

TOSHIBA Photocoupler Photo Relay

## TLP227G, TLP227G-2

Cordless Telephone

PBX

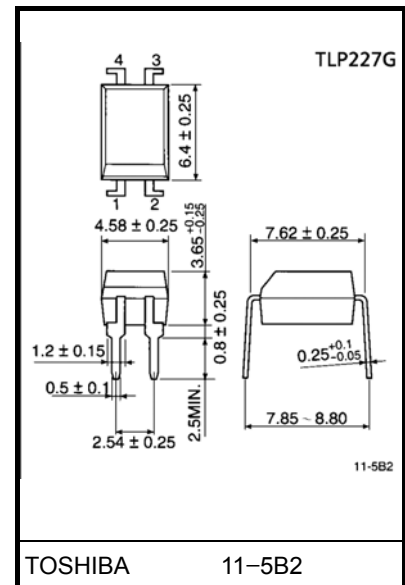
Modem

Unit in mm

The TOSHIBA TLP227G series consist of a gallium arsenide infrared emitting diode optically coupled to a photo-MOS FET in a plastic DIP package.

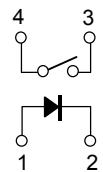
The TLP227G series are a bi-directional switch which can replace mechanical relays in many applications.

- TLP227G: 4 pin DIP(DIP4), 1 channel type(1 form A)
- TLP227G-2: 8 pin DIP(DIP8), 2 channel type(2 form A)
- Peak off-state voltage: 350V(min.)
- Trigger LED current: 3mA(max.)
- On-state current: 120mA(max.)
- On-state resistance: 35Ω(max.)
- Isolation voltage: 2500Vrms (min.)
- Isolation thickness: 0.4mm(min.)
- BSI approved: BS EN60065: 2002, certificate no.8275  
BS EN60950-1: 2002, certificate no.8276
- Option(D4) type  
TUV approved: DIN EN 60747-5-2,  
certificate no. 40011913

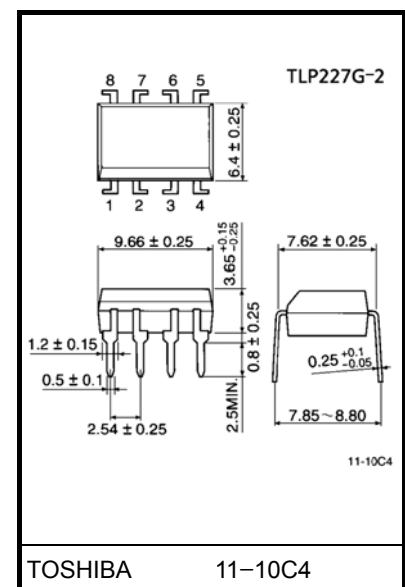
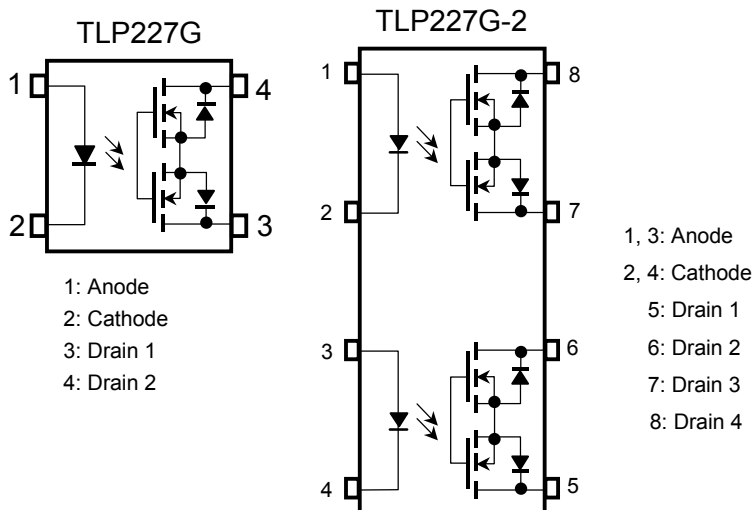


Weight: 0.26g (typ.)

1 Form A

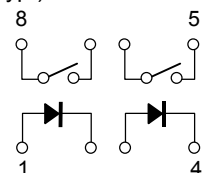


### Pin Configuration (top view)



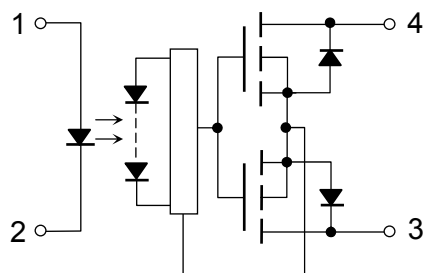
Weight: 0.54g (typ.)

2 Form A



## Internal Circuit

(TLP227G)



## Absolute Maximum Ratings (Ta = 25°C)

| Characteristic                                    |                                           |           |                       | 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(100μs pulse, 100pps) |           |                       | I <sub>FP</sub>       | 1       | A                |
|                                                   | Reverse voltage                           |           |                       | V <sub>R</sub>        | 5       | V                |
|                                                   | Junction temperature                      |           |                       | T <sub>j</sub>        | 125     | °C               |
|                                                   | Off-state output terminal voltage         |           |                       | V <sub>OFF</sub>      | 350     | V                |
| Detector                                          | On-state current                          | TLP227G   |                       | I <sub>ON</sub>       | 120     | mA               |
|                                                   |                                           | TLP227G−2 | One channel           |                       | 120     |                  |
|                                                   |                                           |           | Both channel (Note 1) |                       | 100     |                  |
|                                                   | On-state current derating(Ta ≥ 25°C)      | TLP227G   |                       | ΔI <sub>ON</sub> / °C | −1.2    | mA / °C          |
|                                                   |                                           | TLP227G−2 | One channel           |                       | −1.2    |                  |
|                                                   |                                           |           | Both channel (Note 1) |                       | −1.0    |                  |
|                                                   | Junction temperature                      |           |                       | T <sub>j</sub>        | 125     | °C               |
| Storage temperature range                         |                                           |           |                       | T <sub>stg</sub>      | −55~125 | °C               |
| Operating temperature range                       |                                           |           |                       | T <sub>opr</sub>      | −40~85  | °C               |
| Lead soldering temperature (10 s)                 |                                           |           |                       | T <sub>sol</sub>      | 260     | °C               |
| Isolation voltage (AC,1 min., R.H.≤ 60%) (Note 2) |                                           |           |                       | BV <sub>S</sub>       | 2500    | V <sub>rms</sub> |

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): Two channels operating simultaneously.

(Note 2): Device considered a two-terminal device: LED side pins shorted together, and detector side pins shorted together.

## Recommended Operating Conditions

| Characteristic        | Symbol    | Min. | Typ. | Max. | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage        | $V_{DD}$  | —    | —    | 280  | V    |
| Forward current       | $I_F$     | 5    | 7.5  | 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.

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

| Characteristic |                   | 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   | $\mu\text{A}$ |
|                | Capacitance       | $C_T$     | $V=0, f=1\text{MHz}$  | —    | 30   | —    | pF            |
| Detector       | Off-state current | $I_{OFF}$ | $V_{OFF}=350\text{V}$ | —    | —    | 1    | $\mu\text{A}$ |
|                | Capacitance       | $C_{OFF}$ | $V=0, f=1\text{MHz}$  | —    | 40   | —    | pF            |

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

| Characteristic      | Symbol   | Test Condition                              | Min. | Typ. | Max. | Unit     |
|---------------------|----------|---------------------------------------------|------|------|------|----------|
| Trigger LED current | $I_{FT}$ | $I_{ON}=120\text{mA}$                       | —    | 2    | 3    | mA       |
| On-state resistance | $R_{ON}$ | $I_{ON}=120\text{mA}, I_F=5\text{mA}$       | —    | 22   | 35   | $\Omega$ |
|                     |          | $I_{ON}=20\sim120\text{mA}, I_F=5\text{mA}$ | —    | 26   | 40   |          |

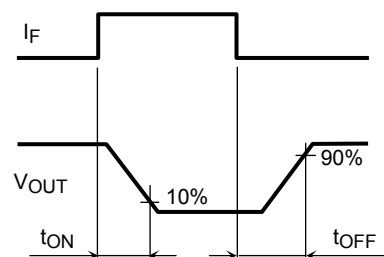
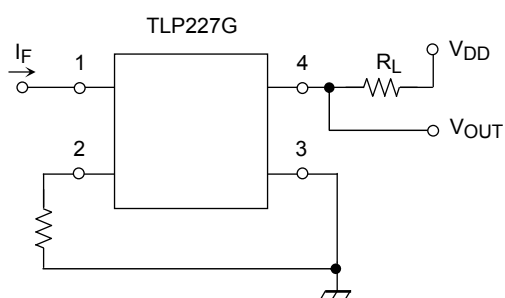
## Isolation Characteristics (Ta = 25°C)

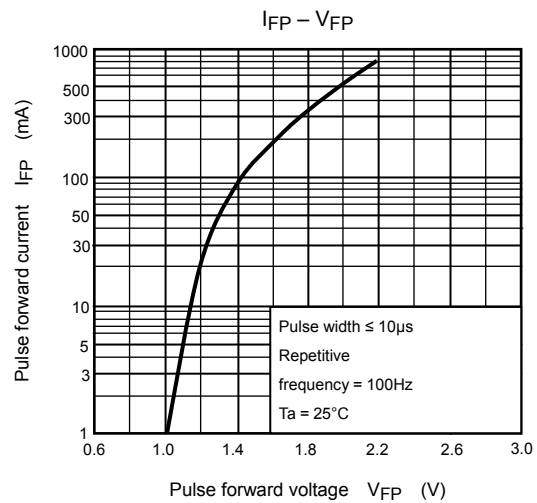
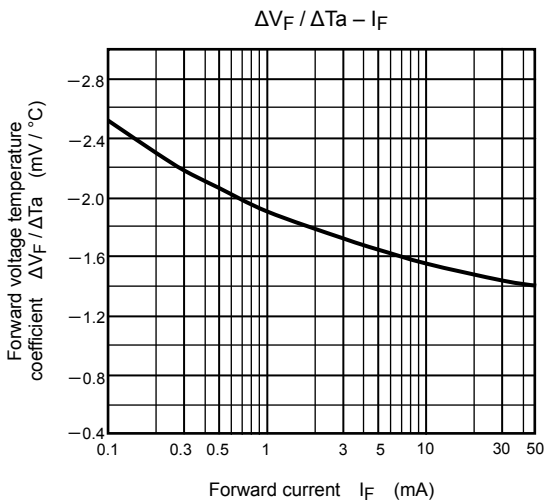
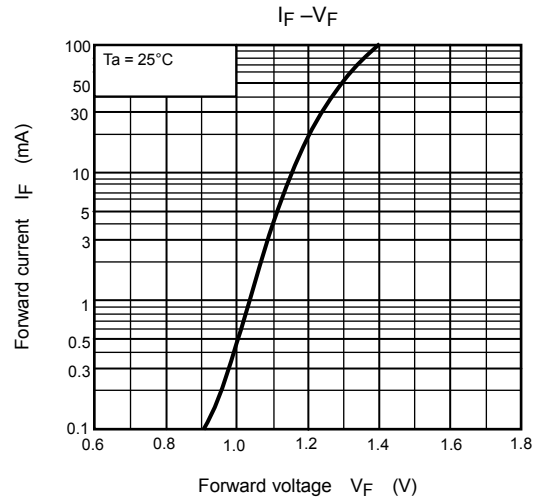
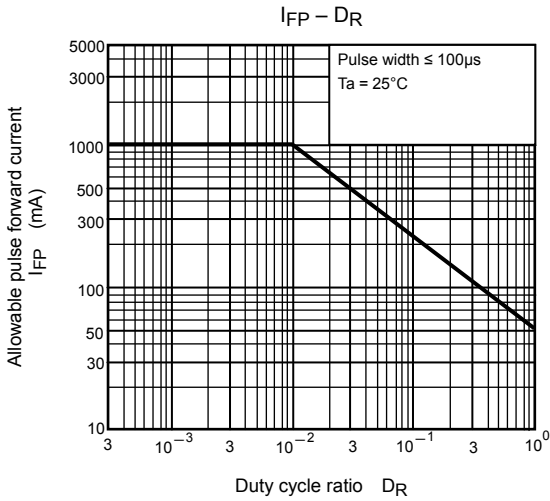
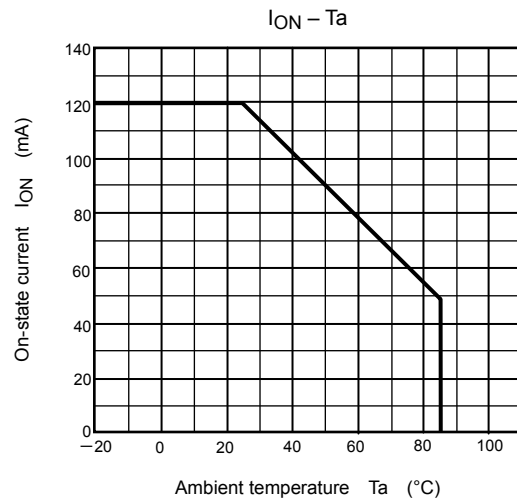
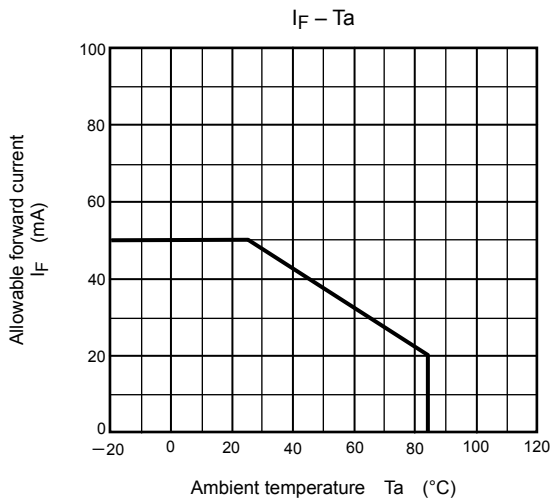
| Characteristic              | Symbol | Test Condition                           | Min.               | Typ.      | Max. | Unit      |
|-----------------------------|--------|------------------------------------------|--------------------|-----------|------|-----------|
| Capacitance input to output | $C_S$  | $V_S=0, f=1\text{MHz}$                   | —                  | 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 minute                             | 2500               | —         | —    | $V_{rms}$ |
|                             |        | AC, 1 second(in oil)                     | —                  | 5000      | —    |           |
|                             |        | DC, 1 minute(in oil)                     | —                  | 5000      | —    | $V_{dc}$  |

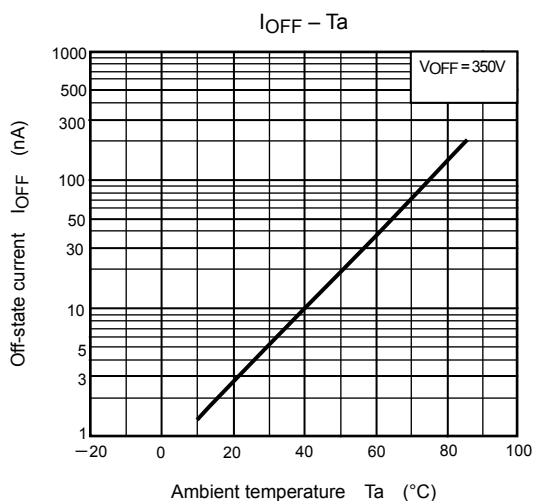
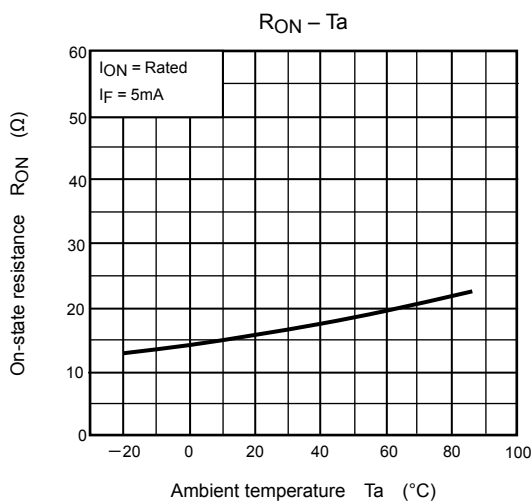
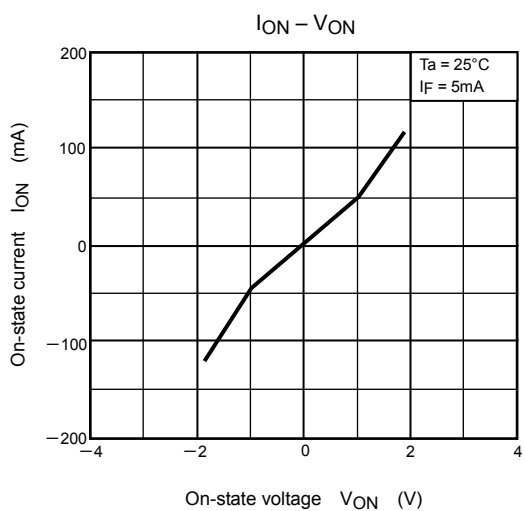
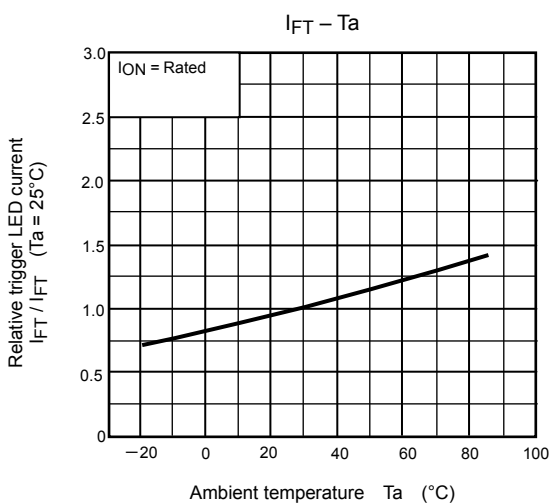
## Switching Characteristics (Ta = 25°C)

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

## Switching Time Test Circuit







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