

TOSHIBA Photocoupler Photorelay

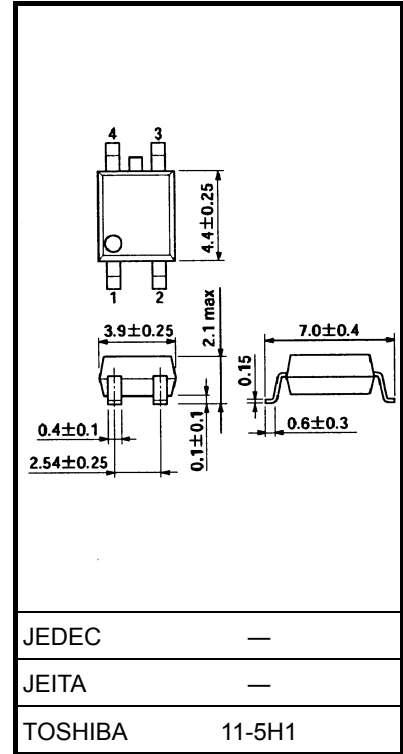
# TLP170A

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.

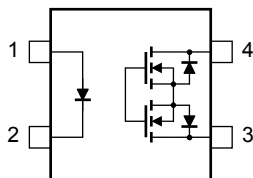
- 4-pin SOP (2.54SOP4): Height = 2.1 mm, pitch = 2.54 mm
- Normally open (1-Form-A) device
- Peak off-state voltage: 60 V (min)
- Trigger LED current: 1 mA (max)
- ON-state current: 400 mA (max)
- ON-state resistance: 2 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1577, File No.E67349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

Unit: mm



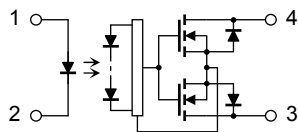
Weight: 0.1 g (typ.)

### Pin Configuration (top view)



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

### Internal Circuit



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

Characteristics		Symbol	Rating	Unit
LED	Forward current	$I_F$	50	mA
	Forward current derating (Ta ≥ 25°C)	$\Delta I_F/^\circ\text{C}$	-0.5	mA/°C
	Reverse voltage	$V_R$	5	V
	Pulse forward current (100 μs pulse, 100 pps)	$I_{FP}$	1	A
	Junction temperature	$T_j$	125	°C
Detector	OFF-state output terminal voltage	$V_{OFF}$	60	V
	ON-state current	$I_{ON}$	400	mA
	Forward current derating (Ta ≥ 25°C)	$\Delta I_{ON}/^\circ\text{C}$	-4.0	mA/°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 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: LED pins are shorted together. Detector pins are also shorted together.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$	—	—	48	V
Forward current	$I_F$	—	2	25	mA
ON-state current	$I_{ON}$	—	—	320	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.

## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	30	—	pF
Detector	OFF-state current	$I_{OFF}$	$V_{OFF} = 60 \text{ V}$	—	1	1000	nA
	Capacitance	$C_{OFF}$	$V = 0, f = 1 \text{ MHz}$	—	130	—	pF

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$	$I_{ON} = 400 \text{ mA}$	—	—	1	mA
Return LED current	$I_{FC}$	$I_{OFF} = 100 \mu\text{A}$	0.1	—	—	mA
On-state resistance	$R_{ON}$	$I_{ON} = 400 \text{ mA}, I_F = 2 \text{ mA}$	—	1	2	$\Omega$

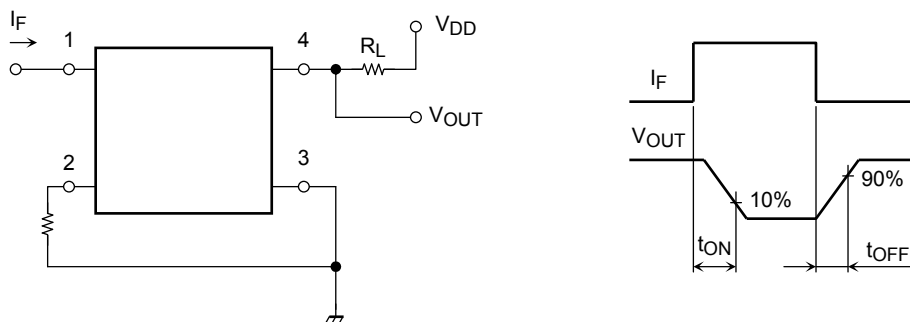
**Isolation Characteristics (Ta = 25°C)**

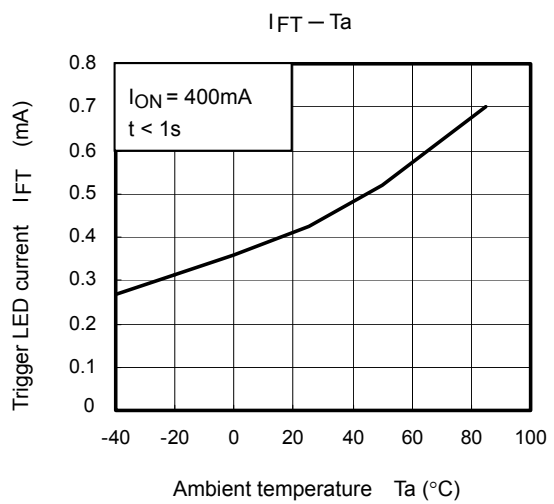
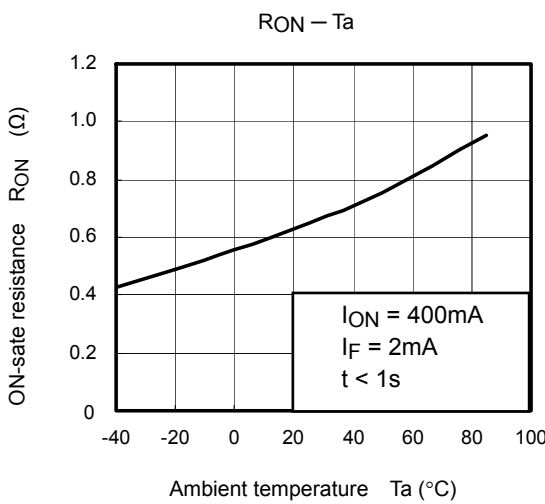
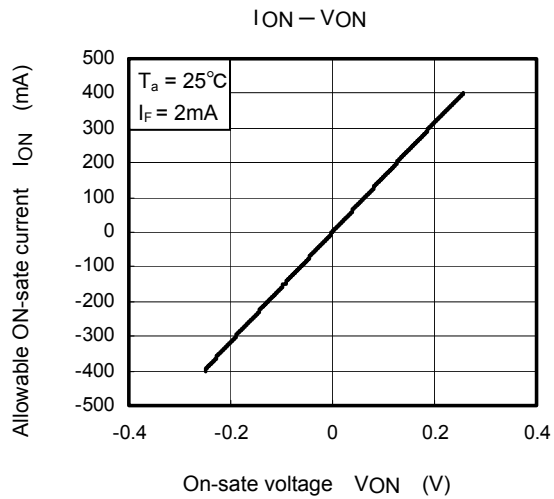
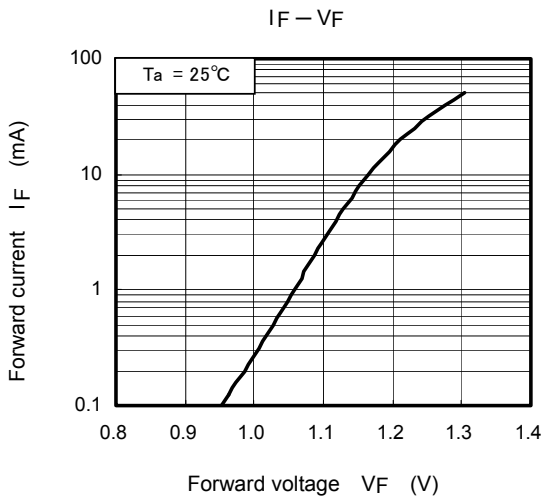
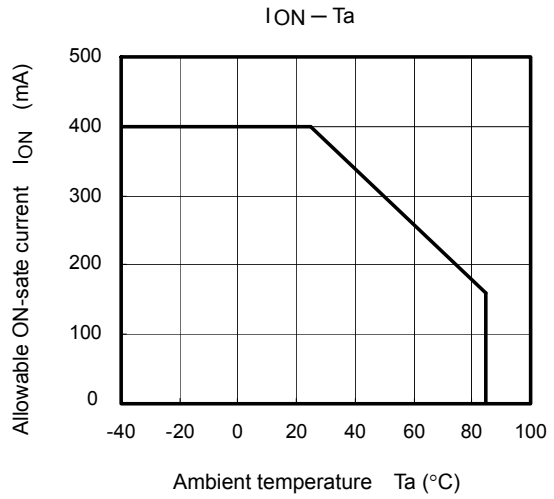
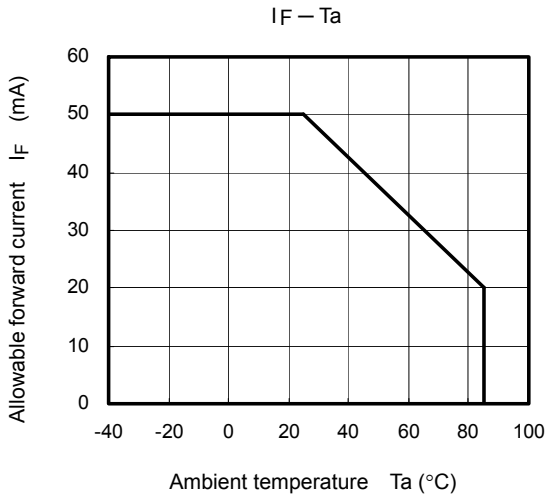
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 min	1500	—	—	Vrms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

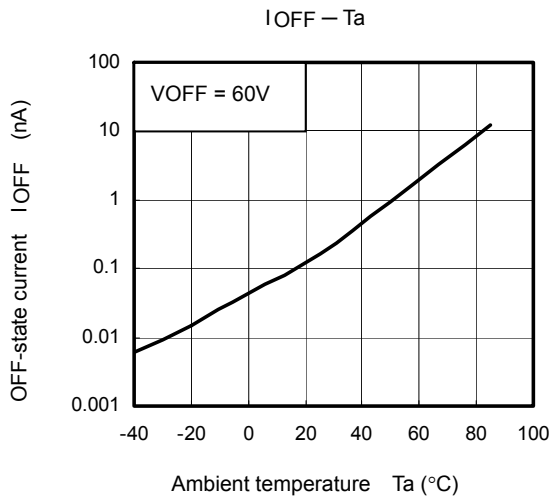
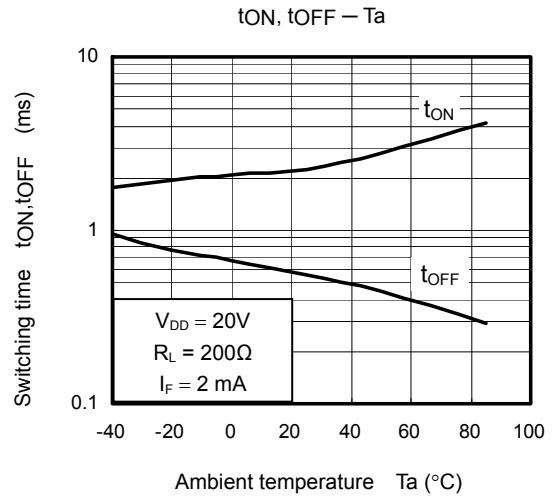
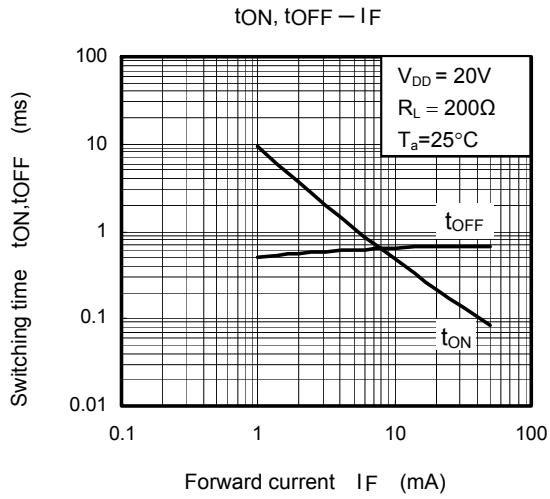
**Switching Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ (注 2) $V_{DD} = 20 \text{ V}, I_F = 2 \text{ mA}$	—	3.0	8.0	ms
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ (注 2) $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	—	5.0	
Turn-off time	$t_{OFF}$	$R_L = 200 \Omega$ (注 2) $V_{DD} = 20 \text{ V}, I_F = 2 \text{ mA}$	—	1.0	3.0	

Note 2: Switching time test circuit







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