

TOSHIBA Photocoupler Photo Relay

# TLP597GA

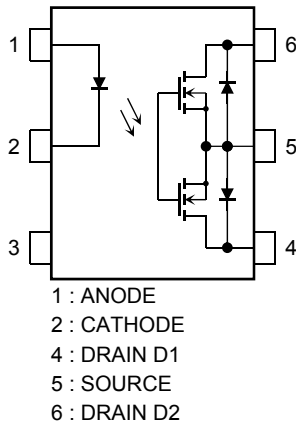
Cordless Telephone  
PBX  
Modem

The TOSHIBA TLP597GA consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOS FET in a six lead plastic DIP package (DIP6).

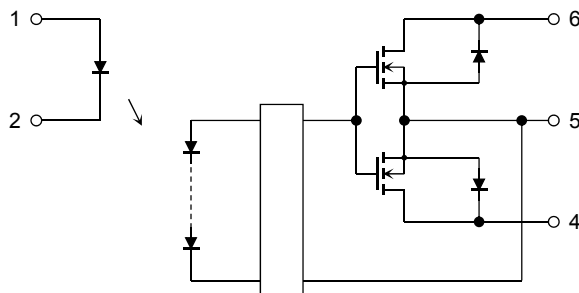
The TLP597GA is a bi-directional switch which can replace mechanical relays in many applications.

- 6 pin DIP (DIP6)
- 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: 2500 Vrms (min)
- UL Recognized :UL1577, File No. E67349

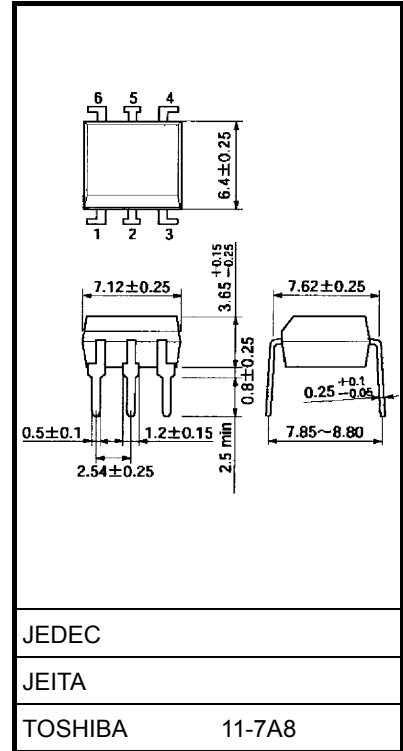
### Pin Configuration (top view)



### Schematic



Unit: mm



Weight: 0.4 g (typ.)

Start of commercial production  
2001/01

## 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                             | A connection                | $I_{ON}$                       | 120   | mA    |
|   |  | B connection                |                                | 120   |       |
|   |  | C connection                |                                | 240   |       |
|   | On-state current derating (Ta ≥ 25°C)        | A connection                | $\Delta I_{ON}/^\circ\text{C}$ | -1.2  | mA/°C |
|   |  | B connection                |                                | -1.2  |       |
|   |  | C connection                |                                | -2.4  |       |
| 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 minute, 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).

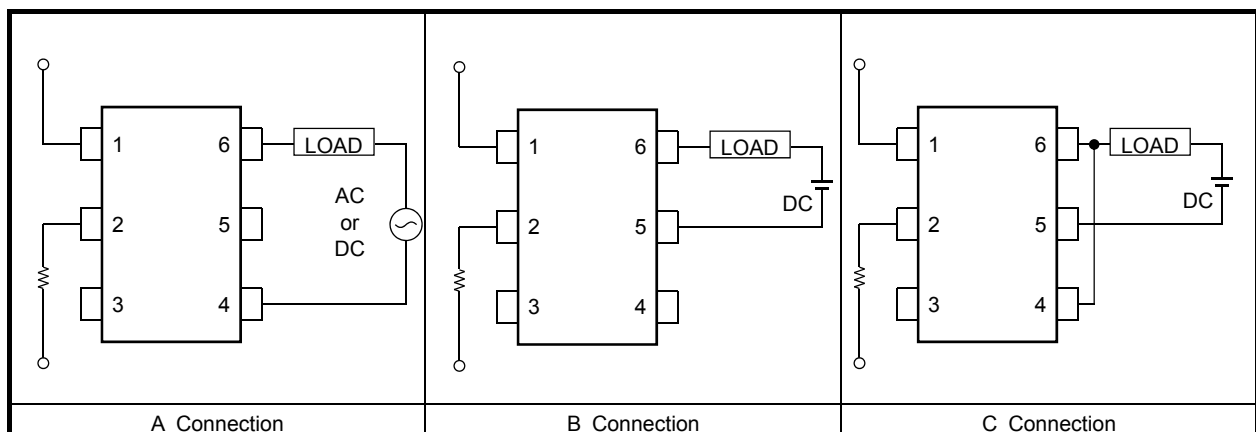
Note 1: Device considered a two-terminal device : Pins 1, 2 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

## 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.

## Circuit Connections



## 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  | $\mu\text{A}$ |
|                 | Capacitance       | $C_T$     | $V = 0, f = 1 \text{ MHz}$ | —   | 30   | —   | pF            |
| Detector        | Off-state current | $I_{OFF}$ | $V_{OFF} = 400 \text{ V}$  | —   | —    | 1   | $\mu\text{A}$ |
|                 | 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 | A connection | $R_{ON}$ | $I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}$                | —   | 17   | 35  | $\Omega$ |
|                     |              |          | $I_{ON} = 20 \text{ to } 120 \text{ mA}, I_F = 5 \text{ mA}$ | —   | 20   | 40  |          |
|                     | B connection |          | $I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}$                | —   | 11   | 20  |          |
|                     | C connection |          | $I_{ON} = 240 \text{ mA}, I_F = 5 \text{ mA}$                | —   | 6    | —   |          |

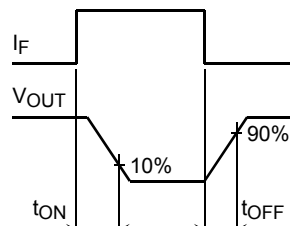
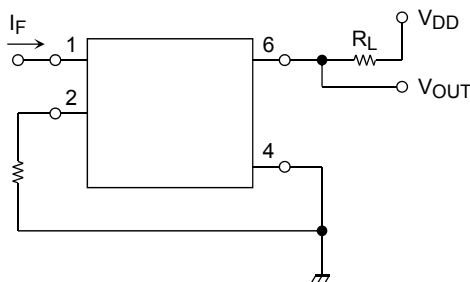
## Isolation Characteristics (Ta = 25°C)

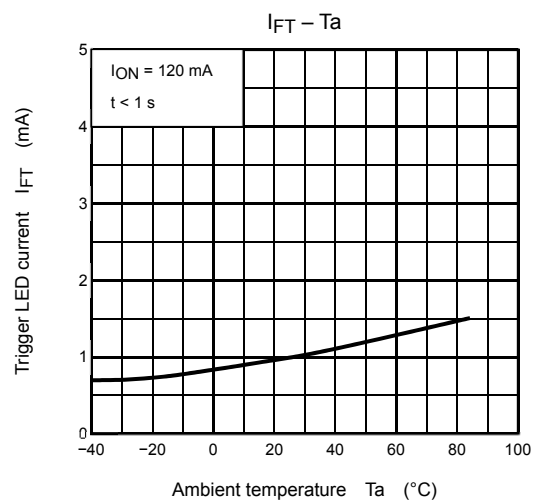
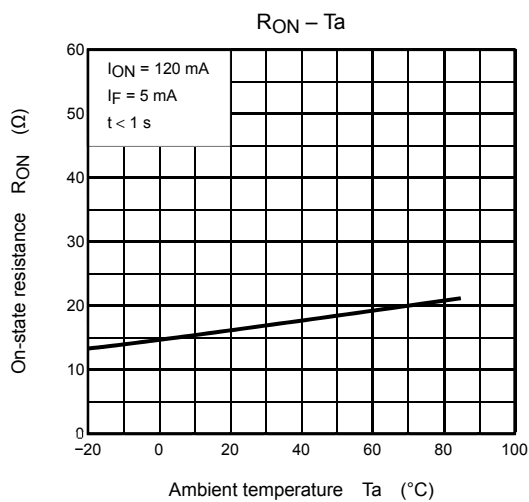
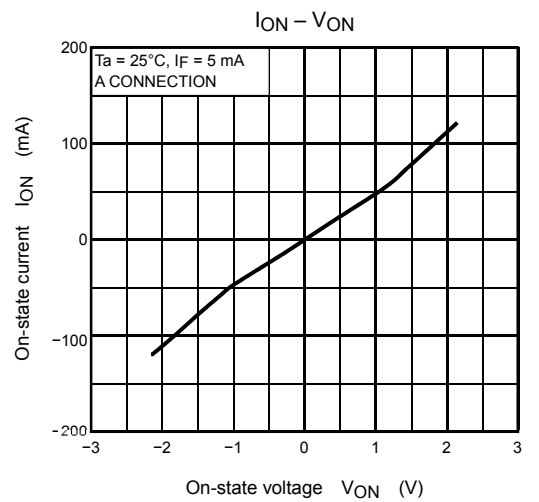
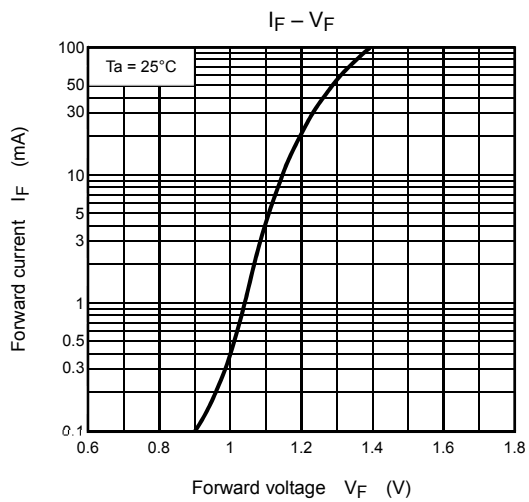
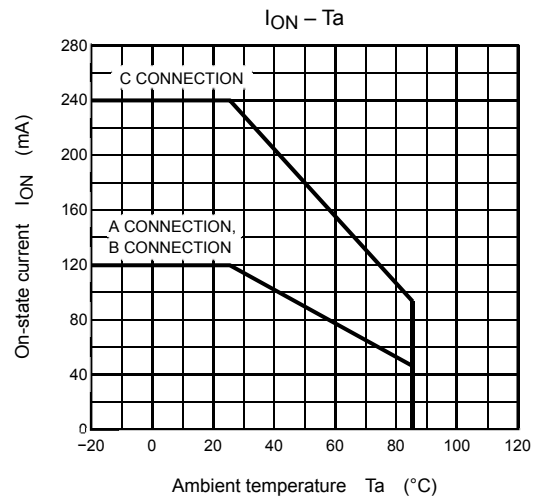
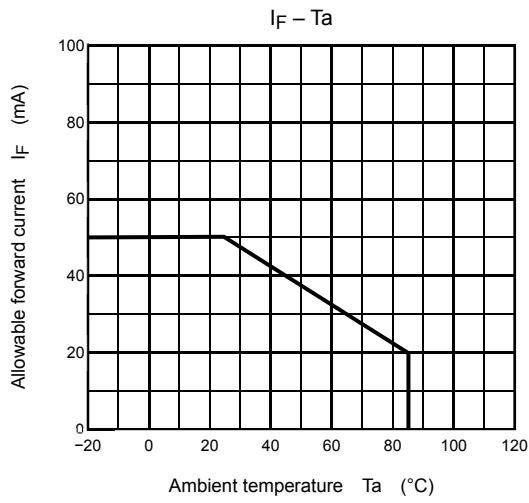
| Characteristics             |        | Symbol                | Test Condition                               | Min                | Typ.      | Max  | Unit     |
|-----------------------------|--------|-----------------------|--|--------------------|-----------|------|----------|
| Capacitance input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

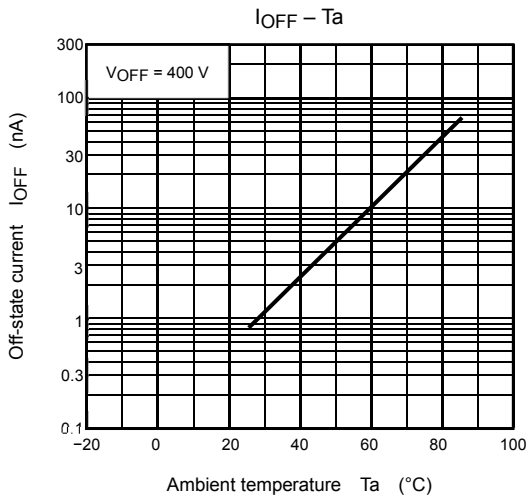
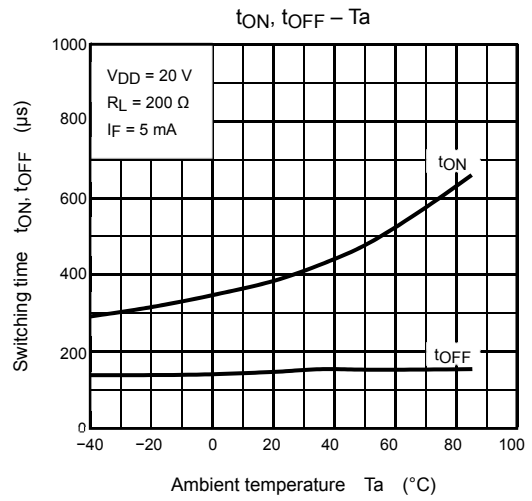
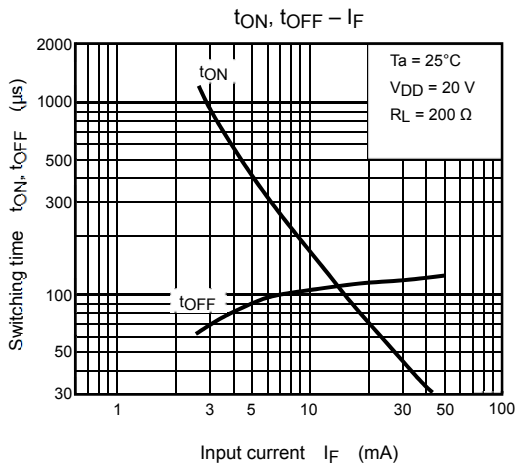
## Switching Characteristics (Ta = 25°C)

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

Note 2: Switching time test circuit







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