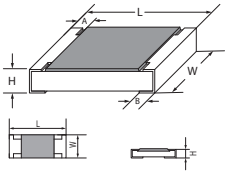
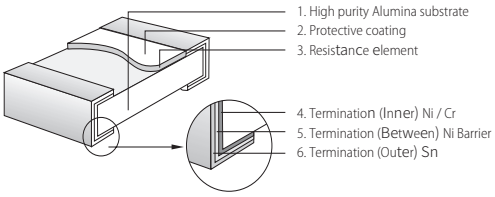
Thick Film Chip Resistors

Feature

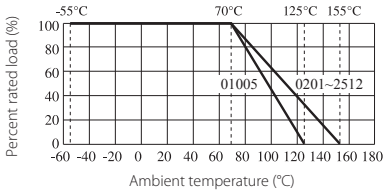
- Small size & light weight
- Save assembly cost.
- Suitable for both wave & re-flow soldering.
- Applications: Navigator, Mobile Phone,Telecom, PDA, Setbox, Meter.

Figures





Derating Curve & Specification



Type	01005	0201	0402	0603	0805	1206	1210	1812	2010	2512
Size	0402	0603	1005	1608	2012	3216	3225	4532	5025	6432
Max. Working Voltage	15V	25V	50V	75V	150V	200V	200V	200V	200V	200V
Max. Overload Voltage	30V	50V	100V	150V	300V	400V	500V	500V	500V	500V
Dielectric withstanding Voltage	-	-	100V	300V	500V	500V	500V	500V	500V	500V
Operating Temperature	-55~+125°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C

Type		01005	0201	0402	0603	0805	1206	1210	1812	2010	2512
Dimension	L(mm)	0.40±0.02	0.60±0.03	1.00±0.10	1.60±0.10	2.00±0.15	3.10±0.15	3.10±0.10	4.50±0.20	5.00±0.10	6.35±0.10
	W(mm)	0.20±0.02	0.30±0.03	0.50±0.05	0.80±0.10	1.25 +0.15 -0.10	1.55 +0.15 -0.10	2.60±0.20	3.20±0.20	2.50±0.20	3.20±0.20
	H(mm)	0.13±0.02	0.23±0.03	0.35±0.05	0.45±0.10	0.55±0.10	0.55±0.10	0.55±0.10	0.55±0.20	0.55±0.10	0.55±0.10
	A(mm)	0.10±0.03	0.10±0.05	0.20±0.10	0.30±0.20	0.40±0.20	0.45±0.20	0.50±0.25	0.50±0.20	0.60±0.25	0.60±0.25
	B(mm)	0.10±0.03	0.15±0.05	0.25±0.10	0.30±0.20	0.40±0.20	0.45±0.20	0.50±0.20	0.50±0.20	0.50±0.20	0.50±0.20
Resistance Value of Jumper		<50mΩ									
Rated Current of Jumper		0.5A	0.5A	1A	1A	2A	2A	2A	2A	2A	2A
Max.Overload Current of Jumper		1A	1A	2A	2A	5A	10A	10A	10A	10A	10A

Type	01005	0201	0402	0603	0805		1206		1210	1812	2010	2512
Power Rating at 70°C	1/32W	1/20W	1/16W	1/10W	1/8W	1/4W	1/4W	1/3W	1/2W	3/4W	3/4W	1W
Resistance Range of 0.5%(E-96)	-	-	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ	-	1Ω~10MΩ	-	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
Resistance Range of 1%,2%(E-96)	10Ω ~ 10MΩ	1Ω~ 10MΩ		0.01Ω~ 10MΩ	0.1Ω≤R <10MΩ	0.01Ω ≤R <0.1 Ω	0.1Ω≤R <10MΩ	0.01Ω≤R <0.1Ω	0.01Ω~10MΩ			
Resistance Range of 5%(E-24)	1Ω~10MΩ			0.01Ω~ 10MΩ	0.1Ω≤R <10MΩ	0.01Ω ≤R <0.1 Ω	0.1Ω≤R <10MΩ	0.01Ω≤R <0.1Ω	0.01Ω~10MΩ			

Marking on the Resistors Body

- For 01005, 0201, 0402 size, no marking on the body due to the small size of the resistor.
- ±5% tolerance product: the marking is 3 digits, the first 2 digits are the significant of the resistance and the 3rd digit denotes number of zeros following.
- 0805, 1206, 1210, 2010, 2512 ≤±1%: the marking is 4 digits, the first 3 digits are the significant of the resistance and the 4th digit denotes number of zeros following.
- Standard E-96 series values of 0603 ≤±1%: due to the small size of the resistor's body, 3 digits marking will be used to indicate the accurate resistance value by using the following Multiplier & Resistance Code.

153 = 15000Ω = 15KΩ

Below 10Ω: 6R8 = 6.8Ω

2372 = 23700Ω = 23.7KΩ

Below 10Ω : 3R24 = 3.24Ω

Multiplier Code (for 0603 ≤±1% marking)

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

Standard E-96 series Resistance Value code (for 0603≤±1% marking)

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

So the resistance value are marked as the following examples:

1.96KΩ= 196 ×10^1 Ω = 29B

12.4Ω= 124 ×10^{-1} = 10X

- Standard E-24 and not belong to E-96 series values (≤±1%) of 0603 size: the marking is the same as 5% tolerance but marking as underline.

122 = 1200 = 1.2 KΩ

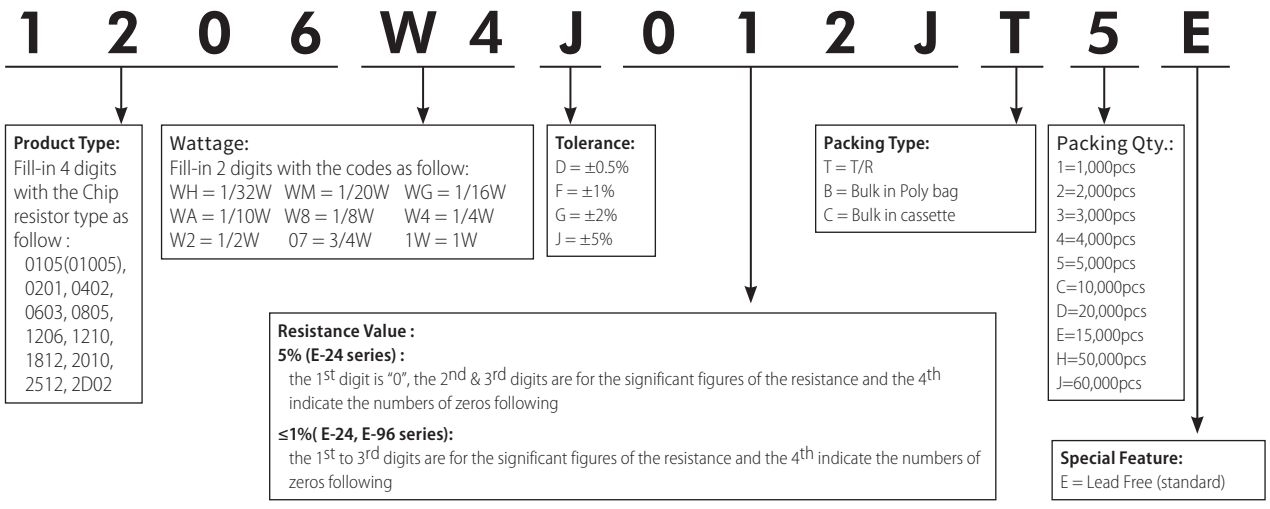
680 = 68Ω

Performance Specifications

Temperature coefficient	01005: 1Ω≤R<10Ω: -200~+600ppm/°C 10Ω≤R<100Ω: ±300ppm/°C 100Ω≤R≤10MΩ: ±200ppm/°C 0201: 1Ω≤R≤10Ω: -100~+350ppm/°C >10Ω: ±200ppm/°C 0402: 1Ω≤R≤10Ω: ±200ppm/°C >10Ω: ±100ppm/°C	0603: 0.01Ω≤R≤0.03Ω:±1500PPM/°C 0.03Ω<R≤0.05Ω:±1000 PPM/°C 0.05Ω<R<1Ω:±800PPM/°C 1Ω≤R≤10Ω: ±200PPM/°C >10Ω:±100PPM/°C	0805, 1206, 1210, 1812, 2010, 2512: 0.01Ω ≤ R ≤0.015Ω: ±1500ppm/°C 0.015Ω < R ≤0.03Ω:±1000ppm/°C 0.03Ω < R <1Ω: ±800ppm/°C 1Ω≤R≤10Ω: ±200ppm/°C >10Ω: ±100ppm/°C
Short-time overload	±5%, ± 2%: ±(2.0% + 0.05Ω) ±1%, ± 0.5%: ±(1.0% + 0.05Ω) 01005 ±5% ±1% : ±(2.0% + 0.05Ω)		
Insulation resistance	≥ 1,000 MΩ		
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown		
Terminal bending	±(1.0% + 0.05Ω)		
Soldering heat	±(1.0% + 0.05Ω)		
Solderability	Coverage must be over 95%.		
Rapid change of temperature	±5%, ± 2%: ±(1.0% + 0.05Ω) ±1%, ± 0.5%: ±(0.5% + 0.05Ω) 01005 ±5% ±1% : ±(1.0% + 0.05Ω)		
Humidity (Steady State)	±5%, ± 2%: ±(3.0% + 0.05Ω) ±1%, ± 0.5%: ±(0.5% + 0.05Ω) 01005 ±5% ±1% (-55°C~125°C): ±(2.0% + 0.05Ω)		
Load life in humidity	±5%, ± 2%: ±(3.0% + 0.05Ω) ±1%, ± 0.5%: ±(1% + 0.05Ω) 01005: ±(3.0% + 0.05Ω)		
Load life	±5%, ± 2%: ±(3.0% + 0.05Ω) ±1%, ± 0.5%: ±(1% + 0.05Ω) 01005: ±(3.0% + 0.05Ω)		

• Resistance value which doesn't belong to E-24 and E-96 Series Standard Values is available case by case.

Ordering Procedure (Example: 1206 1/4W 5% 1.2 Ω T/R-5000)



Remark: For more details, please check page 135, Part No. System

Part No. System

1	2	3	4	5	6	7	8	9	10	11	12	13	14

The standard Part No. includes 14 digits with the following explanation:

1. 1st~4th digits:
   a) This is to indicate the SMD Resistor size. Example: 1206, TC05 or HV03;
   b) For Resistor Network & Coated type, the 1st~3rd digits are to indicate the product type and the 4th digit is the special feature. Example: RNLA = Resistor Newtork Circuit A type; CFRF = Carbon Film Fixed Resistors Non-Flame type; MORI = Metal Oxide Film Fixed Resistor Non-Inductive type.
   c) For Cement Fixed Resistors, these 4 digits are to indicate the product type but if the product type has only 3 digits, the 4th digit will be "0". Example: PRW0=PRW type; PRWC=PRWC type.

2. 5th~ 6th digits:
   a) This is to indicate the wattage or power rating. To distinguish the sizes and the numbers, the following codes are used, and please refer to the following chart for details: W = Normal Size; S = Small Size; U = Ultra Small Size; "1" ~ "G" to denotes "1" ~ "16" as Hexadecimal:

1/16W ~ 1/2W (<1W)

Wattage	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
Normal Size	W2	W3	W4	W5	W6	W7	W8	W9	WA	WB	WC	WD	WE	WF	WG
Small Size	S2	S3	S4	S5	S6	S7	S8	S9	SA	SB	SC	SD	SE	SF	SG
Ultra Small Size	U2	U3	U4	U5	U6	U7	U8	U9	UA	UB	UC	UD	UE	UF	UG

1W ~ 16W (≥1W)

Wattage	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Normal Size	IW	2W	3W	4W	5W	6W	7W	8W	9W	AW	BW	CW	DW	EW	FW	GW
Small Size	1S	2S	3S	4S	5S	6S	7S	8S	9S	AS	BS	CS	DS	ES	FS	GS
Ultra Small Size	1U	2U	3U	4U	5U	6U	7U	8U	9U	AU	BU	CU	DU	EU	FU	GU

   b) For power rating less than 1W, the 5th digit will be the letters W, S or U to represent the size required & the 6th digit will be a number or a letter code. Example: WA = 1/10W; U2 = 1/2W-SS
   c) For power rating of 1W to 16W, the 5th digit will be a number or a letter code and the 6th digit will be the letters of W, S or U. Example: AW = 10W; 3S = 3W-S.
   d) For power rating between 20W to 99W, the 5th & 6th digits will show the whole numbers of the power rating itself. Example: 20 = 20W; 75 = 75W.
   e) For power rating of 100W & over, the 5th & 6th digits will be indicated with "00" and the actual wattage being indicated at the last 3 digits (12th~14th) of the Part No.
   f) For special power ratings, the following codes are to be used:
      1). WH = 1/32W (10P8 Chip Network)
      2). 07 = 3/4WS (Chip 2010 size)
      3). 04 = 0.4W-SS (0.4 watt Ultra Small size)
      4). 06 = 0.6W-S (0.6 watt Small size)
      5). 2A = 2.5W 6). 6A = 6.5W 7). WK= 2/3W
      8). 1A =1.5W 9). 1.25W =1Q
   g) For Resistor Network, since the power rating is fixed as 1/8W for A circuit & 1/5W for B circuit, the 5th & 6th digit is to be used to denote the number of pins required. Example: 09 = 9pins; 12 = 12pins.
   h) For Jumper Wires the 5th & 6th digits will be indicated with "00" .
   i) For Thin Film Chip Resistors, these 2 digits will be used to indicated the requested Temperature coefficient:
      1). 05 = 5PPM 2). 10 = 10PPM 3). 15 = 15PPM 4). 25 = 25PPM 5). 50 = 50PPM

3. The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resisance Tolerance. As for Metal Film Fixed Resistor products, it is also to denote the standard PPM as follows:

B = ±0.1% (15PPM)
C = ±0.25% (25PPM)
D = ±0.5% (50PPM)
F = ±1% (50PPM)
G = ±2% (100PPM)
J = ±5% (200PPM)
K = ±10%
W = ±0.05%
L = ±0.01%

Remark: *if it is not one of the above standard "tolerance-TCR", the requirement should be clearly stated when placing order. Example: ±1% (25PPM), the 7th digit still shows "F" but separately note the requirement of "25PPM"*

4. The 8^{th} to 11^{th} digits is to denote the Resistance Value:

a) For the standard resistance values of E-24 series in 5% & 10% tolerance, the 8^{th} digit is "0", the 9^{th} & 10^{th} digits are to denote the significant figures of the resistance and the 11^{th} digit is the number of zeros following

b) For the standard resistance values of E-96 series in ≤2% tolerance, the 8^{th} digit to the 10^{th} digits are to denote the significant figures of the resistance and the 11^{th} digit is the number of zeros following.

c) For the code to the significant figures to E-24 & E-96 series, please refer to page 170 & 171 of the standards Resistance Value list.

d) The following numbers and the letter codes is to be used to indicate the number of zeros in the 11^{th} digit:

$0 = 10^0$	$1 = 10^1$	$2 = 10^2$	$3 = 10^3$	$4 = 10^4$	$5 = 10^5$	$6 = 10^6$
$J = 10^{-1}$	$K = 10^{-2}$	$L = 10^{-3}$	$M = 10^{-4}$	$N = 10^{-5}$	$P = 10^{-6}$	

e) For Cement Resistors the 8^{th} digit will be coded with "W" or "P" to denote Wire-wound type or Power Film type respectively of the Cement Fixed Resistor proudct. The 9^{th} to 11^{th} please refer to point 4.a

Example:

E-24 series	E-96 series	Cement Resistors
0120 = 12 ohm	1210 = 121 ohm	W120 = 12 ohm Wire-wound type
0123 = 12K ohm	1302 = 13K ohm	W12J = 1.2 ohm Wire-wound type
012J = 1.2 ohm	196J = 19.6 ohm	P273 = 27 kohm Powe Film type

5. The 12^{th}, 13^{th} & 14^{th} digits:

a) The 12^{th} digit is to denote the Packaging type with the following codes:

A = Tape / Box (Ammo Pack)	C = Bulk in Cassette (for Chip product)	
B = Bulk / Box	T = Tape / Reel	P = Tape / Box of PT-26 product

b) The 13^{th} digit is normally to indicate the Packing Quantity of Tape/Box or Tape/Reel packaging types. Except for Chip products Bulk packing, this digit should be filled "0" or other products with "Bulk/Box packaging requirement. The following letter codes is to be used for some packaging quantities.

A = 500pcs	B = 2,500pcs	C = 10,000pcs	N = 12,500pcs	E = 15,000pcs
D = 20,000pcs	G = 25,000pcs	L = 45,000pcs	H = 50,000pcs	J = 60,000pcs

Example:

CHIP product	Other products
TD = T/R-20,000	A5 = T/B-5,000
TE = T/R-15,000	TB = T/R-2,500
T4 = T/R-4,000	B0 = B/B

c) For the Forming type products, the 13^{th} & 14^{th} digits are used to denote the forming types of the product with the following letter codes:

MF = M type with Flattened lead wire	F0 = F type
MK = M type with Kinked lead wire	F1 = F1 type
ML = M type with normal lead wire	F2 = F2 type
MC = M type with kinked lead wire	F3 = F3 type

d) For power rating over 100watt, the 12^{th} to the 14^{th} digits are to denote the actual wattage of the products:
Example: 100 = 100watt 150 = 150watt 225 = 225watt

e) For some products, the 14^{th} digit alone can use to denote special features or additional information with the following codes:

P = Panasert type	1 = Avisert 1 type	2 = Avisert 2 type
3 = Avisert 3 type	A = CO 1/4W - A type	B = CO 1/4W - B type

E = used to denote the "Environment Protection, lead Free type" of SMD category resistors (now, this became the Standard type of SMD)

f) For some products, the 14th digit alone can use to denote special features or additional information with the following codes:
B=1/32W G=1/16W F=1/10W G=1/8W H=1/6W J=1/4W K=1/3W M=1/2W
N=3/4W P=1W S=Special