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

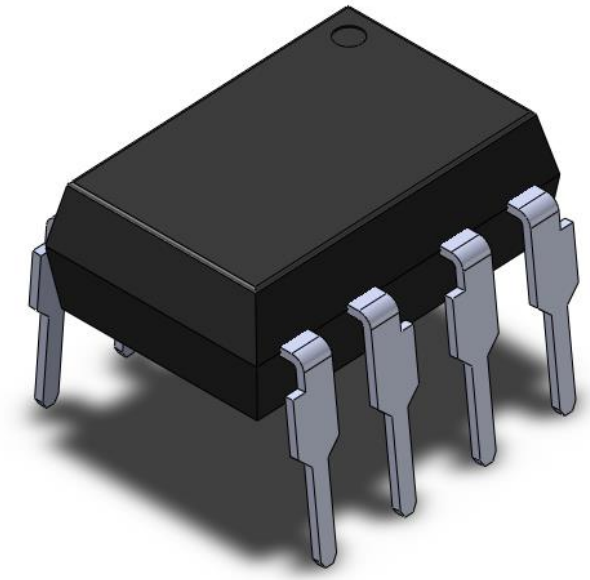
The 6N137, CT2601 optocouplers consist of a 850 nm AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. This output features an open collector,

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

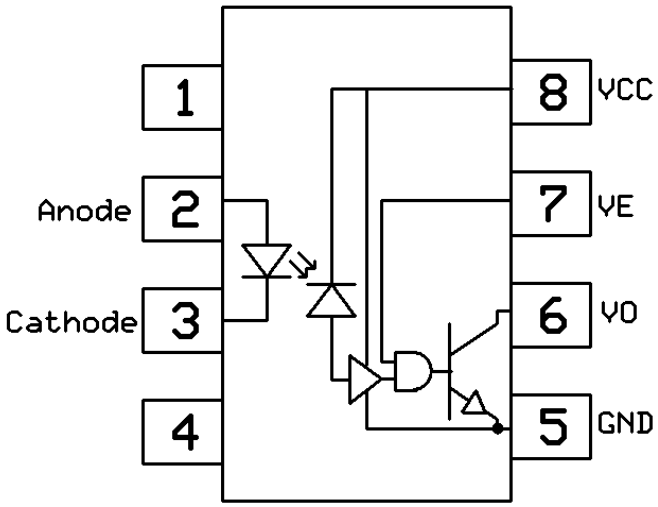
- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances

Package Outline



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

Schematic



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	
VE	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

Electrical Characteristics

T_A = -40 - 85°C (unless otherwise specified). Typical values are measured at T_A = 25^{0}C and V_{CC}=5V

Emitter Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_F	Forward voltage	IF = 10mA	-	1.4	1.6	V	
V_R	Reverse Voltage	IR = 10μA	5.0	-	-	V	
$\Delta V_F/\Delta T_A$	Temperature coefficient of forward voltage	IF =10mA	-	-1.8	-	mV/°C	

Detector Characteristics

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

Transfer Characteristics

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

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^{0}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	VEH= 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	-		

CM_L	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

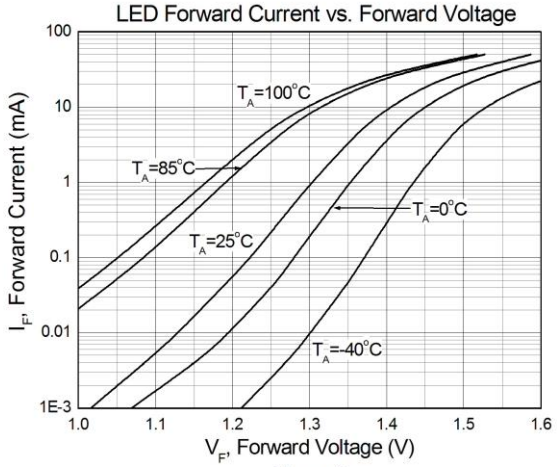


Figure 1

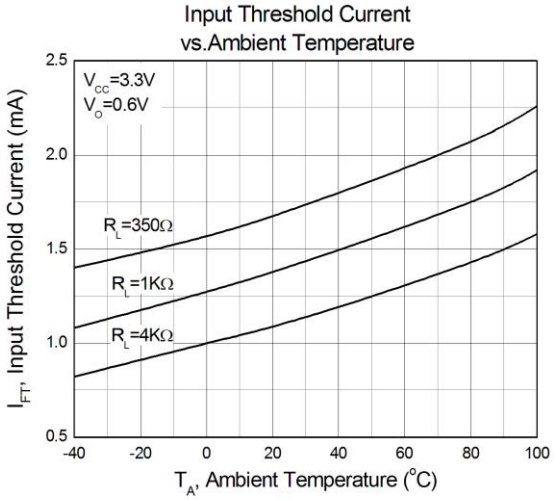


Figure 2

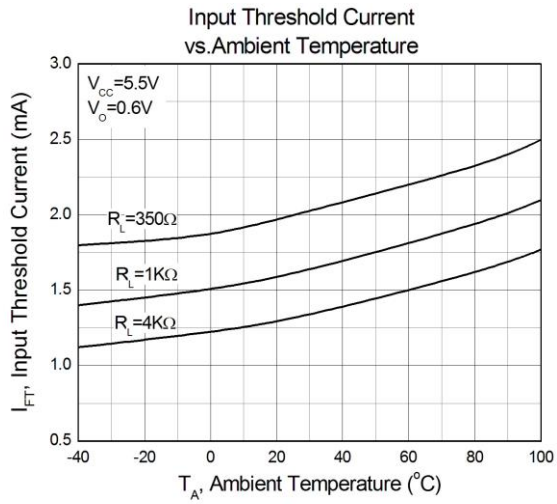
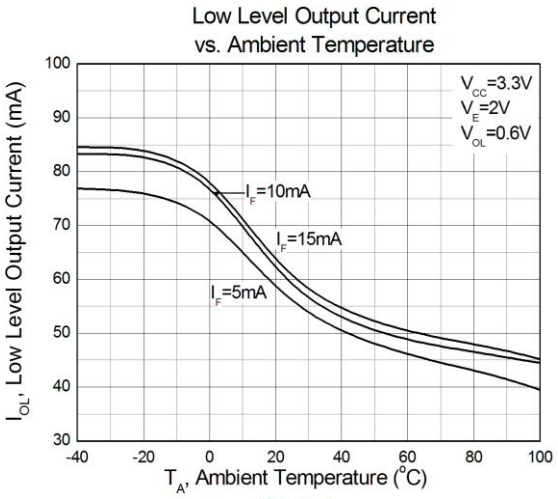


Figure 3



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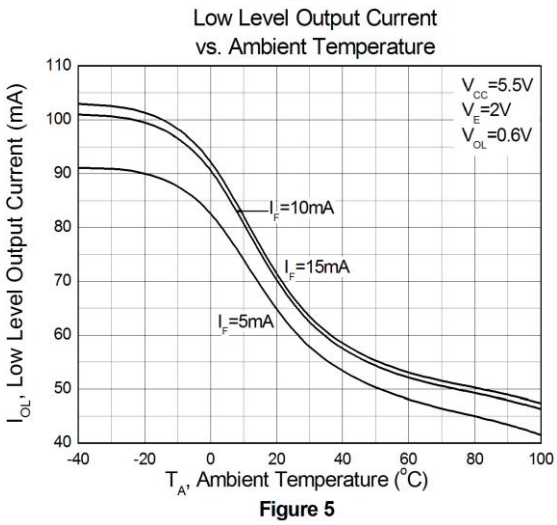

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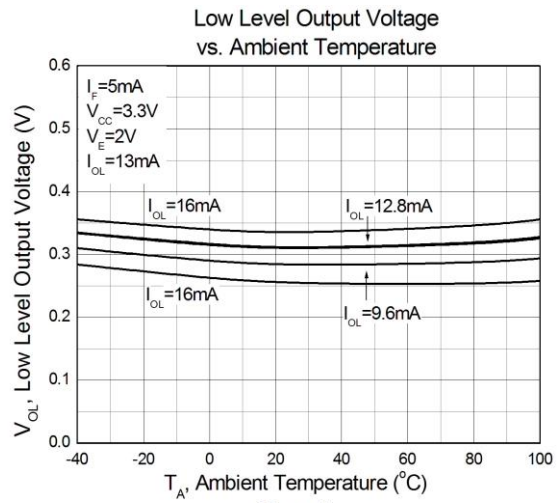
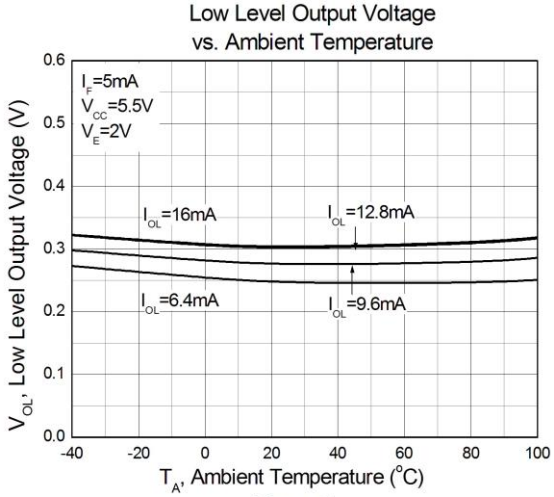


Figure 6

Typical Characteristic Curves



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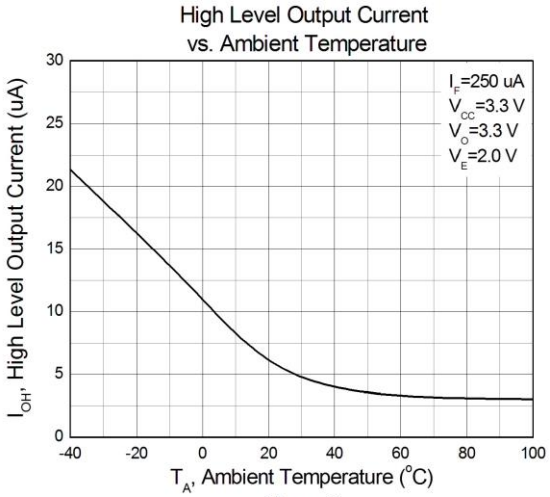

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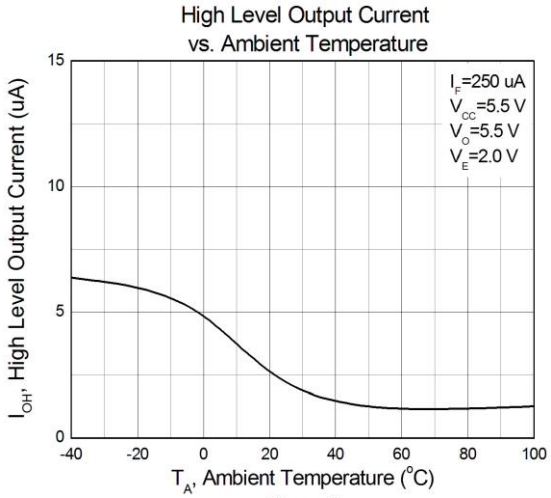

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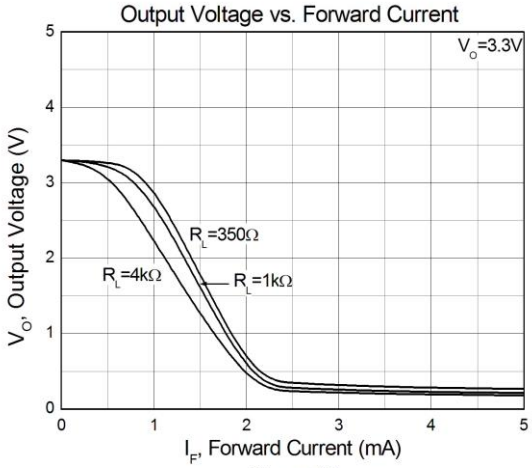

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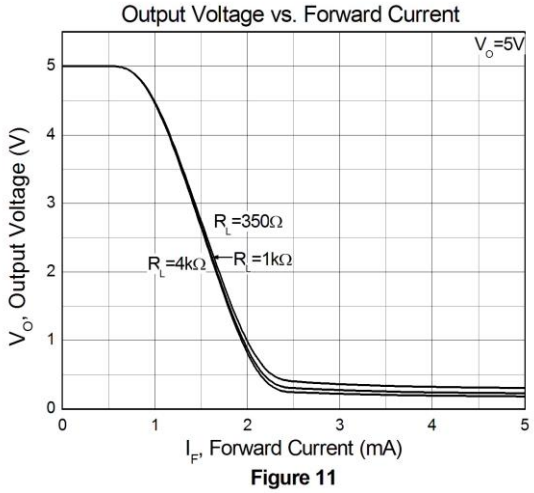

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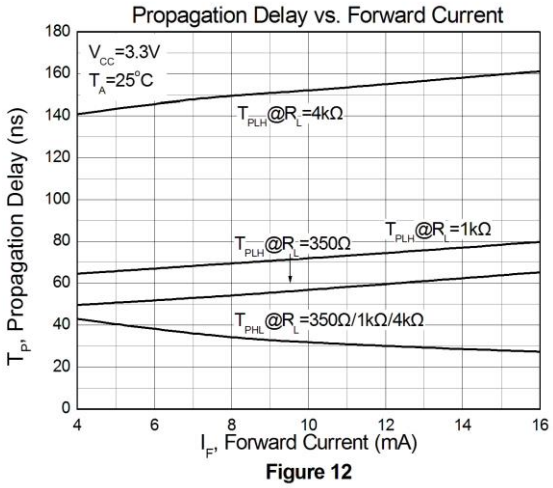

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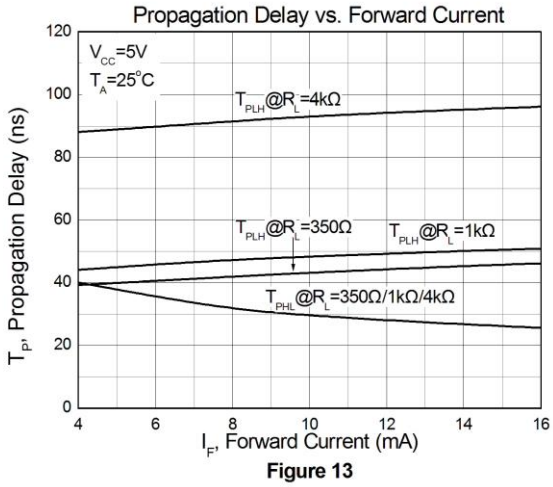
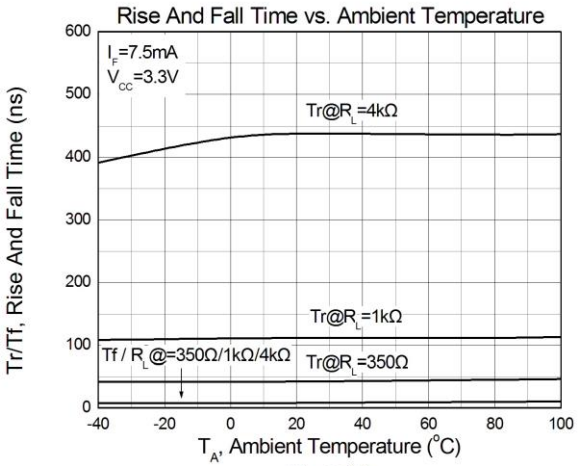
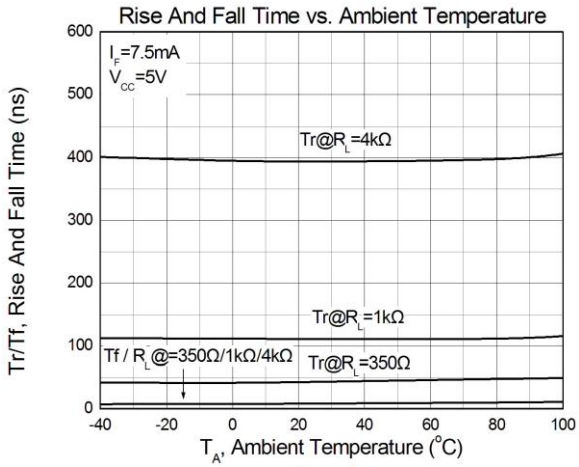


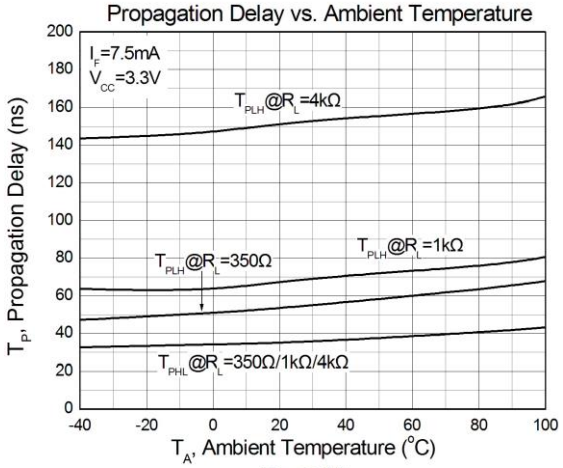
Figure 13



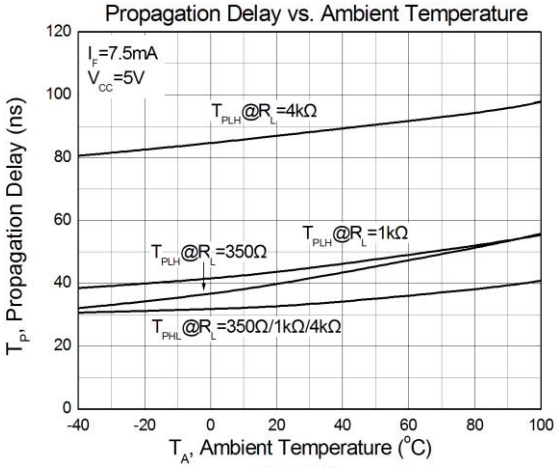
Fgure 14



Fgure 15



Fgure 16



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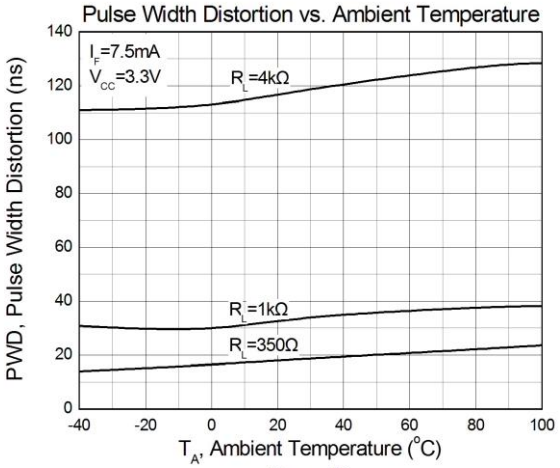
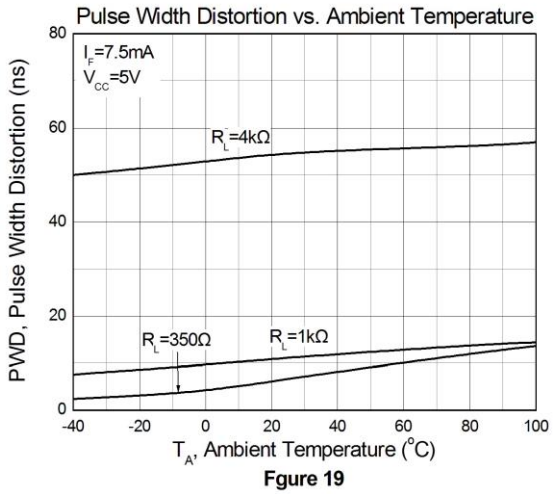
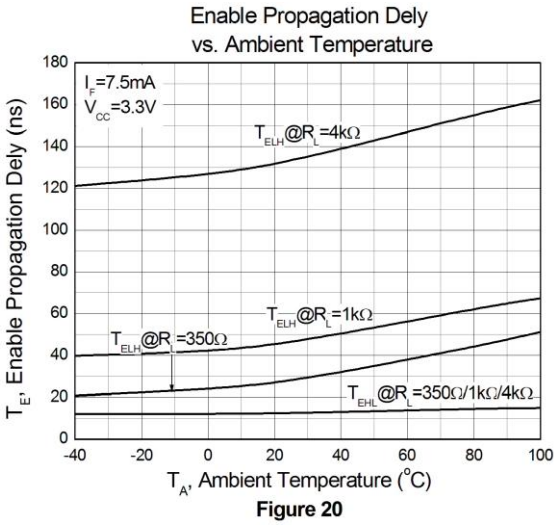


Fgure 18



Fgure 19



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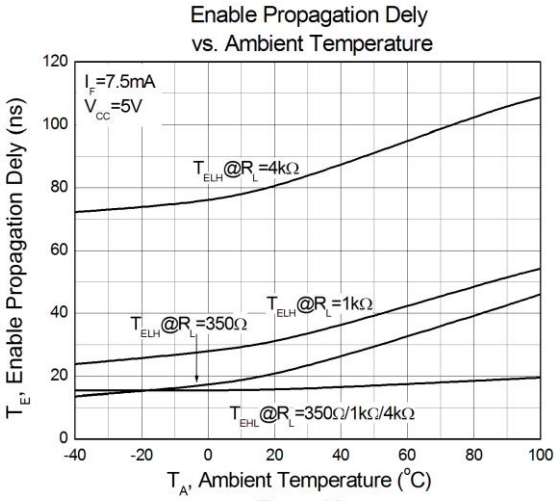
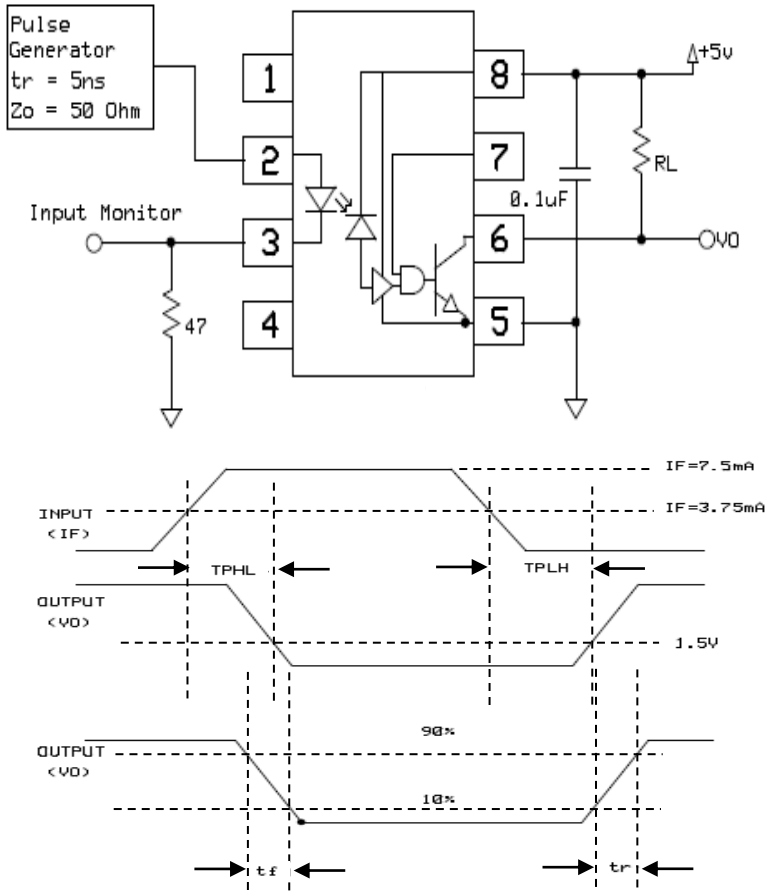


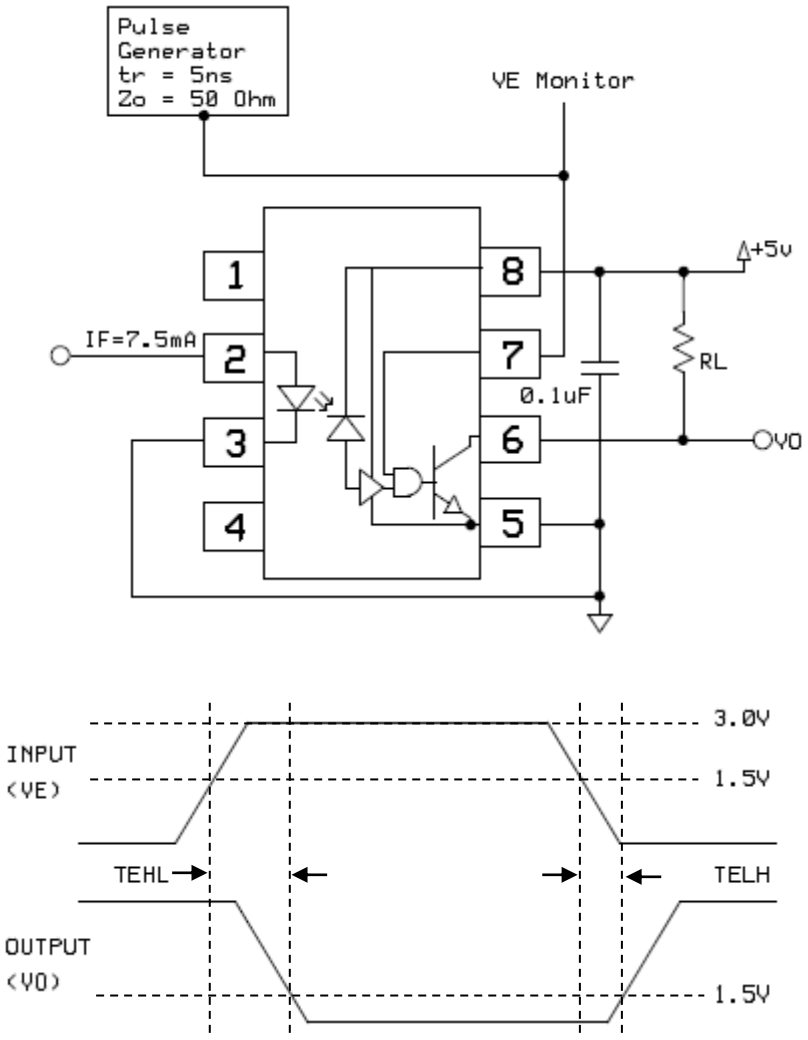
Figure 21

Test Circuits



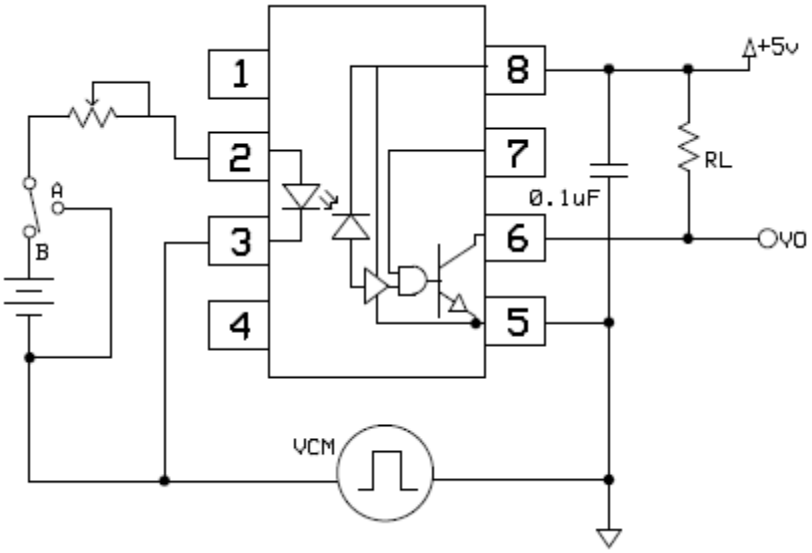
Switching Time Test Circuit

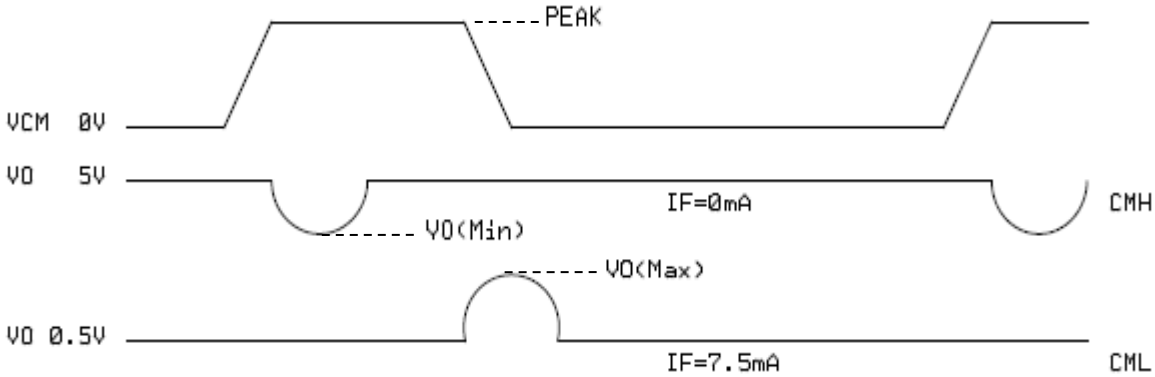
Test Circuits



Enable Switching Time Test Circuit

Test Circuits

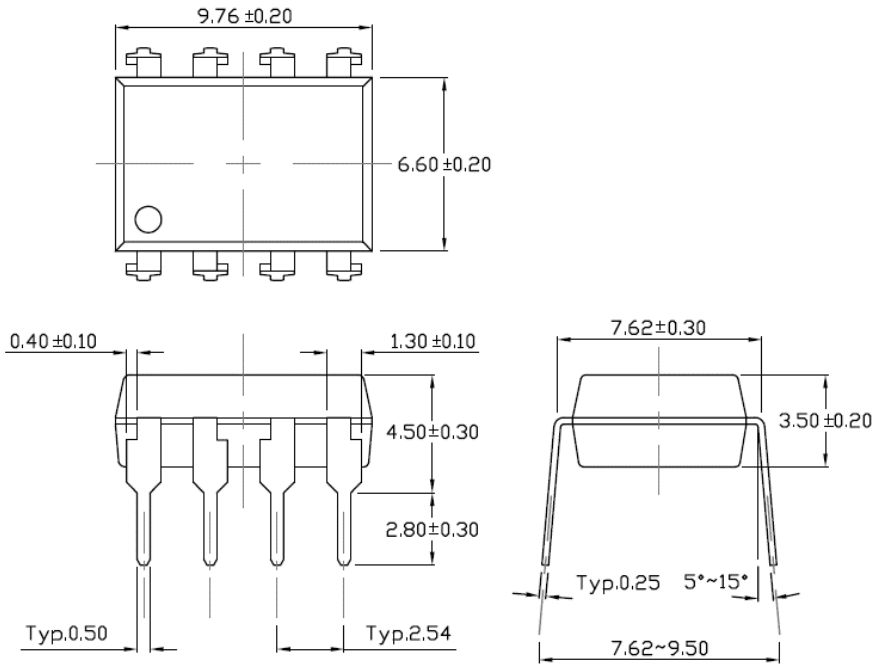




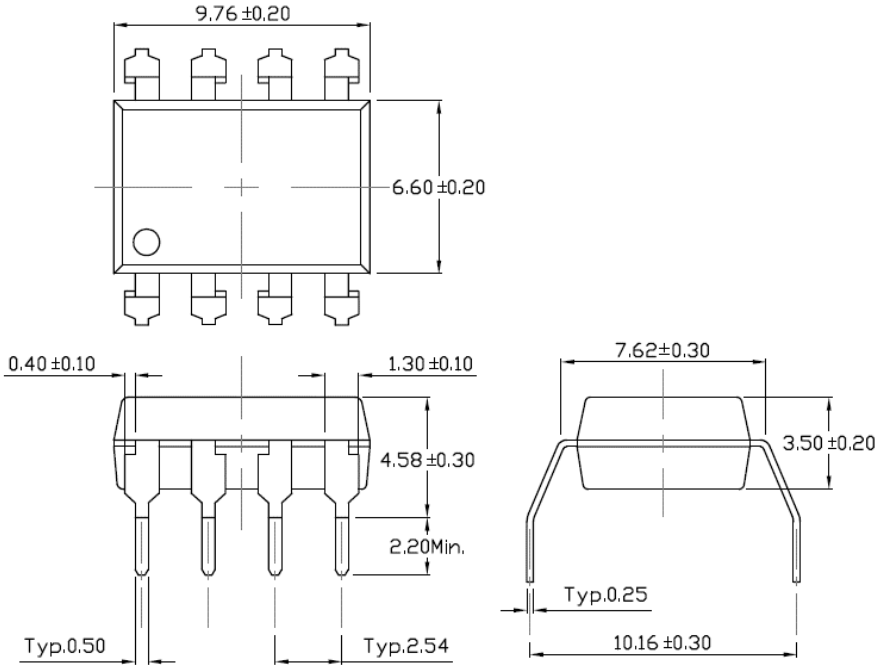
CMR Test Circuit

Package Dimension *Dimensions in mm unless otherwise stated*

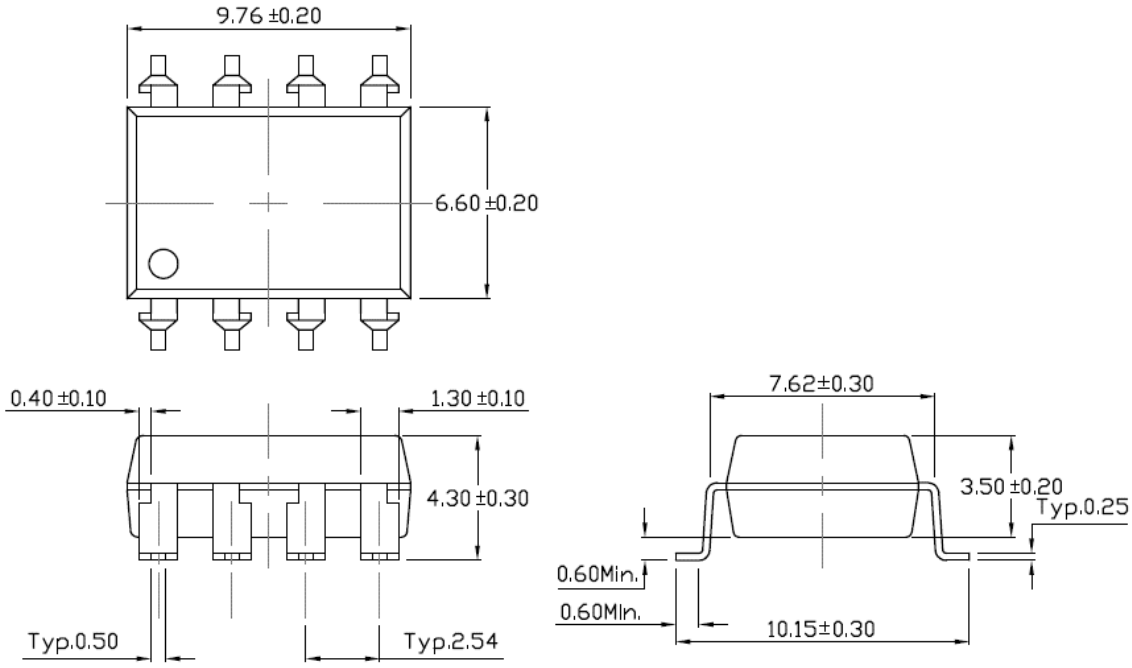
Standard DIP – Through Hole



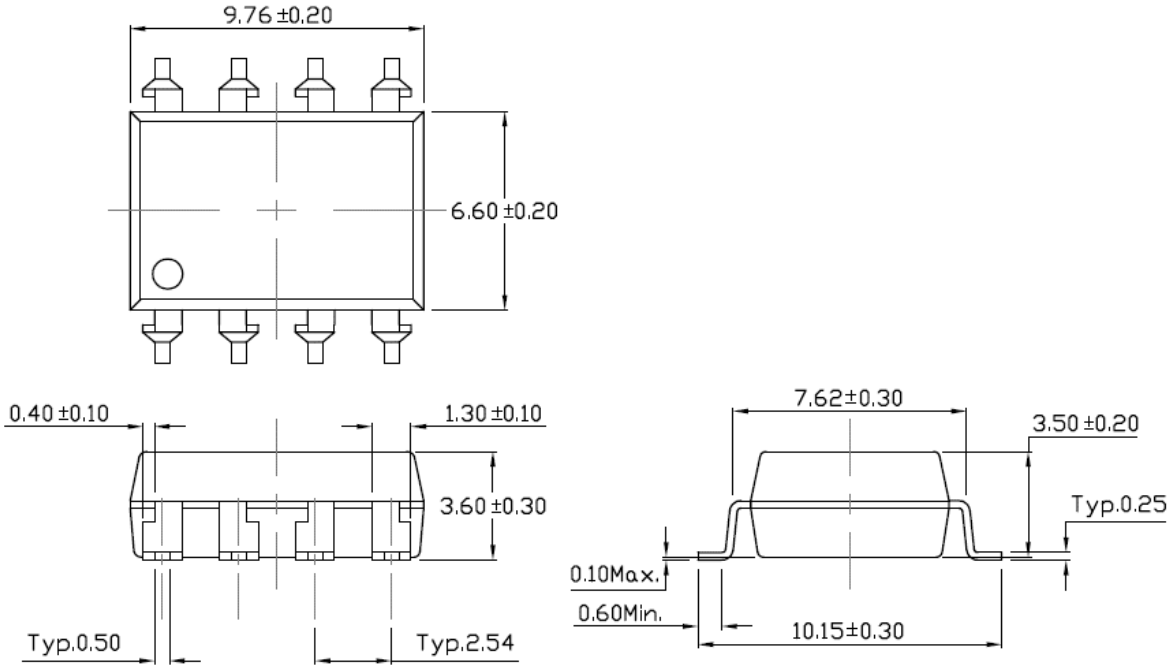
Gullwing (400mil) Lead Forming – Through Hole (M Type)



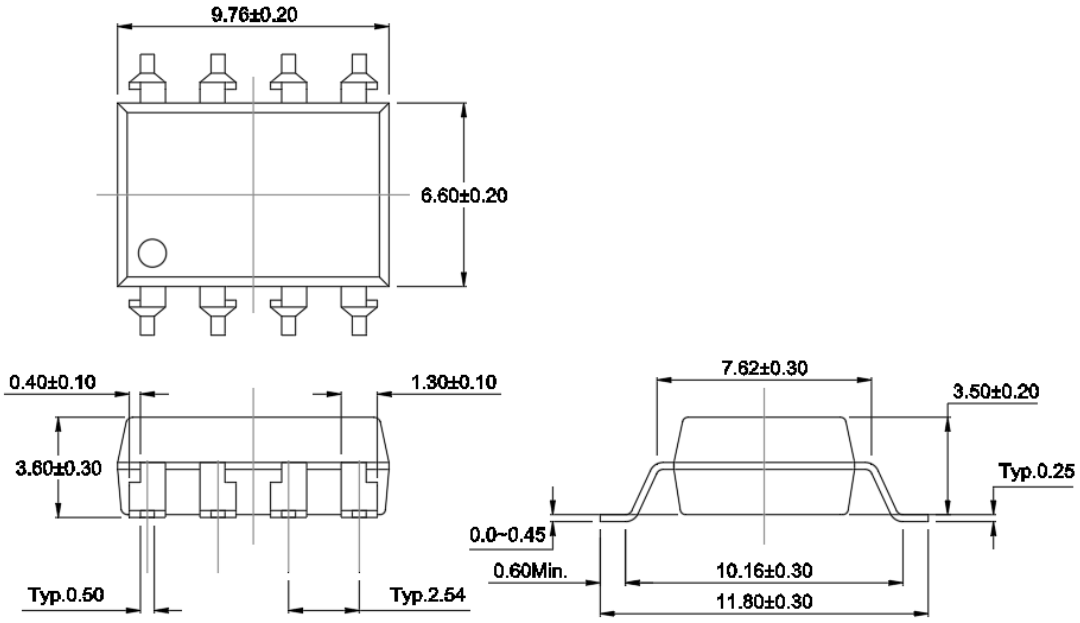
Surface Mount Lead Forming (S Type)



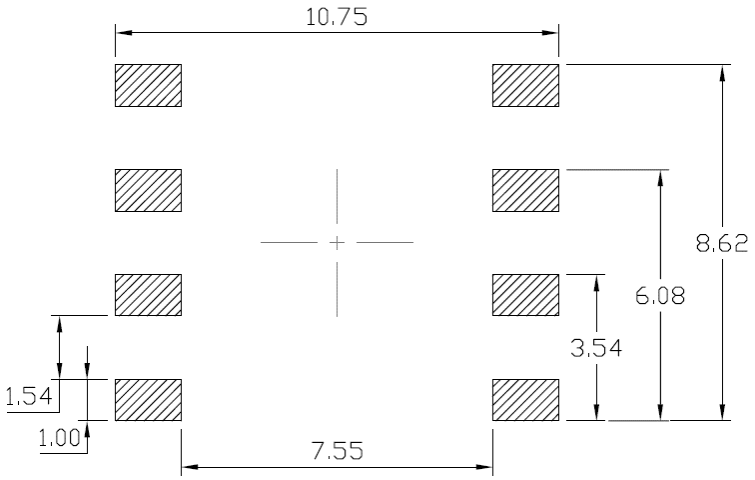
Surface Mount (Low Profile) Lead Forming (SL Type)



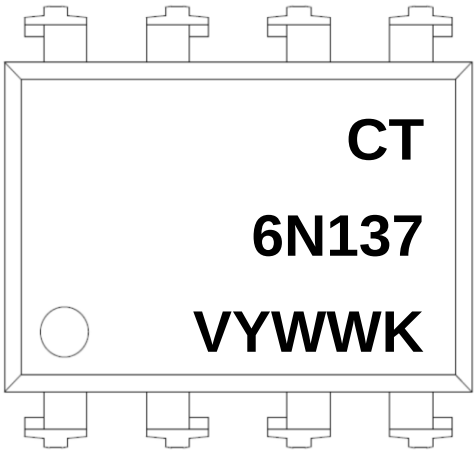
Wide Surface Mount Forming (Low Profile) – SLM Type)

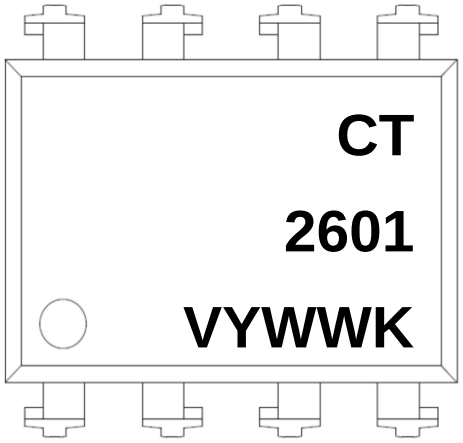


Recommended Solder Mask *Dimensions in mm unless otherwise stated*



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

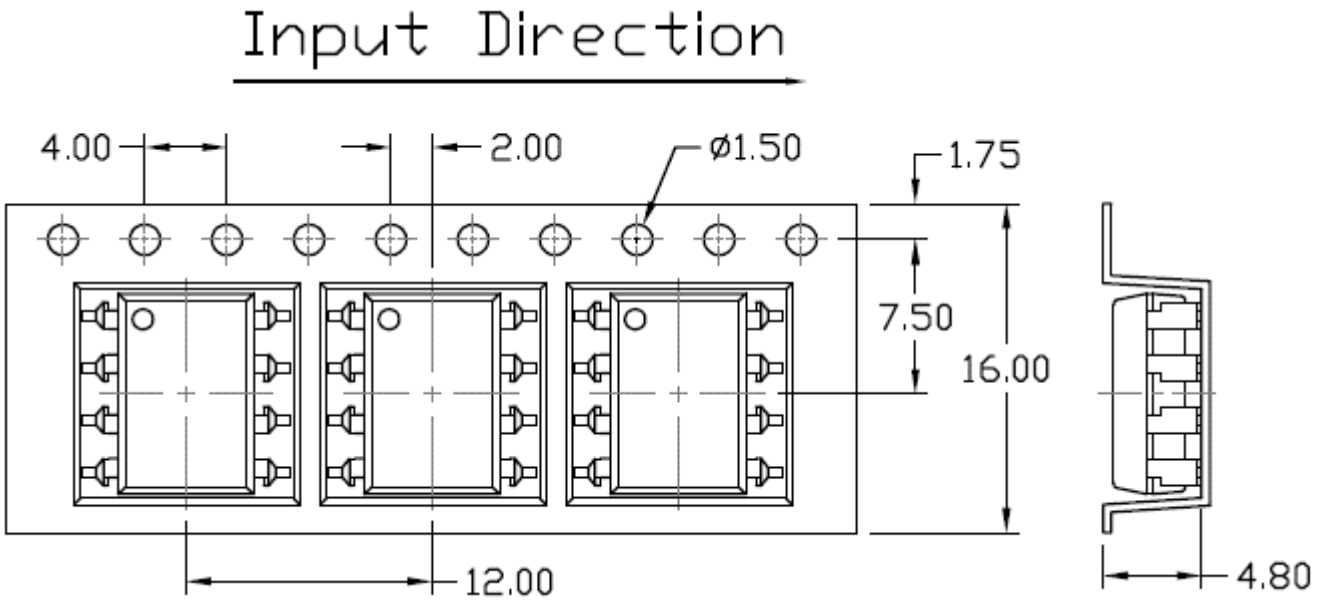
6N137(V)(Y)(Z)-G ； CT2601(V)(Y)(Z)-G

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)

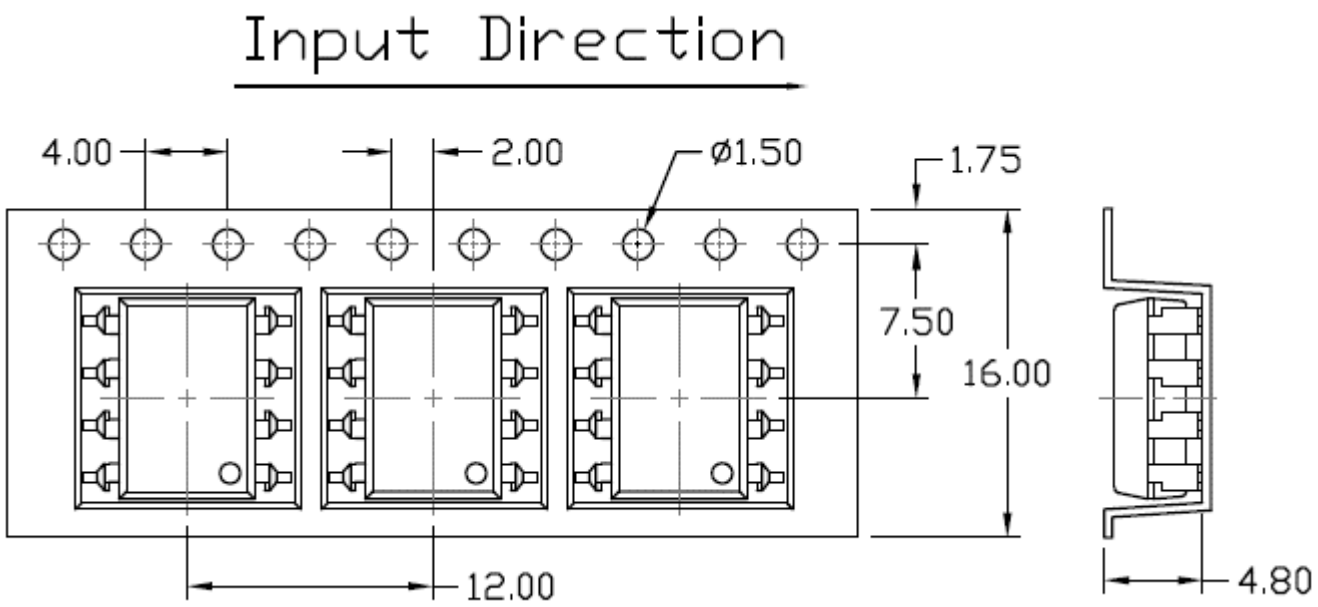
Option	*Description*	*Quantity*
None	Standard 8 Pin Dip	40 Units/Tube
M	Gullwing (400mil) Lead Forming	40 Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount (Low Profile) Lead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

Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

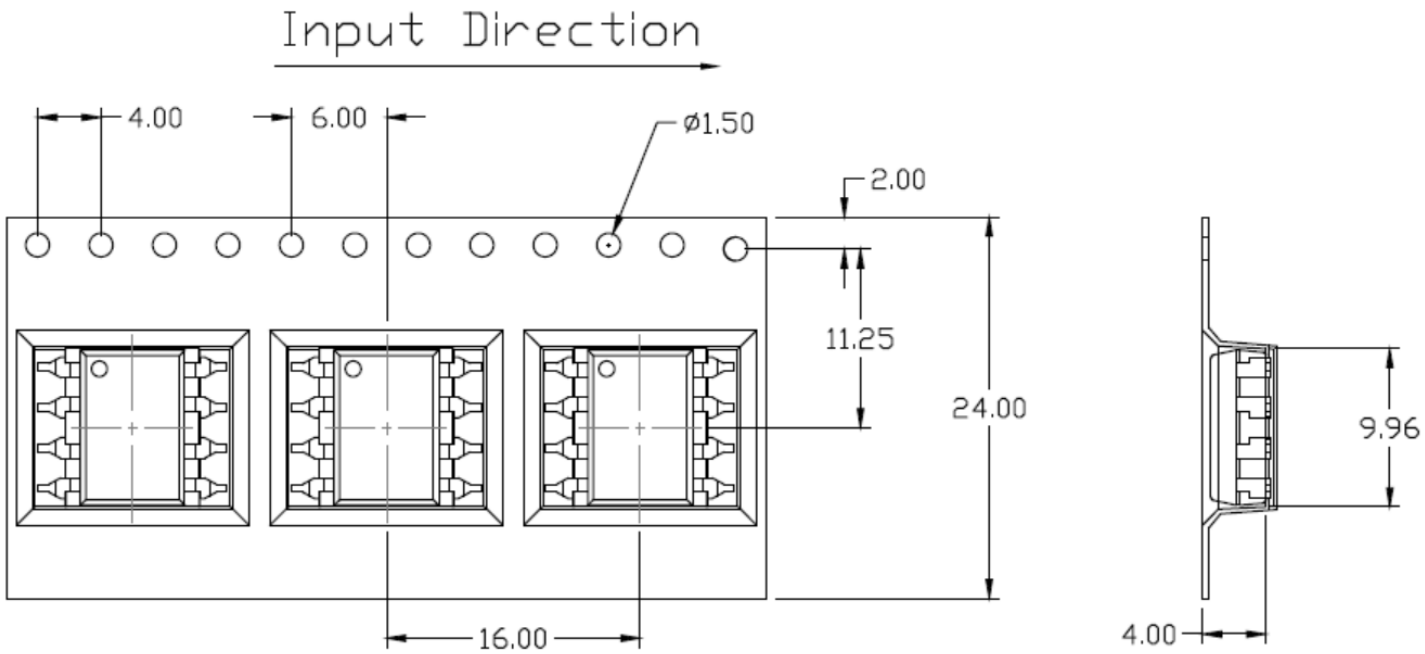
Option S(T1) & SL(T1)



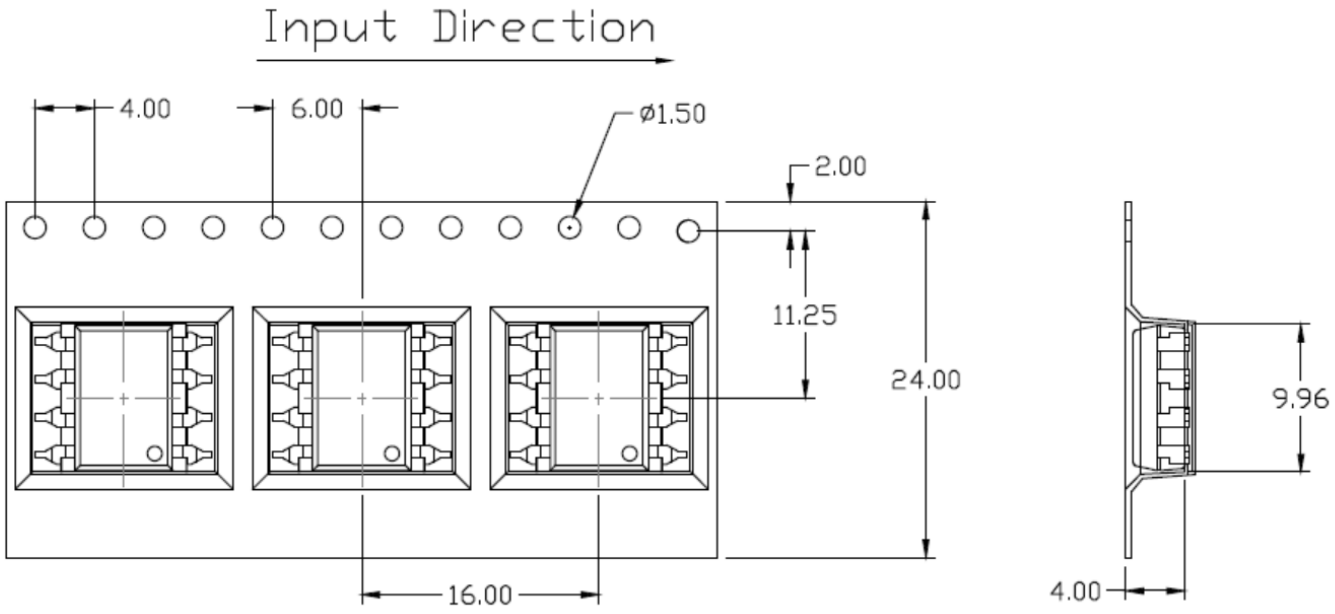
Option S(T2) & SL(T2)



Option SLM(T1)

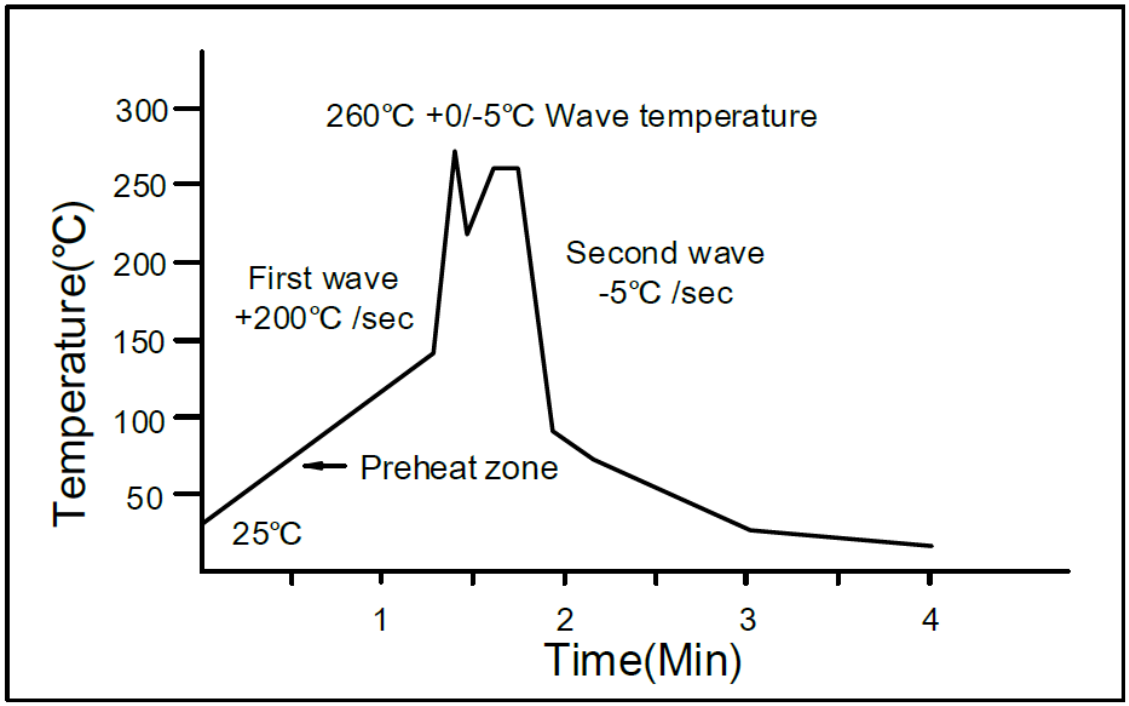


Option SLM(T2)



Wave soldering (follow the JEDEC standard JESD22-A111)

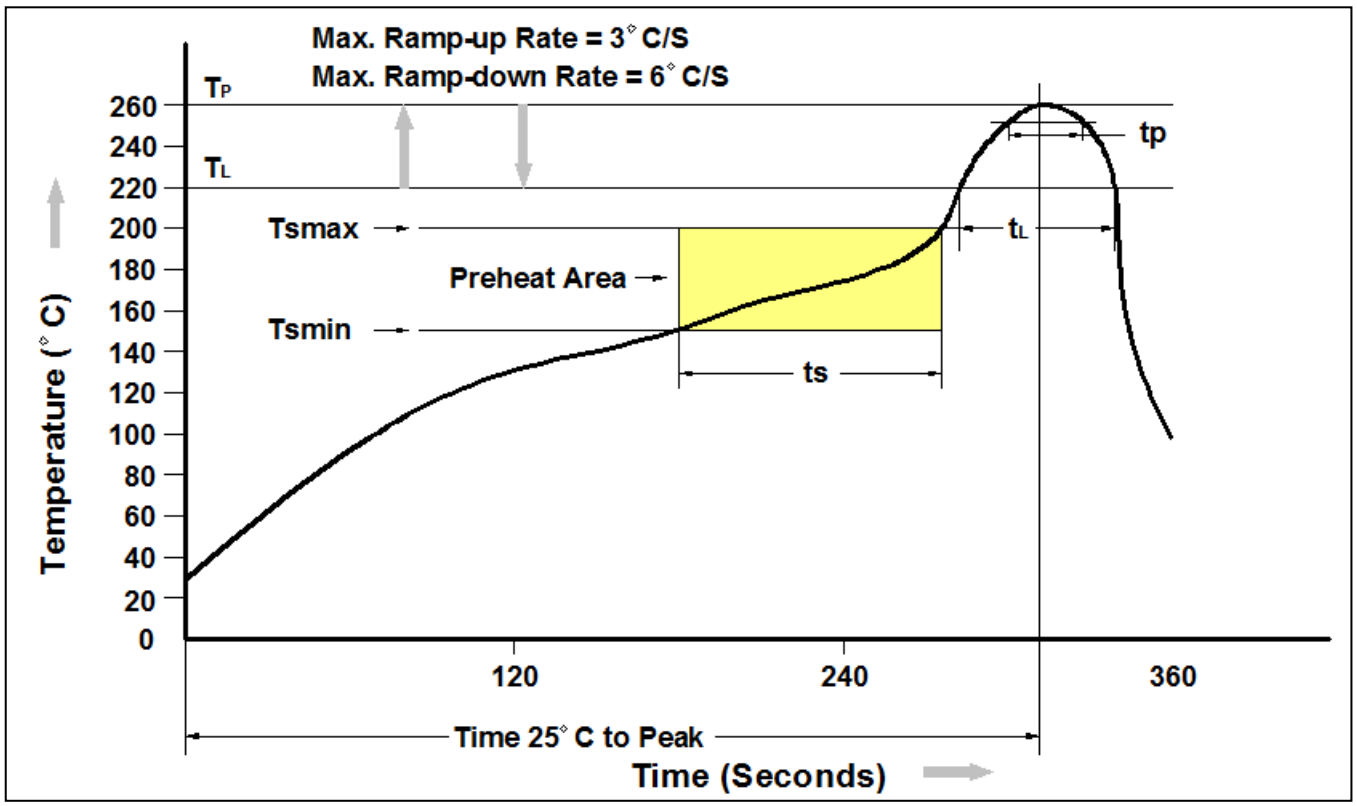
One time soldering is recommended within the condition of temperature.
Temperature: 260+0/-5˚C.
Time: 10 sec.
Preheat temperature:25 to 140˚C.
Preheat time: 30 to 80 sec.



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+±10˚C
Time: 5 sec max.

Reflow Profile



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

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