

MMV Series

Automotive Grade Chip



FEATURES

- AEC-Q200 Compliance
- Highly reliable multilayer electrode construction
- Compatible with all soldering process

APPLICATIONS

- Automotive Industry
- Telecommunication Equipments
- Radio and Tape Recorders, TV Tuners
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments

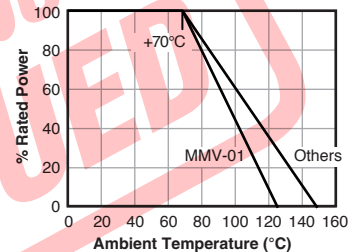
SERIES SPECIFICATIONS

Series	Power @70°C mW	Jumper Current Rated/Max. Overload	Max. Oper. Voltage	Overload Voltage	Resistance Range (Ω)
Standard					
MMV01 (0201)	1/20W	0.5A / 1A	25V	50V	1Ω - 10MΩ
MMV02 (0402)	1/16W	1A / 2A	50V	100V	1Ω - 10MΩ
MMV03 (0603)	1/10W	1A / 3A	75V	150V	1Ω - 10MΩ
MMV05 (0805)	1/8W	2A / 5A	150V	300V	1Ω - 10MΩ
MMV06 (1206)	1/4W	2A / 5A	200V	400V	1Ω - 10MΩ
MMV10 (1210)	1/2W	2A / 5A	200V	400V	1Ω - 10MΩ
MMV11 (2010)	3/4W	2A / 5A	200V	400V	1Ω - 10MΩ
MMV12 (2512)	1W	2A / 5A	250V	500V	1Ω - 10MΩ
High Precision					
MMV02 (0402)	1/16W		50V	100V	10Ω - 1MΩ
MMV03 (0603)	1/10W		75V	150V	10Ω - 1MΩ
MMV05 (0805)	1/8W		150V	300V	10Ω - 1MΩ
MMV06 (1206)	1/4W		200V	400V	10Ω - 1MΩ
MMV10 (1210)	1/3W		200V	400V	10Ω - 1MΩ
MMV11 (2010)	3/4W		200V	400V	10Ω - 1MΩ
MMV12 (2512)	1W		250V	500V	10Ω - 1MΩ
High Power Rating					
MMV02 (0402)	1/8W		50V	100V	1Ω - 1MΩ
MMV03 (0603)	1/4W		75V	150V	1Ω - 1MΩ
MMV05 (0805)	1/3W		150V	300V	1Ω - 1MΩ
MMV06 (1206)	1/2W		200V	400V	1Ω - 1MΩ
MMV11 (2010)	1W		200V	400V	1Ω - 1MΩ

CHARACTERISTICS

Oper. Temp. Range	-55°C to +155°C (MMV01: -55°C to +125°C)	
Resistance Tolerance	E24 & E96	±1%
	E24	±5%
	High-precision	±0.5%
Jumper Resistance	<50mΩ	
TCR	<1/10W	1/10+
	1Ω - 9.76Ω	±400 ±250
	10Ω - 1MΩ	±200 ±100
	1.02MΩ - 10MΩ	±400 ±250
Storage Temperature	15~28°C; Humidity < 80%RH	
Rated Voltage	$\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower	

Derating



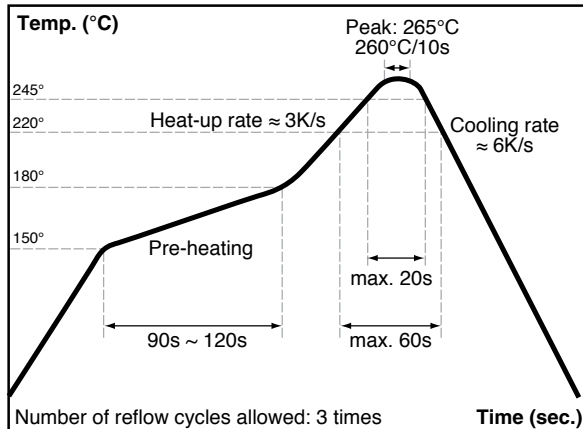
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MMV Series

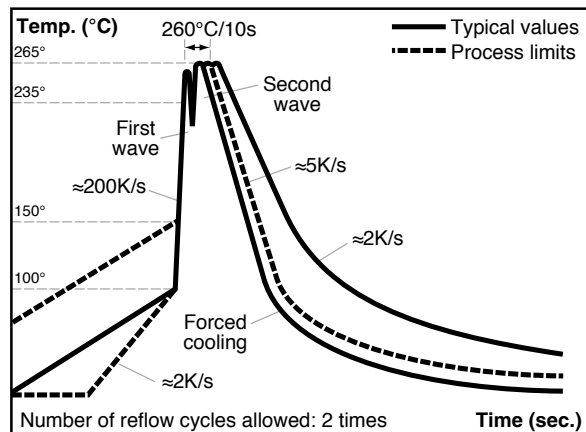
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SOLDERING

IR Reflow Soldering

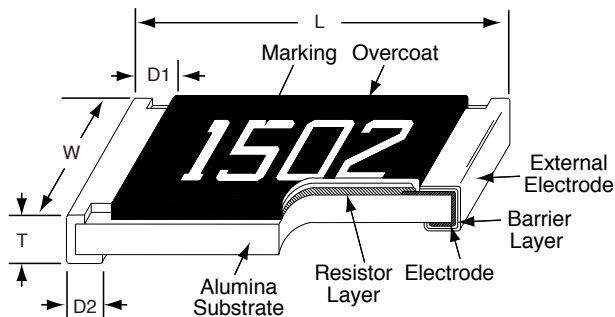


Wave Soldering (Flow Soldering)

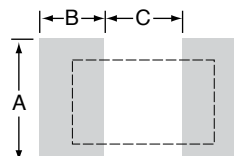


- (1) Time of IR reflow soldering at maximum temperature point 260°C: 10s
- (2) Time of wave soldering at maximum temperature point 260°C: 10s
- (3) Time of soldering iron at maximum temperature point 410°C: 5s

DIMENSIONS



Land pattern



Type	Size	L	W	T	D1	D2	A	B	C	Weight (g) (per 1,000)
MMV01	0201	0.60 ± 0.03	0.30 ± 0.03	0.23 ± 0.03	0.15 ± 0.05	0.15 ± 0.05	0.30	0.25	0.30	0.150
MMV02	0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.25 ± 0.10	0.50	0.45	0.60	0.620
MMV03	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	0.90	0.60	0.90	2.042
MMV05	0805	2.00 ± 0.10	1.25 ± 0.15	0.50 ± 0.10	0.30 ± 0.20	0.40 ± 0.20	1.20	0.70	1.30	4.368
MMV06	1206	3.20 ± 0.20	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20	2.00	0.90	1.60	8.947
MMV10	1210	3.20 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20	2.00	0.90	2.80	15.959
MMV11	2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20	3.80	0.90	2.80	24.241
MMV12	2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20	4.90	1.60	3.50	39.448

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PERFORMANCE

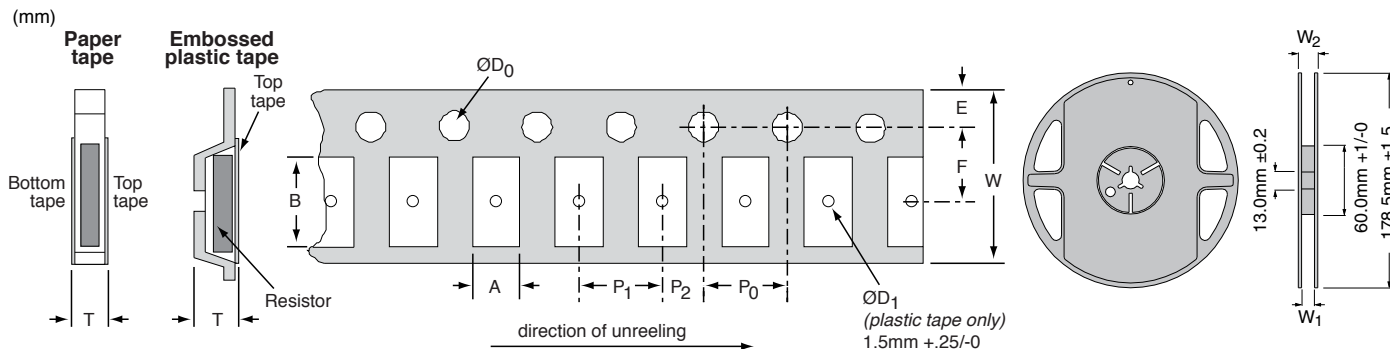
Item	Requirement		Jumper	Test Method
	±1% and below	±5%		
TCR		As Spec.		JIS-C-5201-1 4.8; IEC-60115-1 4.8; -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.13; IEC-60115-1 4.13; RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance		≥10G		JIS-C-5201-1 4.6; IEC-60115-1 4.6; Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	MIL-STD-202 Method 108; Condition D Steady State TA=125°C at derated power.; Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	MIL-STD-202 Method 103; 1000 hrs 85°C/85%RH 10% of operating power
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	MIL-STD-202 Method 108; at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	AEC-Q200-005; Bending once for 60 seconds ; 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability		95% min. coverage		JIS-C-5201-1 4.17; IEC-60115-1 4.17; J-STD-002; 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 210; 260±5°C for 10 seconds
Voltage Proof		No breakdown or flashover		JIS-C-5201-1 4.7; IEC-60115-1 4.7; 1.42 times Max. Operating Voltage for 1 minute
Leaching		Individual leaching area ≤5% Total leaching area ≤10%		JIS-C-5201-1 4.18; IEC-60068-2-58 8.2.1; 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	JESD22 Method JA-104; -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 213; Wave Form: Tolerance for half sine shock pulse. ; Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 204; 5 g's for 20 min., 12 cycles each of 3 orientations,; 10-2000 Hz
ESD		±(1%+0.05Ω)		AEC-Q200-002; Human body, 2KV
Resistance to Solvents	No visible damage on appearance and marking.			MIL-STD-202 Method 215; Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength		No broken		AEC-Q200-006; Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			UL-94; V-0 or V-1 are acceptable. Electrical test not required.; RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

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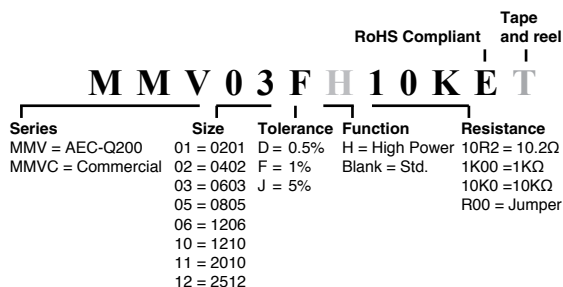
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TAPE AND REEL



	A	B	W	E	F	P0	P1	P2	D0	T	W1	W2	Qty.
Paper tape													
MMV-01	0.38 ±0.05	0.68 ±0.05	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.42 ±0.20	9.0 ±0.5	12.5 ±0.5	10,000
MMV-02	0.65 ±0.10	1.15 ±0.10	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.45 ±0.10	9.0 ±0.5	12.5 ±0.5	10,000
MMV-03	1.10 ±0.10	1.90 ±0.10	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.70 ±0.10	9.0 ±0.5	12.5 ±0.5	5,000
MMV-05	1.60 ±0.10	2.40 ±0.20	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.85 ±0.10	9.0 ±0.5	12.5 ±0.5	5,000
MMV-06	1.90 ±0.10	3.50 ±0.20	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.85 ±0.10	9.0 ±0.5	12.5 ±0.5	5,000
MMV-10	2.90 ±0.10	3.50 ±0.20	8.0 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50+0.1,-0	0.85 ±0.10	9.0 ±0.5	12.5 ±0.5	5,000
Embossed plastic tape													
MMV-11	2.8 ±0.10	5.5 ±0.10	12.0 ±0.30	1.75 ±0.10	5.5 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.50+0.1,-0	1.2+0	13.0 ±0.5	15.5 ±0.5	4,000
MMV-12	3.5 ±0.10	6.7 ±0.10	12.0 ±0.30	1.75 ±0.10	5.5 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.50+0.1,-0	1.2+0	13.0 ±0.5	15.5 ±0.5	4,000

ORDERING INFORMATION



Marking for 1% for 0805-2512

Examples

1000 = 100Ω
2201 = 2.2KΩ
1002 = 10KΩ
4992 = 49.9KΩ
1003 = 100KΩ

Marking for 5% for 0603-2512 (E24)

Examples	E24
101 = 100Ω 102 = 1KΩ	10 11 12 13 15 16 18 20 22 24 27 30 33 36 39 43 47 51 56 62 68 75 82 91

Marking for 1% for 0603 (E24)

3 digits marking in E24, When the E24 and E96 are the same resistance, this marking in E96

Examples
01A = 100Ω 05C = 11KΩ 123 = 12KΩ 273 = 27KΩ

Marking for 1% for 0603 (E96)

Code E96	Code E96	Code E96	Code E96
01 100	25 178	49 316	73 562
02 102	26 182	50 324	74 576
03 105	27 187	51 332	75 590
04 107	28 191	52 340	76 604
05 110	29 196	53 348	77 619
06 113	30 200	54 357	78 634
07 115	31 205	55 365	79 649
08 118	32 210	56 374	80 665
09 121	33 215	57 383	81 681
10 124	34 221	58 392	82 698
11 127	35 226	59 402	83 715
12 130	36 232	60 412	84 732
13 133	37 237	61 422	85 750
14 137	38 243	62 432	86 768
15 140	39 249	63 442	87 787
16 143	40 255	64 453	88 806
17 147	41 261	65 464	89 825
18 150	42 267	66 475	90 845
19 154	43 274	67 487	91 866
20 158	44 280	68 499	92 887
21 162	45 287	69 511	93 909
22 165	46 294	70 523	94 931
23 169	47 301	71 536	95 953
24 174	48 309	72 549	96 976

Code	Multiplier
A	10 ⁰
B	10 ¹
C	10 ²
D	10 ³
E	10 ⁴
F	10 ⁵
G	10 ⁶
H	10 ⁷
X	10 ⁻¹
Y	10 ⁻²
Z	10 ⁻³

Examples

1000 = 100Ω
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