

TOSHIBA Photocoupler Photorelay

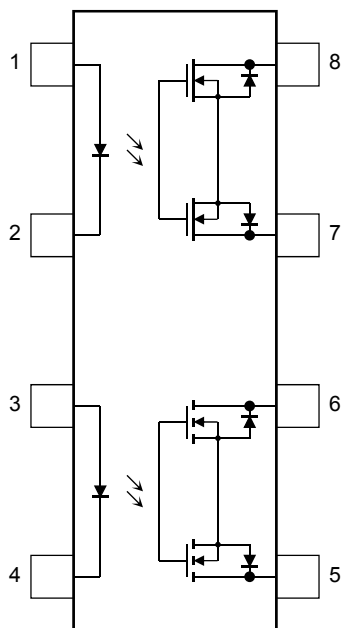
TLP4006G

Telecommunication
 Measurement Equipment
 Security Equipment
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The Toshiba TLP4006G consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET and is the 1-form-A/B photorelay with 350-V withstanding voltage.

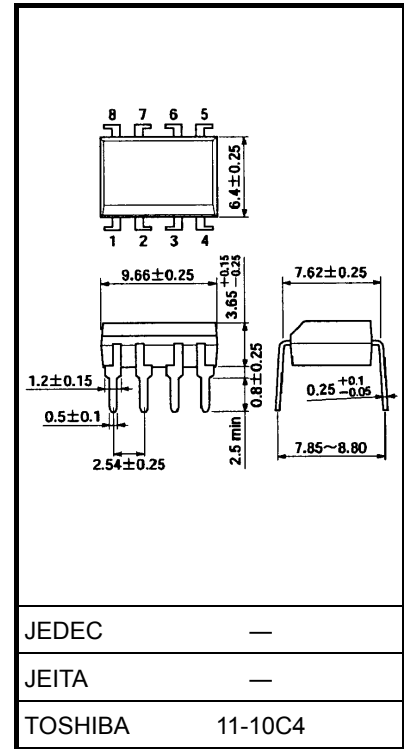
- Normally closed (1-form-B) device, normally opened (1-form-A) device
- Peak off-state voltage: 350 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 120 mA (max)
- On-state resistance: 25 Ω (max)
- Isolation voltage: 2500 Vrms (min)

Pin Configuration (top view)



- 1: Anode (1b)
- 2: Cathode (1b)
- 3: Anode (1a)
- 4: Cathode (1a)
- 5: Drain D1 (1a)
- 6: Drain D2 (1a)
- 7: Drain D3 (1b)
- 8: Drain D4 (1b)

Unit: mm



Weight: 0.54 g (typ.)

Start of commercial production
 2002/09

Absolute Maximum Ratings (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	
	Peak forward current	I_{FP}	1	A	
	Reverse voltage	V_R	5	V	
	Junction temperature	T_j	125	°C	
Detector	Off-state output terminal voltage	V_{OFF}	350	V	
	On-state current	One channel operation	I_{ON}	120	mA
		Two channel operations (1a1b simultaneous operation)			
	On-state current derating (Ta ≥ 25°C)	One channel operation	$\Delta I_{ON}/^\circ\text{C}$	-1.2	mA/°C
		Two channel operations (1a1b simultaneous operation)			
Junction temperature	T_j	125	°C		
Storage temperature range		T_{stg}	-55 to 125	°C	
Operating temperature range		T_{opr}	-40 to 85	°C	
Lead soldering temperature (10 s)		T_{sol}	260	°C	
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 1)		BV_S	2500	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: Pins 1, 2, 3 and 4 are shorted together, and pins 5, 6, 7 and 8 are shorted together.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{DD}	—	—	280	V
Forward current	I_F	5	—	25	mA
On-state current	I_{ON}	—	—	120	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}	$V_{OFF} = 350\text{ V}$	—	—	1	μA
	Capacitance (1b)	C_{OFF}	$V = 0, f = 1\text{ MHz}, I_F = 5\text{ mA}$	—	65	—	pF
	Capacitance (1a)		$V = 0, f = 1\text{ MHz}, I_F = 0$	—	65	—	

Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Form	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	1a	I_{FT}	$I_{ON} = 120 \text{ mA}$	—	1	3	mA
	1b	I_{FC}	$I_{OFF} = 10 \mu\text{A}$				
Return LED current	1a	I_{FC}	$I_{OFF} = 10 \mu\text{A}$	0.1	—	—	mA
	1b	I_{FT}	$I_{ON} = 120 \text{ mA}$				
On-state resistance (Note 2)	—	R_{ON}	$I_{ON} = 120 \text{ mA}$	—	15	25	Ω

Note 2: 1-form-A: $I_F = 5 \text{ mA}$, 1-form-B: $I_F = 0 \text{ mA}$

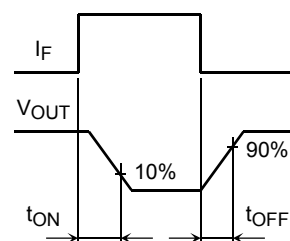
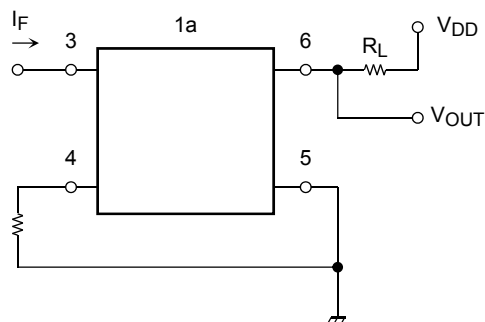
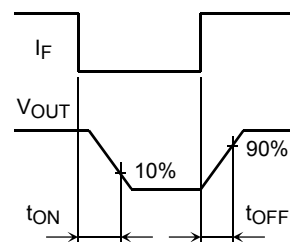
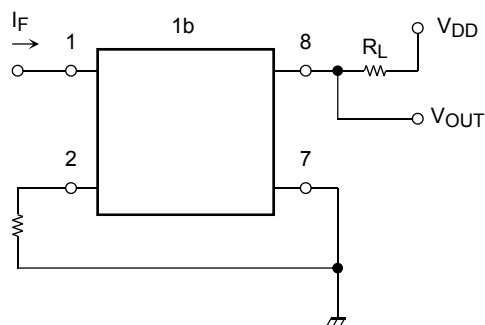
Isolation Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	$V_S = 0, f = 1 \text{ MHz}$	—	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 minute	2500	—	—	Vrms
		AC, 1 second, in oil	—	5000	—	Vrms
		DC, 1 minute, in oil	—	5000	—	Vdc

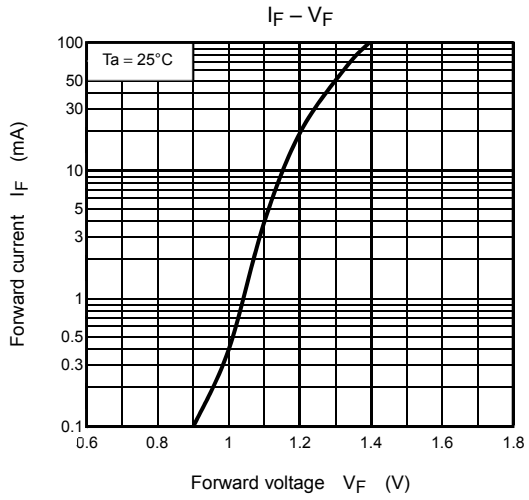
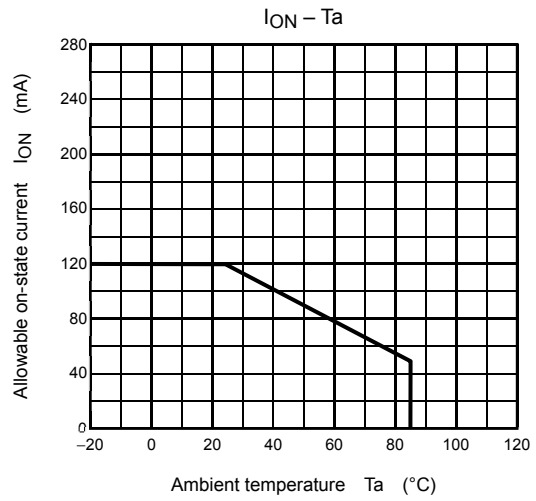
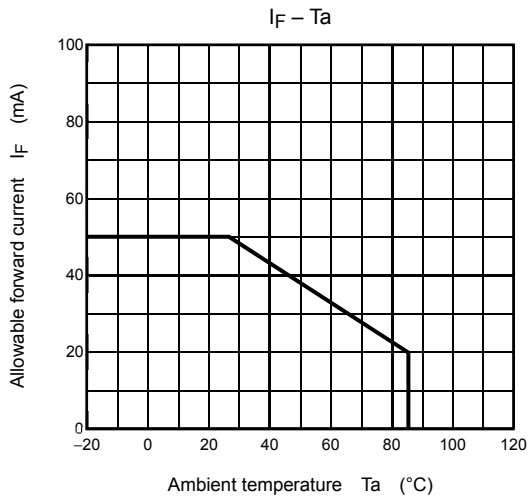
Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
1b	Turn-on time	t_{ON}	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 3)	—	—	1	ms
	Turn-off time	t_{OFF}				3	
1a	Turn-on time	t_{ON}	$R_L = 200 \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 3)	—	—	1	ms
	Turn-off time	t_{OFF}				1	

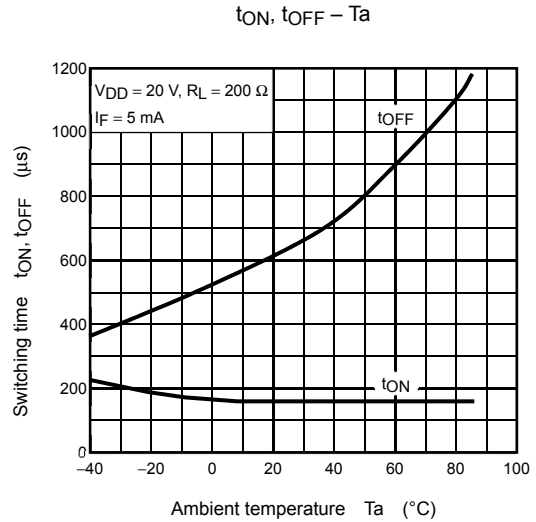
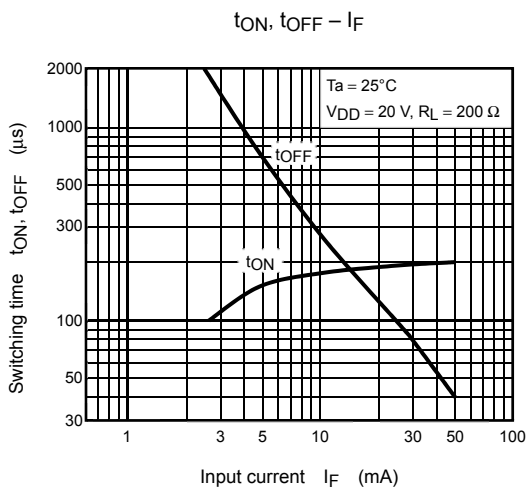
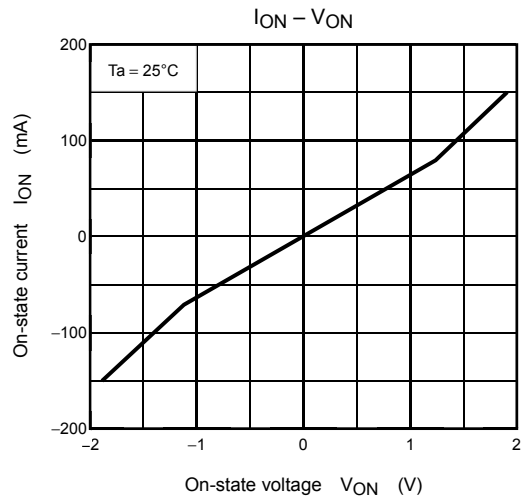
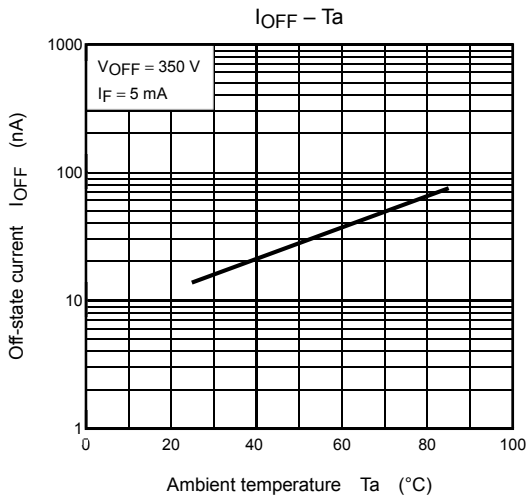
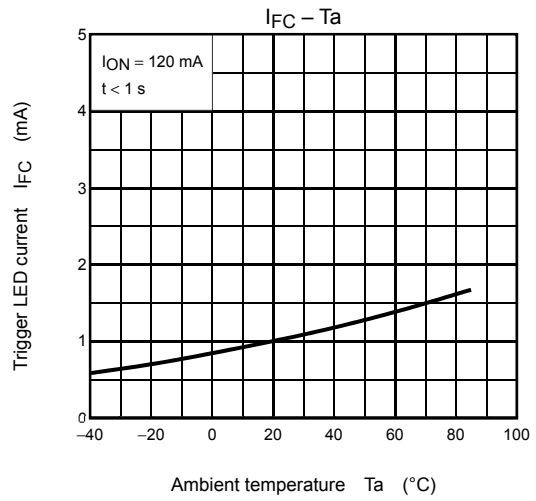
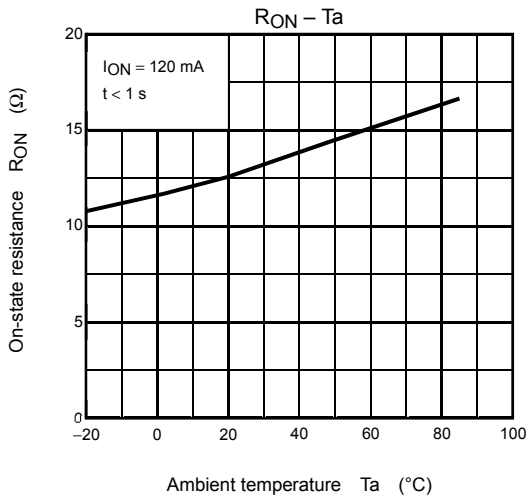
Note 3: Switching time test circuit



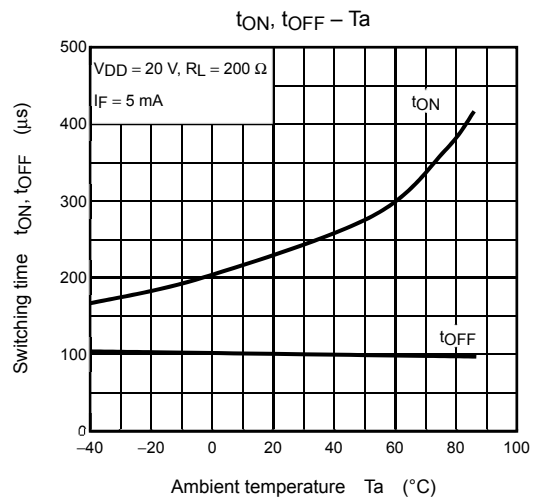
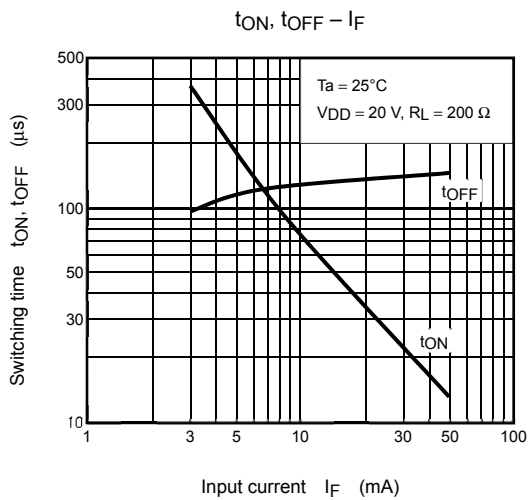
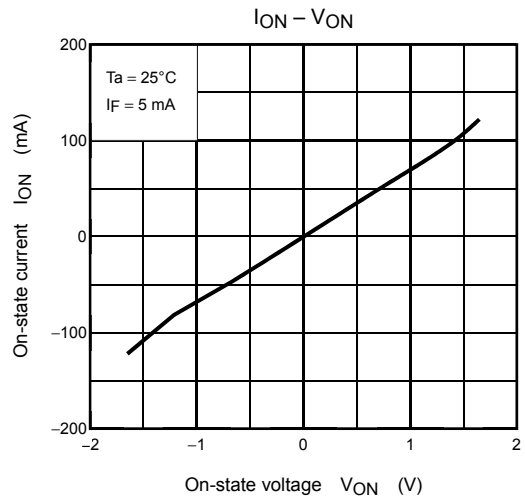
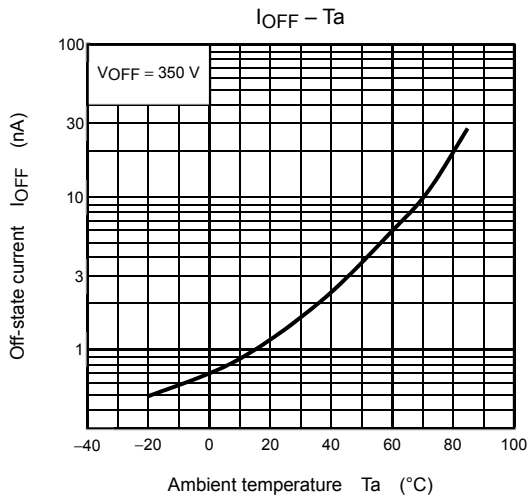
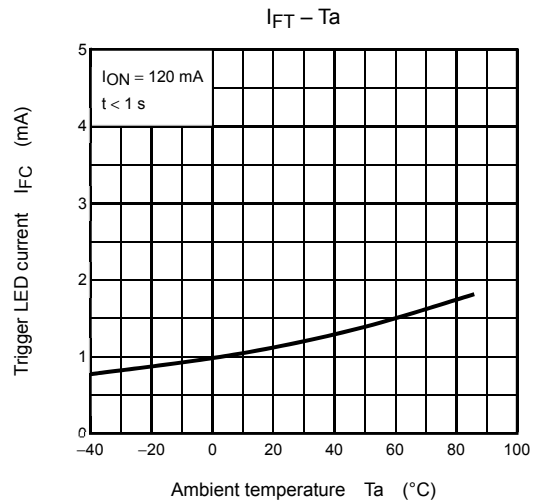
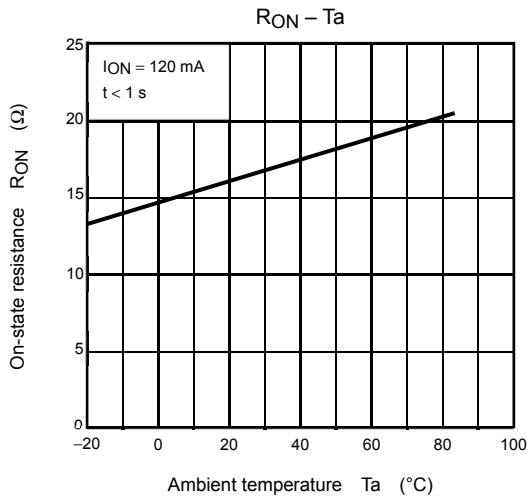
Characteristics curves for 1-form-A/B



Characteristics curves for 1-form-B



Characteristics curves for 1-form-A



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