



**THE DATASHEET OF  
1.5KE250A-E3/51**



## TRANSZORB® Transient Voltage Suppressors



Case Style 1.5KE

PRIMARY CHARACTERISTICS	
$V_{BR}$ unidirectional	6.8 V to 540 V
$V_{BR}$ bidirectional	6.8 V to 220 V
$V_{WM}$ unidirectional	5.8 V to 459 V
$V_{WM}$ bidirectional	5.8 V to 185 V
$P_{PPM}$	1500 W
$P_D$	6.5 W
$I_{FSM}$ (unidirectional only)	200 A
$T_J$ max.	175 °C
Polarity	Unidirectional, bidirectional
Package	1.5KE

### DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional types, use CA suffix (e.g. 1.5KE220CA)  
Electrical characteristics apply in both directions.

### FEATURES

- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 1500 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- AEC-Q101 qualified available
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

### MECHANICAL DATA

**Case:** molded epoxy body over passivated junction  
Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS compliant, commercial grade  
Base P/NHE3\_X - RoHS compliant, and AEC-Q101 qualified  
("X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

#### Note

- 1.5KE250A to 1.5KE540A are commercial grade only
- Bidirectional is available from 1.5KE6.8CA to 1.5KE220CA only

**Polarity:** for unidirectional types the color band denotes cathode end, no marking on bidirectional types

MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Peak pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (fig. 1)	$P_{PPM}$	1500	W
Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>	$I_{PPM}$	See next table	A
Power dissipation on infinite heatsink at $T_L = 75$ °C (fig. 5)	$P_D$	6.5	W
Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup>	$I_{FSM}$	200	A
Maximum instantaneous forward voltage at 100 A for unidirectional only <sup>(3)</sup>	$V_F$	3.5/5.0	V
Operating junction and storage temperature range	$T_J, T_{STG}$	-55 to +175	°C

#### Notes

- (1) Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2
- (2) Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum
- (3)  $V_F = 3.5$  V for 1.5KE220A and below;  $V_F = 5.0$  V for 1.5KE250A and above



ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)									
JEDEC® TYPE NUMBER	GENERAL SEMICONDUCTOR PART NUMBER	BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> (1)		TEST CURRENT I <sub>T</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (V)	MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> (4) (µA)	MAXIMUM PEAK PULSE CURRENT I <sub>PPM</sub> (2) (A)	MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V)	MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub> (%/°C)
		MIN.	MAX.						
1N6267A	(+) <sup>1.5KE6.8A</sup>	6.45	7.14	10	5.80	1000	143	10.5	0.057
1N6268A	(+) <sup>1.5KE7.5A</sup>	7.13	7.88	10	6.40	500	133	11.3	0.061
1N6269A	(+) <sup>1.5KE8.2A</sup>	7.79	8.61	10	7.02	200	124	12.1	0.065
1N6270A	(+) <sup>1.5KE9.1A</sup>	8.65	9.55	1.0	7.78	50	112	13.4	0.068
1N6271A	(+) <sup>1.5KE10A</sup>	9.50	10.5	1.0	8.55	10	103	14.5	0.073
1N6272A	(+) <sup>1.5KE11A</sup>	10.5	11.6	1.0	9.40	5.0	96.2	15.6	0.075
1N6273A	(+) <sup>1.5KE12A</sup>	11.4	12.6	1.0	10.2	5.0	89.8	16.7	0.078
1N6274A	(+) <sup>1.5KE13A</sup>	12.4	13.7	1.0	11.1	5.0	82.4	18.2	0.081
1N6275A	(+) <sup>1.5KE15A</sup>	14.3	15.8	1.0	12.8	1.0	70.8	21.2	0.084
1N6276A	(+) <sup>1.5KE16A</sup>	15.2	16.8	1.0	13.6	1.0	66.7	22.5	0.086
1N6277A	(+) <sup>1.5KE18A</sup>	17.1	18.9	1.0	15.3	1.0	59.5	25.2	0.089
1N6278A	(+) <sup>1.5KE20A</sup>	19.0	21.0	1.0	17.1	1.0	54.2	27.7	0.090
1N6279A	(+) <sup>1.5KE22A</sup>	20.9	23.1	1.0	18.8	1.0	49.0	30.6	0.092
1N6280A	(+) <sup>1.5KE24A</sup>	22.8	25.2	1.0	20.5	1.0	45.2	33.2	0.094
1N6281A	(+) <sup>1.5KE27A</sup>	25.7	28.4	1.0	23.1	1.0	40.0	37.5	0.096
1N6282A	(+) <sup>1.5KE30A</sup>	28.5	31.5	1.0	25.6	1.0	36.2	41.4	0.097
1N6283A	(+) <sup>1.5KE33A</sup>	31.4	34.7	1.0	28.2	1.0	32.8	45.7	0.098
1N6284A	(+) <sup>1.5KE36A</sup>	34.2	37.8	1.0	30.8	1.0	30.1	49.9	0.099
1N6285A	(+) <sup>1.5KE39A</sup>	37.1	41.0	1.0	33.3	1.0	27.8	53.9	0.100
1N6286A	(+) <sup>1.5KE43A</sup>	40.9	45.2	1.0	36.8	1.0	25.3	59.3	0.101
1N6287A	(+) <sup>1.5KE47A</sup>	44.7	49.4	1.0	40.2	1.0	23.1	64.8	0.101
1N6288A	(+) <sup>1.5KE51A</sup>	48.5	53.6	1.0	43.6	1.0	21.4	70.1	0.102
1N6289A	(+) <sup>1.5KE56A</sup>	53.2	58.8	1.0	47.8	1.0	19.5	77.0	0.103
1N6290A	(+) <sup>1.5KE62A</sup>	58.9	65.1	1.0	53.0	1.0	17.6	85.0	0.104
1N6291A	(+) <sup>1.5KE68A</sup>	64.6	71.4	1.0	58.1	1.0	16.3	92.0	0.104
1N6292A	(+) <sup>1.5KE75A</sup>	71.3	78.8	1.0	64.1	1.0	14.6	104	0.105
1N6293A	(+) <sup>1.5KE82A</sup>	77.9	86.1	1.0	70.1	1.0	13.3	113	0.105
1N6294A	(+) <sup>1.5KE91A</sup>	86.5	95.5	1.0	77.8	1.0	12.0	125	0.106
1N6295A	(+) <sup>1.5KE100A</sup>	95.0	105	1.0	85.5	1.0	10.9	137	0.106
1N6296A	(+) <sup>1.5KE110A</sup>	105	116	1.0	94.0	1.0	9.9	152	0.107
1N6297A	(+) <sup>1.5KE120A</sup>	114	126	1.0	102	1.0	9.1	165	0.107
1N6298A	(+) <sup>1.5KE130A</sup>	124	137	1.0	111	1.0	8.4	179	0.107
1N6299A	(+) <sup>1.5KE150A</sup>	143	158	1.0	128	1.0	7.2	207	0.106
1N6300A	(+) <sup>1.5KE160A</sup>	152	168	1.0	136	1.0	6.8	219	0.108
1N6301A	(+) <sup>1.5KE170A</sup>	162	179	1.0	145	1.0	6.4	234	0.108
1N6302A	(+) <sup>1.5KE180A</sup>	171	189	1.0	154	1.0	6.1	246	0.108
1N6303A	(+) <sup>1.5KE200A</sup>	190	210	1.0	171	1.0	5.5	274	0.108
-	(+) <sup>1.5KE220A</sup>	209	231	1.0	185	1.0	4.6	328	0.108
-	<sup>1.5KE250A</sup>	237	263	1.0	214	1.0	4.4	344	0.110
-	<sup>1.5KE300A</sup>	285	315	1.0	256	1.0	3.6	414	0.110
-	<sup>1.5KE350A</sup>	333	368	1.0	300	1.0	3.1	482	0.110
-	<sup>1.5KE400A</sup>	380	420	1.0	342	1.0	2.7	548	0.110
-	<sup>1.5KE440A</sup>	418	462	1.0	376	1.0	2.5	602	0.110
-	<sup>1.5KE480A</sup>	456	504	1.0	408	1.0	2.28	658	0.110
-	<sup>1.5KE510A</sup>	485	535	1.0	434	1.0	2.15	698	0.110
-	<sup>1.5KE540A</sup>	513	567	1.0	459	1.0	2.03	740	0.110

Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) All terms and symbols are consistent with ANSI/IEEE CA62.35
- (4) For bidirectional types with V<sub>R</sub> 10 V and less the I<sub>D</sub> limit is doubled
- (+) Underwriters laboratory recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional devices



THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Typical thermal resistance, junction to ambient	R <sub>θJA</sub>	75	°C/ W
Typical thermal resistance, junction to lead	R <sub>θJL</sub>	15.4	

ORDERING INFORMATION (Example)				
PREFERRED PIN	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
1.5KE6.8A-E3/54	0.968	54	1400	13" diameter paper tape and reel
1.5KE6.8AHE3_B/C (1)(2)	0.968	C	1400	13" diameter paper tape and reel

**Notes**

- (1) AEC-Q101 qualified
- (2) Applied for 1.5KE6.8AHE3\_B to 1.5KE220AHE3\_B, and 1.5KE6.8CAHE3\_B to 1.5KE220CAHE3\_B

**RATINGS AND CHARACTERISTICS CURVES (T<sub>A</sub> = 25 °C unless otherwise noted)**



Fig. 1 - Peak Pulse Power Rating Curve



Fig. 3 - Pulse Waveform



Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature



Fig. 4 - Typical Junction Capacitance



Fig. 5 - Power Derating Curve



Fig. 8 - Incremental Clamping Voltage Curve (Unidirectional)



Fig. 6 - Maximum Non-Repetitive Forward Surge Current Unidirectional only



Fig. 9 - Incremental Clamping Voltage Curve (Bidirectional)



Fig. 7 - Incremental Clamping Voltage Curve (Unidirectional)

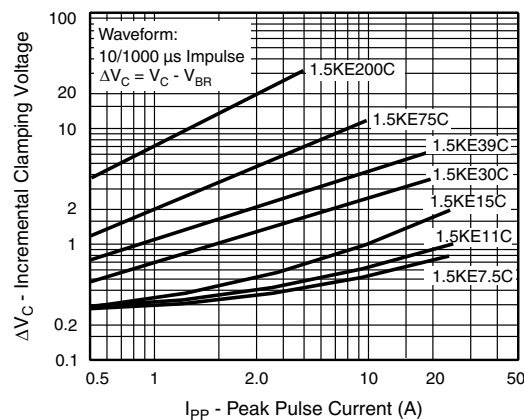


Fig. 10 - Incremental Clamping Voltage Curve (Bidirectional)



Fig. 11 - Instantaneous Forward Voltage Characteristics Curve

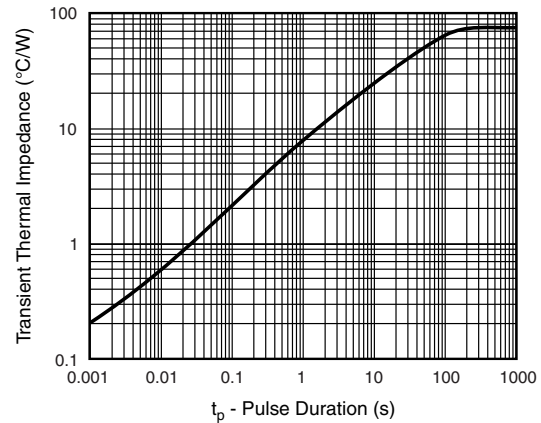


Fig. 12 - Typical Transient Thermal Impedance

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)



## APPLICATION NOTES

- This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.
- The TVS diode can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).
- This Transient Voltage Suppressor diode has a pulse power rating of 1500 W for 1 ms. The response time of TVS diode clamping action is effectively instantaneous ( $1 \times 10^{-9}$  s bi-directional); therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage sensitive semiconductors and components. TVS diodes can also be used in series or parallel to increase the peak power ratings.



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