

TOSHIBA Photocoupler PHOTORELAY

# TLP3121

Measurement Instruments

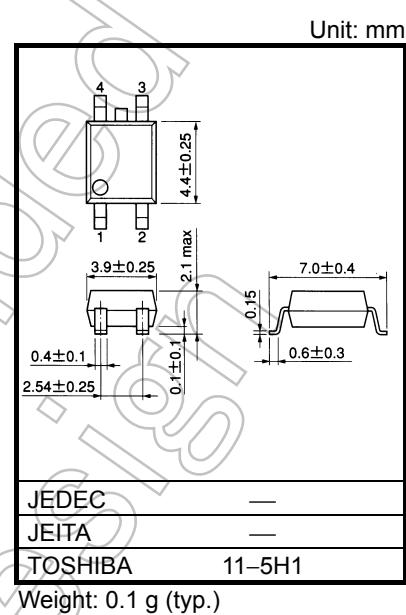
Logic Testers / Memory Testers

Board Testers / Scanners

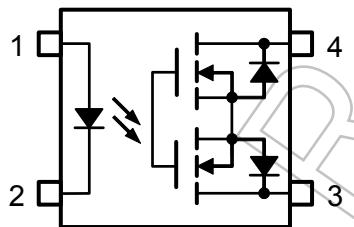
The TOSHIBA TLP3121 Mini-flat photorelay is a small-outline photorelay, suitable for surface-mount assembly. The TLP3121 consists of a GaAs infrared-emitting diode optically coupled to a photo-MOS FET and housed in a 4-pin package.

## Features

- 4 pin SOP (2.54SOP4) : 2.1 mm high, 2.54 mm pitch
- 1-Form-A
- Peak off-state voltage : 80 V (min)
- Trigger LED current : 4 mA (max)
- ON-State current : 350 mA (max)
- ON-state resistance : 1.2 Ω (max)
- OFF-state capacitance : 40 pF (max)
- Isolation voltage : 1500 Vrms (min)



## Pin configuration (top view)



1 : Anode  
2 : Cathode  
3 : Drain  
4 : Drain

Start of commercial production  
2000/12

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

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	50	mA
	Forward current derating (Ta ≥ 25°C)	ΔI <sub>F</sub> /°C	-0.5	mA/°C
	Reverse voltage	V <sub>R</sub>	5	V
Detector	Junction temperature	T <sub>j</sub>	125	°C
	OFF-state output terminal voltage	V <sub>OFF</sub>	80	V
	ON-state current	I <sub>ON</sub>	350	mA
	ON-state current derating (Ta ≥ 50°C)	ΔI <sub>ON</sub> /°C	-3.5	mA/°C
Junction temperature		T <sub>j</sub>	125	°C
Storage temperature range		T <sub>stg</sub>	-40 to 125	°C
Operating temperature range		T <sub>opr</sub>	-20 to 85	°C
Lead soldering temperature (10 s)		T <sub>sol</sub>	260	°C
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 1)		B <sub>VS</sub>	1500	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): Device considered a two-terminal device : LED side pins shorted together, and detector side pins shorted together.

**Recommended Operating Conditions**

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>DD</sub>	—	—	64	V
Forward current	I <sub>F</sub>	5	—	30	mA
On-state current	I <sub>ON</sub>	—	—	350	mA
Operating temperature	T <sub>opr</sub>	25	—	60	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

**Individual Electrical Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA	1.0	1.15	1.3	V
	Reverse current	I <sub>R</sub>	V <sub>R</sub> = 5 V	—	—	10	μA
	Capacitance	C <sub>T</sub>	V = 0, f = 1 MHz	—	15	—	pF
Detector	Off-state current	I <sub>OFF</sub>	V <sub>OFF</sub> = 30 V, Ta = 50°C	—	200	1000	pA
	Capacitance	C <sub>OFF</sub>	V = 0, f = 100 MHz	—	30	40	pF

Coupled Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$	$I_{ON} = 350 \text{ mA}$	—	1	4	mA
Return LED current	$I_{FC}$	$I_{OFF} = 10 \mu\text{A}$	0.2	—	—	mA
On-state resistance	$R_{ON}$	$I_{ON} = 350 \text{ mA}, I_F = 5 \text{ mA}$	—	1.0	1.2	$\Omega$

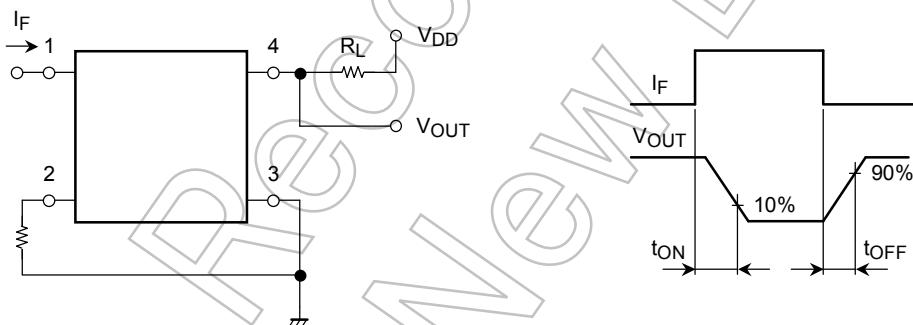
Isolation Characteristics ( $T_a = 25^\circ\text{C}$ )

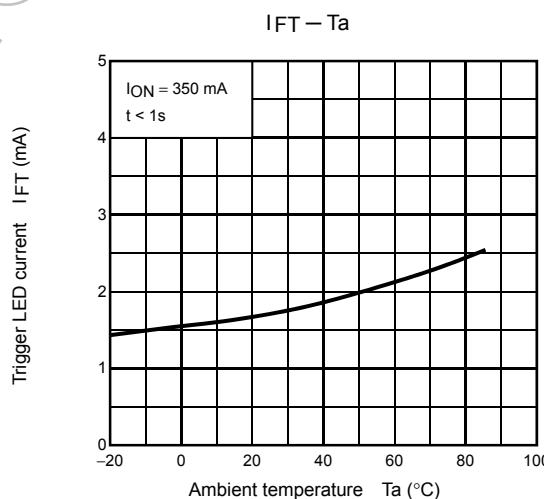
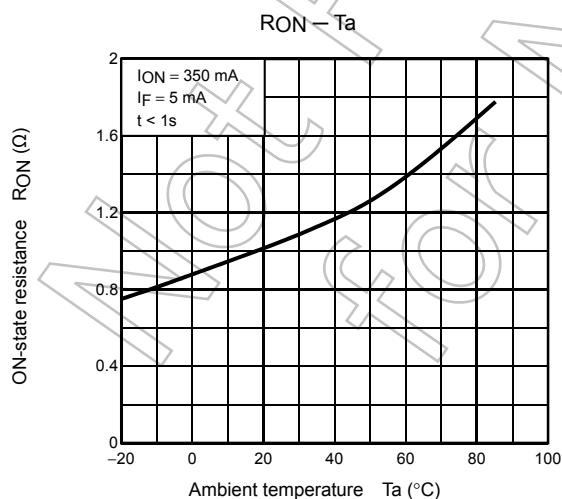
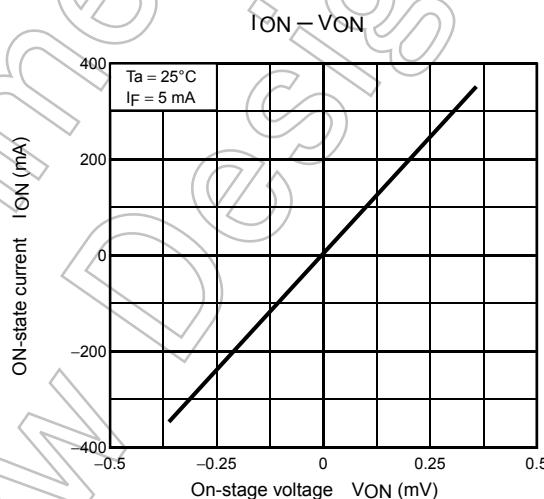
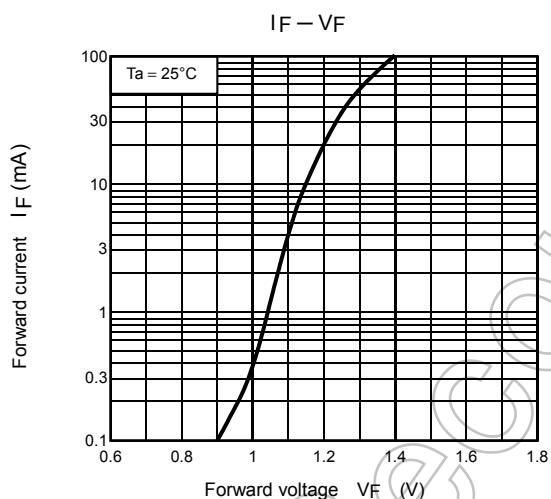
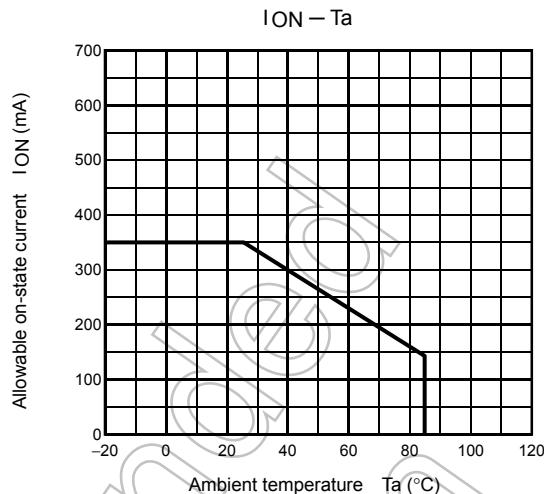
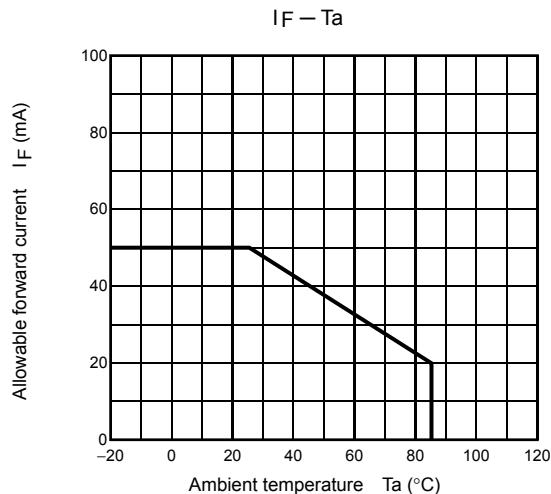
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	1500	—	—	Vrms
		AC, 1 second (in oil)	—	3000	—	
		DC, 1 minute (in oil)	—	3000	—	Vdc

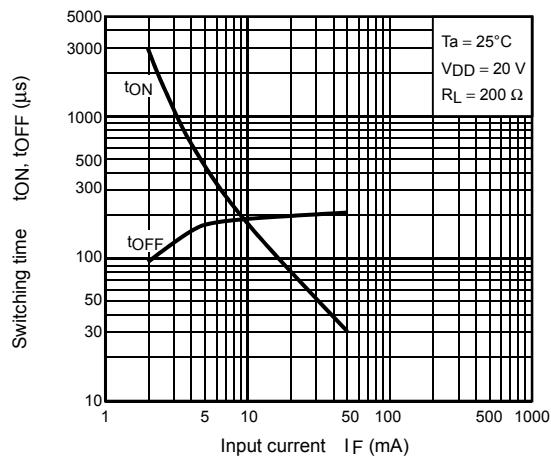
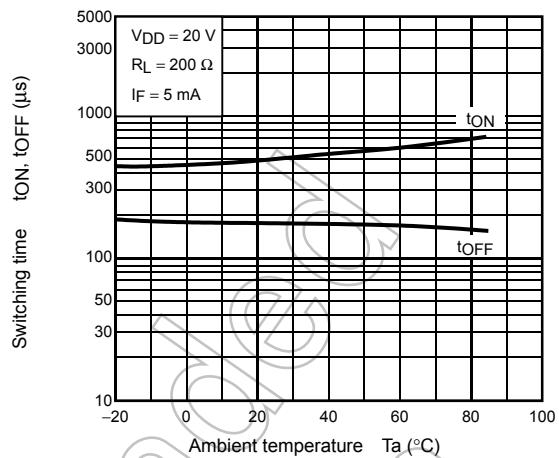
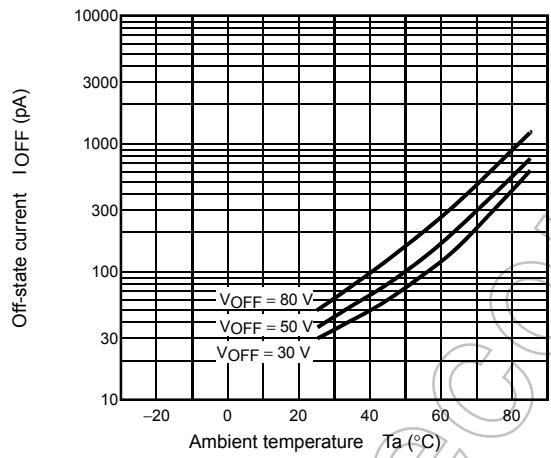
Switching Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	300	500	$\mu\text{s}$
Turn-off time	$t_{OFF}$		—	300	500	

(Note 2) : switching time test circuit





t<sub>ON,tOFF</sub> – I<sub>F</sub>t<sub>ON,tOFF</sub> –  $T_a$ I<sub>OFF</sub> –  $T_a$ 

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