

# TLP3230

## Measuring Instruments

Logic IC Testers / Memory Testers

Board Testers / Scanners

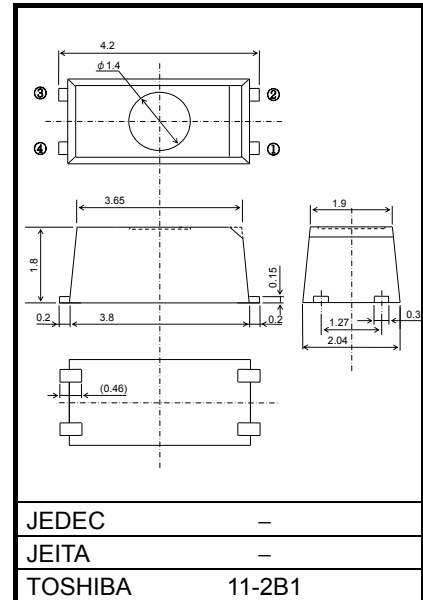
The TOSHIBA TLP3230 is an ultra-small photorelay suitable for surface-mount assembly. The TLP3230 consists of a GaAs infrared-emitting diode optically coupled to a photo-MOSFET and is housed in a 4-pin package.

Its features include low Off-state current and low output pin capacitance, enabling it to be used for high-frequency measuring instrument applications.

## Features

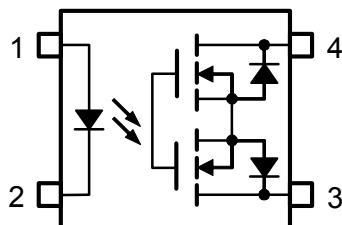
- 4-pin SSOP (SSOP4): 1.8-mm high, 1.27-mm pitch
- 1-Form-A
- Peak Off-State Voltage: 20 V (min)
- Trigger LED Current: 4 mA (max)
- On-State Current: 160 mA (max)
- On-State Resistance: 8  $\Omega$  (max), 5  $\Omega$  (typ.)
- Output Capacitance: 2.5 pF (max), 1.0 pF (typ.)
- Isolation Voltage: 1500 Vrms (min)

Unit: mm



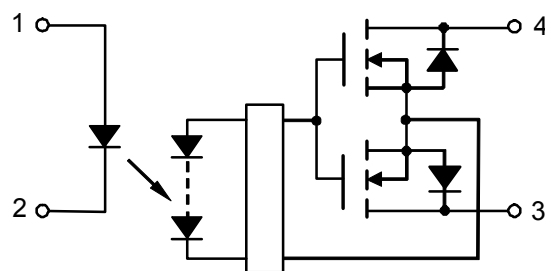
Weight: 0.03 g (typ.)

## Pin Configuration (Top View)



1 : ANODE  
2 : CATHODE  
3 : DRAIN  
4 : DRAIN

## Schematic



Start of commercial production  
2002/09

## 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     | $V_{OFF}$                      | 20         | V     |
|   | On-State Current                      | $I_{ON}$                       | 160        | mA    |
|   | On-State Current Derating (Ta ≥ 25°C) | $\Delta I_{ON}/^\circ\text{C}$ | -1.6       | 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        | $V_{DD}$  | —   | —    | 20  | V    |
| Forward Current       | $I_F$     | —   | —    | 30  | mA   |
| On-State Current      | $I_{ON}$  | —   | —    | 160 | 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.

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

| CHARACTERISTIC |                   | SYMBOL           | TEST CONDITION                     | MIN | TYP. | MAX  | UNIT |
|----------------|-------------------|------------------|------------------------------------|-----|------|------|------|
| LED            | Forward Voltage   | V <sub>F</sub>   | I <sub>F</sub> = 10 mA             | 1.0 | 1.15 | 1.3  | V    |
|                | Reverse Current   | I <sub>R</sub>   | V <sub>R</sub> = 5 V               | —   | —    | 10   | μA   |
|                | Capacitance       | C <sub>T</sub>   | V = 0, f = 1 MHz                   | —   | 15   | —    | pF   |
| DETECTOR       | Off-State Current | I <sub>OFF</sub> | V <sub>OFF</sub> = 20 V, Ta = 50°C | —   | —    | 1000 | pA   |
|                | Capacitance       | C <sub>OFF</sub> | V = 0, f = 100 MHz, t < 1 s        | —   | 1.0  | 2.5  | 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 | $R_{ON}$ | $I_{ON} = 160 \text{ mA}$ , $I_F = 5 \text{ mA}$ , $t < 1 \text{ s}$ | —   | 5    | 8   | $\Omega$ |

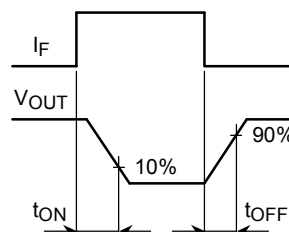
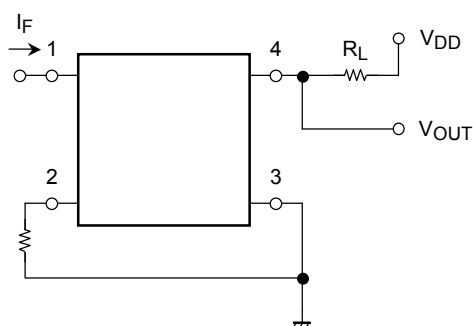
## Isolation Characteristics (Ta = 25°C)

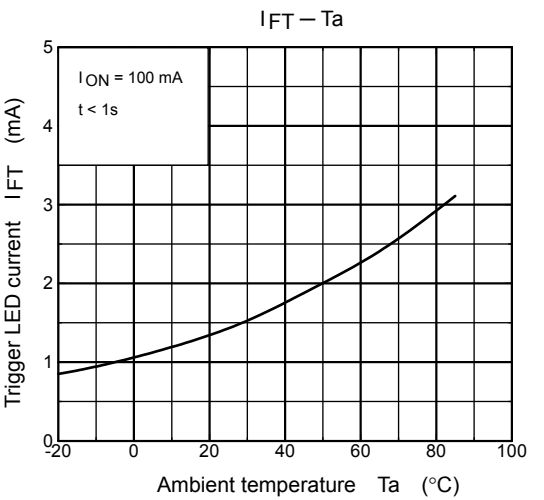
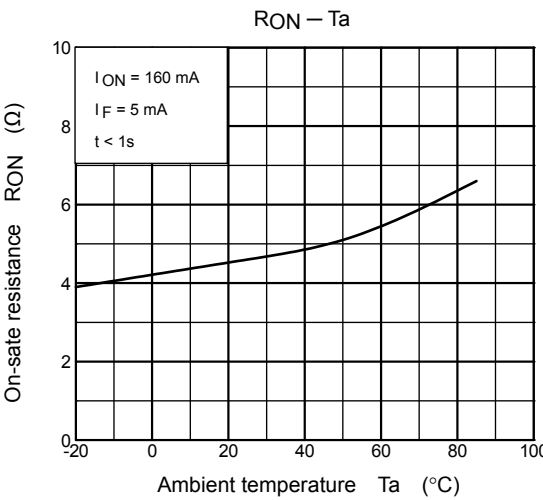
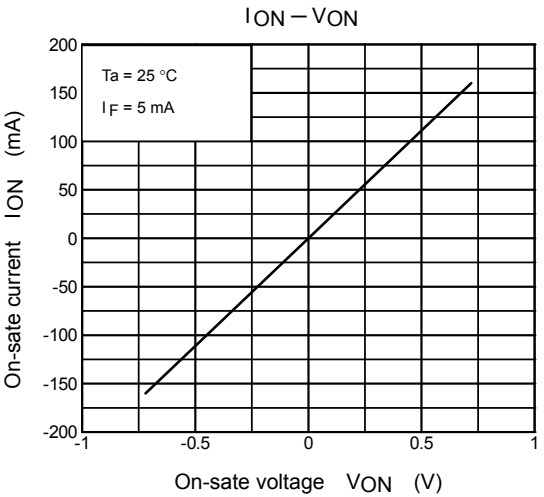
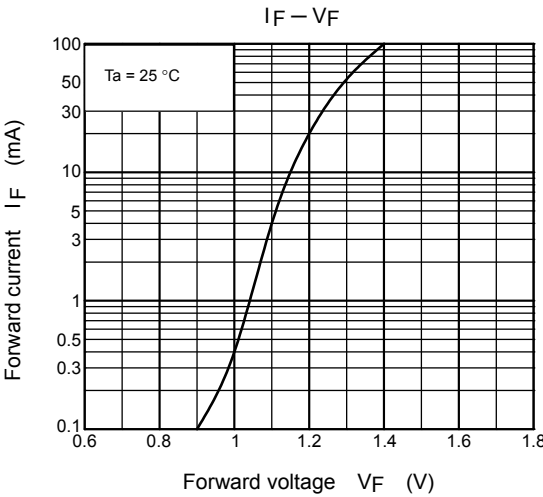
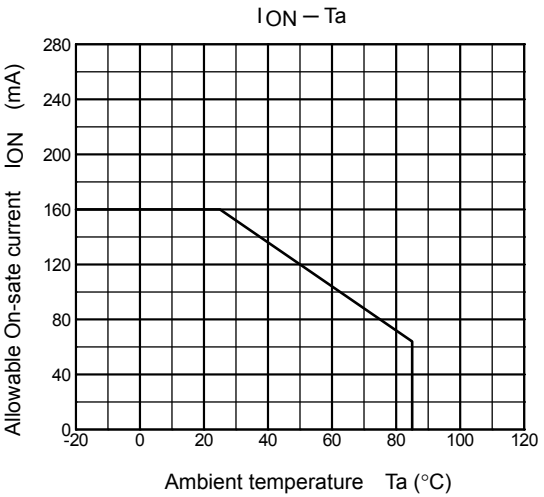
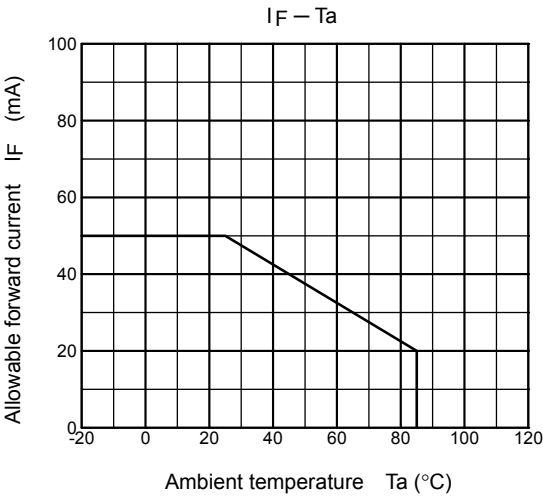
| CHARACTERISTIC              | SYMBOL | TEST CONDITION                            | MIN                | TYP.      | MAX | UNIT     |
|-----------------------------|--------|---|--------------------|-----------|-----|----------|
| Capacitance Input to Output | $C_S$  | $V_S = 0 \text{ V}$ , $f = 1 \text{ MHz}$ | —                  | 0.3       | —   | 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      |

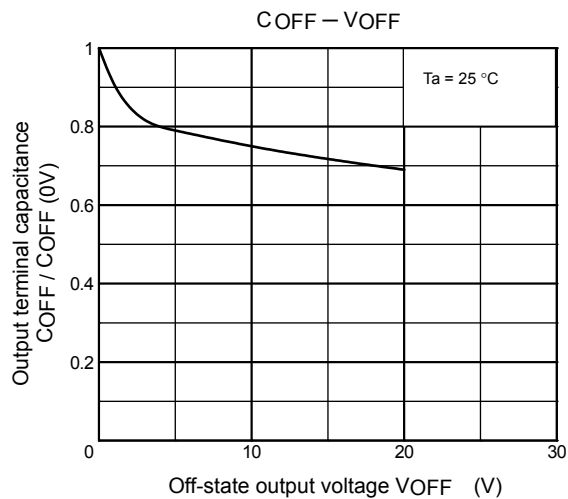
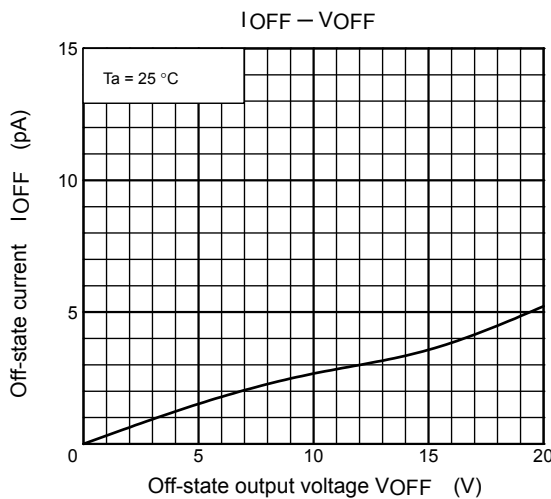
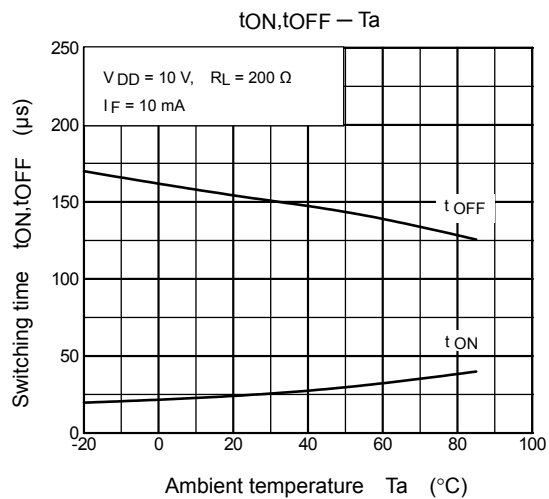
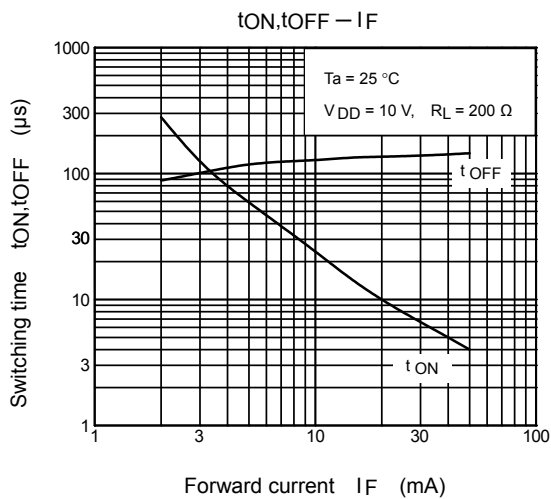
## Switching Characteristics (Ta = 25°C)

| CHARACTERISTIC | SYMBOL    | TEST CONDITION   | MIN | TYP. | MAX | UNIT          |
|----------------|-----------|--|-----|------|-----|---------------|
| Turn-on Time   | $t_{ON}$  | $R_L = 200 \text{ } \Omega$<br>$V_{DD} = 10 \text{ V}$ , $I_F = 5 \text{ mA}$ (Note) | —   | 60   | 500 | $\mu\text{s}$ |
| Turn-off Time  | $t_{OFF}$ |  | —   | 120  | 500 |               |

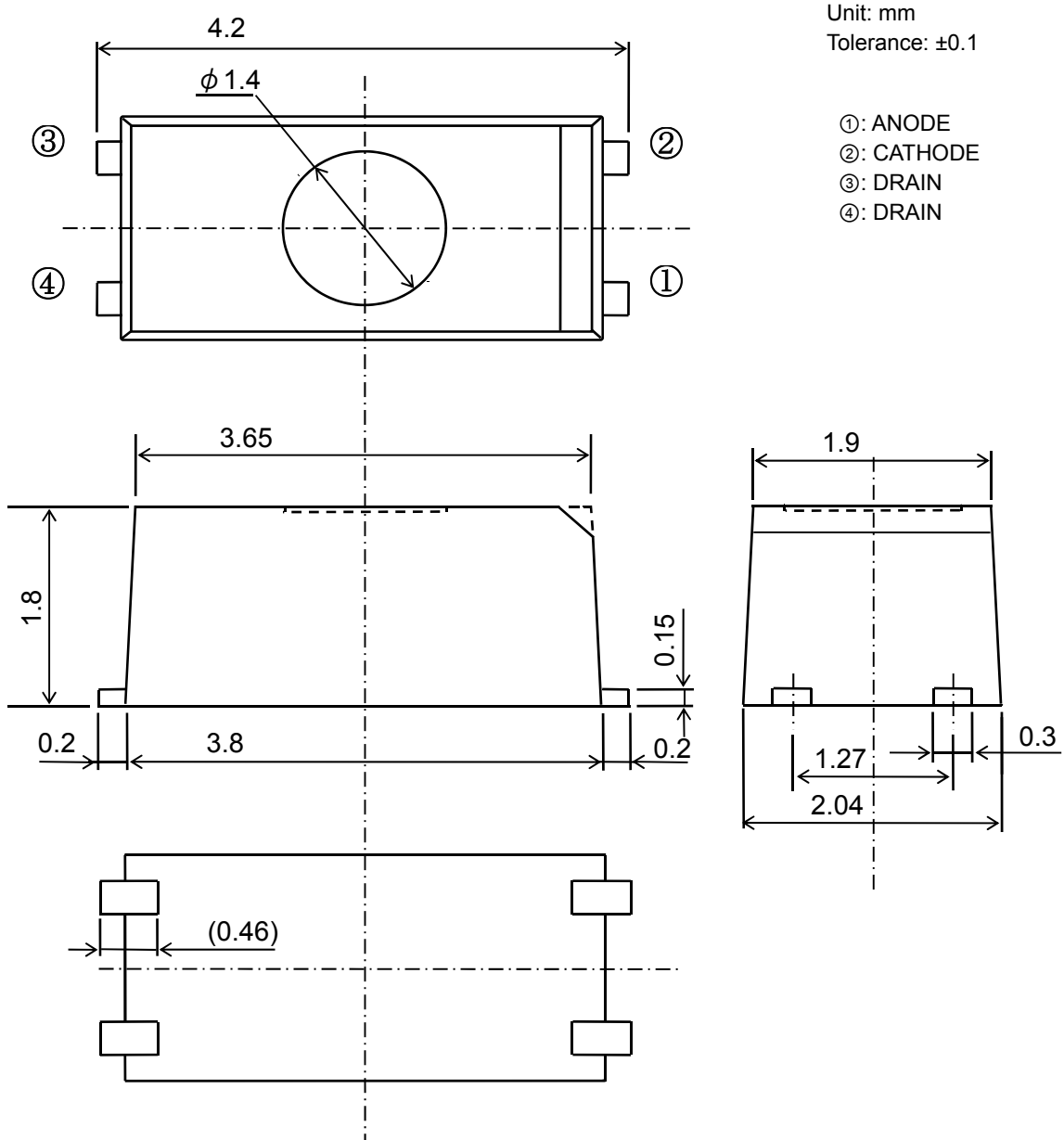
Note: SWITCHING TIME TEST CIRCUIT







Package Dimensions



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