

TLP220GAF

1. Applications

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

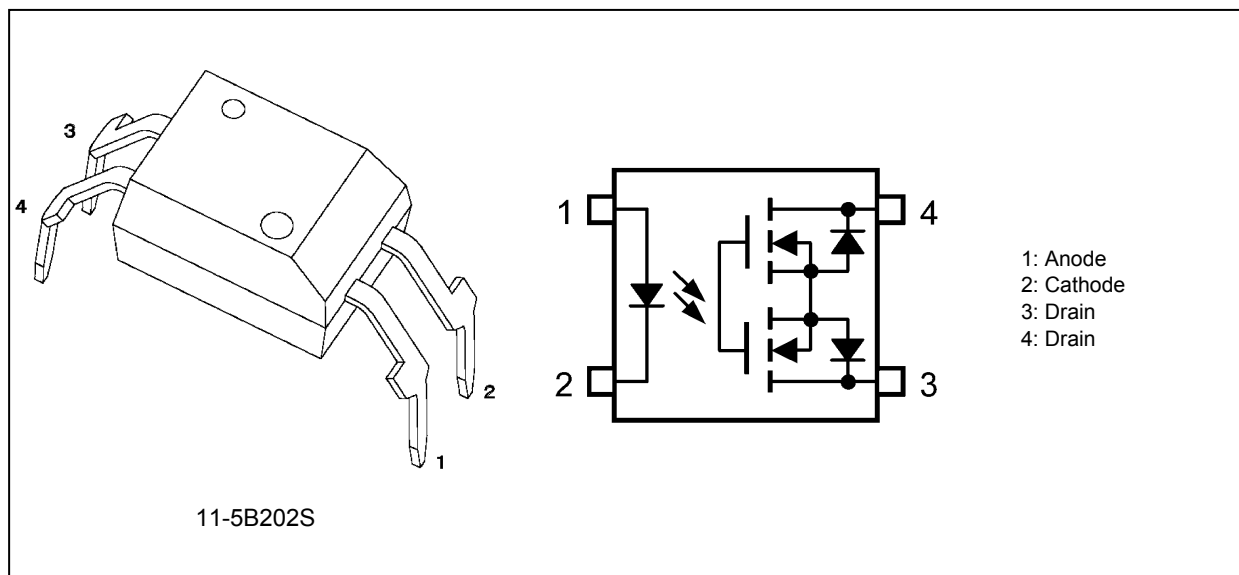
2. General

The TLP220GAF 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: 400 V (min)
- (3) Trigger LED current: 2 mA (max)
- (4) ON-state current: 120 mA (max)
- (5) ON-state resistance: 28 Ω (max, $t < 1s$)
- (6) ON-state resistance: 35 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

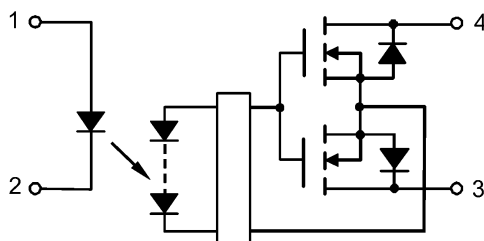


Fig. 5.1 Internal Circuit

6. Mechanical Parameters

Characteristics	7.62-mm Pitch TLP220GA	10.16-mm Pitch TLP220GAF	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, $T_a = 25^\circ\text{C}$)

	Characteristics	Symbol	Note	Rating	Unit
LED	Input forward current	I_F		30	mA
	Input forward current derating ($T_a \geq 25^\circ\text{C}$)	$\Delta I_F / \Delta T_a$		-0.3	mA/ $^\circ\text{C}$
	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	$^\circ\text{C}$
Detector	OFF-state output terminal voltage	V_{OFF}		400	V
	ON-state current	I_{ON}		120	mA
	ON-state current derating ($T_a \geq 25^\circ\text{C}$)	$\Delta I_{ON} / \Delta T_a$		-1.2	mA/ $^\circ\text{C}$
	ON-state current (pulsed) ($t = 100 \text{ ms}$, Duty = 1/10)	I_{ONP}		360	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.

8. Recommended Operating Conditions (Note)

Characteristics	Symbol	Note	Min	Typ.	Max	Unit
Supply voltage	V_{DD}		—	—	320	V
Input forward current	I_F		3	5	15	mA
ON-state current	I_{ON}		—	—	120	
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, $T_a = 25^\circ\text{C}$)

	Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
LED	Input forward voltage	V_F		$I_F = 10 \text{ mA}$	1.45	1.63	1.75	V
	Input reverse current	I_R		$V_R = 5 \text{ V}$	—	—	10	μA
	Input capacitance	C_t		$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	40	—	pF
Detector	OFF-state current	I_{OFF}		$V_{OFF} = 400 \text{ V}$	—	—	1	μA
	Output capacitance	C_{OFF}		$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	80	—	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}		$I_{ON} = 120 \text{ mA}$	—	0.3	2	mA
Return LED current	I_{FC}		$I_{OFF} = 10 \mu\text{A}$	0.1	—	—	mA
ON-state resistance	R_{ON}		$I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}, t < 1 \text{ s}$	—	17	28	Ω
		(Note 1)	$I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}, \text{Continuous}$	—	22	35	

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. $R_L = 200 \Omega, V_{DD} = 20 \text{ V}, I_F = 5 \text{ mA}$	—	0.2	1	ms
Turn-off time	t_{OFF}			—	0.2	1	

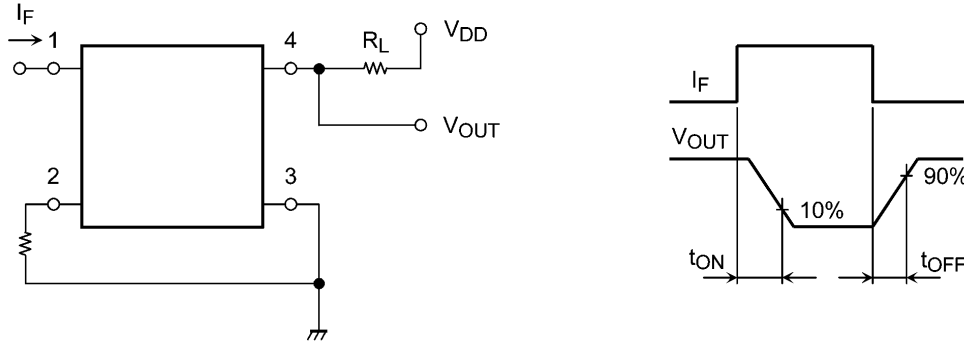


Fig. 12.1 Switching Time Test Circuit

13. Characteristics Curves

13.1. Characteristics Curves (Note)

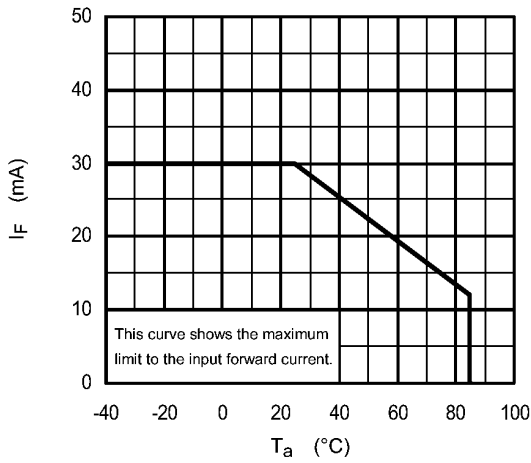


Fig. 13.1.1 I_F - T_a

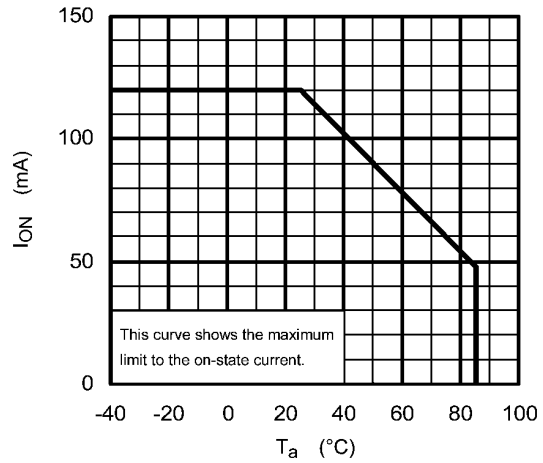


Fig. 13.1.2 I_{ON} - T_a

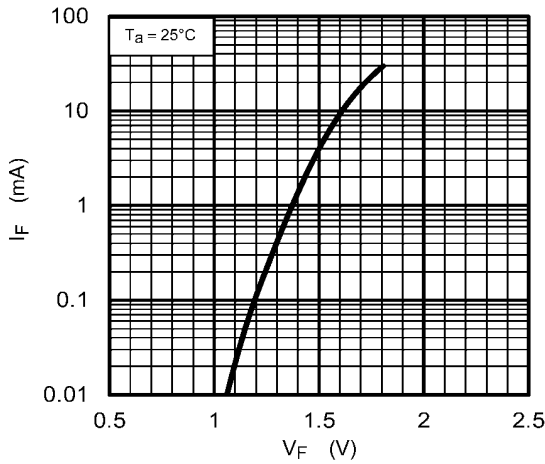


Fig. 13.1.3 I_F - V_F

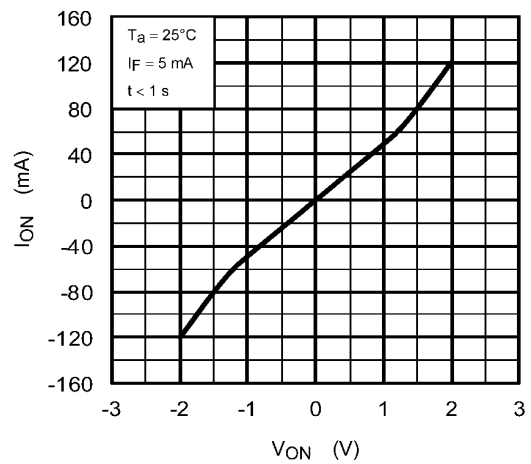


Fig. 13.1.4 I_{ON} - V_{ON}

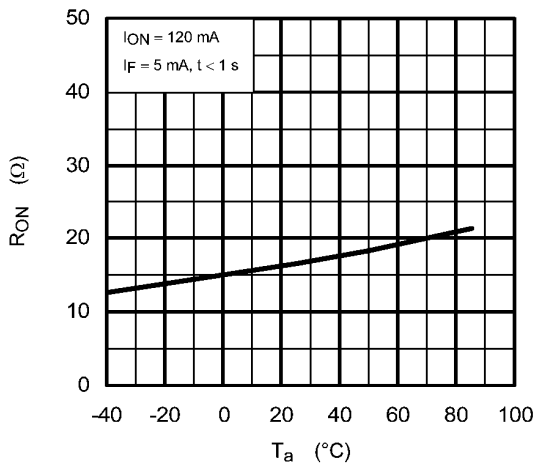


Fig. 13.1.5 R_{ON} - T_a

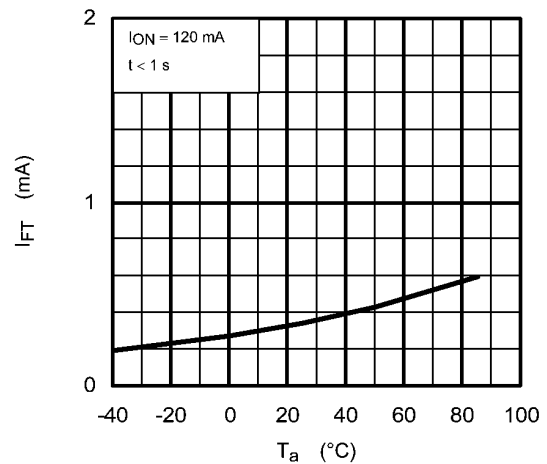


Fig. 13.1.6 I_{FT} - T_a

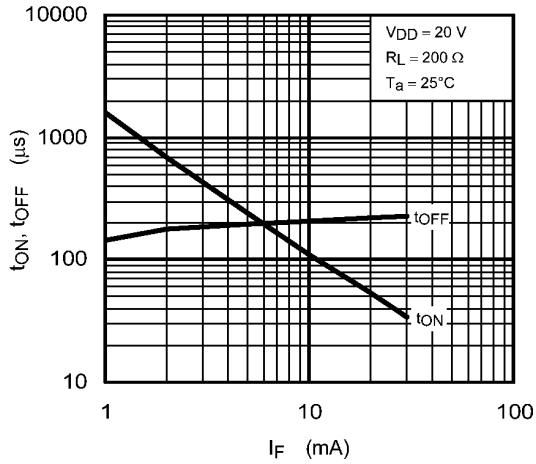


Fig. 13.1.7 $t_{ON}, t_{OFF} - I_F$

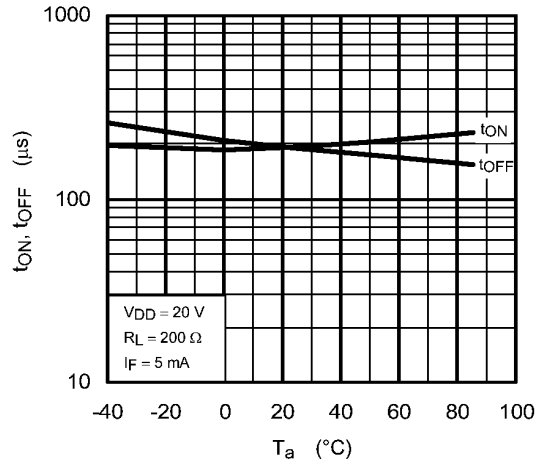


Fig. 13.1.8 $t_{ON}, t_{OFF} - T_a$

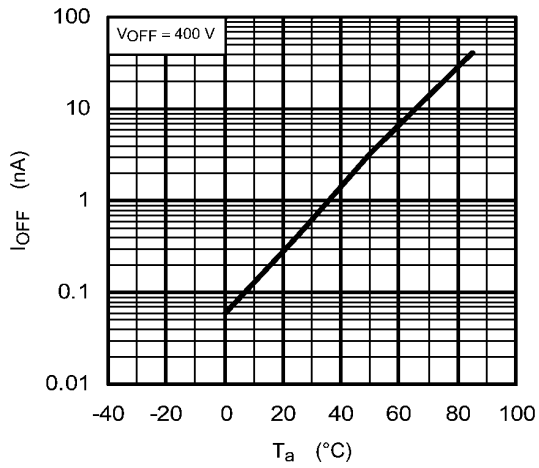
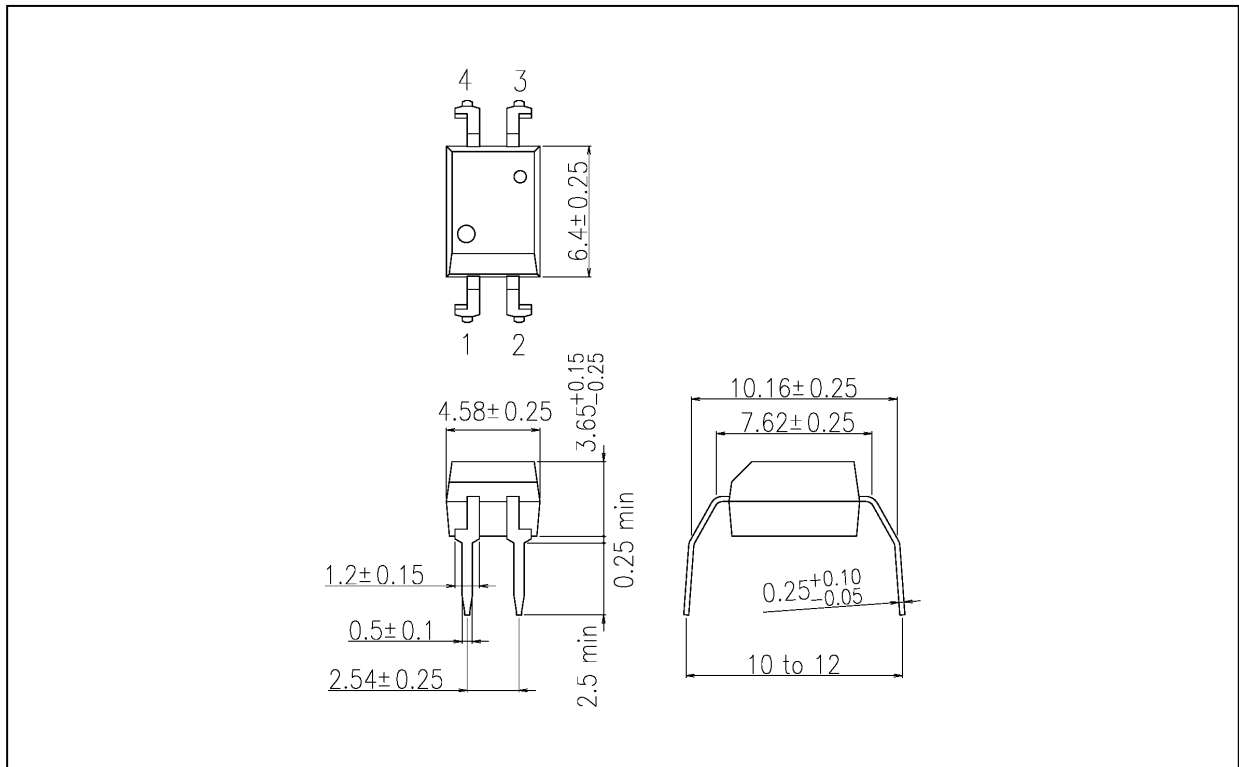


Fig. 13.1.9 $I_{OFF} - T_a$

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: 11-5B202S

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