

(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 GaAs light emitting diode and integrated high gain, high speed photodetector.

This unit is 8-lead DIP package.

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  $1000V/\mu s$ .

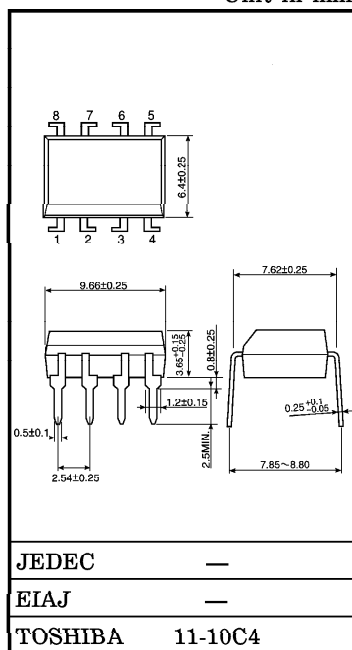
- Input Current Threshold :  $I_F = 5mA$  (MAX.)
- Switching Speed : 10MBd (TYP.)
- Common Mode Transient Immunity :  $\pm 1000V/\mu s$  (MIN.)
- Guaranteed Performance Over Temperature :  $0 \sim 70^\circ C$
- Isolation Voltage :  $2500V_{rms}$  (MIN.)
- UL Recognized : UL1577, File No. E67349

TRUTH TABLE  
(Positive Logic)

| INPUT | OUTPUT |
|-------|--------|
| H     | L      |
| L     | H      |

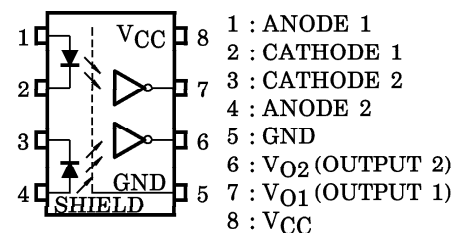
A  $0.01$  to  $0.1\mu F$  bypass capacitor must be connected between pins 8 and 5 (See Note 1).

Unit in mm

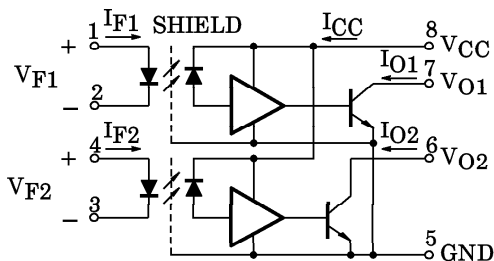


Weight : 0.54g

PIN CONFIGURATION (TOP VIEW)



SCHEMATIC



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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, Output                  | 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   |

\* 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.

MAXIMUM RATINGS (No derating required up to 70°C)

| CHARACTERISTIC                                    |                                                   | SYMBOL           | RATING  | UNIT             |
|---------------------------------------------------|---------------------------------------------------|------------------|---------|------------------|
| LED                                               | Forward Current (Each Channel)                    | I <sub>F</sub>   | 15      | mA               |
|                                                   | Pulse Forward Current (Each Channel)*             | I <sub>FP</sub>  | 30      | mA               |
|                                                   | Reverse Voltage (Each Channel)                    | V <sub>R</sub>   | 5       | V                |
| DETECTOR                                          | Output Current (Each Channel)                     | I <sub>O</sub>   | 16      | mA               |
|                                                   | Output Voltage (Each Channel)                     | V <sub>O</sub>   | −0.5~7  | V                |
|                                                   | Supply Voltage (1 Minute Maximum)                 | V <sub>CC</sub>  | 7       | V                |
|                                                   | Output Collector Power Dissipation (Each Channel) | P <sub>O</sub>   | 40      | mW               |
| Operating Temperature Range                       |                                                   | T <sub>stg</sub> | −55~125 | °C               |
| Storage Temperature Range                         |                                                   | T <sub>opr</sub> | −40~85  | °C               |
| Lead Soldering Temperature (10s)**                |                                                   | T <sub>sol</sub> | 260     | °C               |
| Isolation Voltage (AC, 1min., R.H. ≤ 60%, Note 3) |                                                   | BV <sub>S</sub>  | 2500    | V <sub>rms</sub> |

\* t ≤ 1 msec Duration.

\*\* 1.6mm below seating plane.

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ELECTRICAL CHARACTERISTICS (Ta = 0~70°C, Unless otherwise noted)

| CHARACTERISTIC                                        | SYMBOL                | TEST CONDITION                                                                   | MIN.                 | TYP.*            | MAX. | UNIT    |
|-------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------|----------------------|------------------|------|---------|
| Input Forward Voltage<br>(Each Channel)               | V <sub>F</sub>        | I <sub>F</sub> = 10mA, Ta = 25°C                                                 | —                    | 1.65             | 1.75 | V       |
| Input Diode Temperature<br>Coefficient (Each Channel) | ΔV <sub>F</sub> / ΔTa | I <sub>F</sub> = 10mA                                                            | —                    | −2.0             | —    | mV / °C |
| Input Reverse Breakdown<br>Voltage (Each Channel)     | BV <sub>R</sub>       | I <sub>R</sub> = 10μA, Ta = 25°C                                                 | 5                    | —                | —    | V       |
| Input Capacitance<br>(Each Channel)                   | C <sub>T</sub>        | V <sub>F</sub> = 0, f = 1MHz                                                     | —                    | 45               | —    | pF      |
| High Level Output Current<br>(Each Channel)           | I <sub>OH</sub>       | V <sub>CC</sub> = 5.5V, V <sub>O</sub> = 5.5V<br>I <sub>F</sub> = 250μA          | —                    | 1                | 250  | μA      |
| Low Level Output Voltage<br>(Each Channel)            | V <sub>OL</sub>       | V <sub>CC</sub> = 5.5V, I <sub>F</sub> = 5mA<br>I <sub>OL</sub> (Sinking) = 13mA | —                    | 0.4              | 0.6  | V       |
| High Level Supply Current<br>(Both Channels)          | I <sub>CCH</sub>      | V <sub>CC</sub> = 5.5V, I <sub>F</sub> = 0                                       | —                    | 14               | 30   | mA      |
| Low Level Supply Current<br>(Both Channels)           | I <sub>CCL</sub>      | V <sub>CC</sub> = 5.5V, I <sub>F</sub> = 10mA                                    | —                    | 24               | 38   | mA      |
| Isolation Voltage                                     | R <sub>S</sub>        | V <sub>S</sub> = 500V, R.H. ≤ 60% (Note 3)                                       | 5 × 10 <sup>10</sup> | 10 <sup>14</sup> | —    | Ω       |
| Capacitance (Input-Output)                            | C <sub>S</sub>        | f = 1MHz (Note 3)                                                                | —                    | 0.6              | —    | pF      |
| Input-Input Leakage<br>Current                        | I <sub>I-I</sub>      | R.H. ≤ 60%, t = 5s<br>V <sub>I-I</sub> = 500V (Note 6)                           | —                    | 0.005            | —    | μA      |
| Resistance (Input-Input)                              | R <sub>I-I</sub>      | V <sub>I-I</sub> = 500V (Note 6)                                                 | —                    | 10 <sup>11</sup> | —    | Ω       |
| Capacitance (Input-Input)                             | C <sub>I-I</sub>      | f = 1MHz (Note 6)                                                                | —                    | 0.25             | —    | pF      |

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

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SWITCHING CHARACTERISTICS (Ta = 25°C, V<sub>CC</sub> = 5V)

| CHARACTERISTIC                                      | SYMBOL                          | TEST CIR-CUIT | TEST CONDITION                                                                                                                    | MIN.  | TYP.   | MAX. | UNIT   |
|-----------------------------------------------------|---------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|-------|--------|------|--------|
| Propagation Delay Time to Low Output Level          | t <sub>pHL</sub>                | 1             | I <sub>F</sub> = 0 → 7.5mA, R <sub>L</sub> = 350Ω<br>C <sub>L</sub> = 15pF (Each Channel)                                         | —     | 60     | 75   | ns     |
| Propagation Delay Time to High Output Level         | t <sub>pLH</sub>                | 1             | I <sub>F</sub> = 7.5mA → 0, R <sub>L</sub> = 350Ω<br>C <sub>L</sub> = 15pF (Each Channel)                                         | —     | 60     | 75   | ns     |
| Output Rise time, Output Fall time (10~90%)         | t <sub>r</sub> , t <sub>f</sub> | 1             | I <sub>F</sub> = 0 ⇄ 7.5mA, R <sub>L</sub> = 350Ω<br>C <sub>L</sub> = 15pF (Each Channel)                                         | —     | 30     | —    | ns     |
| Common Mode Transient Immunity at High Output Level | CM <sub>H</sub>                 | 2             | I <sub>F</sub> = 0, R <sub>L</sub> = 350Ω<br>V <sub>CM</sub> = 400V,<br>V <sub>O</sub> (MIN.) = 2V<br>(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> = 7.5mA, R <sub>L</sub> = 350Ω<br>V <sub>CM</sub> = 400V<br>V <sub>O</sub> (MAX.) = 0.8V<br>(Each Channel, Note 5) | −1000 | −10000 | —    | V / μs |

Note 1 : 1.6mm below seating plane

Note 2 : The V<sub>CC</sub> 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<sub>CC</sub> 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> > 2.0V).  
Measured in volts per microsecond (V / μs).

Volts/microsecond can be translated to sinusoidal voltages :

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

Example :

V<sub>CM</sub> = 319V<sub>pp</sub> when f<sub>CM</sub> = 1MHz 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> > 0.8V).  
Measured in volts per microsecond (V / μs).

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

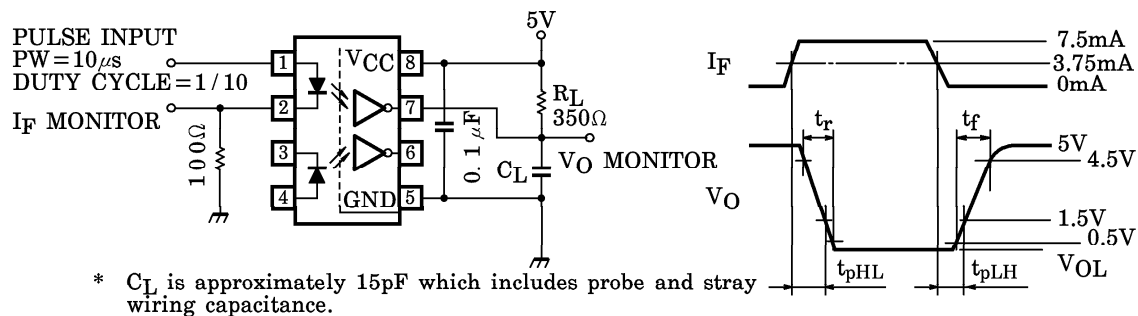
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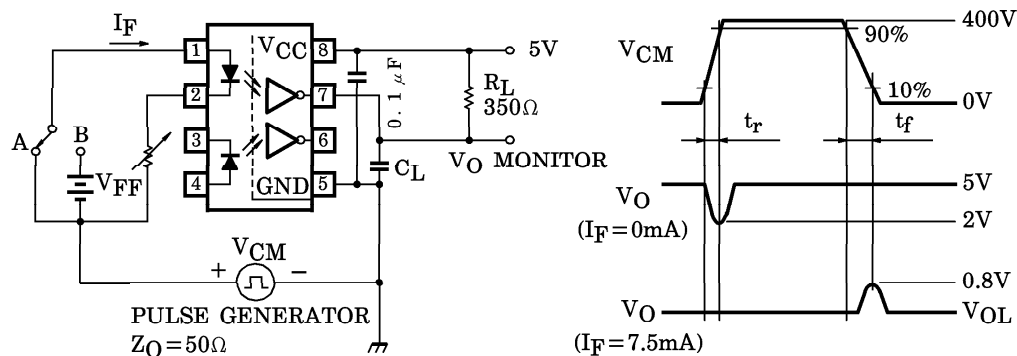
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TEST CIRCUIT 1.  $t_{pHL}$  and  $t_{pLH}$

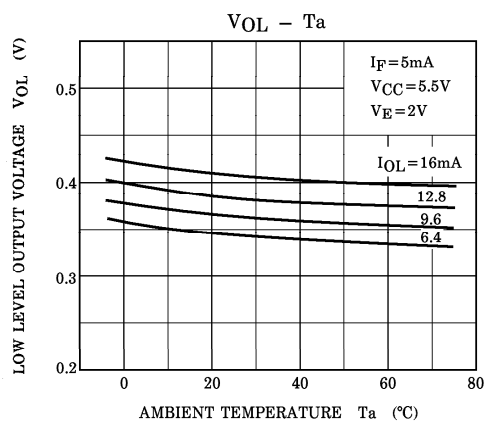
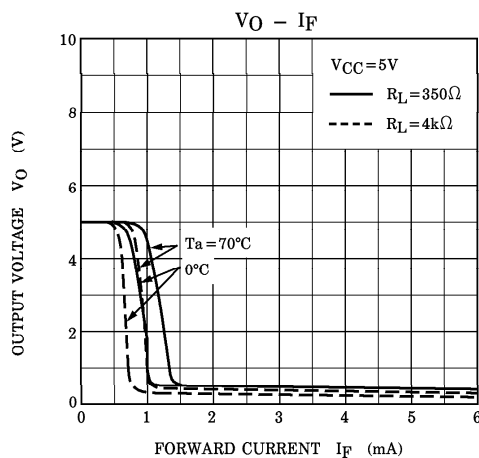
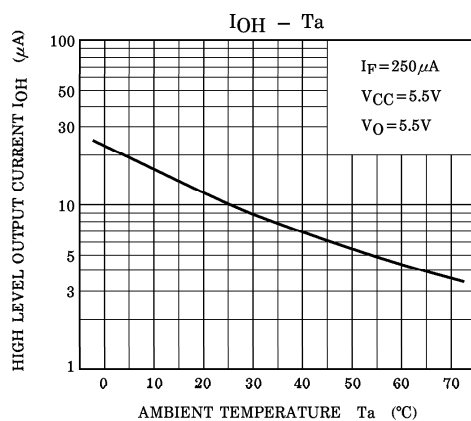
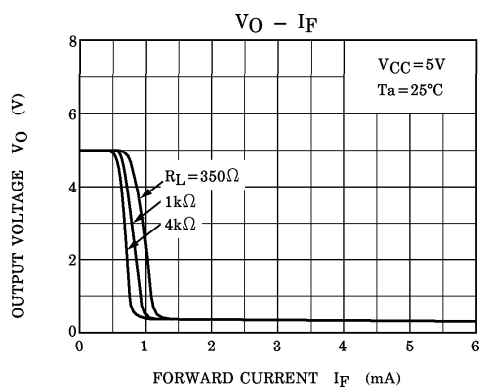
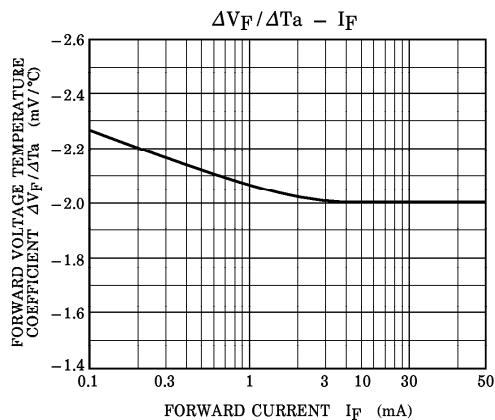
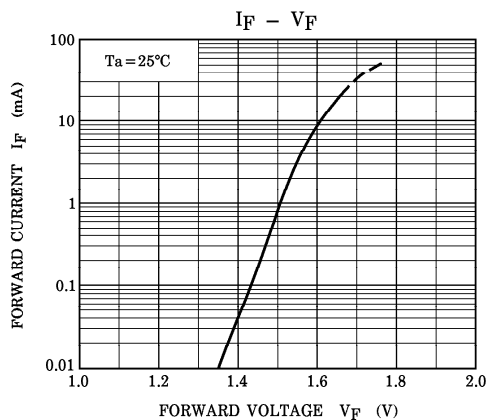


TEST CIRCUIT 2. Transient Immunity and Typical Waveforms.



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

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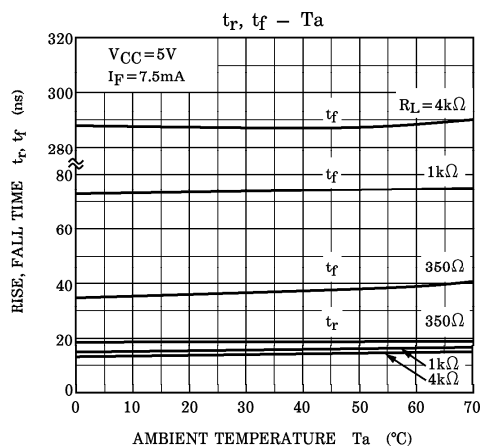
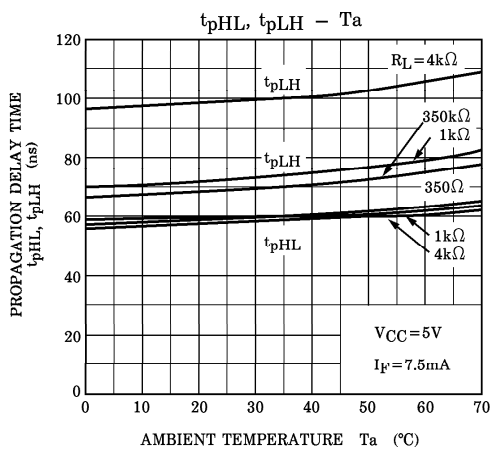
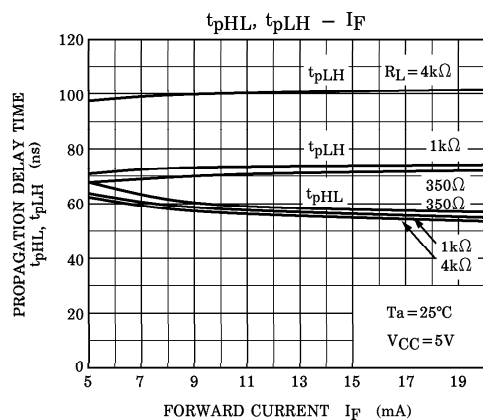


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