



6N137, CT2601

10MBit/s High Speed Logic Gate Optocoupler

Features

- High speed 10MBit/s
- High isolation voltage between input and output (Viso=5000 Vrms)
- Guaranteed performance from -40°C to 85°C
- Wide operating temperature range of -55°C to 100°C
- Regulatory Approvals
 - UL - UL1577 (E364000)
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC – GB4943.1, GB8898
 - IEC60065, IEC60950

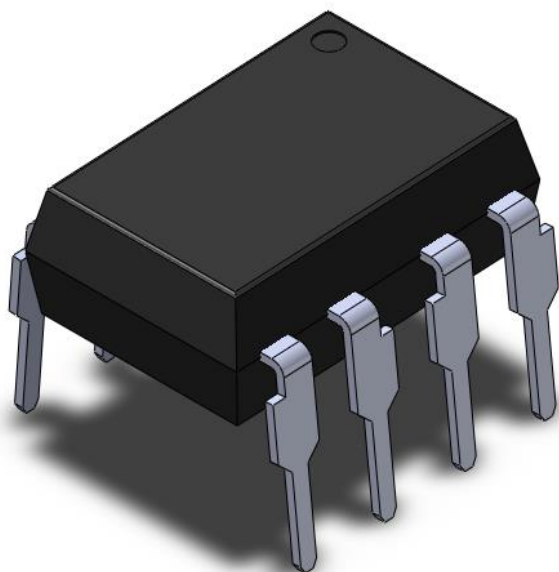
Description

The 6N137, CT2601 optocouplers consist of a 850 nm AlGaAs LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. This output features an open collector, there by permitting wired OR outputs. The switching parameters are guaranteed over the temperature range of -40°C to +85°C. A maximum input signal of 5mA will provide a minimum output sink current of 13mA (fan out of 8).

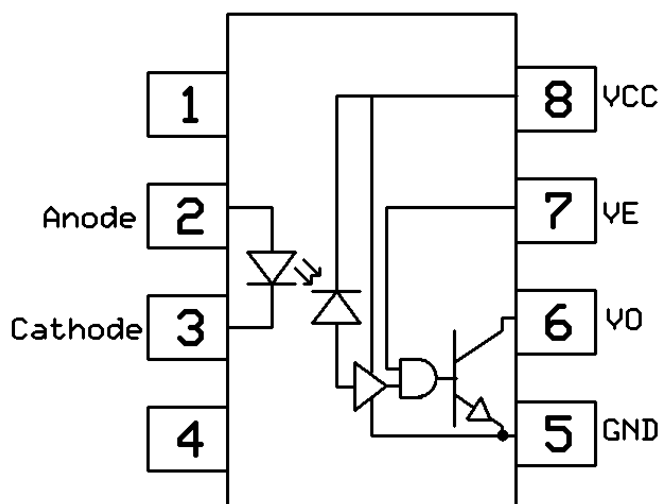
Applications

- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances

Package Outline



Schematic



Note: Different lead forming options available. See package dimension.



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Absolute Maximum Rating at 25°C

Symbol	Parameters	Ratings	Units	Notes
V _{ISO}	Isolation voltage	5000	V _{RMS}	1
T _{OPR}	Operating temperature	-55 ~ +100	°C	
T _{STG}	Storage temperature	-55 ~ +125	°C	
T _{SOL}	Soldering temperature	260	°C	2
Emitter				
I _F	Forward current	50	mA	
V _R	Reverse voltage	5	V	
P _I	Power dissipation	100	mW	
Detector				
P _O	Power dissipation	85	mW	
I _O	Average Output current	50	mA	
V _O	Output voltage	7.0	V	1min(Max.)
V _{CC}	Supply voltage	7.0	V	
V _E	Enable Input Voltage Not to Exceed VCC by more than 500mV	5.5	V	

Notes

1. AC for 1 minute, RH = 40 ~ 60%.
2. For 10 second peak



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Electrical Characteristics

$T_A = -40 - 85^{\circ}\text{C}$ (unless otherwise specified). Typical values are measured at $T_A = 25^{\circ}\text{C}$ and $V_{CC} = 5\text{V}$

Emitter Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
V_F	Forward voltage	$I_F = 10\text{mA}$	-	1.4	1.6	V	
V_R	Reverse Voltage	$I_R = 10\mu\text{A}$	5.0	-	-	V	
$\Delta V_F / \Delta T_A$	Temperature coefficient of forward voltage	$I_F = 10\text{mA}$	-	-1.8	-	mV/ $^{\circ}\text{C}$	

Detector Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
I_{CCH}	Logic High Supply Current	$I_F = 0\text{mA}, V_E = 0.5\text{V}, V_{CC} = 3.3\text{V}$	-	4.0	10	mA	
		$I_F = 0\text{mA}, V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$	-	6.5	10		
I_{CCL}	Logic Low Supply Current	$I_F = 10\text{mA}, V_E = 0.5\text{V}, V_{CC} = 3.3\text{V}$	-	5.5	13	mA	
		$I_F = 10\text{mA}, V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$	-	8.8	13		
V_{EH}	High Level Enable Voltage	$I_F = 10\text{mA}, V_{CC} = 3.3\text{V}$	2.0	-	-	V	
		$I_F = 10\text{mA}, V_{CC} = 5.5\text{V}$	2.0	-	-		
V_{EL}	Low Level Enable Voltage	$I_F = 10\text{mA}, V_{CC} = 3.3\text{V}$	-	-	0.8	V	
		$I_F = 10\text{mA}, V_{CC} = 5.5\text{V}$	-	-	0.8		
I_{EH}	High Level Enable Current	$V_E = 2.0\text{V}, V_{CC} = 3.3\text{V}$	-	-0.2	-1.6	mA	
		$V_E = 2.0\text{V}, V_{CC} = 5.5\text{V}$	-	-0.53	-1.6		
I_{EL}	Low Level Enable Current	$V_E = 0.5\text{V}, V_{CC} = 3.3\text{V}$	-	-0.42	-1.6	mA	
		$V_E = 0.5\text{V}, V_{CC} = 5.5\text{V}$	-	-0.75	-1.6		

Transfer Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
I_{FT}	Input Threshold Current	$V_{CC} = 3.3\text{V}, V_O = 0.6\text{V}, V_E = 2.0\text{V}, I_O = 13\text{mA}$	-	1.6	5	mA	
		$V_{CC} = 5.5\text{V}, V_O = 0.6\text{V}, V_E = 2.0\text{V}, I_O = 13\text{mA}$	-	2.5	5		



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I _{OH}	Logic High Output Current	I _F =250μA, V _O =V _{CC} =3.3V, V _E =2.0V	-	7.0	100	μA	
		I _F =250μA, V _O =V _{CC} =5.5V, V _E =2.0V	-	2.0	100		
V _{OL}	Low Level Output Voltage	I _F =5mA, V _{CC} =3.3V, V _E =2.0V, I _O =13mA	-	0.45	0.6	V	
		I _F =5mA, V _{CC} =5.5V, V _E =2.0V, I _O =13mA	-	0.35	0.6		

Electrical Characteristics

T_A = -40 - 85°C (unless otherwise specified). Typical values are measured at T_A = 25°C, V_{CC} = 5V and I_F = 7.5mA

Switching Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes	
T _{PHL}	Output Propagation Delay High to Low	C _L = 15pF, R _L = 350Ω V _{CC} =3.3V	-	34	75	ns		
		C _L = 15pF, R _L = 350Ω V _{CC} =5.5V	-	34	75			
T _{PLH}	Output Propagation Delay Low to High	C _L = 15pF, R _L = 350Ω V _{CC} =3.3V	-	50	75	ns		
		C _L = 15pF, R _L = 350Ω V _{CC} =5.5V	-	39	75			
P _{WD}	Pulse Width Distortion	C _L = 15pF, R _L = 350Ω V _{CC} =3.3V	-	16	34	ns		
		C _L = 15pF, R _L = 350Ω V _{CC} =5.5V	-	5	34			
T _r	Output Rise Time	C _L = 15pF, R _L = 350Ω V _{CC} =3.3V	-	37	-	ns		
		C _L = 15pF, R _L = 350Ω V _{CC} =5.5V	-	37	-			
T _f	Output Fall Time	C _L = 15pF, R _L = 350Ω V _{CC} =3.3V	-	10	-	ns		
		C _L = 15pF, R _L = 350Ω V _{CC} =5.5V	-	10	-			
T _{ELH}	Enable Propagation Delay Low To High	V _{EH} = 3.5V, C _L = 15pF, R _L = 350Ω	-	15	-	ns		
T _{EHL}	Enable Propagation Delay High To Low		-	15	-	ns		
CM _H	Common Mode Transient Immunity at Logic High	I _F = 0mA, V _{CM} = 50Vp-p, V _{OH} = 2.0V, R _L = 350Ω	6N137	-	10000	-	V/μs	
			CT2601	5000	10000	-		



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CML	Common Mode Transient Immunity at Logic Low	I _F =7.5mA, V _{CM} = 50Vp-p, V _{OL} = 0.8V, R _L = 350Ω	6N137	-	10000	-	V/μs	
			CT2601	5000	10000	-		



Typical Characteristic Curves

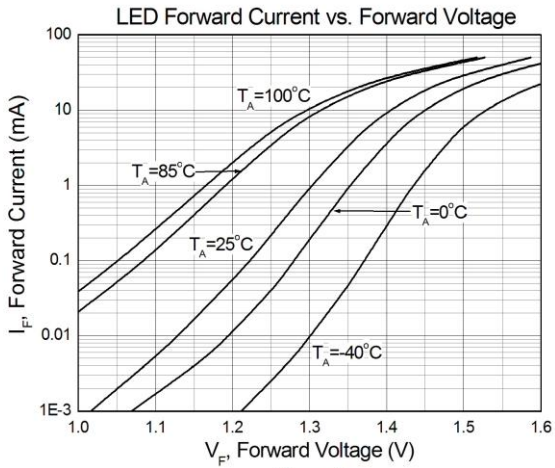


Figure 1

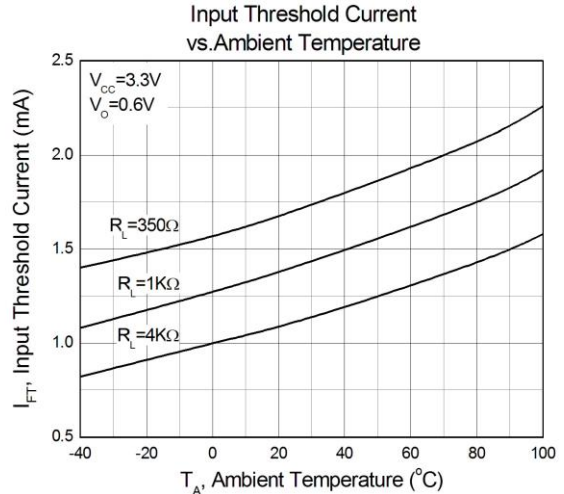


Figure 2

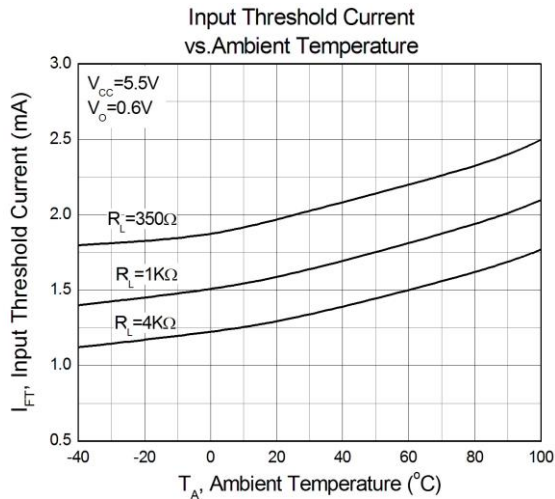


Figure 3

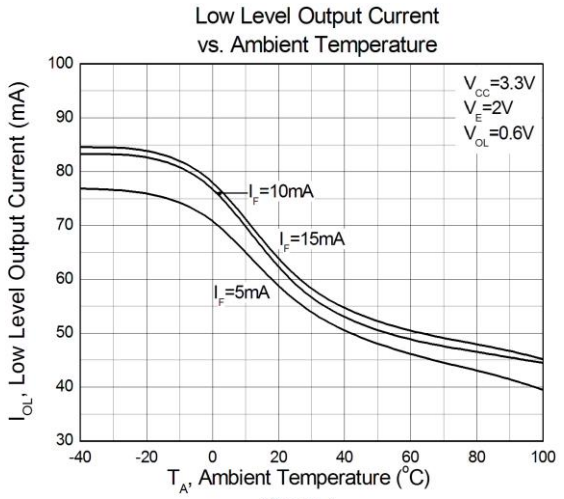


Figure 4

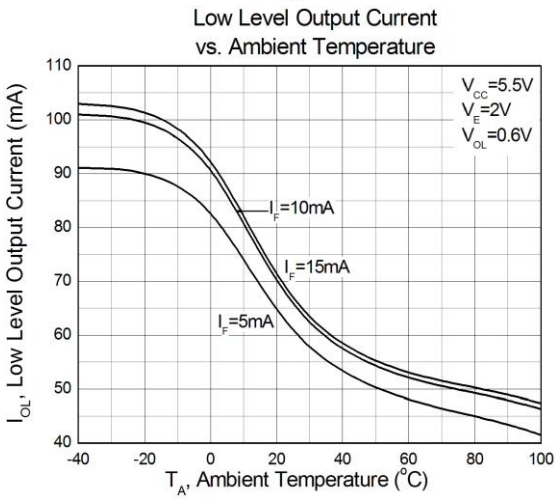


Figure 5

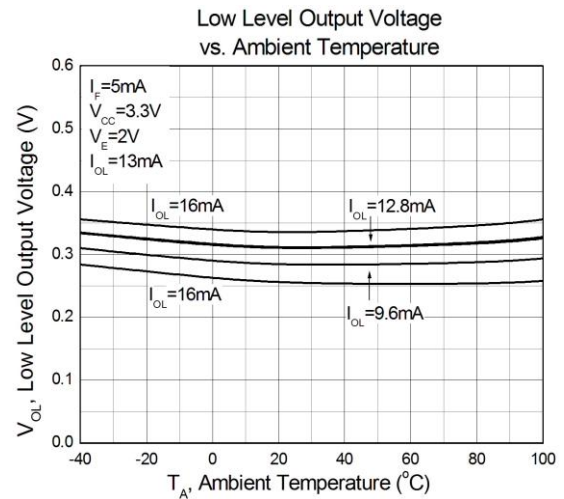
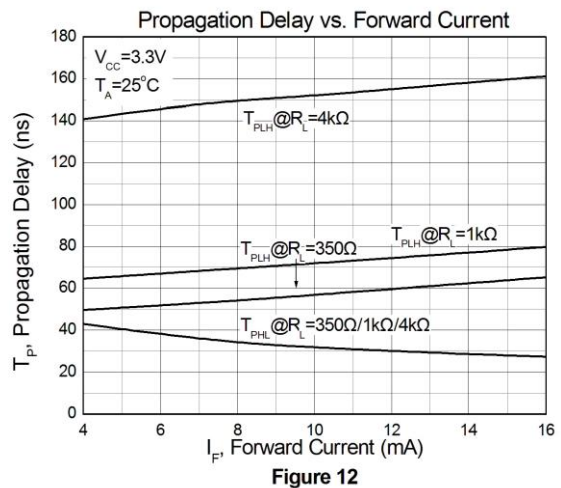
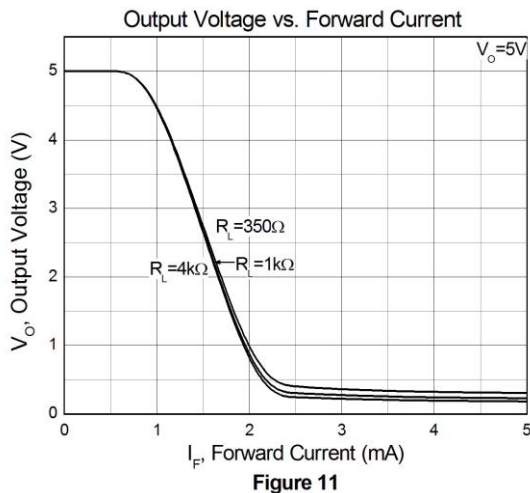
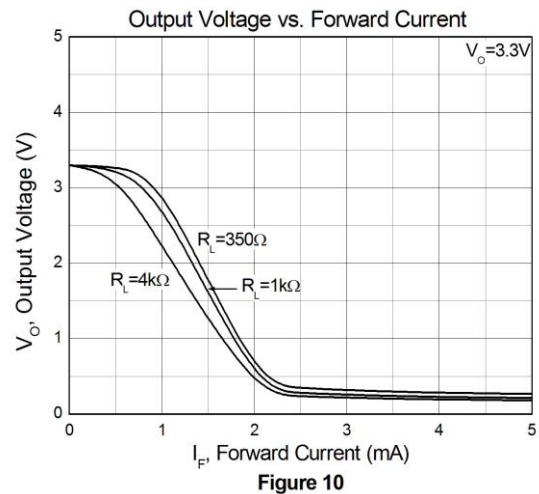
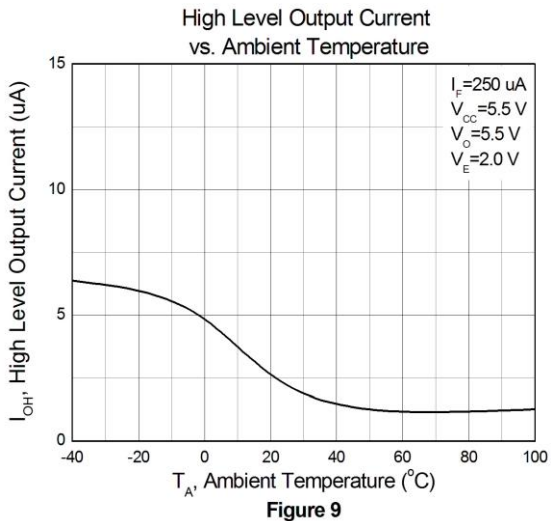
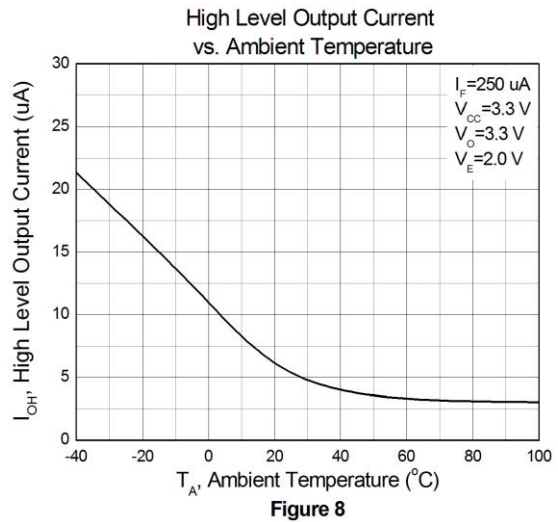
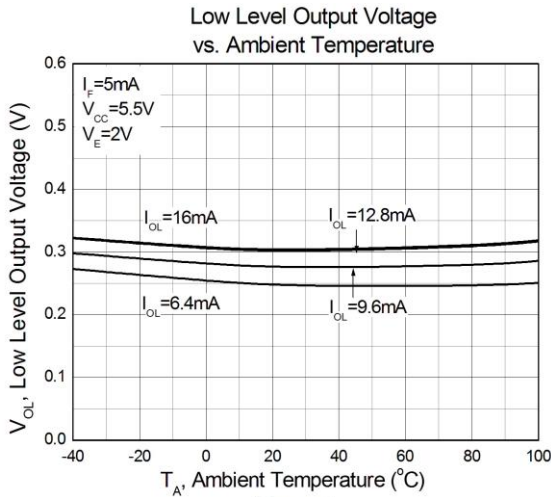


Figure 6



Typical Characteristic Curves





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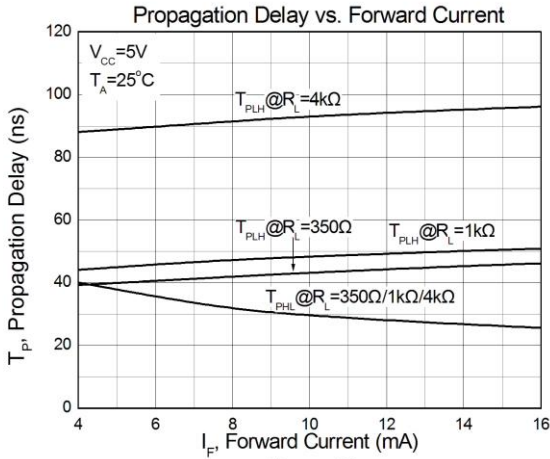


Figure 13

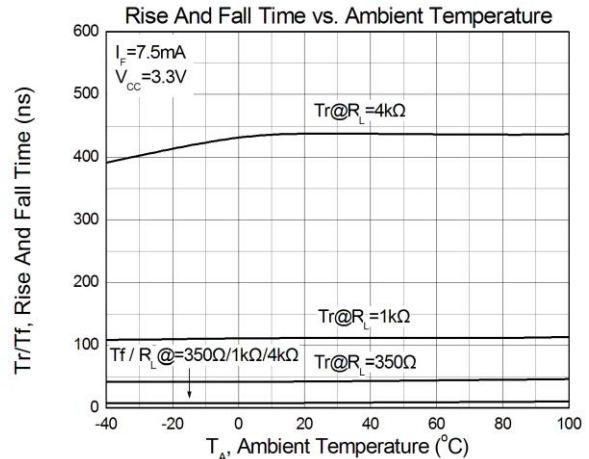


Figure 14

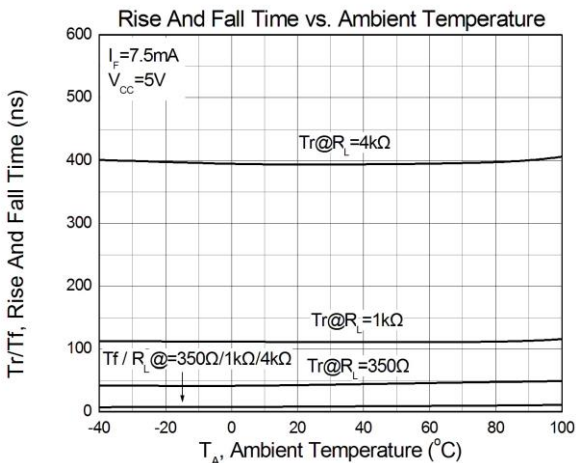


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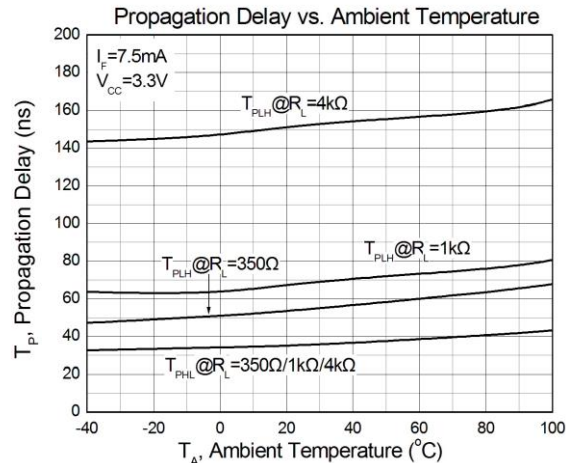


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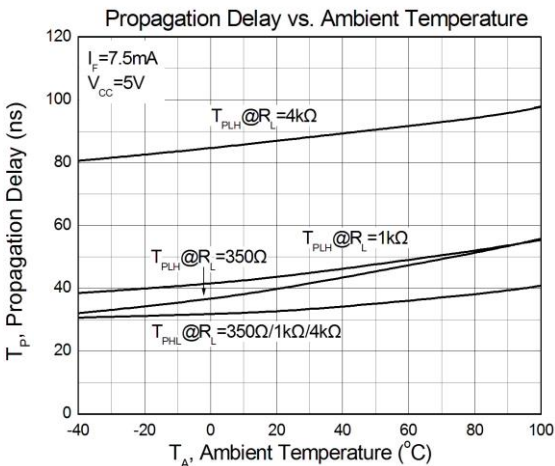


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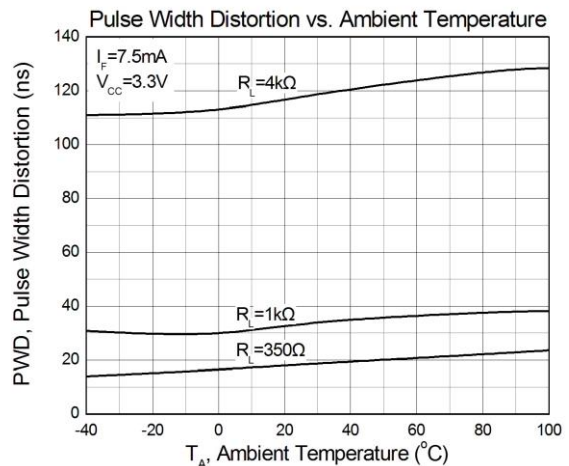


Figure 18



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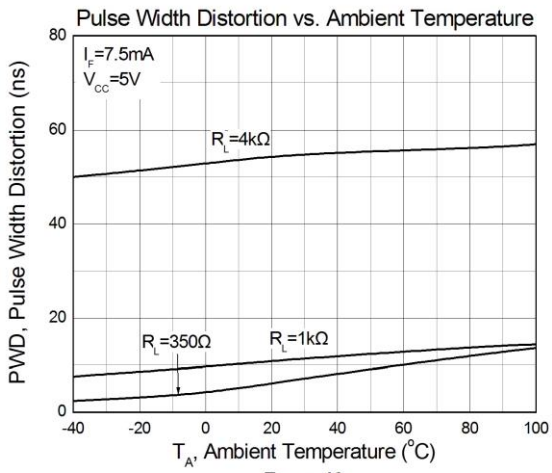


Figure 19

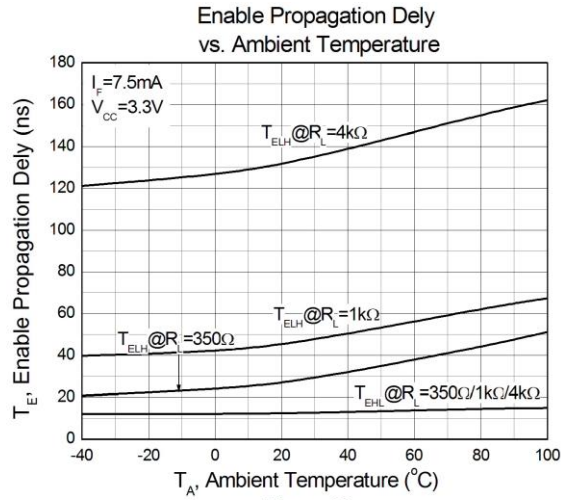


Figure 20

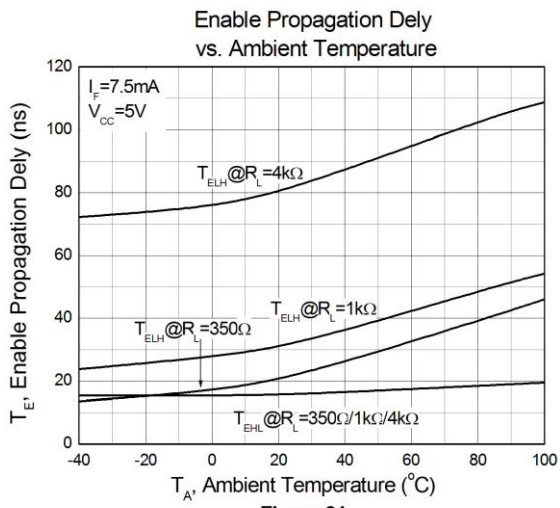
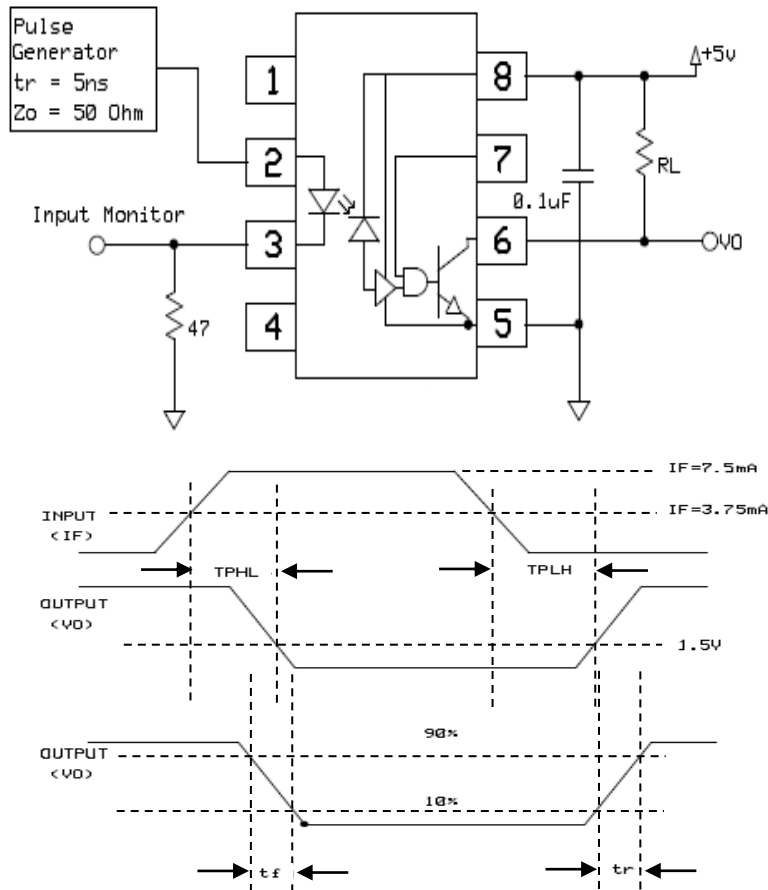


Figure 21



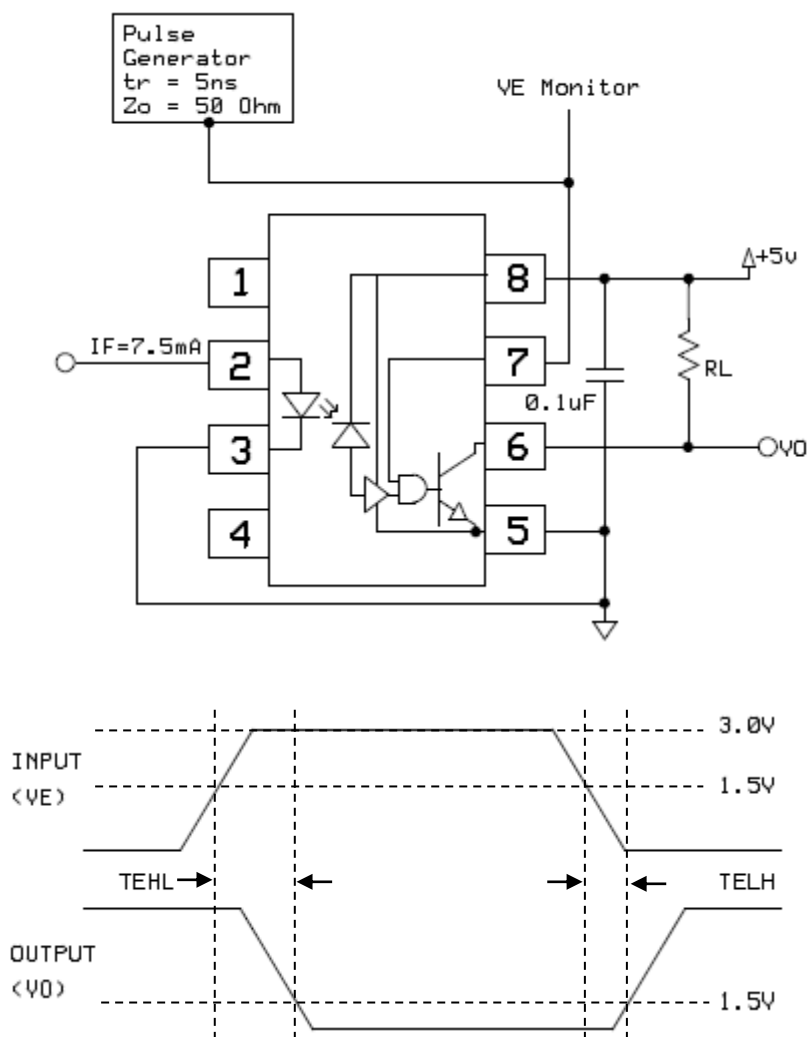
Test Circuits



Switching Time Test Circuit



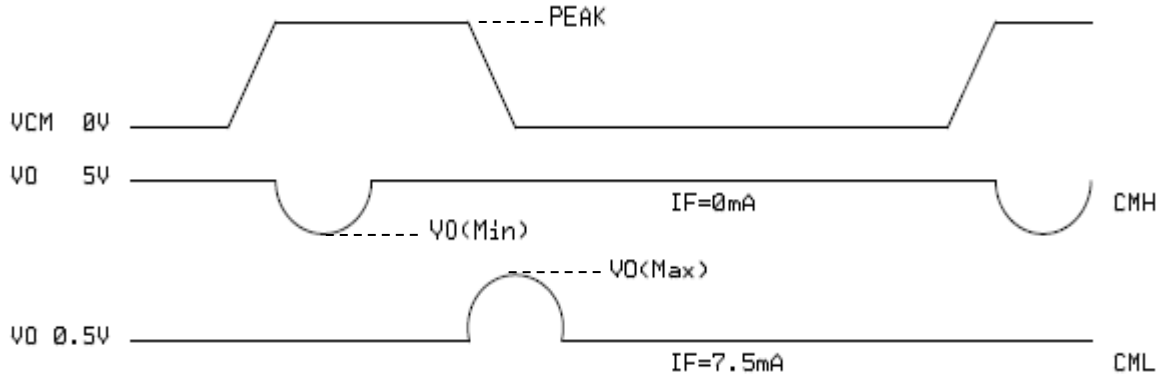
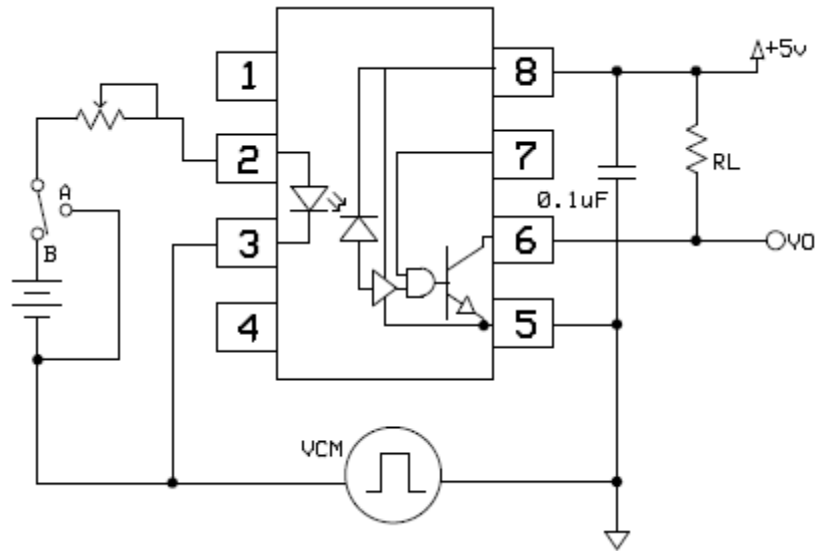
Test Circuits



Enable Switching Time Test Circuit



Test Circuits



CMR Test Circuit

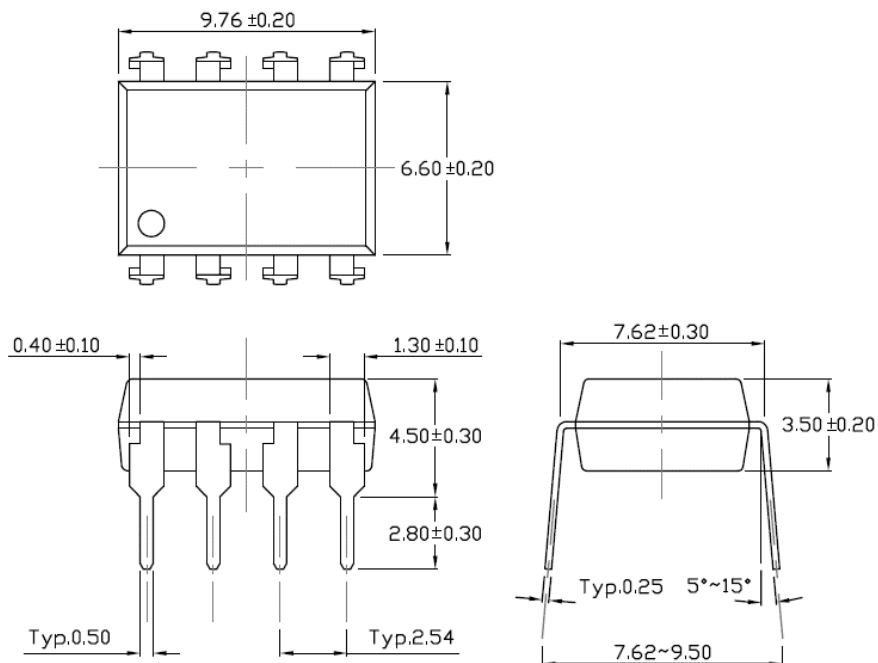


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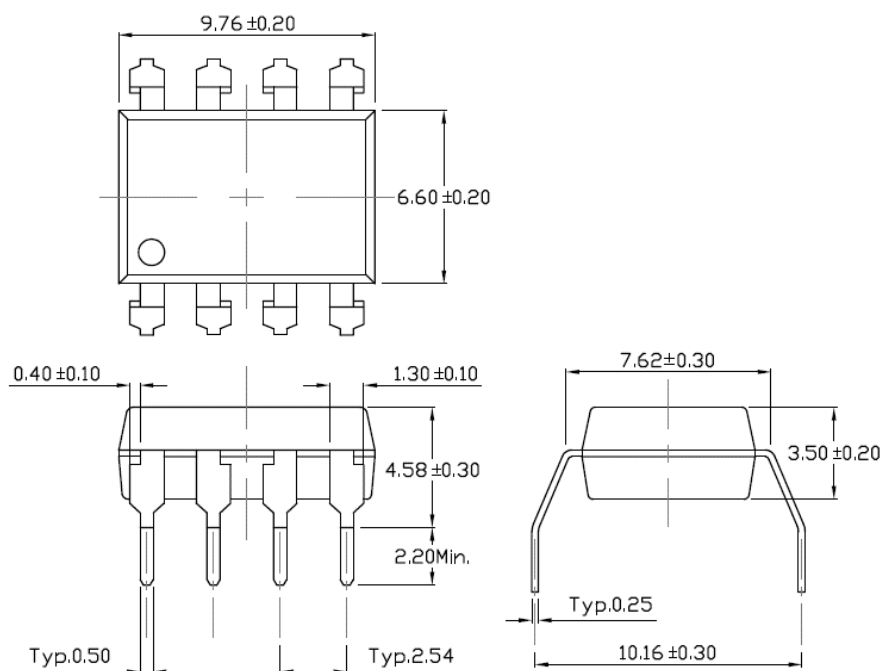
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Package Dimension *Dimensions in mm unless otherwise stated*

Standard DIP – Through Hole



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

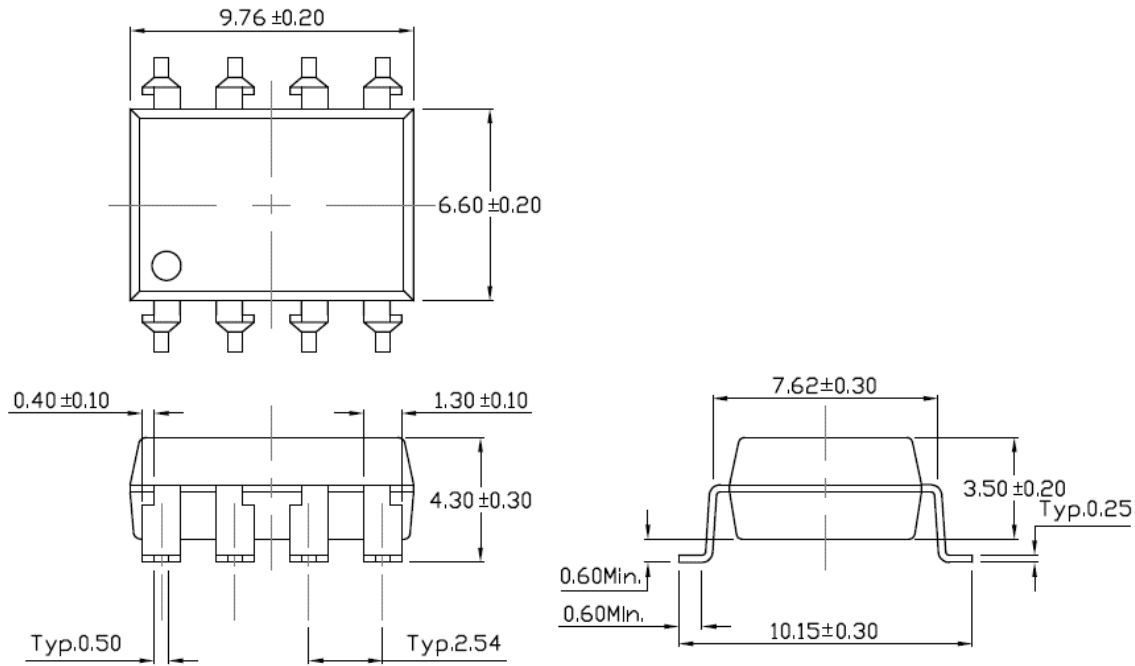




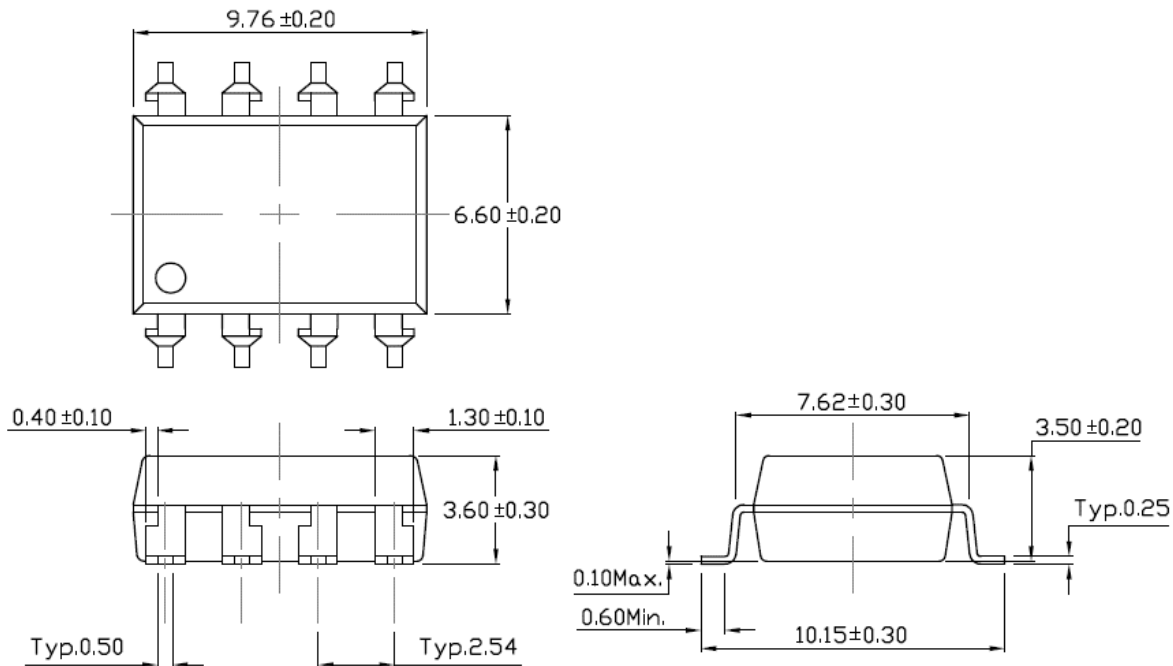
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Surface Mount Lead Forming (S Type)



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

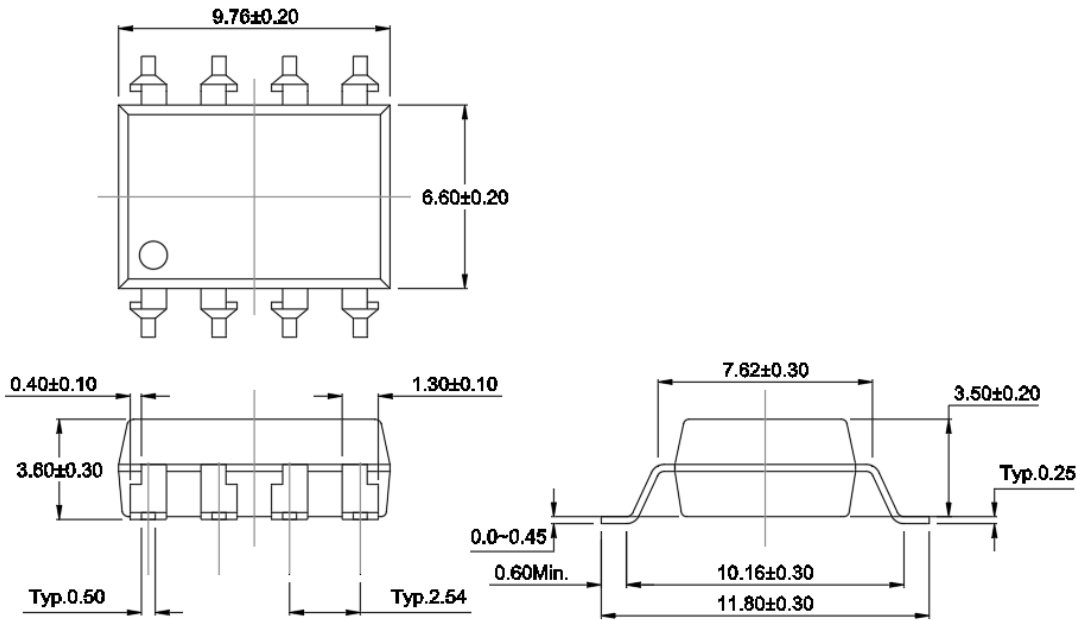




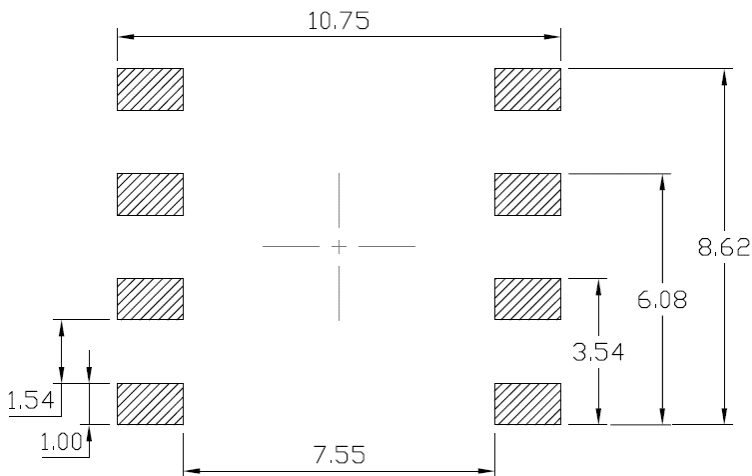
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Wide Surface Mount Forming (Low Profile) – SLM Type



Recommended Solder Mask *Dimensions in mm unless otherwise stated*

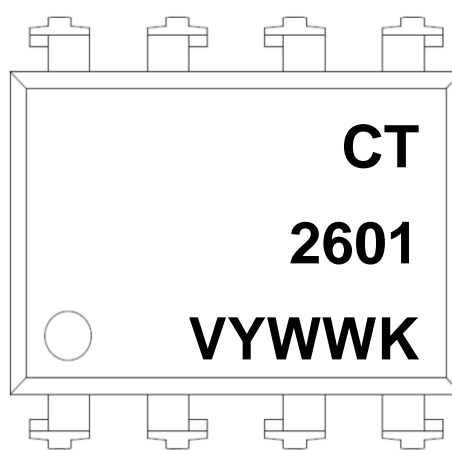
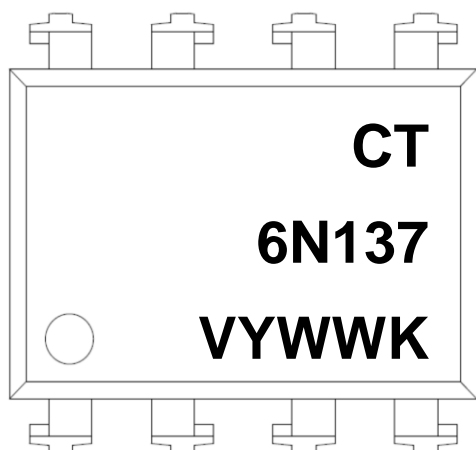




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10MBit/s High Speed Logic Gate Optocoupler

Device Marking



Note:

CT : Denotes “CT Micro”
6N137 : Product Number
2601 : Product Number
V : VDE Option
Y : Fiscal Year
WW : Work Week
K : Production Code

Ordering Information

6N137(V)(Y)(Z)-G ; CT2601(V)(Y)(Z)-G

CT = Denotes “CT Micro”
6N137 = Part Number
2601 = Part Number
V = VDE Option (V or None)
Y = Lead form option (S, SL, M , SLM or none)
Z = Tape and reel option (T1, T2 or none)
G = Material option (G: Green, None: Non-green)



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

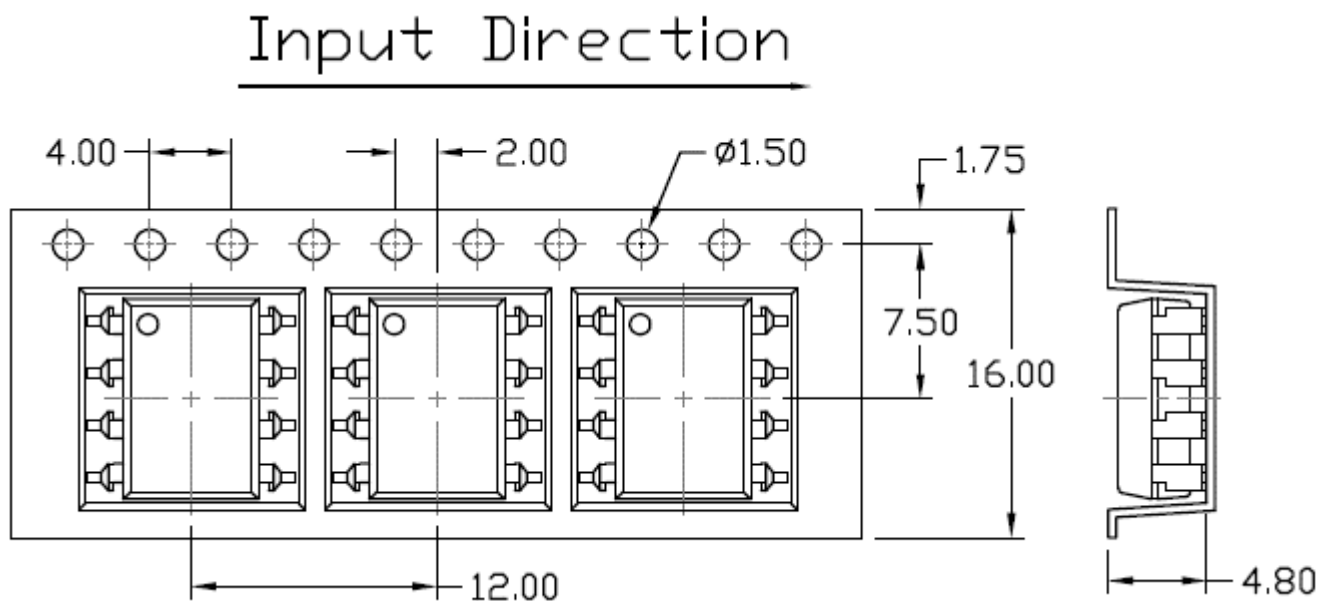


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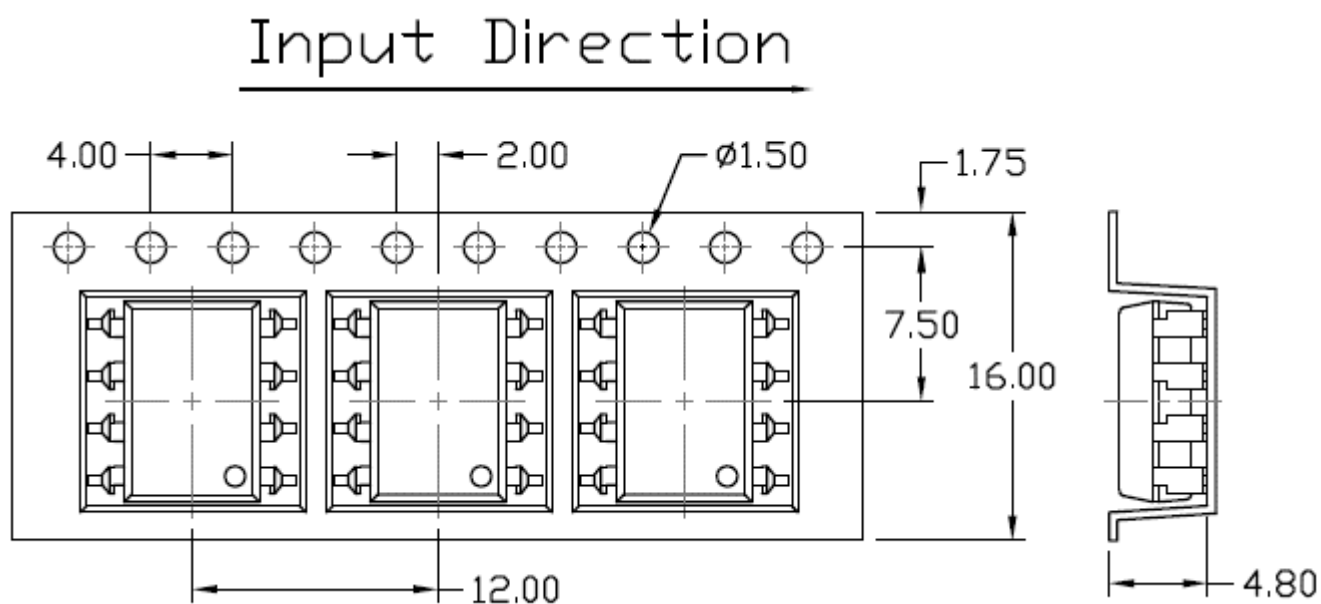
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Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

Option S(T1) & SL(T1)



Option S(T2) & SL(T2)

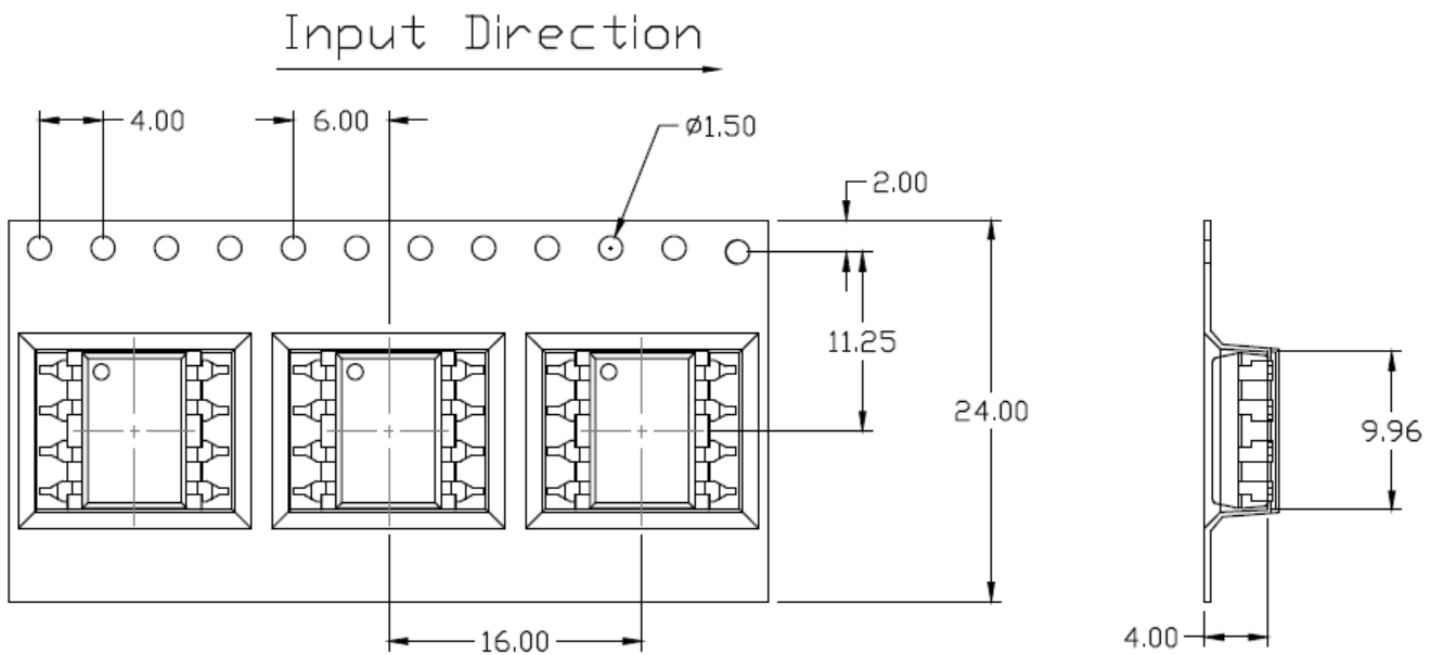




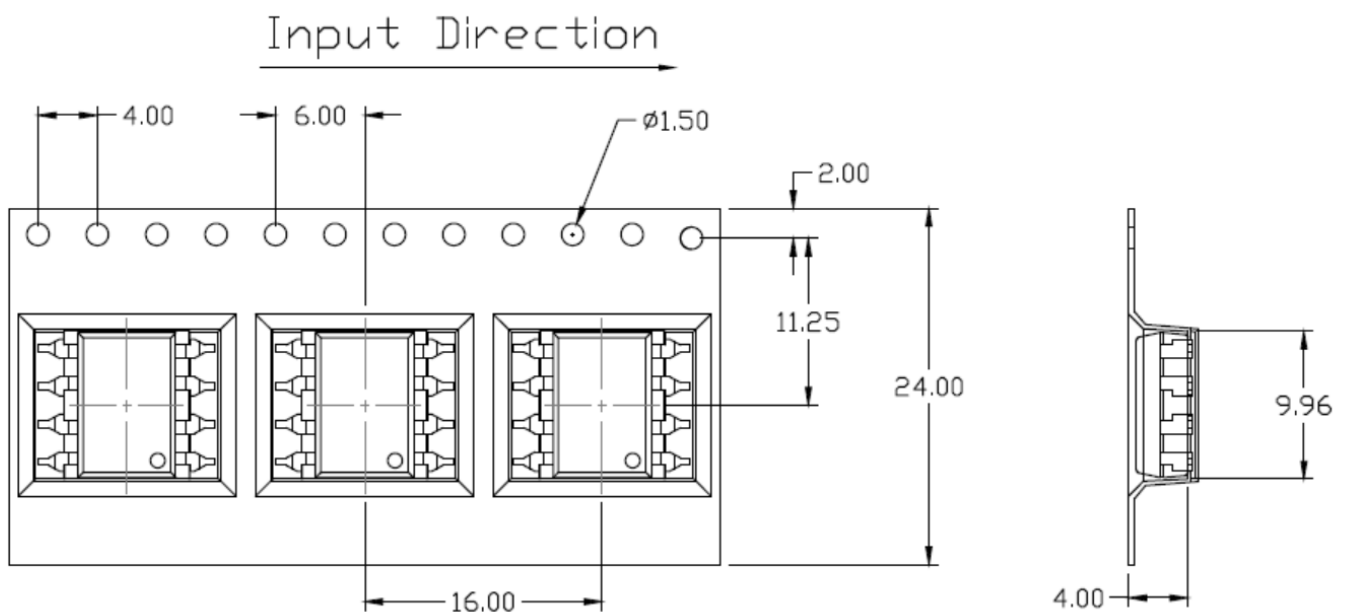
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Option SLM(T1)



Option SLM(T2)





Wave soldering (follow the JEDEC standard JESD22-A111)

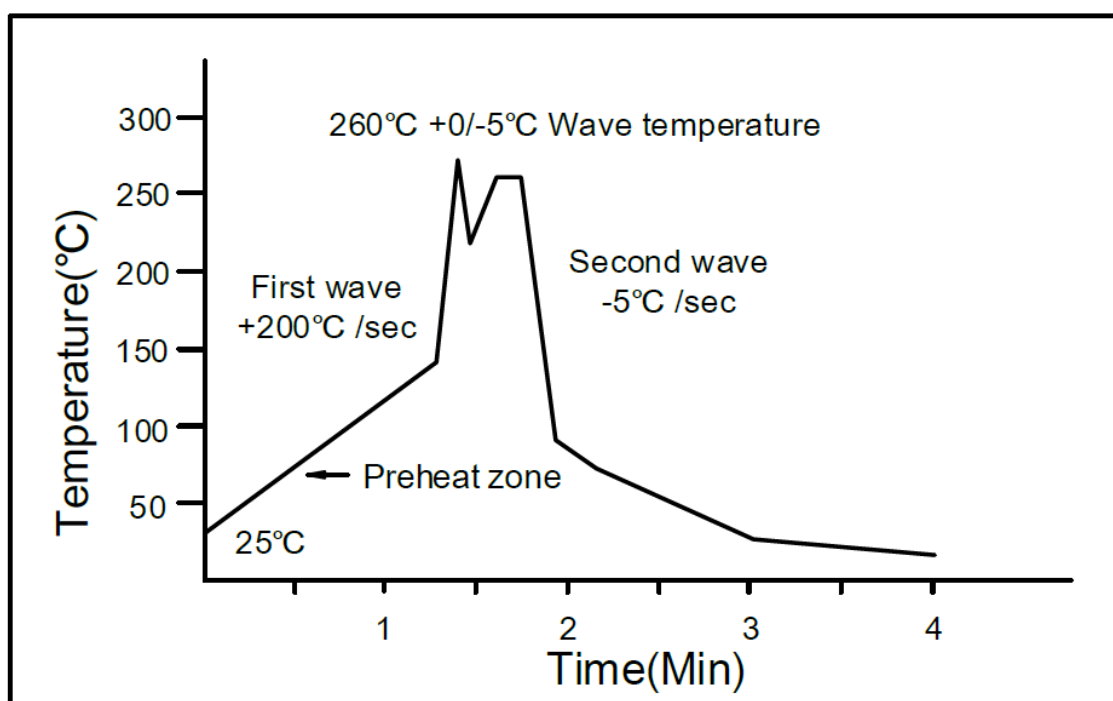
One time soldering is recommended within the condition of temperature.

Temperature: $260 \pm 5^\circ\text{C}$.

Time: 10 sec.

Preheat temperature: 25 to 140°C .

Preheat time: 30 to 80 sec.



Iron soldering (follow the standard MIL-STD 202G, Method 210F)

Allow single lead soldering in every single process.

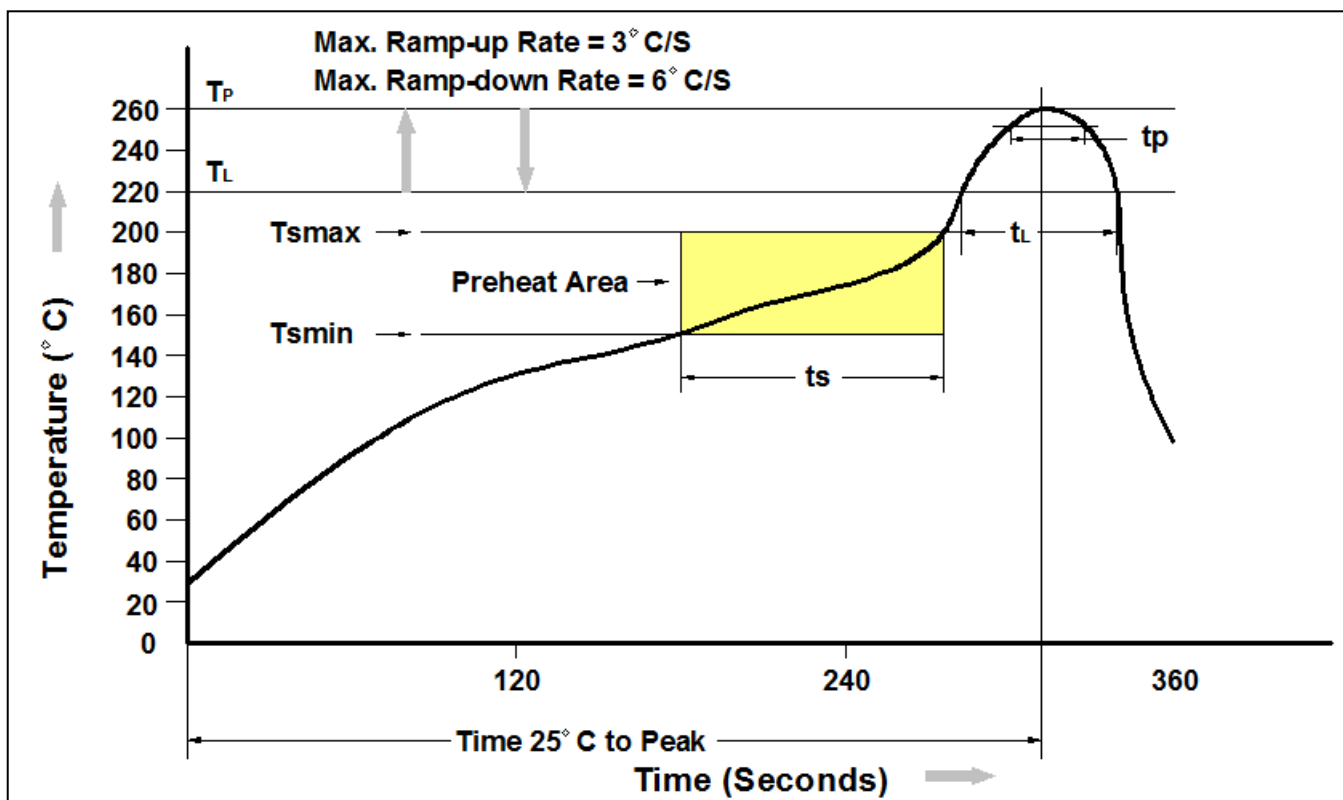
One time soldering is recommended. Temperature: $350 \pm 10^\circ\text{C}$

Time: 5 sec max.



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Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmmin)	150°C
Temperature Max. (Tsmmax)	200°C
Time (ts) from (Tsmmin to Tsmmax)	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



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