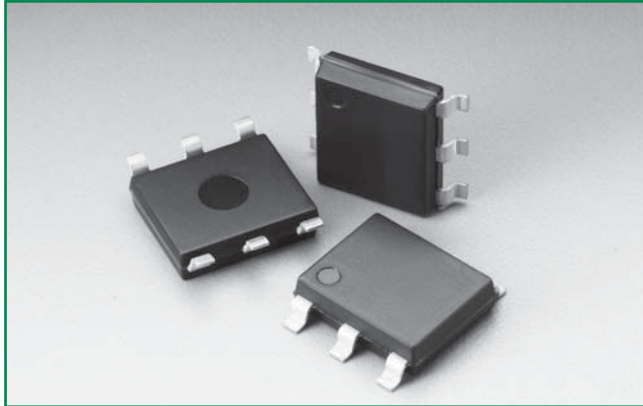
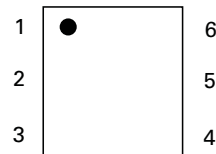




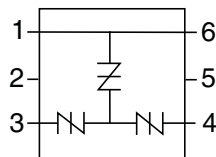
#### Agency Approvals

| 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.

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 with use
- Fails short circuit when surged in excess of ratings
- Replaces three discrete devices
- Meets UL/IEC 60950-1 creepage and clearance

#### Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- GR 1089 Intra-building
- IEC 61000-4-5
- YD/T 1082
- YD/T 993
- YD/T 950
- GR 1089 Inter-building

#### Electrical Characteristics

| Part Number | Part 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/ $\mu s$ | $V_T$ | $I_S$  | $I_T$ | $I_H$  | 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                        |                          |       |        |       |        |                              |
| 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    |                              |

Table continues on next page.

#### 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).

© 2011 Littelfuse, Inc.

Specifications are subject to change without notice.

Please refer to [www.littelfuse.com](http://www.littelfuse.com) for current information.

**Electrical Characteristics (continued)**

| Part Number | Part 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/ $\mu s$ | $V_T$ | $I_S$  | $I_T$ | $I_H$  | 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<br>Capacitance<br>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<br>Tip-Ring |        | Pins 1 & 6-3, 1 & 6-4<br>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     |

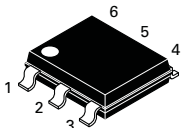
Note: Off-state capacitance ( $C_o$ ) is measured at 1 MHz with a 2 V bias.

## Surge Ratings

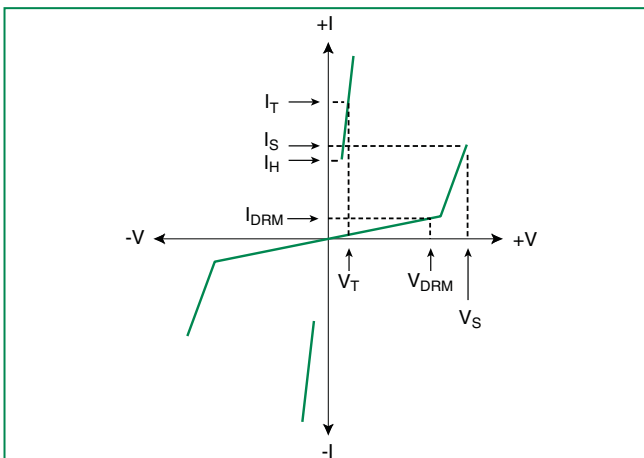
| Series | $I_{PP}$                                     |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | $I_{TSM}$<br>50/60 Hz | di/dt |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|-----------------------|-------|
|        | 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   |
| 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  $\mu$ 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 to +85°C  
 - The device must initially be in thermal equilibrium with -40°C  $\leq T_J \leq$  +150°C

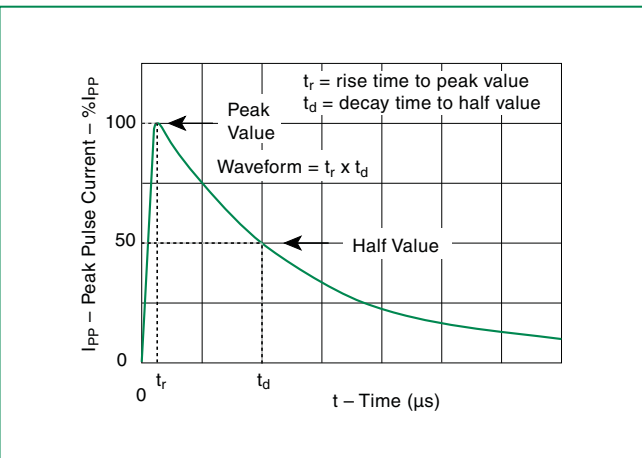
## Thermal Considerations

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

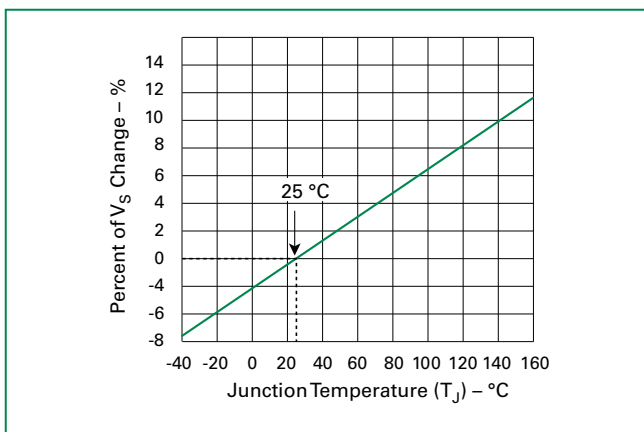
## V-I Characteristics



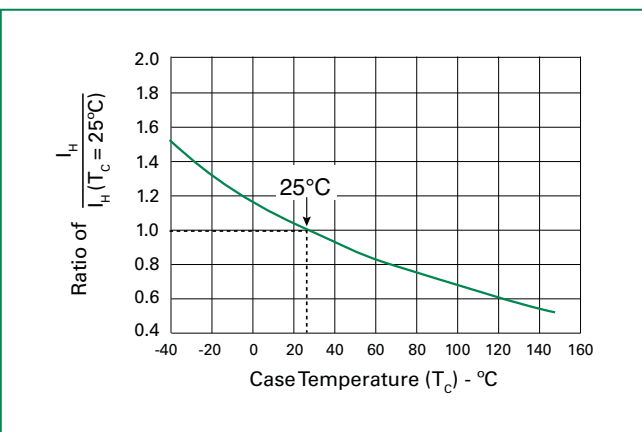
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

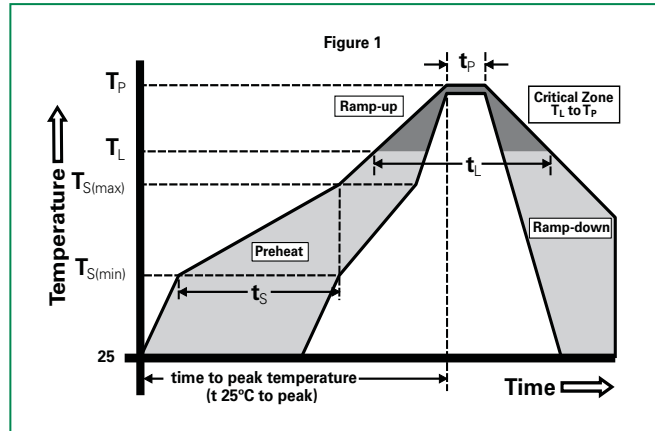


## Normalized DC Holding Current vs. Case Temperature



## Soldering Parameters

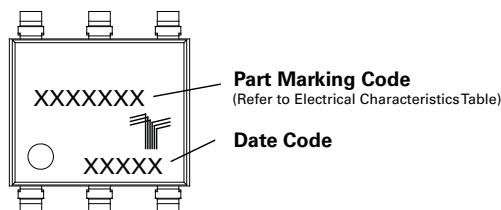
|                                                        |                                   |                               |
|--------------------------------------------------------|-----------------------------------|-------------------------------|
| Reflow Condition                                       |                                   | 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 |

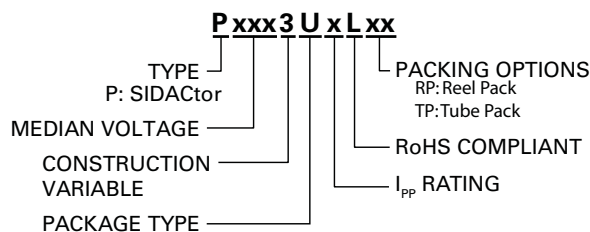
## Part Marking



## 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>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



## Packing Options

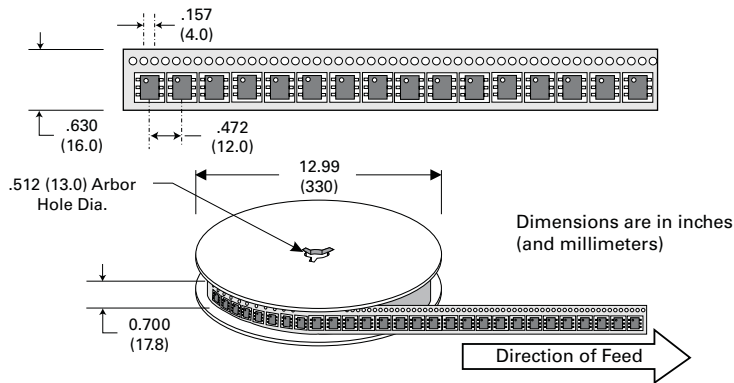
| Package Type | Description                              | Quantity          | Added Suffix | Industry Standard |
|--------------|------------------------------------------|-------------------|--------------|-------------------|
| U            | Modified MS-013 6-pin Tape and Reel Pack | 1500              | RP           | EIA-481-D         |
|              | Modified MS-013 6-pin Tube Pack          | 500 (50 per tube) | TP           | N/A               |

Figure 1: Dimensions and details of the pad. The figure includes a top view of the pad with dimensions A, B, C, D, and E. A side view shows the pad profile with dimensions G, H, J, F, and A. A detail view shows the burr side with dimensions K and 96°. A cross-section shows the pad profile with dimensions 0.138 (3.50), 0.065 (1.65), 0.059 (1.50), and 0.460 (11.68). A note states "Dimension are in inches (and millimeters).".

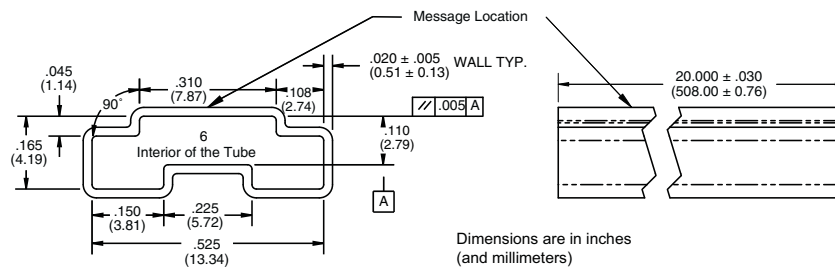
| Dimension | Inches       | Millimeters |
|-----------|--------------|-------------|
| A         | 0.125 (3.18) | 3.18        |
| B         | 0.125 (3.18) | 3.18        |
| C         | 0.125 (3.18) | 3.18        |
| D         | 0.125 (3.18) | 3.18        |
| E         | 0.125 (3.18) | 3.18        |
| F         | 0.125 (3.18) | 3.18        |
| G         | 0.125 (3.18) | 3.18        |
| H         | 0.125 (3.18) | 3.18        |
| J         | 0.125 (3.18) | 3.18        |
| K         | 0.125 (3.18) | 3.18        |

| 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  |

## Tape and Reel Specification — MS-013



## Tube Pack Specification – MS-013





**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331