

### LCE Series



#### Agency Approvals

| AGENCY  | AGENCY FILE NUMBER |
|---|--------------------|
|  | E230531            |

#### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter   | Symbol                            | Value      | Unit |
|---|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.1) (Note 1)              | P <sub>PPM</sub>                  | 1500       | W    |
| Steady State Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =75°C (Fig. 5) | P <sub>D</sub>                    | 6.5        | W    |
| Operating Junction and Storage Temperature Range                                      | T <sub>J</sub> , T <sub>STG</sub> | -65 to 175 | °C   |

**Note:**

1. Non-repetitive current pulse, per Fig. 3 and derated above T<sub>J</sub> (initial) = 25°C per Fig. 2.

#### Additional Information



Datasheet



Resources



Samples

#### Description

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


#### Features

- 1500W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- Glass passivated chip junction in DO-201 Package
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- High temperature to reflow soldering guaranteed: 260°C/40sec / 0.375"/(9.5mm) lead length, 5 lbs., (2.3kg) tension
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Matte tin lead-free plated
- Ideal for data line applications
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

#### Applications

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

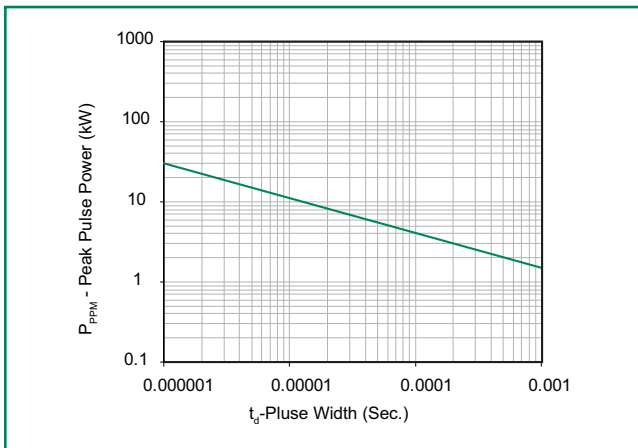
### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number | Reverse Stand off Voltage V <sub>R</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) |        | Test Current I <sub>T</sub> (mA) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Maximum Clamping Voltage at I <sub>PP</sub> V <sub>C</sub> (V) | Maximum Peak Pulse Current (Fig.3) I <sub>PPM</sub> (A) | Maximum Junction Capacitance @ 0Volts (pF) | Working Inverse Blocking Voltage V <sub>WIB</sub> (V) | Inverse Blocking Leakage Current at I <sub>IB</sub> @ V <sub>WIB</sub> (mA) | Peak Inverse Blocking Voltage V <sub>PIB</sub> (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  | X   |
| LCE33A      | 33.0   | 36.70                                 | 40.60  | 1                                | 1  | 53.3   | 28.1  | 100  | 75  | 1.0   | 100  | X   |
| LCE36A      | 36.0   | 40.00                                 | 44.20  | 1                                | 1  | 58.1   | 25.8  | 100  | 75  | 1.0   | 100  | X   |
| LCE40A      | 40.0   | 44.40                                 | 49.10  | 1                                | 1  | 64.5   | 23.3  | 100  | 75  | 1.0   | 100  | X   |
| LCE43A      | 43.0   | 47.80                                 | 52.80  | 1                                | 1  | 69.4   | 21.6  | 100  | 75  | 1.0   | 100  | X   |
| LCE45A      | 45.0   | 50.00                                 | 55.30  | 1                                | 1  | 72.7   | 20.6  | 100  | 75  | 1.0   | 100  | X   |
| LCE48A      | 48.0   | 53.30                                 | 58.90  | 1                                | 1  | 77.4   | 19.4  | 100  | 75  | 1.0   | 100  | X   |
| LCE51A      | 51.0   | 56.70                                 | 62.70  | 1                                | 1  | 82.4   | 18.2  | 100  | 75  | 1.0   | 100  | X   |
| LCE54A      | 54.0   | 60.00                                 | 66.30  | 1                                | 1  | 87.1   | 17.2  | 100  | 100   | 1.0   | 125  | X   |
| LCE58A      | 58.0   | 64.40                                 | 71.20  | 1                                | 1  | 93.6   | 16.0  | 100  | 100   | 1.0   | 125  | X   |
| LCE60A      | 60.0   | 66.70                                 | 73.70  | 1                                | 1  | 96.8   | 15.5  | 100  | 100   | 1.0   | 125  | X   |
| LCE64A      | 64.0   | 71.10                                 | 78.60  | 1                                | 1  | 103.0  | 14.6  | 100  | 100   | 1.0   | 125  | X   |
| LCE70A      | 70.0   | 77.80                                 | 86.00  | 1                                | 1  | 113.0  | 13.3  | 100  | 125   | 1.0   | 150  | X   |
| LCE75A      | 75.0   | 83.30                                 | 92.10  | 1                                | 1  | 121.0  | 12.4  | 100  | 125   | 1.0   | 150  | X   |
| LCE85A      | 85.0   | 94.40                                 | 104.00 | 1                                | 1  | 129.0  | 11.6  | 100  | 125   | 1.0   | 150  | X   |
| LCE90A      | 90.0   | 100.00                                | 111.00 | 1                                | 1  | 146.0  | 10.3  | 100  | 125   | 1.0   | 150  | X   |

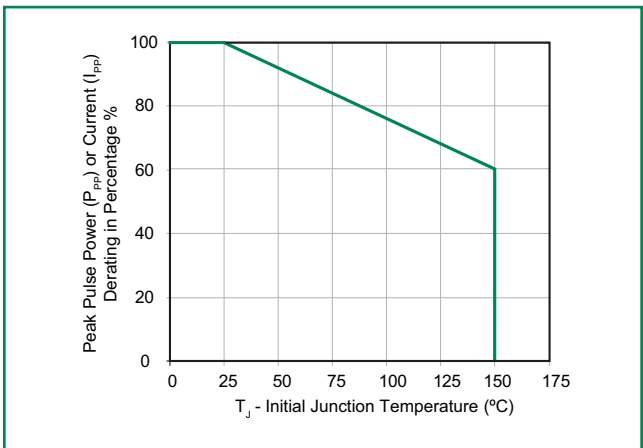
**Note:** For parts without A, the V<sub>BR</sub> is ±10% and V<sub>C</sub> is 5% higher than with A parts.

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

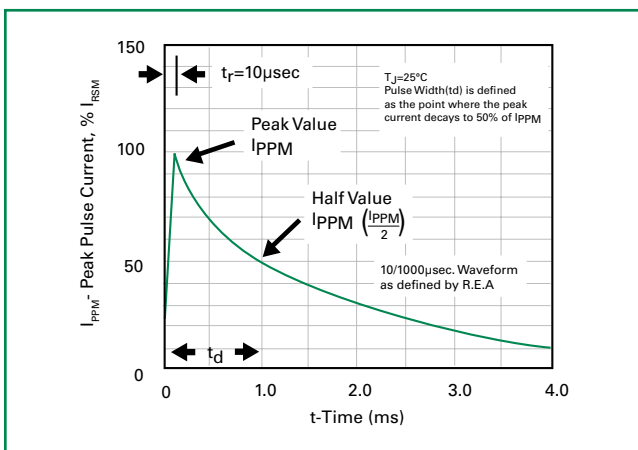
**Figure 1 - Peak Pulse Power Rating**



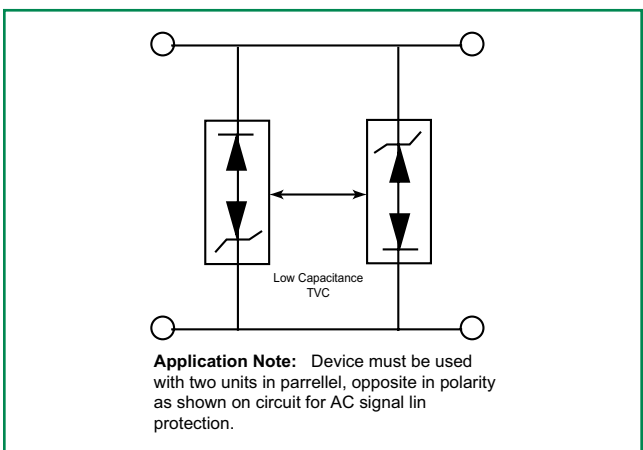
**Figure 2 - Peak Pulse Power Derating Curve**



**Figure 3 - Pulse Waveform**

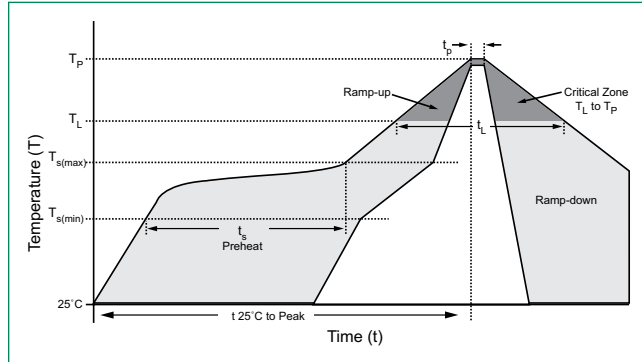


**Figure 4 - AC Line Protection Application**



### 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 ( $T_A$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_A$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow   | - Temperature ( $T_A$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °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  |                                    | 260°C                   |



### Flow/Wave Soldering (Solder Dipping)

|                           |            |
|---------------------------|------------|
| <b>Peak Temperature :</b> | 265°C      |
| <b>Dipping Time :</b>     | 10 seconds |
| <b>Soldering :</b>        | 1 time     |

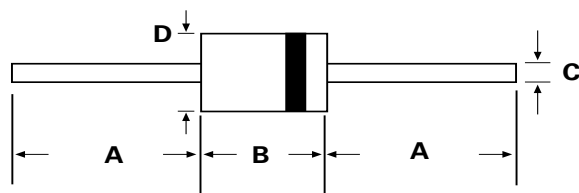
### Physical Specifications

|                 |  |
|-----------------|--|
| <b>Weight</b>   | 0.045oz., 1.2g   |
| <b>Case</b>     | JEDEC DO-201 molded plastic body over passivated junction. |
| <b>Polarity</b> | Color band denotes the cathode except Bipolar.             |
| <b>Terminal</b> | Matte Tin axial leads, solderable per JESD22-B102.         |

### Environmental Specifications

|                            |             |
|----------------------------|-------------|
| <b>High Temp. Storage</b>  | JESD22-A103 |
| <b>HTRB</b>                | JESD22-A108 |
| <b>Temperature Cycling</b> | JESD22-A104 |
| <b>H3TRB</b>               | JESD22-A101 |
| <b>RSH</b>                 | JESD22-B106 |

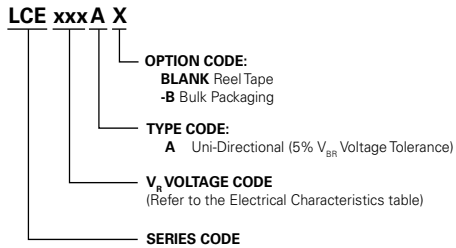
### Dimensions



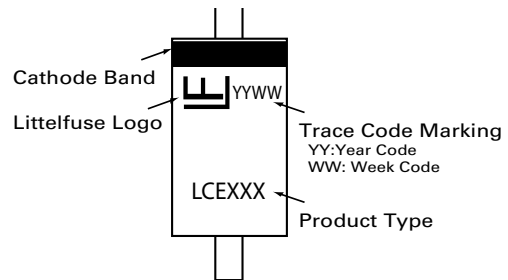
DO-201

| 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



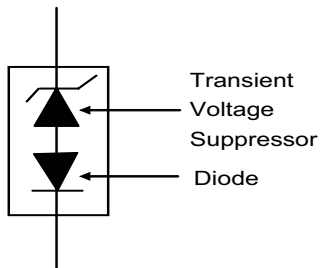
### Part Marking System



### Packaging

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

### Schematic



### Tape and Reel Specification

