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SPECIFICATION

FOR

Product Name : AUTOMOTIVE Soft Termination Multilayer Ceramic
Chip Capacitors

Part No. : MT Soft Termination Capacitors Series

Description : Size 0603 to 1812, X7R, 50Vdc to 250Vdc

SPEC. No.	: <u>MT-000-001-03</u>
DATE	:

RAWN BY	CHECEKED BY	APPROVED BY
<i>Yvens Chou</i>	<i>Yvens Chou</i>	<i>Ryan Chen</i>



1. INTRODUCTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

PDC's MT Soft termination series MLCC is made by X7R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MT Soft termination series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications and qualified to AEC-Q200.

2. FEATURES

- a. A wide selection of sizes is available (0603 to 1812).
- b. High capacitance in given case size.
- c. Capacitor with lead-free termination (pure Tin).
- d. The MT Soft termination series meet AEC-Q200 requirement.
- e. RoHS Compliant.

3. APPLICATIONS

- a. For Navigation & Information equipments.
- b. For entertainment equipments.
- c. For comfortable equipments.
- d. For Automotive electronic equipment.

4. HOW TO ORDER

<u>MT</u>	<u>31</u>	<u>X</u>	<u>471</u>	<u>K</u>	<u>251</u>	<u>P</u>	<u>X</u>	<u>G</u>
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Packaging	Thickness	Control Code
Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8	Table 9

Table 1	PDC Family
Code	Description
MT	Automotive Capacitor Qualified to AEC-Q200

Table 6	Rated Voltage				
Code	Description	Code	Description	Code	Description
500	50Vdc	201	200Vdc	251	250Vdc
101	100Vdc				

Table 2	Size				
Code	Description	Code	Description	Code	Description
18	0603(1608)	31	1206(3216)	42	1808(4520)
21	0805(2012)	32	1210(3225)	43	1812(4532)

Table 3	Dielectric Material Characteristics			
Code	Description	Code	Description	
X	X7R			

Table 7	Packaging Type			
Code	Description	Code	Description	
B	Bulk	T	Tray package	
E	Tape and 7" Reel, Embossed Tape	P	Tape and 7" Reel, Paper Tape	
K	Tape and 10" Reel, Embossed Tape	D	Tape and 10" Reel, Paper Tape	
L	Tape and 13" Reel, Embossed Tape	G	Tape and 13" Reel, Paper Tape	

Table 4	Capacitance Rule Code			
Code	Description	Code	Description	
R47	0.47pF	102	102=10x10 ² =1000pF	
OR5	0.5pF	104	104=10x10 ⁴ =100nF	
100	100=10x10 ⁰ =10pF	106	106=10x10 ⁶ =10μF	

Table 8	Thickness Description				
Code	Description	Code	Description	Code	Description
A	0.60 ± 0.10 mm	I	1.25 ± 0.20 mm	Q	0.50+0.02/-0.05 mm
B	0.8 + 0.15/-0.10 mm	J	1.15 ± 0.15 mm	R	3.10 ± 0.30 mm
C	1.25 ± 0.10 mm	K	0.50 ± 0.20 mm	S	0.80 ± 0.07 mm
D	1.40 ± 0.15 mm	L	0.30 ± 0.03 mm	T	0.85 ± 0.10 mm
E	1.60 ± 0.20 mm	M	0.95 ± 0.10 mm	U	0.50 ± 0.10 mm
F	2.00 ± 0.20 mm	N	0.50 ± 0.05 mm	V	0.20 ± 0.02 mm
G	2.50 ± 0.30 mm	O	3.50 ± 0.20 mm	X	0.80 ± 0.10 mm
H	2.80 ± 0.30 mm	P	1.60 +0.3/-0.10 mm	Z	0.25 ± 0.03 mm

Table 5	Tolerance				
Code	Description	Code	Description	Code	Description
A	±0.05 pF	I	-10% ~ 0%	Q	±0.03 pF
B	±0.10 pF	J	±5 %	Z	-20% ~ +80%
C	±0.25 pF	K	±10 %	X	+10%~+20%
D	±0.50 pF	L	0% ~ +10%		
F	±1 %	M	±20 %		
G	±2 %	N	-5% ~ +10%		
H	±3 %	P	±0.02 pF		

Table 9	Special Control Code
Code	Description
G	RoHS Compliant
Q	Surface Coating (size 1206~2225)
E	Soft Termination

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<http://www.pdc.com.tw>

SPEC. No. : MT-000-001-03



5. EXTERNAL DIMENSIONS

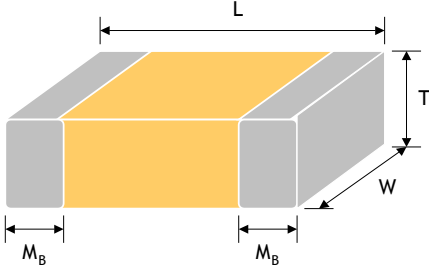
Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)	
0603(1608)	1.60±0.20	0.80±0.15	See No.4 Reference Table 8	0.40±0.15	
0805(2012)	2.10±0.20	1.25±0.20		0.50±0.20	
1206(3216)	3.30±0.30	1.60±0.20		0.60±0.20	
1210(3225)	3.30±0.40	2.50±0.30		0.75±0.35	
1808(4520)	4.60±0.50	2.00±0.25		0.75±0.35	
1812(4532)	4.50±0.50	3.20±0.30		0.75±0.35	

Fig. 5.1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0603, 0805, 1206, 1210, 1808, 1812
Rated voltage (WVDC)	50V, 100V, 200V, 250V
Capacitance range	100pF ~ 3.3μF
Capacitance tolerance	Reference to Table 5
Tan δ	≤2.5%
Capacitance & Tan δ Test condition	Measured at the condition of 30~70% related humidity
	Preconditioning for Class II MLCC : Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement
	1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature
Insulation resistance at U_r	≥10GΩ or RxC≥500Ω-F, whichever is smaller
Operating temperature	-55°C to +125°C
Capacitance characteristic	±15%
Termination	Cu/Ag polymer/Ni/Sn (lead-free termination)

7. CAPACITANCE RANGE

7-1 X7R

DIELECTRIC	X7R																
	SIZE	0603				0805				1206				1210			
	RATED VOLTAGE (V)	50	100	200	250	50	100	200	250	50	100	200	250	50	100	200	250
Capacitance	100pF (101)	S	S	B	B	X	X	X	X	X	X	X	X				
	120pF (121)	S	S	B	B	X	X	X	X	X	X	X	X				
	150pF (151)	S	S	B	B	X	X	X	X	X	X	X	X				
	180pF (181)	S	S	B	B	X	X	X	X	X	X	X	X				
	220pF (221)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	270pF (271)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	330pF (331)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	390pF (391)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	470pF (471)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	560pF (561)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	680pF (681)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	820pF (821)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	1,000pF (102)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	1,200pF (122)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	1,500pF (152)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	1,800pF (182)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	2,200pF (222)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	2,700pF (272)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	3,300pF (332)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	3,900pF (392)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	4,700pF (472)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	5,600pF (562)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	6,800pF (682)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	8,200pF (822)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	0.010μF (103)	S	S	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	0.012μF (123)	S	B	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	0.015μF (153)	S	B	B	B	X	X	X	X	X	X	X	X	M	M	M	M
	0.018μF (183)	S	B			X	X	X	X	X	X	X	X	M	M	M	M
	0.022μF (223)	S	B			X	X	X	X	X	X	X	X	M	M	M	M
	0.027μF (273)	S	B			X	M	M	M	X	X	X	X	M	M	M	M
	0.033μF (333)	B	B			X	M	C	C	X	X	X	X	M	M	M	M
	0.039μF (393)	B	B			X	M	C		X	X	X	X	M	M	M	M
	0.047μF (473)	B	B			X	M	C		X	X	X	X	M	M	M	M
	0.056μF (563)	B				X	M	C		X	X	M	M	M	M	M	M
	0.068μF (683)	B				X	M	C		X	X	C	C	M	M	M	M
	0.082μF (823)	B				X	M			X	X	C	C	M	M	M	M
	0.10μF (104)	B				X	C			X	X	E	E	M	M	M	M
	0.12μF (124)					X	C			X	X			M	M	E	E
	0.15μF (154)					X	C			X	X			M	M	E	E
	0.18μF (184)					X	C			X	M			M	M	E	E
0.22μF (224)					X	C			X	M			M	M	E	E	
0.27μF (274)					D				X	C			M	M	F	F	
0.33μF (334)					D				X	E			M	M	F	F	
0.39μF (394)									C	E			M	C	G	G	
0.47μF (474)									C	E			M	C	G	G	
0.56μF (564)									C	P			M	E	G	G	
0.68μF (684)									C	P			M	E	G	G	
0.82μF (824)									E	P			C	P			
1.0μF (105)									P	P			C	P			
1.2μF (125)													P	F			
1.5μF (155)													F	F			
1.8μF (185)													G	G			
2.2μF (225)													G	G			
2.7μF (275)													G				

7. CAPACITANCE RANGE

7-1 X7R

DIELECTRIC	X7R								
	SIZE	1808				1812			
	RATED VOLTAGE (V)	50	100	200	250	50	100	200	250
Capacitance	100pF (101)								
	120pF (121)								
	150pF (151)	C	C	C	C				
	180pF (181)	C	C	C	C				
	220pF (221)	C	C	C	C				
	270pF (271)	C	C	C	C	C	C	C	C
	330pF (331)	C	C	C	C	C	C	C	C
	390pF (391)	C	C	C	C	C	C	C	C
	470pF (471)	C	C	C	C	C	C	C	C
	560pF (561)	C	C	C	C	C	C	C	C
	680pF (681)	C	C	C	C	C	C	C	C
	820pF (821)	C	C	C	C	C	C	C	C
	1,000pF (102)	C	C	C	C	C	C	C	C
	1,200pF (122)	C	C	C	C	C	C	C	C
	1,500pF (152)	C	C	C	C	C	C	C	C
	1,800pF (182)	C	C	C	C	C	C	C	C
	2,200pF (222)	C	C	C	C	C	C	C	C
	2,700pF (272)	C	C	C	C	C	C	C	C
	3,300pF (332)	C	C	C	C	C	C	C	C
	3,900pF (392)	C	C	C	C	C	C	C	C
	4,700pF (472)	C	C	C	C	C	C	C	C
	5,600pF (562)	C	C	C	C	C	C	C	C
	6,800pF (682)	C	C	C	C	C	C	C	C
	8,200pF (822)	C	C	C	C	C	C	C	C
	0.010μF (103)	C	C	C	C	C	C	C	C
	0.012μF (123)	E	E	E	E	C	C	C	C
	0.015μF (153)	E	E	E	E	C	C	C	C
	0.018μF (183)	E	E	E	E	C	C	C	C
	0.022μF (223)	E	E	E	E	C	C	C	C
	0.027μF (273)	E	E	E	E	C	C	C	C
	0.033μF (333)	E	E	E	E	C	C	C	C
	0.039μF (393)	E	E	E	E	C	C	C	C
	0.047μF (473)	E	E	E	E	C	C	C	C
	0.056μF (563)	E	E	E	E	C	C	C	C
	0.068μF (683)	E	E	E	E	C	C	C	C
	0.082μF (823)	E	E	E	E	C	C	C	C
	0.10μF (104)	E	E	E	E	C	C	C	C
	0.12μF (124)	E	E	E	E	C	C	C	C
	0.15μF (154)	E	E	E	E	C	C	C	C
	0.18μF (184)	E	E	F	F	C	C	C	C
0.22μF (224)	E	E			C	C	C	C	
0.27μF (274)	F	F			C	C	E	E	
0.33μF (334)	F				C	C	E	E	
0.39μF (394)					C	C	F	F	
0.47μF (474)					C	C	G	G	
0.56μF (564)					C	C	G	G	
0.68μF (684)					C	C	G	G	
0.82μF (824)					C	C	G	G	
1.0μF (105)					C	C	G	G	
1.2μF (125)					C	C			
1.5μF (155)					C	C			
1.8μF (185)					E	E			
2.2μF (225)					E	E			
2.7μF (275)					F	F			
3.3μF (335)					F	F			

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements									
1	Pre-and Post-Stress Electrical Test	---										
2	High Temperature Exposure (Storage) MIL-STD-202 Method 108	<ul style="list-style-type: none"> * Test temp. : 150±3°C. * Unpowered. * Test time : 1000 +24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap. change : Within ±10.0%. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller. 									
3	Destructive Physical Analysis EIA-469	Per EIA-469.	* No defects or abnormalities.									
4	Temperature Cycling JESD22 Method JA-104	<ul style="list-style-type: none"> * Conduct 1000 cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C +0/-3</td> <td>30±1</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>30±1</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * Before initial measurement (X7R only) : Perform 150 +0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	Step	Temp.(°C)	Time(min.)	1	-55°C +0/-3	30±1	2	+125°C +3/-0	30±1	<ul style="list-style-type: none"> * No remarkable damage. * Cap. change : Within ±10.0%. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.
Step	Temp.(°C)	Time(min.)										
1	-55°C +0/-3	30±1										
2	+125°C +3/-0	30±1										
5	Moisture Resistance MIL-STD-202 Method 106	<ul style="list-style-type: none"> * Test temp. : 25~65°C. * Humidity : 80~100% RH. * Test time : 10 cycles, t=24hrs/cycle. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap. change : Within ±12.5%. * Q/D.F. value : ≤5.0%. * I.R. : ≥1GΩ or RxC≥50Ω-F, whichever is smaller. 									
6	Biased Humidity MIL-STD-202 Method 103	<ul style="list-style-type: none"> * Test temp. : 85±3°C. * Humidity : 85±5%RH. * Test time : 1000 +24/-0 hrs. * To apply voltage : rated voltage (max. 100Vdc) and 1.3~1.5Vdc (add 100k ohm resistor). * Before initial measurement (Class II only) : To apply test voltage for 1hr at test temp. and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap. change : Within ±12.5%. * Q/D.F. value : ≤5.0%. * I.R. : ≥0.5GΩ or RxC≥25Ω-F, whichever is smaller. 									
7	Operational Life MIL-STD-202 Method 108	<ul style="list-style-type: none"> * Test temp. : 125±3°C. * To apply voltage : Full rated voltage. * Test time : 1000 +24/-0 hrs. * Before initial measurement (X7R only) : Apply rated voltage for 1 hr at 125°C. Remove and let set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap. change : Within ±15%. * Q/D.F. value : ≤5.0%. * I.R. : ≥1GΩ or RxC≥50Ω-F, whichever is smaller. 									

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements									
8	External Visual MIL-STD-883 Method 2009	* Visual inspection.	* No remarkable defect.									
9	Physical Dimension JESD22 Method JB-100	* Using by calipers.	* Within the specified dimensions.									
10	Resistance to Solvents MIL-STD-202 Method 215	* Temperature : 25±5°C. * Time : 3 +0.5/-0 min. * Solvent : Iso-propyl alcohol.	* No remarkable damage. * Cap. : Within the specified tolerance. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.									
11	Mechanical Shock MIL-STD-202 Method 213	* Peak value : 1500g's. * Wave : 1/2 sine. * Velocity : 15.4 ft/sec. * Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks).	* No remarkable damage. * Cap. : Within the specified tolerance. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.									
12	Vibration MIL-STD-202 Method 204	* Vibration frequency : 10~2000 Hz/min. (5g's for 20 min.). * Total amplitude : 1.5mm. * 12 cycles each of 3 orientations (36 times).	* No remarkable damage. * Cap. : Within the specified tolerance. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.									
13	Resistance to Soldering Heat MIL-STD-202 Method 210	* Solder temperature : 270±5°C. * Dipping time : 10±1 sec. * Before initial measurement (X7R only) : Perform 150 +0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap. change : Within ±7.5%. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.									
14	Thermal Shock MIL-STD-202 Method 107	* Conduct 300 cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C +0/-3</td> <td>15±3</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>15±3</td> </tr> </tbody> </table> * Max. transfer time : 20 sec. * Before initial measurement (X7R only) : Perform 150 +0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	Step	Temp.(°C)	Time(min.)	1	-55°C +0/-3	15±3	2	+125°C +3/-0	15±3	* No remarkable damage. * Cap. change : Within the specified tolerance. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.
Step	Temp.(°C)	Time(min.)										
1	-55°C +0/-3	15±3										
2	+125°C +3/-0	15±3										
15	ESD AEC-Q200-002	* Per AEC-Q200-002.	* No remarkable damage. * Cap. : Within the specified tolerance. * Q/D.F. value : ≤3.0%. * I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.									

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

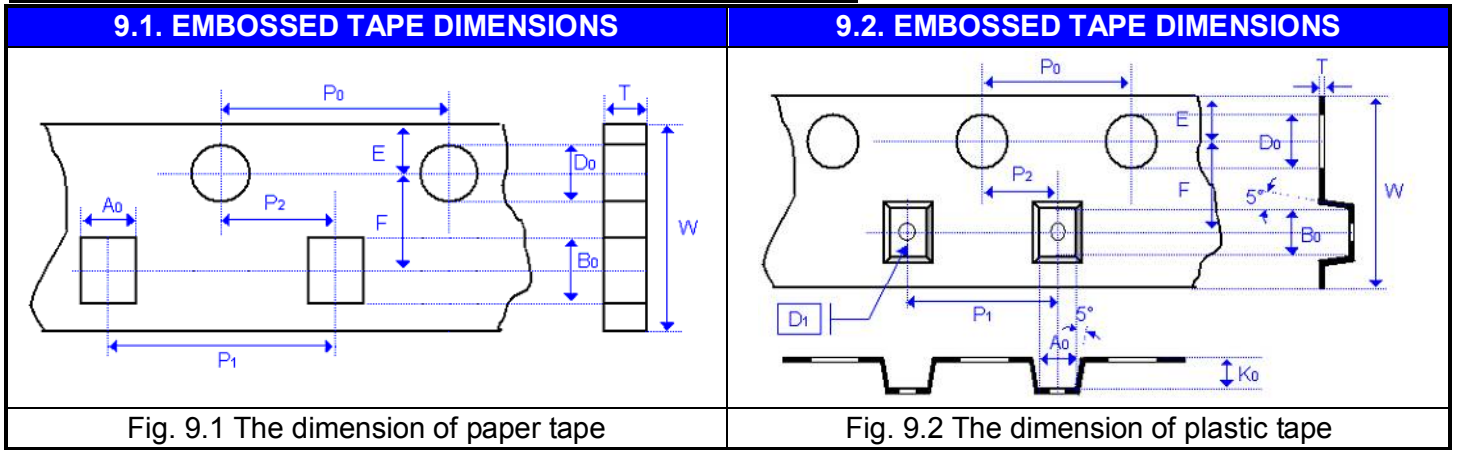
No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements						
16	Solderability J-STD-002 JESD22-B102E	<p>* Condition A Un-mounted chips 4hrs / 155°C*dry then completely immersed for 5±0.5 sec in solder bath at 245±5°C.</p> <p>* Condition B Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 220 +5/-0°C.</p> <p>* Condition C Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260 +0/-5°C.</p>	* All terminations shall exhibit a continuous solder coating free from defects from a minimum of 95% of the critical surface area of any individual termination.						
17	Electrical Characterization	<p>* Capacitance.</p> <p>* Q/D.F. (Dissipation Factor). X7R : Apply 1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature.</p>	<p>* Capacitance within the specified tolerance.</p> <p>* Q/D.F. value : ≤2.5%.</p>						
		<p>* Insulation Resistance. To apply rated voltage for max. 120 sec.</p>	* I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.						
		<p>* Dielectric Strength.</p> <table border="1"> <thead> <tr> <th>Rated Vol.(V)</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>≤100</td> <td>2.5 times of U_R</td> </tr> <tr> <td>100<V≤250</td> <td>2.0 times of U_R</td> </tr> </tbody> </table> <p>* Duration 1~5 sec, charge and discharge current less than 50mA.</p>	Rated Vol.(V)	Condition	≤100	2.5 times of U _R	100<V≤250	2.0 times of U _R	* No evidence of damage or flash over during test.
		Rated Vol.(V)	Condition						
≤100	2.5 times of U _R								
100<V≤250	2.0 times of U _R								
<p>* Temperature Coefficient (With no electrical load) Operation temperature : -55~125°C at 25°C.</p>	* Capacitance Change : X7R within ±15%.								
18	Board Flex AEC-Q200-005	<p>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 5mm and then the pressure shall be maintained for 5±1 sec.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>* No remarkable damage.</p> <p>* Cap. change : Within ±12.5%.</p> <p>* Q/D.F. value : ≤3.0%.</p> <p>* I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller. (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)</p>						
19	Terminal Strength AEC-Q200-006	<p>* Pressurizing force : 5N(0603), 10N(0805), 17.7N(≥1206).</p> <p>* Test time : 60±1 sec.</p>	<p>* No remarkable damage or removal of the terminations.</p> <p>* Capacitance within the specified tolerance.</p> <p>* Q/D.F. value : ≤3.0%.</p> <p>* I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.</p>						
20	Beam Load Test AEC-Q200-003	<p>* Break strength test.</p> <p>* Beam speed : 2.5±0.25 mm/sec.</p>	<p>* The chip endure following force :</p> <p>Chip length ≤2.5mm : Thickness >0.5mm (20N), ≤0.5mm (8N). Chip length ≥3.2mm : Thickness ≥1.25mm (54.5N), <1.25mm (15N).</p>						

9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0603(1608)	0.80±0.07	4k	15k	-	-
	0.80 +0.15/-0.10	4k	15k	-	-
0805(2012)	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
1206(3216)	1.25±0.20	-	-	3k	-
	0.80±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
1210(3225)	1.60±0.20	-	-	2k	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1808(4520)	2.50±0.30	-	-	1k	-
	1.25±0.10	-	-	2k	-
	1.60±0.20	-	-	2k	-
1812(4532)	2.00±0.20	-	-	1k	-
	1.25±0.10	-	-	1k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-

Unit : pcs

9. PACKAGE DIMENSION AND QUANTITY



Size	0201	0402	0603		0805	
Chip Thickness	0.30±0.03	0.50±0.10	0.80±0.07	0.80 +0.15/-0.1	0.80±0.10	1.25±0.10 1.25±0.20
A ₀	0.39±0.07	0.70±0.20	1.00 +0.05/-0.1	1.02 +0.05/-0.1	1.50±0.10	<1.65
B ₀	0.69±0.07	1.20±0.20	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≤0.50	≤0.80	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05
K ₀	-	-	-	-	-	<2.50
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
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
10xP ₀	40.00±0.10	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	2.00±0.05	2.00±0.05	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
D ₀	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.50 +0.10/-0
D ₁	-	-	-	-	-	1.00±0.10
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	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
Unit :	mm	mm	mm	mm	mm	mm

Size	1206			1210		1812	
Chip Thickness	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	1.25±0.10 1.60±0.20 2.00±0.20	2.50±0.30
A ₀	2.00±0.10	<2.00	<2.00	<3.05	<3.10	<3.90	<3.90
B ₀	3.50±0.10	<3.60	<3.70	<3.80	<4.00	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05
K ₀	-	<2.50	<2.50	<2.50	<3.50	<2.50	<3.00
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	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	40.0±0.10	40.00±0.20	40.00±0.20
P ₁	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±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
D ₀	1.55±0.05	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	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	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	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm	mm

9. PACKAGE DIMENSION AND QUANTITY

9.3. REEL DIMENSIONS

Size	0603, 0805, 1206, 1210			1808, 1812
Reel size	7"	7"	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	12.4 +2.0/-0	8.4 +1.5/-0	8.4 +1.5/-0
A	178.0 ±0.10	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	80.0 ±1.0	100 ±1.0	60.0 +1.0/-0

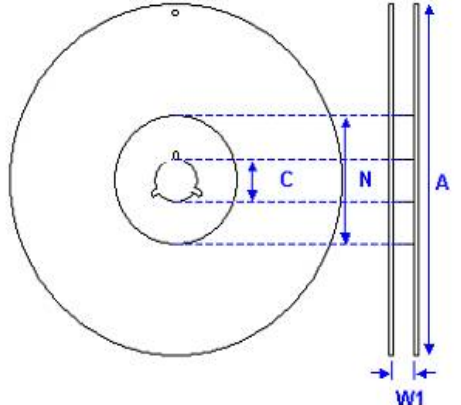


Fig. 9.3 The dimension of reel

10. APPLICATION NOTES

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended:
Indoors under 5 ~ 40°C 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 product is recommended to be used within 12 months after shipment and checked the solderability 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 3°C per second.

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.

a.) Hand soldering :

Soft termination series do not recommend using hand soldering, due to the direct contact of soldering iron might carry a huge temperature deviation to the device and damage the device.

If hand soldering is an unavoidable process, please follow recommend as below :

* Soldering iron tip diameter ≤1.0 mm and wattage max. 20W.

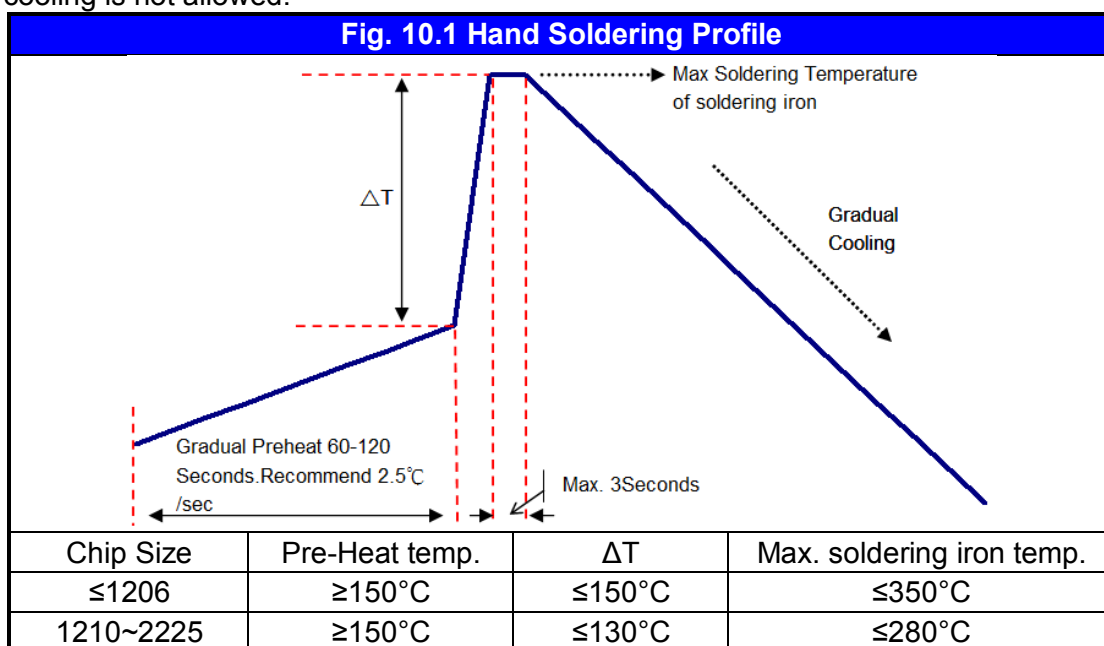
* The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.

* The required amount of solder shall be melted on the soldering tip.

* The tip of iron should not contact the termination of chip capacitor directly.

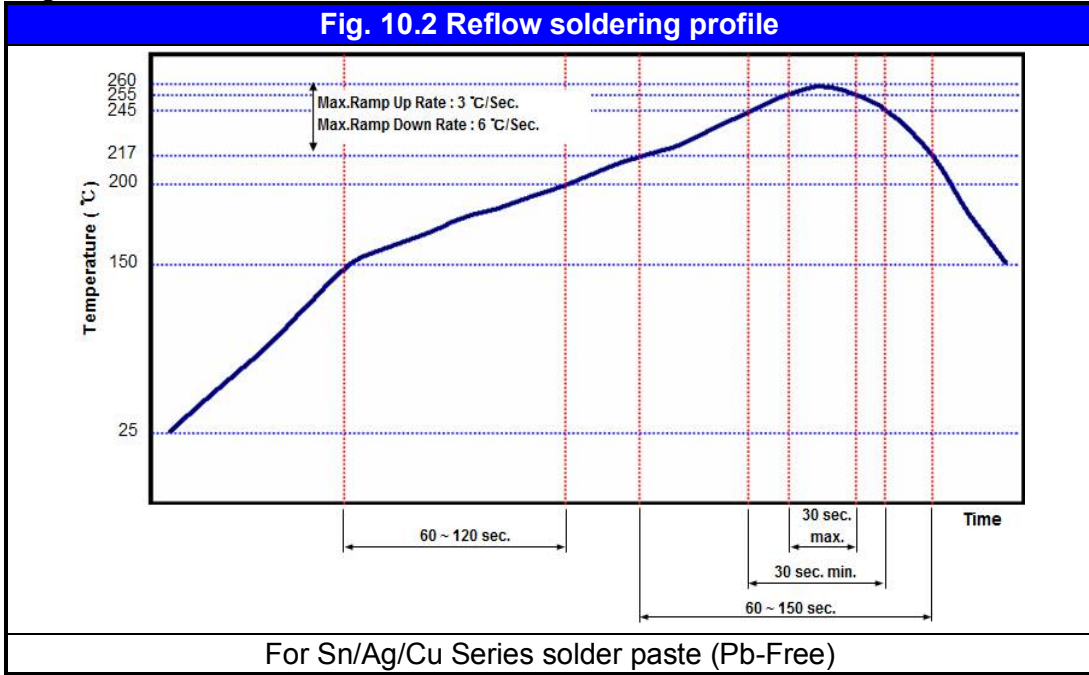
* The Capacitors shall be cooled gradually at room temperature after soldering.

* Forced air cooling is not allowed.

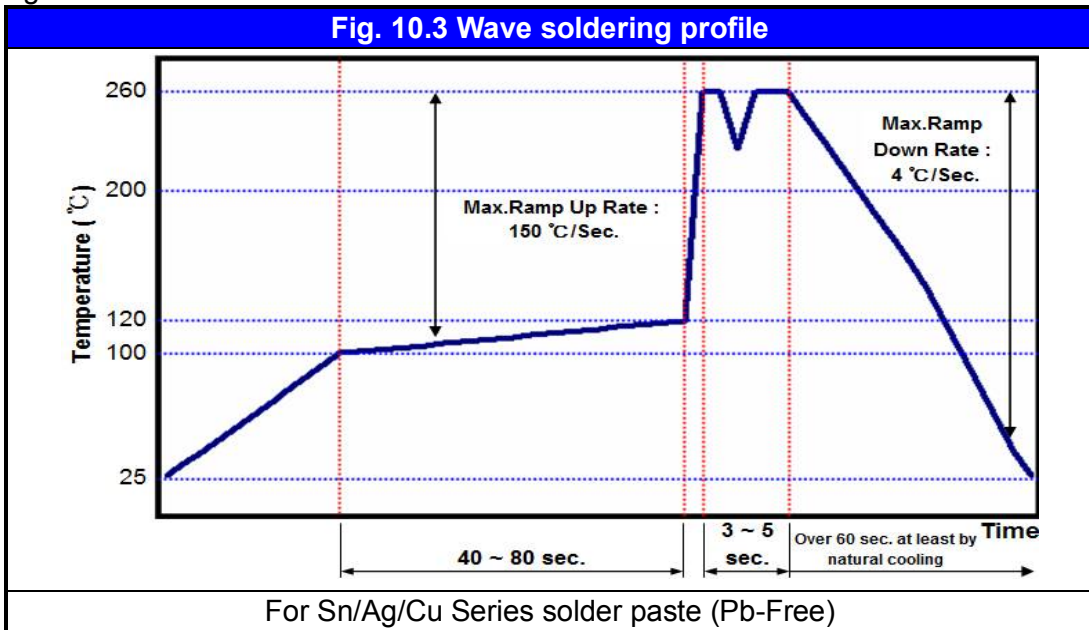


10. APPLICATION NOTES

b.) Reflow soldering :



c.) Wave soldering :



Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402(1005)	Class I - C0G	All	X	O
0603(1608)	Class I - C0G	All	Not recommended	O
0805(2012)	Class I - C0G	All	Not recommended	O
1206(3216)	Class I - C0G	All	Not recommended	O
≥1210(3225)	Class I - C0G	All	X	O

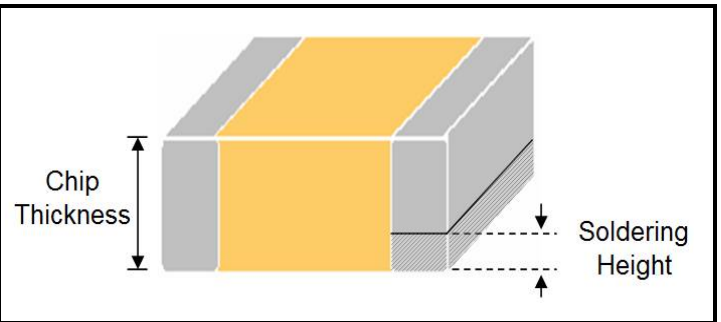
10. APPLICATION NOTES

Soldering conditions :

Class II :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402(1005)	Class II - X7R	All	X	O
0603 (1608)	Class II - X7R	Cap. <2.2μF	Not recommended	O
		Cap. ≥2.2μF	X	O
0805 (2012)	Class II - X7R	Cap. <4.7μF	Not recommended	O
		Cap. ≥4.7μF	X	O
1206 (3216)	Class II - X7R	Cap. <4.7μF	Not recommended	O
		Cap. ≥4.7μF	X	O
≥1210 (3225)	Class II - X7R	All	X	O

Soldering height :

<p>The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less. (Reference from IPC-610E)</p>	
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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.

CLEANING

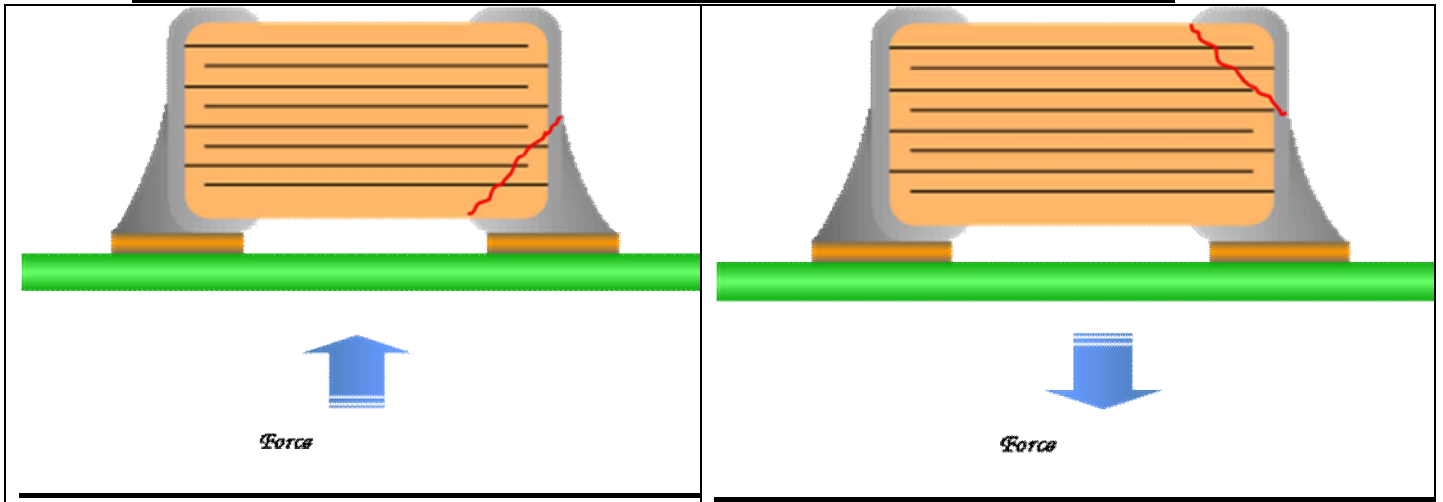
All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors 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.

Notice of MT Series

The standard AEC-Q200 series capacitors are mainly used on general automotive equipment without safety considerations. Please select SAFETY concern type or contact our company in advanced if you intend to use capacitor for designing the equipment which may damage itself and the safety of third party. If necessary, please consider to add the protect circuit in devising process and obtaining fully safety evaluation. The contents of the acknowledgments only used for our parent company, marketing subsidiaries and official marketing agents who purchase our products. Not applicable for the other nonofficial channels.

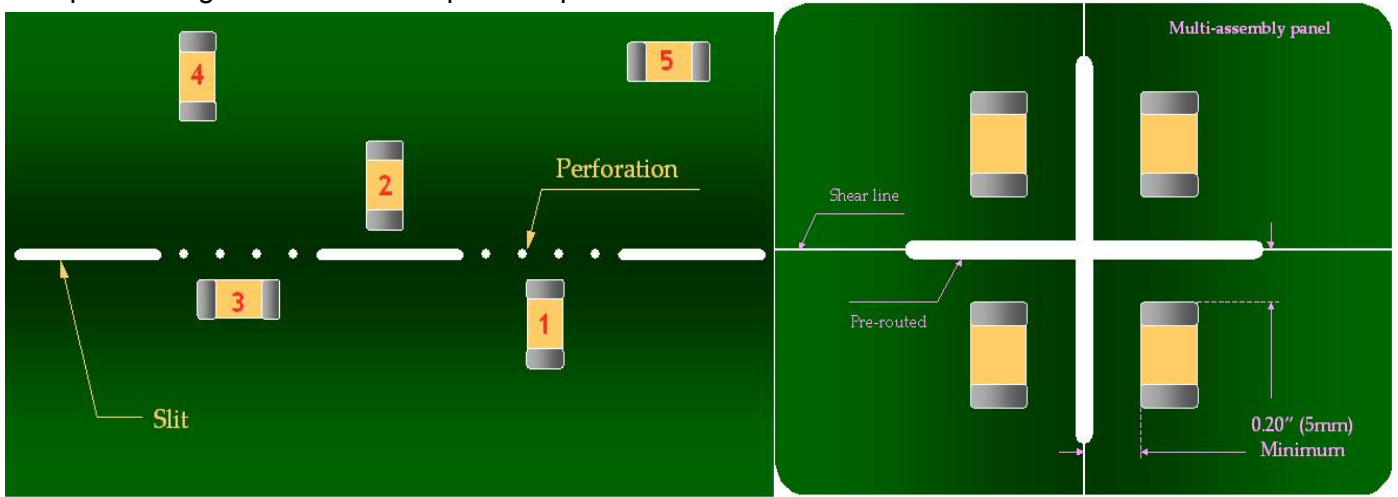
11. Typical Bending Cracks of MLCC

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.**



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

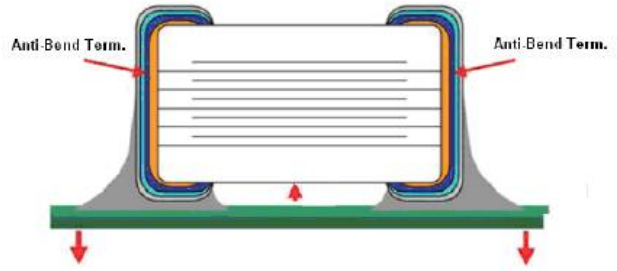
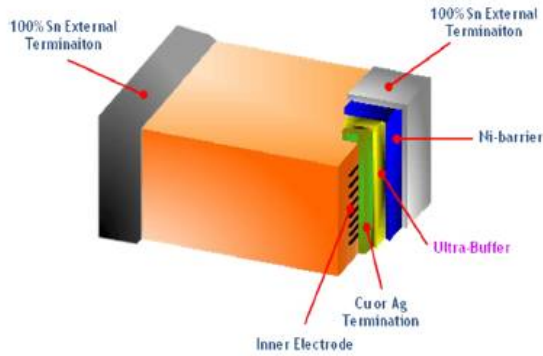
Chip mounting close to board separation point



Magnitude of stress **1 > 2 ≈ 3 > 4 > 5**

13. Structure

PDC FP 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.



14. Illustration of Bending Test

