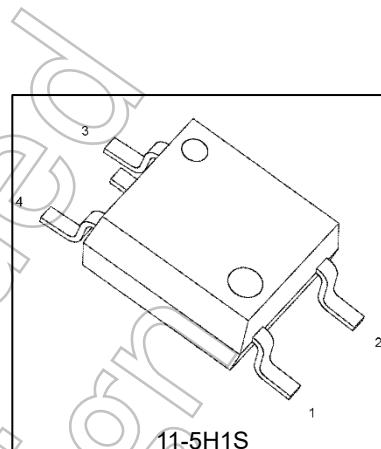


# TLP172A

## 1. Description

The Toshiba TLP172A consists of an infrared emitting diode optically coupled to a photo-MOSFET in a 4-pin SOP package.

This photorelay has higher output current rating than phototransistor-type photocoupler. Hence, it is suitable for use as on / off control for high current.



Weight: 0.1 g (typ.)

## 2. Applications

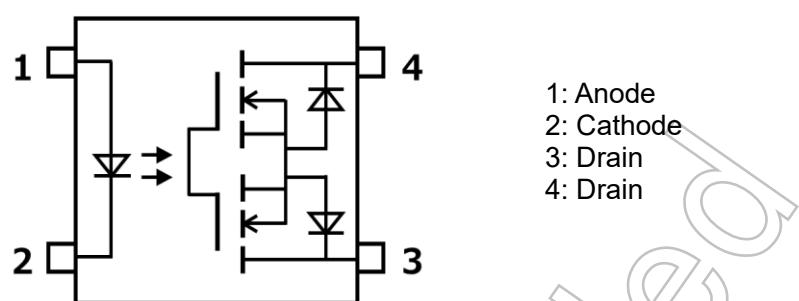
Mechanical relay replacements  
Security Systems  
Data Acquisition System  
Factory Automation (FA)  
Private Branch Exchanges (PBXs)

## 3. Features

- Package : SOP (2.54SOP4) (Height 2.1 mm, pitch 2.54 mm)
- Normally opened (1-Form-A)
- OFF-state output terminal voltage: 60 V (min)
- Trigger LED current: 3 mA (max)
- ON-state current: 400 mA (max)
- ON-state resistance: 2 Ω (max)
- Isolation voltage: 1500 V<sub>rms</sub> (min)
- Safety standards
  - UL-recognized: UL 1577, File No.E67349
  - cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349

Start of commercial production  
2002-03

#### 4. Pin Assignment



1: Anode  
2: Cathode  
3: Drain  
4: Drain

Figure 4.1 Pin Assignment

#### 5. Internal Circuit

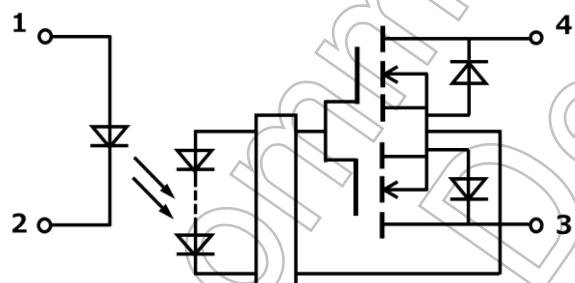


Figure 5.1 Internal Circuit

## 6. Absolute Maximum Ratings (Note)

( $T_a = 25^\circ\text{C}$  unless otherwise specified)

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	$I_F$		50	mA
	Input forward current derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta I_F/\Delta T_a$		-0.5	mA/ $^\circ\text{C}$
	Input reverse voltage	$V_R$		5	V
	Input power dissipation	$P_D$		50	mW
	Input power dissipation derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta P_D/\Delta T_a$		-0.5	mW/ $^\circ\text{C}$
	Junction temperature	$T_j$		125	$^\circ\text{C}$
Detector	OFF-state output terminal voltage	$V_{OFF}$		60	V
	ON-state current	$I_{ON}$		400	mA
	ON-state current derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta I_{ON}/\Delta T_a$		-4.0	mA/ $^\circ\text{C}$
	Output power dissipation	$P_O$		290	mW
	Output power dissipation derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta P_O/\Delta T_a$		-2.9	mW/ $^\circ\text{C}$
	Junction temperature	$T_j$		125	$^\circ\text{C}$
Common	Storage temperature	$T_{stg}$		-55 to 125	$^\circ\text{C}$
	Operating temperature	$T_{opr}$		-40 to 85	$^\circ\text{C}$
	Lead soldering temperature (10 s)	$T_{sol}$		260	$^\circ\text{C}$
	Isolation voltage (AC, 60 s, R.H. $\leq 60\%$ )	$BVs$	(Note 1)	1500	$V_{rms}$

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: This device is considered as a two-terminal device: Pins 1 and 2 are shorted together, and pins 3 and 4 are shorted together.

## 7. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$		—	—	48	V
Input forward current	$I_F$		5	7.5	25	mA
ON-state current	$I_{ON}$		—	—	400	mA
Operating temperature	$T_{opr}$		-20	—	65	$^\circ\text{C}$

Note: The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this data sheet should also be considered.

## 8. Electrical Characteristics

( $T_a = 25^\circ\text{C}$  unless otherwise specified)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	$V_F$		$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Input reverse current	$I_R$		$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	Input capacitance	$C_t$		$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	30	—	pF
Detector	OFF-state current	$I_{OFF}$		$V_{OFF} = 60 \text{ V}$	—	—	1	$\mu\text{A}$
	Output capacitance	$C_{OFF}$		$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	130	—	pF

## 9. Coupled Electrical Characteristics

( $T_a = 25^\circ\text{C}$  unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$		$I_{ON} = 400 \text{ mA}$	—	1.6	3	mA
Return LED current	$I_{FC}$		$I_{OFF} = 100 \mu\text{A}$	0.1	—	—	mA
ON-state resistance	$R_{ON}$		$I_{ON} = 400 \text{ mA}, I_F = 5 \text{ mA}$	—	1	2	$\Omega$

## 10. Isolation Characteristics

( $T_a = 25^\circ\text{C}$  unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Total capacitance (input to output)	$C_s$	(Note 1)	$V_s = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_s$	(Note 1)	$V_s = 500 \text{ V}, \text{R.H.} \leq 60 \%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BVs$	(Note 1)	AC, 60 s	1500	—	—	$\text{V}_{\text{rms}}$

Note 1: This device is considered as a two-terminal device: Pins 1 and 2 are shorted together, and pins 3 and 4 are shorted together.

## 11. Switching Characteristics

( $T_a = 25^\circ\text{C}$  unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$		See Figure 11.1 $R_L = 200 \Omega, V_{DD} = 20 \text{ V}, I_F = 2 \text{ mA}$	—	0.8	2	ms
Turn-on time	$t_{ON}$		See Figure 11.1 $R_L = 200 \Omega, V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	0.1	0.5	

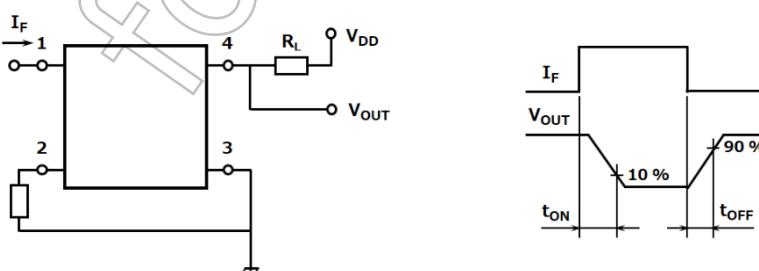
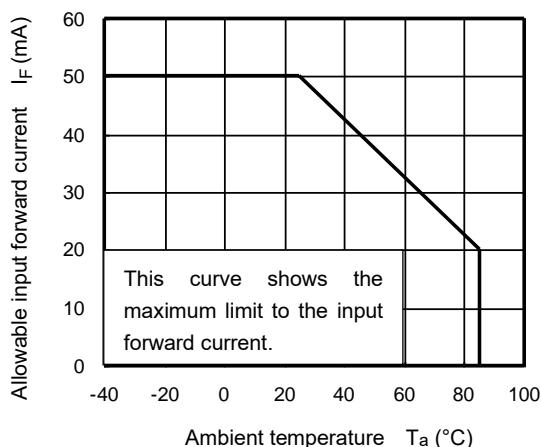
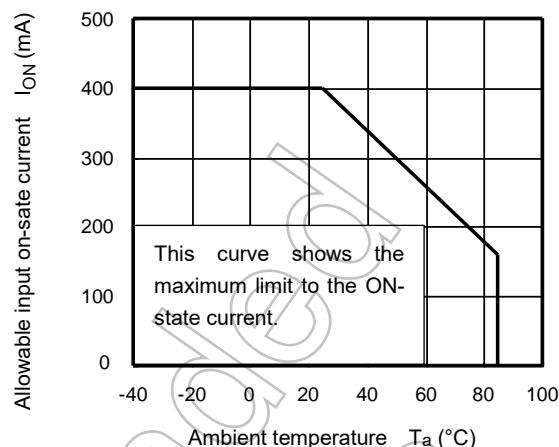
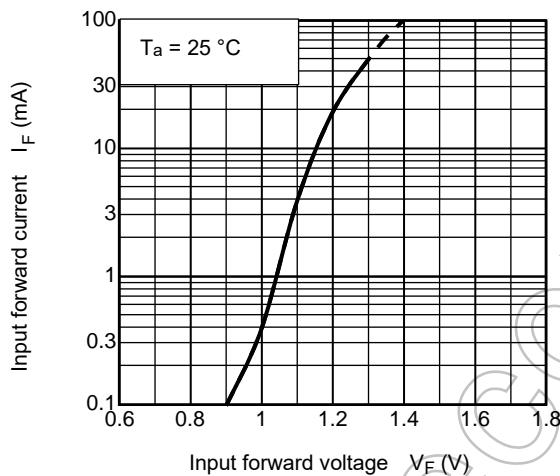
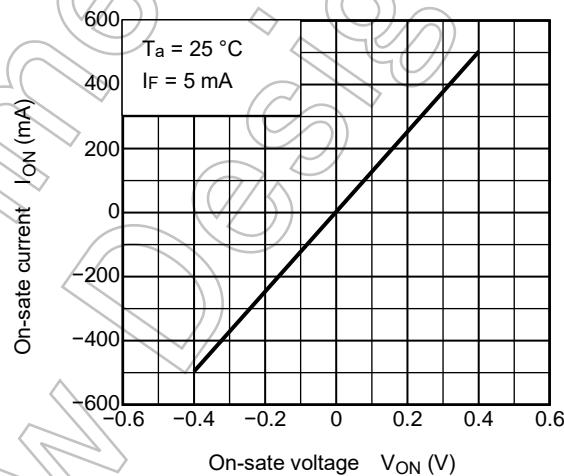
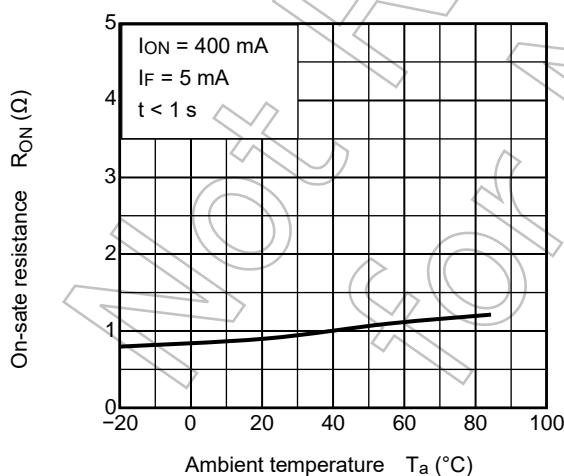
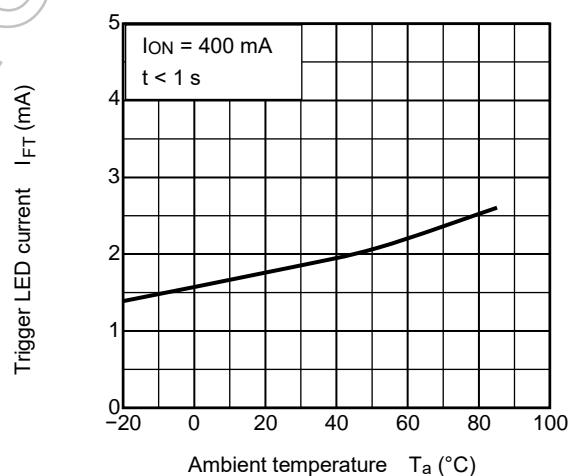
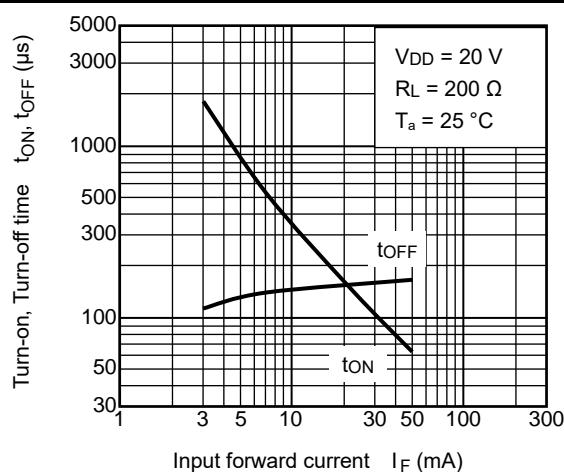
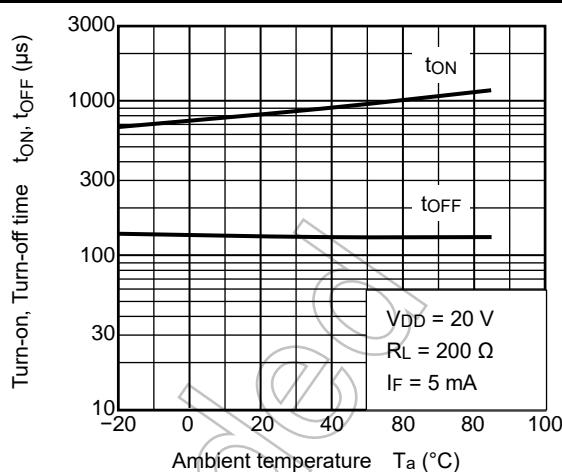
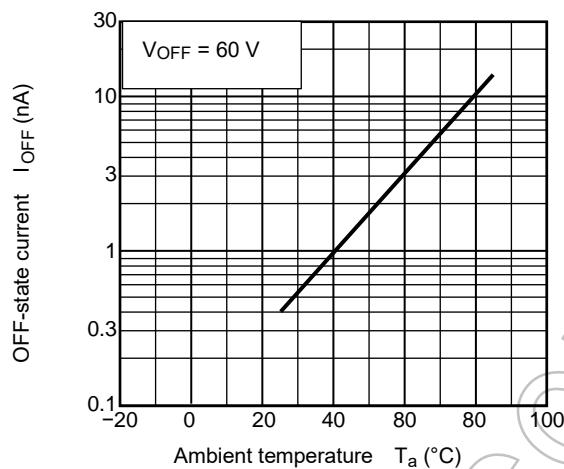


Figure 11.1 Switching Time Test Circuit and Waveform

## 12. Characteristics Curves and Circuit Connections (Note)

Fig.12.1  $I_F - T_a$ Fig.12.2  $I_{ON} - T_a$ Fig.12.3  $I_F - V_F$ Fig.12.4  $I_{ON} - V_{ON}$ Fig.12.5  $R_{ON} - T_a$ Fig.12.6  $I_{FT} - T_a$

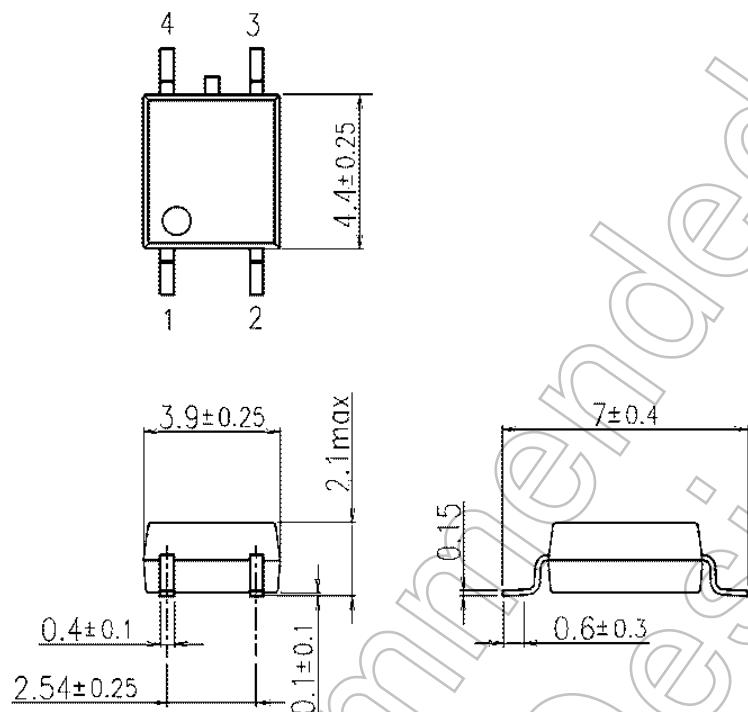
Fig.12.7  $t_{ON}, t_{OFF} - I_F$ Fig.12.8  $t_{ON}, t_{OFF} - T_a$ Fig.12.9  $I_{OFF} - T_a$ 

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

## 13. Package Dimensions

11-5H1S

Unit: mm



Weight: 0.1 g (typ.)

**Fig. 13.1 Package Dimensions**

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