

# GDT

Gas Discharge Tube

SE Series



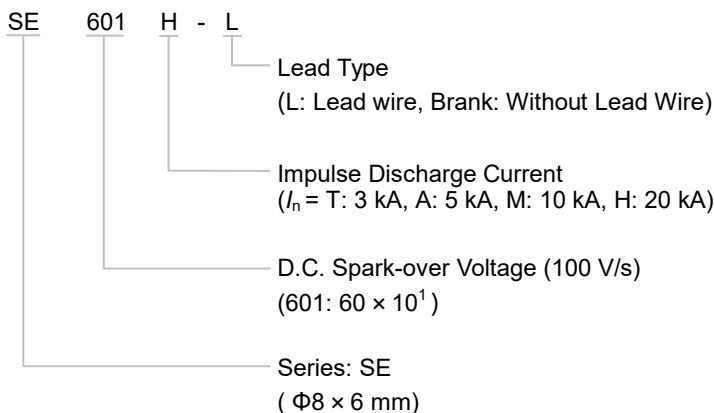
## Features

- Fast Response
- Stable Performance Over Surface Life
- High Current Rating
- Low Capacitance
- High Insulation Resistance
- RoHS & REACH Compliant

## Applications

- WLAN XDSL
- CATV
- MDF
- Ethernet
- BTS(Base Station)
- Power Supply
- Antenna and RF
- Consumer Electronics
- N-PE Protection in AC Power

## Part Number System



## Description

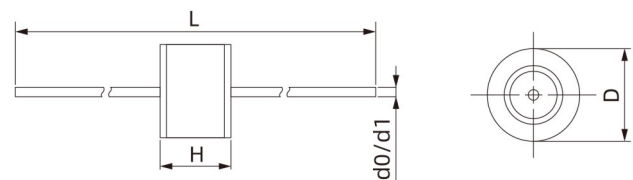
The Gas Discharge Tube (GDT) is a protective device which is filled with certain proportion of noble gas, or mixed gas or other discharge media in the space between metal electrodes and metalized ceramics, and then sealed at high temperature to form a single-gap or multi-gap switch type protective device. When the protected circuit or equipment suffers to surge, GDT will change from high impedance state to low impedance state and release the surge energy to reduce the residual voltage of the circuit, and then protect the equipment or humanbody from the hazard of transient overvoltage.

## Agency Approvals

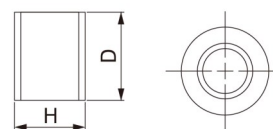
| Agency | Standards | File No. |
|--------|-----------|----------|
|        | UL1449    | E322662  |
|        | UL497B    | E513446  |
|        | TUV       | On-going |

## Dimensions (mm)

Leaded "L" Type Straight "Axial" Devices



Core Devices



| L          | H          | D           |
|------------|------------|-------------|
| 62.0 ± 3.0 | 6.0 ± 0.5  | Φ 8.0 ± 0.5 |
| d0 ①       | d1 ②       |             |
| 0.8 ± 0.05 | 1.0 ± 0.05 |             |

Note:

① This dimension is for I<sub>n</sub> = 10 kA & below

② This dimension is for I<sub>n</sub> = 20 kA

## Glossary

| Item           | Description                                                                                                                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_s$          | <b>D.C. Spark-over Voltage</b><br>The voltage at which the GDT sparks over with slowly increasing d.c. voltage.<br>— (IEC 61643-311)                                                                                                        |
| $V$            | <b>Impulse Spark-over Voltage</b><br>The highest Voltage which appears across the terminals of a GDT in the period between the application of an impulse of given wave-shape and the time when current begins to flow.<br>— (ITU-T K.12)    |
| $V_a$          | <b>Arc Voltage</b><br>Voltage drop across the GDT during arc current flow.<br>— (IEC 61643-311)                                                                                                                                             |
| $V_{gl}$       | <b>Glow Voltage</b><br>The peak value of the voltage drop across the GDT when a glow-current is flowing. It is sometimes called the glow mode voltage.<br>— (ITU-T K.12)                                                                    |
| $8/20 \mu s$   | <b>8/20 Current Impulse</b><br>Current impulse with a nominal virtual front time of 8 $\mu s$ and a nominal time to half-value of 20 $\mu s$ .<br>— (IEC 61643-11)                                                                          |
| $1.2/50 \mu s$ | <b>1.2/50 Voltage Impulse</b><br>Voltage impulse with a nominal virtual front time of 1.2 $\mu s$ and a nominal time to half-value of 50 $\mu s$ .<br>— (IEC 61643-11)                                                                      |
| $I$            | <b>Alternating Discharge Current</b><br>The r.m.s. value of an approximately sinusoidal alternating current passing through the GDT.<br>— (ITU-T K.12)                                                                                      |
| $I_n$          | <b>Nominal Discharge Current</b><br>Crest value of the current through the GDT having a current waveshape of 8/20 $\mu s$ .<br>— (IEC 61643-11)                                                                                             |
| $I_{max}$      | <b>Maximum Discharge Current</b><br>Crest value of a current through the GDT having an 8/20 $\mu s$ waveshape and magnitude according to the manufacturers specification. $I_{max}$ is equal to or greater than $I_n$ .<br>— (IEC 61643-11) |

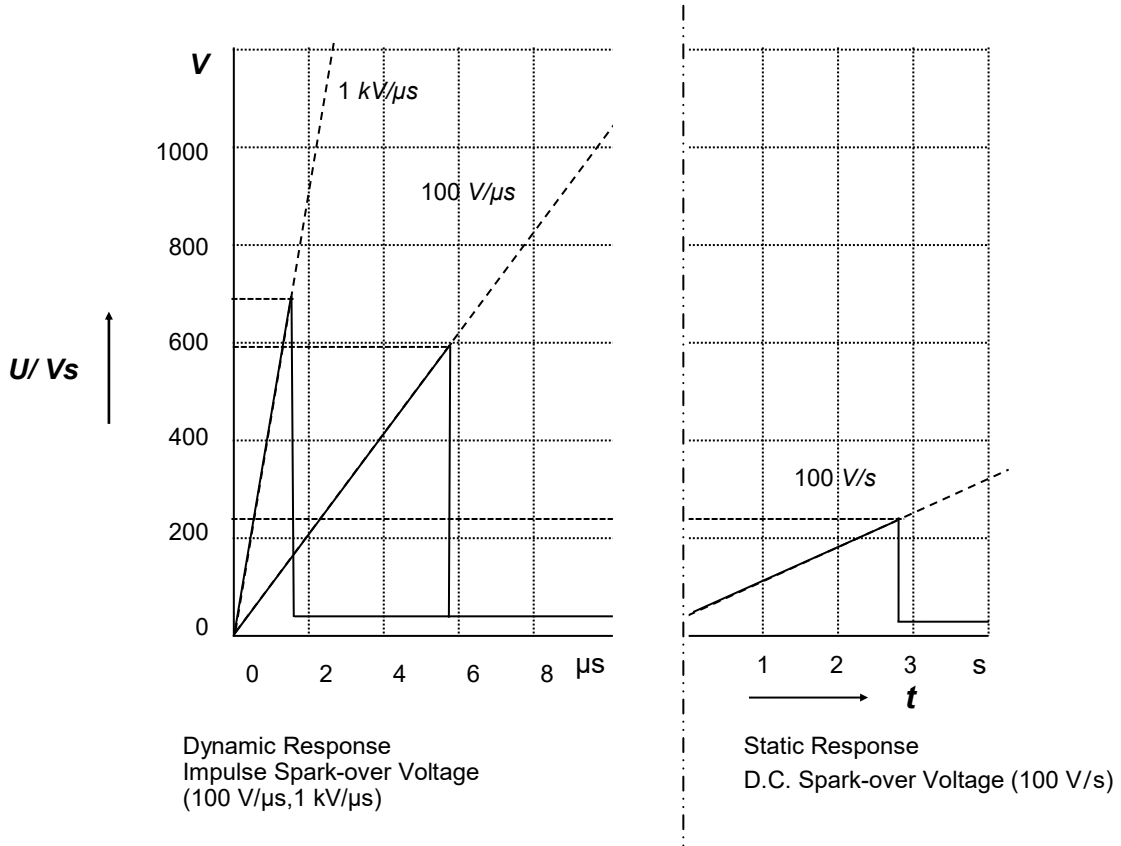
## Specifications

| Model      | D.C. Spark-over Voltage @100 V/s | Tolerance of $V_s$ | Impulse Spark-over Voltage @1 kV/ $\mu$ s | Arc Voltage @1 A | Impulse Discharge Current @8/20 $\mu$ s | Alternating Discharge Current @50Hz 1 s | Insulation Resistance |            | Capacitance 0.5 VDC @ 1MHz | Agency Approvals                                                                    |                                                                                     |     |
|------------|----------------------------------|--------------------|-------------------------------------------|------------------|-----------------------------------------|-----------------------------------------|-----------------------|------------|----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----|
|            | $V_s$                            | $V_s$              | V                                         | $V_a$            | $I_n$                                   | I                                       | $V_{DC}$              | IR         | C                          |  |  |     |
|            | V                                | V                  | V                                         | V                | kA                                      | A (r.m.s.)                              | V                     | G $\Omega$ | (pF)                       | UL497B                                                                              | UL1449                                                                              | TUV |
| SE075M - * | 75                               | 57~ 93             | $\leq 650$                                | $\approx 8$      | 10                                      | 10                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE091M - * | 90                               | 72 ~ 108           | $\leq 700$                                | $\approx 8$      | 10                                      | 10                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE151M - * | 150                              | 120 ~ 180          | $\leq 700$                                | $\approx 8$      | 10                                      | 10                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE231M - * | 230                              | 184 ~ 280          | $\leq 700$                                | $\approx 10$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE351M - * | 350                              | 280 ~ 420          | $\leq 1000$                               | $\approx 10$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE471M - * | 470                              | 376 ~ 564          | $\leq 1200$                               | $\approx 12$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE601M - * | 600                              | 480 ~ 720          | $\leq 1400$                               | $\approx 15$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE801M - * | 800                              | 640 ~ 960          | $\leq 1600$                               | $\approx 15$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ○                                                                                   | ○                                                                                   | ○   |
| SE102M - * | 1000                             | 800 ~ 1200         | $\leq 2000$                               | $\approx 15$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | N/A                                                                                 | ●                                                                                   | ○   |
| SE152M - * | 1500                             | 1200 ~ 1800        | $\leq 2400$                               | $\approx 15$     | 10                                      | 10                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | N/A                                                                                 | ●                                                                                   | ○   |
| SE075H - * | 75                               | 57~ 93             | $\leq 650$                                | $\approx 8$      | 10                                      | 10                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE091H - * | 90                               | 72 ~ 108           | $\leq 700$                                | $\approx 15$     | 20                                      | 20                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | ●                                                                                   | ○   |
| SE151H - * | 150                              | 120 ~ 180          | $\leq 700$                                | $\approx 15$     | 20                                      | 20                                      | 50                    | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE231H - * | 230                              | 184 ~ 280          | $\leq 700$                                | $\approx 15$     | 20                                      | 20                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE351H - * | 350                              | 280 ~ 420          | $\leq 1000$                               | $\approx 15$     | 20                                      | 20                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE471H - * | 470                              | 376 ~ 564          | $\leq 1200$                               | $\approx 15$     | 20                                      | 20                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | N/A                                                                                 | ○   |
| SE601H - * | 600                              | 480 ~ 720          | $\leq 1400$                               | $\approx 15$     | 20                                      | 20                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | ●                                                                                   | ●                                                                                   | ○   |
| SE801H - * | 800                              | 640 ~ 960          | $\leq 1600$                               | $\approx 15$     | 20                                      | 20                                      | 100                   | $\geq 1$   | $\leq 1.5$                 | N/A                                                                                 | ●                                                                                   | ○   |
| SE252A - * | 2500                             | 2000 ~ 3000        | $\leq 4000$                               | $\approx 15$     | 5                                       | 5                                       | 100                   | $\geq 1$   | $\leq 1.5$                 | N/A                                                                                 | ●                                                                                   | ○   |
| SE302A - * | 3000                             | 2400 ~ 3600        | $\leq 4500$                               | $\approx 15$     | 5                                       | 5                                       | 100                   | $\geq 1$   | $\leq 1.0$                 | N/A                                                                                 | ●                                                                                   | ○   |
| SE362A - * | 3600                             | 2880 ~ 4320        | $\leq 5000$                               | $\approx 15$     | 5                                       | 5                                       | 100                   | $\geq 1$   | $\leq 1.5$                 | N/A                                                                                 | ○                                                                                   | ○   |

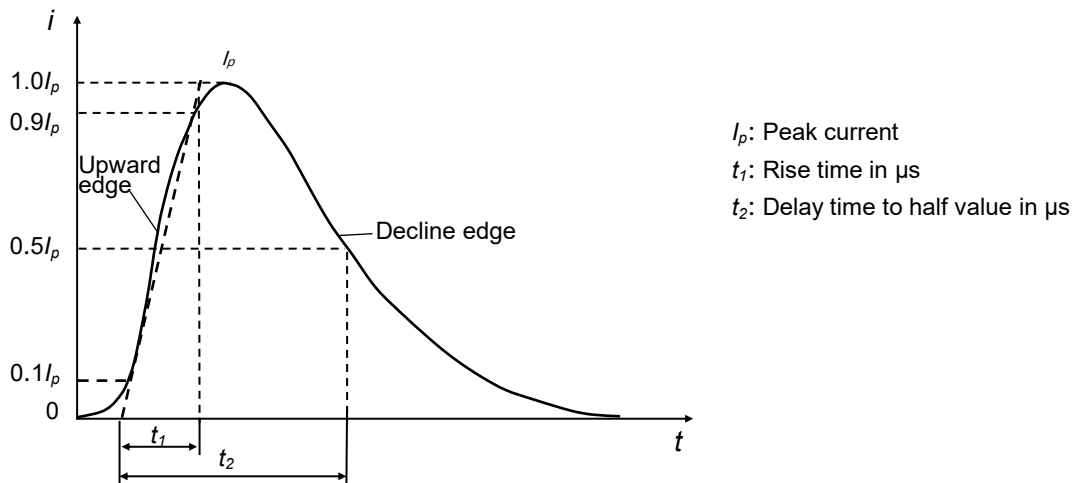
Note:

1. The above parameters based on ITU - T K12 & IEC61643.311 standards.
2. "●" means GDT has gained the certification.  
"○" means GDT is planed to apply for certification.
3. "\*" Means different wire type, such as "SMD" means SMD shape, "L" means lead wire.

## Reference Curve for Spark-over Voltage (Refer to 230 VDC)



## Reference Curve for Impulse Discharge Current

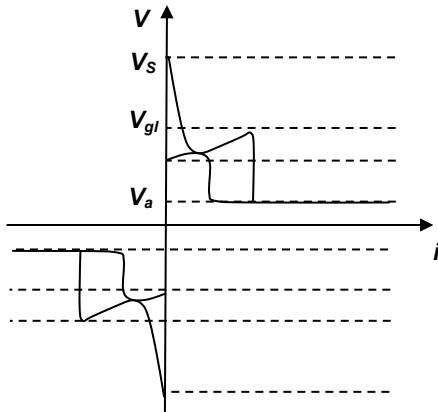


# GDT

Gas Discharge Tube

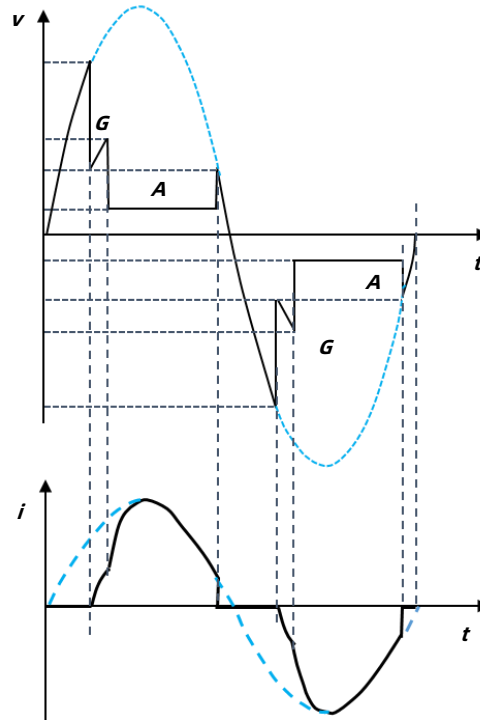
SE Series

## Electrical Characteristics



Relationship between Current and Voltage

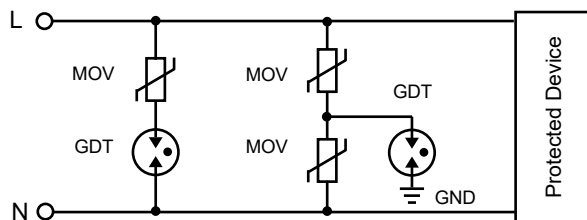
$V_s$  : Spark-over Voltage  
 $V_{gl}$  : Glow Voltage  
 $V_a$  : Arc Voltage  
 $G$  : Glow Mode  
 $A$  : Arc Mode



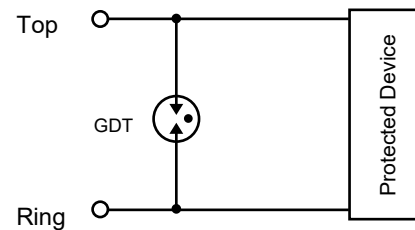
Time Variation Patterns of Voltage and Current

## Application Example

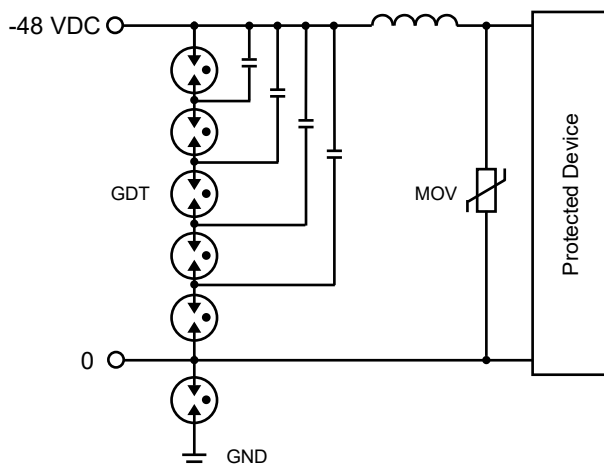
AC Power Protection



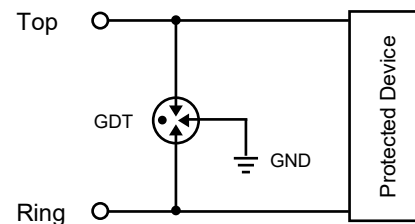
2-Electrode GDT Signal Circuit Protection



DC Power Protection



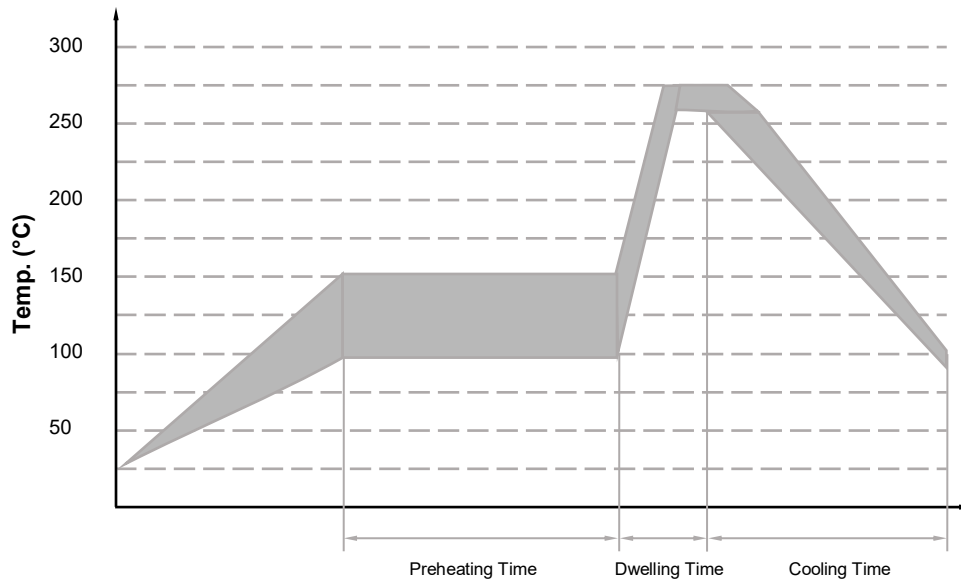
3-Electrode GDT Signal Circuit Protection



### Recommended Hand-soldering Parameters

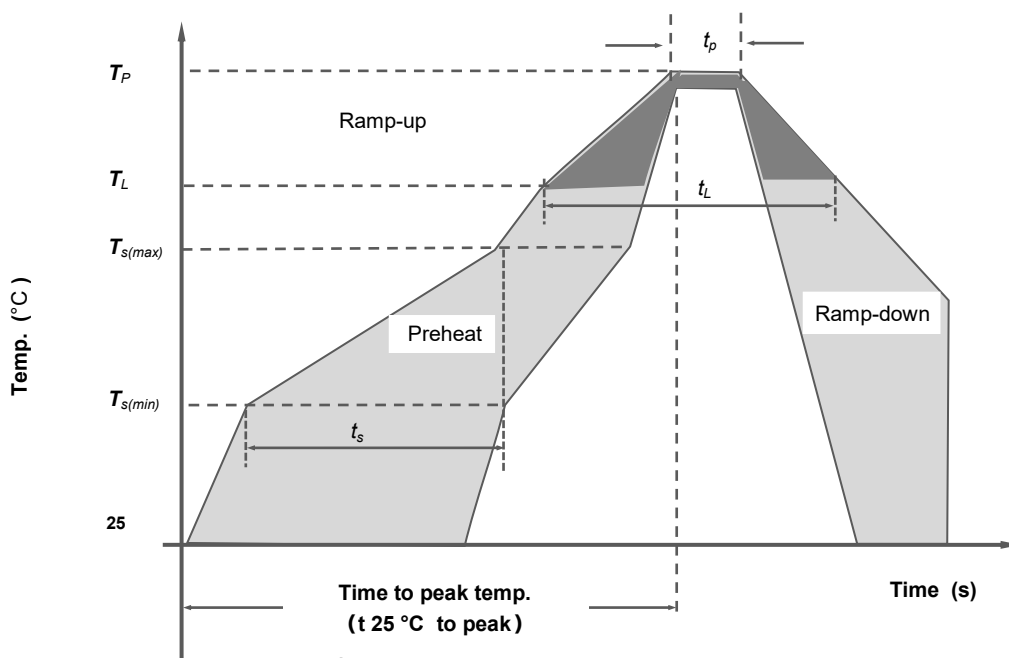
| Items                                          | Condition     |
|------------------------------------------------|---------------|
| Soldering Iron Temperature                     | 350 °C (Max.) |
| Soldering Time                                 | 4 s (Max.)    |
| Space between soldering point and product body | 2 mm (Min.)   |

### Wave Soldering Parameters (For Reference Only)



| Item       | Temp. (°C) | Time (s) |
|------------|------------|----------|
| Preheating | 90 to 150  | < 150    |
| Dwelling   | 255 to 280 | 3 to 10  |

## Reflow Soldering Parameters (For Reference Only)

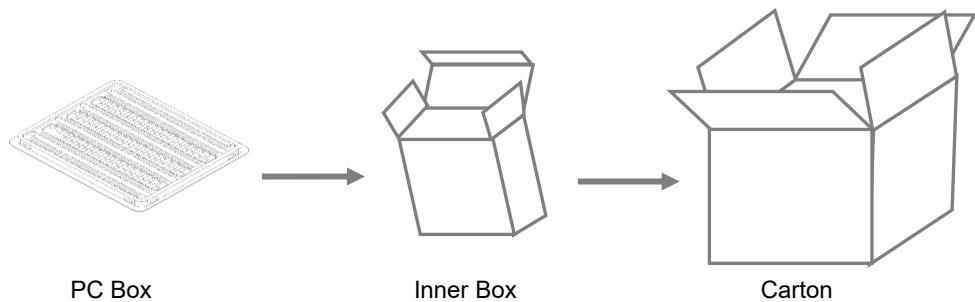


| Reflow Condition                                        |                            | Pb-Free Assembly  |
|---------------------------------------------------------|----------------------------|-------------------|
| Preheat                                                 | Temp. Min $T_{s(min)}$     | 150 °C            |
|                                                         | Temp. Max $T_{s(max)}$     | 200 °C            |
|                                                         | Time (Min to Max) $t_s$    | (60 to 180) s     |
| Average ramp up rate (Liquidus Temp. ( $T_L$ ) to peak) |                            | 3 °C / second max |
| $T_{s(max)}$ to $T_L$ Ramp-up Rate                      |                            | 5 °C / second max |
| Reflow                                                  | Temp. ( $T_L$ ) (Liquidus) | 217 °C            |
|                                                         | Temp. ( $t_L$ )            | (60 to 150) s     |
| Peak Temp. ( $T_P$ )                                    |                            | (255 to 260) °C   |
| Time within 5 °C of actual peak Temp. ( $t_p$ )         |                            | (10 to 30) s      |
| Ramp-down Rate                                          |                            | 6 °C / second max |
| Time 25 °C to peak Temp. ( $T_P$ )                      |                            | 8 minutes max     |
| Do not exceed                                           |                            | 260 °C            |

Packaging Information

1. PC Box Package (Leaded Type Shaped Lead Devices )

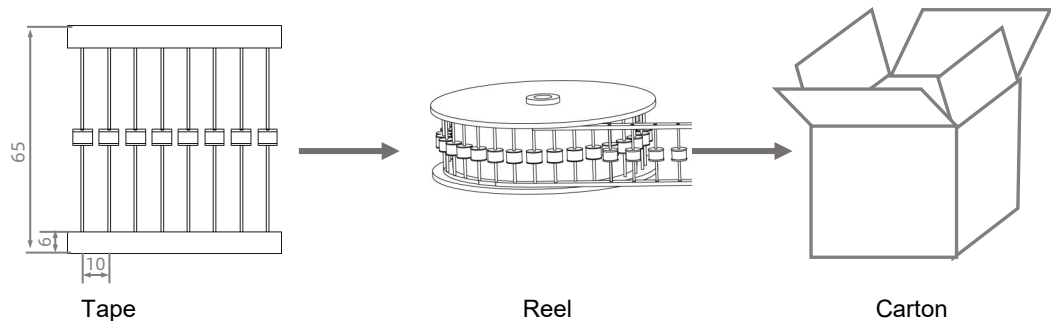
| Item                                                             | PC Box           | Inner Box      | Carton          |
|------------------------------------------------------------------|------------------|----------------|-----------------|
| Dimensions (mm)                                                  | 215 × 205 × 10.5 | 230 × 210 × 60 | 440 × 250 × 325 |
| Quantity (PCS)                                                   | 100              | 500            | 5000            |
| Notes: Packaging dimensions and quantity are for reference only. |                  |                |                 |



Please refer to the specifications for the packaging details.

2. Taping Package (Leaded Type Straight Axial Devices)

| Item                                                             | Reel       | Carton          |
|------------------------------------------------------------------|------------|-----------------|
| Dimensions (mm)                                                  | Φ 340 × 73 | 360 × 360 × 360 |
| Quantity (PCS)                                                   | 1000       | 4000            |
| Notes: Packaging dimensions and quantity are for reference only. |            |                 |



Unit: mm.

Please refer to the specifications for the packaging details.



# ATTENTION

## Usage

1. Do not operate GDT in power supply networks, whose maximum operation voltage exceeds the minimum spark-overvoltage of the GDT.
2. The GDT may become hot in the event of longer periods of current stress (burn risk). In the event of overload the connectors may fail or the component may be destroyed.
3. If the contacts of GDT are defective, current load can cause sparks and loud noises.
4. When air pressure is from 55 kPa to 106 kPa. The relative altitude shall be +5000 m to –500 m.

## Replacement

The GDT is a non-repairable product. For safety sake, please use equivalent GDT for replacement.

## Storage

The packaged GDT should be placed in a dry, ventilation and non-corrosive environment.

## Installation Position

Do not install the GDT in a touchable position.

## Mechanical Stress

Do not take violent action such as knocking when assembling, to avoid product failure.