Specification for Approval

Customer : 深圳市嘉立創科技發展有限公司

Product Name : **LEAD-FREE HIGH PRECISION THIN FILM CHIP RESISTORS**

Part Name : **TC SERIES ±0.1%、±0.25%、±0.50%、±1.00%**

Part No. : **TC*********T*E**

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Approved	Checked	Prepared	File NO.	Edition	Date	Page
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File Name: TC SERIES ±0.1%、±0.25%、±0.50%、±1%		Date	2015.11.26	Edition No.	1
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1.0 Scope:

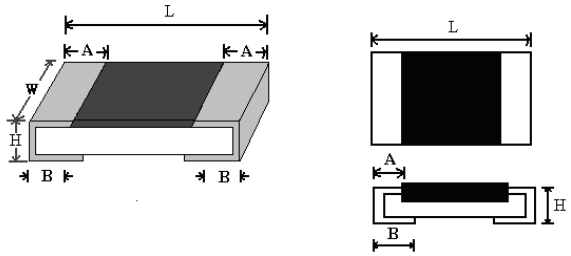
This sheet is the statement of the Lead-Free High Precision Thin Film Chip Resistors specification that UNIOHM'S productions can meet.

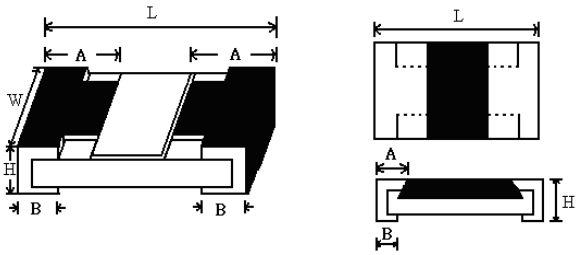
2.0 Ratings:

Type	Power rating At 70°C	Resistance Range(Ω)	TCR (PPM/°C)	Resistance Tolerance	Max. Operating voltage	Max. Overloading voltage	Operating Temp. Range
TC02	1/16W	100Ω~2KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	25V	50V	-55°C~+155°C
		50Ω~12KΩ	±10				
		10Ω~332KΩ	±25				
		10Ω~332KΩ	±50				
TC03	1/16W	100Ω~4KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	50V	100V	-55°C~+155°C
		50Ω~50KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				
TC05	1/10W	100Ω~10KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	100V	200V	-55°C~+155°C
		50Ω~100KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				
TC06	1/8W	100Ω~15KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	150V	300V	-55°C~+155°C
		50Ω~200KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				
TC07	1/5W	100Ω~25KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	150V	300V	-55°C~+155°C
		50Ω~200KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				
TC10	1/4W	100Ω~25KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	150V	300V	-55°C~+155°C
		50Ω~200KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				
TC12	1/2W	100Ω~25KΩ	±5	±0.10% ±0.25% ±0.50% ±1.00%	150V	300V	-55°C~+155°C
		50Ω~200KΩ	±10				
		4.7Ω~1MΩ	±25				
		4.7Ω~1MΩ	±50				

3.0 Dimension:

TC02	TC03、TC05、TC06、TC07、TC10、TC12

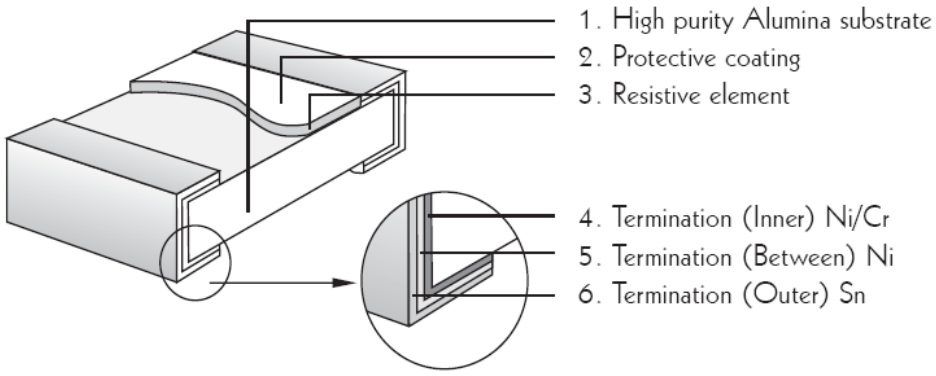




Dimension: mm

Type	L	W	H	A	B
TC02	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
TC03	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
TC05	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20
TC06	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20
TC07	3.10±0.10	2.60±0.20	0.55±0.10	0.45±0.20	0.45±0.20
TC10	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
TC12	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

4.0 Structure:



5.0 Marking:

(1) For TC02 size. Due to the very small size of the resistor's body, there is no marking on the body.

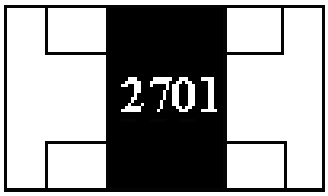
Example:



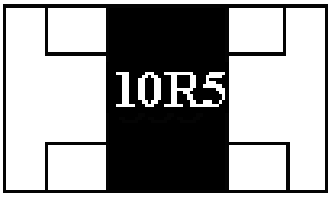
.....TC02

(2) 4 digits, first three digits are significant; the forth digit is number of zeros. Letter r is decimal point.

Example:



2701 → 2.7KΩ



10R5 → 10.5Ω

(3) Standard E-96 series values of TC03 size. Due 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.

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

First two digits----------Resistance code

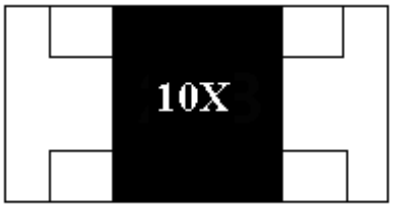
Third digit----------Multiplier code

Example:

1.96KΩ=196×10^1Ω------29B



12.4Ω=124×10^{-1}Ω-----10X

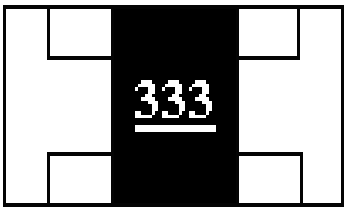


Standard E-96 values and TC03 resistance code

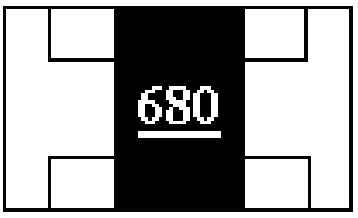
Ω VALUE	CODE	Ω VALUE	CODE	Ω VALUE	CODE	Ω VALUE	CODE
100	01	178	25	316	49	562	73
102	02	182	26	324	50	576	74
105	03	187	27	332	51	590	75
107	04	191	28	340	52	604	76
110	05	196	29	348	53	619	77
113	06	200	30	357	54	634	78
115	07	205	31	365	55	649	79
118	08	210	32	374	56	665	80
121	09	215	33	383	57	681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

(4) Standard E-24 and not belong to E-96 series values of TC03 size .The marking is the same as 5% tolerance but marking as underline

Example:



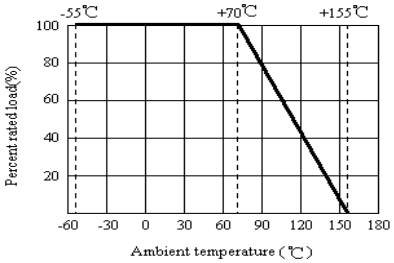
333=33000→33KΩ



680→68Ω

6.0 Power rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derate as shown in figure 1



6.1 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working

Voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

Where: RCWV commercial-line frequency and waveform (Volt.)
P = Power rating (VATT.)
R = Nominal resistance (OHM)

In no case shall the rated dc or RMS ac continuous working voltage be greater than the applicable maximum value. The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less.

7.0 Performance Specification:

Characteristic	Limits	Test Method (JIS-C-5201 & JIS-S-5202)
Temperature Coefficient	Refer to item 2.0	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(T_2-T_1)} \times 10^6 (PPM/^\circ C)$ R_1: resistance value at room temp. (T_1) R_2: resistance value at room temp. +100°C (T_2) Test pattern: room temp. (T_1), room temp. +100°C(T_2)
Short-time overload	ΔR/R: ±0.5%	Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..
Insulation resistance	≥1000MΩ	the measuring voltage shall be ,measured with a direct voltage of (100±15)V or a voltage equal to the dielectric withstanding voltage., and apply for 1min
Load life	ΔR/R:±0.2% >7KΩ ΔR/R:±0.5%	Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours "ON", 0.5 hour "OFF" at 70°C±2°C ambient.

Humidity	ΔR/R:±0.3%	Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% relative humidity,
Terminal bending	ΔR/R: ±0.2%	4.33 Twist of test board: Y/X = 3/90 mm for 60Seconds
Solderability	95% coverage min.	Wave solder: Test temperature of solder: 245°C±3°C dipping time in solder: 2-3 seconds.
Soldering heat	ΔR/R: ±0.2%	4.18 Dip the resistor into a solder bath having a temperature of 260°C ±5°C and hold it for 10±1 seconds.

8.0 Explanation of Part No. System:

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

8.1 This is to indicate the Lead-Free High Precision Thin Film Chip Resistors

Example:

TC02, TC03, TC05, TC06, TC07, TC10, TC12

8.2 5th~6th digits:

8.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers, The following codes are used; and please refer to the following chart for detail:

W=Normal Size; S=Small Size; U=Extra Small Size; "1"~"G"to denotes"1"~"16"as Hexadecimal:

1/16W~1W:

Wattage	1/2	1/3	1/4	1/5	1/8	1/10	1/16
Normal Size	W2	1/3W	W4	W5	W8	WA	WG

8.2.2 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

8.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.

B=±0.10% C=±0.25% D=±0.50% F=±1.00%

8.4 The 8th to 11th digits is to denote the Resistance Value.

8.4.1 For the standard resistance values of TC series, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.

8.4.2 The following number s and the letter codes is to be used to indicate the number of zeros in the 11th digit:

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

8.5 The 12th, 13th & 14th digits.

The 12th digit is to denote the Packaging Type with the following codes:

C=Bulk in (Chip Product) T=Tape/Reel

8.5.1 The 13th digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. The following letter code and number is to be used for some packing quantities:

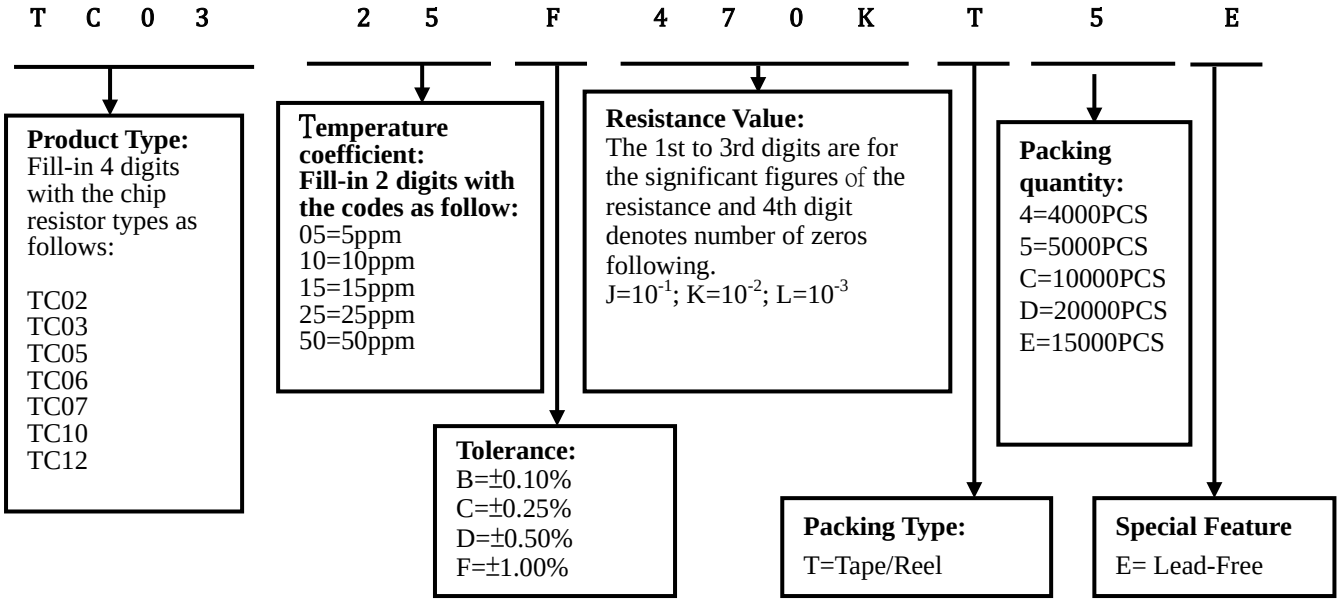
4=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

8.5.2 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

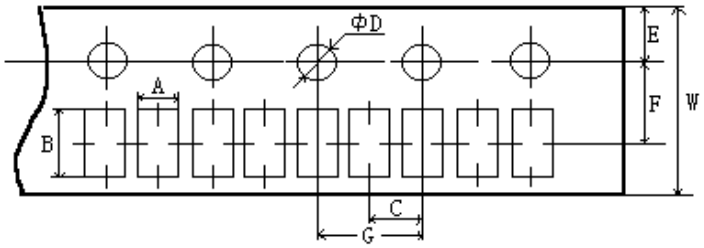
E=For "Environmental Protection Lead Free type"

9.0 Ordering Procedure: (Example: TC03 1/16W ±1% 25PPM 4.7Ω T/R-5000)



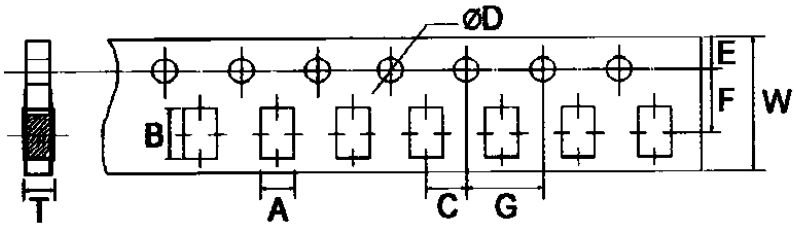
10.0 Packaging:

10.1 Tapping Dimension:



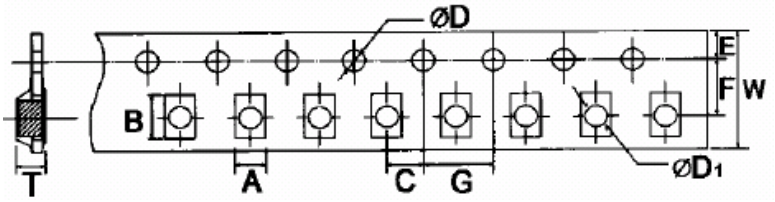
Unit: mm

Type	A ± 0.2	B ± 0.2	C ± 0.05	ϕD+ 0.1	E ± 0.1	F ± 0.05	G ± 0.1	W ± 0.2
TC02	0.65	1.15	2.0	1.5	1.75	3.5	4.0	8.0



Unit: mm

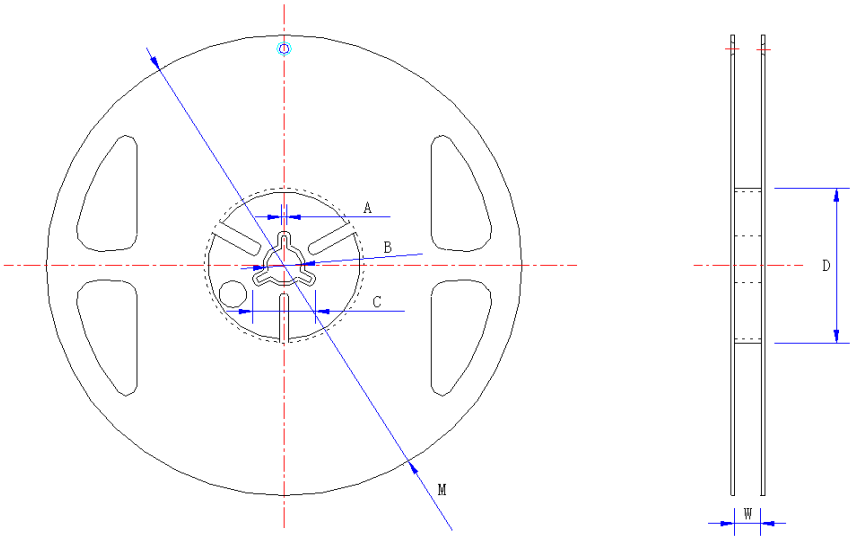
TYPE	A ± 0.2	B ± 0.2	C ± 0.05	ϕD+ 0.1	E ± 0.1	F ± 0.05	G ± 0.1	W ± 0.2	T±0.1
TC03	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
TC05	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
TC06	2.00	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.81
TC07	2.80	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.75



Unit: mm

Type	A±0.2	B±0.2	C±0.05	ϕD+0.1	ϕD1+0.25	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
TC10	2.9	5.6	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0
TC12	3.5	6.7	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0

10.2 Dimension:



Unit: mm

Type	Taping	Size	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
TC02	Paper	10,000pcs Reel	2.0	13.0	21.0	60.0	178	10
TC03	Paper	5,000pcs Reel	2.0	13.0	21.0	60.0	178	10
TC05	Paper	5,000pcs Reel	2.0	13.0	21.0	60.0	178	10
TC06	Paper	5,000pcs Reel	2.0	13.0	21.0	60.0	178	10
TC07	Paper	5,000pcs Reel	2.0	13.0	21.0	60.0	178	10
TC10	Paper or Embossed	4,000pcs Reel	2.0	13.0	21.0	60.0	178	13.8
TC12	Embossed	4,000pcs Reel	2.0	13.0	21.0	60.0	178	13.8

11.0 Precaution for storage/Transportation:

11.1. We recommend the storage condition temperature: 15℃~35℃, humidity: 25%~75%.
(Put condition for individual product)
Under storage condition UNIOHM recommended, solderability of products will keep over 1 year. If not, it will be degraded.

11.2. Store / Delivery cartons in the correct direction, which indicated on carton's symbol.
Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

11.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:

a. Storage in high Electrostatic

b. Storage in direct sunshine, rain and snow or condensation

c. Where the products are exposed to sea wind or corrosive gas, including Cl_2, H_2S, NH_3, SO_2, NO_2.