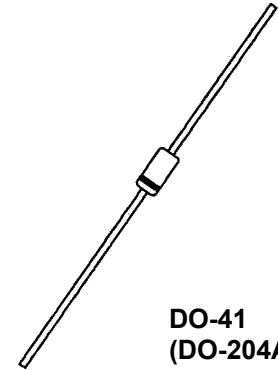


### DESCRIPTION

These small axial-leaded 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-41  
(DO-204AL)

**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 40,000 V per MIL-STD-750, Method 1020 (approx. 150 ns exponential wave)
- Absorbs ESD level transients\* of 14,000 Watts per MIL-STD-750, Method 1020 (approximately 150 ns exponential wave, or one microsecond transients up to 4000 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 5V to 170V
- Hermetic DO-41 Package. Also available in surface mount DO-213AB MELF package (see separate data sheet)

### APPLICATIONS / BENEFITS

- Protects Sensitive circuits from short duration fast rise time transients such as Electrostatic Discharge (ESD) or Electrical Fast Transients (EFT)
- Minimal capacitance (See Figure #3)
- Flexible axial-lead mounting terminals
- Bidirectional features available by adding a "C" or "CA" suffix

### MAXIMUM RATINGS

- 4000 Watts for One Microsecond Square Wave or 14,000 watts per ESD Wave form of MIL-STD-750, method 1020.
- See Surge Rating curve in Figures #1 and 2.
- Operating and storage temperature  $-65^{\circ}\text{C}$  to  $175^{\circ}\text{C}$
- THERMAL RESISTANCE: Less than  $83^{\circ}\text{C}/\text{Watt}$  junction to lead at 0.375 inches from body.
- DC power dissipation 1500 mW at  $T_L = 75^{\circ}\text{C}$  at 3/8 inch (10 mm) lead length from body.
- Derate at  $22.8 \text{ W}/^{\circ}\text{C}$  above  $25^{\circ}\text{C}$  for  $P_{PP}$  (1 $\mu\text{s}$ ) and at  $15 \text{ mW}/^{\circ}\text{C}$  above  $75^{\circ}\text{C}$  for dc power.
- Forward Surge Current 500 amps for 1 $\mu\text{s}$  at  $T_L = 25^{\circ}\text{C}$  (rise time  $\geq 100 \text{ ns}$ ).

### MECHANICAL AND PACKAGING

- CASE: Hermetically sealed axial-lead glass DO-41 (DO-204AL) package
- TERMINALS: Leads, tin-lead plated solderable per MIL-STD-750, method 2026
- POLARITY: Banded end is cathode
- WEIGHT: 0.378 grams (typical)
- MARKING: Part number
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- See package dimension on last page

**ELECTRICAL CHARACTERISTICS**

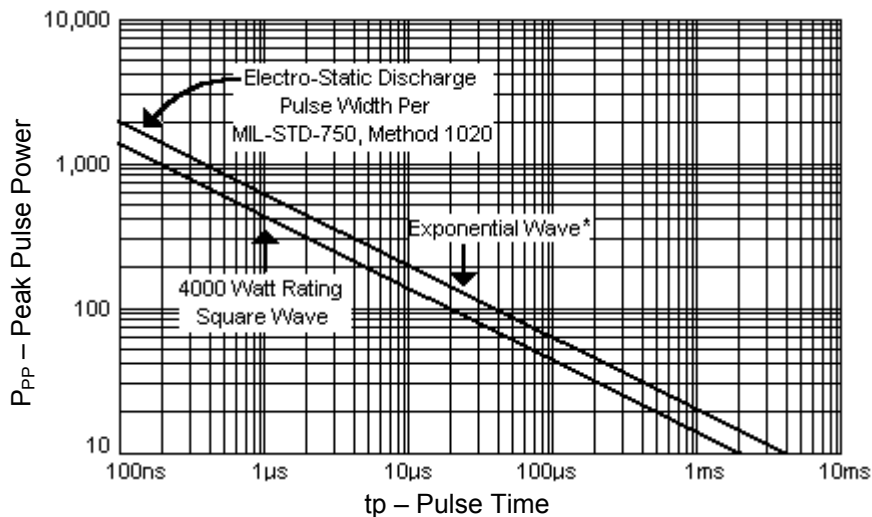
| TYPE NUMBER* | REVERSE STAND-OFF VOLTAGE | BREAKDOWN VOLTAGE V <sub>BR</sub> MINIMUM | BREAKDOWN CURRENT | MAXIMUM STANDBY CURRENT          | MAXIMUM CLAMPING VOLTAGE         | PEAK PULSE CURRENT |
|--------------|---------------------------|---|-------------------|----------------------------------|----------------------------------|--------------------|
|              | V <sub>WM</sub>           | V <sub>(BR)</sub>                         | I <sub>(BR)</sub> | I <sub>D</sub> @ V <sub>WM</sub> | V <sub>C</sub> @ I <sub>PP</sub> | I <sub>PP</sub> ** |
|              | VOLTS                     | VOLTS                                     | mA                | µA                               | VOLTS                            | AMPS               |
| 14KESD5.0    | 5.0                       | 6.40                                      | 10                | 600                              | 17.1                             | 233.6              |
| 14KESD5.0A   | 5.0                       | 6.40                                      | 10                | 600                              | 16.8                             | 238.8              |
| 14KESD6.0    | 6.0                       | 6.67                                      | 10                | 600                              | 18.5                             | 215.9              |
| 14KESD6.0A   | 6.0                       | 6.67                                      | 10                | 600                              | 17.6                             | 227.9              |
| 14KESD6.5    | 6.5                       | 7.22                                      | 10                | 400                              | 20.1                             | 199.5              |
| 14KESD6.5A   | 6.5                       | 7.22                                      | 10                | 400                              | 19.0                             | 210.5              |
| 14KESD7.0    | 7.0                       | 7.78                                      | 10                | 150                              | 21.6                             | 185.0              |
| 14KESD7.0A   | 7.0                       | 7.78                                      | 10                | 150                              | 20.5                             | 195.4              |
| 14KESD7.5    | 7.5                       | 8.33                                      | 1.0               | 50                               | 23.2                             | 172.6              |
| 14KESD7.5A   | 7.5                       | 8.33                                      | 1.0               | 50                               | 21.9                             | 182.4              |
| 14KESD8.0    | 8.0                       | 8.89                                      | 1.0               | 25                               | 24.8                             | 161.6              |
| 14KESD8.0A   | 8.0                       | 8.89                                      | 1.0               | 25                               | 23.4                             | 170.9              |
| 14KESD8.5    | 8.5                       | 9.44                                      | 1.0               | 5                                | 26.2                             | 152.8              |
| 14KESD8.5A   | 8.5                       | 9.44                                      | 1.0               | 5                                | 24.8                             | 161.3              |
| 14KESD9.0    | 9.0                       | 10.0                                      | 1.0               | 1.0                              | 27.8                             | 144.1              |
| 14KESD9.0A   | 9.0                       | 10.0                                      | 1.0               | 1.0                              | 26.4                             | 151.7              |
| 14KESD10     | 10                        | 11.1                                      | 1.0               | 1.0                              | 30.9                             | 129.5              |
| 14KESD10A    | 10                        | 11.1                                      | 1.0               | 1.0                              | 29.3                             | 136.8              |
| 14KESD11     | 11                        | 12.2                                      | 1.0               | 1.0                              | 33.9                             | 118.0              |
| 14KESD11A    | 11                        | 12.2                                      | 1.0               | 1.0                              | 32.1                             | 124.5              |
| 14KESD12     | 12                        | 13.3                                      | 1.0               | 1.0                              | 37.0                             | 108.1              |
| 14KESD12A    | 12                        | 13.3                                      | 1.0               | 1.0                              | 35.0                             | 114.3              |
| 14KESD13     | 13                        | 14.4                                      | 1.0               | 1.0                              | 40.0                             | 100.0              |
| 14KESD13A    | 13                        | 14.4                                      | 1.0               | 1.0                              | 37.9                             | 105.6              |
| 14KESD14     | 14                        | 15.6                                      | 1.0               | 1.0                              | 43.4                             | 92.2               |
| 14KESD14A    | 14                        | 15.6                                      | 1.0               | 1.0                              | 41.0                             | 97.6               |
| 14KESD15     | 15                        | 16.7                                      | 1.0               | 1.0                              | 46.4                             | 86.2               |
| 14KESD15A    | 15                        | 16.7                                      | 1.0               | 1.0                              | 42.2                             | 94.7               |
| 14KESD16     | 16                        | 17.8                                      | 1.0               | 1.0                              | 45.5                             | 87.8               |
| 14KESD16A    | 16                        | 17.8                                      | 1.0               | 1.0                              | 41.3                             | 97.0               |
| 14KESD17     | 17                        | 18.9                                      | 1.0               | 1.0                              | 41.8                             | 95.7               |
| 14KESD17A    | 17                        | 18.9                                      | 1.0               | 1.0                              | 39.8                             | 100.5              |
| 14KESD18     | 18                        | 20.0                                      | 1.0               | 1.0                              | 42.2                             | 94.8               |
| 14KESD18A    | 18                        | 20.0                                      | 1.0               | 1.0                              | 37.9                             | 105.6              |
| 14KESD20     | 20                        | 22.2                                      | 1.0               | 1.0                              | 41.9                             | 95.4               |
| 14KESD20A    | 20                        | 22.2                                      | 1.0               | 1.0                              | 37.4                             | 107.1              |
| 14KESD22     | 22                        | 24.4                                      | 1.0               | 1.0                              | 40.7                             | 98.4               |
| 14KESD22A    | 22                        | 24.4                                      | 1.0               | 1.0                              | 38.5                             | 103.9              |
| 14KESD24     | 24                        | 26.7                                      | 1.0               | 1.0                              | 44.5                             | 89.9               |
| 14KESD24A    | 24                        | 26.7                                      | 1.0               | 1.0                              | 42.2                             | 94.9               |
| 14KESD26     | 26                        | 28.9                                      | 1.0               | 1.0                              | 48.2                             | 83.1               |
| 14KESD26A    | 26                        | 28.9                                      | 1.0               | 1.0                              | 45.6                             | 87.7               |
| 14KESD28     | 28                        | 31.1                                      | 1.0               | 1.0                              | 51.8                             | 77.2               |
| 14KESD28A    | 28                        | 31.1                                      | 1.0               | 1.0                              | 49.1                             | 81.4               |
| 14KESD30     | 30                        | 33.3                                      | 1.0               | 1.0                              | 55.5                             | 72.1               |
| 14KESD30A    | 30                        | 33.3                                      | 1.0               | 1.0                              | 52.6                             | 76.1               |
| 14KESD33     | 33                        | 36.7                                      | 1.0               | 1.0                              | 61.2                             | 65.4               |
| 14KESD33A    | 33                        | 36.7                                      | 1.0               | 1.0                              | 58.0                             | 69.0               |
| 14KESD36     | 36                        | 40.0                                      | 1.0               | 1.0                              | 66.7                             | 60.0               |
| 14KESD36A    | 36                        | 40.0                                      | 1.0               | 1.0                              | 63.2                             | 63.3               |
| 14KESD40     | 40                        | 44.4                                      | 1.0               | 1.0                              | 74.0                             | 54.0               |
| 14KESD40A    | 40                        | 44.4                                      | 1.0               | 1.0                              | 70.1                             | 57.0               |
| 14KESD43     | 43                        | 47.8                                      | 1.0               | 1.0                              | 79.7                             | 50.2               |
| 14KESD43A    | 43                        | 47.8                                      | 1.0               | 1.0                              | 75.5                             | 53.0               |
| 14KESD45     | 45                        | 50.0                                      | 1.0               | 1.0                              | 83.3                             | 48.0               |
| 14KESD45A    | 45                        | 50.0                                      | 1.0               | 1.0                              | 79.0                             | 50.6               |
| 14KESD48     | 48                        | 53.3                                      | 1.0               | 1.0                              | 88.8                             | 45.0               |
| 14KESD48A    | 48                        | 53.3                                      | 1.0               | 1.0                              | 84.2                             | 47.5               |
| 14KESD51     | 51                        | 56.7                                      | 1.0               | 1.0                              | 94.5                             | 42.3               |
| 14KESD51A    | 51                        | 56.7                                      | 1.0               | 1.0                              | 89.6                             | 44.6               |

| 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                | $\mu A$                 | VOLTS                    | AMPS               |
| 14KESD54     | 54                        | 60.0                               | 1.0               | 1.0                     | 100.0                    | 40.0               |
| 14KESD54A    | 54                        | 60.0                               | 1.0               | 1.0                     | 94.7                     | 42.2               |
| 14KESD58     | 58                        | 64.4                               | 1.0               | 1.0                     | 107.4                    | 37.2               |
| 14KESD58A    | 58                        | 64.4                               | 1.0               | 1.0                     | 101.7                    | 39.3               |
| 14KESD60     | 60                        | 66.7                               | 1.0               | 1.0                     | 111.2                    | 36.0               |
| 14KESD60A    | 60                        | 66.7                               | 1.0               | 1.0                     | 105.3                    | 38.0               |
| 14KESD64     | 64                        | 71.1                               | 1.0               | 1.0                     | 118.5                    | 33.7               |
| 14KESD64A    | 64                        | 71.1                               | 1.0               | 1.0                     | 112.3                    | 35.6               |
| 14KESD70     | 70                        | 77.8                               | 1.0               | 1.0                     | 129.7                    | 30.8               |
| 14KESD70A    | 70                        | 77.8                               | 1.0               | 1.0                     | 122.9                    | 32.5               |
| 14KESD75     | 75                        | 83.3                               | 1.0               | 1.0                     | 139.0                    | 28.8               |
| 14KESD75A    | 75                        | 83.3                               | 1.0               | 1.0                     | 131.5                    | 30.4               |
| 14KESD78     | 78                        | 86.7                               | 1.0               | 1.0                     | 144.5                    | 27.7               |
| 14KESD78A    | 78                        | 86.7                               | 1.0               | 1.0                     | 136.9                    | 29.2               |
| 14KESD85     | 85                        | 94.4                               | 1.0               | 1.0                     | 157.1                    | 25.4               |
| 14KESD85A    | 85                        | 94.4                               | 1.0               | 1.0                     | 148.8                    | 26.9               |
| 14KESD90     | 90                        | 100.0                              | 1.0               | 1.0                     | 166.5                    | 24.0               |
| 14KESD90A    | 90                        | 100.0                              | 1.0               | 1.0                     | 158.3                    | 25.3               |
| 14KESD100    | 100                       | 111.0                              | 1.0               | 1.0                     | 185.3                    | 21.6               |
| 14KESD100A   | 100                       | 111.0                              | 1.0               | 1.0                     | 175.5                    | 22.8               |
| 14KESD110    | 110                       | 122.0                              | 1.0               | 1.0                     | 203.3                    | 19.7               |
| 14KESD110A   | 110                       | 122.0                              | 1.0               | 1.0                     | 192.8                    | 20.7               |
| 14KESD120    | 120                       | 133.0                              | 1.0               | 1.0                     | 222.0                    | 18.0               |
| 14KESD120A   | 120                       | 133.0                              | 1.0               | 1.0                     | 210.0                    | 19.0               |
| 14KESD130    | 130                       | 144.0                              | 1.0               | 1.0                     | 240.0                    | 16.7               |
| 14KESD130A   | 130                       | 144.0                              | 1.0               | 1.0                     | 227.3                    | 17.6               |
| 14KESD150    | 150                       | 167.0                              | 1.0               | 1.0                     | 278.3                    | 14.4               |
| 14KESD150A   | 150                       | 167.0                              | 1.0               | 1.0                     | 264.0                    | 15.2               |
| 14KESD160    | 160                       | 178.0                              | 1.0               | 1.0                     | 297.0                    | 13.5               |
| 14KESD160A   | 160                       | 178.0                              | 1.0               | 1.0                     | 281.2                    | 14.2               |
| 14KESD170    | 170                       | 189.0                              | 1.0               | 1.0                     | 315.0                    | 12.7               |
| 14KESD170A   | 170                       | 189.0                              | 1.0               | 1.0                     | 298.5                    | 13.4               |

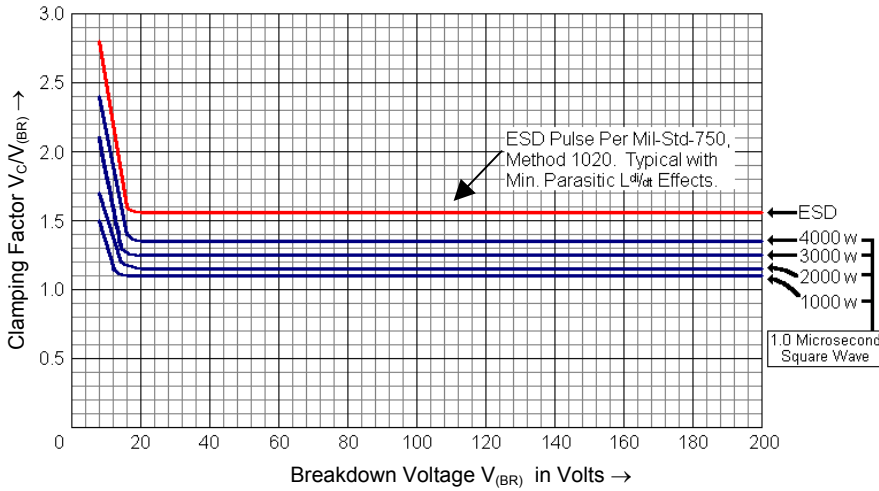
\* For bidirectional, add a "C" or "CA" suffix after the part number, e.g. 14KESD5.0C or 14KESD5.0CA for the 14KESD5.0 or 14KESD5.0A part numbers respectively. Capacitance will be one-half that shown in Figure 3 for zero volts.

\*\* At 4000 watts 1 $\mu$ s square wave rating (See Figures 1 and 2).

**GRAPHS**

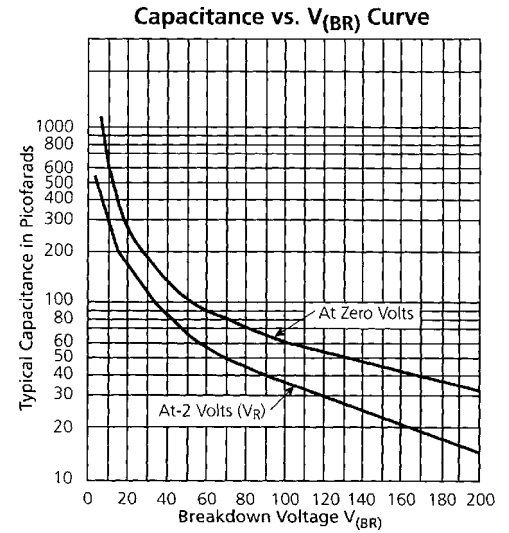


**FIGURE 1**  
Peak Pulse Power vs. Pulse Width  
(\*Exponential Wave Form Pulse Width to 50% Decay of Peak.)



**FIGURE 2**

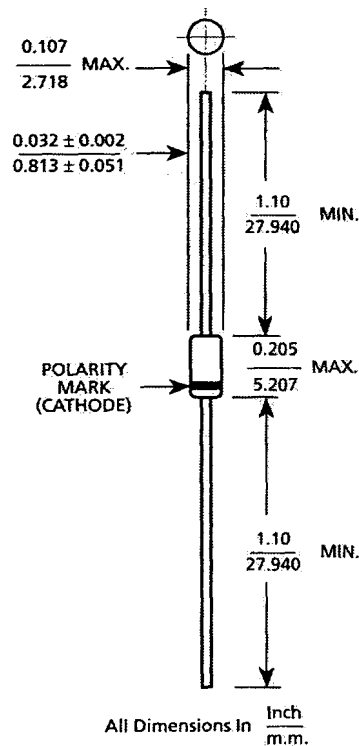
Clamping Factor vs. Breakdown Voltage for Various Power Levels



**FIGURE 3**

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

**PACKAGE DIMENSIONS**



DO-41

This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.