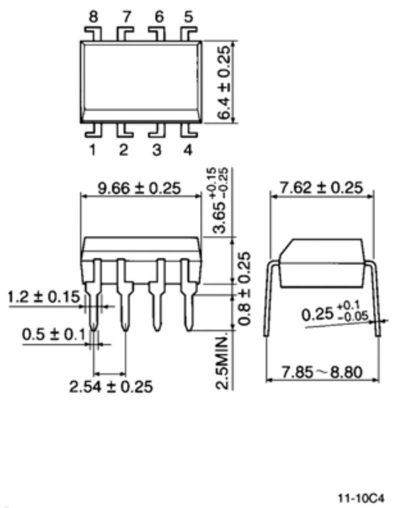
TOSHIBA Photocoupler GaAℓAs Ired+Photo−IC

TLP759

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

Unit: mm



TOSHIBA 11−10C4

Weight: 0.54 g (typ.)

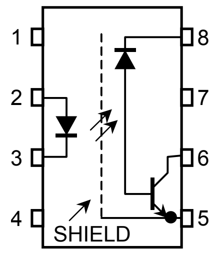
The TOSHIBA TLP759 consists of a GaAℓAs high−output light emitting diode and a high speed detector of one chip photo diode−transistor. This unit is 8-lead DIP.
TLP759 has no internal base connection, and a faraday shield integrated on the photodetector chip provides an effective common mode noise transient immunity.
So this is suitable for application in noisy environmental condition.

- Isolation voltage: 5000 Vrms(min.)
- Switching speed: t_{pHL} = 0.2μs(typ.)
  t_{pLH} = 0.3μs(typ.) (R_L=1.9 kΩ)
- TTL compatible
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065:2002, certificate no.8869
  BS EN60950-1:2002, certificate no.8870
- Option (D4) type
  VDE Approved: DIN EN 60747-5-2
  Certificate No. 40009302
  Maximum operating insulation voltage: 890V_{PK}
  Highest permissible over voltage: 6000V_{PK}

(Note) When a EN 60747-5-2 approved type is needed, please designate the “Option (D4)”

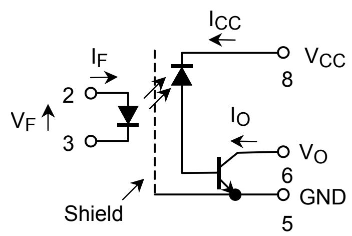
- Creepage distance: 7.0mm (min)
  Clearance: 7.0mm (min)
  Insulation thickness: 0.4mm (min)

Pin Configuration (top view)



1: N.C.
2: Anode
3: Cathode
4: N.C.
5: Emitter(gnd)
6: Collector(output)
7: N.C.
8: Vcc

Schematic



Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LDE	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	−0.5~20	V
	Supply voltage	V_{CC}	−0.5~30	V
	Output power dissipation (Note 5)	P_O	100	mW
Operating temperature range		T_{opr}	−55~100	°C
Storage temperature range		T_{opr}	−55~125	°C
Lead solder temperature (10s) (Note 6)		T_{sol}	260	°C
Isolation voltage (AC, 1min., R.H.≤ 60%) (Note 7)		BV_S	5000	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 / °C 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 the 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
LDE	Forward voltage	V_F	I_F = 16mA	—	1.65	1.85	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta Ta$	I_F = 16mA	—	−2	—	mV /°C
	Reverse current	I_R	V_R = 5V	—	—	10	μA
	Capacitance between terminals	C_T	V = 0, f = 1MHz	—	45	—	pF
Detector	High level output current	$I_{OH\ (1)}$	I_F = 0mA, V_{CC} = V_O = 5.5V	—	3	500	nA
		$I_{OH\ (2)}$	I_F = 0mA, V_{CC} = 30V, V_O = 20V	—	—	5	μA
		I_{OH}	I_F = 0mA, V_{CC} = 30V, V_O = 20V Ta = 70°C	—	—	50	
	High level supply voltage	I_{CCH}	I_F = 0mA, V_{CC} = 30V	—	0.01	1	μA
Coupled	Current transfer ratio	I_O / I_F	I_F = 16mA, V_{CC} = 4.5V V_O = 0.4V	20	40	—	%
	Low level output voltage	V_{OL}	I_F = 16mA, V_{CC} = 4.5V I_O = 2.4 mA	—	—	0.4	V
	Resistance (input−output)	R_S	R.H.≤ 60%, V_S= 500V (Note 7)	1×10^{12}	10^{14}	—	Ω
	Capacitance (input−output)	C_S	V_S = 0, f = 1MHz (Note 7)	—	0.8	—	pF

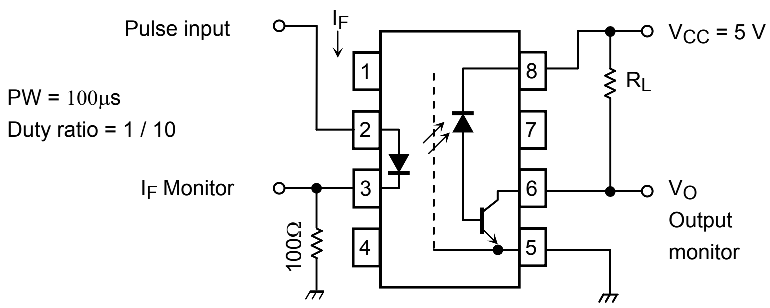
Switching Characteristics (Ta = 25°C, VCC = 5V)

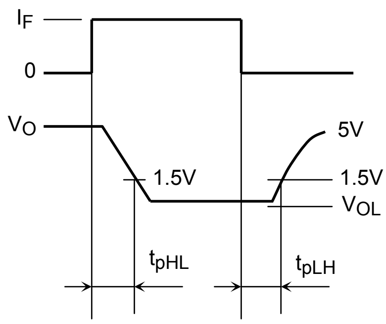
Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time (H→ L)	t_{pHL}	1	I_F = 0→ 16mA, V_{CC} = 5V R_L = 1.9kΩ	—	0.2	0.8	μs
Propagation delay time (L→ H)	t_{pLH}		I_F = 16→ 0mA, V_{CC} = 5V RL = 1.9kΩ	—	0.3	0.8	μs
Common mode transient immunity at logic high output (Note 8)	CM_H	2	I_F = 0mA, V_{CM} = 400V_{p-p} R_L = 4.1kΩ	5000	10000	—	V / μs
Common mode transient immunity at logic low output (Note 8)	CM_L		I_F = 16mA V_{CM} = 400V_{p-p} R_L = 4.1kΩ	−5000	−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 < 0.8V).
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 > 2.0V).

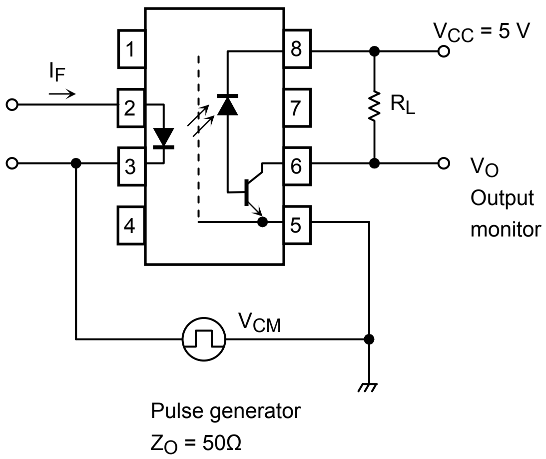
(Note 9) Maximum electrostatic discharge voltage for any pins: 100V (C = 200pF, R = 0)

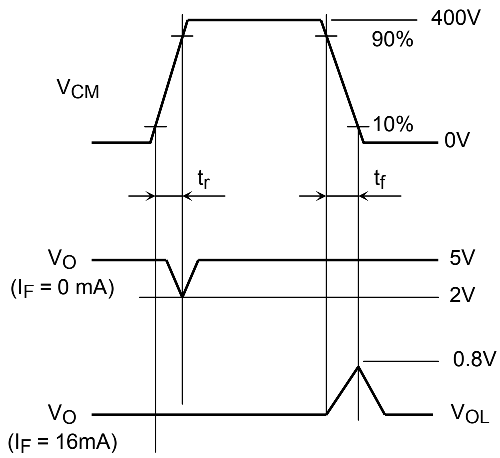
Test Circuit 1: Switching Time Test Circuit





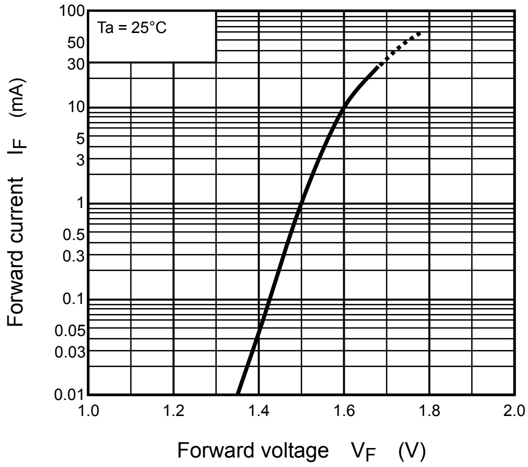
Test Circuit 2: Common Mode Noise Immunity Test Circuit



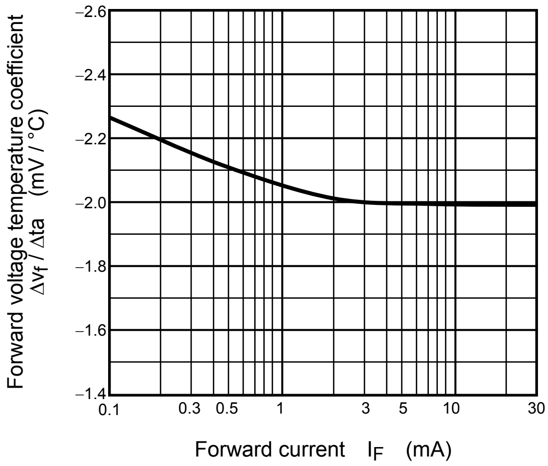


$$CM_H = \frac{320\ (V)}{t_r\ (\mu s)},\ CM_L = \frac{320\ (V)}{t_f\ (\mu s)}$$

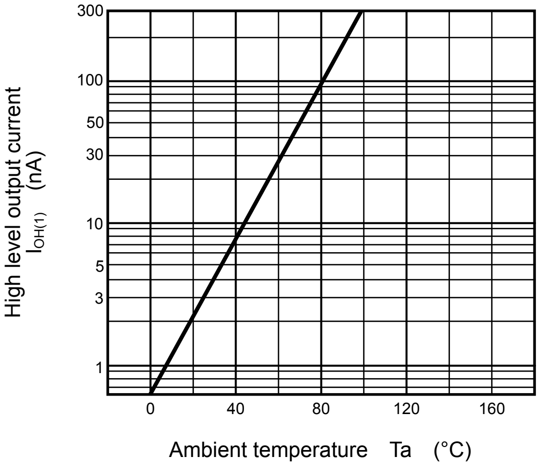
$I_F – V_F$



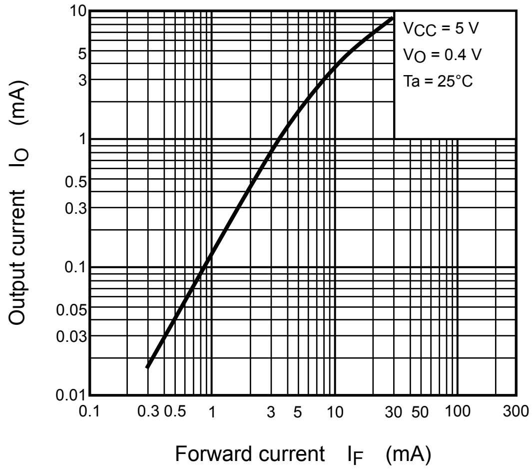
$\Delta V_F / \Delta Ta – I_F$



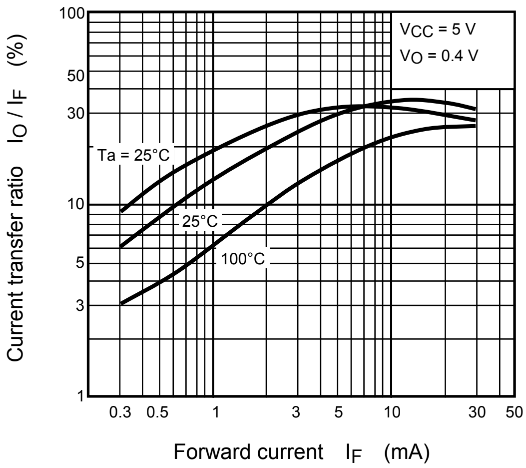
$I_{OH(1)} – Ta$



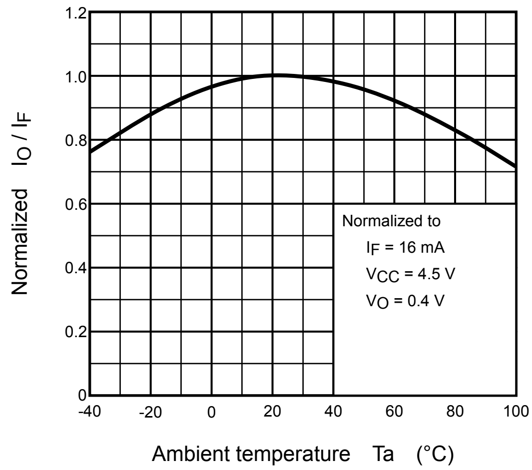
$I_O – I_F$

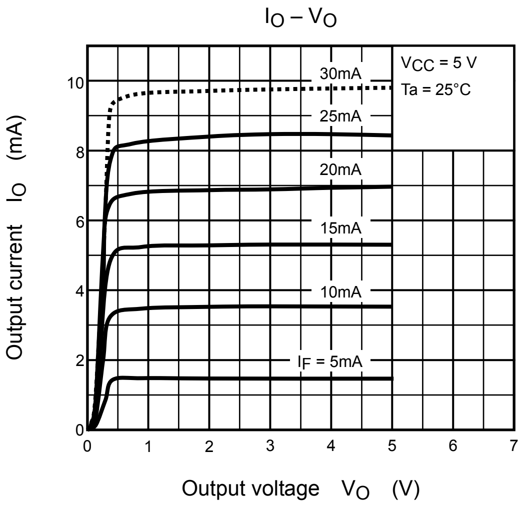


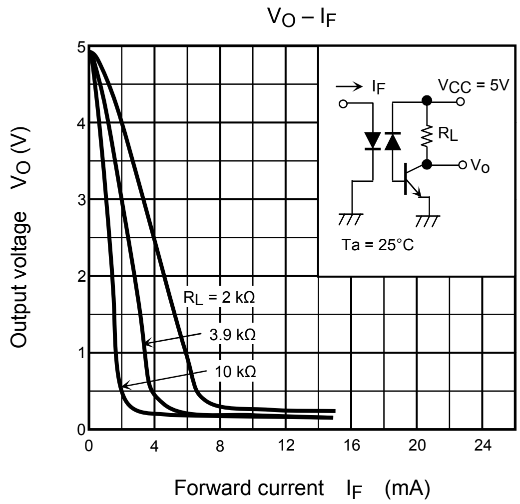
$I_O / I_F – I_F$

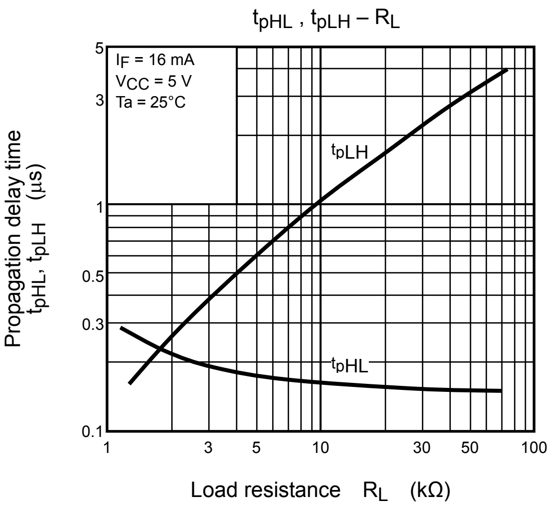


$I_O / I_F – Ta$




IO – VO
VCC = 5 V
Ta = 25°C
30mA
25mA
20mA
15mA
10mA
IF = 5mA
Output current IO (mA)
Output voltage VO (V)


VO – IF
IF
VCC = 5V
RL
VO
Ta = 25°C
RL = 2 kΩ
3.9 kΩ
10 kΩ
Output voltage VO (V)
Forward current IF (mA)


tpHL , tpLH – RL
IF = 16 mA
VCC = 5 V
Ta = 25°C
tpLH
tpHL
Propagation delay time tpHL, tpLH (μs)
Load resistance RL (kΩ)

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