LTV-063L

LVTTL/LVCMOS Compatible 3.3V Dual-Channel Optocouplers (10 Mb/s)

Description

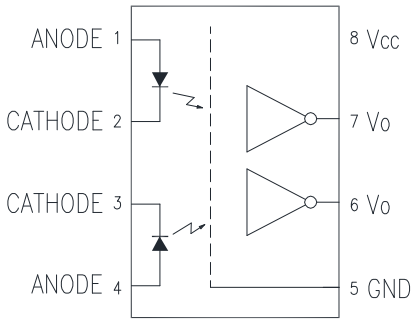
The LTV-063L consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. The output of the optical detector features an open collector Schottky clamped transistor. The enable function allows the optical detector to be strobed. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 10KV/μs at 3.3V.

The Optocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +85°C.

This unique design provides maximum AC and DC circuit isolation while achieving LVTTL/LVCMOS compatibility.

Functional Diagram

Pin No. and Internal connection diagram



Truth Table (Positive Logic)

LED	OUT
ON	Low
OFF	High

A 0.1μF bypass Capacitor must be connected between Pin8 and Pin5

Features

- 3.3V/5V Dual Supply Voltage
- Small outline SO-8 package
- Dual channel output
- Lower power consumption
- 10KV/μs minimum Common Mode Rejection (CMR) at V_{CM} = 1000V
- High speed: 10 Mbd typical
- Low input current capability: 5mA
- LVTTL/LVCMOS compatible
- Guaranteed performance from temperature -40°C to +85°C
- Safety approval

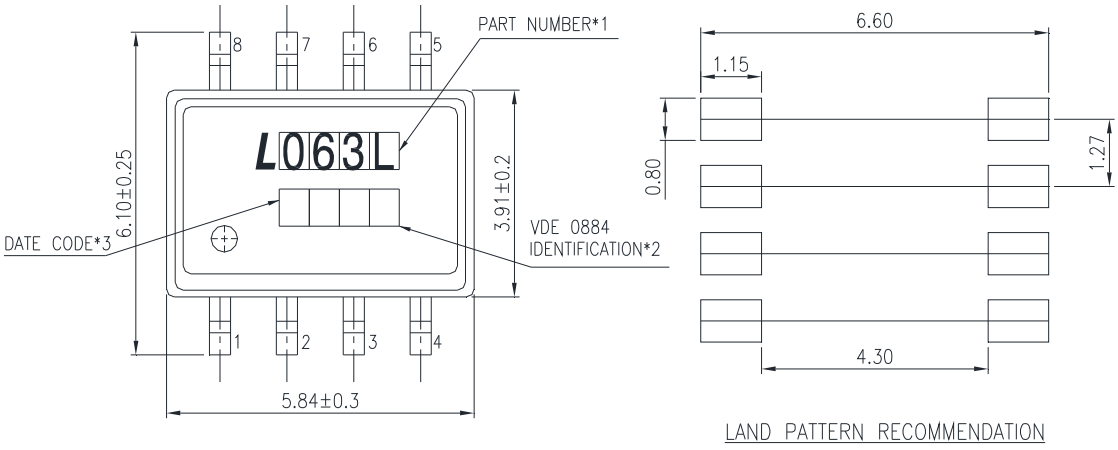
  UL 1577
  VDE DIN/EN 60747-5-5

Application

- Isolation in line receivers
- Digital isolation for A/D, D/A conversion
- Ground loop elimination
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their peripheral

Package Dimensions

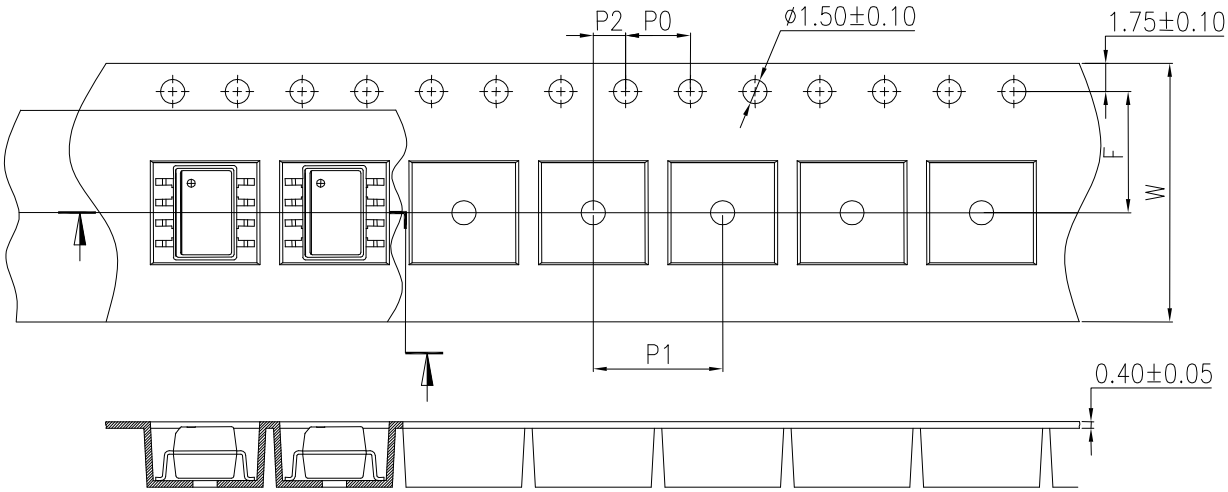
SO8 Package (LTV-063L)



*1. Part Numbers
*2. "V" to represent VDE0884
*3. 1st digit year code, 2nd and 3rd digit work week code

*. Dimensions are all in Millimeters.
*. Lead Coplanarity = 0.1mm max.

Taping Dimensions



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	16.0±0.30(0.63)
Pitch of sprocket holes	P0	4.0±0.10(0.15)
Distance of compartment	F P2	7.5±0.10(0.295) 2±0.10(0.079)
Distance of compartment to compartment	P1	8.0±0.10(0.47)

Quantities Per Reel

Package Type	LTV-063L
Quantities (pcs)	**3000**

Absolute Maximum Ratings*1

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	T_{ST}	-55	125	°C	
Operating Temperature	T_A	-40	85	°C	
Isolation Voltage	V_{ISO}	3750		V_{RMS}	8, 9
Supply Voltage	V_{CC}		7	V	
Lead Solder Temperature * 2			260	°C	
Input					
Average Forward Input Current	I_F		15	mA	2, 3
Reverse Input Voltage	V_R		5	V	2
Input Power Dissipation	P_I		40	mW	
Output					
Output Collector Current	I_O		50	mA	2
Output Collector Voltage	V_O		7	V	2
Output Collector Power Dissipation	P_O		60	mW	2

1.Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

2.260°C for 10 seconds. Refer to Lead Free Reflow Profile.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Operating Temperature	T_A	-40	85	°C
Supply Voltage	V_{CC}	2.7	3.6	V
		4.5	5.5	
Low Level Input Current	I_{FL}	0	250	μA
High Level Input Current	I_{FH}	5	15	mA
Operating Temperature	T_A	-40	85	°C
Supply Voltage	V_{CC}	2.7	3.6	V
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (at R_L=1kΩ per channel)	N		5	TTL Loads

Electrical Specifications (DC)

Parameters	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Input Forward Voltage	I_F = 10mA	V_F		1.38	1.70	V		
Input Forward Voltage Temperature Coefficient	I_F = 10mA	$\Delta V_F/\Delta T$		-1.5		mV/^{O}C		2
Input Reverse Voltage	I_R = 10μA	BV_R	5			V		2
Input Threshold Current	V_{CC} = 3.3V, V_O = 0.6V I_{OL} (sinking) = 13mA	I_{TH}		1.5	5	mA		2
Input Capacitance	f = 1MHz, V_F = 0V	C_{IN}		34		pF		
High Level Supply Current	V_{CC} = 3.3V, I_F = 0mA	I_{CCH}		3.8	10	mA		
Low Level Supply Current	V_{CC} = 3.3V, I_F = 10mA	I_{CCL}		5.8	13	mA		
High Level Output Current	V_{CC} = 3.3V, V_O = 5.5V, I_F = 250μA	I_{OH}		5	100	μA		2
Low Level Output Voltage	V_{CC} = 3.3V, I_F = 5mA, I_{OL} (sinking) = 13mA	V_{OL}		0.3	0.60	V		

Over Recommended Operating Conditions (T_A = –40°C to +85°C , 2.7V ≤ V_{CC} ≤ 3.6V) unless otherwise specified. All Typicals at V_{CC} = 3.3 V, T_A = 25°C.

Electrical Specifications (DC)

Parameters	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Input Forward Voltage	I_F = 10mA	V_F		1.38	1.70	V		
Input Forward Voltage Temperature Coefficient	I_F = 10mA	$\Delta V_F/\Delta T$		-1.5		mV/^{O}C		2
Input Reverse Voltage	I_R = 10μA	BV_R	5			V		2
Input Threshold Current	V_{CC} = 5.5V, V_O = 0.6V I_{OL} (sinking) = 13mA	I_{TH}		1.35	5	mA		2
Input Capacitance	f = 1MHz, V_F = 0V	C_{IN}		34		pF		
High Level Supply Current	V_{CC} = 5.5V, I_F = 0mA	I_{CCH}		6.1	10	mA		
Low Level Supply Current	V_{CC} = 5.5V, I_F = 10mA	I_{CCL}		8.3	13	mA		
High Level Output Current	V_{CC} = 5.5V, V_O = 5.5V, I_F = 250μA	I_{OH}		0.9	100	μA		2
Low Level Output Voltage	V_{CC} = 5.5V, I_F = 5mA, I_{OL} (sinking) = 13mA	V_{OL}		0.4	0.6	V		

Over recommended operating conditions (TA = -40°C to +85°C, 4.5V ≤ VDD ≤ 5.5V) unless otherwise specified.
All typicals at VCC = 5 V, TA = 25 °C.

Switching Specifications (AC)

Parameter	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Propagation Delay Time to High Output Level	R_L = 350Ω, C_L = 15pF	t_{PLH}	25	48	100	ns		2, 4
Propagation Delay Time to Low Output Level		t_{PHL}	25	35	100			2, 5
Pulse Width Distortion		$\|t_{PLH} - t_{PHL}\|$		13				
Propagation Delay Skew		t_{PSK}			40			10
Output Rise Time (10 to 90%)		t_r		21				2
Output Fall Time (90 to 10%)		t_f		6.6				2

Over Recommended Operating Conditions (TA = –40°C to +85°C, 2.7V ≤ VCC ≤ 3.6V), IF = 7.5 mA unless otherwise specified. All Typicals at TA = 25°C, VCC = 3.3 V.

Switching Specifications (AC)

Parameter	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Propagation Delay Time to High Output Level	R_L = 350Ω, C_L = 15pF	t_{PLH}	25	40	100	ns		2, 4
Propagation Delay Time to Low Output Level		t_{PHL}	25	32	100			2, 5
Pulse Width Distortion		$\|t_{PLH} - t_{PHL}\|$		8				
Propagation Delay Skew		t_{PSK}			40			10
Output Rise Time (10 to 90%)		t_r		22				2
Output Fall Time (90 to 10%)		t_f		6.9				2

Over recommended operating conditions TA = -40°C to 85°C, 4.5 ≤ Vcc ≤ 5.5V, IF = 7.5 mA unless otherwise specified. All typicals at TA = 25 °C, VCC = 5 V.

Switching Specifications

Parameter	Test Condition	Symbol	Min.	Typ.	Units	Fig.	Note
Common Mode Transient Immunity at High Output Level	V_{CC} = 3.3V V_{CM} = 1000V R_L = 350Ω I_F = 0mA T_A = 25°C	|CMH|	10	15	KV/μs		6
	V_{CC} = 5V V_{CM} = 1000V R_L = 350Ω I_F = 0mA T_A = 25°C		10	15			
Common Mode Transient Immunity at Low Output Level	V_{CC} = 3.3V V_{CM} = 1000V R_L = 350Ω IF=10.0mA T_A = 25°C	|CML|	10	15	KV/μs		7
	V_{CC} = 5V V_{CM} = 1000V R_L = 350Ω IF=10.0mA T_A = 25°C		10	15			

Package Characteristics

Parameter	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Input-Input Insulation Leakage Current	45% RH, t = 5s, V_{I-O} = 3kV DC, T_A = 25°C	I_{I-1}		0.0005	1.0	μA		8
Withstand Insulation Test Voltage	RH ≤ 50%, t = 1min, T_A = 25°C	V_{ISO}	3750			V_{RMS}		8, 9
Input-Input Resistance	V_{I-O} = 500V DC	R_{I-1}		10^{11}		Ω		8
Input-Input Capacitance	f = 1MHz	C_{I-I}		0.25		pG		8

*All Typical at T_A =25 °C

Switching Time Test Circuit

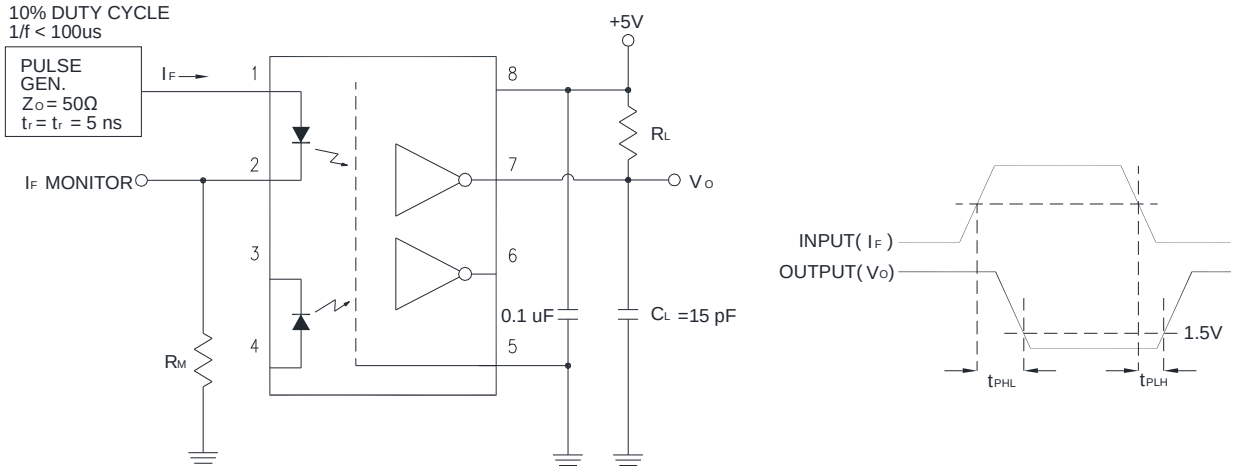


Figure 1: Test Circuit for t_{PHL} and t_{PLH}

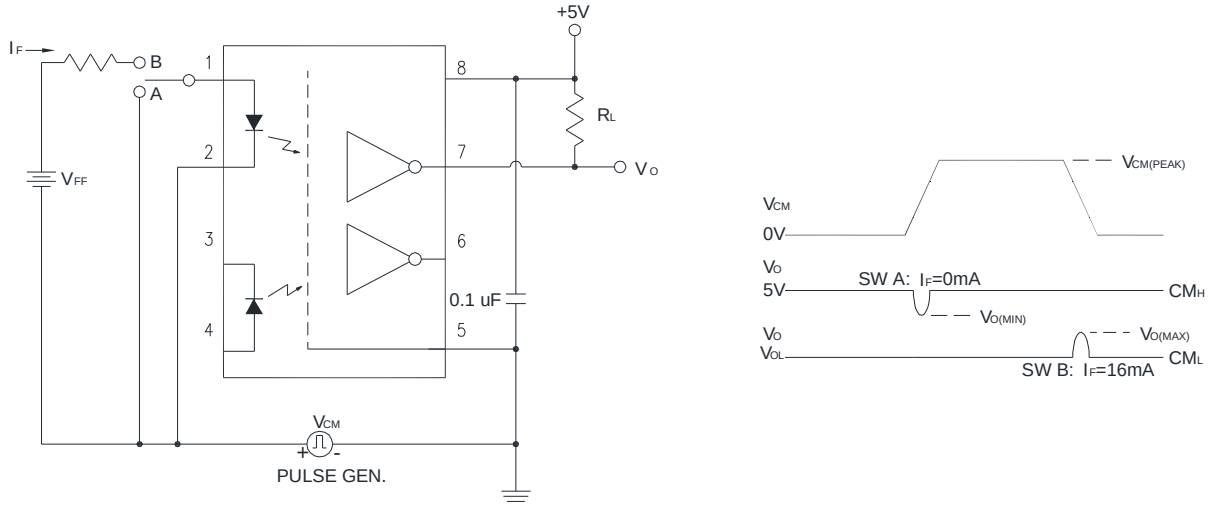


Figure 2: Test Circuit for Common Mode Transient Immunity

Characteristics Curves

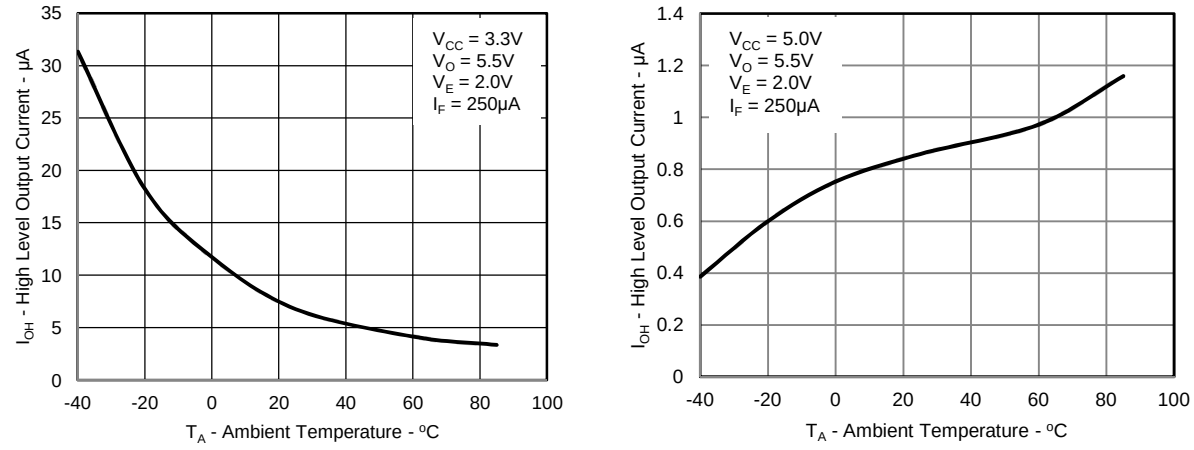


Figure 3: Typical High Level Output Current vs. Ambient Temperature

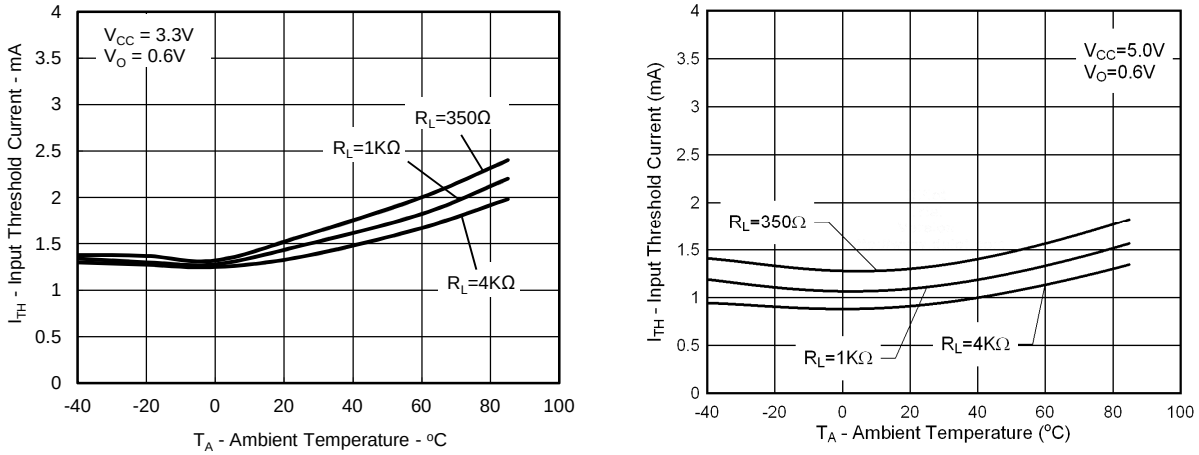


Figure 4: Typical Input Diode Threshold Current vs. Ambient Temperature

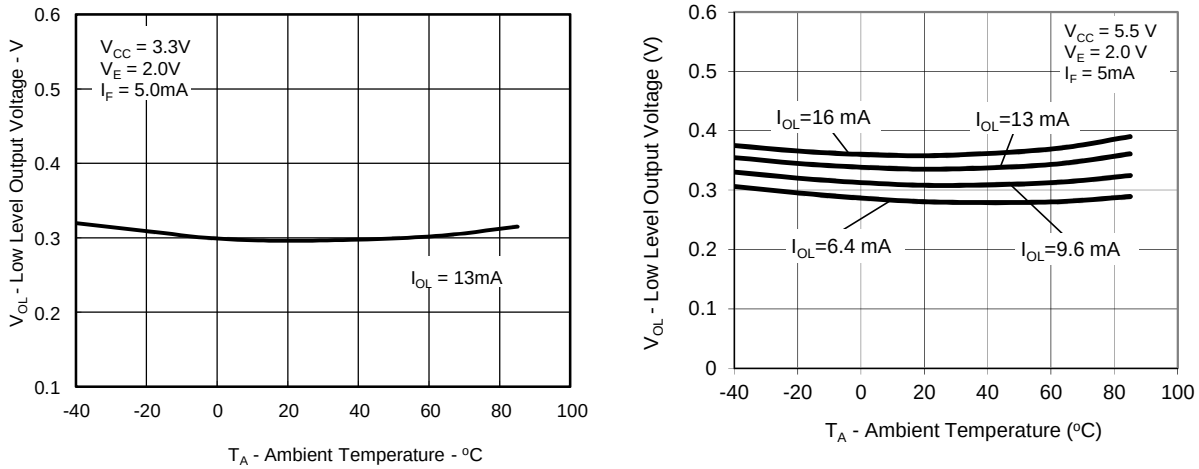


Figure 5: Typical Low Level Output Voltage vs. Ambient

Characteristics Curves

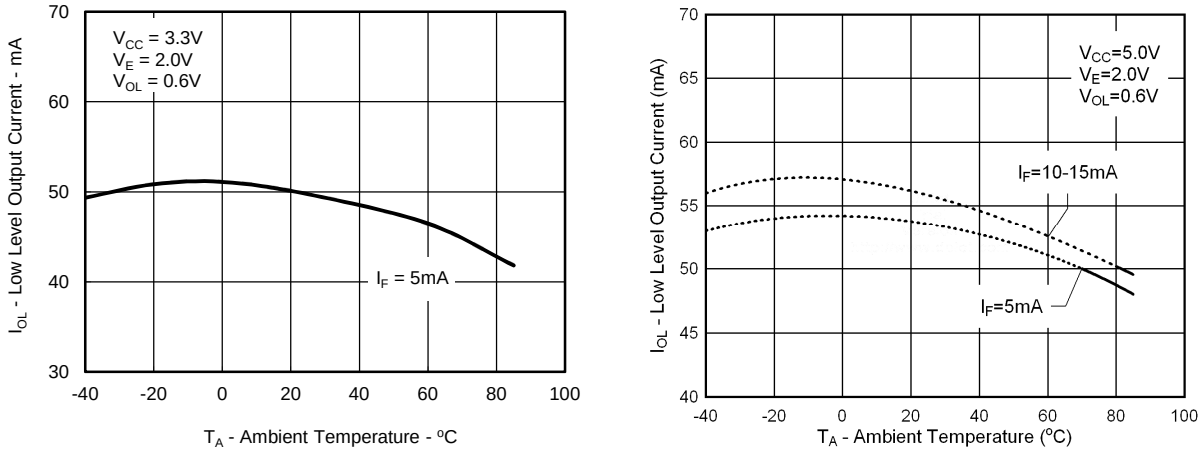


Figure 6: Typical Low Level Output Current vs. temperature

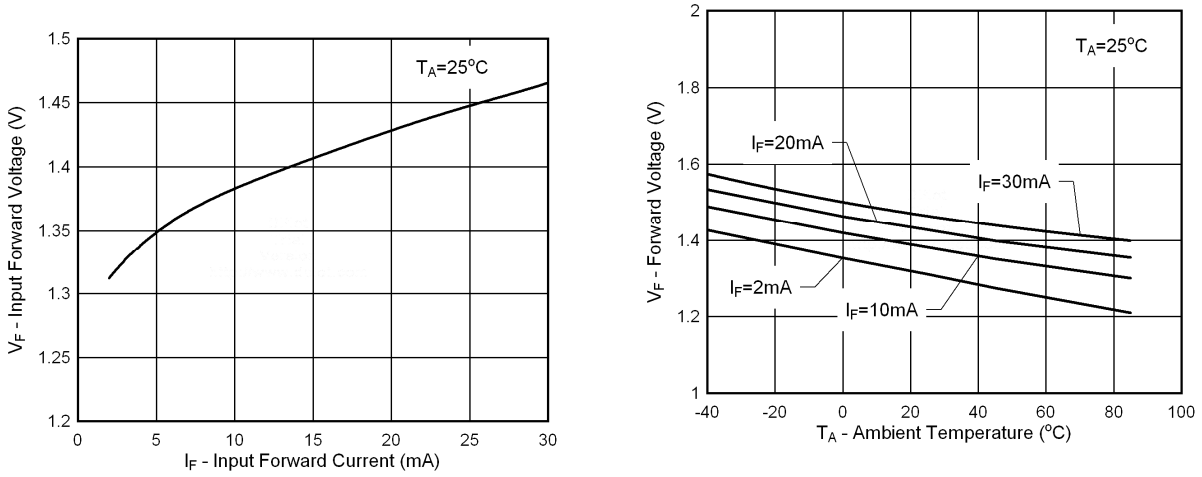


Figure 7: Typical Input Diode Forward Characteristic

Characteristics Curves

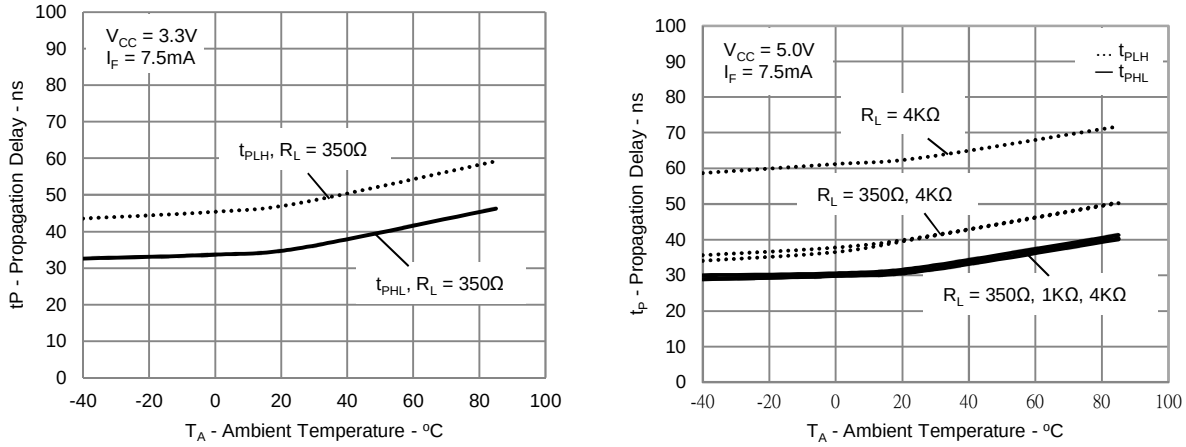


Figure 8: Typical Propagation Delay vs. Ambient Temperature

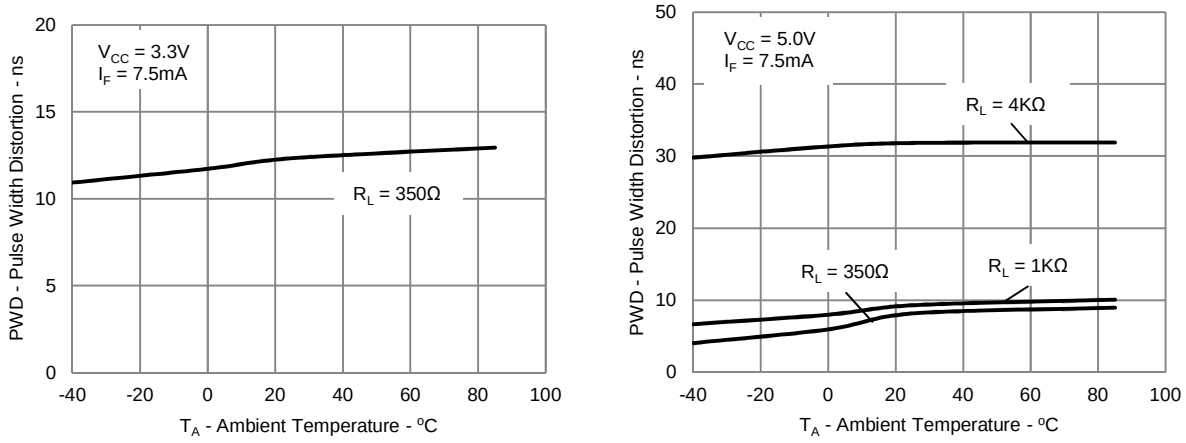
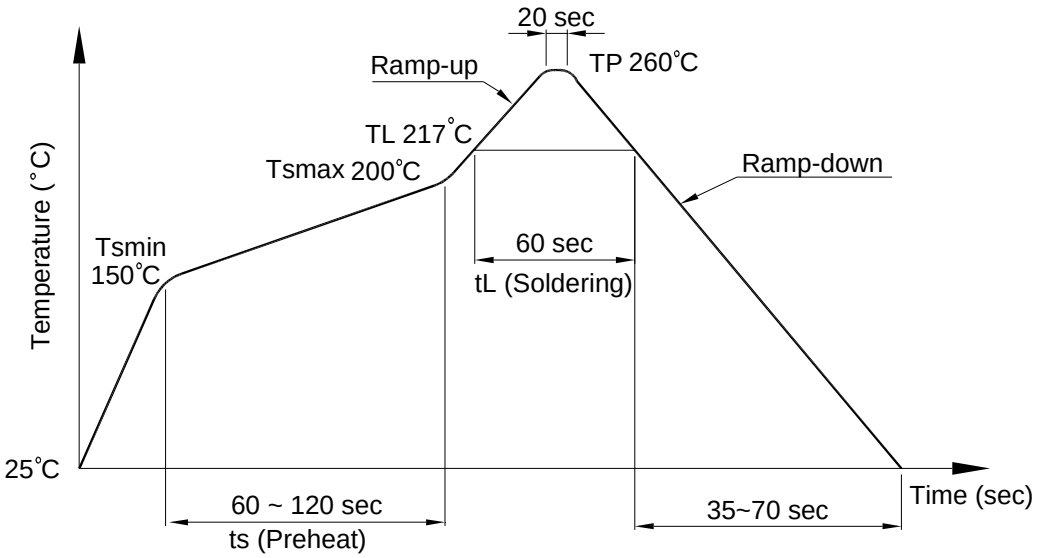


Figure 9 Typical Pulse Width Distortion vs. Ambient Temperature

Temperature Profile Of Soldering Reflow

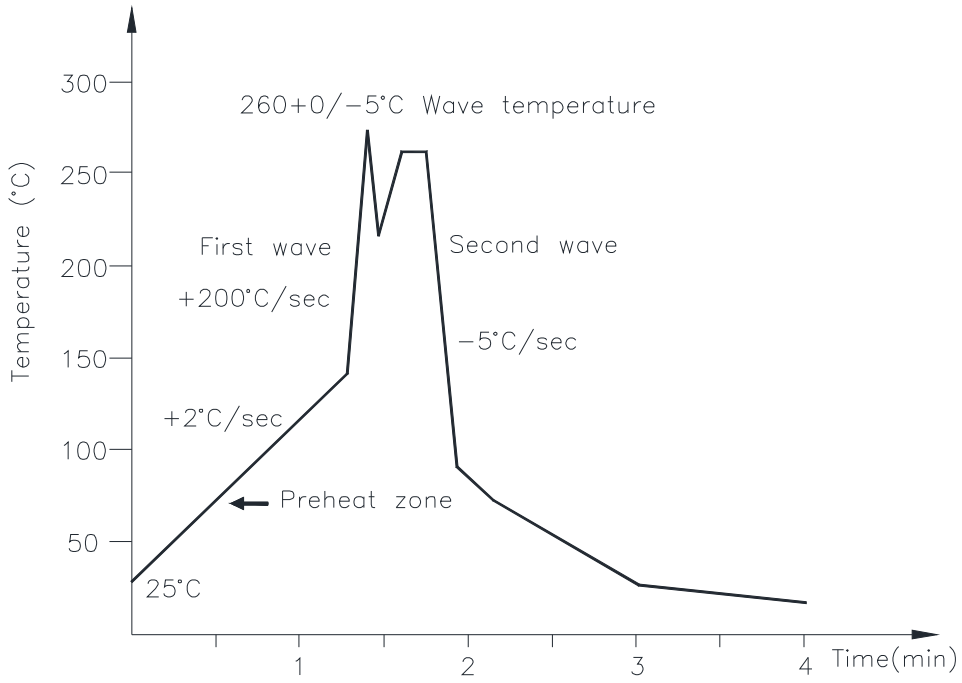
(1) IR Reflow soldering (JEDEC-STD-020C compliant)
One time soldering reflow is recommended within the condition of temperature and time profile shown below.

Profile item	Conditions
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (T_L) - Time (t_L)	 217˚C 60 sec
Peak Temperature (T_P)	260˚C
Ramp-up rate	3˚C / sec max.
Ramp-down rate	3~6˚C / sec



Temperature Profile Of Soldering Reflow

(2) Wave soldering (JEDEC22A111 compliant)
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.



(3) Hand soldering by soldering iron
Allow single lead soldering in every single process. One time soldering is recommended.
Temperature: 380+0/-5˚C
Time: 3 sec max.

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Notes

Specifications of the products displayed herein are subject to change without notice.

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 instrumentation and application. For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.

1. A 0.1µF or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. Each channel
3. Peaking driving circuit may be used to speed up the LED. The peak drive current of LED may go up to 50mA and maximum pulse width 50ns, as long as average current doesn't exceed 15mA.
4. t_{PLH} (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.
5. t_{PHL} (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.
6. CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (i.e., VO > 2.0 V).
7. CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (i.e., VO < 0.8 V).
8. Device is considered a two-terminal device: pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.
9. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 4500Vrms for one second (leakage current less than 10 uA). This test is performed before the 100% production test for partial discharge
10. t_{PSK} is equal to the worst case difference in t_{PHL} and/or t_{PLH} that will be seen between units at any given temperature and specified test conditions.