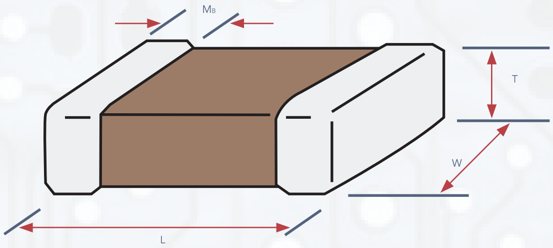
AUTOMOTIVE MULTILAYER CERAMIC CHIP CAPACITORS
- GMG SERIES -

SCOPE

- Consists of conducting material and electrodes - to achieve chip-type SMT and small size, high denisty and high efficience ceramic condensers are used.
- NPO, X7R, & X5R dielectrics provide product with high electrical precision, stability and reliability
- Assured quality performance in automotive applications

CONSTRUCTION AND DIMENSIONS



SIZE INCH (MM)	L (MM)	W (MM)	T / SYMBOL (MM)		SOLDERING METHOD*	M_B (MM)
0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	B	R	0.15±0.05
	0.6±0.05$^{\#2}$	0.3±0.05$^{\#2}$	0.3±0.05$^{\#2}$			
	0.6±0.09$^{\#3}$	0.3±0.09$^{\#3}$	0.3±0.09$^{\#3}$			0.15+0.1/-0.05
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	E	R	0.25+0.05/-0.10
			0.50+0.02/-0.05	D		
	1.00±0.20	0.50±0.20	0.5±0.20	C		
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	I	R/W	0.40±0.15
	1.60+0.15/-0.10	0.80-0.15/-0.10	0.50±0.10	F		
			0.80-0.15/-0.10	H		
	1.60±0.20$^{\#1}$	0.80±0.20$^{\#1}$	0.8±0.20$^{\#1}$			
0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	F	R/W	0.50±0.20
			0.60±0.10	G		
			0.80±0.10	J		
			1.25±0.10	N	R	
	2.00±0.20	1.25±0.20	0.85±0.10	K	R/W	
			1.25±0.20	O	R	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	J	R/W	0.60±0.20 (0.5±0.25)***
			0.95±0.10	L	R	
			1.25±0.10	N		
	3.20±0.20		1.15±0.15	M		
		1.60±0.20	1.60±0.20	R		
			0.85±0.10	K	R/W	
	3.20+0.30/-0.10	1.60+0.30/-0.10	1.60+0.30/-0.10	Q	R	
1210 (3225)	3.20±0.30	2.50+0.20	0.95±0.10	L	R	0.75±0.25
			0.85±0.10	K		
			1.25±0.10	N		
	2.00±0.20	2.50+0.30	1.60±0.20	R		
			2.00±0.20	S		
			2.50±0.30	T		
	3.20±0.60$^{\#4}$	2.50±0.50$^{\#4}$	2.50±0.50$^{\#4}$			
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	N	#	0.75±0.25 (0.5±0.25)***
			1.60±0.20	R		
			2.00±0.20	S		
		3.20±0.40	2.50±0.30	T	#	
			2.80±0.30	U		

* R = Reflow soldering process ; W = Wave soldering process.
** For 1808/1812/1825_200V~4000V and safety certificated products.
*** For 1206_≥1000V, 1808/1812_200V~4000V and safety certificated products.
#1: For 0603/Cap≥10μF or 0603(≤6.3V)/Cap≥4.7μF or 0603(>10V)/Cap>1μF products,
Excluding 0603X225(16V&25V),0603S225(6.3V&16V),0603X475(6.3V&16V),0603S475(4V&6.3V).
#2: For 0201/ 0.1uF < Cap < 0.68uF products, Excluding 0201X334~474(≤6.3V) & 0201X224(≤10V).
#3: For 0201/Cap≥0.68μF products.
#4: For 1210(200V&250V)/Cap>0.47μF products.
#5: For 1206(100V)/Cap≥1.2μF products.

APPLICATIONS

- For navigation and information equipment
- For entertainment equipment
- For comfortable equipment

FEATURES

- Wide selection of sizes available
- High capacitance in given case size
- Lead free termination (pure Tin)

STD. ELECTRICAL SPECIFICATIONS

DIALECTRIC	NP0	X7R	X5R
SIZE	0402, 0603, 0805, 1206, 1210, 1812		
CAPACITANCE RANGE **	0.5pF to 0.033μF	100pF to 2.2μF	0.056μF to 10μF
CAPACITANCE TOLERANCE **	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)	J (±5%), K (±10%), M (±20%)	
RATED VOLTAGE (WVDC)	16V, 25V, 50V, 100V	10V, 16V, 25V, 50V, 100V, 200V, 250V	6.3V, 10V, 16V, 25V
TAN δ*	Cap<30pF: Q≥400+20C Cap:≥30pF: Q≥1000	Note 1	
INSULATION RESISTANCE AT UR	≥10GΩ or RxC≥500Ω - F whichever is less		
OPERATING TEMPERATURE	-55° to +125°C		-55° to +85°C
CAPACITANCE CHARACTERISTIC	±30ppm/°C	±15%	
TERMINATION	Ni/Si (lead-free termination)		

*Measured at the condition of 30~70% related humidity.
NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature
Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10uF; 0.5±0.2Vrms, 120Hz±20% for C> 10uF, 30-~70% related humidity, 25°C ambient temperature for X7R, X5R
** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.
Note 1: X7R, X5R

RATED VOLTAGE	D.F. ≤	EXCEPTION OF D.F. ≤	
≥50V	≤2.5%	≤3%	0603≥0.047uF; 0805≥0.18uF; 1206≥0.47uF
		≤5%	1210≥4.7uF
		≤10%	0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥10uF
35V	≤3.5%	≤10%	0805≥2uF; 1210≥10uF
25V	≤3.5%	≤5%	0805≥1uF; 1210≥10uF
		≤7%	0603≥0.33uF; 1206≥4.7uF
		≤10%	0402≥0.10uF; 0603≥0.47uF; 0805≥2.2uF; 1206≥6.8uF; 1210≥22uF
16V	≤3.5%	≤5%	0402≥0.033uF; 0603≥0.15uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF
		≤10%	0402≥0.22uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF
10V	≤5%	≤10%	0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF
		≤15%	0402≥1uF
6.3V	10%	≤15%	0402≥1uF; 0603≥10uF; 0805≥4.7uF; 1206≥47uF; 1210≥100uF
		≤20%	0402≥2.2uF
4V	≤15%	---	---

PART NUMBER

GMG	04	CG	102	J	50	NT	4
PRODUCT TYPE	SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE	PACKAGING CODE	REEL SIZE
Without AEC-Q200 qualification	04 - 0402 10 - 0603 21 - 0805 31 - 1206 32 - 1210 43 - 1812	CG - NPO (C0G) X7R - X7R	0R5: 0.5pF 5R0: 5pF 100: 10pF 101: 100pF 102: 1000pF 103: 0.01uF 104: 0.1uF 105: 1.0uF 106: 10uF	B: ± 0.1pF C: ± 0 25pF D: ± 0 5pF F: ± 1% G: ± 2% J: ± 5% K: ± 10% M: ± 20%	6R3: 6.3VDC 10: 10VDC 16: 16VDC 25: 25VDC 50: 50VDC 100: 100VDC 200: 200VDC 250: 250VDC 500: 50VDC 101: 100VDC 201: 200VDC 251: 250VDC 501: 500VDC 631: 630VDC 102: 1KVDC 302: 3KVDC	NT: Tape Reel	1: 1K 2: 2K 3: 3K 4: 4K 5: 5K 6: 6K 9: 9K 10: 10K 15: 15K 50: 50K

MS LEVEL 1 RoHS HF

NP0 / COG

DIELECTRIC			NP0 / COG																																																	
DIMENSION (MM)			0201					0402					0603							0805									1206										1210										1812				
RATED VOLTAGE			10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	200	250	10	16	25	50	100	200	250	500	630	10	16	25	50	100	200	250	500	630	1K	10	16	25	50	100	200	250	500	630	1K	10	16	25	50	100
CAP. RANGE	0.1	0R1	B	B	B	B	B	E	E	E	E	E								G	G	G	G	G	G	G	G	G																									
	0.2	0R2	B	B	B	B	B	E	E	E	E	E								G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J																
	0.3	0R3	B	B	B	B	B	E	E	E	E	E								G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.4	0R4	B	B	B	B	B	E	E	E	E	E								G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.5pF	0R5	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.6	056	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.7	0R7	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.8	0R8	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	0.9	0R9	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	1	1R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	1.2	1R2	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	1.5	1R5	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	1.8	1R8	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	2.2	2R2	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	2.7	2R7	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	3.3	3R3	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	3.9	3R9	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	4.0	4R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	4.7	4R7	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	5.0	5R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	5.6	5R6	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	6.0	6R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	6.8	6R8	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	7.0	7R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	8.0	8R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	8.2	8R2	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	9.0	9R0	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J															
	10	100	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	L	L	L	L	L	L	L	L	L	L					N
	12	120	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	L	L	L	L	L	L	L	L	L	L					N
	15	150	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	L	L	L	L	L	L	L	L	L	L					N
	18	180	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	L	L	L	L	L	L	L	L	L	L					N
	22	220	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	27	270	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	33	330	B	B	B	B	B	E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	39	390	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	47	470	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	56	560	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	68	680	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	82	820	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	L					N
	100	101	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	N					N
	120	121	B	B	B	B		E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	J	J	N	N	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	N					N
	150	151						E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	N	N	N	N	J	J	J	J	J	J	J	J	J	N	L	L	L	L	L	L	L	L	L	N					N
	180	181						E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	N	N	N	N	J	J	J	J	J	J	J	J	J	R	L	L	L	L	L	L	L	L	L	N					N
	220	221						E	E	E	E	E	I	I	I	I	I	I	I	G	G	G	G	G	N	N	N	N	J	J	J	J	J	J	J	J	J	R	L	L	L	L	L	L	L	L	L	R					N
	270	271						E	E	E	E		I	I	I	I	I	H	H	G	G	G	G	G	N	N	N	N	J	J	J	J	J	J	L	L	L	R	L	L	L	L	L	L	L	L	L	R					N
	330	331						E	E	E	E		I	I	I	I	I	H	H	G	G	G	G	G	N	N	N	N	J	J	J	J	J	J	L	L	L	R	L	L	L	L	L	L	L	L	L	R					N
	390	391						E	E	E	E		I	I	I	I	I	H	H	J	J	J	J	J	N	N	N	N	J	J	J	J	J	J	L	L	L	R	L	L	L	L	L	L	L	L	L	R					N
	470	471						E	E	E	E		I	I	I	I	I	H	H	J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	L	L	L	R	L	L	L	L	L	L	L	L	L	R					N
	560	561						E	E	E	E		I	I	I	I	I	H	H	J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	N	N	N	R	L	L	L	L	L	L	L	L	L	R					N
	680	681						E	E	E	E		I	I	I	I	I	H	H	J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	N	N	N	R	L	L	L	L	L	L	L	L	L	R					N
	820	821						E	E	E	E		I	I	I	I	I	H	H	J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	R	R	R	R	L	L	L	L	L	L	L	L	L	R					N
	1000	102						E	E	E	E		I	I	I	I	I			J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	R	R	R	R	L	L	L	L	L	N	N	N	N	R	N	N	N	N	N
	1200	122											H	H	H	H	H			J	J	J	J	J	N	N	O	O	J	J	J	J	J	L	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	1500	152											H	H	H	H	H			J	J	J	J	J	N	N	O	O	J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	1800	182											H	H	H	H	H			J	J	J	J	J	N	N	O	O	J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	2200	222											H	H	H	H				J	J	J	J	J	N	N	O	O	J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	2700	272											H	H	H	H				N	N	N	N	N	O	O			J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	3300	332											H	H	H	H				N	N	N	N	N	O	O			J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	3900	392																		N	N	N	N	N	O	O			J	J	J	J	J	N	R	R	R		L	L	L	L	L	N	N	N	N	S	N	N	N	N	N
	4700	472																		N	N	N	N	N	O	O			J	J	J	J	J	N	R	R	R		L	L	L	L	L	R	R	R	R	S	N	N	N	N	N
	5600	562																		N	N	N	N	N					J	J	J	J	J	R	R				L	L	L	L	L	R	R	R	R	S	N	N	N	N	N
	6800	682																		N	N	N	N	N					L	L	L	L	L	R	R				L	L	L	L	L	R	R	R	R	S	N	N	N	N	N
	8200	822																		N	N	N	N	N					N	N	N	N	N	R	R				L	L	L	L	L	R	R	R	R	S	N	N	N	N	N
	0.010uF	103																		N	N	N	N	N					N	N	N	N	N	R	R				L	L	L	L	L	R	R	S	S	T	N	N	N	N	N
	0.012	123																		N	N	N	N	N															N	N	N	N	N	S	S	T	T	T	N	N	N	N	N
	0.015	153																		N	N	N	N	N															N	N	N	N	N	S	S	T	T	T	N	N	N	N	N
	0.018	183																		N	N	N	N	N															S	S	S	S	S	S	S				N	N	N	N	N
	0.022	223																		N	N	N	N	N															S	S	S	S	S	S	S				N	N	N	N	N
	0.027	273																																					S	S	S	S	S	S	S				N	N	N	N	N
	0.033	333																																					S	S	S	S	S	S	S				N	N	N	N	N
	0.039	393																																					S	S	S	S	S	S	S								
	0.047	473																																					S	S	S	S	S	S	S								

B	E	G	H	I	J	L	N	O	R	S	T
0.3±0.03 0.3±0.05#2 0.3±0.09#3	0.50±0.05	0.60±0.10	0.80+0.15/-0.10 0.8±0.20#1	0.80±0.07	0.80±0.10	0.95±0.10	1.25±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30

MS LEVEL 1 RoHS Pb HF

X7R

DIELECTRIC		X7R																																																
DIMENSION (MM)		0201				0402				0603					0805										1206									1210									1812							
RATED VOLTAGE		10	16	25	50	10	16	25	50	10	16	25	50	100	10	16	25	50	100	200	250	500	630	1K	10	16	25	50	100	200	250	500	630	10	16	25	50	100	200	250	500	1K	10	16	25	50	100	200	250	3K
CAP. RANGE																																																		
100	101	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I						N	N	N	N							N	N	N								
120	121	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I						N	N	N	N							N	N	N								
150	151	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								
180	181	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								
220	221	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								
270	271	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								S
330	331	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								S
390	391	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								S
470	471	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								S
560	561	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							N	N	N								S
680	681	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							L	N	N								S
820	821	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N							L	N	N								S
1000	102	B	B	B	B	D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	S
1200	122	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	S
1500	152	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	S
1800	182	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	T
2200	222	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	T
2700	272	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	T
3300	332	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	N	N	N	N	N	N	N	N	T
3900	392	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	I	I	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	T
4700	472	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	N	N	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	T
5600	562	B	B	B		D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	N	N	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	
6800	682	B				D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	N	N	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	
8200	822	B				D	D	D	D	H	H	H	H	H	I	I	I	I	I	I	I	N	N	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	
0.010	103	B				D	D	D	D	H	H	H	H	H	I	I	I	I	I	N	N	N	N	N	I	I	I	I	I	N	N	N	N	L	L	L	L	L	L	L	N	R	N	N	N	N	N	N	N	
0.012	123					D	D	D		H	H	H	H	J	I	I	I	I	I	N	N				I	I	I	I	I	N	N			L	L	L	L	L	L	L	N		N	N	N	N	N	N	N	
0.015	153					D	D	D		H	H	H	H	J	I	I	I	I	I	N	N				I	I	I	I	I	N	N			L	L	L	L	L	L	L	N		N	N	N	N	N	N	N	
0.018	183					D	D	D		H	H	H	H	J	I	I	I	I	I	N	N				I	I	I	I	I	N	N			L	L	L	L	L	L	L	N		N	N	N	N	N	N	N	
0.022	223					D	D	D		H	H	H	H	J	I	I	I	I	I	N	N				I	I	I	I	I	N	N			L	L	L	L	L	L	L	N		N	N	N	N	N	N	N	
0.027	273					D	D	D		H	H	H	H	J	I	I	I	I	N						I	I	I	I	I	N	N			L	L	L	L	L	L	L			N	N	N	N	N	N	N	
0.033	333					D	D	D		H	H	H	J	J	I	I	I	I	N						I	I	I	I	I	R	R			L	L	L	L	L	L	L			N	N	N	N	N	N	N	
0.039	393					D	D	D		H	H	H	J	J	I	I	I	I	N						I	I	I	I	I	R	R			L	L	L	L	L	L	L			N	N	N	N	N	N	N	
0.047	473					D	D	D		H	H	H	J	J	I	I	I	I	N						I	I	I	I	I	R	R			L	L	L	L	L	N	N			N	N	N	N	N	N	N	
0.056	563					D	D	D		H	H	H	J		I	I	I	I	N						I	I	I	I	I	R	R			L	L	L	L	L	N	N			N	N	N	N	N	N	N	
0.068	683					D	D	D		H	H	H	J		I	I	I	I	N						I	I	I	I	I	R	R			L	L	L	L	L	R	R			N	N	N	N	N	N	N	
0.082	823					D	D	D		H	H	H	J		I	I	I	I	N						I	I	I	I	N	R	R			L	L	L	L	L	R	R			N	N	N	N	N	N	N	
0.10uF	104					D	D	D		H	H	H	J		I	I	I	I	N						I	I	I	I	N	R	R			L	L	L	L	L	R	R			N	N	N	N	N	N	N	
0.12	124									H	H	J			I	I	I	N							I	I	I	I	N					L	L	L	L	L	R	R			N	N	N	N	N	N	N	
0.15	154									H	H	J	J		N	N	N	N							L	L	L	L	R					L	L	L	L	N	T	T			N	N	N	N	N	S	S	
0.18	184									H	H	J			N	N	N	N							L	L	L	L	R					L	L	L	L	N	T	T			N	N	N	N	N	S	S	
0.22	224									H	H	J	J		N	N	N	N							L	L	L	L	R					L	L	L	L	N	T	T			N	N	N	N	N	S	S	
0.27	274									J	J	J			N	N	N	O							L	L	L	N						L	L	L	L	R	T	T			N	N	N	N	N	S	S	
0.33	334									J	J	J	J		N	N	N	O							L	L	L	N						L	L	L	N	R	T	T			N	N	N	N	N	S	S	
0.39	394									J	J	J			N	N	N	O							L	L	M	Q						L	L	L	N	T	T	T			N	N	N	N	N	S	S	
0.47	474									J	J	J			N	N	N	O							M	M	M	Q						L	L	L	N	T	T	T			N	N	N	N	S	S	S	
0.56	564														N	N	N								M	M	M	Q						N	N	N	N	T					N	N	N	N	S			
0.68	684														N	N	N	O							M	M	M	Q						N	N	N	N	S					N	N	N	S	S			
0.82	824														N	N	N								M	M	M	Q						N	N	N	N	S					N	N	N	S	S			
1.00	105														N	N	N	O							M	M	M	Q						N	N	N	N	S					N	N	N	S	S			
1.50	155																								M	M	Q							S	S	R											S			
2.20	225																								M	M	Q							S	S	R											T			
4.70	475																																																	
10	106																																																	

B	D	H	I	J	L	M	N	O	Q	R	S	T
0.3±0.03 0.3±0.05$^{\#2}$ 0.3±0.09$^{\#3}$	0.50±0.05	0.80±0.07	0.80±0.10	0.80+0.15/-0.10	0.95±0.10	1.15±0.15	1.25±0.10	1.25±0.20	1.60+0.30/-0.10	1.60±0.20	2.00±0.20	2.50±0.30

X5R

DIELECTRIC			X5R																	
DIMENSION (MM)			0402				0603				0805				1206				1210	
RATED VOLTAGE			6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	10	16
CAP. RANGE	0.022	223																		
	0.033	333																		
	0.047	473																		
	0.068	683		D																
	0.10uF	104		D	D															
	0.15	154		D	D															
	0.22	224	D	D	D					J										
	0.33	334	D	D				J	J	J										
	0.47	474	D					J	J	J										
	0.68	684	D					J	J	J										
	1.00	105					J	J	J	J										
	1.50	155									O	O				M	M	Q	S	S
	2.20	225									O	O	O	O		M	M	Q	S	S
	3.3	335											O	O	Q	Q	Q	Q	S	S
	4.70	475											O	O	Q	Q	Q	Q	S	S
	6.8	685													Q					
	10	106													Q					
	22	226																		

D	E	J	M	O	Q	S
0.50±0.05	0.50±0.05	0.80+0.15/-0.10	1.15±0.15	1.25±0.20	1.60+0.30/-0.10	2.00±0.20

MS LEVEL 1 RoHS Pb HF

RELIABILITY TEST CONDITIONS AND DIMENSIONS

<table>
<thead>
<tr><th>NO.</th><th>TEST ITEM</th><th>TEST CONDITION</th><th>REQUIREMENTS</th></tr>
</thead>
<tbody>
<tr><td>1.</td><td>Visual and Mechanical</td><td>- - -</td><td>- No remarkable defect.
- Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td rowspan="2">Class I: NP0
Cap≤1000pF, 1.0±0.2Vrms I 1MHz±10%
Cap>1000pF, 1.0±0.2Vrms I 1KHz±10%

Class II: X7R, X5R
Cap≤10μF, 1.0±0.2Vrms I 1KHz±10%
Cap>10μF, 0.5±0.2Vrms I 120Hz±20%</td><td>- Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/D.F. (Dissapation Factor)</td><td>- NP0: Cap≥30pF, Q≥1000; Cap≥30pF, Q≥400+20C
X7R, X5R
<table>
<tr><th>RATED VOL.</th><th>D.F. ≤</th><th colspan="2">EXCEPTION OF D.F. ≤</th></tr>
<tr><td rowspan="3">≥50V</td><td rowspan="3">≤2.5%</td><td>≤3%</td><td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr>
<tr><td>≤5%</td><td>1210≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td></tr>
<tr><td>35V</td><td>≤3.5%</td><td>≤10%</td><td>0805≥2.2μF; 1210≥10μF</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; 1210≥22μF</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>0402≥0.22uF; 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>0402≥1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≤10%</td><td>≤15%</td><td>0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td></tr>
<tr><td>≤20%</td><td>1210≥100μF</td></tr>
<tr><td>4V</td><td>≤15%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td>4.</td><td>Dielectric Strength</td><td>- To apply (≤100V) 250%
- Duration 1 to 5 seconds
- Charge and discharge current less than 50mA</td><td>- No evidence of damage or flas over during test.</td></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>- To apply rated voltage for max. 120 seconds</td><td>10GΩ or RxC≥500ΩF Whichever is smaller
<table>
<tr><th>RATED VOLTAGE</th><th>INSULATION RESITANCE</th></tr>
<tr><td>100V: X7R</td><td rowspan="4">10GΩ or RxC≥100 Ω-F whichever is smaller.</td></tr>
<tr><td>16V: 0402≥0.22μF</td></tr>
<tr><td>10V: 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF; 1210≥47μF</td></tr>
<tr><td>6.3V</td></tr>
</table></td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>- With no electrical load
<table>
<tr><th>T.C.</th><th>CAPACITANCE CHANGE</th></tr>
<tr><td>NP0</td><td>-55~125°C at 25°C</td></tr>
<tr><td>X7R</td><td>-55~125°C at 25°C</td></tr>
<tr><td>X5R</td><td>-55~85°C at 25°C</td></tr>
</table></td><td>
<table>
<tr><th>T.C.</th><th>CAPACITANCE CHANGE</th></tr>
<tr><td>NP0</td><td>Within ±33ppm/°C</td></tr>
<tr><td>X7R</td><td>Within ±15%</td></tr>
<tr><td>X5R</td><td>Withink ±15%</td></tr>
</table></td></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td>- Pressurizing force: 5N (≤0603) and 10N (>0603)
- Test time: 10±1 sec.</td><td>- No remarkable damage or removal of the terminations.</td></tr>
<tr><td>8.</td><td>Vibration Resistance</td><td>- Vibration frequency: 10-55 Hz/min.
- Total amplitude: 1.5mm
- Test time: 6hrs.
(Two hrs each in three mutually perpendicular directions.)
- Measurement to be made after keeping at room temp. for 24±2hrs.</td><td>- No remarkable damage
- Cap change and Q/D.F.: To meet initial spec.</td></tr>
<tr><td>9.</td><td>Solderability</td><td>- Solder temperature: 235±5°C
- Dipping time 2±0.5 sec.</td><td>- 95% min. coverage of all metalized area.</td></tr>
<tr><td>10.</td><td>Bending Test</td><td>- The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec.
- Measurement to be made after keeping at room temp. for 24±2 hrs..</td><td>- No remarkable damage
- Cap change:
NP0: within ±5% or 0.5pF whichever is larger
X7R, X5R: within ±12.5%
(This capacitance change the means change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11.</td><td>Resistance to Soldering Heat</td><td>- Solder temperature: 260±5°C
- Dipping time: 10±1sec
- Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder
- Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp.
- Measurement to be made after keeping at room temp. for 24±2hrs.</td><td>- No remarkable damage
- Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger
X7R, X5R: within ±7.5%
- Q/D.F., I.R. and dielectric strength: To meet initial requirements.
- 25% max. leaching on each edge.</td></tr>
<tr><td>12.</td><td>Temperature Cycle</td><td>- Conduct the five cycles according to the temperatures and time.
<table>
<tr><th>STEP</th><th>TEMP. (°C)</th><th>TIME (MIN.)</th></tr>
<tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room Temp</td><td>2~3</td></tr>
<tr><td>3</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>4</td><td>Room Temp</td><td>2~3</td></tr>
</table>
- Before initial measurement (Class II only): perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp.
- Measurement to be made after keeping at room temp. for 24±2hrs</td><td>No remarkable damage
- Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger
X7R, X5R: within ±7.5%
- Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
</tbody>
</table>

RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS
13.	Humidity (Damp Heat) Steady State	- Test temp.: 40±2°C - Humidity 90~95% RH - Test time: 500+24/-0 hrs - Before initial measurement (Class II only): Perform 150+0/-10C for 1 hr and then set for 24±2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24±2 hrs.	- No remarkable damage - Cap change: NP0: within ±5% or ±0.5pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; C≥ 1μF, within ±25% **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%; - Q/D.F. value: NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R: *I.R.: ≥10V, 1GΩ OR 50 Ω-F whichever is smaller Class II (X7R, X5R):
14.	Humidity (Damp Heat) Steady State	- Test temp.: 40±2°C - Humidity 90~95% RH - Test time: 500+24/-0 hrs -To apply voltage : rated voltage. - Before initial measurement (Class II only): To apply test voltage for 1 hr at 40°C and then set for 24±2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24±2 hrs.	No remarkable damage - Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; C≥ 1μF, within ±25% **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%; - Q/D.F. value: NP0: More than 30pF Q≥200, C≤30pF, Q≥100+10/3C X7R, X5R: *I.R.: ≥10V, 500MΩ OR 25 Ω-F whichever is smaller Class II (X7R, X5R):

MS LEVEL 1 RoHS Pb HF

RELIABILITY TEST CONDITIONS AND DIMENSONS

NO.	TEST ITEM
15.	High Temperature Load (Endruance)

TEST CONDITION

- Test temp.:
  NP0, X7R: 125±3°C
  X5R: 85±3°C
- Test time: 1000+24/-0 hrs
- To apply voltage:
  (1) ≤6.3V or C≥10μF:150% of rated voltage.
  (2) 10V≤Ur<500V: 200% of rated voltage.
  (3) 500V: 150% of rated voltage.
  (4) Ur≥630V: 120% of rated voltage.
  (5) 100% of rated voltage for below range.

SIZE	DIALECTRIC	RATED VOLTAGE	CAPACITANCE CHANGE
0402	X5R/X7R	6.3V, 10V	C≥1.0μF
0603	X5R/X7R	6.3V, 10V	C≥4.7μF
0805	X5R/X7R	6.3V	C≥22μF
1206	X5R/X7R	6.3V	C≥47μF
	NP0	3000V	C≥1.5μF

(6) 150% of rated voltage for below range.

SIZE	DIALECTRIC	RATED VOLTAGE	CAPACITANCE CHANGE
0402	X5R/X7R	10V, 16V, 25V	C≥0.22μF
0603	X5R/X7R	10V, 16V	C≥1.0μF
0805	X5R/X7R	10V	C≥4.7μF

*Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. and then set for 24±2 hrs at room temp.

*Measurement to be made after keeping at room temp. for 24±2 hrs

REQUIREMENTS

- No remarkable damage
- Cap change:
  NP0: ±3.0% or ±0.3pF whichever is larger
  X7R, X7E, X5R: ≥10V**,within ±12.5%; ≤6.3V within ±25%;
  C≥ 1uF,within ±25%
  **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%;

Q/D.F. value:
NP0: More than 30pF, Q≥350
10pF≤C<30pF, Q≥275+2.5C
Less than 10pF, Q≥200+10C

X7R, X5R:

RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	
≥50V	≤3%	≤6%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
		≤10%	1210≥4.7μF
		≤20%	0603>1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF
35V	≤5%	≤10%	0805≥2.2μF; 1210≥10μF
25V	≤3.5%	≤10%	0805≥1μF; 1210≥10μF
		≤14%	0603≥0.33μF; 1206≥4.7μF
		≤15%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF
16V	≤5%	≤10%	0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF, 1210≥4.7μF
		≤15%	0402≥0.33μF; 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%	0402≥1μF
6.3V	≤15%	≤30%	0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF
4V	≤20%	---	---

*I.R.: ≥10V, 1GΩ OR 50 Ω-F whichever is smaller

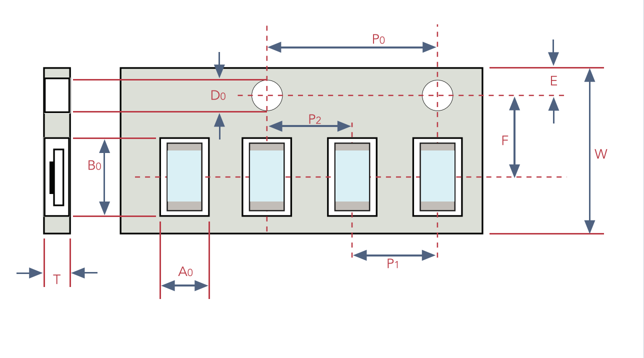
Class II (X7R, X5R)

RATED VOLTAGE	INSULATION RESITANCE
100V: X7R	1GΩ or RxC≥10 Ω-F whichever is smaller.
50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF	
35V: 0805≥2.2μF; 1210≥10μF	
25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF	
16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF	
10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	
6.3V; 4V	

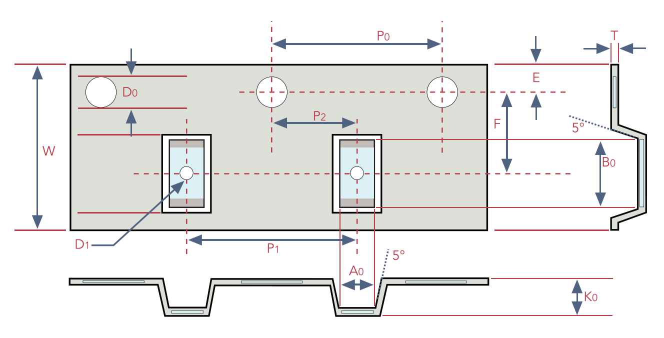
PACKAGING STYLE AND QUANTITY

SIZE	THICKNESS (MM) / SYMBOL	PAPER TAPE		PLASTIC TAPE	
		7″ REEL	13″ REEL	7″ REEL	13″ REEL
0402 (1005)	0.50 ± 0.5	10k	50k		
0603 (1608)	0.80 ± 0.07	4k	15k		
	0.80 ± 0.15/-0.10	4k	15k		
0805 (2012)	0.60 ± 0.10	4k	15k		
	0.80 ± 0.10	4k	15k		
	1.25 ± 0.10			3k	10k
	1.25 ± 0.20			3k	10k
1206 (3216)	0.80±0.10	4k	15k		
	0.95±0.10			3k	10k
	1.15±0.15			3k	10k
	1.25±0.10			3k	10k
	1.60±0.20			2k	10k
	1.60±0.30/-.010			2k	9k
1210 (3225)	0.95±0.10			3k	10k
	01.25±0.10			3k	10k
	01.60±0.20			2k	
	2.00±0.20			1k	6k
	2.50±0.30			1k	6k
1812 (4532)	1.25±0.10			1k	5k
	1.60±0.20			1k	

PACKAGING

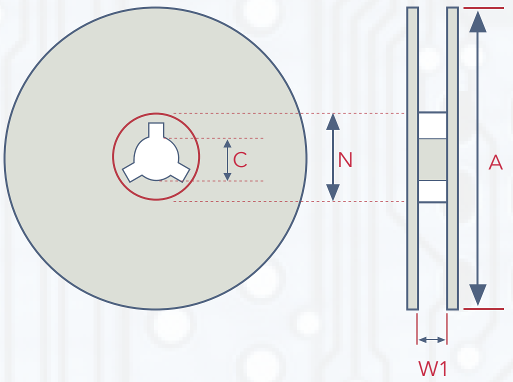


The dimension of paper tape



The dimension of plastic tape

SIZE	0402	0603	0805			1206			1210		1812
THICKNESS	N	S, B	A	X	M, C, I	X	M, J, C	E	M, C, E	G	C, F
A_0	0.62 ± 0.05	1.02 ± 0.05	1.05 ± 0.10	1.05 ± 0.10	<1.57	2.00 ± 0.10	<1.85	<1.95	<2.97	<2.97	<2.97
B_0	1.1 2± 0.05	1.80 ± 0.05	2.30 ± 0.10	2.30 ± 0.10	<2.40	3.50 ± 0.10	<3.43	<3.67	<3.73	<3.73	<3.73
T	0.60 ± 0.05	0.95 ± 0.05	0.75 ± 0.05	0.95 ± 0.05	0.23±0.05	0.95 ± 0.05	0.23 ± 0.05	0.23 ± 0.05	0.23 ± 0.5	0.23 ± 0.05	0.235±0.1
K_0	-	-	-	-	<2.50	-	<2.50	<2.50	<2.50	<3.00	<3.00
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	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	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
10 X P_0	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10	40.00 ± 0.10
P_1	2.00 ± 0.05	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	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	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	1.50 ± 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
E	1.75 ± 0.05	1.75 ± 0.05	1.75 ± 0.05	1.75 ± 0.05	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	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	5.50 ± 0.10



SIZE	0402, 0603, 0805, 1206, 1210		1812
REELSIZE	7″	13″	7″
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W_1	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0 ± 0.10	330.0 ± 1.0	178.0 ± 1.0
N	60.0+1.0/-0	100+1.0	60.0+1.0/-0

STORAGE AND HANDLING CONDITIONS

(1) To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions.
(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.

c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

RECOMMENDED SOLDERING CONDITIONS

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.