

TOSHIBA Photocoupler Photorelay

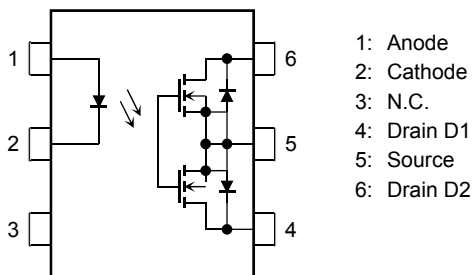
# TLP3100

## Measurement Equipment FA (Factory Automation) Power Line Control

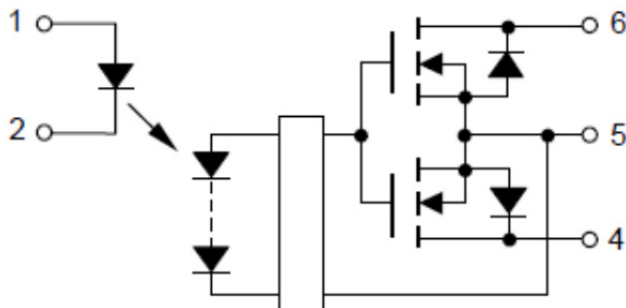
The Toshiba TLP3100 consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a SOP, which is suitable for surface-mount assembly. The TLP3100 features high ON-state current and low ON-state resistance, hence the TLP3100 is suitable to control a power line.

- 6-pin SOP (2.54SOP6): 2.1 mm high, 2.54 mm pitch
- Normally opened (form A) device
- Peak OFF-state voltage: 20 V (min)
- Trigger LED current: 3 mA (max)
- ON-state current: 2.5 A (max) ( $T_a=50^\circ\text{C}$ )
- ON-state resistance: 0.02  $\Omega$  (typ.), 0.05  $\Omega$  (max)
- Capacitance: 1000 pF (typ.)
- OFF-state current: 10 nA (max)
- Isolation voltage: 1500 V<sub>rms</sub> (min)

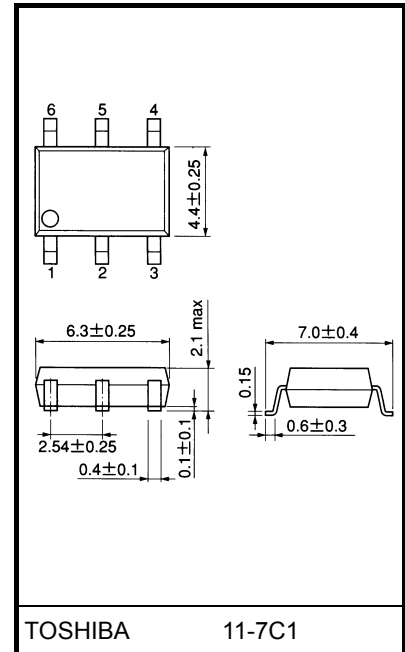
### Pin Configuration (top view)



### Schematic



Unit: mm



Weight: 0.13 g (typ.)

Start of commercial production  
2008/04

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

Characteristics		Symbol	Rating	Unit	
LED	Forward current	$I_F$	30	mA	
	Forward current derating (Ta ≥ 25°C)	$\Delta I_F/^\circ\text{C}$	-0.3	mA/°C	
	Reverse voltage	$V_R$	5	V	
	Junction temperature	$T_j$	125	°C	
Detector	Off-state output terminal voltage	$V_{OFF}$	20	V	
	On-state current	A connection	$I_{ON}$	2.5	A
		B connection		2.5	
		C connection		5.0	
	On-state current derating (Ta ≥ 50°C)	A connection	$\Delta I_{ON}/^\circ\text{C}$	-33.3	mA/°C
		B connection		-33.3	
		C connection		-66.7	
	Junction temperature		$T_j$	125	°C
Storage temperature		$T_{stg}$	-55 to 125	°C	
Operating temperature		$T_{opr}$	-40 to 85	°C	
Lead soldering temperature (10 s)		$T_{sol}$	260	°C	
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 1)		$BV_S$	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: Pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

## Caution

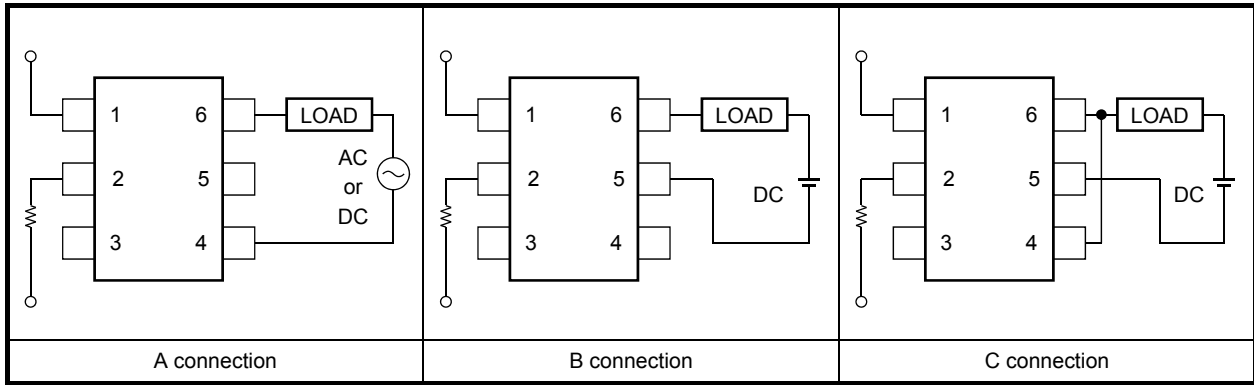
This device is sensitive to electrostatic discharge. When using this device, please ensure that all tools and equipment are earthed.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$	—	—	20	V
Forward current	$I_F$	5	10	20	mA
Operating temperature	$T_{opr}$	-20	—	65	°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.

## Circuit Connections



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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward current	$V_F$	$I_F = 10 \text{ mA}$	1.18	1.33	1.48	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	70	—	pF
Detector	OFF-state current	$I_{OFF}$	$V_{OFF} = 20 \text{ V}$	—	—	10	nA
	Capacitance	$C_{OFF}$	$V = 0, f = 1 \text{ MHz}$	—	1000	—	pF

## Coupled Electrical Characteristics (Ta = 25°C)

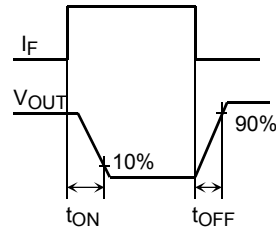
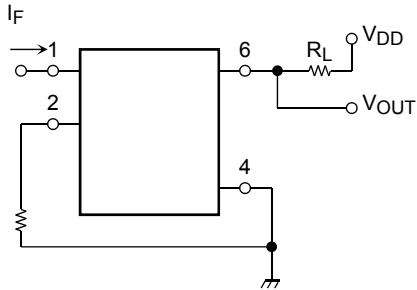
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current		$I_{FT}$	$I_{ON} = 100 \text{ mA}$	—	—	3	mA
Return LED current		$I_{FC}$	$I_{OFF} = 10 \mu\text{A}$	0.1	—	—	mA
On-state resistance	A connection	$R_{ON}$	$I_{ON} = 2.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.02	0.05	$\Omega$
	B connection		$I_{ON} = 2.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.01	0.025	
	C connection		$I_{ON} = 4.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.005	—	

## Isolation Characteristics (Ta = 25°C)

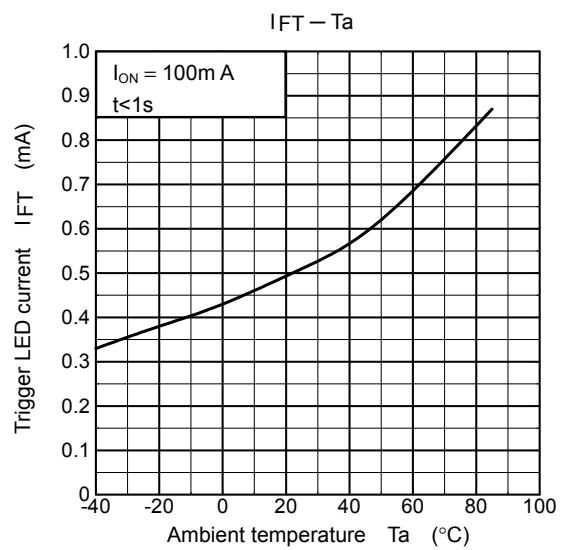
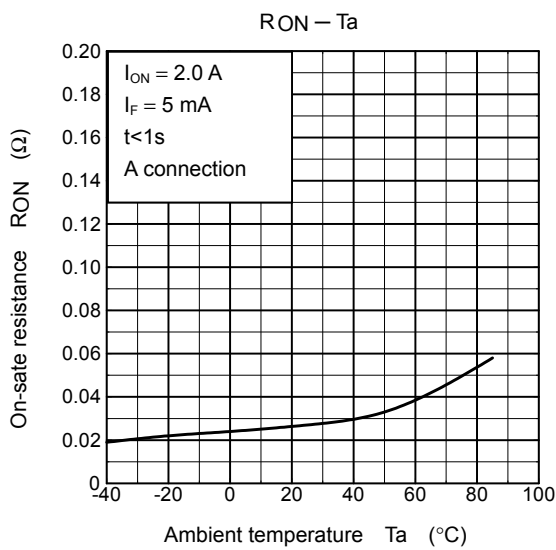
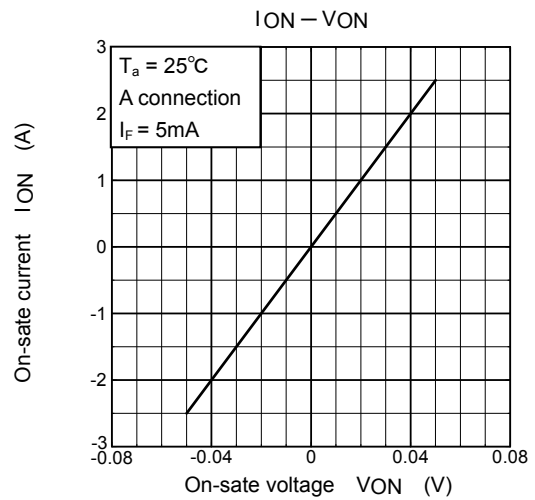
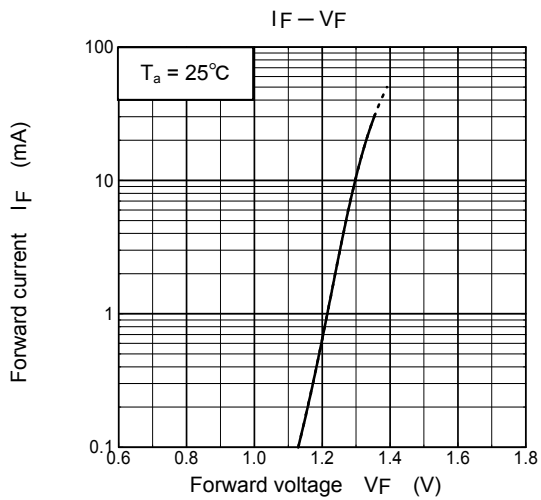
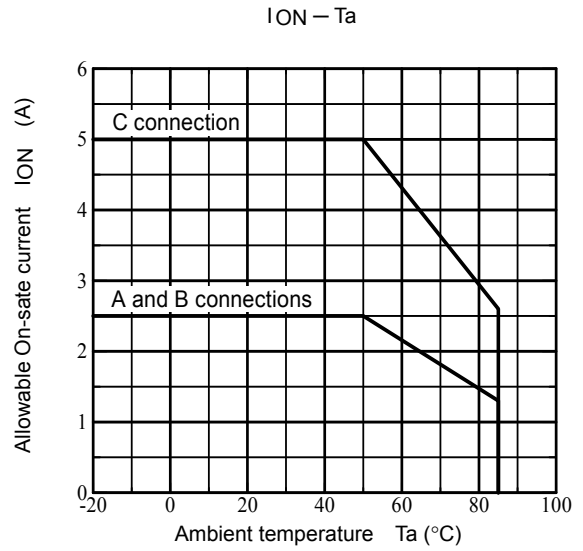
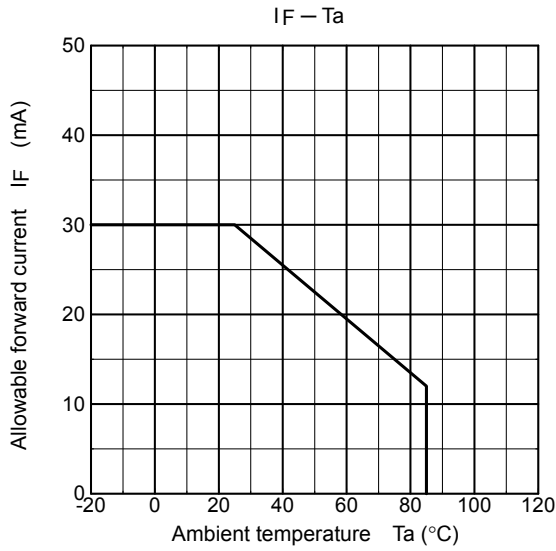
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	1500	—	—	Vrms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

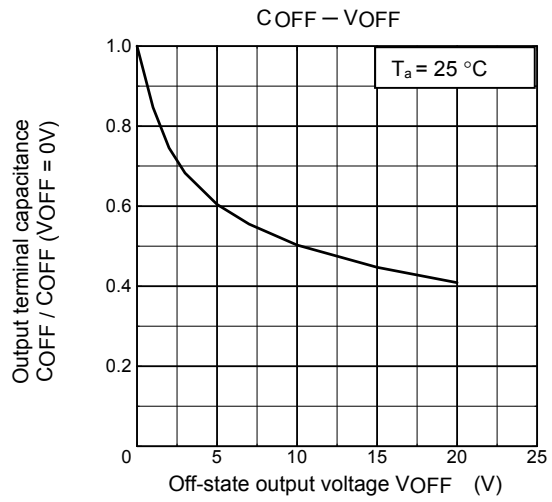
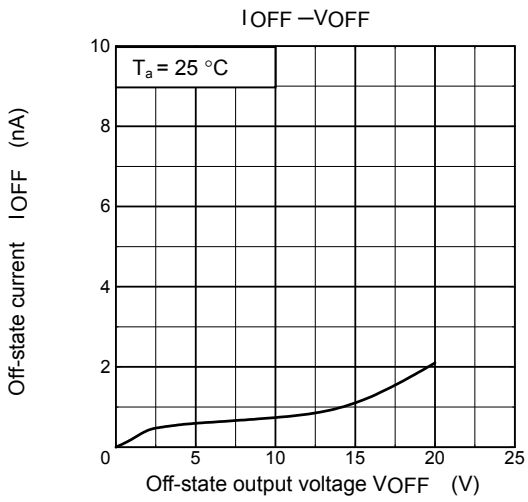
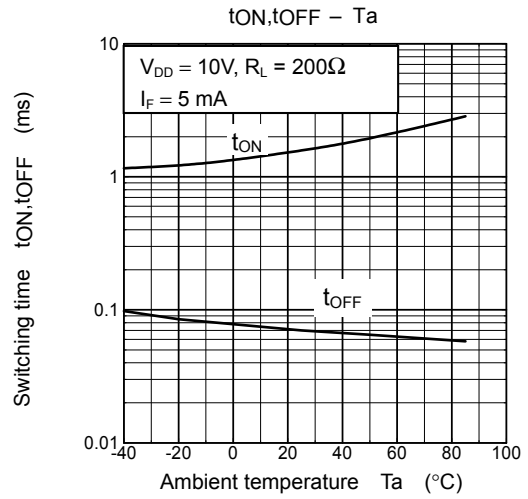
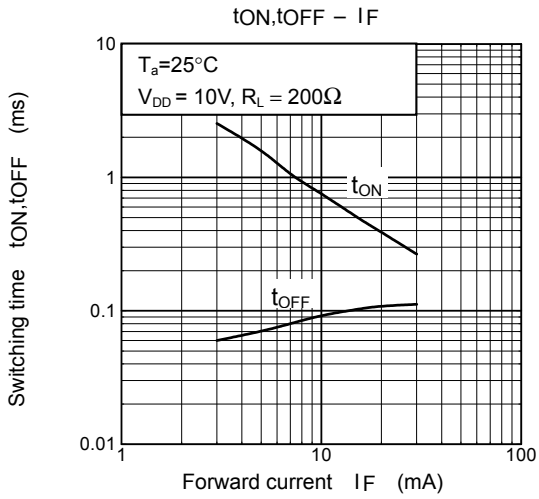
**Switching Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-ON time	$t_{ON}$	$R_L = 200 \Omega$ $V_{DD} = 10 \text{ V}, I_F = 5 \text{ mA}$ (Note 2)	—	1.5	5.0	ms
Turn-OFF time	$t_{OFF}$		—	0.1	1.0	



Note 2: Switching time test circuit





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