

TOSHIBA Photocoupler Photorelay

TLX9160T

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

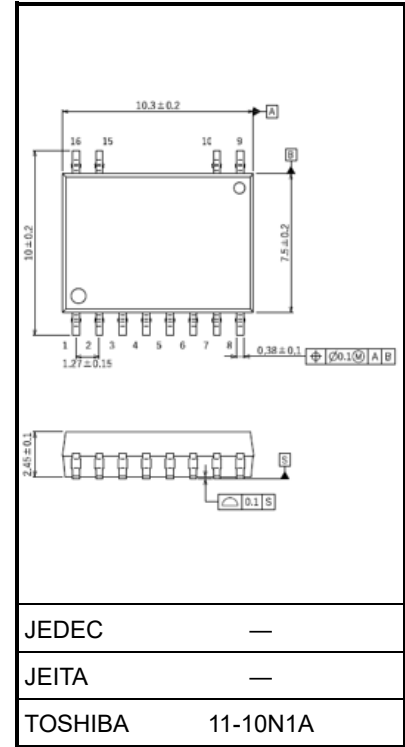
Unit: mm

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.

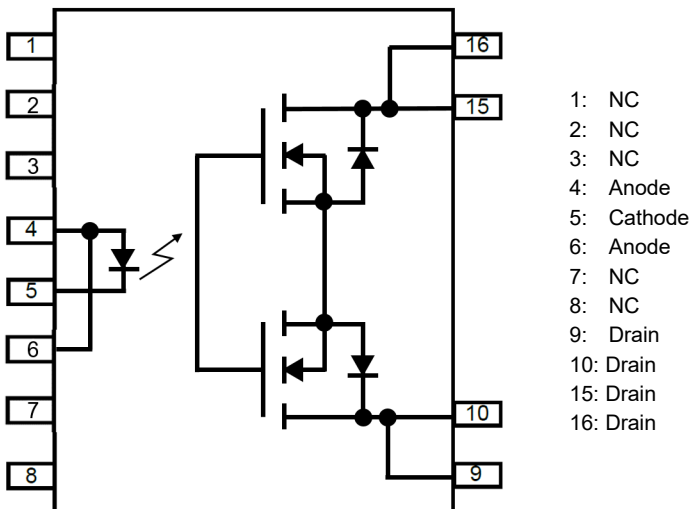
It is adequate for the automotive control applications with a battery voltage of 1000V or less in an environment with a pollution degree 2 since the creepage distance on the detector side is 5mm or more.

- 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



Weight: 0.42 g (typ.)

Pin Configuration (top view)



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)	$\Delta I_F/^\circ\text{C}$	-0.8	mA/°C	
	Reverse voltage	V_R	5	V	
	Input Power Dissipation	PD	50	mW	
	Input Power Dissipation Derating (Ta ≥ 100 °C)	$\Delta PD/^\circ\text{C}$	-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	$\Delta I_{ON}/^\circ\text{C}$	-0.5	mA/°C
	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)	I_{AV}	0.6	mA	
	Output power dissipation	P_O	600	mW	
	Output power dissipation derating (Ta ≥ 47 °C)	$\Delta P_O/^\circ\text{C}$	-7	mW/°C	
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}	I _{OFF} =10μA, 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)

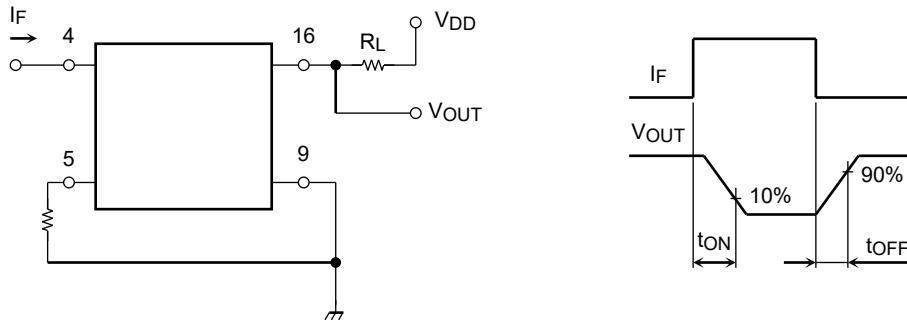
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S	V _S = 0 V, f = 1 MHz (Note 1)	—	0.9	—	pF
Isolation resistance	R _S	V _S = 1000 V, R.H. ≤ 60 % (Note 1)	5 × 10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 60 s (Note 1)	5000	—	—	V _{rms}

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

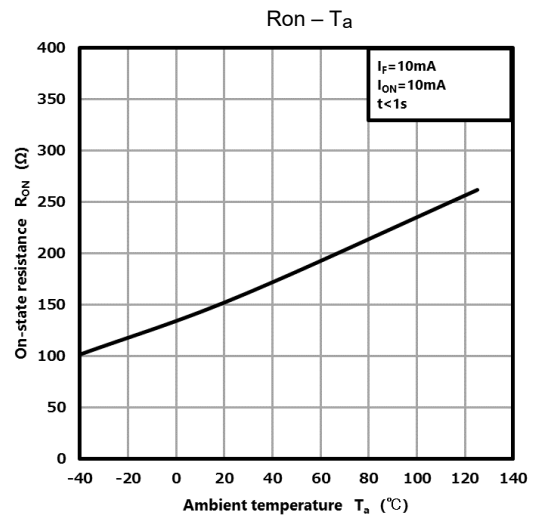
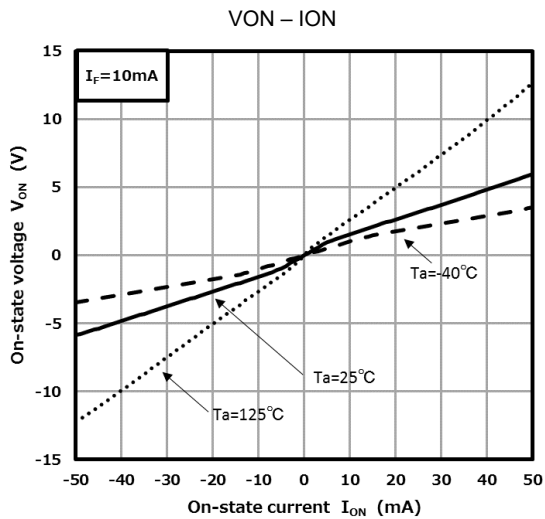
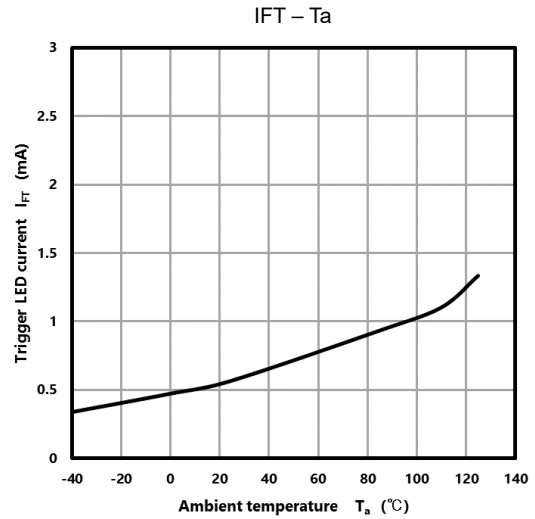
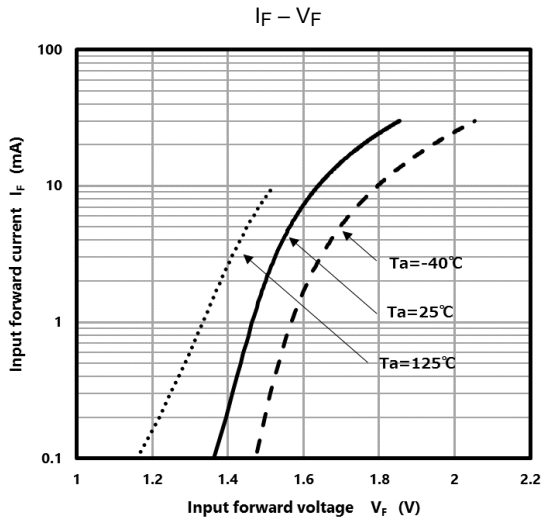
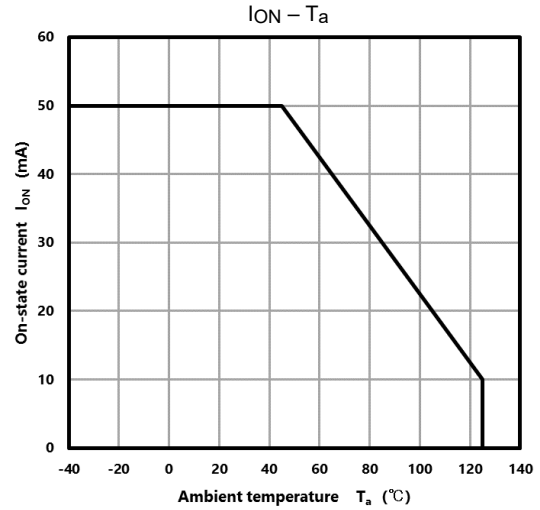
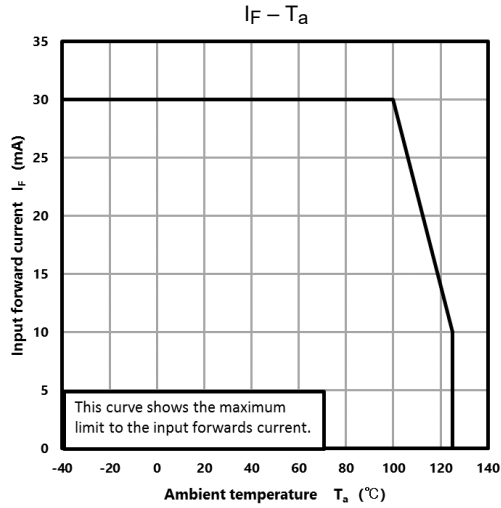
Switching Characteristics

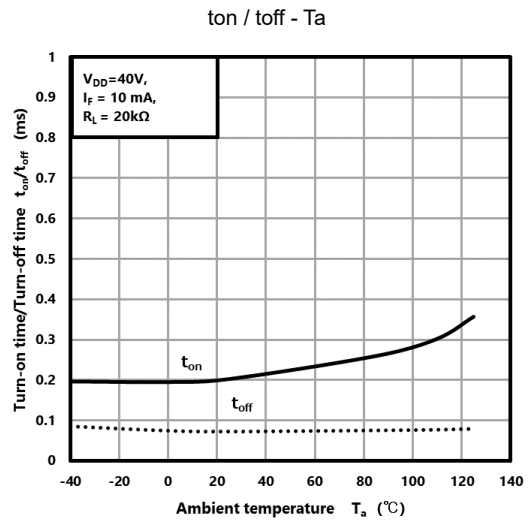
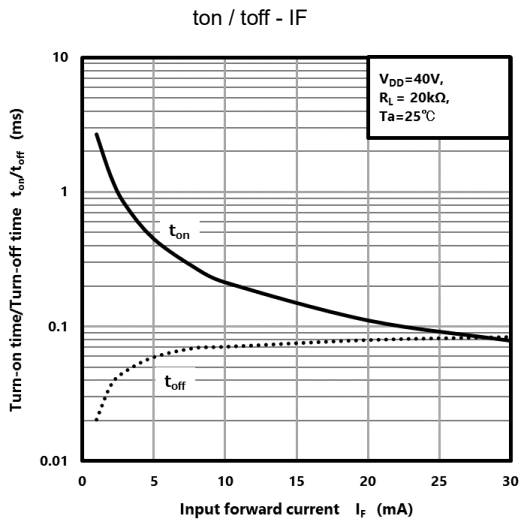
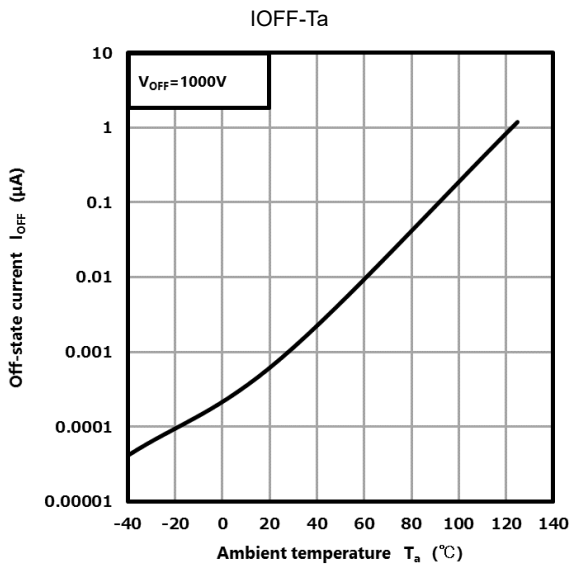
Characteristics	Symbol	Test Condition		Min	Typ.	Max	Unit
Turn-on time	t_{ON}	$I_F = 10\text{ mA}$, $R_L = 20\text{ k}\Omega$,	$T_a = 25\text{ }^\circ\text{C}$	—	—	1	ms
Turn-off time	t_{OFF}			—	—	1	
Turn-on time	t_{ON}	$V_{DD} = 40\text{ V}$ (Note 1)	$T_a = -40\text{ to }125\text{ }^\circ\text{C}$	—	—	1	ms
Turn-off time	t_{OFF}			—	—	1	

Note 1: Switching time test circuit



Characteristics curve (Note)





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

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