

TOSHIBA PHOTOCOUPLER GaAs IRED &amp; PHOTO-IC

# TLP112

DIGITAL LOGIC ISOLATION

LINE RECEIVER

SWITCHING POWER SUPPLY FEEDBACK CONTROL

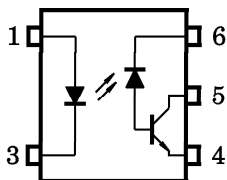
TRANSISTOR INVERTOR

The TOSHIBA MINI FLAT COUPLER TLP112 is a small outline coupler, suitable for surface mount assembly.

TLP112 consists of a GaAs light emitting diode, optically coupled to a high speed detector of one chip photodiode-transistor.

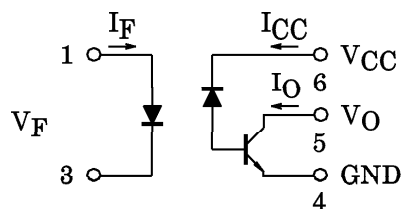
- Isolation Voltage : 2500Vrms (Min.)
- Switching Speed :  $t_{pHL} = 0.8\mu s$ ,  $t_{pLH} = 2\mu s$  (Max.)  
( $R_L = 4.1k\Omega$ )
- TTL Compatible
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATION (TOP VIEW)

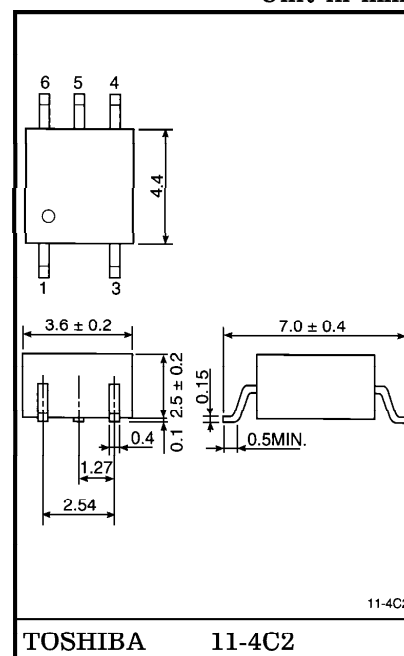


- 1 : ANODE
- 3 : CATHODE
- 4 : EMITTER (GND)
- 5 : COLLECTOR (OUTPUT)
- 6 : VCC

SCHEMATIC



Unit in mm



Weight : 0.09g

961001EBC2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC                                       |                                         | SYMBOL           | RATING  | UNIT             |
|------------------------------------------------------|-----------------------------------------|------------------|---------|------------------|
| LED                                                  | Forward Current (Note 1)                | I <sub>F</sub>   | 25      | mA               |
|                                                      | Pulse Forward Current (Note 2)          | I <sub>FP</sub>  | 50      | mA               |
|                                                      | Peak Transient Forward Current (Note 3) | I <sub>FPT</sub> | 1       | A                |
|                                                      | Reverse Voltage                         | V <sub>R</sub>   | 5       | V                |
|                                                      | Diode Power Dissipation (Note 4)        | P <sub>D</sub>   | 45      | mW               |
| DETECTOR                                             | Output Current                          | I <sub>O</sub>   | 8       | mA               |
|                                                      | Peak Output Current                     | I <sub>OP</sub>  | 16      | mA               |
|                                                      | Supply Voltage                          | V <sub>CC</sub>  | -0.5~15 | V                |
|                                                      | Output Voltage                          | V <sub>O</sub>   | -0.5~15 | V                |
|                                                      | Output Power Dissipation (Note 5)       | P <sub>O</sub>   | 100     | mW               |
| Operating Temperature Range                          |                                         | T <sub>opr</sub> | -55~100 | °C               |
| Storage Temperature Range                            |                                         | T <sub>stg</sub> | -55~125 | °C               |
| Lead Soldering Temperature (10s)                     |                                         | T <sub>sol</sub> | 260     | °C               |
| Isolation Voltage<br>(AC, 1 min., R.H ≤ 60%, Note 6) |                                         | BV <sub>S</sub>  | 2500    | V <sub>rms</sub> |

(Note 1) Derate 0.8mA / °C 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 2mW / °C above 70°C.

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC |                                           | SYMBOL                    | TEST CONDITION                                                            | MIN.               | TYP.      | MAX. | UNIT          |
|----------------|-------------------------------------------|---------------------------|---------------------------------------------------------------------------|--------------------|-----------|------|---------------|
| LED            | Forward Voltage                           | $V_F$                     | $I_F = 16\text{mA}$                                                       | —                  | 1.65      | 1.85 | V             |
|                | Forward Voltage Temperature Coefficient   | $\Delta V_F / \Delta T_a$ | $I_F = 16\text{mA}$                                                       | —                  | -2        | —    | mV / °C       |
|                | Reverse Current                           | $I_R$                     | $V_R = 5\text{V}$                                                         | —                  | —         | 10   | $\mu\text{A}$ |
|                | Capacitance Between Terminals             | $C_T$                     | $V_F = 0, f = 1\text{MHz}$                                                | —                  | 45        | —    | pF            |
| DETECTOR       | High Level Output Current                 | $I_{OH(1)}$               | $I_F = 0\text{mA}, V_{CC} = V_O = 5.5\text{V}$                            | —                  | 3         | 500  | nA            |
|                |                                           | $I_{OH(2)}$               | $I_F = 0\text{mA}, V_{CC} = V_O = 15\text{V}$                             | —                  | —         | 5    | $\mu\text{A}$ |
|                |                                           | $I_{OH}$                  | $I_F = 0\text{mA}, V_{CC} = V_O = 15\text{V}$<br>$T_a = 70^\circ\text{C}$ | —                  | —         | 50   |               |
|                | High Level Supply Current                 | $I_{CCH}$                 | $I_F = 0\text{mA}, V_{CC} = 15\text{V}$                                   | —                  | 0.01      | 1    | $\mu\text{A}$ |
| COUPLED        | Current Transfer Ratio                    | $I_O / I_F$               | $I_F = 16\text{mA}, V_{CC} = 4.5\text{V}$<br>$V_O = 0.4\text{V}$          | 10                 | —         | —    | %             |
|                | Low Level Output Voltage                  | $V_{OL}$                  | $I_F = 16\text{mA}, V_{CC} = 4.5\text{V}$<br>$I_O = 1.1\text{mA}$         | —                  | —         | 0.4  | V             |
|                | Isolation Resistance                      | $R_S$                     | R.H. $\leq 60\%$<br>$V_S = 500\text{V DC}$ (Note 6)                       | $5 \times 10^{10}$ | $10^{14}$ | —    | $\Omega$      |
|                | Stray Capacitance Between Input to Output | $C_S$                     | $V_S = 0, f = 1\text{MHz}$ (Note 6)                                       | —                  | 0.8       | —    | pF            |

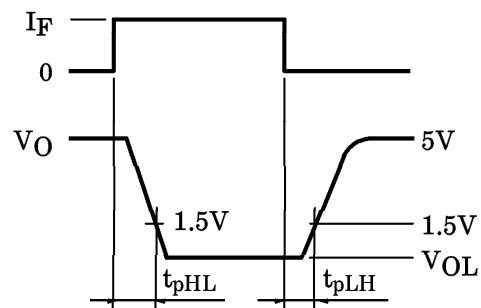
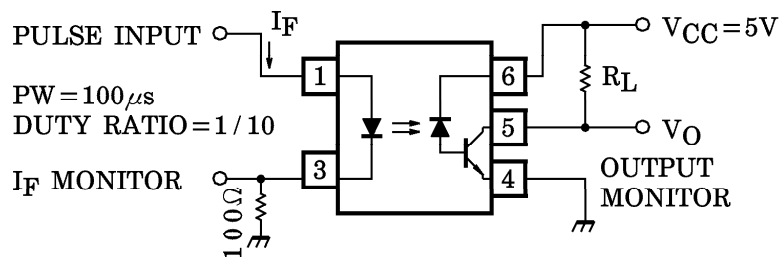
## SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                      | SYMBOL    | TEST CIR-CUIT | TEST CONDITION                                                                     | MIN. | TYP.  | MAX. | UNIT              |
|-----------------------------------------------------|-----------|---------------|------------------------------------------------------------------------------------|------|-------|------|-------------------|
| Propagation Delay Time (H→L)                        | $t_{pHL}$ | 1             | $I_F = 0 \rightarrow 16\text{mA}$<br>$V_{CC} = 5\text{V}, R_L = 4.1\text{k}\Omega$ | —    | —     | 0.8  | $\mu\text{s}$     |
| Propagation Delay Time (L→H)                        | $t_{pLH}$ | 1             | $I_F = 16 \rightarrow 0\text{mA}$<br>$V_{CC} = 5\text{V}, R_L = 4.1\text{k}\Omega$ | —    | —     | 2.0  | $\mu\text{s}$     |
| Common Mode Transient Immunity at High Output Level | $CM_H$    | 2             | $I_F = 0\text{mA}, V_{CM} = 200\text{V}_{p-p}$<br>$R_L = 4.1\text{k}\Omega$        | —    | 1500  | —    | V / $\mu\text{s}$ |
| Common Mode Transient Immunity at Low Output Level  | $CM_L$    | 2             | $I_F = 16\text{mA}, V_{CM} = 200\text{V}_{p-p}$<br>$R_L = 4.1\text{k}\Omega$       | —    | -1500 | —    | V / $\mu\text{s}$ |

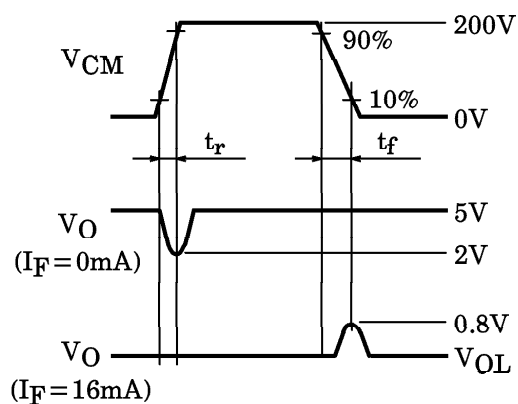
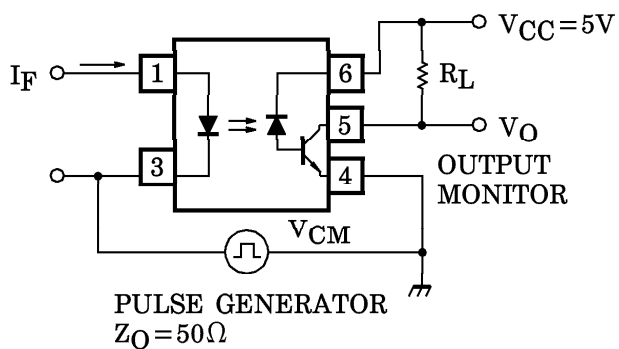
(Note 6) Device considered a two-terminal device : Pins 1 and 3 shorted together and Pin 4, 5 and 6 shorted together.

(Note 7) Maximum electrostatic discharge voltage for any pins : 100V (C=200pF, R=0)

## TEST CIRCUIT 1 : Switching Time Test Circuit



## TEST CIRCUIT 2 : Common Mode Transient Immunity Test Circuit



$$CM_H = \frac{160(V)}{t_r(\mu s)}, \quad CM_L = \frac{160(V)}{t_f(\mu s)}$$

