

TOSHIBA Photocoupler Photorelay

TLP3105

Measurement Equipment

FA (Factory Automation)

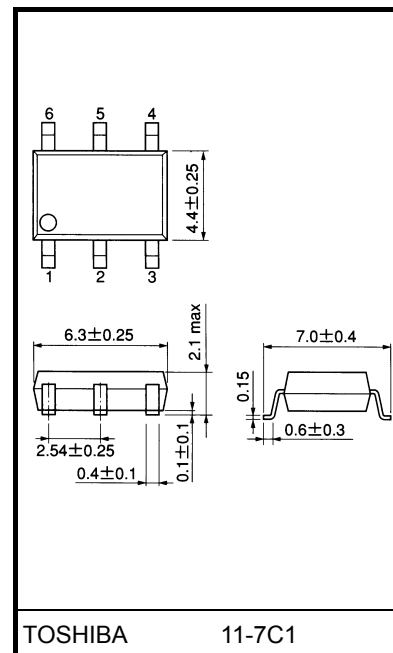
Power Line Control

Security Equipment

The Toshiba TLP3105 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 TLP3105 features high ON-state current and low ON-state resistance, hence the TLP3105 is suitable to control a power line.

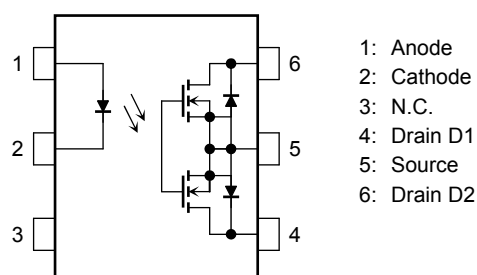
- 6-pin SOP (2.54SOP6): 2.1 mm high, 2.54 mm pitch
- Normally opened (form A) device
- Peak OFF-state voltage: 100 V (min)
- Trigger LED current: 3 mA (max)
- ON-state current: 1.4 A (max) ($T_a=50^\circ\text{C}$)
- ON-state resistance: $0.1\ \Omega$ (typ.), $0.2\ \Omega$ (max)
- Capacitance: 1000 pF (typ.)
- OFF-state current: 10 nA (max)
- Isolation voltage: 1500 V_{rms} (min)

Unit: mm

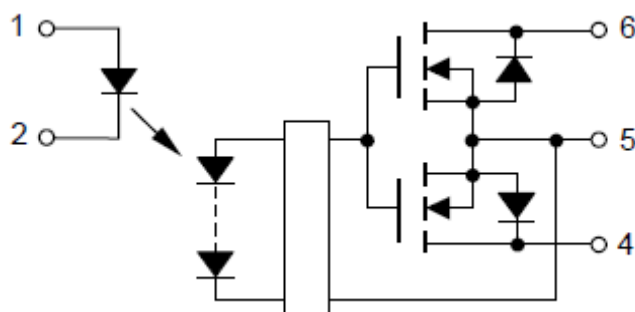


Weight: 0.13 g (typ.)

Pin Configuration (top view)



Schematic



Absolute Maximum Ratings (Ta = 25°C)

Characteristics			Symbol	Rating	Unit
LED	Forward current		I _F	30	mA
	Forward current derating (Ta ≥ 25°C)		ΔI _F /°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}	100	V
	On-state current	A connection	I _{ON}	1.4	A
		B connection		1.4	
		C connection		2.8	
	Forward current derating (Ta ≥ 50°C)	A connection	ΔI _{ON} /°C	−18.7	mA/°C
		B connection		−18.7	
		C connection		−37.3	
	Pulse on-state current(t = 100ms)		I _{ONP}	4	A
	Junction temperature		T _j	125	°C
	Storage temperature			T _{stg}	−55 to 125
Operating temperature			T _{opr}	−40 to 85	°C
Lead soldering temperature (10 s)			T _{sol}	260	°C
Isolation voltage (AC, 1 min, 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).

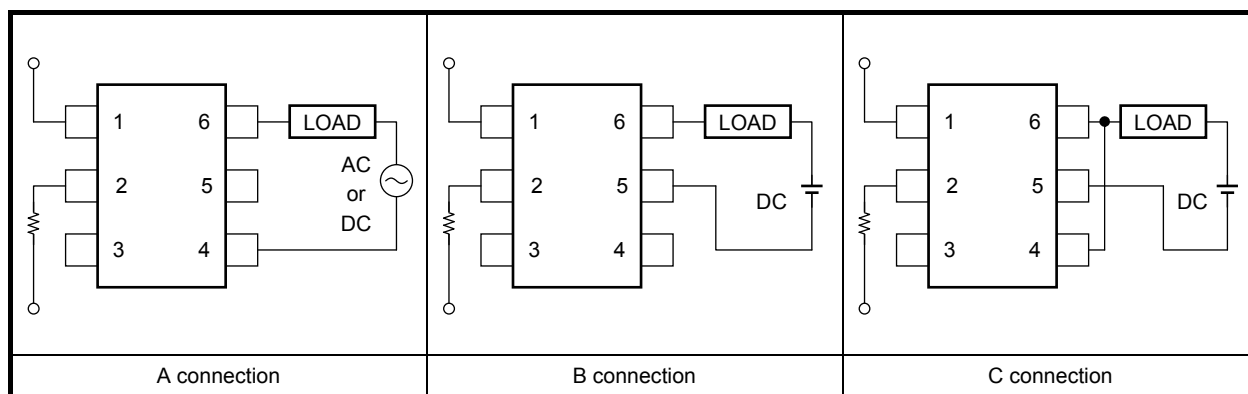
Note 1: Device considered a two-terminal device: Pins 1, 2 and, 3 shorted together, and pins 4, 5 and 6 shorted together.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{DD}	—	—	100	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 voltage	V_F	$I_F = 10 \text{ mA}$	1.18	1.33	1.48	V
	Reverse current	I_R	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance	C_T	$V = 0, f = 1 \text{ MHz}$	—	70	—	pF
Detector	OFF-state current	I_{OFF}	$V_{OFF} = 100 \text{ V}$	—	—	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}	$I_{ON} = 1.4 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.1	0.2	Ω
	B connection		$I_{ON} = 1.4 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.05	0.1	
	C connection		$I_{ON} = 2.8 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	0.025	—	

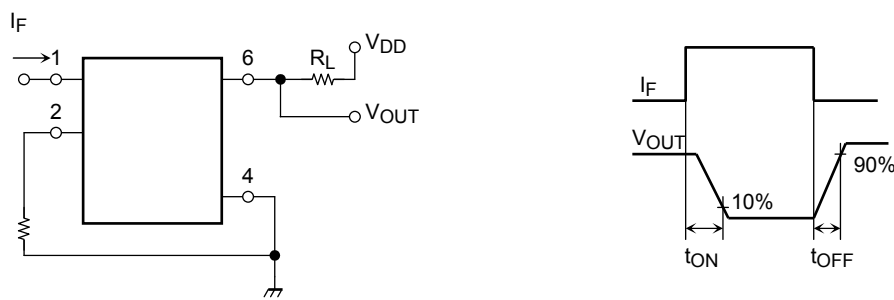
Isolation Characteristics (Ta = 25°C)

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	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 min	1500	—	—	Vrms
		AC, 1 s (in oil)	—	3000	—	
		DC, 1 min (in oil)	—	3000	—	Vdc

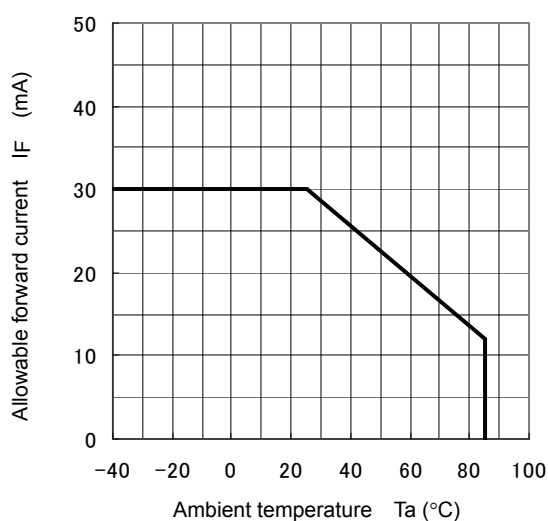
Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-ON time	t _{ON}	R _L = 200 Ω	—	1.0	5.0	ms
Turn-OFF time	t _{OFF}	V _{DD} = 20 V, I _F = 5 mA (Note 2)	—	0.15	1.0	
Turn-ON time	t _{ON}	R _L = 200 Ω	—	0.5	3.0	
Turn-OFF time	t _{OFF}	V _{DD} = 20 V, I _F = 10 mA (Note 2)	—	0.15	1.0	

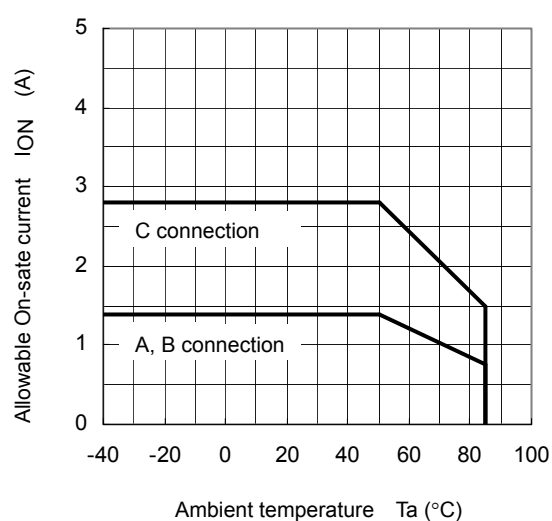
Note 2: Switching time test circuit



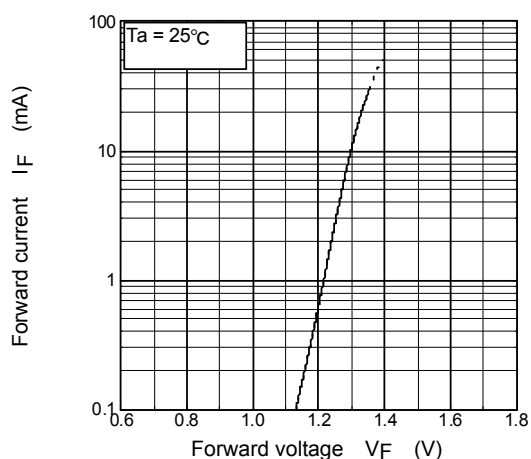
$I_F - T_a$



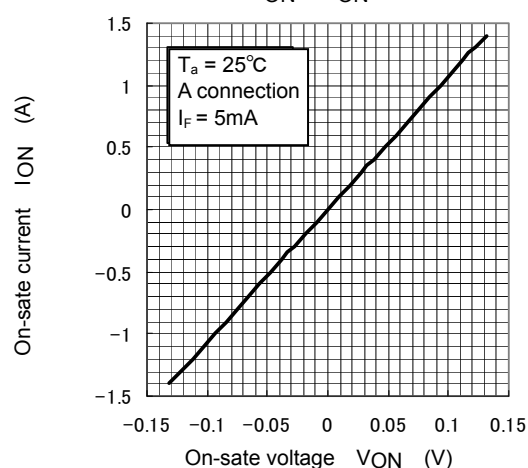
$I_{ON} - T_a$



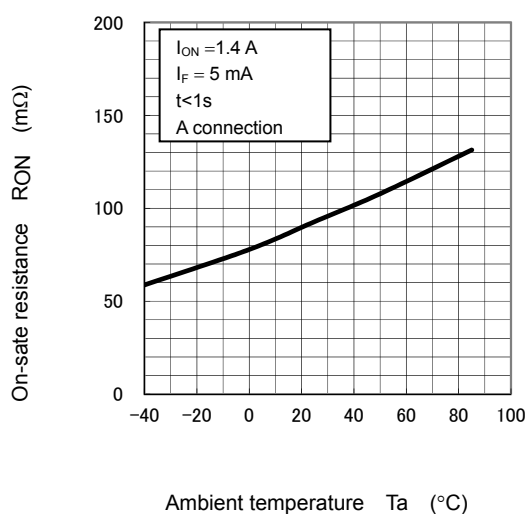
$I_F - V_F$



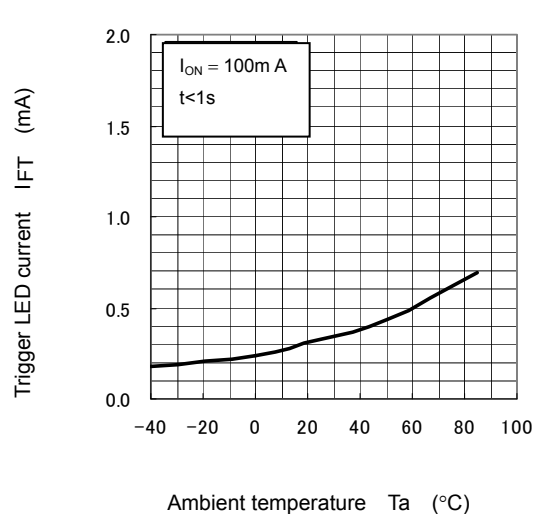
$I_{ON} - V_{ON}$



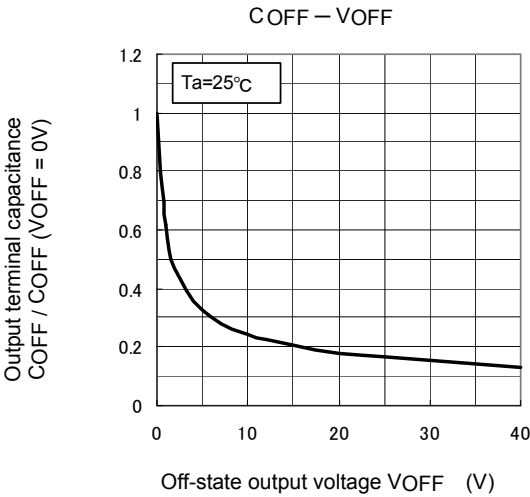
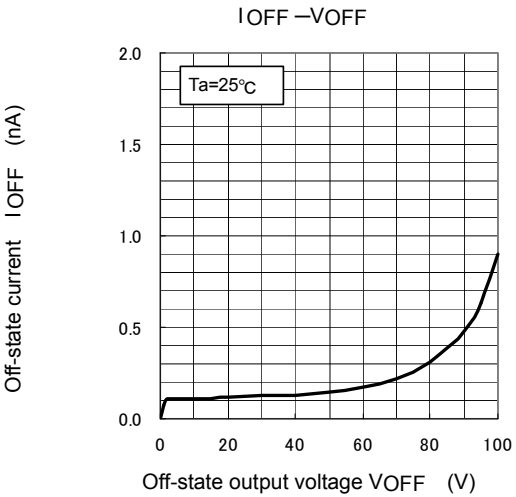
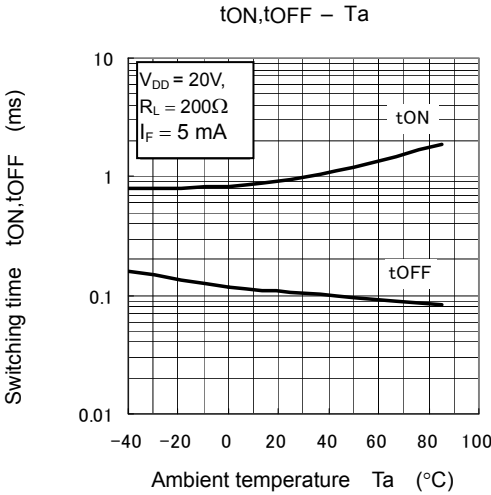
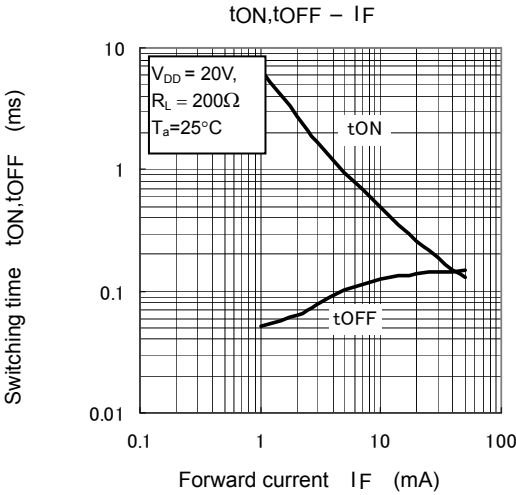
$R_{ON} - T_a$



$I_{FT} - T_a$



*: The above graphs show typical characteristics.



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