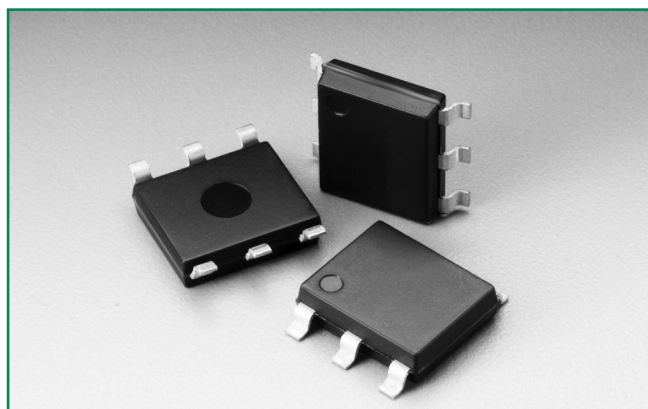



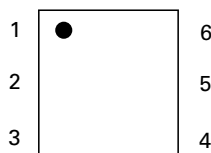
SIDACtor® Balanced Series - MS-013



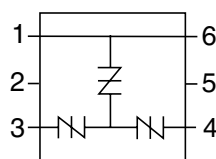
Agency Approvals

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

Pinout Designation



Schematic Symbol



Description

The SIDACtor® Balanced Series MS-013 are designed to protect baseband equipment from overvoltage transients. The patented “Y” configuration ensures balanced overvoltage protection that prevents a longitudinal to differential conversion.

The series provides a single port surface mount solution that enables voice through DS-1 equipment to comply with various global regulatory standards.

Features and Benefits

- Balanced overvoltage protection
- 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
- Replaces three discrete components
- Meets UL/IEC 60950-1 creepage and clearance
- RoHS Compliant and Lead-Free
- 2nd level interconnect is Pb-free per IPC/JEDEC J-STD-609A.01

Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21/45 Enhanced Level
- ITU K.20/21/45 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

Electrical Characteristics

| Part Number | Part Marking | V_{DRM} @ $I_{DRM}=5\mu A$ | | V_S @ $100V/\mu s$ | | V_T | I_S | I_T | I_H | Capacitance |
|-------------|--------------|------------------------------|-------|----------------------|-------|-------|-------|-------|-------|------------------------------|
| | | V min | V max | V min | V max | | | | | |
| | | Pins 1 & 6-3, 1 & 6-4 | | Pins 3-4 | | | | | | |
| P1553UALxx | P1553UA | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | See Capacitance Values table |
| P1803UALxx | P1803UA | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UALxx | P2103UA | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UALxx | P2353UA | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UALxx | P2703UA | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UALxx | P3203UA | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UALxx | P3403UA | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UALxx | P5103UA | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |

Notes:

- Absolute maximum ratings measured at $T_A = +25^\circ C$ (unless otherwise noted).
- Components are bi-directional.
- **XX** = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).

Table continues on next page.

Electrical Characteristics (continued)

| Part Number | Part Marking | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | V_T | I_S | I_T | I_H | Capacitance |
|-------------|--------------|---------------------------------|--------------------------|---------------------------------|--------------------------|-------|--------|-------|--------|------------------------------------|
| | | V min | V max | V min | V max | V max | mA max | A max | mA min | |
| | | Pins 1 & 6-3, 1 & 6-4 | | Pins 3-4 | | | | | | |
| P1553UBLxx | P1553UB | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | See Capacitance Values table |
| P1803UBLxx | P1803UB | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UBLxx | P2103UB | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UBLxx | P2353UB | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UBLxx | P2703UB | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UBLxx | P3203UB | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UBLxx | P3403UB | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UBLxx | P5103UB | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |
| P1553UCLxx | P1553UC | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | |
| P1803UCLxx | P1803UC | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UCLxx | P2103UC | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UCLxx | P2353UC | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UCLxx | P2703UC | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UCLxx | P3203UC | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UCLxx | P3403UC | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UCLxx | P5103UC | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |

Capacitance Values

| Part Number | Pin 3-4 Tip-Ring | | Pins 1 & 6-3, 1 & 6-4 Tip-Ground, Ring-Ground | |
|-------------|---------------------|--------|--|--------|
| | pF min | pF max | pF min | pF max |
| P1553UALxx | 20 | 95 | 10 | 60 |
| P1803UALxx | 20 | 85 | 10 | 55 |
| P2103UALxx | 15 | 85 | 10 | 55 |
| P2353UALxx | 15 | 75 | 10 | 50 |
| P2703UALxx | 15 | 75 | 10 | 50 |
| P3203UALxx | 15 | 70 | 10 | 45 |
| P3403UALxx | 15 | 65 | 10 | 45 |
| P5103UALxx | 10 | 60 | 10 | 40 |
| P1553UBLxx | 25 | 95 | 15 | 60 |
| P1803UBLxx | 25 | 85 | 15 | 55 |
| P2103UBLxx | 20 | 85 | 15 | 55 |
| P2353UBLxx | 20 | 75 | 15 | 50 |
| P2703UBLxx | 20 | 75 | 10 | 50 |
| P3203UBLxx | 20 | 70 | 10 | 45 |
| P3403UBLxx | 15 | 65 | 10 | 45 |
| P5103UBLxx | 15 | 60 | 10 | 40 |
| P1553UCLxx | 30 | 95 | 20 | 60 |
| P1803UCLxx | 30 | 85 | 15 | 55 |
| P2103UCLxx | 30 | 85 | 15 | 55 |
| P2353UCLxx | 25 | 75 | 15 | 50 |
| P2703UCLxx | 25 | 75 | 15 | 50 |
| P3203UCLxx | 25 | 70 | 15 | 45 |
| P3403UCLxx | 20 | 65 | 15 | 45 |
| P5103UCLxx | 20 | 60 | 10 | 40 |

Note: Off-state capacitance (C_o) is measured at 1 MHz with a 2 V bias.

Additional Information



Datasheet



Resources



Samples

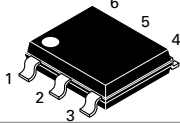
Surge Ratings

| 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 | 20 | 150 | 150 | 90 | 50 | 75 | 75 | 45 | 75 | 20 | 500 |
| B | 25 | 250 | 250 | 150 | 100 | 100 | 125 | 80 | 100 | 25 | 500 |
| C | 50 | 500 | 400 | 200 | 150 | 200 | 175 | 100 | 200 | 50 | 500 |

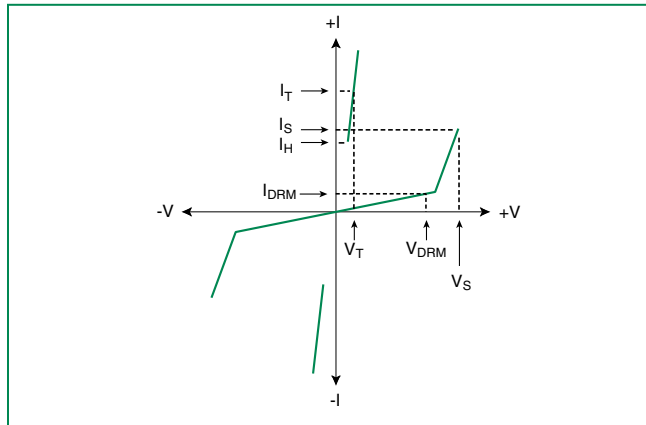
Notes:
 1 Current waveform in μs
 2 Voltage waveform in μs

- 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 to $+85^\circ C$
- The component must initially be in thermal equilibrium with $-40^\circ C \leq T_j \leq +150^\circ C$

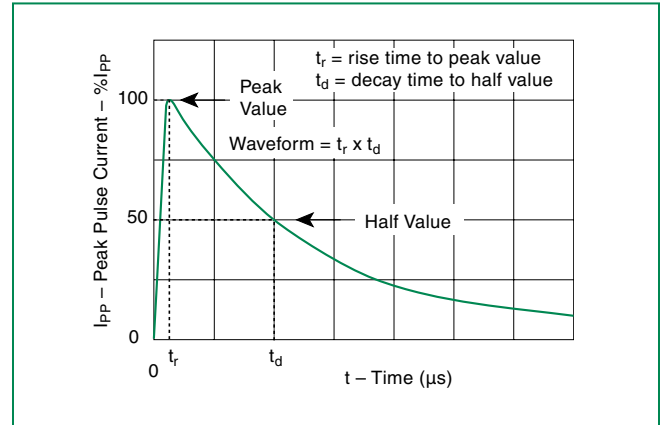
Thermal Considerations

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

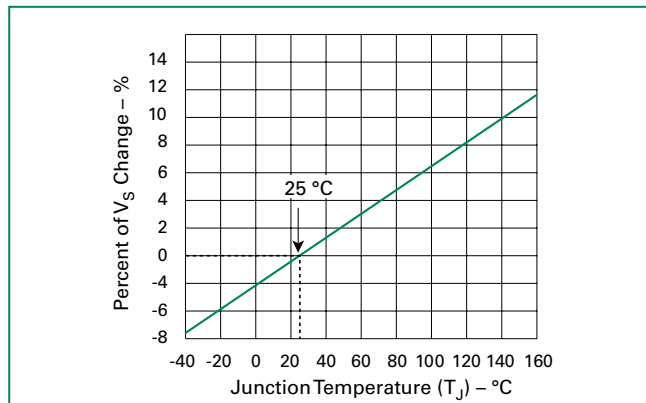
V-I Characteristics



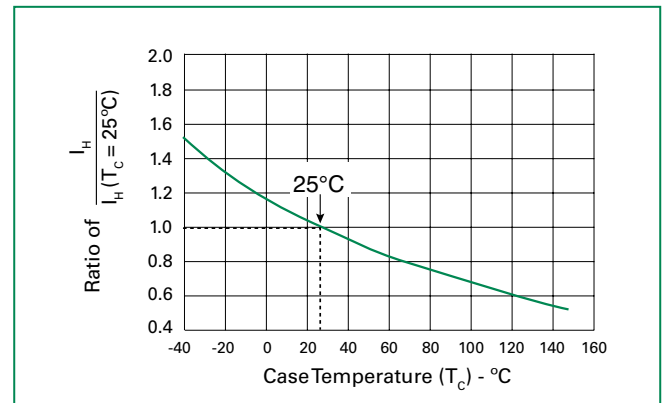
$t_r \times t_d$ Pulse Waveform



Normalized V_S Change vs. Junction Temperature

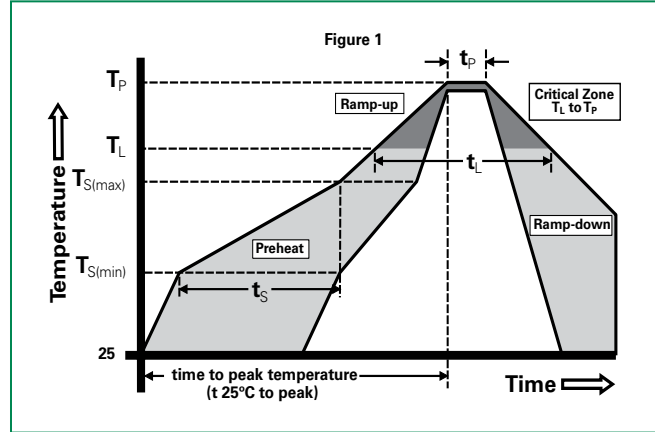


Normalized DC Holding Current vs. Case Temperature



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 (LiquidusTemp (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 Peak Temp (T_p) | 8 min. Max. | |
| Do not exceed | +260°C | |



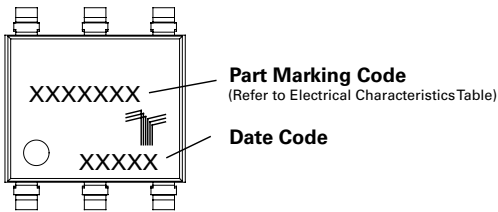
Physical Specifications

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

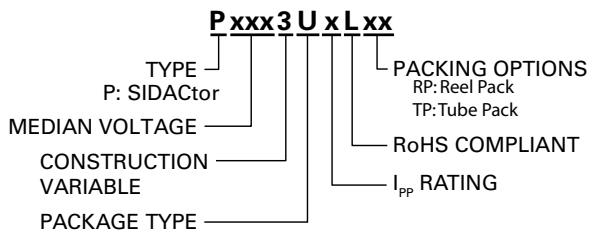
Environmental Specifications

| | |
|----------------------------------|--|
| High Temp Voltage Blocking | 80% Rated V_{DRM} ($V_{AC Peak}$) +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 Marking



Part Numbering



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 |