

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

# TLP651

- DIGITAL LOGIC GROUND ISOLATION
- LINE RECEIVER
- MICROPROCESSOR SYSTEM INTERFACES
- SWITCHING POWER SUPPLY FEEDBACK CONTROL
- ANALOG SIGNAL ISOLATION

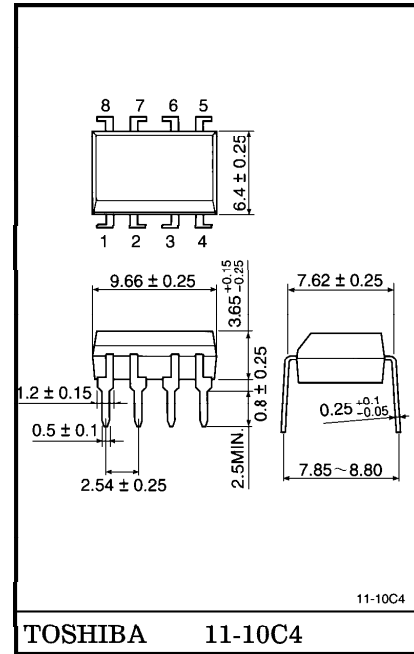
The TOSHIBA TLP651 consists of a GaAlAs high-output light emitting diode and a high speed detector of one chip photo diode-transistor.

This unit is 8-lead DIP.

TLP651 has internal base connection. This base pin should be used for analog application or enable operation. If base pin is open, output signal will be noisy by environmental condition. For this case, TLP650 is suitable.

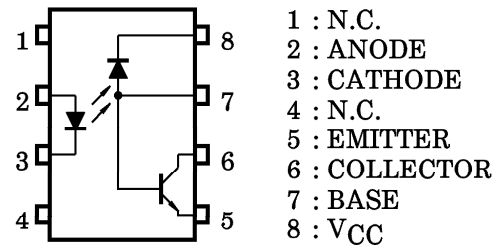
- Isolation Voltage : 5000V<sub>rms</sub> (MIN.)
- Switching Speed :  $t_{pHL} = 0.3\mu s$  (TYP.)  
 $t_{pLH} = 0.5\mu s$  (TYP.) ( $R_L = 1.9k\Omega$ )
- TTL Compatible
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS EN60065 : 1994  
Certificate No. 7613  
BS EN60950 : 1992  
Certificate No. 7614

Unit in mm

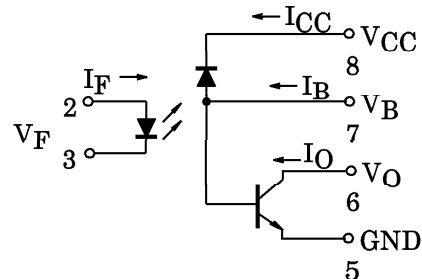


Weight : 0.54g

PIN CONFIGURATION (TOP VIEW)



SCHEMATIC



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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current (Note 1)	I <sub>F</sub>	25	mA
	Pulse Forward Current (Note 2)	I <sub>FP</sub>	50	mA
	Peak Transient Forward Current (Note 3)	I <sub>FPT</sub>	1	A
	Reverse Voltage	V <sub>R</sub>	5	V
	Diode Power Dissipation (Note 4)	P <sub>D</sub>	45	mW
DETECTOR	Output Current	I <sub>O</sub>	8	mA
	Peak Output Current	I <sub>OP</sub>	16	mA
	Output Voltage	V <sub>O</sub>	-0.5~15	V
	Supply Voltage	V <sub>CC</sub>	-0.5~15	V
	Base Current	I <sub>B</sub>	5	mA
	Emitter-Base Reverse Voltage	V <sub>EB</sub>	5	V
	Output Power Dissipation (Note 5)	P <sub>O</sub>	100	mW
Operating Temperature Range		T <sub>opr</sub>	-55~100	°C
Storage Temperature Range		T <sub>stg</sub>	-55~125	°C
Lead Solder Temperature (10s) (Note 6)		T <sub>sol</sub>	260	°C
Isolation Voltage (AC, 1min., R.H. ≤ 60%) (Note 7)		BV <sub>S</sub>	5000	V <sub>rms</sub>

(Note 1) Derate 0.8mA above 70°C.

(Note 2) 50% duty cycle, 1ms pulse width.  
Derate 1.6mA/°C above 70°C.

(Note 3) Pulse width ≤ 1μs, 300pps.

(Note 4) Derate 0.9mW/°C above 70°C.

(Note 5) Derate 2mW/°C above 70°C.

(Note 6) Soldering portion of lead : up to 2mm from the body of the device.

(Note 7) Device considered a two terminal device : Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

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- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
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- The information contained herein is subject to change without notice.

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 16mA		—	1.65	1.85	V
	Forward Voltage Temperature Coefficient	ΔV <sub>F</sub> / ΔTa	I <sub>F</sub> = 16mA		—	-2	—	mV / °C
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5V		—	—	10	μA
	Capacitance Between Terminal	C <sub>T</sub>	V <sub>F</sub> = 0, f = 1MHz		—	45	—	pF
DETECTOR	High Level Output Current	I <sub>OH</sub> (1)	I <sub>F</sub> = 0mA, V <sub>CC</sub> = V <sub>O</sub> = 5.5V		—	3	500	nA
		I <sub>OH</sub> (2)	I <sub>F</sub> = 0mA, V <sub>CC</sub> = V <sub>O</sub> = 15V		—	—	5	μA
		I <sub>OH</sub>	I <sub>F</sub> = 0mA, V <sub>CC</sub> = V <sub>O</sub> = 15V Ta = 70°C		—	—	250	μA
	High Level Supply Voltage	I <sub>CCH</sub>	I <sub>F</sub> = 0mA, V <sub>CC</sub> = 15V		—	0.01	1	μA
COUPLED	Current Transfer Ratio	I <sub>O</sub> / I <sub>F</sub>	I <sub>F</sub> = 16 mA V <sub>CC</sub> = 4.5V V <sub>O</sub> = 0.4V	Ta = 25°C	10	30	—	%
				Rank : O	19	30	—	
				Ta = 0~70°C	5	—	—	
					Rank : O	15	—	—
	Low Level Output Voltage	V <sub>OL</sub>	I <sub>F</sub> = 16mA, V <sub>CC</sub> = 4.5V, I <sub>O</sub> = 1.1mA (Rank 0 : I <sub>O</sub> = 2.4mA)		—	—	0.4	V
Isolation Resistance	R <sub>S</sub>	R.H. ≤ 60%, V <sub>S</sub> = 500V <sub>DC</sub> (Note 7)		5 × 10 <sup>10</sup>	10 <sup>14</sup>	—	Ω	
Capacitance Between Input to Output	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz (Note 7)		—	0.8	—	pF	

SWITCHING CHARACTERISTICS (Ta = 25°C, V<sub>CC</sub> = 5V)

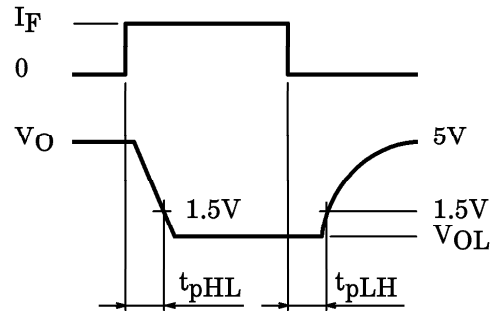
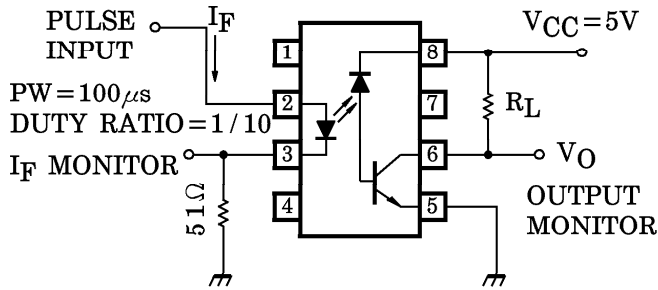
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t <sub>pHL</sub>	1	I <sub>F</sub> = 0→16mA, V <sub>CC</sub> = 5V, R <sub>L</sub> = 4.1kΩ	—	0.2	0.8	μs
			Rank O : R <sub>L</sub> = 1.9kΩ	—	0.3	0.8	
Propagation Delay Time (L→H)	t <sub>pLH</sub>	1	I <sub>F</sub> = 16→0mA, V <sub>CC</sub> = 5V, R <sub>L</sub> = 4.1kΩ	—	1.0	2.0	μs
			Rank O : R <sub>L</sub> = 1.9kΩ	—	0.5	1.2	
Common Mode Transient Immunity at Logic High Output (Note8)	C <sub>MH</sub>	2	I <sub>F</sub> = 0mA, V <sub>CM</sub> = 200V <sub>p-p</sub> R <sub>L</sub> = 4.1kΩ (Rank O : R <sub>L</sub> = 1.9kΩ)	—	400	—	V / μs
			I <sub>F</sub> = 16mA, V <sub>CM</sub> = 200V <sub>p-p</sub> R <sub>L</sub> = 4.1kΩ (Rank O : R <sub>L</sub> = 1.9kΩ)	—	-1000	—	V / μs

(Note 8)  $CM_L$  is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state ( $V_O < 0.8V$ ).

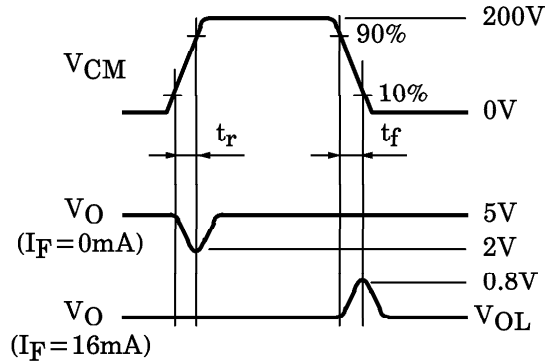
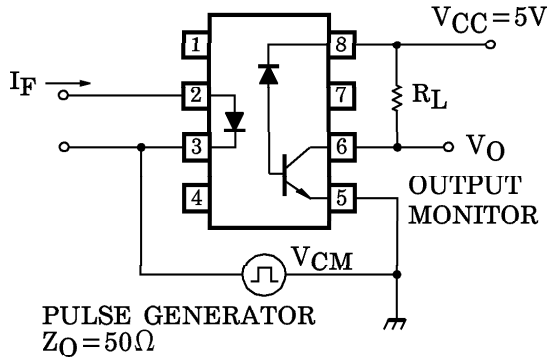
$CM_H$  is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state ( $V_O > 2.0V$ ).

(Note 9) Maximum electrostatic discharge voltage for any pins : 100V (C=200pF, R=0).

TEST CIRCUIT 1 : Switching Time Test Circuit



TEST CIRCUIT 2 : Common Mode Noise Immunity Test Circuit



$$CM_H = \frac{160(V)}{t_r(\mu s)}, \quad CM_L = \frac{160(V)}{t_f(\mu s)}$$

