

High-Precision Low-TCR Alloy Current Sensing Resistors

■ MSRSF 3951

AEC-Q200 Compliant

Features

- The MSRSF3951 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 $\pm 25\text{ppm}/^\circ\text{C}$ over a wide temperature range of $+20^\circ\text{C}$ to $+120^\circ\text{C}$.
- 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

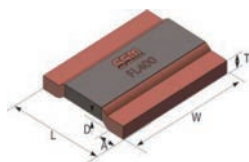
- Automotive Electronic
- Precision Power Supply
- Instrumentation
- Medical Equipment

◆ Electrical Specification

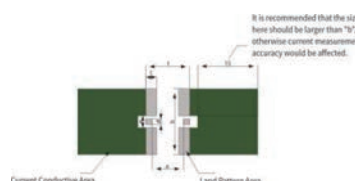
Series	Size inch. (mm)	Resistance Value	Power	Max. Operating Current	Operating Temperature	TCR (20°CRef)	Tolerance	Thermal Resistance	PKG.
MSRSF	3951 (10013)	0.3 mΩ	15W	220 A	$-55^\circ\text{C} \sim 170^\circ\text{C}$	$\pm 25\text{ ppm}/^\circ\text{C}$	$\pm 0.5\%$	2.3 $^\circ\text{C}/\text{W}$	1,200 pcs.
		0.4 mΩ	15W	190 A			$\pm 1\%$	3.2 $^\circ\text{C}/\text{W}$	
		0.8 mΩ	10W	110 A			$\pm 5\%$	6.1 $^\circ\text{C}/\text{W}$	

◆ 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	d	e	f
MSRSF	3951 (10013)	0.3 mΩ	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±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11.0±0.2
		0.4 mΩ	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±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11.0±0.2
		0.8 mΩ	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±0.2	2.7±0.2	1.2±0.2	2.8±0.2	11.0±0.2

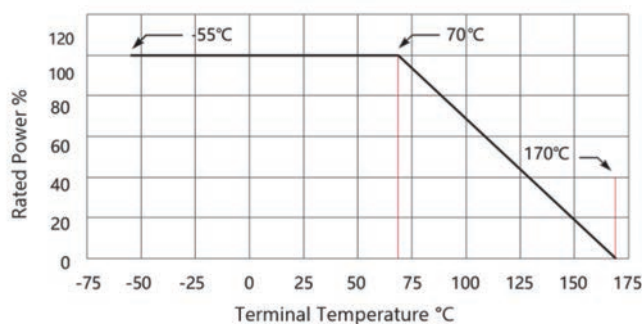
◆ Part Number information

M	S	R	S	F	3	9	5	1	P	-	0	L	3	0	-	F	1	P	2
Series (5 digits)					Size (4 digits)				TCR (1 digits)		Resistance (4 digits)				Tolerance (1 digits)		Quantity (3 digits)		
MSRSF					3951				P: $\pm 25\text{ ppm}/^\circ\text{C}$		0L30 = 0.3 mΩ 0L40 = 0.4 mΩ 0L80 = 0.8 mΩ				D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$		1P2 = 1,200 pcs.		

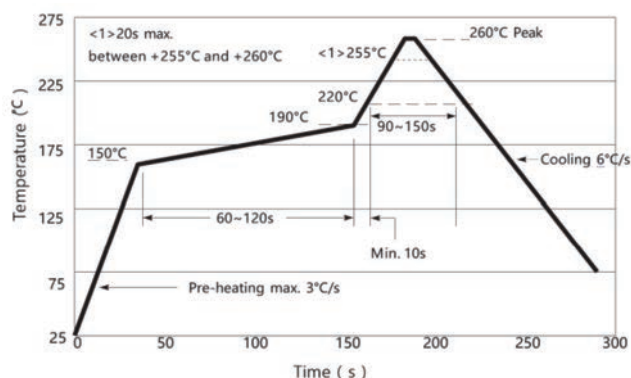
◆ Performance

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	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
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	$\Delta R \leq \pm 0.1\%$	$\Delta R \leq \pm 0.5\%$
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	+20°C and +120°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

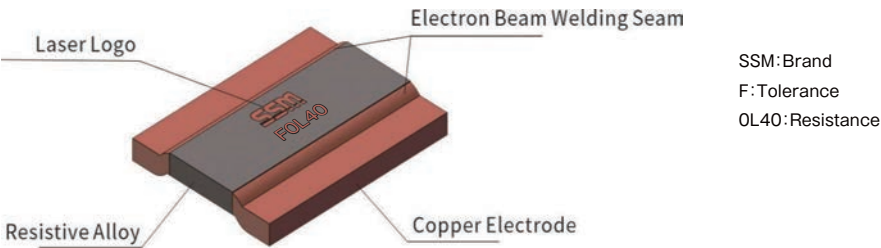


◆ Reflow Soldering Profile

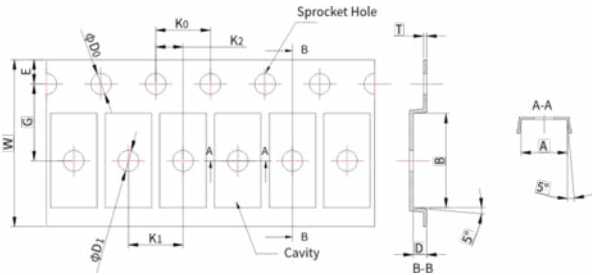


Resistor Surface Temperature:
 Pre-Heat: +150°C~190°C, 60~120sec.
 Reflow: Above +220°C, 90~150sec.
 Applicable Solder Composition: Sn-Ag-Cu

◆Construction & Marking

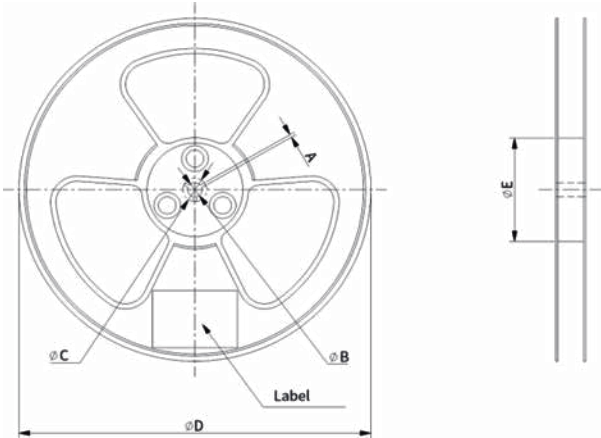


◆Tape Specification



Series	Size inch (mm)	Resistance Value	Unit:mm											
			A	B	φD0	φD1	K0	K1	K2	E	G	W	D	T
MSRSF	3951 (10013)	0.3 mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4.0±0.1	16.0±0.1	2.00±0.1	1.75±0.1	11.5±0.1	24.0±0.3	2.7±0.1	0.4±0.05
		0.4 mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4.0±0.1	16.0±0.1	2.00±0.1	1.75±0.1	11.5±0.1	24.0±0.3	2.7±0.1	0.4±0.05
		0.8 mΩ	10.5±0.2	13.4±0.2	1.5±0.1	1.5±0.1	4.0±0.1	16.0±0.1	2.00±0.1	1.75±0.1	11.5±0.1	24.0±0.3	2.7±0.1	0.4±0.05

◆Reel Specification



Series	Unit:mm					
	Size inch. (mm)	A	φB	φC	φD	φE
MSRSF	3951 (10013)	1.5 Min.	13.0+0.5/-0.2	20.2 Min.	330±2	100±2