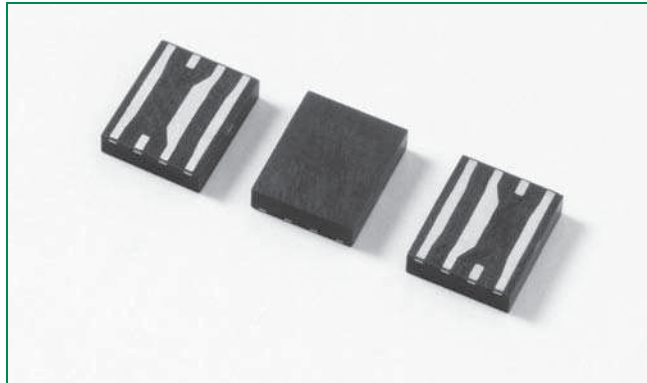


**HF RoHS SDP Biased Series - 5x6 QFN**



**Description**

This new SDP Biased series provides overvoltage protection for applications such as VDSL2, ADSL2, and ADSL2+ with minimal effect on data signals. This latest silicon design innovation results in a capacitive loading characteristic that is compatible with these high bandwidth applications. This surface mount QFN package provides a surge capability that exceeds most worldwide standards and recommendations for lightning surge withstand capability of secondary protectors.

**Features & Benefits**

- Compatible with VDSL2 (30MHz)
- Balanced overvoltage protection
- Low distortion
- Low insertion loss (30MHz)
- Low profile
- SO-8 footprint compatible
- Fails short circuit when surged in excess of ratings

**Agency Approvals**

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

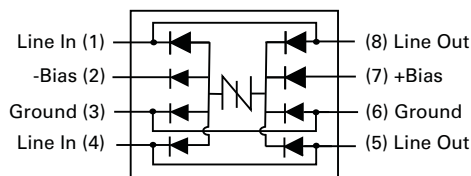
**Pinout Designation**

|         |   |   |          |
|---------|---|---|----------|
| Tip in  | 1 | 8 | Tip out  |
| - Bias  | 2 | 7 | + Bias   |
| Ground  | 3 | 6 | Ground   |
| Ring in | 4 | 5 | Ring out |

**Applicable Global Standards**

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

**Schematic Symbol**

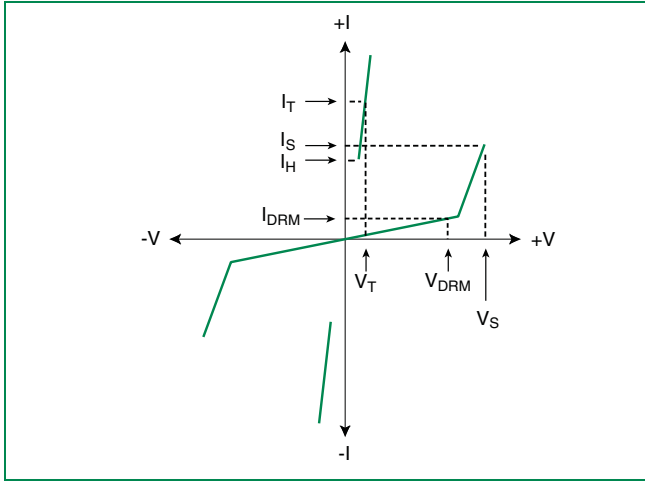


**Electrical Characteristics**

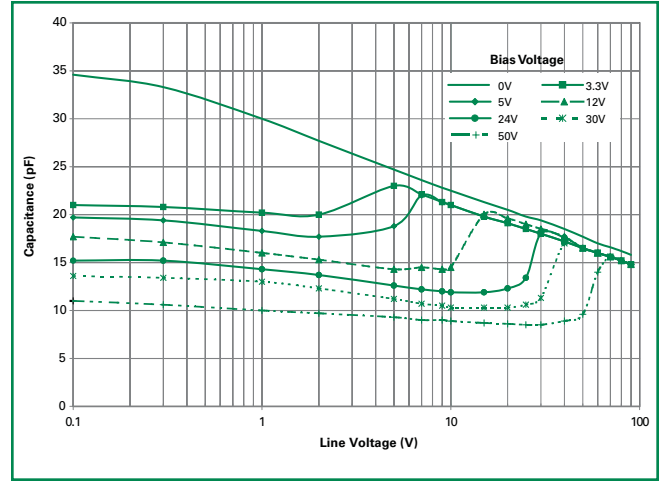
| Part Number  | Marking | $V_{DRM} @ I_{DRM}=5\mu A$ | $V_S @ 100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T @ I_T=2.2$<br>Amps | Capacitance                      |
|--------------|---------|----------------------------|--------------------|--------|--------|-------|-------------------------|----------------------------------|
|              |         | V min                      | V max              | mA min | mA max | A max | V max                   |                                  |
| SDP0080Q38CB | SDP-8C  | 6                          | 25                 | 50     | 800    | 2.2   | 8                       | See Capacitance vs Voltage Chart |
| SDP0640Q38CB | SDP06C  | 58                         | 77                 | 150    | 800    | 2.2   | 8                       |                                  |
| SDP0720Q38CB | SDP07C  | 65                         | 88                 | 150    | 800    | 2.2   | 8                       |                                  |
| SDP0900Q38CB | SDP09C  | 75                         | 98                 | 150    | 800    | 2.2   | 8                       |                                  |
| SDP1100Q38CB | SDP11C  | 90                         | 130                | 150    | 800    | 2.2   | 8                       |                                  |
| SDP1300Q38CB | SDP13C  | 120                        | 160                | 150    | 800    | 2.2   | 8                       |                                  |
| SDP1800Q38CB | SDP18C  | 170                        | 220                | 150    | 800    | 2.2   | 8                       |                                  |
| SDP2600Q38CB | SDP26C  | 220                        | 300                | 150    | 800    | 2.2   | 8                       |                                  |
| SDP3100Q38CB | SDP31C  | 275                        | 350                | 150    | 800    | 2.2   | 8                       |                                  |
| SDP3500Q38CB | SDP35C  | 320                        | 400                | 150    | 800    | 2.2   | 8                       |                                  |

Notes:  
 - Absolute maximum ratings measured at  $T_c=25^\circ C$  (unless otherwise noted).  
 - Devices are bi-directional (unless otherwise noted).

**V-I: Characteristics**



**Capacitance vs. Voltage\***



\* Bias voltage must be lower than  $V_{DRM}$

**50/60Hz Ratings**

| Parameter Name   | Test Conditions | Value | Units |
|--|-----------------|-------|-------|
| $I_{TSM}$ Maximum non-repetitive on-state current, 50/60Hz | 0.5s            | 6.5   | A     |
|  | 1s              | 4.6   |       |
|  | 2s              | 3.4   |       |
|  | 5s              | 2.3   |       |
|  | 30s             | 1.3   |       |
|  | 900s            | 0.73  |       |

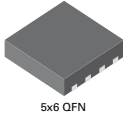
**Surge Ratings**

| Series | $I_{PP}$     |                             |                      |                 | $I_{TSM}$                   |
|--------|--------------|-----------------------------|----------------------|-----------------|-----------------------------|
|        | 2x10 $\mu$ s | 1.2x50 $\mu$ s/8x20 $\mu$ s | 10x700/5x310 $\mu$ s | 10x1000 $\mu$ s | 600V <sub>RMS</sub> 1 cycle |
|        | A min        | A min                       | A min                | A min           | A <sub>RMS</sub>            |
| C      | 500          | 400                         | 200                  | 100             | 30                          |

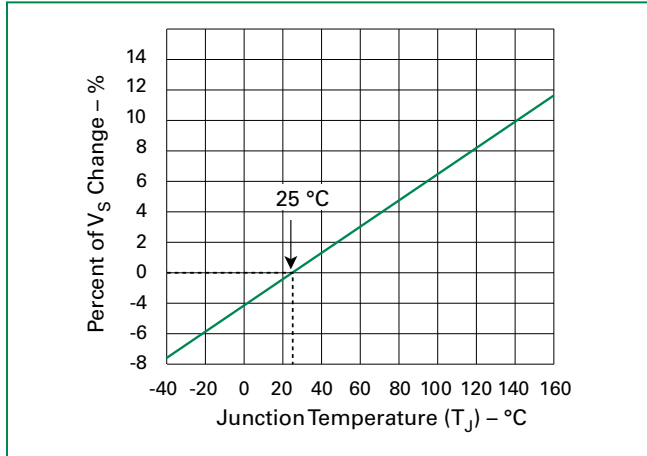
Notes:

- 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

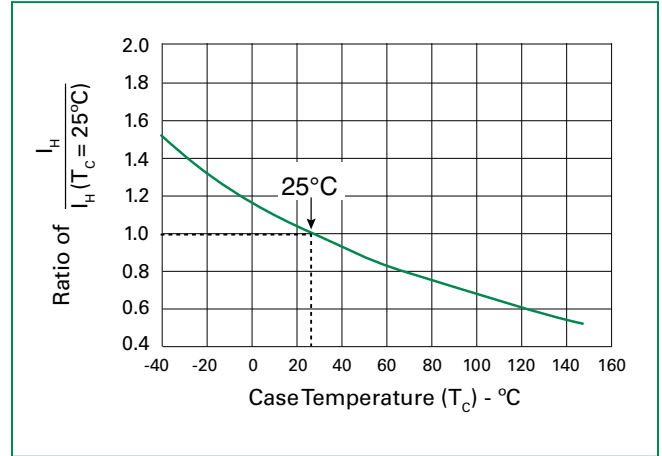
**Thermal Considerations**

| Package  | Symbol          | Parameter                               | Value       | Unit |
|--|-----------------|---|-------------|------|
| <br>5x6 QFN | $T_J$           | Junction Temperature                    | -40 to +150 | °C   |
|  | $T_{STG}$       | Storage Temperature Range               | -40 to +150 | °C   |
|  | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 100         | °C/W |

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

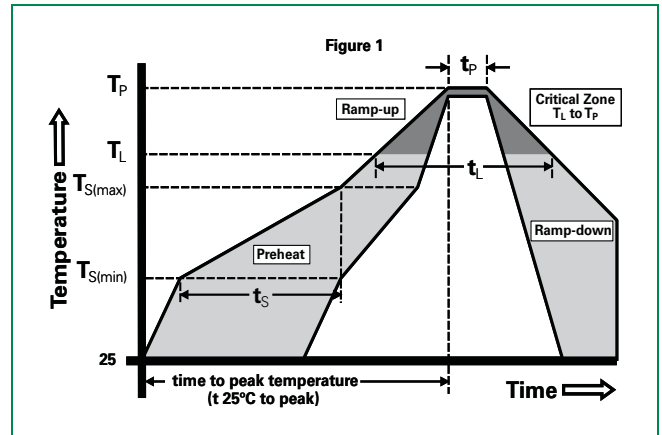


**Normalized DC Holding Current vs. Case Temperature**



**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) ( $t_p$ )       | 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                        |



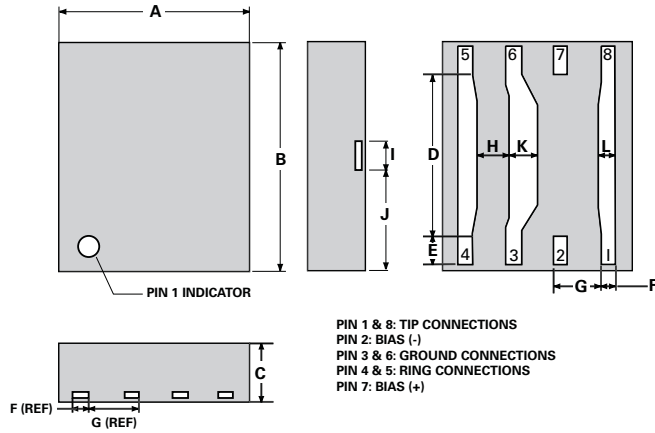
**Physical Specifications**

|                        |   |
|------------------------|---|
| <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**

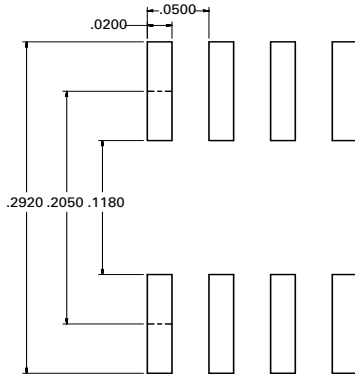
|                                   |   |
|-----------------------------------|---|
| <b>High Temp Voltage Blocking</b> | 80% Rated $V_{DRM}$ ( $V_{AC}$ Peak) +125°C or +150°C, 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101 |
| <b>Temp Cycling</b>               | -65°C to +150°C, 15 min. 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>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                                       |

**Dimensions — 5x6 QFN**

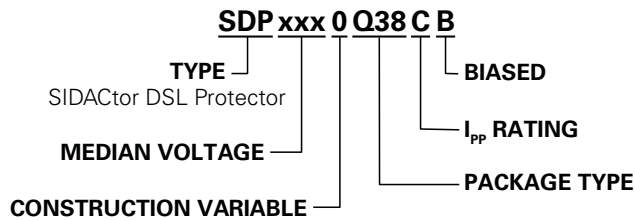


| Dimension | Inches |       | Millimeters |       |
|-----------|--------|-------|-------------|-------|
|           | Min    | Max   | Min         | Max   |
| <b>A</b>  | 0.187  | 0.207 | 4.745       | 5.253 |
| <b>B</b>  | 0.226  | 0.246 | 5.745       | 6.253 |
| <b>C</b>  | 0.054  | 0.064 | 1.374       | 1.628 |
| <b>D</b>  | 0.165  | 0.171 | 4.199       | 4.351 |
| <b>E</b>  | 0.027  | 0.033 | 0.686       | 0.838 |
| <b>F</b>  | 0.011  | 0.017 | 0.279       | 0.432 |
| <b>G</b>  | 0.047  | 0.053 | 1.194       | 1.346 |
| <b>H</b>  | 0.032  | 0.038 | 0.800       | 0.953 |
| <b>I</b>  | 0.027  | 0.033 | 0.686       | 0.838 |
| <b>J</b>  | 0.100  | 0.106 | 2.540       | 2.692 |
| <b>K</b>  | 0.027  | 0.033 | 0.686       | 0.838 |
| <b>L</b>  | 0.015  | 0.021 | 0.381       | 0.533 |

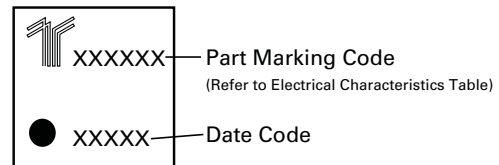
**5x6 QFN Solder Pad Layout**



**Part Numbering**



**Part Marking**

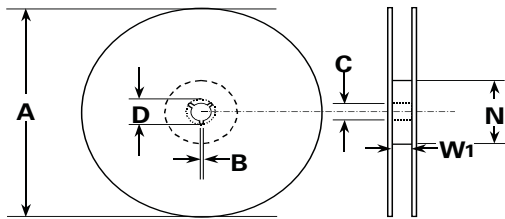


**Packing Options**

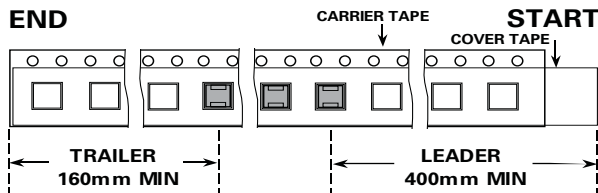
| Package Type | Description                       | Quantity | Added Suffix | Industry Standard |
|--------------|-----------------------------------|----------|--------------|-------------------|
| Q38          | 5x6x1.5 QFN<br>Tape and Reel Pack | 4000     | N/A          | EIA-481-D         |

**Tape and Reel Specifications — 5x6 QFN**

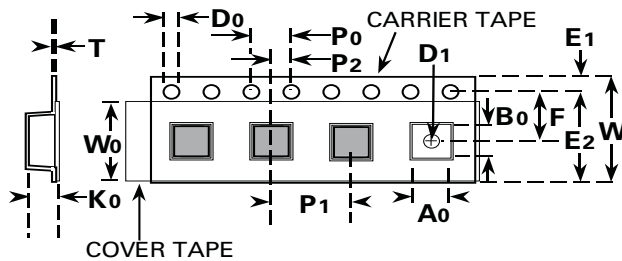
Reel Dimension



Tape Leader and Trailer Dimensions



Tape Dimension Items



| Symbols        | Description                                | Inches |        | Millimeters |       |
|----------------|--|--------|--------|-------------|-------|
|                |  | Min    | Max    | Min         | Max   |
| A              | Reel Diameter                              | N/A    | 12.992 | N/A         | 330.0 |
| B              | Drive Spoke Width                          | 0.059  | N/A    | 1.50        | N/A   |
| C              | Arbor Hole Diameter                        | 0.504  | 0.531  | 12.80       | 13.50 |
| D              | Drive Spoke Diameter                       | 0.795  | N/A    | 20.20       | N/A   |
| N              | Hub Diameter                               | 1.969  | N/A    | 50.00       | N/A   |
| W <sub>1</sub> | Reel Inner Width at Hub                    | 0.488  | 0.567  | 12.40       | 14.40 |
| A <sub>0</sub> | Pocket Width at Bottom                     | 0.204  | 0.212  | 5.20        | 5.40  |
| B <sub>0</sub> | Pocket Length at Bottom                    | 0.244  | 0.252  | 6.20        | 6.40  |
| D <sub>0</sub> | Feed Hole Diameter                         | 0.059  | 0.063  | 1.50        | 1.60  |
| D <sub>1</sub> | Pocket Hole Diameter                       | 0.059  | N/A    | 1.50        | N/A   |
| E <sub>1</sub> | Feed Hole Position 1                       | 0.065  | 0.073  | 1.65        | 1.85  |
| E <sub>2</sub> | Feed Hole Position 2                       | 0.400  | 0.408  | 10.15       | 10.35 |
| F              | Feed Hole Center -<br>Pocket Hole Center 2 | 0.212  | 0.220  | 5.40        | 5.60  |
| K <sub>0</sub> | Pocket Depth                               | 0.067  | 0.075  | 1.70        | 1.90  |
| P <sub>0</sub> | Feed Hole Pitch                            | 0.153  | 0.161  | 3.90        | 4.10  |
| P <sub>1</sub> | Component Spacing                          | 0.311  | 0.319  | 7.90        | 8.10  |
| P <sub>2</sub> | Feed Hole Center -<br>Pocket Hole Center 1 | 0.077  | 0.081  | 1.90        | 2.10  |
| T              | Carrier Tape Thickness                     | 0.010  | 0.014  | 0.25        | 0.35  |
| W              | Embossed Carrier<br>Tape Width             | 0.460  | 0.484  | 11.70       | 12.30 |
| W <sub>0</sub> | Cover Tape Width                           | 0.358  | 0.366  | 9.10        | 9.30  |