# 1.5KE Series 1500W Transient Voltage Suppressor

## DESCRIPTION:

The 1.5KE series of high current uni/bi-directional transient suppressors are designed for A.C. line protection and high power DC bus clamping applications. These devices offer uni/bi-directional port protection from 6.8 volts to 550 volts. They provide a clamping voltage lower than the avalanche voltage. Therefore, any voltage rise due to increased current conduction is contained to a minimum, providing the best possible protection level. They can also be connected in series and/or parallel to create very high capacity protection solutions.

Symbol

## FEATURES:

- ✧ Low zener impedance.
- ✧ Excellent clamping capability.
- ✧ Repetition rate (duty cycle): 0.01%.
- ✧ JEDEC DO-27/DO-201 Molded Plastic.
- ✧ Color band denoted cathode except bidirectional.
- ✧ High temperature soldering: 260℃/10s at terminals.
- ✧ Glass passivated chip junction in DO-27/DO-201 package.
- ✧ 1500W Peak Pulse power capability at 10×1000μs waveform.
- ✧ Fast response time: typically less than 1.0ps from 0V to $V_{BR}$ min.

## ABSOLUTE MAXIMUM RATINGS ($T_A$=25℃, RH=45%-75%, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Peak pulse power dissipation on 10/1000μs waveform | $P_{PP}$ | 1500 | W |
| Peak pulse current of on 10/1000μs waveform | $I_{PP}$ | See next table | A |
| Steady state power dissipation at $T_L$=75℃ | $P_{M(AV)}$ | 6.5 | W |
| Operating junction and Storage temperature range | $T_{STG}$, $T_J$ | -55 to +150 | ℃ |
| Peak forward surge current, 8.3ms single half sine-wave | $I_{FSM}$ | 200 | A |

## ELECTRICAL CHARACTERISTICS ($T_A$=25℃)

| Part Number | | $V_R$ | $I_R$@$V_R$ | $V_{BR}$@$I_T$ | | $I_T$ | $V_C$@$I_{PP}$ | $I_{PP}$① |
|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | V | μA | min(V) | max(V) | mA | max(V) | A |
| 1.5KE6.8A | 1.5KE6.8CA | 5.8 | 1000 | 6.45 | 7.14 | 10 | 10.5 | 147.1 |
| 1.5KE7.5A | 1.5KE7.5CA | 6.4 | 500 | 7.13 | 7.88 | 10 | 11.3 | 132.8 |
| 1.5KE8.2A | 1.5KE8.2CA | 7.02 | 200 | 7.79 | 8.61 | 10 | 12.1 | 124.0 |
| 1.5KE9.1A | 1.5KE9.1CA | 7.78 | 50 | 8.65 | 9.55 | 1 | 13.4 | 112.0 |
| 1.5KE10A | 1.5KE10CA | 8.55 | 10 | 9.50 | 10.50 | 1 | 14.5 | 103.5 |
| 1.5KE11A | 1.5KE11CA | 9.4 | 5 | 10.50 | 11.60 | 1 | 15.6 | 96.2 |
| 1.5KE12A | 1.5KE12CA | 10.2 | 5 | 11.40 | 12.60 | 1 | 16.7 | 89.8 |
| 1.5KE13A | 1.5KE13CA | 11.1 | 5 | 12.40 | 13.70 | 1 | 18.2 | 82.5 |
| 1.5KE15A | 1.5KE15CA | 12.8 | 1 | 14.30 | 15.80 | 1 | 21.2 | 70.8 |
| 1.5KE16A | 1.5KE16CA | 13.6 | 1 | 15.20 | 16.80 | 1 | 22.5 | 66.7 |
| 1.5KE18A | 1.5KE18CA | 15.3 | 1 | 17.10 | 18.90 | 1 | 25.2 | 59.6 |
| 1.5KE20A | 1.5KE20CA | 17.1 | 1 | 19.00 | 21.00 | 1 | 27.7 | 54.2 |
| 1.5KE22A | 1.5KE22CA | 18.8 | 1 | 20.90 | 23.10 | 1 | 30.6 | 49.1 |
| 1.5KE24A | 1.5KE24CA | 20.5 | 1 | 22.80 | 25.20 | 1 | 33.2 | 45.2 |
| 1.5KE27A | 1.5KE27CA | 23.1 | 1 | 25.70 | 28.40 | 1 | 37.5 | 40.0 |
| 1.5KE30A | 1.5KE30CA | 25.6 | 1 | 28.50 | 31.50 | 1 | 41.4 | 36.3 |
| 1.5KE33A | 1.5KE33CA | 28.2 | 1 | 31.40 | 34.70 | 1 | 45.7 | 32.9 |
| 1.5KE36A | 1.5KE36CA | 30.8 | 1 | 34.20 | 37.80 | 1 | 49.9 | 30.1 |
| 1.5KE39A | 1.5KE39CA | 33.3 | 1 | 37.10 | 41.00 | 1 | 53.9 | 27.9 |
| 1.5KE43A | 1.5KE43CA | 36.8 | 1 | 40.90 | 45.20 | 1 | 59.3 | 25.3 |
| 1.5KE47A | 1.5KE47CA | 40.2 | 1 | 44.70 | 49.40 | 1 | 64.8 | 23.2 |
| 1.5KE51A | 1.5KE51CA | 43.6 | 1 | 48.50 | 53.60 | 1 | 70.1 | 21.4 |
| 1.5KE56A | 1.5KE56CA | 47.8 | 1 | 53.20 | 58.80 | 1 | 77.0 | 19.5 |
| 1.5KE62A | 1.5KE62CA | 53.0 | 1 | 58.90 | 65.10 | 1 | 85.0 | 17.7 |
| 1.5KE68A | 1.5KE68CA | 58.1 | 1 | 64.60 | 71.40 | 1 | 92.0 | 16.4 |
| 1.5KE75A | 1.5KE75CA | 64.1 | 1 | 71.30 | 78.80 | 1 | 103.0 | 14.6 |
| 1.5KE82A | 1.5KE82CA | 70.1 | 1 | 77.90 | 86.10 | 1 | 113.0 | 13.3 |
| 1.5KE91A | 1.5KE91CA | 77.8 | 1 | 86.50 | 95.50 | 1 | 125.0 | 12.0 |
| 1.5KE100A | 1.5KE100CA | 85.5 | 1 | 95.00 | 105.0 | 1 | 137.0 | 11.0 |
| 1.5KE110A | 1.5KE110CA | 94.0 | 1 | 105.0 | 116.0 | 1 | 152.0 | 10.0 |

## ELECTRICAL CHARACTERISTICS ($T_A$=25℃, continued)

| Part Number | | $V_R$ | $I_R$@$V_R$ | $V_{BR}$@$I_T$ | | $I_T$ | $V_C$@$I_{PP}$ | $I_{PP}$① |
|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | V | μA | min(V) | max(V) | mA | max(V) | A |
| 1.5KE120A | 1.5KE120CA | 102.0 | 1 | 114.0 | 126.0 | 1 | 165.0 | 9.1 |
| 1.5KE130A | 1.5KE130CA | 111.0 | 1 | 124.0 | 137.0 | 1 | 179.0 | 8.4 |
| 1.5KE150A | 1.5KE150CA | 128.0 | 1 | 143.0 | 158.0 | 1 | 207.0 | 7.3 |
| 1.5KE160A | 1.5KE160CA | 136.0 | 1 | 152.0 | 168.0 | 1 | 219.0 | 6.9 |
| 1.5KE170A | 1.5KE170CA | 145.0 | 1 | 162.0 | 179.0 | 1 | 234.0 | 6.5 |
| 1.5KE180A | 1.5KE180CA | 154.0 | 1 | 171.0 | 189.0 | 1 | 246.0 | 6.1 |
| 1.5KE200A | 1.5KE200CA | 171.0 | 1 | 190.0 | 210.0 | 1 | 274.0 | 5.5 |
| 1.5KE220A | 1.5KE220CA | 185.0 | 1 | 209.0 | 231.0 | 1 | 328.0 | 4.6 |
| 1.5KE250A | 1.5KE250CA | 214.0 | 1 | 237.0 | 263.0 | 1 | 344.0 | 4.4 |
| 1.5KE300A | 1.5KE300CA | 256.0 | 1 | 285.0 | 315.0 | 1 | 414.0 | 3.7 |
| 1.5KE350A | 1.5KE350CA | 300.0 | 1 | 332.0 | 368.0 | 1 | 482.0 | 3.2 |
| 1.5KE400A | 1.5KE400CA | 342.0 | 1 | 380.0 | 420.0 | 1 | 548.0 | 2.8 |
| 1.5KE440A | 1.5KE440CA | 376.0 | 1 | 418.0 | 462.0 | 1 | 602.0 | 2.5 |
| 1.5KE480A | 1.5KE480CA | 408.0 | 1 | 456.0 | 504.0 | 1 | 658.0 | 2.28 |
| 1.5KE510A | 1.5KE510CA | 434.0 | 1 | 485.0 | 535.0 | 1 | 698.0 | 2.15 |
| 1.5KE530A | 1.5KE530CA | 450.0 | 1 | 503.5 | 556.5 | 1 | 725.0 | 2.07 |
| 1.5KE540A | 1.5KE540CA | 459.0 | 1 | 513.0 | 567.0 | 1 | 740.0 | 2.03 |
| 1.5KE550A | 1.5KE550CA | 467.0 | 1 | 522.5 | 577.5 | 1 | 760.0 | 1.97 |

① Surge waveform: 10/1000μs

$V_R$: Stand-off Voltage -- Maximum voltage that can be applied $V_{BR}$: Breakdown Voltage

$V_C$: Clamping Voltage -- Peak voltage measured across the suppressor at a specified Ipp $I_R$: Reverse Leakage Current

## RATINGS AND V-I CHARACTERISTICS CURVES ($T_A$=25℃, unless otherwise noted)

**FIG .1:V- I curve characteristics (Uni-directional)**

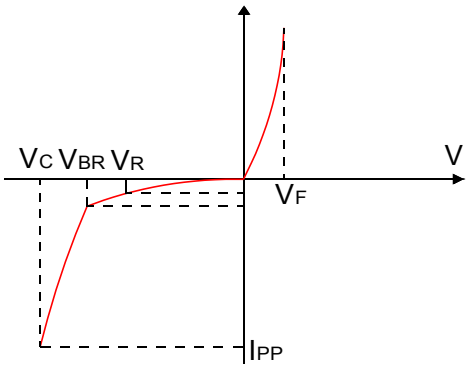



**FIG .2:V- I curve characteristics (Bi-directional)**

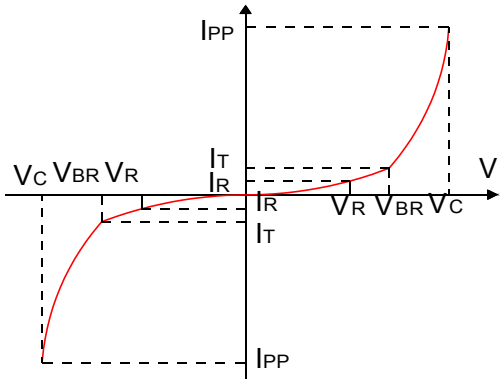


**FIG.3: Pulse waveform**

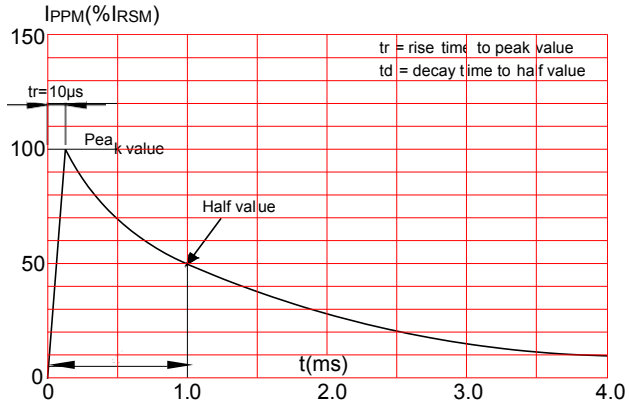
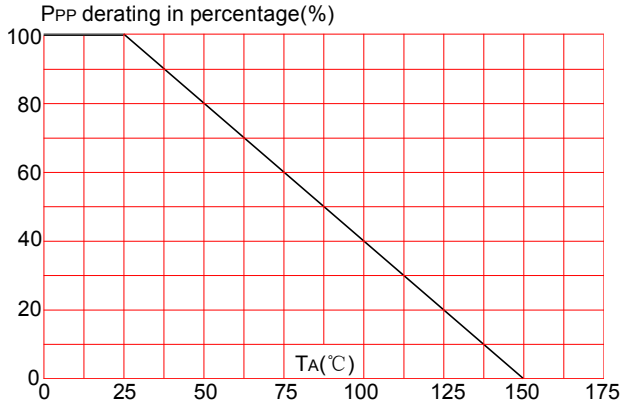


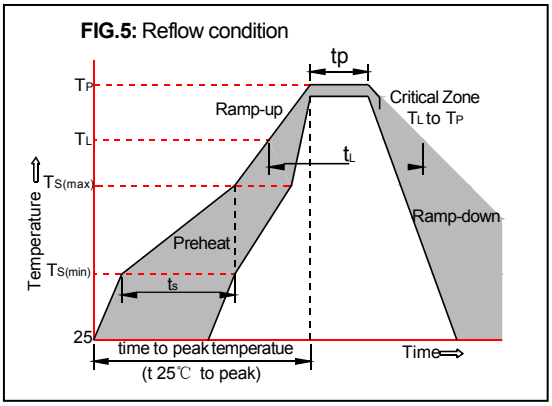

**FIG.4: Pulse derating curve**



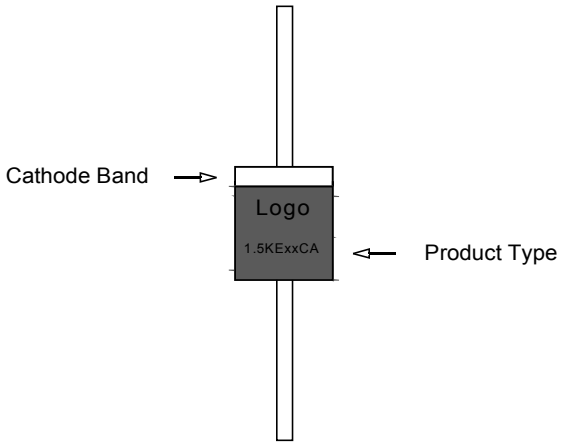

## SOLDERING PARAMETERS

| | | |
|---|---|---|
| Reflow Condition | | Pb-Free assembly (see FIG.5) |
| Pre Heat | -Temperature Min ($T_{s(min)}$) | +150℃ |
| | -Temperature Max($T_{s(max)}$) | +200℃ |
| | -Time (Min to Max) ($t_s$) | 60-180 secs. |
| Average ramp up rate (Liquid us Temp ($T_L$) to peak) | | 3℃/sec. Max |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate | | 3℃/sec. Max |
| Reflow | -Temperature($T_L$)(Liquid us) | +217℃ |
| | -Temperature($t_L$) | 60-150 secs. |
| Peak Temp ($T_p$) | | +260(+0/-5)℃ |
| Time within 5℃ of actual Peak Temp ($t_p$) | | 30 secs. Max |
| Ramp-down Rate | | 6℃/sec. Max |
| Time 25℃ to Peak Temp ($T_P$) | | 8 min. Max |
| Do not exceed | | +260℃ |

**FIG.5:** Reflow condition



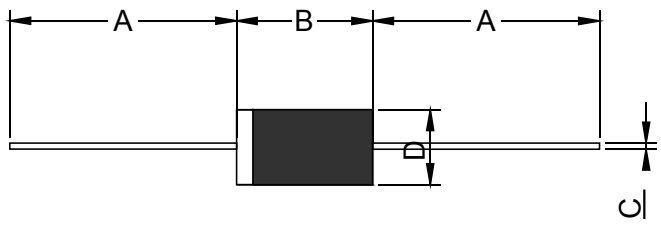

## MARKING & ORDERING INFORMATION




1.5KE XX C A
(1) (2) (3) (4)

(1) Series:1500 watts series
(2)Reverse Stand-off Voltage
(3)Bi-directional
(4)5% $V_{BR}$ Voltage tolerance

## PACKAGE MECHANICAL DATA




| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min. | Max. | Min. | Max. |
| A | 1.000 | - | 25.40 | - |
| B | 0.339 | 0.362 | 8.60 | 9.20 |
| C | 0.045 | 0.057 | 1.15 | 1.45 |
| D | 0.193 | 0.221 | 4.90 | 5.60 |

| Part Number | Case Type | Quantity | Packing Option |
|---|---|---|---|
| 1.5KEXXCA/A | DO-27/DO-201 | 1000 | Box |

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