

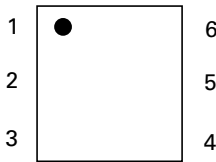
**Battrax® Series - Dual Port Negative - MS-013**



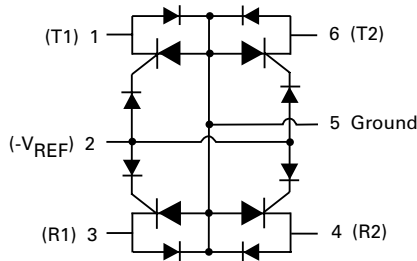
**Agency Approvals**

Agency	Agency File Number
	E133083

**Pinout Designation**



**Schematic Symbol**



**Description**

The Dual Port Negative Battrax® Protection Thyristor Series are programmable SIDACtor® components designed to protect SLICs (Subscriber Line Interface Circuit) from damaging overvoltage transients.

Dual port protection is provided by 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 surge capability after multiple surge events within limit.
- RoHS Compliant and Lead-Free
- Dual-port protection
- Gate trigger tracking device
- Fails short circuit when surged in excess of ratings
- Integrated diode for positive voltage surges
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

**Applicable Global Standards**

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- GR 1089 Inter-building
- GR 1089 Intra-building
- IEC 61000-4-5 2nd edition
- YD/T 1082
- YD/T 993
- YD/T 950

**Additional Information**



**Datasheet**



**Resources**



**Samples**

**Electrical Characteristics**

Part Number	Marking	$V_{DRM}$ @ $I_{DRM} = 5\mu A$	$V_S$ @ 100V/ $\mu s$	$I_H$	$I_S$	$I_T$	$V_T$ @ $I_T = 2.2$ Amps	$V_F$	Capacitance*	
		V min	V max	mA min	mA max	A max	V max	V max	pF min	pF max
B1101UC4Lxx	B1101UC4	$-I-V_{REF} + I - 1.2V$	$-I-V_{REF} + I - 10V$	100	100	2.2	4	5	30	200
B1161UC4Lxx	B1161UC4	$-I-V_{REF} + I - 1.2V$	$-I-V_{REF} + I - 10V$	160	100	2.2	4	5	30	200
B1201UC4Lxx	B1201UC4	$-I-V_{REF} + I - 1.2V$	$-I-V_{REF} + I - 10V$	200	100	2.2	4	5	30	200

Notes:  
 - Absolute maximum ratings measured at  $T_A = 25^\circ C$  (unless otherwise noted).  
 - Components are uni-directional  
 - All electrical characteristics shown are defined from Tip (pin 1 & 6) to Ground (pin 5) and Ring (pin 3 & 4) to Ground (pin 5)  
 - Components are polarity sensitive and are not appropriate for positive ringing systems.

-  $V_{REF}$  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, 3 & 5, 4 & 5, and 6 & 5 at 1 MHz with a 2V bias.

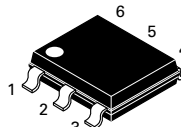
**Surge Ratings**

Series	$I_{PP}$									$I_{TSM}$ 50/60 Hz	di/dt A/ $\mu$ s max
	0.2/310 <sup>1</sup> 0.5/700 <sup>2</sup>	2/10 <sup>1</sup> 2/10 <sup>2</sup>	8/20 <sup>1</sup> 1.2/50 <sup>2</sup>	10/160 <sup>1</sup> 10/160 <sup>2</sup>	10/560 <sup>1</sup> 10/560 <sup>2</sup>	5/320 <sup>1</sup> 9/720 <sup>2</sup>	10/360 <sup>1</sup> 10/360 <sup>2</sup>	10/1000 <sup>1</sup> 10/1000 <sup>2</sup>	5/310 <sup>1</sup> 10/700 <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

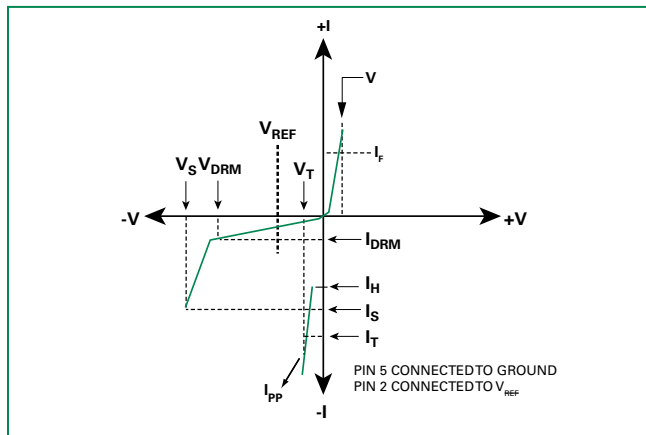
Notes:

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

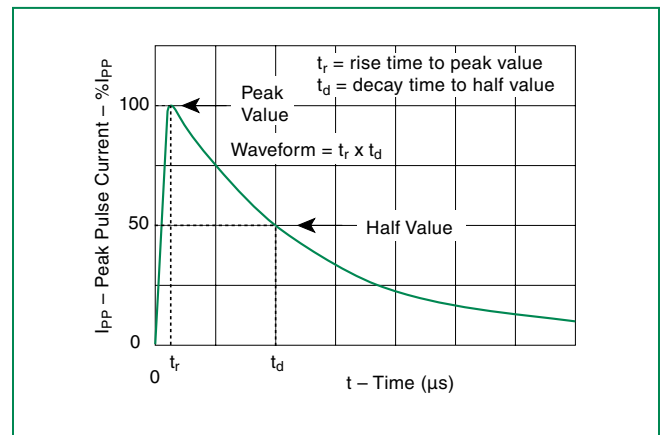
**Thermal Considerations**

Package	Symbol	Parameter	Value	Unit
Modified MS-013 	$T_J$	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

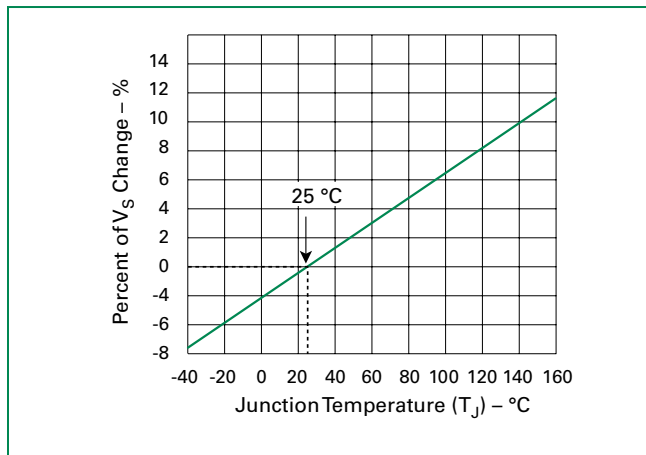
**V-I Characteristics**



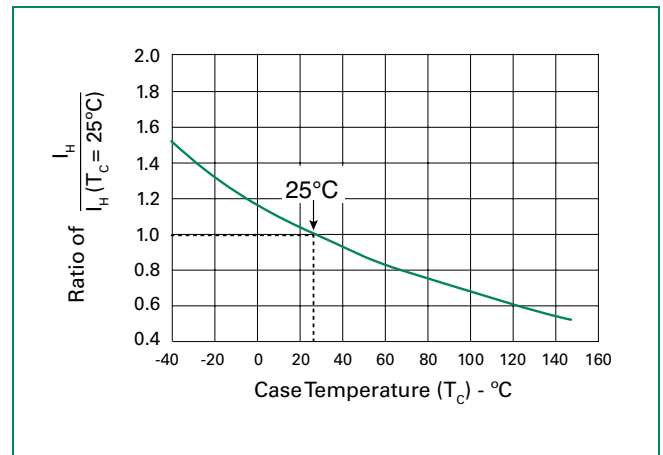
**$t_r \times t_d$  Pulse Waveform**



**Normalized  $V_S$  Change vs. Junction Temperature**

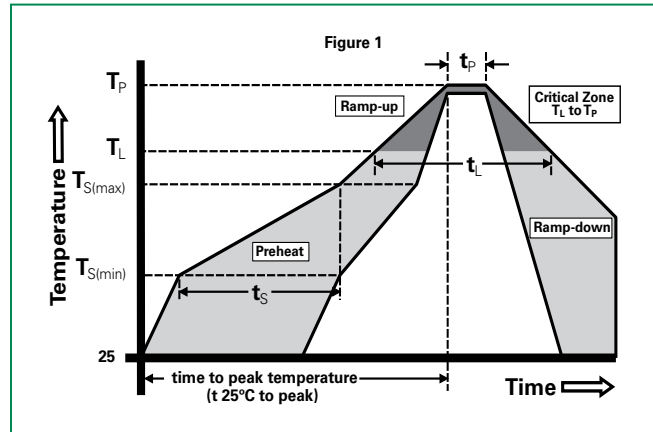


**Normalized DC Holding Current vs. Case Temperature**



**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 Peak Temp ( $t_p$ )		30 secs. Max.
Ramp-down Rate		6°C/sec. Max.
Time 25°C to Peak Temp ( $T_p$ )		8 min. Max.
Do not exceed		+260°C



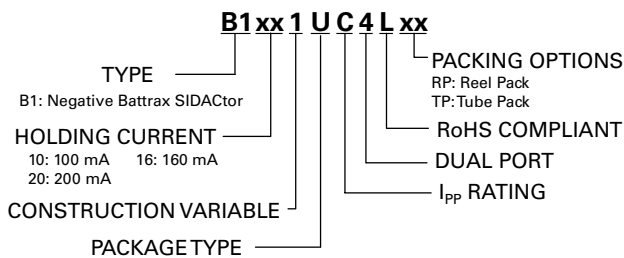
**Physical Specifications**

<b>Lead Material</b>	Copper Alloy
<b>Terminal Finish</b>	100% Matte-Tin Plated
<b>Body Material</b>	UL Recognized epoxy meeting flammability classification V-0

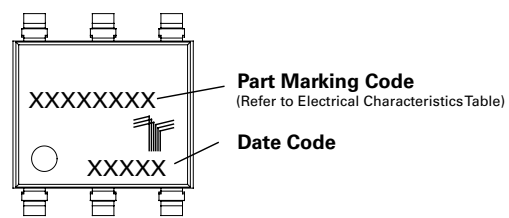
**Environmental Specifications**

<b>High Temp Voltage Blocking</b>	80% Rated $V_{DRM}$ ( $V_{DC}$ 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-A104
<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

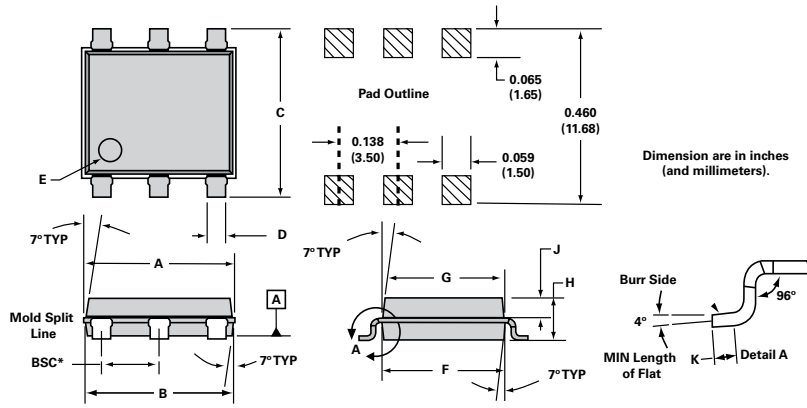
**Part Numbering**



**Part Marking**



**Dimensions – MS-013**



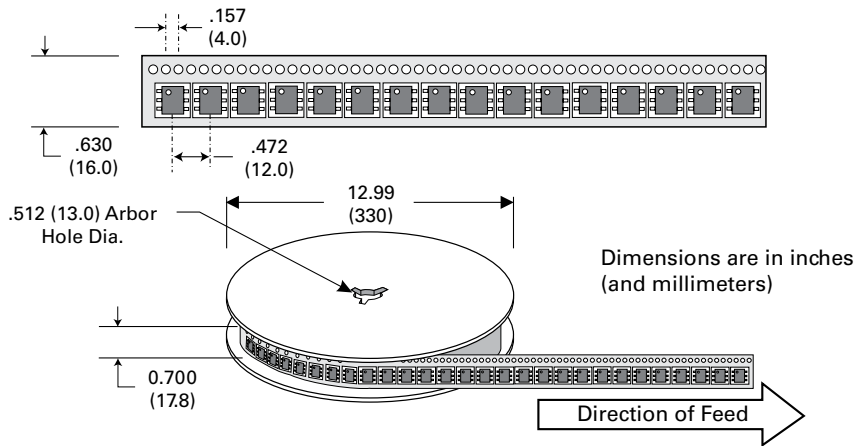
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.360	0.364	9.14	9.25
<b>B</b>	0.352	0.356	8.94	9.04
<b>C</b>	0.400	0.412	10.16	10.46
<b>D</b>	0.043	0.045	1.09	1.13
<b>E</b>	0.047	0.055	1.19	1.40
<b>F</b>	0.293	0.297	7.44	7.54
<b>G</b>	0.289	0.293	7.34	7.44
<b>H</b>	0.089	0.093	2.26	2.36
<b>J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

\* BSC = Basic Spacing between Centers

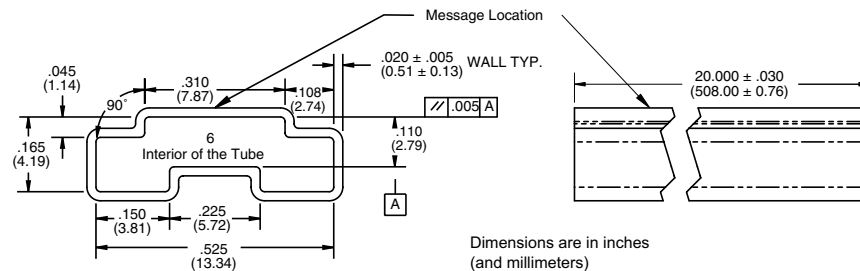
**Packing Options**

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 (50 per tube)	TP	N/A

**Tape and Reel Specification – MS-013**



**Tube Pack Specification – MS-013**



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