Photocouplers Photorelay

TLP222D

1. Applications

- Mechanical relay replacements
- Security Systems
- Measuring Instruments
- Factory Automation (FA)
- Amusement Equipment
- Smart Meters
- Electricity Meters

2. General

The TLP222D photorelay consist of a photo MOSFET optically coupled to an infrared LED. They are housed in a 4-pin DIP package whose withstanding voltage is 200V.

3. Features

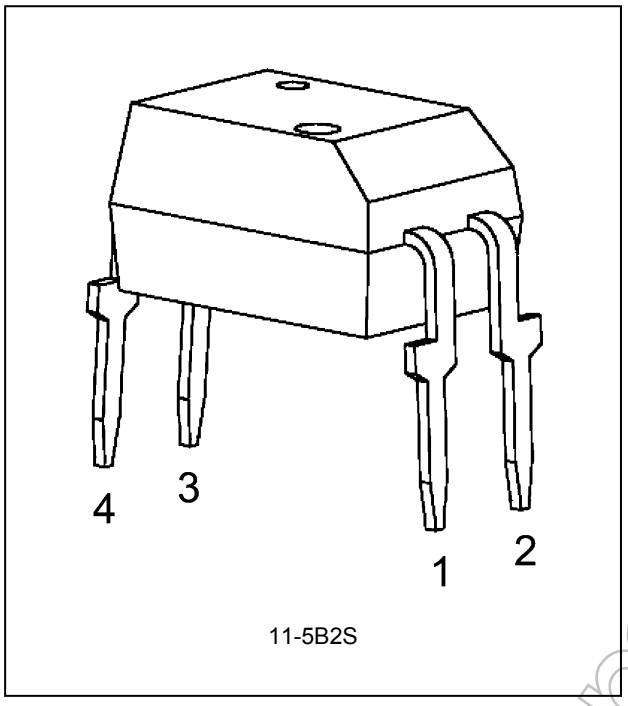
(1) Normally opened (1-Form-A)
(2) OFF-state output terminal voltage: 200 V (min)
(3) Trigger LED current: 3 mA (max)
(4) ON-state current: 300 mA (max)
(5) ON-state resistance: 8 Ω (max, Continuous)

(6) Isolation voltage: 2500 Vrms (min)
(7) Safety standards
UL-recognized: UL 1577, File No.E67349
cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349

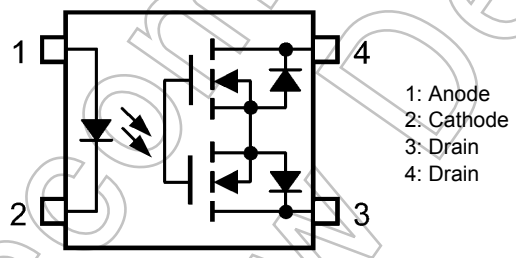
Start of commercial production
2013-05

2019-11-21
Rev.4.0

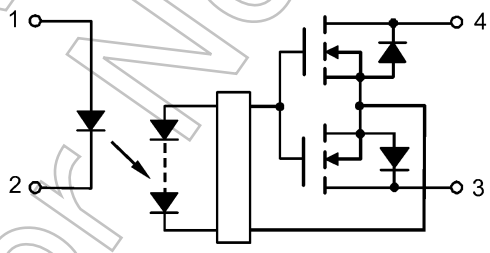
4. Packaging



5. Pin Assignment



6. Internal Circuit



7. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

	Characteristics		Symbol	Note	Rating	Unit
LED	Input forward current		I_F		50	mA
	Input forward current derating	($T_a \geq$ 25 °C)	$\Delta I_F/\Delta T_a$		-0.5	mA/°C
	Input forward current (pulsed)	(100 μs pulse, 100 pps)	I_{FP}		1	A
	Input reverse voltage		V_R		6	V
	Input power dissipation		P_D		50	mW
	Input power dissipation derating	($T_a \geq$ 25 °C)	$\Delta P_D/\Delta T_a$		-0.5	mW/°C
	Junction temperature		T_j		125	°C
Detector	OFF-state output terminal voltage		V_{OFF}		200	V
	ON-state current		I_{ON}		300	mA
	ON-state current derating	($T_a \geq$ 25 °C)	$\Delta I_{ON}/\Delta T_a$		-3.0	mA/°C
	ON-state current (pulsed)	(t = 100 ms, Duty = 1/10)	I_{ONP}		0.9	A
	Output power dissipation		P_O		550	mW
	Output power dissipation derating	($T_a \geq$ 25 °C)	$\Delta P_O/\Delta T_a$		-5.5	mW/°C
	Junction temperature		T_j		125	°C
Common	Storage temperature		T_{stg}		-55 to 125	°C
	Operating temperature		T_{opr}		-40 to 85	°C
	Lead soldering temperature	(10 s)	T_{sol}		260	°C
	Isolation voltage	AC, 60 s, R.H. ≤ 60 %	BV_S	(Note 1)	2500	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 2 are shorted together, and pins 3 and 4 are shorted together.

8. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V_{DD}		—	—	160	V
Input forward current	I_F		5	7.5	25	mA
ON-state current	I_{ON}		—	—	300	mA
Operating temperature	T_{opr}		-20	—	65	°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.

9. Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	V_F		I_F = 10 mA	1.0	1.15	1.3	V
	Input reverse current	I_R		V_R = 5 V	—	—	10	μA
	Input capacitance	C_t		V = 0 V, f = 1 MHz	—	30	—	pF
Detector	OFF-state current	I_{OFF}		V_{OFF} = 200 V	—	—	1000	nA
	Output capacitance	C_{OFF}		V = 0 V, f = 1 MHz	—	100	—	pF

10. Coupled Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I_{FT}		I_{ON} = 300 mA	—	0.5	3	mA
Return LED current	I_{FC}		I_{OFF} = 10 μA	0.1	—	—	
ON-state resistance	R_{ON}	(Note 1)	I_{ON} = 300 mA, I_F = 5 mA, Continuous	—	5	8	Ω

Note 1: Thermally saturated state.

11. Isolation Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Total capacitance (input to output)	C_S	(Note 1)	V_S = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	(Note 1)	V_S = 500 V, R.H. ≤ 60 %	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	(Note 1)	AC, 60 s	2500	—	—	Vrms

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.

12. Switching Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}		See Fig. 12.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 5 mA	—	1.0	3.0	ms
			See Fig. 12.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 10 mA	—	0.5	1.0	
Turn-off time	t_{OFF}		See Fig. 12.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 5 mA	—	0.1	1.0	
			See Fig. 12.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 10 mA	—	0.1	1.0	

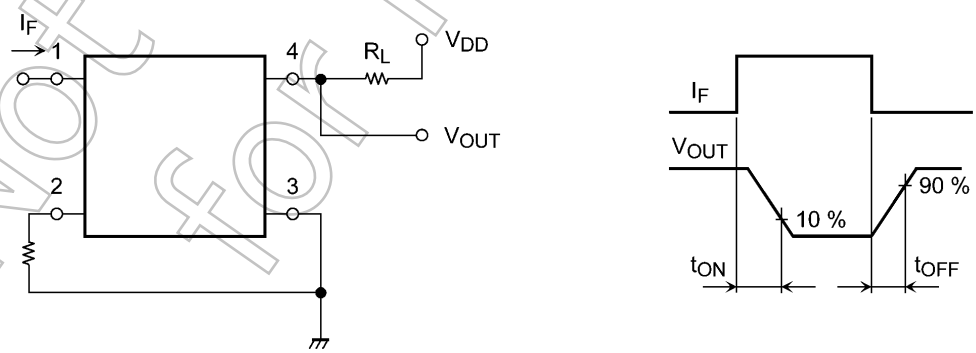


Fig. 12.1 Switching Time Test Circuit and Waveform

13. Characteristics Curves

13.1. Characteristics Curves (Note)

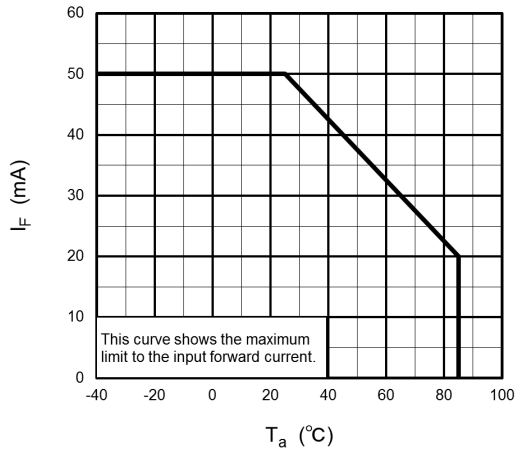


Fig. 13.1.1 I_F - T_a

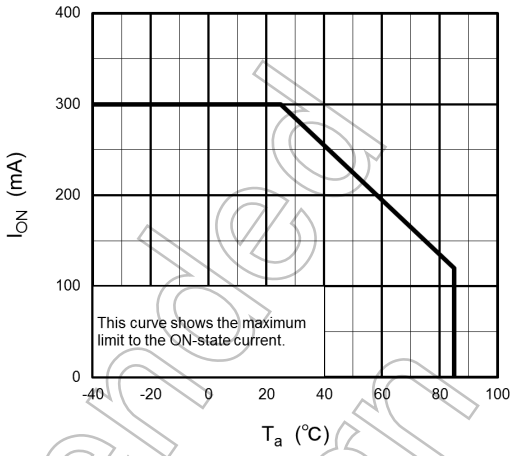


Fig. 13.1.2 I_{ON} - T_a

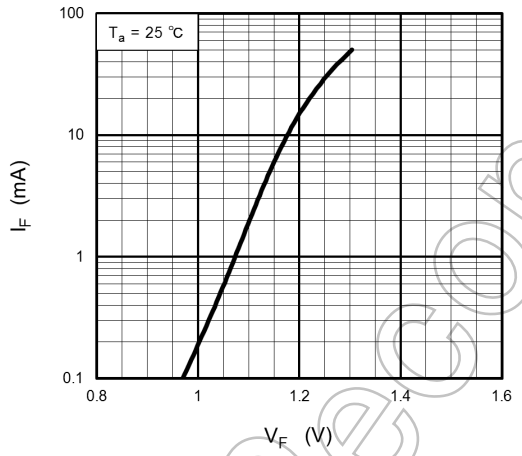


Fig. 13.1.3 I_F - V_F

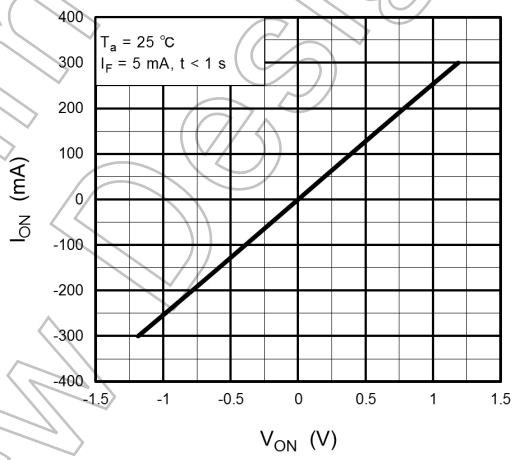


Fig. 13.1.4 I_{ON} - V_{ON}

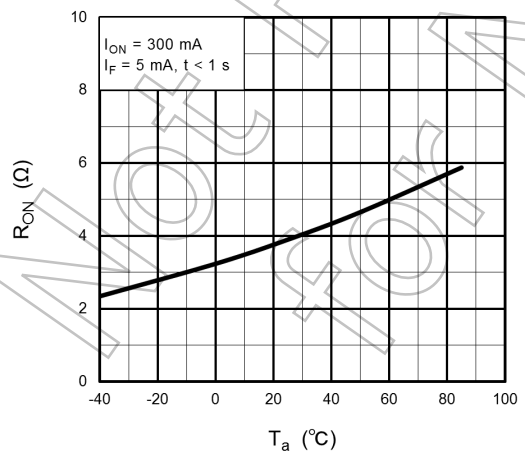


Fig. 13.1.5 R_{ON} - T_a

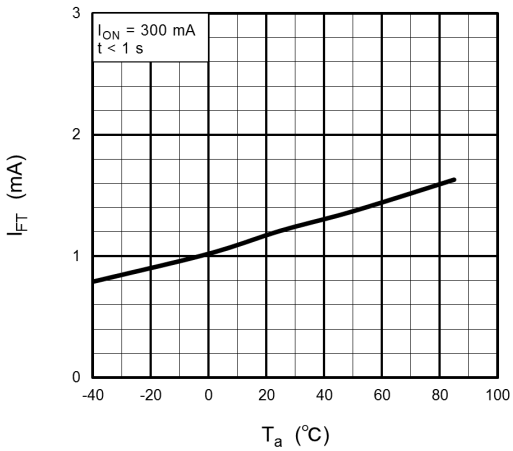


Fig. 13.1.6 I_{FT} - T_a

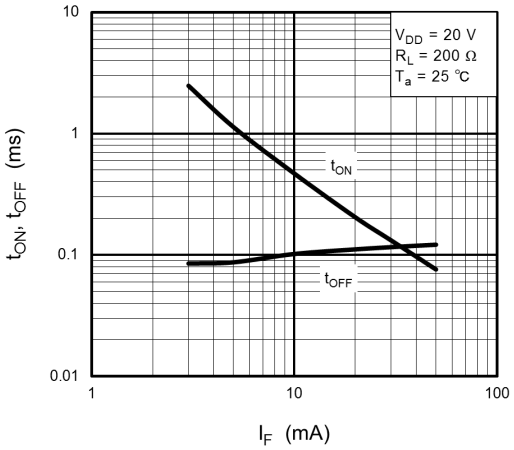


Fig. 13.1.7 t_{ON}, t_{OFF} - I_F

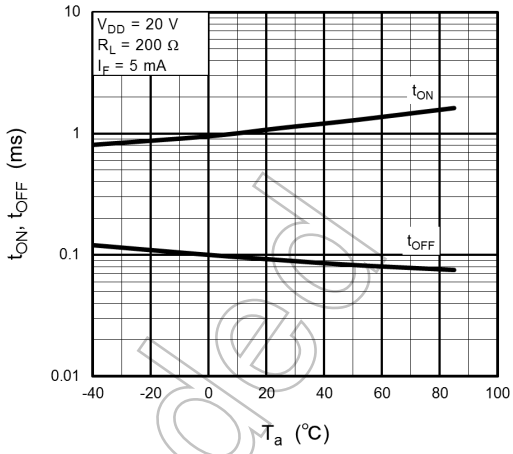


Fig. 13.1.8 t_{ON}, t_{OFF} - T_a

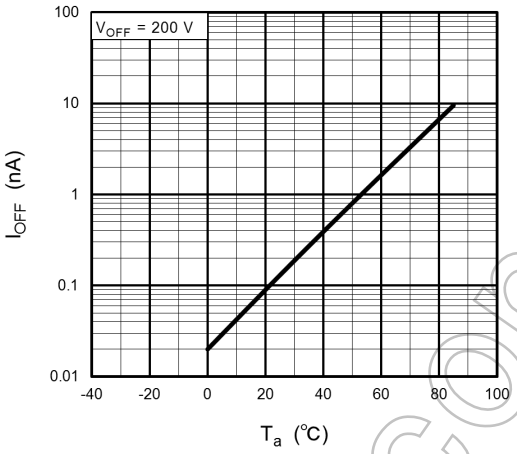
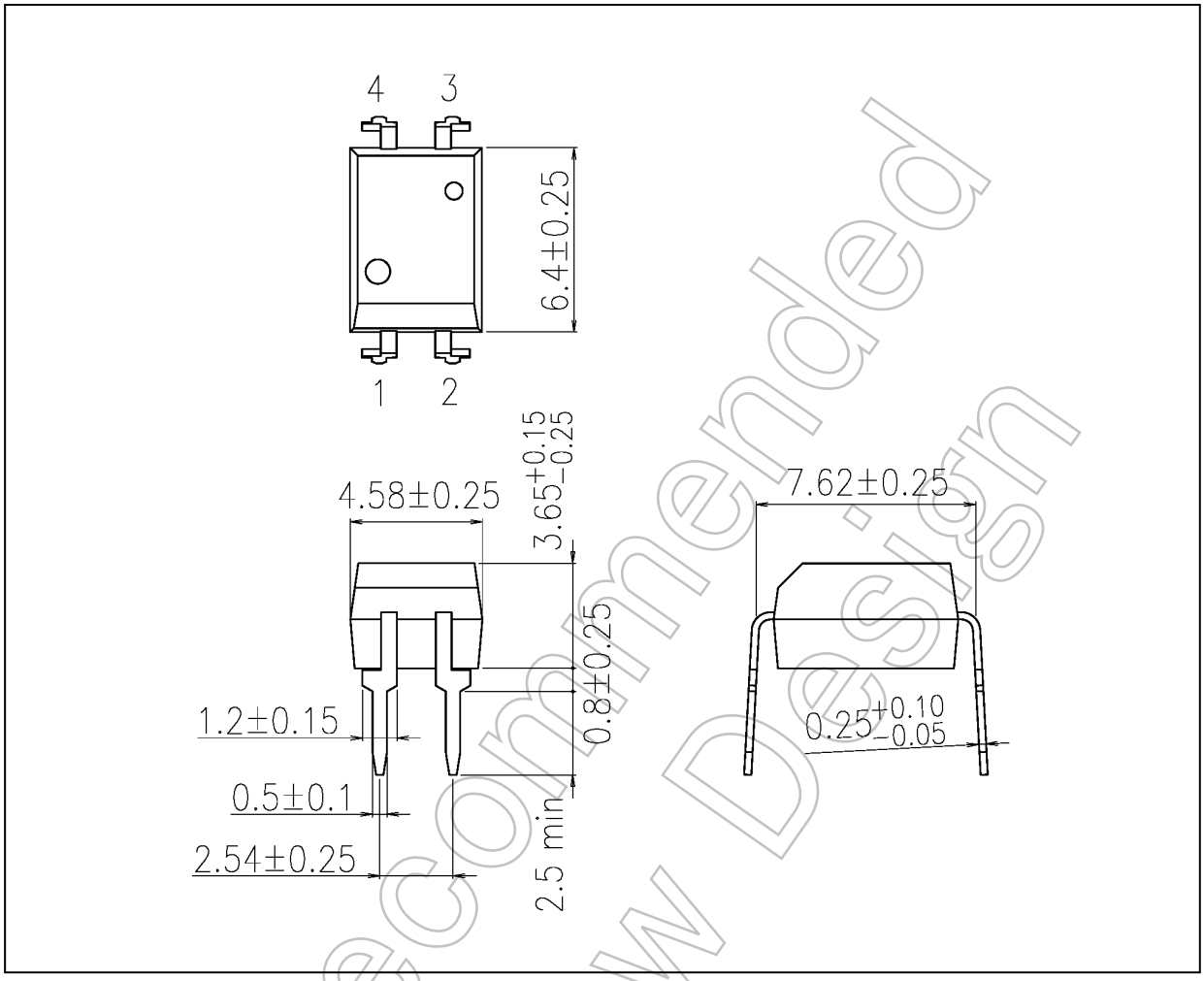


Fig. 13.1.9 I_{OFF} - T_a

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

Package Dimensions

Unit: mm



Weight: 0.26 g (typ.)

Package Name(s)
TOSHIBA: 11-5B2S

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