Surface Mount Multilayer Ceramic Chip Capacitor Solutions for High Voltage Applications

FEATURES

- Excellent reliability and thermal shock performance
- High voltage breakdown compared to standard design
- High reliable serial electrode design
- Protective surface coating may be required to prevent surface arcing
- Polymer termination available for intensive, board flex requirements
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

- Input filter capacitors
- Output filter capacitors
- Snubber capacitors reduce MOSFET voltage spikes
- Filtering for switching power supplies
- For lighting and other AC applications please contact: mlcc@vishay.com

ELECTRICAL SPECIFICATIONS

C0G (NP0)

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

Operating Temperature: -55 °C to +125 °C

Capacitance Range: 15 pF to 3.3 nF

Voltage Range: 3000 V_{DC}, 4000 V_{DC}, 5000 V_{DC}

Temperature Coefficient of Capacitance (TCC):
0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C

Dissipation Factor (DF):
0.1 % maximum at 1.0 V_{RMS} and 1 MHz for value ≤ 1000 pF
0.1 % maximum at 1.0 V_{RMS} and 1 kHz for values > 1000 pF

Insulating Resistance:
at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less
at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less

Aging Rate: 0 % maximum per decade

Dielectric Strength Test:
applied test voltages
3000 V_{DC}- / 4000 V_{DC}- / 5000 V_{DC}-rated:
120 % of rated voltage

X7R

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

Operating Temperature: -55 °C to +125 °C

Capacitance Range: 47 pF to 15 nF

Voltage Range:
3000 V_{DC}, 4000 V_{DC}, 5000 V_{DC}, 6000 V_{DC}, 8000 V_{DC}

Temperature Coefficient of Capacitance (TCC):
± 15 % from -55 °C to +125 °C, with 0 V_{DC} applied

Dissipation Factor (DF):
2.5 % maximum at 1.0 V_{RMS} and 1 kHz

Insulating Resistance:
at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less
at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less

Aging Rate: 1 % maximum per decade

Dielectric Strength Test:
applied test voltages
3000 V_{DC}- / 4000 V_{DC}- / 5000 V_{DC}- / 6000 V_{DC} /
8000 V_{DC}-rated:
min. 120 % of rated voltage

QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	1812	5000	15 pF	1.0 nF
	1825	5000	33 pF	2.2 nF
	2220	5000	33 pF	2.2 nF
	2225	5000	47 pF	3.3 nF
X7R	1808	6000	47 pF	330 pF
	1812	6000	150 pF	3.9 nF
	1825	6000	470 pF	10 nF
	2220	6000	470 pF	10 nF
	2225	6000	470 pF	15 nF
	3640	8000	1.0 nF	5.6 nF

Note

- Detail ratings see “Selection Chart”

ORDERING INFORMATION

HV2220	Y	152	K	X	M	A	T	HV [2]
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING [1]	MARKING	PACKAGING	PROCESS CODE
1808 1812 1825 2220 2225 3640	Y = X7R A = C0G (NP0)	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. **Examples** 152 = 1500 pF	C0G (NP0): F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % X7R: J = ± 5 % K = ± 10 % M = ± 20 %	X = Ni barrier 100 % tin plated matte finish B = polymer 100 % tin plated matte finish	H = 3000 V V = 4000 V M = 5000 V 6 = 6000 V 8 = 8000 V	A = unmarked	T = 7" reel / plastic tape R = 11 1/4" / 13" reel / plastic tape	HV = high voltage

Notes

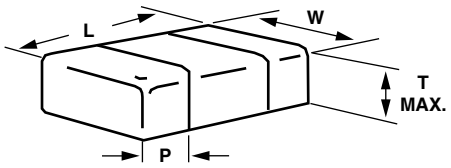
[1] DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: mlcc@vishay.com

[2] Process code with 2 digits has to be added

ENVIRONMENTAL STATUS

TERMINATION CODE	TERMINATION DESCRIPTION	RoHS COMPLIANT	VISHAY GREEN
X	Ni barrier 100 % tin plated matte finish	Yes	Yes
B	Polymer layer, 100 % tin plated matte finish	Yes	Yes

DIMENSIONS in inches (millimeters)



CASE CODE	STYLE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (P)	
					MINIMUM	MAXIMUM
1808	HV1808	0.177 ± 0.012 (4.50 ± 0.30)	0.080 ± 0.010 (2.03 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.035 (0.90)
1812	HV1812	0.177 ± 0.012 (4.50 ± 0.30)	0.126 ± 0.008 (3.20 ± 0.20)	0.106 (2.70)	0.010 (0.25)	0.035 (0.90)
1825	HV1825	0.177 ± 0.012 (4.50 ± 0.30)	0.252 ± 0.010 (6.40 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.035 (0.90)
2220	HV2220	0.220 ± 0.010 (5.59 ± 0.25)	0.200 ± 0.010 (5.08 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.037 (0.95)
2225	HV2225	0.220 ± 0.010 (5.59 ± 0.25)	0.250 ± 0.010 (6.35 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.037 (0.95)
3640	HV3640	0.360 ± 0.015 (9.14 ± 0.38)	0.400 ± 0.015 (10.20 ± 0.38)	0.130 (3.30)	0.010 (0.25)	0.037 (0.95)

Note

- Polymer layer (B termination) have increased dimensions: length 0.006" (0.15 mm)

SELECTION CHART

DIELECTRIC		C0G (NP0)															
STYLE		HV1812 (1)				HV1825 (1)				HV2220 (1)				HV2225 (1)			
EIA CODE		1812				1825				2220				2225			
VOLTAGE (V_{DC})		3000	4000	5000		3000	4000	5000		3000	4000	5000		3000	4000	5000	
VOLTAGE CODE		H	V	M		H	V	M		H	V	M		H	V	M	
CAP. CODE	CAP.																
100	10 pF																
120	12 pF																
150	15 pF	•	•	•													
180	18 pF	•	•	•													
220	22 pF	•	•	•													
270	27 pF	•	•	•													
330	33 pF	•	•	•		•	•	•		•	•	•					
390	39 pF	•	•	•		•	•	•		•	•	•					
470	47 pF	•	•	•		•	•	•		•	•	•		•	•	•	
560	56 pF	•	•	•		•	•	•		•	•	•		•	•	•	
680	68 pF	•	•	•		•	•	•		•	•	•		•	•	•	
820	82 pF	•	•	•		•	•	•		•	•	•		•	•	•	
101	100 pF	•	•	•		•	•	•		•	•	•		•	•	•	
121	120 pF	•	•	•		•	•	•		•	•	•		•	•	•	
151	150 pF	•	•	•		•	•	•		•	•	•		•	•	•	
181	180 pF	•	•	•		•	•	•		•	•	•		•	•	•	
221	220 pF	•	•	•		•	•	•		•	•	•		•	•	•	
271	270 pF	•	•			•	•	•		•	•	•		•	•	•	
331	330 pF	•				•	•	•		•	•	•		•	•	•	
391	390 pF	•				•	•	•		•	•	•		•	•	•	
471	470 pF	•				•	•	•		•	•	•		•	•	•	
561	560 pF	•				•	•	•		•	•	•		•	•	•	
681	680 pF	•				•	•			•	•			•	•	•	
821	820 pF	•				•				•				•	•	•	
102	1.0 nF	•				•				•				•	•		
122	1.2 nF					•				•				•			
152	1.5 nF					•				•				•			
182	1.8 nF					•				•				•			
222	2.2 nF					•				•				•			
272	2.7 nF													•			
332	3.3 nF													•			
392	3.9 nF																
472	4.7 nF																

Notes

(1) See soldering recommendations within this data book, or visit: www.vishay.com/doc?45034

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART										
DIELECTRIC		X7R								
STYLE		HV1808 (1)	HV1812 (1)				HV1825 (1)			
EIA CODE		1808	1812				1825			
VOLTAGE (V_{DC})		6000	3000	4000	5000	6000	3000	4000	5000	6000
VOLTAGE CODE		6	H	V	M	6	H	V	M	6
CAP. CODE	CAP.									
470	47 pF	•								
560	56 pF	•								
680	68 pF	•								
820	82 pF	•								
101	100 pF	•								
121	120 pF	•								
151	150 pF	•				•				
181	180 pF	•			•	•				
221	220 pF	•		•	•	•				
271	270 pF	•		•	•	•				
331	330 pF	•		•	•	•		•	•	
391	390 pF			•	•	•		•	•	
471	470 pF			•	•	•		•	•	•
561	560 pF		•	•	•	•		•	•	•
681	680 pF		•	•	•	•		•	•	•
751	750 pF					•				•
821	820 pF		•	•	•			•	•	•
102	1.0 nF		•	•				•	•	•
122	1.2 nF		•	•			•	•	•	•
152	1.5 nF		•	• (2)			•	•	•	•
182	1.8 nF		•				•	•	•	
222	2.2 nF		•				•	•		
272	2.7 nF		• (2)				•	•		
332	3.3 nF		• (2)				•	•		
392	3.9 nF		• (2)				•			
472	4.7 nF						•			
562	5.6 nF						• (2)			
682	6.8 nF						• (2)			
822	8.2 nF						• (2)			
103	10 nF						• (2)			
123	12 nF									
153	15 nF									
183	18 nF									

Notes

(1) See soldering recommendations within this data book, or visit: www.vishay.com/doc?45034

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

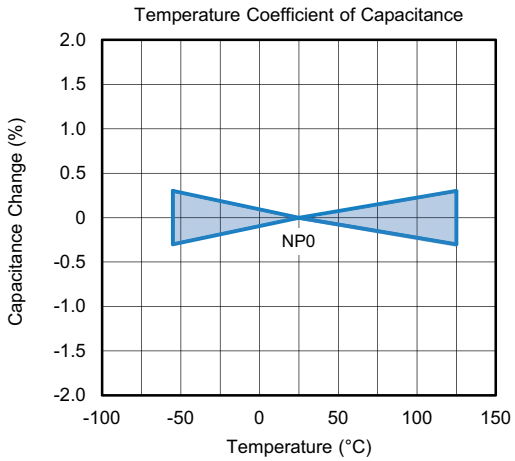
SELECTION CHART											
DIELECTRIC		X7R									
STYLE		HV2220 (1)				HV2225 (1)				HV3640 (1)	
EIA CODE		2220				2225				3640	
VOLTAGE (V_{DC})		3000	4000	5000	6000	3000	4000	5000	6000	6000	8000
VOLTAGE CODE		H	V	M	6	H	V	M	6	6	8
CAP. CODE	CAP.										
101	100 pF										
121	120 pF										
151	150 pF										
181	180 pF										
221	220 pF										
271	270 pF										
331	330 pF										
391	390 pF			•							
471	470 pF		•	•	•			•	•		•
561	560 pF		•	•	•			•	•		•
681	680 pF		•	•	•		•	•	•		•
751	750 pF				•				•		•
821	820 pF		•	•	•		•	•	•		•
102	1.0 nF		•	•	•		•	•	•	•	•
122	1.2 nF	•	•	•	•		•	•	•	•	•
152	1.5 nF	•	•	•	•		•	•	•	•	•
182	1.8 nF	•	•	•	•	•	•	•	•	•	•
222	2.2 nF	•	•		•	•	•	•	•	•	•
272	2.7 nF	•	•			•	•	•	•	•	•
332	3.3 nF	•	•			•	•	•		•	•
392	3.9 nF	•				•	•			•	
472	4.7 nF	•				•	•			•	
562	5.6 nF	• (2)				•	•			•	
682	6.8 nF	• (2)				•					
822	8.2 nF	• (2)				•					
103	10 nF	• (2)				•					
123	12 nF					•					
153	15 nF					•					
183	18 nF										

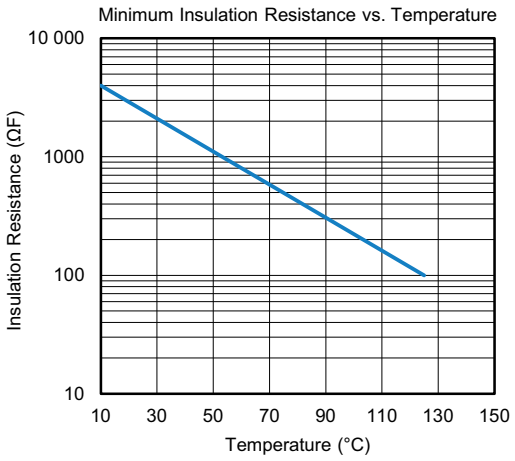
Notes

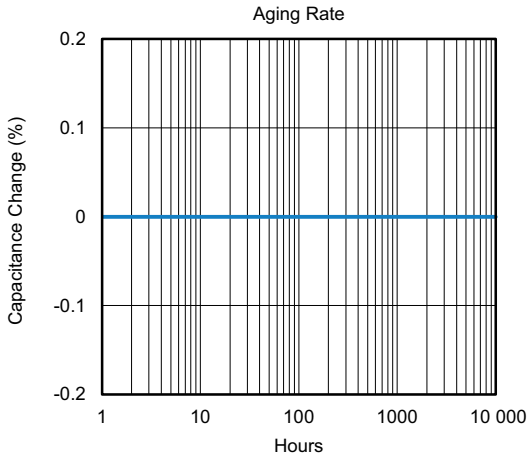
(1) See soldering recommendations within this data book, or visit: www.vishay.com/doc?45034

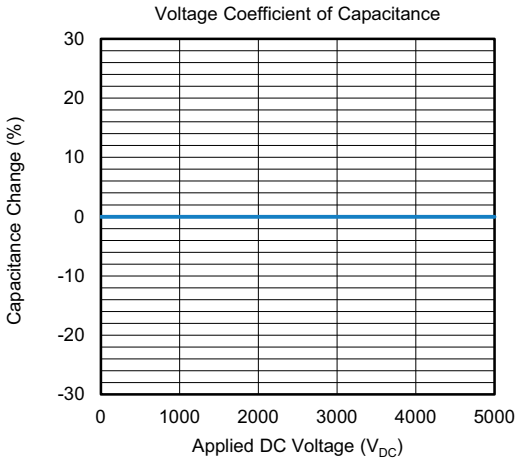
(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS



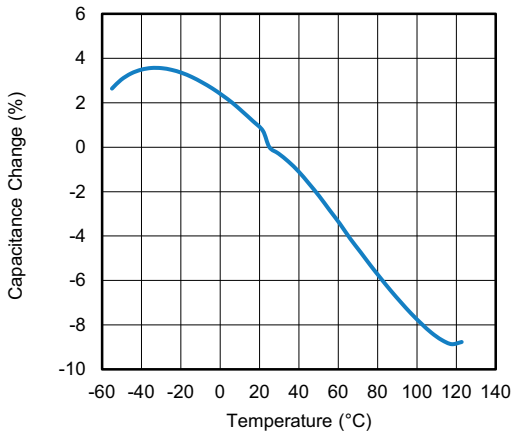




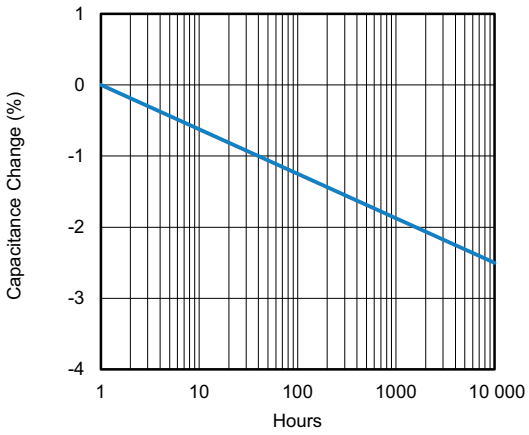


X7R DIELECTRIC - TYPICAL PARAMETERS

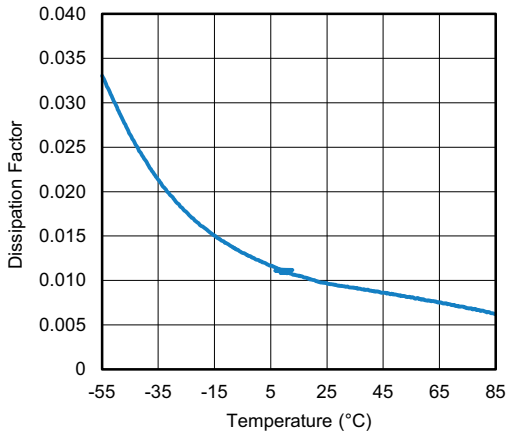
Temperature Coefficient of Capacitance



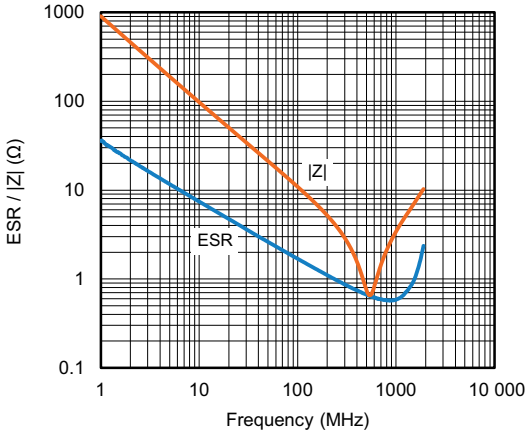
Aging Rate



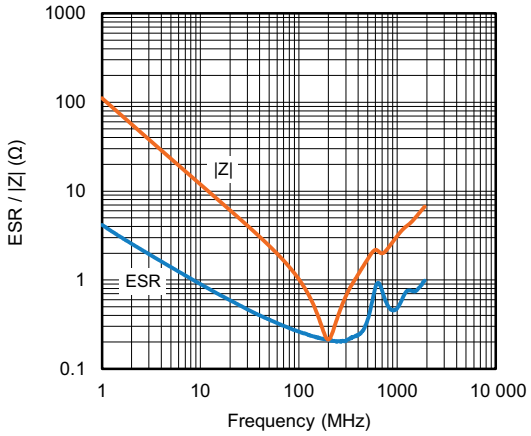
Dissipation Factor vs. Temperature



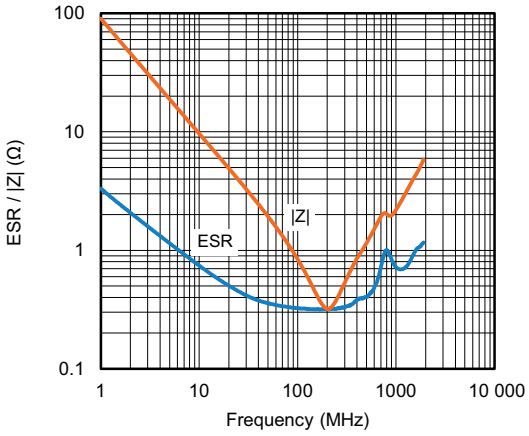
Impedance / ESR vs. Frequency (HV1812Y181KXMATHV)



Impedance / ESR vs. Frequency (HV1812Y152KXVATHV)

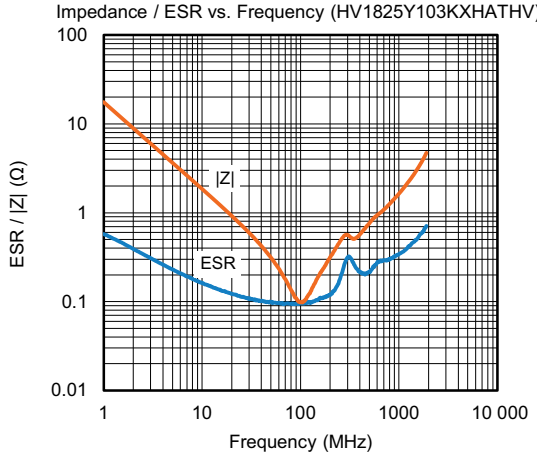


Impedance / ESR vs. Frequency (HV1825Y182KXMATHV)

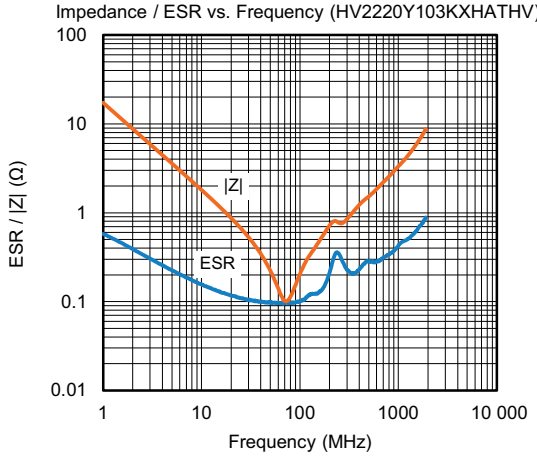


X7R DIELECTRIC - TYPICAL PARAMETERS

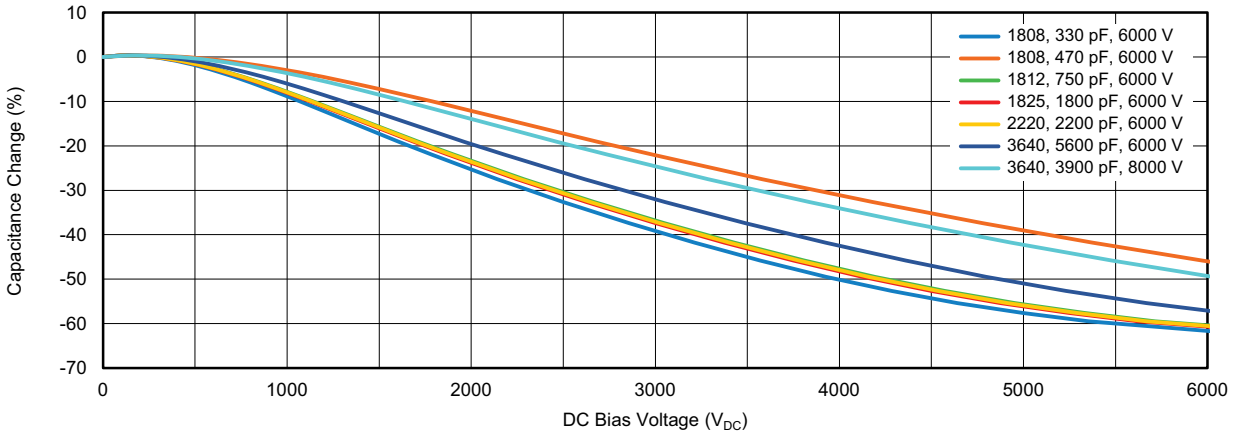
Impedance / ESR vs. Frequency (HV1825Y103KXHATHV)



Impedance / ESR vs. Frequency (HV2220Y103KXHATHV)



Voltage Coefficient of Capacitance

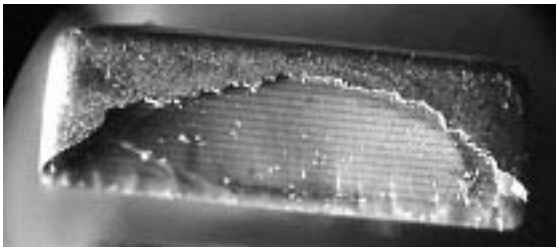


POLYMER TERMINATION

Polymer termination provides additional protection against board flexure damage by absorbing greater mechanical and thermal stresses. Components can be packaged, transported, stored and handled the same standard terminated product. Reflow soldering of MLCC does not require modification to equipment and / or process. Polymer termination greatly reduces the risk of mechanical cracking however it does not completely eliminate.

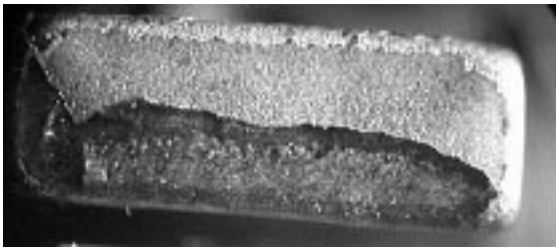
STANDARD TERMINATION

Exposed Electrodes = Electrical Short



OMD CAP PLUS POLYMER TERMINATION

No Exposed Electrodes = No Electrical Short



STANDARD PACKAGING QUANTITIES (1)			
CASE CODE	TAPE SIZE	7" REEL QUANTITIES PACKAGING CODE "T"	11 1/4" AND 13" REEL QUANTITIES PACKAGING CODE "R"
1808	12 mm	2000	10 000
1812	12 mm	500 (2) / 1000	4000
1825	12 mm	500 (2) / 1000	4000
2220	12 mm	500 (2) / 1000	n/a
2225	12 mm	500	n/a
3640	16 mm	500	n/a

Notes

(1) Reference: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"

(2) Lower quantity for certain ratings, see "Selection Chart"

STORAGE AND HANDLING CONDITIONS

(1) Store the components at 5 °C to 40 °C ambient temperature and ≤ 70 % relative humidity conditions.

(2) The product is recommended to be used within a time-frame of 2 years after shipment.
Check solderability in case extended shelf life beyond the expiry date is needed.

Precautions:

a. Do not store products in an environment containing corrosive elements, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. This may cause corrosion or oxidization of the terminations, which can easily lead to poor soldering.

b. Store products on the shelf and avoid exposure to moisture or dust.

c. Do not expose products to excessive shock, vibration, direct sunlight and so on.

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