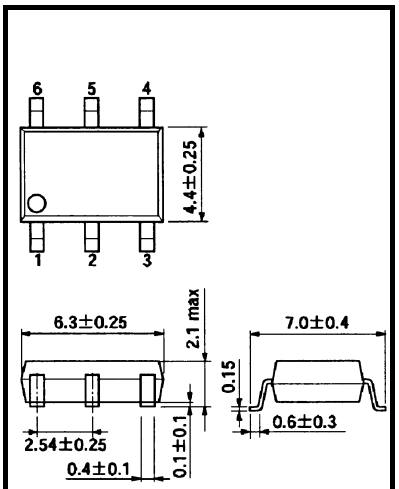
TOSHIBA Photocoupler Photorelay

# TLP192G

PC Card Modems
PBX
STBs (Set-Top Boxes)
Measurement Equipment

Unit: mm




| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 11-7C1 |

Weight: 0.2 g (typ.)

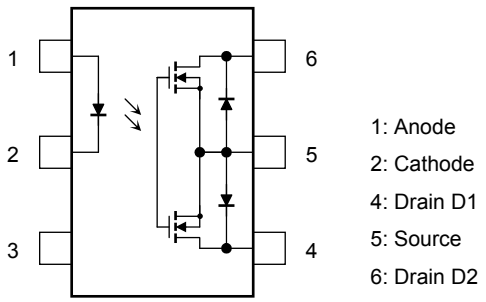
The Toshiba TLP192G consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 6-pin SOP package.

The TLP192G photorelay features high withstanding voltage between output pins, which makes it suitable for hook relay and dial-pulse applications for modems and facsimiles.

The TLP192G is also ideal for PCMCIA-compliant card modems due to the maximum mounted height as low as 2.1 mm.

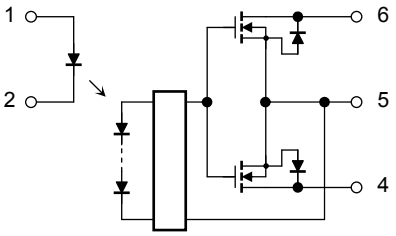
- 6-pin SOP (2.54SOP4): Height = 2.1 mm, Pitch = 2.54 mm
- Normally open (1-form-A) device
- Peak off-state voltage: 350 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 110 mA (max)
- On-state resistance: 35 Ω (max, t < 1 s)
- On-state resistance: 50 Ω (max, continuous)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1557, File No.E67349

## Pin Configuration (top view)




1: Anode
2: Cathode
4: Drain D1
5: Source
6: Drain D2

## Schematic



## 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 |
| | 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 | $I_{ON}$ | 110 | mA |
| | Forward current derating (Ta ≥ 25°C) | $\Delta I_{ON}$/°C | −1.1 | mA/°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 min, 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: LED pins are shorted together. Detector pins are also 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 | $I_{ON}$ | — | — | 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.

## 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 | $C_T$ | V = 0, f = 1 MHz | — | 30 | — | pF |
| Detector | Off-state current | $I_{OFF}$ | $V_{OFF}$ = 350 V | — | — | 1 | μA |
| | Capacitance | $C_{OFF}$ | V = 0, f = 1 MHz | — | 30 | — | pF |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Trigger LED current | | $I_{FT}$ | $I_{ON}$ = 110 mA | — | 1 | 3 | mA |
| Return LED current | | $I_{FC}$ | $I_{OFF}$ = 100 μA | 0.1 | — | — | mA |
| On-state resistance | A connection | $R_{ON}$ | $I_{ON}$ = 110 mA, $I_F$ = 5 mA, t < 1 s | — | 25 | 35 | Ω |
| | | | $I_{ON}$ = 110 mA, $I_F$ = 5 mA | — | 35 | 50 | |
| | B connection | | $I_{ON}$ = 110 mA, $I_F$ = 5 mA | — | 28 | 40 | |
| | C connection | | $I_{ON}$ = 220 mA, $I_F$ = 5 mA | — | 14 | 20 | |

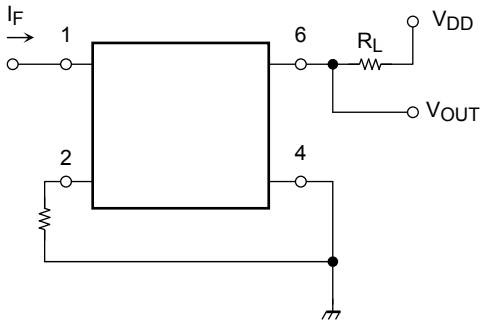
## Isolation Characteristics (Ta = 25°C)

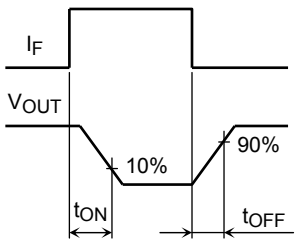
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Capacitance input to output | $C_S$ | $V_S$ = 0 V, f = 1 MHz | — | 0.8 | — | pF |
| Isolation resistance | $R_S$ | $V_S$ = 500 V, R.H. ≤ 60% | $5 \times 10^{10}$ | $10^{14}$ | — | Ω |
| Isolation voltage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

## Switching Characteristics (Ta = 25°C)

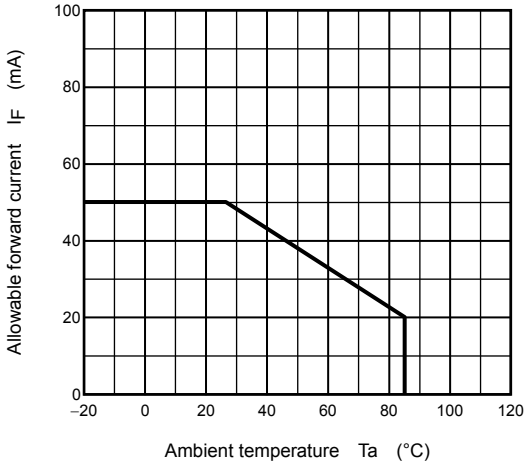
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Turn-on time | $t_{ON}$ | $R_L$ = 200 Ω<br>$V_{DD}$ = 20 V, $I_F$ = 5 mA (Note 2) | — | 0.3 | 1 | ms |
| Turn-off time | $t_{OFF}$ | | — | 0.1 | 1 | |

Note 2: Switching time test circuit

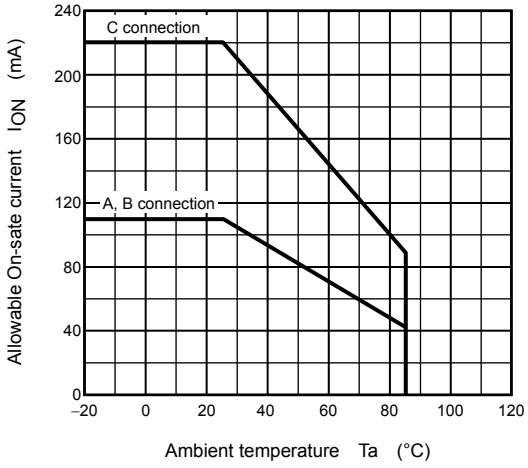


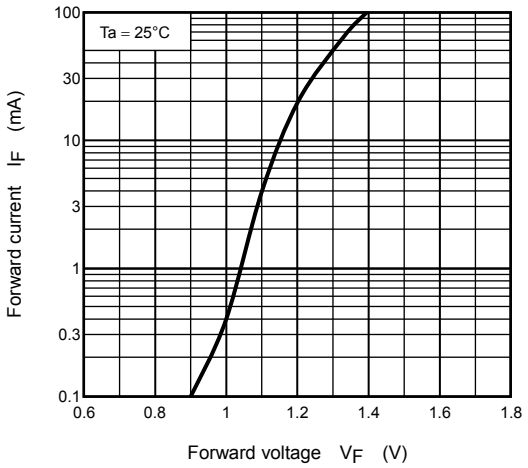
$I_F$ – Ta



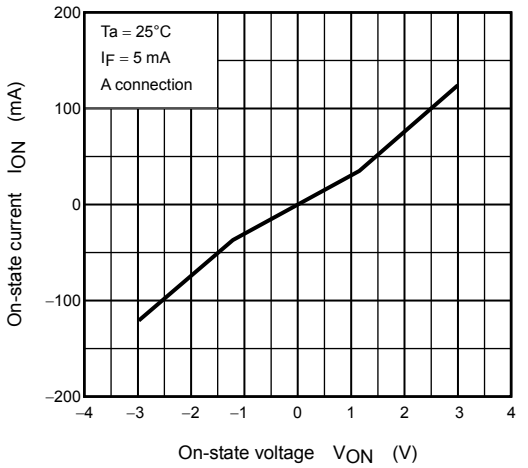

$I_{ON}$ – Ta



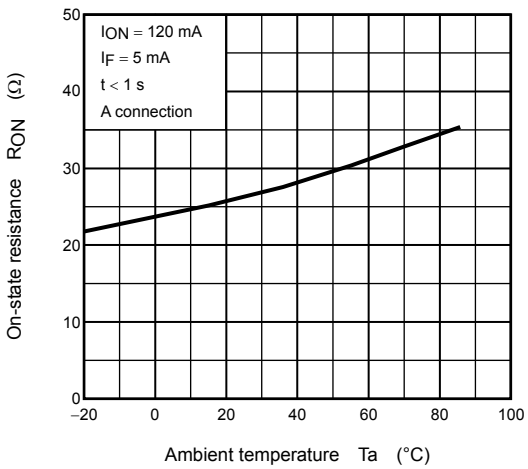

$I_F$ – $V_F$



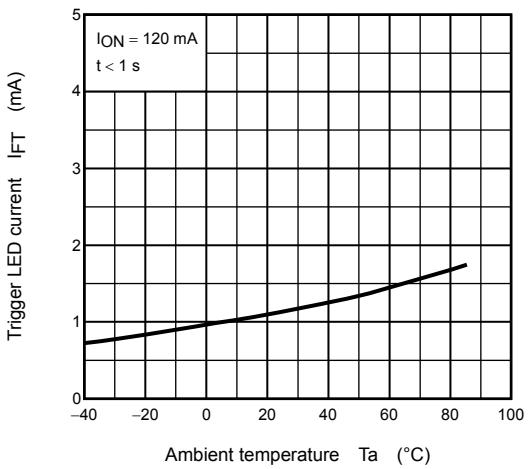

$I_{ON}$ – $V_{ON}$



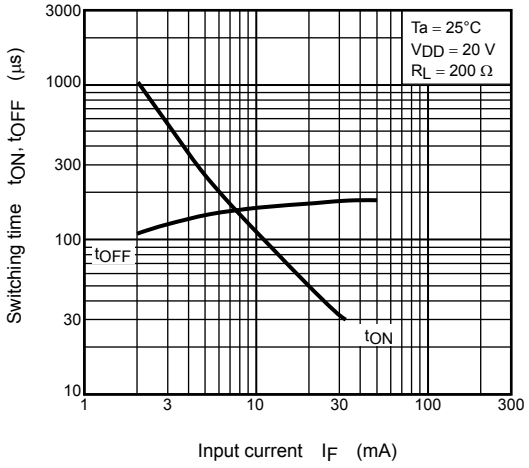

$R_{ON}$ – Ta



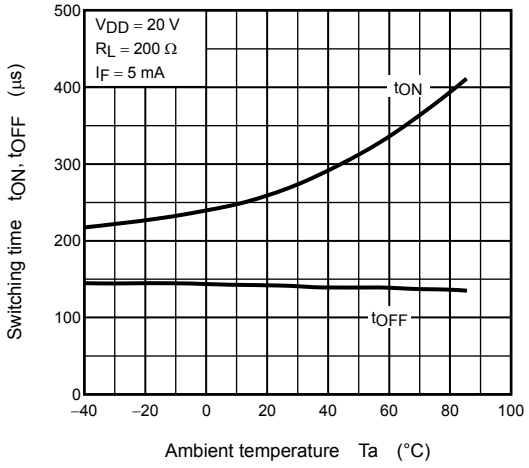

$I_{FT}$ – Ta



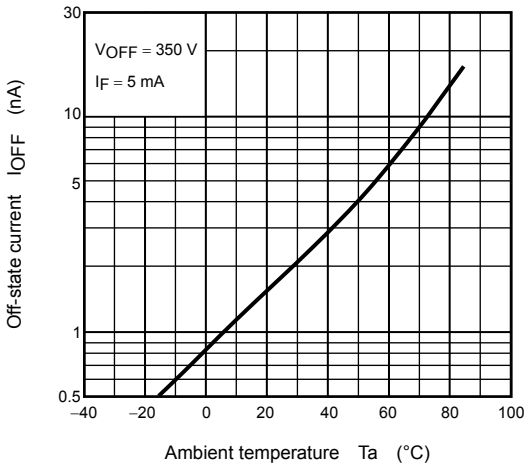
$t_{ON}$, $t_{OFF}$ – $I_F$




$t_{ON}$, $t_{OFF}$ – Ta




$I_{OFF}$ – Ta



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