

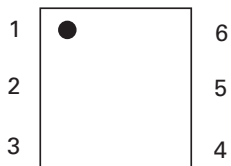
**RoHS Battrax® Series - Single Port Negative - MS-013**



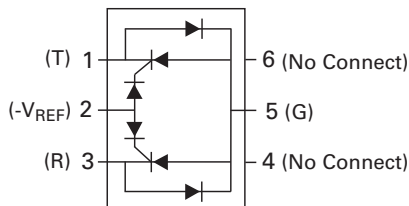
**Agency Approvals**

| Agency | Agency File Number |
|--------|--------------------|
|        | E133083            |

**Pinout Designation**



**Schematic Symbol**



**Electrical Characteristics**

| Part Number | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$ Amps | $V_F$ | Capacitance* |        |
|-------------|---------|---------------------------------|-------------------------|--------|--------|-------|---------------------------|-------|--------------|--------|
|             |         | V min                           | V max                   | mA min | mA max | A max | V max                     | V max | pF min       | pF max |
| B1101UCLxx  | B1101UC | $-V_{REF}I + I-1.2VI$           | $-V_{REF}I + I-10VI$    | 100    | 100    | 2.2   | 4                         | 5     | 30           | 200    |
| B1161UCLxx  | B1161UC | $-V_{REF}I + I-1.2VI$           | $-V_{REF}I + I-10VI$    | 160    | 100    | 2.2   | 4                         | 5     | 30           | 200    |
| B1201UCLxx  | B1201UC | $-V_{REF}I + I-1.2VI$           | $-V_{REF}I + I-10VI$    | 200    | 100    | 2.2   | 4                         | 5     | 30           | 200    |

Notes:  
 - Absolute maximum ratings measured at  $T_A = 25^\circ C$  (unless otherwise noted).  
 - Devices are uni-directional  
 - All electrical characteristics shown are defined from Tip (pin 1) to Ground (pin 5), and Ring (pin 3) to Ground (pin 5)

**Description**

The Battrax® series offers programmable SIDACtor® overvoltage protection devices for SLIC applications. The Single Port Negative Battrax Series provides a programmable device that is referenced to a negative voltage source while internal diodes provide protection from positive surge events.

**Features and Benefits**

- Low voltage overshoot
- Low on-state voltage
- Does not degrade with use
- Fails short circuit when surged in excess of ratings
- Single-port protection
- Gate triggered tracking device
- Integrated diodes for positive voltage

**Applicable Global Standards**

- TIA-968-A
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- GR 1089 Inter-building
- GR 1089 Intra-building
- IEC 61000-4-5
- YD/T 1082
- YD/T 993
- YD/T 950

-  $V_{REF}$  Max Value for the negative Battrax is -200 V.  
 - **XX** = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).  
 \* Off-state capacitance ( $C_O$ ) is measured across pins 1 & 5 and 3 & 5 at 1 MHz with a 2V bias.

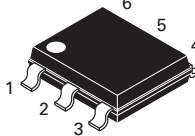
## Surge Ratings

| Series | I <sub>PP</sub>                              |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | I <sub>TSM</sub><br>50/60 Hz | di/dt |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|------------------------------|-------|
|        | 0.2x310 <sup>1</sup><br>0.5x700 <sup>2</sup> | 2x10 <sup>1</sup><br>2x10 <sup>2</sup> | 8x20 <sup>1</sup><br>1.2x50 <sup>2</sup> | 10x160 <sup>1</sup><br>10x160 <sup>2</sup> | 10x560 <sup>1</sup><br>10x560 <sup>2</sup> | 5x320 <sup>1</sup><br>9x720 <sup>2</sup> | 10x360 <sup>1</sup><br>10x360 <sup>2</sup> | 10x1000 <sup>1</sup><br>10x1000 <sup>2</sup> | 5x310 <sup>1</sup><br>10x700 <sup>2</sup> |                              |       |
|        | A min                                        | A min                                  | A min                                    | A min                                      | A min                                      | A min                                    | A min                                      | A min                                        | A min                                     |                              |       |
| C      | 50                                           | 500                                    | 400                                      | 200                                        | 150                                        | 200                                      | 175                                        | 100                                          | 200                                       | 50                           | 500   |

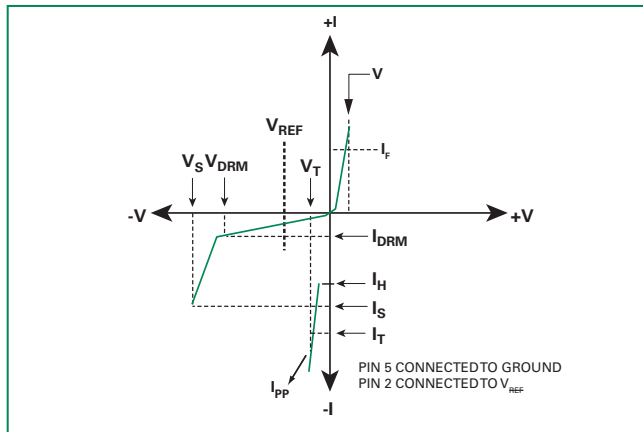
Notes:

- Current waveform in  $\mu s$
  - Voltage waveform in  $\mu s$
- Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product.
  - $I_{PP}$  ratings applicable over temperature range of -40°C to +85°C ( $I_{PP}$  rating assumes  $V_{REF}$  equals +/- 48 V)
  - The device must initially be in thermal equilibrium with -40°C  $\leq T_J \leq$  +150°C

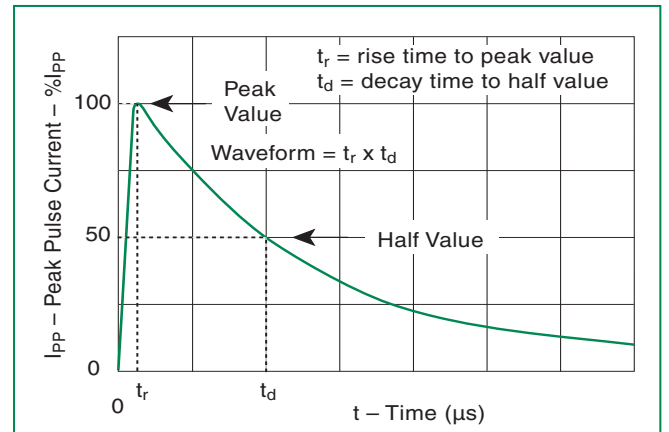
## Thermal Considerations

| Package                                                                                              | Symbol          | Parameter                               | Value       | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| Modified MS-013<br> | $T_J$           | Operating Junction Temperature Range    | -40 to +125 | °C   |
|                                                                                                      | $T_S$           | Storage Temperature Range               | -65 to +150 | °C   |
|                                                                                                      | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 60          | °C/W |

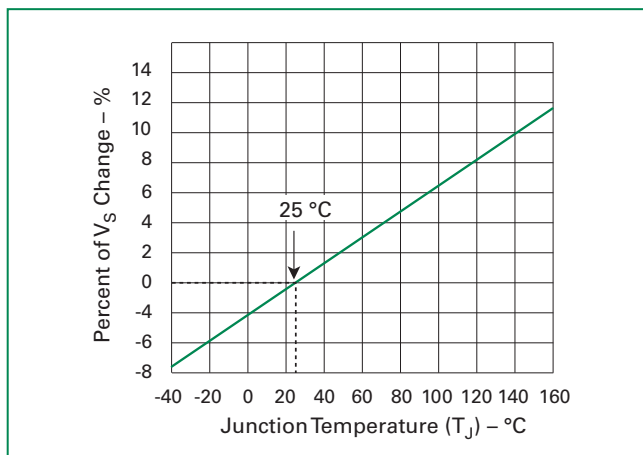
## V-I Characteristics



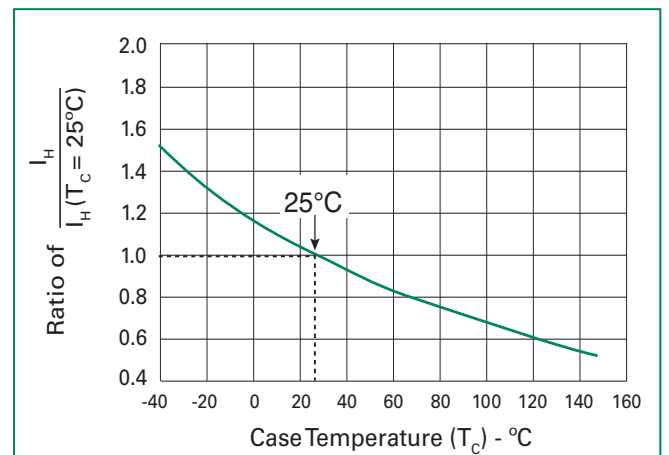
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

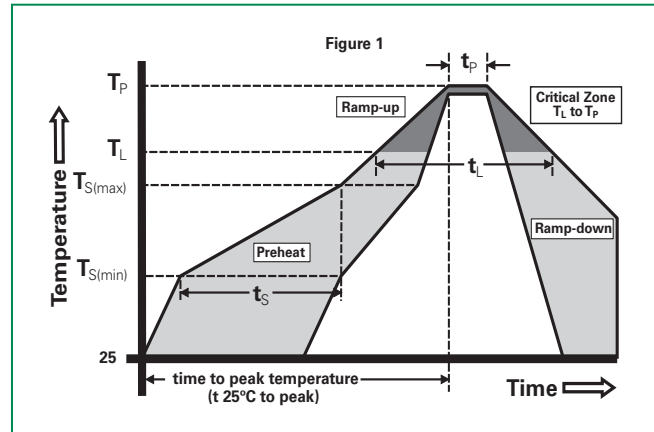


## Normalized DC Holding Current vs. Case Temperature



## Soldering Parameters

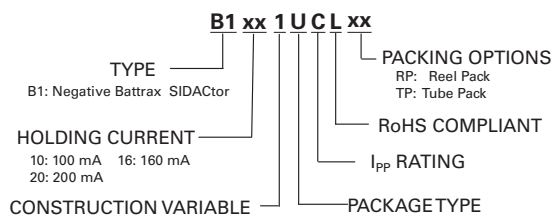
|                                                        |                                   |                               |
|--------------------------------------------------------|-----------------------------------|-------------------------------|
| Reflow Condition                                       |                                   | Pb-Free assembly (see Fig. 1) |
| 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/sec. Max.                 |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                   | 3°C/sec. Max.                 |
| Reflow                                                 | -Temperature ( $T_L$ ) (Liquidus) | +217°C                        |
|                                                        | -Temperature ( $t_L$ )            | 60-150 secs.                  |
| Peak Temp ( $T_p$ )                                    |                                   | +260(+0/-5)°C                 |
| Time within 5°C of actual PeakTemp ( $t_p$ )           |                                   | 30 secs. Max.                 |
| Ramp-down Rate                                         |                                   | 6°C/sec. Max.                 |
| Time 25°C to PeakTemp ( $T_p$ )                        |                                   | 8 min. Max.                   |
| Do not exceed                                          |                                   | +260°C                        |



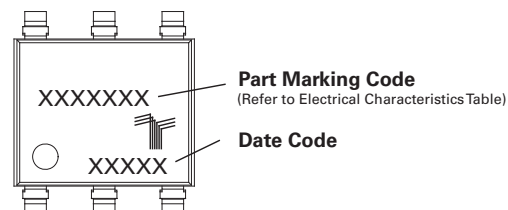
## Environmental Specifications

|                                         |                                                                                                                            |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>High Temp Voltage Blocking</b>       | 80% Rated $V_{REF}$ Max. ( $V_{DC}$ Peak) +125°C or +150°C, 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101 |
| <b>Temp Cycling</b>                     | -65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A-104                     |
| <b>Biased Temp &amp; Humidity</b>       | 52 $V_{DC}$ (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101                                                     |
| <b>High Temp Storage</b>                | +150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101                                                             |
| <b>Low Temp Storage</b>                 | -65°C, 1008 hrs.                                                                                                           |
| <b>Thermal Shock</b>                    | 0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106                    |
| <b>Autoclave (Pressure Cooker Test)</b> | +121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/JEDEC, JESD22-A-102                                                            |
| <b>Resistance to Solder Heat</b>        | +260°C, 30 secs. MIL-STD-750 (Method 2031)                                                                                 |
| <b>Moisture Sensitivity Level</b>       | 85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1                                            |

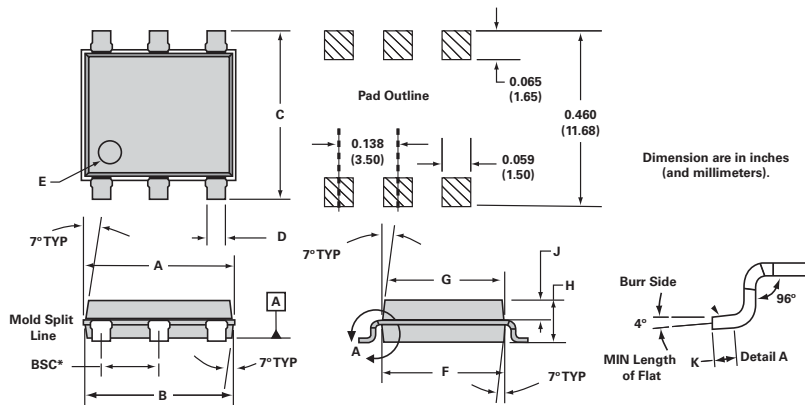
## Part Numbering



## Part Marking



## Dimensions — MS-013



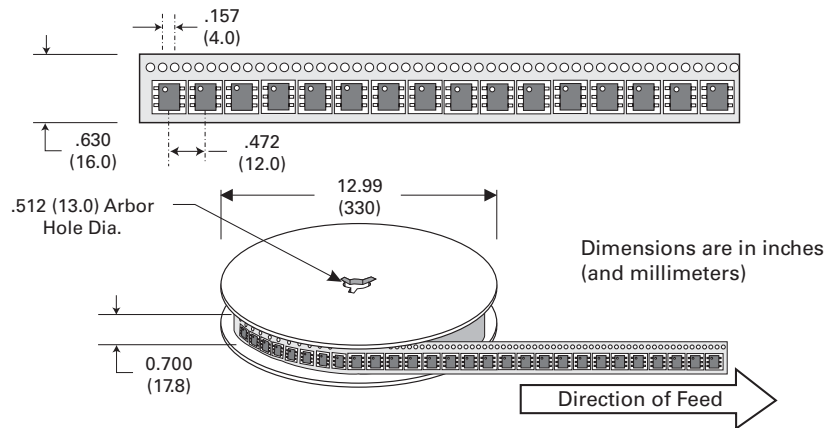
| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.360  | 0.364 | 9.14        | 9.25  |
| B          | 0.352  | 0.356 | 8.94        | 9.04  |
| C          | 0.400  | 0.412 | 10.16       | 10.46 |
| D          | 0.043  | 0.045 | 1.09        | 1.13  |
| E          | 0.047  | 0.055 | 1.19        | 1.40  |
| F          | 0.293  | 0.297 | 7.44        | 7.54  |
| G          | 0.289  | 0.293 | 7.34        | 7.44  |
| H          | 0.089  | 0.093 | 2.26        | 2.36  |
| J          | 0.041  | 0.049 | 1.04        | 1.24  |
| K          | 0.020  | 0.021 | 0.51        | 0.53  |
| BSC*       | 0.133  | 0.143 | 3.38        | 3.63  |

\* BSC = Basic Spacing between Centers

## Packing Options

| Package Type | Description                              | Quantity             | Added Suffix | Industry Standard |
|--------------|------------------------------------------|----------------------|--------------|-------------------|
| U            | Modified MS-013 6-pin Tape and Reel Pack | 1500                 | RP           | EIA-481-D         |
|              | Modified MS-013 6-pin Tube Pack          | 500<br>(50 per tube) | TP           | N/A               |

## Tape and Reel Specification — MS-013



## Tube Pack Specification — MS-013

