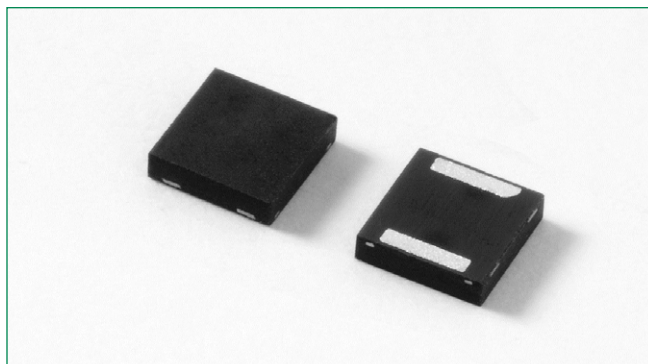


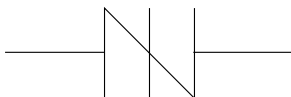
## Pxxx0Q22xLHL, Low IH Series – QFN 3.3X3.3



### Agency Approvals

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

### Schematic Symbol



### Description

The Pxxx0Q22xLHL Low IH series is the low capacitance SIDACtor® component designed to protect high density broadband equipment from damaging overvoltage transients.

It provides a low profile, chip scale surface mount solution that enables broadband equipment to comply with global regulatory standards while limiting the impact to broadband signals and board space.

### Features and Benefits

- Low profile
- Small footprint
- Low capacitance
- 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
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin (Sn) (IPC/JEDEC J-STD-609A.01)
- Halogen-Free and RoHS-Compliant

### 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 2nd Edition
- YD/T 1082
- YD/T 993
- YD/T 950

### Electrical Characteristics

| Part Number  | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$ Amps | Capacitance<br>@ 1MHz, 2V bias |        |
|--------------|---------|---------------------------------|-------------------------|--------|--------|-------|---------------------------|--------------------------------|--------|
|              |         | V min                           | V max                   | mA min | mA max | A max | V max                     | pF min                         | pF max |
| P4500Q22DLHL | P45DL   | 400                             | 570                     | 10     | 800    | 2.2   | 4                         | 25                             | 65     |

**Notes:**

- Absolute maximum ratings measured at  $T_A=25^\circ C$  (unless otherwise noted).
- Components are bi-directional (unless otherwise noted).

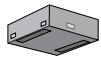
### Surge Ratings

| 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> | 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 typ                                     |                       |       |
| D      | -                                            | 600                                    | 550                                      | -                                          | -                                        | -                                          | 130                                          | 250                                       | 50                    | 500   |

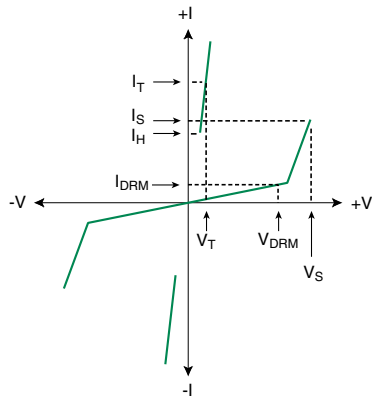
**Notes:**

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  $-40^\circ C \leq T_J \leq +150^\circ C$

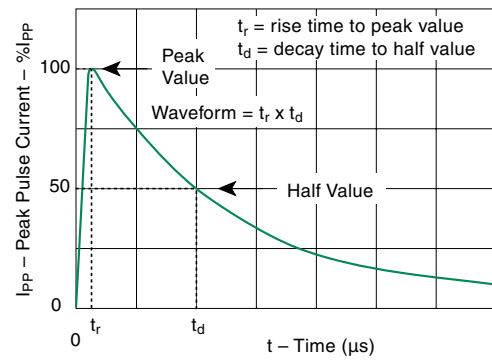
## Thermal Considerations

| Package                                                                                            | Symbol          | Parameter                               | Value       | Unit |
|----------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| 3.3 x 3.3 QFN<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 | 120         | °C/W |

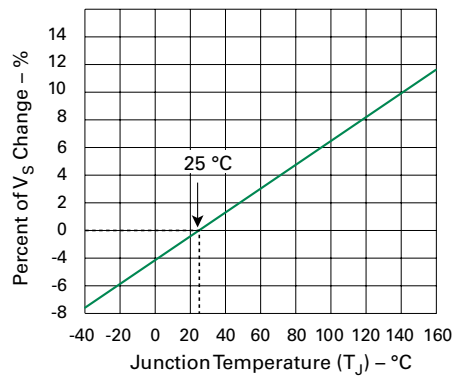
## V-I Characteristics



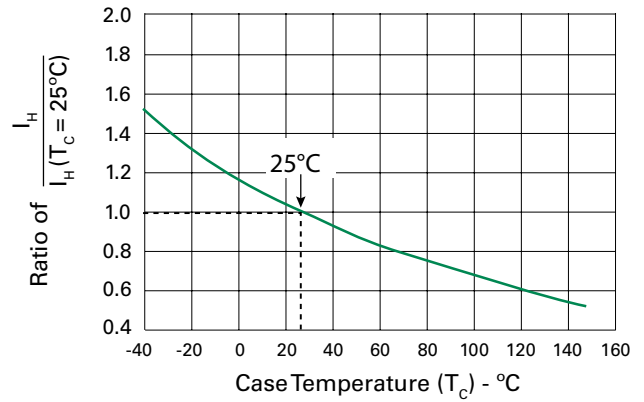
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

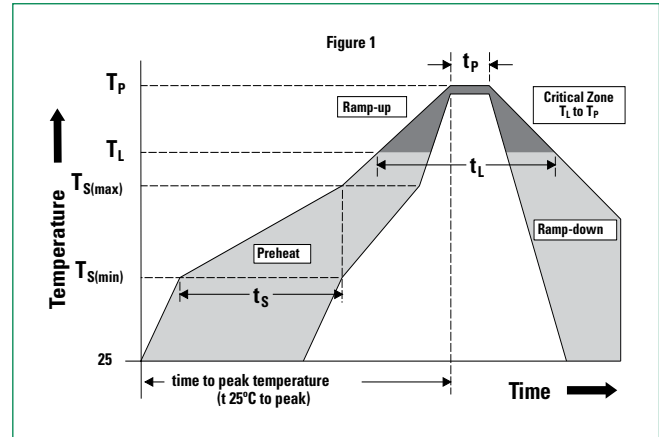


## Normalized DC Holding Current vs. Case Temperature



## Soldering Parameters

| Reflow Condition                                       |                                    | Pb-Free assembly |
|--------------------------------------------------------|------------------------------------|------------------|
| 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           |



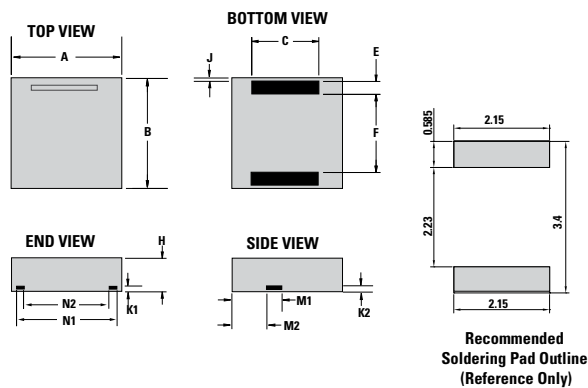
## Physical Specifications

|                 |                                                        |
|-----------------|--------------------------------------------------------|
| Lead Material   | Copper Alloy                                           |
| Terminal Finish | 100% Matte-Tin Plated                                  |
| Body Material   | UL Recognized compound meeting flammability rating V-0 |

## Environmental Specifications

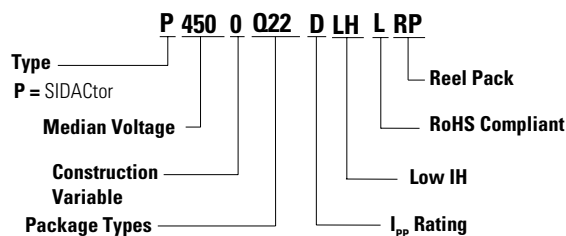
|                            |                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 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-A-104                |
| 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               |
| 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                                       |

## Dimensions — 3.3x3.3 QFN

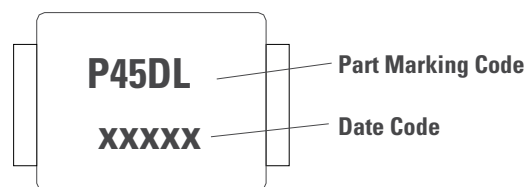


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.126  | 0.134 | 3.200       | 3.400 |
| B          | 0.126  | 0.134 | 3.200       | 3.400 |
| C          | 0.075  | 0.083 | 1.900       | 2.100 |
| E          | 0.011  | 0.019 | 0.285       | 0.485 |
| F          | 0.088  | 0.096 | 2.230       | 2.430 |
| H          | 0.035  | 0.043 | 0.900       | 1.100 |
| J          | 0.000  | 0.008 | 0.000       | 0.200 |
| K1         | 0.004  | 0.012 | 0.100       | 0.300 |
| K2         | 0.004  | 0.012 | 0.100       | 0.300 |
| M1         | 0.063  | 0.071 | 1.610       | 1.810 |
| M2         | 0.045  | 0.053 | 1.153       | 1.353 |
| N1         | 0.095  | 0.103 | 2.420       | 2.620 |
| N2         | 0.082  | 0.090 | 2.080       | 2.280 |

### Part Numbering



### Part Marking

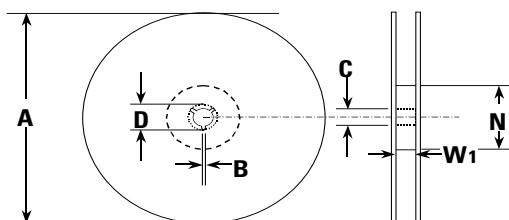


### Packing Options

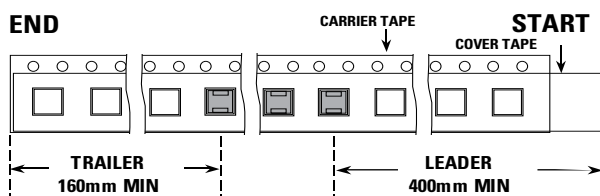
| Package Type | Description                    | Quantity | Added Suffix | Industry Standard |
|--------------|--------------------------------|----------|--------------|-------------------|
| Q22          | 3.3x3.3 QFN Tape and Reel Pack | 5000     | RP           | EIA-481-D         |

### Tape and Reel Specifications — 3.3x3.3 QFN

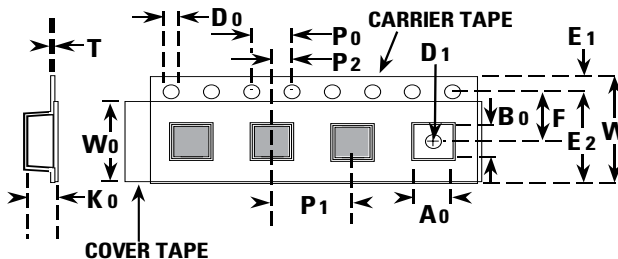
#### Reel Dimension



#### Tape Leader and Trailer Dimensions



#### Tape Dimension Items



| Symbols              | Description                             | Inches |        | Millimeters |       |
|----------------------|-----------------------------------------|--------|--------|-------------|-------|
|                      |                                         | Min    | Max    | Min         | Max   |
| <b>A</b>             | Reel Diameter                           | N/A    | 12.992 | N/A         | 330.0 |
| <b>B</b>             | Drive Spoke Width                       | 0.059  | N/A    | 1.50        | N/A   |
| <b>C</b>             | Arbor Hole Diameter                     | 0.504  | 0.531  | 12.80       | 13.50 |
| <b>D</b>             | Drive Spoke Diameter                    | 0.795  | N/A    | 20.20       | N/A   |
| <b>N</b>             | Hub Diameter                            | 1.969  | N/A    | 50.00       | N/A   |
| <b>W<sub>1</sub></b> | Reel Inner Width at Hub                 | 0.488  | 0.567  | 12.40       | 14.40 |
| <b>A<sub>0</sub></b> | Pocket Width at Bottom                  | 0.138  | 0.146  | 3.50        | 3.70  |
| <b>B<sub>0</sub></b> | Pocket Length at Bottom                 | 0.138  | 0.146  | 3.50        | 3.70  |
| <b>D<sub>0</sub></b> | Feed Hole Diameter                      | 0.059  | 0.063  | 1.50        | 1.60  |
| <b>D<sub>1</sub></b> | Pocket Hole Diameter                    | 0.059  | N/A    | 1.50        | N/A   |
| <b>E<sub>1</sub></b> | Feed Hole Position 1                    | 0.065  | 0.073  | 1.65        | 1.85  |
| <b>E<sub>2</sub></b> | Feed Hole Position 2                    | 0.400  | 0.408  | 10.15       | 10.35 |
| <b>F</b>             | Feed Hole Center - Pocket Hole Center 2 | 0.215  | 0.219  | 5.45        | 5.55  |
| <b>K<sub>0</sub></b> | Pocket Depth                            | 0.039  | 0.051  | 1.00        | 1.30  |
| <b>P<sub>0</sub></b> | Feed Hole Pitch                         | 0.153  | 0.161  | 3.90        | 4.10  |
| <b>P<sub>1</sub></b> | Component Spacing                       | 0.311  | 0.319  | 7.90        | 8.10  |
| <b>P<sub>2</sub></b> | Feed Hole Center - Pocket Hole Center 1 | 0.077  | 0.081  | 1.90        | 2.05  |
| <b>T</b>             | Carrier Tape Thickness                  | 0.010  | 0.014  | 0.25        | 0.35  |
| <b>W</b>             | Embossed Carrier Tape Width             | 0.453  | 0.484  | 11.50       | 12.30 |
| <b>W<sub>0</sub></b> | Cover Tape Width                        | 0.358  | 0.366  | 9.10        | 9.30  |