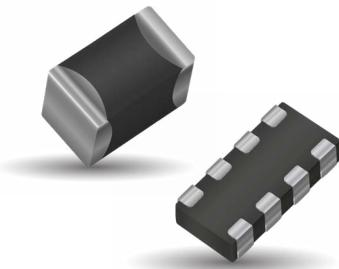


Communication BUS Varistor



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

- Operating Temperature: -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
Style
CAN = CAN BUS
FLX = FlexRay

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

D
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

P
Termination
P = Ni/Sn (Plated)



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 |

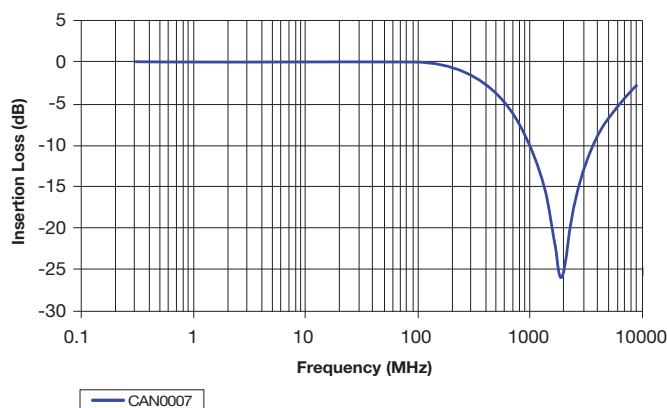
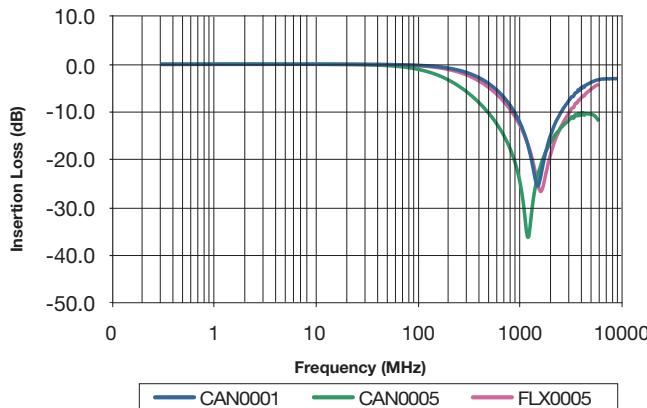
Termination Finish Code
Packaging Code

V_w (DC) DC Working Voltage (V)
V_w (AC) AC Working Voltage (V)
V_b Typical Breakdown Voltage (V @ 1mA DC)
V_c Clamping Voltage (V @ IVC)
I_{vc} Test Current for VC (A, 8x20μs)

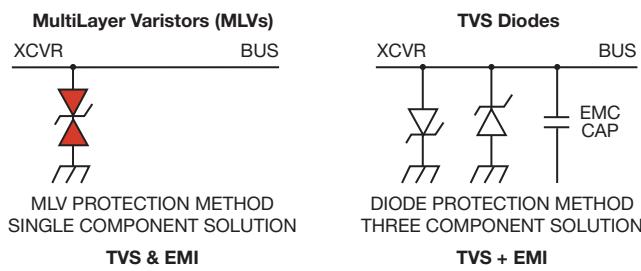
I_L Maximum Leakage Current at the Working Voltage (μA)
E_T Transient Energy Rating (J, 10x1000μs)
I_P Peak Current Rating (A, 8x20μs)
Cap Maximum Capacitance (pF) @ 1 MHz and 0.5Vrms
Temp Range -55°C to +125°C

Communication BUS Varistor

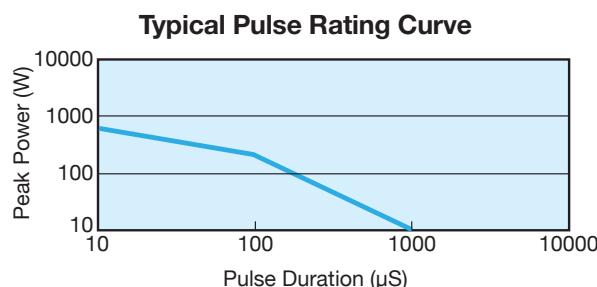
S21 CHARACTERISTICS



TYPICAL MLV IMPLEMENTATION

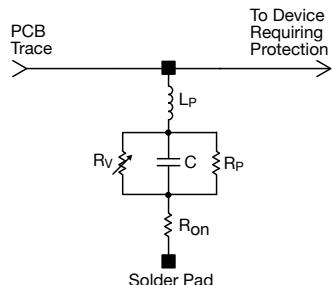


TYPICAL PULSE RATING CURVE



EQUIVALENT CIRCUIT MODEL

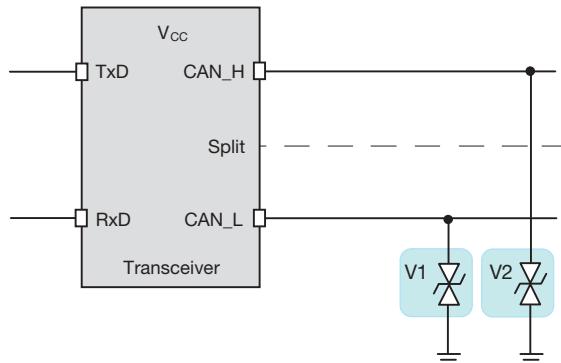
Discrete MLV Model



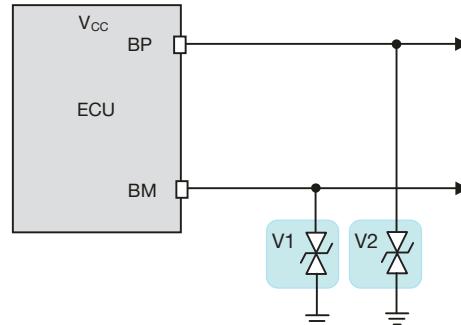
Where:
 R_v = Voltage Variable resistance (per VI curve)
 $R_p \geq 1012 \Omega$
 C = defined by voltage rating and energy level
 R_{on} = turn on resistance
 L_p = parallel body inductance

Communication BUS Varistor

TYPICAL CAN BUS IMPLEMENTATION SCHEME



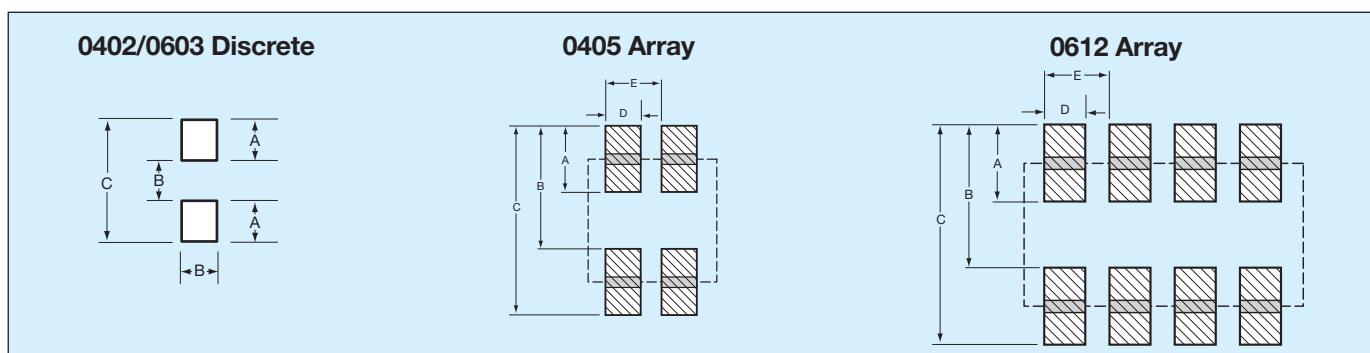
TYPICAL FLEX RAY IMPLEMENTATION SCHEME



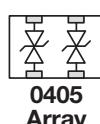
PHYSICAL DIMENSIONS

| | mm (inches) | | | |
|-----------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | 0402 D discrete | 0603 Discrete | 0405 Array | 0612 Array |
| Length | 1.00 \pm 0.10 (0.040 \pm 0.004) | 1.60 \pm 0.15 (0.063 \pm 0.006) | 1.00 \pm 0.15 (0.039 \pm 0.006) | 1.60 \pm 0.20 (0.063 \pm 0.008) |
| Width | 0.50 \pm 0.10 (0.020 \pm 0.004) | 0.80 \pm 0.15 (0.032 \pm 0.006) | 1.37 \pm 0.15 (0.054 \pm 0.006) | 3.20 \pm 0.20 (0.126 \pm 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 \pm 0.15 (0.010 \pm 0.006) | 0.35 \pm 0.15 (0.014 \pm 0.006) | 0.36 \pm 0.10 (0.014 \pm 0.004) | 0.41 \pm 0.10 (0.016 \pm 0.010) |

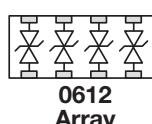
SOLDER PAD DIMENSIONS



0402, 0603
Discrete



0405
Array



0612
Array

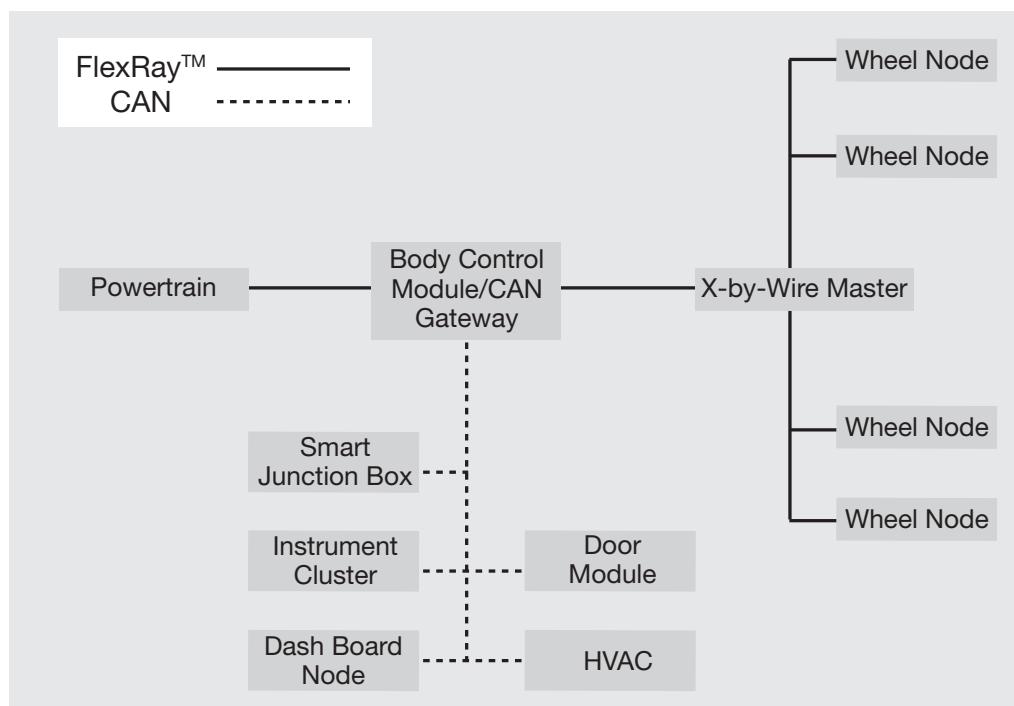
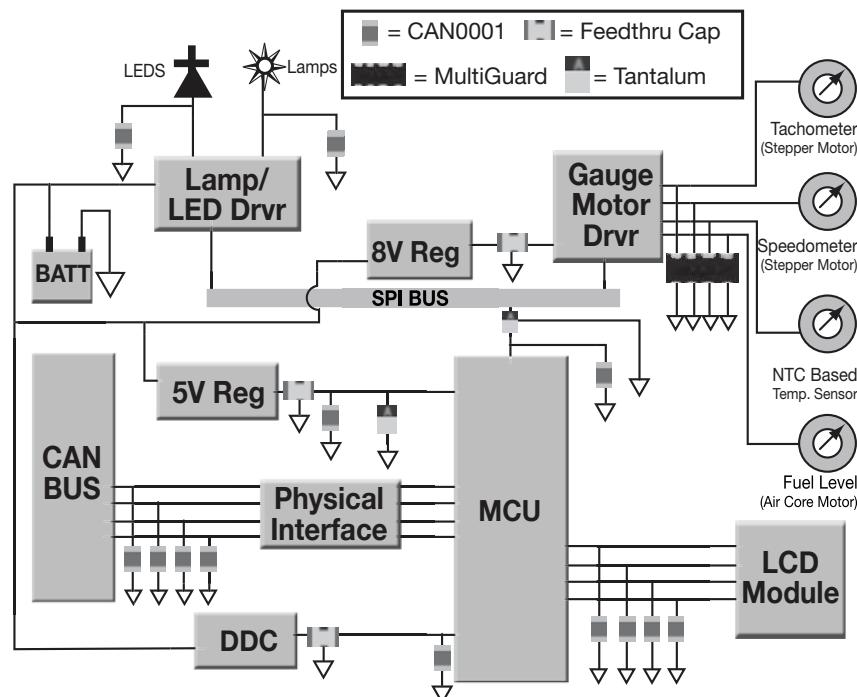
| | A | B | C | D | E |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0402 Discrete | 0.61 (0.024) | 0.51 (0.020) | 1.70 (0.067) | - | - |
| 0603 Discrete | 0.89 (0.035) | 0.76 (0.030) | 2.54 (0.100) | - | - |
| 0405 Array | 0.46 (0.018) | 0.74 (0.029) | 0.12 (0.047) | 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) |

Communication BUS Varistor

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 20 μ S
- FIT rate ≤ 0.1 failures (per billion hours)



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