

# TLP2631

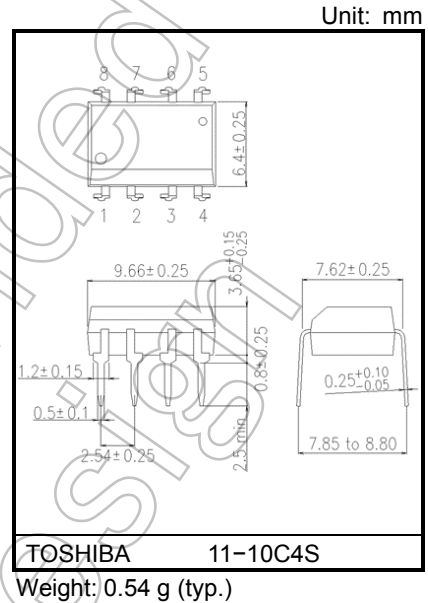
Isolated Line Receiver  
 Simplex / Multiplex Data Transmission  
 Computer-Peripheral Interface  
 Microprocessor System Interface  
 Digital Isolation for A / D, D / A Conversion

The TOSHIBA TLP2631 dual photocoupler consists of a pair of infrared 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.

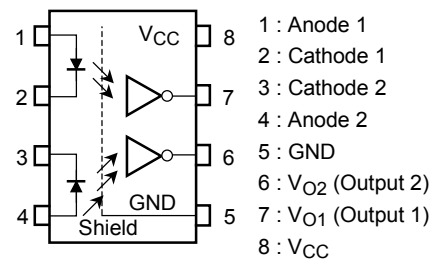
- Input current threshold:  $I_F = 5 \text{ mA}$  (max)
- Switching speed: 10MBd (typ.)
- Common mode transient immunity:  $\pm 1000 \text{ V}/\mu\text{s}$  (min)
- Guaranteed performance over temperature: 0 to 70°C
- Isolation voltage: 2500  $V_{RMS}$  (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349



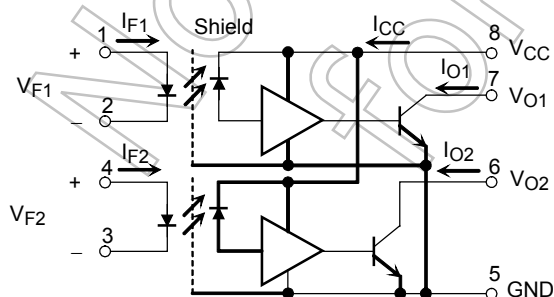
### Truth Table (positive logic)

Input	Output
H	L
L	H

### Pin Configuration (top view)



### Schematic



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

Start of commercial production  
 1986-03

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

Characteristic		Symbol	Rating	Unit
LED	Forward current (each channel)	I <sub>F</sub>	20	mA
	Pulse forward current (each channel)*	I <sub>FP</sub>	30	mA
	Reverse voltage (each channel)	V <sub>R</sub>	5	V
	Input power dissipation (each channel)	P <sub>D</sub>	25	mW
	Input power dissipation derating (Ta ≥ 70°C) (each channel)	ΔP <sub>D</sub> /°C	-0.45	mW/°C
Detector	Output current (each channel)	I <sub>O</sub>	16	mA
	Output voltage (each channel)	V <sub>O</sub>	-0.5 to 7	V
	Supply voltage (1 minute maximum)	V <sub>CC</sub>	7	V
	Output collector power dissipation (each channel)	P <sub>O</sub>	40	mW
	Output power dissipation derating (Ta ≥ 70°C) (each channel)	ΔP <sub>O</sub> /°C	-0.75	mW/°C
Storage temperature range		T <sub>stg</sub>	-55 to 125	°C
Operating temperature range		T <sub>opr</sub>	-40 to 85	°C
Lead soldering temperature (10 s)**		T <sub>sol</sub>	260	°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %, Ta = 25°C) (Note 3)		BV <sub>S</sub>	2500	V <sub>rms</sub>

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 ≤ 1 msec duration.

\*\* 2 mm below seating plane.

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Input current, low level, each channel	I <sub>FL</sub>	0	—	250	μA
Input current, high level, each channel	I <sub>FH</sub>	6.3*	—	20	mA
Supply voltage**	V <sub>CC</sub>	4.5	5	5.5	V
Fan out (TTL load, each channel)	N	—	—	8	
Operating temperature	T <sub>opr</sub>	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.

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

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

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

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

\* All typical values are at V<sub>CC</sub> = 5 V, Ta = 25 °C.

Not Recommended for New Design

### 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 <sub>pHL</sub>	1	I <sub>F</sub> = 0→7.5 mA, R <sub>L</sub> = 350 Ω C <sub>L</sub> = 15 pF (each channel)	—	60	75	ns
Propagation delay time to high output level	t <sub>pLH</sub>	1	I <sub>F</sub> = 7.5→0 mA, R <sub>L</sub> = 350 Ω C <sub>L</sub> = 15 pF (each channel)	—	60	75	ns
Output rise time, output fall time (10 to 90%)	t <sub>r</sub> , t <sub>f</sub>	1	I <sub>F</sub> = 0↔7.5 mA, R <sub>L</sub> = 350 Ω C <sub>L</sub> = 15 pF (each channel)	—	30	—	ns
Common mode transient immunity at high output level	CM <sub>H</sub>	2	I <sub>F</sub> = 0 mA, R <sub>L</sub> = 350 Ω V <sub>CM</sub> = 400 V, V <sub>O(min.)</sub> = 2 V (each channel, Note 4)	1000	10000	—	V / μs
Common mode transient immunity at low output level	CM <sub>L</sub>	2	I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 Ω V <sub>CM</sub> = 400 V V <sub>O(max.)</sub> = 0.8 V (each channel, Note 5)	-1000	-10000	—	V / μs

(Note 1) 2mm below seating plane

(Note 2) The V<sub>CC</sub> supply voltage to each TLP2631 isolator must be bypassed by a 0.1 μF 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 VCC 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<sub>H</sub>·the maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the high state (i.e. V<sub>OUT</sub> > 2.0 V).

Measured in volts per microsecond (V / μs).

Volts/ microsecond can be translated to sinusoidal voltages:

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

Example:

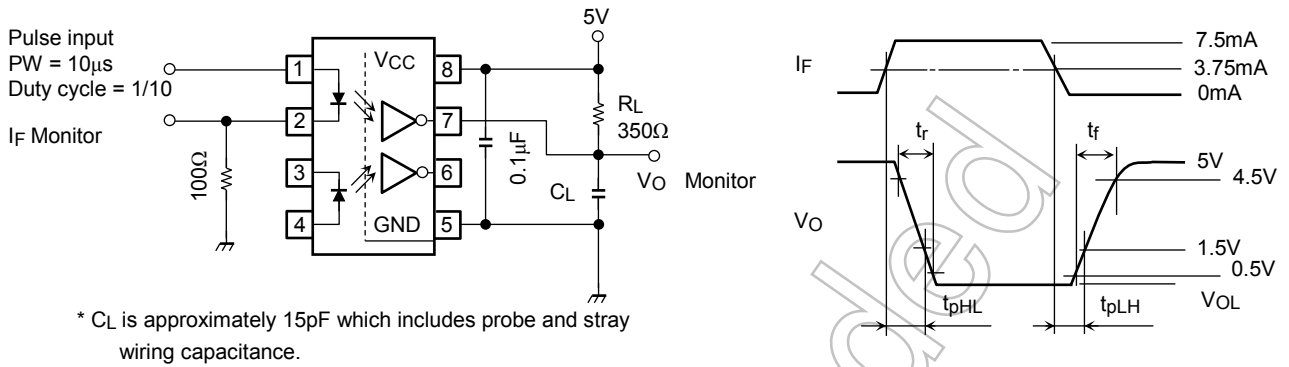
V<sub>CM</sub> = 319 V<sub>pp</sub> when f<sub>CM</sub> = 1 MHz using CM<sub>L</sub> and CM<sub>H</sub> = 1000V / μs data sheet specified minimum.

(Note 5) CM<sub>L</sub>·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<sub>OUT</sub> < 0.8 V).

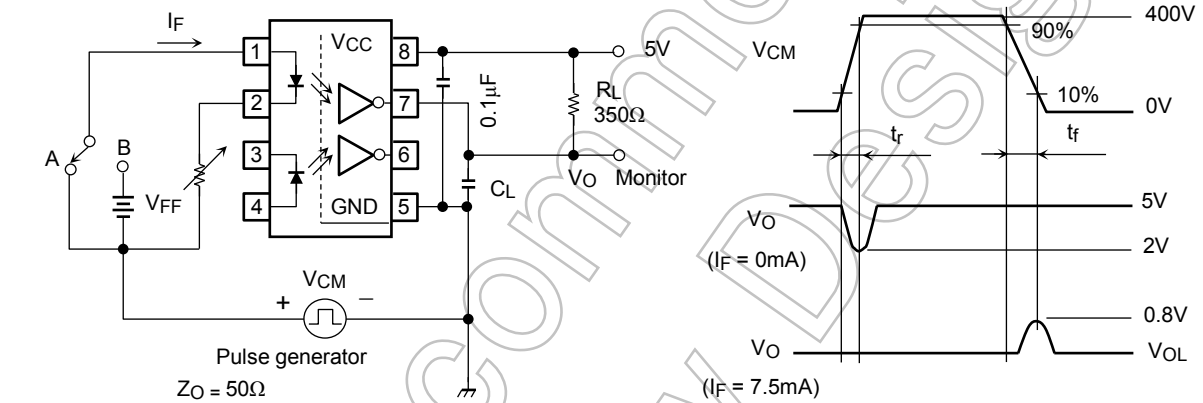
Measured in volts per microsecond (V / μs).

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

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

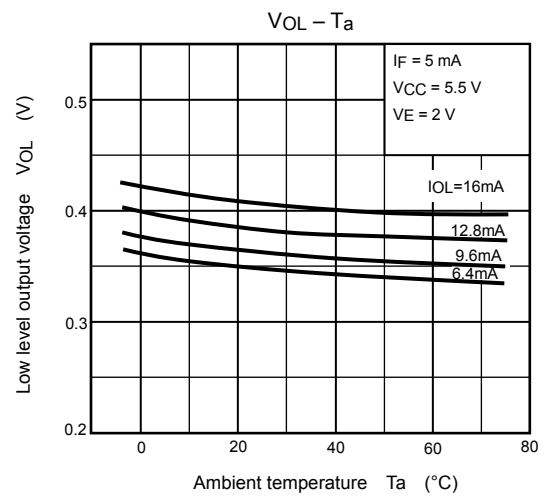
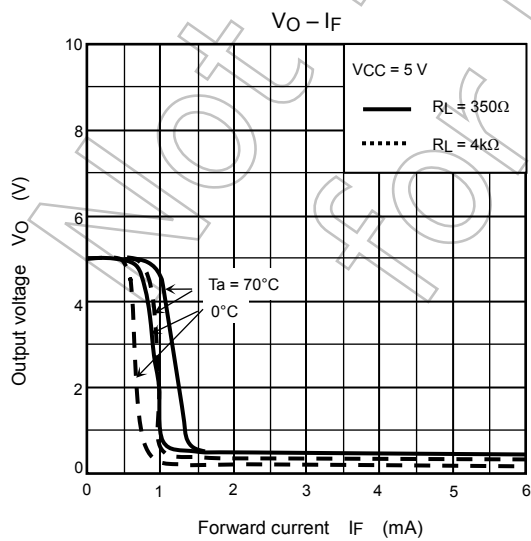
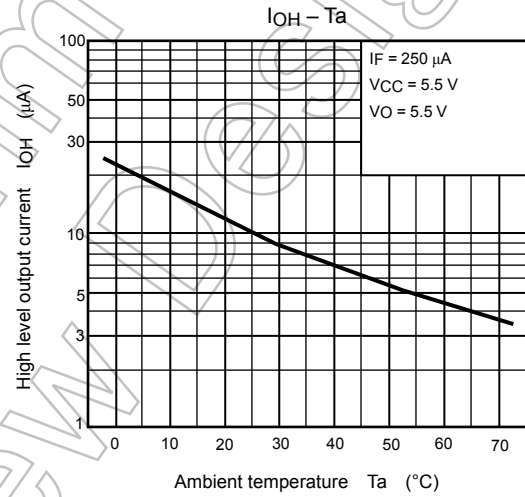
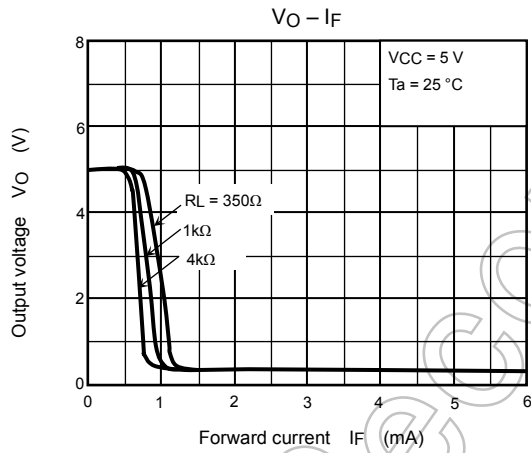
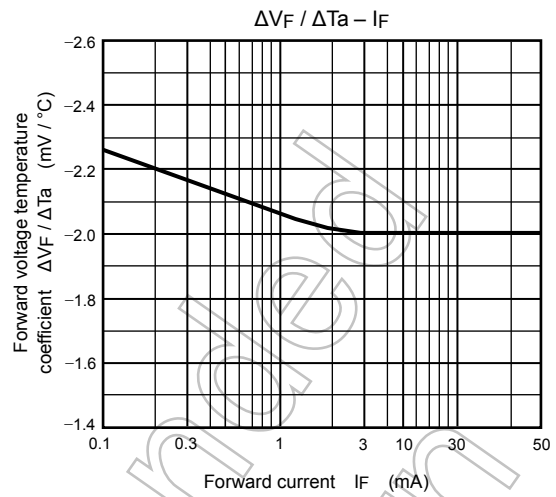
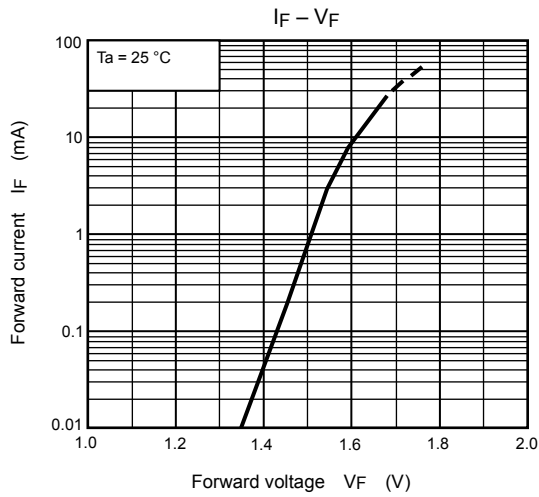


## Test Circuit 2. Transient Immunity and Typical Waveforms

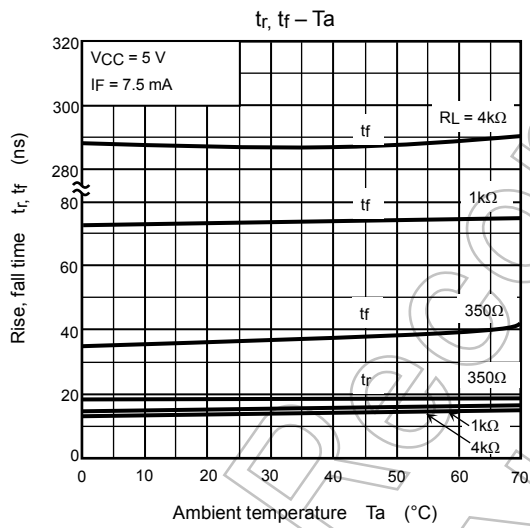
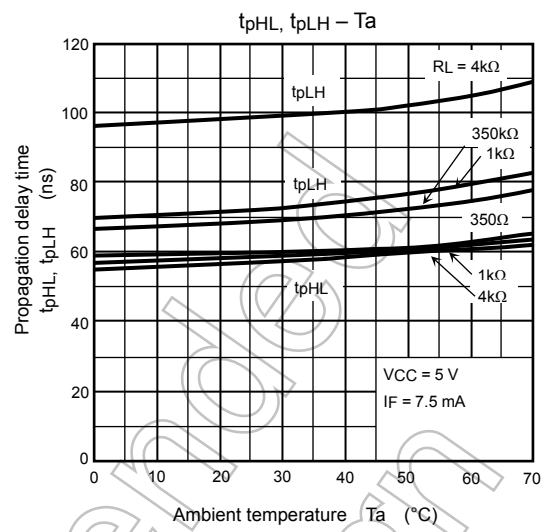
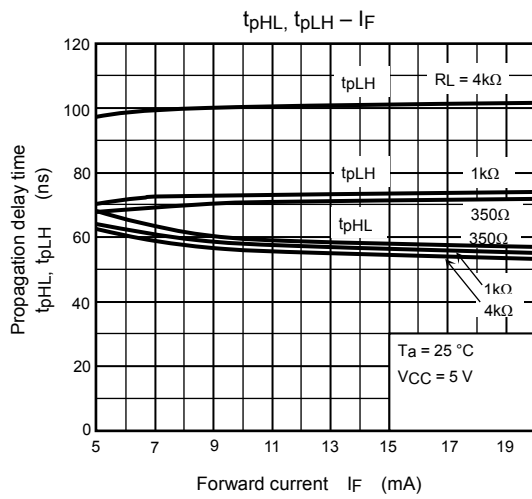


$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$

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



NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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