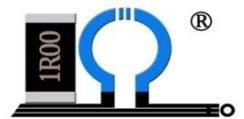


Metal Film Precision Cylindrical Resistors

SMM Series 精密金属膜圆柱电阻



■ Features

- Stable metal film on high quality ceramic
- Low TC and tight tolerances
- Excellent stability in different environmental conditions
- AEC-Q200 Compliance
- Thin film technology
- Pure tin termination on nickel barrier, plated on press fit steel caps
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to ± 5 PPM/ $^{\circ}\text{C}$
- Could bear relatively large currents
- SMD enabled structure
- Lead (Pb)-free and RoHS compliant
- Compatible with lead (Pb)-free and lead containing soldering processes



ROHS



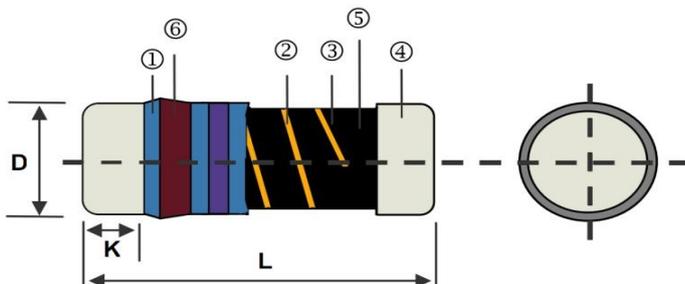
■ Applications

- Measurement/Testing Equipment
- Medical Equipment
- Automotive
- Industrial
- Telecommunication

■ PART NUMBER

SMM	0204	B	F	1002	T	30	A
PART CODE	SIZE	TOLERANCE	TCR	RESISTANCE	PACKAGING	PACKAGE	POWER
	0102 0204 0207	B= $\pm 0.1\%$ C= $\pm 0.25\%$ D= $\pm 0.5\%$ F= $\pm 1\%$ G= $\pm 2\%$ J= $\pm 5\%$ T=SPECIAL	—=JUMPER B= ± 5 PPM/ $^{\circ}\text{C}$ C= ± 10 PPM/ $^{\circ}\text{C}$ D= ± 15 PPM/ $^{\circ}\text{C}$ E= ± 25 PPM/ $^{\circ}\text{C}$ F= ± 50 PPM/ $^{\circ}\text{C}$ G= ± 100 PPM/ $^{\circ}\text{C}$	0R00=JUMPER 1R00=1 Ω 4R99=4.99 Ω 20R0=20 Ω 1000=100 Ω 3011=3.01K Ω 1002=10K Ω 5103=510K Ω 6804=6.8M Ω 1005=10M Ω	B=BULK T=TAPING RFFI	10=1000PCS 20=2000PCS 25=2500PCS 30=3000PCS	A=STANDARD B=1W C=3/4W D=1/2W E=1/3W F=1/4W G=1/5W H=1/6W I=1/8W

DIMENSION

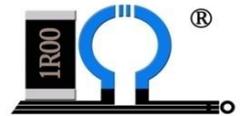


①	Insulation Coating	④	Electrode Cap
②	Trimming Line	⑤	Resistor Layer
③	Ceramic Rod	⑥	Marking

TYPE	L	ΦD (mm)	K min(mm)	Weight 1,000EA(g)
SMM0102	2.00 ± 0.10	1.30 ± 0.05	0.5	7.2
SMM0204	3.50 ± 0.20	1.40 ± 0.15	0.5	18.7
SMM0207	5.90 ± 0.20	2.20 ± 0.20	0.5	80.9

Metal Film Precision Cylindrical Resistors

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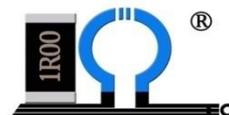
Standard Electrical Specifications

Operating Temp. Range -55~+155°C

TYPE	Power Rating at 70°C (W)	LIMITING ELEMENT VOLTAGE DC or AC rms	Max. Overload Voltage	TEMPERATURE COEFFICIENT (ppm/°C)	TOLERANCE %	RESISTANCE RANGE Ω	
SMM0102	1/8W	150V	300V	±200PPM	5%	0.22Ω-2.2MΩ	
	1/8W	150V	300V	±100PPM	5%	0.22Ω-2.2MΩ	
	1/8W	150V	300V	±50PPM	1%	1Ω-1MΩ	
	1/8W	150V	300V	±25PPM	1%	49.9Ω-500Ω	
	1/8W	150V	300V	±15PPM	1%	100Ω-56KΩ	
	1/8W	150V	300V	±10PPM	1%	100Ω-20KΩ	
	1/8W	150V	300V	±50PPM	0.5%	1Ω-1MΩ	
	1/8W	150V	300V	±25PPM	0.5%	49.9Ω-200KΩ	
	1/8W	150V	300V	±15PPM	0.5%	100Ω-56KΩ	
	1/8W	150V	300V	±10PPM	0.5%	50Ω-12KΩ	
	1/8W	150V	300V	±50PPM	0.25%	100Ω-100KΩ	
	1/8W	150V	300V	±25PPM	0.25%	100Ω-82KΩ	
	1/8W	150V	300V	±15PPM	0.25%	100Ω-56KΩ	
	1/8W	150V	300V	±10PPM	0.25%	100Ω-12KΩ	
	1/8W	150V	300V	±50PPM	0.1%	100Ω-100KΩ	
	1/8W	150V	300V	±25PPM	0.1%	100Ω-82KΩ	
	SMM0204	1/4W	200V	400V	±200PPM	5%	0.1Ω-10MΩ
1/4W		200V	400V	±100PPM	5%	0.1Ω-10MΩ	
1/4W		200V	400V	±50PPM	1%	0.1Ω-10MΩ	
1/4W		200V	400V	±25PPM	1%	5Ω-5MΩ	
1/4W		200V	400V	±15PPM	1%	10Ω-300KΩ	
1/4W		200V	400V	±10PPM	1%	10Ω-20KΩ	
1/4W		200V	400V	±5PPM	1%	50Ω-5KΩ	
1/4W		200V	400V	±50PPM	0.5%	1Ω-1MΩ	
1/4W		200V	400V	±25PPM	0.5%	5Ω-1MΩ	
1/4W		200V	400V	±15PPM	0.5%	10Ω-300KΩ	
1/4W		200V	400V	±10PPM	0.5%	10Ω-20KΩ	
1/4W		200V	400V	±5PPM	0.5%	100Ω-5KΩ	
1/4W		200V	400V	±50PPM	0.25%	1Ω-1MΩ	
1/4W		200V	400V	±25PPM	0.25%	5Ω-1MΩ	
1/4W		200V	400V	±15PPM	0.25%	10Ω-300KΩ	
1/4W		200V	400V	±10PPM	0.25%	10Ω-20KΩ	
1/4W		200V	400V	±5PPM	0.25%	50Ω-5KΩ	
1/4W		200V	400V	±50PPM	0.1%	5Ω-1MΩ	
SMM0207		1/2W	300V	500V	±200PPM	5%	0.1Ω-10MΩ
		1/2W	300V	500V	±100PPM	5%	0.1Ω-10MΩ
	1/2W	300V	500V	±50PPM	1%	0.1Ω-10MΩ	
	1/2W	300V	500V	±25PPM	1%	5Ω-5MΩ	
	1/2W	300V	500V	±15PPM	1%	10Ω-300KΩ	
	1/2W	300V	500V	±10PPM	1%	10Ω-20KΩ	
	1/2W	300V	500V	±5PPM	1%	50Ω-5KΩ	
	1/2W	300V	500V	±5PPM	1%	50Ω-5KΩ	

Metal Film Precision Cylindrical Resistors

SMM Series 精密金属膜圆柱电阻



SMM0207	1/2W	300V	500V	±50PPM	0.5%	1Ω-1MΩ
	1/2W	300V	500V	±25PPM	0.5%	5Ω-1MΩ
	1/2W	300V	500V	±15PPM	0.5%	10Ω-300KΩ
	1/2W	300V	500V	±10PPM	0.5%	10Ω-20KΩ
	1/2W	300V	500V	±5PPM	0.5%	100Ω-5KΩ
	1/2W	300V	500V	±50PPM	0.25%	1Ω-1MΩ
	1/2W	300V	500V	±25PPM	0.25%	5Ω-1MΩ
	1/2W	300V	500V	±15PPM	0.25%	10Ω-300KΩ
	1/2W	300V	500V	±10PPM	0.25%	10Ω-20KΩ
	1/2W	300V	500V	±5PPM	0.25%	50Ω-5KΩ
	1/2W	300V	500V	±50PPM	0.1%	5Ω-1MΩ
	1/2W	300V	500V	±25PPM	0.1%	5Ω-1MΩ
	1/2W	300V	500V	±15PPM	0.1%	10Ω-300KΩ
	1/2W	300V	500V	±10PPM	0.1%	10Ω-20KΩ
1/2W	300V	500V	±5PPM	0.1%	100Ω-5KΩ	

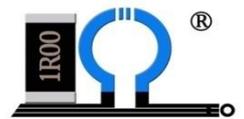
High Power Rating Electrical Specifications

Operating Temp. Range -55~+155°C

TYPE	Power Rating at 70°C (W)	LIMITING ELEMENT VOLTAGE DC or AC rms	Max. Overload Voltage	TEMPERATURE COEFFICIENT (ppm/°C)	TOLERANCE %	RESISTANCE RANGE Ω
SMM0102	1/5W	200V	400V	±200PPM	5%	0.22Ω-2.2MΩ
	1/5W	200V	400V	±100PPM	5%	0.22Ω-2.2MΩ
	1/5W	200V	400V	±50PPM	1%	1Ω-1MΩ
	1/5W	200V	400V	±25PPM	1%	49.9Ω-500Ω
	1/5W	200V	400V	±15PPM	1%	100Ω-56KΩ
	1/5W	200V	400V	±10PPM	1%	100Ω-20KΩ
	1/5W	200V	400V	±50PPM	0.5%	1Ω-1MΩ
	1/5W	200V	400V	±25PPM	0.5%	49.9Ω-200KΩ
	1/5W	200V	400V	±15PPM	0.5%	100Ω-56KΩ
	1/5W	200V	400V	±10PPM	0.5%	50Ω-12KΩ
	1/5W	200V	400V	±50PPM	0.25%	100Ω-100KΩ
	1/5W	200V	400V	±25PPM	0.25%	100Ω-82KΩ
	1/5W	200V	400V	±15PPM	0.25%	100Ω-56KΩ
	1/5W	200V	400V	±10PPM	0.25%	100Ω-12KΩ
	1/5W	200V	400V	±50PPM	0.1%	100Ω-100KΩ
	1/5W	200V	400V	±25PPM	0.1%	100Ω-82KΩ
	1/5W	200V	400V	±15PPM	0.1%	100Ω-56KΩ
1/5W	200V	400V	±10PPM	0.1%	100Ω-12KΩ	
SMM0204	2/5W	300V	400V	±200PPM	5%	0.1Ω-10MΩ
	2/5W	300V	400V	±100PPM	5%	0.1Ω-10MΩ
	2/5W	300V	400V	±50PPM	1%	0.1Ω-10MΩ
	2/5W	300V	400V	±25PPM	1%	5Ω-1MΩ
	2/5W	300V	400V	±15PPM	1%	10Ω-100KΩ
	2/5W	300V	400V	±10PPM	1%	10Ω-20KΩ
	2/5W	300V	400V	±50PPM	0.5%	1Ω-1MΩ
	2/5W	300V	400V	±25PPM	0.5%	5Ω-1MΩ
	2/5W	300V	400V	±15PPM	0.5%	10Ω-100KΩ
	2/5W	300V	400V	±10PPM	0.5%	10Ω-20KΩ
	2/5W	300V	400V	±50PPM	0.25%	1Ω-1MΩ
	2/5W	300V	400V	±25PPM	0.25%	5Ω-1MΩ
	2/5W	300V	400V	±15PPM	0.25%	10Ω-100KΩ
	2/5W	300V	400V	±10PPM	0.25%	10Ω-20KΩ
	2/5W	300V	400V	±50PPM	0.1%	5Ω-1MΩ
	2/5W	300V	400V	±25PPM	0.1%	5Ω-1MΩ
	2/5W	300V	400V	±15PPM	0.1%	10Ω-100KΩ
2/5W	300V	400V	±10PPM	0.1%	10Ω-20KΩ	

Metal Film Precision Cylindrical Resistors

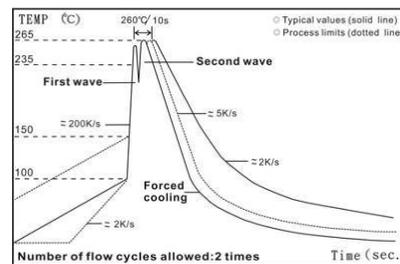
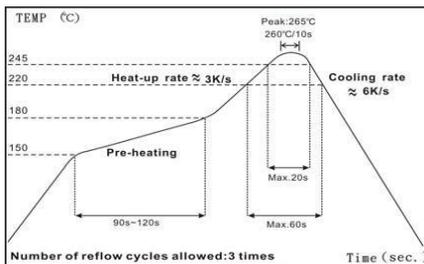
SMM Series 精密金属膜圆柱电阻



SMM0207	1W	350V	700V	±200PPM	5%	0.1Ω-10MΩ
	1W	350V	700V	±100PPM	5%	0.1Ω-10MΩ
	1W	350V	700V	±50PPM	1%	0.1Ω-10MΩ
	1W	350V	700V	±25PPM	1%	5Ω-1MΩ
	1W	350V	700V	±15PPM	1%	10Ω-100KΩ
	1W	350V	700V	±10PPM	1%	10Ω-20KΩ
	1W	350V	700V	±5PPM	1%	50Ω-5KΩ
	1W	350V	700V	±50PPM	0.5%	1Ω-1MΩ
	1W	350V	700V	±25PPM	0.5%	5Ω-1MΩ
	1W	350V	700V	±15PPM	0.5%	10Ω-100KΩ
	1W	350V	700V	±10PPM	0.5%	10Ω-20KΩ
	1W	350V	700V	±50PPM	0.25%	1Ω-1MΩ
	1W	350V	700V	±25PPM	0.25%	5Ω-1MΩ
	1W	350V	700V	±15PPM	0.25%	10Ω-100KΩ
	1W	350V	700V	±10PPM	0.25%	10Ω-20KΩ
	1W	350V	700V	±50PPM	0.1%	5Ω-1MΩ
	1W	350V	700V	±25PPM	0.1%	5Ω-1MΩ
	1W	350V	700V	±15PPM	0.1%	10Ω-100KΩ
1W	350V	700V	±10PPM	0.1%	10Ω-20KΩ	

TYPE	Power Rating at 70°C (W)	RESISTANCE RANGE Ω
SMM0102	Jumper: 2A	0Ω(< 15mΩ)
SMM0204	Jumper: 2A	0Ω(< 15mΩ)
SMM0207	Jumper: 4A	0Ω(< 15mΩ)

■ Soldering Condition

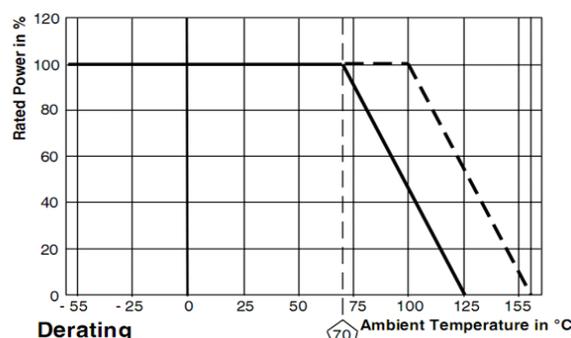
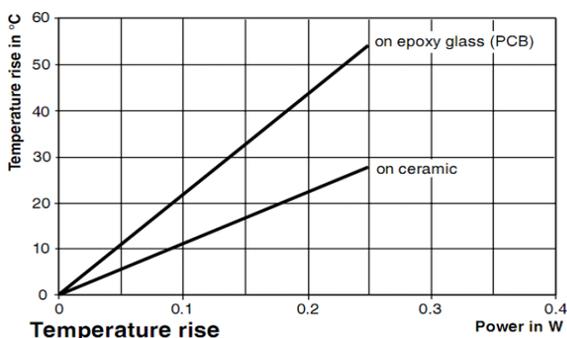


IR Reflow Soldering

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

■ Ambient temperature in °C Derating



Metal Film Precision Cylindrical Resistors

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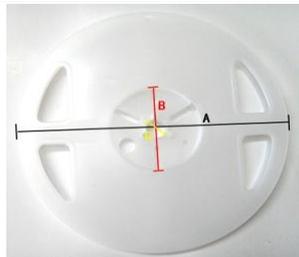


PACKAGING

PACKAGING QUANTITY & REEL SPECIFICATIONS

UNIT:mm

TYPE	A	B	C	D	E	PIECES/ REEL	Special	WEIGHT: g / 1000pcs
SMM0102	178.0 ±1.0	60.0 ±1.0	13.5 ±0.7	9.5±1.0	12.5 ±1.0	3000	(1000/2000)	7.2g
SMM0204	178.0 ±1.0	60.0 ±1.0	13.5 ±0.7	9.5±1.0	12.5 ±1.0	3000	(1000/2500)	18.7g
SMM0207	178.0 ±1.0	60.0 ±1.0	13.5 ±0.7	13.0±1.0	15.5 ±1.0	2000	(1000/1500)	80.9g



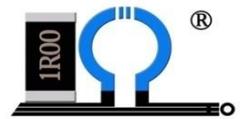
PERFORMANCE

TESTS	REQUIREMENT	TEST METHOD
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 for 5 seconds
Temperature Coefficient of Resistance (T.C.R.)	As Spec	-55°C~+125°C, 25°C is the reference temperature
Endurance	0204/0207: $\pm(0.5\%+0.05\ \Omega)$ 0102: $\pm(1.5\%+0.05\ \Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Insulation Resistance	>10G Ω	Max. Overload voltage for 1 minute
Damp Heat with Load	0204/0207: $\pm(1.0\%+0.05\ \Omega)$ 0102: $\pm(1.5\%+0.05\ \Omega)$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5hrs "ON" and 0.5 hrs "OFF"
Bending Strength	$\pm(0.5\%+0.05\ \Omega)$	Bending once for 5 seconds with 2mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\ \Omega)$	260±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±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±3°C; Humidity < 80%RH

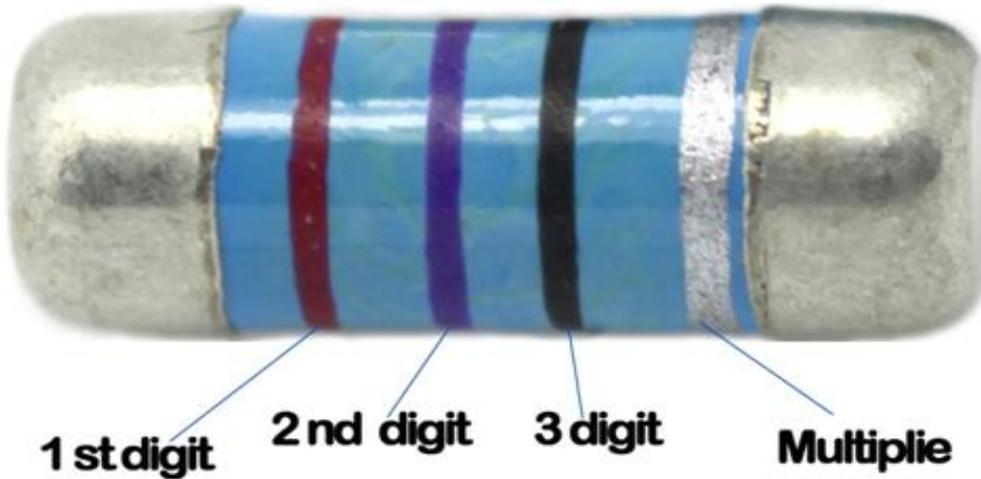
Metal Film Precision Cylindrical Resistors

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Marking & Resistance Tolerance

EXAMPLE: for: 1% 0.5% 0.25% 0.1%



1st digit=Red=2 2nd digit=Violet=7 3 digit=Black=0 Multiplie=Silver=10⁻²

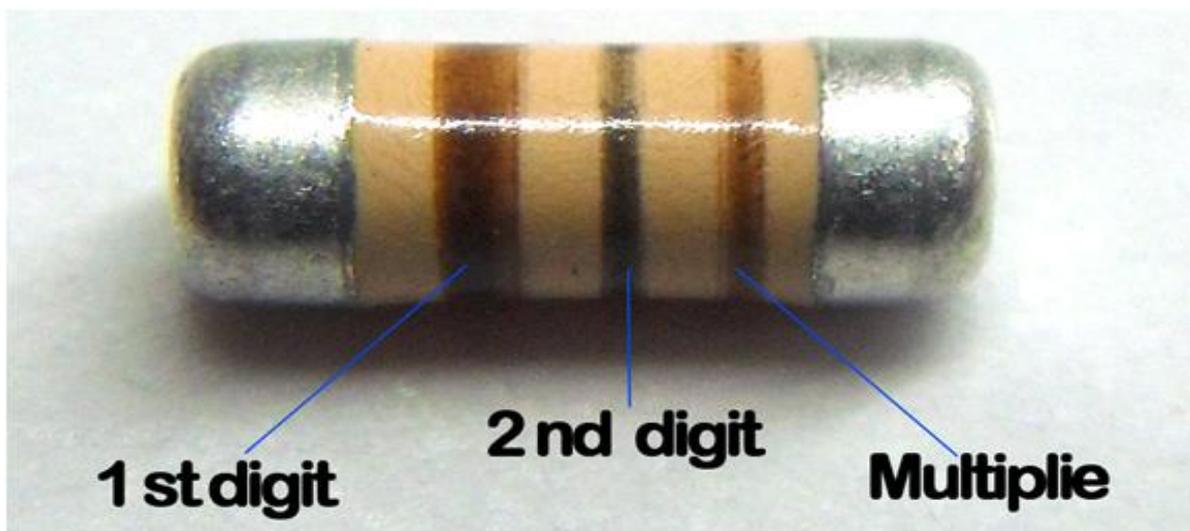
Resistance: 2 - 7 - 0 - 10⁻² = 2.7 Ω

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

±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% ±0.25% ±0.1%	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

■ Marking & Resistance Tolerance

EXAMPLE: for 5%



1st digit=Brown=1

2nd digit=Black=0

Multiplie=Brown=10¹

Resistance: 1 - 0 - 10¹ = 100 Ω

±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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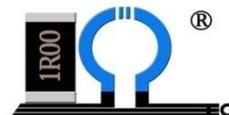
■ SMM Value list

E24 and E96: for: 1% 0.5% 0.25% 0.1%

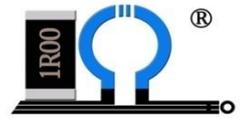
0Ω	1Ω	1.02Ω	1.05Ω	1.07Ω	1.1Ω	1.13Ω	1.15Ω	1.18Ω	1.2Ω	1.21Ω	1.24Ω	1.27Ω	1.3Ω	1.33Ω
1.37Ω	1.4Ω	1.43Ω	1.47Ω	1.5Ω	1.54Ω	1.58Ω	1.6Ω	1.62Ω	1.65Ω	1.69Ω	1.74Ω	1.78Ω	1.8Ω	
1.82Ω	1.87Ω	1.91Ω	1.96Ω	2Ω	2.05Ω	2.1Ω	2.15Ω	2.2Ω	2.21Ω	2.26Ω	2.32Ω	2.37Ω	2.4Ω	2.43Ω
2.49Ω	2.55Ω	2.61Ω	2.67Ω	2.7Ω	2.74Ω	2.8Ω	2.87Ω	2.94Ω	3Ω	3.01Ω	3.09Ω	3.16Ω	3.24Ω	
3.3Ω	3.32Ω	3.4Ω	3.48Ω	3.57Ω	3.6Ω	3.65Ω	3.74Ω	3.83Ω	3.9Ω	3.92Ω	4.02Ω	4.12Ω	4.22Ω	
4.3Ω	4.32Ω	4.42Ω	4.53Ω	4.64Ω	4.7Ω	4.75Ω	4.87Ω	4.99Ω	5.1Ω	5.11Ω	5.23Ω	5.36Ω	5.49Ω	
5.6Ω	5.62Ω	5.76Ω	5.9Ω	6.04Ω	6.19Ω	6.2Ω	6.34Ω	6.49Ω	6.65Ω	6.8Ω	6.81Ω	6.98Ω	7.15Ω	7.32Ω
7.5Ω	7.68Ω	7.87Ω	8.06Ω	8.2Ω	8.25Ω	8.45Ω	8.66Ω	8.87Ω	9.09Ω	9.1Ω	9.31Ω	9.53Ω	9.76Ω	
10Ω	10.2Ω	10.5Ω	10.7Ω	11Ω	11.3Ω	11.5Ω	11.8Ω	12Ω	12.1Ω	12.4Ω	12.7Ω	13Ω	13.3Ω	
13.7Ω	14Ω	14.3Ω	14.7Ω	15Ω	15.4Ω	15.8Ω	16Ω	16.2Ω	16.5Ω	16.9Ω	17.4Ω	17.8Ω	18Ω	
18.2Ω	18.7Ω	19.1Ω	19.6Ω	20Ω	20.5Ω	21Ω	21.5Ω	22Ω	22.1Ω	22.6Ω	23.2Ω	23.7Ω	24Ω	24.3Ω
24.9Ω	25.5Ω	26.1Ω	26.7Ω	27Ω	27.4Ω	28Ω	28.7Ω	29.4Ω	30Ω	30.1Ω	30.9Ω	31.6Ω	32.4Ω	
33Ω	33.2Ω	34Ω	34.8Ω	35.7Ω	36Ω	36.5Ω	37.4Ω	38.3Ω	39Ω	39.2Ω	40.2Ω	41.2Ω	42.2Ω	
43Ω	43.2Ω	44.2Ω	45.3Ω	46.4Ω	47Ω	47.5Ω	48.7Ω	49.9Ω	51Ω	51.1Ω	52.3Ω	53.6Ω	54.9Ω	
56Ω	56.2Ω	57.6Ω	59Ω	60.4Ω	61.9Ω	62Ω	63.4Ω	64.9Ω	66.5Ω	68Ω	68.1Ω	69.8Ω	71.5Ω	73.2Ω
75Ω	76.8Ω	78.7Ω	80.6Ω	82Ω	82.5Ω	84.5Ω	86.6Ω	87.7Ω	90.9Ω	91Ω	93.1Ω	95.3Ω	97.6Ω	
100Ω	102Ω	105Ω	107Ω	110Ω	113Ω	115Ω	118Ω	120Ω	121Ω	124Ω	127Ω	130Ω	133Ω	
137Ω	140Ω	143Ω	147Ω	150Ω	154Ω	158Ω	160Ω	162Ω	165Ω	169Ω	174Ω	178Ω	180Ω	
182Ω	187Ω	191Ω	196Ω	200Ω	205Ω	210Ω	215Ω	220Ω	221Ω	226Ω	232Ω	237Ω	240Ω	243Ω
249Ω	255Ω	261Ω	267Ω	270Ω	274Ω	280Ω	287Ω	294Ω	300Ω	301Ω	309Ω	316Ω	324Ω	

Metal Film Precision Cylindrical Resistors

SMM Series 精密金属膜圆柱电阻



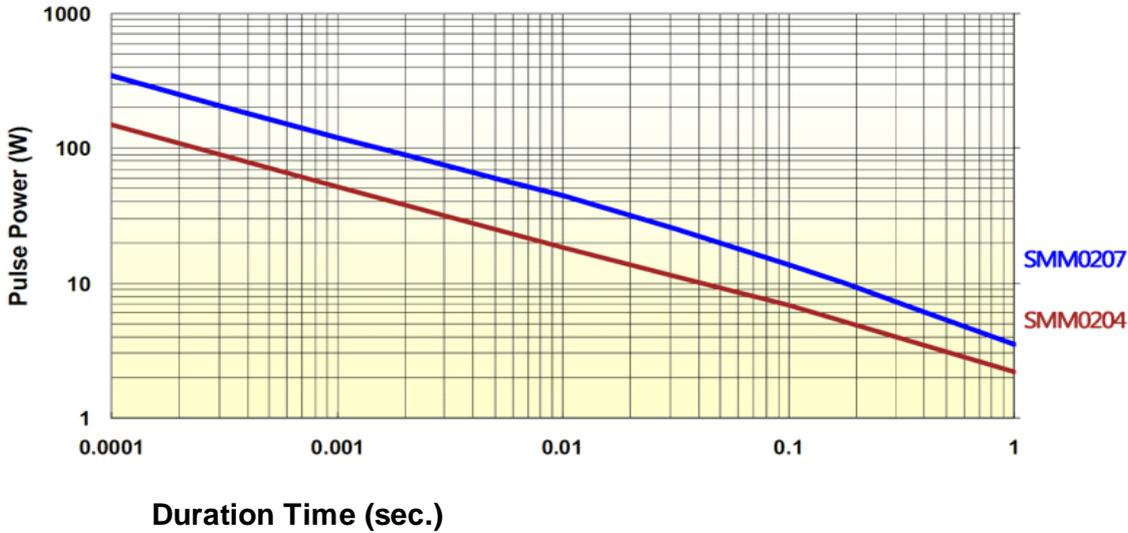
330Ω	332Ω	340Ω	348Ω	357Ω	360Ω	365Ω	374Ω	383Ω	390Ω	392Ω	402Ω	412Ω	422Ω	
430Ω	432Ω	442Ω	453Ω	464Ω	470Ω	475Ω	487Ω	499Ω	510Ω	511Ω	523Ω	536Ω	549Ω	
560Ω	562Ω	576Ω	590Ω	604Ω	619Ω	620Ω	634Ω	649Ω	665Ω	680Ω	681Ω	698Ω	715Ω	732Ω
750Ω	768Ω	787Ω	806Ω	820Ω	825Ω	845Ω	866Ω	887Ω	909Ω	910Ω	931Ω	953Ω	976Ω	
1KΩ	1.02KΩ	1.05KΩ	1.07KΩ	1.1KΩ	1.13KΩ	1.15KΩ	1.18KΩ	1.2KΩ	1.21KΩ	1.24KΩ	1.27KΩ			
1.3KΩ	1.33KΩ	1.37KΩ	1.4KΩ	1.43KΩ	1.47KΩ	1.5KΩ	1.54KΩ	1.58KΩ	1.6KΩ	1.62KΩ	1.65KΩ			
1.69KΩ	1.74KΩ	1.78KΩ	1.8KΩ	1.82KΩ	1.87KΩ	1.91KΩ	1.96KΩ	2KΩ	2.05KΩ	2.1KΩ	2.15KΩ			
2.2KΩ	2.21KΩ	2.26KΩ	2.32KΩ	2.37KΩ	2.4KΩ	2.43KΩ	2.49KΩ	2.55KΩ	2.61KΩ	2.67KΩ	2.7KΩ			
2.74KΩ	2.8KΩ	2.87KΩ	2.94KΩ	3KΩ	3.01KΩ	3.09KΩ	3.16KΩ	3.24KΩ	3.3KΩ	3.32KΩ	3.4KΩ			
3.48KΩ	3.57KΩ	3.6KΩ	3.65KΩ	3.74KΩ	3.83KΩ	3.9KΩ	3.92KΩ	4.02KΩ	4.12KΩ	4.22KΩ	4.3KΩ			
4.32KΩ	4.42KΩ	4.53KΩ	4.64KΩ	4.7KΩ	4.75KΩ	4.87KΩ	4.99KΩ	5.1KΩ	5.11KΩ	5.23KΩ	5.36KΩ			
5.49KΩ	5.6KΩ	5.62KΩ	5.76KΩ	5.9KΩ	6.04KΩ	6.19KΩ	6.2KΩ	6.34KΩ	6.49KΩ	6.65KΩ	6.8KΩ			
6.81KΩ	6.98KΩ	7.15KΩ	7.32KΩ	7.5KΩ	7.68KΩ	7.87KΩ	8.06KΩ	8.2KΩ	8.25KΩ	8.45KΩ				
8.66KΩ	8.87KΩ	9.09KΩ	9.1KΩ	9.31KΩ	9.53KΩ	9.76KΩ								
10KΩ	10.2KΩ	10.5KΩ	10.7KΩ	11KΩ	11.3KΩ	11.5KΩ	11.8KΩ	12KΩ	12.1KΩ	12.4KΩ	12.7KΩ			
13KΩ	13.3KΩ	13.7KΩ	14KΩ	14.3KΩ	14.7KΩ	15KΩ	15.4KΩ	15.8KΩ	16KΩ	16.2KΩ	16.5KΩ			
16.9KΩ	17.4KΩ	17.8KΩ	18KΩ	18.2KΩ	18.7KΩ	19.1KΩ	19.6KΩ	20KΩ	20.5KΩ	21KΩ	21.5KΩ			
22KΩ	22.1KΩ	22.6KΩ	23.2KΩ	23.7KΩ	24KΩ	24.3KΩ	24.9KΩ	25.5KΩ	26.1KΩ	26.7KΩ	27KΩ			
27.4KΩ	28KΩ	28.7KΩ	29.4KΩ	30KΩ	30.1KΩ	30.9KΩ	31.6KΩ	32.4KΩ	33KΩ	33.2KΩ	34KΩ			
34.8KΩ	35.7KΩ	36KΩ	36.5KΩ	37.4KΩ	38.3KΩ	39KΩ	39.2KΩ	40.2KΩ	41.2KΩ	42.2KΩ	43KΩ			
43.2KΩ	44.2KΩ	45.3KΩ	46.4KΩ	47KΩ	47.5KΩ	48.7KΩ	49.9KΩ	51KΩ	51.1KΩ	52.3KΩ	53.6KΩ			
54.9KΩ	56KΩ	56.2KΩ	57.6KΩ	59KΩ	60.4KΩ	61.9KΩ	62KΩ	63.4KΩ	64.9KΩ	66.5KΩ	68KΩ			
68.1KΩ	69.8KΩ	71.5KΩ	73.2KΩ	75KΩ	76.8KΩ	78.7KΩ	80.6KΩ	82KΩ	82.5KΩ	84.5KΩ	86.6KΩ			
87.7KΩ	90.9KΩ	91KΩ	93.1KΩ	95.3KΩ	97.6KΩ									
100KΩ	102KΩ	105KΩ	107KΩ	110KΩ	113KΩ	115KΩ	118KΩ	120KΩ	121KΩ	124KΩ	127KΩ			
130KΩ	133KΩ	137KΩ	140KΩ	143KΩ	147KΩ	150KΩ	154KΩ	158KΩ	160KΩ	162KΩ	165KΩ			
169KΩ	174KΩ	178KΩ	180KΩ	182KΩ	187KΩ	191KΩ	196KΩ	200KΩ	205KΩ	210KΩ	215KΩ			
220KΩ	221KΩ	226KΩ	232KΩ	237KΩ	240KΩ	243KΩ	249KΩ	255KΩ	261KΩ	267KΩ	270KΩ			
274KΩ	280KΩ	287KΩ	294KΩ	300KΩ	301KΩ	309KΩ	316KΩ	324KΩ	330KΩ	332KΩ	340KΩ			
348KΩ	357KΩ	360KΩ	365KΩ	374KΩ	383KΩ	390KΩ	392KΩ	402KΩ	412KΩ	422KΩ	430KΩ			
432KΩ	442KΩ	453KΩ	464KΩ	470KΩ	475KΩ	487KΩ	499KΩ	510KΩ	511KΩ	523KΩ	536KΩ			
549KΩ	560KΩ	562KΩ	576KΩ	590KΩ	604KΩ	619KΩ	620KΩ	634KΩ	649KΩ	665KΩ	680KΩ			
681KΩ	698KΩ	715KΩ	732KΩ	750KΩ	768KΩ	787KΩ	806KΩ	820KΩ	825KΩ	845KΩ	866KΩ			
887KΩ	909KΩ	910KΩ	931KΩ	953KΩ	976KΩ									
1MΩ	1.02MΩ	1.05MΩ	1.07MΩ	1.1MΩ	1.13MΩ	1.15MΩ	1.18MΩ	1.2MΩ	1.21MΩ	1.24MΩ				
1.27MΩ	1.3MΩ	1.33MΩ	1.37MΩ	1.4MΩ	1.43MΩ	1.47MΩ	1.5MΩ	1.54MΩ	1.58MΩ	1.6MΩ				
1.62MΩ	1.65MΩ	1.69MΩ	1.74MΩ	1.78MΩ	1.8MΩ	1.82MΩ	1.87MΩ	1.91MΩ	1.96MΩ	2MΩ				
2.05MΩ	2.1MΩ	2.15MΩ	2.2MΩ	2.21MΩ	2.26MΩ	2.32MΩ	2.37MΩ	2.4MΩ	2.43MΩ	2.49MΩ				
2.55MΩ	2.61MΩ	2.67MΩ	2.7MΩ	2.74MΩ	2.8MΩ	2.87MΩ	2.94MΩ	3MΩ	3.01MΩ	3.09MΩ				
3.16MΩ	3.24MΩ	3.3MΩ	3.32MΩ	3.4MΩ	3.48MΩ	3.57MΩ	3.6MΩ	3.65MΩ	3.74MΩ	3.83MΩ				
3.9MΩ	3.92MΩ	4.02MΩ	4.12MΩ	4.22MΩ	4.3MΩ	4.32MΩ	4.42MΩ	4.53MΩ	4.64MΩ	4.7MΩ				
4.75MΩ	4.87MΩ	4.99MΩ	5.1MΩ	5.11MΩ	5.23MΩ	5.36MΩ	5.49MΩ	5.6MΩ	5.62MΩ	5.76MΩ				
5.9MΩ	6.04MΩ	6.19MΩ	6.2MΩ	6.34MΩ	6.49MΩ	6.65MΩ	6.8MΩ	6.81MΩ	6.98MΩ	7.15MΩ				
7.32MΩ	7.5MΩ	7.68MΩ	7.87MΩ	8.06MΩ	8.2MΩ	8.25MΩ	8.45MΩ	8.66MΩ	8.87MΩ	9.09MΩ				
9.1MΩ	9.31MΩ	9.53MΩ	9.76MΩ	10M										



■ Pulse withstanding capacity

The single impulse graph is the result of 50 impulses of rectangular shape applied at one-minute intervals. The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown

SMM Series Single Pulse(100 Ohm)

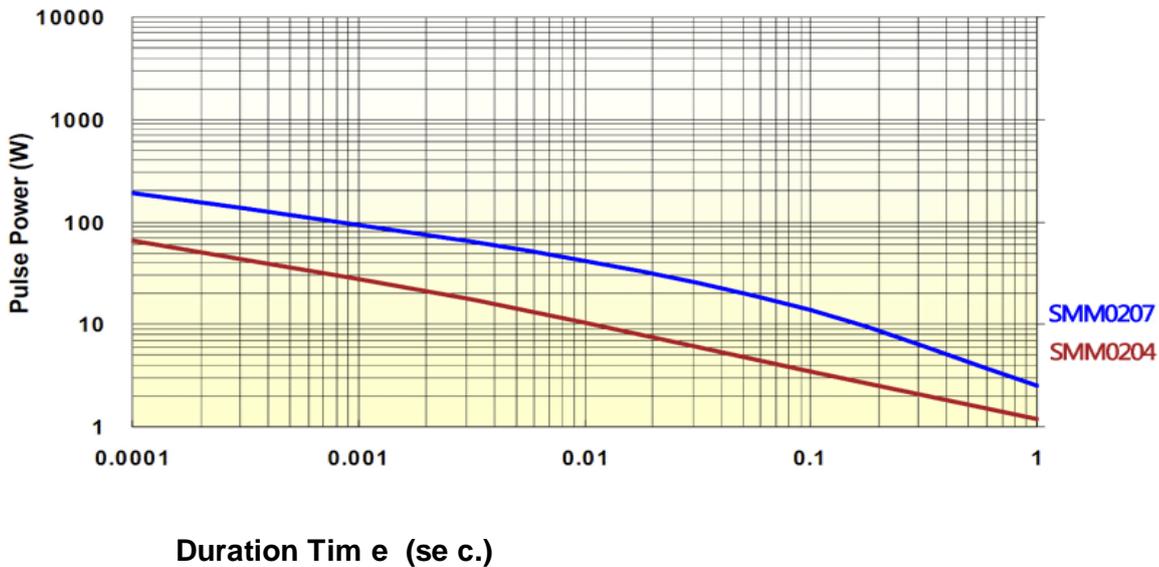


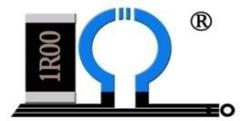
■ Continuous Pulse

The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70°C.

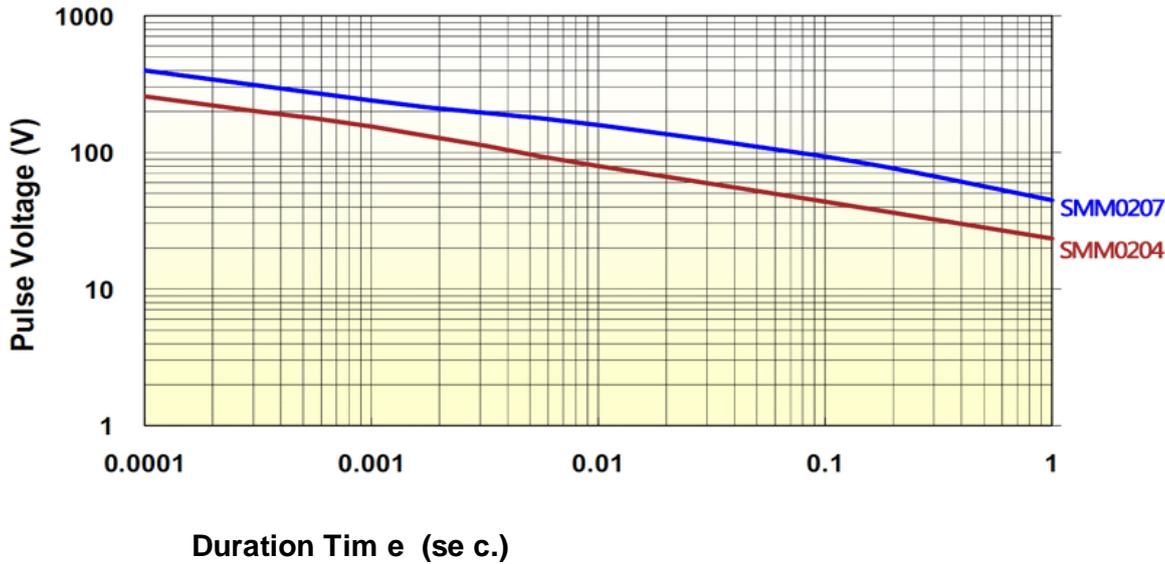
Again the limit of acceptance was a shift in resistance of less than 1% from the initial value

SMM Series Continuous Pulse(100 Ohm)





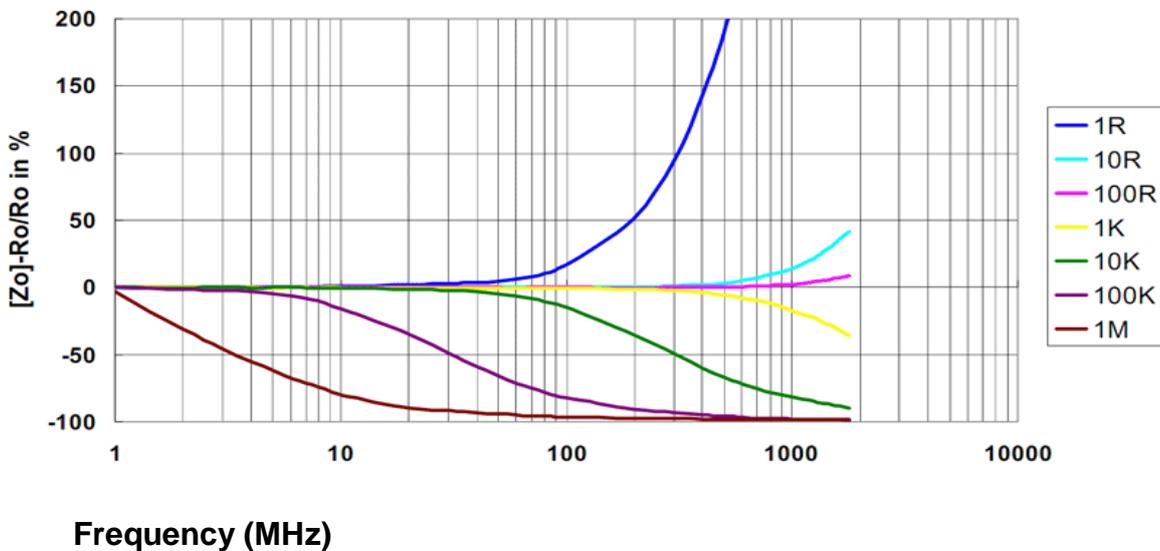
SMM Series Pulse Voltage(100 Ohm)

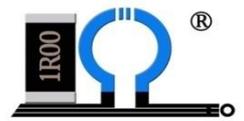


Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The values of the capacitance and inductance are mainly determined by the dimensions of the terminations and the conductive path length.

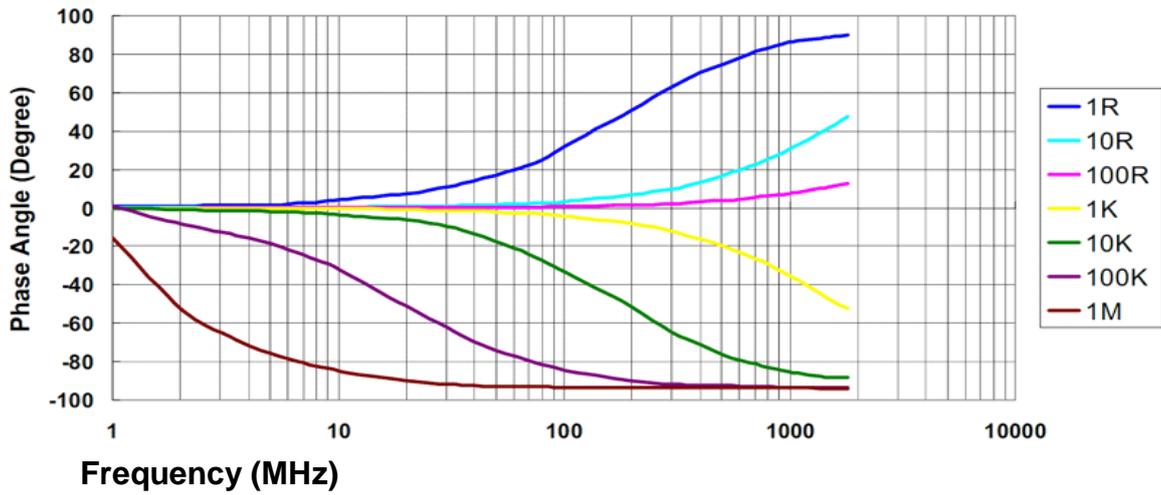
The environment surrounding components has a large influence on the behavior of the component on the printed-circuit board.

Frequency vs. Impedance SMM Series(SMM0204)

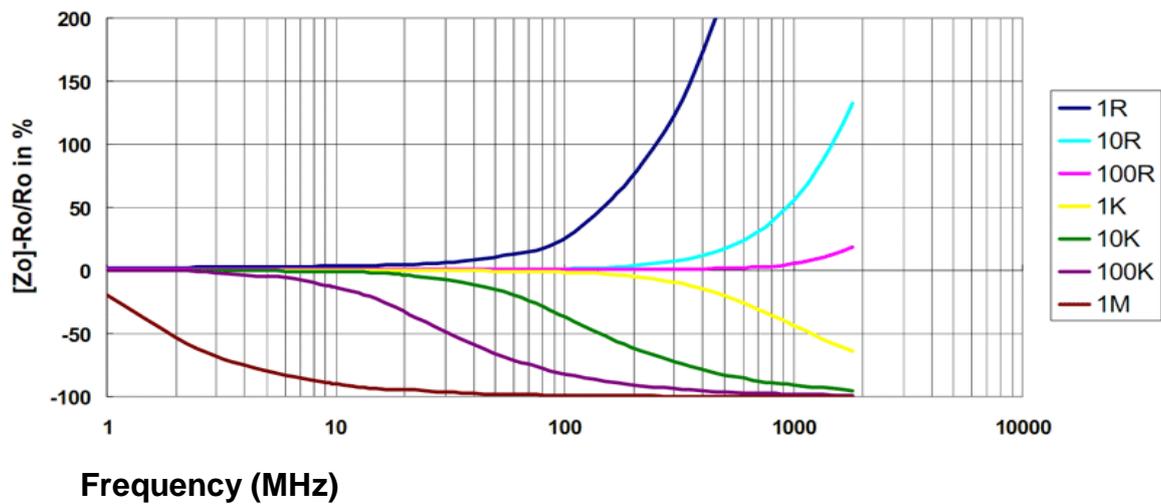




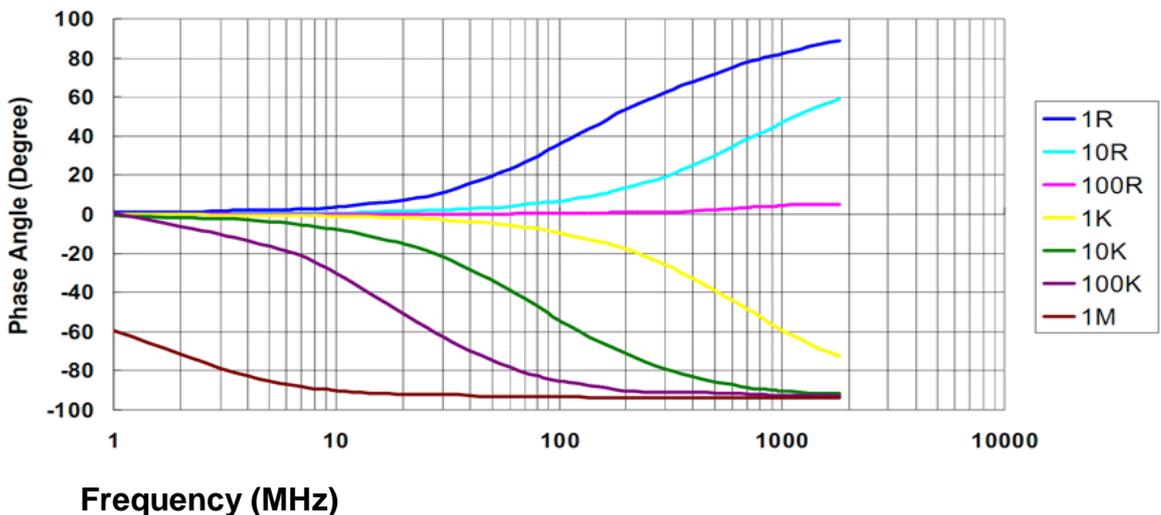
Frequency vs. Phase Angle SMM Series(SMM0204)

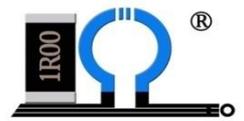


Frequency vs. Impedance SMM Series(SMM0207)



Frequency vs. Phase Angle SMM Series(SMM0207)

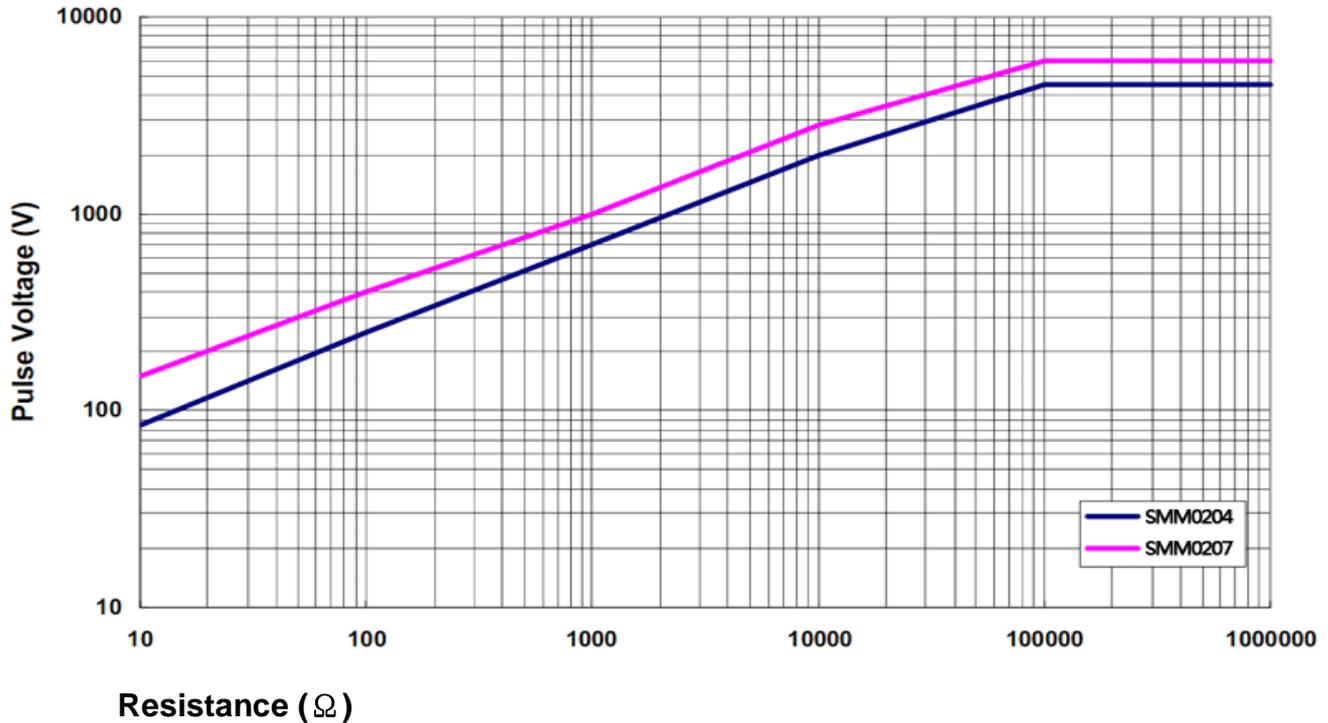




■ Lightning Surge

Resistors are tested in accordance with IEC 60 115-1 using both 1.2/50 μ s and 10/700 μ s pulse shapes. The limit of acceptance is a shift in resistance of less than 0.5% from the initial value.

1.2/50 μ s Lightning Surge



10/700 μ s Lightning Surge

