



Description

The 6N137, TD2601, TD2611 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed integrated photo-detector logic gate with a strobable output in a plastic DIP8 package with different lead forming options.

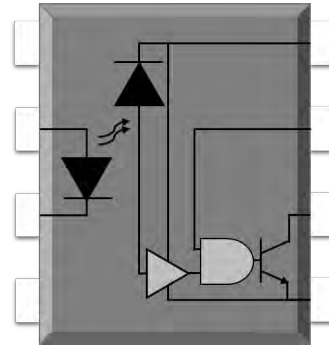
Features

- High isolation 5000 VRMS
- DC input with logic gate output
- Operating temperature range - 55 °C to 100 °C
- REACH compliance
- Halogen free (Optional)
- MSL class 1
- Regulatory Approvals (Pending Approved)
 - UL - UL1577
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC - GB4943.1, GB8898
 - cUL- CSA Component Acceptance Service Notice No. 5A

Applications

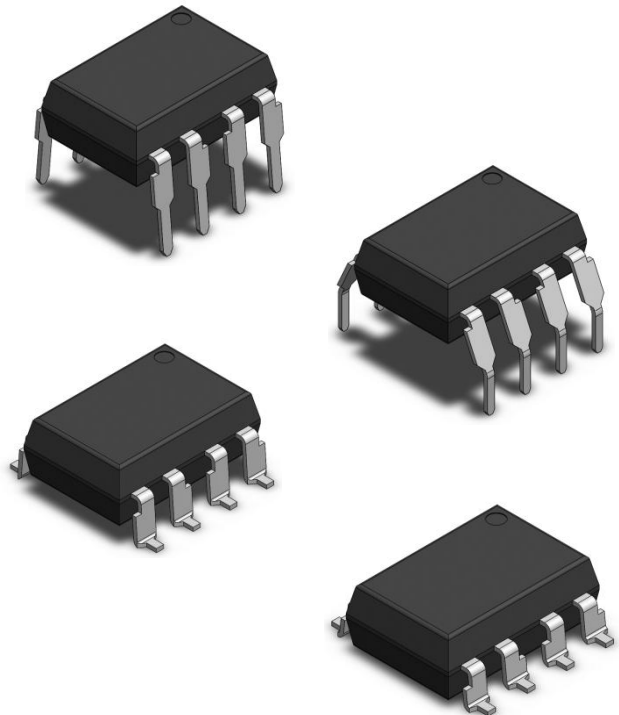
- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supply
- Pulse transformer replacement
- Computer-peripheral interface

SCHEMATIC



PIN DEFINITION

1.NC	8.VCC
2.Anode	7.VE
3.Cathode	6.VO
4.NC	5.GND





ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
Forward Current	I_F	25	mA	
Peak Forward Current	I_{FP}	50	mA	1
Peak Transient Current	$I_{F(trans)}$	1	A	2
Reverse Voltage	V_R	5	V	
Enable Voltage	V_E	VCC+0.5	V	
Input Power Dissipation	P_I	100	mW	
OUTPUT				
Supply Voltage	V_{CC}	7	V	
Output Voltage	V_O	7	V	
Output Current	I_o	50	mA	
Output Power Dissipation	P_o	85	mW	
COMMON				
Total Power Dissipation	P_{tot}	200	mW	
Isolation Voltage	V_{iso}	5000	V _{rms}	3
Operating Temperature	T_{opr}	-55~100	°C	
Storage Temperature	T_{stg}	-55~125	°C	
Soldering Temperature	T_{sol}	260	°C	4

Note 1. 50% duty, 1ms P.W

Note 2. $\leq 1\mu s$ P.W,300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds



RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	TA	-40	100	°C
Supply Voltage	VCC	2.7	3.6	V
	VCC	4.5	5.5	V
Low Level Input Current	IFL	0	250	μA
High Level Input Current	IFH	5	15	mA
Low Level Enable Voltage	VEL	0	0.8	V
High Level Enable Voltage	VEH	2	VCC	V
Output Pull-up Resistor	RL	330	4k	Ω
Fan Out (at RL=1kΩ per channel)	N	-	5	TTL Loads

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V _F	-	1.38	1.8	V	I _F =10mA	
Reverse Current	I _R	-	-	10	μA	V _R =5V	
Input Capacitance	C _{in}	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I _{CCH}	-	6.3	10	mA	I _F =0mA, V _E =0.5V, V _{CC} =5.5V	
Low Level Supply Current	I _{CCL}	-	8.3	13	mA	I _F =10mA, V _{CC} =5.5V	
High Level Enable Current	I _{EH}	-	-0.52	-1.6	mA	V _E =2.0V, V _{CC} =5.5V	
Low Level Enable Current	I _{EL}	-	-0.75	-1.6	mA	V _E =0.5V, V _{CC} =5.5V	
High Level Enable Voltage	V _{EH}	2.0	-	-	V	I _F =10mA, V _{CC} =5.5V	
Low Level Enable Voltage	V _{EL}	-	-	0.8	V	I _F =10mA, V _{CC} =5.5V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I _{OH}	-	0.73	100	μA	V _{CC} =5.5V, V _O =5.5V, I _F =250μA, V _E =2.0V	
Low Level Output Voltage	V _{OL}	-	0.28	0.6	V	V _{CC} =5.5V, I _F =5mA, V _E =2.0V, I _{CL} =13mA	
Input Threshold Current	I _{FT}	-	2.5	5	mA	V _{CC} =5.5V, V _O =0.6V, V _E =2.0V, I _{OL} =13mA	
Isolation Resistance	R _{iso}	10 ¹²	10 ¹⁴	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C _{io}	-	1.0	-	pF	V=0, f=1MHz	



ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V _{CC} =5V, I _F =7.5mA unless specified otherwise)							
Propagation Delay Time to Output Low Level	TPHL	-	35	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	
Propagation Delay Time to Output High Level	TPLH	-	40	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	
Pulse Width Distortion	TPHL-TPLH	-	5	35	ns	C _L =15pF, R _L =350Ω	
Rise Time	tr	-	27	-	ns	C _L =15pF, R _L =350Ω	
Fall Time	tf	-	7	-	ns	C _L =15pF, R _L =350Ω	
Enable Propagation Delay Time to Output Low Level	TEHL	-	15	-	ns	I _F =7.5mA, V _{EH} =3.5V, C _L =15pF, R _L =350Ω	
Enable Propagation Delay Time to Output High Level	TELH	-	15	-	ns	I _F =7.5mA, V _{EH} =3.5V, C _L =15pF, R _L =350Ω	
Common Mode Transient Immunity at Logic High	6N137	-	-	-	V/μs	I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =10Vp-p	
	TD2601	5000	-	-		I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =50Vp-p	
	TD2611	10000	-	-		I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	-	-	-	V/μs	I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =10Vp-p	
	TD2601	5000	-	-		I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =50Vp-p	
	TD2611	10000	-	-		I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	



6N137,TD2601,TD2611 Series

DIP8, 10Mbit/s High Speed Logic Gate Photo Coupler

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V _F	-	1.38	1.8	V	I _F =10mA	
Reverse Current	I _R	-	-	10	μA	V _R =5V	
Input Capacitance	C _{in}	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I _{CCH}	-	4.3	10	mA	I _F =0mA, V _E =0.5V, V _{CC} =3.3V	
Low Level Supply Current	I _{CCL}	-	6.4	13	mA	I _F =10mA, V _{CC} =3.3V	
High Level Enable Current	I _{EH}	-	-0.21	-1.6	mA	V _E =2.0V, V _{CC} =3.3V	
Low Level Enable Current	I _{EL}	-	-0.42	-1.6	mA	V _E =0.5V, V _{CC} =3.3V	
High Level Enable Voltage	V _{EH}	2.0	-	-	V	I _F =10mA, V _{CC} =3.3V	
Low Level Enable Voltage	V _{EL}	-	-	0.8	V	I _F =10mA, V _{CC} =3.3V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I _{OH}	-	4.1	100	μA	V _{CC} =3.3V, V _O =3.3V, I _F =250μA, V _E =2.0V	
Low Level Output Voltage	V _{OL}	-	0.29	0.6	V	V _{CC} =3.3V, I _F =5mA, V _E =2.0V, I _{CL} =13mA	
Input Threshold Current	I _{FT}	-	2.2	5	mA	V _{CC} =3.3V, V _O =0.6V, V _E =2.0V, I _{OL} =13mA	
Isolation Resistance	R _{iso}	10 ¹²	10 ¹⁴	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C _{io}	-	1.0	-	pF	V=0, f=1MHz	



ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V _{CC} =3.3V, I _F =7.5mA unless specified otherwise)							
Propagation Delay Time to Output Low Level	TPHL	-	35	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	
Propagation Delay Time to Output High Level	TPLH	-	47	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	
Pulse Width Distortion	TPHL-TPLH	-	12	35	ns	C _L =15pF, R _L =350Ω	
Rise Time	tr	-	30	-	ns	C _L =15pF, R _L =350Ω	
Fall Time	tf	-	8.5	-	ns	C _L =15pF, R _L =350Ω	
Enable Propagation Delay Time to Output Low Level	TEHL	-	15	-	ns	I _F =7.5mA, V _{EH} =3.3.3V, C _L =15pF, R _L =350Ω	
Enable Propagation Delay Time to Output High Level	TELH	-	15	-	ns	I _F =7.5mA, V _{EH} =3.3.3V, C _L =15pF, R _L =350Ω	
Common Mode Transient Immunity at Logic High	6N137	-	-	-	V/μs	I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =10Vp-p	
	TD2601	5000	-	-		I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =50Vp-p	
	TD2611	10000	-	-		I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	-	-	-	V/μs	I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =10Vp-p	
	TD2601	5000	-	-		I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =50Vp-p	
	TD2611	10000	-	-		I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	



CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Forward Voltage

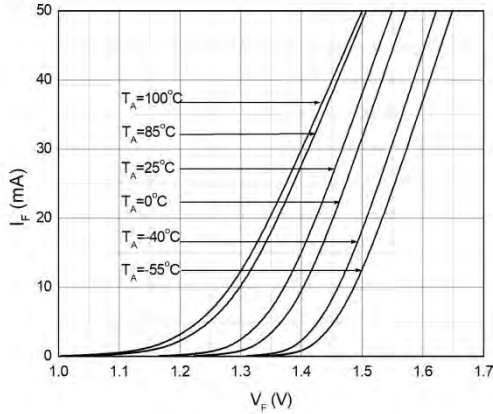


Fig.2 Forward Voltage vs. Ambient Temperature

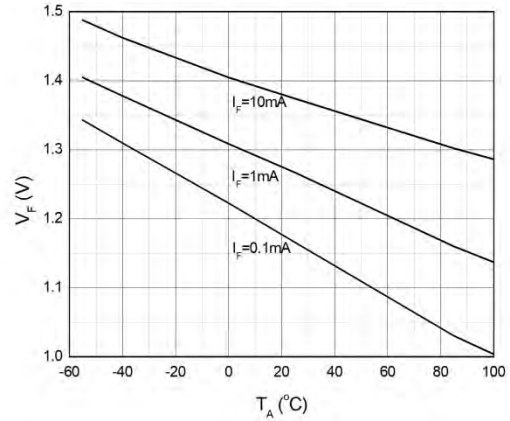


Fig.3 Input Threshold Current vs. Ambient Temperature

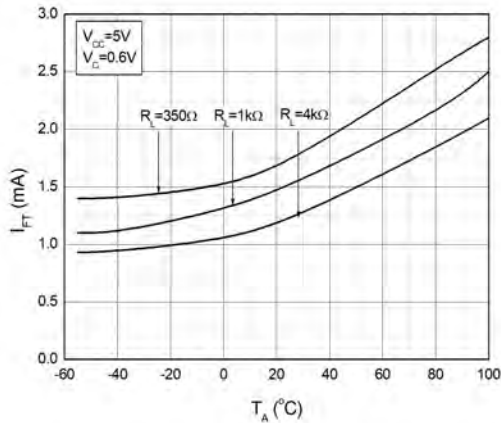


Fig.4 Input Threshold Current vs. Ambient Temperature

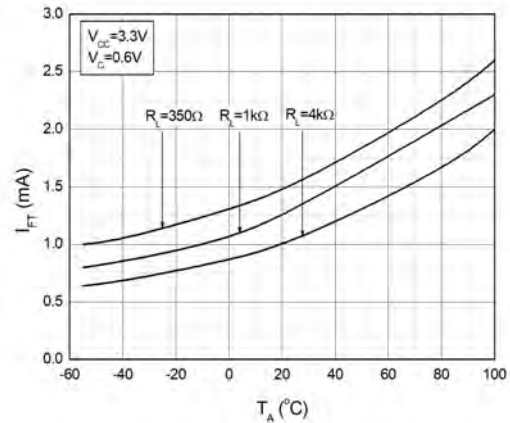


Fig.5 Low Level Output Current vs. Ambient Temperature

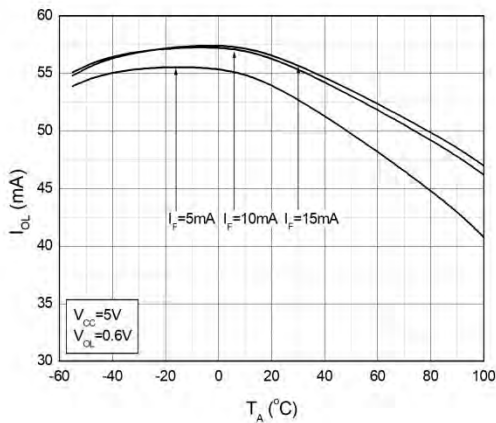
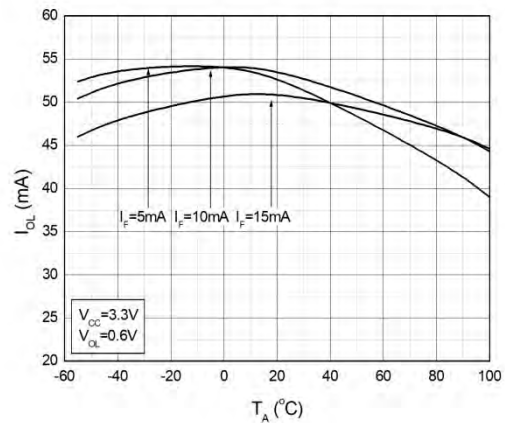


Fig.6 Low Level Output Current vs. Ambient Temperature





CHARACTERISTIC CURVES

Fig.7 Low Level Output Voltage vs. Ambient Temperature

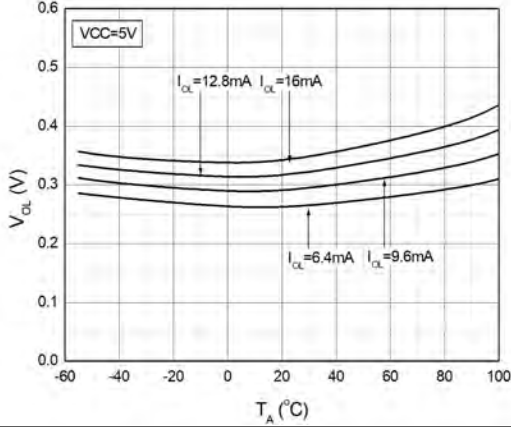


Fig.8 Low Level Output Voltage vs. Ambient Temperature

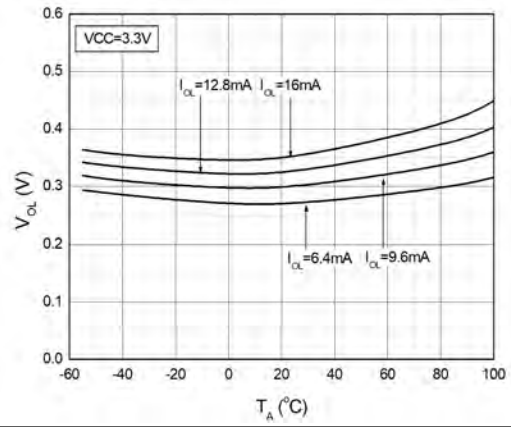


Fig.9 High Level Output Current vs. Ambient Temperature

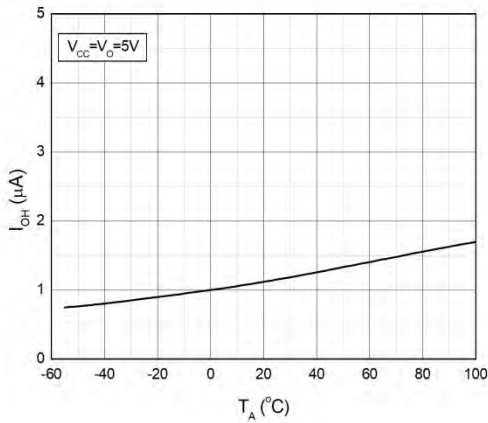


Fig.10 High Level Output Current vs. Ambient Temperature

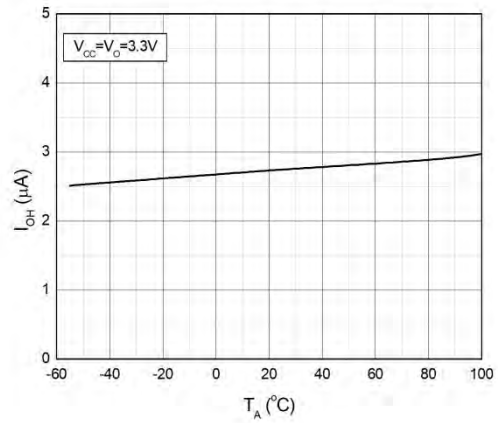


Fig.11 Output Voltage vs. Forward Current

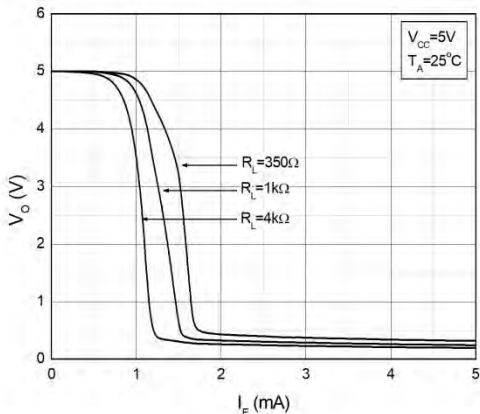
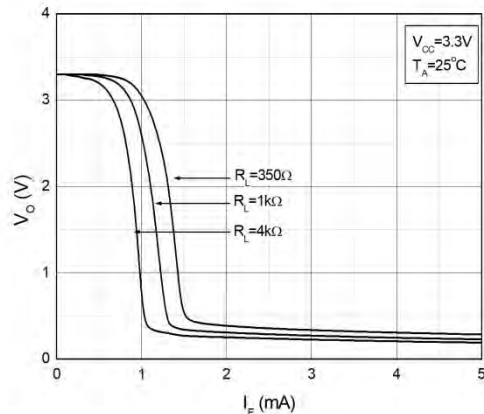


Fig.12 Output Voltage vs. Forward Current





CHARACTERISTIC CURVES

Fig.13 Propagation Delay vs. Forward Current

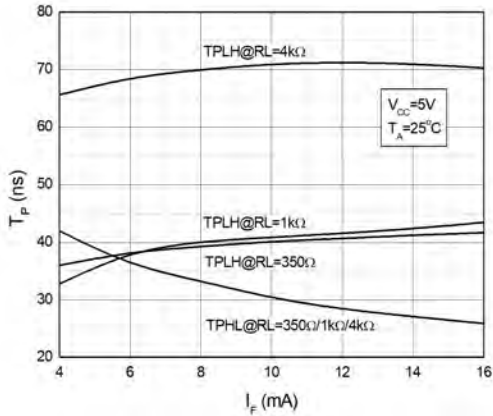


Fig.14 Propagation Delay vs. Forward Current

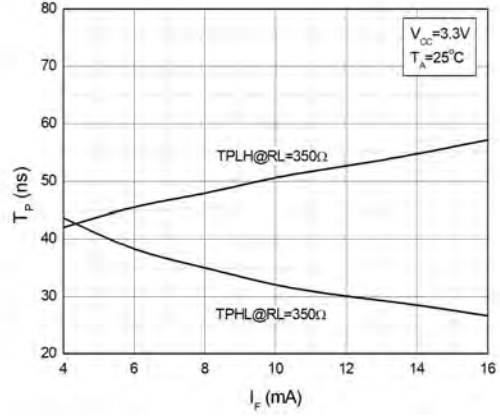


Fig.15 Rise and Fall Time vs. Ambient Temperature

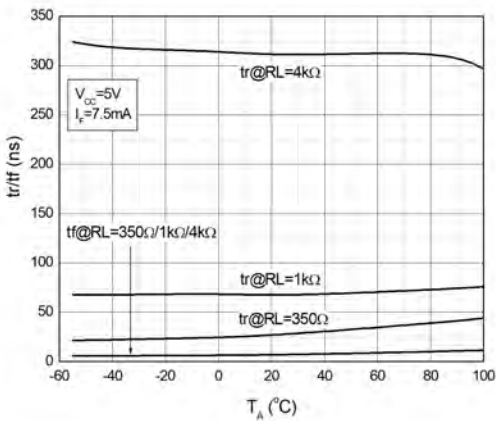


Fig.16 Rise and Fall Time vs. Ambient Temperature

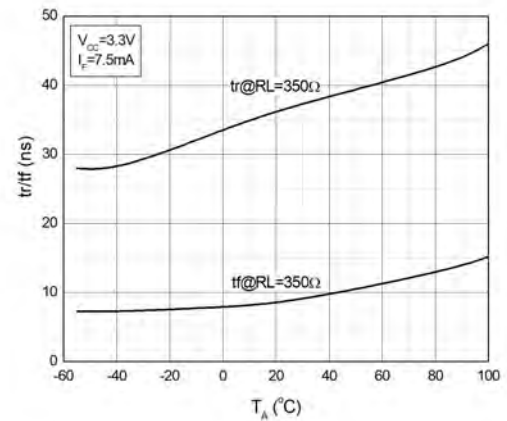


Fig.17 Propagation Delay vs. Ambient Temperature

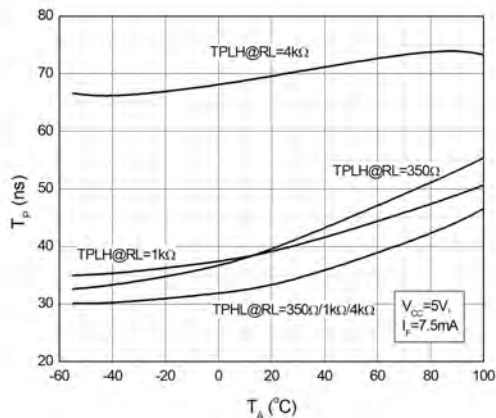
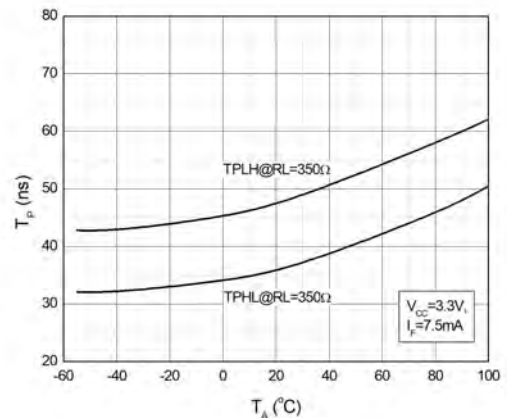


Fig.18 Propagation Delay vs. Ambient Temperature





CHARACTERISTIC CURVES

Fig.19 Pulse Width Distortion vs. Ambient Temperature

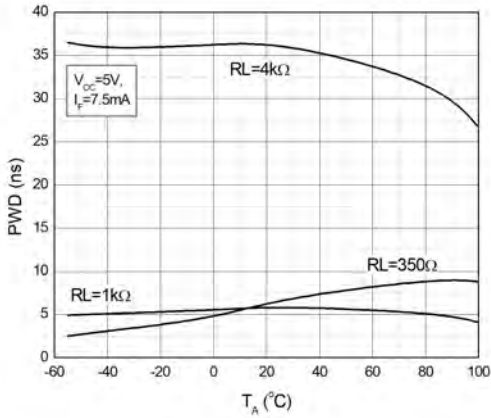


Fig.20 Pulse Width Distortion vs. Ambient Temperature

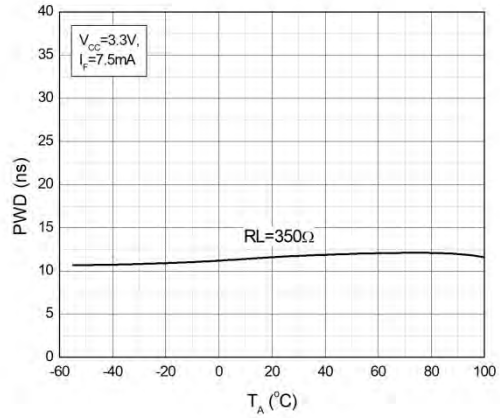


Fig.21 Enable Propagation Delay vs. Ambient Temperature

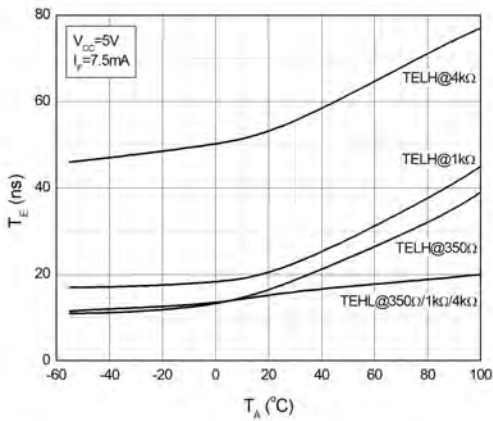
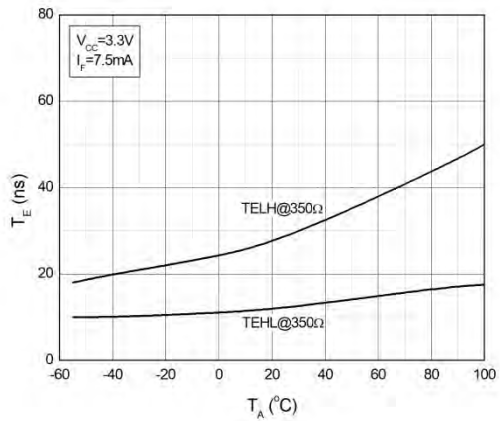


Fig.22 Enable Propagation Delay vs. Ambient Temperature



TEST CIRCUITS

Fig.23 Test Circuits for TPHL, TPLH, tr, tf

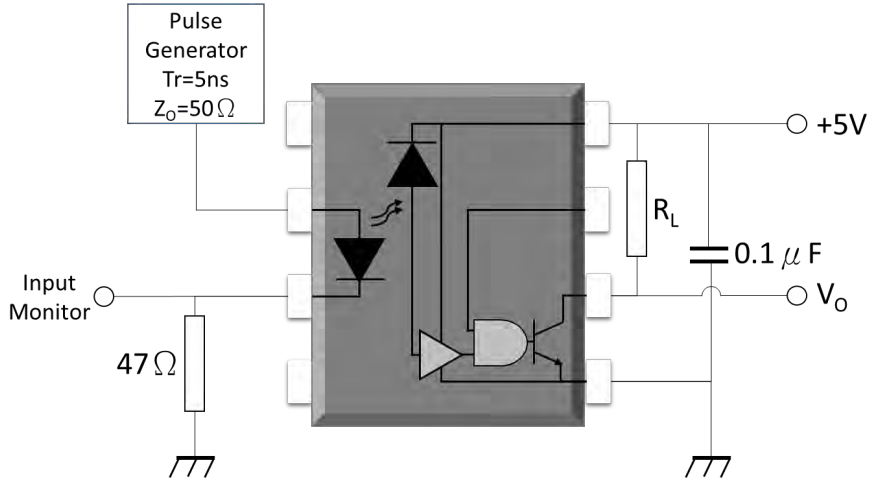
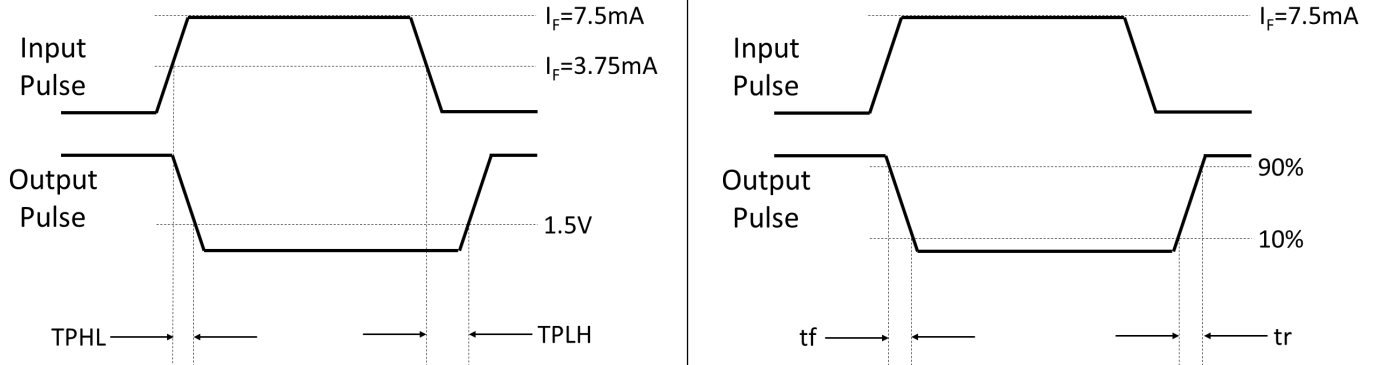


Fig.24 Waveforms of TPHL, TPLH, tr, tf



TEST CIRCUITS

Fig.25 Test Circuits for TEHL, TELH

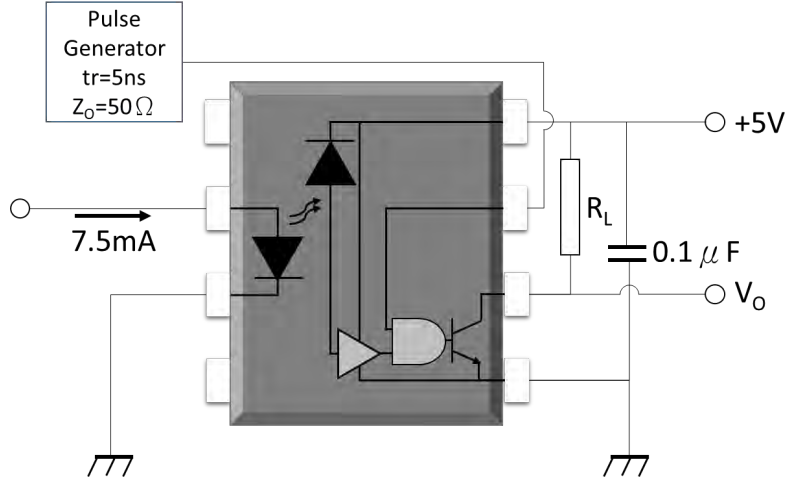
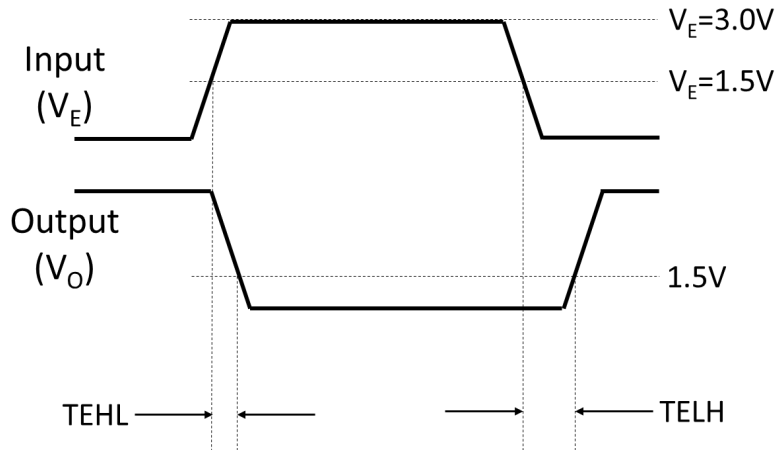


Fig.26 Waveforms of TEHL, TELH



TEST CIRCUITS

Fig.25 Test Circuits for Common Mode Transient Immunity

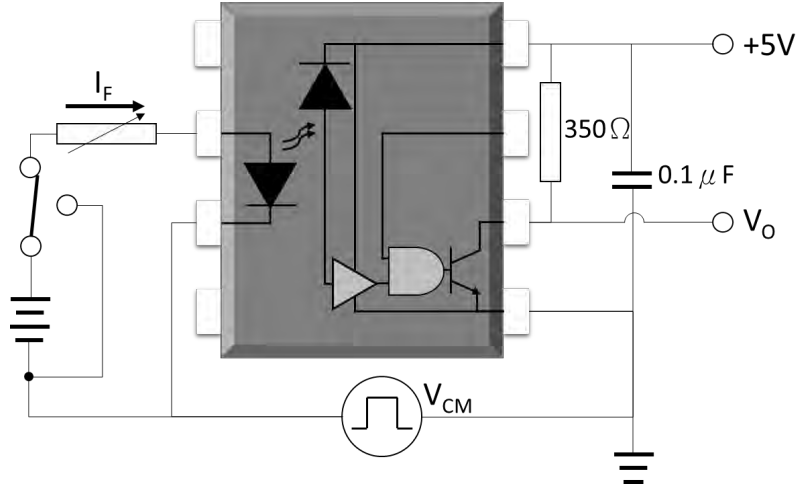
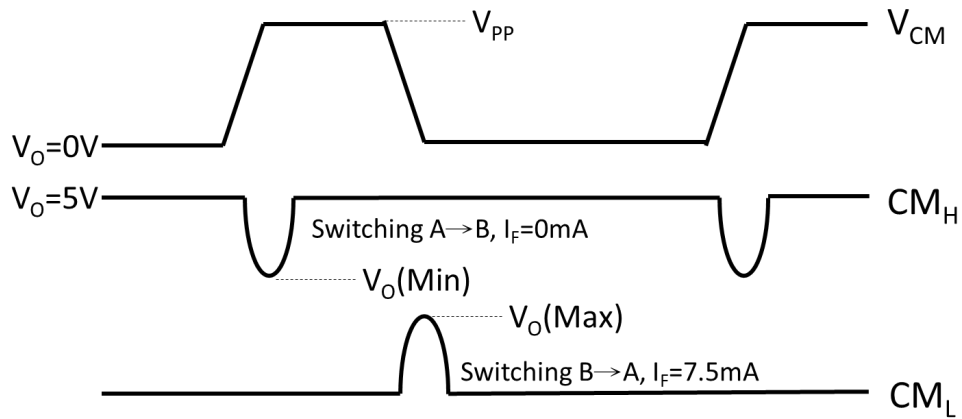


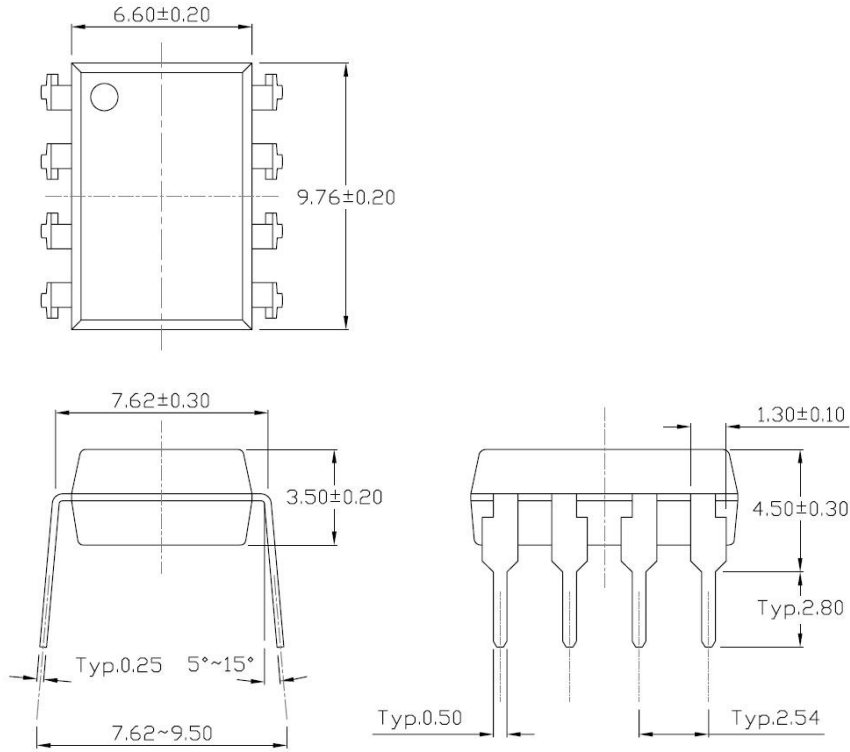
Fig.26 Waveforms of Common Mode Transient Immunity



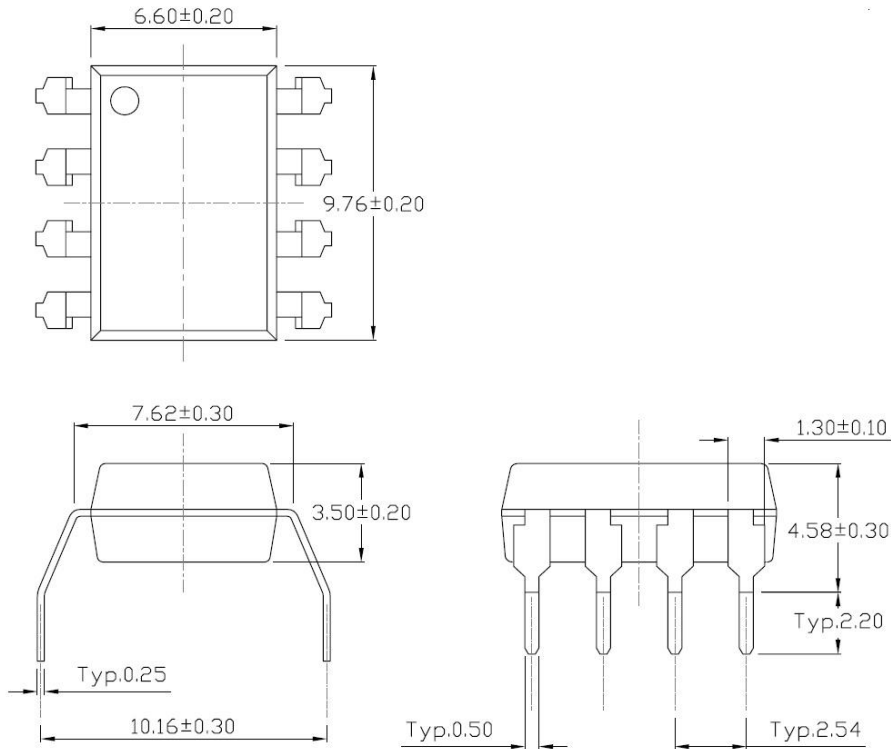


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Standard DIP – Through Hole (DIP Type)

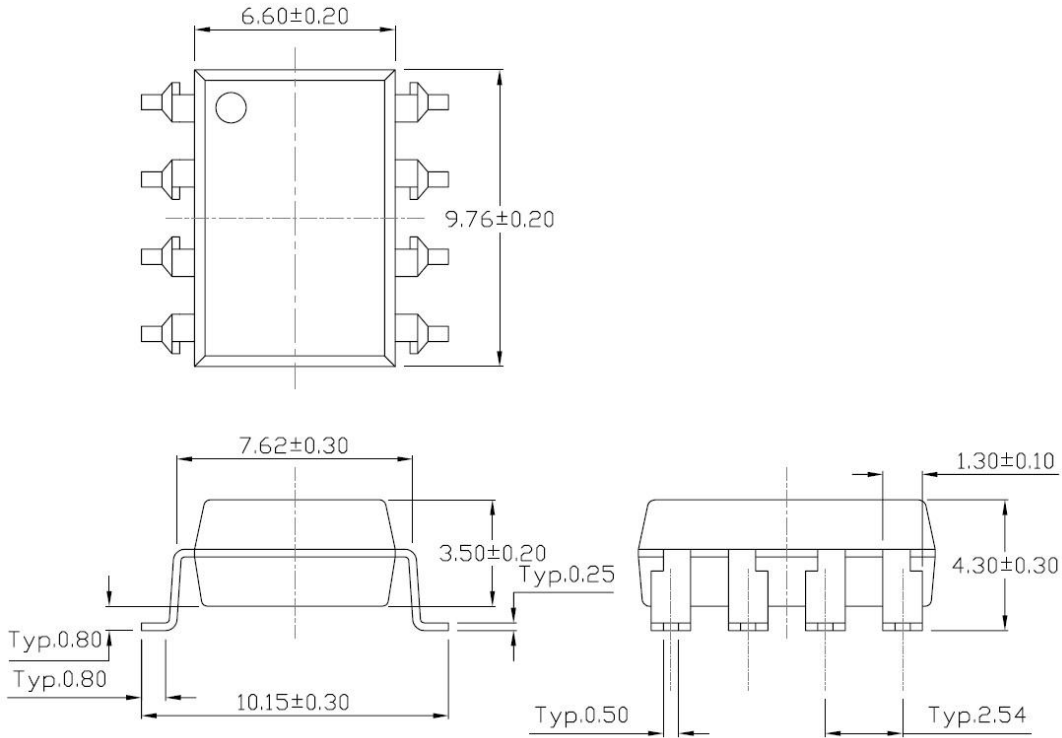


Gullwing (400mil) Lead Forming – Through Hole (M Type)

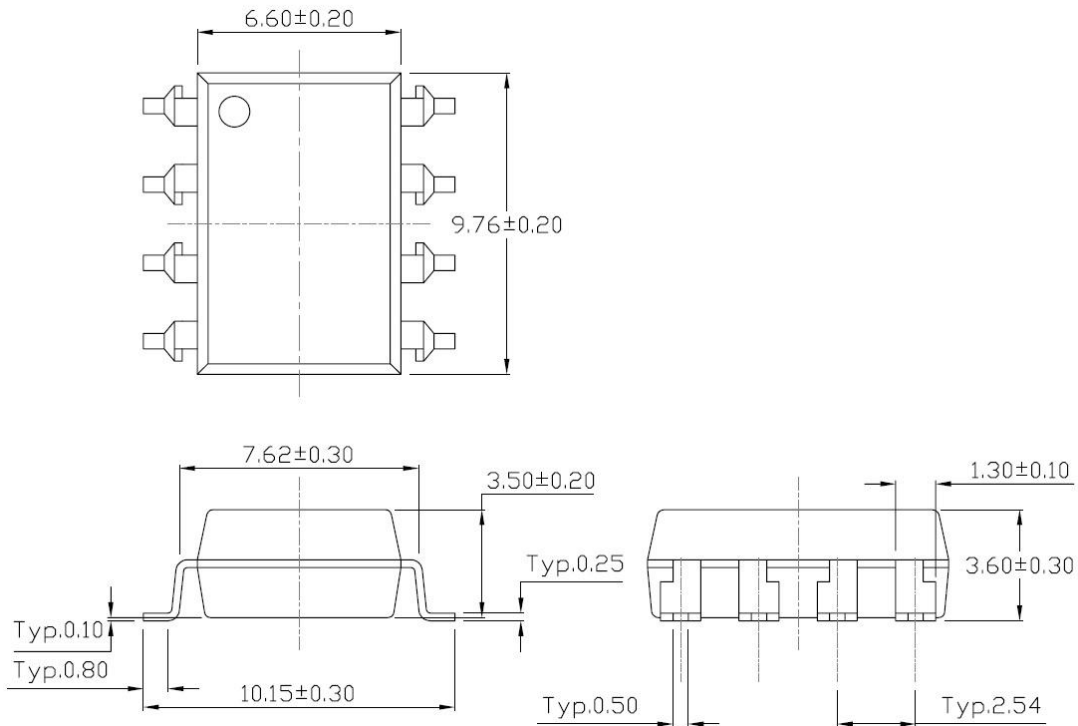


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (S Type)



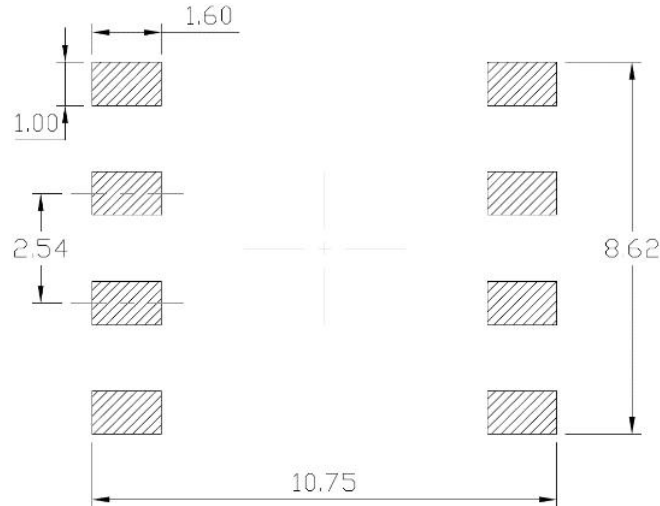
Surface Mount (Low Profile) Lead Forming (SL Type)



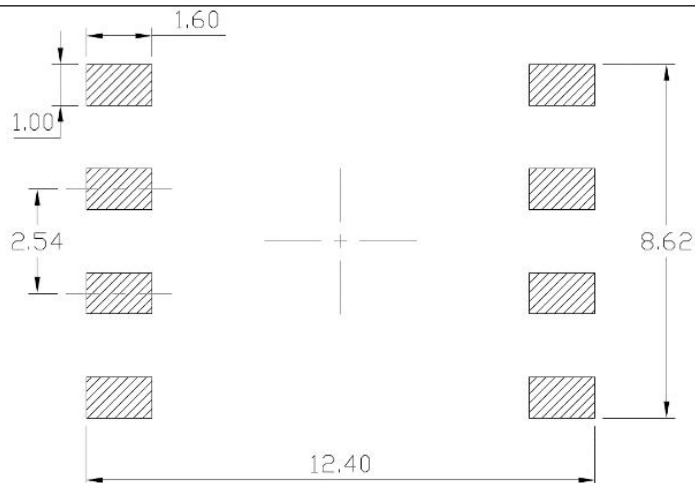


Recommended Solder Mask (Dimensions in mm unless otherwise stated)

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



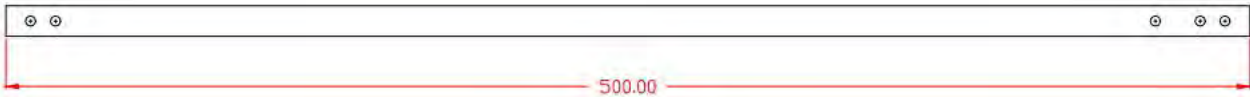
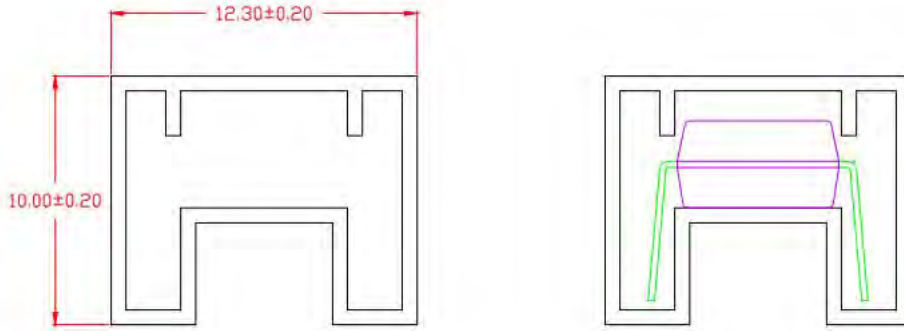
Surface Mount (Gullwing) Lead Forming



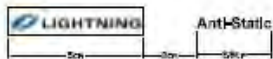
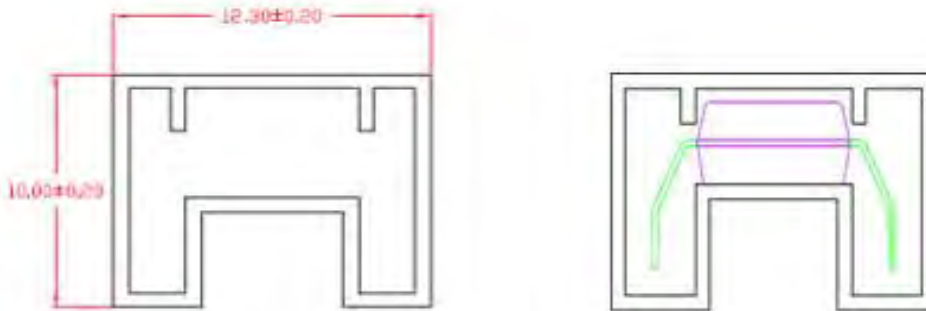


TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Standard DIP



Option M



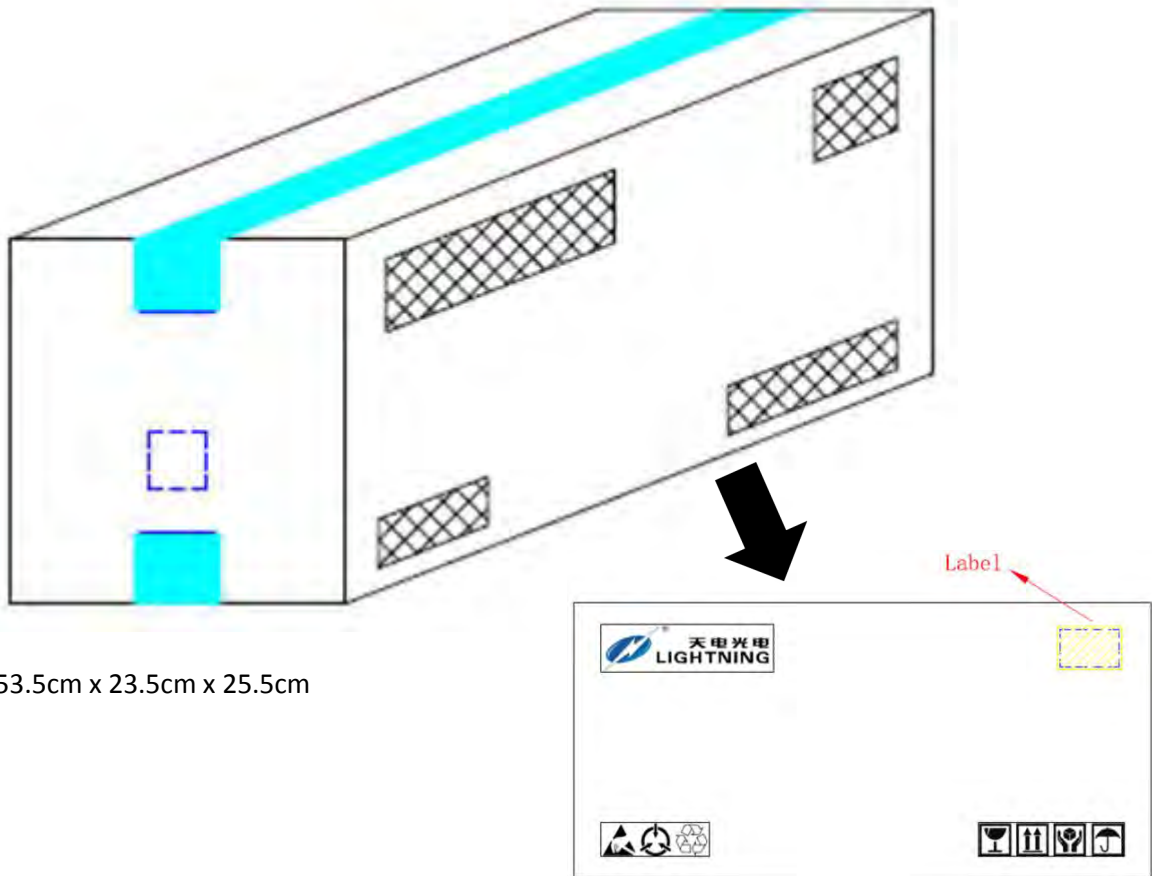
BOX SPECIFICATIONS (Tube Type)

Inner Box



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

Outer Box

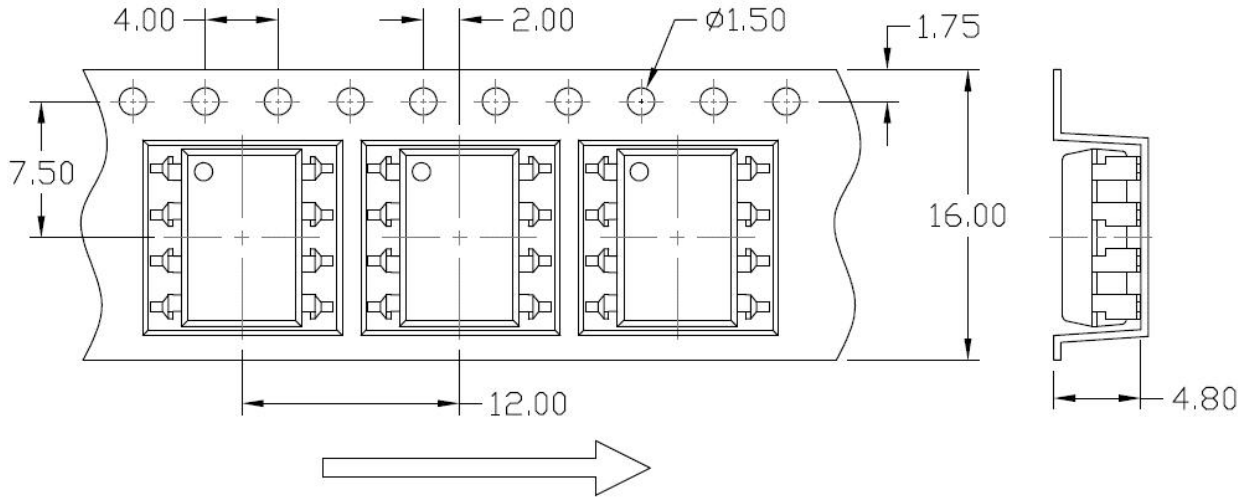


- L x W x H = 53.5cm x 23.5cm x 25.5cm

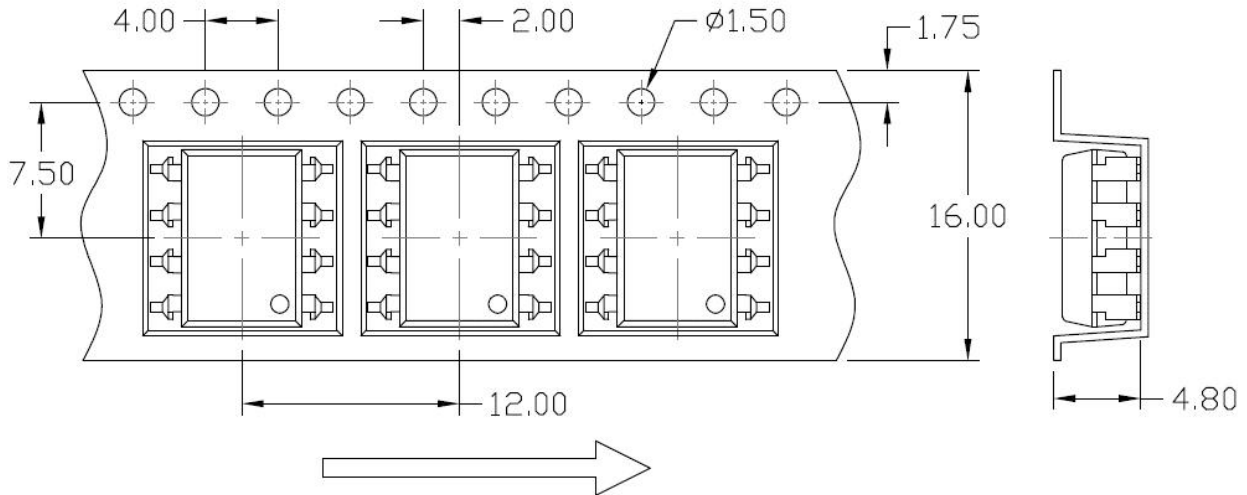


Carrier Tape Specifications (Dimensions in mm unless otherwise stated)

Option S(T1) & SL(T1)

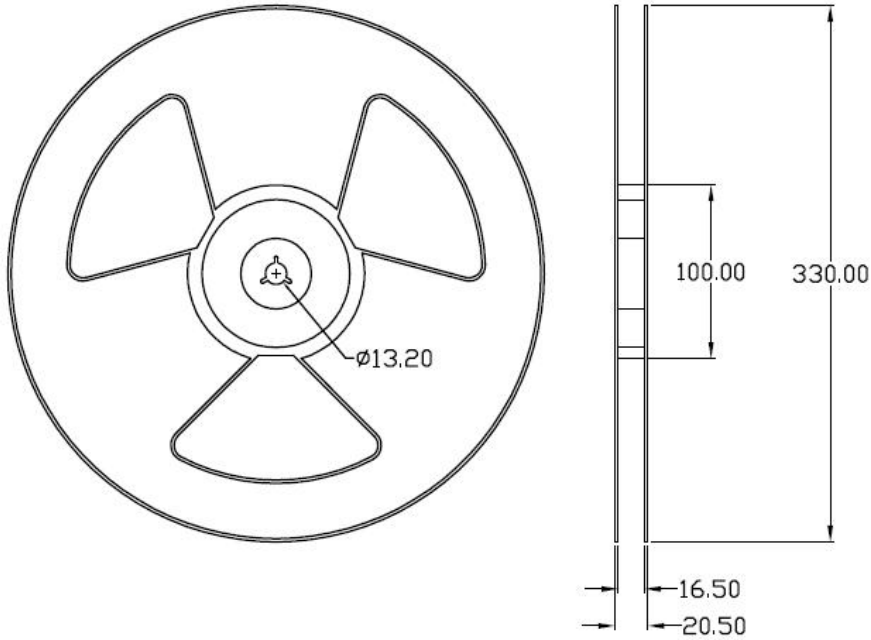


Option S(T2) & SL(T2)



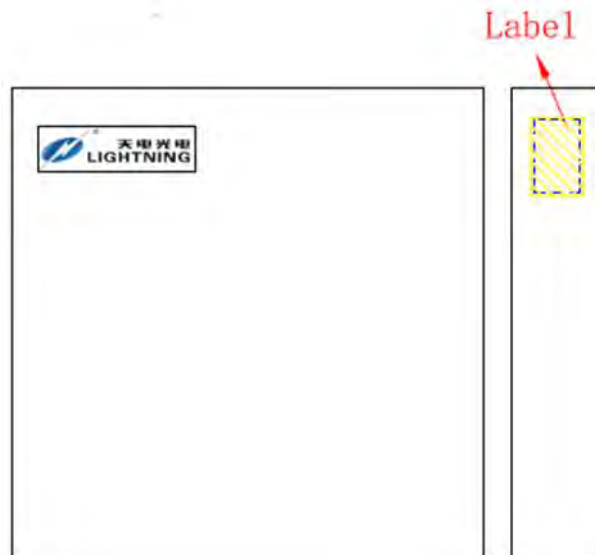
REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option S & Option SL



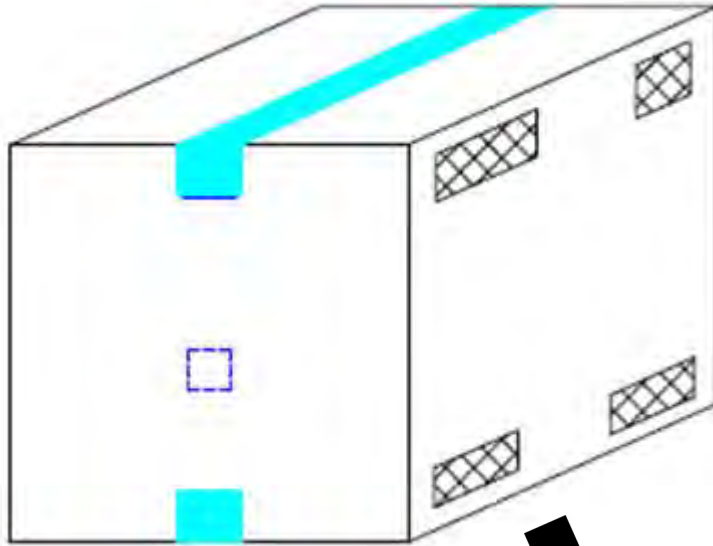
BOX SPECIFICATIONS (Reel Type)

Inner Box

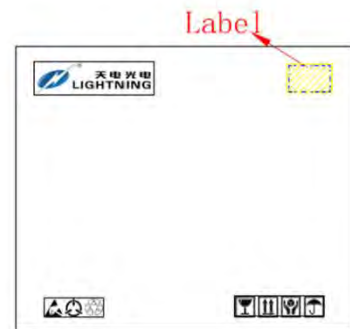


- L x W x H = 36cm x 36cm x 6.9cm

Outer Box



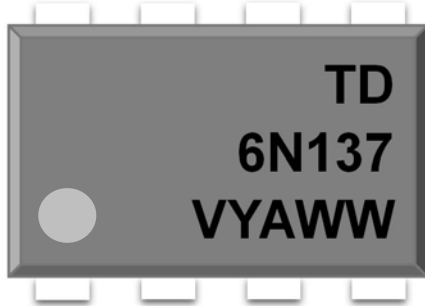
- L x W x H = 45cm x 38cm x 38cm





ORDERING AND MARKING INFORMATION

MARKING INFORMATION



TD : Company Abbr.
6N137 : Part Number
V : VDE Option
Y : Fiscal Year
A : Manufacturing Code
WW : Work Week

ORDERING INFORMATION

6N137(Y)(Z)-GV

6N137 – Part Number
 Y – Lead Form Option
 (M/S/SL/None)
 Z – Tape and Reel Option (T1/T2)
 G – Material Option
 (G: Green, None: Non-Green)
 V – VDE Option (V or None)

LABEL INFORMATION



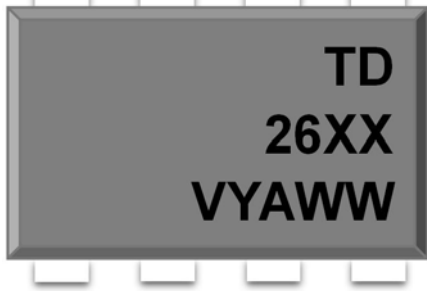
PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	40 Units/Tube	30 Tubes/Inner box	10 Inner box/Outer box = 12k Units
M	40 Units/Tube	30 Tubes/Inner box	10 Inner box/Outer box = 12k 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



ORDERING AND MARKING INFORMATION

MARKING INFORMATION



TD : Company Abbr.
 26XX : Part Number & Rank
 V : VDE Option
 Y : Fiscal Year
 A : Manufacturing Code
 WW : Work Week

ORDERING INFORMATION

TD26XX(Y)(Z)-GV

TD – Company Abbr.
 26XX – Rank (01/11)
 Y – Lead Form Option (M/S/SL/None)
 Z – Tape and Reel Option (T1/T2)
 G – Material Option (G: Green, None: Non-Green)
 V – VDE Option (V or None)

LABEL INFORMATION



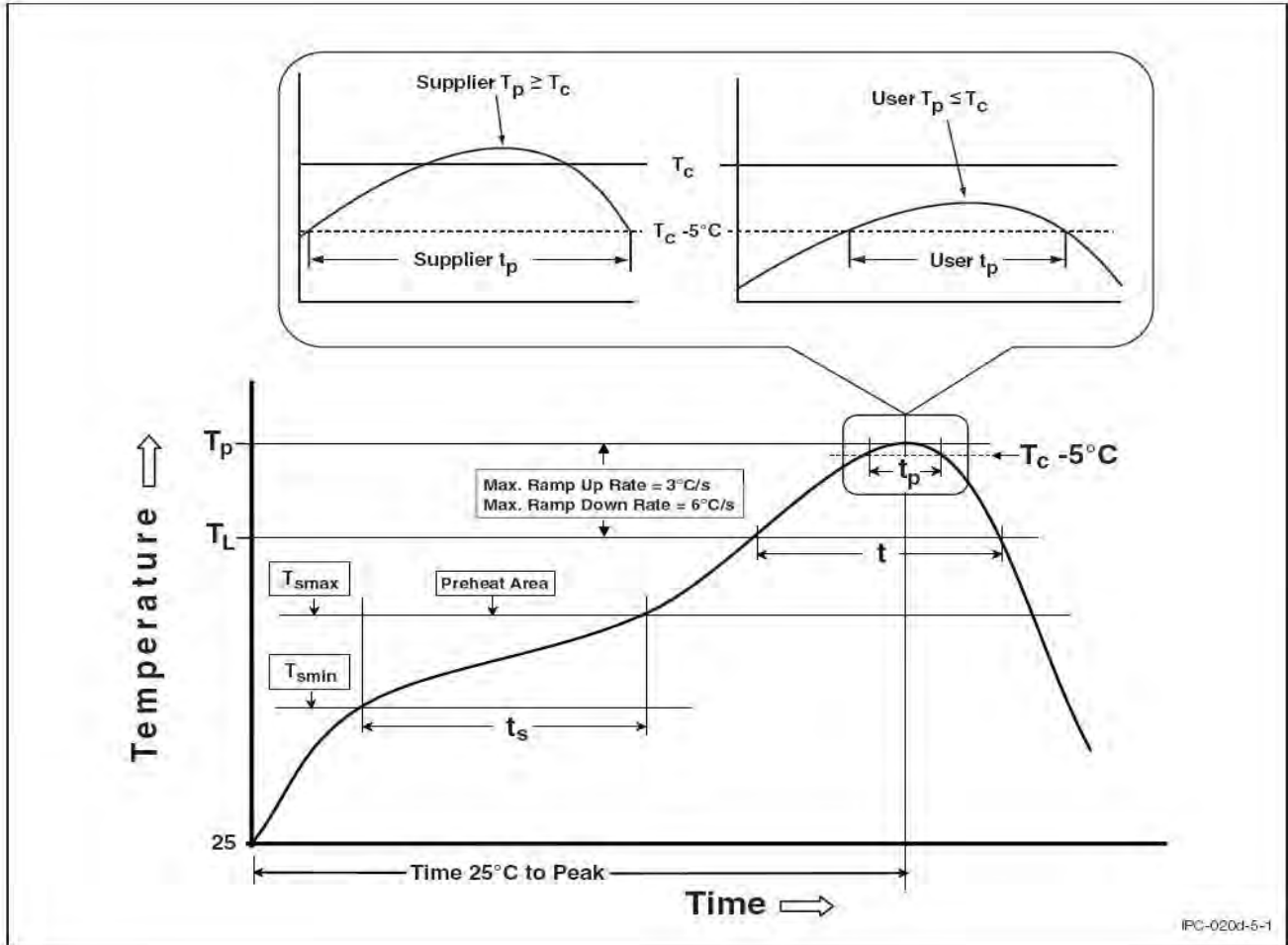
PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	40 Units/Tube	30 Tubes/Inner box	10 Inner box/Outer box = 12k Units
M	40 Units/Tube	30 Tubes/Inner box	10 Inner box/Outer box = 12k 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

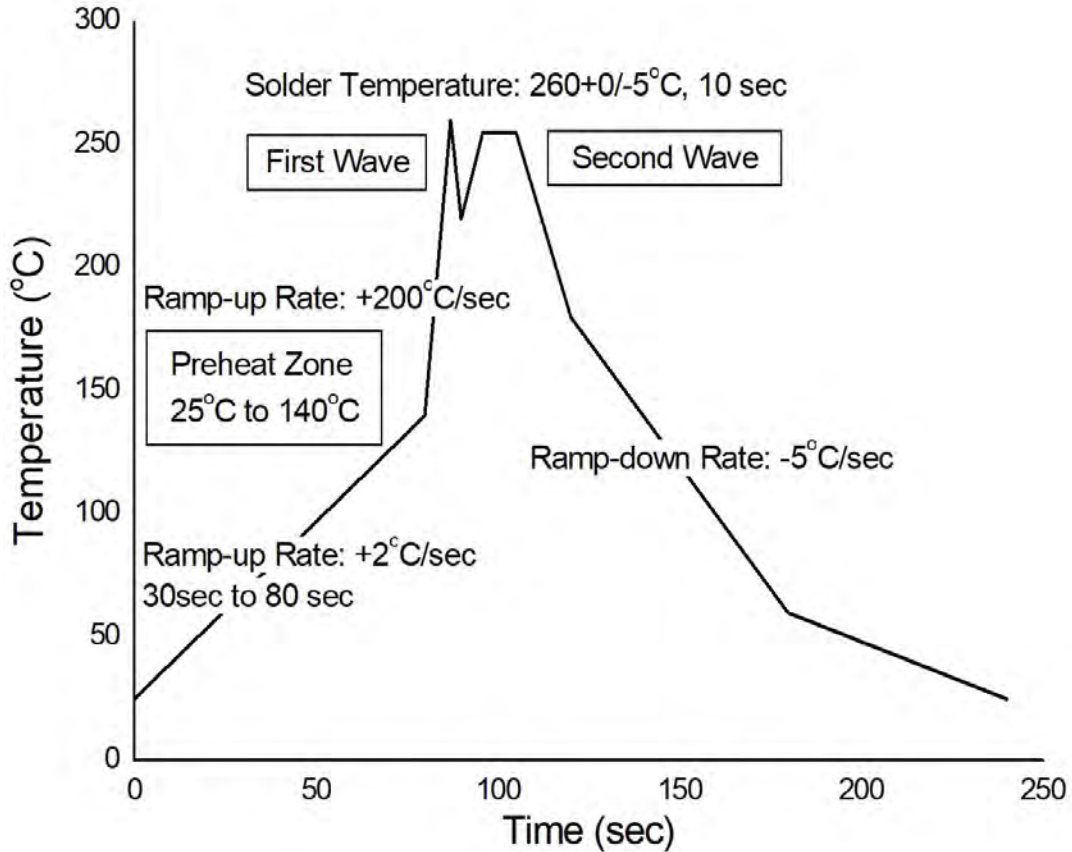


Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	100	150°C
Temperature Max. (T _{smax})	150	200°C
Time (t _s) from (T _{smin} to T _{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.	3°C/second max.
Liquidous Temperature (T _L)	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

- 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.
- LIGHTNING 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, LIGHTNING 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 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.