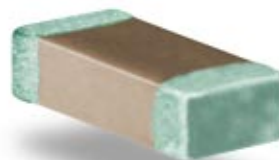




Multilayer Ceramic Capacitors 2002-2003



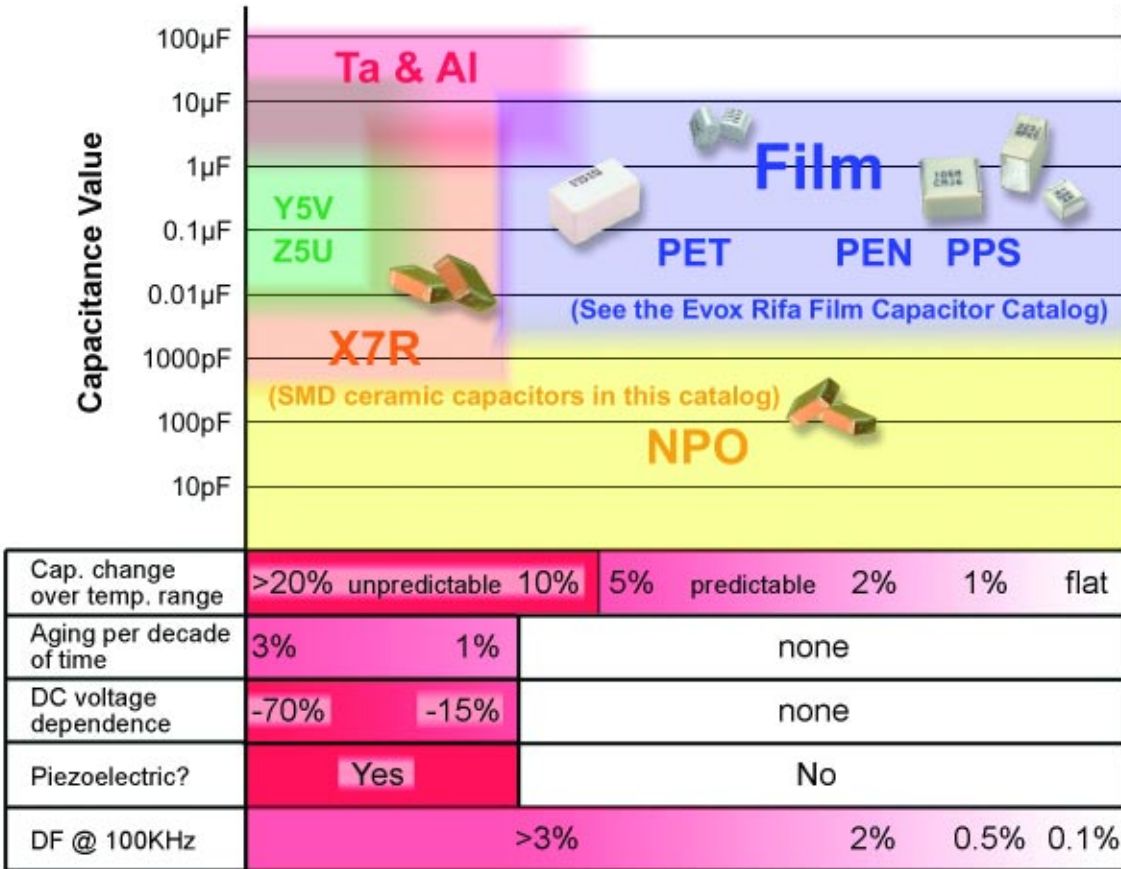
SIZES DOWN TO 0201

Selection Guidelines For Surface Mount Capacitors

Surface Mount Capacitor Application Chart

While variations do exist, the chart below provides a general guideline for selecting the correct surface mount capacitor. Begin at the left edge of the red stripes which denote the various electrical properties. Move to the right until all the properties meet your design requirements. Then move upward to the capacitance value of interest.

Film capacitors are recommended for all applications where transients or surges may occur. "Self healing" metallized film capacitors are designed to recover from a transient overvoltage.



Complete specifications and tech notes for the entire line of Evox Rifa products are available for download at www.evoxrifa.com. These include:

- SMD and leaded film capacitors.
- Agency approved X and Y capacitors including SMD.
- Film capacitors for AC, precision and pulse applications.
- Electrolytic capacitors including high-ripple screw terminal types.
- Other regionally-specific products.

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Additional specifications, test methods and performance curves
plus updates to this catalog are available at
www.evorrifa.com

Specifications subject to change without notice.

NPO Standard Products and Thickness

T.C.	NPO Class I																				
Type	Standard															High Voltage					
Size	0201				0402				0603			0805				1206				1206	1808
RV	25V	25V	50V	100V	25V	50V	100V	25V	50V	100V	200V	50V	100V	200V	500V	1kV	2kV	3kV			
0.47 pF		B	B	B	D	D	D	C	C	C	C										
0.56 pF		B	B	B	D	D	D	C	C	C	C										
0.68 pF		B	B	B	D	D	D	C	C	C	C										
0.82 pF		B	B	B	D	D	D	C	C	C	C										
1.0 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D						
1.2 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D						
1.5 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
1.8 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
2.2 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
2.7 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
3.3 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
3.9 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
4.7 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D				
5.6 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
6.8 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
8.2 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
10 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
12 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
15 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
18 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	D	H			
22 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
27 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
33 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
39 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
47 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
56 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
68 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
82 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
100 pF	A	B	B	B	D	D	D	C	C	C	C	D	D	D	D	D	K	H			
120 pF		B	B	B	D	D	D	C	C	C	C	D	D	D	D	K	K				
150 pF		B	B		D	D	D	C	C	C	C	D	D	D	D	K	K				
180 pF		B	B		D	D	D	C	C	C	C	D	D	D	D	K	K				
220 pF		B	B		D	D	D	C	C	C	E	D	D	D	D	K	K				
270 pF					D	D	D	C	C	C	E	D	D	D	D	K	H				
330 pF					D	D	D	C	C	C	E	D	D	D	D	K	H				
390 pF					D	D	D	C	C	C	E	D	D	D	D	K	H				
470 pF					D	D	D	C	C	C	E	D	D	D	E	H	H				
560 pF					D	D	D	C	C	C	G	D	D	D	E						
680 pF					D	D	D	C	C	C		D	D	D	E						
820 pF					D	D		C	C	C		D	D	E	F						
1.0 nF					D	D		C	C	C		D	D	E	F						
1.2 nF					D	D		E	E	E		C	D	E							
1.5 nF					D			E	E	E		C	D	F							
1.8 nF								E	E	E		C	D								
2.2 nF								E	E	E		C	D								
2.7 nF								E	E			C	D								
3.3 nF								E	E			C	E								
3.9 nF								E	E			E	E								
4.7 nF								E	E			E	E								
5.6 nF								E	E			E									
6.8 nF								G	G			F									
8.2 nF								G	G			F									
10 nF												L									
12 nF												L									
15 nF																					
18 nF																					
22 nF																					

Standard NME
Standard BME
 Certain types may be available in the alternate material. Ask for details.

Thickness Codes

Code	A	B	C	D	E	F	G	H	K	L
Thickness	0.30±0.03	0.50±0.05	0.60±0.10	0.80±0.10	0.85±0.10	1.15±0.10	1.25±0.10	1.50±0.15	1.10±0.20	1.60±0.15

X7R Standard Products and Thickness

T.C.	X7R Class II																										
Type	Standard																				High Voltage						
Size	0402				0603				0805						1206						1206	1808	1812				
RV	10V	16V	25V	50V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	500V	1kV	2kV	2kV	2kV	
47 pF																											
56 pF																											
68 pF																											
82 pF																											
100 pF	B	B	B	B			D	D	D																		
120 pF	B	B	B	B			D	D	D																		
150 pF	B	B	B	B			D	D	D																		
180 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	D	E	E			
220 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	D	E	E	H		
270 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	D	E	E	H		
330 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	D	E	E	H		
390 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	D	E	E	H		
470 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	F	K	K	H		
560 pF	B	B	B	B			D	D	D			C	C	C	E				D	D	D	F	K	K	H		
680 pF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K	K	H		
820 pF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K	H	H		
1.0 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K	H	H	H	H
1.2 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K	H	H		
1.5 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
1.8 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
2.2 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
2.7 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
3.3 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
3.9 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	K		H		
4.7 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F	H		H		
5.6 nF	B	B	B	B			D	D	D			C	C	C	E				E	E	E	F					
6.8 nF	B	B	B	B			D	D	D			C	C	C	G				E	E	E	F					
8.2 nF	B	B	B	B			D	D	D			C	C	C	G				E	E	E	F					
10 nF	B	B	B				D	D	D			C	C	C					E	E	E	F					
12 nF	B	B					D	D	D			C	C	E					E	E	E						
15 nF	B	B					D	D	D			C	C	E					E	E	E						
18 nF	B	B					D	D				C	C	E					E	E	F						
22 nF	B	B					D	D				C	C	E					E	E	F						
27 nF	B	B					D	D				C	C	E					E	E	F						
33 nF	B	B					D	D				C	C						E	E							
39 nF	B	B					D					C	C						E	E							
47 nF	B	B					D	D				C	E						E	E							
56 nF							D					C	E						E	E							
68 nF							D					C	E						E	F							
82 nF							D					E	E						E	F							
100 nF					D	D						E	E	G					E	F							
120 nF					D							E	E	G					E								
150 nF					D							E	G	G					E	F							
180 nF					D							E							E	F							
220 nF					D					E	E								E	F							
270 nF										E	G								E								
330 nF										E	G								E	E							
390 nF										E	G								E	E							
470 nF										E	G								E								
560 nF										E	G								E								
680 nF										E	G								F								
820 nF										G	G								F								
1.0 μF										G	G								E	F							
1.2 μF																			F								
1.5 μF																			F								
1.8 μF																			L								
2.2 μF																			L								

 Standard NME Standard BME Certain types may be available in the alternate electrode material. Ask for details.

Thickness Codes

Code	A	B	C	D	E	F	G	H	K	L
Thickness	0.30±0.03	0.50±0.05	0.60±0.10	0.80±0.10	0.85±0.10	1.15±0.10	1.25±0.10	1.50±0.15	1.10±0.20	1.60±0.15

X5R & Y5V Standard Products and Thickness

T.C.	X5R Class II						Y5V Class II											
Type	Standard						Standard											
Size	0402		0603	0402			0603			0805			1206				1210	
RV	10V	16V	10V	10V	16V	25V	16V	25V	50V	16V	25V	50V	10V	16V	25V	50V	16V	
10 nF					B	B		D	D						C	C		
12 nF	B	B			B	B		D	D						C	C		
15 nF	B	B			B	B		D	D						C	C		
18 nF	B	B			B	B		D	D						C	C		
22 nF	B	B			B	B		D	D						C	C		
27 nF	B	B			B			D	D						C	C		
33 nF	B	B			B			D	D						C	C		
39 nF	B				B			D	D						C	C		
47 nF	B				B			D	D			C	C		C	C		
56 nF	B				B			D	D			C	C		C	C		
68 nF	B				B			D	D			C	C		C	C		
82 nF	B				B			D	D			C	C		C	C		
100 nF	B			B	B		D	D	D			C	C		C	C		
120 nF				B			D					E	E		C	C		
150 nF			D	B			D					E	E		C	C		
180 nF			D	B			D					E	E		C	C		
220 nF			D	B			D			C	E	E			C	C		
270 nF			D				D			C	E				C	C		
330 nF			D				D			E	G				C	C		
390 nF			D				D			E	G				C	C		
470 nF			D				D			E	G				E	E		
560 nF							D			E	G				E	E		
680 nF							D			E	G				E	E		
820 nF							D			G	G				E	E		
1.0 µF							D			G	G			E	F	F		
1.2 µF										G				E	F			
1.5 µF										G				E	F			
1.8 µF										G				F	F			
2.2 µF										G				F	F			
2.7 µF														F	F			
3.3 µF														F	L			
3.9 µF														L	L			
4.7 µF														L	L	L		E
5.6 µF														L				F
6.8 µF														L				F
8.2 µF														L				H
10 µF														L				H
12 µF																		
15 µF																		
18 µF																		
22 µF																		

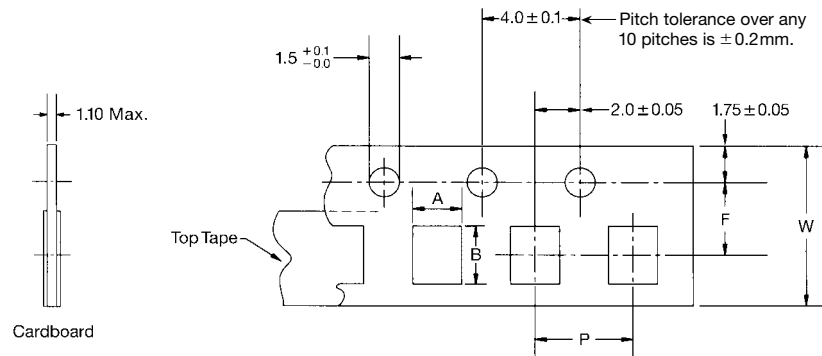
Standard NME
 Standard BME
 Certain types may be available in the alternate material. Ask for details.

Thickness Codes

Code	A	B	C	D	E	F	G	H	K	L
Thickness	0.30±0.03	0.50±0.05	0.60±0.10	0.80±0.10	0.85±0.10	1.15±0.10	1.25±0.10	1.50±0.15	1.10±0.20	1.60±0.15

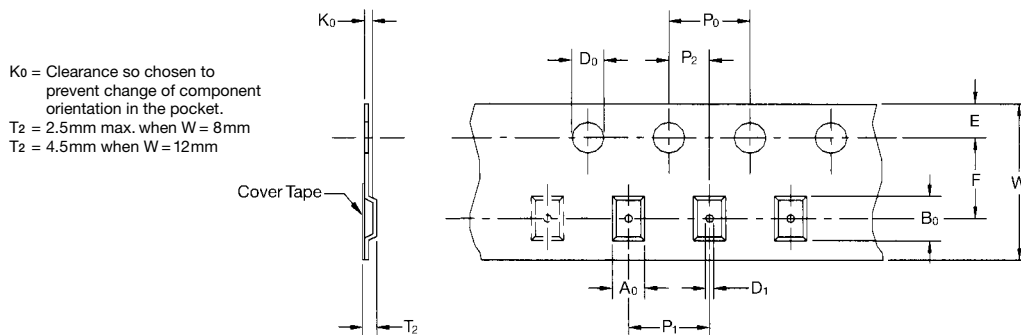
Standard Paper and Embossed Tape Specifications

Unit mm



Paper Tape Specifications

Dimension	Paper Tape Dimensions				
	0201	0402	0603	0805	1206
A	0.37 ± 0.03	0.62 ± 0.05	1.0 ± 0.20	1.5 ± 0.20	1.9 ± 0.20
B	0.67 ± 0.03	1.12 ± 0.05	1.8 ± 0.20	2.3 ± 0.20	3.5 ± 0.20
W	8.0 ± 0.20	8.0 ± 0.20	8.0 ± 0.20	8.0 ± 0.20	8.0 ± 0.20
F	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05
P	2.0 ± 0.10	2.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10



Embossed Tape Specifications

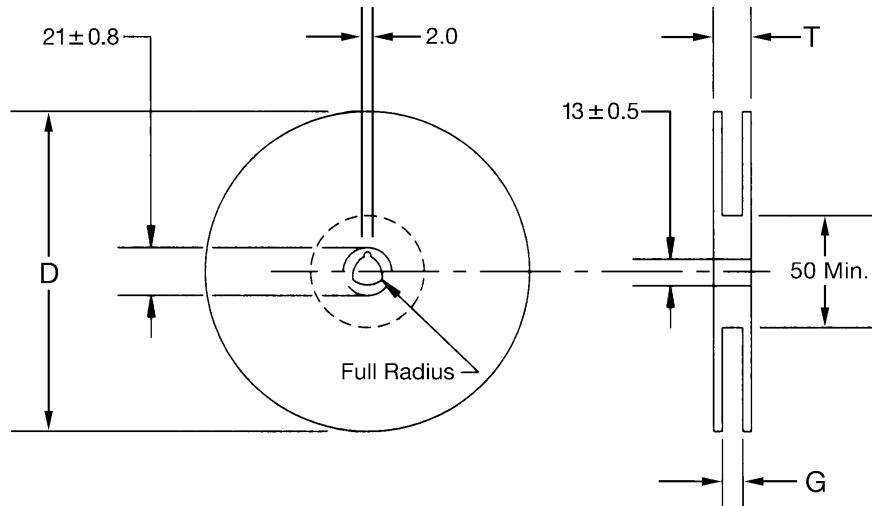
Dimension	Embossed Tape Dimensions				
	0805	1206	1210	1808	1812
A0 Nominal Clearance (Note 1)	0.2	0.3	0.3	0.4	0.4
B0 Nominal Clearance (Note 1)	0.2	0.3	0.3	0.4	0.4
K0 Nominal Clearance (Note 1)	0.05	0.05	0.05	0.05	0.05
W	8.1 ± 0.20	8.1 ± 0.20	8.1 ± 0.20	12 ± 0.20	12 ± 0.20
E	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10
F	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	5.5 ± 0.05	5.5 ± 0.05
D0	1.5 + 0.1, - 0.0	1.5 + 0.1, - 0.0	1.5 + 0.1, - 0.0	1.5 + 0.1, - 0.0	1.5 + 0.1, - 0.0
D1	1 min. + 0.1, - 0.0	1 min. + 0.1, - 0.0	1 min. + 0.1, - 0.0	1.5 min. + 0.1, - 0.0	1.5 min. + 0.1, - 0.0
P0 (Note 2)	4 ± 0.10	4 ± 0.10	4 ± 0.10	4 ± 0.10	4 ± 0.10
P1	4 ± 0.10	4 ± 0.10	4 ± 0.10	8 ± 0.10	8 ± 0.10
P2	2 ± 0.05	2 ± 0.05	2 ± 0.05	2 ± 0.05	2 ± 0.05

Note 1: Typical capacitor displacement in pocket.

Note 2: P0 pitch tolerance over any 10 pitches is ± 0.2mm.

Standard Reel Specifications

Unit mm



Reel Dimensions

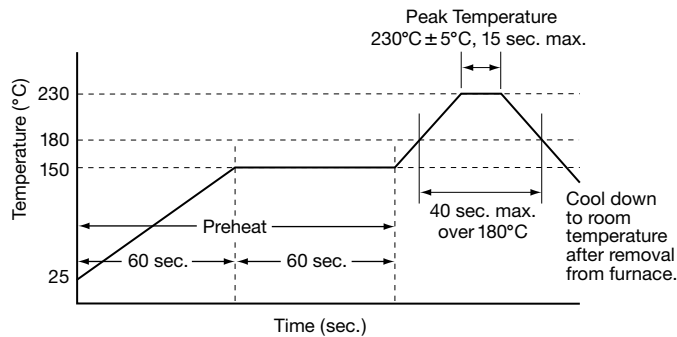
Tape Width (mm)	G (mm)	T max. (mm)	D (mm)
8	10.0 ± 1.5	14.4	180
8	10.0 ± 1.5	14.4	250
8	10.0 ± 1.5	14.4	330
12	14.0 ± 1.5	18.4	180

Quantity Per Reel

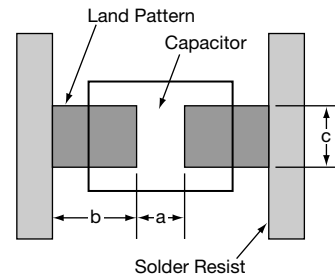
Thickness (mm)		Pieces Per Reel					
		180mm Reel Diameter		220mm Reel Diameter		330mm Reel Diameter	
Code	Dimensions	Paper Tape	Embossed Tape	Paper Tape	Embossed Tape	Paper Tape	Embossed Tape
A	0.30 ± 0.03	15,000	-	-	-	-	-
B	0.50 ± 0.05	10,000	-	-	-	50,000	-
C	0.60 ± 0.10	4,000	4,000	10,000	10,000	15,000	15,000
D	0.80 ± 0.10	4,000	4,000	10,000	10,000	15,000	15,000
E	0.85 ± 0.10	4,000	4,000	10,000	10,000	15,000	15,000
F	1.15 ± 0.10	-	3,000	-	-	-	10,000
G	1.25 ± 0.10	-	3,000	-	-	-	10,000
H	1.50 ± 0.15	-	1,500	-	-	-	-
K	1.10 ± 0.20	-	3,000	-	-	-	-
L	1.60 ± 0.15	-	2,000	-	-	-	-

Soldering Guidelines

Recommended Reflow Temperature Profile



Recommended PCB Land Pattern



PCB Land Pattern Dimensions For Standard Case Sizes

MLCC Size		MLCC Pad Dimensions		
Size Code	L × W (mm)	a (mm)	b (mm)	c (mm)
0201	0.6 × 0.3	0.20 to 0.30	0.20 to 0.35	0.20 to 0.40
0402	1.0 × 0.5	0.30 to 0.50	0.35 to 0.45	0.40 to 0.60
0603	1.6 × 0.8	0.70 to 1.00	0.80 to 1.00	0.60 to 0.80
0805	2.0 × 1.25	1.00 to 1.30	1.00 to 1.20	0.80 to 1.00
1206	3.2 × 1.6	2.10 to 2.50	1.10 to 1.30	1.00 to 1.30
1210	3.2 × 2.5	2.10 to 2.50	1.10 to 1.30	1.90 to 2.30
1808	4.5 × 2.0	2.50 to 3.20	1.80 to 2.30	2.60 to 1.80
1812	4.5 × 3.2	2.50 to 3.20	1.80 to 2.30	2.60 to 3.00

Soldering Precautions

Resin Molding

1. Use a low shrinkage resin when a large amount of resin is used for molding chips. This will prevent cracking that may occur due to contraction stress on the chip capacitors during curing.
2. Use a low moisture absorption resin to avoid degradation of the insulation resistance of the chip capacitors caused by moisture retention.
3. Carefully check that the resin does not generate harmful gases during the curing process or during normal storage. Such gases may crack the chip capacitors.

Soldering Methods

1. Follow the recommended reflow soldering profile shown above.
2. Ceramic is easily damaged by rapid heating or cooling. If some heat shock is unavoidable, limit the temperature difference (ΔT) to within 130°C.
3. When using a soldering iron, preheat the chip capacitors to approximately 150°C, then quickly solder on a hot plate using a soldering iron temperature between 250°C to 280°C.

Soldering PCB Land Patterns

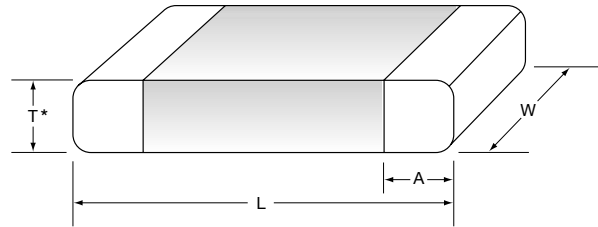
When mounting chip capacitors to a substrate, it is important to consider that the amount of solder used (size of fillet) has a direct effect upon the capacitor after it is mounted.

1. Follow the recommended land pattern dimensions shown in the table above.
2. Be aware that the greater the amount of solder, the greater the stress on the elements, and this may cause the substrate to crack or break.
3. In a situation where two or more devices are mounted onto a common land, use soldering resist to separate the individual pad patterns for each device.

Mechanical Specifications

Dimensions (mm)

Size Code	L	W	A min./max.
0201	0.6±0.03	0.3±0.03	0.10/0.20
0402	1.0±0.05	0.5±0.05	0.20/0.30
0603	1.6±0.10	0.8±0.10	0.25/0.65
0805	2.0±0.10	1.25±0.10	0.25/0.75
1206	3.2±0.15	1.6±0.15	0.25/0.75
1210	3.2±0.20	2.5±0.20	0.25/0.75
1808	4.5±0.20	2.0±0.20	0.25/0.75
1812	4.5±0.20	3.2±0.20	0.25/0.75



*T = Thickness. For thickness dimensions and coding system, refer to the Standard Products tables.

Handling and Storage

Handling

1. Chip capacitors should be handled with care to avoid contamination or damage.
2. The use of vacuum pick-up or plastic tweezers is recommended for manual placement.
3. Tape and reel packages are suitable for automatic pick-and-place machines.

Storage

1. Chip capacitors shall be packaged in carrier tapes or bulk cases.
2. Keep storage area temperature from +5°C to +35°C and humidity from 45 to 70% RH.
3. The storage environment must be free of harmful gases such as sulfur or chlorine. Avoid exposing capacitors to saline moisture. If capacitors are exposed to such atmospheric conditions, oxidation will occur and affect the solderability of the terminations.
4. Solderability is assured for 12 months from our final inspection date if the above storage conditions are followed.

General Information

Product Specification

All descriptions, drawings and other particulars (including dimensions, materials and performance data) given by Evox Rifa are as accurate as possible but, being given for general information, are not binding on Evox Rifa unless specifically agreed in writing. All dimensions and materials are, unless otherwise stated, subject to reasonable variations resulting from the raw material available or arising in the ordinary course of manufacture. Any performance data are based upon Evox Rifa's experience and are such as Evox Rifa normally expects to achieve.

Warranty, Product Liability

Evox Rifa warrants that the goods manufactured by Evox Rifa are free from defects in design, material and workmanship.

Evox Rifa's liability under this warranty shall be limited to replacement or repair free of charge, at one of Evox Rifa's factories selected by Evox Rifa, provided that notification of such failure or defect is given to Evox Rifa immediately upon the same becoming apparent and that on Evox Rifa's request and instruction the goods are promptly returned to Evox Rifa carriage paid by buyer.

In case the goods thus returned as defective, prove to be without fault or defect, Evox Rifa is entitled to charge buyer 10% of the value of the returned goods.

If the goods supplied or part thereof are not manufactured by or branded Evox Rifa, Evox Rifa will only extend to the buyer the benefit of the warranty granted by the manufacturer of the goods. Evox Rifa's liability is further limited to a period of 12 months from the date of shipment to buyer.

Evox Rifa shall not be liable for any defect which is due to accident, fair wear and tear, negligent use, tampering, improper handling, improper use, improper operation or improper storage or any other default on the part of any person other than Evox Rifa.

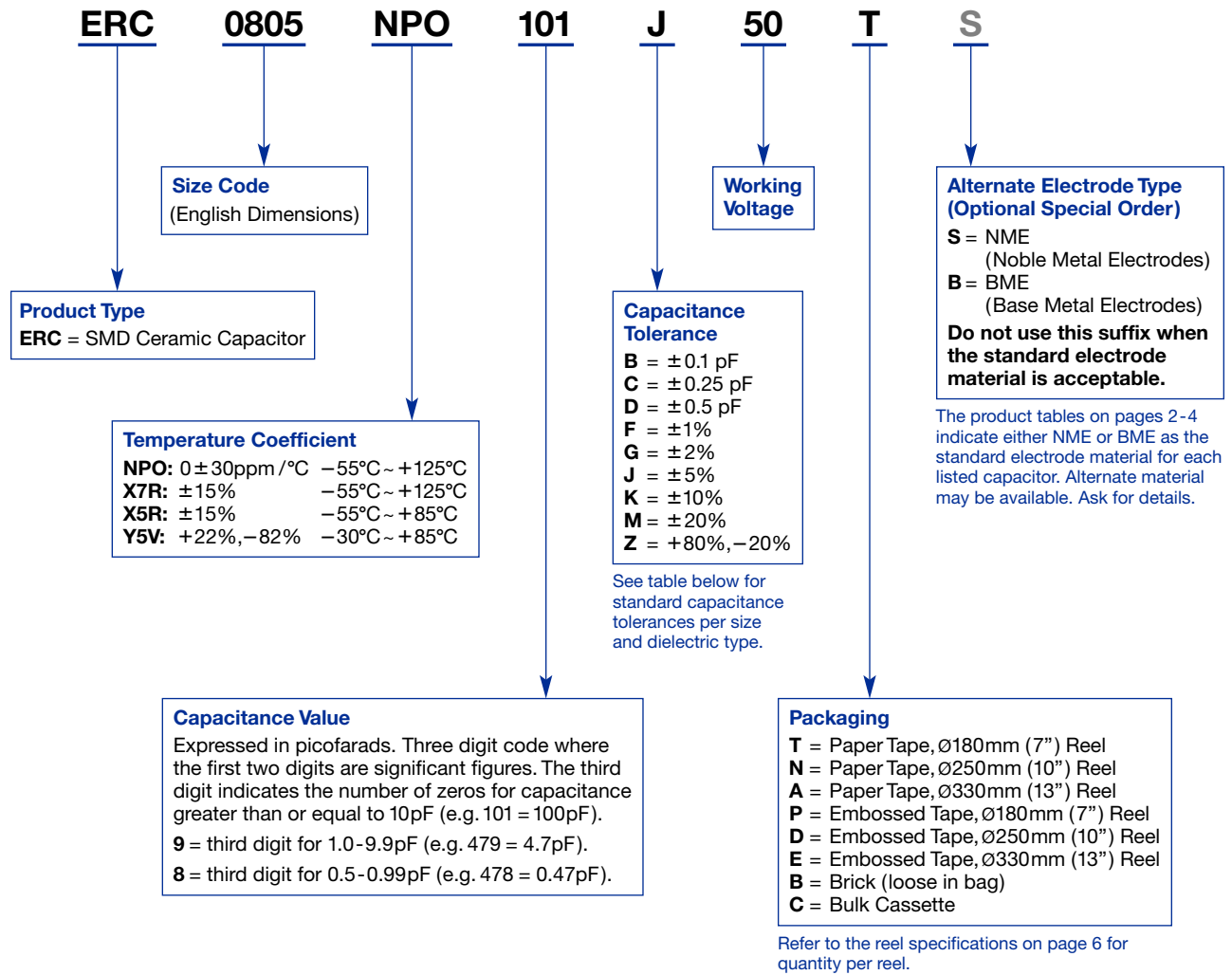
Evox Rifa shall have no other liabilities in case of defective goods than those stated above and shall under no circumstances be liable for any consequential loss or damage arising from the use of goods sold by Evox Rifa. Liability under paragraph 823 BGB is expressly excluded.

The above limitations of Evox Rifa's liability for defective goods shall apply also with regard to product liability, and Evox Rifa shall have no responsibility for injury to persons or for damage to goods or property of any kind.

In case of product liability claims from third parties against Evox Rifa, not falling within Evox Rifa's liability in accordance with the above, buyer shall hold Evox Rifa harmless.

Ordering Information

Part Numbering System for Multilayer Ceramic Chip Capacitors



EIA 198 Temperature Performance Identifiers For Class II~IV Dielectric Capacitors

Low Temperature Rating	High Temperature Rating	Allowed Capacitance Change With Temperature
Z = $+10^\circ\text{C}$	2 = $+40^\circ\text{C}$	A = $\pm 1.0\%$
Y = -30°C	4 = $+65^\circ\text{C}$	B = $\pm 1.5\%$
X = -55°C	5 = $+85^\circ\text{C}$	C = $\pm 2.2\%$
	6 = $+105^\circ\text{C}$	D = $\pm 3.3\%$
	7 = $+125^\circ\text{C}$	E = $\pm 4.7\%$
	8 = $+150^\circ\text{C}$	F = $\pm 7.5\%$
	9 = $+200^\circ\text{C}$	P = $\pm 10\%$
		R = $\pm 15\%$
		S = $\pm 22\%$
		T = $+22\%, -33\%$
		U = $+22\%, -56\%$
		V = $+22\%, -82\%$

Standard Capacitance Tolerances

Size	NPO	X5R	X7R	Y5V
0201	J	-	-	-
0402	$\leq 4.7 \text{ pF}$	C	K	Z
	5.6-8.2 pF	D	K	Z
	$\geq 10 \text{ pF}$	J	K	Z
0805	J	-	K	Z
1206	J	-	K	Z
1210	-	-	-	Z
1808	J	-	K	-
1812	-	-	K	-



Evox Rifa offers a broad range of electronic components. Visit our web site at www.evoxrifa.com for complete technical data, application notes, worldwide sales support and more.