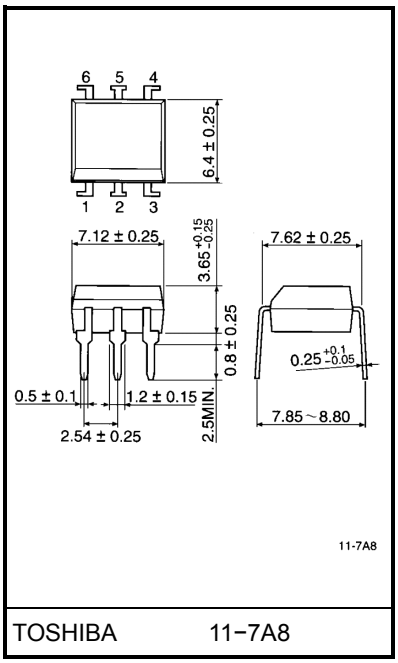
TOSHIBA Photocoupler GaAs Ired&Photo−Transistor

# TLP733, TLP734

Office Machine
Household Use Equipment
Solid State Relay
Switching Power Supply

Unit in mm




TOSHIBA 11−7A8

Weight: 0.42 g

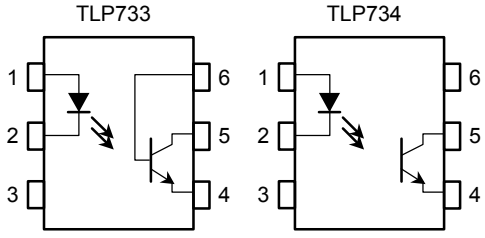
The TOSHIBA TLP733 and TLP734 consist of a photo−transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.
TLP734 is no−base internal connection for high−EMI environments.

- Collector−emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)
- UL recognized: UL1577, file no. E67349
- BSI approved: BS EN60065: 1994
  Certificate no. 7364
  BS EN60950: 1992
  Certificate no. 7365
- SEMKO approved: SS4330784
  Certificate no. 9325163, 9522142
- Isolation voltage: 4000 $V_{rms}$ (min.)
- Option (D4) type
  VDE approved: DIN VDE0884 / 06.92,
  Certificate no. 74286, 91808
  Maximum operating insulation voltage: 630, 890 $V_{PK}$
  Highest permissible over voltage: 6000, 8000 $V_{PK}$

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

| | 7.62 mm pich standard type | 10.16 mm pich TLP×××F type |
|---|---|---|
| • Creepage distance | : 7.0 mm (min.) | 8.0 mm (min.) |
| Clearance | : 7.0 mm (min.) | 8.0 mm (min.) |
| Internal creepage path | : 4.0 mm (min.) | 4.0 mm (min.) |
| Insulation thickness | : 0.5 mm (min.) | 0.5 mm (min.) |

## Pin Configurations (top view)




| TLP733 | TLP734 |
|---|---|
| 1: Anode | 1: Anode |
| 2: Cathode | 2: Cathode |
| 3: Nc | 3: Nc |
| 4: Emitter | 4: Emitter |
| 5: Collector | 5: Collector |
| 6: Base | 6: Nc |

## Current Transfer Ratio

| Type | Classification *1 | Current Transfer Ratio (%) ($I_C$ / $I_F$) $I_F$ = 5mA, $V_{CE}$ = 5V, Ta = 25°C | | Marking Of Classification |
|---|---|---|---|---|
| | | Min. | Max. | |
| TLP733 TLP734 | (None) | 50 | 600 | Blank, Y, Y■, G, G■, B, B■, GB |
| | | 50 | 150 | Y, Y■ |
| | Rank GR | 100 | 300 | G, G■ |
| | | 200 | 600 | B, B■ |
| | Rank GB | 100 | 600 | G, G■, B, B■, GB |

*1: Ex. rank GB: TLP733 (GB)

Note: Application type name for certification test, please use standard product type name, i.e. TLP733 (GB): TLP733

## Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|---|---|---|---|---|
| LED | Forward current | $I_F$ | 60 | mA |
| | Forward current derating (Ta ≥ 39°C) | $\Delta I_F$ / °C | −0.7 | mA / °C |
| | Peak forward current (100 μs pulse, 100 pps) | $I_{FP}$ | 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 (TLP733) | $V_{CBO}$ | 80 | V |
| | Emitter−collector voltage | $V_{ECO}$ | 7 | V |
| | Emitter−base voltage (TLP733) | $V_{EBO}$ | 7 | V |
| | Collector current | $I_C$ | 50 | mA |
| | Power dissipation | $P_C$ | 150 | mW |
| | Power dissipation derating (Ta ≥ 25°C) | $\Delta P_C$ / °C | −1.5 | mW / °C |
| | Junction temperature | $T_j$ | 125 | °C |
| Storage temperature range | | $T_{stg}$ | −55~125 | °C |
| Operating temperature range | | $T_{opr}$ | −40~100 | °C |
| Lead soldering temperature (10 s) | | $T_{sol}$ | 260 | °C |
| Total package power dissipation | | $P_T$ | 250 | mW |
| Total package power dissipation derating (Ta ≥ 25°C) | | $\Delta P_T$ / °C | −2.5 | mW / °C |
| Isolation voltage (AC, 1 min., 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 mA | | 1.0 | 1.15 | 1.3 | V |
| | Reverse current | | $I_R$ | $V_R$ = 5 V | | — | — | 10 | μA |
| | Capacitance | | $C_T$ | V = 0, f = 1 MHz | | — | 30 | — | pF |
| Detector | Collector−emitter breakdown voltage | | $V_{(BR)CEO}$ | $I_C$ = 0.5 mA | | 55 | — | — | V |
| | Emitter−collector breakdown voltage | | $V_{(BR)ECO}$ | $I_E$ = 0.1 mA | | 7 | — | — | V |
| | Collector−base breakdown voltage | (TLP733) | $V_{(BR)CBO}$ | $I_C$ = 0.1 mA | | 80 | — | — | V |
| | Emitter−base breakdown voltage | (TLP733) | $V_{(BR)EBO}$ | $I_E$ = 0.1 mA | | 7 | — | — | V |
| | Collector dark current | | $I_{CEO}$ | $V_{CE}$ = 24 V | (ambient light below 1000 ℓx) | — | 0.01 (2) | 0.1 (10) | μA |
| | | | | $V_{CE}$ = 24 V, Ta = 85°C | (ambient light below 1000 ℓx) | — | 2 (4) | 50 (50) | μA |
| | Collector dark current | (TLP733) | $I_{CER}$ | $V_{CE}$ = 24 V, Ta = 85°C, $R_{BE}$ = 1MΩ | | — | 0.5 | 10 | μA |
| | Collector dark current | (TLP733) | $I_{CBO}$ | $V_{CB}$ = 10 V | | — | 0.1 | — | nA |
| | DC forward current gain | (TLP733) | $h_{FE}$ | $V_{CE}$ = 5 V, $I_C$ = 0.5 mA | | — | 400 | — | — |
| | Capacitance collector to emitter | | $C_{CE}$ | V = 0, f = 1 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 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 | — | % |
| 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 | |

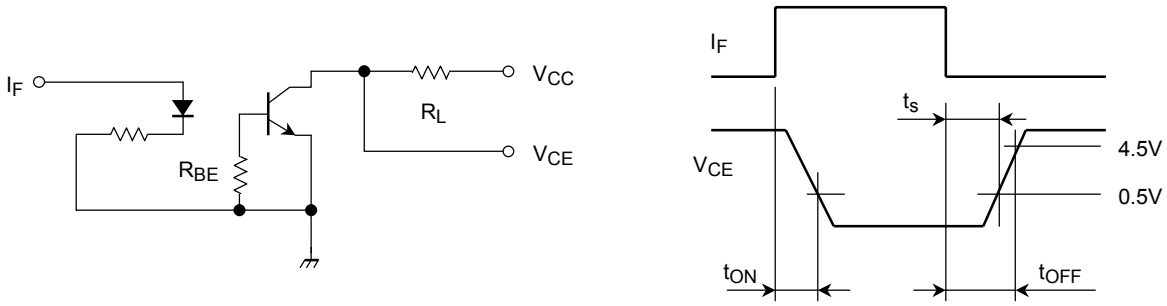
## Isolation Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Capacitance (input to output) | $C_S$ | $V_S$ = 0, f = 1 MHz | — | 0.8 | — | pF |
| Isolation resistance | $R_S$ | $V_S$ = 500 V, R.H.≤ 60% | $1\times10^{12}$ | $10^{14}$ | — | Ω |
| Isolation voltage | $BV_S$ | AC, 1 minute | 4000 | — | — | Vrms |
| | | AC, 1 second, in oil | — | 10000 | — | |
| | | DC, 1 minute, in oil | — | 10000 | — | Vdc |

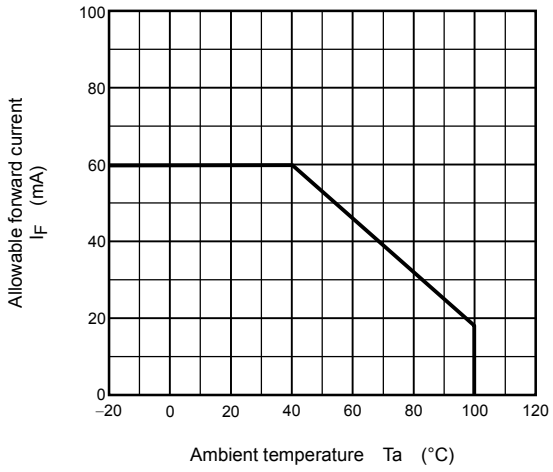
## Switching Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Rise time | $t_r$ | $V_{CC}$ = 10 V, $I_C$ = 2 mA<br>$R_L$ = 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 | $t_{ON}$ | $R_L$ = 1.9 kΩ (Fig.1)<br>$R_{BE}$ = open<br>$V_{CC}$ = 5 V, $I_F$ = 16 mA | — | 3 | — | μs |
| Storage time | $t_S$ | | — | 40 | — | |
| Turn−off time | $t_{OFF}$ | | — | 90 | — | |
| Turn−on time | $t_{ON}$ | $R_L$ = 1.9 kΩ (Fig.1)<br>$R_{BE}$ = 220 kΩ (TLP733)<br>$V_{CC}$ = 5 V, $I_F$ = 16 mA | — | 3 | — | μs |
| Storage time | $t_S$ | | — | 30 | — | |
| Turn−off time | $t_{OFF}$ | | — | 60 | — | |

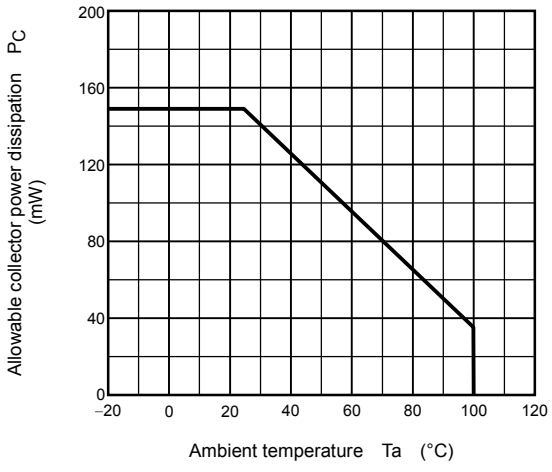
Fig. 1 Switching time test circuit



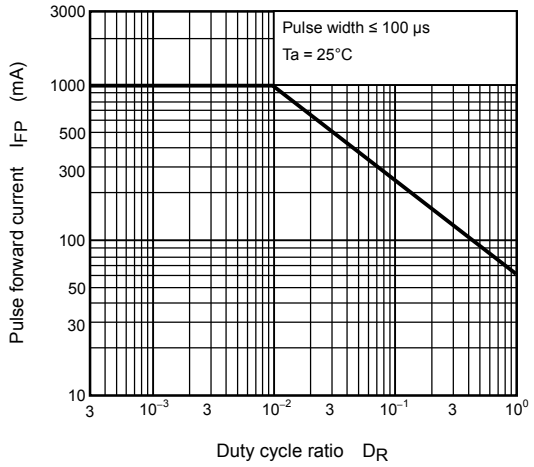
$I_F$ – Ta



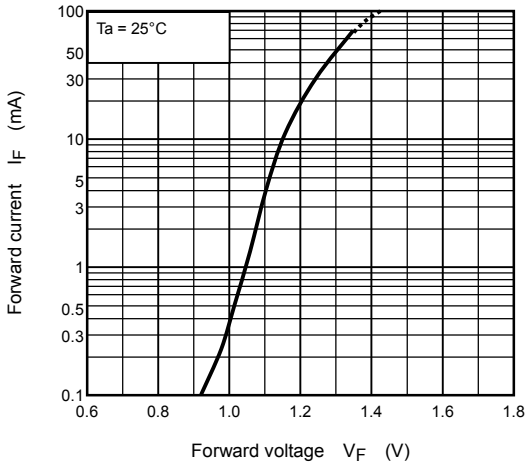

$P_C$ – Ta



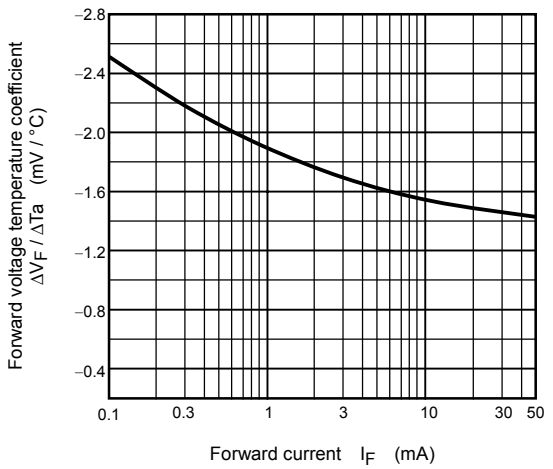

$I_{FP}$ – $D_R$



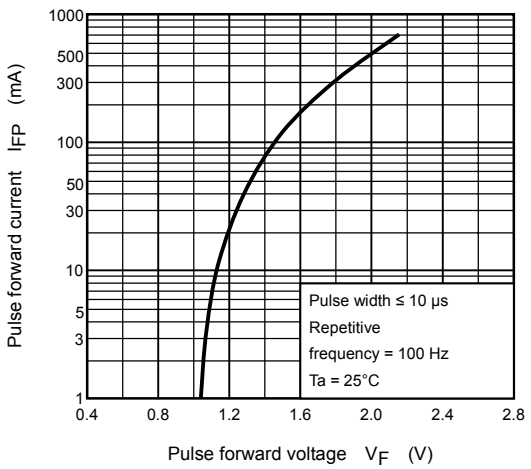

$I_F$ – $V_F$



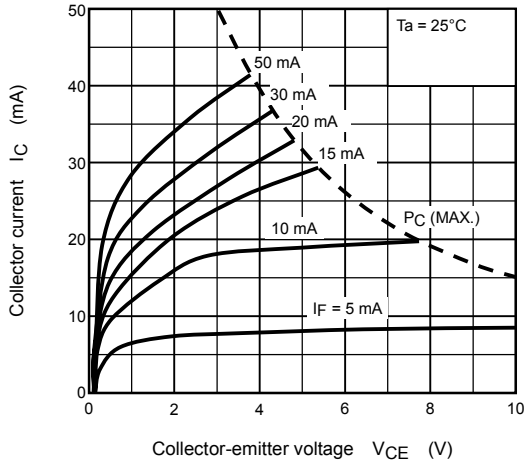

$\Delta V_F / \Delta Ta$ – $I_F$



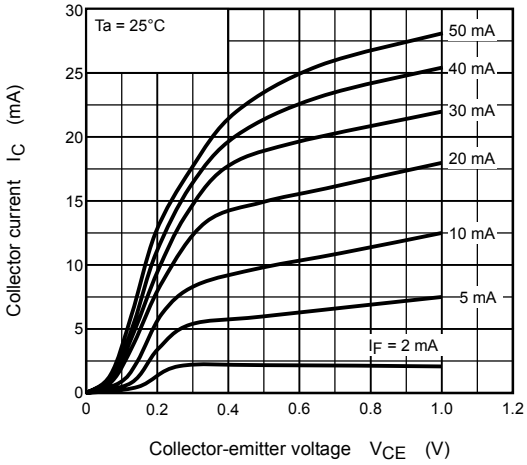

$I_{FP}$ – $V_{FP}$



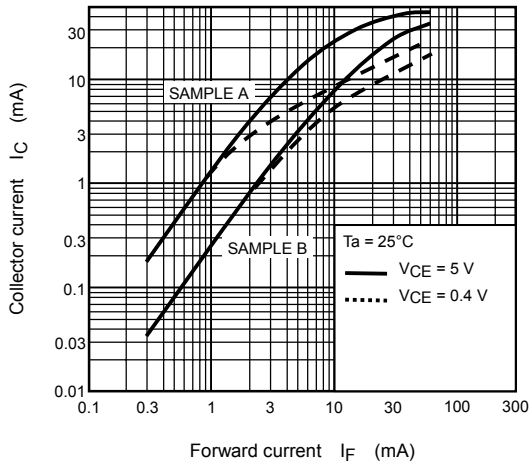
$I_C - V_{CE}$



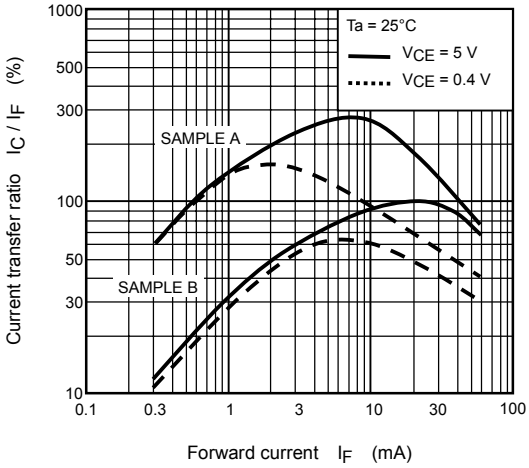

$I_C - V_{CE}$



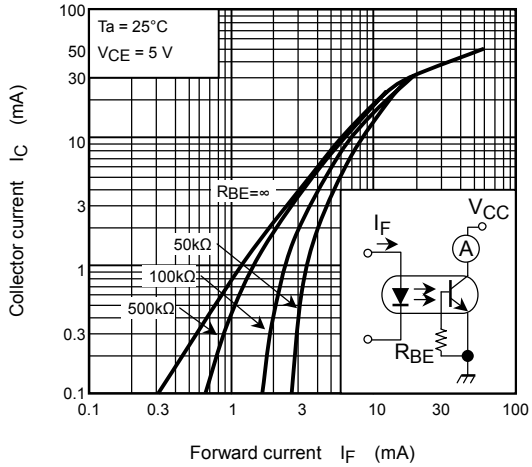

$I_C - I_F$



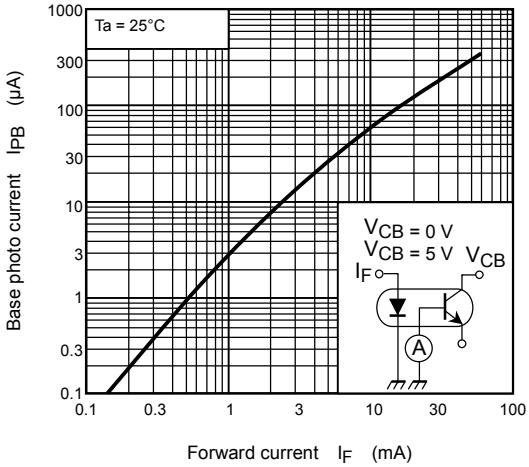

$I_C / I_F - I_F$



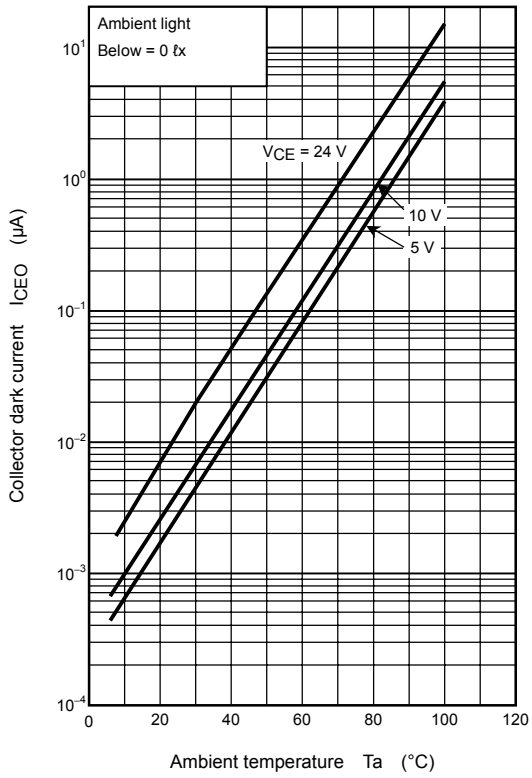

TLP733 $I_C - I_F$ at $R_{BE}$



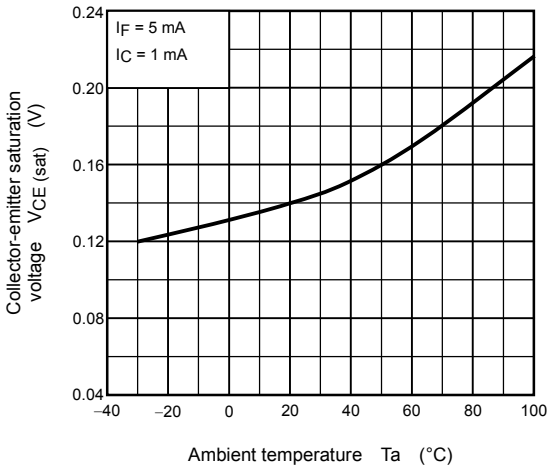

TLP733 $I_{PB} - I_F$



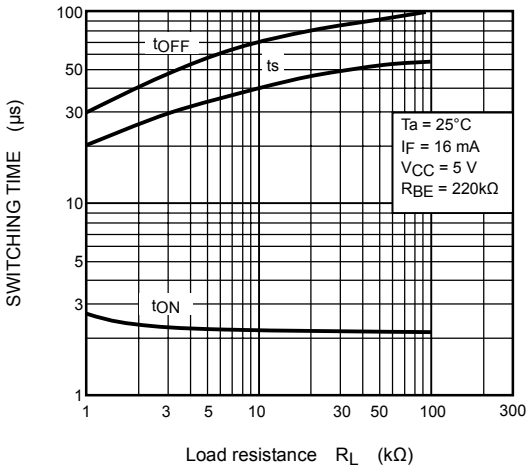
$I_{CEO}$ / Ta



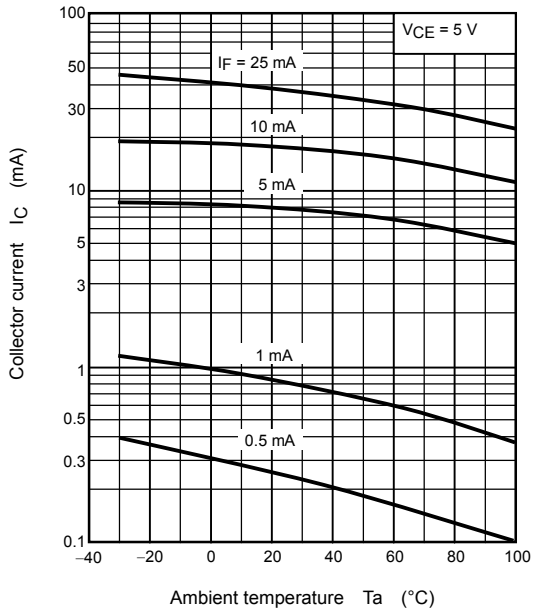

$V_{CE\ (sat)}$ – Ta



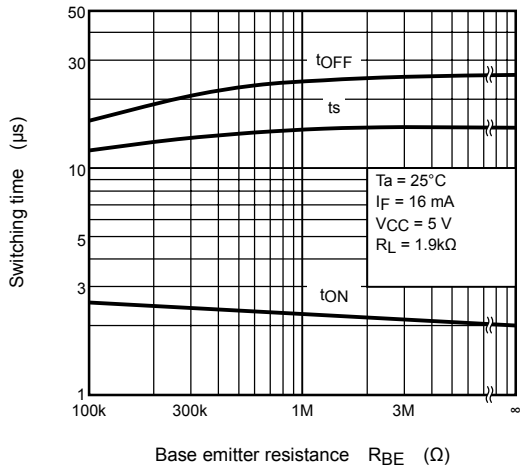

TLP733 Switching Time – $R_L$



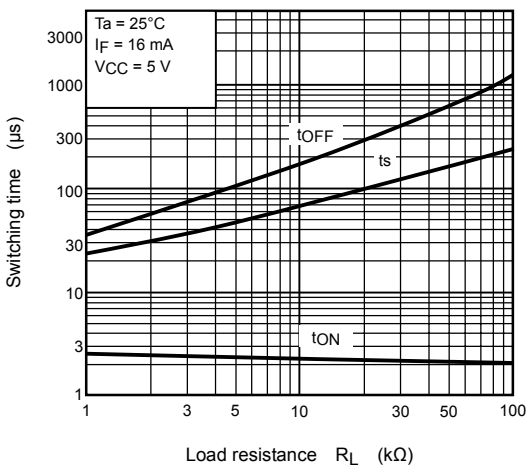

$I_C$ – Ta



Switching Time $R_{BE}$




Switching Time – $R_L$



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