TOSHIBA Photocoupler GaAℓAs Ired + Photo IC

TLP750

Degital Logic Ground Isolation
Line Receiver
Microprocessor System Interfaces
Switching Power Supply Feedback Control
Analog Signal Isolation

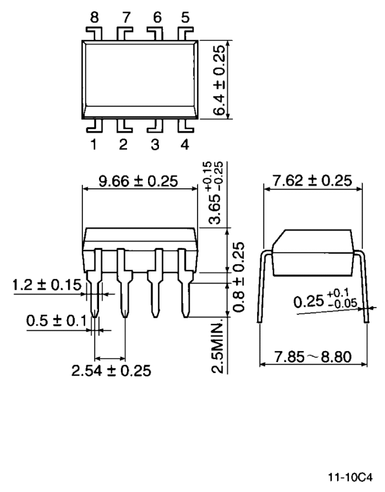
The TOSHIBA TLP750 consists of GaAℓAs high−output light emitting diode and a high speed detector of one chip photo diode−transistor.
This unit is 8−lead DIP.
TLP750 has no internal base connection, and is suitable for application in noisy environmental conditions.

- Switching speed: t_{pHL}=0.3μs(typ.)
- Switching speed: t_{pLH}=0.5μs(typ.)(R_L=1.9kΩ)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065: 1994,
  Certificate No.7613
  BS EN60950: 1992,
  Certificate No.7614
- Isolation voltage: 5000V_{rms}(min.)
- Option(d4)type
  VDE approved: DIN VDE0884/06.92,
  Certificate No.68384
  Maximum operating insulation voltage: 890V_{PK}
  Highest permissible over voltage: 8000V_{PK}

(Note) When a VDE0884 approved type is needed, please designate the "Option(D4)"

- Creepage distance: 6.4mm(min.)
  Clearance: 6.4mm(min.)
  Insulation thickness: 0.4mm(min.)

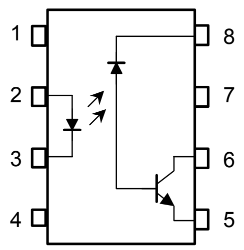
Unit in mm



TOSHIBA	11−10C4

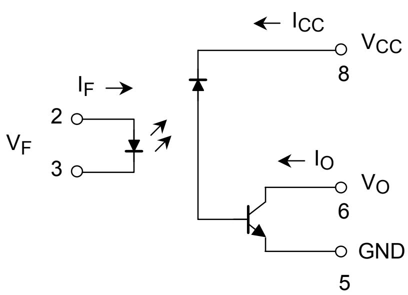
Weight: 0.54g

Pin Configuration (top view)



1 : N.C.
2 : Anode
3 : Cathode
4 : N.C.
5 : Emitter
6 : Collector
7 : N.C.
8 : Cathode

Schematic



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	−0.5~15	V
	Supply voltage		V_{CC}	−0.5~15	V
	Output power dissipation	(Note 5)	P_O	100	mW
Operating temperature range			T_{opr}	−55~100	°C
Storage temperature range			T_{stg}	−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	V_{rms}

(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
LED	Forward voltage	V_F	I_F=16mA			—	1.65	1.85	V
LED	Forward voltage temperature coefficient	$\Delta V_F / \Delta Ta$	I_F=16mA			—	−2	—	mV / °C
LED	Reverse current	I_R	V_R=5V			—	—	10	μA
LED	Capacitance between terminal	C_T	V_F=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
Detector	High level output current	$I_{OH(2)}$	I_F=0mA, V_{CC}=V_O=15V			—	—	5	μA
Detector	High level output current	I_{OH}	I_F=0mA, V_{CC}=V_O=15V Ta=70°C			—	—	50	μA
Detector	High level supply voltage	I_{CCH}	I_F=0mA, V_{CC}=15V			—	0.01	1	μA
Coupled	Current transfer ratio	I_O/I_F	I_F=16mA V_{CC}=4.5V V_O=0.4V	Ta=25°C		10	30	—	%
Coupled	Current transfer ratio	I_O/I_F			Rank: 0	19	30	—	%
Coupled	Current transfer ratio	I_O/I_F		Ta=0~70°C		5	—	—	%
Coupled	Current transfer ratio	I_O/I_F			Rank: 0	15	—	—	%
Coupled	Low level output voltage	V_{OL}	I_F=16mA, V_{CC}=4.5V, I_O=1.1mA (rank 0: I_O=2.4mA)			—	—	0.4	V
Coupled	Isolation resistance	R_S	R.H.=60%, V=5000V_{DC} (Note 7)			1×10^{12}	10^{14}	—	Ω
Coupled	Capacitance between input to output	C_S	V_S=0, f=1MHz (Note 8)			—	0.8	—	pF

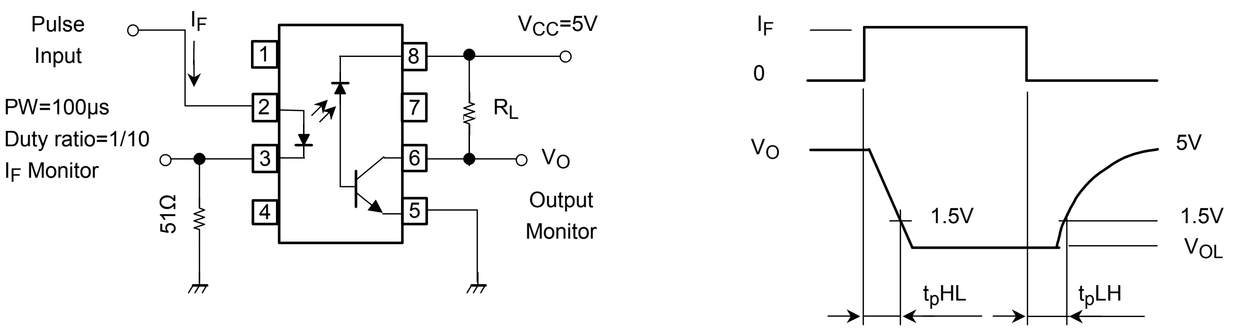
Switching Characteristics (Ta = 25°C, V_{CC} = 5V)

Characteristic	Symbol	Test Cir–cuit	Test Condition		Min.	Typ.	Max.	Unit
Propagation delay time (H→L)	t_{pHL}	1	I_F=0→16mA, V_{CC}=5V,		—	0.2	0.8	μs
			R_L=4.1kΩ	Rank 0: R_L=1.9kΩ	—	0.3	0.8	μs
Propagation delay time (L→H)	t_{pLH}	1	I_F=16→0mA, V_{CC}=5V,		—	1.0	2.0	μs
			R_L=4.1kΩ	Rank 0: R_L=1.9kΩ	—	0.5	1.2	μs
Common mode transient immunity at logic high output (Note 8)	C_{MH}	2	I_F=0mA, V_{CM}=200V_{p-p} R_L=4.1kΩ (Rank 0: R_L=1.9kΩ)		—	1500	—	V / μs
Common mode transient immunity at logic low output (Note 8)	C_{ML}	2	I_F=16mA, V_{CM}=200V_{p-p} R_L=4.1kΩ (Rank 0: R_L=1.9kΩ)		—	−1500	—	V / μs

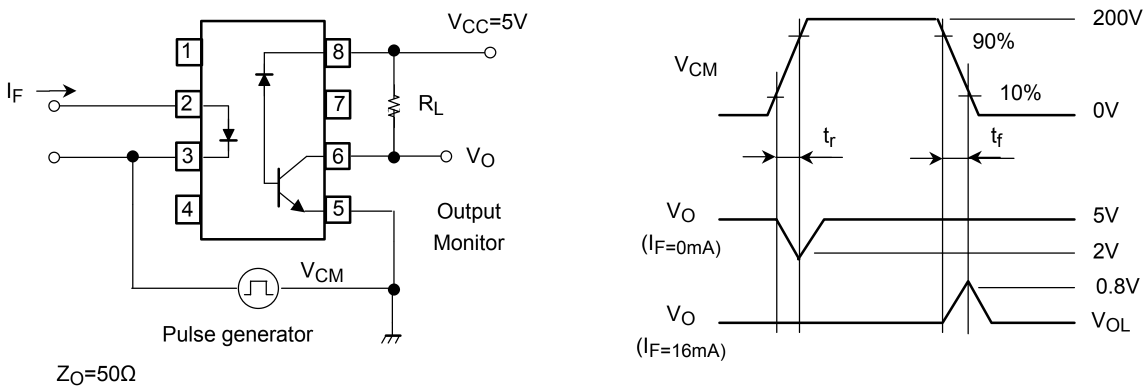
(Note 8) CML is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state(V_O < 0.8V).
CMH is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state(V_O > 2.0V).

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

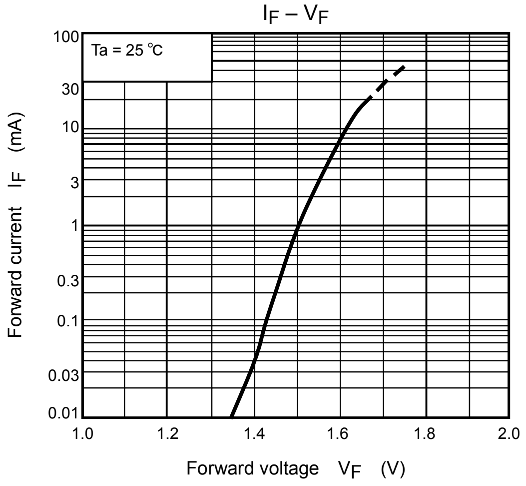
Test Circuit 1: Switching Time Test Circuit

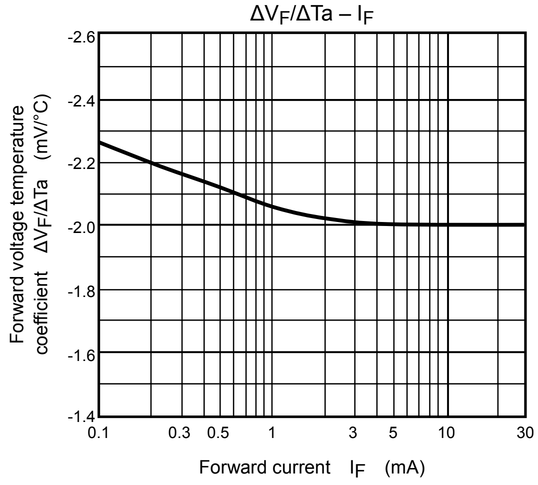


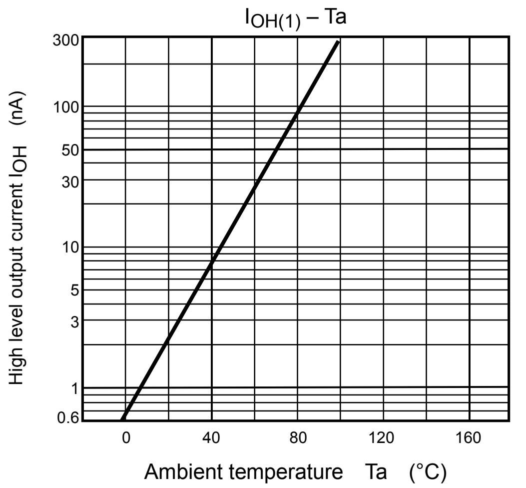
Test Circuit 2: Common Mode Noise Immunity Test Circuit

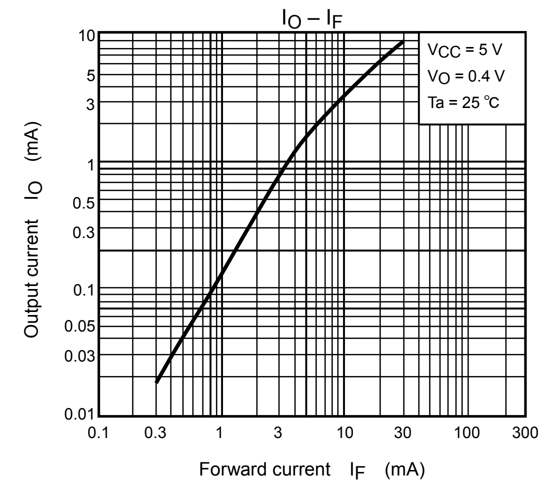


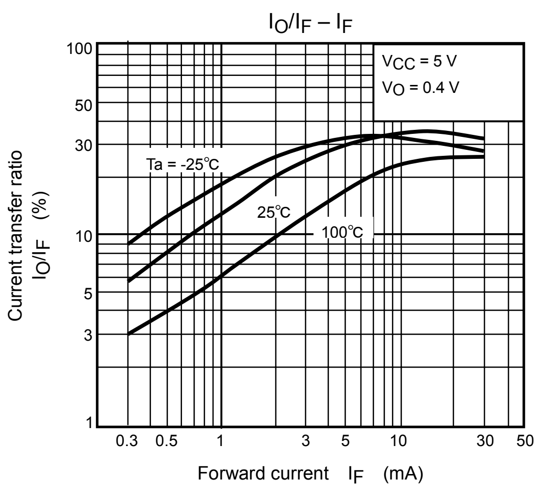
$$CM_H = \frac{160(V)}{t_r(\mu s)}, CM_L = \frac{160(V)}{t_f(\mu s)}$$

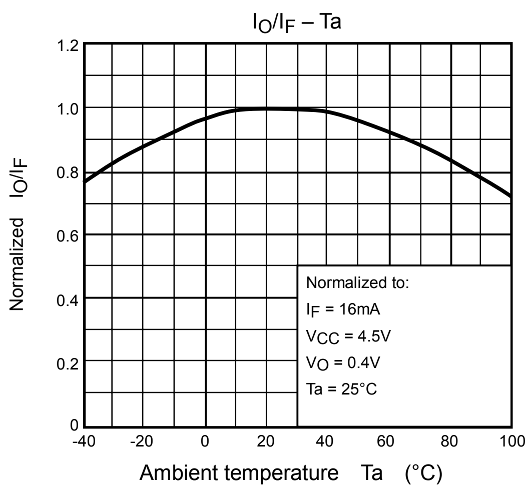

$I_F - V_F$
Ta = 25 °C
Forward current I_F (mA)
100
30
10
3
1
0.3
0.1
0.03
0.01
1.0
1.2
1.4
1.6
1.8
2.0
Forward voltage V_F (V)


$\Delta V_F/\Delta Ta - I_F$
Forward voltage temperature coefficient $\Delta V_F/\Delta Ta$ (mV/°C)
-2.6
-2.4
-2.2
-2.0
-1.8
-1.6
-1.4
0.1
0.3
0.5
1
3
5
10
30
Forward current I_F (mA)

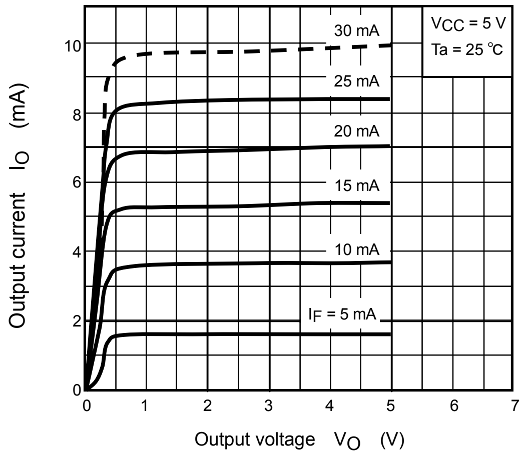

$I_{OH(1)} - Ta$
High level output current I_{OH} (nA)
300
100
50
30
10
5
3
1
0.6
0
40
80
120
160
Ambient temperature Ta (°C)


$I_O - I_F$
V_{CC} = 5 V
V_O = 0.4 V
Ta = 25 °C
Output current I_O (mA)
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.1
0.3
1
3
10
30
100
300
Forward current I_F (mA)

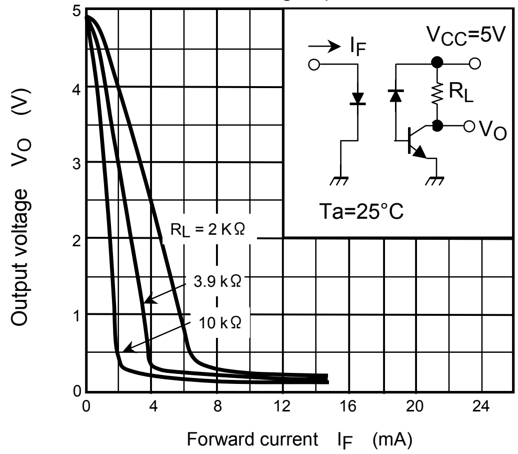

$I_O/I_F - I_F$
V_{CC} = 5 V
V_O = 0.4 V
Ta = -25°C
25°C
100°C
Current transfer ratio I_O/I_F (%)
100
50
30
10
5
3
1
0.3
0.5
1
3
5
10
30
50
Forward current I_F (mA)


$I_O/I_F - Ta$
Normalized I_O/I_F
1.2
1.0
0.8
0.6
0.4
0.2
0
Normalized to:
I_F = 16mA
V_{CC} = 4.5V
V_O = 0.4V
Ta = 25°C
-40
-20
0
20
40
60
80
100
Ambient temperature Ta (°C)

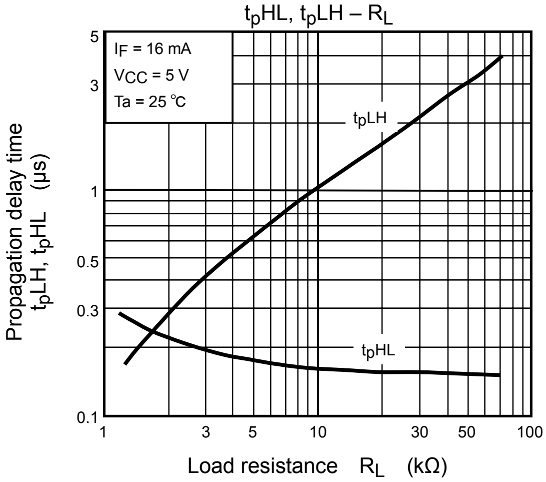
$I_O – V_O$



$V_O – I_F$



$t_pHL, t_pLH – R_L$



RESTRICTIONS ON PRODUCT USE