


HF  1.5KE Automotive Series

Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|---|--------------------|
|  | E128662/E230531 |

**Maximum Ratings and Thermal Characteristics
(T_A=25°C unless otherwise noted)**

| Parameter | Symbol | Value | Unit |
|---|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation by 10x1000µs test waveform (Fig.1) (Note 1) | P _{PPM} | 1500 | W |
| Steady State Power Dissipation on infinite heat sink at T _L =75°C (Fig. 5) | P _D | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional only (Note 2) | I _{FSM} | 200 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional only | V _F | 3.5 | V |
| Operating Junction and Storage Temperature Range | T _J , T _{STG} | -55 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | R _{WJL} | 15 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{WJA} | 75 | °C/W |

Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25°C per Fig. 2.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

Description

The 1.5KE Automotive Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.


Features

- Halogen-Free
- RoHS compliant
- Typical maximum temperature coefficient
 $\Delta V_{BR} = 0.1\% \times V_{BR} @ 25^\circ\text{C} \times \Delta T$
- Glass passivated chip junction in DO-201 Package
- 1500W peak pulse capability at 10x1000µs waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 1µA above 13V
- High temperature soldering guaranteed: 260°C/40 seconds / 0.375"(9.5mm) lead length, 5 lbs., (2.3kg) tension
- Plastic package has Underwriters Laboratory Flammability classification 94V-0
- Matte Tin Lead-free plated

Applications

TVS devices are ideal for the protection of I/O interfaces, V_{CC} bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

Electrical Characteristics

| Part Number (Uni) | Part Number (Bi) | Reverse Stand off Voltage V_R (Volts) | Breakdown Voltage V_{BR} (Volts) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage V_C @ I_{PP} (Volts) | Maximum Peak Pulse Current I_{PP} (A) | Maximum Reverse Leakage I_R @ V_R (μ A) | Agency Approval  |
|-------------------|------------------|---|--|-------|-------------------------|---|---|--|---|
| | | | MIN | MAX | | | | | |
| 1.5KE12AAUTO | 1.5KE12CAAUTO | 10.20 | 11.40 | 12.60 | 1 | 16.7 | 91.0 | 5 | X |
| 1.5KE13AAUTO | 1.5KE13CAAUTO | 11.10 | 12.40 | 13.70 | 1 | 18.2 | 83.5 | 1 | X |
| 1.5KE15AAUTO | 1.5KE15CAAUTO | 12.80 | 14.30 | 15.80 | 1 | 21.2 | 71.7 | 1 | X |
| 1.5KE16AAUTO | 1.5KE16CAAUTO | 13.60 | 15.20 | 16.80 | 1 | 22.5 | 67.6 | 1 | X |
| 1.5KE18AAUTO | 1.5KE18CAAUTO | 15.30 | 17.10 | 18.90 | 1 | 25.2 | 60.3 | 1 | X |
| 1.5KE20AAUTO | 1.5KE20CAAUTO | 17.10 | 19.00 | 21.00 | 1 | 27.7 | 54.9 | 1 | X |
| 1.5KE22AAUTO | 1.5KE22CAAUTO | 18.80 | 20.90 | 23.10 | 1 | 30.6 | 49.7 | 1 | X |
| 1.5KE24AAUTO | 1.5KE24CAAUTO | 20.50 | 22.80 | 25.20 | 1 | 33.2 | 45.8 | 1 | X |
| 1.5KE27AAUTO | 1.5KE27CAAUTO | 23.10 | 25.70 | 28.40 | 1 | 37.5 | 40.5 | 1 | X |
| 1.5KE30AAUTO | 1.5KE30CAAUTO | 25.60 | 28.50 | 31.50 | 1 | 41.4 | 36.7 | 1 | X |
| 1.5KE33AAUTO | 1.5KE33CAAUTO | 28.20 | 31.40 | 34.70 | 1 | 45.7 | 33.3 | 1 | X |
| 1.5KE36AAUTO | 1.5KE36CAAUTO | 30.80 | 34.20 | 37.80 | 1 | 49.9 | 30.5 | 1 | X |
| 1.5KE39AAUTO | 1.5KE39CAAUTO | 33.30 | 37.10 | 41.00 | 1 | 53.9 | 28.2 | 1 | X |
| 1.5KE43AAUTO | 1.5KE43CAAUTO | 36.80 | 40.90 | 45.20 | 1 | 59.3 | 25.6 | 1 | X |
| 1.5KE47AAUTO | 1.5KE47CAAUTO | 40.20 | 44.70 | 49.40 | 1 | 64.8 | 23.5 | 1 | X |

For parts without A, the V_{BR} is $\pm 10\%$ and V_C is 5% higher than with A parts.

Ratings and Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1 - Peak Pulse Power Rating Curve

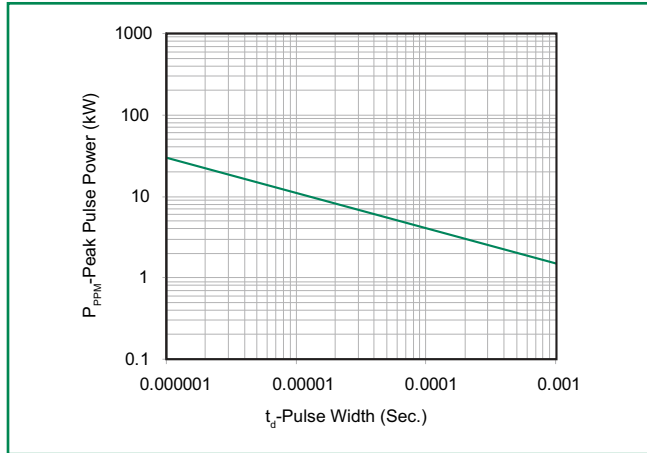


Figure 2 - Pulse Derating Curve

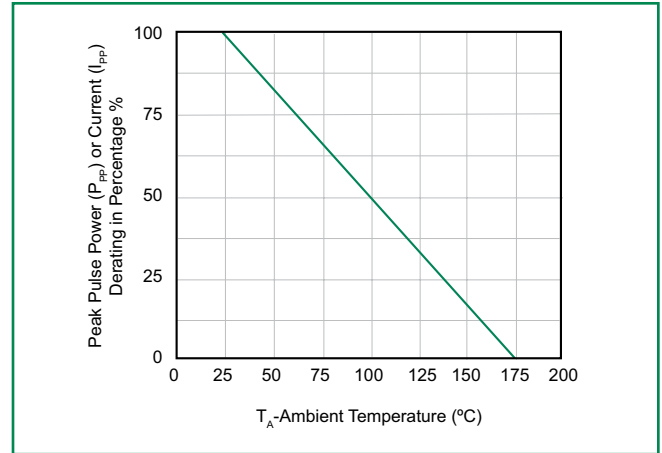


Figure 3 - Pulse Waveform

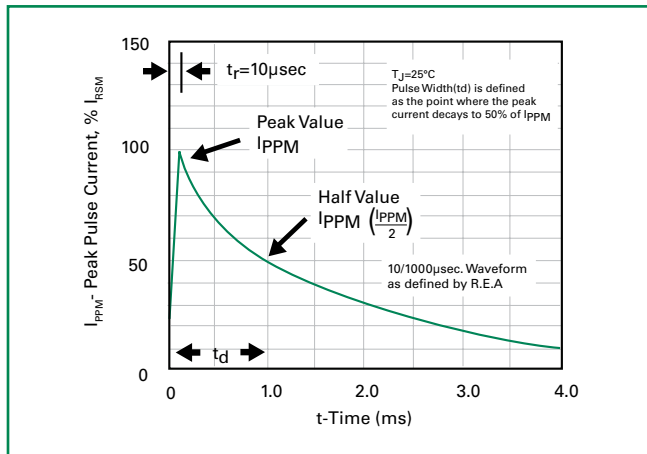


Figure 4 - Typical Junction Capacitance

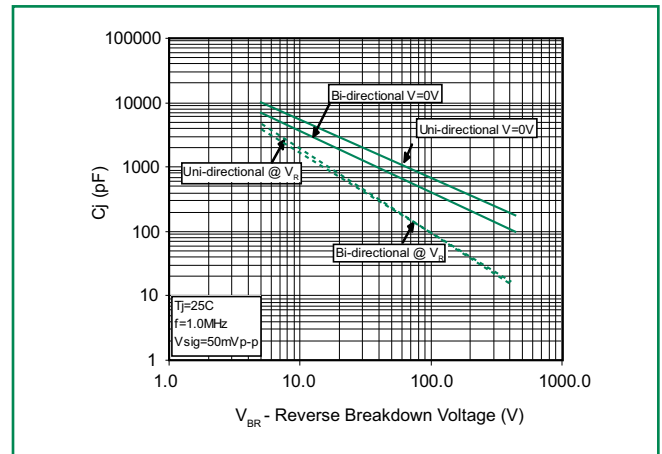


Figure 5 - Steady State Power Derating Curve

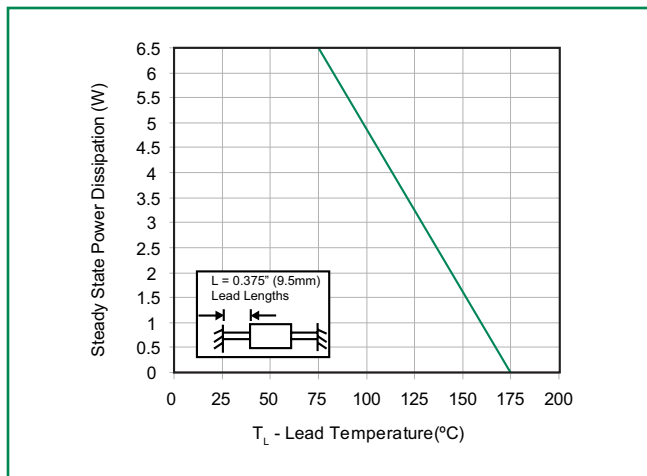
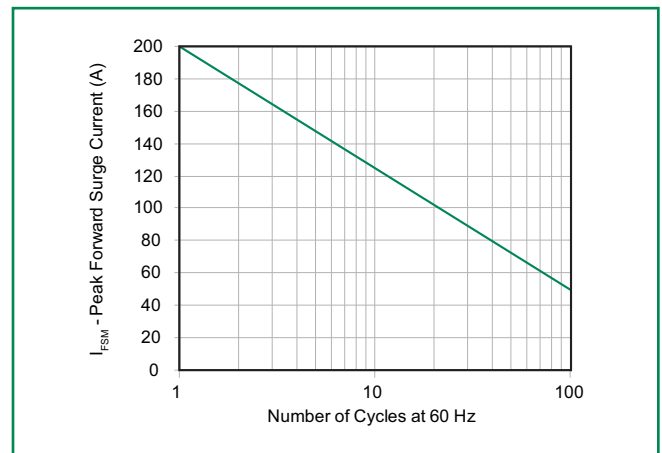


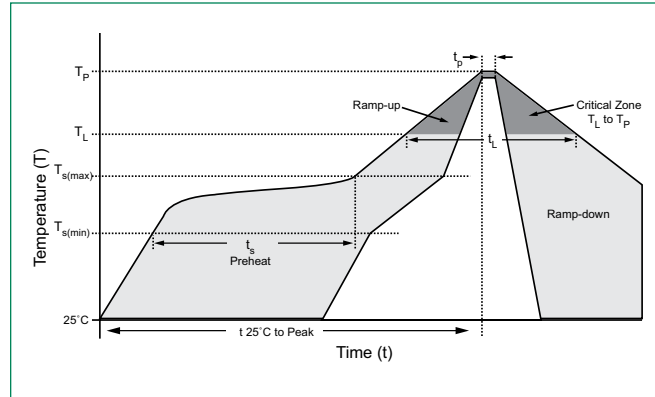
Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



1.5KE Automotive Series

Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Lead-free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Time (min to max) (t_s) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 20 – 40 seconds |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes Max. |
| Do not exceed | | 280°C |



Flow/Wave Soldering (Solder Dipping)

| | |
|---------------------------|------------|
| Peak Temperature : | 265°C |
| Dipping Time : | 10 seconds |
| Soldering : | 1 time |

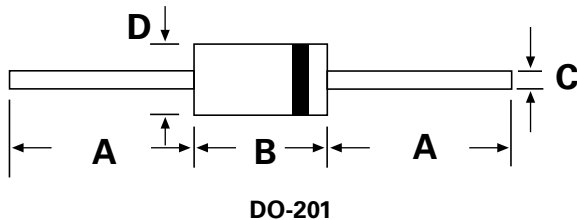
Physical Specifications

| | |
|-----------------|--|
| Weight | 0.045oz., 1.2g |
| Case | JEDEC DO-201 molded plastic body over passivated junction. |
| Polarity | Color band denotes the cathode except Bipolar. |
| Terminal | Matte Tin axial leads, solderable per JESD22-B102D. |

Environmental Specifications

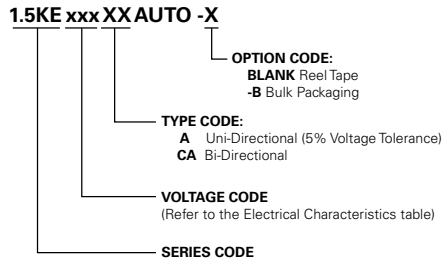
| | |
|---------------------------|--------------|
| Temperature Cycle | JESD22-A104 |
| Pressure Cooker | JESD 22-A102 |
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Thermal Shock | JESD22-A106 |

Dimensions

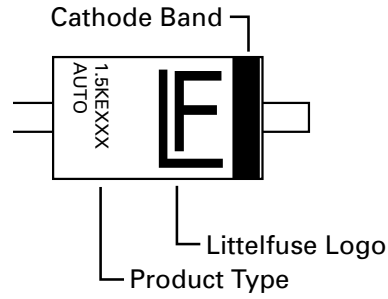


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|------|
| | Min | Max | Min | Max |
| A | 1.000 | - | 25.40 | - |
| B | 0.285 | 0.375 | 7.20 | 9.50 |
| C | 0.038 | 0.042 | 0.96 | 1.07 |
| D | 0.190 | 0.210 | 4.80 | 5.30 |

Part Numbering System



Part Marking System



Packaging

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|------------------|-------------------|----------|------------------|--|
| 1.5KExxxXXAUTO | DO-201 | 1200 | Tape & Reel | EIA STD RS-296E |
| 1.5KExxxXXAUTO-B | DO-201 | 500 | BULK | Littelfuse Concord Packing Spec. DM-0016 |

