

# TLP3320

## 1. Applications

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

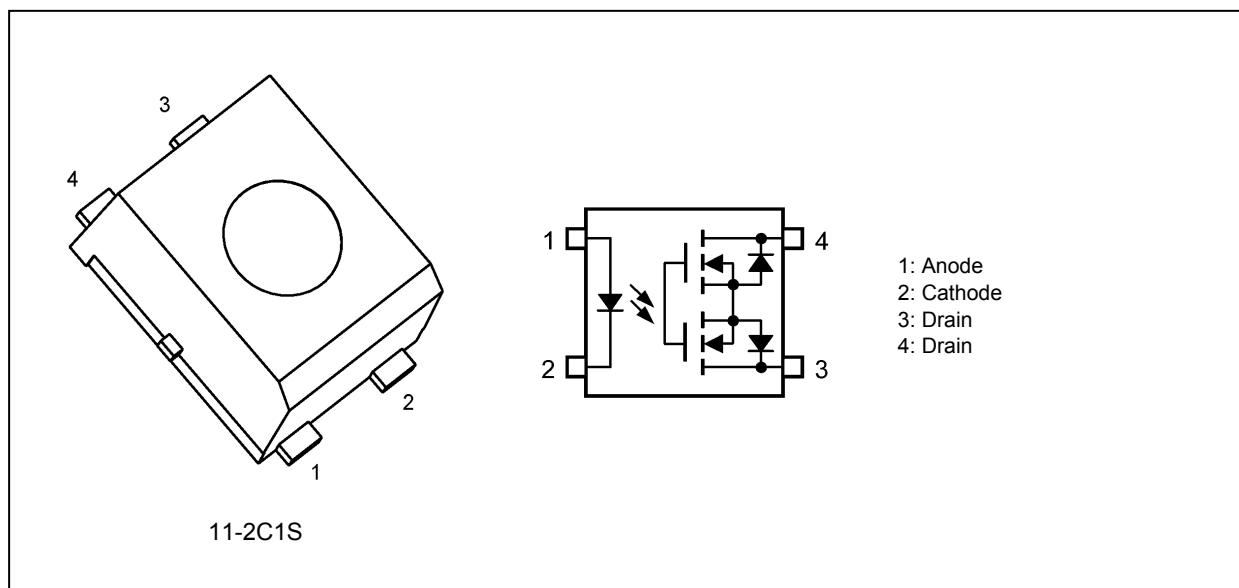
## 2. General

The TLP3320 is a photorelay in a 4-pin USOP that consists of a photo MOSFET optically coupled with an infrared light emitting diode.

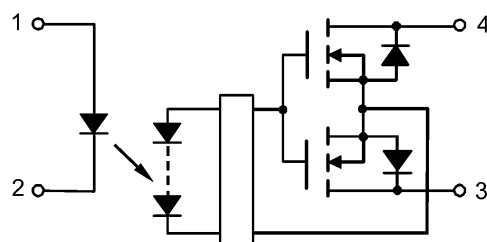
## 3. Features

- (1) Normally open (1-Form-A)
- (2) OFF-state output terminal voltage: 100 V (min)
- (3) Trigger LED current: 3 mA (max)
- (4) ON-state current: 100 mA (max)
- (5) ON-state resistance: 8 Ω (typ.), 14 Ω (max)
- (6) OFF-state Capacitance: 6 pF (typ.), 8 pF (max)
- (7) Isolation voltage: 500 Vrms (min)
- (8) Safety standards  
UL recognized : UL1577 File No.E67349

## 4. Packaging and Pin Assignment



## 5. Internal Circuit



**6. Absolute Maximum Ratings (Note) (Unless otherwise specified, T<sub>a</sub> = 25 °C)**

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	I <sub>F</sub>		50	mA
	Input forward current derating (T <sub>a</sub> ≥ 25 °C)	ΔI <sub>F</sub> /ΔT <sub>a</sub>		-0.5	mA/°C
	Input reverse voltage	V <sub>R</sub>		5	V
	Input power dissipation	P <sub>D</sub>		50	mW
	Junction temperature	T <sub>j</sub>		125	°C
Detector	OFF-state output terminal voltage	V <sub>OFF</sub>		100	V
	ON-state current	I <sub>ON</sub>		100	mA
	ON-state current derating (T <sub>a</sub> ≥ 25 °C)	ΔI <sub>ON</sub> /ΔT <sub>a</sub>		-1.0	mA/°C
	ON-state current (pulsed) (t = 100 ms, Duty = 1/10)	I <sub>ONP</sub>		300	mA
	Output power dissipation	P <sub>O</sub>		200	mW
	Junction temperature	T <sub>j</sub>		125	°C
Common	Storage temperature	T <sub>stg</sub>		-40 to 125	°C
	Operating temperature	T <sub>opr</sub>		-40 to 85	
	Lead soldering temperature (10 s)	T <sub>sol</sub>		260	
	Isolation voltage AC, 1 min, R.H. ≤ 60 %	BV <sub>S</sub>	(Note 1)	500	

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.

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

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V <sub>DD</sub>		—	—	80	V
Input forward current	I <sub>F</sub>		5	7.5	20	mA
ON-state current	I <sub>ON</sub>		—	—	100	
Operating temperature	T <sub>opr</sub>		-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.

**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	$V_F$		$I_F = 10\text{ mA}$	1.0	1.15	1.3	V
	Input reverse current	$I_R$		$V_R = 5\text{ V}$	—	—	10	$\mu\text{A}$
	Input capacitance	$C_t$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	15	—	pF
Detector	OFF-state current	$I_{OFF}$		$V_{OFF} = 100\text{ V}$	—	—	200	$\mu\text{A}$
	Output capacitance	$C_{OFF}$		$V = 0\text{ V}, f = 100\text{ MHz}, t < 1\text{ s}$	—	6	8	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		$I_{FT}$		$I_{ON} = 100\text{ mA}$	—	0.5	3	mA
	Return LED current	$I_{FC}$		$I_{OFF} = 10\text{ }\mu\text{A}$	0.1	—	—	
ON-state resistance		$R_{ON}$		$I_{ON} = 100\text{ mA}, I_F = 5\text{ mA}, t < 1\text{ s}$	—	8	14	$\Omega$

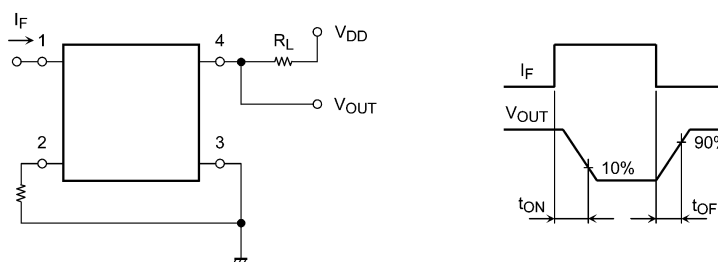
**10. Isolation Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^\circ\text{C}$ )**

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Total capacitance (input to output)		$C_S$	(Note 1)	$V_S = 0\text{ V}, f = 1\text{ MHz}$	—	0.4	—	pF
Isolation resistance		$R_S$	(Note 1)	$V_S = 500\text{ V}, R.H. \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage		$BV_S$	(Note 1)	AC, 1 min	500	—	—	Vrms
				AC, 1s in oil	—	1000	—	
				DC, 1 min, in oil	—	1000	—	Vdc

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,  $T_a = 25\text{ }^\circ\text{C}$ )**

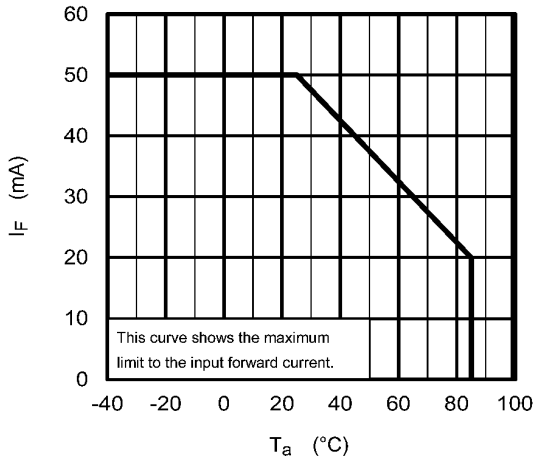
	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time		$t_{ON}$		See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 5\text{ mA}$	—	120	300	$\mu\text{s}$
Turn-off time		$t_{OFF}$			—	180	300	



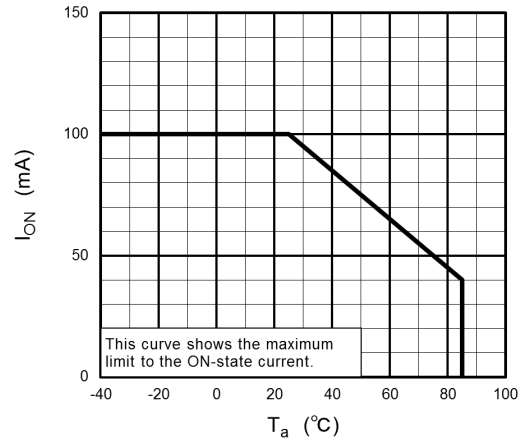
**Fig. 11.1 Switching Time Test Circuit**

**12. Characteristics Curves and Circuit Connections**

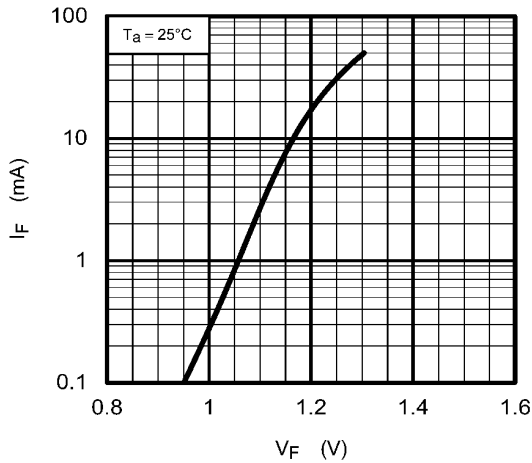
**12.1. Characteristics Curves (Note)**



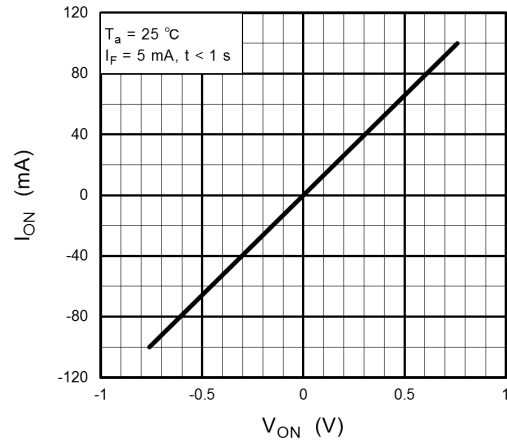
**Fig. 12.1.1  $I_F - T_a$**



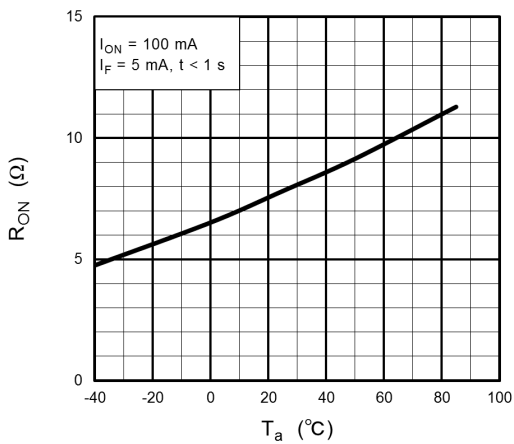
**Fig. 12.1.2  $I_{ON} - T_a$**



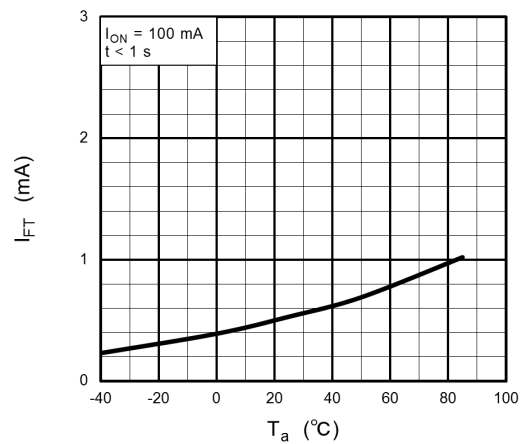
**Fig. 12.1.3  $I_F - V_F$**



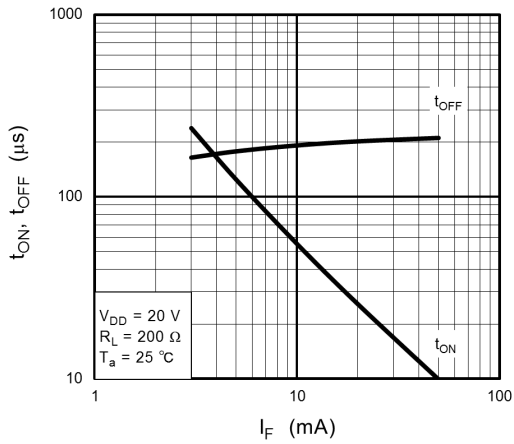
**Fig. 12.1.4  $I_{ON} - V_{ON}$**



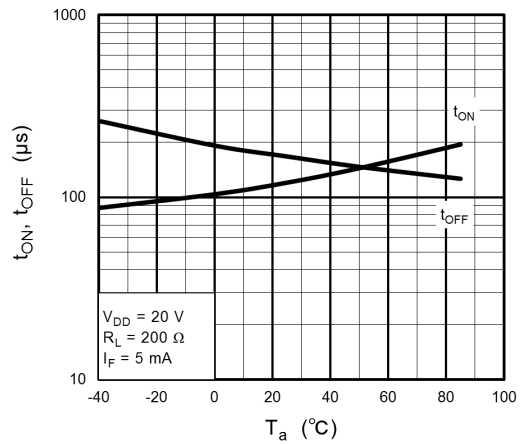
**Fig. 12.1.5  $R_{ON} - T_a$**



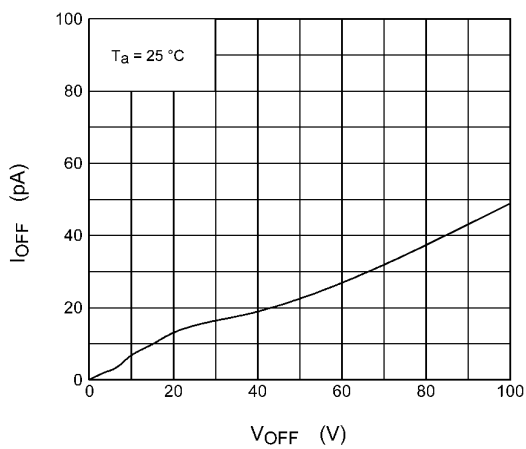
**Fig. 12.1.6  $I_{FT} - T_a$**



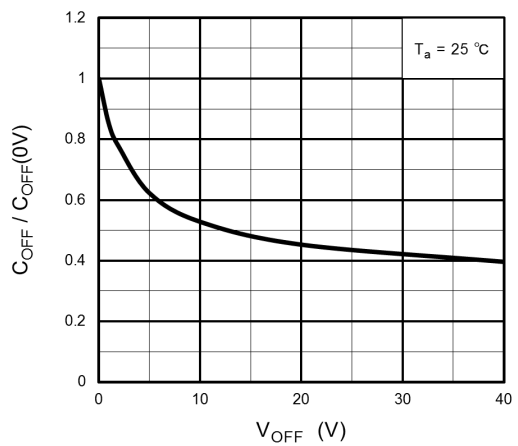
**Fig. 12.1.7  $t_{ON}, t_{OFF} - I_F$**



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



**Fig. 12.1.9  $I_{OFF} - V_{OFF}$**

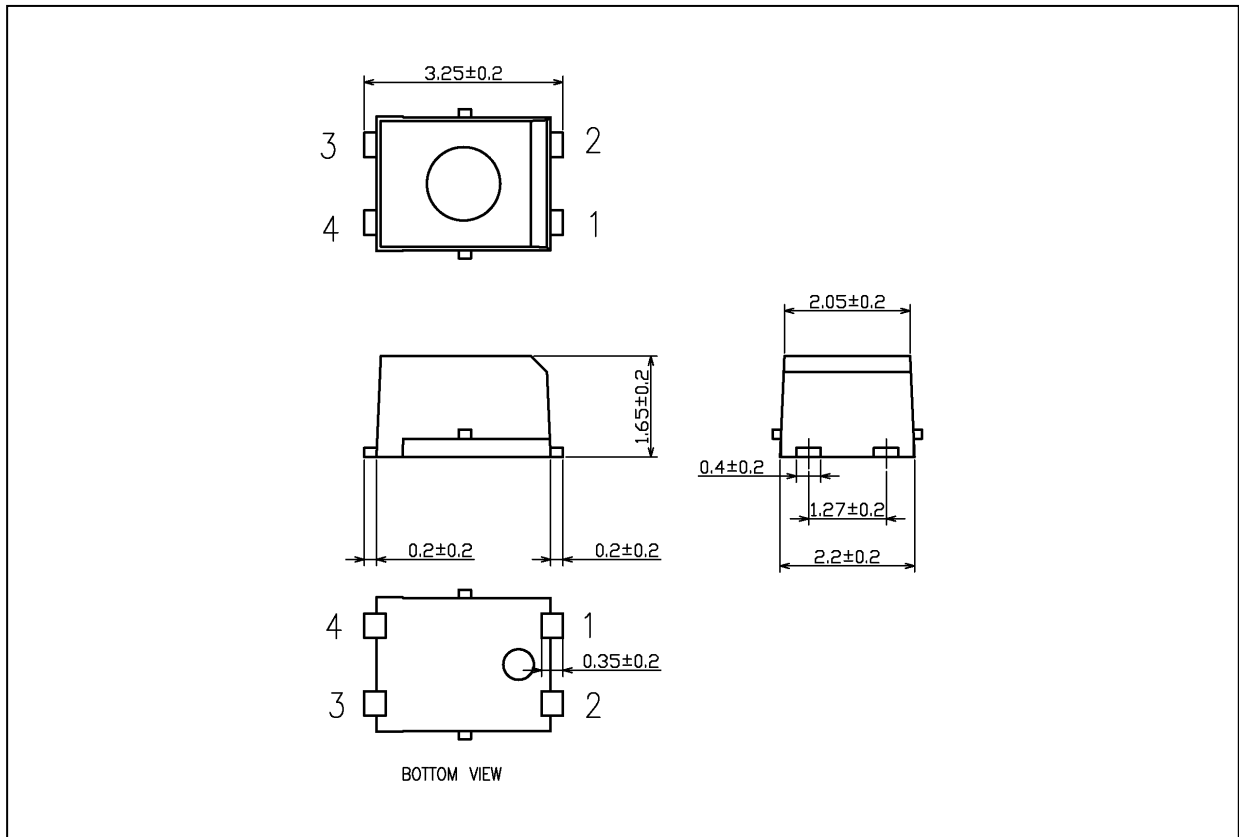


**Fig. 12.1.10  $C_{OFF}/C_{OFF}(0V) - V_{OFF}$**

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

**Package Dimensions**

Unit: mm



Weight: 0.03 g (typ.)

Package Name(s)
TOSHIBA: 11-2C1S

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