

TOSHIBA PHOTOCOUPLER PHOTO RELAY

# TLP199D

MEASUREMENT INSTRUMENTS

LOGIC IC TESTERS / MEMORY TESTERS

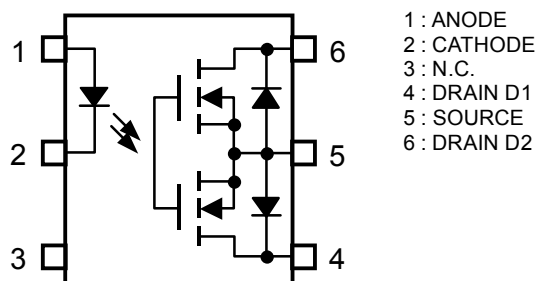
BOARD TESTERS / SCANNERS

The TOSHIBA TLP199D consist of a gallium arsenide infrared emitting diode optically coupled to a photo-MOS FET in a plastic SOP package. Its characteristics include low OFF-state current and low output pin capacitance, enabling it to be used in high-frequency measurement instruments.

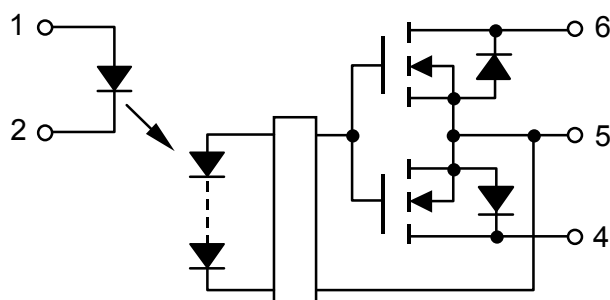
## FEATURES

- 6 pin SOP (2.54SOP6) : 2.1 mm high, 2.54 mm pitch
- 1-Form-A
- Peak Off-State Voltage : 200 V (min)
- Trigger LED Current : 3 mA (max)
- On-State Current : 50 mA (max)
- On-State Resistance : 50 ohm (max)
- Output Capacitance : 20 pF (max)
- Isolation Voltage : 1500 Vrms (min)

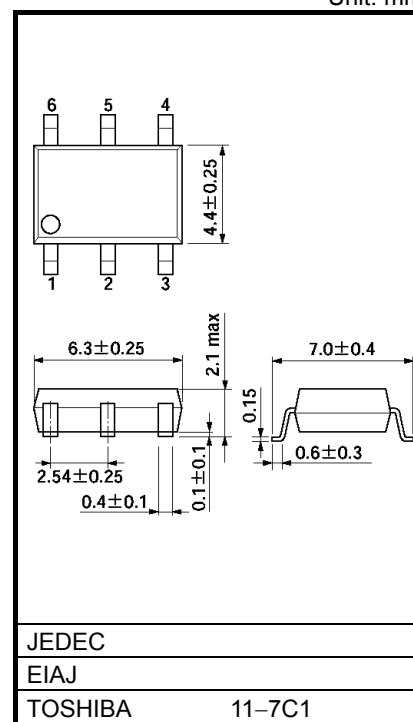
## PIN CONFIGURATION (TOL VIEW)



## SCHEMATIC



Unit: mm



Weight: 0.13 g

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

| CHARACTERISTIC                                       |  |                  | 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 |
|  | Reverse Voltage                          |                  | V <sub>R</sub>       | 5      | V     |
|  | Junction Temperature                     |                  | T <sub>j</sub>       | 125    | °C    |
| DETECTOR   | Off-State Output Terminal Voltage        |                  | V <sub>OFF</sub>     | 200    | V     |
|  | On-State Current                         | A Connection     | I <sub>ON</sub>      | 50     | mA    |
|  |  | B Connection     |                      | 50     |       |
|  |  | C Connection     |                      | 100    |       |
|  | On-State Current Derating<br>(Ta ≥ 25°C) | A Connection     | ΔI <sub>ON</sub> /°C | −0.5   | mA/°C |
|  |  | B Connection     |                      | −0.5   |       |
|  |  | C Connection     |                      | −1.0   |       |
|  | Junction Temperature                     |                  | T <sub>j</sub>       | 125    | °C    |
| Storage Temperature Range                            |  | T <sub>stg</sub> | −55~125              | °C     |       |
| Operating Temperature Range                          |  | T <sub>opr</sub> | −40~85               | °C     |       |
| Lead Soldering Temperature (10 s)                    |  | T <sub>sol</sub> | 260                  | °C     |       |
| Isolation Voltage (AC, 1 minute, R.H. ≤ 60%) (NOTE1) |  | 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).

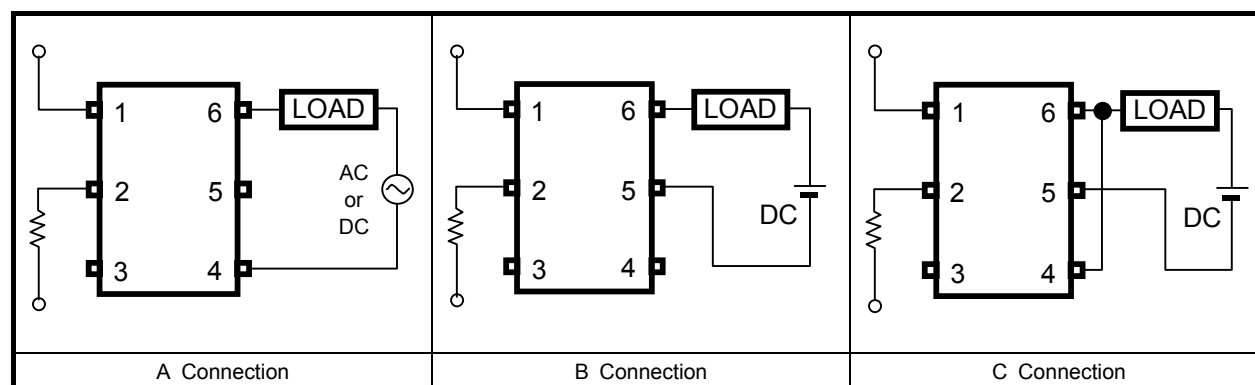
(NOTE1) : Device considered a two-terminal device : LED side pins are shorted together, and DETECTOR side pins are shorted together.

## RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC        | SYMBOL    | Min | Typ. | Max | UNIT |
|-----------------------|-----------|-----|------|-----|------|
| Supply Voltage        | $V_{DD}$  | —   | —    | 160 | V    |
| Forward Current       | $I_F$     | 5   | 7.5  | 15  | mA   |
| On-State Current      | $I_{ON}$  | —   | —    | 50  | mA   |
| Operating Temperature | $T_{opr}$ | -20 | —    | 60  | °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)

| CHARACTERISTIC |                   | 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 | $I_{OFF}$ | $V_{OFF} = 160 \text{ V}$  | —   | —    | 1   | nA            |
|                | Capacitance       | $C_{OFF}$ | $V = 0, f = 1 \text{ MHz}$ | —   | 15   | 20  | pF            |

## COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC      |              | SYMBOL   | TEST CONDITION                                | Min | Typ. | Max | UNIT     |
|---------------------|--------------|----------|---|-----|------|-----|----------|
| Trigger LED Current |              | $I_{FT}$ | $I_{ON} = 50 \text{ mA}$                      | —   | 1    | 3   | mA       |
| Return LED Current  |              | $I_{FC}$ | $I_{OFF} = 100 \mu\text{A}$                   | 0.1 | —    | —   | mA       |
| On-State Resistance | A Connection | $R_{ON}$ | $I_{ON} = 50 \text{ mA}, I_F = 5 \text{ mA}$  | —   | 40   | 50  | $\Omega$ |
|                     | B Connection |          | $I_{ON} = 50 \text{ mA}, I_F = 5 \text{ mA}$  | —   | 30   | 40  |          |
|                     | C Connection |          | $I_{ON} = 100 \text{ mA}, I_F = 5 \text{ mA}$ | —   | 15   | —   |          |

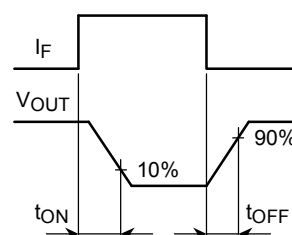
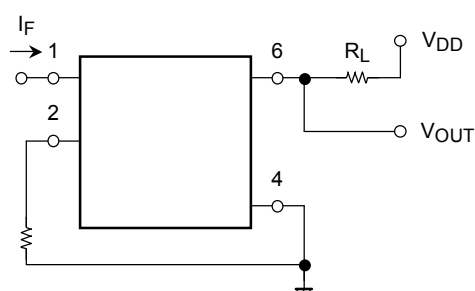
## ISOLATION CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC              | 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                                 | 1500               | —         | —   | Vrms     |
|                             |        | AC, 1 second (in oil)                        | —                  | 3000      | —   |          |
|                             |        | DC, 1 minute (in oil)                        | —                  | 3000      | —   | Vdc      |

## SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL    | TEST CONDITION                              | Min | Typ. | Max | UNIT |
|----------------|-----------|---|-----|------|-----|------|
| Turn-on Time   | $t_{ON}$  | $R_L = 200 \Omega$ (NOTE 2)                 | —   | —    | 0.5 | ms   |
| Turn-off Time  | $t_{OFF}$ | $V_{DD} = 10 \text{ V}, I_F = 5 \text{ mA}$ | —   | —    | 0.2 |      |

(NOTE 2) : SWITCHING TIME TEST CIRCUIT



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