

TOSHIBA Photocoupler Photorelay

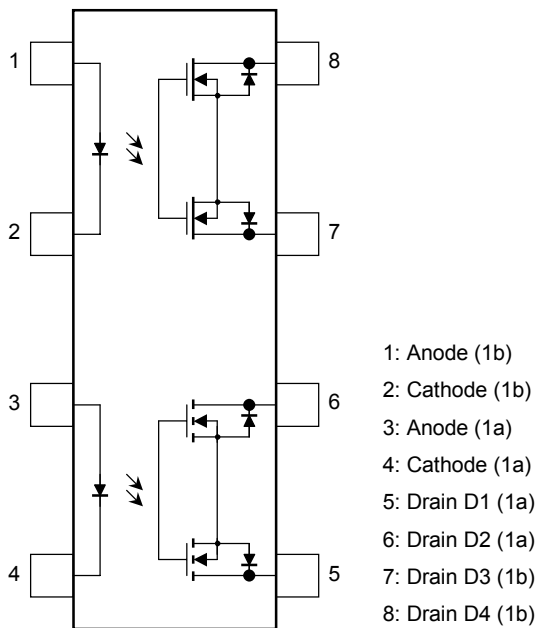
# TLP4027G

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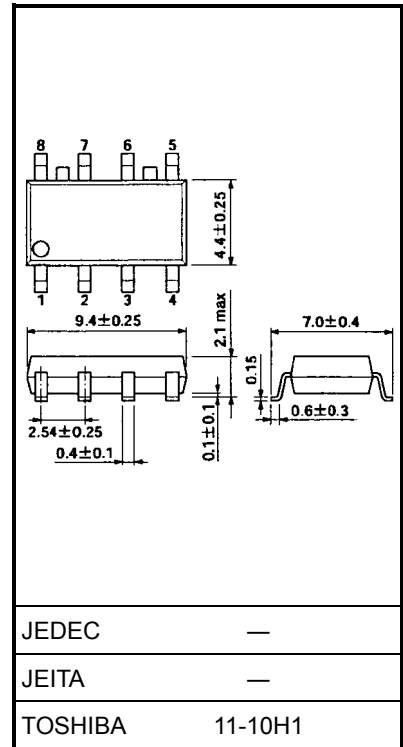
The Toshiba TLP4027G consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET and is the 1-form-A/B photorelay with 350-V withstanding voltage.

- 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)

### Pin Configuration (top view)



Unit: mm



Weight: 0.2 g (typ.)

## 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                                | $I_{ON}$                       | 90    | mA    |
|  |                                       | Two channel operations (1a1b simultaneous operation) |                                |       |       |
|  | On-state current derating (Ta ≥ 25°C) | One channel operation                                | $\Delta I_{ON}/^\circ\text{C}$ | -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 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   |

## 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)  | $C_{OFF}$ | $V = 0, f = 1 \text{ MHz}, I_F = 5 \text{ mA}$ | —   | 30   | —   | pF   |
|                 | Capacitance (1a)  |           | $V = 0, f = 1 \text{ MHz}$                     | —   | 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   | $I_{FC}$ | $I_{OFF} = 10 \mu\text{A}$                |     |      |     |          |
| Return LED current           | 1a   | $I_{FC}$ | $I_{OFF} = 10 \mu\text{A}$                | 0.1 | —    | —   | mA       |
|                              | 1b   | $I_{FT}$ | $I_{ON} = 90 \text{ mA}$                  |     |      |     |          |
| On-state resistance (Note 2) | —    | $R_{ON}$ | $I_{ON} = 90 \text{ mA}, t < 1 \text{ s}$ | —   | 30   | 35  | $\Omega$ |
|                              |      |          | $I_{ON} = 90 \text{ mA}$                  | —   | 40   | 50  |          |

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

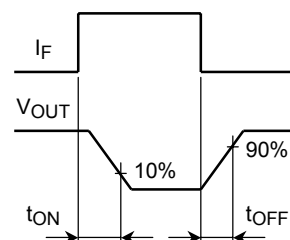
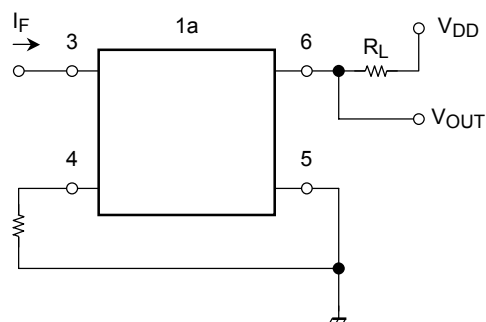
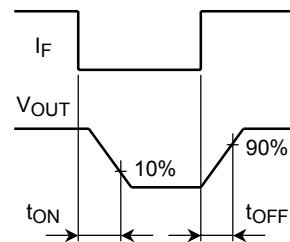
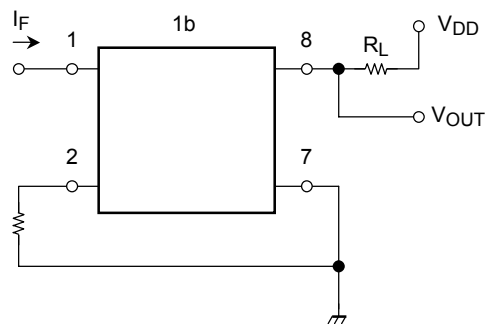
## Isolation Characteristics (Ta = 25°C)

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

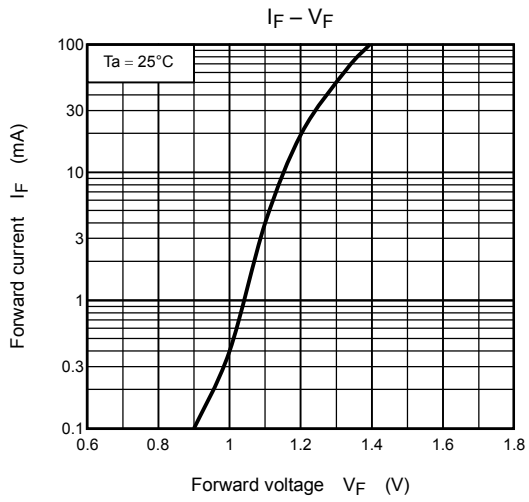
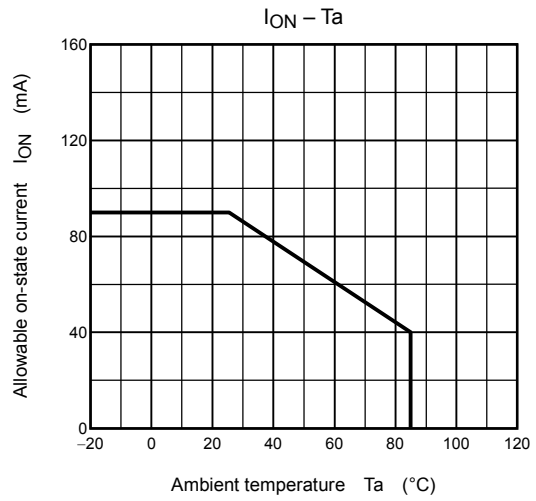
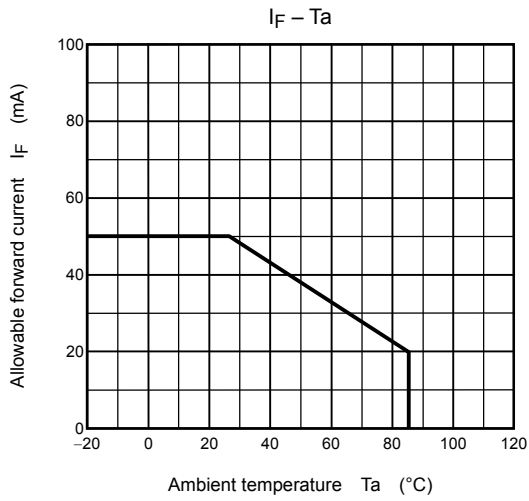
## Switching Characteristics (Ta = 25°C)

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

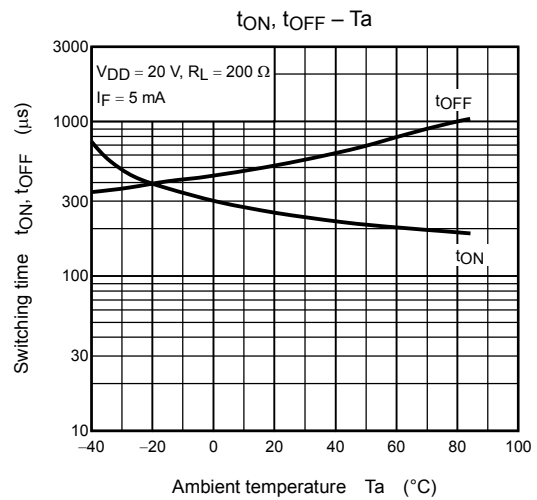
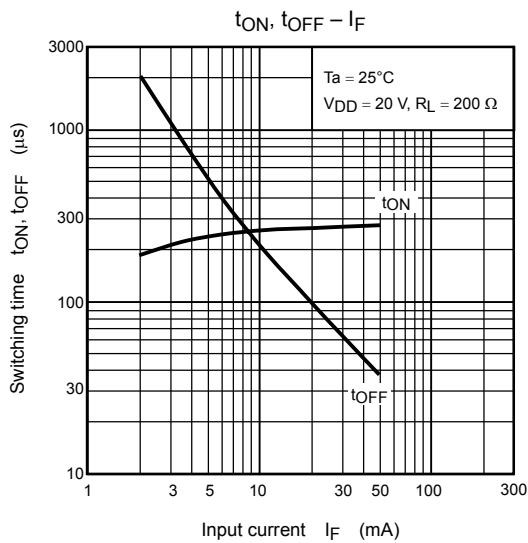
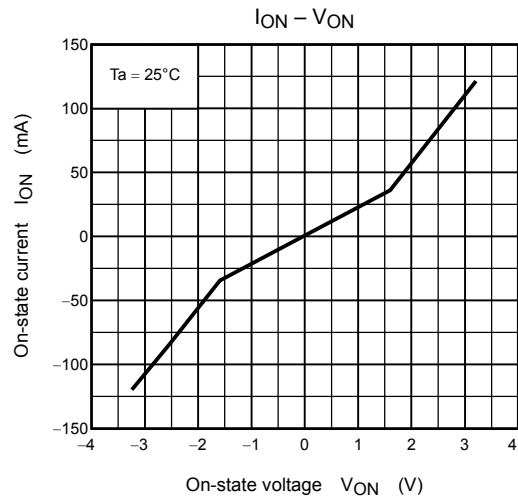
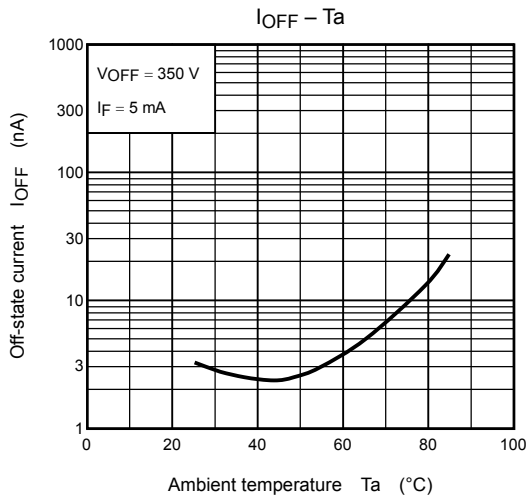
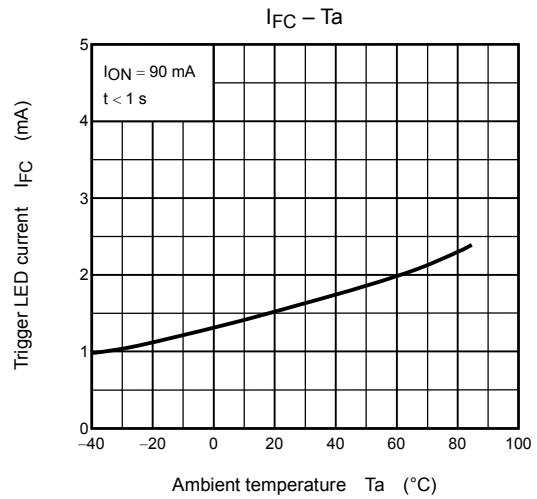
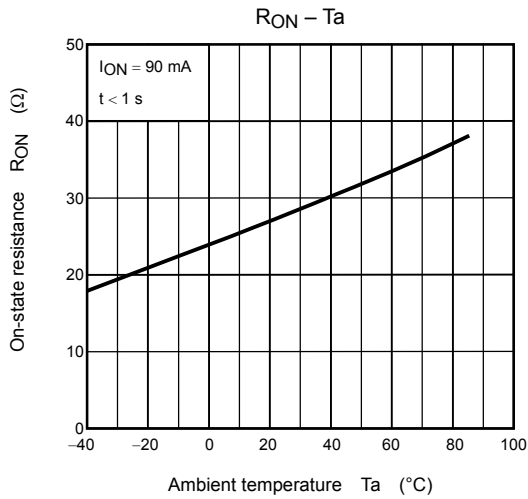
Note 3: Switching time test circuit



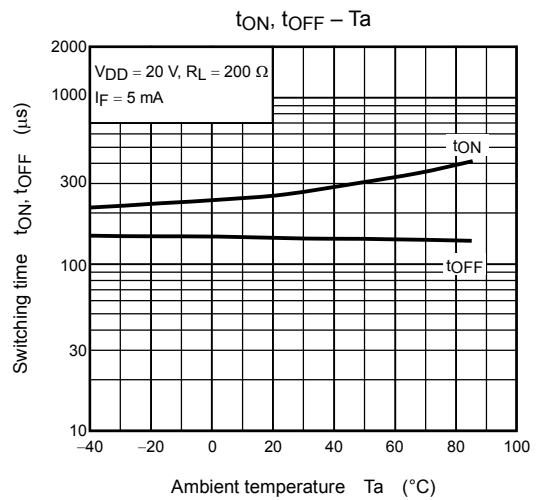
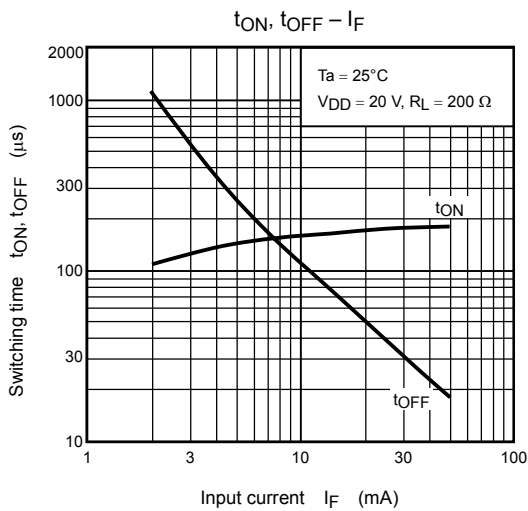
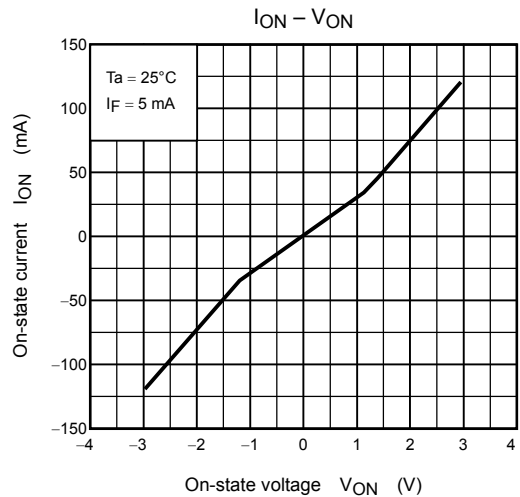
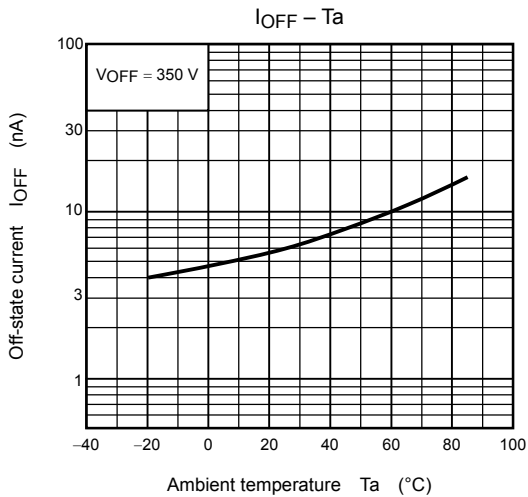
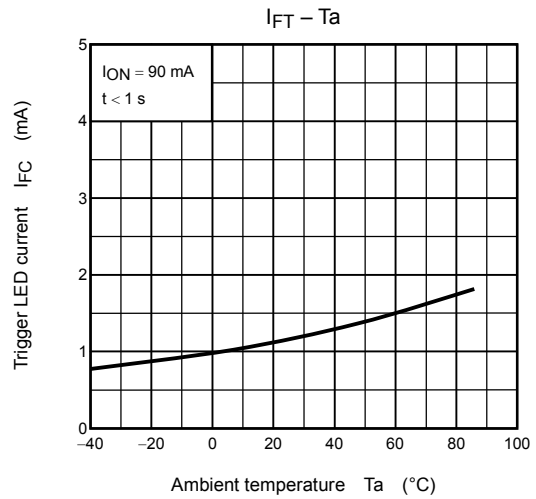
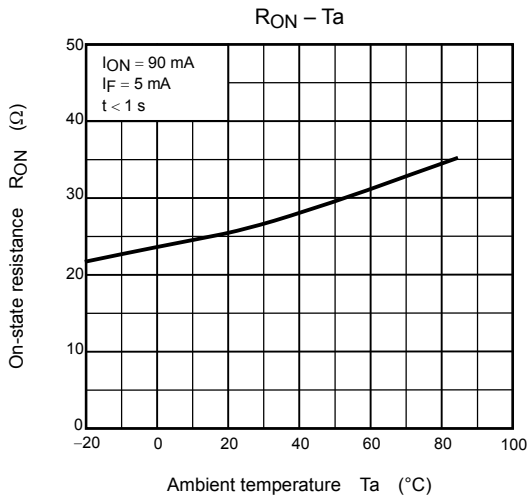
**Characteristics curves for 1-form-A/B**



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



**Characteristics curves for 1-form-A**



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