

# 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



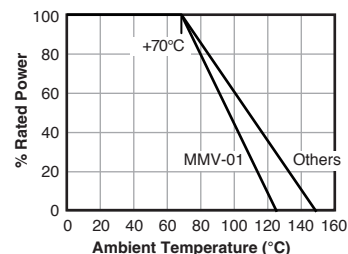
### SERIES SPECIFICATIONS

Series	Power @70°C mW	Jumper Rated Current	Max. Operating Voltage	Overload Voltage	Resistance Range (Ω)
<b>Standard</b>					
MMV01 (0201)	1/20W	1A	25V	50V	1Ω - 10MΩ
MMV02 (0402)	1/16W	1A	50V	100V	1Ω - 10MΩ
MMV03 (0603)	1/10W	1A	75V	150V	1Ω - 10MΩ
MMV05 (0805)	1/8W	2A	150V	300V	1Ω - 10MΩ
MMV06 (1206)	1/4W	2A	200V	400V	1Ω - 10MΩ
MMV10 (1210)	1/2W	2.5A	200V	400V	1Ω - 10MΩ
MMV11 (2010)	3/4W	3.5A	200V	400V	1Ω - 10MΩ
MMV12 (2512)	1W	4A	250V	500V	1Ω - 10MΩ
<b>High Precision</b>					
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
<b>High Power Rating</b>					
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

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

### Derating



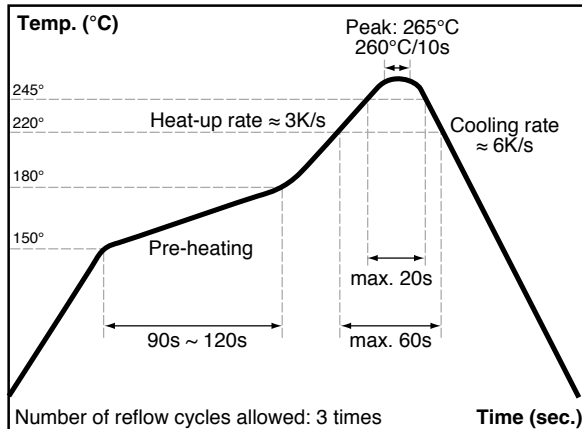
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# MMV Series

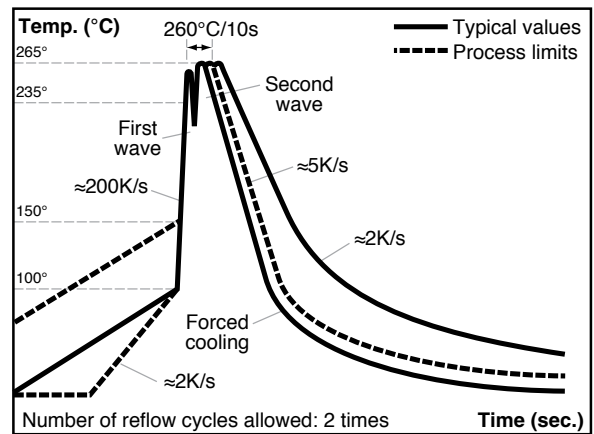
## Automotive Grade Chip

### SOLDERING

#### IR Reflow Soldering

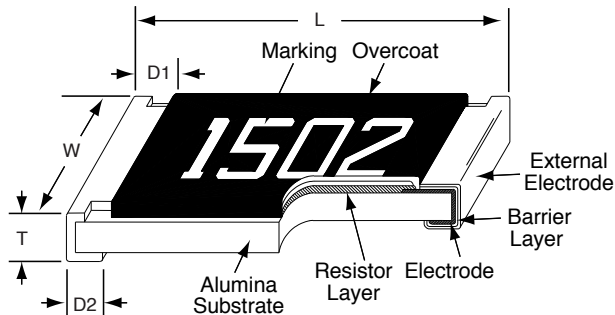


#### Wave Soldering (Flow Soldering)

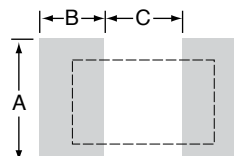


- (1) Time of IR reflow soldering at maximum temperature point 260°C: 10s
- (2) Time of wave soldering at maximum temperature point 260°C: 10s
- (3) Time of soldering iron at maximum temperature point 410°C: 5s

### 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	0.35 ± 0.05	0.20 ± 0.10	0.20 ± 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 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20	1.20	0.70	1.30	4.368
MMV06	1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	2.00	0.90	1.60	8.947
MMV10	1210	3.10 ± 0.10	2.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	2.00	0.90	2.80	15.959
MMV11	2010	5.00 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	3.80	0.90	2.80	24.241
MMV12	2512	6.35 ± 0.10	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	4.90	1.60	3.50	39.448

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### PERFORMANCE

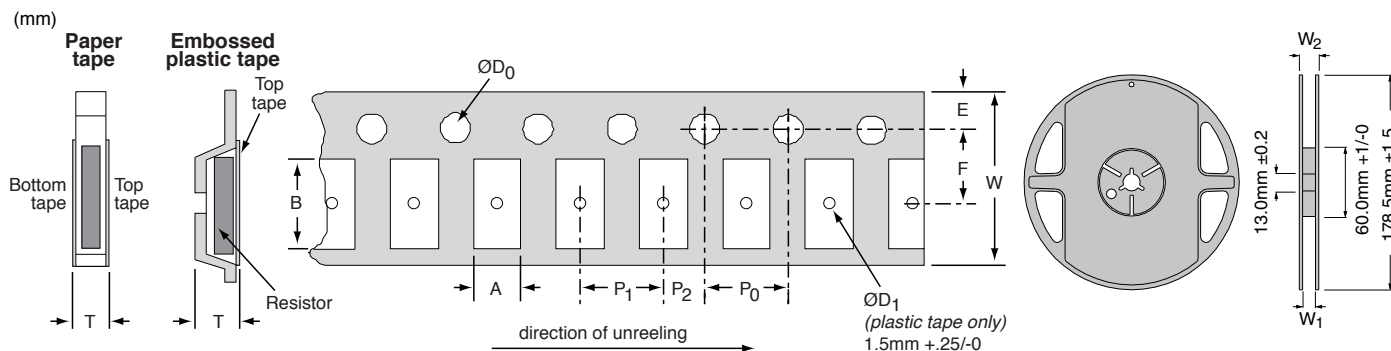
Item	Requirement		Jumper	Test Method
	±1% and below	±5%		
<b>TCR</b>		As Spec.		JIS-C-5201-1 4.8; IEC-60115-1 4.8; -55°C~+125°C, 25°C is the reference temperature
<b>Short Time Overload</b>	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.13; IEC-60115-1 4.13; RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
<b>Insulation Resistance</b>		≥10G		JIS-C-5201-1 4.6; IEC-60115-1 4.6; Max. Overload Voltage for 1 minute
<b>Operational Life</b>	±(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.
<b>Biased Humidity</b>	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	MIL-STD-202 Method 103; 1000 hrs 85°C/85%RH 10% of operating power
<b>High Temperature Exposure</b>	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	MIL-STD-202 Method 108; at +155°C for 1000 hrs
<b>Board Flex</b>	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	AEC-Q200-005; Bending once for 60 seconds ; 2010, 2512 sizes: 2mm Other sizes: 3mm
<b>Solderability</b>		95% min. coverage		JIS-C-5201-1 4.17; IEC-60115-1 4.17; J-STD-002; 245±5°C for 3 seconds
<b>Resistance to Soldering Heat</b>	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 210; 260±5°C for 10 seconds
<b>Voltage Proof</b>		No breakdown or flashover		JIS-C-5201-1 4.7; IEC-60115-1 4.7; 1.42 times Max. Operating Voltage for 1 minute
<b>Leaching</b>		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
<b>Temperature Cycling</b>	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	JESD22 Method JA-104; -55°C to +125°C, 1000 cycles
<b>Mechanical Shock</b>	±(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.
<b>Vibration</b>	±(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
<b>ESD</b>		±(1%+0.05Ω)		AEC-Q200-002; Human body, 2KV
<b>Resistance to Solvents</b>	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.
<b>Terminal Strength</b>		No broken		AEC-Q200-006; Force of 1.8kg for 60 seconds.
<b>Flammability</b>	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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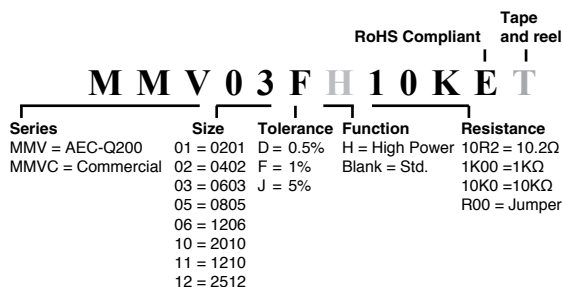
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### TAPE AND REEL



	A	B	W	E	F	P0	P1	P2	D0	T	W1	W2	Qty.
<b>Paper tape</b>													
MMV-01	0.38 ±.05	0.68 ±.05	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	2.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.42 ±.20	9.0 ±.5	12.5 ±.5	10,000
MMV-02	0.65 ±.10	1.15 ±.10	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	2.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.45 ±.10	9.0 ±.5	12.5 ±.5	10,000
MMV-03	1.10 ±.10	1.90 ±.10	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	4.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.70 ±.10	9.0 ±.5	12.5 ±.5	5,000
MMV-05	1.60 ±.10	2.40 ±.20	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	4.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.85 ±.10	9.0 ±.5	12.5 ±.5	5,000
MMV-06	1.90 ±.10	3.50 ±.20	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	4.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.85 ±.10	9.0 ±.5	12.5 ±.5	5,000
MMV-10	2.90 ±.10	3.50 ±.20	8.0 ±.20	1.75 ±.10	3.50 ±.05	4.00 ±.10	4.00 ±.05	2.00 ±.05	1.50+0.1,-0	0.85 ±.10	9.0 ±.5	12.5 ±.5	5,000
<b>Embossed plastic tape</b>													
MMV-11	2.8 ±.10	5.5 ±.10	12.0 ±.30	1.75 ±.10	5.5 ±.05	4.00 ±.10	4.00 ±.10	2.00 ±.05	1.50+0.1,-0	1.2+0	13.0 ±.5	15.5 ±.5	4,000
MMV-12	3.5 ±.10	6.7 ±.10	12.0 ±.30	1.75 ±.10	5.5 ±.05	4.00 ±.10	4.00 ±.10	2.00 ±.05	1.50+0.1,-0	1.2+0	13.0 ±.5	15.5 ±.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	10 11 12 13 15 16
102 = 1KΩ	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	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 <sup>0</sup>
B	10 <sup>1</sup>
C	10 <sup>2</sup>
D	10 <sup>3</sup>
E	10 <sup>4</sup>
F	10 <sup>5</sup>
G	10 <sup>6</sup>
H	10 <sup>7</sup>
X	10 <sup>-1</sup>
Y	10 <sup>-2</sup>
Z	10 <sup>-3</sup>

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1000 = 100Ω  
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1002 = 10KΩ  
4992 = 49.9KΩ  
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