**APPLICATION BRIEF**

**Controller Area Network (CAN) Bus Surge Protection**

**Bourns® Model CDSOT23-T24CAN**

<table>
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<tr>
<th>Markets</th>
<th>Applications</th>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| • AEC-Q101 Compliant  
• Entertainment applications  
• Comfort applications  
• Industrial automation  
• Medical equipment  
• Computed tomography  
• Linked equipment | • High-speed CANbus  
• Industrial control networks  
• Smart Distribution Systems (SDS)  
• DeviceNet™  
• Factory & process automation systems  
• Lift control systems | • Single device for two I/O lines  
• Low capacitance for high-speed CANbus  
• IEC 61000-4-2 30 kV ESD  
• IEC 61000-4-5 (Level 1, CWG 1.2/50)  
500 V Surge | • Compatible with transceivers that have internal protection against 24 VDC (+ 5%) miswiring  
• Protection capability exceeds IEC 61000-4-2 Level 4 and IEC 61000-4-5 Level 1 |

**Application Information**

**CANbus Communication (n devices/nodes)**

**CANbus Protection Schematic**

\[ R_T \]

\[ RT \]

\[ CDSOT23-T24CAN* \]

Note: Protection may not be required at every node. In many applications, protection at a subset of the total number of nodes is sufficient.

**CDSOT23-T24CAN* Capabilities**

<table>
<thead>
<tr>
<th>CDSOT23-T24CAN</th>
<th>Units</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VDRM</td>
<td>V</td>
<td>[V_{DRM}]</td>
</tr>
<tr>
<td>8 A IPPSM</td>
<td>A</td>
<td>[I_{PPSM}] (8/20 µs Current Waveform)</td>
</tr>
<tr>
<td>30 kV ESD</td>
<td>kV</td>
<td>ESD (Contact)</td>
</tr>
<tr>
<td>26.2 V VBR min.</td>
<td>V</td>
<td>V_{BR min.} @ I_{BR} = 1 mA</td>
</tr>
<tr>
<td>0.1 µA I_R max.</td>
<td>µA</td>
<td>I_R max.</td>
</tr>
<tr>
<td>40 V Typical Clamping Voltage</td>
<td>V</td>
<td>Typical Clamping Voltage @ I_{PPSM}</td>
</tr>
<tr>
<td>22 pF Typical Capacitance (Line to GND)</td>
<td>pF</td>
<td>Typical Capacitance (Line to GND)</td>
</tr>
</tbody>
</table>

* "Q" suffix for AEC-Q101 compliance.
Controller Area Network (CAN) Bus Surge Protection

IEC 61000-4-2 ESD Test

IEC 61000-4-5 Surge Test

The Bourns® Model CDSOT23-T24CAN* dual TVS diode array is designed to protect a CANbus transceiver against surge events per IEC 61000-4-5 (Level 1). The surge test setup below shows an ECAT surge generator connected to the test circuit through two 80 ohm resistors and two coupling devices. The surge generator’s E501B output module, which generates a 1.2/50 µs voltage, 8/20 µs current combination wave, was used for the test. The test circuit was subjected to five 500 V longitudinal (common mode) surges in both the positive and negative polarities. The oscilloscope traces below show the clamp voltage with respect to ground for the CAN H and CAN L signal lines, as well as the total generator surge current, for each of these surges. The peak current on each line is ~ 5.5 A (11 A total for two lines) when subjected to the 500 V surge. The TVS diode clamped the voltage at the I/O of the transceiver to within 37 V during the surge. No change in performance or in supply current was measured after the surge test was completed.

Summary

The robust surge and ESD protection capability of Bourns® Model CDSOT23-T24CAN*, protecting CANbus transceivers against IEC 61000-4-5 Level 1 500 V surges and IEC 61000-4-2 30kV ESD, has been demonstrated. Its minimum breakdown voltage of 26.2 V is designed to work in conjunction with a transceiver capable of withstanding a 24 V power cross event caused by miswiring.

Additional Resources

For more information on Bourns® TVS diodes and diode arrays, please visit:

www.bourns.com