

TOSHIBA Photocoupler Photorelay

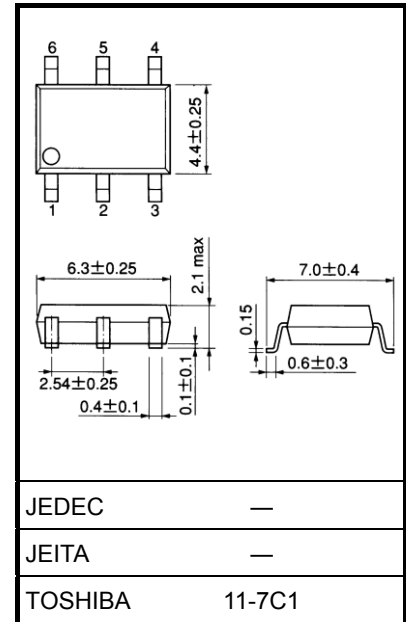
TLP3105

Measurement Equipment
 FA (Factory Automation)
 Power Line Control
 Security Equipment

The Toshiba TLP3105 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. The TLP3105 features high ON-state current and low ON-state resistance, hence the TLP3105 is suitable to control a power line.

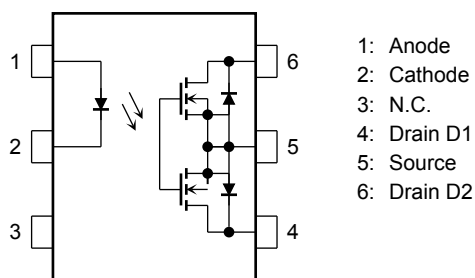
- 6-pin SOP (2.54SOP6): 2.1 mm high, 2.54 mm pitch
- Normally opened (form A) device
- Peak OFF-state voltage: 100 V (min)
- Trigger LED current: 3 mA (max)
- ON-state current: 1.4 A (max) (Ta=50°C)
- ON-state resistance: 0.1 Ω (typ.), 0.2 Ω (max)
- Capacitance between output terminals: 1000 pF (typ.)
- OFF-state current: 10 nA (max)
- Isolation voltage: 1500 V_{rms} (min)
- UL approved: UL1577, File No.E67349
- cUL approved :CSA Component Acceptance Service No. 5A, File No.E67349

Unit: mm

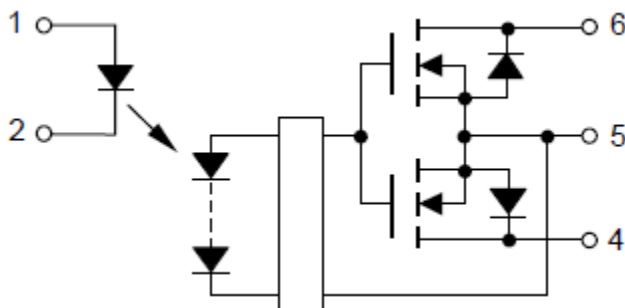


Weight: 0.13 g (typ.)

Pin Configuration (top view)



Schematic



Start of commercial production
 2010-06

Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | | Symbol | Rating | Unit | |
|---|---|-------------------------------|----------------------------------|---------|-------|
| LED | Forward current | I_F | 30 | mA | |
| | Forward current derating (Ta ≥ 25°C) | $\Delta I_F / ^\circ\text{C}$ | -0.3 | mA/°C | |
| | Reverse voltage | V_R | 5 | V | |
| | Diode power dissipation | P_D | 50 | mW | |
| | Diode power dissipation derating (Ta ≥ 25°C) | $\Delta P_D / ^\circ\text{C}$ | -0.5 | mW/°C | |
| | Junction temperature | T_j | 125 | °C | |
| Detector | Off-state output terminal voltage | V_{OFF} | 100 | V | |
| | On-state current | A connection | I_{ON} | 1.4 | A |
| | | B connection | | 1.4 | |
| | | C connection | | 2.8 | |
| | On-state current derating (Ta ≥ 50°C) | A connection | $\Delta I_{ON} / ^\circ\text{C}$ | -18.7 | mA/°C |
| | | B connection | | -18.7 | |
| | | C connection | | -37.3 | |
| | Pulse on-state current (t = 100ms) | I_{ONP} | 4 | A | |
| | Output power dissipation | P_O | 196 | mW | |
| | Output power dissipation derating (Ta ≥ 50°C) | $\Delta P_O / ^\circ\text{C}$ | -2.62 | mW / °C | |
| 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.).

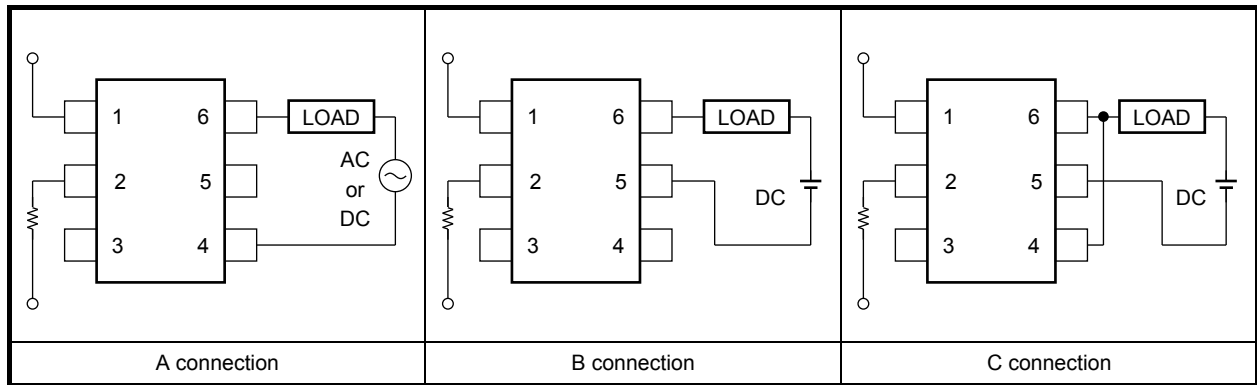
Note 1: Device considered a two-terminal device: Pins 1 and 2 shorted together, and pins 4, 5 and 6 shorted together.

Recommended Operating Conditions

| Characteristics | Symbol | Min | Typ. | Max | Unit |
|-----------------------|-----------|-----|------|-----|------|
| Supply voltage | V_{DD} | — | — | 100 | V |
| Forward current | I_F | — | 7.5 | 20 | 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



Individual Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------|-------------------|-----------|--|------|------|------|---------------|
| LED | Forward voltage | V_F | $I_F = 10 \text{ mA}$ | 1.18 | 1.33 | 1.48 | V |
| | Reverse current | I_R | $V_R = 5 \text{ V}$ | — | — | 10 | μA |
| | Capacitance | C_T | $V_F = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 70 | — | pF |
| Detector | OFF-state current | I_{OFF} | $V_{OFF} = 100 \text{ V}$ | — | — | 10 | nA |
| | Capacitance | C_{OFF} | $V = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 1000 | — | pF |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---------------------|--------------|----------|---|-----|-------|-----|----------|
| Trigger LED current | | I_{FT} | $I_{ON} = 100 \text{ mA}$ | — | — | 3 | mA |
| Return LED current | | I_{FC} | $I_{OFF} = 10 \mu\text{A}$ | 0.1 | — | — | mA |
| On-state resistance | A connection | R_{ON} | $I_{ON} = 1.4 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$ | — | 0.1 | 0.2 | Ω |
| | B connection | | $I_{ON} = 1.4 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$ | — | 0.05 | 0.1 | |
| | C connection | | $I_{ON} = 2.8 \text{ A}, I_F = 5 \text{ mA}, t < 1 \text{ s}$ | — | 0.025 | — | |

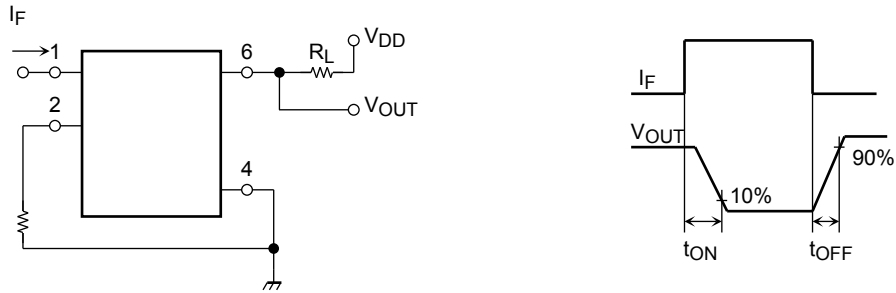
Isolation Characteristics (Ta = 25°C)

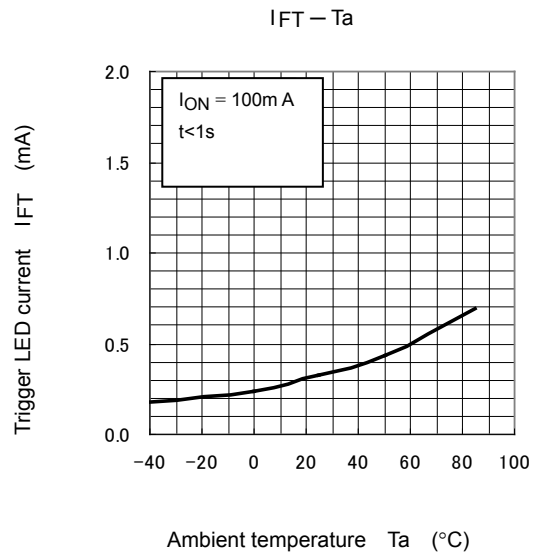
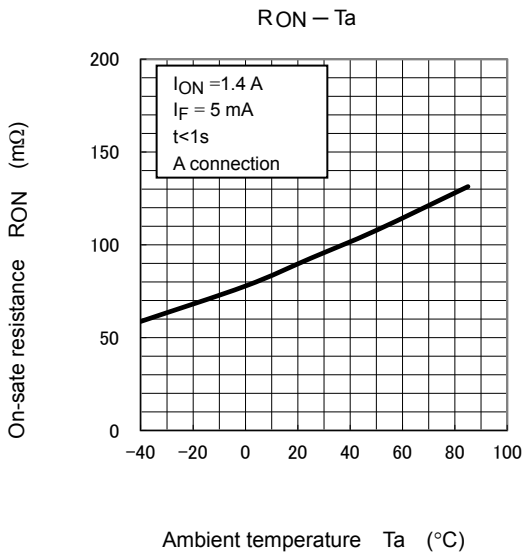
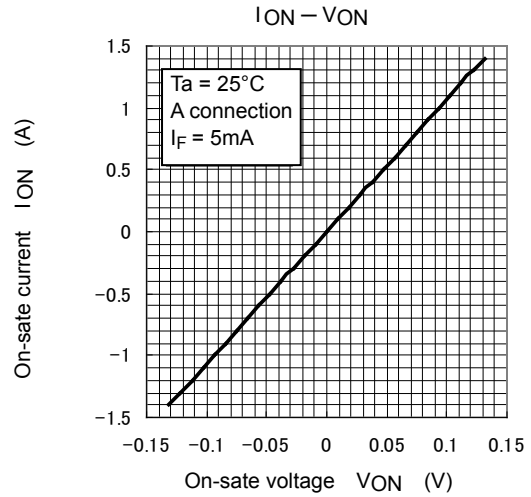
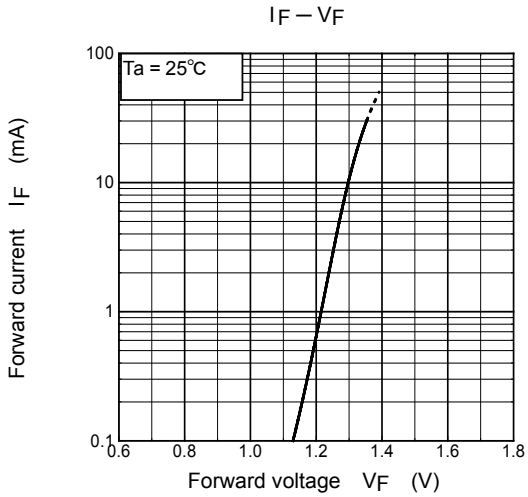
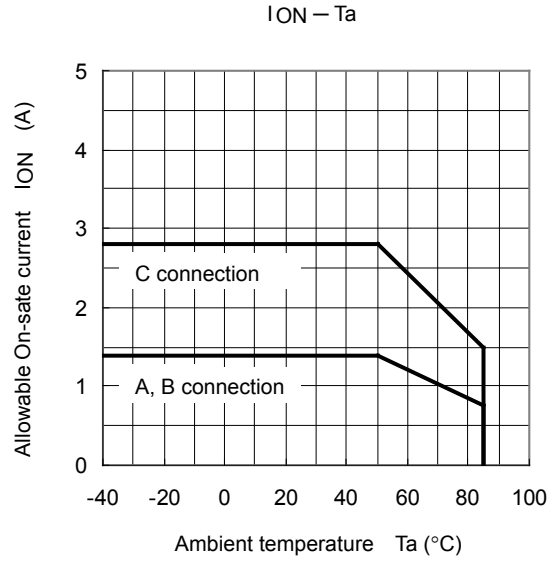
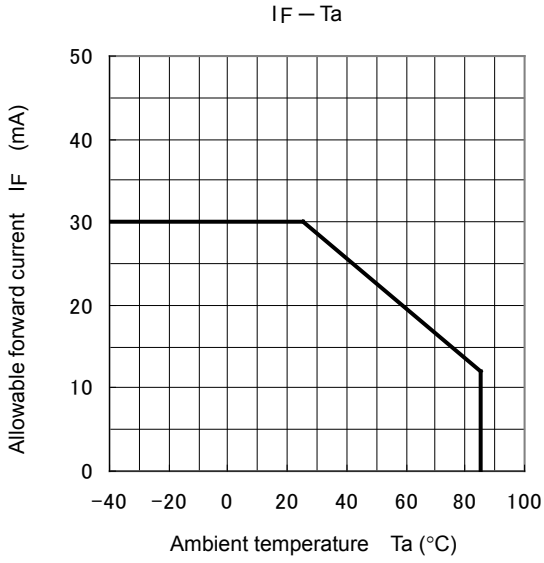
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------------------|--------|--|--------------------|-----------|-----|----------|
| Capacitance input to output | C_S | $V_S = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 0.8 | — | pF |
| Isolation resistance | R_S | $V_S =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

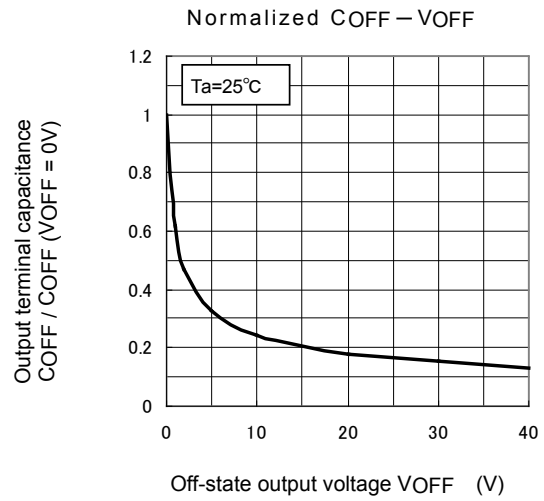
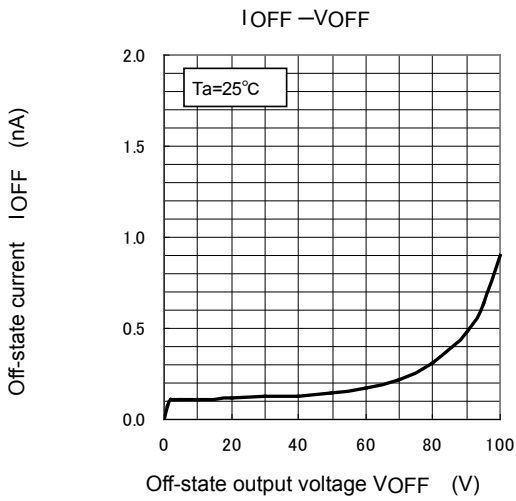
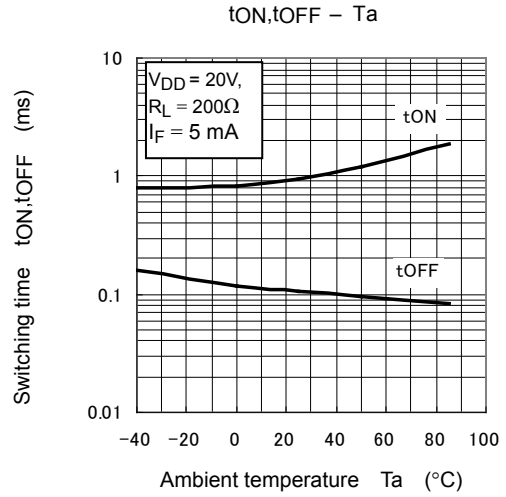
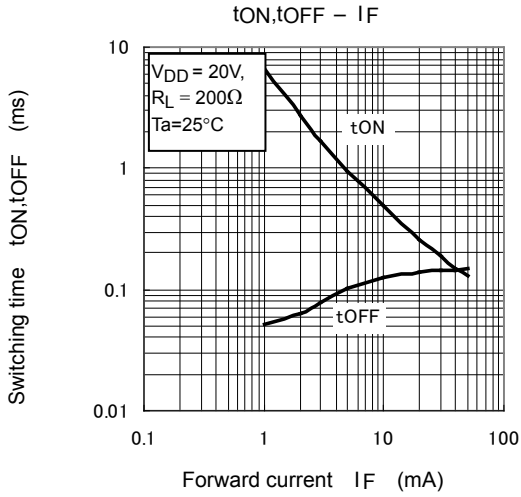
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------|-----------|---|-----|------|-----|------|
| Turn-ON time | t_{ON} | $R_L = 200 \Omega$ | — | 1.0 | 5.0 | ms |
| Turn-OFF time | t_{OFF} | $V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$ (Note 2) | — | 0.15 | 1.0 | |
| Turn-ON time | t_{ON} | $R_L = 200 \Omega$ | — | 0.5 | 3.0 | |
| Turn-OFF time | t_{OFF} | $V_{DD} = 20 \text{ V}, I_F = 10 \text{ mA}$ (Note 2) | — | 0.15 | 1.0 | |

Note 2: Switching time test circuit





*: The above graphs show typical characteristics.



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