

Description

The TWS301X and TWS302X and TWS305X and TWS307X 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.

With the robust coplanar double mold structure, TWS301X, TWS302X and TWS305X and TWS307X series provide the most stable isolation feature.

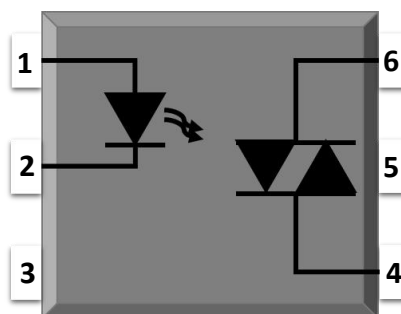
Features

- High isolation 5000 VRMS
- DC input with random-phase photo triac output
- Operating temperature range - 40 °C to 100 °C
- REACH & RoHS compliance
- MSL class 1

Applications

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

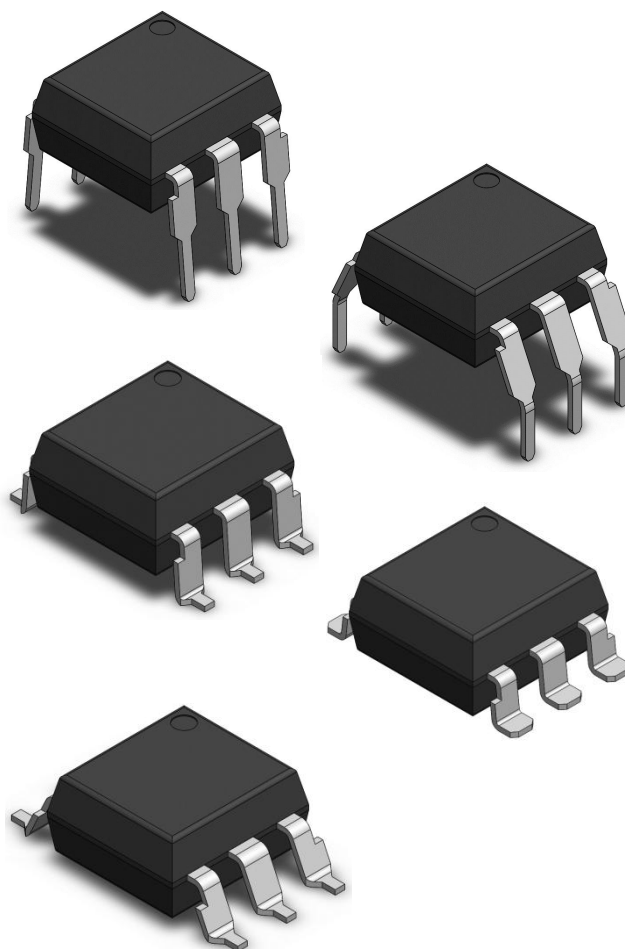
SCHEMATIC



PIN DEFINITION

- | | |
|------------|--------------|
| 1. Anode | 4. Terminal |
| 2. Cathode | 5. Substrate |
| 3. NC | 6. 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	TWS301X	V_{DRM}	250	V	
	TWS302X		400		
	TWS305X		600		
	TWS307X		800		
Peak Repetitive Surge Current 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}	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

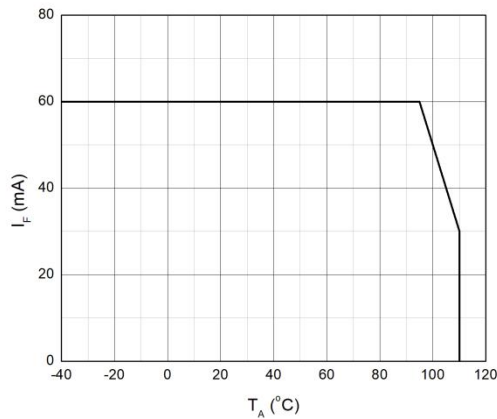
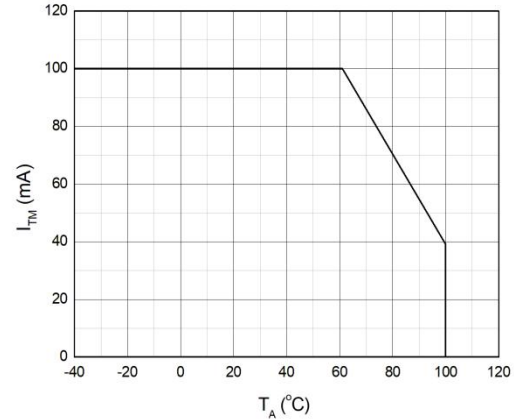
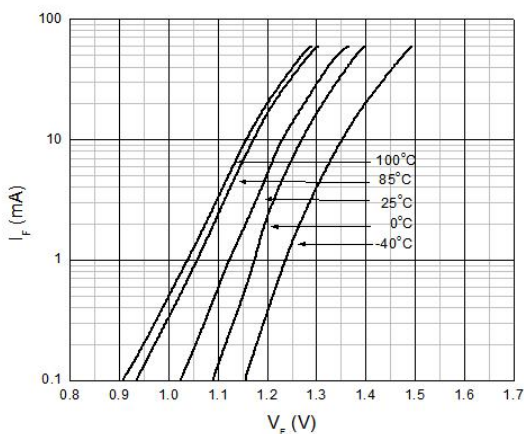
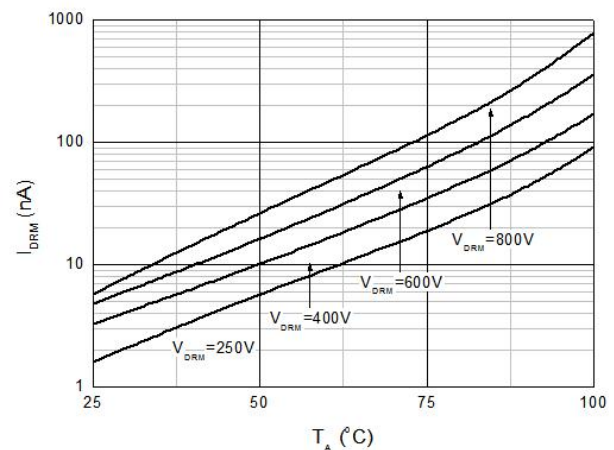
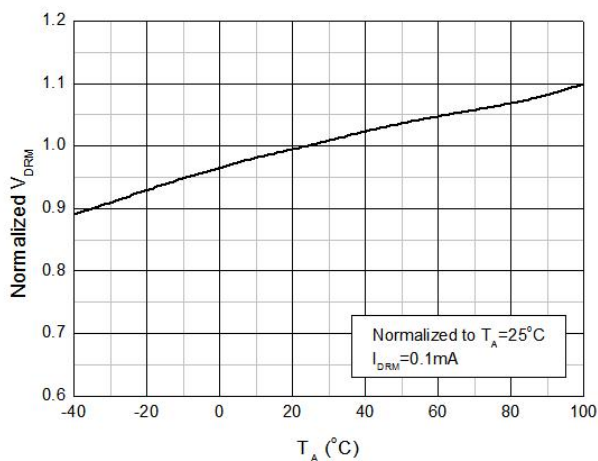
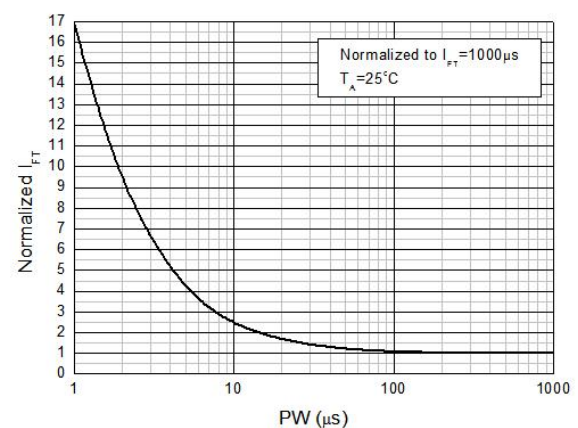
Note 1. AC For 1 Minute, R.H. = 40 ~ 60%

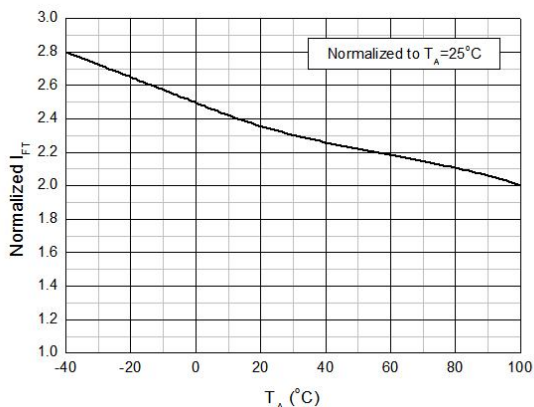
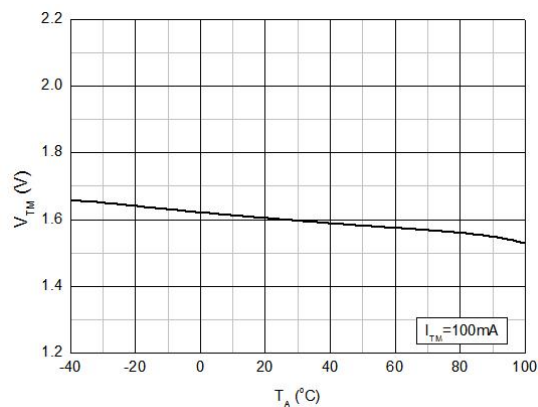
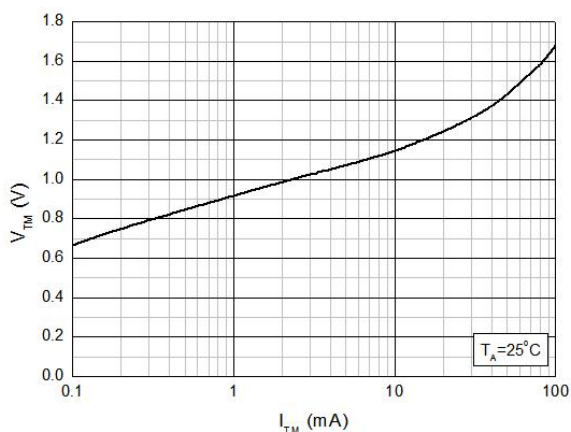
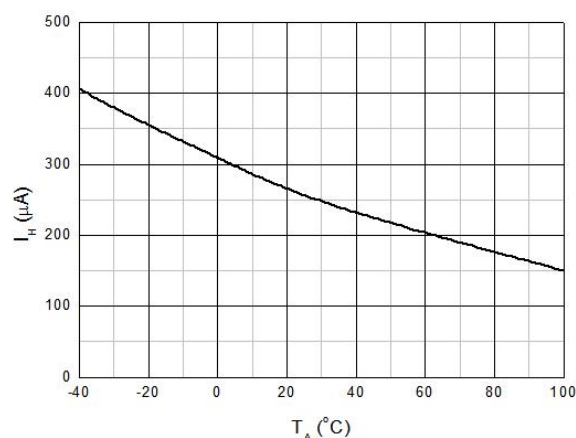
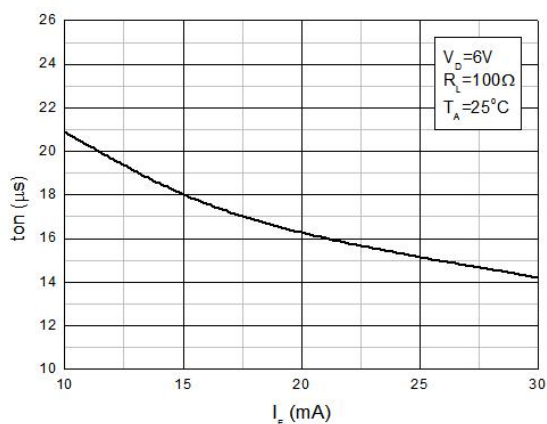
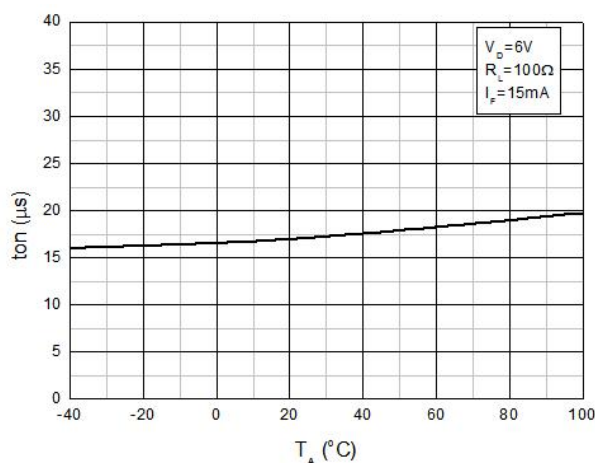
Note 2. For 10 seconds

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	μA	$V_R=6\text{V}$	
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	$V_{DRM}=\text{Rated } V_{DRM}$ $I_F=0$	
Peak On-state Voltage, Either Direction		V_{TM}	-	1.58	2.5	V	$I_{TM}=100\text{mA}$	
Critical Rate of Rise of Off-state Voltage		dV/dt	1000	-	-	V/ μs	$V_{PEAK}=400\text{V},$ $I_F=0$	3
TRANSFER CHARACTERISTICS								
LED Trigger Current	TWS3010,TWS3021, TWS3051,TWS3071	I_{FT}	-	-	15	mA	Terminal Voltage = 3V $I_{TM}=100\text{mA}$	
	TWS3011,TWS3022, TWS3052,TWS3072		-	-	10			
	TWS3012,TWS3023, TWS3053,TWS3073		-	-	5			
Holding Current		I_H	-	257	-	μA		
Isolation Resistance		R_{iso}	10^{12}	10^{14}	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance		C_{IO}	-	0.8	-	pF	$V=0, f=1\text{MHz}$	

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

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

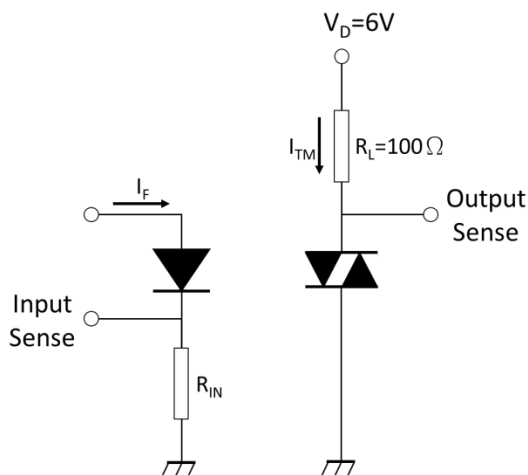


Fig.14 Waveforms of Turn On Time

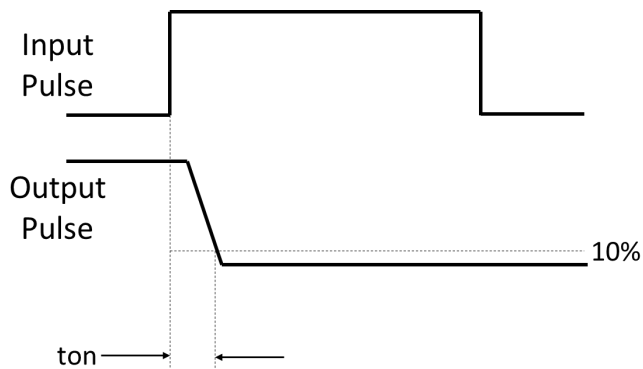


Fig.15 Test Circuits of dV/dt

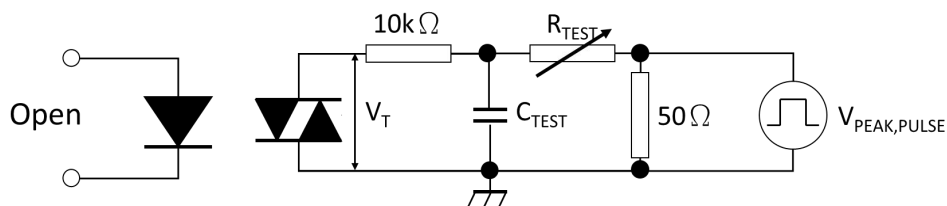
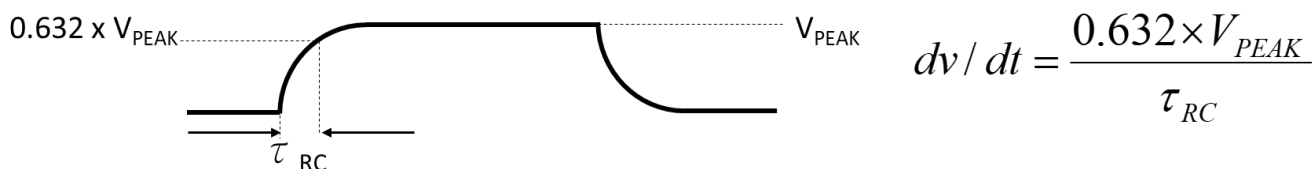
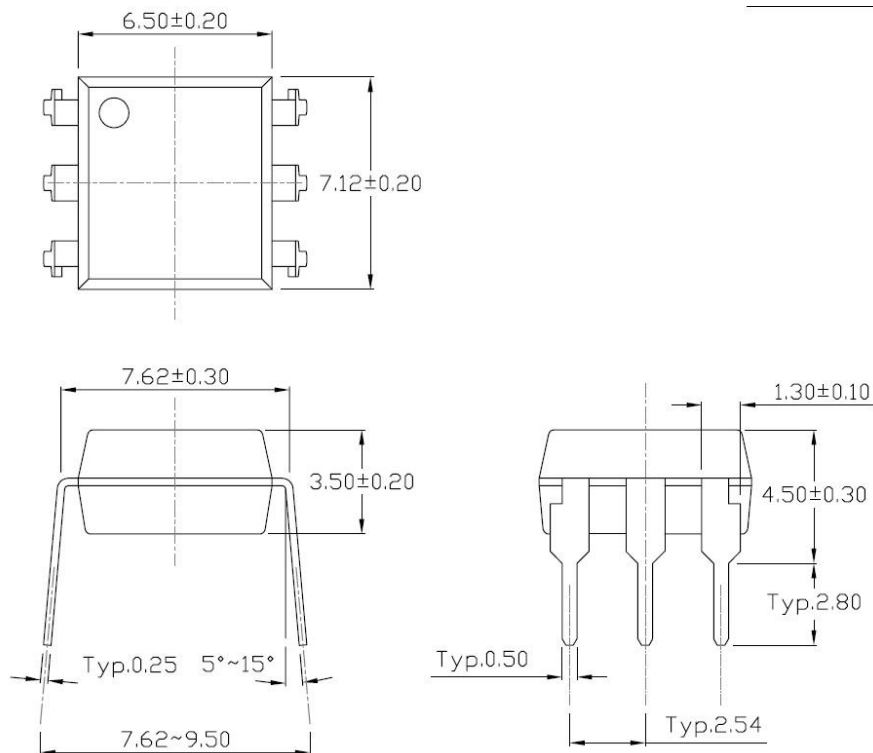
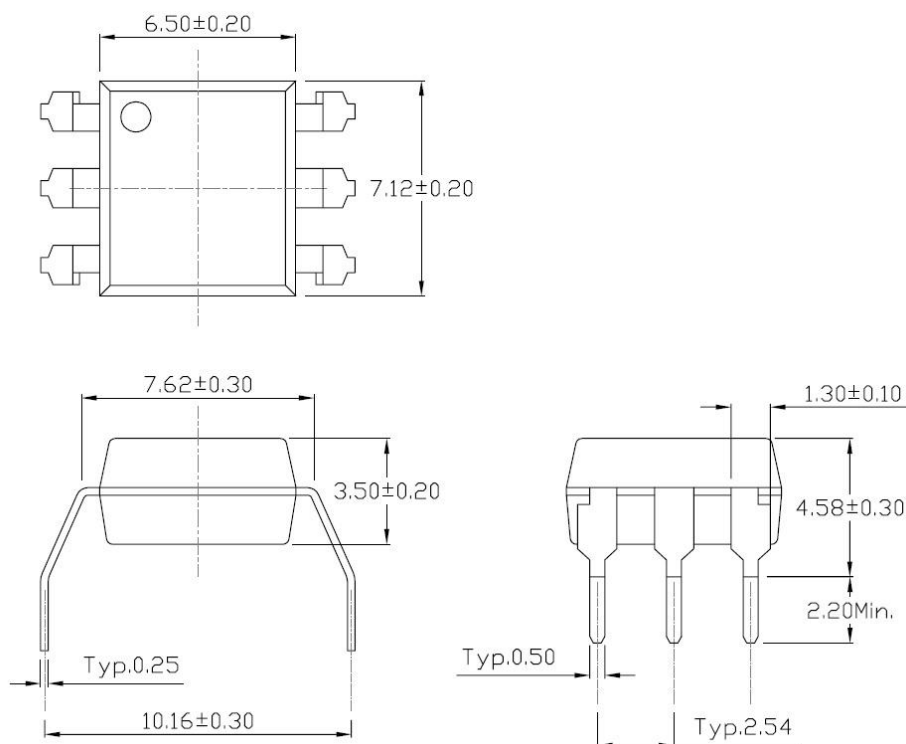
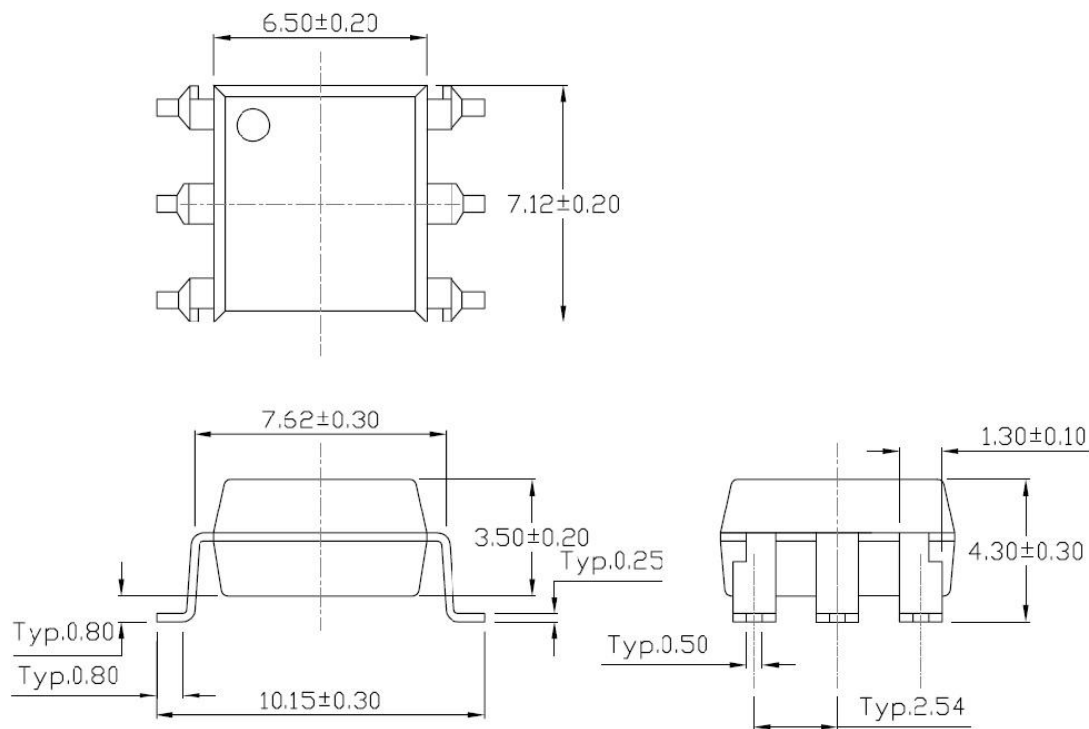
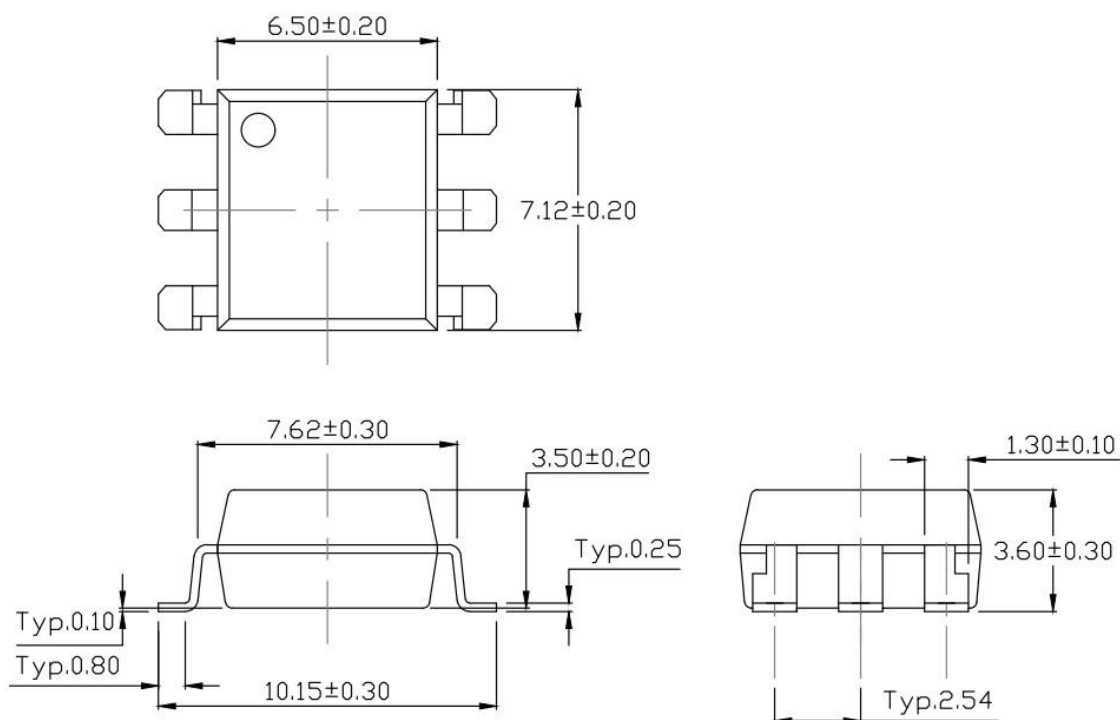
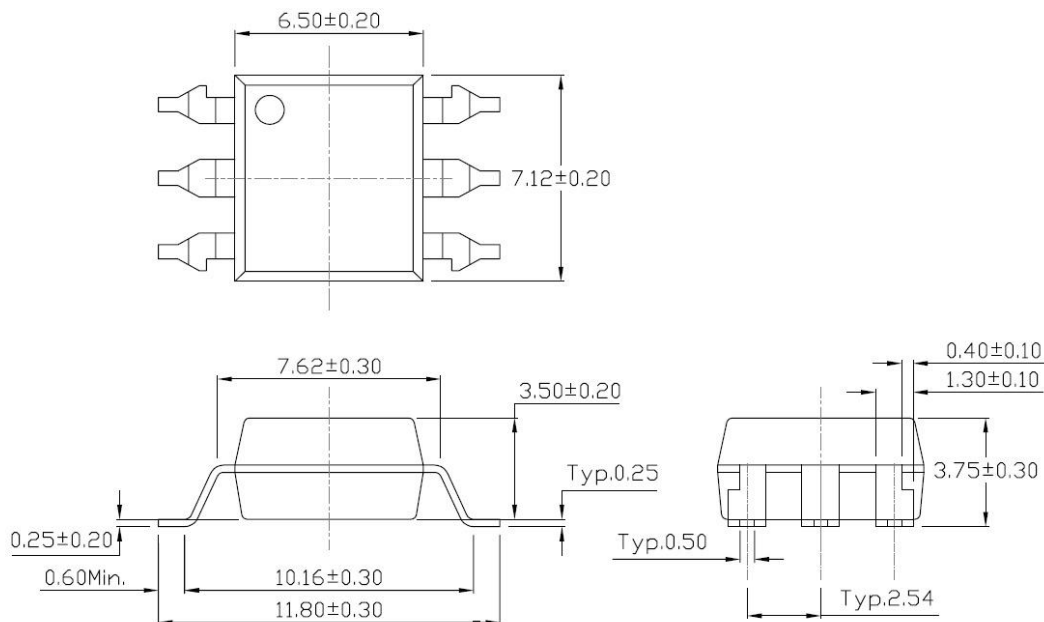
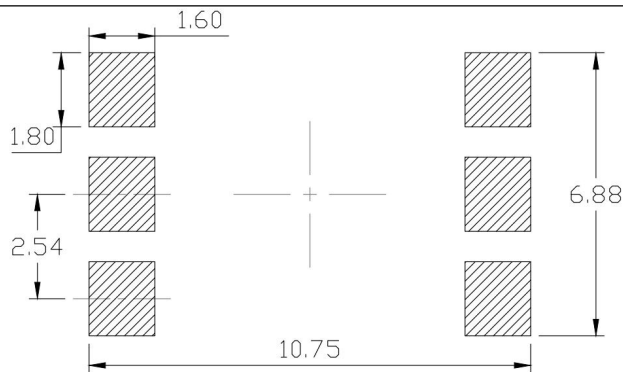
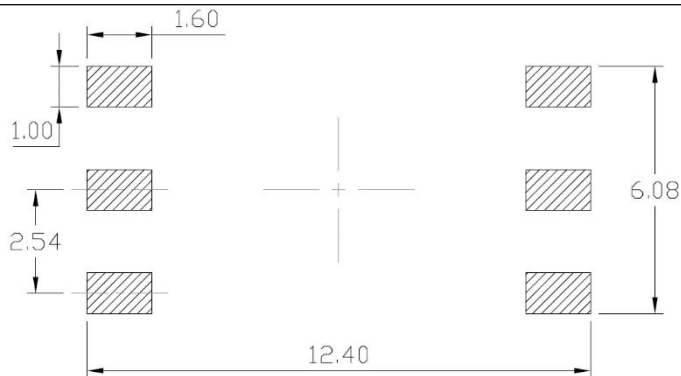


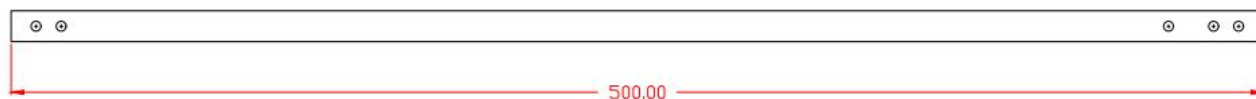
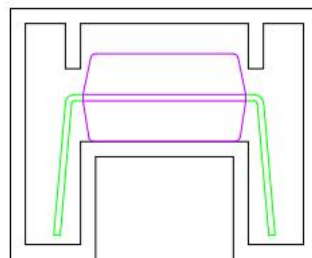
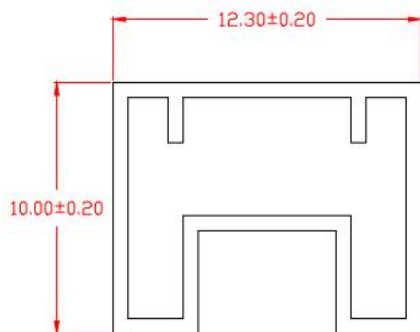
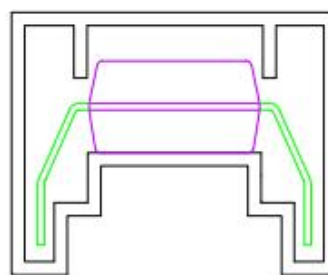
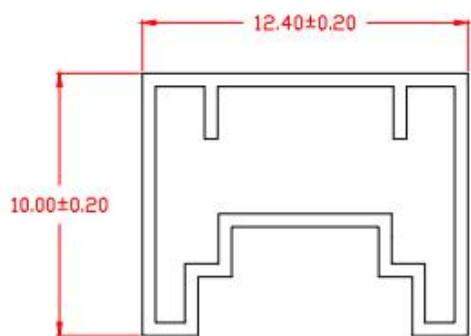
Fig.16 Waveforms of dV/dt

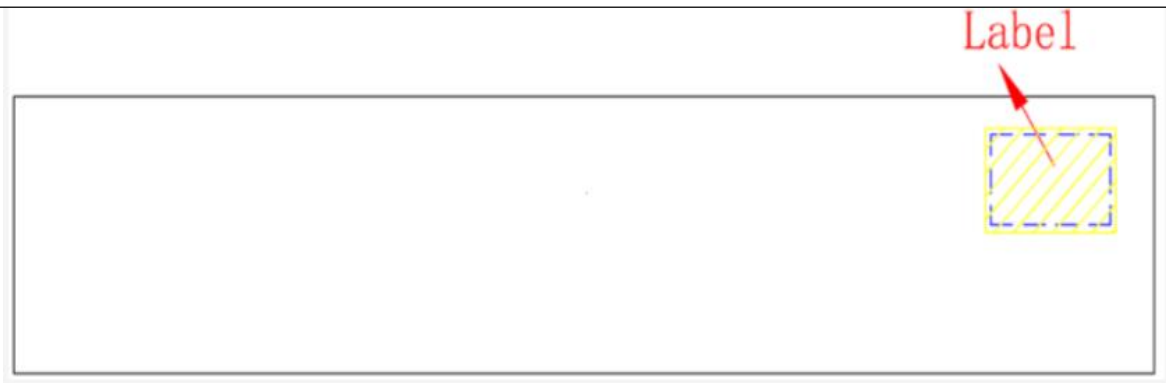
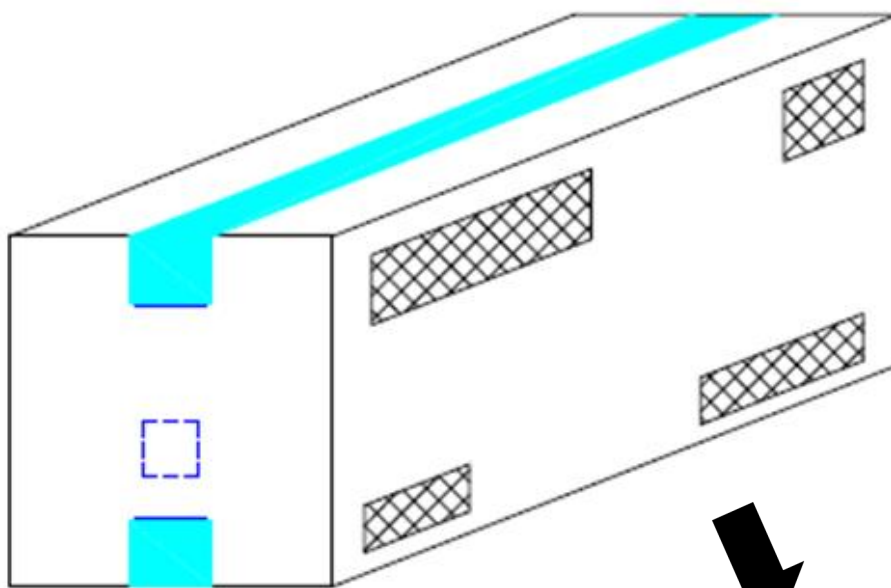


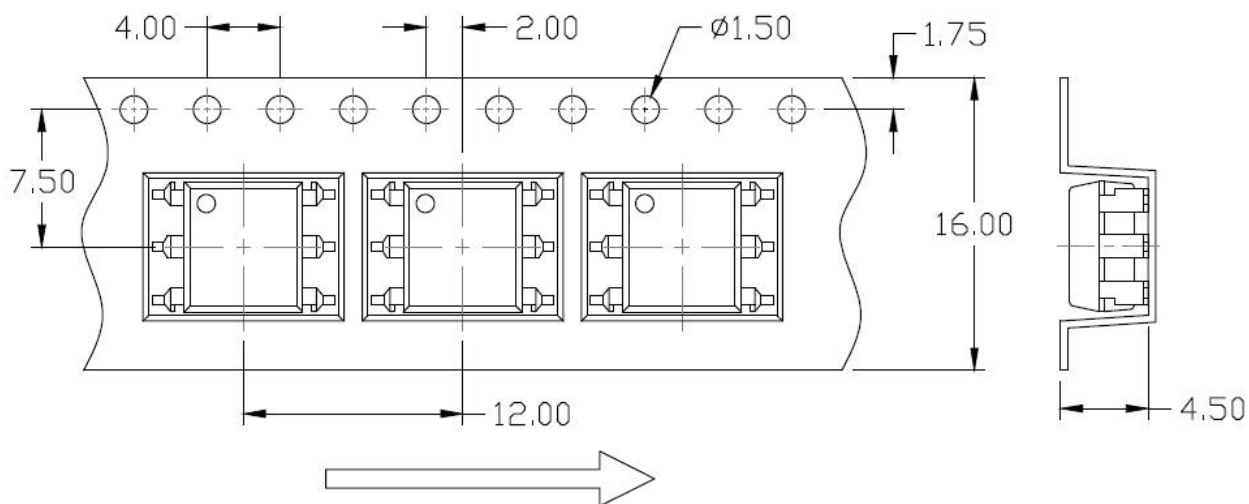
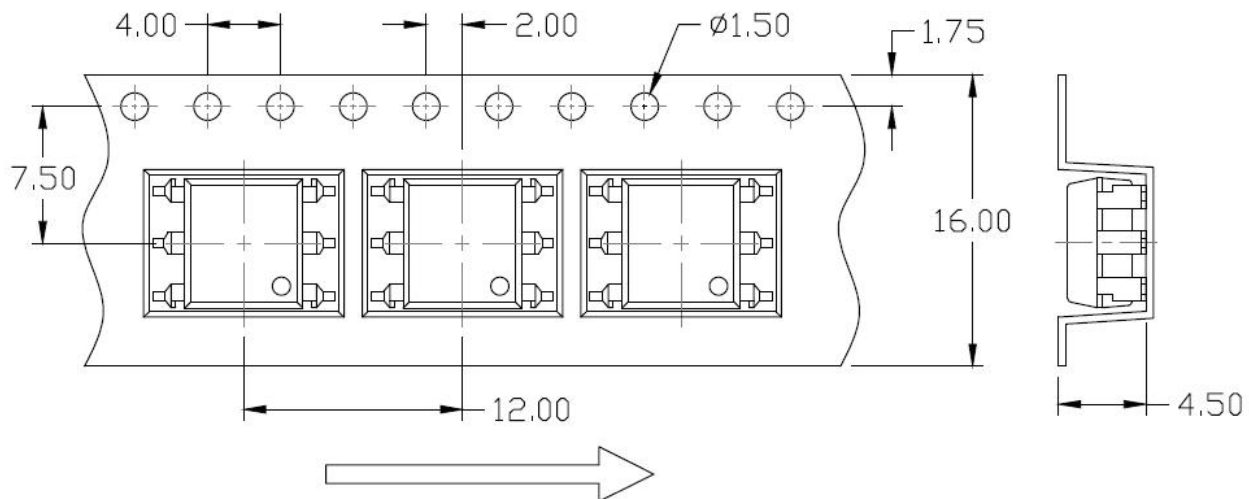
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**Standard DIP – Through Hole (DIP Type)****Gullwing (400mil) Lead Forming – Through Hole (M Type)**

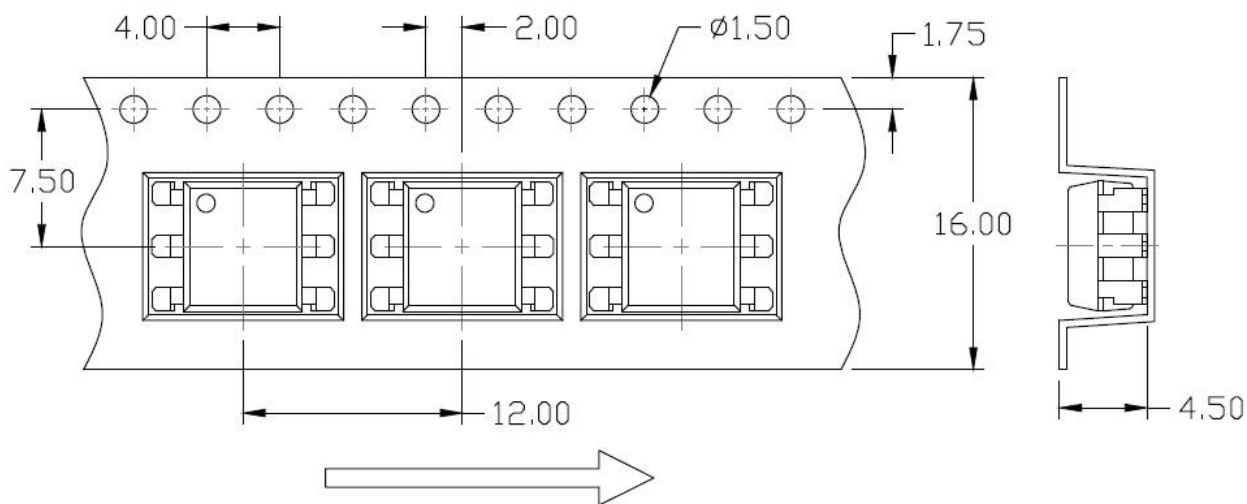
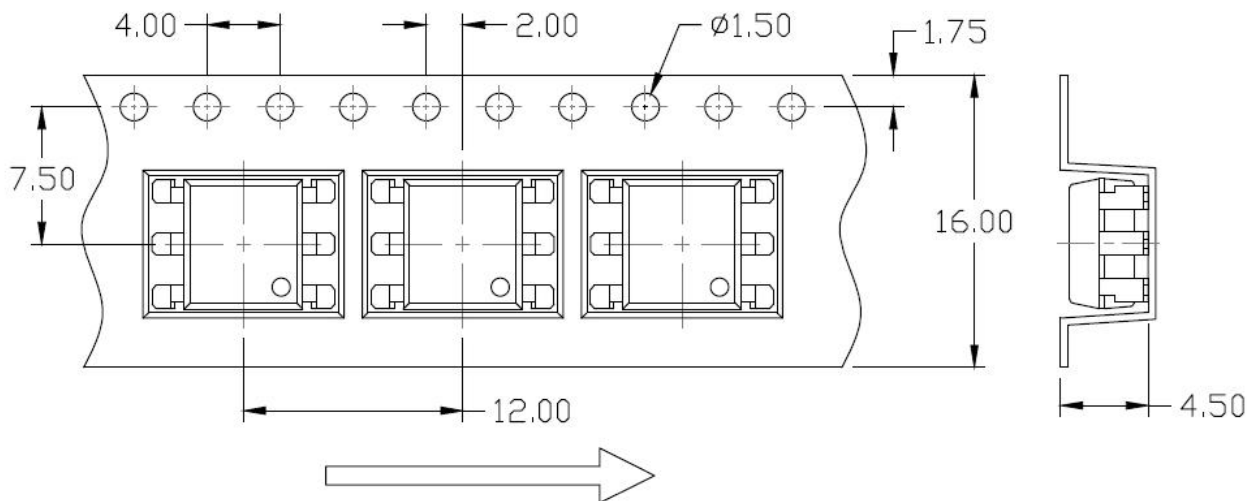
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**Surface Mount Lead Forming (S Type)****Surface Mount (Low Profile) Lead Forming (SL Type)**

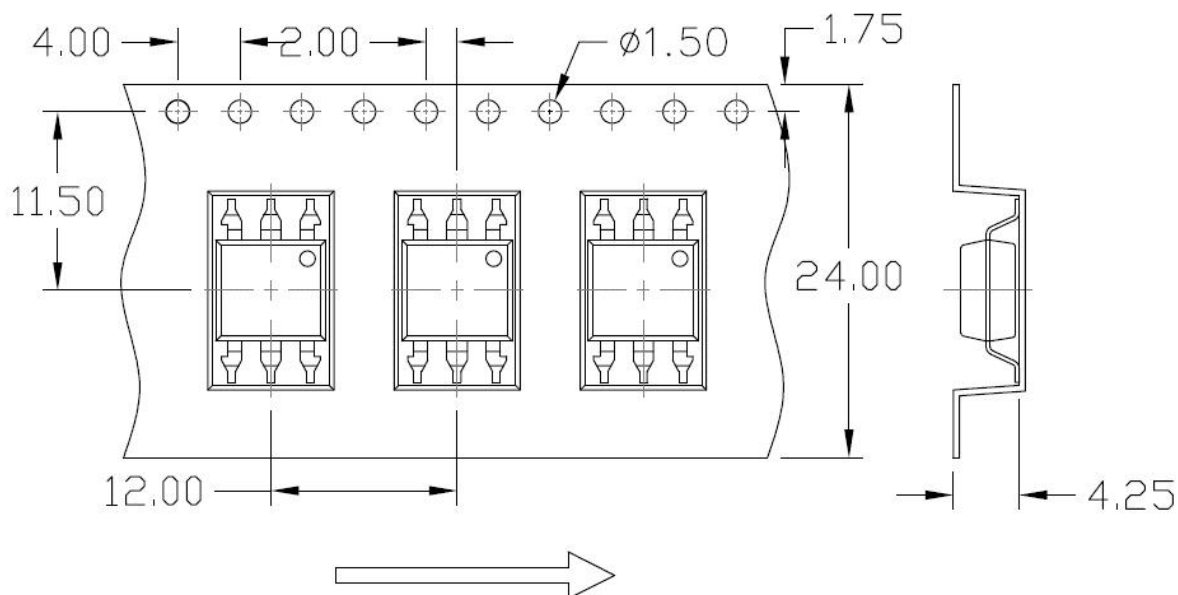
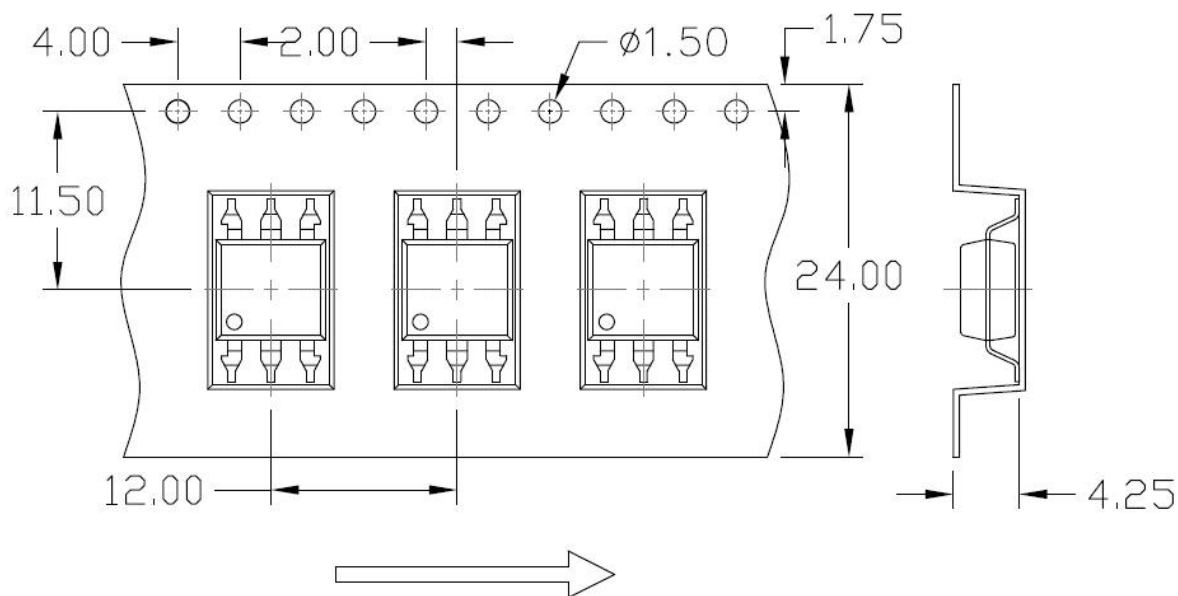
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**Surface Mount (Low Profile) Lead Forming (SLM Type)****RECOMMENDED SOLDER MASK** (Dimensions in mm unless otherwise stated)**Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming****Surface Mount (Gullwing) Lead Forming**

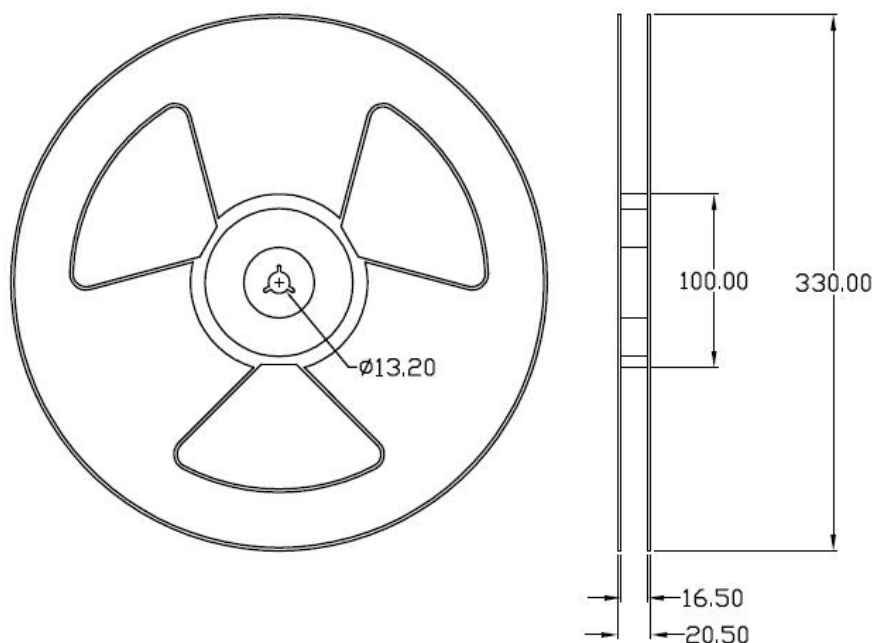
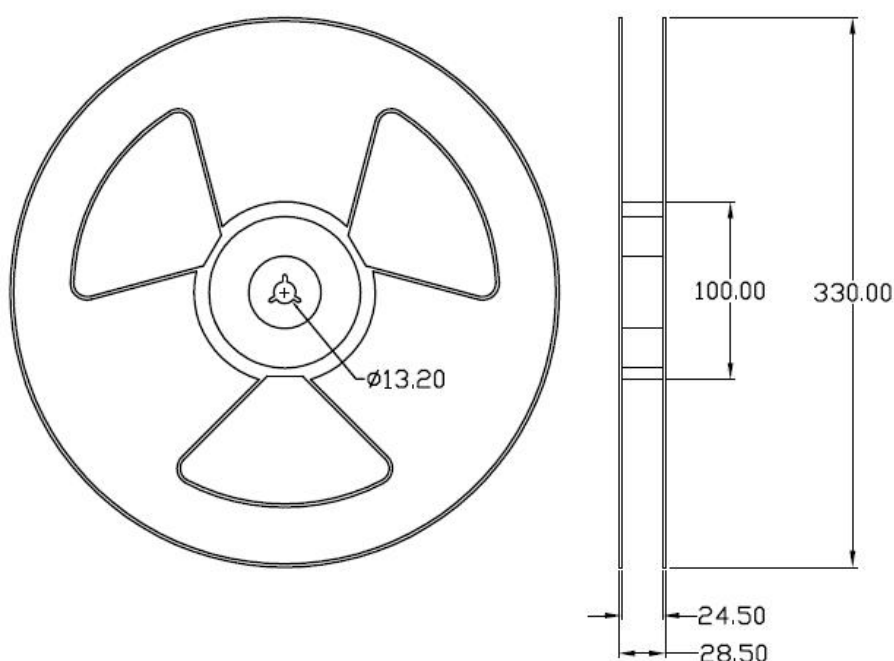
TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**Standard DIP****Option M**

BOX SPECIFICATIONS (Tube Type)**Inner Box** $L \times W \times H = 52.5\text{cm} \times 10.7\text{cm} \times 4.7\text{cm}$ **Outer Box** $L \times W \times H = 53.5\text{cm} \times 23.5\text{cm} \times 25.5\text{cm}$ 

CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**Option S(T1)****Option S(T2)**

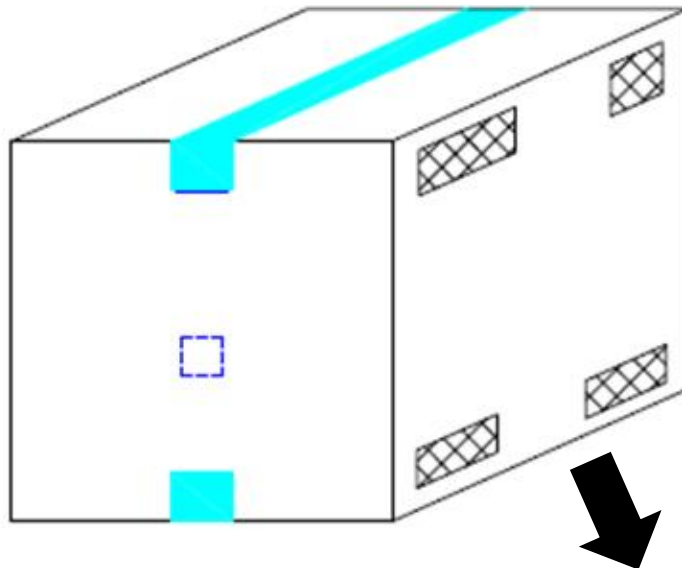
CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**Option SL(T1)****Option SL(T2)**

Carrier Tape Specifications (Dimensions in mm unless otherwise stated)**Option SLM(T1)****Option SLM(T2)**

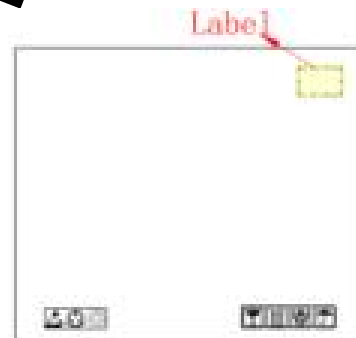
REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)**Option S & Option SL****Option SLM**

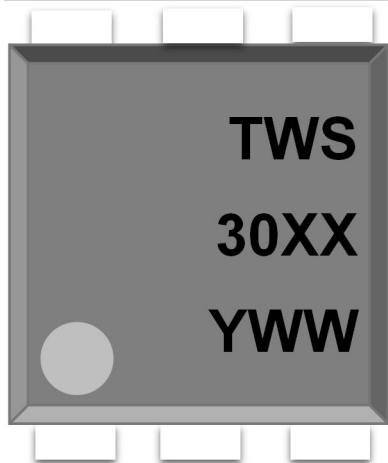
BOX SPECIFICATIONS (Reel Type)**Inner Box**

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

Outer Box

- Option1: L x W x H = 45cm x 38cm x 38cm
- Option2: L x W x H = 39cm x 38cm x 38cm



ORDERING AND MARKING INFORMATION**MARKING INFORMATION**

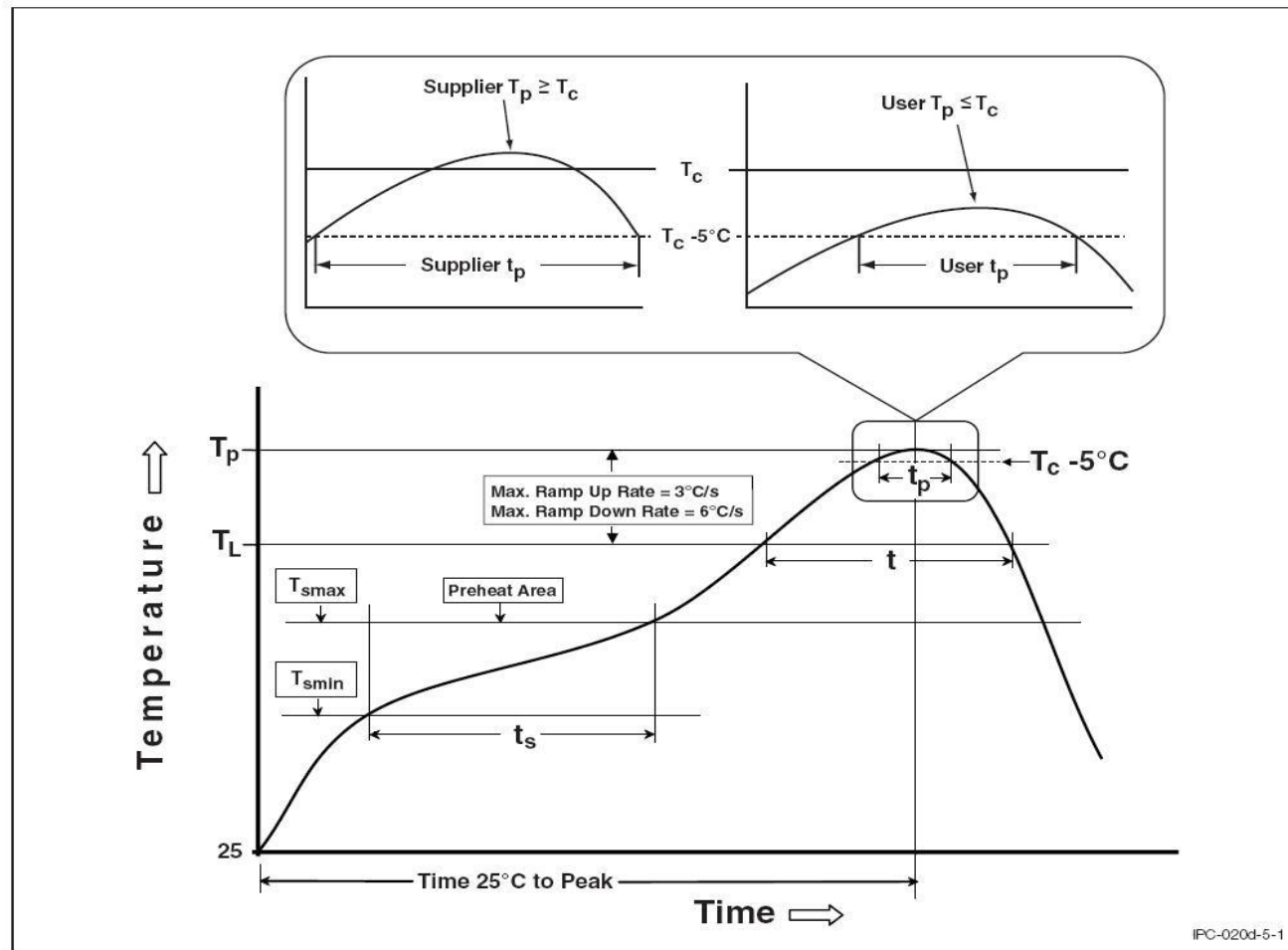
TWS : Company Abbr.
30XX : Part Number & Rank
Y : Fiscal Year
WW : Work Week

ORDERING INFORMATION**LABEL INFORMATION****TWS30XX(Y)(Z)-G**

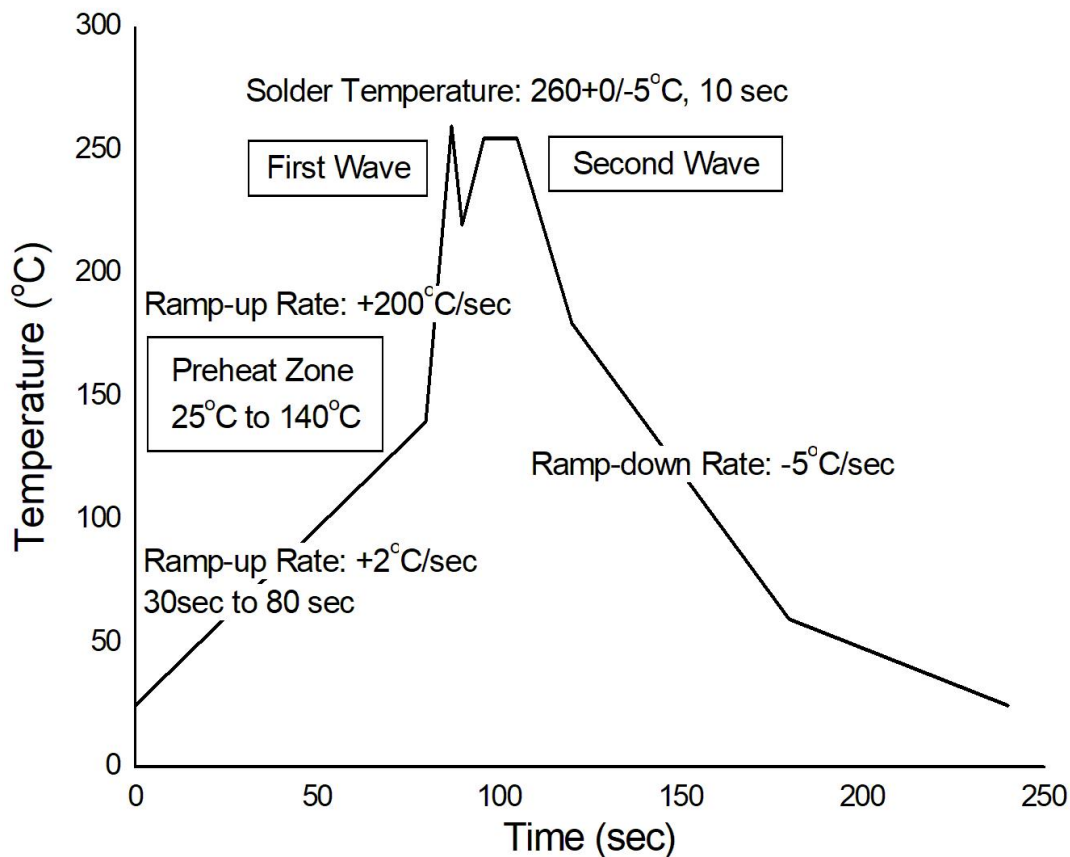
TWS – Company Abbr.
 30XX – Part Number
 (10/11/12/21/22/23/51/52/53/71/72/73)
 Y – Lead Form Option (M/S/SL/SLM/None)
 Z – Tape and Reel Option (T1/T2)
 G – Green Option (G or None)

**Packing Quantity**

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	65 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 20.8k Units
M	65 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 20.8k 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
SLM(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SLM(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. (T _{smin})	100	150°C
Temperature Max. (T _{smax})	150	200°C
Time (t _s) from (T _{smin} to T _{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.	3°C/second max.
Liquidous Temperature (T _L)	183°C	217°C
Time (t _L) Maintained Above (T _L)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T _P to T _L)	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±0/-5°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

- TWS is continually improving the quality, reliability, function and design. TWS reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- TWS makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, TWS disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular
- The products shown in this publication are designed for the general use in electronic applications such as office automation, equipment, communications devices, audio/visual equipment, electrical application and instrumentation purpose, non-infringement and merchantability.
- 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 TWS 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 TWS'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.