

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

**Part Number:** VJ13MC0260KBA  
**Manufacturer:** KYOCERA AVX  
**Package:** 1210 (3225 Metric)  
**Availability:** Please confirm with sales

**Product Page:**

<https://antrexco.com/product/details/kyocera-avx/vj13mc0260kba.html>

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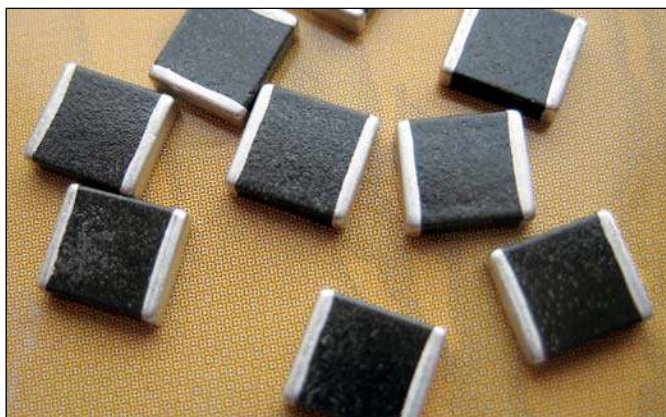
**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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

Transient Voltage Suppression, ESD Protection Devices & EMI Devices



## GENERAL DESCRIPTION

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

- Standard M0/MC/PC Series
- Telecom MT Series
- Automotive MA/PA/QA Series

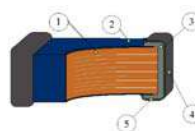
The glass encapsulation process ensures high insulation resistance values after reflow soldering and excellent SMT compatibility. This protection ensures reliability and acidresistance against harsh environment like chlorite flux.

## 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
- 4) Industrial Applications

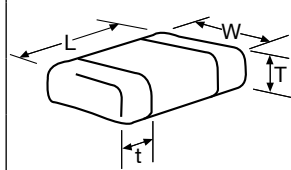
## PHYSICAL CHARACTERISTICS



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<br>(0.079±0.008) | 1.25±0.15<br>(0.049±0.006) | 1.3 max. (0.051 max.)   | 0.15...0.55<br>(0.006...0.022) |
|                                                                                    | VJ20 | 1206     | 3.20±0.20<br>(0.126±0.008) | 1.60±0.20<br>(0.063±0.008) | 1.7 max. (0.067 max.)   | 0.25...0.75<br>(0.010...0.030) |
|                                                                                    | VJ13 | 1210     | 3.20±0.30<br>(0.126±0.012) | 2.50±0.25<br>(0.098±0.010) | 1.7 max. (0.067 max.)   | 0.25...0.75<br>(0.010...0.030) |
|                                                                                    | VJ14 | 1812     | 4.50±0.30<br>(0.177±0.012) | 3.20±0.30<br>(0.126±0.012) | 2.0 max. (0.079 max.)   | 0.25...1.00<br>(0.010...0.039) |
|                                                                                    | VJ15 | 2220     | 5.70±0.40<br>(0.224±0.016) | 5.00±0.40<br>(0.197±0.016) | 2.5max.<br>(0.098 max.) | 0.25...1.00<br>(0.010...0.039) |
|                                                                                    | VJ32 | 3220     | 8.20±0.40<br>(0.323±0.016) | 5.00±0.40<br>(0.197±0.016) | 2.5 max. (0.098 max.)   | 0.35...1.30<br>(0.014...0.051) |

## 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,MC/QC = Industrial  
MT = Telecom  
MA/PA/QA = 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



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

## Automotive MLV Range – MA, PA and QA Series



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

#### FEATURES

- Well suited to protect against automotive related transients
- Response time <1ns
- Load Dump capability 1J to 50J according to ISO standard DP7637 pulse 5
- Jump start capability
- Complying to AEC-Q 200
- VJ: Nickel and Tin (100%) plated Termination suitable for lead free soldering
- VC: PdPtAg termination for hybrid assembly without glass coating
- RoHS Compliant, IMDS Registration upon request

#### GENERAL CHARACTERISTICS

Storage Temperature: -55°C to +150°C  
Operating Temperature: -55°C to +125°C\*  
\* 150°C upon request  
Available in case size 0805 to 3220  
Working voltage from 16Vdc to 85Vdc

#### 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

|                | Case<br>Size<br>EIA | Working<br>Voltage   |                 | Breakdown<br>Voltage at 1mA |      |      | Vclamp<br>(8x20µs) |                    | Max. Peak<br>current<br>(8x20µs) | Max.<br>leakage<br>current at<br>Vdc | Energy<br>(10x<br>1000µs) | Energy<br>Load-<br>Dump<br>(x10**) | Jump<br>Start<br>(5mn) | Mean Power<br>Dissipation | Typical<br>Cap 1KHz/<br>.5Vrms | T<br>max. |
|----------------|---------------------|----------------------|-----------------|-----------------------------|------|------|--------------------|--------------------|----------------------------------|--------------------------------------|---------------------------|------------------------------------|------------------------|---------------------------|--------------------------------|-----------|
|                |                     | V <sub>rms</sub>     | V <sub>dc</sub> | min                         | Nom  | max  | V <sub>p</sub>     | I <sub>p</sub> (A) | Amp.                             | µA                                   | J                         | J                                  | max. V                 | W                         | pF                             | mm        |
|                |                     | 12-16 V Power Supply |                 |                             |      |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                |           |
| *VJ12PA0160K-- | 0805                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 1                  | 120                              | 15                                   | 0.3                       | 1                                  | 24.5                   | 0.005                     | 500                            | 1.3       |
| VJ20MA0160K--  | 1206                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 1                  | 200                              | 15                                   | 0.6                       | 1.5                                | 24.5                   | 0.008                     | 800                            | 1.7       |
| VJ20PA0160K--  | 1206                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 1                  | 300                              | 15                                   | 1.1                       | 2                                  | 24.5                   | 0.008                     | 1 100                          | 1.7       |
| VJ13MA0160K--  | 1210                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 2.5                | 400                              | 15                                   | 1.6                       | 3                                  | 24.5                   | 0.010                     | 1 800                          | 1.7       |
| VJ13PA0160K--  | 1210                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 2.5                | 500                              | 15                                   | 2                         | 5                                  | 24.5                   | 0.010                     | 2 300                          | 1.7       |
| VJ14MA0160K--  | 1812                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 5                  | 800                              | 15                                   | 2.4                       | 6                                  | 24.5                   | 0.015                     | 5 400                          | 2.0       |
| VJ14PA0160K--  | 1812                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 5                  | 1000                             | 15                                   | 2.9                       | 10                                 | 24.5                   | 0.015                     | 6 200                          | 2.0       |
| VJ15MA0160K--  | 2220                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 10                 | 1200                             | 15                                   | 5.8                       | 12                                 | 24.5                   | 0.030                     | 11 000                         | 2.0       |
| VJ15PA0160K--  | 2220                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 10                 | 1500                             | 15                                   | 7.2                       | 25                                 | 24.5                   | 0.030                     | 16 000                         | 2.0       |
| VJ15QA0160K--  | 2220                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 10                 | 2000                             | 15                                   | 7.5                       | 35                                 | 24.5                   | 0.030                     | 25 000                         | 2.0       |
| VJ32PA0160K--  | 3220                | 14                   | 16              | 22                          | 24.5 | 27   | 40                 | 10                 | 3000                             | 15                                   | 13.8                      | 50                                 | 24.5                   | 0.040                     | 30 000                         | 2.5       |
|                |                     | 12-22 V Power Supply |                 |                             |      |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                |           |
| VJ20PA0220K--  | 1206                | 17                   | 22              | 27                          | 30   | 33   | 49                 | 1                  | 250                              | 15                                   | 1                         | 2                                  | 26                     | 0.008                     | 1 000                          | 1.7       |
| VJ13PA0220K--  | 1210                | 17                   | 22              | 27                          | 30   | 33   | 49                 | 2.5                | 400                              | 15                                   | 1.7                       | 5                                  | 26                     | 0.010                     | 2 000                          | 1.7       |
| VJ14PA0220K--  | 1812                | 17                   | 22              | 27                          | 30   | 33   | 49                 | 5                  | 700                              | 15                                   | 2.5                       | 10                                 | 26                     | 0.015                     | 6 000                          | 2.0       |
| VJ15PA0220K--  | 2220                | 17                   | 22              | 27                          | 30   | 33   | 49                 | 10                 | 1500                             | 15                                   | 6.8                       | 25                                 | 26                     | 0.030                     | 15 000                         | 2.0       |
| VJ32PA0220K--  | 3220                | 17                   | 22              | 27                          | 30   | 33   | 49                 | 10                 | 3000                             | 15                                   | 13                        | 50                                 | 26                     | 0.040                     | 25 000                         | 2.5       |
|                |                     | 12-26 V Power Supply |                 |                             |      |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                |           |
| VJ20PA0260K--  | 1206                | 23                   | 26              | 31.5                        | 35   | 38.5 | 57                 | 1                  | 200                              | 15                                   | 1                         | 2                                  | 30                     | 0.008                     | 600                            | 1.7       |
| VJ13PA0260K--  | 1210                | 23                   | 26              | 31.5                        | 35   | 38.5 | 57                 | 2.5                | 300                              | 15                                   | 1.7                       | 5                                  | 30                     | 0.010                     | 1 200                          | 1.7       |
| VJ14PA0260K--  | 1812                | 23                   | 26              | 31.5                        | 35   | 38.5 | 57                 | 5                  | 600                              | 15                                   | 2.5                       | 10                                 | 30                     | 0.015                     | 3 000                          | 2.0       |
| VJ15PA0260K--  | 2220                | 23                   | 26              | 31.5                        | 35   | 38.5 | 57                 | 10                 | 1500                             | 15                                   | 6.8                       | 25                                 | 30                     | 0.030                     | 7 000                          | 2.0       |
| VJ32PA0260K--  | 3220                | 23                   | 26              | 31.5                        | 35   | 38.5 | 57                 | 10                 | 3000                             | 15                                   | 13                        | 50                                 | 30                     | 0.040                     | 15 000                         | 2.5       |
|                |                     | 24-34 V Power Supply |                 |                             |      |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                |           |
| VJ20PA0340K--  | 1206                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 1                  | 200                              | 15                                   | 1.5                       | 1.5                                | 47                     | 0.008                     | 300                            | 1.7       |
| VJ13PA0340K--  | 1210                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 2.5                | 350                              | 15                                   | 3.5                       | 3                                  | 47                     | 0.010                     | 650                            | 1.7       |
| VJ14PA0340K--  | 1812                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 5                  | 600                              | 15                                   | 5                         | 6                                  | 47                     | 0.015                     | 1 800                          | 2.0       |
| VJ15MA0340K--  | 2220                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 10                 | 1200                             | 15                                   | 10                        | 12                                 | 47                     | 0.030                     | 4 000                          | 2.0       |
| VJ15PA0340K--  | 2220                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 10                 | 1500                             | 15                                   | 12                        | 25                                 | 47                     | 0.030                     | 7 000                          | 2.0       |
| VJ32PA0340K--  | 3220                | 30                   | 34              | 42.3                        | 47   | 51.7 | 77                 | 10                 | 3000                             | 15                                   | 13                        | 50                                 | 47                     | 0.040                     | 10 000                         | 2.5       |
|                |                     | 24-42 V Power Supply |                 |                             |      |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                |           |
| *VJ20PA0420K-- | 1206                | 37                   | 42              | 50.4                        | 56   | 61.6 | 91                 | 1                  | 150                              | 15                                   | 1.5                       | 1.5                                | 47                     | 0.008                     | 140                            | 1.7       |
| *VJ13PA0420K-- | 1210                | 37                   | 42              | 50.4                        | 56   | 61.6 | 91                 | 2.5                | 250                              | 15                                   | 3.5                       | 3                                  | 47                     | 0.010                     | 300                            | 1.7       |
| *VJ14PA0420K-- | 1812                | 37                   | 42              | 50.4                        | 56   | 61.6 | 91                 | 5                  | 500                              | 15                                   | 5                         | 6                                  | 47                     | 0.015                     | 800                            | 2.0       |
| *VJ15PA0420K-- | 2220                | 37                   | 42              | 50.4                        | 56   | 61.6 | 91                 | 10                 | 1500                             | 15                                   | 12                        | 12                                 | 47                     | 0.030                     | 1 800                          | 2.0       |
| *VJ32PA0420K-- | 3220                | 37                   | 42              | 50.4                        | 56   | 61.6 | 91                 | 10                 | 3000                             | 15                                   | 13                        | 50                                 | 47                     | 0.040                     | 2 800                          | 2.5       |

\* under development

\*\* time interval between pulses: 60s min.

VC with hybrid solderable termination same electrical characteristics

Other voltage or energy values available upon request



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

## Automotive MLV Range – MA, PA and QA Series



|                | Case Size<br>EIA | Working Voltage      |                 | Breakdown Voltage at 1mA |     |      | Vclamp<br>(8x20µs) |                    | Max. Peak<br>current<br>(8x20µs) | Max.<br>leakage<br>current at<br>Vdc | Energy<br>(10x<br>1000µs) | Energy<br>Load-<br>Dump<br>(x10**) | Jump<br>Start<br>(5mn) | Mean Power<br>Dissipation | Typical<br>Cap<br>1KHz/<br>.5Vrms | T<br>max. |
|----------------|------------------|----------------------|-----------------|--------------------------|-----|------|--------------------|--------------------|----------------------------------|--------------------------------------|---------------------------|------------------------------------|------------------------|---------------------------|-----------------------------------|-----------|
|                |                  | V <sub>rms</sub>     | V <sub>dc</sub> | min                      | Nom | max  | V <sub>p</sub>     | I <sub>p</sub> (A) | Amp.                             | µA                                   | J                         | J                                  | max. V                 | W                         | pF                                | mm        |
|                |                  | 24-65 V Power Supply |                 |                          |     |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                   |           |
| *VJ20MA0650K-- | 1206             | 50                   | 65              | 76.5                     | 85  | 93.5 | 135                | 1                  | 150                              | 15                                   | 1.5                       | 1.5                                | 70                     | 0.008                     | 200                               | 1.7       |
| *VJ13MA0650K-- | 1210             | 50                   | 65              | 76.5                     | 85  | 93.5 | 135                | 2.5                | 250                              | 15                                   | 3.5                       | 3                                  | 70                     | 0.010                     | 200                               | 1.7       |
| *VJ14MA0650K-- | 1812             | 50                   | 65              | 76.5                     | 85  | 93.5 | 135                | 5                  | 500                              | 15                                   | 5                         | 6                                  | 70                     | 0.015                     | 400                               | 2.0       |
| *VJ15MA0650K-- | 2220             | 50                   | 65              | 76.5                     | 85  | 93.5 | 135                | 10                 | 1000                             | 15                                   | 12                        | 12                                 | 70                     | 0.030                     | 800                               | 2.0       |
| *VJ32MA0650K-- | 3220             | 50                   | 65              | 76.5                     | 85  | 93.5 | 135                | 10                 | 1500                             | 15                                   | 13                        | 50                                 | 70                     | 0.040                     | 3500                              | 2.5       |
|                |                  | 24-85 V Power Supply |                 |                          |     |      |                    |                    |                                  |                                      |                           |                                    |                        |                           |                                   |           |
| *VJ20MA0850K-- | 1206             | 60                   | 85              | 99                       | 110 | 121  | 165                | 1                  | 120                              | 15                                   | 1.5                       | 1.5                                | 90                     | 0.008                     | 120                               | 1.7       |
| *VJ13MA0850K-- | 1210             | 60                   | 85              | 99                       | 110 | 121  | 165                | 2.5                | 200                              | 15                                   | 3.5                       | 3                                  | 90                     | 0.010                     | 200                               | 1.7       |
| *VJ14MA0850K-- | 1812             | 60                   | 85              | 99                       | 110 | 121  | 165                | 5                  | 500                              | 15                                   | 5                         | 6                                  | 90                     | 0.015                     | 400                               | 2.0       |
| *VJ15MA0850K-- | 2220             | 60                   | 85              | 99                       | 110 | 121  | 165                | 10                 | 1000                             | 15                                   | 12                        | 12                                 | 90                     | 0.030                     | 800                               | 2.0       |
| *VJ32MA0850K-- | 3220             | 60                   | 85              | 99                       | 110 | 121  | 165                | 10                 | 1500                             | 15                                   | 13                        | 50                                 | 90                     | 0.040                     | 2500                              | 2.5       |

\* under development

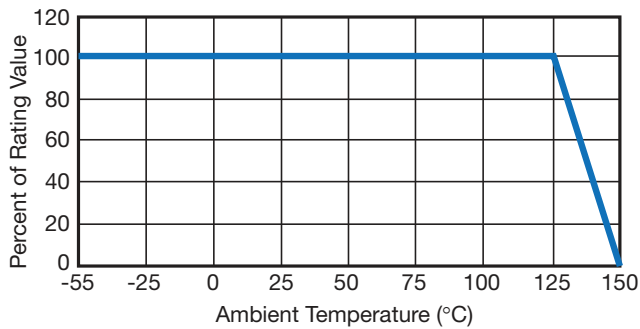
\*\* time interval between pulses: 60s min.

VC with hybrid solderable termination same electrical characteristics

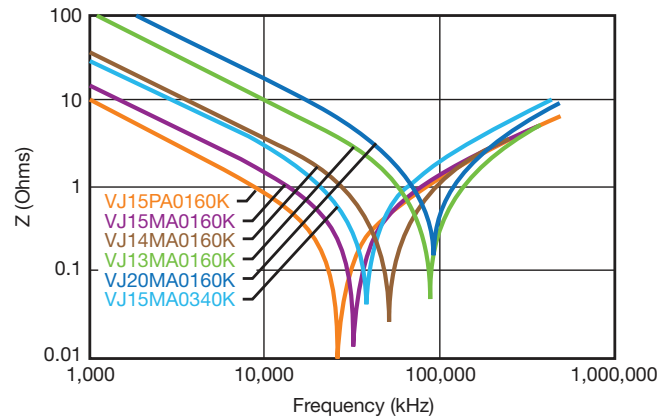
Other voltage or energy values available upon request

## TEMPERATURE CHARACTERISTICS

For Current, Energy and Power



## IMPEDANCE CHARACTERISTICS



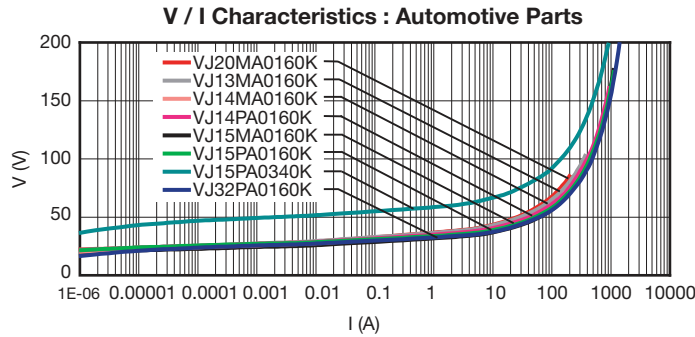
# Glass Encapsulated MLV SMD Varistor (VJ12, 20, 13, 14, 15, 32)

Automotive MLV Range – MA and PA Series

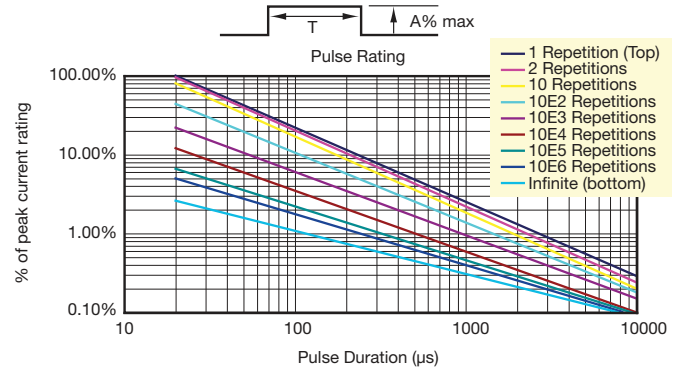


## AUTOMOTIVE SERIES – VJ12, 20, 13, 14, 15, 32 MA & PA SERIES

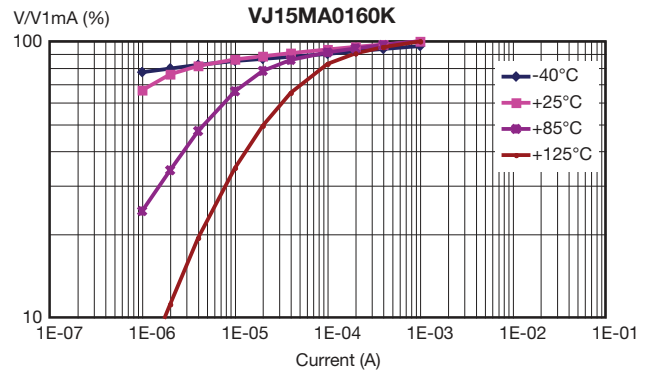
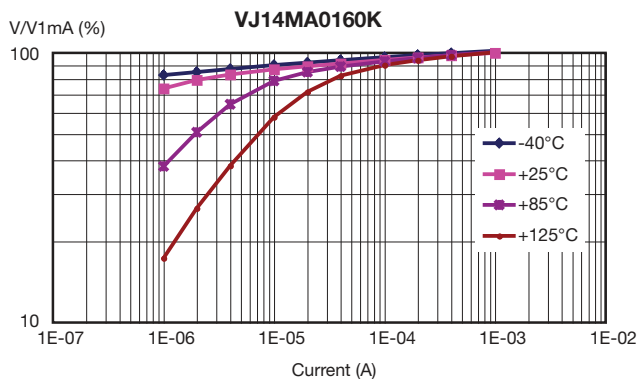
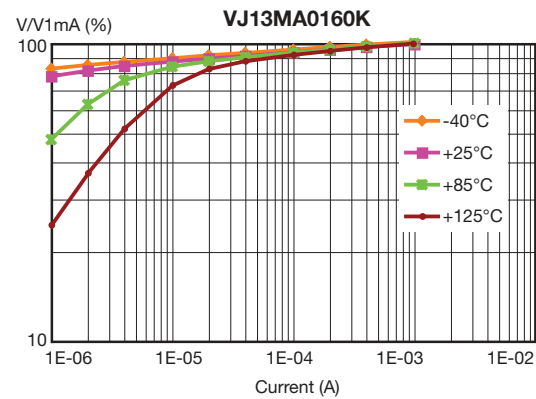
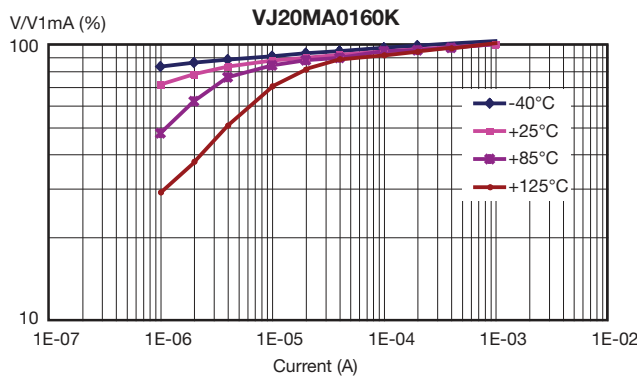
### V / I CHARACTERISTICS



### PULSE RATING



### TEMPERATURE DEPENDENCE OF V/I CHARACTERISTICS

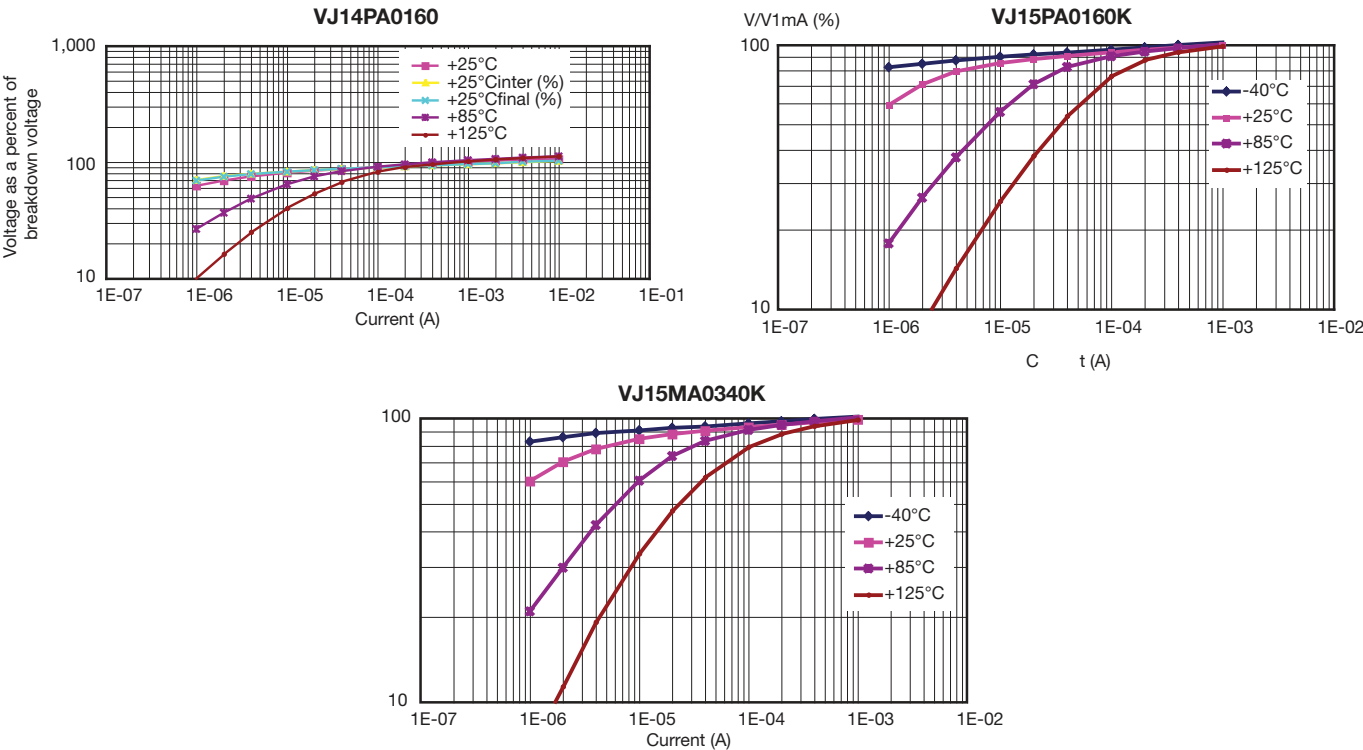


Glass Encapsulated MLV  
SMD Varistor (VJ12, 20, 13, 14, 15, 32)

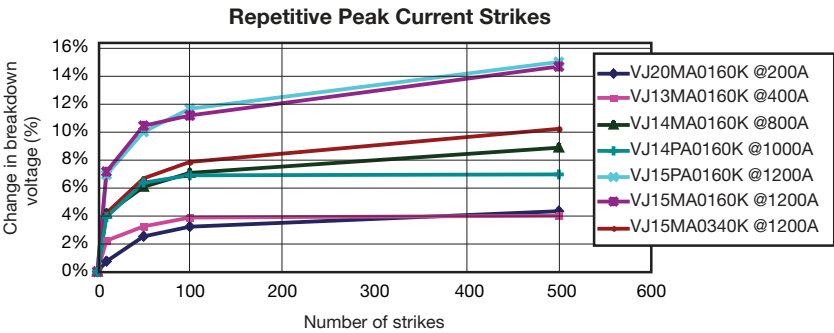
Automotive MLV Range – MA and PA Series



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



PULSE DEGRADATION



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

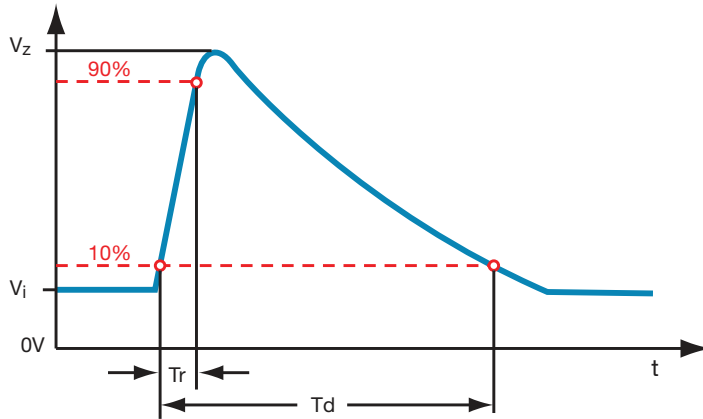
## Automotive MLV Range – MA and PA Series



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

#### 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

$V_i = 13.5V$   
 $T_d = 100$  to  $350ms$   
 $R_i = 2 \text{ Ohms}$  (Internal Resistance)  
 $V_z = 70$  to  $200V$   
 Number of Pulses = 10 Pulses  
 Other Load Dump Simulations can be achieved

#### 24V Network

$V_i = 27V$   
 $T_d = 100$  to  $350ms$   
 $R_i = 2 \text{ Ohms}$  (Internal Resistance)  
 $V_z = 70$  to  $200V$   
 Number of Pulses = 10 Pulses

#### Pulse 5: Typical $V_z$ max versus Pulse duration and $R_s$

| VJ20PA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
|-------------|--------------|------------|------------|------------|
| 50ms        | 33           | 34         | 39         | 49         |
| 100ms       | 31           | 31         | 34         | 43         |
| 200ms       | 27           | 28         | 33         | 43         |
| 400ms       | 28           | 30         | 34         | 42         |
| VJ13PA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 50ms        | 44           | 48         | 57         | 75         |
| 100ms       | 36           | 39         | 46         | 60         |
| 200ms       | 33           | 33         | 39         | 50         |
| 400ms       | 28           | 28         | 34         | 46         |
| VJ14PA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 50ms        | 60           | 68         | 85         | 125        |
| 100ms       | 46           | 52         | 62         | 77         |
| 200ms       | 37           | 41         | 50         | 63         |
| 400ms       | 32           | 35         | 43         | 54         |
| VJ15PA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 50ms        | 80           | 116        | 145        | 188        |
| 100ms       | 61           | 80         | 104        | 140        |
| 200ms       | 47           | 60         | 78         | 100        |
| 400ms       | 39           | 47         | 58         | 74         |

| VJ15QA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
|-------------|--------------|------------|------------|------------|
| 100ms       | 65           | 78         | 91         | 117        |
| 200ms       | 54           | 60         | 73         | 92         |
| 400ms       | 44           | 51         | 60         | 75         |
| VJ15MA0340K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 100ms       | 66           | 78         | 91         | 117        |
| 200ms       | 55           | 60         | 73         | 92         |
| 400ms       | 49           | 53         | 60         | 75         |
| VJ15PA0340K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 100ms       | 80           | 90         | 108        | 134        |
| 200ms       | 60           | 67         | 80         | 106        |
| 400ms       | 58           | 62         | 69         | 85         |
| VJ32PA0160K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 100ms       | 102          | 120        | 175        | 200        |
| 200ms       | 72           | 85         | 120        | 158        |
| 400ms       | 53           | 62         | 78         | 105        |
| VJ32PA0340K | 0.5 $\Omega$ | 1 $\Omega$ | 2 $\Omega$ | 4 $\Omega$ |
| 100ms       | 90           | 105        | 133        | 170        |
| 200ms       | 70           | 79         | 98         | 132        |
| 400ms       | 62           | 70         | 83         | 106        |



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

## 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: -55°C to +150°C

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

#### 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      | 15                      | 0.5              | 200                      | 800                      |
| VJ13M00140K--- | 1210      | 14   | 18  | 22±10%            | 38                    | 2.5    | 15                      | 1.5              | 400                      | 1800                     |
| VJ14M00140K--- | 1812      | 14   | 18  | 22±10%            | 38                    | 5      | 15                      | 2.3              | 800                      | 4200                     |
| VJ15M00140K--- | 2220      | 14   | 18  | 22±10%            | 38                    | 10     | 15                      | 5.8              | 1200                     | 9600                     |
| VJ20M00170K--- | 1206      | 17   | 22  | 27±10%            | 44                    | 1      | 15                      | 0.6              | 200                      | 800                      |
| VJ13M00170K--- | 1210      | 17   | 22  | 27±10%            | 44                    | 2.5    | 15                      | 1.7              | 500                      | 1600                     |
| VJ14M00170K--- | 1812      | 17   | 22  | 27±10%            | 44                    | 5      | 15                      | 2.7              | 800                      | 3700                     |
| VJ15M00170K--- | 2220      | 17   | 22  | 27±10%            | 44                    | 10     | 15                      | 7.2              | 1200                     | 8600                     |
| VJ20M00200K--- | 1206      | 20   | 26  | 33±10%            | 54                    | 1      | 15                      | 0.7              | 200                      | 600                      |
| VJ13M00200K--- | 1210      | 20   | 26  | 33±10%            | 54                    | 2.5    | 15                      | 1.9              | 400                      | 1200                     |
| VJ14M00200K--- | 1812      | 20   | 26  | 33±10%            | 54                    | 5      | 15                      | 3                | 800                      | 3000                     |
| VJ15M00200K--- | 2220      | 20   | 26  | 33±10%            | 54                    | 10     | 15                      | 7.8              | 1200                     | 6400                     |
| VJ20M00250K--- | 1206      | 25   | 31  | 39±10%            | 65                    | 1      | 15                      | 1                | 200                      | 400                      |
| VJ13M00250K--- | 1210      | 25   | 31  | 39±10%            | 65                    | 2.5    | 15                      | 1.7              | 300                      | 1100                     |
| VJ14M00250K--- | 1812      | 25   | 31  | 39±10%            | 65                    | 5      | 15                      | 3.7              | 800                      | 2400                     |
| VJ15M00250K--- | 2220      | 25   | 31  | 39±10%            | 65                    | 10     | 15                      | 9.6              | 1200                     | 5500                     |
| VJ20M00300K--- | 1206      | 30   | 38  | 47±10%            | 77                    | 1      | 15                      | 1.1              | 200                      | 350                      |
| VJ13M00300K--- | 1210      | 30   | 38  | 47±10%            | 77                    | 2.5    | 15                      | 2                | 300                      | 750                      |
| VJ14M00300K--- | 1812      | 30   | 38  | 47±10%            | 77                    | 5      | 15                      | 4.2              | 800                      | 1900                     |
| VJ15M00300K--- | 2220      | 30   | 38  | 47±10%            | 77                    | 10     | 15                      | 12               | 1200                     | 4200                     |
| VJ20M00350K--- | 1206      | 35   | 45  | 56±10%            | 90                    | 1      | 15                      | 0.6              | 200                      | 260                      |
| VJ13M00350K--- | 1210      | 35   | 45  | 56±10%            | 90                    | 2.5    | 15                      | 1.5              | 300                      | 530                      |
| VJ14M00350K--- | 1812      | 35   | 45  | 56±10%            | 90                    | 5      | 15                      | 4                | 500                      | 1400                     |
| VJ15M00350K--- | 2220      | 35   | 45  | 56±10%            | 90                    | 10     | 15                      | 7.7              | 1000                     | 2800                     |
| VJ20M00400K--- | 1206      | 40   | 56  | 68±10%            | 110                   | 1      | 15                      | 0.7              | 200                      | 180                      |
| VJ13M00400K--- | 1210      | 40   | 56  | 68±10%            | 110                   | 2.5    | 15                      | 2.3              | 250                      | 380                      |
| VJ14M00400K--- | 1812      | 40   | 56  | 68±10%            | 110                   | 5      | 15                      | 4.8              | 500                      | 800                      |
| VJ15M00400K--- | 2220      | 40   | 56  | 68±10%            | 110                   | 10     | 15                      | 9                | 1000                     | 2000                     |
| VJ20M00500K--- | 1206      | 50   | 65  | 82±10%            | 135                   | 1      | 15                      | 0.8              | 200                      | 160                      |
| VJ13M00500K--- | 1210      | 50   | 65  | 82±10%            | 135                   | 2.5    | 15                      | 1.6              | 200                      | 300                      |
| VJ14M00500K--- | 1812      | 50   | 65  | 82±10%            | 135                   | 5      | 15                      | 4.5              | 400                      | 800                      |
| VJ15M00500K--- | 2220      | 50   | 65  | 82±10%            | 135                   | 10     | 15                      | 5.6              | 800                      | 1400                     |
| VJ20M00600K--- | 1206      | 60   | 85  | 100±10%           | 165                   | 1      | 15                      | 0.9              | 120                      | 100                      |
| VJ13M00600K--- | 1210      | 60   | 85  | 100±10%           | 165                   | 2.5    | 15                      | 2.0              | 200                      | 210                      |
| VJ14M00600K--- | 1812      | 60   | 85  | 100±10%           | 165                   | 5      | 15                      | 5.8              | 400                      | 600                      |
| VJ15M00600K--- | 2220      | 60   | 85  | 100±10%           | 165                   | 10     | 15                      | 6.8              | 800                      | 1100                     |

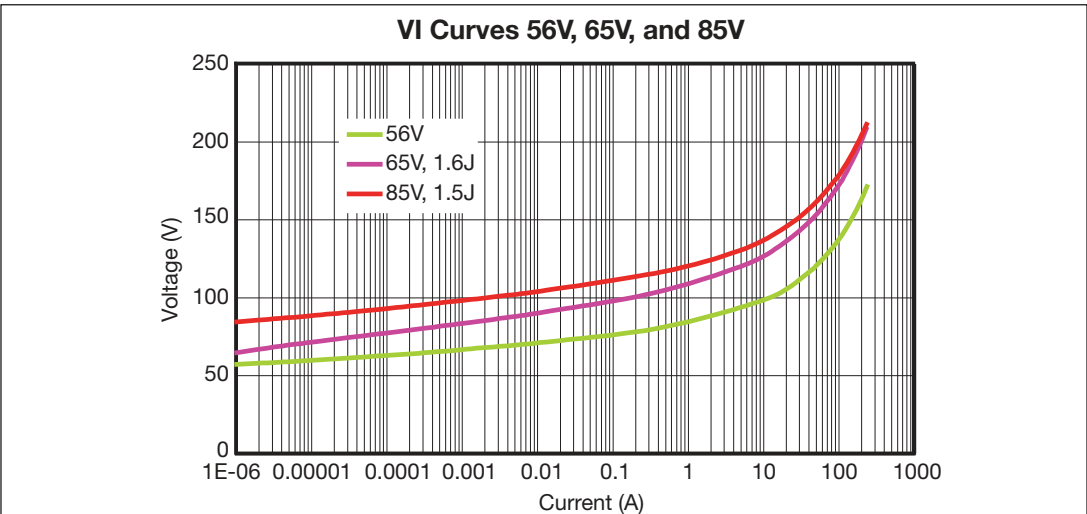
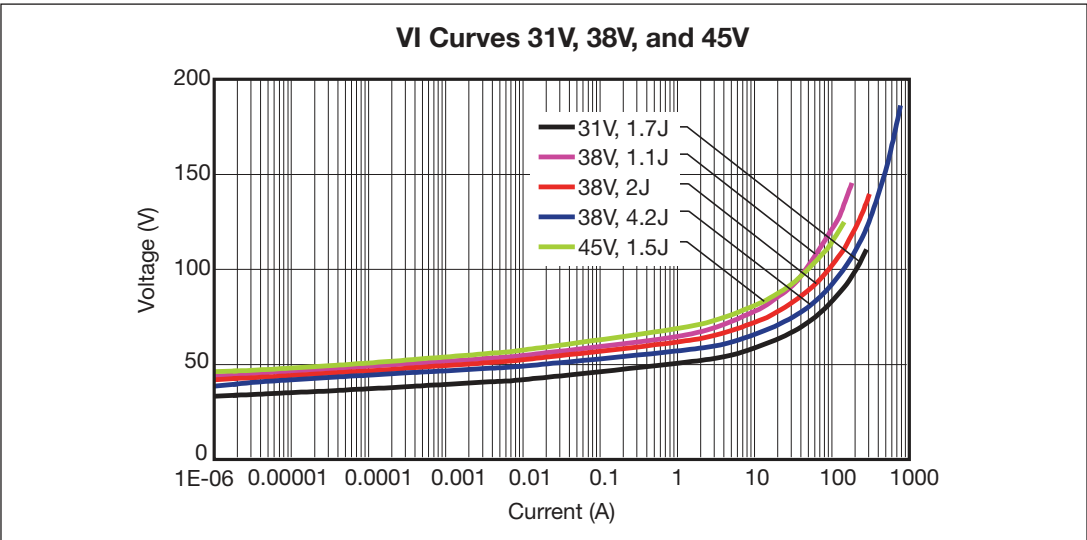
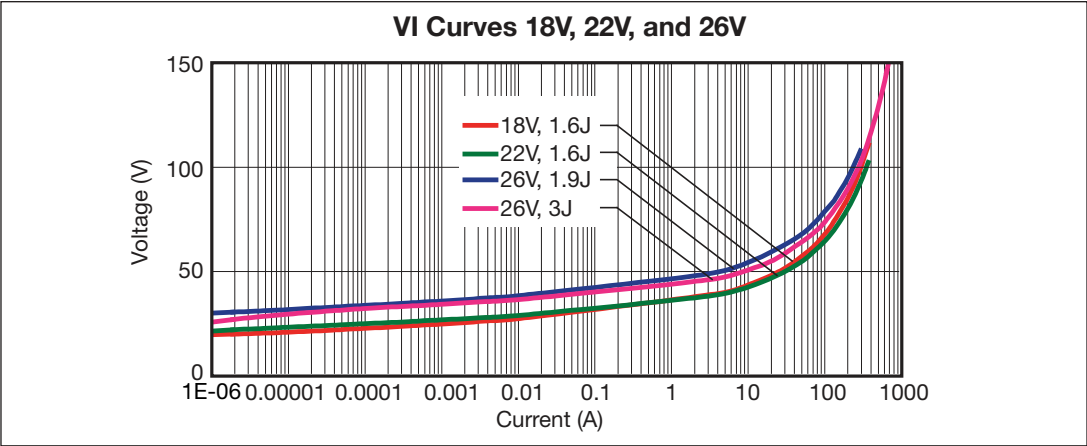


Glass Encapsulated MLV  
SMD Varistor (VJ12, 20, 13, 14, 15, 32)

Industrial MLV Range – M0 Series



INDUSTRIAL MLV RANGE – VJ12, 20, 13, 14, 15 M0 SERIES  
V/I CHARACTERISTIC



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

## Industrial MLV Range – MC/PC Series



### INDUSTRIAL MLV RANGE – VJ13 MC/PC SERIES

#### FEATURES

- Glass encapsulation device with very low leakage current under DC operating conditions
- Device available in 1210 case size
- Bi-Directional protection. Fast Turn-On Time.
- Nickel and Tin (100%) plated Termination (Hybrid AgPdPt termination available upon request)
- Excellent transient clamping characteristics up to 500amps peak current
- Multi strike capability. Provide EMC Capacitance
- RoHS Compliant

#### GENERAL CHARACTERISTICS

Storage Temperature: -55°C to +150°C  
Operating Temperature: -55°C to +125°C  
Working Voltage: 18Vdc to 60Vdc

#### TYPICAL APPLICATIONS

- Protection of various semiconductor elements from overvoltage
- Industrial equipment
- Consumer Electronics
- Plug-in cards, remote controls
- Home automation

| Part Number   | Working Voltage | Breakdown Voltage<br>Voltage at 1mA |      |      | Vclamp<br>(8x20µs) |       | max.<br>peak current<br>(8x20µs) | Energy (10x1000µs) | CAP<br>(1KHz/.5Vrms) |
|---------------|-----------------|-------------------------------------|------|------|--------------------|-------|----------------------------------|--------------------|----------------------|
|               | Vdc             | min                                 | Nom  | max  | Vp                 | Ip(A) | Amp.                             | J                  | pF                   |
| VJ13MC0180K-- | 18              | 21.6                                | 24   | 26.5 | 45                 | 10    | 500                              | 1.5                | 2200                 |
| VJ13MC0260K-- | 26              | 29.7                                | 33   | 36.3 | 62                 | 10    | 300                              | 1.2                | 1200                 |
| VJ13MC0300K-- | 30              | 35.1                                | 39   | 42.9 | 73                 | 10    | 220                              | 0.9                | 1000                 |
| VJ13PC0300K-- | 30              | 35.1                                | 39   | 42.9 | 73                 | 10    | 280                              | 1.2                | 1000                 |
| VJ13MC0480K-- | 48              | 54.5                                | 60.5 | 66.5 | 110                | 10    | 220                              | 0.9                | 530                  |
| VJ13PC0480K-- | 48              | 54.5                                | 60.5 | 66.5 | 110                | 10    | 250                              | 1.2                | 500                  |
| VJ13MC0600K-- | 60              | 67                                  | 75   | 83   | 126                | 10    | 250                              | 1.5                | 400                  |

VC with hybrid solderable termination same electrical characteristics

Other voltage values available upon request

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

## Telecom MLV Range – MT Series



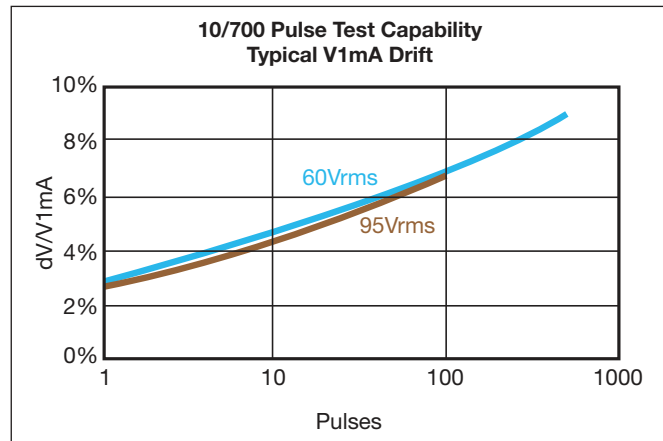
### TELECOM MLV RANGE - VJ14 MT SERIES

#### FEATURES

- Effective alternative to leaded MOVs between 60 and 90 Vrms
- 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

#### CCITT 10X700MS 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.



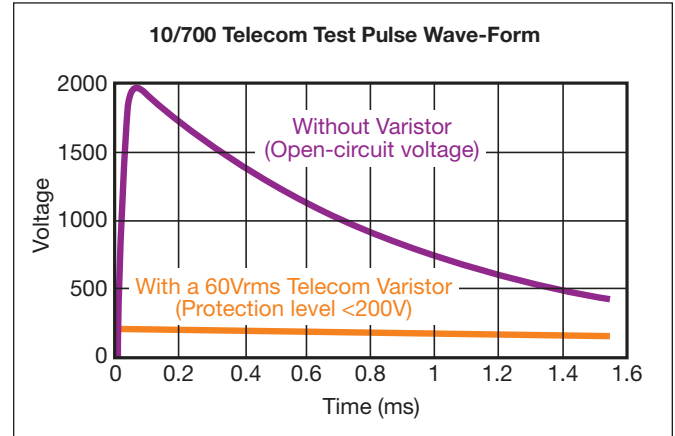
#### TARGET APPLICATIONS

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

#### GENERAL CHARACTERISTICS

Storage Temperature: -55°C to +125°C

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



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.

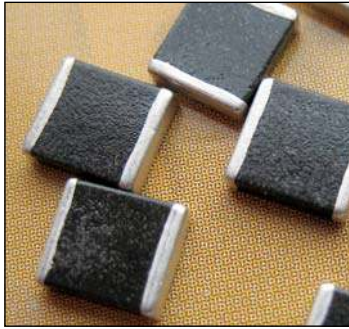
#### PART NUMBERS

| 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. |
|---------------|-----------|-------------------|-----|-------------------|-----------------------|------|--------------------------|---------------|------------------|------------------------|--------------|
|               |           | Vac               | Vdc |                   | V                     | Amp. |                          |               |                  |                        |              |
| VJ14MT0600--- | 1812      | 60                | 85  | 107               | 200                   | 45   | 45                       | 400           | 6                | 0.015                  | 400          |
| VJ14MT0750--- | 1812      | 75                | 100 | 120               | 250                   | 45   | 45                       | 400           | 6                | 0.015                  | 400          |
| VJ14MT0950--- | 1812      | 95                | 125 | 150               | 270                   | 45   | 45                       | 250           | 5                | 0.015                  | 280          |

Hybrid termination AgPdPt (VC Range) upon request



# Glass Encapsulated MLV SMD Varistor (VJ32/VC32)



## GENERAL DESCRIPTION

The VJ32/VC32M0 Series offers the designer a surface mount solution with higher voltage ratings and transient energy ratings. This Multilayer 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
- VJ32 with Ni barrier/100% Sn Termination (for lead free soldering applications)
- VC32 with hybrid PdPtAg Termination (not suitable for lead free soldering)
- Operating temperature from -55°C to +85°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   | Case Size | Operating voltage |     | Breakdown Voltage Voltage at 1mA |         |      | Max. Clamping Voltage 8*20µs |    | Max. Leakage Current | Energy 10*1000µs | Max. Peak Current 8*20µs 1 Pulse | Cap. Typical (1KHz,0.5V) |
|---------------|-----------|-------------------|-----|----------------------------------|---------|------|------------------------------|----|----------------------|------------------|----------------------------------|--------------------------|
|               |           | Vrms              | Vdc | Min.                             | Average | Max. | V                            | A  | µA                   | Joule            | A                                | pF                       |
| VJ32M00140K-- | 3220      | 14                | 18  | 19.8                             | 22      | 24.2 | 47                           | 10 | 15                   | 0.7              | 1500                             | 15000                    |
| VJ32M00170K-- | 3220      | 17                | 22  | 24.3                             | 27      | 29.7 | 57                           | 10 | 15                   | 0.9              | 1500                             | 15000                    |
| VJ32M00200K-- | 3220      | 20                | 26  | 29.7                             | 33      | 36.3 | 68                           | 10 | 15                   | 1.1              | 1500                             | 15000                    |
| VJ32M00250K-- | 3220      | 25                | 31  | 35.1                             | 39      | 42.9 | 79                           | 10 | 15                   | 1.2              | 1500                             | 15000                    |
| VJ32M00300K-- | 3220      | 30                | 38  | 42.3                             | 47      | 51.7 | 92                           | 10 | 15                   | 1.5              | 1500                             | 15000                    |
| VJ32M00350K-- | 3220      | 35                | 45  | 50.4                             | 56      | 61.6 | 107                          | 10 | 15                   | 1.8              | 1200                             | 5000                     |
| VJ32M00400K-- | 3220      | 40                | 56  | 61.2                             | 68      | 74.8 | 127                          | 10 | 15                   | 2.2              | 1200                             | 5000                     |
| VJ32M00500K-- | 3220      | 50                | 66  | 73.8                             | 82      | 90.2 | 135                          | 10 | 15                   | 2.5              | 1000                             | 3500                     |
| VJ32M00600K-- | 3220      | 60                | 85  | 90.0                             | 100     | 110  | 165                          | 10 | 15                   | 3                | 1000                             | 2500                     |
| VJ32M00750K-- | 3220      | 75                | 102 | 108                              | 120     | 132  | 200                          | 10 | 15                   | 3.5              | 600                              | 2000                     |
| VJ32M00900K-- | 3220      | 95                | 127 | 135                              | 150     | 165  | 250                          | 10 | 15                   | 6                | 600                              | 1500                     |
| VJ32M01150K-- | 3220      | 115               | 153 | 162                              | 180     | 198  | 295                          | 10 | 15                   | 6.5              | 300                              | 350                      |
| VJ32M00131K-- | 3220      | 130               | 175 | 180                              | 200     | 220  | 340                          | 10 | 15                   | 7                | 300                              | 170                      |
| VJ32M00141K-- | 3220      | 140               | 180 | 198                              | 220     | 242  | 360                          | 10 | 15                   | 7.5              | 300                              | 140                      |
| VJ32M00151K-- | 3220      | 150               | 200 | 216                              | 240     | 264  | 395                          | 10 | 15                   | 9                | 300                              | 130                      |
| VJ32M01750K-- | 3220      | 175               | 225 | 243                              | 270     | 297  | 455                          | 10 | 15                   | 9.5              | 300                              | 120                      |
| VJ32M00231K-- | 3220      | 230               | 300 | 324                              | 360     | 396  | 595                          | 10 | 15                   | 10               | 300                              | 80                       |
| VJ32M00251K-- | 3220      | 250               | 330 | 351                              | 390     | 429  | 650                          | 10 | 15                   | 11               | 300                              | 75                       |
| VJ32M02750K-- | 3220      | 275               | 369 | 387                              | 430     | 473  | 710                          | 10 | 15                   | 13               | 300                              | 70                       |
| VJ32M00301K-- | 3220      | 300               | 385 | 423                              | 470     | 517  | 775                          | 10 | 15                   | 15               | 300                              | 65                       |

VC32 Series with solderable hybrid termination. Glass encapsulation from 115Vrms to 300Vrms.  
Other voltage values available upon request

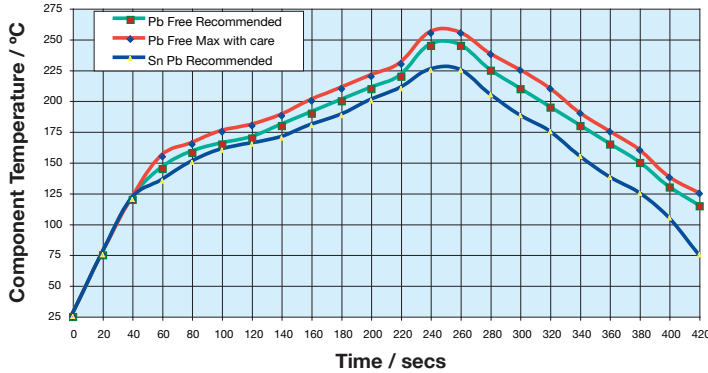
# Glass Encapsulated MLV SMD Varistor (VJ13, 14, 15, 20)

## Surface Mounting Guide



### SURFACE MOUNTING GUIDE (VJ13, 14, 15, 20, 32) APPLICATIONS NOTES

Recommended Reflow Profiles

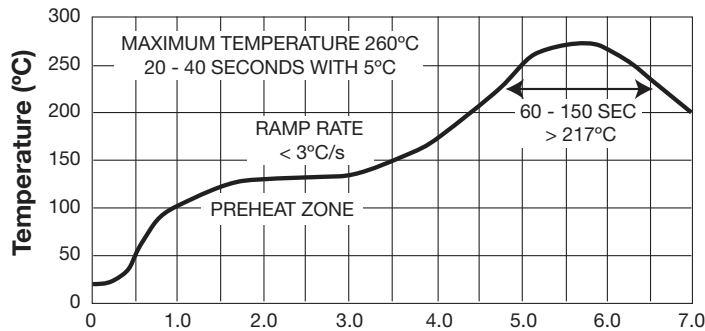


### RECOMMENDED SOLDERING PROFILES

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 shown below for reference.

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

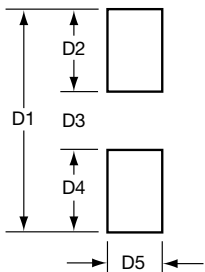
#### VJ Products Lead-Free Reflow Profile



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.

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) |