

# TLP240D,TLP240DF

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## 1. Applications

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

## 2. General

The TLP240D and TLP240DF 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

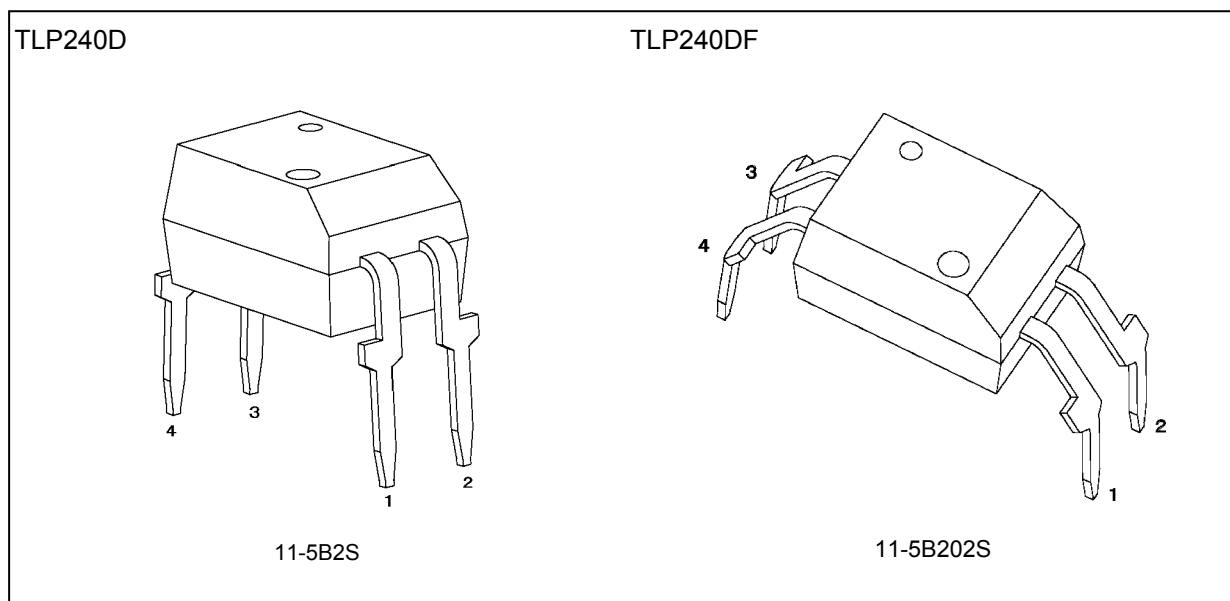
- (1) Normally opened (1-Form-A)
- (2) OFF-state output terminal voltage: 200 V (min)
- (3) Trigger LED current: 3 mA (max)
- (4) ON-state current: 250 mA (max)
- (5) ON-state resistance: 8  $\Omega$  (max)
- (6) Isolation voltage: 5000 Vrms (min)
- (7) Safety standards

UL-under application: UL1577 File No. E67349

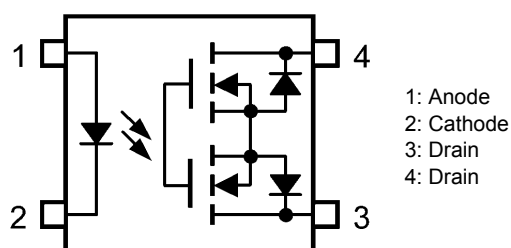
cUL-under application: CSA Component Acceptance Service No. 5A, File No. E67349

VDE-under application: EN60747-5-5

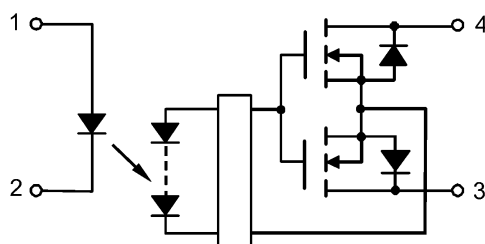
## 4. Packaging



## 5. Pin Assignment



## 6. Internal Circuit



## 7. Mechanical Parameters

Characteristics	7.62-mm Pitch TLP240D	10.16-mm Pitch TLP240DF	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, $T_a = 25\text{ }^{\circ}\text{C}$ )

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	$I_F$		30	mA
	Input forward current derating ( $T_a \geq 25\text{ }^{\circ}\text{C}$ )	$\Delta I_F / \Delta T_a$		-0.3	mA/ $^{\circ}\text{C}$
	Input forward current (pulsed) (100 $\mu\text{s}$ 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	$^{\circ}\text{C}$
Detector	OFF-state output terminal voltage	$V_{OFF}$		200	V
	ON-state current	$I_{ON}$		250	mA
	ON-state current derating ( $T_a \geq 25\text{ }^{\circ}\text{C}$ )	$\Delta I_{ON} / \Delta T_a$		-2.5	mA/ $^{\circ}\text{C}$
	ON-state current (pulsed) ( $t = 100\text{ ms}$ , Duty = 1/10)	$I_{ONP}$		750	mA
	Output power dissipation	$P_O$		500	mW
	Junction temperature	$T_j$		125	$^{\circ}\text{C}$
Common	Storage temperature	$T_{stg}$		-55 to 125	$^{\circ}\text{C}$
	Operating temperature	$T_{opr}$		-40 to 85	
	Lead soldering temperature (10 s)	$T_{sol}$		260	
	Isolation voltage AC, 1 min, R.H. $\leq 60\%$	$BV_S$	(Note 1)	5000	

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	$V_{DD}$		—	—	160	V
Input forward current	$I_F$		5	7.5	25	mA
ON-state current	$I_{ON}$		—	—	250	
Operating temperature	$T_{opr}$		-20	—	65	$^{\circ}\text{C}$

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 datasheet should also be considered.

**10. Electrical Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^{\circ}\text{C}$ )**

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	$V_F$		$I_F = 10\text{ mA}$	1.1	1.27	1.4	V
	Input reverse current	$I_R$		$V_R = 5\text{ V}$	—	—	10	$\mu\text{A}$
	Input capacitance	$C_t$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	50	—	pF
Detector	OFF-state current	$I_{OFF}$		$V_{OFF} = 200\text{ V}$	—	—	1000	nA
	Output capacitance	$C_{OFF}$		$V = 0\text{ V}, f = 1\text{ MHz}$	—	90	—	pF

**11. Coupled Electrical Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^{\circ}\text{C}$ )**

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$		$I_{ON} = 250\text{ mA}$	—	0.6	3	mA
Return LED current	$I_{FC}$		$I_{OFF} = 10\text{ }\mu\text{A}$	0.1	—	—	
ON-state resistance	$R_{ON}$	(Note 1)	$I_{ON} = 250\text{ mA}, I_F = 5\text{ mA}, \text{Continuous}$	—	5	8	$\Omega$

Note 1: Thermally saturated state.

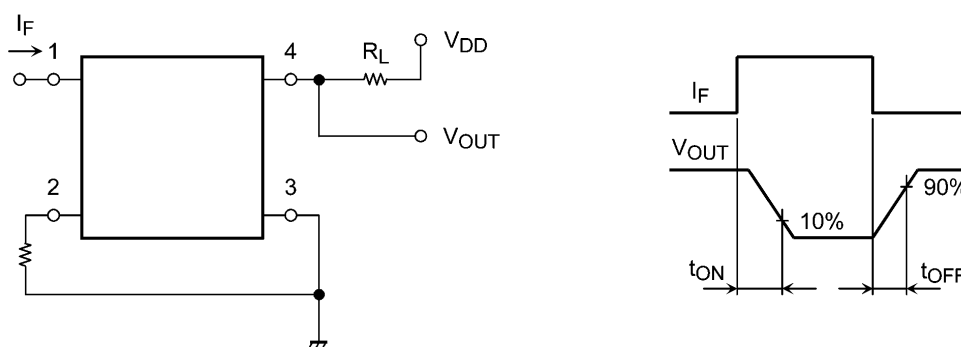
**12. Isolation Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^{\circ}\text{C}$ )**

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)	$V_S = 500\text{ V}, \text{R.H.} \leq 60\%$	$1 \times 10^{12}$	$10^{14}$	—	$\Omega$
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,  $T_a = 25\text{ }^{\circ}\text{C}$ )**

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$		See Fig. 13.1.	—	1	3	ms
Turn-off time	$t_{OFF}$		$R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 5\text{ mA}$	—	0.1	1	



**Fig. 13.1 Switching Time Test Circuit**

## 14. Characteristics Curves

### 14.1. Characteristics Curves (Note)

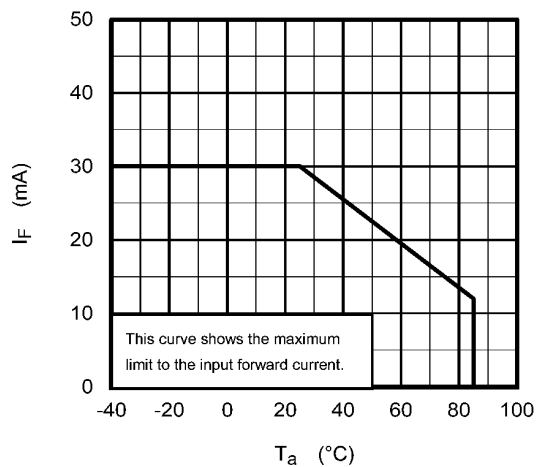


Fig. 14.1.1  $I_F - T_a$

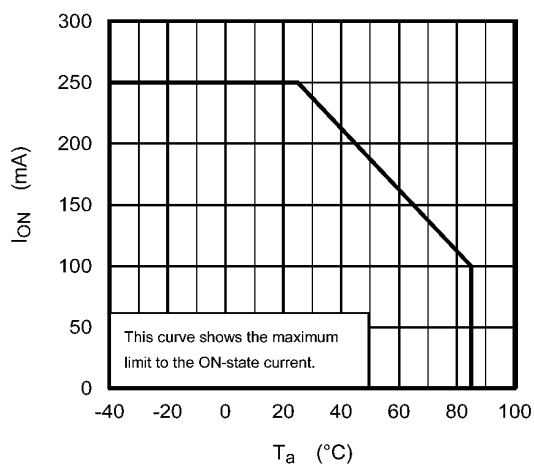


Fig. 14.1.2  $I_{ON} - T_a$

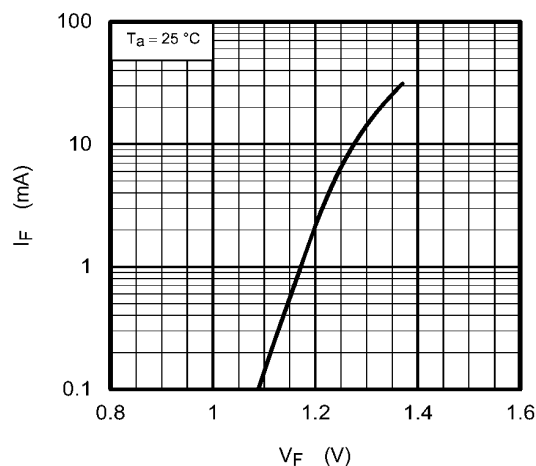


Fig. 14.1.3  $I_F - V_F$

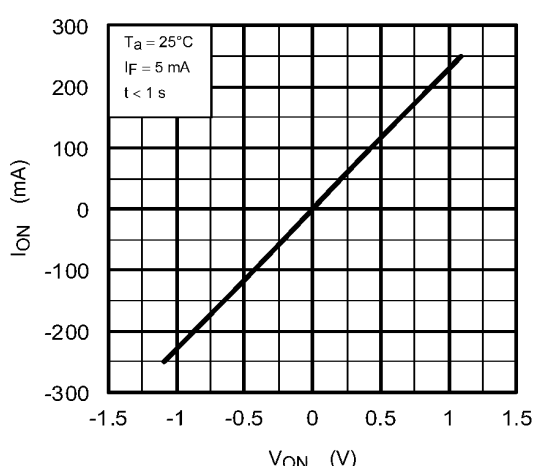


Fig. 14.1.4  $I_{ON} - V_{ON}$

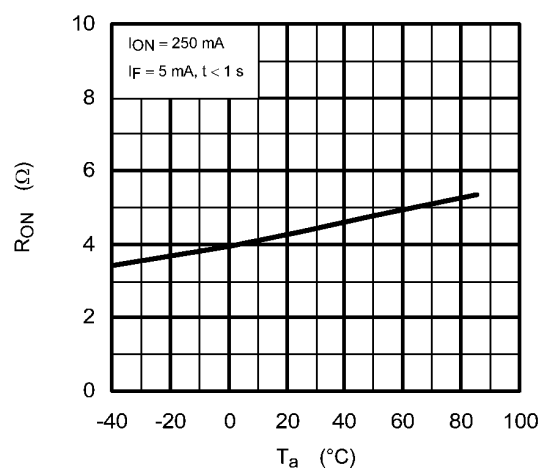


Fig. 14.1.5  $R_{ON} - T_a$

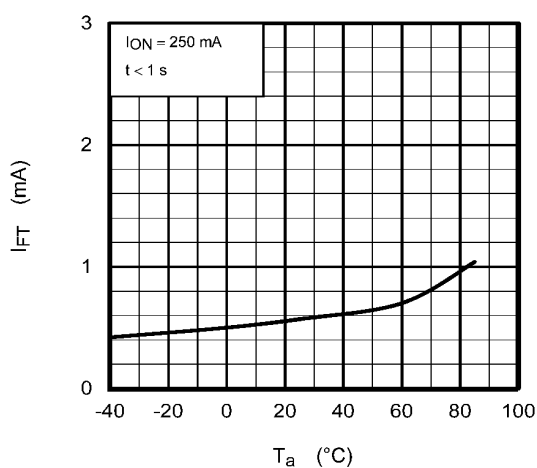
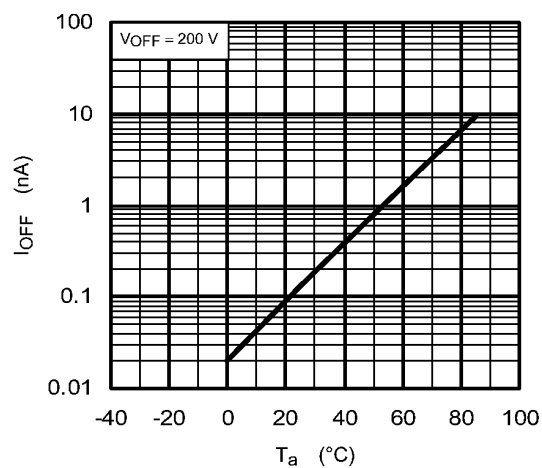
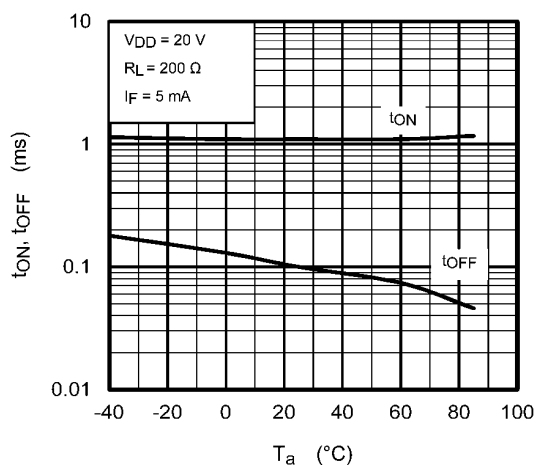
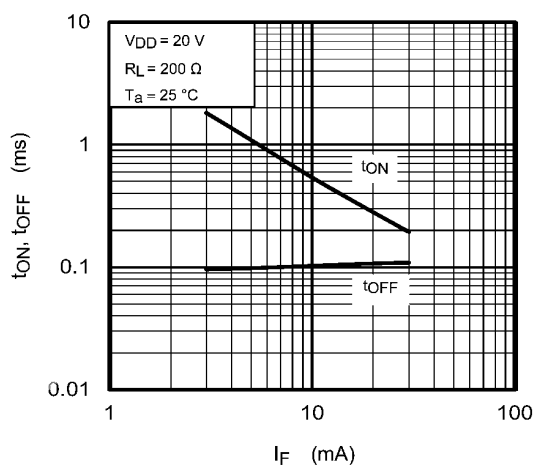


Fig. 14.1.6  $I_{FT} - T_a$

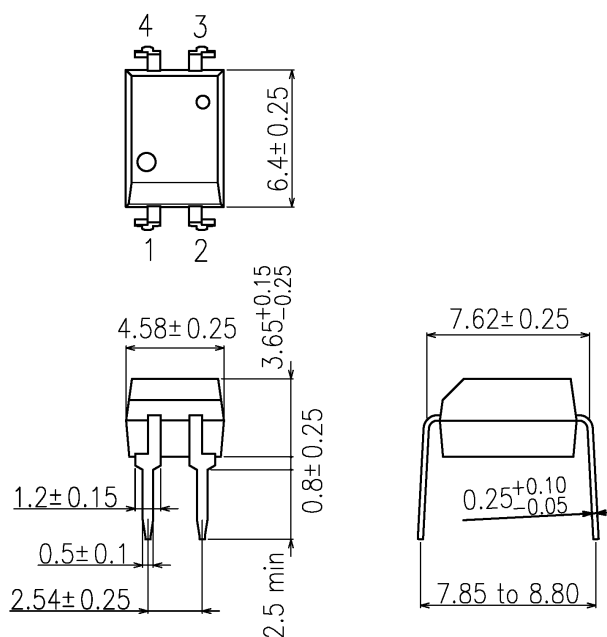


Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

## Package Dimensions

Unit: mm

TLP240D



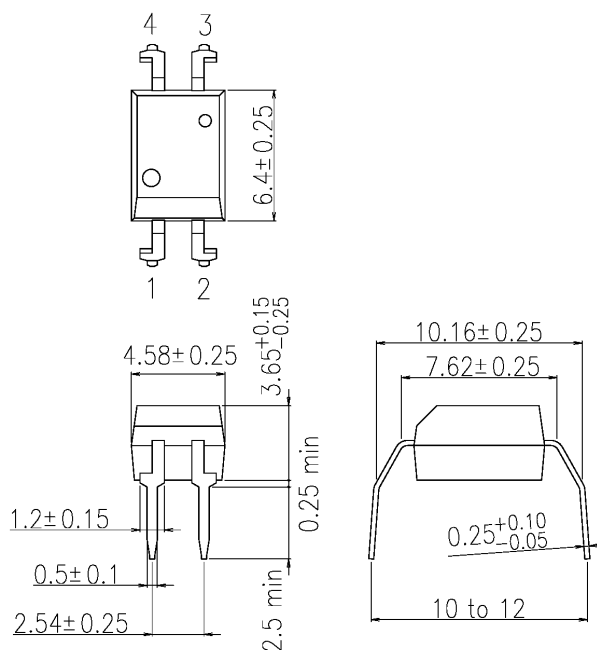
Weight: 0.26 g (typ.)

Package Name(s)
TOSHIBA: 11-5B2S

## Package Dimensions

Unit: mm

TLP240DF



Weight: 0.26 g (typ.)

Package Name(s)
TOSHIBA: 11-5B202S



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