

TOSHIBA Photocoupler GaAlAs IRED + Photo IC

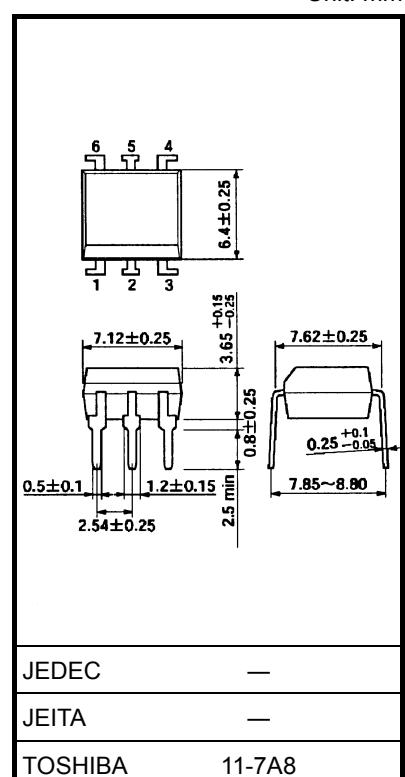
TLP512

Digital Logic Ground Isolation
Line Receiver
Microprocessor System Interfaces
Switching Power Supply Feedback Control
Transistor Inverter

The TLP512 consists of a GaAlAs high-output light emitting diode and a high-speed detector that contains a PN photodiode and an amplifier transistor into a single chip.

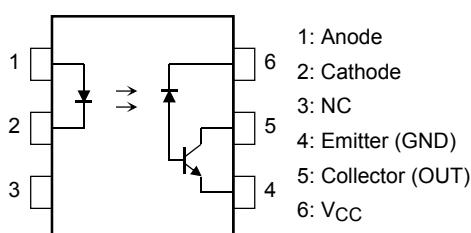
- Isolation voltage: 2500 Vrms (min)
- Switching speed: $t_{pHL} = 0.8 \mu s$, $t_{pLH} = 0.8 \mu s$ (max)

$$@R_L = 1.9 \text{ k}\Omega$$
- TTL compatible
- UL recognized: UL1577, file No. E67349

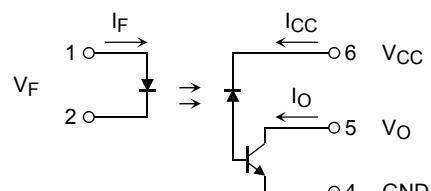


Weight: 0.4 g (typ.)

Pin Configuration (top view)



Schematic



Start of commercial production
1997/04

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	DC forward current (Note 1)	I _F	25	mA
	Pulse forward current (Note 2)	I _{FP}	50	mA
	Peak transient forward current (Note 3)	I _{FPT}	1	A
	DC reverse voltage	V _R	5	V
	Diode power dissipation (Note 4)	P _D	45	mW
Detector	Output current	I _O	8	mA
	Peak output current	I _{OP}	16	mA
	Output voltage	V _O	-0.5 to 15	V
	Supply voltage	V _{CC}	-0.5 to 15	V
	Output power dissipation (Note 5)	P _O	100	mW
Operating temperature range		T _{opr}	-55 to 100	°C
Storage temperature range		T _{stg}	-55 to 125	°C
Soldering temperature (10 s) (Note 6)		T _{sol}	260	°C
Isolation voltage (R.H. ≤ 60%, AC 1 minute) (Note 7)		BV _S	2500	Vrms

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.

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.).

Note 1: Decreases at the rate of 0.8 mA/°C with the ambient temperature of 70°C or higher.

Note 2: Duty cycle of 50%, pulse width of 1 ms.

Decreases at the rate of 1.6 mA/°C with the ambient temperature of 70°C or higher.

Note 3: Pulse width ≤ 1 µs, 300 pps

Note 4: Decreases at the rate of 0.9 mW/°C with the ambient temperature of 70°C or higher.

Note 5: Decreases at the rate of 2 mW/°C with the ambient temperature of 70°C or higher.

Note 6: Soldering is performed 2 mm from the bottom of the package.

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

Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V _F	I _F = 16 mA	—	1.65	1.85	V
	Forward voltage temperature coefficient	ΔV _F /ΔTa	I _F = 16 mA	—	-2	—	mV/°C
	Reverse current	I _R	V _R = 5 V	—	—	10	μA
	Pin-to-pin capacitance	C _T	V _F = 0 V, f = 1 MHz	—	45	—	pF
Detector	High-level output current	I _{OH} (1)	I _F = 0 mA, V _{CC} = V _O = 5.5 V	—	3	500	nA
		I _{OH} (2)	I _F = 0 mA, V _{CC} = V _O = 15 V	—	—	5	μA
		I _{OH}	I _F = 0 mA, V _{CC} = V _O = 15 V Ta = 70°C	—	—	50	
	High-level supply current	I _{CCH}	I _F = 0 mA, V _{CC} = 15 V	—	0.01	1	μA

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I _O /I _F		I _F = 16 mA, V _{CC} = 4.5 V V _O = 0.4 V	20	40	—	%
			I _F = 16 mA, V _{CC} = 4.5 V V _O = 0.4 V, Ta = 0 to 70°C	15	—	—	
Low-level output voltage	V _{OL}		I _F = 16 mA, V _{CC} = 4.5 V I _O = 2.4 mA	—	—	0.4	V

Isolation Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S		V _S = 0 V, f = 1 MHz (Note 7)	—	0.8	—	pF
Isolation resistance	R _S		R.H. ≤ 60%, V _S = 500 V (Note 7)	5 × 10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BVs	AC 1 minute		2500	—	—	Vrms
		AC 1 second, in oil		—	5000	—	
		DC 1 minute, in oil		—	5000	—	V _{dc}

Switching Characteristics ($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{ V}$)

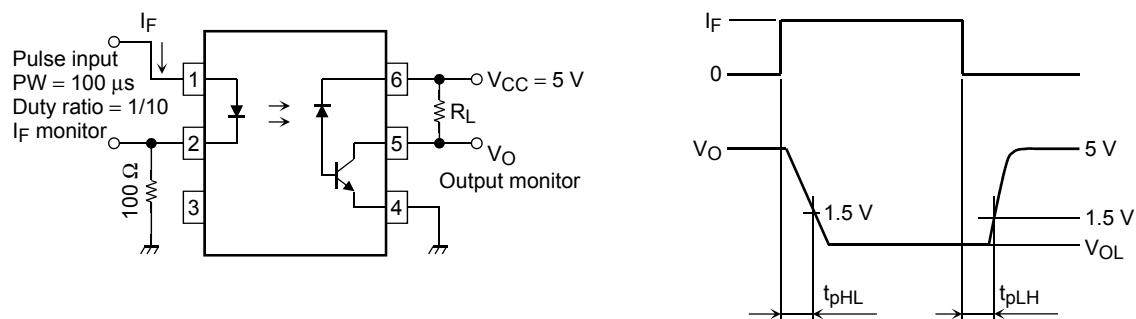
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time ($H \rightarrow L$)	t_{pHL}	1	$I_F = 0 \rightarrow 16\text{ mA}$, $R_L = 1.9\text{ k}\Omega$	—	—	0.8	μs
Propagation delay time ($L \rightarrow H$)	t_{pLH}		$I_F = 16 \rightarrow 0\text{ mA}$, $R_L = 1.9\text{ k}\Omega$	—	—	0.8	μs
Common mode transient immunity at logic high output (Note 8)	CM_H	2	$I_F = 0\text{ mA}$, $V_{CM} = 200\text{ V}_{\text{P-P}}$ $R_L = 1.9\text{ k}\Omega$	—	1500	—	$\text{V}/\mu\text{s}$
Common mode transient immunity at logic low output (Note 8)	CM_L		$I_F = 16\text{ mA}$, $V_{CM} = 200\text{ V}_{\text{P-P}}$ $R_L = 1.9\text{ k}\Omega$	—	-1500	—	$\text{V}/\mu\text{s}$

Note 8: 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 ($V_{OUT} > 2.0\text{ V}$).

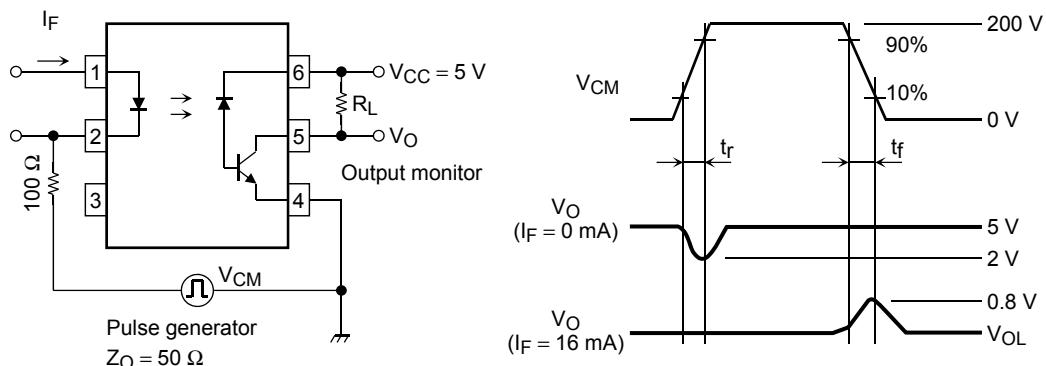
Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse, V_{CM} , to assure that the output will remain in a logic low state ($V_{OUT} < 0.8\text{ V}$).

Note 9: Electrostatic discharge immunity (pin to pin): 100 V (max)
($C \leq 200\text{ pF}$, $R = 0$)

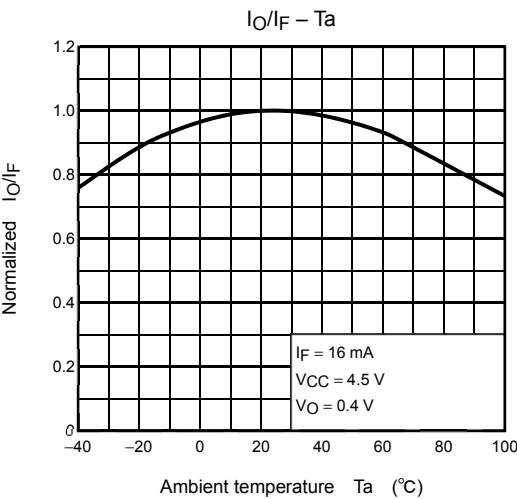
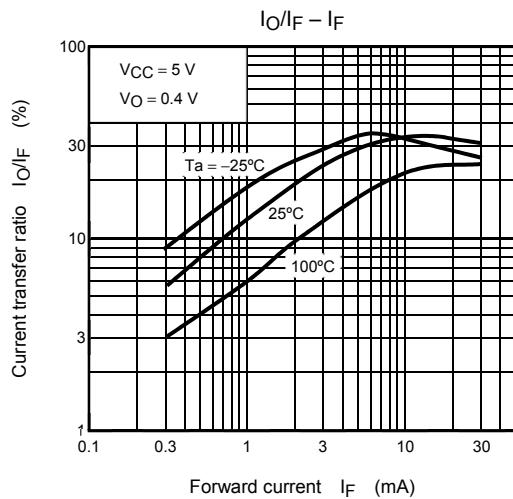
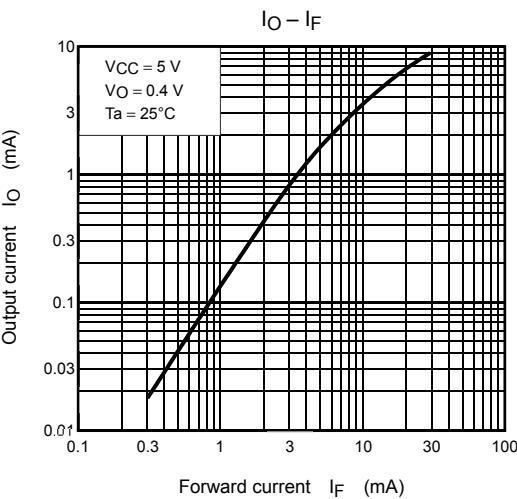
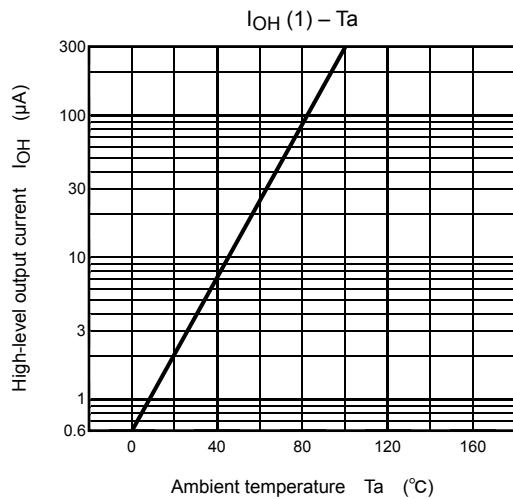
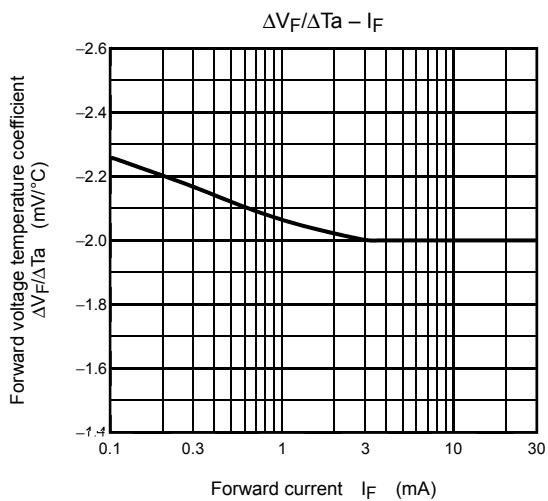
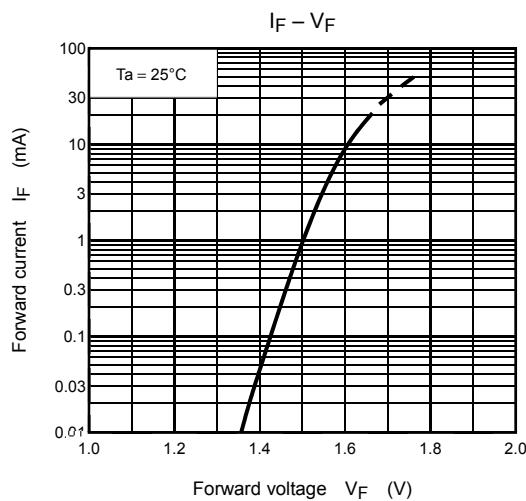
Test Circuit 1: Switching Time Test Circuit



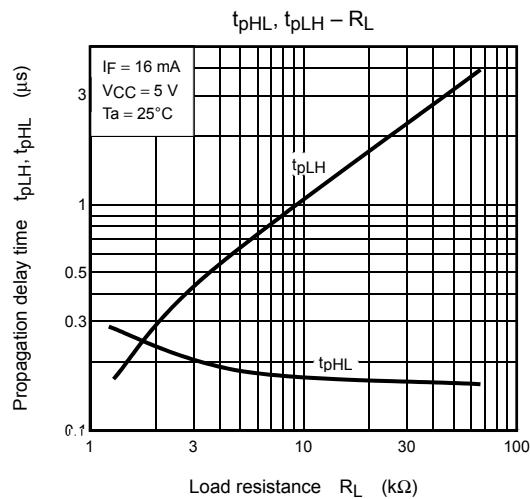
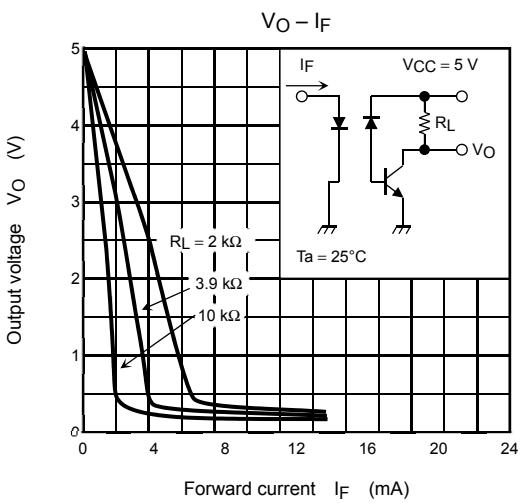
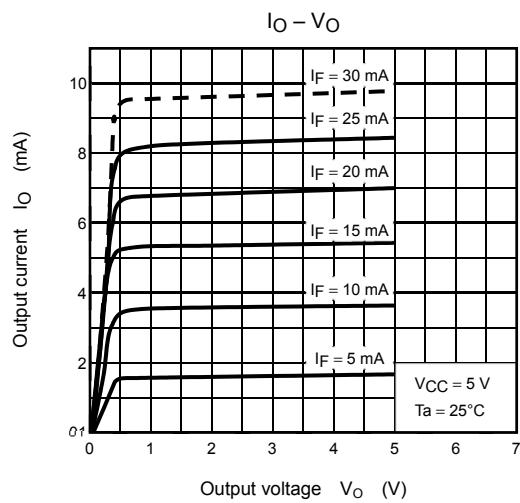
Test Circuit 2: Common Mode Noise Immunity Test Circuit



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



*: The above graphs show typical characteristics.



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