

# TLP3115

MEASUREMENT INSTRUMENTS  
LOGIC IC TESTERS / MEMORY TESTERS  
BOARD TESTERS / SCANNERS

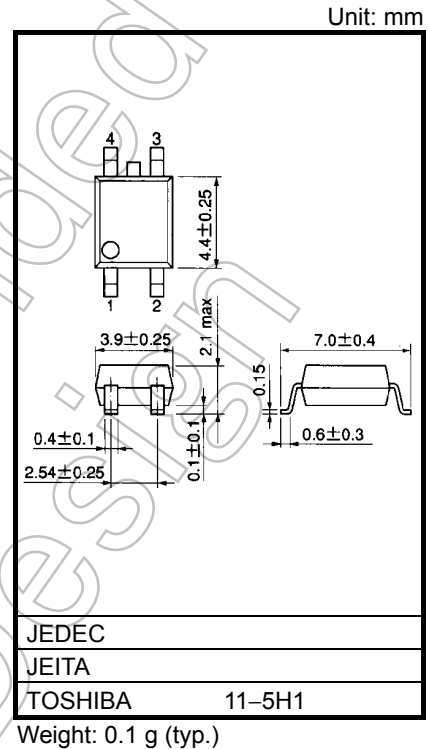
The TOSHIBA TLP3115 Mini-flat photorelay is a small-outline photorelay, suitable for surface-mount assembly. The TLP3115 consists of a GaAs infrared-emitting diode optically coupled to a photo-MOS FET and housed in a 4-pin package.

The TLP3115 features low CR product and especially low On-state resistance, allowing high ON-state current.

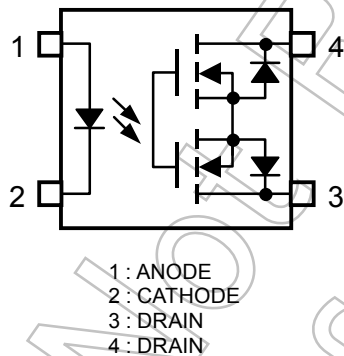
Its characteristics also include low OFF-state current and low output pin capacitance, enabling it to be used in high-frequency measuring instruments.

## Features

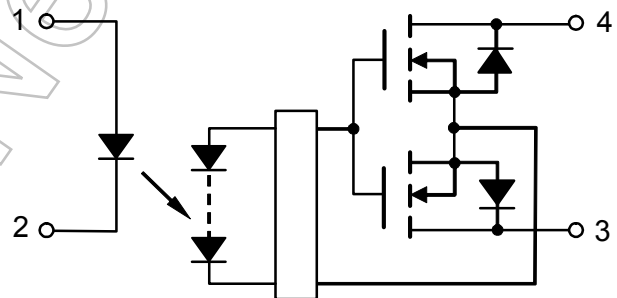
- 4 pin SOP (2.54SOP4) : 2.1 mm high, 2.54 mm pitch
- 1-Form-A
- Peak Off-State Voltage : 40 V (min)
- Trigger LED Current : 4 mA (max)
- On-State Current : 300 mA (max)
- On-State Resistance : 1.5  $\Omega$  (max), 1.0  $\Omega$  (typ.)
- Output Capacitance : 14 pF (max), 10 pF (typ.)
- Isolation Voltage : 1500 Vrms (min)



## Pin Configuration (top view)



## Schematic



Start of commercial production  
2000/11

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

| CHARACTERISTIC  |                                       | 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 |
|   | Reverse Voltage                       | $V_R$                          | 5          | V     |
|   | Junction Temperature                  | $T_j$                          | 125        | °C    |
| DETECTOR  | Off-State Output Terminal Voltage     | $V_{OFF}$                      | 40         | V     |
|   | On-State Current                      | $I_{ON}$                       | 300        | mA    |
|   | On-State Current Derating (Ta ≥ 25°C) | $\Delta I_{ON}/^\circ\text{C}$ | -3.0       | mA/°C |
|   | Junction Temperature                  | $T_j$                          | 125        | °C    |
| Storage Temperature Range                             |                                       | $T_{stg}$                      | -40 to 125 | °C    |
| Operating Temperature Range                           |                                       | $T_{opr}$                      | -20 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 3 and 4 shorted together.

## CAUTION

This device is sensitive to electrostatic discharge. When using this device, please ensure that all tools and equipment are earthed.

## Recommended Operating Conditions

| CHARACTERISTIC        | SYMBOL    | MIN | TYP. | MAX | UNIT |
|-----------------------|-----------|-----|------|-----|------|
| Supply Voltage        | $V_{DD}$  | —   | —    | 32  | V    |
| Forward Current       | $I_F$     | 10  | —    | 30  | mA   |
| On-State Current      | $I_{ON}$  | —   | —    | 300 | mA   |
| Operating Temperature | $T_{opr}$ | 25  | —    | 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.

## 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   | μA   |
|                | Capacitance       | $C_T$     | $V = 0, f = 1 \text{ MHz}$                       | —   | 15   | —    | pF   |
| DETECTOR       | Off-State Current | $I_{OFF}$ | $V_{OFF} = 30 \text{ V}, T_a = 50^\circ\text{C}$ | —   | —    | 1000 | pA   |
|                | Capacitance       | $C_{OFF}$ | $V = 0, f = 100 \text{ MHz}, t < 1 \text{ s}$    | —   | 10   | 14   | pF   |

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

| CHARACTERISTIC      | SYMBOL   | TEST CONDITION   | MIN | TYP. | MAX | UNIT     |
|---------------------|----------|--|-----|------|-----|----------|
| Trigger LED Current | $I_{FT}$ | $I_{ON} = 100 \text{ mA}$  | —   | —    | 4   | mA       |
| Return LED Current  | $I_{FC}$ | $I_{OFF} = 10 \text{ } \mu\text{A}$                                  | 0.2 | 0.75 | —   | mA       |
| On-State Resistance | $R_{ON}$ | $I_{ON} = 300 \text{ mA}$ , $I_F = 5 \text{ mA}$ , $t < 1 \text{ s}$ | —   | 1.0  | 1.5 | $\Omega$ |

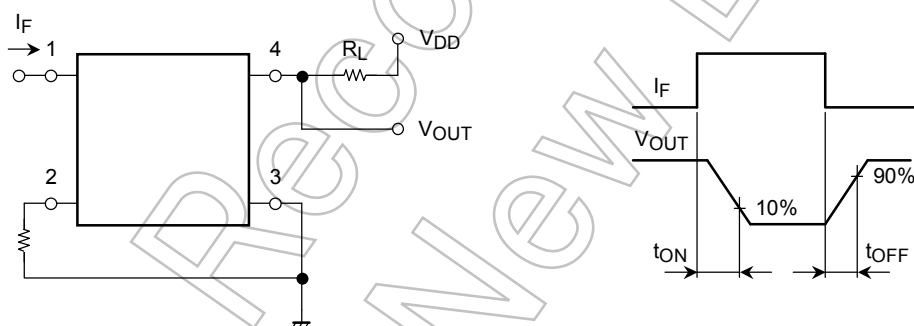
## Isolation Characteristics (Ta = 25°C)

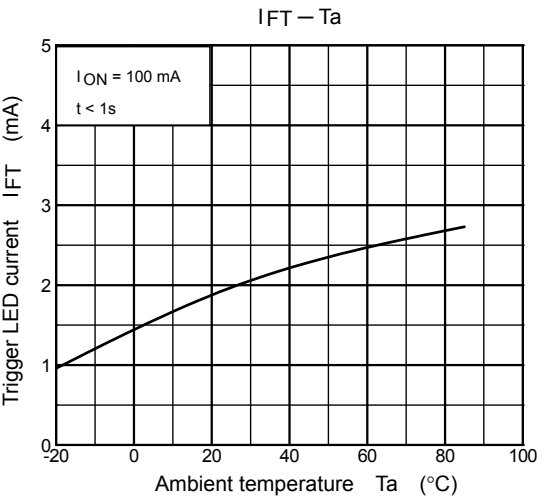
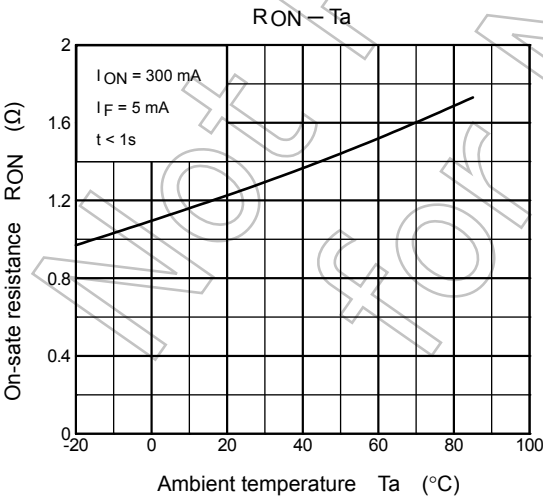
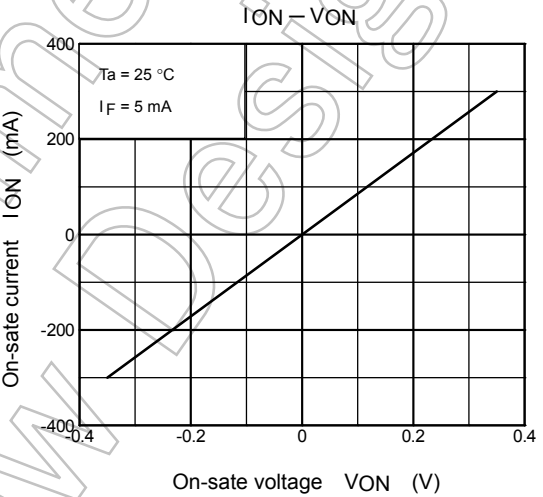
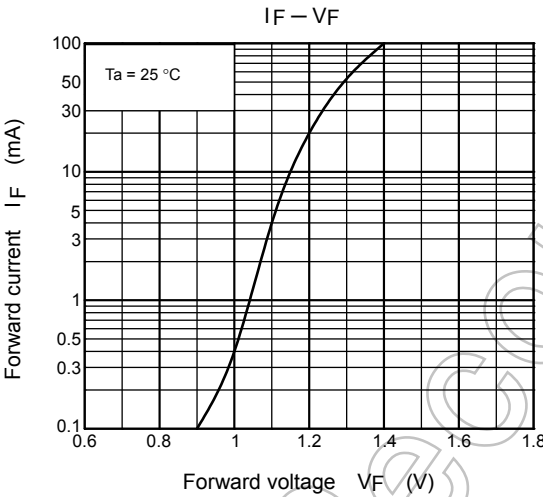
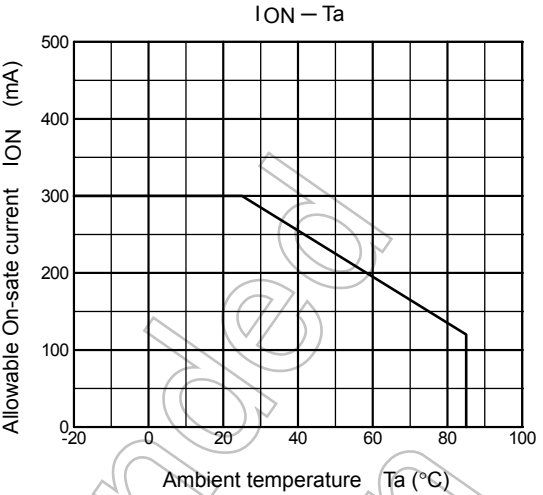
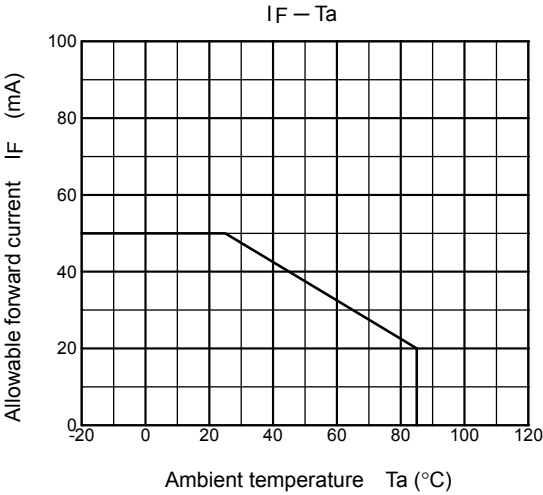
| CHARACTERISTIC              | SYMBOL | TEST CONDITION                            | MIN                | TYP.      | MAX | UNIT     |
|-----------------------------|--------|---|--------------------|-----------|-----|----------|
| Capacitance Input to Output | $C_S$  | $V_S = 0 \text{ V}$ , $f = 1 \text{ MHz}$ | —                  | 0.8       | —   | pF       |
| Isolation Resistance        | $R_S$  | $V_S = 500 \text{ V}$ , 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      |

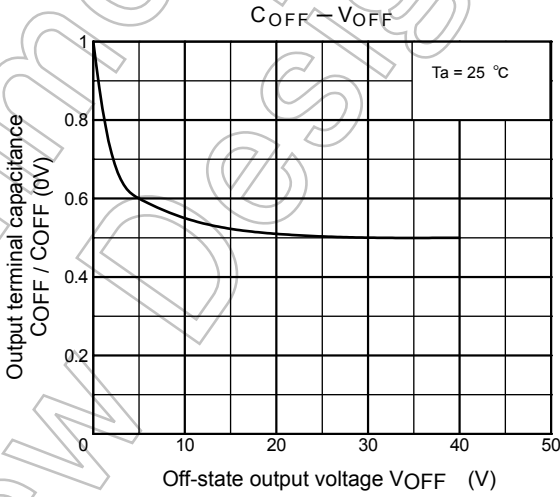
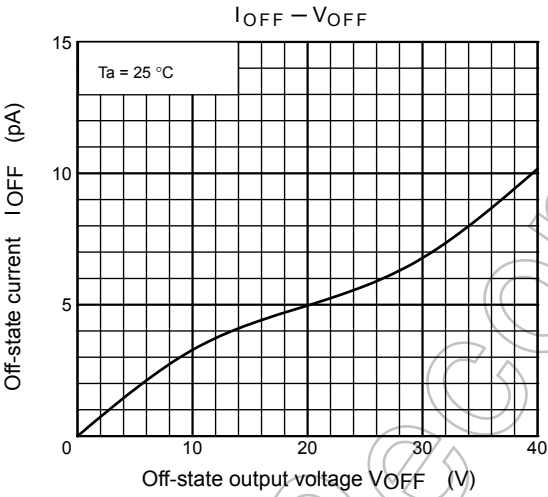
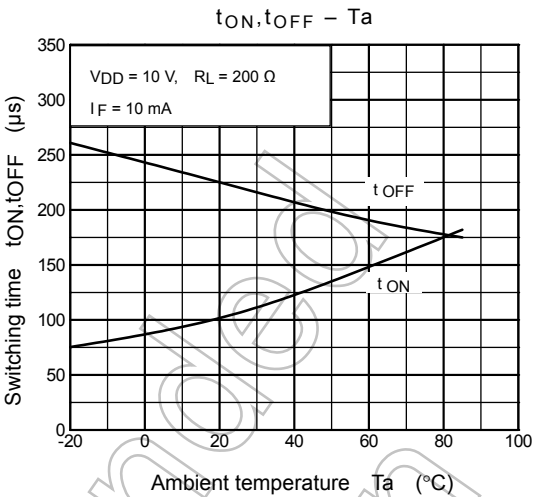
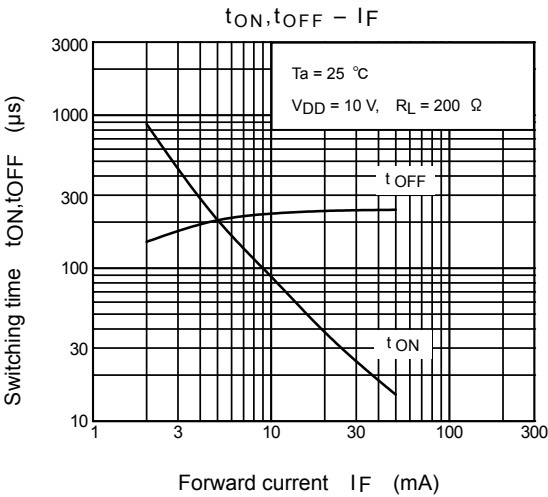
## Switching Characteristics (Ta = 25°C)

| CHARACTERISTIC | SYMBOL    | TEST CONDITION                                  | MIN | TYP. | MAX | UNIT          |
|----------------|-----------|---|-----|------|-----|---------------|
| Turn-on Time   | $t_{ON}$  | $R_L = 200 \text{ } \Omega$ (NOTE 2)            | —   | —    | 500 | $\mu\text{s}$ |
| Turn-off Time  | $t_{OFF}$ | $V_{DD} = 10 \text{ V}$ , $I_F = 10 \text{ mA}$ | —   | —    | 500 |               |

(NOTE 2) : SWITCHING TIME TEST CIRCUIT







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