Data Sheet

Customer:

Product: Multilayer Ceramic Chip Capacitors - ST series

Size : 0603/0805/1206/1210/1808/1812/1825/2220/2225

Issued Date: 17-Feb-2016

Edition: Ver. 1

Record of change

Date	Ver.	Description	Page
17-Feb.-2016	1		

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17-Feb.-2016	17-Feb.-2016	17-Feb.-2016	
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CHIP CAPACITORS SOFT TERMINATION ST SERIES

■ Introduction

HITANO Multilayer Ceramic Chip Capacitors supplied in bulk or tape & reel package are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards.

ST series use a special material between nickel-barrier and ceramic body. It provides excellent performance to withstand bending stress occurred during process and provide more security for PCB process.

The nickel-barrier terminations are consisted of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solder ability. The nickel barrier layer in terminations prevents the dissolution of termination when extended immersion in molten solder at elevated solder temperature.

■ Features

* High performance to withstanding 5mm of substrate bending test guarantee.
* A wide selection of sizes is available (0603 to 2225).
* High capacitance in given case size.
* Capacitor with lead-free termination (pure Tin).
* Reduction in PCB bend failure.
* High reliability and stability.
* RoHS & HALOGEN compliant.

■ Applications

* For general digital circuit.
* For power supply bypass capacitors.
* For consumer electronics.
* For telecommunication.
* DC to DC converter

■ Part Numbering

ST	0603	N	100	G	500	N	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
	Inch (mm) **0603** (1608) **0805** (2012) **1206** (3216) **1210** (3225) **1808** (4520) **1812** (4532) **1825** (4563) **2220** (5750) **2225** (5763)	**N**: C0G(NPO) **B**: X7R	Two significant digits followed by no. of zeros and R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF 102=10x10^2 = 1000pF 104=10x10^4 = 100000pF	**B**=±0.1pF **C**=±0.25pF **D**=±0.5pF **F**=±1% **G**=±2% **J**=±5% **K**=±10% **M**=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. **500**= 50 VDC **101**= 100 VDC **201**= 200 VDC **251**= 250 VDC **501**= 500 VDC **631**= 630 VDC **102**= 1000 VDC **202**= 2000 VDC **302**= 3000 VDC	**N**=Cu/Ni/Sn	**B** = Bulk in Tray **05** = 500/Reel **1**= 1K/Reel **2**= 2K/Reel **3**= 3K/Reel **T**= 4K/Reel **U**= 10K/ Reel **V**= 15K/ Reel

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■ Dimensions

Size inch(mm)	L (mm)	W (mm)	Thickness T(mm)	MB (mm)
0603 (1608)	1.60±0.20	0.80±0.15	Refer to range table	0.40±0.15
0805 (2012)	2.10±0.20	1.25±0.20		0.50±0.20
1206 (3216)	3.30±0.30	1.60+0.30/-0.10		0.60±0.20
1210 (3225)	3.30±0.40	2.50±0.30		0.75±0.35
1808 (4520)	4.60±0.50	2.00±0.20		0.75±0.35
1812 (4532)	4.60±0.50	3.20±0.30		0.75±0.35
1825 (4563)	4.60±0.50	6.30±0.40		0.75±0.35
2220 (5750)	5.70±0.50	5.00±0.40		0.85±0.35
2225 (5763)	5.70±0.50	6.30±0.40		0.85±0.35

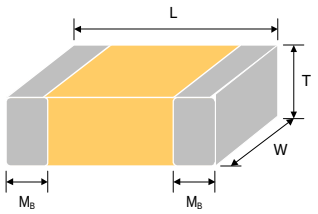

Fig. 1 The outline of MLCC

■ General Electric Data

<table>
<tr><td>Dielectric</td><td>NP0</td><td>X7R</td></tr>
<tr><td>Size</td><td>0603, 0805, 1206, 1210, 1808,
1812, 1825, 2220, 2225</td><td>0603, 0805, 1206, 1210, 1808,
1812, 1825, 2220, 2225</td></tr>
<tr><td>Rated voltage (WVDC)</td><td>50V, 100V, 200V, 250V, 500V,
630V, 1KV, 1.5KV, 2KV, 3KV,4KV</td><td>25V, 50V, 100V, 200V, 250V, 500V,
630V, 1KV, 1.5KV, 2KV, 3KV,4KV</td></tr>
<tr><td>Capacitance range</td><td>0.5pF ~ 270nF</td><td>100pF ~ 10μF</td></tr>
<tr><td>Capacitance tolerance</td><td>Reference to Table5</td><td>Reference to Table5</td></tr>
<tr><td>Tan δ</td><td><table><tr><th>Cap. Rang</th><th>Q Spec.</th></tr><tr><td>Cap<30pF:</td><td>Q≥400+20C</td></tr><tr><td>Cap≥30pF:</td><td>Q≥1000</td></tr></table></td><td><table><tr><th>Rated Volt.</th><th>D.F. Spec.</th></tr><tr><td>25V</td><td>≤ 3.5%</td></tr><tr><td>≥ 50V</td><td>≤ 2.5%</td></tr></table></td></tr>
<tr><td rowspan="3">Capacitance & Tan δ Test Condition</td><td colspan="2">Measured at the condition of 30~70% related humidity.</td></tr>
<tr><td>for 25℃ at ambient temperature</td><td>Preconditioning for Class II MLCC: Perform a heat treatment at 150±10℃ for 1 hour, then leave in ambient condition for 24±2 hours before measurement.</td></tr>
<tr><td><table><tr><th>Cap. Rang</th><th>Test Condition</th></tr><tr><td>Cap≤1000pF</td><td>1.0±0.2Vrms, 1.0MHz±10%</td></tr><tr><td>Cap>1000pF,</td><td>1.0±0.2Vrms, 1.0kHz±10%</td></tr></table></td><td>Apply 1.0±0.2Vrms, 1.0kHz±10%,
at 25℃ ambient temperature.</td></tr>
<tr><td>Insulation resistance</td><td>≥100GΩ or R•C≥ 500Ω-F
whichever is smaller</td><td>≥10GΩ or R•C≥100Ω-F
whichever is smaller</td></tr>
<tr><td>Operating temperature</td><td colspan="2">- 55 to + 125 ℃</td></tr>
<tr><td>Temperature coefficient</td><td>±30ppm / ℃</td><td>±15%</td></tr>
<tr><td>Termination</td><td colspan="2">Ag (or Cu)/Ni/Sn (lead-free termination)</td></tr>
</table>

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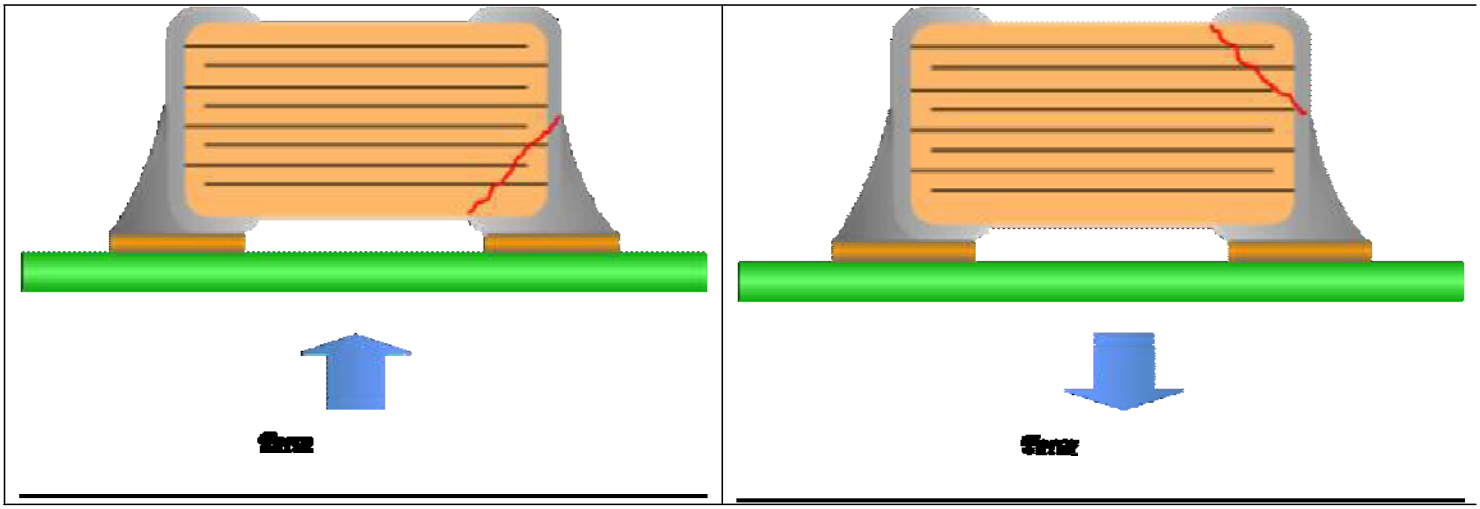
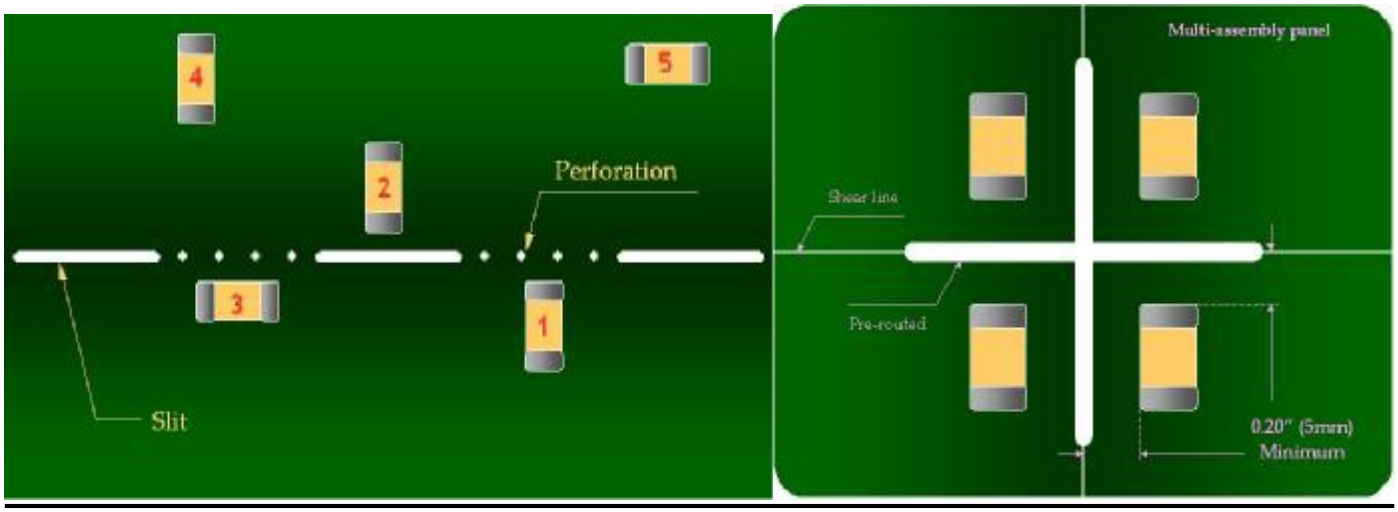
■ Typical Bending Cracks of MLCC

MLCC ceramic body is consisted of rigidity material. It will be suffered compressive and tensional stress when the carried board is bended. If the suffered stress is over ceramic body strength, the bending crack is occurred. **Therefore, the bending crack will be only occurred after soldering process.**



■ The stress v.s. position on PCB during bending

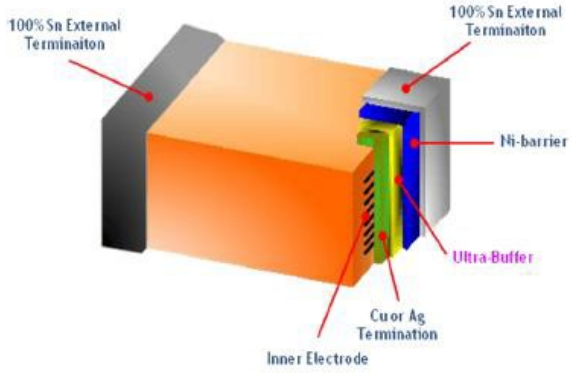
Chip mounting close to board separation point

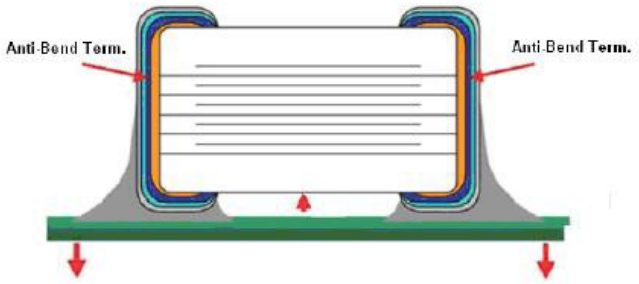


Magnitude of stress 1 > 2 ≒3 > 4 > 5

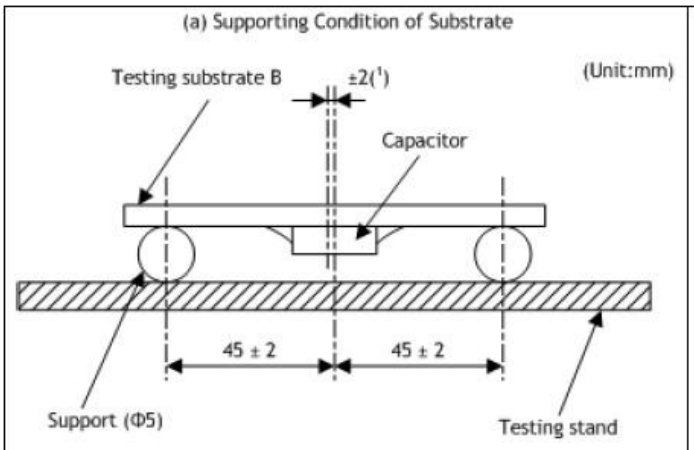
9.Structure

HITANO ST series is added a special termination material (Ultra-Buffer or Anti-Bend)between ceramic body and Ni-barrier that can absorb mechanical stress to prevent bending crack occurred.

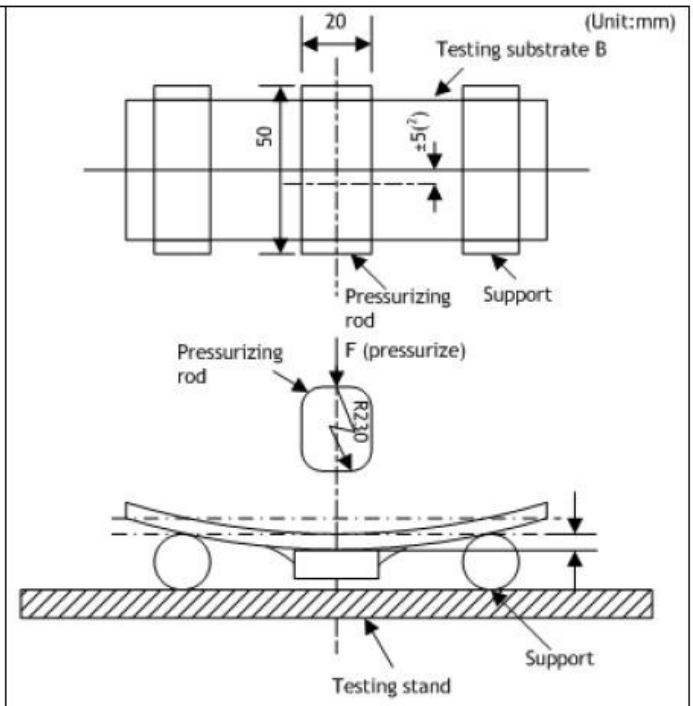




10.Illustration of Bending Test



Discrepancy between center of supports and center of substrate



Discrepancy between center of testing substrate A and center of pressurizing rod.

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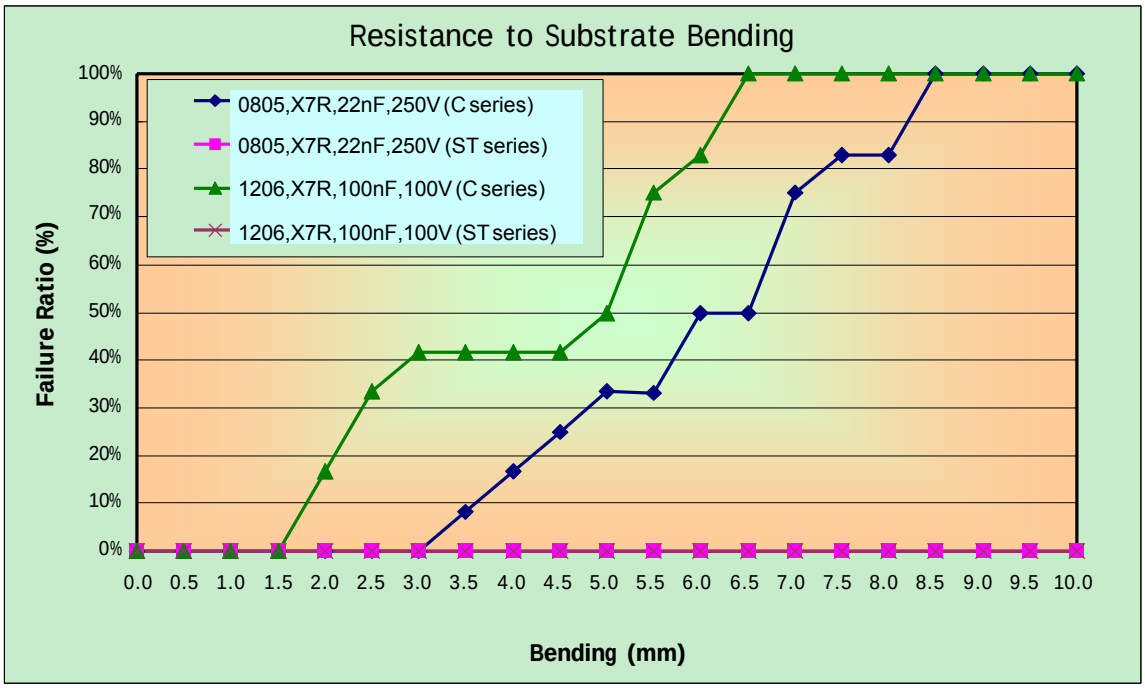
■ Comparison of Bending Test Result



PCB TEST RESULT			
Size	**Mean Bend C series(mm)**	**Mean Bend ST series.(mm)**	**Improvement with Ultra-buffer**
0603	≥ 2	≥ 5	300%
0805	≥ 2	≥ 5	300%
1206	≥ 2	≥ 5	300%
1210	≥ 2	≥ 5	300%
1808	≥ 3	≥ 5	300%
1812	≥ 3	≥ 5	140%
1825	≥ 3	≥ 5	117%
2220	≥ 5	≥ 7	114%
2225	≥ 5	≥ 7	114%

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■ Capacitance Range

NPO(C0G)

Dimension		0603				0805							1206							
Cap(pF)	code	50V	100V	200V	250V	50V	100V	200V	250V	500V	630V	1KV	50V	100V	200V	250V	500V	630V	1KV	2KV
0.5	0R5	P	P	P	P	A	A	A	A	A	A									
1.0	1R0	P	P	P	P	A	A	A	A	A	A									
1.2	1R2	P	P	P	P	A	A	A	A	A	A									
1.5	1R5	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
1.8	1R8	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
2.2	2R2	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
2.7	2R7	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
3.3	3R3	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
3.9	3R9	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
4.7	4R7	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
5.6	5R6	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
6.8	6R8	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
8.2	8R2	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
10	100	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
12	120	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
15	150	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
18	180	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
22	220	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
27	270	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	H
33	330	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	C
39	390	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	H	C
47	470	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	C	C
56	560	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	C	X
68	680	P	P	P	P	A	A	A	A	A	A	X	H	H	H	H	H	H	C	X
82	820	P	P	P	P	A	A	A	A	H	H	X	H	H	H	H	H	H	X	X
100	101	P	P	P	P	A	A	A	H	H	H	X	H	H	H	H	H	H	X	X
120	121	P	P	P	P	A	A	A	H	X	X	X	H	H	H	H	H	H	X	L
150	151	P	P	P	P	A	A	H	H	X	X	X	H	H	H	H	H	H	X	L
180	181	P	P	P	P	A	A	H	X	X	X		H	H	H	H	H	H	L	L
220	221	P	P	P	P	A	A	X	X	X	X		H	H	H	H	H	H	L	L
270	271	P	P	P	P	A	A	X	X	X	X		H	H	H	C	C	C	L	L
330	331	P	P	P	P	A	A	X	X	X	X		H	H	H	C	C	C	L	L
390	391	P	P	P	P	H	H	X	X	X	X		H	H	H	C	C	C	L	L
470	471	P	P	P	P	H	H	X	X	X	X		H	H	C	C	C	C	L	L
560	561	P	P	P	P	H	H	X	X	X	X		H	H	C	X	X	X	L	
680	681	P	P	P	P	H	H	X	X	X	X		H	H	C	X	X	X	L	
820	821	P	P	P	P	H	H	X	X	X	X		H	H	C	L	L	L	L	
1000	102	P				H	H	X	X	X	X		H	H	C	L	L	L	L	
1200	122					H	H	X	X	X	X		H	H	C	L	L	L	L	
1500	152					H	H	X	X	X	X		H	H	X	L	L	L		
1800	182					H	H	X	X	X	X		H	H	X	L	L	L		
2200	222					H	H	X	X	X	X		H	H	X	L	L	L		
2700	272					X	X						H	H	X	L	L	L		
3300	332					X	X						H	H	X	L	L	L		
3900	392					X	X						H	H	L	L	L	L		
4700	472					X	X						H	H	L	L	L	L		
5600	562					X							H	H	L	L	L	L		
6800	682					X							C	C	L	L				
8200	822												X	X	L	L				
10000	103												X	X						
12000	123												X							
15000	153												X							
18000	183																			
22000	223																			
27000	273																			
33000	333																			
39000	393																			
47000	473																			
56000	563																			
68000	683																			
82000	823																			
100000	104																			

NPO(C0G) (continued)

Dimension		1210								1808								
Cap(pF)	code	50V	100V	200V	250V	500V	630V	1KV	2KV	50	100	200	250	500V	630V	1KV	2KV	3KV
2.2	2R2									X	X	X	X	X	X	X	X	X
2.7	2R7									X	X	X	X	X	X	X	X	X
3.3	3R3									X	X	X	X	X	X	X	X	X
3.9	3R9									X	X	X	X	X	X	X	X	X
4.7	4R7									X	X	X	X	X	X	X	X	X
5.6	5R6									X	X	X	X	X	X	X	X	X
6.8	6R8									X	X	X	X	X	X	X	X	X
8.2	8R2									X	X	X	X	X	X	X	X	X
10	100	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
12	120	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
15	150	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
18	180	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
22	220	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
27	270	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
33	330	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
39	390	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
47	470	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X
56	560	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X
68	680	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X
82	820	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X
100	101	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X	Z
120	121	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X	Z
150	151	C	C	C	C	C	C	X	L	X	X	X	X	X	X	X	Z	Z
180	181	C	C	C	C	C	C	X	L	X	X	X	X	X	X	X	Z	Z
220	221	C	C	C	C	C	C	L	L	X	X	X	X	X	X	X	Z	Z
270	271	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	Z
330	331	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	Z
390	391	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	Z
470	471	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	Z
560	561	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	Z
680	681	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	
820	821	C	C	C	C	C	C	L	L	X	X	X	X	Z	Z	Z	Z	
1000	102	C	C	X	X	X	X	L	Z	X	X	X	X	Z	Z	Z	Z	
1200	122	C	C	X	X	X	X	L	Z	X	X	X	X	Z	Z	Z	Z	
1500	152	C	C	X	X	X	X	Z	G	X	X	X	X	Z	Z	Z	Z	
1800	182	C	C	X	X	X	X	G	G	X	X	X	X	Z	Z	Z	Z	
2200	222	C	C	X	X	X	X	G		X	X	X	X	Z	Z	Z		
2700	272	C	C	X	X	X	X	G		X	X	X	X	Z	Z	Z		
3300	332	C	C	X	X	X	X	G		X	X	X	X	Z	Z	Z		
3900	392	C	C	X	X	X	X	G		X	X	X	X	Z	Z			
4700	472	X	X	X	X	X	X			X	X	X	X	Z	Z			
5600	562	X	X	X	X	X	X			X	X	L	L	Z	Z			
6800	682	L	L	L	L	L	L			X	X	L	L	Z	Z			
8200	822	L	L	L	L	L	L			X	L	Z	Z	Z	Z			
10000	103	L	L	Z	Z	Z	Z			X	L	Z	Z	Z	Z			
12000	123	L	L	Z	Z	Z	Z			L	Z	Z	Z					
15000	153	L	Z	G	G	G	G			L	Z	Z	Z					
18000	183	Z	G	G	G					Z	Z							
22000	223	Z	G	G	G					Z	Z							
27000	273	G	G							Z								
33000	333	G	G															
39000	393	G																
47000	473	G																

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NPO(C0G) (continued)

Dimension		1812									1825								
Cap(pF)	code	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV
10	100	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
12	120	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
15	150	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
18	180	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
22	220	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
27	270	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
33	330	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
39	390	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
47	470	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
56	560	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
68	680	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
82	820	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
100	101	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
120	121	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
150	151	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	Z	Z	Z
180	181	X	X	X	X	X	X	X	X	Z	L	L	L	L	L	L	Z	Z	Z
220	221	X	X	X	X	X	X	X	X	Z	L	L	L	L	L	L	Z	Z	Z
270	271	X	X	X	X	X	X	X	Z	Z	L	L	L	L	L	L	Z	Z	Z
330	331	X	X	X	X	X	X	X	Z	Z	L	L	L	L	L	L	Z	Z	Z
390	391	X	X	X	X	X	X	X	Z	Z	L	L	L	L	L	L	Z	Z	Z
470	471	X	X	X	X	X	X	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z
560	561	X	X	X	X	X	X	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z
680	681	X	X	X	X	X	X	Z	Z	Z	L	L	L	L	L	L	Z	Z	G
820	821	X	X	X	X	X	X	Z	Z	G	L	L	L	L	L	L	Z	Z	G
1000	102	X	X	X	X	X	X	Z	Z	G	L	L	L	L	L	L	Z	Z	G
1200	122	X	X	X	X	X	X	Z	Z		L	L	L	L	L	L	Z	Z	G
1500	152	X	X	X	X	X	X	Z	Z		L	L	L	L	L	L	Z	G	G
1800	182	X	X	X	X	X	X	Z	Z		L	L	L	L	L	L	Z	G	G
2200	222	X	X	X	X	X	X	Z	Z		L	L	L	L	L	L	Z	G	G
2700	272	X	X	X	X	X	X	Z	G		L	L	L	L	L	L	Z	G	G
3300	332	X	X	X	X	X	X	Z	G		L	L	L	L	L	L	Z	G	
3900	392	X	X	X	X	X	X	G			L	L	L	L	L	L	G	G	
4700	472	X	X	X	X	X	X	G			L	L	L	L	L	L	G	G	
5600	562	X	X	X	X	X	X	G			L	L	L	L	L	L	G	G	
6800	682	X	X	X	X	X	X				L	L	L	L	L	L	G	G	
8200	822	X	X	X	X	X	X				L	L	L	L	L	L	G	G	
10000	103	X	X	X	X	X	X				L	L	L	L	L	L	G		
12000	123	X	X	L	L	L	L				L	L	L	L	L	L	G		
15000	153	X	X	L	L	L	L				L	L	L	L	L	L			
18000	183	X	L	Z	Z	Z	Z				L	L	L	L	L	L			
22000	223	X	L	Z	Z	Z	Z				L	L	L	L	L	L			
27000	273	X	Z	G	G	G	G				L	L	L	L	Z	Z			
33000	333	X	Z	G	G	G	G				L	L	L	L	Z	Z			
39000	393	Z	G	G	G						L	L	Z	Z	G	G			
47000	473	Z	G	G	G						L	L	Z	Z	G	G			
56000	563	G	G								L	Z	G	G	G	G			
68000	683	G	G								L	Z	G	G	G	G			
82000	823	G									Z	G	G	G					
100000	104	G									G	G							
120000	124										G								

HITANO ENTERPRISE CORP.®

CHIP CAPACITORS SOFT TERMINATION ST SERIES

NPO(C0G) (continued)

Dimension		2220										2225									
Cap(pF)	code	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV
10	100	L	L	L	L	L	L	Z	Z	Z		L	L	L	L	L	L	Z	Z	Z	
12	120	L	L	L	L	L	L	Z	Z	Z		L	L	L	L	L	L	Z	Z	Z	
15	150	L	L	L	L	L	L	Z	Z	Z		L	L	L	L	L	L	Z	Z	Z	
18	180	L	L	L	L	L	L	Z	Z	Z		L	L	L	L	L	L	Z	Z	Z	
22	220	L	L	L	L	L	L	Z	Z	Z		L	L	L	L	L	L	Z	Z	Z	
27	270	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
33	330	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
39	390	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
47	470	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
56	560	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
68	680	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
82	820	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
100	101	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
120	121	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
150	151	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
180	181	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
220	221	L	L	L	L	L	L	Z	Z	Z	Z	L	L	L	L	L	L	Z	Z	Z	Z
270	271	L	L	L	L	L	L	Z	Z	Z	G	L	L	L	L	L	L	Z	Z	Z	Z
330	331	L	L	L	L	L	L	Z	Z	G	G	L	L	L	L	L	L	Z	Z	Z	G
390	391	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	Z	Z	
470	471	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	Z	Z	
560	561	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	Z	Z	
680	681	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	Z	Z	
820	821	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	G	G	
1000	102	L	L	L	L	L	L	Z	Z	G		L	L	L	L	L	L	Z	G	G	
1200	122	L	L	L	L	L	L	G	G	G		L	L	L	L	L	L	Z	G	G	
1500	152	L	L	L	L	L	L	G	G	G		L	L	L	L	L	L	Z	G	G	
1800	182	L	L	L	L	L	L	G	G	G		L	L	L	L	L	L	Z	G	G	
2200	222	L	L	L	L	L	L	G	G	G		L	L	L	L	L	L	Z	G	G	
2700	272	L	L	L	L	L	L	G	G	G		L	L	L	L	L	L	Z	G	G	
3300	332	L	L	L	L	L	L	G	G			L	L	L	L	L	L	Z	G	G	
3900	392	L	L	L	L	L	L	G	G			L	L	L	L	L	L	Z	G		
4700	472	L	L	L	L	L	L	G	G			L	L	L	L	L	L	Z	G		
5600	562	L	L	L	L	L	L	G	G			L	L	L	L	L	L	G	G		
6800	682	L	L	L	L	L	L	G	G			L	L	L	L	L	L	G	G		
8200	822	L	L	L	L	L	L	G	G			L	L	L	L	L	L	G	G		
10000	103	L	L	L	L	L	L	G				L	L	L	L	L	L	G	G		
12000	123	L	L	L	L	L	L	G				L	L	L	L	L	L	G			
15000	153	L	L	L	L	L	L					L	L	L	L	L	L				
18000	183	L	L	L	L	L	L					L	L	L	L	L	L				
22000	223	L	L	L	L	L	L					L	L	L	L	L	L				
27000	273	L	L	L	L	Z	Z					L	L	L	L	L	L				
33000	333	L	L	Z	Z	Z	Z					L	L	L	L	L	L				
39000	393	L	L	Z	Z	G	G					L	L	Z	Z	Z	Z				
47000	473	L	L	G	G	G	G					L	L	Z	Z	Z	Z				
56000	563	L	Z	G	G	G	G					L	L	G	G	G	G				
68000	683	Z	Z	G	G							L	Z	G	G	G	G				
82000	823	G	G	G	G							Z	Z	G	G	G	G				
100000	104	G	G									Z	G	G	G						
120000	124	G	G									G	G	G	G						
150000	154	G										G	G								
180000	184	G										G	G								
220000	224											G									
270000	274											G									

HITANO ENTERPRISE CORP. ®

CHIP CAPACITORS SOFT TERMINATION ST SERIES

X7R

Dimensio		0603				0805								1206								
Cap(pF)	code	50V	100V	200V	250V	25V	50V	100	200	250	500	630	1KV	25V	50V	100V	200V	250V	500V	630V	1KV	2KV
100	101	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
120	121	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
150	151	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
180	181	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
220	221	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
270	271	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
330	331	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
390	391	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
470	471	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
560	561	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
680	681	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
820	821	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
1000	102	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	X
1200	122	P	P	P	P	H	H	H	H	H	H	H	H		H	H	X	X	X	X	X	L
1500	152	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	L
1800	182	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	L
2200	222	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	L
2700	272	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	L
3300	332	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	L
3900	392	P	P	P	P	H	H	H	H	H	H	H	X		H	H	X	X	X	X	X	
4700	472	P	P	P	P	H	H	H	H	H	X	X	X		H	H	X	X	X	X	X	
5600	562	P	P	P	P	H	H	H	H	H	X	X	X		H	H	X	X	X	X	X	
6800	682	P	P	P	P	H	H	H	H	H	X	X	X		H	H	X	X	X	X	X	
8200	822	P	P	P	P	H	H	H	X	X	X	X	X		H	H	X	X	X	X	X	
10000	103	P	P	P	P	H	H	H	X	X	X	X		H	H	H	X	X	X	X	X	
12000	123	P	P	P	P	H	H	H	X	X	X	X		H	H	H	X	X	X	X	L	
15000	153	P	P	P	P	H	H	H	X	X	X	X		H	H	H	X	X	X	X	L	
18000	183	P	P			H	H	H	X	X	X	X		H	H	H	X	X	X	X	L	
22000	223	P	P			H	H	H	X	X	X	X		H	H	H	X	X	L	L	L	
27000	273	P	P			H	H	X	X	X				H	H	H	X	X	L	L		
33000	333	P	P			H	H	X	X	X				H	H	H	L	L	L	L		
39000	393	P	P			H	H	X	X					H	H	H	L	L	L	L		
47000	473	P	P			H	H	X	X					H	H	H	L	L	L	L		
56000	563	P				H	H	X	X					H	H	H	L	L				
68000	683	P				H	H	X	X					H	H	H	L	L				
82000	823	P				H	H	X						H	H	X	L	L				
100000	104	P				H	H	X						H	H	X	L	L				
120000	124					H	X	X						H	H	X						
150000	154					X	X	X						C	C	L						
180000	184					X	X	X						C	C	L						
220000	224					X	X	X						C	C	L						
270000	274					X	X							C	C	L						
330000	334					X	X							C	C	L						
390000	394					X								X	L	L						
470000	474					X								X	L	L						
560000	564					X								X	L	L						
680000	684					X								X	L	L						
820000	824					X								X	L	L						
1000000	105					X								X	L	L						
1500000	155													P								
2200000	225													P								
3300000	335													P								
4700000	475													P								

HITANO ENTERPRISE CORP.®

CHIP CAPACITORS SOFT TERMINATION ST SERIES

X7R (continued)

Dimension		1210									1808									
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1KV	2KV	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV
150	151										X	X	X	X	X	X	X	X	X	Z
180	181										X	X	X	X	X	X	X	X	X	Z
220	221		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	X	Z
270	271		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	X	Z
330	331		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
390	391		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
470	471		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
560	561		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
680	681		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
820	821		C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
1000	102	C	C	C	C	C	X	X	X	L	X	X	X	X	X	X	X	X	Z	Z
1200	122	C	C	C	C	C	X	X	X	Z	X	X	X	X	X	X	X	Z	Z	
1500	152	C	C	C	C	C	X	X	X	Z	X	X	X	X	X	X	X	Z	Z	
1800	182	C	C	C	C	C	X	X	X	Z	X	X	X	X	X	X	X	Z	Z	
2200	222	C	C	C	C	C	X	X	X	Z	X	X	X	X	X	X	X	Z	Z	
2700	272	C	C	C	C	C	X	X	X	G	X	X	X	X	X	X	X	Z		
3300	332	C	C	C	C	C	X	X	X	G	X	X	X	X	X	X	X	Z		
3900	392	C	C	C	C	C	X	X	L	G	X	X	X	X	X	X	X	Z		
4700	472	C	C	C	C	C	X	X	L	G	X	X	X	X	X	X	X	Z		
5600	562	C	C	C	C	C	X	X	L	G	L	L	L	L	Z	Z	Z	Z		
6800	682	C	C	C	C	C	X	X	L	G	L	L	L	L	Z	Z	Z	Z		
8200	822	C	C	C	C	C	X	X	L	G	L	L	L	L	Z	Z	Z			
10000	103	C	C	C	C	C	X	X	L		L	L	L	L	Z	Z	Z			
12000	123	C	C	C	C	C	X	X	L		L	L	L	L	Z	Z	Z			
15000	153	C	C	C	C	C	X	X	L		L	L	L	L	Z	Z	Z			
18000	183	C	C	C	C	C	X	X	L		L	L	L	L	Z	Z	Z			
22000	223	C	C	C	C	C	X	X	L		L	L	L	L	Z	Z	Z			
27000	273	C	C	C	C	C	L	L	L		L	L	L	L	Z	Z	Z			
33000	333	C	C	C	C	C	L	L	L		L	L	L	L	Z	Z	Z			
39000	393	C	C	C	C	C	L	L	Z		L	L	L	L	Z	Z	Z			
47000	473	C	C	C	X	X	L	L	G		L	L	L	L	Z	Z	Z			
56000	563	C	C	C	X	X	L	L	G		L	L	L	L	Z	Z	Z			
68000	683	C	C	C	L	L	Z	Z	G		L	L	L	L	Z	Z	Z			
82000	823	C	C	C	L	L	G	G			L	L	L	L	Z	Z				
100000	104	C	C	C	L	L	G	G			L	L	L	L	Z	Z				
120000	124	C	C	C	L	L	G	G			L	L	L	L						
150000	154	C	C	X	G	G	G	G			L	L	L	L						
180000	184	C	C	X	G	G					L	L	Z	Z						
220000	224	C	C	X	G	G					L	L	Z	Z						
270000	274	C	C	L	G	G					Z	Z	Z	Z						
330000	334	C	X	L	G	G					Z	Z	Z	Z						
390000	394	C	X	G	G	G					Z	Z	Z	Z						
470000	474	C	X	G	G	G					Z	Z	Z	Z						
560000	564	X	X	G	G	G					Z	Z	Z	Z						
680000	684	X	X	Z	G	G					Z	Z								
820000	824	X	X	Z							Z	Z								
1000000	105	X	X	Z							Z	Z								
1200000	125		G	G							Z									
1500000	155		G	G																
2200000	225	L	G	G																
2700000	275		G																	
3300000	335	L																		
4700000	475	Z																		
6800000	685																			
10000000	106	Z																		

HITANO ENTERPRISE CORP.®

CHIP CAPACITORS SOFT TERMINATION ST SERIES

X7R (continued)

Dimension		1812										1825									
Cap(pF)	code	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV
270	271	X	X	X	X	X	X	X	X	L	Z										Z
330	331	X	X	X	X	X	X	X	X	L	Z										Z
390	391	X	X	X	X	X	X	X	X	L	Z										Z
470	471	X	X	X	X	X	X	X	X	L	Z										Z
560	561	X	X	X	X	X	X	X	X	L	Z										Z
680	681	X	X	X	X	X	X	X	X	Z	Z										Z
820	821	X	X	X	X	X	X	X	X	Z	Z										Z
1000	102	X	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
1200	122	X	X	X	X	X	X	X	X	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
1500	152	X	X	X	X	X	X	X	X	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
1800	182	X	X	X	X	X	X	X	L	G	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
2200	222	X	X	X	X	X	X	X	L	G		Z	Z	Z	Z	Z	Z	Z	Z	Z	
2700	272	X	X	X	X	X	X	X	L	G		Z	Z	Z	Z	Z	Z	Z	Z	Z	
3300	332	X	X	X	X	X	X	X	Z	G		Z	Z	Z	Z	Z	Z	Z	Z	Z	
3900	392	X	X	X	X	X	X	X	Z	G		Z	Z	Z	Z	Z	Z	Z	Z	Z	
4700	472	X	X	X	X	X	X	X	Z	G		Z	Z	Z	Z	Z	Z	Z	Z	Z	
5600	562	X	X	X	X	X	X	X	G			Z	Z	Z	Z	Z	Z	Z	Z	G	
6800	682	X	X	X	X	X	X	X	G			Z	Z	Z	Z	Z	Z	Z	Z	G	
8200	822	X	X	X	X	X	X	X	G			Z	Z	Z	Z	Z	Z	Z	Z	G	
10000	103	X	X	X	X	X	X	L	G			Z	Z	Z	Z	Z	Z	Z	Z	G	
12000	123	X	X	X	X	X	X	Z				Z	Z	Z	Z	Z	Z	Z	G	U	
15000	153	X	X	X	X	X	X	Z				Z	Z	Z	Z	Z	Z	Z	G	U	
18000	183	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	G	U	
22000	223	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	G		
27000	273	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	U		
33000	333	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	U		
39000	393	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	U		
47000	473	X	X	X	X	X	X	G				Z	Z	Z	Z	Z	Z	Z	U		
56000	563	X	X	X	X	Z	Z	G				Z	Z	Z	Z	Z	Z	Z	U		
68000	683	X	X	X	X	Z	Z	G				Z	Z	Z	Z	Z	Z	Z			
82000	823	X	X	X	X	Z	Z	G				Z	Z	Z	Z	Z	Z	G			
100000	104	X	L	X	X	Z	Z	G				Z	Z	Z	Z	Z	Z	G			
120000	124	X	L	X	X	G	G					Z	Z	Z	Z	Z	Z	U			
150000	154	X	L	Z	Z	G	G					Z	Z	Z	Z	Z	Z	U			
180000	184	X	L	Z	Z	G	G					Z	Z	Z	Z	Z	Z	U			
220000	224	X	L	Z	Z	G	G					Z	Z	Z	Z	Z	Z	U			
270000	274	X	L	Z	Z	G						Z	Z	Z	Z	Z	Z	U			
330000	334	X	L	Z	Z	G						Z	Z	Z	Z	Z	Z	U			
390000	394	X	L	Z	Z	G						Z	Z	Z	Z	Z	Z				
470000	474	X	L	Z	Z	G						Z	Z	Z	Z	Z	Z				
560000	564	X	Z	G	G							Z	Z	Z	Z	G	G				
680000	684	Z	Z	G	G							Z	Z	Z	Z	G	G				
820000	824	Z	Z	G	G							Z	Z	Z	Z	U	U				
1000000	105	Z	Z	G	G							Z	Z	Z	Z						
1200000	125	Z	Z									Z	Z	G	G						
1500000	155	Z	Z									Z	Z	G	G						
1800000	185	Z	Z									Z	Z	G	G						
2200000	225	G	G									Z	Z	G	G						
2700000	275	G	G									Z	Z	U	U						
3300000	335	G	G									Z	Z								
3900000	395											Z	Z								
4700000	475											Z	G								
5600000	565											G	G								
6800000	685											G	G								
8200000	825											G	G								
10000000	106											G	G								

HITANO ENTERPRISE CORP.®

CHIP CAPACITORS SOFT TERMINATION ST SERIES

X7R (continued)

Dimension		2220										2225									
Cap(pF)	code	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV	50V	100V	200V	250V	500V	630V	1KV	2KV	3KV	4KV
270	271										Z										Z
330	331										Z										Z
390	391										Z										Z
470	471										Z										Z
560	561										Z										Z
680	681										Z										Z
820	821										Z										Z
1000	102	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
1200	122	Z	Z	Z	Z	Z	Z	Z	Z	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
1500	152	Z	Z	Z	Z	Z	Z	Z	Z	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
1800	182	Z	Z	Z	Z	Z	Z	Z	Z	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z	G
2200	222	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	Z	
2700	272	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	Z	
3300	332	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	Z	
3900	392	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	Z	
4700	472	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	Z	
5600	562	Z	Z	Z	Z	Z	Z	Z	Z	Z		Z	Z	Z	Z	Z	Z	Z	Z	G	
6800	682	Z	Z	Z	Z	Z	Z	Z	Z	G		Z	Z	Z	Z	Z	Z	Z	Z	G	
8200	822	Z	Z	Z	Z	Z	Z	Z	G	G		Z	Z	Z	Z	Z	Z	Z	Z	G	
10000	103	Z	Z	Z	Z	Z	Z	Z	G	G		Z	Z	Z	Z	Z	Z	Z	Z	G	
12000	123	Z	Z	Z	Z	Z	Z	Z	G	U		Z	Z	Z	Z	Z	Z	Z	G	G	
15000	153	Z	Z	Z	Z	Z	Z	Z	G	U		Z	Z	Z	Z	Z	Z	Z	G	G	
18000	183	Z	Z	Z	Z	Z	Z	Z	U	U		Z	Z	Z	Z	Z	Z	Z	G	U	
22000	223	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	G		
27000	273	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	G		
33000	333	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	G		
39000	393	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	U		
47000	473	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	U		
56000	563	Z	Z	Z	Z	Z	Z	Z	U			Z	Z	Z	Z	Z	Z	Z	U		
68000	683	Z	Z	Z	Z	Z	Z	G				Z	Z	Z	Z	Z	Z	Z			
82000	823	Z	Z	Z	Z	Z	Z	G				Z	Z	Z	Z	Z	Z	Z			
100000	104	Z	Z	Z	Z	Z	Z	G				Z	Z	Z	Z	Z	Z	G			
120000	124	Z	Z	Z	Z	Z	Z	G				Z	Z	Z	Z	Z	Z	U			
150000	154	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
180000	184	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
220000	224	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
270000	274	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
330000	334	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
390000	394	Z	Z	Z	Z	Z	Z	U				Z	Z	Z	Z	Z	Z	U			
470000	474	Z	Z	Z	Z	Z	Z					Z	Z	Z	Z	Z	Z				
560000	564	Z	Z	Z	Z	G	G					Z	Z	Z	Z	Z	Z				
680000	684	Z	Z	Z	Z	G	G					Z	Z	Z	Z	Z	Z				
820000	824	Z	Z	Z	Z	U	U					Z	Z	Z	Z	G	G				
1000000	105	Z	Z	Z	Z	U	U					Z	Z	Z	Z	G	G				
1200000	125	Z	Z	G	G							Z	Z	G	G	U	U				
1500000	155	Z	Z	G	G							Z	Z	G	G	U	U				
1800000	185	Z	Z	G	G							Z	Z	G	G						
2200000	225	Z	Z	G	G							Z	Z	G	G						
2700000	275	Z	Z	U	U							Z	Z	G	G						
3300000	335	Z	Z									Z	Z	U	U						
3900000	395	Z	Z									Z	Z	U	U						
4700000	475	Z	G									Z	G								
5600000	565	G	G									Z	G								
6800000	685	G	G									G	G								
8200000	825	G	G									G	G								
10000000	106	G	G									G	G								

CHIP CAPACITORS SOFT TERMINATION ST SERIES

Thickness Code & Standqard Packaging Q'ty per Reel

Thickness Code	Chip Size	Chip Thickness	Max Tape Thickness	Q'ty of carboard tape in		Q'ty of Embosses tape in	
				7" reel	13" reel	7" reel	13" reel
S	0402	0.50±0.05 mm	0.60 mm	10,000	50,000	--	--
P	0603	0.80±0.10 mm	0.95 mm	4,000	15,000	--	--
A	0805	0.60±0.10 mm	0.75 mm	4,000	15,000	--	--
H		0.85±0.10 mm	0.95 mm	4,000	15,000	--	--
X		1.25±0.10 mm	1.80 mm	--	--	3,000	10,000
H	1206	0.85±0.10 mm	0.90 mm	4,000	15,000	--	--
C		0.95±0.10 mm	1.80 mm			3,000	10,000
X		1.25±0.10 mm	1.80 mm	--	--	3,000	10,000
L		1.65±0.20 mm	1.80 mm	--	--	2,000	--
C	1210	0.95±0.10 mm	1.80 mm			3,000	10,000
X		1.25±0.10 mm	1.80 mm	--	--	2,000	--
L		1.65±0.20 mm	1.80 mm	--	--	2,000	--
Z		2.00±0.20 mm	2.20 mm	--	--	2,000	--
G		2.50±0.20 mm	2.75 mm	--	--	1,000	--
X	1808	1.25±0.10 mm	1.80 mm	--	--	2,000	--
F		1.40±0.20 mm	1.80 mm	--	--	2,000	--
L		1.65±0.20 mm	1.80 mm	--	--	2,000	--
Z		2.00±0.20 mm	2.20 mm	--	--	1,000	--
X	1812	1.25±0.20 mm	1.80 mm	--	--	1,000	--
L		1.65±0.20 mm	1.80 mm			1,000	
Z		2.00±0.20 mm	2.20 mm	--	--	1,000	--
G		2.50±0.20 mm	2.75 mm	--	--	500	--
U		2.80±0.30 mm	3.00 mm	--	--	500	--
Z	1825	2.00±0.20 mm	2.20 mm	--	--	1,000	--
G		2.50±0.20 mm	2.75 mm	--	--	500	--
U		2.80±0.30 mm	3.00 mm	--	--	500	
Z	2220	2.00±0.20 mm	2.20 mm	--	--	500	--
G		2.50±0.20 mm	2.75 mm	--	--	500	--
U		2.80±0.30 mm	3.00 mm	--	--	500	--
L	2211	1.65±0.20 mm	1.80 mm			1,000	
Z		2.00±0.20 mm	2.20 mm	--	--	1,000	--
G		2.50±0.20 mm	2.75 mm	--	--	500	--
Z	2225	2.00±0.20 mm	2.20 mm	--	--	1,000	--
G		2.50±0.20 mm	2.75 mm	--	--	500	--

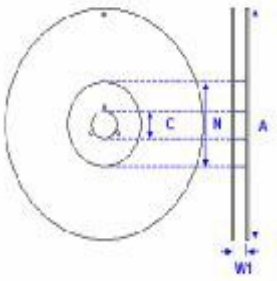

Fig. 4 The dimension of reel

Size	0603, 0805, 1206, 1210			1812, 1825, 2220, 2225
Reel size	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W_1	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.0+1.0/-0	100.0±1.0	100±1.0	80.0±1.0

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CARDBOARD TAPE DIMESIONS

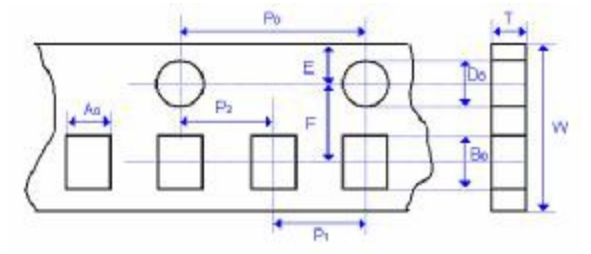


Fig. 2 The dimension of paper tape

EMBOSSED TAPE DIMENSIONS

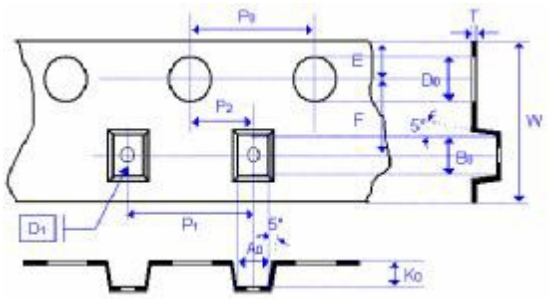


Fig. 3 The dimension of plastic tape

Size	0603		0805		1206			1210	
Chip Thicknes	0.80±0.07	0.80+0.15/-0.10	0.80±0.10	1.25±0.10 1.25±0.20	0.80±0.10	0.95±0.10 1.25±0.10	1.60±0.20 1.60+0.3/-0/1	0.95±0.10 1.25±0.10 1.60±0.20	2.50±0.30
A_0	1.00+0.05/-0.10	1.02+0.05/-0.10	1.50±0.10	<1.65	2.00±0.10	<2.00	<2.00	<3.05	<3.10
B_0	1.80±0.10	1.80±0.10	2.30±0.10	<2.40	3.50±0.10	<3.60	<3.70	<3.80	<4.00
T	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05
K_0	-	-	-	<2.50	-	<2.50	<2.50	<2.50	<3.50
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P_0	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	4.00±0.10
$10xP_0$	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.0±0.10
P_1	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.55±0.05	1.55±0.05	1.55±0.05	1.50±0.10/-0	1.55±0.05	1.50±0.10/-0	1.50±0.10/-0	1.50±0.10/-0	1.50±0.10/-
D_1	-	-	-	1.00±0.10	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05

Size	1812		1825		2220		2225	
Chip Thicknes	1.25±0.10 1.60±0.20 2.00±0.20	2.50±0.30	1.60±0.20 2.00±0.20	2.50±0.30	1.40±0.15 1.60±0.20 2.00±0.20	2.50±0.30	2.00±0.20	2.50±0.30
A_0	<3.90	<3.90	<6.80	<6.80	<5.80	<5.80	<6.80	<6.80
B_0	<5.30	<5.30	<5.30	<5.30	<6.50	<6.50	<6.50	<6.50
T	0.25±0.05	0.25±0.05	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10
K_0	<2.50	<3.00	<2.50	<3.10	<2.50	<3.10	<2.50	<3.10
W	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20
P_0	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
$10xP_0$	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P_1	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0
D_1	1.50±0.10	1.50+/-0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	1.75+/-0.1	1.75±0.1	1.75±0.10	1.75±0.1	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50+/-0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05

■ Application Note

Storage

To prevent the damage of solder ability of terminations, the following storage conditions are recommended: Indoors under 5 ~ 40℃ and 20% ~ 70% RH. No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine. Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The capacitors should be used within 6 months and checked the solder ability before use.

Handling

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

Preheat

In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 4℃ per second and the final preheat temperature should be within 100℃ of the soldering temperature for small chips such as 0603, 0805 and 1206, within 50℃ of the soldering temperature chip size for bigger such as 1210 ~ 2520.

Soldering

Use middy activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate. Hand soldering with temperature-controlled iron not exceeding 30 watts and diameter of tip less than 1.2 mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260℃. For bigger chips such as 1210, 1808, 1812, 2211, 2220 etc. wave soldering and hand soldering are no recommended. Refer IPC/JEDEC J-STD-020D Method recommended soldering profiles :

Reflow not sooner than 15 minutes and not longer than 4 hrs after removal from the temperature/humidity chamber, subject the sample to 3 cycle of the appropriate reflow conditions as defined as blow Table description.

Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min.(T_{smin}) Temperature Max.(T_{smax}) Time(t_s) from (T_{smin} to T_{smax})	150℃ 200℃ 60 to 120 seconds
Ramp-up rate(T_L to T_p)	3℃/second max.
Liquidous temperature(T_L) Time(t_L) maintained above T_L	217℃ 60 to 150 seconds
Peak package body temperature(T_p)	For user Tp must not exceed the Classification temp 260℃ For suppliers Tp must equal or exceed the Classification temp 260℃
Time(T_p)* within 5℃ of the specified classification temperature(T_c)	30* second
Ramp-down rate (T_p to T_L)	6℃/second max.
Time 25℃ to peak temperature 260℃	8 minutes max.

Lead-free : Soldering temperature = 235 to 260℃, depending on product.

Maximum temperature = Minimum temperature (235℃)+ΔT+ Tolerance for oven process and measurement(5 ~ 7℃)

Time at peak temperature = 10sec, Dwell above 217℃ = 90sec, Ramping rate = 3℃/sec(heating) and 6℃/sec(heating).

Cooling

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint. A cooling rate not exceeding 4℃ per second should be used when forced cooling is necessary.

Cleaning

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

■ Reliability Test Condition and Requirement

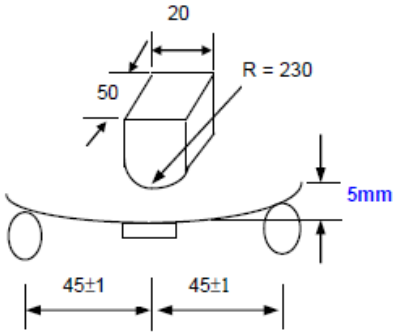
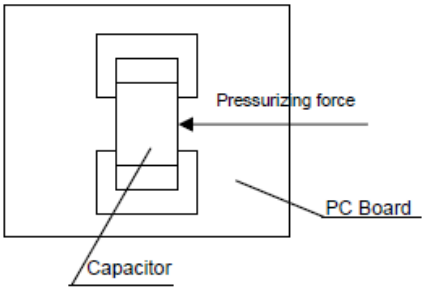
<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Dimensions</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>Class I: (NP0)</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td>Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10%
Cap>1000pF, 1.0±0.2Vrms, 1KHz±10%

Class II: (X7R):
Cap≤10μF, 1.0±0.2Vrms, 1KHz±10%</td><td><table><tr><th>Dielectric</th><th>Rated vol.(V)</th><th>Q/D.F.</th><th>Remark</th></tr><tr><td rowspan="2">Class I(NPO)</td><td rowspan="2">All</td><td>Q≥1000</td><td>Cap≥30pF</td></tr><tr><td>Q≥400+20C</td><td>Cap<30pF</td></tr><tr><td rowspan="3">Class II(X7R)</td><td>25V</td><td>D.F. < 3.5%</td><td></td></tr><tr><td rowspan="2">≥50</td><td>D.F. < 2.5%</td><td></td></tr><tr><td>D.F. < 3.0%</td><td>0603≥0.047μF;
0805≥0.18μF,
1206≥0.47μF</td></tr></table></td></tr>
<tr><td>4.</td><td>Temperature Coefficient</td><td>With no electrical load.<table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>X7R</td><td>-55~125℃ at 25℃</td></tr><tr><td>NP0</td><td>-55~125℃ at 25℃</td></tr></table></td><td><table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>NPO</td><td>Within ±30ppm/℃</td></tr></table></td></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td><table><tr><th>Rated vol.(V)</th><th>Apply Voltage</th><th>Test Condition</th></tr><tr><td>≤ 100</td><td>1 times of U_R</td><td>Max. 120 sec</td></tr><tr><td>100 <V ≤ 500</td><td>1 times of U_R</td><td>60 sec</td></tr><tr><td>> 500</td><td>500VDC</td><td>60 sec</td></tr></table></td><td><table><tr><th>Dielectric</th><th>Requirements</th></tr><tr><td>Class I(NPO)</td><td>≥100GΩ or RxC≥ 500Ω-F whichever is smaller</td></tr><tr><td>Class II(X7R)</td><td>≥10GΩ or RxC≥ 100Ω-F whichever is smaller.</td></tr></table></td></tr>
<tr><td>6.</td><td>Solderability</td><td>* Solder temperature: 235±5℃ for (0603~1210)
* Solder temperature: 245±5℃ for (1808~2225)
* Dipping time: 2±0.5 sec.</td><td>75% min. coverage of all metalized area.</td></tr>
<tr><td>7.</td><td>Dielectric Strength</td><td><table><tr><th>Rated vol.(V)</th><th>Condition</th></tr><tr><td>≤ 250</td><td>2.0 times of U_R</td></tr><tr><td>250<V≤500</td><td>1.5 times of U_R</td></tr><tr><td>630≤V≤3000V</td><td>1.2 times of U_R</td></tr><tr><td>3000<V≤5000V</td><td>1.1 times of U_R</td></tr><tr><td>>5000V</td><td>1.0 times of U_R</td></tr></table>* Duration: 1 to 5 sec.
* Charge and discharge current less than 50mA.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>8.</td><td>Resistance to Soldering Heat</td><td>* Solder temperature: 260±5℃
* Dipping time: 10±1 sec
* Preheating: 120 to 150℃ for 1 minute before immerse the capacitor in a eutectic solder.
* Before initial measurement (Class II only): Perform 150+0/-10℃ for 1 hr and then set for 48±4 hrs at room temp.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</td><td>* No remarkable damage.<table><tr><th>Dielectric</th><th>Cap Change</th><th>Q/D.F & IR</th></tr><tr><td>Class I(NPO)</td><td>Within ±2.5% or ±0.25pF whichever is larger.</td><td rowspan="2">To meet Initial requirement</td></tr><tr><td>Class II(X7R)</td><td>within ±7.5%</td></tr></table>* 25% max. leaching on each edge.</td></tr>
<tr><td>9.</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.<table><tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table>* Before initial measurement (Class II only): Perform 150+0/-10℃ for 1 hr and then set for 48±4 hrs at room temp.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</td><td>* No remarkable damage.<table><tr><th>Dielectric</th><th>I.R.</th><th>Cap Change</th><th>Q/D.F</th></tr><tr><td>Class I(NPO)</td><td rowspan="2">To meet Initial requirement</td><td>Within ±2.5% or ±0.25pF whichever is larger.</td><td>≤ 1.0(Q) × Initial requirement</td></tr><tr><td>Class II(X7R)</td><td>within ±7.5%</td><td>≤ 1.5(D.F.) × Initial requirement</td></tr></table></td></tr>
</table>

■ Reliability Test Condition and Requirement (Continued)

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>10.</td><td>Humidity (Damp Heat) Steady State</td><td>* Test temp.: 40±2℃
* Humidity: 90~95% RH
* Test time: 500+24/-0hrs.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</td><td>* No remarkable damage.
<table>
<tr><th>Dielectric</th><th>I.R</th><th>Cap Change</th><th colspan="2">Q/D.F</th></tr>
<tr><td rowspan="3">Class I(NPO)</td><td rowspan="3">≥1GΩ or RxC≥ 50Ω-F whichever is smaller.</td><td rowspan="3">within ±5.0% or ± 0.5pF whichever is larger</td><td>Cap ≥30pF</td><td>Q≥350;</td></tr>
<tr><td>10pF ≤ Cap < 30pF</td><td rowspan="2">Q≥275+2.5C</td></tr>
<tr><td>Cap < 10pF</td><td>Q≥200+10C</td></tr>
<tr><td>Class II(X7R)</td><td>within ±12.5%</td><td colspan="2">D.F. ≤ 200% × Initial requirement</td></tr>
</table></td></tr>
<tr><td>11</td><td>Humidity (Damp Heat) Load</td><td>* Test temp.: 40±2℃
* Humidity: 90~95% RH
* Test time: 500+24/-0hrs.
*To apply voltage :rated voltage
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</td><td>* No remarkable damage.
<table>
<tr><th>Dielectric</th><th>I.R</th><th>Cap Change</th><th colspan="2">Q/D.F</th></tr>
<tr><td rowspan="3">Class I(NPO)</td><td rowspan="3">≥1GΩ or RxC≥ 50Ω-F whichever is smaller.</td><td rowspan="3">within ±7.5% or ± 0.75pF whichever is larger</td><td>Cap ≥30pF</td><td>Q≥350;</td></tr>
<tr><td>10pF ≤ Cap < 30pF</td><td rowspan="2">Q≥275+2.5C</td></tr>
<tr><td>Cap < 10pF</td><td>Q≥200+10C</td></tr>
<tr><td>Class II(X7R)</td><td>within ±12.5%</td><td colspan="2">D.F. ≤ 200% × Initial requirement</td></tr>
</table></td></tr>
<tr><td>12.</td><td>High Temperature Load (Endurance)</td><td>* Test temp.:
NP0, X7R : 125±3℃
<table>
<tr><th>Rated vol.(V)</th><th>Apply Voltage</th></tr>
<tr><td>≤ 250</td><td>2.0 times of U_R</td></tr>
<tr><td>250 <V ≤ 500</td><td>1.5 times of U_R</td></tr>
<tr><td>630≤ V≤1000</td><td>1.2 times of U_R</td></tr>
<tr><td>1000<V≤5000V</td><td>1.1 times of U_R</td></tr>
<tr><td>>5000</td><td>1.0 times of U_R</td></tr>
</table>
Exception item(X7R only):
<table>
<tr><th>Rated vol.(V)</th><th>Size</th><th>Cap. Range</th><th>Apply Voltage</th></tr>
<tr><td rowspan="2">100</td><td>0805</td><td>≥ 124</td><td rowspan="5">1.5 times of U_R</td></tr>
<tr><td>1206
1210
1825
2220
2225</td><td>≥ 105</td></tr>
<tr><td rowspan="3">200 & 250</td><td>1210</td><td>> 224</td></tr>
<tr><td>1812</td><td>> 474</td></tr>
<tr><td>1825
2220
2225</td><td>≥ 105</td></tr>
</table>
* Test time: 1000+24/-0 hrs.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</td><td>* No remarkable damage.
<table>
<tr><th>Dielectric</th><th>I.R</th><th>Cap Change</th><th>Q/D.F</th></tr>
<tr><td>Class I(NPO)</td><td rowspan="2">≥1GΩ or RxC≥ 50Ω-F whichever is smaller.</td><td>within ±3.0% or ±0.3pF whichever is larger</td><td rowspan="2">D.F. ≤ 200% × Initial requirement</td></tr>
<tr><td>Class II(X7R)</td><td>within ±12.5%</td></tr>
</table></td></tr>
</table>

■ Reliability Test Condition and Requirement (continued)

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>13.</td><td>Resistance to Flexure of Substrate</td><td>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 5mm.
 
</td><td>* No remarkable damage.
<table>
<tr><th>Dielectric</th><th>Cap Change</th></tr>
<tr><td>Class I(NPO)</td><td>within ±3.0% or ±0.3pF whichever is larger</td></tr>
<tr><td>Class II(X7R)</td><td>within ±12.5%</td></tr>
</table>
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>14.</td><td>Adhesive Strength of Termination</td><td>* Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(> 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second.
 
</td><td>* No remarkable damage or removal of the terminations.</td></tr>
<tr><td>15.</td><td>Vibration Resistance</td><td>* Vibration frequency: 10~55 Hz/min.
* Total amplitude: 1.5mm
* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</td><td>* No remarkable damage.
* Cap change and Q/D.F.: To meet initial spec.</td></tr>
</table>