

METAL FILM RESISTOR

MELF & MINI-MELF MM, MML TYPE

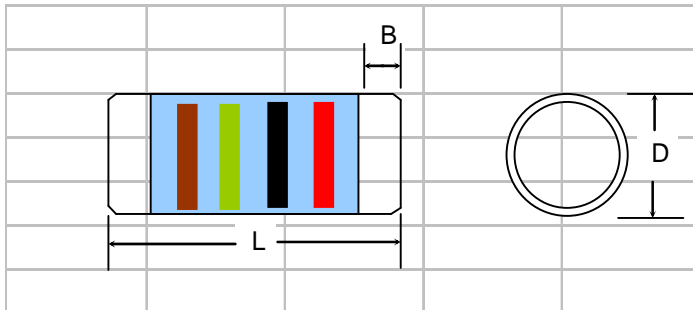
■ Features

- SMD enabled structure.
- Conformal Multi-layer Coating Against Humidity
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 10 \text{ PPM}/^\circ\text{C}$

■ Applications

- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

■ Construction and Dimension



Body Color : Light Blue

Marking: Color code (3 or 4 bands)

Type	Body Length (L)	Body Diameter (D)	Soldering spot (B)
MM102	2.0 \pm 0.1mm	1.3 \pm 0.05mm	0.5mm Min.
MML102	2.0 \pm 0.1mm	1.3 \pm 0.05mm	0.5mm Min.
MM204	3.5 \pm 0.2mm	1.4 \pm 0.15mm	0.5mm Min.
MML204	3.5 \pm 0.2mm	1.4 \pm 0.15mm	0.5mm Min.
MM207	5.9 \pm 0.2mm	2.2 \pm 0.20mm	0.5mm Min.
MML207	5.9 \pm 0.2mm	2.2 \pm 0.20mm	0.5mm Min.

General Specification

Type	Power Rating (at 70°C)	Max. Working Voltage	Max. Overload Voltage	Resistance Range		Resistance Tolerance	Standard Resistance Value
				Min.	Max.		
MM102	0.125W	150V	300V	0 & 1 Ω	2MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24
MML102	0.2W	200V	400V	0 & 1 Ω	2MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24
MM204	0.25W	200V	400V	0 & 1 Ω	10MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24
MML204	0.4W	200V	400V	0 & 1 Ω	10MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24
MM207	0.5W	300V	500V	0 & 1 Ω	10MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24
MML207	1W	350V	700V	0 & 1 Ω	10MΩ	±0.1%~±1%	E-24/E-96
						±2%, 5%	E-24

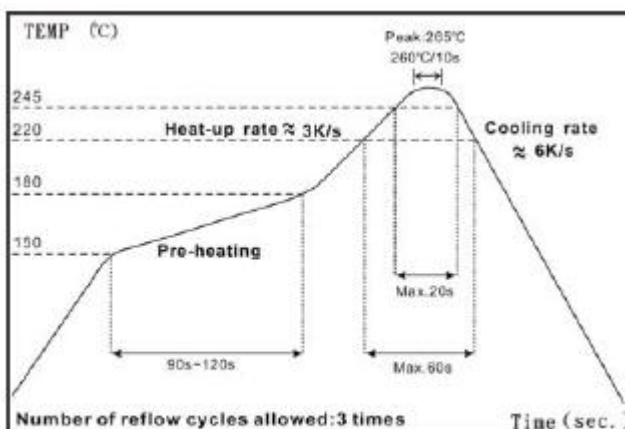
* For zero-ohm jumper, resistance value is under 20 mΩ.

* Please consult factory for values out of above range, or the range of tolerance ±0.1%, ±0.25% and ±0.5%

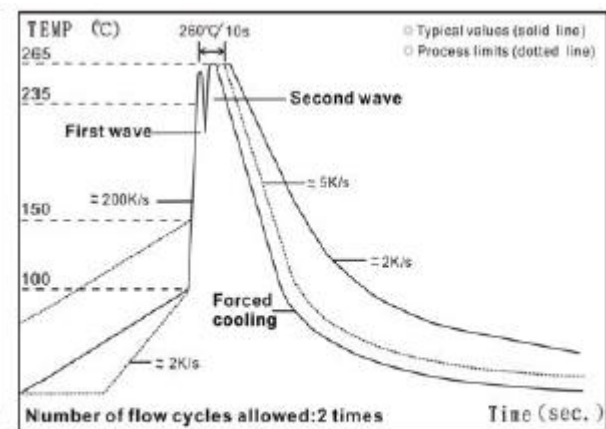
* Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

* Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260° C : 10s
- (2) Time of wave soldering at maximum temperature point 260° C : 10s
- (3) Time of soldering iron at maximum temperature point 410° C : 5s

■ Environmental Characteristics

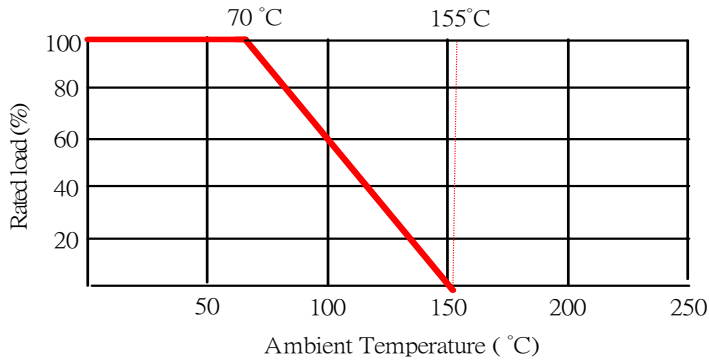
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	0204/0207: $\pm(0.15\%+0.05\Omega)$ 0102: $\pm(0.5\%+0.05\Omega)$	RCWV*2.5 or Max. Overload voltage whichever is lower
Insulation Resistance	$\geq 10G$	Max. Overload voltage for 1 minute
Endurance	0204/0207: $\pm(0.5\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	70 \pm 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	0204/0207: $\pm(1.0\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	40 \pm 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Thermal Shock	0204/0207: $\pm(0.5\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	-55°C/+155°C, No. of cycles required – 300, Maximum Transfer time – 20 sec, Dwell time – 15 min. Air-Air
Bending Strength	$\pm(0.5\%+0.05\Omega)$	Bending once for 5 seconds with 2mm
Solderability	95% min. coverage	245 \pm 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	260 \pm 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 \pm 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower.

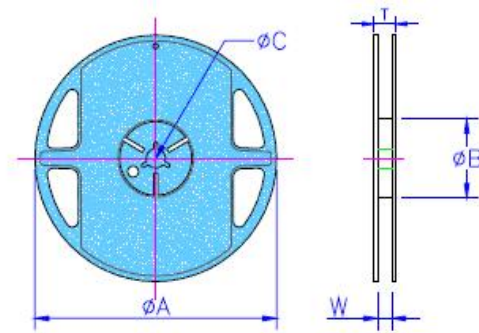
Storage Temperature: 25 \pm 3°C; Humidity < 80%RH

Reference standards : JIS-C 5201-1, 6429; IEC 60115-1; 60068-2-58; AEC-Q200; MIL-STD-202; JESD22

Derating Curve



Packaging



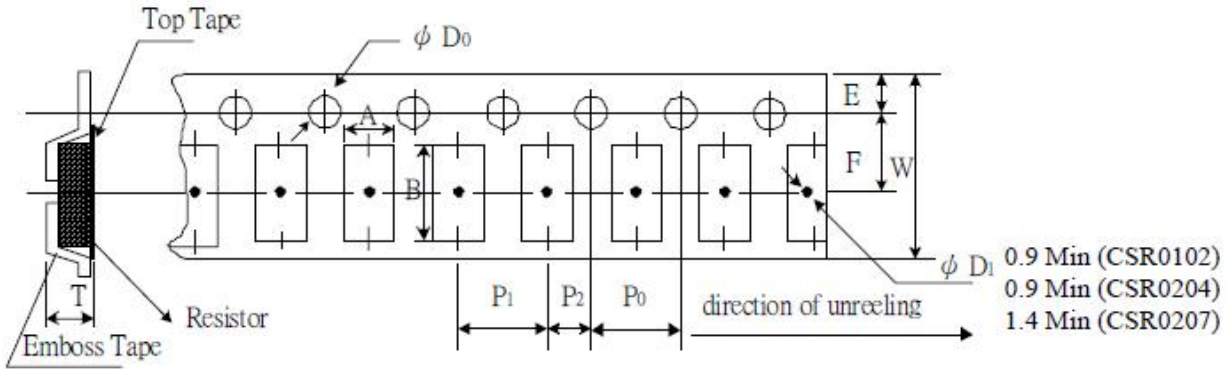
Packaging Quantity & Reel Specifications

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss
	Diameter	(mm)	(mm)	(mm)	(mm)	(mm)	Plastic Tape (EA)
MM/MML102	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
MM/MML204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
MM/MML207	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	13.0±0.5	15.5±0.5	2,000

Part Numbering

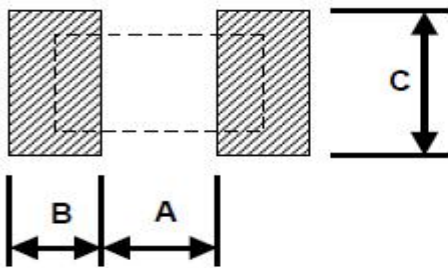
<u>MM204</u>	<u>F</u>	<u>E</u>	<u>- 100KR</u>
Type	Tolerance	PPM	Ohmic value
MM102	J = ±5%	C = ±15	10R=10Ω
MM204	G = ±2%	D = ±25	120R=120Ω
MML204	F = ±1%	E = ±50	1K2R=1.2KΩ
MM207	D = ±0.5%	F = ±100	1MR=1MΩ
	B = ±0.1%		

■ **Emboss Plastic Tape Specifications**



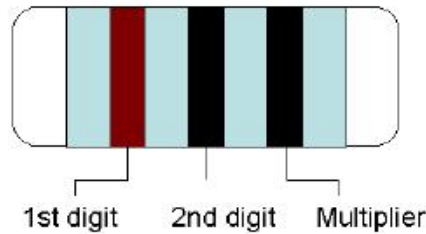
Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
MM/MML102	1.50±0.10	2.30±0.10	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.70±0.10
MM/MML204	1.55±0.10	3.65±0.10	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
MM/MML207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

■ **Recommend Land Pattern**

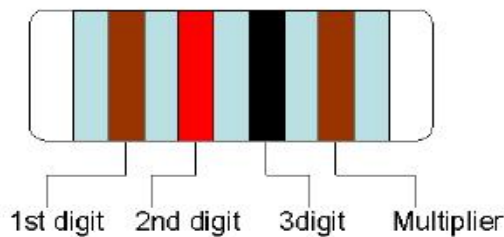


Type	A	B	C
	(mm)	(mm)	(mm)
MM/MML102	1.0	0.8	1.5
MM/MML204	1.6	1.2	1.6
MM/MML207	3.0	1.7	2.4

Marking & Resistance
Tolerance



±5%	E-24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
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±1%	E-96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74
		1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.10	2.15	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87	2.94	3.01	3.09
		3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49
		5.62	5.76	5.90	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45	8.66	8.87	9.09	9.31	9.53	9.76
±0.5%	E-192	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	13.0	13.2
		13.3	13.5	13.7	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.2	17.4	17.6
		17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.1	22.3	22.6	22.9	23.2	23.4
		23.7	24.0	24.3	24.6	24.9	25.2	25.5	25.8	26.1	26.4	26.7	27.1	27.4	27.7	28.0	28.4	28.7	29.1	29.4	29.8	30.1	30.5	30.9	31.2
		31.6	32.0	32.4	32.8	33.2	33.6	34.0	34.4	34.8	35.2	35.7	36.1	36.5	37.0	37.4	37.9	38.3	38.8	39.2	39.7	40.2	40.7	41.2	41.7
		42.2	42.7	43.2	43.7	44.2	44.8	45.3	45.9	46.4	47.0	47.5	48.1	48.7	49.3	49.9	50.5	51.1	51.7	52.3	53.0	53.6	54.2	54.9	55.6
		56.2	56.9	57.6	58.3	59.0	59.7	60.4	61.2	61.9	62.6	63.4	64.2	64.9	65.7	66.5	67.3	68.1	69.0	69.8	70.6	71.5	72.3	73.2	74.1
75.0	75.9	76.8	77.7	78.7	79.6	80.6	81.6	82.5	83.5	84.5	85.6	86.6	87.6	88.7	89.8	90.9	92.0	93.1	94.2	95.3	96.5	97.6	98.8		

Color	Digit	Multiplier
Silver	-	10 ⁻²
Gold	-	10 ⁻¹
Black	0	10 ⁰
Brown	1	10 ¹
Red	2	10 ²
Orange	3	10 ³
Yellow	4	10 ⁴
Green	5	10 ⁵
Blue	6	10 ⁶
Violet	7	10 ⁷
Grey	8	10 ⁸
White	9	10 ⁹