



MCSS-2 SERIES

METAL SHUNT RESISTOR

CURRENT METAL SHUNT RESISTOR ▲ SMD type

Low resistance values up to 0.045mΩ

Sulfur resistant construction

18W in wide terminal design for 2550 size

Moisture Sensitivity Level ▲ MSL 1

Excellent long-term stability

SPECIFICATION

Item		Characteristics		
Operating Temperature Range		-55°C to +170°C		
Resistive Element Material		MnCuSn ▲ MnCu ▲ FeCrAl		
Resistance Range ^{Note 1}	R	0.045mΩ to 5mΩ		
Resistance Tolerance	ΔR	±1% ▲ ±2% ▲ ±5%		
Power Rating at 70°C ^{Note 2}	P ₇₀	4W to 18W		
Max. Working Voltage ^{Note 3}	V _W	$\sqrt{P \cdot R}$		
Temperature Coefficient Component ^{Note 4}	TCR _{COMP}	±50ppm to ±150ppm		
Temperature Coefficient Element ^{Note 5}	TCR _{ELEM}	< ±30ppm to < ±40ppm		
Case sizes		Size	Length	Width
		1206	3.2mm	1.65mm
		2512	6.5mm	3.25mm
		2527	6.5mm	6.85mm
		2550	6.5mm	12.80mm
		3920	10.0mm	5.20mm
		5930	15.0mm	7.75mm
				Height
				0.80mm to 1.20mm
				0.66mm to 1.30mm
				1.00mm to 1.50mm
				1.20mm to 1.50mm
				0.85mm to 1.92mm
				0.80mm to 1.92mm

Notes:

- 1: R Other values may be available, consult MGT.
- 2: P₇₀ Power rating is guaranteed for use on aluminum substrate (MCPCB). Please check with MGT before order or using.
- 3: V_W Working voltage is the maximum DC or AC (rms) continuous voltage, corresponding to the rated power P at the operating temperature.
 $V_W = \sqrt{P \cdot R}$ [P = Rated power (W) at operating temperature; R = Resistance value (Ω)]
- 4: TCR_{COMP} Component TCR - Total TCR that includes the TCR effects of the resistor element and the copper terminal
- 5: TCR_{ELEM} Element TCR - Only applies to the alloy used for the resistor element.

APPLICATIONS

Battery Charger	Welding Inverter	Renewable Energy	Motors & Drives	AC/DC Converter	DC/DC Converter	Industrial
						

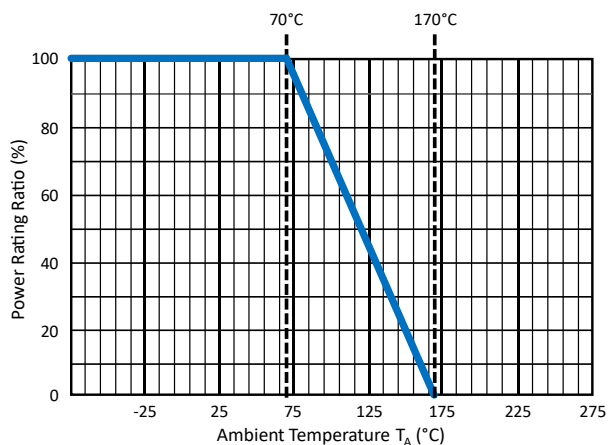
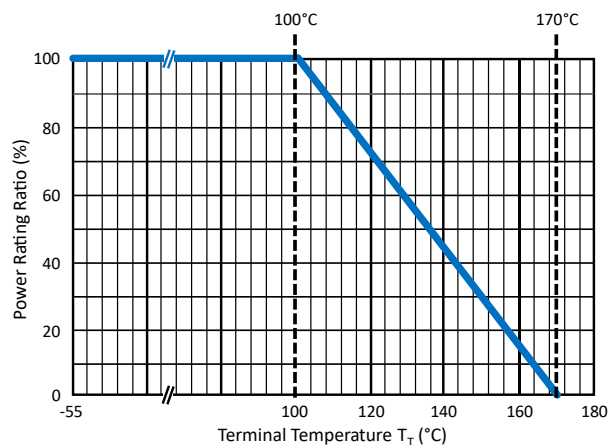
ELECTRICAL CHARACTERISTICS

Part number shows blister tape on plastic reel.

Size	R Resistance (mΩ)	P ₇₀ Power Rating at 70°C (W)	P ₁₀₀ Power Rating at 100°C (W)	TCR _{Comp} Temperature Coefficient Component (ppm)	TCR _{Elem} Temperature Coefficient Element (ppm)	Element Material	Part Number
1206	0.30	5	3	±100	< ±30	MnCuSn	MCSS1206E □ I0L30
	0.50	5	3	±100	< ±30	MnCu	MCSS1206E □ I0L50
	1.00	4	2	±75	< ±30	MnCu	MCSS1206E □ P1L00
	2.00	4	2	±75	< ±40	FeCrAl	MCSS1206E □ P2L00
	3.00	4	2	±75	< ±40	FeCrAl	MCSS1206E □ P3L00
2512	0.20	5	3	±150	< ±30	MnCuSn	MCSS2512E □ I0L20
	0.25	5	3	±150	< ±30	MnCuSn	MCSS2512E □ I0L25
	0.30	5	3	±150	< ±30	MnCuSn	MCSS2512E □ I0L30
	0.40	5	5	±150	< ±30	MnCuSn	MCSS2512E □ I0L40
	0.50	5	3	±100	< ±30	MnCu	MCSS2512E □ I0L50
	0.75	5	3	±100	< ±30	MnCu	MCSS2512E □ I0L75
	1.00	5	3	±100	< ±30	MnCu	MCSS2512E □ I1L00
	1.50	5	3	±50	< ±40	FeCrAl	MCSS2512E □ I1L50
	2.00	5	3	±50	< ±40	FeCrAl	MCSS2512E □ I2L00
	3.00	5	3	±50	< ±40	FeCrAl	MCSS2512E □ I3L00
	4.00	5	3	±50	< ±40	FeCrAl	MCSS2512E □ I4L00
	5.00	5	3	±50	< ±40	FeCrAl	MCSS2512E □ I5L00
2527	0.10	10	6	±125	< ±30	MnCu	MCSS2527E □ N0L10
	0.20	10	6	±125	< ±30	MnCu	MCSS2527E □ N0L20
2550	0.045	18	12	±50	< ±30	MnCuSn	MCSS2550E □ LL045
	0.10	18	12	±50	< ±30	MnCuSn	MCSS2550E □ L0L10
	0.50	18	12	±50	< ±30	MnCu	MCSS2550E □ L0L50
3920	0.20	10	5	±150	< ±30	MnCu	MCSS3920E □ N0L20
	0.30	10	5	±150	< ±30	MnCu	MCSS3920E □ N0L30
	0.50	10	5	±70	< ±30	MnCu	MCSS3920E □ N0L50
	1.00	9	5	±70	< ±30	MnCu	MCSS3920E □ J1L00
	2.00	7	5	±50	< ±40	FeCrAl	MCSS3920E □ B2L00
	3.00	7	5	±50	< ±40	FeCrAl	MCSS3920E □ B3L00
	4.00	7	5	±50	< ±40	FeCrAl	MCSS3920E □ B4L00
	5.00	7	5	±50	< ±40	FeCrAl	MCSS3920E □ B5L00
5930	0.10	12	10	±150	< ±30	MnCu	MCSS5930E □ O0L10
	0.20	12	10	±100	< ±30	MnCu	MCSS5930E □ O0L20
	0.30	10	7	±100	< ±30	MnCu	MCSS5930E □ N0L30
	0.50	9	7	±75	< ±30	MnCu	MCSS5930E □ J0L50
	1.00	8	7	±50	< ±40	FeCrAl	MCSS5930E □ G1L00
	2.00	8	6	±50	< ±40	FeCrAl	MCSS5930E □ G2L00
	3.00	10	8	±50	< ±40	FeCrAl	MCSS5930E □ N3L00
	3.00	8	6	±50	< ±40	FeCrAl	MCSS5930E □ G3L00

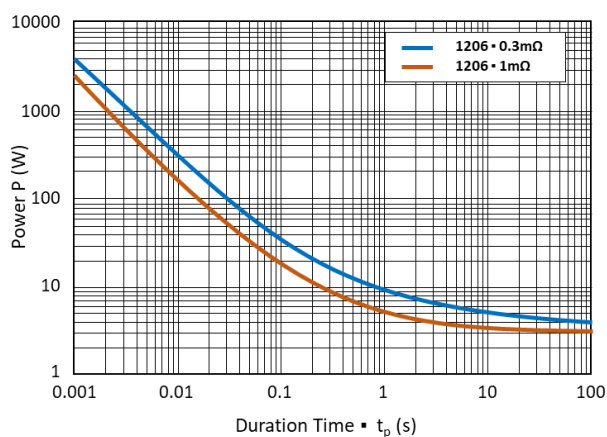
Note: □ : Enter the appropriate resistance tolerance code. F for ±1%, G for ±2% or J for ±5%.

DERATING CURVE

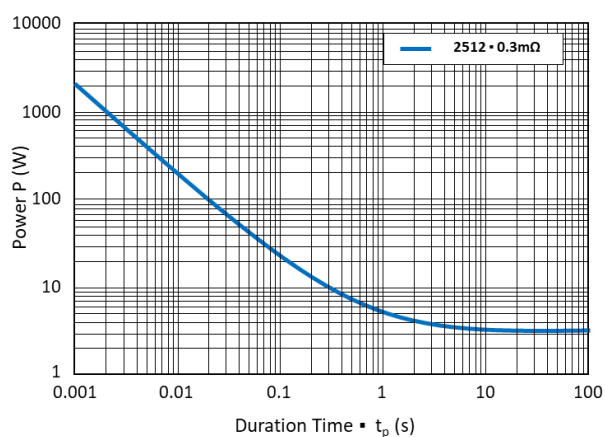
Power Derating Characteristics at $T_A = 70^\circ\text{C}$

Power Derating Characteristics at $T_T = 100^\circ\text{C}$


PULSE CAPABILITY

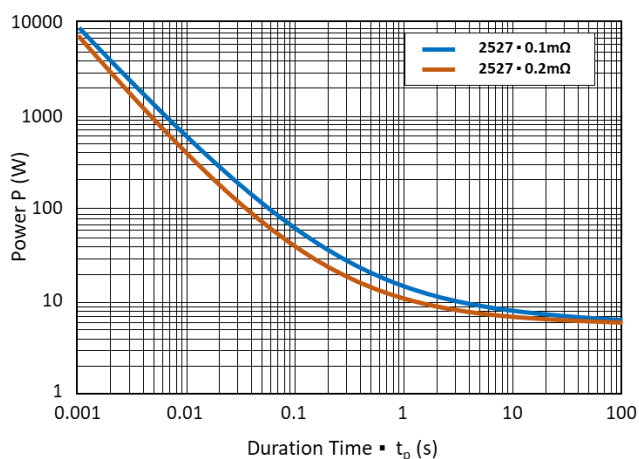
Pulsed Power Characteristics • MCSS 1206 Series



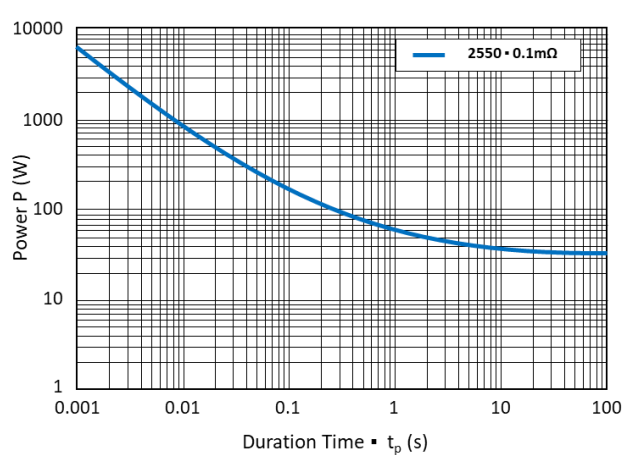
Pulsed Power Characteristics • MCSS 2512 Series



Pulsed Power Characteristics • MCSS 2527 Series



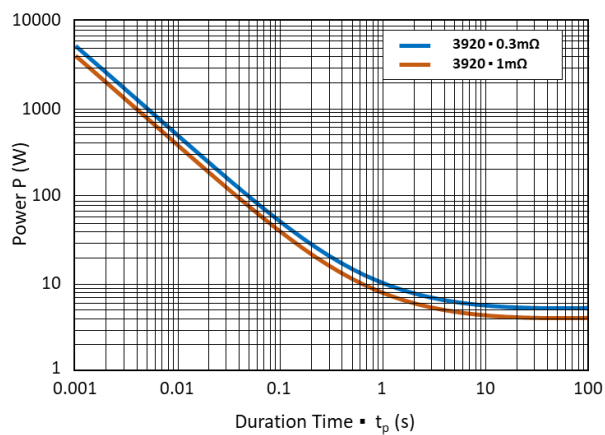
Pulsed Power Characteristics • MCSS 3920 Series



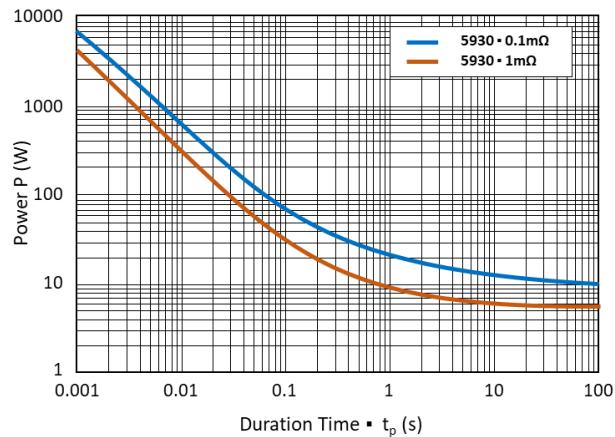
Note: Other pulsed power characteristics on request.

PULSE CAPABILITY

Pulsed Power Characteristics ▪ MCSS 3920 Series

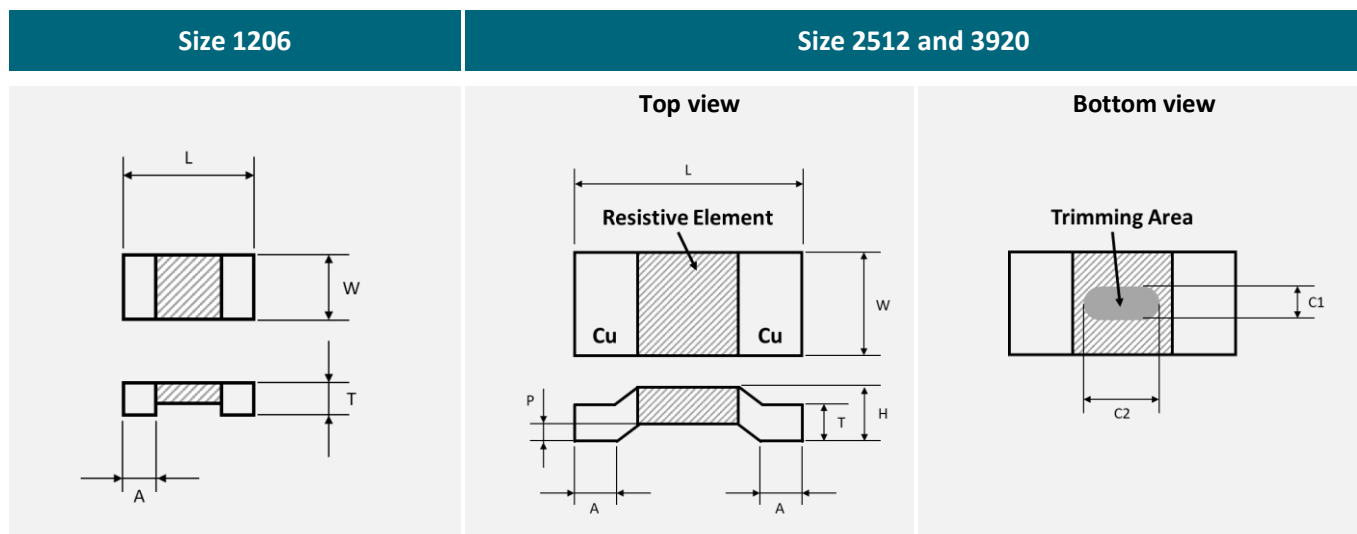


Pulsed Power Characteristics ▪ MCSS 5930 Series



Note: Other pulsed power characteristics on request.

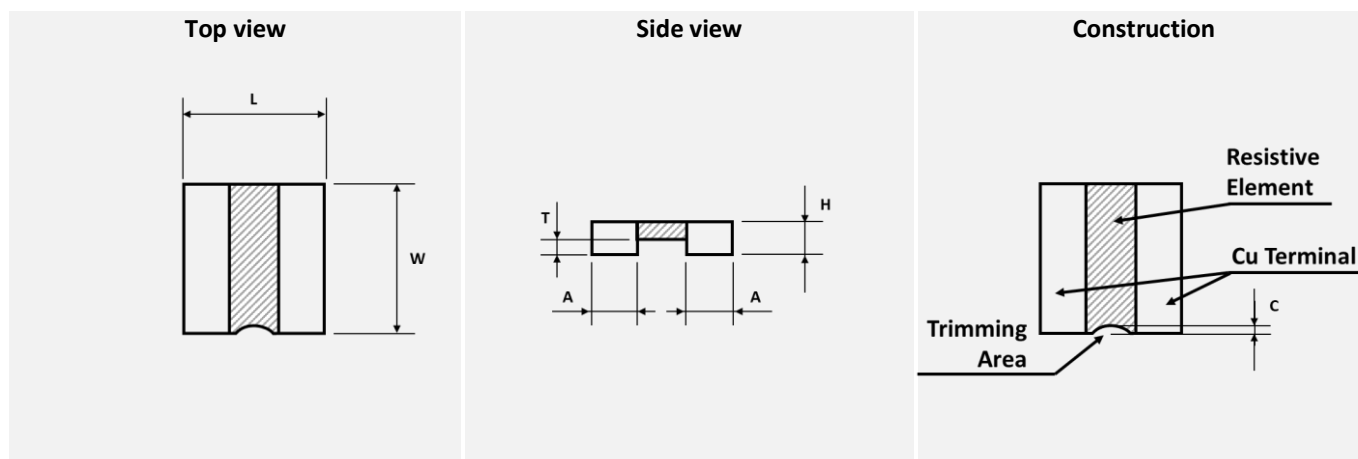
PACKAGE OUTLINE ▲ All dimensions in mm



Size	R Resistance (mΩ)	L	W	H	T	A	C1 (max.)	C2 (max.)	P
1206	0.30	3.2±0.2	1.65±0.2	-	1.20±0.15	0.80±0.2	-	-	-
	0.50	3.2±0.2	1.65±0.2	-	0.90±0.15	0.80±0.2	-	-	-
	1.00	3.2±0.2	1.65±0.2	-	0.85±0.15	0.80±0.2	-	-	-
	2.00	3.2±0.2	1.65±0.2	-	0.85±0.15	0.80±0.2	-	-	-
	3.00	3.2±0.2	1.65±0.2	-	0.80±0.15	0.80±0.2	-	-	-
2512	0.20	6.5±0.2	3.25±0.2	1.30±0.15	0.95±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	0.25	6.5±0.2	3.25±0.2	1.30±0.15	0.95±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	0.30	6.5±0.2	3.25±0.2	1.17±0.15	0.82±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	0.50	6.5±0.2	3.25±0.2	1.17±0.15	0.70±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	0.75	6.5±0.2	3.25±0.2	1.07±0.15	0.72±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	1.00	6.5±0.2	3.25±0.2	1.07±0.15	0.72±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	1.50	6.5±0.2	3.25±0.2	0.73±0.15	0.38±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	2.00	6.5±0.2	3.25±0.2	0.96±0.15	0.61±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	3.00	6.5±0.2	3.25±0.2	0.76±0.15	0.41±0.15	0.90±0.2	2.0	3.0	0.35±0.1
	4.00	6.5±0.2	3.25±0.2	0.66±0.15	0.31±0.15	0.90±0.2	2.0	3.0	0.35±0.1
3920	0.20	10.0±0.2	5.20±0.2	1.92±0.15	1.42±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	0.30	10.0±0.2	5.20±0.2	1.92±0.15	1.42±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	0.50	10.0±0.2	5.20±0.2	1.36±0.15	0.86±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	1.00	10.0±0.2	5.20±0.2	0.92±0.15	0.42±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	2.00	10.0±0.2	5.20±0.2	1.19±0.15	0.69±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	3.00	10.0±0.2	5.20±0.2	0.94±0.15	0.44±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	4.00	10.0±0.2	5.20±0.2	0.85±0.15	0.35±0.15	1.8±0.3	2.5	3.5	0.50±0.1
	5.00	10.0±0.2	5.20±0.2	0.85±0.15	0.35±0.15	1.8±0.3	2.5	3.5	0.50±0.1

PACKAGE OUTLINE ▲ All dimensions in mm

Size 2527

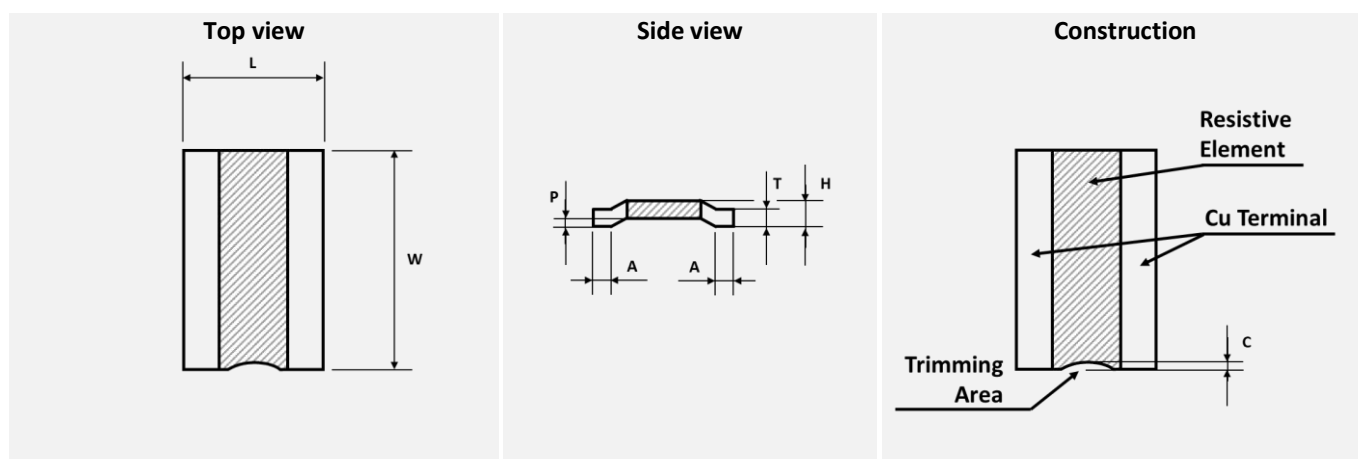


Note: Coplanarity difference between the two electrodes should within 0.1mm.

Resistive element has on the bottom side green isolation coating.

Size	R Resistance (mΩ)	L	W	H	T	A	Trimming Area C (max.)
2527	0.10	6.5±0.2	6.85±0.2	1.50±0.15	0.5±0.15	2.1±0.2	1.0
	0.20	6.5±0.2	6.85±0.2	1.00±0.20	0.5±0.15	2.1±0.2	1.0

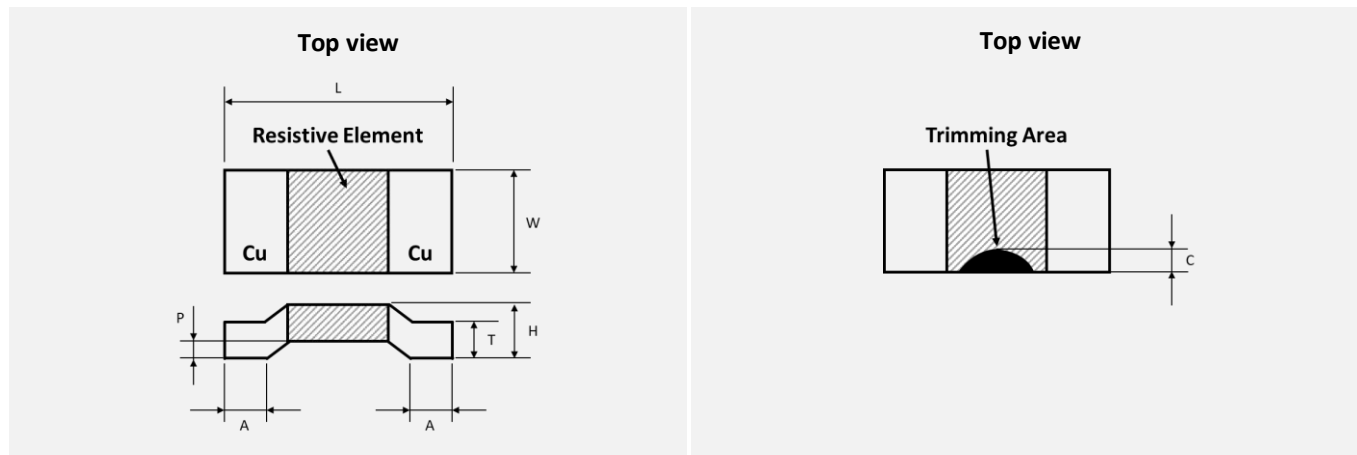
Size 2550



Size	R Resistance (mΩ)	L	W	H	T	A	P	Trimming Area C (max.)
2550	0.045	6.5±0.2	12.8±0.4	1.50±0.30	1.0±0.20	1.0±0.3	0.5±0.1	0.4
	0.10	6.5±0.2	12.8±0.4	1.50±0.15	1.0±0.20	1.0±0.3	0.5±0.1	0.4
	0.50	6.5±0.3	12.8±0.4	1.20±0.15	0.6±0.15	1.0±0.3	0.5±0.1	0.4

PACKAGE OUTLINE ▲ All dimensions in mm

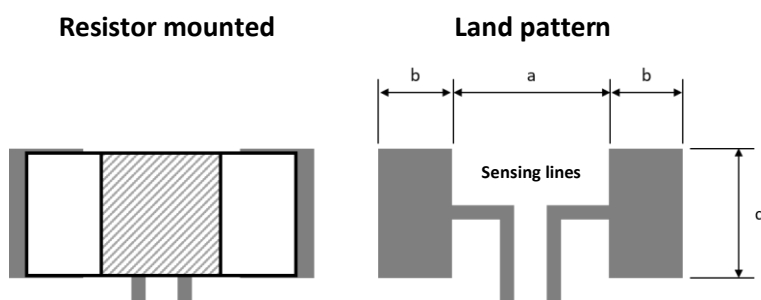
Size 5930



Size	R Resistance (mΩ)	L	W	H	T	A	C (max.)	P
5930	0.10	15.0±0.2	7.75±0.2	1.92±0.15	1.45±0.15	4.2±0.3	1.0	0.40±0.1
	0.20	15.0±0.2	7.75±0.2	1.85±0.15	1.38±0.15	4.2±0.3	1.0	0.50±0.1
	0.30	15.0±0.2	7.75±0.2	1.45±0.15	0.94±0.15	4.2±0.3	1.0	0.50±0.1
	0.50	15.0±0.2	7.75±0.2	1.08±0.15	0.58±0.15	4.2±0.3	1.0	0.50±0.1
	1.00	15.0±0.2	7.75±0.2	1.37±0.15	0.87±0.15	4.2±0.3	1.0	0.50±0.1
	2.00	15.0±0.2	7.75±0.2	1.10±0.15	0.68±0.15	4.2±0.3	1.0	0.50±0.1
	3.00	15.0±0.2	7.75±0.2	0.80±0.15	0.40±0.15	4.2±0.3	1.0	0.50±0.1
	3.00	15.0±0.2	7.75±0.2	0.87±0.15	0.46±0.15	4.2±0.3	1.0	0.50±0.1

RECOMMENDED PAD LAYOUT (REFERENCE ONLY) ▲ All dimensions in mm

Size	a	b	c
1206	2.0	1.32	1.8
2512	3.8	1.8	3.4
2527	2.4	2.8	7.1
2550	3.6	1.5	13.2
3920	5.6	2.7	6.2
5930	6.6	5.2	8.75

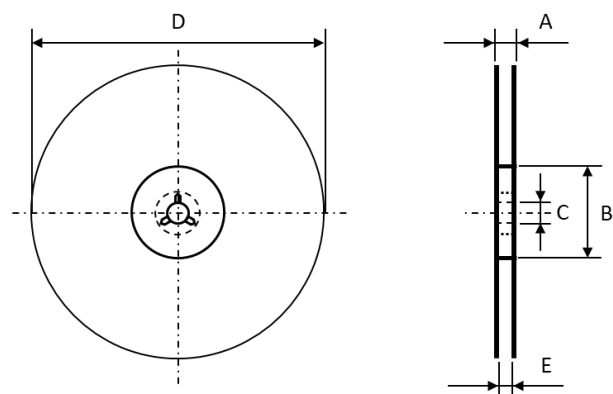


PRODUCT CODE

Example: MCSS series ▲ Size 3920 ▲ 0.50mΩ ▲ ±1% ▲ 10W ▲ Tape & Reel

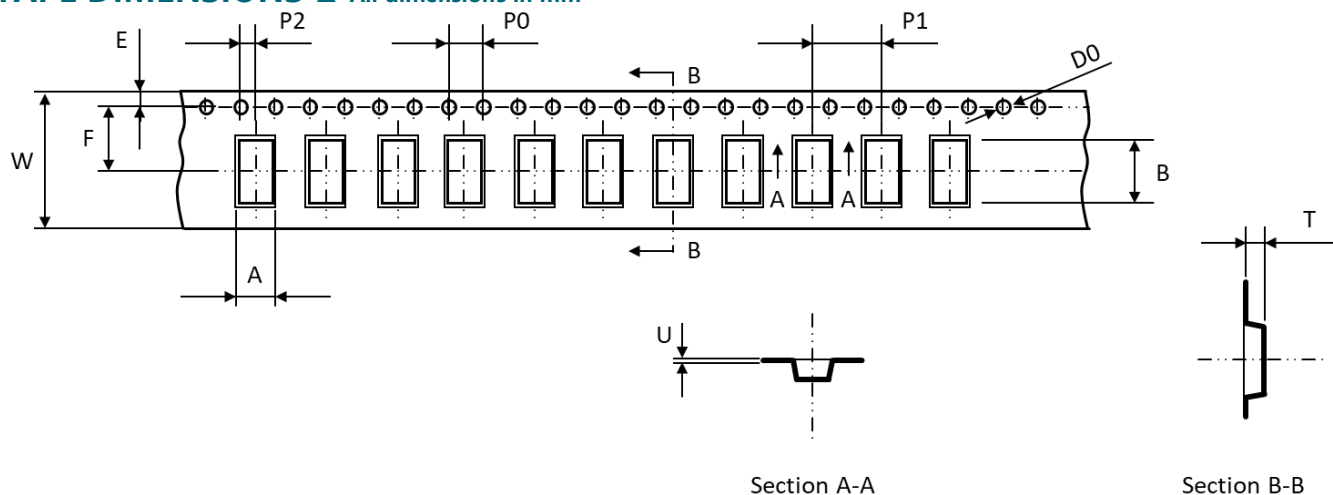
MCSS		3920		E		F		N		0L50	
Series		Dimensions		Packaging		Tolerance		Power Rating		Resistance	
Code	Desc.	Code	Size	Code	Desc.	Code	%	Code	P70 (W)	Code	mΩ
MCSS	Standard	1206	1206	E	Emboss	F	±1	H	3	L045	0.045
		2512	2512			G	±2	P	4	0L25	0.25
		2527	2527			J	±5	I	5	0L30	0.30
		2550	2550					A	6	0L50	0.50
		3920	3920					B	7	1L00	1.00
		5930	5930					G	8	3L00	3.00
								J	9		
								N	10		
								O	12		
								L	18		

REEL DIMENSIONS ▲ All dimensions in mm



Size	A	B	C	D	E
1206	11.7±1.0	60±0.5	13.5±0.5	178±1.0	9.5±1.0
2512	16.5±1.0	62±0.5	13±0.5	250±1.0	12.5±1.0
2550	20.7±1.0	99±0.5	13.5±0.5	330±1.0	16.7±1.0
2527	20.7±1.0	99±0.5	13±0.5	330±1.0	16.7±1.0
3920	20.7±1.0	99±0.5	13±0.5	330±1.0	16.7±1.0
5930	20.7±1.0	99±0.5	13.5±0.5	330±1.0	16.7±1.0

TAPE DIMENSIONS ▲ All dimensions in mm



TAPE DIMENSIONS ▲ All dimensions in mm

Size	A	B	E	F	W	P0	P1	P2	D0	T (Ref.)	U (Ref.)
1206	2.0±0.1	3.65±0.1	1.75±0.1	5.5±0.05	12.0±0.2	4.0±0.1	4.0±0.1	2.0±0.05	1.5±0.05	1.2±0.2	0.25±0.05
2512	3.55±0.1	6.75±0.1	1.75±0.1	5.5±0.05	12.0±0.2	4.0±0.05	4.0±0.1	2.0±0.05	1.5±0.1	1.2±0.2	0.25±0.1
2527	6.9±0.1	7.2±0.1	1.75±0.1	7.5±0.05	16.0±0.2	4.0±0.05	8.0±0.1	2.0±0.05	1.5±0.1	1.6±0.2	0.3±0.05
2550	6.8±0.1	13.1±0.1	1.75±0.1	11.5±0.05	24.0±0.2	4.0±0.05	12.0±0.1	2.0±0.05	1.5±0.1	1.7±0.1	0.3±0.1
3920	5.5±0.1	10.8±0.1	1.75±0.1	7.5±0.05	16.0±0.2	4.0±0.05	8.0±0.1	2.0±0.1	1.5±0.1	1.65±0.2	0.35±0.1
5930 ¹	8.3±0.1	15.4±0.1	1.75±0.1	11.5±0.1	24.0±0.3	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	2.30±0.2	0.3±0.1
5930 ²	8.3±0.1	15.4±0.1	1.75±0.1	11.5±0.1	24.0±0.3	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	1.40±0.2	0.3±0.1

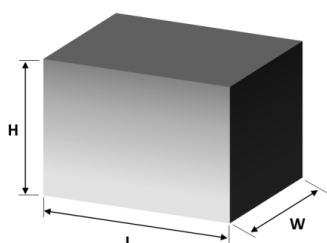
Notes:

- ¹ Resistance value 0.1mΩ to 0.3mΩ
- ² Resistance value 0.5mΩ to 3mΩ

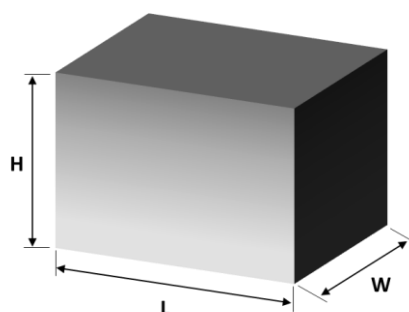
PACKAGING, STORAGE CONDITIONS AND TRANSPORTATION

Size	Quantity (pcs) Chip / Reel	Quantity Inner Box (pcs)	L x W x H (mm) Inner Box	Quantity (pcs) Outer Carton	L x W x H (mm) Outer Carton
1206	3 000	30 000	180 x 180 x 120	30 000	190 x 160 x 190
2512	4 000	20 000	255 x 255 x 85	100 000	280 x 460 x 290
2527	2 000	4 000	340 x 350 x 50	20 000	360 x 320 x 360
2550	2 000	4 000	340 x 350 x 50	20 000	360 x 320 x 360
3920	3 000	6 000	340 x 350 x 50	30 000	360 x 320 x 360
5930	2 000	4 000	340 x 350 x 50	20 000	360 x 320 x 360

Inner box



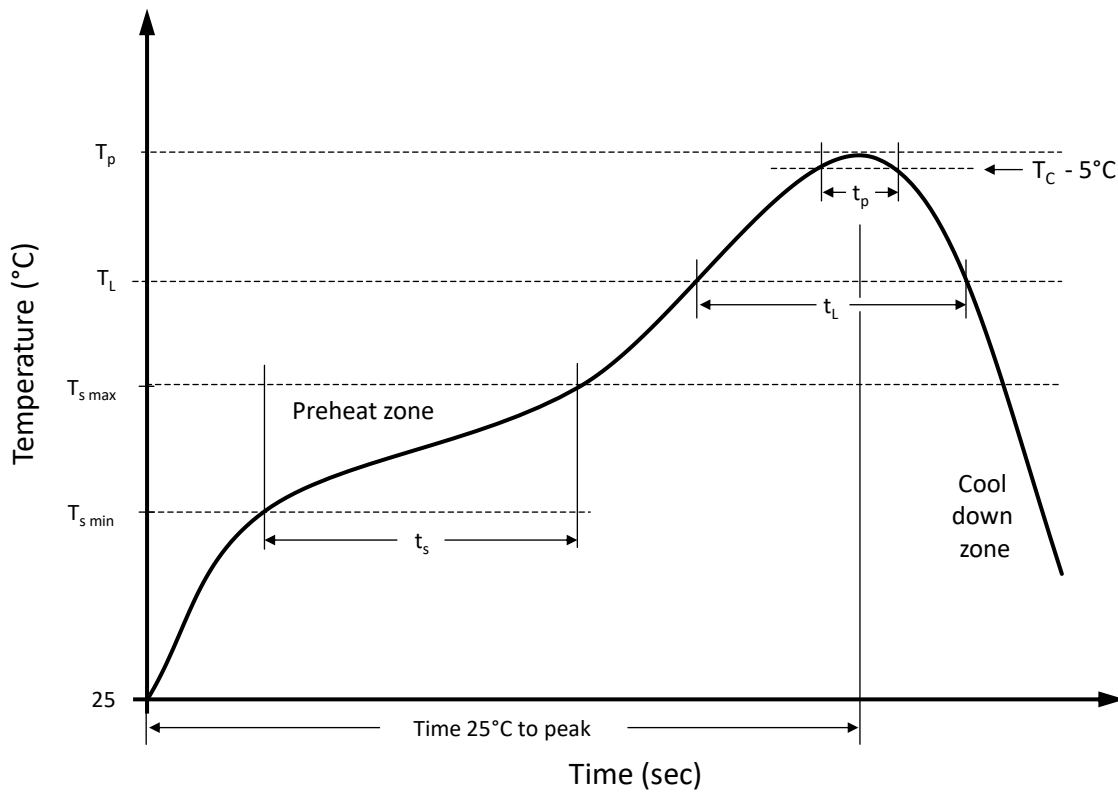
Outer carton



STORAGE AND HANDLING CONDITIONS

Floor life	Temperature	Humidity	MSL
Unlimited	T _A = 22 to 28°C	RH = 40 to 75%	1

RECOMMENDED REFLOW SOLDERING PROFILE

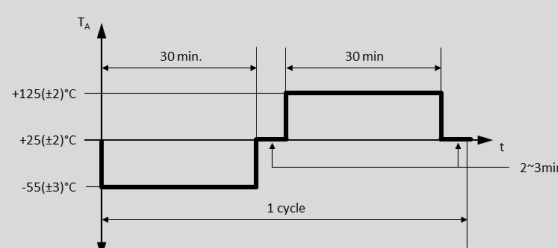


Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s \min}$	100 °C	150 °C
Preheat temperature max.	$T_{s \max}$	150 °C	200 °C
Preheat time t_s from $T_{s \min}$ to $T_{s \max}$	t_s	120 seconds	120 seconds
Ramp-up rate (T_L to T_p)		max. 3 °C/second	max. 3 °C/second
Liquidous temperature	T_L	183 °C	217 °C
Time t_L maintained above T_L	t_L	150 seconds max.	60 seconds max.
Peak package body temperature	T_p	235°C	260°C
Timeframe of within 5°C below and up to max actual peak body temperature	t_p	20 seconds max.	30 seconds max.
Ramp-down rate (T_L to T_p)		max. 6 °C/second	max. 6 °C/second
Time 25°C to peak temperature		max. 6 minutes	max. 8 minutes

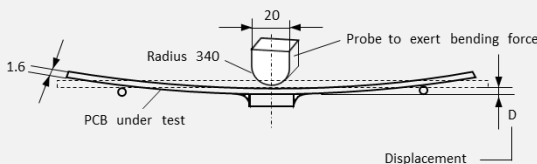
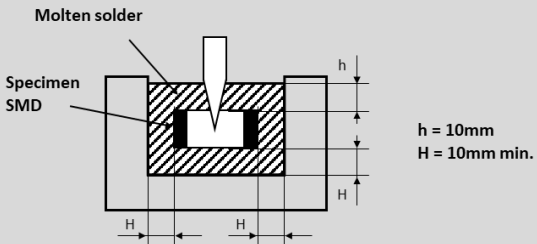
RELIABILITY TESTS ▲ STANDARD

Standard: JIS C 5202, MIL-STD 202

No.	Test	Test Specification	Test Standard	Test Limits
1	Short Time Overload	Loading 5 times rated power for 5sec	JIS C 5202-5.5	$\Delta R: \pm(1\%+0.0005\Omega)$
2	Temperature Coefficient of Resistance (T.C.R.)	+25°C to +125°C $TCR(ppm/^{\circ}C) = \frac{\Delta R}{R \cdot \Delta T} \cdot 10^6$	JIS C 5202-5.2	Refer to electrical specification.
3	Moisture Resistance	The specimens shall be placed in a chamber and subjected to a relative humidity of 90~98% percent and a temperature of 25°C / 65°C with 10 cycles.	MIL-STD-202, Method 106	$\Delta R: \pm(1\%+0.0005\Omega)$
4	High Temperature Exposure	The chip (mounted on board) is exposed in the heat chamber 125°C for 1000 hrs.	JIS C 5202-7.2	$\Delta R: \pm(1\%+0.0005\Omega)$
5	Load Life	Apply rated power for 1000 hours with 1.5 hours ON and 0.5 hour OFF.	JIS C 5202-7.10	$\Delta R: \pm(1\%+0.0005\Omega)$
6	Thermal Shock	-55°C to +155°C, 1000 cycles, 15 min at each extreme	MIL-STD-202 Method 107	$\Delta R: \pm(1\%+0.0005\Omega)$
7	Vibration	5 g's for 20 min., 12 cycles each of 3 orientations.	MIL-STD-202 Method 201	$\Delta R: \pm(0.5\%+0.0005\Omega)$
8	Rapid change of temperature	The chip (mounted on board) is exposed, -55±3°C (30min.)/+125±2°C (30min.) for 5 cycles. The following conditions as the following figure. 	JIS C 5202-7.4	$\Delta R: \pm(1\%+0.0005\Omega)$

RELIABILITY TESTS ▲ STANDARD

Standard: JIS C 5202, MIL-STD 202

No.	Test	Test Specification	Test Standard	Test Limits
9	Bending Strength	Mount the chip to test 90mm(L)*40mm(W) FR4 printed circuit board substrate. Apply pressure in direction of arrow unit band width reaches 2mm(+0.2/-0mm) illustrated in the figure below and hold for 10±1 sec. Unit: mm 	JIS C 5202-6.1	$\Delta R: \pm(1\%+0.0005\Omega)$
10	Solderability	The specimen chip shall be immersed into the flux specified in the solder bath 235±5°C for 2±0.5 sec. It shall be immersed to a point 10mm from its root. (Sn96.5/Ag3.0/Cu0.5) 	JIS C 5202-6.11	Solder shall be covered 95% or more of the electrode area

Notes:

- The terminal electron temperature of component should below 100°C.

REVISION TABLE

Revision	Date	Status	Notes
001	01/10/2021	Initial release	Initial publication

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