

TOSHIBA Photocoupler Photorelay

# TLP170A

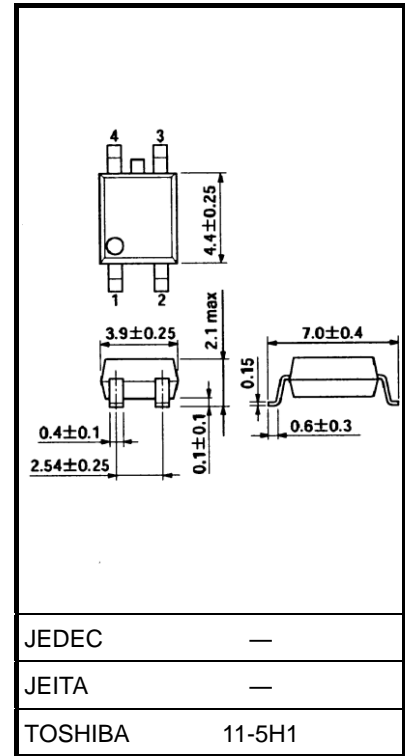
Telecommunications  
Control Equipment  
Data Acquisition System  
Security Equipment  
Measurement Equipment

The Toshiba TLP170A consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 4-pin SOP package. This photorelay requires 1mA of LED current to turn it on. It is suitable for applications that need electrical power savings.

- 4-pin SOP (2.54SOP4): Height = 2.1 mm, pitch = 2.54 mm
- Normally open (1-Form-A) device
- Peak off-state voltage: 60 V (min)
- Trigger LED current: 1 mA (max)
- ON-state current: 400 mA (max)
- ON-state resistance: 2 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1577, File No.E67349
- cUL recognized: CSA Component Acceptance Service No. 5A  
File No.E67349
- Option (V4) VDE approved: EN60747-5-5 (Note1)

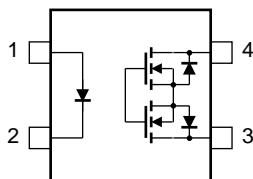
**(Note 1) When a VDE approved type is needed, please designate the "Option(V4)"**

Unit: mm



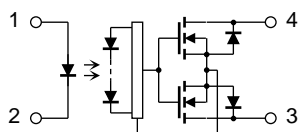
Weight: 0.1 g (typ.)

## Pin Configuration (top view)



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

## Internal Circuit



Start of commercial production  
2009-06

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

Characteristics		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
	Pulse forward current(100 μs pulse, 100 pps)	I <sub>FP</sub>	1	A
	Diode power dissipation	P <sub>D</sub>	50	mW
	Diode power dissipation derating (Ta ≥ 25°C)	ΔP <sub>D</sub> /°C	-0.5	mW/°C
	Junction temperature	T <sub>j</sub>	125	°C
Detector	OFF-state output terminal voltage	V <sub>OFF</sub>	60	V
	ON-state current	I <sub>ON</sub>	400	mA
	Forward current derating (Ta ≥ 25°C)	ΔI <sub>ON</sub> /°C	-4.0	mA/°C
	Output power dissipation	P <sub>C</sub>	300	mW
	Output power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> /°C	-3.0	mW / °C
	Junction temperature	T <sub>j</sub>	125	°C
Storage temperature		T <sub>stg</sub>	-55 to 125	°C
Operating temperature		T <sub>opr</sub>	-40 to 85	°C
Lead soldering temperature (10 s)		T <sub>sol</sub>	260	°C
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	1500	V <sub>rms</sub>

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: LED pins are shorted together. Detector pins are also shorted together.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>DD</sub>	—	—	48	V
Forward current	I <sub>F</sub>	—	2	25	mA
ON-state current	I <sub>ON</sub>	—	—	320	mA
Operating temperature	T <sub>opr</sub>	-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.

## Electrical Characteristics (Ta = 25°C)

Characteristics		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 V, f = 1 MHz	—	30	—	pF
Detector	OFF-state current	I <sub>OFF</sub>	V <sub>OFF</sub> = 60 V	—	1	1000	nA
	Capacitance	C <sub>OFF</sub>	V = 0 V, f = 1 MHz	—	130	—	pF

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I <sub>FT</sub>	I <sub>ON</sub> = 400 mA	—	0.4	1	mA
Return LED current	I <sub>FC</sub>	I <sub>OFF</sub> = 100 μA	0.1	—	—	mA
On-state resistance	R <sub>ON</sub>	I <sub>ON</sub> = 400 mA, I <sub>F</sub> = 2 mA	—	1	2	Ω

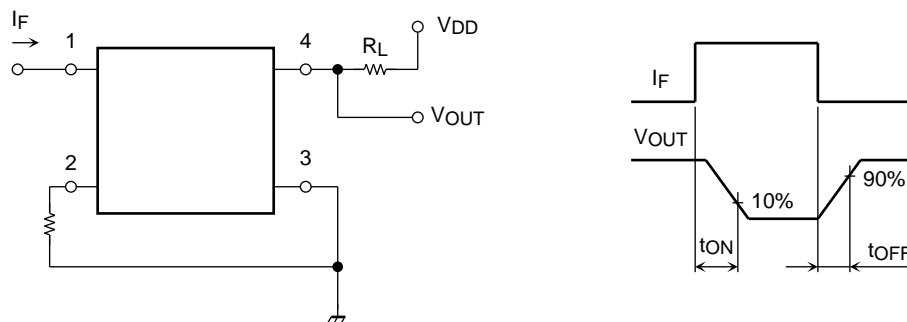
## Isolation Characteristics (Ta = 25°C)

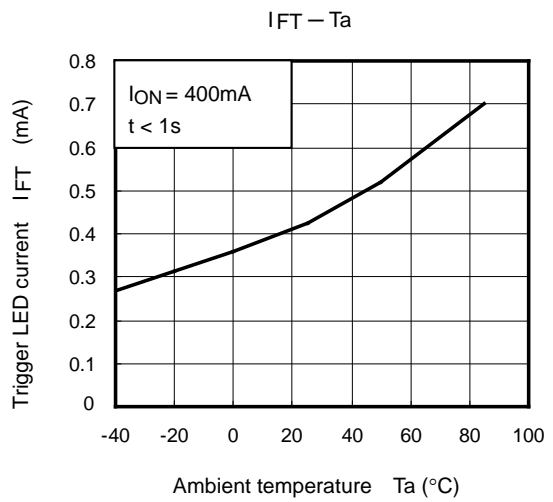
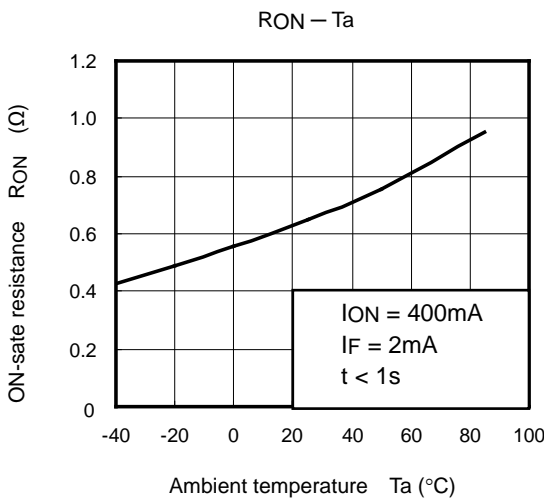
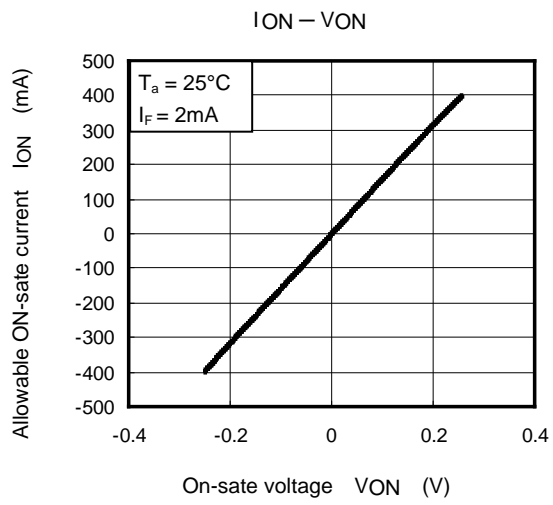
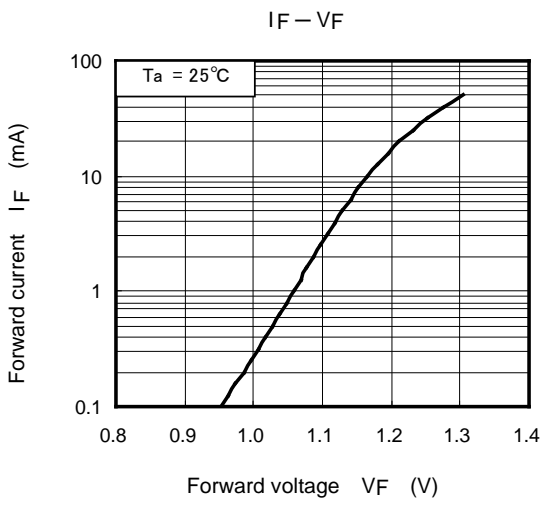
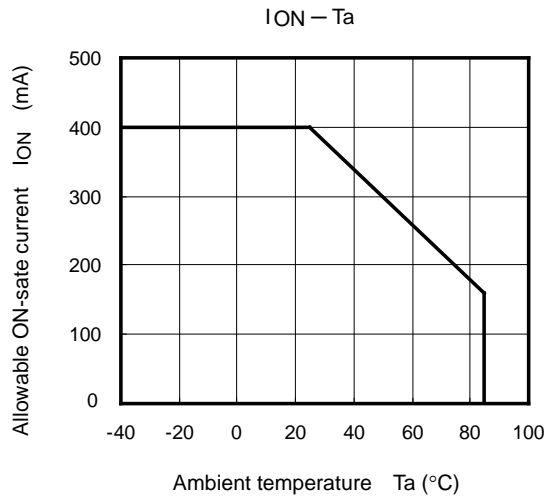
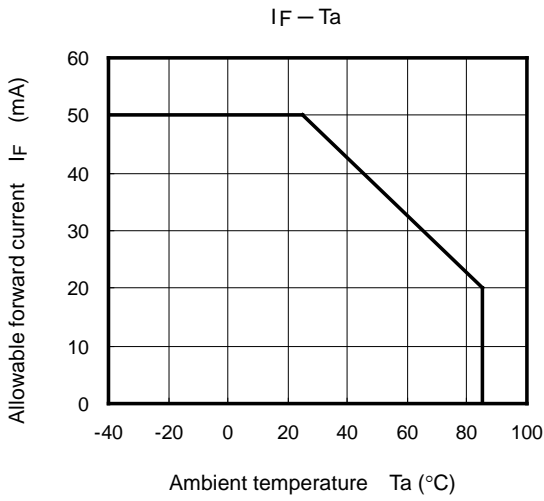
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5 × 10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	1500	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	3000	—	
		DC, 1 minute, in oil	—	3000	—	V <sub>dc</sub>

## Switching Characteristics (Ta = 25°C)

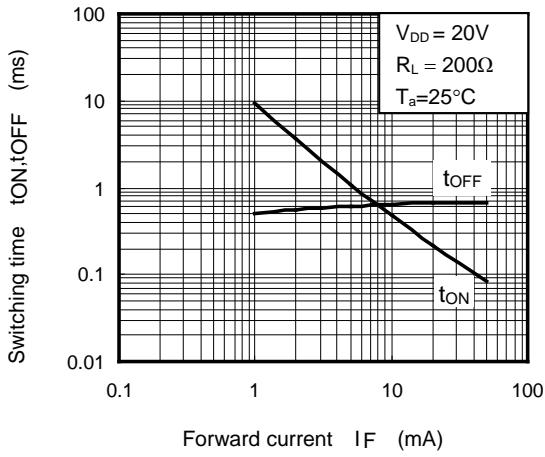
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 200 Ω (Note 2) V <sub>DD</sub> = 20 V, I <sub>F</sub> = 2 mA	—	3.0	8.0	ms
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 200 Ω (Note 2) V <sub>DD</sub> = 20 V, I <sub>F</sub> = 5 mA	—	—	5.0	
Turn-off time	t <sub>OFF</sub>	R <sub>L</sub> = 200 Ω (Note 2) V <sub>DD</sub> = 20 V, I <sub>F</sub> = 2 mA	—	1.0	3.0	

Note 2: Switching time test circuit

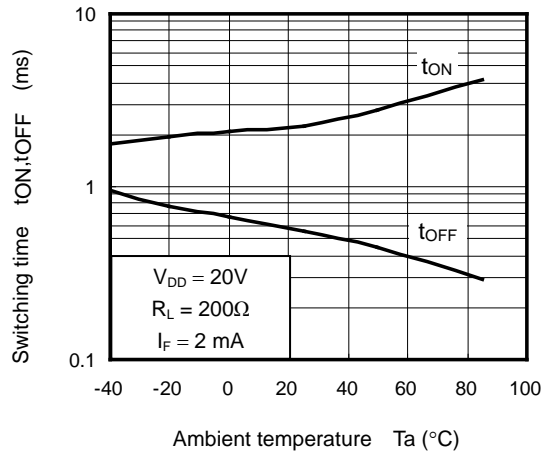




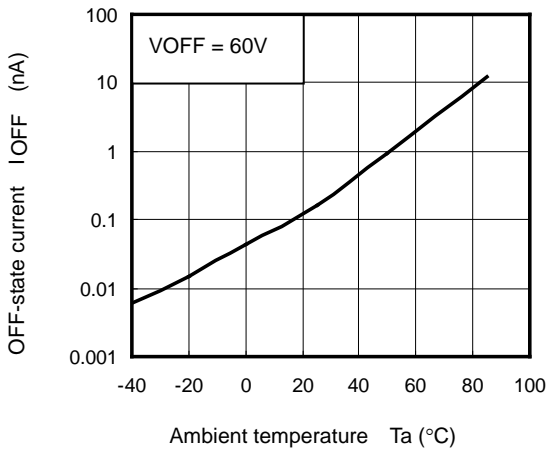
t<sub>ON</sub>, t<sub>OFF</sub> – I<sub>F</sub>



t<sub>ON</sub>, t<sub>OFF</sub> – T<sub>a</sub>



I<sub>OFF</sub> – T<sub>a</sub>



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