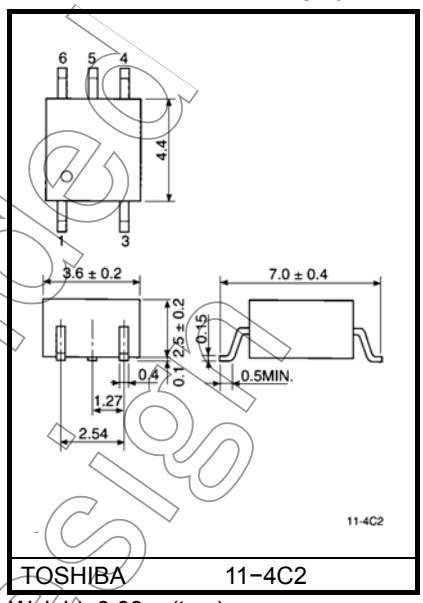
TOSHIBA Photocoupler GaAℓAs Ired & Photo−IC

TLP112A

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

Unit in mm



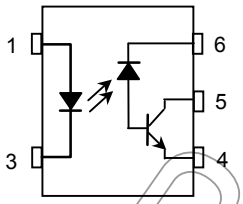
TOSHIBA 11−4C2

Weight: 0.09 g (typ.)

The TOSHIBA mini flat coupler TLP112A is a small outline coupler, suitable for surface mount assembly.
TLP112A consists of a high output power GaAℓAs light emitting diode, optically coupled to a high speed detector of one chip photodiode−transistor.

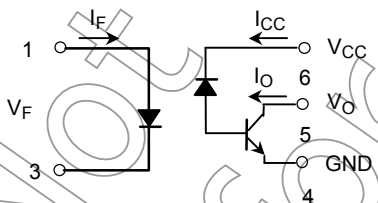
- Isolation voltage: 2500Vrms (min.)
- Switching speed: t_{pHL}=0.8μs, t_{pLH}=0.8μs(max.)(R_L=1.9kΩ)
- TTL compatible
- UL recognized: UL1577, file no. E67349

Pin Configuration(top view)



1: Anode
3: Cathode
4: Emitter (GND)
5: Collector (Output)
6: V_{CC}

Schematic



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Absolute Maximum Ratings (Ta = 25°C)

Characteristic			Symbol	Rating	Unit
LED	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}	−0.5~15	V
	Output voltage		V_O	−0.5~15	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 soldering temperature(10s)			T_{sol}	260	°C
Isolation voltage (AC, 1min., R.H.≤ 60%,		Note 5)	BV_S	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 0.36mA / °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.

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Electrical Characteristics(Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	I_F=16mA	1.22	1.42	1.72	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta Ta$	I_F=16mA	—	−2	—	mV / °C
	Reverse current	I_R	V_R=3V	—	—	10	μA
	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
		$I_{OH(2)}$	I_F=0mA, V_{CC}=V_O=15V	—	—	5	μA
		I_{OH}	I_F=0mA, V_{CC}=V_O=15V Ta=70°C	—	—	50	
	High level supply current	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	20	—	—	%
	Low level output voltage	V_{OL}	I_F=16mA, V_{CC}=4.5V I_O=2.4mA	—	—	0.4	V
	Isolation resistance	R_S	R.H.≤ 60% V_S=500V DC (Note 5)	5×10^{10}	10^{14}	—	Ω
	Stray capacitance between input to output	C_S	V_S=0, f=1MHz (Note 5)	—	0.8	—	pF

Switching Characteristics(Ta = 25°C)

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, R_L=1.9kΩ	—	—	0.8	μs
Propagation delay time (L→H)	t_{pLH}	1	I_F=16→0mA V_{CC}=5V, R_L=1.9kΩ	—	—	0.8	μs
Common mode transient imunity at high output level	CM_H	2	I_F=0mA, V_{CM}=200V_{p-p} R_L=4.1kΩ	—	1500	—	V / μs
Common mode transient imunity at low output level	CM_L	2	I_F=16mA, V_{CM}=200V_{p-p} R_L=4.1kΩ	—	−1500	—	V / μs

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

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

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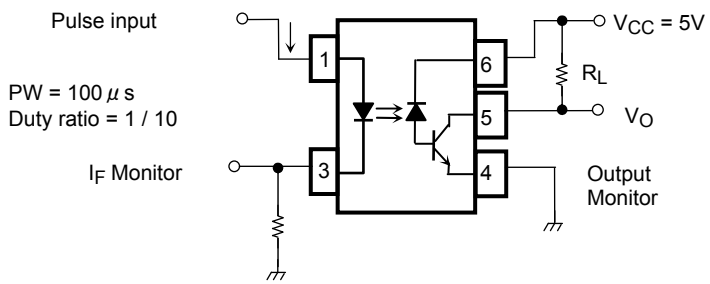
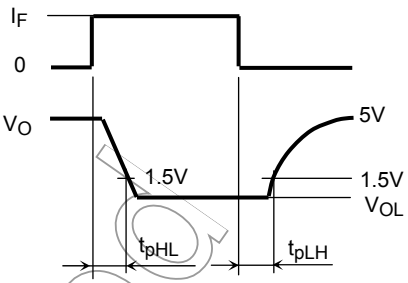
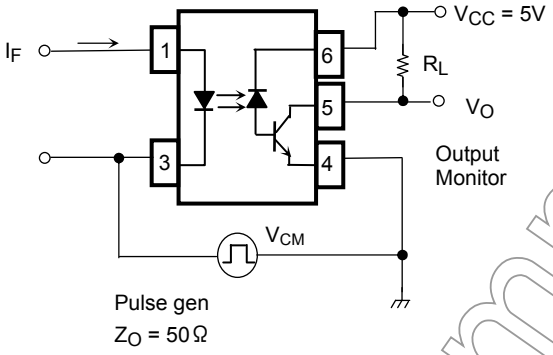
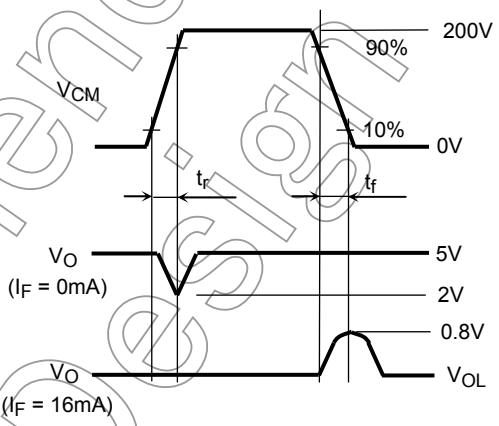
Test Circuit 1: Switching Time Test Circuit





Test Circuit 2: Common Mode Transient Immunity Test Circuit





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

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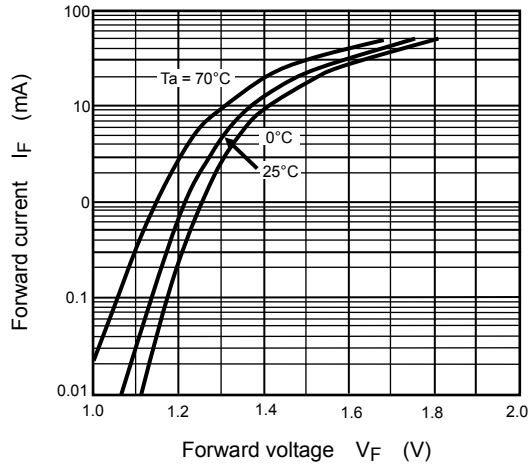
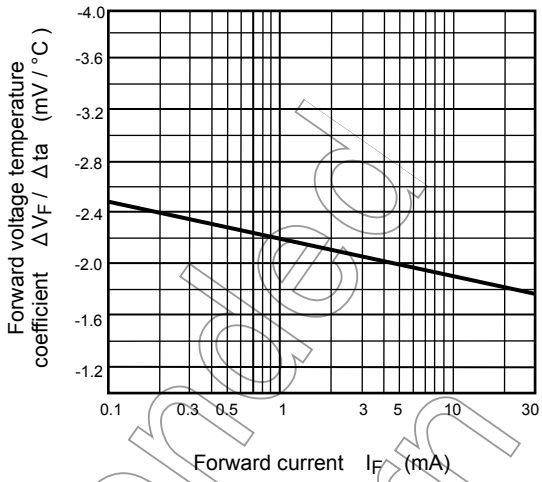
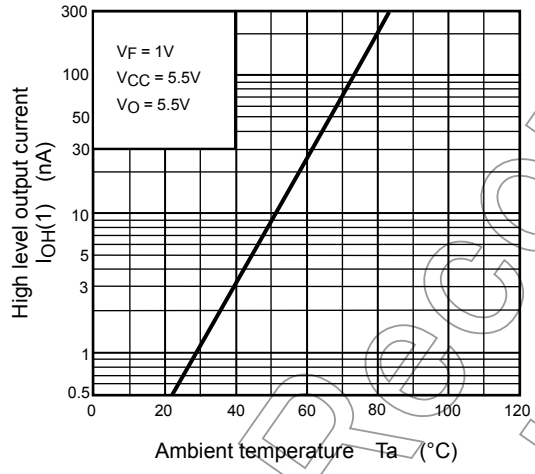
$I_F - V_F$



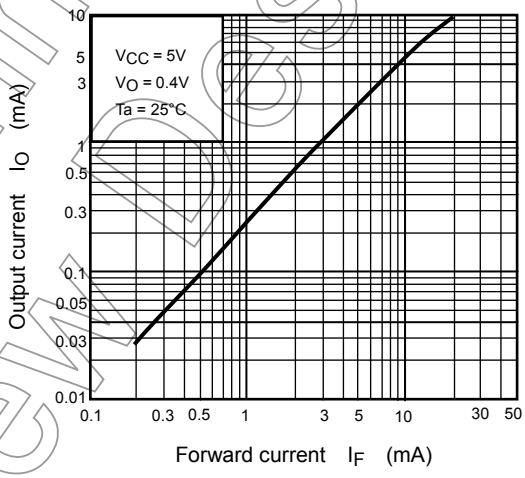
$\Delta V_F / \Delta Ta - I_F$



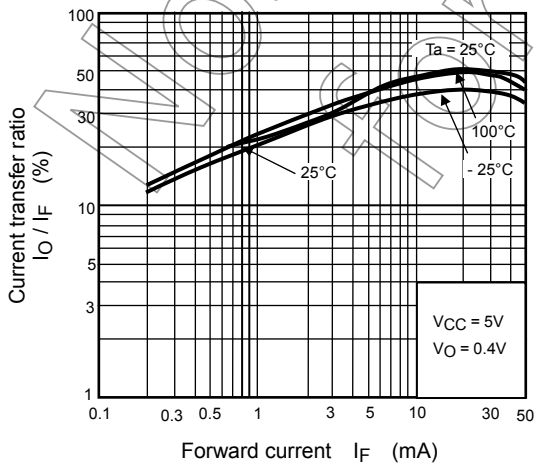
$I_{OH(1)} - Ta$



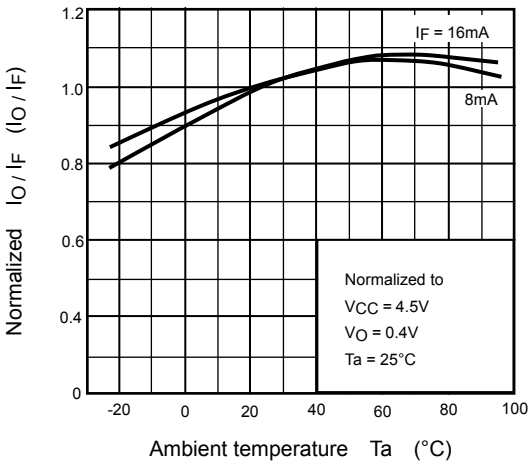
$I_O - I_F$



$I_O / I_F - I_F$



$I_O / I_F - Ta$



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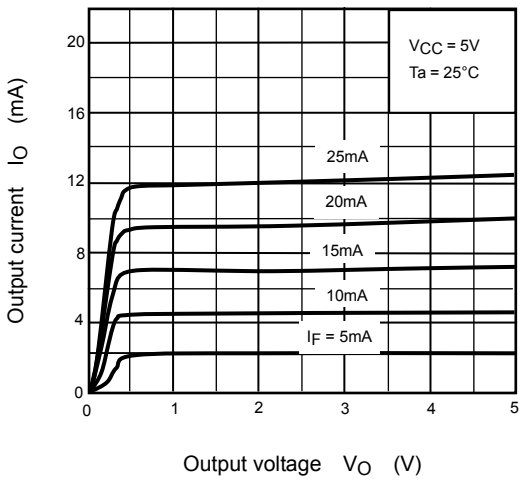
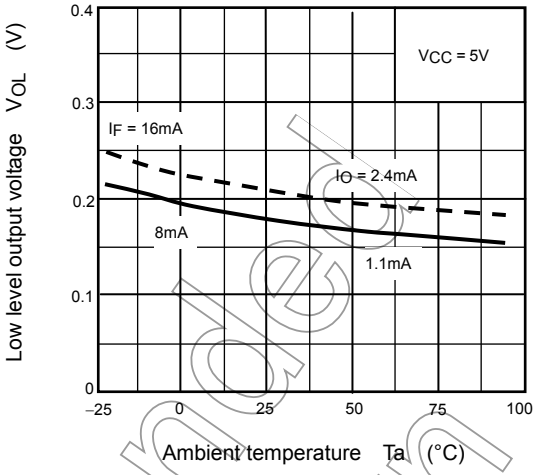
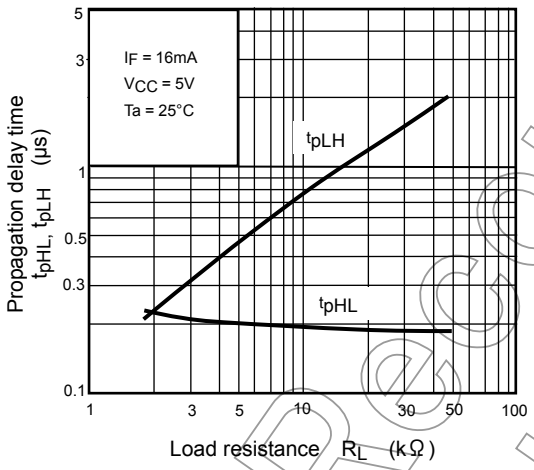
$I_O - V_O$



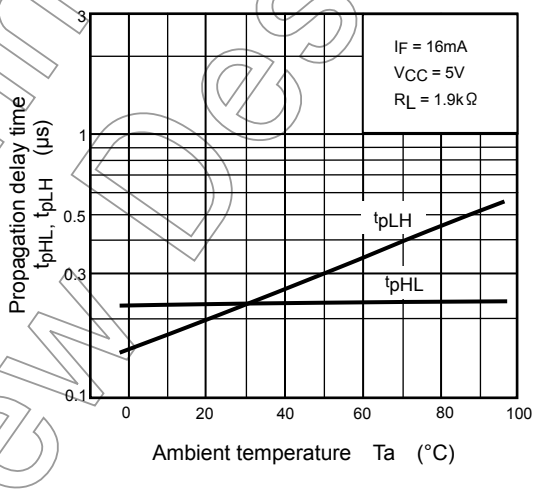
$V_{OL} - Ta$



$t_{pHL}, t_{pLH} - R_L$



$t_{pHL}, t_{pLH} - Ta$



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