

**SIDACtor® Balanced Multiport Series - MS-013**



**Agency Approvals**

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

**Pinout Designation**



**Schematic Diagram**



**Description**

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

The series provides overvoltage protection that prevents longitudinal to differential conversions.

**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
- Replaces six discrete devices
- Balanced overvoltage protection
- Meets UL/IEC 60950-1 creepage and clearance
- Two-port 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.20/21/45 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

\*A/B-rated parts require series resistance

**Electrical Characteristics**

| Part Number             | Marking  | $V_{DRM}$          | $V_S$           | $V_{DRM}$               | $V_S$           | $V_T$         | $I_H$  | $I_S$  | $I_T$ | Capacitance                  |
|-------------------------|----------|--------------------|-----------------|-------------------------|-----------------|---------------|--------|--------|-------|------------------------------|
|                         |          | @ $I_{DRM}=5\mu A$ | @ 100V/ $\mu s$ | @ $I_{DRM}=5\mu A$      | @ 100V/ $\mu s$ | @ $I_T=2.2 A$ |        |        |       |                              |
|                         |          | V min              | V max           | V min                   | V max           | V max         |        |        |       |                              |
| Pins 1-2, 3-2, 4-5, 6-5 |          | Pins 1-3, 4-6      |                 | Pins 1-2, 3-2, 4-5, 6-5 |                 |               | mA min | mA max | A max |                              |
| A2106UA6Lxx             | A2106UA6 | 170                | 250             | 50                      | 80              | 8             | 120    | 800    | 2.2   | See Capacitance Values Table |
| A5030UA6Lxx             | A5030UA6 | 400                | 550             | 270                     | 340             | 8             | 150    | 800    | 2.2   |                              |
| A2106UB6Lxx             | A2106UB6 | 170                | 250             | 50                      | 80              | 8             | 120    | 800    | 2.2   |                              |
| A5030UB6Lxx             | A5030UB6 | 400                | 550             | 270                     | 340             | 8             | 150    | 800    | 2.2   |                              |
| A2106UC6Lxx             | A2106UC6 | 170                | 250             | 50                      | 80              | 8             | 120    | 800    | 2.2   |                              |
| A3614UC6Lxx             | A3614UC6 | 333                | 427             | 116                     | 154             | 8             | 150    | 800    | 2.2   |                              |
| A5030UC6Lxx             | A5030UC6 | 400                | 550             | 270                     | 340             | 8             | 150    | 800    | 2.2   |                              |
| P1556UALxx              | P1556UA  | 130                | 180             | 130                     | 180             | 8             | 150    | 800    | 2.2   |                              |
| P1806UALxx              | P1806UA  | 150                | 210             | 150                     | 210             | 8             | 150    | 800    | 2.2   |                              |
| P2106UALxx              | P2106UA  | 170                | 250             | 170                     | 250             | 8             | 150    | 800    | 2.2   |                              |
| P2356UALxx              | P2356UA  | 200                | 270             | 200                     | 270             | 8             | 150    | 800    | 2.2   |                              |
| P2706UALxx              | P2706UA  | 230                | 300             | 230                     | 300             | 8             | 150    | 800    | 2.2   |                              |
| P3206UALxx              | P3206UA  | 270                | 350             | 270                     | 350             | 8             | 150    | 800    | 2.2   |                              |
| P3406UALxx              | P3406UA  | 300                | 400             | 300                     | 400             | 8             | 150    | 800    | 2.2   |                              |

Table continues on next page.

### Electrical Characteristics (continued)

| Part Number | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ 100V/ $\mu s$ | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ 100V/ $\mu s$ | $V_T$<br>@ $I_T=2.2 A$  | $I_H$  | $I_S$  | $I_T$ | Capacitance                        |
|-------------|---------|---------------------------------|--------------------------|---------------------------------|--------------------------|-------------------------|--------|--------|-------|------------------------------------|
|             |         | V min                           | V max                    | V min                           | V max                    | V max                   | mA min | mA max | A max |                                    |
|             |         | Pins 1-2, 3-2, 4-5, 6-5         |                          | Pins 1-3, 4-6                   |                          | Pins 1-2, 3-2, 4-5, 6-5 |        |        |       |                                    |
| P5106UALxx  | P5106UA | 420                             | 600                      | 420                             | 600                      | 8                       | 150    | 800    | 2.2   | See<br>Capacitance<br>Values Table |
| P1556UBLxx  | P1556UB | 130                             | 180                      | 130                             | 180                      | 8                       | 150    | 800    | 2.2   |                                    |
| P1806UBLxx  | P1806UB | 150                             | 210                      | 150                             | 210                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2106UBLxx  | P2106UB | 170                             | 250                      | 170                             | 250                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2356UBLxx  | P2356UB | 200                             | 270                      | 200                             | 270                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2706UBLxx  | P2706UB | 230                             | 300                      | 230                             | 300                      | 8                       | 150    | 800    | 2.2   |                                    |
| P3206UBLxx  | P3206UB | 270                             | 350                      | 270                             | 350                      | 8                       | 150    | 800    | 2.2   |                                    |
| P3406UBLxx  | P3406UB | 300                             | 400                      | 300                             | 400                      | 8                       | 150    | 800    | 2.2   |                                    |
| P5106UBLxx  | P5106UB | 420                             | 600                      | 420                             | 600                      | 8                       | 150    | 800    | 2.2   |                                    |
| P1556UCLxx  | P1556UC | 130                             | 180                      | 130                             | 180                      | 8                       | 150    | 800    | 2.2   |                                    |
| P1806UCLxx  | P1806UC | 150                             | 210                      | 150                             | 210                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2106UCLxx  | P2106UC | 170                             | 250                      | 170                             | 250                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2356UCLxx  | P2356UC | 200                             | 270                      | 200                             | 270                      | 8                       | 150    | 800    | 2.2   |                                    |
| P2706UCLxx  | P2706UC | 230                             | 300                      | 230                             | 300                      | 8                       | 150    | 800    | 2.2   |                                    |
| P3206UCLxx  | P3206UC | 270                             | 350                      | 270                             | 350                      | 8                       | 150    | 800    | 2.2   |                                    |
| P3406UCLxx  | P3406UC | 300                             | 400                      | 300                             | 400                      | 8                       | 150    | 800    | 2.2   |                                    |
| P5106UCLxx  | P5106UC | 420                             | 600                      | 420                             | 600                      | 8                       | 150    | 800    | 2.2   |                                    |

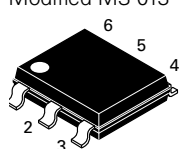
Notes:  
 - Absolute maximum ratings measured at  $T_A = 25^\circ C$  (unless otherwise noted).  
 - Components are bi-directional (some are asymmetrical).  
 - XX = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).

### Surge Ratings

| Series | $I_{PP}$                                     |  |  |  |  |  |  |  |   | $I_{TSM}$<br>50/60 Hz | di/dt |
|--------|--|--|--|--|--|--|--|--|---|-----------------------|-------|
|        | 0.2/310 <sup>1</sup><br>0.5/700 <sup>2</sup> | 2/10 <sup>1</sup><br>2/10 <sup>2</sup> | 8/20 <sup>1</sup><br>1.2/50 <sup>2</sup> | 10/160 <sup>1</sup><br>10/160 <sup>2</sup> | 10/560 <sup>1</sup><br>10/560 <sup>2</sup> | 5/320 <sup>1</sup><br>9/720 <sup>2</sup> | 10/360 <sup>1</sup><br>10/360 <sup>2</sup> | 10/1000 <sup>1</sup><br>10/1000 <sup>2</sup> | 5/310 <sup>1</sup><br>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   |
| B      | 25   | 250                                    | 250                                      | 150  | 100  | 100                                      | 125  | 80   | 100                                       | 25                    | 500   |
| C      | 50   | 500                                    | 400                                      | 200  | 150  | 200                                      | 175  | 100  | 200                                       | 30                    | 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  $-40$  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<br> | $T_J$           | 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          | $^\circ C/W$ |

### Capacitance Values

| Part Number | pF<br>Pin 1-2 / 3-2 (4-5 / 6-5)<br>Tip-Ground, Ring-Ground |     | pF<br>Pin 1-3 (4-6)<br>Tip-Ring |     |
|-------------|--|-----|---------------------------------|-----|
|             | MIN  | MAX | MIN                             | MAX |
| A2106UA6Lxx | 20   | 60  | 10                              | 30  |
| A5030UA6Lxx | 15   | 35  | 10                              | 45  |
| A2106UB6Lxx | 20   | 60  | 10                              | 30  |
| A5030UB6Lxx | 15   | 35  | 10                              | 45  |
| A2106UC6Lxx | 20   | 70  | 10                              | 45  |
| A3614UC6Lxx | 25   | 40  | 25                              | 35  |
| A5030UC6Lxx | 25   | 40  | 20                              | 35  |
| P1556UALxx  | 20   | 45  | 10                              | 30  |
| P1806UALxx  | 20   | 40  | 10                              | 30  |
| P2106UALxx  | 15   | 35  | 10                              | 25  |
| P2356UALxx  | 15   | 35  | 10                              | 25  |
| P2706UALxx  | 15   | 35  | 10                              | 25  |
| P3206UALxx  | 15   | 30  | 10                              | 20  |
| P3406UALxx  | 15   | 30  | 10                              | 20  |
| P5106UALxx  | 10   | 20  | 5                               | 15  |
| P1556UBLxx  | 20   | 45  | 10                              | 30  |
| P1806UBLxx  | 20   | 40  | 10                              | 30  |
| P2106UBLxx  | 15   | 35  | 10                              | 25  |
| P2356UBLxx  | 15   | 35  | 10                              | 25  |
| P2706UBLxx  | 15   | 35  | 10                              | 25  |
| P3206UBLxx  | 15   | 30  | 10                              | 20  |
| P3406UBLxx  | 15   | 30  | 10                              | 20  |
| P5106UBLxx  | 10   | 20  | 5                               | 15  |
| P1556UCLxx  | 30   | 55  | 20                              | 35  |
| P1806UCLxx  | 30   | 50  | 15                              | 35  |
| P2106UCLxx  | 30   | 45  | 15                              | 30  |
| P2356UCLxx  | 25   | 40  | 15                              | 30  |
| P2706UCLxx  | 25   | 40  | 15                              | 30  |
| P3206UCLxx  | 20   | 35  | 15                              | 25  |
| P3406UCLxx  | 20   | 35  | 15                              | 25  |
| P5106UCLxx  | 20   | 30  | 10                              | 20  |

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

### 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 |

### 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                             |              |



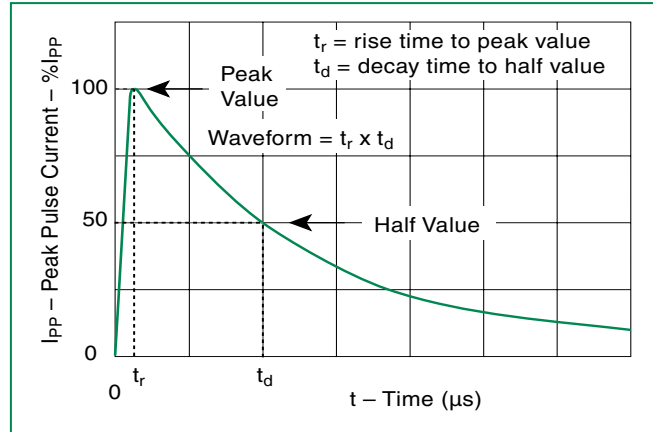
### Environmental Specifications

|   |  |
|---|--|
| <b>High Temp Voltage Blocking</b>       | 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 |
| <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  |

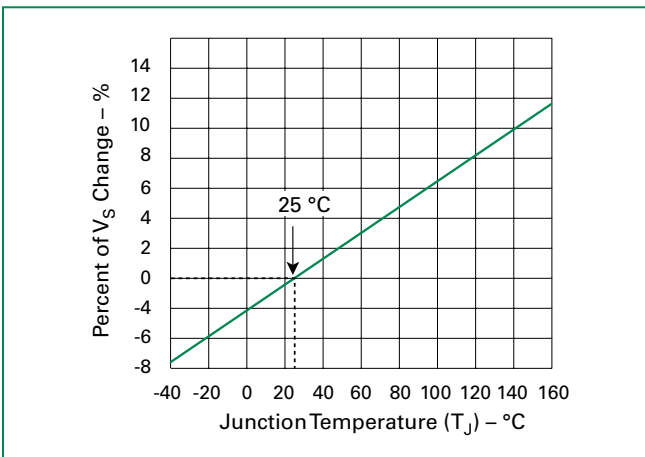
**V-I Characteristics**



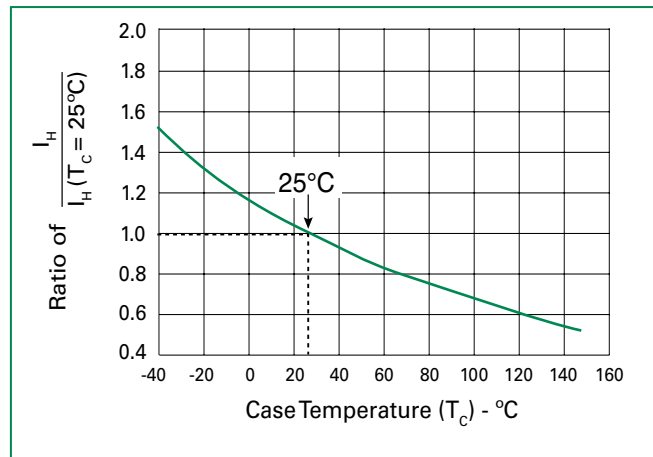
**$t_r \times t_d$  Pulse Waveform**



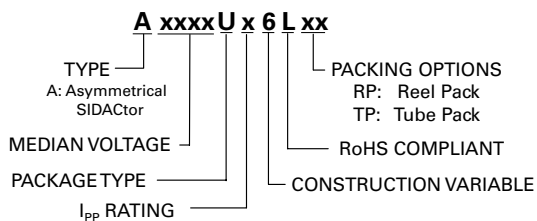
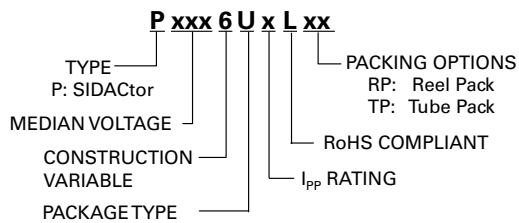
**Normalized  $V_S$  Change vs. Junction Temperature**



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



**Part Numbering**



**Part Marking**



**Additional Information**



Datasheet



Resources



Samples