

TOSHIBA Photocoupler GaAlAs Ired & Photo IC

TLP2530, TLP2531

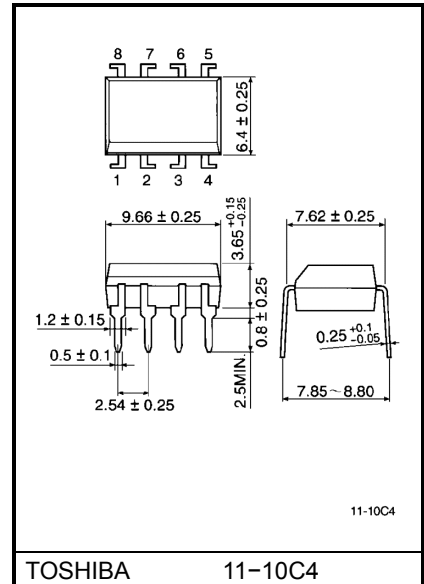
- Digital Logic Isolation
- Line Receiver
- Power Supply Control
- Switching Power Supply
- Transistor Inverter

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.

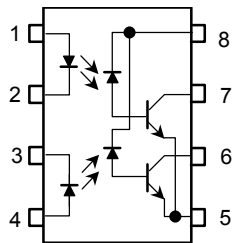
- TTL compatibel
- Switching speed: $t_{pHL}=0.3\mu s$, $t_{pLH}=0.3\mu s$ (typ.)
(@ $R_L=1.9k\Omega$)
- Guaranteed performance over temp: 0~70°C
- Isolation voltage: 2500 Vrms(min.)
- UL recognized: UL1577, file no. E67349

Unit in mm



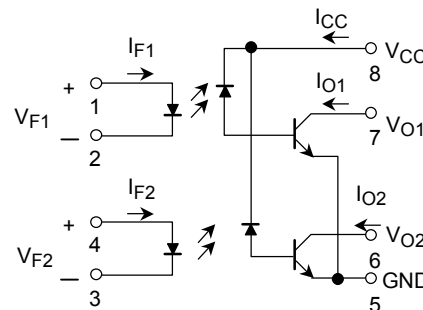
Weight: 0.54g

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 (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 = 10μA, 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-iutput) | | 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 | $R_L = 4.1\text{k}\Omega$ | — | 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.

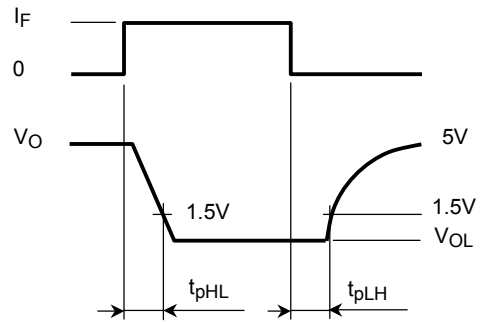
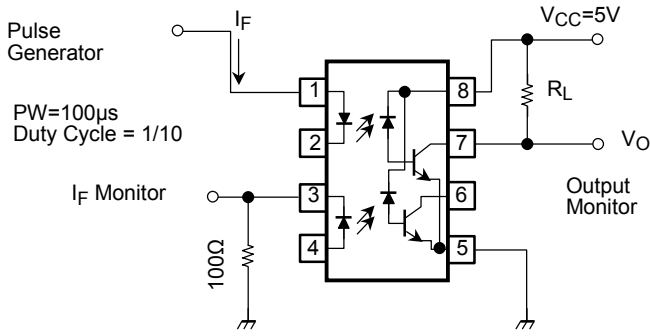
(Note 8) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

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

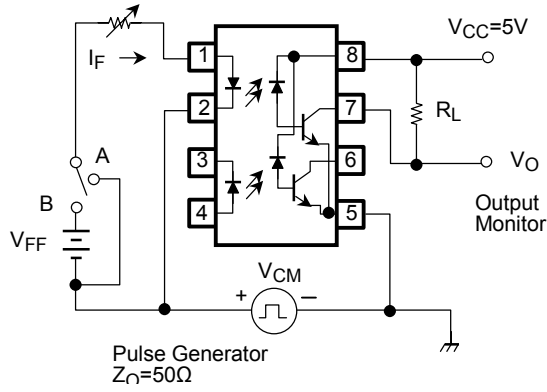
Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{cm} / dt on the trailing edge of the common mode pulse signal, V_{cm} , to assure that the output will remain in logic low state (i.e., $V_O > 0.8\text{V}$).

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

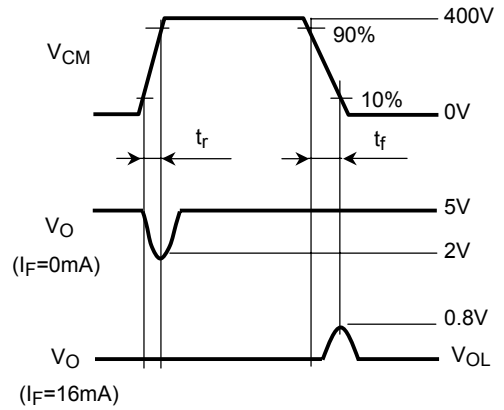
Test Circuit 1: Switching Time, t_{pHL} , t_{pLH}



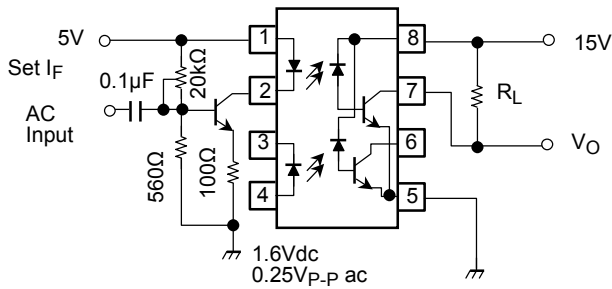
Test Circuit 2: Transient Immunity And Typical Waveform

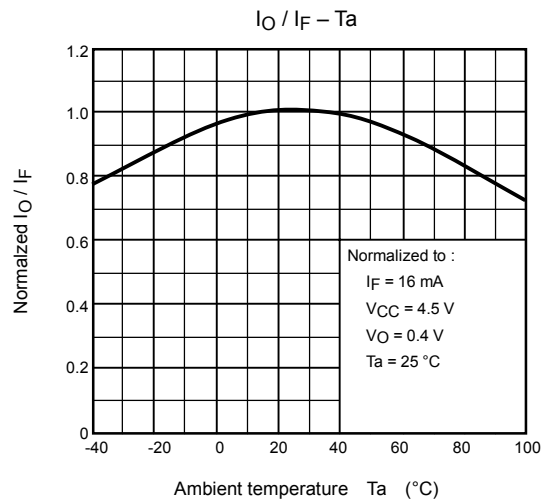
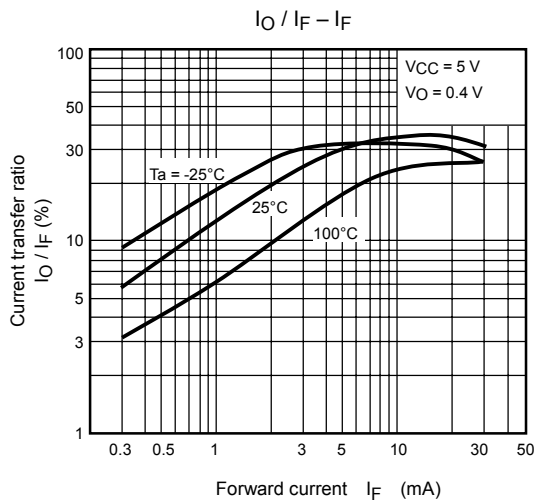
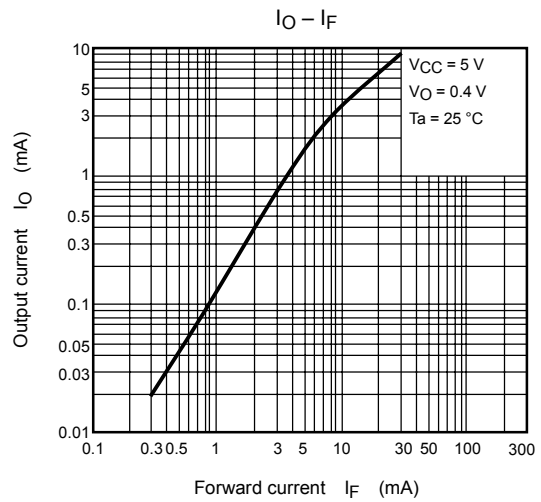
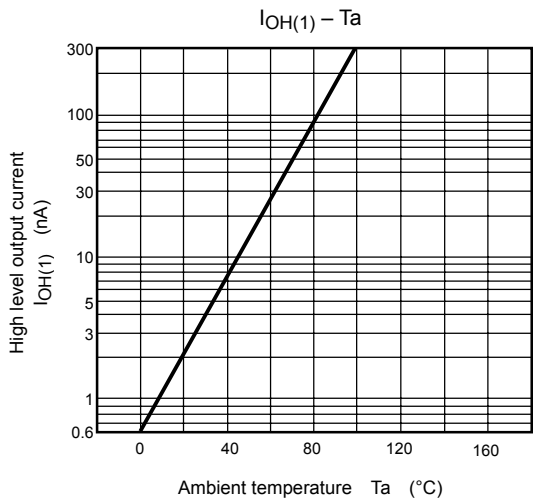
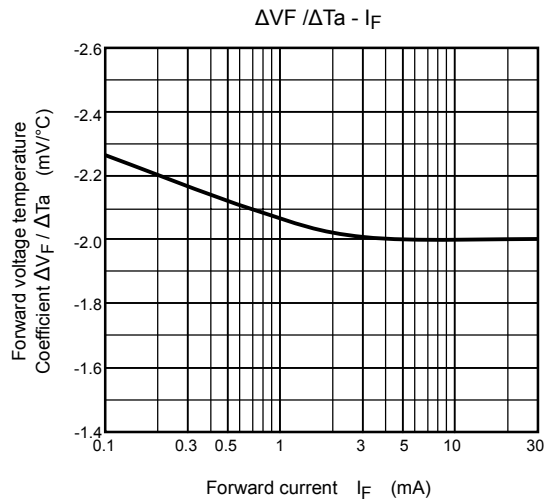
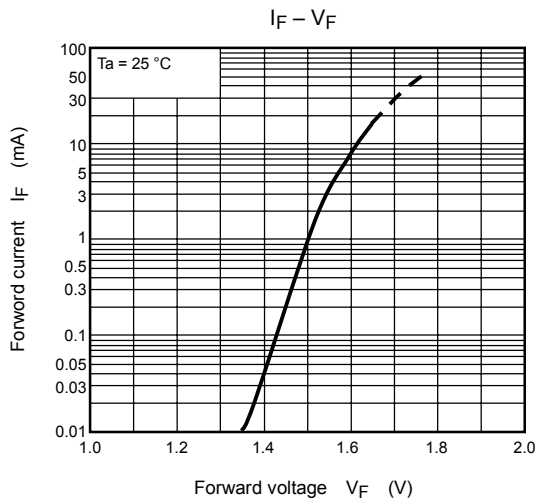


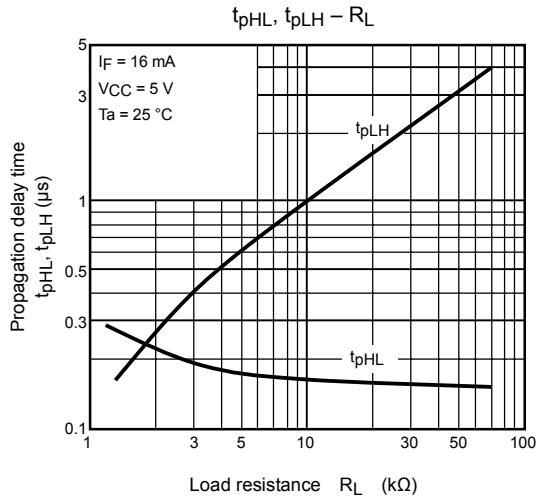
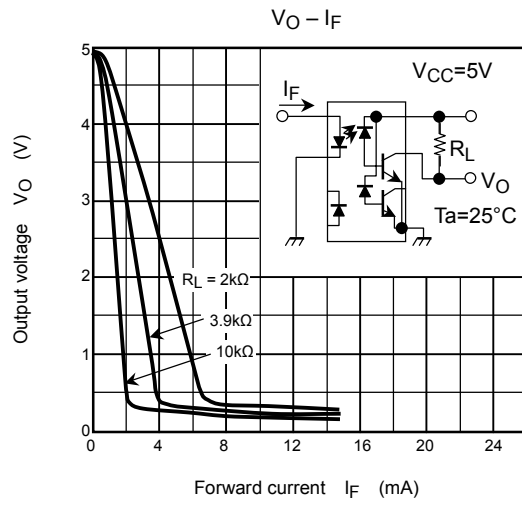
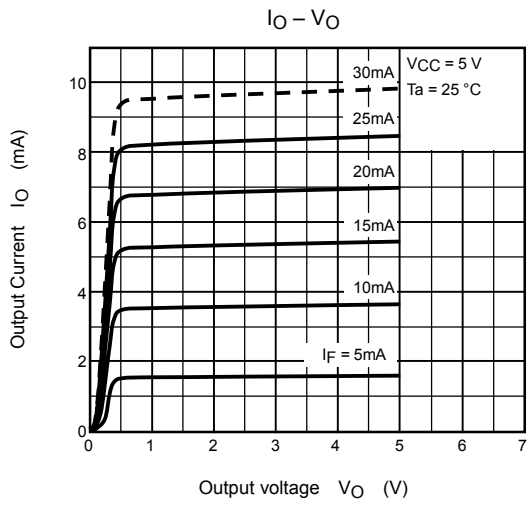
$$CM_H = \frac{320(V)}{t_r (\mu s)}, CM_L = \frac{320(V)}{t_f (\mu s)}$$



Test Circuit 3: Frequency Response







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