

Photocouplers Photorelay

TLP3554

1. Applications

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

2. General

The TLP3554 photorelay consists of a photo MOSFET optically coupled to an infrared LED. It is housed in a 4-pin DIP package. The low ON-state resistance and the high permissible ON-state current of the the TLP3554 make it suitable for power line control applications.

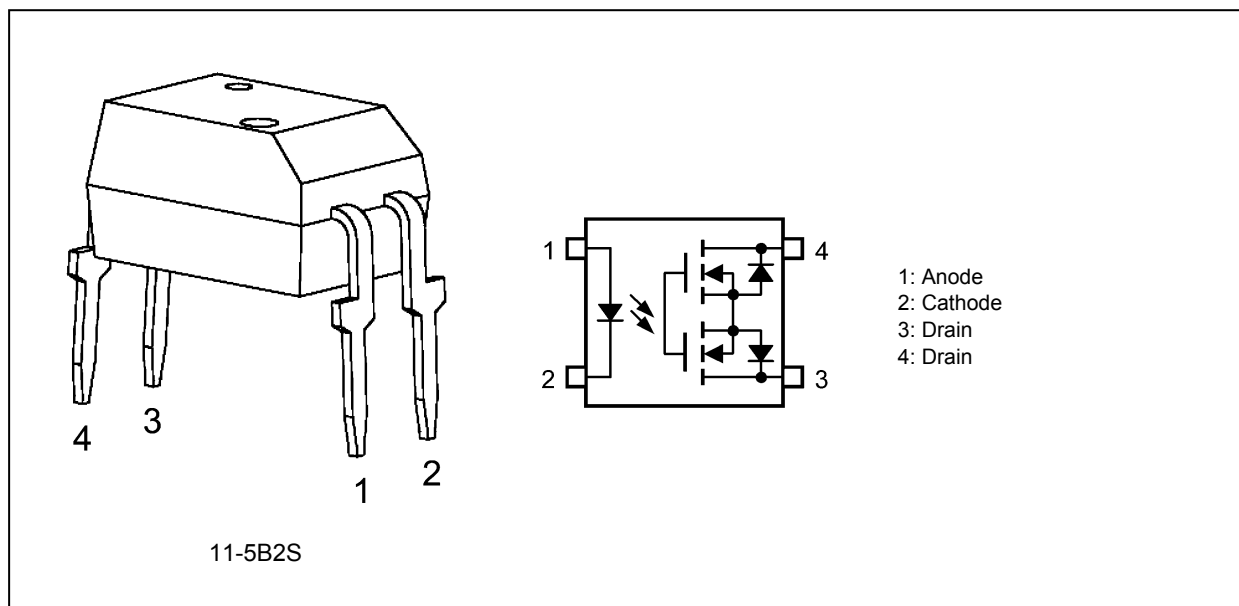
3. Features

- (1) Normally opened (1-Form-A)
- (2) OFF-state output terminal voltage: 40 V (min)
- (3) Trigger LED current: 3 mA (max)
- (4) ON-state current: 2.5 A (max)
- (5) ON-state resistance: 150 mΩ (max)
- (6) Isolation voltage: 2500 Vrms (min)
- (7) Safety standards

UL-recognized: UL 1577, File No.E67349

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

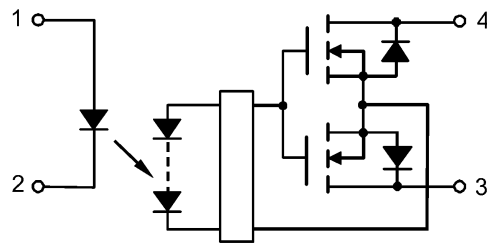
4. Packaging and Pin Assignment



Start of commercial production

2011-11

5. Internal Circuit



6. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

| | Characteristics | Symbol | Note | Rating | Unit |
|----------|---|----------------------------|----------|------------|----------------------|
| LED | Input forward current | I_F | | 30 | mA |
| | Input forward current derating ($T_a \geq 25\text{ }^\circ\text{C}$) | $\Delta I_F/\Delta T_a$ | | -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 |
| | Input power dissipation derating ($T_a \geq 25\text{ }^\circ\text{C}$) | $\Delta P_D/\Delta T_a$ | | -0.5 | mW/ $^\circ\text{C}$ |
| | Junction temperature | T_j | | 125 | $^\circ\text{C}$ |
| Detector | OFF-state output terminal voltage | V_{OFF} | | 40 | V |
| | ON-state current | I_{ON} | | 2.5 | A |
| | ON-state current derating ($T_a \geq 25\text{ }^\circ\text{C}$) | $\Delta I_{ON}/\Delta T_a$ | | -25 | mA/ $^\circ\text{C}$ |
| | ON-state current (pulsed) (t = 100 ms, Duty = 1/10) | I_{ONP} | | 7.5 | A |
| | Output power dissipation | P_O | | 500 | mW |
| | Output power dissipation derating ($T_a \geq 25\text{ }^\circ\text{C}$) | $\Delta P_O/\Delta T_a$ | | -5.0 | mW/ $^\circ\text{C}$ |
| | 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 | $^\circ\text{C}$ |
| | Lead soldering temperature (10 s) | T_{sol} | | 260 | $^\circ\text{C}$ |
| | Isolation voltage AC, 60 s, R.H. \leq 60 % | BV_S | (Note 1) | 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: This device is considered as a two-terminal device: Pins 1 and 2 are shorted together, and pins 3 and 4 are shorted together.

7. Recommended Operating Conditions (Note)

| Characteristics | Symbol | Note | Min | Typ. | Max | Unit |
|-----------------------|-----------|------|-----|------|-----|------------------|
| Supply voltage | V_{DD} | | — | — | 32 | V |
| Input forward current | I_F | | 5 | 10 | 25 | mA |
| ON-state current | I_{ON} | | — | — | 2.5 | A |
| Operating temperature | T_{opr} | | -20 | — | 65 | $^\circ\text{C}$ |

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.

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

| | Characteristics | Symbol | Note | Test Condition | Min | Typ. | Max | Unit |
|----------|-----------------------|-----------|------|------------------------------------|------|------|------|---------------|
| LED | Input forward voltage | V_F | | $I_F = 10\text{ mA}$ | 1.18 | 1.33 | 1.48 | V |
| | Input reverse current | I_R | | $V_R = 5\text{ V}$ | — | — | 10 | μA |
| | Input capacitance | C_t | | $V = 0\text{ V}, f = 1\text{ MHz}$ | — | 70 | — | pF |
| Detector | OFF-state current | I_{OFF} | | $V_{OFF} = 40\text{ V}$ | — | — | 1 | μA |
| | Output capacitance | C_{OFF} | | $V = 0\text{ V}, f = 1\text{ MHz}$ | — | 300 | — | pF |

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

| | Characteristics | Symbol | Note | Test Condition | Min | Typ. | Max | Unit |
|---------------------|--------------------|----------|------|--|-----|------|-----|------------|
| Trigger LED current | | I_{FT} | | $I_{ON} = 1.0\text{ A}$ | — | 0.5 | 3 | mA |
| | Return LED current | I_{FC} | | $I_{OFF} = 10\text{ }\mu\text{A}$ | 0.1 | — | — | |
| ON-state resistance | | R_{ON} | | $I_{ON} = 2.0\text{ A}, I_F = 5\text{ mA}, t < 1\text{ s}$ | — | 50 | 150 | m Ω |

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

| | 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) | $V_S = 500\text{ V}, R.H. \leq 60\%$ | 5×10^{10} | 10^{14} | — | Ω |
| Isolation voltage | | BV_S | (Note 1) | AC, 60 s | 2500 | — | — | Vrms |

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.

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

| | Characteristics | Symbol | Note | Test Condition | Min | Typ. | Max | Unit |
|--------------|-----------------|-----------|------|---|-----|------|-----|------|
| Turn-on time | | t_{ON} | | See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 5\text{ mA}$ | — | 0.8 | 5 | ms |
| | Turn-off time | t_{OFF} | | | — | 0.3 | 1 | |
| Turn-on time | | t_{ON} | | See Fig. 11.1. $R_L = 200\text{ }\Omega, V_{DD} = 20\text{ V}, I_F = 10\text{ mA}$ | — | 0.4 | 3 | |
| | Turn-off time | t_{OFF} | | | — | 0.3 | 1 | |

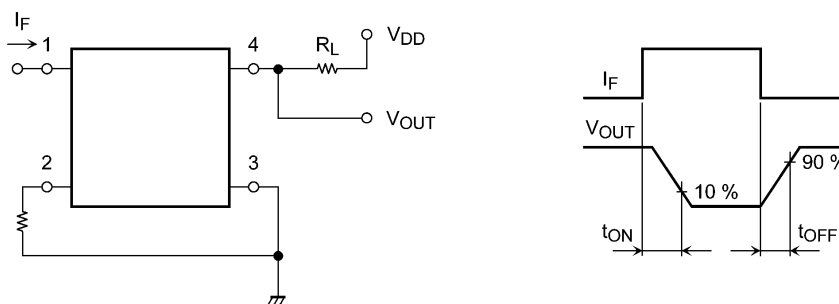


Fig. 11.1 Switching Time Test Circuit and Waveform

12. Characteristics Curves (Note)

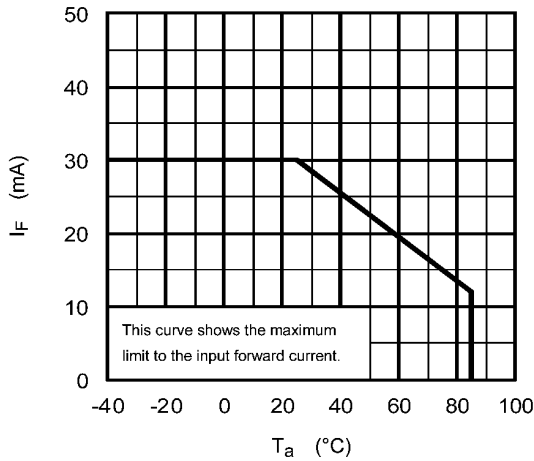


Fig. 12.1 $I_F - T_a$

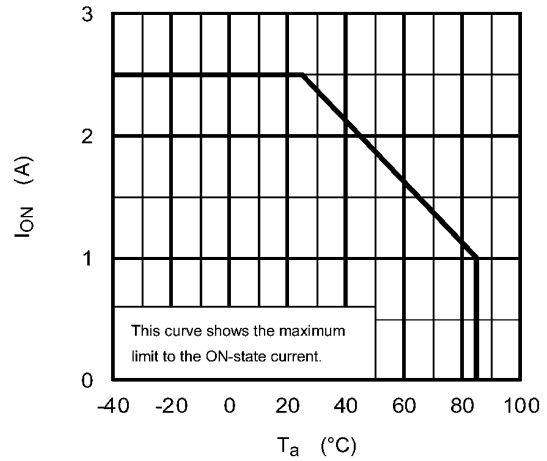


Fig. 12.2 $I_{ON} - T_a$

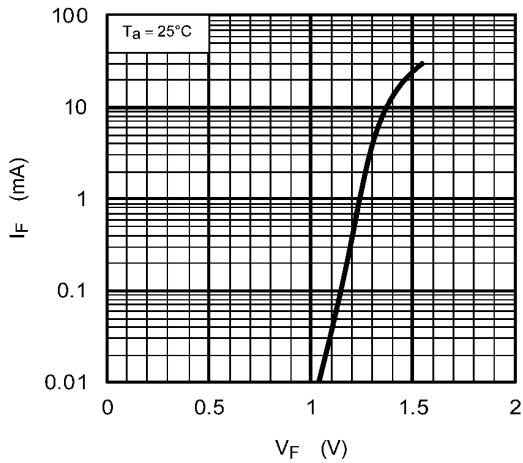


Fig. 12.3 $I_F - V_F$

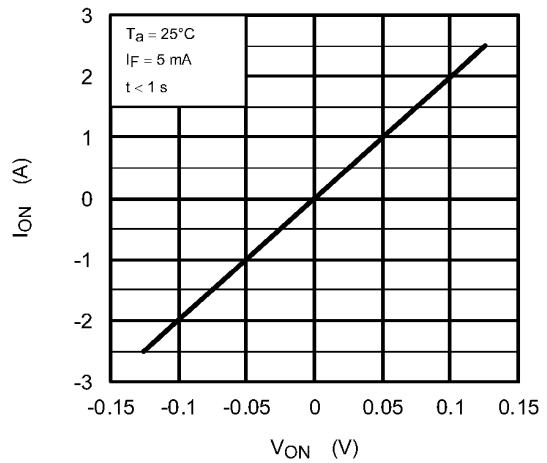


Fig. 12.4 $I_{ON} - V_{ON}$

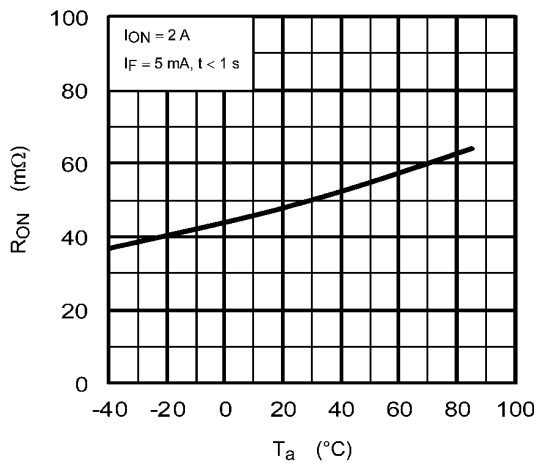


Fig. 12.5 $R_{ON} - T_a$

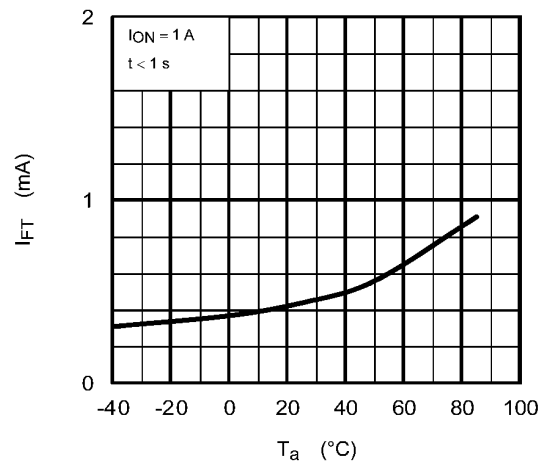


Fig. 12.6 $I_{FT} - T_a$

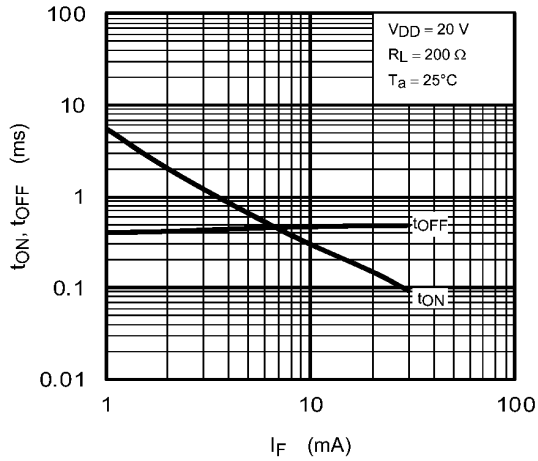


Fig. 12.7 t_{ON} , t_{OFF} - I_F

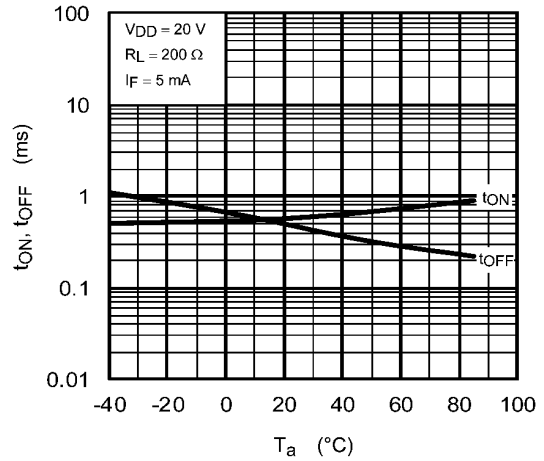


Fig. 12.8 t_{ON} , t_{OFF} - T_a

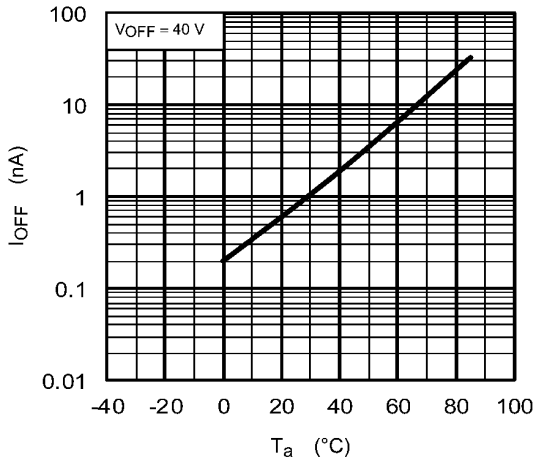
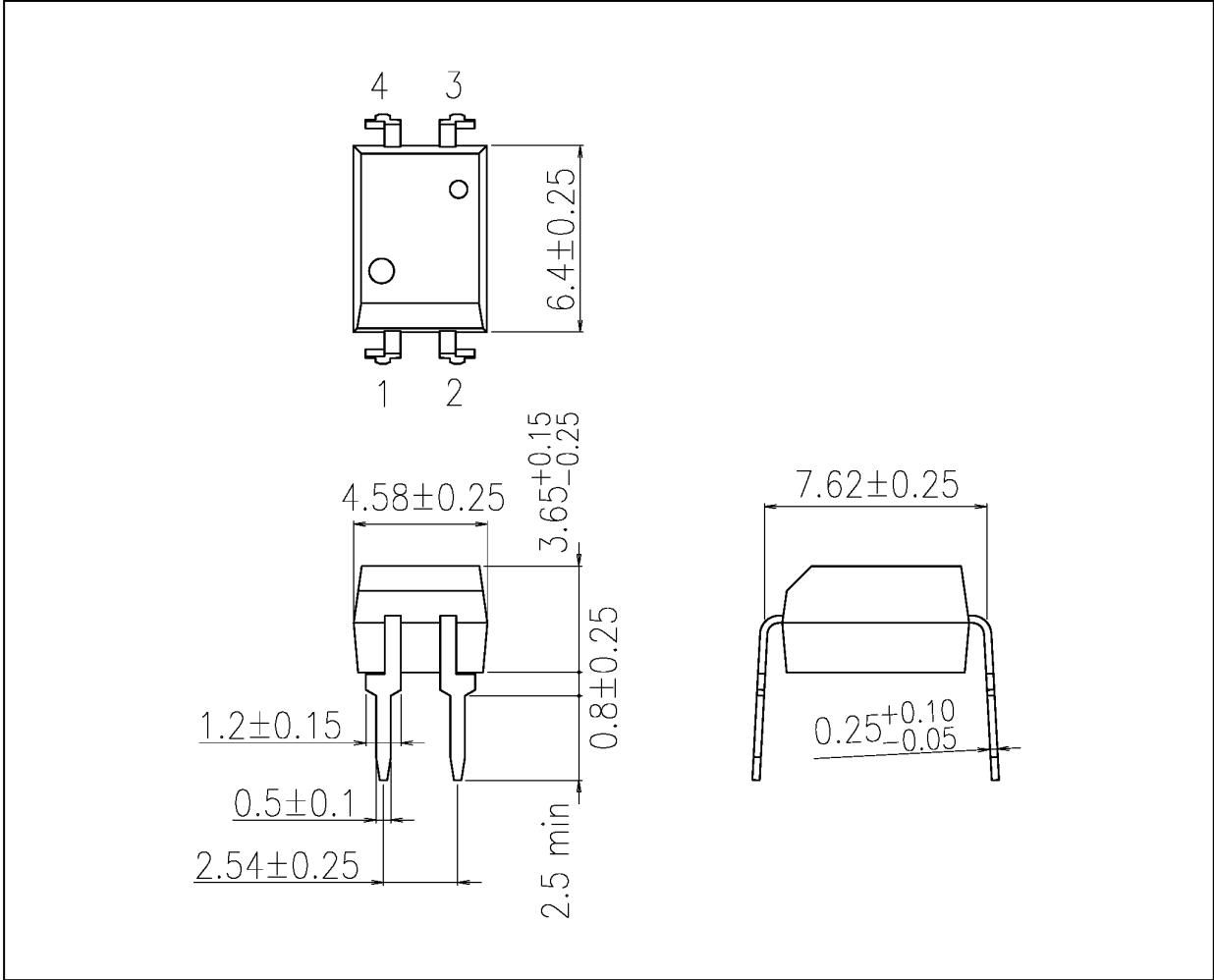


Fig. 12.9 I_{OFF} - T_a

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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