

TLP192A

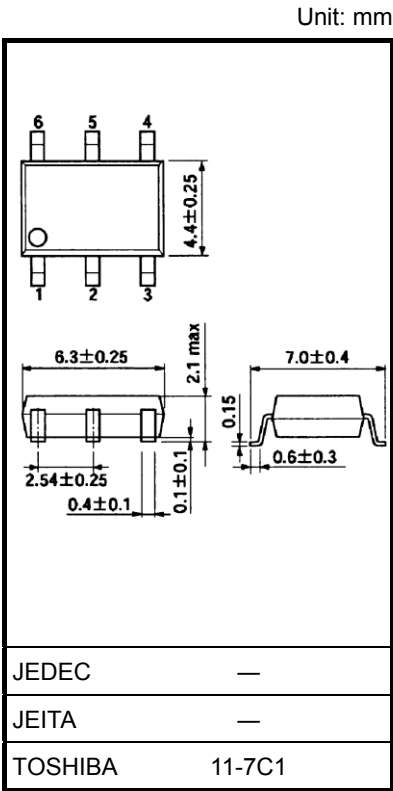
Telecommunications  
Measurement and Control Equipment  
Data Acquisition System  
Measurement Equipment

The Toshiba TLP192A consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 6-pin SOP package.

Because of the low offset voltage at turn-on, this photorelay is suitable for analog signal switching, eg. micro signal scan circuit of data acquisition system, subscriber circuit of digital exchange.

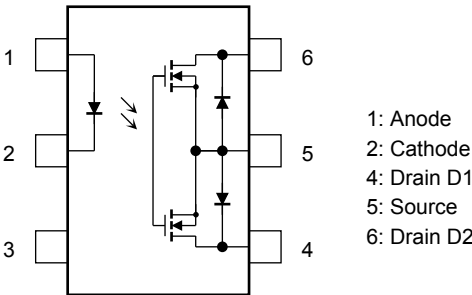
This photorelay has higher output current rating than phototransistor-type photocoupler; hence, it is suitable for use as On/Off control for high current.

- 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 approved: UL1577, File No.E67349
- cUL approved :CSA Component Acceptance Service No. 5A, File No.E67349

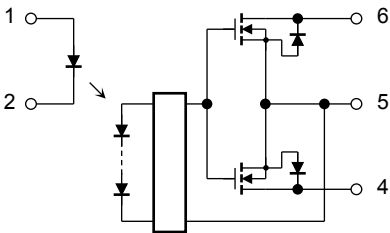


Weight: 0.13 g (typ.)

Pin Configuration (top view)



Schematic



Start of commercial production  
2002/03

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

| Characteristics                                          |                                                 |              | 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<br>(100 μs pulse, 100 pps) |              | I <sub>FP</sub>      | 1          | A       |
|                                                          | Reverse voltage                                 |              | V <sub>R</sub>       | 5          | V       |
|                                                          | Diode power dissipation                         |              | P <sub>D</sub>       | 50         | mW      |
|                                                          | Diode power dissipation derating (Ta >25°C)     |              | ΔP <sub>D</sub> /°C  | −0.5       | mW/°C   |
|                                                          | Junction temperature                            |              | T <sub>j</sub>       | 125        | °C      |
| Detector                                                 | Off-state output terminal voltage               |              | V <sub>OFF</sub>     | 60         | V       |
|                                                          | On-state<br>current                             | A connection | I <sub>ON</sub>      | 400        | mA      |
|                                                          |                                                 | B connection |                      | 400        |         |
|                                                          |                                                 | C connection |                      | 800        |         |
|                                                          | Forward<br>current<br>derating (Ta<br>≥ 25°C)   | A connection | ΔI <sub>ON</sub> /°C | −4.0       | mA/°C   |
|                                                          |                                                 | B connection |                      | −4.0       |         |
|                                                          |                                                 | C connection |                      | −8.0       |         |
|                                                          | Output power dissipation                        |              | P <sub>O</sub>       | 256        | mW      |
|                                                          | Output power dissipation derating (Ta ≥ 25°C)   |              | ΔP <sub>O</sub> /°C  | −2.56      | mW / °C |
|                                                          | Junction temperature                            |              | T <sub>j</sub>       | 125        | °C      |
| Storage temperature                                      |                                                 |              | T <sub>stg</sub>     | −55 to 125 | °C      |
| Operating temperature                                    |                                                 |              | T <sub>opr</sub>     | −40 to 85  | °C      |
| Lead soldering temperature (10 s)                        |                                                 |              | T <sub>sol</sub>     | 260        | °C      |
| Isolation voltage<br>(AC, 1 minute, R.H. ≤ 60%) (Note 1) |                                                 |              | BV <sub>S</sub>      | 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).

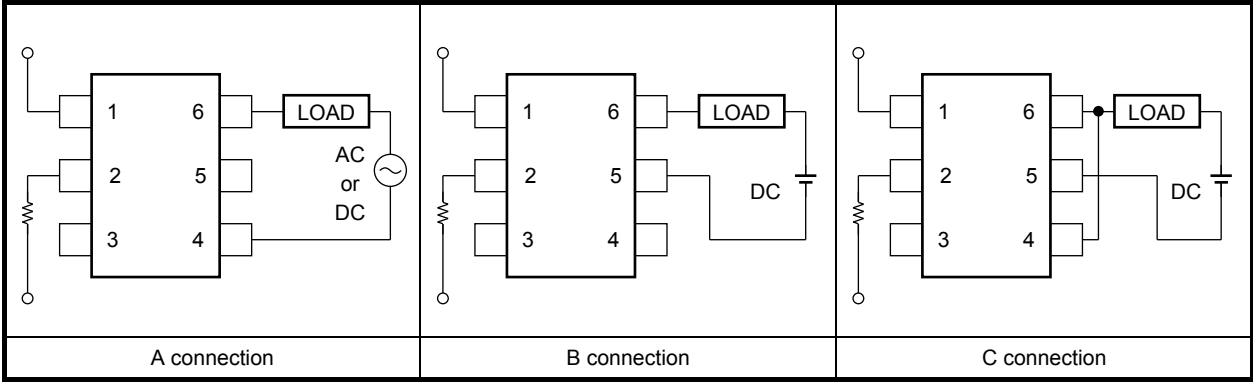
Note 1: LED pins are shorted together. Detector pins are also shorted together.

## 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  | $\mu\text{A}$ |
|                 | Capacitance between terminals | $C_T$     | $V_F = 0 \text{ V}$ , $f = 1 \text{ MHz}$ | —   | 30   | —   | pF            |
| Detector        | Off-state current             | $I_{OFF}$ | $V_{OFF} = 60 \text{ V}$                  | —   | —    | 1   | $\mu\text{A}$ |
|                 | Capacitance between terminals | $C_{OFF}$ | $V = 0 \text{ V}$ , $f = 1 \text{ MHz}$   | —   | 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   | $\Omega$ |
|                     | 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 | —   |          |

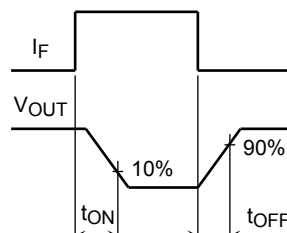
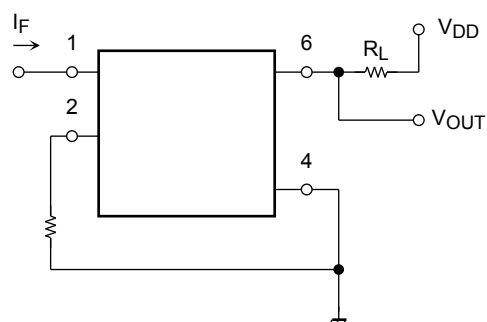
## Isolation Characteristics (Ta = 25°C)

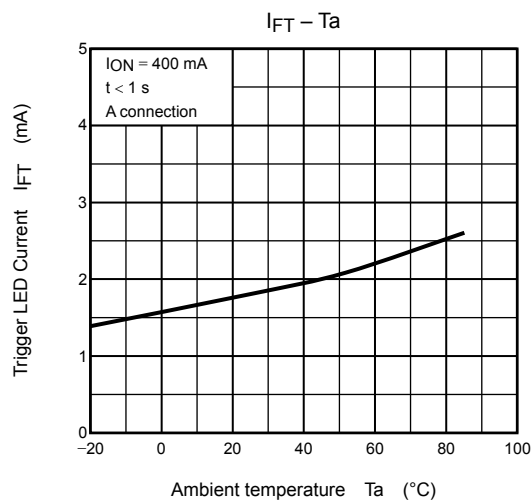
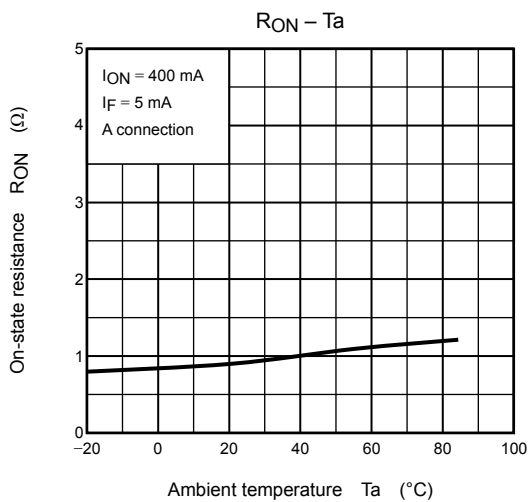
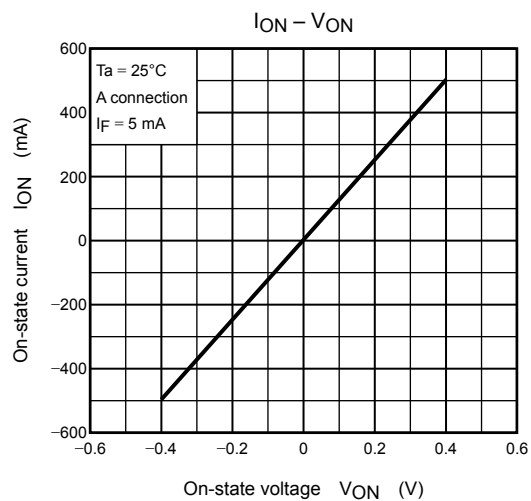
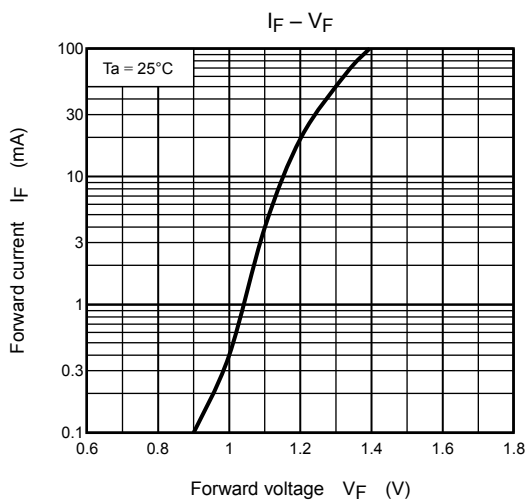
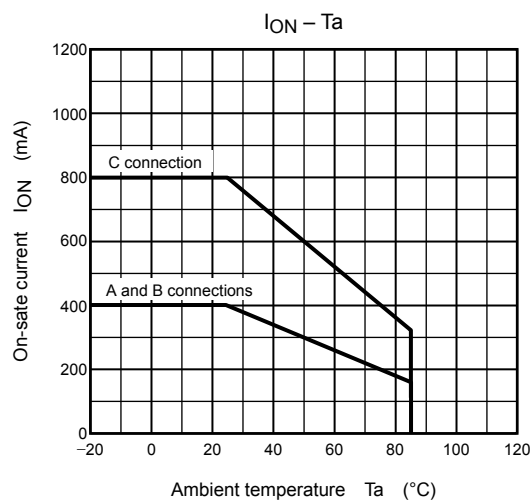
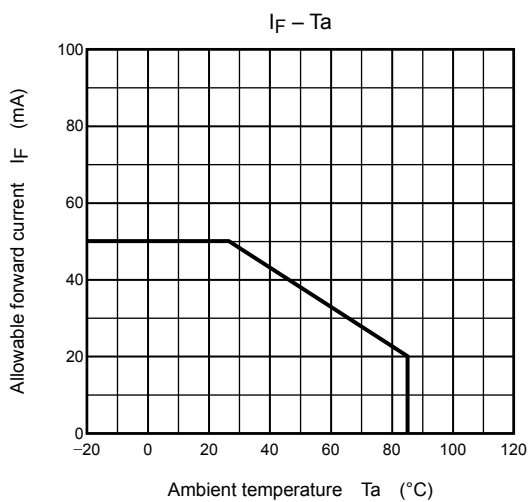
| Characteristics             | Symbol | Test Condition                            | Min                | Typ.      | Max | Unit     |
|-----------------------------|--------|-------------------------------------------|--------------------|-----------|-----|----------|
| Capacitance input to output |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

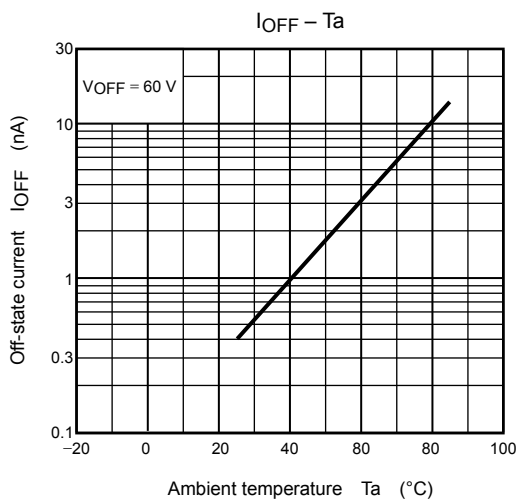
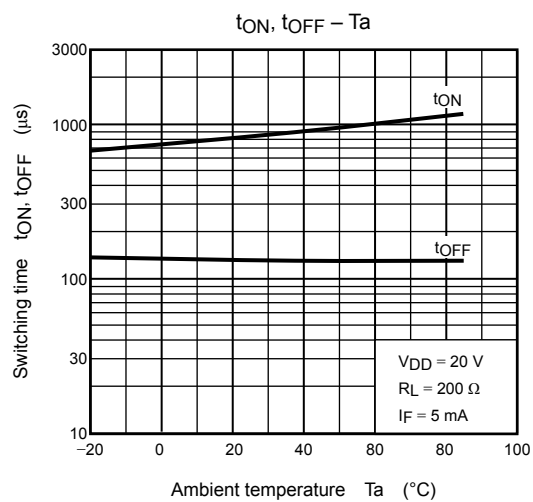
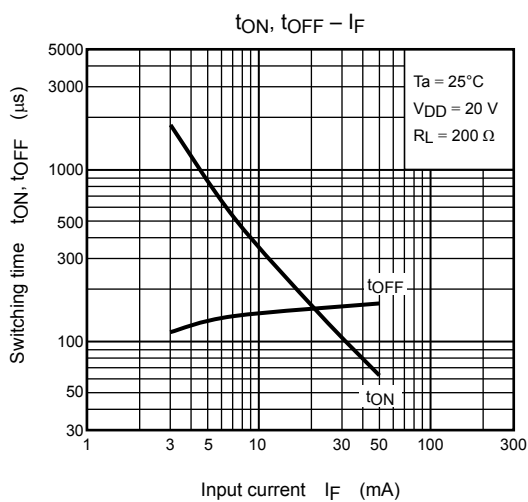
## Switching Characteristics (Ta = 25°C)

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

Note 2: Switching time test circuit







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