

# TLP559

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

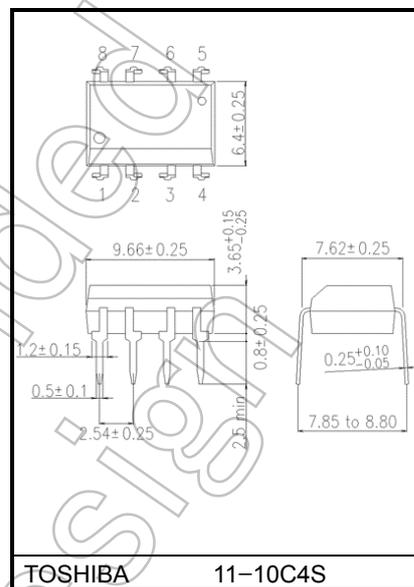
Unit: mm

The TOSHIBA TLP559 consists of a high-output infrared 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.

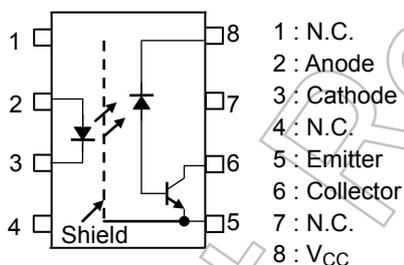
- Isolation voltage: 2500 Vrms (min)
- Switching speed:  $t_{pHL} = 0.2\mu s$  (typ.)  
 $t_{pLH} = 0.3\mu s$  (typ.) ( $R_L = 1.9k\Omega$ )
- TTL compatible
- UL-recognized: UL 1577, File No.E67349.
- cUL-recognized: CSA Component Acceptance Service No.5A  
 File No.E67349.



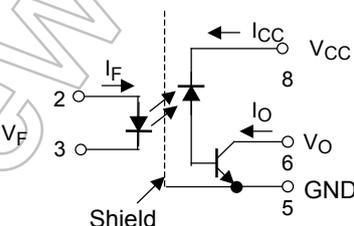
TOSHIBA 11-10C4S

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 <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
	Output voltage	V <sub>O</sub>	-0.5 to 15	V
	Supply voltage	V <sub>CC</sub>	-0.5 to 15	V
	Output power dissipation (Note 5)	P <sub>O</sub>	100	mW
Operating temperature range		T <sub>opr</sub>	-55 to 100	°C
Storage temperature range		T <sub>stg</sub>	-55 to 125	°C
Lead solder temperature (10 s) (Note 6)		T <sub>sol</sub>	260	°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %)		BV <sub>S</sub>	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) Derate 0.8mA above 70 °C.

(Note 2) 50 % duty cycle, 1 ms pulse width. Derate 1.6 mA / °C above 70 °C.

(Note 3) Pulse width ≤ 1μs, 300 pps.

(Note 4) Derate 0.9 mW / °C above 70 °C.

(Note 5) Derate 2 mW / °C above 70 °C.

(Note 6) Soldering portion of lead: up to 2 mm 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	$\mu\text{A}$
	Capacitance between terminal	$C_T$	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	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	$\mu\text{A}$
		$I_{OH}$	$I_F = 0 \text{ mA}, V_{CC} = 15 \text{ V}$ $V_O = 15 \text{ V}, T_a = 70 \text{ }^\circ\text{C}$	—	—	50	
	High level supply voltage	$I_{CCH}$	$I_F = 0 \text{ mA}, V_{CC} = 15 \text{ V}$	—	0.01	1	$\mu\text{A}$
	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	—	%
		$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}, V_O = 0.4 \text{ V}, T_a = 0 \text{ to } 70 \text{ }^\circ\text{C}$	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) (Note 7)	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Resistance (input-output) (Note 7)	$R_S$	R.H. $\leq 60\%$ , $V_S = 500 \text{ VDC}$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage (Note 7)	$BV_S$	AC, 60 s	2500	—	—	$V_{rms}$

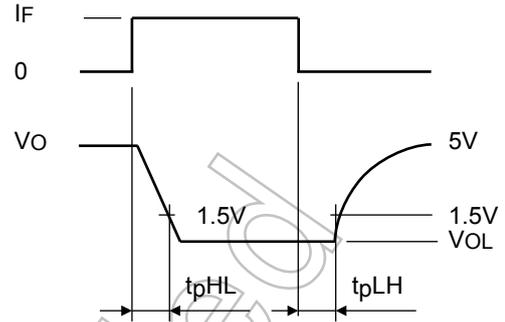
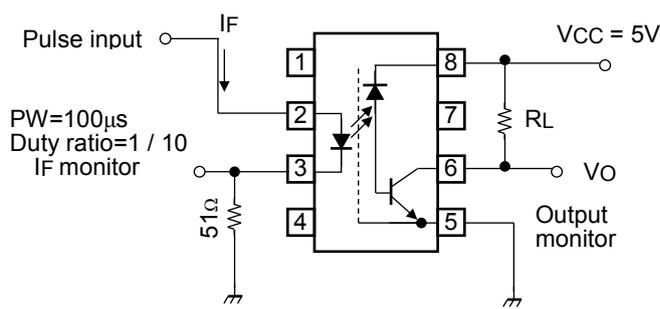
### Switching Characteristics (Ta = 25°C, Vcc = 5V)

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	$\mu\text{s}$
Propagation delay time (L→H)	$t_{pLH}$			—	0.3	0.8	$\mu\text{s}$
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 / $\mu\text{s}$
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 / $\mu\text{s}$

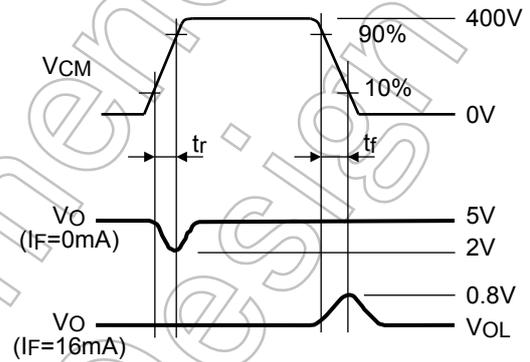
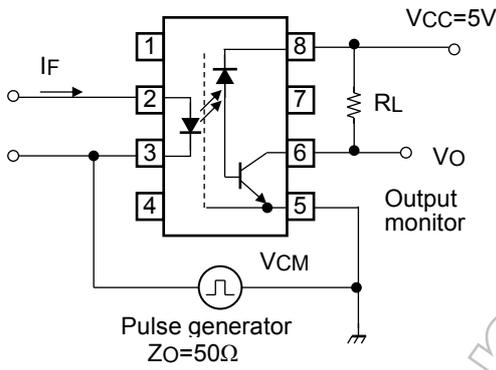
(Note 8)  $CM_L$  is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state ( $V_O < 0.8 \text{ V}$ ).

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

**Test Circuit 1: Switching Time Test Circuit**

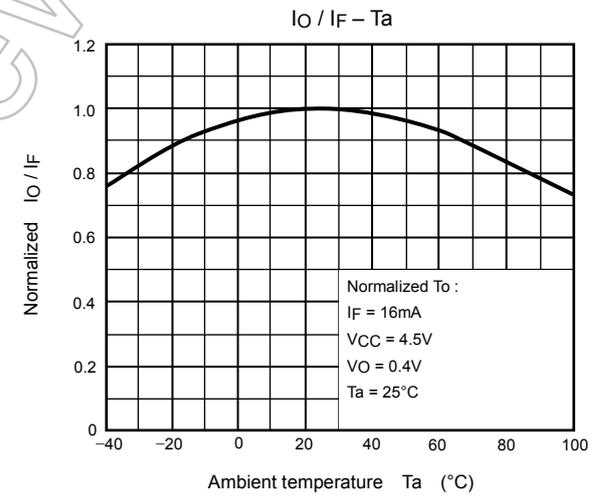
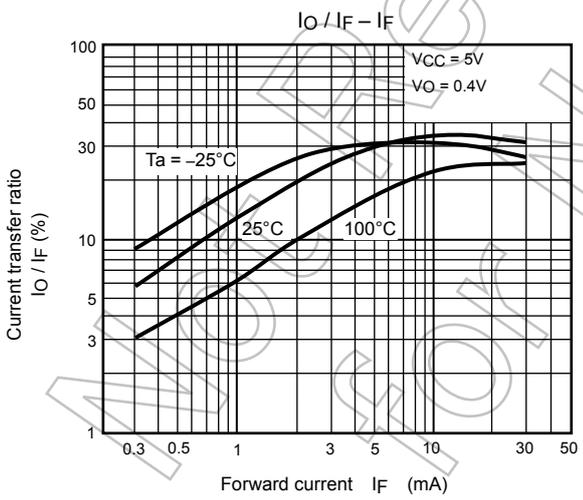
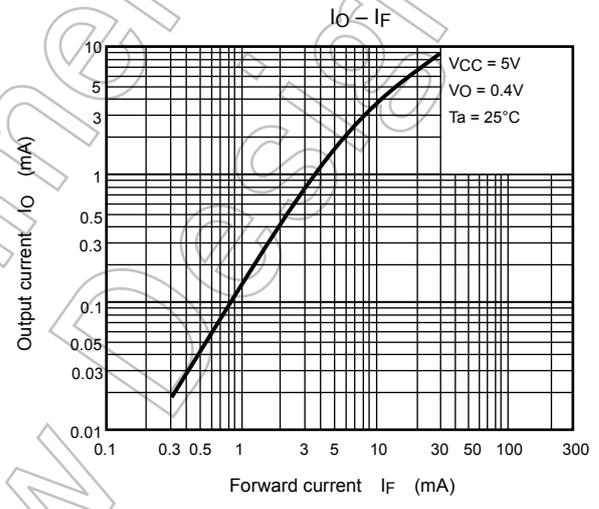
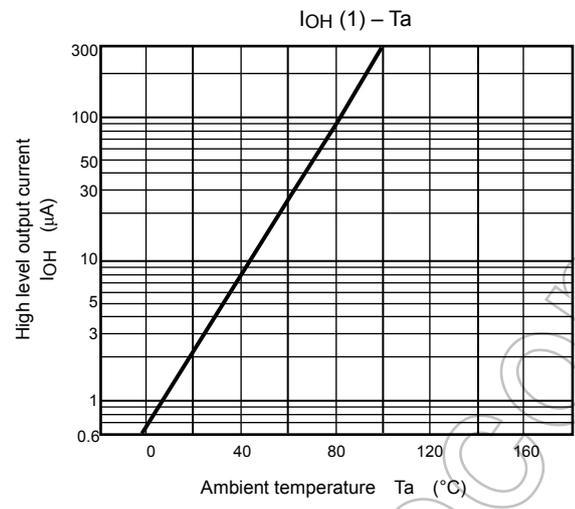
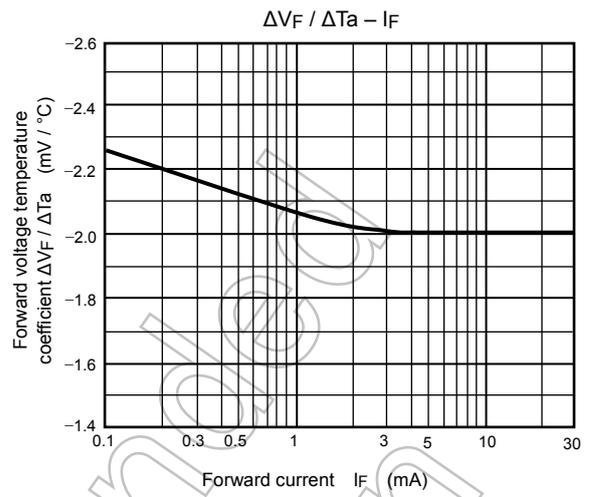
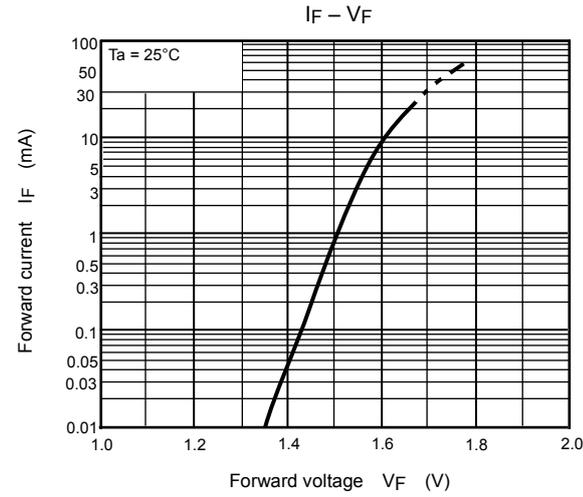


**Test Circuit 2: Common Mode Noise Immunity Test Circuit**

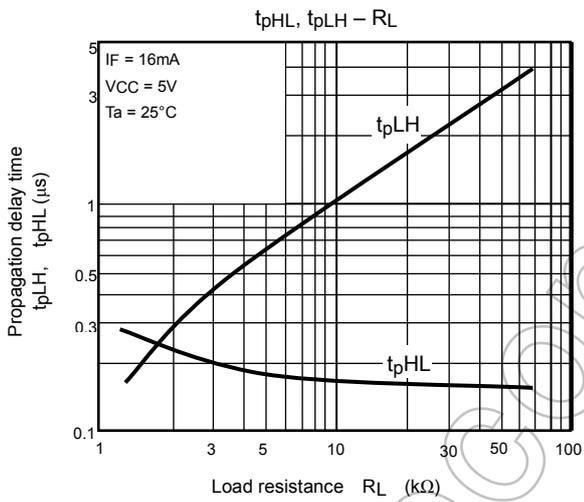
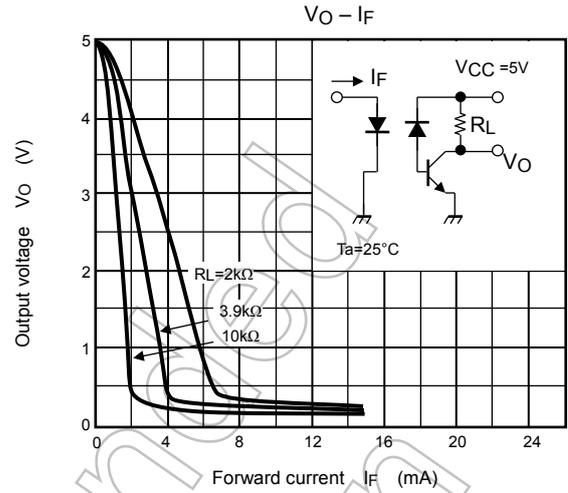
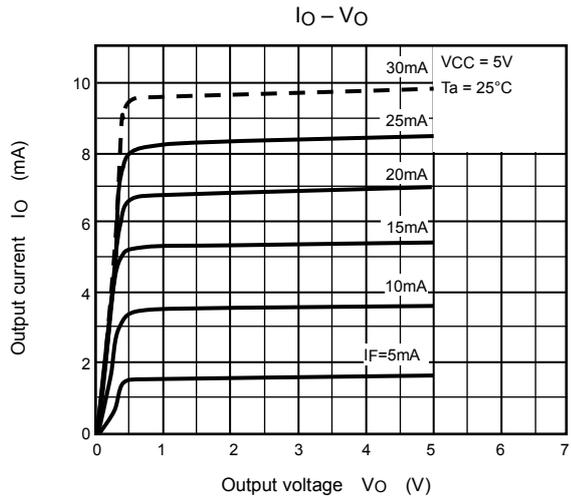


$$CM_H = \frac{320(V)}{t_r(\mu s)}, CM_L = \frac{320(V)}{t_f(\mu s)}$$

Not Recommended for New Design



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



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