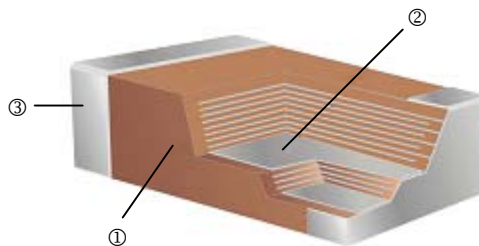


Multilayer Ceramic Capacitor – MC Series

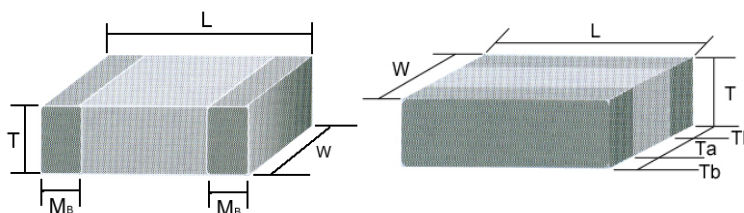
Construction



①	Ceramic Material	③	Termination: NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric
②	Inner Electrodes		

Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10



Dimensions

MC / MCHL / MCRF Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		Mb	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.05 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.10	0.60±0.10	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
				1.25±0.10	D		-	3K
		0.85±0.10	T	4K	-			
		1.25±0.20	I	-	3K			
06	1206	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20	4K	-
				0.95±0.10	C		-	3K
				1.25±0.10	D		-	3K
		1.15±0.15	J	-	3K			
		1.60±0.20	G	-	2K			
3.20±0.3 / -0.1	1.60±0.3 / -0.1	1.60±0.3 / -0.1	P	-	2K			
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
				1.60±0.20	G		-	2K
		2.00±0.20	K	-	1K			
		2.50±0.30	M	-	1K			
08	1808	4.50±0.40	2.03±0.25	1.25±0.10	D	0.75±0.25	-	2K
				2.00±0.20	K		-	1K
12	1812	4.50±0.40	3.20±0.30	1.25±0.10	D	0.75±0.25	-	1K
				2.00±0.20	K		-	1K
			3.20±0.40	2.50±0.30	M		-	0.5K

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		Ta min.	Tb min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: ±0.1pF (Cap ≤ 5pF) C: ±0.25pF (Cap ≤ 5pF) D: ±0.5pF (5pF < Cap < 10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20%	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF

General Capacitance & Voltage

Capacitance & Voltage (NPO)

Dielectric	EIA	Size	NPO													
			0402				0603					0805				
	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
0R5	0.5pF	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R6	0.6	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R7	0.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R8	0.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R9	0.9	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R0	1.0	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R2	1.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R5	1.5	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R8	1.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
2R2	2.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
2R7	2.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
3R3	3.3	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
3R9	3.9	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
4R7	4.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
5R6	5.6	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
6R8	6.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
8R2	8.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
100	10pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
120	12	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
150	15	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
180	18	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
220	22	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
270	27	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
330	33	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
390	39	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
470	47	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
560	56	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
680	68	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
820	82	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
101	100pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
121	120	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
151	150	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
181	180	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
221	220	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
271	270	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
331	330	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
391	390	N	N	N	N	N	S	S	S	S	S	B	B	B	B	B
471	470	N	N	N	N	N	S	S	S	S	S	B	B	B	B	B
561	560	N	N	N	N	N	S	S	S	S	S	B	B	B	B	B
681	680	N	N	N	N	N	S	S	S	S	S	B	B	B	B	B
821	820						S	S	S	S	S	B	B	B	B	B
102	1000pF						S	S	S	S	S	B	B	B	B	B
122	1200						X	X	X	X		B	B	B	B	B
152	1500						X	X	X	X		B	B	B	B	B
182	1800						X	X	X	X		B	B	B	B	B
222	2200						X	X	X	X		B	B	B	B	B
272	2700						X	X	X	X		D	D	D	D	D
332	3300						X	X	X	X		D	D	D	D	D
392	3900											D	D	D	D	D
472	4700											D	D	D	D	D
562	5600											D^	D^			
682	6800											D^	D^			
822	8200											D^	D^			
103	0.01uF											D^	D^			
123	0.012											D^	D^			

The letter in cell is expressed the symbol of product thickness

The "A" mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (NPO)

Dielectric		NPO												
EIA	Size	1206					1210					1812		
Code	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	16V	50V	100V
1R8	1.8pF	B	B	B	B	B								
2R2	2.2	B	B	B	B	B								
2R7	2.7	B	B	B	B	B								
3R3	3.3	B	B	B	B	B					C^			
3R9	3.9	B	B	B	B	B					C^			
4R7	4.7	B	B	B	B	B					C^			
5R6	5.6	B	B	B	B	B					C^			
6R8	6.8	B	B	B	B	B					C^			
8R2	8.2	B	B	B	B	B					C^			
100	10pF	B	B	B	B	B					C^			D^
120	12	B	B	B	B	B					C^			D^
150	15	B	B	B	B	B					C^			D^
180	18	B	B	B	B	B					C^			D^
220	22	B	B	B	B	B	C^	C^	C^	C^	C^			D^
270	27	B	B	B	B	B	C^	C^	C^	C^	C^			D^
330	33	B	B	B	B	B	C^	C^	C^	C^	C^			D^
390	39	B	B	B	B	B	C^	C^	C^	C^	C^			D^
470	47	B	B	B	B	B	C^	C^	C^	C^	C^			D^
560	56	B	B	B	B	B	C^	C^	C^	C^	C^			D^
680	68	B	B	B	B	B	C^	C^	C^	C^	C^			D^
820	82	B	B	B	B	B	C^	C^	C^	C^	C^			D^
101	100pF	B	B	B	B	B	C^	C^	C^	C^	C^			D^
121	120	B	B	B	B	B	C^	C^	C^	C^	C^			D^
151	150	B	B	B	B	B	C^	C^	C^	C^	C^			D^
181	180	B	B	B	B	B	C^	C^	C^	C^	C^			D^
221	220	B	B	B	B	B	C^	C^	C^	C^	C^			D^
271	270	B	B	B	B	B	C^	C^	C^	C^	C^			D^
331	330	B	B	B	B	B	C^	C^	C^	C^	C^			D^
391	390	B	B	B	B	B	C^	C^	C^	C^	C^			D^
471	470	B	B	B	B	B	C^	C^	C^	C^	C^			D^
561	560	B	B	B	B	B	C^	C^	C^	C^	C^			D^
681	680	B	B	B	B	B	C^	C^	C^	C^	C^			D^
821	820	B	B	B	B	B	C^	C^	C^	C^	C^			D^
102	1000pF	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
122	1200	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
152	1500	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
182	1800	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
222	2200	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
272	2700	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
332	3300	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
392	3900	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
472	4700	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
562	5600	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
682	6800	C	C	C	C	C	C^	C^	C^	C^	C^	D^	D^	D^
822	8200	D	D	D	D	D	C^	C^	C^	C^	C^	D^	D^	D^
103	0.01uF	D	D	D	D	D	C^	C^	C^	C^	C^	D^	D^	D^
123	0.012	D^	D^				C^	C^	D^	D^	D^	D^	D^	D^
153	0.015	D^	D^				C^	C^	D^	D^	D^	D^	D^	D^
183	0.018	D^	D^									D^	D^	D^
223	0.022	D^	D^									D^	D^	D^
273	0.027	D^	D^									D^	D^	D^
333	0.033	D^	D^									D^	D^	D^
393	0.039	G^	G^											

■ The letter in cell is expressed the symbol of product thickness

■ The “^” mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	0402				0603						0805					
Code	VDCW	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V
101	100pF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
121	120	N	N	N	N		S	S	S	S	S		B	B	B	B	B
151	150	N	N	N	N		S	S	S	S	S		B	B	B	B	B
181	180	N	N	N	N		S	S	S	S	S		B	B	B	B	B
221	220	N	N	N	N		S	S	S	S	S		B	B	B	B	B
271	270	N	N	N	N		S	S	S	S	S		B	B	B	B	B
331	330	N	N	N	N		S	S	S	S	S		B	B	B	B	B
391	390	N	N	N	N		S	S	S	S	S		B	B	B	B	B
471	470	N	N	N	N		S	S	S	S	S		B	B	B	B	B
561	560	N	N	N	N		S	S	S	S	S		B	B	B	B	B
681	680	N	N	N	N		S	S	S	S	S		B	B	B	B	B
821	820	N	N	N	N		S	S	S	S	S		B	B	B	B	B
102	1000pF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
122	1200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
152	1500	N	N	N	N		S	S	S	S	S		B	B	B	B	B
182	1800	N	N	N	N		S	S	S	S	S		B	B	B	B	B
222	2200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
272	2700	N	N	N	N		S	S	S	S	S		B	B	B	B	B
332	3300	N	N	N	N		S	S	S	S	S		B	B	B	B	B
392	3900	N	N	N	N		S	S	S	S	S		B	B	B	B	B
472	4700	N	N	N	N		S	S	S	S	S		B	B	B	B	B
562	5600	N	N	N	N		S	S	S	S	S		B	B	B	B	B
682	6800	N	N	N	N		S	S	S	S	S		B	B	B	B	B
822	8200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
103	0.01μF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
123	0.012	N	N	N			S	S	S	S			B	B	B	B	B
153	0.015	N	N	N			S	S	S	S			B	B	B	B	B
183	0.018	N	N	N			S	S	S	S			B	B	B	B	B
223	0.022	N	N	N			S	S	S	S			B	B	B	B	B
273	0.027	N	N	N			S	S	S	S			B	B	B	B	D
333	0.033	N	N	N			S	S	S	X			B	B	B	B	D
393	0.039	N	N	N			S	S	S	X			B	B	B	B	D
473	0.047	N	N	N			S	S	S	X			B	B	B	B	D
563	0.056	N	N				S	S	S	X			B	B	B	B	D
683	0.068	N	N				S	S	S	X			B	B	B	B	D
823	0.082	N	N				S	S	S	X			B	B	B	B	D
104	0.10μF	N	N				S	S	S	X			B	B	B	B	D
124	0.12						S	X	X				D	D	D	D	
154	0.15						S	X	X				D	D	D	D	
184	0.18						S	X	X				D	D	D	D	
224	0.22					X	S	X	X				D	D	D	D	
274	0.27					X	X	X	X				D	D	D	I	
334	0.33					X	X	X	X				D	D	D	I	
394	0.39					X	X	X	X				D	D	D	I	
474	0.47					X	X	X	X				D	D	D	I	
564	0.56					X	X						D	D	D		
684	0.68					X	X						D	D	D		
824	0.82					X	X						D	D	D		
105	1.0μF					X	X						D	D	D		
155	1.5												I	I			
225	2.2											I	I	I	I		
335	3.3																
475	4.7																

■ The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	1206					1210					1812					
Code	VDCW	6.3V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
101	100pF																
121	120																
151	150		B	B	B	B	B										
181	180		B	B	B	B	B										
221	220		B	B	B	B	B										
271	270		B	B	B	B	B										
331	330		B	B	B	B	B										
391	390		B	B	B	B	B										
471	470		B	B	B	B	B										
561	560		B	B	B	B	B										
681	680		B	B	B	B	B										
821	820		B	B	B	B	B										
102	1000pF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
122	1200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
152	1500		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
182	1800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
222	2200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
272	2700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
332	3300		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
392	3900		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
472	4700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
562	5600		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
682	6800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
822	8200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
103	0.01μF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
123	0.012		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
153	0.015		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
183	0.018		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
223	0.022		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
273	0.027		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
333	0.033		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
393	0.039		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
473	0.047		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
563	0.056		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
683	0.068		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
823	0.082		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
104	0.10μF		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
124	0.12		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
154	0.15		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
184	0.18		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
224	0.22		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
274	0.27		C	C	C	D		C	C	C	C	G	D	D	D	D	D
334	0.33		C	C	C	D		C	C	C	D	G	D	D	D	D	D
394	0.39		C	C	J	P		C	C	C	D	M	D	D	D	D	D
474	0.47		J	J	J	P		C	C	C	D	M	D	D	D	D	K
564	0.56		J	J	J	P		D	D	D	D	M	D	D	D	D	K
684	0.68		J	J	J	P		D	D	D	D	K	D	D	D	K	K
824	0.82		J	J	J	P		D	D	D	D	K	D	D	D	K	K
105	1.0μF		J	J	J	P		D	D	D	D	K	D	D	D	K	K
155	1.5		J	J	J												K
225	2.2		J	J	J	P			K	G						M	M
335	3.3		P	P	P	P											
475	4.7		P	P	P	P		K	K								
106	10		P	P				K	K								

■ The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X5R)

Dielectric		X5R																										
EIA	Size	0402				0603				0805				1206				1210										
Code	VDCW	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V								
273	0.027µF				N																							
333	0.033				N																							
393	0.039				N																							
473	0.047				N																							
563	0.056		N		N																							
683	0.068		N		N																							
823	0.082	N	N		N																							
104	0.10µF	N	N		N	N																						
224	0.22	N	N									X	X															
274	0.27							X	X																			
334	0.33	N						X	X	X	X																	
394	0.39							X	X																			
474	0.47	N						X	X	X	X																	
684	0.68	N						X	X	X	X																	
824	0.82							X	X	X	X																	
105	1.0µF	N	N					X	X	X	X																	
155	1.5							X						I	I					J	J					K	K	
225	2.2	N						X	X					I	I	I	I			J	J	P				K	K	
335	3.3													I	I	I	I			P	P	P						
475	4.7							X						I	I	I	I			P	P	P	P				K	K
685	6.8																			P	P							
106	10µF													I	I					P	P	P	P			K	K	K
226	22																			P	P							

Capacitance & Voltage (Y5V)

Dielectric		Y5V																																								
EIA	Size	0402					0603					0805					1206					1210					1812															
Code	VDCW	6.3	10V	16V	25V	50V	6.3	10V	16V	25V	50V	6.3	10V	16V	25V	50V	100	10V	16V	25V	35V	50V	100	6.3	10V	16V	25V	35V	50V	100	10V	16V	25V	50V	100							
103	0.010µF		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
153	0.015		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
223	0.022		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
333	0.033		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
473	0.047		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
683	0.068		N	N	N			S	S	S	S		A	A	A	A	B	B	B	B		B	B																			
104	0.10µF		N	N	N			S	S	S	S		A	A	A	A	B	B	B	B		B	B				C	C	C		C	C	D	D	D	D	D	D	D			
154	0.15		N					S	S	S	S		A	A	A	A		B	B	B		B	C			C	C	C		C	C	D	D	D	D	D	D	D				
224	0.22	N	N					S	S	S	S		A	A	A	A		B	B	B		B	C			C	C	C		C	C	D	D	D	D	D	D	D	D			
334	0.33	N	N					S	S	S			B	B	B	B		B	B	B		B				C	C	C		C	C	D	D	D	D	D	D	D	D	D		
474	0.47	N	N					S	S	X			B	B	B	B/D		B	B	B		B				C	C	C		C		D	D	D	D	D	D	D	D	D		
684	0.68	N						S	X				B	B	D	D		B	B	B		B				C	C	C		C		D	D	D	D	D	D	D	D	D		
105	1.0µF	N	N					S	X	X			B	B	D	D		C	C	C		C/D				C	C	C		C		D	D	D	D	D	D	D	D	D		
155	1.5							S					D	D	I			C	C	C						C	C	C				D	D	D	D	D	D	D	D	D		
225	2.2							S	S	X			D	D	D			C	C	C		J				C	C	C		G		D	D	D	D	D	D	D	D	D		
335	3.3												D	D	I			J	J	J						C	C	C				D	D	D	D	D	D	D	D	D		
475	4.7							X					D	D	D			J	J	J	J					C	C	D		G		D	D	D	D	D	D	D	D	D		
685	6.8												I													C	C	D				D	D	D	D	D	D	D	D	D		
106	10µF												I	I				J	J	P						D	D	G	K			D	D	D								
226	22µF																	P																								
476	47µF																									K	K															
107	100µF																									M																

Environmental Characteristics

Size	0402, 0603, 0805, 1206, 1210, 1812			
Dielectric	NPO	X7R	X5R	Y5V
Capacitance*	0.5pF~0.039μF	100pF~10μF	27nF~22μF	10nF~100μF
Capacitance tolerance	Cap ≤ 5pF: B (±0.1pF), C (±0.25pF) 5pF < Cap < 10pF: C (±0.25pF), D (±0.50pF) Cap ≥ 10pF: J (±5%)	J (±5%) K (±10%)		M (±20%) Z (-20 / +80%)
Rated voltage (VDCW)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		
Q*	Cap < 30pF: Q ≥ 400 +20C Cap ≥ 30pF: Q ≥ 1000	Note 1		
Insulation resistance at Ur**	≥ 10GΩ or R×C ≥ 500Ω×F Whichever is less			
Operating temperature	-55 to +125°C		-55 to 85°C	-25 to +85°C
Capacitance change	±30 ppm	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)			

■ **Measured at the condition of 30~70% related humidity

■ NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF and 1.0±0.2Vrms, 1.0 KHz±10% for Cap > 1000pF, 25°C ambient temperature

■ X7R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature

■ Y5V: Apply 1.0±0.2Vrms, 1.0 KHz±10% at the condition of 20°C ambient temperature

Note 1:

X7R / X5R

Rated vol.	D.F.	Exception of D.F.	
≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF 0805 ≥ 0.18μF 1206 ≥ 0.47μF
25V	≤ 3.5%	≤ 5%	0805 ≥ 1μF 1210 ≥ 10μF
		≤ 7%	0603 ≥ 0.33μF 1206 ≥ 4.7μF
		≤ 10%	0402 ≥ 0.10μF 0603 ≥ 0.47μF 0805 ≥ 2.2μF 1206 ≥ 6.8μF
16V	≤ 3.5%	≤ 5%	0402 ≥ 0.033μF 0603 ≥ 0.15μF 0805 ≥ 0.68μF 1206 ≥ 2.2μF 1210 ≥ 4.7μF
		≤ 10%	0603 ≥ 0.68μF 0805 ≥ 0.68μF 1206 ≥ 4.7μF 1210 ≥ 22μF
10V	≤ 5.0%	≤ 10%	0402 ≥ 0.33μF 0603 ≥ 0.33μF 0805 ≥ 2.2μF 1206 ≥ 2.2μF 1210 ≥ 22μF
		≤ 15%	0402 ≥ 1μF
6.3V	≤ 10%	≤ 15%	0603 ≥ 10μF 0805 ≥ 4.7μF 1210 ≥ 100μF
		≤ 20%	0402 ≥ 2.2μF

Y5V

Rated vol.	D.F.	Exception of D.F.	
≥ 50V	≤ 5.0%	≤ 7%	0603 ≥ 0.1μF 0805 ≥ 0.47μF 1206 ≥ 4.7μF
35V	7%	—	—
25V	≤ 5.0%	≤ 7%	0402 ≥ 0.047μF 0603 ≥ 0.1μF 0805 ≥ 0.33μF 1206 ≥ 1μF 1210 ≥ 4.7μF
		≤ 9%	0402 ≥ 0.068μF 0603 ≥ 0.47μF 1206 ≥ 4.7μF 1210 ≥ 22μF
16V (C < 1.0μF)	≤ 7.0%	≤ 9%	0402 ≥ 0.068μF 0603 ≥ 0.68μF
		≤ 12.5%	0402 ≥ 0.22μF
16V (C ≥ 1.0μF)	≤ 9.0%	≤ 12.5%	0603 ≥ 2.2μF 0805 ≥ 3.3μF 1206 ≥ 10μF 1210 ≥ 22μF 1812 ≥ 47μF
10V	≤ 12.5%	≤ 20%	0402 ≥ 0.47μF
6.3V	≤ 20%	—	—

Environmental Characteristics

Item	Requirement	Test Method																																																																								
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																																																								
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap≤1000pF 1.0±0.2Vrms, 1KHz±10%																																																																								
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	<p>NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C</p> <p>X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>2.5%</td> <td>3%</td> <td>0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>7%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>10%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.15μF 0805 ≥ 0.68μF; 1206 ≥ 2.2μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>10%</td> <td>0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 2.2μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>5%</td> <td>7%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 0.47μF</td> </tr> <tr> <td>9%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C < 1.0μF)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>12.5%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td rowspan="2">16V (C ≥ 1.0μF)</td> <td rowspan="2">9%</td> <td>12.5%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	2.5%	3%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	25V	3.5%	5%	0805 ≥ 1μF; 1210 ≥ 10μF	7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	10%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF	16V	3.5%	5%	0402 ≥ 0.033μF; 0603 ≥ 0.15μF 0805 ≥ 0.68μF; 1206 ≥ 2.2μF 1210 ≥ 4.7μF	10%	0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	5%	10%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF	15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	10%	15%	0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF	20%	0402 ≥ 2.2μF	Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	5%	7%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	7%	-	-	25V	5%	7%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 0.47μF	9%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	7%	9%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	12.5%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	9%	12.5%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	20%	0402 ≥ 0.47μF	10V	12.5%	20%	0402 ≥ 0.47μF	6.3V	20%	-	-	<p>X7R, X5R, Y5V: (Class II) Cap≤10uF 1.0±0.2Vrms, 1KHz±10% Cap>10uF 0.5±0.2Vrms, 120Hz±10%</p>
Rated vol.	D.F.≤	Exception of D.F. ≤																																																																								
≥50V	2.5%	3%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																							
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10V	12.5%	20%	0402 ≥ 0.47μF																																																																							
6.3V	20%	-	-																																																																							
Dielectric Strength	No evidence of damage or flash over during test	<p>To apply voltage(≤100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA</p> <p>To apply voltage: 200V~300V ≥ 2 time VDC 500V~999V ≥ 1.5 time VDC 1000V~3000V ≥ 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0</p>																																																																								

Item	Requirement	Test Method																				
Insulation Resistance	<p>10GΩ or $RxC \geq 500\Omega\text{-F}$ Whichever is smaller X7R, X5R, Y5V:</p> <table border="1" data-bbox="391 264 1007 504"> <tr> <th data-bbox="391 264 842 331">Rated Voltage</th> <th data-bbox="842 264 1007 331">Insulation Resistance</th> </tr> <tr> <td data-bbox="391 331 842 365">100V: X7R</td> <td data-bbox="842 331 1007 504" rowspan="4">$RxC \geq 100\Omega\text{-F}$</td> </tr> <tr> <td data-bbox="391 365 842 398">16V: 0402$\geq 0.22\mu\text{F}$</td> </tr> <tr> <td data-bbox="391 398 842 465">10V: 0201$\geq 47\text{nF}$;0402$\geq 0.47\mu\text{F}$;0603$\geq 0.47\mu\text{F}$ 0805$\geq 2.2\mu\text{F}$;1206$\geq 4.7\mu\text{F}$;1210$\geq 47\mu\text{F}$</td> </tr> <tr> <td data-bbox="391 465 842 504">6.3V</td> </tr> </table> <p>$\geq 10\text{G}\Omega$ or $100\Omega\text{-F}$ whichever is smaller Rated voltage: 200V~630V</p> <p>$\geq 10\text{G}\Omega$ Rated voltage: >630V</p>	Rated Voltage	Insulation Resistance	100V: X7R	$RxC \geq 100\Omega\text{-F}$	16V: 0402 $\geq 0.22\mu\text{F}$	10V: 0201 $\geq 47\text{nF}$;0402 $\geq 0.47\mu\text{F}$;0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$;1206 $\geq 4.7\mu\text{F}$;1210 $\geq 47\mu\text{F}$	6.3V	<p>To apply rated voltage for max. 120sec</p> <p>To apply rated voltage(500V max.) for 60sec.</p> <p>To apply 500V for 60sec.</p>													
Rated Voltage	Insulation Resistance																					
100V: X7R	$RxC \geq 100\Omega\text{-F}$																					
16V: 0402 $\geq 0.22\mu\text{F}$																						
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Temperature Characteristic of Capacitance	<table border="1" data-bbox="391 701 943 869"> <tr> <th data-bbox="391 701 531 734">T.C.</th> <th data-bbox="531 701 943 734">Capacitance Change</th> </tr> <tr> <td data-bbox="391 734 531 768">NPO</td> <td data-bbox="531 734 943 768">± 30 (ppm/$^{\circ}\text{C}$)</td> </tr> <tr> <td data-bbox="391 768 531 801">X7R</td> <td data-bbox="531 768 943 801">$\pm 15\%$</td> </tr> <tr> <td data-bbox="391 801 531 835">X5R</td> <td data-bbox="531 801 943 835">$\pm 15\%$</td> </tr> <tr> <td data-bbox="391 835 531 869">Y5V</td> <td data-bbox="531 835 943 869">+30%~-80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	± 30 (ppm/ $^{\circ}\text{C}$)	X7R	$\pm 15\%$	X5R	$\pm 15\%$	Y5V	+30%~-80%	<p>With no electrical load.</p> <table border="1" data-bbox="1038 701 1477 869"> <tr> <th data-bbox="1038 701 1158 734">T.C.</th> <th data-bbox="1158 701 1477 734">Operating Temp</th> </tr> <tr> <td data-bbox="1038 734 1158 768">NPO</td> <td data-bbox="1158 734 1477 768">-55 ~ 125$^{\circ}\text{C}$ at 25$^{\circ}\text{C}$</td> </tr> <tr> <td data-bbox="1038 768 1158 801">X7R</td> <td data-bbox="1158 768 1477 801">-55 ~ 125$^{\circ}\text{C}$ at 25$^{\circ}\text{C}$</td> </tr> <tr> <td data-bbox="1038 801 1158 835">X5R</td> <td data-bbox="1158 801 1477 835">-55 ~ 85$^{\circ}\text{C}$ at 25$^{\circ}\text{C}$</td> </tr> <tr> <td data-bbox="1038 835 1158 869">Y5V</td> <td data-bbox="1158 835 1477 869">-25 ~ 85$^{\circ}\text{C}$ at 20$^{\circ}\text{C}$</td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	X7R	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	X5R	-55 ~ 85 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	Y5V	-25 ~ 85 $^{\circ}\text{C}$ at 20 $^{\circ}\text{C}$
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Adhesive Strength of Termination	No remarkable damage or removal of the terminations	<p>Pressurizing force: 0201:2N 0402&0603:5N >0603:10N Test time: 10± 1 sec</p>																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	<p>Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(tow hrs each in three mutually Perpendicular directions.)</p>																				
Solderability	95% min. coverage of all metalized area.	<p>Solder temperature: 235$\pm 5^{\circ}\text{C}$ Dipping time: 2± 0.5 sec.</p>																				
Bending Test	<p>No remarkable damage Cap change: NPO: within$\pm 5\%$ or 0.5pF whichever is larger X7R, X5R: within$\pm 12.5\%$ Y5V: within$\pm 30\%$ (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>	<p>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5± 1sec. Measurement to be made after keeping at room temp. for 24± 2hrs(Class I) or 48± 4hrs(Class II) (Thickness>1.0mm, Thickness\leq 1.0mm)</p>																				
Resistance to Soldering Heat	<p>No remarkable damage Cap change: NPO: within$\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: within$\pm 7.5\%$ Y5V: within$\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.</p>	<p>Solder temperature: 270$\pm 5^{\circ}\text{C}$ Dipping time: 10± 1sec Preheating: 120 to 150$^{\circ}\text{C}$ for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10$^{\circ}\text{C}$ for 1hr and then set for 48± 4hrs at room temp. Measurement to be made after keep at room temp. for 24± 2 hrs.(Class I) or 48± 4 hrs.(Class II).</p>																				
Temperature Cycle	<p>No remarkable damage. Cap change: NPO: within$\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: within$\pm 7.5\%$ Y5V: within$\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p>	<p>Conduct the five cycles according to the temperature and time.</p> <table border="1" data-bbox="1038 1760 1517 1921"> <tr> <th data-bbox="1038 1760 1102 1794">Step</th> <th data-bbox="1102 1760 1398 1794">Temp.($^{\circ}\text{C}$)</th> <th data-bbox="1398 1760 1517 1794">Time(min)</th> </tr> <tr> <td data-bbox="1038 1794 1102 1827">1</td> <td data-bbox="1102 1794 1398 1827">Min. operating temp.+0/-3</td> <td data-bbox="1398 1794 1517 1827">30± 3</td> </tr> <tr> <td data-bbox="1038 1827 1102 1861">2</td> <td data-bbox="1102 1827 1398 1861">Room temp</td> <td data-bbox="1398 1827 1517 1861">2-3</td> </tr> <tr> <td data-bbox="1038 1861 1102 1895">3</td> <td data-bbox="1102 1861 1398 1895">Max. operating temp.+3/-0</td> <td data-bbox="1398 1861 1517 1895">30± 3</td> </tr> <tr> <td data-bbox="1038 1895 1102 1921">4</td> <td data-bbox="1102 1895 1398 1921">Room temp.</td> <td data-bbox="1398 1895 1517 1921">2-3</td> </tr> </table> <p>Before initial measurement(Cass II only): Perform 150+0/-10$^{\circ}\text{C}$ for 1hr and then set for 48± 4 hrs at room temp. Measurement to be made after keeping at room temp. for 24± 2 hrs.(Class I) or 48± 4 hrs.(Class II).</p>	Step	Temp.($^{\circ}\text{C}$)	Time(min)	1	Min. operating temp.+0/-3	30 ± 3	2	Room temp	2-3	3	Max. operating temp.+3/-0	30 ± 3	4	Room temp.	2-3					
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Humidity (steady state)	<p>No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R:≥10V, within±12.5%;6.3V, within±25% Y5V:≥10V, within±30%;6.3V, within+30/-40% Q/D.F. value: NPO: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R:</p> <table border="1" data-bbox="288 528 922 1061"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>3.0%</td> <td>6%</td> <td>0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF ; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF; 0603 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.68μF 0805 ≥ 2.2μF; 1206 ≥ 4.7μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0402 ≥ 2.2μF; 0603 ≥ 10μF 0805 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="288 1095 914 1592"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C<1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="288 1693 927 1939"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">Rx C ≥ 10Ω-F</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF 0603 ≥ 0.47uF; 0805 ≥ 2.2uF 1206 ≥ 0.47uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF ; 1206 ≥ 0.47μF	25V	5.0%	10%	0805 ≥ 1μF; 1210 ≥ 10μF	14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF	16V	5%	10%	0603 ≥ 0.15μF; 0603 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF 0805 ≥ 2.2μF; 1206 ≥ 4.7μF 1210 ≥ 22μF	10V	7.5%	15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF	20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	15%	30%	0402 ≥ 2.2μF; 0603 ≥ 10μF 0805 ≥ 4.7μF; 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	Rx C ≥ 10Ω-F	16V:0402 ≥ 0.22uF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF 0603 ≥ 0.47uF; 0805 ≥ 2.2uF 1206 ≥ 0.47uF; 1210 ≥ 47uF	6.3V	<p>Test temp: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.(Class I) or 48±4 hrs. (Class II).</p>
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Humidity load	<p>No remarkable damage. Cap change: NPO: $\pm 7.5\%$ or $0.75\mu\text{F}$ whichever is larger X5R, X5R: $\geq 10\text{V}$, within $\pm 12.5\%$; 6.3V, within $\pm 25\%$ Y5V: $\geq 10\text{V}$, within $\pm 30\%$; 6.3V, within $+30/-40\%$ Q/D.F. value: NPO: $C \geq 30\mu\text{F}, Q \geq 200$; $C < 30\mu\text{F}, Q \geq 100+10/3C$</p> <p>X7R, X5R:</p> <table border="1" data-bbox="384 506 1010 1111"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>$\geq 50\text{V}$</td> <td>3.0%</td> <td>6%</td> <td>0201(50V); 0603 $\geq 0.047\mu\text{F}$ 0805 $\geq 0.18\mu\text{F}$; 1206 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0805 $\geq 1\mu\text{F}$; 1210 $\geq 10\mu\text{F}$</td> </tr> <tr> <td>14%</td> <td>0603 $\geq 0.33\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.10\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 6.8\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$ 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.033\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$ 1210 $\geq 22\mu\text{F}$</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 0.33\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$ 1210 $\geq 22\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0402 $\geq 2.2\mu\text{F}$; 0603 $\geq 10\mu\text{F}$ 0805 $\geq 4.7\mu\text{F}$; 1210 $\geq 100\mu\text{F}$</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="384 1173 1010 1715"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>$\geq 50\text{V}$</td> <td>7.5%</td> <td>10%</td> <td>0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$ 1206 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 0805 $\geq 0.033\mu\text{F}$; 1206 $\geq 1\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V ($C < 1.0\mu\text{F}$)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.22\mu\text{F}$</td> </tr> <tr> <td>16V ($C \geq 1.0\mu\text{F}$)</td> <td>12.5%</td> <td>20%</td> <td>0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 3.3\mu\text{F}$ 1206 $\geq 10\mu\text{F}$; 1210 $\geq 22\mu\text{F}$ 1812 $\geq 47\mu\text{F}$</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: $\geq 10\text{V}$ 500MΩ or 25Ω-F (Whichever is smaller) Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="384 1809 1010 2033"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="4">RxC $\geq 5\Omega$-F</td> </tr> <tr> <td>16V: 0402 $\geq 0.22\mu\text{F}$</td> </tr> <tr> <td>10V: 0201 $\geq 47\text{nF}$; 0402 $\geq 0.47\mu\text{F}$ 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	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Item	Requirement	Test Method																																				
High Temperature Load (Endurance)	No remarkable damage Cap change: NPO: $\pm 3\%$ or $\pm 0.3F$ whichever is larger X7R, X5R: $\geq 10V$, within $\pm 12.5\%$; 6.3V, within $+30/-40\%$ Q/D.F. value: NPO: more than 30pF, $Q \geq 350$ $10pF \leq C < 30pF$, $Q \geq 275+2.5C$ Less than 10pF, $Q \geq 200+10C$ X7R, X5R:	Test temp: NPO, X7R: $125 \pm 3^\circ C$ X5R, Y5V: $85 \pm 3^\circ C$ To apply voltage: (1.1) 100% of rated voltage for below range <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R</td> <td>6.3V,10V</td> <td>$C \geq 0.1\mu F$</td> </tr> <tr> <td>0402</td> <td>X5R,Y5V</td> <td>6.3V,10V</td> <td>$C \geq 1.0\mu F$</td> </tr> <tr> <td>0603</td> <td>X5R</td> <td>6.3V,10V</td> <td>$C \geq 4.7\mu F$</td> </tr> <tr> <td>0805</td> <td>X5R</td> <td>6.3V</td> <td>$C \geq 22\mu F$</td> </tr> </tbody> </table> (1.2) 6.3V or $C \geq 10\mu F$: 150% of rated voltage (2) $10V \leq U_r < 500V$: 200% of rated voltage 150% of rated voltage for below range <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0603</td> <td>X5R</td> <td>10V,16V</td> <td>$C \geq 1.0\mu F$</td> </tr> <tr> <td>0805</td> <td>X5R</td> <td>10V</td> <td>$C \geq 4.7\mu F$ $T = 0.85 \pm 0.1mm$</td> </tr> <tr> <td>1206</td> <td>X5R</td> <td>10V</td> <td>$C \geq 4.7\mu F$ & $T = 0.85 \pm 0.1mm$</td> </tr> </tbody> </table> (3) 500V: 150% of rated voltage (4) $U_r \geq 630V$: 120% of rated voltage Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for $24 \pm 2hrs$.(Class I) or $48 \pm 4hrs$.(Class II).	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R	6.3V,10V	$C \geq 0.1\mu F$	0402	X5R,Y5V	6.3V,10V	$C \geq 1.0\mu F$	0603	X5R	6.3V,10V	$C \geq 4.7\mu F$	0805	X5R	6.3V	$C \geq 22\mu F$	Size	Dielectric	Rated voltage	Capacitance range	0603	X5R	10V,16V	$C \geq 1.0\mu F$	0805	X5R	10V	$C \geq 4.7\mu F$ $T = 0.85 \pm 0.1mm$	1206	X5R	10V	$C \geq 4.7\mu F$ & $T = 0.85 \pm 0.1mm$
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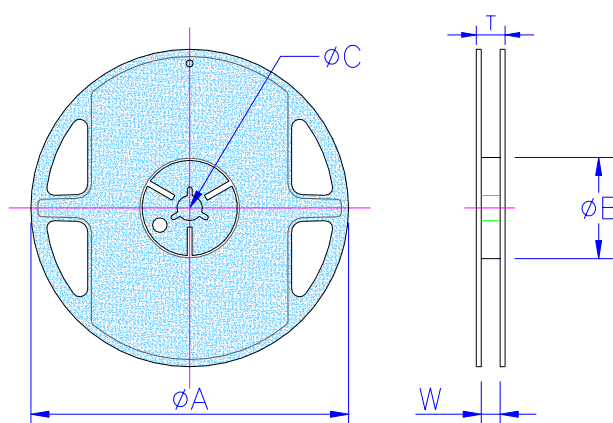
■ Packaging

Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.07	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

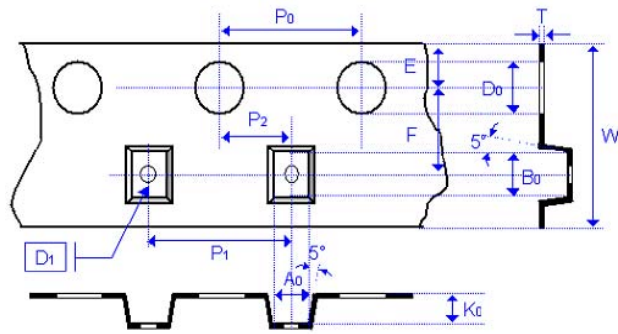
Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
ΦC	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
ΦA	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
ΦB	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

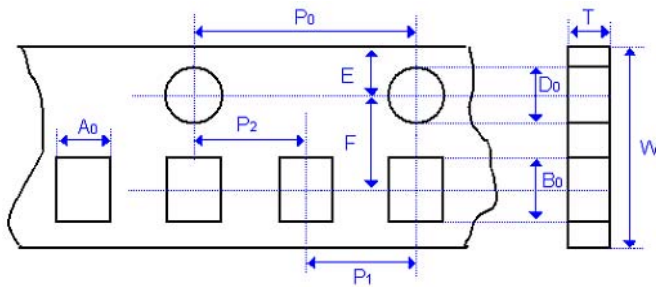
Plastic Tape Size Specification



Unit: mm

Type	0805		1206				1210				1808		1812				
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A ₀	<1.57		<1.85		<1.95		<2.97		<2.97		<2.35		<3.81				
B ₀	<2.40		<3.46		<3.67		<3.73		<3.73		<4.98	<5.00	<5.30				
T	0.23±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		<2.50		<3.00		<2.50		<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±0.10		4.00±0.10		4.00±0.10		4.00±0.10				
P ₁	4.00±0.10		4.00±0.10		4.00±0.10		4.00±0.10		4.00±0.10		4.00±0.10		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	1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05				
D ₁	1.00±0.10		1.00±0.10		1.00±0.10		1.00±0.10		1.00±0.10		1.00±0.10		1.00±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		3.50±0.05		5.50±0.05				

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A ₀	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B ₀	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
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
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±0.05
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