



**6N135.6N136.JOC4502.JOC4503 Series**

**1Mbit/s High Speed Transistor Photo Coupler**

**Description**

The 6N135, 6N136, JOC450X series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed photo transistor in a plastic DIP8 package with different lead forming options.

A separate design between photodiode and transistor reduces the base-collector capacitance of the input transistor which improves the speed by several orders of magnitude over conventional phototransistor optocouplers.

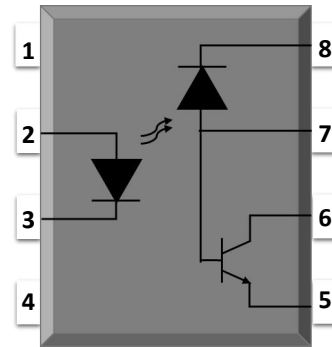
**Features**

- High isolation 5000 VRMS
- DC input with transistor output
- Operating temperature range - 55 °C to 100 °C
- REACH compliance
- Halogen free (Optional)
- MSL class 1
- Regulatory Approvals
  - UL
  - VDE

**Applications**

- Line receivers
- Telecommunication equipment
- Out interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling
- Pulse transformer replacement
- Computer-peripheral interface

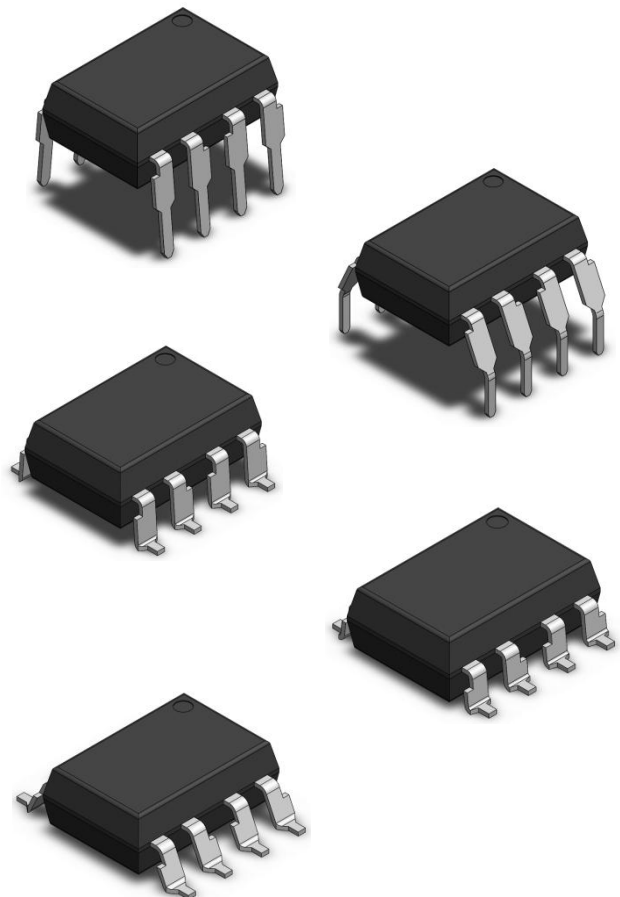
**SCHEMATIC**



**PIN DEFINITION**

<b>1.NC</b>	<b>8.VCC</b>
<b>2.Anode</b>	<b>7.VB(for 6N135/6N136)</b> <b>NC(for JOC4502/JOC4503)</b>
<b>3.Cathode</b>	<b>6.VO</b>
<b>4.NC</b>	<b>5.GND</b>

**OUTLINE**



**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	
Input Power Dissipation	$P_I$	100	mW	
OUTPUT				
Supply Voltage	$V_{CC}$	-0.5~30	V	
Output Voltage	$V_O$	-0.5~20	V	
Output Current	$I_O$	50	mA	
Emitter-Base Reverse Voltage	$V_{EBR}$	5	V	
Base Current	$I_B$	5	mA	
Output Power Dissipation	$P_O$	100	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	$T_{stg}$	-55~150	°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

**ELECTRICAL OPTICAL CHARACTERISTICS**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
INPUT(at Ta=0 to 70°C , unless specified otherwise)							
Forward Voltage	$V_F$	-	1.45	1.8	V	$I_F=16\text{mA}$	
Reverse Current	$I_R$	-	-	10	$\mu\text{A}$	$V_R=5\text{V}$	
Input Capacitance	$C_{in}$	-	60	-	pF	$V=0, f=1\text{MHz}$	
OUTPUT(at Ta=0 to 70°C , unless specified otherwise)							
High Level Supply Current	$I_{CCH}$	-	0.01	1	$\mu\text{A}$	$I_F=0\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}, T_a=25^\circ\text{C}$	
		-	-	2	$\mu\text{A}$	$I_F=0\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}$	
Low Level Supply Current	$I_{CCL}$	-	200	-	$\mu\text{A}$	$I_F=16\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}$	
Logic High Output Current	$I_{OH}$	-	0.001	0.5	$\mu\text{A}$	$I_F=0\text{mA}, V_O=V_{CC}=5.5\text{V}, T_a=25^\circ\text{C}$	
		-	0.01	1	$\mu\text{A}$	$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}, T_a=25^\circ\text{C}$	
		-	-	50	$\mu\text{A}$	$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}$	

**ELECTRICAL OPTICAL CHARACTERISTICS**

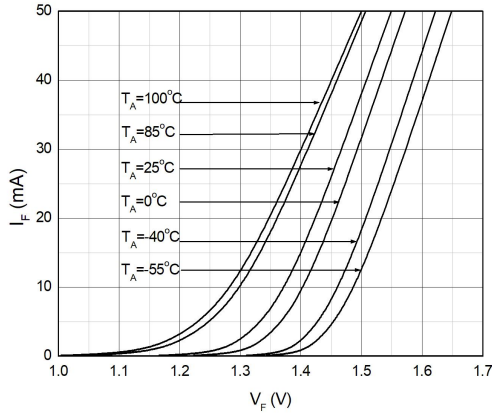
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
TRANSFER CHARACTERISTICS(at Ta=0 to 70°C , unless specified otherwise)							
Current Transfer Ratio	6N135	CTR	7	-	50	%	I <sub>F</sub> = 16mA ,V <sub>O</sub> = 0.4V, V <sub>CC</sub> =4.5V, Ta=25°C
	6N136		19	-	50		
	JOC4502						
	JOC4503						
	6N135		5	-	-		
6N136	15	-	-				
JOC4502							
JOC4503							
Logic Low Output Voltage	6N135	V <sub>OL</sub>	-	0.18	0.4	V	I <sub>F</sub> = 16mA ,I <sub>O</sub> = 1.1mA, V <sub>CC</sub> =4.5V, Ta=25°C
	6N136		-	0.25	0.4		
	JOC4502						
	JOC4503						
	6N135		-	-	0.5		
6N136	-	-	0.5				
JOC4502							
JOC4503							
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>	-	0.3	1	pF	V=0, f=1MHz	

**ELECTRICAL OPTICAL CHARACTERISTICS**

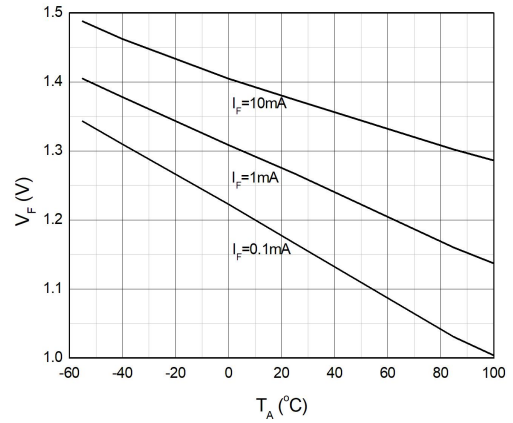
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE	
SWITCHING CHARACTERISTICS(at Ta=0 to 70°C, I <sub>F</sub> =16mA, V <sub>CC</sub> =5V, unless specified otherwise)								
Propagation Delay Time to Logic Low	6N135	TPHL	-	0.35	1.5	μs	R <sub>L</sub> =4.1kΩ, T <sub>A</sub> =25°C	Fig.13
			-	-	2		R <sub>L</sub> =4.1kΩ	
	6N136 JOC4502 JOC4503		-	0.35	0.8		R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	
			-	-	1.0		R <sub>L</sub> =1.9kΩ	
Propagation Delay Time to Logic High	6N135	TPLH	-	0.5	1.5	μs	R <sub>L</sub> =4.1kΩ, T <sub>A</sub> =25°C	Fig.13
			-	-	2		R <sub>L</sub> =4.1kΩ	
	6N136 JOC4502 JOC4503		-	0.3	0.8		R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	
			-	-	1.0		R <sub>L</sub> =1.9kΩ	
Common Mode Transient Immunity at Logic High	6N135	CM <sub>H</sub>	1000	-	-	V/μs	I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vpp, R <sub>L</sub> =4.1kΩ, T <sub>A</sub> =25°C	Fig.14
	6N136 JOC4502		1000	-	-		I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vpp, R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	
	JOC4503		15000	20000	-		I <sub>F</sub> = 0mA, V <sub>CM</sub> =1500Vpp, R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	
Common Mode Transient Immunity at Logic Low	6N135	CM <sub>L</sub>	1000	-	-	V/μs	I <sub>F</sub> = 16mA, V <sub>CM</sub> =10Vpp, R <sub>L</sub> =4.1kΩ, T <sub>A</sub> =25°C	Fig.14
	6N136 JOC4502		1000	-	-		I <sub>F</sub> = 16mA, V <sub>CM</sub> =10Vpp, R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	
	JOC4503		15000	20000	-		I <sub>F</sub> = 16mA, V <sub>CM</sub> =1500Vpp, R <sub>L</sub> =1.9kΩ, T <sub>A</sub> =25°C	

**CHARACTERISTIC CURVES**

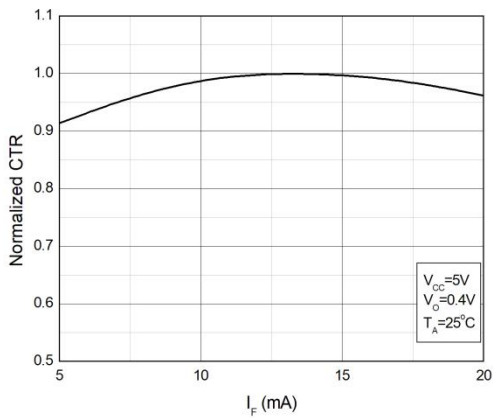
**Fig.1 Forward Current vs. Forward Voltage**



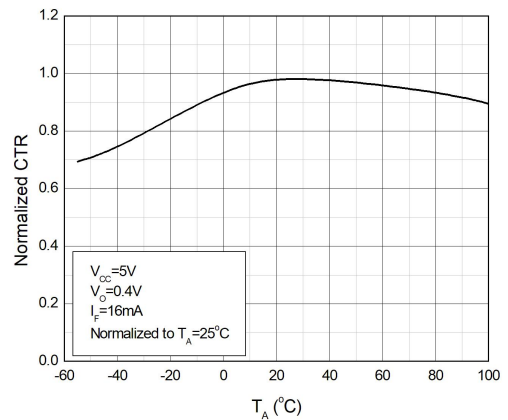
**Fig.2 Forward Voltage vs. Ambient Temperature**



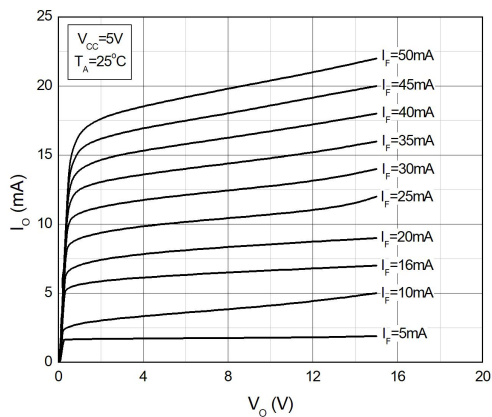
**Fig.3 Input Threshold Current vs. Ambient Temperature**



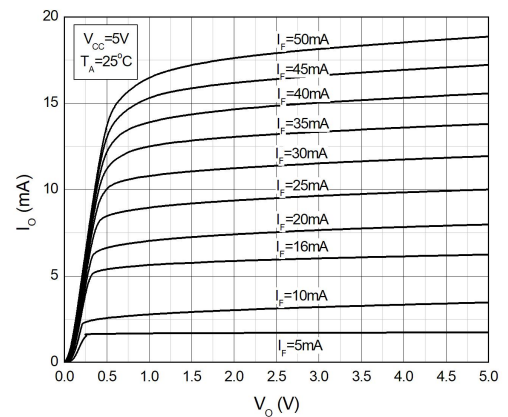
**Fig.4 Input Threshold Current vs. Ambient Temperature**



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

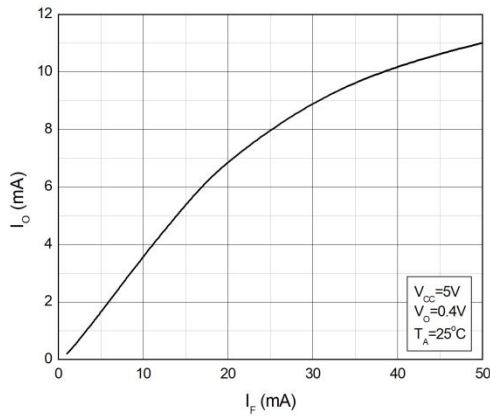


**Fig.6 Low Level Output Current vs. Ambient Temperature**

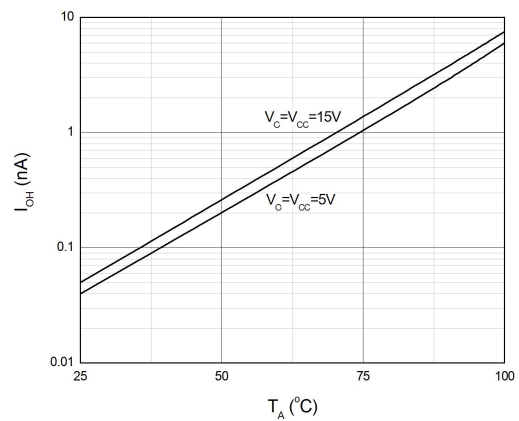


**CHARACTERISTIC CURVES**

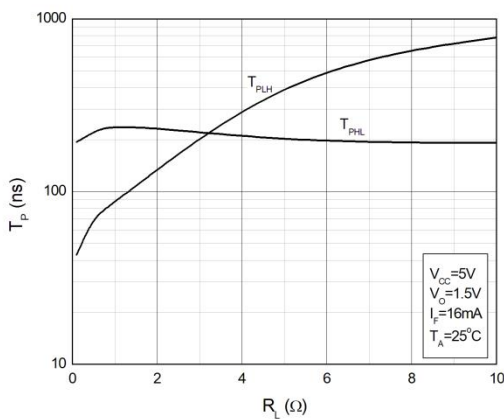
**Fig.7 Low Level Output Voltage vs. Ambient Temperature**



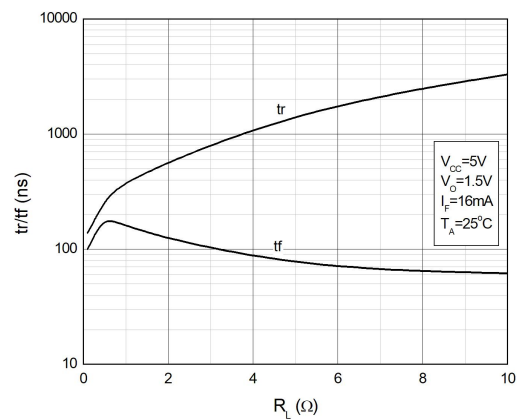
**Fig.8 Low Level Output Voltage vs. Ambient Temperature**



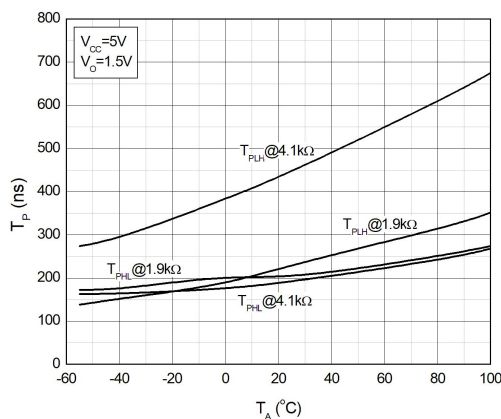
**Fig.9 High Level Output Current vs. Ambient Temperature**



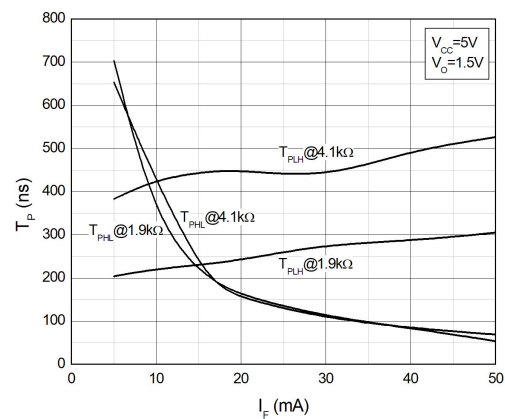
**Fig.10 High Level Output Current vs. Ambient Temperature**



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



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



### TEST CIRCUITS

Fig.13 Test Circuits for TPHL, TPLH, tr, tf

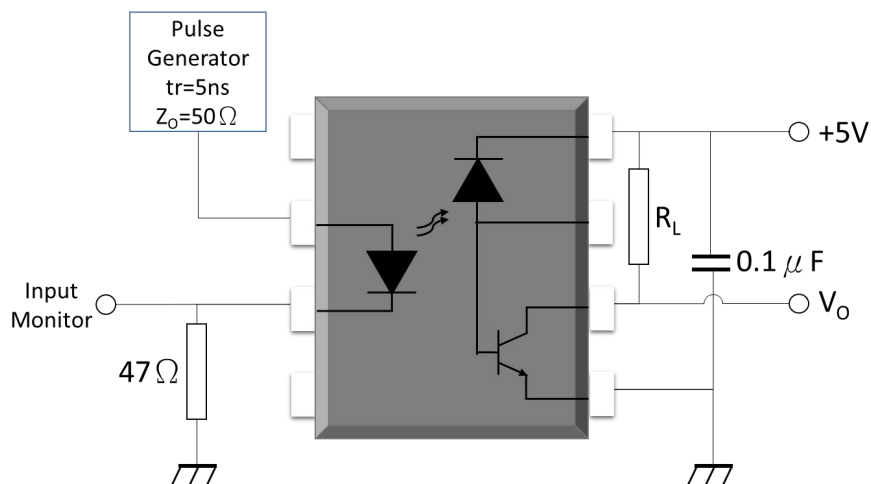
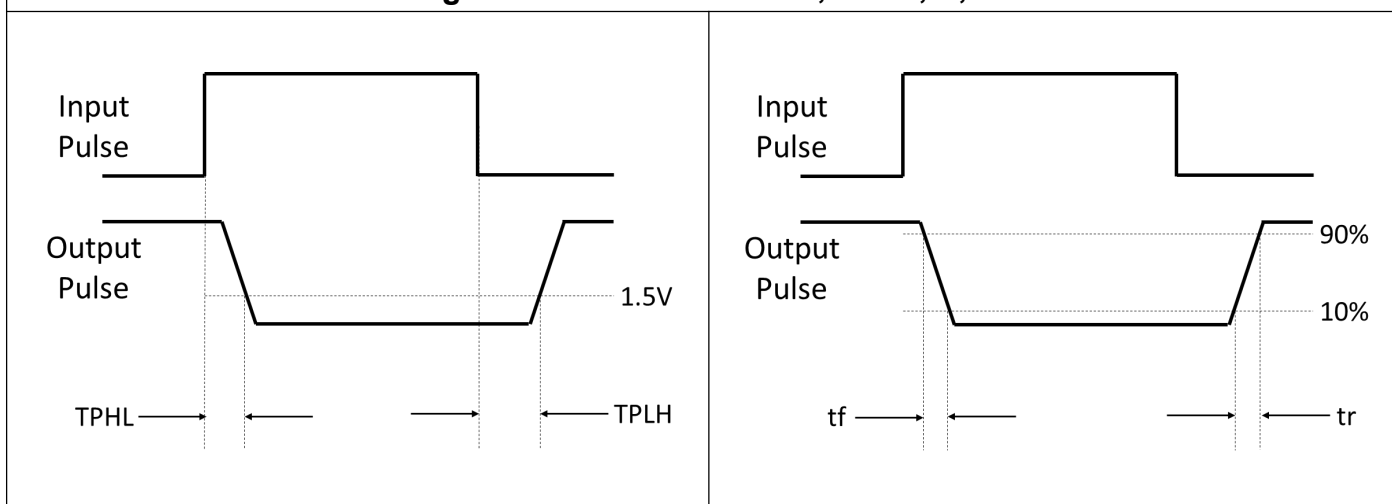


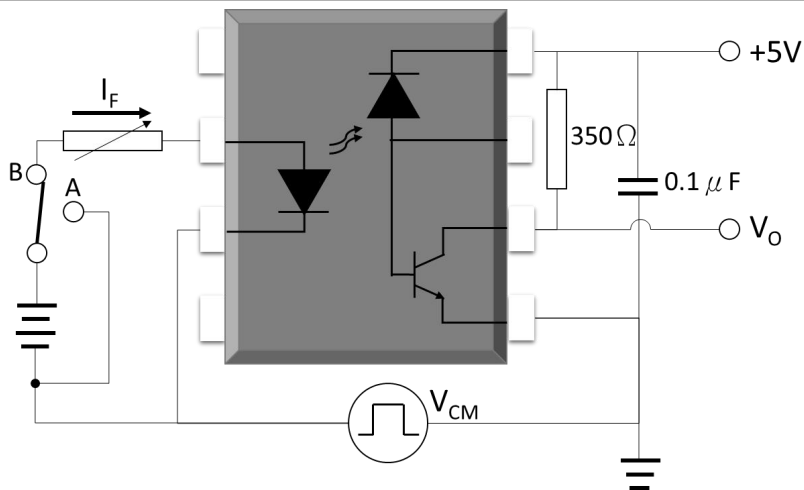
Fig.14 Waveforms of TPHL, TPLH, tr, tf



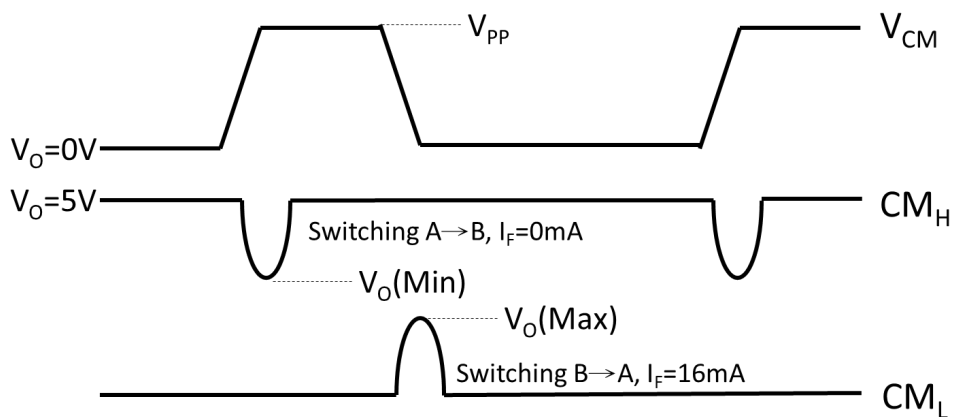


**TEST CIRCUITS**

**Fig.15 Test Circuits for Common Mode Transient Immunity**

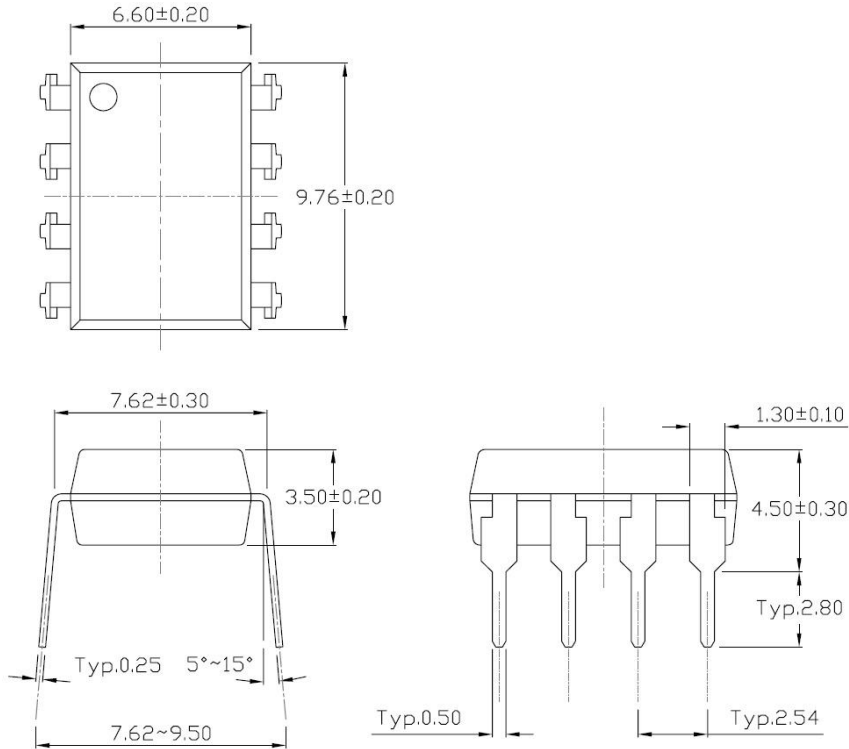


**Fig.16 Waveforms of Common Mode Transient Immunity**

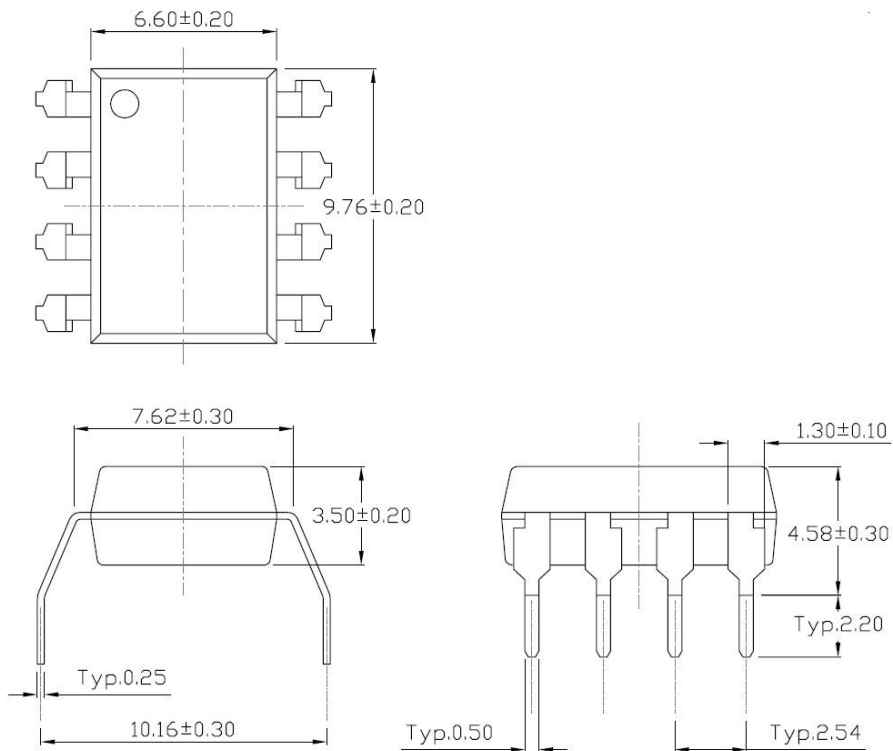


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

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

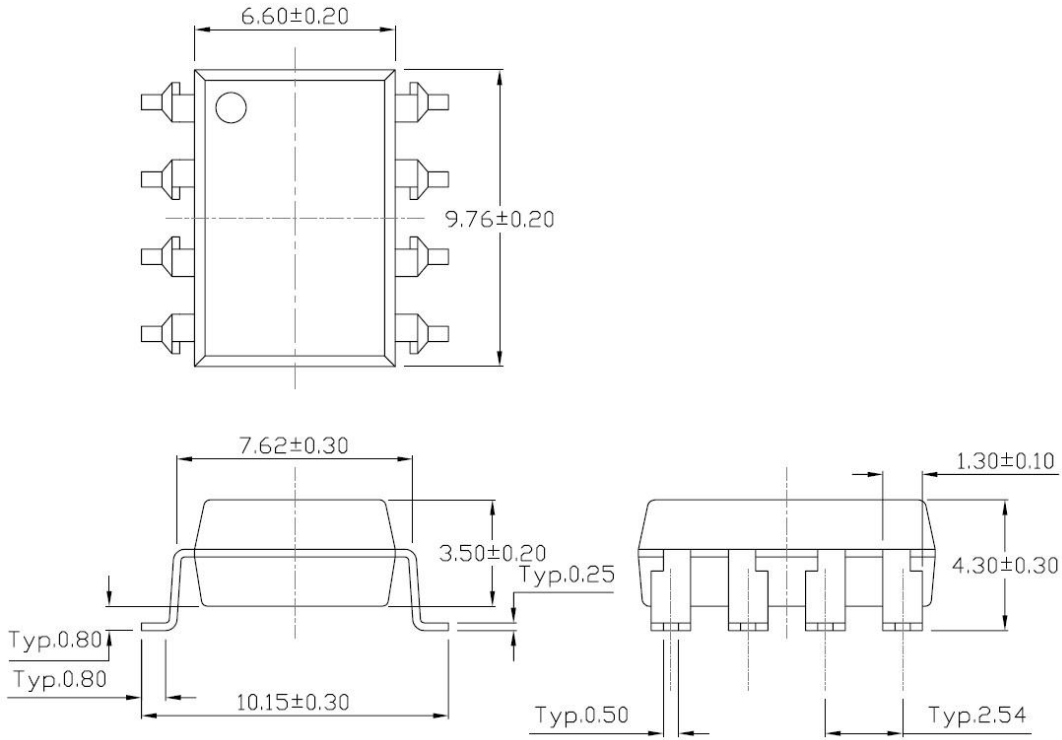


**Gullwing (400mil) Lead Forming – Through Hole (M Type)**

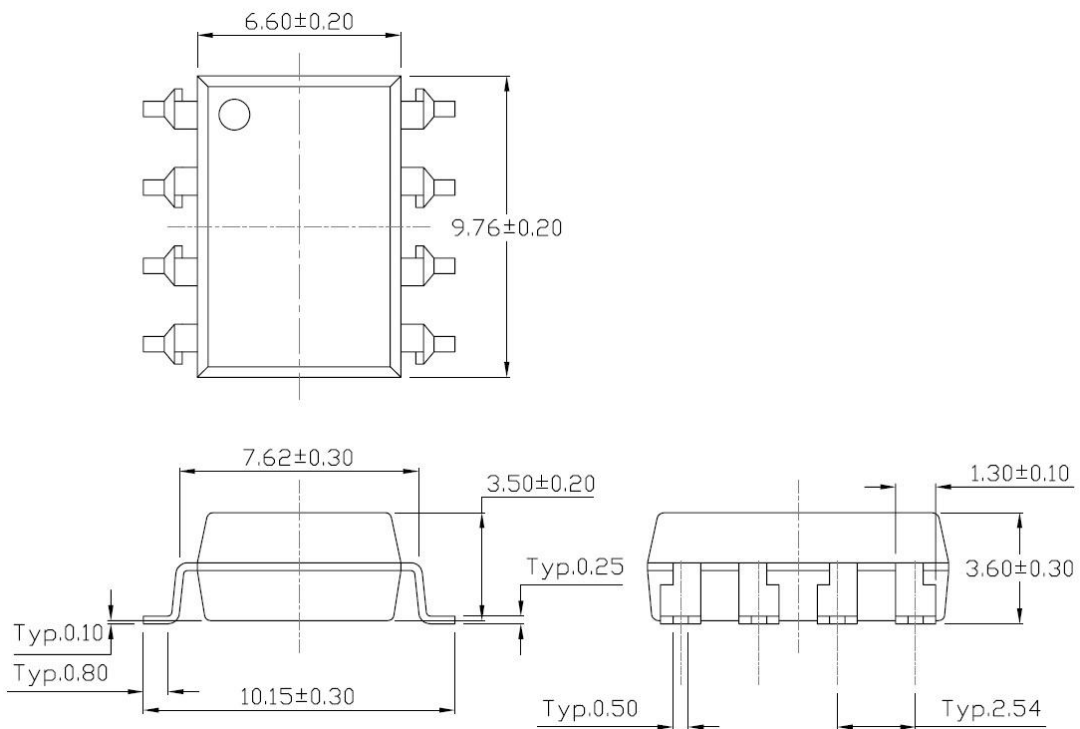


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

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

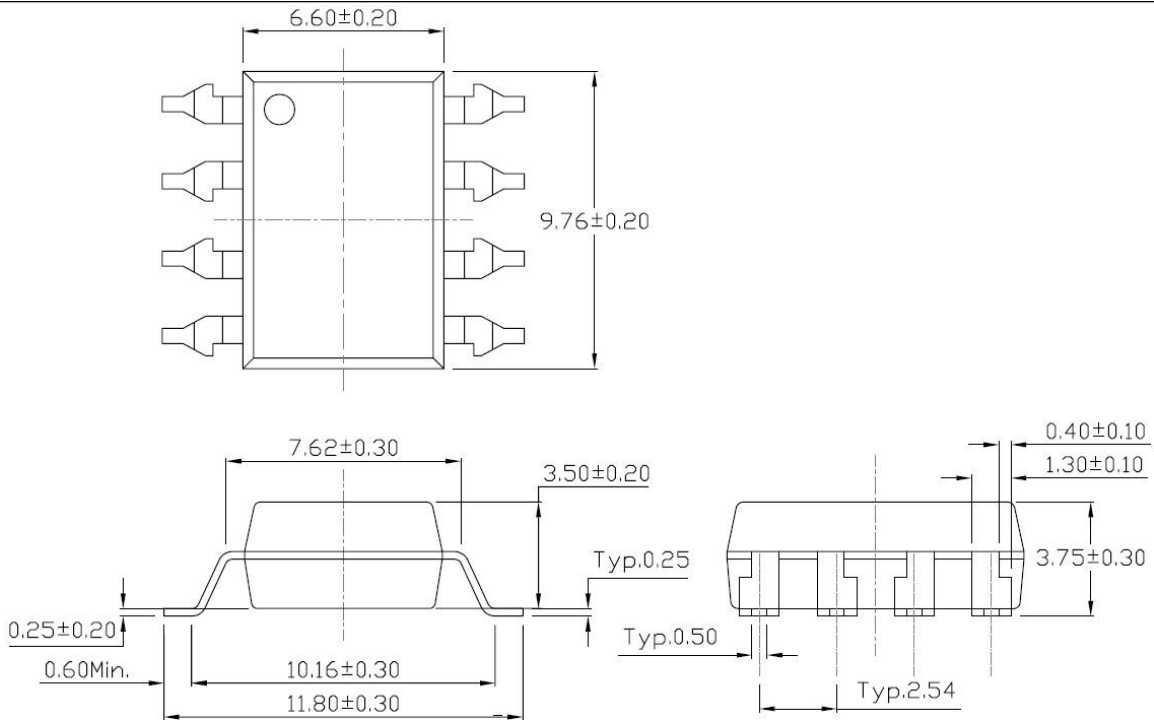


**Surface Mount (Low Profile) Lead Forming (SL Type)**



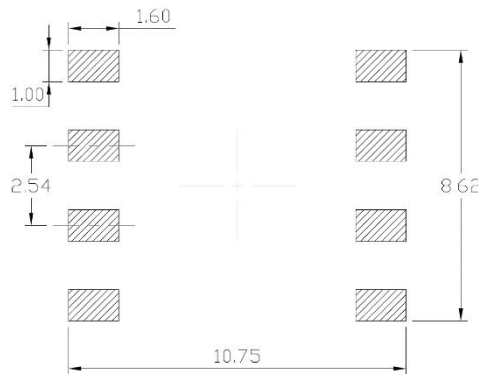
**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**

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

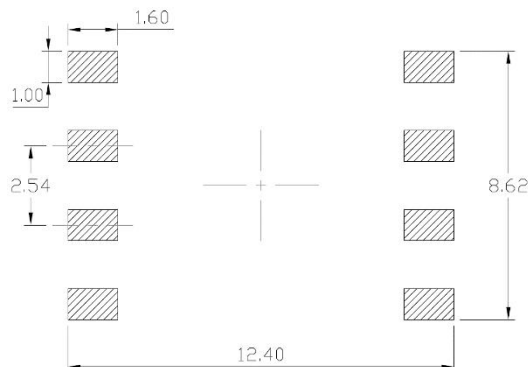


**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**

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

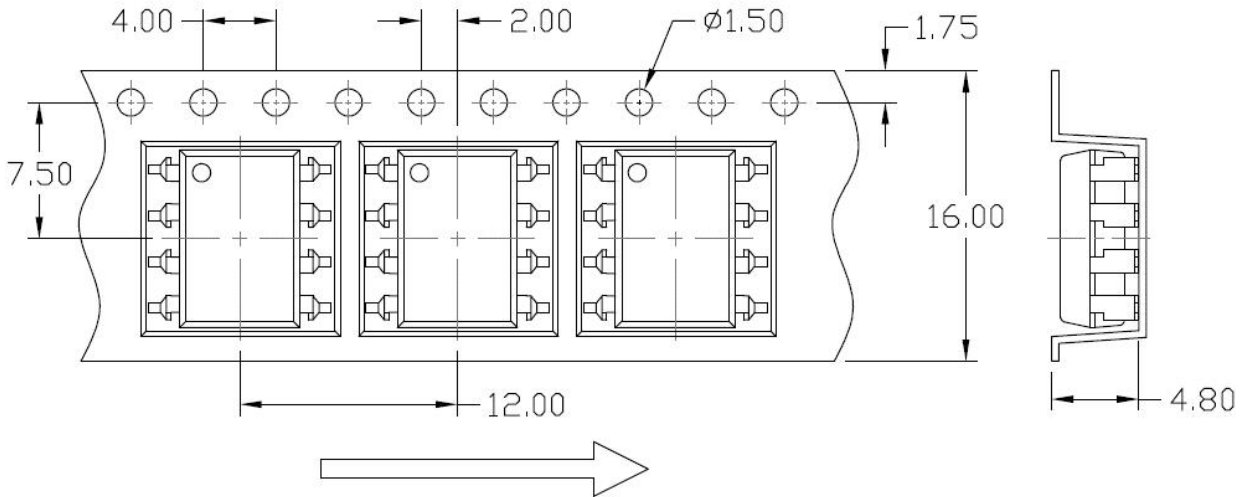


**Surface Mount (Gullwing) Lead Forming**

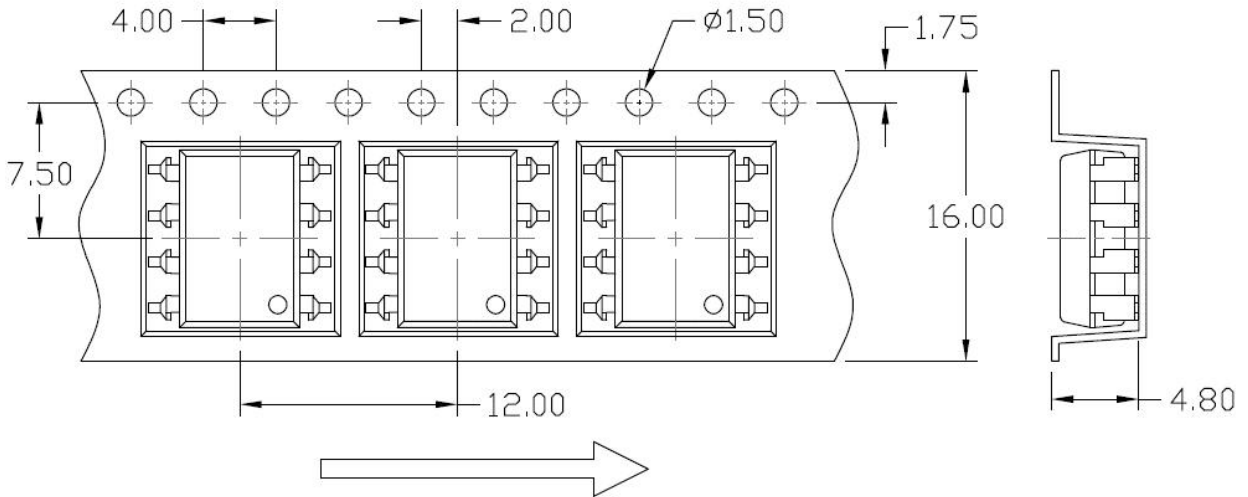


**Carrier Tape Specifications (Dimensions in mm unless otherwise stated)**

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

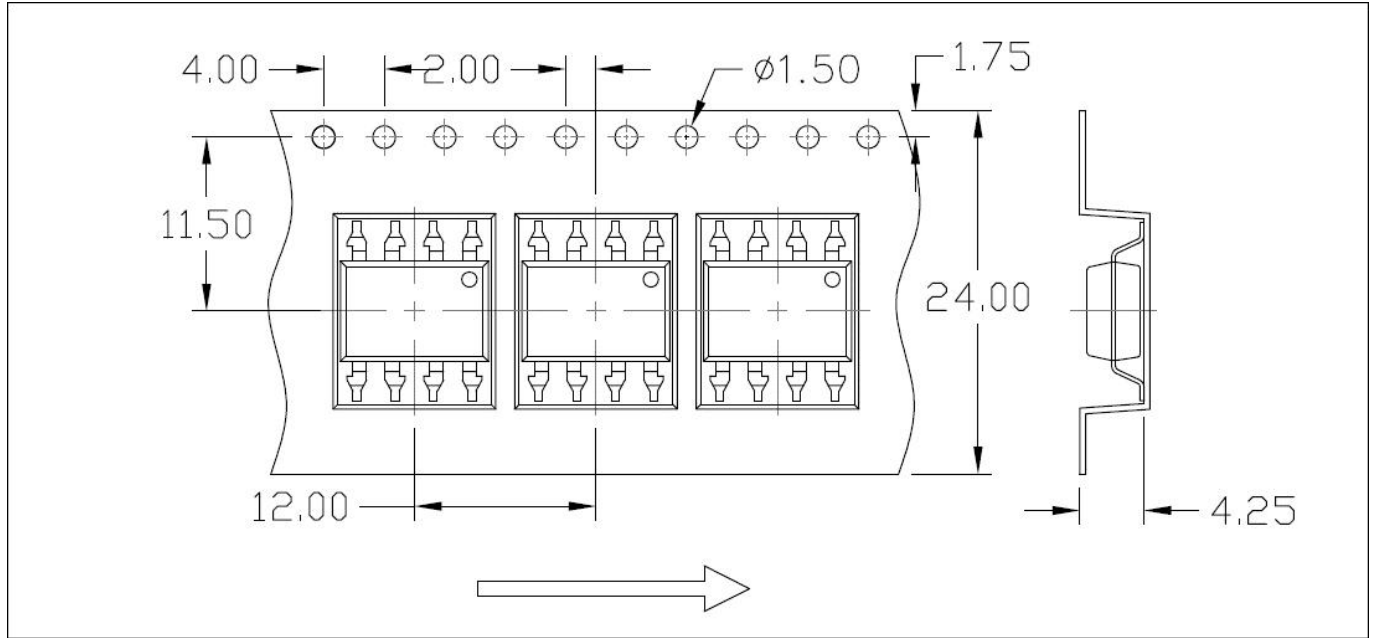


**Option S(T2) & SL(T2)**

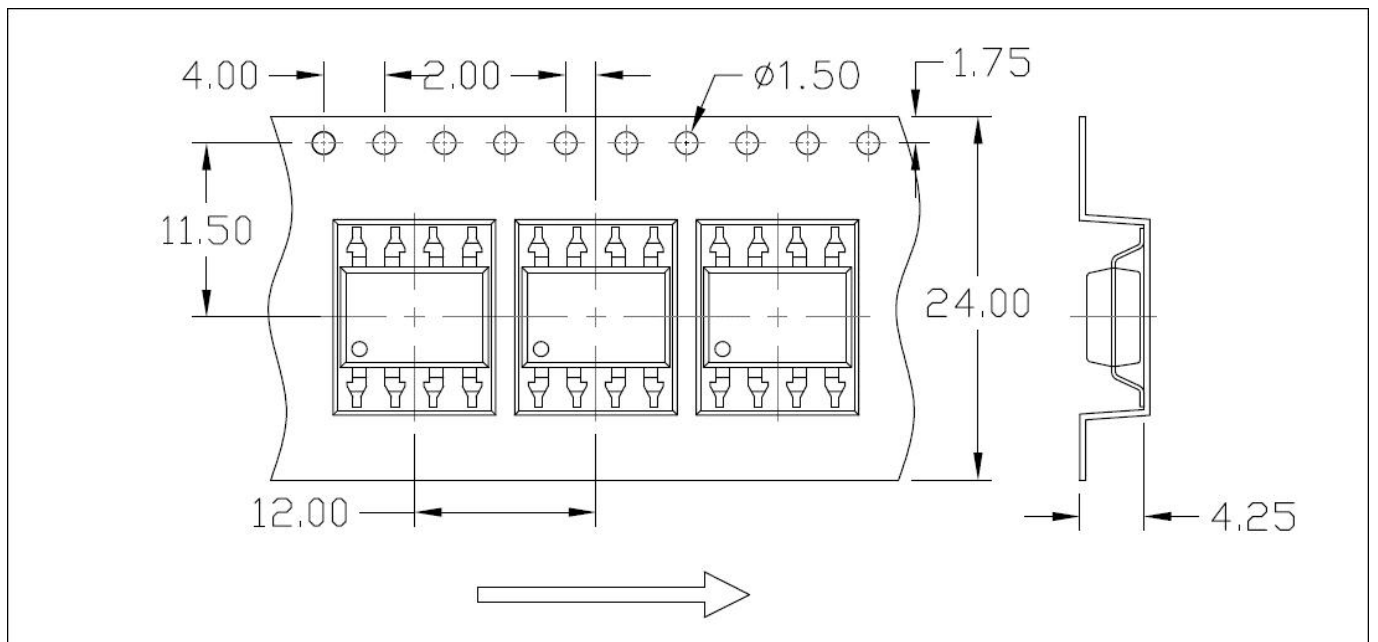


**Carrier Tape Specifications (Dimensions in mm unless otherwise stated)**

**Option SLM(T1)**

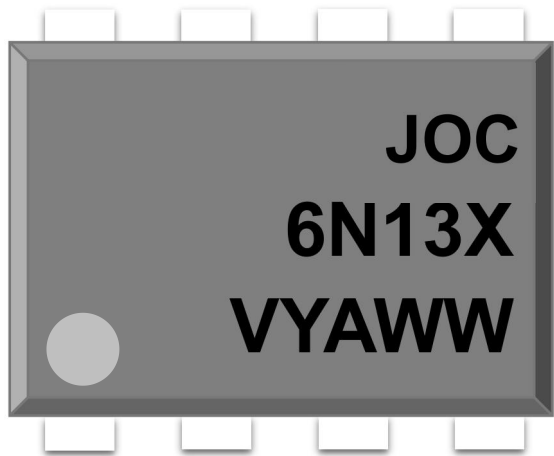


**Option SLM(T2)**



**ORDERING AND MARKING INFORMATION**

**MARKING INFORMATION**



**JOC** : Company Abbr.  
**6N13X** : Part Number  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

**ORDERING INFORMATION**

**6N13X(Y)(Z)-GV**

6N13X – Part Number (X=5 or 6)  
 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**

 捷捷微电（深圳）有限公司  
 JIEJIE MICROELECTRONICS (Shenzhen) Co Ltd

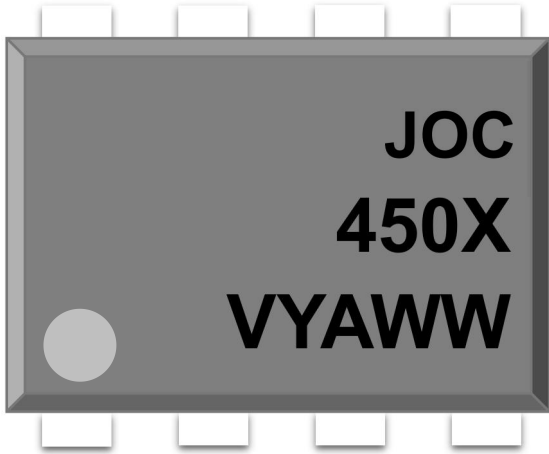
Part No.: XXXXXXXXXXXX Bin Code: X  
  
 Lot No.: XXXXXXXXXXXX  
 Date Code: XXXX  
 QTY: XXX PCS  
  

**PACKING QUANTITY**

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	45Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 14.4k 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**



**JOC** : Company Abbr.  
**450X** : Part Number & Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

**ORDERING INFORMATION**

**JOC450X(Y)(Z)-GV**

JOC – Company Abbr.  
 450X – Rank (X=2 or 3)  
 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**

 捷捷微电（深圳）有限公司  
 JIEJIE MICROELECTRONICS (Shenzhen) Co Ltd

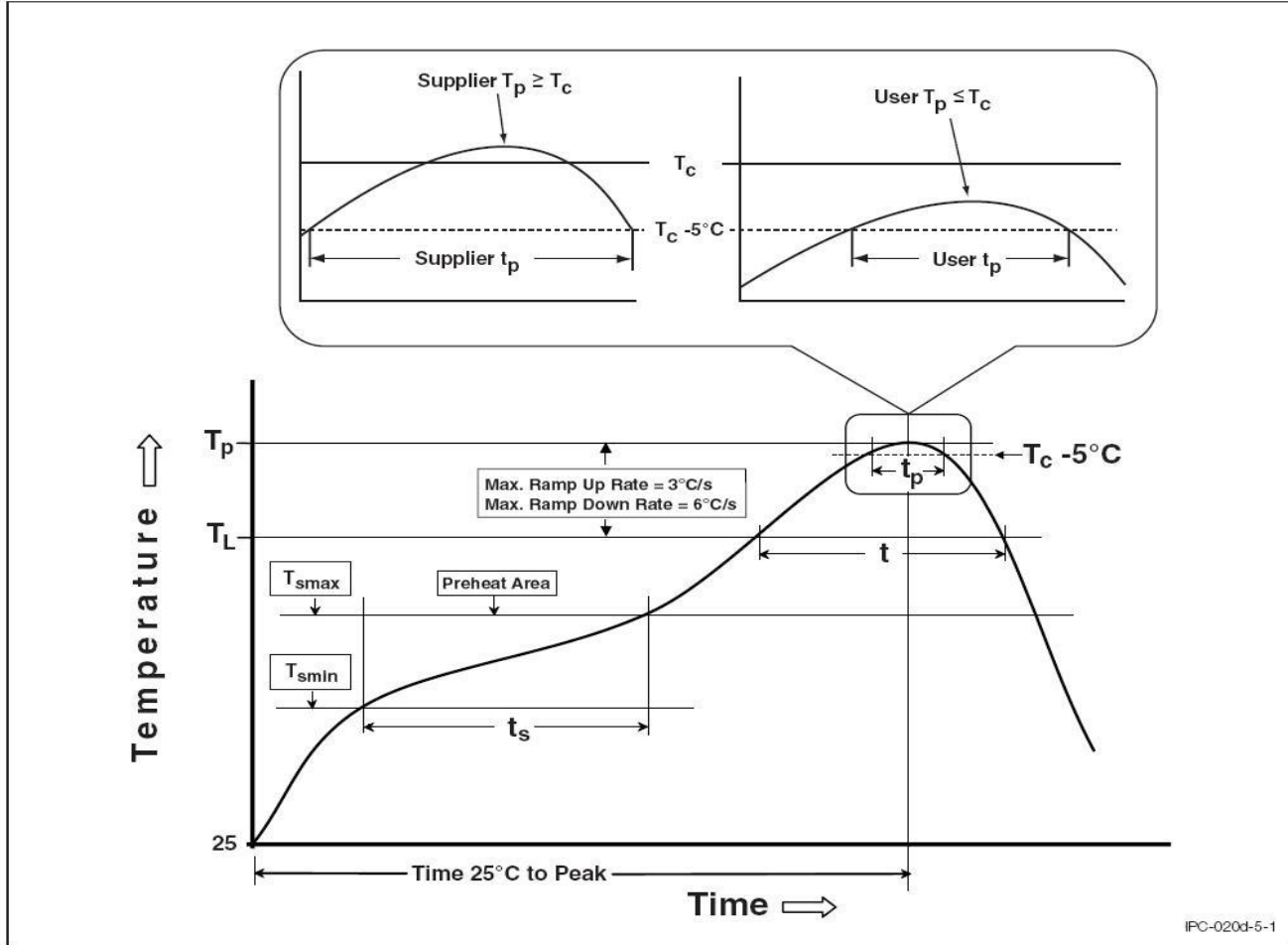
Part No.:XXXXXXXXXX Bin Code: X  
  
 Lot No.: XXXXXXXXXXXX  
 Date Code: XXXX  
 QTY: XXX PCS  
  

Option	Quantity	Quantity – Inner box	Quantity – Outer box
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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.

**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.