Photocouplers Photorelay

TLP171A

1. Applications

- Mechanical relay replacements
- Security Systems
- Home Electric Appliances
- Factory Automation (FA)
- Office Equipment

2. General

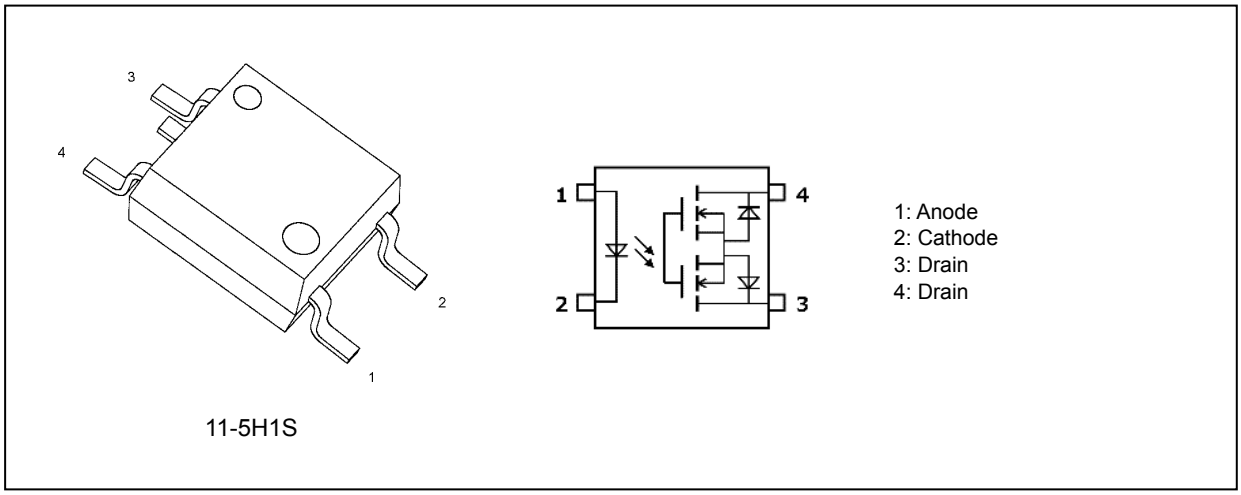
The TLP171A photorelay consists of a photo MOSFET optically coupled to an infrared LED. It is housed in a 4-pin package with 2.54-mm lead pitch and 2.1-mm height. This photorelay requires 0.2 mA of LED current to turn it on. It is suitable for applications that need electrical power savings.

3. Features

(1) Package: SOP(2.54SOP4) (Height 2.1 mm, pitch 2.54 mm)
(2) Normally opened (1-Form-A)
(3) OFF-state output terminal voltage: 60 V (min)
(4) Trigger LED current: 0.1 mA (max)(t≤1s)
0.2 mA (max)(t >1s)
(5) ON-state current: 400 mA (max)
(6) ON-state resistance: 2 Ω (max)
(7) Isolation voltage: 1500 Vrms (min)
(8) Safety Standards
UL-recognized: UL 1577, File No.E67349
cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349
VDE-approved: EN 60747-5-5 **(Note 1)**

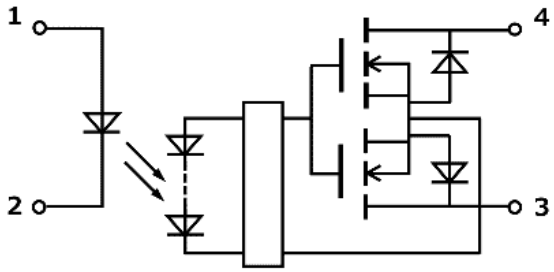
Note 1: When a VDE approved type is needed, please designate the **Option (V4)**.

4. Packaging and Pin Assignment



Start of commercial production
2012-10

5. Internal Circuit



6. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

	Characteristics		Symbol	Note	Rating	Unit
LED	Input forward current		I_F		30	mA
	Input forward current derating	($T_a \geq 25$ °C)	$\Delta I_F/\Delta T_a$		-0.3	mA/°C
	Input forward current (pulsed)	(100 μs pulse, 100 pps)	I_{FP}		1	A
	Input reverse voltage		V_R		5	V
	Input power dissipation		P_D		50	mW
	Input power dissipation derating	($T_a \geq 25$ °C)	$\Delta P_D/\Delta T_a$		-0.5	mW/°C
	Junction temperature		T_j		125	°C
Detector	OFF-state output terminal voltage		V_{OFF}		60	V
	ON-state current		I_{ON}		400	mA
	ON-state current derating	($T_a \geq 25$ °C)	$\Delta I_{ON}/\Delta T_a$		-4.0	mA/°C
	ON-state current (pulsed)	(t = 100 ms)	I_{ONP}		1.2	A
	Output power dissipation		P_O		300	mW
	Output power dissipation derating	($T_a \geq 25$ °C)	$\Delta P_O/\Delta T_a$		-3.0	mW/°C
	Junction temperature		T_j		125	°C
Common	Storage temperature		T_{stg}		-55 to 125	
	Operating temperature		T_{opr}		-40 to 85	
	Lead soldering temperature	(10 s)	T_{sol}		260	°C
	Isolation voltage	AC, 60 s, R.H. ≤ 60 %	BV_S	(Note 1)	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: 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		—	0.5	25	mA
ON-state current	I_{ON}		—	—	320	mA
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 data sheet should also be considered.

8. Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	V_F		I_F = 10 mA	1.1	1.27	1.4	V
	Input reverse current	I_R		V_R = 5 V	—	—	10	μA
	Input capacitance	C_t		V = 0 V, f = 1 MHz	—	30	—	pF
Detector	OFF-state current	I_{OFF}		V_{OFF} = 60 V	—	1	1000	nA
	Output capacitance	C_{OFF}		V = 0 V, f = 1 MHz	—	130	—	pF

9. Coupled Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I_{FT}		I_{ON} = 400 mA, t≤1s	—	0.02	0.1	mA
			I_{ON} = 400 mA, t>1s	—	—	0.2	mA
Return LED current	I_{FC}		I_{OFF} = 100 μA	—	0.001	—	mA
ON-state resistance	R_{ON}		I_{ON} = 400 mA, I_F = 0.5 mA, t < 1 s	—	1	2	Ω

10. Isolation Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Total capacitance (input to output)	C_S	(Note 1)	V_S = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	(Note 1)	V_S = 500 V, R.H. ≤ 60 %	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	(Note 1)	AC, 60 s	1500	—	—	Vrms

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 (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}		See Fig. 11.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 0.5 mA	—	3.5	10	ms
			See Fig. 11.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 1.0 mA	—	1.5	5	
Turn-off time	t_{OFF}		See Fig. 11.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 0.5 mA	—	1	5	
			See Fig. 11.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 1.0 mA	—	1.5	5	

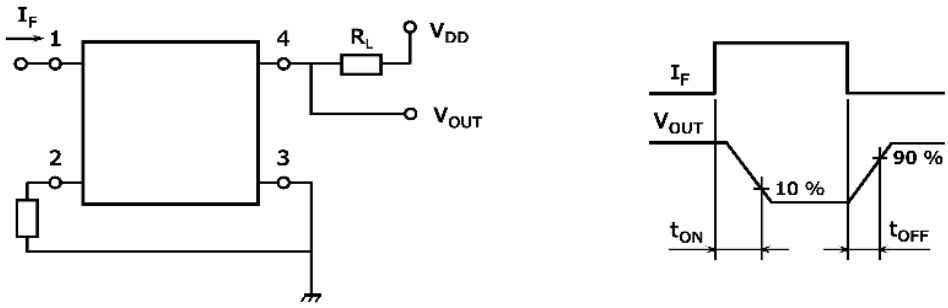


Fig. 11.1 Switching Time Test Circuit and Waveform

12. Characteristics Curves

12.1. Characteristics Curves (Note)

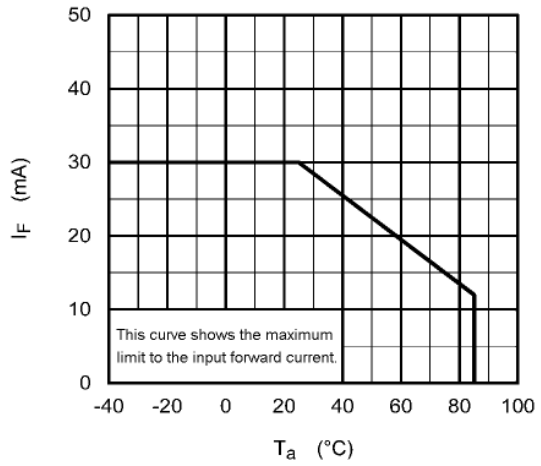


Fig. 12.1.1 I_F - T_a

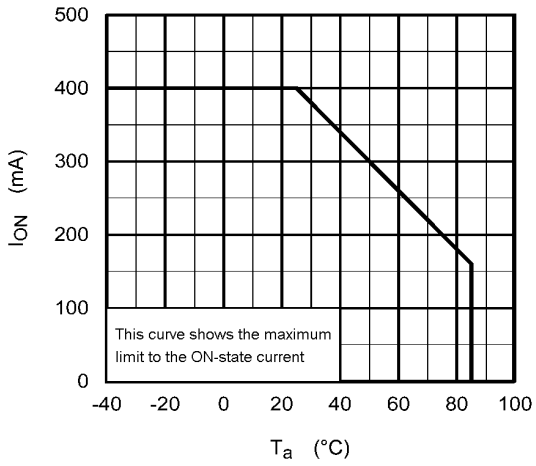


Fig. 12.1.2 I_{ON} - T_a

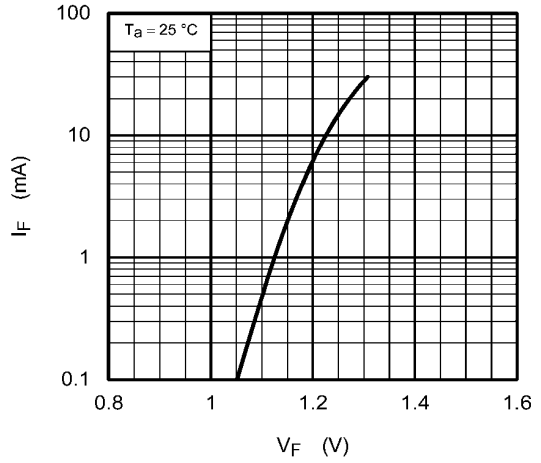


Fig. 12.1.3 I_F - V_F

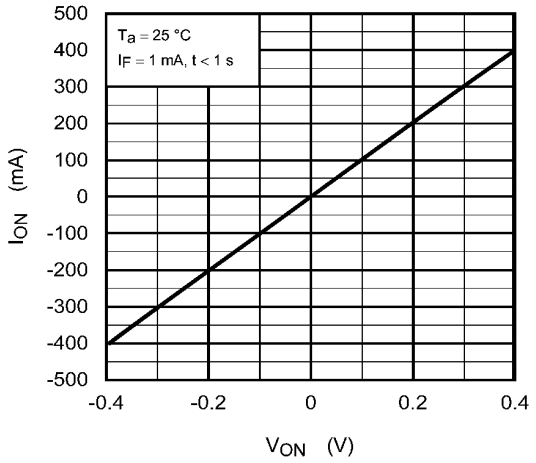


Fig. 12.1.4 I_{ON} - V_{ON}

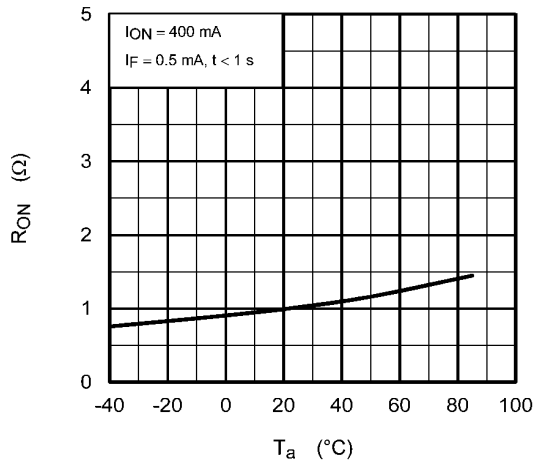


Fig. 12.1.5 R_{ON} - T_a

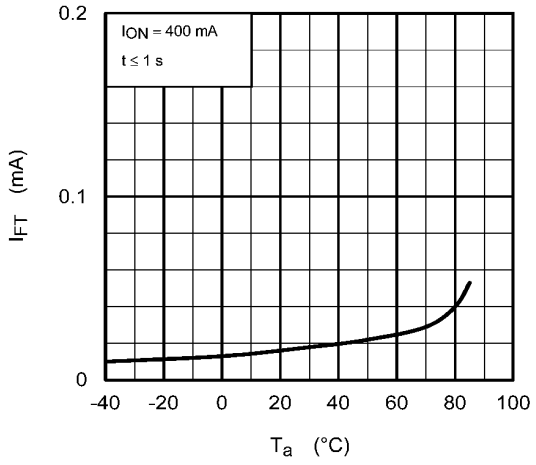


Fig. 12.1.6 I_{FT} - T_a

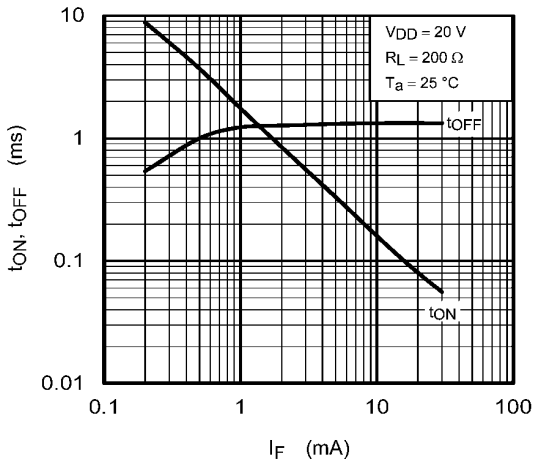


Fig. 12.1.7 t_{ON}, t_{OFF} - I_F

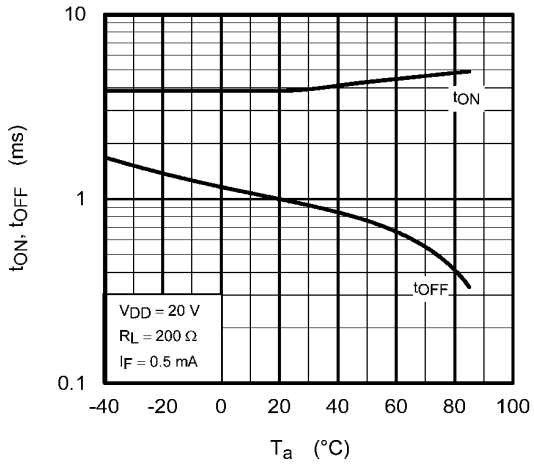


Fig. 12.1.8 t_{ON}, t_{OFF} - T_a

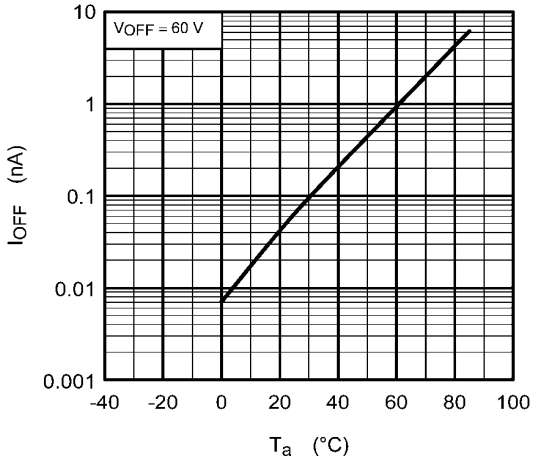


Fig. 12.1.9 I_{OFF} - T_a

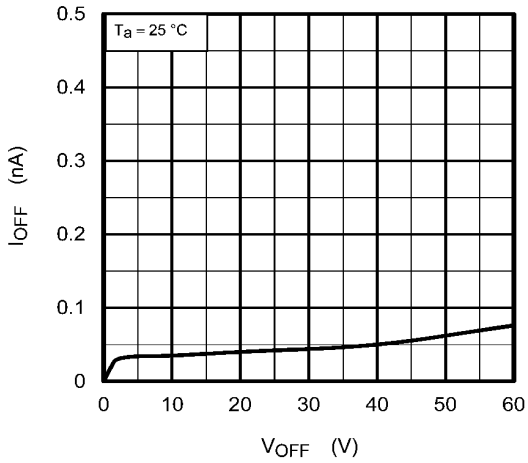
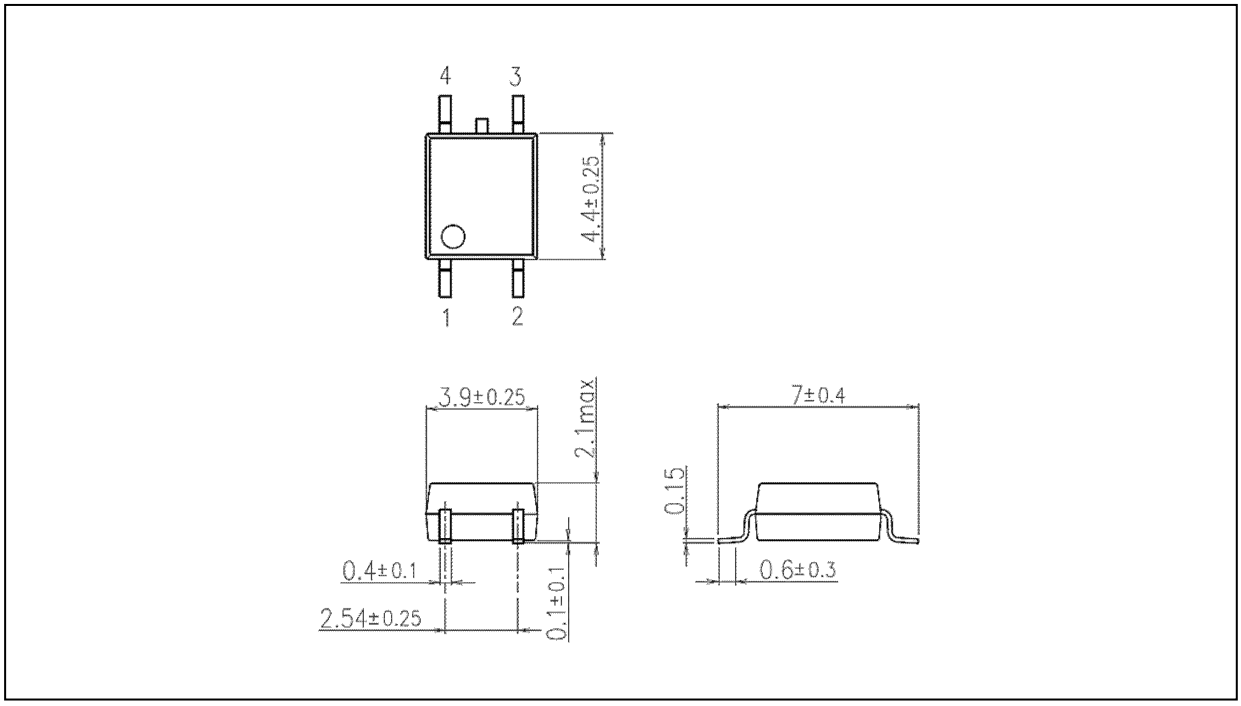


Fig. 12.1.10 I_{OFF} - V_{OFF}

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

Package Dimensions

Unit: mm



Weight: 0.1 g (typ.)

Package Name(s)
TOSHIBA: 11-5H1S

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