# HF RoHS LCE 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 |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 175 | °C |

**Note:**
1. Non-repetitive current pulse , per Fig. 3 and derated above $T_A$ = 25°C per Fig. 2.

## Description

The LCE 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
- Glass passivated chip junction in DO-201 Package
- 1500W peak pulse power capability at 10×1000µs 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
- 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-O
- Matte Tin Lead–free plated
- Ideal for data line applications

## 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.

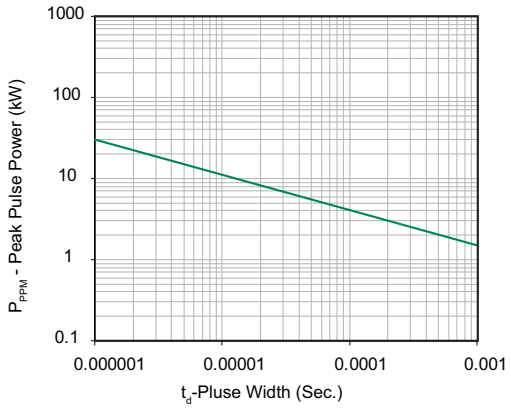
## Electrical Characteristics

| Part Number | Reverse Stand off Voltage $V_R$ (V) | Breakdown Voltage $V_{BR}$ (V) | | Test Current $I_T$ (mA) | Maximum Reverse Leakage $I_R$ @ $V_R$ (µA) | Maximum Clamping Voltage at $I_{PP}$ $V_C$ (V) | Maximum Peak Pulse Current (Fig.3) $I_{PPM}$ (A) | Maximum Junction Capacitance @ 0 Volts (pF) | Working Inverse Blocking Voltage $V_{WIB}$ (V) | Inverse Blocking Leakage Current at $I_{IB}$ @ $V_{WIB}$ (mA) | Peak Inverse Blocking Voltage $V_{PIB}$ (V) | Agency Approval ®Ⓤ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | | | | | | | | | |
| LCE6.5A | 6.5 | 7.22 | 7.98 | 10 | 1000 | 11.2 | 100.0 | 100 | 75 | 1.0 | 100 | X |
| LCE7.0A | 7.0 | 7.78 | 8.60 | 10 | 500 | 12.0 | 100.0 | 100 | 75 | 1.0 | 100 | X |
| LCE7.5A | 7.5 | 8.33 | 9.21 | 10 | 250 | 12.9 | 100.0 | 100 | 75 | 1.0 | 100 | X |
| LCE8.0A | 8.0 | 8.89 | 9.83 | 1 | 100 | 13.6 | 100.0 | 100 | 75 | 1.0 | 100 | X |
| LCE8.5A | 8.5 | 9.44 | 10.40 | 1 | 50 | 14.4 | 100.0 | 100 | 75 | 1.0 | 100 | X |
| LCE9.0A | 9.0 | 10.00 | 11.10 | 1 | 10 | 15.4 | 97.0 | 100 | 75 | 1.0 | 100 | X |
| LCE10A | 10.0 | 11.10 | 12.30 | 1 | 5 | 17.0 | 88.0 | 100 | 75 | 1.0 | 100 | X |
| LCE11A | 11.0 | 12.20 | 13.50 | 1 | 1 | 18.2 | 82.0 | 100 | 75 | 1.0 | 100 | X |
| LCE12A | 12.0 | 13.30 | 14.70 | 1 | 1 | 19.9 | 75.0 | 100 | 75 | 1.0 | 100 | X |
| LCE13A | 13.0 | 14.40 | 15.90 | 1 | 1 | 21.5 | 70.0 | 100 | 75 | 1.0 | 100 | X |
| LCE14A | 14.0 | 15.60 | 17.20 | 1 | 1 | 23.2 | 65.0 | 100 | 75 | 1.0 | 100 | X |
| LCE15A | 15.0 | 16.70 | 18.50 | 1 | 1 | 24.4 | 61.0 | 100 | 75 | 1.0 | 100 | X |
| LCE16A | 16.0 | 17.80 | 19.70 | 1 | 1 | 26.0 | 57.0 | 100 | 75 | 1.0 | 100 | X |
| LCE17A | 17.0 | 18.90 | 20.90 | 1 | 1 | 27.6 | 54.0 | 100 | 75 | 1.0 | 100 | X |
| LCE18A | 18.0 | 20.00 | 22.10 | 1 | 1 | 29.2 | 51.0 | 100 | 75 | 1.0 | 100 | X |
| LCE20A | 20.0 | 22.20 | 24.50 | 1 | 1 | 32.4 | 46.0 | 100 | 75 | 1.0 | 100 | X |
| LCE22A | 22.0 | 24.40 | 26.90 | 1 | 1 | 35.5 | 42.0 | 100 | 75 | 1.0 | 100 | X |
| LCE24A | 24.0 | 26.70 | 29.50 | 1 | 1 | 38.9 | 39.0 | 100 | 75 | 1.0 | 100 | X |
| LCE26A | 26.0 | 28.90 | 31.90 | 1 | 1 | 42.1 | 36.0 | 100 | 75 | 1.0 | 100 | X |
| LCE28A | 28.0 | 31.10 | 34.40 | 1 | 1 | 45.5 | 33.0 | 100 | 75 | 1.0 | 100 | X |
| LCE30A | 30.0 | 33.30 | 36.80 | 1 | 1 | 48.4 | 31.0 | 100 | 75 | 1.0 | 100 | |
| LCE33A | 33.0 | 36.70 | 40.60 | 1 | 1 | 53.3 | 28.1 | 100 | 75 | 1.0 | 100 | |
| LCE36A | 36.0 | 40.00 | 44.20 | 1 | 1 | 58.1 | 25.8 | 100 | 75 | 1.0 | 100 | |
| LCE40A | 40.0 | 44.40 | 49.10 | 1 | 1 | 64.5 | 23.3 | 100 | 75 | 1.0 | 100 | |
| LCE43A | 43.0 | 47.80 | 52.80 | 1 | 1 | 69.4 | 21.6 | 100 | 75 | 1.0 | 100 | |
| LCE45A | 45.0 | 50.00 | 55.30 | 1 | 1 | 72.7 | 20.6 | 100 | 75 | 1.0 | 100 | |
| LCE48A | 48.0 | 53.30 | 58.90 | 1 | 1 | 77.4 | 19.4 | 100 | 75 | 1.0 | 100 | |
| LCE51A | 51.0 | 56.70 | 62.70 | 1 | 1 | 82.4 | 18.2 | 100 | 75 | 1.0 | 100 | |
| LCE54A | 54.0 | 60.00 | 66.30 | 1 | 1 | 87.1 | 17.2 | 100 | 100 | 1.0 | 125 | |
| LCE58A | 58.0 | 64.40 | 71.20 | 1 | 1 | 93.6 | 16.0 | 100 | 100 | 1.0 | 125 | |
| LCE60A | 60.0 | 66.70 | 73.70 | 1 | 1 | 96.8 | 15.5 | 100 | 100 | 1.0 | 125 | |
| LCE64A | 64.0 | 71.10 | 78.60 | 1 | 1 | 103.0 | 14.6 | 100 | 100 | 1.0 | 125 | |
| LCE70A | 70.0 | 77.80 | 86.00 | 1 | 1 | 113.0 | 13.3 | 100 | 125 | 1.0 | 150 | |
| LCE75A | 75.0 | 83.30 | 92.10 | 1 | 1 | 121.0 | 12.4 | 100 | 125 | 1.0 | 150 | |
| LCE85A | 85.0 | 94.40 | 104.00 | 1 | 1 | 129.0 | 11.6 | 100 | 125 | 1.0 | 150 | |
| LCE90A | 90.0 | 100.00 | 111.00 | 1 | 1 | 146.0 | 10.3 | 100 | 125 | 1.0 | 150 | |

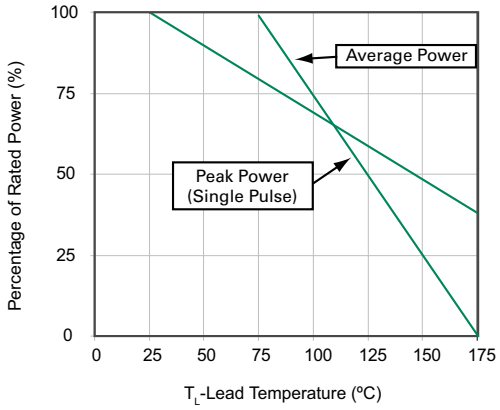
**Note:** For parts without A, the $V_{BR}$ is ± 10%.

## Ratings and Characteristic Curves ($T_A$=25°C unless otherwise noted)

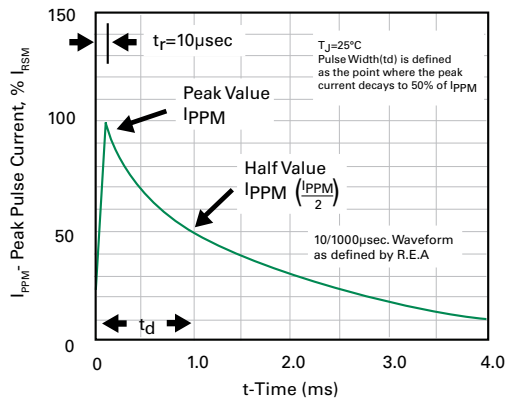
### Figure 1 - Peak Pulse Power Rating



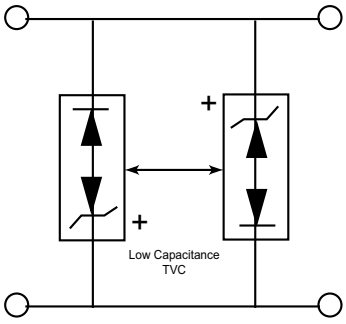

### Figure 2 - Power Derating Curve




### Figure 3 - Pulse Waveform

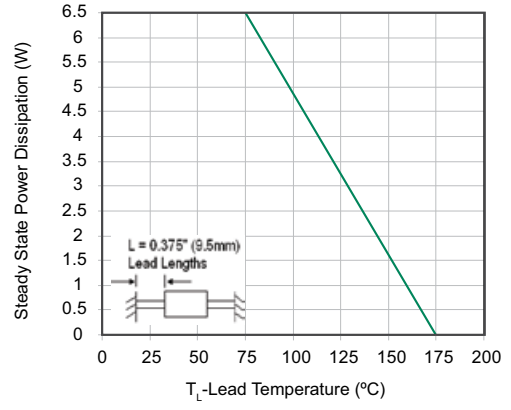



### Figure 4 - AC Line Protection Application




**Application Note:** Device must be used with two units in parrellel, opposite in polarity as shown on circuit for AC signal lin protection.

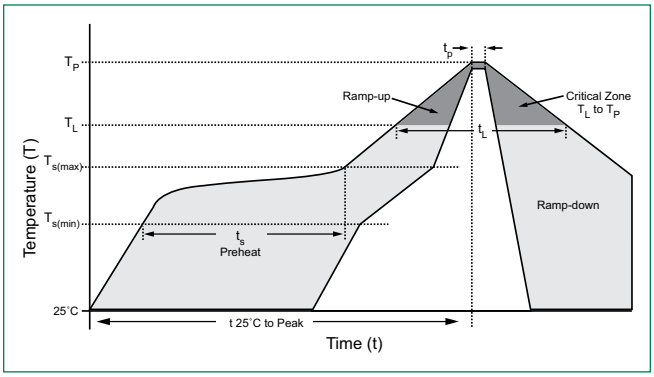
### Figure 5 - Steady State Power Derating Curve




LCE 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 |

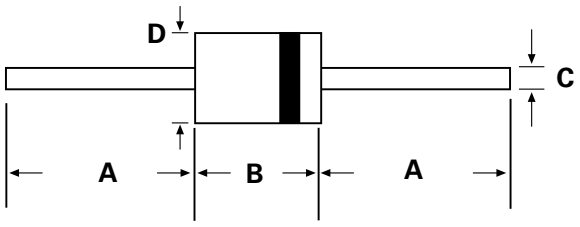
## Physical Specifications

| | |
|---|---|
| **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



DO-201

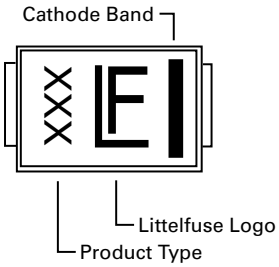
| Dimensions | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.000 | - | 25.40 | - |
| B | 0.285 | 0.375 | 7.20 | 9.50 |
| C | 0.038 | 0.042 | 0.96 | 1.07 |
| D | 0.190 | 0.210 | 4.80 | 5.30 |

## Part Numbering System

**LCE xxx A X**

- **OPTION CODE:**
  - **BLANK** Reel Tape
  - **-B** Bulk Packaging
- **TYPE CODE:**
  - **A** Uni-Directional (5% Voltage Tolerance)
- **VOLTAGE CODE**
  (Refer to the Electrical Characteristics table)
- **SERIES CODE**

## Part Marking System




## Packaging

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

## Schematic