

Aillen® Multilayer Ceramic Capacitors

1. DESCRIPTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

MLCC is made by NP0, X7R, X6S, X5R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

- A wide selection of sizes is available (0201 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).

3. APPLICATIONS

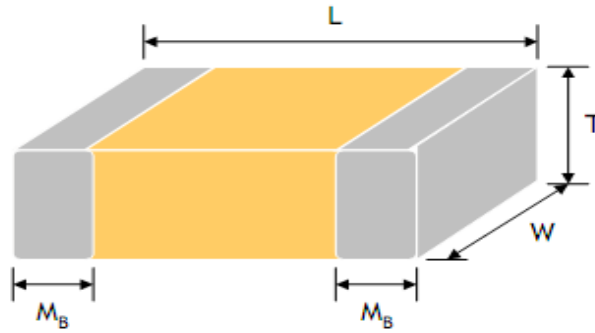
- For general digital circuit.
- For power supply bypass capacitors.
- For consumer electronics.
- For telecommunication

4. HOW TO ORDER

1206	B	104	K	500	A	D
Size Inch (mm) 0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	Dielectric N=NP0 (COG) B=X7R Y=Y5V W=X5R S=X6S	Capacitance Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 104=10x104=100nF	Tolerance A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	Rated Voltage Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0 =4 VDC 6R3 =6.3 VDC 100 =10 VDC 160 =16 VDC 250 =25 VDC 500 =50 VDC 101 =100 VDC	Thickness Item 5 & Item 7 for details	Packaging Quantity A: 1KPS/Reel B: 2KPS/Reel C: 3KPS/Reel D: 4KPS/Reel E: 15KPS/Reel I: 10KPS/Reel J: 2.5KPS/Reel F: others

Aillen® Multilayer Ceramic Capacitors

5. EXTERNAL DIMENSIONS



Size Inch(mm)	L (mm)	W (mm)	T(mm)/Symbol	Soldering Method *	MB (mm)	
01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.10±0.03
0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	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	H	R	0.25±0.05/-0.10
	1.00±0.20	0.50±0.20	0.50±0.02/-0.05	Q		
			0.5±0.20	E		
0603 (1608)	1.60±0.15/-0.10	0.80±0.15/-0.10	0.80±0.07	S	R/W	0.40±0.15
			0.50±0.10	N		
			0.80±0.15/-0.10	X		
	1.60±0.20 ^{#1}	0.80±0.20 ^{#1}				
0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	N	R/W	0.50±0.20
			0.60±0.10	A	R/W	
			0.85±0.15	B	R/W	
	1.25±0.15	C	R			
	2.00±0.20	1.25±0.20	0.85±0.10 ^{#4}	T ^{#4}	R/W	
			1.25±0.15	C	R	
1206 (3216)	3.20±0.15	1.60±0.15	0.85±0.15	B	R/W	0.60±0.20 (0.5±0.25) ^{***}
			0.95±0.10	I	R	
			1.25±0.15	C	R	
	3.20±0.20	1.60±0.20	1.15±0.15	J	R	
			1.60±0.15	D	R	
	3.20±0.30/-0.10	1.60±0.30/-0.10	0.85±0.10	T	R/W	
1210 (3225)	3.20±0.30	2.50±0.20	1.60±0.15	P	R	0.75±0.25
			0.95±0.10	I	R	
			0.85±0.10	T	R	
	3.20±0.40	3.20±0.40	1.25±0.15	C	R	
			2.00±0.20	D	R	
			2.00±0.20	K	R	
1808 (4520)	4.50±0.40 (4.5±0.5/-0.3) ^{**}	2.03±0.25	2.50±0.30	M	R	
			1.25±0.15	C	R	
			1.40±0.15	F	R	
			1.60±0.15	D	R	
1812 (4532)	4.50±0.40 (4.5±0.5/-0.3) ^{**}	3.20±0.30	2.00±0.20	K	R	0.75±0.25 (0.5±0.25) ^{***}
			2.50±0.30	M	R	
			2.80±0.30	U	R	
		3.20±0.40	1.25±0.15	C	R	
			1.60±0.15	D	R	
			2.00±0.20	K	R	

* R = Reflow soldering process ; W = Wave soldering process.

** For 1808_200V~3kV, 1812_200V~3kV and safety certificated products.

*** For 1206_1000V~3kV, 1808_200V~3kV, 1812_200V~3kV and safety certificated products.

#1 : For 0603/Cap ≥ 10μF or 0603(>10V)/Cap > 1 μF products.

#2 : For 0201/Cap ≥ 0.68μF products.

#3 : For 0201/Cap ≥ 1 μF products.

#4 : For 0805/0.22μF/100V/ T thickness:0.85±0.15/-0.1(mm).

Aillen® Multilayer Ceramic Capacitors

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	Y5V	X5R	X6S
Size	0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1 μF	100pF to 47μF	0.01 μF to 100μF	100pF to 220μF	0.1 μF to 100μF
Capacitance tolerance**	Cap≤5pF ^{#1} : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)	K (±10%), M (±20%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V,100V	6.3V, 10V, 16V, 25V, 50V, 100V		4V, 6.3V, 10V, 16V, 25V, 50V	
DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	See Note 1			
Operating temperature	55 to +125°C		-25 to +85°C	-55 to +85°C	-55 to +105°C
Capacitance characteristic	±30ppm	±15%	+30/-80%	±15%	±22%
Termination	Ni/Sn (lead-free termination)				

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide C tolerance.

* Measured at the condition of 30~70% related humidity, 20°C ambient temperature.

Class I: (NP0)

≤1000pF, 1.0±0.2Vrms, 1MHz±10%

>1000pF, 1.0±0.2Vrms, 1KHz±10%

Class II: (X7R, X7E, X6S, X5R, Y5V)

C≤10μF, 1.0±0.2Vrms, 1KHz±10%

C>10μF, 1.0±0.2Vrms, 120Hz±20%

** 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/X6S

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥100V	≤2.5%	≤3%	1206≥0.47μF
		≤5%	0805>0.1μF, 0603≥0.068 μF, 1206>1 μF
50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
		≤5%	1210≥4.7μF
		≤10%	0402≥0.1 μF; 0603>0.1 μF; 0805≥1μF; 1206 ≥2.2μF; 1210≥10μF
35V	≤3.5%	≤10%	0603≥1 μF; 0805≥2.2μF; 1210≥10 μF
		≤5%	0201≥0.01μF; 0805≥1 μF; 1210≥10μF
25V	≤3.5%	≤7%	0603≥0.33μF; 1206≥4.7μF
		≤10%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF
		≤12.5%	0402≥1μF
		≤5%	0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF
16V	≤3.5%	≤10%	0201≥0.1μF; 0402≥0.22uF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
		≤10%	0201≥0.012μF; 0402≥0.33μF(0402/X7R≥0.22μF); 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF
10V	≤5%	≤15%	0201≥0.1μF; 0402≥1 μF
		≤15%	0201≥0.1μF; 0402≥1 μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF ; 1210≥100μF;
6.3V	≤10%	≤20%	0402≥2.2μF
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4V	≤15%	---	---

Y5V

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥50V	≤5%	≤7%	0603≥0.1 μF; 0805≥0.47μF; 1210≥4.7μF
35V	≤7%	---	---
25V	≤5%	≤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%	≤9%	0402≥0.068μF; 0603≥0.68μF
		≤12.5%	0402≥0.22uF
16V (C≥1.0μF)	≤9%	≤12.5%	0603≥2.2μF; 0805≥3.3μF; 1206≥10μF; 1210≥22μF; 1812≥47μF
10V	≤12.5%	≤20%	0402≥0.47uF
6.3V	≤20%	---	---

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7. CAPACITANCE RANGE

7-1. NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

DIELECTRIC		NP0																	
SIZE		0201			0402				0603					0805					
RATED VOLTAGE (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (0R1)	L	L	L	H	H	H	H											
	0.2pF (0R2)	L	L	L	H	H	H	H											
	0.3pF (0R3)	L	L	L	H	H	H	H		S	S	S	S						
	0.4pF (0R4)	L	L	L	H	H	H	H		S	S	S	S						
	0.5pF (0R5)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	82pF (820)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
120pF (121)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A	
150pF (151)				H	H	H	H	H	S	S	S	S	S	A	A	A	A	A	
180pF (181)				H	H	H	H	H	S	S	S	S	S	A	A	A	A	A	
220pF (221)				H	H	H	H	H	S	S	S	S	S	A	A	A	A	A	
270pF (271)				H	H	H	H		S	S	S	S	S	A	A	A	A	A	
330pF (331)				H	H	H	H		S	S	S	S	S	A	A	A	A	A	
390pF (391)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
470pF (471)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
560pF (561)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
680pF (681)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
820pF (821)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
1,000pF (102)				H	H	H	H		S	S	S	S	S	B	B	B	B	B	
1,200pF (122)									X	X	X	X	X	B	B	B	B	B	
1,500pF (152)									X	X	X	X	X	B	B	B	B	B	
1,800pF (182)									X	X	X	X		B	B	B	B	B	
2,200pF (222)									X	X	X	X		B	B	B	B	B	
2,700pF (272)									X	X	X	X		C	C	C	C	C	
3,300pF (332)									X	X	X	X		C	C	C	C	C	
3,900pF (392)									X	X	X	X		C	C	C	C	C	
4,700pF (472)									X	X	X	X		C	C	C	C	C	
5,600pF (562)									X	X	X	X		C	C	C	C	C	
6,800pF (682)									X	X	X	X		C	C	C	C	C	
8,200pF (822)									X	X	X	X		C	C	C	C	C	
0.010μF (103)									X	X	X	X		C	C	C	C		
0.012μF (123)														T	T	T	T		
0.018μF (183)														C	C	C	C		
0.022μF (223)														C	C	C	C		

1、 The letter in cell is expressed the symbol of product thickness.

2、 For more information about products with special capacitance or other data, please contact our sales local representative.

Aillen® Multilayer Ceramic Capacitors

7-1. NP0 Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		NP0													
SIZE		1206					1210					1812			
RATED VOLTAGE(VDC)		10	16	25	50	100	10	16	25	50	100	16	50	100	
Capacitance	1.0pF (1R0)														
	1.2pF (1R2)	B	B	B	B	B									
	1.5pF (1R5)	B	B	B	B	B									
	1.8pF (1R8)	B	B	B	B	B									
	2.2pF (2R2)	B	B	B	B	B									
	2.7pF (2R7)	B	B	B	B	B									
	3.3pF (3R3)	B	B	B	B	B									
	3.9pF (3R9)	B	B	B	B	B									
	4.7pF (4R7)	B	B	B	B	B									
	5.6pF (5R6)	B	B	B	B	B									
	6.8pF (6R8)	B	B	B	B	B									
	8.2pF (8R2)	B	B	B	B	B									
	10pF (100)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	15pF (150)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	18pF (180)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	22pF (220)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	27pF (270)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	33pF (330)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	39pF (390)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	47pF (470)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	56pF (560)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	68pF (680)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	82pF (820)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	100pF (101)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	120pF (121)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	150pF (151)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	180pF (181)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	220pF (221)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	270pF (271)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	330pF (331)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	390pF (391)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	560pF (561)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	680pF (681)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	820pF (821)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	1,000pF (102)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	1,200pF (122)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	1,500pF (152)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	1,800pF (182)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	2,200pF (222)	B	B	B	B	B	I	I	I	I	I	C	C	C	
	2,700pF (272)	B	B	B	B	B	I	I	I	I	I	C	C	C	
3,300pF (332)	B	B	B	B	B	I	I	I	I	I	C	C	C		
3,900pF (392)	B	B	B	B	B	I	I	I	I	I	C	C	C		
4,700pF (472)	B	B	B	B	B	I	I	I	I	I	C	C	C		
5,600pF (562)	B	B	B	B	B	I	I	I	I	I	C	C	C		
6,800pF (682)	I	I	I	I	I	I	I	I	I	I	C	C	C		
8,200pF (822)	C	C	C	C	C	I	I	I	I	I	C	C	C		
0.010μF (103)	C	C	C	C	C	I	I	I	I	I	C	C	C		
0.012μF (123)	T	T	T	T	T	C	C	C	C	C	C	C	C		
0.015μF (153)	T	T	T	T	T	C	C	C	C	C	C	C	C		
0.018μF (183)	T	T	T	T	T						C	C	C		
0.022μF (223)	T	T	T	T	T						C	C	C		
0.027μF (273)	T	T	T	T							C	C	C		
0.033μF (333)	T	T	T	T							C	C	C		
0.039μF (393)	J	J	J	J											
0.047μF (473)	J	J	J	J											
0.056μF (563)	J	J	J	J											
0.068μF (683)	D	D	D	D											
0.082μF (823)	D	D	D	D											
0.1μF (104)	D	D	D	D											

- 1、 The letter in cell is expressed the symbol of product thickness.
- 2、 For more information about products with special capacitance or other data, please contact our sales local representative.

Aillen® Multilayer Ceramic Capacitors

7-2. X7R Dielectric 0201, 0402, 0603, 0805 Sizes

DIELECTRIC		X7R																							
SIZE		0201					0402					0603					0805								
RATED VOLTAGE(VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
Capacitance	100pF (101)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	120pF (121)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	150pF (151)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	180pF (181)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	220pF (221)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	270pF (271)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	330pF (331)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	390pF (391)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	470pF (471)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	560pF (561)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	680pF (681)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	820pF (821)			L	L	L		H	H	H	H	H		S	S	S	S	S		B	B	B	B	B	
	1,000pF (102)	L	L	L	L	L		H	H	H	H	H		S	S	S	S	S	S/E		B	B	B	B	B
	1,200pF (122)	L	L	L	L			H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	1,500pF (152)	L	L	L	L			H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	1,800pF (182)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	2,200pF (222)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	2,700pF (272)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	3,300pF (332)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	3,900pF (392)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	4,700pF (472)	L	L	L				H	H	H	H	H		S	S	S	S	S			B	B	B	B	B
	5,600pF (562)	L	L					H	H	H	H			S	S	S	S	S			B	B	B	B	B
	6,800pF (682)	L	L					H	H	H	H			S	S	S	S	S			B	B	B	B	B
	8,200pF (822)	L	L					H	H	H	H			S	S	S	S	S			B	B	B	B	B
	0.010μF (103)	L	L	L				H	H	H	H			S	S	S	S	S			B	B	B	B	B
	0.012μF (123)							H	H	H				S	S	S	S	X			B	B	B	B	B
	0.015μF (153)							H	H	H				S	S	S	S	X			B	B	B	B	B
	0.018μF (183)							H	H	H				S	S	S	S	X			B	B	B	B	B
	0.022μF (223)							H	H	H	H			S	S	S	S	X			B	B	B	B	B
	0.027μF (273)							H	H	H	H			S	S	S	S	X			B	B	B	B	C
	0.033μF (333)							H	H	H	H			S	S	S	X	X			B	B	B	B	C
	0.039μF (393)							H	H	H				S	S	S	X	X			B	B	B	B	C
	0.047μF (473)							H	H	H	H			S	S	S	X	X			B	B	B	B	C
0.056μF (563)							H	H					S	S	S	X	X			B	B	B	B	C	
0.068μF (683)							H	H		H			S	S	S	X	X			B	B	B	B	C	
0.082μF (823)							H	H	H				S	S	S	X	X			B	B	B	B	C	
0.10μF (104)						H	H	H	H	H			S	S/B	S	X	X			B	B	B	B	C	
0.12μF (124)													S	S	X					B	B	B	C		
0.15μF (154)													S	S	X					C	C	C	C		
0.18μF (184)													S	S	X					C	C	C	C		
0.22μF (224)						H	H	H	H				S	S	X	X				C	C	C	C	T	
0.27μF (274)													X	X	X	X				C	C	C	C		
0.33μF (334)													X	X	X	X				C	C	C	C		
0.39μF (394)													X	X	X	X				C	C	C	C		
0.47μF (474)						H	H						X	X	X	X	X			C	C	C	C	C	
0.56μF (564)													X	X	X					C	C	C			
0.68μF (684)													X	X	X					C	C	C			
0.82μF (824)													X	X	X					C	C	C			
1.0μF (105)						H							X	X	X	X	X			C	C	C	C		
1.5μF (155)																				C	C	C	C		
2.2μF (225)													X	X	X					C	C	C	C	C	
3.3μF (335)																									
4.7μF (475)																				C	C	C	C		
6.8μF (685)																									
10μF (106)																				C	C	C*			
22μF (226)																									

- 1、 The letter in cell is expressed the symbol of product thickness.
- 2、 The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Aillen® Multilayer Ceramic Capacitors

7-2. X7R Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC	X7R																	
	SIZE	1206					1210					1812						
RATED VOLTAGE(VDC)	6.3	10	16	25	50	100	6.3	10	16	25	50	100	10	16	25	50	100	
Capacitance	100pF (101)																	
	120pF (121)																	
	150pF (151)		B	B	B	B	B											
	180pF (181)		B	B	B	B	B											
	220pF (221)		B	B	B	B	B											
	270pF (271)		B	B	B	B	B											
	330pF (331)		B	B	B	B	B											
	390pF (391)		B	B	B	B	B											
	470pF (471)		B	B	B	B	B											
	560pF (561)		B	B	B	B	B											
	680pF (681)		B	B	B	B	B											
	820pF (821)		B	B	B	B	B											
	1,000pF (102)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	1,200pF (122)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	1,500pF (152)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	1,800pF (182)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	2,200pF (222)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	2,700pF (272)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	3,300pF (332)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	3,900pF (392)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	4,700pF (472)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	5,600pF (562)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	6,800pF (682)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	8,200pF (822)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.010μF (103)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.012μF (123)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.015μF (153)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.018μF (183)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.022μF (223)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.027μF (273)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.033μF (333)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.039μF (393)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.047μF (473)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.056μF (563)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.068μF (683)		B	B	B	B	B	I	I	I	I	I	I	C	C	C	C	C
	0.082μF (823)		B	B	B	B	C	I	I	I	I	I	I	C	C	C	C	C
	0.10μF (104)		B	B	B	B	C	I	I	I	I	I	I	C	C	C	C	C
	0.12μF (124)		B	B	B	B	C	I	I	I	I	I	I	C	C	C	C	C
	0.15μF (154)		I	I	I	I	D	I	I	I	I	I	C	C	C	C	C	C
	0.18μF (184)		I	I	I	I	D	I	I	I	I	I	C	C	C	C	C	C
	0.22μF (224)		I	I	I	I	D	I	I	I	I	I	C	C	C	C	C	C
	0.27μF (274)		I	I	I	C	D	I	I	I	I	D	C	C	C	C	C	C
0.33μF (334)		I	I	I	C	D	I	I	I	C	D	C	C	C	C	C	C	
0.39μF (394)		I	I	J	P	D	I	I	I	C	M	C	C	C	C	C	C	
0.47μF (474)		J	J	J	P	D	I	I	I	C	M	C	C	C	C	C	K	
0.56μF (564)		J	J	J	P	P	C	C	C	C	M	C	C	C	C	C	K	
0.68μF (684)		J	J	J	P	P	C	C	C	C	K	C	C	C	C	K	K	
0.82μF (824)		J	J	J	P	P	C	C	C	C	K	C	C	C	C	K	K	
1.0μF (105)		J	J	J	P	P	C	C	C	C	K	C	C	C	C	K	K	
1.5μF (155)	J	J	J	P					K	D	M	M					K	
2.2μF (225)	J	J	J	P	P	P			K	D	M	M				M	M	
3.3μF (335)		P	P	P	P				K	D								
4.7μF (475)	P	P	P	P	P				K	K	K	M						
6.8μF (685)																		
10μF (106)	P	P	P	P					K	K	K	M						
22μF (226)	P	P	P*						M	M	M							
47μF (476)							M	M										
100μF (107)																		

- 1、The letter in cell is expressed the symbol of product thickness.
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Aillen® Multilayer Ceramic Capacitors

7-3. Y5V Dielectric 0402, 0603, 0805 Sizes

DIELECTRIC		Y5V															
SIZE		0402					0603					0805					
RATED VOLTAGE(VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010μF (103)		H	H	H	H		S	S	S	S		A	A	A	A	B
	0.015μF (153)		H	H	H	H		S	S	S	S		A	A	A	A	B
	0.022μF (223)		H	H	H	H		S	S	S	S		A	A	A	A	B
	0.033μF (333)		H	H	H	H		S	S	S	S		A	A	A	A	B
	0.047μF (473)		H	H	H			S	S	S	S		A	A	A	A	B
	0.068μF (683)		H	H	H			S	S	S	S		A	A	A	A	B
	0.10μF (104)		H	H	H			S	S	S	S		A	A	A	A	B
	0.15μF (154)		H	H	H			S	S	S	S		A	A	A	A	
	0.22μF (224)	H	H	H				S	S	S	S		A	A	A	A	
	0.33μF (334)	H	H	H				S	S	S	X		B	B	B	B	
	0.47μF (474)	H	H	H				S	S	X	X		B	B	B	B	
	0.68μF (684)	H						S	X	X			B	B	C	C	
	1.0μF (105)	H	H					S	X	X			B	B	C	C	
	1.5μF (155)							S					C	C			
	2.2μF (225)						S	S	X				C	C	C		
	3.3μF (335)												C	C			
	4.7μF (475)						X	X					C	C	C		
6.8μF (685)												C					
10μF (106)												C	C	C			
22μF (226)												C	C				

7-3. Y5V Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		Y5V																		
SIZE		1206					1210					1812								
RATED VOLTAGE(VDC)		6.3	10	16	25	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100	
Capacitance	0.010μF (103)		B	B	B	B	B							I					C	
	0.015μF (153)		B	B	B	B	B							I					C	
	0.022μF (223)		B	B	B	B	B							I					C	
	0.033μF (333)		B	B	B	B	B							I					C	
	0.047μF (473)		B	B	B	B	B							I					C	
	0.068μF (683)		B	B	B	B	B							I					C	
	0.10μF (104)		B	B	B	B	B		I	I	I			I	I	C	C	C	C	C
	0.15μF (154)		B	B	B	B	I		I	I	I			I	I	C	C	C	C	C
	0.22μF (224)		B	B	B	B	I		I	I	I			I	I	C	C	C	C	C
	0.33μF (334)		B	B	B	B			I	I	I			I	I	C	C	C	C	C
	0.47μF (474)		B	B	B	B			I	I	I			I		C	C	C	C	C
	0.68μF (684)		B	B	B	B			I	I	I			I		C	C	C	C	C
	1.0μF (105)		I	I	I	I			I	I	I			I		C	C	C	C	C
	1.5μF (155)		I	I	I				I	I	I					C	C	C	C	
	2.2μF (225)		I	I	I	J			I	I	I			D		C	C	C	C	
	3.3μF (335)		J	J	J				I	I	I					C	C	C	C	
	4.7μF (475)		J	J	J	P			I	I	C			D		C	C	C	C	
6.8μF (685)		J	J					I	I	C			K		C	C	C	C		
10μF (106)		J	J	P				C	C	D		K	K		C	C	C	K		
22μF (226)		P	P					K	K											
47μF (476)	P							K	K							M				
100μF (107)								M												

- 1、 The letter in cell is expressed the symbol of product thickness.
- 2、 For more information about products with special capacitance or other data, please contact our sales local representative.

Aillen® Multilayer Ceramic Capacitors

7-4. X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	100pF (101)			L	L	L										
	120pF (121)			L	L	L										
	150pF (151)			L	L	L										
	180pF (181)			L	L	L										
	220pF (221)			L	L	L										
	270pF (271)			L	L	L										
	330pF (331)			L	L	L										
	390pF (391)			L	L	L										
	470pF (471)			L	L	L										
	560pF (561)			L	L	L										
	680pF (681)			L	L	L										
	820pF (821)			L	L	L										
	1,000pF (102)		L	L	L	L										
	1,500pF (152)		L	L												
	2,200pF (222)		L	L												
	2,700pF (272)		L	L												
	3,300pF (332)		L	L												
	4,700pF (472)		L	L												
	6,800pF (682)		L													
	0.010µF (103)	L	L	L	L											
	0.015µF (153)	L	L													
	0.022µF (223)	L	L													
	0.027µF (273)	L	L						H							
	0.033µF (333)	L	L						H							
	0.039µF (393)	L	L						H							
	0.047µF (473)	L	L						H							
	0.056µF (563)	L	L						H	H						
	0.068µF (683)	L	L						H	H						
	0.082µF (823)	L	L					H	H	H						
	0.10µF (104)	L	L	L	L		H	H	H	H	H					
	0.15µF (154)						H	H	H	H						
	0.22µF (224)	L	L				H	H	H	H	H			X	X	
0.27µF (274)												X	X	X	X	
0.33µF (334)						H	H				X	X	X	X		
0.39µF (394)												X	X	X	X	
0.47µF (474)	L					H	H	E	E	E	X	X/B	X	X	X	
0.68µF (684)						H	H				X	X	X	X		
0.82µF (824)											X	X	X			
1.0µF (105)	L	L*				H	H	H	H		X	X	X	X	X	
1.5µF (155)											X					
2.2µF (225)	L*					H	H	E	E		X	X	X	X	X	
3.3µF (335)											X	X				
4.7µF (475)						E*	E*	E*			X	X	X	X		
6.8µF (685)																
10µF (106)						E*	E*				X	X	X	X*		
22µF (226)											X*	X*				

Dielectric		X5R																
Size		0805					1206					1210						
Rated Voltage (VDC)		4	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50
Capacitance	1.0µF (105)			C	C	C	C											
	1.5µF (155)		C	C	C	C		J	J					K	K			
	2.2µF (225)		C	C	C	C	C	J	J	P	P			K	K			
	3.3µF (335)		C	C	C	C		P	P	P								
	4.7µF (475)		C	C	C	C	C	P	P	P	P	P			K	K	K	
	6.8µF (685)							P	P									
	10µF (106)		C	C	C	C	C	P	P	P	P	P		K	K	K	K	M
	22µF (226)		C	C*	C*	C*		P	P	P	P			M	M	M	M	
	47µF (476)		C*	C*				P	P					M	M	M		
	100µF (107)	C*						P*						M*	M*			
	220µF (227)												M*					

- 1、The letter in cell is expressed the symbol of product thickness.
- 2、The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Aillen® Multilayer Ceramic Capacitors

7-5. X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X6S																																					
Size		0201					0402					0603					0805					1206					1210												
Rated Voltage (VDC)		4	6.3	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50					
Capacitance	0.10µF (104)	L	L																																				
	0.15µF (154)																																						
	0.22µF (224)		L																																				
	0.33µF (334)																																						
	0.47µF (474)			H																																			
	0.68µF (684)																																						
	1.0µF (105)	L*		H	E	E	E																																
	1.5µF (155)																																						
	2.2µF (225)			H	E	E						X																											
	3.3µF (335)																																						
	4.7µF (475)									X		X	X											C	C														
	6.8µF (685)																																						
	10µF (106)									X*	X*	X*		C	C	C	C	C									D												
	22µF (226)							X*	X*						C*	C*	C*									P	P*										M		
47µF (476)													C*												P										M	M	M		
100µF (107)																																				M*			

- 1、The letter in cell is expressed the symbol of product thickness.
- 2、The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

8. PACKAGING STYLE AND QUANTIT

Unit: pieces

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15,000	70,000	-	-
	0.30±0.05	L	15,000	-	-	-
	0.30±0.09	L	15,000	-	-	-
0402 (1005)	0.50±0.05	H	10,000	50,000	-	-
	0.50+0.02/-0.05	Q	10,000	50,000	-	-
	0.50±0.20	E	10,000	-	-	-
0603 (1608)	0.50±0.10	N	4,000	-	-	-
	0.80±0.07	S	4,000	15,000	-	-
	0.80+0.15/-0.10	X	4,000	15,000	-	-
0805 (2012)	0.50±0.10	N	4,000	15,000	-	-
	0.60±0.10	A	4,000	15,000	-	-
	0.85±0.15	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	1.25±0.15	C	-	-	3,000	10,000
1206 (3216)	0.85±0.15	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	0.95±0.10	I	-	-	3,000	10,000
	1.15±0.15	J	-	-	3,000	10,000
	1.25±0.15	C	-	-	3,000	10,000
	1.60±0.15	D	-	-	2,000	10,000
	1.60+0.30/-0.10	P	-	-	2,000	9,000
1210 (3225)	0.85±0.10	T	-	-	3,000	10,000
	0.95±0.10	I	-	-	3,000	10,000
	1.25±0.15	C	-	-	3,000	10,000
	1.60±0.15	D	-	-	2,000	-
	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
1808 (4520)	1.25±0.15	C	-	-	2,000	10,000
	1.10±0.15	F	-	-	2,000	10,000
	1.60±0.15	D	-	-	2,000	8,000
	2.00±0.20	K	-	-	1,000	6,000
1812 (4532)	1.25±0.15	C	-	-	1,000	5,000
	1.60±0.15	D	-	-	1,000	-
	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	3,000
	2.80±0.30	U	-	-	500	-

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

Aillen® Multilayer Ceramic Capacitors

No.	Item	Test Condition	Requirements																								
1	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																								
2	Capacitance	Class I: (NP0) ≤1000pF, 1.0±0.2Vrms, 1MHz±10% >1000pF, 1.0±0.2Vrms, 1KHz±10% Class II: (X7R, X7E, X6S, X5R, Y5V) C≤10μF, 1.0±0.2Vrms, 1KHz±10% C>10μF, 1.0±0.2Vrms, 120Hz±20%	* Shall not exceed the limits given in the detailed spec.																								
3	Q/D.F.(Dissipation Factor)	** Test condition: 1.0±0.2Vrms,1KHz±10% X7R: 0805=106(6.3V&10V) X5R: 01R5≥103, 0201≥224 (6.3V,10V), 0402≥475 (6.3V), 0402≥225(10V), 0603=106 (6.3V,10V), X6S:0201≥104(6.3V),0402≥225(6.3V), 0603≥106 (6.3V). * 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.	NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R,X6S,Y5V:See <Note 1>																								
4	Dielectric Strength	* To apply voltage (≤100V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																								
5	Insulation Resistance	To apply rated voltage for max. 120 sec.	Class I: (NP0) 10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>IR</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="4">10GΩ or RxC≥100Ω-F whichever is smaller</td> </tr> <tr> <td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥2.2μF;1210≥10μF</td> </tr> <tr> <td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td> <td rowspan="4">RxC≥50Ω-F</td> </tr> <tr> <td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> <tr> <td>All X6S items</td> </tr> <tr> <td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td> <td rowspan="4">RxC≥50Ω-F</td> </tr> <tr> <td>35V: 0603≥1μF;</td> </tr> <tr> <td>25V:0201≥0.1μF;0402≥0.22μF;0603≥10μF;0805≥10μF;1206≥22μF</td> </tr> <tr> <td>16V: 0603≥10μF</td> </tr> <tr> <td>10V: 0201>0.1μF; 0603≥10μF; 0805≥47μF</td> <td rowspan="2"></td> </tr> <tr> <td>6.3V: 0201≥0.1μF; 1206≥10μF</td> </tr> <tr> <td>4V:0603≥22μF; 0805≥47μF</td> <td></td> </tr> </tbody> </table>	Rated voltage	IR	100V: X7R	10GΩ or RxC≥100Ω-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	RxC≥50Ω-F	10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF	6.3V; 4V	All X6S items	50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF	RxC≥50Ω-F	35V: 0603≥1μF;	25V:0201≥0.1μF;0402≥0.22μF;0603≥10μF;0805≥10μF;1206≥22μF	16V: 0603≥10μF	10V: 0201>0.1μF; 0603≥10μF; 0805≥47μF		6.3V: 0201≥0.1μF; 1206≥10μF	4V:0603≥22μF; 0805≥47μF			
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6	Temperature Coefficient	With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NPO</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> <tr> <td>X6S</td> <td>-55~105°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25~ 85°C at 20°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	NPO	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X5R	-55~ 85°C at 25°C	X6S	-55~105°C at 25°C	Y5V	-25~ 85°C at 20°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>Within ±30ppm/°C</td> </tr> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> <tr> <td>X5R</td> <td>Within ±15%</td> </tr> <tr> <td>X6S</td> <td>Within ±22%</td> </tr> <tr> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table>	T.C.	Operating Temp	NPO	Within ±30ppm/°C	X7R	Within ±15%	X5R	Within ±15%	X6S	Within ±22%	Y5V	Within +30%/-80%
T.C.	Operating Temp																										
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7	Adhesive Strength of Termination	* Pressurizing force: 1N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.																								
8	Vibration Resistance	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.																								

Aillen® Multilayer Ceramic Capacitors

No.	Item	Test Condition	Requirements															
9	Solder ability	<ul style="list-style-type: none"> * Solder temperature: 235±5°C * Dipping time: 2±0.5 sec. 	95% min. coverage of all metalized area.															
10	Bending Test	<ul style="list-style-type: none"> * 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. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.) 															
11	Resistance to Soldering Heat	<ul style="list-style-type: none"> * Solder temperature: 260±5°C * Dipping time: 10±1 sec * 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±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge. 															
12	Temperature Cycle	<p>* Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <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>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * 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±2 hrs. 	Step	Temp. (°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	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
Step	Temp. (°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																

13	Humidity (Damp Heat)Steady State	<p>* Test temp.: 40±2°C * Humidity: 90~95% RH * Test time: 500+24/-0hrs. *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±2 hrs.</p>	<p>* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: ≥10V**, within ±12.5%; 6.3V within ±25%;≤ TT series & C≥ 1uF, within ±25% **10V: 0603≥ 4.7μF;0402≥1μF;0201 ≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/≤ -40% * 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, X6S:</p> <table border="1" data-bbox="774 589 1441 1151"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤3%</td> <td>≤ 6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0805 > 0.1μF; 0603≥0.068 μF; 1206>1 μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤3%</td> <td>≤ 6%</td> <td>0201(50V);0603≥0.047μF;0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402≥0.1μF;0603>0.1μF;0805≥1μF; 1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1 μF;0805≥2.2μF; 1210≥10 μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF;0805≥1 μF; 1210≥10μF</td> </tr> <tr> <td>≤14%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥0.10μF;0603≥0.47μF; 0805≥2.2μF;1206≥6.8μF ; 1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥1μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF;0402≥0.033μF;0603≥0.15μF;0805 ≥0.68μF;1206≥2.2μF;1210≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF;0402≥0.22μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>10V</td> <td>≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF;0402≥0.33μF(0402/X7R≥0.22μF) ;0603≥0.33μF;0805≥2.2μF; 1206≥2.2μF; 1210≥22 μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 15%</td> <td>≤30%</td> <td>0201≥0.1μF;0402≥1μF;0603≥10μF;0805≥4.7μF; 1206≥47μF ;1210≥ 100μF;</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>Y5V</p> <table border="1" data-bbox="774 1173 1441 1503"> <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>≤7.5%</td> <td>≤10%</td> <td>0603≥0.1 μF;0805≥0.47μF; 1210≥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>16V (C<1.0μF)</td> <td>≤10%</td> <td>≤12.5%</td> <td>0402≥0.068μF;0603≥0.68μF</td> </tr> <tr> <td rowspan="2">16V (C≥1.0μF)</td> <td rowspan="2">≤12.5%</td> <td>≤20%</td> <td>0402≥0.22uF</td> </tr> <tr> <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≥0.47uF</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)</p> <table border="1" data-bbox="774 1552 1441 1805"> <thead> <tr> <th>Rated voltage</th> <th>I.R.</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or Rx≥10Ω-F whichever is smaller</td> </tr> <tr> <td>50V:0402≥0.1μF ;0603≥1μF;0805≥1μF;1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V:0603≥1μF ;0805≥2.2μF;1210≥10μF;</td> </tr> <tr> <td>25V:0201≥0.1uF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V:0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td> </tr> <tr> <td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V; 4V; All X6S items</td> </tr> </tbody> </table>	Rated vol.	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14

Humidity (Damp Heat) Load

- * 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 1hr 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: ±7.5% or 0.75pF whichever is larger.
 X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%;
 TT series & C≥1uF, within ±25%
 **10V: 0603 4.7≥≥μF; 0402 1 μF; 0201 0.1 μF, within ±25%;
 Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40%
 Q/D.F. value:
 NP0: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C
 X7R, X5R, X6S:

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥100V	≤3%	≤6%	1206≥0.47μF
		≤7.5%	0805>0.1μF, 0603≥0.068 μF, 1206>1 μF
50V	≤3%	≤6%	0201(50V);0603≥0.047μF;0805≥0.18μF; 1206≥0.47μF
		≤10%	1210≥4.7μF
		≤20%	0402≥0.1μF;0603>0.1μF;0805≥1μF; 1206≥2.2μF;1210≥10μF
35V	≤5%	≤20%	0603≥1 μF;0805≥2.2μF; 1210≥10 μF
25V	≤5%	≤10%	0201≥0.01μF;0805≥1 μF; 1210≥10μF
		≤14%	0603≥0.33μF; 1206≥4.7μF
		≤15%	0402≥0.10μF;0603≥0.47μF; 0805≥2.2μF;1206≥6.8μF; 1210≥22μF
		≤20%	0402≥1μF
16V	≤5%	≤10%	0201≥0.01μF;0402≥0.033μF;0603≥0.15μF;0805 ≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤15%	0201≥0.1μF;0402≥0.22μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
10V	≤7.5%	≤15%	0201≥0.012μF;0402≥0.33μF(0402/X7R≥0.22μF); 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22 μF
		≤20%	0201≥0.1μF; 0402≥1 μF
6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF;0805≥4.7μF; 1206≥47μF;1210≥100μF;
4V	≤20%	---	---

Y5V

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥50V	≤7.5%	≤10%	0603≥0.1 μF;0805≥0.47μF; 1210≥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
16V (C≥1.0μF)	≤12.5%	≤20%	0402≥0.22μF
		≤20%	0603≥2.2μF;0805≥3.3μF;1206≥10μF;1210≥22μF; 1812≥47μF
10V	≤20%	≤30%	0402≥0.47μF
6.3V	≤30%	---	---

*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.

Class II (X7R, X5R, X6S, Y5V)

Rated voltage	IR
100V: X7R	500MΩ or RxC≥5Ω-F whichever is smaller
50V:0402≥0.1μF ;0603≥1μF;0805≥1μF;1206≥4.7μF; 1210≥4.7μF	
35V:0603≥1μF ;0805≥2.2μF;1210≥10μF;	
25V:0201≥0.1uF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V:0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	
10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	
6.3V: 4V; All X6S items	

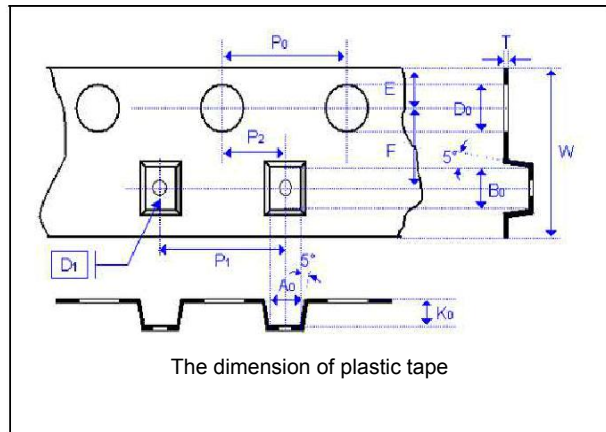
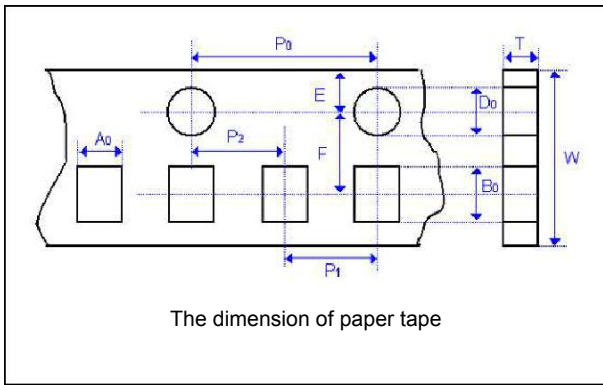
Aillen® Multilayer Ceramic Capacitors

15	High Temperature Load (Endurance)	<p>*Test temp.: NP0, X7R/X7E: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C *Test time: 1000+24/-0 hrs. *To apply voltage: (1) ≤ 6.3V or C 10 ≥ μF : 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</p>	<p>* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; **10V: 0603≥4.7μF;0402≥ 1μF;0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% 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, X6S:</p>																																																																																												
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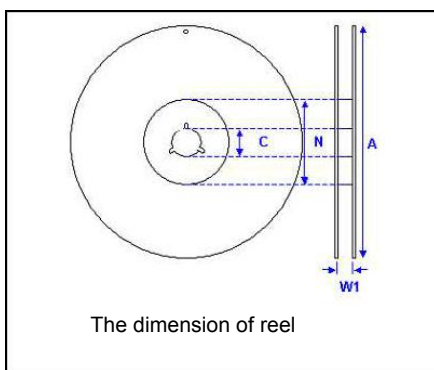
Aillen® Multilayer Ceramic Capacitors

APPENDIXES

☐ Tape & reel dimensions



Size	0201			0402			0603	0805			1206			1210			1812		
Thickness	L	H	E	S, X	A, N	B, T	C	B, T	I, J, C	D, P	I, C	F, D, K	M	C, F, D, K	M	U			
A ₀	0.38±0.05	0.62±0.05	0.70±0.10	1.02±0.05	1.50±0.10	1.50±0.10	<1.57	2.00±0.10	<1.85	<1.95	<2.97	<2.97	<2.97	<3.81	<3.81	<3.90			
B ₀	0.68±0.05	1.12±0.05	1.20±0.10	1.80±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	<3.73	<3.73	<3.73	<5.30	<5.30	<5.30			
T	0.42±0.05	0.60±0.05	0.70±0.10	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±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05	0.25±0.05			
K ₀	-	-	-	-	-	-	<2.50	-	<2.50	<2.50	<2.50	<2.50	<3.00	<2.50	<3.00	<3.50			
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	8.00±0.10	8.00±0.10	12.0±0.20	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	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			
10xP ₀	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10			
P ₁	2.00±0.05	2.00±0.05	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	8.00±0.10	8.00±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	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	1.55±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	1.50±0.05	1.50±0.05	1.50±0.10			
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	1.50±0.10	1.50±0.10	1.50±0.10			
E	1.75±0.05	1.75±0.05	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	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	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05			



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13.0+0.5/-0.2	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	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

Aillen[®] Multilayer Ceramic Capacitors

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 solder ability in case of shelf life extension is needed.
- (3) Don't open the tape until the parts are to be used, use the chips within 3 months after the tape is opened.
- (4) For product of high dielectric constant (Class 2&3, characteristics B/W & Y), the Electro static capacity changes with the passage of time due to the inherent characteristics of ceramic dielectric materials. The changed capacity reverts to nominal at the temperature it reaches during the soldering process.

Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solder ability. 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, solder ability 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 sun light, the solder ability 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.

