

TCQ 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: COG: $0 \pm 30 \text{ ppm}/^\circ\text{C}$
- Capacitance drift: no more than $\pm 0.2\%$ or $\pm 0.05 \text{ pF}$, whichever is larger.
- Quality factor (Q value): greater than 2,000 at a frequency of 1MHz/1KHz
- Insulation resistance: $\geq 100000 \text{ M}\Omega$ at 20°C
- Operating temperature: $-55 \sim 125^\circ\text{C}$

2. Product model naming

2.1 UF Capacitors specification description

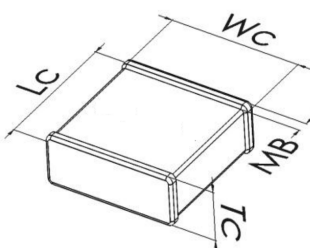
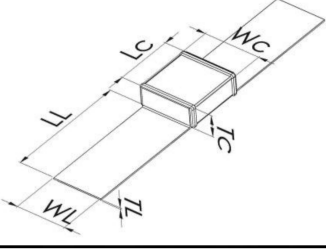
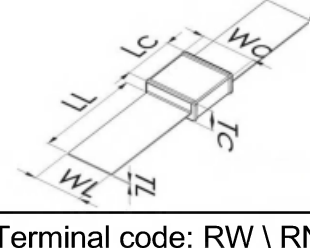
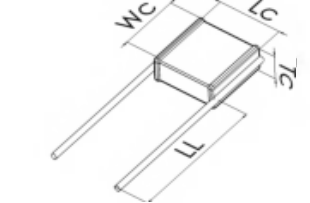
2.2 The correspondence relationship between UF Capacitors product series and ATC product series.

Series specifications	Series specifications of ATC
TCQ-0402	ATC600L
TCQ-0603	ATC600S
TCQ-0805	ATC600F
TCQ-0505	ATC100A/700A
TCQ-1111	ATC100B
TCQ-2525	ATC100C
TCQ-3838	ATC100E
TCQ-7676	ATC100H

How to order

<u>TCQ</u>	<u>1111</u>	<u>CG</u>	<u>1R0</u>	<u>B</u>	<u>501</u>	<u>N</u>	<u>R</u>
Type	Size	Dielectric	Capacitance (unit: pF)	Tolerance	Rated voltage	Termination	Packaging style
TCQ series RF high Q capacitor	0402 2525 0603 3838 0805 6243 0505 7676 1111	CG=COG: $\pm 30 \text{ ppm}/^\circ\text{C}$	The first two digits are significant figures, and the last digit is the power of 10	A : $\pm 0.05 \text{ pF}$ B : $\pm 0.10 \text{ pF}$ C : $\pm 0.25 \text{ pF}$ D : $\pm 0.50 \text{ pF}$ F : $\pm 1.0\%$ G : $\pm 2.0\%$ J : $\pm 5.0\%$ K : $\pm 10.0\%$	The first two digits are significant figures, and the last digit is the power of 10	N: Leading-out Terminal: Ag/Ni/Sn	R: Tape & reel C: Cut Tray B: Bulk

3. Product dimension

Product type	Size specifications (imperial)	Capacitor size(mm)			Terminal size(mm)			
		Lc	Wc	Tc max	MB	LL min	WL	TL
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)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	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		
0R4	0.4			2R7	2.7			180	18		
0R5	0.5	3R0		3	200			20			
0R6	0.6	3R3		3.3	220			22			
0R7	0.7	3R6		3.6	240		24	50			
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	200					
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								
1R9	1.9	110	11			F, G, J.					
2R0	2	120	12								

4.2 0603 specification capacitance table

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	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	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								
1R4	1.4	110		11								
1R5	1.5	A, B, C, D.			120	12		F, G, J, K, M.				
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

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (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.	250
0R3	0.3			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	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					
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								
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

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (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.	250
0R3	0.3			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	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	B, C, D.		100	10	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						
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

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)
0R1	0.1	A, B, C.	1500	3R3	3.3	A, B, C, D.	1500	360	36	F, G, J, K.	1000	391	390	F, G, J, K.	500
0R2	0.2			3R6	3.6			390	39			431	430		
0R3	0.3			3R9	3.9			430	43			471	470		
0R4	0.4			4R3	4.3			470	47			511	510		
0R5	0.5	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	A, B, C, D.		100	10	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	600									
2R2	2.2	240	24	271	270										
2R4	2.4	270	27	301	300	500									
2R7	2.7	300	30	331	330										
3R0	3	330	33	361	360										

4.6 2525 specification capacitance table

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (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.	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	B, C, D.		110	11	121		120	152			1500	500		
1R5	1.5			120	12	131		130	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	2500						
2R0	2.0			200	20	221		220							
2R1	2.1			220	22	241		240							
2R2	2.2	240		24	271	270		2000							
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	1500									
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	1000									
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)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)									
1R0	1.0	B, C.	7200	7R5	7.5	B,	7200	820	82	F, G, J, K, M.	7200	911	910	F, G, J, K, M.	1500									
1R1	1.1			8R2	8.2	C,		910	91			102	1000											
1R2	1.2			9R1	9.1	D.		101	100			112	1100											
1R3	1.3				100	10			111			110	122		1200	1000								
1R4	1.4			110	11			121	120			152	1500											
1R5	1.5	B, C, D.			120	12		F, G, J, K, M.				131	130		7200	5000	182	1800	F, G, J, K, M.	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			272	2700							
2R0	2.0				200	20						221	220			302	3000	3600		2500	332	3300	F, G, J, K, M.	250
2R1	2.1				220	22						241	240			362	3600							
2R2	2.2				240	24						271	270			392	3900							
2R4	2.4				270	27						301	300			432	4300							
2R7	2.7				300	30						331	330			472	4700							
3R0	3				330	33						361	360			512	5100							
3R3	3.3			360	36		391		390	562	5600													
3R6	3.6			390	39		431		430	622	6200													
3R9	3.9			430	43		471		470	682	6800													
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																	

4.8 6243 specification capacitance table

Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)	Capacitance code	Capacitance (pF)	Accuracy	Max DC working voltage (V)			
1R0	1.0	B, C.	10000	7R5	7.5	B,	10000	820	82	F, G, J, K, M.	10000	911	910	F, G, J, K, M.	3000			
1R1	1.1			8R2	8.2	C,		910	91			102	1000					
1R2	1.2			9R1	9.1	D.		101	100			122	1200					
1R3	1.3			100	10			111	110			152	1500					
1R4	1.4	B, C, D.		110	11			121	120			182	1800		2000			
1R5	1.5			120	12			131	130			202	2000		1500			
1R6	1.6			130	13			151	150			222	2200		1000			
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			302	3000					
2R0	2.0		B, C, D.	200	20	F, G, J, K, M.	10000	221	220	332	3300	3600						
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

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

Program	Technical specifications		Test method			
Temperature	(-55 ~ +125)°C					
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)°C 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)°C 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 coefficient or temperature characteristics	C0G: (0±30) ppm/°C		Measured after the temperature is stable for 30 minutes in the following temperature order (ΔC is based on T3)			
			Step	Temperature (°C)		
			T1	20±2		
			T2	-55±3		
			T3	20±2		
			T4	125±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)°C for (10~30)sec,then immerse it in a solder solution. Soldering temperature:(235±5)°C;			

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

Program	Technical specifications		Test method		
Resistance to soldering heat	Appearance	No visible damage,inning rate $\geq 95\%$	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.		
	$\Delta C/C$	$\pm 0.5\%$ or $\pm 0.5\text{pF}$,take the larger	Soldering temperature:260±5°C; Soldering speed:25±0.25mm/s Soldering time:10±1sec		
	D.F.	Same as the initial standard	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		
	I.R.	Same as the initial standard	has been placed in a room for 24±2hrs		
Terminal electrode adhesion strength	The end electrode does not peel off Appearance: no visible damage		Apply thrust: 5N Time: 10±1sec Speed: 1±0.5mm/sec		
Bending strength	Appearance	No visible damage	Test substrate: PCB board Bending depth: 1mm		
	$\Delta C/C$	$\leq 5\%$	Application speed: 1±0.5mm/sec. Measurement should be performed in a bent state.		
Temperature cycling	Appearance	No visible damage	Number of cycles: 5 times, one cycle is divided into the following 4 steps:		
	$\Delta C/C$	$\leq 1\%$ or $\pm 1\text{pF}$ Take the larger of the two	Step	Temperature(°C)	Time(min)
	D.F.	Same as the initial standard	Step 1	-55±3	30
			Step 2	20±3	3
			Step 3	125±3	30
I.R.	Same as the initial standard	Step 4	20±3	3	
			After the test, place it at room temperature for 24±2 hrs before measuring again.		
Resistance to soldering heat	Appearance	No visible damage	Temperature: 40±2°C Humidity: 90~95%RH Time: 500+24/-0hrs		
	$\Delta C/C$	$\leq 2\%$ or $\pm 1\text{pF}$ Take the larger of the two	After the test, place it at room temperature for 24±2 hrs before measuring again.		
	D.F.	Same as the initial standard			
	I.R.	$R_i \geq 2500\text{M}\Omega$ or $R_i \cdot C_R > 25\text{S}$ Take the smaller of the two			
Life test	Appearance	No visible damage	Rated voltage	Applied voltage	Time
			$U_r \leq 200\text{V}$	2 U_r	1000h
	$\Delta C/C$	$\leq 2\%$ or $\pm 1\text{pF}$ Take the larger of the two	200V < $U_r \leq 500\text{V}$	1.5 U_r	1500h
			500V < $U_r \leq 1000\text{V}$	1.2 U_r	2000h
	D.F.	Twice the initial standard	$U_r > 1000\text{V}$	U_r	2000h
I.R.	$R_i \geq 4000\text{M}\Omega$ or $R_i \cdot C_R > 40\text{S}$ Take the smaller of the two	Charging and discharging current: $\leq 50\text{mA}$ Temperature: (125±3)°C After the test, place it at room temperature for 24±2 hrs before measuring again.			

6. Precautions for use

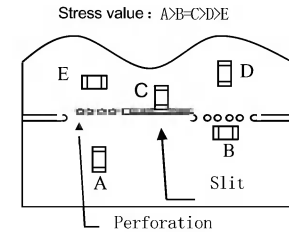
1. Precautions before use:

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

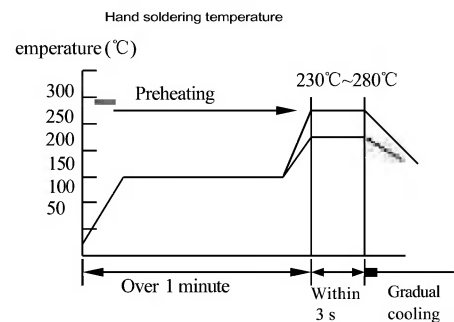
4.1 MLCC is a combination of ceramics and metal. As a ceramic body, especially a large-

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.

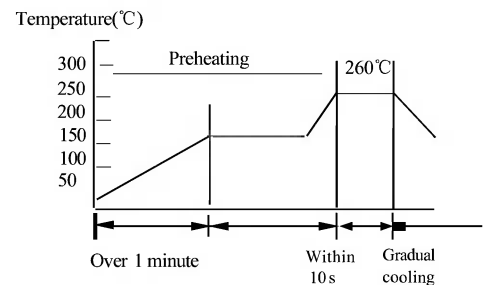
4.2 The interior of MLCC is a metal electrode with good thermal plasticity and fast response to heat. Therefore, under heating conditions, there must be a certain degree of inconsistency in expansion between metal parts and ceramic parts, this will cause internal stress and easily cause ceramic body 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 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.

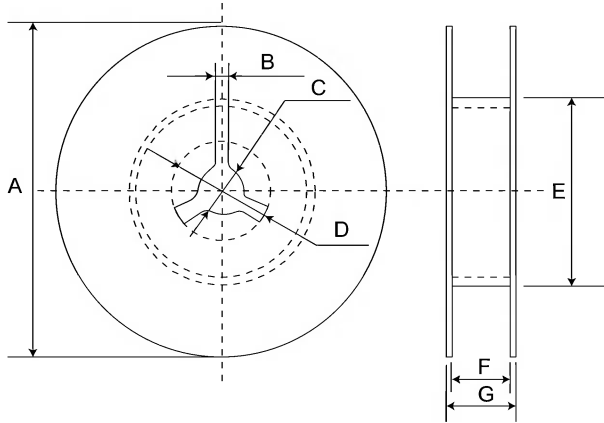
Soldering temperature: 260±5°C; Soldering speed: 25±0.25mm/s; Soldering time: 10±1 seconds. After being taken out, it is cleaned with a solvent and observed under a microscope with a magnification of at least 10x. The test is performed again after the capacitor has been placed in a room for 24±2 hours

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)°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
$\Phi 178.00 \pm 2.00$	3.00	$\Phi 13.00 \pm 0.50$	$\Phi 21.00 \pm 0.80$	$\Phi 50.00$ or larger	10.00 ± 1.50	12Max
$\Phi 330.00 \pm 2.00$	3.00	$\Phi 13.00 \pm 0.50$	$\Phi 21.00 \pm 0.80$	$\Phi 50.00$ or larger	10.00 ± 1.50	12Max

7.2 Taping method

7.2.1 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.

7.2.2 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 of the 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)