

TOSHIBA Photocoupler Photorelay

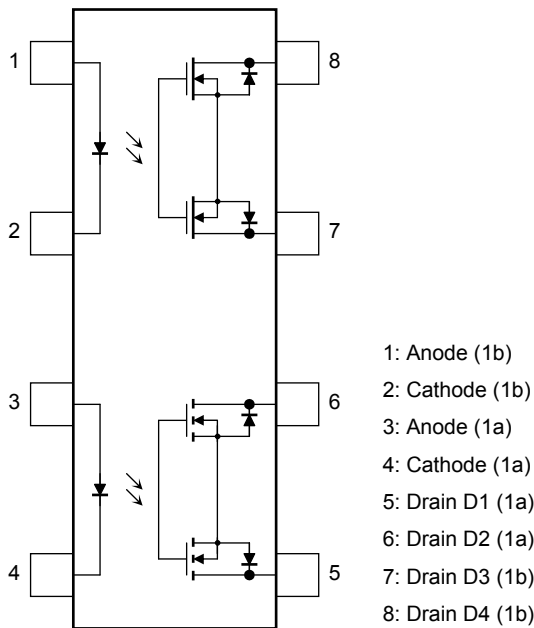
TLP4026G

Telecommunication  
Measuring Equipment  
Security Equipment  
FA

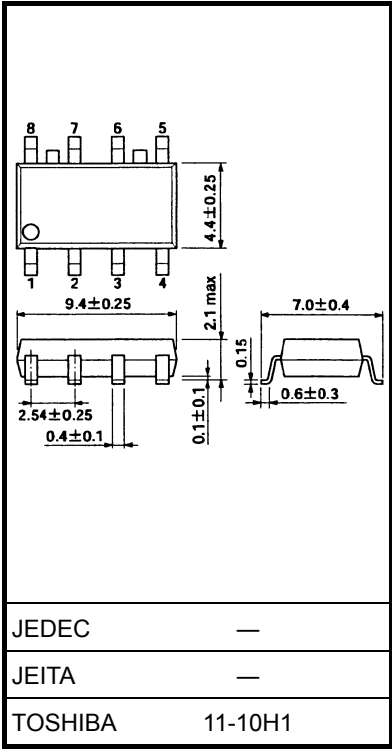
The Toshiba TLP4026G consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET and is the 1-form-A/B photorelay with 350-V withstanding voltage.

- 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: 1500 Vrms (min)

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 <sub>F</sub>       | 50         | mA    |
|                                                    | Forward current derating (Ta > 25°C)     |                                                         | ΔI <sub>F</sub> /°C  | −0.5       | mA/°C |
|                                                    | Peak forward current                     |                                                         | I <sub>FP</sub>      | 1          | A     |
|                                                    | Reverse voltage                          |                                                         | V <sub>R</sub>       | 5          | V     |
|                                                    | Junction temperature                     |                                                         | T <sub>j</sub>       | 125        | °C    |
| Detector                                           | Off-state output terminal voltage        |                                                         | V <sub>OFF</sub>     | 350        | V     |
|                                                    | On-state current                         | One channel operation                                   | I <sub>ON</sub>      | 120        | mA    |
|                                                    |                                          | Two channel operations<br>(1a1b simultaneous operation) |                      |            |       |
|                                                    | On-state current derating<br>(Ta ≥ 25°C) | One channel operation                                   | ΔI <sub>ON</sub> /°C | −1.2       | mA/°C |
|                                                    |                                          | Two channel operations<br>(1a1b simultaneous operation) |                      |            |       |
|                                                    | 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 min, R.H. < 60%) (Note 1) |                                          |                                                         | BV <sub>S</sub>      | 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   | —    | 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)  |           | $V = 0, f = 1 \text{ MHz}$                     |     |      |     |      |

## 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   | $I_{FC}$ | $I_{OFF} = 10 \text{ } \mu\text{A}$   |     |      |     |          |
| Return LED current  | 1a   | $I_{FC}$ | $I_{OFF} = 10 \text{ } \mu\text{A}$   | 0.1 | —    | —   | mA       |
|                     | 1b   | $I_{FT}$ | $I_{ON} = 120 \text{ mA}$             |     |      |     |          |
| On-state resistance | —    | $R_{ON}$ | $I_{ON} = 120 \text{ mA}$<br>(Note 2) | —   | 15   | 25  | $\Omega$ |

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

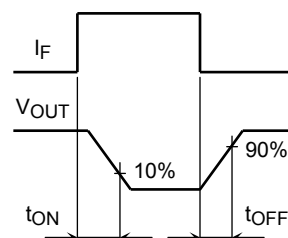
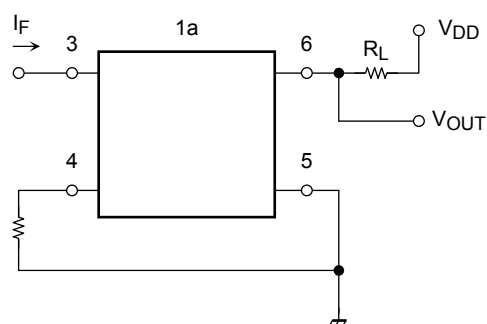
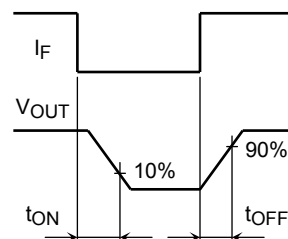
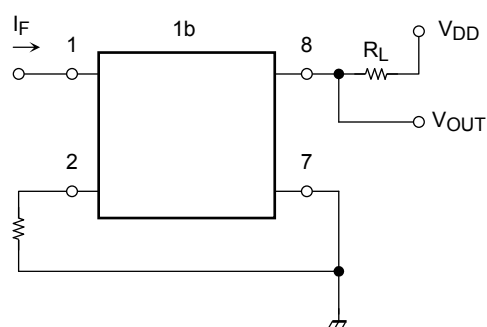
## Isolation Characteristics (Ta = 25°C)

| 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        | $R_S$  | $V_S = 500 \text{ V}$ , R.H. < 60% | $5 \times 10^{10}$ | $10^{14}$ | —   | $\Omega$ |
| Isolation voltage           | $BV_S$ | AC, 1 min                          | 1500               | —         | —   | Vrms     |
|                             |        | AC, 1 s, in oil                    | —                  | 3000      | —   |          |
|                             |        | DC, 1 min, in oil                  | —                  | 3000      | —   | Vdc      |

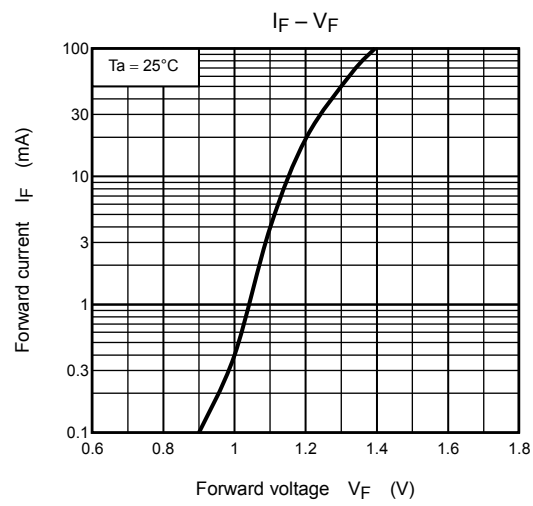
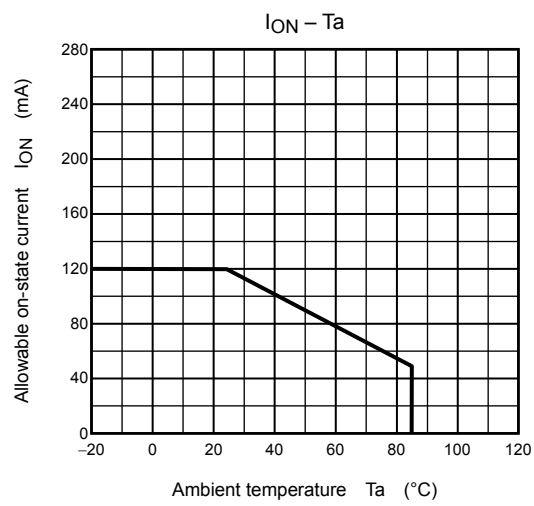
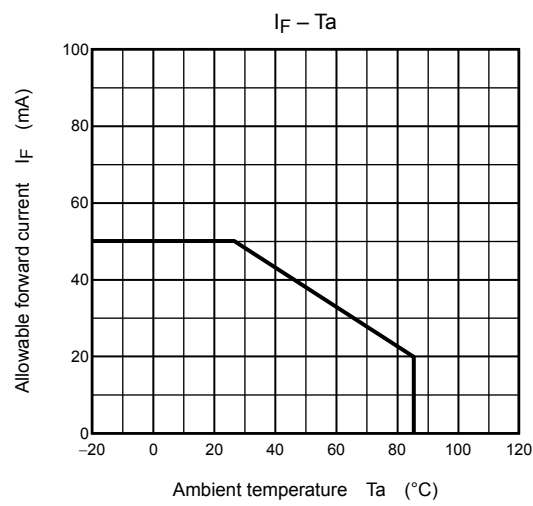
## Switching Characteristics (Ta = 25°C)

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

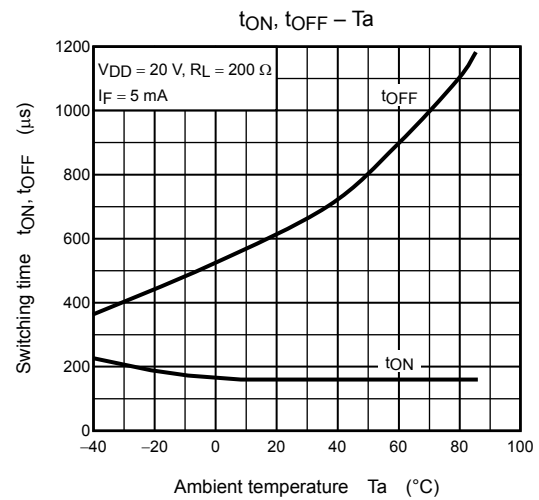
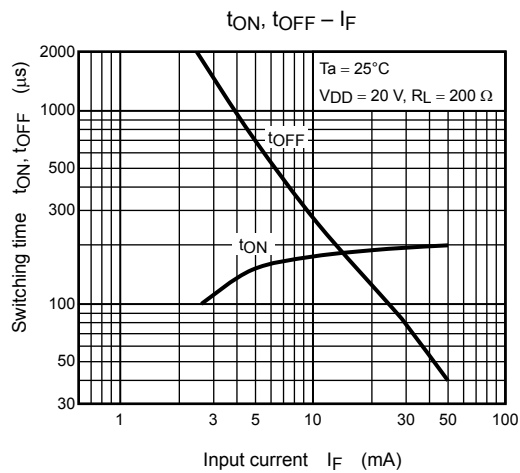
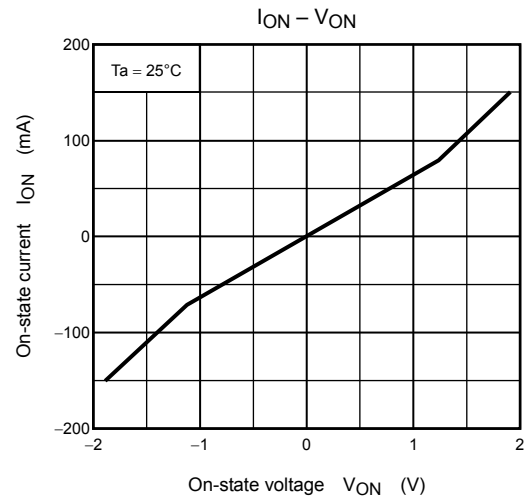
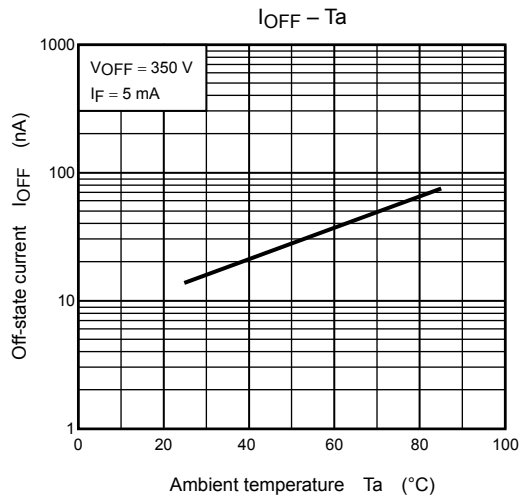
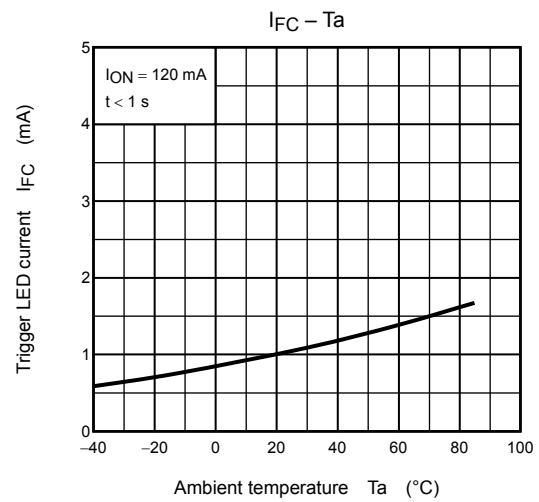
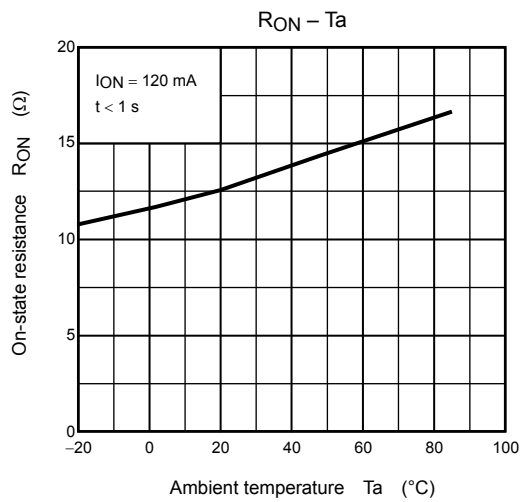
Note 3: Switching time test circuit



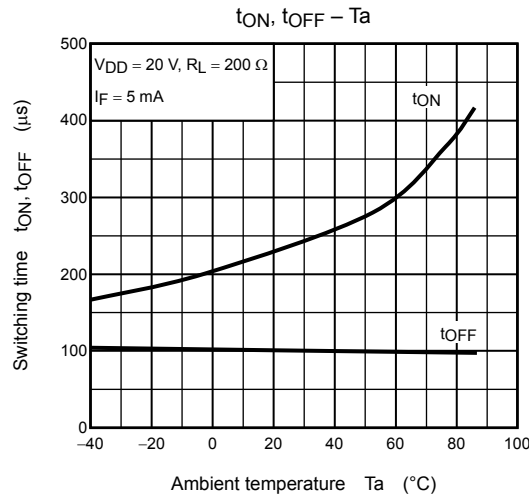
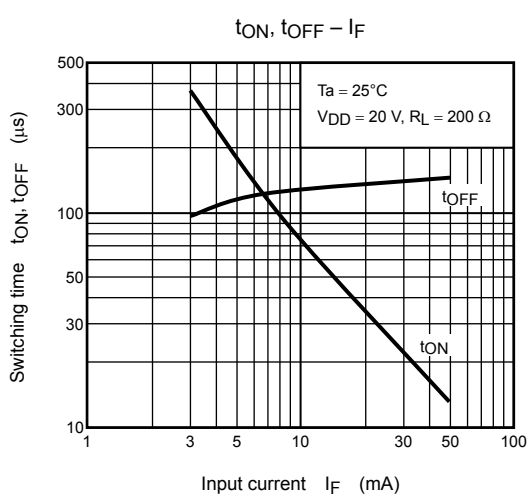
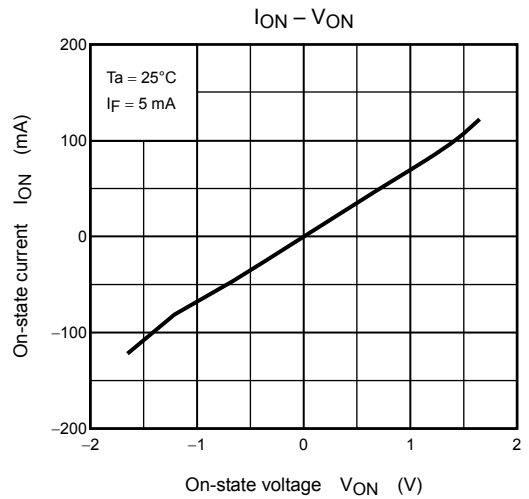
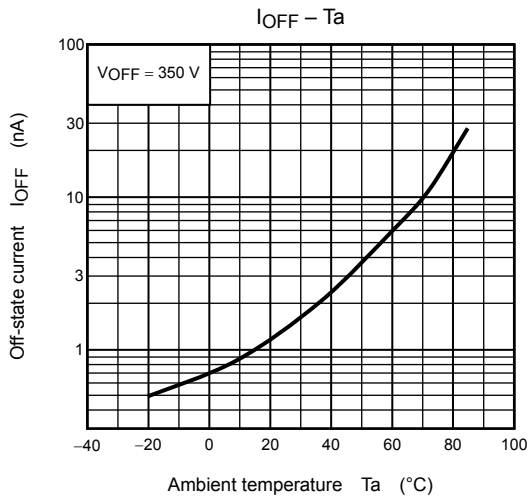
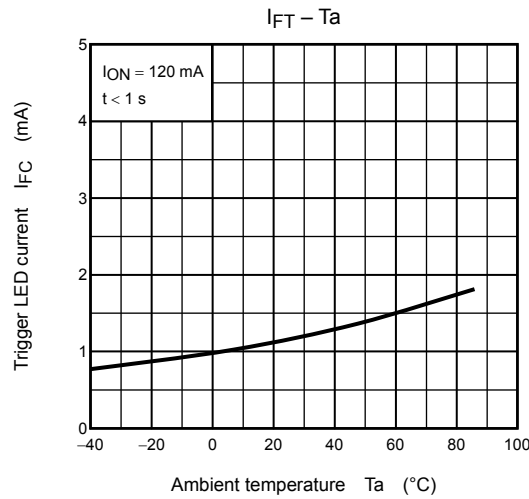
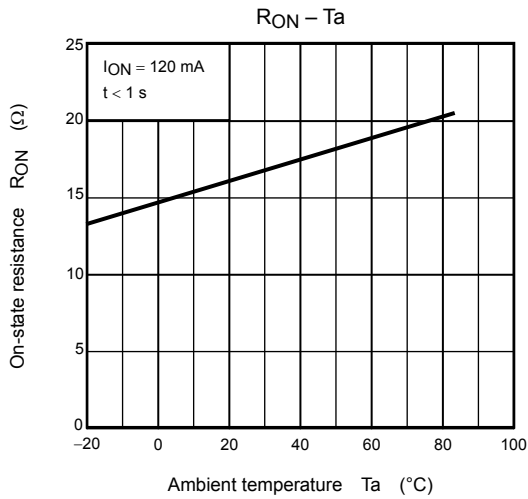
Characteristics curves for 1-form-A/B



**Characteristics curves for 1-form-B**



Characteristics curves for 1-form-A



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