

### Description

The TD101X(B) series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon planar phototransistor detector in a plastic LSOP4 package.

With the robust coplanar double mold structure, TD101X(B) series provide the most stable isolation feature.

### Features

- High isolation 5000 VRMS
- CTR flexibility available see order information
- DC input with transistor output
- Operating temperature range - 55 °C to 110 °C
- RoHS & REACH Compliance
- MSL class 1
- Halogen free (Optional)
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC - GB4943.1, GB8898
  - cUL- CSA Component
 Acceptance Service Notice No. 5A

### Applications

- Switch mode power supplies
- Programmable controllers
- Household appliances
- Office equipment

### SCHEMATIC



### PIN DEFINITION

1. Anode
2. Cathode
3. Emitter
4. Collector

### PACKAGE OUTLINE





**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	VALUE	UNIT	NOTE
INPUT				
Forward Current	I <sub>F</sub>	60	mA	
Peak Forward Current	I <sub>FP</sub>	1	A	1
Reverse Voltage	V <sub>R</sub>	6	V	
Input Power Dissipation	P <sub>I</sub>	100	mW	
OUTPUT				
Collector - Emitter Voltage	V <sub>CEO</sub>	80	V	
Emitter - Collector Voltage	V <sub>ECO</sub>	7	V	
Collector Current	I <sub>c</sub>	50	mA	
Output Power Dissipation	P <sub>O</sub>	150	mW	
COMMON				
Total Power Dissipation	P <sub>tot</sub>	250	mW	
Isolation Voltage	V <sub>iso</sub>	5000	V <sub>rms</sub>	2
Operating Temperature	T <sub>opr</sub>	-55~110	°C	
Storage Temperature	T <sub>stg</sub>	-55~125	°C	
Soldering Temperature	T <sub>sol</sub>	260	°C	

Note 1. 100μs pulse, 100Hz frequency

Note 2. AC For 1 Minute, R.H. = 40 ~ 60%



ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C									
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE		
INPUT									
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>	-	30	250	pF	V=0, f=1kHz			
OUTPUT									
Collector Dark Current	I <sub>CEO</sub>	-	-	100	nA	V <sub>CE</sub> =20V, I <sub>F</sub> =0			
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	80	-	-	V	I <sub>C</sub> =0.1mA, I <sub>F</sub> =0			
Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	6	-	-	V	I <sub>E</sub> =0.1mA, I <sub>F</sub> =0			
TRANSFER CHARACTERISTICS									
Current Transfer Ratio	TD1010	CTR	300	-	600	%	I <sub>F</sub> =5mA, V <sub>CE</sub> =5V		
	TD1015		50	-	150				
	TD1016		100	-	300				
	TD1017		80	-	160				
	TD1018		130	-	260				
	TD1019		200	-	400				
	TD1011		60	-	300		I <sub>F</sub> =10mA, V <sub>CE</sub> =5V		
	TD1012		63	-	125				
	TD1013		100	-	200				
	TD1014		160	-	320				
	TD1012		22	-	-			I <sub>F</sub> =1mA, V <sub>CE</sub> =5V	
	TD1013		34	-	-				
	TD1014		56	-	-				
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	-	0.1	0.3	V	I <sub>F</sub> =10mA, I <sub>C</sub> =1mA			
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			
Cut-off Frequency	F <sub>c</sub>	-	80	-	kHz	V <sub>CE</sub> =2V, I <sub>C</sub> =2mA R <sub>L</sub> =100Ω, -3dB	3		
Response Time (Rise)	T <sub>r</sub>	-	6	18	μs	V <sub>CE</sub> =2V, I <sub>C</sub> =2mA R <sub>L</sub> =100Ω	4		
Response Time (Fall)	T <sub>f</sub>	-	8	18	μs		4		

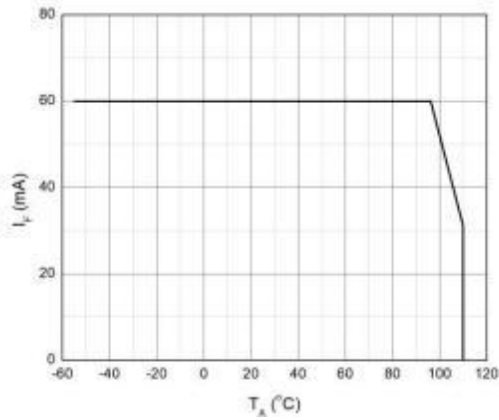
Note 3. Fig.12&13

Note 4. Fig.14

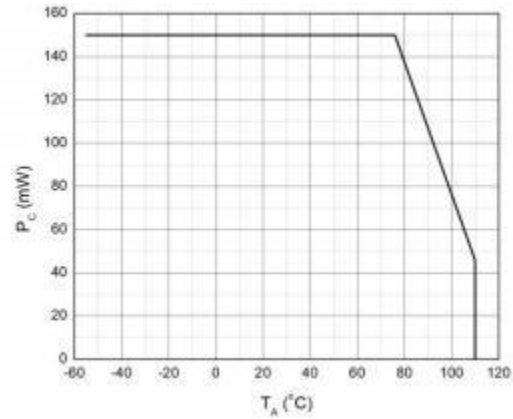


**CHARACTERISTIC CURVES**

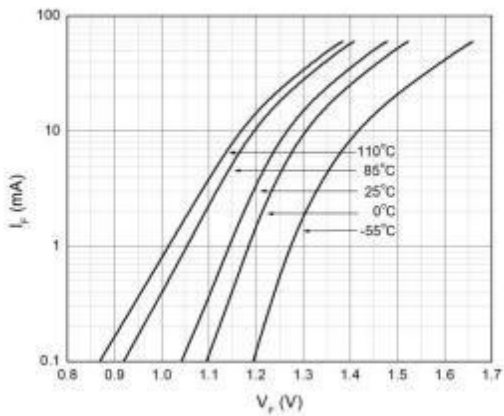
**Fig.1 Forward Current vs. Ambient Temperature**



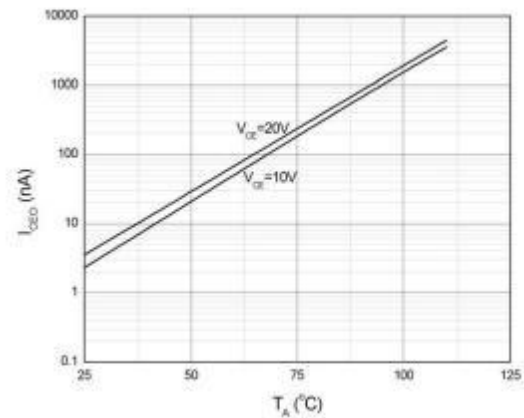
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



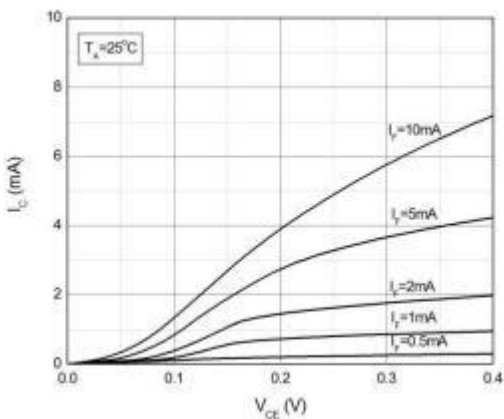
**Fig.3 Forward Current vs. Forward Voltage**



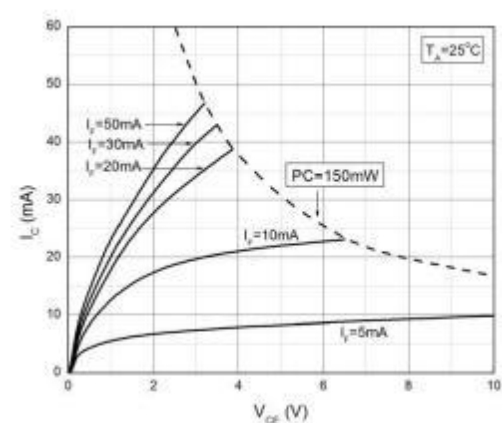
**Fig.4 Collector Dark Current vs. Ambient Temperature**



**Fig.5 Collector Current vs. Collector-emitter Voltage**

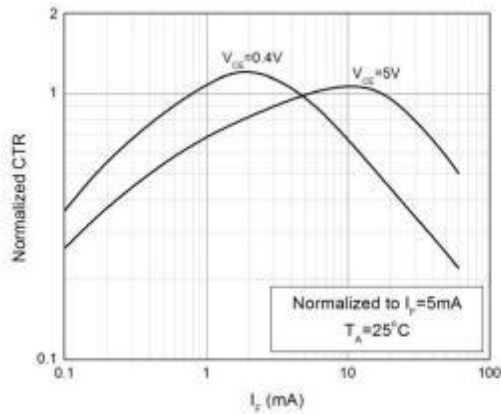


**Fig.6 Collector Current vs. Collector-emitter Voltage**

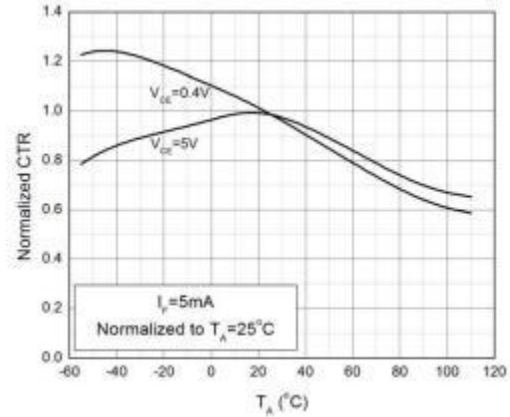


**CHARACTERISTIC CURVES**

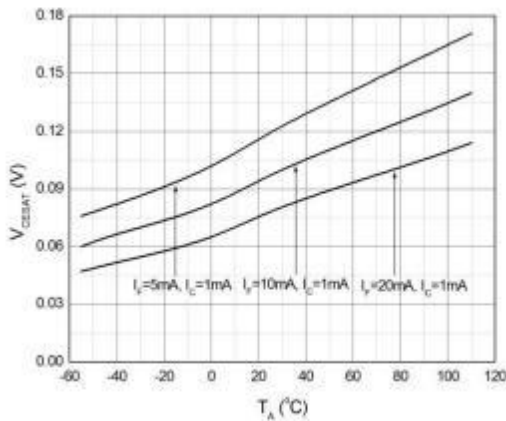
**Fig.7 Normalized Current Transfer Ratio vs. Forward Current**



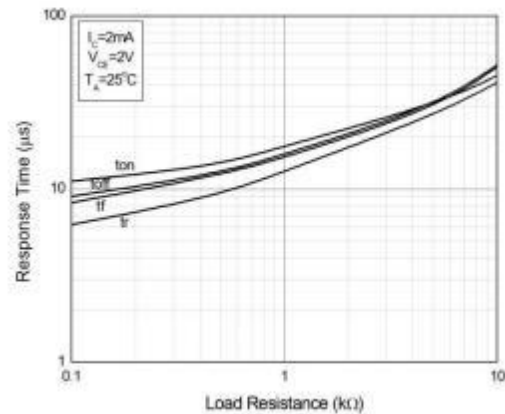
**Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature**



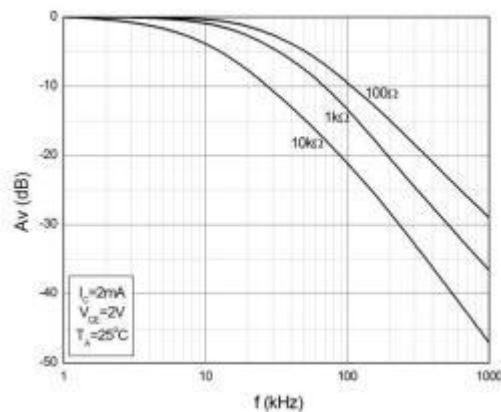
**Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature**



**Fig.10 Switching Time vs. Load Resistance**

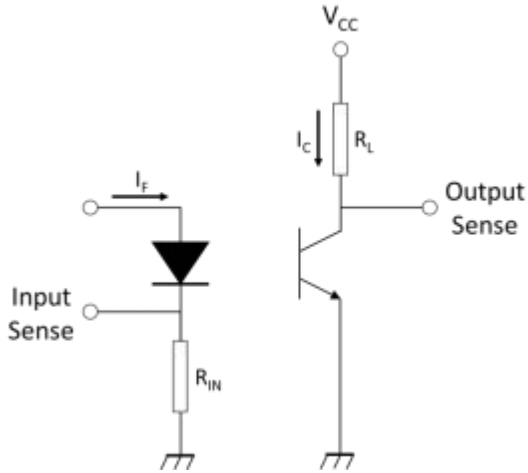


**Fig.11 Frequency Response**

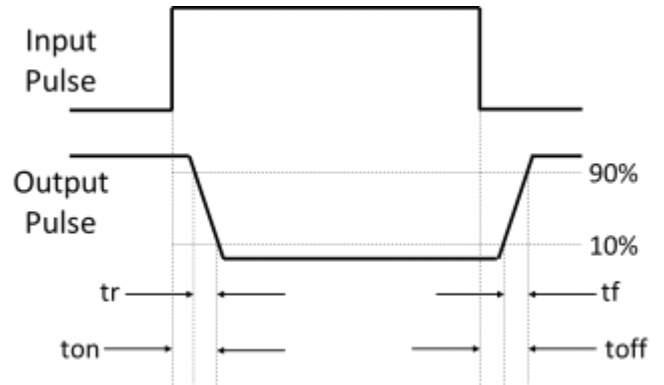


**TEST CIRCUITS**

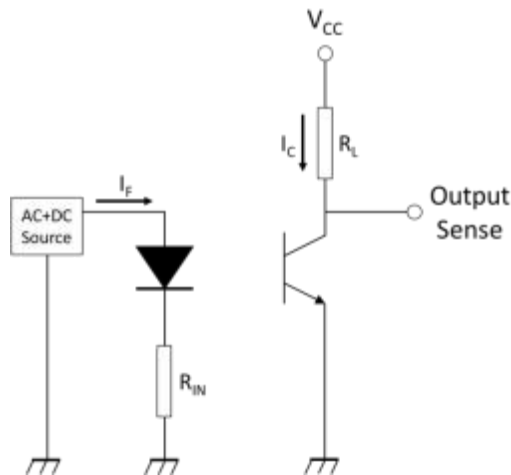
**Fig.12 Test Circuits of Response Time**



**Fig.13 Curves of Response Time**

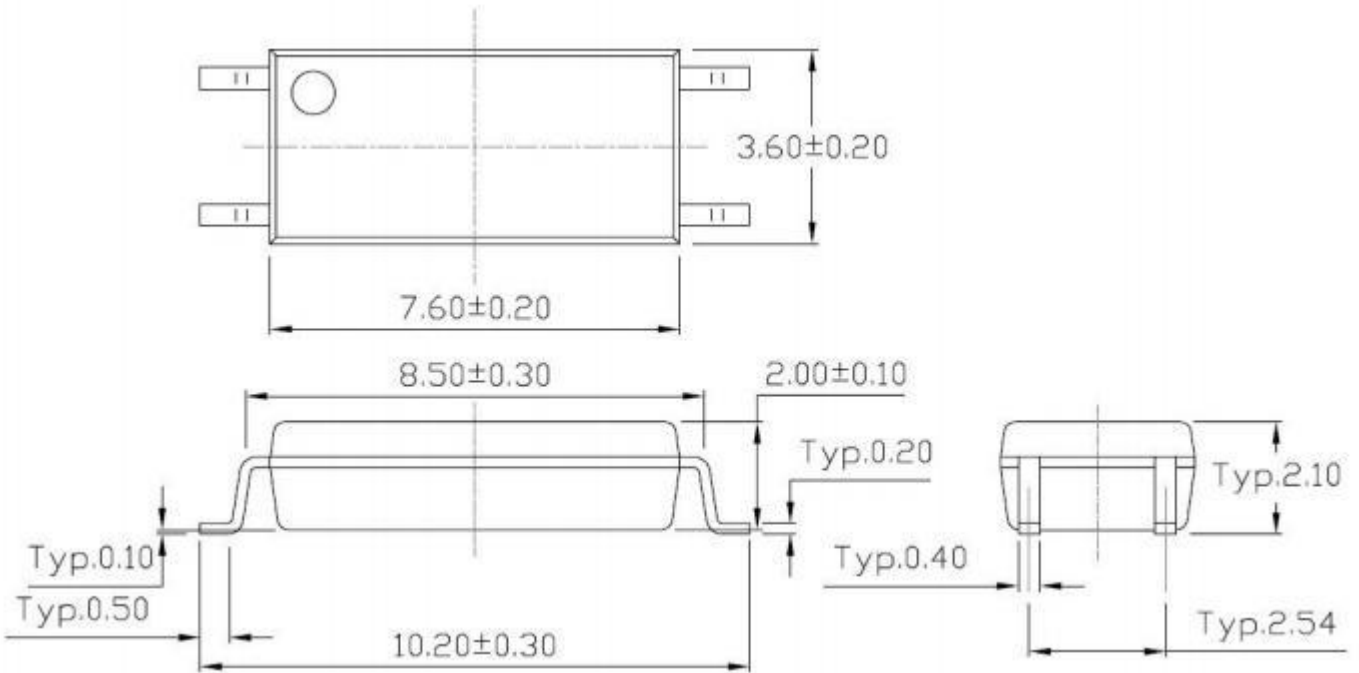


**Fig.14 Test Circuits of Frequency Response**

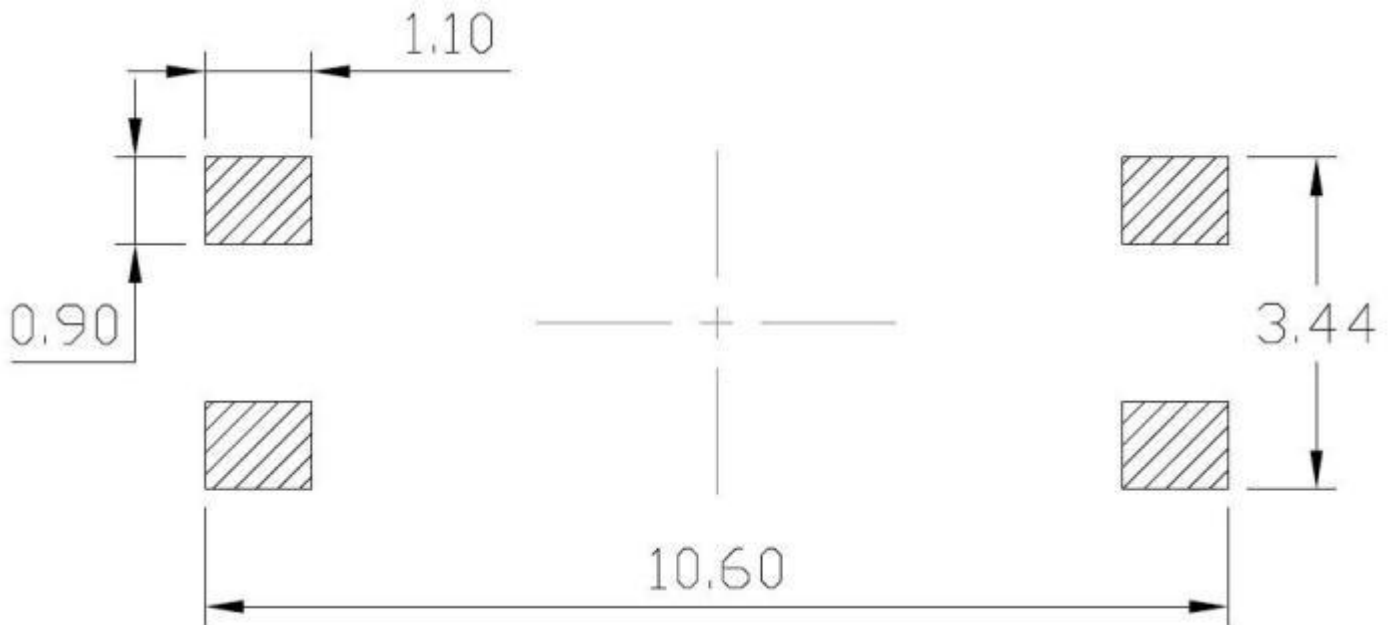




### PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

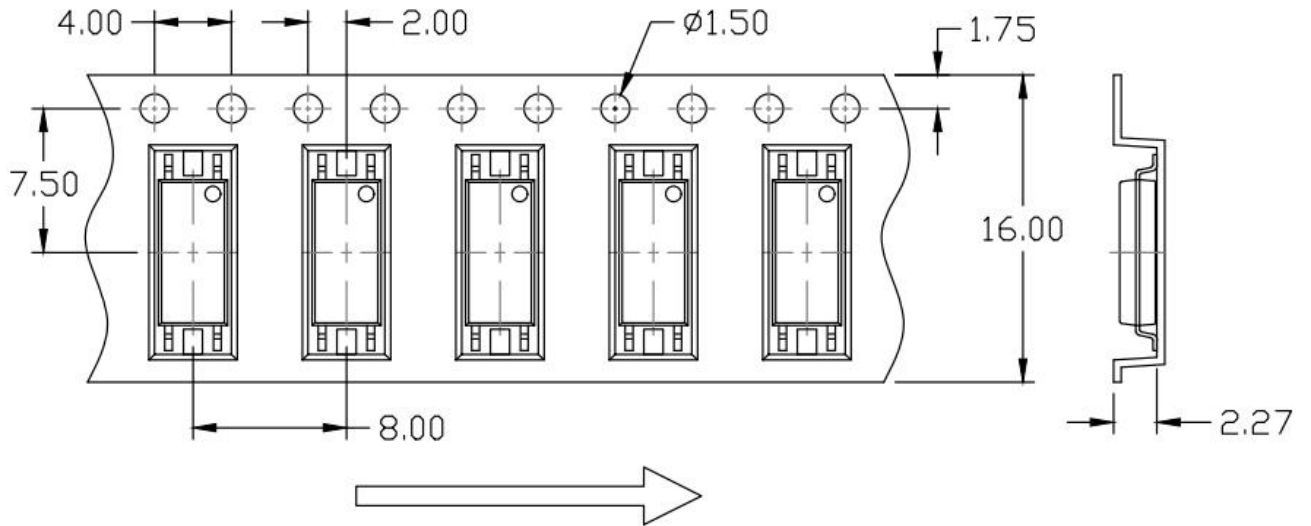


### RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

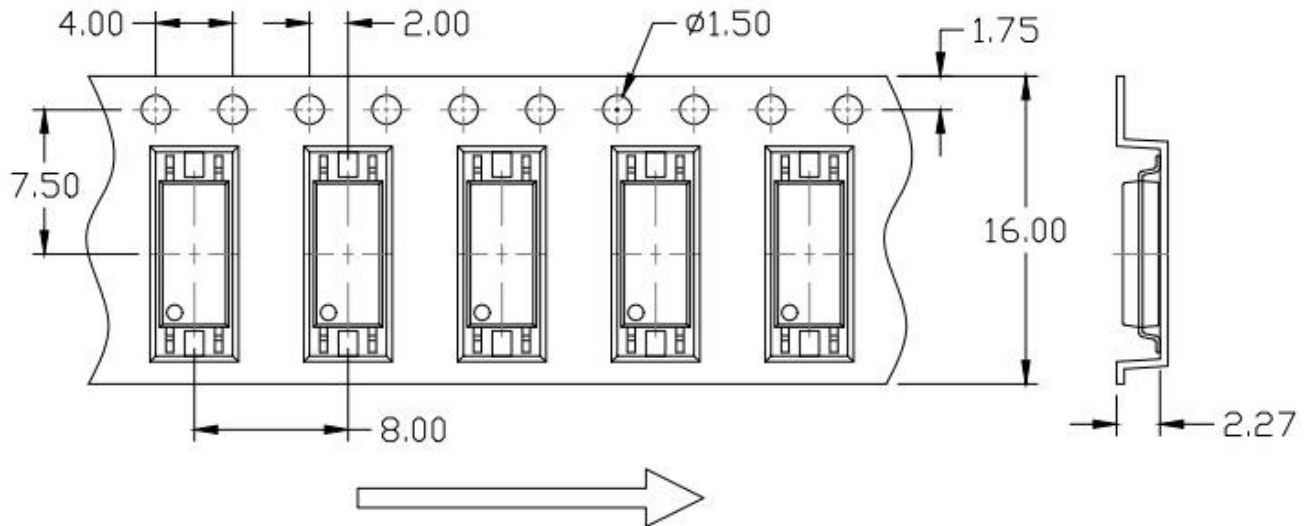


### CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

#### Option T1



#### Option T2

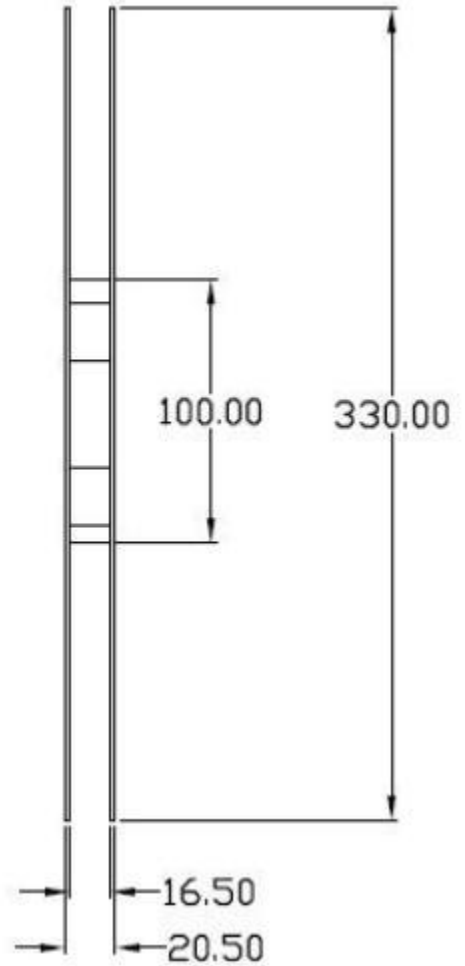






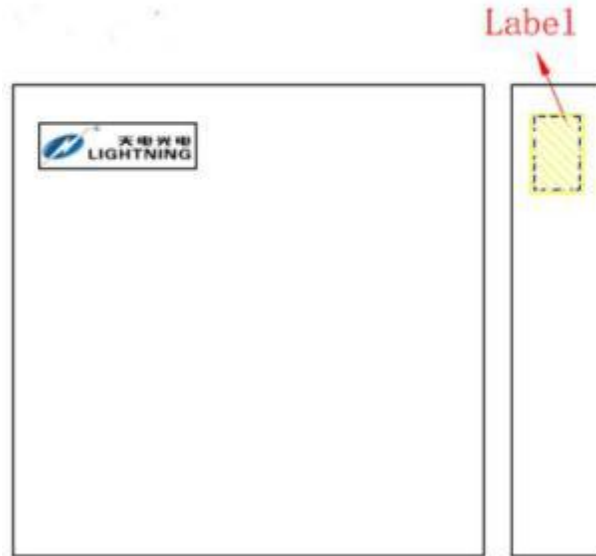
**REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option T1 & T2**



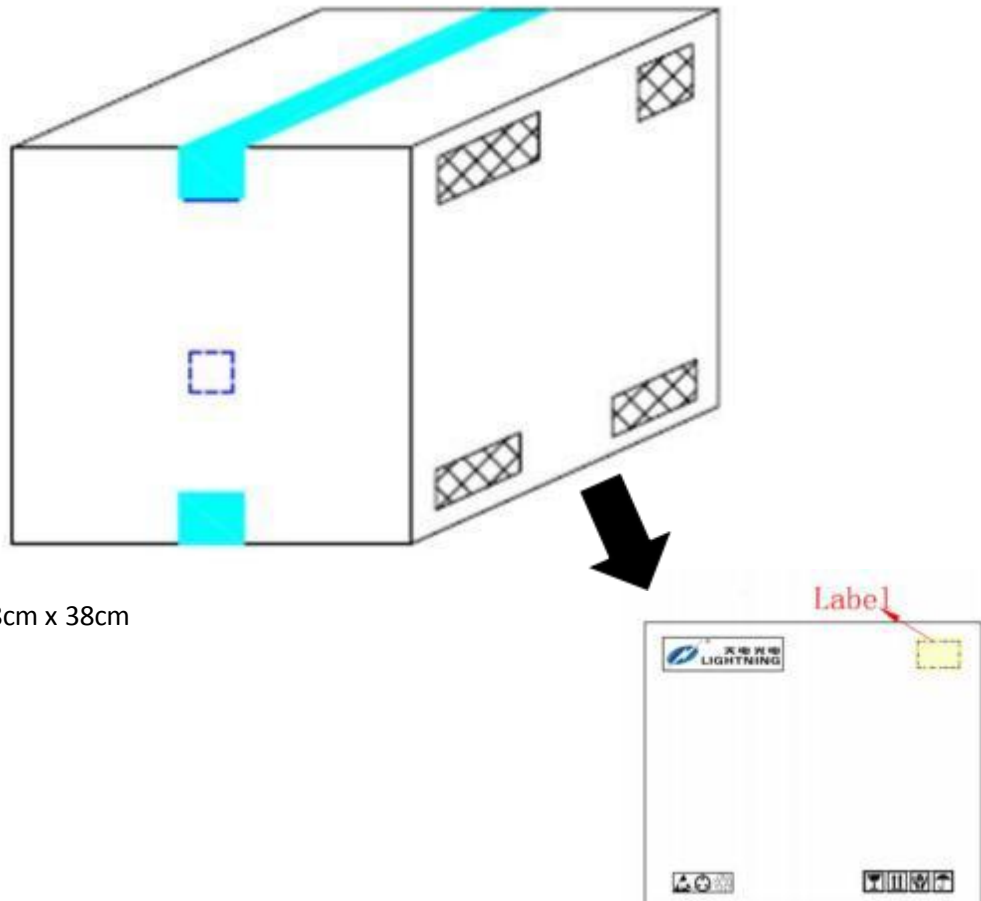
### BOX SPECIFICATIONS (Reel Type)

#### 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.  
**101X** : Part Number & Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

**ORDERING INFORMATION**

**TD101X(Z)-G(B)**

TD – Company Abbr.  
 101X – Rank (0/1/2/3/4/5/6/7/8/9)  
 Z – Tape and Reel Option (T1/T2)  
 G – Green  
 V – VDE Option (V or None)  
 B – Black

**LABEL INFORMATION**

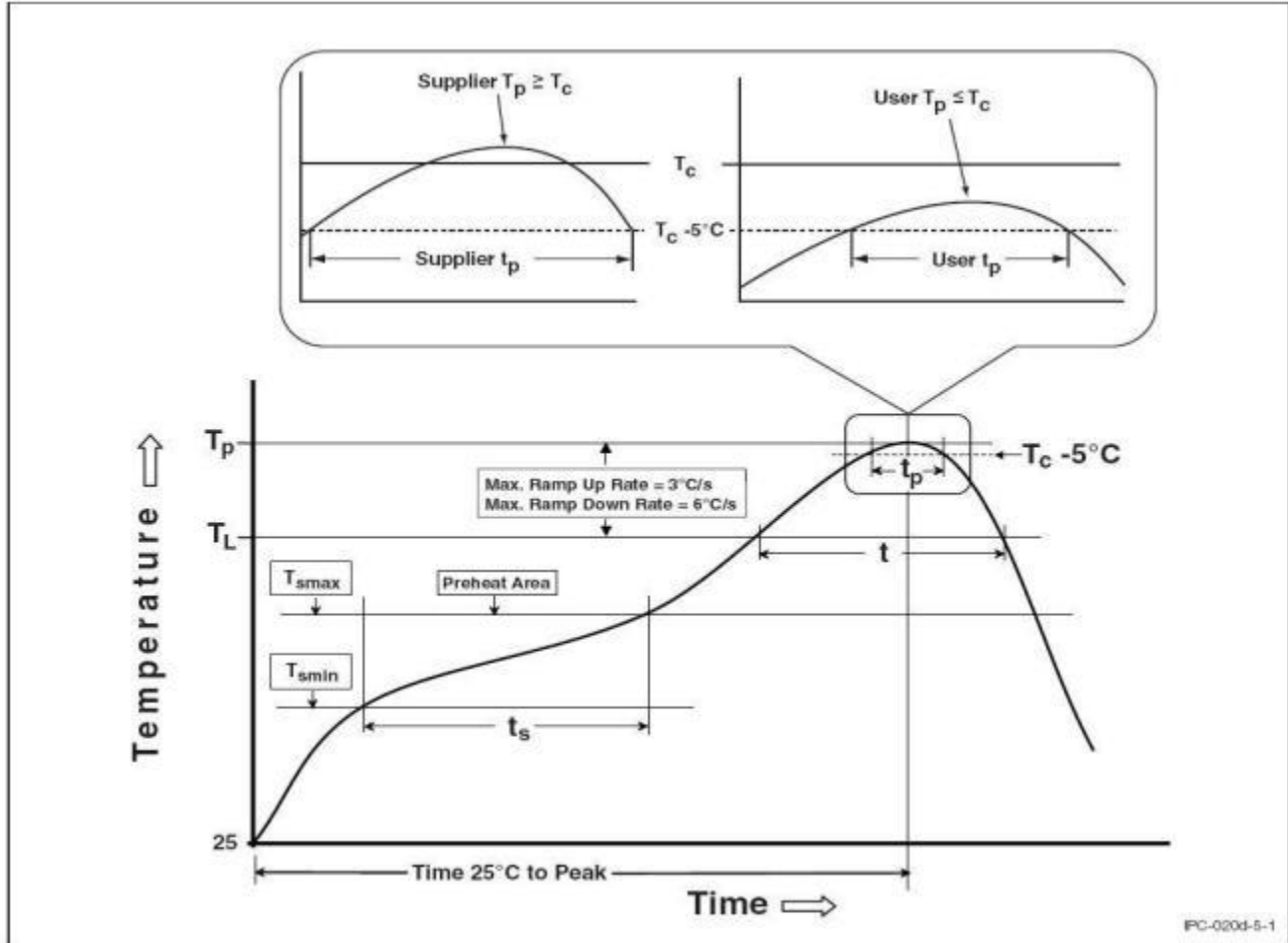


**PACKING QUANTITY**

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**

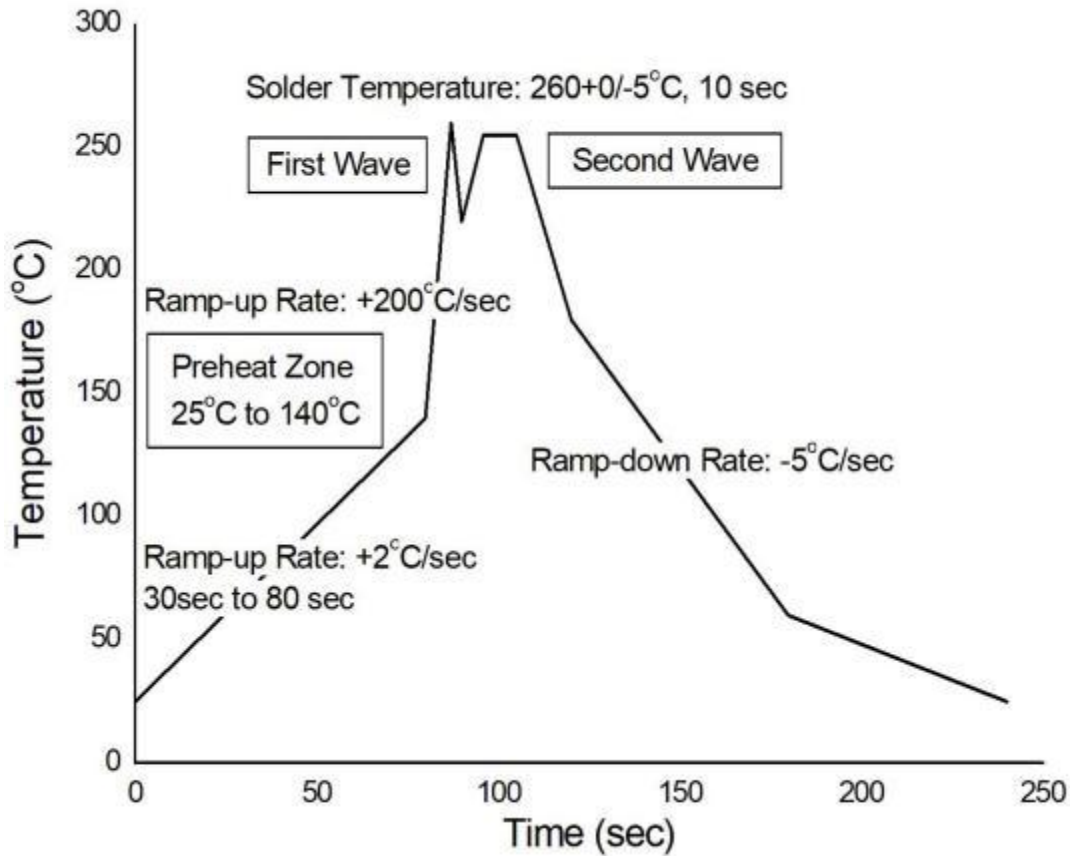


Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	100	150°C
Temperature Max. (T <sub>smax</sub> )	150	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	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	$380 \pm 0/-5^{\circ}\text{C}$
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.



**DISCLAIMER**

- LIGHTNING is continually improving the quality, reliability, function and design. LIGHTNING reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
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- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact LIGHTNING sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- 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.