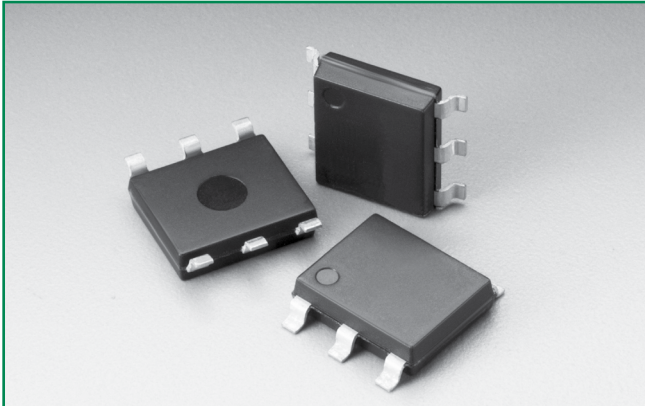


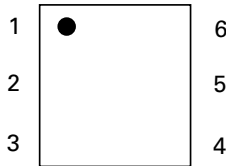
**Battrax® Series - Single Port Negative - MS-013**



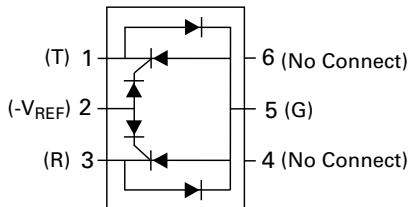
**Agency Approvals**

Agency	Agency File Number
	E133083

**Pinout Designation**



**Schematic Symbol**



**Description**

The Battrax® Protection Thyristor series offers programmable SIDACtor® overvoltage protection components for SLIC applications. The Single Port Negative Battrax® Protection Thyristor 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 device
- Low on-state voltage
- Does not degrade surge capability after multiple surge events within limit.
- Fails short circuit when surged in excess of ratings
- Single-port protection
- Gate triggered tracking
- Integrated diodes for positive voltage protection
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- RoHS compliant and lead-free

**Applicable Global Standards**

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- 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	$V_{DRM}$	$V_S$	$I_H$	$I_S$	$I_T$	$V_T$	$V_F$	Capacitance*	
		@ $I_{DRM} = 5\mu A$	@ 100V/ $\mu s$	mA min	mA max	A max	@ $I_T = 2.2$ Amps	V max	pF min	pF max
B1101UALxx	B1101UA	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	100	100	2.2	4	5	30	200
B1161UALxx	B1161UA	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	160	100	2.2	4	5	30	200
B1201UALxx	B1201UA	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	200	100	2.2	4	5	30	200
B1101UCLxx	B1101UC	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	100	100	2.2	4	5	30	200
B1161UCLxx	B1161UC	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	160	100	2.2	4	5	30	200
B1201UCLxx	B1201UC	$-V_{REF} + I + 1.2VI$	$-V_{REF} + I + 10VI$	200	100	2.2	4	5	30	200

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

-  $V_{REF}$  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.

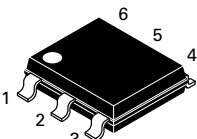
### Surge Ratings

Series	$I_{PP}$									$I_{TSM}$ 50/60 Hz	di/dt
	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		
A	20	150	150	90	50	75	75	45	75	20	500
C	50	500	400	200	150	200	175	100	200	50	500

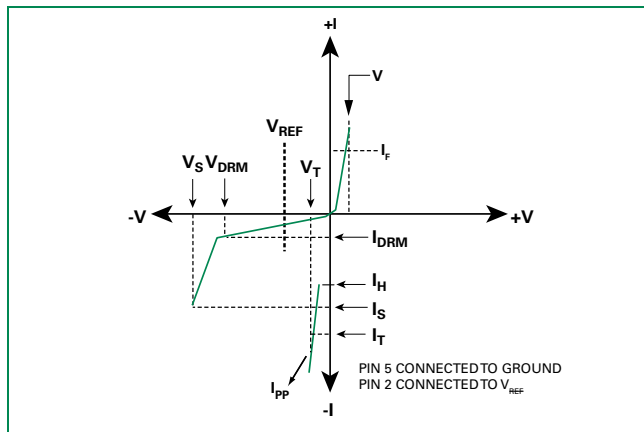
Notes:

- 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  $-40^{\circ}C$  to  $+85^{\circ}C$  ( $I_{PP}$  rating assumes  $V_{REF}$  equals -48 V)
- The component must initially be in thermal equilibrium with  $-40^{\circ}C \leq T_J \leq +150^{\circ}C$

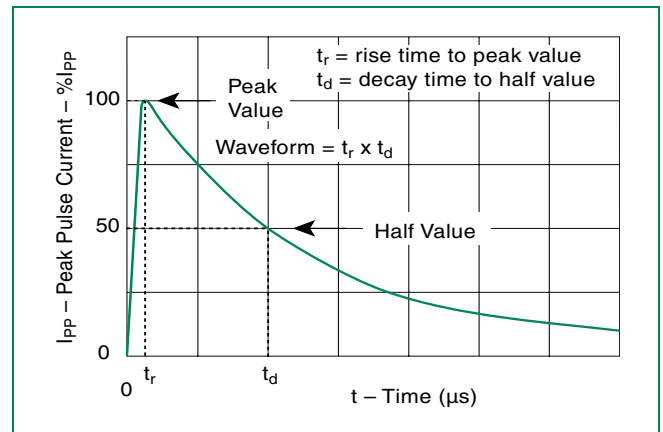
### Thermal Considerations

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

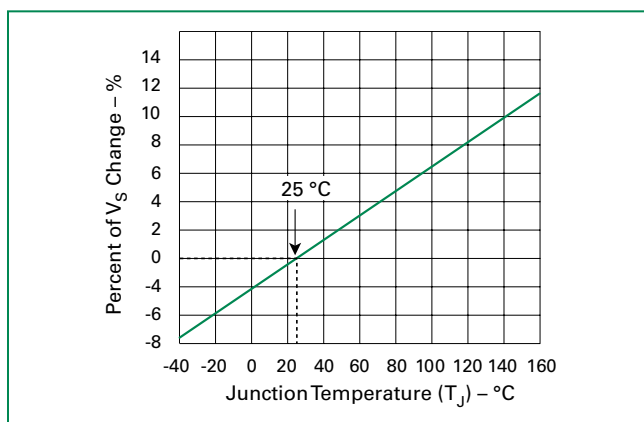
### V-I Characteristics



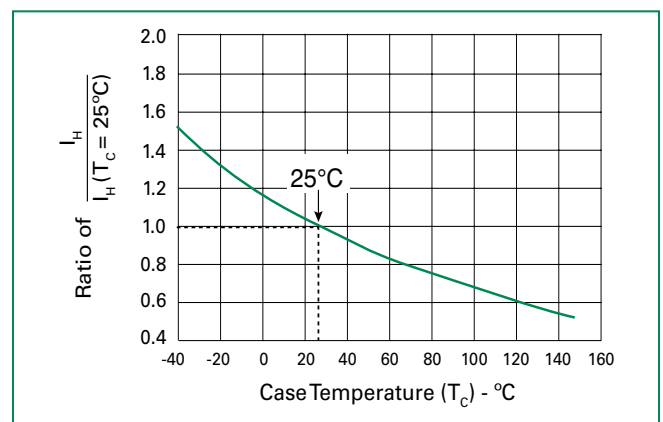
### $t_r \times t_d$ Pulse Waveform



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

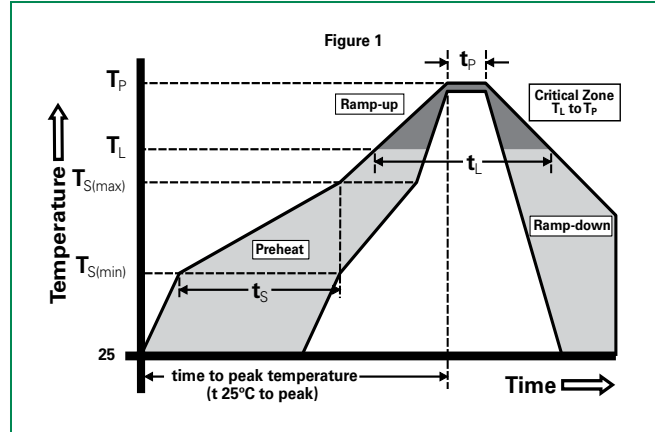


### Normalized DC Holding Current vs. Case Temperature



**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	



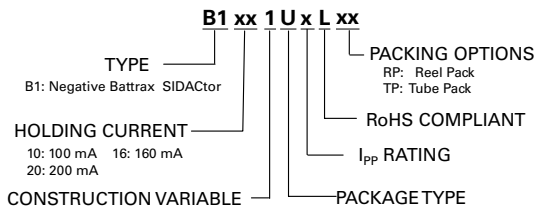
**Physical Specifications**

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

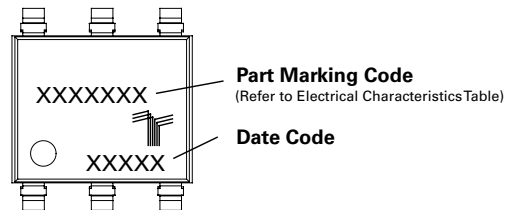
**Environmental Specifications**

High Temp Voltage Blocking	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
Temp Cycling	-65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A104
Biased Temp & Humidity	52 $V_{DC}$ (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101
High Temp Storage	+150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101
Low Temp Storage	-65°C, 1008 hrs.
Thermal Shock	0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106
Autoclave (Pressure Cooker Test)	+121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/JEDEC, JESD22-A-102
Resistance to Solder Heat	+260°C, 30 secs. MIL-STD-750 (Method 2031)
Moisture Sensitivity Level	85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1

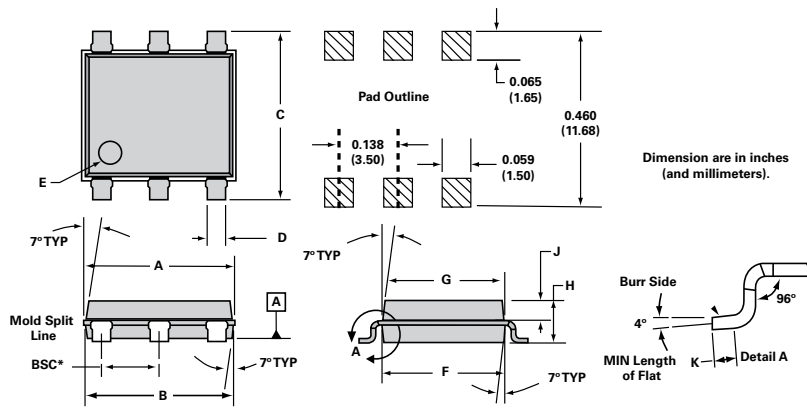
**Part Numbering**



**Part Marking**



**Dimensions — MS-013**



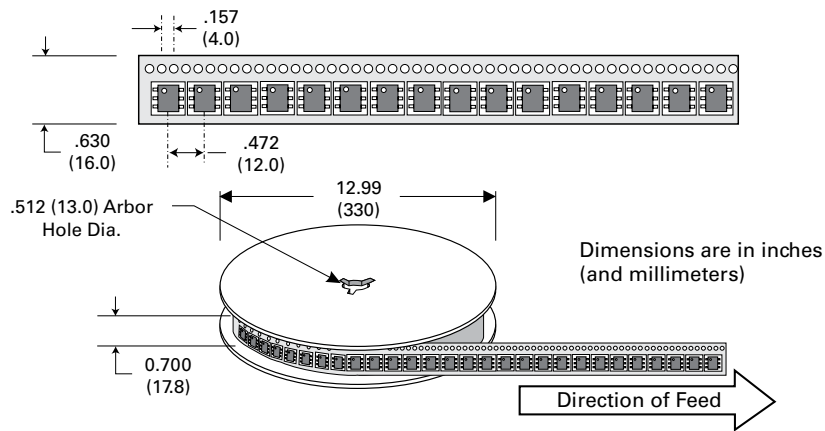
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.360	0.364	9.14	9.25
<b>B</b>	0.352	0.356	8.94	9.04
<b>C</b>	0.400	0.412	10.16	10.46
<b>D</b>	0.043	0.045	1.09	1.13
<b>E</b>	0.047	0.055	1.19	1.40
<b>F</b>	0.293	0.297	7.44	7.54
<b>G</b>	0.289	0.293	7.34	7.44
<b>H</b>	0.089	0.093	2.26	2.36
<b>J</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

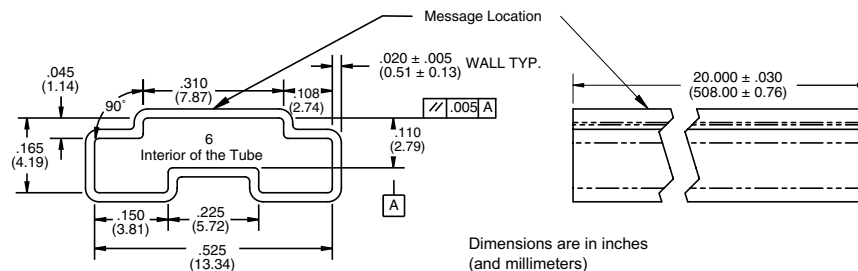
**Packing Options**

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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