

TOSHIBA Photocoupler GaAs IRed & Photo-Transistor

TLP531, TLP532

Programmable Controllers

AC / DC-Input Module

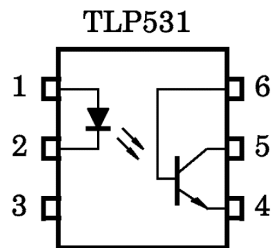
Solid State Relay

The TOSHIBA TLP531 and TLP532 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.

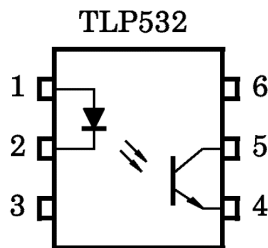
TLP532 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
Rank GB: 100% (min.)
- Isolation voltage: 2500 V_{rms} (min.)
- UL recognized: UL1577, file no. E67349

Pin Configurations (top view)

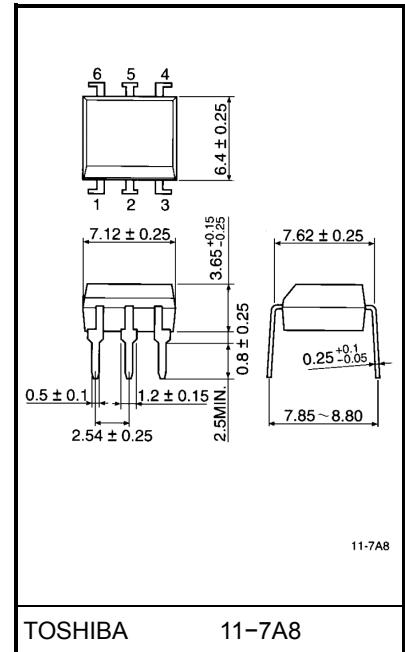


1 : ANODE
2 : CATHODE
3 : N.C.
4 : EMITTER
5 : COLLECTOR
6 : BASE



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Unit in mm



Weight: 0.4g

Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|--|---|-------------------------------|---------|-----------|
| LED | Forward current | I_F | 70 | mA |
| | Forward current derating (Ta ≥ 50°C) | $\Delta I_F / ^\circ\text{C}$ | 0.93 | mA / °C |
| | Peak forward current (100 μs pulse, 100pps) | I_{FP} | 1 | A |
| | Reverse voltage | V_R | 5 | V |
| | Junction temperature | T_j | 125 | °C |
| Detector | Collector-emitter voltage | V_{CEO} | 55 | V |
| | Collector-base voltage (TLP531) | V_{CBO} | 80 | V |
| | Emitter-collector voltage | V_{ECO} | 7 | V |
| | Emitter-base voltage (TLP531) | 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 | 2500 | V_{rms} |

Recommends 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 (TLP531) | $V_{(BR)CBO}$ | $I_C = 0.1\text{mA}$ | 80 | — | — | V |
| | Emitter-base breakdown voltage (TLP531) | $V_{(BR)EBO}$ | $I_E = 0.1\text{mA}$ | 7 | — | — | V |
| | Collector dark current | I_{CEO} | $V_{CE} = 24\text{V}$ | — | 10 | 100 | nA |
| | | | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ | — | 2 | 50 | μA |
| | 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 Y Rank YG Rank GR Rank GB Rank BL | 50 | 200 | 600 | % |
| | | | 50 | — | 150 | |
| | | | 50 | — | 300 | |
| | | | 100 | — | 300 | |
| | | | 100 | — | 600 | |
| | | | 200 | — | 600 | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$ | — | — | 0.4 | V |

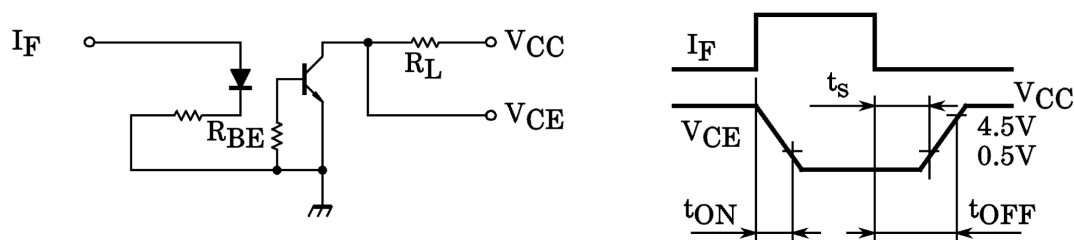
Isolation Characteristics (Ta = 25°C)

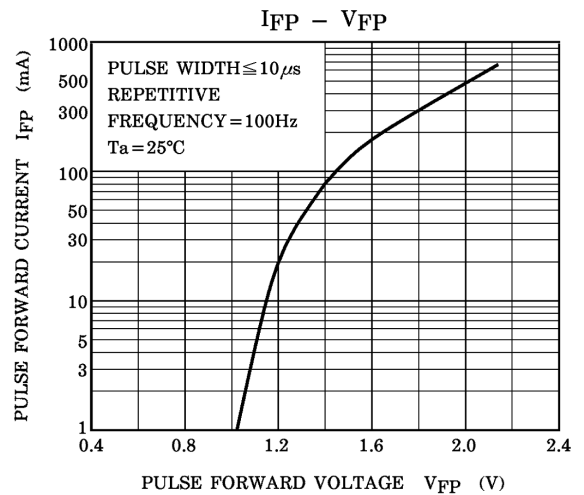
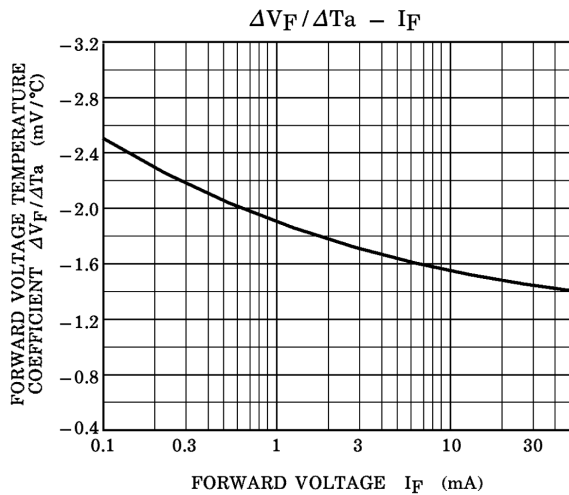
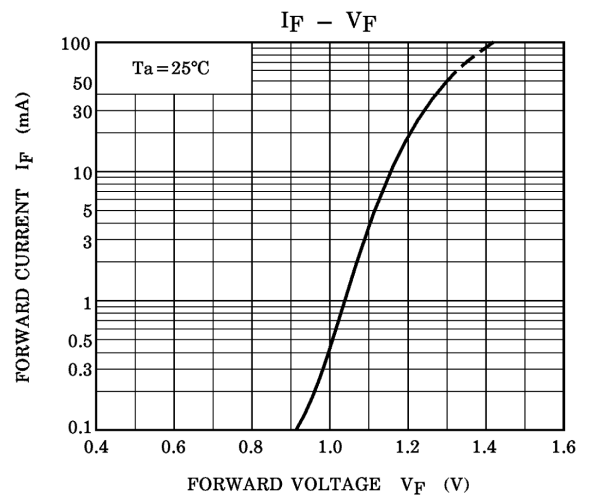
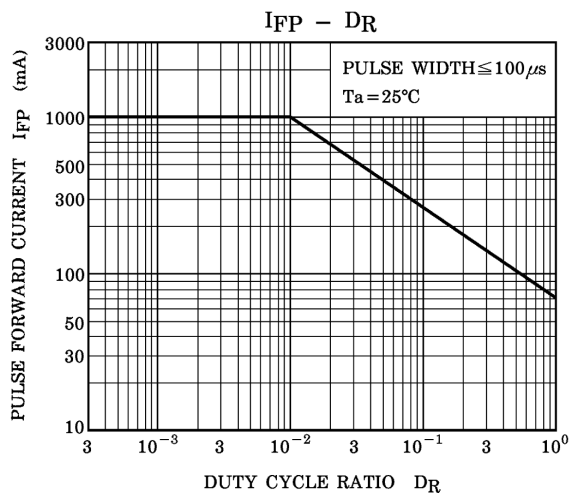
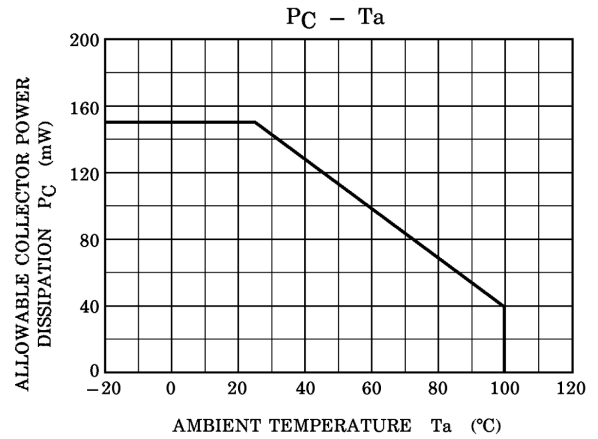
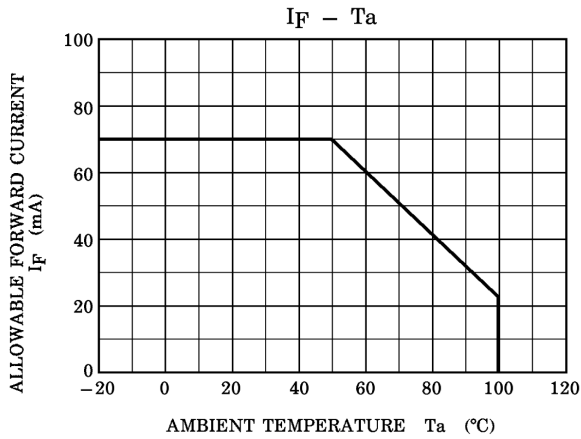
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|-------------------------------|--------|--|--------------------|-----------|------|------------------|
| Capacitance (input to output) | C_S | $V_S = 0, f = 1\text{MHz}$ | — | 0.8 | — | pF |
| Isolation resistance | R_S | $V_S = 500\text{V}, \text{R.H.} \leq 60\%$ | 5×10^{10} | 10^{14} | — | Ω |
| Isolation voltage | BV_S | AC, 1 minute | 2500 | — | — | V_{rms} |

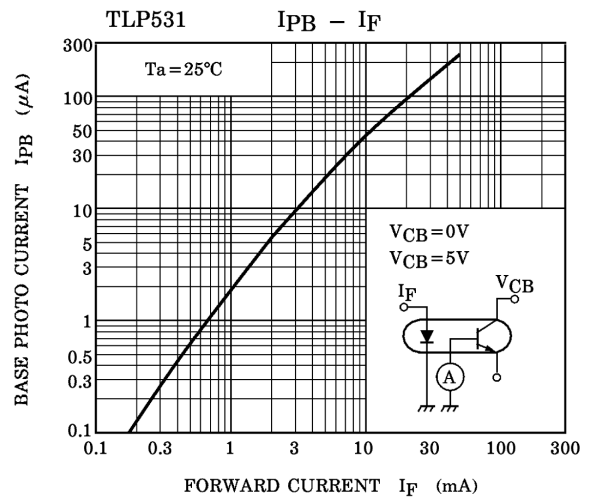
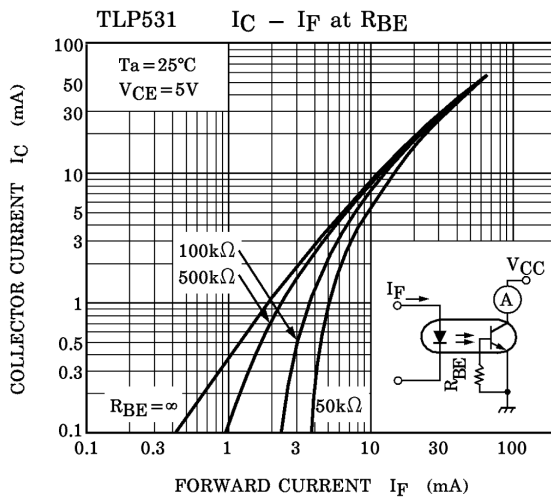
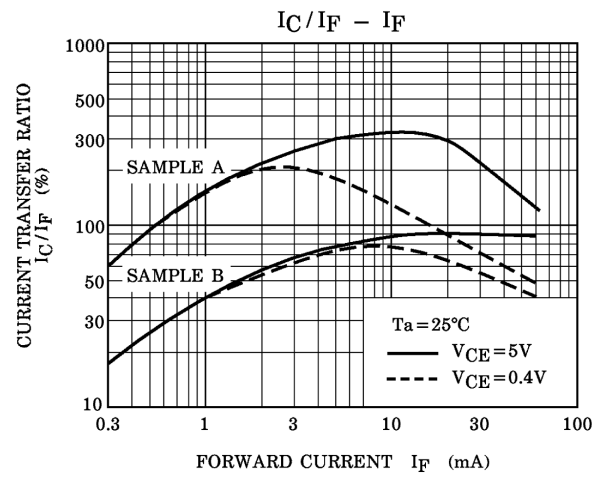
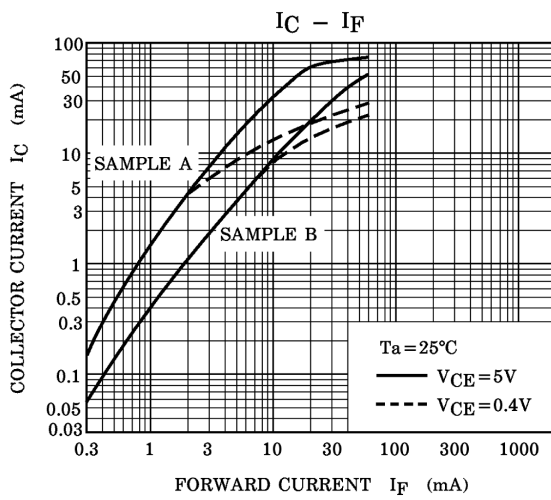
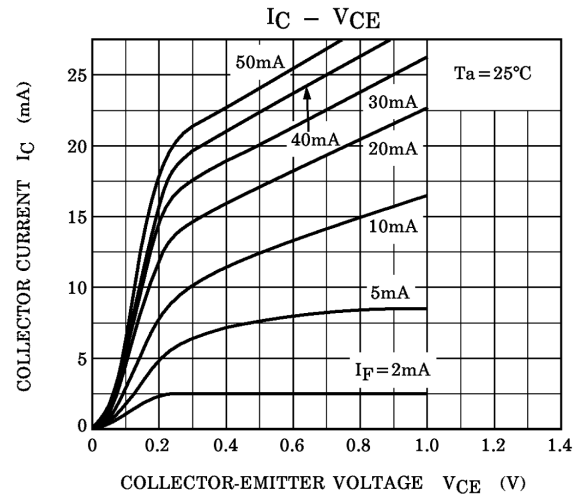
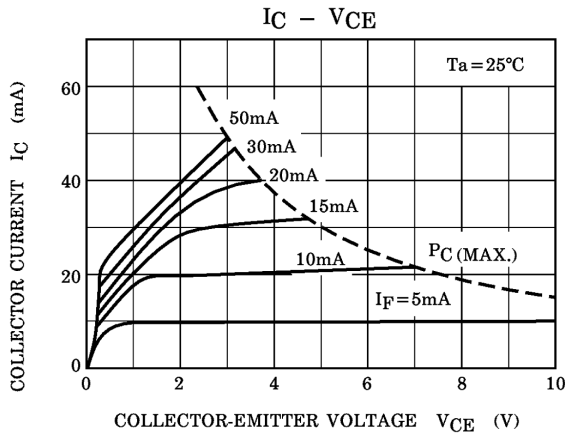
Switching Characteristics (Ta = 25°C)

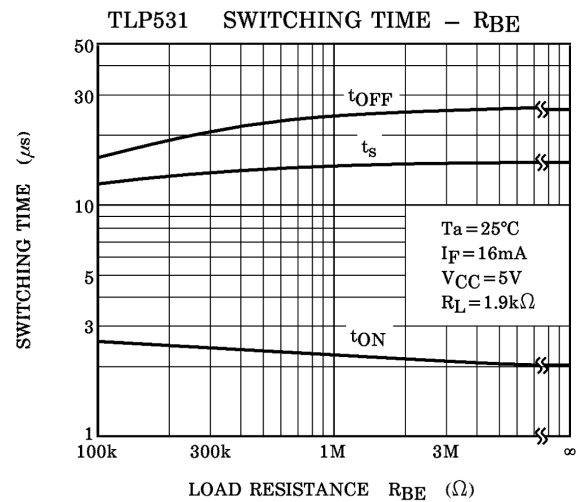
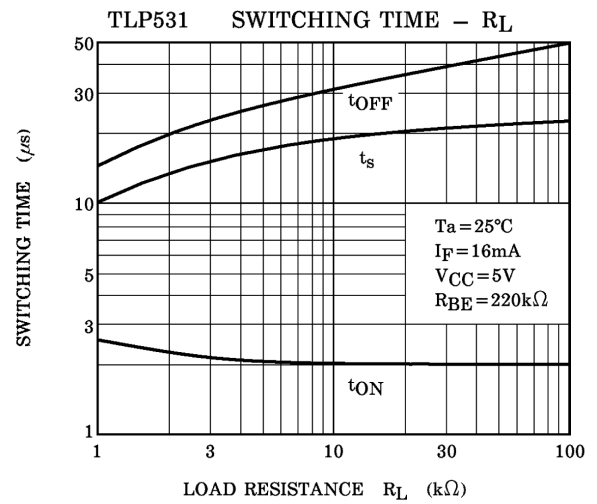
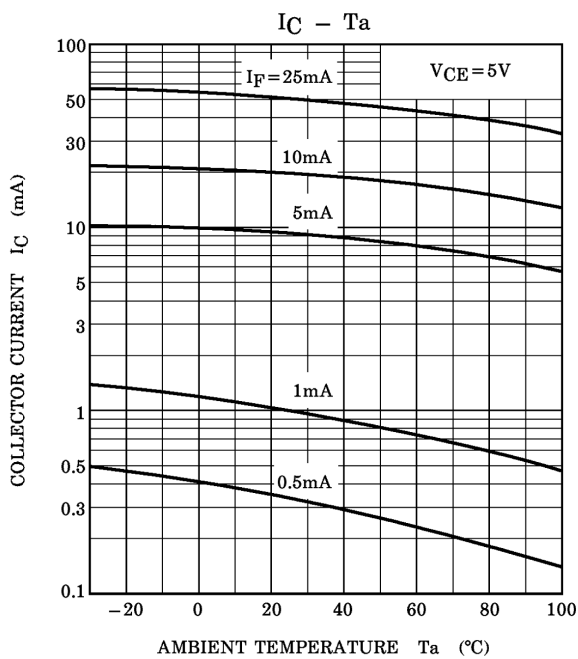
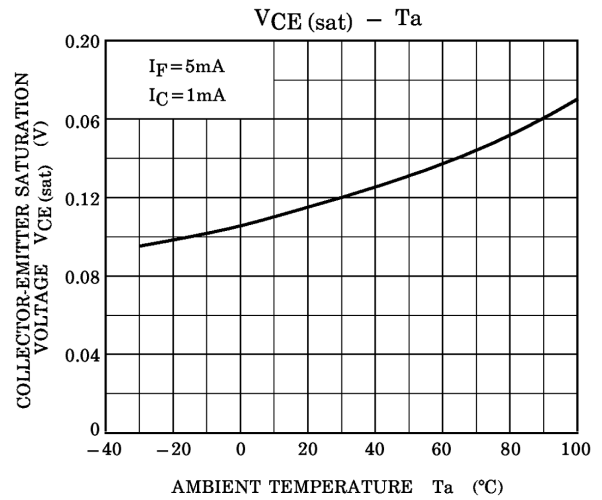
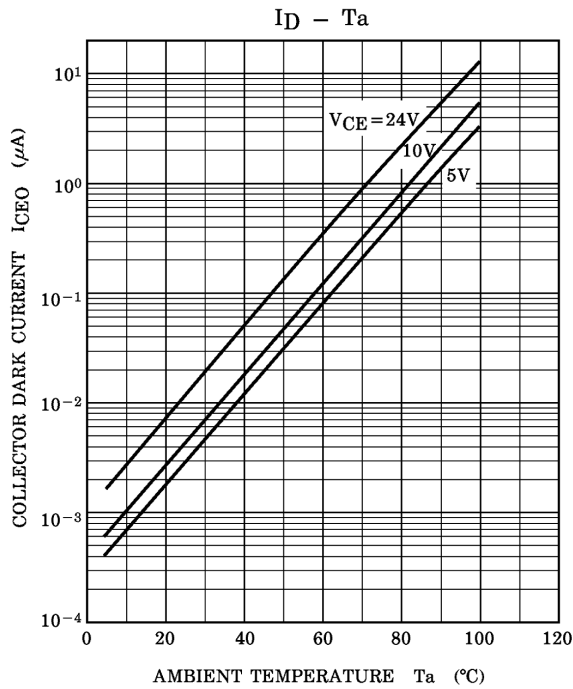
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------|-----------|--|------|------|------|---------------|
| Rise time | t_r | $V_{CC} = 10\text{V}$ $I_C = 2\text{mA}$ $R_L = 100\Omega$ | — | 2 | — | μs |
| Fall time | t_f | | — | 3 | — | |
| Turn-on time | t_{ON} | | — | 3 | — | |
| Turn-off time | t_{OFF} | | — | 3 | — | |
| Turn-on time | t_{ON} | $R_L = 1.9\text{k}\Omega$ $R_{BE} = \text{open}$ $V_{CC} = 5\text{V}, I_F = 16\text{mA}$ (Fig.1) | — | 2 | — | μs |
| Storage time | t_s | | — | 15 | — | |
| Turn-off time | t_{OFF} | | — | 25 | — | |
| Turn-on time | t_{ON} | $R_L = 1.9\Omega$ $R_{BE} = 220\text{k}\Omega$ (TLP531) $V_{CC} = 5\text{V}, I_F = 16\text{mA}$ (Fig.1) | — | 2 | — | μs |
| Storage time | t_s | | — | 12 | — | |
| Turn-off time | t_{OFF} | | — | 20 | — | |

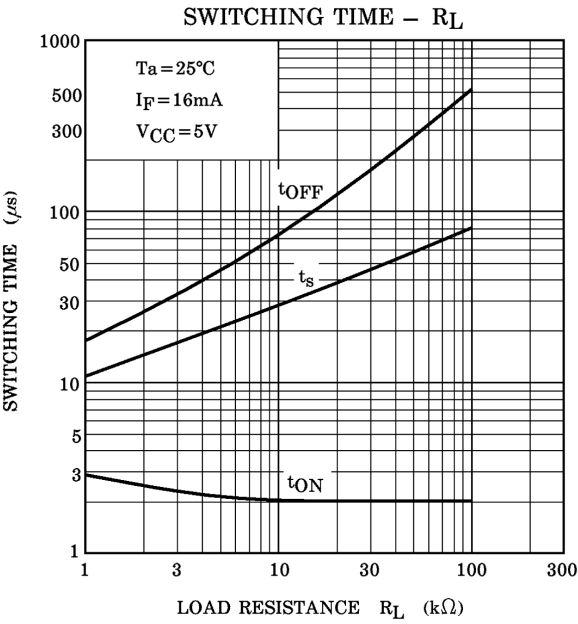
Fig. 1 Switching time test circuit











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