

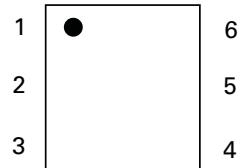
**RoHS SIDACtor® Multiport Series - MS-013**



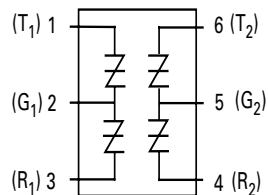
**Agency Approvals**

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

**Pinout Designation**



**Schematic Symbol**



**Description**

SIDACtor® Multiport Series MS-013 are designed to protect baseband equipment from overvoltage transients.

Targeted for voice through DS-1 applications, the series provides a dual port surface mount solution that enables equipment to comply with various global regulatory standards.

**Features and Benefits**

- Low voltage overshoot
- Low on-state voltage
- Does not degrade with use
- Replaces four discrete components
- Fails short circuit when surged in excess of ratings
- Low Capacitance

**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
- YD/T 1082
- YD/T 993
- YD/T 950

\*A-rated parts require series resistance

**Electrical Characteristics**

| 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                   |        |        |       |                              |
|             |         | 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 |                              |
| P0084UALxx  | P0084UA | 6                               | 25                      | 12                              | 50                      | 4                       | 50     | 800    | 2.2   | See Capacitance Values Table |
| P0304UALxx  | P0304UA | 25                              | 40                      | 50                              | 80                      | 4                       | 50     | 800    | 2.2   |                              |
| P0644UALxx  | P0644UA | 58                              | 77                      | 116                             | 154                     | 4                       | 150    | 800    | 2.2   |                              |
| P0724UALxx  | P0724UA | 65                              | 88                      | 130                             | 176                     | 4                       | 150    | 800    | 2.2   |                              |
| P0904UALxx  | P0904UA | 75                              | 98                      | 150                             | 196                     | 4                       | 150    | 800    | 2.2   |                              |
| P1104UALxx  | P1104UA | 90                              | 130                     | 180                             | 260                     | 4                       | 150    | 800    | 2.2   |                              |
| P1304UALxx  | P1304UA | 120                             | 160                     | 240                             | 320                     | 4                       | 150    | 800    | 2.2   |                              |
| P1504UALxx  | P1504UA | 140                             | 180                     | 280                             | 360                     | 4                       | 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>@ $I_T = 2.2$ Amps | $I_H$  | $I_S$  | $I_T$ | Capacitance                  |
|-------------|---------|-----------------------------------|--------------------------|-----------------------------------|--------------------------|-----------------------------|--------|--------|-------|------------------------------|
|             |         | 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 |                              |
| P1804UALxx  | P1804UA | 170                               | 220                      | 340                               | 440                      | 4                           | 150    | 800    | 2.2   | See Capacitance Values Table |
| P2304UALxx  | P2304UA | 190                               | 260                      | 380                               | 520                      | 4                           | 150    | 800    | 2.2   |                              |
| P2604UALxx  | P2604UA | 220                               | 300                      | 440                               | 600                      | 4                           | 150    | 800    | 2.2   |                              |
| P3104UALxx  | P3104UA | 275                               | 350                      | 550                               | 700                      | 4                           | 150    | 800    | 2.2   |                              |
| P3504UALxx  | P3504UA | 320                               | 400                      | 640                               | 800                      | 4                           | 150    | 800    | 2.2   |                              |
| P0084UCLxx  | P0084UC | 6                                 | 25                       | 12                                | 50                       | 4                           | 50     | 800    | 2.2   |                              |
| P0304UCLxx  | P0304UC | 25                                | 40                       | 50                                | 80                       | 4                           | 50     | 800    | 2.2   |                              |
| P0644UCLxx  | P0644UC | 58                                | 77                       | 116                               | 154                      | 4                           | 150    | 800    | 2.2   |                              |
| P0724UCLxx  | P0724UC | 65                                | 88                       | 130                               | 176                      | 4                           | 150    | 800    | 2.2   |                              |
| P0904UCLxx  | P0904UC | 75                                | 98                       | 150                               | 196                      | 4                           | 150    | 800    | 2.2   |                              |
| P1104UCLxx  | P1104UC | 90                                | 130                      | 180                               | 260                      | 4                           | 150    | 800    | 2.2   |                              |
| P1304UCLxx  | P1304UC | 120                               | 160                      | 240                               | 320                      | 4                           | 150    | 800    | 2.2   |                              |
| P1504UCLxx  | P1504UC | 140                               | 180                      | 280                               | 360                      | 4                           | 150    | 800    | 2.2   |                              |
| P1804UCLxx  | P1804UC | 170                               | 220                      | 340                               | 440                      | 4                           | 150    | 800    | 2.2   |                              |
| P2304UCLxx  | P2304UC | 190                               | 260                      | 380                               | 520                      | 4                           | 150    | 800    | 2.2   |                              |
| P2604UCLxx  | P2604UC | 220                               | 300                      | 440                               | 600                      | 4                           | 150    | 800    | 2.2   |                              |
| P3104UCLxx  | P3104UC | 275                               | 350                      | 550                               | 700                      | 4                           | 150    | 800    | 2.2   |                              |
| P3504UCLxx  | P3504UC | 320                               | 400                      | 640                               | 800                      | 4                           | 150    | 800    | 2.2   |                              |

**Notes:**

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

**Capacitance Values**

| Part Number | Pin 1-2 / 3-2 (4-5 / 6-5)<br>Tip-Ground, Ring-Ground |        | Pin 1-3 (4-6)<br>Tip-Ring |        |
|-------------|------------------------------------------------------|--------|---------------------------|--------|
|             | pF min                                               | pF max | pF min                    | pF max |
| P0084UALxx  | 25                                                   | 155    | 15                        | 90     |
| P0304UALxx  | 15                                                   | 140    | 10                        | 90     |
| P0644UALxx  | 40                                                   | 60     | 20                        | 35     |
| P0724UALxx  | 35                                                   | 60     | 20                        | 35     |
| P0904UALxx  | 35                                                   | 55     | 20                        | 30     |
| P1104UALxx  | 30                                                   | 50     | 15                        | 30     |
| P1304UALxx  | 25                                                   | 45     | 15                        | 25     |
| P1504UALxx  | 25                                                   | 40     | 15                        | 25     |
| P1804UALxx  | 25                                                   | 35     | 10                        | 20     |
| P2304UALxx  | 25                                                   | 35     | 10                        | 20     |
| P2604UALxx  | 20                                                   | 35     | 10                        | 20     |
| P3104UALxx  | 20                                                   | 35     | 10                        | 20     |
| P3504UALxx  | 20                                                   | 35     | 10                        | 20     |
| P0084UCLxx  | 35                                                   | 285    | 20                        | 165    |
| P0304UCLxx  | 25                                                   | 250    | 10                        | 145    |
| P0644UCLxx  | 55                                                   | 155    | 30                        | 90     |
| P0724UCLxx  | 50                                                   | 145    | 25                        | 85     |
| P0904UCLxx  | 45                                                   | 135    | 25                        | 80     |
| P1104UCLxx  | 45                                                   | 115    | 25                        | 65     |
| P1304UCLxx  | 40                                                   | 105    | 20                        | 60     |
| P1504UCLxx  | 35                                                   | 95     | 20                        | 55     |
| P1804UCLxx  | 35                                                   | 90     | 15                        | 50     |
| P2604UCLxx  | 30                                                   | 85     | 15                        | 50     |
| P3104UCLxx  | 30                                                   | 80     | 15                        | 45     |
| P3504UCLxx  | 25                                                   | 75     | 15                        | 45     |

## Surge Ratings

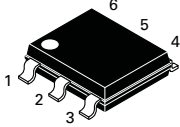
| Series | $I_{PP}$                                     |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | $I_{TSM}$<br>50/60 Hz | di/dt<br>A/ $\mu$ s max |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|-----------------------|-------------------------|
|        | 0.2x310 <sup>1</sup><br>0.5x700 <sup>2</sup> | 2x10 <sup>1</sup><br>2x10 <sup>2</sup> | 8x20 <sup>1</sup><br>1.2x50 <sup>2</sup> | 10x160 <sup>1</sup><br>10x160 <sup>2</sup> | 10x560 <sup>1</sup><br>10x560 <sup>2</sup> | 5x320 <sup>1</sup><br>9x720 <sup>2</sup> | 10x360 <sup>1</sup><br>10x360 <sup>2</sup> | 10x1000 <sup>1</sup><br>10x1000 <sup>2</sup> | 5x310 <sup>1</sup><br>10x700 <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                                       | 30                    | 500                     |

Notes:

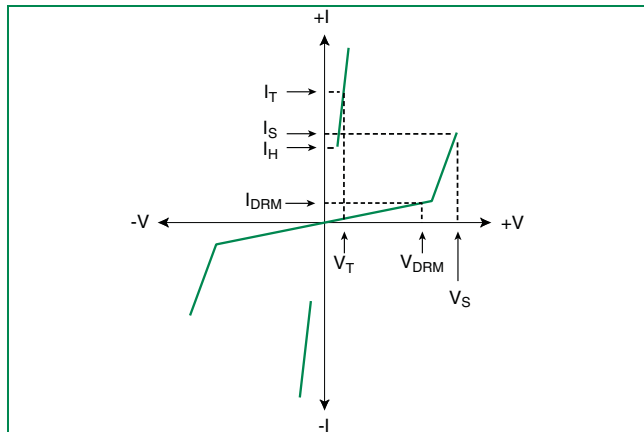
- 1 Current waveform in  $\mu$ s  
2 Voltage waveform in  $\mu$ s

- Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product.  
-  $I_{PP}$  ratings applicable over temperature range of -40°C to +85°C  
- The device must initially be in thermal equilibrium with -40°C  $\leq T_J \leq$  +150°C

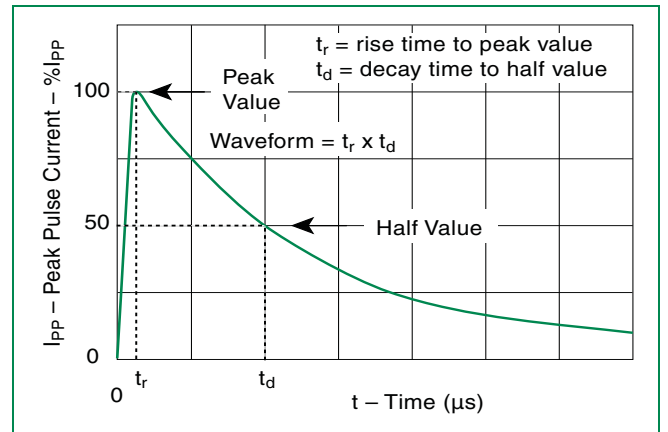
## Thermal Considerations

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

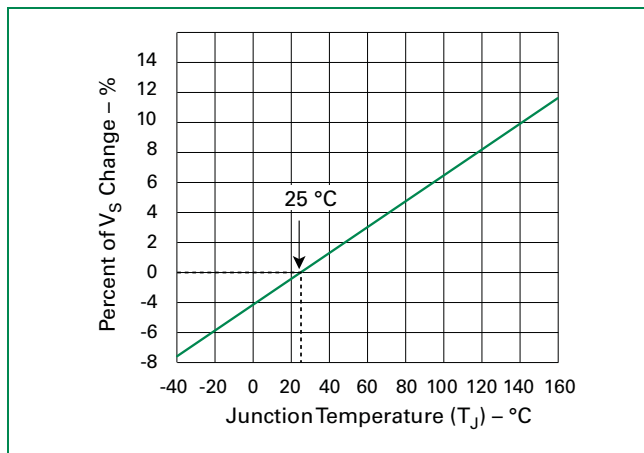
## V-I Characteristics



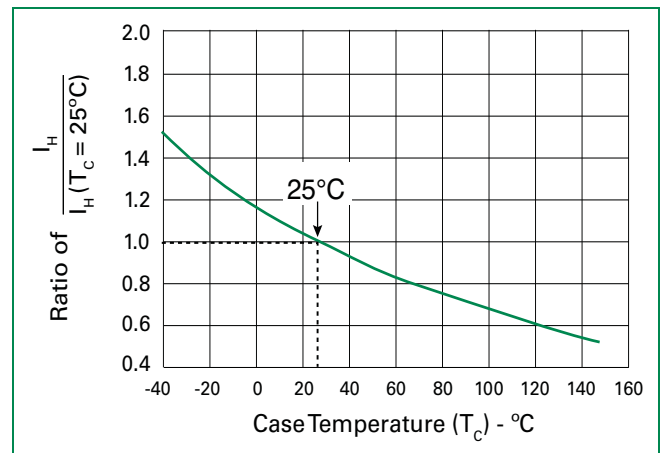
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

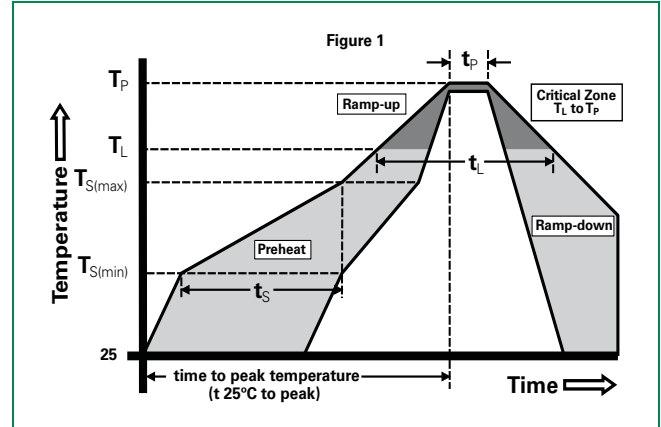


## Normalized DC Holding Current vs. Case Temperature



## 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                        |



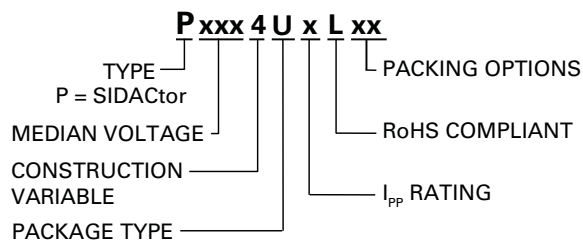
## Physical Specifications

|                        |                                                               |
|------------------------|---------------------------------------------------------------|
| <b>Lead Material</b>   | Copper Alloy                                                  |
| <b>Terminal Finish</b> | 100% Matte-Tin Plated                                         |
| <b>Body Material</b>   | UL recognized epoxy meeting flammability classification 94V-0 |

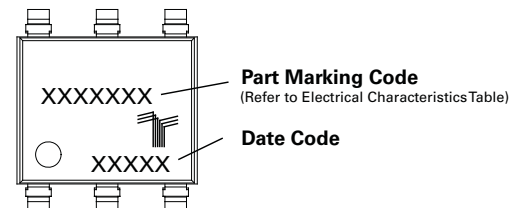
## Environmental Specifications

|                                         |                                                                                                                        |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <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                                        |

## Part Numbering



## Part Marking



| 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  |

| 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<br>(50 per tube) | TP           | N/A               |

Technical drawing of a circular saw blade showing dimensions in inches and millimeters. The drawing includes a side view of the blade with dimensions: .157 (4.0) for the top edge thickness, .630 (16.0) for the total thickness, .472 (12.0) for the core thickness, .512 (13.0) Arbor Hole Dia. for the central hole, and 12.99 (330) for the outer diameter. A top view shows the blade's profile with a .700 (17.8) thickness. A large arrow indicates the "Direction of Feed".

Technical drawing of a tube with a message location. The drawing shows a cross-section of a tube with a 90-degree bend. Dimensions are given in inches and millimeters. Key features include a message location on the outer wall, a wall thickness of  $.020 \pm .005$  (0.51 ± 0.13), and a surface finish of .005 A. The interior of the tube is labeled "Interior of the Tube". The drawing also shows a detail view of the message location on the outer wall.

Dimensions are in inches  
(and millimeters)



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