

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

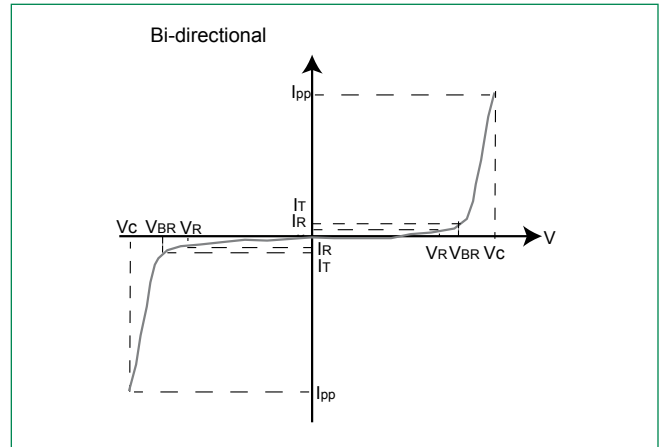
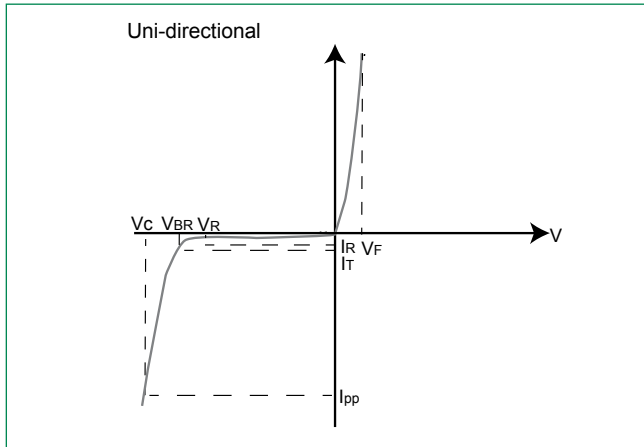
| Part Number (Uni) | Part Number (Bi) | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>PP</sub> (Volts) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Agency Approval  |
|-------------------|------------------|--------------------------------------------------|------------------------------------------------------------|--------|----------------------------------|-------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                   |                  |                                                  | Min.                                                       | Max.   |                                  |                                                                   |                                                |                                                              |                                                                                                     |
| 1.5KE6.8A         | 1.5KE6.8CA       | 5.80                                             | 6.45                                                       | 7.14   | 10                               | 10.5                                                              | 144.8                                          | 1000                                                         | X                                                                                                   |
| 1.5KE7.5A         | 1.5KE7.5CA       | 6.40                                             | 7.13                                                       | 7.88   | 10                               | 11.3                                                              | 134.5                                          | 500                                                          | X                                                                                                   |
| 1.5KE8.2A         | 1.5KE8.2CA       | 7.02                                             | 7.79                                                       | 8.61   | 10                               | 12.1                                                              | 125.6                                          | 200                                                          | X                                                                                                   |
| 1.5KE9.1A         | 1.5KE9.1CA       | 7.78                                             | 8.65                                                       | 9.50   | 1                                | 13.4                                                              | 113.4                                          | 50                                                           | X                                                                                                   |
| 1.5KE10A          | 1.5KE10CA        | 8.55                                             | 9.50                                                       | 10.50  | 1                                | 14.5                                                              | 104.8                                          | 10                                                           | X                                                                                                   |
| 1.5KE11A          | 1.5KE11CA        | 9.40                                             | 10.50                                                      | 11.60  | 1                                | 15.6                                                              | 97.4                                           | 5                                                            | X                                                                                                   |
| 1.5KE12A          | 1.5KE12CA        | 10.20                                            | 11.40                                                      | 12.60  | 1                                | 16.7                                                              | 91.0                                           | 5                                                            | X                                                                                                   |
| 1.5KE13A          | 1.5KE13CA        | 11.10                                            | 12.40                                                      | 13.70  | 1                                | 18.2                                                              | 83.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE15A          | 1.5KE15CA        | 12.80                                            | 14.30                                                      | 15.80  | 1                                | 21.2                                                              | 71.7                                           | 1                                                            | X                                                                                                   |
| 1.5KE16A          | 1.5KE16CA        | 13.60                                            | 15.20                                                      | 16.80  | 1                                | 22.5                                                              | 67.6                                           | 1                                                            | X                                                                                                   |
| 1.5KE18A          | 1.5KE18CA        | 15.30                                            | 17.10                                                      | 18.90  | 1                                | 25.2                                                              | 60.3                                           | 1                                                            | X                                                                                                   |
| 1.5KE20A          | 1.5KE20CA        | 17.10                                            | 19.00                                                      | 21.00  | 1                                | 27.7                                                              | 54.9                                           | 1                                                            | X                                                                                                   |
| 1.5KE22A          | 1.5KE22CA        | 18.80                                            | 20.90                                                      | 23.10  | 1                                | 30.6                                                              | 49.7                                           | 1                                                            | X                                                                                                   |
| 1.5KE24A          | 1.5KE24CA        | 20.50                                            | 22.80                                                      | 25.20  | 1                                | 33.2                                                              | 45.8                                           | 1                                                            | X                                                                                                   |
| 1.5KE27A          | 1.5KE27CA        | 23.10                                            | 25.70                                                      | 28.40  | 1                                | 37.5                                                              | 40.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE30A          | 1.5KE30CA        | 25.60                                            | 28.50                                                      | 31.50  | 1                                | 41.4                                                              | 36.7                                           | 1                                                            | X                                                                                                   |
| 1.5KE33A          | 1.5KE33CA        | 28.20                                            | 31.40                                                      | 34.70  | 1                                | 45.7                                                              | 33.3                                           | 1                                                            | X                                                                                                   |
| 1.5KE36A          | 1.5KE36CA        | 30.80                                            | 34.20                                                      | 37.80  | 1                                | 49.9                                                              | 30.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE39A          | 1.5KE39CA        | 33.30                                            | 37.10                                                      | 41.00  | 1                                | 53.9                                                              | 28.2                                           | 1                                                            | X                                                                                                   |
| 1.5KE43A          | 1.5KE43CA        | 36.80                                            | 40.90                                                      | 45.20  | 1                                | 59.3                                                              | 25.6                                           | 1                                                            | X                                                                                                   |
| 1.5KE47A          | 1.5KE47CA        | 40.20                                            | 44.70                                                      | 49.40  | 1                                | 64.8                                                              | 23.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE51A          | 1.5KE51CA        | 43.60                                            | 48.50                                                      | 53.60  | 1                                | 70.1                                                              | 21.7                                           | 1                                                            | X                                                                                                   |
| 1.5KE56A          | 1.5KE56CA        | 47.80                                            | 53.20                                                      | 58.80  | 1                                | 77.0                                                              | 19.7                                           | 1                                                            | X                                                                                                   |
| 1.5KE62A          | 1.5KE62CA        | 53.00                                            | 58.90                                                      | 65.10  | 1                                | 85.0                                                              | 17.9                                           | 1                                                            | X                                                                                                   |
| 1.5KE68A          | 1.5KE68CA        | 58.10                                            | 64.60                                                      | 71.40  | 1                                | 92.0                                                              | 16.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE75A          | 1.5KE75CA        | 64.10                                            | 71.30                                                      | 78.80  | 1                                | 103.0                                                             | 14.8                                           | 1                                                            | X                                                                                                   |
| 1.5KE82A          | 1.5KE82CA        | 70.10                                            | 77.90                                                      | 86.10  | 1                                | 113.0                                                             | 13.5                                           | 1                                                            | X                                                                                                   |
| 1.5KE91A          | 1.5KE91CA        | 77.80                                            | 86.50                                                      | 95.50  | 1                                | 125.0                                                             | 12.2                                           | 1                                                            | X                                                                                                   |
| 1.5KE100A         | 1.5KE100CA       | 85.50                                            | 95.00                                                      | 105.00 | 1                                | 137.0                                                             | 11.1                                           | 1                                                            | X                                                                                                   |
| 1.5KE110A         | 1.5KE110CA       | 94.00                                            | 105.00                                                     | 116.00 | 1                                | 152.0                                                             | 10.0                                           | 1                                                            | X                                                                                                   |
| 1.5KE120A         | 1.5KE120CA       | 102.00                                           | 114.00                                                     | 126.00 | 1                                | 165.0                                                             | 9.2                                            | 1                                                            | X                                                                                                   |
| 1.5KE130A         | 1.5KE130CA       | 111.00                                           | 124.00                                                     | 137.00 | 1                                | 179.0                                                             | 8.5                                            | 1                                                            | X                                                                                                   |
| 1.5KE150A         | 1.5KE150CA       | 128.00                                           | 143.00                                                     | 158.00 | 1                                | 207.0                                                             | 7.3                                            | 1                                                            | X                                                                                                   |
| 1.5KE160A         | 1.5KE160CA       | 136.00                                           | 152.00                                                     | 168.00 | 1                                | 219.0                                                             | 6.9                                            | 1                                                            | X                                                                                                   |
| 1.5KE170A         | 1.5KE170CA       | 145.00                                           | 162.00                                                     | 179.00 | 1                                | 234.0                                                             | 6.5                                            | 1                                                            | X                                                                                                   |
| 1.5KE180A         | 1.5KE180CA       | 154.00                                           | 171.00                                                     | 189.00 | 1                                | 246.0                                                             | 6.2                                            | 1                                                            | X                                                                                                   |
| 1.5KE200A         | 1.5KE200CA       | 171.00                                           | 190.00                                                     | 210.00 | 1                                | 274.0                                                             | 5.5                                            | 1                                                            | X                                                                                                   |
| 1.5KE220A         | 1.5KE220CA       | 185.00                                           | 209.00                                                     | 231.00 | 1                                | 328.0                                                             | 4.6                                            | 1                                                            | X                                                                                                   |
| 1.5KE250A         | -                | 214.00                                           | 237.00                                                     | 263.00 | 1                                | 344.0                                                             | 4.4                                            | 1                                                            | X                                                                                                   |
| -                 | 1.5KE250CA*      | 214.00                                           | 237.00                                                     | 263.00 | 1                                | 344.0                                                             | 5.9                                            | 1                                                            | X                                                                                                   |
| 1.5KE300A*        | 1.5KE300CA*      | 256.00                                           | 285.00                                                     | 315.00 | 1                                | 414.0                                                             | 4.9                                            | 1                                                            | X                                                                                                   |
| 1.5KE320A*        | 1.5KE320CA*      | 273.00                                           | 304.00                                                     | 336.00 | 1                                | 441.0                                                             | 4.6                                            | 1                                                            | X                                                                                                   |
| 1.5KE350A*        | 1.5KE350CA*      | 300.00                                           | 332.00                                                     | 368.00 | 1                                | 482.0                                                             | 4.2                                            | 1                                                            | X                                                                                                   |
| 1.5KE400A*        | 1.5KE400CA*      | 342.00                                           | 380.00                                                     | 420.00 | 1                                | 548.0                                                             | 3.7                                            | 1                                                            | X                                                                                                   |
| 1.5KE440A*        | 1.5KE440CA*      | 376.00                                           | 418.00                                                     | 462.00 | 1                                | 602.0                                                             | 3.1                                            | 1                                                            | X                                                                                                   |
| 1.5KE480A*        | 1.5KE480CA*      | 408.00                                           | 456.00                                                     | 504.00 | 1                                | 658.0                                                             | 3.1                                            | 1                                                            | -                                                                                                   |
| 1.5KE510A*        | 1.5KE510CA*      | 434.00                                           | 485.00                                                     | 535.00 | 1                                | 698.0                                                             | 2.9                                            | 1                                                            | -                                                                                                   |
| 1.5KE530A*        | 1.5KE530CA*      | 451.00                                           | 503.50                                                     | 556.50 | 1                                | 725.0                                                             | 2.8                                            | 1                                                            | -                                                                                                   |
| 1.5KE540A*        | 1.5KE540CA*      | 460.00                                           | 513.00                                                     | 567.00 | 1                                | 740.0                                                             | 2.8                                            | 1                                                            | -                                                                                                   |
| 1.5KE550A*        | 1.5KE550CA*      | 468.00                                           | 522.50                                                     | 577.50 | 1                                | 760.0                                                             | 2.7                                            | 1                                                            | -                                                                                                   |
| 1.5KE600A*        | 1.5KE600CA*      | 512.00                                           | 570.00                                                     | 630.00 | 1                                | 828.0                                                             | 2.5                                            | 1                                                            | -                                                                                                   |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.

For parts without A, the V<sub>BR</sub> is ± 10% and V<sub>C</sub> is 5% higher than with A parts, the parts without A are currently available, but not recommended for new designs. The parts with A are preferred.

For stack-die parts, use \* to label the part number.

### I-V Curve Characteristics



**$P_{PPM}$**  Peak Pulse Power Dissipation – Max power dissipation  
 **$V_R$**  Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation  
 **$V_{BR}$**  Breakdown Voltage – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )  
 **$V_C$**  Clamping Voltage – Peak voltage measured across the TVS at a specified  $I_{PPM}$  (peak impulse current)  
 **$I_R$**  Reverse Leakage Current – Current measured at  $V_R$   
 **$V_F$**  Forward Voltage Drop for Uni-directional

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

Figure 1 - TVS Transients Clamping Waveform

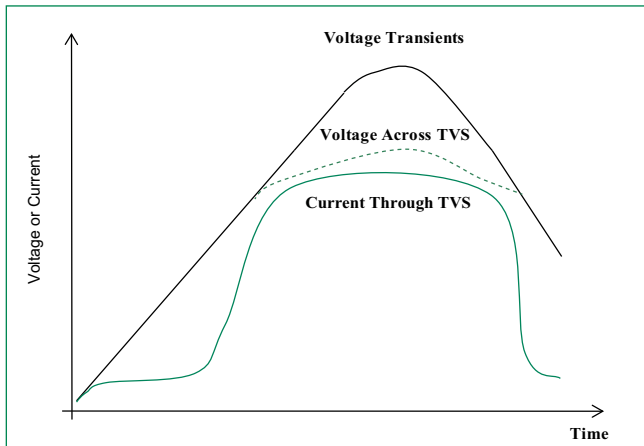
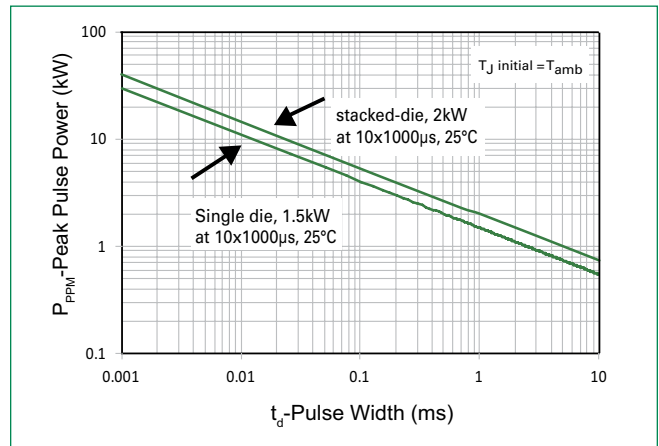
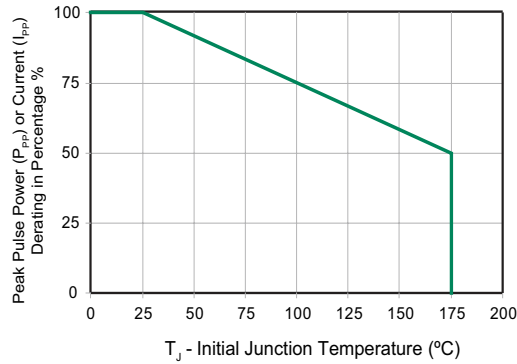


Figure 2 - Peak Pulse Power Rating

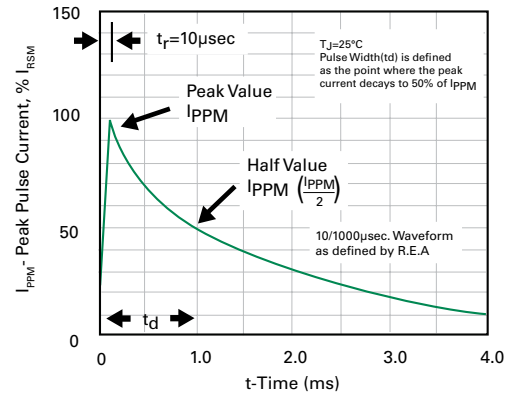


**Ratings and Characteristic Curves** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

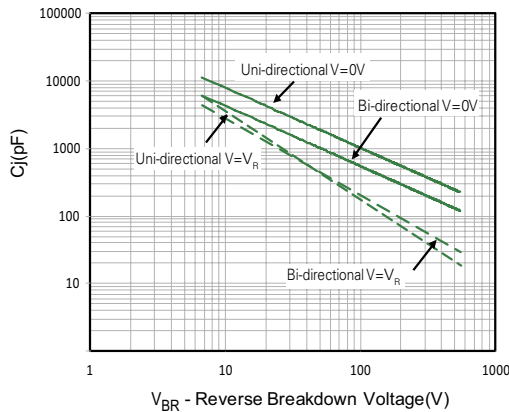
**Figure 3 - Peak Pulse Power Derating Curve**



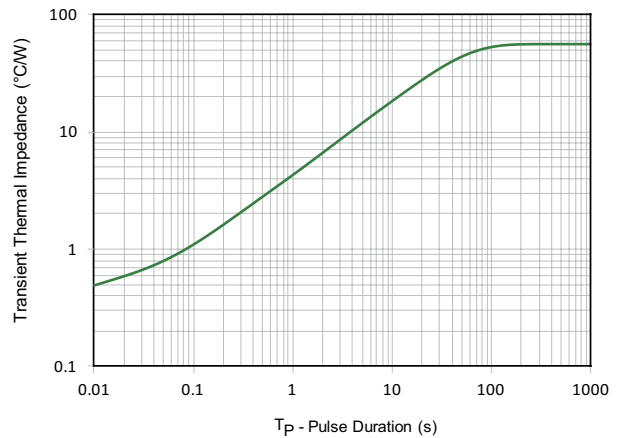
**Figure 4 - Pulse Waveform**



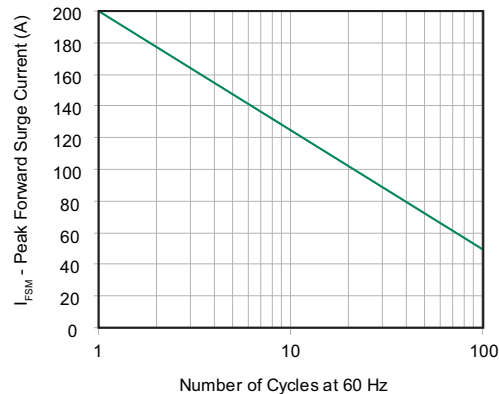
**Figure 5 - Typical Junction Capacitance**



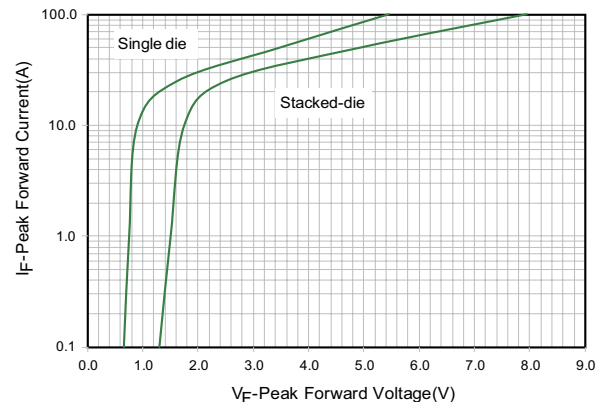
**Figure 6 - Typical Transient Thermal Impedance**



**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**

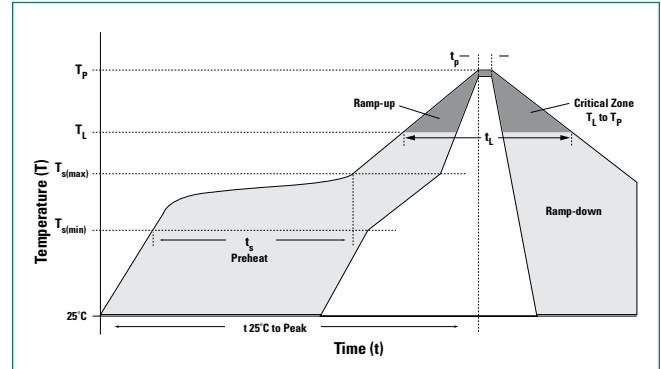


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



## 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 – 120 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) ( $t_L$ )      | 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>  |                                    | 30 seconds max          |
| <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                   |



## Flow/Wave Soldering (Solder Dipping)

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

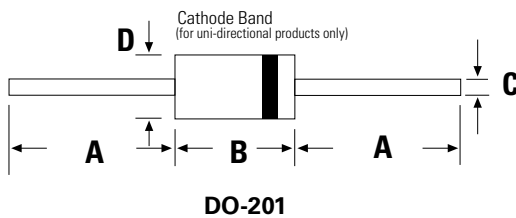
## Physical Specifications

|                 |                                                            |
|-----------------|------------------------------------------------------------|
| <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

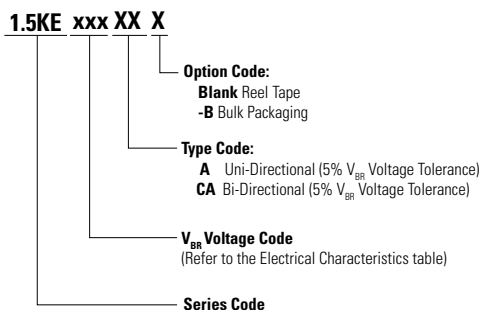
|                            |             |
|----------------------------|-------------|
| <b>High Temp. Storage</b>  | JESD22-A103 |
| <b>HTRB</b>                | JESD22-A108 |
| <b>Temperature Cycling</b> | JESD22-A104 |
| <b>H3TRB</b>               | JESD22-A101 |
| <b>RSH</b>                 |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

## Dimensions

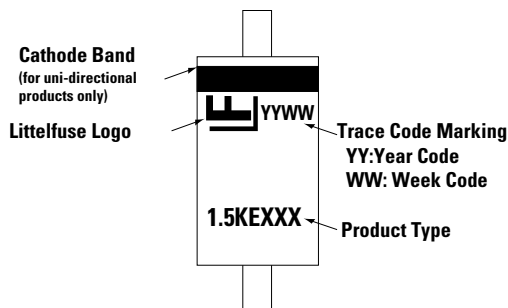


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 1.000  | -     | 25.40       | -    |
| B          | 0.285  | 0.375 | 7.20        | 9.50 |
| C          | 0.038  | 0.042 | 0.96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

### Part Numbering System



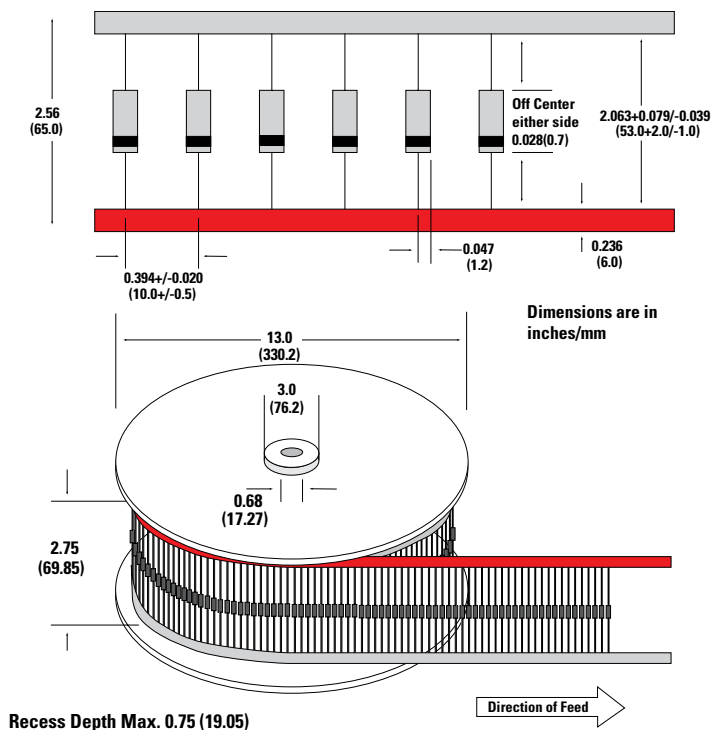
### Part Marking System



### Packaging

| Part Number  | Component Package | Quantity | Packaging Option | Packaging Specification |
|--------------|-------------------|----------|------------------|-------------------------|
| 1.5KExxxXX   | DO-201            | 1200     | Tape & Reel      | EIA STD RS-296          |
| 1.5KExxxXX-B | DO-201            | 500      | BULK             | Littelfuse Spec.        |

### Tape and Reel Specification



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