

晶片電阻 *Chip Resistors*

1. 適用範圍 (Scope):

The specifications are applicable to all series of SMT resistors.

Include: Thick film chip resistors, Low ohm chip resistors, Current sensing resistors, Thick film trimmable chip resistors, Thick film high precision chip resistors, Thick film high voltage chip resistors, Thin film chip resistors, Thick film chip resistor networks.

2. 規格描述 (Part Numbering System):

<u>CR</u>	<u>03</u>	<u>J</u>	<u>A</u>	<u>10K</u>
<p><u>Series Name</u></p> <p>Chip Resistor:</p> <p>CR: Thick Film chip resistors</p> <p>CL: Low Ohm chip resistors</p> <p>PL: Power Low Ohm chip Resistors</p> <p>CS: Current sensing resistors</p> <p>CT: Trimmable chip resistors</p> <p>CH: Thick Film High Voltage chip resistors</p> <p>CF: Thin Film chip</p> <p>CN: Chip Resistor Network</p> <p>AR: Thin Film High Precision Chip Resistors</p> <p>LR: Ultra Low Chip Resistors</p> <p>AT: Automotive</p> <p>AMR: Anti-Sulfuration Chip Resistors</p> <p>CP: High power Chip Resistors</p> <p>AS: Anti-Surge Chip Resistors</p>	<p><u>Type Inch (mm)</u></p> <p>01-0201(0603)</p> <p>02-0402(1005)</p> <p>03-0603(1608)</p> <p>05-0805(2012)</p> <p>06-1206(3216)</p> <p>10-1210(3225)</p> <p>18-1812(4532)</p> <p>0A-2010(5025)</p> <p>12-2512(6332)</p> <p>22-0402x2R</p> <p>24-0402x4R</p> <p>28-0402x8R</p> <p>32-0603x2R</p> <p>34-0603x4R</p> <p>35-0603x5R</p>	<p><u>Tolerance</u></p> <p>T=±0.01%</p> <p>B= ± 0.1%</p> <p>C= ± 0.25%</p> <p>D= ± 0.50%</p> <p>F= ± 1.0%</p> <p>G= ± 2.0%</p> <p>H= ± 3.0%</p> <p>J= ± 5.0%</p> <p>K= ± 10%</p> <p>M= ± 20%</p>	<p><u>Package</u></p> <p>A=4Kpcs/7"Reel</p> <p>B=5Kpcs/7"Reel</p> <p>C=10Kpcs/7"Reel</p> <p>D=10Kpcs/10"Reel</p> <p>E=20Kpcs/10"Reel</p> <p>F=20Kpcs/13"Reel</p> <p>G=40Kpcs/13"Reel</p> <p>H=5Kpcs/Cartridge</p> <p>I=10Kpcs/Cartridge</p> <p>J=20Kpcs/Cartridge</p> <p>K=50Kpcs/Cartridge</p> <p>L=2Kpcs/Reel</p>	<p><u>Resistance</u></p> <p>m50=0.5mΩ</p> <p>R001=1mΩ</p> <p>1M50=1.5 mΩ</p> <p>R025=0.025Ω</p> <p>0R1=0.1 Ω</p> <p>1R2=1.2Ω</p> <p>10K-10KΩ</p>

3. 阻值標示說明(Resistance Marking Explanation):

3.1 E-24 Series (G, J) :



683=68000Ω =68KΩ ex:R22=0.22Ω ; 1R0=1.0Ω



17.8=17R8=17.8Ω

3 digits marking for E-24 (G, J), first two digits are significant figures, third digit is number of zeros. Letter "R" is decimal point.

decimal point "." instead of "R", the marking 17R8 and 17.8 has the same Resistance

3.2 E-96 Series (D, F) :



17R8=17.8Ω



4 digits marking for E-96 (D, F), first three digits are significant figures, fourth digit is number of zeros. Letter "R" is decimal point.

ex:1000=100Ω ; 43R2=43.2Ω ; R050=0.05Ω =50mΩ ; 6812=68.1KΩ

decimal point "." instead of "R", the marking 17R8 and 17.8 has the same Resistance

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4 digits marking for E-96 (D , F) , first three digits are significant figures , fourth digit is number of zeros. Letter “R” is decimal point.

$$1504=1.5G\Omega \quad \text{ex:} 1504=150 \times 10^4 \Omega = 1.5 \times 10^5 \Omega = 1.5 G\Omega ; 6812=68.1K\Omega$$

3.3 E-96 Series (F) :



For 0603 ±1% E-96 (F) , marking as below list.(Table1)

The third character is a letter of multiplier: ex. Y=10⁻²....

The table1 shows the first two digits for the three-digits EIA-96 part marking scheme.

$$50C=32.4K\Omega$$



decimal point “. ” instead of “R” , the marking 17R8 and 17.8 has the same Resistance

$$17.8=17R8=17.8\Omega$$

Multiplier Code:

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

Table 1 0603 ±1% EIA-96 Marking code.

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

3.4 Jumper Series:



Letter “0” for all size jumper. (<50mΩ)

3.5 No marking Series :



For chip size smaller than 0603 of thick film chip resistors and chip resistor networks.

4. 阻值編號定義 (Significant figures of nominal resistance):

IEC 63

E6 Series	10		15		22		33		47		68	
E12 Series	10	12	15	18	22	27	33	39	47	56	68	82

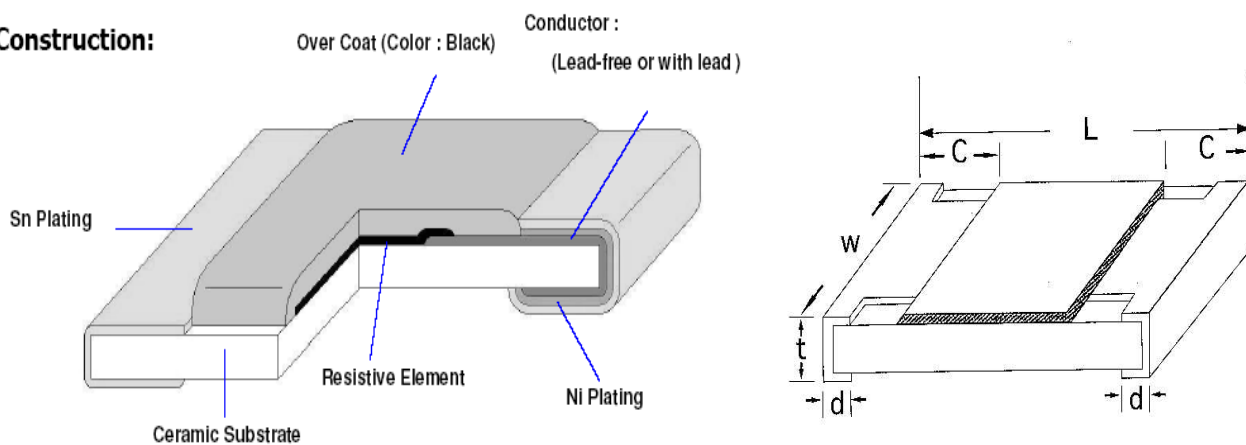
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E24 Series	10	11	12	13	15	16	18	20	22	24	27	30	
	33	36	39	43	47	51	56	62	68	75	82	91	
E48 Series	100		105		110		115		121		127		
	133		140		147		154		162		169		
	178		187		196		205		215		226		
	237		249		261		274		287		301		
	316		332		348		365		383		402		
	422		442		464		487		511		536		
	562		590		619		649		681		715		
750		787		825		866		909		953			
E96 Series	100	102	105	107	110	113	115	118	121	124	127	130	
	133	137	140	143	147	150	154	158	162	165	169	174	
	178	182	187	191	196	200	205	210	215	221	226	232	
	237	243	249	255	261	267	274	280	287	294	301	309	
	316	324	332	340	348	357	365	374	383	392	402	412	
	422	432	442	453	464	475	487	499	511	523	536	549	
	562	576	590	604	619	634	649	665	681	698	715	732	
	750	768	787	806	825	845	866	887	909	931	953	976	
	E192 Series	100	101	102	104	105	106	107	109	110	111	113	114
		115	117	118	120	121	123	124	126	127	129	130	132
133		135	137	138	140	142	143	145	147	149	150	152	
154		156	158	160	162	164	165	167	169	172	174	176	
178		180	182	184	187	189	191	193	196	198	200	203	
205		208	210	213	215	218	221	223	226	229	232	234	
237		240	243	246	249	252	255	258	261	264	267	271	
274		277	280	284	287	291	294	298	301	305	309	312	
316		320	324	328	332	336	340	344	348	352	357	361	
365		370	374	379	383	388	392	397	402	407	412	417	
422		427	432	437	442	448	453	459	464	470	475	481	
487		493	499	505	511	517	523	530	536	542	549	556	
562		569	576	583	590	597	604	612	619	626	634	642	
649		657	665	673	681	690	698	706	715	723	732	741	
750		759	768	777	787	796	806	816	825	835	845	856	
866		876	887	898	909	920	931	942	953	965	976	988	

5. 尺寸與構造(Dimensions and Construction):

5.1 晶片電阻 Chip Resistor Series:

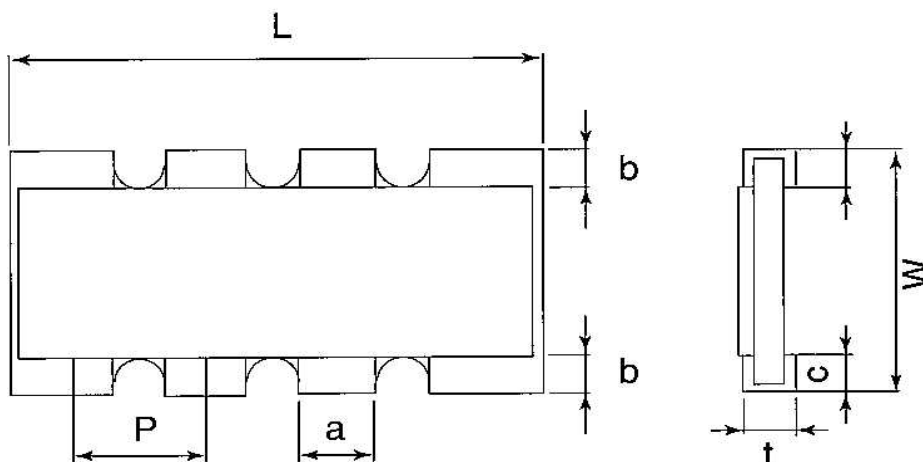
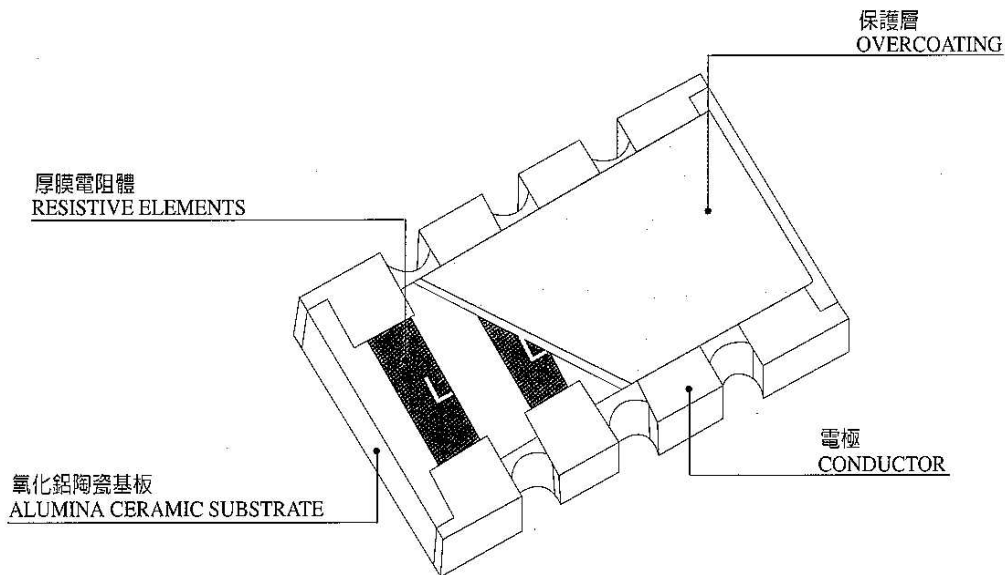
Construction:



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Type Inch	Type mm	L (mm)	W (mm)	C (mm)	d (mm)	t (mm)
0201	0603	0.60±0.03	0.30±0.03	0.10±0.05	0.15±0.05	0.25±0.05
0402	1005	1.00	+0.10	0.50±0.05	0.20±0.10	0.25±0.10
			-0.05			
0603	1608	1.60±0.10	0.80±0.10	0.30±0.20	0.30	+0.20
						-0.10
0805	2012	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.15
1206	3216	3.10±0.10	1.60±0.10	0.50±0.30	0.45±0.20	0.60±0.15
1210	3225	3.10±0.10	2.60±0.10	0.50±0.30	0.50±0.20	0.60±0.10
2010	5025	5.00±0.20	2.50±0.20	0.65±0.30	0.60±0.25	0.60±0.10
2512	6332	6.40±0.20	3.20±0.20	0.65±0.30	0.90±0.25	0.60±0.10

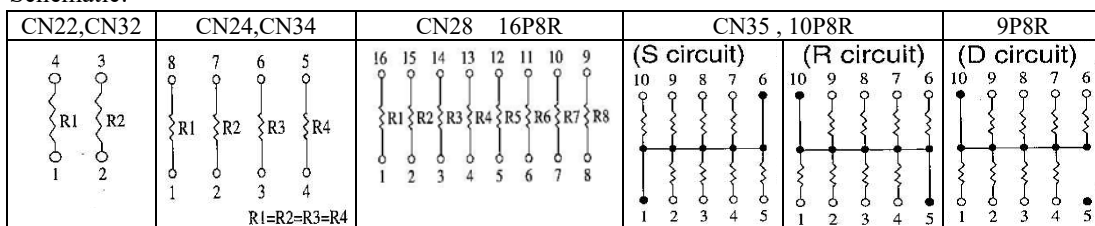
5.2 晶片型排阻 Chip Resistor Network Series:



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Type	Type	L (mm)	W (mm)	t (mm)	P (mm)	a (mm)	b (mm)	c (mm)
CN22	0402-2R	1.00±0.10	1.00±0.10	0.35±0.10	0.65±0.10	0.33±0.10	0.15±0.10	0.25±0.10
CN24	0402-4R	2.00±0.10	1.00±0.10	0.45±0.10	0.50±0.05	0.35±0.10	0.20±0.10	0.25±0.10
CN28	0402-8R	3.30±0.20	1.60±0.15	0.55±0.10	0.64±0.05	0.50±0.10	0.40±0.10	0.40±0.10
CN32	0603-2R	1.60±0.15	1.50±0.15	0.50±0.10	1.00±0.10	0.60±0.10	0.30±0.20	-
CN34	0603-4R	3.20±0.20	1.60±0.15	0.50±0.10	0.80±0.10	0.60±0.10	0.30±0.20	0.40±0.20
CN35	0603-8R	4.00±0.20	1.60±0.15	0.45±0.10	0.50±0.05	0.35±0.10	0.30±0.20	0.30±0.20

Schematic:



6. 適用溫度範圍 (Operating Temperature Range):

-55°C ~ +155°C

7. 儲存條件 (Storage):

7.1 Keep the storage environment conditions as following:

Temperature : ≤ 40°C

Humidity : ≤ 85% RH

7.2 Don't open the tape until the parts are to be used ,and store them within one year since the date printed on the reel.

7.3 Use the chips within 3 months after the tape is opened.

8. 電阻特性(Resistor Characteristics):

8.1: Thick Film chip resistors Series(CR):

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/ °C)	Resistance Range(Ω)	
					F(±1%) E-96	J(±5%) E-24
0201	0603	1/20W	25V	±200	1MΩ ~10MΩ	1MΩ ~10MΩ
				±300	1Ω ~1MΩ	1Ω ~1MΩ
0402	1005	1/16W	50V	±100	10Ω ~10MΩ	10Ω ~10MΩ
				±200	1Ω ~10Ω	1Ω ~10Ω
0603	1608	1/10W	75V	±100	10Ω ~10MΩ	10Ω ~10MΩ
				±200	1Ω ~10Ω	1Ω ~10Ω
0805	2012	1/8W	150V	±100	10Ω ~10MΩ	10Ω ~10MΩ
				±200	1Ω ~10Ω	1Ω ~10Ω
1206	3216	1/4W	200V	±100	10Ω ~10MΩ	10Ω ~10MΩ
				±200	1Ω ~10Ω	1Ω ~10Ω
1210	3225	1/3W	200V	±200	1MΩ ~10MΩ	1MΩ ~10MΩ
				±100	10Ω ~1MΩ	10Ω ~1MΩ
				±200	1Ω ~10Ω	1Ω ~10Ω
2010	5025	1/2W	200V	±200	1MΩ ~10MΩ	1MΩ ~10MΩ
				±100	10Ω ~1MΩ	10Ω ~1MΩ

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				±200	1Ω~10Ω	1Ω~10Ω
2512	6332	1W	250V	±200	1MΩ~10MΩ	1MΩ~10MΩ
				±100	10Ω~1MΩ	10Ω~1MΩ
				±200	1Ω~10Ω	1Ω~10Ω

Remark: 1. Resistance range and tolerance are for standard value; any special value will be available on request.

2. 0Ω thick Film chip resistors: Resistance Range \leq 50mΩ .

8.2: Low Ohm chip resistors Series(CL):

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/°C)	Resistance Range(mΩ)	
					F(±1%)	J(±5%)
0402	1005	1/16W	50V	≤600	100~976	100~976
0603	1608	1/10W	50V	≤500	100~976	100~976
0805	2012	1/8W	100V	≤1500	20~976	20~976
1206	3216	1/4W	200V	≤1500	20~976	20~976
1210	3225	1/3W	200V	±200	20~976	20~976
1218	3248	1W	200V	≤1500	20~976	20~976
2010	5025	1/2W	200V	≤1500	20~976	20~976
2512	6432	1W	250V	≤1500	15~976	15~976

Remark: Resistance range and tolerance are for standard value, any special value will be available on request.

8.3: Power Low Ohm chip Resistors(PL)

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/ °C)	Resistance Range(mΩ)	
					F(±1%)	J(±5%)
0402	1005	1/8W	50V	0~+300	100~976	100~976
0603	1608	1/4W	50V	±250	47~99	47~99
				±200	100~976	100~976
0805	2012	1/3W	150V	±200	47~99	47~99
				±150	100~976	100~976
1206	3216	1/2W	200V	±200	47~99	47~99
				±100	100~976	100~976
2010	5025	1W	200V	±150	47~99	47~99
				±100	100~976	100~976
2512	6432	2W	250V	±150	47~99	47~99
				±100	100~976	100~976

1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8".

2. Max. Operation Voltage : So called RCWW (Rated Continuous Working Voltage) is determined by $RCWW = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWW listed above, whichever is lower.

3. 2W loading with total solder-pad and trace size of 300mm²

8.4: Current sensing resistors Series(CS):

Type Inch	Type mm	Power Rating at 70°C	TCR (ppm/°C)	Resistance Range(mΩ)	Max. Operation Current(DC or RMS)
				±1%, ±2%, ±5%	
0603	1608	1/3W	±75	5, 10, 15 mΩ	8.1A, 5.7A, 3.8A
0805	2012	1/2W	±75	4, 5, 6, 8, 9, 10 mΩ	11A, 10A, 9.1A, 7.9A, 7.4A, 7A
			±100	20, 25, 30, 40, 50 mΩ	5A~3A
1206	3216	1W	±75	1~15 mΩ	30A~8A
			±100	20, 25, 30, 40, 50 mΩ	14A~3A

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2512	6432	1W	±100	1~15mΩ	44A~8A
		2W	±100	1,2,3,4,5,6,7,8,9,10,15,20,25 mΩ	44A~8.5A

Remark: 1. Resistance range and tolerance are for standard value; any special value will be available on request.
2. Operating Temperature Range -55°C ~ +155°C

8.5: Thick Film trimmable chip resistors Series(CT):

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/°C)	Resistance Range(Ω) E-24	
					-20%/0	-30%/0
0603	1608	1/10W	75V	±200	10Ω~4.7MΩ	10Ω~4.7MΩ
0805	2012	1/8W	150V	10Ω~4.7MΩ:±2	1Ω~4.7MΩ	1Ω~4.7MΩ
1206	3216	1/4W	200V	00	1Ω~4.7MΩ	1Ω~4.7MΩ
1210	3225	1/3W	200V	1Ω~9.1Ω:-200~	1Ω~4.7MΩ	1Ω~4.7MΩ
2010	5025	1/2W	200V	+500	1Ω~4.7MΩ	1Ω~4.7MΩ
2512	6332	1W	200V		1Ω~4.7MΩ	1Ω~4.7MΩ

Remark: Resistance range and tolerance are for standard value; any special value will be available on request.

8.6: Thick Film High Voltage chip resistors Series(CH):

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/ °C)	Resistance Range(Ω)		
					F(±1%)	J(±5%)	k(±10%)
0603	1608	1/10W	200V	±200	47Ω~10MΩ	47Ω~10MΩ	
0805	2012	1/8W	400V	±200	47Ω~51MΩ	47Ω~51MΩ	
1206	3216	1/4W	500V	±200	47Ω~51MΩ	47Ω~51MΩ	
2010	5025	1/2W	500V	±200	47Ω~51MΩ	47Ω~51MΩ	
			1500V	±200		1MΩ~16MΩ	1MΩ~16MΩ
2512	6332	1W	800V	±200	47Ω~51MΩ	47Ω~51MΩ	
			2000V	±200		4.7MΩ~16MΩ	4.7MΩ~16MΩ

Remark: Resistance range and tolerance are for standard value; any special value will be available on request.

8.7: Thin Film chip resistors Series(CF):

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	MAX Over Load Voltage	TCR (ppm/°C)	Resistance Range(Ω)
						±0.5~±1.0
0402	1005	1/16W	50V	100V	±50	10Ω~91Ω
					±25	100Ω~10KΩ
					±100	11KΩ~100KΩ
0603	1608	1/10W	75V	150V	±50	10Ω~91Ω
					±25	100Ω~33KΩ
					±100	36KΩ~360KΩ
0805	2012	1/8W	150V	300V	±50	10Ω~91Ω
					±25	100Ω~100KΩ
					±100	110KΩ~360KΩ
1206	3216	1/8W	150V	300V	±50	10Ω~91Ω

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					±25	100Ω~100KΩ
					±100	110KΩ~360KΩ

Remark: Resistance range and tolerance are for standard value; any special value will be available on request.

8.8: Chip Resistor Network Series(CN):

Type	Type	Power Rating at 70oC	MAX Working Voltage	MAX Over Load Voltage	TCR (ppm/°C)	Resistance Range(Ω)	
						F(±1%) E-96	J(±5%) E-24
CN22	0402-2R	1/16W	25V	50V	±250	10Ω ~1MΩ	10Ω ~1MΩ
CN24	0402-4R	1/16W	25V	50V	±250	10Ω ~1MΩ	10Ω ~1MΩ
CN28	0402-8R	1/16W	25V	50V	±250	10Ω ~1MΩ	10Ω ~1MΩ
CN32	0603-2R	1/16W	50V	100V	±200	10Ω ~1MΩ	10Ω ~1MΩ
CN34	0603-4R	1/16W	50V	100V	±200	10Ω ~1MΩ	10Ω ~1MΩ
CN35	0603-5R	1/16W	25V	50V	±200	10Ω ~1MΩ	10Ω ~1MΩ

Remark: Resistance range and tolerance are for standard value; any special value will be available on request.

8.9 Thin Film High Precision Chip Resistors Series(AR):

Item Type	Power Rating at 70oC	Operating Temp.Range	TCR. (PPM/°C)	Max Operating Voltage	Resistance Tolerance	Resistance Range	
0402	1/16W	-55~155°C	±5	25V	±0.05%,±0.10%,±0.50%	25Ω~8KΩ	
			±10			25Ω~20KΩ	
			±15			25Ω~20KΩ	
			±25	25V		±0.05%,±0.10%,±0.50%,±1%	10Ω~100KΩ
			±50				
0603	1/10W	-55~155°C	±5	50V	±0.05%,±0.10%,±0.50%	25Ω~40KΩ	
			±10			25Ω~100KΩ	
			±15			25Ω~100KΩ	
	1/10W, 1/16W		±25	75V(1/10W) 50V(1/16W)		±0.05%,±0.10%,±0.50%,±1%	4.7Ω~680KΩ
			±50				
0805	1/8W	-55~155°C	±5	100V	±0.05%,±0.10%,±0.50%	25Ω~80KΩ	
			±10			25Ω~200KΩ	
			±15			25Ω~200KΩ	
	1/8W, 1/10W		±25	150V(1/8W) 100V(1/10W)		±0.05%,±0.10%,±0.50%,±1%	4.7Ω~1MΩ
			±50				
1206	1/8W	-55~155°C	±5	150V	±0.05%,±0.10%,±0.50%	25Ω~120KΩ	
			±10			25Ω~300KΩ	
			±15			25Ω~300KΩ	
	1/4W, 1/8W		±25	200V		±0.05%,±0.10%,±0.50%,±1%	4.7Ω~1MΩ
			±50				
1210	2/5W, 1/4W		±25 ±50	200V	±0.05%,±0.10%,±0.50%,±1%	10Ω~1MΩ	
2010	3/4W,		±25	200V	±0.05%,±0.10%,±0.50%,±1%	10Ω~1.5MΩ	

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	1/2W		±50			
2512	1W, 3/4W		±25 ±50	200V	±0.05%,±0.10%,±0.50%,±1%	10Ω~1.5MΩ

Note: When TCR(PPM/°C)=50, Part number series=ART; When TCR(PPM/°C)=25, Part number series=ARU;

When TCR(PPM/°C)=15, Part number series=ARF; When TCR(PPM/°C)=10, Part number series=ARW;

When TCR(PPM/°C)=5, Part number series=ARZ;

8.10: Ultra Low Chip Resistors Series(LR):

Type	Item Power Rating at 70°C	Operating Temp.Range	Resistance Tolerance (±%)	Resistance (mΩ)	TCR (PPM/°C)
2512	1W	-55~+ 170°C	3,5	0.50	50
2512	1W	-55~+ 170°C	1,3,5	0.75	50
2512	1W	-55~+ 170°C	1,3,5	1.0	50
2512	1W	-55~+ 170°C	1,3,5	1.5	50
2512	1W	-55~+ 170°C	1,3,5	2.0	50
2512	1W	-55~+ 170°C	1,3,5	2.5	100
2512	1W	-55~+ 170°C	1,3,5	3.0	100
2512	1W	-55~+ 170°C	1,3,5	3.5	100
2512	1W	-55~+ 170°C	1,3,5	4.0	100
2512	1W	-55~+ 170°C	1,3,5	4.5	100
2512	1W	-55~+ 170°C	1,3,5	5.0	100
2512	1W	-55~+ 170°C	1,3,5	5.5	100
2512	1W	-55~+ 170°C	1,3,5	6.0	100
2512	1W	-55~+ 170°C	1,3,5	6.5	100
2512	1W	-55~+ 170°C	1,3,5	7.0	100
2512	1W	-55~+ 170°C	1,3,5	10	100

8.11: Automotive & Anti-Sulfuration Chip Resistors(AT)

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/ °C)	Resistance Range(Ω)	
					F(±1%)	J(±5%)
0402	1005	1/16W	50V	±200	1Ω~10MΩ	1Ω~10MΩ
0603	1608	1/10W	75V	±200	1Ω~10MΩ	1Ω~10MΩ
0805	2012	1/8W	150V	±200	1Ω~10MΩ	1Ω~10MΩ
1206	3216	1/4W	200V	±200	1Ω~10MΩ	1Ω~10MΩ
1210	3225	1/2W	200V	±200	1Ω~10MΩ	1Ω~10MΩ
1218	3248	1W	200V	±200	1Ω~10MΩ	1Ω~10MΩ
2010	5025	1/2W	200V	±200	1Ω~10MΩ	1Ω~10MΩ
2512	6432	1W	250V	±200	1Ω~10MΩ	1Ω~10MΩ

8.12: High power Chip Resistors(CP)

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/ °C)	Resistance Range(Ω)	
					F(±1%)	J(±5%)
0402	1005	1/8W	50V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ
0603	1608	1/8W	50V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ

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0805	2012	1/4W	150V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ
1206	3216	1/2W	200V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ
1210	3225	1/2W	200V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ
2010	5025	1W	200V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ
2512	6432	2W	300V	±100	0Ω,1Ω~1MΩ	0Ω,1Ω~1MΩ

1. This is the maximum voltage that may be continuously supplied to the resistor element, see “IEC publication 60115-8”.
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by $RCWV = \sqrt{\text{Rater Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.
3. 2W loading with total solder-pad and trace size of 300mm²
4. 0Ω maximum resistance $R_{max} < 15m\Omega$ and rated current $< 4Amp$

8.13: Anti-Surge Chip Resistors(AS)

Type Inch	Type mm	Power Rating at 70°C	MAX Working Voltage	TCR (ppm/°C)	Resistance Range(Ω)		
					J(±5%) E24	K(±10%) E24	M(±20%) E24
0805	2012	1/8W	150V	±200	0.27Ω~22MΩ	0.27Ω~22MΩ	0.27Ω~22MΩ
1206	3216	1/4W	200V	±200	0.27Ω~22MΩ	0.27Ω~22MΩ	0.27Ω~22MΩ
1210	3225	1/2W	200V	±200	0.27Ω~22MΩ	0.27Ω~22MΩ	0.27Ω~22MΩ
2010	5025	3/4W	200V	±200	0.27Ω~22MΩ	0.27Ω~22MΩ	0.27Ω~22MΩ
2512	6432	1W	200V	±200	0.27Ω~22MΩ	0.27Ω~22MΩ	0.27Ω~22MΩ

1. This is the maximum voltage that may be continuously supplied to the resistor element, see “IEC publication 60115-8”.
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by $RCWV = \sqrt{\text{Rater Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.

8.14: Power Rating: Δ

For resistors operated in ambient over 70°C, loading power ratio will derate in accordance with following curve.

Fig.1

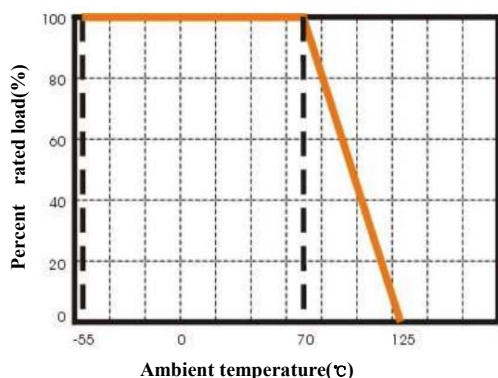
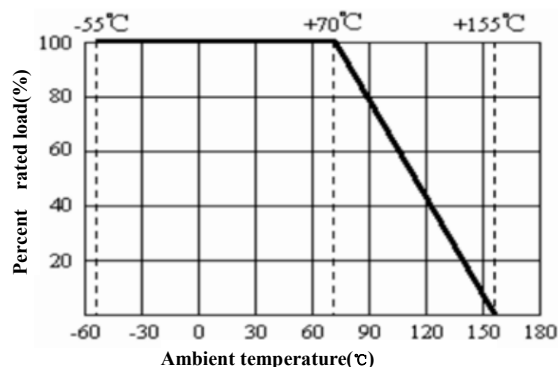


Fig.2



Remark:

- 1) Maximum dissipation in percentage of rated power, As a function of the ambient temperature.
- 2) Fig.1 for 0201;
- 3) Fig.2 for 0402~2512.

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The rated voltage is calculated by the following formula:

$$E=(P \cdot R)^{1/2}$$

E=Rated Voltage (V)
P=Rated Power (W)
R=Resistance Value (Ω)

9. 信賴性測試(Environment Test):**9.1 Temperature Coefficient of Resistance (T.C.R.):**

Reference standard	Condition of test	Specification
JIS-C5202-5.2	Measure resistance at 25°C or specified room temperature as R_1 , then measure -55°C or +125°C respectively as R_2 . Determine the temperature coefficient of resistance from the following formula. $T.C.R. = (R_2 - R_1) / R_1 (t_2 - t_1) * 10^6 (PPM/^\circ C)$ $t_1 = +25^\circ C$ or specified room temperature $t_2 = -55^\circ C$ or +125°C test temperature $R_1 =$ resistance at reference temperature(Ω) $R_2 =$ resistance at test temperature(Ω)	Refer 7.1~7.7

9.2 Short Time Overload:

Reference standard	Condition of test	Specification
JIS-C5202-5.5	Apply 2.5 times of rated voltage but not exceeding the maximum overload voltage for 5 seconds. Have the specimen stabilized at room temperature for minimum 30 minutes. Measure the resistance to determine $\Delta R/R(\%)$. Jumper shall be applied max overload current as per 7.1~7.7.	$\Delta R \leq \pm(2\% + 0.10\Omega)$ Remarks: 0201 $\leq \pm(3\% + 0.1\Omega)$ 0402 $\leq \pm(2\% + 0.1\Omega)$ Jumper(0Ω) $\leq 50m\Omega$

9.3 Insulation Resistance:

Reference standard	Condition of test	Specification
JIS-C5202-5.6	Applying voltage 100V for 1 minute. Remark 0201 50V.	$\geq 1G\Omega$

9.4 Intermittent Overload Test:

Reference standard	Condition of test	Specification
JIS-C5202-5.8	The specimen shall be subjected to 10000 \pm 200 cycles of AC voltage of 3 times the rated voltage between tests applied for 1 sec with pauses of 25 sec. And the specimen shall be kept at standard atmospheric condition without electrical load for 30min after which the resistance shall be measured. However the applied voltage shall not exceed the maximum intermittent overload voltage. (Jumper with Max. Overload current.)	$\Delta R \leq \pm(5\% + 0.10\Omega)$ Jumper(0Ω) $\leq 50m\Omega$

9.5 Solder-Ability:

Reference standard	Condition of test	Specification
JIS-C5202-6.11	Immerse the specimen into R type flux for 1-2 sec. And then into the solder pot at 235 \pm 5°C for 2 \pm 0.5sec	At least 95% of surface area of electrode shall be covered with new solder.

晶片電阻 *Chip Resistors***9.6 Resistance to Soldering Heat:**

Reference standard	Condition of test	Specification
JIS-C5202-6.10	Immerse the specimen into the solder pot at $260\pm 5^{\circ}\text{C}$ for 10 ± 1 second. Have the specimen stabilized at room temperature for minimum 30 minutes. Then measure the resistively.	0.5%,1% $\Delta R \leq \pm(0.5\%+0.10\Omega)$ 2%,5% $\Delta R \leq \pm(1\%+0.10\Omega)$ Remarks: 0201 $\leq \pm(3\%+0.1\Omega)$ Jumper(0Ω) $\leq 50\text{m}\Omega$

9.7 Load Life with Humidity:

Reference standard	Condition of test	Specification
JIS-C5202-7.9	Place the specimen in the test chamber, and maintain the temperature of the specimen at $40\pm 2^{\circ}\text{C}$ and 90~95%RH apply the rated voltage to the specimen at the 1.5 hours ON and 0.5 hour OFF cycle. The total length of test is 1000hours. After the test, have the specimen stabilized at room temperature for one hour minimum and measure the $\Delta R/R(\%)$.	0.5%,1% $\Delta R \leq \pm(1.0\%+0.05\Omega)$ 2%,5% $\Delta R \leq \pm(3.0\%+0.10\Omega)$ Remarks: 0201 $\leq \pm(5\%+0.1\Omega)$ 0402 $\leq \pm(3\%+0.1\Omega)$ Jumper(0Ω) $\leq 100\text{m}\Omega$ Without mechanical damage

9.8 Load Life:

Reference standard	Condition of test	Specification
JIS-C5202-7.10	Place the specimen in the oven at $70\pm 2^{\circ}\text{C}$. Apply the rated voltage to the specimen at the 1.5hours ON and 0.5 hours OFF cycle. The total length of test is 1000hours. After the test, have the specimen stabilized at room temperature for one hour minimum and measure the $\Delta R/R(\%)$.	0.5%,1% $\Delta R \leq \pm(1.0\%+0.05\Omega)$ 2%,5% $\Delta R \leq \pm(3.0\%+0.10\Omega)$ Remarks: 0201 $\leq \pm(5\%+0.1\Omega)$ 0402 $\leq \pm(3\%+0.1\Omega)$ Jumper(0Ω) $\leq 100\text{m}\Omega$ Without mechanical damage

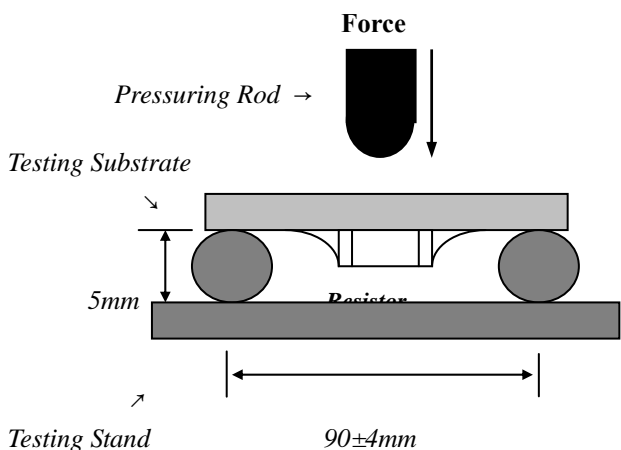
9.9 Thermal Shock:

Reference standard	Condition of test	Specification															
JIS-C5202-7.4	The testing specimen shall be subjected to 5 continuous cycles , each cycle per following : <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temp.</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$</td> <td>30</td> </tr> <tr> <td>2</td> <td>Standard atmospheric conditions</td> <td>2</td> </tr> <tr> <td>3</td> <td>$125^{\circ}\text{C} \pm 3^{\circ}\text{C}$</td> <td>30</td> </tr> <tr> <td>4</td> <td>Standard atmospheric conditions</td> <td>10-15</td> </tr> </tbody> </table>	Step	Temp.	Duration	1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30	2	Standard atmospheric conditions	2	3	$125^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30	4	Standard atmospheric conditions	10-15	0.5%,1% $\Delta R \leq \pm(0.5\%+0.10\Omega)$ 2%,5% $\Delta R \leq \pm(1\%+0.10\Omega)$ Remarks: 0201 $\leq \pm(3\%+0.1\Omega)$ Jumper(0Ω) $\leq 50\text{m}\Omega$
Step	Temp.	Duration															
1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30															
2	Standard atmospheric conditions	2															
3	$125^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30															
4	Standard atmospheric conditions	10-15															

9.10 Bending Strength:

Reference standard	Condition of test	Specification

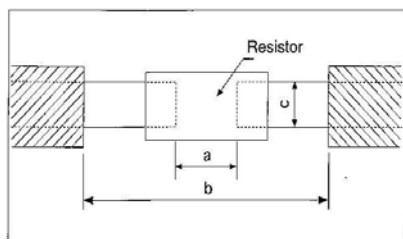
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<p>JIS-C5202-6.1</p>	<p>Mount the specimen on a test board as $3\text{mm} \leq 1206$; $2\text{mm} \geq 1210$. Slowly apply the force till the board is bent for 5 ± 1 sec , measured the $\Delta R/R(\%)$ at this position.</p> 	<p>$0.5\%, 1\% \Delta R \leq \pm(0.5\% + 0.10\Omega)$ $2\%, 5\% \Delta R \leq \pm(1.0\% + 0.10\Omega)$ Remarks: $0201 \leq \pm(1\% + 0.1\Omega)$ $\text{Jumper}(0\Omega) \leq 50\text{m}\Omega$</p>
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10. 電阻使用注意事項(Precautions on the use of Chip Resistors):

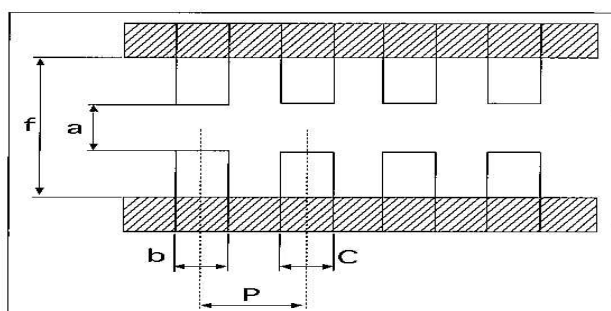
10.1 Recommended PCB Land Pattern Design:

Chip Resistor Series:



Type	a (mm)	b (mm)	c (mm)
01(0201)	0.25~0.3	0.7~0.9	0.3~0.4
02(0402)	0.5~0.6	1.4~1.6	0.4~0.6
03(0603)	0.7~0.9	2.0~2.2	0.8~1.0
05(0805)	1.0~1.4	3.2~3.8	0.9~1.4
06(1206)	2.0~2.4	4.4~5.0	1.2~1.8
10(1210)	2.0~2.4	4.4~5.0	2.3~3.5
0A(2010)	3.3~3.7	5.7~6.5	2.3~3.5
12(2512)	3.6~4.0	7.8~8.6	2.3~3.5

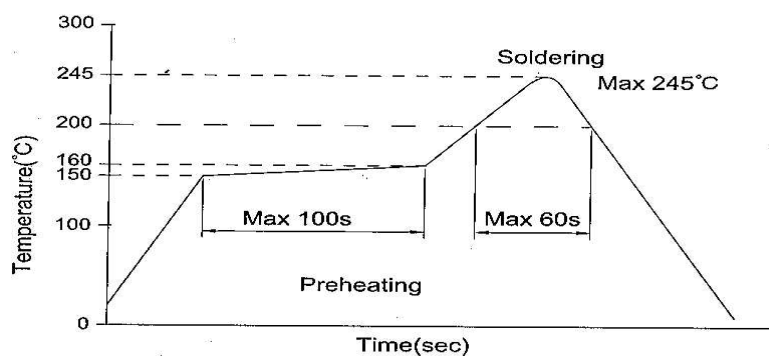
Chip Resistor Network Series:



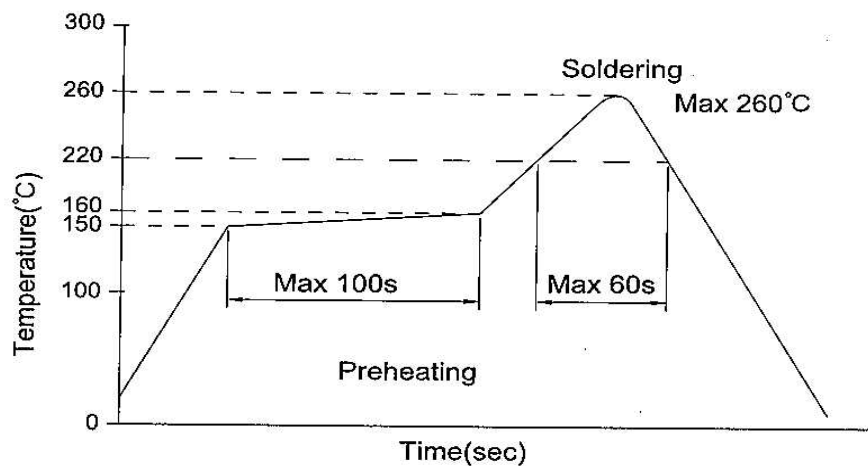
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Type	a (mm)	b (mm)	c (mm)	p (mm)	f (mm)
CN22	0.4~0.5	0.3~0.33	0.3~0.33	0.66	1.4~1.5
CN24	0.5~0.6	0.3~0.4	0.25~0.3	0.50	1.4~1.5
CN28	0.7~0.9	0.3~0.4	0.25~0.3	0.50	2.1~2.2
CN32	0.7~0.9	0.4~0.46	0.4~0.46	0.76	2.1~2.5
CN34	0.7~0.9	0.5~0.6	0.4~0.5	0.80	2.1~2.5
CN35	0.7~0.9	0.4~0.5	0.3~0.4	0.64	2.1~2.5

10.2 Recommended Reflow Soldering Temp. Profile:

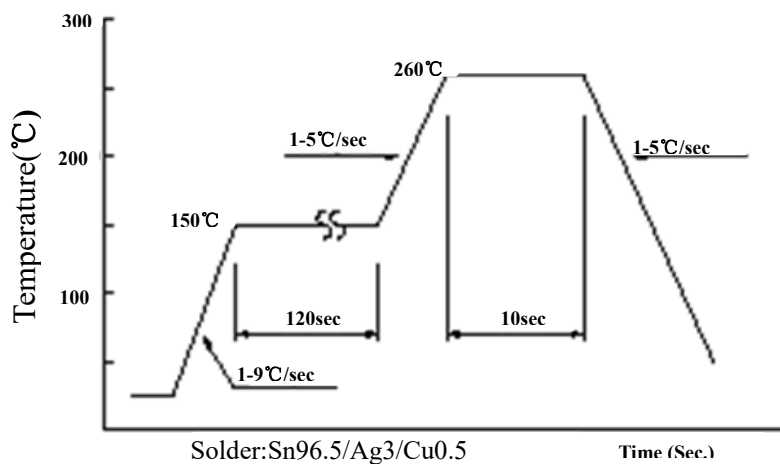


Lead Solder Paste



Lead Free Solder Paste

Example for soldering condition

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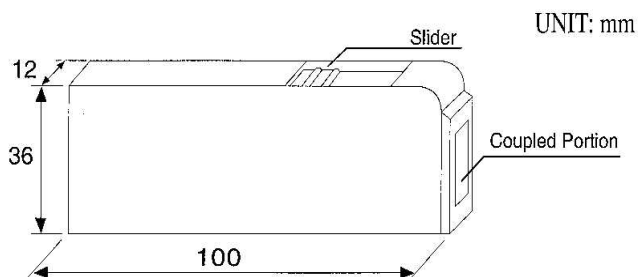
AR、LR SERIES

11. 包裝(Packing):^c

11.1 Bulk Packing:

Standard packing 5K , 10K , 20K & 50K pcs/cartridge; others are according to customer request.

Bulk Cassette Specifications:



11.2 Tape Packing:

Chip Size : 0201 , 0402 , 0603 , 0805 , 1206 , 1210 , 2010,2512, CN22, 24,28,32,34,35

Reel Size : 7" , 10" and 13" available.

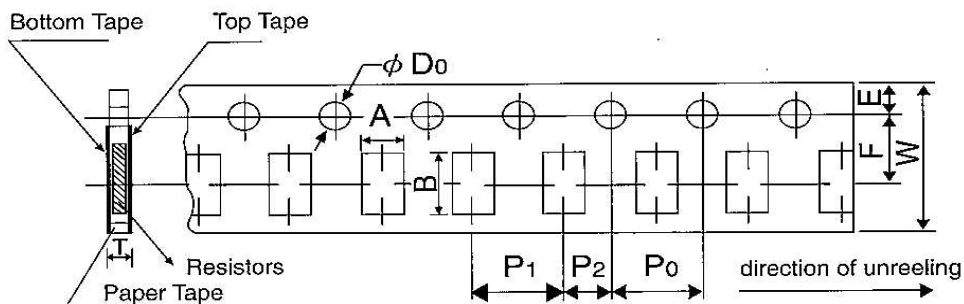
Tape width : 8mm/12mm tape width

Paper Tape: Standard taping (8mm paper width) suitable to CR01, 02, 03,05,06,10 & CN22, 24,28,32,34,35

Plastic Tape: Standard taping (12mm paper width) suitable CR0A, 12

11.2.1 Dimensions of Packing Paper (paper tape):

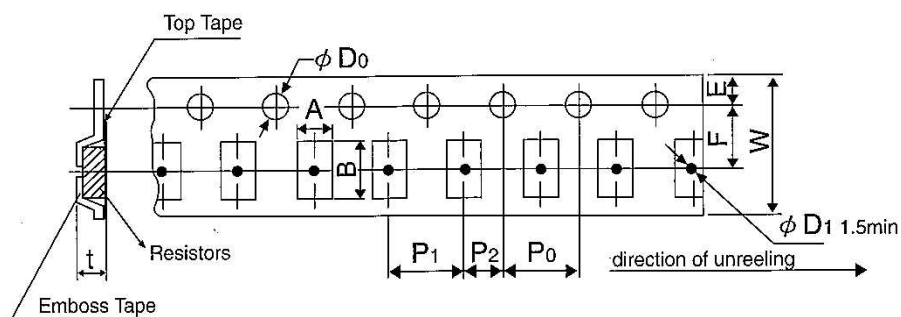
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(Unit: mm)

Type	A	B	W	E	F	P ₀	P ₁	P ₂	D ₀	T
01	0.37±0.05	0.67±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.5+0.1/-0	0.37+0.2/-0
02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.5+0.1/-0	0.45±0.10
03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.65±0.15
05	1.60±0.15	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.84±0.15
06	1.95±0.20	3.55±0.25	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.84±0.15
10	2.80±0.20	3.55±0.25	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.84±0.15
CN22	1.20±0.15	1.20±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.5+0.1/-0	0.60±0.25
CN24	1.20±0.15	2.20±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.5+0.1/-0	0.65±0.15
CN28	1.90±0.20	4.30±0.25	12.0±0.20	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.65±0.15
CN32	1.80±0.20	1.80±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.84±0.15
CN34,35	2.00±0.15	3.60±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	0.84±0.15

11.2.2 Dimensions of Embossed Packing (plastic tape):



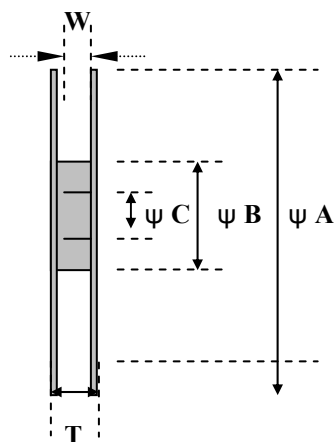
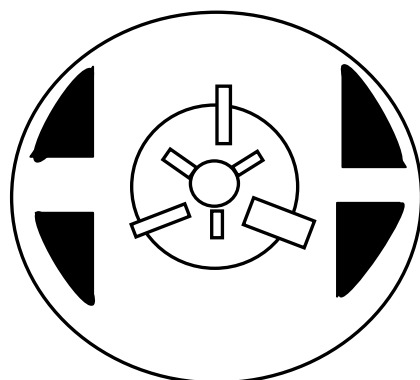
UNIT: mm

(unit : mm)

Type	A	B	W	E	F	P ₀	P ₁	P ₂	D ₀	T
0A	2.80±0.20	5.40±0.30	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	Max1.2
12	3.55±0.25	6.80±0.30	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.5+0.1/-0	Max1.2

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11.2.3 Dimensions of Reel:



Unit: mm

Tape	Parking	Tape width	Reel size	ψA	ψB	ψC	W	T
CR01 ,02,03,05,06,10,CN22,24,28,32,34,35	Paper	8mm	7"	180.0+0/-3	60.0±1.0	13.0±0.2	9.0±0.3	11.4±2.0
			10"	254.0±1.0	100.0±1.0	13.0±0.2	9.5±0.3	13.5±2.0
			13"	330.0±1.0	100.0±1.0	13.0±0.2	9.5±0.3	13.5±2.0
CR0A , 12	Embossed	12mm	7"	180.0+0/-3	60.0±1.0	13.0±0.2	13.0±1.0	15.4±2.0

11.2.4 Taping Quantity:

Tape	Paper Tape						Embossed Tape	Bulk Cassette
	4mm pitch			2mm pitch			4mm pitch	
	7"	10"	13"	7"	10"	13"	7"	
01	-	-	-	10000	-	-	-	-
02	-	-	-	10000	20000	40000	-	50000
03	5000	10000	20000	10000	20000	-	-	20000
05	5000	10000	20000	-	-	-	-	10000
06	5000	10000	20000	-	-	-	-	5000
10	5000	10000	20000	-	-	-	-	-
0A	-	-	-	-	-	-	4000	-
12	-	-	-	-	-	-	4000	-
CN22	-	-	-	10000	20000	-	-	-
CN24	-	-	-	10000	20000	40000	-	-
CN28	5000	-	-	-	-	-	-	-
CN32	5000	-	-	-	-	-	-	-
CN34	5000	10000	20000	-	-	-	-	-
CN35	5000	10000	-	-	-	-	-	-

11.2.5 Performance of Taping :

11.2.5.1.Strength of Carrier Tape and Top Cover Tape

11.2.5.1.1.Carrier Tape

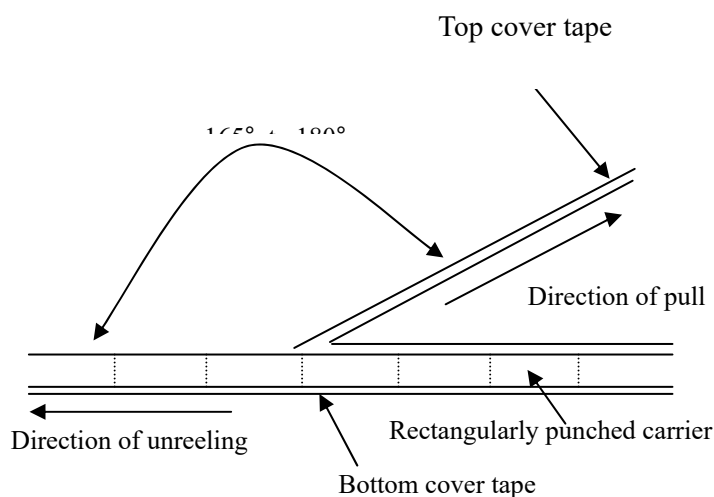
When a tensile force 1.02kgf is applied in the direction of unreeling the tape, the tape shall withstand this force.

11.2.5.1.2.Top cover Tape

When a tensile force 1.02kgf is applied to the tape, the tape shall withstand this force.

晶片電阻 *Chip Resistors***11.2.5.2. Peel Force of Top Cover Tape**

Unless otherwise specified, the peel force of top cover tape shall be 10.2 to 71.4 g f when the top cover tape is pulled at a speed of 300mm/min with the angle between the taped during peel and the direction of unreeling maintained at 165 to 180° as illustrated in Fig.

**13. 證明書(Warranty):****保證生產過程中不含有害物質****Warranty for Non-Inclusion of Hazardous Substances in Manufacturing Processes**

我司籍此證明生產過程中符合 SS-00259 (索尼管理規定標準) 分類標準(化合物與目標), 在生產過程中沒有使用以下材料和物質(Our company hereby certify that the “ Targets” (combinations of substances and purposes) classified at SS-00259 (a management standard specified, issued by SONY) are not used for the following materials and substances: the materials which used in manufacturing Processes.)。

產品及零組件成分之相關證明**Assurance relative to the composition of products and components**

我司保證不含以下物質(We guarantee that the substances below will not be contained.)。

禁用物質(Banned substances)

●重金屬(Heavy metals): 鎘及其化合物(Cadmium and cadmium compounds)

鉛及其化合物(Lead and lead compounds)

汞及其化合物(Mercury and mercury compounds)

六价鉻及其化合物(Hexavalent chromium compounds)

●氯化物(Chlorinate dorganic compounds): 多氯連苯(Polychlorinated biphenyl (PCB))

晶片電阻 *Chip Resistors*

多氯化鈉(Polychlorinated naphthalenes (PCN))

氯代烷烴(Chlorinated paraffins (CP))

污泥(過氧化物)(Mires (Perchlordecone))

其他含氯化物(Other chlorinated organic compounds)

• 溴化物(Brominated organic compounds): 多溴連苯(Polybrominated biphenyls (PBB))

多溴二苯醚(Polybrominated diphenylethers (PBDE))

其他含溴化物(Other brominated organic compounds)

• 有機錫化物(三丁基錫化合物,三苯基化合物)

Organic tin compounds (Tributyl tin compounds, Triphenyl tin compounds)

• 石棉(Asbestos)

• 氮化物(Azo compounds)

• 甲醛(Formaldehyde)

• 聚氯乙烯及其化合物(Polyvinyl chloride (PVC) and PVC blends)

不使用含有損害臭氧層的物质材料(will not use the material, which has ozonosphere damage concerned.)