

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO IC

TLP2530, TLP2531

DEGITAL LOGIC ISOLATION

LINE RECEIVER

POWER SUPPLY CONTROL

SWITCHING POWER SUPPLY

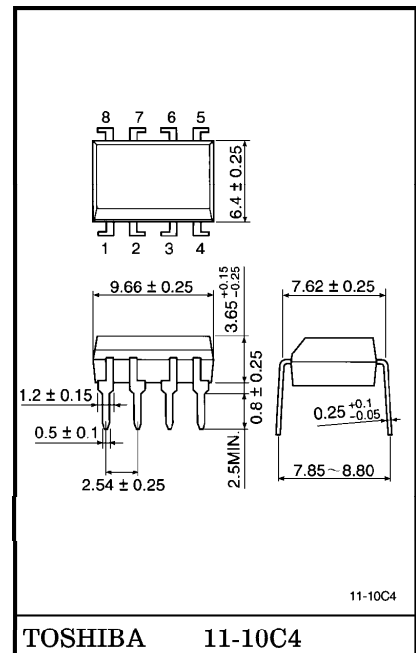
TRANSISTOR INVERTER

The TOSHIBA TLP2530 and TLP2531 dual photocouplers consist of a pair of GaAlAs light emitting diode and integrated photodetector. This unit is 8-lead DIP.

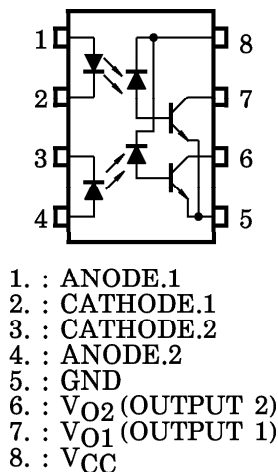
Separate connection for the photodiode bias and output transistor collectors improve the speed up to a hundred times that of a conventional phototransistor coupler by reducing the base-collector capacitance.

- TTL Compatibel
- Switching Speed : $t_{pHL}=0.3\mu s$, $t_{pLH}=0.3\mu s$ (Typ.)
(@ $R_L=1.9k\Omega$)
- Guaranteed Performance Over Temp : $0\sim 70^\circ C$
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

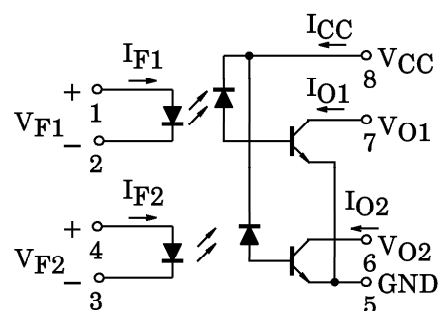
Unit in mm



PIN CONFIGURATION (TOP VIEW)



SCHEMATIC



980508EBC2

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MAXIMUM RATINGS

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current (Each channel) (Note 1)	I_F	25	mA
	Pulse Forward Current (Each channel) (Note 2)	I_{FP}	50	mA
	Total Pulse Forward Current (Each channel) (Note 3)	I_{FPT}	1	A
	Reverse Voltage (Each channel)	V_R	5	V
	Diode Power Dissipation (Each channel) (Note 4)	P_D	45	mW
DETECTOR	Output Current (Each channel)	I_O	8	mA
	Peak Output Current (Each channel)	I_{OP}	16	mA
	Supply Voltage	V_{CC}	-0.5~15	V
	Output Voltage (Each channel)	V_O	-0.5~15	V
	Output Power Dissipation (Each channel) (Note 5)	P_O	35	mW
Operating Temperature Range		T_{opr}	-55~100	°C
Storage Temperature Range		T_{stg}	-55~125	°C
Lead Solder Temperature (10s)**		T_{sol}	260	°C
Isolation Voltage (AC, 1min., R.H. ≤ 60%) (Note 7)		BVS	2500	V _{rms}

(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 1mW/°C above 70°C.

** 2mm below seating plane.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	0	—	12	V
Forward Current, Each Channel	I_F	—	16	25	mA
Operating Temperature	T_{opr}	-25	—	85	°C

ELECTRICAL CHARACTERISTICS

OVER RECOMMENDED TEMPERATURE (Ta = 0°C~70°C, Unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.**	MAX.	UNIT
Current Transfer Ratio (Each Channel)	TLP2530	CTR	I _F = 16mA, V _O = 0.4V V _{CC} = 4.5V, Ta = 25°C (Note 6)	7	30	—	%
	TLP2531			19	30	—	
	TLP2530	CTR	I _F = 16mA, V _O = 0.5V V _{CC} = 4.5V (Note 6)	5	—	—	%
	TLP2531			15	—	—	
Logic Low Output Voltage (Each Channel)	TLP2530	V _{OL}	I _F = 16mA, I _O = 1.1mA V _{CC} = 4.5V	—	0.1	0.4	V
	TLP2531		I _F = 16mA, I _O = 2.4mA V _{CC} = 4.5V	—	0.1	0.4	V
Logic High Output Current (Each Channel)		I _{OH}	I _F = 0mA, V _O = V _{CC} = 5.5V Ta = 25°C	—	3	500	nA
			I _F = 0mA, V _O = V _{CC} = 15V	—	—	50	μA
Logic Low Supply Current		I _{CCL}	I _{F1} = I _{F2} = 16mA V _{O1} = V _{O2} = Open V _{CC} = 15V	—	160	—	μA
Logic High Supply Current		I _{CCH}	I _{F1} = I _{F2} = 0mA V _{O1} = V _{O2} = Open V _{CC} = 15V	—	0.05	4	μA
Input Forward Voltage (Each Channel)		V _F	I _F = 16mA, Ta = 25°C	—	1.65	1.7	V
Temperature Coefficient of Forward Voltage (Each Channel)		ΔV _F / ΔTa	I _F = 16mA	—	−2	—	mV / °C
Input Reverse Breakdown Voltage (Each Channel)		BV _R	I _R = 10 μA, Ta = 25°C	5	—	—	V
Input Capacitance (Each Channel)		C _{IN}	f = 1MHz, V _F = 0	—	60	—	pF
Input-Output Insulation Leakage Current		I _{I-O}	Relative Humidity = 45% t = 5s, V _{I-O} = 3000V _{dc} Ta = 25°C (Note 7)	—	—	1.0	μA
Resistance (Input-Output)		R _{I-O}	V _{I-O} = 500V _{dc} (Note 7)	—	10 ¹²	—	Ω
Capacitance (Input-Output)		C _{I-O}	f = 1MHz (Note 7)	—	0.6	—	pF
Input-Input Leakage Current		I _{I-I}	Relative Humidity = 45% t = 5s, V _{I-I} = 500V (Note 8)	—	0.005	—	μA
Resistance (Input-Input)		R _{I-I}	V _{I-I} = 500V _{dc} (Note 8)	—	10 ¹¹	—	Ω
Capacitance (Input-Input)		C _{I-I}	f = 1MHz (Note 8)	—	0.25	—	pF

** All typicals at Ta = 25°C.

SWITCHING CHARACTERISTICS (Unless otherwise specified, $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 16\text{mA}$)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic Low at Output (Each Channel)	TLP2530	t _{pHL}	1	R _L = 4.1kΩ	—	0.3	1.5	μs
	TLP2531			R _L = 1.9kΩ	—	0.2	0.8	
Propagation Delay Time to Logic High at Output (Each Channel)	TLP2530	t _{pLH}	1	R _L = 4.1kΩ	—	0.5	1.5	μs
	TLP2531			R _L = 1.9kΩ	—	0.3	0.8	
Common Mode Transient Immunity at Logic High Level Output (Each Channel, Note 9)	TLP2530	CM _H	2	I _F = 0mA, V _{CM} = 400V _{p-p} R _L = 4.1kΩ	—	1500	—	V / μs
	TLP2531			I _F = 0mA, V _{CM} = 400V _{p-p} R _L = 1.9kΩ	—	1500	—	
Common Mode Transient Immunity at Logic Low Level Output (Each Channel, Note 9)	TLP2530	CM _L	2	V _{CM} = 400V _{p-p} R _L = 4.1kΩ, I _F = 16mA	—	−1500	—	V / μs
	TLP2531			V _{CM} = 400 _{p-p} R _L = 1.9kΩ, I _F = 16mA	—	−1500	—	
Bandwidth (Each Channel, Note 10)		BW	3	R _L = 100Ω	—	2	—	MHz

(Note 6) DC CURRENT TRANSFER RATIO is defined as the ratio of output collector current, I_O , to the forward LED input current, I_F , times 100%.

(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.

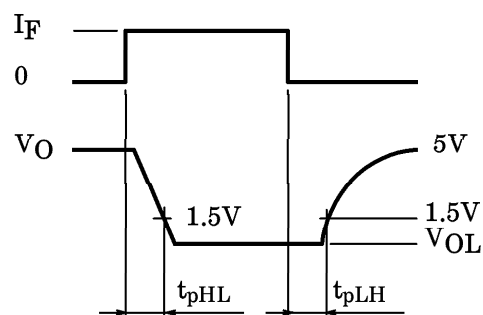
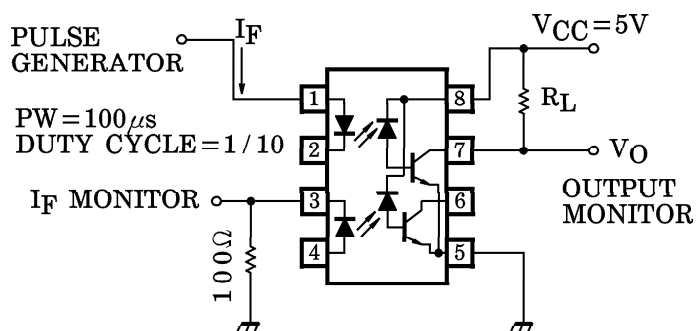
(Note 8) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

(Note 9) Common mode transient immunity in Logic High level is the maximum tolerable (Positive) dV_{cm}/dt on the leading edge of the common mode pulse, V_{cm} , to assure that the output will remain in a Logic High state (i.e., $V_O > 2.0\text{V}$).

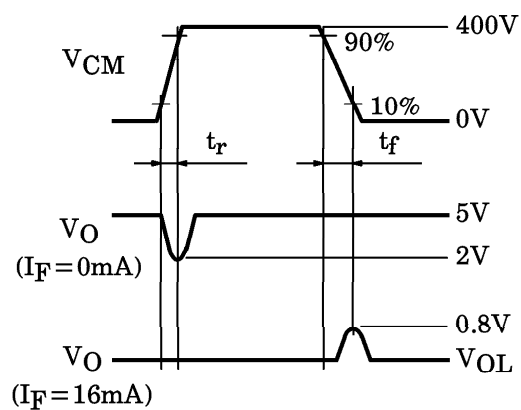
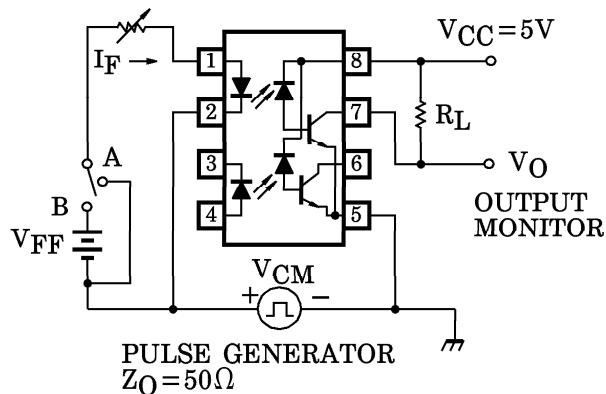
Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common mode pulse signal, V_{cm} , to assure that the output will remain in a Logic Low state (i.e., $V_O > 0.8\text{V}$).

(Note 10) The frequency at which the ac output voltage is 3dB below the low frequency asymptote.

TEST CIRCUIT 1 : SWITCHING TIME, t_{pHL} , t_{pLH}



TEST CIRCUIT 2 : TRANSIENT IMMUNITY AND TYPICAL WAVEFORM



$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$

TEST CIRCUIT 3 : FREQUENCY RESPONSE

