



## Description

The TDM301X and TDM302X and TDM305X and TDM307X series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon random-phase photo triac in a plastic SOP4 package.

With the robust coplanar double mold structure, TDM301X, TDM302X and TDM305X series provide the most stable isolation feature.

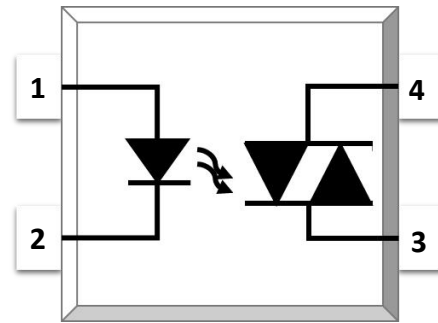
## Features

- High isolation 3750 VRMS
- DC input with random-phase photo triac output
- Operating temperature range - 40 °C to 100 °C
- REACH & RoHS compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC - GB4943.1, GB8898
  - cUL- CSA Component Acceptance Service Notice No. 5A

## Applications

- Solenoid/valve controls
- Lighting controls
- Motor controls
- Temperature controls
- Static AC power switches
- Solid state relays
- Interfacing microprocessors to 115 to 240VAC peripherals

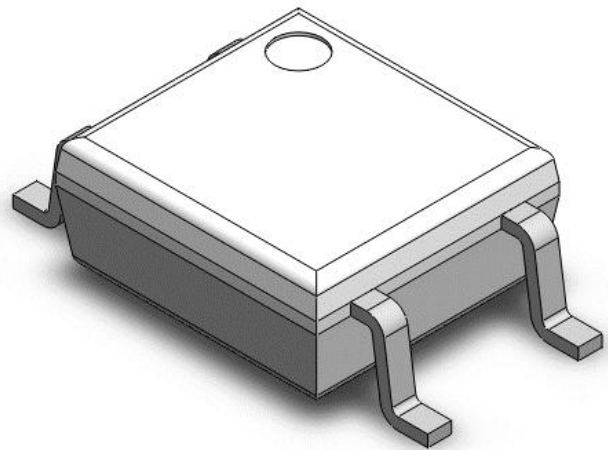
## SCHEMATIC



## PIN DEFINITION

1. Anode
2. Cathode
3. Terminal
4. Terminal

## PACKAGE OUTLINE





| ABSOLUTE MAXIMUM RATINGS                          |         |              |         |                  |      |
|---|---------|--------------|---------|------------------|------|
| PARAMETER   |         | SYMBOL       | VALUE   | UNIT             | NOTE |
| INPUT   |         |              |         |                  |      |
| Forward Current                                   |         | $I_F$        | 60      | mA               |      |
| Reverse Voltage                                   |         | $V_R$        | 6       | V                |      |
| Junction Temperature                              |         | $T_j$        | 125     | °C               |      |
| Input Power Dissipation                           |         | $P_i$        | 100     | mW               |      |
| OUTPUT  |         |              |         |                  |      |
| Off-state Output Terminal Voltage                 | TDM301X | $V_{DRM}$    | 250     | V                |      |
|   | TDM302X |              | 400     |                  |      |
|   | TDM305X |              | 600     |                  |      |
|   | TDM307X |              | 800     |                  |      |
| Peak Repetitive Surge Current<br>PW=100μs, 120pps |         | $I_{TSM}$    | 1       | A                |      |
| On-State RMS Current                              |         | $I_{T(RMS)}$ | 100     | mA               |      |
| Junction Temperature                              |         | $T_j$        | 125     | °C               |      |
| Output Power Dissipation                          |         | $P_o$        | 300     | mW               |      |
| COMMON  |         |              |         |                  |      |
| Total Power Dissipation                           |         | $P_{tot}$    | 330     | mW               |      |
| Isolation Voltage                                 |         | $V_{iso}$    | 3750    | V <sub>rms</sub> | 1    |
| Operating Temperature                             |         | $T_{opr}$    | -40~100 | °C               |      |
| Storage Temperature                               |         | $T_{stg}$    | -55~125 | °C               |      |
| Soldering Temperature                             |         | $T_{sol}$    | 260     | °C               | 2    |

Note 1. AC For 1 Minute, R.H. = 40 ~ 60%

Note 2. For 10 seconds



| <b>ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C</b> |                                     |                  |                  |      |      |   |   |  |
|--|-------------------------------------|------------------|------------------|------|------|---|---|--|
| PARAMETER  | SYMBOL                              | MIN.             | TYP.             | MAX. | UNIT | TEST CONDITION  | NOTE  |  |
| <b>INPUT</b>   |                                     |                  |                  |      |      |   |   |  |
| Forward Voltage                                      | V <sub>F</sub>                      | -                | 1.24             | 1.4  | V    | I <sub>F</sub> =10mA  |   |  |
| Reverse Current                                      | I <sub>R</sub>                      | -                | -                | 10   | μA   | V <sub>R</sub> =6V  |   |  |
| Input Capacitance                                    | C <sub>in</sub>                     | -                | 8.5              | 250  | pF   | V=0, f=1kHz   |   |  |
| <b>OUTPUT</b>  |                                     |                  |                  |      |      |   |   |  |
| Peak Off-state Current,<br>Either Direction          | I <sub>DRM</sub>                    | -                | -                | 100  | nA   | V <sub>DRM</sub> =Rated V <sub>DRM</sub><br>I <sub>F</sub> =0 | 3   |  |
| Peak On-state Current,<br>Either Direction           | V <sub>TM</sub>                     | -                | 1.58             | 2.5  | V    | I <sub>TM</sub> =100mA  |   |  |
| Critical Rate of Rise of Off-state<br>Voltage        | dV/dt                               | 1000             | -                | -    | V/μs | V <sub>PEAK</sub> =Rated V <sub>DRM</sub>                     | 4   |  |
| <b>TRANSFER CHARACTERISTICS</b>                      |                                     |                  |                  |      |      |   |   |  |
| LED<br>Trigger<br>Current                            | TDM3010,TDM3021,<br>TDM3051,TDM3071 | I <sub>FT</sub>  | -                | -    | 15   | mA  | Terminal Voltage = 3V<br>I <sub>TM</sub> =100mA |  |
|  | TDM3011,TDM3022,<br>TDM3052,TDM3072 |                  | -                | -    | 10   |   |   |  |
|  | TDM3012,TDM3023,<br>TDM3053,TDM3053 |                  | -                | -    | 5    |   |   |  |
| Holding Current                                      | I <sub>H</sub>                      | -                | 257              | -    | μA   |   |   |  |
| Isolation Resistance                                 | R <sub>iso</sub>                    | 10 <sup>12</sup> | 10 <sup>14</sup> | -    | Ω    | DC500V, 40 ~ 60% R.H.   |   |  |
| Floating Capacitance                                 | C <sub>IO</sub>                     | -                | 0.4              | 1    | pF   | V=0, f=1MHz   |   |  |

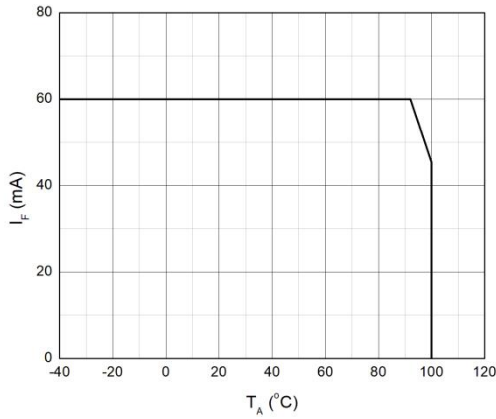
Note3. Test voltage must be applied within dV/dt rating.

Note4. Refer to Fig.15 & Fig.16

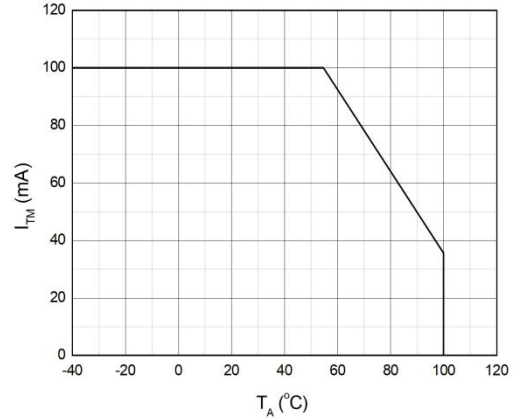


**CHARACTERISTIC CURVES**

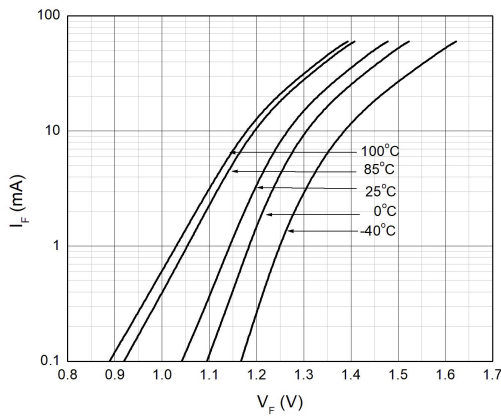
**Fig.1 Forward Current vs. Ambient Temperature**



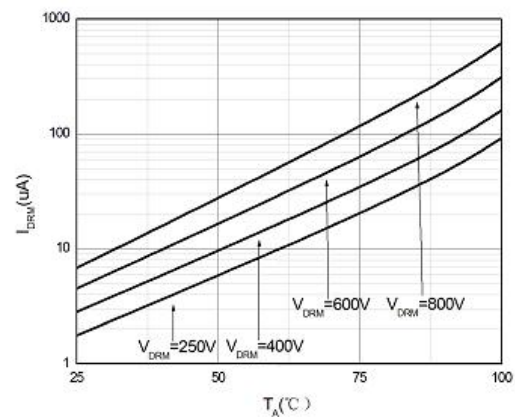
**Fig.2 On-state Terminal Current vs. Ambient Temperature**



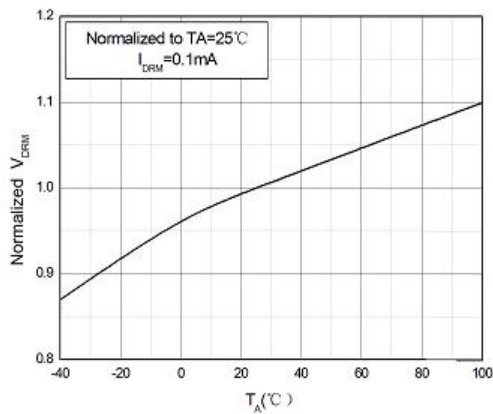
**Fig.3 Forward Current vs. Forward Voltage**



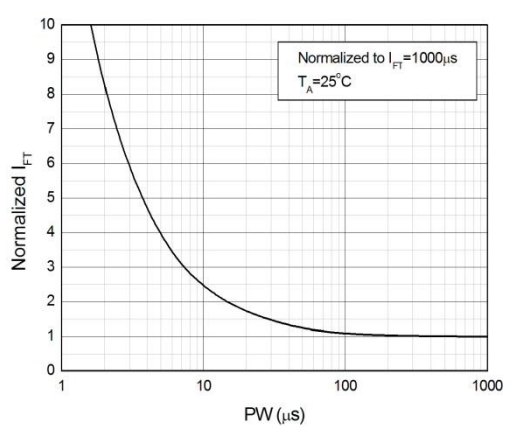
**Fig.4 Off-state Terminal Current vs. Ambient Temperature**



**Fig.5 Normalized Off-state Terminal Voltage vs. Ambient Temperature**



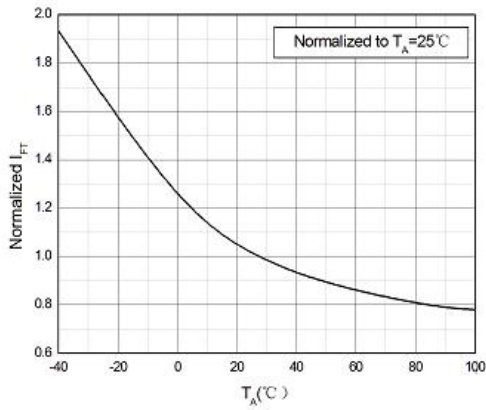
**Fig.6 Normalized Trigger Current vs. LED Trigger Pulse Width**



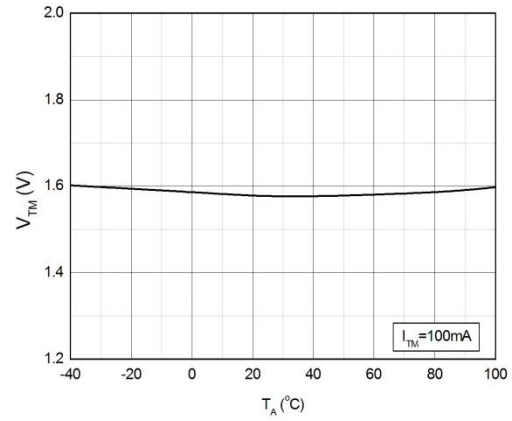


**CHARACTERISTIC CURVES**

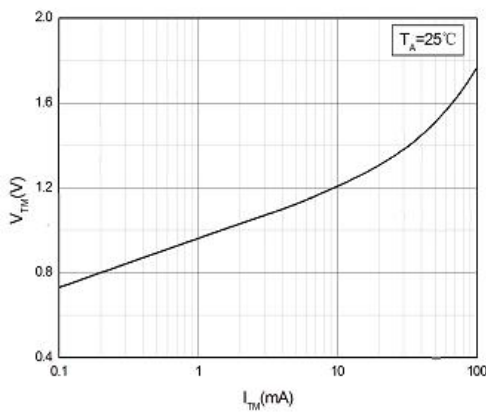
**Fig.7 Normalized Trigger Current vs. Ambient Temperature**



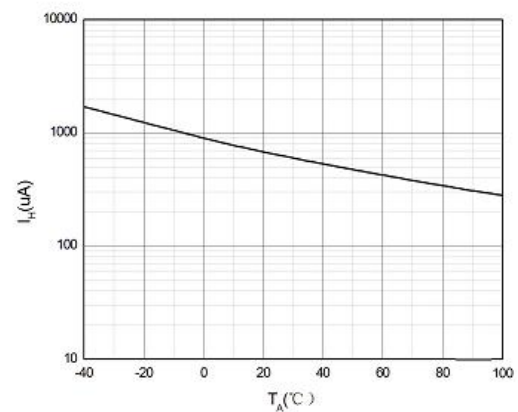
**Fig.8 On-state Terminal Voltage vs. Ambient Temperature**



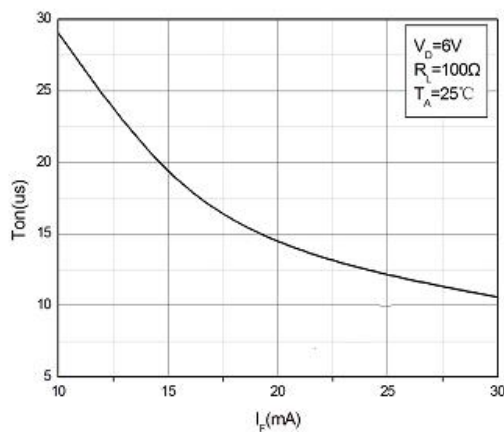
**Fig.9 On-state Terminal Voltage vs. On-state Terminal Current**



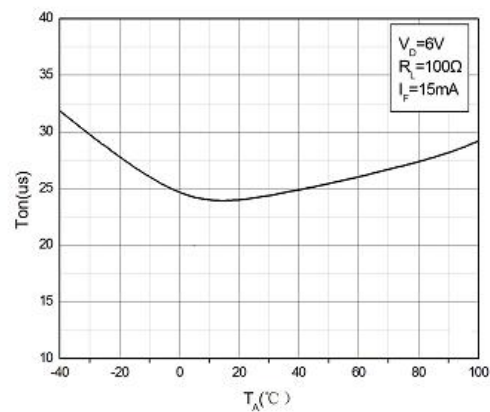
**Fig.10 Holding Current vs. Ambient Temperature**



**Fig.11 Turn On Time vs. Forward Current**

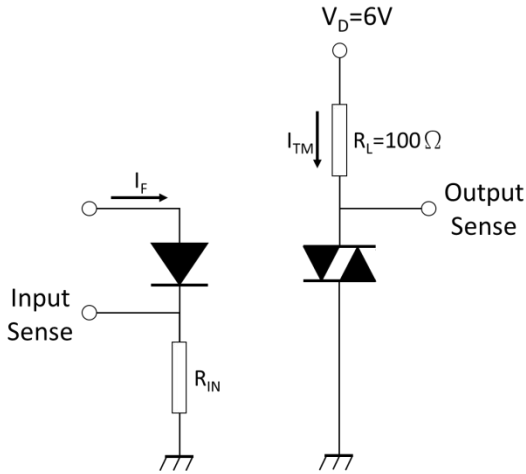


**Fig.12 Turn On Time vs. Ambient Temperature**

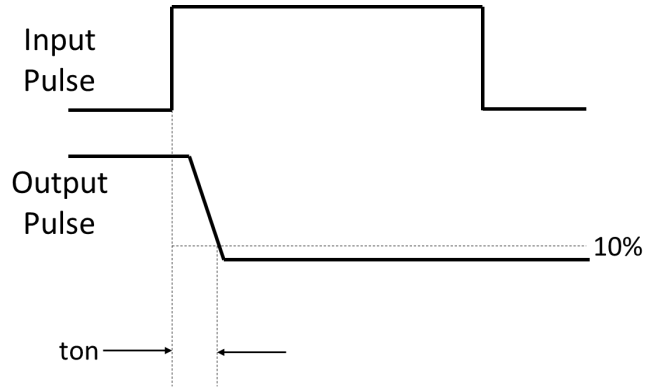


**TEST CIRCUITS**

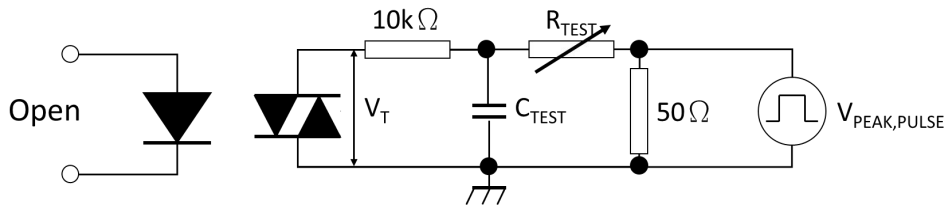
**Fig.13 Test Circuits of Turn On Time**



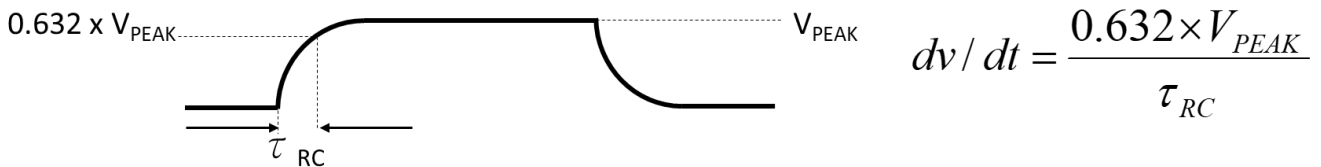
**Fig.14 Waveforms of Turn On Time**



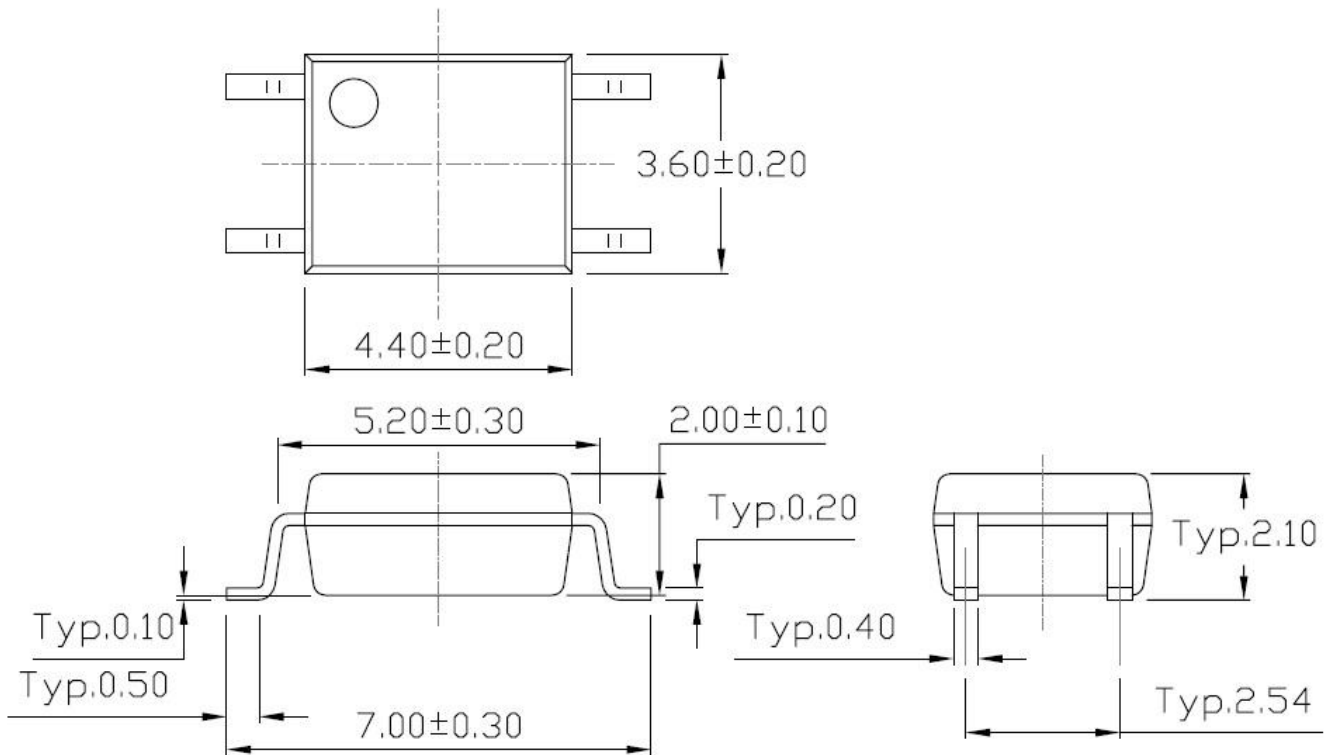
**Fig.15 Test Circuits of dV/dt**



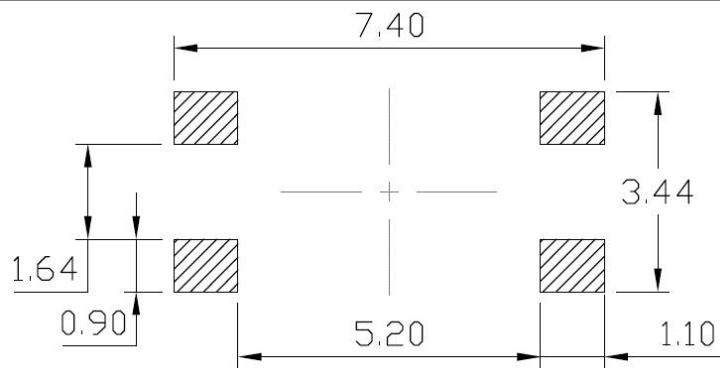
**Fig.16 Waveforms of dV/dt**



**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**



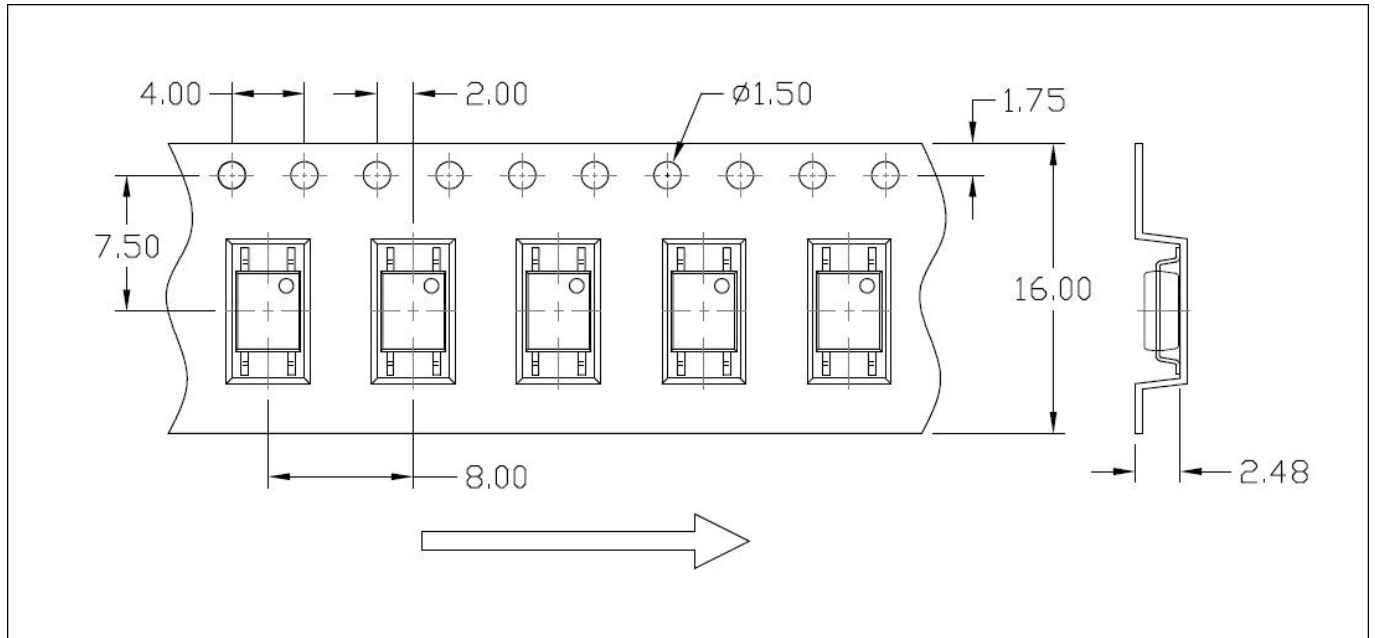
**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**



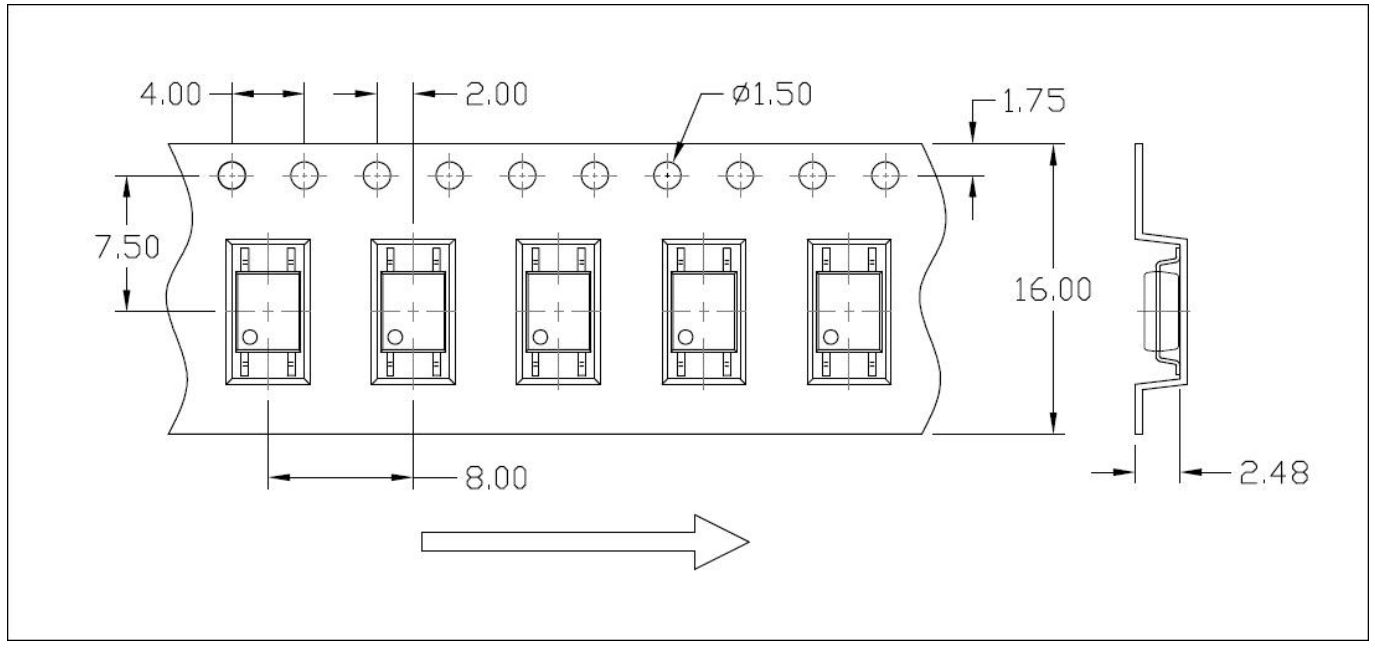


**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option T1**



**Option T2**

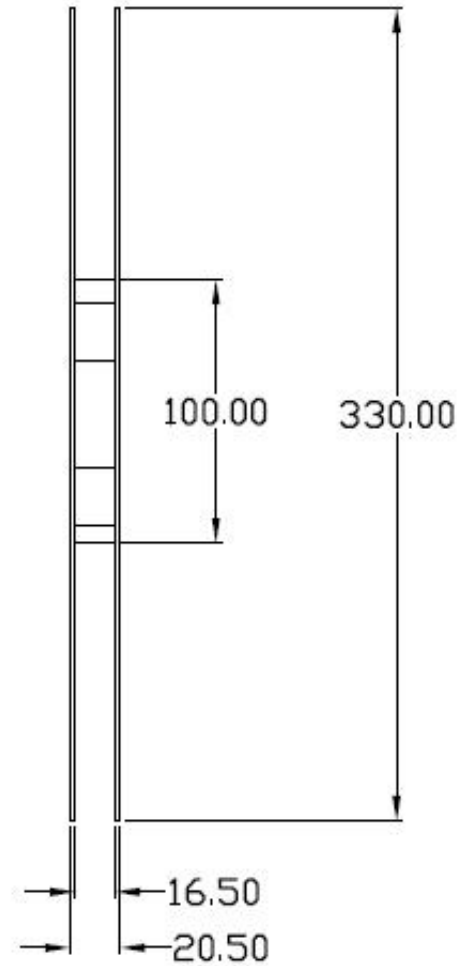
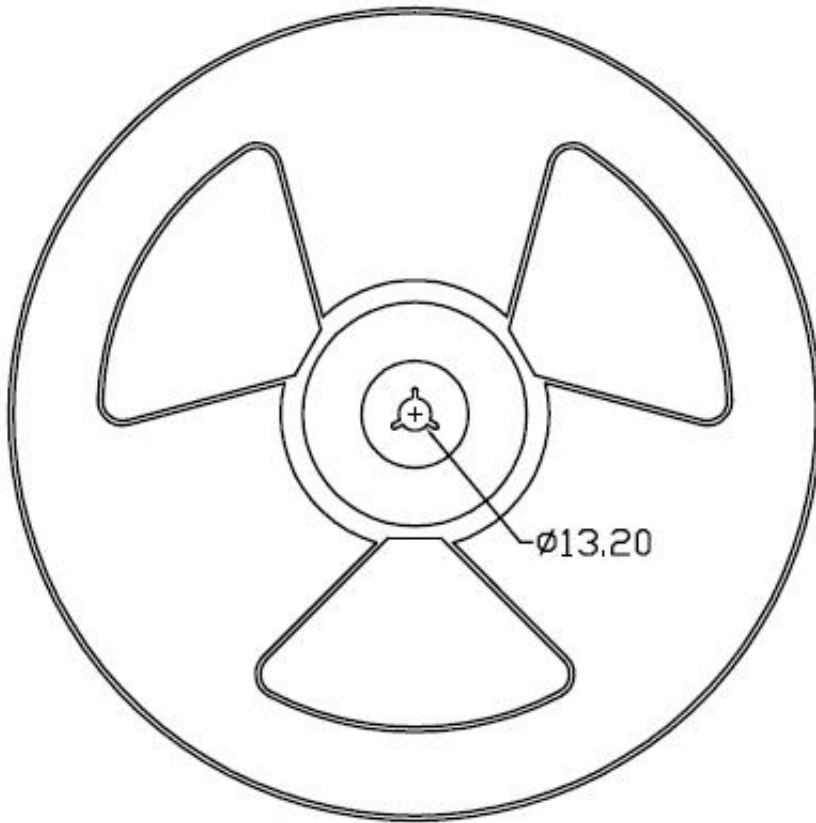






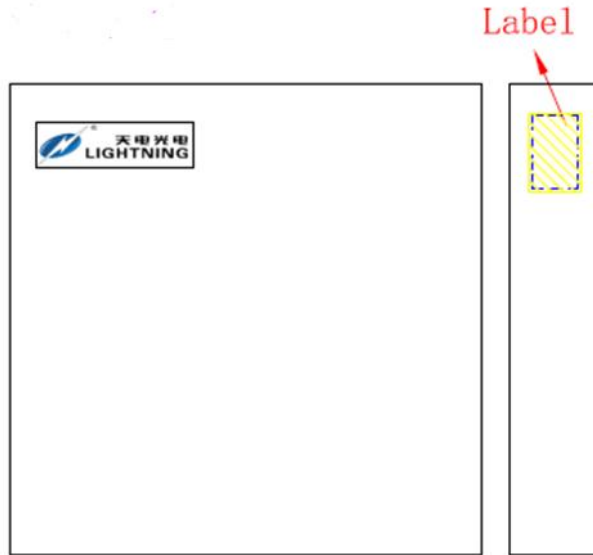
**REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option T1 & T2**



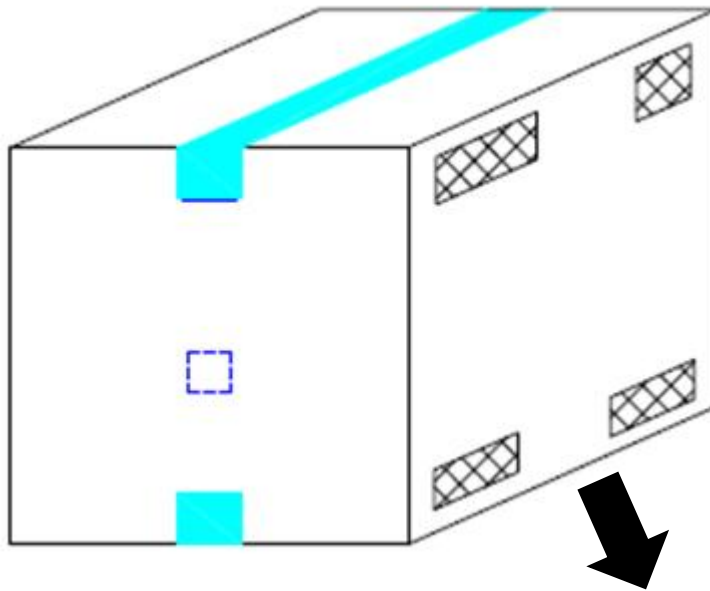
**BOX SPECIFICATIONS (Reel Type)**

**Inner Box**

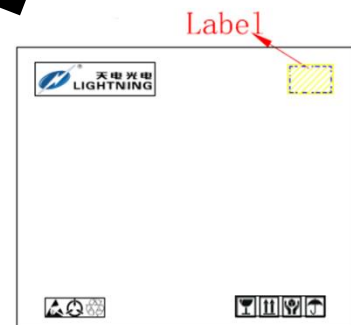


- L x W x H = 36cm x 36cm x 6.9cm

**Outer Box**



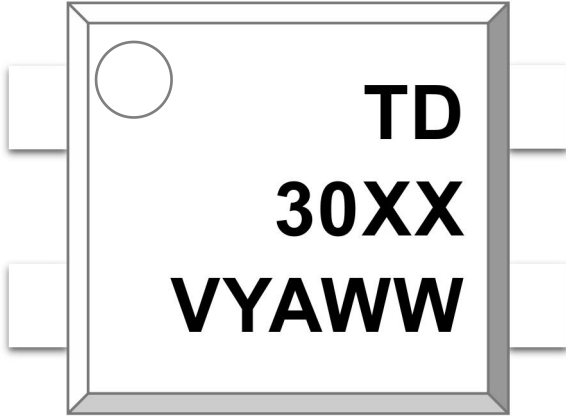
- L x W x H = 45cm x 38cm x 38cm





**ORDERING AND MARKING INFORMATION**

**MARKING INFORMATION**



**TD** : Company Abbr.  
**30XX** : Part Number & Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

**ORDERING INFORMATION**

**TDM30XX(Z)-GV**

TD – Company Abbr.  
M – SOP Package  
30XX – Rank  
(10/11/12/21/22/23/51/52/53)  
Z – Tape and Reel Option (T1/T2)  
G – Green  
V – VDE Option (V or None)

**LABEL INFORMATION**

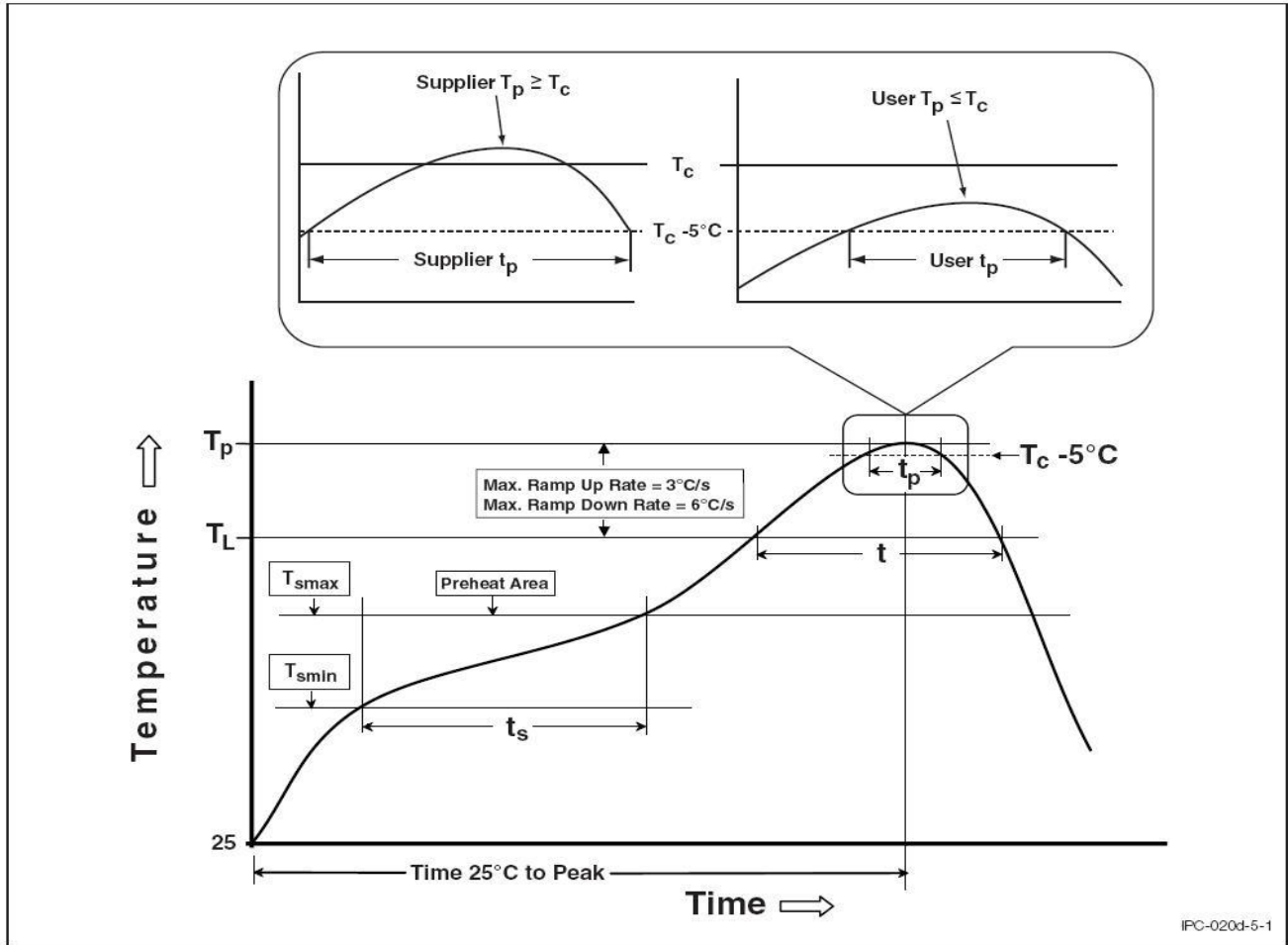


**PACKING QUANTITY**

| Option | Quantity        | Quantity – Inner box | Quantity – Outer box              |
|--------|-----------------|----------------------|-----------------------------------|
| T1     | 3000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 45k Units |
| T2     | 3000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 45k Units |

**REFLOW INFORMATION**

**REFLOW PROFILE**



| Profile Feature                   | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|-----------------------------------|------------------------|--------------------------|
| Temperature Min. (Tsmmin)         | 100                    | 150°C                    |
| Temperature Max. (Tsmmax)         | 150                    | 200°C                    |
| Time (ts) from (Tsmmin to Tsmmax) | 60-120 seconds         | 60-120 seconds           |
| Ramp-up Rate (tL to tP)           | 3°C/second max.        | 3°C/second max.          |
| Liquidous Temperature (TL)        | 183°C                  | 217°C                    |
| Time (tL) Maintained Above (TL)   | 60 – 150 seconds       | 60 – 150 seconds         |
| Peak Body Package Temperature     | 235°C +0°C / -5°C      | 260°C +0°C / -5°C        |
| Time (tP) within 5°C of 260°C     | 20 seconds             | 30 seconds               |
| Ramp-down Rate (TP to TL)         | 6°C/second max         | 6°C/second max           |
| Time 25°C to Peak Temperature     | 6 minutes max.         | 8 minutes max.           |



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- Please contact LIGHTNING sales agent for special application request.
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