TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

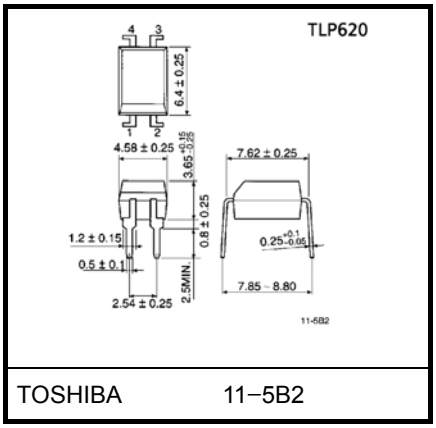
# TLP620, TLP620−2, TLP620−4

Programmable Controllers

AC / DC−Input Module

Telecommunication

Unit in mm

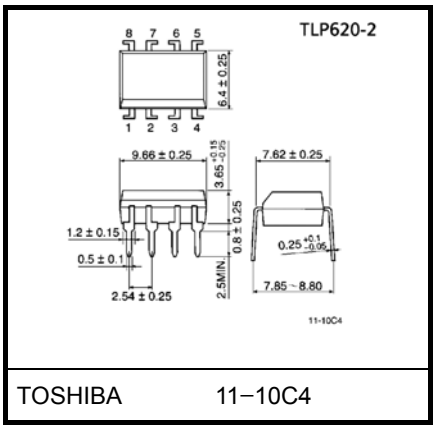



TOSHIBA 11−5B2

Weight: 0.26 g (typ.)

The TOSHIBA TLP620, −2 and −4 consists of a photo−transistor optically coupled to two gallium arsenide infrared emitting diode connected in inverse parallel.
The TLP620−2 offers two isolated channels in an eight lead plastic DIP, while the TLP620−4 provides four isolated channels in a sixteen plastic DIP.

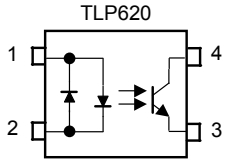
- Collector−emitter voltage: 55V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)



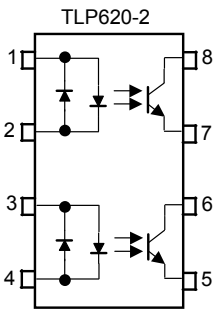

TOSHIBA 11−10C4

Weight: 0.54 g (typ.)

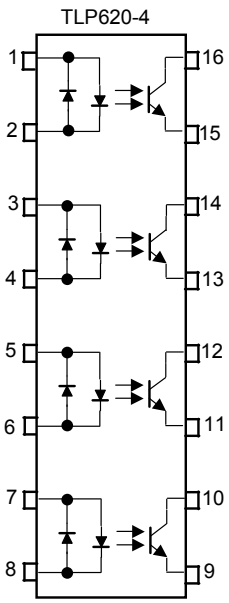
## Pin Configurations (top view)



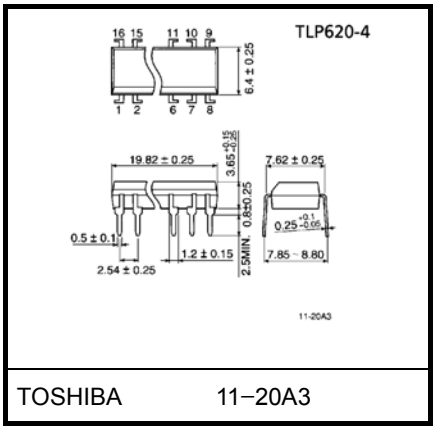

1 : ANODE
CATHODE
2 : CATHODE
ANODE
3 : EMITTER
4 : COLLECTOR




1, 3 : ANODE
CATHODE
2, 4 : CATHODE
ANODE
5, 7 : EMITTER
6, 8 : COLLECTOR




1, 3, 5, 7 : ANODE, CATHODE
2, 4, 6, 8 : CATHODE, ANODE
9, 11, 13, 15 : EMITTER
10, 12, 14, 16 : COLLECTOR




TOSHIBA 11−20A3

Weight: 1.1 g (typ.)

| | Made In Japan | | Made In Thailand | |
|---|---|---|---|---|
| UL recognized | E67349 | *1 | E152349 | *1 |
| BSI approved | 7426, 7427 | *2 | 7426, 7427 | *2 |

*1 UL1577

*2 BS EN60065: 2002, BS EN60950-1: 2002

- Isolation voltage: 5000$V_{rms}$ (min.)
- Option (D4) type
  VDE approved: DIN EN 60747-5-2, certificate no.40009302
  Maximum operating insulation voltage: 890$V_{PK}$
  Highest permissible over voltage: 8000$V_{PK}$

  **(Note) When an EN 60747-5-2 approved type is needed, please designate the "Option(D4)".**

- Creepage distance: 6.4mm (min.)
  Clearance: 6.4mm (min.)
  Insulation thickness: 0.4mm (min.)

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

| Characteristic | | Symbol | Rating | | Unit |
|---|---|---|---|---|---|
| | | | TLP620 | TLP620−2<br>TLP620−4 | |
| LED | Forward current | $I_{F\ (RMS)}$ | 60 | 50 | mA |
| | Forward current derating | $\Delta I_F$ / °C | −0.7 (Ta ≥ 39°C) | −0.5 (Ta ≥ 25°C) | mA / °C |
| | Pulse forward current | $I_{FP}$ | 1 (100μs pulse, 100pps) | | A |
| | Power dissipation (1 circuit) | $P_D$ | 100 | 70 | mW |
| | Power dissipation derating | $\Delta P_D$ / °C | −1.0 | −0.7 | mW / °C |
| | Junction temperature | $T_j$ | 125 | | °C |
| Detector | Collector−emitter voltage | $V_{CEO}$ | 55 | | V |
| | Emitter−collector voltage | $V_{ECO}$ | 7 | | V |
| | Collector current | $I_C$ | 50 | | mA |
| | Collector power dissipation (1 circuit) | $P_C$ | 150 | 100 | mW |
| | Collector power dissipation derating (1 circuit) (Ta ≥ 25°C) | $\Delta P_C$ / °C | −1.5 | −1.0 | 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 | | $T_{sold}$ | 260 (10s) | | °C |
| Total package power dissipation | | $P_T$ | 250 | 150 | mW |
| Total package power dissipation derating (Ta ≥ 25°C, 1 circuit) | | $\Delta P_T$ / °C | −2.5 | −1.5 | mW / °C |
| Isolation voltage | | $BV_S$ | 5000 (AC, 1 min., RH ≤ 60%) | | $V_{rms}$ |

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).

## Recommended Operating Conditions

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | — | 5 | 24 | V |
| Forward current | $I_{F\ (RMS)}$ | — | 16 | 20 | mA |
| Collector current | IC | — | 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.

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

| Characteristic | | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| LED | Forward voltage | $V_F$ | $I_F$ = ±10mA | 1.0 | 1.15 | 1.3 | V |
| | Forward current | $I_F$ | $V_F$ = ±0.7V | — | 2.5 | 20 | μA |
| | Capacitance | $C_T$ | V = 0, f = 1MHz | — | 60 | — | pF |
| Detector | Collector−emitter breakdown voltage | $V_{(BR)\ CEO}$ | $I_C$ = 0.5mA | 55 | — | — | V |
| | Emitter−collector breakdown voltage | $V_{(BR)\ ECO}$ | $I_E$ = 0.1mA | 7 | — | — | V |
| | Collector dark current | $I_{CEO}$ | $V_{CE}$ = 24V | — | 10 | 100 | nA |
| | | | $V_{CE}$ = 24V, Ta = 85°C | — | 2 | 50 | μA |
| | Capacitance (collector to emitter) | $C_{CE}$ | $V_{CE}$ = 0, f = 1MHz | — | 10 | — | pF |

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

| Characteristic | Symbol | Test Condition | MIn. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Current transfer ratio | $I_C$ / $I_F$ | $I_F$ = ±5mA, $V_{CE}$ = 5V | 50 | — | 600 | % |
| | | Rank GB | 100 | — | 600 | |
| Saturated CTR | $I_C$ / $I_{F\ (sat)}$ | IF = ±1mA, $V_{CE}$ = 0.4V | — | 60 | — | % |
| | | Rank GB | 30 | — | — | |
| Collector−emitter saturation voltage | $V_{CE\ (sat)}$ | $I_C$ = 2.4mA, $I_F$ = ±8mA | — | — | 0.4 | V |
| | | $I_C$ = 0.2 mA, $I_F$ = ±1 mA | — | 0.2 | — | |
| | | Rank GB | — | — | 0.4 | |
| Off−state collector current | $I_{C\ (off)}$ | $V_F$ = ± 0.7V, $V_{CE}$ = 24V | — | 1 | 10 | μA |
| CTR symmetry | $I_{C\ (ratio)}$ | $I_C$ ($I_F$ = −5mA) / $I_C$ ($I_F$ = +5mA) | 0.33 | 1 | 3 | — |

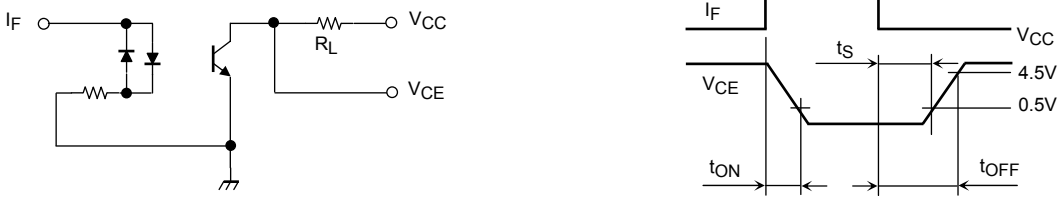
## Isolation Characteristics (Ta = 25°C)

| 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 | $1\times10^{12}$ | $10^{14}$ | — | Ω |
| Isolation voltage | $BV_S$ | AC, 1 minute | 5000 | — | — | $V_{rms}$ |
| | | AC, 1 second, in oil | — | 10000 | — | |
| | | DC, 1 minute, in oil | — | 10000 | — | $V_{dc}$ |

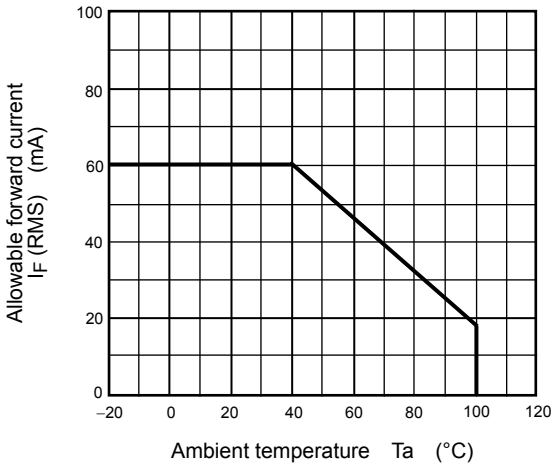
## Switching Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Rise time | $t_r$ | $V_{CC}$ = 10V<br>$I_C$ = 2mA<br>$R_L$ = 100Ω | — | 2 | — | μs |
| Fall time | $t_f$ | | — | 3 | — | |
| Turn−on time | $t_{on}$ | | — | 3 | — | |
| Turn−off time | $t_{off}$ | | — | 3 | — | |
| Turn−on time | $t_{ON}$ | $R_L$ = 1.9kΩ (Fig.1)<br>$V_{CC}$ = 5V, $I_F$ = ±16mA | — | 2 | — | μs |
| Storage time | $t_s$ | | — | 15 | — | |
| Turn−off time | $t_{OFF}$ | | — | 25 | — | |

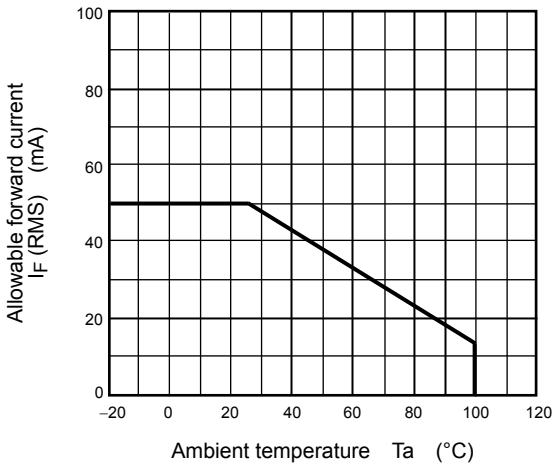
Fig. 1 Switching time test circuit



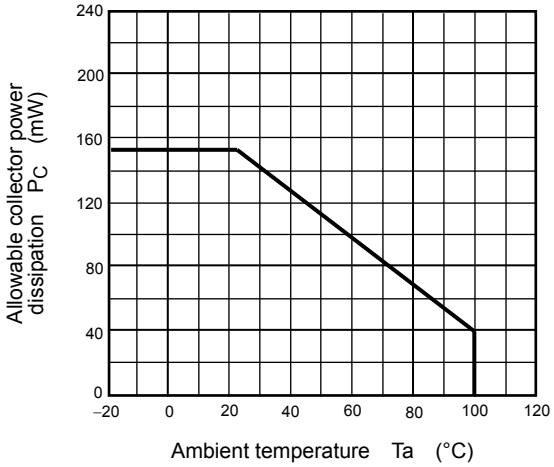
TLP620 $I_F$ – Ta



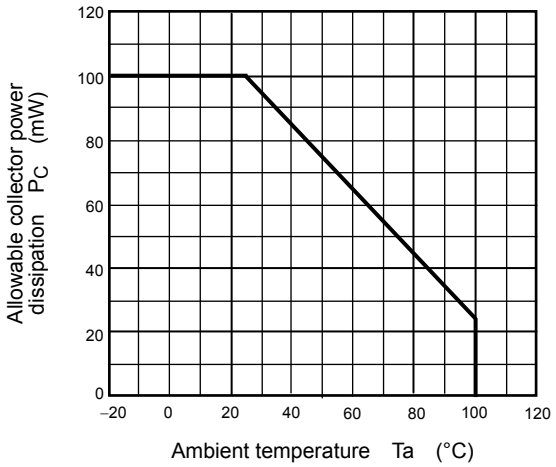

TLP620-2
TLP620-4 $I_F$ – Ta



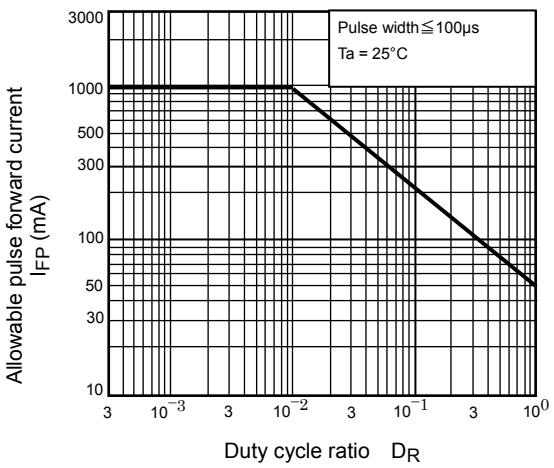

TLP620 $P_C$ – Ta



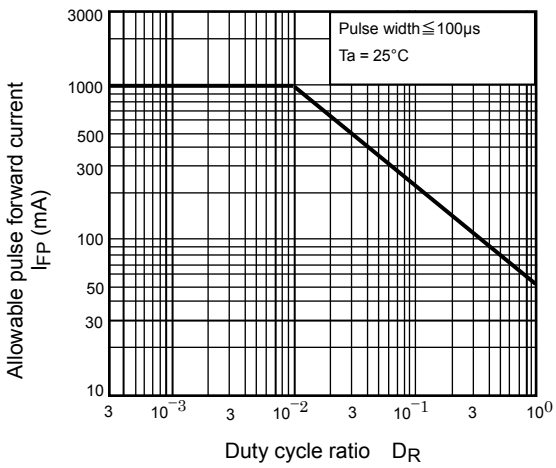

TLP620-2
TLP620-4 $P_C$ – Ta



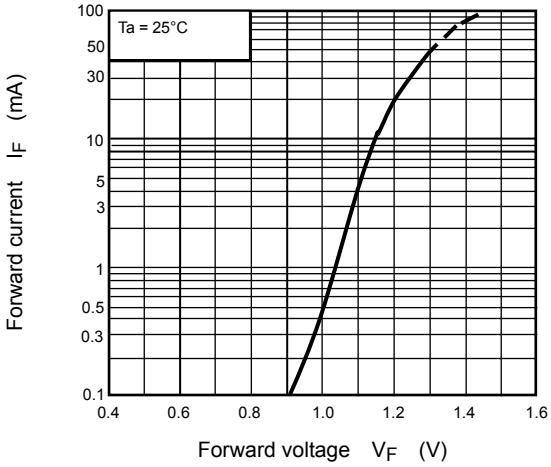

TLP620 $I_{FP}$ – $D_R$



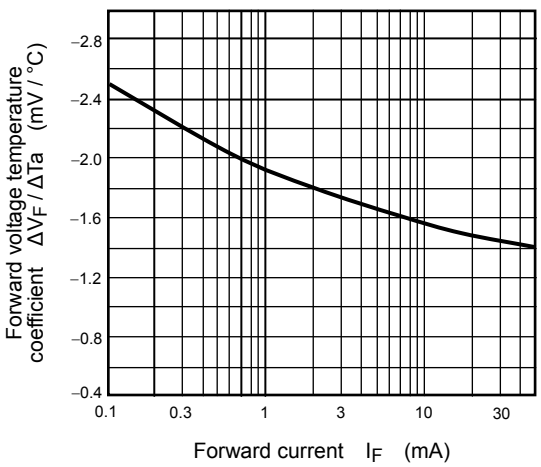

TLP620-2
TLP620-4 $I_{FP}$ – $D_R$



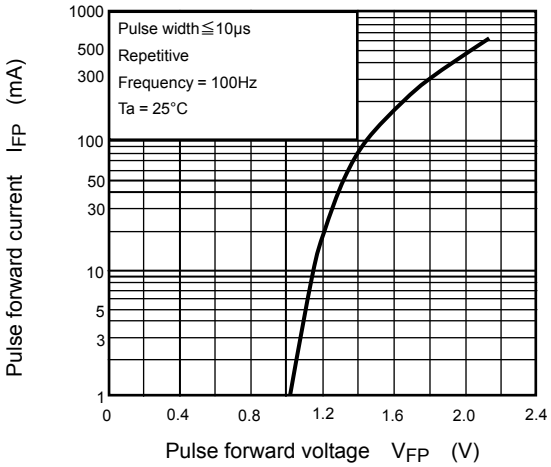
$I_F - V_F$



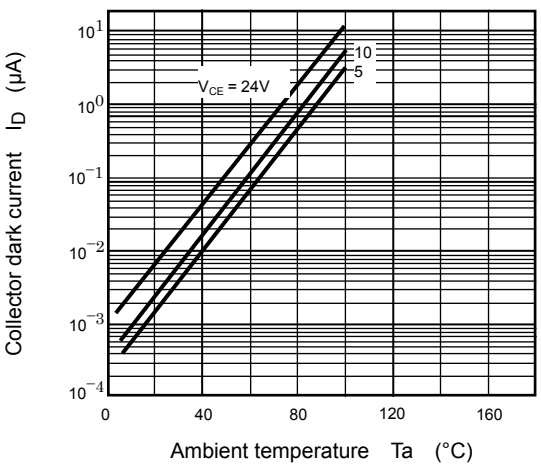

$\Delta V_F / \Delta Ta - I_F$



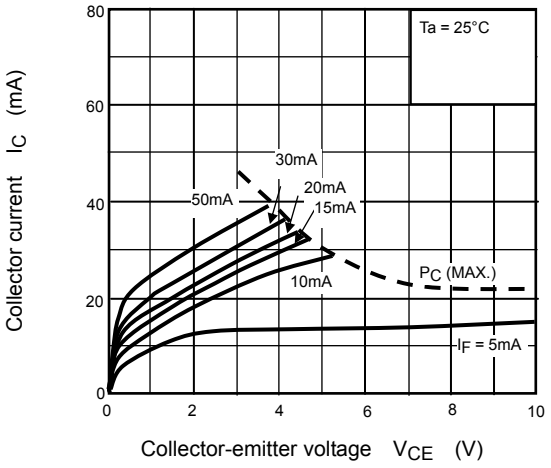

$I_{FP} - V_{FP}$



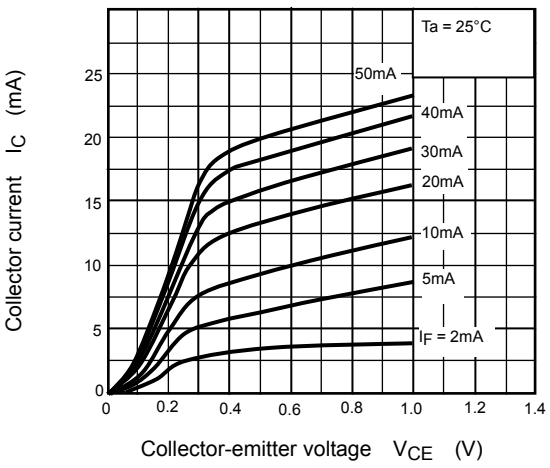

$I_D - T_a$



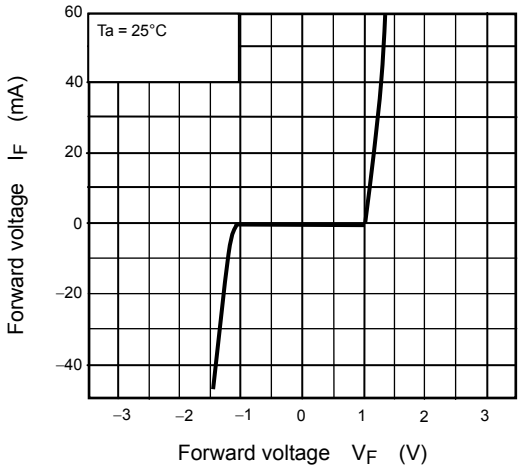

$I_C - V_{CE}$



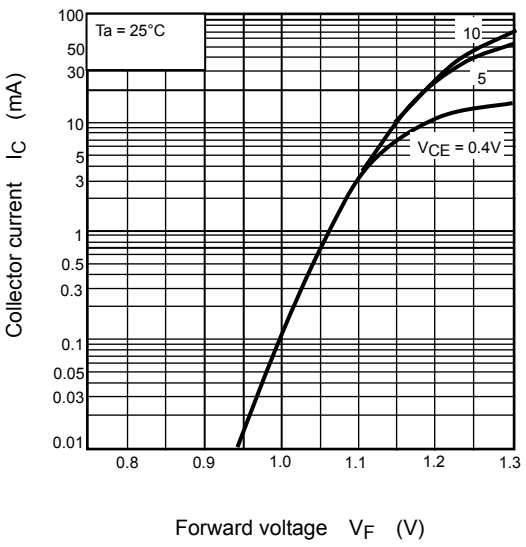

$I_C - V_{CE}$



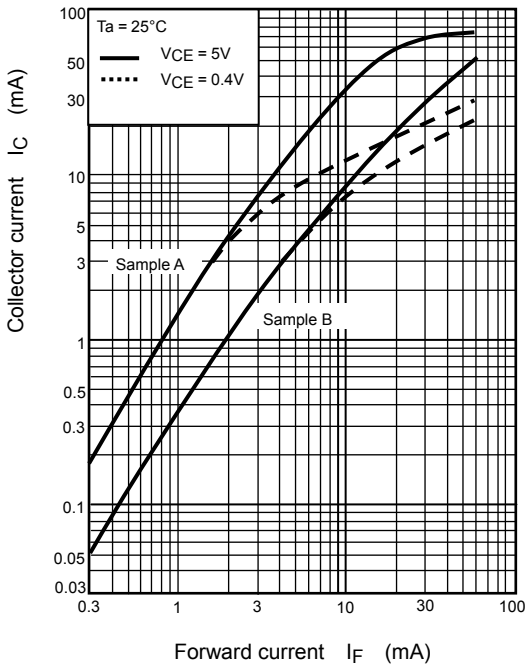
$V_F - I_F$



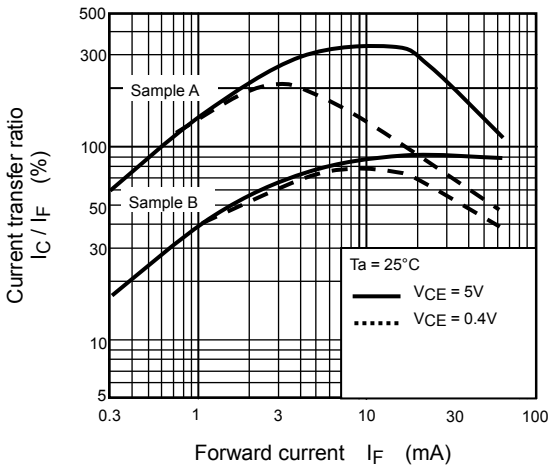

$I_C - V_F$



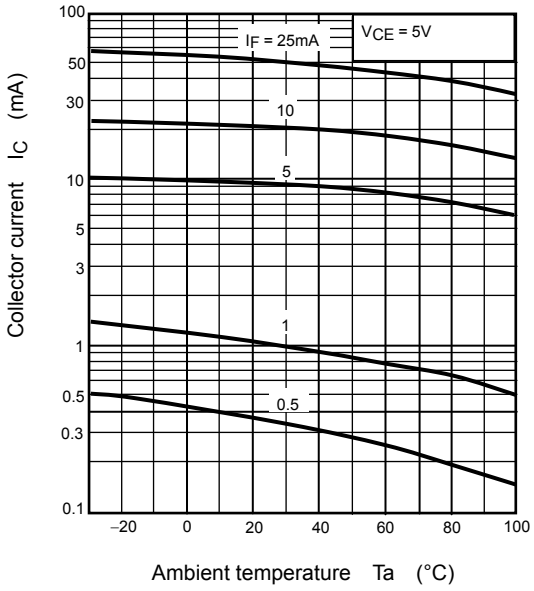

$I_C - I_F$



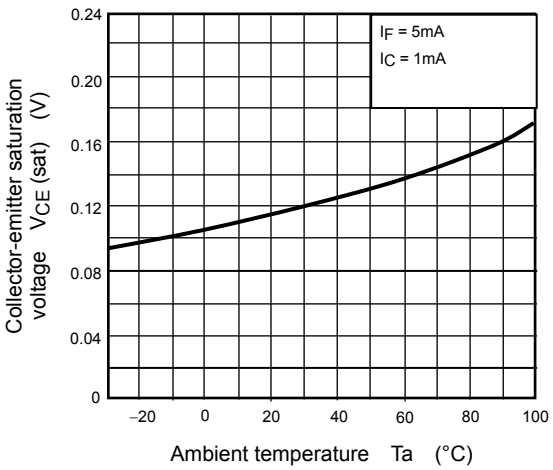

$I_C / I_F - I_F$

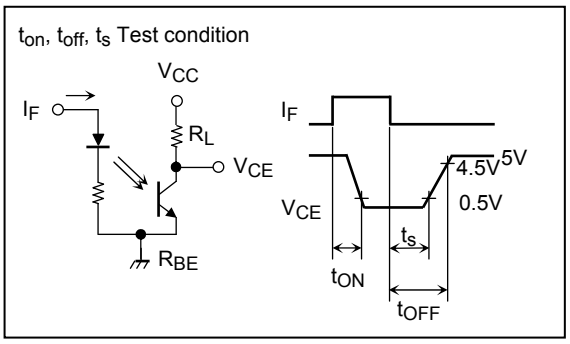


$I_C$ – Ta

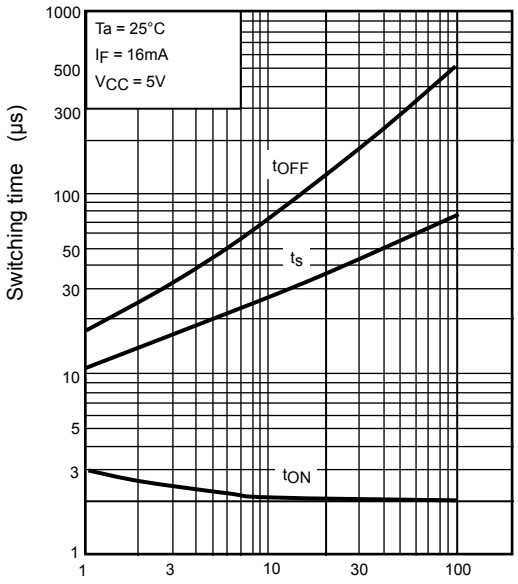



$V_{CE}$ (sat) – Ta




$R_L$ – Switching Time



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