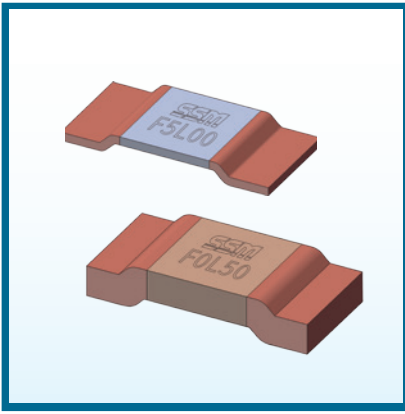


High-Precision Low-TCR Alloy Current Sensing Resistors



MSR series

Features

- The MSR series is based on precision resistance 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 25ppm/°C over a wide temperature range of -55°C to 170°C.
- The "trim-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



Part numbering system

MSRSF 2512 P - 5L00 - D 4P0

Series code

Size : 2512, 3920, 5930

Temperature Coefficient of Resistance

Nominal resistance value

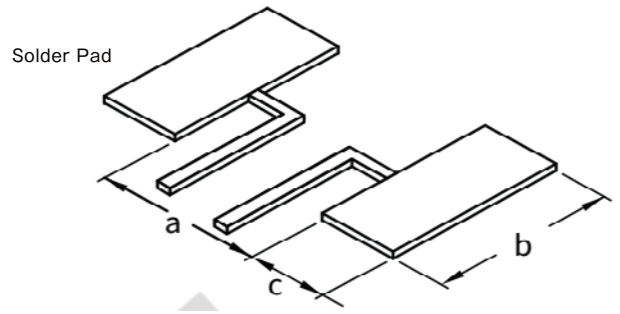
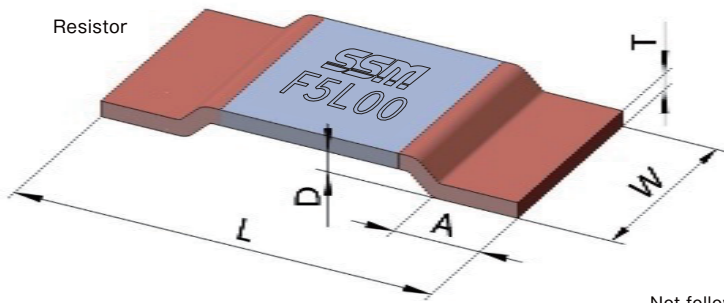
Resistance tolerance

Packaging : 4P0 (4,000)

Electrical Specification

Series	Size inch. (mm)	Resistance Value	Power	Max. Current	Operating Temperature	TCR (20°C/R _{sef})	Tolerance	Thermal Resistance	PKG.		
MSRSF	2512 (6432)	3 mΩ	4 W	36 A	-55~170 °C	±25 ppm/°C	±0.5 % ±1 % ±5 %	19.7 °C/W	4,000 pcs.		
		5 mΩ	2.5 W	22 A				31.1 °C/W			
	3920 (10052)	1 mΩ	8 W	89 A				7.8 °C/W			
		2 mΩ	6 W	55 A				15.4 °C/W			
		3 mΩ	5 W	41 A				23 °C/W			
		4 mΩ	6 W	32 A				31.1 °C/W			
		5 mΩ	5 W	25 A				38.4 °C/W			
	5930 (15078)	1 mΩ	10 W	100 A				6.4 °C/W			
		2 mΩ	10 W	63 A				12.6 °C/W			
3 mΩ		10 W	45 A	19.1 °C/W							
MSRPF	2512 (6432)	1.5 mΩ	5 W	57 A	-55~170 °C	±50 ppm/°C	±0.5 % ±1 % ±5 %	9.7 °C/W	4,000 pcs.		
		2 mΩ	5 W	50 A				13.4 °C/W			
		3 mΩ	4 W	36 A				19.8 °C/W			
		4 mΩ	3 W	27 A				26.9 °C/W			
		5 mΩ	2.5 W	22 A				33.6 °C/W			
MSREK	2512 (6432)	2 mΩ	5 W	50 A	-55~170 °C	±100 ppm/°C	±0.5 % ±1 % ±5 %	13.2 °C/W	4,000 pcs.		
		3 mΩ	4 W	36 A				19.8 °C/W			
		4 mΩ	3 W	27 A				24.3 °C/W			
		5 mΩ	2.5 W	22 A				31.1 °C/W			
MSREM	2512 (6432)	0.3 mΩ	6 W	140 A	-55~170 °C	±200 ppm/°C	±0.5 % ±1 % ±5 %	4.1 °C/W	4,000 pcs.		
		0.5 mΩ	6 W	109 A				5.1 °C/W			
		1 mΩ	6 W	77 A				11.1 °C/W			
MSRPK	3920 (10052)	1 mΩ	8 W	89 A	-55~170 °C	±50 pm/°C	±0.5 % ±1 % ±5 %	7.6 °C/W	2,000 pcs.		
		2 mΩ	6 W	54 A				15.4 °C/W			
		3 mΩ	5 W	40 A				23.1 °C/W			
		4 mΩ	4 W	30 A				28.9 °C/W			
		5 mΩ	3 W	24 A				36.5 °C/W			
MSRPM	3920 (10052)	0.2 mΩ	12 W	244 A	-55~170 °C	±150 ppm/°C	±0.5 % ±1 % ±5 %	3.6 °C/W	2,000 pcs.		
		0.3 mΩ	10 W	182 A				3.8 °C/W			
		0.5 mΩ	9 W	134 A				6.3 °C/W			
		1 mΩ	8 W	89 A				12.6 °C/W			
	5930 (15078)	0.2 mΩ	15 W	273 A		±100 ppm/°C		±100 ppm/°C		±0.5 % ±1 % ±5 %	2.6 °C/W
		0.5 mΩ	10 W	142 A							6.5 °C/W
		0.8 mΩ	9 W	105 A							9.3 °C/W
		1 mΩ	9 W	94 A							11.4 °C/W

◆ Dimensions



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

◆ Electrical Specification

Series	Size inch. (mm)	Resistance Value	Unit:mm							
			L	W	A	T	D	a	b	c
MSRSF	2512 (6432)	3 mΩ	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
		5 mΩ	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
	3920 (1050)	1 mΩ	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
		2 mΩ	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
		3 mΩ	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
		4 mΩ	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
5930 (1576)	1 mΩ	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	
	2 mΩ	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	
	3 mΩ	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	
MSRPF	2512 (6432)	1.5 mΩ	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
		2 mΩ	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
		3 mΩ	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
		4 mΩ	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
		5 mΩ	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
MSREK	2512 (6432)	2 mΩ	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
		3 mΩ	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
		4 mΩ	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
		5 mΩ	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
MSREM	2512 (6432)	0.3 mΩ	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
		0.5 mΩ	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
		1 mΩ	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
MSRPF	3920 (1050)	1 mΩ	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
		2 mΩ	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
		3 mΩ	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
		4 mΩ	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
		5 mΩ	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
MSRPF	3920 (1050)	0.2 mΩ	10.0±0.3	5.2±0.3	1.8±0.3	1.4±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2
		0.3 mΩ	10.0±0.3	5.2±0.3	1.8±0.3	1.3±0.2	0.5±0.2	5.6±0.1	6.2±0.2	2.7±0.2
		0.5 mΩ	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
	5930 (1576)	1 mΩ	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
		0.2 mΩ	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±0.2
		0.5 mΩ	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±0.2
5930 (1576)	0.8 mΩ	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±0.2	
	1 mΩ	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±0.2	

Metal Alloy Current Sensing Resistors

MSR series

◆ Part Number information

M	S	R	S	F	2	5	1	2	P	5	L	0	0	F	4	P	0
Series (4 digits)				Size (4 digits)			TCR (1 digits)		Resistance (4 digits)			Tolerance (1 digits)		Quantity (3 digits)			
MSRSF MSRPF MSREK MSREM MSRPF MSRPF MSRPF				2512 3920 5930			P:±25 ppm/°C Q:±50 ppm/°C R:±100 ppm/°C E:±150 ppm/°C S:±200 ppm/°C		5L00 = 5 mΩ 0L50 = 0.5 mΩ			D:±0.5 % F:±1 % J:±5 %		2P0 = 2,000 pcs. 4P0 = 4,000 pcs.			

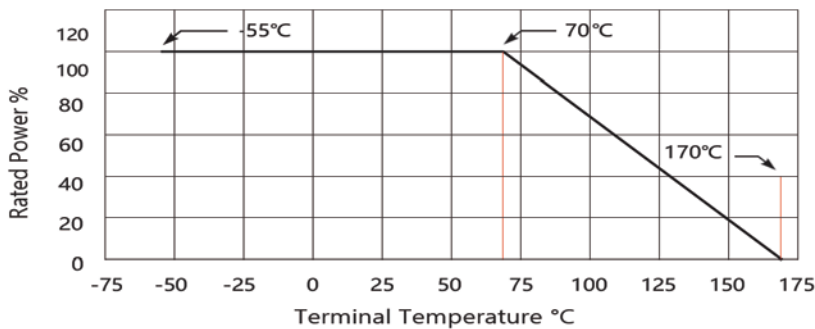
High-Precision Low-TCR Alloy Current Sensing Resistors

MSR series

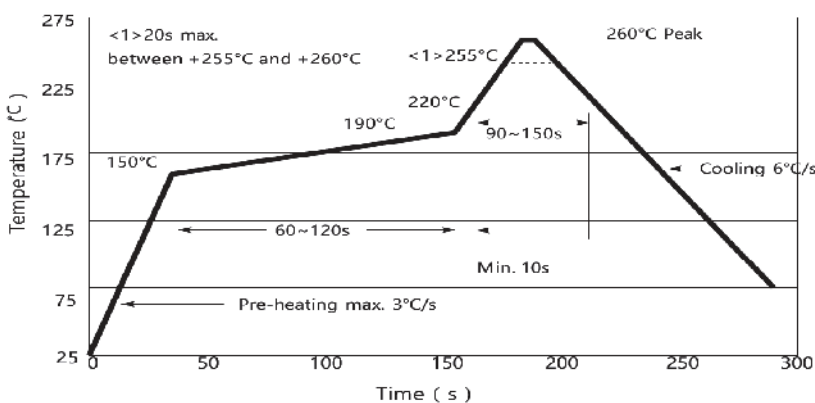
Performance

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, +20d Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Within the nominal TCR	$\Delta R \leq \pm 1.0\%$
Substrate Bending	2mm. Duration: 60s.	AEC-Q200 TEST 21 AEC-Q200-005	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 0.5\%$
Short Time Overload	5x rated voltage, 5s	IEC 60115-1 4.13	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 0.5\%$
Low Temperature Storage	-55°C for 96h, unpowered	IEC 60068-2-1	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 0.5\%$
Moisture Resistance	Apply T=24 h/cycle, zero power, method 7a and 7b are not required	MIL-STD-202 Method 106	$\Delta R \leq \pm 0.5\%$	$\Delta R \leq \pm 0.5\%$

Derating Curve



Reflow Soldering Profile



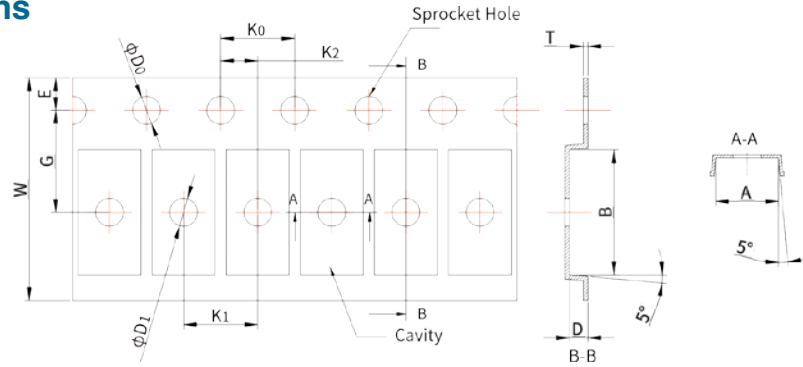
Resistor Surface Temperature:

Pre-Heat: +150°C+190°C, 60~120sec.

Reflow: Above +220°C, 90~150sec.

Applicable Solder Composition: Sn-Ag-Cu

◆Tape Specifications



◆Electrical Specification

Series	Size (mm)	Resistance Value	Unit:mm											
			A	B	ϕD0	ϕD1	K0	K1	K2	E	G	W	D	T
MSRSF	2512 (6432)	3 mΩ	3.20±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
		5 mΩ	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
	3920 (1050)	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
	5930 (1576)	1 mΩ	8.05±0.2	15.3±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	11.5±0.05	24.0±0.3	1.9±0.1	0.3±0.05
		2 mΩ	8.05±0.2	15.3±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	11.5±0.05	24.0±0.3	1.3±0.1	0.3±0.05
		3 mΩ	8.05±0.2	15.3±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	11.5±0.05	24.0±0.3	1.3±0.1	0.3±0.05
	MSRPF	2512 (6432)	1.5 mΩ	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
2 mΩ			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
3 mΩ			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
4 mΩ			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
5 mΩ			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
MSREK	2512 (6432)	2 mΩ	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
		3 mΩ	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
		4 mΩ	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
		5 mΩ	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
MSREM	2512 (6432)	0.3 mΩ	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
		0.5 mΩ	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
		1 mΩ	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	0.9±0.1	0.25±0.05
MSRPFK	3920 (1050)	1 mΩ	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 mΩ	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 mΩ	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 mΩ	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 mΩ	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
MSRPFM	3920 (1050)	0.2 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	2.7±0.1	0.3±0.05
		0.3 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
		0.5 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
		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	1.5±0.1	0.3±0.05
	5930 (1576)	0.2 mΩ	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
		0.5 mΩ	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
		0.8 mΩ	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 mΩ	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		

Metal Alloy Current Sensing Resistors

MSR series

Series	Unit:mm					
	Size (mm)	A	ϕB	ϕC	ϕD	ϕE
MSRSF	2152	1.5 Min.	13.0+0.5/-0.2	20.2 Min.	330±2	100±2
MSRPF						
MSREK						
MSREM	3920					
MSRPFK	5930					
MSRPFM						

