

TOSHIBA Photocoupler GaAlAs Ired & Photo-IC

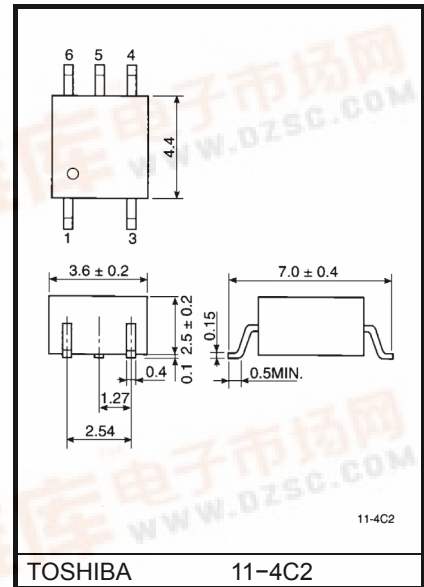
# TLP114A

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

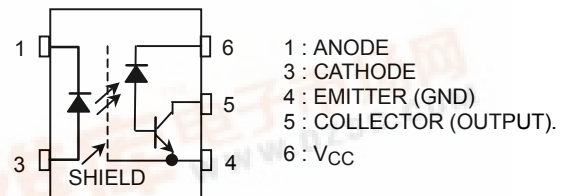
The TOSHIBA mini flat coupler TLP114A is a small outline coupler, suitable for surface mount assembly. TLP114A consists of a high output power GaAlAs light emitting diode, optically coupled to a high speed detector of one chip photodiode-transistor.

- Isolation voltage: 3750 Vrms (min.)
- Switching speed:  $t_{pHL} = 0.8\mu s$ ,  $t_{pLH} = 0.8\mu s$  (max.) ( $R_L = 1.9 k\Omega$ )
- TTL compatible
- UL recognized: UL1577, file no. E67349

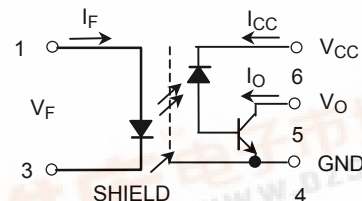
Unit in mm



## Pin Configuration (top view)



## Schematic



## Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LDE	Forward current (Note 1)	I <sub>F</sub>	20	mA
	Pulse forward current (Note 2)	I <sub>FP</sub>	40	mA
	Peak transient forward current (Note 3)	I <sub>FPT</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
Detector	Output current	I <sub>O</sub>	8	mA
	Peak output current	I <sub>OP</sub>	16	mA
	Supply voltage	V <sub>CC</sub>	-0.5~30	V
	Output voltage	V <sub>O</sub>	-0.5~20	V
	Output power dissipation (Note 4)	P <sub>O</sub>	100	mW
Operating temperature range		T <sub>opr</sub>	-55~100	°C
Storage temperature range		T <sub>stg</sub>	-55~125	°C
Lead solder temperature(10 sec.)		T <sub>sol</sub>	260	°C
Isolation Voltage (AC, 1 min., R.H. ≤ 60%) (Note 5)		BV <sub>S</sub>	3750	V <sub>rms</sub>

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, 1ms 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	$V_F$	$I_F = 16\text{mA}$	1.22	1.42	1.72	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta T_a$	$I_F = 16\text{mA}$	—	-2	—	mV / °C
	Reverse current	$I_R$	$V_R = 3\text{V}$	—	—	10	$\mu\text{A}$
	Capacitance between terminals	$C_T$	$V_F = 0, f = 1\text{MHz}$	—	30	—	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
		$I_{OH(2)}$	$I_F = 0\text{mA}, V_{CC} = 30\text{V}$ $V_O = 20\text{V}$	—	—	5	$\mu\text{A}$
		$I_{OH}$	$I_F = 0\text{mA}, V_{CC} = 30\text{V}$ $V_O = 20\text{V}, T_a = 70^\circ\text{C}$	—	—	50	
	High level supply current	$I_{CCH}$	$I_F = 0\text{mA}, V_{CC} = 30\text{V}$	—	0.01	1	$\mu\text{A}$
Coupled	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	—	—	%
	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 resistance	$R_S$	R.H. $\leq 60\%$ , $V_S = 500\text{V}$ (Note 5)	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
	Stray capacitance between input to output	$C_S$	$V_S = 0, f = 1\text{MHz}$ (Note 5)	—	0.8	—	pF

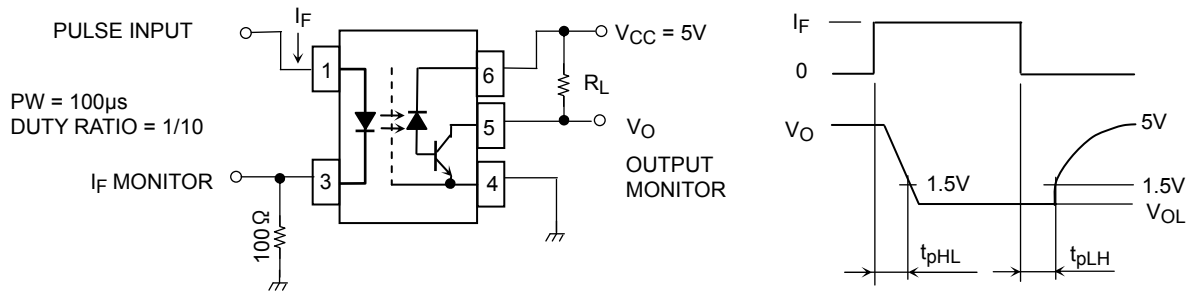
## Switching Characteristics (Ta = 25°C, VCC = 5V)

Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time (H → L)	$t_{pHL}$	1	$I_F = 0 \rightarrow 16\text{mA}$ $V_{CC} = 5\text{V}, R_L = 1.9\text{k}\Omega$	—	—	0.8	$\mu\text{s}$
Propagation delay time (L → H)	$t_{pLH}$	1	$I_F = 16 \rightarrow 0\text{mA}$ $V_{CC} = 5\text{V}, R_L = 1.9\text{k}\Omega$	—	—	0.8	$\mu\text{s}$
Common mode transient immunity at high output level	$C_{MH}$	2	$I_F = 0\text{mA}$ , $V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$	5000	10000	—	V / $\mu\text{s}$
Common mode transient immunity at low output level	$C_{ML}$	2	$I_F = 16\text{mA}$ , $V_{CM} = 400\text{V}_{p-p}$ $R_L = 4.1\text{k}\Omega$	-5000	-10000	—	V / $\mu\text{s}$

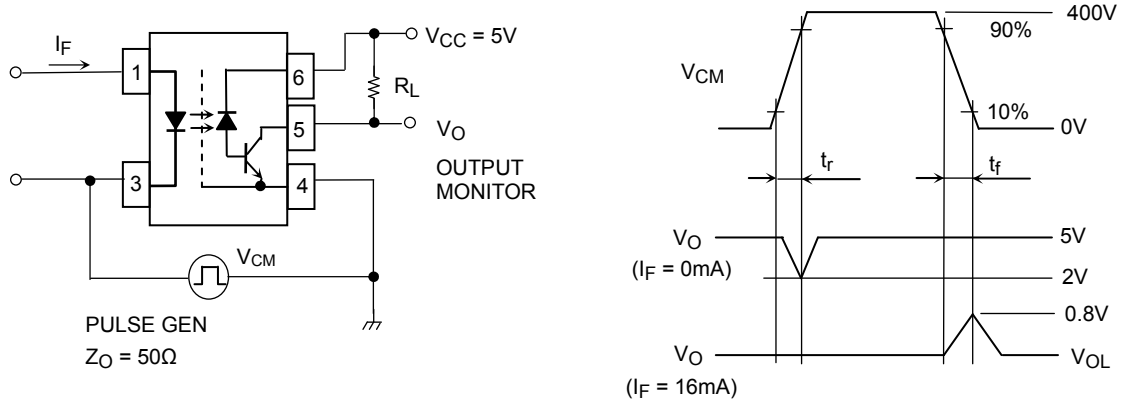
(Note 5) Device considered a two-terminal device: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.

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

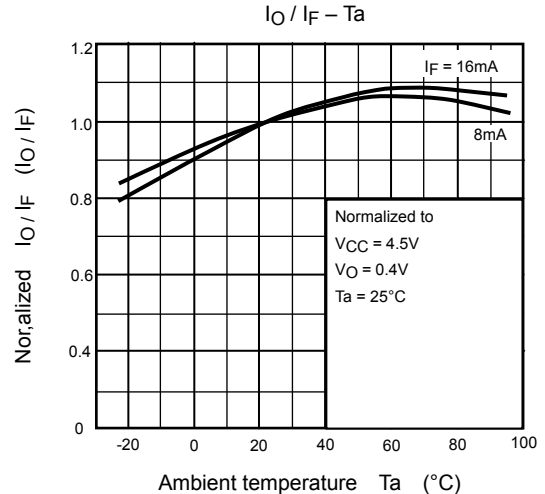
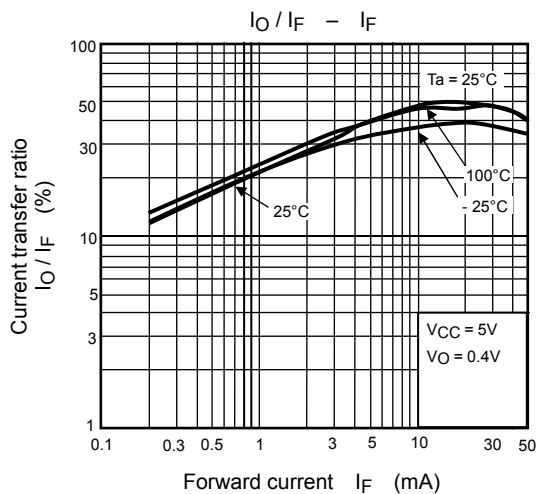
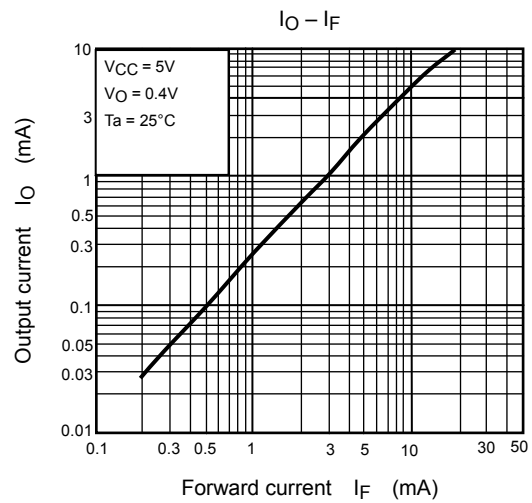
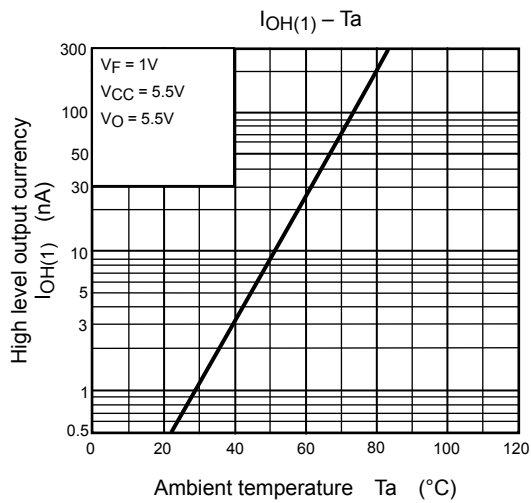
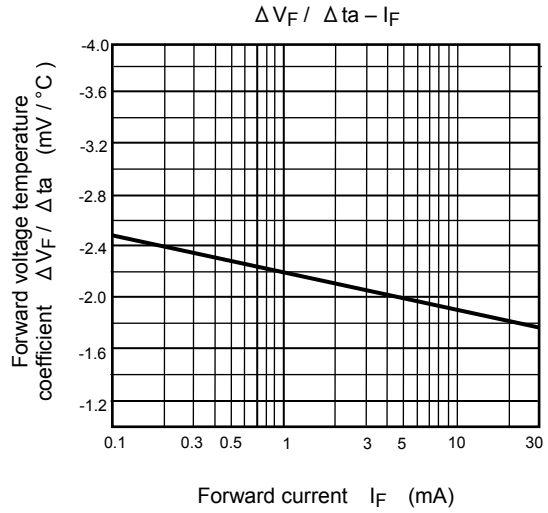
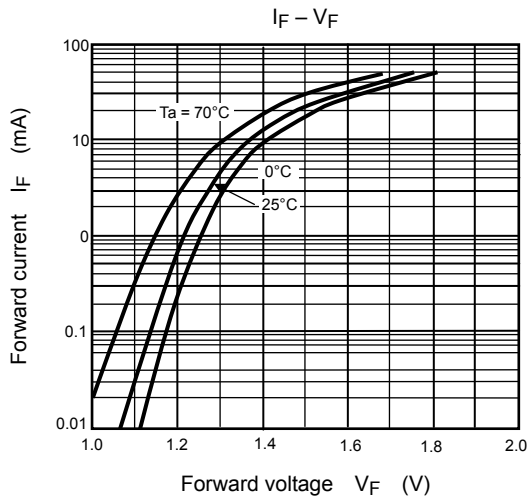
## Test Circuit 1: Switching Time Test Circuit

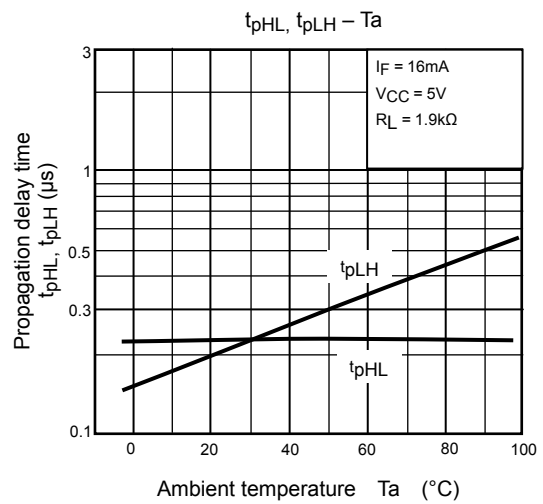
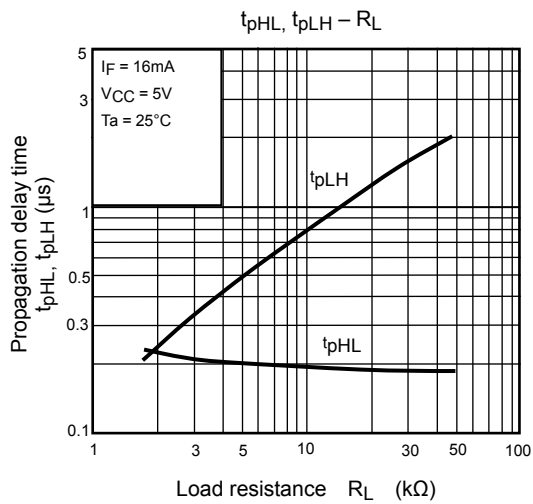
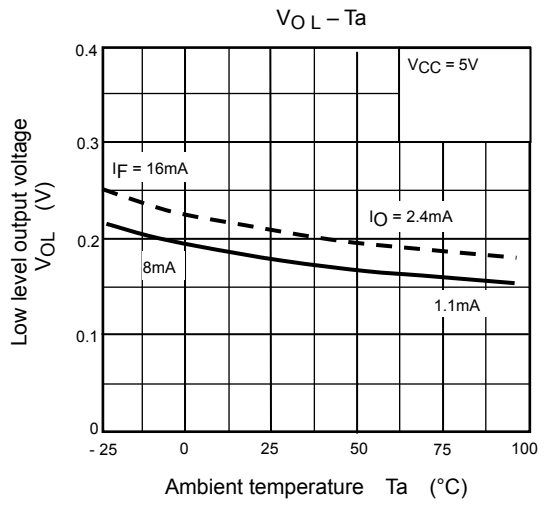
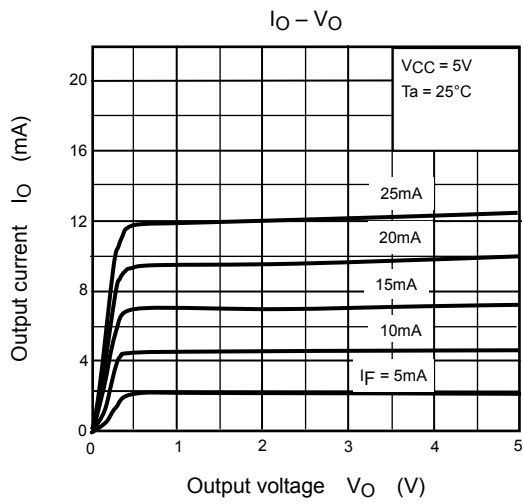


## Test Circuit =2: Common Mode Transient Immunity Test Circuit



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





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