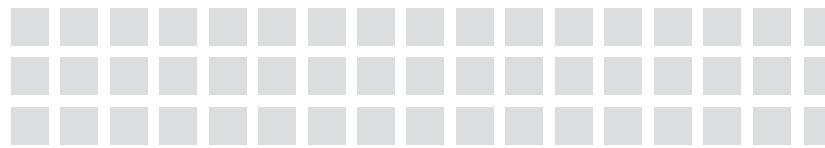


# SH Series

## Gas Discharge Tubes



### Additional Information



Resources



Accessories



Samples

### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
|        | E128662            |

### Two Electrode GDT Graphical Symbol



### Description

The Littelfuse SH Gas Discharge Tubes (GDT) series provides high levels of protection against fast rising transients caused by lightning disturbances. It has a surge rating of 5kA, 8/20µs. Offered in a Squared Surface Mount package, which helps to make pick and place on PCB process easier.

This GDT series is perfectly suited for broadband equipment applications. The GDT's low off-state capacitance is compatible with high bandwidth applications and this capacitance loading value does not vary if the voltage across the GDT changes.

The Littelfuse SH Gas Discharge Tube (GDT) series are specifically designed for protection of electrical, multimedia, and communication equipment against over voltage transients in surface mount assembly applications.

### Features

- Excellent response to fast rising transients
- GHz working frequency
- 5kA, 8/20µs surge capability as defined by IEC 61000-4-5 2nd Edition
- UL Recognized
- Offered with squared body package
- Non-Radioactive
- Ultra Low capacitance (<0.7pF)
- Lead-free and RoHS compliant

### Applications

- CATV equipment
- Antennas
- RS 485
- Telecom Base Station
- Power Supply AC Main
- G.fast
- EV power Charging
- Inverter/Variable Frequency Drivers (VFDs)
- IEEE 802.3 compliant Ethernet interfaces
- Broad Band equipment
- xDSL, ADSL, ADSL2, VDSL, and VDSL2
- Medical Electronics
- Test Equipment
- General Telecom Equipment
- Renewable Energy

# SH Series

## Gas Discharge Tubes

### Electrical Characteristics

| Part Number | Component Specifications (at 25°C) |     |     |                                    |          |  |                       |                     |                                    | Life Ratings                      |                                       |                               |                                 |  |  |  |  |
|-------------|------------------------------------|-----|-----|------------------------------------|----------|--|-----------------------|---------------------|------------------------------------|-----------------------------------|---------------------------------------|-------------------------------|---------------------------------|--|--|--|--|
|             | DC Breakdown in Volts (@100V/s)    |     |     | Maximum Impulse Break-down Voltage |          | Maximum Impulse Discharge Current (8/20μs) | Insulation Resistance | Capacitance (@1MHz) | Impulse Discharge Current (8/20μs) | AC Discharge Current (50Hz, 1sec) | AC Discharge Current (9 Cycles @50Hz) | DC Holdover Voltage (<150ms)* | Impulse Life (10/1000μs) (100A) |  |  |  |  |
|             | MIN                                | TYP | MAX | @100V/μs                           | 1000V/μs | 1 Time                                     | MIN                   | MAX                 | MIN                                | MIN                               |                                       | MIN                           | MIN                             |  |  |  |  |
| SH75        | 60                                 | 75  | 90  | 600                                | 700      | 6kA  | 1GΩ @50V              | 0.7pf               | 10 Shots @ (5kA)                   | 5A                                | 15A                                   | 52V                           | 300 Shots                       |  |  |  |  |
| SH90        | 72                                 | 90  | 108 | 600                                | 700      |  | 1GΩ @100V             |                     |                                    |                                   |                                       | 52V                           |                                 |  |  |  |  |
| SH145       | 116                                | 145 | 174 | 600                                | 700      |  |                       |                     |                                    |                                   |                                       | 52V                           |                                 |  |  |  |  |
| SH230       | 186                                | 230 | 276 | 600                                | 700      |  | 1GΩ @250V             | 1 Shot at 6kA**     |                                    |                                   |                                       | 80V                           |                                 |  |  |  |  |
| SH250       | 200                                | 250 | 300 | 600                                | 700      |  |                       |                     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |
| SH300       | 240                                | 300 | 360 | 650                                | 800      |  | 1GΩ @250V             | 1 Shot at 6kA**     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |
| SH350       | 280                                | 350 | 420 | 750                                | 900      |  |                       |                     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |
| SH400       | 360                                | 400 | 480 | 850                                | 1000     |  | 1GΩ @250V             | 1 Shot at 6kA**     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |
| SH470       | 376                                | 470 | 564 | 900                                | 1100     |  |                       |                     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |
| SH600       | 480                                | 600 | 720 | 1000                               | 1200     |  |                       |                     |                                    |                                   |                                       | 135V                          |                                 |  |  |  |  |

**Note:**

\* Reference REA PE-80, 0.2A, tested to ITU-T Rec K.12 and REA PE 80 <150 ms.

\*\* DC spark-over may exceed  $\pm 25\%$  after discharge, but will continue to protect without venting

### Product Characteristics

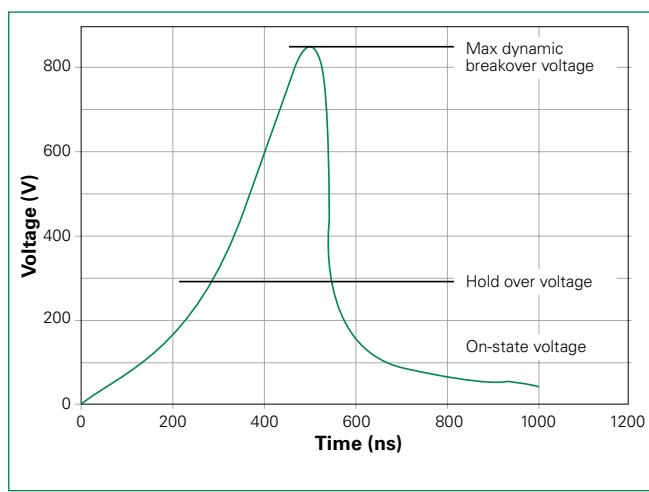
|                                     |  |
|-------------------------------------|--|
| Materials                           | Device Tin Plated 3 -15 Microns<br>Construction: Ceramic Insulator |
| Storage and Operational Temperature | -40 to +90°C   |

### Typical Insertion Loss

|                  |
|------------------|
| @1.0GHz = 0.08dB |
| @1.4GHz = 0.16dB |
| @1.8GHz = 0.26dB |
| @2.0GHz = 0.33dB |
| @2.4GHz = 0.47dB |
| @2.8GHz = 0.59dB |
| @3.1GHz = 0.70dB |
| @3.5GHz = 0.89dB |
| @4.0GHz = 1.24dB |

**Note:** Insertion data for customer reference only, application testing needed for verification.

### Voltage Vs. Time Characteristic



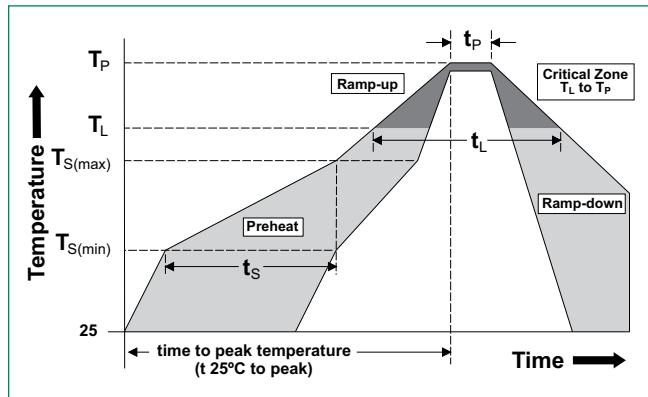
**Note:** Tested per 1kV/μs waveform

# SH Series

## Gas Discharge Tubes

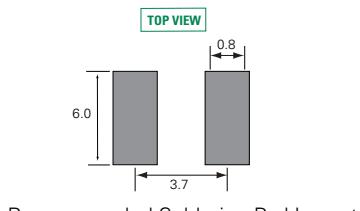
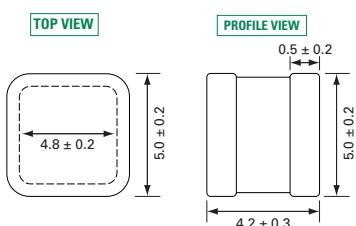
### Soldering Parameters - Reflow Soldering (Surface Mount Devices)

| 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/second max          |
| Reflow  | $T_{s(\max)}$ to $T_L$ - Ramp-up Rate | 5°C/second max          |
|   | - Temperature ( $T_L$ ) (Liquidus)    | 217°C                   |
|   | - Temperature ( $t_L$ )               | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                            |                                       | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )  |                                       | 10 – 30 seconds         |
| Ramp-down Rate  |                                       | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )               |                                       | 8 minutes Max.          |
| Do not exceed   |                                       | 260°C                   |



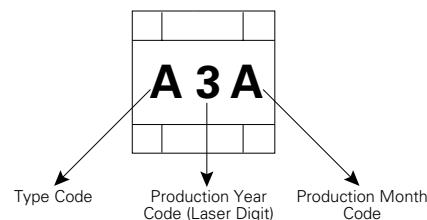
### Product Dimensions

Dimensions in millimeters



Recommended Soldering Pad Layout

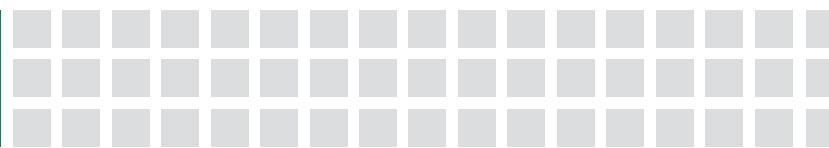
### Product Marking



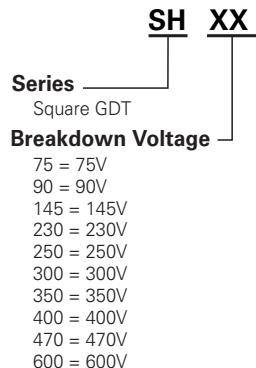
| Type Code |       | Month Code |           |
|-----------|-------|------------|-----------|
| A         | SH75  | A          | January   |
| B         | SH90  | B          | February  |
| S         | SH145 | C          | March     |
| D         | SH230 | D          | April     |
| R         | SH250 | E          | May       |
| E         | SH300 | F          | June      |
| G         | SH350 | G          | July      |
| I         | SH400 | H          | August    |
| P         | SH470 | I          | September |
| V         | SH600 | J          | October   |
|           |       | K          | November  |
|           |       | L          | December  |

# SH Series

## Gas Discharge Tubes



### Part Numbering System and Ordering Information

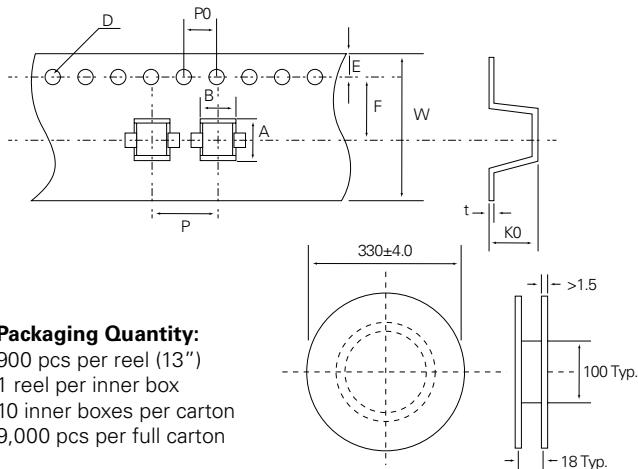


### Taping and Reel Specifications

#### Taping

Unit = mm

| Item | Spec           | Item | Spec                        |
|------|----------------|------|-----------------------------|
| P    | $12.0 \pm 0.1$ | D    | $\varnothing 1.55 \pm 0.05$ |
| P0   | $4.0 \pm 0.1$  | W    | $16.0 \pm 0.3$              |
| A    | $5.4 \pm 0.1$  | K0   | $5.4 \pm 0.1$               |
| B    | $4.6 \pm 0.1$  | t    | $0.5 \pm 0.05$              |



#### Packaging Quantity:

900 pcs per reel (13")  
1 reel per inner box  
10 inner boxes per carton  
9,000 pcs per full carton

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