

TOSHIBA Photocoupler Photorelay

# TLP224G, TLP224G-2

Modems

PBX

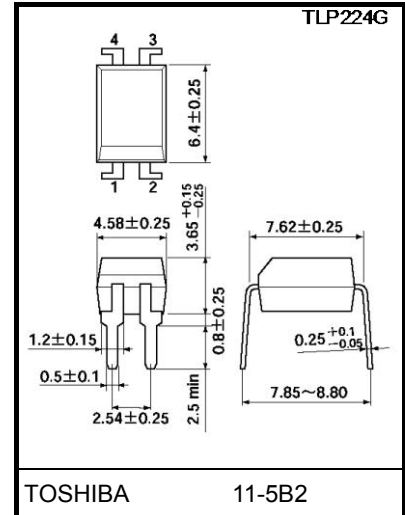
Telecommunications

The TOSHIBA TLP224G series consists of gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a 4 pin DIP (DIP4), which is suitable for equipment for high tech communications, including modems.

The TLP224G series complies with FCC part 68 rules with current limiting function.

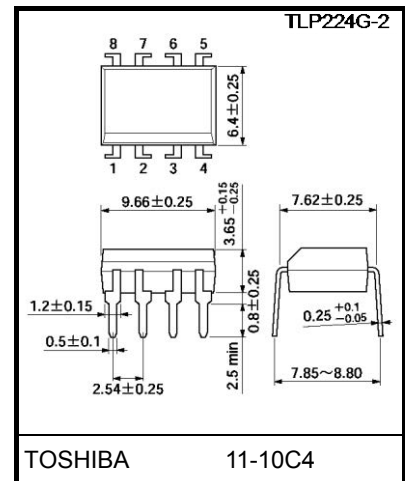
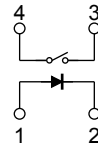
- TLP224G: 4 pin DIP, 1 channel type (1 form A)
- TLP224G-2: 8 pin DIP, 2 channel type (2 form A)
- Peak off-state voltage: 350 V (min)
- Trigger LED current: 3 mA (max)
- On-state current: 120 mA (max)
- Load current limiting: 150 mA to 300 mA (t = 5 ms)
- On-state resistance: 35 Ω (max)
- Isolation voltage: 2500 Vrms (min)
- UL approved: UL1577, File No.E67349
- cUL approved :CSA Component Acceptance Service No. 5A, File No.E67349

Unit: mm



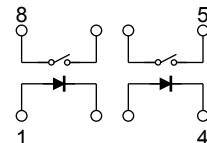
Weight: 0.26 g (typ.)

1 form A



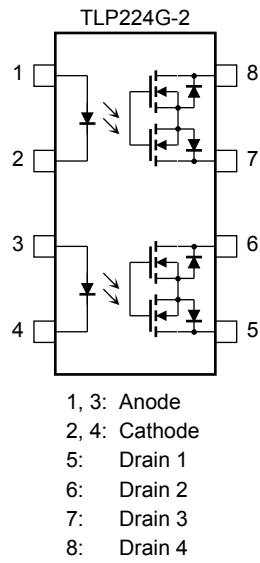
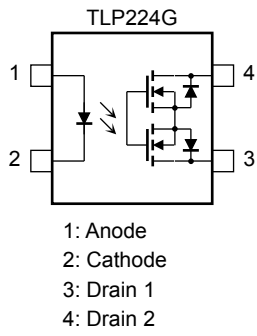
Weight: 0.54 g (typ.)

2 form A

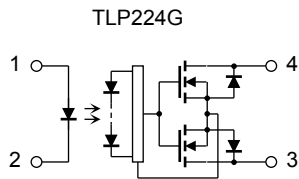


Start of commercial production  
1999-09

## Pin Configuration (top view)



## Internal Circuit



**Absolute Maximum Ratings (Ta = 25°C)**

Characteristics		Symbol	Rating	Unit
LED	Forward current	$I_F$	50	mA
	Forward current derating (Ta ≥ 25°C)	$\Delta I_F / ^\circ\text{C}$	-0.5	mA/°C
	Peak forward current (100 μs pulse, 100 pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	6	V
	Diode power dissipation	$P_D$	50	mW
	Diode power dissipation derating (Ta ≥ 25°C)	$\Delta P_D / ^\circ\text{C}$	-0.5	mW/°C
	Junction temperature	$T_j$	125	°C
Detector	Off-state output terminal voltage	$V_{OFF}$	350	V
	On-state current (Note 1)	$I_{ON}$	120	mA
	On-state current derating (Ta ≥ 25°C) (Note 1)	$\Delta I_{ON} / ^\circ\text{C}$	-1.2	mA/°C
	Output power dissipation	$P_O$	504	mW
	Output power dissipation derating (Ta ≥ 25°C)	$\Delta P_O / ^\circ\text{C}$	-5.04	mW / °C
	Junction temperature	$T_j$	125	°C
Storage temperature range		$T_{stg}$	-55 to 125	°C
Operating temperature range		$T_{opr}$	-40 to 85	°C
Lead soldering temperature (10 s)		$T_{sol}$	260	°C
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 2)		$BV_S$	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: Two channels operating simultaneously.

Note 2: Device considered a two-terminal device: LED side pins shorted together, and detector side pins shored together.

**Recommended Operating Conditions**

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{DD}$	—	—	280	V
Forward current	$I_F$	5	7.5	25	mA
On-state current	$I_{ON}$	—	—	100	mA
Operating temperature	$T_{opr}$	-20	—	65	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

## Individual Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 6 \text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	30	—	pF
Detector	Off-state current	$I_{OFF}$	$V_{OFF} = 350 \text{ V}$	—	—	1	$\mu\text{A}$
	Capacitance	$C_{OFF}$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	40	—	pF

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Trigger LED current	$I_{FT}$	$I_{ON} = 120 \text{ mA}$	—	1	3	mA
Return LED current	$I_{FC}$	$I_{OFF} = 10 \mu\text{A}$	0.1	0.4	—	mA
Load current limiting	$I_{LIM}$	$I_F = 5 \text{ mA}, V_{DD} = 5 \text{ V}, t = 5 \text{ ms}$	150	—	300	mA
On-state resistance	$R_{ON}$	$I_{ON} = 120 \text{ mA}, I_F = 5 \text{ mA}$	—	22	35	$\Omega$

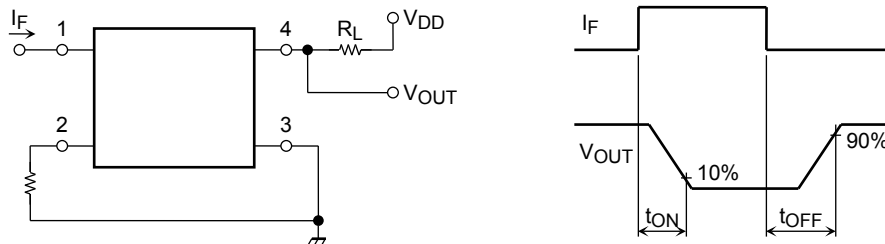
## Isolation Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second (in oil)	—	5000	—	
		DC, 1 minute (in oil)	—	5000	—	Vdc

## Switching Characteristics (Ta = 25°C)

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

Note: Switching time test circuit



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