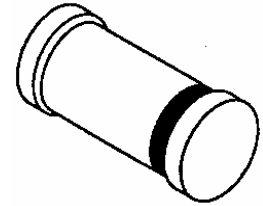


**DESCRIPTION**

These surface mount Transient Voltage Suppressor (TVS) devices feature the ability to clamp dangerous high voltage short-term transients such as produced by direct or radiated electro-static discharge phenomena before entering sensitive component regions of a circuit design. They are small economical TVSs targeted primarily for short term transients below a few microseconds while still achieving significant peak-pulse-power capability as seen in Figure 1.

**APPEARANCE**



DO-213AB

**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-213AB package. Also available in axial-leaded DO-41 package (see separate data sheet for 14KESD5.0 series)
- RoHS Compliant devices available by adding "e3" suffix

**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)
- Small surface-mount footprint for high density mounting
- Bidirectional features available by adding a "C" or "CA" suffix to part number

**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:  $40^{\circ}\text{C/W}$  junction to end cap, or  $120^{\circ}\text{C/W}$  junction to ambient when mounted on FR4 PC board (1 oz Cu) with recommended footprint (see last page)
- Steady-State Power: 1.50 watts at  $T_{\text{EC}} \leq 115^{\circ}\text{C}$ , or 1.25 watts at  $T_{\text{A}} = 25^{\circ}\text{C}$  when mounted on FR4 PC board and recommended footprint as described for thermal resistance (also see Figure 1)
- Derate at  $22.8 \text{ W}^{\circ}\text{C}$  above  $25^{\circ}\text{C}$  for  $P_{\text{PP}}$  (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  $T_{\text{L}} = 25^{\circ}\text{C}$  (rise time  $\geq 100 \text{ ns}$ ).

**MECHANICAL AND PACKAGING**

- CASE: Hermetically sealed DO-213AB glass MELF package
- FINISH: End caps are tin-lead or RoHS compliant matte-Tin plated solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band.
- MARKING: Cathode band only
- TAPE & REEL optional: Standard per EIA-481-B with 12 mm tape, 1500 per 7 inch reel or 5000 per 13 inch reel (add "TR" suffix to part number)
- WEIGHT: 0.05 grams
- See package dimensions on last page

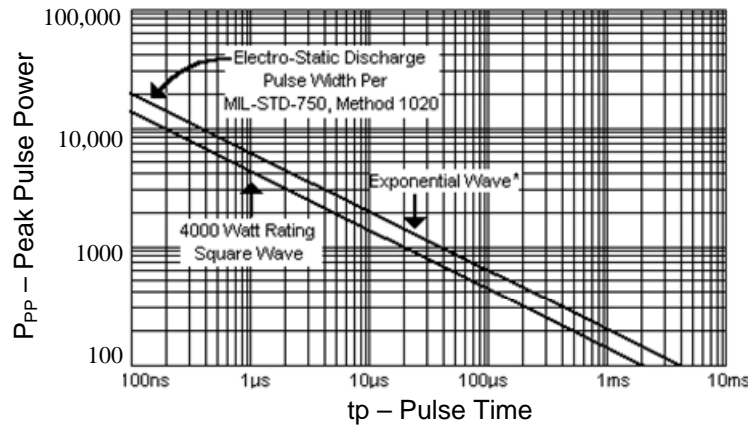
**ELECTRICAL CHARACTERISTICS**

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN 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
MLL14KESD5.0	5.0	6.40	10	600	17.1	233.6
MLL14KESD5.0A	5.0	6.40	10	600	16.8	238.8
MLL14KESD6.0	6.0	6.67	10	600	18.5	215.9
MLL14KESD6.0A	6.0	6.67	10	600	17.6	227.9
MLL14KESD6.5	6.5	7.22	10	400	20.1	199.5
MLL14KESD6.5A	6.5	7.22	10	400	19.0	210.5
MLL14KESD7.0	7.0	7.78	10	150	21.6	185.0
MLL14KESD7.0A	7.0	7.78	10	150	20.5	195.4
MLL14KESD7.5	7.5	8.33	1.0	50	23.2	172.6
MLL14KESD7.5A	7.5	8.33	1.0	50	21.9	182.4
MLL14KESD8.0	8.0	8.89	1.0	25	24.8	161.6
MLL14KESD8.0A	8.0	8.89	1.0	25	23.4	170.9
MLL14KESD8.5	8.5	9.44	1.0	5	26.2	152.8
MLL14KESD8.5A	8.5	9.44	1.0	5	24.8	161.3
MLL14KESD9.0	9.0	10.0	1.0	1.0	27.8	144.1
MLL14KESD9.0A	9.0	10.0	1.0	1.0	26.4	151.7
MLL14KESD10	10	11.1	1.0	1.0	30.9	129.5
MLL14KESD10A	10	11.1	1.0	1.0	29.3	136.8
MLL14KESD11	11	12.2	1.0	1.0	33.9	118.0
MLL14KESD11A	11	12.2	1.0	1.0	32.1	124.5
MLL14KESD12	12	13.3	1.0	1.0	37.0	108.1
MLL14KESD12A	12	13.3	1.0	1.0	35.0	114.3
MLL14KESD13	13	14.4	1.0	1.0	40.0	100.0
MLL14KESD13A	13	14.4	1.0	1.0	37.9	105.6
MLL14KESD14	14	15.6	1.0	1.0	43.4	92.2
MLL14KESD14A	14	15.6	1.0	1.0	41.0	97.6
MLL14KESD15	15	16.7	1.0	1.0	46.4	86.2
MLL14KESD15A	15	16.7	1.0	1.0	42.2	94.7
MLL14KESD16	16	17.8	1.0	1.0	45.5	87.8
MLL14KESD16A	16	17.8	1.0	1.0	41.3	97.0
MLL14KESD17	17	18.9	1.0	1.0	41.8	95.7
MLL14KESD17A	17	18.9	1.0	1.0	39.8	100.5
MLL14KESD18	18	20.0	1.0	1.0	42.2	94.8
MLL14KESD18A	18	20.0	1.0	1.0	37.9	105.6
MLL14KESD20	20	22.2	1.0	1.0	41.9	95.4
MLL14KESD20A	20	22.2	1.0	1.0	37.4	107.1
MLL14KESD22	22	24.4	1.0	1.0	40.7	98.4
MLL14KESD22A	22	24.4	1.0	1.0	38.5	103.9
MLL14KESD24	24	26.7	1.0	1.0	44.5	83.9
MLL14KESD24A	24	26.7	1.0	1.0	42.2	94.9
MLL14KESD26	26	28.9	1.0	1.0	48.2	83.1
MLL14KESD26A	26	28.9	1.0	1.0	45.6	87.7
MLL14KESD28	28	31.1	1.0	1.0	51.8	77.2
MLL14KESD28A	28	31.1	1.0	1.0	49.1	81.4
MLL14KESD30	30	33.3	1.0	1.0	55.5	72.1
MLL14KESD30A	30	33.3	1.0	1.0	52.6	76.1
MLL14KESD33	33	36.7	1.0	1.0	61.2	65.4
MLL14KESD33A	33	36.7	1.0	1.0	58.0	69.0
MLL14KESD36	36	40.0	1.0	1.0	66.7	60.0
MLL14KESD36A	36	40.0	1.0	1.0	63.2	63.3
MLL14KESD40	40	44.4	1.0	1.0	74.0	54.0
MLL14KESD40A	40	44.4	1.0	1.0	70.1	57.0
MLL14KESD43	43	47.8	1.0	1.0	79.7	50.2
MLL14KESD43A	43	47.8	1.0	1.0	75.5	53.0
MLL14KESD45	45	50.0	1.0	1.0	83.3	48.0

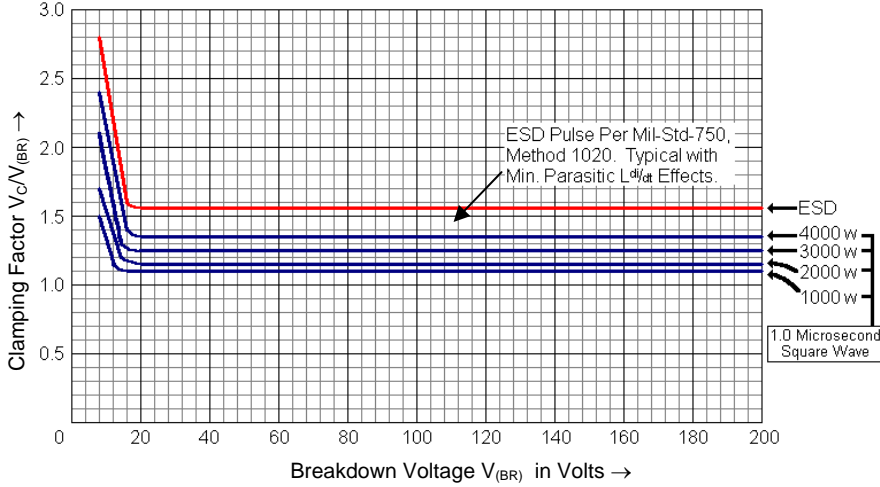
TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAKDOWN VOLTAGE $V_{BR}$ MINIMUM	BREAKDOWN CURRENT	MAXIMUM STANDBY CURRENT	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	$V_{WM}$	$V_{(BR)}$	$I_{(BR)}$	$I_D @ V_{WM}$	$V_C @ I_{PP}$	$I_{PP}^{**}$
	VOLTS	VOLTS	mA	$\mu A$	VOLTS	AMPS
MLL14KESD45A	45	50.0	1.0	1.0	79.0	50.6
MLL14KESD48	48	53.3	1.0	1.0	88.8	45.0
MLL14KESD48A	48	53.3	1.0	1.0	84.2	47.5
MLL14KESD51	51	56.7	1.0	1.0	94.5	42.3
MLL14KESD51A	51	56.7	1.0	1.0	89.6	44.6
MLL14KESD54	54	60.0	1.0	1.0	100.0	40.0
MLL14KESD54A	54	60.0	1.0	1.0	94.7	42.2
MLL14KESD58	58	64.4	1.0	1.0	107.4	37.2
MLL14KESD58A	58	64.4	1.0	1.0	101.7	39.3
MLL14KESD60	60	66.7	1.0	1.0	111.2	36.0
MLL14KESD60A	60	66.7	1.0	1.0	105.3	38.0
MLL14KESD64	64	71.1	1.0	1.0	118.5	33.7
MLL14KESD64A	64	71.1	1.0	1.0	112.3	35.6
MLL14KESD70	70	77.8	1.0	1.0	129.7	30.8
MLL14KESD70A	70	77.8	1.0	1.0	122.9	32.5
MLL14KESD75	75	83.3	1.0	1.0	139.0	28.8
MLL14KESD75A	75	83.3	1.0	1.0	131.5	30.4
MLL14KESD78	78	86.7	1.0	1.0	144.5	27.7
MLL14KESD78A	78	86.7	1.0	1.0	136.9	29.2
MLL14KESD85	85	94.4	1.0	1.0	157.1	25.4
MLL14KESD85A	85	94.4	1.0	1.0	148.8	26.9
MLL14KESD90	90	100.0	1.0	1.0	166.5	24.0
MLL14KESD90A	90	100.0	1.0	1.0	158.3	25.3
MLL14KESD100	100	111.0	1.0	1.0	185.3	21.6
MLL14KESD100A	100	111.0	1.0	1.0	175.5	22.8
MLL14KESD110	110	122.0	1.0	1.0	203.3	19.7
MLL14KESD110A	110	122.0	1.0	1.0	192.8	20.7
MLL14KESD120	120	133.0	1.0	1.0	222.0	18.0
MLL14KESD120A	120	133.0	1.0	1.0	210.0	19.0
MLL14KESD130	130	144.0	1.0	1.0	240.0	16.7
MLL14KESD130A	130	144.0	1.0	1.0	227.3	17.6
MLL14KESD150	150	167.0	1.0	1.0	278.3	14.4
MLL14KESD150A	150	167.0	1.0	1.0	264.0	15.2
MLL14KESD160	160	178.0	1.0	1.0	297.0	13.5
MLL14KESD160A	160	178.0	1.0	1.0	281.2	14.2
MLL14KESD170	170	189.0	1.0	1.0	315.0	12.7
MLL14KESD170A	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. MLL14KESD5.0C or MLL14KESD5.0CA for the MLL14KESD5.0 or MLL14KESD5.0A 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

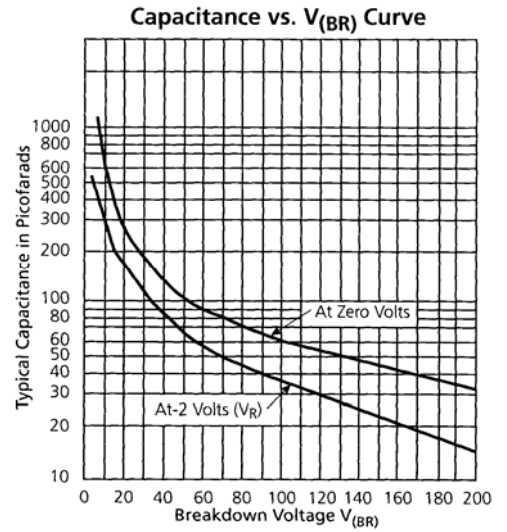


**FIGURE 1**  
Peak Pulse Power vs. Pulse Width  
(\*Exponential Wave Form Pulse Width to 50% Decay of Peak.)



**FIGURE 2**

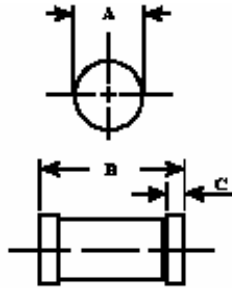
Clamping Factor vs. Breakdown Voltage for Various Power Levels  
bidirectional, value is one-half that shown at zero volts.



**FIGURE 3**

Capacitance vs.  $V_{(BR)}$  for unidirectional.  
For

PACKAGE DIMENSIONS



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.094	0.102	2.39	2.66
B	0.189	0.205	4.80	5.20
C	0.016	0.022	0.41	0.55