Photocouplers Photorelay

TLP241A,TLP241AF

1. Applications

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

2. General

The TLP241A nad TLP241AF photorelay consist of a photo MOSFET optically coupled to an infrared light emitting diode. They are housed in a 4-pin DIP package. They provide an isolation voltage of 5000 Vrms, making them suitable for applications that require reinforced insulation.

3. Features

(1) Normally opened (1-Form-A)

(2) OFF-state output terminal voltage: 40 V (min)

(3) Trigger LED current: 3 mA (max)

(4) ON-state current: 2.0 A (max)

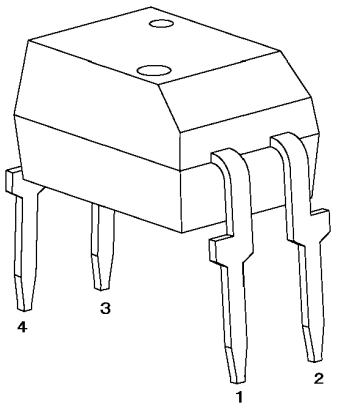
(5) ON-state resistance: 100 mΩ (max, t < 1s)
150 mΩ (max, Continuous)

(6) Isolation voltage: 5000 Vrms (min)

(7) Safety standards
UL-under application: UL1577 File No. E67349
cUL-under application: CSA Component Acceptance Service No. 5A, File No. E67349
VDE-under application: EN60747-5-5

4. Packaging

TLP241A



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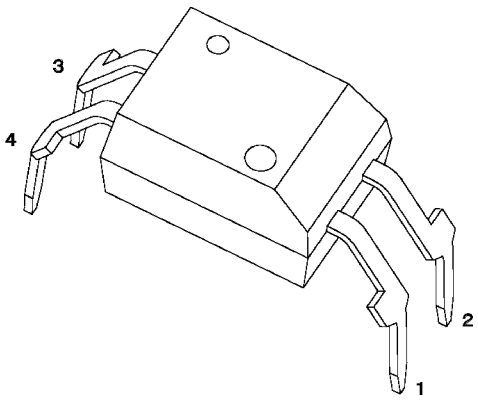
TLP241AF



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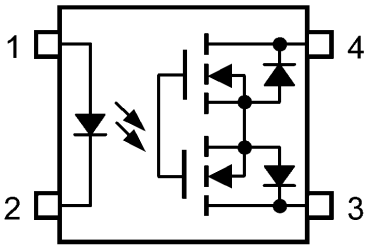
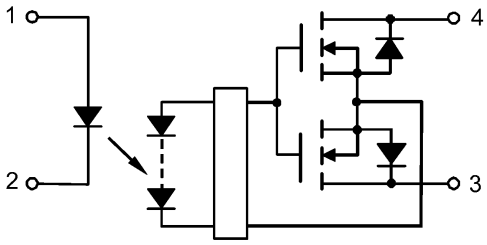
5. Pin Assignment



1: Anode
2: Cathode
3: Drain
4: Drain

6. Internal Circuit



7. Mechanical Parameters

Characteristics	7.62-mm Pitch TLP241A	10.16-mm Pitch TLP241AF	Unit
Creepage distances	7.0 (min)	8.0 (min)	mm
Clearance distances	7.0 (min)	8.0 (min)	
Internal isolation thickness	0.4 (min)	0.4 (min)	

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

	Characteristics		Symbol	Note	Rating	Unit
LED	Input forward current		I_F		30	mA
	Input forward current derating	($T_a \geq$ 25 °C)	$\Delta I_F/\Delta T_a$		-0.3	mA/°C
	Input forward current (pulsed)	(100 μs pulse, 100 pps)	I_{FP}		1	A
	Input reverse voltage		V_R		5	V
	Input power dissipation		P_D		50	mW
	Junction temperature		T_j		125	°C
Detector	OFF-state output terminal voltage		V_{OFF}		40	V
	ON-state current		I_{ON}		2.0	A
	ON-state current derating	($T_a \geq$ 25 °C)	$\Delta I_{ON}/\Delta T_a$		-20	mA/°C
	ON-state current (pulsed)	(t = 100 ms, Duty = 1/10)	I_{ONP}		6.0	A
	Output power dissipation		P_O		500	mW
	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, 1 min, R.H. ≤ 60 %	BV_S	(Note 1)	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 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.

9. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V_{DD}		—	—	32	V
Input forward current	I_F		5	7.5	25	mA
ON-state current	I_{ON}		—	—	2.0	A
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 datasheet should also be considered.

10. 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	1.1	1.27	1.4	V
	Input reverse current	I_R		V_R = 5 V	—	—	10	μA
	Input capacitance	C_t		V = 0 V, f = 1 MHz	—	50	—	pF
Detector	OFF-state current	I_{OFF}		V_{OFF} = 40 V	—	—	1000	nA
	Output capacitance	C_{OFF}		V = 0 V, f = 1 MHz	—	300	—	pF

11. 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} = 1.0 A	—	0.5	3	mA
Return LED current	I_{FC}		I_{OFF} = 10 μA	0.1	—	—	
ON-state resistance	R_{ON}		I_{ON} = 2.0 A, I_F = 5 mA, t < 1s	—	60	100	mΩ
		(Note 1)	I_{ON} = 2.0 A, I_F = 5 mA, Continuous	—	90	150	

Note 1: Thermally saturated state.

12. 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 %	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	(Note 1)	AC, 1 min	5000	—	—	Vrms
			AC, 1s in oil	—	10000	—	
			DC, 1 min, in oil	—	10000	—	Vdc

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.

13. 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. 13.1. R_L = 200 Ω, V_{DD} = 20 V, I_F = 10 mA	—	2.8	5	ms
Turn-off time	t_{OFF}			—	0.3	1	

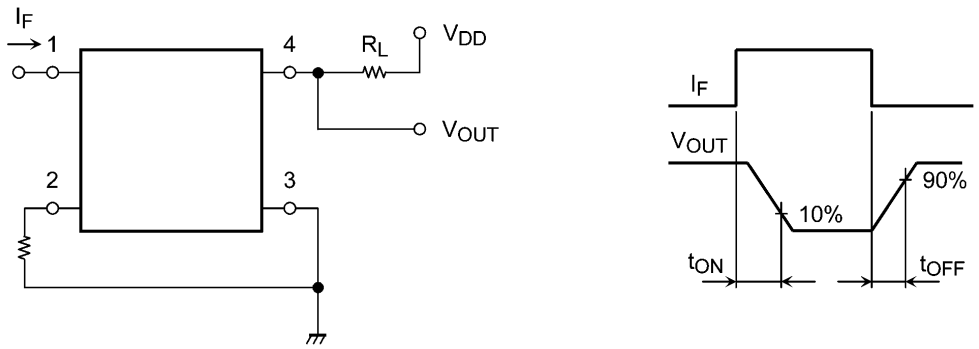


Fig. 13.1 Switching Time Test Circuit

14. Characteristics Curves

14.1. Characteristics Curves (Note)

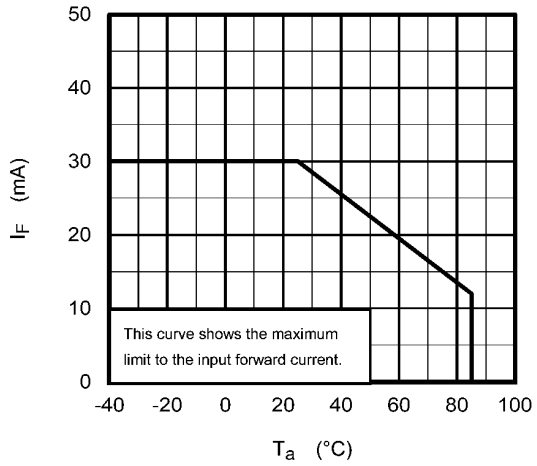


Fig. 14.1.1 I_F - T_a

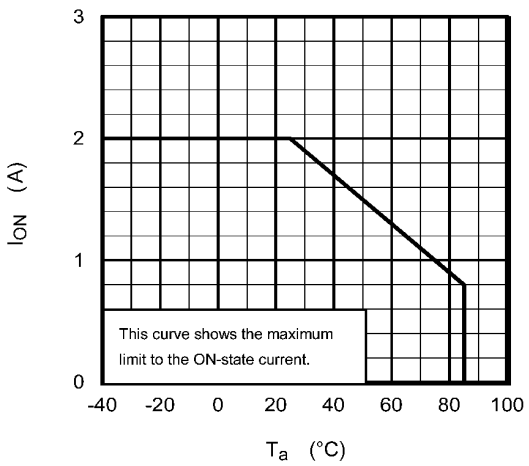


Fig. 14.1.2 I_{ON} - T_a

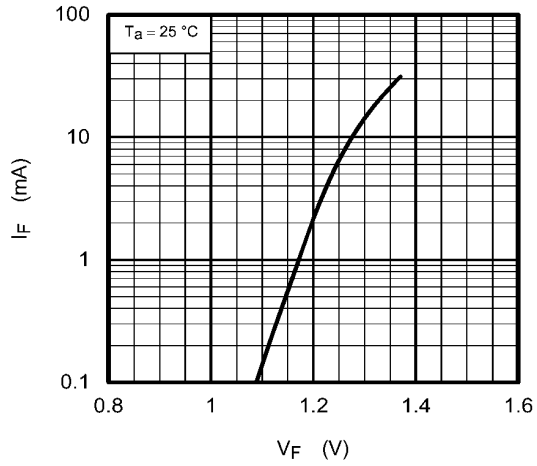


Fig. 14.1.3 I_F - V_F

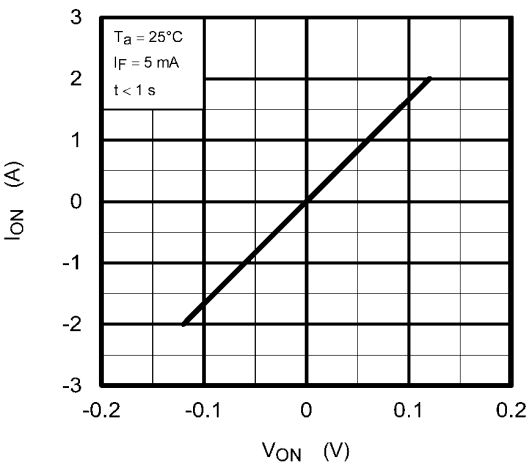


Fig. 14.1.4 I_{ON} - V_{ON}

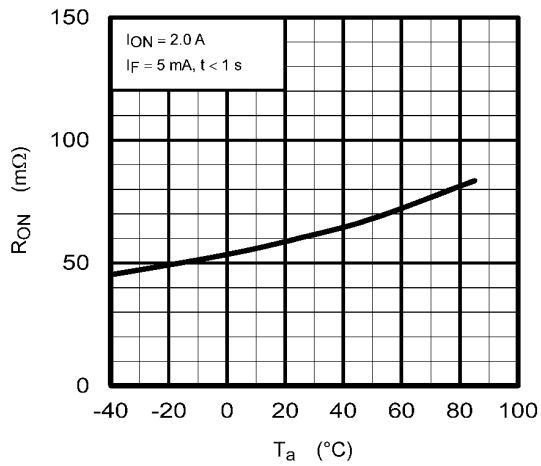


Fig. 14.1.5 R_{ON} - T_a

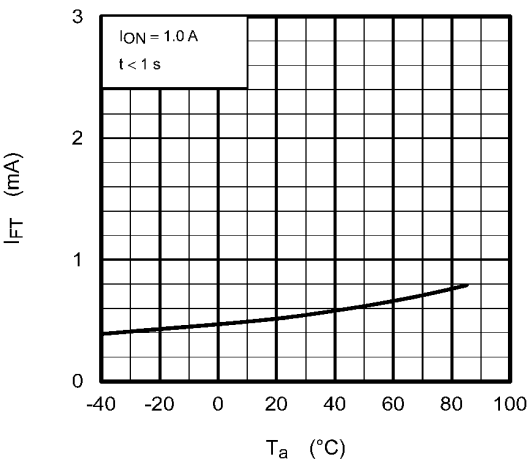


Fig. 14.1.6 I_{FT} - T_a

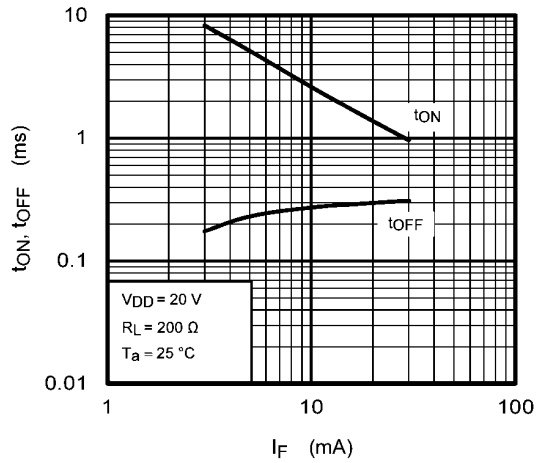


Fig. 14.1.7 t_{ON}, t_{OFF} - I_F

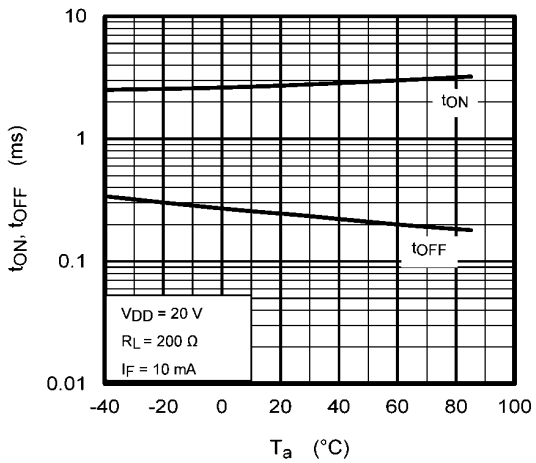


Fig. 14.1.8 t_{ON}, t_{OFF} - T_a

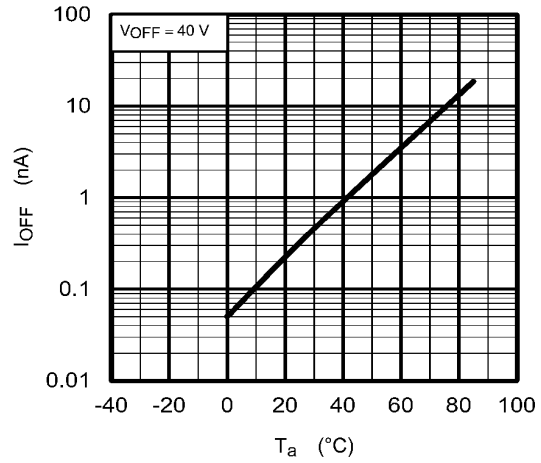


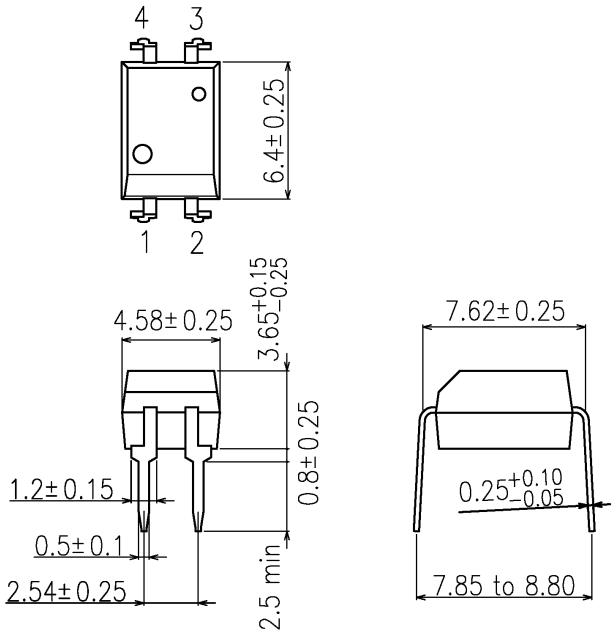
Fig. 14.1.9 I_{OFF} - T_a

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

Package Dimensions

Unit: mm

TLP241A



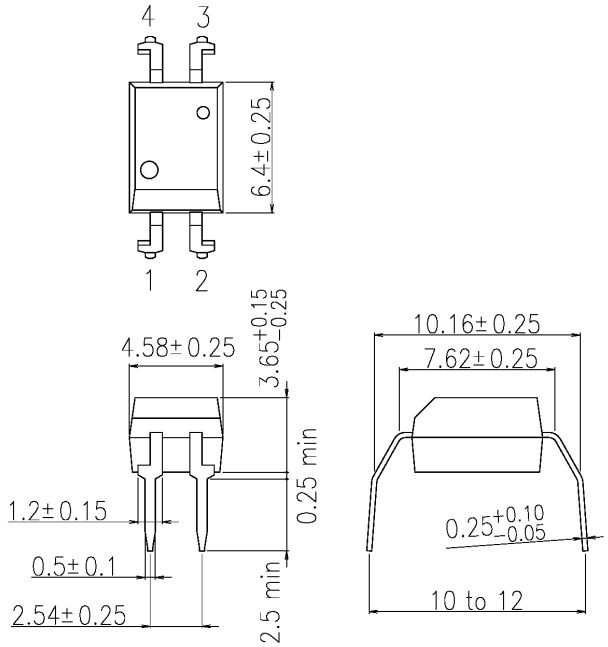
Weight: 0.26 g (typ.)

Package Name(s)
TOSHIBA: 11-5B2S

Package Dimensions

Unit: mm

TLP241AF



Weight: 0.26 g (typ.)

Package Name(s)
TOSHIBA: 11-5B202S

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