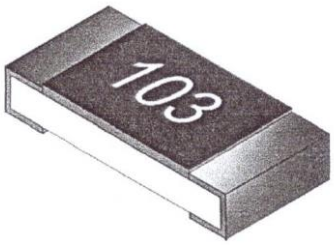
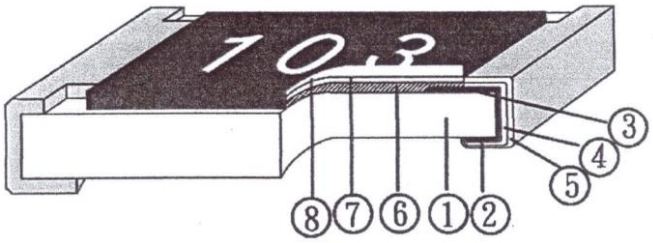
Thick Film Chip Resistor – SMR Series



Construction



1	Alumina Substrate	5	External Electrode (Sn)
2	Bottom Electrode (Ag)	6	Resistor Layer (RuO_2)
3	Top Electrode (Ag/Pd)	7	Primary Overcoat (Glass)
4	Barrier Layer (Ni)	8	Secondary Overcoat (Epoxy)

Application

- Entertainment: Stereo, TV tuners, Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply, Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment

Features

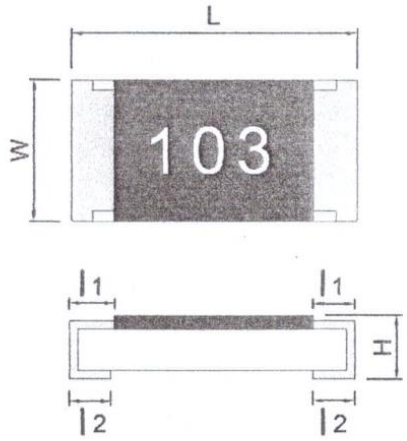
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality and fast delivery

Standard & High Power Electrical Specifications

Item / Type	Rated Power at 70℃		Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range			Operating Temperature Range
	Standard	High				B(±0.1%) D(±0.5%)	F(±1%) G±(2%)	J(±5%) K(±10%)	
SMR0201	0.05 W	-	25V	50V	±200	-	10Ω~1MΩ	10Ω~1MΩ	-55℃ ~ +155℃
SMR0402	0.063 W	-	50V	100V	0~+400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±300	-	10Ω~990Ω	10Ω~990Ω	
					±200	10Ω~1MΩ	1KΩ~10MΩ	1KΩ~10MΩ	
SMR0603	0.1 W	0.125 W	50V	100V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR0805	0.125 W	0.25 W	150V	300V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR1206	0.25 W	0.5 W	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR1210	0.33 W	0.66 W	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR1812	0.5 W	1w	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR2010	0.5 W	1w	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR1218	1 W	2w	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR2512	1 W	2w	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	
SMR2030	2 W	3w	200V	400V	±400	-	1Ω~9.9Ω	1Ω~9.9Ω	
					±200	-	-	10Ω~10MΩ	
					±100	10Ω~1MΩ	10Ω~10MΩ	-	

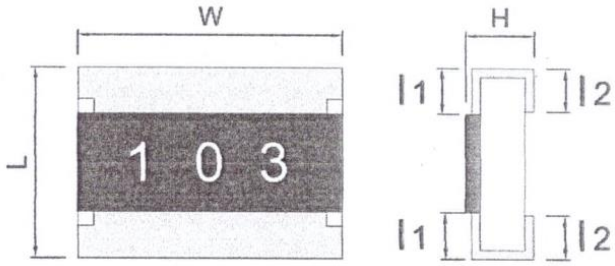
Type	0201	0402	0603	0805	1206	1210	1812	2010	1218	2512	2030
Jumper Rated Current	0.5A	1A			2A						

Type Dimension



CR0201 / CR0402 / CR0603 / CR0805 /
CR1206 / CR1210 / CR1812 / CR2010 /
CR2512

SMR0201 / SMR0402 / SMR0603 / SMR0805 /
SMR1206 / SMR1210 / SMR1812 / SMR2010 /
SMR2512



CR1218 / CR2030

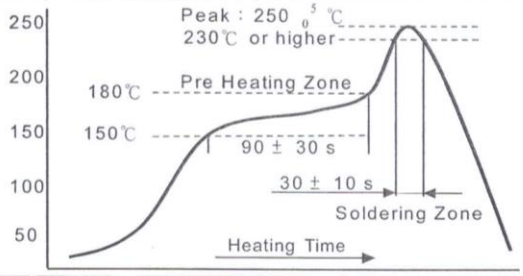
SMR1218 / SMR2030

Dimension

Unit: mm

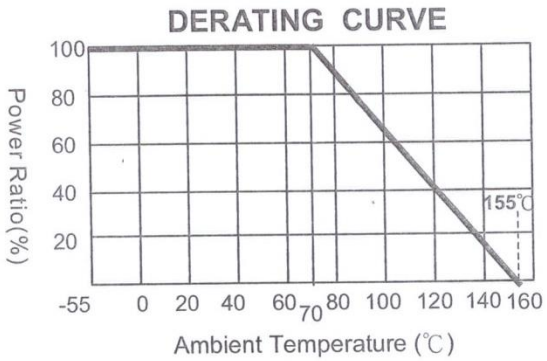
	TYPE	L	W	H	l_1	l_2
SMR0201	CR0201	0.60 ± 0.03	0.30 ± 0.03	0.23 ± 0.05	0.15 ± 0.05	0.15 ± 0.05
SMR0402	CR0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.15 ± 0.10
SMR0603	CR0603	1.60 ± 0.20	0.80 ± 0.15	0.40 ± 0.10	0.20 ± 0.10	0.20 ± 0.10
SMR0805	CR0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
SMR1206	CR1206	3.05 ± 0.10	1.60 ± 0.20	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
SMR1210	CR1210	3.05 ± 0.10	2.50 ± 0.20	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
SMR1812	CR1812	4.50 ± 0.10	3.00 ± 0.10	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
SMR2010	CR2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
SMR1218	CR1218	3.10 ± 0.10	4.60 ± 0.10	0.55 ± 0.05	0.40 ± 0.20	0.50 ± 0.20
SMR2512	CR2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
SMR2030	CR2030	5.10 ± 0.10	7.60 ± 0.10	0.60 ± 0.05	0.80 ± 0.20	0.80 ± 0.20

Test Procedures and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS C 5201-1 clause 4.8	-55℃ ~ +155℃, 20℃ is the reference temperature	Refer to Ratings
Short Time Overload	JIS C 5201-1 clause 4.13	General : 2.5 times RCWV or Max. Overload voltage for 5 seconds. High Power : 2.5 times RCWV or Max. Overload voltage for 2 seconds.	±1 : ±(1.0%+0.05Ω) ±5 : ±(2.0%+0.1Ω)
IR Reflow	Sony SS-00254		±1 : ±(1.0%+0.05Ω) ±5 : ±(1.0%+0.05Ω)
Leaching	Sony SS-00254-9	260±5℃ for 30 seconds.	>95% Coverage
Soldering Heat	JIS C 5201-1 clause 4.18	260±5℃ for 10 seconds.	±1 : ±(0.5%+0.05Ω) ±5 : ±(1.0%+0.05Ω)
Temperature Cycling	JIS C 5201-1 clause 4.19	-55℃ to +155℃,5 cycles	0.1%、0.5%、1% : ±(0.5%+0.05Ω) 2%、5% : ±(1.0%+0.10Ω)
Electric Iron	Sony SS-00254-5	Preheating temperature : 350±5℃ Electric iron preheating time : 3+1/-0 sec	±1 : ±(1.0%+0.05Ω) ±5 : ±(1.0%+0.05Ω)
Resistance to Solvent	JIS C 5201-1 clause 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	±1 : ±(0.5%+0.05Ω) ±5 : ±(0.5%+0.05Ω)
Load Life in Humidity	JIS C 5201-1 clause 4.24	40±2℃, 90~95% R.H. or Max. working voltage for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	0.1%、0.5%、1% : ±(0.5%+0.05Ω) 2%、5% : ±(2.0%+0.05Ω)
Load Life (Endurance)	JIS C 5201-1 clause 4.25	70±2℃, or Max. working voltage for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	0.1%、0.5%、1% : ±(1.0%+0.05Ω) 2%、5% : ±(3.0%+0.10Ω)
Terminal Bending Strength	JIS C 5201-1 clause 4.33	Bending once for 5 seconds D : CR Series 0402、0603、0805=5mm CR Series 1206、1210、1812=3mm CR Series 1218、2010、2512、2030=2mm	±1 : ±(1.0%+0.05Ω) ±5 : ±(1.0%+0.05Ω)
Insulation Resistance	JIS C 5201-1 clause 4.6	Max. Overload voltage for 1 minute.	≧10GΩ

Performance Characteristics

Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Voltage Rating or Current Rating

Resistance Range: ≧1Ω
Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

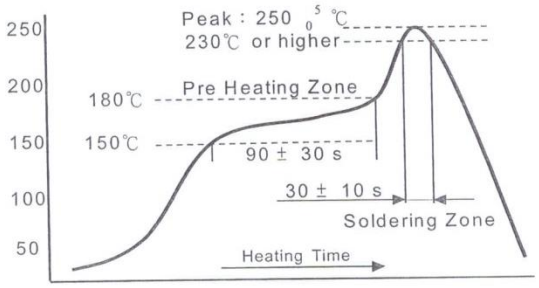
$E=\sqrt{P \times R}$

E=Rated voltage(V)
P=Power rating(W)
R=Nominal resistance(Ω)

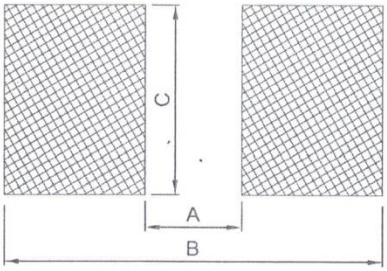
Operation and Storage Temperature

	MIN	MAX
Operation temperature	-55℃	70℃
Storage temperature	20℃	30℃
Storage humidity	30%	70%

Soldering Profile



Recommend Land Pattern Design (For Reflow Soldering)

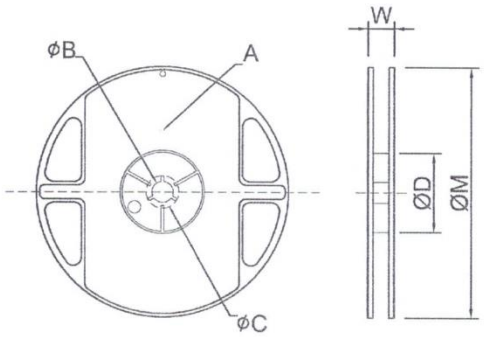


Dimension

Unit: mm

Item \ Type	0201	0402	0603	0805	1206	1210	1812	2010	1218	2512	2030
A	0.25	0.60	0.80	1.30	2.20	2.00	3.11	3.80	2.04	4.90	3.50
B	1.10	1.60	2.40	2.90	4.20	4.40	5.91	6.60	4.24	8.10	7.50
C	0.32	0.70	1.00	1.40	1.70	2.70	3.00	2.70	4.50	3.40	7.80

Packaging



Dimension

Unit: mm

TYPE	SIZE		A	ϕB	ϕC	ϕD	W	ϕM
SMR0201 SMR0402	7	10K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
SMR0603 SMR0805 SMR1206	7	5K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
	10	10K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	254±2.0
	13	20K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	330±2.0
SMR1210	7	5K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
SMR1812 SMR2010 SMR1218 SMR2512	7	4K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0
SMR2030	7	1K/Reel	2.0 ±0.5	13.5±1.0	21±1.0	60±1.0	19.0±2.0	178±2.0

Equipments Applicable:

Our company's products are produced under low temperature processing applicable to IR reflow surface mounting devices. It is comparatively not applicable to wave soldering which will possibly cause the risk ablating the element protection layer and the front conductor and cause the drift of the resistance value and ablation of the markings.

Product Testing Method:

Our products are tested with our company's tapping & testing equipments by using four-feet probe to touch at the back of both electrodes. Supposed different testing points or methods are requested, please advise beforehand and customized-made production is available.

0603 E-96 Multiplier Code

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

CODING FORMULA

XX X

Multiplier Code

Resistance Code

Example: $10.2K\Omega = \frac{102}{02} \times \frac{10^2\Omega}{C} = 02C$

$33.2\Omega = \frac{332}{51} \times \frac{10^{-1}\Omega}{X} = 51X$

0603 Standard E-96 Values and 0603 Resistance Codes

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