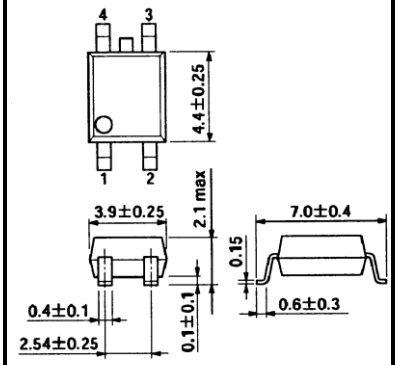
TOSHIBA Photocoupler Photorelay

TLP170A

Telecommunications
Control Equipment
Data Acquisition System
Security Equipment
Measurement Equipment

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	11-5H1

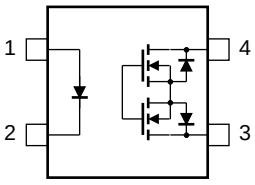
Weight: 0.1 g (typ.)

The Toshiba TLP170A consists of an 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: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349
- VDE-approved: EN 60747-5-5 (Note 1)

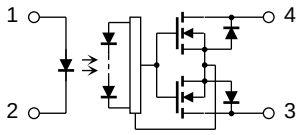
Note 1: When a VDE approved type is needed,
please designate the **Option(V4)**.

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_F	50	mA
	Forward current derating (Ta ≥ 25°C)		ΔI_F/°C	−0.5	mA/°C
	Reverse voltage		V_R	5	V
	Pulse forward current(100 μs pulse, 100 pps)		I_{FP}	1	A
	Diode power dissipation		P_D	50	mW
	Diode power dissipation derating (Ta ≥25°C)		$\triangle P_D$ /°C	-0.5	mW/°C
	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)		ΔI_{ON}/°C	−4.0	mA/°C
	Output power dissipation		P_C	300	mW
	Output power dissipation derating (Ta ≥ 25°C)		ΔP_C / °C	−3.0	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, 60 s, 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 mA	1.0	1.15	1.3	V
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	30	—	pF
Detector	OFF-state current	I_{OFF}	V_{OFF} = 60 V	—	1	1000	nA
	Capacitance	C_{OFF}	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_{FT}	I_{ON} = 400 mA	—	0.4	1	mA
Return LED current	I_{FC}	I_{OFF} = 100 μA	0.1	—	—	mA
On-state resistance	R_{ON}	I_{ON} = 400 mA, I_F = 2 mA	—	1	2	Ω

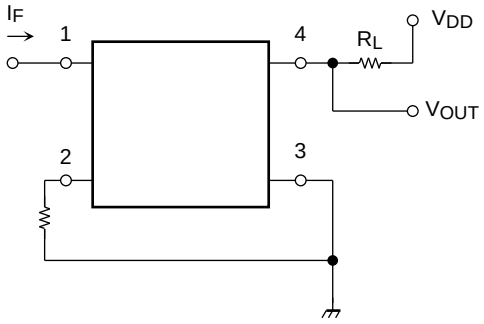
Isolation Characteristics (Ta = 25°C)

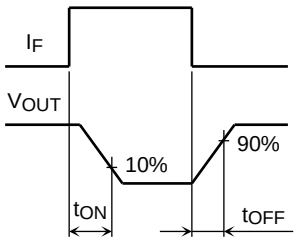
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V, R.H. ≤ 60 %	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	1500	—	—	Vrms

Switching Characteristics (Ta = 25°C)

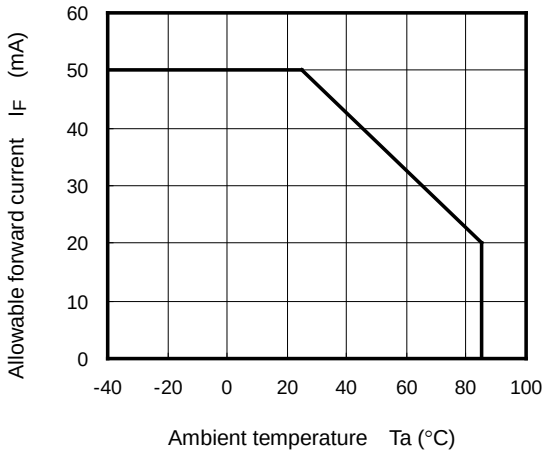
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}	R_L = 200 Ω (Note 2) V_{DD} = 20 V, I_F = 2 mA	—	3.0	8.0	ms
Turn-on time	t_{ON}	R_L = 200 Ω (Note 2) V_{DD} = 20 V, I_F = 5 mA	—	—	5.0	
Turn-off time	t_{OFF}	R_L = 200 Ω (Note 2) V_{DD} = 20 V, I_F = 2 mA	—	1.0	3.0	

Note 2: Switching time test circuit

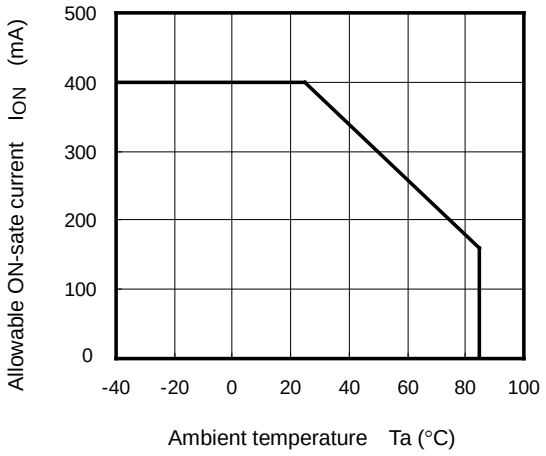




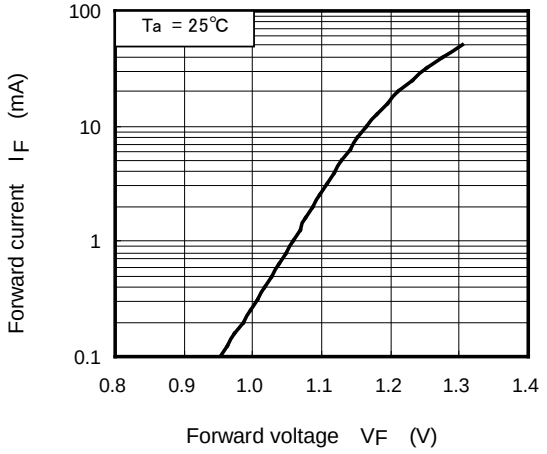
$I_F - Ta$



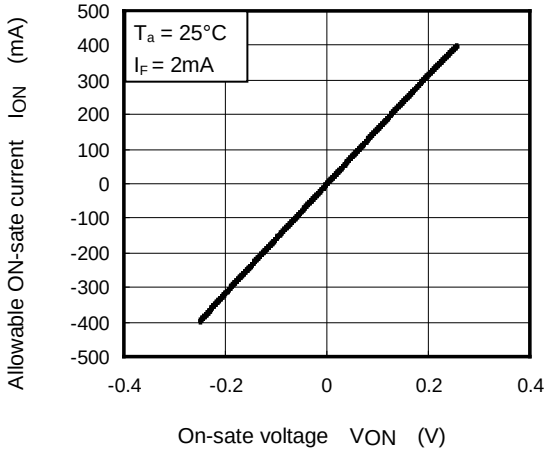
$I_{ON} - Ta$



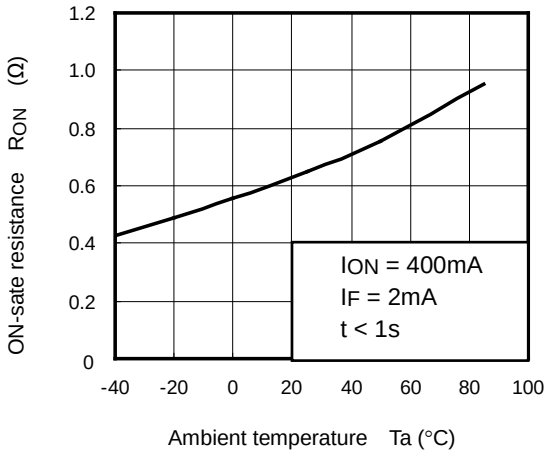
$I_F - V_F$



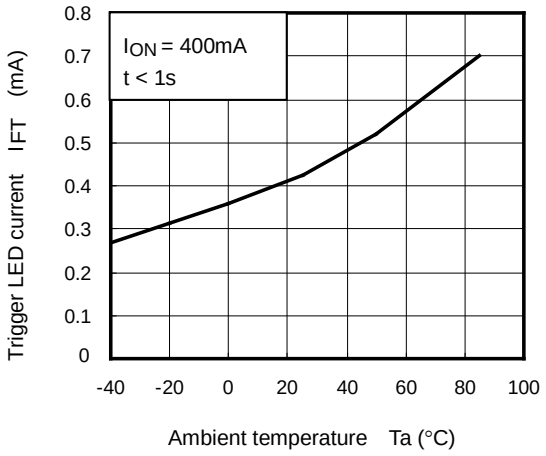
$I_{ON} - V_{ON}$



$R_{ON} - Ta$

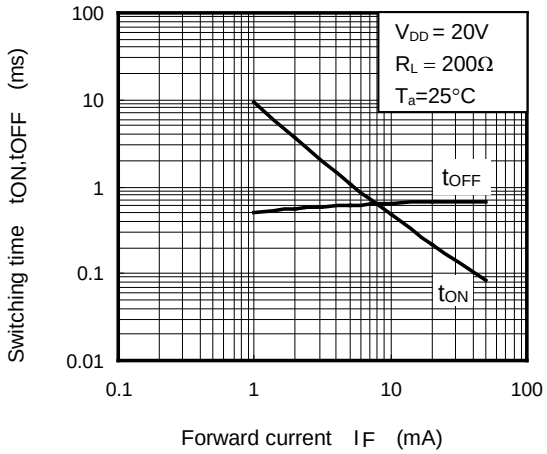


$I_{FT} - Ta$

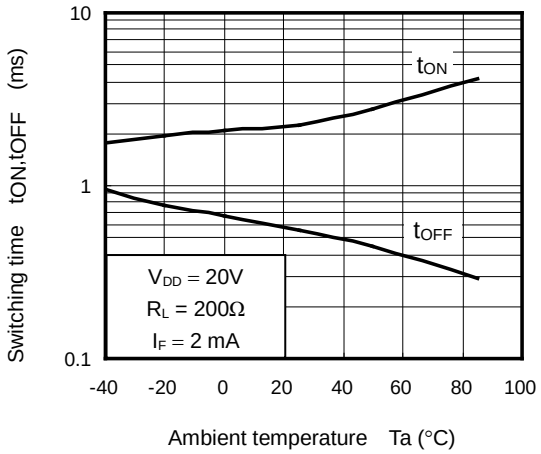


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

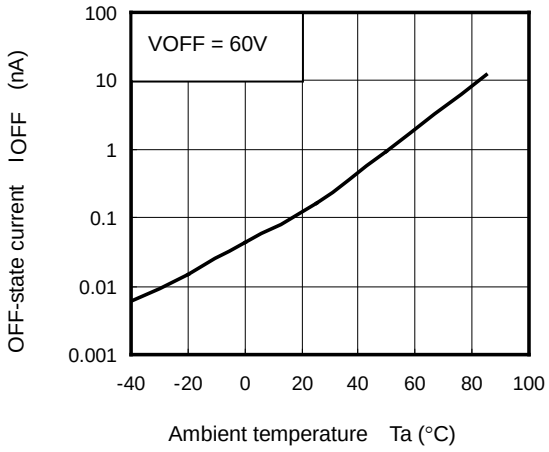
tON, tOFF ─ IF



tON, tOFF ─ Ta



IOFF ─ Ta



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