



# 500 W, Unidirectional **Low Capacitance TVS Array**

**HALOGEN FREE** 

#### **DESCRIPTION**

This Transient Voltage Suppressor (TVS) is assembled in a QFN-143 package which has the same pinout and footprint as the SOT-143 package. The configuration gives protection to 1 unidirectional data or interface line. It is designed for use in applications where low capacitance protection is required at the board level from voltage transients caused by electrostatic discharge (ESD) as defined in IEC 61000-4-2, electrical fast transients (EFT) per IEC 61000-4-4 and the secondary effects of lightning. These TVS arrays have a peak power rating of 500 watts for an 8/20 µs pulse (figure 1). With a capacitance of only 3 pF, this part can provide protection to very fast data lines including USB at 900 Mbits/sec.





**QFN-143** 

Important: For the latest information, visit our website <a href="http://www.microsemi.com">http://www.microsemi.com</a>.

#### **FEATURES**

- Protects 1 unidirectional line
- Surge protection per IEC 61000-4-2 and IEC 61000-4-4
- Ultra low capacitance
- Low profile surface mount package
- RoHS compliant

## Also available:

**Bidirectional** (QFN-143) USBQ50403Ce3

USBQ50424Ce3

#### **APPLICATIONS / BENEFITS**

- EIA RS485 data rates: 5 Mbps
- 10 Base-T Ethernet
- USB data rate 900 Mbps

## MAXIMUM RATINGS @ 25 °C unless otherwise noted

| Parameters/Test Conditions  | Symbol           | Value       | Unit |
|---|------------------|-------------|------|
| Storage Temperature   | T <sub>STG</sub> | -55 to +150 | °C   |
| Junction Temperature  | TJ               | -55 to +125 | °C   |
| Peak Pulse Power Dissipation with a 8/20µs waveform (with a duty factor of 0.01%) | P <sub>PP</sub>  | 500         | W    |
| Solder Temperature @ 10 s   |                  | 260         | °C   |

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#### Website:

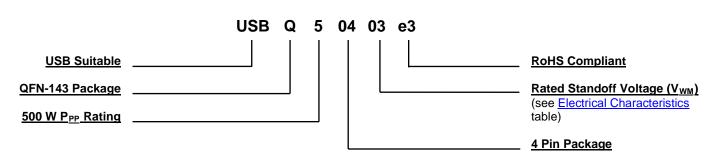
www.microsemi.com



## **MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0.
- TERMINALS: RoHS compliant annealed matte-tin plating. Readily solderable per MIL-STD-750, method 2026.
- MARKING: Body marked with part number code (Qxx).
- POLARITY: Dot in corner indicates pin 1.
- TAPE-AND-REEL: Standard per EIA-481-B (add "TR" suffix to part number). Consult factory for quantities.
- Approximately 16.53 milligrams
- See <u>Package Dimensions</u> on last page.

#### PART NOMENCLATURE



| SYMBOLS & DEFINITIONS |   |  |  |  |
|-----------------------|---|--|--|--|
| Symbol                | Definition  |  |  |  |
| $\alpha_{V(BR)}$      | Temperature Coefficient of Breakdown Voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.   |  |  |  |
| I <sub>(BR)</sub>     | Breakdown Current: The current used for measuring Breakdown Voltage V <sub>(BR)</sub> .   |  |  |  |
| I <sub>D</sub>        | Standby Current: The current through the device at rated stand-off voltage.   |  |  |  |
| I <sub>PP</sub>       | Peak Impulse Current: The maximum rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives. |  |  |  |
| $V_{(BR)}$            | Breakdown Voltage: The voltage across the device at a specified current I <sub>(BR)</sub> in the breakdown region.  |  |  |  |
| V <sub>C</sub>        | Clamping Voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current (I <sub>PP</sub> ) for a specified waveform.  |  |  |  |
| V <sub>WM</sub>       | Working Standoff Voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.  |  |  |  |

## ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated

| PART<br>NUMBER | DEVICE<br>MARKING | STAND-<br>OFF<br>VOLTAGE<br>V <sub>WM</sub><br>Volts | BREAKDOWN<br>VOLTAGE<br>V <sub>BR</sub><br>@ 1 mA<br>Volts | CLAMPING VOLTAGE V <sub>C</sub> @ 1 Amp (Figure 2) Volts | CLAMPING VOLTAGE V <sub>C</sub> @ 5 Amp (Figure 2) Volts | STANDBY<br>CURRENT<br>I <sub>D</sub><br>@ V <sub>WM</sub><br>µA | CAPACITANCE<br>(f= 1 MHz)<br>C<br>@ 0 V<br>pF | TEMPERATURE COEFFICIENT OF V <sub>BR</sub> α <sub>VBR</sub> mV/°C |
|----------------|-------------------|--|--|--|--|---|---|---|
|                |                   | MAX  | MIN  | MAX  | MAX  | MAX   | MAX   | MAX   |
| USBQ50403e3    | Q03               | 3.3  | 4.0  | 8.0  | 11   | 200   | 3   | -5  |
| USBQ50405e3    | Q05               | 5.0  | 6.0  | 10.8   | 12   | 40  | 3   | 1   |
| USBQ50412e3    | Q12               | 12.0   | 13.3   | 19.0   | 26   | 1   | 3   | 8   |
| USBQ50415e3    | Q15               | 15.0   | 16.7   | 24.0   | 32   | 1   | 3   | 11  |
| USBQ50424e3    | Q24               | 24.0   | 26.7   | 43.0   | 57   | 1   | 3   | 28  |



## **GRAPHS**

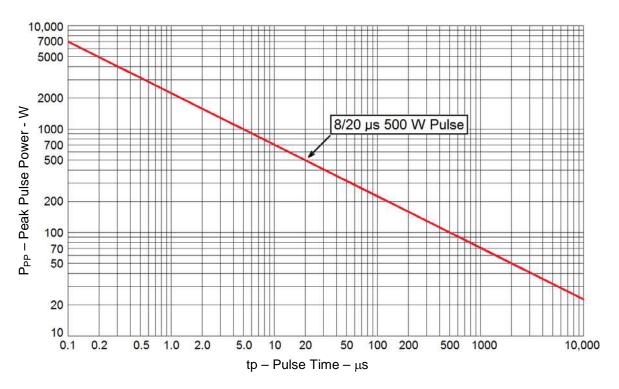


FIGURE 1
Peak Pulse Power vs. Pulse Time

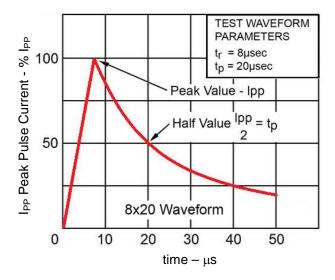
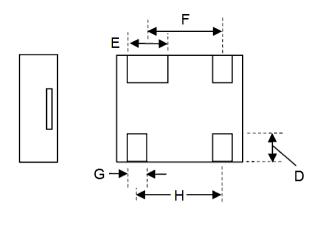


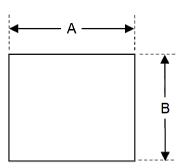
FIGURE 2
Pulse Waveform

1.92 NOM



## **PACKAGE DIMENSIONS**

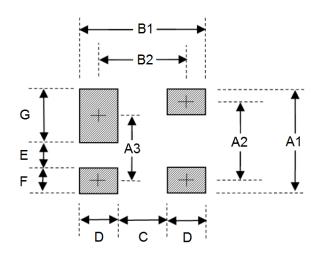




|      | Dimensions |        |          |        |  |
|------|------------|--------|----------|--------|--|
| Ref. | Inch       |        | Millin   | neters |  |
|      | Min        | Max    | Min      | Max    |  |
| Α    | 0.112      | 0.116  | 2.85     | 2.95   |  |
| В    | 0.096      | 0.100  | 2.45     | 2.55   |  |
| С    | 0.0354     | 0.0366 | 0.900    | 0.930  |  |
| D    | 0.020      | 0.024  | 0.50     | 0.60   |  |
| Е    | 0.031      | NOM    | 0.80 NOM |        |  |
| F    | 0.069 NOM  |        | 1.75     | MOM    |  |
| G    | 0.018      | NOM    | 0.45     | MOM    |  |

0.076 NOM

# **PAD LAYOUT**

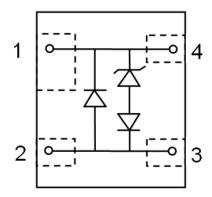


|      | Dimensions |             |  |  |
|------|------------|-------------|--|--|
| Ref. | Inch       | Millimeters |  |  |
|      | Nominal    | Nominal     |  |  |
| A1   | 0.112      | 2.85        |  |  |
| A2   | 0.079      | 2.00        |  |  |
| A3   | 0.071      | 1.80        |  |  |
| B1   | 0.108      | 2.75        |  |  |
| B2   | 0.075      | 1.90        |  |  |
| С    | 0.041      | 1.05        |  |  |
| D    | 0.033      | 0.85        |  |  |
| E    | 0.032      | 0.80        |  |  |
| F    | 0.033      | 0.85        |  |  |
| G    | 0.047      | 1.20        |  |  |

See schematic on next page



# **SCHEMATIC**



Seen from above