

# TLX9905

## 1. Applications

- Automotive
- MOSFET Gate Drivers

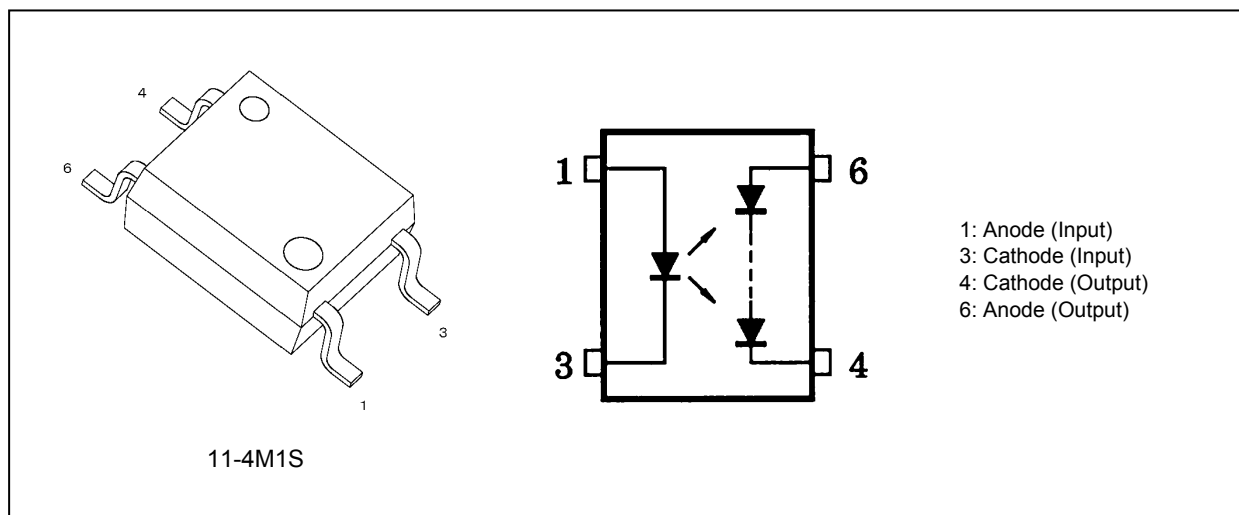
## 2. General

The TLX9905 is a photocoupler in the SO6 package that consists of an infrared light emitting diode optically coupled to a photodiode array. The photodiodes are connected in series, making the TLX9905 suitable for MOS gate drive applications.

## 3. Features

- (1) Open voltage: 7 V (min)
- (2) Short current: 12  $\mu$ A (min)
- (3) Isolation voltage: 3750 Vrms (min)
- (4) AEC-Q101 qualified

## 4. Packaging and Pin Assignment



## 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 ( $T_a = 125\text{ }^\circ\text{C}$ )			10	
	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	$V_R$		3	V
Detector	Output forward current	$I_{FD}$		50	$\mu\text{A}$
	Output reverse voltage	$V_{RD}$		10	V
	Output power dissipation ( $-40\text{ }^\circ\text{C} \leq T_a \leq 125\text{ }^\circ\text{C}$ )	$P_O$		0.5	mW
Common	Operating temperature	$T_{opr}$		-40 to 125	$^\circ\text{C}$
	Storage temperature	$T_{stg}$		-55 to 150	$^\circ\text{C}$
	Lead soldering temperature (10 s)	$T_{sol}$		260	$^\circ\text{C}$
	Isolation voltage AC, 60 s, R.H. $\leq 60\%$	$BV_S$	(Note 1)	3750	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 3 are shorted together, and pins 4 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	$I_R$		$V_R = 3\text{ V}$	—	—	10	$\mu\text{A}$
	Input capacitance	$C_t$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	45	—	pF
Detector	Output forward voltage	$V_{FD}$		$I_F = 10\text{ }^\mu\text{A}$	—	10	—	V
	Output reverse current	$I_{RD}$		$V_R = 10\text{ V}$	—	1	—	nA

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

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Open voltage	$V_{OC}$		$I_F = 10\text{ mA}$	7	9	—	V
			$I_F = 10\text{ mA}, T_a = 125\text{ }^\circ\text{C}$	—	5	—	
Short-circuit current	$I_{SC}$		$I_F = 10\text{ mA}$	12	30	—	$\mu\text{A}$
			$I_F = 10\text{ mA}, T_a = 125\text{ }^\circ\text{C}$	—	12	—	

## 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)	$V_S = 0\text{ V}$ , $f = 1\text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	(Note 1)	$V_S = 500\text{ V}$ , R.H. $\leq 60\%$	$10^{12}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	(Note 1)	AC, 60 s	3750	—	—	Vrms

Note 1: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4 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	$t_{on}$		$I_F = 10\text{ mA}$ , $C_L = 1000\text{ pF}$	—	0.3	—	ms
Turn-off time	$t_{off}$		$R_{SH} = 510\text{ k}\Omega$ , See Fig. 10.1	—	1	—	

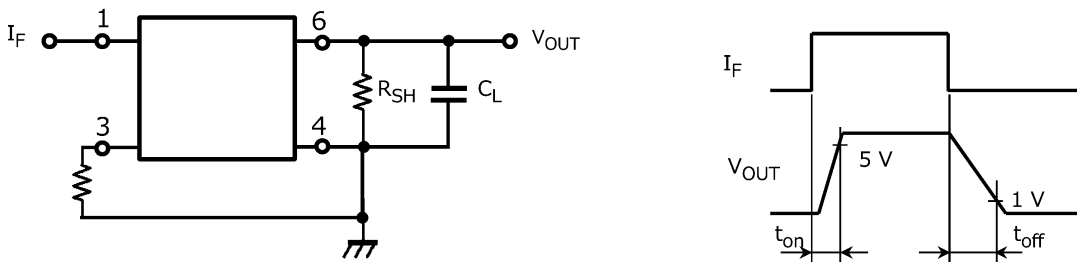
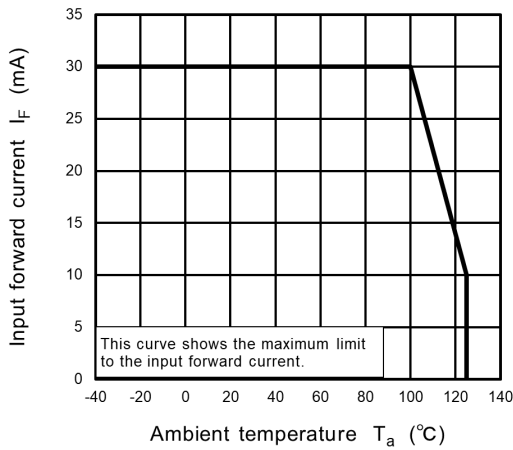
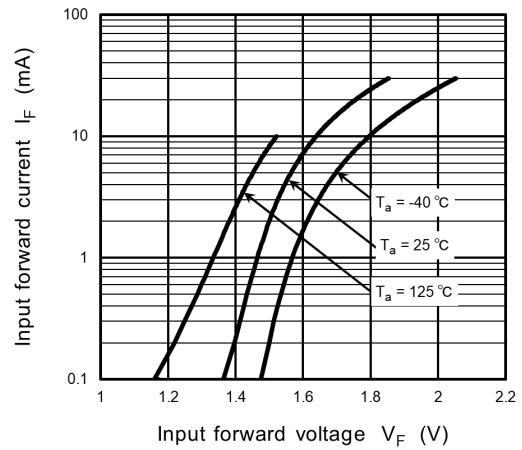


Fig. 10.1 Switching Time Test Circuit, Waveform

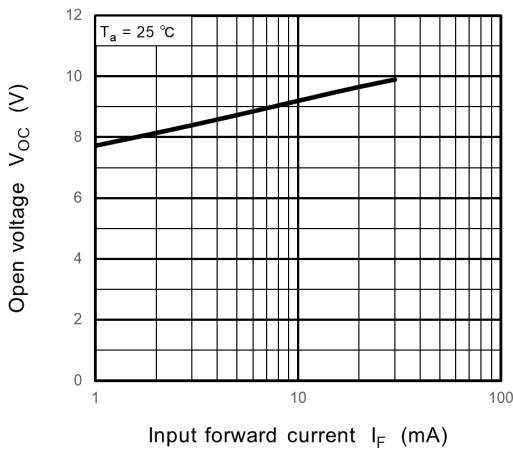
## 11. Characteristics Curves (Note)



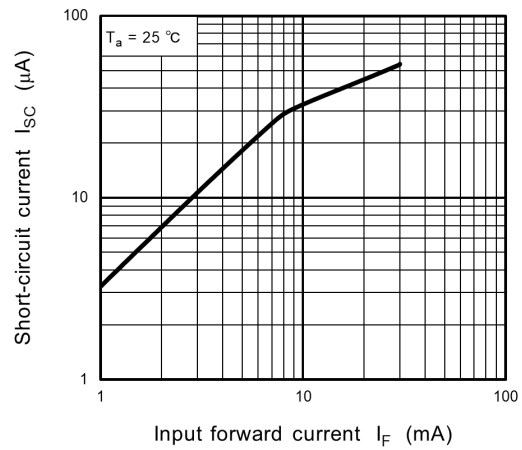
**Fig. 11.1**  $I_F - T_a$



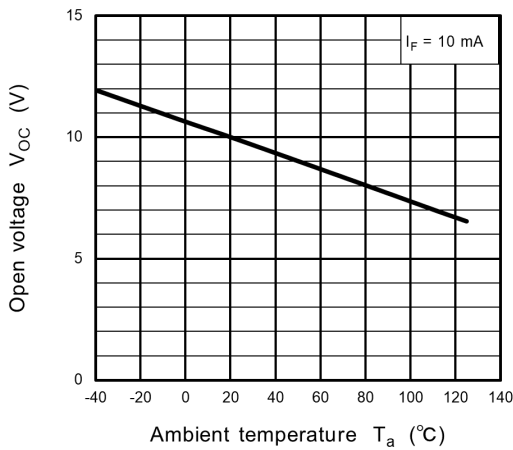
**Fig. 11.2**  $I_F - V_F$



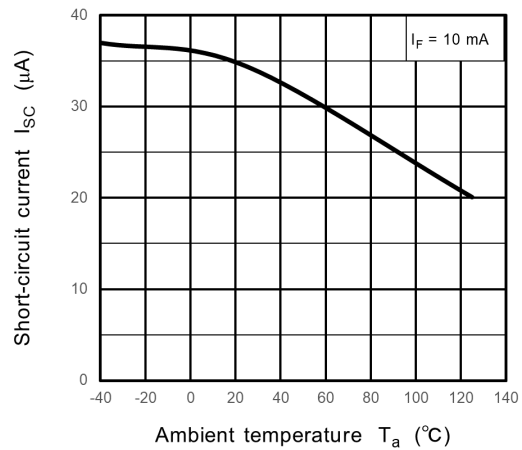
**Fig. 11.3**  $V_{OC} - I_F$



**Fig. 11.4**  $I_{SC} - I_F$



**Fig. 11.5**  $V_{OC} - T_a$

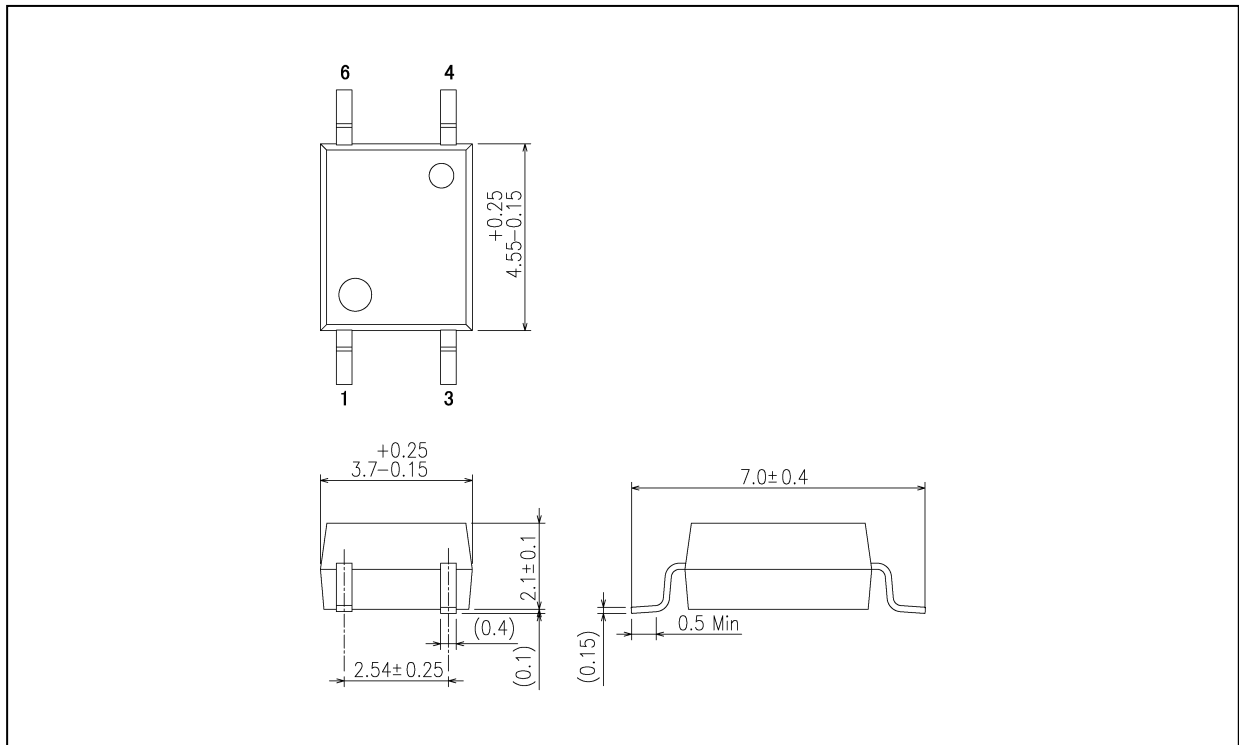


**Fig. 11.6**  $I_{SC} - T_a$

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

## Package Dimensions

Unit: mm



Weight: 0.08 g (typ.)

Package Name(s)
TOSHIBA: 11-4M1S

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