MultiGuard (2 & 4 Elements)
AVX Multilayer Ceramic Transient Voltage Suppression Arrays – ESD Protection for CMOS and Bi Polar Systems

GENERAL DESCRIPTION
AVX’s Transient Voltage Suppression (TVS) Arrays address six trends in today’s electronic circuits: (1) mandatory ESD protection, (2) mandatory EMI control, (3) signal integrity improvement, (4) PCB downsizing, (5) reduced component placement costs, and (6) protection from induced slow speed transient voltages and currents.

AVX’s MultiGuard products offer numerous advantages, which include a faster turn-on-time (<1nS), repetitive strike capability, and space savings. In some cases, MultiGuard consumes less than 75% of the PCB real estate required for the equivalent number of discrete chips. This size advantage, coupled with the savings associated with placing only one chip, makes MultiGuard the TVS component of choice for ESD protection of I/O lines in portable equipment and programming ports in cellular phones. Other applications include differential data line protection, ASIC protection and LCD driver protection for portable computing devices.

GENERAL CHARACTERISTICS
- Operating Temperature: -55°C to 125°C
- Working Voltage: 5.6Vdc-18Vdc
- Case Size: 0405 2x Array
  0508 2x Array
  0612 4x Array
- Energy: 0.02-0.1J
- Peak Current: 15-30A

FEATURES
- Bi-Directional protection
- Very fast response time to ESD strikes
- EMI/RFI filtering in the off-state
- 2 and 4 element arrays
- Multiple lines protection
- Space saving
- Pick & place cost savings

APPLICATIONS
- I/O Lines
- Portable equipment
- Cell phones, radios
- Programming ports
- Differential data lines
- ASIC
- LCD driver
- and more

HOW TO ORDER

<table>
<thead>
<tr>
<th>MG</th>
<th>04</th>
<th>2</th>
<th>L</th>
<th>14</th>
<th>A</th>
<th>300</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultiGuard</td>
<td>Case</td>
<td>Configuration</td>
<td>Style</td>
<td>Working Voltage</td>
<td>Energy Rating</td>
<td>Clamping Voltage</td>
<td>Packaging</td>
<td>Termination</td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>2 = 2 Elements</td>
<td>S = Standard Construction</td>
<td>05 = 5.6VDC</td>
<td>A = 0.10 Joules</td>
<td>150 = 18V</td>
<td>(PCS/REEL)</td>
<td>Finish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 = 4 Elements</td>
<td>L = Low Capacitance</td>
<td>09 = 9.0VDC</td>
<td>V = 0.02 Joules</td>
<td>200 = 22V</td>
<td>D = 1,000</td>
<td>P = Ni/Sn</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14 = 14.0VDC</td>
<td>X = 0.05 Joules</td>
<td>300 = 32V</td>
<td>R = 4,000</td>
<td>(Plated)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18 = 18.0VDC</td>
<td></td>
<td>400 = 42V</td>
<td>T = 10,000</td>
<td></td>
</tr>
</tbody>
</table>

080216
MultiGuard (2 & 4 Elements)
AVX Multilayer Ceramic
Transient Voltage Suppression Arrays
ESD Protection for CMOS and Bi Polar Systems

**ELECTRICAL CHARACTERISTICS PER ELEMENT**

<table>
<thead>
<tr>
<th>AVX Part Number</th>
<th>Working Voltage (DC)</th>
<th>Working Voltage (AC)</th>
<th>Breakdown Voltage</th>
<th>Clamping Voltage</th>
<th>Test Current For V&lt;sub&gt;C&lt;/sub&gt;</th>
<th>Maximum Leakage Current</th>
<th>Transient Energy Rating</th>
<th>Peak Current Rating</th>
<th>Typical Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Element 0405 Chip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG042S05X150</td>
<td>5.6</td>
<td>4.0</td>
<td>8.5±20%</td>
<td>18</td>
<td>1</td>
<td>35</td>
<td>0.05</td>
<td>15</td>
<td>300</td>
</tr>
<tr>
<td>MG042L14V400</td>
<td>14.0</td>
<td>10.0</td>
<td>18.5±12%</td>
<td>32</td>
<td>1</td>
<td>15</td>
<td>0.02</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>MG042L18V500</td>
<td>18.0</td>
<td>14.0</td>
<td>28.0±10%</td>
<td>50</td>
<td>1</td>
<td>10</td>
<td>0.02</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>2 Element 0508 Chip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG052S05A150</td>
<td>5.6</td>
<td>4.0</td>
<td>8.5±20%</td>
<td>18</td>
<td>1</td>
<td>35</td>
<td>0.10</td>
<td>30</td>
<td>825</td>
</tr>
<tr>
<td>MG052S09A200</td>
<td>9.0</td>
<td>6.4</td>
<td>12.7±15%</td>
<td>22</td>
<td>1</td>
<td>25</td>
<td>0.10</td>
<td>30</td>
<td>550</td>
</tr>
<tr>
<td>MG052S14A300</td>
<td>14.0</td>
<td>10.0</td>
<td>19.5±12%</td>
<td>32</td>
<td>1</td>
<td>15</td>
<td>0.10</td>
<td>30</td>
<td>425</td>
</tr>
<tr>
<td>MG052S18A400</td>
<td>18.0</td>
<td>14.0</td>
<td>25.5±10%</td>
<td>42</td>
<td>1</td>
<td>10</td>
<td>0.10</td>
<td>30</td>
<td>225</td>
</tr>
<tr>
<td>MG052L18X500</td>
<td>≤18.0</td>
<td>≤14.0</td>
<td>28.0±10%</td>
<td>≤50</td>
<td>1</td>
<td>10</td>
<td>0.10</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>4 Element 0612 Chip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG064S05A150</td>
<td>5.6</td>
<td>4.0</td>
<td>8.5±20%</td>
<td>18</td>
<td>1</td>
<td>35</td>
<td>0.10</td>
<td>30</td>
<td>825</td>
</tr>
<tr>
<td>MG064S09A200</td>
<td>9.0</td>
<td>6.4</td>
<td>12.7±15%</td>
<td>22</td>
<td>1</td>
<td>25</td>
<td>0.10</td>
<td>30</td>
<td>550</td>
</tr>
<tr>
<td>MG064S14A300</td>
<td>14.0</td>
<td>10.0</td>
<td>19.5±12%</td>
<td>32</td>
<td>1</td>
<td>15</td>
<td>0.10</td>
<td>30</td>
<td>425</td>
</tr>
<tr>
<td>MG064S18A400</td>
<td>18.0</td>
<td>14.0</td>
<td>25.5±10%</td>
<td>42</td>
<td>1</td>
<td>10</td>
<td>0.05</td>
<td>15</td>
<td>120</td>
</tr>
<tr>
<td>MG064L18X500</td>
<td>≤18.0</td>
<td>≤14.0</td>
<td>28.0±10%</td>
<td>≤50</td>
<td>1</td>
<td>10</td>
<td>0.10</td>
<td>20</td>
<td>75</td>
</tr>
</tbody>
</table>

**TERMINATION FINISH CODE**
- AVX Working Breakdown Clamping Test Maximum Transient Peak Typical

**Packaging Code**
- DC Working Voltage (V)
- AC Working Voltage (V)
- Typical Breakdown Voltage (V @ 1mA)
- Tolerance is ± from Typical Value

**COMPONENT LAYOUT**

- SIZE: 0405
- SIZE: 0508
- SIZE: 0612
### MultiGuard (2 & 4 Elements)

**AVX Multilayer Ceramic**

**Transient Voltage Suppression Arrays**

**ESD Protection for CMOS and Bi Polar Systems**

---

**PHYSICAL DIMENSIONS AND PAD LAYOUT**

#### 2-ELEMENT MULTIGUARD

**SIZE: 0405**

- L: 1.00±0.15 (0.039±0.006)
- W: 1.37±0.15 (0.054±0.006)
- T: 0.66 MAX (0.026 MAX)
- BW: 0.38±0.10 (0.014±0.004)
- BL: 0.20±0.10 (0.008±0.004)
- P: 0.84 REF (0.033 REF)
- S: 0.32±0.10 (0.012±0.004)

#### 0405 2 Element Dimensions mm (inches)

<table>
<thead>
<tr>
<th>L</th>
<th>W</th>
<th>T</th>
<th>BW</th>
<th>BL</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00±0.15</td>
<td>1.37±0.15</td>
<td>0.66 MAX</td>
<td>0.38±0.10</td>
<td>0.20±0.10</td>
<td>0.84 REF</td>
<td>0.32±0.10</td>
</tr>
</tbody>
</table>

#### 0508 2 Element Dimensions mm (inches)

<table>
<thead>
<tr>
<th>L</th>
<th>W</th>
<th>T</th>
<th>BW</th>
<th>BL</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25±0.20</td>
<td>2.01±0.20</td>
<td>1.02 MAX</td>
<td>0.41±0.10</td>
<td>0.18±0.05</td>
<td>0.76 REF</td>
<td>0.38±0.10</td>
</tr>
</tbody>
</table>

**0508 2 Element Dimensions**

- L: 1.25±0.20 (0.049±0.008)
- W: 2.01±0.20 (0.079±0.008)
- T: 1.02 MAX (0.040 MAX)
- BW: 0.41±0.10 (0.016±0.004)
- BL: 0.18±0.05 (0.007±0.003)
- P: 0.76 REF (0.030 REF)
- S: 0.38±0.10 (0.015±0.004)

#### Pad Layout Dimensions mm (inches)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.46 (0.018)</td>
<td>0.74 (0.029)</td>
<td>1.20 (0.047)</td>
<td>0.38 (0.015)</td>
<td>0.64 (0.025)</td>
</tr>
</tbody>
</table>

#### Pad Layout Dimensions mm (inches)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.89 (0.035)</td>
<td>1.27 (0.050)</td>
<td>2.16 (0.085)</td>
<td>0.46 (0.018)</td>
<td>0.76 (0.030)</td>
</tr>
</tbody>
</table>

#### 0508 2 Element

- A: 0.89 (0.035)
- B: 1.27 (0.050)
- C: 2.16 (0.085)
- D: 0.46 (0.018)
- E: 0.76 (0.030)

#### 0612 4 Element Dimensions mm (inches)

<table>
<thead>
<tr>
<th>L</th>
<th>W</th>
<th>T</th>
<th>BW</th>
<th>BL</th>
<th>P</th>
<th>X</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.60±0.20</td>
<td>3.20±0.20</td>
<td>1.22 MAX</td>
<td>0.41±0.10</td>
<td>0.18±0.05</td>
<td>0.76 REF</td>
<td>1.14±0.10</td>
<td>0.38±0.10</td>
</tr>
</tbody>
</table>

#### Pad Layout Dimensions mm (inches)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.89 (0.035)</td>
<td>1.65 (0.065)</td>
<td>2.54 (0.100)</td>
<td>0.46 (0.018)</td>
<td>0.76 (0.030)</td>
</tr>
</tbody>
</table>

#### Pad Layout Dimensions mm (inches)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.89 (0.035)</td>
<td>1.65 (0.065)</td>
<td>2.54 (0.100)</td>
<td>0.46 (0.018)</td>
<td>0.76 (0.030)</td>
</tr>
</tbody>
</table>

---
MultiGuard (2 & 4 Elements)
AVX Multilayer Ceramic
Transient Voltage Suppression Arrays
ESD Protection for CMOS and Bi Polar Systems

TYPICAL PERFORMANCE CURVES – VOLTAGE/CURRENT CHARACTERISTICS
Multilayer construction and improved grain structure result in excellent transient clamping characteristics in excess of 30 amps (20 amps on MG064L18X500) peak current while maintaining very low leakage currents under DC operating conditions. The VI curves below show the voltage/current characteristics for the 5.6V, 9V, 14V and 18V parts with currents ranging from fractions of a micro amp to tens of amps.

TYPICAL PERFORMANCE CURVES – TEMPERATURE CHARACTERISTICS
MultiGuard suppressors are designed to operate over the full temperature range from -55°C to +125°C.
MultiGuard (2 & 4 Elements)
AVX Multilayer Ceramic
Transient Voltage Suppression Arrays
ESD Protection for CMOS and Bi Polar Systems

**TRANSIENT VOLTAGE SUPPRESSORS – TYPICAL PERFORMANCE CURVES**

![Graph: TYPICAL PULSE RATING CURVE 5.6V MULTIGUARD](image1)

![Graph: TYPICAL PULSE RATING CURVE 14V MULTIGUARD](image2)

**APPLICATION**

Transmitter -> MUX BUS -> 14V - 18V 0.02J -> Receiver

![Diagram: KEYBOARD CONTROLLER](image3)

74AHCT05 FERRITE BEAD
14V - 18V 0.1J

DATA

CLOCK

14V - 18V 0.1J