

# Pxxx4UCMC Series

## MicroCapacitance Multiport SIDAct<sup>®</sup> - MS-013



### Additional Information



Resources

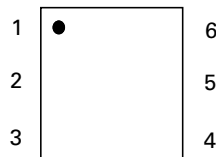


Accessories

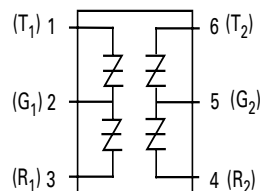


Samples

### Pinout Designation



### Schematic Symbol



### Description

The Pxxx4UCMC Series MS-013 are low capacitance SIDAct<sup>®</sup> thyristors designed to protect broadband equipment from damaging overvoltage transients.

The series provides a robust peak surge current capability that enables equipment to comply with various global regulatory standards while limiting the impact to broadband signals.

### Features and Benefits

- Low voltage overshoot
- Low on-state voltage
- surge capability does not degrade after multiple surge events within limit
- Fails short circuit when surged in excess of ratings
- Two-pair protection
- 40% lower capacitance than our Baseband Protectors, for applications that demand greater signal integrity
- Replaces four discrete components
- 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

### 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 Intra-building
- IEC 61000-4-5, 2nd Edition
- YD/T 1082
- YD/T 993
- YD/T 950

### Agency Approvals

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

### 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>@ $100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$<br>Amps | Capacitance                        |
|--------------|-----------|---------------------------------|-------------------------|---------------------------------|-------------------------|--------|--------|-------|------------------------------|------------------------------------|
|              |           | V                               | V                       | V                               | V                       | mA min | mA max | A max | V max                        |                                    |
|              |           | Pins 1-2, 3-2, 4-5, 6-5         |                         | Pins 1-3, 4-6                   |                         |        |        |       |                              |                                    |
| P0084UCMCLxx | P0084UCMC | 6                               | 25                      | 12                              | 50                      | 50     | 800    | 2.2   | 8                            | See<br>Capacitance<br>Values Table |
| P0304UCMCLxx | P0304UCMC | 25                              | 40                      | 50                              | 80                      | 50     | 800    | 2.2   | 8                            |                                    |
| P0644UCMCLxx | P0644UCMC | 58                              | 77                      | 116                             | 154                     | 150    | 800    | 2.2   | 8                            |                                    |
| P0724UCMCLxx | P0724UCMC | 65                              | 88                      | 130                             | 176                     | 150    | 800    | 2.2   | 8                            |                                    |
| P0904UCMCLxx | P0904UCMC | 75                              | 98                      | 150                             | 196                     | 150    | 800    | 2.2   | 8                            |                                    |
| P1104UCMCLxx | P1104UCMC | 90                              | 130                     | 180                             | 260                     | 150    | 800    | 2.2   | 8                            |                                    |
| P1304UCMCLxx | P1304UCMC | 120                             | 160                     | 240                             | 320                     | 150    | 800    | 2.2   | 8                            |                                    |

#### 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.

# Pxxx4UCMC Series

## MicroCapacitance Multiport SIDAct<sup>®</sup> - MS-013

### 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/ $\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$<br>Amps | Capacitance                        |
|--------------|-----------|---------------------------------|--------------------------|---------------------------------|--------------------------|--------|--------|-------|------------------------------|------------------------------------|
|              |           | V                               | V                        | V                               | V                        |        |        |       |                              |                                    |
|              |           | Pins 1-2, 3-2, 4-5, 6-5         |                          | Pins 1-3, 4-6                   |                          | mA min | mA max | A max | V max                        |                                    |
| P1504UCMCLxx | P1504UCMC | 140                             | 180                      | 280                             | 360                      | 150    | 800    | 2.2   | 8                            | See<br>Capacitance<br>Values Table |
| P1804UCMCLxx | P1804UCMC | 170                             | 220                      | 340                             | 440                      | 150    | 800    | 2.2   | 8                            |                                    |
| P2304UCMCLxx | P2304UCMC | 190                             | 260                      | 380                             | 520                      | 150    | 800    | 2.2   | 8                            |                                    |
| P2604UCMCLxx | P2604UCMC | 220                             | 300                      | 440                             | 600                      | 150    | 800    | 2.2   | 8                            |                                    |
| P3104UCMCLxx | P3104UCMC | 275                             | 350                      | 550                             | 700                      | 150    | 800    | 2.2   | 8                            |                                    |
| P3504UCMCLxx | P3504UCMC | 320                             | 400                      | 600                             | 800                      | 150    | 800    | 2.2   | 8                            |                                    |

#### 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).

### 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 |
| P0084UCMCLxx | 35                                                         | 75  | 20                              | 45  |
| P0304UCMCLxx | 25                                                         | 45  | 10                              | 25  |
| P0644UCMCLxx | 55                                                         | 85  | 30                              | 50  |
| P0724UCMCLxx | 50                                                         | 75  | 25                              | 45  |
| P0904UCMCLxx | 45                                                         | 70  | 25                              | 40  |
| P1104UCMCLxx | 45                                                         | 70  | 25                              | 40  |
| P1304UCMCLxx | 40                                                         | 60  | 20                              | 35  |
| P1504UCMCLxx | 35                                                         | 55  | 20                              | 35  |
| P1804UCMCLxx | 35                                                         | 50  | 15                              | 30  |
| P2304UCMCLxx | 30                                                         | 50  | 15                              | 30  |
| P2604UCMCLxx | 30                                                         | 45  | 15                              | 30  |
| P3104UCMCLxx | 30                                                         | 45  | 15                              | 25  |
| P3504UCMCLxx | 25                                                         | 40  | 15                              | 25  |

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

### 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                                     |                       |       |
| C      | 50                                           | 500                                    | 400                                      | 200                                        | 150                                        | 200                                      | 175                                        | 100                                          | 200                                       | 30                    | 500   |

#### Notes:

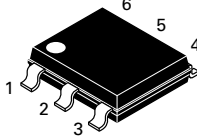
1. Current waveform in  $\mu s$
2. Voltage waveform in  $\mu s$

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

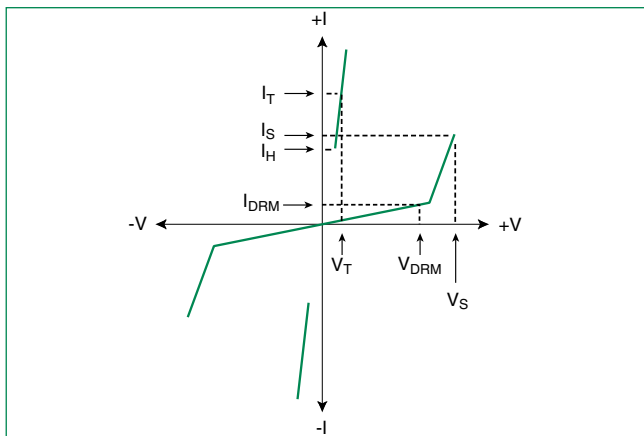
# Pxxx4UCMC Series

## MicroCapacitance Multiport SIDACtor® - MS-013

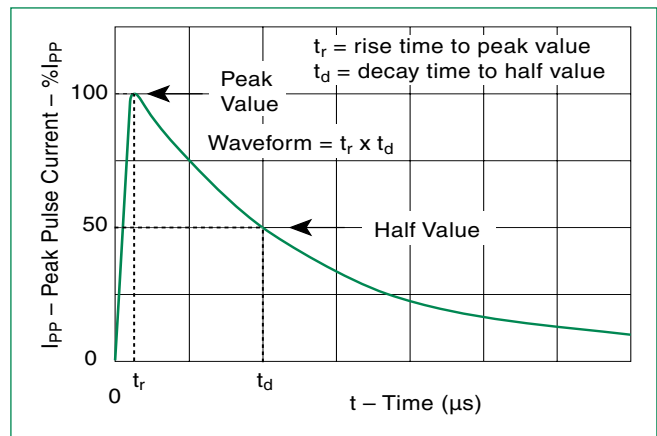
### Thermal Considerations

| Package                                                                                              | Symbol          | Parameter                               | Value       | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| Modified MS-013<br> | $T_J$           | 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 |

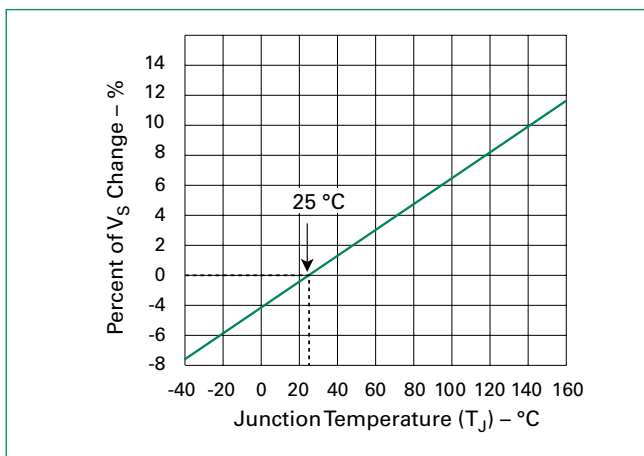
### V-I Characteristics



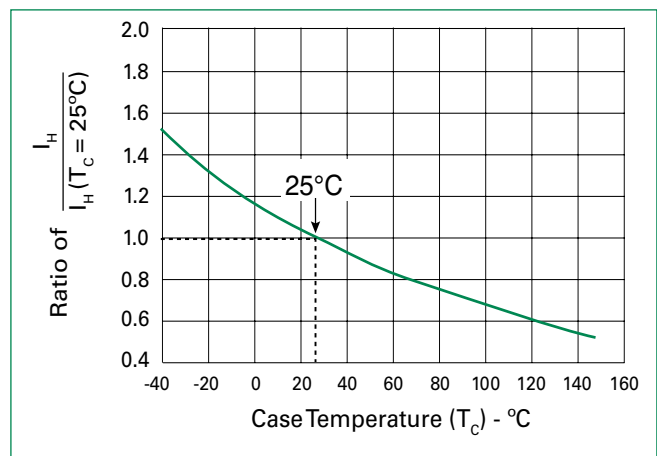
### tr x td Pulse Waveform



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



### Normalized DC Holding Current vs. Case Temperature

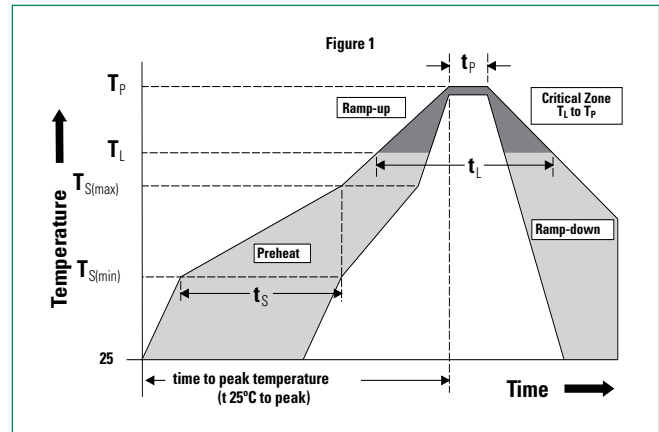


# Pxxx4UMC Series

## MicroCapacitance Multiport SIDAct<sup>®</sup> - MS-013

### Soldering Parameters

|                                                                        |                                    |                               |
|------------------------------------------------------------------------|------------------------------------|-------------------------------|
| <b>Reflow Condition</b>                                                |                                    | Pb-Free assembly (see Fig. 1) |
| <b>Pre Heat</b>                                                        | - Temperature Min ( $T_{s(min)}$ ) | +150°C                        |
|                                                                        | - Temperature Max ( $T_{s(max)}$ ) | +200°C                        |
|                                                                        | - Time (Min to Max) ( $t_s$ )      | 60-180 secs.                  |
| <b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak)</b> |                                    | 3°C/sec. Max.                 |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/sec. Max.                 |
| <b>Reflow</b>                                                          | - Temperature ( $T_L$ ) (Liquidus) | +217°C                        |
|                                                                        | - Temperature ( $t_L$ )            | 60-150 secs.                  |
| <b>Peak Temp (<math>T_p</math>)</b>                                    |                                    | +260(+0/-5)°C                 |
| <b>Time within 5°C of actual Peak Temp (<math>t_p</math>)</b>          |                                    | 30 secs. Max.                 |
| <b>Ramp-down Rate</b>                                                  |                                    | 6°C/sec. Max.                 |
| <b>Time 25°C to Peak Temp (<math>T_p</math>)</b>                       |                                    | 8 min. Max.                   |
| <b>Do not exceed</b>                                                   |                                    | +260°C                        |



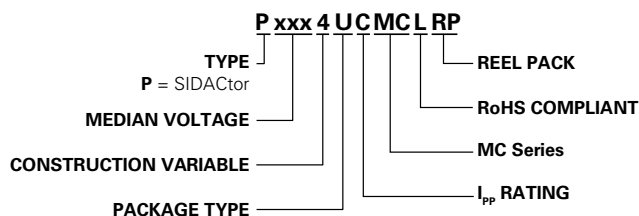
### Physical Specifications

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

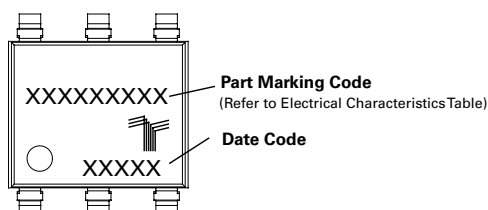
### Environmental Specifications

|                                                |                                                                                                                       |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <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-A-104                |
| <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>Unbiased Highly Accelerated Stress Test</b> | +130°C, 85%RH, 2atm, 96 hrs. JESD22-A-118                                                                             |
| <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-TD-020, Level 1                                        |

### Part Numbering



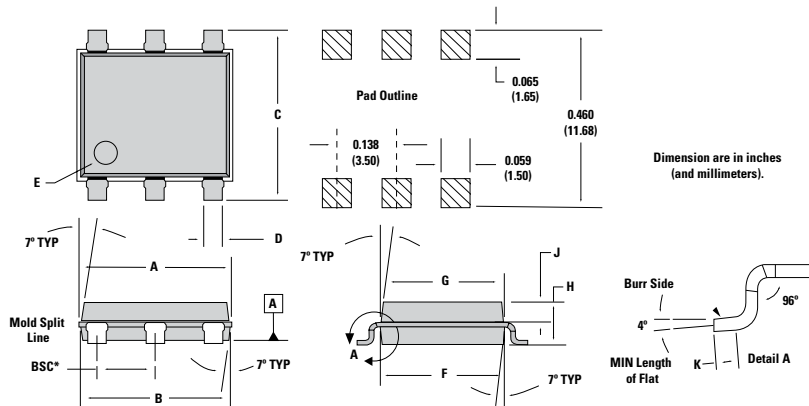
### Part Marking



# Pxxx4UCMC Series

## MicroCapacitance Multiport SIDActor® - MS-013

## Dimensions — MS-013



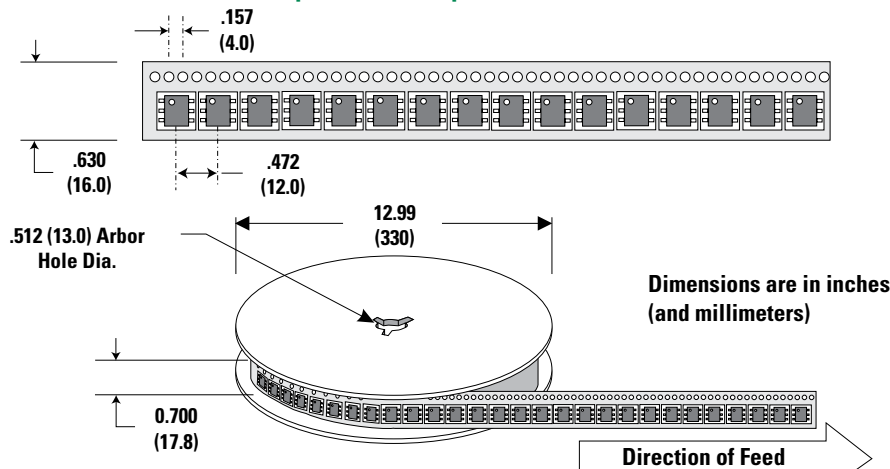
| Dimensions  | Inches |       | Millimeters |       |
|-------------|--------|-------|-------------|-------|
|             | Min    | Max   | Min         | Max   |
| <b>A</b>    | 0.360  | 0.364 | 9.14        | 9.25  |
| <b>B</b>    | 0.352  | 0.356 | 8.94        | 9.04  |
| <b>C</b>    | 0.400  | 0.412 | 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 = **B**asic **S**pacing between **C**enters

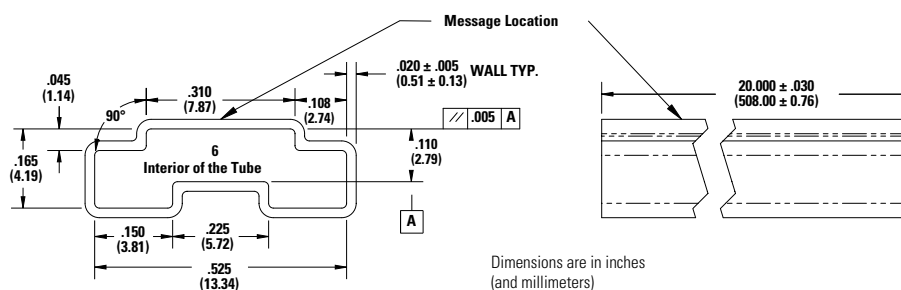
## Packing Options

| 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 Dimensions – MS-013



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