

# TLP3312

## Applications

Battery Control

Measuring Instruments

Logic IC Testers / Memory Testers

## General

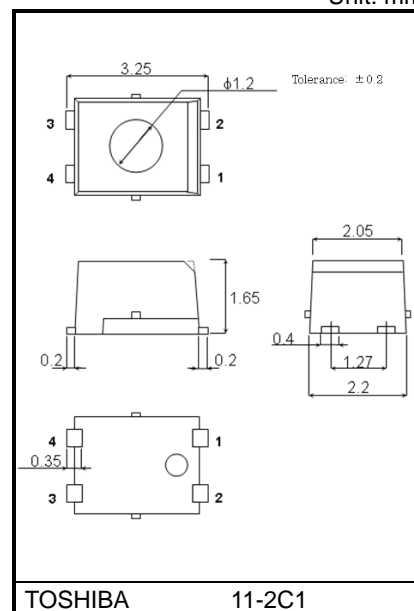
The TOSHIBA TLP3312 is an ultra-small photorelay suitable for surface-mount assembly. The TLP3312 consists of a GaAs infrared-emitting diode optically coupled to a photo-MOSFET and is housed in a 4-pin package.

Its features include low Off-state current and low output pin capacitance.

## Features

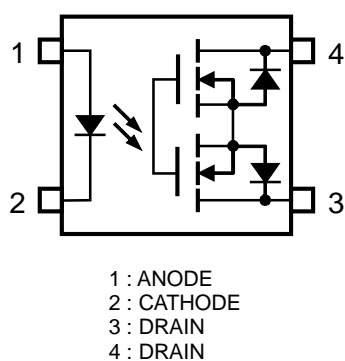
- 4-pin USOP (SSOP4): height=1.65 mm, pitch=1.27 mm
- 1-Form-A
- Peak Off-State Voltage: 60 V (min)
- Trigger LED Current: 3 mA (max)
- On-State Current: 400 mA (max)
- On-State Resistance: 1.5  $\Omega$  (max), 1.0  $\Omega$  (typ.)
- Isolation Voltage: 1000 Vrms (min)
- UL approved: UL1577, File No.E67349

Unit: mm

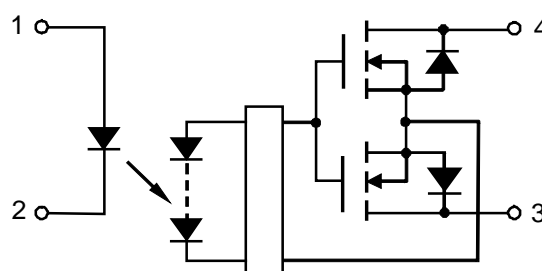


Weight: 0.03 g (typ.)

## Pin Configuration (Top View)



## Schematic



Start of commercial production  
2009-03

**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
	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 Current	I <sub>ON</sub>	400	mA
	On-State Current Derating (Ta ≥ 25°C)	ΔI <sub>ON</sub> /°C	−4.0	mA/°C
	Output Power Dissipation	P <sub>O</sub>	240	mW
	Output Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>O</sub> /°C	−2.4	mW / °C
	Junction Temperature	T <sub>j</sub>	125	°C
Storage Temperature Range		T <sub>stg</sub>	−40 to 125	°C
Operating Temperature Range		T <sub>opr</sub>	−40 to 85	°C
Lead Soldering Temperature (10 s)		T <sub>sol</sub>	260	°C
Isolation Voltage (AC, 1 minute, R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	1000	V <sub>rms</sub>

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: 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 <sub>DD</sub>	—	—	48	V
Forward Current	I <sub>F</sub>	—	—	20	mA
On-State Current	I <sub>ON</sub>	—	—	400	mA
Operating Temperature	T <sub>opr</sub>	−20	—	65	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the devices. Each item also has its own independent guideline document. In developing designs using these products, please confirm the specified characteristics shown in these documents.

## 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 <sub>F</sub> = 0V, f = 1 MHz	—	15	—	pF
DETECTOR	Off-State Current	I <sub>OFF</sub>	V <sub>OFF</sub> = 60 V	—	—	1	nA
	Capacitance	C <sub>OFF</sub>	V = 0V, f = 1 MHz, t < 1 s	—	20	—	pF

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Trigger LED Current	I <sub>FT</sub>	I <sub>ON</sub> = 100 mA	—	—	3	mA
Close LED Current	I <sub>FC</sub>	I <sub>OFF</sub> = 10 μA	0.2	—	—	mA
On-State Resistance	R <sub>ON</sub>	I <sub>ON</sub> = 400 mA, I <sub>F</sub> = 5 mA	—	1.0	1.5	Ω

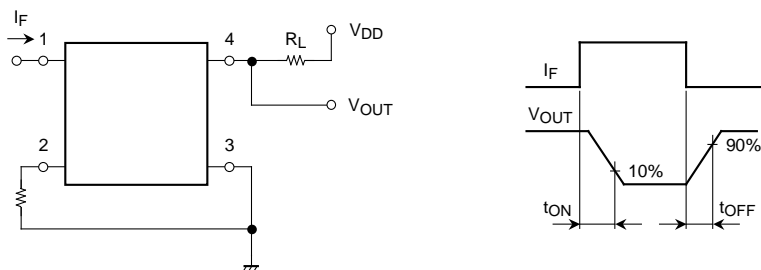
## Isolation Characteristics (Ta = 25°C)

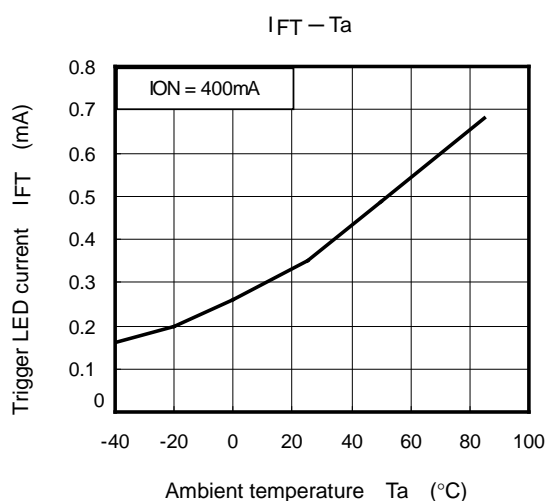
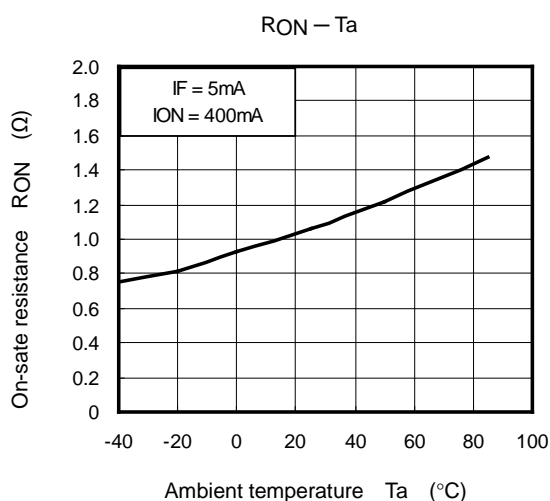
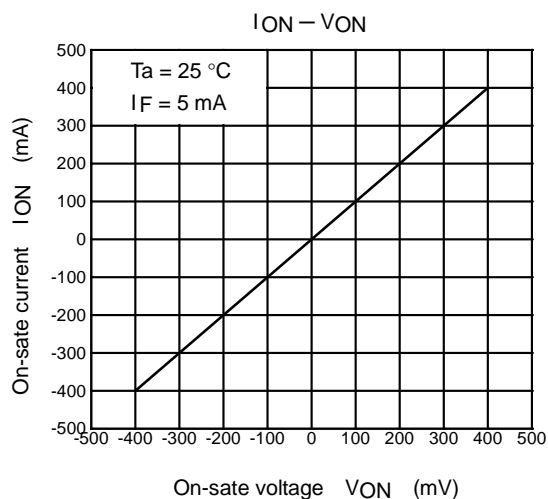
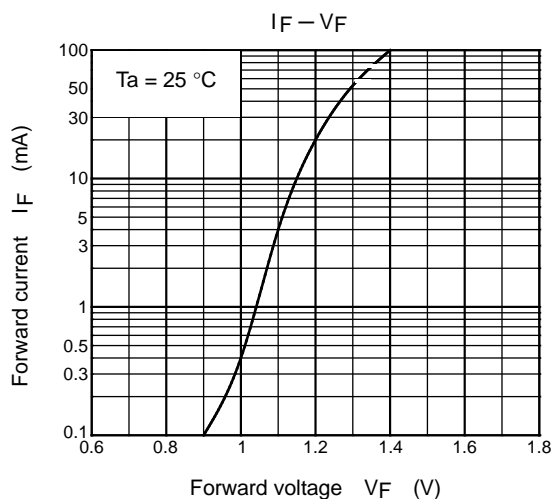
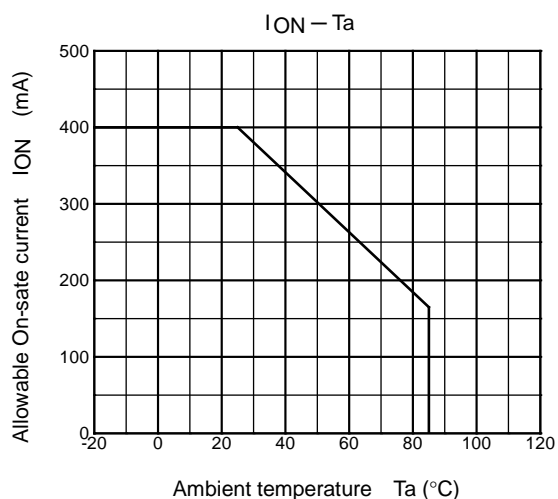
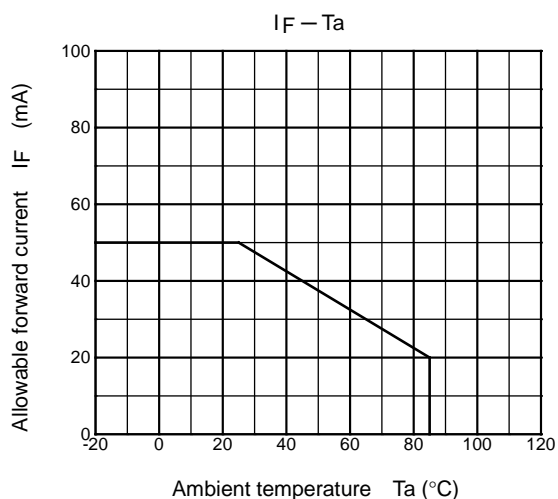
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Capacitance Input to Output	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.3	—	pF
Isolation Resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5 × 10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	1000	—	—	V <sub>rms</sub>

## Switching Characteristics (Ta = 25°C)

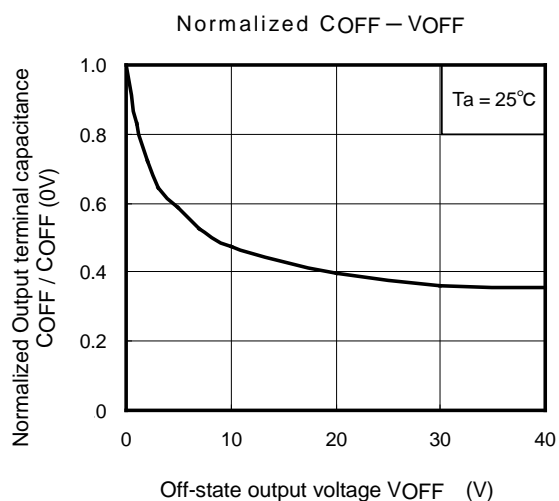
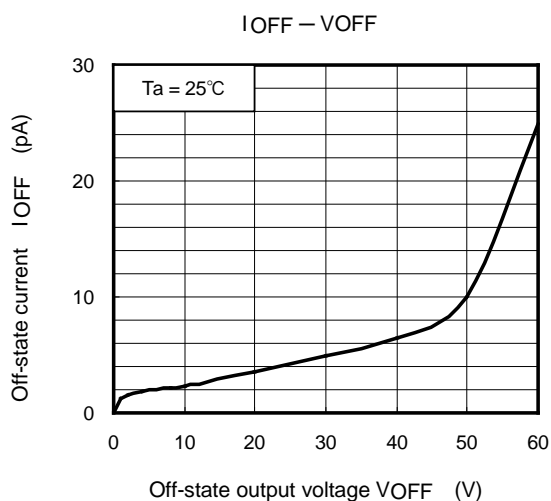
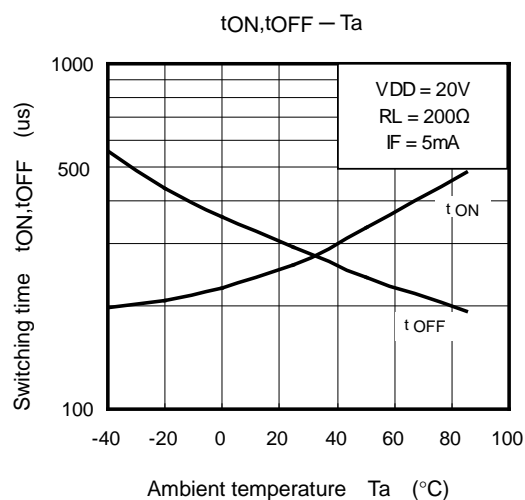
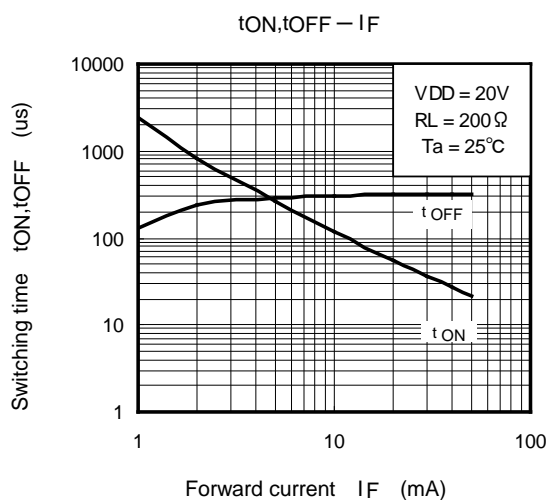
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> = 200 Ω V <sub>DD</sub> = 20 V, I <sub>F</sub> = 5 mA (Note 2)	—	—	500	μs
Turn-off Time	t <sub>OFF</sub>		—	—	500	

Note 2: Switching time test circuit





\*: The above graphs show typical characteristics.



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## 1. Recommended Soldering

### Precautions about the Soldering of the SMD Type Photocoupler

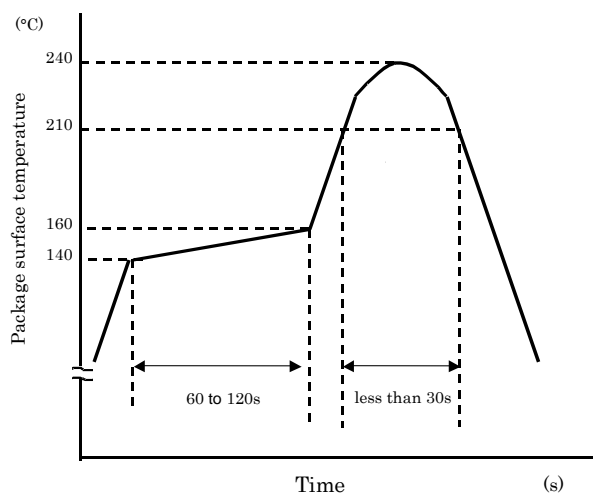
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TLP3312

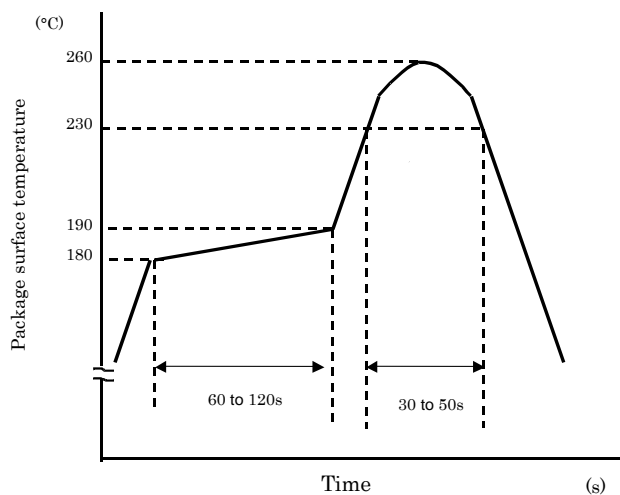
<Mounting Method>

#### 1) Using Solder Reflow

- Temperature profile example of lead (Pb) solder



- Temperature profile example of using lead (Pb-free) solder



Reflow soldering must be performed once or twice.

## **2. Packing**

Please use the device in a condition of the following because package breaking may occur when the USOP coupler catches the heat stress in the time of soldering in the state that exposure to moisture in the air.

1. This moisture-proof bag may be stored unopened for up to 12 months under the following conditions.  
Temperature: 5°C to 30°C  
Humidity: 90% (max)
2. After the moisture-proof bag has been opened, the devices should be assembled within 168 hours in an environment of 5°C to 30°C/70% RH or below.
3. If, upon opening, the moisture indicator card shows humidity of 30% or above (when the indication color changes to pink) or the expiration date has passed, the devices should be baked while packed in the tape reel. After baking, use the baked devices within 72 hours, but perform baking only once.  
Baking conditions: 60 ±5°C, for 64 to 72 hours.  
Expiration date: 12 months from the sealing date, which is imprinted on the same side as this label.
4. Repeated baking may cause the peeling strength of the tape to change, leading to trouble in mounting. Also, be sure to prevent damage to the device from static electricity during the baking process.
5. Any breakage in the laminate packing material will cause the hermeticity of the product to deteriorate. Do not toss or drop the packed devices.



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