

TOSHIBA Photocoupler GaAs IRED & Photo-MOSFET

# TLP170D

PBX

Modem · Fax Card

Telecommunication

Security Equipment

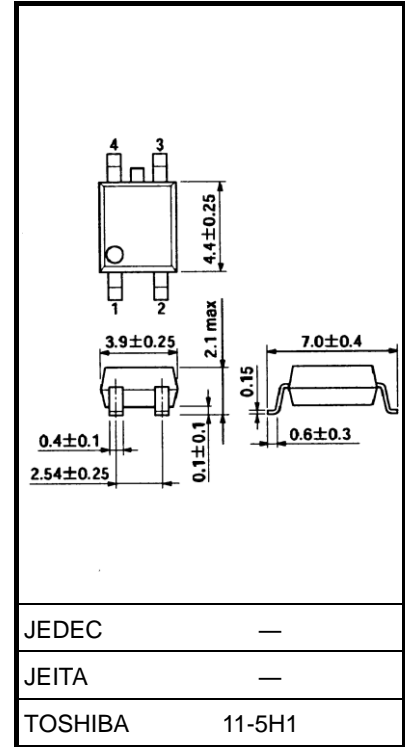
Measurement Equipment

The Toshiba TLP170D consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 4-pin SOP package. This photorelay requires 1 mA of LED current to turn it on. It is suitable for applications that need electrical power saving.

- SOP 4 pin (2.54SOP4): 1-Form-A
- Peak off-state voltage: 200 V (min)
- Trigger LED current: 1 mA (max)
- ON-state current: 200 mA (max)
- ON-state resistance: 8 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)

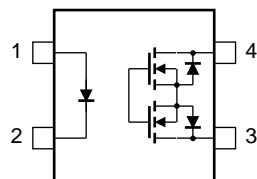
**(Note 1) When a VDE approved type is needed, please designate the "Option(V4)"**

Unit: mm



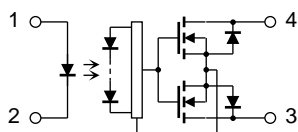
Weight: 0.1 g (typ.)

## Pin Configuration (top view)



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

## Internal Circuit



Start of commercial production  
2009-06

## Absolute Maximum Ratings (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
	Pulse forward current (100 μs pulse, 100 pps)	I <sub>FP</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	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>	200	V
	On-state current	I <sub>ON</sub>	200	mA
	On-state RMS current derating (Ta ≥ 25°C)	ΔI <sub>ON</sub> /°C	-2.0	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 range		T <sub>stg</sub>	-55 to 125	°C
Operating temperature range		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: Device considered a two-terminal device: pins 1 and 2 shorted together and pins 3 and 4 shorted together.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>DD</sub>	—	—	160	V
Forward current	I <sub>F</sub>	—	2	25	mA
ON-state current	I <sub>ON</sub>	—	—	160	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.

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	30	—	pF
Detector	OFF-state current	$I_{OFF}$	$V_{OFF} = 200 \text{ V}$	—	1	1000	nA
	Capacitance	$C_{OFF}$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	90	—	pF

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$	$I_{ON} = 200 \text{ mA}$	—	0.4	1	mA
Return LED current	$I_{FC}$	$I_{OFF} = 100 \mu\text{A}$	0.1	—	—	mA
On-state resistance	$R_{ON}$	$I_{ON} = 200 \text{ mA}, I_F = 2 \text{ mA}$	—	5	8	$\Omega$

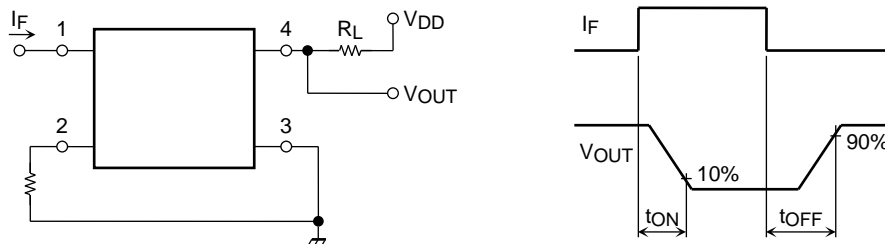
## Isolation Characteristics (Ta = 25°C)

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	$BVS$	AC, 1 minute	1500	—	—	Vrms
		AC, 1 second, in oil	—	3000	—	
		DC, 1 minute, in oil	—	3000	—	Vdc

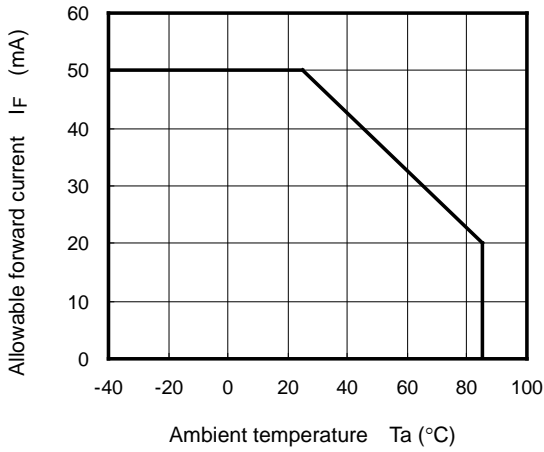
## Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 2 \text{ mA}$ (Note2)	—	3.0	8.0	ms
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note2)	—	—	5.0	ms
Turn-off time	$t_{OFF}$	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 2 \text{ mA}$ (Note2)	—	0.6	3.0	ms

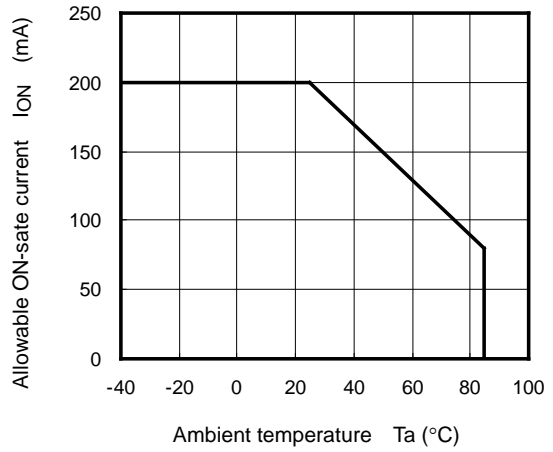
Note2: Switching time test circuit



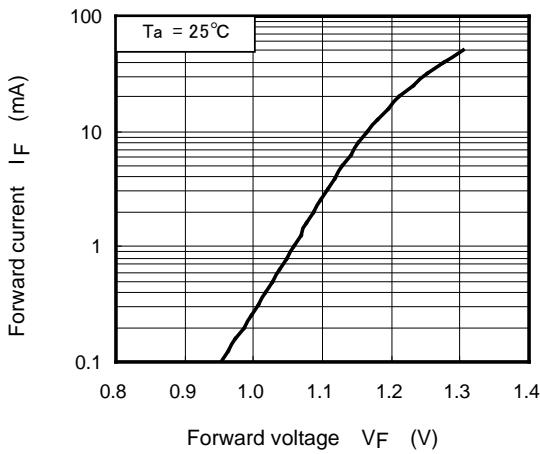
$I_F - T_a$



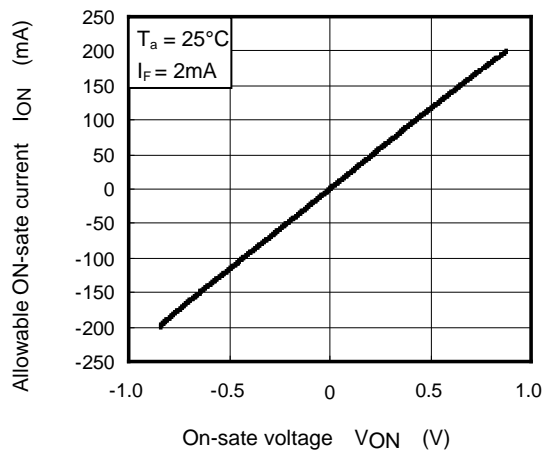
$I_{ON} - T_a$



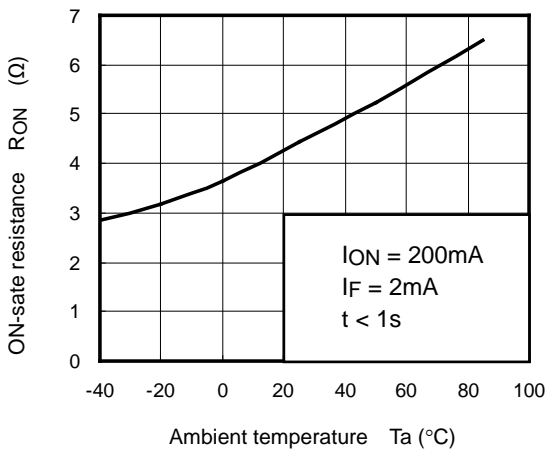
$I_F - V_F$



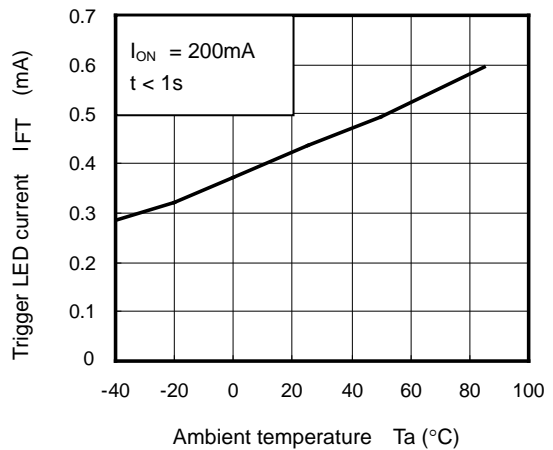
$I_{ON} - V_{ON}$



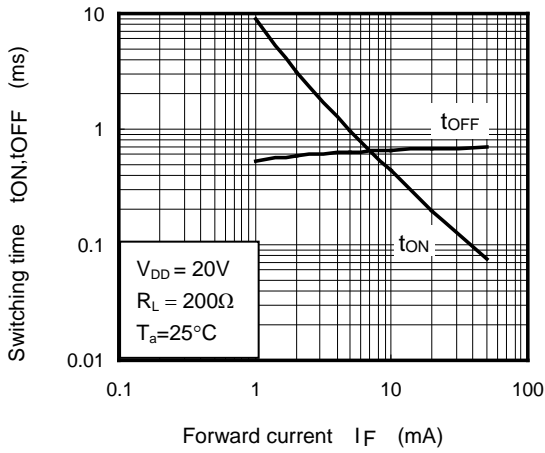
$R_{ON} - T_a$



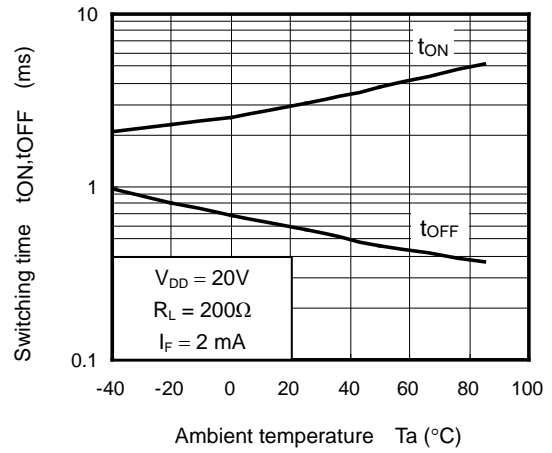
$I_{FT} - T_a$



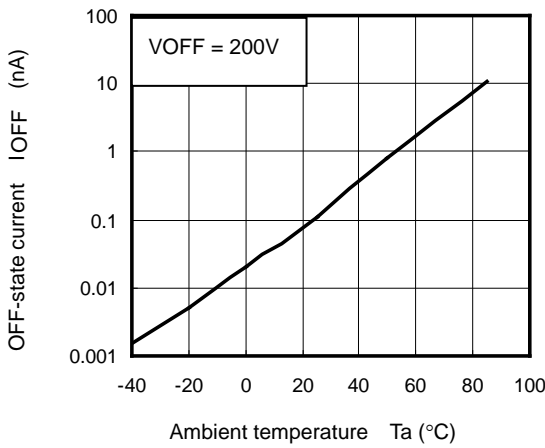
$t_{ON}, t_{OFF} - I_F$



$t_{ON}, t_{OFF} - T_a$



$I_{OFF} - T_a$



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