

TOSHIBA Photocoupler GaAs Ired & Photo-MOS FET

TLP176G

Modem-Fax Cards

PBX

STB

Measurement Equipment

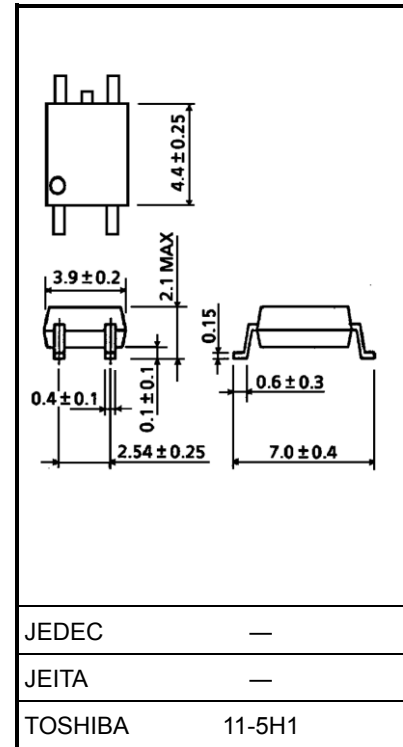
The TOSHIBA TLP176G consists of gallium arsenide infrared emitting diode optically coupled to a photo-MOS FET in a SOP, which is suitable for surface mount assembly.

Because of the high-voltage MOSFET used to output terminals, TLP176G is suitable for a hook relay of a modem, a facsimile, and dial pulls relay.

- 4-pin SOP(2.54SOP4)
- Peak off-state voltage: 350 V (min)
On-state current: 120 mA (max)
- Trigger LED current: 3 mA (max)
- On-state resistance: 35 Ω (max)
- Isolation voltage: 1500 Vrms (min)
- UL recognized: UL1577, file No. E67349
- cUL recognized: CSA Component Acceptance Service No. 5A
File No.E67349
- Option(V4) type
VDE approved: EN 60747-5-5 (Note 1)

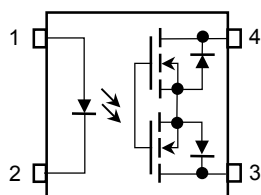
Note 1: When an EN 60747-5-5 approved type is needed,
Please designate the "Option(V4)"

Unit mm



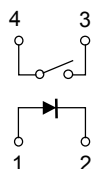
Weight: 0.1 g (typ.)

Pin Configuration (top view)

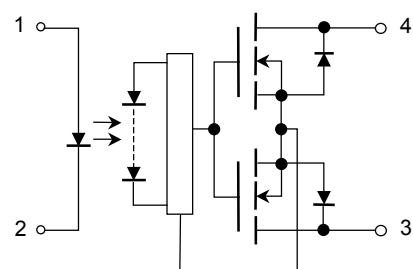


- 1. : Anode
- 2. : Cathode
- 3. : Drain
- 4. : Drain

1-Form-A



Schematic



Start of commercial production
1997-10

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|---|---|-----------------------|------------|------------------|
| LED | Forward current | I _F | 50 | mA |
| | Forward current derating (Ta ≥ 25°C) | ΔI _F / °C | -0.5 | mA / °C |
| | Pulse forward current (100μs pulse, 100pps) | I _{FP} | 1 | A |
| | Reverse voltage | V _R | 5 | V |
| | Diode power dissipation | P _D | 50 | mW |
| | Diode power dissipation derating (Ta ≥ 25°C) | ΔP _D / °C | -0.5 | mW / °C |
| | Junction temperature | T _j | 125 | °C |
| Detector | Off-state output terminal voltage | V _{OFF} | 350 | V |
| | On-state current | I _{ON} | 120 | mA |
| | On-state current derating (Ta ≥ 25°C) | ΔI _{ON} / °C | -1.2 | mA / °C |
| | Output power dissipation | P _O | 300 | mW |
| | Output power dissipation derating (Ta ≥ 25°C) | ΔP _O / °C | -3.0 | mW / °C |
| | Junction temperature | T _j | 125 | °C |
| Total power dissipation | | P _T | 350 | mW |
| Total power dissipation derating (Ta ≥ 25°C) | | ΔP _T / °C | -3.5 | mW / °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, 60 s, R.H. ≤ 60%) (Note 1) | | BV _S | 1500 | V _{rms} |

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: Device considered a two-terminal device: Pin 1 and 2 shorted together and pin 3 and 4 shorted together.

Recommended Operating Conditions

| Characteristic | 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.

Electrical Characteristics (Ta = 25°C)

| Characteristic | | 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 | $V_R = 5\text{V}$ | — | — | 10 | μA |
| | 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 | μA |
| | Capacitance between terminals | C_{OFF} | $V = 0\text{V}$, $f = 1\text{MHz}$ | — | 40 | — | pF |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---------------------|----------|--|-----|------|-----|----------|
| Trigger LED current | I_{FT} | $I_{ON} = 120\text{mA}$ | — | 1 | 3 | mA |
| On-state resistance | R_{ON} | $I_{ON} = 120\text{mA}$, $I_F = 5\text{mA}$ | — | 22 | 35 | Ω |
| Return LED current | I_{FC} | $I_{OFF} = 100\mu\text{A}$ | 0.1 | — | — | mA |

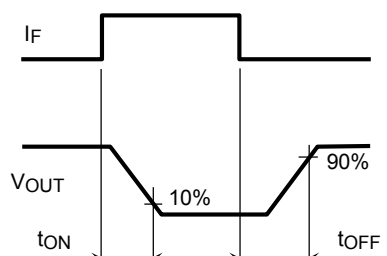
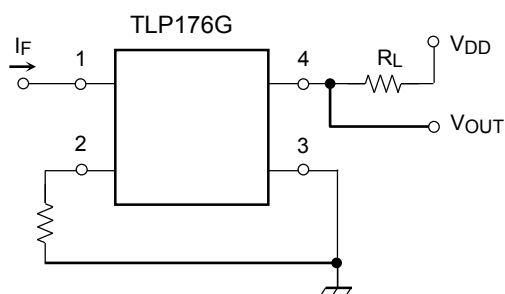
Isolation Characteristics (Ta = 25°C)

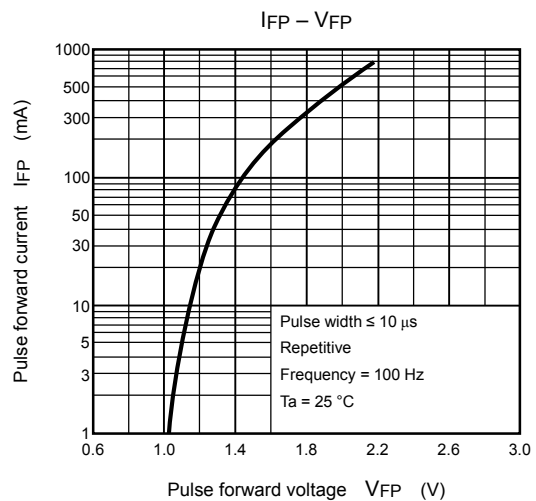
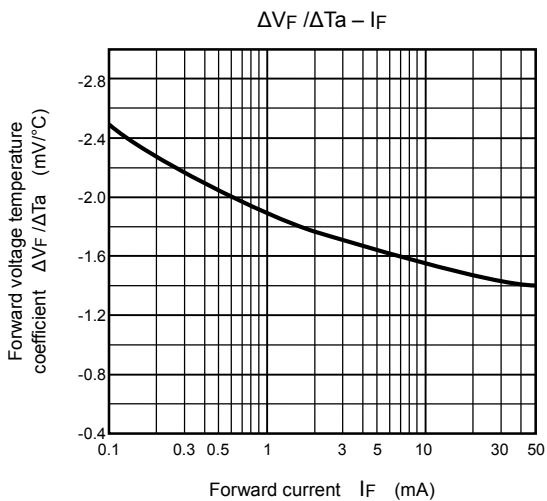
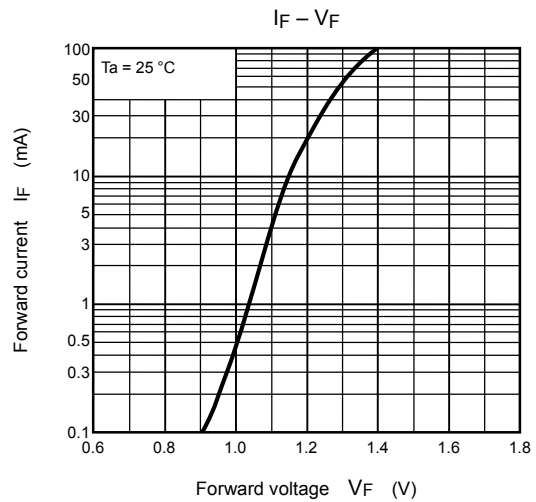
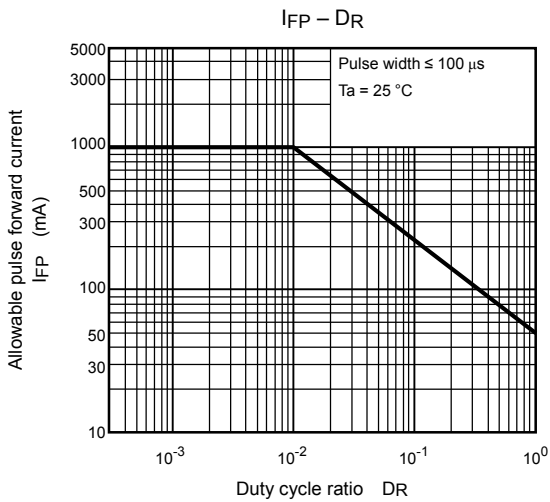
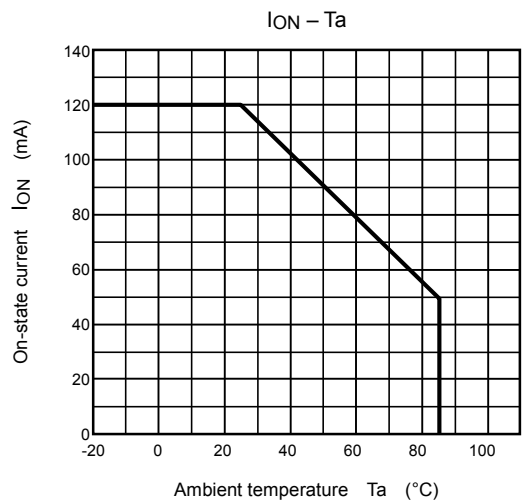
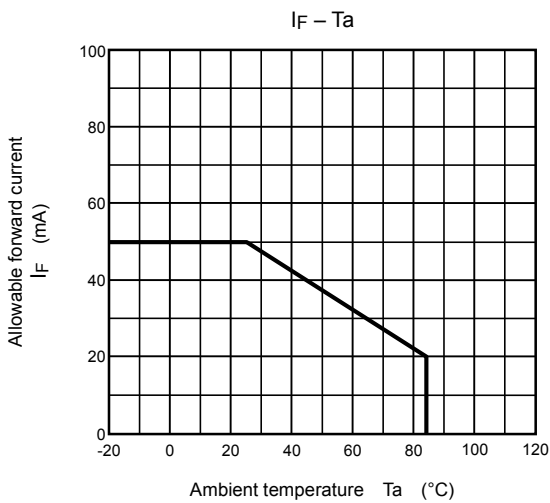
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------------------|--------|---------------------------------------|--------------------|-----------|-----|----------|
| Capacitance input to output | C_S | $V_S = 0\text{V}$, $f = 1\text{MHz}$ | — | 0.8 | — | pF |
| Isolation resistance | R_S | $V_S = 500\text{V}$, $R.H \leq 60\%$ | 5×10^{10} | 10^{14} | — | Ω |
| Isolation voltage | BV_S | AC, 60 s | 1500 | — | — | Vrms |
| | | AC, 1 s (in oil) | — | 3000 | — | |
| | | DC, 60 s (in oil) | — | 3000 | — | Vdc |

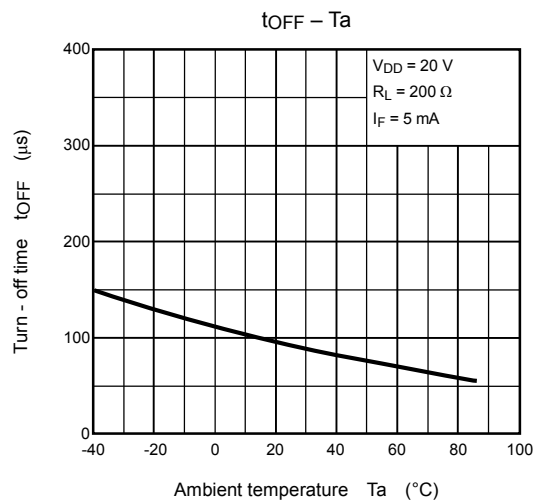
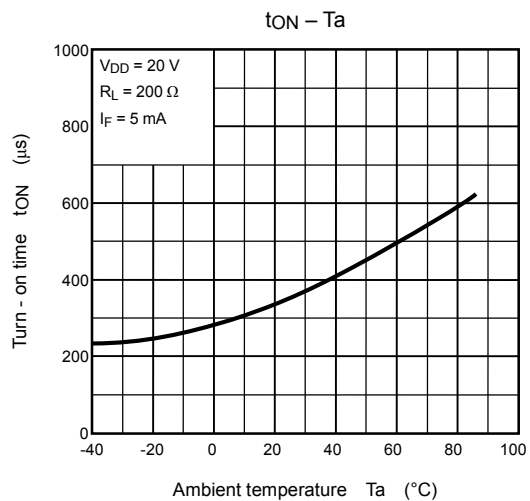
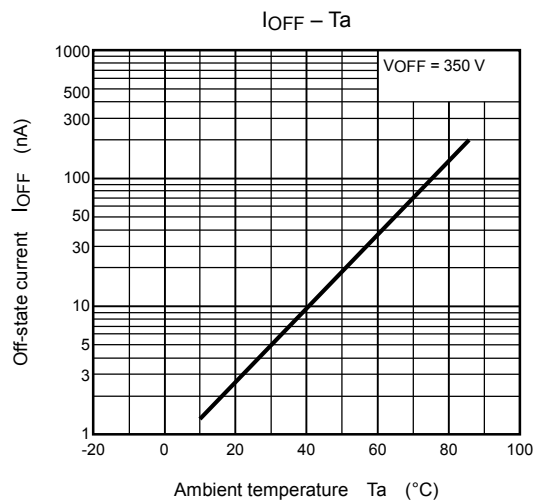
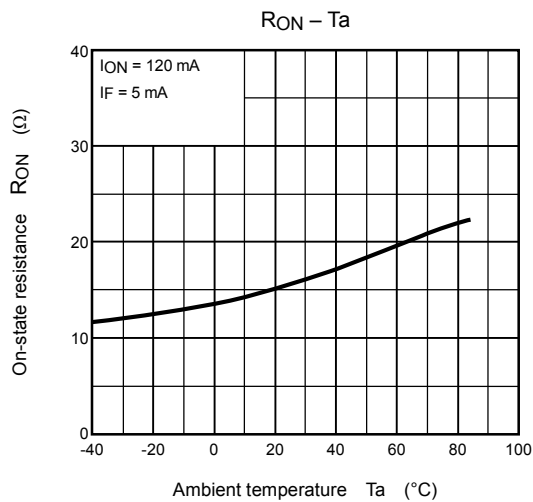
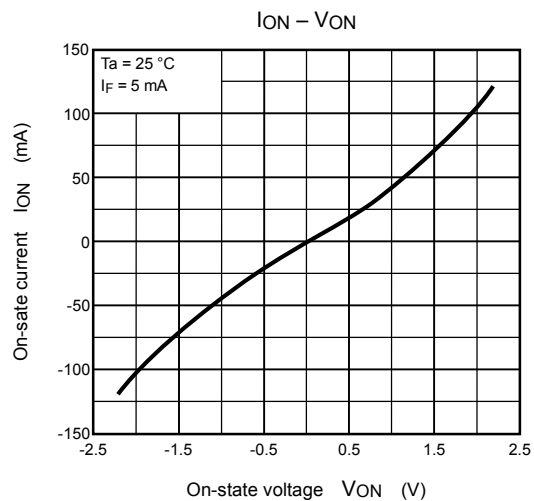
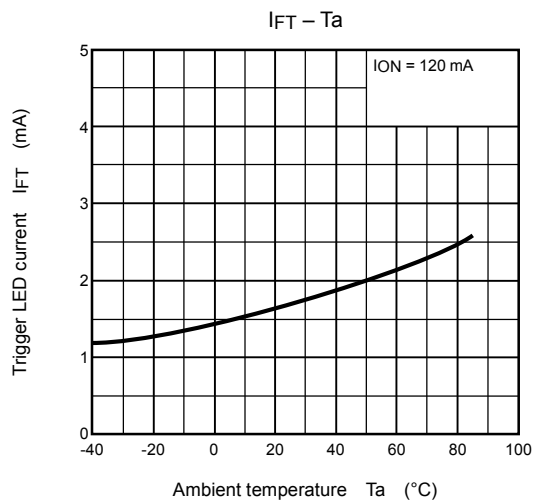
Switching Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------|-----------|--|-----|------|-----|------|
| Turn-on time | t_{ON} | $R_L = 200\Omega$ (Note 2) | — | 0.3 | 1 | ms |
| Turn-off time | t_{OFF} | $V_{DD} = 20\text{V}$, $I_F = 5\text{mA}$ | — | 0.1 | 1 | |

Note 2: Switching time test circuit







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