## Current Transfer Ratio

| Classification | Current Transfer Ratio (%) ($I_C/I_F$) $I_F$ = 5 mA, $V_{CE}$ = 5 V, Ta = 25°C | | Marking Of Classification |
|---|---|---|---|
| | Min | Max | |
| Blank | 50 | 600 | Blank, Y, Y■, YE, G, G■, GR, B, B■, BL, GB |
| Rank Y | 50 | 150 | YE |
| Rank GR | 100 | 300 | GR |
| Rank BL | 200 | 600 | BL |
| Rank GB | 100 | 600 | GB |
| Rank YH | 75 | 150 | Y■ |
| Rank GRL | 100 | 200 | G |
| Rank GRH | 150 | 300 | G■ |
| Rank BLL | 200 | 400 | B |

Note: Please ask your local retailer about the devices with Rank Y or Rank BL.

Note: Application type name for certiffication test,please use standard product type name,i.e.
TLP131(GB): TLP131

## Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | | | Symbol | Rating | Unit |
|---|---|---|---|---|---|
| LED | Forward current | | $I_F$ | 50 | mA |
| | Forward current derating | (Ta ≥ 53°C) | $\Delta I_F$/°C | -0.7 | mA/°C |
| | Peak forward current | (100 μs pulse, 100 pps) | $I_{FP}$ | 1 | A |
| | Reverse voltage | | $V_R$ | 5 | V |
| | Diode power dissipation | | PD | 100 | mW |
| | Diode power dissipation derating | (Ta ≥ 53°C) | ΔPD/°C | -1.39 | mW/°C |
| | Junction temperature | | $T_j$ | 125 | °C |
| Detector | Collector-emitter voltage | | $V_{CEO}$ | 80 | V |
| | Collector-base voltage | | $V_{CBO}$ | 80 | V |
| | Emitter-collector voltage | | $V_{ECO}$ | 7 | V |
| | Emitter-base voltage | | $V_{EBO}$ | 7 | V |
| | Collector current | | $I_C$ | 50 | mA |
| | Peak collector current | (10 ms pulse, 100 pps) | $I_{CP}$ | 100 | mA |
| | Power dissipation | | $P_C$ | 150 | mW |
| | Power dissipation derationg | (Ta ≥ 25°C) | $\Delta P_C$/°C | -1.5 | mW/°C |
| | Junction temperature | | $T_j$ | 125 | °C |
| Storage temperature range | | | $T_{stg}$ | -55 to 125 | °C |
| Operating temperature range | | | $T_{opr}$ | -55 to 100 | °C |
| Lead soldering temperature | | (10 s) | $T_{sol}$ | 260 | °C |
| Total package power dissipation | | | $P_T$ | 200 | mW |
| Total package power dissipation derating | | (Ta ≥ 25°C) | $\Delta P_T$/°C | -2.0 | mW/°C |
| Isolation voltage (AC, 60 s, RH ≤ 60 %) | | (Note 1) | $BV_S$ | 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: Device considered a two terminal device: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.

## Recommended Operating Conditions

| Characteristics | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | — | 5 | 48 | V |
| Forward current | $I_F$ | — | 16 | 25 | mA |
| Collector current | $I_C$ | — | 1 | 10 | mA |
| Operating temperature | $T_{opr}$ | -25 | — | 85 | °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.

## Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| LED | Forward voltage | $V_F$ | $I_F$ = 10 mA | 1.0 | 1.15 | 1.3 | V |
| | Reverse current | $I_R$ | $V_R$ = 5 V | — | — | 10 | μA |
| | Capacitance | $C_T$ | V = 0 V, f = 1 MHz | — | 30 | — | 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-base breakdown voltage | $V_{(BR)CBO}$ | $I_C$ = 0.1 mA | 80 | — | — | V |
| | Emitter-base breakdown voltage | $V_{(BR)EBO}$ | $I_E$ = 0.1 mA | 7 | — | — | V |
| | collector dark current | $I_{CEO}$ | $V_{CE}$ = 48 V | — | 10 | 100 | nA |
| | | | $V_{CE}$ = 48 V, Ta = 85 °C | — | 2 | 50 | μA |
| | Collector dark current | $I_{CER}$ | $V_{CE}$ = 48 V, Ta = 85 °C<br>$R_{BE}$ = 1 MΩ | — | 0.5 | 10 | μA |
| | Collector dark current | $I_{CBO}$ | $V_{CB}$ = 10 V | — | 0.1 | — | nA |
| | DC forward current gain | $h_{FE}$ | $V_{CE}$ = 5 V, $I_C$ = 0.5 mA | — | 400 | — | — |
| | Capacitance (collector to emitter) | $C_{CE}$ | V = 0 V, f = 1 MHz | — | 10 | — | pF |

## Coupled Electrical Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Current transfer ratio | $I_C/I_F$ | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 50 | — | 600 | % |
| | | Rank GB | 100 | — | 600 | |
| Saturated CTR | $I_C/I_{F(sat)}$ | $I_F$ = 1 mA, $V_{CE}$ = 0.4 V | — | 60 | — | % |
| | | Rank GB | 30 | — | — | |
| Base photo-current | $I_{PB}$ | $I_F$ = 5 mA, $V_{CB}$ = 5 V | — | 10 | — | μA |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$ = 2.4 mA, $I_F$ = 8 mA | — | — | 0.4 | V |
| | | $I_C$ = 0.2 mA, $I_F$ = 1 mA | — | 0.2 | — | |
| | | Rank GB | — | — | 0.4 | |
| Off-state collector current | $I_{C(off)}$ | $I_F$ = 0.7 mA, $V_{CE}$ = 48 V | — | 1 | 10 | μA |

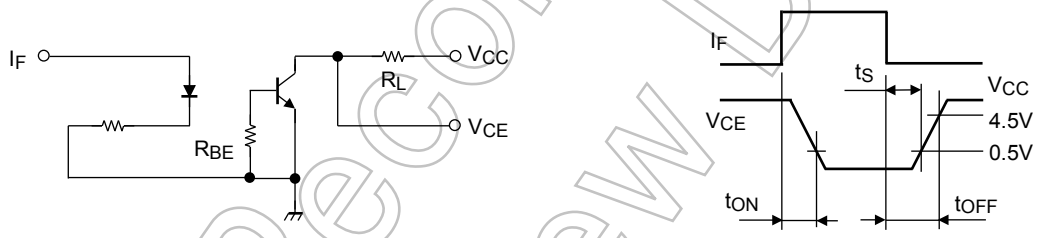
## Isolation Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Capacitance (input to output) | $C_S$ | $V_S$ = 0 V, f = 1 MHz | — | 0.8 | — | pF |
| Isolation resistance | $R_S$ | $V_S$ = 500 V, RH ≤ 60 % | $5\times10^{10}$ | $10^{14}$ | — | Ω |
| Isolation voltage | $BV_S$ | AC, 60 s | 3750 | — | — | Vrms |

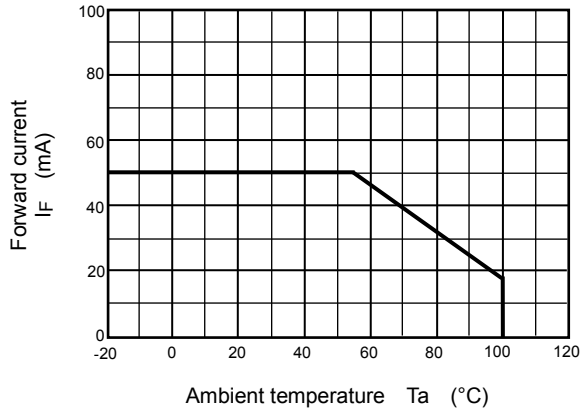
## Switching Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Rise time | $t_r$ | $V_{CC}$ = 10 V, $I_C$ = 2 mA<br>$R_L$ = 100 Ω | — | 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 kΩ (Fig.1)<br>$R_{BE}$ = OPEN<br>$V_{CC}$ = 5 V, $I_F$ = 16 mA | — | 2 | — | μs |
| Storage time | $t_s$ | | — | 25 | — | |
| Turn-off time | $t_{OFF}$ | | — | 40 | — | |
| Turn-on time | $t_{ON}$ | $R_L$ = 1.9 kΩ (Fig.1)<br>$R_{BE}$ = 220 kΩ<br>$V_{CC}$ = 5 V, $I_F$ = 16 mA | — | 2 | — | μs |
| Storage time | $t_s$ | | — | 20 | — | |
| Turn-off time | $t_{OFF}$ | | — | 30 | — | |

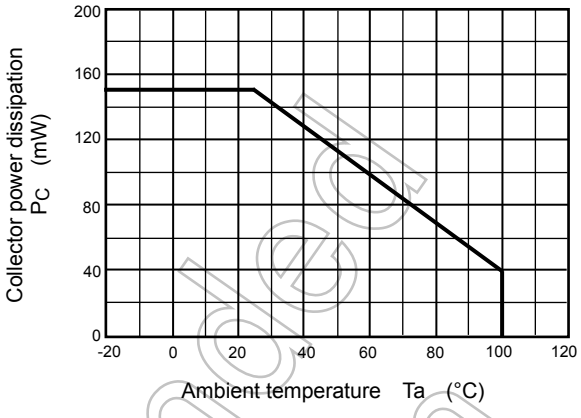
Fig. 1 Switching time test circuit



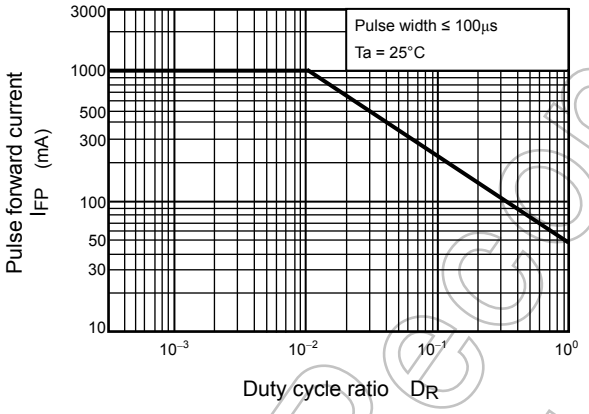
$I_F$ – Ta



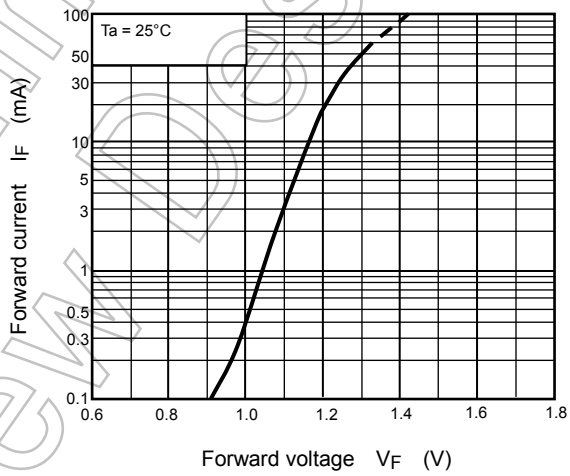

$P_C$ – Ta



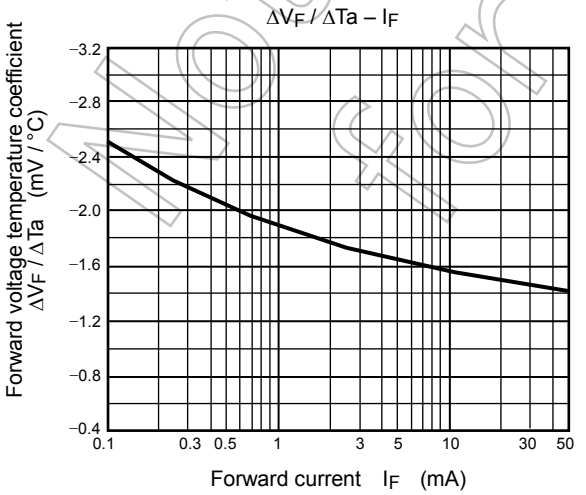

$I_{FP}$ – $D_R$



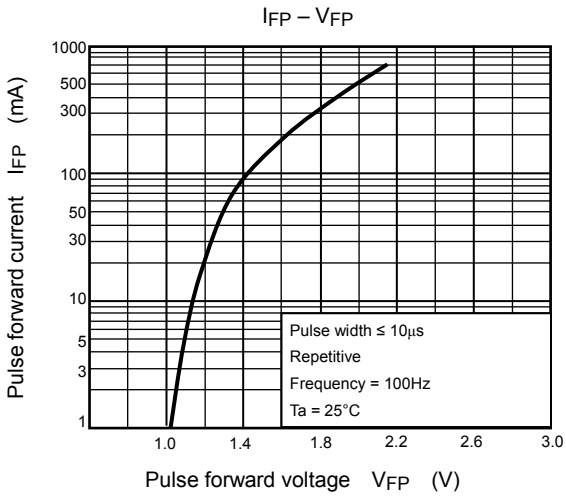

$I_F$ – $V_F$




$\Delta V_F / \Delta Ta$ – $I_F$




$I_{FP}$ – $V_{FP}$

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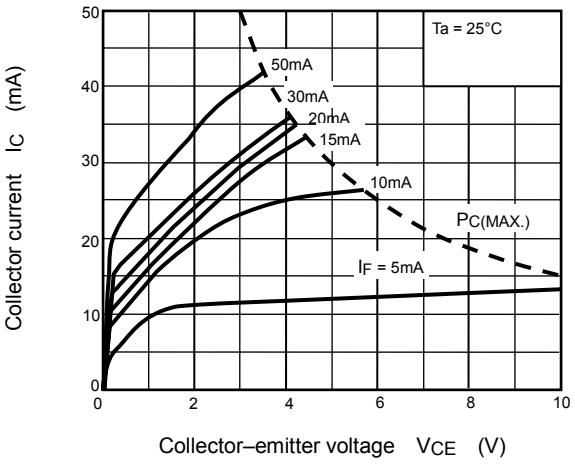
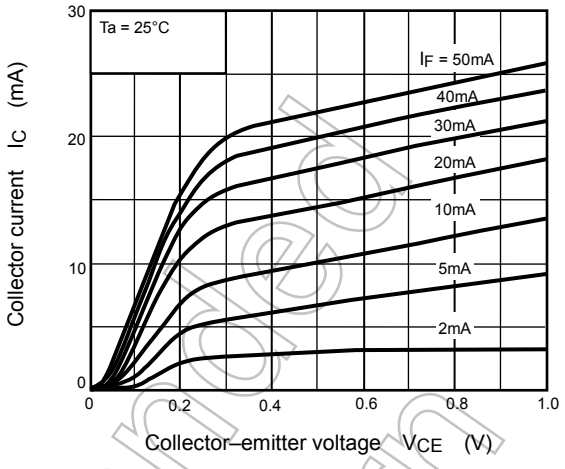
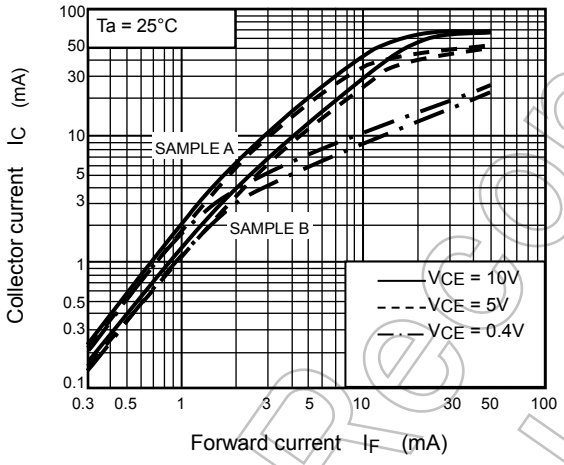
$I_C - V_{CE}$



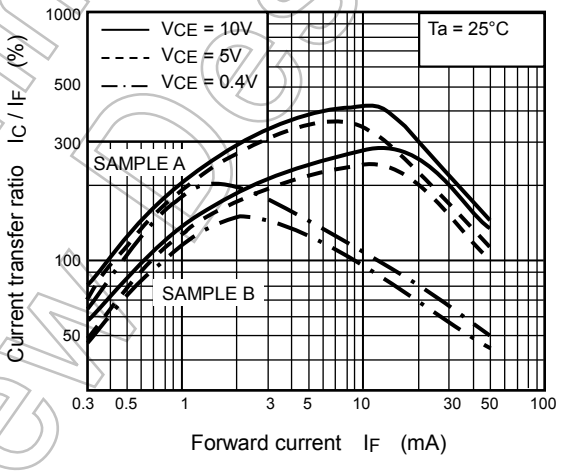

$I_C - V_{CE}$



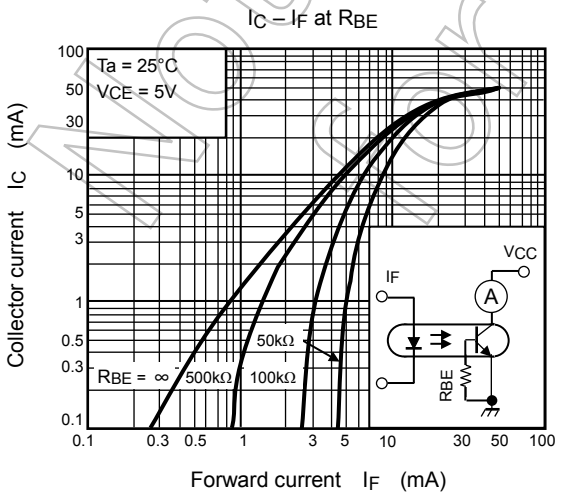

$I_C - I_F$



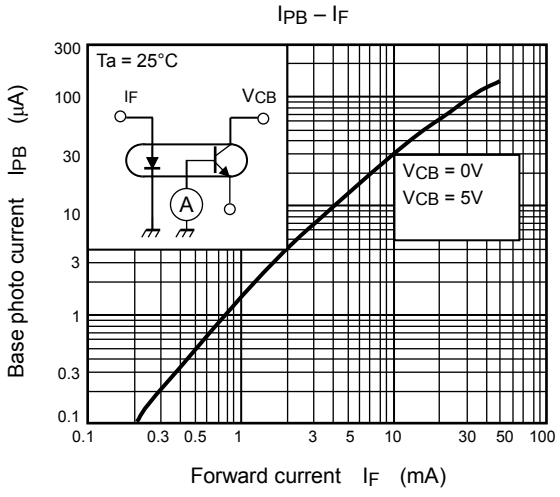

$I_C / I_F - I_F$




$I_C - I_F$ at $R_{BE}$




$I_{PB} - I_F$



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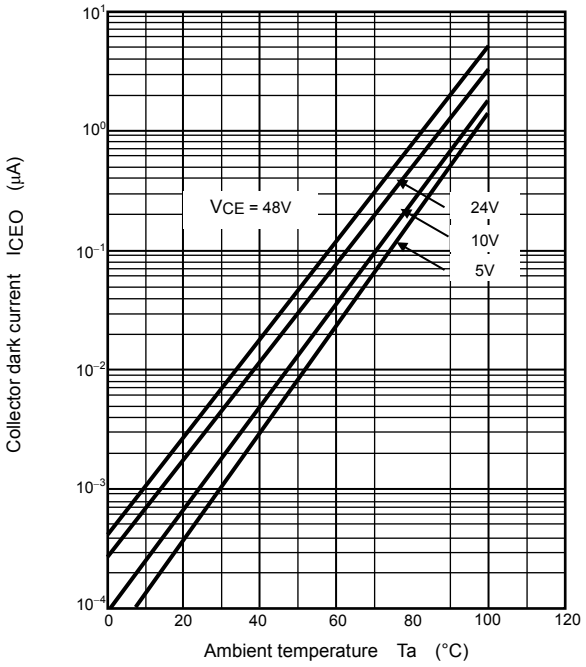
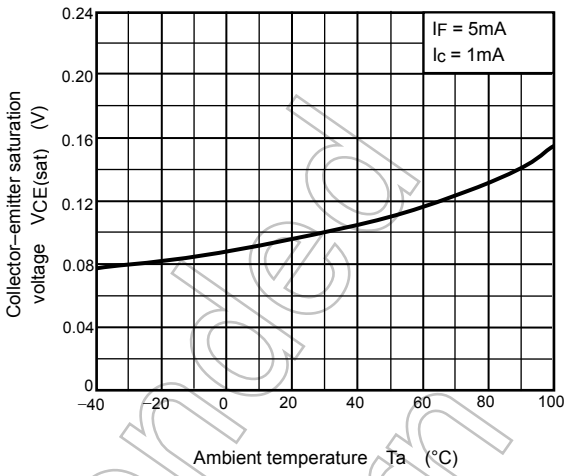
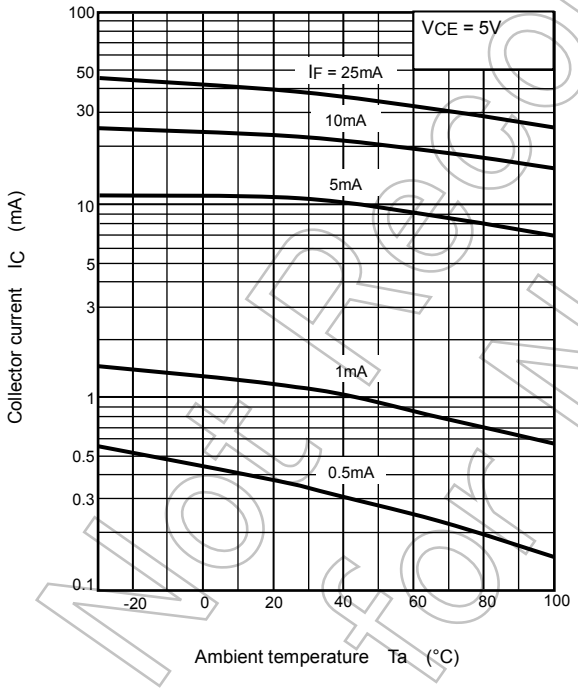
$I_{CEO}$ – Ta



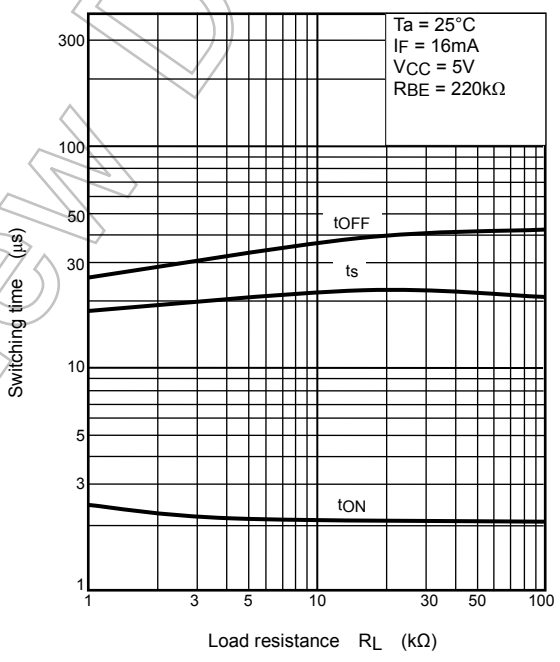

$V_{CE(sat)}$ – Ta




$I_C$ – Ta




Switching Time – RL

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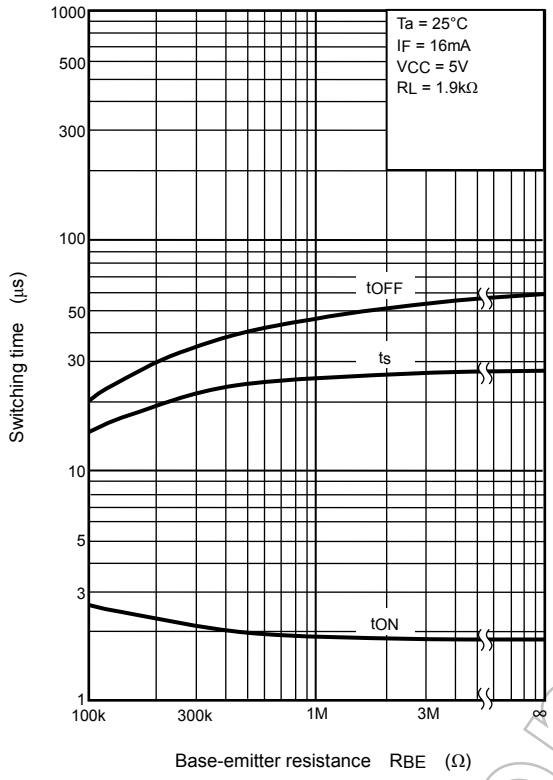
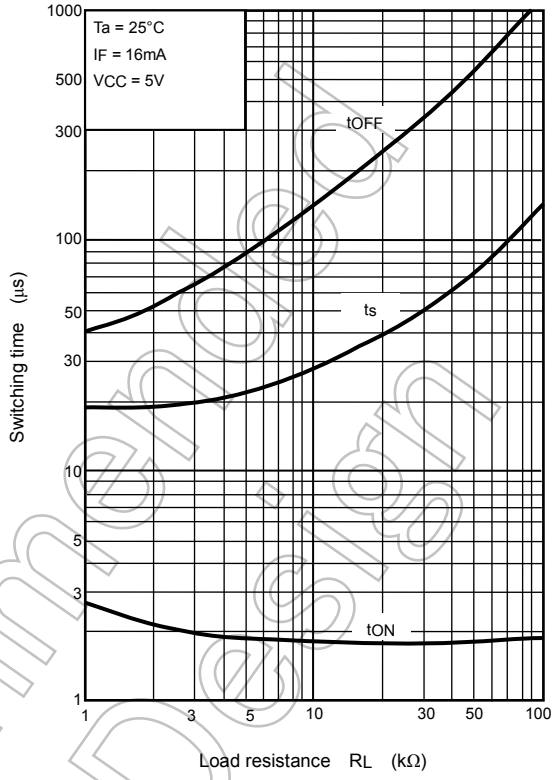
Switching Time – $R_{BE}$




Switching Time – $R_L$

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