

# TLP175A

## 1. Applications

- Mechanical relay replacements
- Security Systems
- Measuring Instruments
- Factory Automation (FA)
- Amusement Equipment
- Smart Meters
- Electricity Meters

## 2. General

The TLP175A photorelay consists of a photo MOSFET optically coupled to an infrared light emitting diode. It is housed in a 4-pin SO6 package. This photorelay requires 1mA of LED current to turn it on. It is suitable for applications that need electrical power savings.

## 3. Features

- (1) Normally opened (1-Form-A)
- (2) OFF-state output terminal voltage: 60 V (min)
- (3) Trigger LED current: 1 mA (max)
- (4) ON-state current: 100 mA (max)
- (5) ON-state resistance: 50 Ω (max)
- (6) Isolation voltage: 3750 Vrms (min)
- (7) Safety Standards

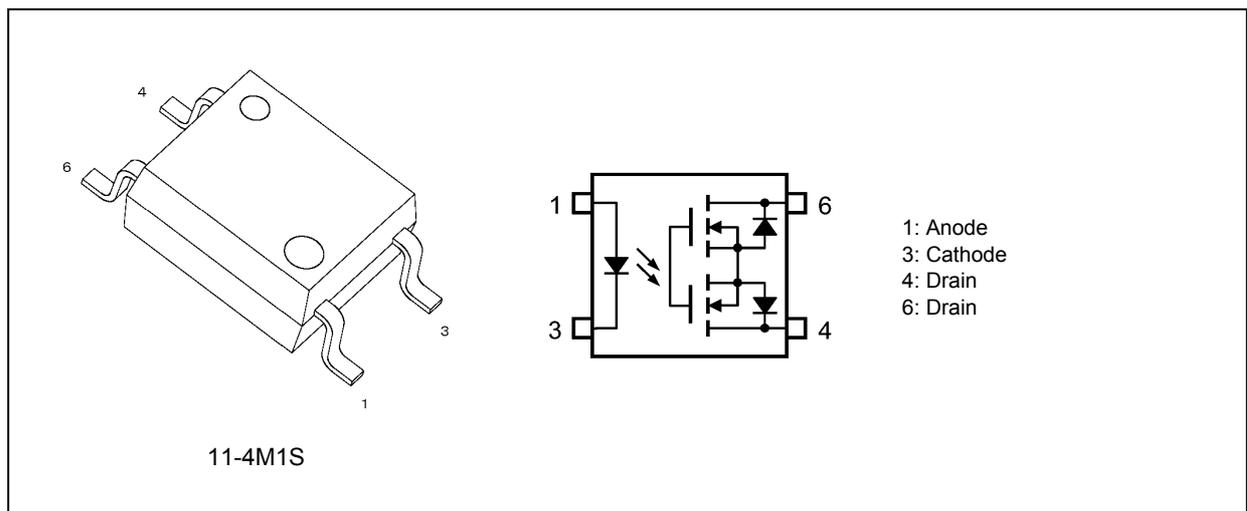
UL approved: UL1577, File No. E67349

cUL approved: CSA Component Acceptance Service No. 5A File No.E67349

VDE approved: EN60747-5-5(Note)

**Note: When a EN60747-5-5 approved type is needed, please designate "Option(V4)"**

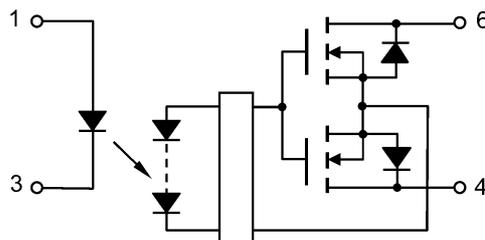
## 4. Packaging and Pin Assignment



Start of commercial production

2012-08

**5. Internal Circuit**



**Fig. 5.1 Internal Circuit**

**6. Mechanical Parameters**

Characteristics	TLP175A	Unit
Creepage distances	5.0 (min)	mm
Clearance distances	5.0 (min)	
Internal isolation thickness	0.4 (min)	

**7. Absolute Maximum Ratings (Note) (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ )**

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	$I_F$		30	mA
	Input forward current derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta I_F/\Delta T_a$		-0.3	mA/ $^\circ\text{C}$
	Input forward current (pulsed) (100 $\mu\text{s}$ pulse, 100 pps)	$I_{FP}$		1	A
	Input reverse voltage	$V_R$		5	V
	Input power dissipation	$P_D$		50	mW
	Junction temperature	$T_j$		125	$^\circ\text{C}$
Detector	OFF-state output terminal voltage	$V_{OFF}$		60	V
	ON-state current	$I_{ON}$		100	mA
	ON-state current derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta I_{ON}/\Delta T_a$		-1.0	mA/ $^\circ\text{C}$
	ON-state current (pulsed) ( $t = 100\text{ ms}$ , Duty = 1/10)	$I_{ONP}$		300	mA
	Output power dissipation	$P_O$		200	mW
	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	
	Lead soldering temperature (10 s)	$T_{sol}$		260	
	Isolation voltage AC, 60 s, R.H. $\leq 60\%$	$BV_S$	(Note 1)	3750	

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 3 are shorted together, and pins 4 and 6 are shorted together.

Note: This device is sensitive to electrostatic discharge (ESD). Extreme ESD conditions should be guarded against by using proper antistatic precautions for the worktable, operator, solder iron, soldering equipment and so on.

**8. Recommended Operating Conditions (Note)**

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$		—	—	48	V
Input forward current	$I_F$		2	5	15	mA
ON-state current	$I_{ON}$		—	—	80	
Operating temperature	$T_{opr}$		-20	—	65	°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 datasheet should also be considered.

**9. Electrical Characteristics (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ )**

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	$V_F$		$I_F = 10\text{ mA}$	1.1	1.27	1.4	V
	Input reverse current	$I_R$		$V_R = 5\text{ V}$	—	—	10	$\mu\text{A}$
	Input capacitance	$C_t$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	50	—	pF
Detector	OFF-state current	$I_{OFF}$		$V_{OFF} = 60\text{ V}$	—	—	1	$\mu\text{A}$
	Output capacitance	$C_{OFF}$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	10	—	pF

**10. Coupled Electrical Characteristics (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ )**

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$		$I_{ON} = 100\text{ mA}$	—	0.2	1	mA
Return LED current	$I_{FC}$		$I_{OFF} = 100\text{ }\mu\text{A}$	0.01	—	—	mA
ON-state resistance	$R_{ON}$		$I_{ON} = 100\text{ mA}, I_F = 2\text{ mA}, t < 1\text{ s}$	—	25	50	$\Omega$

**11. Isolation Characteristics (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ )**

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)	$V_S = 500\text{ V}, \text{R.H.} \leq 60\%$	$1 \times 10^{12}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	(Note 1)	AC, 60 s	3750	—	—	Vrms
			AC, 1 s in oil	—	10000	—	
			DC, 60 s, in oil	—	10000	—	Vdc

Note 1: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4 and 6 are shorted together.

**12. Switching Characteristics (Unless otherwise specified,  $T_a = 25^\circ\text{C}$ )**

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$		See Fig. 12.1. $R_L = 200\text{ }\Omega, V_{DD} = 10\text{ V}, I_F = 2\text{ mA}$	—	1	5	ms
Turn-off time	$t_{OFF}$			—	1	5	

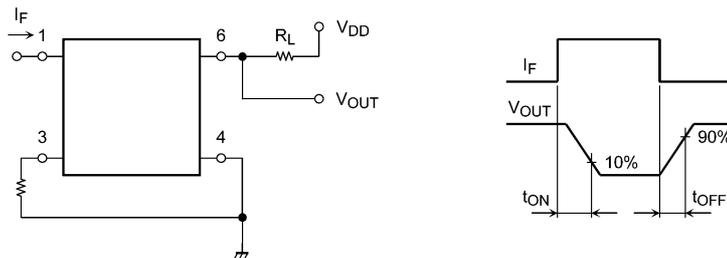
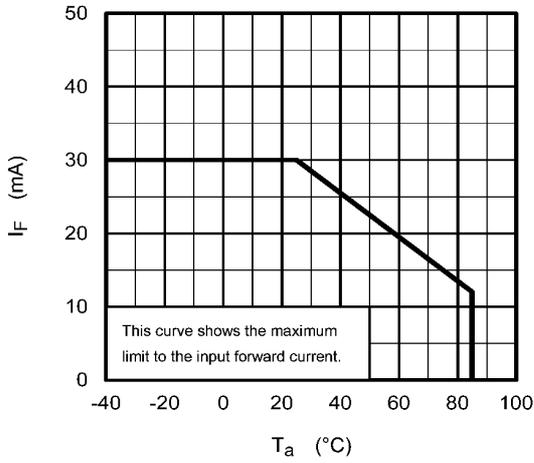


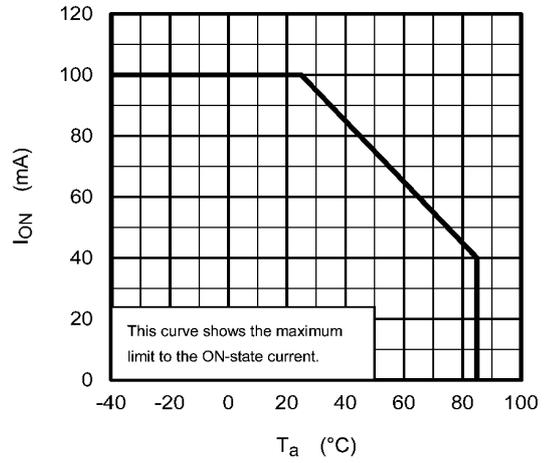
Fig. 12.1 Switching Time Test Circuit

**13. Characteristics Curves and Circuit Connections**

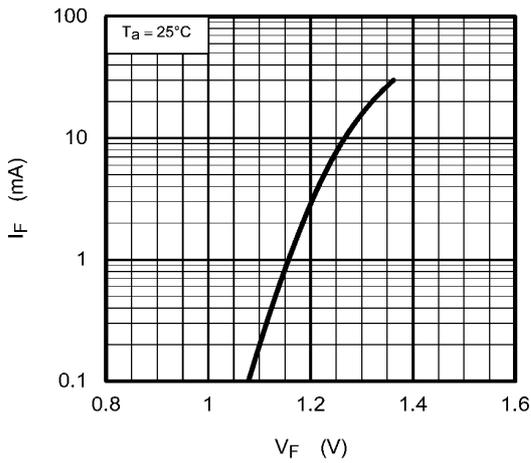
**13.1. Characteristics Curves (Note)**



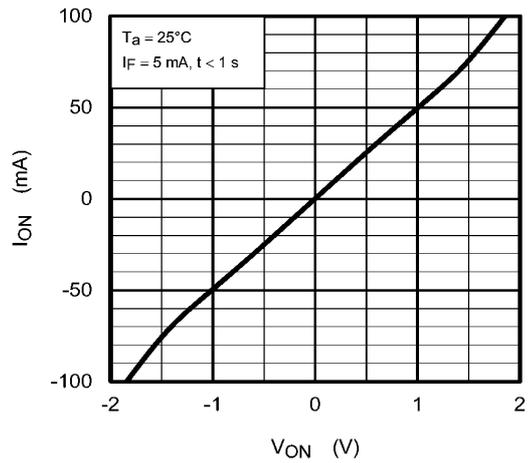
**Fig. 13.1.1 I<sub>F</sub> - T<sub>a</sub>**



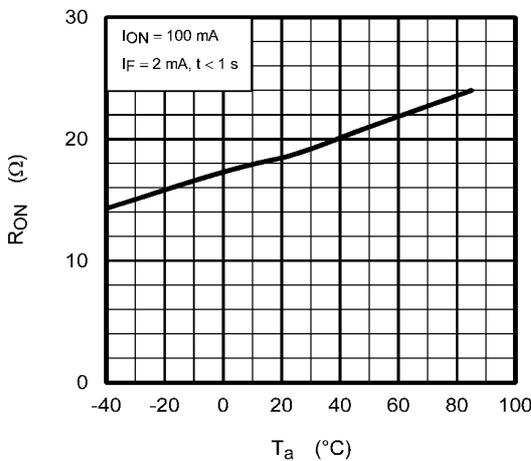
**Fig. 13.1.2 I<sub>ON</sub> - T<sub>a</sub>**



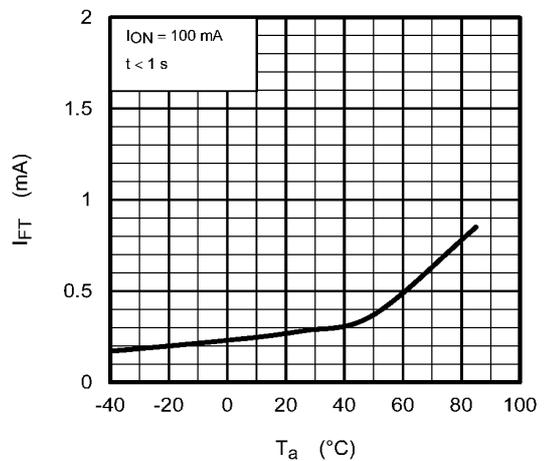
**Fig. 13.1.3 I<sub>F</sub> - V<sub>F</sub>**



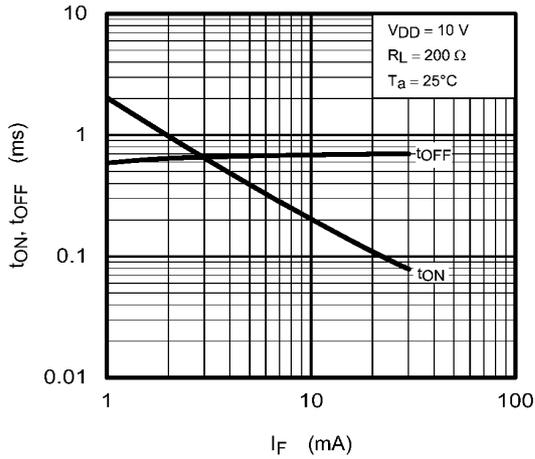
**Fig. 13.1.4 I<sub>ON</sub> - V<sub>ON</sub>**



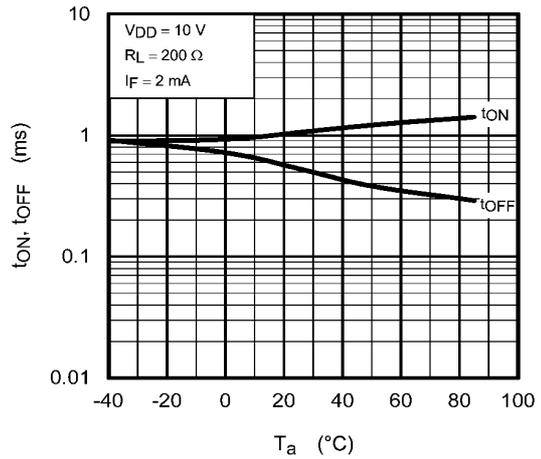
**Fig. 13.1.5 R<sub>ON</sub> - T<sub>a</sub>**



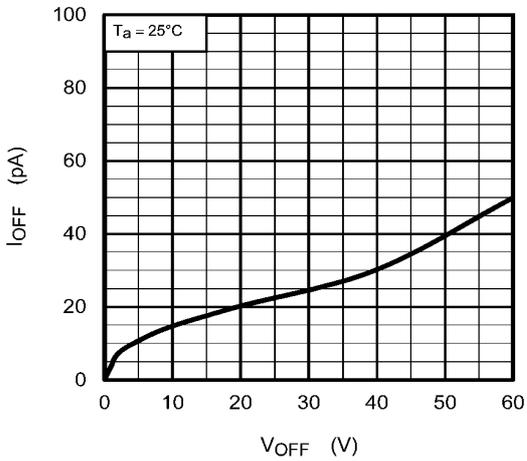
**Fig. 13.1.6 I<sub>FT</sub> - T<sub>a</sub>**



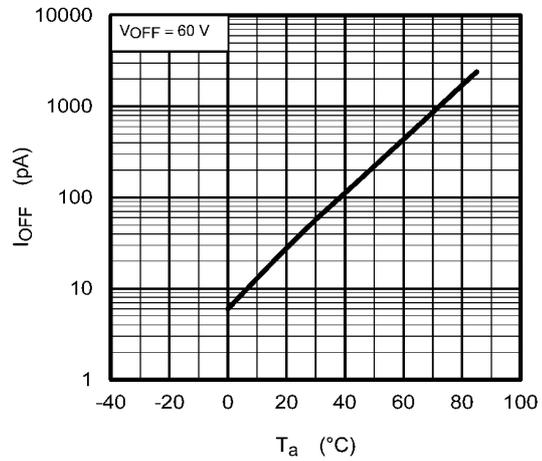
**Fig. 13.1.7  $t_{ON}$ ,  $t_{OFF}$  -  $I_F$**



**Fig. 13.1.8  $t_{ON}$ ,  $t_{OFF}$  -  $T_a$**



**Fig. 13.1.9  $I_{OFF}$  -  $V_{OFF}$**

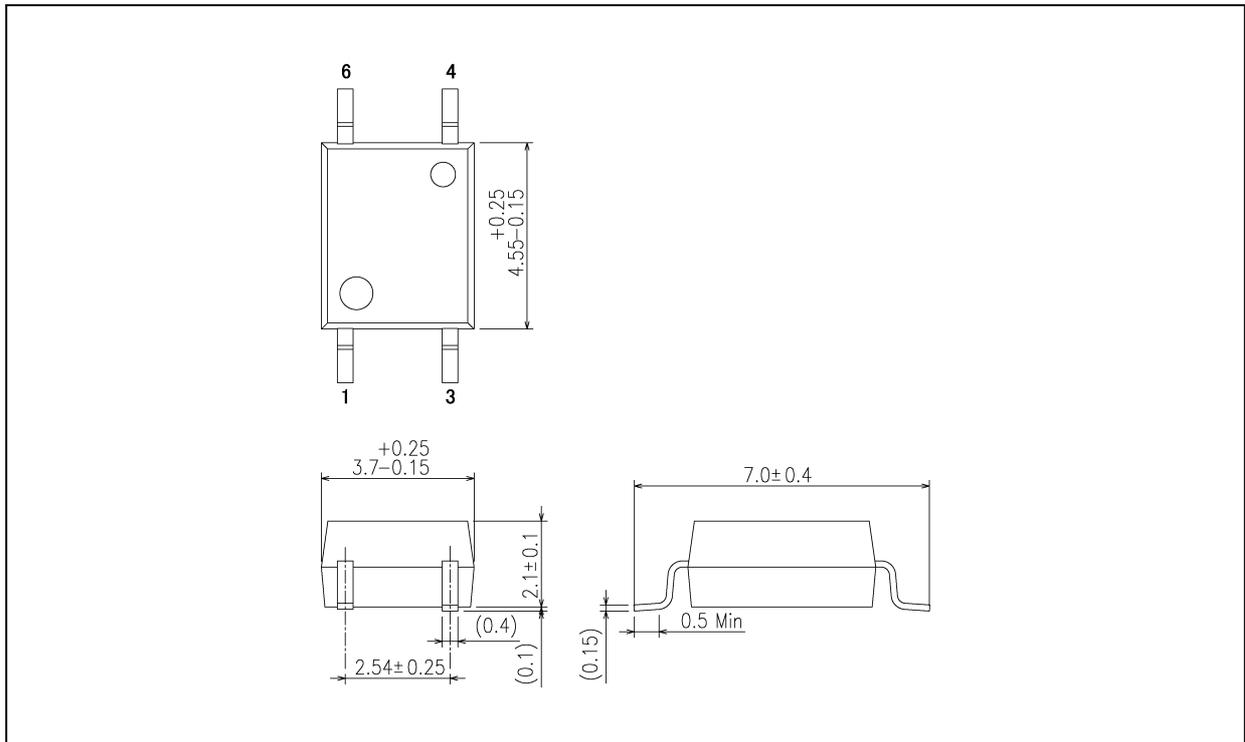


**Fig. 13.1.10  $I_{OFF}$  -  $T_a$**

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

**Package Dimensions**

Unit: mm



Weight: 0.08 g (typ.)

Package Name(s)
TOSHIBA: 11-4M1S

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