

TOSHIBA Photocoupler Photorelay

# TLP176GA

PBX

Telecommunication

Modem·FAX Cards, Modems In PC

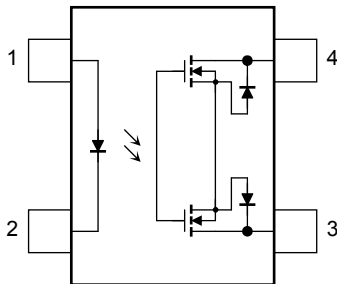
Measurement Instrumentation

The TOSHIBA TLP176GA consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a SOP, which is suitable for surface mount assembly.

The TLP176GA is suitable for the modem applications which require space savings.

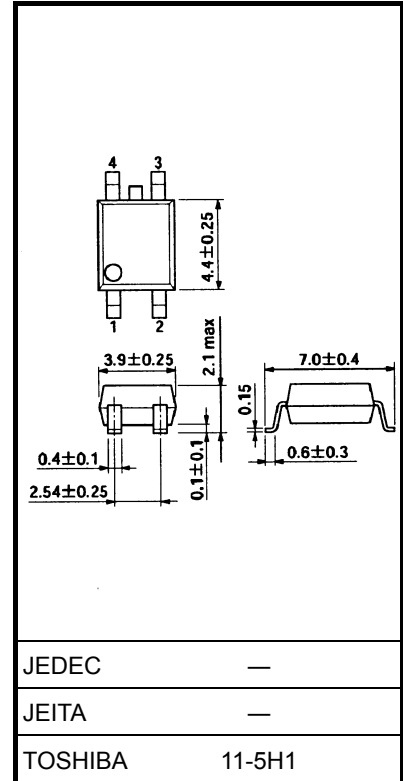
- 4 pin SOP (2.54SOP4): 2.1 mm high, 2.54 mm pitch
- 1-form-A
- Peak off-state voltage: 400 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 120 mA (max)
- On-state resistance: 35 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- BSI approved: BS EN60065:2002, certificate no.8753  
BS EN60950-1:2002, certificate no.8754

### Pin Configuration (top view)



- 1: ANODE
- 2: CATHODE
- 3: DRAIN
- 4: DRAIN

Unit: mm



Weight: 0.1 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)	$\Delta I_F/^\circ\text{C}$	-0.5	mA/°C
	Peak forward current (100 μs pulse, 100 pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Junction temperature	$T_j$	125	°C
Detector	Off-state output terminal voltage	$V_{OFF}$	400	V
	On-state current	$I_{ON}$	120	mA
	On-state current derating (Ta ≥ 25°C)	$\Delta I_{ON}/^\circ\text{C}$	-1.2	mA/°C
	Junction temperature	$T_j$	125	°C
Operating temperature range		$T_{opr}$	-40 to 85	°C
Storage temperature range		$T_{stg}$	-55 to 125	°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: Device considered a two-terminal device: LED side pins shorted together, and DETECTOR side pins shorted together.

## Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$	—	—	320	V
Forward current	$I_F$	5	7.5	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.

## 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	μA
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	30	—	pF
Detector	Off-state current	$I_{OFF}$	$V_{OFF} = 400 \text{ V}$	—	—	1	μA
	Capacitance	$C_{OFF}$	$V = 0, f = 1 \text{ MHz}$	—	70	—	pF

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$	$I_{ON} = 120 \text{ mA}$	—	1	3	mA
Return LED current	$I_{FC}$	$I_{OFF} = 100 \mu\text{A}$	0.1	—	—	mA
On-state resistance	$R_{ON}$	$I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}$	—	17	35	$\Omega$

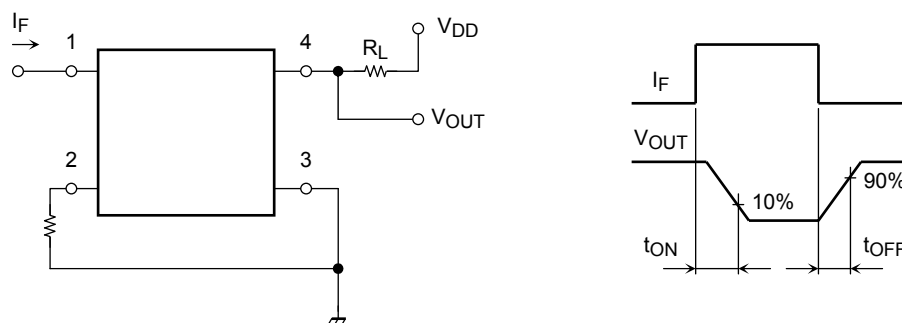
## Isolation Characteristics (Ta = 25°C)

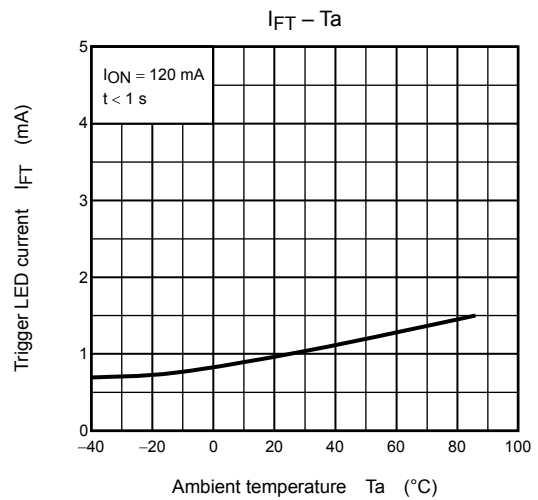
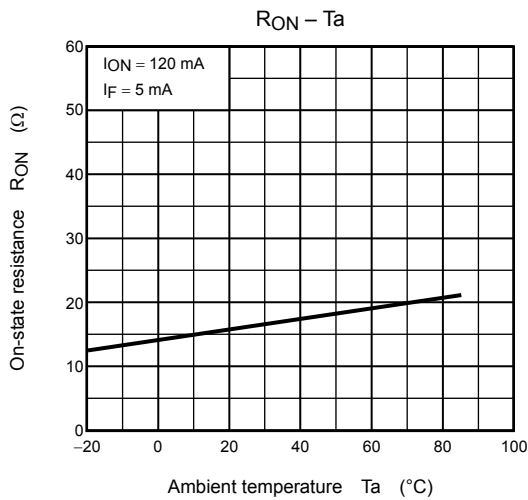
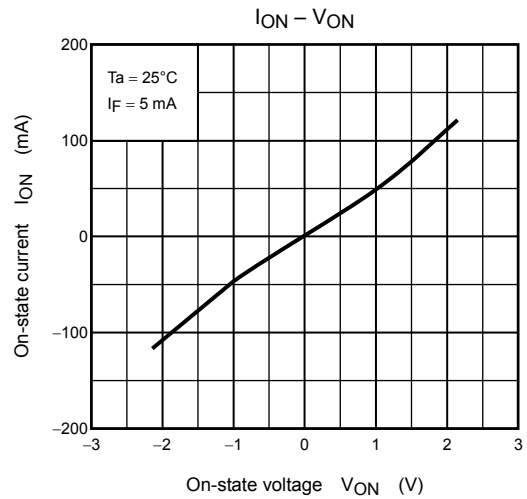
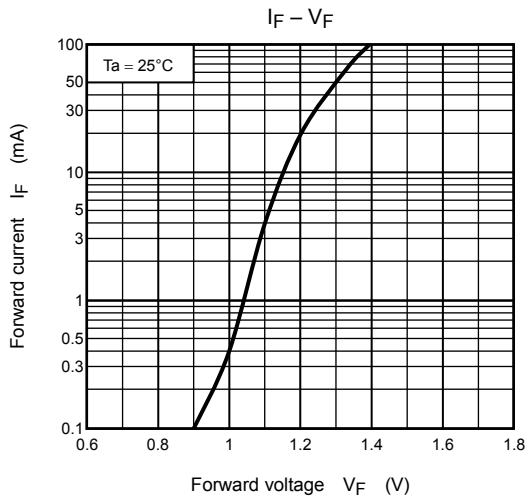
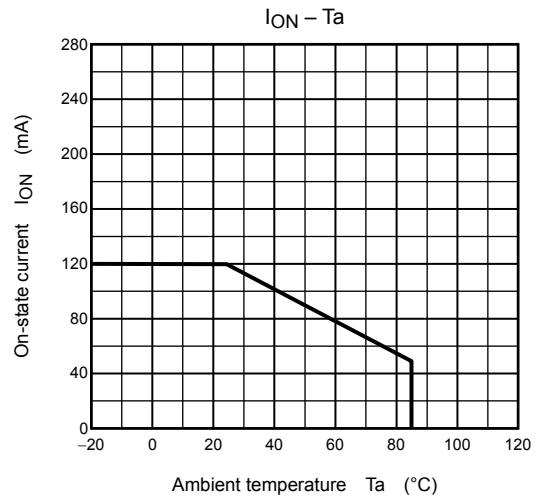
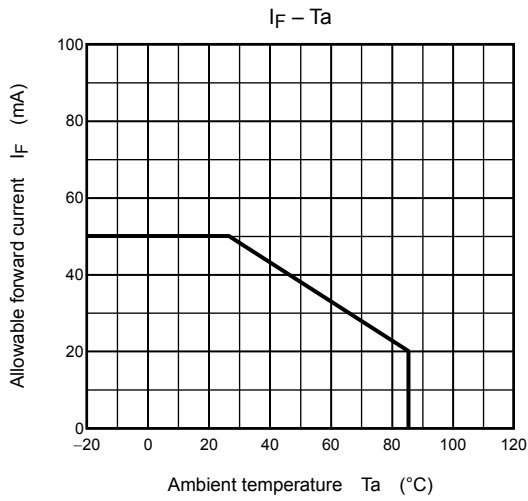
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 min	1500	—	—	Vrms
		AC, 1 s, in oil	—	3000	—	Vrms
		DC, 1 min, in oil	—	3000	—	Vdc

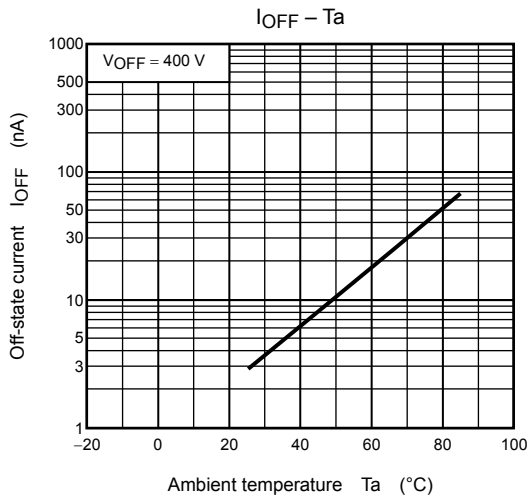
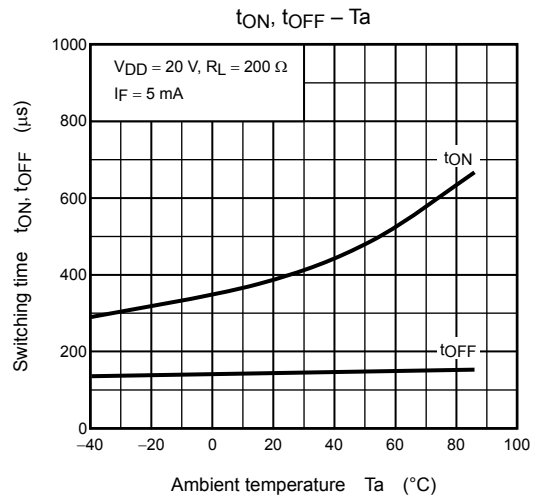
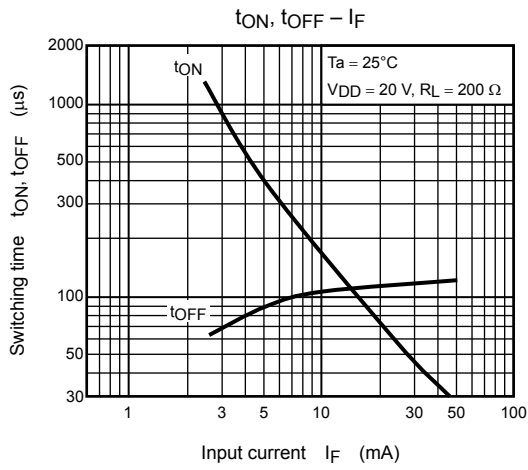
## Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$	$R_L = 200 \Omega$ (Note 2)	—	0.3	1	ms
Turn-off time	$t_{OFF}$	$V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	0.1	1	ms

Note 2: Switching time test circuit







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