TOSHIBA Photocoupler IRED + Photo IC

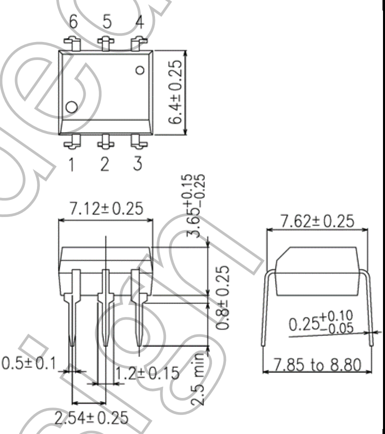
TLP512

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

The TLP512 consists of a high-output infrared 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 μs, t_{pLH} = 0.8 μs (max)
  @R_L = 1.9 kΩ
- TTL compatible
- UL-recognized: UL 1577, File No.E67349

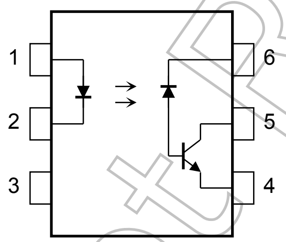
Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	11-7A8S

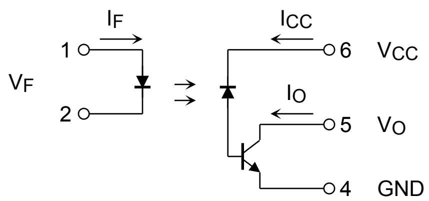
Weight: 0.4 g (typ.)

Pin Configuration (top view)



1: Anode
2: Cathode
3: NC
4: Emitter (GND)
5: Collector (OUT)
6: V_{CC}

Schematic



Start of commercial production
1987-04

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 60 s) (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)

	Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = 16 mA	—	1.65	1.85	V
LED	Forward voltage temperature coefficient	$\Delta V_F/\Delta Ta$	I_F = 16 mA	—	−2	—	mV/°C
LED	Reverse current	I_R	V_R = 5 V	—	—	10	μA
LED	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
Detector	High-level output current	$I_{OH\ (2)}$	I_F = 0 mA, V_{CC} = V_O = 15 V	—	—	5	μA
Detector	High-level output current	I_{OH}	I_F = 0 mA, V_{CC} = V_O = 15 V Ta = 70 °C	—	—	50	μA
Detector	High-level supply current	I_{CCH}	I_F = 0 mA, V_{CC} = 15 V	—	0.01	1	μA

Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	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)

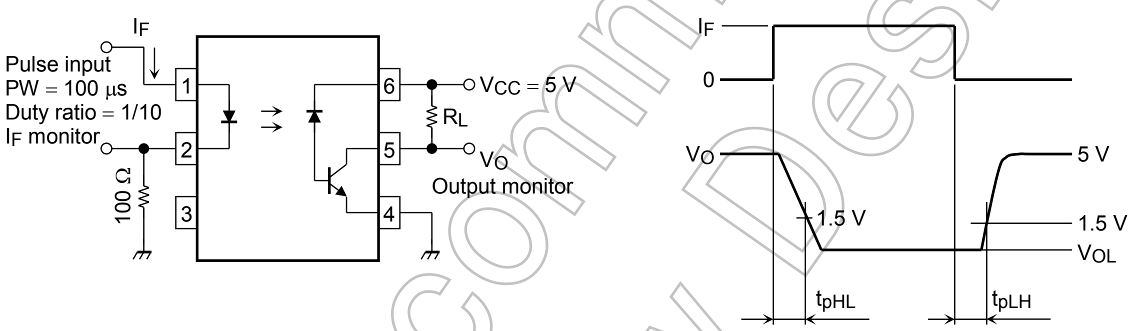
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0 V, f = 1 MHz (Note 7)	—	0.8	—	pF
Isolation resistance	R_S	R.H. ≤ 60 %, V_S = 500 V (Note 7)	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC 60 s	2500	—	—	Vrms

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

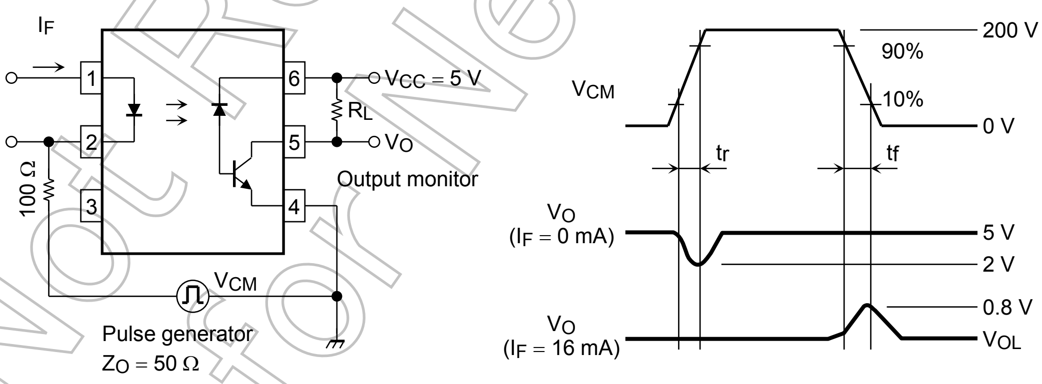
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time (H → L)	t_{pHL}	1	$I_F = 0 \rightarrow 16$ mA, $R_L = 1.9$ kΩ	—	—	0.8	μs
Propagation delay time (L → H)	t_{pLH}		$I_F = 16 \rightarrow 0$ mA, $R_L = 1.9$ kΩ	—	—	0.8	μs
Common mode transient immunity at logic high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

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 ($V_{OUT} > 2.0$ 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 ($V_{OUT} < 0.8$ V).

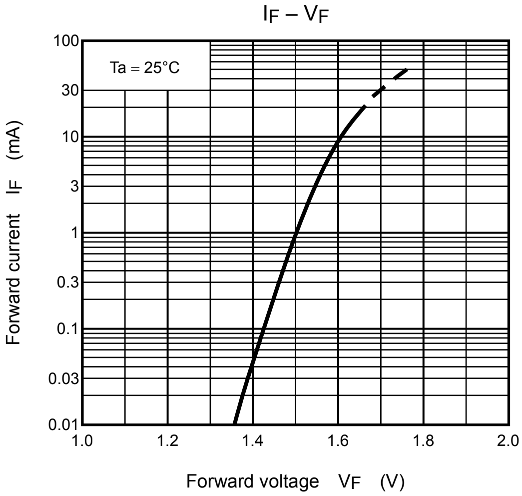
Test Circuit 1: Switching Time Test Circuit

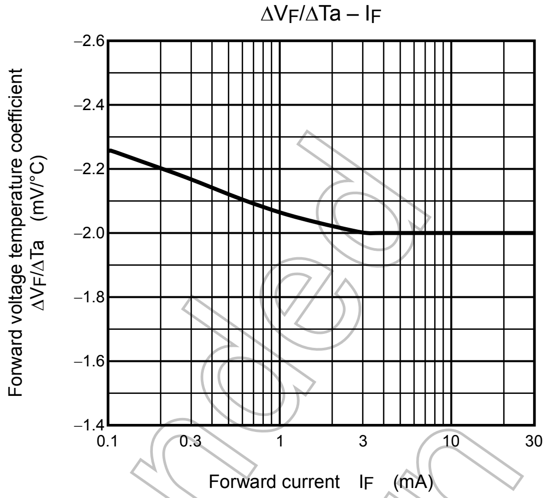


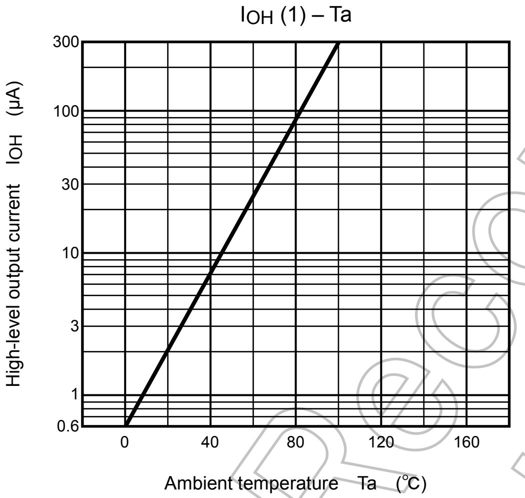
Test Circuit 2: Common Mode Noise Immunity Test Circuit

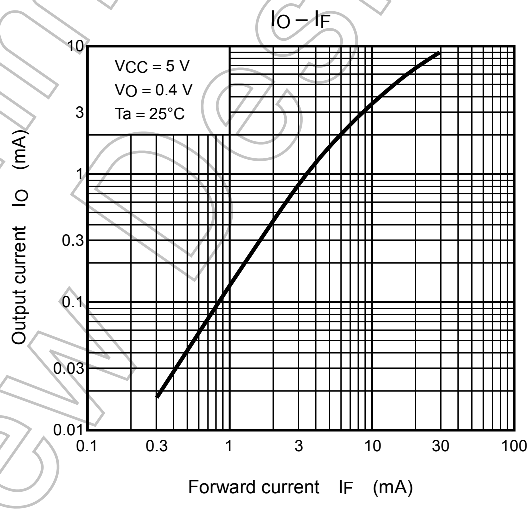


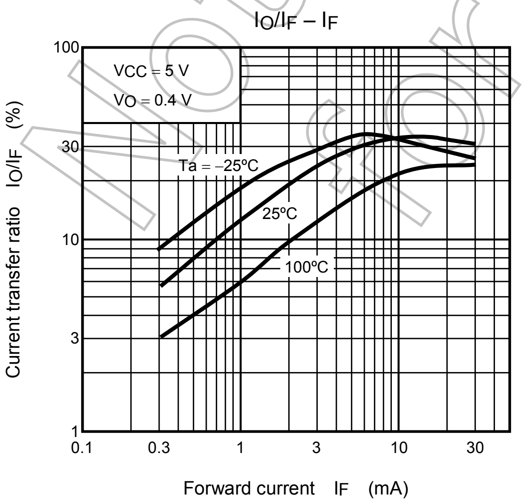
$$CM_H = \frac{160\ (V)}{t_r\ (\mu s)},\ CM_L = \frac{160\ (V)}{t_f\ (\mu s)}$$

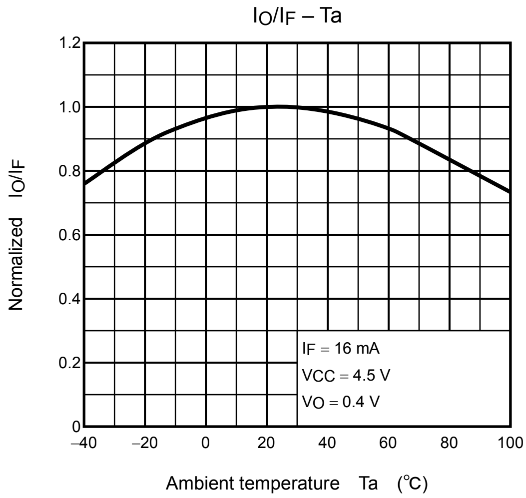




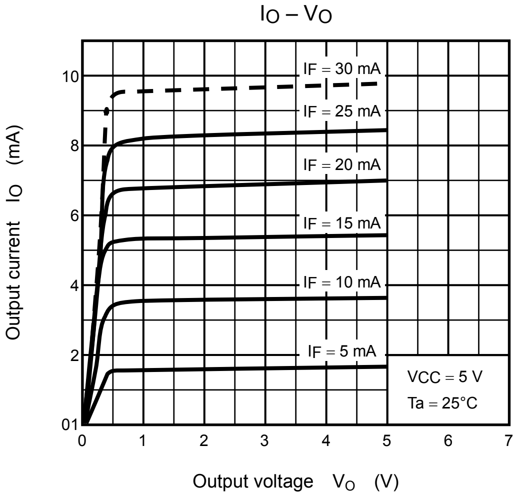


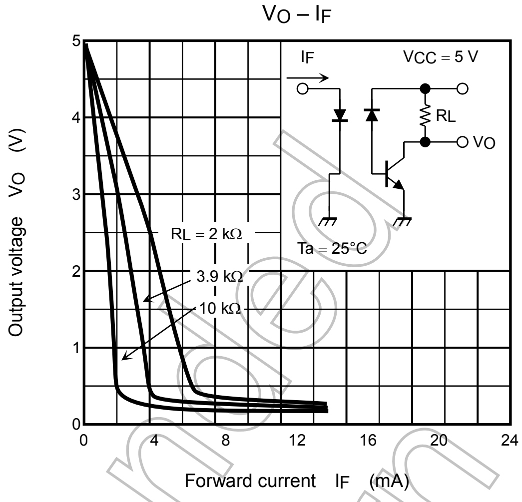


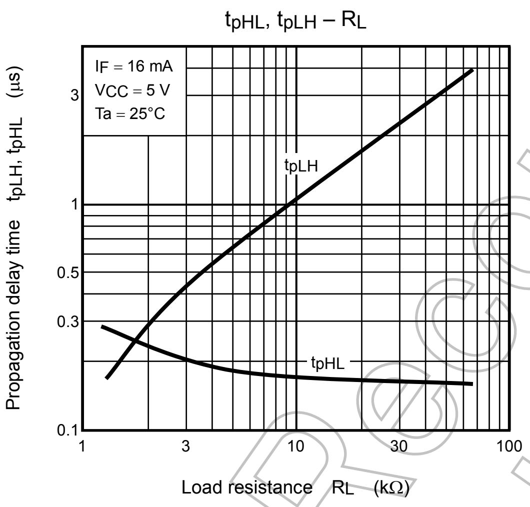




NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.







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