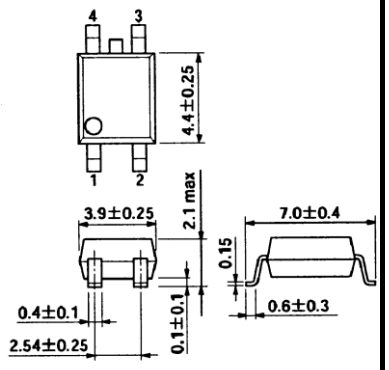
TOSHIBA Photocoupler Photorelay

# TLP174G

Modem·Fax Cards, Modems in PC
Telecommunications
PBX
Measurement Equipment

Unit: mm




| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 11-5H1 |

Weight: 0.1 g (typ.)

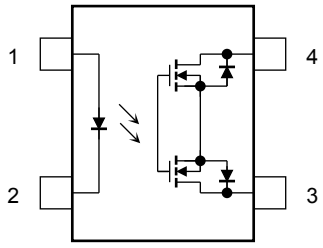
The Toshiba TLP174G consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a SOP, which is suitable for surface mount assembly.

Because of the high-voltage MOS FET used for the output stage, the TLP174G is suitable for replacement of dial pulse relay and hook relay of modem and facsimile, and also suitable for PBX and the line interface section of exchange.

In addition, the MOS FET control circuit is provided the current limiting function, and it conforms to the FCC Part 68 new standard.

- 4-pin SOP (2.54SOP4): Height = 2.1 mm, Pitch = 2.54 mm
- 1-Form-A
- Peak Off-state voltage: 350 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 120 mA (max)
- Limit current: 150 mA to 300 mA (t = 5 ms)
- On-state resistance: 35 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1577, File No.E67349
- cUL recognized: CSA Component Acceptance Service No. 5A
  File No.E67349

## Pin Configuration (top view)




1: Anode
2: Cathode
3: Drain
4: Drain

Start of commercial production
2002-02

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

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| LED | Forward current | $I_F$ | 50 | mA |
| | Forward current derating (Ta≥25°C) | $\Delta I_F$/°C | −0.5 | mA/°C |
| | Peak forward current (100 μs pulse, 100 pps) | $I_{FP}$ | 1 | A |
| | Reverse voltage | $V_R$ | 5 | V |
| | Diode power dissipation | $P_D$ | 50 | mW |
| | Diode power dissipation derating (Ta ≥ 25°C) | $\Delta P_D$ /°C | -0.5 | mW/°C |
| | Junction temperature | $T_j$ | 125 | °C |
| Detector | Off-state output terminal voltage | $V_{OFF}$ | 350 | V |
| | On-state current | $I_{ON}$ | 120 | mA |
| | On-state current derating (Ta≥25°C) | $\Delta I_{ON}$/°C | −1.2 | mA/°C |
| | Output power dissipation | $P_O$ | 300 | mW |
| | Output power dissipation derating (Ta ≥ 25°C) | $\Delta P_O$ / °C | −3.0 | mW / °C |
| | 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) | | $BV_S$ | 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 | $V_{DD}$ | — | — | 280 | 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 mA | 1.0 | 1.15 | 1.3 | V |
| | Reverse current | $I_R$ | $V_R$ = 5 V | — | — | 10 | μA |
| | Capacitance between terminals | $C_T$ | $V_F$ = 0 V, f = 1 MHz | — | 30 | — | pF |
| Detector | Off-state current | $I_{OFF}$ | $V_{OFF}$ = 350 V | — | — | 1 | μA |
| | Capacitance between terminals | $C_{OFF}$ | V = 0 V, f = 1 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 mA | — | 1 | 3 | mA |
| Return LED current | $I_{FC}$ | $I_{OFF}$ = 100 μA | 0.1 | — | — | mA |
| Load current limiting | $I_{LIM}$ | $I_F$ = 5 mA, $V_{DD}$= 5 V, t = 5 ms | 150 | — | 300 | mA |
| On-state resistance | $R_{ON}$ | $I_{ON}$ = 120 mA, $I_F$= 5 mA | — | 17 | 35 | Ω |

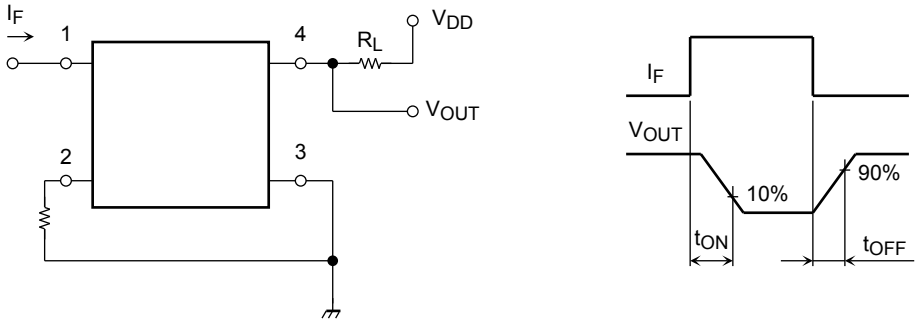
## Isolation Characteristics (Ta = 25°C)

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

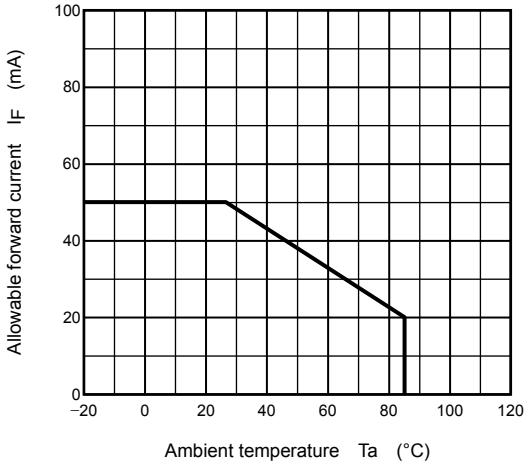
## Switching Characteristics (Ta = 25°C)

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

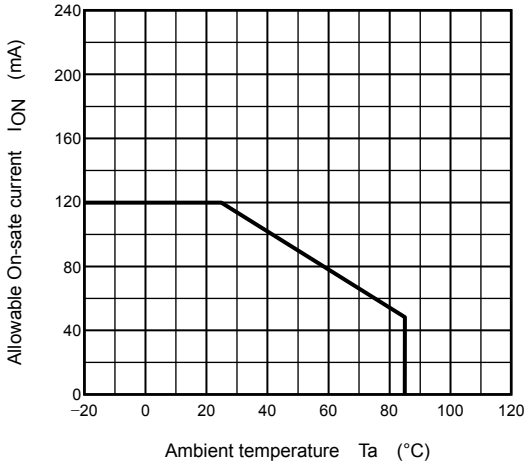
Note 2: Switching time test circuit



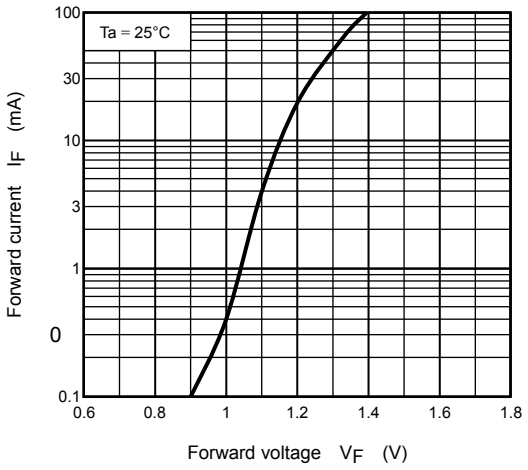
$I_F$ – Ta



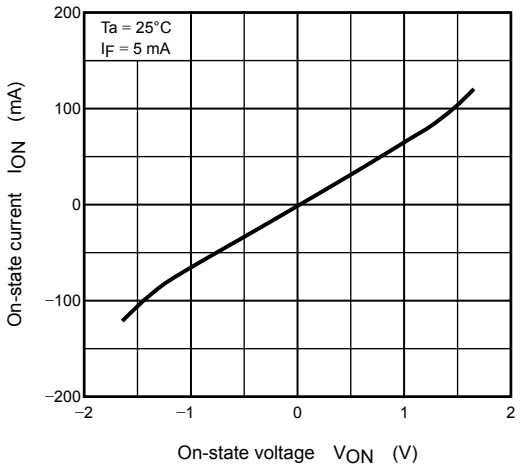

$I_{ON}$ – Ta



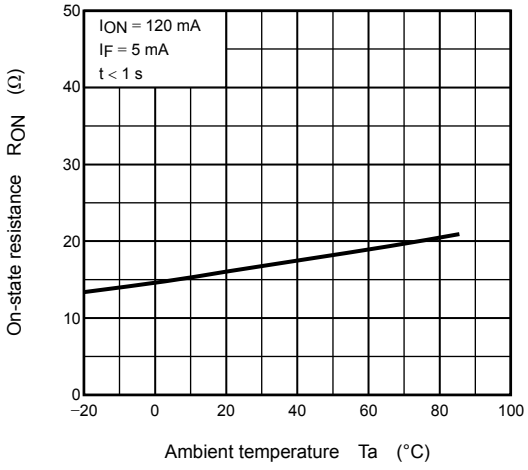

$I_F$ – $V_F$



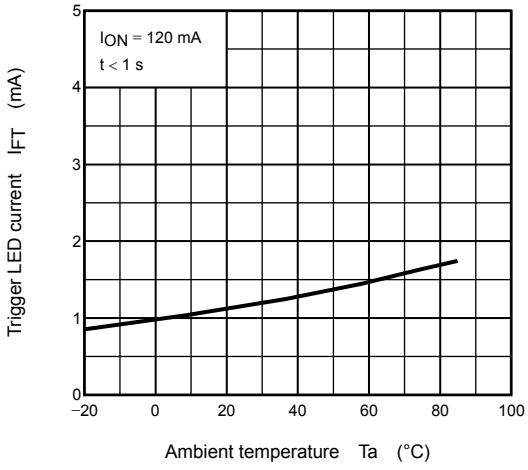

$I_{ON}$ – $V_{ON}$



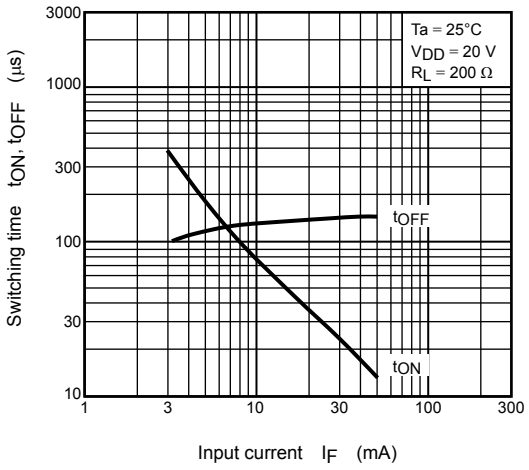

$R_{ON}$ – Ta



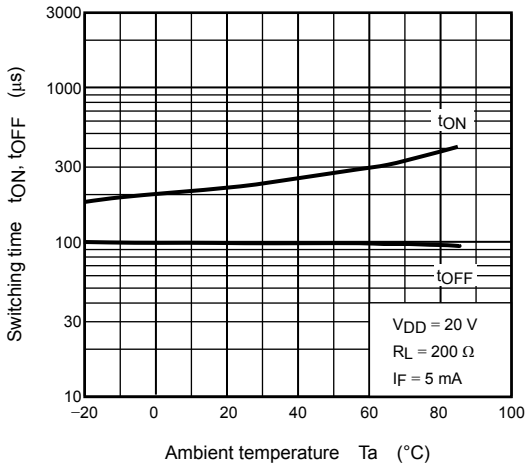

$I_{FT}$ – Ta



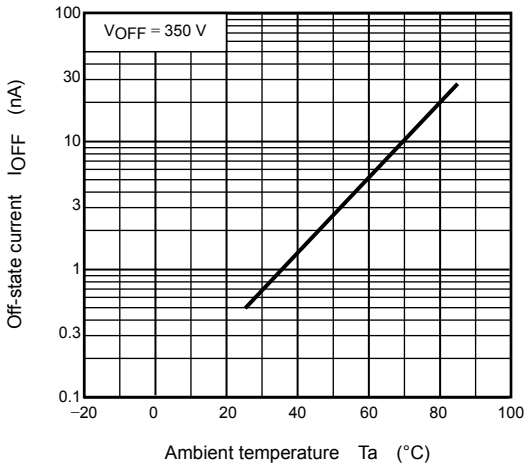
$t_{ON}$, $t_{OFF}$ – $I_F$




$t_{ON}$, $t_{OFF}$ – Ta




$I_{OFF}$ – Ta



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