

TOSHIBA Photocoupler Photorelay

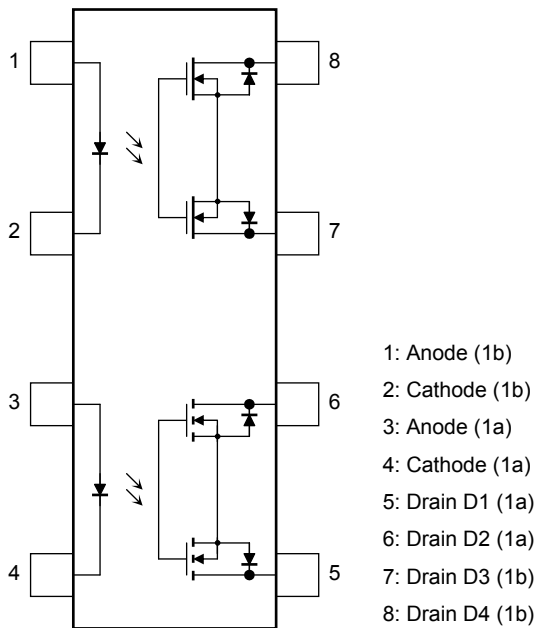
TLP4027G

Telecommunication
Measurement Equipment
Security Equipment
FA

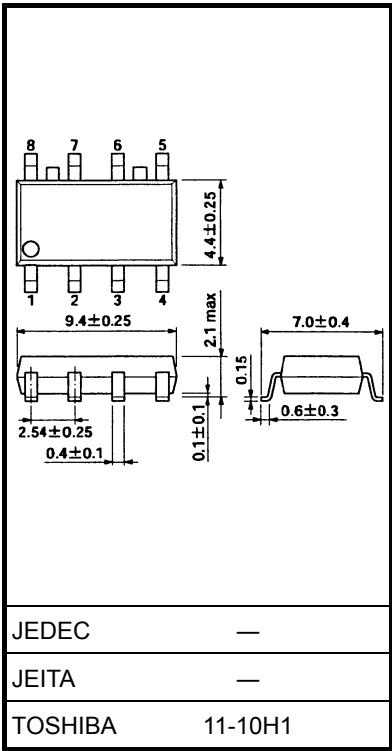
The Toshiba TLP4027G consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET and is the 1-form-A/B photorelay with 350-V withstanding voltage.

- 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: 90 mA (max)
- On-state resistance: 50 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL Recognized: UL1577, File No. E67349

Pin Configuration (top view)



Unit: mm



Weight: 0.2 g (typ.)

Absolute Maximum Ratings (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
	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}	90	mA
		Two channel operations (1a1b simultaneous operation)			
	On-state current derating (Ta ≥ 25°C)	One channel operation	ΔI _{ON} /°C	−0.9	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 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: 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	10	25	mA
On-state current	I _{ON}	—	—	90	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, f = 1 MHz	—	30	—	pF
Detector	Off-state current	I _{OFF}	V _{OFF} = 350 V	—	—	1	μA
	Capacitance (1b)	C _{OFF}	V = 0, f = 1 MHz, I _F = 5 mA	—	30	—	pF
	Capacitance (1a)		V = 0, f = 1 MHz	—	30	—	

Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Form	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	1a	I_{FT}	$I_{ON} = 90 \text{ mA}$	—	1	3	mA
	1b	I_{FC}	$I_{OFF} = 10 \text{ } \mu\text{A}$				
Return LED current	1a	I_{FC}	$I_{OFF} = 10 \text{ } \mu\text{A}$	0.1	—	—	mA
	1b	I_{FT}	$I_{ON} = 90 \text{ mA}$				
On-state resistance (Note 2)	—	R_{ON}	$I_{ON} = 90 \text{ mA}, t < 1 \text{ s}$	—	27	35	Ω
			$I_{ON} = 90 \text{ mA}$	—	40	50	

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

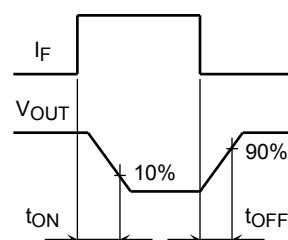
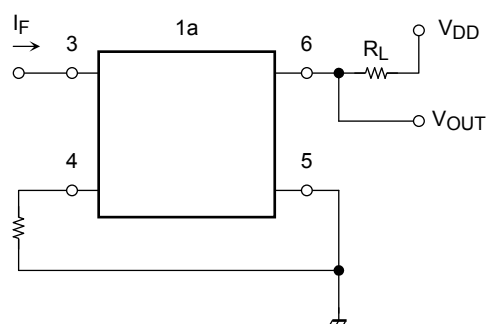
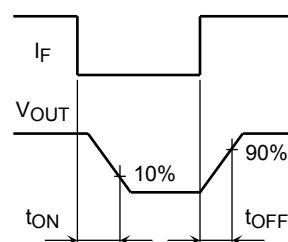
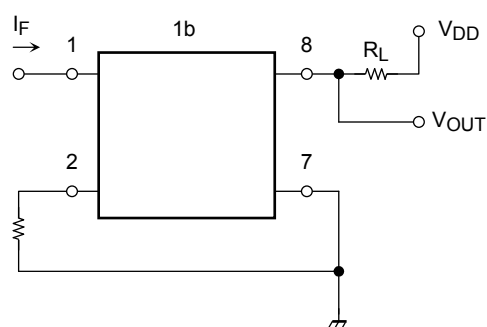
Isolation Characteristics (Ta = 25°C)

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 min	1500	—	—	Vrms
		AC, 1 s, in oil	—	3000	—	
		DC, 1 min, in oil	—	3000	—	Vdc

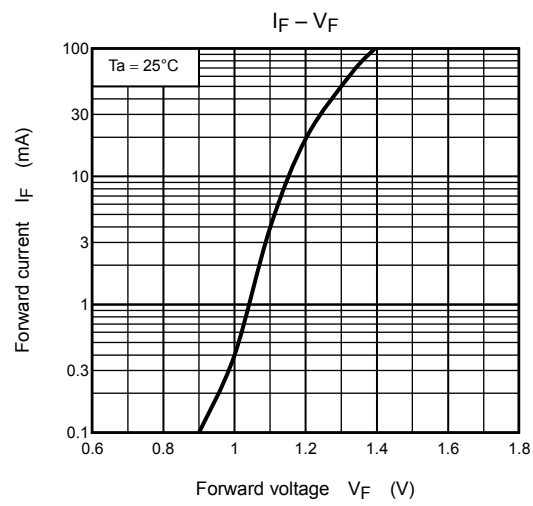
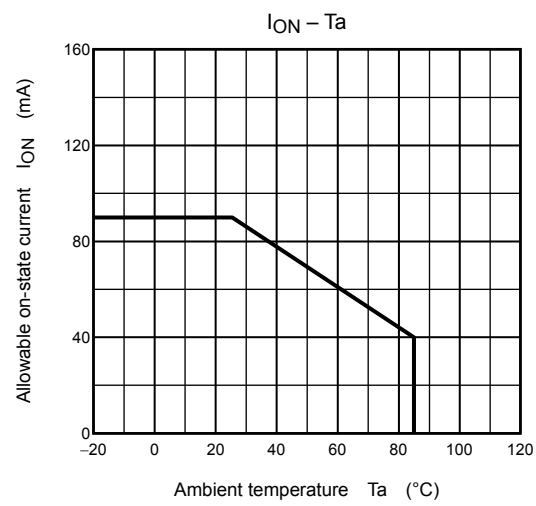
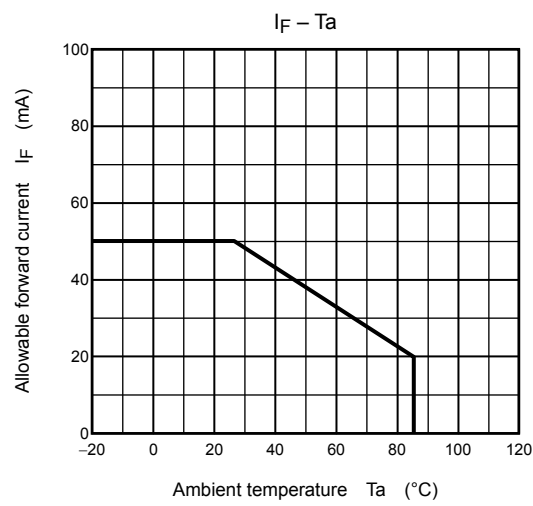
Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
1b	Turn-on time	$R_L = 200 \text{ } \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 3)	—	0.25	1	ms
	Turn-off time		—	0.5	1	
1a	Turn-on time	$R_L = 200 \text{ } \Omega$ $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 3)	—	0.3	1	ms
	Turn-off time		—	0.15	1	

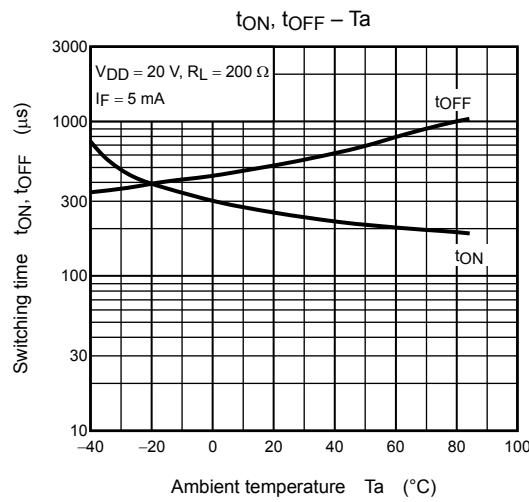
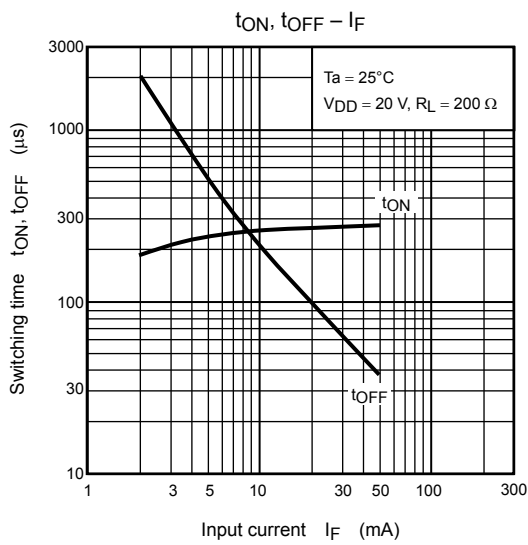
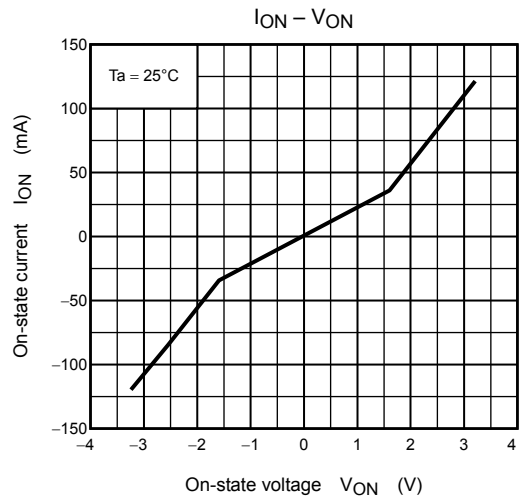
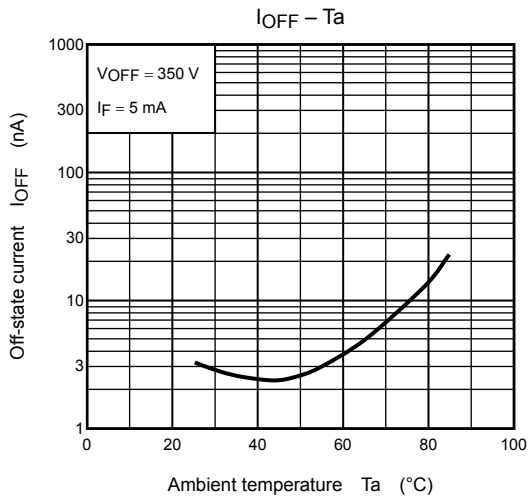
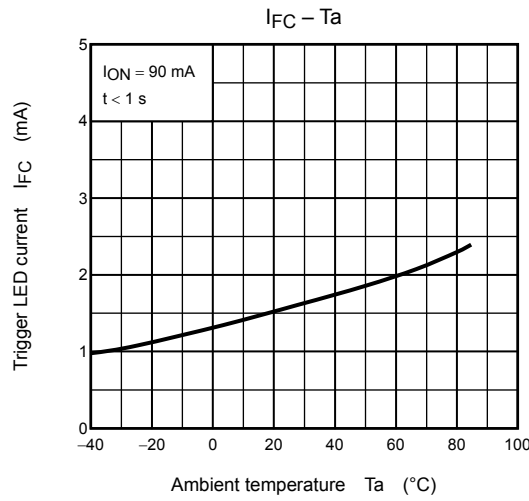
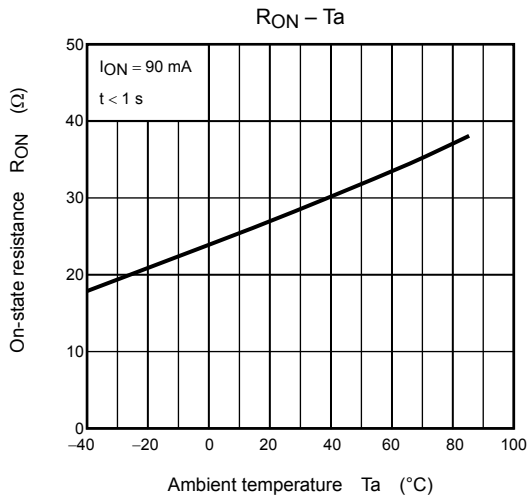
Note 3: Switching time test circuit



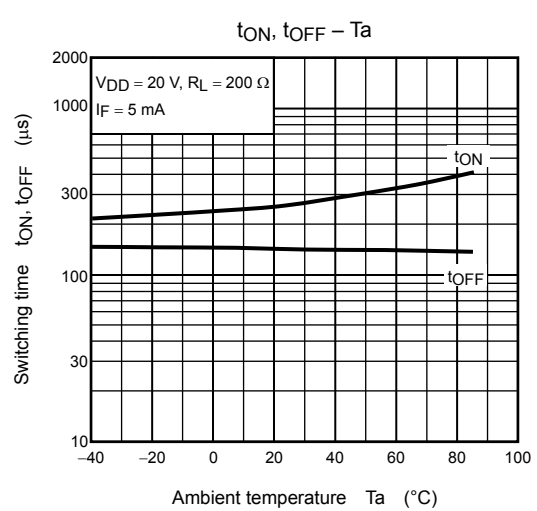
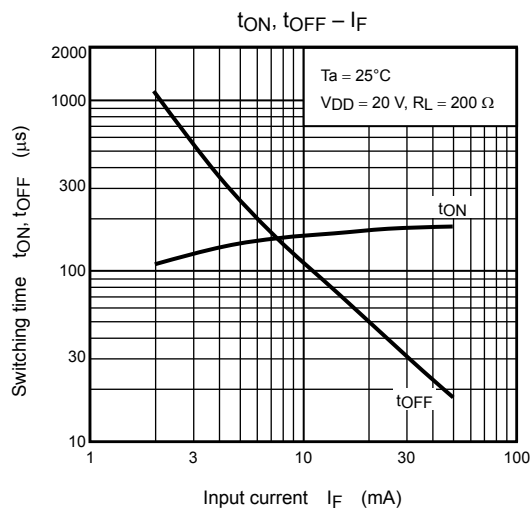
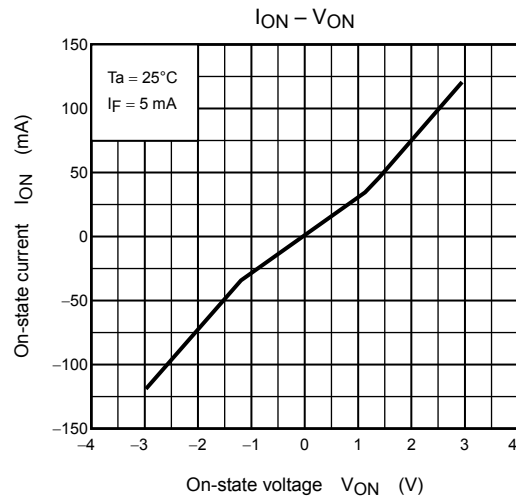
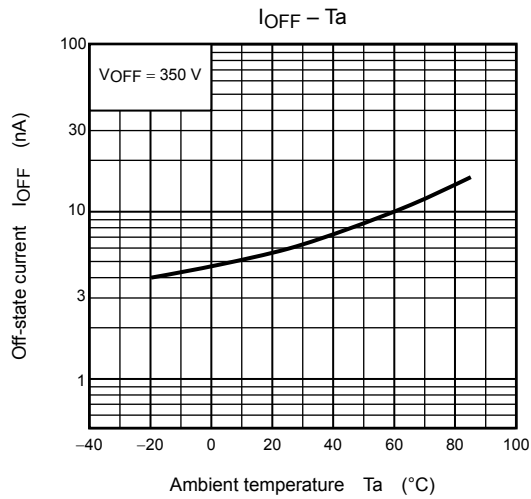
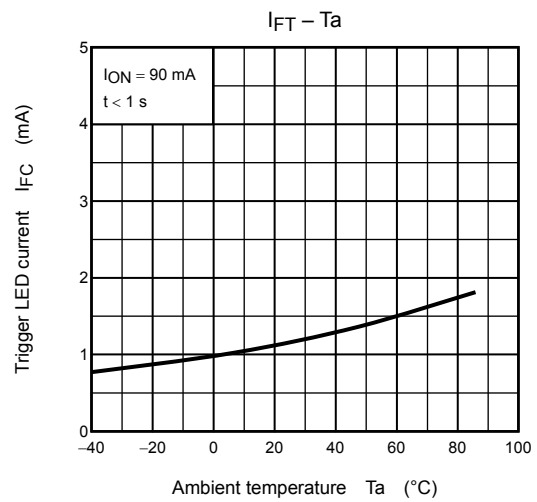
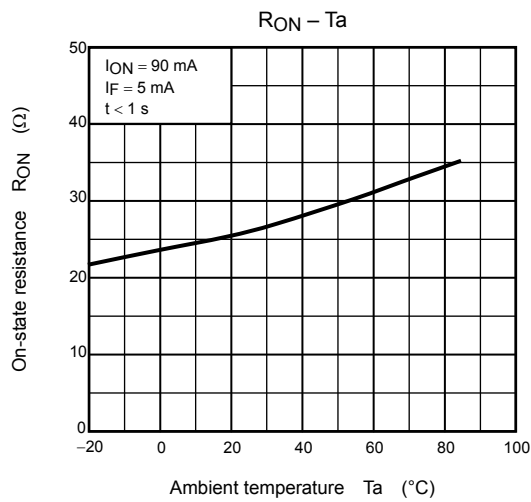
Characteristics curves for 1-form-A/B



Characteristics curves for 1-form-B



Characteristics curves for 1-form-A



RESTRICTIONS ON PRODUCT USE

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