

TOSHIBA Photocoupler Photorelay

TLX9160T

Battery Control in Automotive Equipment

Fuel Battery Control in Automotive Equipment

Application for Electrical Vehicle

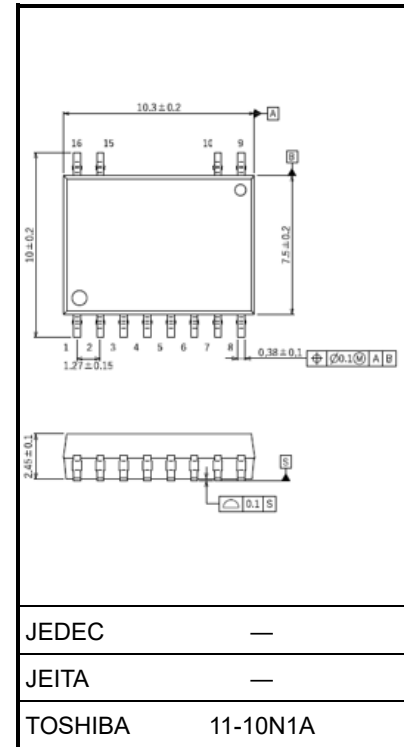
The Toshiba TLX9160T consists of an infrared emitting diode optically coupled to a photo-MOSFET in a SO16L-T package.

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.

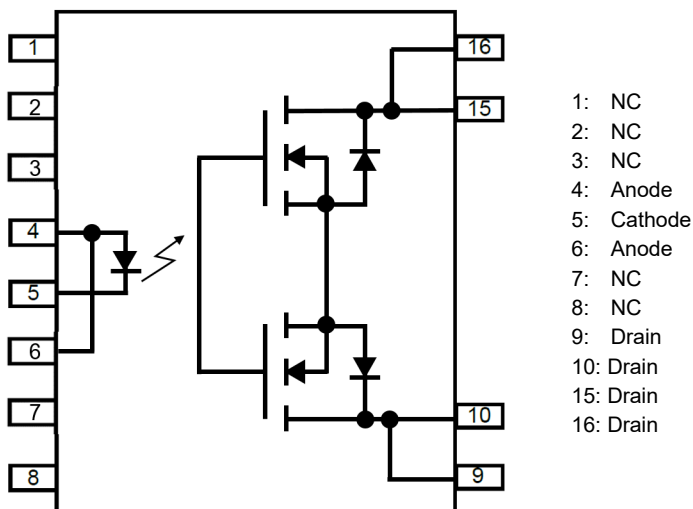
- Normally open (1-Form-A) device
- Peak off-state voltage: 1500 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 50 mA (max)
- On-state resistance: 250 Ω (max)(@ $t < 1$ s)
- Isolation voltage: 5000 Vrms (min)
- Clearance distance: 8mm (min)
- Creepage distance: 8mm (min)
- Insulation thickness: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

Unit: mm



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)		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	ΔI _{ON} /°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)		ΔP _O /°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	V _{rms}

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)

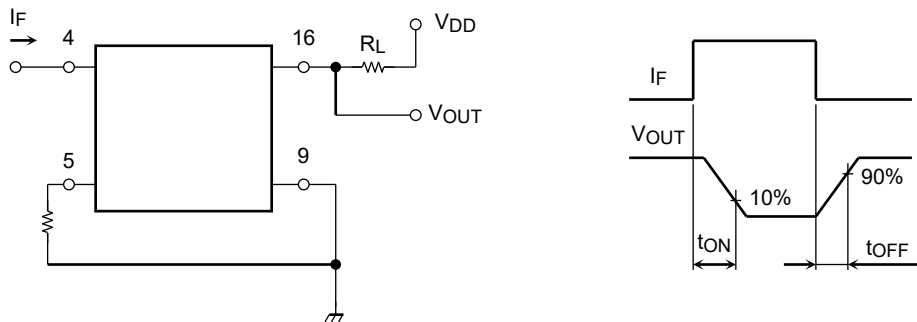
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S	V _S = 0 V, f = 1 MHz (Note 1)	—	0.9	—	pF
Isolation resistance	R _S	V _S = 1000 V, R.H. ≤ 60 % (Note 1)	5 × 10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 60 s (Note 1)	5000	—	—	Vrms

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

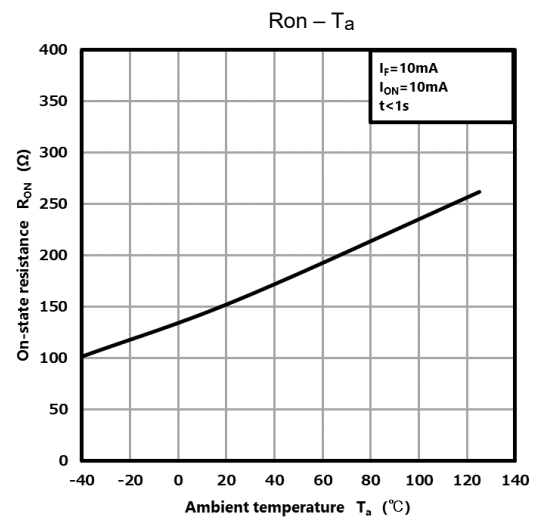
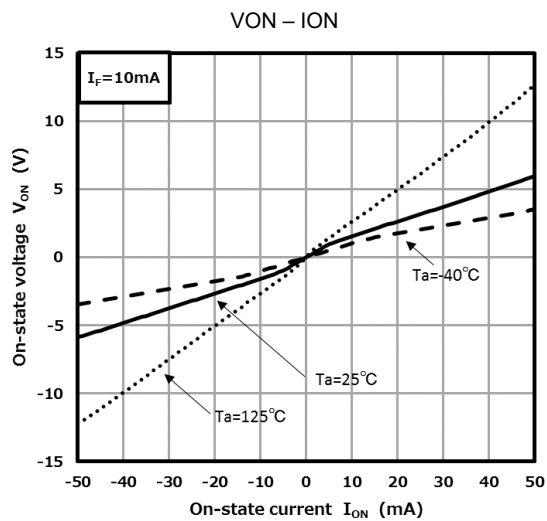
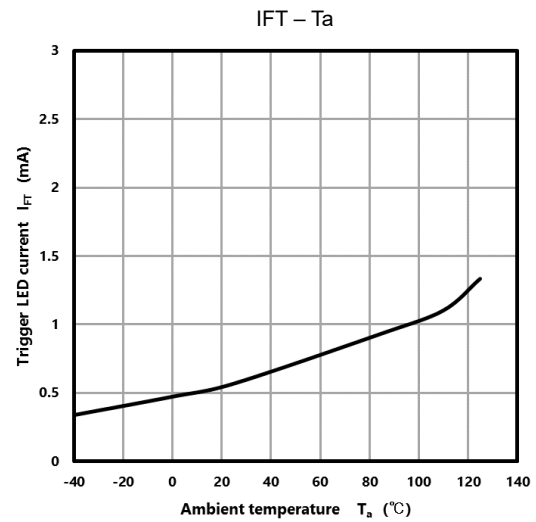
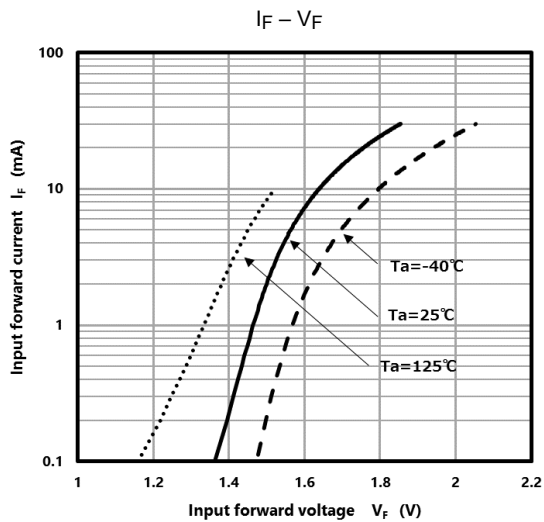
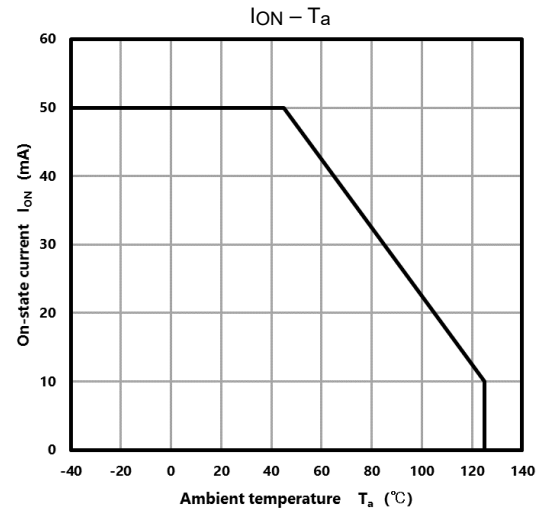
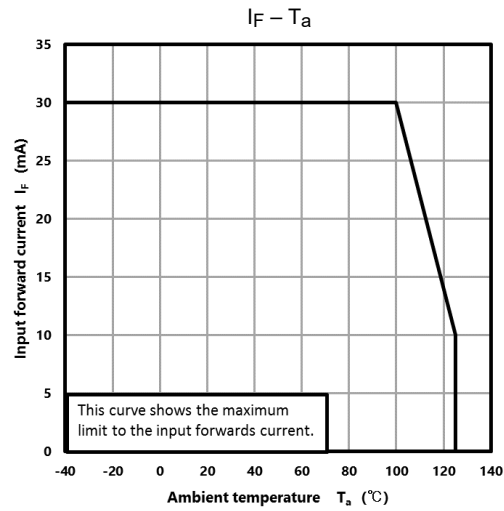
Switching Characteristics

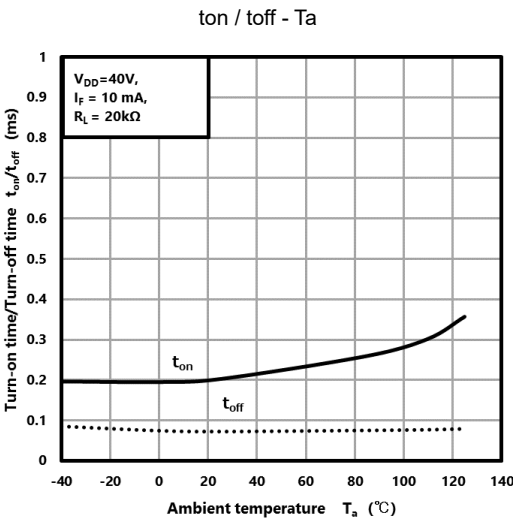
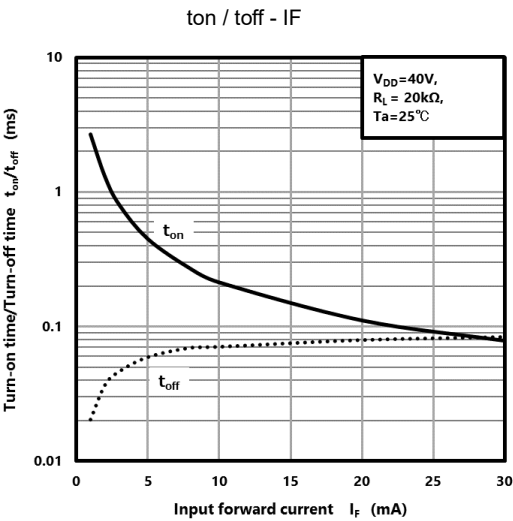
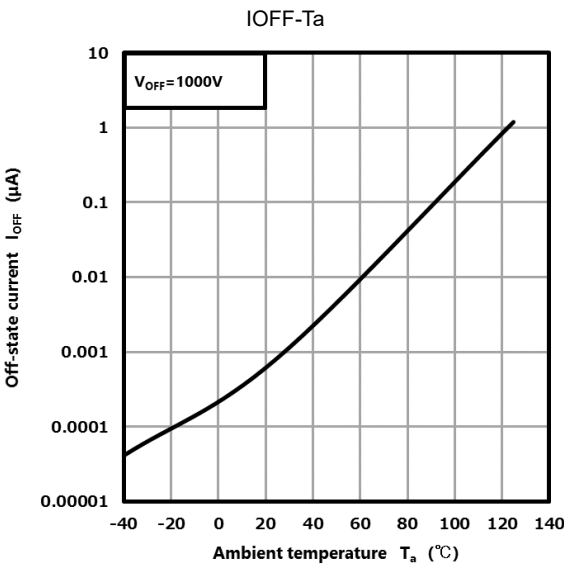
Characteristics	Symbol	Test Condition		Min	Typ.	Max	Unit
Turn-on time	t _{ON}	I _F = 10 mA, R _L = 20 kΩ, V _{DD} = 40 V (Note 1)	T _a =25 °C	—	—	1	ms
Turn-off time	t _{OFF}			—	—	1	
Turn-on time	t _{ON}	V _{DD} = 40 V (Note 1)	T _a =-40 to 125 °C	—	—	1	ms
Turn-off time	t _{OFF}			—	—	1	

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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