

### Description

The TD303X, TD304X and TD306X 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 DIP6 package with different lead forming options.

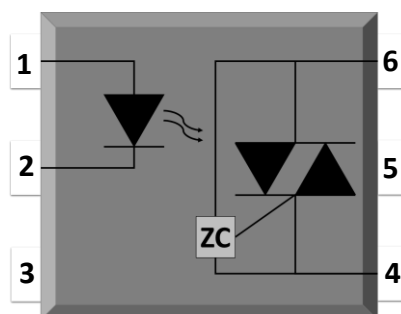
### Features

- High isolation 5000 VRMS
- DC input with zero-cross photo triac output
- Operating temperature range - 40 °C to 100 °C
- REACH & RoHS compliance
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

### Applications

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

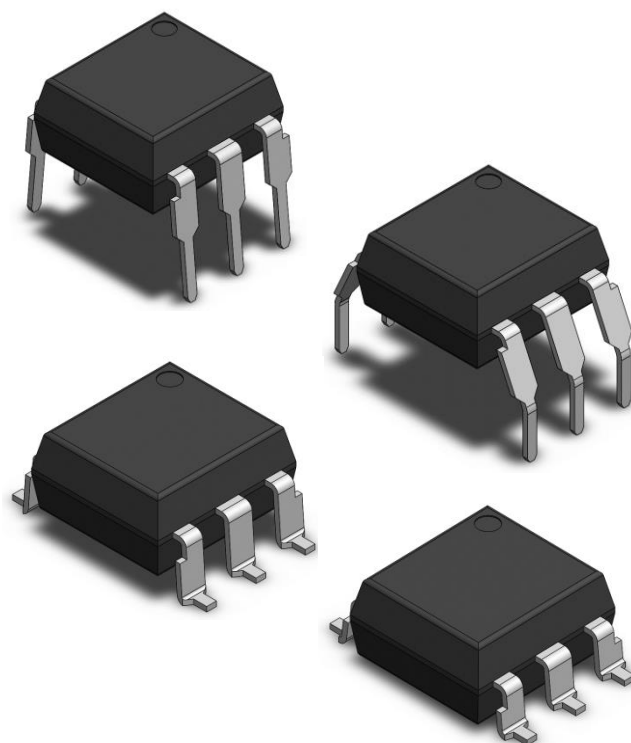
### SCHEMATIC



### PIN DEFINITION

4. Anode	1. Terminal
5. Cathode	2. Substrate
6. NC	3. 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	TD303X	250	V	
	TD304X	400		
	TD306X	600		
Peak Repetitive Surge Current PW=100μs, 120pps	$I_{TSM}$	1	A	
Junction Temperature	$T_j$	125	°C	
Output Power Dissipation	$P_O$	300	mW	
COMMON				
Total Power Dissipation	$P_{tot}$	400	mW	
Isolation Voltage	$V_{iso}$	5000	$V_{rms}$	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



### ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

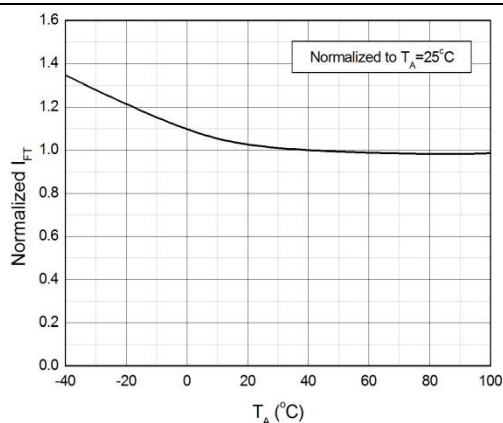
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT								
Forward Voltage		$V_F$	-	1.24	1.4	V	$I_F=10\text{mA}$	
Reverse Current		$I_R$	-	-	10	$\mu\text{A}$	$V_R=6\text{V}$	
Input Capacitance		$C_{in}$	-	8.5	250	pF	$V=0, f=1\text{kHz}$	
OUTPUT								
Peak Off-state Current, Either Direction		$I_{DRM}$	-	-	100	nA	$V_{DRM}=\text{Rated } V_{DRM}$ $I_F=0$	3
Peak On-state Current, Either Direction		$V_{TM}$	-	1.59	2.5	V	$I_{TM}=100\text{mA}$ $I_F=\text{Rated } I_{FT}$	
Critical Rate of Rise of Off-state Voltage		$dV/dt$	1000	-	-	V/ $\mu\text{s}$	$V_{PEAK}=\text{Rated } V_{DRM}$	4
TRANSFER CHARACTERISTICS								
LED Trigger Current	TD3031,TD3041,TD3061	$I_{FT}$	-	-	15	mA	Terminal Voltage = 3V $I_{TM}=100\text{mA}$	
	TD3032,TD3042,TD3062		-	-	10			
	TD3033,TD3043,TD3063		-	-	5			
Holding Current		$I_H$	-	237	-	$\mu\text{A}$		
Isolation Resistance		$R_{iso}$	$10^{12}$	$10^{14}$	-	$\Omega$	DC500V, 40 ~ 60% R.H.	
Floating Capacitance		$C_{io}$	-	0.4	-	pF	$V=0, f=1\text{MHz}$	

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

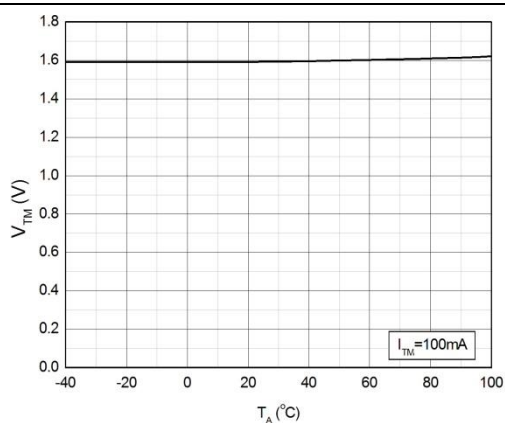
Note4. Refer to Fig.15 & Fig.16

## CHARACTERISTIC CURVES

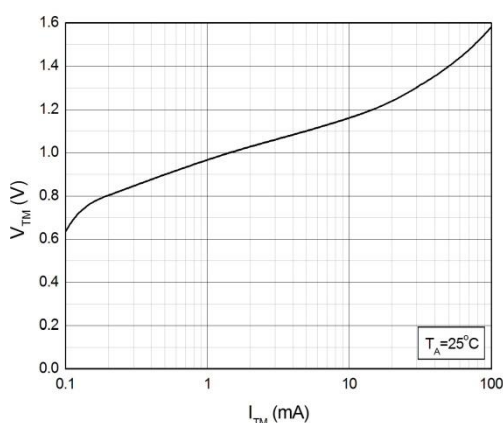
**Fig.7 Normalized Trigger Current vs. Ambient Temperature**



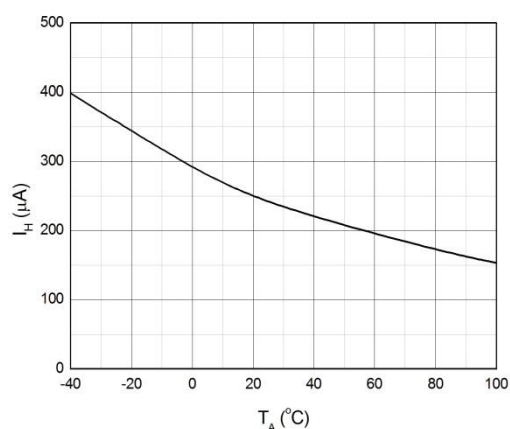
**Fig.8 On-state Terminal Voltage vs. Ambient Temperature**



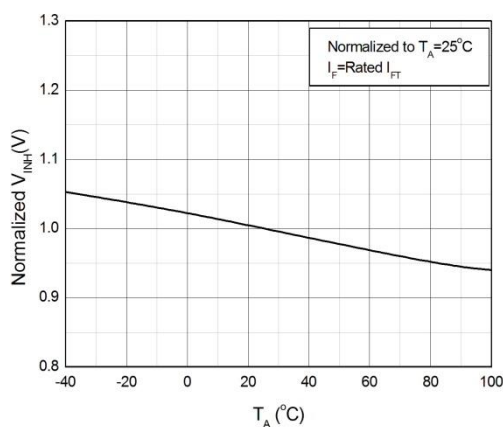
**Fig.9 On-state Terminal Voltage vs. On-state Terminal Current**



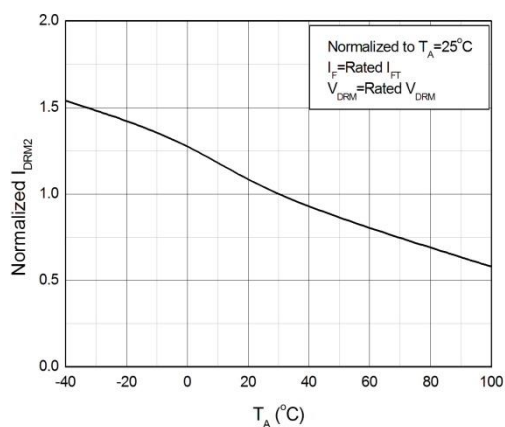
**Fig.10 Holding Current vs. Ambient Temperature**



**Fig.11 Normalized Inhibit Voltage vs. Ambient Temperature**

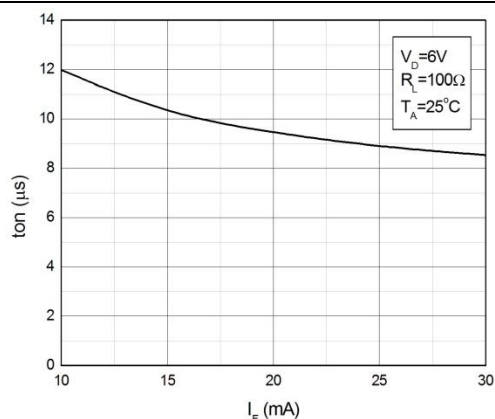


**Fig.12 Normalized Leakage in Inhibit State vs. Ambient Temperature**

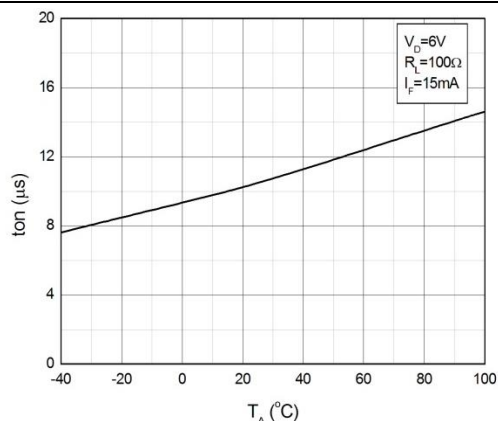


## CHARACTERISTIC CURVES

**Fig.13 Turn On Time vs. Forward Current**

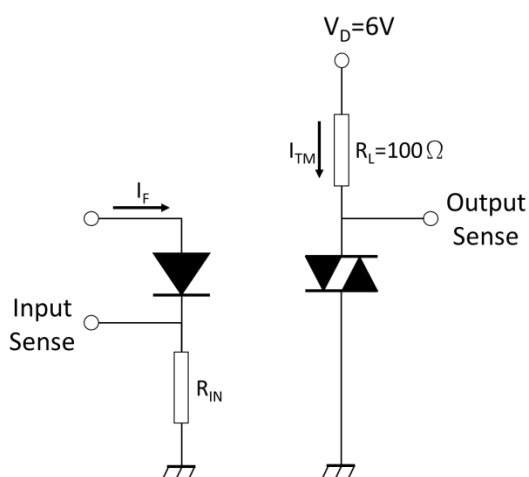


**Fig.14 Turn On Time vs. Ambient Temperature**

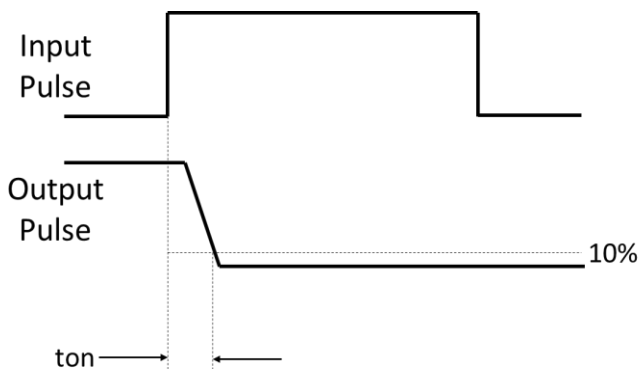


## TEST CIRCUITS

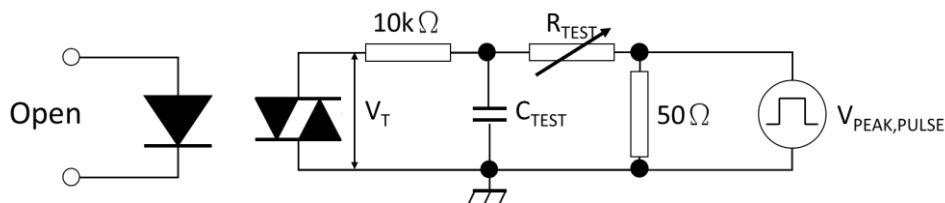
**Fig.15 Test Circuits of Turn On Time**



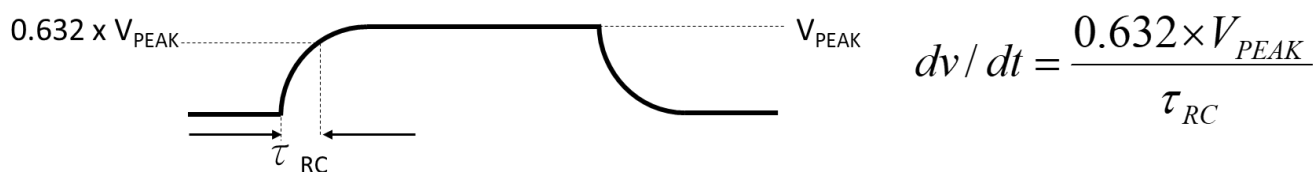
**Fig.16 Waveforms of Turn On Time**



**Fig.17 Test Circuits of dV/dt**

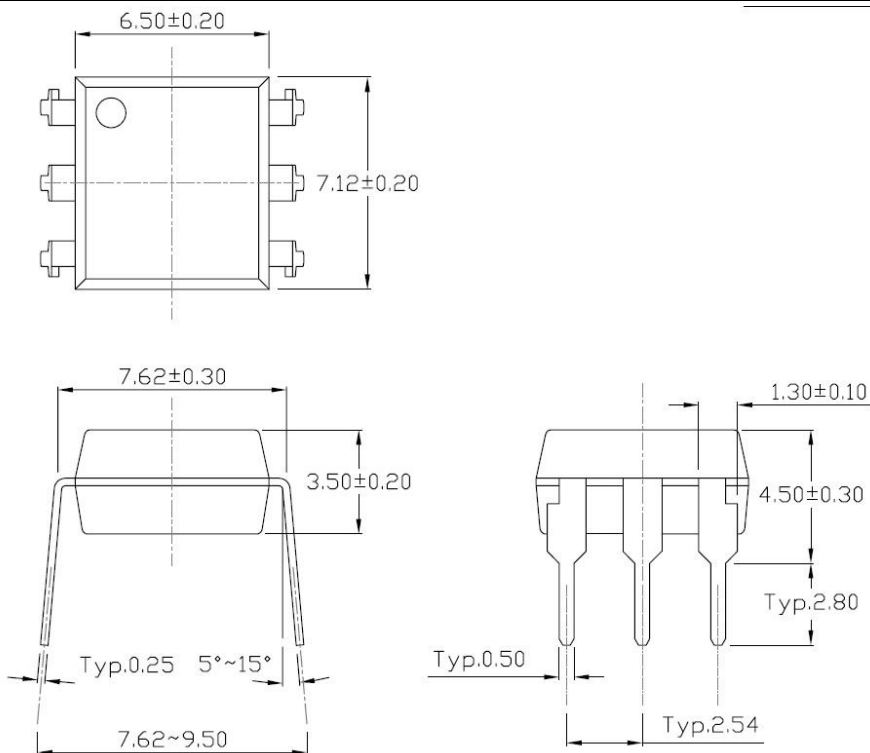


**Fig.18 Waveforms of dV/dt**

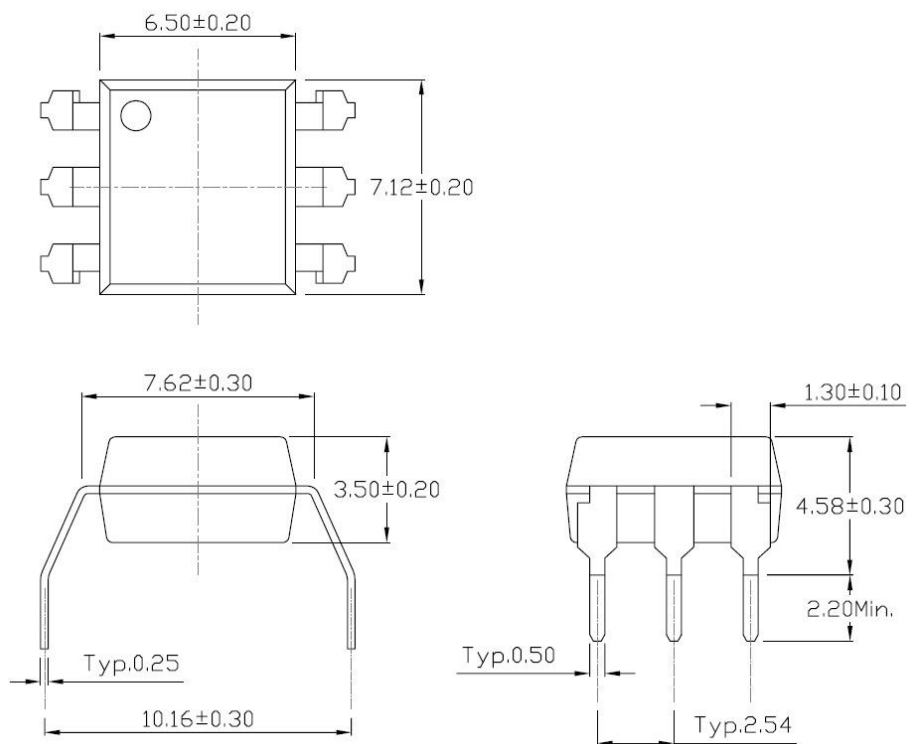


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

**Standard DIP – Through Hole (DIP Type)**

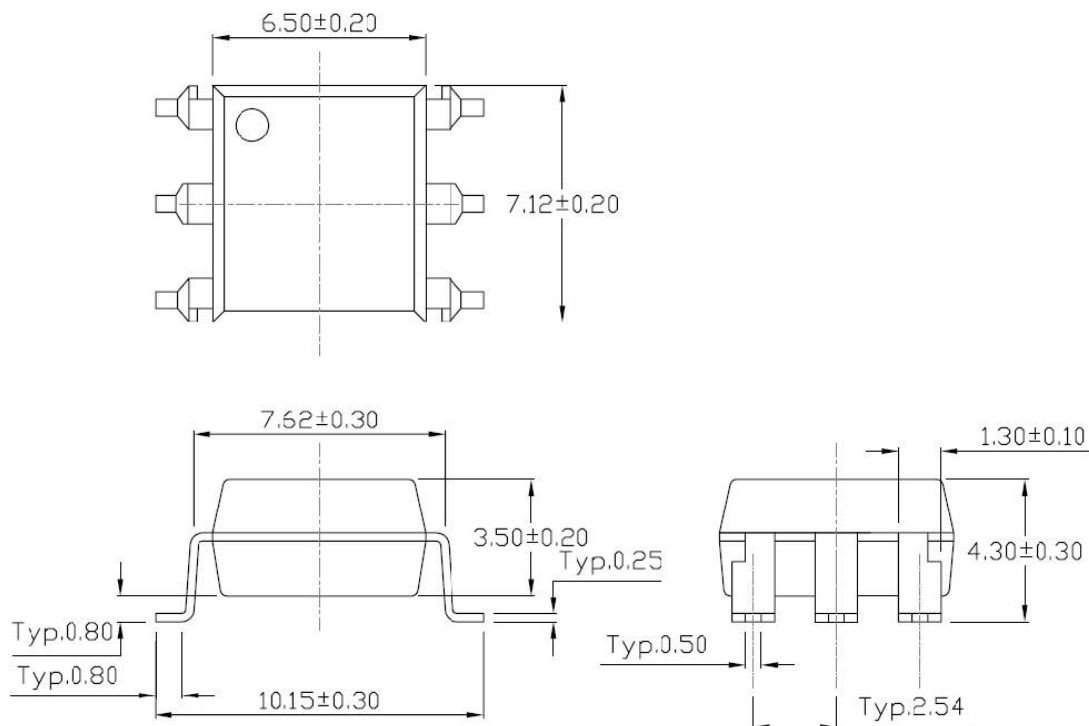


**Gullwing (400mil) Lead Forming – Through Hole (M Type)**

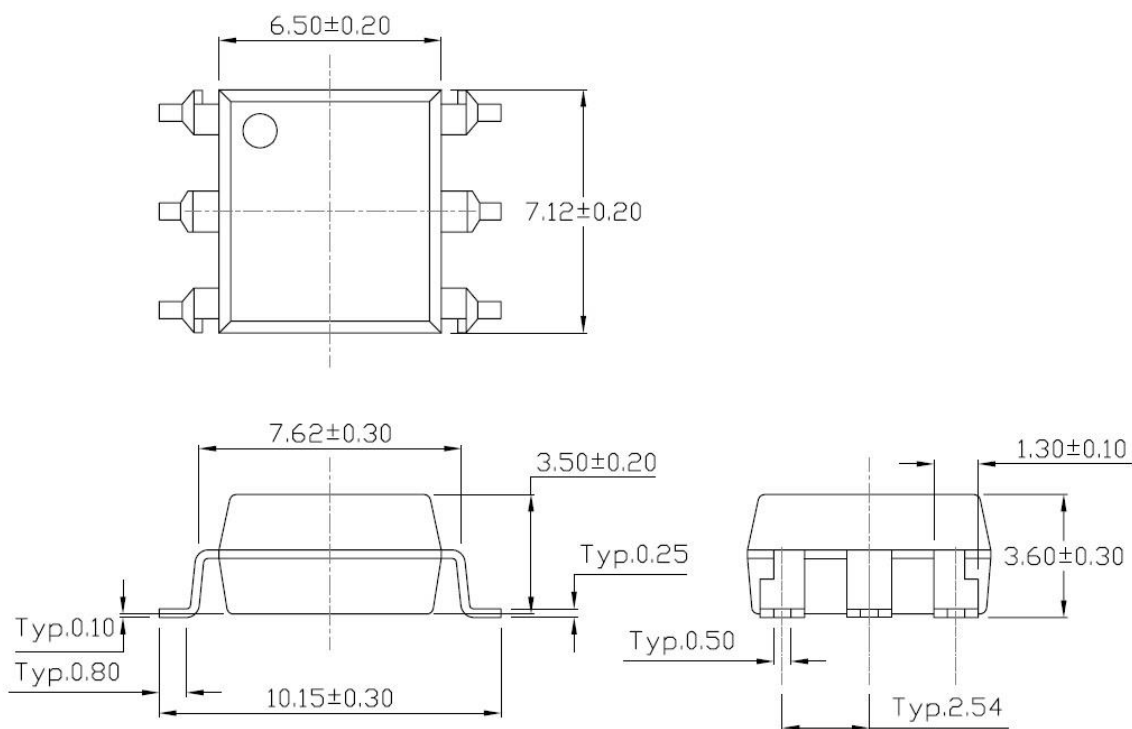


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

**Surface Mount Lead Forming (S Type)**



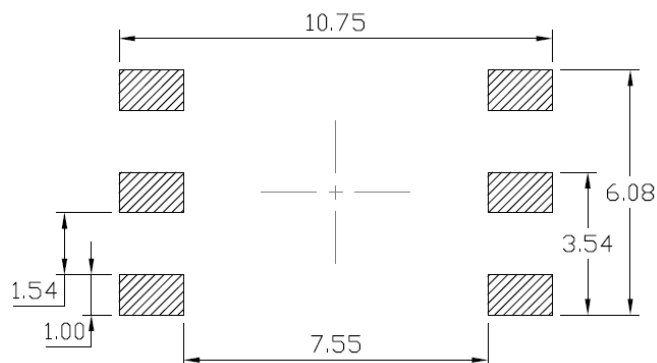
**Surface Mount (Low Profile) Lead Forming (SL Type)**



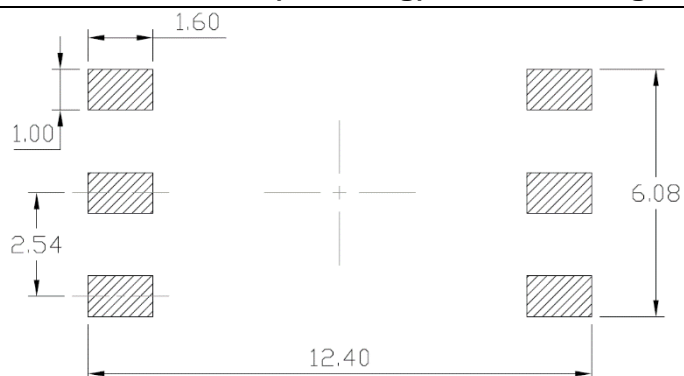


**RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)**

**Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming**



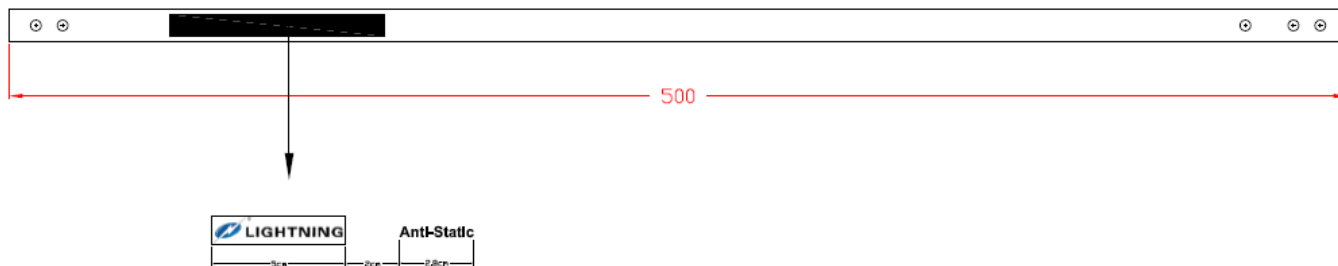
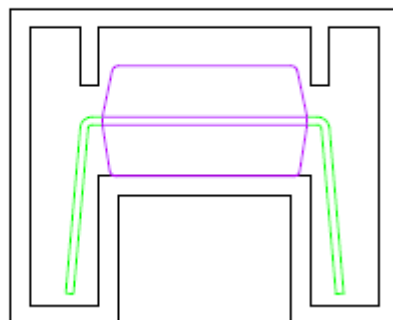
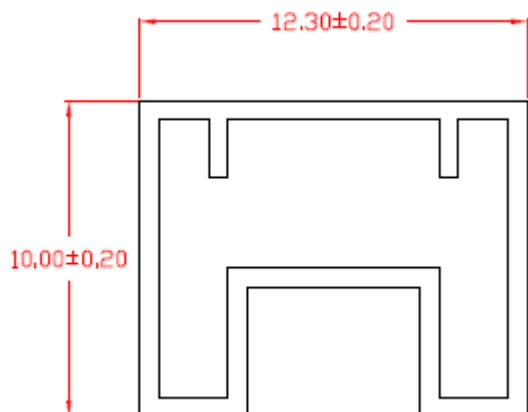
**Surface Mount (Gullwing) Lead Forming**



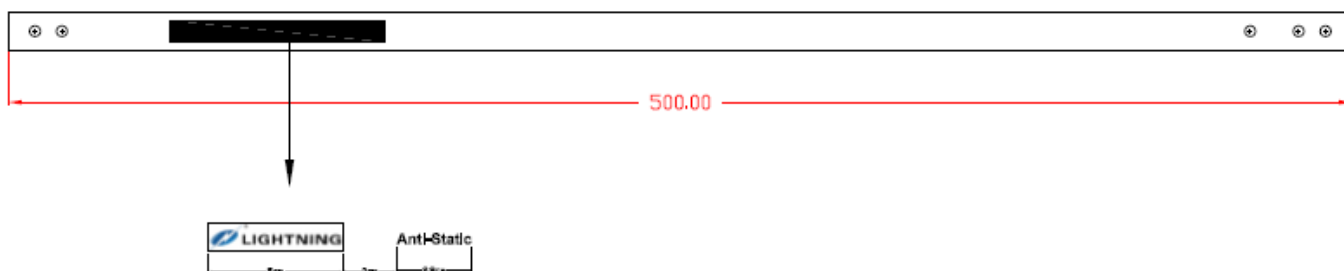
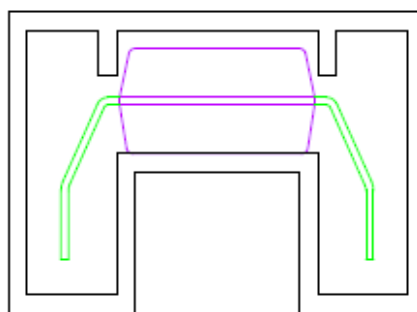
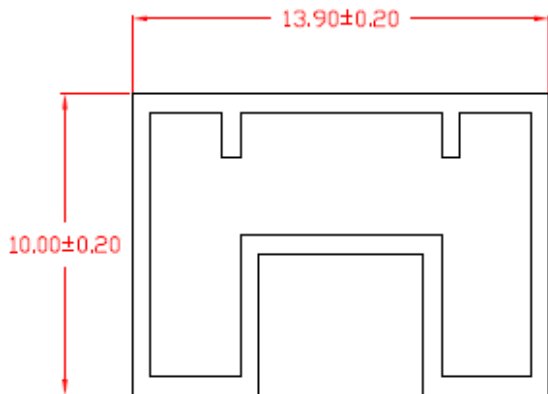


## TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

### Standard DIP

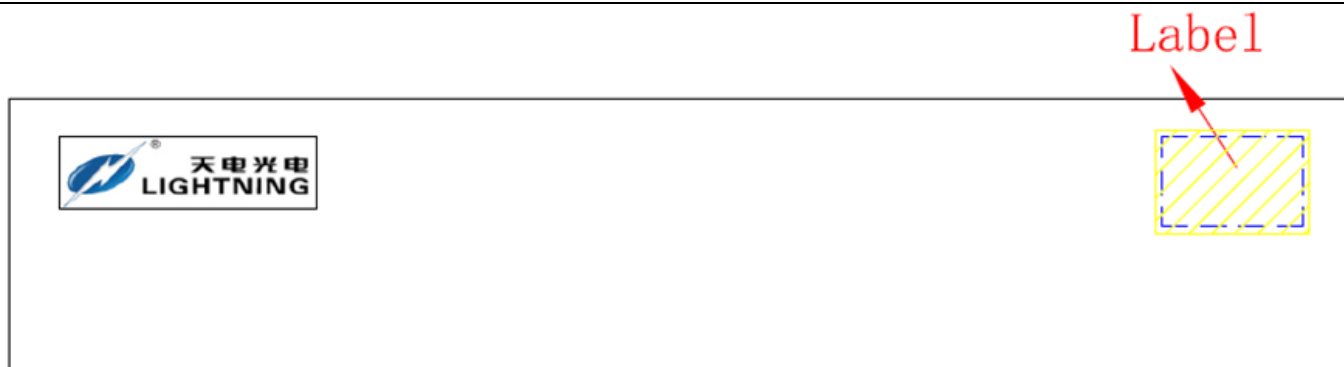


### Option M



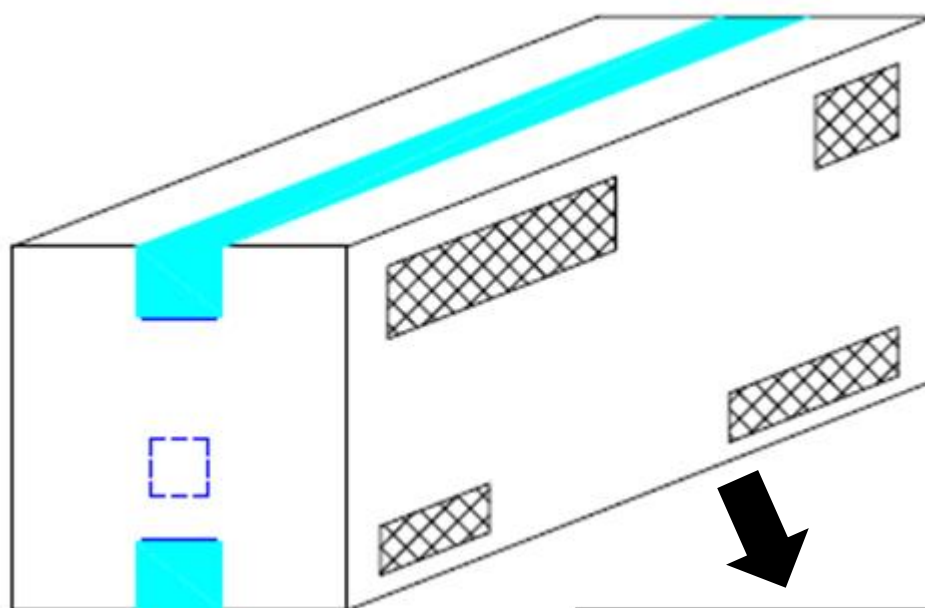
## **BOX SPECIFICATIONS (Tube Type)**

### **Inner Box**

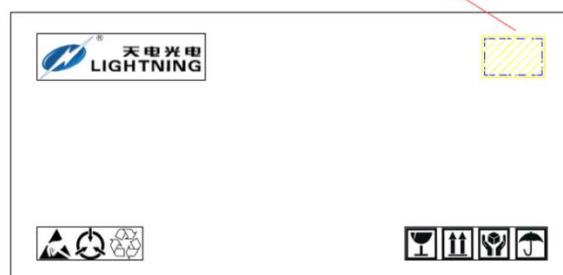


- L x W x H = 52.5cm x 10.7cm x 4.7cm

### **Outer Box**

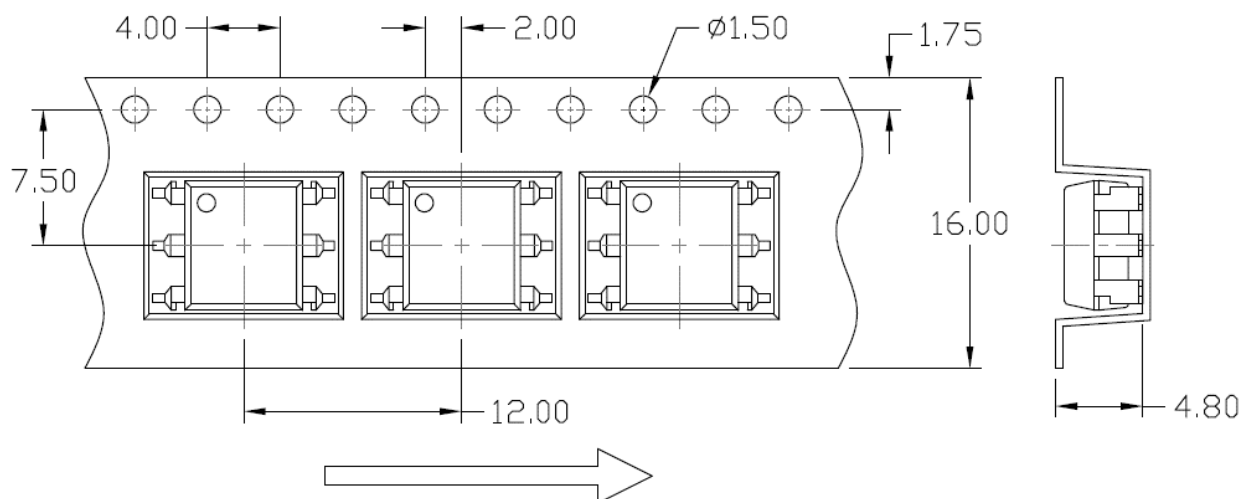


- L x W x H = 53.5cm x 23.5cm x 25.5cm

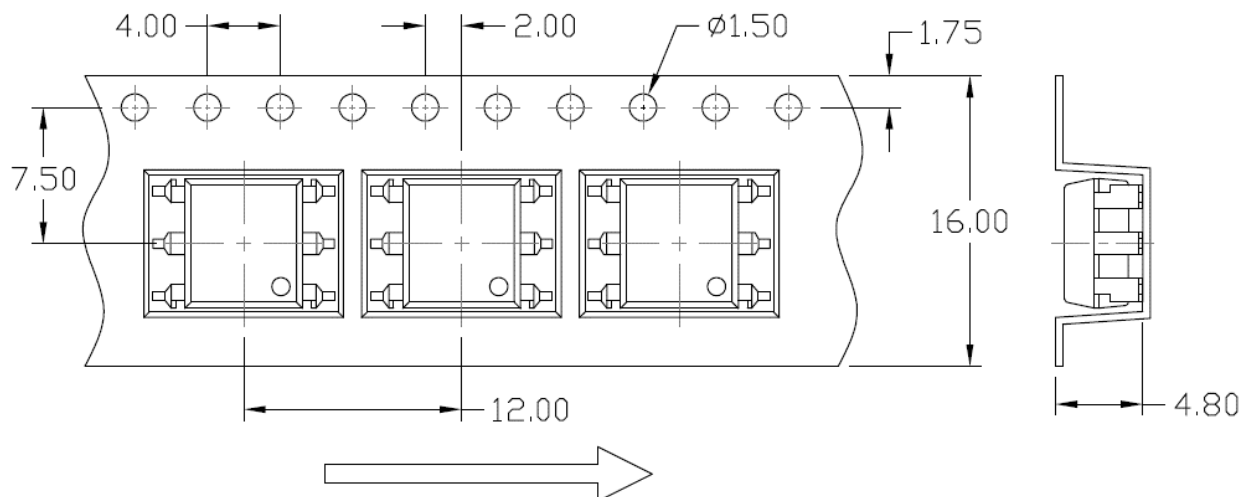


**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option S(T1) & SL(T1)**

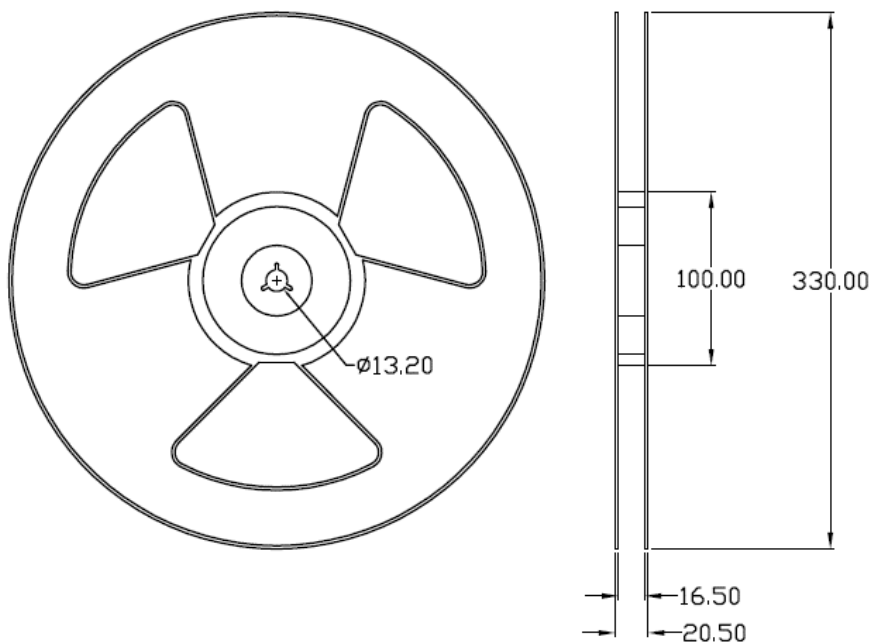


**Option S(T2) & SL(T2)**



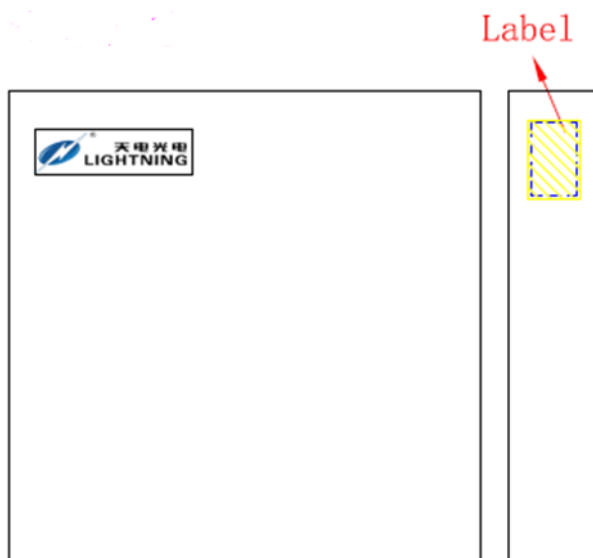
**REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option S & Option SL**



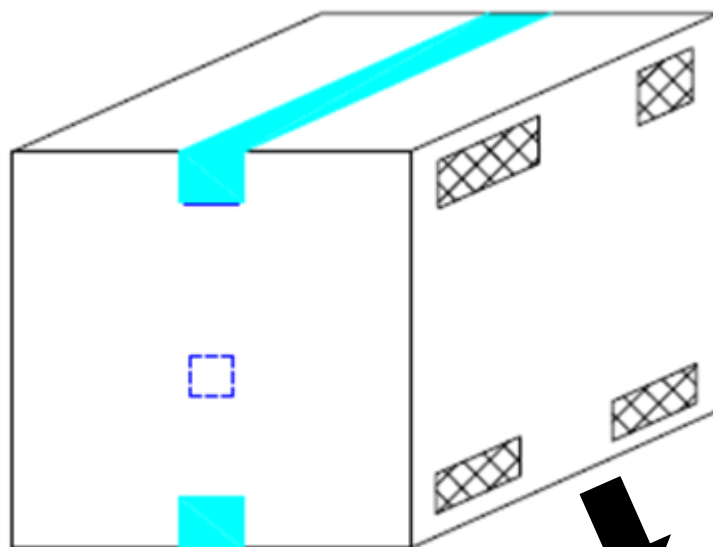
## **BOX SPECIFICATIONS (Reel Type)**

### **Inner Box**

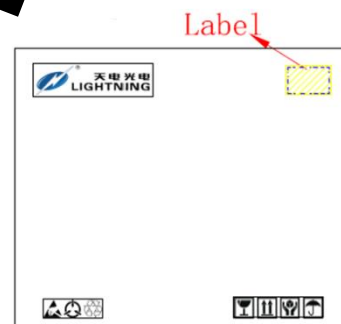


- L x W x H = 36cm x 36cm x 6.9cm

### **Outer Box**

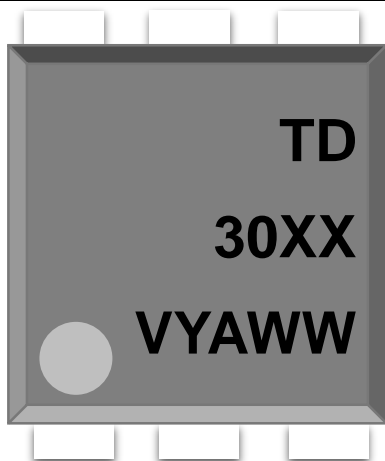


- L x W x H = 45cm x 38cm x 38cm



### ORDERING AND MARKING INFORMATION

#### MARKING INFORMATION



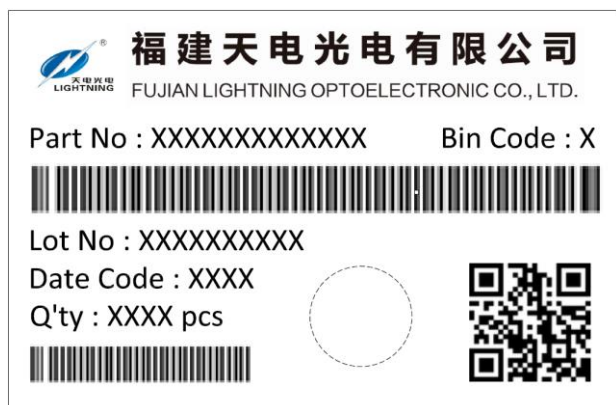
**TD** : Company Abbr.  
**30XX** : Part Number & Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

#### ORDERING INFORMATION

### TD30XX(Y)(Z)-GV

TD – Company Abbr.  
 30XX – Part Number  
 (31/32/33/41/42/43/61/62/63)  
 Y – Lead Form Option (M/S/SL/None)  
 Z – Tape and Reel Option (T1/T2)  
 G – Green Option (G or None)  
 V – VDE Option (V or None)

#### LABEL INFORMATION

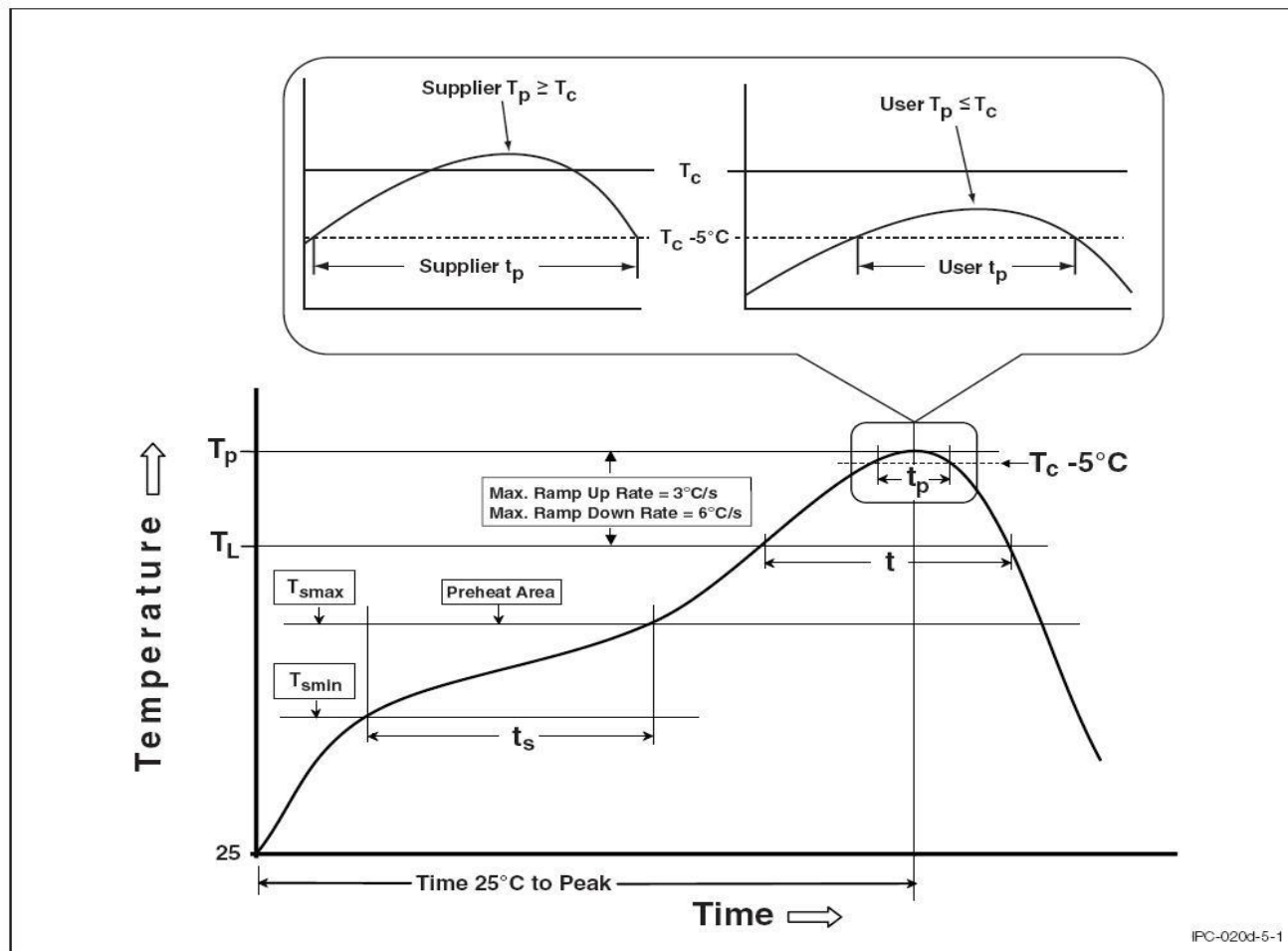


#### Packing Quantity

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	50 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 16k Units
M	50 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 16k Units
S(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
S(T2)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SL(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SL(T2)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units

## REFLOW INFORMATION

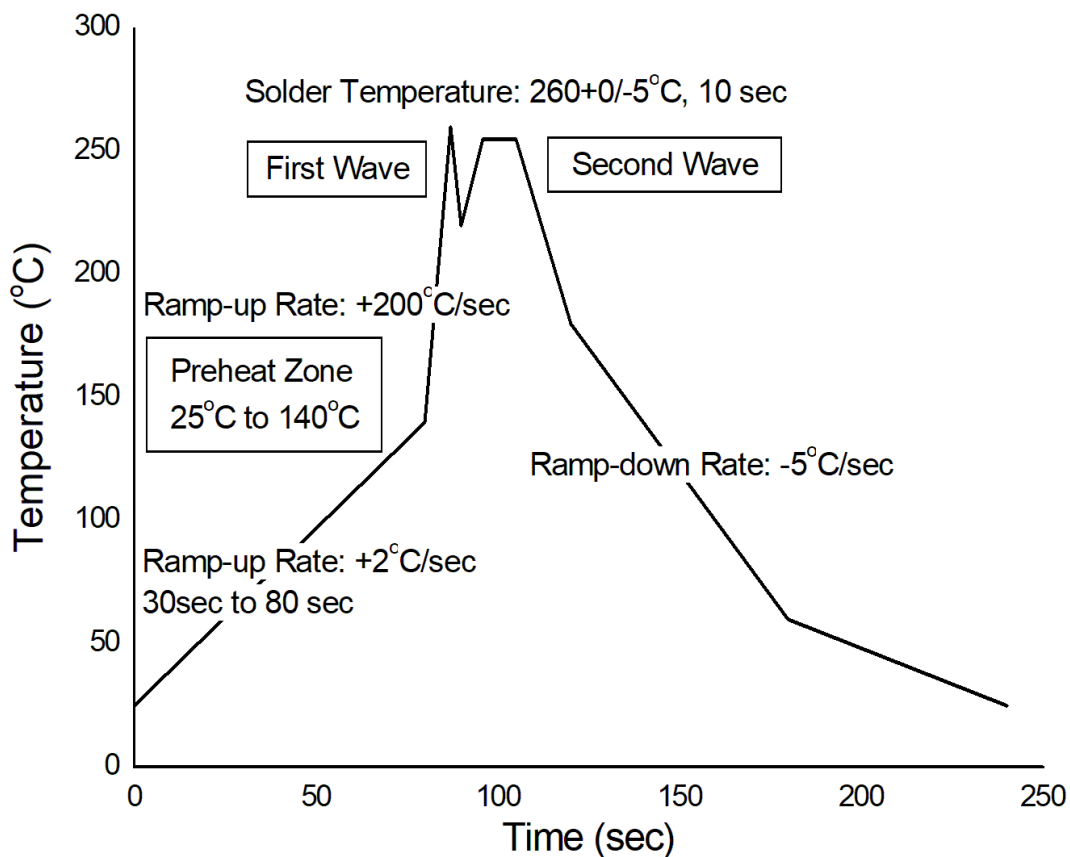
### REFLOW PROFILE



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.

### TEMPERATURE PROFILE OF SOLDERING

#### WAVE SOLDERING (JESD22-A111 COMPLIANT)



#### HAND SOLDERING BY SOLDERING IRON

Soldering Temperature	$380 \pm 5^\circ\text{C}$
Soldering Time	3 sec max.

- One time soldering is recommended for all soldering method.
- Do not solder more than three times for IR reflow soldering.





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- Please contact LIGHTNING sales agent for special application request.
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- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify LIGHTNING's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.