

Photocouplers Photorelay

TLP171GA

1. Applications

- Mechanical relay replacements
- Security Systems
- Private Branch Exchanges (PBXs)
- Set-Top Boxes (STBs)
- Measuring Instruments

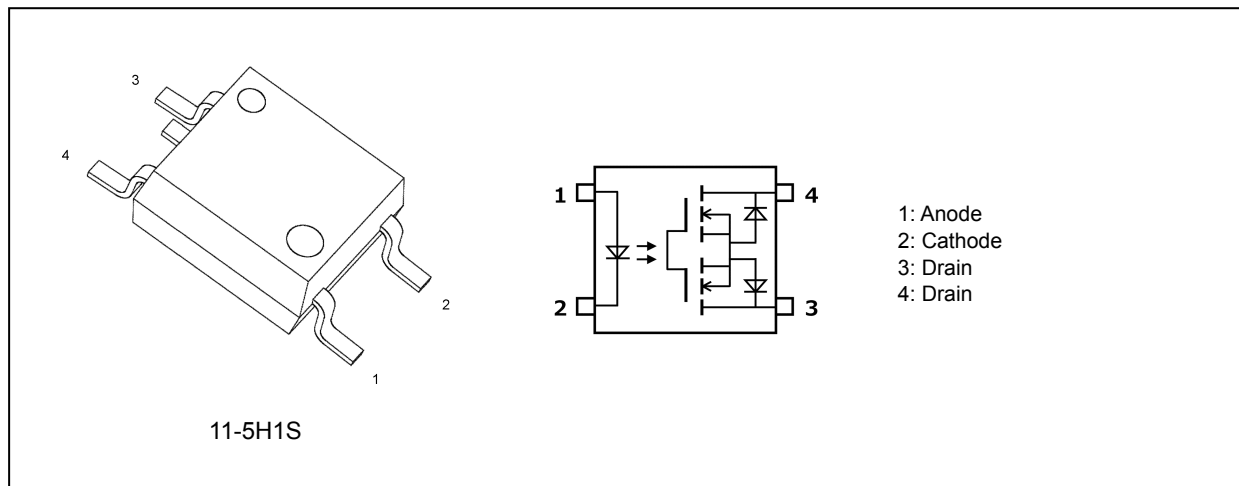
2. General

The TLP171GA 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

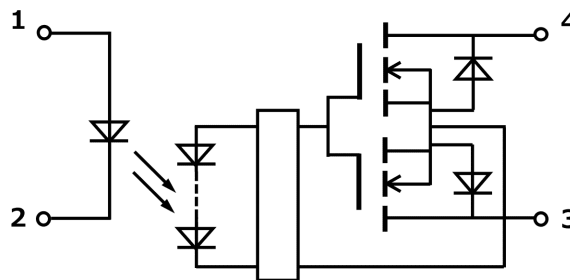
- (1) Package: SOP(2.54SOP4) (Height 2.1 mm, pitch 2.54 mm)
- (2) Normally opened (1-Form-A)
- (3) OFF-state output terminal voltage: 400 V (min)
- (4) Trigger LED current: 0.1 mA (max)($t \leq 1s$)
0.2 mA (max)($t > 1s$)
- (5) ON-state current: 100 mA (max)
- (6) ON-state resistance: 35 Ω (max)
- (7) Isolation voltage: 1500 Vrms (min)

4. Packaging and Pin Assignment



Start of commercial production
2012-10

5. Internal Circuit



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

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	I_F		30	mA
	Input forward current derating ($T_a \geq 25\text{ }^\circ\text{C}$)	$\Delta I_F/\Delta T_a$		-0.3	mA/ $^\circ\text{C}$
	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 ($T_a \geq 25\text{ }^\circ\text{C}$)	$\Delta P_D/\Delta T_a$		-0.5	mW/ $^\circ\text{C}$
	Junction temperature	T_j		125	$^\circ\text{C}$
Detector	OFF-state output terminal voltage	V_{OFF}		400	V
	ON-state current	I_{ON}		100	mA
	ON-state current derating ($T_a \geq 25\text{ }^\circ\text{C}$)	$\Delta I_{ON}/\Delta T_a$		-1.0	mA/ $^\circ\text{C}$
	ON-state current (pulsed) ($t = 100\text{ ms}$)	I_{ONP}		300	mA
	Output power dissipation	P_O		300	mW
	Output power dissipation derating ($T_a \geq 25\text{ }^\circ\text{C}$)	$\Delta P_O/\Delta T_a$		-3.0	mW/ $^\circ\text{C}$
	Junction temperature	T_j		125	$^\circ\text{C}$
Common	Storage temperature	T_{stg}		-55 to 125	
	Operating temperature	T_{opr}		-40 to 85	
	Lead soldering temperature (10 s)	T_{sol}		260	$^\circ\text{C}$
	Isolation voltage AC, 60 s, R.H. $\leq 60\%$, $T_a = 25\text{ }^\circ\text{C}$	BV_S	(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}		—	—	320	V
Input forward current	I_F		—	0.5	25	mA
ON-state current	I_{ON}		—	—	80	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 (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

	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	μA
	Input capacitance	C_t		$V = 0\text{ V}, f = 1\text{ MHz}$	—	30	—	pF
Detector	OFF-state current	I_{OFF}		$V_{OFF} = 400\text{ V}$	—	1	1000	nA
	Output capacitance	C_{OFF}		$V = 0\text{ V}, f = 1\text{ MHz}$	—	70	—	pF

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

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current		I_{FT}		$I_{ON} = 100\text{ mA}, t \leq 1\text{ s}$	—	0.02	0.1	mA
				$I_{ON} = 100\text{ mA}, t > 1\text{ s}$	—	—	0.2	mA
Return LED current		I_{FC}		$I_{OFF} = 100\text{ }\mu\text{A}$	—	0.001	—	mA
ON-state resistance		R_{ON}		$I_{ON} = 100\text{ mA}, I_F = 0.5\text{ mA}, t < 1\text{ s}$	—	18	35	Ω

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

	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)	$V_S = 500\text{ V}, \text{R.H.} \leq 60\text{ }\%$	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, $T_a = 25\text{ }^\circ\text{C}$)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time		t_{ON}		See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 0.5\text{ mA}$	—	2	10	ms
				See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 1.0\text{ mA}$	—	1	5	
Turn-off time		t_{OFF}		See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 0.5\text{ mA}$	—	1	5	
				See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 1.0\text{ mA}$	—	1	5	

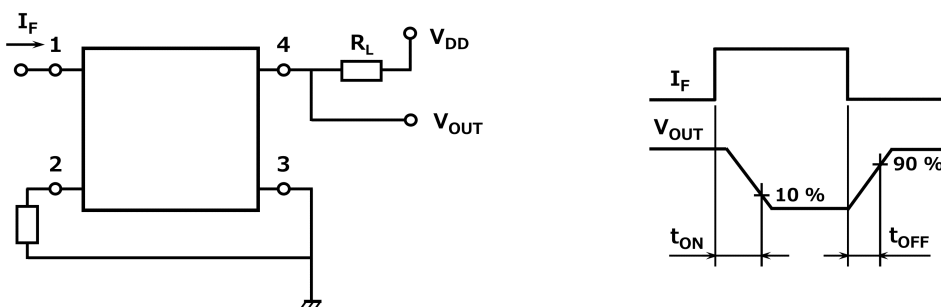


Fig. 11.1 Switching Time Test Circuit and Waveform

12. Characteristics Curves

12.1. Characteristics Curves (Note)

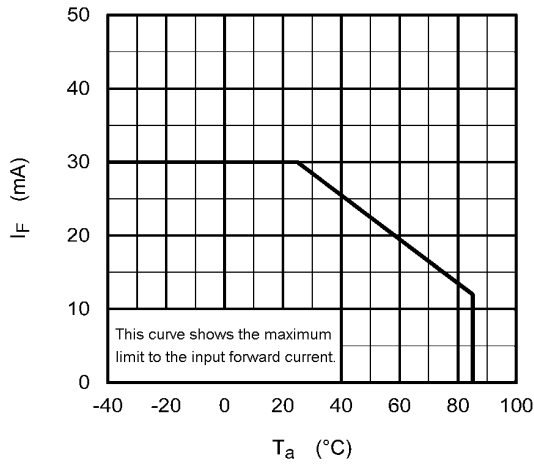


Fig. 12.1.1 I_F - T_a

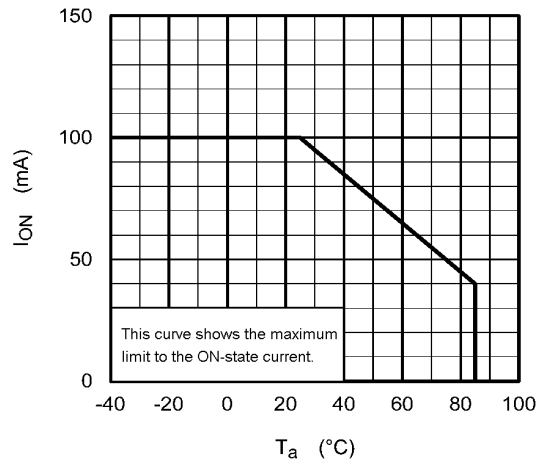


Fig. 12.1.2 I_{ON} - T_a

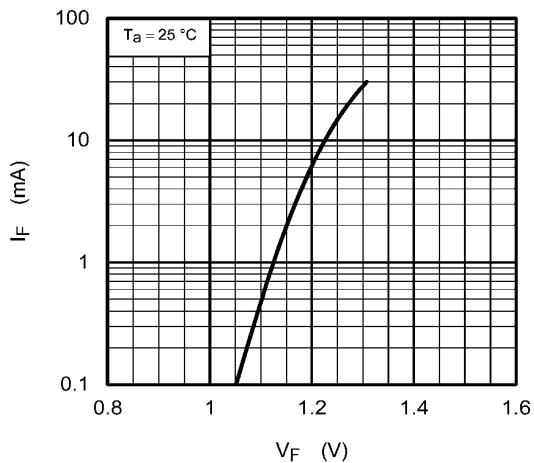


Fig. 12.1.3 I_F - V_F

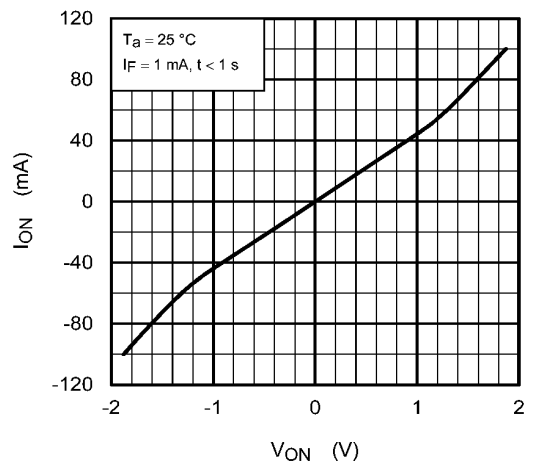


Fig. 12.1.4 I_{ON} - V_{ON}

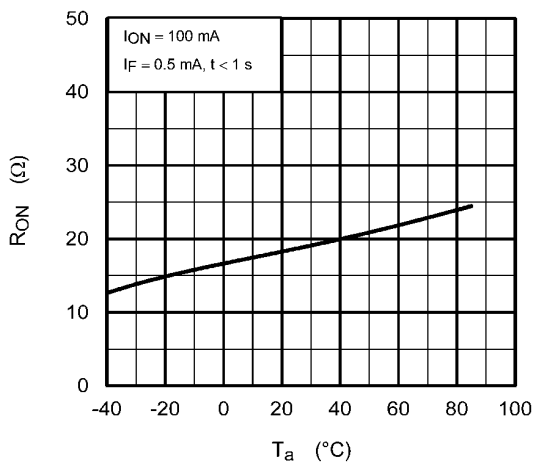


Fig. 12.1.5 R_{ON} - T_a

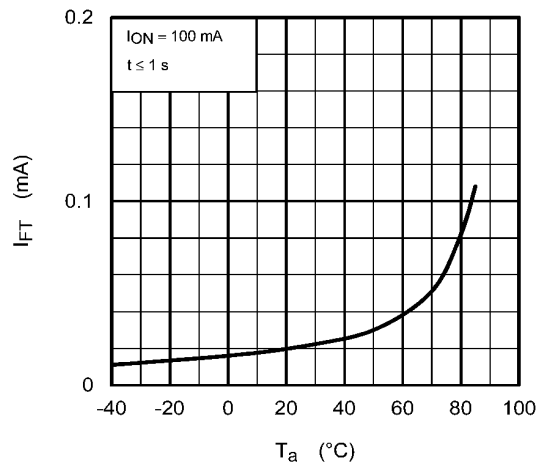


Fig. 12.1.6 I_{FT} - T_a

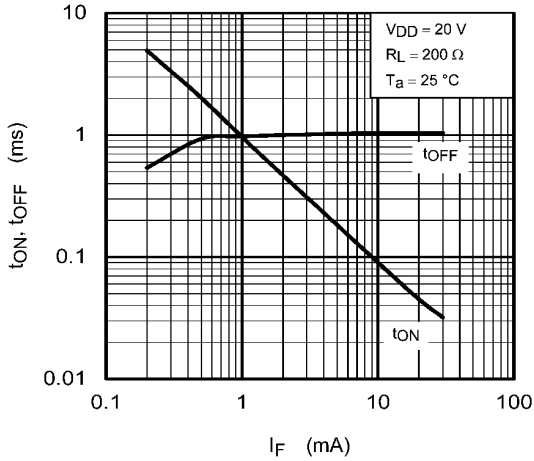


Fig. 12.1.7 $t_{ON}, t_{OFF} - I_F$

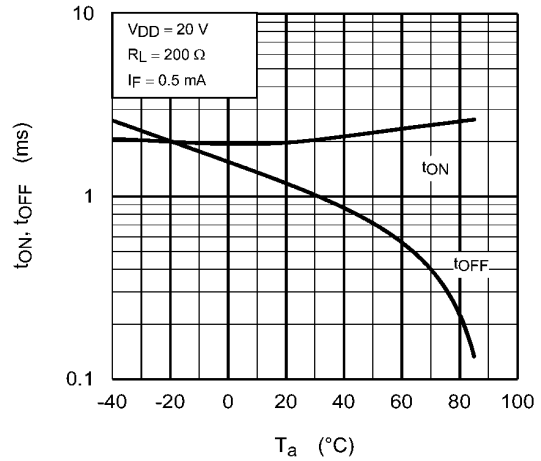


Fig. 12.1.8 $t_{ON}, t_{OFF} - T_a$

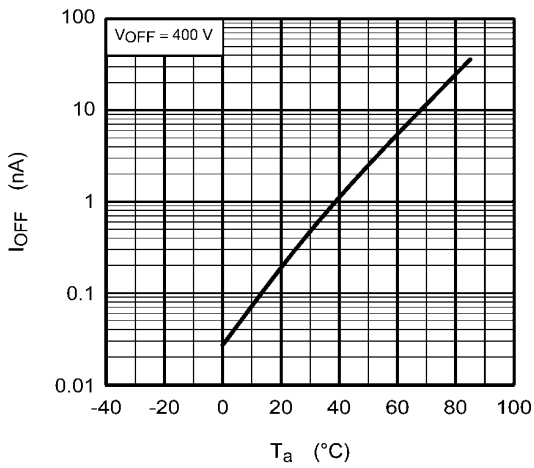


Fig. 12.1.9 $I_{OFF} - T_a$

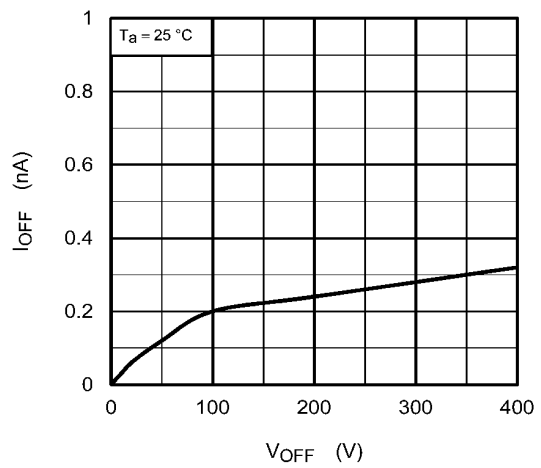
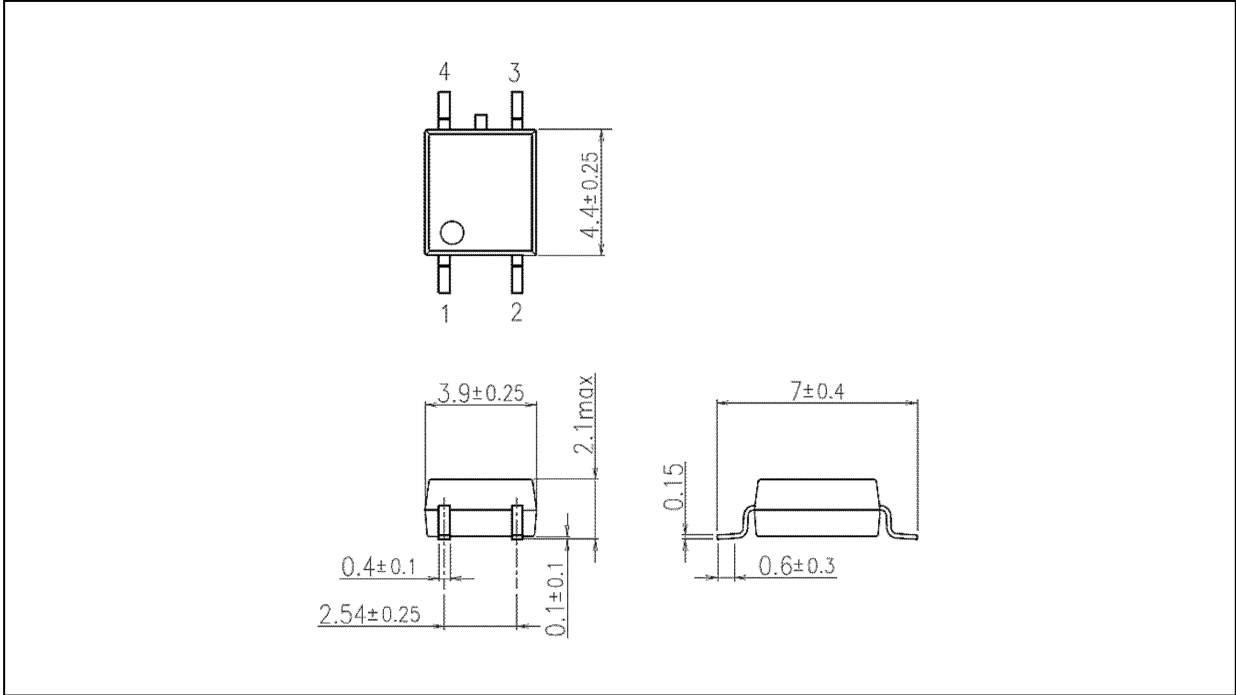


Fig. 12.1.10 $I_{OFF} - V_{OFF}$

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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