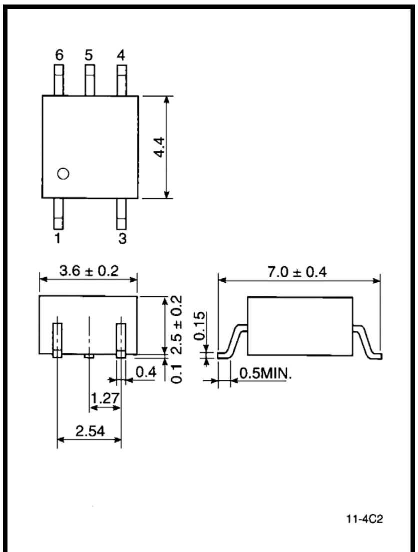
TOSHIBA Photocoupler GaAℓAs Ired & Photo-IC

TLP114A

Digital Logic Isolation.
Line Receiver.
Power Supply Control Feedback Control.
Switching Power Supply.
Transistor Inverter.

Unit in mm



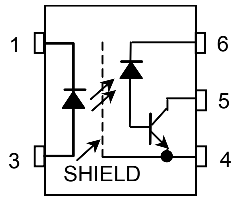
TOSHIBA	11−4C2

Weight: 0.09g

The TOSHIBA mini flat coupler TLP114A is a small outline coupler, suitable for surface mount assembly.
TLP114A consists of a high output power GaAℓAs light emitting diode, optically coupled to a high speed detector of one chip photodiode-transistor.

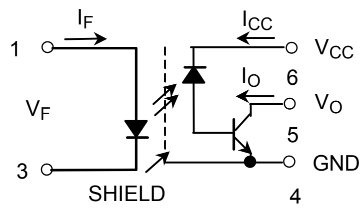
- Isolation voltage: 3750 Vrms (min.)
- Switching speed: t_{pHL} = 0.8μs, t_{pLH} = 0.8μs (max.) (R_L = 1.9 kΩ)
- TTL compatible
- UL recognized: UL1577, file no. E67349

Pin Configuration (top view)



1 : ANODE
3 : CATHODE
4 : EMITTER (GND)
5 : COLLECTOR (OUTPUT).
6 : V_{CC}

Schematic



Absolute Maximum Ratings (Ta = 25°C)

Characteristic			Symbol	Rating	Unit
LDE	Forward current	(Note 1)	I_F	20	mA
	Pulse forward current	(Note 2)	I_{FP}	40	mA
	Peak transient forward current	(Note 3)	I_{FPT}	1	A
	Reverse voltage		V_R	5	V
Detector	Output current		I_O	8	mA
	Peak output current		I_{OP}	16	mA
	Supply voltage		V_{CC}	−0.5~30	V
	Output voltage		V_O	−0.5~20	V
	Output power dissipation	(Note 4)	P_O	100	mW
Operating temperature range			T_{opr}	−55~100	°C
Storage temperature range			T_{stg}	−55~125	°C
Lead solder temperature(10 sec.)			T_{sol}	260	°C
Isolation Voltage (AC,1 min., R.H.≤ 60°%)		(Note 5)	BV_S	3750	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 0.36mA / °C above 70°C.

(Note 2) 50% duty cycle, Ims pulse width.
Derate 0.72mA / °C above 70°C.

(Note 3) Pulse width≤ 1μs, 300pps.

(Note 4) Derate 1.8mW / °C above 70°C.

Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
LDE	Forward voltage	V_F	I_F = 16mA	1.22	1.42	1.72	V
LDE	Forward voltage temperature coefficient	$\Delta V_F / \Delta Ta$	I_F = 16mA	—	−2	—	mV /°C
LDE	Reverse current	I_R	V_R = 3V	—	—	10	μA
LDE	Capacitance between terminals	C_T	V_F = 0, f = 1MHz	—	30	—	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} = 30V V_O = 20V	—	—	5	μA
Detector	High level output current	I_{OH}	I_F = 0mA, V_{CC} = 30V V_O = 20V, Ta = 70°C	—	—	50	μA
Detector	High level supply current	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	—	—	%
Coupled	Low level output voltage	V_{OL}	I_F = 16mA, V_{CC} = 4.5V I_O = 2.4 mA	—	—	0.4	V
Coupled	Isolation resistance	R_S	R.H.≤ 60%, V_S = 500V (Note 5)	5×10^{10}	10^{14}	—	Ω
Coupled	Stray capacitance between input to output	C_S	V_S= 0, f = 1MHz (Note 5)	—	0.8	—	pF

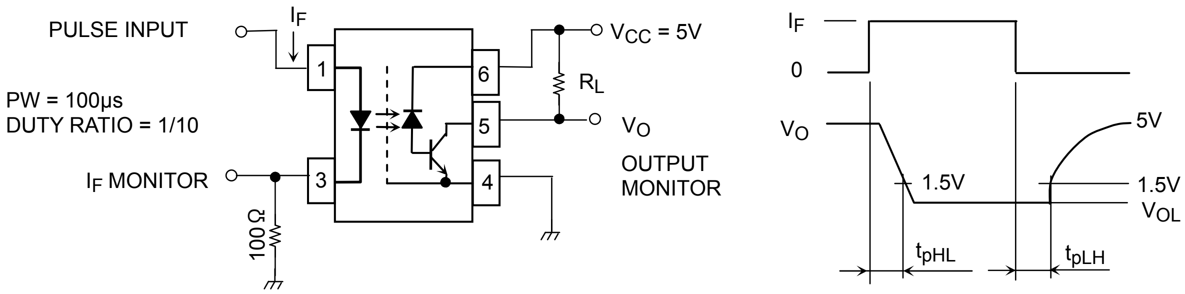
Switching Characteristics (Ta = 25°C, VCC = 5V)

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	—	—	0.8	μs
Propagation delay time (L→ H)	t_{pLH}	1	IF = 16→ 0mA V_{CC} = 5V, R_L = 1.9kΩ	—	—	0.8	μs
Common mode transient immunity at high output level	C_{MH}	2	I_F = 0mA, V_{CM} = 400V_{p-p} R_L = 4.1kΩ	5000	10000	—	V / μs
Common mode transient immunity at low output level	C_{ML}	2	I_F = 16mA, V_{CM} = 400V_{p-p} R_L = 4.1kΩ	−5000	−10000	—	V / μs

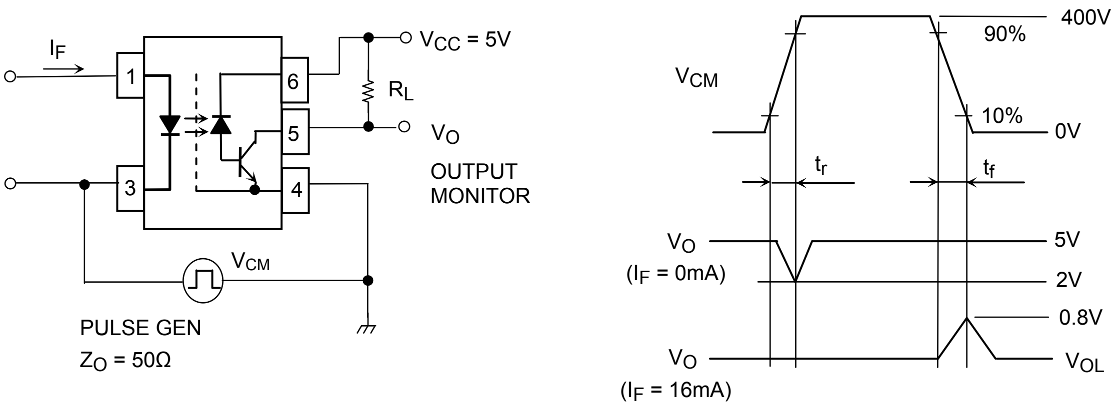
(Note 5) Device considered a two−terminal device: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.

(Note 6) Maximum electrostatic discharge voltage for any pins: 100V(C=200pF, R=0)

Test Circuit 1: Switching Time Test Circuit

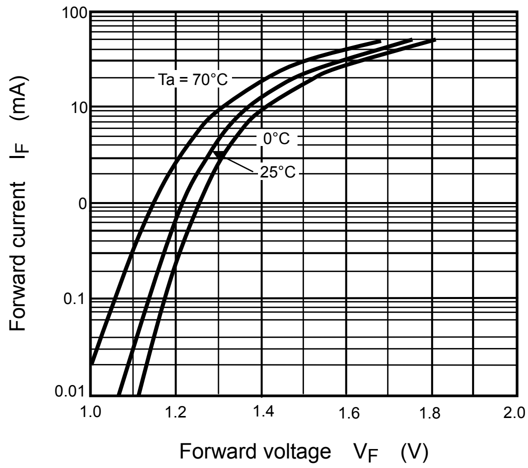


Test Circuit =2: Common Mode Transient Immunity Test Circuit

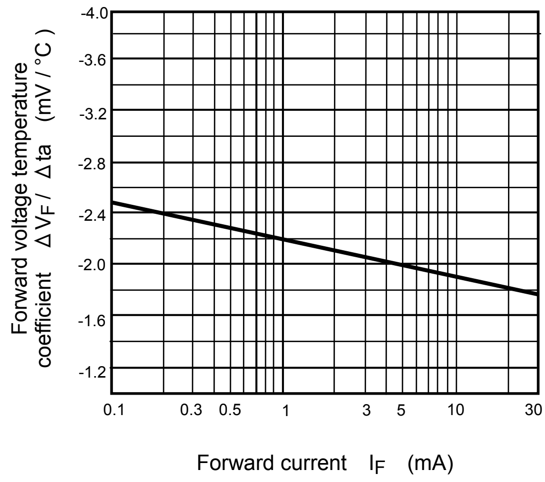


$$CM_H = \frac{320(V)}{t_r(\mu s)},\quad CM_L = \frac{320(V)}{t_r(\mu s)}$$

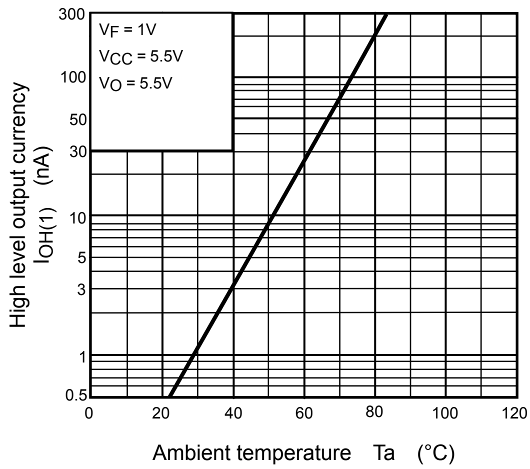
I_F – V_F



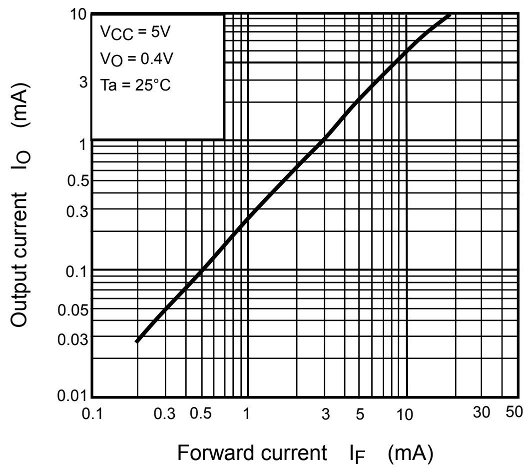
ΔV_F / Δta – I_F



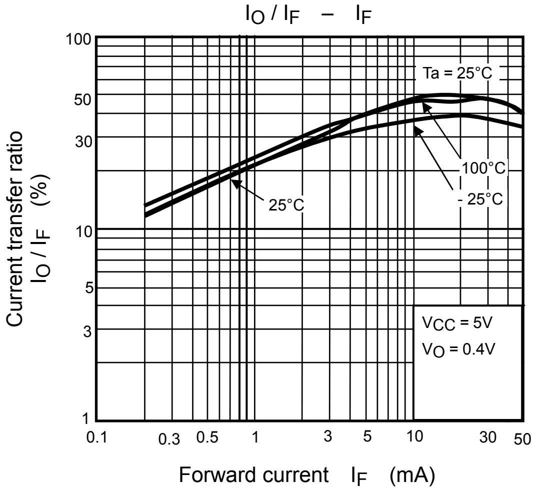
$I_{OH(1)}$ – Ta



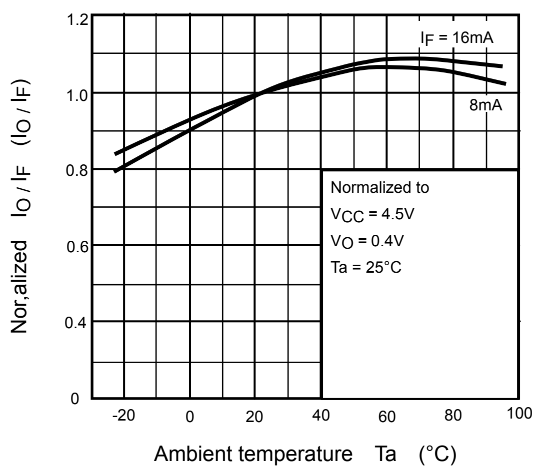
I_O – I_F



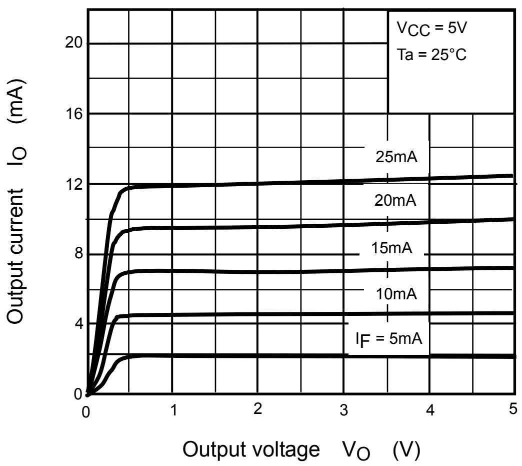
I_O / I_F – I_F



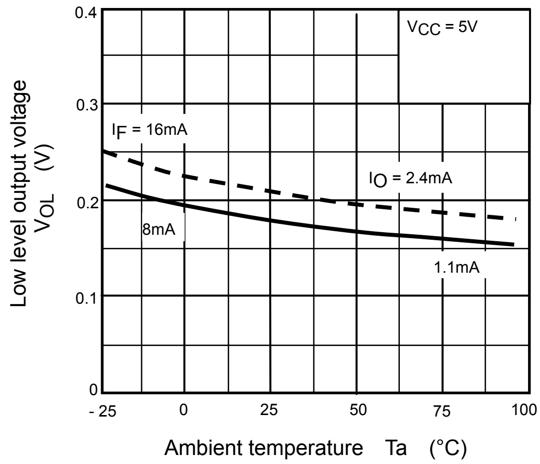
I_O / I_F – Ta



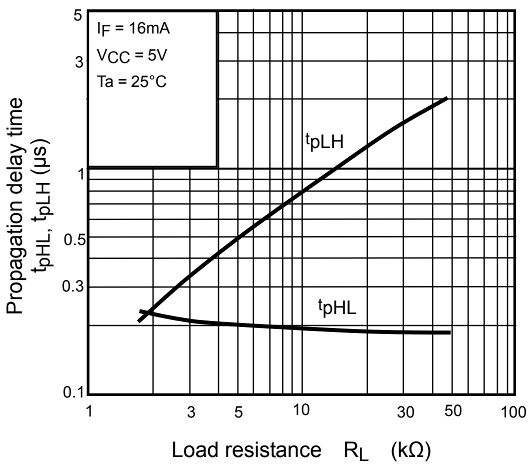
I_O – V_O



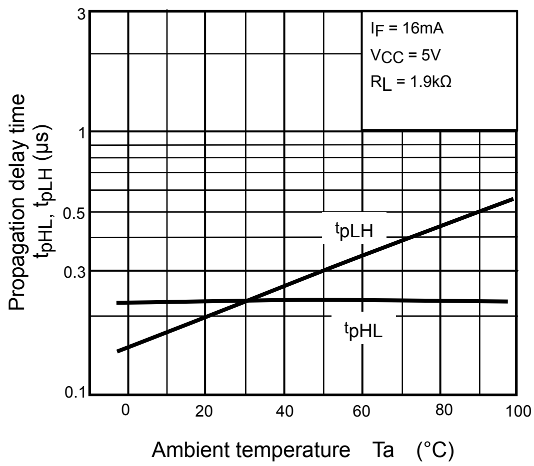
V_{OL} – Ta



t_{pHL}, t_{pLH} – R_L



t_{pHL}, t_{pLH} – Ta



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