Glass Encapsulated SMD Varistor MLV (VJ12, 20, 13, 14, 15, 32)

Transient Voltage Suppression, ESD Protection Devices & EMI Devices

GENERAL DESCRIPTION

AVX's Professional Multilayer Varistors include 3 series of glass coated products as listed below:

- Standard M0 Series
- Telecom MT Series
- Automotive MA/PA Series

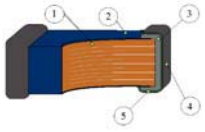
The glass encapsulation process ensures high insulation resistance values after reflow soldering and excellent SMT compatibility. This protection ensures reliability and acid-resistance against harsh environment like chlorite flux.

TYPICAL APPLICATIONS

Mainly used to reduce transient over-voltages in a very wide range of electronic products. Some example applications are:
1) Telecom, 2) Automotive, 3) Consumer Electronics, and 4) Industrial Applications.

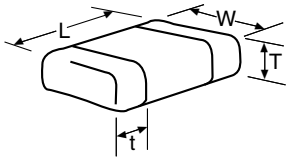
PHYSICAL CHARACTERISTICS

Construction Weight: <0.2g



1 Zinc varistor
2 Glass lead-free encapsulation
3 Silver termination
4 Nickel barrier
5 Tin 100%

PHYSICAL DIMENSIONS: mm (inches)



Type	IEC Size	L	W	T	Land Length t
VJ12	0805	2.01±0.20 (0.079±0.008)	1.25±0.15 (0.049±0.006)	1.3 max. (0.051 max.)	0.15...0.55 (0.006...0.022)
VJ20	1206	3.20±0.20 (0.126±0.008)	1.60±0.20 (0.063±0.008)	1.7 max. (0.067 max.)	0.25...0.75 (0.010...0.030)
VJ13	1210	3.20±0.30 (0.126±0.012)	2.50±0.25 (0.098±0.010)	1.7 max. (0.067 max.)	0.25...0.75 (0.010...0.030)
VJ14	1812	4.50±0.30 (0.177±0.012)	3.20±0.30 (0.126±0.012)	2.0 max. (0.079 max.)	0.25...1.00 (0.010...0.039)
VJ15	2220	5.70±0.40 (0.224±0.016)	5.00±0.40 (0.197±0.016)	2.5max. (0.098 max.)	0.25...1.00 (0.010...0.039)
VJ32	3220	8.20±0.40 (0.323±0.016)	8.20±0.40 (0.323±0.016)	2.5 max. (0.098 max.)	0.25...1.00 (0.010...0.039)

PART NUMBERING

VJ
Varistor Termination
VJ = Plated Ni/Sn100%
VU = Plated Ni/SnPb
VC = Hybrid AgPdPt

14
Chip Size
12 = 0805
20 = 1206
13 = 1210
14 = 1812
15 = 2220
32 = 3220

MT
Series Code
M0 = Industrial
MT = Telecom
MA/PA = Automotive

0950
Operating Voltage
AC or DC

K
1mA Voltage Tolerance
K = ±10%

BA
Packaging
BA = Tape & Reel
VJ12 = 4000 pcs/reel
VJ20 = 3000 pcs/reel
VJ13 = 2000 pcs/reel
VJ14 = 1250 pcs/reel
VJ15 = 1250 pcs/reel
VJ32 = 1000 pcs/reel

RoHS COMPLIANT

Glass Encapsulated SMD Varistor MLV (VJ12, 20, 13, 14, 15, 32)

Automotive MLV Range – MA and PA Series

AUTOMOTIVE SERIES – VJ12, 20, 13, 14, 15, 32 MA and PA SERIES

FEATURES

- Available in case size 0805, 1206, 1210, 1812, 2220, (3220 under development)
- Nickel and Tin (100%) plated Termination
- Max Energy absorption: 1.5 to 25J (50J under development)
- Well suited to protect against automotive related transients
- Load Dump capabilities: according to ISO standard DP7637-2 12V and 24V pulse 5
- Jump start capability (12V): 24.5 V - 5mn
- Complying to main requirements of AECQ 200
- RoHS Compliant and IMDS Registration

GENERAL CHARACTERISTICS

Storage Temperature: -55ºC to +150ºC
Operating Temperature: -55ºC to +125ºC*
* 150°C upon request

APPLICATIONS

- Protection of various semiconductor elements from overvoltage.
- Absorption of switching surge and electrostatic surge for relays and motors.
- Protection of electronic equipment for automobiles from induced lightning surge.

PART NUMBERS

Part Number	Case Size EIA	Working Voltage	Breakdown Voltage	Peak current	Maximum leakage current at Vdc	Energy 10*1000µs	Energy Load-Dump (x10)	Jump Start	T max
		Vdc	V(1mA)	Amp. 8*20µs	µA	Joules	Joules	Vmax (5mn min.)	Thickness mm (inches)
*VJ12PA0160---	0805	16	24.5	120	20	0.3	1	24.5	1.3
VJ20MA0160---	1206	16	24.5	200	20	0.6	1.5	24.5	1.7
VJ20PA0160---	1206	16	24.5	300	20	1.1	2	24.5	1.7
VJ13MA0160---	1210	16	24.5	400	20	1.6	3	24.5	1.7
VJ13PA0160---	1210	16	24.5	500	20	2	5	24.5	1.7
VJ14MA0160---	1812	16	24.5	800	20	2.4	6	25.5	2
VJ14PA0160---	1812	16	24.5	1000	20	2.9	10	25.5	2
VJ15MA0160---	2220	16	24.5	1200	20	5.8	12	25.5	2
VJ15PA0160---	2220	16	24.5	1500	20	7.2	25	25.5	2
VJ32PA0160---	3220	16	24.5	2000	20	13.8	50	24.5	2.5
VJ15MA0340---	2220	34	47	1200	20	10	12	47	2.5
VJ15PA0340---	2220	34	47	2000	20	13	25	47	2.5
*VJ32PA0340	3220	34	47	2000	20	19	50	47	2.5

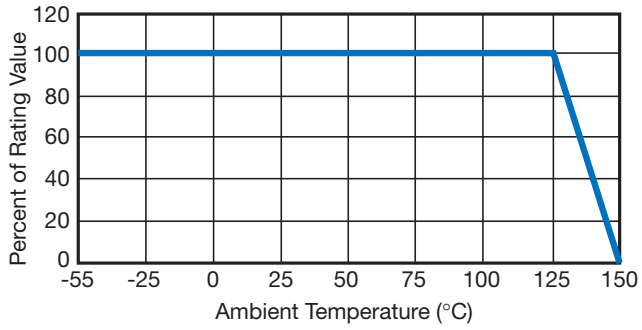
* under development

Hybrid termination AgPdPt upon request

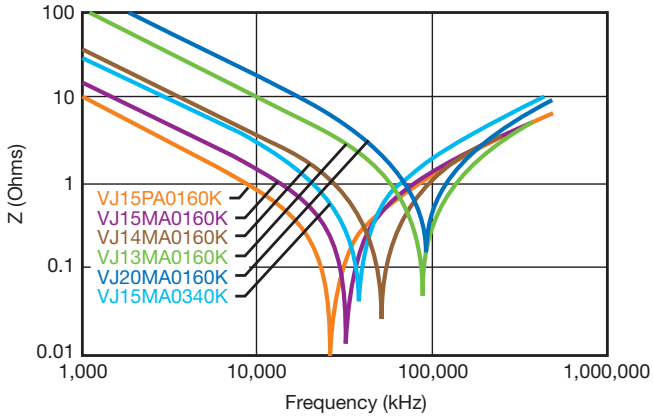
RoHS COMPLIANT

TEMPERATURE CHARACTERISTICS

For Current, Energy and Power



IMPEDANCE CHARACTERISTICS

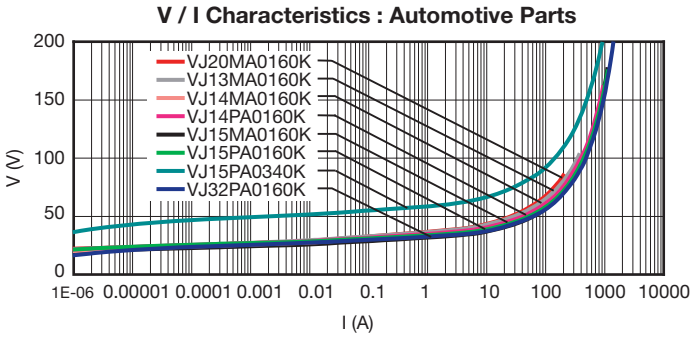


Glass Encapsulated SMD Varistor MLV (VJ12, 20, 13, 14, 15, 32)

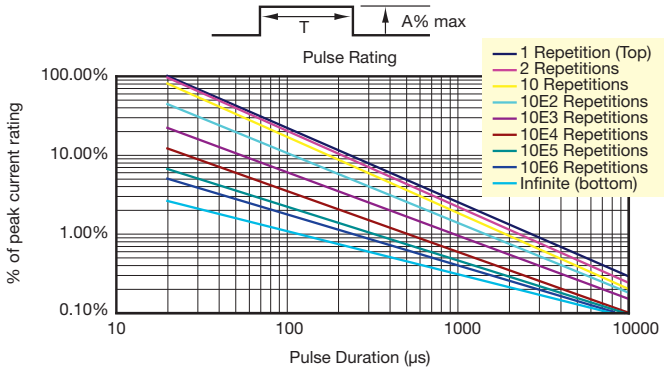
Automotive MLV Range – MA and PA Series

AUTOMOTIVE SERIES – VJ12, 20, 13, 14, 15, 32 MA and PA SERIES

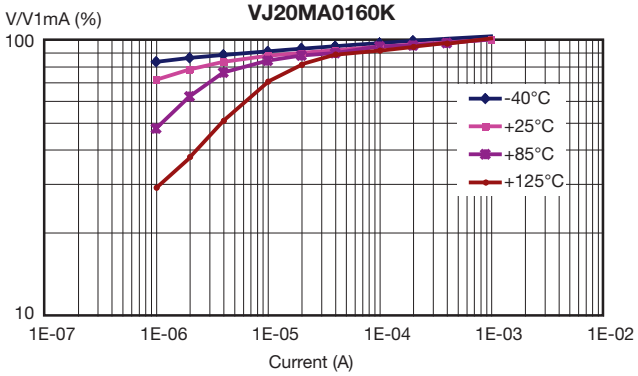
V / I CHARACTERISTICS

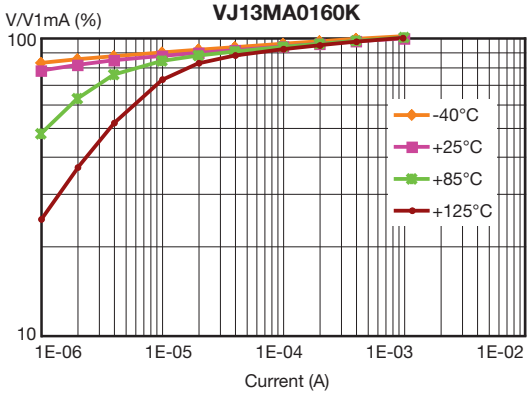


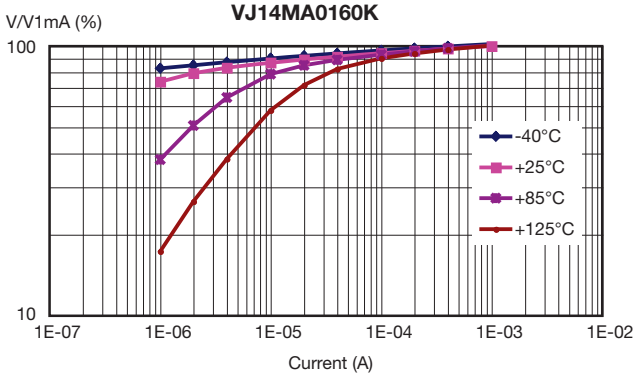
PULSE RATING

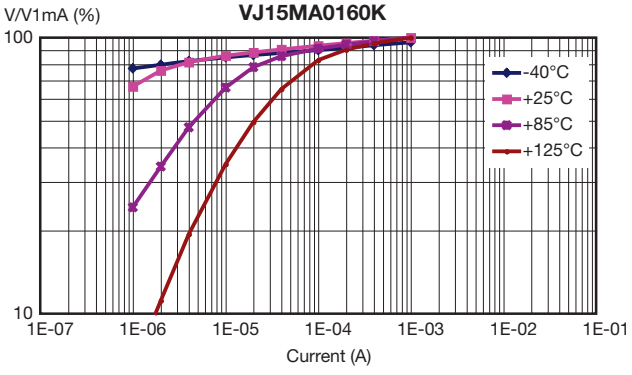


TEMPERATURE DEPENDENCE OF V/I CHARACTERISTICS







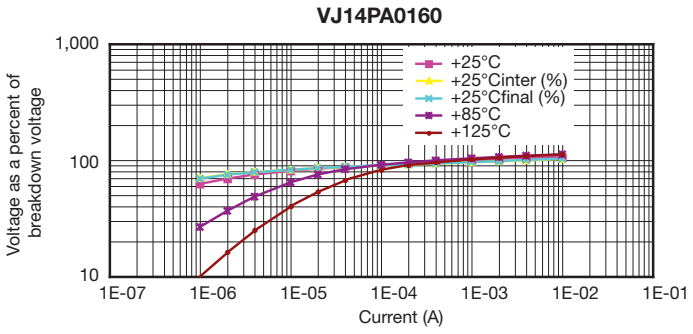


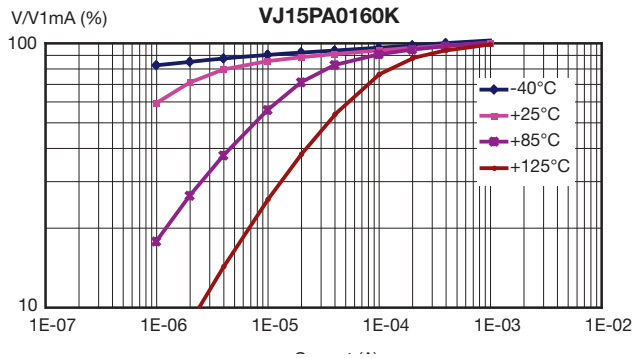
RoHS COMPLIANT

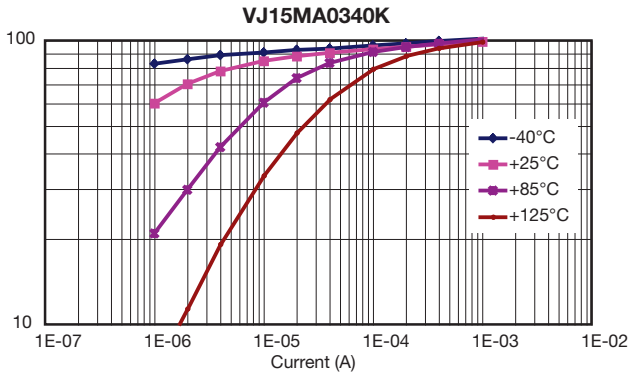
Glass Encapsulated SMD Varistor MLV (VJ12, 20, 13, 14, 15, 32)

Automotive MLV Range – MA and PA Series

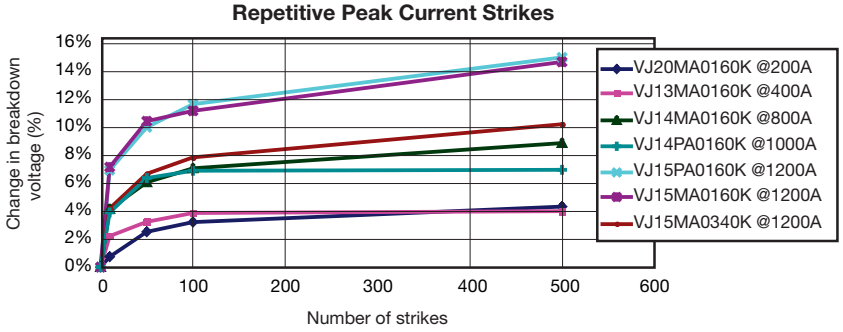
AUTOMOTIVE SERIES – VJ12, 20, 13, 14, 15, 32 MA and PA SERIES







PULSE DEGRADATION

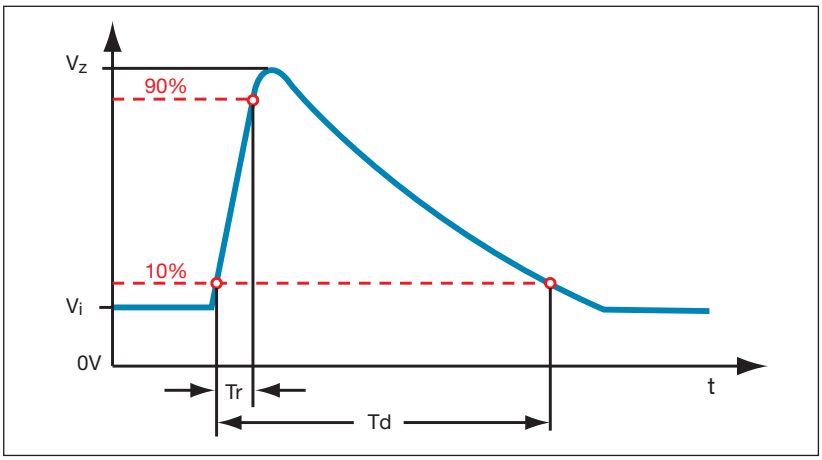


RoHS COMPLIANT

AUTOMOTIVE SERIES – VJ12, 20, 13, 14, 15, 32 MA and PA SERIES

AUTOMOTIVE LOAD DUMP TEST

(According to ISO DP7637/2 Pulse 5)



When using the test method indicated below, the amount of Energy dissipated by the varistor must not exceed the Load Dump Energy value specified in the product table.

Voltage Pulse applied to the varistor:

12V Network

Vi = 13.5V

Td = 100 to 350ms

Ri = 2 Ohms (Internal Resistance)

Vz - 70 to 200V

Number of Pulses = 10 Pulses

Other Load Dump Simulations can be achieved

24V Network

Vi = 27V

Td = 100 to 350ms

Ri = 2 Ohms (Internal Resistance)

Vz - 70 to 200V

Number of Pulses = 10 Pulses

Pulse 5: Typical Vz max versus Pulse duration and Rs

VJ20MA0160K	0.5 Ohm	1 Ohm	2 Ohms
50ms	33	34	39
100ms	31	31	34
200ms	27	28	33
400ms	28	30	34
VJ13PA0160K	0.5 Ohm	1 Ohm	2 Ohms
50ms	44	48	57
100ms	36	39	46
200ms	33	33	39
400ms	29	28	34
VJ14PA0160K	0.5 Ohm	1 Ohm	2 Ohms
50ms	60	68	85
100ms	46	52	62
200ms	37	41	50
400ms	32	35	43
VJ15PA0160K	0.5 Ohm	1 Ohm	2 Ohms
50ms	98	116	150
100ms	66	80	104
200ms	50	60	78
400ms	41	47	58
VJ32PA0160K	0.5 Ohm	1 Ohm	2 Ohms
50ms	146	186	200
100ms	105	131	179
200ms	72	88	113
400ms	54	67	96

RoHS COMPLIANT

Glass Encapsulated SMD Varistor MLV (VJ12, 20, 13, 14, 15)

Industrial MLV Range – M0 Series

INDUSTRIAL MLV RANGE – VJ12, 20, 13, 14, 15 M0 SERIES

FEATURES

- Glass encapsulation device with very low leakage current under DC operating conditions
- Device available in case size 1206, 1210, 1812, 2220 (3220)
- Nickel and Tin (100%) plated Termination (Hybrid AgPdPt termination available upon request)
- Bi-Directional protection. Fast Turn-On Time.
- Excellent transient clamping characteristics up to 1200amps peak current
- Multi strike capability. Provide EMC Capacitance
- RoHS Compliant

GENERAL CHARACTERISTICS

Storage Temperature: -55ºC to +150ºC
Operating Temperature: -55ºC to +125ºC

TYPICAL APPLICATIONS

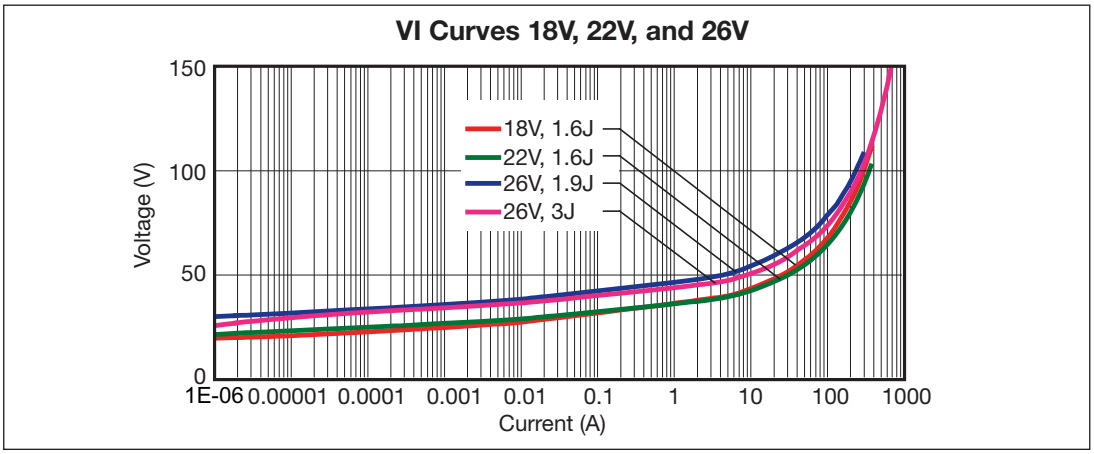
Many uses to reduce transient over-voltage in the very wide range of electronic products in the Professional, Industrial and Consumer Applications.

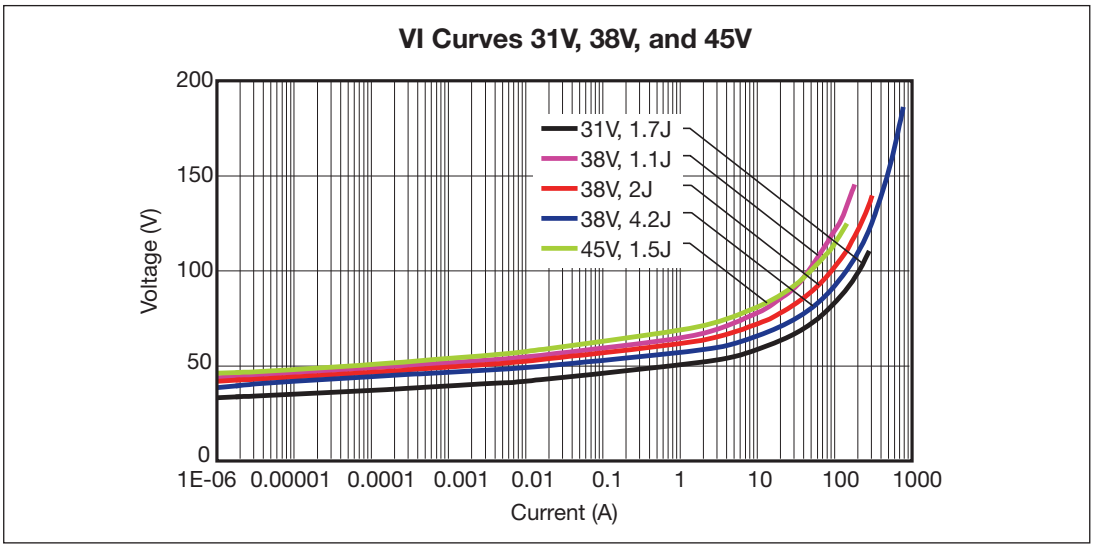
Type	Case Size	Vrms	VDC	Breakdown Voltage	Max. Clamping Voltage		Maximum Leakage Current	Energy 10*1000µs	Max. Peak Current 8*20µs	Cap. Typical (1KHz/0.5V)
		(V)	(V)	(V)	Vp (V)	Ip (A)	µA	(J)	(A)	(pF)
VJ20M00140K---	1206	14	18	22±10%	38	1	20	0.5	200	900
VJ13M00140K---	1210	14	18	22±10%	38	2.5	20	1.6	400	1800
VJ14M00140K---	1812	14	18	22±10%	38	5	20	2.3	800	4200
VJ15M00140K---	2220	14	18	22±10%	38	10	20	5.8	1200	9600
VJ20M00170K---	1206	17	22	27±10%	44	1	20	0.6	200	800
VJ13M00170K---	1210	17	22	27±10%	44	2.5	20	1.7	500	2500
VJ14M00170K---	1812	17	22	27±10%	44	5	20	2.7	800	3700
VJ15M00170K---	2220	17	22	27±10%	44	10	20	7.2	1200	8600
VJ20M00200K---	1206	20	26	33±10%	54	1	20	0.7	200	550
VJ13M00200K---	1210	20	26	33±10%	54	2.5	20	1.9	500	1200
VJ14M00200K---	1812	20	26	33±10%	54	5	20	3	800	2800
VJ15M00200K---	2220	20	26	33±10%	54	10	20	7.8	1200	6400
VJ20M00250K---	1206	25	31	39±10%	65	1	20	1	200	500
VJ13M00250K---	1210	25	31	39±10%	65	2.5	20	1.7	500	1100
VJ14M00250K---	1812	25	31	39±10%	65	5	20	3.7	800	2600
VJ15M00250K---	2220	25	31	39±10%	65	10	20	9.6	1200	5800
VJ20M00300K---	1206	30	38	47±10%	77	1	20	1.1	200	400
VJ13M00300K---	1210	30	38	47±10%	77	2.5	20	2	400	1200
VJ14M00300K---	1812	30	38	47±10%	77	5	20	4.2	800	1800
VJ15M00300K---	2220	30	38	47±10%	77	10	20	12	1200	4200
VJ20M00350K---	1206	35	45	56±10%	90	1	20	0.6	200	260
VJ13M00350K---	1210	35	45	56±10%	90	2.5	20	1.5	300	1200
VJ14M00350K---	1812	35	45	56±10%	90	5	20	4	500	2500
VJ15M00350K---	2220	35	45	56±10%	90	10	20	10	1000	4000
VJ20M00400K---	1206	40	56	68±10%	110	1	20	0.7	100	190
VJ13M00400K---	1210	40	56	68±10%	110	2.5	20	2.3	250	380
VJ14M00400K---	1812	40	56	68±10%	110	5	20	4.8	500	800
VJ15M00400K---	2220	40	56	68±10%	110	10	20	9	1000	2000
VJ20M00500K---	1206	50	65	82±10%	135	1	20	0.8	100	130
VJ13M00500K---	1210	50	65	82±10%	135	2.5	20	1.6	250	700
VJ14M00500K---	1812	50	65	82±10%	135	5	20	4.5	400	600
VJ15M00500K---	2220	50	65	82±10%	135	10	20	7	800	1400
VJ20M00600K---	1206	60	85	100±10%	165	1	20	0.9	100	100
VJ13M00600K---	1210	60	85	100±10%	165	2.5	20	1.5	250	600
VJ14M00600K---	1812	60	85	100±10%	165	5	20	4.5	400	500
VJ15M00600K---	2220	60	85	100±10%	165	10	20	6.8	800	1100

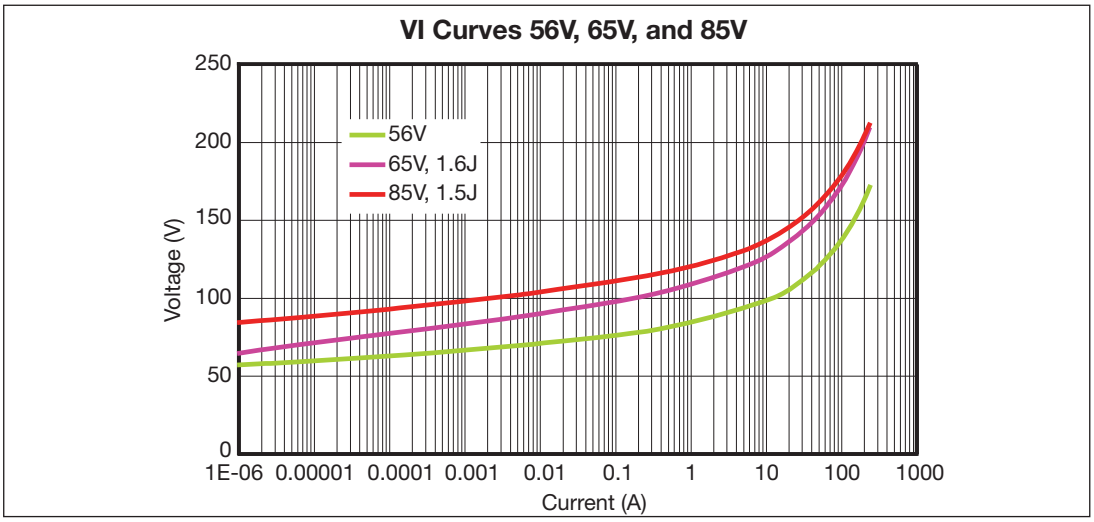
RoHS COMPLIANT

INDUSTRIAL MLV RANGE – VJ12, 20, 13, 14, 15 M0 SERIES

V/I CHARACTERISTIC







RoHS COMPLIANT

Glass Encapsulated SMD Varistor MLV (VJ14)

Telecom MLV Range – MT Series

TELECOM MLV RANGE - VJ14 MT SERIES

FEATURES

- Effective alternative to leaded MOVs between 60 and 90 Vrsm
- High Energy Ratings up to 6 Joules with 1812 case size
- Nickel barrier or hybrid AgPdPt terminations
- Multiple Strike Capability
- Provide EMC Capacitance
- Specified in accordance to CCITT 10/1000µs Pulse test
- RoHS Compliant and IMDS Registration

TARGET APPLICATIONS

- Phone Lines, ADSL Lines, and other Telecom Circuits
- Consumer Products

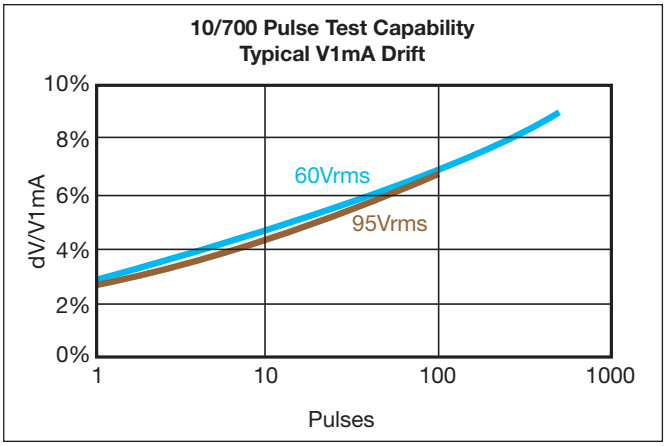
GENERAL CHARACTERISTICS

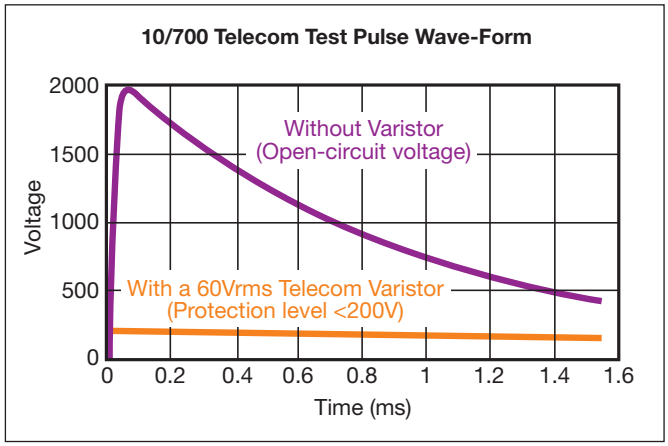
Storage Temperature: -55ºC to +125ºC
Operating Temperature: -55ºC to +125ºC

CCITT 10x700µs TEST

A pulse of 10 x 700µs duration as specified by CCITT or IEC 61000-4-5 is often used to check the interference immunity of Telecom equipment.

The curves show that the 60Vrms Varistor can reduce the interference of the equipment from 2KV to less than 200V.





Ten pulses with a duration of 10x700µs applied at one minute intervals are specified for telecom equipment.

The curves show the V1mA drift when more than 10 pulses are applied.

PART NUMBERS

Part Number	Case Size	Operating Voltage		Breakdown Voltage	Max. Clamping Voltage		CCITT 10 Pulses 10*700µs	I max. 8*20µs	Energy 10*1000µs	Mean Power Dissipation	Typical Cap.
	EIA	Vac	Vdc	V(1mA)	V	Amp.	Amp.	Amp.	Joules	W	pF
VJ14MT0600---	1812	60	85	100	400	45	45	400	6	0.015	400
VJ14MT0750---	1812	75	100	120	400	45	45	400	6	0.015	400
VJ14MT0950---	1812	95	125	150	250	45	45	250	5	0.015	250

Hybrid termination AgPdPt (VC Range) upon request

RoHS COMPLIANT

Glass Encapsulated SMD Varistor MLV (VC32)

Single Layer SLV Range – M0 Series

GENERAL DESCRIPTION

The VC32M0 Series offers the designer a surface mount solution with higher voltage ratings and transient energy ratings. This Single Layer Surface Mount Varistor replaces the traditional radial-lead Varistors with reduced size and weight. The glass encapsulation ensures the high performances in voltage up to 300Vrms reliability and acid-resistance against harsh environment like chlorite soldering flux.

FEATURES

- Lead less surface mount chip 3220 Case Size
- Voltage Ratings from 175Vrms to 300 Vrms
- VC32 with hybrid Ag-100% Terminations
- Operating temperature from -55°C to +125°C
- RoHS Compliant

APPLICATIONS

- MOV (Radial) Replacement
- Suppression of transient on line voltage
- Electric Meters
- Industrial Equipment
- Mains PSUs
- Telecommunications
- Consumer Electronics

PART NUMBERS

Part Number	Operating Voltage		Max. Leakage	Max. Clamping Voltage 8*20µs		Max. Peak Current 8*20µs Pulse	Energy 10*1000µs	Cap. Typical (1KHz/0.5V)
	Vrms	Vdc	µA	V	A		J	pF
VC32M01750K--	175	270	100	455	10	400	15	135
VC32M00231K--	230	360	50	595	10	400	20	100
VC32M00251K--	250	390	50	650	10	400	21	90
VC32M02750K--	275	430	50	710	10	400	23	80
VC32M00301K--	300	470	50	775	10	400	23	70

RoHS COMPLIANT

SURFACE MOUNTING GUIDE (VJ13, 14, 15, 20)

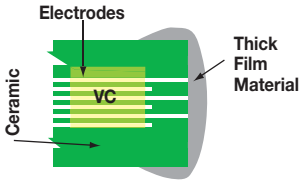
APPLICATIONS NOTES

SOLDERABILITY/LEACHING

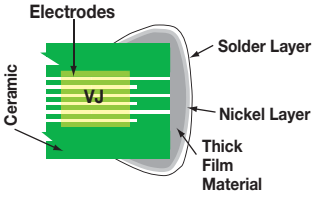
Terminations to be well soldered after immersion in a 60/40 tin/lead solder bath at 235±5°C for 2±1 seconds. Terminations will resist leaching for at least the immersion times and conditions recommendations shown below.

P/N	Termination Type	Solder Tin/Lead	Solder Temp. °C	Immersion Time (sec)
VC	Unplated MLV Hybrid Termination	60/40	260±5	15 max
VJ	Plated MLV Nickel and Matte Tin Plating Termination	60/40	260±5	30±1

Unplated MLV



Plated MLV

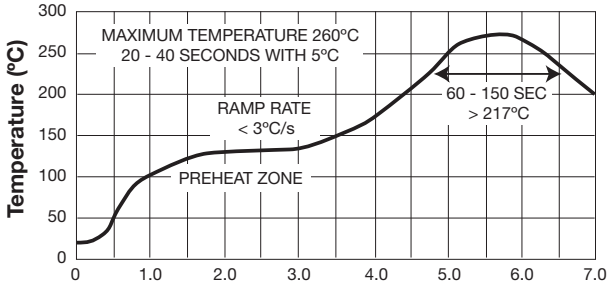


RECOMMENDED SOLDERING PROFILES

VJ products are compatible with a wide range of soldering conditions consistent with good manufacturing practice for surface mount components. This includes Pb free reflow processes and peak temperatures up to 270°C. Recommended profiles for reflow and wave soldering are show below for reference.

VC products are recommended for lead soldering application or gluing techniques.

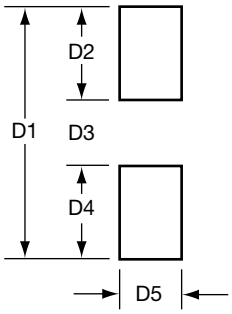
VJ Products Lead-Free Reflow Profile



a) The visual standards used for evaluation of solder joints will need to be modified as lead free joints are not as bright as with tin-lead pastes and the fillet may not be as large.

b) Lead-free solder pastes do not allow the same self alignment as lead containing systems. Standard mounting pads are acceptable, but machine set up may need to be modified.

RECOMMENDED SOLDER PAD LAYOUT



REFLOW SOLDERING

Dimensions in mm (inches)

Case Size	D1	D2	D3	D4	D5
1206	4.00 (0.157)	1.00 (0.039)	2.00 (0.079)	1.00 (0.039)	1.06 (0.042)
1210	4.00 (0.157)	1.00 (0.039)	2.00 (0.079)	1.00 (0.039)	2.05 (0.081)
1812	5.60 (0.220)	1.00 (0.039)	3.60 (0.142)	1.00 (0.039)	3.00 (0.118)
2220	6.60 (0.260)	1.00 (0.039)	4.60 (0.181)	1.00 (0.039)	5.00 (0.197)
3220	10.21 (0.402)	2.21 (0.087)	5.79 (0.228)	2.21 (0.087)	5.50 (0.217)

WAVE SOLDERING

Dimensions in mm (inches)

Case Size	D1	D2	D3	D4	D5
1206	5.00 (0.197)	1.50 (0.059)	2.00 (0.079)	1.50 (0.059)	1.06 (0.042)
1210	5.00 (0.197)	1.50 (0.059)	2.00 (0.079)	1.50 (0.059)	2.05 (0.081)
1812	6.60 (0.260)	1.50 (0.059)	3.60 (0.142)	1.50 (0.059)	3.00 (0.118)
2220	7.60 (0.299)	1.50 (0.059)	4.60 (0.181)	1.50 (0.059)	5.00 (0.197)
3220	11.21 (0.441)	1.50 (0.059)	5.79 (0.228)	1.50 (0.059)	5.50 (0.217)

RoHS COMPLIANT