SHENZHEN TERUIXIANG ELECTRONIC CO.,LTD

Specifications for a.c. ceramic capacitors

Y1 Capacitors

Edition B2
2014-04-25
DANRY DENG

RoHS H.F.
REACH

团结 Unity	务实 Pragmatic	共赢 Win-win	2014-04-25

ADD: Bldg 4,XINPOTOU Industrial Park,Guangming Office,Guangming new developed area,Shenzhen,China

Specifications for a.c. ceramic capacitors (Y1)

Revision history

Edition	RevisionTime	Revision content	Revision People
A0	Mar 15,2008	The first draft	DANRY DENG
A1	Feb 15,2010	Change : 5. How to order 18.Voltage proof test guide	DANRY DENG
A2	Feb 14,2011	Add: Capacitors on tape type pitch 7.5mm /10mm Chang: 5. How to order	DANRY DENG
A3	May 13,2011	Add: Cautions and warnings Change: 6. Approval standard and file number ENEC10 VDE	DANRY DENG
A4	Jan 02,2012	Change : 7. Capacitance and dimension	DANRY DENG
B0	Aug 23,2012	Change : 10. Temperature characteristic of capacitor 11. Requirements for concentration limits for certain hazardous substances SVHC84item	DANRY DENG
B1	Dec 30,2012	Add: The book cover Revision history Directory Change : 5. How to order 11. Requirements for concentration limits for certain hazardous substances SVHC128item 14. Packing	DANRY DENG
B2	Apr 25,2014	Change : 6. Approval standard and file number 400VAC to 500VAC 13. Marking design	DANRY DENG

Directory

Specifications for a.c. ceramic capacitors (Y1)

1. Scope

Y1 a.c, ceramic capacitors are used in electrical and electronic equipment and connected an a.c. main with nominal voltage not exceeding 1000va.c, and with a nominal frequency not exceeding 100Hz.

2. Object

The principal object of this standard is to prescribe preferred ratings and characteristics and to select the appropriate tests and measuring methods and to give general performance requirements for Y1 a.c. ceramic capacitors.

3. Normative references

IEC 60384-1: 2008
Fixed capacitors for use in electronic equipment-
Part 1: Generic specification

IEC 60384-14 3'rd: 2005
Fixed capacitors for use in electronic equipment
Part 14: Sectional specification
Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

GB/T 5169.5-1997 (IDT IEC 60695-2-2:1991)
Fire hazard testing for electronic products Part 2: Test methods
Section 2: Needle-flame test

GB/T 2828.1-2003 (IDT ISO 2859-1:1999)
Sampling procedures for inspection by attributes-
Part 1: Sampling schemes indexed by acceptance quality limit(AQL)for lot-blot inspection

GB/T 2471-1995 (IDT IEC 63:1963): Preferred number series for resistors and capacitors

GB/T 2691-1994 (IDT IEC 62:1992): Marking codes for resistors and capacitors

SJ/T 11363-2006: Requirements for concentration limits for certain hazardous substances in electronic information products

SJ/T 11364-2006: Marking for control of pollution caused by electronic information products

SJ/T 11365-2006: Testing methods for hazardous substances in electronic information products

2011/65/EU: (RoHS2.0)The Restriction of the use of certain Hazardous substances in Electrical and Electronic Equipment

2002/96/EC (WEEE): Waste Electrical and Electronic Equipment

94/62/EC: Europe Parliament and Council Directive94/62/EC of 20 December 1994 on Packaging and packaging waste

No1907/2006(REACH): Registration, Evaluation, Authorization and Restriction of Chemicals(151item)

4. Terms and definitions

4.1 a.c. capacitor

Capacitor designed essentially for application with a power-frequency alternating voltage

NOTE: a.c. capacitor may be used on d.c. supplies having the same voltage as the a.c. r.m.s. rated voltage of the capacitor.

4.2 capacitor of class Y

Capacitor of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock.

4.3rated voltage

Either the r.m.s. operating voltage of rated frequency or the d.c. operating voltage, which may be applied continuously to the terminations of a capacitor at any temperature between the lower and the upper category temperatures.

4.4 tangent of loss angle(tanδ)

The power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage at a specified frequency.

4.5upper category temperature

Maximum surface temperature for which the capacitor has been designed to operate continuously.

4.6 lower category temperature

Minimum surface temperature for which the capacitor has been designed to operate continuously.

4.7climatic category

The climatic category which the capacitor belong to is expressed in numbers (IEC 60068-1e.g.:25/125/21). The first number represents the lower category temperature (e.g.:-25℃); the second number represents the upper category temperature (e.g.:+125℃) and the third number represents the number of days relevant to the damp heat test (e.g.:21days)

4.8 temperature characteristic of capacitor

The maximum reversible variation of capacitance produced over a given temperature range within the category temperature range, normally expressed as a percentage of the capacitance related to a reference temperature of 20℃.

5. How to order

Y1	F	222	M	073	X	280	A
Class	**Dielectric**	**Capacitance**	**Tolerance**	**Dielectric diameter**	**Leads spacing**	**Leads length**	**Lead Type**
Y1	B:Y5P	222:2200PF	K: ± 10%	073:7.3mm	X:10mm	280:28mm	A: Straight
Y2	F:Y5V	101:100PF	M: ± 20%	112:11.2mm	U:7.5mm	028:2.8mm	C: outside k
	E:Y5U	103:10000PF					D: front and back curve

Codes for capacitance shall be find expression in three numbers. The first two digits are significant, and the third digit is number of zero.

6. Approval standard and file number

Table 1

NO	COUNTRY	STANDARD NO.		CLASS TYPE W.V C.C P.F.C	FILE NO.	MARK
1	GERMANY EUROPE	VDE	DIN EN 60384-14 (VDE 0565 Teil 1-1): 2006-04 EN60384-14:2005-08 IEC 60384-14(ed.3)	Y1 TY AC 400V 25/125/21C	40023136 40031733	
2	USA CSA	UL CUL	UL 60384-14 2010 CSA E60384-14 :09	Y1 TY AC 500V 25/125/21B	E315719	
3	CHINA	CQC	IEC 60384-14:2005	Y1 TY AC500V 25/125/21B	CQC14001107432	

7. The constituent parts of capacitor

Design1

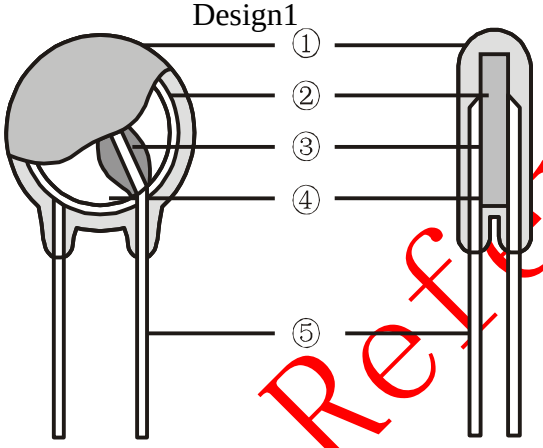


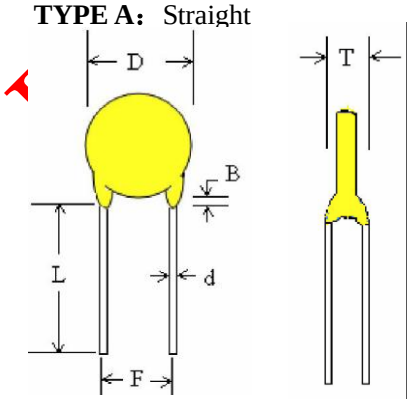
Table 2

NO.	constituent	material
①	Coating	Epoxy
②	Ceramic medium	Ceramic
③	Solder	Soldering tin
④	Electrode	Silver oxide
⑤	Lead Frame	CP wire

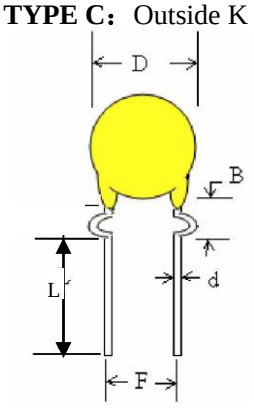
8. Figure and code of dimension

Design2

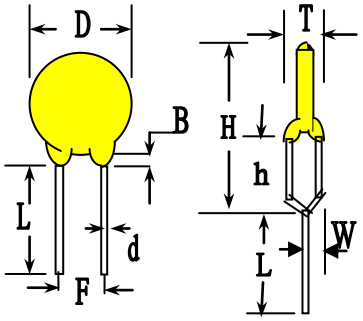
TYPE A： Straight



TYPE C： Outside K



TYPE D： Front and back curve



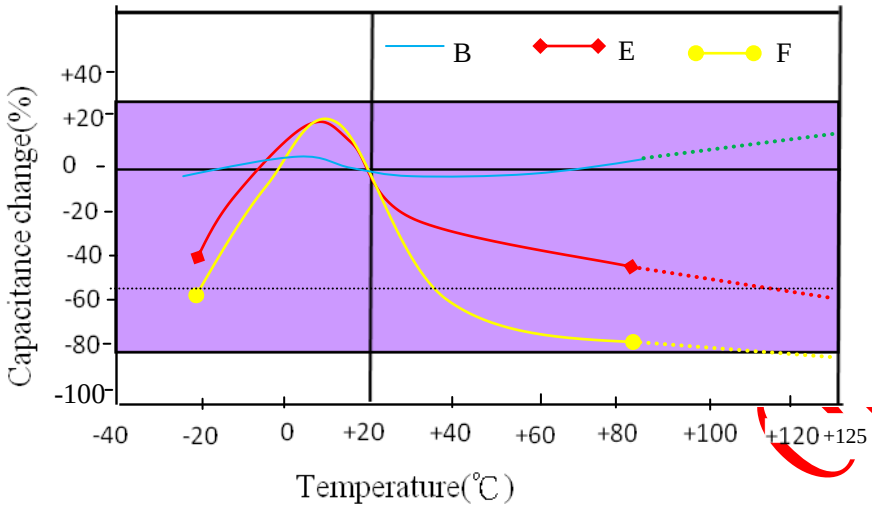
9. Capacitance and dimension

TY Type – CLASS Y1 Table 3

Part Number	Temp Char	Cap Value (Pf)	CAP TOL	DIMENSIONS(mm)			d ±0.05mm
				D (±0.8)	F (±0.5)	T (±0.8)	
Y1B101K□□□□	Y5P (B) ±10%	100	K ±10%	6.5	7.5 or 10	4.5	0.55
Y1B151K□□□□		150		6.5			
Y1B221K□□□□		220		6.5			
Y1B271K□□□□		270		6.5			
Y1B331K□□□□		330		7.5			
Y1B391K□□□□		390		8.5			
Y1B471K□□□□		470		8.5			
Y1B561K□□□□		560		9.5			
Y1B681K□□□□		680		9.5			
Y1B821K□□□□		820		10			
Y1B102K□□□□		1000		11			
Y1E471M□□□□	Y5U (E) +22% −56%	470	M ±20%	6.5	7.5 or 10	4.5	
Y1E102M□□□□		1000		7.5			
Y1E152M□□□□		1500		9			
Y1E222M□□□□		2200		11			
Y1E272M□□□□		2700		12			
Y1E332M□□□□		3300		12			
Y1E392M□□□□		3900		13			
Y1E472M□□□□		4700		15			
Y1F471M□□□□	Y5V (F) +22% −82%	470	M ±20%	6.5	7.5 or 10	4.5	
Y1F102M□□□□		1000		6.5			
Y1F152M□□□□		1500		7.5			
Y1F222M□□□□		2200		8.5			
Y1F272M□□□□		2700		9			
Y1F332M□□□□		3300		10			
Y1F392M□□□□		3900		11			
Y1F472M□□□□		4700		11			

10. Temperature characteristic of capacitor

Design3



11. Requirements for concentration limits for certain hazardous substances

Table 4

substances	concentration (unit: ppm)
Cadmium and cadmium compounds	<100
Lead and lead compounds	<1000
Mercury and mercury compounds	<1000
Hexavalent chromium compounds	<1000
Polubrominated biphenyls	<1000
Polubrominated diphenylethers	<1000
Cd+Pb+ Hg + Cr^{+6}(packing materials)	<100
Cl	<900
Br	<900
Cl+Br	<1500
SVHC (151item)	<1000

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12. Performance test

Table 5(1)

NO	item		performance	measuring method
1	4.1Visual examination		No visible damage legible marking lead frame is not oxidation and its surface is without sundries.	unaided eye or magnifier
2	4.1Dimensions		accorder Table3	vernier caliper
3	4.1Printing		accorder design4	magnifier
4	4.2.1 Voltage proof	Between lead wire	No permanent break-down or flashover during the test period	test voltage: 4000VAC frequency: 50/60Hz duration: 60 seconds leakage current: 5mA max
		Body insulation	No permanent break-down or flashover during the test period	test voltage: 4000VAC frequency: 50/60Hz duration: 60 seconds leakage current: 5mA max
5	4.2.2 Capacitance		Within specified tolerance K: ±10% M: ±20%	Temperature: 25±3℃ Humidity: 55±30%RH Voltage: 1.0±0.2V Frequency: 1±0.2KHZ
6	4.2.3 Dissipation factor		Within specified tolerance Y5P: ≤2.5% Y5U: ≤2.5% Y5V: ≤2.5%	Temperature: 25±3℃ Humidity: 55±30%RH Voltage: 1.0±0.2V Frequency: 1±0.2KHZ
7	4.2.4 Capacitor-temperature characteristic		Y5P: ±10% Y5U: +22%~-56% Y5V: +22%~-82%	Temperature tolerance: ±2℃ step 1 2 3 4 5 Tem (℃) +20 -25 +20 +85 +20 $\Delta = (C_X - C_0) / C_0$ C_X capacitor for step2,4 C_0 capacitor for step 3

Table 5(2)

NO	item		performance		measuring method
8	4.2.5 Insulation resistance	Between lead wire	6000MΩ MIN		Measuring voltage: 500VDC Frequency: 50/60Hz duration: 60 seconds leakage current: 5mA max
		Body insulation	6000MΩ MIN		Measuring voltage: 500VDC Frequency: 50/60Hz duration:60 seconds leakage current: 5mA max
9	4.3 Robustness of terminations	tensile	force:>10N		Fixed capacitor'body and Lead wire , lower lead wire.
		bending	Lead wire shall not cut off. Capacitor shall not be broken. No visible damage.		Two consecutive bends shall be applied in each direction
10	4.4 Resistance to soldering heat		visual examination	no visible damage	Solder temperature: 260±5℃ Immersion time:10±1seconds The depth of immersion: $2^{+0}_{-0.5}$mm from the seating plane Using a thermal insulating screen of 1.5±0.5mm thickens Capacitor shall be placed at 25±3℃for 24±2h before initial measurements.
			voltage proof	accorder 4.2.1	
			capacitance	Y5P: ±10% Y5U: ±20% Y5V: ±20%	
			dissipation factor	Y5P: ≤2.5% Y5U:≤2.5% Y5V: ≤2.5%	
			Insulation resistance	accorder 4.2.5	
11	4.5 Solderability		Good tinning as evidenced by free flowing of the solder with wetting of the terminations or solder shall flow within 3s.		Bath temperature:260±5℃ Immersion time:2±0.5seconds Depth of immersion(from the seating plane or component body): Capacitors below 2^{0}-0.5mm,using a thermal insulating screen of 1.5±0.5mm thickness.
12	4.6 Rapid change of temperature		visual examination	No visible damage	test temperature: upper category temperature +125±3℃ lower category temperature -25±3℃ number of cycles :5 duration of exposure at the temperature limits: 30minutes Capacitor shall be placed at 25±3℃for 24±2h before initial measurements.
			voltage proof	accorder 4.2.1	
			capacitance	Y5P: ±10% Y5U: ±20% Y5V: ±20%	
			dissipation factor	Y5P: ≤2.5% Y5U:≤2.5% Y5V: ≤2.5%	
			Insulation resistance	accorder 4.2.5	
13	4.7 Vibration		Capacitor shall not visible damage		Frequency rangs:10→55→10Hz swing:0.75mm, The total duration shall be 6 hours. duration of exposure at X,Y,Z: 2hours

Table 5(3)

NO	item	performance		measuring method
14	4.12 Damp heat (steady state)	visual examination	No visible damage	test temperature: 40±2℃ humidity: 95±3%RH duration: 500+24/-0hours voltage: 500VAC（U_R）for one half of the samples. capacitor shall be placed at 25±3℃for 24±2hours before measurements.
		capacitance	Δ =(C_X-C_0)/C_0 Δ: ±15%	
		voltage proof	accorder 4.2.1	
		Insulation resistance	≥3000MΩ Δ =(R_X-R_0)/R_0 Δ >50%	
15	4.13 Impulse voltage	No permanent breakdown or flashover during the test period.		Peak impulse voltage:8.0KV Impulses distance : > 10seconds Impulses times:24
		If any three successive impulses are shown by the oscilloscope monitor to have had a waveform indicating that no self-healing breakdowns or flashovers have taken place in the capacitor, then no further impulses shall be applied and the capacitor shall be counted as conforming.		
		If all 24 impulses have been applied to the capacitor and 3 or more of them are of a waveform indicating that no self-healing breakdowns or flashovers have occurred, then the capacitor shall be counted as conforming.		
		If less than three impulses are of the required waveform, then the capacitor shall be counted as a nonconforming item.		
16	4.14 Endurance	visual examination	No visible damage	Test temperature: 125±3℃ Duration: 1000+24/-0hours test voltage: 850VAC（1.7U_R）, except that once every hour the voltage shall be increased to 1000v r.m.s. for 0.1s. Each of these voltage shall be applied To each capacitor individually through a resistor of 47Ω±5%. Capacitor shall be placed at 25±3℃for 24±2hours before measurements.
		capacitance	Δ =(C_X-C_0)/C_0 Δ: ±20%	
		voltage proof	accorder 4.2.1	
		Insulation resistance	≥3000MΩ Δ =(R_X-R_0)/R_0 Δ >50%	

Table 5(4)

<table>
<tr><th>NO</th><th>item</th><th colspan="2">performance</th><th>measuring method</th></tr>
<tr><td rowspan="2">17</td><td rowspan="2">4.15
Charge and discharge</td><td>capacitance</td><td>$\Delta = (C_X - C_0)/C_0$
Δ : ±20%</td><td rowspan="2">Charge voltage: 707VAC($\sqrt{2}U_R$)
number of cycles:10000
the rate of approximately:
one operation per second.
Each cycle shall consist of charging and discharging the capacitor.
Each capacitor shall be individually charged by applying the test voltage through a resistor with the value
$R=\frac{220\times10^{-6}}{C_R}\ \Omega$
Capacitor shall be placed at 25±3℃ for 24±2hours before measurements.</td></tr>
<tr><td>Insulation resistance</td><td>≥3000MΩ
$\Delta = (R_X - R_0)/R_0$
Δ >50%</td></tr>
<tr><td>18</td><td>4.17
Passive flammability</td><td colspan="2">category: B
The burning time of any specimen shall not exceed the time specified.
Burning droplets or glowing parts falling down shall not ignite the tissue paper.</td><td>category: B
<table>
<tr><th>volume ranges</th><th>flame time</th><th>Maximum burning time</th></tr>
<tr><td>V<250mm^3</td><td>5S</td><td>≤30S</td></tr>
<tr><td>250<V≤500mm^3</td><td>10S</td><td>≤30S</td></tr>
<tr><td>500<V≤1750mm^3</td><td>20S</td><td>≤30S</td></tr>
<tr><td>V>1750mm^3</td><td>30S</td><td>≤30S</td></tr>
</table></td></tr>
<tr><td>19</td><td>4.19
Component solvent resistance</td><td colspan="2">No visible damage.
Performance accorder 4.2.1~4.2.5</td><td>Solvent to be used:
30±5%isopropyl alcohol
and 70±5%fluxional compound
Solvent temperature: 23±5℃
The capacitor shall be immerged in solvent for 5±0.5seconds.
Recovery time: 8hours</td></tr>
<tr><td>20</td><td>4.20
Solvent resistance of the marking</td><td colspan="2">The marking shall be legible</td><td>Solvent to be used:
30±5%isopropyl alcohol
and 70±5%fluxional compound
Solvent temperature:23±5℃
The capacitor shall be immerged in solvent for 5±0.5seconds and its markshall be wiped with pledget for 10times.</td></tr>
</table>

13. Marking design

Design 4

trademark
TY type/model reference
B code of Dielectric
Y1 capacitor classed sub-class
101 code of capacitance (three design)
K code of tolerance
500V~ rated voltage
a.c. mark
400V~ voltage for VDE ENEC
E0410 code of making time

- **Code of making time**

Table 6

code of year				code of month		code of day			
year	code	year	code	month	code	day	code	day	code
		2020	M	1	01	1	01	16	16
↓	↓	2021	N	2	02	2	02	17	17
2010	A	2022	P	3	03	3	03	18	18
2011	B	2023	R	4	04	4	04	19	19
2012	C	2024	S	5	05	5	05	20	20
2013	D	2025	T	6	06	6	06	21	21
2014	E	2026	U	7	07	7	07	22	22
2015	F	2027	V	8	08	8	08	23	23
2016	H	2028	W	9	09	9	09	24	24
2017	J	2029	X	10	10	10	10	25	25
2018	K	↓	↓	11	11	11	11	26	26
2019	L			12	12	12	12	27	27
						13	13	28	28
						14	14	29	29
						15	15	30	30
								31	31

NOTE: The code of year shall be one operation per 20 years.

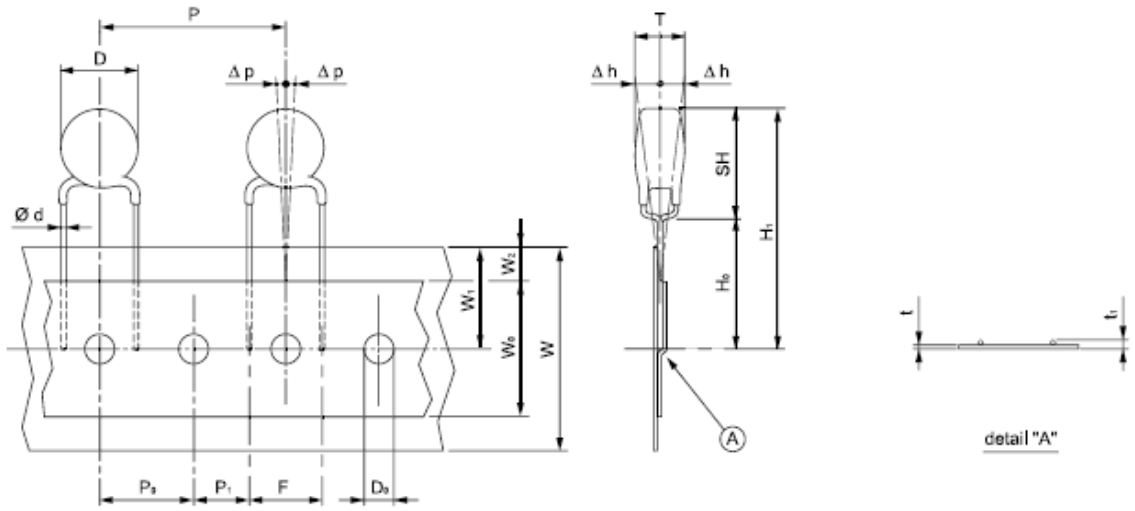
14. Packing

A:bulk

DIMENSION	Lead length	Bag
ΦD<8mm	≤10mm	1000PCS
	>10mm	500PCS
ΦD≥8mm	500PCS	

B: TAPE (1000PCS/BOX)

Capacitors on tape type pitch 7.5mm /10mm



Parameter	Symbol	Taping Specifications(unit: mm)		
		Pitch 7.5	Pitch 10	Tolerance
lead diameter	Φd	0.55	0.55	±0.1
pitch between capacitors	p	12.7	25.4	±1.0
feed-hole pitch	P_0	12.7	12.7	±0.3
feed-hole centre to lead centre	P_1	8.95	7.62	±0.7
lead spacing	F	7.5	10.0	±1.0
component alignment	Δh	0	0	±3.0
deviation along tape, left or right	Δp	0	0	±1.3
tape width	w	18.0	18.0	±0.5
hold-down tape width	W_0	12.0	12.0	-
hole position	W_1	9.0	9.0	±0.5
hold-down tape position	W_2	3.0	3.0	-
seated height to tape centre	H_0	20.0	20.0	±1.0
maximum component height	H_1	37.0	37.0	-
feed-hole diameter	D_0	4.0	4.0	±0.2
total tape thickness	t	0.50	0.50	±0.2
maximum thickness of tape and wires	t_1	1.0	1.0	-

15. Storage conditions

The capacitors are must not stored in a corrosive atmosphere, where sulphide or chloride gas,acid,alkali or salt are present. Exposure of the components to moisture, should be avoided. Capacitors can be stored for short periods at any temperature within the entire range of category temperature. For long storage periods, however, the following conditions should be observed:

■Storage temperature:-25 to +40℃

■Maximum relative humidity 80%,no dew allowed on the capacitor.

■Maximum duration 12months.

16. Cautions and warnings

1. Attention is drawn to the fact that repetition of the voltage proof test by the user may damage the capacitor.
2. Do not place the capacitor a PC board whose hole space differs from the specified lead space.
3. Avoid any compressive, tensile or flexural stress.
4. Please consult us first if you wish to embed the capacitor in plastic resins.
5. Do not move the capacitor after it has been soldered to the board.
6. Do not pick up the PC board by the soldered capacitor.

17.general knowledge for AC ceramic Capacitors

1.The test conditions for capacitance and Dissipation factor(tanδ)

1.1Environment: temperature：25±3℃ humidity：55±30%RH

1.2voltage and frequency for test apparatus: 1.0±0.2V , 1KHZ±20HZ

1.3Capacitor shall be store in environment for test more than two hours before test.

2.The test method

2.1for capacitance and Dissipation factor(tanδ) :

2.1.1The capacitor is tested after be clamped with the test tool, can't take the capacitor' s noumenon for test with hand. Capacitance and dissipation factor are not exact because of temperature in hand and test result is not right.

2.1.2The capacitor's capacitance and Dissipation factor after voltage tested may not test before the capacitor is stored for 24 hours after voltage test.the capacitor must be discharge between leads before test, or else voltage of remainder attaint test apparatus.

2.2for Voltage proof:

Charge to capacitor after AC or DC Voltage, value, time and current are seted in test apparatus, clamping capacitor's lead with clamp for test apparatus output. Space between clamps for test apparatus output must meet standard , or else flashover will be happened between two leads if space is too small. Capacitor's configuration was be destroyed if great current will be happened in capacitor for moment.

18.Voltage proof test guide

A. Correct Method

Operate explain:

1.Set up test voltage , current and time in high voltage instrument.

2.The two pins of capacitor are nipped in fixture of high voltage instrument.

3.Give the start button a slight press and the capacitor changed and tested, high voltage instrument stop output when the time arrived.

B. Error Method

Operate explain:

Capacitor was test with high voltage test probe for electriferous touch the two pins of capacitor.

Harm:

It will happen flashover in high voltage test probe and two pins of capacitor. One part of capacitors will hazardous. It will emerge bad in used.