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TOSHIBA Photocoupler GaAlAs IRED + Photo IC

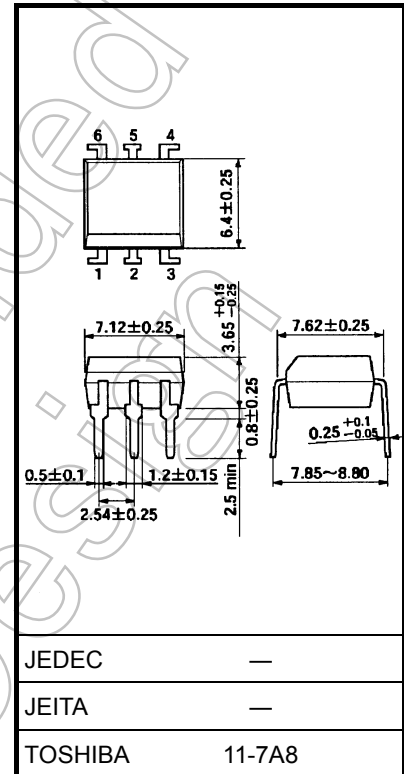
TLP512

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.

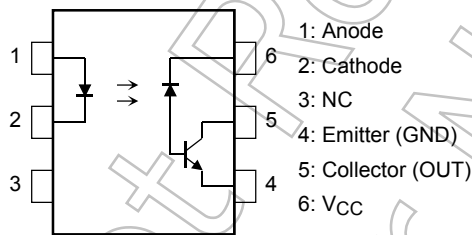
- Isolation voltage: 2500 Vrms (min)
- Switching speed: $t_{pHL} = 0.8 \mu s$, $t_{pLH} = 0.8 \mu s$ (max)
 @ $R_L = 1.9 k\Omega$
- TTL compatible
- UL recognized: UL1577, file No. E67349

Unit: mm

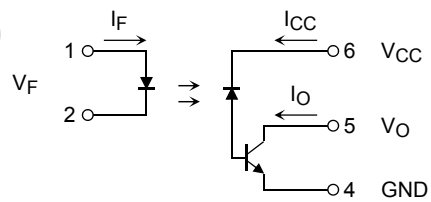


Weight: 0.4 g (typ.)

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	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.

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	$I_F = 16 \text{ mA}$	—	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	μA
	Pin-to-pin capacitance	C_T	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	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	μA
		I_{OH}	$I_F = 0 \text{ mA}, V_{CC} = V_O = 15 \text{ V}$ $T_a = 70^\circ\text{C}$	—	—	50	
	High-level supply current	I_{CCH}	$I_F = 0 \text{ mA}, V_{CC} = 15 \text{ V}$	—	0.01	1	μA

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_O / I_F	$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $V_O = 0.4 \text{ V}$	20	40	—	%
		$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $V_O = 0.4 \text{ V}, T_a = 0 \text{ to } 70^\circ\text{C}$	15	—	—	
Low-level output voltage	V_{OL}	$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $I_O = 2.4 \text{ mA}$	—	—	0.4	V

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$ (Note 7)	—	0.8	—	pF
Isolation resistance	R_S	R.H. $\leq 60\%$, $V_S = 500 \text{ V}$ (Note 7)	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC 1 minute	2500	—	—	Vrms
		AC 1 second, in oil	—	5000	—	
		DC 1 minute, in oil	—	5000	—	Vdc

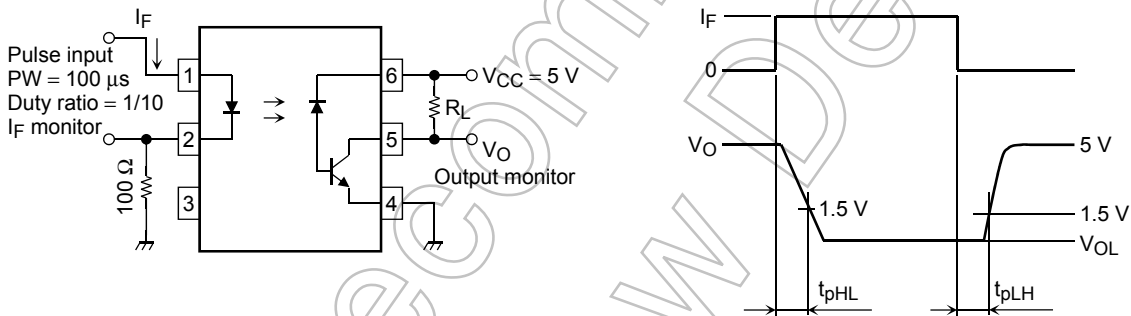
Switching Characteristics (Ta = 25°C, VCC = 5 V)

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

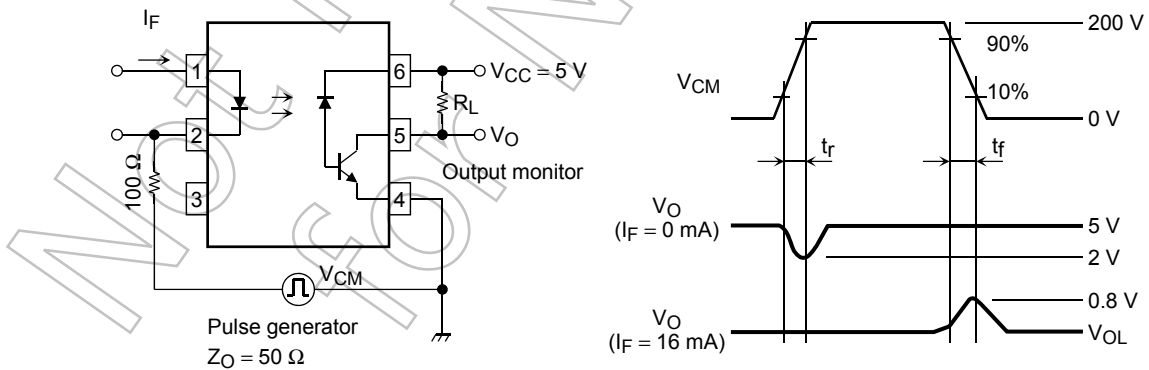
Note 8: Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse, V_{CM} , to assure that the output will remain in a logic high state ($V_{OUT} > 2.0 \text{ V}$).
 Common mode transient immunity in logic low level 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)
 ($C \leq 200 \text{ pF}, R = 0$)

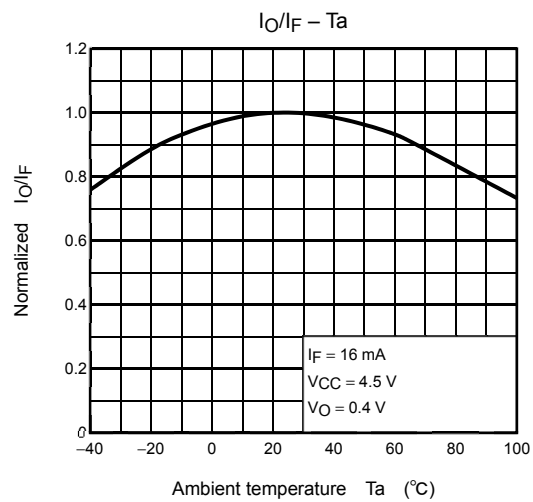
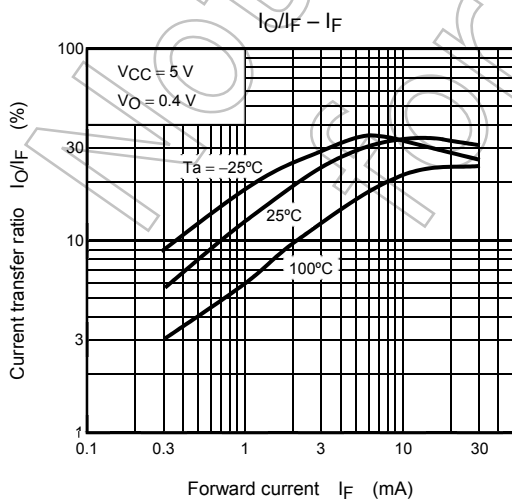
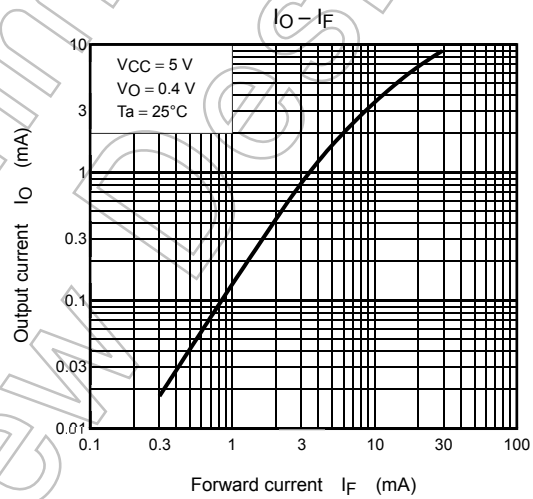
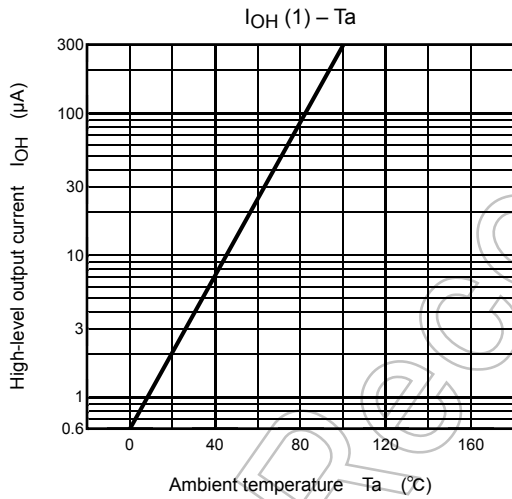
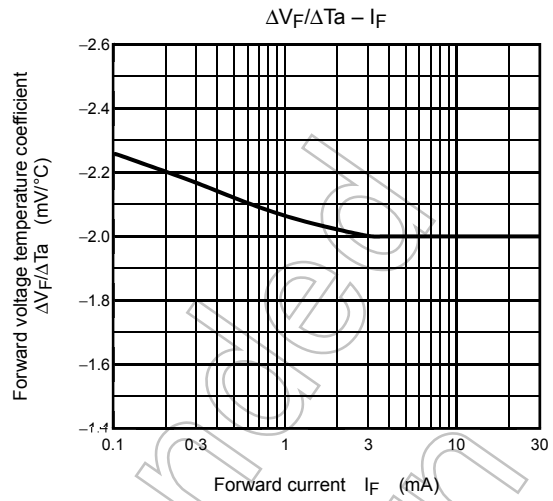
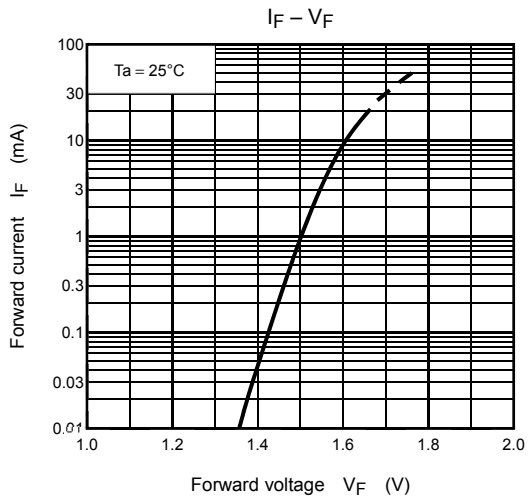
Test Circuit 1: Switching Time Test Circuit



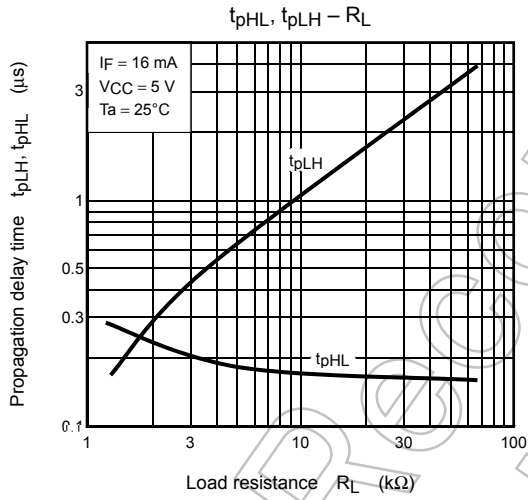
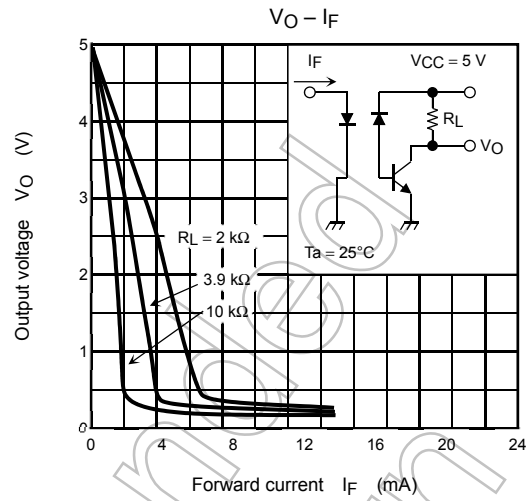
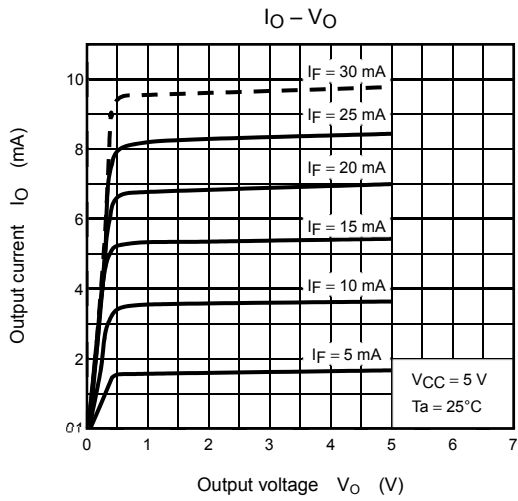
Test Circuit 2: Common Mode Noise Immunity Test Circuit



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



*: The above graphs show typical characteristics.



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