to wait for next sampling interval. As shown in Figure 7-4.

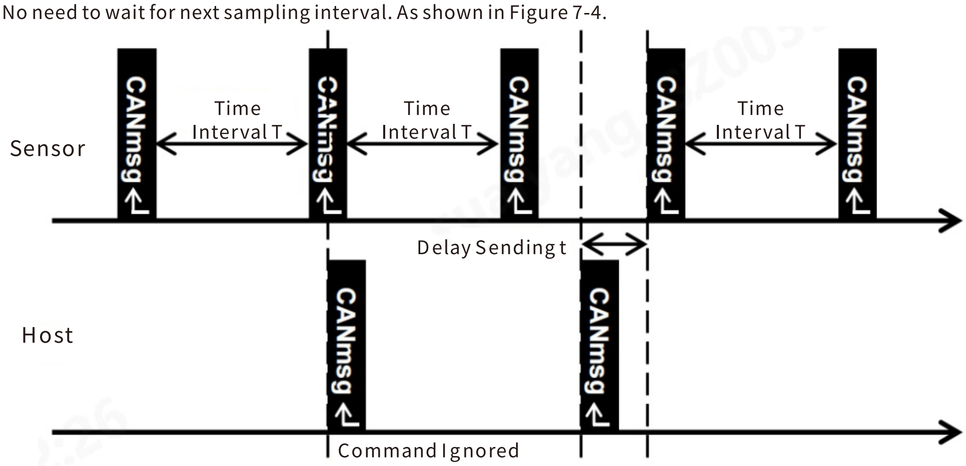


Figure 7-4. Time Interval + Command Trigger Mode

After the sensor receives the trigger command, if it is sampling or sending CAN message, the present trigger command will be ignored. When the command is valid, a sampling and sending process will be started, and the time interval T for the next sending will be automatically calculated from the moment of this trigger. As Figure 7 - 4 shown, there is a delay between the sensor receiving a valid trigger command and sending the CAN message, which is less than 1 ms.

7.4.2 Command Triggered Mode

Under this mode, the sensor will not automatically send message, but keep sampling, calculating and filtering data at a fixed time interval. The sensor will send the recent sampling data to CAN bus and reset the s tart of time interval when a valid command i s received from the host, as Figure 7 - 5 shown.

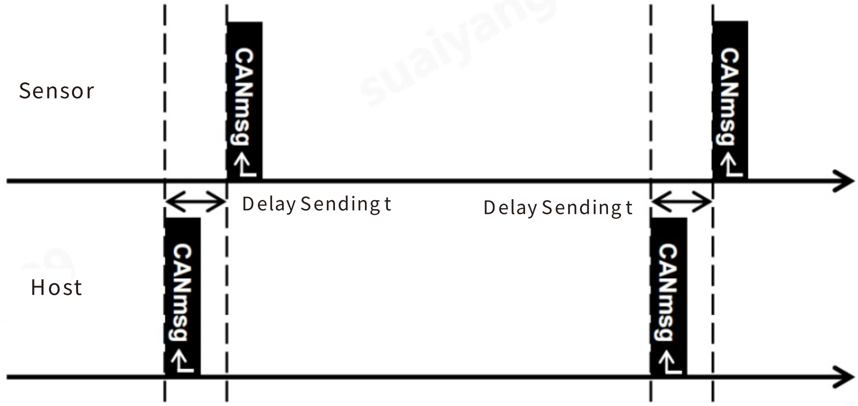


Figure 7-5. Command Trigger Mode

As Figure 7 - 5 shown, the sensor sends data to the CAN bus after receiving at rigger command from the host, with a delay of less that 1 ms between receiving the command and sending the data.

8、Mechanical Structure

8.1 Dimensions

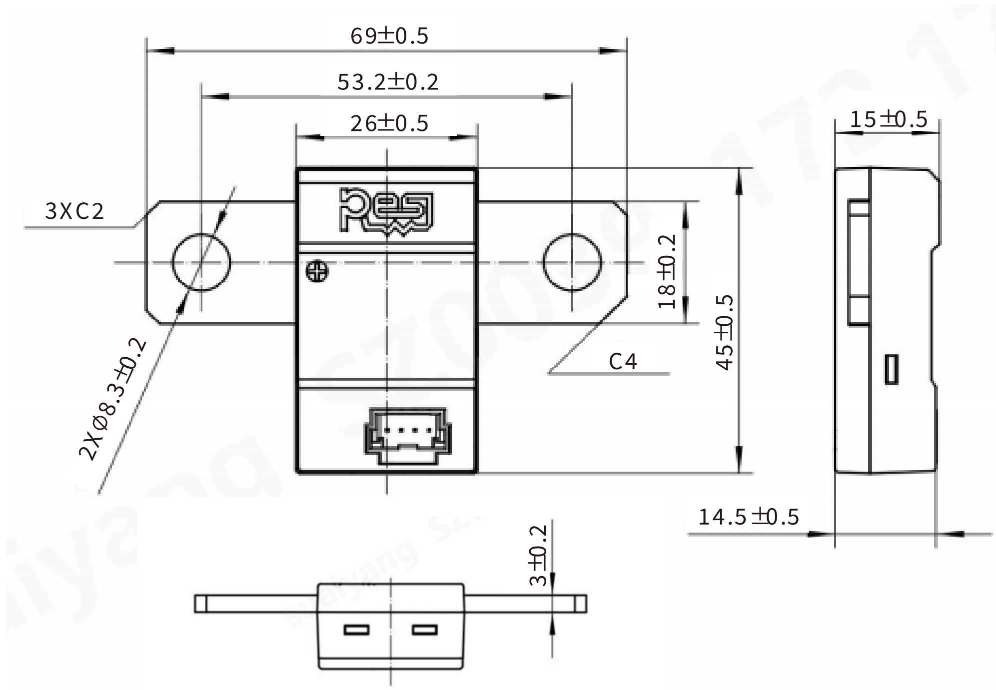


Figure 8. 1 Structure Diagram

8.2 Copper Bar Connection

- Recommended Bolts :M8
- Recommended Torque:15- 20Nm
- Recommended Width * Thickness of Copper Bar:24mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar:20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

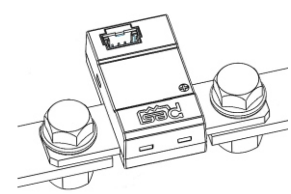


Figure 8-2. CB350M6918A Copper Bar Connection Diagram

8.3 Connector

Connector	Manufacturer	Pin Count	Part #
Male Connector[1]	Molex	4	5600200420
Recommended Female Connector[2]	Molex	4	5601230400

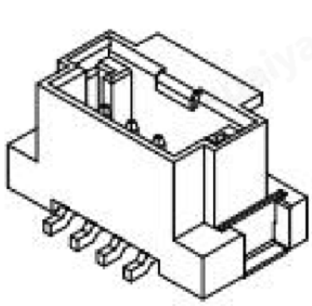


Figure 8-3. Male Connector

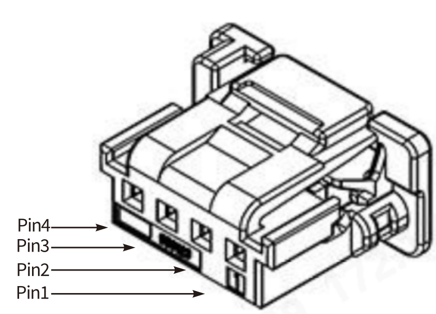


Figure 8-4. Female Connector（Wire end reference)

[1] For more information about male connector, please refer to Molex datasheet:https://www.molex.com/pdm_docs/sd/5600200420_sd.pdf
[2]For more information about female connector, please refer to Molex datasheet :https://www.molex.com/pdm_docs/sd/5601230400_sd.pdf

8.4 Connector Definition

Pin No.	Description
Pin4	VCC
Pin3	CAN_L
Pin2	CAN_H
Pin1	GND

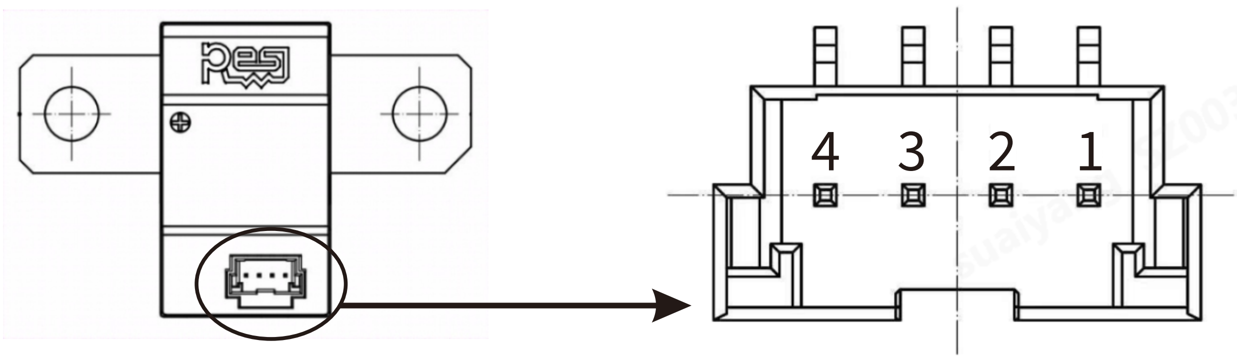


Figure 8-5. Male Connector Molex5600200420

9、Typical Applications

CB350M6918A[1] is used for accurate current measurement in key system. It is recommended that the current sensor connects to the circuit of positive or negative electrode of high-voltage end[2] as shown in Figure 9-1 and Figure 9-2, to sample the current in the main circuit. The high and low voltage ends are galvanic isolated inside the sensor. It is recommended that the low voltage end connects to the battery management system, as shown in Figure 9-3, for real-time and accurate reporting of current data in key system.

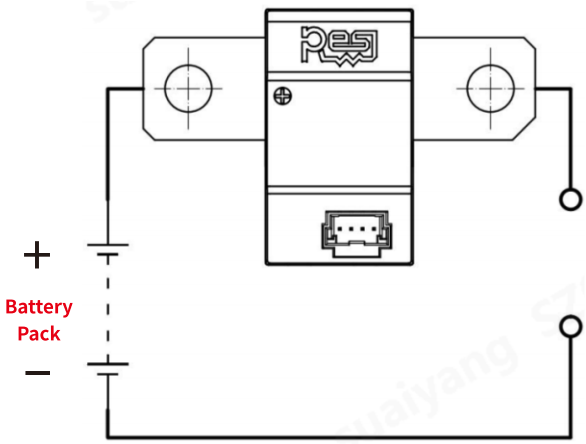


Figure 9-1. Recommended Use of Positive Electrode of High-Voltage End

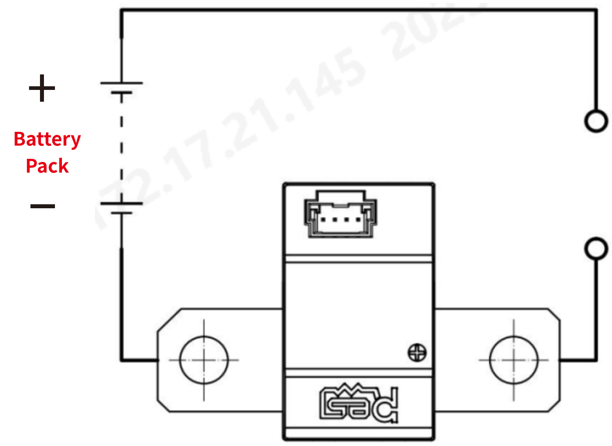


Figure 9-2. Recommended Use of Negative Electrode of High-Voltage End

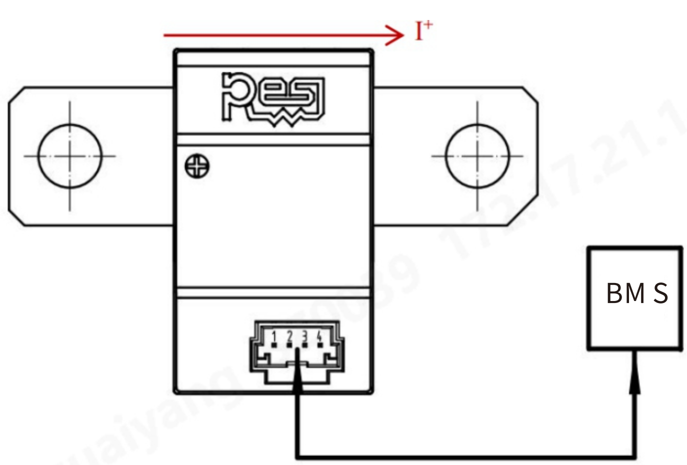


Figure 9-3. Recommended Use of Low-Voltage End

[1] The "+" on the CB350M8536A current sensor housing is the direction of current entry, that is, the positive current direction.
[2]The high voltage electrode is installed as shown in the figure. The operating condition indicated by the sensor output value is:
When the sensor outputs positive value, the battery pack is discharging;
When the sensor outputs negative value, the battery pack is charging.

10、Storage & Packaging

10.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases, and the packaging case shall be protected from direct sunlight.
- Anti-static bracelet or anti-static gloves shall be worn during installation, storage and handling.

10.2 Packaging

10.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container Name	Carton	
Container Size	480*410*282	mm
Unit Weight of Finished Product	42±5	g

[1] SNP, Standard Number of Package

10.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H (mm)	Quantity
1	50-Grid EPE Tray	468*398*86	3
2	EPE Tray Cover	460*390*10	1
3	Anti-Static PE Bag	200*150	150
4	Anti-Static PE Accordion Bag	900*510	1

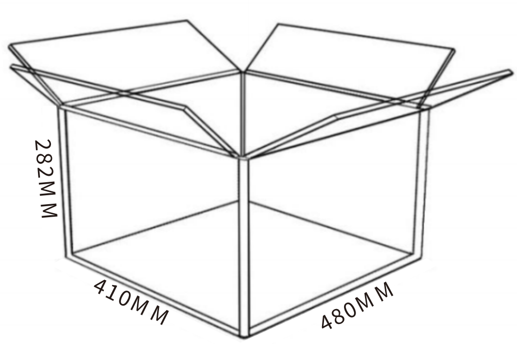


Figure 10-1. Carton Diagram

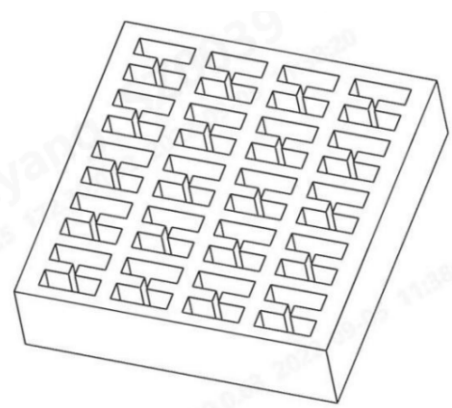


Figure 10-2. Structure Diagram of EPE

11、Part Number Information

CB 350 M 6918 A 1 S S NN

Series

CB: C& B Current Sensor

Rated Current

350: 350A
600: 600A
1000: 1000A

Tolerance

B: 0.05%
F: 0.1%
L: 0.2%
M : 0.5%
K: 1%

Shunt Size

6918: 69mm ×18mm
8518: 85mm ×18mm
8436: 84mm ×36mm
8536: 85mm ×36mm

Application Grade

A: CAN Automotive
T: CAN Industrial
T: 485 Industrial

Type

0: Standard, Thickness 4mm
1: Standard, Thickness 3mm
2: Customized

Special Byte

Standard
- K:25μΩ
- S:50μΩ
- P:100μΩ
- J:150μΩ

Customized
- Custom Byte, 0~9, A~Z

Special Byte

Standard
- S:CAN Terminal Resistor
- N:No CAN Terminal Resistor

Customized
- Custom Byte, 0 ~ 9, A ~ Z

Code

NN : 00～99 or Blank

For more performance options and other relevant information, please refer to the official website: https://en.resistor.today/

CB600F8536A Series, Automotive, 0.1% Tolerance Operating Temperature -40℃~+105℃ Shunt Based Current Sensor

1、Characteristics

- Current Sensing: Measurement Range：-20000A~+20000A
  - Continuous Operating Range：-600A~+600A
  - Measurement Accuracy：±0.1% (MAX)
  - Resolution: 1mA
- Temperature Sensing: Measurement Range: -50℃~+150℃
  - Measurement Error: ±3℃ (MAX)
  - Resolution: 0.1℃
- Communication Protocol：CAN2.0 A/B
  - Selectable Data Format
  - Configurable CAN ID
  - Configurable CAN Speed：250Kbps/500Kbps/1Mbps
- Supply Voltage：6V~18V
- Operating Temperature Range：-40℃~+105℃
- Power Consumption：≤384mW @12VDC
- Galvanic Isolation：3000VAC

2、Applications

- Automotive Current Monitor
- Grid Energy Storage
- UPS
- Charging Station

3、Introduction

CB600F8536A current sensor is an automotive current sensing module, which can be used to measure bidirectional DC current. Featuring high accuracy, low power consumption, wide operating temperature range, excellent response speed, temperature stability and anti-interference ability.

The sensor is designed based on low-TCR shunt, adopts high-precision ADC, communicates through CAN2.0 A/B protocol, and has large ranges of current and temperature measurement capabilities, and current compensation at whole temperature range.

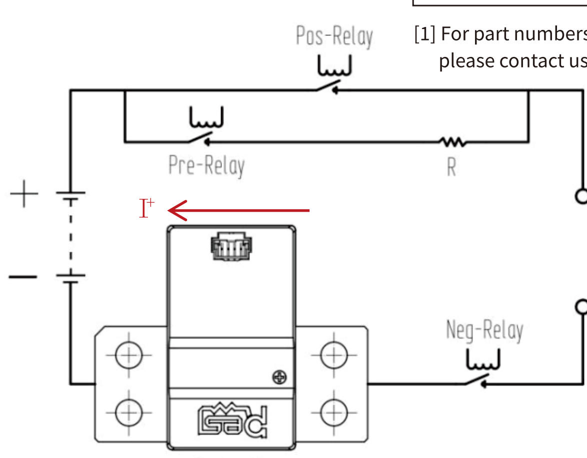
The sensor meets the operating temperature range of -40℃~+105℃, can apply to the continuous operating current of -600A~+600A at the whole temperature range, and the current measurement accuracy is no more than ± 0.1% in the range of +50A~+600A or -600A~-50A.

Power supply of CB600F8536A current sensor is from 6VDC to 18VDC. Its power consumption is controlled below 384mW (12VDC), and it can realize complete high-low voltage isolation, which can be applied to the main positive electrode or the main negative electrode of the battery system.

Sensor Information

Part Number	Shunt Thickness	Resistance	Terminal Resistor
CB600F8536A1SS00	3mm	50μΩ	Yes
CB600F8536A1SN00	3mm	50μΩ	No

[1] For part numbers not included in the table, please contact us for technical support.



Typical Application

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4、Revision

Date	Revised Content	Note
2023.01	/	A0
2023.02	Revised maximum supply voltage from 26V to 18V.	A1
2023.04.06	Flat washer is removed in Copper Bar Connection Diagram	A2
2023.08.21	Change the product packaging	A3
2023.09.14	Modify limit parameters of CAN, format B of data frame, order of connector pin and start-up time test curve	A4

5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Supply Voltage				30	VDC
Current Measurement Range	±1500A			30	s
	±1800A			25	s
	±2500A			15	s
	±3000A			10	s
	±20000A			50	ms
CAN Interface	Configured 120Ω Terminal Resistor (Continuous Power Supply)			6	V
	ESD			8	KV
Operating Temperature		-40		105	℃
Storage Temperature		-40		125	℃
Humidity				95	%RH

5.2 General Parameters

Test Conditions: Ambient Temperature 25 ℃ (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Power Supply					
Supply Voltage		6	12	18	VDC
Operating Current	6V	20	26	32	mA
	12V	20	26	32	mA
	18V	20	26	32	mA
Power Consumption	6V	120	150	192	mW
	12V	240	300	384	mW
	18V	360	450	576	mW
Start-Up Time	Required time from power-on to sending the first frame valid message	100	130	150	ms
Current Measurement (-40℃~+105℃)					
Accuracy	-50A~+50A		±30	±50	mA
	+50A~+600A or -600A~-50A			±0.1	%
	+600A~+3000A or -3000A~-600A		±0.5	±1	%
	+3000A~+20000A or -20000A~-3000A		±1	±5	%
Duration	-600A~+600A		Continuous		
	±1500A			25	s
	±3000A			5	s
	±20000A			40	ms
Resolution	-600A~+600A		1		mA
	＞600A or＜-600A		10		mA
Linearity	-600A~+600A		±0.01		%
	＞600A or＜-600A		±0.1		%

Test Conditions: Ambient Temperature 25 °C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Temperature Measurement					
Measurement Range		-50		+150	°C
Measurement Error	-50°C~+150°C	-3		+3	°C
Resolution			0.1		°C
Power & Temperature Rise					
DC Impedance		45	50	55	μΩ
Inductance				3	nH
Temperature Rise	±600A@25°C Copper Bus Bar 40mm*3mm, 15Nm			60	°C
	±600A@85°C Copper Bus Bar 40mm*3mm, 15Nm			60	°C
Communication					
Protocol	CAN2.0A/B				
Communication Speed		250	500	1000	Kbps
Terminal Resistor	With Terminal Resistor	108	120	132	Ω
	Without Terminal Resistor				
Output Rate of Current Message		10	10	1000	ms
Output Rate of Temperature Message		10	100	1000	ms
Isolation					
Galvanic Isolation			3000		VAC
Creepage Distance			6		mm
Clearance			4.5		mm

5.3 Typical Characteristic Curve

5.3.1 Start-Up Time Test Curve

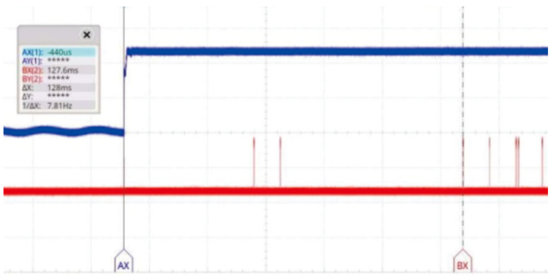


Figure 5-1 Sample1 Start-Up Time Test Curve

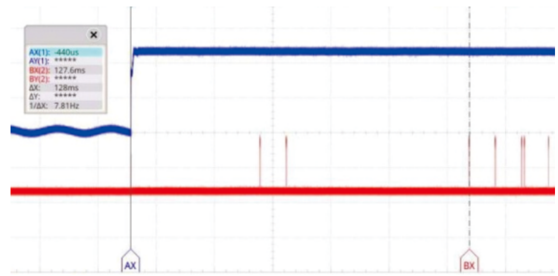


Figure 5-2 Sample2 Start-Up Time Test Curve

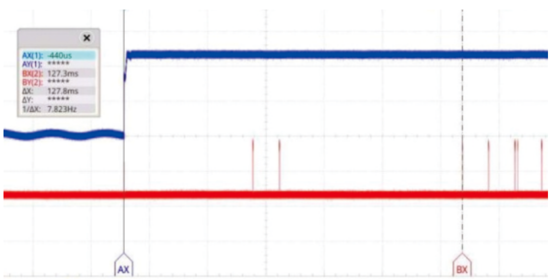


Figure 5-3 Sample3 Start-Up Time Test Curve

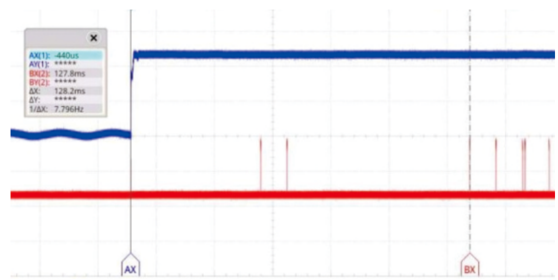


Figure 5-4 Sample4 Start-Up Time Test Curve

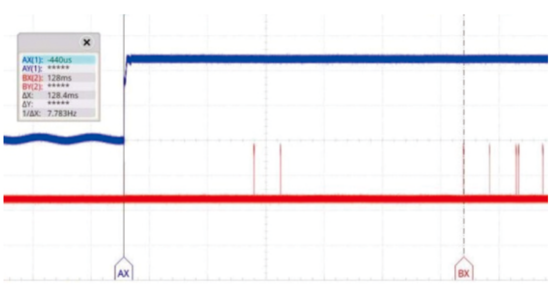


Figure 5-5 Sample5 Start-Up Time Test Curve

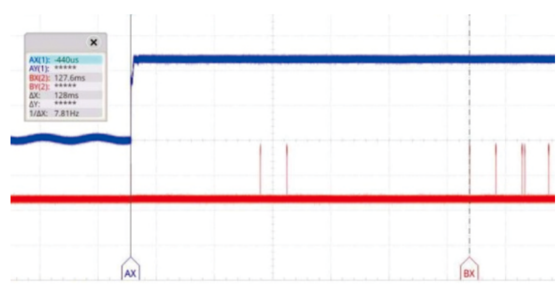


Figure 5-6 Sample6 Start-Up Time Test Curve

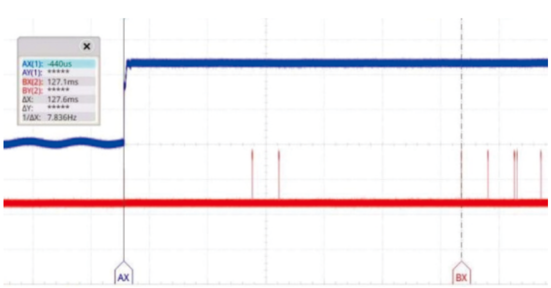


Figure 5-7 Sample7 Start-Up Time Test Curve

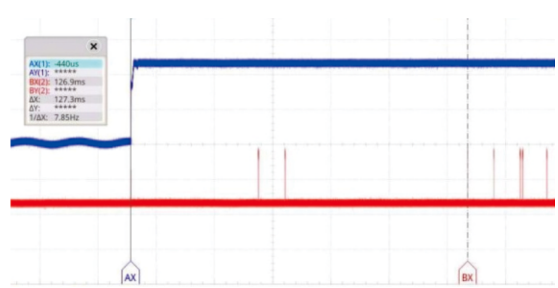


Figure 5-8 Sample8 Start-Up Time Test Curve

[1] A channel acquires data of power supply, VCC and GND.
[2] B channel acquires data of CAN differential signal, CAN_H and CAN_L.
[3] ΔX is the time interval from power-on to sending the first frame valid message

5.3.2 Operating Current Test Curve

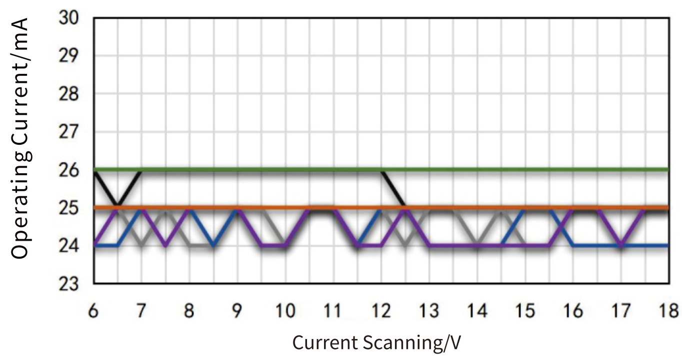


Figure 5-9 + 25℃ Operating Current Curve

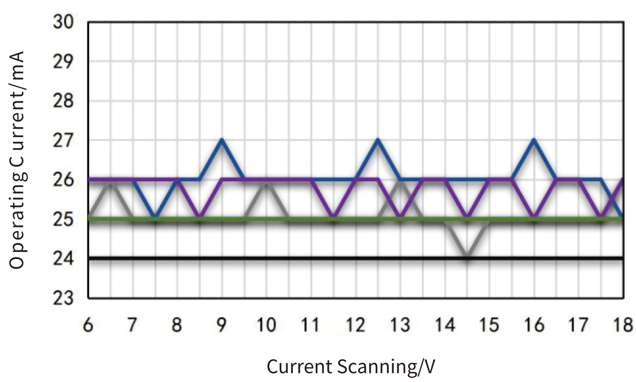


Figure 5-10 - 40℃ Operating Current Curve

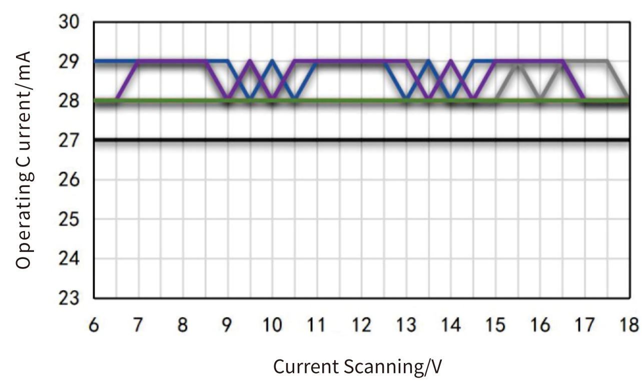


Figure 5-11 + 105℃ Operating Current Curve

5.3.3 O vercurrent Test Curve

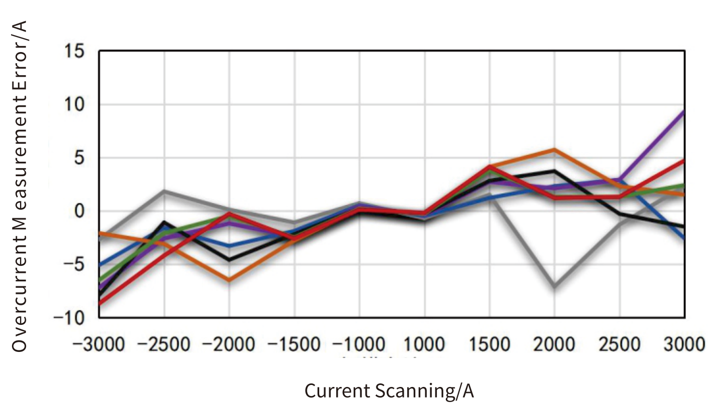


Figure 5-12 + 25℃ Overcurrent Test Curve

5.3.5 High-Current Accuracy Test Curve

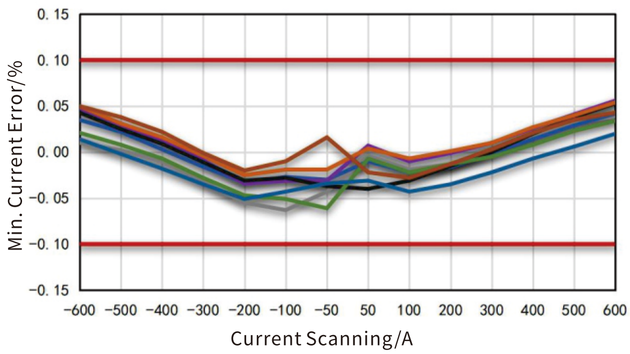


Figure 5-19 -40℃
High-Current Test Accuracy@Min. Current Error

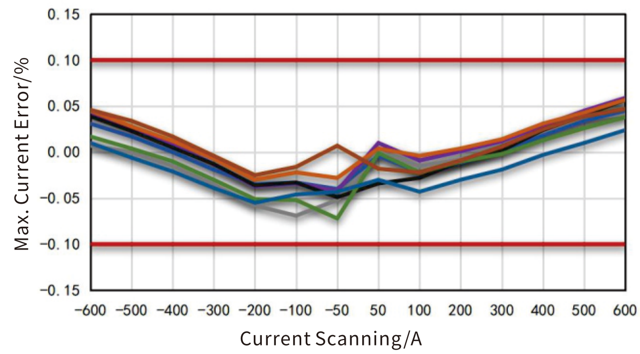


Figure 5-20 -40℃
High-Current Test Accuracy@Max. Current Error

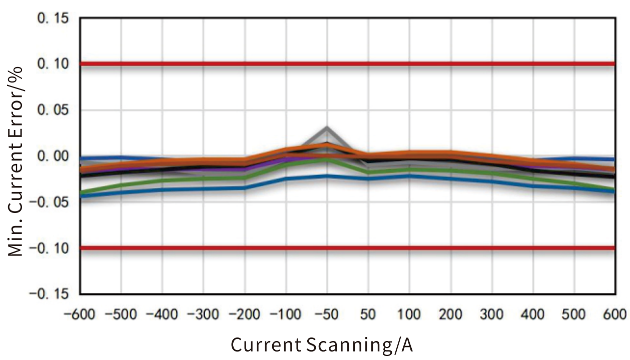


Figure 5-21 +25℃
High-Current Test Accuracy@Min. Current Error

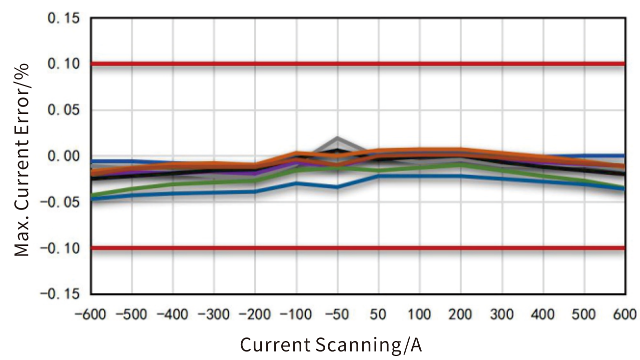


Figure 5-22 +25℃
High-Current Test Accuracy@Max. Current Error

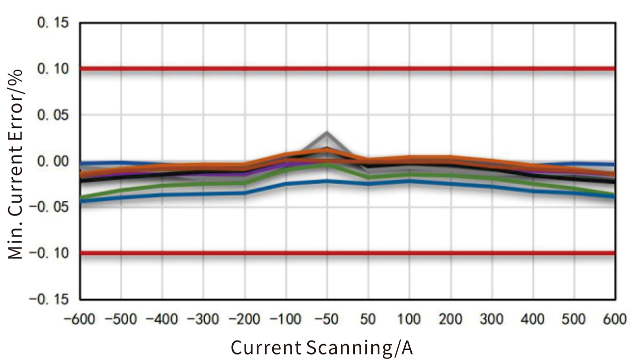


Figure 5-23 +85℃
High-Current Test Accuracy@Min. Current Error

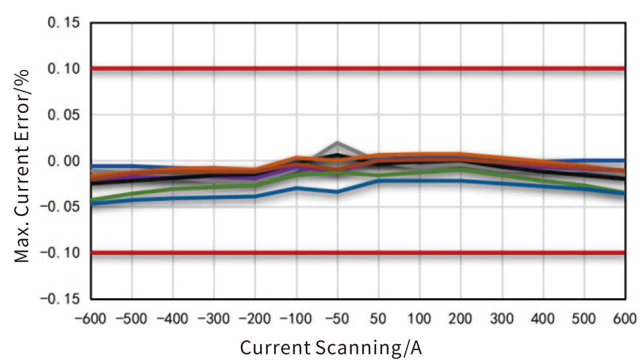


Figure 5-24 +85℃
High-Current Test Accuracy@Max. Current Error

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Function Check
Electrical loads		
5	VW 80000	E-01 Long-term overvoltage
6	VW 80000	E-02 Transient overvoltage
7	VW 80000	E-03 Transient undervoltage
8	VW 80000	E-04 Jump start
9	VW 80000	E-05 Load dump
10	VW 80000	E-06 Ripple voltage
11	VW 80000	E-07 Slow decrease and increase of the supply voltage
12	VW 80000	E-08 Slow decrease, quick increase of the supply voltage
13	VW 80000	E-09 Reset behavior
14	VW 80000	E-10 Brief interruptions
15	VW 80000	E-11 Start pulses
16	VW 80000	E-12 Voltage curve with vehicle electrical system control
17	VW 80000	E-13 Pin interruption
18	VW 80000	E-14 Connector interruption
19	VW 80000	E-15 Reverse polarity
20	VW 80000	E-16 Ground potential difference
21	VW 80000	E-17 Short circuit in signal cable and load circuits ..
22	VW 80000	E-18 Insulation resistance
23	VW 80000	E-19 Quiescent current
24	VW 80000	E-20 Dielectric strength
25	/	Continuous power test
26	ISO 7637-2:2011	CI pulse 1
27	ISO 7637-2:2011	CI pulse 2a / 2b
28	ISO 7637-2:2011	CI pulse 3a / 3b
29	ISO 7637-2:2011	CI pulse 4
30	ISO 7637-2:2011	CI pulse 5b
31	ISO 10605:2008	ESD
32	CISRP 25	Radiated emissions
33	CISRP 25	Conducted emissions
34	ISO 11452-2	Radiated immunity
35	ISO 11452-4	Bulk current injection

Test No.	Test Standards	Test Items
Climatic loads		
36	VW 80000	K-01 High-/low-temperature aging
37	VW 80000	K-02 Incremental temperature test
38	VW 80000	K-03 Low-temperature operation
39	VW 80000	K-05 Thermal shock (component).
40	VW 80000	K-14 Damp heat, constant
41	VW 80000	L-02 Service life test - high-temperature durability testing
42	VW 80000	L-03 Service life test – Temperature cycle durability testing
43	IEC 60068-2-30	Dew test
44	GB/T 2423.34	Composite temeperature & humidity cyclic test
Mechanical loads		
45	VW 80000	M-01 Free fall
46	VW 80000	M-04 Vibration test
47	VW 80000	M-05 Mechanical shock
48	VW 80000	M-08 Protection against foreign bodies - IP0x to IP4x, A, B, C, D
Regulation Validation		
49	GB/T 30512-2014	Requirements for prohibited substances on automobiles
50	UL-94:2016	Vertical Burning Test

7、Communication

7.1 CAN Protocol

CB600F8536A applies CAN2.0 A/B communication protocol and communicates through data frame. The data length of message frame is between 1-8 bytes. The default CAN speed is 500Kbps. 1Mbps/250Kbps are also available. There are two kinds of data frame, standard frame and extended frame, as shown in Figure 7-1 and Figure 7-2. Standard frame has an ID of 11 bytes, and the extended frame has an ID of 29 bytes. The defaulted data frame is standard frame, which can be adjusted to the extended frame. The defaulted data format is Motorola, which can be adjusted to Intel.

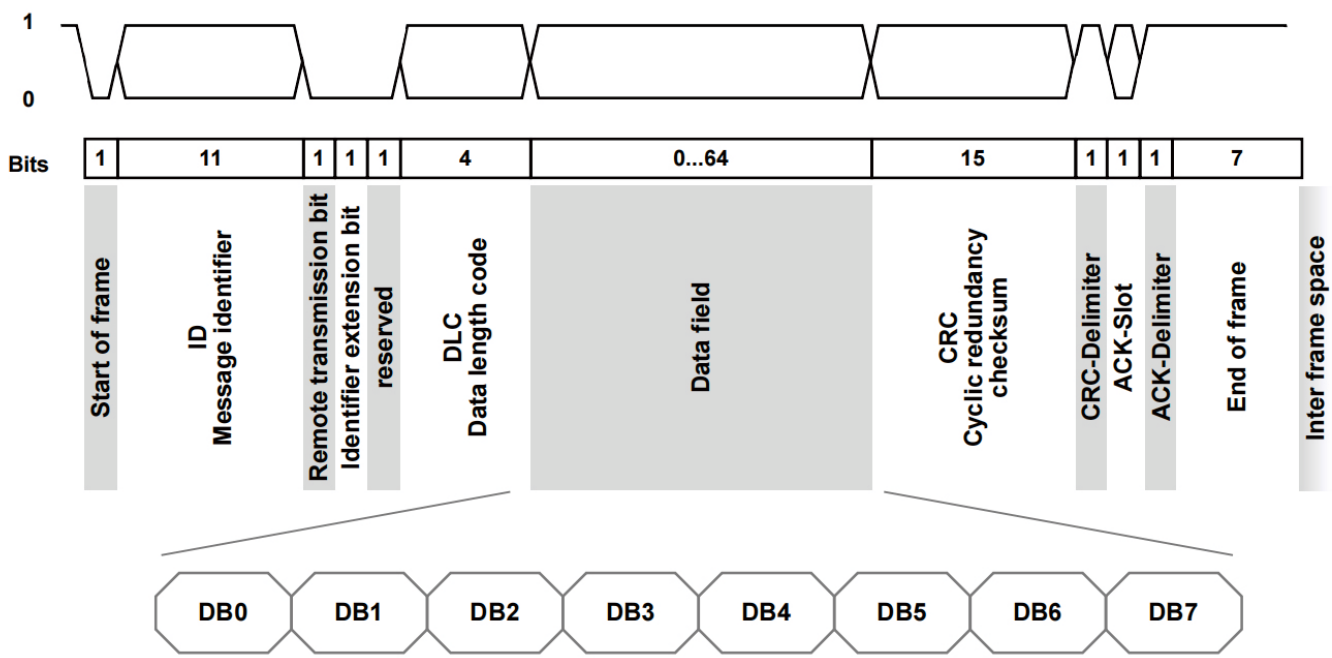


Figure 7-1 S tandard Frame

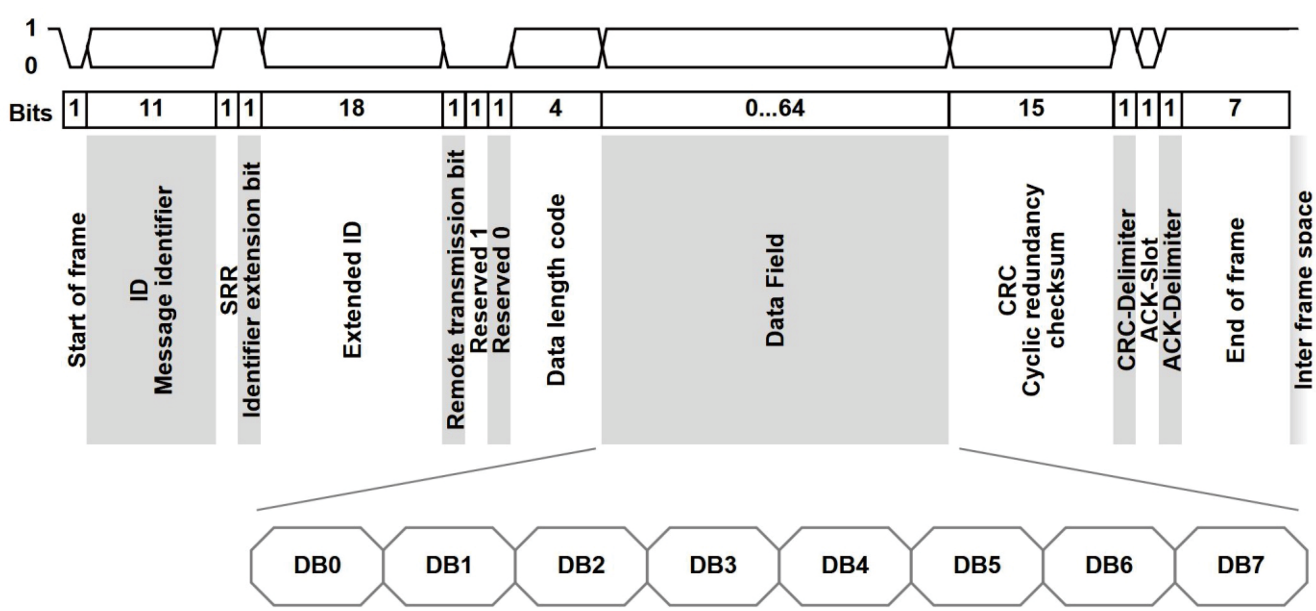


Figure 7-2 Extended Frame

7.2 Data Frame

The data frame of CB600F8536A can apply multiple data formats, as shown in Table 7-1. Among them, both formats A and B are composed of two frames of messages, which transmit real-time current and real-time temperature. Both formats C and D are composed of one frame of message. Format C transmits real-time current and real-time temperature in one frame of message. Format D only transmits real-time current. The data frame format defaults to format A.

Table 7-1. Message Frame Data Format

Data Format Type	Data Frame Content	CANID[1]	Data Length	Characteristics
Format A	Real-Time Current	0x0301	6	32-bit current value is a signed integer. Available Unit: mA/µA
	Real-Time Temperature	0x0325	6	32-bit temperature value is a signed integer, in 0.1℃
Format B	Real-Time Current	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA
	Real-Time Temperature	0x06C2	8	8-bit NTC temperature value is a signed short integer, in ℃ 8-bit MCU temperature value is a signed short integer, in ℃
Format C	Real-Time Current & Temperature	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA 16-bit temperature value is a signed short integer. Unit: 0.1 ℃
Format D	Real-Time Current	0x03C0	8	32-bit current value is an unsigned integer with offset 0x80000000, in mA

[1] The CAN ID in the above table are default and can be modified by commands (refer to the relevant application documents for details)

7.2.1 Format A

Format A consists of current data frame and temperature data frame, each with a 4-bit cyclic counter and a 2-bit module exception flag. In addition, the current data frame has an 8-bit current channel flag, a 32-bit current value, a 1-bit unit selection and a 1-bit reserved bit. The temperature data frame has an 8-bit temperature channel flag, a 32-bit temperature value and a 2-bit reserved bit. The details of the message are shown in Table 7-2, Examples of message and decoding information are shown in Table 7-3 and Table 7-4.

Table 7-2. Format A Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5
Current (mA/µA)	0x0301	6	0x00[1]	B[7]: Reserved Bit[2] B[6]: Current Unit[3] B[5]: Measurement Error Flag[4] B[4]: Overcurrent Flag[5] B[3:0]: Cyclic Counter[6]	32-bit Signed Current Value[7]			
Temperature (0.1℃)	0x0325	6	0x04[8]	B[7:6]: Reserved Bit[2] B[5]: Overtemperature Flag of Shunt[9] B[4]: Overtemperature Flag of PCBA[10] B[3:0]: Cyclic Counter[6]	32-bit Signed Temperature Value[11]			

[1] Current Channel Flag.
[2] Reserved bit, default is 0.
[3] Current Unit, 0: mA; 1: µA
[4] Measurement error flag, active when the ADC fault is detected, indicates that the current value is invalid. When alarming, the current sensor still sends and receives data messages, but the current value in the message is invalid. The measurement deviation may exceed the range specified in the technical specification.
[5] Overcurrent error flag. Default is inactive. It can be defined by the user.
[6] Cyclic Counter, 0x0-0xF cycle count value.
[7] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer.
[8] Temperature Channel Flag.
[9] Overtemperature Flag of Shunt, active when the shunt temperature is detected to be more than 150 ℃, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature for a long time, the performance of current sensor can be damaged. At this time, it is recommended to limit the output power of BMS.
[10] Overtemperature Flag of PCBA, active when the board temperature is detected to be more than 125 ℃, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature lasts for a long time, the performance of current sensor can be damaged. Then, it is recommended to limit the output power of BMS.
[11] 32-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: 0.1 ℃

Table 7-3. Examples of Format A Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5
1	0x00	0x00	0x00	0x00	0x03	0xE8
2	0x00	0x00	0xFF	0xFF	0xFC	0x18
3	0x04	0x00	0x00	0x00	0x01	0x0A
4	0x04	0x00	0xFF	0xFF	0xFE	0xF6

Table 7-4. Decoding Information of Table 7-3 Examples

Example	Byte	Value	Message
1	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0x000003E8	Current: 1000mA, i.e. 1A
2	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0xFFFFFC18	Current: -1000mA, i.e. -1A
3	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0x0000010A	The Temperature is + 26.6 °C
4	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0xFFFFFEF6	The Temperature is - 26.6 °C

7.2.2 Format B

Format B consists of current data frame and temperature data frame, each with a 4-bit cyclic counter. In addition, the current data frame has a 24-bit current value, a 2-bit flag bit, an 8-bit software version, an 8-bit check bit and an 18-bit reserved bit. The temperature data frame has an 8-bit temperature value, a 4-bit status bit, an 8-bit check bit and a 32-bit reserved bit. The details of the message are shown in Table 7-5, Examples of message and decoding information are shown in Table 7-6 and Table 7-7.

Table 7-5. Format B Message

<table>
<tr><th>Frame Type</th><th>CAN ID</th><th>Length</th><th>byte0</th><th>byte1</th><th>byte2</th><th>byte3</th><th>byte4</th><th>byte5</th><th>byte6</th><th>byte7</th></tr>
<tr><td>Current (mA)</td><td>0x03C2</td><td>8</td><td>B[7:4]: Cyclic Counter[1]
B[3:2]: Reserved Bit [2]
B[1]: Hardware Fault Flag[3]
B[0]: ADC Conversion Error[4]</td><td colspan="3">24-bit Unsigned Current Value Offset 0x800000[5]</td><td colspan="2">Reserved Bit[2]</td><td>Software Version</td><td>CRC-8 Check SAE J1850[6]</td></tr>
<tr><td>Temperature (°C)</td><td>0x06C2</td><td>8</td><td>B[7:4]: Cyclic Counter[1]
B[3]: SHUNT Over Temperature Flag[7]
B[2]: PCBA Over Temperature Flag[8]
B[1]: SHUNT Temperature measurement Error Flag. [9]
B[0]: PCBA Temperature measurement Error Flag[10]</td><td>SHUNT (°C) [11]</td><td>PCBA (°C) [12]</td><td colspan="4">Reserved Bit[2]</td><td>CRC-8 Check SAE J1850[6]</td></tr>
</table>

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Reserved bit, default is 0.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4]ADC conversion error flag. When ADC sampling timeout exceeded, indicating the present current value is invalid. When flag occurs, the sensor can still receive and send message, but the current value of the message is invalid. The measured value may be out of the specifications range.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unflaged integer. Unit: mA
The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] CRC-8 Check generates a check code for the first 7 bytes of data.
[7] SHUNT over temperature flag. When measured temperature of SHUNT is over 150℃, it will be no message or measurement accuracy decreased.
When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal.
If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[8] PCBA over temperature flag. When measured temperature of PCBA is over 125℃, it will be no message or measurement accuracy decreased.
When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal.
If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[9] SHUNT temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[10] PCBA temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[11] SHUNT temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.
[12] PCBA temperature, 8-bit temperature data by default unflaged integers. Unit: ℃. The actual value expression is V=D-55. D is the value in the message.

Table 7-6. Examples of Format B Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x00	0x00	0x64	0x83
2	0x00	0x7F	0xFC	0x18	0x00	0x00	0x64	0xAB
3	0x00	0x1A	0x1A	0x00	0x00	0x00	0x00	0xD5
4	0x00	0xE6	0xE6	0x00	0x00	0x00	0x00	0x47

Table 7-7. Decoding Information of Table 7-6 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x8003E8	Current: 1000mA, i.e. + 1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0x83	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0xAB	CRC-8 Check Value
3	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0x1A	SHUNT ：+ 26℃
	DB2	0x1A	PCBA：+ 26℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0xD5	CRC-8 Check Value
4	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0xE6	SHUNT ：-26℃
	DB2	0xE6	PCBA：-26℃
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0x47	CRC-8 Check Value

7.2.3 Format C

Format C consists of one frame of message, including a 24-bit current value, an 16-bit temperature value, a 4-bit cyclic counter, a 2-bit status bit, a 1-bit flag bit, an 8-bit check bit and a 9-bit reserved bit. The details of the message are shown in Table 7-8, Examples of message and decoding information are shown in Table 7-9 and Table 7-10.

Table 7-8. Format C Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA) Temperature (0.1°C)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]: Malfunction Status[2] B[1]: Hardware Fault Flag[3] B[0]: Reserved Bit [4]	24-bit Unsigned Current Value Offset 0x800000[5]			16-bit Signed Temperature Value[6]		Reserved Bit[4]	CRC-8 Check SAE J1850[7]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Malfunction Status, '0': Normal; '1': ADC Conversion Error; '2': Current exceeds 1550A; '3': Shunt temperature exceeds 150 °C or PCBA temperature exceeds 125 °C.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4] Reserved bit, default is 0.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] 16-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: °C.
[7] CRC-8 Check generates a check code for the first 7 bytes of data.

Table 7-9. Examples of Format C Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x01	0x0A	0x00	0x2E
2	0x00	0x7F	0xFC	0x18	0xFE	0xF6	0x00	0x9D

Table 7-10. Decoding Information of Table 7-9 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x8003E8	Current: 1000mA, i.e. + 1A
	DB4-DB5	0x010A	The Temperature is + 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x2E	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0xFEF6	The Temperature is - 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x9D	CRC-8 Check Value

7.2.4 Format D

Format D consists of one frame of message, including a 32-bit current value, a 1-bit flag bit, a 7-bit status bit, an 8-bit software version, a 16-bit reserved byte and no temperature value. The details of the message are shown in Table 7-11, Examples of message and decoding information are shown in Table 7-12 and Table 7-13.

Table 7-11. Format D Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C0	8	32-bit Unsigned Current Value Offset 0x80000000[1]				B[0]: Error Flag [2] B[7:1]: Error Status[3]	Reserved Bit[4]		Software Version

[1] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA. The actual value is expressed as V=D-0x80000000. D is the value in the message.
[2] Error Flag, '0': Normal; '1': Error;
[3] Error Status, 0x64: no error; 0x50: ADC hardware error; 0x51: ADC conversion error; 0x60: Temperature exceeds the limit (current value remains measured).
[4] Reserved bit, default is 0.

Table 7-12. Examples of Format D Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x080	0x00	0x03	0xE8	0xC8	0x00	0x00	0x64
2	0x7F	0xFF	0xFC	0x18	0xC8	0x00	0x00	0x64

Table 7-13. Decoding Information of Table 7-12 Examples

Example	Byte	Value	Message
1	DB0-DB3	0x800003E8	Current: 1000mA, i.e. 1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved bit 0
	DB7	0x64	Software version is V 1.00
2	DB0-DB3	0x7FFFFC18	Current: -1000mA, i.e. -1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved byte 0
	DB7	0x64	Software version is V 1.00

7.3 Bus Topology

CB600F8536A can be applied to a bus-type topology and transmits network information to each node through the bus, as shown in Figure 7-3.

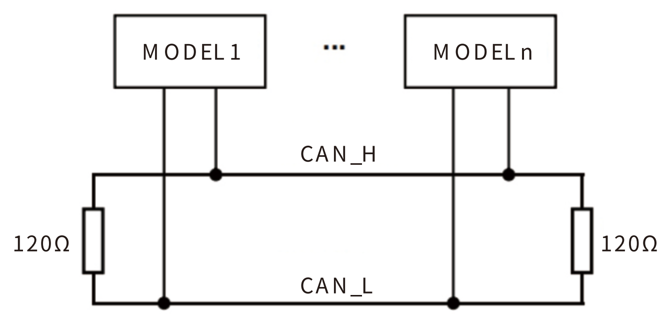


Figure 7-3 CAN Bus Topology

7.4 Measuring Mode

7.4.1 Time Interval + Command Trigger Mode

The sensor samples data at a fixed time interval set by the system and sends message to the CAN bus. At the same time, It can also respond to the trigger command. In the sampling period, the measurement will be active immediately when the trigger command is received and sends message to CAN bus. No need to wait for next sampling interval. As shown in Figure 7-4.

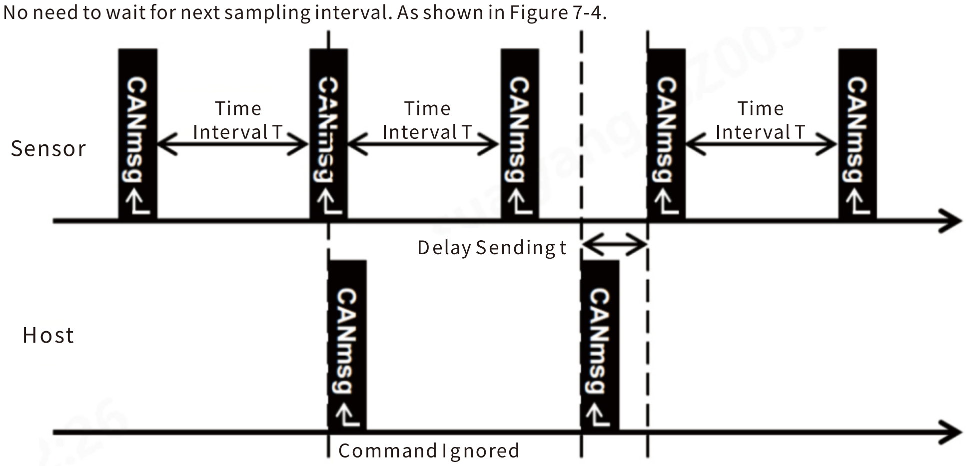


Figure 7-4. Time Interval + Command Trigger Mode

After the sensor receives the trigger command, if it is sampling or sending CAN message, the p resent trigger command will be ignored. When the command is valid, a sampling and sending process will be started, and the time interval T for the next sending will be automatically calculated from the moment of this trigger. As Figure 7 - 4 shown, there is a delay between the sensor receiving a valid trigger command and sending the CAN message, which is less than 1 ms.

7.4.2 Command Triggered Mode

Under this mode, the sensor will not automatically send message, but keep sampling, calculating and filtering data at a fixed time interval. The sensor will send the recent sampling data to CAN bus and reset the start of time interval when a valid command i s received from the host, as Figure 7 - 5 shown.

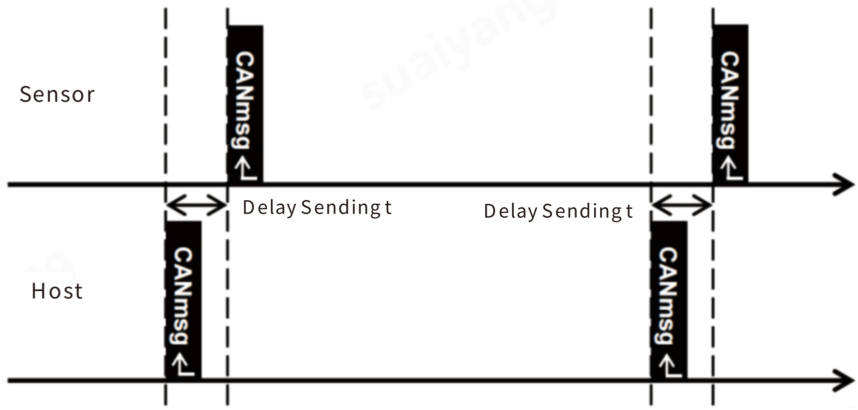


Figure 7-5. Command Trigger Mode

As Figure 7 - 5 shown, the sensor sends data to the CAN bus after receiving at rigger command from the host, with a delay of less that 1 ms between receiving the command and sending the data.

8、Mechanical Structure

8.1 Dimensions

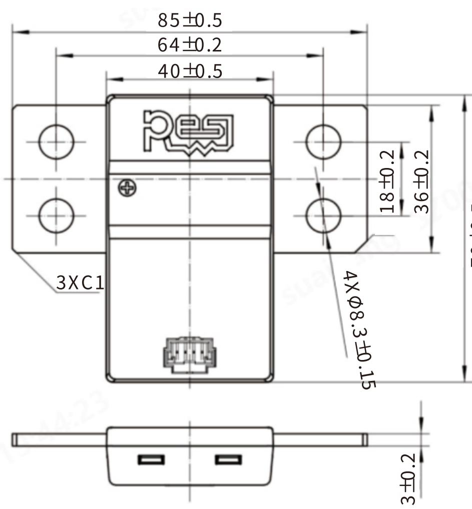


Figure 8. 1 Structure Diagram

8.2 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque:15- 20Nm
- Recommended Width * Thickness of Copper Bar:40mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar:20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

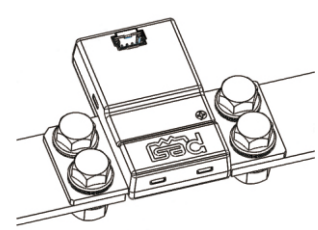


Figure 8-2. CB600F8536A Copper Bar Connection Diagram

8.3 Connector

Connector	Manufacturer	Pin Count	Part #
Male Connector[1]	Molex	4	5600200420
Recommended Female Connector[2]	Molex	4	5601230400

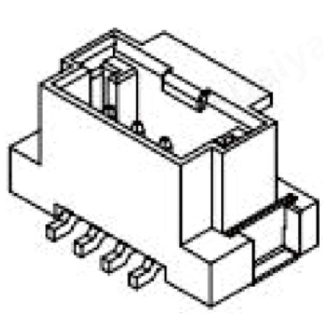


Figure 8-3. Male Connector

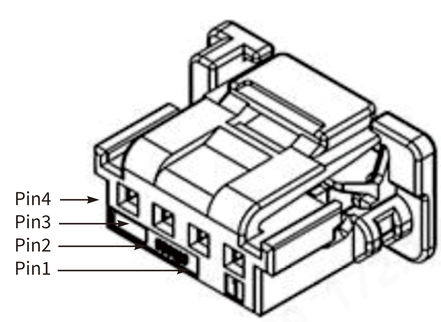


Figure 8-4. Female Connector（Wire end reference)

[1] For more information about male connector, please refer to Molex datasheet:https://www.molex.com/pdm_docs/sd/5600200420_sd.pdf
[2]For more information about female connector, please refer to Molex datasheet :https://www.molex.com/pdm_docs/sd/5601230400_sd.pdf

8.4 Connector Definition

Pin No.	Description
Pin4	VCC
Pin3	CAN_L
Pin2	CAN_H
Pin1	GND

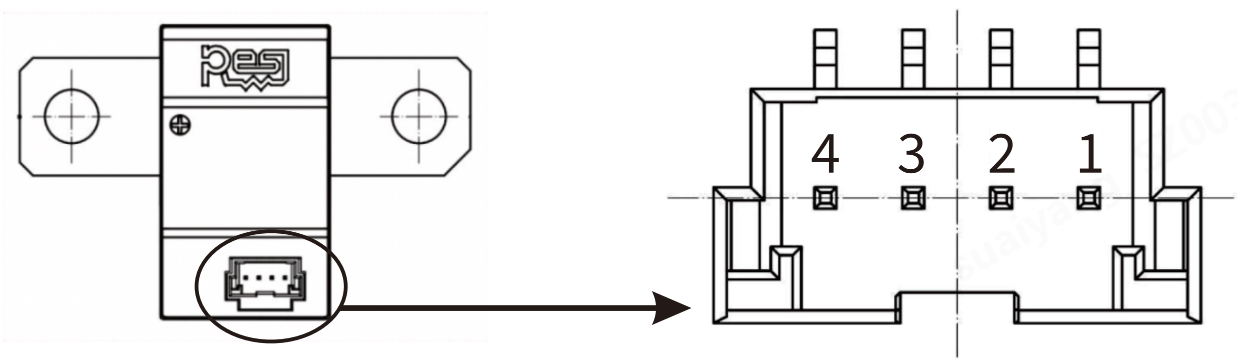


Figure 8-5. Male Connector Molex5600200420

9、Typical Applications

CB600F8536A[1]is used for accurate current measurement in key system. It is recommended that the current sensor connects to the circuit of positive or negative electrode of high-voltage end[2], as shown in Figure 9-1 and Figure 9-2, to sample the current in the main circuit. The high and low voltage ends are galvanic isolated inside the sensor. It is recommended that the low voltage end connects to the battery management system, as shown in Figure 9-3, for real-time and accurate reporting of current data in key system.

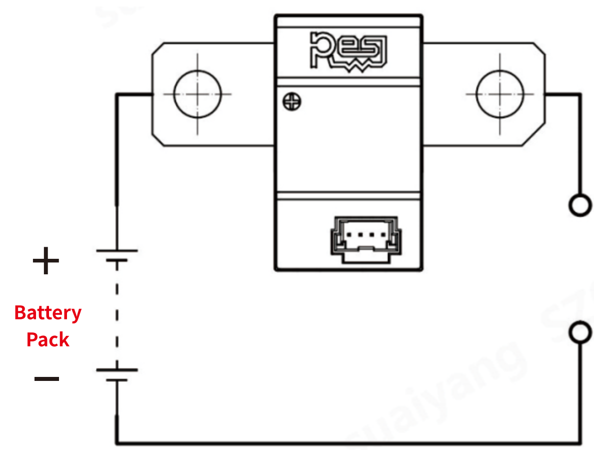


Figure 9-1. Recommended Use of Positive Electrode of High-Voltage End

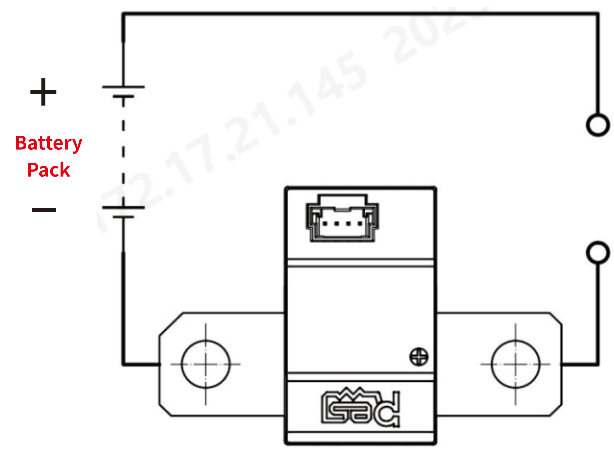


Figure 9-2. Recommended Use of Negative Electrode of High-Voltage End

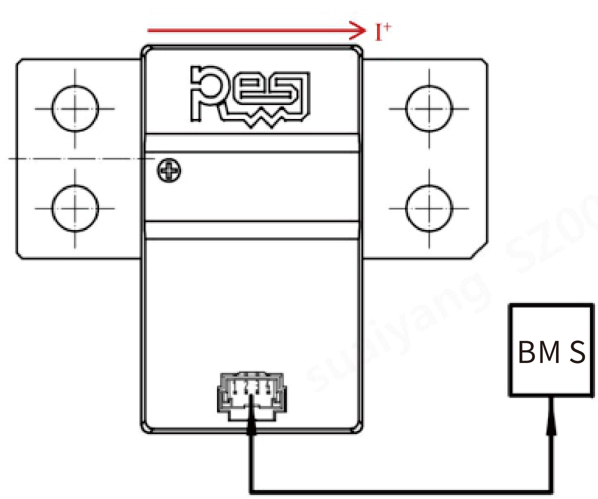


Figure 9-3. Recommended Use of Low-Voltage End

[1] The "+" on the CB600F8536A current sensor housing is the direction of current entry, that is, the positive current direction.
[2]The high voltage electrode is installed as shown in the figure. The operating condition indicated by the sensor output value is:
When the sensor outputs positive value, the battery pack is discharging;
When the sensor outputs negative value, the battery pack is charging.

10、Storage & Packaging

10.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases, and the packaging case shall be protected from direct sunlight.
- Anti-static bracelet or anti-static gloves shall be worn during installation, storage and handling.

10.2 Packaging

10.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container Name	Carton	
Container Size	480*410*282	mm
Unit Weight of Finished Product	100±5	g

[1] SNP, Standard Number of Package

10.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H (mm)	Quantity
1	50-Grid EPE Tray	468*398*86	3
2	EPE Tray Cover	460*390*10	1
3	Anti-Static PE Bag	200*150	150
4	Anti-Static PE Accordion Bag	900*510	1

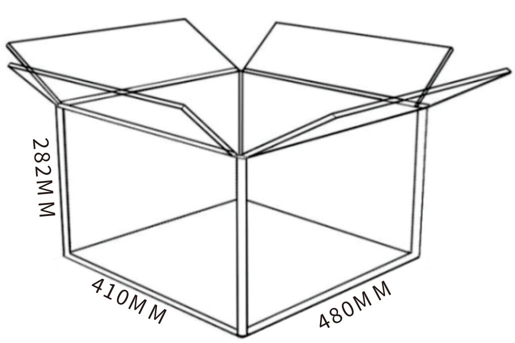


Figure 10-1. Carton Diagram

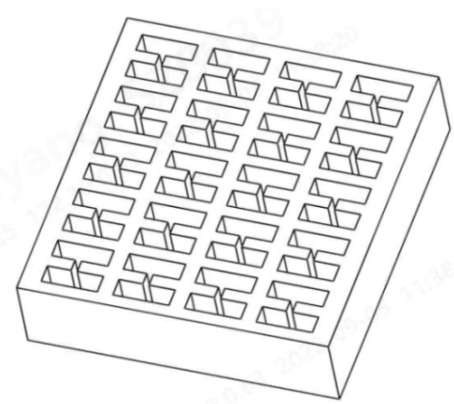


Figure 10-2. Structure Diagram of EPE

11、Part Number Information

CB 600 F 8536 A 1 S S NN

Series
CB: C & B Current Sensor

Rated Current
350: 350A
600: 600A
1000: 1000A

Tolerance
B: 0.05%
F: 0.1%
L: 0.2%
M : 0.5%
K: 1%

Shunt Size
6918: 69mm ×18mm
8518: 85mm ×18mm
8436: 84mm ×36mm
8536: 85mm ×36mm

Application Grade
A: CAN Automotive
I: CAN Industrial
T: 485 Industrial

Type
0: Standard, Thickness 4mm
1: Standard, Thickness 3mm
2: Customized

Special Byte
Standard
- K:25μΩ
- S:50μΩ
- P:100μΩ
- J:150μΩ

Customized
- Custom Byte, 0~9, A~Z

Special Byte
Standard
- S:CAN Terminal Resistor
- N:No CAN Terminal Resistor

Customized
- Custom Byte , 0 ~ 9, A ~ Z

Code
NN : 00～99 or Blank
For more performance options and other relevant information, please refer to the official website: https://en.resistor.today/

CB1000F8436A Series, Automotive, 0.1% Tolerance Operating Temperature -40℃~+105℃ Shunt Based Current Sensor

1、Characteristics

- Current Sensing: Measurement Range：-22400A~+22400A
  - Continuous Operating Range：-1000A~+1000A
  - Measurement Accuracy：±0.1% (MAX)
  - Resolution: 1mA
- Temperature Sensing: Measurement Range: -50℃~+150℃
  - Measurement Error: ±3℃
  - Resolution: 0.1℃
- Communication Protocol：CAN2.0 A/B
  - Selectable Data Format
  - Configurable CAN ID
  - Configurable CAN Speed：250Kbps~1Mbps
- Supply Voltage：6V~18V
- Operating Temperature Range：-40℃~+105℃
- Power Consumption：≤384mW @12VDC
- Galvanic Isolation：3000VAC

2、Applications

- Automotive Current Monitor
- Grid Energy Storage
- UPS
- Charging Station

3、Introduction

CB1000F8436A current sensor is an automotive current sensing module, which can be used to measure bidirectional DC current. Featuring high accuracy, low power consumption, wide operating temperature range, excellent response speed, temperature stability and anti-interference ability.

The sensor is designed based on low-TCR shunt, adopts high-precision ADC, communicates through CAN2.0 A/B protocol, and has large ranges of current and temperature measurement capabilities, and current compensation at whole temperature range.

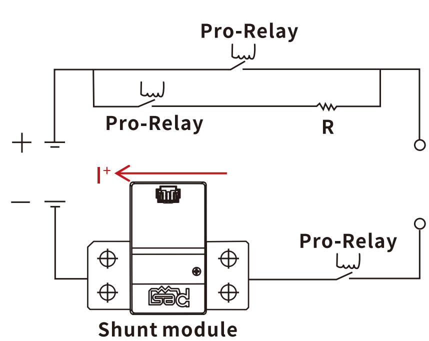
The sensor meets the operating temperature range of -40℃~+105℃, can apply to the continuous operating current of -1000A~+1000A at the whole temperature range, and the current measurement accuracy is no more than ± 0.1% in the range of +50A~+1000A or -1000A~-50A.

Power supply of CB1000F8436A current sensor is from 6VDC to 18VDC. Its power consumption is controlled below 384mW (12VDC), and it can realize complete high-low voltage isolation, which can be applied to the main positive electrode or the main negative electrode of the battery system.

Sensor Information

Part Number	Shunt Thickness	Resistance	Terminal Resistor
CB1000F8436A0KS00	4mm	25μΩ	Yes
CB1000F8436A0KN00	4mm	25μΩ	No

[1] For part numbers not included in the table, please contact us for technical support.



Typical Application

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4、Revision

Date	Revised Content	Note
2023.05.12	/	A0

5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max	Unit
Supply Voltage				30	VDC
Current Measurement Range	±1100A			60	s
	±1500A			40	s
	±2500A			15	s
	±3000A			10	s
	±22400A			50	ms
CAN Interface	Configured 120Ω Terminal Resistor (Continuous Power Supply)			6	V
	ESD			8	KV
Operating Temperature		-40		105	°C
Storage Temperature		-40		125	°C
Humidity				95	%RH

5.2 General Parameters

Test Conditions: Ambient Temperature 25 °C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Power Supply					
Supply Voltage		6	12	18	VDC
Operating Current	6V	20	26	32	mA
	12V	20	26	32	mA
	18V	20	26	32	mA
Power Consumption	6V	120	150	192	mW
	12V	240	300	384	mW
	18V	360	450	576	mW
Start- Up Time	Required time from power-on to s ending t he first frame valid message	100	130	150	ms
Current Measurement (- 40℃~+105℃)					
Accuracy	- 50A ~ + 50A		±30	±50	mA
	+50A ~ +1000A or -1000A ~ -50A			±0.1	%
	+1000A ~ +3000A or -3000A ~ -1000A		±0.5	±1	%
	+3000A ~ +22400A or -22400A ~ -3000A		±1	±5	%
Duration	-1000A ~ +1000A		Continuous		
	±1500A			30	s
	±3000A			5	s
	±22400A			40	ms
Resolution	-1000A~ +1000A		1		mA
	＞1000A or＜- 1000A		10		mA
Linearity	- 1000A~ + 1000A		±0.01		%
	＞1000A or＜- 1000A		±0.1		%

Test Conditions: Ambient Temperature 25 °C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Temperature Measurement					
Measurement Range		-50		150	℃
Measurement Error	- 50℃~ + 150℃	-3		3	℃
Resolution			0.1		℃
Power & Temperature Rise					
DC I mpedance		23.75	25	26.25	μΩ
Inductance				3	nH
Communication					
Protocol	CAN 2.0 A /B				
Communication Speed		250	500	1000	Kbps
Terminal Resistor	With Terminal Resistor	108	120	132	Ω
	Without Terminal Resistor				
Output Rate of Current Message		10	10	1000	ms
Output Rate of Temperature Message		10	100	1000	ms
Isolation					
Galvanic Isolation			3000		VAC
Creepage Distance			6		mm
Clearance			4.5		mm

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Function Check
Electrical loads		
5	VW 80000	E-01 Long-term overvoltage
6	VW 80000	E-02 Transient overvoltage
7	VW 80000	E-03 Transient undervoltage
8	VW 80000	E-04 Jump start
9	VW 80000	E-05 Load dump
10	VW 80000	E-06 Ripple voltage
11	VW 80000	E-07 Slow decrease and increase of the supply voltage
12	VW 80000	E-08 Slow decrease, quick increase of the supply voltage
13	VW 80000	E-09 Reset behavior
14	VW 80000	E-10 Brief interruptions
15	VW 80000	E-11 Start pulses
16	VW 80000	E-12 Voltage curve with vehicle electrical system control
17	VW 80000	E-13 Pin interruption
18	VW 80000	E-14 Connector interruption
19	VW 80000	E-15 Reverse polarity
20	VW 80000	E-16 Ground potential difference
21	VW 80000	E-17 Short circuit in signal cable and load circuits ..
22	VW 80000	E-18 Insulation resistance
23	VW 80000	E-19 Quiescent current
24	VW 80000	E-20 Dielectric strength
25	/	Continuous power test
26	ISO 7637-2:2011	CI pulse 1
27	ISO 7637-2:2011	CI pulse 2a / 2b
28	ISO 7637-2:2011	CI pulse 3a / 3b
29	ISO 7637-2:2011	CI pulse 4
30	ISO 7637-2:2011	CI pulse 5b
31	ISO 10605:2008	ESD
32	CISRP 25	Radiated emissions
33	CISRP 25	Conducted emissions
34	ISO 11452-2	Radiated immunity
35	ISO 11452-4	Bulk current injection

Test No.	Test Standards	Test Items
Climatic loads		
36	VW 80000	K-01 High-/low-temperature aging
37	VW 80000	K-02 Incremental temperature test
38	VW 80000	K-03 Low-temperature operation
39	VW 80000	K-05 Thermal shock (component).
40	VW 80000	K-14 Damp heat, constant
41	VW 80000	L-02 Service life test - high-temperature durability testing
42	VW 80000	L-03 Service life test – Temperature cycle durability testing
43	IEC 60068-2-30	Dew test
44	GB/T 2423.34	Composite temeperature & humidity cyclic test
Mechanical loads		
45	VW 80000	M-01 Free fall
46	VW 80000	M-04 Vibration test
47	VW 80000	M-05 Mechanical shock
48	VW 80000	M-08 Protection against foreign bodies - IP0x to IP4x, A, B, C, D
Regulation Validation		
49	GB/T 30512-2014	Requirements for prohibited substances on automobiles
50	UL-94:2016	Vertical Burning Test

7、Communication

7.1 CAN Protocol

CB1000F8436A applies CAN2.0 A/B communication protocol and communicates through data frame. The data length of message frame is between 1-8 bytes. The default CAN speed is 500Kbps. 1Mbps/250Kbps are also available. There are two kinds of data frame, standard frame and extended frame, as shown in Figure 7-1 and Figure 7-2. Standard frame has an ID of 11 bytes, and the extended frame has an ID of 29 bytes. The defaulted data frame is standard frame, which can be adjusted to the extended frame. The defaulted data format is Motorola, which can be adjusted to Intel.

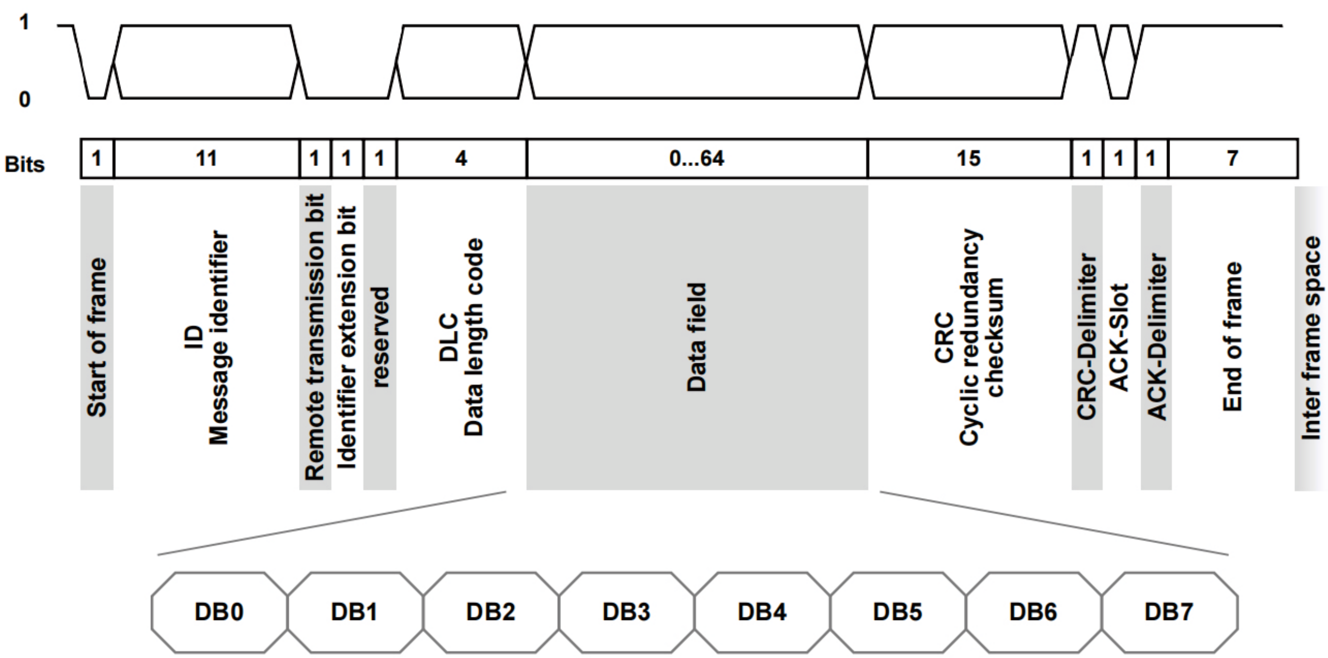


Figure 7-1 S tandard Frame

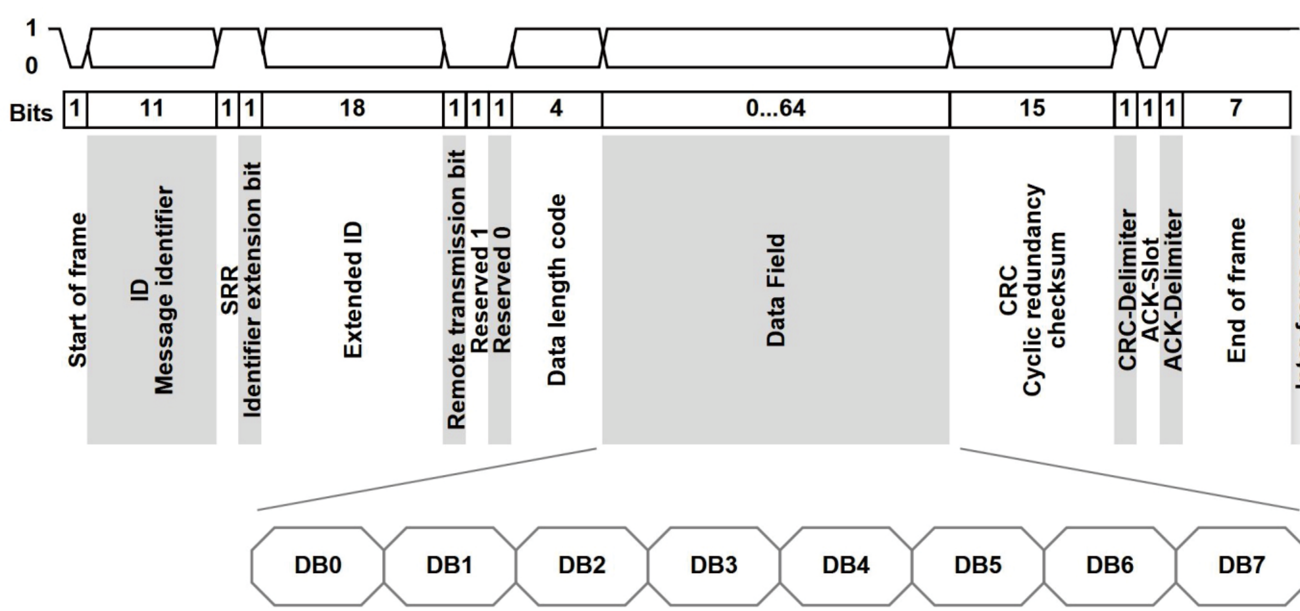


Figure 7-2 Extended Frame

7.2 Data Frame

The data frame of CB1000F8436A can apply multiple data formats, as shown in Table 7-1. Among them, both formats A and B are composed of two frames of messages, which transmit real-time current and real-time temperature. Both formats C and D are composed of one frame of message. Format C transmits real-time current and real-time temperature in one frame of message. Format D only transmits real-time current. The data frame format defaults to format A.

Table 7-1. Message Frame Data Format

Data Format Type	Data Frame Content	CAN ID[1]	Data Length	Characteristics
Format A	Real-Time Current	0x0301	6	32-bit current value is a signed integer. Available Unit: mA/μA
	Real-Time Temperature	0x0325	6	32-bit temperature value is a signed integer, in 0.1℃
Format B	Real-Time Current	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA
	Real-Time Temperature	0x06C2	8	8-bit NTC temperature value is a signed short integer, in ℃ 8-bit MCU temperature value is a signed short integer, in ℃
Format C	Real-Time Current & Temperature	0x03C2	8	24-bit current value is an unsigned integer with offset 0x800000, in mA 16-bit temperature value is a signed short integer. Unit: 0.1 ℃
Format D	Real-Time Current	0x03C0	8	32-bit current value is an unsigned integer with offset 0x80000000, in mA

[1] The CAN ID in the above table are default and can be modified by commands (refer to the relevant application documents for details)

7.2.1 Format A

Format A consists of current data frame and temperature data frame, each with a 4-bit cyclic counter and a 2-bit module exception flag. In addition, the current data frame has an 8-bit current channel flag, a 32-bit current value, a 1-bit unit selection and a 1-bit reserved bit. The temperature data frame has an 8-bit temperature channel flag, a 32-bit temperature value and a 2-bit reserved bit. The details of the message are shown in Table 7-2, Examples of message and decoding information are shown in Table 7-3 and Table 7-4.

Table 7-2. Format A Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5
Current (mA/μA)	0x0301	6	0x00[1]	B[7]: Reserved Bit[2] B[6]: Current Unit[3] B[5]: Measurement Error Flag[4] B[4]: Overcurrent Flag[5] B[3:0]: Cyclic Counter[6]	32-bit Signed Current Value[7]			
Temperature (0.1℃)	0x0325	6	0x04[8]	B[7:6]: Reserved Bit[2] B[5]: Overtemperature Flag of Shunt[9] B[4]: Overtemperature Flag of PCBA[10] B[3:0]: Cyclic Counter[6]	32-bit Signed Temperature Value[11]			

[1] Current Channel Flag.
[2] Reserved bit, default is 0.
[3] Current Unit, 0: mA; 1: μA
[4] Measurement error flag, active when the ADC fault is detected, indicates that the current value is invalid. When alarming, the current sensor still sends and receives data messages, but the current value in the message is invalid. The measurement deviation may exceed the range specified in the technical specification.
[5] Overcurrent error flag. Default is inactive. It can be defined by the user.
[6] Cyclic Counter, 0x0-0xF cycle count value.
[7] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer.
[8] Temperature Channel Flag.
[9] Overtemperature Flag of Shunt, active when the shunt temperature is detected to be more than 150 ℃, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature for a long time, the performance of current sensor can be damaged. At this time, it is recommended to limit the output power of BMS.
[10] Overtemperature Flag of PCBA, active when the board temperature is detected to be more than 125 ℃, indicates that the sensor may have no message output or low accuracy. When alarming, the current sensor can still send and receive data messages in a short time, and the current value in the message is valid. If overtemperature lasts for a long time, the performance of current sensor can be damaged. Then, it is recommended to limit the output power of BMS.
[11] 32-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: 0.1 ℃

Table 7-3. Examples of Format A Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5
1	0x00	0x00	0x00	0x00	0x03	0xE8
2	0x00	0x00	0xFF	0xFF	0xFC	0x18
3	0x04	0x00	0x00	0x00	0x01	0x0A
4	0x04	0x00	0xFF	0xFF	0xFE	0xF6

Table 7-4. Decoding Information of Table 7-3 Examples

Example	Byte	Value	Message
1	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0x000003E8	Current: 1000mA , i.e. 1A
2	DB0	0x00	Current Channel Flag.
	DB1	0x00	Reserved bit 0, unit: mA, no measurement error, cycle sequence 0
	DB2-DB5	0xFFFFFC18	Current: -1000mA, i.e. -1A
3	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0x0000010A	The Temperature i s + 26.6 °C
4	DB0	0x04	Temperature Channel Flag.
	DB1	0x00	Reserved bit 0, Shunt temperature＜150 °C, PCBA temperature＜125 °C, cycle sequence 0
	DB2-DB5	0xFFFFFEF6	The Temperature i s - 26.6 °C

7.2.2 Format B

Format B consists of current data frame and temperature data frame, each with a 4-bit cyclic counter. In addition, the current data frame has a 24-bit current value, a 2-bit flag bit, an 8-bit software version, an 8-bit check bit and an 18-bit reserved bit. The temperature data frame has an 8-bit temperature value, a 4-bit status bit, an 8-bit check bit and a 32-bit reserved bit. The details of the message are shown in Table 7-5, Examples of message and decoding information are shown in Table 7-6 and Table 7-7.

Table 7-5. Format B Message

Frame Type	CAN ID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]:Reserved Bit [2] B[1]: Hardware Fault Flag[3] B[0]:ADC Conversion Error[4]	24-bit Unsigned Current Value Offset 0x800000[5]			Reserved Bit[2]		Software Version	CRC-8 Check SAE J1850[6]
Temperature (°C)	0x06C2	8	B[7:4]: Cyclic Counter[1] B[3]:SHUNT Over Temperature Flag[7] B[2]:PCBA Over Temperature Flag[8] B[1]:SHUNT Temperature measurement Error Flag.[9] B[0]:PCBA Temperature measurement Error Flag[10]	SHUNT (°C)[11]	PCBA (°C)[12]	Reserved Bit[2]				CRC-8 Check SAE J1850[6]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Reserved bit, default is 0.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4]ADC conversion error flag. When ADC sampling timeout exceeded, indicating the present current value is invalid. When flag occurs, the sensor can still receive and send message, but the current value of the message is invalid. The measured value may be out of the specifications range.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unflaged integer. Unit: mA
The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] CRC-8 Check generates a check code for the first 7 bytes of data.
[7] SHUNT over temperature flag. When measured temperature of SHUNT is over 150°C, it will be no message or measurement accuracy decreased. When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal. If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[8] PCBA over temperature flag. When measured temperature of PCBA is over 125°C, it will be no message or measurement accuracy decreased. When flag occurs, the sensor can still receive and send message in a short period and the current value in the message is normal. If the sensor is over temperature for a long time, it could affect the functions of the sensor. It is recommended to derate BMS output power.
[9] SHUNT temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[10] PCBA temperature measurement error flag. Sign sets when SHUNT temperature measurement is error.
[11] SHUNT temperature, 8-bit temperature data by default unflaged integers. Unit: °C. The actual value expression is V=D-55. D is the value in the message.
[12] PCBA temperature, 8-bit temperature data by default unflaged integers. Unit: °C. The actual value expression is V=D-55. D is the value in the message.

Table 7-6. Examples of Format B Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x00	0x00	0x64	0x83
2	0x00	0x7F	0xFC	0x18	0x00	0x00	0x64	0xAB
3	0x00	0x1A	0x1A	0x00	0x00	0x00	0x00	0xD5
4	0x00	0xE6	0xE6	0x00	0x00	0x00	0x00	0x47

Table 7-7. Decoding Information of Table 7-6 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x8003E8	Current: 1000mA , i.e. +1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0x83	CRC-8 Check Value
2	DB0	0x00	Cycle sequence 0, reserved bit 0, no hardware fault, No ADC conversion error
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0x0000	Reserved bit 0
	DB6	0x64	Software version is V 1.00
	DB7	0xAB	CRC-8 Check Value
3	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0x1A	SHUNT : + 26°C
	DB2	0x1A	PCBA : + 26°C
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0xD5	CRC-8 Check Value
4	DB0	0x00	Cycle sequence 0, normal SHUNT & PCBA temperature，normal SHUNT、PCBA temperature
	DB1	0xE6	SHUNT : - 26°C
	DB2	0xE6	PCBA : - 26°C
	DB3-DB6	0x00000000	Reserved bit 0
	DB7	0x47	CRC-8 Check Value

7.2.3 Format C

Format C consists of one frame of message, including a 24-bit current value, an 16-bit temperature value, a 4-bit cyclic counter, a 2-bit status bit, a 1-bit flag bit, an 8-bit check bit and a 9-bit reserved bit. The details of the message are shown in Table 7-8, Examples of message and decoding information are shown in Table 7-9 and Table 7-10.

Table 7-8. Format C Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA) Temperature (0.1°C)	0x03C2	8	B[7:4]: Cyclic Counter[1] B[3:2]: Malfunction Status[2] B[1]: Hardware Fault Flag[3] B[0]:Reserved Bit [4]	24-bit Unsigned Current Value Offset 0x800000[5]			16-bit Signed Temperature Value[6]		Reserved Bit[4]	CRC-8 Check SAE J1850[7]

[1] Cyclic Counter, 0x0-0xF cycle count value.
[2] Malfunction Status, '0': Normal; '1': ADC Conversion Error; '2': Current exceeds 1550A; '3' : Shunt temperature exceeds 150 °C or PCBA temperature exceeds 125 °C.
[3] Hardware Fault Flag, active when a hardware fault is detected, indicates that the ADC may have a fault.
[4] Reserved bit, default is 0.
[5] 24-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA The actual value is expressed as V=D-0x800000. D is the value in the message.
[6] 16-bit temperature data uses big-endian by default. The high bit is followed by the low bit. It is a signed integer. Unit: °C.
[7] CRC-8 Check generates a check code for the first 7 bytes of data.

Table 7-9. Examples of Format C Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x00	0x80	0x03	0xE8	0x01	0x0A	0x00	0x2E
2	0x00	0x7F	0xFC	0x18	0xFE	0xF6	0x00	0x9D

Table 7-10. Decoding Information of Table 7-9 Examples

Example	Byte	Value	Message
1	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x8003E8	Current: 1000mA , i.e. +1A
	DB4-DB5	0x010A	The Temperature i s + 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x2E	CRC- 8 Check Value
2	DB0	0x00	Cycle sequence 0, normal function, no hardware fault, reserved bit 0
	DB1-DB3	0x7FFC18	Current: -1000mA, i.e. -1A
	DB4-DB5	0xFEF6	The Temperature i s - 26.6 °C
	DB6	0x00	Reserved bit 0
	DB7	0x9D	CRC- 8 Check Value

7.2.4 Format D

Format D consists of one frame of message, including a 32-bit current value, a 1-bit flag bit, a 7-bit status bit, an 8-bit software version, a 16-bit reserved byte and no temperature value. The details of the message are shown in Table 7-11, Examples of message and decoding information are shown in Table 7-12 and Table 7-13.

Table 7-11. Format D Message

Frame Type	CANID	Length	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Current (mA)	0x03C0	8	32-bit Unsigned Current Value Offset 0x80000000[1]				B[0]:Error Flag [2] B[7:1]: Error Status[3]	Reserved Bit[4]		Software Version

[1] 32-bit current data uses big-endian by default. The high bit is followed by the low bit. It is an unsigned integer. Unit: mA. The actual value is expressed as V=D-0x80000000. D is the value in the message.
[2] Error Flag, '0': Normal; '1': Error;
[3] Error Status, 0x64: no error; 0x50: ADC hardware error; 0x51: ADC conversion error; 0x60: Temperature exceeds the limit (current value remains measured).
[4] Reserved bit, default is 0.

Table 7-12. Examples of Format D Message Frame

Example	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7
1	0x080	0x00	0x03	0xE8	0xC8	0x00	0x00	0x64
2	0x7F	0xFF	0xFC	0x18	0xC8	0x00	0x00	0x64

Table 7-13. Decoding Information of Table 7-12 Examples

Example	Byte	Value	Message
1	DB0-DB3	0x800003E8	Current: 1000mA, i.e. 1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved bit 0
	DB7	0x64	Software version is V1.00
2	DB0-DB3	0x7FFFFC18	Current: -1000mA, i.e. -1A
	DB4	0xC8	Normal, no error
	DB5-DB6	0x0000	Reserved byte 0
	DB7	0x64	Software version is V1.00

7.3 Bus Topology

CB1000F8436A can be applied to a bus-type topology and transmits network information to each node through the bus, as shown in Figure 7-3.

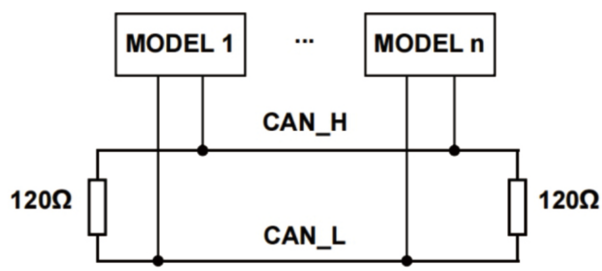


Figure 7-3 CAN Bus Topology

7.4 Measuring Mode

7.4.1 Time Interval + Command Trigger Mode

The sensor samples data at a fixed time interval set by the system and sends message to the CAN bus. At the same time, It can also respond to the trigger command. In the sampling period, the measurement will be active immediately when the trigger command is received and sends message to CAN bus. No need to wait for next sampling interval. As shown in Figure 7-4.

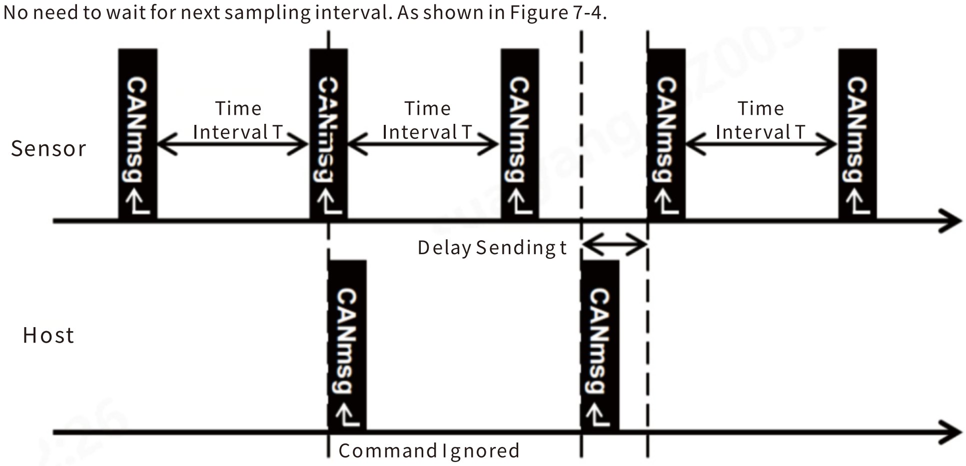


Figure 7-4. Time Interval + Command Trigger Mode

After the sensor receives the trigger command, if it is sampling or sending CAN message, the p resent trigger command will be ignored. When the command is valid, a sampling and sending process will be started, and the time interval T for the next sending will be automatically calculated from the moment of this trigger. As Figure 7 - 4 shown, there is a delay between the sensor receiving a valid trigger command and sending the CAN message, which is less than 1 ms.

7.4.2 Command Triggered Mode

Under this mode, the sensor will not automatically send message, but keep sampling, calculating and filtering data at a fixed time interval. The sensor will send the recent sampling data to CAN bus and reset the start of time interval when a valid command i s received from the host, as Figure 7 - 5 shown.

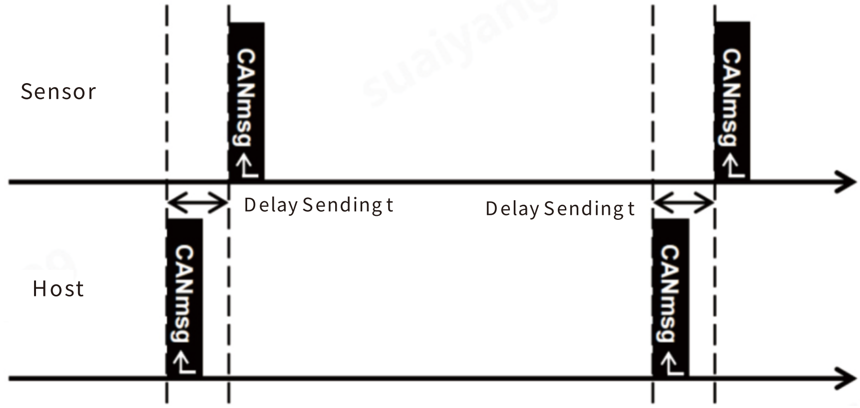


Figure 7-5. Command Trigger Mode

As Figure 7 - 5 shown, the sensor sends data to the CAN bus after receiving at rigger command from the host, with a delay of less that 1 ms between receiving the command and sending the data.

8、Mechanical Structure

8.1 Dimensions

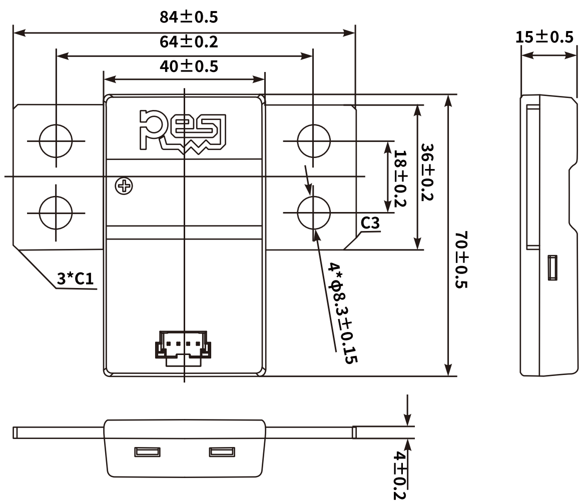


Figure 8. 1 Structure Diagram

8.2 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque:15- 20Nm
- Recommended Width * Thickness of Copper Bar:40mm*5mm
- Recommended Length of Overlap between Shunt and Copper Bar:20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

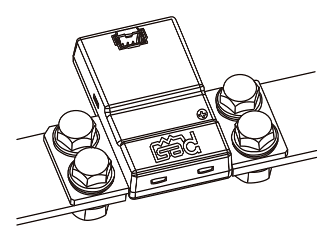


Figure 8-2. CB1000F8436A Copper Bar Connection Diagram

8.3 Connector

Connector	Manufacturer	Pin Count	Part #
Male Connector[1]	Molex	4	5600200420
Recommended Female Connector[2]	Molex	4	5601230400

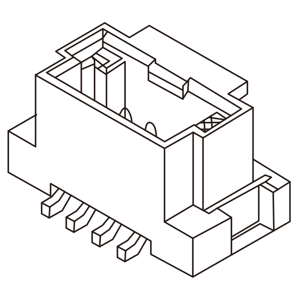


Figure 8-3. Male Connector

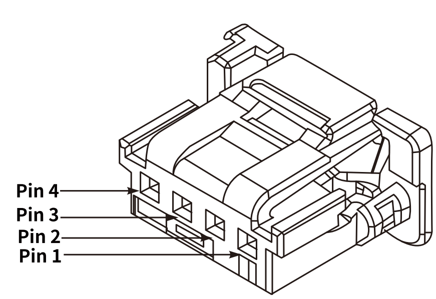


Figure 8-4. Female Connector（Wire end reference)

[1] For more information about male connector, please refer to Molex datasheet:https://www.molex.com/pdm_docs/sd/5600200420_sd.pdf
[2]For more information about female connector, please refer to Molex datasheet :https://www.molex.com/pdm_docs/sd/5601230400_sd.pdf

8.4 Connector Definition

Pin No.	Description
Pin4	VCC
Pin3	CAN_L
Pin2	CAN_H
Pin1	GND

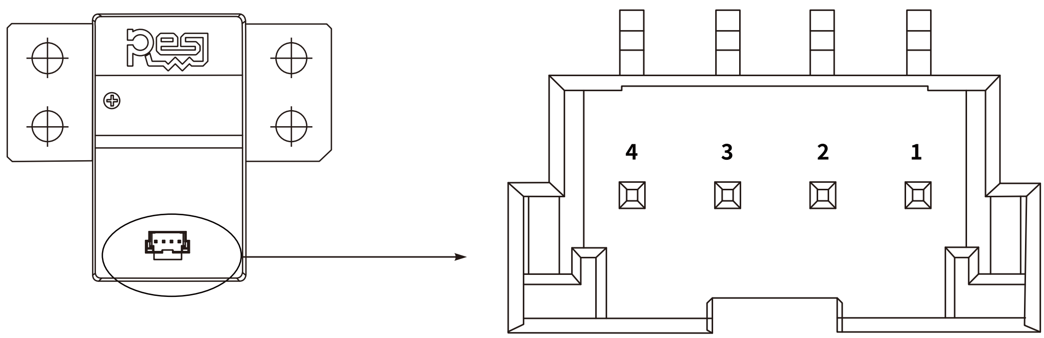


Figure 8-5. Male Connector Molex5600200420

9、Typical Applications

CB1000F8436A[1] is used for accurate current measurement in key system. It is recommended that the current sensor connects to the circuit of positive or negative electrode of high-voltage end[2], as shown in Figure 9-1 and Figure 9-2, to sample the current in the main circuit. The high and low voltage ends are galvanic isolated inside the sensor. It is recommended that the low voltage end connects to the battery management system, as shown in Figure 9-3, for real-time and accurate reporting of current data in key system.

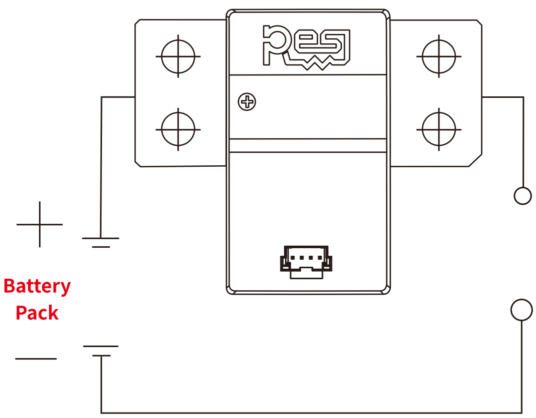


Figure 9-1. Recommended Use of Positive Electrode of High-Voltage End

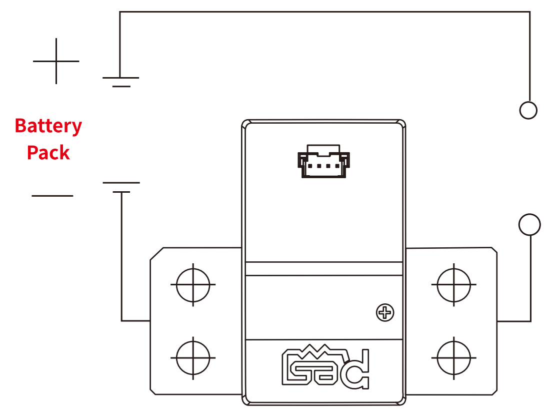


Figure 9-2. Recommended Use of Negative Electrode of High-Voltage End

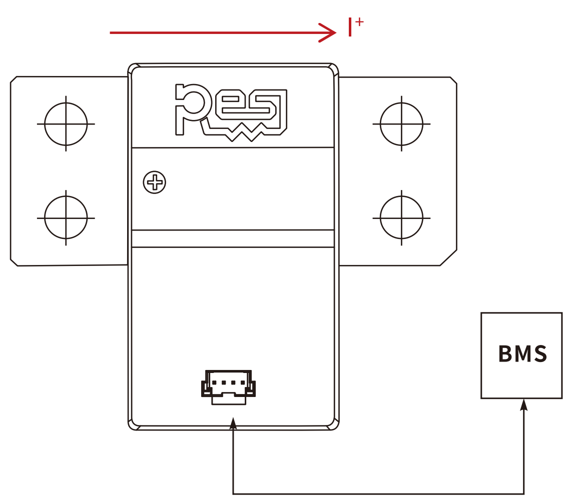


Figure 9-3. Recommended Use of Low-Voltage End

[1] The "+" on the CB1000F8436A current sensor housing is the direction of current entry, that is, the positive current direction.
[2]The high voltage electrode is installed as shown in the figure. The operating condition indicated by the sensor output value is:
When the sensor outputs positive value, the battery pack is discharging;
When the sensor outputs negative value, the battery pack is charging.

10、Storage & Packaging

10.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases, and the packaging case shall be protected from direct sunlight.
- Anti-static bracelet or anti-static gloves shall be worn during installation, storage and handling.

10.2 Packaging

10.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container Name	Carton	
Container Size	480*410*282	mm
Unit Weight of Finished Product	126±5	g

[1] SNP, Standard Number of Package

10.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity
1	50-Grid EPE Tray	468*398*86	3
2	EPE Tray Cover	460*390*10	1
3	Anti-Static PE Bag	200*150	150
4	Anti-Static PE Accordion Bag	900*510	1

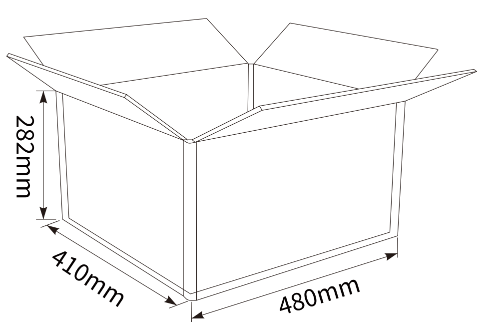


Figure 10-1. Carton Diagram

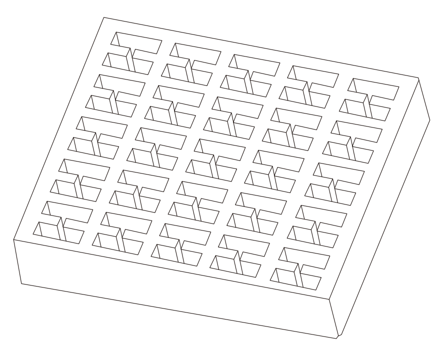


Figure 10-2. Structure Diagram of EPE

11、Part Number Information

CB 1000 F 8436 A 0 K S NN

Series

CB: C & B Current Sensor

Rated Current

350: 350A
600: 600A
1000: 1000A

Tolerance

B: 0.05%
F: 0.1%
L: 0.2%
M: 0.5%
K: 1%

Shunt Size

6918: 69mm ×18mm
8518: 85mm ×18mm
8436: 84mm ×36mm
8536: 85mm ×36mm

Application Grade

A: CAN Automotive
I: CAN Industrial
T: 485 Industrial

Type

0: Standard, Thickness 4mm
1: Standard, Thickness 3mm
2: Customized

Special Byte

Standard
- K:25μΩ
- S:50μΩ
- P:100μΩ
- J:150μΩ

Customized
- Custom Byte, 0~9, A~Z

Special Byte

Standard
- S:CAN Terminal Resistor
- N:No CAN Terminal Resistor

Customized
- Custom Byte , 0 ~ 9, A ~ Z

Code

NN : 00～99 or Blank
For more performance options and other relevant information, please refer to the official website: https://en.resistor.today/

PCBS6918B100P2AC00, Automotive Operation Temperature -40 ℃~+125 ℃ Shunt Based Current Sensing Module

1、Characteristics

- Continuous Operating Range: -350A~+350A
- Connector: Horizontal 4 PIN
- High Accuracy Current Measurement
- Real-Time Temperature Measurement
- Applicable to High Pulse Current
- Low TCR, Low Inductance, Low Thermal EMF
- Excellent Long-Term Stability
- Operating Temperature Range:-40℃~125℃

2、Applications

- BMS Current Measurement
- BDU/PDU Current Measurement

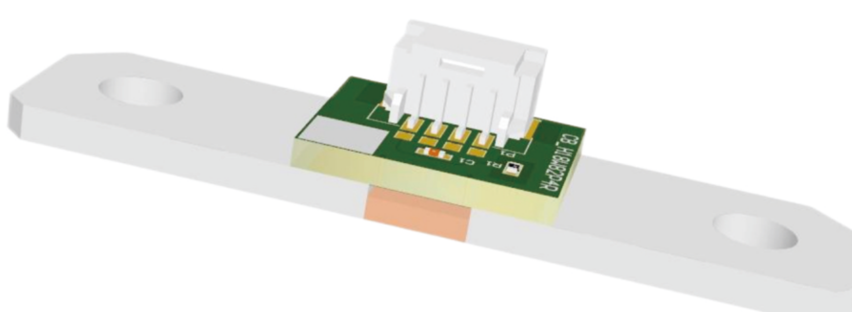
3、Introduction

PCBS6918B100P2AC00 is an automotive current sensing module used to assist in measuring bidirectional DC current. It has high accuracy, low TCR, low inductance, low thermal EMF, and excellent long-term stability and anti-interference ability.

This module is designed based on a low-TCR shunt, which is welded with PCBA and can be installed on the circuit through bolts. It is used to collect bus current and shunt temperature, and send the measured signal to the signal processing side of the user defined module. It can be customized according to the specific technical requirements.

Module Information

Shunt Size	Hole Diameter	Connector
69mm×18mm	7mm	5023520400



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4、Revision

Date	Note	Revised Content
2023.04.14	/	A0
2023.05.06	Revise the information of data matrix	A1
2023.09.21	Revise the derating curve	A2
2023.12.01	Revise the layout of datasheet	A3

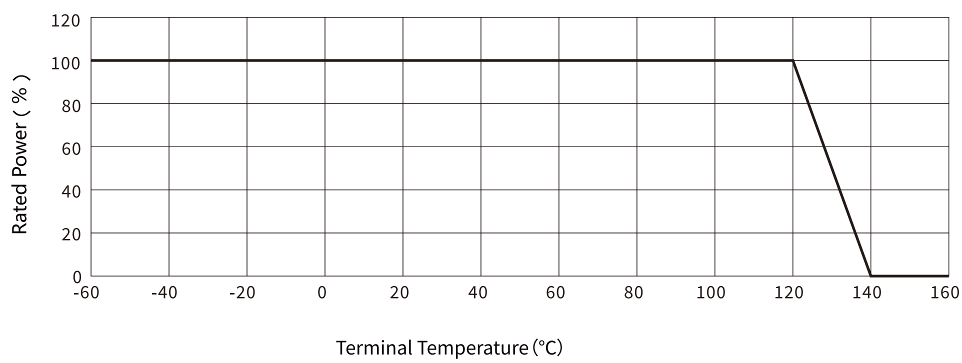
5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Current Measurement Range	±1000A			5	s
Operating Temperature		-40		125	℃
Storage Temperature		-40		125	℃
Humidity				95	%RH

[1] When operating temperature＞120℃, derating power is needed. The specific derating range refers to the figure below.



5.2 General Parameters

Test Conditions: Ambient Temperature 25℃ (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Shunt					
Resistance			100		μΩ
Tolerance			±5		%
TCR	-40℃~+125℃		±100		ppm/℃
Continuous Operating Current			±350		A
Thermal EMF				3	μV/℃
Inductance				5	nH
Operating Temperature Range			-55~+175		℃
NTC					
Resistance			10		kΩ
Tolerance			±1		%
TCR	25/85℃		3434		K
Operating Temperature Range			-40~+150		℃
Capacitor					
Capacitance			0.1		μF
Tolerance			±10		%
Rated Voltage			50		V
Operating Temperature Range			-55~+125		℃

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Flatness of installation
Electrical loads		
5	VW 80000-2021 5.4.20	E-18 Insulation resistance
6	VW 80000-2021 5.4.22	E-20 Dielectric strength
7	GB/T 6148-2005	Drift of temperature
Climatic loads		
8	GB/T 2423.2-2008	High temperature aging
9	GBT 2423.1-2008	Low-temperature operation
10	VW 80000：2021 5.6.5	K-05 Thermal shock (component)
11	GB/T2423.50-2012 MIL-STD-202 Method 103	Damp heat, constant
12	VW 80000：2021 5.8.3	L-03 Service life test – Temperature cycle durability testing
13	GB/T 10125-2021	Salt spray
Mechanical loads		
14	VW 80000-2021 5.5.1	M-01 Free fall
15	VW 80000-2021 5.5.4	M-04 Vibration test
16	VW 80000-2021 5.5.5	M-05 Mechanical shock
Regulation Validation		
17	RoHS	Pb, Cd, Hg, Cr(V), PBBs, PBDEs
18	REACH	CMR,PBT,vPvB...

7、Current Data

7.1 Temperature Compensation

PCBS6918B100P2AC00 applies temperature compensation to weaken the impact of ambient temperature changes on the shunt resistance. A fitting algorithm is used to compute a curve of the shunt resistance change with temperature , as shown in Figure 7-1.

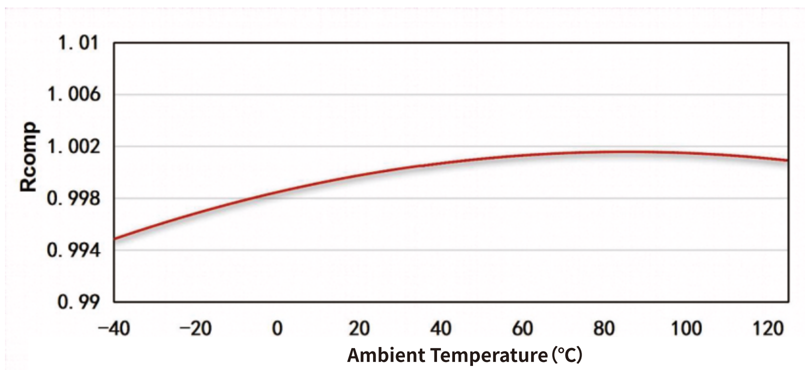


Figure 7-1. R_{COMP} Temperature Characteristic Curve

As shown in Figure 7-1, the compensation factor R_{COMP} temperature characteristic curve is:

$$R_{COMP}=A*T^2+B*T+C$$

Demonstration:

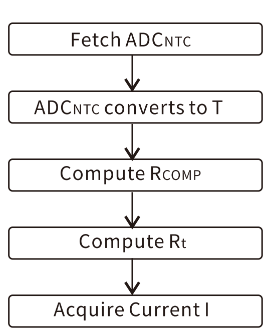
R_{COMP} : The drift of the shunt resistance relative to the change from initial temperature to present temperature, in ppm.
T : Present Temperature of Shunt
A : Coefficient of Quadratic Term T^2
B : Coefficient of Primary Term T
C : Constant Term

Shunt resistance R_t at present temperature t, through temperature compensation:

$$R_t=R_0*R_{COMP}$$ [1]

[1] R_0 is the initial resistance of shunt at lab environment, usually at +25℃±2℃
[2] Figure 7-1 is only for illustration of this product. It is not the temperature characteristic curve for all products.

7.2 Current Data Acquisition



ADC_{NTC}: ADC of NTC

T: NTC Temperature (℃)

R_{COMP}: $R_{COMP}=A*T^2+B*T+C$

$R_t=R_0*R_{COMP}$

$I=V_{SHUNT}/R_t$
V_{SHUNT}: Voltage of Shunt

8、Mechanical Structure

8.1 D imensions

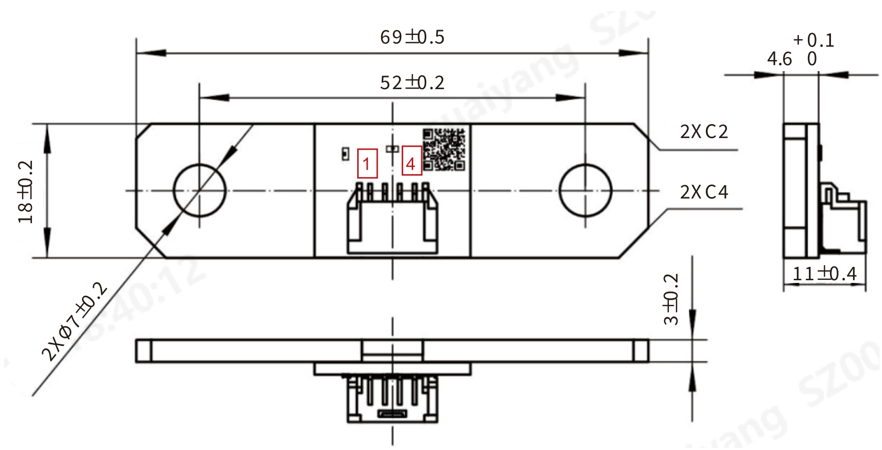


Figure 8. 1 Structure Diagram

8.2 Laser QR Code

8.2.1 Code Size

No.	Materials	Size L*W(mm)
1	PCB Cover Size	6*6
2	Data Matrix Size	5*5

8.2.2 Data Matrix

The content of the QR code includes date, serial number, and the actual resistance value

(Take 100 μΩ for example, measurement is to three decimal places: 100.000 μΩ, output as R100000n, if it is 99.000μΩ is R99000n)

Content	Year	Month	Day	Module ID	R_0[1]	Coefficient A	Coefficient B	Constant Term C
Format	YYYY	MM	DD	XXXXX	Rxxxxxxn or Rxxxxxn[2]	±X.XXXXXXXXX	±X.XXXXXXXXX	±X.XXXXXXXXX
Example	2020	11	25	00001	R100123n R99123n	-0.000000576	+0.000086780	+0.998188760
	If R≥100nΩ 2020112500001R100123n-0.000000576+0.000086780+0.998188760 If R<100nΩ 2020112500001R99123n-0.000000576+0.000086780+0.998188760[3]							

[1]R_0, the initial resistance of shunt at lab environment, usually at 25℃±2℃, in nΩ.

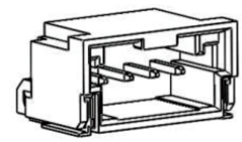
[2] If R≥100μΩ, R_0 is expressed as Rxxxxxxn.

If R<100μΩ, R_0 is expressed as Rxxxxxn.

[3] If R≥100μΩ, the total number of characters is 57

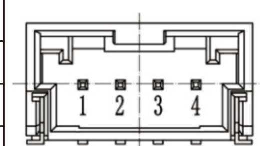
If R<100μΩ, the total number of characters is 56

8.3 Connector

Manufacturer	Pin Count	Part #	Structural Diagram
Molex	4	5023520400	

[1] Recommended female connector: 5023510400.

8.4 Connector Definition

No.	Pin No.	Code	Description	Structural Diagram
1	Pin 1	T1	Temperature Sensor Pin 1	
2	Pin 2	S+	Current Signal Positive	
3	Pin 3	S-	Current Signal Negative	
4	Pin 4	T2	Temperature Sensor Pin 2	

[1] Refer to the recommended current direction in the PCB Structural Diagram.
[2] Recommend Pin1 and Pin4 as twisted pair. Pin2 and Pin3 as twisted pair.

8.5 PCB Structural Diagram

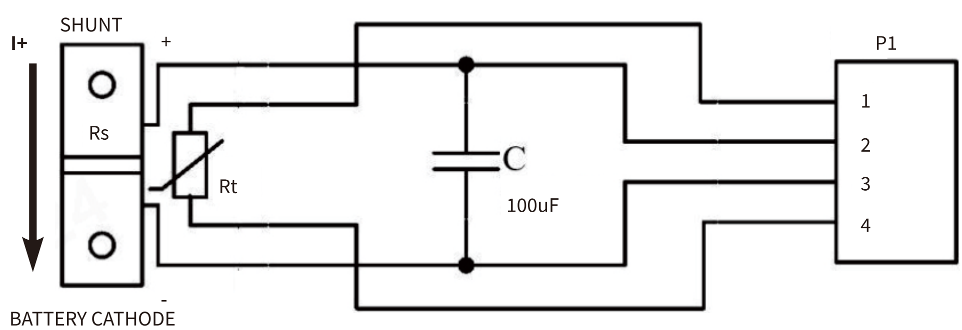


Figure 8-1. PCB Structural Diagram

[1] The direction of current is related to the installation position of the PCBS product in the BDU, and is not related to the PCBS itself.
[2] The positive and negative electrode of the PIN is determined by the direction of the current in the diagram.
[3] Generally, battery discharge is considered positive and charging is considered negative.

8.6 Copper Bar Connection

- Recommended Bolts: M6
- Recommended Torque: 8-10Nm
- Recommended Width * Thickness of Copper Bar: 24mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar: 20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

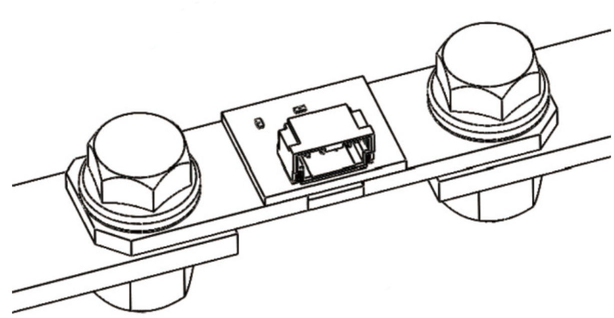


Figure 8-2. Diagram

9.Storage & Packaging

9.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases.
  The packaging case shall be protected from direct sunlight.
- Anti-static bracelet or gloves shall be worn during installation, storage and handling.

9.2 Packaging

9.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container	Carton	
Container Size	509*342*240	mm

[1] SNP, Standard Number of Package

9.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity	Recycle
1	50-Grid EPE Tray	496*328*61	3	No
2	EPE Tray Cover	495*325*5	4	No
3	Anti-Static PE Bag	900*510	1	No

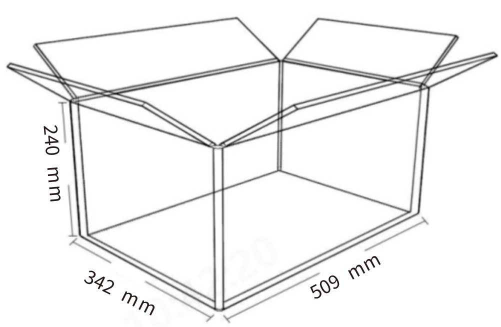


Figure 9-1. Carton Diagram

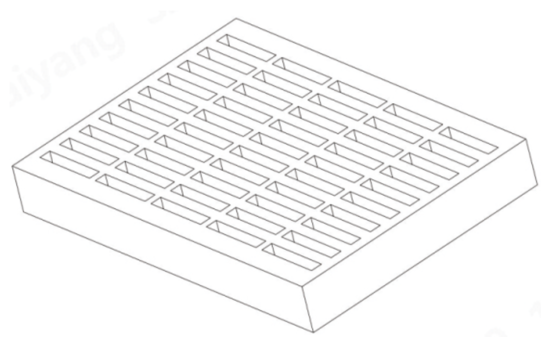


Figure 9-2.Structure Diagram of EPE

PCBS8518A050P1SC00, Automotive Operation Temperature -40 ℃~+125 ℃ Shunt Based Current Sensing Module

1、Characteristics

- Continuous Operating Range: -350A~+350A
- Connector: Horizontal 4 PIN
- High Accuracy Current Measurement
- Real-Time Temperature Measurement
- Applicable to High Pulse Current
- Low TCR, Low Inductance, Low Thermal EMF
- Excellent Long-Term Stability
- Operating Temperature Range:-40℃~125℃

2、Applications

- BMS Current Measurement
- BDU/PDU Current Measurement

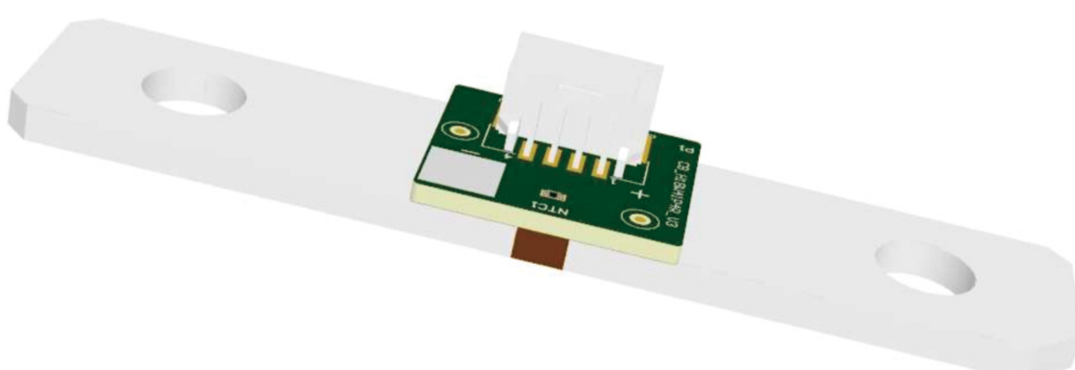
3、Introduction

PCBS8518A050P1SC00 is an automotive current sensing module used to assist in measuring bidirectional DC current. It has high accuracy, low TCR, low inductance, low thermal EMF, and excellent long-term stability and anti-interference ability.

This module is designed based on a low-TCR shunt, which is welded with PCBA and can be installed on the circuit through bolts. It is used to collect bus current and shunt temperature, and send the measured signal to the signal processing side of the user defined module. It can be customized according to the specific technical requirements.

Module Information

Shunt Size	Hole Diameter	Connector
85mm×18mm	8.3mm	5023520400



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4、 Revision

Date	Note	Revised Content
2023.02	/	A0
2023.04.10	Revise the copper bar connection diagram.	A1
2023.09.20	Revise the derating curve	A2
2023.12.05	Revise the layout of datasheet	A3

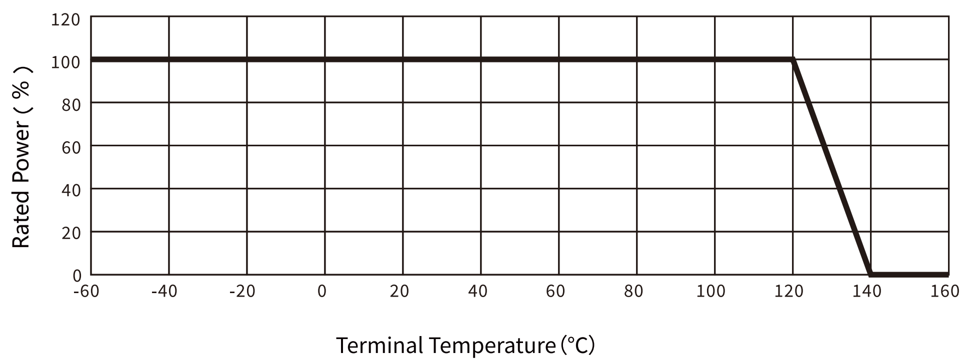
5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Current Measurement Range	±1000A			5	s
Operating Temperature		-40		125	°C
Storage Temperature		-40		125	°C
Humidity				95	%RH

[1] When operating temperature＞120°C, derating power is needed. The specific derating range refers to the figure below.



5.2 General Parameters

Test Conditions: Ambient Temperature 25°C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Shunt					
Resistance			50		μΩ
Tolerance			±5		%
TCR	-40°C~+125°C		±100		ppm/°C
Continuous Operating Current			±350		A
Thermal EMF				3	μV/°C
Inductance				5	nH
Operating Temperature Range			-55~+175		°C
NTC					
Resistance			10		kΩ
Tolerance			±1		%
TCR	25/85°C		3435		K
Operating Temperature Range			-50~+150		°C

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Flatness of installation
Electrical loads		
5	VW 80000-2021 5.4.20	E-18 Insulation resistance
6	VW 80000-2021 5.4.22	E-20 Dielectric strength
7	GB/T 6148-2005	Drift of temperature
Climatic loads		
8	GB/T 2423.2-2008	High temperature aging
9	GBT 2423.1-2008	Low-temperature operation
10	VW 80000：2021 5.6.5	K-05 Thermal shock (component)
11	GB/T2423.50-2012 MIL-STD-202 Method 103	Damp heat, constant
12	VW 80000：2021 5.8.3	L-03 Service life test – Temperature cycle durability testing
13	GB/T 10125-2021	Salt spray
Mechanical loads		
14	VW 80000-2021 5.5.1	M-01 Free fall
15	VW 80000-2021 5.5.4	M-04 Vibration test
16	VW 80000-2021 5.5.5	M-05 Mechanical shock
Regulation Validation		
17	RoHS	Pb, Cd, Hg, Cr(V), PBBs, PBDEs
18	REACH	CMR,PBT,vPvB...

7、Current Data

7.1 Temperature Compensation

PCBS8518A050P1SC00 applies temperature compensation to weaken the impact of ambient temperature changes on the shunt resistance. A fitting algorithm is used to compute a curve of the shunt resistance change with temperature , as shown in Figure 7-1.

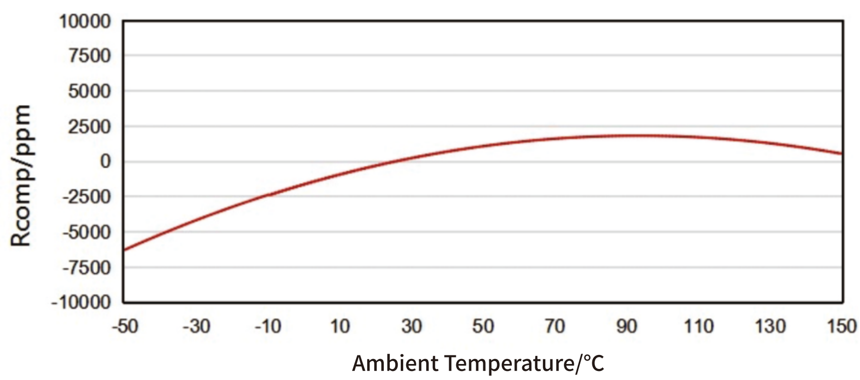


Figure 7-1. R_{COMP} Temperature Characteristic Curve

As shown in Figure 7-1, the compensation factor R_{COMP} temperature characteristic curve is:

$$R_{COMP}=A*T^2+B*T+C$$

Demonstration:

R_{COMP} : The drift of the shunt resistance relative to the change from initial temperature to present temperature, in ppm.
T : Present Temperature of Shunt
A : Coefficient of Quadratic Term T^2
B : Coefficient of Primary Term T
C : Constant Term

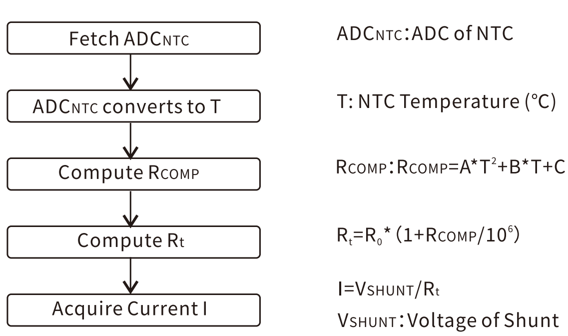
Shunt resistance R_t at present temperature t, through temperature compensation:

$$R_t=R_0*(1+R_{COMP}/10^6)$$ [1]

[1] R_0 is the initial resistance of shunt at lab environment, usually at +25℃±2℃

[2] Figure 7-1 is only for illustration of this product. It is not the temperature characteristic curve for all products.

7.2 Current Data Acquisition



8、Mechanical Structure

8.1 Dimensions

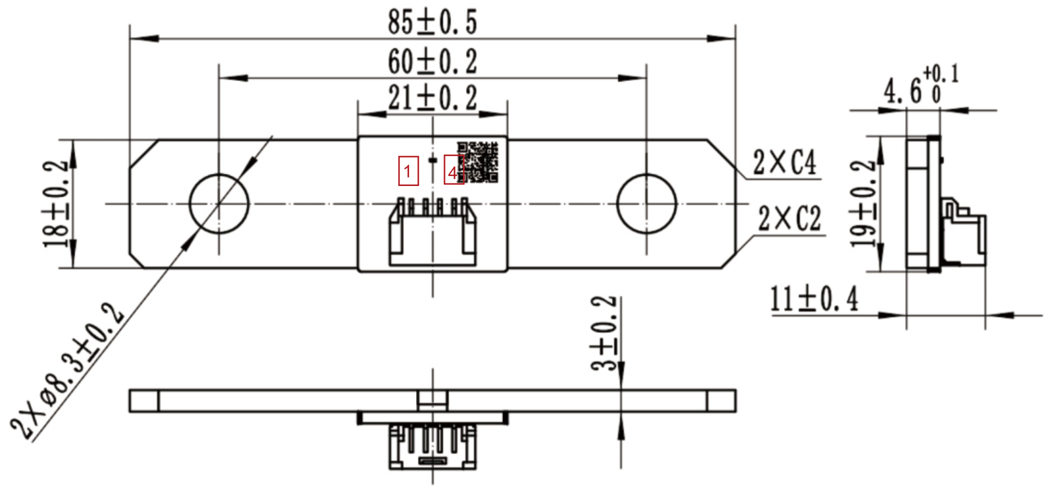


Figure 8. 1 Structure Diagram

8.2 Laser QR Code

8.2.1 Code Size

No.	Materials	Size L*W(mm)
1	PCB Cover Size	6*6
2	Data Matrix Size	5*5

8.2.2 Data Matrix

Content	Year	Month	Day	Module ID	R_0[1]	Coefficient A[2]	Coefficient B[3]	Constant Term C[4]
Format	YYYY	MM	DD	XXXXX	RXXX.XXXX	±X.XXXXXXXX	±XXX.XXXXX	±XXXX.XXX
Example	2023	02	13	00001	R051.4912	-0.45837105	+130.48848	-2975.730
	2023021300001R051.4912-0.45837105+130.48848-2975.730[5]							

[1]R_0, the initial resistance of shunt at lab environment, usually at 25℃±2℃, rounded to 4 decimal places, in μΩ.

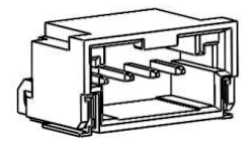
[2]Coefficient A of Quadratic Term T^2, rounded to 8 decimal places.

[3]Coefficient B of Primary Term T, rounded to 5 decimal places.

[4]Constant Term C, rounded to 3 decimal places.

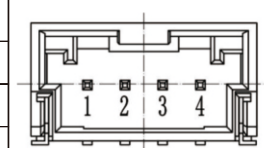
[5]The total number of characters is 52.

8.3 Connector

Manufacturer	Pin Count	Part #	Structural Diagram
Molex	4	5023520400	

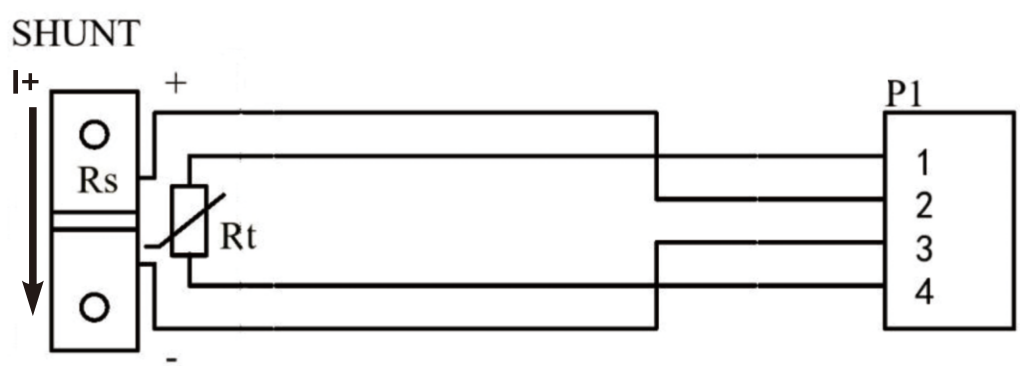
[1] 推荐对插母头型号:5023510400 。

8.4 Connector Definition

No.	Pin No.	Code	Description	Structural Diagram
1	Pin 1	T1	Temperature Sensor Pin 1	
2	Pin 2	S+	Current Signal Positive	
3	Pin 3	S-	Current Signal Negative	
4	Pin 4	T2	Temperature Sensor Pin 2	

[1] Refer to the recommended current direction in the PCB Structural Diagram.
[2] Recommend Pin1 and Pin4 as twisted pair. Pin2 and Pin3 as twisted pair.

8.5 PCB Structural Diagram



BATTERY CATHODE

Figure 8-1. PCB Structural Diagram

[1] The direction of current is related to the installation position of the PCBS product in the BDU, and is not related to the PCBS itself.
[2] The positive and negative electrode of the PIN is determined by the direction of the current in the diagram.
[3] Generally, battery discharge is considered positive and charging is considered negative.

8.6 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque: 15-20Nm
- Recommended Width * Thickness of Copper Bar: 24mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar: 20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

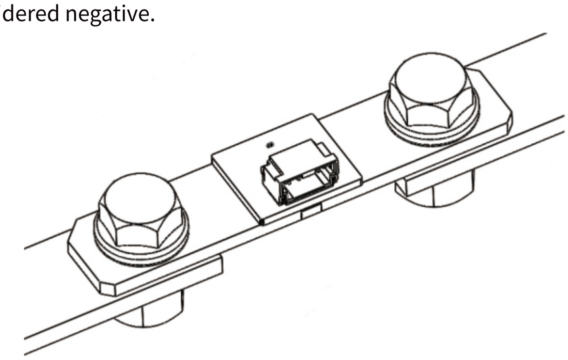


Figure 8-2. Shunt Connection Diagram

9.Storage & Packaging

9.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases.
  The packaging case shall be protected from direct sunlight.
- Anti-static bracelet or gloves shall be worn during installation, storage and handling.

9.2 Packaging

9.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container	Carton	
Container Size	509*342*240	mm

[1] SNP, Standard Number of Package

9.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity	Recycle
1	50-Grid EPE Tray	496*328*61	3	No
2	EPE Tray Cover	495*325*5	4	No
3	Anti-Static PE Bag	900*510	1	No

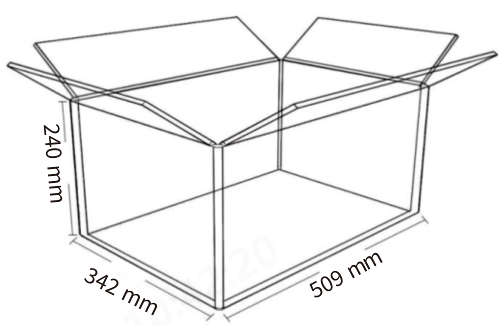


Figure 9-1. Carton Diagram

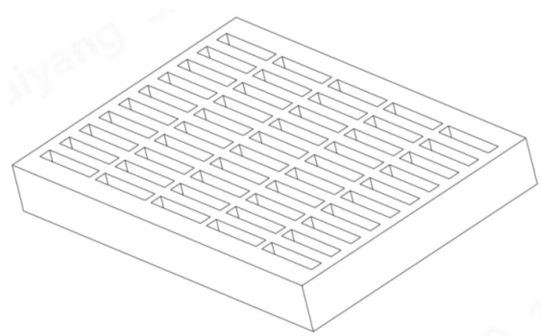


Figure 9-2.Structure Diagram of EPE

PCBS8436P025T2AC00, Automotive Operation Temperature -40 ℃~+125 ℃ Shunt Based Current Sensing Module

1、Characteristics

- Continuous Operating Range: -1000A~+1000A
- Connector: Horizontal 9 PIN
- High Accuracy Current Measurement
- Real-Time Temperature Measurement
- Applicable to High Pulse Current
- Low TCR, Low Inductance, Low Thermal EMF
- Excellent Long-Term Stability
- Operating Temperature Range:-40℃~125℃

2、Applications

- BMS Current Measurement
- BDU/PDU Current Measurement

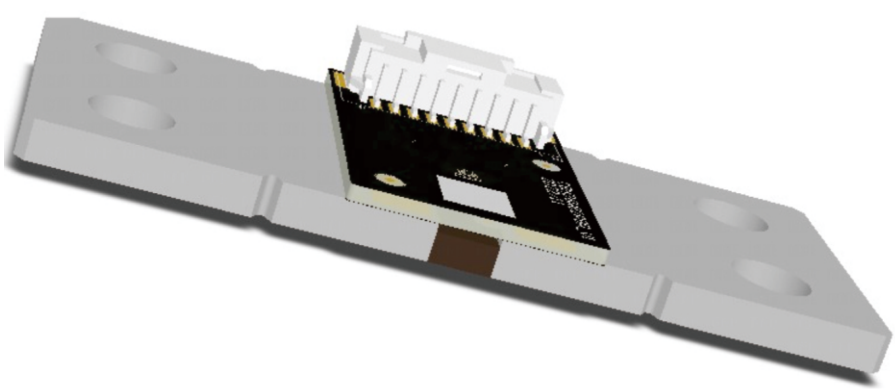
3、Introduction

PCBS8436P025T2AC00 is an automotive current sensing module used to assist in measuring bidirectional DC current. It has high accuracy, low TCR, low inductance, low thermal EMF, and excellent long-term stability and anti-interference ability.

This module is designed based on a low-TCR shunt, which is welded with PCBA and can be installed on the circuit through bolts. It is used to collect bus current and shunt temperature, and send the measured signal to the signal processing side of the user defined module. It can be customized according to the specific technical requirements.

Module Information

Shunt Size	Hole Diameter	Connector
84mm×36mm	8.3mm	5023520900



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4、 Revision

Date	Note	Revised Content
2022.10.28	/	A0
2023.05.09	The upper limit of operating temperature changed from +105℃ to +125℃. Derating curve is added;	A1
2023.11.01	Complement connector definitions	A2
2023.11.13	Revise parameters	A3

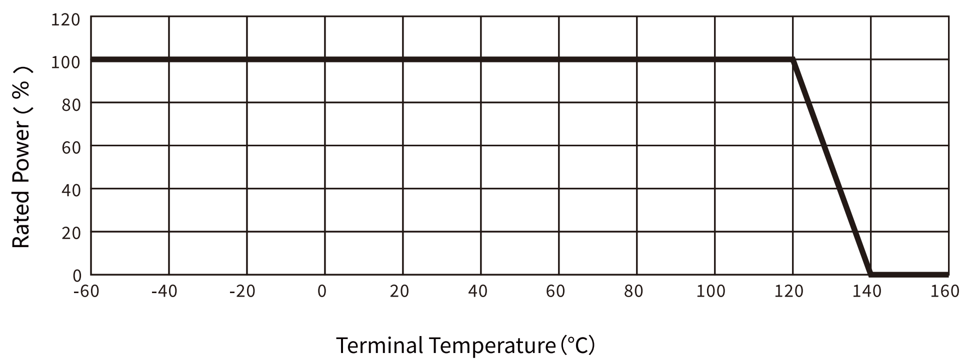
5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Current Measurement Range	±3000A			5	s
Operating Temperature		-40		125	°C
Storage Temperature		-40		125	°C
Humidity				95	%RH

[1] When operating temperature＞120°C, derating power is needed. The specific derating range refers to the figure below.



5.2 General Parameters

Test Conditions: Ambient Temperature 25°C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Shunt (Component)					
Resistance			25		μΩ
Tolerance			±5		%
TCR	-40°C~+125°C		±100		ppm/°C
Continuous Operating Current			±1000		A
Thermal EMF				3	μV/°C
Inductance				5	nH
Operating Temperature Range			-55~+175		°C
NTC (Component)					
Resistance			10		kΩ
Tolerance			±1		%
TCR	25/85°C		3435		K
Operating Temperature Range			-50~+150		°C
PCBS (Assembly)					
Initial Resistance Tolerance	Scan the QR code on the product to obtain the initial resistance R_0[1]		±0.2		%

[1] R_0 is the initial resistance of shunt at lab environment, usually at +25°C±2°C

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Flatness of installation
Electrical loads		
5	VW 80000-2021 5.4.20	E-18 Insulation resistance
6	VW 80000-2021 5.4.22	E-20 Dielectric strength
7	GB/T 6148-2005	Drift of temperature
Climatic loads		
8	GB/T 2423.2-2008	High temperature aging
9	GBT 2423.1-2008	Low-temperature operation
10	VW 80000：2021 5.6.5	K-05 Thermal shock (component)
11	GB/T2423.50-2012 MIL-STD-202 Method 103	Damp heat, constant
12	VW 80000：2021 5.8.3	L-03 Service life test – Temperature cycle durability testing
13	GB/T 10125-2021	Salt spray
Mechanical loads		
14	VW 80000-2021 5.5.1	M-01 Free fall
15	VW 80000-2021 5.5.4	M-04 Vibration test
16	VW 80000-2021 5.5.5	M-05 Mechanical shock
Regulation Validation		
17	RoHS	Pb, Cd, Hg, Cr(V), PBBs, PBDEs
18	REACH	CMR,PBT,vPvB...

7、Current Data

7.1 Temperature Compensation

PCBS8436P025T2AC00 applies temperature compensation to weaken the impact of ambient temperature changes on the shunt resistance. A fitting algorithm is used to compute a curve of the shunt resistance change with temperature , as shown in Figure 7-1.

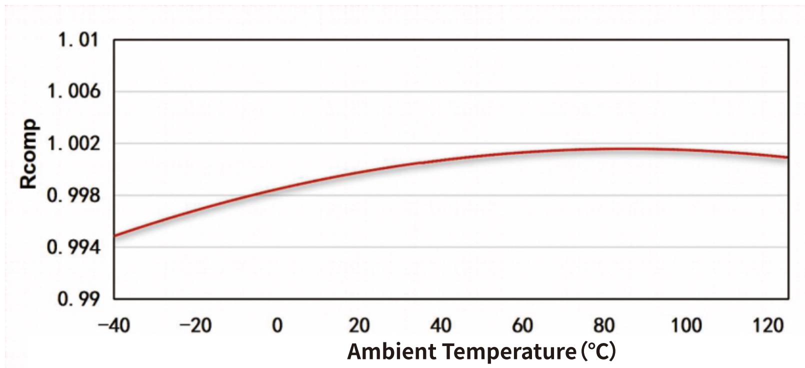


Figure 7-1. R_{COMP} Temperature Characteristic Curve

As shown in Figure 7-1, the compensation factor R_{COMP} temperature characteristic curve is:

$$R_{COMP}=A*T^2+B*T+C$$

Demonstration:

R_{COMP} : The drift of the shunt resistance relative to the change from initial temperature to present temperature, in ppm.
T : Present Temperature of Shunt
A : Coefficient of Quadratic Term T^2
B : Coefficient of Primary Term T
C : Constant Term

Shunt resistance R_t at present temperature t, through temperature compensation:

$$R_t=R_0*R_{COMP}$$ [1]

[1] R_0 is the initial resistance of shunt at lab environment, usually at +25℃±2℃
[2] Figure 7-1 is only for illustration of this product. It is not the temperature characteristic curve for all products.

7.2 Current Data Acquisition

Fetch ADC_{NTC}	ADC_{NTC}:ADC of NTC
↓	
ADC_{NTC} converts to T	T: NTC Temperature (℃)
↓	
Compute R_{COMP}	R_{COMP}:$R_{COMP}=A*T^2+B*T+C$
↓	
Compute R_t	$R_t=R_0*R_{COMP}$
↓	
Acquire Current I	$I=V_{SHUNT}/R_t$ V_{SHUNT}:Voltage of Shunt

8、Mechanical Structure

8.1 Dimensions

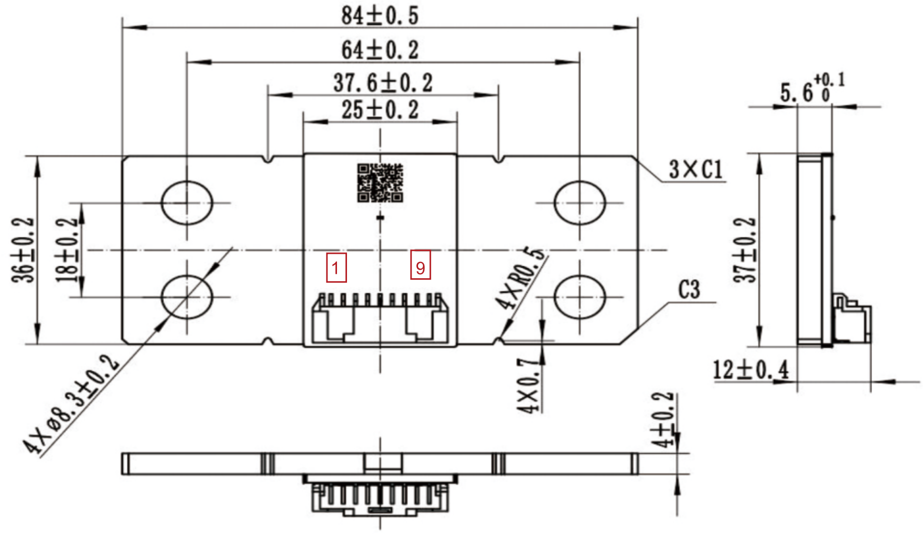


Figure 8. 1 Structure Diagram

8.2 Laser QR Code

8.2.1 Code Size

No.	Materials	Size L*W(mm)
1	PCB Cover Size	7*7
2	Data Matrix Size	5*5

8.2.2 Data Matrix

The content of the QR code includes date, serial number, and the actual resistance value

(Take 100 μΩ for example, measurement is to three decimal places: 100.000 μΩ, output as R100000n, if it is 99.000 μΩ is R99000n)

Content	Year	Month	Day	Module ID	R_0[1]	Coefficient A	Coefficient B	Constant Term C
Format	YYYY	MM	DD	XXXXX	Rxxxxxxn or Rxxxxxn[2]	±X.XXXXXXXXX	±X.XXXXXXXXX	±X.XXXXXXXXX
Example	2020	11	25	00001	R100123n R99123n	-0.000000576	+0.000086780	+0.998188760
	If R⩾100nΩ 2020112500001R100123n-0.000000576+0.000086780+0.998188760 If R<100nΩ 2020112500001R99123n-0.000000576+0.000086780+0.998188760[3]							

[1]R_0, the initial resistance of shunt at lab environment, usually at 25°C±2°C, in nΩ.

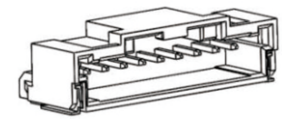
[2] If R⩾100μΩ, R_0 is expressed as Rxxxxxxn.

If R<100μΩ, R_0 is expressed as Rxxxxxn.

[3] If R⩾100μΩ, the total number of characters is 57

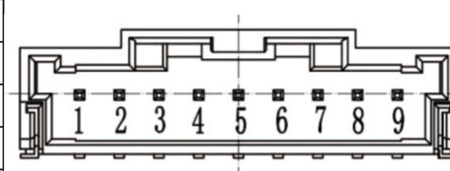
If R<100μΩ, the total number of characters is 56

8.3 Connector

Manufacturer	Pin Count	Part #	Structural Diagram
Molex	9	5023520900	

[1] Recommended female connector: 5023510400.

8.4 Connector Definition

No.	Pin No.	Code	Description	Structural Diagram
1	Pin 1	A+	Current Signal Group A Positive	
2	Pin 2	A-	Current Signal Group A Negative	
3	Pin 3	B+	Current Signal Group B Positive	
4	Pin 4	B-	Current Signal Group B Negative	
5	Pin 5	C+	Current Signal Group C Positive	
6	Pin 6	C-	Current Signal Group C Negative	
7	Pin 7	GND	Shunt Common Mode End	
8	Pin 8	T1	Temperature Sensor Pin 1	
9	Pin 9	T2	Temperature Sensor Pin 2	

[1] Refer to the recommended current direction in the PCB Structural Diagram.
[2] The recommended current sampling channel is Group C as the main channel and Group B & A as the auxiliary channel.
[3] Recommend Pin1 and Pin2 as twisted pair. Pin3 and Pin4 as twisted pair. Pin5 and Pin6 as twisted pair. Pin8 and Pin9 as twisted pair.

8.5 PCB Structural Diagram

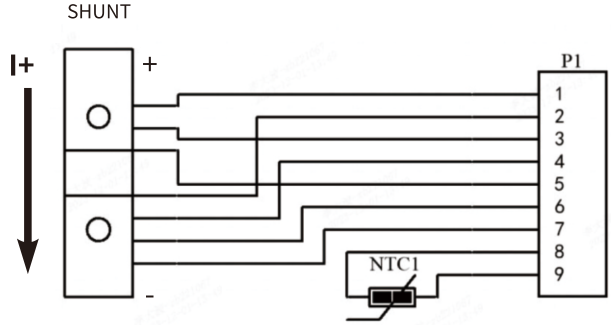


Figure 8-1. PCB Structural Diagram

[1] The direction of current is related to the installation position of the PCBS product in the BDU, and is not related to the PCBS itself.
[2] The positive and negative electrode of the PIN is determined by the direction of the current in the diagram.
[3] Generally, battery discharge is considered positive and charging is considered negative.

8.6 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque: 15-20Nm
- Recommended Width * Thickness of Copper Bar: 40mm*4mm
- Recommended Length of Overlap between Shunt and Copper Bar: 20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

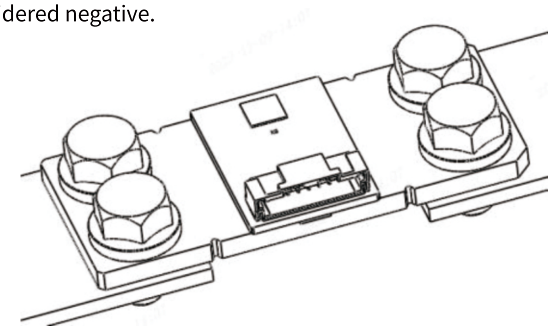


Figure 8-2. 8436 Shunt Connection Diagram

9.Storage & Packaging

9.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases.
  The packaging case shall be protected from direct sunlight.
- Anti-static bracelet or gloves shall be worn during installation, storage and handling.

9.2 Packaging

9.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container	Carton	
Container Size	509*342*240	mm

[1] SNP, Standard Number of Package

9.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity	Recycle
1	50-Grid EPE Tray	496*328*61	3	No
2	EPE Tray Cover	495*325*5	4	No
3	Anti-Static PE Bag	900*510	1	No

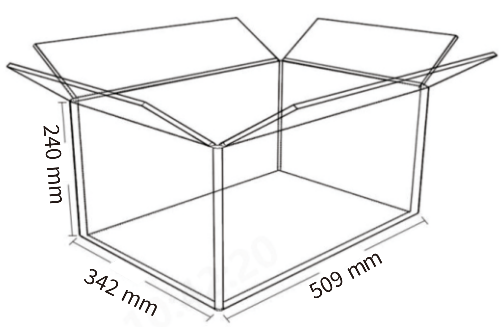


Figure 9-1. Carton Diagram

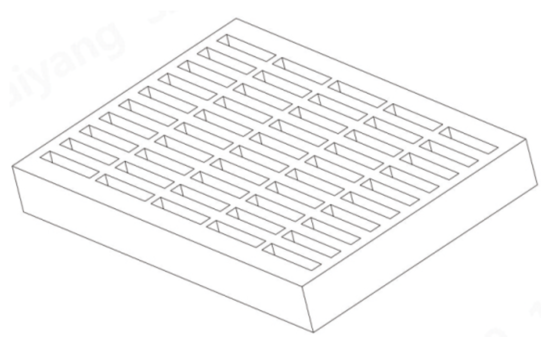


Figure 9-2.Structure Diagram of EPE

PCBS8536P050T1SN00, Automotive Operation Temperature -40 ℃~+125 ℃ Shunt Based Current Sensing Module

1、Characteristics

- Continuous Operating Range: -600A~+600A
- Connector: Horizontal 9 PIN
- High Accuracy Current Measurement
- Real-Time Temperature Measurement
- Applicable to High Pulse Current
- Low TCR, Low Inductance, Low Thermal EMF
- Excellent Long-Term Stability
- Operating Temperature Range:-40℃~125℃

2、Applications

- BMS Current Measurement
- BDU/PDU Current Measurement

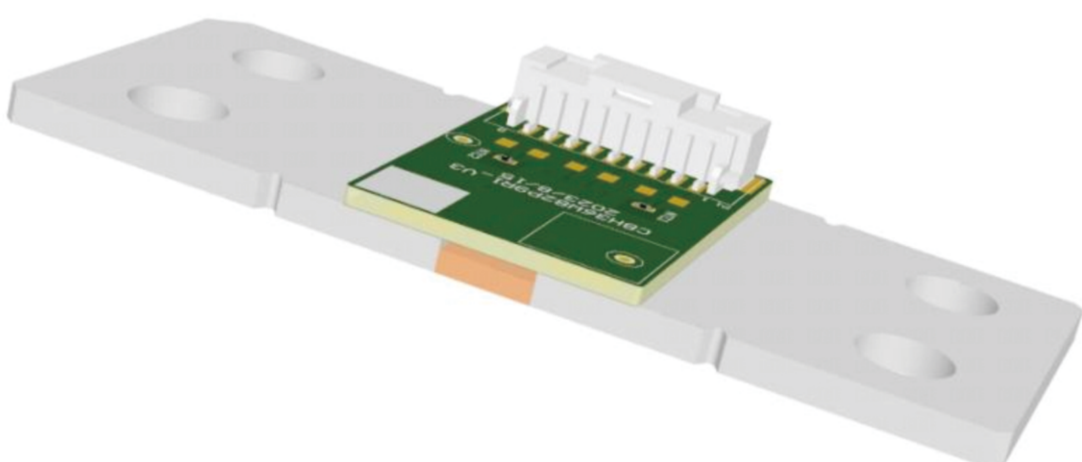
3、Introduction

PCBS8536P050T1SN00 is an automotive current sensing module used to assist in measuring bidirectional DC current. It has high accuracy, low TCR, low inductance, low thermal EMF, and excellent long-term stability and anti-interference ability.

This module is designed based on a low-TCR shunt, which is welded with PCBA and can be installed on the circuit through bolts. It is used to collect bus current and shunt temperature, and send the measured signal to the signal processing side of the user defined module. It can be customized according to the specific technical requirements.

Module Information

Shunt Size	Hole Diameter	Connector
85mm×36mm	8.3mm	5023520900



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4、Revision

Date	Note	Revised Content
2023.02	/	A0
2023.04.10	The upper limit of operating temperature changed from +105℃ to +125℃. Derating curve is added; Flat washer is removed in Copper Bar Connection Diagram.	A1
2023.08.24	Revise the information of data matrix	A2
2023.11.02	Revise the derating curve	A3
2023.12.01	Revise the layout of datasheet	A4

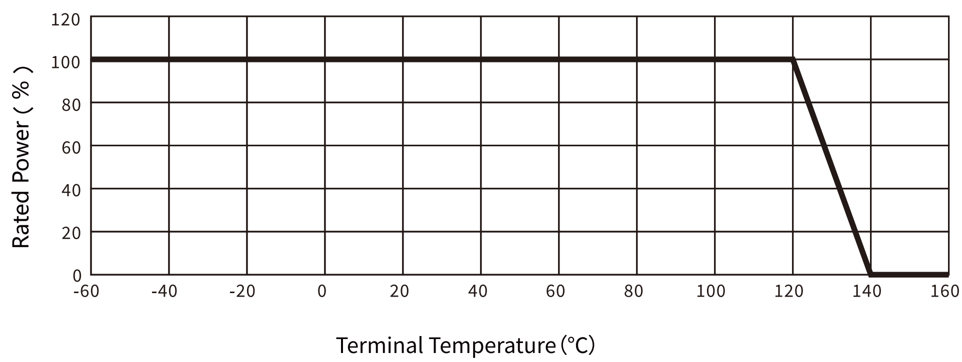
5、Specifications

5.1 Limit Parameters

Note: Product will affect its reliability and cause unexpected permanent damage if operating under limit parameters for long time.

Parameter	Condition	Min.	Typical	Max.	Unit
Current Measurement Range	±3000A			10	s
Operating Temperature		-40		125	°C
Storage Temperature		-40		125	°C
Humidity				95	%RH

[1] When operating temperature＞120°C, derating power is needed. The specific derating range refers to the figure below.



5.2 General Parameters

Test Conditions: Ambient Temperature 25°C (Unless Otherwise Noted)

Parameter	Condition	Min.	Typical	Max.	Unit
Shunt					
Resistance			50		μΩ
Tolerance			±5		%
TCR	-40°C~+125°C		±100		ppm/°C
Continuous Operating Current			±600		A
Thermal EMF				3	μV/°C
Inductance				5	nH
Operating Temperature Range			-55~+175		°C
NTC					
Resistance			10		kΩ
Tolerance			±1		%
TCR	25/85°C		3435		K
Operating Temperature Range			-50~+150		°C

6、Test Standards

Test No.	Test Standards	Test Items
General inspection		
1	/	Appearance
2	/	Dimension
3	/	Weight
4	/	Flatness of installation
Electrical loads		
5	VW 80000-2021 5.4.20	E-18 Insulation resistance
6	VW 80000-2021 5.4.22	E-20 Dielectric strength
7	GB/T 6148-2005	Drift of temperature
Climatic loads		
8	GB/T 2423.2-2008	High temperature aging
9	GBT 2423.1-2008	Low-temperature operation
10	VW 80000：2021 5.6.5	K-05 Thermal shock (component)
11	GB/T2423.50-2012 MIL-STD-202 Method 103	Damp heat, constant
12	VW 80000：2021 5.8.3	L-03 Service life test – Temperature cycle durability testing
13	GB/T 10125-2021	Salt spray
Mechanical loads		
14	VW 80000-2021 5.5.1	M-01 Free fall
15	VW 80000-2021 5.5.4	M-04 Vibration test
16	VW 80000-2021 5.5.5	M-05 Mechanical shock
Regulation Validation		
17	RoHS	Pb, Cd, Hg, Cr(V), PBBs, PBDEs
18	REACH	CMR,PBT,vPvB...

7、 Current Data

7.1 Temperature Compensation

PCBS8536P050T1SN00 applies temperature compensation to weaken the impact of ambient temperature changes on the shunt resistance. A fitting algorithm is used to compute a curve of the shunt resistance change with temperature , as shown in Figure 7-1.

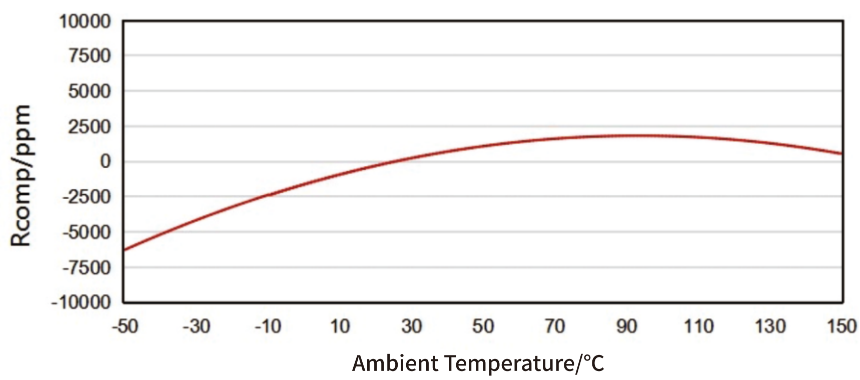


Figure 7-1. R_{COMP} Temperature Characteristic Curve

As shown in Figure 7-1, the compensation factor R_{COMP} temperature characteristic curve is:

$$R_{COMP}=A*T^2+B*T+C$$

Demonstration:

R_{COMP} : The drift of the shunt resistance relative to the change from initial temperature to present temperature, in ppm.
T : Present Temperature of Shunt
A : Coefficient of Quadratic Term T^2
B : Coefficient of Primary Term T
C : Constant Term

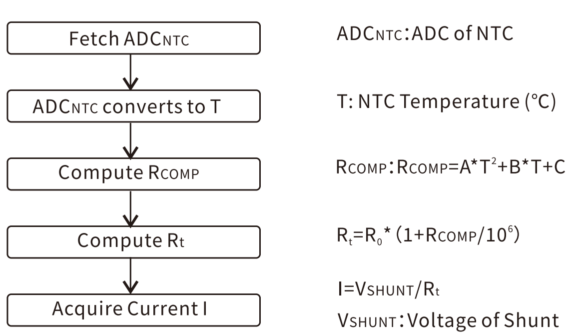
Shunt resistance R_t at present temperature t, through temperature compensation:

$$R_t=R_0*(1+R_{COMP}/10^6)$$ [1]

[1] R_0 is the initial resistance of shunt at lab environment, usually at +25℃±2℃

[2] Figure 7-1 is only for illustration of this product. It is not the temperature characteristic curve for all products.

7.2 Current Data Acquisition



8、Mechanical Structure

8.1 Dimensions

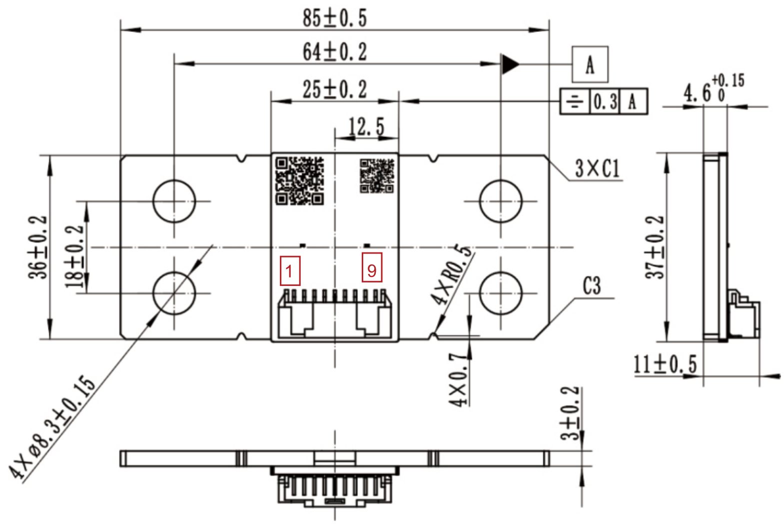


Figure 8. 1 Structure Diagram

8.2 Laser QR Code

8.2.1 Code Size

No.	Materials	Size L*W(mm)
1	PCB Cover Size	10*10
	Data Matrix Size	9*9
2	PCB Cover Size	7*7
	Data Matrix Size	6*6

8.2.2 Data Matrix

Code 1：

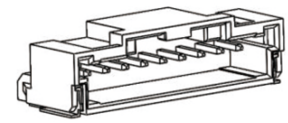
Content	Year	Month	Day	Module ID	R_0[1]	Coefficient A[2]	Coefficient B[3]	Constant Term C[4]
Format	YYYY	MM	DD	XXXXX	RXXX.XXXX	±X.XXXXXXXX	±XXX.XXXXX	±XXXX.XXX
Example	2023	02	13	00001	R051.4912	-0.45837105	+130.48848	-2975.730
	2023021300001R051.4912-0.45837105+130.48848-2975.730[5]							

[1]R_0, the initial resistance of shunt at lab environment, usually at 25°C±2°C, rounded to 4 decimal places, in μΩ.
[2]Coefficient A of Quadratic Term T^2, rounded to 8 decimal places.
[3]Coefficient B of Primary Term T, rounded to 5 decimal places.
[4]Constant Term C, rounded to 3 decimal places.
[5]The total number of characters is 52.

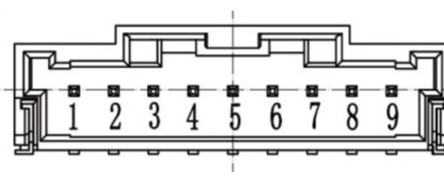
Code 2：

Content	Part Number PIN	Hardware Version	Date	Serial Number
Example	PCBS8536P050T1SN00	V2.0	B62	00001
	PCBS8536P050T1SN00V2.0B620001			

8.3 Connector

Manufacturer	Pin Count	Part #	Structural Diagram
Molex	9	5023520900	

8.4 Connector Definition

No.	Pin No.	Code	Description	Structural Diagram
1	Pin 1	TL1	Temperature Sensor Pin 1	
2	Pin 2	TL2	Temperature Sensor Pin 2	
3	Pin 3	SB+	Current Signal Group B Positive	
4	Pin 4	SA+	Current Signal Group A Positive	
5	Pin 5	SA-	Current Signal Group A Negative	
6	Pin 6	SB-	Current Signal Group B Negative	
7	Pin 7	GND	Shunt Common Mode End	
8	Pin 8	TR1	Temperature Sensor Pin 1	
9	Pin 9	TR2	Temperature Sensor Pin 2	

[1] Refer to the recommended current direction in the PCB Structural Diagram.
[2] The recommended current sampling channel is Group C as the main channel and Group B as the auxiliary channel.
[3] Recommend Pin1 and Pin2 as twisted pair. Pin3 and Pin6 as twisted pair. Pin4 and Pin5 as twisted pair. Pin8 and Pin9 as twisted pair.

8.5 PCB Structural Diagram

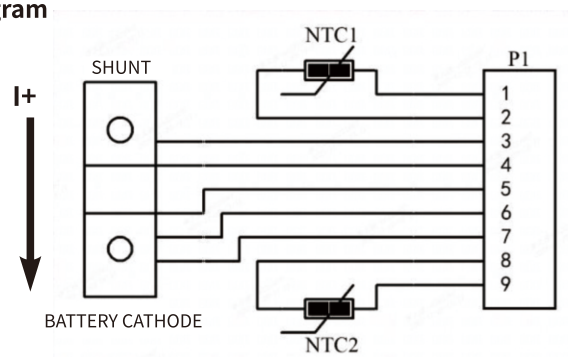


Figure 8-1. PCB Structural Diagram

[1] The direction of current is related to the installation position of the PCBS product in the BDU, and is not related to the PCBS itself.
[2] The positive and negative electrode of the PIN is determined by the direction of the current in the diagram.
[3] Generally, battery discharge is considered positive and charging is considered negative.

8.6 Copper Bar Connection

- Recommended Bolts: M8
- Recommended Torque: 15-20Nm
- Recommended Width * Thickness of Copper Bar: 40mm*3mm
- Recommended Length of Overlap between Shunt and Copper Bar: 20mm
- Do not use a flat washer between the copper bar and the shunt
- Keep the surface of shunt and copper bar clean and free of scratches

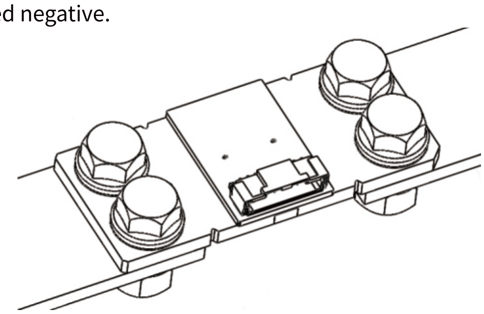


Figure 8-2. 8536 Shunt Connection Diagram

9.Storage & Packaging

9.1 Storage

- Recommended storage at room temperature.
- The storage environment shall be clean, tidy, dry and free of harmful gases.
  The packaging case shall be protected from direct sunlight.
- Anti-static bracelet or gloves shall be worn during installation, storage and handling.

9.2 Packaging

9.2.1 General Information

Packaging Element	Specifications	
SNP[1]	150	
Container	Carton	
Container Size	509*342*240	mm

[1] SNP, Standard Number of Package

9.2.2 Auxiliary Materials Information

No.	Materials	Size L*W*H(mm)	Quantity	Recycle
1	50-Grid EPE Tray	496*328*61	3	No
2	EPE Tray Cover	495*325*5	4	No
3	Anti-Static PE Bag	900*510	1	No

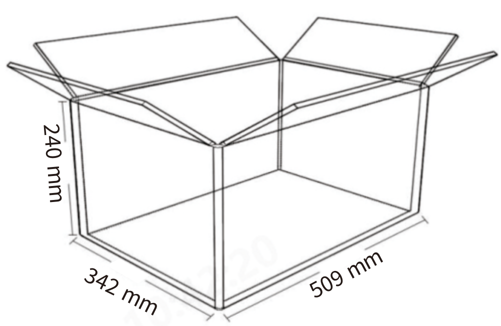


Figure 9-1. Carton Diagram

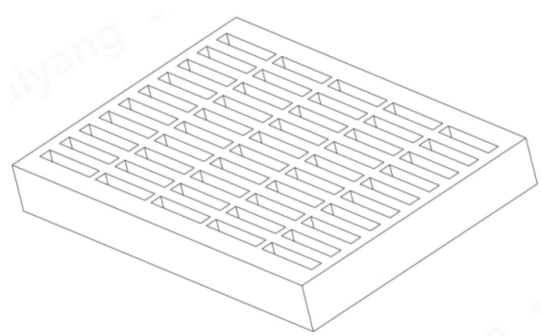


Figure 9-2.Structure Diagram of EPE

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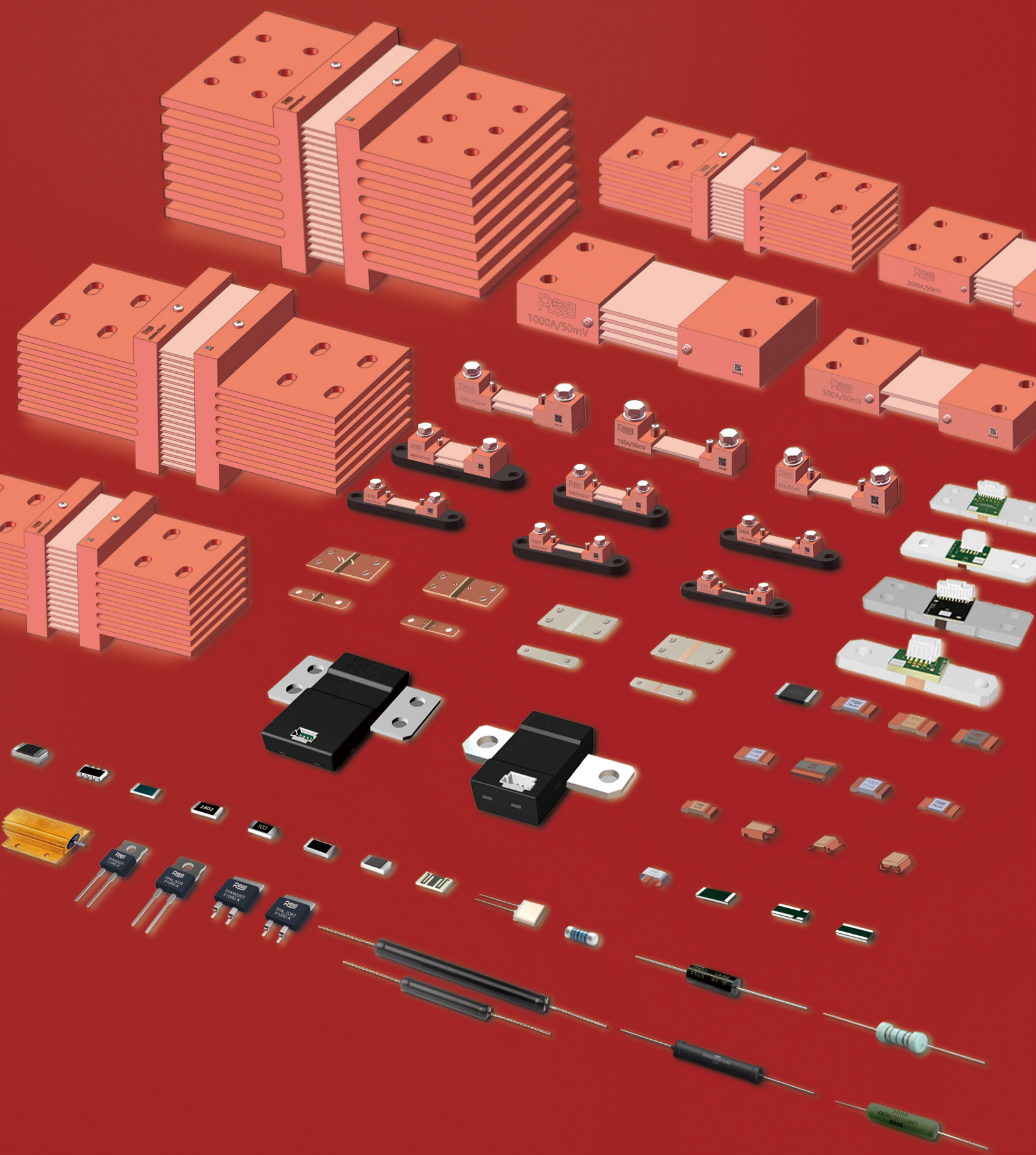
Customer name		
Stage of project		
Key information		
Application scenario		
Rated current		
Accuracy		
Terminal resistor		
Basic information		
Peak current & and duration		
Supply voltage		
Galvanic isolation		
Communication protocol		
Current direction		
Data frame		
Data format		
CAN speed		
Current ID		
Temperature ID		
Output Rate of Current Message		
Output Rate of Temperature Message		
Wiring harness		
Additional information		
High voltage		
Copper busbar	Width×thickness(mm)	



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