

TOSHIBA Photocoupler GaAlAs Ired & Photo IC

TLP559

Digital Logic Ground Isolation

Line Receiver

Microprocessor System Interfaces

Switching Power Supply Feedback Control

Transistor Inverter

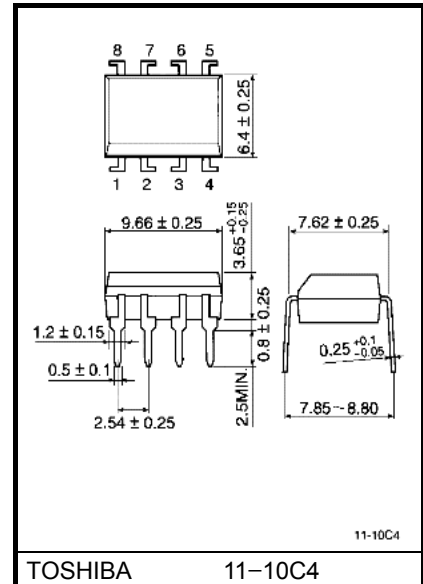
Unit: mm

The TOSHIBA TLP559 consists of a GaAlAs high-output light emitting diode and a high speed detector of one chip photo diode-transistor. This unit is 8-lead DIP package.

TLP559 has no internal base connection, and a Faraday shield integrated on the photodetector chip provides an effective common mode noise transient immunity.

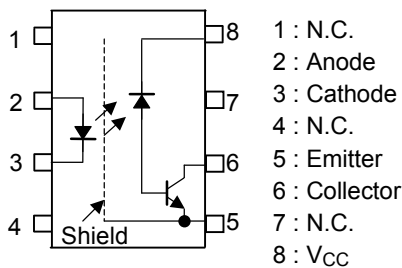
So this is suitable for application in noisy environmental condition.

- Isolation voltage: 2500 Vrms (min)
- Switching speed: $t_{pHL} = 0.3\mu s$ (typ.)
 $t_{pLH} = 0.5\mu s$ (typ.) ($R_L = 1.9k\Omega$)
- TTL compatible
- UL recognized: UL1577, file No.E67349

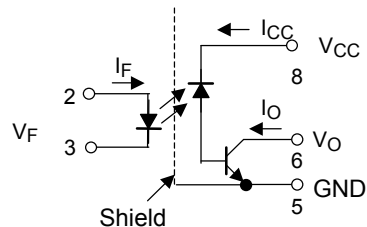


Weight: 0.54 g (typ.)

Pin Configuration (top view)



Schematic



Start of commercial production
1987/09

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	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
	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
Lead solder temperature (10s) (Note 6)		T _{sol}	260	°C
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (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) Derate 0.8mA 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.

(Note 6) Soldering portion of lead: up to 2mm from body of the device.

(Note 7) Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 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
	Capacitance between terminal	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	μA
		I_{OH}	$I_F = 0\text{mA}, V_{CC} = 15\text{V}$ $V_O = 15\text{V}, T_a = 70^\circ\text{C}$	—	—	50	
	High level supply voltage	I_{CCH}	$I_F = 0\text{mA}, V_{CC} = 15\text{V}$	—	0.01	1	μA
	Supply voltage	V_{CC}	$I_{CC} = 0.01\text{mA}$	15	—	—	V
	Output voltage	V_O	$I_O = 0.5\text{mA}$	15	—	—	V

Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	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)

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

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

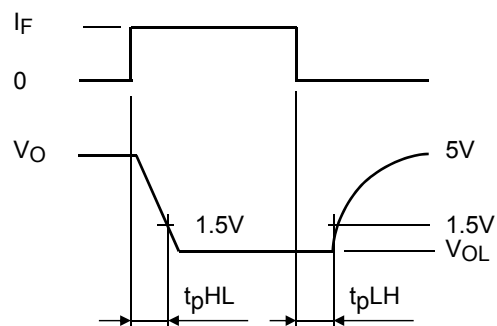
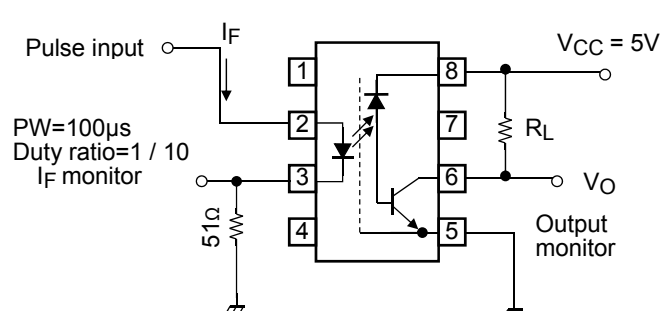
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time (H → L)	t_{pHL}	1	$I_F = 16\text{mA}, R_L = 1.9\text{k}\Omega$	—	0.2	0.8	μs
Propagation delay time (L → H)	t_{pLH}			—	0.3	0.8	μs
Common mode transient immunity at logic high output (Note 8)	CM_H	2	$I_F = 0\text{mA}, V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$	2000	10000	—	V / μs
Common mode transient immunity at logic high output (Note 8)	CM_L		$I_F = 16\text{mA}, V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$	-2000	-10000	—	V / μs

(Note 8) CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state ($V_O < 0.8\text{V}$).

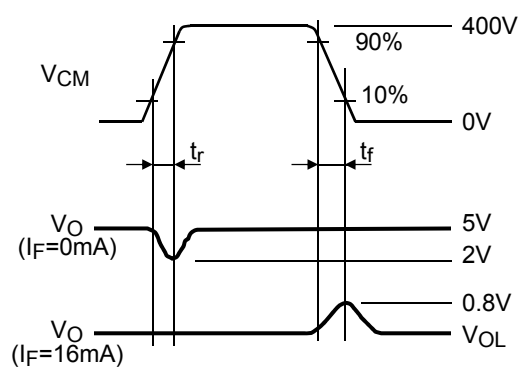
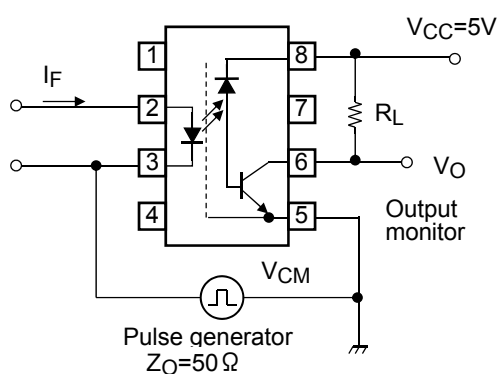
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state ($V_O > 2.0\text{V}$).

(Note 9) Maximum electrostatic discharge voltage for any pins: 100V (C = 200pF, R = 0)

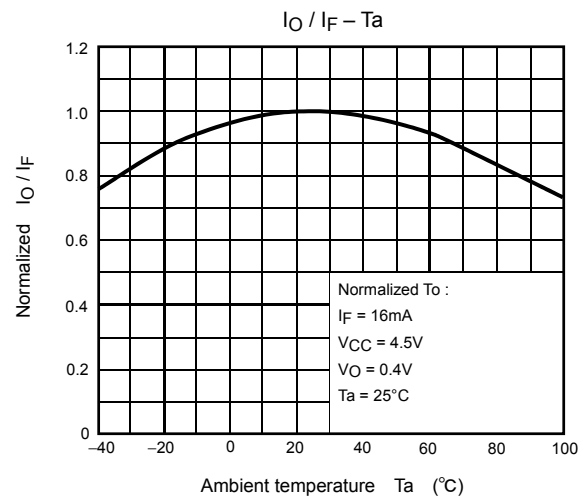
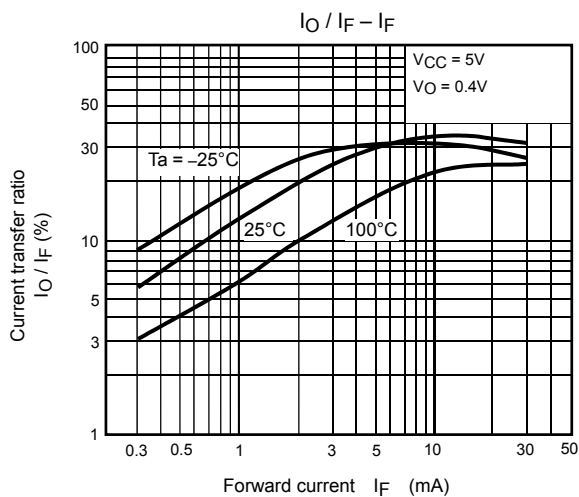
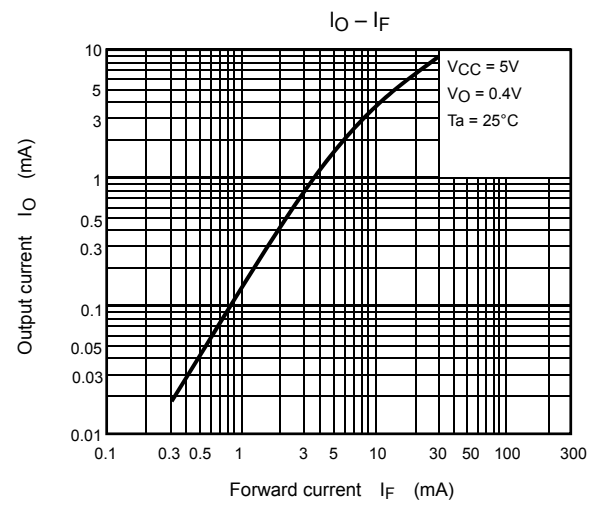
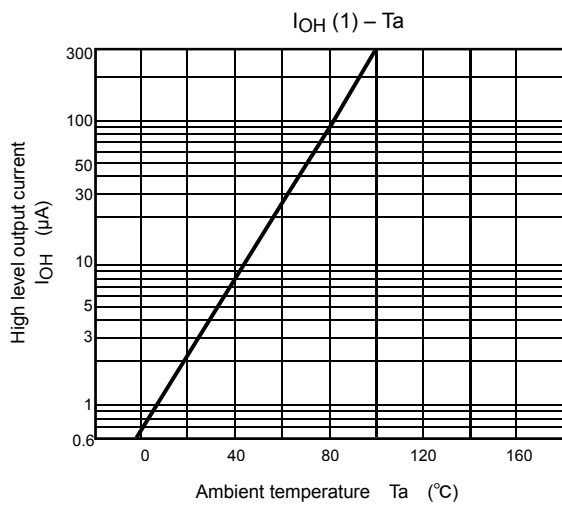
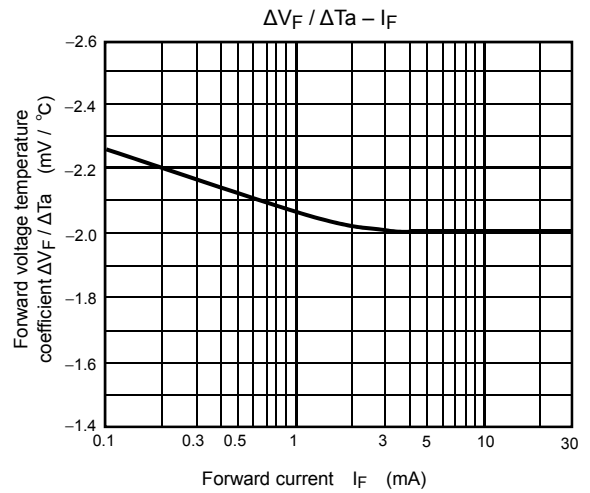
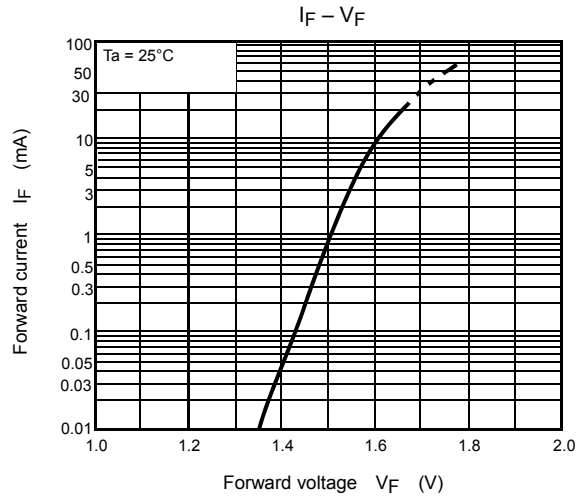
Test Circuit 1: Switching Time Test Circuit

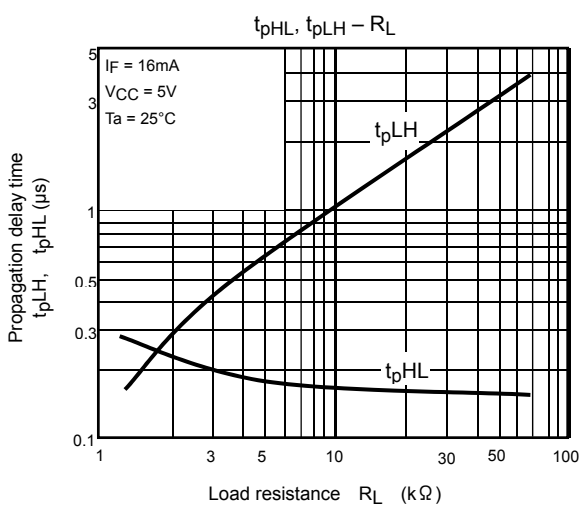
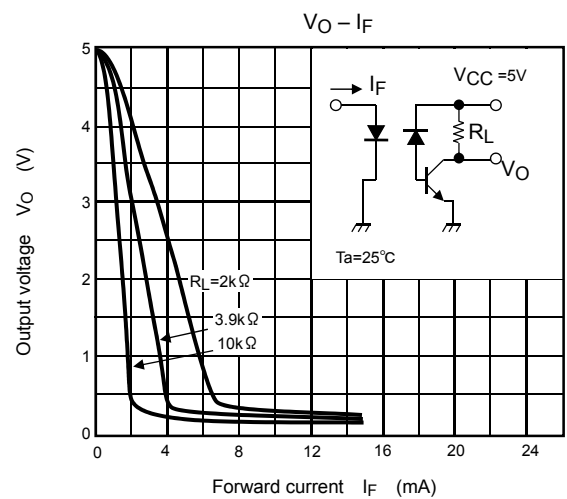
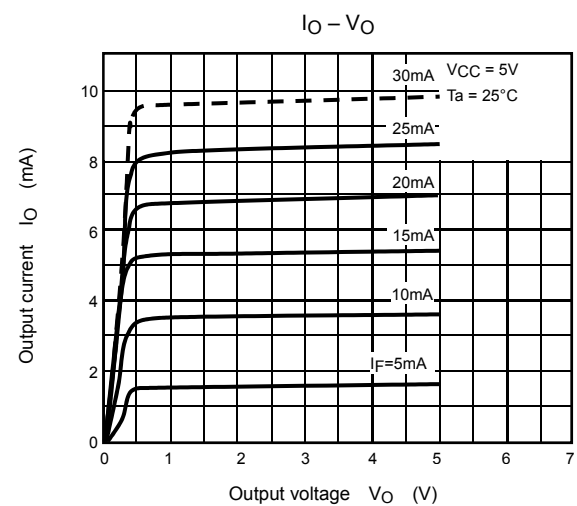


Test Circuit 2: Common Mode Noise Immunity Test Circuit



$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$





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