



6N137, JOC2601, JOC2611 Series

10Mbit/s High Speed Logic Gate Photo Coupler

Description

The 6N137, JOC2601, JOC2611 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.

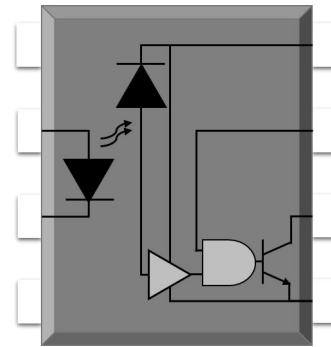
Features

- 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
  - UL
  - VDE

Applications

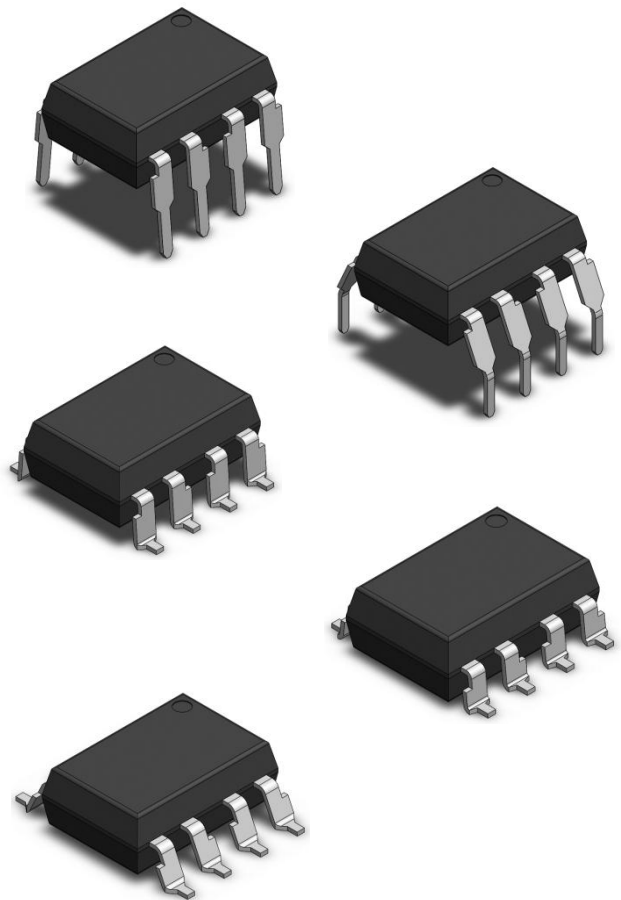
- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supply
- Pulse transformer replacement
- Computer-peripheral interface

SCHEMATIC



PIN DEFINITION

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



**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 <sub>rms</sub>	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

## 10Mbit/s High Speed Logic Gate Photo Coupler

**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 <sub>F</sub>	-	1.38	1.8	V	I <sub>F</sub> =10mA	
Reverse Current	I <sub>R</sub>	-	-	10	μA	V <sub>R</sub> =5V	
Input Capacitance	C <sub>in</sub>	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I <sub>CCH</sub>	-	6.3	10	mA	I <sub>F</sub> =0mA, V <sub>E</sub> =0.5V, V <sub>CC</sub> =5.5V	
Low Level Supply Current	I <sub>CCL</sub>	-	8.3	13	mA	I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V	
High Level Enable Current	I <sub>EH</sub>	-	-0.52	-1.6	mA	V <sub>E</sub> =2.0V, V <sub>CC</sub> =5.5V	
Low Level Enable Current	I <sub>EL</sub>	-	-0.75	-1.6	mA	V <sub>E</sub> =0.5V, V <sub>CC</sub> =5.5V	
High Level Enable Voltage	V <sub>EH</sub>	2.0	-	-	V	I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V	
Low Level Enable Voltage	V <sub>EL</sub>	-	-	0.8	V	I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I <sub>OH</sub>	-	0.73	100	μA	V <sub>CC</sub> =5.5V, V <sub>O</sub> =5.5V, I <sub>F</sub> =250μA, V <sub>E</sub> =2.0V	
Low Level Output Voltage	V <sub>OL</sub>	-	0.28	0.6	V	V <sub>CC</sub> =5.5V, I <sub>F</sub> =5mA, V <sub>E</sub> =2.0V, I <sub>CL</sub> =13mA	
Input Threshold Current	I <sub>FT</sub>	-	2.5	5	mA	V <sub>CC</sub> =5.5V, V <sub>O</sub> =0.6V, V <sub>E</sub> =2.0V, I <sub>OL</sub> =13mA	
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>	-	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 <sub>CC</sub> =5V, I <sub>F</sub> =7.5mA unless specified otherwise)								
Propagation Delay Time to Output Low Level		TPHL	-	35	75	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C	
Propagation Delay Time to Output High Level		TPLH	-	40	75	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C	
Pulse Width Distortion		TPHL-TPLH	-	5	35	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Rise Time		tr	-	27	-	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Fall Time		tf	-	7	-	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Enable Propagation Delay Time to Output Low Level		TEHL	-	15	-	ns	I <sub>F</sub> =7.5mA, V <sub>EH</sub> =3.5V, C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Enable Propagation Delay Time to Output High Level		TELH	-	15	-	ns	I <sub>F</sub> =7.5mA, V <sub>EH</sub> =3.5V, C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Common Mode Transient Immunity at Logic High	6N137	CMH	-	-	-	V/μs	I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =10Vp-p	
	JOC2601		5000	-	-		I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =50Vp-p	
	JOC2611		10000	-	-		I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	CML	-	-	-	V/μs	I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =10Vp-p	
	JOC2601		5000	-	-		I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =50Vp-p	
	JOC2611		10000	-	-		I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =400Vp-p	

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

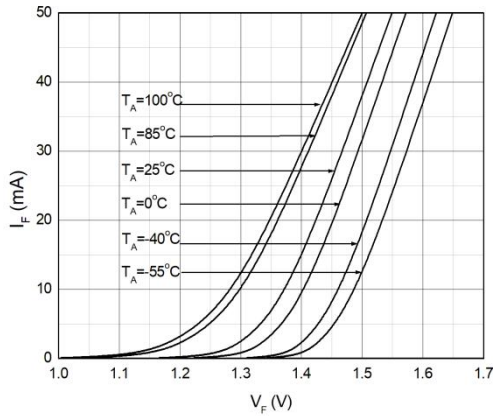
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V <sub>F</sub>	-	1.38	1.8	V	I <sub>F</sub> =10mA	
Reverse Current	I <sub>R</sub>	-	-	10	μA	V <sub>R</sub> =5V	
Input Capacitance	C <sub>in</sub>	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I <sub>CCH</sub>	-	4.3	10	mA	I <sub>F</sub> =0mA, V <sub>E</sub> =0.5V, V <sub>CC</sub> =3.3V	
Low Level Supply Current	I <sub>CCL</sub>	-	6.4	13	mA	I <sub>F</sub> =10mA, V <sub>CC</sub> =3.3V	
High Level Enable Current	I <sub>EH</sub>	-	-0.21	-1.6	mA	V <sub>E</sub> =2.0V, V <sub>CC</sub> =3.3V	
Low Level Enable Current	I <sub>EL</sub>	-	-0.42	-1.6	mA	V <sub>E</sub> =0.5V, V <sub>CC</sub> =3.3V	
High Level Enable Voltage	V <sub>EH</sub>	2.0	-	-	V	I <sub>F</sub> =10mA, V <sub>CC</sub> =3.3V	
Low Level Enable Voltage	V <sub>EL</sub>	-	-	0.8	V	I <sub>F</sub> =10mA, V <sub>CC</sub> =3.3V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I <sub>OH</sub>	-	4.1	100	μA	V <sub>CC</sub> =3.3V, V <sub>O</sub> =3.3V, I <sub>F</sub> =250μA, V <sub>E</sub> =2.0V	
Low Level Output Voltage	V <sub>OL</sub>	-	0.29	0.6	V	V <sub>CC</sub> =3.3V, I <sub>F</sub> =5mA, V <sub>E</sub> =2.0V, I <sub>CL</sub> =13mA	
Input Threshold Current	I <sub>FT</sub>	-	2.2	5	mA	V <sub>CC</sub> =3.3V, V <sub>O</sub> =0.6V, V <sub>E</sub> =2.0V, I <sub>OL</sub> =13mA	
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>	-	1.0	-	pF	V=0, f=1MHz	

### ELECTRICAL OPTICAL CHARACTERISTICS

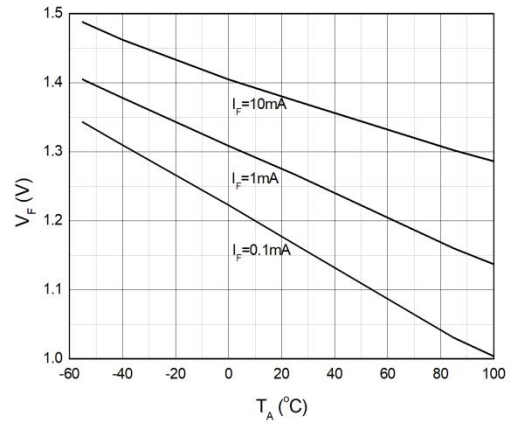
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V <sub>CC</sub> =3.3V, I <sub>F</sub> =7.5mA unless specified otherwise)								
Propagation Delay Time to Output Low Level		TPHL	-	35	75	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C	
Propagation Delay Time to Output High Level		TPLH	-	47	75	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C	
Pulse Width Distortion		TPHL-TPLH	-	12	35	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Rise Time		tr	-	30	-	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Fall Time		tf	-	8.5	-	ns	C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Enable Propagation Delay Time to Output Low Level		TEHL	-	15	-	ns	I <sub>F</sub> =7.5mA, V <sub>EH</sub> =3.3.3V, C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Enable Propagation Delay Time to Output High Level		TELH	-	15	-	ns	I <sub>F</sub> =7.5mA, V <sub>EH</sub> =3.3.3V, C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω	
Common Mode Transient Immunity at Logic High	6N137	CMH	-	-	-	V/μs	I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =10Vp-p	
	JOC2601		5000	-	-		I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =50Vp-p	
	JOC2611		10000	-	-		I <sub>F</sub> = 7.5mA, V <sub>OH</sub> =2.0V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =400Vp-p	
Common Mode Transient Immunity at Logic Low	6N137	CML	-	-	-	V/μs	I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =10Vp-p	
	JOC2601		5000	-	-		I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =50Vp-p	
	JOC2611		10000	-	-		I <sub>F</sub> = 0mA, V <sub>OH</sub> =0.8V, R <sub>L</sub> =350Ω, Ta=25°C V <sub>CM</sub> =400Vp-p	

**CHARACTERISTIC CURVES**

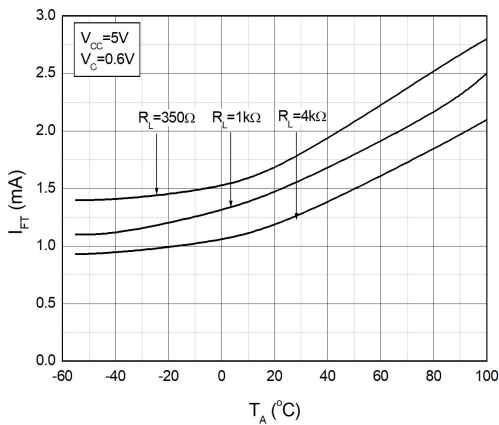
**Fig.1 Forward Current vs. Forward Voltage**



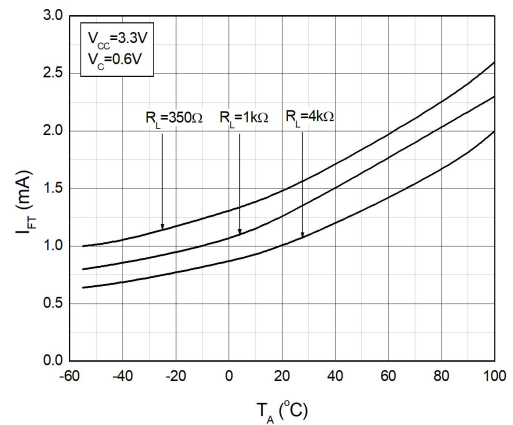
**Fig.2 Forward Voltage vs. Ambient Temperature**



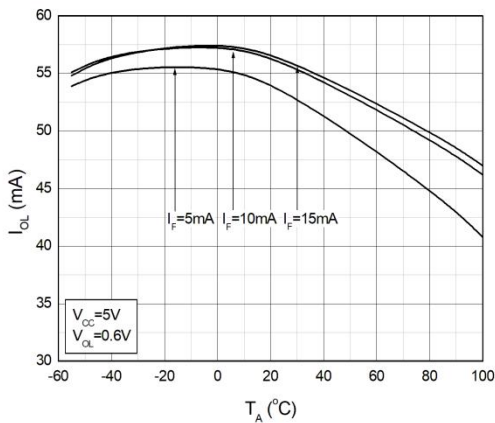
**Fig.3 Input Threshold Current vs. Ambient Temperature**



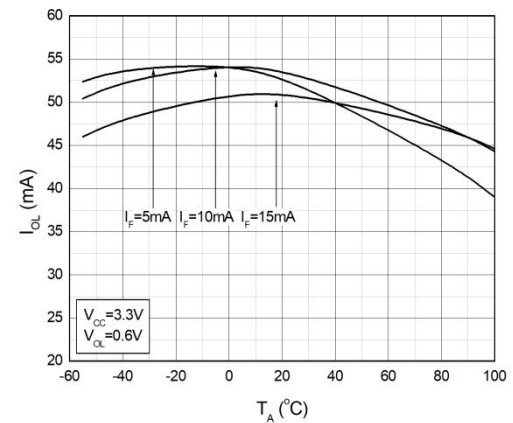
**Fig.4 Input Threshold Current vs. Ambient Temperature**



**Fig.5 Low Level Output Current vs. Ambient Temperature**

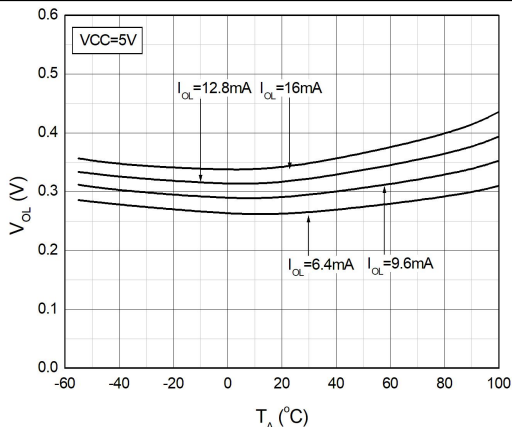


**Fig.6 Low Level Output Current vs. Ambient Temperature**

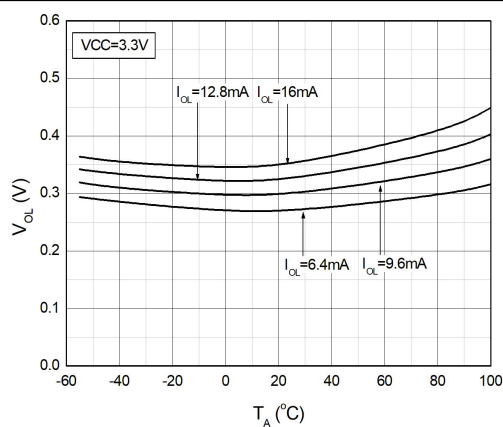


**CHARACTERISTIC CURVES**

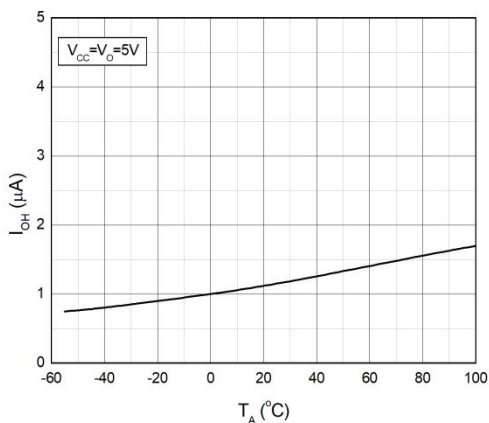
**Fig.7 Low Level Output Voltage vs. Ambient Temperature**



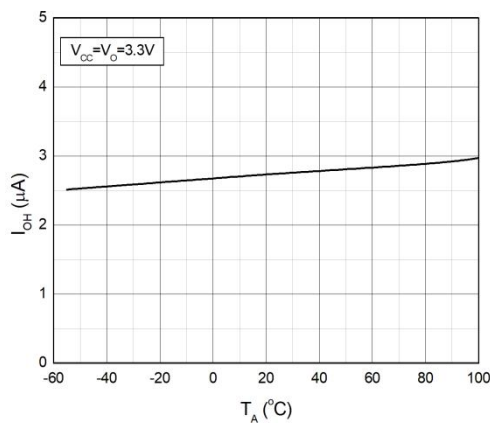
**Fig.8 Low Level Output Voltage vs. Ambient Temperature**



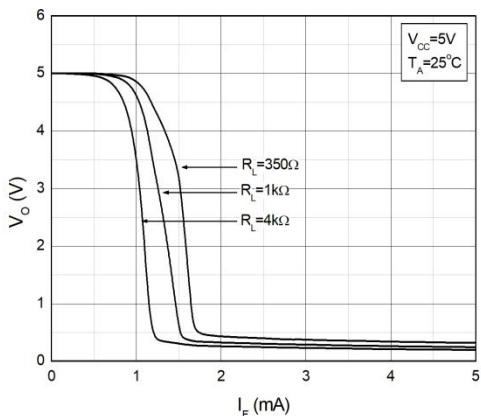
**Fig.9 High Level Output Current vs. Ambient Temperature**



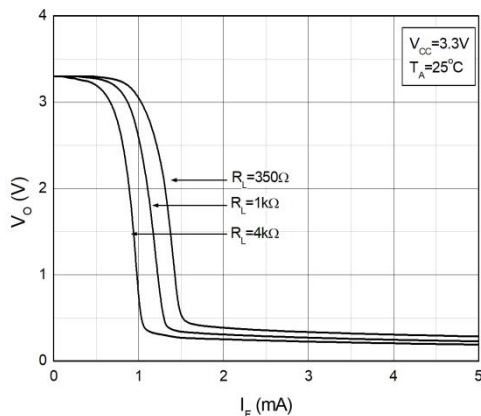
**Fig.10 High Level Output Current vs. Ambient Temperature**



**Fig.11 Output Voltage vs. Forward Current**



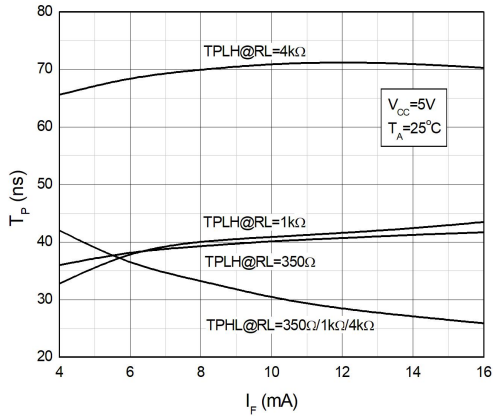
**Fig.12 Output Voltage vs. Forward Current**



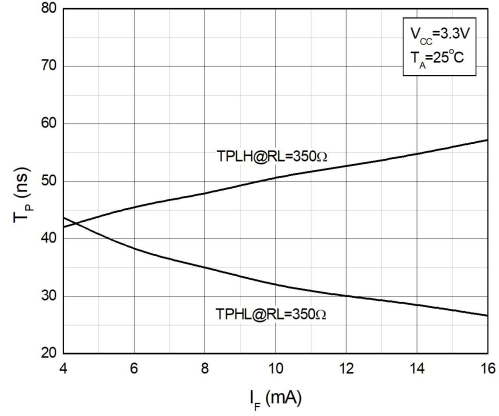


**CHARACTERISTIC CURVES**

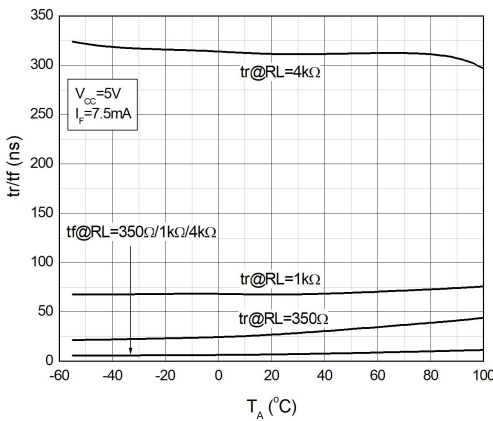
**Fig.13 Propagation Delay vs. Forward Current**



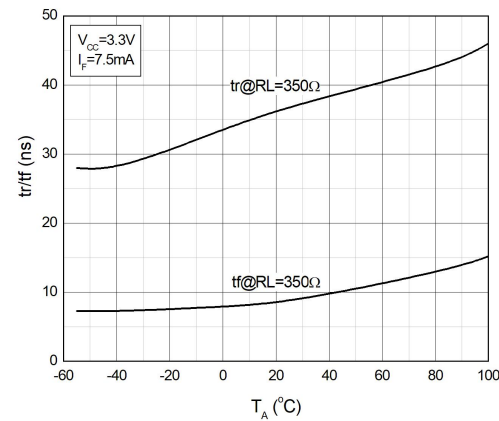
**Fig.14 Propagation Delay vs. Forward Current**



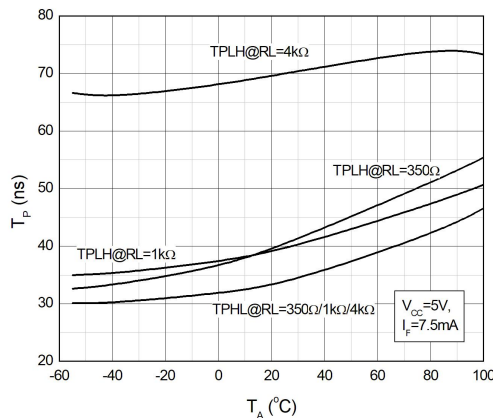
**Fig.15 Rise and Fall Time vs. Ambient Temperature**



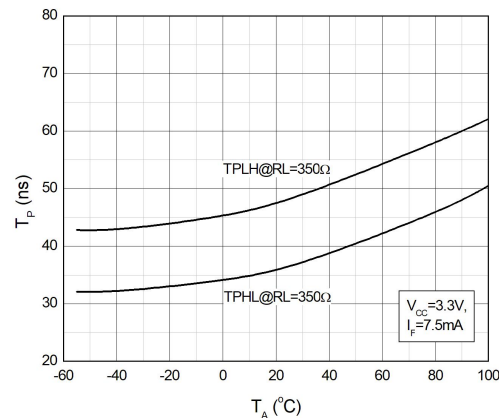
**Fig.16 Rise and Fall Time vs. Ambient Temperature**



**Fig.17 Propagation Delay vs. Ambient Temperature**

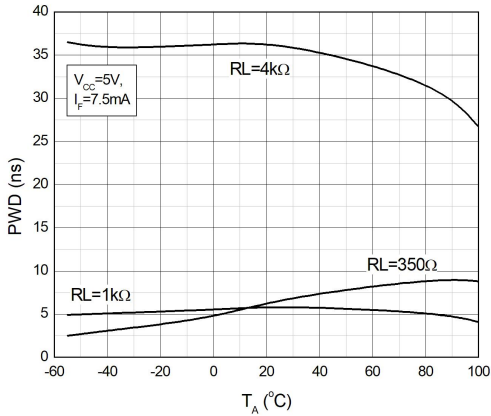


**Fig.18 Propagation Delay vs. Ambient Temperature**

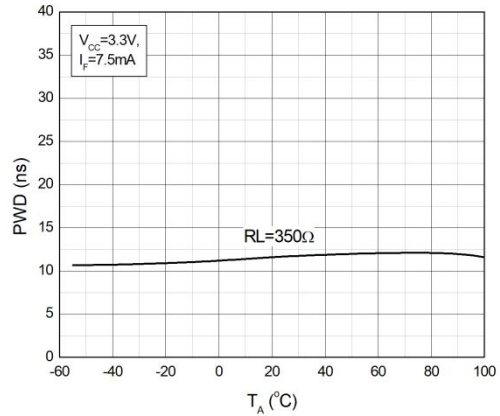


**CHARACTERISTIC CURVES**

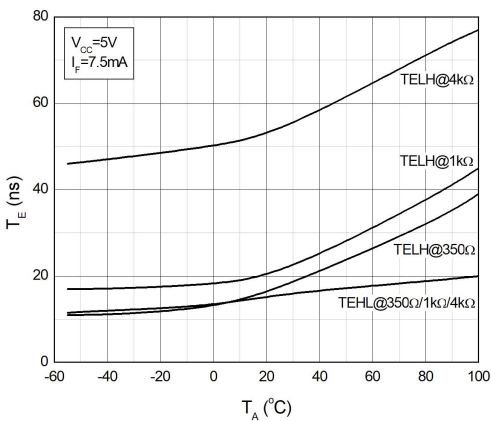
**Fig.19 Pulse Width Distortion vs. Ambient Temperature**



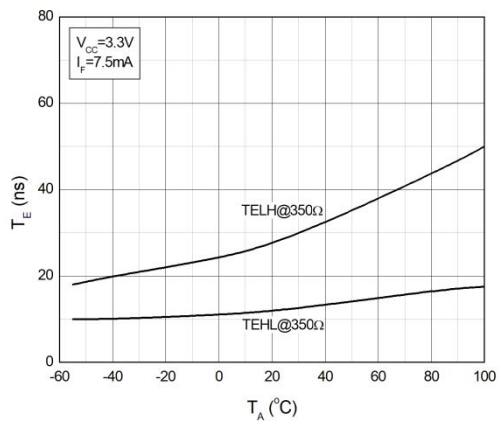
**Fig.20 Pulse Width Distortion vs. Ambient Temperature**



**Fig.21 Enable Propagation Delay vs. Ambient Temperature**

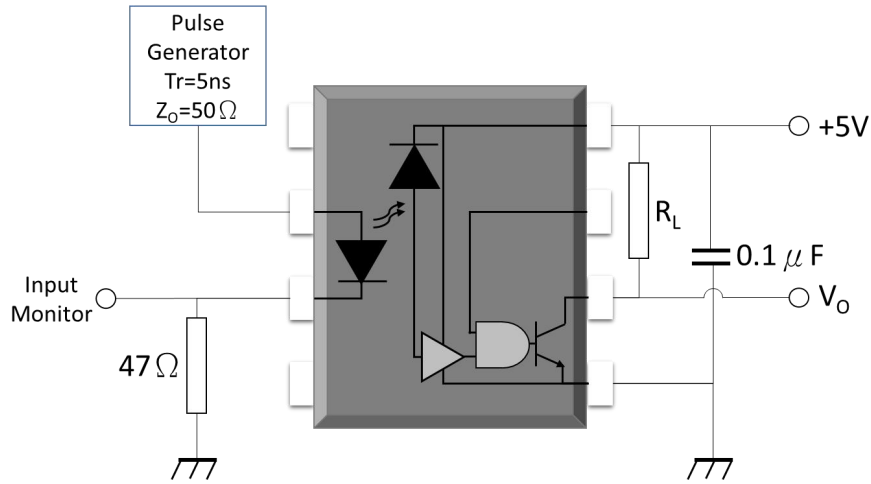


**Fig.22 Enable Propagation Delay vs. Ambient Temperature**

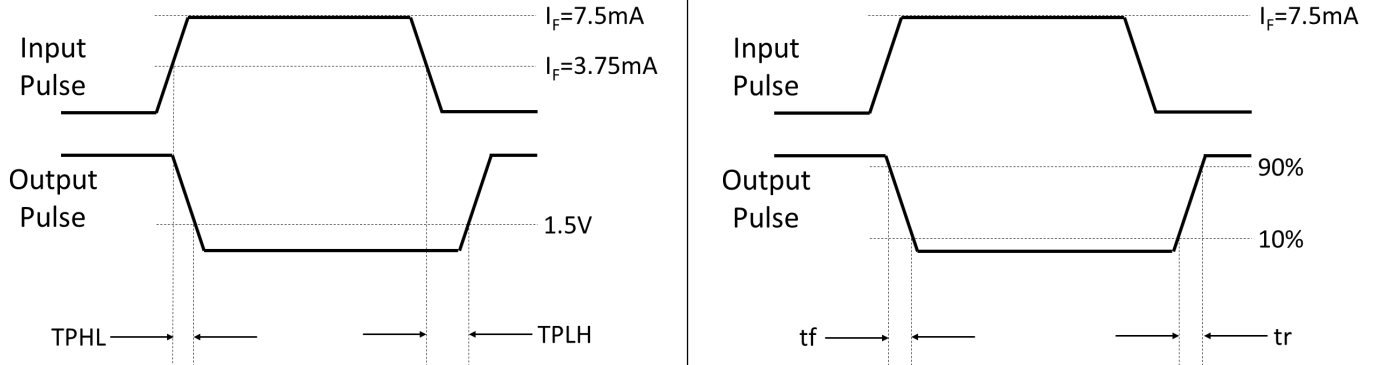


**TEST CIRCUITS**

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

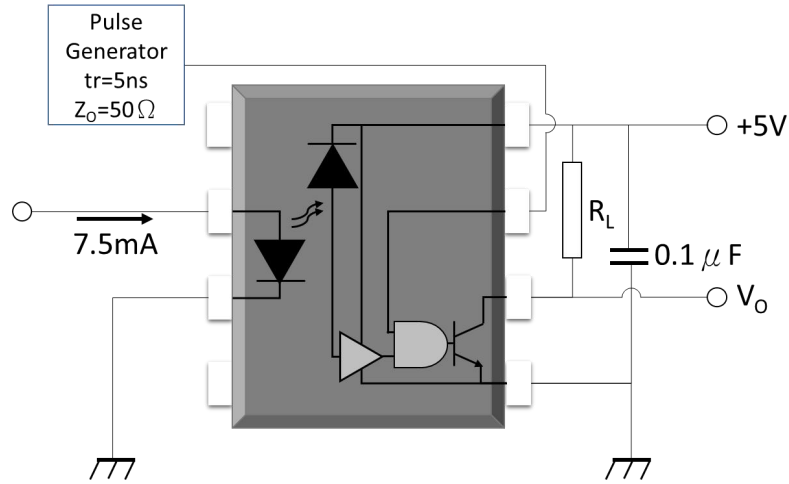


**Fig.24 Waveforms of TPHL, TPLH, tr, tf**

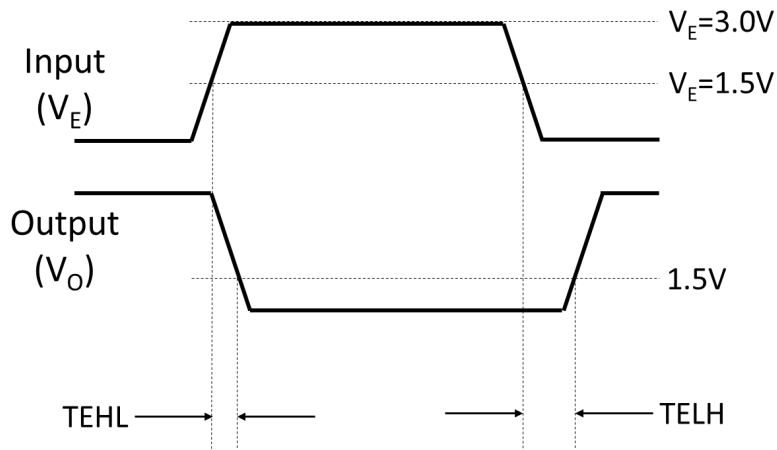


**TEST CIRCUITS**

**Fig.25 Test Circuits for TEHL, TELH**

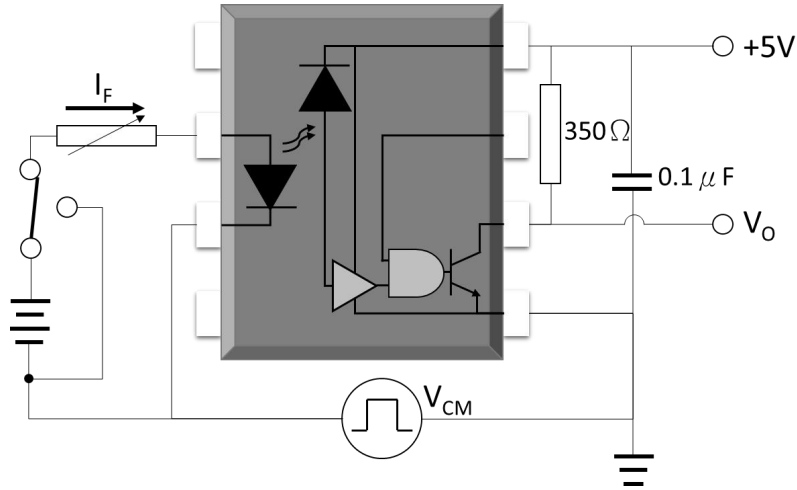


**Fig.26 Waveforms of TEHL, TELH**

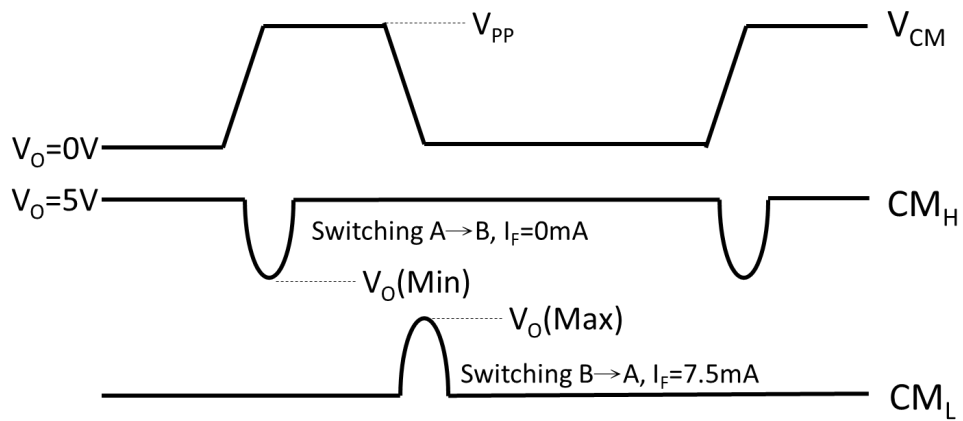


**TEST CIRCUITS**

**Fig.25 Test Circuits for Common Mode Transient Immunity**

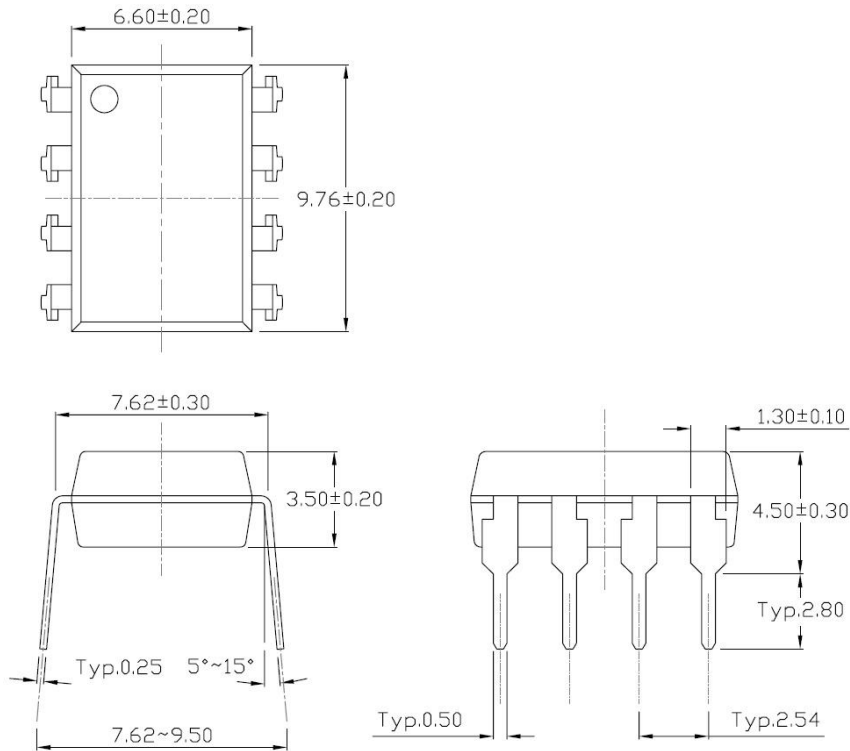


**Fig.26 Waveforms of Common Mode Transient Immunity**

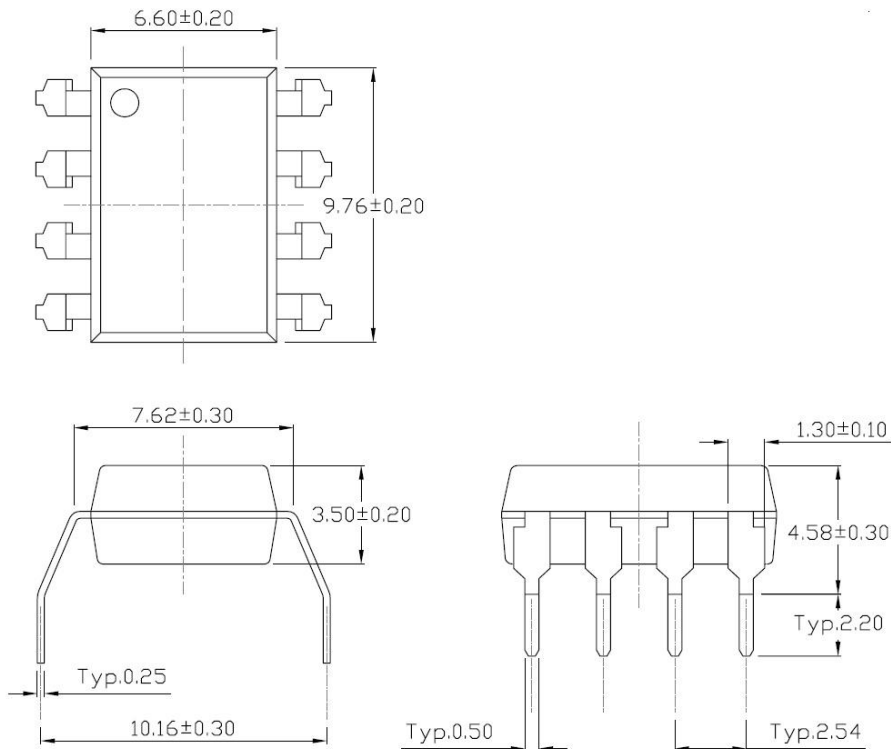


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

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

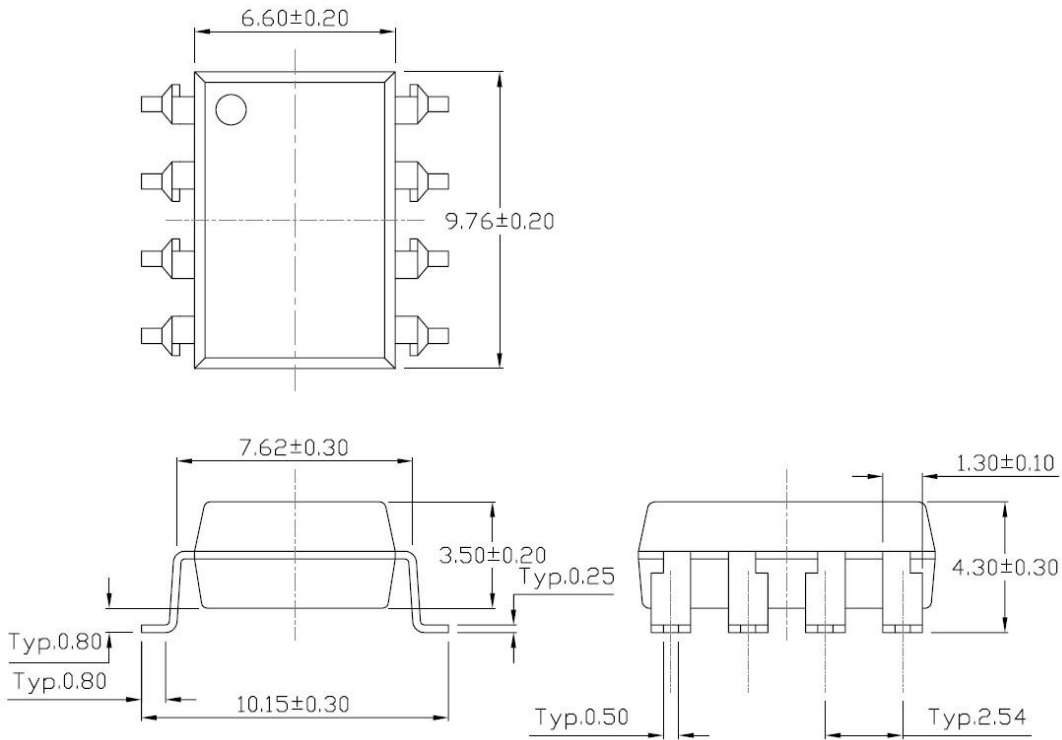


**Gullwing (400mil) Lead Forming – Through Hole (M Type)**

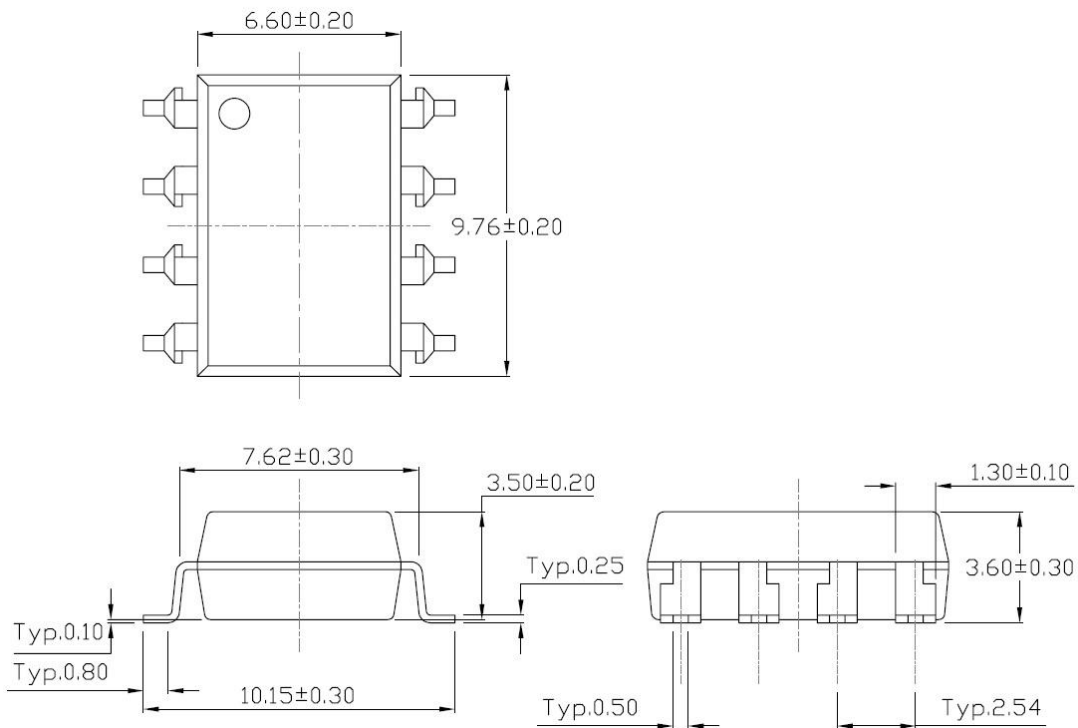


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

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

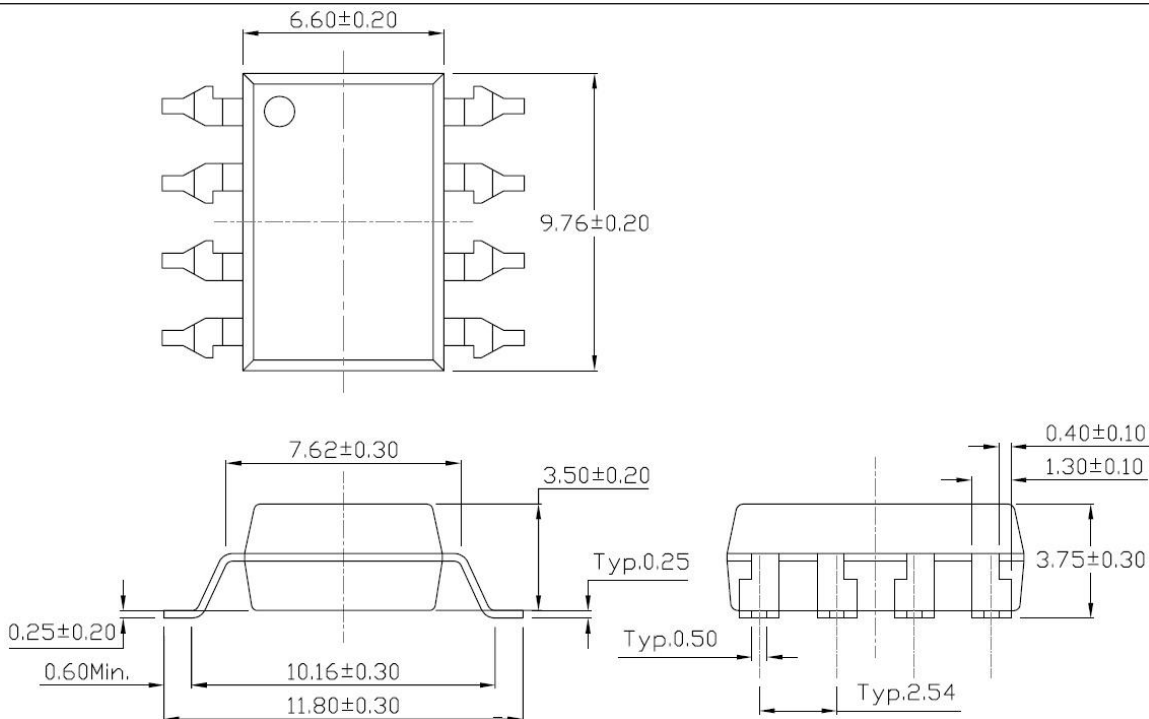


**Surface Mount (Low Profile) Lead Forming (SL Type)**



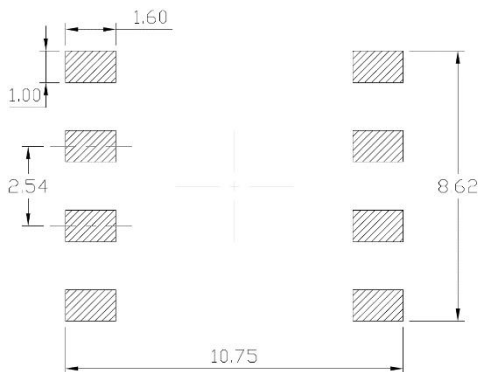
**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

**Surface Mount (Gullwing) Lead Forming (SLM Type)**

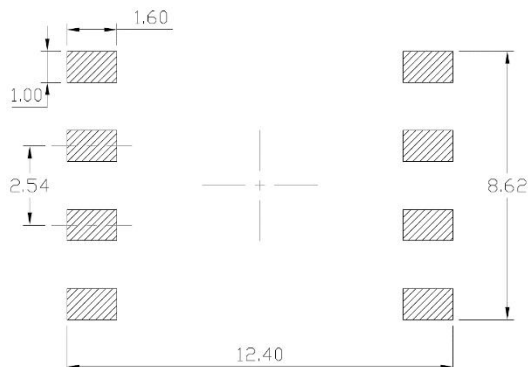


**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**

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



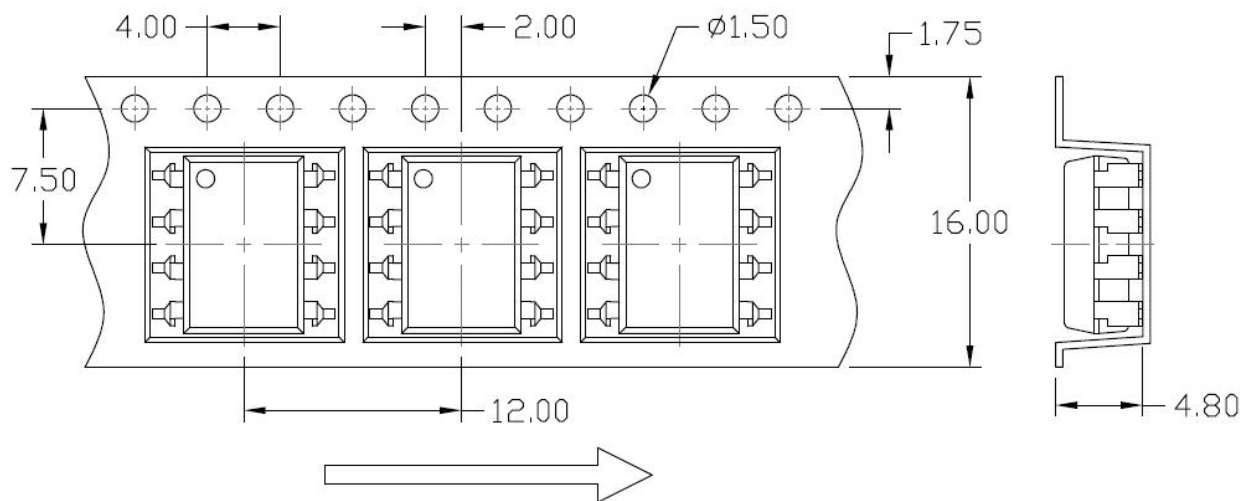
**Surface Mount (Gullwing) Lead Forming**



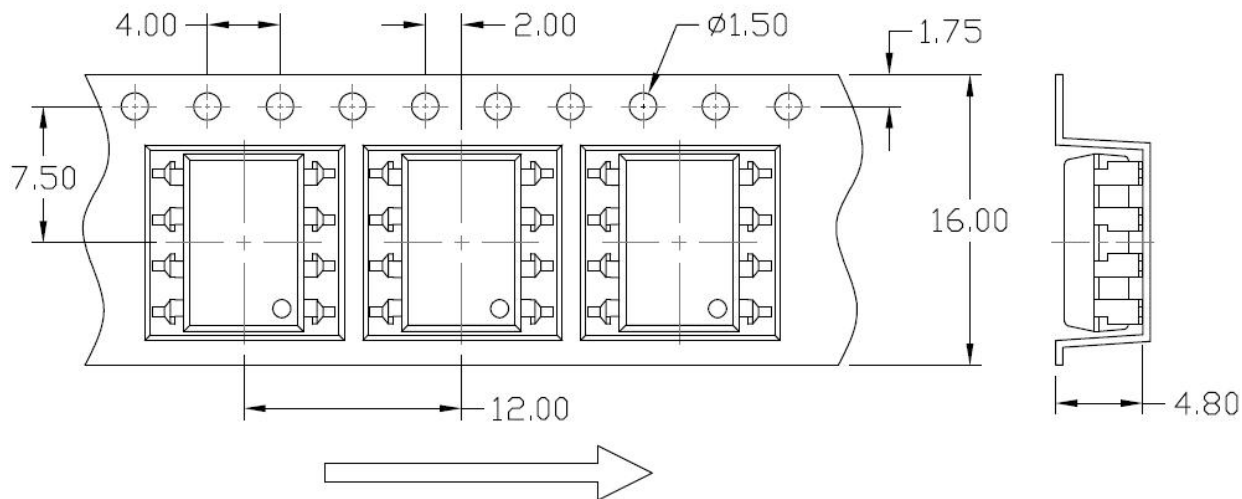


**Carrier Tape Specifications (Dimensions in mm unless otherwise stated)**

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

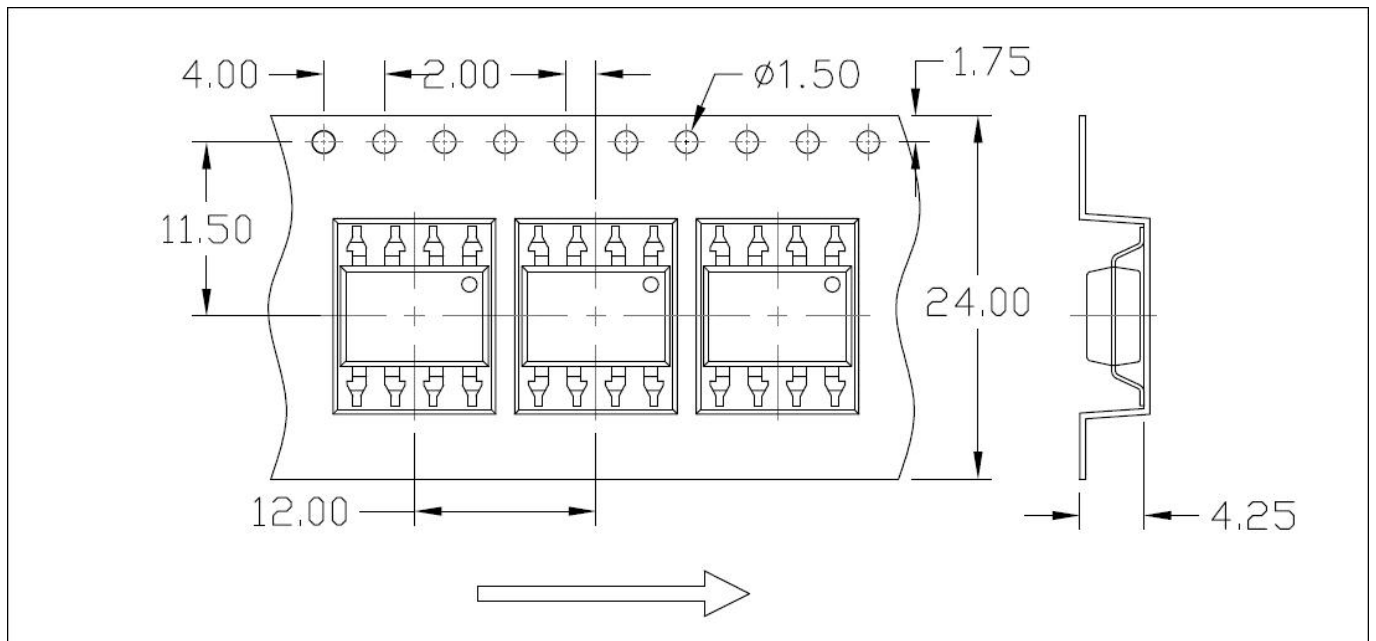


**Option S(T2) & SL(T2)**

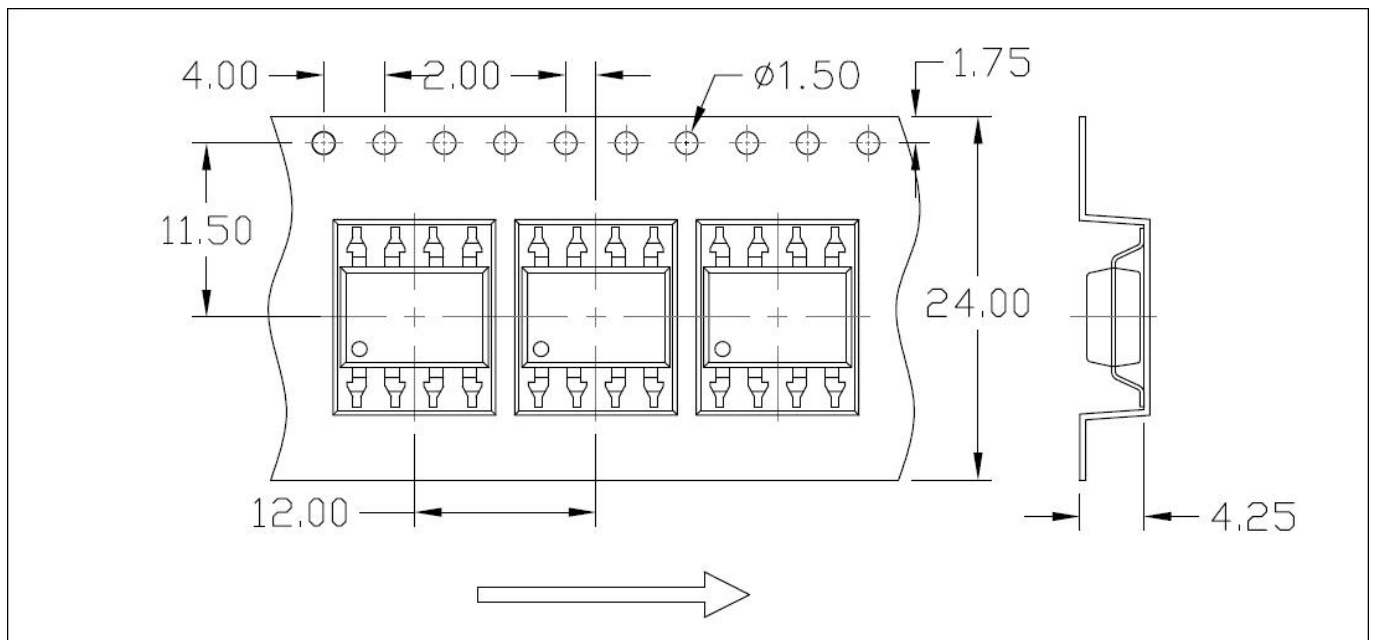


**Carrier Tape Specifications (Dimensions in mm unless otherwise stated)**

**Option SLM(T1)**

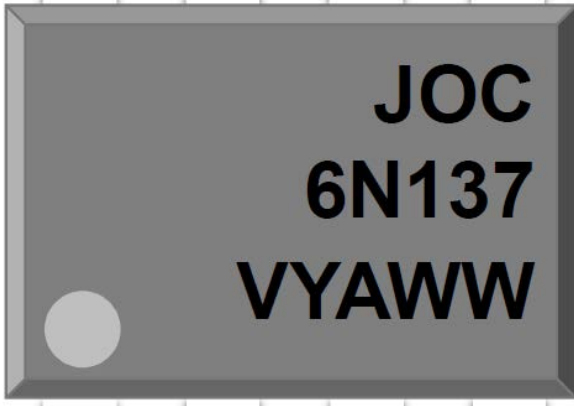


**Option SLM(T2)**



**ORDERING AND MARKING INFORMATION**

**MARKING INFORMATION**



**JOC** : 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/SLM/None)  
 Z – Tape and Reel Option (T1/T2)  
 G – Material Option  
 (G: Green, None: Non-Green)  
 V – VDE Option (V or None)

**LABEL INFORMATION**

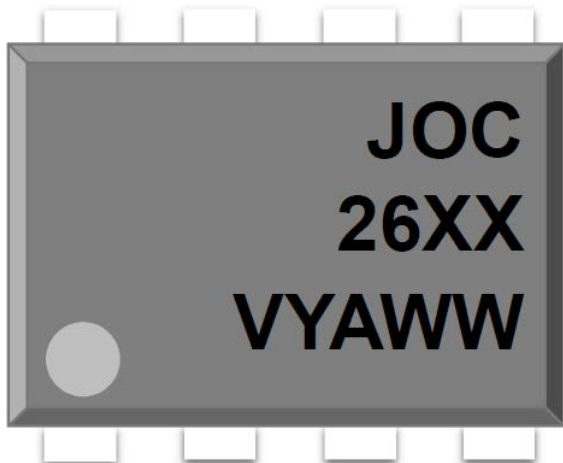


**PACKING QUANTITY**

Option	Description	Quantity
None	Standard 8 Pin Dip	40Units/Tube
M	Gullwing(400mil) Lead Forming	40Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount Lead Forming(Low Profile) – With Option 1 Taping	1000 Units/Reel
SL(T2)	Surface Mount Lead Forming(Low Profile) – With Option 2 Taping	1000 Units/Reel

## ORDERING AND MARKING INFORMATION

### MARKING INFORMATION



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

### ORDERING INFORMATION

## JOC26XX(Y)(Z)-GV

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

### LABEL INFORMATION

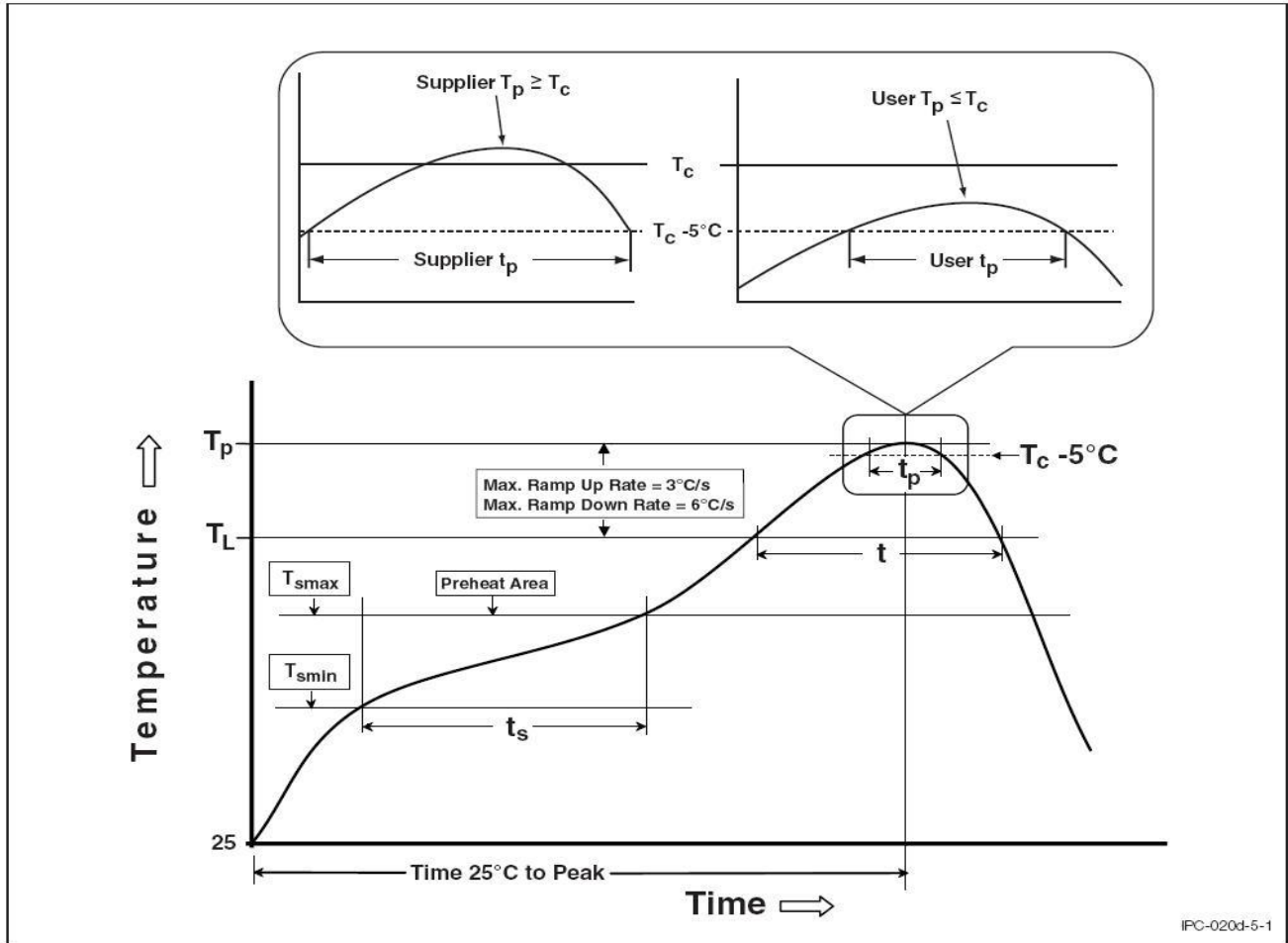


### PACKING QUANTITY

Option	Description	Quantity
None	Standard 8 Pin Dip	40Units/Tube
M	Gullwing(400mil) Lead Forming	40Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount Lead Forming(Low Profile) – With Option 1 Taping	1000 Units/Reel
SL(T2)	Surface Mount Lead Forming(Low Profile) – With Option 2 Taping	1000 Units/Reel

**REFLOW INFORMATION**

**REFLOW PROFILE**



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T <sub>sm</sub> )	100	150°C
Temperature Max. (T <sub>sm</sub> )	150	200°C
Time (t <sub>s</sub> ) from (T <sub>sm</sub> to T <sub>sm</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.

**DISCLAIMER**

- JIEJIE is continually improving the quality, reliability, function and design. JIEJIE reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- JIEJIE 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, JIEJIE 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 JIEJIE 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 JIEJIE'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.