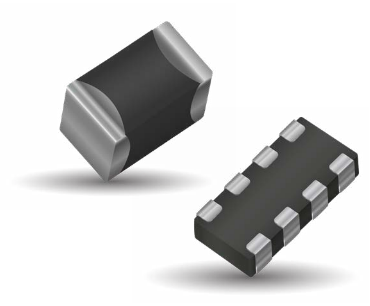
Communication BUS Varistor



GENERAL DESCRIPTION

The CAN BUS and FlexRay varistor is a zinc oxide (ZnO) based ceramic semiconductor device with non-linear voltage-current characteristics (bi-directional) similar to back-to-back Zener diodes and an EMC capacitor in parallel (see equivalent circuit model). They have the added advantage of greater current and energy handling capabilities as well as EMI/RFI attenuation. Devices are fabricated by a ceramic sintering process that yields a structure of conductive ZnO grains surrounded by electrically insulating barriers, creating varistor like behavior.

KYOCERA AVX Communication Bus Varistors offer the advantages of large in-rush current capability, low capacitance to minimize signal distortion, fast turn on time to conservatively clamp the energy before its maximum and off state EMI filtering through their bulk capacitance. These features coupled with an extremely low FIT rate and excellent process capability make an ideal device for today's automotive or general circuit protection.

GENERAL CHARACTERISTICS

- Operting Teperature: -55°C to +125°C
- Working Voltage: ≤18Vdc
- Case Size: 0402, 0603
  0405 2xArray
  0612 4xArray

FEATURES

- Compact footprint
- High ESD capability (25kV)
- High Inrush Current (8x20μs)
- EMI/RFI Attenuation
- Low Capacitance/Low Insertion Loss
- Very Fast Response Time
- High Reliability <0.1 FIT
- AEC-Q200 Qualified

APPLICATIONS

- Communication Bus:
  CAN Bus, FlexRay, etc.
- General I/O Protocols
- Keyboard Interfaces
- Datalines
- Sensors
- Capacitance sensitive
  applications and more

HOW TO ORDER

CAN **0001** **D** **P**

Style
CAN = CAN BUS
FLX = FlexRay

Case Size
0001 = 0603 Discrete
0002 = 0405 2-Element
0003 = 0405 2-Element
0004 = 0612 4-Element
0005 = 0402 Discrete
0007 = 0603 Discrete

Packaging Code (Reel Size)
D = 7" reel (1,000 pcs.)
R = 7" reel (4,000 pcs.)
T = 13" reel (10,000 pcs.)
W = 7" reel (10,000 pcs.) 0402 only

Termination
P = Ni/Sn
(Plated)

RoHS COMPLIANT

PERFORMANCE CHARACTERISTICS

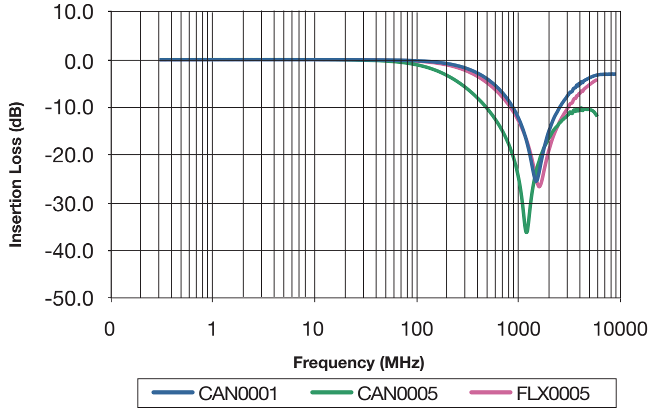
Part Number	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	I_P	Cap	Freq	VJump	PDiss Max	Case	Elements
CAN0001 _ _	≤ 18	≤ 14	120	225	1	2	0.015	4	22 Max	M	27.5	0.003	0603	1
CAN0002 _ _	≤ 18	≤ 14	70	145	1	2	0.015	4	22 Max	M	27.5	0.003	0405	2
CAN0003 _ _	≤18	≤14	28.5	50	1	5	0.02	15	50 Max	M	27.5	0.0008	0405	2
CAN0004 _ _	≤ 18	≤ 14	100	180	1	2	0.015	4	22 Max	M	27.5	0.003	0612	4
CAN0005 _ _	≤ 18	≤ 14	33	55	1	2	0.05	10	37 Max	M	27.5	0.01	0402	1
CAN0007 _ _	≤ 32.0	≤ 25.0	61	120	1	5	0.05	5	15 Max	M	27.5	0.003	0603	1
FLX0005 _ _	≤ 18	≤ 14	26	45	1	5	0.02	4	17 Max	M	27.5	0.004	0402	1

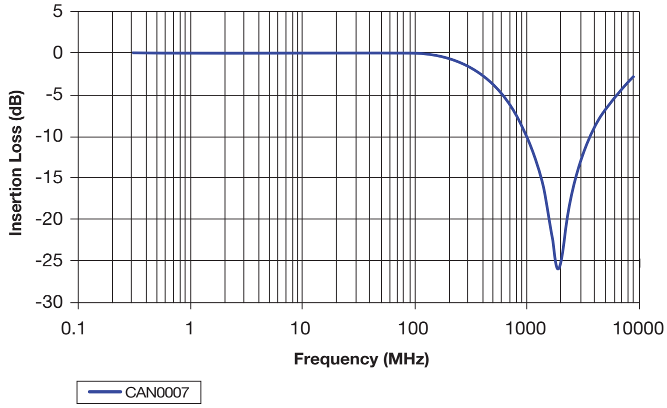
Termination Finish Code
Packaging Code

V_W (DC) DC Working Voltage (V)
V_W (AC) AC Working Voltage (V)
V_B Typical Breakdown Voltage (V @ 1mADC)
V_C Clamping Voltage (V @ IVC)
I_{VC} Test Current for VC (A, 8x20μS)

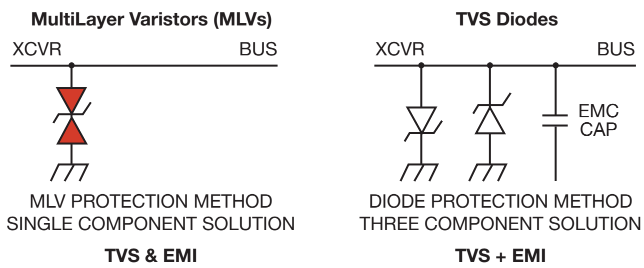
I_L Maximum Leakage Current at the Working Voltage (μA)
E_T Transient Energy Rating (J, 10x1000μS)
I_P Peak Current Rating (A, 8x20μS)
Cap Maximum Capacitance (pF) @ 1 MHz and 0.5Vrms
Temp Range -55°C to +125°C

S21 CHARACTERISTICS

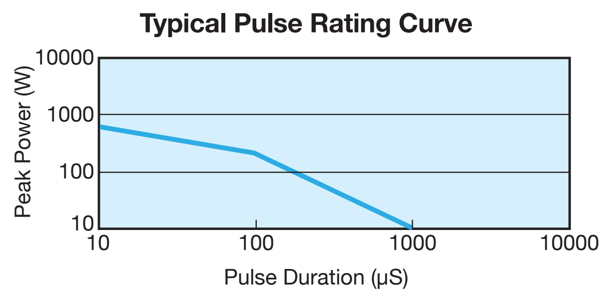




TYPICAL MLV IMPLEMENTATION

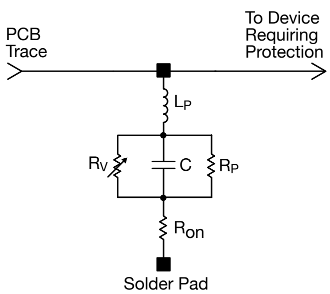


TYPICAL PULSE RATING CURVE



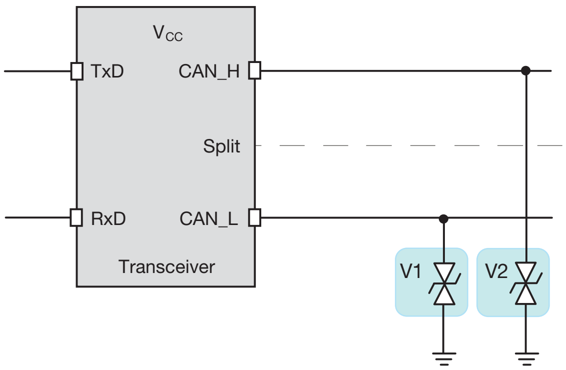
EQUIVALENT CIRCUIT MODEL

Discrete MLV Model

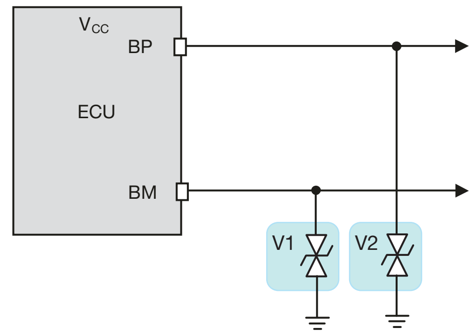


Where: R_v = Voltage Variable resistance (per VI curve)
R_p ≥ 1012 Ω
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = parallel body inductance

TYPICAL CAN BUS IMPLEMENTATION SCHEME



TYPICAL FLEX RAY IMPLEMENTATION SCHEME



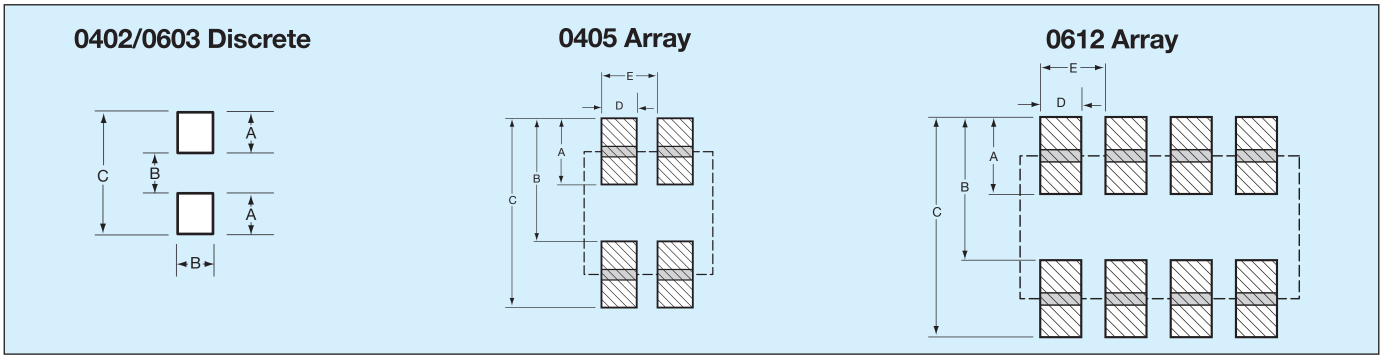
PHYSICAL DIMENSIONS

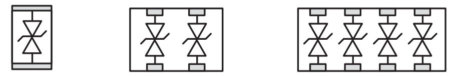
mm (inches)

	0402 D iscrete	0603 Discrete	0405 Array	0612 Array
Length	1.00 ±0.10 (0.040 ±0.004)	1.60 ±0.15 (0.063 ±0.006)	1.00 ±0.15 (0.039 ±0.006)	1.60 ±0.20 (0.063 ±0.008)
Width	0.50 ±0.10 (0.020 ±0.004)	0.80 ±0.15 (0.032 ±0.006)	1.37 ±0.15 (0.054 ±0.006)	3.20 ±0.20 (0.126 ±0.008)
Thickness	0.60 Max. (0.024 Max.)	0.90 Max. (0.035 Max.)	0.66 Max. (0.026 Max.)	1.22 Max. (0.048 Max.)
Term Band Width	0.25 ±0.15 (0.010 ±0.006)	0.35 ±0.15 (0.014 ±0.006)	0.36 ±0.10 (0.014 ±0.004)	0.41 ±0.10 (0.016 ±0.010)

SOLDER PAD DIMENSIONS

mm (inches)





0402, 0603 Discrete **0405 Array** **0612 Array**

	A	B	C	D	E
0402 Discrete	0.61 (0.024)	0.51 (0.020)	1.70 (0.067)	–	–
0603 Discrete	0.89 (0.035)	0.76 (0.030)	2.54 (0.100)	–	–
0405 Array	0.46 (0.018)	0.74 (0.029)	0.12 (0047)	0.38 (0.015)	0.64 (0.025)
0612 Array	0.89 (0.035)	1.65 (0.065)	2.54 (0.100)	0.46 (0.018)	0.76 (0.030)

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APPLICATION

KYOCERA AVX CAN BUS and FlexRay varistors offer significant advantages in general areas of a typical CAN or FlexRay network as shown on the right. Some of the advantages over diodes include:

- space savings
- higher ESD capability @ 25kV contact
- higher in rush current (4A) 8 x 20µS
- FIT rate ≤0.1 failures (per billion hours)