

## High-Precision Low-TCR Alloy Current Sensing Resistors

### ■ MSRPK series

AEC-Q200 Compliant

#### Features

- The MSRPK series is based on precision resistive alloy and welded with vacuum electron beam welding equipment to ensure its characteristics and reliability.
- Precision machining and uniform welding provide a minimum tolerance of  $\pm 0.5\%$  without trimming.
- The TCR achieves a minimum of  $\pm 50\text{ppm}/^\circ\text{C}$  over a wide temperature range of  $-55^\circ\text{C}$  to  $+170^\circ\text{C}$ .
- The "Trimming-free" technology avoids current loss and is free of hot spots.
- The thermoelectric power is extremely low and thermal fluctuations are minimized.

#### Applications

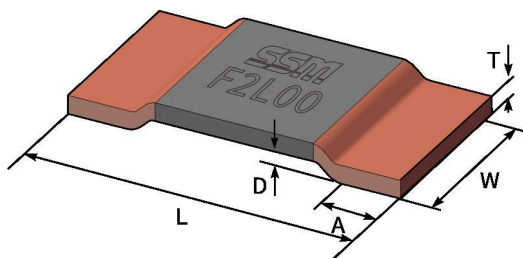
- Automotive Electronics
- Precision Power Supply
- Instrumentation
- Medical Equipment

### ◆ Electrical Specification

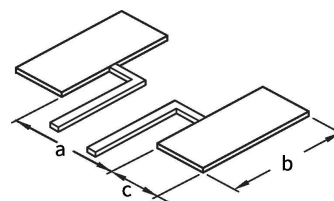
Series	Size inch. (mm)	Resistance Value	Power	Max. Operating Current	Operating Temperature	TCR (20°C Ref)	Tolerance	Thermal Resistance	PKG.
MSRPK	3920 (10052)	1 mΩ	8 W	89 A	$-55^\circ\text{C} \sim +170^\circ\text{C}$	$\pm 50\text{ppm}/^\circ\text{C}$	$\pm 0.5\%$ $\pm 1.0\%$ $\pm 5.0\%$	7.6 $^\circ\text{C}/\text{W}$	2,000 pcs.
		2 mΩ	6 W	54 A				15.4 $^\circ\text{C}/\text{W}$	
		3 mΩ	5 W	40 A				23.1 $^\circ\text{C}/\text{W}$	
		4 mΩ	4 W	30 A				28.9 $^\circ\text{C}/\text{W}$	
		5 mΩ	3 W	24 A				36.5 $^\circ\text{C}/\text{W}$	

### ◆ Dimensions

Resistor



Land Pattern



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

Series	Size inch. (mm)	Resistance Value	Unit:mm							
			L	W	A	T	D	a	b	c
MSRPK	3920 (10052)	1 mΩ	10.0 $\pm$ 0.3	5.2 $\pm$ 0.3	2.0 $\pm$ 0.3	1.3 $\pm$ 0.2	0.5 $\pm$ 0.2	5.6 $\pm$ 0.1	6.2 $\pm$ 0.2	2.7 $\pm$ 0.2
		2 mΩ	10.0 $\pm$ 0.3	5.2 $\pm$ 0.3	2.0 $\pm$ 0.3	0.6 $\pm$ 0.2	0.5 $\pm$ 0.2	5.6 $\pm$ 0.1	6.2 $\pm$ 0.2	2.7 $\pm$ 0.2
		3 mΩ	10.0 $\pm$ 0.3	5.2 $\pm$ 0.3	2.0 $\pm$ 0.3	0.4 $\pm$ 0.2	0.5 $\pm$ 0.2	5.6 $\pm$ 0.1	6.2 $\pm$ 0.2	2.7 $\pm$ 0.2
		4 mΩ	10.0 $\pm$ 0.3	5.2 $\pm$ 0.3	2.0 $\pm$ 0.3	0.33 $\pm$ 0.15	0.5 $\pm$ 0.2	5.6 $\pm$ 0.1	6.2 $\pm$ 0.2	2.7 $\pm$ 0.2
		5 mΩ	10.0 $\pm$ 0.3	5.2 $\pm$ 0.3	2.0 $\pm$ 0.3	0.25 $\pm$ 0.15	0.5 $\pm$ 0.2	5.6 $\pm$ 0.1	6.2 $\pm$ 0.2	2.7 $\pm$ 0.2

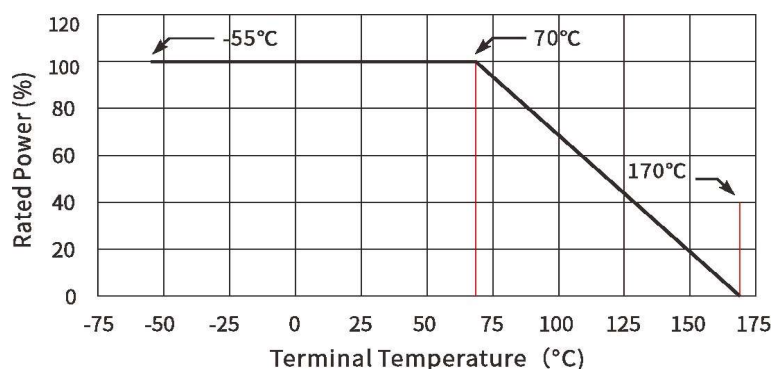
### ◆ Part Number information

M	S	R	P	K	3	9	2	0	Q	5	L	0	0	F	2	P	0
Series (5 digits)					Size (4 digits)				TCR (1 digits)		Resistance (4 digits)		Tolerance (1 digits)		Quantity (3 digits)		
MSRPK					3920				Q= $\pm 50\text{ppm}/^\circ\text{C}$		1L00=1mΩ 2L00=2mΩ 3L00=3mΩ 4L00=4mΩ 5L00=5mΩ		D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$		2P0 = 2,000 pcs.		

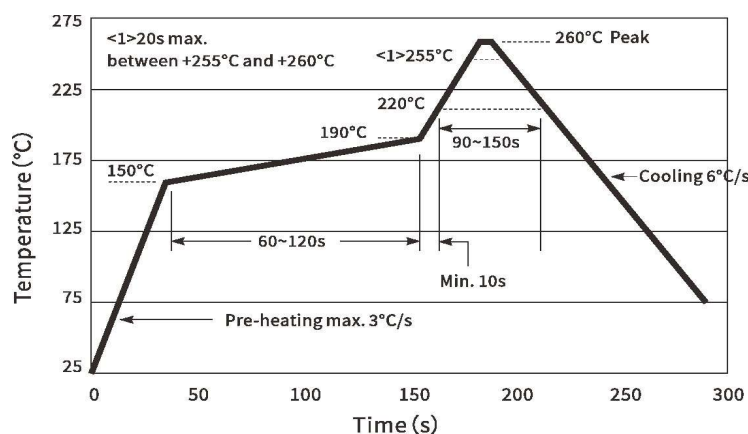
◆ Performance

Test	Test Method	Standards	Typical	Max.
High Temperature Storage	1000h@+170°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 1.0\%$
Thermal Shock	-55°C, 15min~ambient temperature <20s~+155°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
Bias Humidity	+85°C, 85%RH, powered no less than 10% rated power for 1000h	AEC-Q200 TEST 7 MIL-STD-202 Method 103	$\Delta R \leq \pm 0.2\%$	$\Delta R \leq \pm 0.5\%$
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	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 1.0\%$
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	$\Delta R \leq \pm 0.01\%$	$\Delta R \leq \pm 0.2\%$
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	$\Delta R \leq \pm 0.01\%$	$\Delta R \leq \pm 0.2\%$
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	$\Delta R \leq \pm 0.2\%$	$\Delta R \leq \pm 0.5\%$
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	Within the nominal TCR	
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
Short Time Overload	5x rated voltage, 5s	IEC 60115-1 4.13	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$

◆ Derating Curve

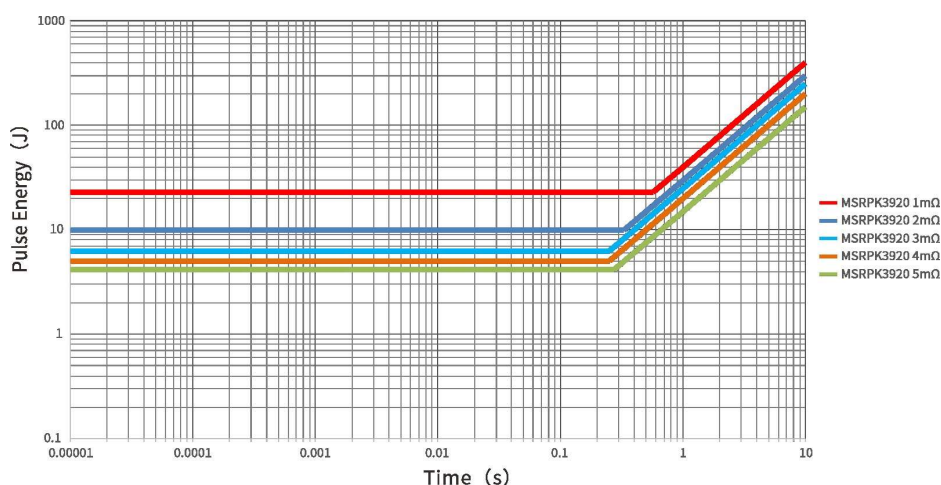


◆ Reflow Soldering Profile

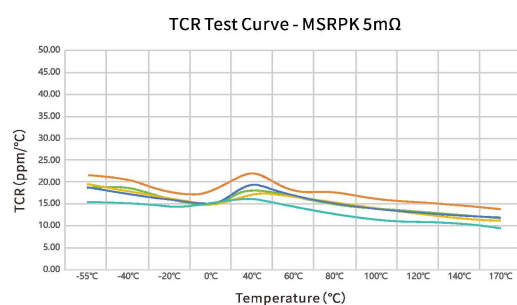
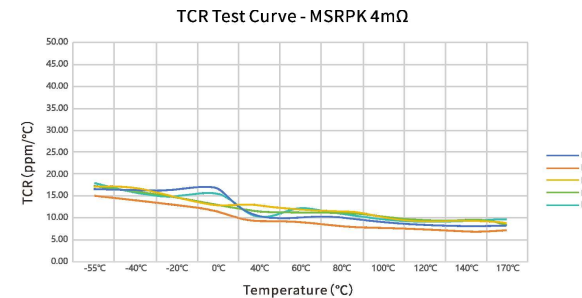
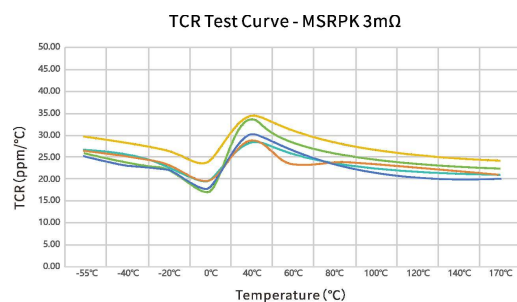
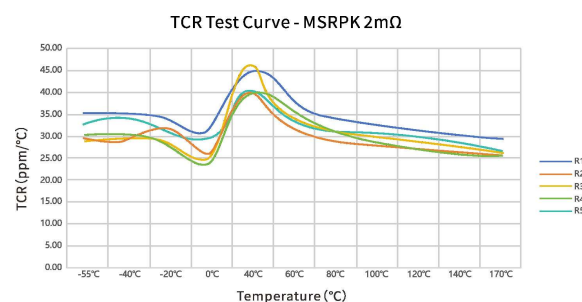
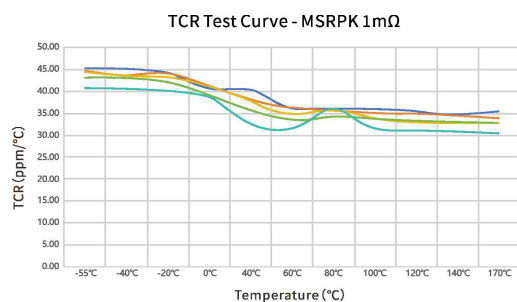


Resistor Surface Temperature :  
Pre-Heat: +150°C+190°C, 60~120sec.  
Reflow: Above +220°C, 90~150sec.  
Applicable Solder Composition: Sn-Ag-Cu

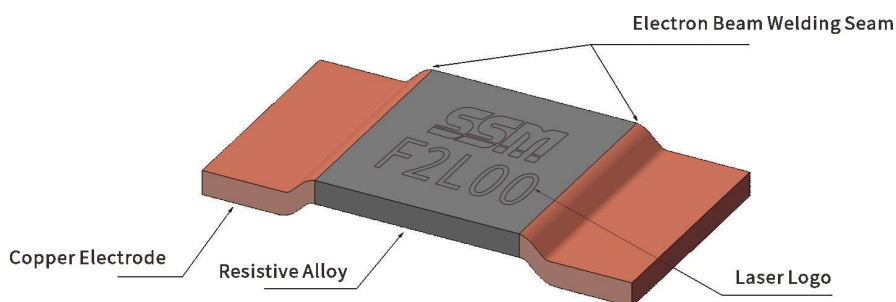
### ◆ Maximum Pulse Energy Curve



### ◆ Temperature Coefficient of Resistance Test Curve

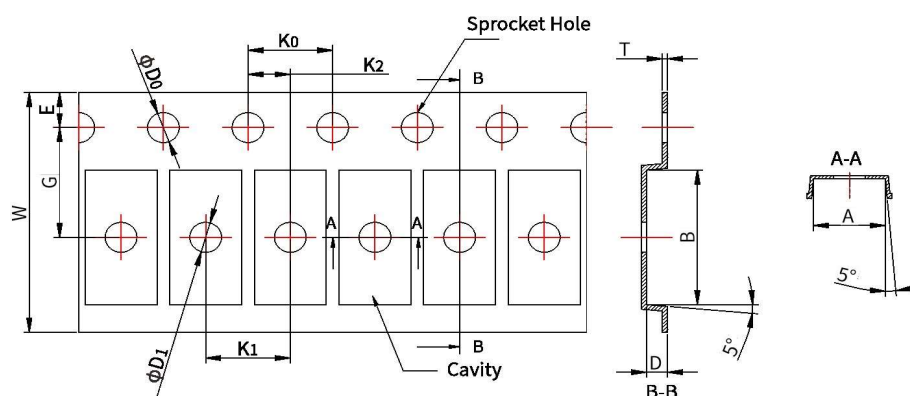


## ◆ Construction & Marking



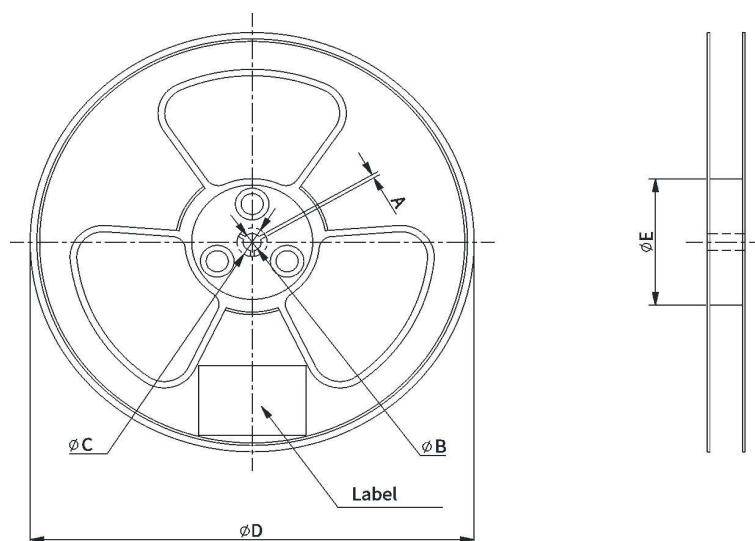
SSM : Brand  
F : Tolerance  
2L00 : Resistance

## ◆ Tape Specification



Series	Size inch. (mm)	Resistance Value	Unit:mm											
MSRPK	3920 (10052)	1 mΩ	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
		2 mΩ	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
		3 mΩ	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
		4 mΩ	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
		5 mΩ	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

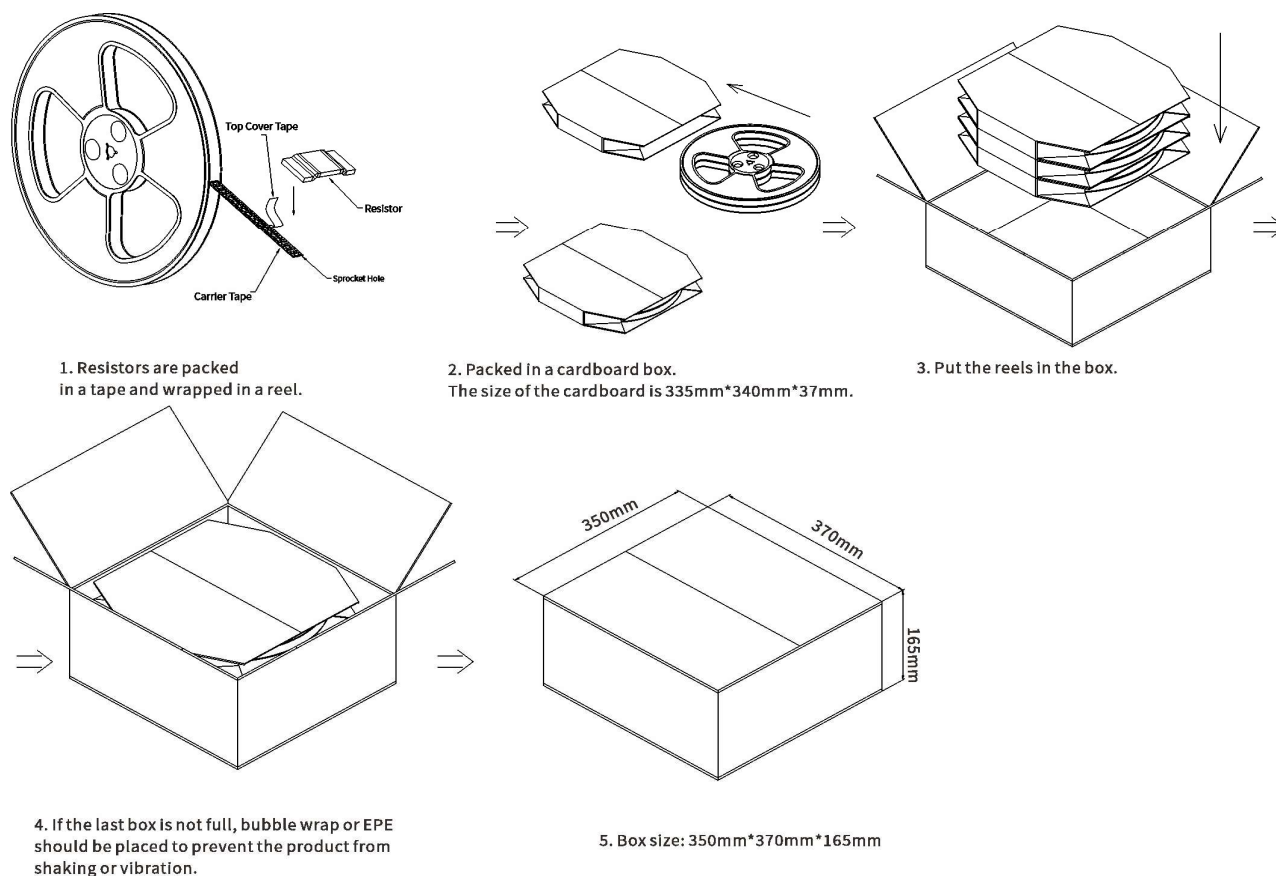
## ◆ Reel Specification



Series	Size inch. (mm)	Unit:mm				
		A	φB	φC	φD	φE
MSRPK	3920 (10052)	1.5 Min.	13.0+0.5/-0.2	20.2 Min.	330±2	100±2

## ◆ Packaging

Size 3920(10052): 2000 pcs/reel, 6 reel/box  
Size 5930(15078): 2000 pcs/reel, 3 reel/box



## ◆ 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<sub>2</sub>S, 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.