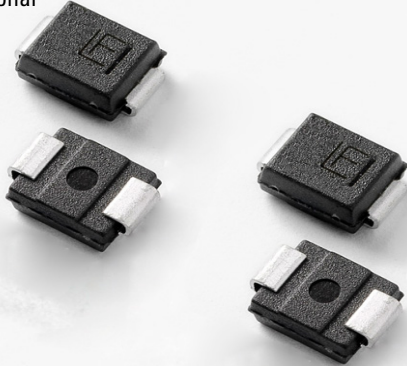


# SMBLCE-HR Series

## Surface Mount - 600W

Uni-directional



### Agency Approvals

| Agency | Agency File/Certificate Number |
|--------|--------------------------------|
|        | E230531                        |

### Maximum Ratings & Thermal Characteristics

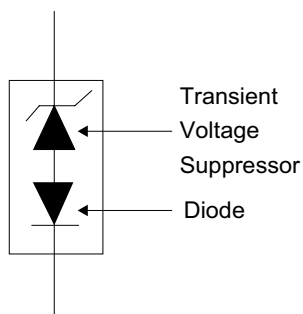
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Parameter                                                                                                                           | Symbol    | Value      | Unit             |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------|------------|------------------|
| Peak Pulse Power Dissipation ( $I_{PP} \times V_C$ ) at $T_L = 25^\circ\text{C}$ by 10/1000 $\mu\text{s}$ Waveform (fig.1) (Note 1) | $P_{PPM}$ | 600        | W                |
| Power Dissipation on Infinite Heat Sink at $T_L = 50^\circ\text{C}$                                                                 | $P_D$     | 3.0        | W                |
| Operating Temperature Range                                                                                                         | $T_J$     | -65 to 150 | $^\circ\text{C}$ |
| Typical Thermal Resistance Junction to Lead                                                                                         | $T_{STG}$ | -65 to 175 | $^\circ\text{C}$ |

#### Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above  $T_J$  (initial) =  $25^\circ\text{C}$  per Fig. 2.

### Schematic



### Description

SMBLCE-HR High Reliability series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- 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
- ESD protection of data lines in accordance with IEC 61000-4-2 ESD 30kV (Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Glass passivated chip junction
- Low incremental surge resistance
- 600W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles): 0.01 %
- Fast response and excellent clamping capability
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, high temperature soldering guaranteed:  $260^\circ\text{C}/10$  seconds at terminals
- Matte tin lead-free plated
- 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 Components 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.



# SMBLCE-HR Series

## Surface Mount - 600W

### Electrical Characteristics

| Part Number  | Marking Code | Stand-Off Voltage $V_R$ (V) | Minimum Breakdown Voltage $V_{BR}(V)$ @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Reverse Leakage at $I_R$ @ $V_R$ ( $\mu A$ ) | Maximum Clamping Voltage @ $I_{PP}$ $V_C(V)$ | Maximum Peak Pulse Current per (Fig.3) $I_{PP}(A)$ | Maximum Junction Capacitance at 0 Volts $f=1MHz$ (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   |                         |                                                      |                                              |                                                    |                                                       |                                               |                                                               |                                            |                                                                                                     |
| SMBLCE6.5-HR | SKK          | 6.5                         | 7.22                                          | 7.98  | 10                      | 1000                                                 | 11.2                                         | 53.58                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE7.0-HR | SKM          | 7.0                         | 7.78                                          | 8.60  | 10                      | 500                                                  | 12.0                                         | 50.00                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE7.5-HR | SKP          | 7.5                         | 8.33                                          | 9.21  | 10                      | 250                                                  | 12.9                                         | 46.52                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE8.0-HR | SKR          | 8.0                         | 8.89                                          | 9.83  | 1                       | 100                                                  | 13.6                                         | 44.12                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE8.5-HR | SKT          | 8.5                         | 9.44                                          | 10.40 | 1                       | 50                                                   | 14.4                                         | 41.67                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE9.0-HR | SKV          | 9.0                         | 10.00                                         | 11.10 | 1                       | 10                                                   | 15.4                                         | 38.97                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE10-HR  | SKX          | 10.0                        | 11.10                                         | 12.30 | 1                       | 5                                                    | 17.0                                         | 35.30                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE11-HR  | SKZ          | 11.0                        | 12.20                                         | 13.50 | 1                       | 0.96                                                 | 18.2                                         | 32.97                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE12-HR  | SLE          | 12.0                        | 13.30                                         | 14.70 | 1                       | 0.96                                                 | 19.9                                         | 30.16                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE13-HR  | SLG          | 13.0                        | 14.40                                         | 15.90 | 1                       | 0.96                                                 | 21.5                                         | 27.91                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE14-HR  | SLK          | 14.0                        | 15.60                                         | 17.20 | 1                       | 0.96                                                 | 23.2                                         | 25.87                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE15-HR  | SLM          | 15.0                        | 16.70                                         | 18.50 | 1                       | 0.96                                                 | 24.4                                         | 24.59                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE16-HR  | SLP          | 16.0                        | 17.80                                         | 19.70 | 1                       | 0.96                                                 | 26.0                                         | 23.10                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE17-HR  | SLR          | 17.0                        | 18.90                                         | 20.90 | 1                       | 0.96                                                 | 27.6                                         | 21.74                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE18-HR  | SLT          | 18.0                        | 20.00                                         | 22.10 | 1                       | 0.96                                                 | 29.2                                         | 20.55                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE20-HR  | SLV          | 20.0                        | 22.20                                         | 24.50 | 1                       | 0.96                                                 | 32.4                                         | 18.52                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE22-HR  | SLX          | 22.0                        | 24.40                                         | 26.90 | 1                       | 0.96                                                 | 35.5                                         | 16.91                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE24-HR  | SLZ          | 24.0                        | 26.70                                         | 29.50 | 1                       | 0.96                                                 | 38.9                                         | 15.43                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE26-HR  | SME          | 26.0                        | 28.90                                         | 31.90 | 1                       | 0.96                                                 | 42.1                                         | 14.26                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE28-HR  | SMG          | 28.0                        | 31.10                                         | 34.40 | 1                       | 0.96                                                 | 45.5                                         | 13.19                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE30-HR  | SMK          | 30.0                        | 33.30                                         | 36.80 | 1                       | 0.96                                                 | 48.4                                         | 12.40                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE33-HR  | SMM          | 33.0                        | 36.70                                         | 40.60 | 1                       | 0.96                                                 | 53.3                                         | 11.26                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE36-HR  | SMP          | 36.0                        | 40.00                                         | 44.20 | 1                       | 0.96                                                 | 58.1                                         | 10.33                                              | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE40-HR  | SMR          | 40.0                        | 44.40                                         | 49.10 | 1                       | 0.96                                                 | 64.5                                         | 9.31                                               | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE43-HR  | SMT          | 43.0                        | 47.80                                         | 52.80 | 1                       | 0.96                                                 | 69.4                                         | 8.65                                               | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE45-HR  | SMV          | 45.0                        | 50.00                                         | 55.30 | 1                       | 0.96                                                 | 72.7                                         | 8.26                                               | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE48-HR  | SMX          | 48.0                        | 53.30                                         | 58.90 | 1                       | 0.96                                                 | 77.4                                         | 7.76                                               | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE51-HR  | SMZ          | 51.0                        | 56.70                                         | 62.70 | 1                       | 0.96                                                 | 82.4                                         | 7.29                                               | 50                                                    | 75                                            | 1.0                                                           | 100                                        | X                                                                                                   |
| SMBLCE54-HR  | SNE          | 54.0                        | 60.00                                         | 66.30 | 1                       | 0.96                                                 | 87.1                                         | 6.90                                               | 50                                                    | 100                                           | 1.0                                                           | 125                                        | X                                                                                                   |
| SMBLCE58-HR  | SNG          | 58.0                        | 64.40                                         | 71.20 | 1                       | 0.96                                                 | 93.6                                         | 6.42                                               | 50                                                    | 100                                           | 1.0                                                           | 125                                        | X                                                                                                   |
| SMBLCE60-HR  | SNK          | 60.0                        | 66.70                                         | 73.70 | 1                       | 0.96                                                 | 96.8                                         | 6.20                                               | 50                                                    | 100                                           | 1.0                                                           | 125                                        | X                                                                                                   |
| SMBLCE64-HR  | SNM          | 64.0                        | 71.10                                         | 78.60 | 1                       | 0.96                                                 | 103.0                                        | 5.83                                               | 50                                                    | 100                                           | 1.0                                                           | 125                                        | X                                                                                                   |
| SMBLCE70-HR  | SNP          | 70.0                        | 77.80                                         | 86.00 | 1                       | 0.96                                                 | 113.0                                        | 5.31                                               | 50                                                    | 125                                           | 1.0                                                           | 150                                        | X                                                                                                   |

Note: Each lot of parts will pass group B test requirement.

### Screen Process

|                                                                                    |                                   |
|------------------------------------------------------------------------------------|-----------------------------------|
| <b>100% Vision Inspection</b>                                                      | MIL-STD-750 method 2074           |
| <b>100% X-RAY inspection</b>                                                       | MIL-STD-750 method 2076           |
| <b>100% Temperature Cycle Test (-55 to 150°C, 20 cycles, dwell time 15 min)</b>    | MIL-STD-750 method 1051           |
| <b>100% Reflow (2x)</b>                                                            | JEDEC J-STD-020                   |
| <b>100% Surge Test (2x)</b>                                                        | MIL-STD-750 method 4066           |
| <b>100% HTRB 150°C Bias=<math>V_R</math> (80% breakdown voltage, 96hrs)</b>        | MIL-STD-750 method 1038           |
| <b>Final Electrical Test( 100% 3 sigma limit, 100% dynamic test and PAT limit)</b> | MIL-STD-750 method 4016.4021.4011 |

Note: Up-screen program can be specified by customer's request by contacting Littelfuse customer service

# SMBLCE-HR Series

Surface Mount - 600W

### Group B Test Requirement

| Screen           | Method                              | Condition                                                               | Requirement                                        |
|------------------|-------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------|
| Surge test       | 10/1000 $\mu$ s Peak Pulse Waveform | Maximum clamping Voltage ( $V_C$ )<br>@ Peak Pulse Current ( $I_{PP}$ ) | Sample Size 45<br>perform 10x<br>Accept 0 failures |
| Burn - In (HTRB) | MIL -STD-750, Method 1038.5         | Applied voltage<br>100% $V_R$ @ 150°C                                   | Sample size 45<br>340 hours<br>Accept 0 failures   |
| Electrical test  | -                                   | $I_R$ @ $V_R$ , $V_{BR}$ @ $I_T$                                        | Sample size 45<br>Accept 0 failures                |

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

Figure 1 - Peak Pulse Power Rating Curve

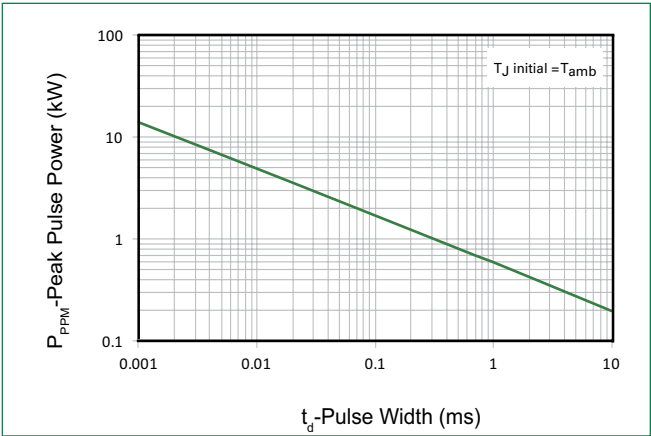


Figure 2 - Peak Pulse Power Derating Curve

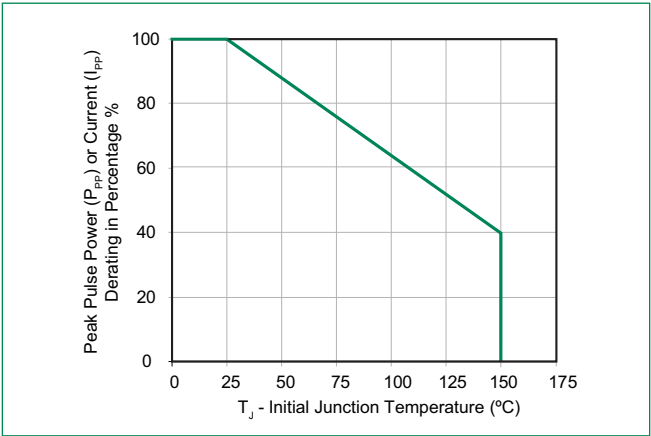


Figure 3 - Pulse Waveform

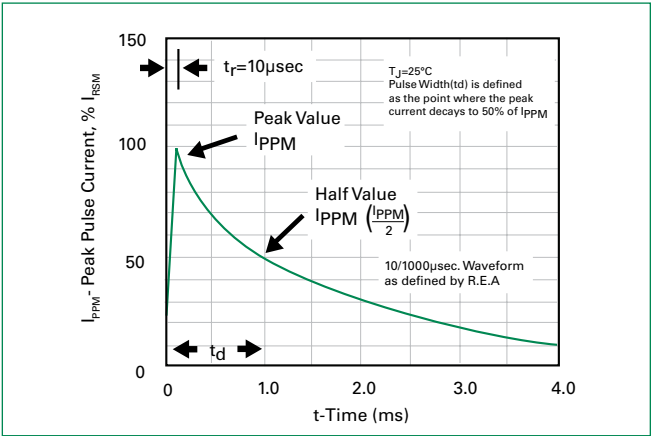
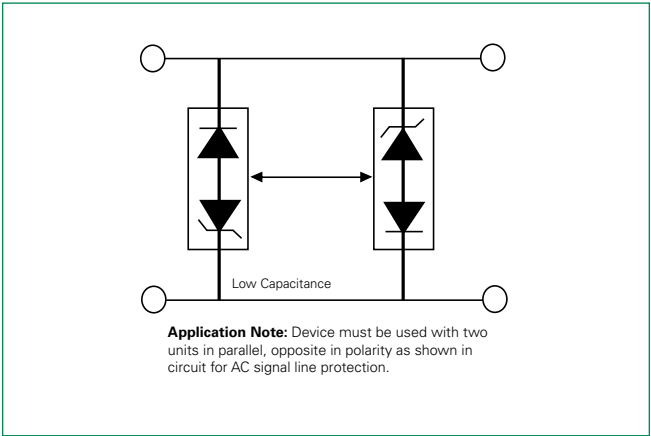


Figure 4 - AC Line Protection Application

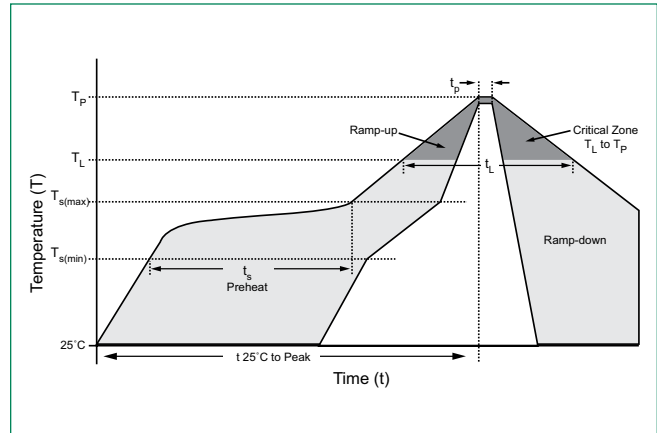


# SMBLCE-HR Series

## Surface Mount - 600W

### Soldering Parameters

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



### Physical Specifications

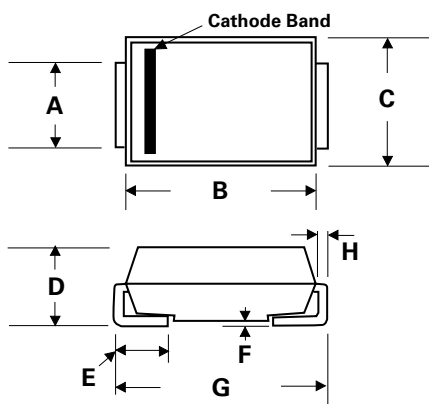
|                 |                                                                    |
|-----------------|--------------------------------------------------------------------|
| <b>Weight</b>   | 0.003oz., 0.093g                                                   |
| <b>Case</b>     | JEDEC DO-214AA molded plastic body over glass passivated junction. |
| <b>Polarity</b> | Color band denotes cathode except Bidirectional                    |
| <b>Terminal</b> | Matte Tin-plated 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>MSL</b>                 | JEDEC-J-STD-020, Level 1 |
| <b>H3TRB</b>               | JESD22-A101              |
| <b>RSH</b>                 | JESD22-A111              |

### Dimensions

DO-214AA (SMB J-Bend)

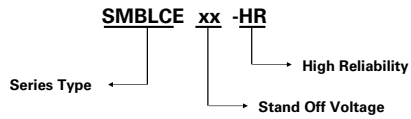


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.077  | 0.086 | 1.950       | 2.200 |
| <b>B</b>   | 0.160  | 0.180 | 4.060       | 4.570 |
| <b>C</b>   | 0.130  | 0.155 | 3.300       | 3.940 |
| <b>D</b>   | 0.084  | 0.096 | 2.130       | 2.440 |
| <b>E</b>   | 0.030  | 0.060 | 0.760       | 1.520 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.205  | 0.220 | 5.210       | 5.590 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |

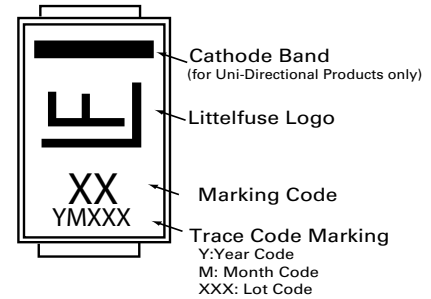
# SMBLCE-HR Series

## Surface Mount - 600W

### Part Numbering System



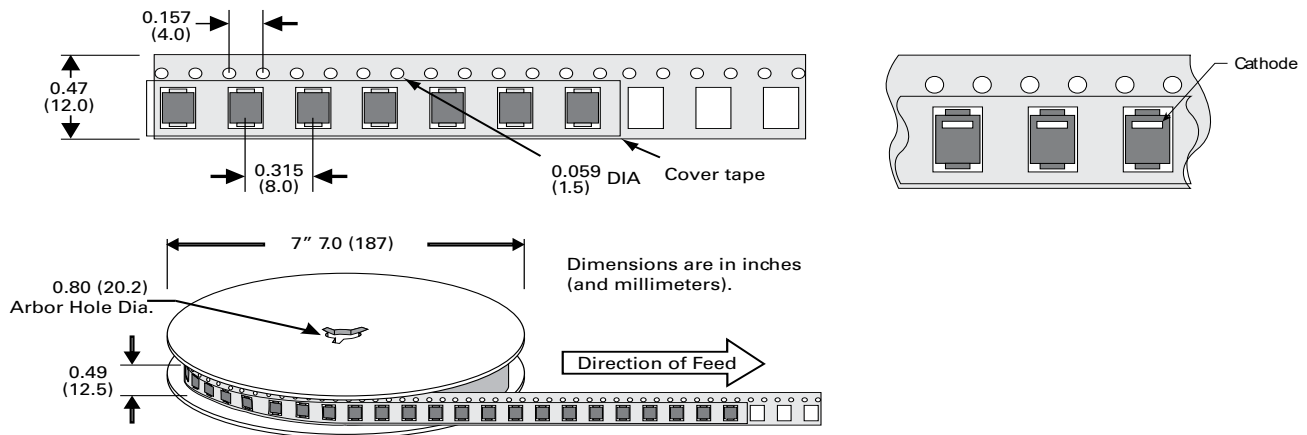
### Part Marking System



### Packaging

| Part number | Component Package | Quantity | Packaging Option                | Packaging Specification |
|-------------|-------------------|----------|---------------------------------|-------------------------|
| SMBLCE-HR   | DO-214AA          | 500      | Tape & Reel - 12mm tape/7" reel | EIA STD RS-481          |

### Tape and Reel Specification



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