HFQ 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, 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℃

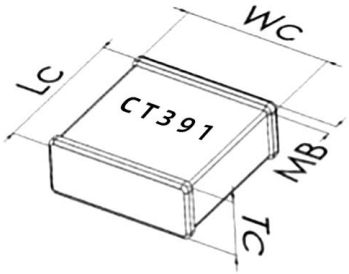
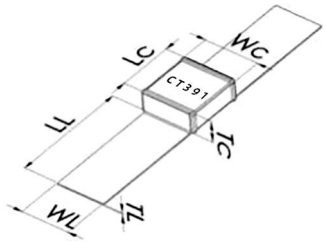
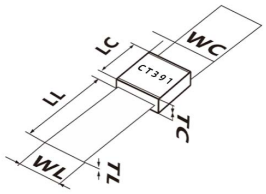
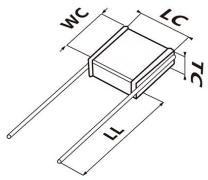
2. Product model naming

How to order

HFQ | 1111 | C0G | 1R0 | B | 501 | N | T

Type	Size	Dielectric	Capacitance unit: (pF)	Tolerance	Rated voltage	Termination	Packaging style
HFQ series RF high Q capacitor	0402 2525 0603 3838 0805 6243 0505 7676 1111	C0G: +30ppm/°C	The first two digits are significant figures, and the last digit is the power of 10	A: ±0.05pF B: ±0.10pF C: ±0.25pF D: ±0.50pF F: ±1.0% G: ±2.0% J: ±5.0% K: ±10.0%	The first two digits are significant figures, and the last digit is the power of 10	N: Leading-out Terminal: Ag/Ni/Sn Terminal: Z: Leading-out Ag/Ni/SnPb E: Non-magnetic Terminal M: Microstrip, A: Axial tape RW: Radial wire, RN: Non-magneticradialwire	T: Tape & reel C: Cut Tray B: Bulk

3. Product dimension

Product type	Size specifications Inch	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			
	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(L)	9.90 -0.25~+0.38	8.89±0.25	4.0	1.00±0.50			
	3838(M)	9.65 -0.25~+0.38	9.65±0.25	4.5	1.00±0.50			
	6243	15.60 -0.25~+0.51	10.92±0.38	5.0	1.20±0.50			
	7676	19.30 -0.25~+0.51	19.30±0.38	5.0	1.50±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(M)	9.65 -0.25~+0.89	9.65±0.25	4.50		19.05	8.64±0.25	0.25±0.10
	6243	15.60 -0.25~+0.89	10.92±0.38	5.0		19.05	8.64±0.25	0.25±0.10
	7676	19.30 -0.25~+0.89	19.30±0.38	5.0		19.05	15.00±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(M)	9.65 -0.25~+0.89	9.65±0.25	4.50		19.05	8.64±0.25	0.25±0.10
	6243	15.60 -0.25~+0.89	10.92±0.38	5.0		19.05	8.64±0.25	0.25±0.10
	7676	19.30 -0.25~+0.89	19.30±0.38	5.0		19.05	15.00±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(L)	9.90 -0.25~+2.16	8.89±0.25	4.0				
	3838(M)	9.65 -0.25~+2.16	9.65±0.25	4.50				

4. Capacity range

4.1 0402 specification capacitance table

Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)
0R1	0.1	A, B, C.	250	2R1	2.1	B, C, D.	250	130	13	F, G, J.	200
0R2	0.2			2R2	2.2			150	15		
0R3	0.3			2R4	2.4			160	16		50
0R4	0.4			2R7	2.7			180	18		
0R5	0.5	A, B, C, D.		3R0	3			200	20		
0R6	0.6			3R3	3.3			220	22		
0R7	0.7			3R6	3.6		200	240	24		
0R8	0.8			3R9	3.9			270	27		
0R9	0.9			4R3	4.3			300	30		
1R0	1			4R7	4.7			330	33		
1R1	1.1			5R1	5.1			360	36		
1R2	1.2			5R6	5.6			390	39		
1R3	1.3			6R2	6.2			430	43		
1R4	1.4			6R8	6.8			470	47		
1R5	1.5			7R5	7.5						
1R6	1.6			8R2	8.2						
1R7	1.7			9R1	9.1						
1R8	1.8			100	10	F, G, J.					
1R9	1.9			110	11						
2R0	2			120	12						

4.2 0603 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
0R1	0.1	A, B, C.	250	3R3	3.3	B, C, D.	250	360	36	F, G, J, K, M.	250
0R2	0.2			3R6	3.6			390	39		
0R3	0.3			3R9	3.9			430	43		
0R4	0.4			4R3	4.3			470	47		
0R5	0.5	A, B, C, D.		4R7	4.7			510	51		
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		150
1R2	1.2			9R1	9.1			101	100		
1R3	1.3			100	10	F, G, J, K, M.					
1R4	1.4			110	11						
1R5	1.5			120	12						
1R6	1.6			130	13						
1R7	1.7			150	15						
1R8	1.8			160	16						
1R9	1.9			180	18						
2R0	2			200	20						
2R1	2.1			220	22						
2R2	2.2			240	24						
2R4	2.4			270	27						
2R7	2.7			300	30						
3R0	3			330	33						

4.3 0505 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
0R2	0.2	B, C.	250	3R6	3.6	B, C, D.	150 ~ 250	390	39	F, G, J, K, M.	150 ~ 250
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		
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		150
1R7	1.7			150	15			161	160		
1R8	1.8			160	16			181	180		
1R9	1.9			180	18			201	200		100
2R0	2			200	20			221	220		
2R1	2.1			220	22						
2R2	2.2			240	24						
2R4	2.4			270	27						
2R7	2.7			300	30						
3R0	3			330	33						
3R3	3.3			360	36						

4.4 0805 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
0R2	0.2	B, C.	250	3R6	3.6	B, C, D.	250	390	39	F, G, J, K.	250
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		
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.		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		150
1R8	1.8			160	16			181	180		
1R9	1.9			180	18			201	200		
2R0	2			200	20			221	220		100
2R1	2.1			220	22			241	240		
2R2	2.2			240	24						
2R4	2.4			270	27						
2R7	2.7			300	30						
3R0	3			330	33						
3R3	3.3			360	36						

4.5 1111 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
0R1	0.1	A, B, C.	1500	3R3	3.3	A, B, C, D.	500 ~ 1500	360	36	F, G, J, K.	1000 ~ 1500	391	390	F, G, J, K.	500
0R2	0.2			3R6	3.6			390	39			431	430		250
0R3	0.3			3R9	3.9			430	43			471	470		
0R4	0.4			4R3	4.3			470	47			511	510		
0R5	0.5	A, B, C, D.		4R7	4.7			510	51			561	560		
0R6	0.6			5R1	5.1			560	56			621	620		
0R7	0.7			5R6	5.6			620	62			681	680		
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			8R2	8.2			910	91			102	1000		
1R2	1.2			9R1	9.1			101	100						
1R3	1.3			100	10	F, G, J, K.		111	110						
1R4	1.4	A, B, C, D.		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		600				
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		1000	331	330		200 ~ 500				
3R0	3			330	33			361	360						

4.6 2525 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
1R0	1.0	B, C, D.	3600	7R5	7.5	F, G, J, K, M.	3600	820	82	F, G, J, K, M.	3600	911	910	F, G, J, K, M.	1000
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			111	110			122	1200		
1R4	1.4			110	11			121	120			152	1500		500
1R5	1.5			120	12			131	130		2500	182	1800		
1R6	1.6			130	13			151	150			202	2000		
1R7	1.7			150	15			161	160			222	2200		
1R8	1.8			160	16			181	180			272	2700		250
1R9	1.9			180	18			201	200						
2R0	2.0			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		2000				
2R7	2.7			300	30			331	330						
3R0	3			330	33			361	360		1500				
3R3	3.3			360	36			391	390						
3R6	3.6			390	39			431	430						
3R9	3.9			430	43			471	470						
4R3	4.3			470	47			511	510		1000				
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						

4.7 3838 specification capacitance table

Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Tolerance	Max DC working voltage (V)
1R0	1.0	B, C.	3600 ~ 7200	7R5	7.5	B, C, D.	3600 ~ 7200	820	82	F, G, J, K, M.	3600 ~ 7200	911	910	F, G, J, K, M.	1000 ~ 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		3600 ~ 5000	122	1200		
1R4	1.4	B, C, D.		110	11			121	120			152	1500		
1R5	1.5			120	12			131	130			182	1800		500
1R6	1.6			130	13			151	150			202	2000		
1R7	1.7			150	15			161	160			222	2200		
1R8	1.8			160	16			181	180			242	2400		
1R9	1.9			180	18			201	200		3600	272	2700		
2R0	2.0			200	20			221	220			302	3000		
2R1	2.1			220	22			241	240			332	3300		
2R2	2.2			240	24			271	270			362	3600		250
2R4	2.4			270	27			301	300			392	3900		
2R7	2.7			300	30			331	330			432	4300		
3R0	3			330	33			361	360			472	4700		
3R3	3.3			360	36			391	390			512	5100		
3R6	3.6			390	39			431	430		2500	562	5600		
3R9	3.9			430	43			471	470			622	6200		
4R3	4.3			470	47			511	510			682	6800		
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		1500				
6R8	6.8			750	75			821	820						

4.8 6243 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
1R0	1.0	B, C, D.	10000	7R5	7.5	B, C, D.	10000	820	82	F, G, J, K, M.	10000	911	910	F, G, J, K, M.	3000
1R1	1.1			8R2	8.2			910	91			102	1000		
1R2	1.2			9R1	9.1			101	100		7200	122	1200		
1R3	1.3			100	10	F, G, J, K, M.		111	110			152	1500		2500
1R4	1.4	B, C, D.		110	11			121	120			182	1800		2000
1R5	1.5			120	12			131	130			202	2000		
1R6	1.6			130	13			151	150			222	2200		1500
1R7	1.7			150	15			161	160			242	2400		1000
1R8	1.8			160	16			181	180			272	2700		
1R9	1.9			180	18			201	200		3600	302	3000		
2R0	2.0			200	20			221	220			332	3300		
2R1	2.1			220	22			241	240			392	3900		500
2R2	2.2			240	24			271	270			472	4700		
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						
3R9	3.9			430	43			471	470						
4R3	4.3			470	47			511	510						
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		3000				
6R8	6.8			750	75			821	820						

4.9 7676 specification capacitance table

Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)	Capac-itance code	Capac-itance (pF)	Tolerance	Max DC working voltage (V)
1R0	1.0			7R5	7.5	B,		820	82			911	910		
1R1	1.1	B,		8R2	8.2	C,		910	91		10000	102	1000		3600
1R2	1.2	C.		9R1	9.1	D.		101	100			122	1200		
1R3	1.3			100	10			111	110			152	1500		
1R4	1.4			110	11			121	120			182	1800		
1R5	1.5			120	12			131	130			202	2000		
1R6	1.6			130	13			151	150		8000	222	2200	F, G, J, K, M.	3000
1R7	1.7			150	15			161	160			272	2700		
1R8	1.8			160	16			181	180			332	3300		
1R9	1.9			180	18			201	200			392	3900		2000
2R0	2.0			200	20			221	220			472	4700		
2R1	2.1			220	22			241	240	F, G, J, K, M.		562	5600		
2R2	2.2		10000	240	24	F, G, J, K, M.	10000	271	270			682	6800		1000
2R4	2.4	B, C, D.		270	27			301	300			752	7500		
2R7	2.7			300	30			331	330			822	8200		
3R0	3			330	33			361	360						
3R3	3.3			360	36			391	390						
3R6	3.6			390	39			431	430		3600				
3R9	3.9			430	43			471	470						
4R3	4.3			470	47			511	510						
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						

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 met

<table>
<tr><td>Program</td><td colspan="2">Technical specifications</td><td colspan="4">Test method</td></tr>
<tr><td>ating temperaturer</td><td colspan="2">(-55 ~ +125)℃</td><td colspan="4"></td></tr>
<tr><td>Appearance</td><td colspan="2">No obvious defects</td><td colspan="4">Visual inspection</td></tr>
<tr><td rowspan="3">Capacitance</td><td colspan="2" rowspan="3">Within the specification error range</td><td>Nominal capacitance</td><td>Test frequency</td><td>Test voltage</td><td>Environment</td></tr>
<tr><td>≤1000pF</td><td>1MHz(±10%)</td><td>(1.0±0.2)Vrms</td><td rowspan="2">Temperature(25±2)℃ Humidity<75%</td></tr>
<tr><td>＞1000pF</td><td>1KHz(±10%)</td><td>(1.0±0.2)Vrms</td></tr>
<tr><td>Quality factor(Q value)</td><td colspan="2">Greater than 2000 when the frequency is 1MHz</td><td colspan="4" rowspan="2">Test method: Same as 'Capacitance'</td></tr>
<tr><td>Loss angle tangent</td><td colspan="2">Less than 0.0005 when the frequency is 1MHz</td></tr>
<tr><td rowspan="2">Insulation Resistance</td><td colspan="2" rowspan="2">≥100000MΩ</td><td>Test voltage</td><td>Test time</td><td>Charge and discharge current</td><td>Environment</td></tr>
<tr><td>Ur or 1000V，take the smaller or the two</td><td>≤60 sec</td><td>≤50mA</td><td>Temperature(25±2)℃ Humidity<75%</td></tr>
<tr><td rowspan="4">Dielectric Withstanding Voltage</td><td colspan="2" rowspan="4">There should be no dielectric breakdown or damage</td><td>Rated voltage</td><td>Test voltage</td><td>Time</td><td>Charge and discharge current</td></tr>
<tr><td>Ur<200V</td><td>2.5Ur</td><td rowspan="3">(1~5)sec</td><td rowspan="3">≤50mA</td></tr>
<tr><td>200V≤Ur≤1000V</td><td>1.5Ur</td></tr>
<tr><td>Ur＞1000V</td><td>1.2Ur</td></tr>
<tr><td rowspan="6">Capacitance temperature coefficient or temperature characteristics</td><td colspan="2" rowspan="6">C0G: (0±30) ppm/℃</td><td colspan="4">Measured after the temperature is stable for 30 minutes in the following temperature order (△C is based on T3)</td></tr>
<tr><td>Step</td><td colspan="3">Temperature（℃）</td></tr>
<tr><td>T1</td><td colspan="3">20±2</td></tr>
<tr><td>T2</td><td colspan="3">-55±3</td></tr>
<tr><td>T3</td><td colspan="3">20±2</td></tr>
<tr><td>T4</td><td colspan="3">125±2</td></tr>
<tr><td>Solderability</td><td>Appearance</td><td>No visible damage, inning rate≥95%</td><td colspan="4">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)℃;</td></tr>
<tr><td colspan="6">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.</td></tr>
</table>

5.3 Reliability indicators and perio

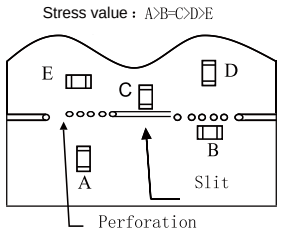
<table>
<tr><th>Program</th><th colspan="2">Technical specifications</th><th>Test method</th></tr>
<tr><td rowspan="4">Resistance to soldering heat</td><td>Appearance</td><td>No visible damage,inning rate ≥95%</td><td rowspan="4">The capacitor is immersed in a solution of ethanol and rosin (25% by weight), taken
out and preheated at a temperature of 100-200°C for 10±2min, then immersed in a soldering solution.

Soldering temperature:260±5℃; 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 performed in a bent state.</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>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>

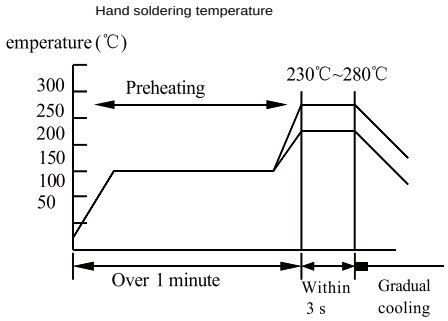
6. Precautions for use

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

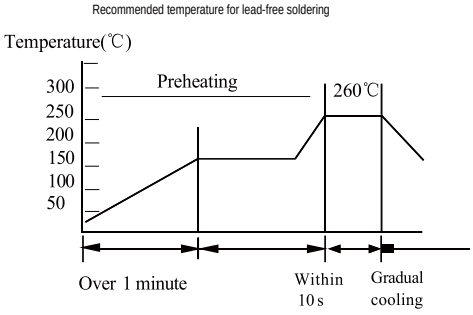
2.PCB board design
2.1 The amount of solder used will affect the chip's ability to resist mechanical stress, which may cause RF-MLCC to break or crack. Therefore, when designing the substrate, the size and configuration of the pads must be carefully considered, which has a decisive effect on the amount 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 1N 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.



4.Welding
4.l MLCC is a combination of ceramics and metal. As a ceramic body, especiallya 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.



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 will cause excessive vibration on the PC board, This will cause MLCC or solder joints to crack or reduce terminal electrode strength. Therefore pay special attention to the following points: Ultrasonic output: 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 materials are in good condition, recommended storage conditions are as follows:
Storage temperature: 5-40°C; Storage relative humidity: 20-70%RH Even if stored under ideal storage conditions, MLCC terminal weldability will decrease over time, Therefore MLCC should be used within 6 months from date of shipment.

Soldering temperature: 260±5°C; Soldering speed: 25±0.25mm/s; Soldering time: 10±1 seconds. 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±2 hours

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±0.25)mm/sec; Soldering time: (2±0.5)sec

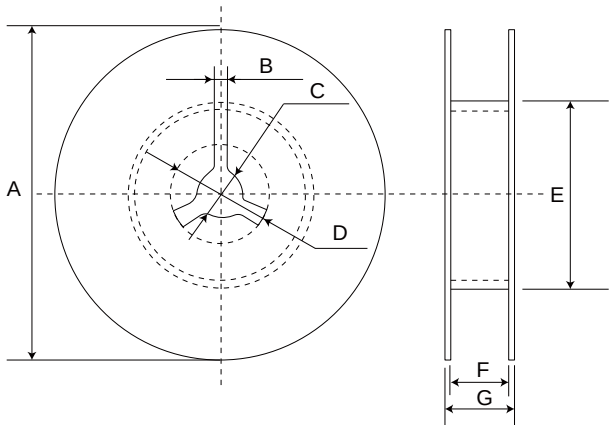
7. Product packaging

7.1 Packaging

Spec（Specification）	Qty（Quantity）	Comment
0402	10000	The packaging form and quantity can be customized
0603	5000	
0805	5000	
0505	5000	
1111	2000	

7.2 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

7.3 Taping method

7.3.1 The tape for packaging capacitors is wound clockwise. When pulling out the tape from top to bottom, the feed hole is on the right side of the tape.

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

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

7.3.4 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.

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

7.3.6 The cumulative error of the feed hole is within ±0.3 mm for 10 spacings.

8. Inspection results of prohibited substances in products About R

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)