



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



MLCCs for Automotive Applications



VJ...31 / VJ...34

- Automotive applications
- Product range
- AEC-Q200 testing
- Part numbering

RESOURCES

- For more information, visit <http://www.vishay.com/ppg?45040>
- For technical questions, email mlcc@vishay.com

Capacitors - For Automotive Applications

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



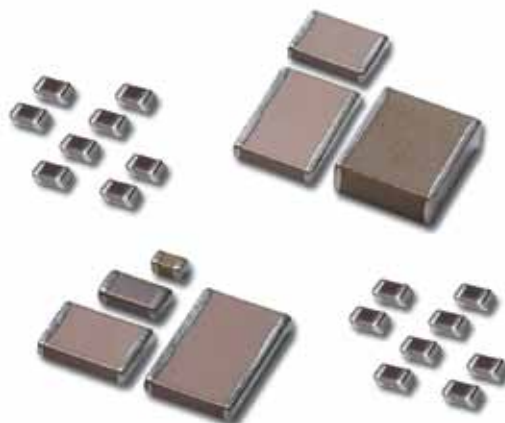


MULTILAYER CERAMIC CHIP CAPACITORS

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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-Q200 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 offered for intensive board flex requirements.



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)



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Capacitors - For Automotive Applications

SELECTION CHART										
DIELECTRIC		COG (NP0)								
STYLE		VJ0402		VJ0603			VJ0805			
CASE CODE		0402		0603			0805			
VOLTAGE (V _{DC})		25/50	100	50	100	200	50	100	200	500
VOLTAGE CODE		X/A	B	A	B	C	A	B	C	E
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	1.0 nF			++			++	++	+	
122	1.2 nF						++	+		
152	1.5 nF						++	+		
182	1.8 nF						+	+		
222	2.2 nF						+			
242	2.4 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									
153	15 nF									
183	18 nF									
223	22 nF									
273	27 nF									
333	33 nF									
393	39 nF									
473	47 nF									
563	56 nF									

Notes
 •• Paper tape, • Plastic tape, ++ Paper tape, + Plastic tape, see table "Product drawings (in use)"
 (1) See soldering recommendations within this data book, or visit www.vishay.com/doc/245034



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



Capacitors - For Automotive Applications

SELECTION CHART																
DIELECTRIC		COG (NP0)														
STYLE		VJ1206 ⁽¹⁾					VJ1210 ⁽¹⁾				VJ1812 ⁽¹⁾					
CASE CODE		1206 ⁽¹⁾					1210 ⁽¹⁾				1812 ⁽¹⁾					
VOLTAGE (V _{DC})		50	100	200	250	500/630	50	100	200	500/630	50	100	200	500/630	1000	3000
VOLTAGE CODE		A	B	C	P	E/L	A	B	C	E/L	A	B	C	E/L	G	H
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	1.0 nF	+	+	+		+	+	+	+		•	•	•	•	•	•
122	1.2 nF	+	+	+		+	+	+	+		•	•	•	•	•	•
152	1.5 nF	+	+	+		+	+	+	+		•	•	•	•	•	•
182	1.8 nF	+	+	+		+	+	+	+		•	•	•	•	•	•
222	2.2 nF	+	+	+	+	+	+	+	+		•	•	•	•	•	•
242	2.4 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						+	+			•	•	•			
153	15 nF						+	+			•	•				
183	18 nF						+	+			•					
223	22 nF							+			•					
273	27 nF															
333	33 nF															
393	39 nF															
473	47 nF															
563	56 nF															

Notes
 •• Paper tape, • Plastic tape, ++ Paper tape, + Plastic tape, see table "Product drawings (in use)"
⁽¹⁾ See soldering recommendations within this data book, or visit www.vishay.com/doc?45034



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



Capacitors - For Automotive Applications

SELECTION CHART																		
DIELECTRIC		X7R/X5R ⁽²⁾																
STYLE		VJ0402				VJ0603					VJ0805 ⁽²⁾							
CASE CODE		0402				0603					0805							
VOLTAGE (V _{DC})		16	25	50	100	16	25	50	100	200	10	16	25	50	100	200	250	500
VOLTAGE CODE		J	X	A	B	J	X	A	B	C	Q	J	X	A	B	C	P	E
CAP. CODE	CAP.																	
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	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
153	15 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
183	18 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
223	22 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
273	27 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
333	33 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
393	39 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
473	47 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
563	56 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
683	68 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
823	82 nF	••	••	••	••	••	••	••	••	••		••	••	••	••	••		
104	100 nF					••	••	••	••	••		••	••	••	••	••		
124	120 nF					••	••	••	••	••		••	••	••	••	••		
154	150 nF					••	••	••	••	••		••	••	••	••	••		
184	180 nF					••	••	••	••	••		••	••	••	••	••		
224	220 nF					••	••	••	••	••		••	••	••	••	••		
274	270 nF					••	••	••	••	••		••	••	••	••	••		
334	330 nF					••	••	••	••	••		••	••	••	••	••		
394	390 nF					••	••	••	••	••		••	••	••	••	••		
474	470 nF					••	••	••	••	••		••	••	••	••	••		
564	560 nF					••	••	••	••	••		••	••	••	••	••		
684	680 nF					••	••	••	••	••		••	••	••	••	••		
824	820 nF					••	••	••	••	••		••	••	••	••	••		
105	1.0 μF																	
125	1.2 μF																	
155	1.5 μF																	
185	1.8 μF																	
225	2.2 μF																	
275	2.7 μF																	
335	3.3 μF																	
395	3.9 μF																	
475	4.7 μF																	
565	5.6 μF																	
685	6.8 μF																	

Notes

•• Paper tape, • Plastic tape, ++ Paper tape, + Plastic tape, see table "Product drawings (in use)"

(1) See soldering recommendations within this data book, or visit www.vishay.com/doc?245034

(2) X5R (- 55 °C to + 85 °C TCC: ± 15 %) for all 0805/10 V ratings



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Automotive Applications



Capacitors - For Automotive Applications

SELECTION CHART																		
DIELECTRIC		X7R																
STYLE		VJ1206					VJ1210 ⁽¹⁾						VJ1812 ⁽¹⁾					
CASE CODE		1206 ⁽¹⁾					1210 ⁽¹⁾						1812 ⁽¹⁾					
VOLTAGE (V _{DC})		16	25	50	100	200	500/630	16	25	50	100	200	500/630	50	100	200	500	630
VOLTAGE CODE		J	X	A	B	C	E/L	J	X	A	B	C	E/L	A	B	C	E	L
CAP. CODE	CAP.																	
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	•	•	•	•	•	•	•	•	•	•	•	•				•	•
153	15 nF	•	•	•	•	•	•	•	•	•	•	•	•				•	•
183	18 nF	•	•	•	•	•	•	•	•	•	•	•	•				•	•
223	22 nF	•	•	•	•	•	•	•	•	•	•	•	•	+	•	•	•	•
273	27 nF	•	•	•	•	•	•	•	•	•	•	•	•	+	•	•	•	•
333	33 nF	•	•	•	•	•	•	•	•	•	•	•	•	+	•	•	•	•
393	39 nF	•	•	•	•	•	•	•	•	•	•	•	•	+	•	•	•	•
473	47 nF	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
563	56 nF	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
683	68 nF	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
823	82 nF	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
104	100 nF	•	•	•	+	+		•	•	•	+	+		•	•	•	•	
124	120 nF	•	•	•	+	+		•	•	•	+	+		•	•	•	•	
154	150 nF	•	•	+	+			•	•	•	+	+		•	•	•	•	
184	180 nF	•	•	+	+			•	•	•	+	+		•	•	•	•	
224	220 nF	+	+	+	+			+	+	+	+			•	•	•	•	
274	270 nF	+	+	+	+			+	+	+	+			•	•	•	•	
334	330 nF	+	+	+				+	+	+	+			•	•			
394	390 nF	+	+	+				+	+	+	+			•	•			
474	470 nF	+	+	+				+	+	+	+			•	•			
564	560 nF	+	+					+	+	+	+			•	•			
684	680 nF	+	+					+	+	+	+			•	•			
824	820 nF	+	+					+	+	+	+			•	•			
105	1.0 μF	+	+					+	+	+	+			•				
125	1.2 μF																	
155	1.5 μF																	
185	1.8 μF																	
225	2.2 μF																	
275	2.7 μF																	
335	3.3 μF																	
395	3.9 μF																	
475	4.7 μF																	
565	5.6 μF																	
685	6.8 μF																	

Notes
 •• Paper tape, • Plastic tape, ++ Paper tape, + Plastic tape, see table "Product drawings (in use)"
 (1) See soldering recommendations within this data book, or visit www.vishay.com/doc?45034



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



Capacitors - For Automotive Applications

SELECTION CHART									
DIELECTRIC		X8R							
STYLE		VJ0603		VJ0805		VJ1206		VJ1210 ⁽¹⁾	
CASE CODE		0603		0805		1206		1210 ⁽¹⁾	
VOLTAGE (V _{DC}) ⁽²⁾		25	50	25	50	25	50	25	50
VOLTAGE CODE		X	A	X	A	X	A	X	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	••	••	••	••	•	•	•	•
153	15 nF	••	••	••	••	•	•	•	•
183	18 nF	••	••	••	••	•	•	•	•
223	22 nF	••		••	••	•	•	•	•
273	27 nF	••		••	•	•	•	•	•
333	33 nF	••		••	•	•	•	•	•
393	39 nF			••	•	•	•	•	•
473	47 nF			•	•	•	•	•	•
563	56 nF			•	•	•	•	•	•
683	68 nF			•	•	•	•	•	•
823	82 nF			•	•	•	•	•	•
104	100 nF			•		•	•	•	•
124	120 nF					•	•	•	•
154	150 nF					•		•	•
184	180 nF					•		•	•
224	220 nF					•		•	•
274	270 nF							•	•
334	330 nF							•	•
394	390 nF							•	
474	470 nF								
564	560 nF								
684	680 nF								
824	820 nF								
105	1.0 μF								
125	1.2 μF								

Notes

•• Paper tape, • Plastic tape

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

⁽²⁾ For other voltage ratings, please contact mlcc@vishay.com



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications

Ordering Information - 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 = C0G (NP0) Y = X7R G = X5R ⁽⁵⁾ H = X8R		B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % Note: C0G (NP0): B, C, D < 10 pF F, G, J, K ≥ 10 pF X5R / X7R / X8R: 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 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 % tin 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/paper tape M/R = 11 1/4"/13" reel/plastic tape ⁽⁶⁾ P = 11 1/4"/13" reel/paper tape		

Ordering Information - Silver Palladium Termination

VJ0805 ⁽²⁾	Y	102	K	F	A	A	O	34
Case Code	Dielectric	Capacitance Nominal Code	Capacitance Tolerance	Termination	DC Voltage Rating ⁽¹⁾	Marking	Packaging	Process Code
0402 0603 0805 1206 1210 1812	A = C0G (NP0) Y = X7R G = X5R ⁽⁵⁾ H = X8R		B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % Note: C0G (NP0): B, C, D < 10 pF F, G, J, K ≥ 10 pF X5R / X7R / X8R: J, K, M	F, E = AgPd ⁽⁷⁾	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V 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/flamed paper tape M/R = 11 1/4"/13" reel/plastic tape ⁽⁶⁾ I = 11 1/4"/13" reel/flamed paper tape Note: "I" and "O" are used for "F", "E" termination size 0402/0603/0805		

Notes:

- DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance.
- Case size designator may be replaced by a four digit drawing number
- Polymer termination contact mlcc@vishay.com for availability of ratings
- Per customer request. Contact: mlcc@vishay.com for availability
- Selected values for X5R, see dielectric selection chart
- Packaging "T" and "R" is used for 1812 size
- Termination code "E" is for conductive epoxy assembly.



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



Capacitors - For Automotive Applications

COG (NPO) DIELECTRIC

GENERAL SPECIFICATION

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

Voltage Range: 25 V_{DC} to 3000 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 values ≤ 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: 0 % maximum per decade

Dielectric Strength Test:

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

Applied test voltages

≤ 250 V _{DC} -rated:	250 % of rated voltage
500 V _{DC} -rated:	200 % of rated voltage
630 V _{DC} , 1000 V _{DC} -rated:	150 % of rated voltage
3000 V _{DC} -rated:	120 % of rated voltage

X5R, X7R, X8R DIELECTRIC

GENERAL SPECIFICATION

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

Voltage Range: 10 V_{DC} to 1000 V_{DC}

Temperature Coefficient of Capacitance (TCC):

X5R: ± 15 % from - 55 °C to + 85 °C, with 0 V_{DC} applied ⁽⁵⁾
X7R: ± 15 % from - 55 °C to + 125 °C, with 0 V_{DC} applied
X8R: ± 15 % from - 55 °C to + 150 °C, with 0 V_{DC} applied

Dissipation Factor (DF):

10 V ratings: 5 % maximum at 1.0 V_{RMS} and 1 kHz
16 V, 25 V ratings: 3.5 % maximum at 1.0 V_{RMS} and 1 kHz
> 25 V ratings: 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:

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

Applied test voltages

≤ 250 V _{DC} -rated:	250 % of rated voltage
500 V _{DC} -rated:	min. 150 % of rated voltage
630 V _{DC} , 1000 V _{DC} -rated:	150 % of rated voltage

General Certificates

- Quality Management System acc. to ISO/TS 16949 : 2009
- Quality Management System acc. to ISO 9001 : 2008
- Health and safety system acc. to OHSAS 18001
- Environmental Certification acc. to ISO 14001 : 2004

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



MULTILAYER CERAMIC CHIP CAPACITORS

Automotive Applications



Capacitors - For Automotive Applications

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.
37A TAMPINES STREET 92 #07-00
SINGAPORE 528886
PH: +65-6788-6668
FAX: +65-6788-0988

P.R. CHINA

VISHAY CHINA 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.
SHIBUYA PRESTIGE BLDG. 4F
3-12-22, SHIBUYA
SHIBUYA-KU
TOKYO 150-0002
JAPAN
PH: +81-3-5466-7150
FAX: +81-3-5466-7160

EUROPE

GERMANY

VISHAY ELECTRONIC GMBH
DR.-FELIX-ZANDMAN-PLATZ 1
95100 SELB
GERMANY
PH: +49-9287-71-0
FAX: +49-9287-70435

FRANCE

VISHAY S.A.
199, BD DE LA MADELEINE
06003 NICE, CEDEX 1
FRANCE
PH: +33-4-9337-2727
FAX: +33-4-9337-2726

UNITED KINGDOM

VISHAY LTD.
SUITE 6C, TOWER HOUSE
ST. CATHERINE'S COURT
SUNDERLAND ENTERPRISE PARK
SUNDERLAND SR5 3XJ
UNITED KINGDOM
PH: +44-191-516-8584
FAX: +44-191-549-9556