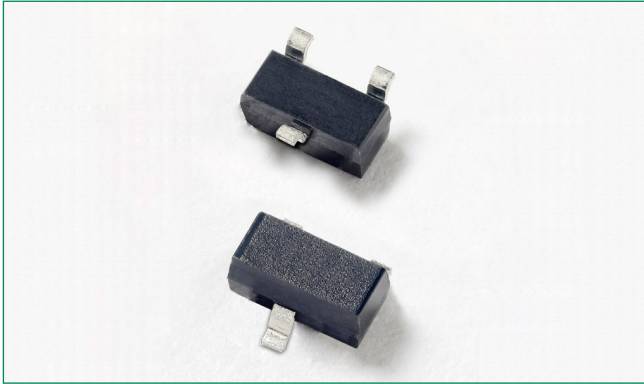


# AQ24CANA Series

## General Purpose ESD Protection



### Description

The AQ24CANA TVS Diode Array is designed to protect automotive Controller Area Network (CAN) lines from damage due to electrostatic discharge (ESD), electrical fast transient (EFT), and other overvoltage transients.

The AQ24CANA can absorb repetitive ESD strikes above the maximum level specified in IEC 61000-4-2 international standard without performance degradation and safely dissipate 5A of 8/20 $\mu$ s surge current (IEC 61000-4-5 2nd Edition) with very low clamping voltages.

### Features & Benefits

- ESD, IEC 61000-4-2,  $\pm 27$ kV contact,  $\pm 30$ kV air
- EFT, IEC 61000-4-4, 50A (5/50ns)
- Lightning, 5A (8/20 $\mu$ s as defined in IEC 61000-4-5 2nd Edition)
- PPAP capable
- Low clamping voltage
- Low leakage current
- ESD, ISO 10605, 330pF 330 $\Omega$ ,  $\pm 27$ kV contact,  $\pm 30$ kV air
- AEC-Q101 qualified
- Halogen-Free, Lead-Free and RoHS-Compliant
- Moisture Sensitivity Level(MSL -1)

### Additional Information



Resources

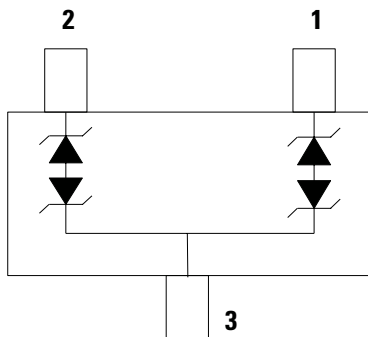


Accessories



Samples

### Pinout and Functional Block Diagram



### Applications

- Automotive Applications
- CAN Bus
- Electronic Control Units
- Body Control Units
- ADAS Control Units
- PowerTrain Control Units
- Telematics and Connectivity
- LED Lighting Control

Life Support Note:

**Not Intended for Use in Life Support or Life Saving Applications**

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

# AQ24CANA Series

## General Purpose ESD Protection

### Absolute Maximum Ratings

| Symbol     | Parameter                              | Value      | Units |
|------------|--|------------|-------|
| $P_{PK}$   | Peak Pulse Power ( $t_p=8/20\mu s$ )   | 250        | W     |
| $I_{PP}$   | Peak Pulse Current ( $t_p=8/20\mu s$ ) | 5.0        | A     |
| $T_{OP}$   | Operating Temperature                  | -40 to 150 | °C    |
| $T_{STOR}$ | Storage Temperature                    | -55 to 150 | °C    |

**Caution:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### Electrical Characteristics ( $T_{OP}=25^\circ C$ )

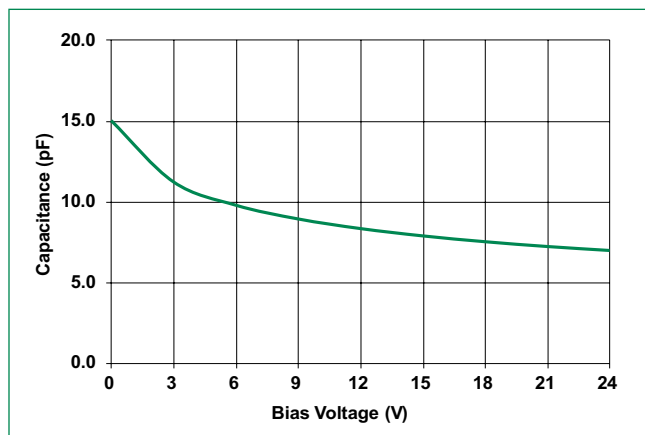
| Parameter                          | Symbol        | Test Conditions   | Min      | Typ  | Max | Units    |
|------------------------------------|---------------|---|----------|------|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     | $I_R=1\mu A$ , Pin 1 or Pin 2 to Pin 3                  | -        | -    | 24  | V        |
| Breakdown Voltage                  | $V_{BR}$      | $I_R=1mA$ , Pin 1 or Pin 2 to Pin 3                     | 26.7     | 28   | -   | V        |
| Reverse Leakage Current            | $I_{LEAK}$    | $V_R=24V$   | -        | 0.02 | 0.1 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A$ , $t_p=8/20\mu s$ , Pin 1 or Pin 2 to Pin 3 | -        | 34   | 36  | V        |
|                                    |               | $I_{PP}=5A$ , $t_p=8/20\mu s$ , Pin 1 or Pin 2 to Pin 3 | -        | 47   | 50  | V        |
| Dynamic Resistance <sup>2</sup>    | $R_{DYN}$     | TLP, $t_p=100ns$ , Pin 1 or Pin 2 to Pin 3              | -        | 0.7  | -   | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC 61000-4-2 (Contact Discharge)                       | $\pm 27$ | -    | -   | kV       |
|                                    |               | IEC 61000-4-2 (Air Discharge)                           | $\pm 30$ | -    | -   | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V, $f=1MHz$ ;<br>Pin 1 or Pin 2 to Pin 3  | -        | 15   | 17  | pF       |

**Note:**

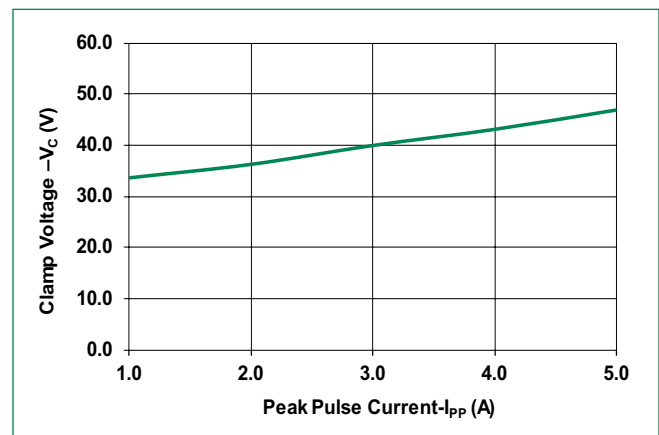
<sup>1</sup> Parameter is guaranteed by design and/or component characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

#### Capacitance vs. Reverse Bias (Pin1 or Pin2 to Pin3)



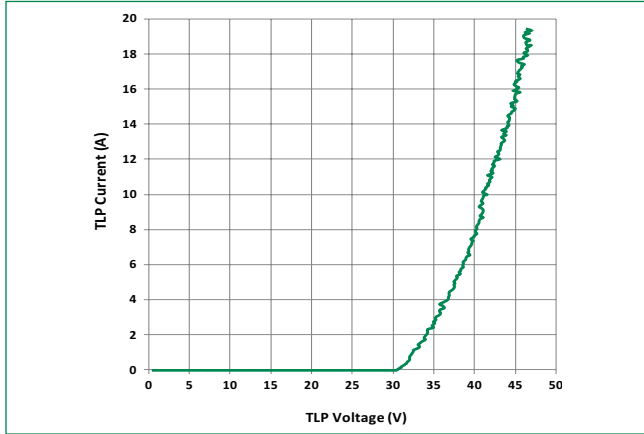
#### Clamping Voltage vs. Peak Pulse Current



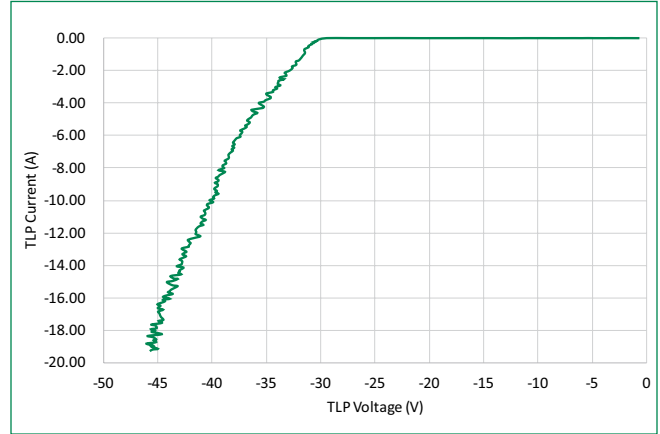
# AQ24CANA Series

## General Purpose ESD Protection

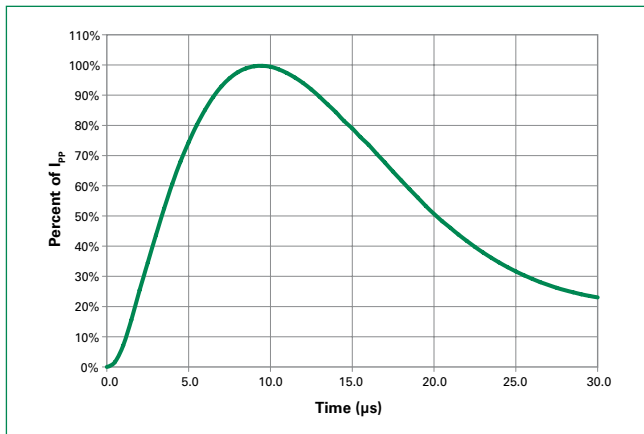
**Positive Transmission Line Pulsing (TLP) Plot**



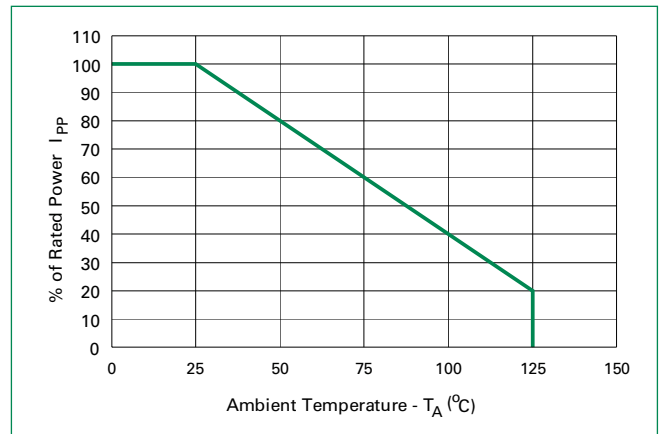
**Negative Transmission Line Pulsing (TLP) Plot**



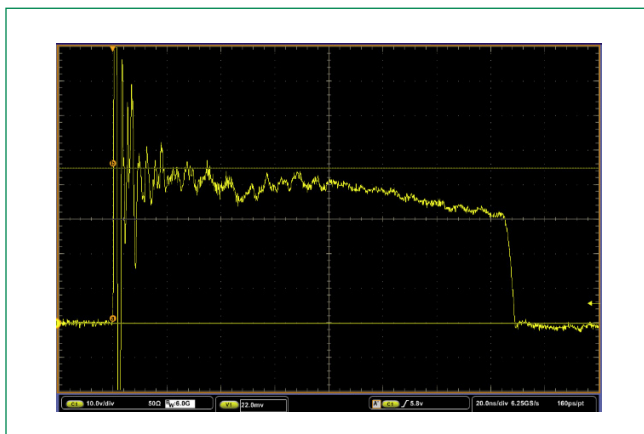
**8/20µs Pulse Waveform**



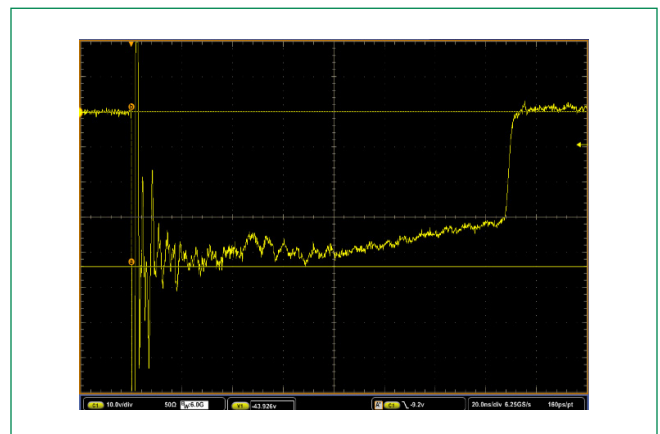
**Power Derating Curve**



**IEC 61000-4-2 +8kV Contact ESD Clamping Voltage**



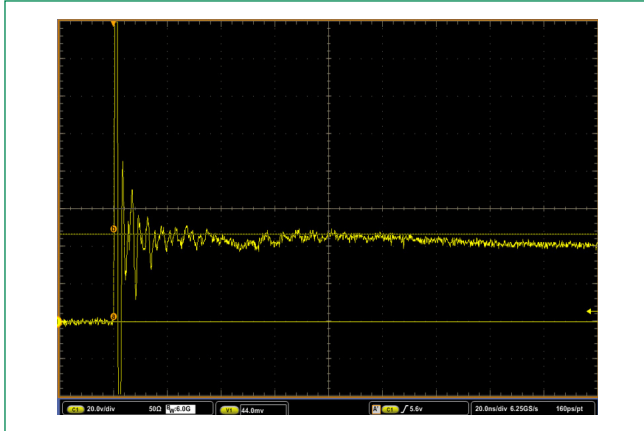
**IEC 61000-4-2 -8kV Contact ESD Clamping Voltage**



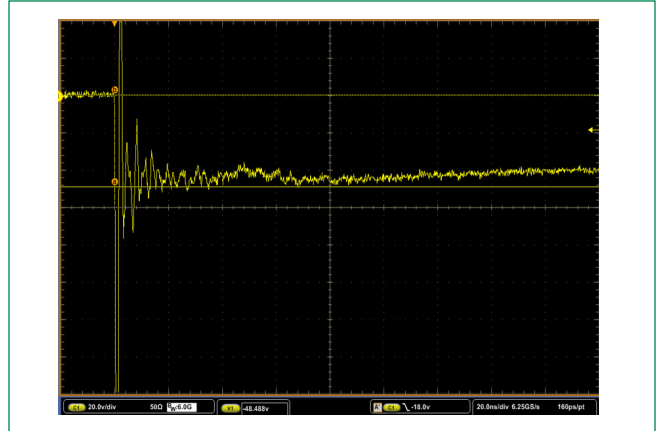
# AQ24CANA Series

## General Purpose ESD Protection

ISO 10605 (C:330pF, R:330Ω)  
contact discharge plot at +8kV

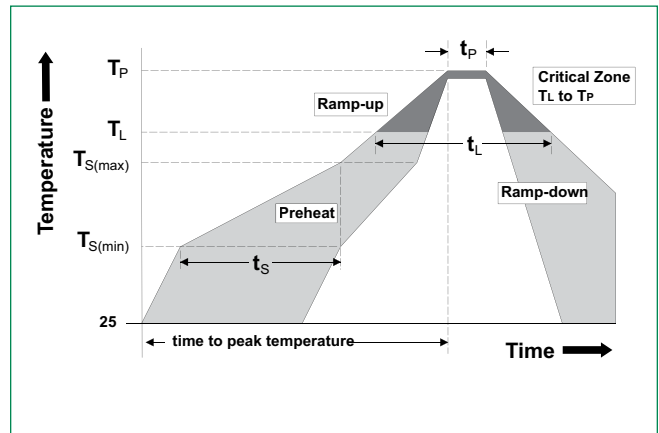


ISO 10605 (C:330pF, R:330Ω)  
contact discharge plot at -8kV

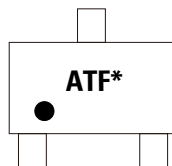


## Soldering Parameters

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <b>Reflow Condition</b>  |                                    | Pb – Free assembly      |
| <b>Pre Heat</b>  | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 120 secs           |
| <b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>  | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|  | - Temperature ( $t_L$ )            | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 30 seconds              |
| <b>Ramp-down Rate</b>  |                                    | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes Max.          |
| <b>Do not exceed</b>   |                                    | 260°C                   |



## Part Marking System



AT = Part code  
F = Assembly code  
\* = Date code

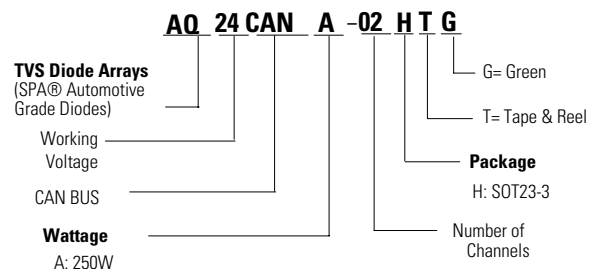
## Ordering Information

| Part Number    | Package | Min. Order Qty. |
|----------------|---------|-----------------|
| AQ24CANA-02HTG | SOT23-3 | 3000            |

## Product Characteristics

|                           |  |
|---------------------------|--|
| <b>Lead Plating</b>       | Matte Tin  |
| <b>Lead Material</b>      | Copper Alloy   |
| <b>Lead Coplanarity</b>   | 0.004 inches(0.102mm)                                  |
| <b>Substrate Material</b> | Silicon  |
| <b>Body Material</b>      | Molded Compound  |
| <b>Flammability</b>       | UL Recognized compound meeting flammability rating V-0 |

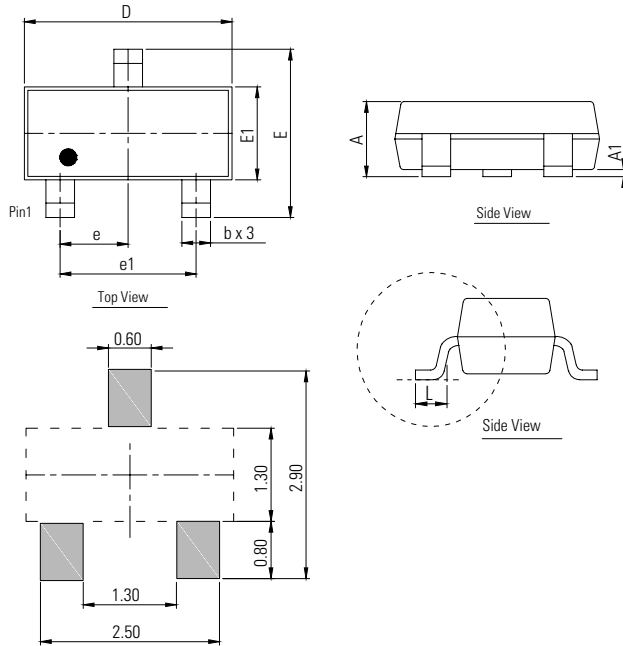
## Part Numbering System



# AQ24CANA Series

## General Purpose ESD Protection

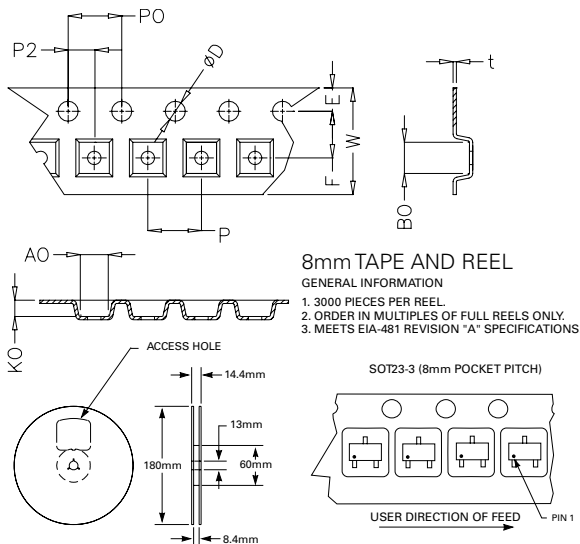
### Package Dimensions – SOT23-3



Recommended soldering pad layout (unit :mm)  
Drawing# : H01-B

| Package | SOT23-3     |      |      |           |       |       |
|---------|-------------|------|------|-----------|-------|-------|
| Pins    | 3           |      |      |           |       |       |
| JEDEC   | TO-236      |      |      |           |       |       |
| Symbol  | Millimeters |      |      | Inches    |       |       |
|         | Min         | Nom  | Max  | Min       | Nom   | Max   |
| A       | 0.90        | 1.00 | 1.11 | 0.035     | 0.039 | 0.044 |
| A1      | 0.013       | -    | 0.1  | 0.001     | -     | 0.004 |
| b       | 0.37        | 0.44 | 0.51 | 0.015     | 0.017 | 0.020 |
| D       | 2.80        | 2.95 | 3.04 | 0.110     | 0.116 | 0.120 |
| E       | 2.10        | 2.40 | 2.64 | 0.083     | 0.094 | 0.104 |
| E1      | 1.20        | 1.30 | 1.40 | 0.047     | 0.051 | 0.055 |
| e       | 0.95 BSC    |      |      | 0.037 BSC |       |       |
| e1      | 1.90 BSC    |      |      | 0.075 BSC |       |       |
| L       | 0.30        | 0.45 | 0.55 | 0.012     | 0.018 | 0.022 |

### Embossed Carrier Tape & Reel Specification – SOT23-3



| Symbol | Millimeters |      | Inches |       |
|--------|-------------|------|--------|-------|
|        | Min         | Max  | Min    | Max   |
| E      | 1.65        | 1.85 | 0.065  | 0.073 |
| F      | 3.40        | 3.60 | 0.134  | 0.142 |
| P2     | 1.90        | 2.10 | 0.075  | 0.083 |
| D      | 1.40        | 1.60 | 0.055  | 0.063 |
| P0     | 3.90        | 4.10 | 0.154  | 0.161 |
| W      | 7.70        | 8.30 | 0.303  | 0.327 |
| P      | 3.90        | 4.10 | 0.154  | 0.161 |
| A0     | 3.05        | 3.25 | 0.120  | 0.128 |
| B0     | 2.67        | 2.87 | 0.105  | 0.113 |
| K0     | 1.12        | 1.32 | 0.044  | 0.052 |
| t      | 0.22        | 0.24 | 0.009  | 0.009 |

**Disclaimer Notice** - Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, automotive, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse. "Littelfuse" includes Littelfuse, Inc., and all of its affiliate entities. <http://www.littelfuse.com/disclaimer-electronics>