

# MCSSA-4 SERIES

## 4-TERMINAL METAL SHUNT RESISTOR

**CURRENT METAL SHUNT RESISTOR ▲ SMD type**

Low resistance values up to 0.2mΩ

Sulfur resistant construction

4-terminal design for stable resistance tolerance to 1%

Moisture Sensitivity Level ▲ MSL 1

**AEC-Q200 qualified**

### SPECIFICATION

Item		Characteristics		
Operating Temperature Range		-55°C to +170°C		
Resistive Element Material		MnCuSn ▲ MnCu ▲ FeCrAl		
Resistance Range <sup>Note 1</sup>	R	0.2mΩ to 5mΩ		
Resistance Tolerance	ΔR	±1% ▲ ±2% ▲ ±5%		
Power Rating at 70°C <sup>Note 2</sup>	P <sub>70</sub>	5W to 12W		
Max. Working Voltage <sup>Note 3</sup>	V <sub>W</sub>	$\sqrt{P \cdot R}$		
Temperature Coefficient Component <sup>Note 4</sup>	TCR <sub>COMP</sub>	±50ppm to ±100ppm		
Temperature Coefficient Element <sup>Note 5</sup>	TCR <sub>ELEM</sub>	< ±30ppm to < ±40ppm		
Case sizes	Size	Length	Width	Height
	2725	6.9mm	6.6mm	2.75mm ~ 3.80mm
	4026	10.1mm	6.6mm	2.68mm ~ 3.81mm

#### Notes:

- R** Other values may be available, consult MGT.
- P<sub>70</sub>** Power rating is guaranteed for use on aluminum substrate (MCPCB).  
Please check with MGT before order or using.
- V<sub>W</sub>** 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)]
- TCR<sub>COMP</sub>** Component TCR - Total TCR that includes the TCR effects of the resistor element and the copper terminal
- TCR<sub>ELEM</sub>** Element TCR - Only applies to the alloy used for the resistor element.

### APPLICATIONS

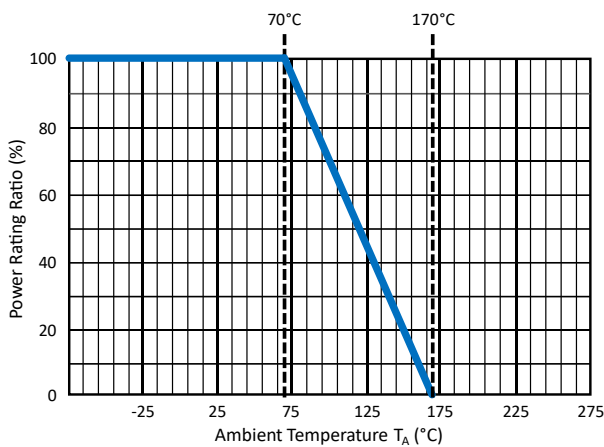
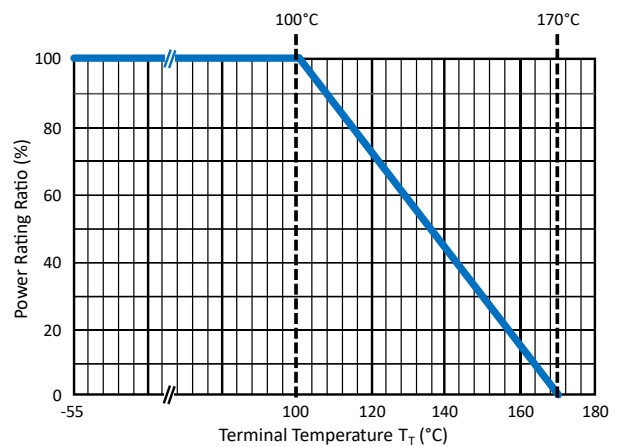
Automotive	Battery Charger	Renewable Energy	Motors & Drives	AC/DC Converter	DC/DC Converter	Welding Inverter

**ELECTRICAL CHARACTERISTICS**

Part number shows blister tape on plastic reel.

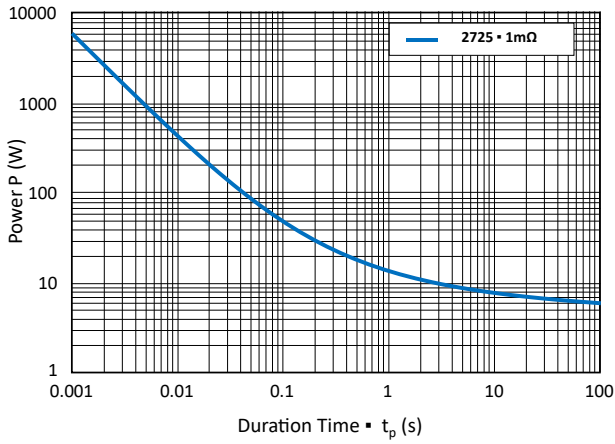
Size	R Resistance (mΩ)	P <sub>70</sub> Power Rating at 70°C (W)	P <sub>100</sub> Power Rating at 100°C (W)	TCR <sub>Comp</sub> Temperature Coefficient Component (ppm)	TCR <sub>Elem</sub> Temperature Coefficient Element (ppm)	Element Material	Part Number
<b>2725</b>	0.20	12	5	±100	< ±30	MnCu	MCSSA2725E □ O0L20
	0.30	10	5	±100	< ±30	MnCu	MCSSA2725E □ N0L30
	0.50	9	5	±75	< ±30	MnCu	MCSSA2725E □ J0L50
	0.70	8	5	±75	< ±30	MnCu	MCSSA2725E □ G0L70
	1.00	7	5	±75	< ±30	MnCu	MCSSA2725E □ B1L00
	2.00	6	4	±50	< ±40	NiCr	MCSSA2725E □ A2L00
	3.00	5	3	±50	< ±40	NiCr	MCSSA2725E □ I3L00
	4.00	5	3	±50	< ±40	NiCr	MCSSA2725E □ I4L00
	5.00	5	3	±50	< ±40	NiCr	MCSSA2725E □ I5L00
<b>4026</b>	0.20	10	7	±100	< ±30	MnCuSn	MCSSA4026E □ N0L20
	0.30	10	7	±100	< ±30	MnCu	MCSSA4026E □ N0L30
	0.50	10	7	±100	< ±30	MnCu	MCSSA4026E □ N0L50
	1.00	9	7	±75	< ±30	MnCu	MCSSA4026E □ J1L00
	1.50	7	5	±75	< ±40	NiCr	MCSSA4026E □ B1L50
	2.00	7	5	±50	< ±40	NiCr	MCSSA4026E □ B2L00
	3.00	7	5	±50	< ±40	NiCr	MCSSA4026E □ B3L00
	4.00	7	5	±50	< ±40	NiCr	MCSSA4026E □ B4L00
	5.00	7	5	±50	< ±40	NiCr	MCSSA4026E □ B5L00

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

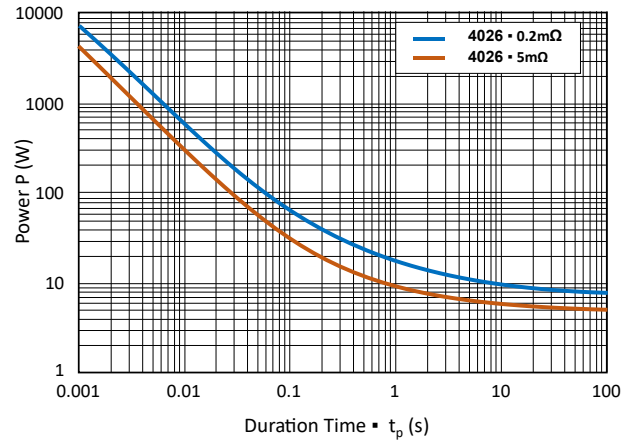
**DERATING CURVE**
**Power Derating Characteristics at T<sub>A</sub> = 70°C**

**Power Derating Characteristics at T<sub>T</sub> = 100°C**


## PULSE CAPABILITY

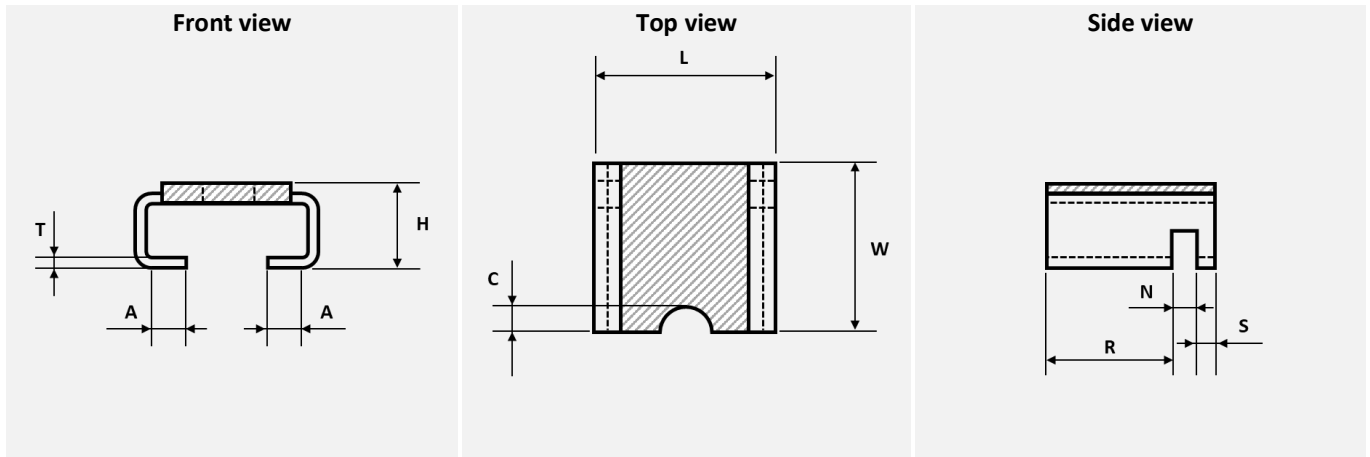
Pulsed Power Characteristics - MCSSA 2725 Series



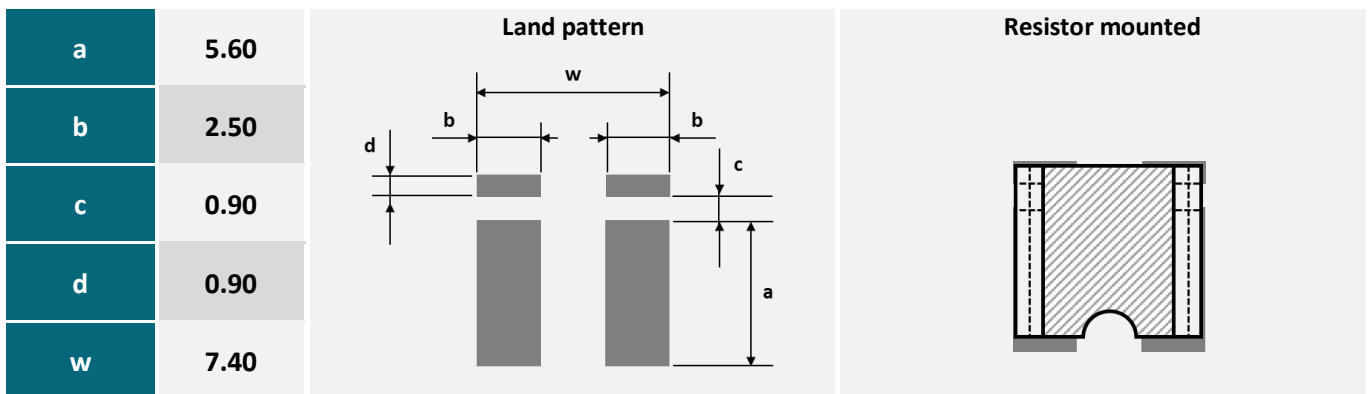
Pulsed Power Characteristics - MCSSA 4026 Series

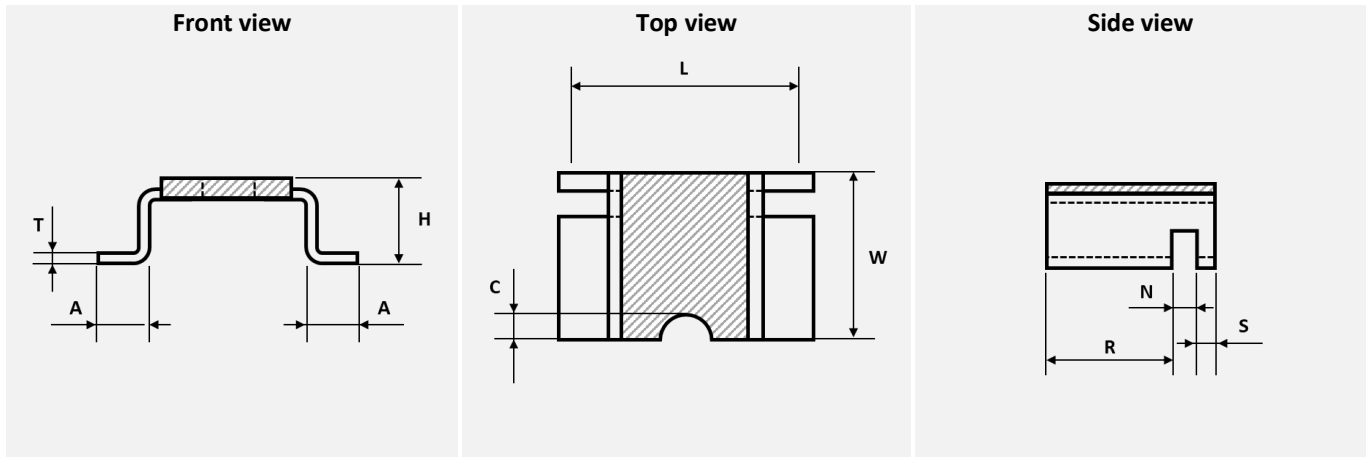


Note: Other pulsed power characteristics on request.

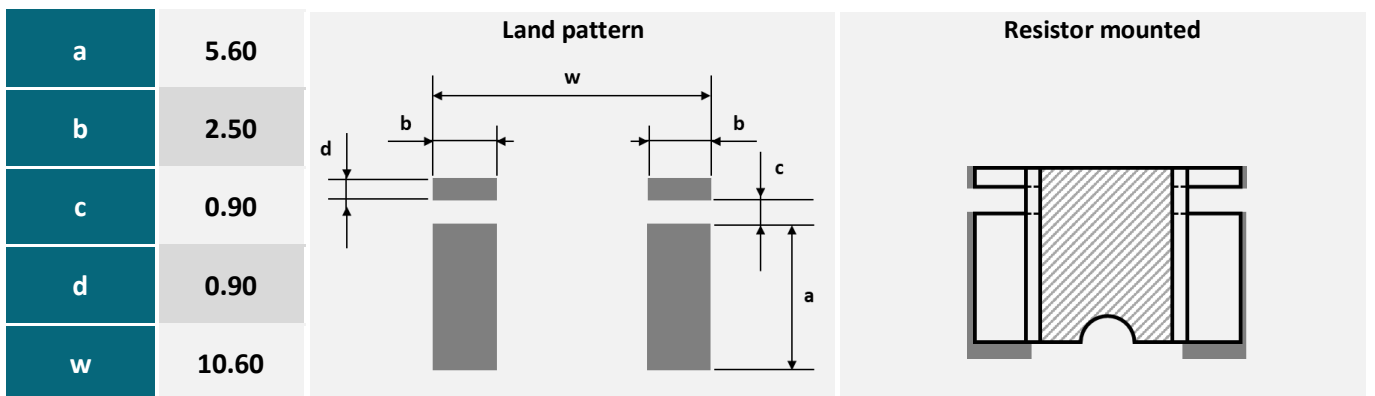
**PACKAGE OUTLINE ▲ All dimensions in mm**
**Size 2725**


Size	R Resistance (mΩ)	L	W	H	A	T	R (Ref.)	N	S	C (Max.)
2725	0.20	6.90±0.15	6.60±0.25	3.70±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	0.30	6.90±0.15	6.60±0.25	3.40±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	0.50	6.90±0.15	6.60±0.25	3.10±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	0.70	6.90±0.15	6.60±0.25	2.90±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	1.00	6.90±0.15	6.60±0.25	2.80±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	2.00	6.90±0.15	6.60±0.25	2.90±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	3.00	6.90±0.15	6.60±0.25	2.80±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	4.00	6.90±0.15	6.60±0.25	2.80±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
5.00	6.90±0.15	6.60±0.25	2.80±0.2	1.90±0.2	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0	

**RECOMMENDED PAD LAYOUT (REFERENCE ONLY) ▲ All dimensions in mm**
**Size 2725**


**PACKAGE OUTLINE ▲ All dimensions in mm**
**Size 4026**


Size	R Resistance (mΩ)	L	W	H	A	T	R (Ref.)	N	S	C
4026	0.20	10.1±0.2	6.6±0.3	3.81±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	0.30	10.1±0.2	6.6±0.3	3.58±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	0.50	10.1±0.2	6.6±0.3	2.95±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	1.00	10.1±0.2	6.6±0.3	2.68±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	1.50	10.1±0.2	6.6±0.3	3.02±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	2.00	10.1±0.2	6.6±0.3	2.90±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	3.00	10.1±0.2	6.6±0.3	2.79±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
	4.00	10.1±0.2	6.6±0.3	2.79±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0
5.00	10.1±0.2	6.6±0.3	2.79±0.2	2.0±0.1	0.4±0.05	5.0	0.99±0.15	0.7±0.1	1.0	

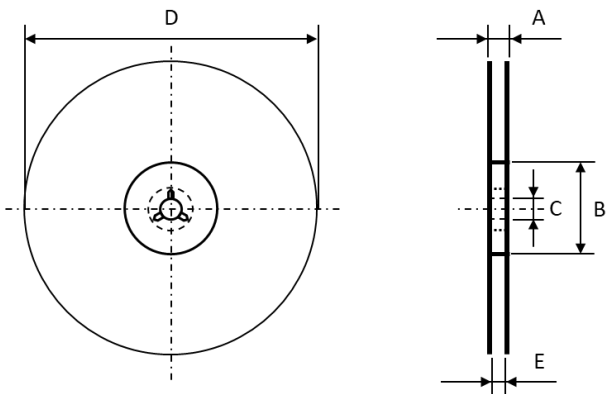
**RECOMMENDED PAD LAYOUT (REFERENCE ONLY) ▲ All dimensions in mm**
**Size 4026**


## PRODUCT CODE

Example: MCSSA series ▲ AEC-Q200 ▲ Size 4026 ▲ 0.50mΩ ▲ ±1% ▲ 10W ▲ Tape & Reel

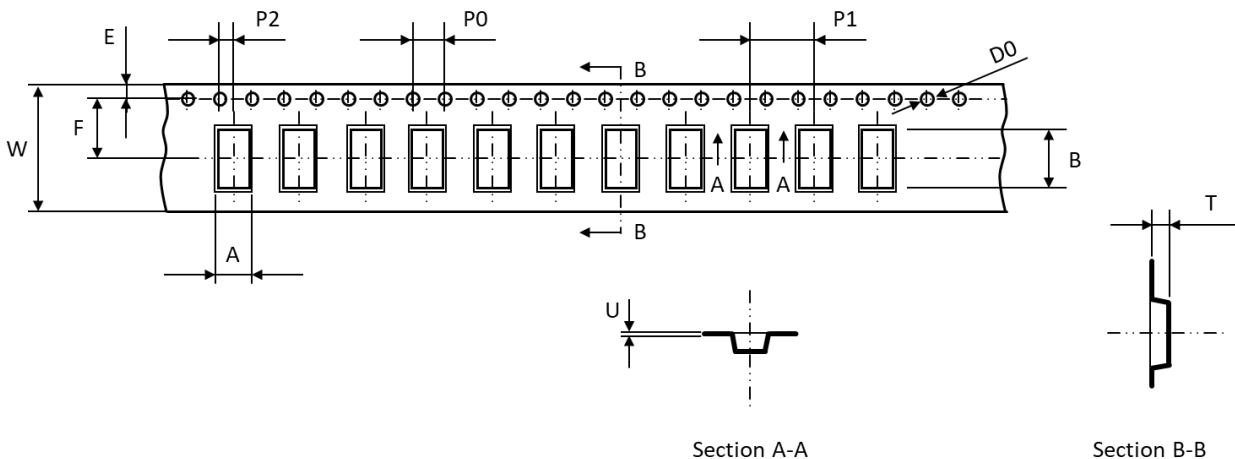
MCSSA		4026		E		F		N		0L50	
Series		Dimensions		Packaging		Tolerance		Power Rating		Resistance	
Code	Desc.	Code	Size	Code	Desc.	Code	%	Code	P70 (W)	Code	mΩ
MCSSA	AEC-Q200	2725	2725	E	Emboss	F	±1	I	5	0L20	0.20
		4026	4026			G	±2	A	6	0L30	0.30
						J	±5	B	7	0L50	0.50
								G	8	0L70	0.70
								J	9	1L00	1.00
								N	10	1L50	1.50
								O	12	2L00	2.00
										3L00	3.00
										4L00	4.00
										5L00	5.00

## REEL DIMENSIONS ▲ All dimensions in mm

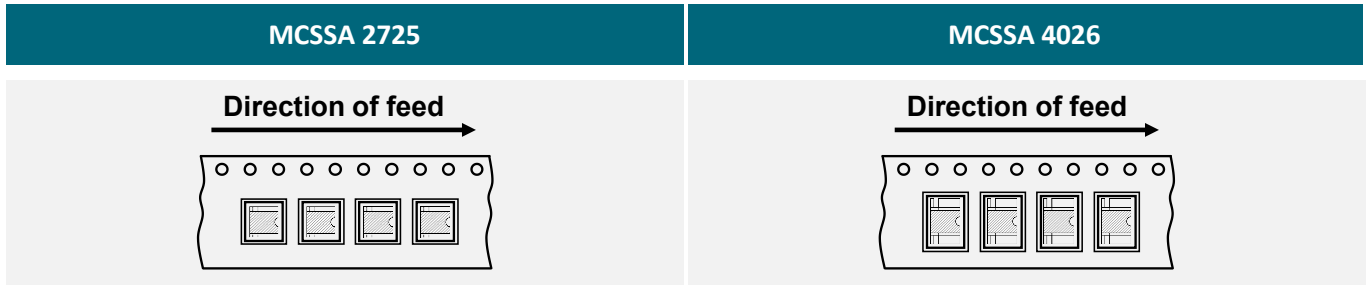


Size	A	B	C	D	E
2725	20.7±1.0	99±0.5	13±0.5	330±1.0	16.7±1.0
4026	20.7±1.0	99±0.5	13±0.5	330±1.0	16.7±1.0

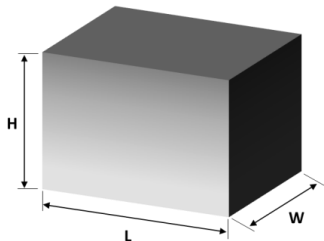
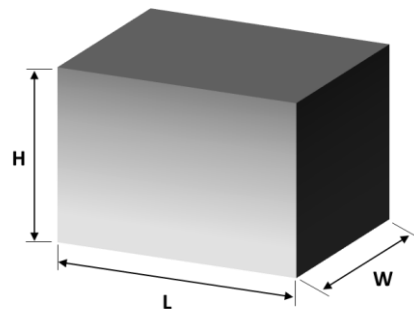
## TAPE DIMENSIONS ▲ All dimensions in mm



Size	A	B	E	F	W	P0	P1	P2	D0	T (Ref.)	U (Ref.)
2725	7.0±0.1	7.0±0.1	1.75±0.1	7.5±0.1	16.0±0.2	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	3.1±0.1	0.35±0.1
4026	7.0±0.1	10.5±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	3.1±0.1	0.30±0.1

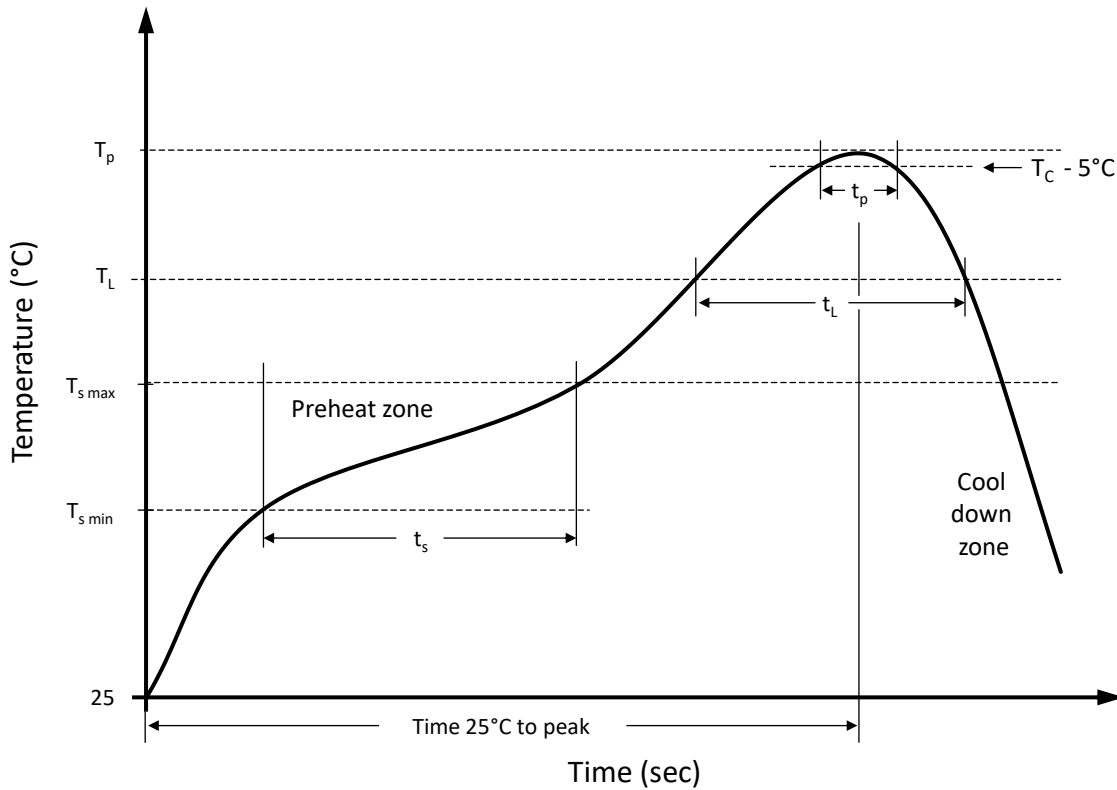
**TAPE ▲ DIRECTION OF FEED**

**PACKAGING**

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
2725	1 400	4 200	340 x 350 x 50	25 200	360 x 320 x 360
4026	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	$T_A = 22 \text{ to } 28^\circ\text{C}$	RH = 40 to 75%	1

## RECOMMENDED REFLOW SOLDERING PROFILE



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

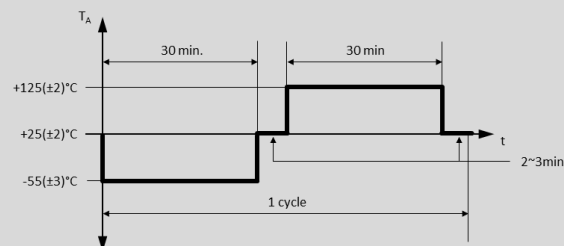
Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s\ min}$	100 °C	150 °C
Preheat temperature max.	$T_{s\ max}$	150 °C	200 °C
Preheat time $t_s$ from $T_{s\ min}$ to $T_{s\ max}$	$t_s$	120 seconds	120 seconds
Ramp-up rate ( $T_L$ to $T_p$ )		max. 3 °C/second	max. 3 °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	<p>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.</p> <p>Unit: mm</p>	JIS C 5202-6.1	$\Delta R: \pm(1\%+0.0005\Omega)$
10	Solderability	<p>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)</p> <p>h = 10mm H = 10mm min.</p>	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

## DISCLAIMER

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All MGT products with the technical specifications described are suitable for use in certain applications. Operating, production, storage and environmental conditions can have a massive influence on the parameters mentioned in the data sheets, which cause the performance to vary over time.

It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

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