

TLP2631

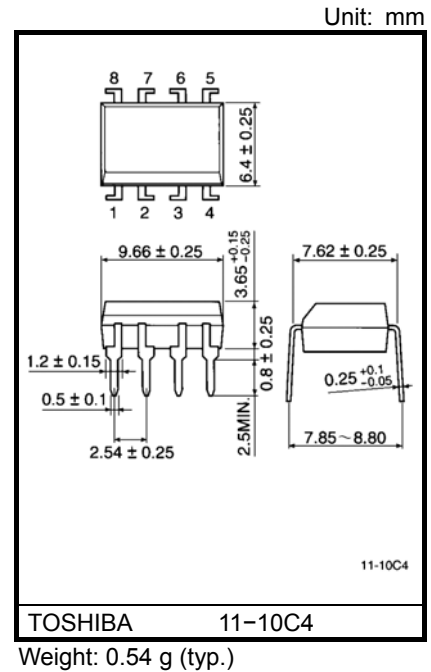
- Isolated Line Receiver
- Simplex / Multiplex Data Transmission
- Computer-Peripheral Interface
- Microprocessor System Interface
- Digital Isolation for A / D, D / A Conversion

The TOSHIBA TLP2631 dual photocoupler consists of a pair of GaAlAs light emitting diode and integrated high gain, high speed photodetector. This unit is 8-lead DIP.

The output of the detector circuit is an open collector, Schottky clamped transistor.

A Faraday shield integrated on the photodetector chip reduces the effects of capacitive coupling between the input LED emitter and the high gain stages of the detector. This provides an effective common mode transient immunity of 1000 V/μs.

- Input current threshold: $I_F = 5 \text{ mA (max)}$
- Switching speed: 10MBd (typ.)
- Common mode transient immunity: $\pm 1000 \text{ V}/\mu\text{s (min)}$
- Guaranteed performance over temperature: 0 to 70°C
- Isolation voltage: 2500 V_{rms} (min)
- UL recognized: UL1577, file no. E67349

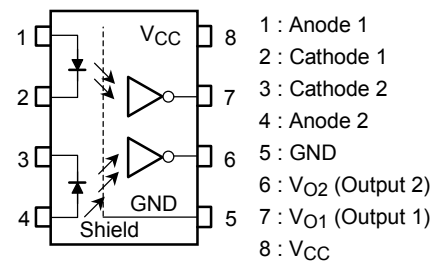


Truth Table (positive logic)

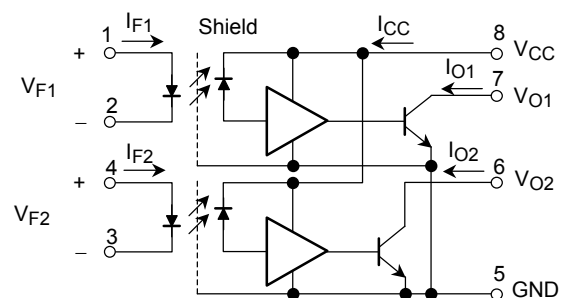
| Input | Output |
|-------|--------|
| H | L |
| L | H |

A 0.01 to 0.1μF bypass capacitor must be connected between pins 8 and 5 (see Note 1).

Pin Configuration (top view)



Schematic



Absolute Maximum Ratings (no derating required up to 70°C)

| Characteristic | | Symbol | Rating | Unit |
|--|---|-----------|---------|------------------|
| LED | Forward current (each channel) | I_F | 20 | mA |
| | Pulse forward current (each channel)* | I_{FP} | 30 | mA |
| | Reverse voltage (each channel) | V_R | 5 | V |
| Detector | Output current (each channel) | I_O | 16 | mA |
| | Output voltage (each channel) | V_O | -0.5~7 | V |
| | Supply voltage (1 minute maximum) | V_{CC} | 7 | V |
| | Output collector power dissipation (each channel) | P_O | 40 | mW |
| Operating temperature range | | T_{stg} | -55~125 | °C |
| Storage temperature range | | T_{opr} | -40~85 | °C |
| Lead soldering temperature (10s)** | | T_{sol} | 260 | °C |
| Isolation voltage (AC, 1 min., R.H.≤60%, Note 3) | | BV_S | 2500 | V _{rms} |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

* $t \leq 1$ msec duration.

** 2mm below seating plane.

Recommended Operating Conditions

| Characteristic | Symbol | Min | Typ. | Max | Unit |
|---|-----------|------|------|-----|------|
| Input current, low level, each channel | I_{FL} | 0 | — | 250 | μA |
| Input current, high level, each channel | I_{FH} | 6.3* | — | 20 | mA |
| Supply voltage**, output | V_{CC} | 4.5 | 5 | 5.5 | V |
| Fan out (TTL load, each channel) | N | — | — | 8 | |
| Operating temperature | T_{opr} | 0 | — | 70 | °C |

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

*6.3mA is a guard banded value which allows for at least 20% CTR degradation.
Initial input current threshold value is 5.0mA or less.

**This item denotes operating ranges, not meaning of recommended operating conditions.

Electrical Characteristics (Ta = 0~70°C unless otherwise noted)

| Characteristic | Symbol | Test Condition | Min. | Typ. * | Max. | Unit |
|--|-----------------------|--|--------------------|------------------|------|---------|
| Input forward voltage (each channel) | V _F | I _F = 10mA, Ta = 25°C | — | 1.65 | 1.75 | V |
| Input diode temperature coefficient (each channel) | ΔV _F / ΔTa | I _F = 10mA | — | -2.0 | — | mV / °C |
| Input reverse breakdown voltage (each channel) | BV _R | I _R = 10μA, Ta = 25°C | 5 | — | — | V |
| Input capacitance (each channel) | C _T | V _F = 0, f = 1MHz | — | 45 | — | pF |
| High level output current (each channel) | I _{OH} | V _{CC} = 5.5V, V _O = 5.5V I _F = 250μA | — | 1 | 250 | μA |
| Low level output voltage (each channel) | V _{OL} | V _{CC} = 5.5V, I _F = 5mA I _{OL} (sinking) = 13mA | — | 0.4 | 0.6 | V |
| High level supply current (both channels) | I _{CCH} | V _{CC} = 5.5V, I _F = 0 | — | 14 | 30 | mA |
| Low level supply current (both channels) | I _{CCL} | V _{CC} = 5.5V, I _F = 10mA | — | 24 | 38 | mA |
| Isolation voltage | R _S | V _S = 500V, R.H. ≤ 60% (Note 3) | 5×10 ¹⁰ | 10 ¹⁴ | — | Ω |
| Capacitance (input-output) | C _S | f = 1MHz (Note 3) | — | 0.6 | — | pF |
| Input-input leakage current | I _{I-I} | R.H. ≤ 60%, t = 5s V _{I-I} = 500V (Note 6) | — | 0.005 | — | μA |
| Resistance (input-input) | R _{I-I} | V _{I-I} = 500V (Note 6) | — | 10 ¹¹ | — | Ω |
| Capacitance (input-input) | C _{I-I} | f = 1MHz (Note 6) | — | 0.25 | — | pF |

* All typical values are at V_{CC} = 5V, Ta = 25°C.

Switching Characteristics (Ta = 25°C, VCC = 5V)

| Characteristic | Symbol | Test Circuit | Test Condition | Min. | Typ. | Max. | Unit |
|---|---------------------------------|--------------|--|-------|--------|------|--------|
| Propagation delay time to low output level | t _{pHL} | 1 | I _F = 0 → 7.5mA, R _L = 350Ω C _L = 15pF (each channel) | — | 60 | 75 | ns |
| Propagation delay time to high output level | t _{pLH} | 1 | I _F = 7.5mA → 0, R _L = 350Ω C _L = 15pF (each channel) | — | 60 | 75 | ns |
| Output rise time, output fall time (10~90%) | t _r , t _f | 1 | I _F = 0 ↔ 7.5mA, R _L = 350Ω C _L = 15pF (each channel) | — | 30 | — | ns |
| Common mode transient immunity at high output level | CM _H | 2 | I _F = 0, R _L = 350Ω V _{CM} = 400V, V _{O(min.)} = 2V (each channel, Note 4) | 1000 | 10000 | — | V / μs |
| Common mode transient immunity at low output level | CM _L | 2 | I _F = 7.5mA, R _L = 350Ω V _{CM} = 400V V _{O(max.)} = 0.8V (each channel, Note 5) | -1000 | -10000 | — | V / μs |

(Note 1) 2mm below seating plane

(Note 2) The V_{CC} supply voltage to each TLP2631 isolator must be bypassed by a 0.01μF capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins each device.

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

(Note 4) CM_H: the maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the high state (i.e., V_{OUT} > 2.0V).

Measured in volts per microsecond (V / μs).

Volts/ microsecond can be translated to sinusoidal voltages:

$$V / \mu s = \frac{(dV_{CM})_{Max.}}{dt} = f_{CM} V_{CM(p.p.)}$$

Example:

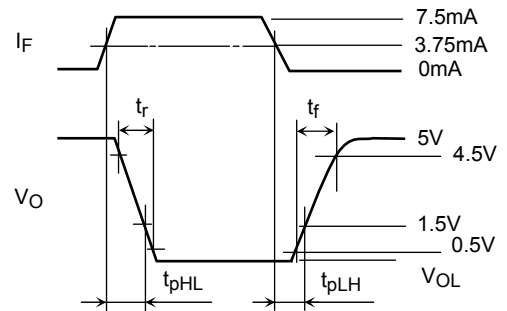
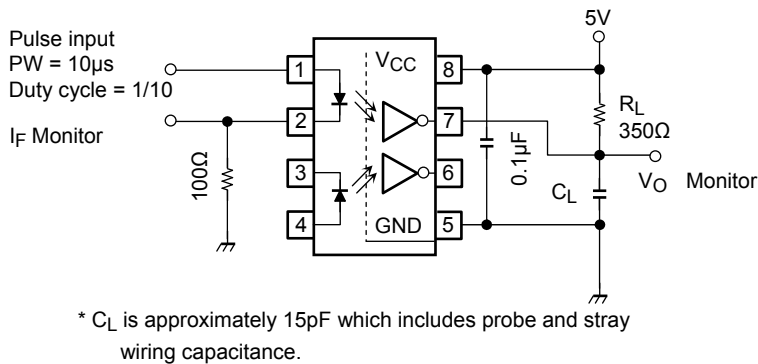
V_{CM} = 319V_{pp} when f_{CM} = 1MHz using CM_L and CM_H = 1000V / μs data sheet specified minimum.

(Note 5) CM_L: the maximum tolerable rate of fall of the common mode voltage to ensure the output will remain in the low output state (i.e., V_{OUT} > 0.8V).

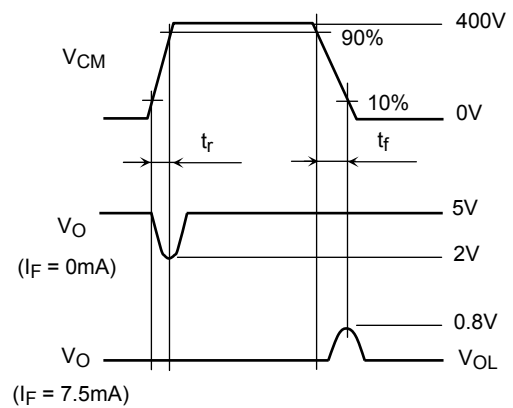
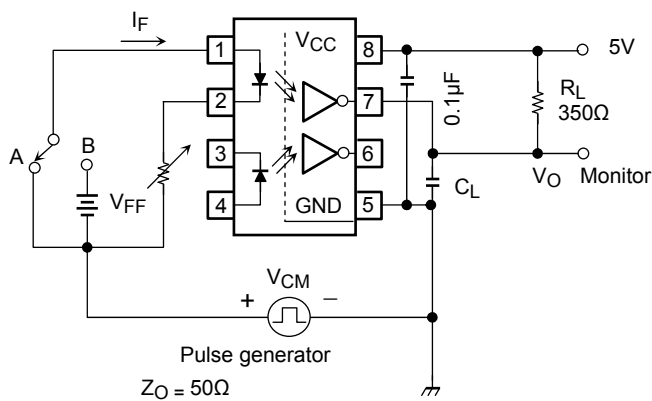
Measured in volts per microsecond (V / μs).

(Note 6) Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

Test Circuit 1. t_{pHL} and t_{pLH}

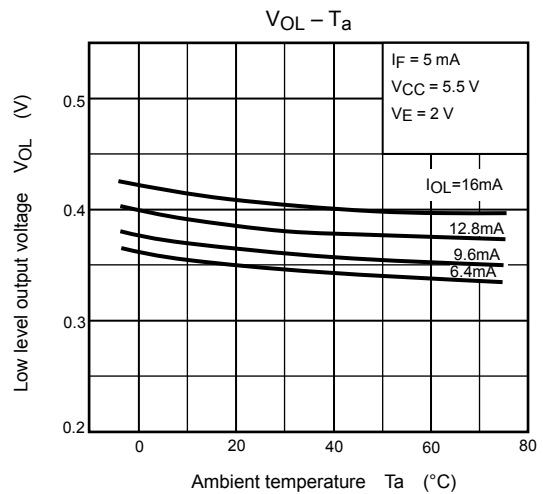
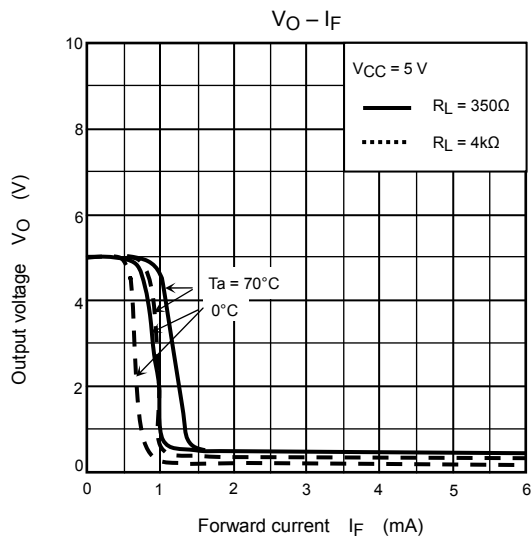
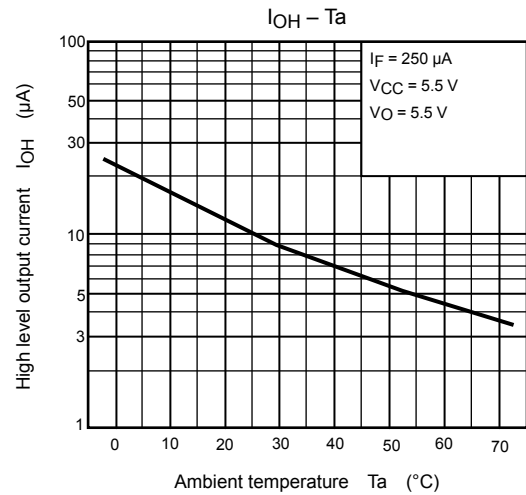
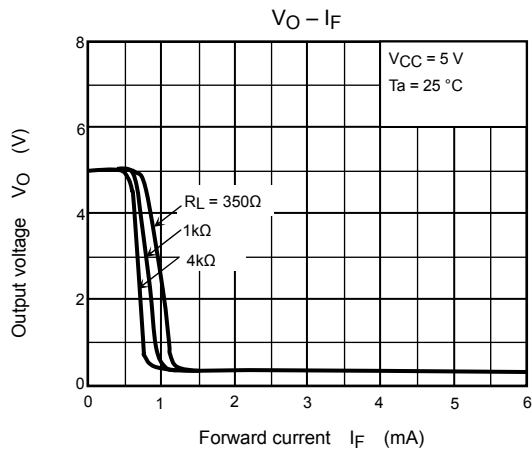
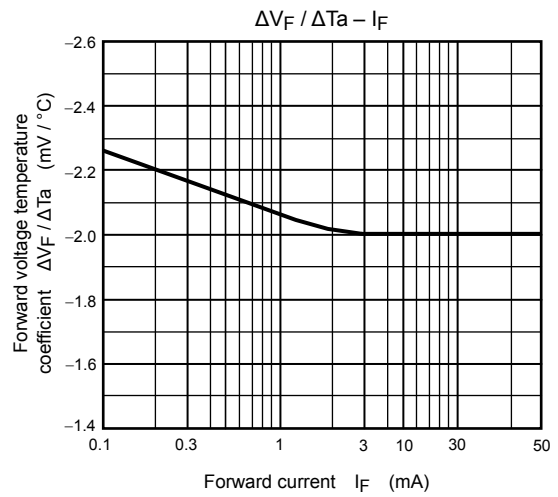
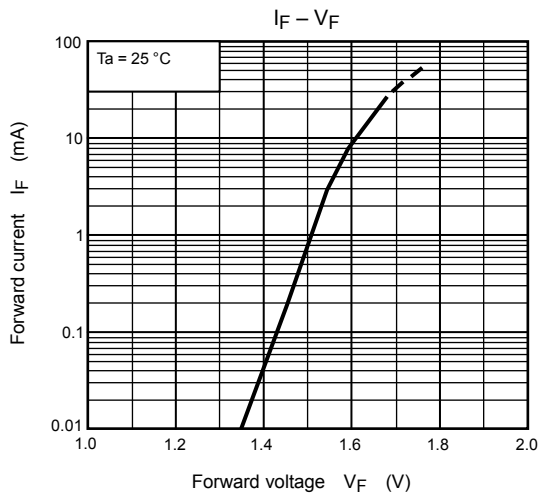


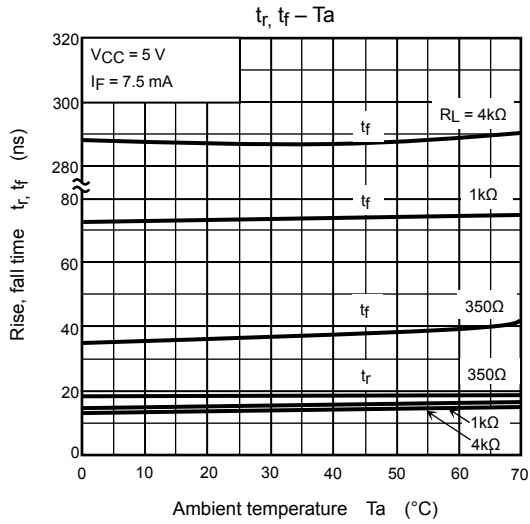
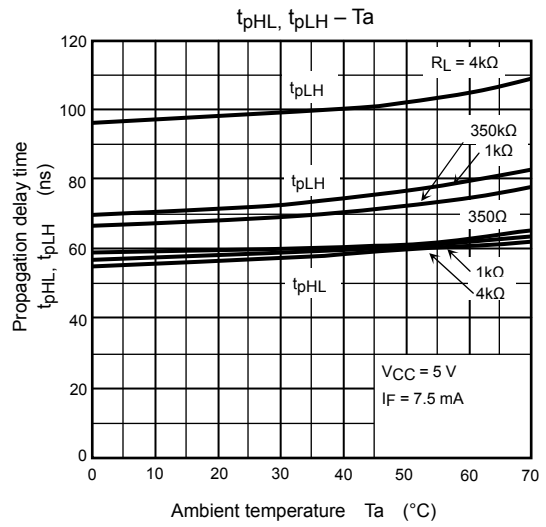
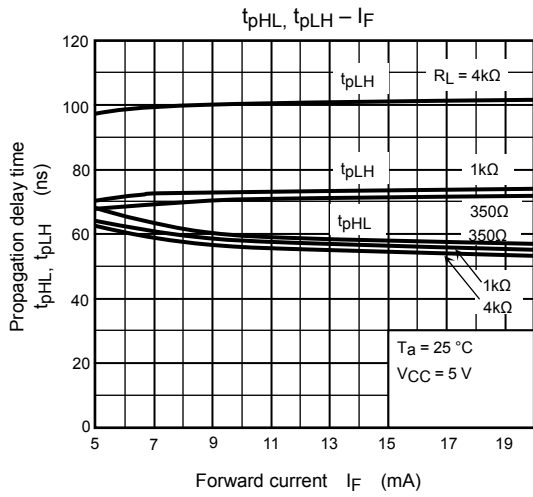
Test Circuit 2. Transient Immunity And Typical Waveforms.



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

* C_L is approximately 15pF which includes probe and stray wiring capacitance.





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