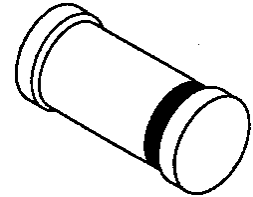


DESCRIPTION

These small surface mount TVS devices feature the ability to clamp dangerous high voltage short-term transients such as produced by directed or radiated electrostatic discharge phenomena before entering sensitive component regions of a circuit design. They are small economical transient voltage suppressors targeted primarily for short-term transients below a few microseconds while still achieving significant peak-pulse-power capability as illustrated in Figure #1.

APPEARANCE



DO-213AA

IMPORTANT: For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

FEATURES

- Excellent protection in clamping direct ESD level transients in excess of 15,000 V per MIL-STD-750, Method 1020 (approx. 150 ns exponential wave)
- Absorbs ESD level transients* of 1400 Watts per MIL-STD-750, Method 1020 (approx. 150 ns exponential wave, or one microsecond transients up to 400 watts. See Figure #1 and #2 for overall transient Peak Pulse Power.
- Clamps Transients in less than 100 picoseconds
- Working Stand-off Voltage range of 5 V to 170 V
- Hermetic DO-213AA Package. Also available in axial-leaded DO-35 package (see separate data sheet for 1.4KESD5.0 series)

APPLICATIONS / BENEFITS

- Protects Sensitive circuits from short duration fast rise time transients such as Electrostatic Discharge (ESD) or Electrical Fast Transients (EFT)
- Low inherent capacitance for high-frequency applications (See Figure #4)
- Small surface mount foot print
- Bidirectional features available by adding a "C" or "CA" suffix

MAXIMUM RATINGS

- 400 Watts for One Microsecond Square Wave or 1400 watts per ESD Wave form of MIL-STD-750, method 1020
- See Surge Rating curves in Figures #1, 2 and 3
- Operating and storage temperature -65°C to 175°C
- THERMAL RESISTANCE: $150^{\circ}\text{C}/\text{W}$ junction to end cap
- DC power dissipation 500 mW at $T_{\text{EC}} \leq 100^{\circ}\text{C}$
- Derate at $2.3 \text{ W}/^{\circ}\text{C}$ above 25°C for P_{PP} (1 μs) and at $6.67 \text{ mW}/^{\circ}\text{C}$ above 100°C for dc power
- Forward Surge Current 50 amps for 1 μs at $T_{\text{L}} = 25^{\circ}\text{C}$ (rise time $\geq 100 \text{ ns}$)

MECHANICAL AND PACKAGING

- CASE: Hermetically sealed glass DO-213AA surface mount package
- TERMINALS: Leads, tin-lead plated solderable per MIL-STD-750, method 2026
- POLARITY: Banded end is cathode
- WEIGHT: 0.04 grams (typical)
- MARKING: Cathode band only
- TAPE & REEL option: Standard per EIA-481-B (add "TR" suffix to part number)
- See package dimension on last page

ELECTRICAL CHARACTERISTICS

| TYPE NUMBER* | REVERSE STAND-OFF VOLTAGE | BREAKDOWN VOLTAGE V _{BR} MINIMUM | BREAKDOWN CURRENT | MAXIMUM STANDBY CURRENT | MAXIMUM CLAMPING VOLTAGE | PEAK PULSE CURRENT |
|----------------|---------------------------|---|-------------------|----------------------------------|----------------------------------|--------------------|
| | V _{WM} | V _(BR) | I _(BR) | I _D @ V _{WM} | V _C @ I _{PP} | I _{PP} ** |
| | VOLTS | VOLTS | mA | µA | VOLTS | AMPS |
| MLL1.4KESD5.0 | 5.0 | 6.40 | 10 | 600 | 13.7 | 29.20 |
| MLL1.4KESD5.0A | 5.0 | 6.40 | 10 | 600 | 13.2 | 29.85 |
| MLL1.4KESD6.0 | 6.0 | 6.67 | 10 | 600 | 14.8 | 27.00 |
| MLL1.4KESD6.0A | 6.0 | 6.67 | 10 | 600 | 14.0 | 28.50 |
| MLL1.4KESD6.5 | 6.5 | 7.22 | 10 | 400 | 16.0 | 24.94 |
| MLL1.4KESD6.5A | 6.5 | 7.22 | 10 | 400 | 15.2 | 26.32 |
| MLL1.4KESD7.0 | 7.0 | 7.78 | 10 | 150 | 17.3 | 23.12 |
| MLL1.4KESD7.0A | 7.0 | 7.78 | 10 | 150 | 16.4 | 24.42 |
| MLL1.4KESD7.5 | 7.5 | 8.33 | 1.0 | 50 | 18.5 | 21.57 |
| MLL1.4KESD7.5A | 7.5 | 8.33 | 1.0 | 50 | 17.5 | 22.81 |
| MLL1.4KESD8.0 | 8.0 | 8.89 | 1.0 | 25 | 19.8 | 20.20 |
| MLL1.4KESD8.0A | 8.0 | 8.89 | 1.0 | 25 | 18.7 | 21.37 |
| MLL1.4KESD8.5 | 8.5 | 9.44 | 1.0 | 5 | 20.9 | 19.10 |
| MLL1.4KESD8.5A | 8.5 | 9.44 | 1.0 | 5 | 19.8 | 20.16 |
| MLL1.4KESD9.0 | 9.0 | 10.0 | 1.0 | 1.0 | 22.2 | 18.02 |
| MLL1.4KESD9.0A | 9.0 | 10.0 | 1.0 | 1.0 | 21.1 | 18.96 |
| MLL1.4KESD10 | 10 | 11.1 | 1.0 | 1.0 | 24.7 | 16.19 |
| MLL1.4KESD10A | 10 | 11.1 | 1.0 | 1.0 | 23.4 | 17.09 |
| MLL1.4KESD11 | 11 | 12.2 | 1.0 | 1.0 | 27.1 | 14.76 |
| MLL1.4KESD11A | 11 | 12.2 | 1.0 | 1.0 | 25.7 | 15.56 |
| MLL1.4KESD12 | 12 | 13.3 | 1.0 | 1.0 | 29.6 | 13.51 |
| MLL1.4KESD12A | 12 | 13.3 | 1.0 | 1.0 | 28.0 | 14.29 |
| MLL1.4KESD13 | 13 | 14.4 | 1.0 | 1.0 | 32.0 | 12.50 |
| MLL1.4KESD13A | 13 | 14.4 | 1.0 | 1.0 | 30.3 | 13.20 |
| MLL1.4KESD14 | 14 | 15.6 | 1.0 | 1.0 | 31.2 | 12.81 |
| MLL1.4KESD14A | 14 | 15.6 | 1.0 | 1.0 | 29.5 | 13.60 |
| MLL1.4KESD15 | 15 | 16.7 | 1.0 | 1.0 | 33.4 | 11.98 |
| MLL1.4KESD15A | 15 | 16.7 | 1.0 | 1.0 | 31.7 | 12.63 |
| MLL1.4KESD16 | 16 | 17.8 | 1.0 | 1.0 | 35.6 | 11.22 |
| MLL1.4KESD16A | 16 | 17.8 | 1.0 | 1.0 | 33.8 | 11.85 |
| MLL1.4KESD17 | 17 | 18.9 | 1.0 | 1.0 | 37.8 | 10.58 |
| MLL1.4KESD17A | 17 | 18.9 | 1.0 | 1.0 | 35.8 | 11.17 |
| MLL1.4KESD18 | 18 | 20.0 | 1.0 | 1.0 | 40.0 | 10.00 |
| MLL1.4KESD18A | 18 | 20.0 | 1.0 | 1.0 | 37.9 | 10.56 |
| MLL1.4KESD20 | 20 | 22.2 | 1.0 | 1.0 | 44.4 | 9.02 |
| MLL1.4KESD20A | 20 | 22.2 | 1.0 | 1.0 | 42.0 | 9.52 |
| MLL1.4KESD22 | 22 | 24.4 | 1.0 | 1.0 | 48.8 | 8.20 |
| MLL1.4KESD22A | 22 | 24.4 | 1.0 | 1.0 | 46.2 | 8.66 |
| MLL1.4KESD24 | 24 | 26.7 | 1.0 | 1.0 | 53.4 | 7.49 |
| MLL1.4KESD24A | 24 | 26.7 | 1.0 | 1.0 | 50.6 | 7.91 |
| MLL1.4KESD26 | 26 | 28.9 | 1.0 | 1.0 | 57.8 | 6.93 |
| MLL1.4KESD26A | 26 | 28.9 | 1.0 | 1.0 | 54.7 | 7.31 |
| MLL1.4KESD28 | 28 | 31.1 | 1.0 | 1.0 | 62.2 | 6.43 |
| MLL1.4KESD28A | 28 | 31.1 | 1.0 | 1.0 | 59.0 | 6.79 |
| MLL1.4KESD30 | 30 | 33.3 | 1.0 | 1.0 | 66.6 | 6.01 |
| MLL1.4KESD30A | 30 | 33.3 | 1.0 | 1.0 | 63.1 | 6.34 |
| MLL1.4KESD33 | 33 | 36.7 | 1.0 | 1.0 | 73.4 | 5.45 |
| MLL1.4KESD33A | 33 | 36.7 | 1.0 | 1.0 | 69.6 | 5.75 |
| MLL1.4KESD36 | 36 | 40.0 | 1.0 | 1.0 | 80.0 | 5.00 |
| MLL1.4KESD36A | 36 | 40.0 | 1.0 | 1.0 | 75.8 | 5.28 |
| MLL1.4KESD40 | 40 | 44.4 | 1.0 | 1.0 | 88.8 | 4.50 |
| MLL1.4KESD40A | 40 | 44.4 | 1.0 | 1.0 | 84.2 | 4.75 |
| MLL1.4KESD43 | 43 | 47.8 | 1.0 | 1.0 | 95.6 | 4.18 |
| MLL1.4KESD43A | 43 | 47.8 | 1.0 | 1.0 | 90.5 | 4.42 |
| MLL1.4KESD45 | 45 | 50.0 | 1.0 | 1.0 | 100.0 | 4.00 |
| MLL1.4KESD45A | 45 | 50.0 | 1.0 | 1.0 | 94.8 | 4.22 |
| MLL1.4KESD48 | 48 | 53.3 | 1.0 | 1.0 | 106.6 | 3.75 |
| MLL1.4KESD48A | 48 | 53.3 | 1.0 | 1.0 | 101.0 | 3.96 |
| MLL1.4KESD51 | 51 | 56.7 | 1.0 | 1.0 | 113.4 | 3.53 |
| MLL1.4KESD51A | 51 | 56.7 | 1.0 | 1.0 | 107.5 | 3.72 |

| TYPE NUMBER* | REVERSE STAND-OFF VOLTAGE | BREAKDOWN VOLTAGE V_{BR} MINIMUM | BREAKDOWN CURRENT | MAXIMUM STANDBY CURRENT | MAXIMUM CLAMPING VOLTAGE | PEAK PULSE CURRENT |
|----------------|---------------------------|------------------------------------|-------------------|-------------------------|--------------------------|--------------------|
| | V_{WM} | $V_{(BR)}$ | $I_{(BR)}$ | $I_D @ V_{WM}$ | $V_C @ I_{PP}$ | I_{PP}^{**} |
| | VOLTS | VOLTS | mA | μA | VOLTS | AMPS |
| MLL1.4KESD54 | 54 | 60.0 | 1.0 | 1.0 | 120.0 | 3.33 |
| MLL1.4KESD54A | 54 | 60.0 | 1.0 | 1.0 | 113.7 | 3.52 |
| MLL1.4KESD58 | 58 | 64.4 | 1.0 | 1.0 | 128.9 | 3.10 |
| MLL1.4KESD58A | 58 | 64.4 | 1.0 | 1.0 | 122.0 | 3.28 |
| MLL1.4KESD60 | 60 | 66.7 | 1.0 | 1.0 | 133.4 | 3.00 |
| MLL1.4KESD60A | 60 | 66.7 | 1.0 | 1.0 | 126.4 | 3.17 |
| MLL1.4KESD64 | 64 | 71.1 | 1.0 | 1.0 | 142.2 | 2.81 |
| MLL1.4KESD64A | 64 | 71.1 | 1.0 | 1.0 | 134.7 | 2.97 |
| MLL1.4KESD70 | 70 | 77.8 | 1.0 | 1.0 | 155.6 | 2.57 |
| MLL1.4KESD70A | 70 | 77.8 | 1.0 | 1.0 | 147.4 | 2.71 |
| MLL1.4KESD75 | 75 | 83.3 | 1.0 | 1.0 | 166.8 | 2.40 |
| MLL1.4KESD75A | 75 | 83.3 | 1.0 | 1.0 | 158.0 | 2.53 |
| MLL1.4KESD78 | 78 | 86.7 | 1.0 | 1.0 | 173.4 | 2.31 |
| MLL1.4KESD78A | 78 | 86.7 | 1.0 | 1.0 | 164.3 | 2.44 |
| MLL1.4KESD85 | 85 | 94.4 | 1.0 | 1.0 | 188.5 | 2.12 |
| MLL1.4KESD85A | 85 | 94.4 | 1.0 | 1.0 | 178.6 | 2.24 |
| MLL1.4KESD90 | 90 | 100.0 | 1.0 | 1.0 | 199.8 | 2.00 |
| MLL1.4KESD90A | 90 | 100.0 | 1.0 | 1.0 | 189.9 | 2.11 |
| MLL1.4KESD100 | 100 | 111.0 | 1.0 | 1.0 | 222.3 | 1.80 |
| MLL1.4KESD100A | 100 | 111.0 | 1.0 | 1.0 | 210.6 | 1.90 |
| MLL1.4KESD110 | 110 | 122.0 | 1.0 | 1.0 | 243.9 | 1.64 |
| MLL1.4KESD110A | 110 | 122.0 | 1.0 | 1.0 | 213.3 | 1.73 |
| MLL1.4KESD120 | 120 | 133.0 | 1.0 | 1.0 | 266.4 | 1.50 |
| MLL1.4KESD120A | 120 | 133.0 | 1.0 | 1.0 | 252.0 | 1.59 |
| MLL1.4KESD130 | 130 | 144.0 | 1.0 | 1.0 | 288.0 | 1.39 |
| MLL1.4KESD130A | 130 | 144.0 | 1.0 | 1.0 | 273.0 | 1.47 |
| MLL1.4KESD150 | 150 | 167.0 | 1.0 | 1.0 | 333.9 | 1.20 |
| MLL1.4KESD150A | 150 | 167.0 | 1.0 | 1.0 | 316.8 | 1.26 |
| MLL1.4KESD160 | 160 | 178.0 | 1.0 | 1.0 | 356.4 | 1.12 |
| MLL1.4KESD160A | 160 | 178.0 | 1.0 | 1.0 | 337.5 | 1.19 |
| MLL1.4KESD170 | 170 | 189.0 | 1.0 | 1.0 | 378.0 | 1.06 |
| MLL1.4KESD170A | 170 | 189.0 | 1.0 | 1.0 | 358.2 | 1.12 |

• For bidirectional, add a "C" or "CA" suffix after the part number, e.g. MLL1.4KESD5.0C or MLL1.4KESD5.0CA for MLL1.4KESD5.0 or MLL1.4KESD5.0A part numbers respectively. Capacitance will be one-half that shown in Figure 4 at zero volts.

** At 400 watts 1 μ s square wave rating (See Figures 1 and 2).

OUTLINE AND CIRCUIT

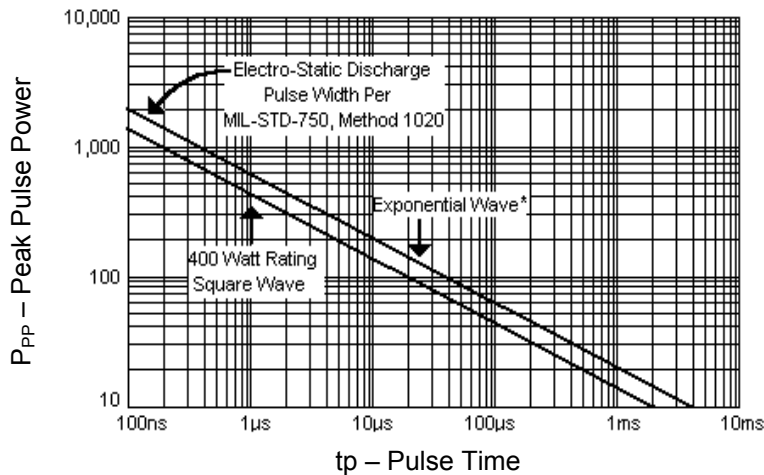


FIGURE 1
Peak Pulse Power vs. Pulse Width
(*Exponential Wave Form Pulse Width to 50% Decay of Peak.)

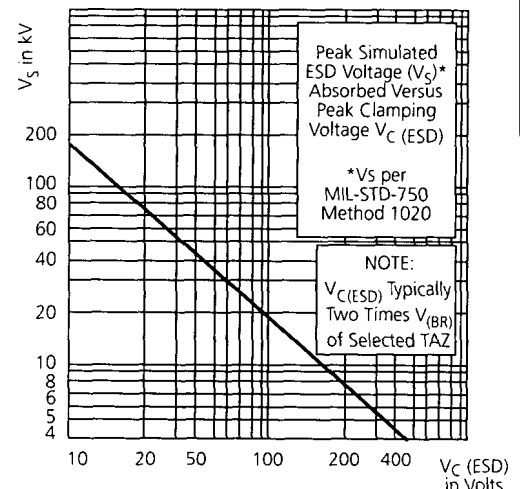


FIGURE 2

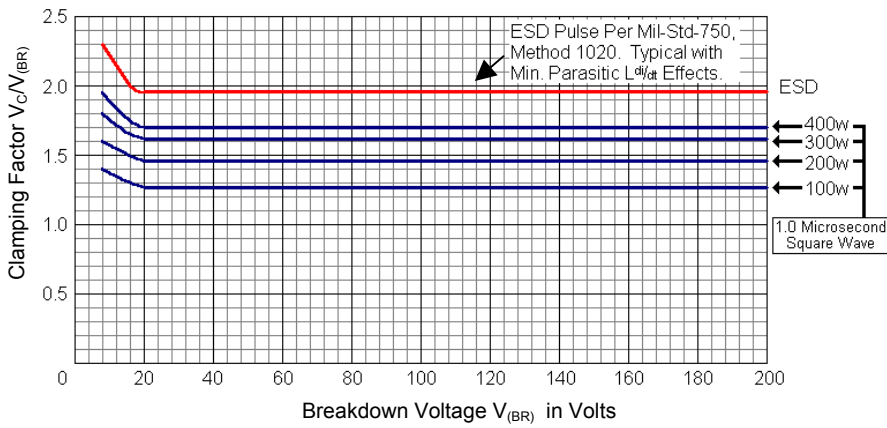


FIGURE 3

Clamping Factor vs. Breakdown Voltage for Various Power Levels

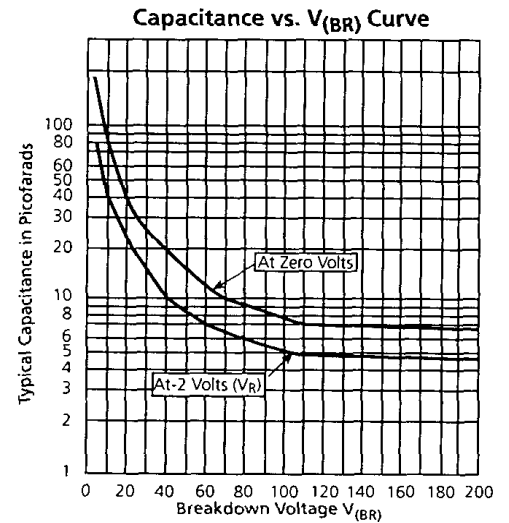
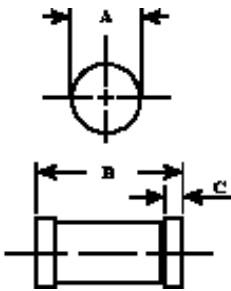


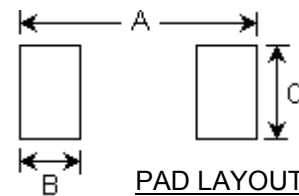
FIGURE 4

Capacitance vs. $V_{(BR)}$ for unidirectional. For Bidirectional, value is one-half that shown at zero volts.

PACKAGE DIMENSIONS & PAD LAYOUT



| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.063 | 0.067 | 1.60 | 1.70 |
| B | 0.130 | 0.146 | 3.30 | 3.70 |
| C | 0.016 | 0.022 | 0.41 | 0.55 |



| | INCHES | mm |
|---|--------|------|
| A | .200 | 5.08 |
| B | .055 | 1.40 |
| C | .080 | 2.03 |