

TOSHIBA Photocoupler GaAlAs Ired & Photo IC

TLP2530, TLP2531

Digital Logic Isolation

Line Receiver

Power Supply Control

Switching Power Supply

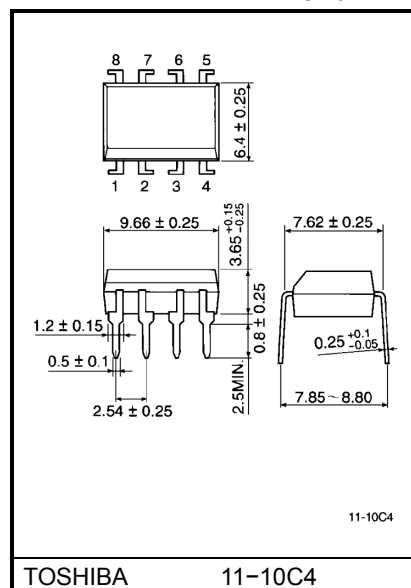
Transistor Inverter

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.

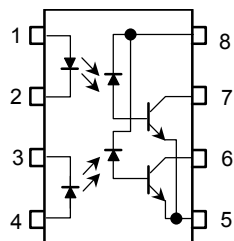
- TTL compatibel
- Switching speed: $t_{pHL}=0.3\mu s$, $t_{pLH}=0.3\mu s$ (typ.)
(@ $R_L=1.9k\Omega$)
- Guaranteed performance over temp: $0\sim 70^\circ C$
- Isolation voltage: 2500 Vrms(min.)
- UL recognized: UL1577, file no. E67349

Unit in mm



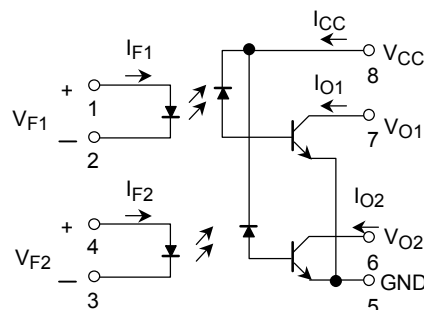
Weight: 0.54g

Pin Configuration (top view)



1. : Anode.1
2. : Cathode.1
3. : Cathode.2
4. : Anode.2
5. : Gnd
6. : V_{O2} (output 2)
7. : V_{O1} (output 1)
8. : V_{CC}

Schematic



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)		BV_S	2500	Vrms

(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 ($T_a = 0^\circ\text{C} \sim 70^\circ\text{C}$, unless otherwise noted)

Characteristic		Symbol	Test Condition	Min.	Typ.**	Max.	Unit
Current transfer ratio (each channel)	TLP2530	CTR	$I_F = 16\text{mA}$, $V_O = 0.4\text{V}$ $V_{CC} = 4.5\text{V}$, $T_a = 25^\circ\text{C}$ (Note 6)	7	30	—	%
	TLP2531			19	30	—	
	TLP2530	CTR	$I_F = 16\text{mA}$, $V_O = 0.5\text{V}$ $V_{CC} = 4.5\text{V}$ (Note 6)	5	—	—	%
	TLP2531			15	—	—	
Logic low output voltage (each channel)	TLP2530	V_{OL}	$I_F = 16\text{mA}$, $I_O = 1.1\text{mA}$ $V_{CC} = 4.5\text{V}$	—	0.1	0.4	V
	TLP2531		$I_F = 16\text{mA}$, $I_O = 2.4\text{mA}$ $V_{CC} = 4.5\text{V}$	—	0.1	0.4	V
Logic high output current (each channel)		I_{OH}	$I_F = 0\text{mA}$, $V_O = V_{CC} = 5.5\text{V}$ $T_a = 25^\circ\text{C}$	—	3	500	nA
			$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$	—	—	50	μA
Logic low supply current		I_{CCL}	$I_{F1} = I_{F2} = 16\text{mA}$ $V_{O1} = V_{O2} = \text{Open}$ $V_{CC} = 15\text{V}$	—	160	—	μA
Logic high supply current		I_{CCH}	$I_{F1} = I_{F2} = 0\text{mA}$ $V_{O1} = V_{O2} = \text{Open}$ $V_{CC} = 15\text{V}$	—	0.05	4	μA
Input forward voltage (each channel)		V_F	$I_F = 16\text{mA}$, $T_a = 25^\circ\text{C}$	—	1.65	1.7	V
Temperature coefficient of forward voltage (each channel)		$\Delta V_F / \Delta T_a$	$I_F = 16\text{mA}$	—	-2	—	mV/ $^\circ\text{C}$
Input reverse breakdown voltage (each channel)		BV_R	$I_R = 10\mu\text{A}$, $T_a = 25^\circ\text{C}$	5	—	—	V
Input capacitance (each channel)		C_{IN}	$f = 1\text{MHz}$, $V_F = 0$	—	60	—	pF
Input-output insulation leakage current		I_{I-O}	Relative humidity = 45% $t = 5\text{s}$, $V_{I-O} = 3000V_{dc}$ $T_a = 25^\circ\text{C}$ (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}	$f = 1\text{MHz}$ (Note 7)	—	0.6	—	pF
Input-input leakage current		I_{I-I}	Relative humidity = 45% $t = 5\text{s}$, $V_{I-I} = 500\text{V}$ (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}	$f = 1\text{MHz}$ (Note 8)	—	0.25	—	pF

 **All typicals at $T_a = 25^\circ\text{C}$.

Switching Characteristics (unless otherwise specified, $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F = 16\text{mA}$)

Characteristic		Symbol	Test Cir-cuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time to logic low at output (each channel)	TLP2530	t_{pHL}	1	$R_L = 4.1\text{k}\Omega$	—	0.3	1.5	μs
	TLP2531			$R_L = 1.9\text{k}\Omega$	—	0.2	0.8	
Propagation delay time to logic high at output (each channel)	TLP2530	t_{pLH}	1	$R_L = 4.1\text{k}\Omega$	—	0.5	1.5	μs
	TLP2531			$R_L = 1.9\text{k}\Omega$	—	0.3	0.8	
Common mode transient immunity at logic high level output (each channel, Note 9)	TLP2530	CM_H	2	$I_F = 0\text{mA}$, $V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$	—	1500	—	$\text{V} / \mu\text{s}$
	TLP2531			$I_F = 0\text{mA}$, $V_{CM} = 400\text{V}_{p-p}$ $R_L = 1.9\text{k}\Omega$	—	1500	—	
Common mode transient immunity at logic low level output (each channel, Note 9)	TLP2530	CM_L	2	$V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$, $I_F = 16\text{mA}$	—	–1500	—	$\text{V} / \mu\text{s}$
	TLP2531			$V_{CM} = 400\text{V}_{p-p}$ $R_L = 1.9\text{k}\Omega$, $I_F = 16\text{mA}$	—	–1500	—	
Bandwidth (each channel, Note 10)		BW	3	$R_L = 100\Omega$	—	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.

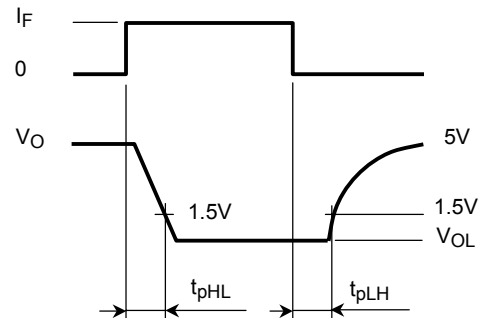
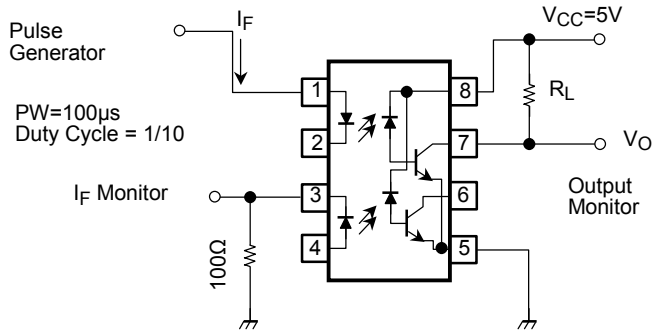
(Note 8) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

(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., $V_O > 2.0\text{V}$).

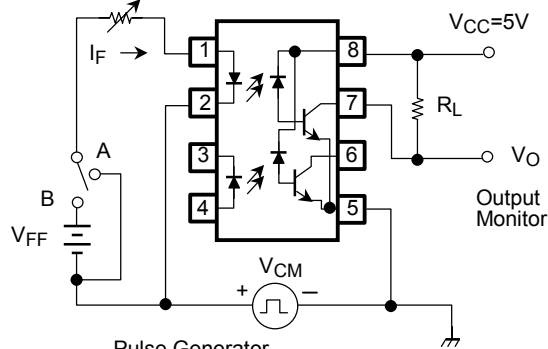
Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{cm} / dt on the trailing edge of the common mode pulse signal, V_{cm} , to assure that the output will remain in logic low state (i.e., $V_O > 0.8\text{V}$).

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

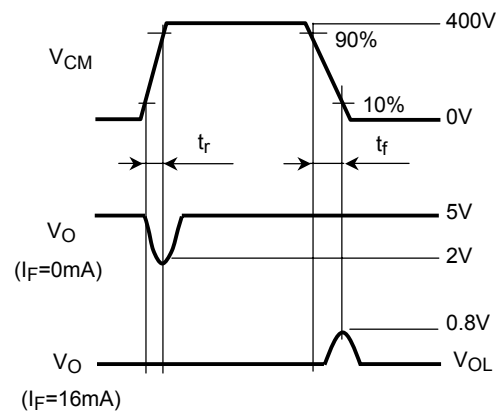
Test Circuit 1: Switching Time, t_{pHL} , t_{pLH}



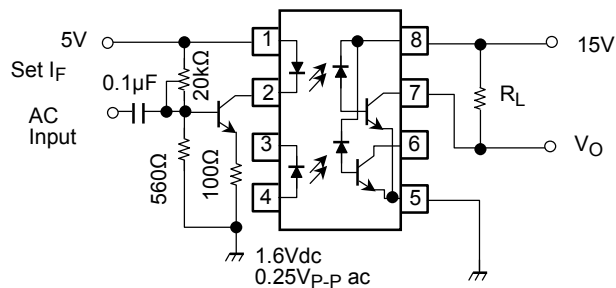
Test Circuit 2: Transient Immunity And Typical Waveform

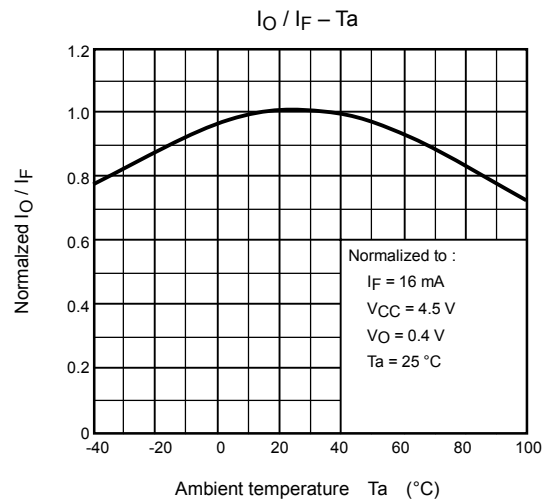
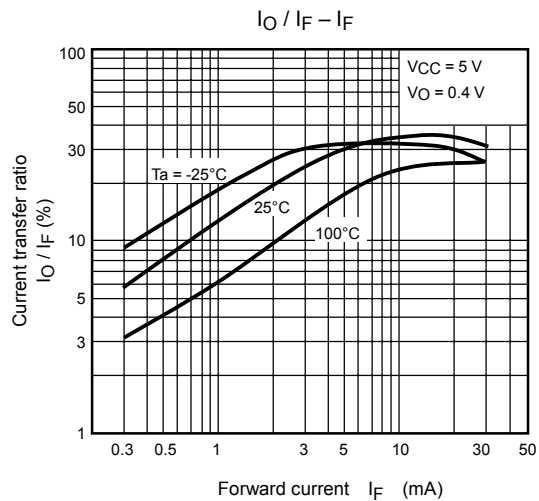
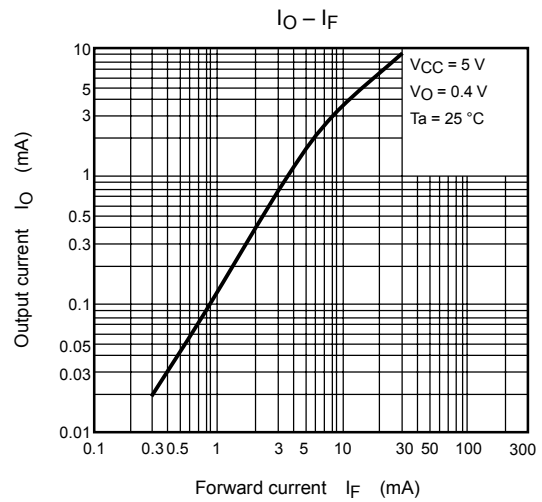
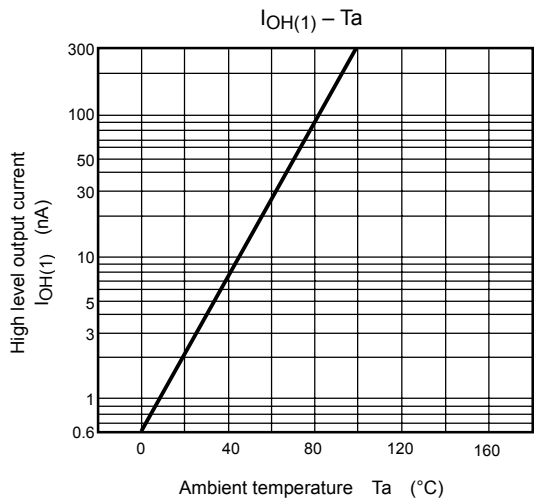
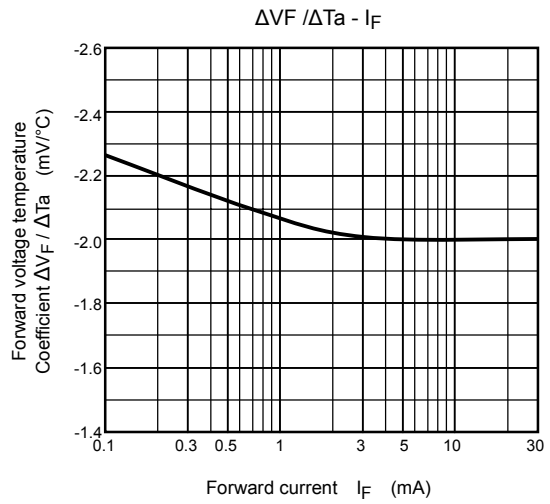
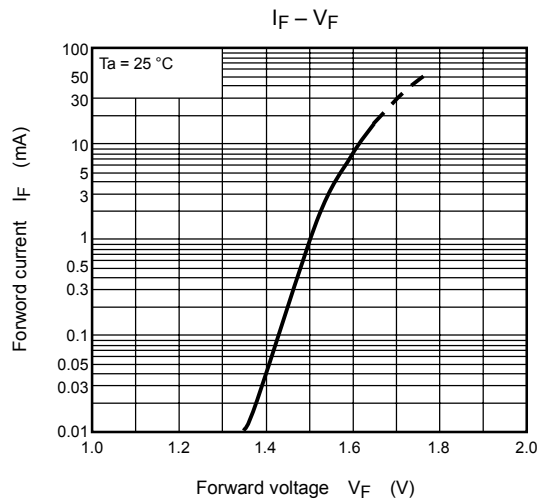


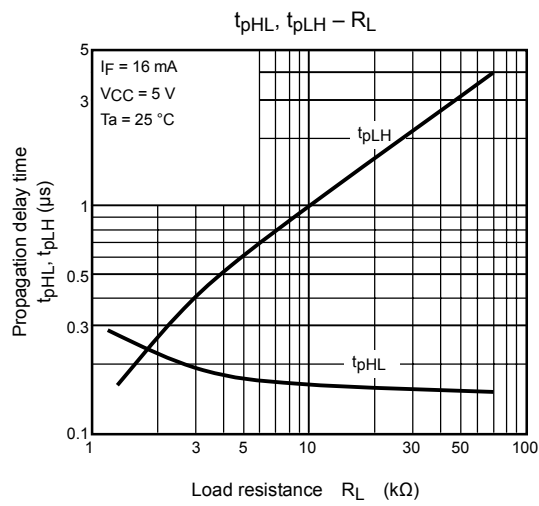
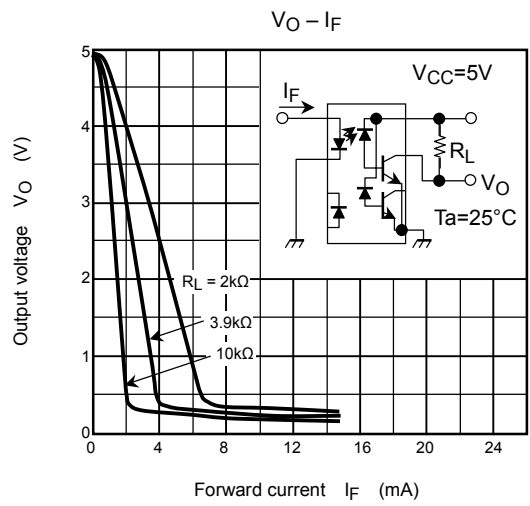
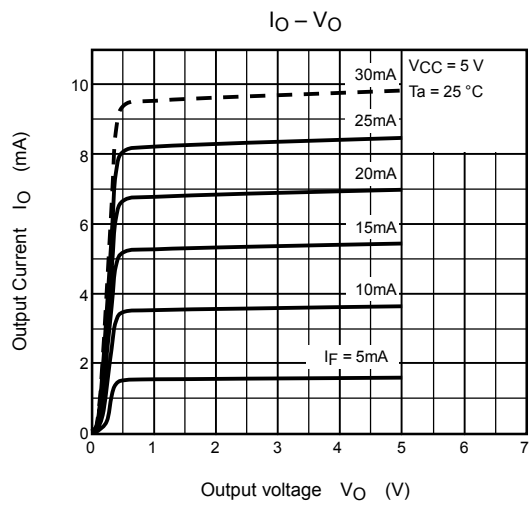
$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$



Test Circuit 3: Frequency Response







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