TNQ Series RF High Q Multilayer Chip Ceramic Capacitor

1 . Capacitor characteristics and applications

1.1 Characteristics

- Size specifications are standardized and suitable for surface mount components in hybrid integrated circuits or printed circuits;
- High Q value, ultra low ESR, high reliability;
- Low loss, high capacitance stability, high operating frequency;
- Suitable for high-frequency circuits, VHF-microwave bands, RF and amplification circuits in various equipment;

1.2 Main performance indicators

- Temperature coefficient: C0G: 0±30ppm/℃
- Capacitance drift: no more than±0.2% or ±0.05pF,whichever is larger.
- Quality factor (Q value): greater than 2,000 at a frequency of 1MHz/1KHz
- Insulation resistance: ≥100000MΩ at 20℃
- Operating temperature: -55～125℃

2 .How to order

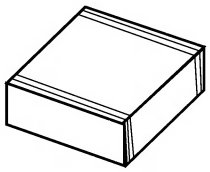
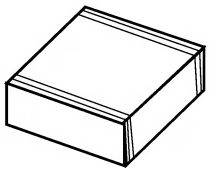
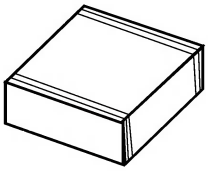
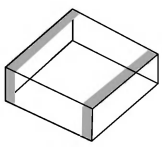
TNQ | 1111 | CG | 1R0 | B | 501 | N | R

Product serles	Size (mm)	Dielectric	Capacitance (unit: pF)	Tolerance	Rated Voltage	Termination	Packaging style
TNQ series RF high capacitor	0402 1111 0603 2525 3838 0805 0505 0709	CG=C0G: +30ppm/°C	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 104=10x104 =100nF	A:±0.05pF B:±0.10pF C:±0.25pF D:±0.50pF F:±1.0% G:±2.0% J:±5.0% K:±10.0%	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 6R3=6.3V 500=50V 501=500 VDC	N:Leading-out Terminal: Ag/Ni/Sn;	R: Tape & reel C: Cut Tray B: Bulk

2.1 Cross to

UF Capacitors Series	Cross to ATC Series
TNQ-0402	ATC600L
TNQ-0603	ATC600S
TNQ-0805	ATC600F
TNQ-0505	ATC100A/ATC800A
TNQ-1111	ATC100B/ATC800B
TNQA-0709	ATC180R/ATC800R

3 . Product dimension

Product type	Size specifications (imperial)	Capacitor size(mm)			Terminal size(mm)			
		Lc	Wc	Tc max	MB	L_L min	W_L	T_L
Terminal code:N \ Z \ E 	0402	1.00±0.20	0.50±0.20	0.55	0.25±0.10	—		
	0603	1.52±0.25	0.76±0.25	1.01	0.30±0.15			
	0805	2.00±0.25	1.25±0.25	1.45	0.50±0.20			
	0505	1.40 -0.25~+0.38	1.40±0.38	1.45	0.40±0.15			
	0709	1.78±0.25	2.29±0.25	2.92	0.50±0.20			
	1111	2.79 -0.25~+0.51	2.79±0.38	2.59	0.60±0.20			
	2525	5.84 -0.25~+0.51	6.35±0.38	3.68	0.80±0.30			
	3838	9.65 -0.25~+0.38	9.65±0.25	5.00	1.00±0.50			
Terminal code:M 	1111	3.50±0.38	2.79±0.25	2.54	—	6.35	2.36±0.13	0.20±0.05
	2525	6.35±0.38	6.35±0.38	3.68		12.70	6.10±0.13	0.20±0.05
	3838	9.65 -0.25~+0.89	9.65±0.25	5.00		19.05	8.64±0.25	0.25±0.10
Terminal code:A 	2525	6.35±0.38	6.35±0.38	3.68		12.70	6.10±0.13	0.20±0.05
	3838	9.65 -0.25~+0.89	9.65±0.25	5.00		19.05	8.64±0.25	0.25±0.10
Terminal code: RW \ RN 	1111	3.90±0.51	2.79±0.38	2.59		12.70	Lead diameter 0.40±0.05	
	2525	5.84 -0.25~+1.91	6.35±0.38	3.68		25.40	Lead diameter 0.80±0.05	
	3838	9.65 -0.25~+2.16	9.65±0.25	5.00				

4 . Capacity range

4.1 0402 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
0R1 0R2 0R3 0R4	0.1 0.2 0.3 0.4	A, B, C.	250	2R1 2R2 2R4 2R7 3R0 3R3	2.1 2.2 2.4 2.7 3 3.3	B, C, D.	250	130 150 160 180 200 220	13 15 16 18 20 22	F, G, J.	200
0R5 0R6 0R7 0R8 0R9 1R0 1R1 1R2 1R3 1R4 1R5 1R6 1R7 1R8 1R9 2R0	0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2	A, B, C, D.		3R6 3R9 4R3 4R7 5R1 5R6 6R2 6R8 7R5 8R2 9R1	3.6 3.9 4.3 4.7 5.1 5.6 6.2 6.8 7.5 8.2 9.1			240 270 300 330	24 27 30 33		
				100 110 120	10 11 12	F, G, J.	200				

4.2 0603 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
0R2	0.2	A, B, C.	250	3R3	3.3	B, C, D.	250	360	36	F, G, J, K, M.	250
0R3	0.3			3R6	3.6			390	39		
0R4	0.4			3R9	3.9			430	43		
0R5	0.5	A, B, C, D.		4R3	4.3			470	47		
0R6	0.6			4R7	4.7			510	51		
0R7	0.7			5R1	5.1			560	56		
0R8	0.8			5R6	5.6			620	62		
0R9	0.9			6R2	6.2			680	68		
1R0	1			6R8	6.8			750	75		
1R1	1.1			7R5	7.5			820	82		
1R2	1.2			8R2	8.2			910	91		
1R3	1.3			9R1	9.1			101	100		
1R4	1.4			100	10	F, G, J, K, M.		111	110		
1R5	1.5			110	11			121	120		
1R6	1.6			120	12			131	130		150
1R7	1.7			130	13			151	150		
1R8	1.8			150	15						
1R9	1.9			160	16						
2R0	2			180	18						
2R1	2.1			200	20						
2R2	2.2			220	22						
2R4	2.4			240	24						
2R7	2.7			270	27						
3R0	3			300	30						
				330	33						

4.3 0505 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
0R2	0.2	B, C.	250	3R6	3.6	B, C, D.	250	390	39	F, G, J, K, M.	300
0R3	0.3			3R9	3.9			430	43		
0R4	0.4			4R3	4.3			470	47		
0R5	0.5	B, C, D.		4R7	4.7			510	51		250
0R6	0.6			5R1	5.1			560	56		
0R7	0.7			5R6	5.6			620	62		
0R8	0.8			6R2	6.2			680	68		
0R9	0.9			6R8	6.8			750	75		
1R0	1			7R5	7.5			820	82		
1R1	1.1			8R2	8.2			910	91		
1R2	1.2			9R1	9.1			101	100		
1R3	1.3			100	10	F, G, J, K, M.		111	110		
1R4	1.4			110	11			121	120		
1R5	1.5			120	12			131	130		
1R6	1.6			130	13			151	150		
1R7	1.7			150	15			161	160		
1R8	1.8			160	16			181	180		
1R9	1.9			180	18			201	200		
2R0	2			200	20			221	220		
2R1	2.1			220	22			241	240		
2R2	2.2			240	24			271	270		200
2R4	2.4			270	27			301	300		
2R7	2.7			300	30			331	330		150
3R0	3			330	33			361	360		
3R3	3.3			360	36			391	390		

4.4 0805 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
0R3	0.3	A, B, C.		3R9	3.9			430	43		
0R4	0.4			4R3	4.3			470	47		
0R5	0.5			4R7	4.7			510	51		
0R6	0.6			5R1	5.1			560	56		
0R7	0.7			5R6	5.6	B, C, D.		620	62		
0R8	0.8			6R2	6.2			680	68		
0R9	0.9			6R8	6.8			750	75		
1R0	1			7R5	7.5			820	82		
1R1	1.1			8R2	8.2			910	91		
1R2	1.2			9R1	9.1			101	100		
1R3	1.3			100	10			111	110		
1R4	1.4			110	11			121	120		250
1R5	1.5			120	12			131	130	F, G, J, K.	
1R6	1.6	B, C, D.	250	130	13		250	151	150		
1R7	1.7			150	15			161	160		
1R8	1.8			160	16			181	180		
1R9	1.9			180	18	F, G, J, K.		201	200		
2R0	2			200	20			221	220		
2R1	2.1			220	22			241	240		
2R2	2.2			240	24			271	270		
2R4	2.4			270	27			301	300		
2R7	2.7			300	30			331	330		
3R0	3			330	33			361	360		
3R3	3.3			360	36			391	390		150
3R6	3.6			390	39			431	430		

4.5 1111 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
0R5	0.5	A, B, C, D.	1500	4R7	4.7	B, C, D.	1500	510	51	F, G, J, K.	1500	561	560	F, G, J.	600
0R6	0.6			5R1	5.1			560	56			621	620		
0R7	0.7			5R6	5.6			620	62			681	680		500
0R8	0.8			6R2	6.2			680	68			751	750		
0R9	0.9			6R8	6.8			750	75			821	820		
1R0	1			7R5	7.5			820	82			911	910		
1R1	1.1	B, C, D.		8R2	8.2	F, G, J, K.		910	91			102	1000		
1R2	1.2			9R1	9.1			101	100			112	1100		250
1R3	1.3			100	10			111	110			122	1200		
1R4	1.4			110	11			121	120			132	1300		
1R5	1.5			120	12			131	130		1000	152	1500		150
1R6	1.6			130	13			151	150			162	1600		
1R7	1.7			150	15			161	160			182	1800		
1R8	1.8			160	16			181	180						
1R9	1.9			180	18			201	200						
2R0	2			200	20			221	220						
2R1	2.1			220	22			241	240						
2R2	2.2			240	24			271	270						
2R4	2.4			270	27			301	300						
2R7	2.7			300	30			331	330						
3R0	3			330	33			361	360						
3R3	3.3			360	36			391	390						
3R6	3.6			390	39			431	430		600				
3R9	3.9			430	43			471	470						
4R3	4.3			470	47			511	510						

4.6 2525 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
1R0	1.0	B, C.	3600	7R5	7.5	B, C, D.	3600	820	82	F, G, J, K, M.	3600	911	910	F, G, J, K, M.	1500
1R1	1.1			8R2	8.2			910	91			102	1000		
1R2	1.2			9R1	9.1			101	100			112	1100		1000
1R3	1.3			100	10	F, G, J, K, M.		111	110			122	1200		
1R4	1.4	B, C, D.		110	11			121	120			132	1300		
1R5	1.5			120	12			131	130			152	1500		
1R6	1.6			130	13			151	150			162	1600		
1R7	1.7			150	15			161	160			182	1800		
1R8	1.8			160	16			181	180			202	2000		
1R9	1.9			180	18			201	200			222	2200		
2R0	2.0			200	20			221	220			242	2400		
2R1	2.1			220	22			241	240			272	2700		500
2R2	2.2			240	24			271	270			302	3000		
2R4	2.4			270	27			301	300		3000	332	3300		
2R7	2.7			300	30			331	330			362	3600		
3R0	3			330	33			361	360			392	3900		
3R3	3.3			360	36			391	390			432	4300		250
3R6	3.6			390	39			431	430			472	4700		
3R9	3.9			430	43			471	470			512	5100		
4R3	4.3			470	47			511	510		2000	562	5600		
4R7	4.7			510	51			561	560						
5R1	5.1			560	56			621	620						
5R6	5.6			620	62			681	680						
6R2	6.2			680	68			751	750						
6R8	6.8			750	75			821	820		1500				

4.7 3838 specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
1R0	1.0	B, C.	7200	7R5	7.5	B, C, D.	7200	820	82	F, G, J, K, M.	7200	911	910	F, G, J, K, M.	2500
1R1	1.1			8R2	8.2			910	91			102	1000		
1R2	1.2			9R1	9.1			101	100			112	1100		
1R3	1.3			100	10	F, G, J, K, M.		111	110			122	1200		
1R4	1.4	B, C, D.		110	11			121	120			132	1300		2000
1R5	1.5			120	12			131	130			152	1500		
1R6	1.6			130	13			151	150			162	1600		
1R7	1.7			150	15			161	160			182	1800		1500
1R8	1.8			160	16			181	180			202	2000		
1R9	1.9			180	18			201	200		3600	222	2200		
2R0	2.0			200	20			221	220			242	2400		1000
2R1	2.1			220	22			241	240			272	2700		
2R2	2.2			240	24			271	270			302	3000		
2R4	2.4			270	27			301	300			332	3300		
2R7	2.7			300	30			331	330			362	3600		
3R0	3			330	33			361	360			392	3900		
3R3	3.3			360	36			391	390			432	4300		
3R6	3.6			390	39			431	430			472	4700		
3R9	3.9			430	43			471	470			512	5100		
4R3	4.3			470	47			511	510			562	5600		
4R7	4.7			510	51			561	560			622	6200		500
5R1	5.1			560	56			621	620		2500	682	6800		
5R6	5.6			620	62			681	680						
6R2	6.2			680	68			751	750						
6R8	6.8			750	75			821	820						

4.8 0709specification capacitance table

Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)	Capac-itance code	Capac-itance (pF)	Accuracy	Max DC working voltage(V)
1R0	1	B, C, D.	500	6R2	6.2	B, C, D.	500	560	56	F, G, J.	500
1R1	1.1			6R8	6.8			620	62		
1R2	1.2			7R5	7.5			680	68		
1R3	1.3			8R2	8.2			750	75		
1R4	1.4			9R1	9.1			820	82		
1R5	1.5			100	10	F, G, J.		910	91		
1R6	1.6			110	11			101	100		
1R7	1.7			120	12						
1R8	1.8			130	13						
1R9	1.9			150	15						
2R0	2			160	16						
2R1	2.1			180	18						
2R2	2.2			200	20						
2R4	2.4			220	22						
2R7	2.7			240	24						
3R0	3			270	27						
3R3	3.3			300	30						
3R6	3.6			330	33						
3R9	3.9			360	36						
4R3	4.3			390	39						
4R7	4.7			430	43						
5R1	5.1			470	47						
5R6	5.6			510	51						

4.9 0709specification capacitance table

Capac -itance code	Capac -itance (pF)	Accuracy	Max DC working voltage(V)	Capac -itance code	Capac -itance (pF)	Accuracy	Max DC working voltage(V)	Capac code	Capac -itance (pF)	Accuracy	Max DC working voltage(V)
2R0	2	B, C, D.	500	160	16	B, C, D.	500	151	150	F, G, J.	500
2R1	2.1			180	18			161	160		
2R2	2.2			200	20			181	180		
2R4	2.4			220	22			201	200		
2R7	2.7			240	24			221	220		
3R0	3			270	27	F, G, J.		241	240		
3R3	3.3			300	30			271	270		
3R6	3.6			330	33			301	300		
3R9	3.9			360	36						
4R3	4.3			390	39						
4R7	4.7			430	43						
5R1	5.1			470	47						
5R6	5.6			510	51						
6R2	6.2			560	56						
6R8	6.8			620	62						
7R5	7.5			680	68						
8R2	8.2			750	75						
9R1	9.1			820	82						
100	10			910	91						
110	11			101	100						
120	12			111	110						
130	13			121	120						
150	15			131	130						

5. Technical requirements and test condition

5.1 General specifications

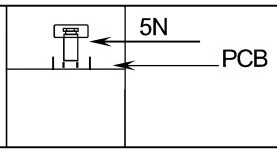
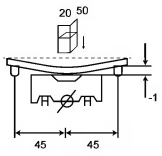
General specification GB/T 21041-2007 《Fixed capacitors for use in electronic equipment Part 21:Sectional specification: Fixed surface mount multilayer capacitors of ceramic dielectric, class 1》

5.2 Conventional technical indicators and test me

Program	Technical specifications	Test method			
Temperature	(-55 ~ +125)℃				
Appearance	No obvious defects	Visual inspection			
Capacitance	Within the specification error range	Nominal capacitance	Test frequency	Test voltage	Environment
		≤1000pF	1MHz(±10%)	(1.0±0.2)Vrms	Temperature (25±2)℃ Humidity<75%
		>1000pF	1KHz(±10%)	(1.0±0.2)Vrms	
Quality factor (Q value)	Greater than 2000 when the frequency is 1MHz	Test method: Same as 'Capacitance'			
Loss angle tangent	Less than 0.0005 when the frequency is 1MHz				
Insulation Resistance	≥100000MΩ	Test voltage	Test time	Charge and discharge current	Environment
		Ur or 1000V, take the smaller or the two	≤60 sec	≤50mA	Temperature (25±2)℃ Humidity<75%
Dielectric Withstanding Voltage	There should be no dielectric breakdown or damage	Rated voltage	Test voltage	Time	Charge and discharge current
		Ur<200V	2.5Ur	(1~5) sec	≤50mA
		200V≤Ur≤1000V	1.5Ur		
		Ur＞1000V	1.2Ur		
Capacitance temperature coefficientor temperature characteristics	C0G: (0±30) ppm/℃	Measured after the temperature is stable for 30 minutes in the following temperature order (△C is based on T3)			
		Step	Temperature (℃)		
		T1	20±2		
		T2	-55±3		
		T3	20±2		
		T4	125±2		
		T1	20±2		
Solderability	Appearance: No visible damage, inning rate≥95%	Immerse the capacitor in a solution of ethanol and rosin (25% by weight), take it out and preheat it at a temperature of (80~120)℃ for (10~30)sec,then immerse it in a solder solution. Soldering temperature:(235±5)℃; Soldering speed:(25±			

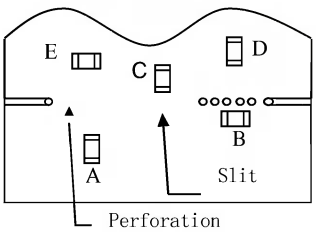
Note: When testing the dielectric strength of capacitors, in order to eliminate the influence of the external environment, when the test voltage exceeds 1000Vdc, the capacitor should be immersed in insulating oil for testing.

5.3 Reliability indicators and period

<table>
<tr><th>Program</th><th colspan="2">Technical specifications</th><th>Test method</th></tr>
<tr><td rowspan="4">Resistance to soldering heat</td><td>Appearance</td><td>No visible damage,inning rate ≥95% ≤</td><td rowspan="4">The capacitor is immersed in a solution of ethanol and rosin(25% byweight), taken out and preheated at a temperature of 100-200°C for 10+2min, then immersed in a soldering solution.
Soldering temperature:260+5°C; Soldering speed:25+0.25mm/s Soldering time: 10+1sec
After being taken out, it is cleaned with a solvent and observed under a microscope with a magnification of at least 10x. The test is performed again after the capacitor has been placed in a room for 24+2hrs</td></tr>
<tr><td>△C/C</td><td>±0.5% or ±0.5pF,take the larger</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Same as the initial standard</td></tr>
<tr><td>Terminal electrode adhesion strength</td><td colspan="2">The end electrode does not peel off
Appearance: no visible damage</td><td>Apply thrust: 5N
Time: 10±1sec
Speed: 1±0.5mm/sec
  </td></tr>
<tr><td rowspan="2">Bending strength</td><td>Appearance</td><td>No visible damage</td><td rowspan="2">Test substrate: PCB
board Bending depth: 1mm
Application speed: 1±0.5mm/sec.
Measurement should be performedbent
  </td></tr>
<tr><td>△C/C</td><td>≤±5%</td></tr>
<tr><td rowspan="4">Temperature cycling</td><td>Appearance</td><td>No visible damage</td><td rowspan="4">Number of cycles: 5 times, one cycle is divided into the following 4 steps:
<table>
<tr><th>Step</th><th>Temperature(℃)</th><th>Time(min)</th></tr>
<tr><td>Step 1</td><td>-55±3</td><td>30</td></tr>
<tr><td>Step 2</td><td>20±3</td><td>3</td></tr>
<tr><td>Step 3</td><td>125±3</td><td>30</td></tr>
<tr><td>Step 4</td><td>20±3</td><td>3</td></tr>
</table>
After the test, place it at room temperature for 24±2 hrs before measuring again.</td></tr>
<tr><td>△C/C</td><td>≤±1% or ±1pF
Take the larger of the two</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Same as the initial standard</td></tr>
<tr><td rowspan="4">Resistance to soldering heat</td><td>Appearance</td><td>No visible damage</td><td rowspan="4">Temperature: 40±2℃
Humidity: 90～95%RH
Time: 500+24/-0hrs
After the test, place it at room temperature for 24±2 hrs before measuring again.</td></tr>
<tr><td>△C/C</td><td>≤±2% or ±1pF
Take the larger of the two</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Ri≥2500MΩ or Ri*C_R＞25S
Take the smaller of the two</td></tr>
<tr><td rowspan="4">Life test</td><td>Appearance</td><td>No visible damage</td><td rowspan="4">
<table>
<tr><th>Rated voltage</th><th>Applied voltage</th><th>Time</th></tr>
<tr><td>Ur ≤200V</td><td>2Ur</td><td>1000h</td></tr>
<tr><td>200V＜Ur ≤500V</td><td>1.5Ur</td><td>1500h</td></tr>
<tr><td>500V＜Ur ≤1000V</td><td>1.2Ur</td><td>2000h</td></tr>
<tr><td>Ur ＞1000V</td><td>Ur</td><td>2000h</td></tr>
</table>
Charging and discharging current : ≤ 50mA
Temperature: (125±3)℃
After the test, place it at room temperature for 24±2 hrs before measuring again.</td></tr>
<tr><td>△C/C</td><td>≤±2% or ±1pF
Take the larger of the two</td></tr>
<tr><td>D.F.</td><td>Twice the initial standard</td></tr>
<tr><td>I.R.</td><td>Ri≥4000MΩ or Ri*CR＞
40S Take the smaller of the two</td></tr>
</table>

6 . Precautions for use

Stress value : A>B=C>D>E



1. Precautions before use

In harsh working environments or under external mechanical overpressure that exceeds the use conditions described it, first may be damaged, so when consider applying according to the relevant instructions in this approval using

2. PCB board design

2.1 The amount of solder used will affect the chip's ability to resist mechanical stress, which may cause RF-MLCC to break or crack. Therefore, when designing the substrate. the size and configuration of the pads must be carefully considered, which has a decisive effect on the amount of solder that makes up the substrate.

2.2 When designing the pads and the position of the SMD MLCC, consider reducing the stress to the lowest point and install the MLCC in the least affected position on the PC board.

3. Issues to consider for automatic installation

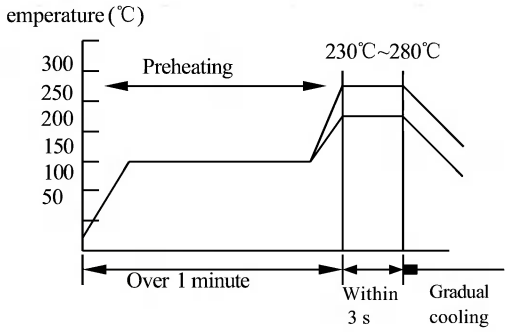
If the suction pipe is lowered beyond the minimum limit, it will exert excessive pressure on the MLCC and cause it to rupture. When lowering the suction pipe, pay attention to the following points:

3.1 After correcting the deviation of the PC board, adjust the lower limit of the suction pipe to the surface level of the PC board.

3.2 The suction pressure should be adjusted between iN and 3N.

3.3 In order to reduce the deformation of the PC board caused by the impact force of the suction pipe, support nails should be placed under the PC board.

Hand soldering temperature



4. Welding

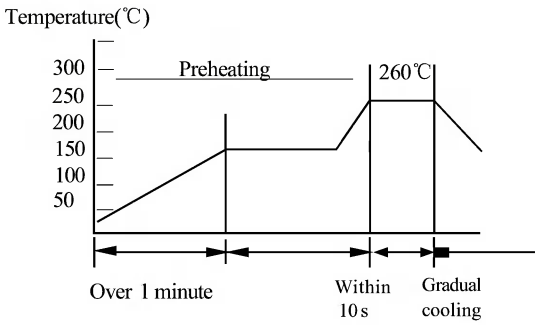
4.1 MLCC is a combination of ceramics and metal. As a ceramic body, especially a large sized ceramic body, Its thermal plasticity is poor and its response to heat is slow, Under sudden cooling and sudden heating conditions, ceramic bodies are prone to cracking. it is recommended to preheat continuously for more than 1 minute before welding.

4.2 The interior of MLCC is a metal electrode with good thermal plasticity and fast response to heat. Therefore, Under heating conditions, there must be a certain degree of inconsistency in expansion between metal parts and ceramic parts, This will cause internal stress and easily cause ceramic body cracking. It is recommended to preheat continuously for more than 1 minute before welding.

4.3 When manual welding, use a constant temperature soldering iron with a maximum diameter of 1.0mm at the tip of its tip and a maximum power of 25 watts; do not touch MLCC components directly with a soldering iron.

4.4 It is recommended to avoid using wave soldering for specifications above 1206. 4.5 The manual welding temperature for tape/lead products should be below 350°C.

Recommended temperature for lead-free soldering



5. Cleaning

5.1 The temperature difference between components and cleaning process cannot be greater than 100°C

5.2 In case of ultrasonic cleaning, if the output power is too high, it wll cause excessive vibraion on the PC board, This will cause MLCC or solder ioinis to crack or reduce terminal electrode strenoth, Therefore pav special atenion to the folowing points. Ultrasonic outout: less than 20W/L: Ultrasonic frequency: less than 40KHz:Ultrasonic cleaning time: 5 minutes or less

6. Cutting PCB board

6.1 After installing MLCC and other components, when dividing PC boards, be careful not to apply any force on them.Do not let MLCC bear excessive mechanical impact.

6.2 The division of boards cannot be divided manually and should use appropriate equipment.

7. Storage method

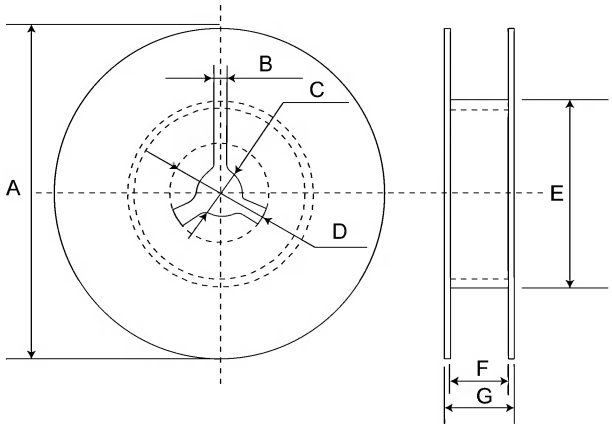
In order to maintain terminal electrode weldability and ensure that packaging materals are in good condion, recommended storage conditions are as folows. Storage temperalure: 5-40°C; Storage relalve humidy: 20-70%RH Even if stored under ideal storage condlions, MLcc terminal weldabiily wil decrease ovel time, Therefore MLCC should be used within 6 months from date of shipment.

Soldering temperature: 260±5°C: Soldering sped:. 25t0.25mms; Soldering time: 10+1 secnds, Afer being taken out, it is cleaned with a sovent and observer under a microscope with a magnifcaion of at least 10x, The test is perfommed again afer the capacitor has been placed in a room for 24±2 hours mmersa the capacitor in a soluton ot elanol and rosin 125% ov weiot. take it out and oreheat it at a temoeraure ot (80~120)°C for (10~30)sec. then immerse it in a solder solution. Soldering temperature: (235±5)°C; Soldering speed: (25±0.25)mm/sec; Soldering time: (2±0.5)sec

7 . Product packaging

7.1 Reel dimension

Reel dimension (unit:mm)



A	B	C	D	E	F	G
Φ178.00±2.00	3.00	Φ13.00±0.50	Φ21.00±0.80	Φ50.00 or larger	10.00±1.50	12Max
Φ330.00±2.00	3.00	Φ13.00±0.50	Φ21.00±0.80	Φ50.00 or larger	10.00±1.50	12Max

7.2 Taping method

7.2.1 The tape for packaging capacitors is wound clockwise. When puling out the tape from top to botom, the feed hole is on the right side ofthe tape.

7.2.2 At the front end of the tape, at least 5 lead spacings should be left.

7.2.3 When taping, the lead part or blank part must be left as shown in the figure below.

7.2.4 The number of products installed incorrectly in the tape must be less than 0.1%% or 1 per reel, and errors must not occur continuously.

7.2.5 The upper and lower adhesive tapes should not exceed the edge ofthe tape and should not block the feed hole.

7.2.6 The cumulative error of the feed hole is within +0.3 mm for 10 spacings.

8. Inspection results of prohibited substances in products About RoHS

All products meet the requirements of the RoHS directive:

- Lead(pb) (＜1000ppm)
- Mercury (Hg) (＜1000ppm)
- Cadmium(cd) (＜100ppm)
- Hexavalent Chromium Content(Cr6+) (＜1000ppm)
- Polybrominated Biphenyls(PBBs) (＜1000ppm)
- Polybrominated diphenyl ethers(PBDE) (＜1000ppm)