

# Metal Alloy Low-Ohmic Resistor AEC-Q200 Current Sensing Type

MLR-MA Series

MERITEK

## FEATURE

- Operating Temperature: -55 ~ +170°C
- ACE-Q200 Compliant
- T.C.R.  $\leq \pm 50 \text{ppm}/^\circ\text{C}$
- Low resistance / Low TCR
- Excellent long term stability
- High precision current sensing and voltage division
- Application: Entertainment, Power supply, Measuring instrument, Industrial, Battery management system



## PART NUMBERING SYSTEM

MLR    1206    3    R050    J    MA  
(1)        (2)        (3)        (4)        (5)        (6)



No	Item	Code	Description	Series Reference
(1)	Meritek Series	MLR	Metal Alloy Resistor Series	Low-Ohmic Current Sensing, AEC-Q200 Compliant
(2)	Size Code	1206	EIA size:1206 (3.2x1.6mm)	0805,1206, 2010, 2512, 2725, 2728, 2817, 4527
(3)	Power Rating	3	3:3.0W	C:1/2W, E:3/4W, 1:1W, A:1.5W, 2:2W, 4:4.0W, 5:5.0W
(4)	Resistance	R050	R050: 50mΩ	R250: 0.250 mΩ ~ 1R00: 1000mΩ
(5)	Tolerance	J	J: $\pm 5\%$	D: $\pm 0.5\%$ , F: $\pm 1\%$ , G: $\pm 2\%$
(6)	Internal Code	MA	Internal Control Code	Internal or Project Reference

## ELECTRICAL CHARACTERISTIC

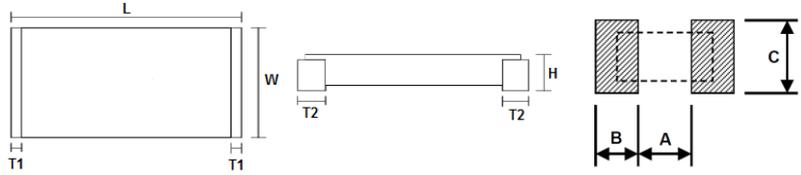
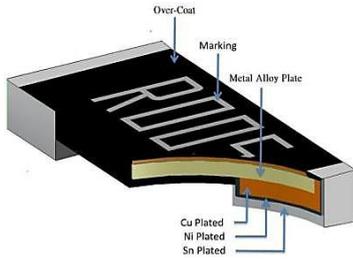
Size	Power Rating at 70°C	Max Rating Current	Max Overload Current	Resistance Range (mΩ)		TCR (PPM/°C)
				$\pm 0.5\%$	$\pm 1\%, \pm 2\%, \pm 5\%$	
0805	3/4W	15.81A	31.62A	10~50	3~50	$\leq \pm 50$
	1W	18.26A	36.51A	10	3~10	
1206	1/2W	22.36A	44.72A	7~100	1~100	$\leq \pm 50$
	3/4W	27.39A	54.77A	7~50	1~50	
	1W	31.62A	63.25A	7~100	1~100	
	1.5W	38.73A	77.46A	7~50	1~50	
2010	3/4W	27.39A	61.24A	7~100	1~100	$\leq \pm 50$
	1W	31.62A	70.71A	7~70	1~70	
	1.5W	38.73A	77.46A	7~100	1~100	
2512	1W	44.72A	100.00A	7~680	0.5~680	$\leq \pm 50$
	2W	63.25A	141.42A	7~450	0.5~450	
	3W	77.46A	134.16A	7~100	0.5~100	
2725	4W	126.49A	252.98A	--	0.25~3	$\leq \pm 50$
2728	4W	31.62A	54.77A	7~600	4~600	$\leq \pm 50$
2817	3W	54.77A	109.54A	7~200	1~200	$\leq \pm 50$
4527	2W	44.72A	77.45A	7~100	1~100	$\leq \pm 50$
	3W	54.77A	94.87A	7~1000	1~1000	
	5W	70.71A	122.47A	7~500	1~500	

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## DIMENSIONS and CONSTRUCTION



Size	Resistance (mΩ)	L ±0.254 (mm)	W ±0.254 (mm)	H ±0.254 (mm)	T1 (mm)	T2 ±0.254 (mm)	A (mm)	B (mm)	C (mm)
0805	3~50	2.100	1.500	0.320	0~0.200	0.400	0.66	1.80	2.18
	3~10	2.100	1.500	0.320	0~0.200	0.400	0.66	1.80	2.18
1206	1~100	3.200	1.650	0.300	0~0.200	0.508	0.66	1.60	2.18
	1~50	3.200	1.650	0.390	0~0.200	0.508	0.66	1.60	2.18
	1~2	3.200	1.650	0.670	0~0.200	0.508	0.66	1.60	2.18
	3~100	3.200	1.650	0.490	0~0.200	0.508	0.66	1.60	2.18
	1~50	3.200	1.650	0.580	0~0.200	0.508	0.66	1.60	2.18
2010	1~100	5.100	2.400	0.310	0~0.200	0.840	2.41	2.29	2.92
	1~70	5.100	2.400	0.460	0~0.200	0.840	2.41	2.29	2.92
	1~2	5.100	2.400	0.670	0~0.200	0.840	1.22	2.29	2.92
	2.5~30	5.100	2.400	0.460	0~0.200	0.840	2.41	2.29	2.92
	31~100	5.100	2.400	0.590	0~0.200	0.840	2.41	2.29	2.92
2512 (1W)	0.5~1	6.350	3.050	0.670	0.200~1.000	2.200	1.27	3.05	3.68
	1.5	6.350	3.050	0.560	0.200~1.000	2.000	1.27	3.05	3.68
	2	6.350	3.050	0.560	0.200~1.000	1.400	3.18	2.11	3.68
	2.5~100	6.350	3.050	0.560	0.200~1.000	1.100	3.50	1.90	3.68
	101~680	6.350	3.050	0.490	0.200~1.000	0.850	3.50	1.90	3.68
2512 (2W)	0.5~1	6.350	3.050	0.670	0.200~1.000	2.200	1.27	3.05	3.68
	1.5	6.350	3.050	0.560	0.200~1.000	2.000	1.27	3.05	3.68
	2	6.350	3.050	0.560	0.200~1.000	1.400	3.18	2.11	3.68
	2.5~100	6.350	3.050	0.560	0.200~1.000	1.100	3.50	1.90	3.68
	101~450	6.350	3.050	0.610	0.200~1.000	0.850	3.50	1.90	3.68
2512 (3W)	0.5~1	6.350	3.050	0.670	0.200~1.000	2.200	1.27	3.05	3.68
	1.5	6.350	3.050	0.670	0.200~1.000	2.000	1.27	3.05	3.68
	2	6.350	3.050	0.670	0.200~1.000	1.400	3.18	2.11	3.68
	2.5~50	6.350	3.050	0.670	0.200~1.000	1.100	3.50	1.90	3.68
	51~100	6.350	3.050	0.740	0.200~1.000	1.100	3.50	1.90	3.68
2725	0.25	6.800	6.350	0.820	0.200~1.000	2.300	1.32	3.18	6.86
	0.5	6.800	6.350	0.690	0.200~1.000	2.300	1.32	3.18	6.86
	1	6.800	6.350	0.690	0.200~1.000	1.800	3.00	2.34	6.86
	1.5~3	6.800	6.350	0.610	0.200~1.000	1.800	3.00	2.34	6.86

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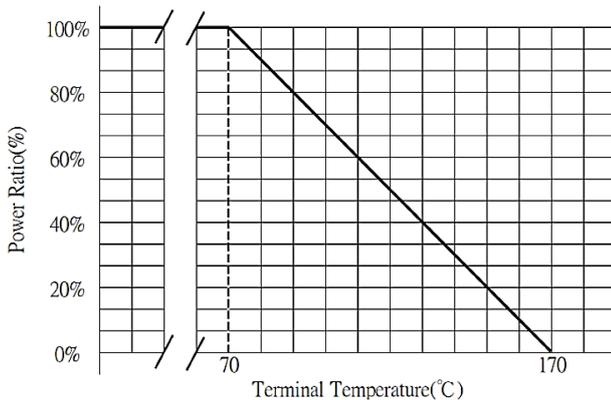
MLR-MA Series

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## DIMENSIONS

Size	Resistance (mΩ)	L ±0.254 (mm)	W ±0.254 (mm)	H ±0.254 (mm)	T1 (mm)	T2 ±0.254 (mm)	A (mm)	B (mm)	C (mm)
2728	4~50	6.600	6.700	0.720	0.200~1.000	1.200	3.51	2.75	7.82
	51.0~450	6.600	6.700	0.840	0.200~1.000	1.200	3.51	2.75	7.82
	451~600	6.600	4.200	0.770	0.200~1.000	1.200	3.51	2.75	7.82
2817	1	7.100	4.200	0.690	0.200~1.000	1.800	3.51	2.75	7.82
	2~30	7.100	4.200	0.610	0.200~1.000	1.500	3.11	2.45	7.82
	31~100	7.100	4.200	0.720	0.200~1.000	1.500	3.11	2.45	7.82
	101~130	7.100	4.200	0.770	0.200~1.000	1.500	3.11	2.45	7.82
	131~200	7.100	4.200	0.690	0.200~1.000	1.500	3.11	2.45	7.82
4527	1~100	11.3±0.5	6.6±0.5	0.670	0.200~1.000	2.000	6.43	3.40	8.74
	1~680	11.3±0.5	6.6±0.5	0.770	0.200~1.000	2.000	6.43	3.40	8.74
	681m~1	11.3±0.5	6.6±0.5	0.690	0.200~1.000	2.000	7.63	2.93	8.74
	1	11.3±0.5	6.6±0.5	0.790	0.200~1.000	3.000	4.50	4.50	8.74
	1.5	11.3±0.5	6.6±0.5	0.840	0.200~1.000	2.000	4.50	4.50	8.74
	2~500	11.3±0.5	6.6±0.5	0.840	0.200~1.000	2.000	7.63	2.93	8.74

## POWER DERATING CURVE



Notes: The following equation may be used to determine the DC or AC currents (RMS) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

$$I = \sqrt{\frac{P}{R}}$$

I: Rating Current (A)  
P: Rating Power (W)  
R: Resistance (Ω)

## MATERIAL OF ALLOY

Series	CuMn	FeCrAl	CuMnSn
MLR0805	R003~R011	R012~R050	-
MLR1206	R002~R010	R011~R100	R001
MLR2010	R002~R007	R008~R100	R001
MLR2512	R001~R006	R007~R680	R0005
MLR2725	R0005~R0025	R003	R00025
MLR2728	-	R004~R600	-
MLR2817	R001~R005	R006~R200	-
MLR4527	R001~R005	R006~1R	-

**RELIABILITY TEST CONDITION AND REQUIREMENT**

Test	Standard	Condition	Requirement																																	
Temperature Coefficient of Resistance (T.C.R.)	JIS-C5201-1 4.8	$T.C.R. (ppm/^{\circ}C) = \frac{(R2 - R1)}{R1(T2 - T1)} \times 10^6$ R1: resistance at room temperature T1 R2: resistance at 150°C (T2)	As Specified																																	
Short Time Overload	JIS-C-5201-1 4.13	Rating power duration: 5 seconds <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Size</th> <th>Power Rating</th> <th>Times of Rated Power</th> </tr> </thead> <tbody> <tr><td>0805</td><td>3/4W, 1W</td><td>4</td></tr> <tr><td>1206</td><td>1/2W, 3/4W, 1W</td><td>4</td></tr> <tr><td>2010</td><td>3/4W, 1W</td><td>5</td></tr> <tr><td>2010</td><td>1.5W</td><td>4</td></tr> <tr><td>2512</td><td>1W, 2W</td><td>5</td></tr> <tr><td>2512</td><td>3W</td><td>3</td></tr> <tr><td>2725</td><td>4W</td><td>4</td></tr> <tr><td>2728</td><td>4W</td><td>3</td></tr> <tr><td>2817</td><td>3W</td><td>4</td></tr> <tr><td>4527</td><td>2W, 3W, 5W</td><td>3</td></tr> </tbody> </table>	Size	Power Rating	Times of Rated Power	0805	3/4W, 1W	4	1206	1/2W, 3/4W, 1W	4	2010	3/4W, 1W	5	2010	1.5W	4	2512	1W, 2W	5	2512	3W	3	2725	4W	4	2728	4W	3	2817	3W	4	4527	2W, 3W, 5W	3	$ \Delta R/R  \leq \pm 0.5\%$ , (4527): $ \Delta R/R  \leq \pm 2.0\%$
Size	Power Rating	Times of Rated Power																																		
0805	3/4W, 1W	4																																		
1206	1/2W, 3/4W, 1W	4																																		
2010	3/4W, 1W	5																																		
2010	1.5W	4																																		
2512	1W, 2W	5																																		
2512	3W	3																																		
2725	4W	4																																		
2728	4W	3																																		
2817	3W	4																																		
4527	2W, 3W, 5W	3																																		
Temperature Cycling	JESD22 Method JA-104	1000 cycles (-55°C to +125°C) measurement at 24±4 hours after test conclusion	0.1%, 0.5%, 1%: $\pm(0.5\%+0.05\Omega)$ 2%, 5%: $\pm(1.0\%+0.10\Omega)$																																	
Resistance to Solvent	MIL-STD-202 Method 215	Add aqueous wash chemical-OKEM clean or equivalent	1%: $\pm(0.5\%+0.05\Omega)$ 5%: $\pm(0.5\%+0.05\Omega)$																																	
High Temperature Exposeure (Storage)	MIL-STD-202 Method 108	1000 hrs. T=125°C	0.1%, 0.5%, 1%: $\pm(0.5\%+0.05\Omega)$ 2%, 5%: $\pm(2.0\%+0.05\Omega)$																																	
Biased Humidity	MIL-STD-202 Method 103	1000 hours 85°C/85% RH. 10% of operation power	0.1%, 0.5%, 1%: $\pm(1.0\%+0.05\Omega)$ 2%, 5%: $\pm(3.0\%+0.05\Omega)$																																	
Operation Life	MIL-STD-202 Method 108	125°C RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5hrs "ON" and 0.5hrs "OFF"	0.1%, 0.5%, 1%: $\pm(1.0\%+0.05\Omega)$ 2%, 5%: $\pm(3.0\%+0.10\Omega)$																																	
Mechanical Shock	MIL-STD-202 Method 213	Impact acceleration : 1500g Pulse duration : 0.5ms Number of shocks : 30 shocks ( 5 shocks for each face)	1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.1\Omega)$																																	
Vibration	MIL-STD-202 Method 204	5 g's for 20min., 12 cycles each of 3 orientations	1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.1\Omega)$																																	
Resistance to Soldering Heat	JIS-C-5201-1 4.18	260±5°C for 10 seconds	1%: $\pm(0.5\%+0.05\Omega)$ 5%: $\pm(1.0\%+0.05\Omega)$																																	
ESD	AEC-Q200-002 or ISO/DIS 10605	0402/ 0603 : 1kV 0805 and above : 2kV	For the product %																																	
Solderability	J-STD-002	4 hrs 155°C, dry heat 260±5°C 10sec.	1%: $\pm(0.5\%+0.05\Omega)$ 5%: $\pm(1.0\%+0.05\Omega)$																																	
Terminal Strength (SMD )	AEC Q200-006	0402/ 0603 : 8N 0805 and above : 17.7N	No broken																																	
Board Flex	AEC Q200-005	Bending once for 60 seconds	1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(1.0\%+0.05\Omega)$																																	

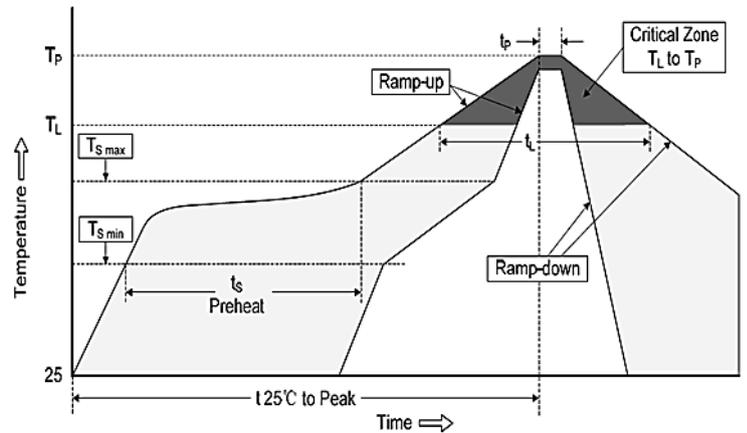
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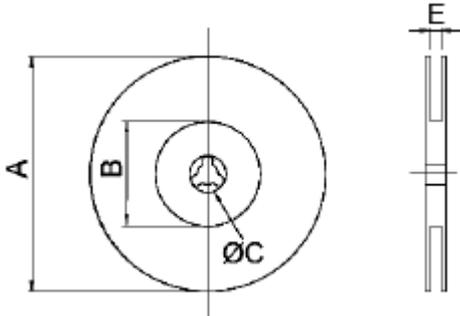
## SOLDERING CONDITION

Reflow Condition		
Average Ramp-up rate ( $T_{Smax}$ to $T_P$ )	3°C/second max	
Preheat	Temperature Min ( $T_{Smin}$ )	150°C
	Temperature Max ( $T_{Smax}$ )	180°C
	Time ( $t_L$ )	60~120seconds
Ramp-up Rate $T_{S(max)}$ to $T_L$	3°C/second max	
Reflow	Temperature ( $T_L$ )	220°C
	Time ( $T_L$ )	60 seconds max
Peak Temperature ( $T_P$ )	255°C~265°C	
Time within 5°C of actual peak Temperature ( $t_P$ )	10 seconds max	
Ramp-down rate	6°C/second	

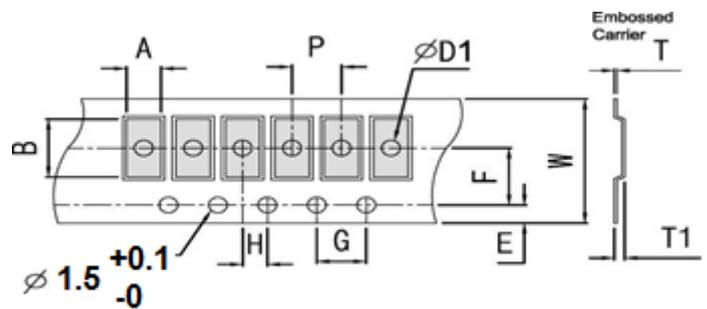


## PACKAGING SPECIFICATIONS

### Reel Specification & Packaging Quantity



### Plastic Tape Specification



Size	Reel Dimension (mm)						
	Parts Per Reel	Tape Width	Reel Diameter	$\phi A$	$\phi B$	$\phi C$	E
0805	5000	8mm	7"	178.0±1.0	60.0±0.5	13.2±0.5	12.0±0.5
1206	5000	8mm	7"	178.0±1.0	60.0±0.5	13.2±0.5	12.0±0.5
2010	4000	12mm	7"	178.0±1.0	60.0±0.5	13.5±0.5	16.2±0.5
2512	4000	12mm	7"	178.0±1.0	60.0±0.5	13.5±0.5	16.2±0.5
2725	2000	12mm	7"	178.0±1.0	60.0±0.5	13.5±0.5	16.2±0.5
2728	2000	12mm	7"	178.0±1.0	60.0±0.5	13.5±0.5	16.2±0.5
2817	1000	12mm	7"	178.0±1.0	60.0±0.5	13.5±0.5	16.2±0.5
4527	1000	24mm	7"	178.0±1.0	60.0±0.5	13.2±0.5	24.4±2.0

Size	Plastic Tape Dimension (mm)										
	A ±0.10	B ±0.10	W ±0.30	E ±0.10	F ±0.10	H ±0.10	G ±0.10	P ±0.10	ØD1 ±0.10	T1 ±0.10	T
0805	1.70	2.45	8.0	1.75	3.5	2.0	4.0	4.0	1.0	0.50	0.20±0.05
1206	2.03	3.55	8.0	1.75	3.5	2.0	4.0	4.0	1.0	0.70	0.20±0.05
2010	2.85	5.55	12.0	1.75	5.5	2.0	4.0	4.0	1.55	0.82	0.25±0.05
2512	3.50	6.75	12.0	1.75	5.5	2.0	4.0	4.0	1.55	0.90	0.20±0.05
2725	6.81	7.16	12.0	1.75	5.5	2.0	4.0	8.0	1.55	1.05	0.25±0.05
2728	7.10	7.05	12.0	1.75	5.5	2.0	4.0	8.0	1.55	0.95	0.20±0.05
2817	4.60	7.50	12.0	1.75	5.5	2.0	4.0	8.0	1.55	1.20	0.25±0.05
4527	7.38	12.0	24.0	1.75	11.5	2.0	4.0	12.0	1.50	1.05	0.30±0.10

\*Specifications subject to change without notice.