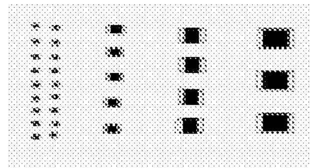
Multilayer Ceramic Chip Capacitors (For General Electronic Equipment)

Series: **ECU**
Series: **ECJ**



■ Features

- Small in size and wide capacitance range
- Superior humidity characteristics and long life thanks to monolithic construction
- Excellent solderability and resistance to soldering heat thanks to terminals with three layers of silver, nickel, and solder
- Low self-inductance and excellent frequency characteristics

■ Recommended Applications

Class 1 (T.C. Type)
Temperature compensation, tuned circuits, and filter circuits, where low loss, high stability of capacitance, and high insulation resistance are required
Class 2 (Hi-K Type)
Coupling and By-pass, where low loss and high stability of capacitance are not so important

■ Explanation of Part Numbers

● ECU Series

1	2	3	4	5	6	7	8	9	10	11	12	
E	C	U	X	1	H	1	0	1	J	C	G	(Example)

Product Code

ECU	Multilayer Ceramic Chip Capacitors

Packaging Styles

Code	Styles
X	Bulk
E	Paper Taping (Pitch: 2 mm)
V	Paper Taping (Pitch: 4 mm)
Y	Embossed Taping (Pitch: 4 mm)
W	Large Size Reel Taping (Pitch: 2 mm)
Z	Large Size Reel Taping (Pitch: 4 mm)
C	Bulk Case

Rated Voltage

Code	Voltage
1H	50 VDC
1E	25 VDC
1C	16 VDC

Nominal Capacitance

Ex.	Cap.
0R5	0.5 pF
010	1 pF
100	10 pF
101	100 pF
104	100000 pF (0.1 μF)

Capacitance Tolerance

Code	Tol.	Note
C	±0.25 pF	≤10 pF
D	±0.5 pF	
F	±1 pF	
J	±5 %	>10 pF
K	±10 %	
M	±20 %	
Z	+80 −20 %	

Temperature Characteristics

Code	Temp.Char.
C	NP0
P	N150
R	N220
S	N330
T	N470
U	N750
Nil*	SL/GP
B	B/X7R
F	F/Y5V

Suffix

Code	Size Code	
Q	10 type	0402
V	11 type	0603
N/G	12 type	0805
X	12 type	
M/H	13 type	1206
W	13 type	

* When omitted, all the rest P/N factors shall be moved up respectively

● ECJ Series

1	2	3	4	5	6	7	8	9	10	11	12	
E	C	J	3	Y	F	1	C	4	7	5	Z	(Example)

Product Code

ECJ	Multilayer Ceramic Chip Capacitors

Suffix

Code	Size Code (EIA)	
0	10 type	(0402)
1	11 type	(0603)
2	12 type	(0805)
3	13 type	(1206)

Packaging Styles

Code	Styles
X	Bulk
E	Paper Taping (Pitch: 2 mm)
V	Paper Taping (Pitch: 4 mm)
Y	Embossed Taping (Pitch: 4 mm)
W	Large Size Reel Taping (Pitch: 2 mm)
Z	Large Size Reel Taping (Pitch: 4 mm)
C	Bulk Case

Temperature Characteristics

Code	Temp.Char.
B	B/X7R
F	F/Y5V

Rated Voltage

Code	Voltage
1H	50 VDC
1E	25 VDC
1C	16 VDC
1A	10 VDC

Nominal Capacitance

Ex.	Cap.
103	10000 pF
104	100000 pF (0.1 μF)
105	1 μF

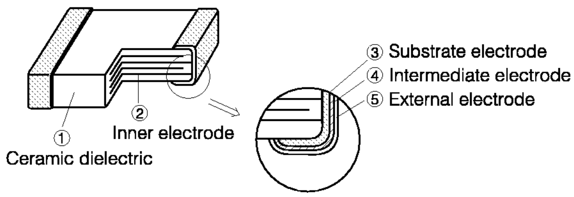
Capacitance Tolerance

Code	Tol.	Note
K	±10 %	>10 pF
M	±20 %	
Z	+80 −20 %	

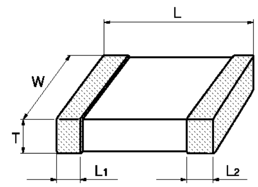
■ Precautions for Handling

See Page 26 to 30

■ Construction



■ Dimensions in mm (not to scale)



(mm)

Size Code (EIA)	L	W	T	L_1, L_2
"10" Type (0402)	1.00±0.05	0.50±0.05	0.50±0.05	0.20±0.10
"11" Type (0603)	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.20
"12" Type (0805)	2.00±0.10	1.25±0.10	1.35 max.*	0.50±0.25
"13" Type (1206)	3.20±0.15	1.60±0.15	1.8 max.*	0.60±0.30

* Specified by the nominal capacitance

■ Capacitance Range in pF

● T.C. Type

Class	Size Code (EIA)	Dim. "T" (mm)	Capacitance Range (pF) [50 VDC]						
			NP0	SL	N150	N220	N330	N470	N750
			CΔ		PΔ*	RΔ*	SΔ*	TΔ*	UΔ*
			50VDC	50VDC	50VDC	50VDC	50VDC	50VDC	50VDC
1	"10" (0402)	0.50±0.05	0.5–220	0.5–220	0.5–39	0.5–39	0.5–39	0.5–39	0.5–120
	"11" (0603)	0.80±0.1	0.5–1000	0.5–1200	0.5–150	0.5–180	0.5–180	0.5–220	0.5–1200
	"12" (0805)	0.6±0.1	0.5–2200	0.5–2700	0.5–220	0.5–220	0.5–220	0.5–270	0.5–2700
		0.85±0.10	2400, 2700	—	240–330	240–390	240–470	300–470	—
	"13" (1206)	0.6±0.1	2400–4700	3000–5600	240–560	240–680	240–680	300–820	3000–5600
		0.85±0.10	5100–6800	—	620–1200	750–1200	750–1500	910–1500	—
		1.15±0.10	7500–10000	—	—	—	—	—	—

* PΔ to UΔ : Special order
• (Capacitance values) E12 series : Standard order, E24 series : Special order

● Hi-K Type

Class	Size Code (EIA)	Dim. "T" (mm)	Capacitance Range (pF)							
			B [X7R]				F [Y5V]			
			50 VDC	25 VDC	16 VDC	10 VDC	50 VDC	25 VDC	16 VDC	10 VDC
2	"10" (0402)	0.50±0.05	100–3900	100–6800	5600–15000	—	1000–10000	1000–22000	15000–100000	—
	"11" (0603)	0.8±0.1	220–15000	10000–47000	10000–100000	120000–220000	1000–47000	68000,100000	100000–470000	1000000
	"12" (0805)	0.6±0.1	1000–22000	—	—	—	10000–68000	68000–150000	100000–220000	—
		0.85±0.10	27000–39000	39000–100000	47000–220000	—	100000–220000	220000	330000–1000000	—
		1.25±0.10	47000–100000	120000–220000	270000–470000	560000–1000000	—	330000,470000	1500000,2200000	3300000,4700000
	"13" (1206)	0.85±0.10	—	100000–330000	100000–680000	—	—	470000	680000–2200000	—
		1.15±0.10	—	390000–470000	820000,1000000	—	—	680000–2200000	3300000,4700000	—
		1.6±0.2	—	560000–1000000	—	1200000–3300000	—	—	—	10000000

• (Capacitance values) B[X7R] E6 series : Standard order, E12 series : Special order
F[F5V] E3 series : Standard order, E6 series : Special order

■ Nominal Capacitance vs. Capacitance Tolerance

Tol. Code	Capacitance Tolerance		Nominal Capacitance Available (pF)		Temp. Char.	Class
C	≦ 10 pF	±0.25 pF	0.5, 1, 1.5, 2, 3, 4, 5		CΔ to UΔ (NP0) (N750) and SL	1 (T.C. Type)
D		±0.5 pF	1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10			
F		±1.0 pF	10			
J	> 10 pF	±5 %	E24	Within Capacitance Range, E-Series Numbers $\times 10^n$		
K		±10 %	E12			
K	±10 %		E12		B (X7R)	2 (Hi-K Type)
M	±20 %		E6			
Z	+80, −20 %		E6		F (Y5V)	

■ E-Series Numbers

E3	1								2.2								4.7							
E6	1				1.5				2.2				3.3				4.7				6.8			
E12	1		1.2		1.5		1.8		2.2		2.7		3.3		3.9		4.7		5.6		6.8		8.2	
E24	1	1.1	1.2	1.3	1.5	1.6	1.8	2	2.2	2.4	2.7	3	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1

■ Temperature Coefficient of Class 1 Capacitors/T.C. Tolerance

(ppm/°C)

T.C. \ Temp. Coeff. Code	Cap.	CΔ (NP0)	PΔ (N150)	RΔ (N220)	SΔ (N330)	TΔ (N470)	UΔ (N750)	SL
T.C. Tol.	≦ 2 pF	CK(±250)	PK(±250)	RK(±250)	SK(±250)	TK(±250)	UK(±250)	+350 to −1000
	3 pF	CJ(±120)	PJ(±120)	RJ(±120)	SJ(±120)	TJ(±120)	UJ(±120)	+350 to −1000
	≧ 4 pF	CH(±60)	PH(±60)	RH(±60)	SH(±60)	TH(±60)	UJ(±120)	+350 to −1000

■ Temperature Characteristics of Class 2 Capacitors

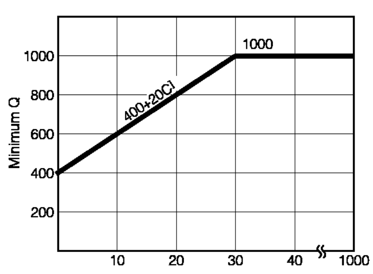
Temp. Char.	Capacitance Change		Measurement Temperature Range	Reference Temperature
	No DC Voltage Applied	1/2 Rated Voltage Applied		
B (X7R)	±10 % max.	+10, −30 % max.	−25 to 85 °C	20 °C
F (Y5V)	+30, −80 % max.	+30, −95 % max.	−25 to 85 °C	20 °C

■ Specifications

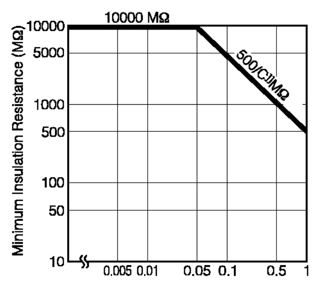
Characteristics	Specifications: Class 1 (T.C. Type) CΔ to UΔ, SL	Specifications: Class 2 (Hi-K Type) B(X7R)	Specifications: Class 2 (Hi-K Type) F(Y5V)	Test Methods
Operating Temperature Range	–55 to 125 °C*	–55 to 125 °C*	–25 to 85 °C	——
Rated Voltage	50 VDC	50 VDC, 25 VDC 16 VDC, 10 VDC	50 VDC, 25 VDC 16 VDC, 10 VDC	——
Dielectric Withstanding Voltage	No break down			Test Voltage Class 1: Rated Voltage ×3 Class 2: Rated Voltage ×2.5 Electrification time : 1 to 5 s Limit surge current: 50 mA max.
Insulation Resistance(IR)	IR≧10000MΩ	IR ≧ 10000MΩ or 500/C (MΩ) whichever is less [C: Rated capacitance in μF]		Measurement Voltage : Rated Voltage Electrification time : 60 ± 5 s (Electrification time of 10VDC is 2 minutes) Limit surge current: 50 mA max.
Capacitance	Within the specified tolerance			Standard Temperature : 20 °C
Q Factor or Dissipation Factor (tan δ)	Capacitance < 30 pF Q ≧ 400+20 C*** 30 pF ≦ Cap. ≦ 1000 pF Q ≧ 1000 Capacitance > 1000 pF (tan δ) ≦ 0.002	Rated Voltage / Temperature Characteristics B: 50 VDC: tan δ ≦ 0.025 25 VDC: tan δ ≦ 0.025 16 VDC: tan δ ≦ 0.025 (tan δ ≦ 0.035)** 10 VDC: tan δ ≦ 0.05	Temperature Characteristics F: 50 VDC: tan δ ≦ 0.05 25 VDC: tan δ ≦ 0.05 (tan δ ≦ 0.07)** 16 VDC: tan δ ≦ 0.07 10 VDC: tan δ ≦ 0.125	Measurement (1) Class 1 (T.C. Type) Nominal Cap. / Frequency / Voltage: C ≦ 1000 pF / 1 MHz±10 % / 0.5–5 Vrms C > 1000 pF / 1 kHz±10 % / 0.5–5 Vrms (2) Class 2 (Hi-K Type) Pretreatment : 150+0/–10 °C for 1 hour and then shall be stored in a room temperature for 48 ± 4 hours, before initial measurement. Frequency / Voltage: 1 kHz±10 % / 1.0±0.2 Vrms

* Operating Temperature Range: –25 to 85 °C for capacitance range of 5100 to 10000 pF, NP0, Type 13.
** Specified by individual Specification
*** Nominal capacitance value in pF

Minimum Q at 1 MHz



Minimum Insulation Resistance



■ Capacitance Range (in pF)

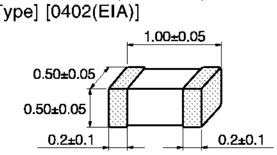
● [Size Code "10" Type/"0402"]

Temp. Char. / Rated Voltage / Cap. (pF)	CΔ (NP0)	SL	PΔ (N150)	RΔ (N220)	SΔ (N330)	TΔ (N470)	UΔ (N750)
	50 V	50 V	50 V	50 V	50 V	50 V	50 V
0.5	□	□	□	□	□	□	□
1	□	□	□	□	□	□	□
1.5	□	□	□	□	□	□	□
2	□	□	□	□	□	□	□
3	□	□	□	□	□	□	□
4	□	□	□	□	□	□	□
5	□	□	□	□	□	□	□
6	□	□	□	□	□	□	□
7	□	□	□	□	□	□	□
8	□	□	□	□	□	□	□
9	□	□	□	□	□	□	□
10	□	□	□	□	□	□	□
11	□	□	□	□	□	□	□
12	□	□	□	□	□	□	□
13	□	□	□	□	□	□	□
15	□	□	□	□	□	□	□
16	□	□	□	□	□	□	□
18	□	□	□	□	□	□	□
20	□	□	□	□	□	□	□
22	□	□	□	□	□	□	□
24	□	□	□	□	□	□	□
27	□	□	□	□	□	□	□
30	□	□	□	□	□	□	□
33	□	□	□	□	□	□	□
36	□	□	□	□	□	□	□
39	□	□	□	□	□	□	□
43	□	□					□
47	□	□					□
51	□	□					□
56	□	□					□
62	□	□					□
68	□	□					□
75	□	□					□
82	□	□					□
91	□	□					□
100	□	□					□
110	□	□					□
120	□	□					□
130	□	□					
150	□	□					
160	□	□					
180	□	□					
200	□	□					
220	□	□					

Temp. Char. / Rated Voltage / Cap. (pF)	B/X7R			F/Y5V		
	50 V	25 V	16 V	50 V	25 V	16 V
100	□	□				
120	□	□				
150	□	□				
180	□	□				
220	□	□				
270	□	□				
330	□	□				
390	□	□				
470	□	□				
560	□	□				
680	□	□				
820	□	□				
1000	□	□		□	□	
1200	□	□				
1500	□	□		□	□	
1800	□	□				
2200	□	□		□	□	
2700	□	□				
3300	□	□		□	□	
3900	□	□				
4700		□		□	□	
5600		□	□			
6800		□	□	□	□	
8200			□			
10000			□	□	□	
12000			□			
15000			□		□	□
18000						
22000					□	□
27000						
33000						□
39000						
47000						□
56000						
68000						□
82000						
100000						□

■ Dimensions in mm (not to scale)

[10 Type] [0402(EIA)]



■ Capacitance Range (in pF)

● [Size Code "11" Type/ "0603" (EIA)]

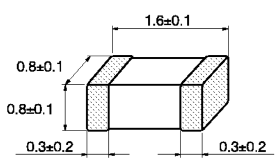
Temp. Char. / Rated Voltage / Cap. (pF)	CΔ (NP0) 50 V	SL 50 V	PΔ (N150) 50 V	RΔ (N220) 50 V	SΔ (N330) 50 V	TΔ (N470) 50 V	UΔ (N750) 50 V
0.5	■	■	■	■	■	■	■
1	■	■	■	■	■	■	■
1.5	■	■	■	■	■	■	■
2	■	■	■	■	■	■	■
3	■	■	■	■	■	■	■
4	■	■	■	■	■	■	■
5	■	■	■	■	■	■	■
6	■	■	■	■	■	■	■
7	■	■	■	■	■	■	■
8	■	■	■	■	■	■	■
9	■	■	■	■	■	■	■
10	■	■	■	■	■	■	■
11	■	■	■	■	■	■	■
12	■	■	■	■	■	■	■
13	■	■	■	■	■	■	■
15	■	■	■	■	■	■	■
16	■	■	■	■	■	■	■
18	■	■	■	■	■	■	■
20	■	■	■	■	■	■	■
22	■	■	■	■	■	■	■
24	■	■	■	■	■	■	■
27	■	■	■	■	■	■	■
30	■	■	■	■	■	■	■
33	■	■	■	■	■	■	■
36	■	■	■	■	■	■	■
39	■	■	■	■	■	■	■
43	■	■	■	■	■	■	■
47	■	■	■	■	■	■	■
51	■	■	■	■	■	■	■
56	■	■	■	■	■	■	■
62	■	■	■	■	■	■	■
68	■	■	■	■	■	■	■
75	■	■	■	■	■	■	■
82	■	■	■	■	■	■	■
91	■	■	■	■	■	■	■
100	■	■	■	■	■	■	■
110	■	■	■	■	■	■	■
120	■	■	■	■	■	■	■
130	■	■	■	■	■	■	■
150	■	■	■	■	■	■	■
160	■	■		■	■	■	■
180	■	■		■	■	■	■
200	■	■				■	■
220	■	■				■	■
240	■	■					■
270	■	■					■
300	■	■					■
330	■	■					■
360	■	■					■
390	■	■					■
430	■	■					■
470	■	■					■
510	■	■					■
560	■	■					■
620	■	■					■
680	■	■					■
750	■	■					■
820	■	■					■
910	■	■					■
1000	■	■					■
1100		■					■
1200		■					■

Temp. Char. / Rated Voltage / Cap. (pF)	B/X7R 50 V	B/X7R 25 V	B/X7R 16 V	B/X7R 6–10 V	F/Y5V 50 V	F/Y5V 25 V	F/Y5V 16 V	F/Y5V 6–10 V
220	■							
270	■							
330	■							
390	■							
470	■							
560	■							
680	■							
820	■							
1000	■				□			
1200	■							
1500	■				□			
1800	■							
2200	■				□			
2700	■							
3300	■				□			
3900	■							
4700	■				□			
5600	■							
6800	■				□			
8200	■							
10000	■	■	■		□			
12000	■	■	■					
15000	■	■	■		□			
18000		■	■					
22000		■	■		□			
27000		■	■					
33000		■	■		□			
39000		■	■					
47000		■	■		□			
56000			■					
68000			■			□		
82000			■					
100000			■			□	□	
120000				■				
150000				■			□	
180000				■				
220000				■			□	
270000				*				
330000				*			□	
390000				*				
470000				*			□	
560000				*				
680000				*				
820000				*				
1000000				*				□

* Under development

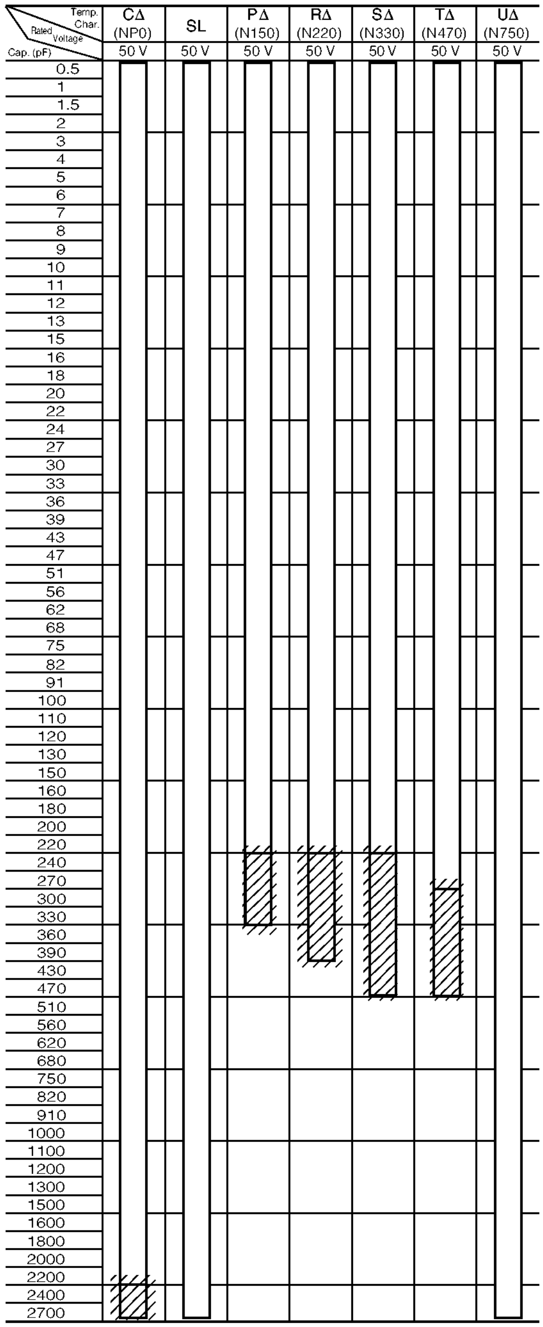
■ Dimensions in mm (not to scale)

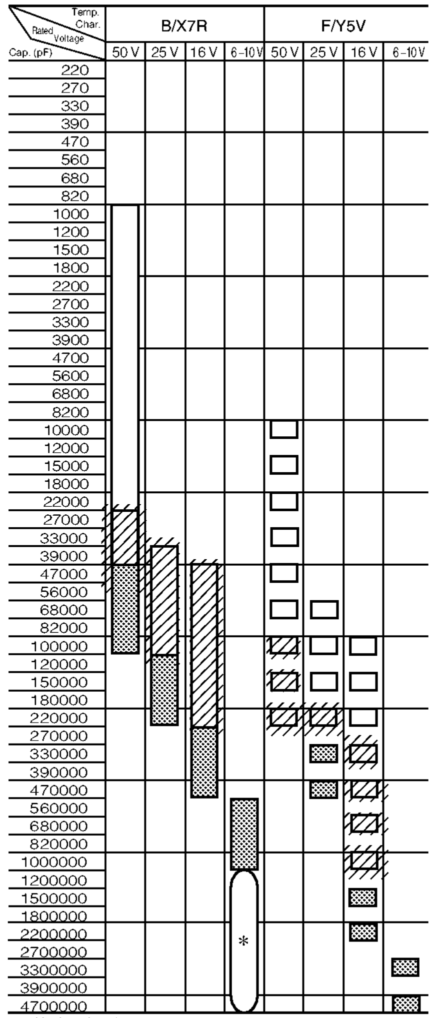
[11 Type] [0603 (EIA)]



■ Capacitance Range (in pF)

● [Size Code "12" Type/ "0805" (EIA)]

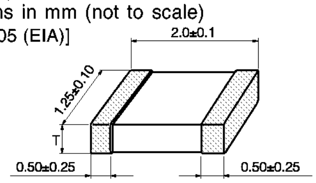




* Under development

■ Dimensions in mm (not to scale)

[12 Type] [0805 (EIA)]

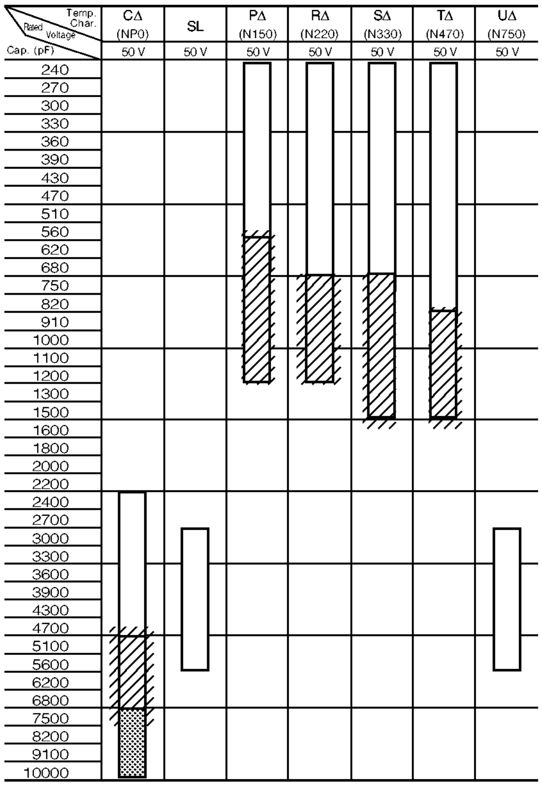


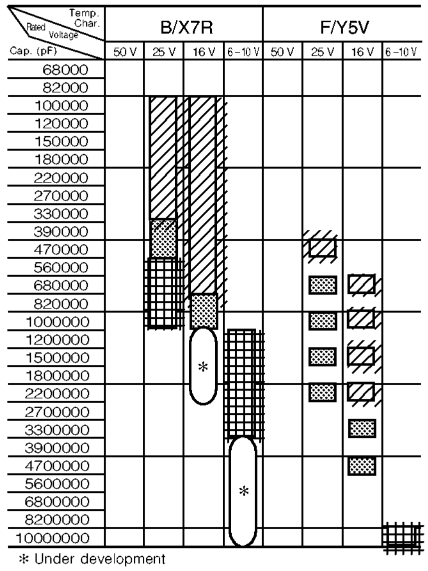
■ Thickness "T"

	T (mm)
	0.6±0.1
	0.85±0.10
	1.25±0.10

■ Capacitance Range (in pF)

● [Size Code “13” Type/ “1206” (EIA)]

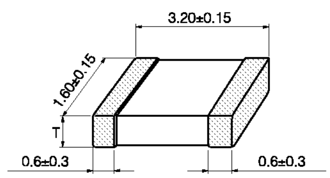




* Under development

■ Dimensions in mm (not to scale)

[13 Type] [1206 (EIA)]



■ Thickness“T”

	T (mm)
	0.6±0.1
	0.85±0.10
	1.15±0.10
	1.6±0.2

• T 1.6mm : L=3.20±0.20, W=1.60±0.20

■ Standard Products for"10"Type (EIA"0402"Type) , Taped Version

[Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ (NP0) Part No.	Dim. T (mm)	SL Part No.	Dim. T (mm)	PΔ (N150) Part No.	Dim. T (mm)	RΔ (N220) Part No.	Dim. T (mm)	SΔ (N330) Part No.	Dim. T (mm)	TΔ (N470) Part No.	Dim. T (mm)	UΔ (N750) Part No.	Dim. T (mm)
0.5	±0.25 pF(C)	ECUE1H0R5CCQ	0.5	ECUE1H0R5CQ	0.5	ECUE1H0R5CPQ	0.5	ECUE1H0R5CRQ	0.5	ECUE1H0R5CSQ	0.5	ECUE1H0R5CTQ	0.5	ECUE1H0R5CUQ	0.5
1	±0.25 pF (C) or ±0.5 pF (D)	ECUE1H010□CQ	0.5	ECUE1H010□Q	0.5	ECUE1H010□PQ	0.5	ECUE1H010□RQ	0.5	ECUE1H010□SQ	0.5	ECUE1H010□TQ	0.5	ECUE1H010□UQ	0.5
1.5		ECUE1H1R5□CQ	0.5	ECUE1H1R5□Q	0.5	ECUE1H1R5□PQ	0.5	ECUE1H1R5□RQ	0.5	ECUE1H1R5□SQ	0.5	ECUE1H1R5□TQ	0.5	ECUE1H1R5□UQ	0.5
2		ECUE1H020□CQ	0.5	ECUE1H020□Q	0.5	ECUE1H020□PQ	0.5	ECUE1H020□RQ	0.5	ECUE1H020□SQ	0.5	ECUE1H020□TQ	0.5	ECUE1H020□UQ	0.5
3		ECUE1H030□CQ	0.5	ECUE1H030□Q	0.5	ECUE1H030□PQ	0.5	ECUE1H030□RQ	0.5	ECUE1H030□SQ	0.5	ECUE1H030□TQ	0.5	ECUE1H030□UQ	0.5
4		ECUE1H040□CQ	0.5	ECUE1H040□Q	0.5	ECUE1H040□PQ	0.5	ECUE1H040□RQ	0.5	ECUE1H040□SQ	0.5	ECUE1H040□TQ	0.5	ECUE1H040□UQ	0.5
5		ECUE1H050□CQ	0.5	ECUE1H050□Q	0.5	ECUE1H050□PQ	0.5	ECUE1H050□RQ	0.5	ECUE1H050□SQ	0.5	ECUE1H050□TQ	0.5	ECUE1H050□UQ	0.5
6	±0.5 pF (D)	ECUE1H060DCQ	0.5	ECUE1H060DQ	0.5	ECUE1H060DPQ	0.5	ECUE1H060DRQ	0.5	ECUE1H060DSQ	0.5	ECUE1H060DTQ	0.5	ECUE1H060DUQ	0.5
7		ECUE1H070DCQ	0.5	ECUE1H070DQ	0.5	ECUE1H070DPQ	0.5	ECUE1H070DRQ	0.5	ECUE1H070DSQ	0.5	ECUE1H070DTQ	0.5	ECUE1H070DUQ	0.5
8		ECUE1H080DCQ	0.5	ECUE1H080DQ	0.5	ECUE1H080DPQ	0.5	ECUE1H080DRQ	0.5	ECUE1H080DSQ	0.5	ECUE1H080DTQ	0.5	ECUE1H080DUQ	0.5
9		ECUE1H090DCQ	0.5	ECUE1H090DQ	0.5	ECUE1H090DPQ	0.5	ECUE1H090DRQ	0.5	ECUE1H090DSQ	0.5	ECUE1H090DTQ	0.5	ECUE1H090DUQ	0.5
10	±0.5 pF (D) or ±1 pF (F)	ECUE1H100□CQ	0.5	ECUE1H100□Q	0.5	ECUE1H100□PQ	0.5	ECUE1H100□RQ	0.5	ECUE1H100□SQ	0.5	ECUE1H100□TQ	0.5	ECUE1H100□UQ	0.5
11	±5 %*** (J) or ±10 % (K)	ECUE1H110JCQ	0.5	ECUE1H110JQ	0.5	ECUE1H110JPQ	0.5	ECUE1H110JRQ	0.5	ECUE1H110JSQ	0.5	ECUE1H110JTQ	0.5	ECUE1H110JUQ	0.5
12		ECUE1H120□CQ	0.5	ECUE1H120□Q	0.5	ECUE1H120□PQ	0.5	ECUE1H120□RQ	0.5	ECUE1H120□SQ	0.5	ECUE1H120□TQ	0.5	ECUE1H120□UQ	0.5
13		ECUE1H130JCQ	0.5	ECUE1H130JQ	0.5	ECUE1H130JPQ	0.5	ECUE1H130JRQ	0.5	ECUE1H130JSQ	0.5	ECUE1H130JTQ	0.5	ECUE1H130JUQ	0.5
15		ECUE1H150□CQ	0.5	ECUE1H150□Q	0.5	ECUE1H150□PQ	0.5	ECUE1H150□RQ	0.5	ECUE1H150□SQ	0.5	ECUE1H150□TQ	0.5	ECUE1H150□UQ	0.5
16		ECUE1H160JCQ	0.5	ECUE1H160JQ	0.5	ECUE1H160JPQ	0.5	ECUE1H160JRQ	0.5	ECUE1H160JSQ	0.5	ECUE1H160JTQ	0.5	ECUE1H160JUQ	0.5
18		ECUE1H180□CQ	0.5	ECUE1H180□Q	0.5	ECUE1H180□PQ	0.5	ECUE1H180□RQ	0.5	ECUE1H180□SQ	0.5	ECUE1H180□TQ	0.5	ECUE1H180□UQ	0.5
20		ECUE1H200JCQ	0.5	ECUE1H200JQ	0.5	ECUE1H200JPQ	0.5	ECUE1H200JRQ	0.5	ECUE1H200JSQ	0.5	ECUE1H200JTQ	0.5	ECUE1H200JUQ	0.5
22		ECUE1H220□CQ	0.5	ECUE1H220□Q	0.5	ECUE1H220□PQ	0.5	ECUE1H220□RQ	0.5	ECUE1H220□SQ	0.5	ECUE1H220□TQ	0.5	ECUE1H220□UQ	0.5
24		ECUE1H240JCQ	0.5	ECUE1H240JQ	0.5	ECUE1H240JPQ	0.5	ECUE1H240JRQ	0.5	ECUE1H240JSQ	0.5	ECUE1H240JTQ	0.5	ECUE1H240JUQ	0.5
27		ECUE1H270□CQ	0.5	ECUE1H270□Q	0.5	ECUE1H270□PQ	0.5	ECUE1H270□RQ	0.5	ECUE1H270□SQ	0.5	ECUE1H270□TQ	0.5	ECUE1H270□UQ	0.5
30		ECUE1H300JCQ	0.5	ECUE1H300JQ	0.5	ECUE1H300JPQ	0.5	ECUE1H300JRQ	0.5	ECUE1H300JSQ	0.5	ECUE1H300JTQ	0.5	ECUE1H300JUQ	0.5
33		ECUE1H330□CQ	0.5	ECUE1H330□Q	0.5	ECUE1H330□PQ	0.5	ECUE1H330□RQ	0.5	ECUE1H330□SQ	0.5	ECUE1H330□TQ	0.5	ECUE1H330□UQ	0.5
36		ECUE1H360JCQ	0.5	ECUE1H360JQ	0.5	ECUE1H360JPQ	0.5	ECUE1H360JRQ	0.5	ECUE1H360JSQ	0.5	ECUE1H360JTQ	0.5	ECUE1H360JUQ	0.5
39		ECUE1H390□CQ	0.5	ECUE1H390□Q	0.5	ECUE1H390□PQ	0.5	ECUE1H390□RQ	0.5	ECUE1H390□SQ	0.5	ECUE1H390□TQ	0.5	ECUE1H390□UQ	0.5
43		ECUE1H430JCQ	0.5	ECUE1H430JQ	0.5									ECUE1H430JUQ	0.5
47		ECUE1H470□CQ	0.5	ECUE1H470□Q	0.5									ECUE1H470□UQ	0.5
51		ECUE1H510JCQ	0.5	ECUE1H510JQ	0.5									ECUE1H510JUQ	0.5
56		ECUE1H560□CQ	0.5	ECUE1H560□Q	0.5									ECUE1H560□UQ	0.5
62		ECUE1H620JCQ	0.5	ECUE1H620JQ	0.5									ECUE1H620JUQ	0.5
68		ECUE1H680□CQ	0.5	ECUE1H680□Q	0.5									ECUE1H680□UQ	0.5
75		ECUE1H750JCQ	0.5	ECUE1H750JQ	0.5									ECUE1H750JUQ	0.5
82		ECUE1H820□CQ	0.5	ECUE1H820□Q	0.5									ECUE1H820□UQ	0.5
91		ECUE1H910JCQ	0.5	ECUE1H910JQ	0.5									ECUE1H910JUQ	0.5
100		ECUE1H101□CQ	0.5	ECUE1H101□Q	0.5									ECUE1H101□UQ	0.5
110		ECUE1H111JCQ	0.5	ECUE1H111JQ	0.5									ECUE1H111JUQ	0.5
120		ECUE1H121□CQ	0.5	ECUE1H121□Q	0.5									ECUE1H121□UQ	0.5
130		ECUE1H131JCQ	0.5	ECUE1H131JQ	0.5										
150		ECUE1H151□CQ	0.5	ECUE1H151□Q	0.5										
160		ECUE1H161JCQ	0.5	ECUE1H161JQ	0.5										
180		ECUE1H181□CQ	0.5	ECUE1H181□Q	0.5										
200		ECUE1H201JCQ	0.5	ECUE1H201JQ	0.5										
220		ECUE1H221□CQ	0.5	ECUE1H221□Q	0.5										

(Cap. Tol. Code)**

(Packing Style Code)*

※Packaging Style Code: "E" for Taped Version (Taping pitch: 2 mm) and "X" for Bulk Type.
※※ □: Capacitance Tolerance Codes.
※※※ Capacitance values of "E24" series and capacitance tolerance of ±5 % are available on special order.

■ Standard Products for “10” Type (EIA “0402” Type) , Taped Version

Capacitance (pF)	B/X7R							F/Y5V						
	Capacitance Tolerance	50 VDC		25 VDC		16 VDC		Capacitance Tolerance	50 VDC		25 VDC		16 VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
100		ECUE1H101□BQ	0.5	ECUE1E101□BQ	0.5									
120		ECUE1H121KBQ	0.5	ECUE1E121KBQ	0.5									
150		ECUE1H151□BQ	0.5	ECUE1E151□BQ	0.5									
180		ECUE1H181KBQ	0.5	ECUE1E181KBQ	0.5									
220		ECUE1H221□BQ	0.5	ECUE1E221□BQ	0.5									
270		ECUE1H271KBQ	0.5	ECUE1E271KBQ	0.5									
330		ECUE1H331□BQ	0.5	ECUE1E331□BQ	0.5									
390		ECUE1H391KBQ	0.5	ECUE1E391KBQ	0.5									
470		ECUE1H471□BQ	0.5	ECUE1E471□BQ	0.5									
560		ECUE1H561KBQ	0.5	ECUE1E561KBQ	0.5									
680		ECUE1H681□BQ	0.5	ECUE1E681□BQ	0.5									
820		ECUE1H821KBQ	0.5	ECUE1E821KBQ	0.5									
1000		ECUE1H102□BQ	0.5	ECUE1E102□BQ	0.5				ECUE1H102ZFQ	0.5	ECUE1E102ZFQ	0.5		
1200	±10 %	ECUE1H122KBQ	0.5	ECUE1E122KBQ	0.5									
1500	(K)	ECUE1H152□BQ	0.5	ECUE1E152□BQ	0.5			+80 %	ECUE1H152ZFQ	0.5	ECUE1E152ZFQ	0.5		
1800	or	ECUE1H182KBQ	0.5	ECUE1E182KBQ	0.5			−20						
2200	±20 %	ECUE1H222□BQ	0.5	ECUE1E222□BQ	0.5			(Z)	ECUE1H222ZFQ	0.5	ECUE1E222ZFQ	0.5		
2700	(M)	ECUE1H272KBQ	0.5	ECUE1E272KBQ	0.5									
3300		ECUE1H332□BQ	0.5	ECUE1E332□BQ	0.5				ECUE1H332ZFQ	0.5	ECUE1E332ZFQ	0.5		
3900		ECUE1H392KBQ	0.5	ECUE1E392KBQ	0.5									
4700	(Packaging Style Code)**			ECUE1E472□BQ	0.5				ECUE1H472ZFQ	0.5	ECUE1E472ZFQ	0.5		
5600				ECUE1E562KBQ	0.5	ECUE1C562KBQ	0.5							
6800				ECUE1E682□BQ	0.5	ECUE1C682□BQ	0.5		ECUE1H682ZFQ	0.5	ECUE1E682ZFQ	0.5		
8200						ECUE1C822KBQ	0.5							
10000						ECUE1C103□BQ	0.5		ECUE1H103ZFQ	0.5	ECUE1E103ZFQ	0.5		
12000						ECUE1C123KBQ	0.5							
15000						ECUE1C153□BQ	0.5				ECUE1E153ZFQ	0.5	ECUE1C153ZFQ	0.5
18000						(Cap. Tol. Code)*								
22000											ECUE1E223ZFQ	0.5	ECUE1C223ZFQ	0.5
27000														
33000													ECUE1C333ZFQ	0.5
39000														
47000													ECUE1C473ZFQ	0.5
56000														
68000													ECUE1C683ZFQ	0.5
82000														
100000													ECUE1C104ZFQ	0.5

* □: Capacitance Tolerance Code.
** Packaging Styles Code: “E” for Taped Version (Taping pitch: 2 mm) and “X” for Bulk Type

■ Standard Products for"11"Type (EIA"0603"Type) , Taped Version [Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ (NP0) Part No.	Dim. T (mm)	SL Part No.	Dim. T (mm)	PΔ (N150) Part No.	Dim. T (mm)	RΔ (N220) Part No.	Dim. T (mm)	SΔ (N330) Part No.	Dim. T (mm)	TΔ (N470) Part No.	Dim. T (mm)	UΔ (N750) Part No.	Dim. T (mm)
0.5	±0.25 pF(C)	ECUV1H0R5CCV	0.8	ECUV1H0R5CV	0.8	ECUV1H0R5CPV	0.8	ECUV1H0R5CRV	0.8	ECUV1H0R5CSV	0.8	ECUV1H0R5CTV	0.8	ECUV1H0R5CUV	0.8
1	±0.25 pF (C) or ±0.5 pF (D)	ECUV1H010□CV	0.8	ECUV1H010□V	0.8	ECUV1H010□PV	0.8	ECUV1H010□RV	0.8	ECUV1H010□SV	0.8	ECUV1H010□TV	0.8	ECUV1H010□UV	0.8
1.5		ECUV1H1R5□CV	0.8	ECUV1H1R5□V	0.8	ECUV1H1R5□PV	0.8	ECUV1H1R5□RV	0.8	ECUV1H1R5□SV	0.8	ECUV1H1R5□TV	0.8	ECUV1H1R5□UV	0.8
2		ECUV1H020□CV	0.8	ECUV1H020□V	0.8	ECUV1H020□PV	0.8	ECUV1H020□RV	0.8	ECUV1H020□SV	0.8	ECUV1H020□TV	0.8	ECUV1H020□UV	0.8
3		ECUV1H030□CV	0.8	ECUV1H030□V	0.8	ECUV1H030□PV	0.8	ECUV1H030□RV	0.8	ECUV1H030□SV	0.8	ECUV1H030□TV	0.8	ECUV1H030□UV	0.8
4		ECUV1H040□CV	0.8	ECUV1H040□V	0.8	ECUV1H040□PV	0.8	ECUV1H040□RV	0.8	ECUV1H040□SV	0.8	ECUV1H040□TV	0.8	ECUV1H040□UV	0.8
5		ECUV1H050□CV	0.8	ECUV1H050□V	0.8	ECUV1H050□PV	0.8	ECUV1H050□RV	0.8	ECUV1H050□SV	0.8	ECUV1H050□TV	0.8	ECUV1H050□UV	0.8
6	±0.5 pF (D)	ECUV1H060DCV	0.8	ECUV1H060DV	0.8	ECUV1H060DPV	0.8	ECUV1H060DRV	0.8	ECUV1H060DSV	0.8	ECUV1H060DTV	0.8	ECUV1H060DUV	0.8
7		ECUV1H070DCV	0.8	ECUV1H070DV	0.8	ECUV1H070DPV	0.8	ECUV1H070DRV	0.8	ECUV1H070DSV	0.8	ECUV1H070DTV	0.8	ECUV1H070DUV	0.8
8		ECUV1H080DCV	0.8	ECUV1H080DV	0.8	ECUV1H080DPV	0.8	ECUV1H080DRV	0.8	ECUV1H080DSV	0.8	ECUV1H080DTV	0.8	ECUV1H080DUV	0.8
9		ECUV1H090DCV	0.8	ECUV1H090DV	0.8	ECUV1H090DPV	0.8	ECUV1H090DRV	0.8	ECUV1H090DSV	0.8	ECUV1H090DTV	0.8	ECUV1H090DUV	0.8
10	±0.5 pF (D) or ±1 pF (F)	ECUV1H100□CV	0.8	ECUV1H100□V	0.8	ECUV1H100□PV	0.8	ECUV1H100□RV	0.8	ECUV1H100□SV	0.8	ECUV1H100□TV	0.8	ECUV1H100□UV	0.8
12	±5 %*** (J) or ±10 % (K)	ECUV1H120□CV	0.8	ECUV1H120□V	0.8	ECUV1H120□PV	0.8	ECUV1H120□RV	0.8	ECUV1H120□SV	0.8	ECUV1H120□TV	0.8	ECUV1H120□UV	0.8
15		ECUV1H150□CV	0.8	ECUV1H150□V	0.8	ECUV1H150□PV	0.8	ECUV1H150□RV	0.8	ECUV1H150□SV	0.8	ECUV1H150□TV	0.8	ECUV1H150□UV	0.8
18		ECUV1H180□CV	0.8	ECUV1H180□V	0.8	ECUV1H180□PV	0.8	ECUV1H180□RV	0.8	ECUV1H180□SV	0.8	ECUV1H180□TV	0.8	ECUV1H180□UV	0.8
22		ECUV1H220□CV	0.8	ECUV1H220□V	0.8	ECUV1H220□PV	0.8	ECUV1H220□RV	0.8	ECUV1H220□SV	0.8	ECUV1H220□TV	0.8	ECUV1H220□UV	0.8
27		ECUV1H270□CV	0.8	ECUV1H270□V	0.8	ECUV1H270□PV	0.8	ECUV1H270□RV	0.8	ECUV1H270□SV	0.8	ECUV1H270□TV	0.8	ECUV1H270□UV	0.8
33		ECUV1H330□CV	0.8	ECUV1H330□V	0.8	ECUV1H330□PV	0.8	ECUV1H330□RV	0.8	ECUV1H330□SV	0.8	ECUV1H330□TV	0.8	ECUV1H330□UV	0.8
39		ECUV1H390□CV	0.8	ECUV1H390□V	0.8	ECUV1H390□PV	0.8	ECUV1H390□RV	0.8	ECUV1H390□SV	0.8	ECUV1H390□TV	0.8	ECUV1H390□UV	0.8
47		ECUV1H470□CV	0.8	ECUV1H470□V	0.8	ECUV1H470□PV	0.8	ECUV1H470□RV	0.8	ECUV1H470□SV	0.8	ECUV1H470□TV	0.8	ECUV1H470□UV	0.8
56		ECUV1H560□CV	0.8	ECUV1H560□V	0.8	ECUV1H560□PV	0.8	ECUV1H560□RV	0.8	ECUV1H560□SV	0.8	ECUV1H560□TV	0.8	ECUV1H560□UV	0.8
68		ECUV1H680□CV	0.8	ECUV1H680□V	0.8	ECUV1H680□PV	0.8	ECUV1H680□RV	0.8	ECUV1H680□SV	0.8	ECUV1H680□TV	0.8	ECUV1H680□UV	0.8
82		ECUV1H820□CV	0.8	ECUV1H820□V	0.8	ECUV1H820□PV	0.8	ECUV1H820□RV	0.8	ECUV1H820□SV	0.8	ECUV1H820□TV	0.8	ECUV1H820□UV	0.8
100		ECUV1H101□CV	0.8	ECUV1H101□V	0.8	ECUV1H101□PV	0.8	ECUV1H101□RV	0.8	ECUV1H101□SV	0.8	ECUV1H101□TV	0.8	ECUV1H101□UV	0.8
120		ECUV1H121□CV	0.8	ECUV1H121□V	0.8	ECUV1H121□PV	0.8	ECUV1H121□RV	0.8	ECUV1H121□SV	0.8	ECUV1H121□TV	0.8	ECUV1H121□UV	0.8
150		ECUV1H151□CV	0.8	ECUV1H151□V	0.8	ECUV1H151□PV	0.8	ECUV1H151□RV	0.8	ECUV1H151□SV	0.8	ECUV1H151□TV	0.8	ECUV1H151□UV	0.8
180		ECUV1H181□CV	0.8	ECUV1H181□V	0.8			ECUV1H181□RV	0.8	ECUV1H181□SV	0.8	ECUV1H181□TV	0.8	ECUV1H181□UV	0.8
220		ECUV1H221□CV	0.8	ECUV1H221□V	0.8			(Packaging Style Code)*				ECUV1H221□TV	0.8	ECUV1H221□UV	0.8
270		ECUV1H271□CV	0.8	ECUV1H271□V	0.8									ECUV1H271□UV	0.8
330		ECUV1H331□CV	0.8	ECUV1H331□V	0.8									ECUV1H331□UV	0.8
390		ECUV1H391□CV	0.8	ECUV1H391□V	0.8									ECUV1H391□UV	0.8
470		ECUV1H471□CV	0.8	ECUV1H471□V	0.8									ECUV1H471□UV	0.8
560		ECUV1H561□CV	0.8	ECUV1H561□V	0.8									ECUV1H561□UV	0.8
680		ECUV1H681□CV	0.8	ECUV1H681□V	0.8									ECUV1H681□UV	0.8
820		ECUV1H821□CV	0.8	ECUV1H821□V	0.8									ECUV1H821□UV	0.8
1000		ECUV1H102□CV	0.8	ECUV1H102□V	0.8									ECUV1H102□UV	0.8
1200		(Cap. Tol. Code)**		ECUV1H122□V	0.8									ECUV1H122□UV	0.8

* Packaging Style Code "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.
** □: Capacitance Tolerance Codes.
*** Capacitance values of "E24" series and capacitance tolerance of ±5 % are available on special order.

■ Standard Products for"11"Type (EIA"0603"Type) , Taped Version

Capacitance (pF)	B/X7R									F/Y5V								
	Capacitance Tolerance	50 VDC		25 VDC		16 VDC		10 VDC		Capacitance Tolerance	50 VDC		25 VDC		16 VDC		10 VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
220		ECUV1H221□BV	0.8															
270		ECUV1H271KBV	0.8															
330		ECUV1H331□BV	0.8															
390		ECUV1H391KBV	0.8															
470		ECUV1H471□BV	0.8															
560		ECUV1H561KBV	0.8															
680		ECUV1H681□BV	0.8															
820		ECUV1H821KBV	0.8															
1000		ECJ1VB1H102□	0.8								ECUV1H102ZFV	0.8						
1200		ECJ1VB1H122K	0.8															
1500		ECJ1VB1H152□	0.8								ECUV1H152ZFV	0.8						
1800		ECJ1VB1H182K	0.8															
2200	±10 %	ECJ1VB1H222□	0.8								ECUV1H222ZFV	0.8						
2700	(K)	ECJ1VB1H272K	0.8							+80 %								
3300	or	ECJ1VB1H332□	0.8							−20	ECUV1H332ZFV	0.8						
3900	±20 %	ECJ1VB1H392K	0.8							(Z)								
4700	(M)	ECJ1VB1H472□	0.8								ECUV1H472ZFV	0.8						
5600		ECJ1VB1H562K	0.8															
6800		ECJ1VB1H682□	0.8								ECUV1H682ZFV	0.8						
8200		ECJ1VB1H822K	0.8															
10000		ECJ1VB1H103□	0.8	ECJ1VB1E103□	0.8	ECJ1VB1C103□	0.8				ECJ1VF1H103Z	0.8						
12000		ECJ1VB1H123K	0.8	ECJ1VB1E123K	0.8	ECJ1VB1C123K	0.8											
15000		ECJ1VB1H153□	0.8	ECJ1VB1E153□	0.8	ECJ1VB1C153□	0.8				ECJ1VF1H153Z	0.8						
18000		(Cap. Tol. Code)**		ECJ1VB1E183K	0.8	ECJ1VB1C183K	0.8											
22000				ECJ1VB1E223□	0.8	ECJ1VB1C223□	0.8				ECJ1VF1H223Z	0.8						
27000				ECJ1VB1E273K	0.8	ECJ1VB1C273K	0.8											
33000				ECJ1VB1E333□	0.8	ECJ1VB1C333□	0.8				ECJ1VF1H333Z	0.8						
39000				ECJ1VB1E393K	0.8	ECJ1VB1C393K	0.8											
47000				ECJ1VB1E473□	0.8	ECJ1VB1C473□	0.8				ECJ1VF1H473Z	0.8						
56000				(Packaging Style Code)*		ECJ1VB1C563K	0.8											
68000						ECJ1VB1C683□	0.8						ECJ1VF1E683Z	0.8				
82000						ECJ1VB1C823K	0.8											
100000						ECJ1VB1C104□	0.8						ECJ1VF1E104Z	0.8	ECJ1VF1C104Z	0.8		
150000								ECJ1VB1A154□	0.8						ECJ1VF1C154Z	0.8		
220000								ECJ1VB1A224□	0.8						ECJ1VF1C224Z	0.8		
330000															ECJ1VF1C334Z	0.8		
470000															ECJ1VF1C474Z	0.8		
680000																		
1000000																	ECJ1VF1A105Z	0.8
1500000																		
2200000																		

*Packaging Styles Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.
**□: Capacitance Tolerance Codes.

■ Standard Products for"12"Type (EIA"0805"Type) , Taped Version

[Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ (NP0) Part No.	Dim. T (mm)	SL Part No.	Dim. T (mm)	PΔ (N150) Part No.	Dim. T (mm)	RΔ (N220) Part No.	Dim. T (mm)	SΔ (N330) Part No.	Dim. T (mm)	TΔ (N470) Part No.	Dim. T (mm)	UΔ (N750) Part No.	Dim. T (mm)
0.5	±0.25 pF(C)	ECUV1H0R5CCN	0.6	ECUV1H0R5CN	0.6	ECUV1H0R5CPN	0.6	ECUV1H0R5CRN	0.6	ECUV1H0R5CSN	0.6	ECUV1H0R5CTN	0.6	ECUV1H0R5CUN	0.6
1	±0.25 pF (C) or ±0.5 pF (D)	ECUV1H010□CN	0.6	ECUV1H010□N	0.6	ECUV1H010□PN	0.6	ECUV1H010□RN	0.6	ECUV1H010□SN	0.6	ECUV1H010□TN	0.6	ECUV1H010□UN	0.6
1.5		ECUV1H1R5□CN	0.6	ECUV1H1R5□N	0.6	ECUV1H1R5□PN	0.6	ECUV1H1R5□RN	0.6	ECUV1H1R5□SN	0.6	ECUV1H1R5□TN	0.6	ECUV1H1R5□UN	0.6
2		ECUV1H020□CN	0.6	ECUV1H020□N	0.6	ECUV1H020□PN	0.6	ECUV1H020□RN	0.6	ECUV1H020□SN	0.6	ECUV1H020□TN	0.6	ECUV1H020□UN	0.6
3		ECUV1H030□CN	0.6	ECUV1H030□N	0.6	ECUV1H030□PN	0.6	ECUV1H030□RN	0.6	ECUV1H030□SN	0.6	ECUV1H030□TN	0.6	ECUV1H030□UN	0.6
4		ECUV1H040□CN	0.6	ECUV1H040□N	0.6	ECUV1H040□PN	0.6	ECUV1H040□RN	0.6	ECUV1H040□SN	0.6	ECUV1H040□TN	0.6	ECUV1H040□UN	0.6
5		ECUV1H050□CN	0.6	ECUV1H050□N	0.6	ECUV1H050□PN	0.6	ECUV1H050□RN	0.6	ECUV1H050□SN	0.6	ECUV1H050□TN	0.6	ECUV1H050□UN	0.6
6	±0.5 pF (D)	ECUV1H060DCN	0.6	ECUV1H060DN	0.6	ECUV1H060DPN	0.6	ECUV1H060DRN	0.6	ECUV1H060DSN	0.6	ECUV1H060DTN	0.6	ECUV1H060DUN	0.6
7		ECUV1H070DCN	0.6	ECUV1H070DN	0.6	ECUV1H070DPN	0.6	ECUV1H070DRN	0.6	ECUV1H070DSN	0.6	ECUV1H070DTN	0.6	ECUV1H070DUN	0.6
8		ECUV1H080DCN	0.6	ECUV1H080DN	0.6	ECUV1H080DPN	0.6	ECUV1H080DRN	0.6	ECUV1H080DSN	0.6	ECUV1H080DTN	0.6	ECUV1H080DUN	0.6
9		ECUV1H090DCN	0.6	ECUV1H090DN	0.6	ECUV1H090DPN	0.6	ECUV1H090DRN	0.6	ECUV1H090DSN	0.6	ECUV1H090DTN	0.6	ECUV1H090DUN	0.6
10	±0.5 pF (D) or ±1 pF (F)	ECUV1H100□CN	0.6	ECUV1H100□N	0.6	ECUV1H100□PN	0.6	ECUV1H100□RN	0.6	ECUV1H100□SN	0.6	ECUV1H100□TN	0.6	ECUV1H100□UN	0.6
12	±5 %*** (J) or ±10 % (K)	ECUV1H120□CN	0.6	ECUV1H120□N	0.6	ECUV1H120□PN	0.6	ECUV1H120□RN	0.6	ECUV1H120□SN	0.6	ECUV1H120□TN	0.6	ECUV1H120□UN	0.6
15		ECUV1H150□CN	0.6	ECUV1H150□N	0.6	ECUV1H150□PN	0.6	ECUV1H150□RN	0.6	ECUV1H150□SN	0.6	ECUV1H150□TN	0.6	ECUV1H150□UN	0.6
18		ECUV1H180□CN	0.6	ECUV1H180□N	0.6	ECUV1H180□PN	0.6	ECUV1H180□RN	0.6	ECUV1H180□SN	0.6	ECUV1H180□TN	0.6	ECUV1H180□UN	0.6
22		ECUV1H220□CN	0.6	ECUV1H220□N	0.6	ECUV1H220□PN	0.6	ECUV1H220□RN	0.6	ECUV1H220□SN	0.6	ECUV1H220□TN	0.6	ECUV1H220□UN	0.6
27		ECUV1H270□CG	0.6	ECUV1H270□G	0.6	ECUV1H270□PN	0.6	ECUV1H270□RN	0.6	ECUV1H270□SN	0.6	ECUV1H270□TN	0.6	ECUV1H270□UN	0.6
33		ECUV1H330□CG	0.6	ECUV1H330□G	0.6	ECUV1H330□PN	0.6	ECUV1H330□RN	0.6	ECUV1H330□SN	0.6	ECUV1H330□TN	0.6	ECUV1H330□UN	0.6
39		ECUV1H390□CG	0.6	ECUV1H390□G	0.6	ECUV1H390□PN	0.6	ECUV1H390□RN	0.6	ECUV1H390□SN	0.6	ECUV1H390□TN	0.6	ECUV1H390□UN	0.6
47		ECUV1H470□CG	0.6	ECUV1H470□G	0.6	ECUV1H470□PN	0.6	ECUV1H470□RN	0.6	ECUV1H470□SN	0.6	ECUV1H470□TN	0.6	ECUV1H470□UN	0.6
56		ECUV1H560□CG	0.6	ECUV1H560□G	0.6	ECUV1H560□PN	0.6	ECUV1H560□RN	0.6	ECUV1H560□SN	0.6	ECUV1H560□TN	0.6	ECUV1H560□UN	0.6
68		ECUV1H680□CG	0.6	ECUV1H680□G	0.6	ECUV1H680□PN	0.6	ECUV1H680□RN	0.6	ECUV1H680□SN	0.6	ECUV1H680□TN	0.6	ECUV1H680□UN	0.6
82		ECUV1H820□CG	0.6	ECUV1H820□G	0.6	ECUV1H820□PN	0.6	ECUV1H820□RN	0.6	ECUV1H820□SN	0.6	ECUV1H820□TN	0.6	ECUV1H820□UN	0.6
100		ECUV1H101□CG	0.6	ECUV1H101□G	0.6	ECUV1H101□PN	0.6	ECUV1H101□RN	0.6	ECUV1H101□SN	0.6	ECUV1H101□TN	0.6	ECUV1H101□UN	0.6
120		ECUV1H121□CG	0.6	ECUV1H121□G	0.6	ECUV1H121□PN	0.6	ECUV1H121□RN	0.6	ECUV1H121□SN	0.6	ECUV1H121□TN	0.6	ECUV1H121□UN	0.6
150		ECUV1H151□CG	0.6	ECUV1H151□G	0.6	ECUV1H151□PN	0.6	ECUV1H151□RN	0.6	ECUV1H151□SN	0.6	ECUV1H151□TN	0.6	ECUV1H151□UN	0.6
180		ECUV1H181□CG	0.6	ECUV1H181□G	0.6	ECUV1H181□PN	0.6	ECUV1H181□RN	0.6	ECUV1H181□SN	0.6	ECUV1H181□TN	0.6	ECUV1H181□UN	0.6
220		ECUV1H221□CG	0.6	ECUV1H221□G	0.6	ECUV1H221□PN	0.6	ECUV1H221□RN	0.6	ECUV1H221□SN	0.6	ECUV1H221□TN	0.6	ECUV1H221□UN	0.6
270		ECUV1H271□CG	0.6	ECUV1H271□G	0.6	ECUV1H271□PN	0.85	ECUV1H271□RN	0.85	ECUV1H271□SN	0.85	ECUV1H271□TN	0.6	ECUV1H271□UN	0.6
330		ECUV1H331□CG	0.6	ECUV1H331□G	0.6	ECUV1H331□PN	0.85	ECUV1H331□RN	0.85	ECUV1H331□SN	0.85	ECUV1H331□TN	0.85	ECUV1H331□UN	0.6
390		ECUV1H391□CG	0.6	ECUV1H391□G	0.6			ECUV1H391□RN	0.85	ECUV1H391□SN	0.85	ECUV1H391□TN	0.85	ECUV1H391□UX	0.6
470		ECUV1H471□CX	0.6	ECUV1H471□G	0.6					ECUV1H471□SN	0.85	ECUV1H471□TN	0.85	ECUV1H471□UX	0.6
560		ECUV1H561□CX	0.6	ECUV1H561□G	0.6					(Packaging Style Code)*				ECUV1H561□UX	0.6
680		ECUV1H681□CX	0.6	ECUV1H681□G	0.6									ECUV1H681□UX	0.6
820		ECUV1H821□CX	0.6	ECUV1H821□X	0.6									ECUV1H821□UX	0.6
1000		ECUV1H102□CX	0.6	ECUV1H102□X	0.6									ECUV1H102□UX	0.6
1200		ECUV1H122□CX	0.6	ECUV1H122□X	0.6									ECUV1H122□UX	0.6
1500		ECUV1H152□CX	0.6	ECUV1H152□X	0.6									ECUV1H152□UX	0.6
1800		ECUV1H182□CX	0.6	ECUV1H182□X	0.6									ECUV1H182□UX	0.6
2200		ECUV1H222□CX	0.6	ECUV1H222□X	0.6									ECUV1H222□UX	0.6
2700		ECUV1H272□CX	0.85	ECUV1H272□X	0.6									ECUV1H272□UX	0.6

(Cap. Tol. Code)**

* Packaging Style Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.
** □: Capacitance Tolerance Codes.
*** Capacitance values of "E24" series and capacitance tolerance of ±5 % are available on special order.

■ Standard Products for"12"Type (EIA"0805"Type) , Taped Version

Capacitance (pF)	B/X7R Capacitance Tolerance	B/X7R 50 VDC Part No.	Dim. T (mm)	B/X7R 25 VDC Part No.	Dim. T (mm)	B/X7R 16 VDC Part No.	Dim. T (mm)	B/X7R 10 VDC Part No.	Dim. T (mm)	F/Y5V Capacitance Tolerance	F/Y5V 50 VDC Part No.	Dim. T (mm)	F/Y5V 25 VDC Part No.	Dim. T (mm)	F/Y5V 16 VDC Part No.	Dim. T (mm)	F/Y5V 10 VDC Part No.	Dim. T (mm)
220																		
270																		
330																		
390																		
470																		
560																		
680																		
820																		
1000		ECUV1H102□BN	0.6															
1200		ECUV1H122KBN	0.6															
1500		ECUV1H152□BN	0.6															
1800		ECUV1H182KBN	0.6															
2200		ECUV1H222□BN	0.6															
2700		ECUV1H272KBN	0.6															
3300		ECUV1H332□BN	0.6															
3900	±10 %	ECUV1H392KBN	0.6															
4700	(K)	ECUV1H472□BG	0.6							+80 -20 %								
5600	or	ECUV1H562KBG	0.6															
6800	±20 %	ECUV1H682□BG	0.6							(Z)								
8200	(M)	ECUV1H822KBG	0.6															
10000		ECUV1H103□BG	0.6								ECJ2VF1H103Z	0.6						
12000		ECUV1H123KBX	0.6															
15000		ECUV1H153□BX	0.6								ECJ2VF1H153Z	0.6						
18000		ECUV1H183KBX	0.6															
22000		ECUV1H223□BX	0.6								ECJ2VF1H223Z	0.6						
27000		ECJ2VB1H273K	0.85															
33000		ECJ2VB1H333□	0.85								ECJ2VF1H333Z	0.6						
39000		ECJ2VB1H393K	0.85	ECJ2VB1E393K	0.85													
47000		ECJ2YB1H473□	1.25	ECJ2VB1E473□	0.85	ECJ2VB1C473□	0.85				ECJ2VF1H473Z	0.6						
56000		ECJ2YB1H563K	1.25	ECJ2VB1E563K	0.85	ECJ2VB1C563K	0.85											
68000		ECJ2YB1H683□	1.25	ECJ2VB1E683□	0.85	ECJ2VB1C683□	0.85				ECJ2VF1H683Z	0.6	ECJ2VF1E683Z	0.6				
82000		ECJ2YB1H823K	1.25	ECJ2VB1E823K	0.85	ECJ2VB1C823K	0.85											
100000		ECJ2YB1H104□	1.25	ECJ2VB1E104□	0.85	ECJ2VB1C104□	0.85				ECJ2VF1H104Z	0.85	ECJ2VF1E104Z	0.6	ECJ2VF1C104Z	0.6		
120000	(Cap. Tol. Code)**			ECJ2YB1E124K	1.25	ECJ2VB1C124K	0.85											
150000				ECJ2YB1E154□	1.25	ECJ2VB1C154□	0.85				ECJ2VF1H154Z	0.85	ECJ2VF1E154Z	0.6	ECJ2VF1C154Z	0.6		
180000				ECJ2YB1E184K	1.25	ECJ2VB1C184K	0.85											
220000				ECJ2YB1E224□	1.25	ECJ2VB1C224□	0.85				ECJ2VF1H224Z	0.85	ECJ2VF1E224Z	0.85	ECJ2VF1C224Z	0.6		
330000		(Packaging Style Code)*				ECJ2YB1C334□	1.25						ECJ2YF1E334Z	1.25	ECJ2VF1C334Z	0.85		
470000						ECJ2YB1C474□	1.25						ECJ2YF1E474Z	1.25	ECJ2VF1C474Z	0.85		
680000								ECJ2YB1A684□	1.25						ECJ2VF1C684Z	0.85		
1000000								ECJ2YB1A105□	1.25						ECJ2VF1C105Z	0.85		
1500000															ECJ2YF1C155Z	1.25		
2200000															ECJ2YF1C225Z	1.25		
3300000																	ECJ2YF1A335Z	1.25
4700000																	ECJ2YF1A475Z	1.25
6800000																		
10000000																		

*Packaging Style Code: "V" for Taped Version (Taping pitch:4 mm) and "X" for Bulk Type.
**□: Capacitance Tolerance Codes.

■ Standard Products for“13”Type (EIA“1206”Type) , Taped Version [Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ (NP0) Part No.	CΔ (NP0) Dim. T (mm)	SL Part No.	SL Dim. T (mm)	PΔ (N150) Part No.	PΔ (N150) Dim. T (mm)	RΔ (N220) Part No.	RΔ (N220) Dim. T (mm)	SΔ (N330) Part No.	SΔ (N330) Dim. T (mm)	TΔ (N470) Part No.	TΔ (N470) Dim. T (mm)	UΔ (N750) Part No.	UΔ (N750) Dim. T (mm)
270						ECUV1H271□PM	0.6	ECUV1H271□RM	0.6	ECUV1H271□SM	0.6	ECUV1H271□TM	0.6		
330	±5 %*** (J) or ±10 % (K)					ECUV1H331□PM	0.6	ECUV1H331□RM	0.6	ECUV1H331□SM	0.6	ECUV1H331□TM	0.6		
390						ECUV1H391□PM	0.6	ECUV1H391□RM	0.6	ECUV1H391□SM	0.6	ECUV1H391□TM	0.6		
470						ECUV1H471□PM	0.6	ECUV1H471□RM	0.6	ECUV1H471□SM	0.6	ECUV1H471□TM	0.6		
560						ECUV1H561□PM	0.6	ECUV1H561□RM	0.6	ECUV1H561□SM	0.6	ECUV1H561□TM	0.6		
680						ECUV1H681□PM	0.85	ECUV1H681□RM	0.6	ECUV1H681□SM	0.6	ECUV1H681□TM	0.6		
820						ECUV1H821□PM	0.85	ECUV1H821□RM	0.85	ECUV1H821□SM	0.85	ECUV1H821□TM	0.6		
1000						ECUV1H102□PM	0.85	ECUV1H102□RM	0.85	ECUV1H102□SM	0.85	ECUV1H102□TM	0.85		
1200						ECUV1H122□PM	0.85	ECUV1H122□RM	0.85	ECUV1H122□SM	0.85	ECUV1H122□TM	0.85		
1500						(Packaging Style Code)*				ECUV1H152□SM	0.85	ECUV1H152□TM	0.85		
1800															
2200															
2700		ECUV1H272□CW	0.6												
3300		ECUV1H332□CW	0.6	ECUV1H332□W	0.6									ECUV1H332□UW	0.6
3900		ECUV1H392□CW	0.6	ECUV1H392□W	0.6									ECUV1H392□UW	0.6
4700		ECUV1H472□CW	0.6	ECUV1H472□W	0.6									ECUV1H472□UW	0.6
5600		ECUV1H562□CW	0.85	ECUV1H562□W	0.6									ECUV1H562□UW	0.6
6800		ECUV1H682□CW	0.85												
8200		ECUY1H822□CW	1.15												
10000		ECUY1H103□CW	1.15												

(Cap. Tol. Code)**

* Packaging Style Code: “V”, “Y” for Taped Version (Taping pitch: 4 mm) and “X” for Bulk Type.
** □: Capacitance Tolerance Codes.
*** Capacitance values of “E24” series and capacitance tolerance of ±5 % are available on special order.

■ Standard Products for"13" Type (EIA "1206"Type), Taped Version

Capacitance (pF)	B/X7R							F/Y5V						
	Capacitance Tolerance	25 VDC		16 VDC		10VDC		Capacitance Tolerance	25 VDC		16 VDC		10 VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
68000														
82000														
100000		ECJ3VB1E104□	0.85	ECJ3VB1C104□	0.85									
120000		ECJ3VB1E124K	0.85	ECJ3VB1C124K	0.85									
150000		ECJ3VB1E154□	0.85	ECJ3VB1C154□	0.85									
180000		ECJ3VB1E184K	0.85	ECJ3VB1C184K	0.85									
220000	±10 % (K) or ±20 % (M)	ECJ3VB1E224□	0.85	ECJ3VB1C224□	0.85			+80 −20 % (Z)						
270000		ECJ3VB1E274K	0.85	ECJ3VB1C274K	0.85									
330000		ECJ3VB1E334□	0.85	ECJ3VB1C334□	0.85									
390000		ECJ3YB1E394K	1.15	ECJ3VB1C394K	0.85									
470000		ECJ3YB1E474□	1.15	ECJ3VB1C474□	0.85				ECJ3VF1E474Z	0.85				
560000				ECJ3VB1C564K	0.85									
680000		ECJ3YB1E684□	1.6	ECJ3VB1C684□	0.85				ECJ3YF1E684Z	1.15	ECJ3VF1C684Z	0.85		
820000				ECJ3YB1C824K	1.15									
1000000		ECJ3YB1E105□	1.6	ECJ3YB1C105□	1.15				ECJ3YF1E105Z	1.15	ECJ3VF1C105Z	0.85		
1500000		(Cap. Tol. Code)**				ECJ3YB1A155□	1.6		ECJ3YF1E155Z	1.15	ECJ3VF1C155Z	0.85		
2200000						ECJ3YB1A225□	1.6		ECJ3YF1E225Z	1.15	ECJ3VF1C225Z	0.85		
3300000						ECJ3YB1A335□	1.6				ECJ3YF1C335Z	1.15		
4700000						(Packaging Style Code)*					ECJ3YF1C475Z	1.15		
6800000														
10000000													ECJ3YF1A106Z	1.6

*Packaging Style Code: "V", "Y" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.
**□: Capacitance Tolerance Codes.

■ Packaging Specifications

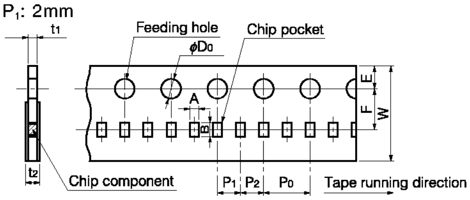
● Standard Packing Quantity

Size Code (EIA)	Thickness \ Style	Paper taping	Embossed taping	Bulk	Bulk case
10 (0402)	0.5 mm	Pitch 2 mm: 10000 (50000) pcs./reel	—	1000 pcs./bag	50000 pcs./case
11 (0603)	0.8 mm	Pitch 2 mm: 8000 (20000) pcs./reel Pitch 4 mm: 4000 (10000) pcs./reel	—	1000 pcs./bag	15000 pcs./case
12 (0805)	0.6 mm	Pitch 2 mm: 10000 (40000) pcs./reel Pitch 4 mm: 5000 (20000) pcs./reel	—	1000 pcs./bag	10000 pcs./case
	0.85 mm	Pitch 4 mm: 4000 (10000) pcs./reel	—	1000 pcs./bag	—
	1.25 mm	—	Pitch 4 mm: 2000 (10000) pcs./reel	1000 pcs./bag	—
13 (1206)	0.6 mm	Pitch 4 mm: 5000 (20000) pcs./reel	—	1000 pcs./bag	—
	0.85 mm	Pitch 4 mm: 4000 (10000) pcs./reel	—	1000 pcs./bag	—
	1.15 mm	—	Pitch 4 mm: 2000 (10000) pcs./reel	1000 pcs./bag	—
	1.6 mm	—	Pitch 4 mm: 2000 pcs./reel	1000 pcs./bag	—

( ) for large size reel applied

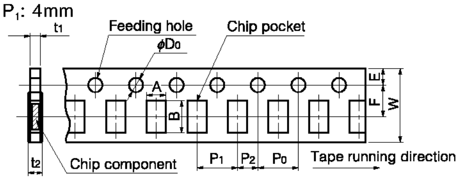
● Paper Taping

P_1: 2mm



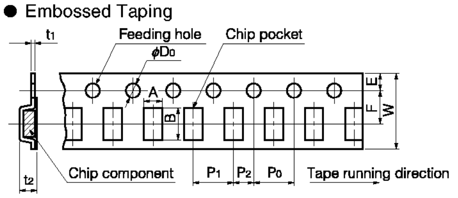
Size Code \ Symbol		A	B	W	F	E	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	10 (0402)	0.65 ±0.05	1.15 ±0.05	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	0.7 max.	1.0 max.
	11 (0603)	1.10 ±0.10	1.90 ±0.10								1.1 max.	1.4 max.
	12 (0805)	1.65 ±0.20	2.4 ±0.2									

P_1: 4mm



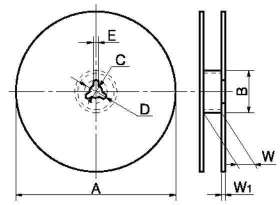
Size Code \ Symbol		A	B	W	F	E	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	11 (0603)	1.10 ±0.10	1.90 ±0.10	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.1 max.	1.4 max.
	12 (0805)	1.65 ±0.20	2.4 ±0.2									
	13 (1206)	2.0 ±0.2	3.6 ±0.2									

● Embossed Taping



Size Code \ Symbol		A	B	W	F	E	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	12 (0805)	1.55 ±0.20	2.35 ±0.2	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	0.6 max.	2.1 max.
	13 (1206)	1.95 ±0.20	3.6 ±0.2									

● Reel for Taping

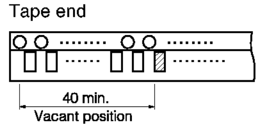


Symbol	A	B	C	D	E	W	W_1
Dim. (mm)	$\phi 180\,^{0}_{-3}$ (330±5)	ϕ60.0±0.5 (50 min.)	13.0±0.5	21.0±0.8 (20 min.)	2.0±0.5	9.0±0.3 (9.5±1.0)	1.3±0.2 (2.0±0.5)

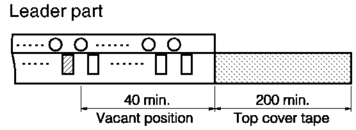
( ): Large size reel

● Leader Part and Taped End

Tape end

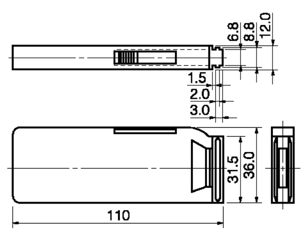


Leader part



Unit : mm

(1)Bulk Case

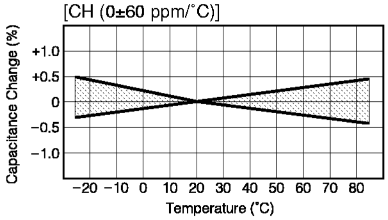


Unit: mm

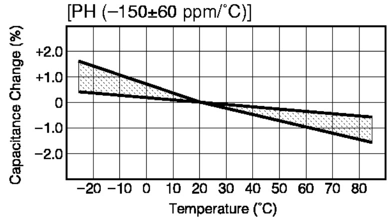
■ Typical Temperature Characteristics

[Class 1 (T.C. Type)]

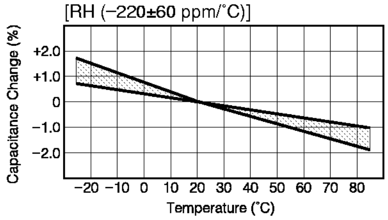
[CH (0±60 ppm/°C)]



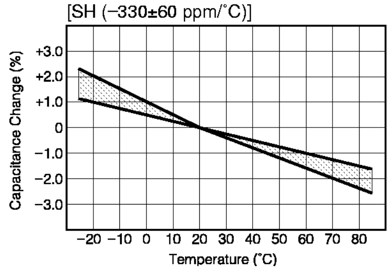
[PH (−150±60 ppm/°C)]



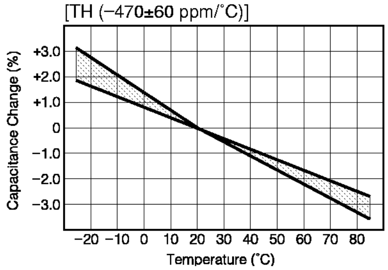
[RH (−220±60 ppm/°C)]



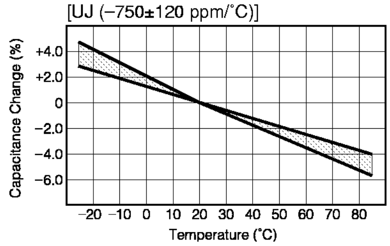
[SH (−330±60 ppm/°C)]



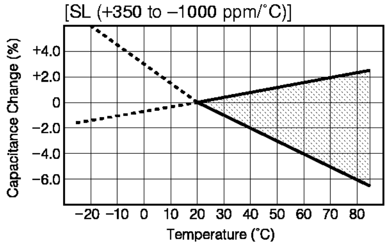
[TH (−470±60 ppm/°C)]



[UJ (−750±120 ppm/°C)]

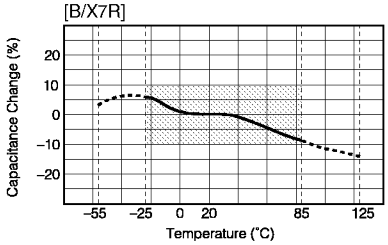


[SL (+350 to −1000 ppm/°C)]

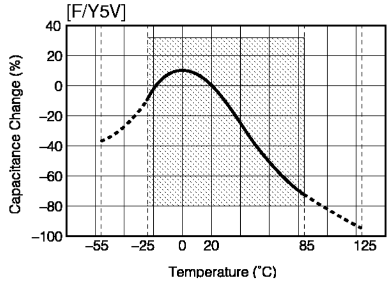


[Class 2 (Hi-K Type)]

[B/X7R]



[F/Y5V]



Multilayer Ceramic Chip Capacitors

Series: **ECU, ECJ** (For General Electronic Equipment)

Handling Precautions

⚠ Safety Precautions

The Multilayer Ceramic Chip Capacitors (hereafter referred to as "The Capacitors") may fail in a short circuit mode or in an open-circuit mode, when subjected to severe conditions of electrical, enviromental and/or mechanical streses beyond the specified "Ratings" and specified "Conditions" in the Catalog and the Specifications, resulting in burnout, flaming or glowing in the worst case.
Following "⚠Precautions for Safety" and "Application Notes" shall be taken in your major consideration. If you have a quetion about the Precautions for Handling. Please contact our engineering section or factory.

1. ⚠Operating Conditions and Circuit Design

1.1 Operating Temperature Range

The specified "Operating Temperature Range" in the catalog is absolute maximum and minimum temperature rating. So in any case, the Capacitors shall be operated within the specified"Operating Temperature Range".

1.2 Designs of Voltage Applications

The Capacitors shall not be operated exceeding the specified "Rated Voltage" in the catalog. If voltage ratings are exceeded, the result could be failure or damage. In case of application of DC and AC voltages to the capacitors, the designed peak voltage shall be within the specified "Rated Voltage".

In case of AC of pulse voltage, the peak voltage (peak to peak) shall be within the specified "Rated Voltage". If high frequency voltage or fast rising pulse voltage is applied continuously even within the "Ratad Voltage", contact our engineering section before use.

1.3 Charging and Discharging Current

The Capacitors shall not be operated beyond the specified "Maximum Charging/Discharging Current Ratings" in the specifications. Applications to a low impeadance circuit such as a "secondary power circuit" are not recommended for safety.

1.4 Temperature Rise by Dielectric Loss of the Capacitor

The "Operating Temperature Range" mentioned above shall include a maximum surface temperature rise of 20 °C, which is caused by the Dielectric Loss of the Capacitor and applied electrical stresses (such as voltage, frequency and wave form etc.)

It is recommended to measure and check "Surface Temperature of the Capacitor" in your equipment at your estimated/designed maximum ambient temperature.

1.5 Restriction on Environmental Conditions

The Capacitors shall not be operated and/or stored under following environmental conditions;

a) To be exposed directly to water or salt water.
b) To be exposed directly to sunlight.
c) Under conditions of condensation
d) Under conditions of corrosive atomosphere such as hydrogen sulfide, sulfuric acid, chlorine, or ammonia etc.
e) Under severe conditions of vibration or shock beyond the specified conditions in the Specifications.

1.6 Secular Changes in Capacitance

(1) Peculiar characteristics of "Secular Changes in Capaitance" are observed in the Capacitors (Class 2 High Dielectric Constant. Temperature Characteristics "X7R" and "Y5V"). The "secular changes" shall be considered in your circuit design.

(2) The Capacitance changes, due to the individual characteristics of ceramic dielectric materials applied, can be recovered to the each initial values at shipping by a heat treatment (140 to 150 °C for 1 hour).
(The recovered capacitance of Class 2 Capacitor shall be measured at the standard test condition after recovery times of 48 hours.)

2. ⚠Design of Printed Circuit Board

2.1 Selection of Printed Circuit Boards

When the Capacitors are mounted and soldered on an "Aluminum Substate", the substrate has influences on Capacitor's reliability against "Temperature Cycles" and "Heat shock" because of difference of thermal expansion coefficient between them. It shall be carefully confirmed that the actual board to be used does not deteriorate the characteristics of the Capacitors.

2.2 Design of Land Pattern

(1) Recommended Dimensions of Lands: As shown in Table 1 and Fig.1.

Notes: * Too large land requires excess amount of solder.

** The Dimmensions shall be symmetrical

Fig.1 Recommended Land Dimensions

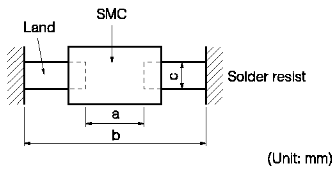


Table 1 Recommended Land Dimensions in mm

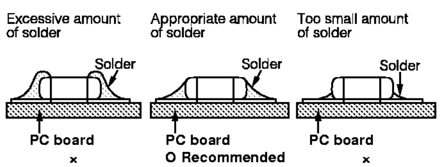
Size Code (EIA)	Components Dimensions			Land Dimensions for Flow Soldering			Land Dimensions for Reflow Soldering		
	L	W	T	a	b	c	a	b	c
13 (1206)	3.2	1.6	0.5–1.25	2.0–2.4	4.4–4.8	1.0–1.3	1.8–2.4	3.8–4.8	1.2–1.6
12 (0805)	2.0	1.25	0.5–1.45	1.0–1.4	3.0–3.2	0.8–1.0	0.8–1.2	2.4–3.2	1.0–1.2
11 (0603)	1.6	0.8	0.8	0.8–1.0	2.0–2.6	0.6–0.8	0.8–1.0	2.0–2.6	0.8–1.0
10 (0402)	1.0	0.5	0.5	—	—	—	0.5–0.6	1.5–1.7	0.5–0.6

(2) Recommended amount of solder

Recommended amount of solder: As shown in Fig.2

Excess amount of solder gives large mechanical stresses to the Capacitors/components.

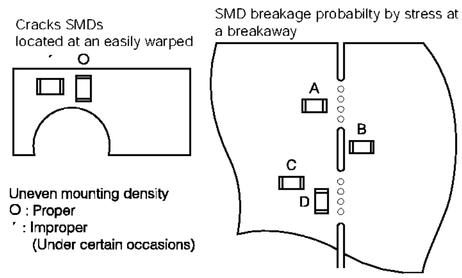
Fig.2 Recommended Amount of Solder



2.3 Component Layout

When placing/mounting the Capacitors/components near an area which is apt to bend or a grid groove on the PC board, it is advisable to have both electrodes subjected to uniform stresses, or to position the components electrodes at right angles to the grid gloove or bending line.

Fig.3 Component Layout



Probability at which the chip capacitor is broken by the stress on PC board break: A>C>B≒D

2.4 Mounting Density and Spaces

Placements in too narrow spaces between components may cause "Solder Bridges", during soldering. The minimum space between components shall be 0.5 mm in view of the positioning tolerances of the mounting machines and the dimensional tolerances of the components and PC Boards.

2.5 Applications of Solder Resist

Applications of Solder Resist are effective to prevent solder bridges and to control amounts of solder on PC boards. (As shown in Table 2)

Table 2 Application Examples of Solder Resist

	Recommended Application Examples	Examples of Solder Bridges
Narrow Spacing between Chip Components	Solder Resist	Solder Bridge
Radial Components are directly commected to Chip Components	Solder Resist	Solder Bridge
Common lands (chassis, etc.) are close to Chip Components.	Solder Resist	Solder Bridge

3. Precautions for Assembly

3.1 Adhesives for Mounting

(1) Selection of adhesives

- The viscosity of an adhesive for mountings shall be such that the adhesive does not flow off on the land during it's curing.
- If the adhesive is too low in its viscosity, mounted components may be out of alignment after or during soldering.
- The adhesives shall not be corrosive or chemically active to the mounted components and the PC boards.

- The amount of adhesive shall be such that the adhesive does not flow off or be out of alignment.

(2) Curing Conditions

- Adhesives for mountings can be cured by ultraviolet or infrared radiation. In order to prevent the terminal electrodes of the Capacitors from oxidizing. The curing shall be done at conditions of 160 °C max., for 2 minutes max.

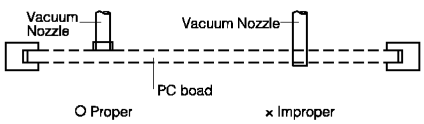
3.2 Chip Mounting Consideration

In mounting the Capacitors/components on a printed circuit board,/any bending and expanding force against them shall be kept minimum to prevent them from being damaged or cracked.
Following precautions and recommendations shall be observed carefully in the process;

(1) Maximum stroke of the vaccum nozzle shall be adjusted so that the pushing force to the printed circuit board shall be limited to a static load of 1 to 3 N (100 to 300 gf). (See Fig.4)

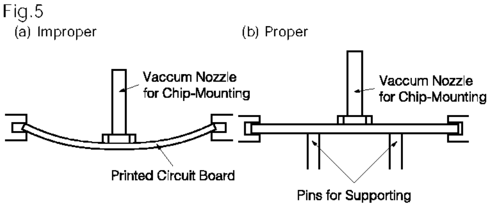
(2) Maximum stroke of the nozzle shall be adjusted so that the maximum bending of printed circuit board does not exceed 0.5 mm. (See Fig.4)

Fig.4



(3) The printed circuit board shall be supported by means of adequate supporting pins as shown in Fig.5-(b).

Fig.5



3.3 ⚠Soldering Flux and Solder

(1) Soldering Flux:

- The content of halogen in the soldering flux shall be 0.2 wt% or less.
- Rosin-based and non-activated soldering flux is recommended.

(2) Water soluble type Soldering Flux:
In case of water soluble type soldering flux being applied, the flux residue on the surface of P.C. boards may have influence on the reliability of the components and cause deterioration and failures of them.

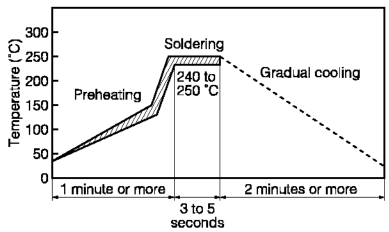
(3) Solder:
An eutetic solder (Sn63: Pb37) is recommended.

3.4 ⚠Soldering

3.4.1 Flow Soldering

In flow soldering process, abnormal and large thermal and mechanical stresses, caused by "Temperature Gradient" between the mounted Capacitors and melted solder in a soldering bath, may be applied directly to the Capacitors, resulting in failure and damage of the capacitors. So it is essential that the soldering process shall be controlled to the following recommended conditions and precautions. (See Fig. 6)

Fig.6 Recommended Soldering Temperature-Time Profile (Flow soldering)



(1) Application of Flux:
The soldering flux (3.3) shall be applied to the mounted Capacitors thinly and uniformly by forming method.

(2) Preheating:
The mounted Capacitors/Components shall be preheated sufficiently so that the "Temperature Gradient" between the Capacitors/components and the melted solder shall be 150 °C or below.

(3) Immersion to Soldering Bath:
The Capacitors shall be immersed into a soldering bath of 240 to 250 °C for 3 to 5 seconds.

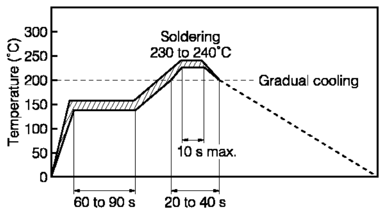
(4) Cooling:
The Capacitors shall be cooled gradually to room ambient temperature with the cooling temperature rates of 8 °C/s max. from 250 °C to 170 °C, and 4 °C/s max. from 170 °C to 130 °C.

(5) Flux Cleaning:
When the Capacitors are immersed into cleaning solvent, it shall be confirmed that the surface temperatures of devices do not exceed 100 °C. (See 3.5)

3.4.2 Reflow Soldering

In reflow soldering process, the mounted Capacitors/components are generally heated and soldered by a thermal conduction system such as an "Infrared radiation and hot blast soldering system" or a "Vapor Phase Soldering System (VPS)", Large temperature gradients such as a rapid heating and cooling in the process may cause electrical failure and mechanical damage of the devices. It is essential that the soldering process shall be controlled by the following recommended conditions and precautions. (See Fig.7)

Fig.7 Recommended Soldering Temperature-Time Profile (Reflow soldering)



(1) Preheating 1:
The mounted Capacitors/components shall be preheated sufficiently, for 60 to 90 seconds so that the surface temperatures of them to be 140 to 160 °C.

(2) Preheating 2:
After "Preheating 1", the mounted Capacitors/ components shall be heated to the elevated temperatures of 150 to 200 °C for 2 to 5 seconds.

(3) Soldering:
The mounted Capacitors/components shall be heated under the specified heating conditions (200 to 240 to 200 °C for total of 20 to 40 seconds, See Fig.7) and shall be soldered at the maximum temperature of 240 °C for 10 seconds or less.

(4) Cooling:
After soldering, the mounted Capacitors/ components shall be gradually cooled to room ambient temperature for preventing mechanical damages such as cracking of the devices.

(5) Flux Cleaning:
When the mounted Capacitors/components are immersed into cleaning solvent, it shall be comfirmed the surface temperatures of them does not exceed 100 °C. (See, 3.5 ⚠Post Soldering Cleaning)

Note: If the mounted Capacitors/components are partially heated in the soldering process, the devices may be separated from the printed circuit board by the surface tension of partially melted solder, and stand up like a "Tomb Stone".

3.4.3 Hand Soldering

In hand soldering of the Capacitors, large temperature gradient between preheated the Capacitors and the tip of soldering iron may cause electrical failures and mechanical damages such as cracking or breaking of the devices. The soldering shall be carefully controlled and carried out so that the temperature gradient is kept minimum with following recommended conditions for hand soldering.

[Recommended Soldering Conditions]

(1) Solder:
ϕ1 mm Thread eutectic solder (Sn63: Pb37) with soldering flux* in the core.
* Rosin-based, and non-activated flux is recommended.

(2) Preheating:
The capacitors shall be preheated so that "Temperature Gradient" between the devices and the tip of soldering iron is 150 °C or below.

(3) Soldering Iron:
Rated Power of 20 W max. with 3 mm soldering tip in diamter.

(4) Temperature of soldering iron tip: 300 °C max.
(The required amount of solder shall be melted in advance on the soldering tip.)

(5) Cooling:
After soldering. The Capacitors shall be cooled gradually at room ambient temperature.

3.5 ⚠Post Soldering Cleaning

(1) Residues of corrosive soldering fluxes on the PC board after cleaning may have great influence on the electrical characteristics and the reliability (such as humidity resistance) of the Capacitors which have been mounted on the board, it shall be confirmed that the characteristics and the reliability of the devices are not affected by the applied cleaning conditions.

(2) Solubility of alternative cleaning solvent such as alcohol etc, is inferior to that of freon cleaning solvent in flux cleaning.
So in the case of alternative cleaning solvents applied, fresh cleaning solvent shall always be used, and sufficient rinsing and drying shall be carried out.

(3) When an ultrasonic cleaning is applied to the mounted Capacitors on PC boards, following conditions are recommended for preventing failure or damage of the devices due to the large vibration energy and the resonance caused by the ultrasonic waves :
Frequency : 29 kHz max.
Radiated Power : 20 W/liter max.
Period : 5 minuets max.

3.6 Process Inspection

When the mounted printed circuits are inspected with measuring terminal pins, abnormal and excess mechanical stresses shall not be applied to the PC board and mounted components, to prevent failure or damage of the devices.

(1) The mounted PC boards shall be supported by some adequate supporting pins to prevent their bending.

(2) It shall be confirmed that the measuring pins have the right shaped tip, are equal in height and are set in the right positions.

3.7 Protective Coating

When the surface of a printed board on which the Capacitors has been mounted is coated with resin to protect against moisture and dust, it shall be confirmed that the protective coat does not influence the reliability of the capacitors in the actual equipment.

(1) Coating materials, such as being corrosive and chemically active, shall not be applied to the Capacitors and other components.

(2) Coating materials with a large expansivity shall not be applied to the Capacitors for preventing failures or damages (such as cracking) of the devices in the curing process.

3.8 ⚠Dividing/Breaking of PC Boards

(1) Abnormal and excessive mechanical stresses, such as bending or expanding force, on the components on the printed circuit board, shall be kept minimum in dividing/breaking.

(2) Dividing/Breaking of the PC boards shall be done carefully at moderate speed by using a jig or apparatus to protect the Capacitors on the boards from mechanical damages.

3.9 Long Term Storage

The Capacitors shall not be stored under severe conditions of high temperatures and high humidities. Store them indoors under 40 °C max. and 75 % RH max.. Use them within 6 months and check the solderability before use. (See 1.5)