Surface Mount Multilayer Ceramic Chip Capacitors
DSCC Qualified Type 03029

FEATURES

- US defense supply center approved
- Federal stock control number, CAGE CODE 2770A
- Small case size (0402)
- Stable BP, BR and BX dielectrics
- Excellent aging characteristics
- Lead (Pb)-free termination code “M”
- Tin / lead termination code “Z” and “U”
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Made with a combination of design, materials and tight process control to achieve very high field reliability
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Available

RoHS* Available

HALOGEN FREE

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

APPLICATIONS

- Broadband wireless communication
- Satellite communication
- WiFi (802.11) and WiMax (802.16)
- Subscriber based wireless devices
- Microwave systems

ELECTRICAL SPECIFICATIONS

Note

- Electrical characteristics at +25 °C unless otherwise specified

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

Capacitance Range:

BP: 1.0 pF to 180 pF

BR: 100 pF to 10 nF

BX: 100 pF to 8.2 nF

Voltage Range: 6.3 V_{DC} to 100 V_{DC}

Temperature Coefficient of Capacitance (TCC):

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with zero (0) V_{DC} applied

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with 100 % rated V_{DC} applied

BR: ± 15 % from -55 °C to +125 °C with zero (0) V_{DC} applied

BR: +15 %, -40 % from -55 °C to +125 °C with 100 % rated V_{DC} applied

BX: ± 15 % from -55 °C to +125 °C with zero (0) V_{DC} applied

BX: +15 %, -25 % from -55 °C to +125 °C with 100 % rated V_{DC} applied

Dissipation Factor (DF):

BP:

0.15 % max. at 1.0 V_{RMS} and 1 MHz for values ≤ 1000 pF

0.15 % max. at 1.0 V_{RMS} and 1 kHz for values > 1000 pF

BR, BX:

≤ 25 V: ± 3.5 % max. at 1.0 V_{RMS} and 1 kHz

≥ 50 V: ± 2.5 % max. at 1.0 V_{RMS} and 1 kHz

Aging Rate:

BP: 0 % maximum per decade

BR, BX: 1 % maximum per decade

Insulation Resistance (IR):

at +25 °C and rated voltage 100 000 MΩ minimum or 1000 ΩF, whichever is less

at +125 °C and rated voltage 10 000 MΩ minimum or 100 ΩF, whichever is less

Dielectric Strength Test:

performed per method 103 of EIA-198-2-E.

Applied test voltages

≤ 200 V_{DC}-rated: 250 % of rated voltage

QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
BP	0402	100	1.0 pF	180 pF
BR	0402	50	100 pF	10 nF
BX	0402	50	100 pF	8.2 nF

Note

- Detail ratings see “Selection Chart”

ORDERING INFORMATION

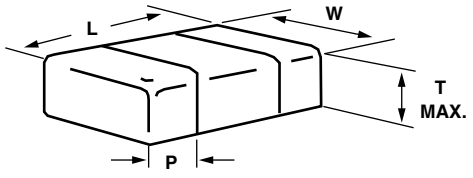
03029-	BX	102	B	J	Z	-	C
DSCC NUMBER	DIELECTRIC	CAPACITANCE NOMINAL CODE	DC VOLTAGE RATING (1)	CAPACITANCE TOLERANCE	TERMINATION	GROUP C TESTING OPTION (2)	PACKAGING
Case code 0402	BP BR BX	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. An “R” indicates a decimal point. Examples: 1R8 = 1.8 pF 101 = 100 pF	W = 6.3 V X = 10 V Y = 16 V Z = 25 V A = 50 V B = 100 V	C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % **Note:** C, D < 10 pF (BP) F, G, J, K, M ≥ 10 pF (BP) J, K, M (BR, BX)	M = silver palladium Z = Ni barrier with tin / lead plate min. 4 % lead U = Ni barrier solder coated (min. of 4 % lead)	C = full group C L = 2000 h life test only M = 1000 h life test only H = low voltage humidity test only - = no group C testing	C = 7" reel / paper tape O = 7" reel / flamed paper tape J = 7" reel (low quantity) P = 11 1/4" / 13" reel / paper tape I = 11 1/4" / 13" reel / flamed paper tape B = bulk **Note:** “I” and “O” are used for “M” termination code

Note

(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) To receive data package, add “P” to the end of the part number. For example, 03029-BX102BJZCTP. Group C will be completed and data included with shipment.

DIMENSIONS in inches (millimeters)



PART ORDERING NUMBER	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (P)	
				MINIMUM	MAXIMUM
03029-	0.040 ± 0.004 (1.02 ± 0.10)	0.020 ± 0.004 (0.51 ± 0.10)	0.024 (0.61)	0.004 (0.10)	0.016 (0.41)

Note

- Metric equivalents are given for general information only

SELECTION CHART

DIELECTRIC		BP						BR					BX				
STYLE		03029															
CASE CODE		0402															
VOLTAGE (V_{DC})		6.3	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50
VOLTAGE CODE		W	X	Y	Z	A	B	W	X	Y	Z	A	W	X	Y	Z	A
CAP. CODE	CAP.																
1R0	1.0 pF	•	•	•	•	•	•										
1R2	1.2 pF	•	•	•	•	•	•										
1R5	1.5 pF	•	•	•	•	•	•										
1R8	1.8 pF	•	•	•	•	•	•										
2R2	2.2 pF	•	•	•	•	•	•										
2R4	2.4 pF	•	•	•	•	•	•										
2R7	2.7 pF	•	•	•	•	•	•										
3R0	3.0 pF	•	•	•	•	•	•										
3R3	3.3 pF	•	•	•	•	•	•										
3R6	3.6 pF	•	•	•	•	•	•										
3R9	3.9 pF	•	•	•	•	•	•										
4R7	4.7 pF	•	•	•	•	•	•										
5R1	5.1 pF	•	•	•	•	•	•										
5R6	5.6 pF	•	•	•	•	•	•										
6R2	6.2 pF	•	•	•	•	•	•										
6R8	6.8 pF	•	•	•	•	•	•										
7R5	7.5 pF	•	•	•	•	•	•										
8R2	8.2 pF	•	•	•	•	•	•										
9R1	9.1 pF	•	•	•	•	•	•										
100	10 pF	•	•	•	•	•	•										
110	11 pF	•	•	•	•	•	•										
120	12 pF	•	•	•	•	•	•										
130	13 pF	•	•	•	•	•	•										
150	15 pF	•	•	•	•	•	•										
160	16 pF	•	•	•	•	•	•										
180	18 pF	•	•	•	•	•	•										
200	20 pF	•	•	•	•	•	•										
220	22 pF	•	•	•	•	•	•										
240	24 pF	•	•	•	•	•	•										
270	27 pF	•	•	•	•	•	•										
300	30 pF	•	•	•	•	•	•										
330	33 pF	•	•	•	•	•	•										
360	36 pF	•	•	•	•	•	•										
390	39 pF	•	•	•	•	•	•										
430	43 pF	•	•	•	•	•	•										
470	47 pF	•	•	•	•	•	•										
510	51 pF	•	•	•	•	•	•										
560	56 pF	•	•	•	•	•	•										
620	62 pF	•	•	•	•	•	•										
680	68 pF	•	•	•	•	•	•										
750	75 pF	•	•	•	•	•	•										
820	82 pF	•	•	•	•	•	•										
910	91 pF	•	•	•	•	•	•										

Notes

RoHS-compliant except when supplied with lead (Pb)-containing termination, code “Z”

Not RoHS-compliant

SELECTION CHART

DIELECTRIC		BP						BR					BX				
STYLE		03029															
CASE CODE		0402															
VOLTAGE (V_{DC})		6.3	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50
VOLTAGE CODE		W	X	Y	Z	A	B	W	X	Y	Z	A	W	X	Y	Z	A
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							•	•	•	•	•	•	•	•	•	•
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							•	•	•			•	•	•		
682	6.8 nF							•	•	•			•	•	•		
822	8.2 nF							•	•	•			•	•	•		
103	10 nF							•	•	•							
123	12 nF																

Notes

RoHS-compliant except when supplied with lead (Pb)-containing termination, code “Z”

Not RoHS-compliant

DSCC PACKAGING QUANTITIES (1)

CASE CODE	TAPE SIZE	7" REEL QUANTITIES		11 1/4" AND 13" REEL QUANTITIES	BULK
		PACKAGING CODE		PACKAGING CODE	VIAL PACKAGING CODE
		“C” / “O”	“J”	“P” / “I”	“B”
0402	8 mm	5000	1000	10 000	100

Note

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

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:

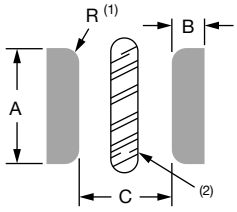
a. Do not store products in an environment containing corrosive elements, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. This may cause corrosion or oxidization of the terminations, which can easily lead to poor soldering.

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.

Solder Pad Dimensions for Vishay Surface-Mount Multilayer Ceramic Chip Capacitors

DIMENSIONS in millimeters



CASE CODE	A	B	C
0402	0.50	0.50	0.40
0505	1.35	1.00	0.60
0603	0.90	1.00	1.00 (3)
0805	1.30	1.20	1.00
1111	2.90	1.30	1.75
1206	1.80	1.20	2.10
1210	2.80	1.30	1.90
1808	2.40	1.50	3.00
1812	3.60	1.50	3.00
1825	6.50	1.50	3.00
2008	2.70	1.50	4.08
2220	5.50 (4)	1.50	4.20
2225	6.50	1.50	4.20
2525	6.60	1.50	4.50
3040	10.80	2.00	5.50
3640	10.80	2.00	7.00
3838	10.20	2.00	7.50
4044	12.30	2.00	8.00

Notes

(1) For safety capacitors and voltages above 3000 V, corner rounding (R) of 0.5 mm is recommended to suppress arcing
(2) Add a 1 mm slot in PCB between pads to allow cleaning and coating under MLCC
(3) For VJ HiFREQ Series, this dimension is 0.6 mm
(4) For safety capacitors, the A dimension should be 5.80 mm

PRINTED CIRCUIT BOARD PCB DESIGN CONSIDERATIONS FOR HIGH VOLTAGE SURFACE-MOUNT MLCCS

Special assembly process and design considerations should be employed for today's high voltage rating MLCCs. As case sizes remain the same and voltage ratings increase, MLCC manufacturers must design, evaluate, and qualify their capacitors using methods that reduce the occurrence of corona discharge and arcover events. To meet similar capability in high voltage applications, users should employ similar cautionary design and assembly methods.

MLCC PAD LAYOUT

A capacitor's arcover inception point can degrade due to factors such as the MLCC termination, PCB pad design, PCB cleanliness, solder flux residue, surface contamination / deposits and environmental conditions. PCB pads and their design affect the air gap distance between the opposing polarities of the MLCC termination. For voltage rating greater than 1500 V_{DC} add a corner radius to the inward facing edge of the MLCC pads and as large a gap as possible between the pads. Too small of a pad gap distance will reduce the capacitor's own arcover inception voltage level. Refer to the Figure and Table Figure 1.0, MLCC Pad Layout and Table 1.0, Vishay MLCC Solder Pad Dimensions for the recommended MLCC solder pad dimensions.

SLOT OR TRENCH BETWEEN PADS

PCB assembly can deposit dust, trap solder balls, or flux residue underneath the capacitors. These contaminants will reduce conductive clearances and the arcover inception level. Assembly methods must include a final PCB cleaning process. A slot or trench can be cut into the PCB in between the pads to allow cleaners to penetrate underneath the MLCC. The slot will also allow conformal or epoxy coatings to flow underneath the MLCC and build an insulative barrier between pads. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.

COATING PRINTED CIRCUIT BOARD

Coating a printed circuit board with materials such as acrylic, silicone and urethane resins provide a protective dielectric barrier that is non-conductive and will enhance the resistance to arcing. Various processes exist which include dipping, brushing, and spaying. Optimal performance will come from coating the MLCC on all sides, top and bottom. The PCB slot in between the pads should extend slightly beyond the width of the MLCC. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.

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