Surface Mount Multilayer Ceramic Chip Capacitors for High Frequency

FEATURES

- Case size 0402, 0603, 0805
- High frequency
- Ultra-stable dielectric material
- Non-magnetic copper termination "C"
- Lead (Pb)-free terminations code "X"
- Tin / lead termination code "L"
- Surface mount, 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

Pb Available
RoHS* Available
HALOGEN FREE
GREEN (5-2008) Available

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.

DESIGN TOOLS (click logo to get started)

MVP Modelithics Vendor Partner

APPLICATIONS

- RF and microwave
- Broadband communication
- Satellite communication
- Base stations
- Medical instrumentation and test
- Military devices (radar, communication, etc.)
- Wireless devices

ELECTRICAL SPECIFICATIONS

Note
- Electrical characteristics at 25 °C unless otherwise specified

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

Capacitance Range:
0402: 0.1 pF to 82 pF
0603: 0.1 pF to 470 pF
0805: 0.1 pF to 1.5 nF

Voltage Rating: 25 V_{DC} to 250 V_{DC}

Temperature Coefficient of Capacitance (TCC):
C0G (D): 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with zero (0) V_{DC} applied

Dissipation Factor (DF):
C0G (D): 0.05 % max. at 1.0 V_{RMS} and 1 MHz for values ≤ 1000 pF
C0G (D): 0.05 % max. at 1.0 V_{RMS} and 1 kHz for values > 1000 pF

Aging Rate: 0 % 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: min. 250 % of rated voltage
> 200 V_{DC}-rated: min. 200 % of rated voltage

For technical questions, contact: mlccrf@vishay.com
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QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
D = HIFREQ	0402	200	0.1 pF	82 pF
	0603	250	0.1 pF	470 pF
	0805	250	0.1 pF	1.5 nF

Note

- For values below 0.4 pF, contact mlccrf@vishay.com

ORDERING INFORMATION

VJ0603	D	1R0	B	X	B	A	C
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING [1]	MARKING	PACKAGING
0402 0603 0805	D = HIFREQ	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. An "R" indicates a decimal point. Examples: 1R0 = 1.0 pF	V = ± 0.05 pF B = ± 0.10 pF C = ± 0.25 pF D = ± 0.50 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % **Note** Details see "Selection Chart"	C = non-magnetic copper barrier 100 % tin plate matte finish E = AgPd [2] X = Ni barrier 100 % tin plate matte finish L = Ni barrier with tin lead plated finish min. 4 % lead	X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V	A = no marking	T = 7" reel / plastic tape C = 7" reel / paper tape O = 7" reel / flamed paper tape J = 7" reel (low quantity) R = 11 1/4" / 13" reel / plastic tape P = 11 1/4" / 13" reel / paper tape I = 11 1/4" / 13" reel / flamed paper tape B = bulk **Note** "I" and "O" is used for "E" / "N" termination code

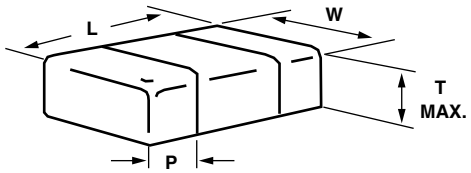
Notes

(1) DC voltage rating should not be exceeded in application
(2) Termination code "E" is for conductive epoxy assembly

ENVIRONMENTAL STATUS

TERMINATION CODE	TERMINATION DESCRIPTION	RoHS COMPLIANT	VISHAY GREEN
C	Non-magnetic copper barrier 100 % tin plated matte finish	Yes	Yes
X	Ni barrier 100 % tin plated matte finish	Yes	Yes
E	AgPd	Yes	Yes
L	Ni barrier tin lead plated with min. 4 % lead	No	No

DIMENSIONS in inches (millimeters)



CASE CODE	STYLE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATIONS PAD (P)	
					MINIMUM	MAXIMUM [1]
0402	VJ0402	0.040 ± 0.004 (1.02 ± 0.10)	0.020 ± 0.004 (0.51 ± 0.10)	0.021 (0.61)	0.004 (0.10)	0.016 (0.41)
0603	VJ0603	0.063 ± 0.006 (1.60 ± 0.15)	0.031 ± 0.005 (0.80 ± 0.12)	0.037 (0.94)	0.012 (0.30)	0.018 (0.46)
0805	VJ0805	0.079 ± 0.008 (2.00 ± 0.20)	0.049 ± 0.008 (1.25 ± 0.20)	0.057 (1.45)	0.010 (0.25)	0.028 (0.71)

Note

(1) For Cu termination "C" add 0.01 mm to maximum pad terminations

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SELECTION CHART

DIELECTRIC (VISHAY CODE)		C0G (D)				
STYLE		VJ0402				TOLERANCE
CASE CODE		0402				
VOLTAGE (V_{DC})		25	50	100	200	
VOLTAGE CODE		X	A	B	C	
CAP. CODE	CAP.					
0R1	0.1 pF	••	••	••	••	V, B, C, D
0R2	0.2 pF	••	••	••	••	V, B, C, D
0R3	0.3 pF	••	••	••	••	V, B, C, D
0R4	0.4 pF	••	••	••	••	V, B, C, D
0R5	0.5 pF	••	••	••	••	V, B, C, D
0R6	0.6 pF	••	••	••	••	V, B, C, D
0R7	0.7 pF	••	••	••	••	V, B, C, D
0R8	0.8 pF	••	••	••	••	V, B, C, D
0R9	0.9 pF	••	••	••	••	V, B, C, D
1R0	1.0 pF	••	••	••	••	V, B, C, D
1R1	1.1 pF	••	••	••	••	V, B, C, D
1R2	1.2 pF	••	••	••	••	V, B, C, D
1R3	1.3 pF	••	••	••	••	V, B, C, D
1R4	1.4 pF	••	••	••	••	V, B, C, D
1R5	1.5 pF	••	••	••	••	V, B, C, D
1R6	1.6 pF	••	••	••	••	V, B, C, D
1R7	1.7 pF	••	••	••	••	V, B, C, D
1R8	1.8 pF	••	••	••	••	V, B, C, D
1R9	1.9 pF	••	••	••	••	V, B, C, D
2R0	2.0 pF	••	••	••	••	V, B, C, D
2R1	2.1 pF	••	••	••	••	V, B, C, D
2R2	2.2 pF	••	••	••	••	V, B, C, D
2R4	2.4 pF	••	••	••	••	V, B, C, D
2R7	2.7 pF	••	••	••	••	V, B, C, D
3R0	3.0 pF	••	••	••	••	V, B, C, D
3R3	3.3 pF	••	••	••	••	V, B, C, D
3R6	3.6 pF	••	••	••	••	V, B, C, D
3R9	3.9 pF	••	••	••	••	V, B, C, D
4R3	4.3 pF	••	••	••	••	V, B, C, D
4R7	4.7 pF	••	••	••	••	V, B, C, D
5R1	5.1 pF	••	••	••	••	V, B, C, D
5R6	5.6 pF	••	••	••	••	V, B, C, D
6R2	6.2 pF	••	••	••	••	V, B, C, D
6R8	6.8 pF	••	••	••	••	V, B, C, D
7R5	7.5 pF	••	••	••	••	V, B, C, D
8R2	8.2 pF	••	••	••	••	V, B, C, D
9R1	9.1 pF	••	••	••	••	V, B, C, D
100	10 pF	••	••	••	••	V, F, G, J, K, M
110	11 pF	••	••	••	••	F, G, J, K, M
120	12 pF	••	••	••	••	F, G, J, K, M
130	13 pF	••	••	••	••	F, G, J, K, M
150	15 pF	••	••	••	••	F, G, J, K, M
180	18 pF	••	••	••	••	F, G, J, K, M
200	20 pF	••	••	••	••	F, G, J, K, M
220	22 pF	••	••	••	••	F, G, J, K, M
240	24 pF	••	••	••	••	F, G, J, K, M
270	27 pF	••	••	••	••	F, G, J, K, M
300	30 pF	••	••			F, G, J, K, M
330	33 pF	••	••			F, G, J, K, M
360	36 pF	••	••			F, G, J, K, M
390	39 pF	••	••			F, G, J, K, M
430	43 pF	••	••			F, G, J, K, M
470	47 pF	••	••			F, G, J, K, M
510	51 pF	••	••			F, G, J, K, M
560	56 pF	••	••			F, G, J, K, M
620	62 pF	••				F, G, J, K, M
680	68 pF	••				F, G, J, K, M
750	75 pF	••				F, G, J, K, M
820	82 pF	••				F, G, J, K, M
910	91 pF					
101	100 pF					
111	110 pF					
121	120 pF					

Notes

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

•• Paper carrier

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SELECTION CHART

DIELECTRIC (VISHAY CODE)		C0G (D)					
STYLE		VJ0603					TOLERANCE
CASE CODE		0603					
VOLTAGE (V_{DC})		25	50	100	200	250	
VOLTAGE CODE		X	A	B	C	P	
CAP. CODE	CAP.						
0R1	0.1 pF	••	••	••	••	••	V, B, C, D
0R2	0.2 pF	••	••	••	••	••	V, B, C, D
0R3	0.3 pF	••	••	••	••	••	V, B, C, D
0R4	0.4 pF	••	••	••	••	••	V, B, C, D
0R5	0.5 pF	••	••	••	••	••	V, B, C, D
0R6	0.6 pF	••	••	••	••	••	V, B, C, D
0R7	0.7 pF	••	••	••	••	••	V, B, C, D
0R8	0.8 pF	••	••	••	••	••	V, B, C, D
0R9	0.9 pF	••	••	••	••	••	V, B, C, D
1R0	1.0 pF	••	••	••	••	••	V, B, C, D
1R1	1.1 pF	••	••	••	••	••	V, B, C, D
1R2	1.2 pF	••	••	••	••	••	V, B, C, D
1R3	1.3 pF	••	••	••	••	••	V, B, C, D
1R4	1.4 pF	••	••	••	••	••	V, B, C, D
1R5	1.5 pF	••	••	••	••	••	V, B, C, D
1R6	1.6 pF	••	••	••	••	••	V, B, C, D
1R7	1.7 pF	••	••	••	••	••	V, B, C, D
1R8	1.8 pF	••	••	••	••	••	V, B, C, D
1R9	1.9 pF	••	••	••	••	••	V, B, C, D
2R0	2.0 pF	••	••	••	••	••	V, B, C, D
2R1	2.1 pF	••	••	••	••	••	V, B, C, D
2R2	2.2 pF	••	••	••	••	••	V, B, C, D
2R4	2.4 pF	••	••	••	••	••	V, B, C, D
2R7	2.7 pF	••	••	••	••	••	V, B, C, D
3R0	3.0 pF	••	••	••	••	••	V, B, C, D
3R3	3.3 pF	••	••	••	••	••	V, B, C, D
3R6	3.6 pF	••	••	••	••	••	V, B, C, D
3R9	3.9 pF	••	••	••	••	••	V, B, C, D
4R3	4.3 pF	••	••	••	••	••	V, B, C, D
4R7	4.7 pF	••	••	••	••	••	V, B, C, D
5R1	5.1 pF	••	••	••	••	••	V, B, C, D
5R6	5.6 pF	••	••	••	••	••	V, B, C, D
6R2	6.2 pF	••	••	••	••	••	V, B, C, D
6R8	6.8 pF	••	••	••	••	••	V, B, C, D
7R5	7.5 pF	••	••	••	••	••	V, B, C, D
8R2	8.2 pF	••	••	••	••	••	V, B, C, D
9R1	9.1 pF	••	••	••	••	••	V, B, C, D
100	10 pF	••	••	••	••	••	V, F, G, J, K, M
110	11 pF	••	••	••	••	••	F, G, J, K, M
120	12 pF	••	••	••	••	••	F, G, J, K, M
130	13 pF	••	••	••	••	••	F, G, J, K, M
150	15 pF	••	••	••	••	••	F, G, J, K, M
180	18 pF	••	••	••	••	••	F, G, J, K, M
200	20 pF	••	••	••	••	••	F, G, J, K, M
220	22 pF	••	••	••	••	••	F, G, J, K, M
240	24 pF	••	••	••	••	••	F, G, J, K, M
270	27 pF	••	••	••	••	••	F, G, J, K, M
300	30 pF	••	••	••	••	••	F, G, J, K, M
330	33 pF	••	••	••	••	••	F, G, J, K, M
360	36 pF	••	••	••	••	••	F, G, J, K, M
390	39 pF	••	••	••	••	••	F, G, J, K, M
430	43 pF	••	••	••	••	••	F, G, J, K, M
470	47 pF	••	••	••	••	••	F, G, J, K, M
510	51 pF	••	••	••	••	••	F, G, J, K, M
560	56 pF	••	••	••	••	••	F, G, J, K, M
620	62 pF	•	•	•	•	•	F, G, J, K, M
680	68 pF	•	•	•	•	•	F, G, J, K, M
750	75 pF	•	•	•	•	•	F, G, J, K, M
820	82 pF	•	•	•	•	•	F, G, J, K, M
910	91 pF	•	•	•	•	•	F, G, J, K, M

Notes

RoHS-compliant except when supplied with lead (Pb)-containing termination, code "L"

•• Paper carrier • Plastic carrier tape

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SELECTION CHART							
DIELECTRIC (VISHAY CODE)		C0G (D)					
STYLE		VJ0603					TOLERANCE
CASE CODE		0603					
VOLTAGE (V_{DC})		25	50	100	200	250	
VOLTAGE CODE		X	A	B	C	P	
CAP. CODE	CAP.						
101	100 pF	•	•	•	•	•	F, G, J, K, M
111	110 pF	•	•	•			F, G, J, K, M
121	120 pF	•	•	•			F, G, J, K, M
131	130 pF	•	•	•			F, G, J, K, M
151	150 pF	•	•	•			F, G, J, K, M
181	180 pF	•	•				F, G, J, K, M
201	200 pF	•	•				F, G, J, K, M
221	220 pF	•	•				F, G, J, K, M
241	240 pF	•	•				F, G, J, K, M
271	270 pF	•	•				F, G, J, K, M
301	300 pF	•	•				F, G, J, K, M
331	330 pF	•	•				F, G, J, K, M
361	360 pF	•					F, G, J, K, M
391	390 pF	•					F, G, J, K, M
431	430 pF	•					F, G, J, K, M
471	470 pF	•					F, G, J, K, M
511	510 pF						
561	560 pF						
621	620 pF						
681	680 pF						
751	750 pF						
821	820 pF						
911	910 pF						
102	1.0 nF						
112	1.1 nF						
122	1.2 nF						
132	1.3 nF						
152	1.5 nF						
182	1.8 nF						

Notes

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SELECTION CHART							
DIELECTRIC (VISHAY CODE)		C0G (D)					
STYLE		VJ0805					TOLERANCE
CASE CODE		0805					
VOLTAGE (V_{DC})		25	50	100	200	250	
VOLTAGE CODE		X	A	B	C	P	
CAP. CODE	CAP.						
0R1	0.1 pF	•	•	•	•	•	V, B, C, D
0R2	0.2 pF	•	•	•	•	•	V, B, C, D
0R3	0.3 pF	•	•	•	•	•	V, B, C, D
0R4	0.4 pF	•	•	•	•	•	V, B, C, D
0R5	0.5 pF	•	•	•	•	•	V, B, C, D
0R6	0.6 pF	•	•	•	•	•	V, B, C, D
0R7	0.7 pF	•	•	•	•	•	V, B, C, D
0R8	0.8 pF	•	•	•	•	•	V, B, C, D
0R9	0.9 pF	•	•	•	•	•	V, B, C, D
1R0	1.0 pF	•	•	•	•	•	V, B, C, D
1R1	1.1 pF	•	•	•	•	•	V, B, C, D
1R2	1.2 pF	•	•	•	•	•	V, B, C, D
1R3	1.3 pF	•	•	•	•	•	V, B, C, D
1R4	1.4 pF	•	•	•	•	•	V, B, C, D
1R5	1.5 pF	•	•	•	•	•	V, B, C, D
1R6	1.6 pF	•	•	•	•	•	V, B, C, D
1R7	1.7 pF	•	•	•	•	•	V, B, C, D
1R8	1.8 pF	•	•	•	•	•	V, B, C, D
1R9	1.9 pF	•	•	•	•	•	V, B, C, D
2R0	2.0 pF	•	•	•	•	•	V, B, C, D
2R1	2.1 pF	•	•	•	•	•	V, B, C, D
2R2	2.2 pF	•	•	•	•	•	V, B, C, D
2R4	2.4 pF	•	•	•	•	•	V, B, C, D
2R7	2.7 pF	•	•	•	•	•	V, B, C, D
3R0	3.0 pF	•	•	•	•	•	V, B, C, D
3R3	3.3 pF	•	•	•	•	•	V, B, C, D
3R6	3.6 pF	•	•	•	•	•	V, B, C, D
3R9	3.9 pF	•	•	•	•	•	V, B, C, D
4R3	4.3 pF	•	•	•	•	•	V, B, C, D
4R7	4.7 pF	•	•	•	•	•	V, B, C, D
5R1	5.1 pF	•	•	•	•	•	V, B, C, D
5R6	5.6 pF	•	•	•	•	•	V, B, C, D
6R2	6.2 pF	•	•	•	•	•	V, B, C, D
6R8	6.8 pF	•	•	•	•	•	V, B, C, D
7R5	7.5 pF	•	•	•	•	•	V, B, C, D
8R2	8.2 pF	•	•	•	•	•	V, B, C, D
9R1	9.1 pF	•	•	•	•	•	V, B, C, D

Notes

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

• Plastic carrier tape

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SELECTION CHART							
DIELECTRIC (VISHAY CODE)		C0G (D)					
STYLE		VJ0805					TOLERANCE
CASE CODE		0805					
VOLTAGE (V_{DC})		25	50	100	200	250	
VOLTAGE CODE		X	A	B	C	P	
CAP. CODE	CAP.						
100	10 pF	•	•	•	•	•	V, F, G, J, K, M
110	11 pF	•	•	•	•	•	F, G, J, K, M
120	12 pF	•	•	•	•	•	F, G, J, K, M
130	13 pF	•	•	•	•	•	F, G, J, K, M
150	15 pF	•	•	•	•	•	F, G, J, K, M
180	18 pF	•	•	•	•	•	F, G, J, K, M
200	20 pF	•	•	•	•	•	F, G, J, K, M
220	22 pF	•	•	•	•	•	F, G, J, K, M
240	24 pF	•	•	•	•	•	F, G, J, K, M
270	27 pF	•	•	•	•	•	F, G, J, K, M
300	30 pF	•	•	•	•	•	F, G, J, K, M
330	33 pF	•	•	•	•	•	F, G, J, K, M
360	36 pF	•	•	•	•	•	F, G, J, K, M
390	39 pF	•	•	•	•	•	F, G, J, K, M
430	43 pF	•	•	•	•	•	F, G, J, K, M
470	47 pF	•	•	•	•	•	F, G, J, K, M
510	51 pF	•	•	•	•	•	F, G, J, K, M
560	56 pF	•	•	•	•	•	F, G, J, K, M
620	62 pF	•	•	•	•	•	F, G, J, K, M
680	68 pF	•	•	•	•	•	F, G, J, K, M
750	75 pF	•	•	•	•	•	F, G, J, K, M
820	82 pF	•	•	•	•	•	F, G, J, K, M
910	91 pF	•	•	•	•	•	F, G, J, K, M
101	100 pF	•	•	•	•	•	F, G, J, K, M
111	110 pF	•	•	•	•	•	F, G, J, K, M
121	120 pF	•	•	•	•	•	F, G, J, K, M
131	130 pF	•	•	•	•	•	F, G, J, K, M
151	150 pF	•	•	•	•	•	F, G, J, K, M
181	180 pF	•	•	•	•	•	F, G, J, K, M
201	200 pF	•	•	•	•	•	F, G, J, K, M
221	220 pF	•	•	•	•	•	F, G, J, K, M
241	240 pF	•	•	•	•	•	F, G, J, K, M
271	270 pF	•	•	•	•	•	F, G, J, K, M
301	300 pF	•	•	•	•	•	F, G, J, K, M
331	330 pF	•	•	•	•	•	F, G, J, K, M
361	360 pF	•	•	•	•		F, G, J, K, M
391	390 pF	•	•	•	•		F, G, J, K, M
431	430 pF	•	•	•			F, G, J, K, M
471	470 pF	•	•	•			F, G, J, K, M
511	510 pF	•	•	•			F, G, J, K, M
561	560 pF	•	•	•			F, G, J, K, M
621	620 pF	•	•	•			F, G, J, K, M
681	680 pF	•	•	•			F, G, J, K, M
751	750 pF	•	•				F, G, J, K, M
821	820 pF	•	•				F, G, J, K, M
911	910 pF	•	•				F, G, J, K, M
102	1.0 nF	•	•				F, G, J, K, M
112	1.1 nF	•					F, G, J, K, M
122	1.2 nF	•					F, G, J, K, M
132	1.3 nF	•					F, G, J, K, M
152	1.5 nF	•					F, G, J, K, M
182	1.8 nF						

Notes

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

• Plastic carrier tape

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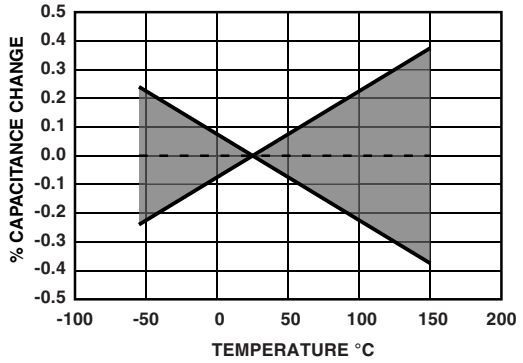
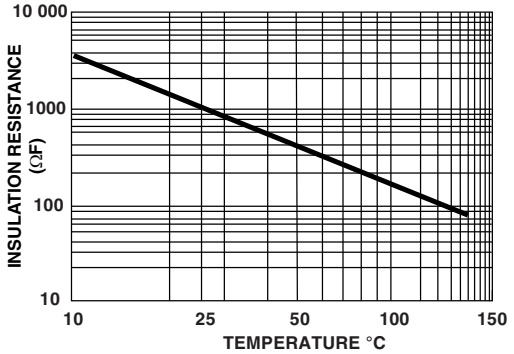
HIGH FREQ DIELECTRIC - TYPICAL PARAMETERS

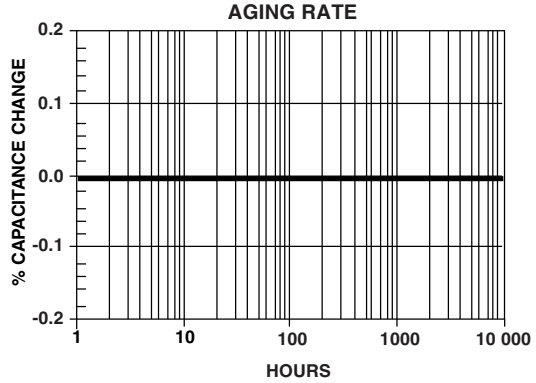
TEMPERATURE COEFFICIENT OF CAPACITANCE



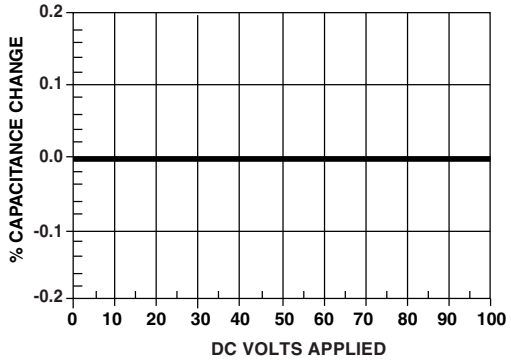
MIN. INSULATION RESISTANCE VS. TEMPERATURE



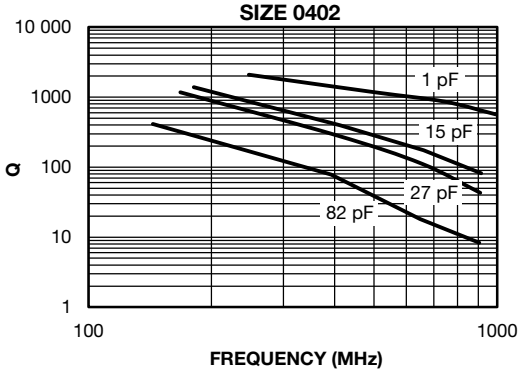
AGING RATE



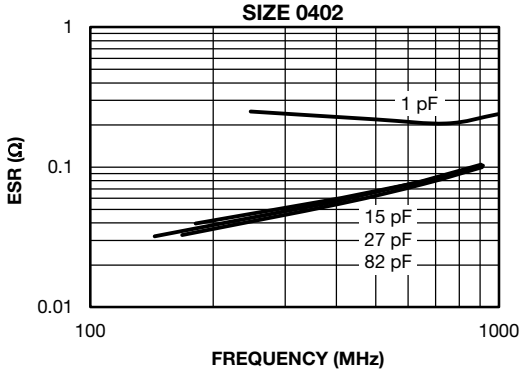
VOLTAGE COEFFICIENT OF CAPACITANCE



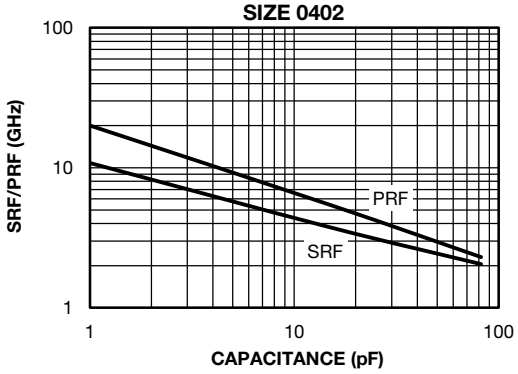
TYPICAL Q VALUE VS. FREQUENCY
SIZE 0402



TYPICAL ESR VS. FREQUENCY
SIZE 0402



TYPICAL SRF/PRF VS. CAPACITANCE
SIZE 0402



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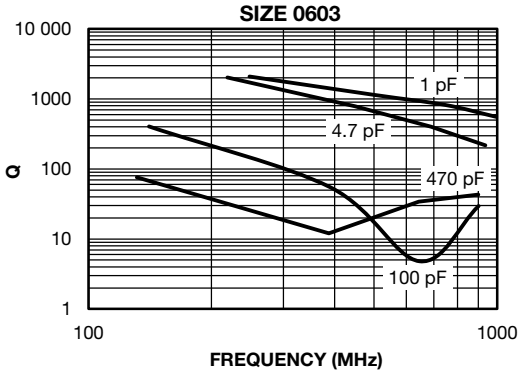
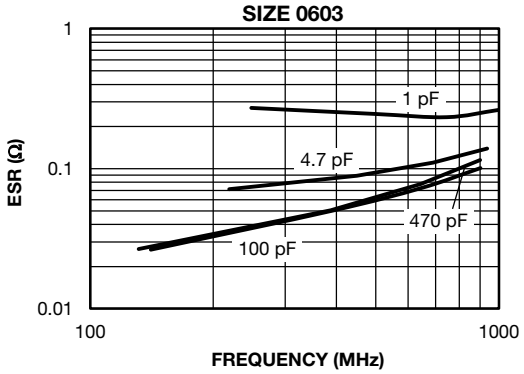
HIGH FREQ DIELECTRIC - TYPICAL PARAMETERS

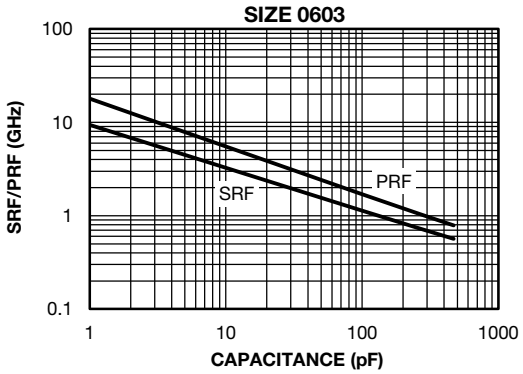
TYPICAL Q VALUE VS. FREQUENCY SIZE 0603



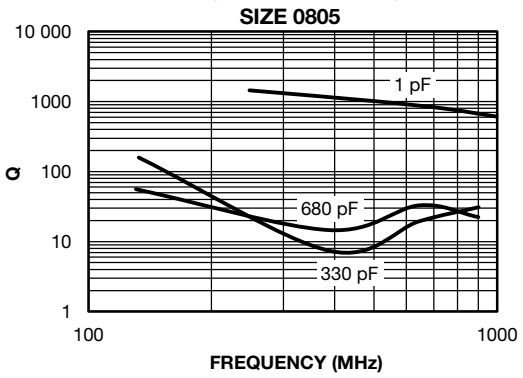
TYPICAL ESR VS. FREQUENCY SIZE 0603



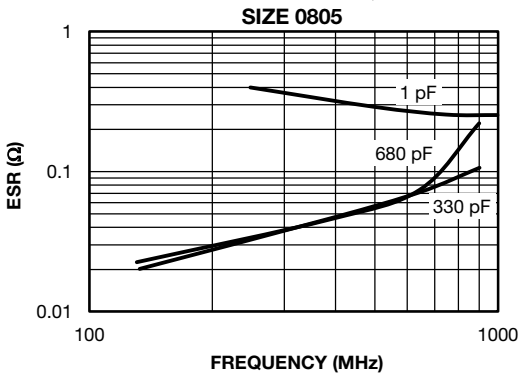
TYPICAL SRF/PRF VS. CAPACITANCE SIZE 0603



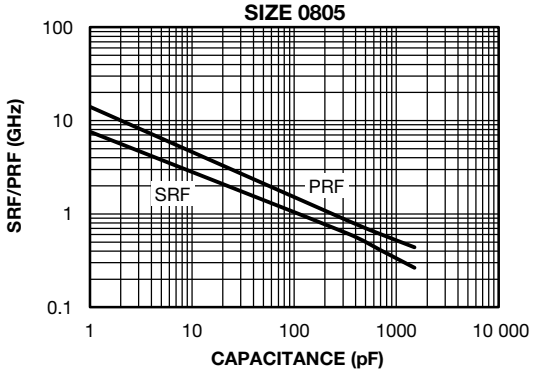
TYPICAL Q VALUE VS. FREQUENCY SIZE 0805



TYPICAL ESR VS. FREQUENCY SIZE 0805



TYPICAL SRF/PRF VS. CAPACITANCE SIZE 0805



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STANDARD PACKAGING QUANTITIES (1)(2)(3)

CASE CODE	TAPE SIZE	7" REEL QUANTITIES			11 1/4" AND 13" REEL QUANTITIES	
		PAPER TAPE PACKAGING CODE "C" / "O"	PLASTIC TAPE PACKAGING CODE "T"	LOW QUANTITY "J" (5)	PAPER TAPE PACKAGING CODE "P" / "I"	PLASTIC TAPE PACKAGING CODE "R"
0402	8 mm	5000	n/a	1000	10 000	n/a
0603 (4)	8 mm	4000	4000	1000	10 000	10 000
0805 (4)	8 mm	n/a	3000	1000	n/a	10 000

Notes

(1) Vishay Vitramon uses embossed plastic carrier tape
(2) REFERENCE: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"
(3) n/a = not available
(4) Packaging "C" / "P" / "O" / "I" and "T" / "R" or lower quantities can depend from product thickness
(5) Paper / plastic tape used by availability

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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