



VISHAY INTERTECHNOLOGY, INC.



CAPACITORS

INSTRUCTIONAL GUIDE

VISHAY VITRAMON AUTOMOTIVE MLCCs

VJ...31 / VJ...34

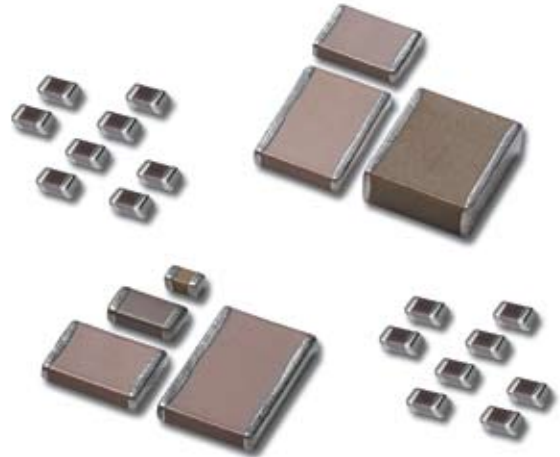
- Automotive Applications
- Product Range
- AEC-Q200 Testing
- Part Numbering



SURFACE-MOUNT MULTILAYER CERAMIC CHIP CAPACITORS

For Automotive Applications

For more than 20 years Vishay Vitramon has supported the automotive industry with robust, highly reliable MLCCs that have made it a leader in this segment. All Vishay Vitramon MLCCs are manufactured in "Precious Metal Technology" (PMT/NME) with a wet build process. They are qualified according to AEC-Q-200 with PPAP available on request. Applications for these devices include automotive "under the hood," safety, and comfort electronics. Their termination finish is 100 % tin plate matte and AgPd which is used with silver epoxy bonding. A polymer (flexible) termination with 100 % tin plate matte finish is under full qualification and expected to be released in 2008.



Applications

Powertrain (Underhood)

- Common Rail Diesel Electrical Control
- Piezoelectric-Injection Driver
- Engine Control Unit (ECU)
- Turbo Charger Control Unit
- Ignition Electrical Drive
- Engine Sensors
- Electrical Water Pump
- Boardnet Management
- Integrated Starter Generator 14 V / 42 V (ISG)
- Board Load-Control Unit
- Engine Cooling (Electrical Fan Control)

Chassis

- Active Safety (ESP, ABS, ASR, USC)
- Electric Park Brake (EPB)
- Sensors
- Electrical Transmission (CVT, ASG, Double Clutch Shifting)
- EAGR, Electrical Catalytic Converter, Diesel Particle Filter
- Active Suspension, Dynamic Control
- Tire Pressure Monitoring
- Electrical Hydraulic Power Steering (EHPS)
- Electrical Power Steering (EPS)

Body and Comfort

- Sensors
- Immobilizer and Security Systems
- Door / Window / Sunroof Control
- Seat Adjust and Memory
- HVAC (Heating, Ventilating, Air Conditioning)
- Climate Control
- Dashboard and Interior Illumination
- Passive Safety (Airbag, Restraint Systems)
- Reversible Wiper Drives
- Keyless or Passive Entry, Passive Start, Bluetooth Communication
- Car TV and DVD Systems (Multimedia)



Lighting Systems

- Headlight Leveling Control and Advanced Front Lighting Headlight Cleaning System
- LED Lighting (Front and Rear)
- HID Electrical (Xenon Driver)
- Sensors (Night Vision Systems, Fog Detection)
- Ambient Lighting

Driver Information

- Driver Information System
- Bluetooth Communication
- GPS Car Navigation and Audio System
- SDARS/Antenna/Amplifier System
- Sensors (ACC, LIDAR)



AUTOMOTIVE SYSTEMS

C0G (NP0) Dielectric

Style		VJ0402			VJ0603			VJ0805				VJ1206				VJ1210 ⁽¹⁾				VJ1812 ^{(1) (2)}					
EIA Type		0402			0603			0805				1206				1210				1812					
Voltage (Vdc)		25	50	100	50	100	200	50	100	200	500	50	100	200	500/630	50	100	200	500/630	50	100	200	500/630	1000	3000
Cap. Code	Cap.																								
1R0	1.0 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
1R2	1.2 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
1R5	1.5 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
1R8	1.8 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
2R2	2.2 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
2R7	2.7 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
3R3	3.3 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
3R9	3.9 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
4R7	4.7 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
5R6	5.6 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
6R8	6.8 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
8R2	8.2 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
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	1000 pF							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
122	1200 pF							•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
152	1500 pF							•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
182	1800 pF							•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
222	2200 pF							•				•	•	•	•	•	•	•	•	•	•	•	•	•	•
272	2700 pF							•				•	•	•	•	•	•	•	•	•	•	•	•	•	•
332	3300 pF							•				•	•	•	•	•	•	•	•	•	•	•	•	•	•
392	3900 pF							•				•	•			•	•	•	•	•	•	•	•	•	•
472	4700 pF											•	•			•	•	•	•	•	•	•	•	•	•
562	5600 pF											•	•			•	•	•	•	•	•	•	•	•	•
682	6800 pF											•	•			•	•	•	•	•	•	•	•	•	•
822	8200 pF											•	•			•	•	•	•	•	•	•	•	•	•
103	0.010 µF											•	•			•	•	•		•	•	•			
123	0.012 µF															•	•	•		•	•	•			
153	0.015 µF															•	•			•	•				
183	0.018 µF															•	•			•					
223	0.022 µF															•	•			•					
273	0.027 µF																			•					
333	0.033 µF																								
393	0.039 µF																								
473	0.047 µF																								
563	0.056 µF																								

(1) See soldering recommendations or visit www.vishay.com/doc?45034

(2) 1812 — 1000 V/3000 V, please contact for availability: mlcc@vishay.com



AUTOMOTIVE SYSTEMS

X8R Dielectric

Style		VJ0603		VJ0805		VJ1206		VJ1210 ⁽¹⁾	
EIA Type		0603		0805		1206		1210	
Voltage (Vdc)		25	50	25	50	25	50	25	50
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	1000 pF	•	•	•	•	•			
122	1200 pF	•	•	•	•	•			
152	1500 pF	•	•	•	•	•			
182	1800 pF	•	•	•	•	•			
222	2200 pF	•	•	•	•	•	•		
272	2700 pF	•	•	•	•	•	•		
332	3300 pF	•	•	•	•	•	•		
392	3900 pF	•	•	•	•	•	•		
472	4700 pF	•	•	•	•	•	•		
562	5600 pF	•	•	•	•	•	•		
682	6800 pF	•	•	•	•	•	•		
822	8200 pF	•	•	•	•	•	•		
103	0.010 µF	•	•	•	•	•	•	•	•
123	0.012 µF	•	•	•	•	•	•	•	•
153	0.015 µF	•	•	•	•	•	•	•	•
183	0.018 µF	•	•	•	•	•	•	•	•
223	0.022 µF	•		•	•	•	•	•	•
273	0.027 µF	•		•	•	•	•	•	•
333	0.033 µF	•		•	•	•	•	•	•
393	0.039 µF			•	•	•	•	•	•
473	0.047 µF			•	•	•	•	•	•
563	0.056 µF			•	•	•	•	•	•
683	0.068 µF			•		•	•	•	•
823	0.082 µF			•		•	•	•	•
104	0.10 µF			•		•	•	•	•
124	0.12 µF					•	•	•	•
154	0.15 µF					•		•	•
184	0.18 µF					•		•	•
224	0.22 µF					•		•	•
274	0.27 µF							•	•
334	0.33 µF							•	•
394	0.39 µF							•	
474	0.47 µF								
564	0.56 µF								
684	0.68 µF								
824	0.82 µF								
105	1.0 µF								
125	1.2 µF								
155	1.5 µF								
185	1.8 µF								
225	2.2 µF								

(1) See soldering recommendations or visit www.vishay.com/doc?45034



PART NUMBERING

VJ...31 / VJ...34

100% Matte Tin Termination

VJ0805 ⁽²⁾	Y	102	K	X	A	A	C	31
Case Code	Dielectric	Capacitance Nominal Code	Capacitance Tolerance	Termination	DC Voltage Rating ⁽¹⁾	Marking	Packaging	Process Code
0402 0603 0805 1206 1210 1812	A = NP0 (C0G) Y = X7R G = X5R ⁽⁵⁾ H = X8R		B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 pF G = ± 2 pF J = ± 5 pF K = ± 10 pF M = ± 20 pF Note: NP0 (C0G): B, C, D < 10 pF F, G, J ≥ 10 pF X7R: J, K, M	X = Ni barrier 100 % tin plate matte finish B = Polymer 100 % tin plate matte finish ⁽³⁾	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V ⁽⁴⁾ T = 400 V ⁽⁴⁾ E = 500 V L = 630 V G = 1000 V H = 3000 V	A = Unmarked B = Marked Note: Marking is only available for 0805 and 1206 vendor ID and date code		31 = Automotive 100 % in plate matte finish
Expressed in picofarads (pF). The first two digits are significant; the third is a multiplier. An "R" indicates a decimal point. Examples: 4R7 = 4.7 pF 102 = 1000 pF						E/T = 7" reel/plastic tape ⁽⁶⁾ C = 7" reel/plastic tape M/R = 11-1/4"/13" reel/plastic tape ⁽⁶⁾ P = 11-1/4"/13" reel/plastic tape		

AgPd (Silver-Palladium Termination)

VJ0805 ⁽²⁾	Y	102	K	X	A	A	C	31
Case Code	Dielectric	Capacitance Nominal Code	Capacitance Tolerance	Termination	DC Voltage Rating (1)	Marking	Packaging	Process Code
0402 0603 0805 1206 1210 1812	A = NP0 (C0G) Y = X7R G = X5R ⁽⁵⁾ H = X8R		B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 pF G = ± 2 pF J = ± 5 pF K = ± 10 pF M = ± 20 pF Note: NP0 (C0G): B, C, D < 10 pF F, G, J ≥ 10 pF X7R: J, K, M	F = AgPd	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V ⁽⁴⁾ T = 400 V ⁽⁴⁾ E = 500 V L = 630 V G = 1000 V H = 3000 V	A = Unmarked Note: Marking is not available		34 = Automotive AgPd finish
Expressed in picofarads (pF). The first two digits are significant; the third is a multiplier. An "R" indicates a decimal point. Examples: 102 = 1000 pF						E/T = 7" reel/plastic tape ⁽⁶⁾ O = 7" reel/plastic tape M/R = 11-1/4"/13" reel/plastic tape ⁽⁶⁾ I = 11-1/4"/13" reel/flamed plastic tape Note: "I" and "O" is used for "F" termination size 0402/0603/0805		

Notes:

⁽¹⁾ DC voltage rating should not be exceeded in application.

⁽²⁾ Case size designator may be replaced by a four-digit drawing number.

⁽³⁾ Polymer termination under qualification. Expected 2008.

⁽⁴⁾ Per customer request. Contact: mlcc@vishay.com for availability.

⁽⁵⁾ For selected values for X5R, see dielectric selection chart.

⁽⁶⁾ Packaging "E/T" and "M/R" is used for 1812 size.

SPECIFICATIONS AND TESTING



VJ...31 / VJ...34

General Specifications	
C0G (NP0) Dielectric	X5R, X7R, X8R Dielectric
Note: Electrical characteristics at +25 °C unless otherwise specified Operating Temperature: -55 °C to +150 °C (above +125 °C changed characteristics) Capacitance Range: 1 pF to 22 nF Temperature Coefficient of Capacitance (TCC): ±30 ppm/°C from -55 °C to +125 °C Dissipation Factor (DF): 0.1 % maximum at 1.0 Vrms and 1 kHz for values > 1000 pF 0.1 % maximum at 1.0 Vrms and 1 MHz for values ≤ 1000 pF Voltage Range: 25 Vdc to 3000 Vdc 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: 0 % maximum per decade Dielectric Withstanding Voltage (DWV): This is the maximum voltage the capacitors are tested for a period of 1 s to 5 s and the charge/discharge current does not exceed 50 mA ≤ 200 Vdc: DWV at 250 % of rated voltage 500 Vdc: DWV at 200 % of rated voltage 630 Vdc/1000 Vdc: DWV at 150 % of rated voltage 3000 Vdc: DWV at 120 % of rated voltage	Note: Electrical characteristics at +25 °C unless otherwise specified Operating Temperature: -55 °C to +150 °C (X5R above +85 °C changed characteristics) (X7R above +125 °C changed characteristics) Capacitance Range: 120 pF to 1.0 μF Temperature Coefficient of Capacitance (TCC): X5R: ±15 % from -55 °C to +85 °C, with 0 Vdc applied X7R: ±15 % from -55 °C to +125 °C, with 0 Vdc applied X8R: ±15 % from -55 °C to +150 °C, with 0 Vdc applied Dissipation Factor (DF): 10 V ratings: 5 % maximum at 1.0 Vrms and 1 kHz 16 V, 25 V ratings: 3.5 % maximum at 1.0 Vrms and 1 kHz > 25 V ratings: 2.5 % maximum at 1.0 Vrms and 1 kHz Aging Rate: 1 % maximum per decade Voltage Range: 10 Vdc to 1000 Vdc 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 Dielectric Withstanding Voltage (DWV): This is the maximum voltage the capacitors are tested for a period of 1 s to 5 s and the charge/discharge current does not exceed 50 mA ≤ 200 Vdc: DWV at 250 % of rated voltage 500 Vdc: DWV at 200 % of rated voltage 630 Vdc/1000 Vdc: DWV at 150 % of rated voltage

General Certificates
- Quality Management System acc. to ISO/TS 16949 - Quality Management System acc. to ISO9000, Rev. 2000 - Environmental Certification acc. to ISO 14001

AEC-Q200 Testing		
No.	AEC-Q200	Reference
1	Pre- and post stress electrical test	User spec
3	High temperature exposure (storage)	MIL-STD-202, Method 108
4	Temperature cycling	JESD22, Method JA-104
5	Destructive physical analysis	EIA-469
6	Moisture resistance	MIL-STD-202, Method 106
7	Biased humidity	MIL-STD-202, Method 103
8	Operation life	MIL-STD-202, Method 108
9	External visual	MIL-STD-883, Method 2009
10	Physical dimension	JESD22, Method JB-100
13	Mechanical shock	MIL-STD-202, Method 213
14	Vibration	MIL-STD-202, Method 204
15	Resistance to solder heat	MIL-STD-202, Method 215
16	ESD	AEC-Q200-REV-C
17	Solderability	J-STD-002
20	Electrical characterization	User spec
21	Board flex	AEC-Q200-005
22	Terminal strength	AEC-Q200-006
23	Beam load	AEC-Q200-003

DISCLAIMER All product specifications and data are subject to change without notice. Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product. Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications. Product names and markings noted herein may be trademarks of their respective owners.

SEMICONDUCTORS:

Rectifiers • High-Power Diodes and Thyristors • Small-Signal Diodes • Zener and Suppressor Diodes
• FETs • RF Transistors • Optoelectronics • ICs • Modules

PASSIVE COMPONENTS:

Resistive Products • Magnetics • Capacitors • Strain Gage Transducers and Stress Analysis Systems



One of the World's Largest Manufacturers of
Discrete Semiconductors and Passive Components

WORLDWIDE SALES CONTACTS**THE AMERICAS****UNITED STATES**

VISHAY AMERICAS
ONE GREENWICH PLACE
SHELTON, CT 06484
UNITED STATES
PH: +1-402-563-6866
FAX: +1-402-563-6296

ASIA**SINGAPORE**

VISHAY INTERTECHNOLOGY ASIA PTE LTD.
25 TAMPINES STREET 92
KEPPEL BUILDING #02-00
SINGAPORE 528877
PH: +65-6788-6668
FAX: +65-6788-0988

P.R. CHINA

VISHAY TRADING (SHANGHAI) CO., LTD.
15D, SUN TONG INFOPORT PLAZA
55 HUAI HAI WEST ROAD
SHANGHAI 200030
P.R. CHINA
PH: +86-21-5258 5000
FAX: +86-21-5258 7979

JAPAN

VISHAY JAPAN CO., LTD.
MG IKENOHATA BLDG. 4F
1-2-18, IKENOHATA
TAITO-KU
TOKYO 110-0008
JAPAN
PH: +81-3-5832-6210
FAX: +81-3-5832-6260

EUROPE**GERMANY**

VISHAY ELECTRONIC GMBH
GEHEIMRAT-ROSENTHAL-STR. 100
95100 SELB
GERMANY
PH: +49-9287-71-0
FAX: +49-9287-70435

FRANCE

VISHAY S.A.
199, BLVD DE LA MADELEINE
06003 NICE, CEDEX 1
FRANCE
PH: +33-4-9337-2920
FAX: +33-4-9337-2997

UNITED KINGDOM

VISHAY LTD.
PALLION INDUSTRIAL ESTATE
SUNDERLAND SR4 6SU
UNITED KINGDOM
PH: +44-191-514-4155
FAX: +44-191-567-8262