

TOSHIBA Photocoupler IRLED & Photo-Transistor

TLX9185A

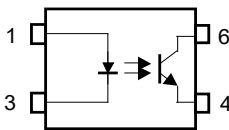
- Various Controllers
- Signal transmission between different circuit potential
- HEV (Hybrid Electric Vehicle) and EV (Electric Vehicle) Applications

The TOSHIBA TLX9185A mini-flat photocoupler is suitable for surface-mount assembly. The TLX9185A consists of an infrared LED optically coupled to a photo-transistor.

This photocoupler can be used to the extensive applications. It is generic speed transistor output.

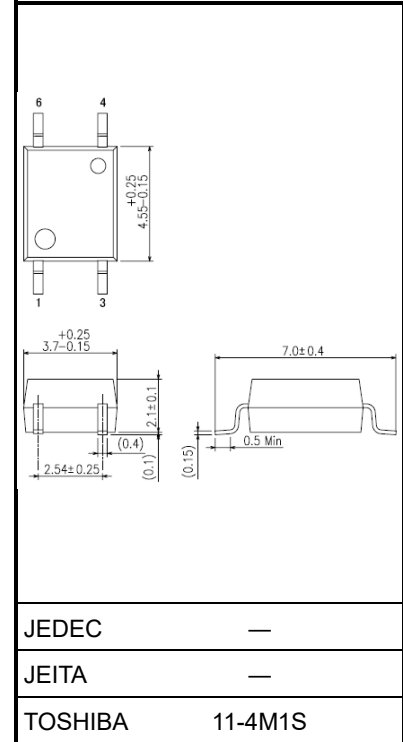
- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min) to 600%(max)
Rank GB: 100% (min) to 600%(max)
- Isolation voltage: 3750 Vrms (min)
- AEC-Q101 qualified

Pin Configuration



- 1: Anode
- 3: Cathode
- 4: Emitter
- 6: Collector

Unit: mm



Weight: 0.08 g (typ.)

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

| Characteristic | | Symbol | Rating | Unit |
|--|--|---------------------|------------|------------------|
| LED | Forward current | I _F | 30 | mA |
| | Forward current (Ta=125°C) | I _F | 18 | mA |
| | Forward current derating (Ta ≥ 108 °C) | ΔI _F /°C | -0.7 | mA/°C |
| | Pulse forward current (Note 1) | I _{FP} | 1 | A |
| | Input Power Dissipation | PD | 50 | mW |
| | Input Power Dissipation Derating (Ta ≥ 50°C) | ΔPD/°C | -0.5 | mW/°C |
| | Reverse voltage | V _R | 5 | V |
| Detector | Collector-emitter voltage | V _{CEO} | 80 | V |
| | Emitter-collector voltage | V _{ECO} | 7 | V |
| | Collector current | I _C | 50 | mA |
| | Collector power dissipation | P _C | 150 | mW |
| | Collector power dissipation derating (Ta ≥ 50°C) | ΔP _C /°C | -1.5 | mW/°C |
| Operating temperature range | | T _{opr} | -40 to 125 | °C |
| Storage temperature range | | T _{stg} | -55 to 150 | °C |
| Lead soldering temperature (10 s) | | T _{sol} | 260 | °C |
| Total package power dissipation | | P _T | 200 | mW |
| Total package power dissipation derating (Ta ≥ 50°C) | | ΔP _T /°C | -2.0 | mW/°C |
| Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 2) | | BV _S | 3750 | 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: Pulse width PW ≤ 100 μs, f = 100 Hz

Note 2: This device is considered as a two terminal device: Pins 1 and 3 are shorted together, and pins 4 and 6 are shorted together.

Recommended Operating Conditions (Note)

| Characteristic | Symbol | Min | Typ. | Max | Unit |
|--------------------------------|------------------|-----|------|-----|------|
| Supply voltage | V _{CC} | — | 5 | 48 | V |
| Forward current | I _F | — | 10 | 15 | mA |
| Collector current | I _C | — | 1 | 10 | mA |
| Operating temperature (Note 1) | T _{opr} | -40 | — | 125 | °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.

Note 1: Denotes the operating range, not the recommended operating condition.

Electrical Characteristics (Unless otherwise specified, Ta = -40 to 125°C)

| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|------------------------------------|-------------------------------------|-----------------------|-------------------------------------|-----|------|------|------|
| LED | Forward voltage | V _F | I _F = 10 mA, Ta = 25 °C | 1.1 | 1.27 | 1.4 | V |
| | | | I _F = 10 mA | 1.0 | — | 1.55 | V |
| | Reverse current | I _R | V _R = 5 V | — | — | 10 | μA |
| Capacitance | | C _T | V = 0 V, f = 1 MHz, Ta = 25 °C | — | 35 | — | pF |
| Detector | Collector-emitter breakdown voltage | V _{(BR) CEO} | I _C = 0.5 mA | 80 | — | — | V |
| | Emitter-collector breakdown voltage | V _{(BR) ECO} | I _E = 0.1 mA | 7 | — | — | V |
| | Collector dark current | I _{CEO} | V _{CE} = 48 V, Ta = 25 °C | — | 10 | 100 | nA |
| | | | V _{CE} = 48 V, Ta = 105 °C | — | 5 | 50 | μA |
| | | | V _{CE} = 48 V, Ta = 125 °C | — | 30 | 100 | μA |
| Capacitance (collector to emitter) | | C _{CE} | V = 0 V, f = 1 MHz, Ta = 25 °C | — | 10 | — | pF |

Coupled Electrical Characteristics (Unless otherwise specified, Ta = -40 to 125°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|---------------------------------------|--|-----|------|-----|------|
| Current transfer ratio | I _C / I _F | I _F = 5 mA, V _{CE} = 5 V | 20 | — | 600 | % |
| | | I _F = 5 mA, V _{CE} = 5 V, Ta = 25 °C | 50 | — | 600 | |
| | | I _F = 5 mA, V _{CE} = 5 V, Ta = 25 °C Rank GB | 100 | — | 600 | % |
| Saturated CTR | I _C / I _F (sat) | I _F = 1 mA, V _{CE} = 0.4 V, Ta = 25 °C | — | 200 | — | % |
| | | I _F = 1 mA, V _{CE} = 0.4 V, Ta = 25 °C Rank GB | 30 | — | — | |
| Collector-emitter saturation voltage | V _{CE} (sat) | I _C = 2.4 mA, I _F = 8 mA, Ta = 25 °C | — | — | 0.4 | V |
| | | I _C = 0.2 mA, I _F = 1 mA | — | — | 0.4 | |
| | | Ta=25 °C | — | 0.1 | 0.4 | |
| Off-state collector current | I _C (off) | V _F = 0.7V, V _{CE} = 48 V, Ta = 25 °C | — | — | 10 | μA |

Isolation Characteristics (Ta = 25°C)

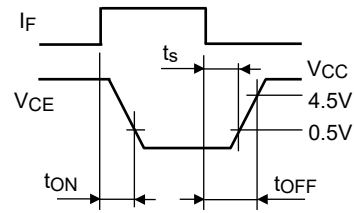
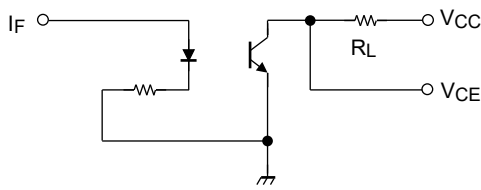
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------|-----------------|------------------------------------|--------------------|------------------|-----|------------------|
| Capacitance (input to output) | C _S | V _S = 0 V, f = 1 MHz | — | 0.5 | — | pF |
| Isolation resistance | R _S | V _S = 500 V, R.H. ≤ 60% | 5×10 ¹⁰ | 10 ¹⁴ | — | Ω |
| Isolation voltage | BV _S | AC, 60 s | 3750 | — | — | V _{rms} |

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

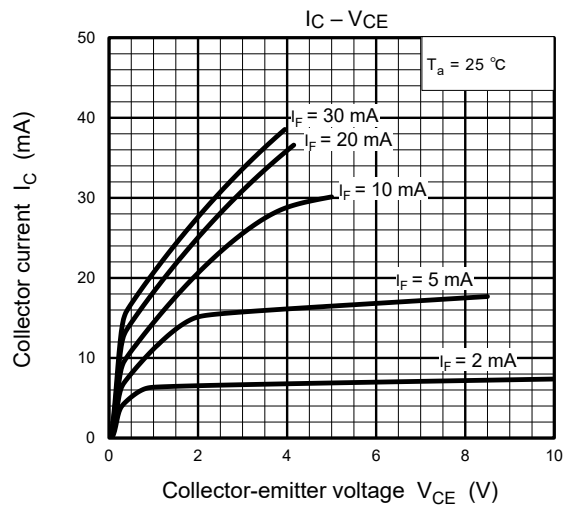
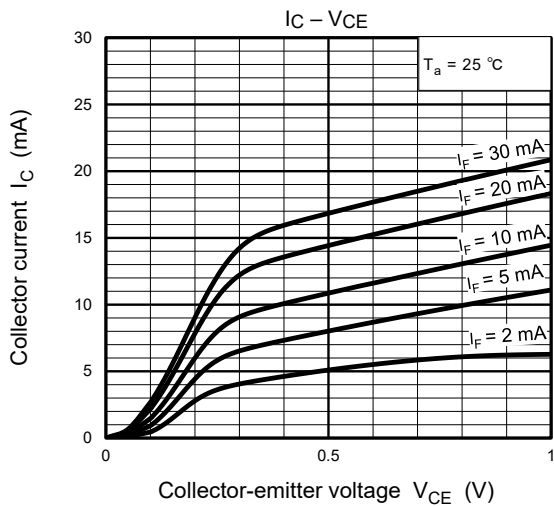
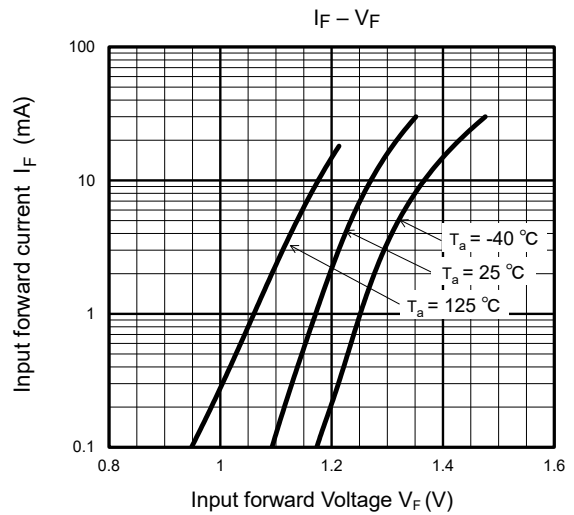
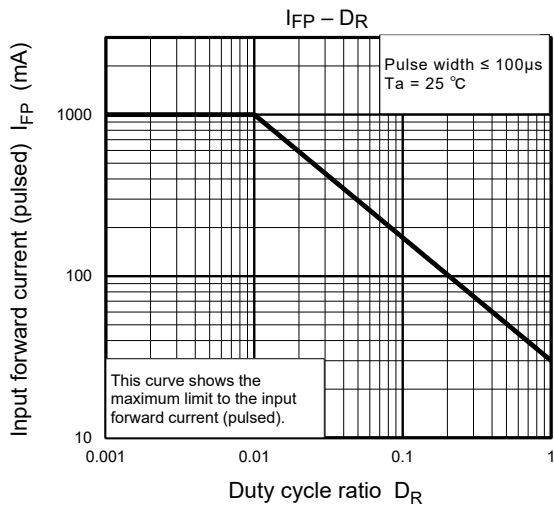
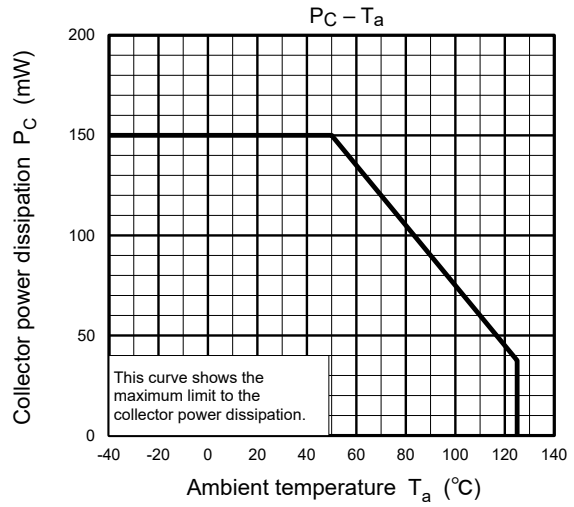
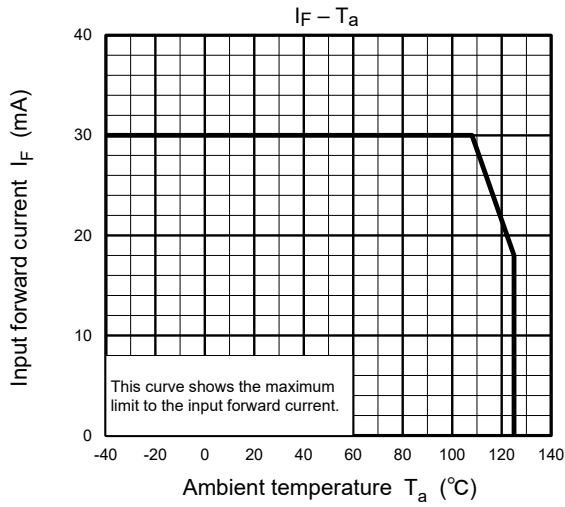
Switching Characteristics (Ta = 25°C)

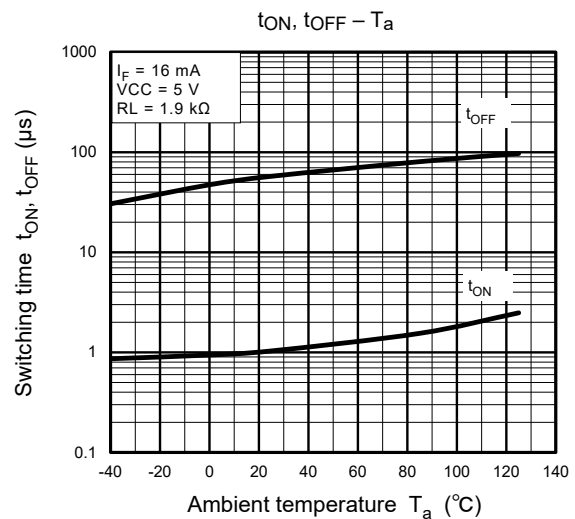
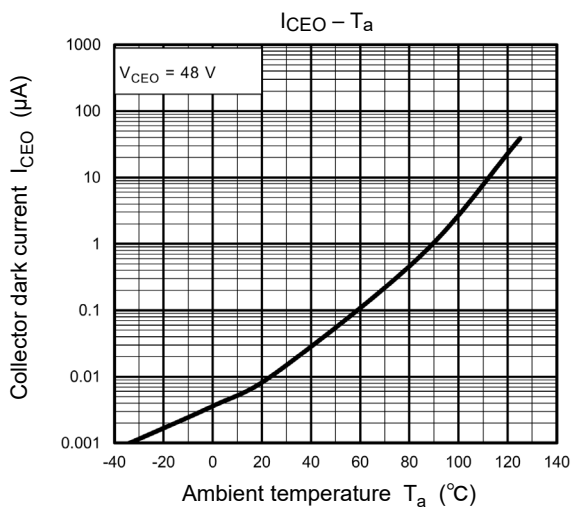
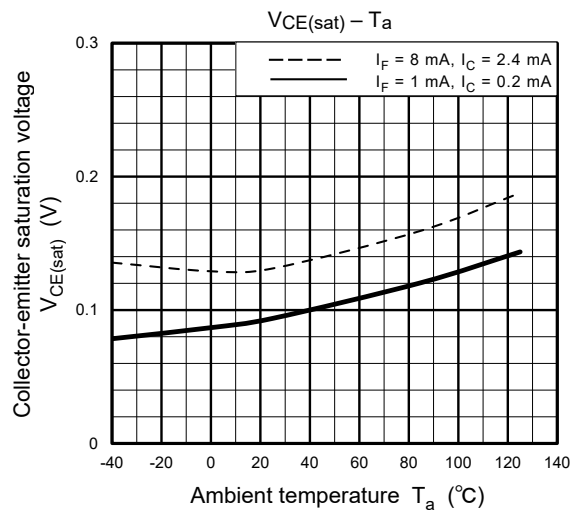
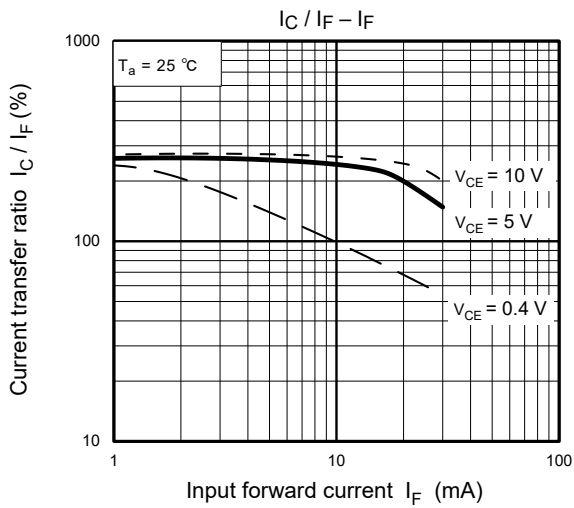
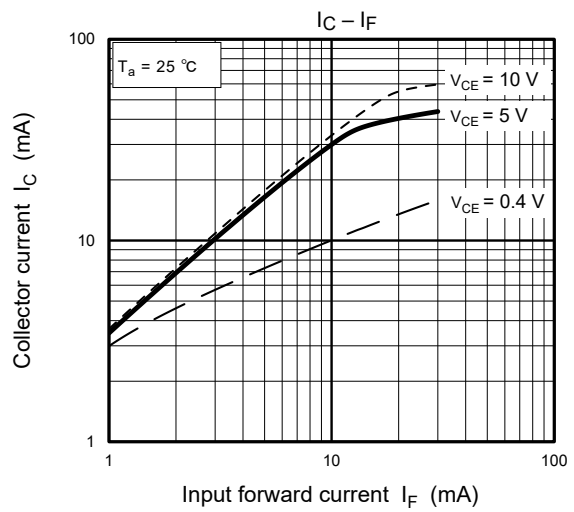
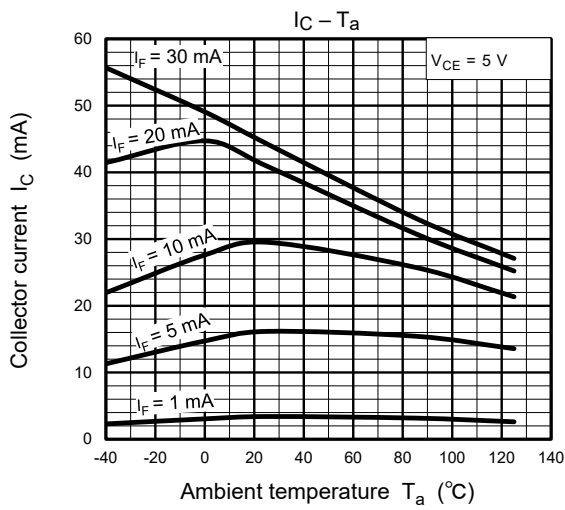
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------|-----------|--|-----|------|-----|---------------|
| Rise time | t_r | $V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\ \Omega$ | — | 3 | — | μs |
| Fall time | t_f | | — | 5 | — | |
| Turn-on time | t_{on} | | — | 5 | — | |
| Turn-off time | t_{off} | | — | 5 | — | |
| Turn-on time | t_{ON} | $R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$ (Note 1) | — | 2 | — | μs |
| Storage time | t_s | | — | 25 | — | |
| Turn-off time | t_{OFF} | | — | 45 | — | |

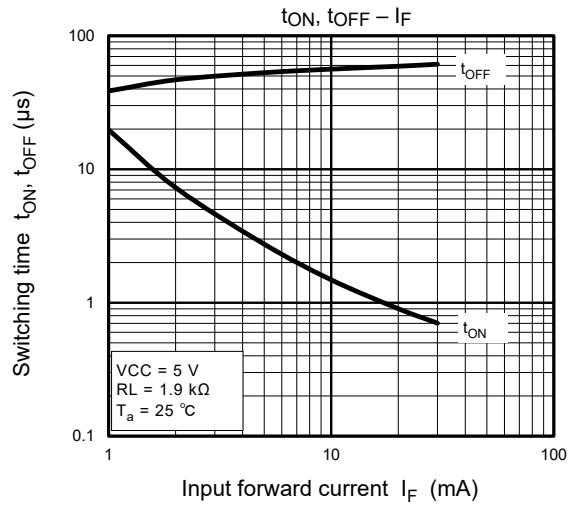
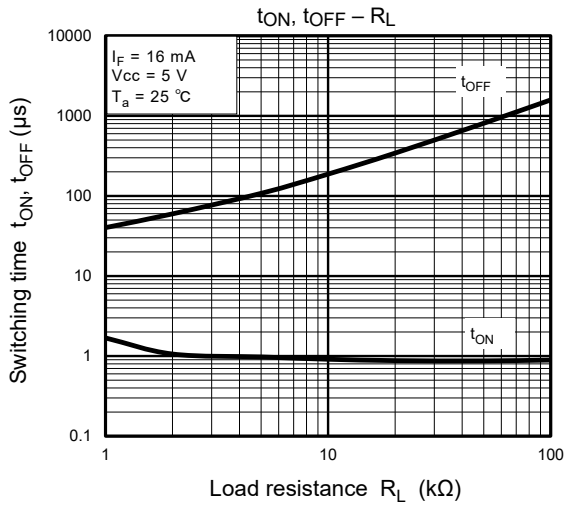
Note 1: Switching time test circuit



Characteristic Curves (Note)







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

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