

Photocouplers Photorelay

TLP3375

1. Applications

- · High-Speed Memory Testers
- · High-Speed Logic IC Testers
- · Radio-Frequency Measuring Instruments
- ATE (Automatic Test Equipment)

2. General

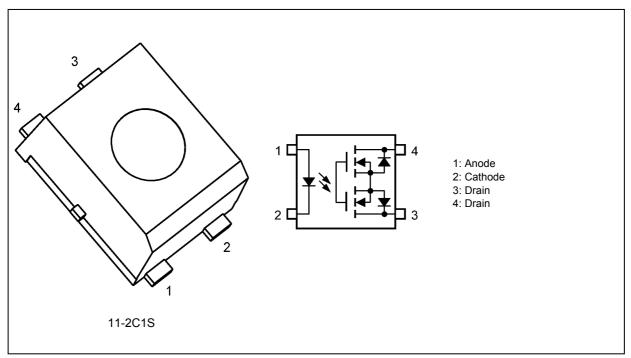
The TLP3375 photorelay consists of a photo MOSFET optically coupled to an infrared light emitting diode. It is housed in a 4-pin USOP package. The TLP3375 is designed to exhibit a fast rise time and reduce signal degradation. It is primarily suitable as a replacement for a mechanical relay to be used as a switching device in high-speed testers.

3. Features

- (1) Normally opened (1-Form-A)
- (2) OFF-state output terminal voltage: 50 V (min)
- (3) Trigger LED current: 3 mA (max)
- (4) ON-state current: 300 mA (max)
- (5) ON-state resistance: 1.0Ω (typ.), 1.5Ω (max)
- (6) OFF-state Capacitance: 12 pF (typ.)
- (7) Isolation voltage: 1000 Vrms (min)
- (8) ERT(Equivalent Rise Time): 40 ps (typ.), 90 ps (max)
- (9) Safety standard

UL-approved: UL1577, File No.E67349

4. Packaging and Pin Configuration



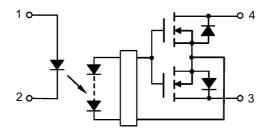
Start of commercial production

2010-10

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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		50	mA
	Input forward current derating	$(T_a \ge 25 ^{\circ}C)$	$\Delta I_F/\Delta T_a$		-0.5	mA/°C
	Input reverse voltage		V_{R}		5	V
	Input power dissipation		P_{D}		50	mW
	Input power dissipation derating	$(T_a \ge 25 ^{\circ}C)$	$\Delta P_D/\Delta T_a$		-0.5	mW/°C
	Junction temperature		Tj		125	°C
Detector	OFF-state output terminal voltage		V_{OFF}		50	V
	ON-state current		I _{ON}		300	mA
	ON-state current derating	$(T_a \ge 25 ^{\circ}C)$	$\Delta I_{ON}/\Delta T_a$		-3.0	mA/°C
	ON-state current (pulsed)	(t = 100 ms, duty = 1/10)	I _{ONP}		900	mA
	Output power dissipation		Po		200	mW
	Output power dissipation derating	$(T_a \ge 25 ^{\circ}C)$	$\Delta P_{O}/\Delta T_{a}$		-2.0	mW/°C
	Junction temperature		Tj		125	°C
Common	Storage temperature		T_{stg}		-40 to 125	
	Operating temperature		T_{opr}		-40 to 85	
	Lead soldering temperature	(10 s)	T_{sol}		260	
	Isolation voltage	(AC, 60 s, R.H. ≤ 60 %)	BV_S	(Note 1)	1000	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.

Caution: 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.

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7. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Тур.	Max	Unit
Supply voltage	V_{DD}		_	_	40	V
Input forward current	I _F		5	7.5	20	mA
ON-state current	I _{ON}				300	
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	Тур.	Max	Unit
LED	Input forward voltage	V _F		I _F = 10 mA	1.0	1.15	1.3	V
	Input reverse current	I _R		V _R = 5 V			10	μΑ
	Input capacitance	Ct		V = 0 V, f = 1 MHz	_	15		pF
Detector	OFF-state current	I _{OFF}		V _{OFF} = 50 V	_	_	1	nA
	Output capacitance	C _{OFF}		V = 0 V, f = 100 MHz, t < 1s	_	12		pF

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

Characteristics	Symbol	Note	Test Condition	Min	Тур.	Max	Unit
Trigger LED current	I _{FT}		I _{ON} = 100 mA		0.5	3	mA
Return LED current	I _{FC}		I _{OFF} = 10 μA	0.2		_	mA
ON-state resistance	R _{ON}		I _{ON} = 300 mA, I _F = 5 mA, t < 1 s	_	1.0	1.5	Ω

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

Characteristics	Symbol	Note	Test Condition	Min	Тур.	Max	Unit
Total capacitance (input to output)	C _S	(Note 1)	V _S = 0 V, f = 1 MHz		0.4		pF
Isolation resistance	R _S	(Note 1)	V_S = 500 V, R.H. \leq 60 %	5 × 10 ¹⁰	1014		Ω
Isolation voltage	BV _S	(Note 1)	AC, 60 s	1000			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	Тур.	Max	Unit
Turn-on time	t _{ON}		See Fig. 11.1	_	200	500	μS
Turn-off time	t _{OFF}		$R_L = 200 \Omega$, $V_{DD} = 20 V$, $I_F = 5 mA$	_	100	400	
Turn-on time	t _{ON}		See Fig. 11.1	_	_	250	
Turn-off time	t _{OFF}		$R_L = 200 \Omega$, $V_{DD} = 20 V$, $I_F = 10 mA$	_	_	400	
Equivalent rise time	ERT		See Fig. 11.2 I _F = 5 mA, V _{DD} = 0.25 V, t _{r(in)} = 25 ps	_	40	90	ps

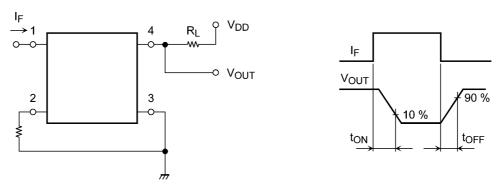


Fig. 11.1 Switching Time Test Circuit and Waveform

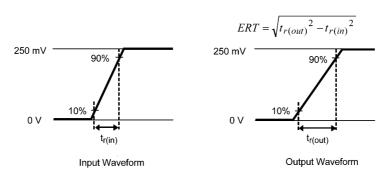
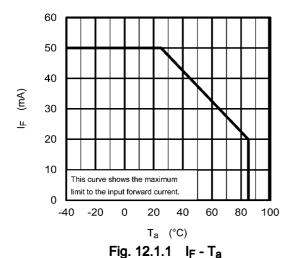


Fig. 11.2 ERT (Equivalent Rise Time)



12. Characteristics Curves and Circuit Connections

12.1. Characteristics Curves (Note)



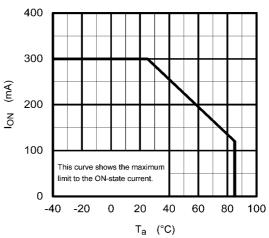


Fig. 12.1.2 I_{ON} - T_a

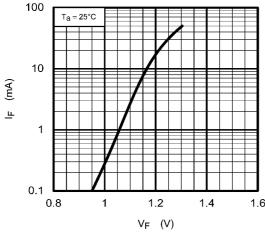


Fig. 12.1.3 I_F - V_F

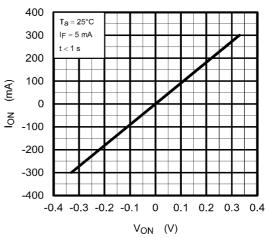
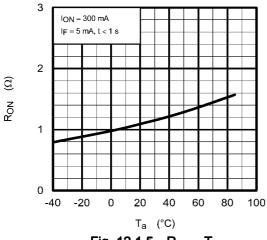


Fig. 12.1.4 I_{ON} - V_{ON}





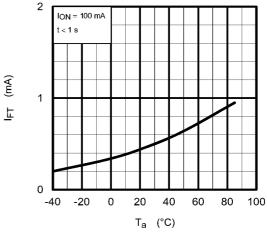


Fig. 12.1.6 I_{FT} - T_a



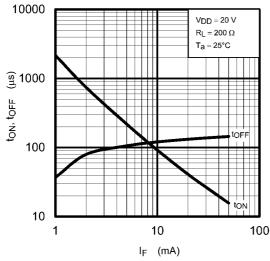


Fig. 12.1.7 t_{ON}, t_{OFF} - I_F

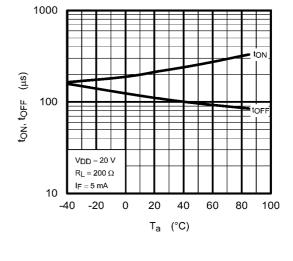


Fig. 12.1.8 t_{ON}, t_{OFF} - T_a

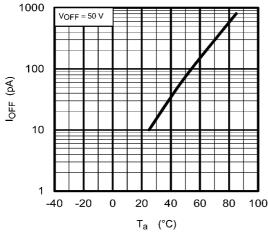


Fig. 12.1.9 I_{OFF} - T_a

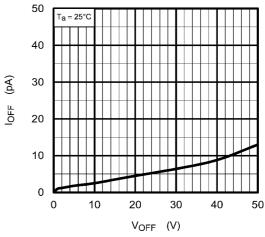


Fig. 12.1.10 I_{OFF} - V_{OFF}

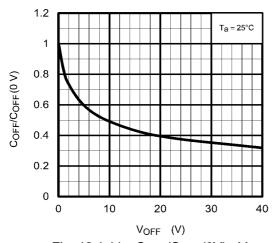


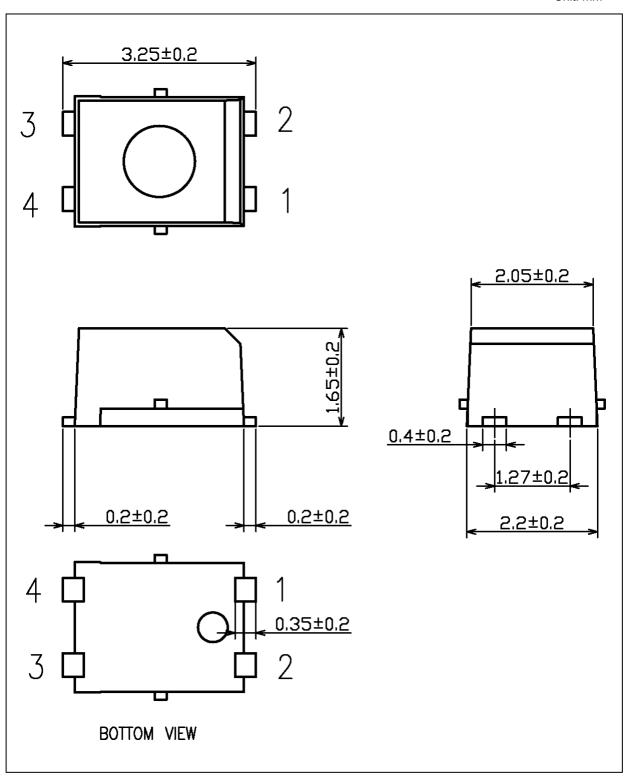
Fig. 12.1.11 Coff/Coff(0V) - Voff

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



Package Dimensions

Unit: mm



Weight: 0.03 g (typ.)

	Package Name(s)
TOSHIBA: 11-2C1S	



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