



# Photocouplers

## LTV-0601 (Preliminary Version)

### Data Sheet

Created Date : 01/ 02/ 2012

Revision : 1.0, 01/ 02/ 2012



Lite-on Technology Corp.

Optoelectronics SBG

<http://www.liteon.com/opto>



## Photocouplers LTV-0601(Preliminary version)

### I. DESCRIPTION

The LTV-0601 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. A guaranteed common mode transient immunity is up to 15,000V/μs.

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

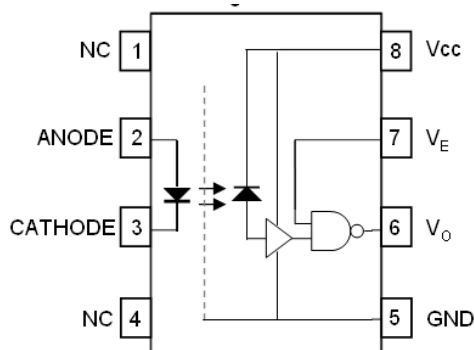
#### 1.1 Features

- SO8 package
- High speed – 10MBd typical
- Guaranteed AC and DC performance over temperature -40°C ~ +85°C.
- LSTTL/TTL Compatible.
- Strobable output.

#### 1.2 Applications

- Isolation in line receivers
- Ground loop elimination
- Feedback Element in Switching Mode Power Supplier
- High Speed Logic Ground Isolation – TTL/TTL, TTL/CMOS, TTL/LSTTL
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their peripheral

#### 1.3 Functional Diagram



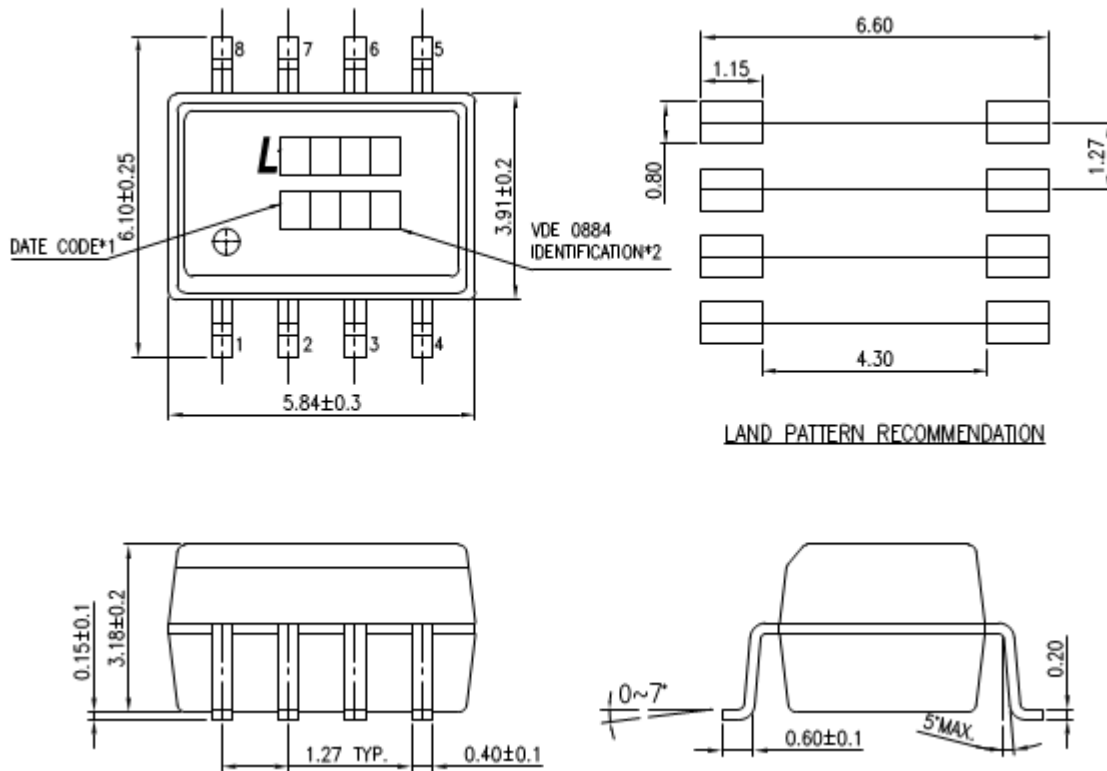
Truth Table (Positive Logic)

LED	ENABLE	OUT
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

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

**Photocouplers**  
**LTV-0601(Preliminary version)**

**2. PACKAGE DIMENSIONS**



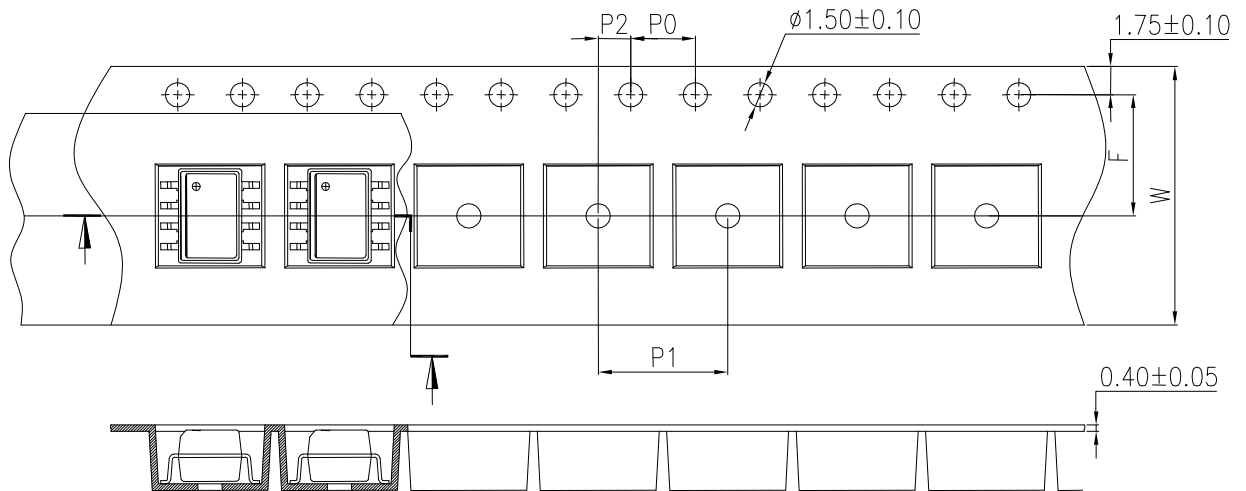
Part No : LTV-0601

**Notes :**

1. Date code
2. "V" to represent VDE0884
3. Date code
4. Dimensions are all in Millimeters.

**Photocouplers**  
**LTV-0601(Preliminary version)**

**3. TAPING DIMENSIONS**



Description	Symbol	Dimension in mm (inch)
Tape wide	W	16±0.3 (0.63)
Pitch of sprocket holes	$P_0$	4±0.1 (0.15)
Distance of compartment	F	7.5±0.1 (0.295)
	$P_2$	2±0.1 (0.079)
Distance of compartment to compartment	$P_1$	8±0.1 (0.47)

**Quantities Per Reel**

Package Type	LTV-0601
Quantities (pcs)	2000

## Photocouplers LTV-0601(Preliminary version)

### 4. RATING AND CHARACTERISTICS

#### 4.1 Absolute Maximum Ratings at Ta=25°C \*1

	Parameter	Symbol	Rating	Unit
Input	Average Forward Input Current	$I_F$	20	mA
	Reverse Input Voltage	$V_R$	5	V
	Power Dissipation	$P_I$	35	mW
	Enable Input Voltage	$V_E$	V <sub>CC</sub> +5	V
	Enable Input current	$I_E$	5	mA
Output	Output Collector Current	$I_O$	50	mA
	Output Collector Voltage	$V_O$	7	V
	Output Collector Power Dissipation	$P_O$	85	mW
	Isolation Voltage	$V_{iso}$	3750	V <sub>rms</sub>
	Supply Voltage	$V_{CC}$	7	V
	Operating Temperature	$T_{opr}$	-55 ~ +85	°C
	Storage Temperature	$T_{stg}$	-55 ~ +125	°C
	Lead Solder Temperature *2	$T_{sol}$	260	°C

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.

**Photocouplers**  
**LTV-0601(Preliminary version)**

**4.2 Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Operating Temperature	$T_A$	-40	85	°C
Supply Voltage	$V_{CC}$	4.5	5.5	V
Low Level Input Current	$I_{FL}$	0	250	$\mu$ A
High Level Input Current	$I_{FH}$	5	15	mA
Low Level Enable Voltage	$V_{EL}$	0	0.8	V
High Level Enable Voltage	$V_{EH}$	2	$V_{CC}$	V
Output Pull-up Resistor	$R_L$	330	4k	$\Omega$
Fan Out (at $R_L=1k\Omega$ per channel)	N	—	5	TTL Loads

## Photocouplers LTV-0601(Preliminary version)

### 4.3 ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
<b>Input</b>						
Input Forward Voltage	$V_F$	—	1.38	1.8	V	$I_F = 10\text{mA}$
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	—	-1.6	—	mV/ <sup>o</sup> C	$I_F = 10\text{mA}$
Input Reverse Voltage	$BV_R$	5.0	—	—	V	$I_R = 10\mu\text{A}$
Input Threshold Current	$I_{TH}$	—	1.35	5	mA	$V_E = 2\text{V}, V_{CC} = 5.5\text{V},$
		—	2 <sup>(1)</sup>	3	mA	$I_{OL}(\text{sinking}) = 13\text{mA}$
Input Capacitance	$C_{IN}$	—	34	—	pF	$f = 1\text{MHz}, V_F = 0\text{V}$
<b>Detector</b>						
High Level Supply Current	$I_{CCH}$	—	7.4	10	uA	$V_E = 0.5\text{V}, V_{CC} = 5.5\text{V},$ $I_F = 0\text{mA}$
Low Level Supply Current	$I_{CCL}$	—	10	13	mA	$V_E = 0.5\text{V}, V_{CC} = 5.5\text{V},$ $I_F = 10\text{mA}$
High Level Enable Current	$I_{EH}$	—	-0.6	-1.6	mA	$V_E = 2\text{V}$
Low Level Enable Current	$I_{EL}$	—	-0.9	-1.6	mA	$V_E = 0.5\text{V}$
High Level Enable Voltage	$V_{EH}$	2	—	—	V	
Low Level Enable Voltage	$V_{EL}$	—	—	0.8	V	
High Level Output Current	$I_{OH}$	—	—	100	$\mu\text{A}$	$V_E = 2\text{V}, V_{CC} = 5.5\text{V},$ $V_O = 5.5\text{V}, I_F = 250\mu\text{A}$
Low Level Output Voltage	$V_{OL}$	—	0.25	0.60	V	$V_E = 2\text{V}, V_{CC} = 5.5\text{V},$ $I_F = 5\text{mA},$ $I_{OL}(\text{sinking}) = 13\text{mA}$

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ) unless otherwise specified. Typical values applies to  $V_{CC} = 5\text{V}$ ,  $T_A = 25^\circ\text{C}$ . See note 1.

## Photocouplers LTV-0601(Preliminary version)

### 5. SWITCHING SPECIFICATION

$T_A=0\sim 70^{\circ}\text{C}$ ,  $V_{CC}=5\text{V}$ , unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Propagation Delay Time to Low Output Level	$t_{PHL}$	25	40	100	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	3
Propagation Delay Time to High Output Level	$t_{PLH}$	25	27	100	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	4
Pulse Width Distortion	$ \mathbf{t_{PLH} - t_{PHL}} $	—	12	—	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	—
Propagation Delay Skew	$t_{PSK}$	—	—	—	—	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	—
Output Rise Time (10 to 90%)	$t_r$	—	20	—	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	—
Output Fall Time (90 to 10%)	$t_f$	—	6.6	—	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$	—
Propagation Delay Time of Enable from $V_{EH}$ to $V_{EL}$	$t_{ELH}$	—	28	—	ns	$R_L = 350\Omega$ , $C_L = 15\text{pF}$ , $V_{EL} = 0\text{V}$ , $V_{EH} = 3\text{V}$	5
Propagation Delay Time of Enable from $V_{EL}$ to $V_{EH}$	$t_{EHL}$	—	12	—	V/ $\mu\text{s}$	$R_L = 350\Omega$ , $C_L = 15\text{pF}$ , $V_{EL} = 0\text{V}$ , $V_{EH} = 3\text{V}$	6
Logic High Common Mode Transient Immunity	$ CM_H $	1,000	—	—	V/ $\mu\text{s}$	$ V_{CM}  = 20\text{V}$ , $V_{CC} = 5\text{V}$ , $I_F = 0\text{mA}$ , $V_{O(MIN)} = 2\text{V}$ , $R_L = 350\Omega$ , $T_A = 25^{\circ}\text{C}$	7,9
Logic Low Common Mode Transient Immunity	$ CM_L $	1,000	—	—	ns	$ V_{CM}  = 20\text{V}$ , $V_{CC} = 5\text{V}$ , $I_F = 7.5\text{mA}$ , $V_{O(MIN)} = 0\text{V}$ , $R_L = 350\Omega$ , $T_A = 25^{\circ}\text{C}$	8,9

\*All Typical at  $T_A = 25^{\circ}\text{C}$



## Photocouplers LTV-0601(Preliminary version)

### 6. ISOLATION CHARACTERISTIC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Input-Output Insulation Leakage Current	$I_{I-O}$	—	—	1.0	$\mu A$	45% RH, $t = 5s$ , $V_{I-O} = 3kV$ DC, $T_A = 25^\circ C$	10,11
Withstand Insulation Test Voltage	$V_{ISO}$	3750	—	—	$V_{RMS}$	RH $\leq 50\%$ , $t = 1min$ , $T_A = 25^\circ C$	10,11,12
Input-Output Resistance	$R_{I-O}$	—	$10^{12}$	—	$\Omega$	$V_{I-O} = 500V$ DC	10
Input-Output Capacitance	$C_{I-O}$	—	1.0	—	p	$f = 1MHz$ , $T_A = 25^\circ C$	10

Specified over recommended temperature ( $T_A = -40^\circ C$  to  $+85^\circ C$ ) unless otherwise specified. Typical values applies to  $T_A = 25^\circ C$

#### Notes

1. A 0.1 $\mu F$  or bigger bypass capacitor for  $V_{CC}$  is needed as shown in Fig.1
2. 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 20mA.
3.  $t_{PLH}$  (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.
4.  $t_{PHL}$  (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.
5. The  $t_{ELH}$  enable propagation delay is measured from the 1.5 V point on the falling edge of the enable input pulse to the 1.5 V point on the rising edge of the output pulse.
6. The  $t_{EHL}$  enable propagation delay is measured from the 1.5 V point on the rising edge of the enable input pulse to the 1.5 V point on the falling edge of the output pulse.
7.  $CM_H$  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.,  $V_O > 2.0$  V).
8.  $CM_L$  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.,  $V_O < 0.8$  V).
9. No external pull up is required for a high logic state on the enable input. If the enable pin is not used, tying it to  $V_{CC}$ .
10. Device is considered a two-terminal device: pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.
11. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 3000 V rms for one second (leakage current less than 5 uA). This test is performed before the 100% production test for partial discharge

# Photocouplers LTV-0601(Preliminary version)

## 7. SWITCHING TIME TEST CIRCUIT

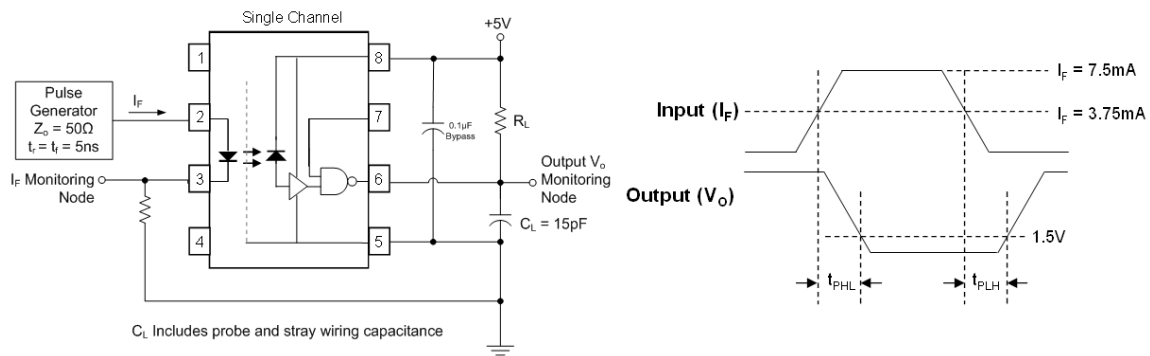


Figure 1: Single Channel Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

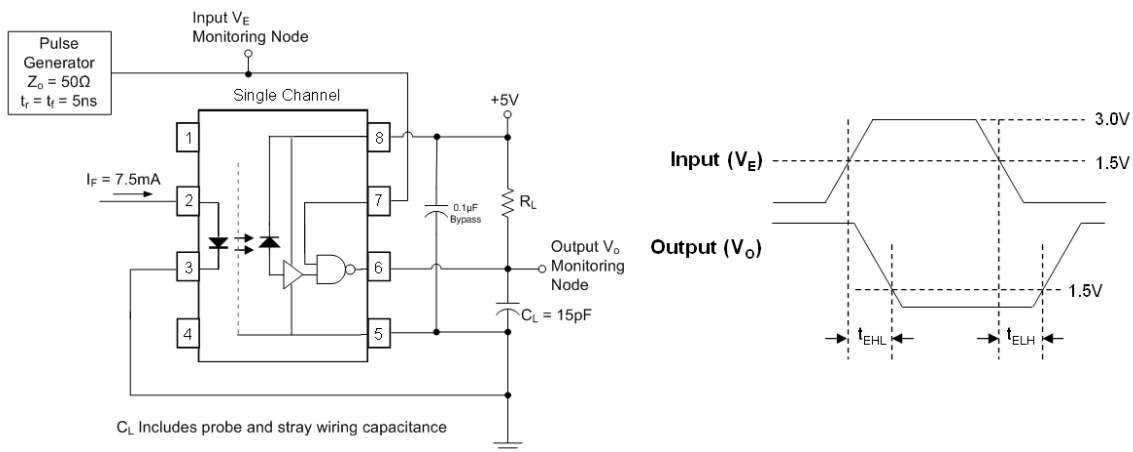


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

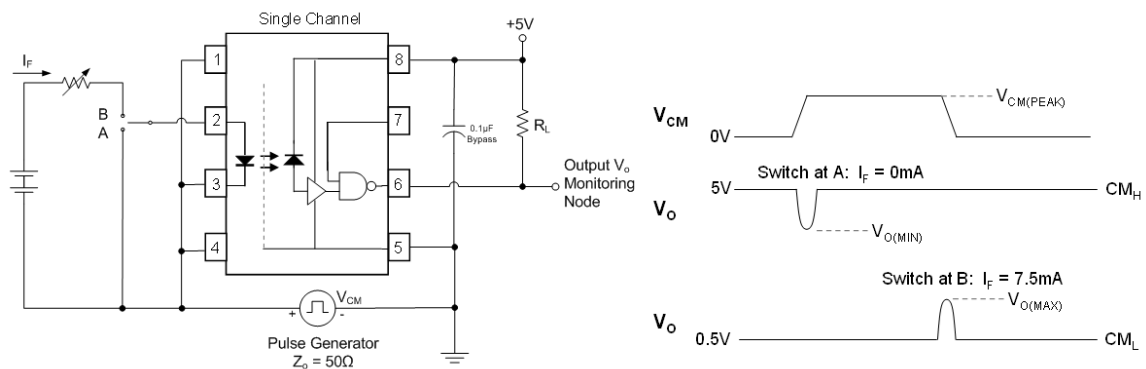


Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity

**Photocouplers**  
**LTV-0601(Preliminary version)**

**8. TEMPERATURE PROFILE OF SOLDERING**

**8.1 IR Reflow soldering (JEDEC-STD-020C compliant)**

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

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

