

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP731, TLP732

- Office Machine
- Household Use Equipment
- Solid State Relay
- Switching Power Supply

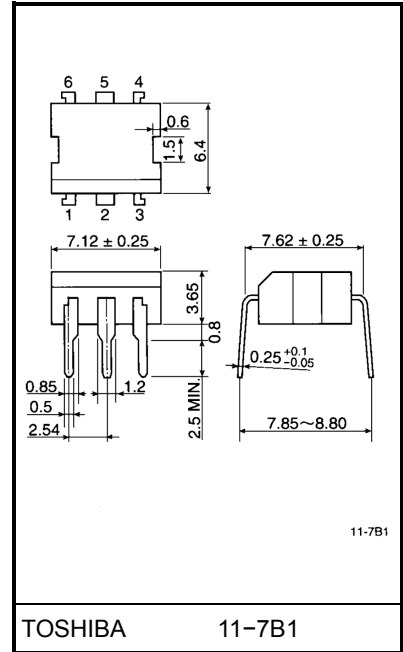
The TOSHIBA TLP731 and TLP732 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.
 TLP732 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55V (min.)
- Current transfer ratio: 50% (min.)
 Rank GB: 100% (min.)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065: 1994
 Certificate No. 6617
 BS EN60950: 1992
 Certificate No. 7366
 Isolation voltage: 4000V_{rms} (min.)
- Option (D4) type
 VDE approved: DIN VDE0884 / 08.87,
 Certificate No. 65640
 Maximum operating insulation voltage: 630V_{PK}
 Highest permissible over voltage: 6000V_{PK}

(Note) When a VDE0884 approved type is needed, please designate the "Option (D4)"

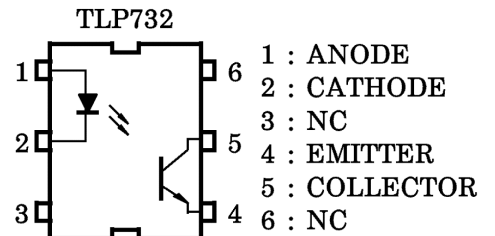
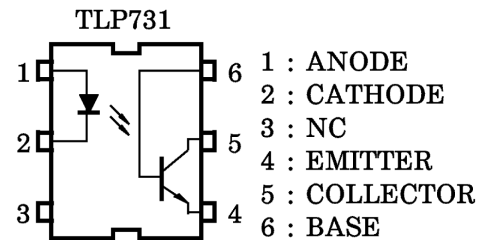
| | | |
|----------------------|-------------------------------------|-----------------------------------|
| | 7.62mm pich <u>standard type</u> | 10.16mm pich <u>(LF2) type</u> |
| • Creepage distance | : 7.0mm (min.) | 8.0 mm (min.) |
| Clearance | : 7.0 mm (min.) | 8.0 mm (min.) |
| Insulation thickness | : 0.5 mm (min.) | 0.5 mm (min.) |

Unit in mm



Weight: 0.35 g

Pin Configurations (top view)



Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|--|--|-------------------------------|---------|-----------|
| LED | Forward current | I_F | 60 | mA |
| | Forward current derating (Ta ≥ 39°C) | $\Delta I_F / ^\circ\text{C}$ | -0.7 | mA / °C |
| | Peak forward current (100µs pulse, 100pps) | I_{FP} | 1 | A |
| | Power dissipation | P_D | 100 | mW |
| | Power dissipation derating (Ta ≥ 25°C) | $\Delta P_D / ^\circ\text{C}$ | -1.0 | mW / °C |
| | Reverse voltage | V_R | 5 | V |
| | Junction temperature | T_j | 125 | °C |
| Detector | Collector-emitter voltage | V_{CEO} | 55 | V |
| | Collector-base voltage (TLP731) | V_{CBO} | 80 | V |
| | Emitter-collector voltage | V_{ECO} | 7 | V |
| | Emitter-base voltage (TLP731) | V_{EBO} | 7 | V |
| | Collector current | I_C | 50 | mA |
| | Power dissipation | P_C | 150 | mW |
| | Power dissipation derating (Ta ≥ 25°C) | $\Delta P_C / ^\circ\text{C}$ | -1.5 | mW / °C |
| | Junction temperature | T_j | 125 | °C |
| Storage temperature range | | T_{stg} | -55~125 | °C |
| Operating temperature range | | T_{opr} | -55~100 | °C |
| Lead soldering temperature (10s) | | T_{sol} | 260 | °C |
| Total package power dissipation | | P_T | 250 | mW |
| Total package power dissipation derating (Ta ≥ 25°C) | | $\Delta P_T / ^\circ\text{C}$ | -2.5 | mW / °C |
| Isolation voltage (AC, 1min., R.H. ≤ 60%) | | BV_S | 4000 | V_{rms} |

Recommended Operating Conditions

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage | V_{CC} | — | 5 | 24 | V |
| Forward current | I_F | — | 16 | 25 | mA |
| Collector current | I_C | — | 1 | 10 | mA |
| Operating temperature | T_{opr} | -25 | — | 85 | °C |

Individual 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 | $V = 0, f = 1\text{MHz}$ | — | 30 | — | pF |
| Detector | Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C = 0.5\text{mA}$ | 55 | — | — | V |
| | Emitter-collector breakdown voltage | $V_{(BR)ECO}$ | $I_E = 0.1\text{mA}$ | 7 | — | — | V |
| | Collector-base breakdown voltage (TLP731) | $V_{(BR)CBO}$ | $I_C = 0.1\text{mA}$ | 80 | — | — | V |
| | Emitter-base breakdown voltage (TLP731) | $V_{(BR)EBO}$ | $I_E = 0.1\text{mA}$ | 7 | — | — | V |
| | Collector dark current | I_{CEO} | $V_{CE} = 24\text{V}$ $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ | — | 10 | 100 | nA |
| | | | | — | 2 | 50 | μA |
| | Collector dark current (TLP731) | I_{CER} | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1\text{M}\Omega$ | — | 0.5 | 10 | μA |
| | Collector dark current (TLP731) | I_{CBO} | $V_{CB} = 10\text{V}$ | — | 0.1 | — | nA |
| | DC forward current gain (TLP731) | h_{FE} | $V_{CE} = 5\text{V}, I_C = 0.5\text{mA}$ | — | 400 | — | — |
| Capacitance collector to emitter | C_{CE} | $V = 0, f = 1\text{MHz}$ | — | 10 | — | pF | |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|--------------------------------------|--------------------------|---|------|------|------|---------------|
| Current transfer ratio | I_C / I_F | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$ Rank GB | 50 | — | 600 | % |
| | | | 100 | — | 600 | |
| Saturated CTR | $I_C / I_F (\text{sat})$ | $I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$ Rank GB | — | 60 | — | % |
| | | | 30 | — | — | |
| Base photo-current (TLP731) | I_{PB} | $I_F = 5\text{mA}, V_{CB} = 5\text{V}$ | — | 10 | — | μA |
| Collector-emitter saturation voltage | $V_{CE} (\text{sat})$ | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$ | — | — | 0.4 | V |
| | | $I_C = 0.2\text{mA}, I_F = 1\text{mA}$ Rank GB | — | 0.2 | — | |
| | | | — | — | 0.4 | |

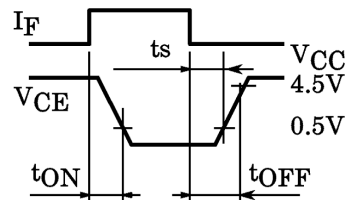
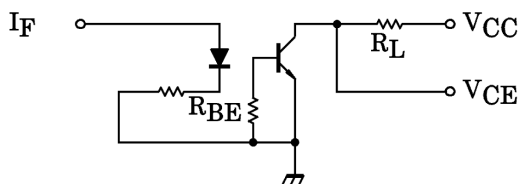
Isolation Characteristics (Ta = 25°C)

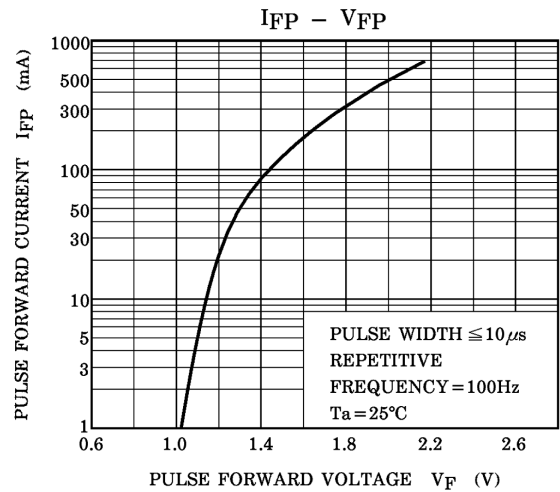
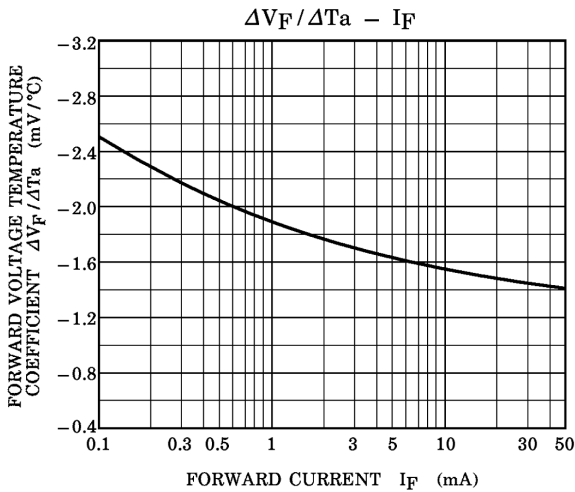
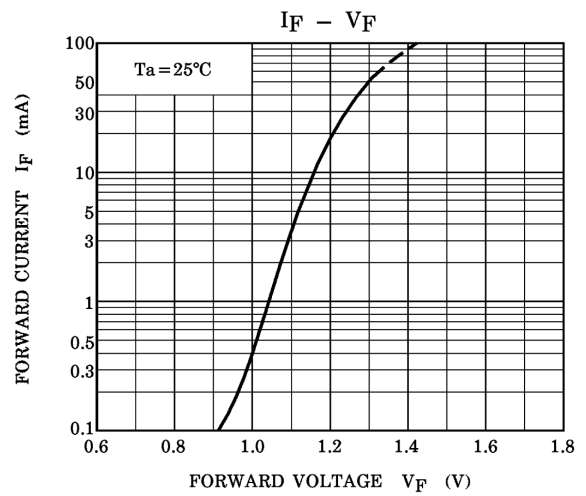
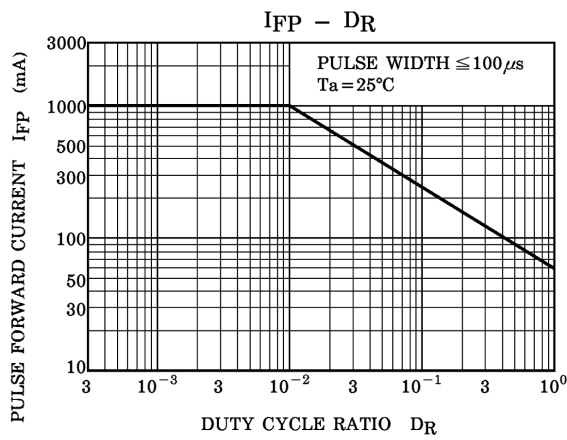
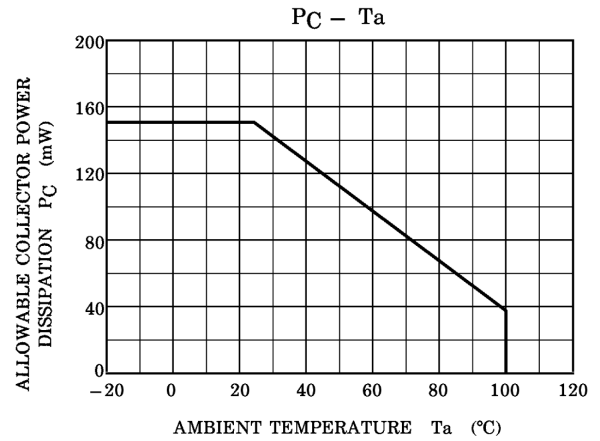
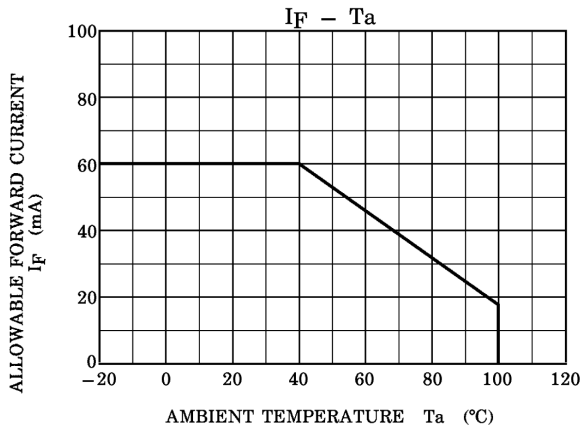
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|-------------------------------|-----------------|------------------------------|--------------------|------------------|------|------------------|
| Capacitance (input to output) | C _S | V _S = 0, f = 1MHz | — | 0.8 | — | pF |
| Isolation resistance | R _S | V _S = 500V | 1×10 ¹² | 10 ¹⁴ | — | Ω |
| Isolation voltage | BV _S | AC, 1 minute | 4000 | — | — | V _{rms} |
| | | AC, 1 second, in oil | — | 10000 | — | |
| | | DC, 1 minute, in oil | — | 10000 | — | V _{dc} |

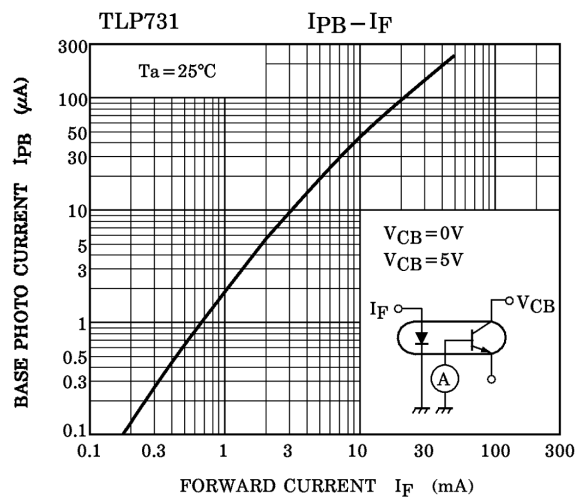
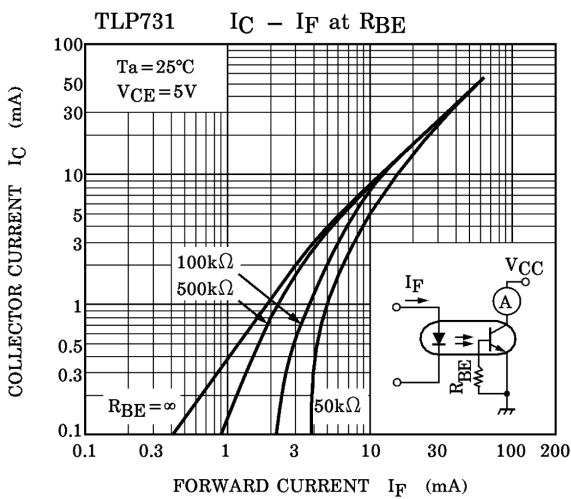
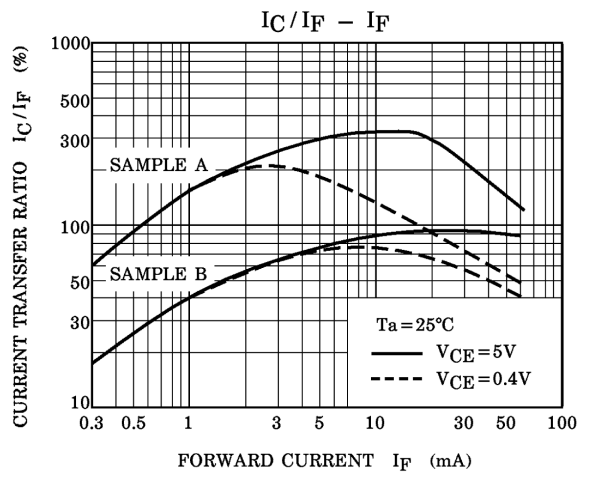
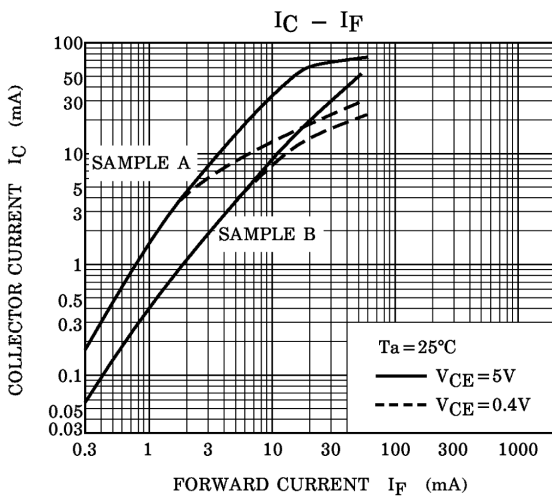
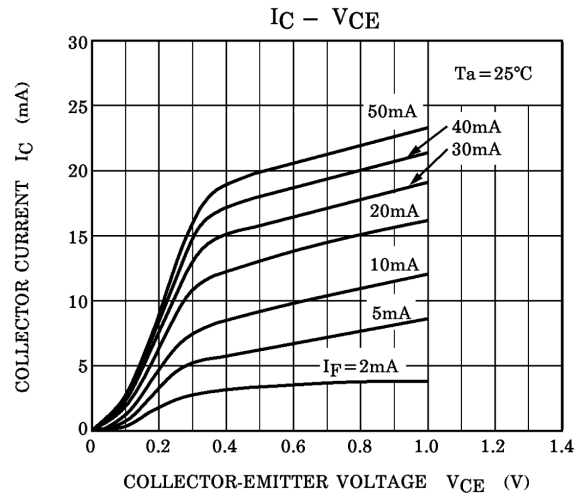
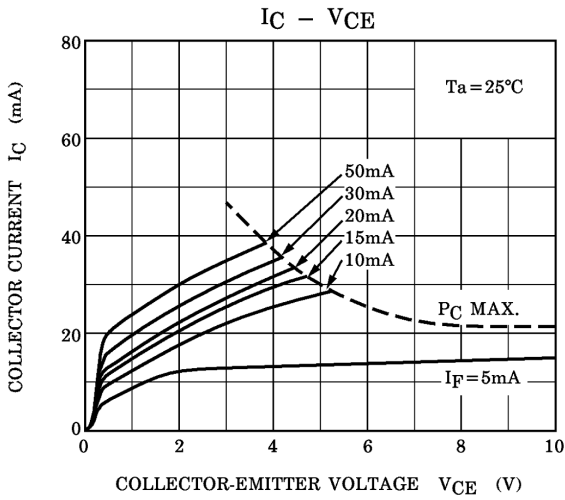
Switching Characteristics (Ta = 25°C)

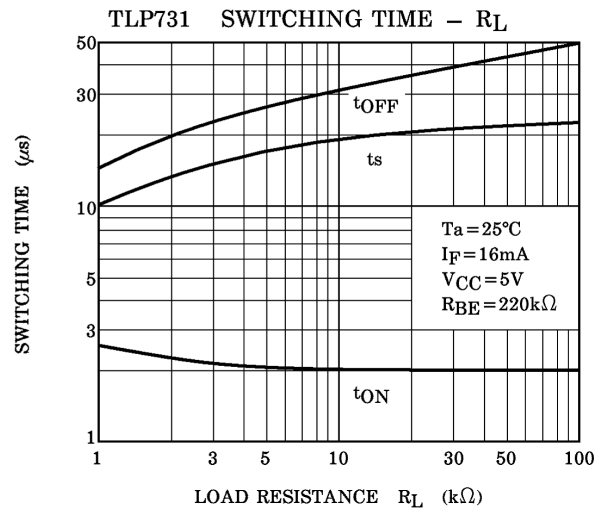
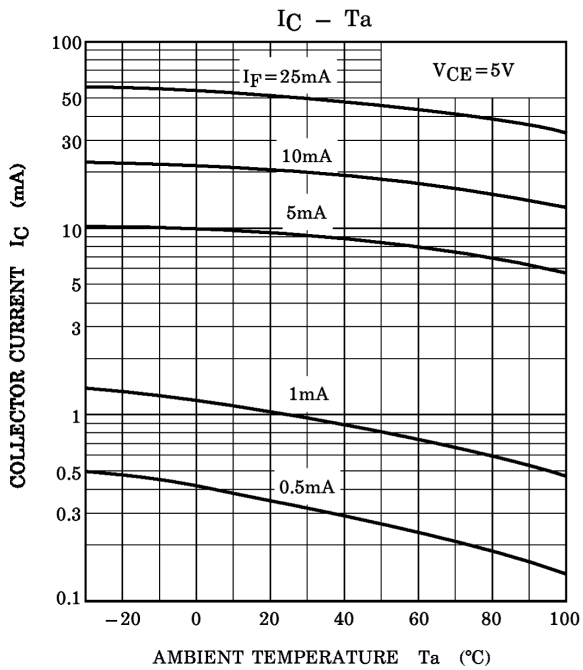
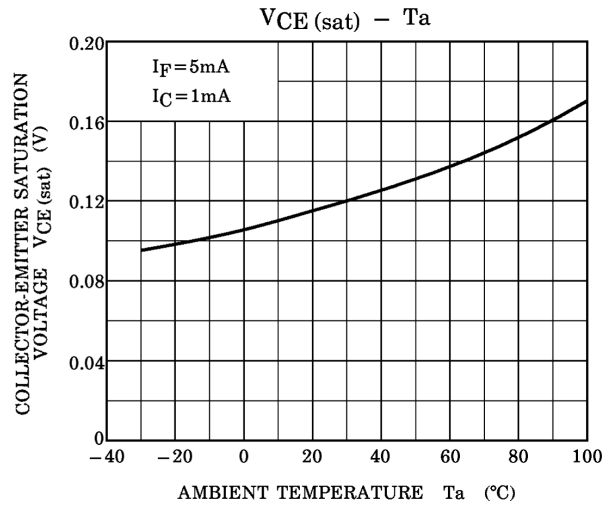
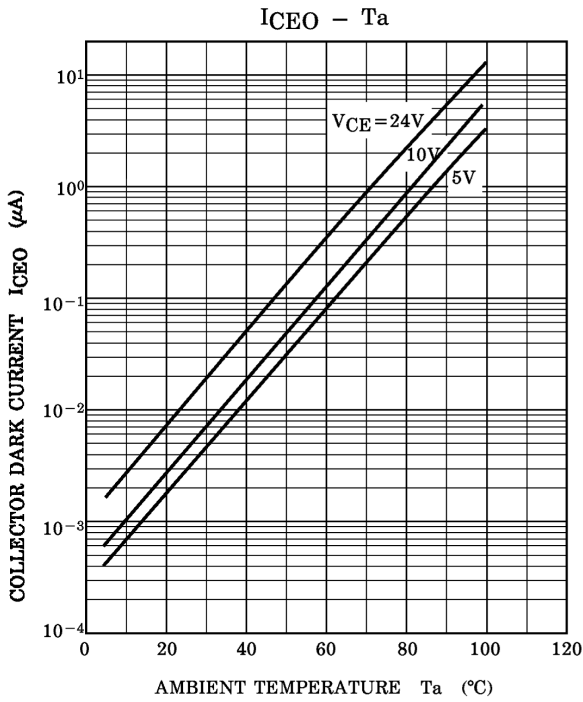
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------|------------------|---|------|------|------|------|
| Rise time | t _r | V _{CC} = 10V, I _C = 2mA R _L = 100Ω | — | 2 | — | μs |
| Fall time | t _f | | — | 3 | — | |
| Turn-on time | t _{on} | | — | 3 | 10 | |
| Turn-off time | t _{off} | | — | 3 | 10 | |
| Turn-on time | t _{ON} | R _L = 1.9kΩ (Fig.1) R _{BE} = open V _{CC} = 5V, I _F = 16mA | — | 2 | — | μs |
| Storage time | t _s | | — | 15 | — | |
| Turn-off time | t _{OFF} | | — | 25 | — | |
| Turn-on time | t _{ON} | R _L = 1.9kΩ (Fig.1) R _{BE} = 220kΩ (TLP731) V _{CC} = 5V, I _F = 16mA | — | 2 | — | μs |
| Storage time | t _s | | — | 12 | — | |
| Turn-off time | t _{OFF} | | — | 20 | — | |

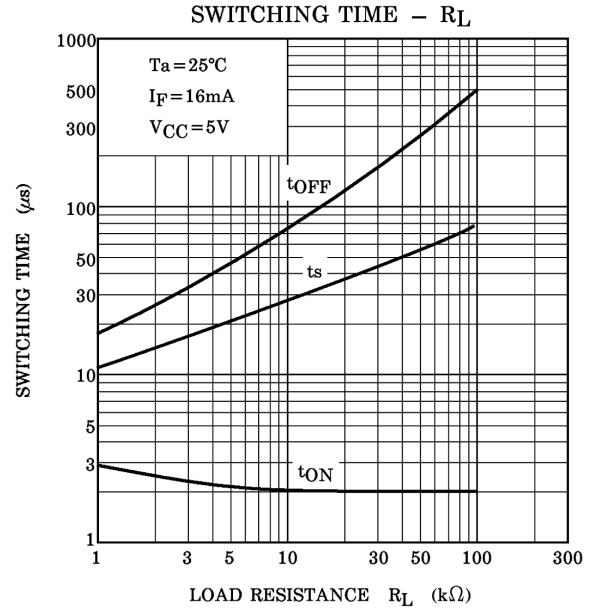
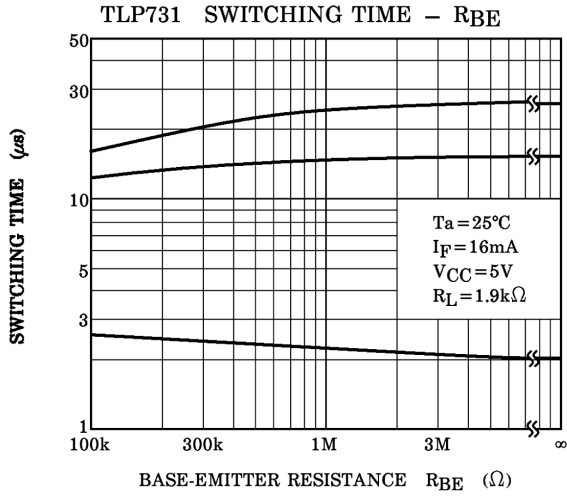
Fig. 1 Switching time test circuit











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