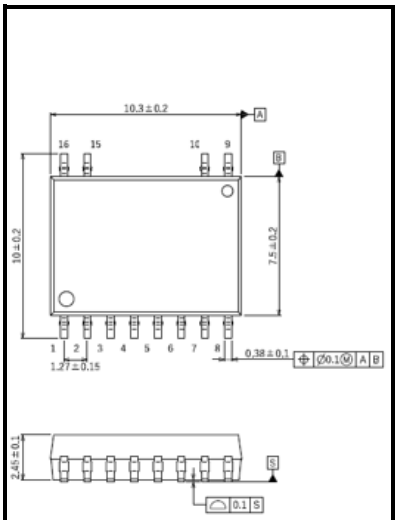
TOSHIBA Photocoupler Photorelay

TLX9160T

Battery Control in Automotive Equipment
Fuel Battery Control in Automotive Equipment
Application for Electrical Vehicle

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	11-10N1A

Weight: 0.42 g (typ.)

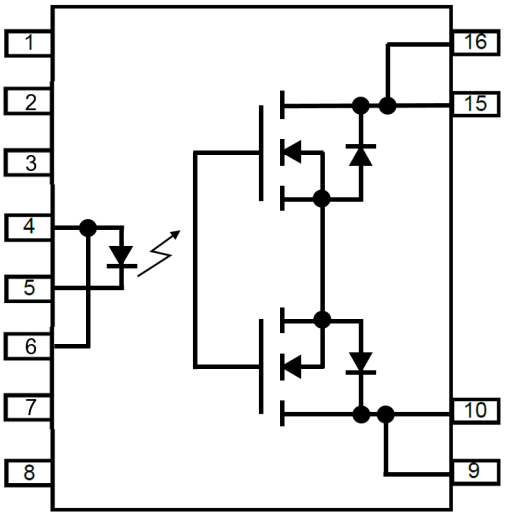
The Toshiba TLX9160T consists of an infrared emitting diode optically coupled to a photo-MOSFET in a SO16L-T package.

This coupler uses high voltage MOSFET between output terminals.

It adequate for the automotive control applications with a battery voltage of 1000V or less in an environment with a pollution degree 2 since the creepage distance on the detector side is 5mm or more.

- Normally open (1-Form-A) device
- Peak off-state voltage: 1500 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 50 mA (max)
- On-state resistance: 250 Ω (max)(@ t < 1 s)
- Isolation voltage: 5000 Vrms (min)
- Clearance distance: 8mm (min)
- Creepage distance: 8mm (min)
- Insulation thickness: 0.4mm (min)
- Outer resin: CTI>600
- AEC-Q101 qualified

Pin Configuration (top view)



1: NC
2: NC
3: NC
4: Anode
5: Cathode
6: Anode
7: NC
8: NC
9: Drain
10: Drain
15: Drain
16: Drain

Absolute Maximum Rating (Unless otherwise specified, Ta = 25°C) (Note)

Characteristics			Symbol	Rating	Unit
LED	Forward current		I_F	30	mA
	Forward current derating (Ta ≥ 100°C)		ΔI_F/°C	-0.8	mA/°C
	Reverse voltage		V_R	5	V
	Input Power Dissipation		PD	50	mW
	Input Power Dissipation Derating (Ta ≥ 100 °C)		ΔPD/°C	-1.3	mW/°C
	Junction temperature		T_j	135	°C
Detector	On-state current	Ta = 25 °C	I_{ON}	50	mA
		Ta = 105 °C		20	mA
		Ta = 125 °C		10	mA
	On-state current derating	Ta-45°C	⊿ION/℃	-0.5	mA/℃
	On-state current (Peak) (Note 3)	Ta = 25 °C	I_{ONpk}	150	mA
		Ta = 105 °C		60	mA
		Ta = 125 °C		30	mA
	Avalanche current (Note 1)		IAV	0.6	mA
	Output power dissipation		P_O	600	mW
	Output power dissipation derating (Ta ≥ 47 °C)		ΔP_O/°C	-7	mW/℃
	Junction temperature		T_j	135	°C
Storage temperature			T_{stg}	-55 to 150	°C
Operating temperature			T_{opr}	-40 to 125	°C
Lead soldering temperature (10 s)			T_{sol}	260	°C
Isolation voltage (AC, 60 s, R.H. ≤ 60%) (Note 2)			BV_S	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: This product is more sensitive than conventional products to electrostatic discharge (ESD). It is therefore all the more necessary to observe general precautions regarding ESD when handling this component.

Note 1: 1min (max. continuous), Duty cycle=0.1%, 5 time over lifetime.

Note 2: LED pins are shorted together. Detector pins are also shorted together.

Note 3: Exponential curve, pulse width < 1ms, f ≤150Hz

Recommended Operating Conditions (Note)

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{DD}	—	—	1000	V
Forward current	I_F	5	10	20	mA
On-state current	I_{ON}	—	—	50	mA
Operating temperature	T_{opr}	-40	—	125	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = 10 mA	1.5	1.65	1.8	V
			I_F = 10 mA , Ta = -40 to 125 °C	1.4	—	1.95	
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	45	—	pF
Detector	Output withstand voltage	V_{OFF}	IOFF=10uA, Ta=25 °C (Note1)	1500	—	—	V
	Off-state current	I_{OFF}	V_{OFF} = 1000 V , Ta = 25 °C	—	—	100	nA
			V_{OFF} = 1000 V , Ta = 105 °C	—	—	1000	
			V_{OFF} = 1000 V , Ta = 125 °C	—	—	5000	
	Capacitance	C_{OFF}	V_{OFF} = 0 V, f = 1 MHz	—	100	—	pF

Note 1: Reliability test of applying high voltage is demonstrated at 1200V.

Coupled Electrical Characteristics

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I_{FT}	I_{ON} = 50 mA , Ta=25 °C , t = 10 ms	—	—	3	mA
		I_{ON} = 20 mA , Ta= -40 to 105 °C, t = 10 ms	—	—	3	
		I_{ON} = 10 mA, Ta= -40 to 125 °C, t = 10 ms	—	—	3	
Return LED current	I_{FC}	I_{OFF} = 100 μA, Ta= -40 to 125 °C, t = 40 ms	0.05	—	—	mA
On-state resistance	R_{ON}	I_{ON} = 50 mA, I_F = 10 mA, Ta = 25 °C, t < 1 s	—	—	250	Ω
		I_{ON} = 20 mA, I_F = 10 mA, Ta = 105 °C, t < 1 s	—	—	350	
		I_{ON} = 10 mA, I_F = 10 mA, Ta = 125 °C, t <1 s	—	—	400	

Isolation Characteristics (Ta = 25°C)

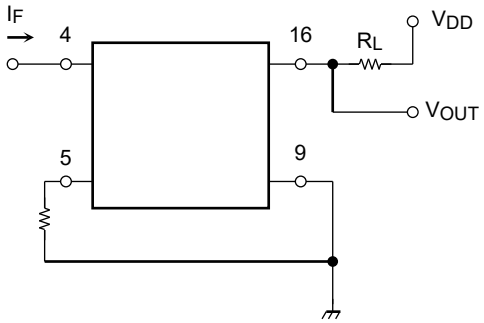
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0 V, f = 1 MHz (Note 1)	—	0.9	—	pF
Isolation resistance	R_S	V_S = 1000 V, R.H. ≤ 60 % (Note 1)	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s (Note 1)	5000	—	—	Vrms

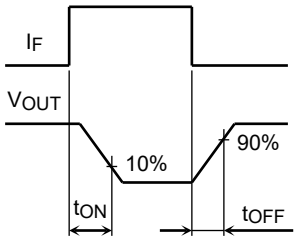
Note 1: Device considered a two terminal device: Pins 1 to 8 shorted together, and pins 9, 10, 15 and 16 shorted together.

Switching Characteristics

Characteristics	Symbol	Test Condition		Min	Typ.	Max	Unit
Turn-on time	t_{ON}	I_F = 10 mA, R_L = 20 kΩ, V_{DD} = 40 V (Note 1)	Ta=25 °C	—	—	1	ms
Turn-off time	t_{OFF}			—	—	1	
Turn-on time	t_{ON}		Ta=-40 to 125 °C	—	—	1	ms
Turn-off time	t_{OFF}			—	—	1	

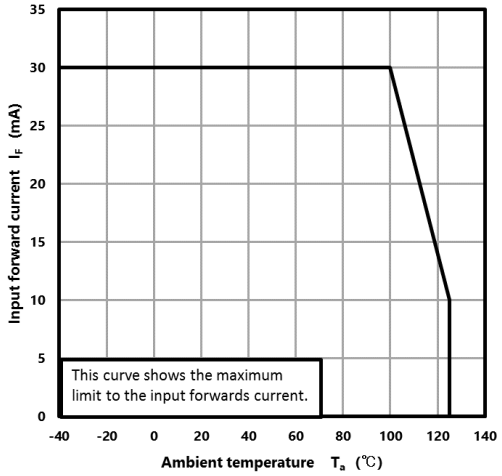
Note 1: Switching time test circuit



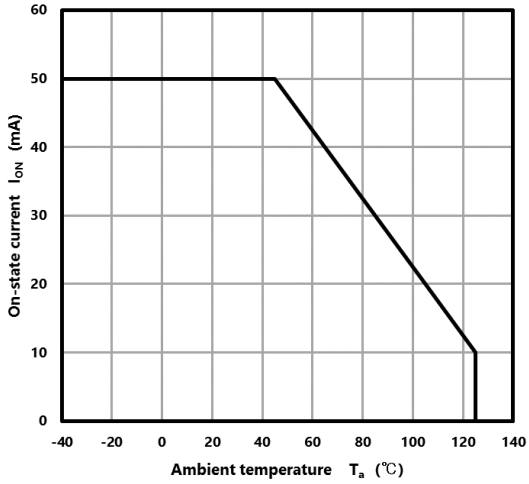


Characteristics curve (Note)

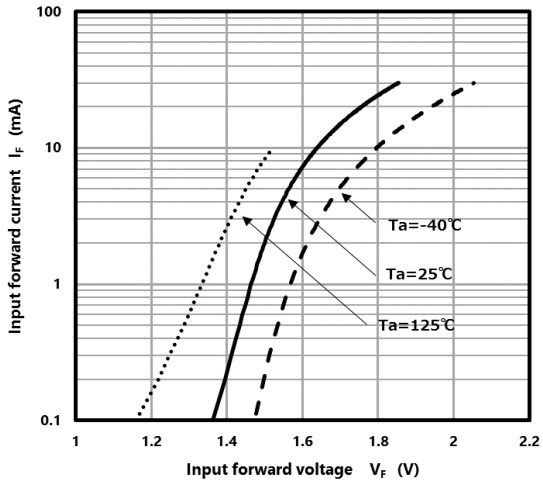
$I_F - T_a$



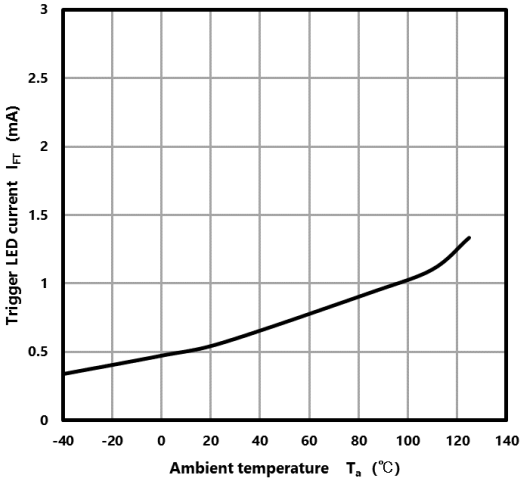
$I_{ON} - T_a$



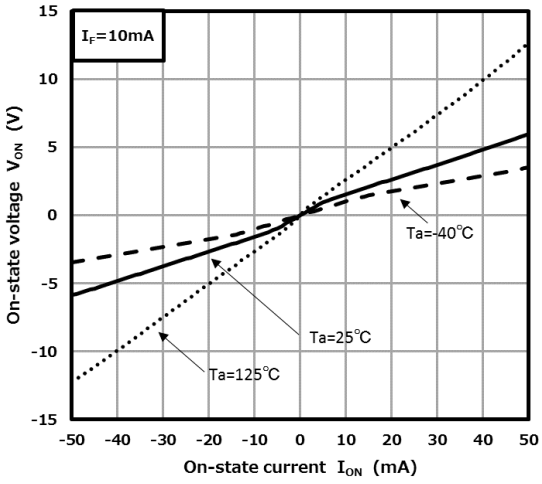
$I_F - V_F$



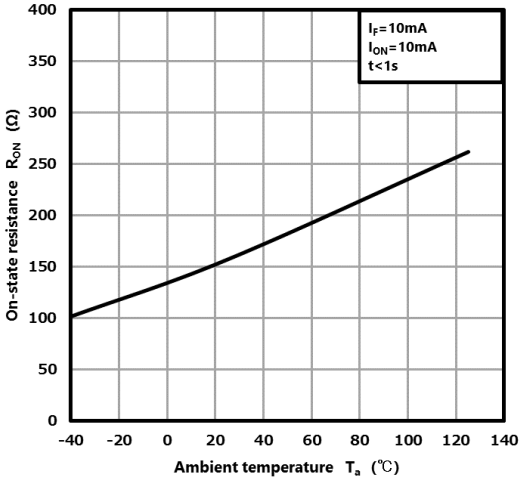
IFT – Ta



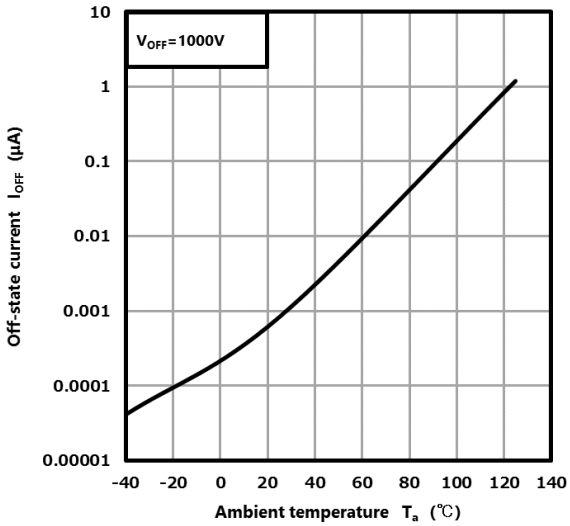
VON – ION



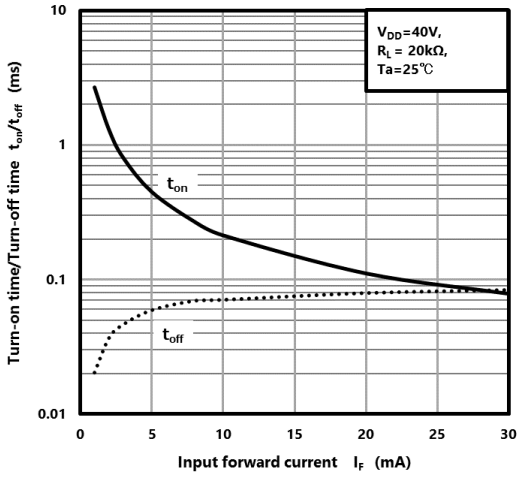
Ron – Ta



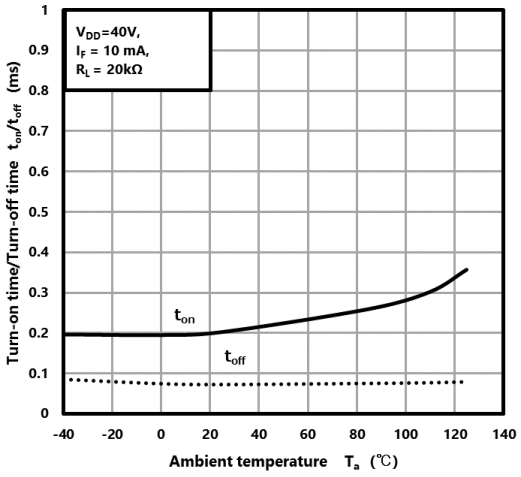
IOFF-Ta



ton / toff - IF



ton / toff - Ta



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

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