

# TLP224GA-2

## Applications

Mechanical relay replacements

Factory Automation (FA)

Measuring Instrument

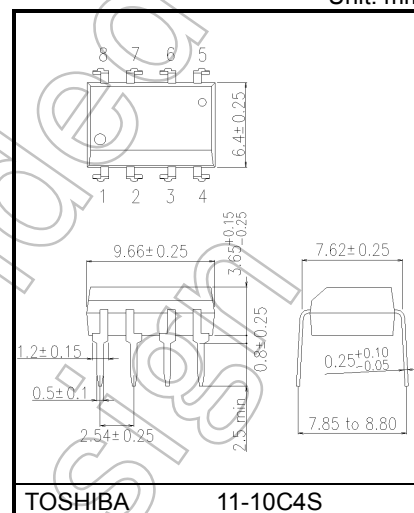
## General

The TLP224GA-2 consists of a gallium arsenide infrared emitting diode optically coupled to a photo-MOS FET in an 8-pin DIP package. The TLP224GA-2 has a performance to protect against external surge with the current limiting function that is included in Output-MOS FET.

## Features

- Normally opened (2- Form-A).
- Peak Off-State Voltage : 400 V (MIN.)
- Trigger LED Current : 3 mA (MAX.)
- On-State Current : 120 mA (MAX.)
- Limit Current : 150 mA to 300 mA ( $t = 5$  ms)
- On-State Resistance : 35  $\Omega$  (MAX.)
- Isolation Voltage : 2500 Vrms (MIN.)
- UL recognized : UL 1577, File No.E67349
- cUL recognized : CSA Component Acceptance Service No.5A File No. E67349

Unit: mm

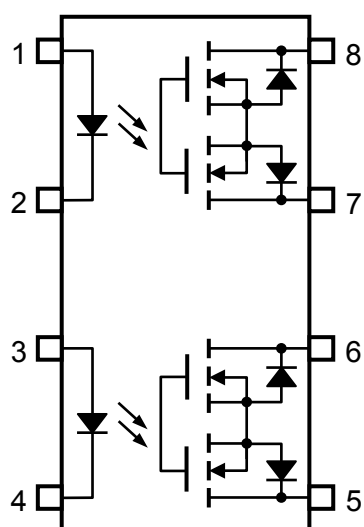


TOSHIBA 11-10C4S

Weight: 0.54 g

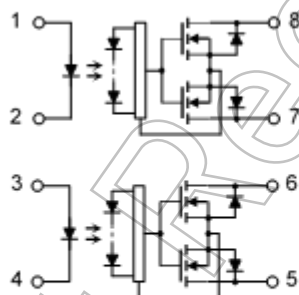
Start of commercial production  
1999-09

## Pin Configuration (Top View)



- 1, 3 : ANODE
- 2, 4 : CATHODE
- 5 : DRAIN 1
- 6 : DRAIN 2
- 7 : DRAIN 3
- 8 : DRAIN 4

## Internal Circuit



**Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25°C)**

| Characteristics                                   |   |                       | Symbol               | Rating  | Unit  |
|---|---|-----------------------|----------------------|---------|-------|
| LED   | Forward Current                               |                       | I <sub>F</sub>       | 50      | mA    |
|   | Forward Current Derating (Ta ≥ 25°C)          |                       | ΔI <sub>F</sub> /°C  | -0.5    | mA/°C |
|   | Peak Forward Current (100μs pulse, 100 pps)   |                       | I <sub>FP</sub>      | 1       | A     |
|   | Reverse Voltage                               |                       | V <sub>R</sub>       | 5       | V     |
|   | Junction Temperature                          |                       | T <sub>j</sub>       | 125     | °C    |
| DETECTOR  | Off-State Output Terminal Voltage             |                       | V <sub>OFF</sub>     | 400     | V     |
|   | On-State Current                              | One Channel           | I <sub>ON</sub>      | 120     | mA    |
|   |   | Both Channel (Note 1) |                      |         |       |
|   | On-State Current Derating (Ta ≥ 25°C)         | One Channel           | ΔI <sub>ON</sub> /°C | -1.2    | mA/°C |
|   |   | Both Channel (Note 1) |                      |         |       |
|   | Output power dissipation                      |                       | P <sub>O</sub>       | 504     | mW    |
|   | Output power dissipation derating (Ta ≥ 25°C) |                       | ΔP <sub>O</sub> /°C  | -5.04   | mW/°C |
| Junction Temperature                              |   | T <sub>j</sub>        | 125                  | °C      |       |
| Storage Temperature Range                         |   |                       | T <sub>stg</sub>     | -55~125 | °C    |
| Operating Temperature Range                       |   |                       | T <sub>opr</sub>     | -40~85  | °C    |
| Lead Soldering Temperature (10 s)                 |   |                       | T <sub>sol</sub>     | 260     | °C    |
| Isolation Voltage (AC, 60 s, R.H. ≤ 60%) (Note 2) |   |                       | BV <sub>S</sub>      | 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 shorted together.

**Recommended Operating Conditions (Note)**

| Characteristics       | Symbol           | Note | Min. | Typ. | Max. | Unit |
|-----------------------|------------------|------|------|------|------|------|
| Supply Voltage        | V <sub>DD</sub>  |      | —    | —    | 320  | V    |
| Forward Current       | I <sub>F</sub>   |      | 5    | 7.5  | 25   | mA   |
| On-State Current      | I <sub>ON</sub>  |      | —    | —    | 120  | mA   |
| Operating Temperature | T <sub>opr</sub> |      | -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 data sheet should also be considered.

### Individual Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

| Characteristics |                   | Symbol           | Note | Test Condition           | Min. | Typ. | Max. | Unit |
|-----------------|-------------------|------------------|------|--------------------------|------|------|------|------|
| LED             | Forward Voltage   | V <sub>F</sub>   |      | I <sub>F</sub> = 10 mA   | 1.0  | 1.15 | 1.3  | V    |
|                 | Reverse Current   | I <sub>R</sub>   |      | V <sub>R</sub> = 5 V     | —    | —    | 10   | μA   |
|                 | Capacitance       | C <sub>T</sub>   |      | V = 0, f = 1 MHz         | —    | 30   | —    | pF   |
| DETECTOR        | Off-State Current | I <sub>OFF</sub> |      | V <sub>OFF</sub> = 400 V | —    | —    | 1    | μA   |
|                 | Capacitance       | C <sub>OFF</sub> |      | V = 0, f = 1 MHz         | —    | 70   | —    | pF   |

### Coupled Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

| Characteristics       | Symbol           | Note | Test Condition  | Min. | Typ. | Max. | Unit |
|-----------------------|------------------|------|---|------|------|------|------|
| Trigger LED Current   | I <sub>FT</sub>  |      | I <sub>ON</sub> = 120 mA                              | —    | 1    | 3    | mA   |
| Return LED Current    | I <sub>FC</sub>  |      | I <sub>OFF</sub> = 100 μA                             | 0.1  | —    | —    | mA   |
| Load Current Limiting | I <sub>LIM</sub> |      | I <sub>F</sub> = 5 mA, V <sub>DD</sub> = 5 V, t = 5ms | 150  | —    | 300  | mA   |
| On-State Resistance   | R <sub>ON</sub>  |      | I <sub>ON</sub> = 120 mA, I <sub>F</sub> = 5 mA       | —    | 17   | 35   | Ω    |

### Isolation Characteristics (Unless otherwise specified, Ta = 25°C)

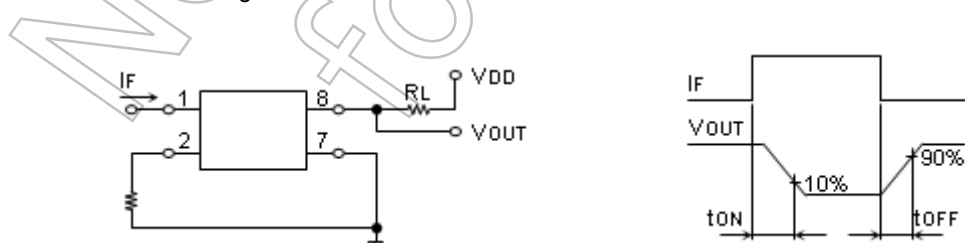
| Characteristics             | Symbol          | Note     | Test Condition                     | Min.                 | Typ.             | Max. | Unit |
|-----------------------------|-----------------|----------|------------------------------------|----------------------|------------------|------|------|
| Capacitance Input to Output | C <sub>S</sub>  | (Note 1) | V <sub>S</sub> = 0 V, f = 1 MHz    | —                    | 0.8              | —    | pF   |
| Isolation Resistance        | R <sub>S</sub>  | (Note 1) | V <sub>S</sub> = 500 V, R.H. ≤ 60% | 5 × 10 <sup>10</sup> | 10 <sup>14</sup> | —    | Ω    |
| Isolation Voltage           | BV <sub>S</sub> | (Note 1) | AC, 60 s                           | 2500                 | —                | —    | Vrms |

Note 1 : Device considered a two-terminal device : LED side pins shorted together, and DETECTOR side pins shorted together.

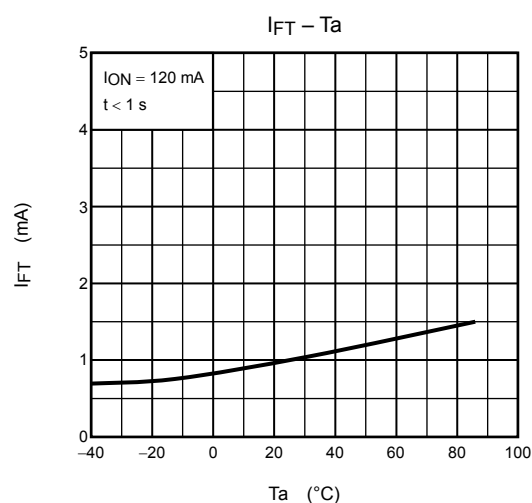
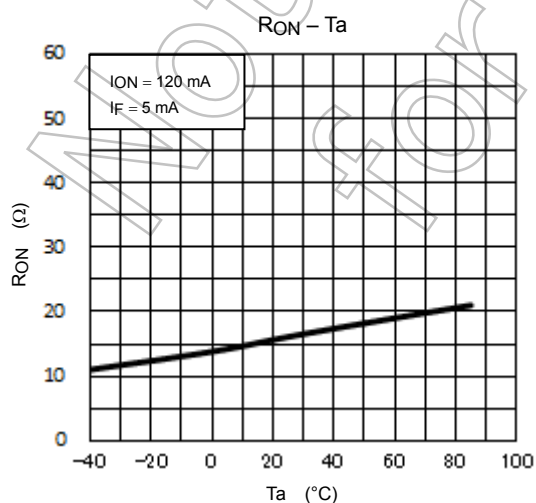
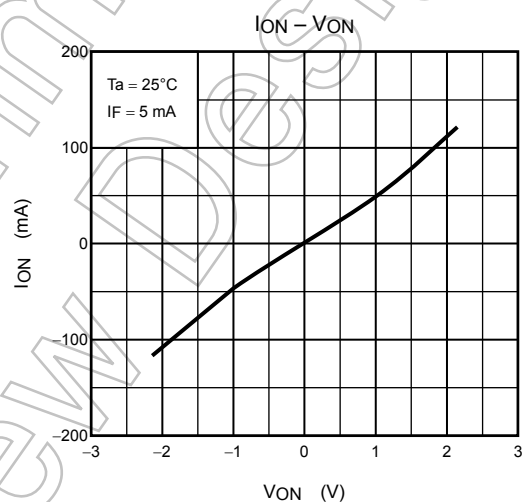
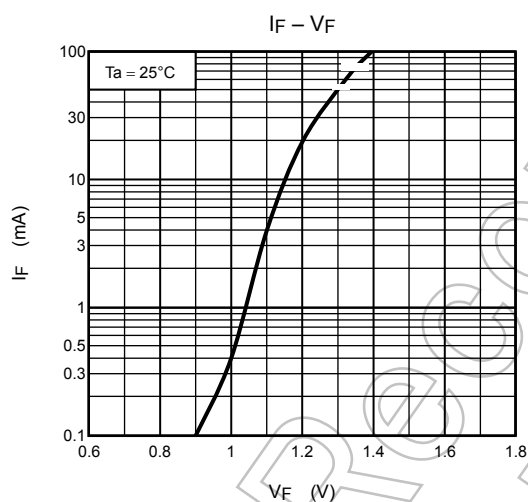
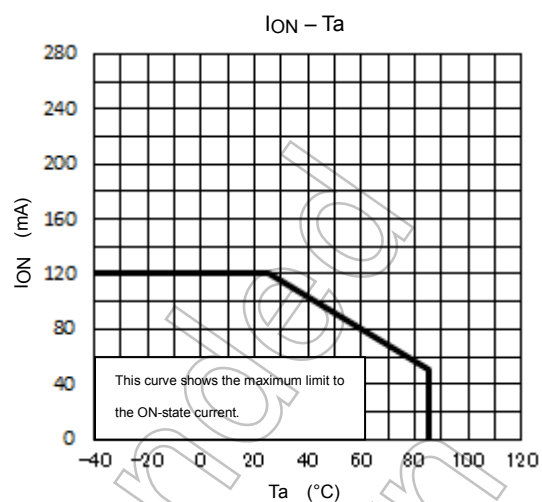
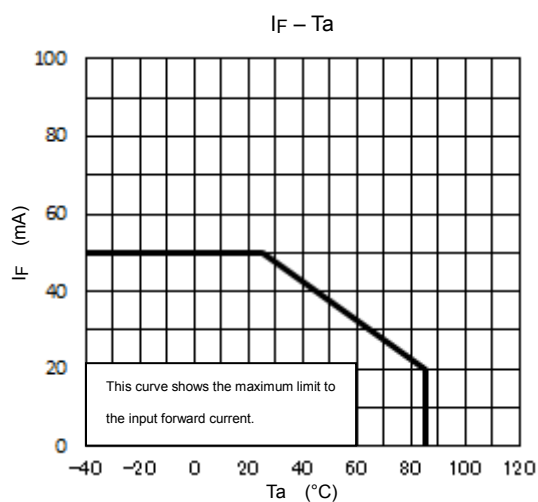
### Switching Characteristics (Unless otherwise specified, Ta = 25°C)

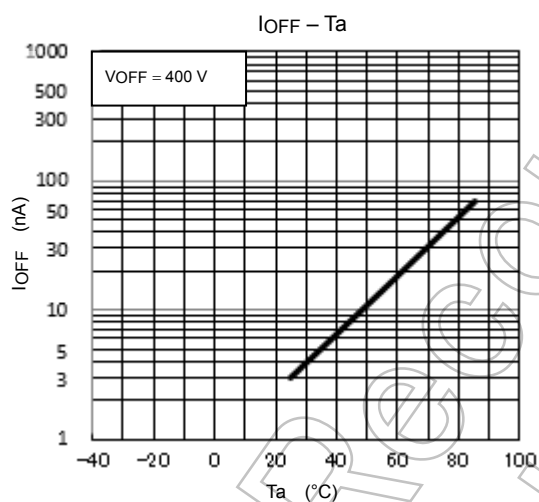
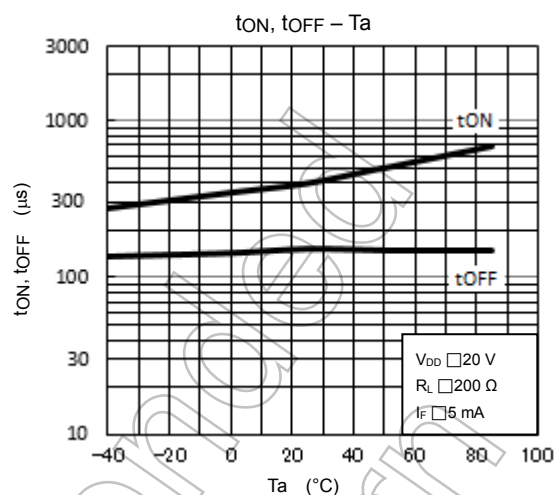
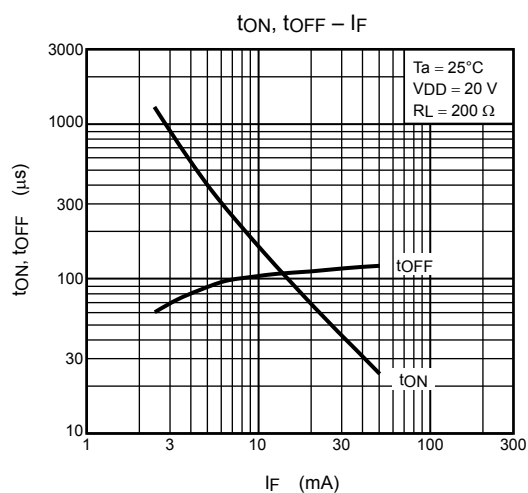
| Characteristics | Symbol           | Note     | Test Condition  | Min. | Typ. | Max. | Unit |
|-----------------|------------------|----------|---|------|------|------|------|
| Turn-on Time    | t <sub>ON</sub>  | (Note 1) | R <sub>L</sub> = 200 Ω<br>V <sub>DD</sub> = 20 V, I <sub>F</sub> = 5 mA | —    | 0.3  | 1    | ms   |
| Turn-off Time   | t <sub>OFF</sub> | (Note 1) |   | —    | 0.1  | 1    |      |

Note 1 : Switching Time Test Circuit



## Characteristics Curves (Note)





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

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