

# USB Series

## Multilayer Varistors for Universal Serial BUS Protection



### DESCRIPTION

USB Series varistors are designed to protect the high speed data lines against ESD transients. They have very low capacitance and fast turn on times that makes this series ideal for data and transmission lines with high data rates. The unique design enables these devices to meet the rigorous testing criteria of the IEC 61000-4 standards. New and improved manufacturing process has created these USB series to be one of the best plated varistors in the market today.

### FEATURES

- Zinc Oxide (ZnO) based ceramic semiconductor devices with non-linear voltage-current characteristics
- Bi-directional device, similar to back-to-back Zener diodes plus an EMC capacitor in parallel
- Entire structure made up of conductive ZnO grains surrounded by electrically insulating barriers, creating varistor like behavior.
- Electrical advantages over Zener diodes are repetitive strike capability, high in rush current capability, fast turn-on-time and EMI attenuation.
- Protects against ESD to meet IEC 61000-4-2 15kV (air) and 8kV (Contact)
- Low Capacitance for high speed datalines
- Available in discrete and array packages (2, 3 and 4 element)
- Low Clamping Voltage
- Low Operating Voltage
- Response time is < 1ns.

### MECHANICAL CHARACTERISTICS

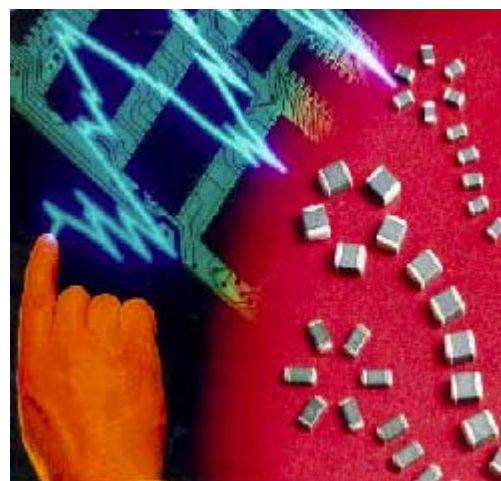
- Available in EIA 0603 (Single), 0405 (Dual), and 0612 (Quad) cases
- Plated Tin over Nickel Barrier
- Packaged in Tape & Reel

### PART NUMBERING

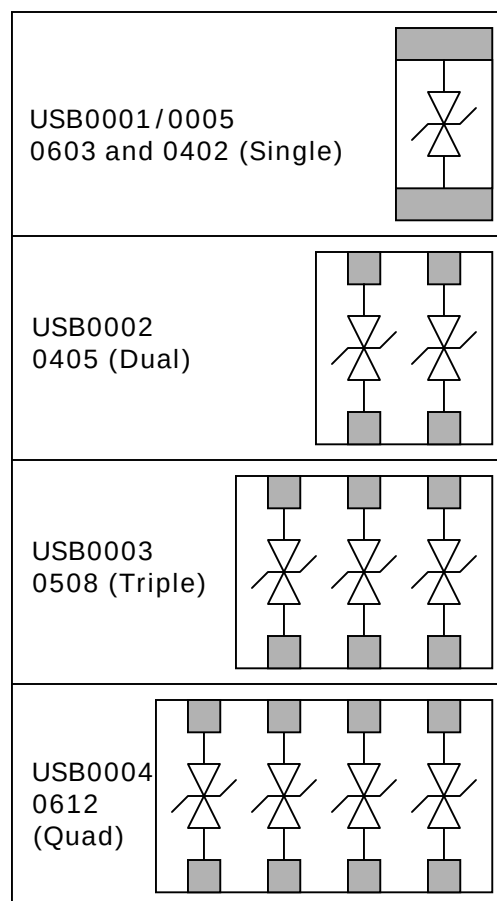
| <u>USB</u> | <u>0001</u>        | <u>D</u>           | <u>P</u>         |
|------------|--------------------|--------------------|------------------|
| Series     | Case Size          | Packaging          | Terminations     |
|            | 0001=0603 (Single) | D = 7" (1000 pcs)  | P = Plated Ni/Sn |
|            | 0002=0405 (2-Elem) | R = 7" (4000 pcs)  | Q = 100% Sn      |
|            | 0003=0508 (3-Elem) | T = 13" (10000pcs) | X = Pt/Pd/Ag     |
|            | 0004=0612 (4-Elem) |                    |                  |
|            | 0005=0402 (Single) |                    |                  |

### TYPICAL APPLICATIONS

- USB BUS Lines / Firewire Data BUS Lines
- I/O BUS Lines
- 10/100/1000 Ethernet Transmission Lines
- Video card Data Lines
- Handheld Devices
- Laptop Computers
- LCD Monitors



### PINOUT CONFIGURATION



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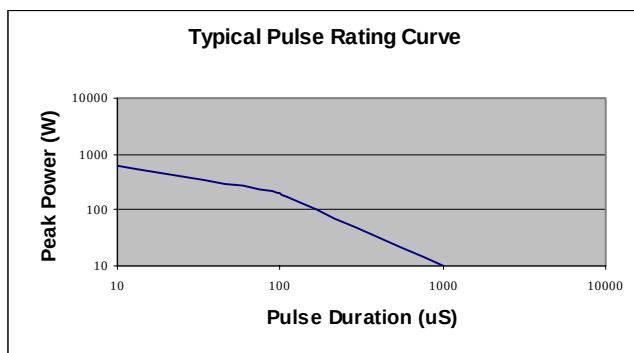
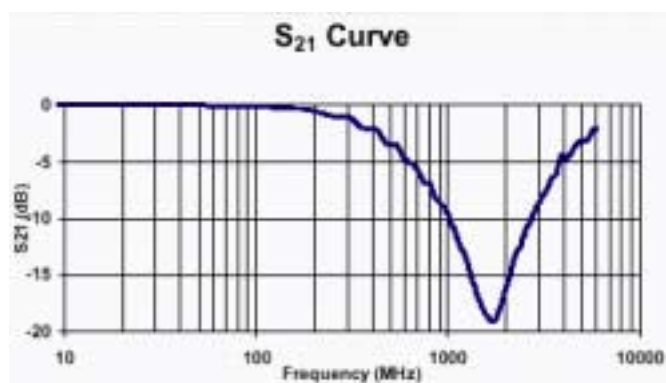
## ELECTRICAL RATINGS

|                       |              |
|-----------------------|--------------|
| Air Discharge ESD     | 15kV         |
| Contact Discharge ESD | 8kV          |
| Oper. Temperature     | -55 to +125C |
| Soldering Temperature | 230C         |

## PERFORMANCE CHARACTERISTICS

| Device  | $V_{Work}$ | $V_{BR}$<br>(Typical) | $E_{Trans}$<br>(Max, 10X1000 us) | Capacitance<br>(Typical @ 1MHz) | $I_{peak}$<br>(Max, 8X20 us) |
|---------|------------|-----------------------|----------------------------------|---------------------------------|------------------------------|
| USB0001 | <18V       | 65V                   | 15mJ                             | 10pF                            | 4A                           |
| USB0002 | <18V       | 70V                   | 15mJ                             | 10pF                            | 4A                           |
| USB0003 | <18V       | 180V                  | 15mJ                             | 10pF                            | 4A                           |
| USB0004 | <18V       | 90V                   | 15mJ                             | 10pF                            | 4A                           |
| USB0005 | <18V       | 250V                  | 15mJ                             | 3pF                             | 2A                           |

## TYPICAL S21 CHARACTERISTICS

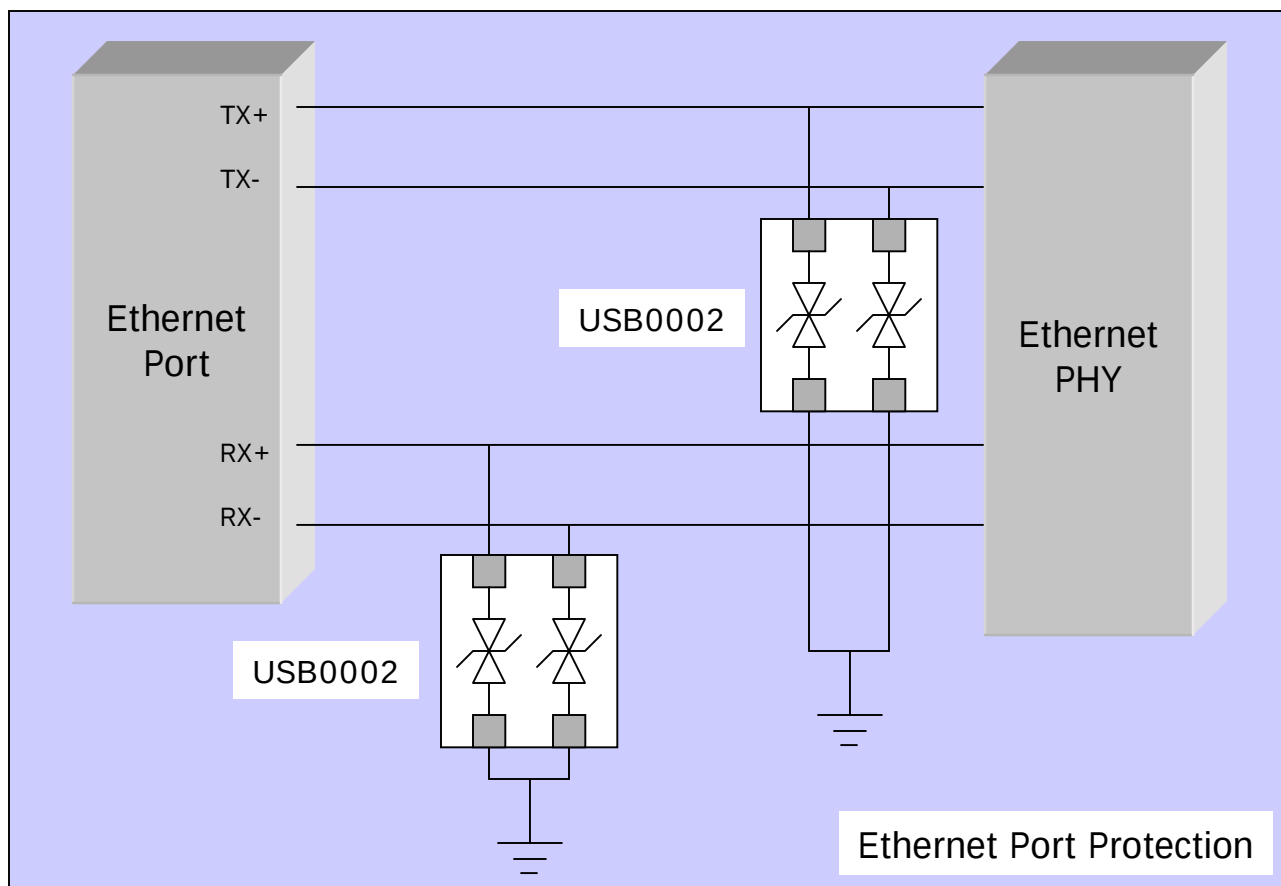
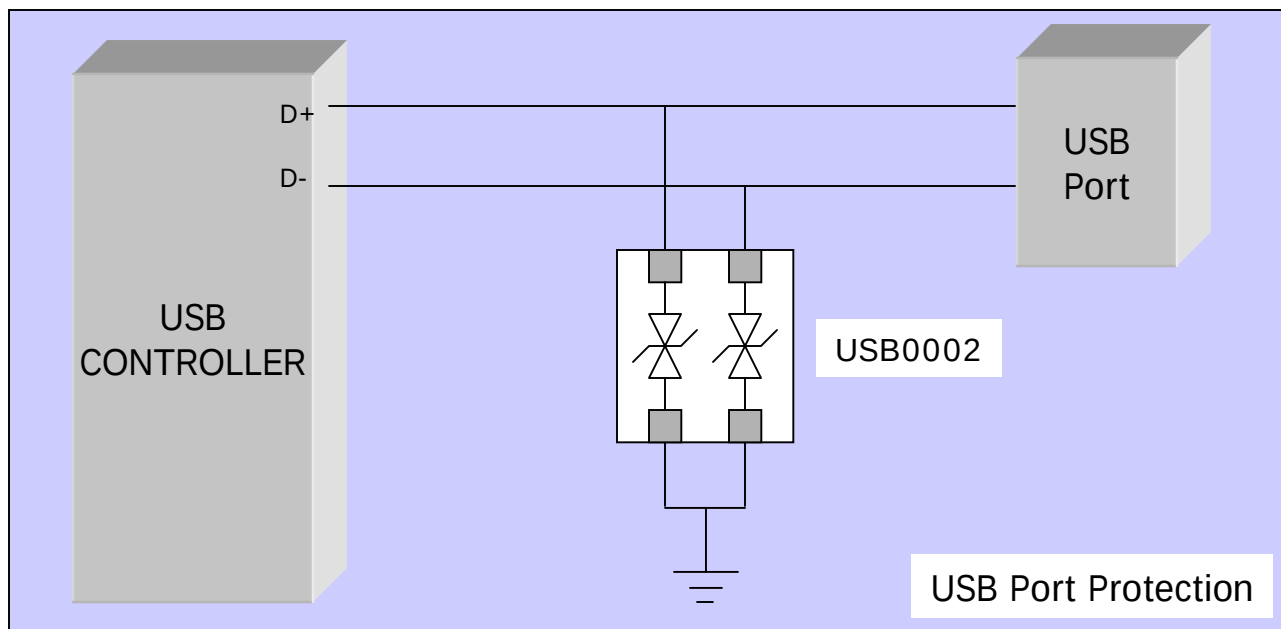


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## APPLICATIONS

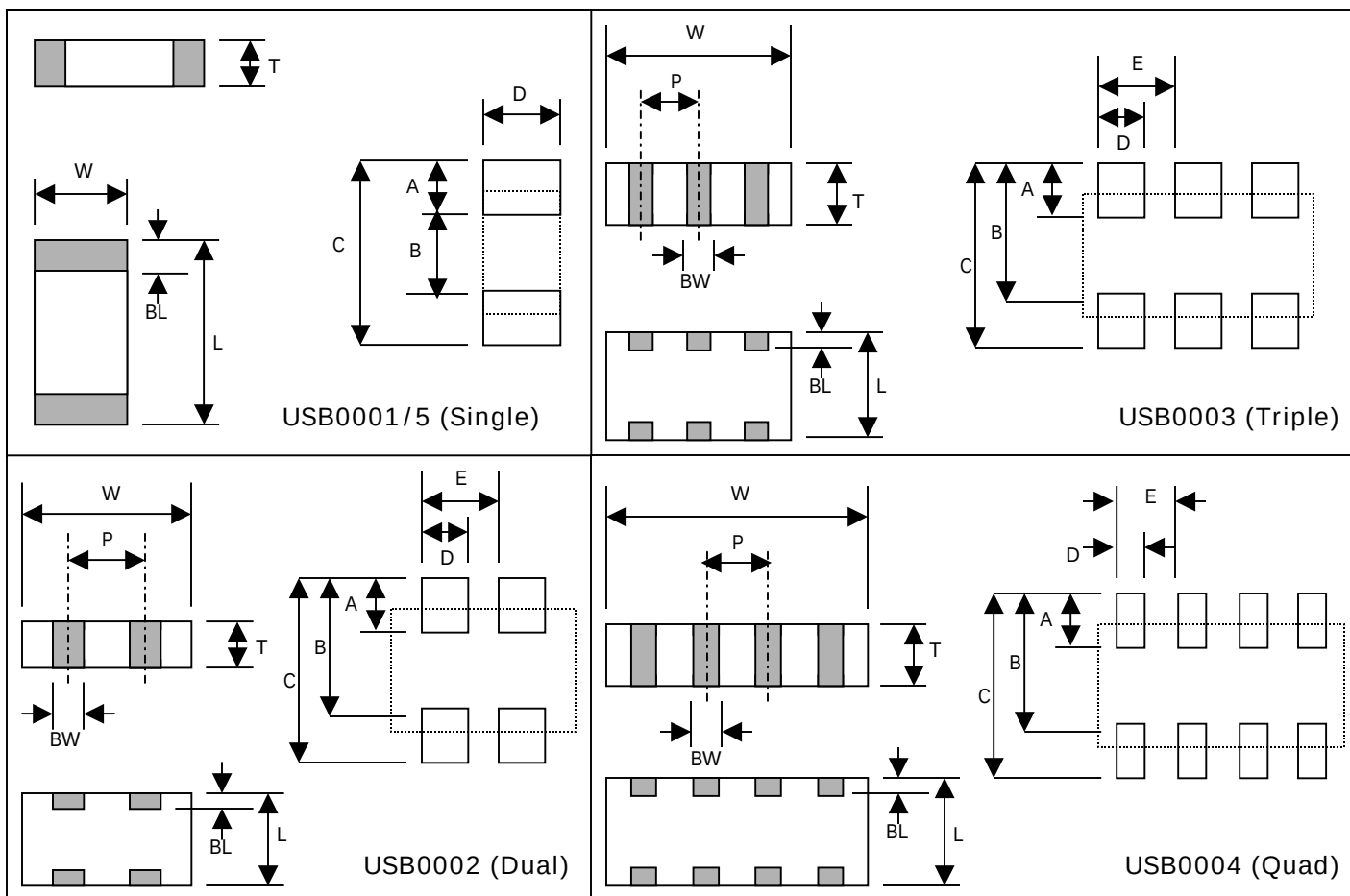


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## PHYSICAL DIMENSIONS AND PAD LAYOUT



## PHYSICAL DIMENSIONS

mm(in)

| L                                   | W                                   | T                      | BW                                   | BL                                         | P                     |
|-------------------------------------|-------------------------------------|------------------------|--------------------------------------|--------------------------------------------|-----------------------|
| USB0001                             |                                     |                        |                                      |                                            |                       |
| 1.6 $\pm$ .15<br>(.063 $\pm$ .006)  | .8 $\pm$ .15<br>(.032 $\pm$ .006)   | .9 Max<br>(.035 Max)   | NA                                   | .35 $\pm$ .15<br>(.014 $\pm$ .006)         | NA                    |
| USB0002                             |                                     |                        |                                      |                                            |                       |
| 1.00 $\pm$ .15<br>(.039 $\pm$ .006) | 1.37 $\pm$ .15<br>(.054 $\pm$ .006) | .66 Max<br>(.026 Max)  | .36 $\pm$ .10<br>(.014 $\pm$ .004)   | .20 $\pm$ .10<br>(.008 $\pm$ .004)         | .64 REF<br>(.025 REF) |
| USB0003                             |                                     |                        |                                      |                                            |                       |
| 1.27 $\pm$ .20<br>(.050 $\pm$ .008) | 2.03 $\pm$ .20<br>(.080 $\pm$ .008) | .965 Max<br>(.038 Max) | .254 $\pm$ .100<br>(.010 $\pm$ .004) | .18 $\pm$ .25-.08<br>(.007 $\pm$ .01-.003) | .64 REF<br>(.025 REF) |
| USB0004                             |                                     |                        |                                      |                                            |                       |
| 1.60 $\pm$ .20<br>(.063 $\pm$ .008) | 3.20 $\pm$ .20<br>(.126 $\pm$ .008) | 1.22 Max<br>(.048 Max) | .41 $\pm$ .10<br>(.016 $\pm$ .004)   | .18 $\pm$ .25-.08<br>(.007 $\pm$ .01-.003) | .76 REF<br>(.030 REF) |
| USB0005                             |                                     |                        |                                      |                                            |                       |
| 1.0 $\pm$ .1<br>(.040 $\pm$ .004)   | .5 $\pm$ .1<br>(.020 $\pm$ .004)    | .6 Max<br>(.024 Max)   | NA                                   | .25 $\pm$ .15<br>(.010 $\pm$ .006)         | NA                    |

## PAD DIMENSIONS

mm(in)

| A             | B              | C              | D             | E             |
|---------------|----------------|----------------|---------------|---------------|
| USB0001       |                |                |               |               |
| .89<br>(.035) | 0.76<br>(.030) | 2.54<br>(.100) | .76<br>(.030) | NA            |
| USB0002       |                |                |               |               |
| .46<br>(.018) | .74<br>(.029)  | 1.20<br>(.047) | .30<br>(.012) | .64<br>(.025) |
| USB0003       |                |                |               |               |
| .64<br>(.025) | 1.27<br>(.050) | 1.91<br>(.750) | .28<br>(.011) | .51<br>(.020) |
| USB0004       |                |                |               |               |
| .89<br>(.035) | 1.65<br>(.065) | 2.54<br>(.100) | .46<br>(.018) | .76<br>(.030) |
| USB0005       |                |                |               |               |
| .61<br>(.024) | .51<br>(.020)  | 1.70<br>(.067) | .51<br>(.020) | NA            |



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