TOSHIBA Photocoupler Photorelay

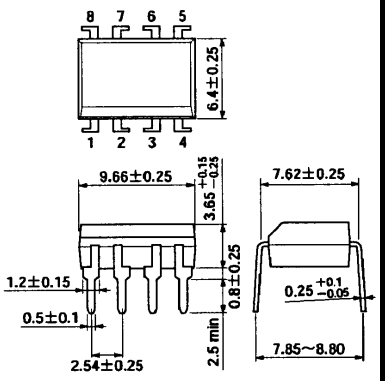
TLP4007G

Telecommunication
Measurement Equipment
Security Equipment
FA

The Toshiba TLP4007G 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: 100 mA (max)
- On-state resistance: 50 Ω (max)
- Isolation voltage: 2500 Vrms (min)

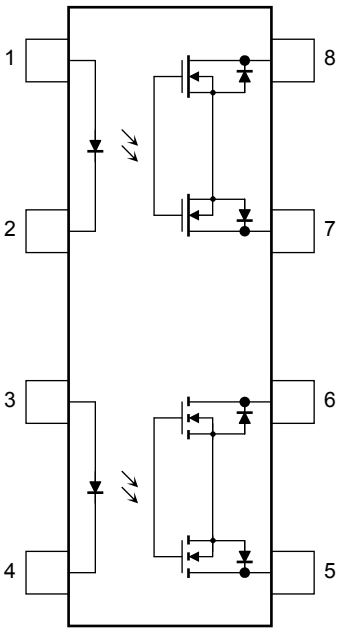
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	11-10C4

Weight: 0.54 g (typ.)

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)

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}	100	mA
		Two channel operations (1a1b simultaneous operation)			
	On-state current derating (Ta ≧ 25°C)	One channel operation	ΔI_{ON}/°C	−1.0	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	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	10	25	mA
On-state current	I_{ON}	—	—	100	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} = 100 mA	—	1	3	mA
	1b	I_{FC}	I_{OFF} = 10 μA				
Return LED current	1a	I_{FC}	I_{OFF} = 10 μA	0.1	—	—	mA
	1b	I_{FT}	I_{ON} = 100 mA				
On-state resistance (Note 2)	—	R_{ON}	I_{ON} = 100 mA, t < 1s	—	27	35	Ω
			I_{ON} = 100 mA	—	40	50	

Note 2: 1-form-A: I_F = 5 mA, 1-form-B: I_F = 0 mA

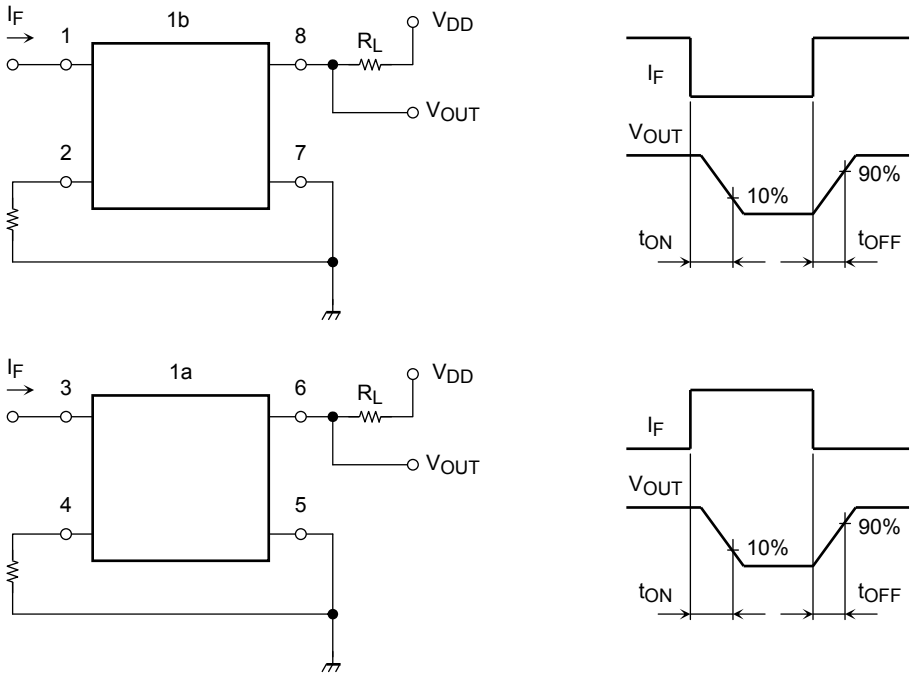
Isolation Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0, f = 1 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, 1 min	2500	—	—	Vrms
		AC, 1 s, in oil	—	5000	—	
		DC, 1 min, in oil	—	5000	—	Vdc

Switching Characteristics (Ta = 25°C)

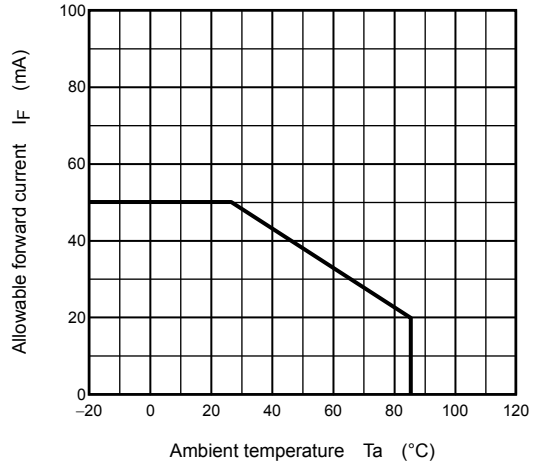
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
1b	Turn-on time	t_{ON}	R_L = 200 Ω, V_{DD} = 20 V, I_F = 5 mA (Note 3)	—	0.25	1	ms
	Turn-off time	t_{OFF}		—	0.5	1	
1a	Turn-on time	t_{ON}	R_L = 200 Ω, V_{DD} = 20 V, I_F = 5 mA (Note 3)	—	0.3	1	ms
	Turn-off time	t_{OFF}		—	0.15	1	

Note 3: Switching time test circuit

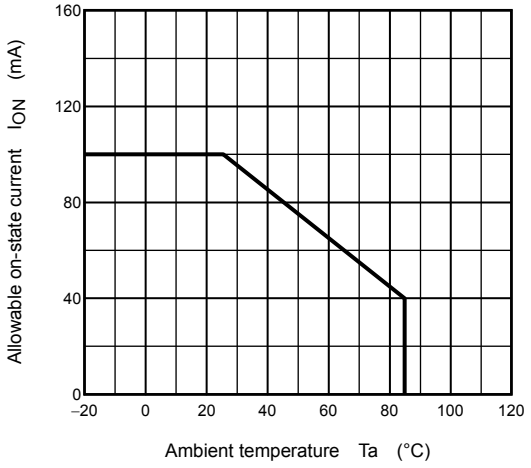


Characteristics curves for 1-form-A/B

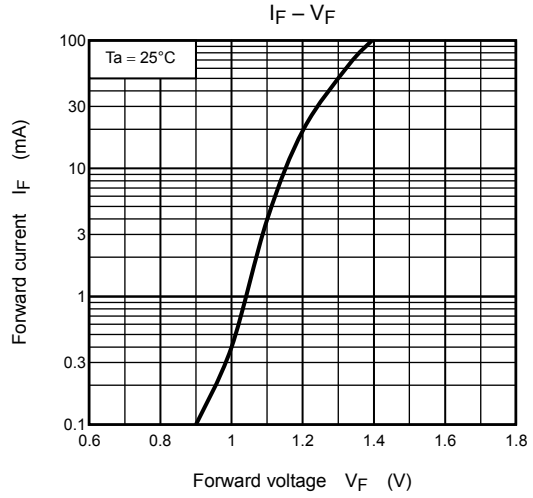
I_F – Ta



I_{ON} – Ta

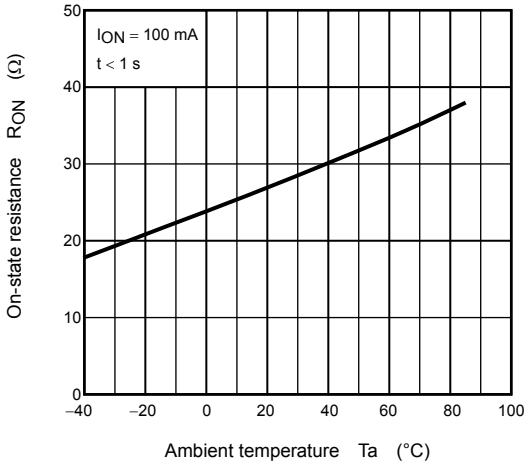


I_F – V_F

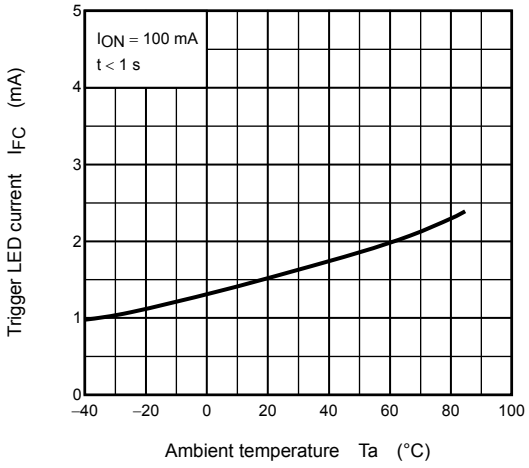


Characteristics curves for 1-form-B

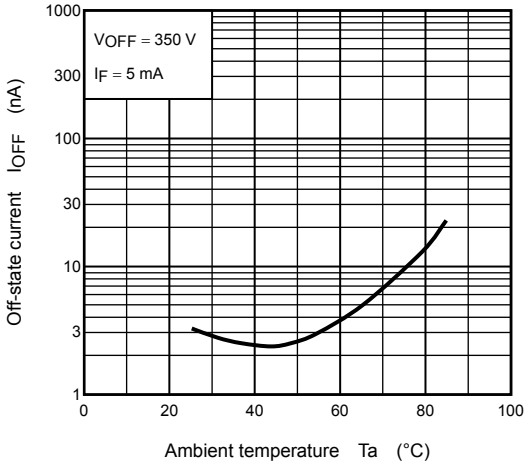
R_{ON} – Ta



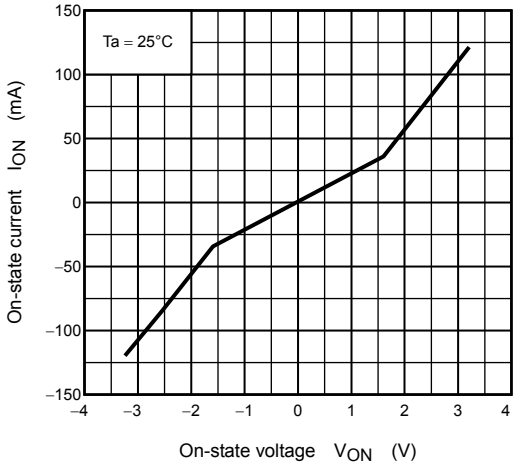
I_{FC} – Ta



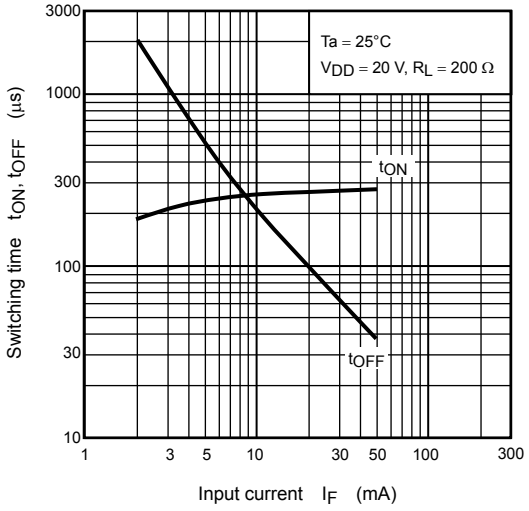
I_{OFF} – Ta



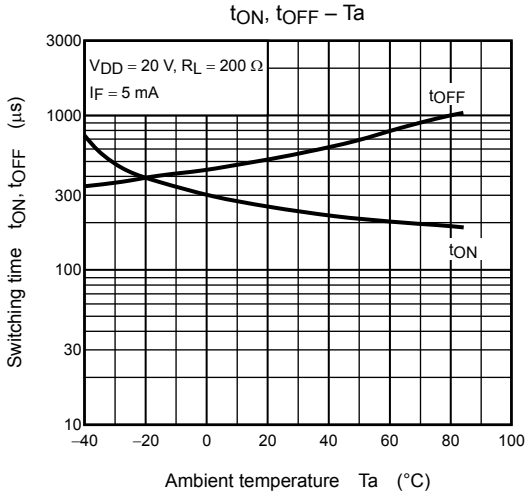
I_{ON} – V_{ON}



t_{ON}, t_{OFF} – I_F

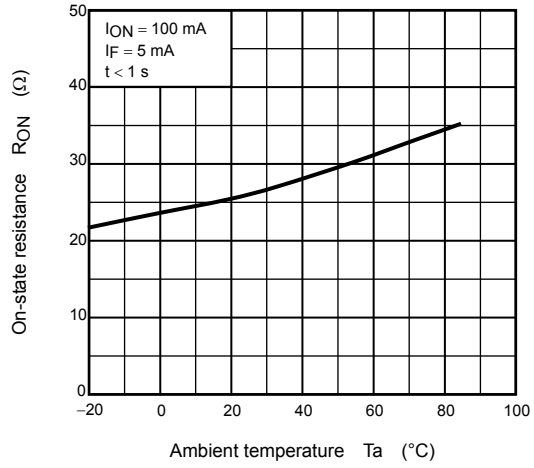


t_{ON}, t_{OFF} – Ta

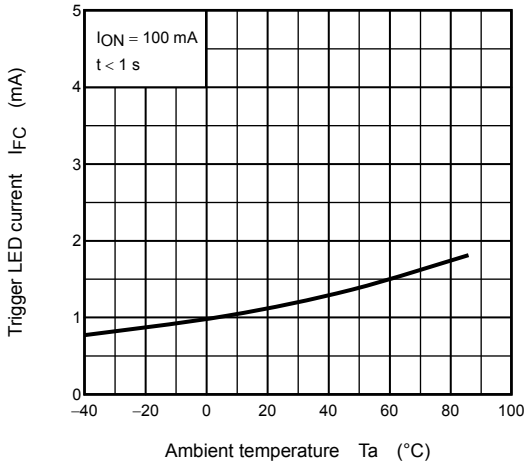


Characteristics curves for 1-form-A

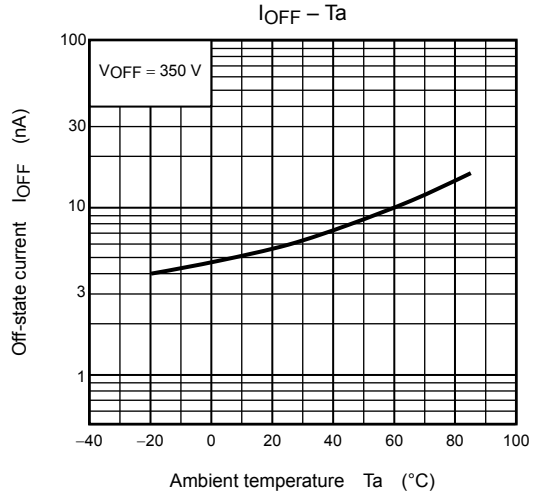
R_{ON} – Ta



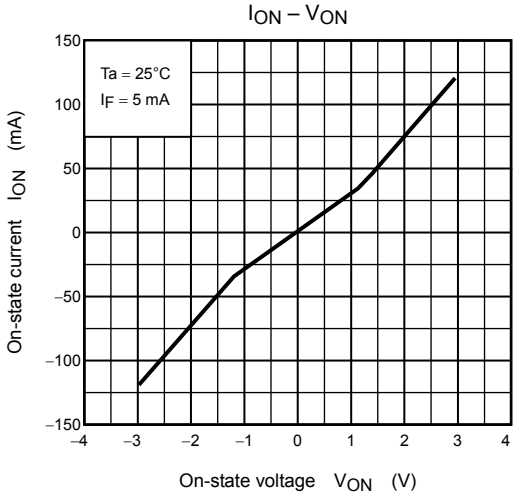
I_{FT} – Ta



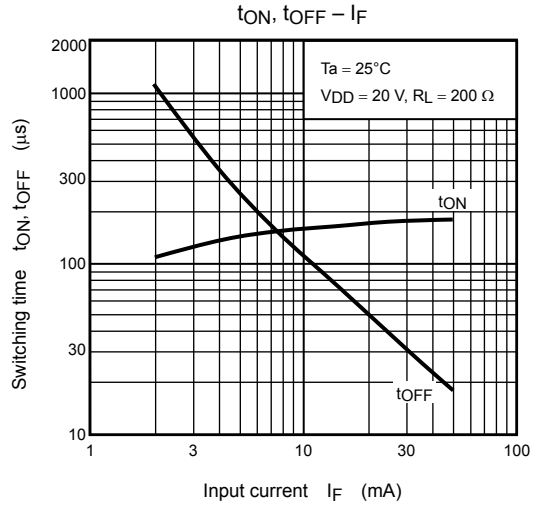
I_{OFF} – Ta



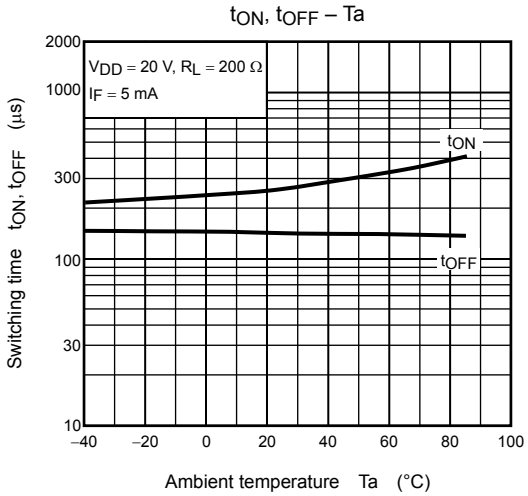
I_{ON} – V_{ON}



t_{ON}, t_{OFF} – I_F



t_{ON}, t_{OFF} – Ta



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