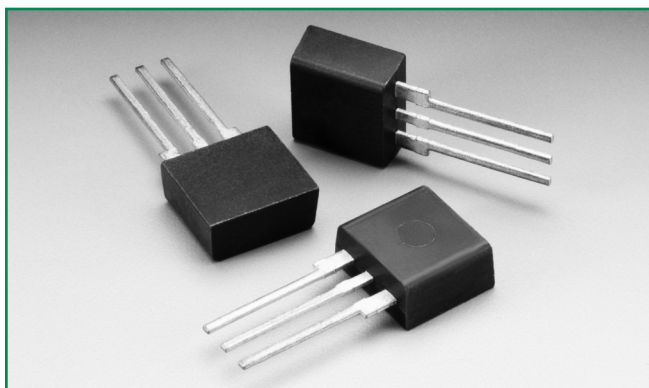


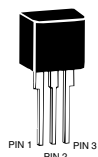
## SIDACtor® Balanced Series - Modified TO-220



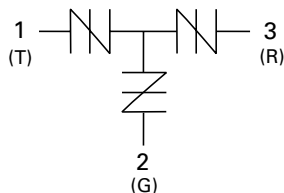
### Agency Approvals

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

### Pinout Designation



### Schematic Symbol



### Description

The SIDACtor® Balanced Series are designed to protect baseband equipment from damaging overvoltage transients. The patented "Y" configuration also ensures balanced overvoltage protection that prevents a longitudinal to differential conversion.

The series provides a single port through-hole 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 surge capability after multiple surge events within limit.
- Fails short circuit when surged in excess of ratings
- Low capacitance
- Balanced overvoltage protection
- Single port protection
- Custom lead forms available
- RoHS Compliant and Lead-Free
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

### 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 | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $I_H$     | $I_S$     | $I_T$    | $V_T@I_T=$<br>2.2 Amps | Capacitance                        |
|-------------|---------|---------------------------------|-------------------------|---------------------------------|-------------------------|-----------|-----------|----------|------------------------|------------------------------------|
|             |         | V min                           | V max                   | V min                           | V max                   | mA<br>min | mA<br>max | A<br>max | V max                  |                                    |
|             |         | Pins 1-2, 3-2                   |                         | Pins 1-3                        |                         |           |           |          |                        |                                    |
| P1553AALxx  | P1553AA | 130                             | 180                     | 130                             | 180                     | 150       | 800       | 2.2      | 8                      | See<br>Capacitance<br>Values table |
| P1803AALxx  | P1803AA | 150                             | 210                     | 150                             | 210                     | 150       | 800       | 2.2      | 8                      |                                    |
| P2103AALxx  | P2103AA | 170                             | 250                     | 170                             | 250                     | 150       | 800       | 2.2      | 8                      |                                    |
| P2353AALxx  | P2353AA | 200                             | 270                     | 200                             | 270                     | 150       | 800       | 2.2      | 8                      |                                    |
| P2703AALxx  | P2703AA | 230                             | 300                     | 230                             | 300                     | 150       | 800       | 2.2      | 8                      |                                    |
| P3203AALxx  | P3203AA | 270                             | 350                     | 270                             | 350                     | 150       | 800       | 2.2      | 8                      |                                    |
| P3403AALxx  | P3403AA | 300                             | 400                     | 300                             | 400                     | 150       | 800       | 2.2      | 8                      |                                    |
| P5103AALxx  | P5103AA | 420                             | 600                     | 420                             | 600                     | 150       | 800       | 2.2      | 8                      |                                    |
| P1553ABLxx  | P1553AB | 130                             | 180                     | 130                             | 180                     | 150       | 800       | 2.2      | 8                      |                                    |
| P1803ABLxx  | P1803AB | 150                             | 210                     | 150                             | 210                     | 150       | 800       | 2.2      | 8                      |                                    |
| P2103ABLxx  | P2103AB | 170                             | 250                     | 170                             | 250                     | 150       | 800       | 2.2      | 8                      |                                    |

Table continues on next page.

| 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/ $\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$ @ $I_T=2.2$ Amps | Capacitance                  |
|-------------|---------|---------------------------------|--------------------------|---------------------------------|--------------------------|--------|--------|-------|------------------------|------------------------------|
|             |         | V min                           | V max                    | V min                           | V max                    | mA min | mA max | A max | V max                  |                              |
|             |         | Pins 1-2, 3-2                   |                          | Pins 1-3                        |                          |        |        |       |                        |                              |
| P2353ABLxx  | P2353AB | 200                             | 270                      | 200                             | 270                      | 150    | 800    | 2.2   | 8                      | See Capacitance Values table |
| P2703ABLxx  | P2703AB | 230                             | 300                      | 230                             | 300                      | 150    | 800    | 2.2   | 8                      |                              |
| P3203ABLxx  | P3203AB | 270                             | 350                      | 270                             | 350                      | 150    | 800    | 2.2   | 8                      |                              |
| P3403ABLxx  | P3403AB | 300                             | 400                      | 300                             | 400                      | 150    | 800    | 2.2   | 8                      |                              |
| P5103ABLxx  | P5103AB | 420                             | 600                      | 420                             | 600                      | 150    | 800    | 2.2   | 8                      |                              |
| P1553ACLxx  | P1553AC | 130                             | 180                      | 130                             | 180                      | 150    | 800    | 2.2   | 8                      |                              |
| P1803ACLxx  | P1803AC | 150                             | 210                      | 150                             | 210                      | 150    | 800    | 2.2   | 8                      |                              |
| P2103ACLxx  | P2103AC | 170                             | 250                      | 170                             | 250                      | 150    | 800    | 2.2   | 8                      |                              |
| P2353ACLxx  | P2353AC | 200                             | 270                      | 200                             | 270                      | 150    | 800    | 2.2   | 8                      |                              |
| P2703ACLxx  | P2703AC | 230                             | 300                      | 230                             | 300                      | 150    | 800    | 2.2   | 8                      |                              |
| P3203ACLxx  | P3203AC | 270                             | 350                      | 270                             | 350                      | 150    | 800    | 2.2   | 8                      |                              |
| P3403ACLxx  | P3403AC | 300                             | 400                      | 300                             | 400                      | 150    | 800    | 2.2   | 8                      |                              |
| P5103ACLxx  | P5103AC | 420                             | 600                      | 420                             | 600                      | 150    | 800    | 2.2   | 8                      |                              |

### Notes:

- Absolute maximum ratings measured at  $T_A = 25^\circ C$ .
- Components are bi-directional.
- **XX** Part Number Suffix: '**RP**' (Reel Pack), '**Blank**' (Bulk Pack), or '**60**' (Type 60 lead form, Bulk Pack)

## Capacitance Values

| Part Number | pF<br>Pin 1-2 / 3-2<br>Tip-Ground, Ring-Ground |     | pF<br>Pin 1-3<br>Tip-Ring |     |
|-------------|------------------------------------------------|-----|---------------------------|-----|
|             | MIN                                            | MAX | MIN                       | MAX |
| P1553AALxx  | 10                                             | 45  | 10                        | 30  |
| P1803AALxx  | 20                                             | 40  | 10                        | 30  |
| P2103AALxx  | 15                                             | 35  | 10                        | 25  |
| P2353AALxx  | 15                                             | 35  | 10                        | 25  |
| P2703AALxx  | 15                                             | 35  | 10                        | 25  |
| P3203AALxx  | 15                                             | 30  | 10                        | 20  |
| P3403AALxx  | 15                                             | 30  | 10                        | 20  |
| P5103AALxx  | 10                                             | 60  | 10                        | 40  |
| P1553ABLxx  | 25                                             | 95  | 15                        | 60  |
| P1803ABLxx  | 25                                             | 85  | 15                        | 55  |
| P2103ABLxx  | 20                                             | 85  | 10                        | 55  |
| P2353ABLxx  | 20                                             | 75  | 15                        | 50  |

| Part Number | pF<br>Pin 1-2 / 3-2<br>Tip-Ground, Ring-Ground |     | pF<br>Pin 1-3<br>Tip-Ring |     |
|-------------|------------------------------------------------|-----|---------------------------|-----|
|             | MIN                                            | MAX | MIN                       | MAX |
| P2703ABLxx  | 20                                             | 75  | 10                        | 50  |
| P3203ABLxx  | 20                                             | 70  | 10                        | 45  |
| P3403ABLxx  | 15                                             | 65  | 10                        | 45  |
| P5103ABLxx  | 15                                             | 60  | 10                        | 40  |
| P1553ACLxx  | 30                                             | 95  | 20                        | 60  |
| P1803ACLxx  | 30                                             | 85  | 15                        | 55  |
| P2103ACLxx  | 30                                             | 85  | 15                        | 55  |
| P2353ACLxx  | 25                                             | 75  | 15                        | 50  |
| P2703ACLxx  | 25                                             | 75  | 15                        | 50  |
| P3203ACLxx  | 25                                             | 70  | 15                        | 45  |
| P3403ACLxx  | 20                                             | 65  | 15                        | 45  |
| P5103ACLxx  | 20                                             | 60  | 10                        | 40  |

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

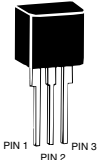
## Surge Ratings

| Series | $I_{PP}$                                     |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | $I_{TSM}$<br>50/60 Hz | di/dt<br>A |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|-----------------------|------------|
|        | 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                                       | 50                    | 500        |

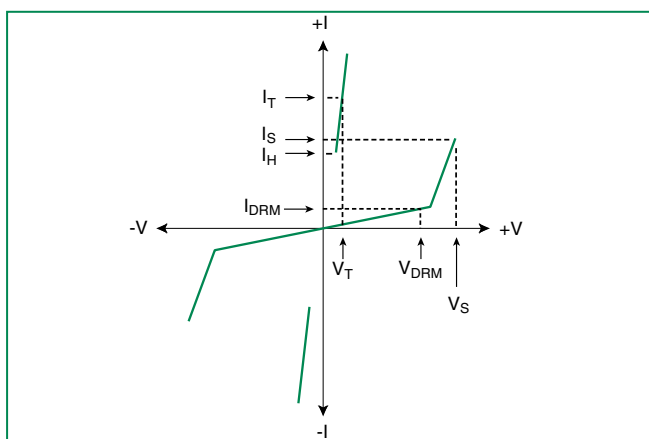
### Notes:

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

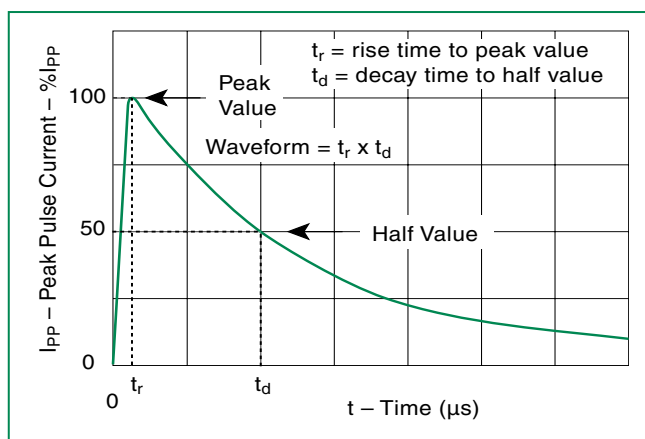
## Thermal Considerations

| Package                                                                                              | Symbol          | Parameter                               | Value       | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| Modified TO-220<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 | 50          | °C/W |

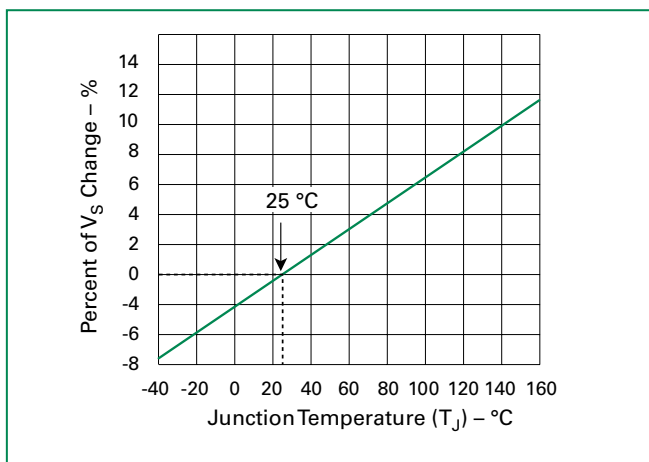
## V-I Characteristics



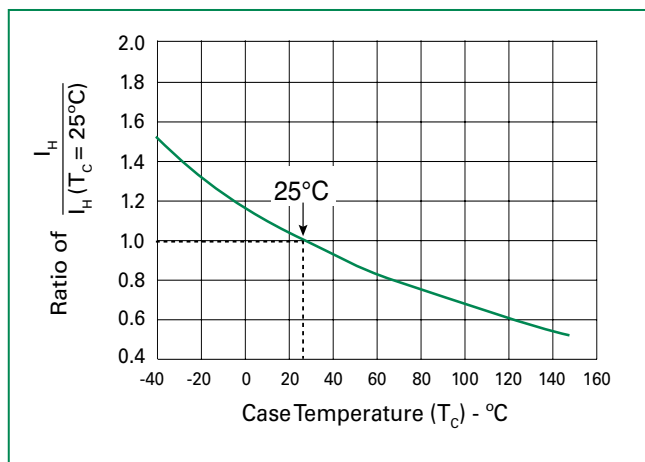
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

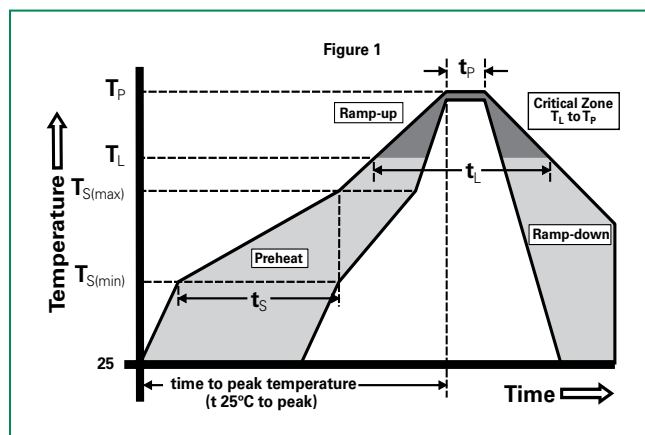


## Normalized DC Holding Current vs. Case Temperature



### 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 V-0 |

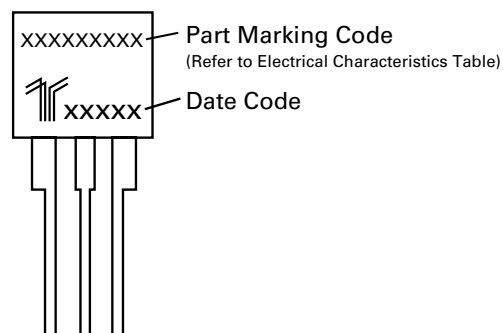
### Environmental Specifications

|                                         |                                                                                                                       |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <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>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                                       |

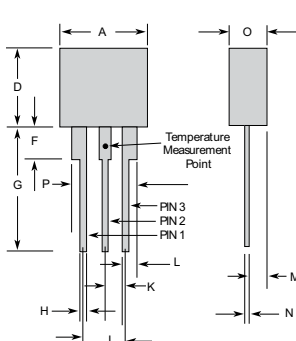
### Part Numbering

|                              |                                                             |
|------------------------------|-------------------------------------------------------------|
| <b>P xxx 3 A x L xx</b>      | <b>PACKING STYLE</b>                                        |
| <b>TYPE</b>                  | P = SIDACtor                                                |
| <b>MEDIAN VOLTAGE</b>        | Blank: Bulk<br>RP: Reel Pack                                |
| <b>CONSTRUCTION VARIABLE</b> | 60: Type 60 Lead Form (for Type 60 orders, contact factory) |
| <b>PACKAGE TYPE</b>          | <b>RoHS COMPLIANT</b>                                       |
|                              | <b><math>I_{PP}</math> RATING</b>                           |

### Part Marking



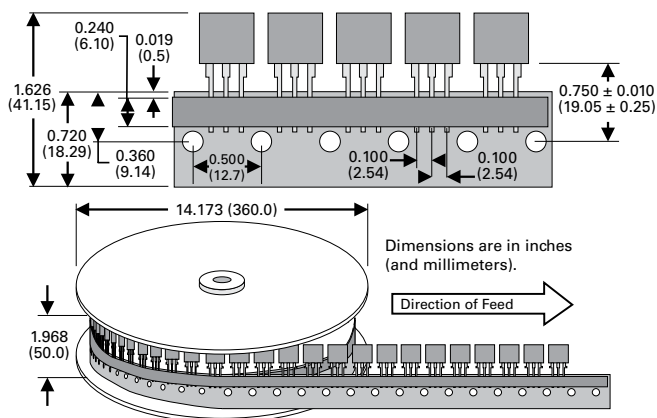
## Dimensions - Modified TO-220



The modified TO-220 package is designed to meet mechanical standards as set forth in JEDEC publication number 95.

|          | Inches |       | Millimeters |       |
|----------|--------|-------|-------------|-------|
|          | Min    | Max   | Min         | Max   |
| <b>A</b> | 0.400  | 0.410 | 10.16       | 10.42 |
| <b>D</b> | 0.360  | 0.375 | 9.14        | 9.53  |
| <b>F</b> | 0.110  | 0.130 | 2.80        | 3.30  |
| <b>G</b> | 0.540  | 0.575 | 13.71       | 14.61 |
| <b>H</b> | 0.025  | 0.035 | 0.63        | 0.89  |
| <b>J</b> | 0.195  | 0.205 | 4.95        | 5.21  |
| <b>K</b> | 0.095  | 0.105 | 2.41        | 2.67  |
| <b>L</b> | 0.060  | 0.075 | 1.52        | 1.90  |
| <b>M</b> | 0.070  | 0.085 | 1.78        | 2.16  |
| <b>N</b> | 0.018  | 0.024 | 0.46        | 0.61  |
| <b>O</b> | 0.178  | 0.188 | 4.52        | 4.78  |
| <b>P</b> | 0.290  | 0.310 | 7.37        | 7.87  |

## Tape and Reel Specification — Modified TO-220



## Packing Options

| Package Type | Description                                 | Packaging Quantity | Added Suffix                                            | Industry Standard |
|--------------|---------------------------------------------|--------------------|---------------------------------------------------------|-------------------|
| A            | Modified TO-220 Tape and Reel Pack          | 700                | RP                                                      | EIA-468-B         |
|              | Modified TO-220 Bulk Pack                   | 500                | N / A<br>(no suffix required)                           | EIA-468-B         |
|              | Modified TO-220 Type 60 Lead Form Bulk Pack | 500                | 60<br>(special order item, contact factory for details) | N/A               |

## Additional Information



Datasheet



Resources



Samples

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