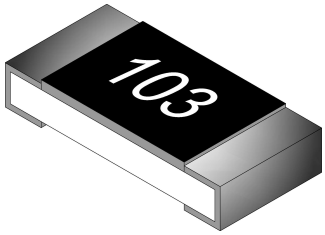
AEC-Q200 Chip Resistor — QR Series



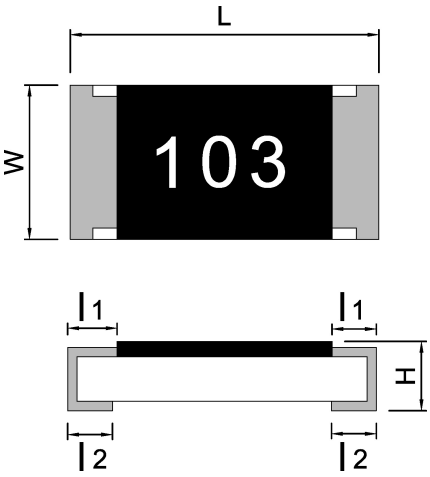
Application

- 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
- Automotive

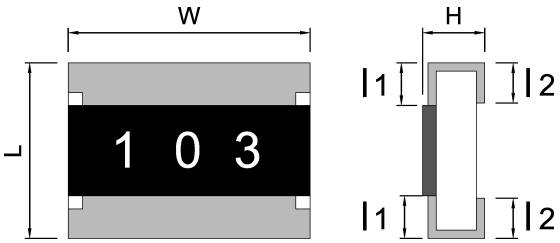
Features

- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality and fast delivery
- AEC-Q200 rev.D compliant

■ Type Dimension



QR0402 / QR0603 / QR0805 / QR1206 /
QR1210 / QR1812 / QR2010 / QR2512



QR1218

■ **Dimension** **Unit: mm**

TYPE	L	W	H	l_1	l_2
QR0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
QR0603	1.60 ± 0.20	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
QR0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
QR1206	3.05 ± 0.10	1.60 ± 0.20	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
QR1210	3.05 ± 0.10	2.50 ± 0.20	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
QR1812	4.50 ± 0.10	3.10 ± 0.20	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
QR2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
QR1218	3.10 ± 0.10	4.60 ± 0.10	0.55 ± 0.05	0.40 ± 0.20	0.50 ± 0.20
QR2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

● AEC-Q200 Low Ohm Chip Resistor

■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Rated Voltage	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%) J±(5%)	Operating Temperature Range
QR0402	0.063 W	0.17~0.25V	0.25 V	0.624 V	±800	470~990	-55℃ ~ +155℃
QR0603	0.1 W	0.1~0.31V	0.31 V	0.775 V	±800	100~330	
					±600	331~510	
					±400	511~990	
QR0805	0.125 W	0.04~0.35V	0.35 V	0.875 V	±1000	10~50	
					±800	51~100	
					±600	101~330	
					±400	331~990	
QR1206	0.25 W	0.05~0.5V	0.5 V	1.25 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR1210	0.5 W	0.07~0.7V	0.7 V	1.75 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR1812	0.5 W	0.07~0.7V	0.7 V	1.75 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR2010	0.75 W	0.08~0.8V	0.8 V	2.15 V	±800	10~50	
					±800	51~100	
					±600	101~330	
					±400	331~990	
QR1218	1 W	0.1~0.99V	0.99 V	2.475V	±800	10~50	
					±400	51~990	
QR2512	1 W	0.1~0.99V	0.99 V	2.475V	±800	10~50	
					±700	51~100	
					±500	101~330	
					±400	331~990	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

■ High Power Electrical Specifications

Item / Type	Rated Power at 70℃	Rated Voltage	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%) J±(5%)	Operating Temperature Range
QR0603	0.125 W	0.11~0.35V	0.352 V	0.879 V	±800	100~330	-55℃ ~ +155℃
					±600	331~510	
					±400	511~990	
QR0805	0.25 W	0.05~0.5V	0.497 V	1.244 V	±1000	10~50	
					±800	51~100	
					±600	101~330	
					±400	331~990	
QR1206	0.5 W	0.07~0.7V	0.704 V	1.759 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR1210	0.66 W	0.08~0.81V	0.808 V	2.021 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR1812	1 W	0.1~0.99V	0.995 V	2.487 V	±800	10~50	
					±600	51~100	
					±500	101~330	
					±400	331~990	
QR2010	1 W	0.1~0.99V	0.995 V	2.487 V	±800	10~50	
					±800	51~100	
					±600	101~330	
					±400	331~990	
QR2512	2 W	0.14~1.41V	1.407 V	3.518 V	±800	10~50	
					±700	51~100	
					±500	101~330	
					±400	331~990	

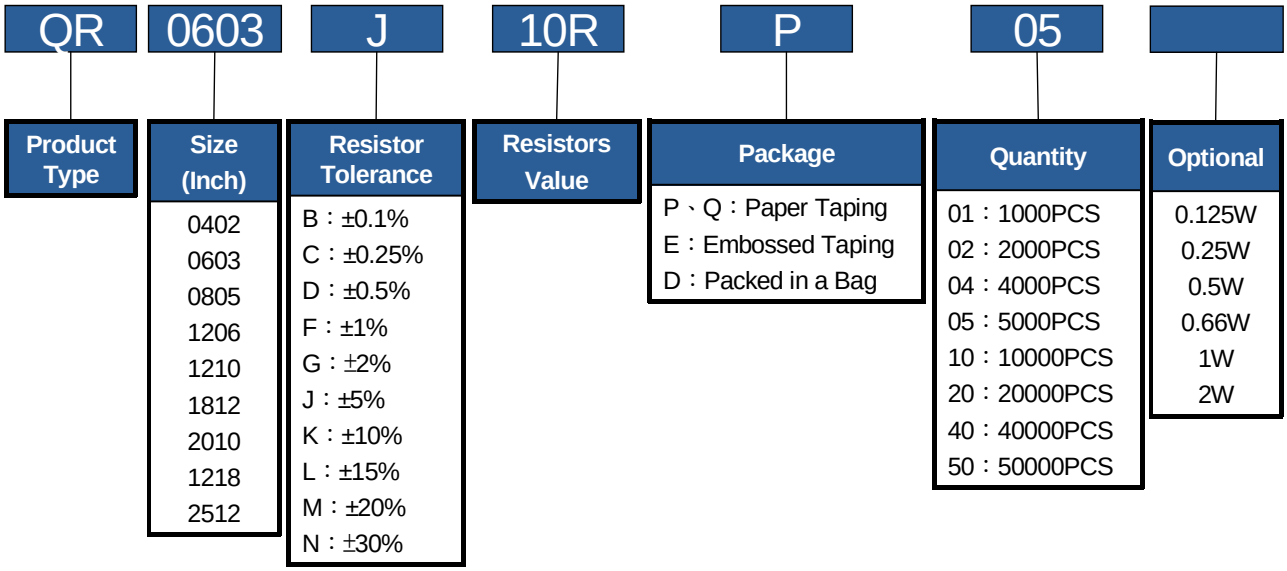
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

■ Rated Resistance(1%&5%)

Resistance	Code	0603 Code	Resistance	Code	0603 Code	Resistance	Code	0603 Code	Resistance	Code	0603 Code	Resistance	Code	0603 Code
10mΩ	R010	010	65mΩ	R065	065	0.12Ω	R120	R12	0.27Ω	R270	R27	0.56Ω	R560	R56
15mΩ	R015	015	68mΩ	R068	068	0.13Ω	R130	R13	0.30Ω	R300	R30	0.60Ω	R600	R60
20mΩ	R020	020	70mΩ	R070	070	0.15Ω	R150	R15	0.33Ω	R330	R33	0.65Ω	R650	R65
30mΩ	R030	030	75mΩ	R075	075	0.16Ω	R160	R16	0.36Ω	R360	R36	0.68Ω	R680	R68
40mΩ	R040	040	80mΩ	R080	080	0.18Ω	R180	R18	0.40Ω	R400	R40	0.70Ω	R700	R70
50mΩ	R050	050	90mΩ	R090	090	0.20Ω	R200	R20	0.43Ω	R430	R43	0.75Ω	R750	R75
56mΩ	R056	056	0.10Ω	R100	R10	0.22Ω	R220	R22	0.47Ω	R470	R47	0.80Ω	R800	R80
60mΩ	R060	060	0.11Ω	R110	R11	0.25Ω	R250	R25	0.50Ω	R500	R50	0.90Ω	R900	R90

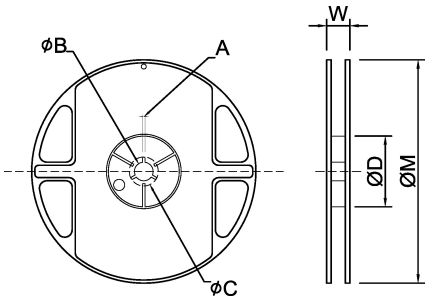
■ Parts Number Explanation

■ Example:



Appendix For SMD Chip Resistor

Packaging Information

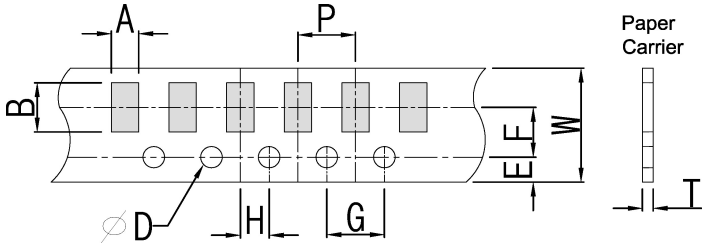


Dimension

Unit: mm

TYPE	SIZE		A	φB	φC	φD	W	φM
0402	7”	10K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
	13”	40K/Reel	2.0±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	330±2.0
	13”	50K/Reel	2.0±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	330±2.0
0603 0805 1206	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
1210	7”	5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
2010/2512 1812/1218	7”	4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0

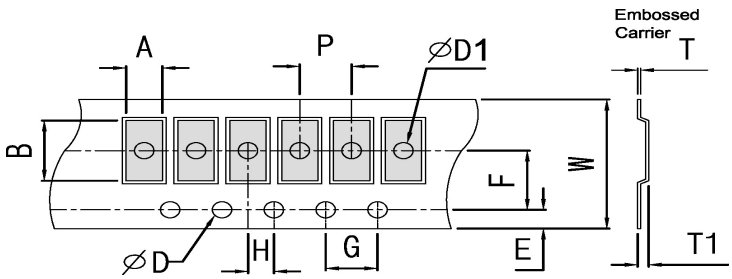
Tapping Specification



Dimension

Unit: mm

Packaging	Type	A	B	W	E	F	G	H	T	φD	P
Paper Type	0402	0.70±0.10	1.20±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	0.45±0.10	1.50 +0.10 -0	2.0±0.1
	0603	1.05±0.20	1.80±0.20	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	0.60±0.10		4.0±0.1
	0805	1.55±0.20	2.30±0.20	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	0.75±0.10		
	1206	1.90±0.20	3.50±0.20	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	0.75±0.10		
	1210	2.85±0.20	3.50±0.20	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	0.75±0.10		



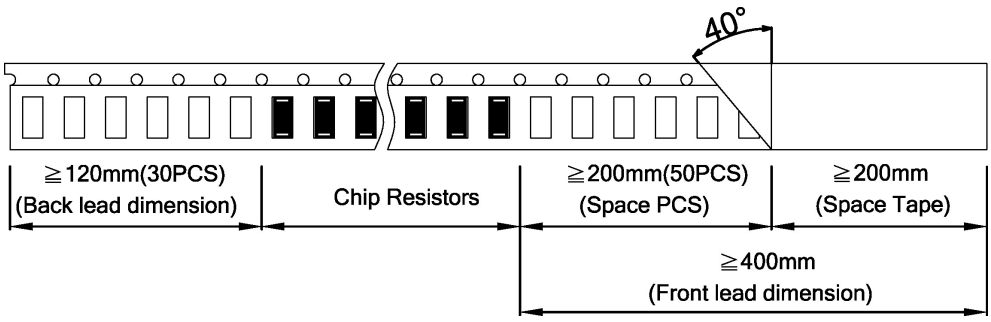
Dimension

Unit: mm

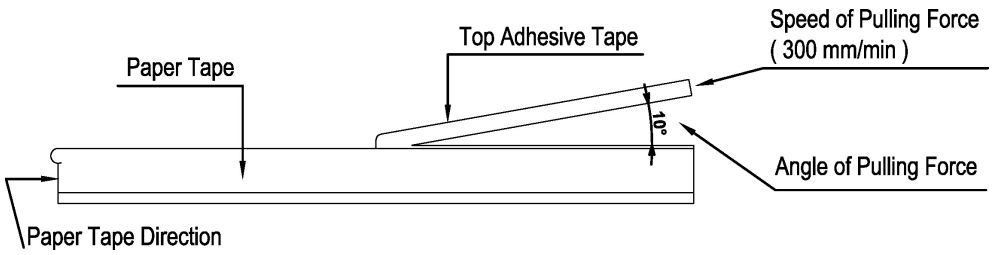
Packaging	Type	A	B	W	E	F	G	H	T	φD	ΨD1	T1	P
Embossed Type	2010	2.80±0.20	5.60±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10	1.50 +0.10 -0	1.50±0.10	0.85±0.15	4.0±0.1
	2512	3.40±0.20	6.70±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10		1.50±0.10	0.85±0.15	
	1812	3.30±0.20	4.60±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10		1.50±0.10	0.85±0.15	
	1218	3.30±0.20	4.60±0.20	12±0.10	1.75±0.10	5.5±0.05	4.0±0.10	2.0±0.05	0.23±0.10		1.50±0.10	0.85±0.15	

■ Packing Material Data/Storage Data

■ Front & Back Lead Dimension

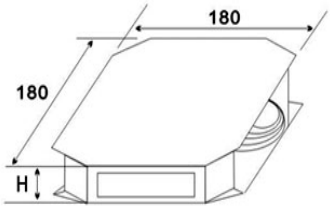


■ Top Adhesive Peel Off Strength：10~70g

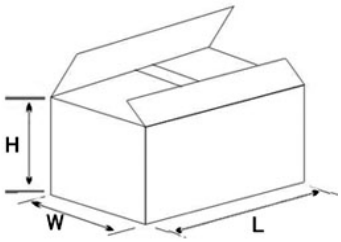


■ Package

Inner Box Size	
Reel	Size H(mm)
1	13
2	24
3	36
5	60
10	113



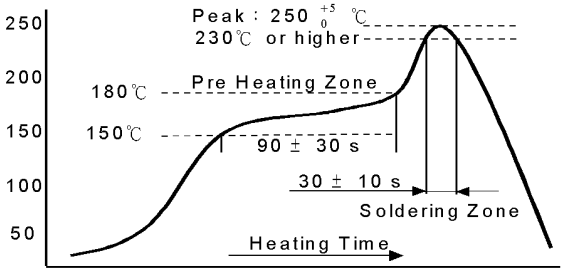
External Box Size			
Contain (Kpcs)	Length (mm)	Width (mm)	Height (mm)
25K	180	180	60
50K	180	180	110
150K	430	200	200
300K	400	400	200



■ Storage Data：

Storage time at the environment temp: 25±5℃& humidity:60±20% is valid for one year from the date of delivery.

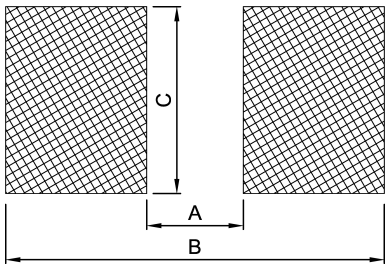
● Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS C 5201-1 clause 4.8	-55℃ or +155℃, 25℃ 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 whichever is less for 5 seconds. High Power：2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.10Ω)
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±10℃ 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. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	0.1%、0.5%、1%：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω)
Load Life (Endurance)	JIS C 5201-1 clause 4.25	70±2℃, RCWV or Max. working voltage whichever is less 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) Value <1Ω：±(3.0%+0.10Ω)
Insulation Resistance	JIS C 5201-1 clause 4.6	100V for 1 minute.	≧10GΩ
Terminal Bending Strength	JIS C 5201-1 clause 4.33	Bending once for 5 seconds D： 0402、0603、0805=5mm 1206、1210、1812=3mm 1218、2010、2512、2030=2mm	±1：±(1.0%+0.05Ω) ±5：±(1.0%+0.05Ω)

AEC-Q200 test			
Test Item	**Test Method**	**Procedure**	**Requirements**
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55℃ to +125℃) Measurement at 24± 4 hours after test conclusion.	0.1%、0.5%、1%：±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical-OKEM clean or equivalent.	±1：±(0.5%+0.05Ω) ±5：±(0.5%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1000 hours 85℃/85%RH. 10% of operation power.	0.1%、0.5%、1%：±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. T=125℃.	0.1%、0.5%、1%：±(1.0%+0.05Ω) 2%、5% ：±(2.0%+0.05Ω)
Operation Life	MIL-STD-202 Method 108	125℃，or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs"ON" and 0.5hr "OFF"	0.1%、0.5%、1%：±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Impact acceleration：1500g Pulse duration：0.5ms Number of shocks：30 shocks(5 shocks for each face)	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20min., 12 cycles each of 3 orientations.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
ESD	ACE-Q200- 002 or ISO/DIS 10605	0402 / 0603：1KV 0805 and above：2KV	For the product %
Solderability	J-STD-002	(1) 4 hrs 155℃ dry heat (2) 260±5℃ 10 sec.	±1：±(0.5%+0.05Ω) ±5：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC Q200-006	0402 / 0603：8N 0805 and above：17.7N	No broken
Board Flex	AEC Q200-005	Beading once for 60 seconds	±1：±(1.0%+0.05Ω) ±5：±(1.0%+0.05Ω)

● General Information

■ Recommend Land Pattern Design (For Reflow Soldering)



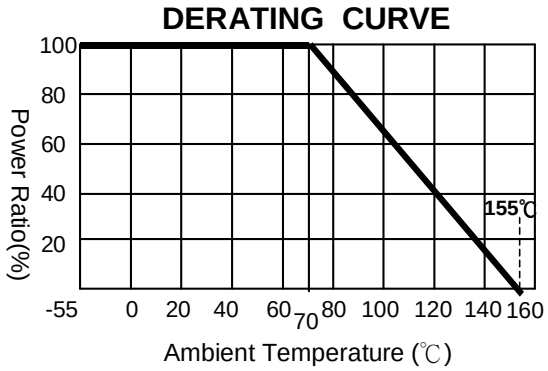
■ Dimension Unit: mm

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

■

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(RCWV)=√PxR

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	40%	80%

■ 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

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