

TLP220G

1. Applications

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

2. General

The TLP220G photorelay consists of a photo MOSFET optically coupled to an infrared light emitting diode. It is housed in a 4-pin DIP package. It provides an isolation voltage of 5000 Vrms, making it suitable for applications that require reinforced insulation.

3. Features

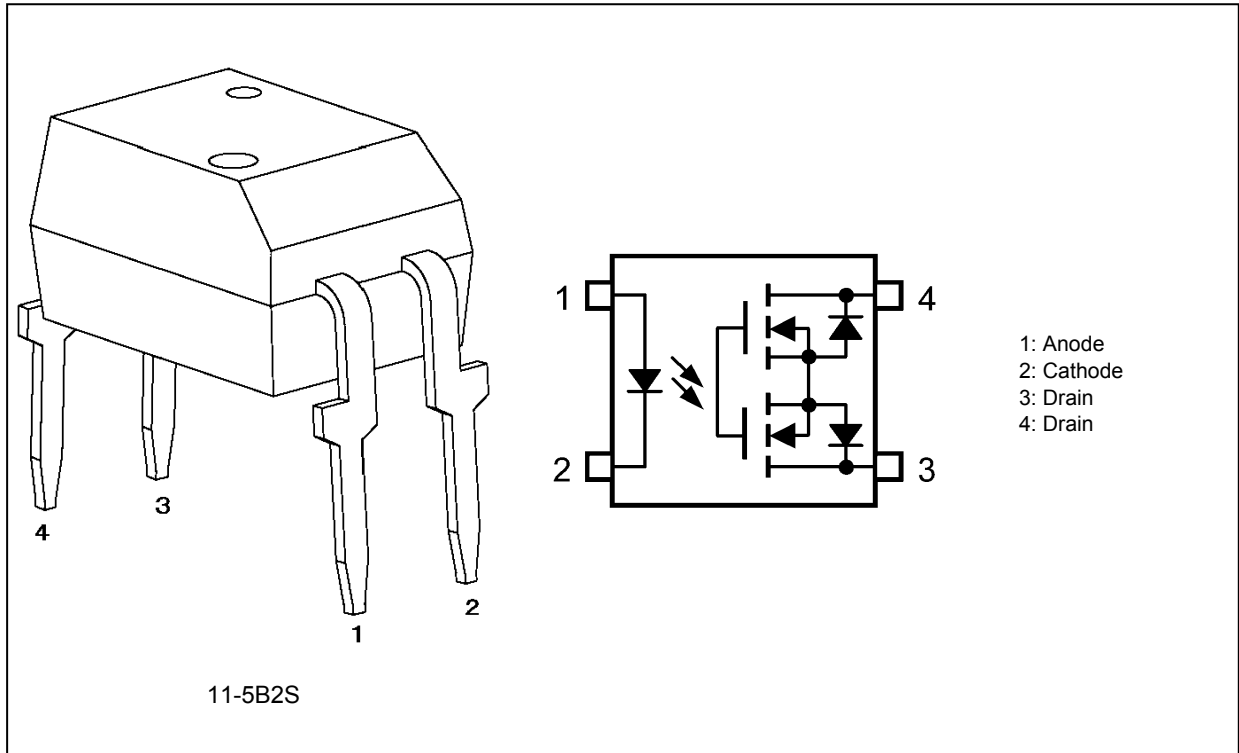
- (1) Normally off (1-Form-A)
- (2) OFF-state output terminal voltage: 350 V (min)
- (3) Trigger LED current: 2 mA (max)
- (4) ON-state current: 100 mA (max)
- (5) ON-state resistance: 35 Ω (max, $t < 1s$)
- (6) ON-state resistance: 50 Ω (max, Continuous)
- (7) Isolation voltage: 5000 Vrms (min)
- (8) Safety standards

UL-approved: UL1577 File No. E67349

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

VDE-under application: Option (D4) EN60747-5-2

4. Packaging and Pin Configuration



5. Internal Circuit

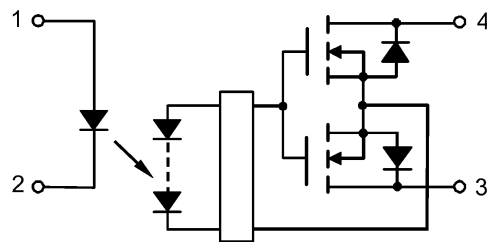


Fig. 5.1 Internal Circuit

6. Mechanical Parameters

Characteristics	7.62-mm Pitch TLP220G	10.16-mm Pitch TLP220GF	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)	

7. 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 ≥ 25°C)	ΔI _F /ΔT _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}		350	V
	ON-state current	I _{ON}		100	mA
	ON-state current derating (T _a ≥ 25°C)	ΔI _{ON} /ΔT _a		-1.0	mA/°C
	ON-state current (pulsed) (t = 100 ms, Duty = 1/10)	I _{ONP}		300	mA
	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	
	Lead soldering temperature (10 s)	T _{sol}		260	
	Isolation voltage AC, 1 min, R.H. ≤ 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.

8. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V _{DD}		—	—	280	V
Input forward current	I _F		3	5	15	mA
ON-state current	I _{ON}		—	—	100	
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.

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	1.45	1.63	1.75	V
	Input reverse current	I _R		V _R = 5 V	—	—	10	μA
	Input capacitance	C _t		V = 0 V, f = 1 MHz	—	40	—	pF
Detector	OFF-state current	I _{OFF}		V _{OFF} = 350 V	—	—	1	μA
	Output capacitance	C _{OFF}		V = 0 V, f = 1 MHz	—	30	—	pF

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

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	I_{FT}		$I_{ON} = 100 \text{ mA}$	—	0.3	2	mA
Return LED current	I_{FC}		$I_{OFF} = 10 \text{ }\mu\text{A}$	0.1	—	—	mA
ON-state resistance	R_{ON}		$I_{ON} = 100 \text{ mA}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	25	35	Ω
		(Note 1)	$I_{ON} = 100 \text{ mA}, I_F = 5 \text{ mA}, \text{Continuous}$	—	35	50	

Note 1: Thermally saturated state.

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

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)	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S		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.

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

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}		See Fig. 12.1. $R_L = 200 \text{ }\Omega, V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	0.1	1	ms
Turn-off time	t_{OFF}			—	0.2	1	

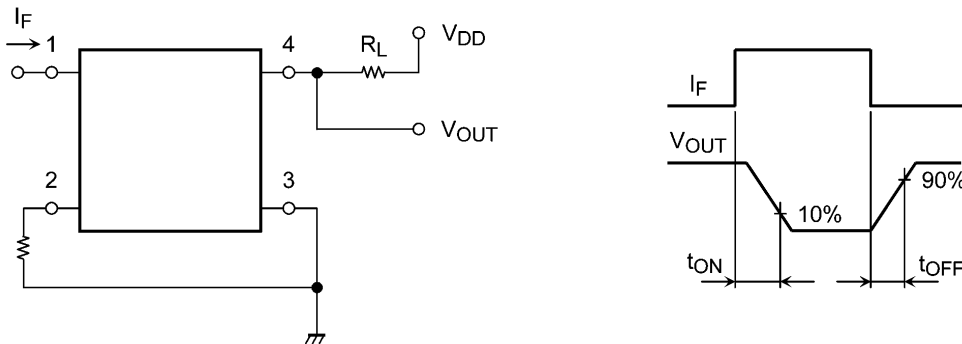


Fig. 12.1 Switching Time Test Circuit

13. Characteristics Curves

13.1. Characteristics Curves (Note)

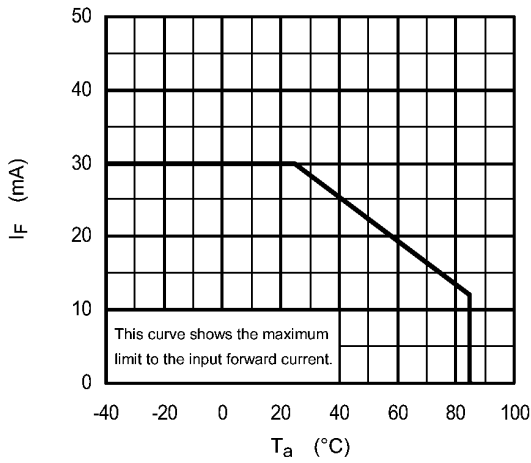


Fig. 13.1.1 I_F - T_a

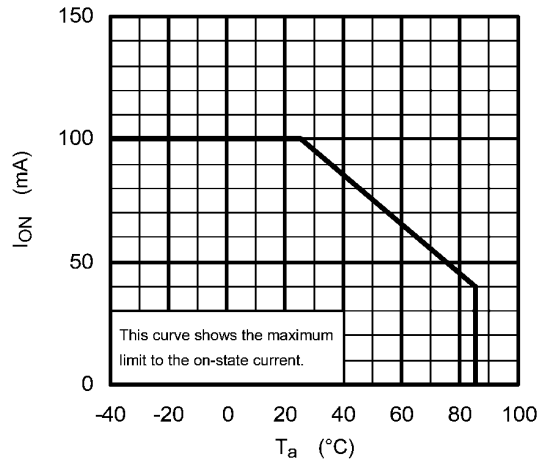


Fig. 13.1.2 I_{ON} - T_a

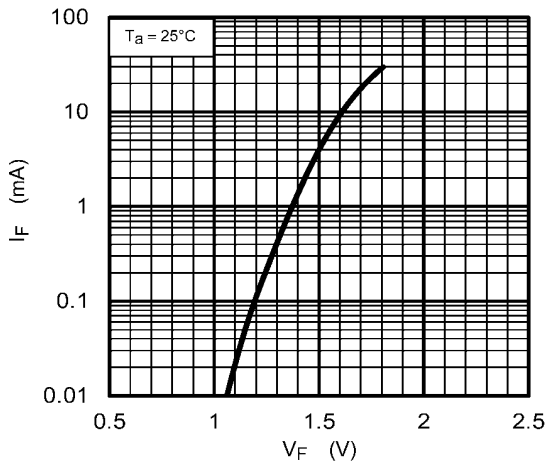


Fig. 13.1.3 I_F - V_F

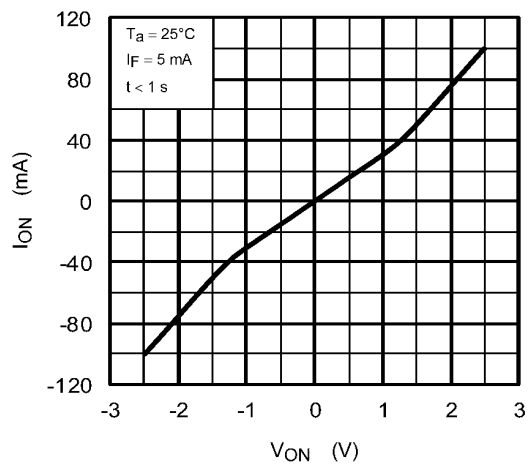


Fig. 13.1.4 I_{ON} - V_{ON}

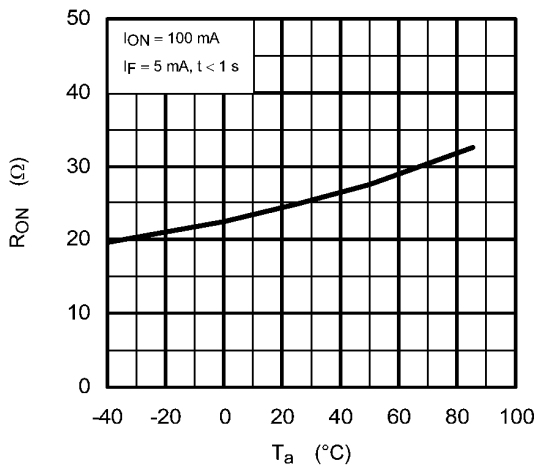


Fig. 13.1.5 R_{ON} - T_a

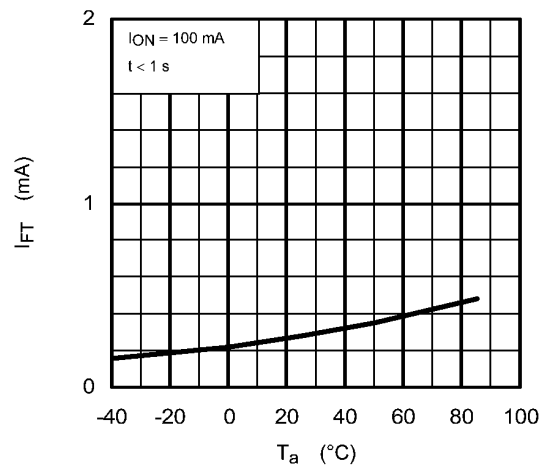


Fig. 13.1.6 I_{FT} - T_a

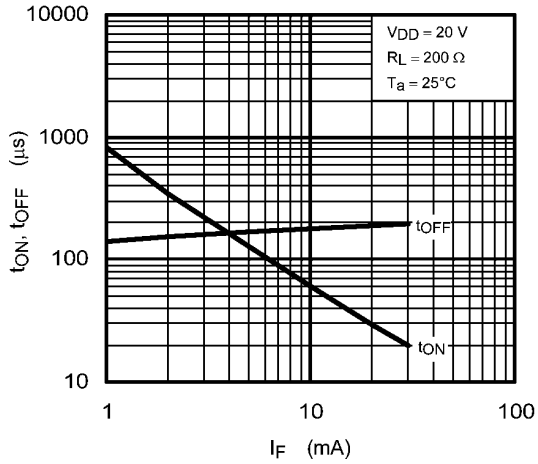


Fig. 13.1.7 $t_{ON}, t_{OFF} - I_F$

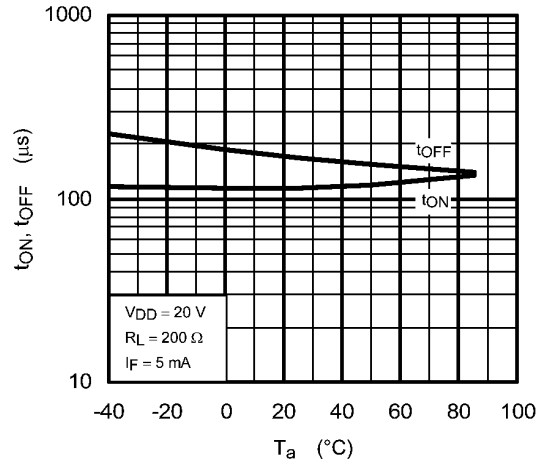


Fig. 13.1.8 $t_{ON}, t_{OFF} - T_a$

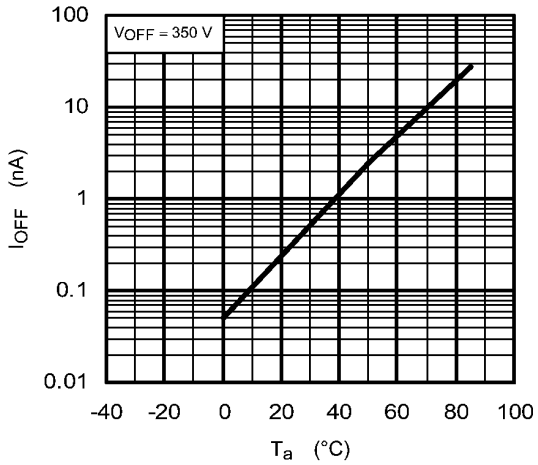
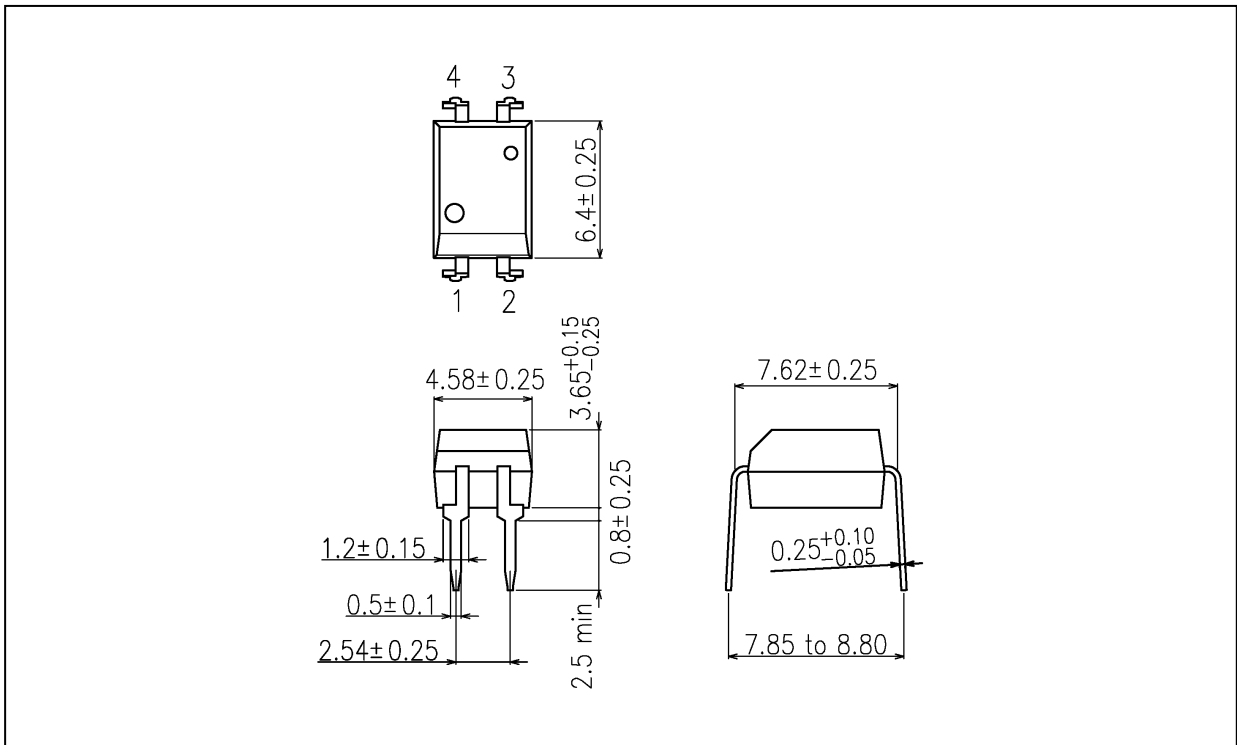


Fig. 13.1.9 $I_{OFF} - T_a$

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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