

TLX9920

1. Applications

- Automotive
- MOSFET Gate Drivers

2. General

The TLX9920 is a photocoupler in an SO6L package that optically couples a photodiode array with an infrared light-emitting diode.

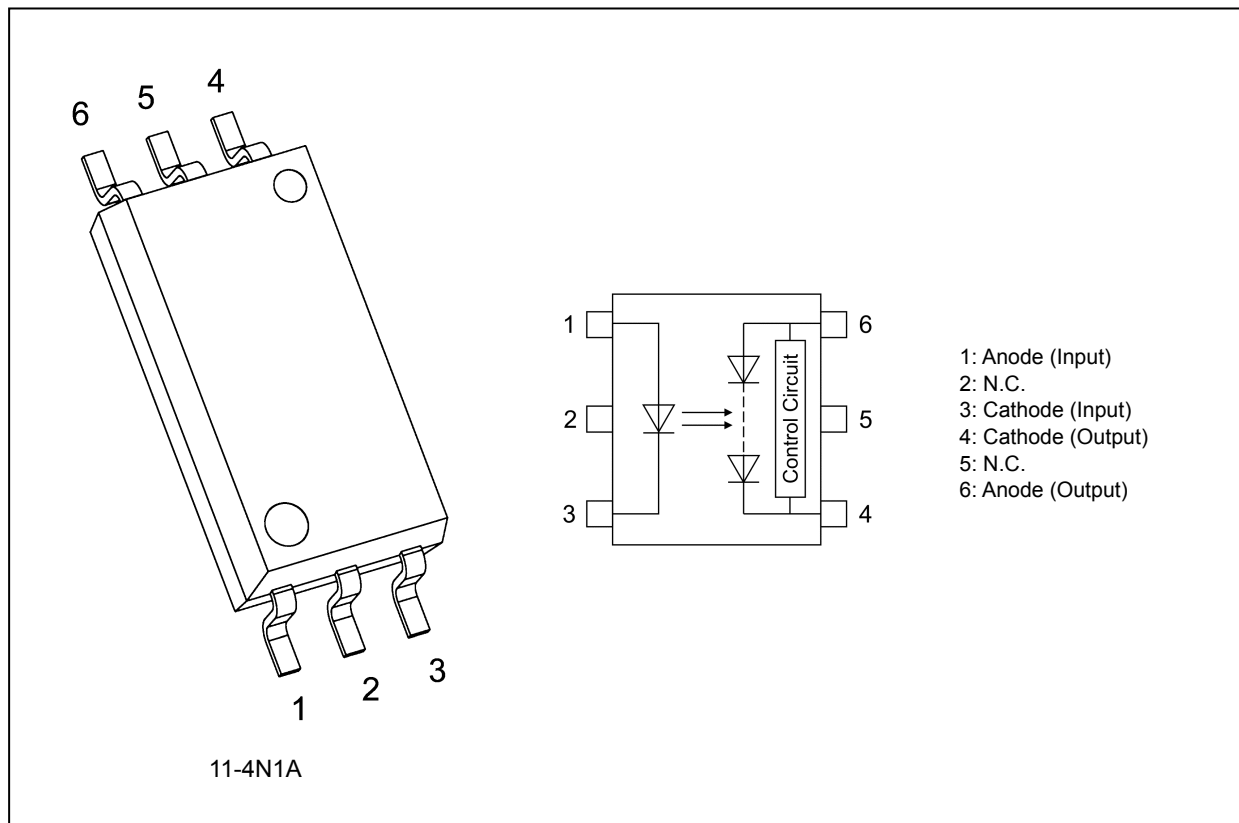
Each photodiode is connected in series, making it suitable for driving the gate of MOS devices.

This photocoupler incorporates a control circuit on the receiver side, eliminating the need for an external discharge resistor and improving switching speed.

3. Features

- (1) Open voltage: 13.5 V (min)
- (2) Short current: 8 μ A (min)
- (3) Isolation voltage: 5000 Vrms (min)
- (4) Package: SO6L
- (5) AEC-Q101 qualified

4. Packaging and Pin Assignment



Start of commercial production
 2026-01

5. 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 ($T_a = 125\text{ }^\circ\text{C}$)	I_F		10	mA
	Input forward current derating ($T_a \geq 100\text{ }^\circ\text{C}$)	$\Delta I_F/\Delta T_a$		-0.8	mA/ $^\circ\text{C}$
	Input power dissipation	P_D		50	mW
	Input power dissipation derating ($T_a \geq 100\text{ }^\circ\text{C}$)	$\Delta P_D/\Delta T_a$		-1.3	mW/ $^\circ\text{C}$
	Input reverse voltage	V_R		5	V
Detector	Output forward current	I_{FD}		50	μA
	Output power dissipation ($-40 \leq T_a \leq 125\text{ }^\circ\text{C}$)	P_O		0.5	mW
Common	Operating temperature	T_{opr}		-40 to 125	$^\circ\text{C}$
	Storage temperature	T_{stg}		-55 to 135	$^\circ\text{C}$
	Lead soldering temperature (10 s)	T_{sol}		260	$^\circ\text{C}$
	Isolation voltage AC, 60 s, R.H. $\leq 60\%$	BV_S	(Note 1)	5000	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, 2 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

6. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Input forward current	I_F		—	12	15	mA
Operating temperature	T_{opr}		-40	—	105	$^\circ\text{C}$

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.

7. 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		$I_F = 10\text{ mA}$	1.5	1.65	1.8	V
	Input reverse current	I_R		$V_R = 5\text{ V}$	—	—	10	μA
	Input capacitance	C_t		$V = 0\text{ V}, f = 1\text{ MHz}$	—	42	—	pF

8. 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}		$V_{OC} \geq 10\text{ V}$	—	—	3	mA
Open voltage	V_{OC}		$I_F = 10\text{ mA}$	13.5	17.5	—	V
			$I_F = 10\text{ mA}, T_a = 125\text{ }^\circ\text{C}$	8	11	—	
Short-circuit current	I_{SC}		$I_F = 10\text{ mA}$	8	20	—	μA
			$I_F = 10\text{ mA}, T_a = 125\text{ }^\circ\text{C}$	6	12.5	—	

9. 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)	$V_S = 0\text{ V}$, $f = 1\text{ MHz}$	—	0.45	—	pF
Isolation resistance	R_S	(Note 1)	$V_S = 500\text{ V}$, R.H. $\leq 60\%$	10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	(Note 1)	AC, 60 s	5000	—	—	Vrms

Note 1: This device is considered as a two-terminal device: Pins 1, 2 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

10. 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}		$I_F = 10\text{ mA}$, $C_L = 1000\text{ pF}$ See Fig. 10.1.	—	0.6	1.0	ms
Turn-off time	t_{off}		$I_F = 10\text{ mA}$, $C_L = 1000\text{ pF}$ See Fig. 10.1.	—	0.1	1.0	

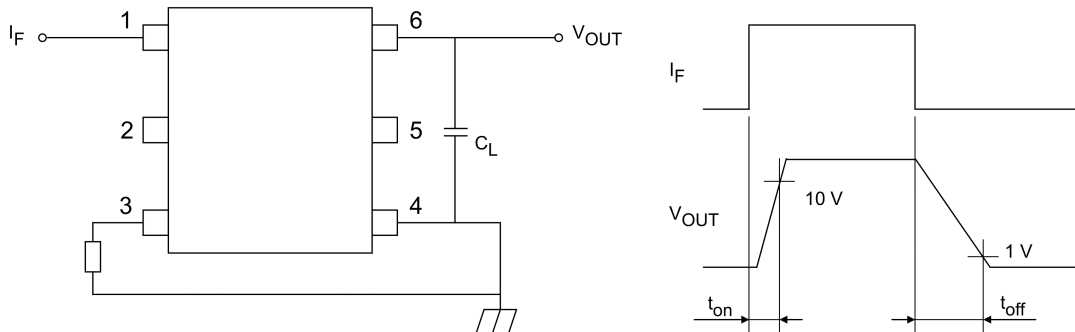


Fig. 10.1 Switching Time Test Circuit, Waveform

11. Characteristics Curves (Note)

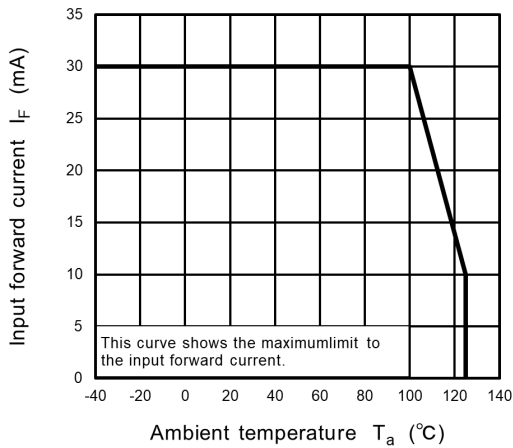


Fig. 11.1 $I_F - T_a$

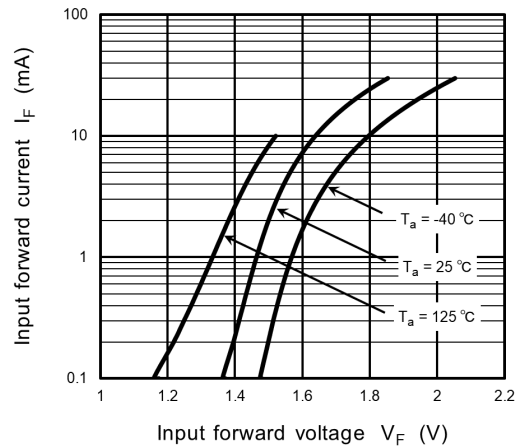


Fig. 11.2 $I_F - V_F$

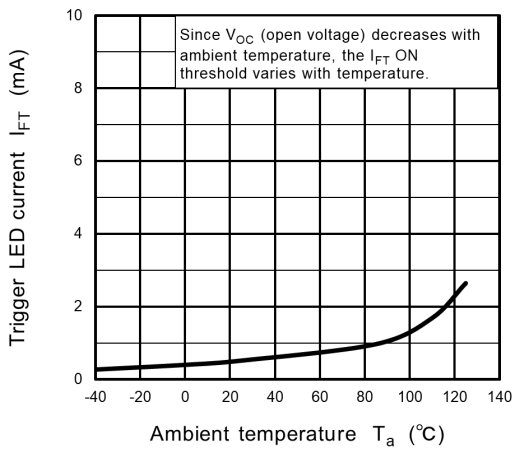


Fig. 11.3 $I_{FT} - T_a$

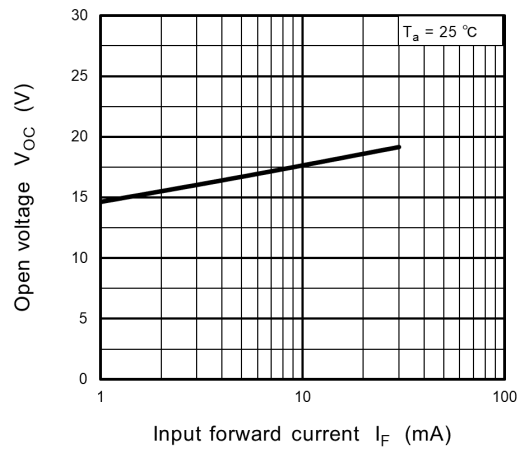


Fig. 11.4 $V_{OC} - I_F$

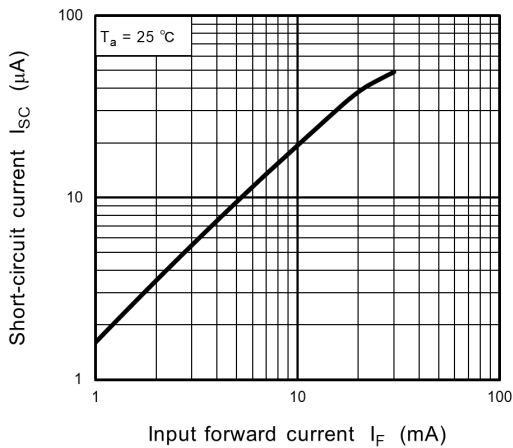


Fig. 11.5 $I_{SC} - I_F$

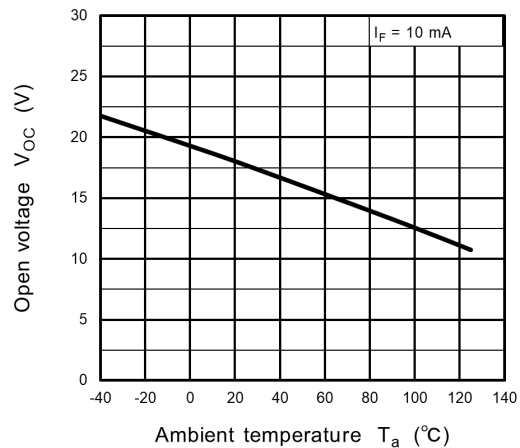


Fig. 11.6 $V_{OC} - T_a$

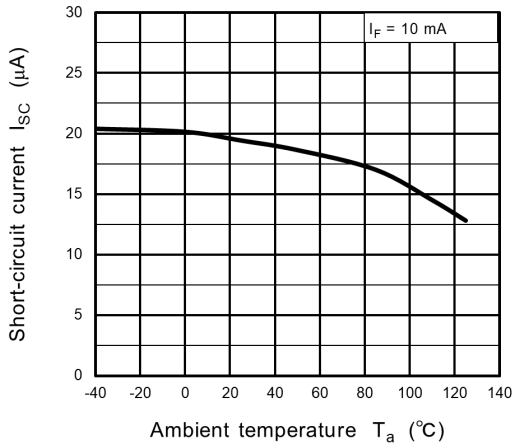


Fig. 11.7 $I_{sc} - T_a$

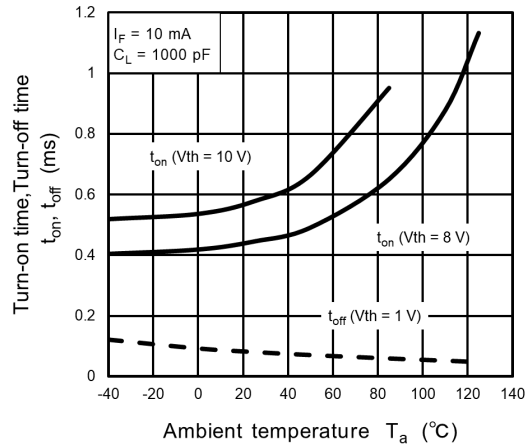


Fig. 11.8 $t_{on}, t_{off} - T_a$

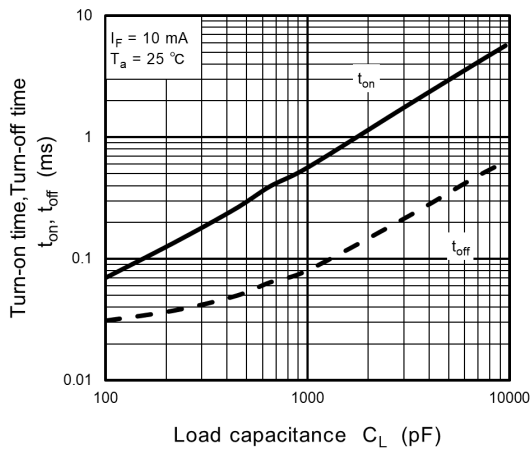


Fig. 11.9 $t_{on}, t_{off} - C_L$

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

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