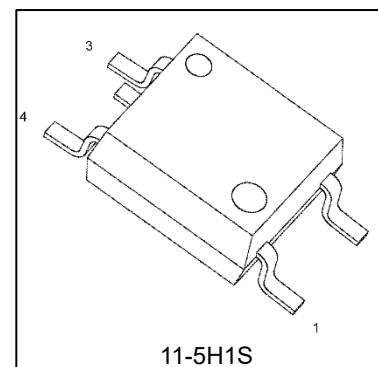


TLP3115

1. Description

The Toshiba TLP3115 consists of an infrared emitting diode optically coupled to a photo-MOSFET in a 4-pin SOP package.

This photorelay features extremely low On-state resistance, enabling it to be used for high-frequency measuring instrument applications.



Weight: 0.1 g (typ.)

2. Applications

ATE (Automatic Test Equipment)
High-Speed Logic IC Testers
High-Speed Memory Testers
Measuring Instruments

3. Features

- Package : SOP (2.54SOP4) (Height 2.1 mm, pitch 2.54 mm)
- Normally opened (1-Form-A)
- OFF-state output terminal voltage: 40 V (min)
- Trigger LED current: 4 mA (max)
- ON-state current: 300 mA (max)
- ON-state resistance: 1 Ω (typ.), 1.5 Ω (max)
- Output capacitance: 10 pF (typ.), 14 pF (max)
- Isolation voltage: 1500 V_{rms} (min)
- Safety standards
 - UL-recognized: UL 1577, File No.E67349
 - cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349

Start of commercial production
2000-11

4. Pin Assignment

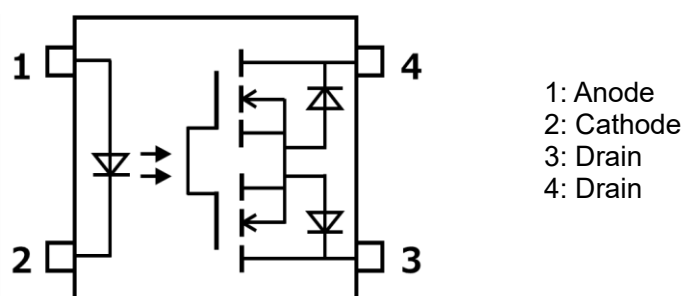


Figure 4.1 Pin Assignment

5. Internal Circuit

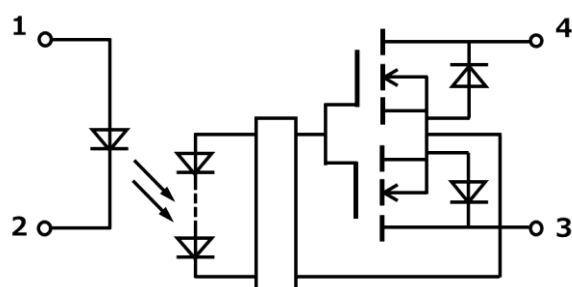


Figure 5.1 Internal Circuit

6. Absolute Maximum Ratings (Note)

($T_a = 25^\circ\text{C}$ unless otherwise specified)

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	I_F		50	mA
	Input forward current derating ($T_a \geq 25^\circ\text{C}$)	$\Delta I_F / \Delta T_a$		-0.5	mA/ $^\circ\text{C}$
	Input reverse voltage	V_R		5	V
	Input power dissipation	P_D		50	mW
	Input power dissipation derating ($T_a \geq 25^\circ\text{C}$)	$\Delta P_D / \Delta T_a$		-0.5	mW/ $^\circ\text{C}$
	Junction temperature	T_j		125	$^\circ\text{C}$
Detector	OFF-state output terminal voltage	V_{OFF}		40	V
	ON-state current	I_{ON}		300	mA
	ON-state current derating ($T_a \geq 25^\circ\text{C}$)	$\Delta I_{ON} / \Delta T_a$		-3.0	mA/ $^\circ\text{C}$
	Output power dissipation	P_O		135	mW
	Output power dissipation derating ($T_a \geq 25^\circ\text{C}$)	$\Delta P_O / \Delta T_a$		-1.35	mW/ $^\circ\text{C}$
	Junction temperature	T_j		125	$^\circ\text{C}$
Common	Storage temperature	T_{stg}		-40 to 125	$^\circ\text{C}$
	Operating temperature	T_{opr}		-20 to 85	$^\circ\text{C}$
	Lead soldering temperature (10 s)	T_{sol}		260	$^\circ\text{C}$
	Isolation voltage (AC, 60 s, R.H. $\leq 60\%$)	BV_S	(Note 1)	1500	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 device is sensitive to electrostatic discharge. When using this device, please ensure that all tools and equipment are earthed.

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

7. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V_{DD}		—	—	32	V
Input forward current	I_F		10	—	30	mA
ON-state current	I_{ON}		—	—	300	mA
Operating temperature	T_{opr}		25	—	60	$^\circ\text{C}$

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.

8. Electrical Characteristics

($T_a = 25^\circ\text{C}$ unless otherwise specified)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	V_F		$I_F = 10\text{ mA}$	1.0	1.15	1.3	V
	Input reverse current	I_R		$V_R = 5\text{ V}$	—	—	10	μA
	Input capacitance	C_t		$V = 0\text{ V}, f = 1\text{ MHz}$	—	15	—	pF
Detector	OFF-state current	I_{OFF}		$V_{\text{OFF}} = 30\text{ V}, T_a = 50^\circ\text{C}$	—	—	1000	pA
	Output capacitance	C_{OFF}		$V = 0\text{ V}, f = 100\text{ MHz}, t < 1\text{ s}$	—	10	14	pF

9. Coupled Electrical Characteristics

($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I_{FT}		$I_{\text{ON}} = 100\text{ mA}$	—	—	4	mA
Return LED current	I_{FC}		$I_{\text{OFF}} = 10\text{ }\mu\text{A}$	0.2	0.75	—	mA
ON-state resistance	R_{ON}		$I_{\text{ON}} = 300\text{ mA}, I_F = 5\text{ mA}, t < 1\text{ s}$	—	1	1.5	Ω

10. Isolation Characteristics

($T_a = 25^\circ\text{C}$ unless otherwise specified)

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)	$V_S = 500\text{ V}, \text{R.H.} \leq 60\%$	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	(Note 1)	AC, 60 s	1500	—	—	V_{rms}

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

11. Switching Characteristics

($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}		See Figure 11.1 $R_L = 200\text{ }\Omega, V_{\text{DD}} = 10\text{ V}, I_F = 10\text{ mA}$	—	—	500	μs
Turn-off time	t_{OFF}		See Figure 11.1 $R_L = 200\text{ }\Omega, V_{\text{DD}} = 10\text{ V}, I_F = 10\text{ mA}$	—	—	500	

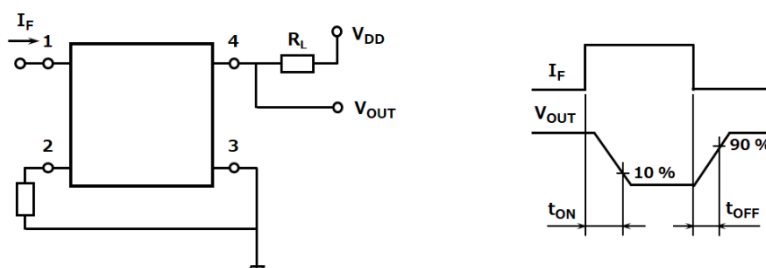


Figure 11.1 Switching Time Test Circuit and Waveform

12. Characteristics Curves and Circuit Connections (Note)

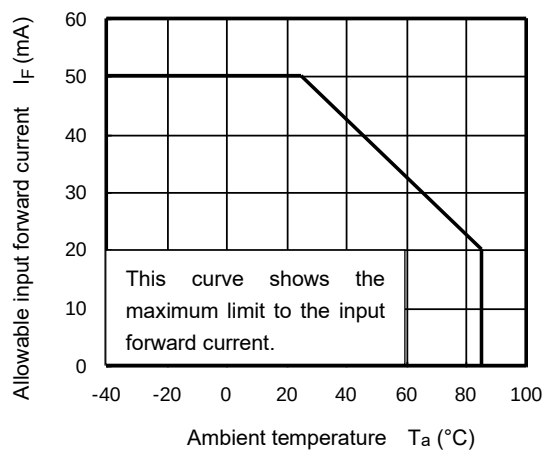


Fig.12.1 $I_F - T_a$

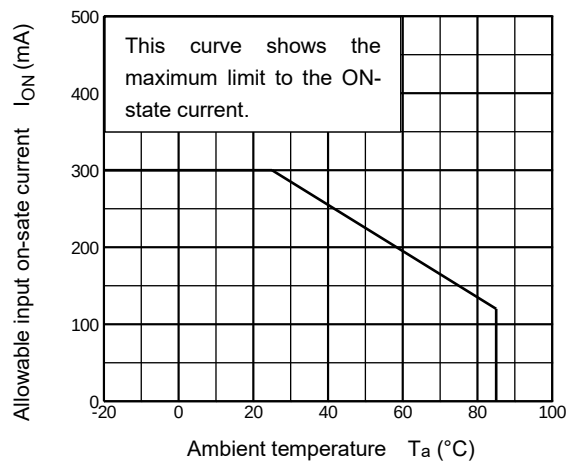


Fig.12.2 $I_{ON} - T_a$

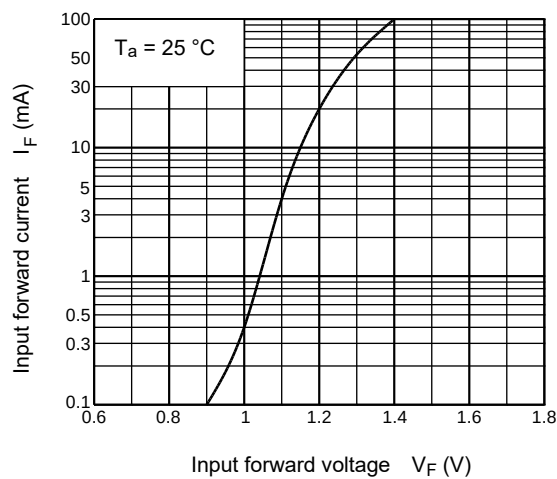


Fig.12.3 $I_F - V_F$

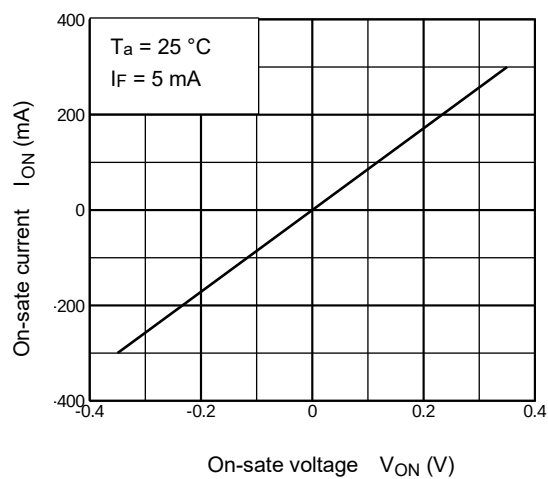


Fig.12.4 $I_{ON} - V_{ON}$

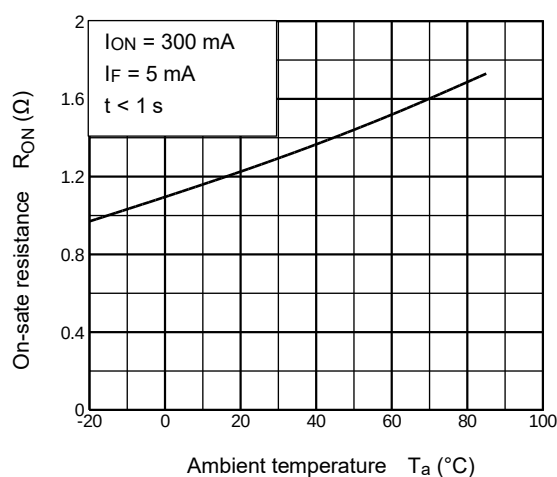


Fig.12.5 $R_{ON} - T_a$

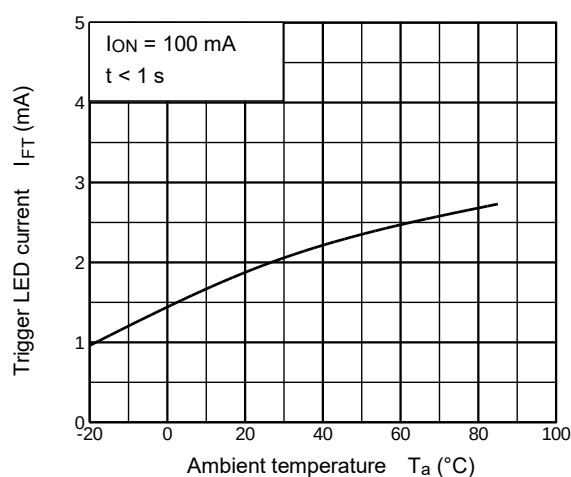
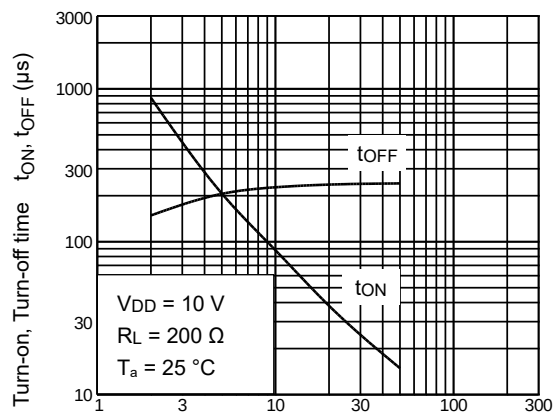
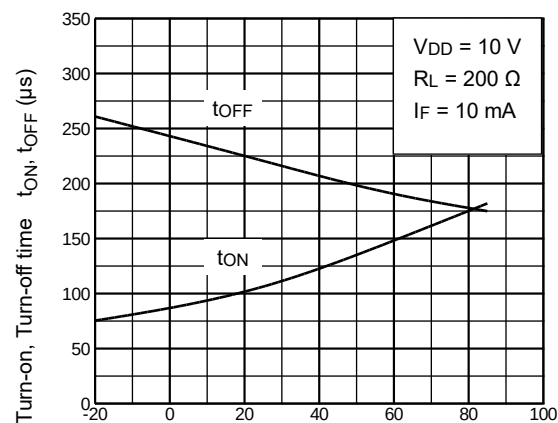


Fig.12.6 $I_{FT} - T_a$



Input forward current I_F (mA)

Fig.12.7 $t_{ON}, t_{OFF} - I_F$



Ambient temperature T_a ($^\circ\text{C}$)

Fig.12.8 $t_{ON}, t_{OFF} - T_a$

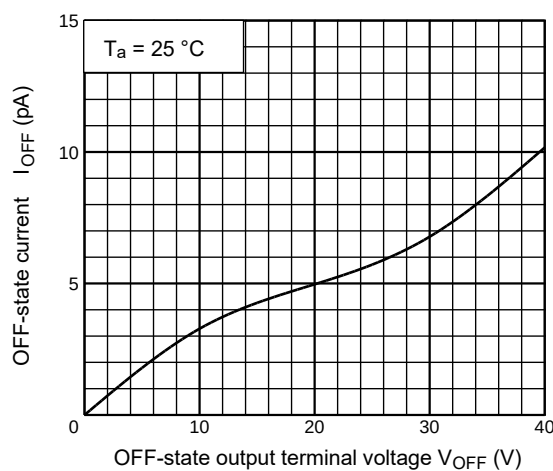


Fig.12.9 $I_{OFF} - V_{OFF}$

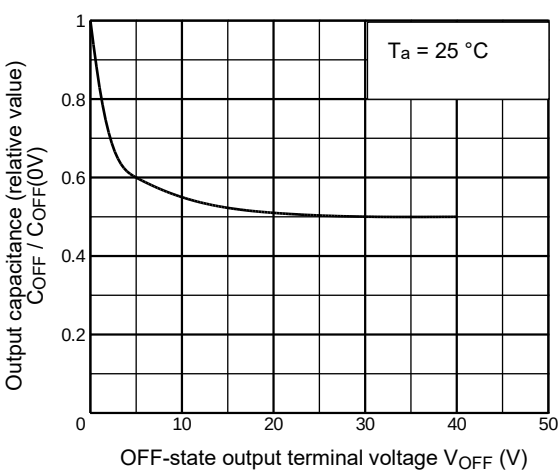


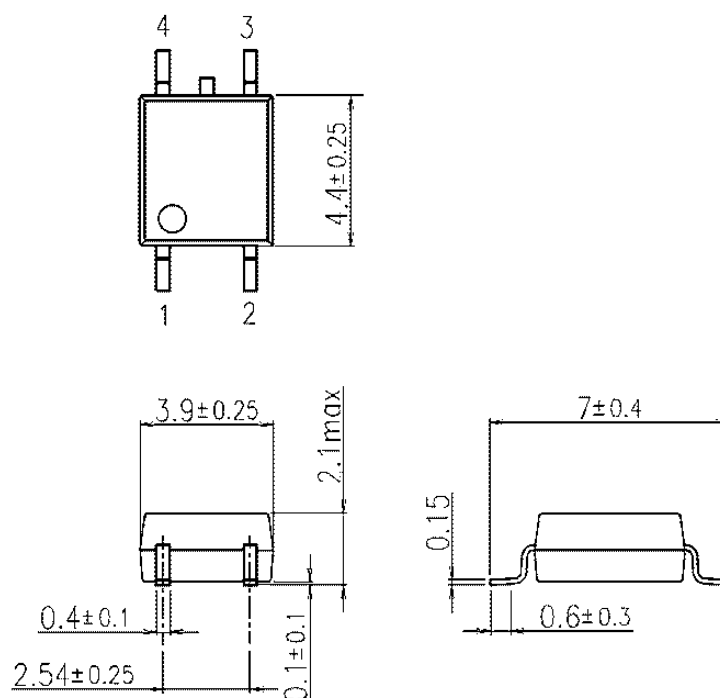
Fig.12.10 $C_{OFF} / C_{OFF(0V)} - V_{OFF}$

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

13. Package Dimensions

11-5H1S

Unit: mm



Weight: 0.1 g (typ.)

Fig. 13.1 Package Dimensions

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