

Battrax® Protection Thyristor Series Single Port Positive/Negative - MS-013



Agency Approvals

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

Pinout Designation



Schematic Symbol



Description

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

This series is designed specifically to protect SLIC devices utilizing positive and negative ringing signals. This one device will protect a single port.

Features and Benefits

- Low voltage overshoot
- Low on-state voltage
- Does not degrade surge capability after multiple surge events within limit.
- Fails short circuit when surged in excess of ratings
- Low capacitance
- Positive and negative ringing compatible
- Single-port protect
- Gate trigger tracking device
- RoHS Compliant and Lead-Free
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- Recognized to UL 497B as an Isolated Loop Circuit Protector

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} @ $I_{DRM} = 5\mu A$ | V_S @ $100V/\mu s$ | I_H | I_S | I_T | V_T @ $I_T = 2.2$ Amps | Capacitance* | |
|-------------|---------|-----------------------------------|-------------------------|--------|--------|-------|-----------------------------|--------------|--------|
| | | V min | V max | mA min | mA max | A max | V max | pF min | pF max |
| B3104UCLxx | B3104UC | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 100 | 100 | 2.2 | 4 | 30 | 200 |
| B3164UCLxx | B3164UC | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 160 | 100 | 2.2 | 4 | 30 | 200 |
| B3204UCLxx | B3204UC | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 200 | 100 | 2.2 | 4 | 30 | 200 |
| B3104UALxx | B3104UA | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 100 | 100 | 2.2 | 4 | 30 | 200 |
| B3164UALxx | B3164UA | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 100 | 100 | 2.2 | 4 | 30 | 200 |
| B3204UALxx | B3204UA | $\pm V_{REF} + \pm 1.2V$ | $\pm V_{REF} + \pm 10V$ | 100 | 100 | 2.2 | 4 | 30 | 200 |

Notes:

- Absolute maximum ratings measured at $T_A = 25^\circ C$ (unless otherwise noted).
- Components are bi-directional
- All electrical characteristics shown are defined from Tip (pin 1) to Ground (pin 4 & 6) and Ring (pin 3) to Ground (pin 4 & 6)

- V_{REF} Max Value for the negative BattraX is -200 V.
- V_{REF} Max Value for the positive BattraX is +110 V.
- XX = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).
- * Off-state capacitance (C_j) is measured across pins 1 & 4,6 and 3 & 4,6 at 1 MHz with a 2V bias.

Surge Ratings

| Series | I_{PP} | | | | | | | | | I_{TSM} 50/60 Hz | di/dt |
|----------|--|--|--|--|--|--|--|--|---|-----------------------|----------|
| | 0.2/310 ¹ 0.5/700 ² | 2/10 ¹ 2/10 ² | 8/20 ¹ 1.2/50 ² | 10/160 ¹ 10/160 ² | 10/560 ¹ 10/560 ² | 5/320 ¹ 9/720 ² | 10/360 ¹ 10/360 ² | 10/1000 ¹ 10/1000 ² | 5/310 ¹ 10/700 ² | | |
| | A min | A min | A min | A min | A min | A min | A min | A min | A min | A min | A/μs max |
| C | 50 | 500 | 400 | 200 | 150 | 200 | 175 | 100 | 200 | 50 | 500 |
| A | 20 | 150 | 150 | 90 | 50 | 75 | 75 | 45 | 75 | 20 | 500 |

Notes:

1. Current waveform in μs
 2. Voltage waveform in μs
- 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



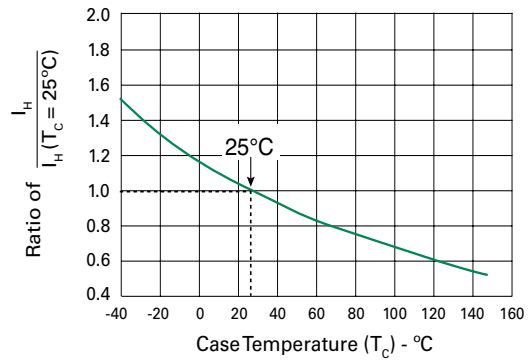
$t_r \times t_d$ Pulse Waveform



Normalized V_S Change vs. Junction Temperature



Normalized DC Holding Current vs. Case Temperature



Soldering Parameters

| | | |
|--|-------------------------------------|------------------|
| Reflow Condition | | Pb-Free assembly |
| 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_{DRM} (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 |
| 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 | | 0.51 | |
| 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 (50 per tube) | TP | N/A |