

TOSHIBA Photocoupler Photorelay

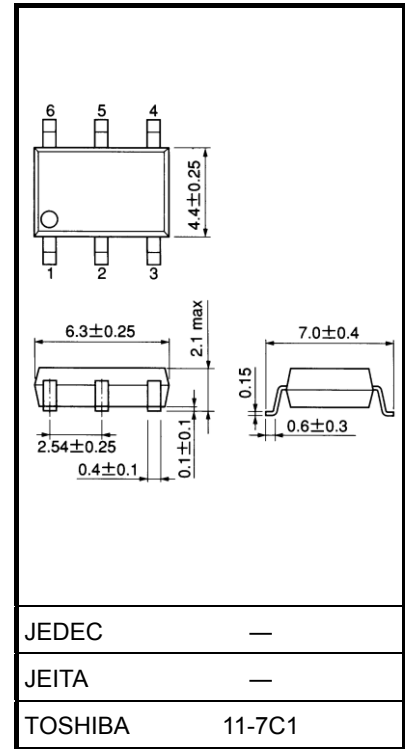
# TLP3103

Measurement Equipment  
 FA (Factory Automation)  
 Power Line Control  
 Security Systems

The Toshiba TLP3103 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 TLP3103 features high ON-state current and low ON-state resistance, hence the TLP3103 is suitable to control a power line.

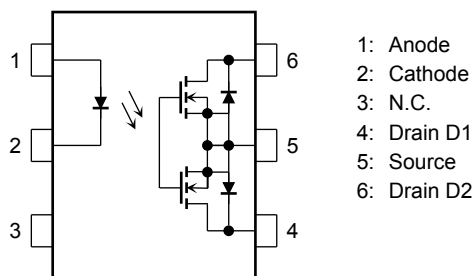
- 6-pin SOP (2.54SOP6): 2.1 mm high, 2.54 mm pitch
- Normally opened (form A) device
- Peak OFF-state voltage: 60 V (min)
- Trigger LED current: 3 mA (max)
- ON-state current: 2.3 A (max) (Ta=50°C)
- ON-state resistance: 0.04 Ω (typ.), 0.07 Ω (max)
- Capacitance between output terminals: 1000 pF (typ.)
- OFF-state current: 10 nA (max)
- Isolation voltage: 1500 V<sub>RMS</sub> (min)
- UL approved: UL1577, File No.E67349
- cUL approved :CSA Component Acceptance Service  
 No. 5A, File No.E67349

Unit: mm

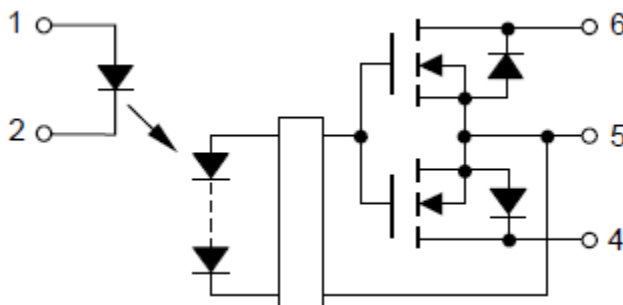


Weight: 0.13 g (typ.)

## Pin Configuration (top view)



## Schematic



Start of commercial production  
 2010-06

## 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	
	Diode power dissipation	$P_D$	50	mW	
	Diode power dissipation derating (Ta ≥ 25°C)	$\Delta P_D / ^\circ\text{C}$	-0.5	mW/°C	
	Junction temperature	$T_j$	125	°C	
Detector	Off-state output terminal voltage	$V_{OFF}$	60	V	
	On-state current	A connection	$I_{ON}$	2.3	A
		B connection		2.3	
		C connection		4.6	
	Forward current derating (Ta ≥ 50°C)	A connection	$\Delta I_{ON} / ^\circ\text{C}$	-30.7	mA/°C
		B connection		-30.7	
		C connection		-61.3	
	On-state current (pulsed) (t = 100 ms)	$I_{ONP}$	7	A	
	Output power dissipation	$P_O$	370	mW	
	Output power dissipation derating (Ta ≥ 50°C)	$\Delta P_O / ^\circ\text{C}$	-4.94	mW / °C	
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).

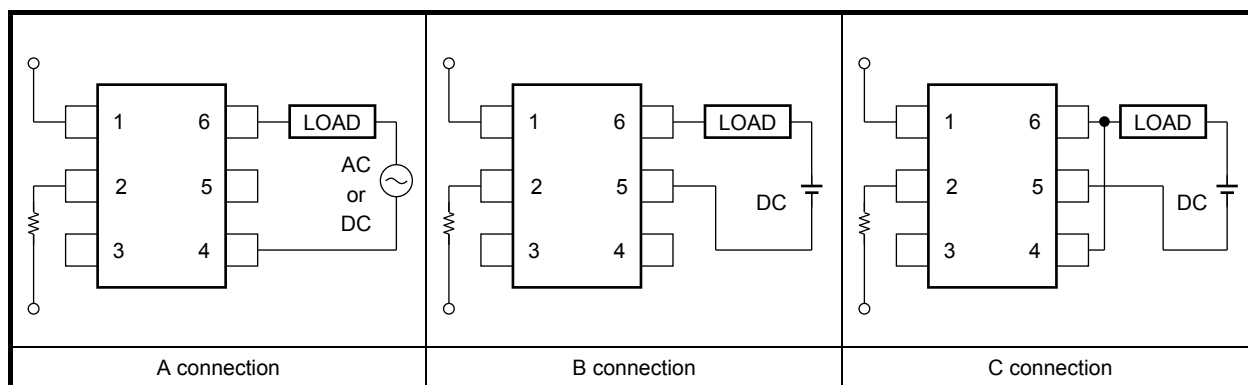
Note 1: Device considered a two-terminal device: Pins 1 and 2 shorted together, and pins 4, 5 and 6 shorted together.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$	—	—	60	V
Forward current	$I_F$	—	7.5	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 between terminals	$C_T$	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	70	—	pF
Detector	OFF-state current	$I_{OFF}$	$V_{OFF} = 60 \text{ V}$	—	—	10	nA
	Capacitance between terminals	$C_{OFF}$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	1000	—	pF

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current		$I_{FT}$	$I_{ON} = 100 \text{ mA}$	—	0.4	3	mA
Return LED current		$I_{FC}$	$I_{OFF} = 10 \mu\text{A}$	0.1	—	—	mA
On-state resistance	A connection	$R_{ON}$	$I_{ON} = 2.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.04	0.07	$\Omega$
	B connection		$I_{ON} = 2.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.02	0.04	
	C connection		$I_{ON} = 4.0 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.01	—	

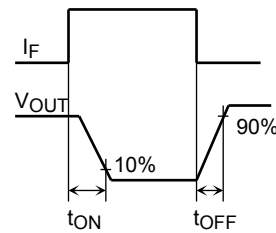
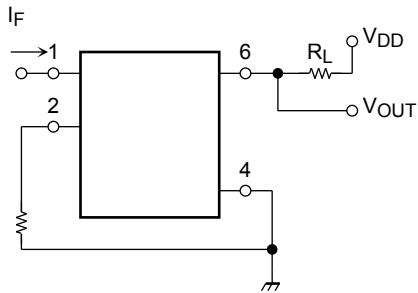
## Isolation Characteristics (Ta = 25°C)

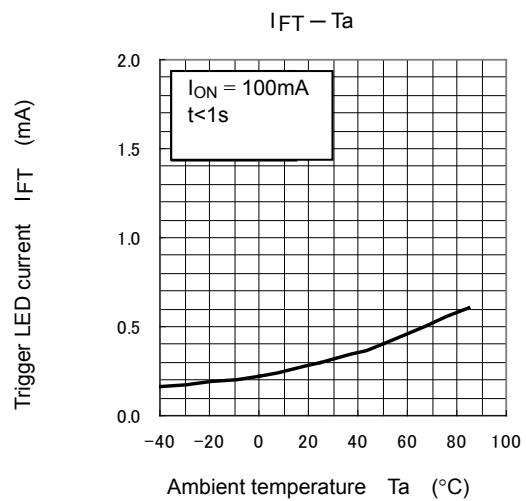
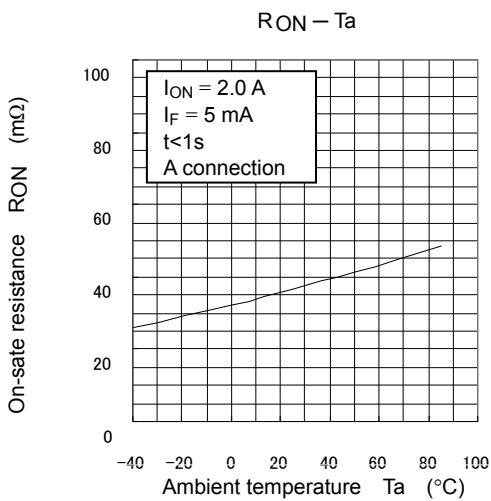
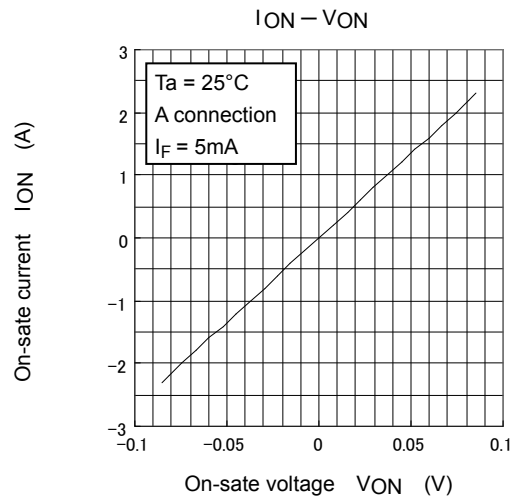
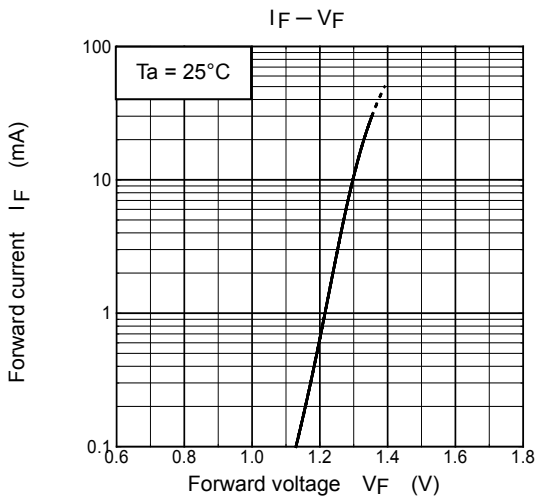
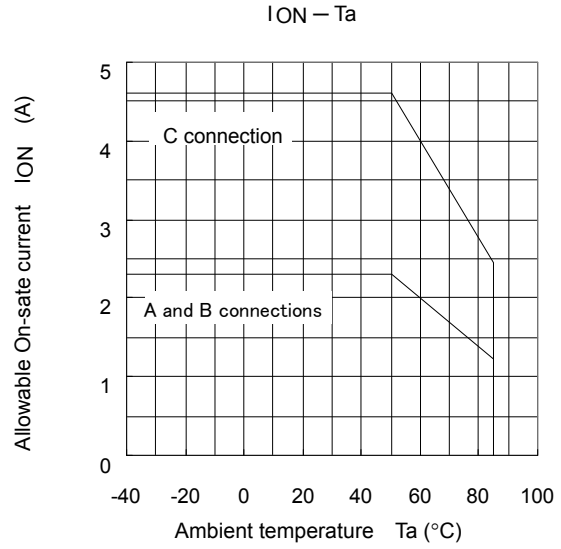
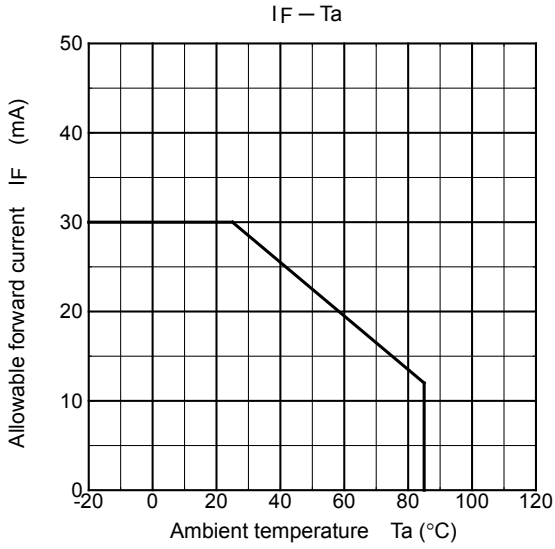
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	1500	—	—	Vrms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

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

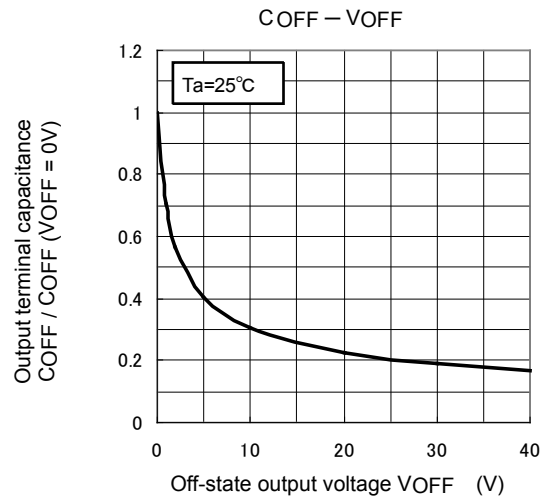
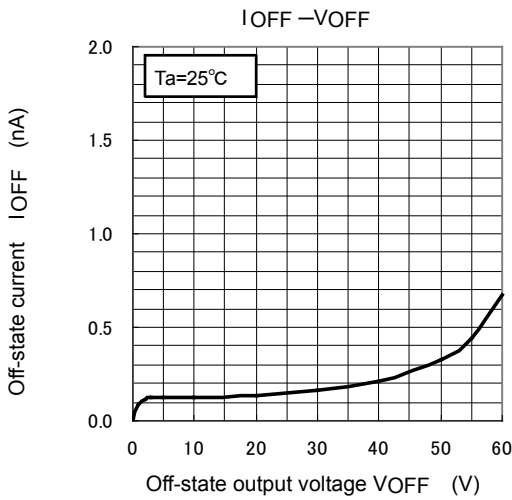
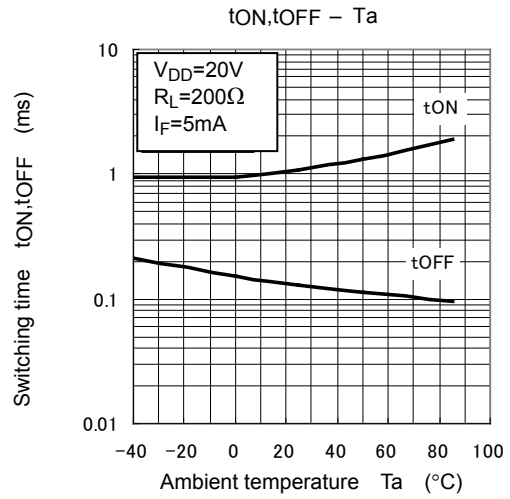
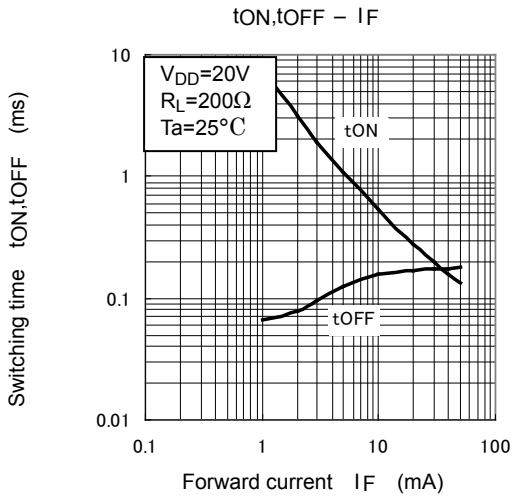
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-ON time	$t_{ON}$	$R_L = 200 \Omega$	—	1.0	5.0	ms
Turn-OFF time	$t_{OFF}$	$V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 2)	—	0.15	1.0	
Turn-ON time	$t_{ON}$	$R_L = 200 \Omega$	—	0.5	3.0	
Turn-OFF time	$t_{OFF}$	$V_{DD} = 20 \text{ V}, I_F = 10 \text{ mA}$ (Note 2)	—	0.15	1.0	

Note 2: Switching time test circuit





Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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