

TOSHIBA Photocoupler Photorelay

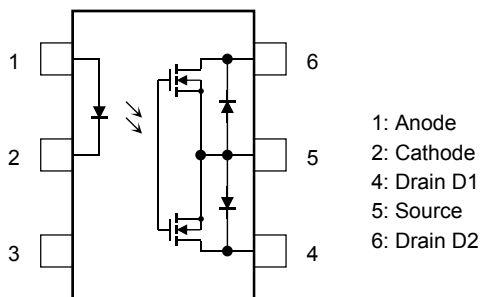
TLP192A

Telecommunications
 Measurement and Control Equipment
 Data Acquisition System
 Measurement Equipment

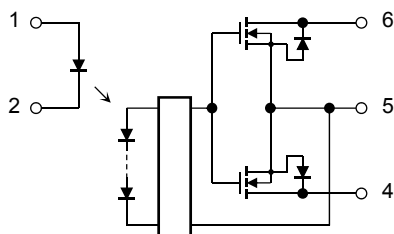
The Toshiba TLP192A consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 6-pin SOP package. This photorelay has higher output current rating than phototransistor-type photocoupler; hence, it is suitable for use as On/Off control for high current.

- 6-pin SOP (2.54SOP6): Height = 2.1 mm, pitch = 2.54 mm
- Normally open (1-form-A) device
- Peak off-state voltage: 60 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 400 mA (max)
- On-state resistance: 2 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1557, File No.E67349

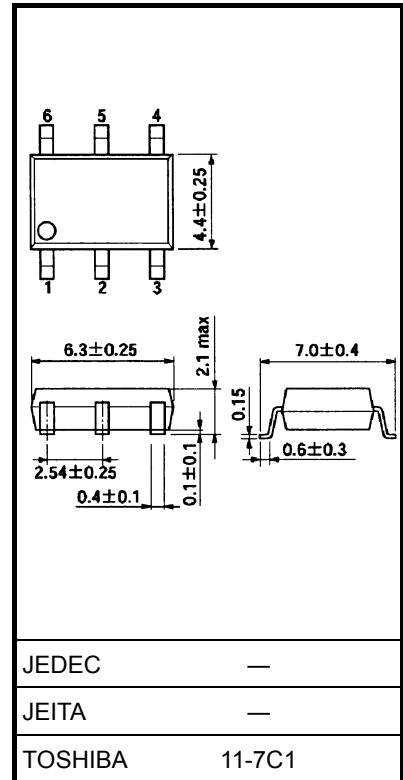
Pin Configuration (top view)



Schematic



Unit: mm



Weight: 0.13 g (typ.)

Start of commercial production
 2002/03

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} | 60 | V |
| | On-state current | A connection | I_{ON} | 400 | mA |
| | | B connection | | 400 | |
| | | C connection | | 800 | |
| | Forward current derating (Ta ≥ 25°C) | A connection | $\Delta I_{ON}/^\circ\text{C}$ | -4.0 | mA/°C |
| | | B connection | | -4.0 | |
| | | C connection | | -8.0 | |
| Junction temperature | | T_j | 125 | °C | |
| Storage temperature | | T_{stg} | -55 to 125 | °C | |
| Operating temperature | | 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).

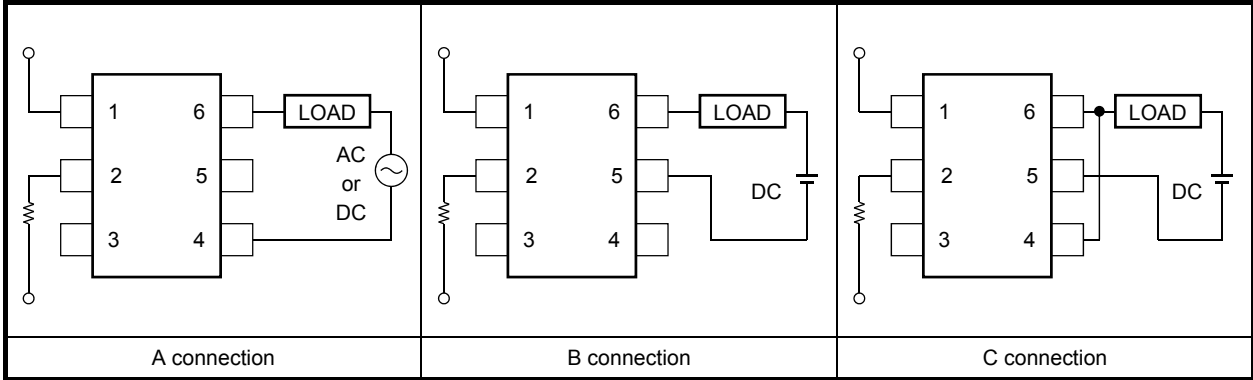
Note 1: LED pins are shorted together. Detector pins are also shorted together.

Recommended Operating Conditions

| Characteristics | Symbol | Min | Typ. | Max | Unit |
|-----------------------|-----------|-----|------|-----|------|
| Supply voltage | V_{DD} | — | — | 48 | V |
| Forward current | I_F | 5 | 7.5 | 25 | mA |
| On-state current | I_{ON} | — | — | 400 | 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



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 voltage | 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} | $V_{OFF} = 60 \text{ V}$ | — | — | 1 | μA |
| | Capacitance | C_{OFF} | $V = 0, f = 1 \text{ MHz}$ | — | 130 | — | pF |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---------------------|--------------|----------|---|-----|------|-----|----------|
| Trigger LED current | | I_{FT} | $I_{ON} = 400 \text{ mA}$ | — | 1.6 | 3 | mA |
| Return LED current | | I_{FC} | $I_{OFF} = 100 \mu\text{A}$ | 0.1 | — | — | mA |
| On-state resistance | A connection | R_{ON} | $I_{ON} = 400 \text{ mA}, I_F = 5 \text{ mA}$ | — | 1 | 2 | Ω |
| | B connection | | $I_{ON} = 400 \text{ mA}, I_F = 5 \text{ mA}$ | — | 0.5 | 1 | |
| | C connection | | $I_{ON} = 800 \text{ mA}, I_F = 5 \text{ mA}$ | — | 0.25 | — | |

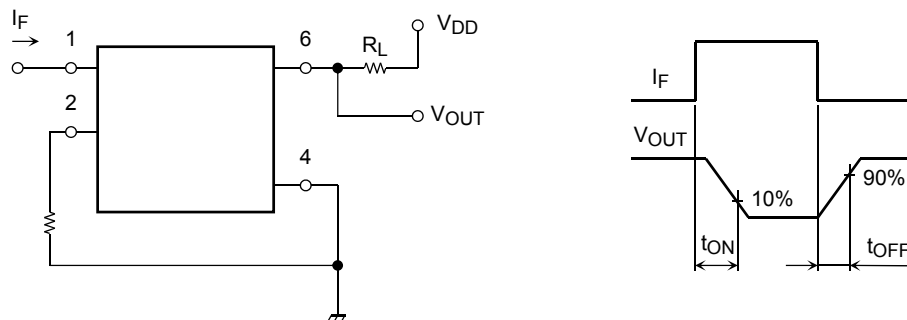
Isolation Characteristics (Ta = 25°C)

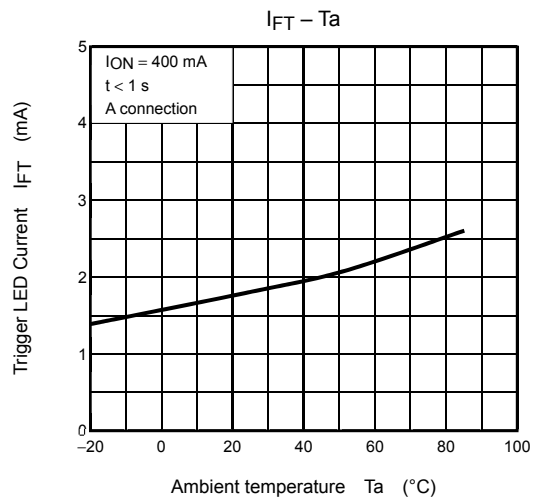
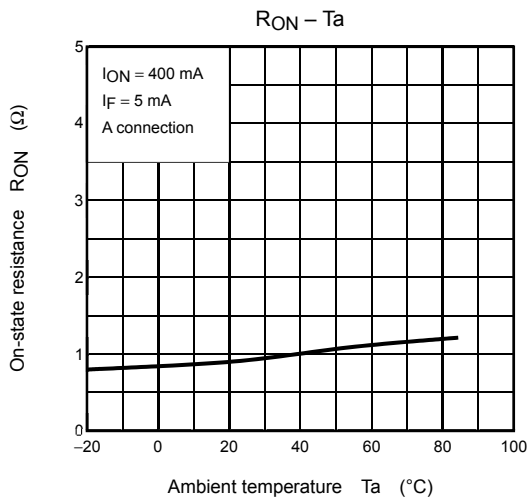
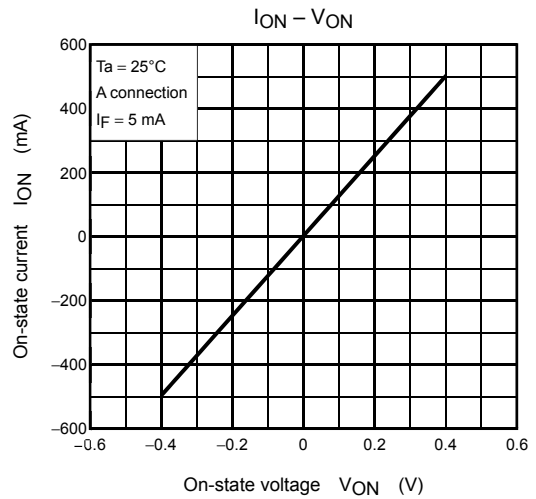
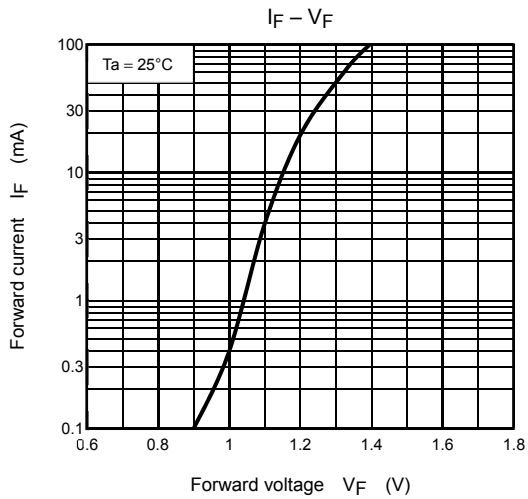
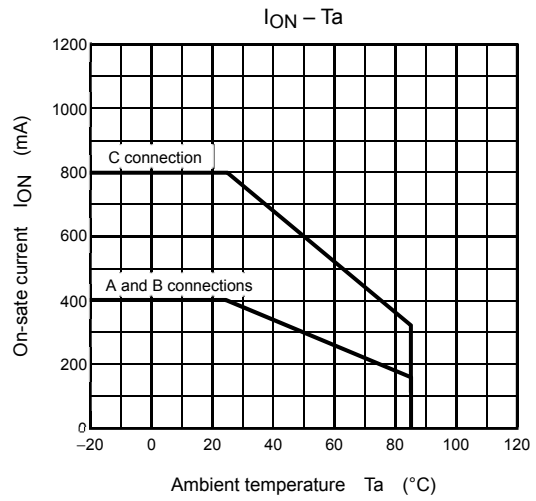
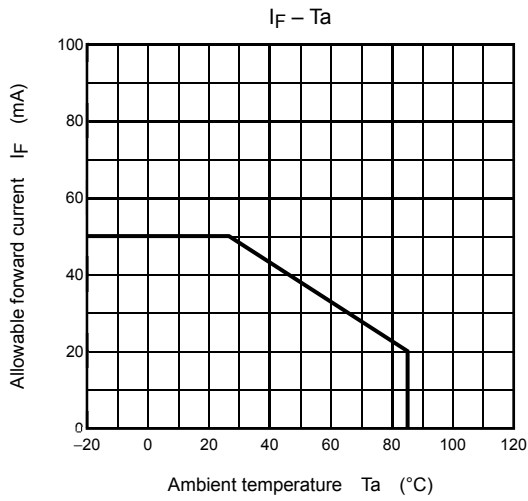
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------------------|--|--------|--|--------------------|-----------|-----|----------|
| Capacitance input to output | | C_S | $V_S = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 0.8 | — | pF |
| Isolation resistance | | R_S | $V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$ | 5×10^{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 |

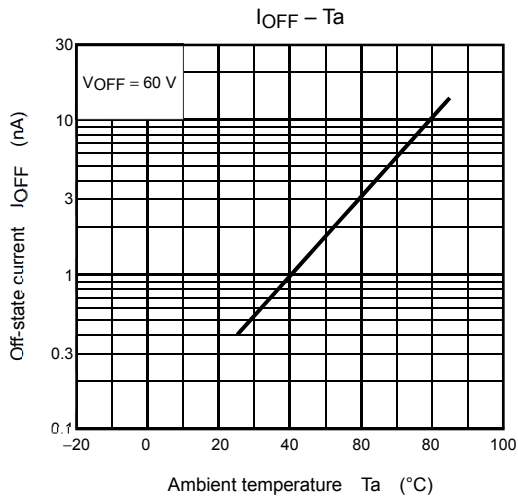
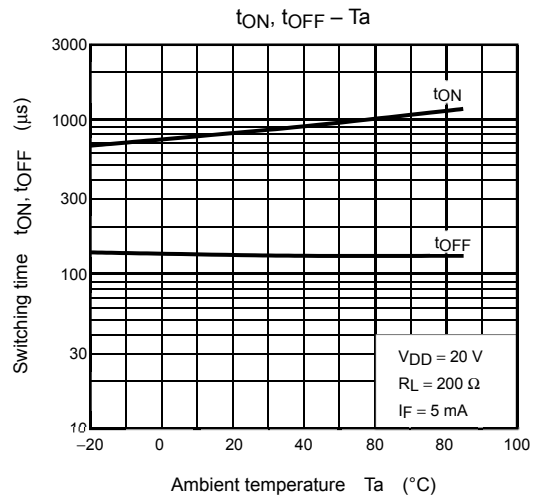
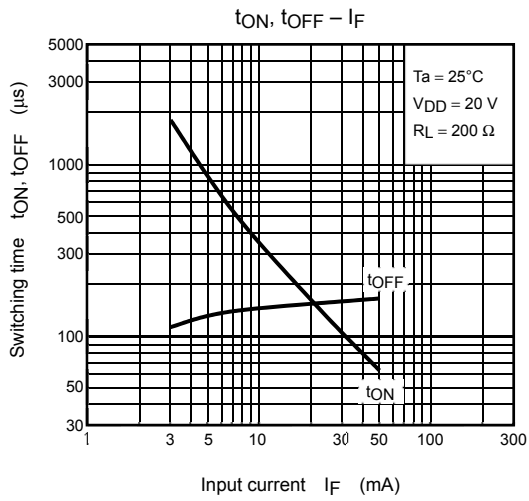
Switching Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------|-----------|-----------------------------|---|-----|------|-----|------|
| Turn-on time | t_{ON} | $R_L = 200 \Omega$ (Note 2) | $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ | — | 0.8 | 2 | ms |
| Turn-off time | t_{OFF} | | | — | 0.1 | 0.5 | |

Note 2: Switching time test circuit







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