

# TLX9906

## 1. Applications

- Automotive
- MOSFET Gate Drivers

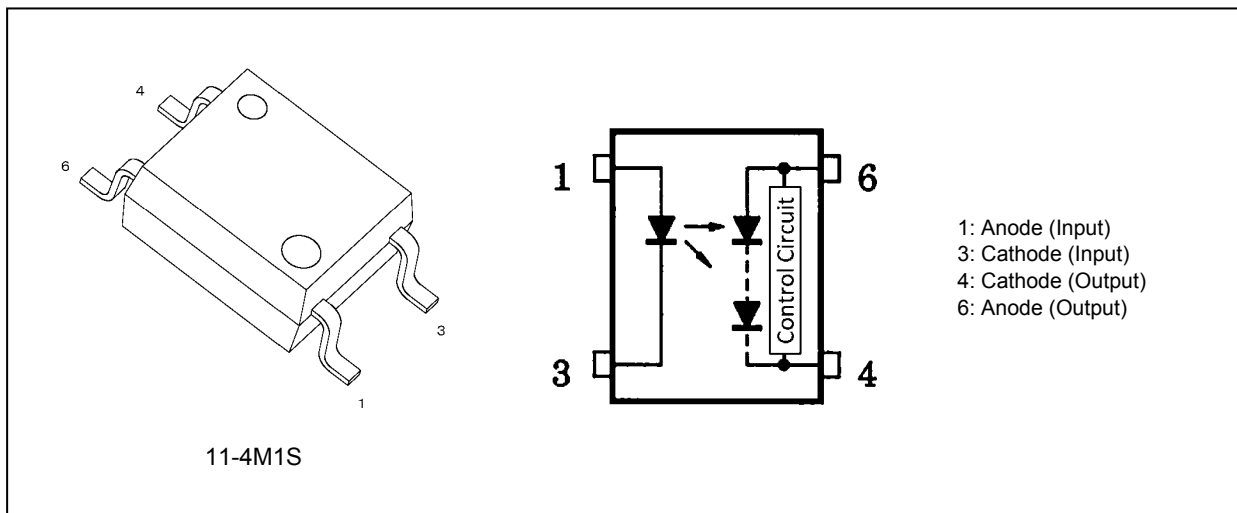
## 2. General

The TLX9906 is a photocoupler in the SO6 package that consists of an infrared light emitting diode optically coupled to a photodiode array. The photodiodes are connected in series, making the TLX9906 suitable for MOS gate drive applications.

## 3. Features

- (1) Open voltage: 7 V (min)
- (2) Short current: 12  $\mu$ A (min)
- (3) Isolation voltage: 3750 Vrms (min)
- (4) AEC-Q101 qualified

## 4. Packaging and Pin Assignment



## 5. 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 ( $T_a = 125\text{ }^{\circ}\text{C}$ )                                        | $I_F$                     |          | 10         |                        |
|          | Input forward current derating ( $T_a \geq 100\text{ }^{\circ}\text{C}$ )                            | $\Delta I_F / \Delta T_a$ |          | -0.8       | mA/ $^{\circ}\text{C}$ |
|          | Input power dissipation                                                                              | $P_D$                     |          | 50         | mW                     |
|          | Input power dissipation derating ( $T_a \geq 100\text{ }^{\circ}\text{C}$ )                          | $\Delta P_D / \Delta T_a$ |          | -1.3       | mW/ $^{\circ}\text{C}$ |
|          | Input reverse voltage                                                                                | $V_R$                     |          | 3          | V                      |
| Detector | Output forward current                                                                               | $I_{FD}$                  |          | 50         | $\mu\text{A}$          |
|          | Output reverse voltage                                                                               | $V_{RD}$                  |          | 10         | V                      |
|          | Output power dissipation ( $-40\text{ }^{\circ}\text{C} \leq T_a \leq 125\text{ }^{\circ}\text{C}$ ) | $P_O$                     |          | 0.5        | mW                     |
| Common   | Operating temperature                                                                                | $T_{opr}$                 |          | -40 to 125 | $^{\circ}\text{C}$     |
|          | Storage temperature                                                                                  | $T_{stg}$                 |          | -55 to 150 | $^{\circ}\text{C}$     |
|          | Lead soldering temperature (10 s)                                                                    | $T_{sol}$                 |          | 260        | $^{\circ}\text{C}$     |
|          | Isolation voltage AC, 60 s, R.H. $\leq 60\%$                                                         | $BV_S$                    | (Note 1) | 3750       | 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 3 are shorted together, and pins 4 and 6 are shorted together.

## 6. Recommended Operating Conditions (Note)

| Characteristics       | Symbol    | Note | Min | Typ. | Max | Unit               |
|-----------------------|-----------|------|-----|------|-----|--------------------|
| Input forward current | $I_F$     |      | —   | 12   | 15  | mA                 |
| Operating temperature | $T_{opr}$ |      | -40 | —    | 105 | $^{\circ}\text{C}$ |

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.

## 7. 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 | $V_F$  |      | $I_F = 10\text{ mA}$                  | 1.5 | 1.65 | 1.8 | V             |
|     | Input reverse current | $I_R$  |      | $V_R = 3\text{ V}$                    | —   | —    | 10  | $\mu\text{A}$ |
|     | Input capacitance     | $C_t$  |      | $V = 0\text{ V}$ , $f = 1\text{ MHz}$ | —   | 45   | —   | pF            |

## 8. 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   | $I_{FT}$ |      | $V_{OC} \geq 5\text{ V}$                                   | —   | —    | 3   | mA            |
| Open voltage          | $V_{OC}$ |      | $I_F = 10\text{ mA}$                                       | 7   | 9    | —   | V             |
|                       |          |      | $I_F = 10\text{ mA}$ , $T_a = 125\text{ }^{\circ}\text{C}$ | —   | 5    | —   | V             |
| Short-circuit current | $I_{SC}$ |      | $I_F = 10\text{ mA}$                                       | 12  | 30   | —   | $\mu\text{A}$ |
|                       |          |      | $I_F = 10\text{ mA}$ , $T_a = 125\text{ }^{\circ}\text{C}$ | —   | 12   | —   | $\mu\text{A}$ |

9. 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. $\leq 60\%$ | $10^{12}$ | $10^{14}$ | —   | $\Omega$ |
| Isolation voltage                   | $BV_S$ | (Note 1) | AC, 60 s                                | 3750      | —         | —   | Vrms     |

Note 1: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4 and 6 are shorted together.

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

| Characteristics | Symbol    | Note | Test Condition                                                  | Min | Typ. | Max | Unit |
|-----------------|-----------|------|-----------------------------------------------------------------|-----|------|-----|------|
| Turn-on time    | $t_{on}$  |      | $I_F = 10\text{ mA}$ , $C_L = 1000\text{ pF}$<br>See Fig. 10.1. | —   | 0.2  | 1   | ms   |
| Turn-off time   | $t_{off}$ |      |                                                                 | —   | 0.2  | 1   |      |

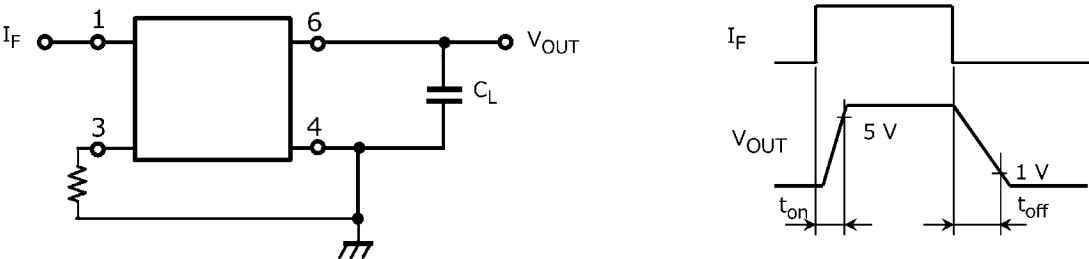


Fig. 10.1 Switching Time Test Circuit and Waveform

11. Characteristics Curves (Note)

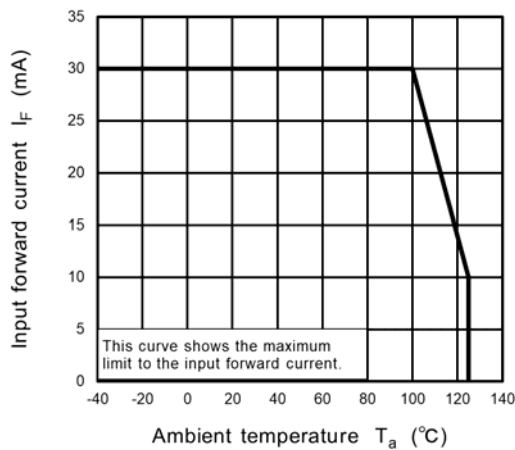


Fig. 11.1  $I_F - T_a$

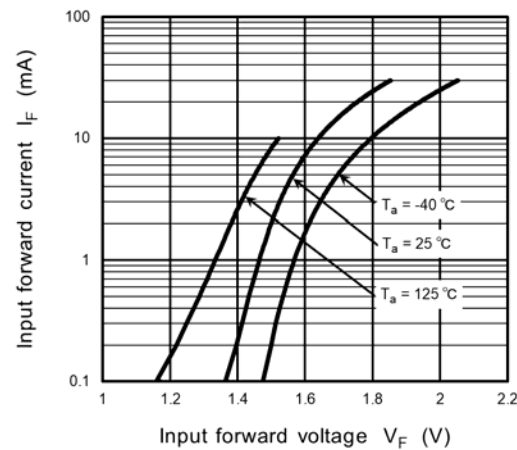


Fig. 11.2  $I_F - V_F$

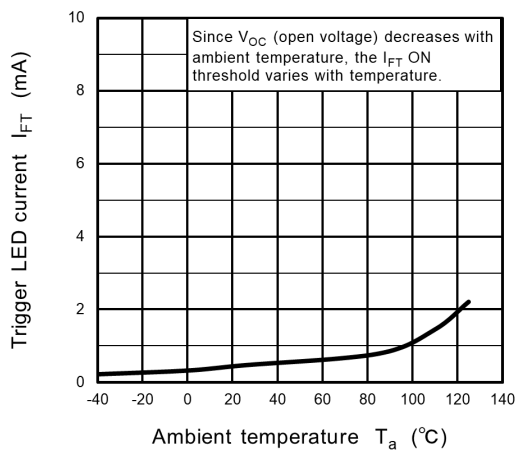


Fig. 11.3  $I_{FT} - T_a$

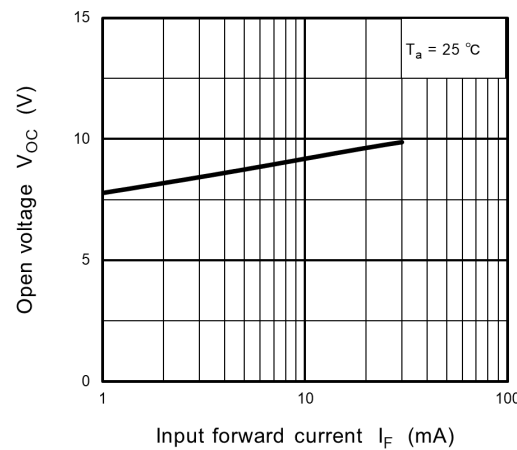


Fig. 11.4  $V_{OC} - I_F$

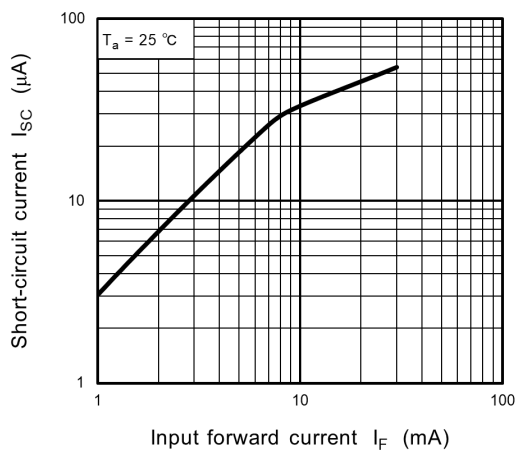


Fig. 11.5  $I_{SC} - I_F$

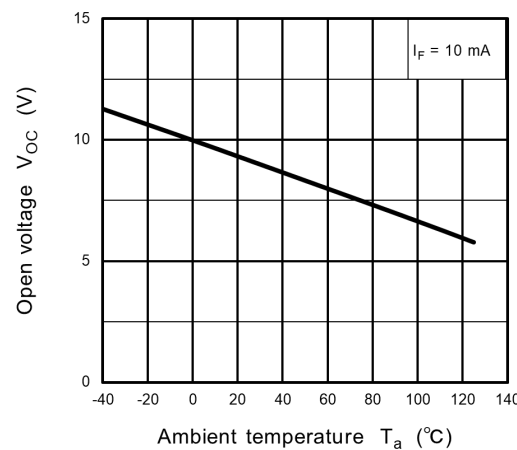


Fig. 11.6  $V_{OC} - T_a$

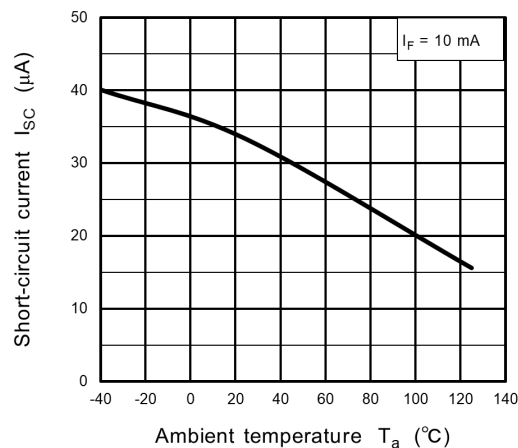


Fig. 11.7  $I_{sc} - T_a$

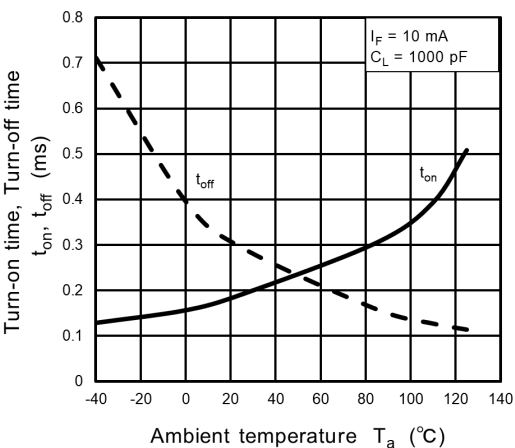


Fig. 11.8  $t_{on}, t_{off} - T_a$

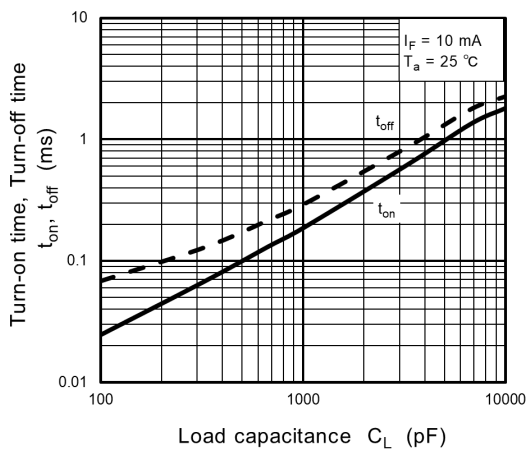
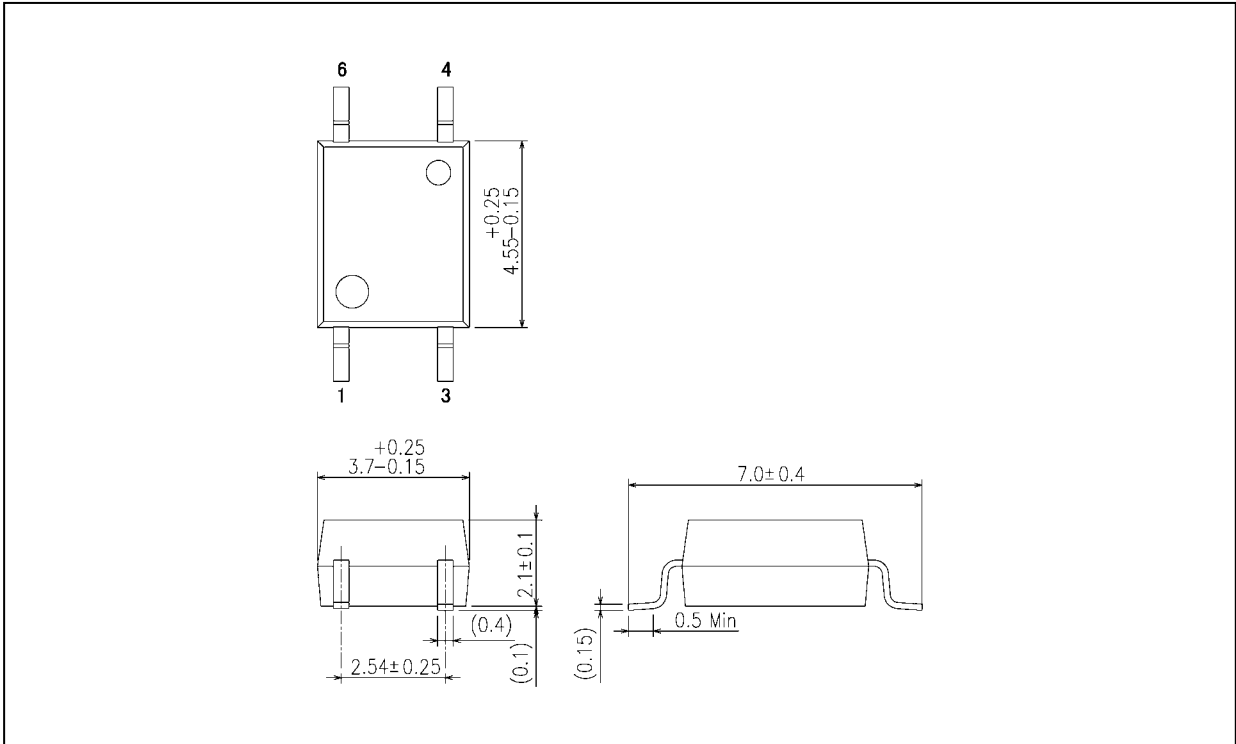


Fig. 11.9  $t_{on}, t_{off} - C_L$

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

Package Dimensions

Unit: mm



Weight: 0.08 g (typ.)

| Package Name(s)  |
|------------------|
| TOSHIBA: 11-4M1S |

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