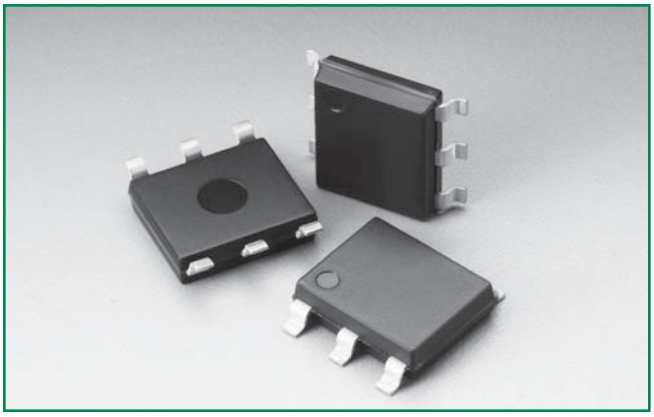
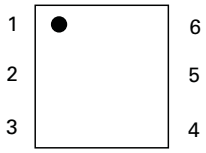
# RoHS SIDACtor® Balanced Multiport Series - MS-013



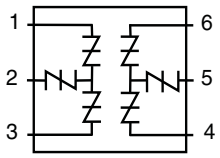
## Agency Approvals

| 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.

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

## Features and Benefits

- Low voltage overshoot
- Low on-state voltage
- Does not degrade with use
- 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

## 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/B-rated parts require series resistance

## Electrical Characteristics

| Part Number | Marking | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $V_T$ @$I_T$=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 | | | | |
| 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 | |
| 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.**

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## Electrical Characteristics (continued)

| Part Number | Marking | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $V_T$ @$I_T$=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 Capacitance 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°C (unless otherwise noted).
- Devices are bi-directional (some are asymmetrical).
- XX = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).

## Surge Ratings

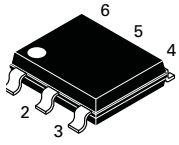
| Series | $I_{PP}$ 0.2x310 [1] 0.5x700 [2] | 2x10 [1] 2x10 [2] | 8x20 [1] 1.2x50 [2] | 10x160 [1] 10x160 [2] | 10x560 [1] 10x560 [2] | 5x320 [1] 9x720 [2] | 10x360 [1] 10x360 [2] | 10x1000 [1] 10x1000 [2] | 5x310 [1] 10x700 [2] | $I_{TSM}$ 50/60 Hz | di/dt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A min | A min | A min | A min | A min | A min | A min | A min | A min | A min | A/µs max |
| 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 µs
2 Voltage waveform in µs

- 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 to +85°C
- The device must initially be in thermal equilibrium with -40°C ≤ $T_J$ ≤ +150°C

## Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|---|---|---|---|---|
| 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 |

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## Capacitance Values

| Part Number | pF Pin 1-2 / 3-2 (4-5 / 6-5) Tip-Ground, Ring-Ground | | pF Pin 1-3 (4-6) 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 |
| 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.

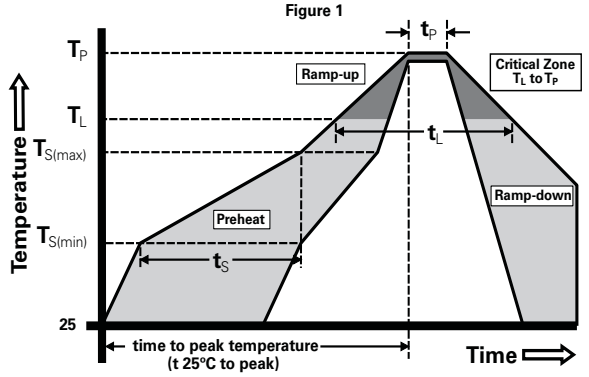
## Physical Specifications

| | |
|---|---|
| **Lead Material** | Copper Alloy |
| **Terminal Finish** | 100% Matte-Tin Plated |
| **Body Material** | UL recognized epoxy meeting flammability classification 94V-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 |

Figure 1




## 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 |

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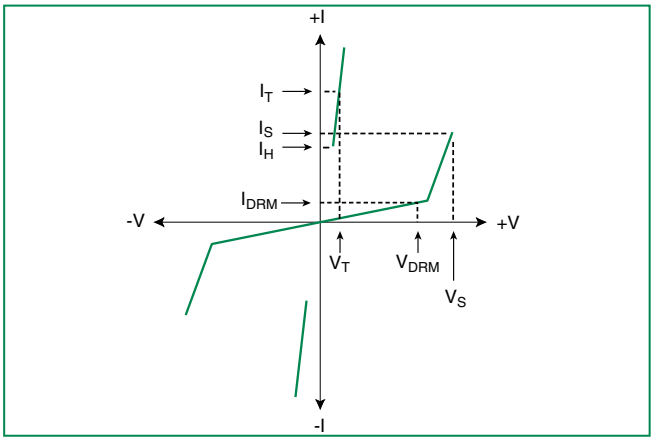
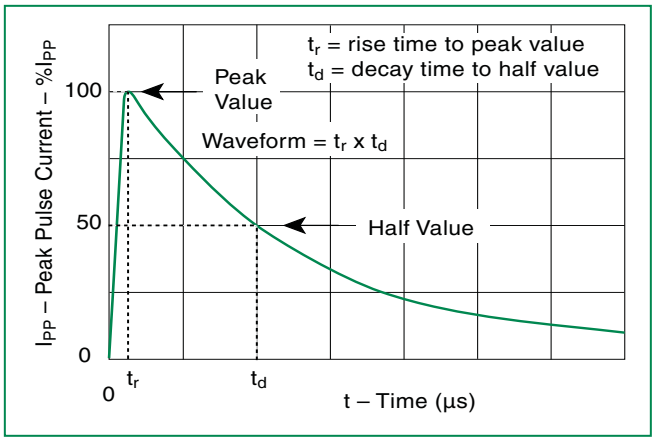
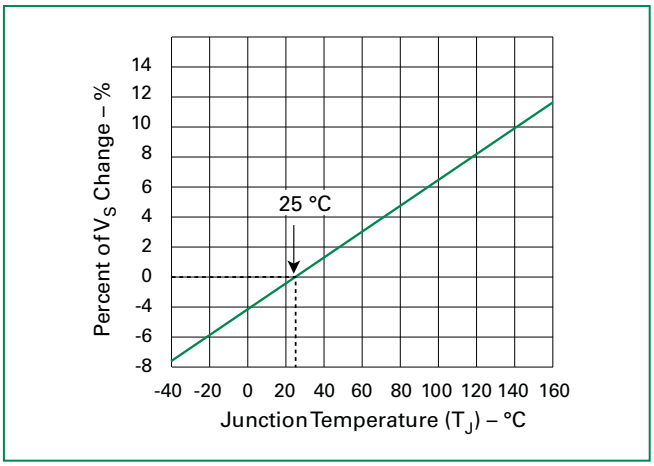
## V-I Characteristics



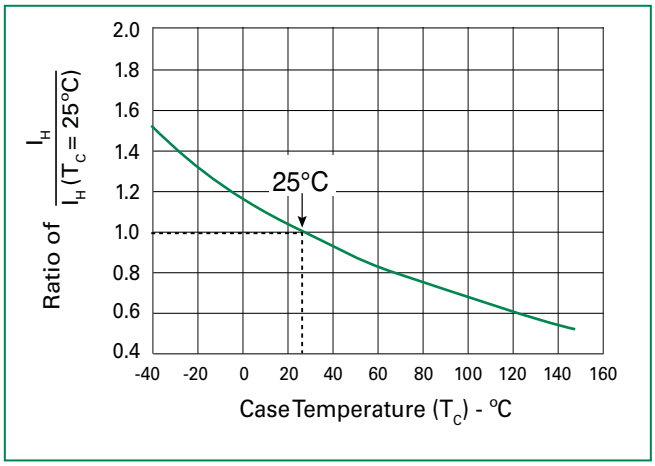

## $t_r$ x $t_d$ Pulse Waveform



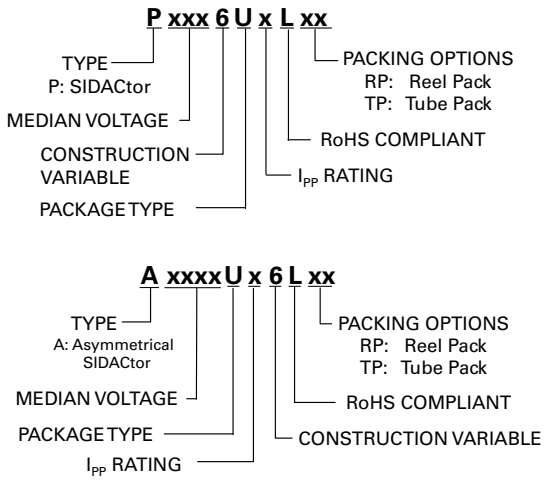

## Normalized $V_S$ Change vs. Junction Temperature



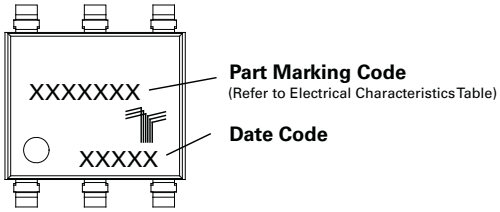

## Normalized DC Holding Current vs. Case Temperature




## Part Numbering




## Part Marking

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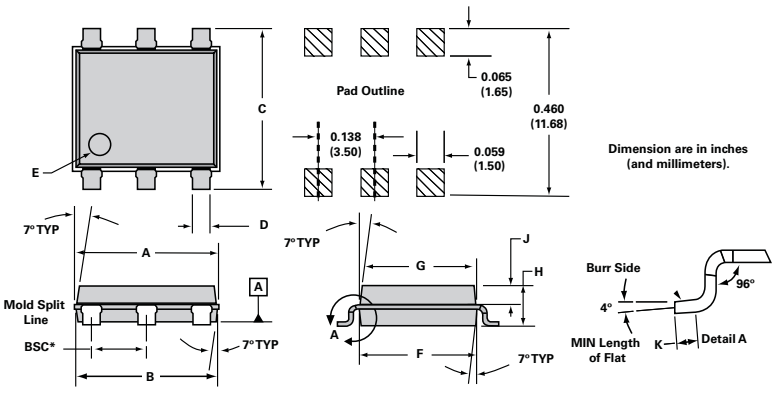
## Dimensions — MS-013



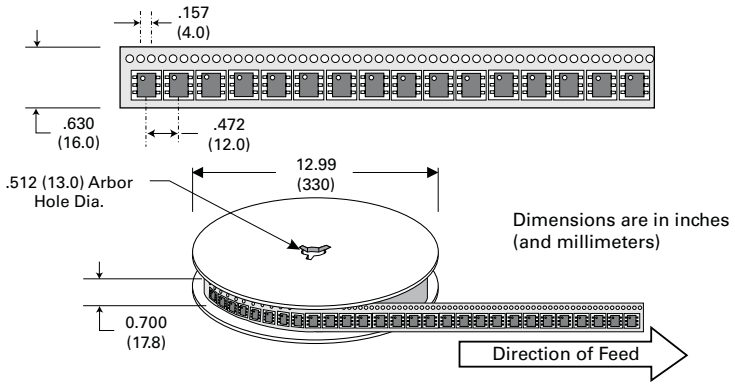

| Dimensions | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| **A** | 0.360 | 0.364 | 9.14 | 9.25 |
| **B** | 0.352 | 0.356 | 8.94 | 9.04 |
| **C** | 0.400 | 0.412 | 10.16 | 10.46 |
| **D** | 0.043 | 0.045 | 1.09 | 1.13 |
| **E** | 0.047 | 0.055 | 1.19 | 1.40 |
| **F** | 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 = **B**asic **S**pacing between **C**enters

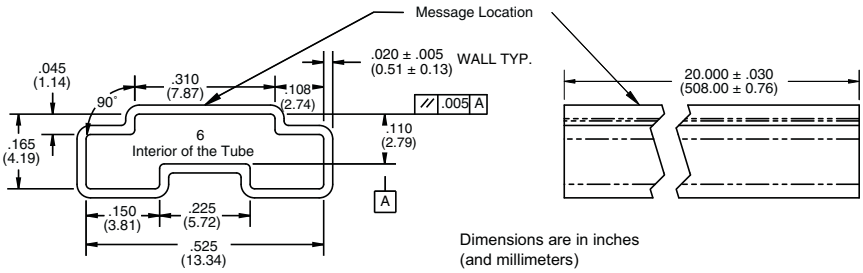
## Packing Options

| 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 Specification — MS-013

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