

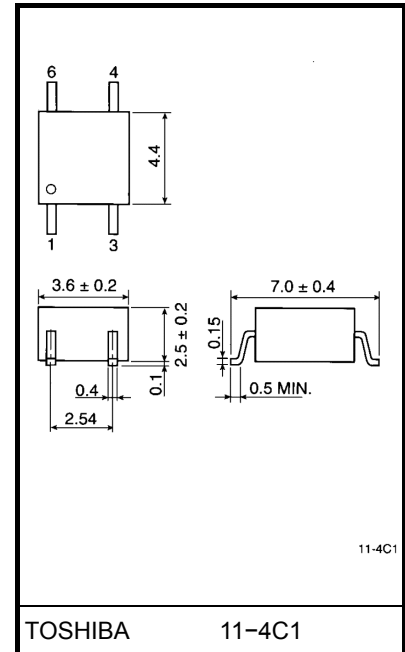
# TLP181

Office Machine  
 Programmable Controllers  
 AC / DC-Input Module  
 Telecommunication

The TOSHIBA mini flat coupler TLP181 is a small outline coupler, suitable for surface mount assembly. TLP181 consist of a photo transistor optically coupled to a gallium arsenide infrared emitting diode.

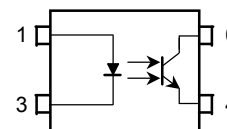
- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)  
     Rank GB: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577,  
     file no. E67349
- Option (V4) type  
     VDE approved: EN 60747-5-2 satisfied  
     Maximum operating insulation voltage: 565V<sub>PK</sub>  
     Highest permissible over voltage: 6000V<sub>PK</sub>
- BSI approved: BS EN60065:2002, certificate no.8285  
     BS EN60950-1:2002, certificate no.8286

Unit in mm



Weight: 0.09 g

### Pin Configuration (top view)



- 1: Anode
- 3: Cathode
- 4: Emitter
- 6: Collector

## Current Transfer Ratio

| Type   | Classification<br>*1 | Current Transfer Ratio (%)<br>( $I_C / I_F$ )                  |      | Marking Of Classification   |
|--------|----------------------|--|------|---|
|        |                      | $I_F = 5\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$ |      |   |
|        |                      | Min.   | Max. |   |
| TLP181 | (None)               | 50   | 600  | BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB |
|        | Rank Y               | 50   | 150  | Y, Y <sup>■</sup>   |
|        | Rank GR              | 100  | 300  | G, G <sup>■</sup>   |
|        | Rank BL              | 200  | 600  | B, B <sup>■</sup>   |
|        | Rank GB              | 100  | 600  | G, G <sup>■</sup> , B, B <sup>■</sup> , GB                            |

\*1: EX, Rank GB: TLP181 (GB)

(Note) Application, type name for certification test, please use standard product type name, i. e.  
TLP181 (GB): TLP181

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

| Characteristic  |   | Symbol                        | Rating                | Unit      |
|---|---|-------------------------------|-----------------------|-----------|
| LED   | Forward current   | $I_F$                         | 50                    | mA        |
|   | Forward current derating  | $\Delta I_F / ^\circ\text{C}$ | -0.7 (Ta $\geq$ 53°C) | mA / °C   |
|   | Pulse forward current (100µs pulse, 100pps)                     | $I_{FP}$                      | 1                     | A         |
|   | Reverse voltage   | $V_R$                         | 5                     | V         |
|   | Junction temperature  | $T_j$                         | 125                   | °C        |
| Detector  | Collector-emitter voltage                                       | $V_{CEO}$                     | 80                    | V         |
|   | Emitter-collector voltage                                       | $V_{ECO}$                     | 7                     | V         |
|   | Collector current   | $I_C$                         | 50                    | mA        |
|   | Collector power dissipation (1 Circuit)                         | $P_C$                         | 150                   | mW        |
|   | Collector power dissipation derating (1 Circuit Ta $\geq$ 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                                |   | $T_{sol}$                     | 260 (10s)             | °C        |
| Total package power dissipation                           |   | $P_T$                         | 200                   | mW        |
| Total package power dissipation derating (Ta $\geq$ 25°C) |   | $\Delta P_T / ^\circ\text{C}$ | -2.0                  | mW / °C   |
| Isolation voltage (AC, 1min., R.H. $\leq$ 60%) (Note 1)   |   | $BV_S$                        | 3750                  | $V_{rms}$ |

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).

(Note 1) Device considered a two-terminal device: Pin1, 3 shorted together and pins 4, 6 shorted together

## Recommended Operating Conditions

| Characteristic        | Symbol    | Min. | Typ. | Max. | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage        | $V_{CC}$  | —    | 5    | 48   | V    |
| Forward current       | $I_F$     | —    | 16   | 20   | 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.

## 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       | $\mu\text{A}$ |
|                                    | Capacitance                         | $C_T$                      | $V = 0, f = 1 \text{ MHz}$  | —    | 30       | —        | pF            |
| Detector                           | Collector-emitter breakdown voltage | $V_{(BR)CEO}$              | $I_C = 0.5 \text{ mA}$  | 80   | —        | —        | V             |
|                                    | Emitter-collector breakdown voltage | $V_{(BR)ECO}$              | $I_E = 0.1 \text{ mA}$  | 7    | —        | —        | V             |
|                                    | Collector dark current              | $I_{CEO}$                  | $V_{CE} = 48 \text{ V}, (\text{ Ambient light below } 1000 \text{ lx})$                         | —    | 0.01 (2) | 0.1 (10) | $\mu\text{A}$ |
|                                    |                                     |                            | $V_{CE} = 48 \text{ V}, T_a = 85^\circ\text{C}, (\text{ Ambient light below } 1000 \text{ lx})$ | —    | 2 (4)    | 50 (50)  | $\mu\text{A}$ |
| 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               | $I_C / I_F$              | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$<br>Rank GB   | 50   | —    | 600  | %             |
|                                      |                          |   | 100  | —    | 600  |               |
| Saturated CTR                        | $I_C / I_F (\text{sat})$ | $I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$<br>Rank GB   | —    | 60   | —    | %             |
|                                      |                          |   | 30   | —    | —    |               |
| Collector-emitter saturation voltage | $V_{CE} (\text{sat})$    | $I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$<br>$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$<br>Rank GB | —    | —    | 0.4  | V             |
|                                      |                          |   | —    | 0.2  | —    |               |
|                                      |                          |   | —    | —    | 0.4  |               |
| Off-state collector current          | $I_C (\text{off})$       | $V_F = 0.7 \text{ V}, V_{CE} = 48 \text{ V}$  | —    | 1    | 10   | $\mu\text{A}$ |

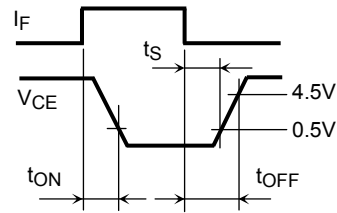
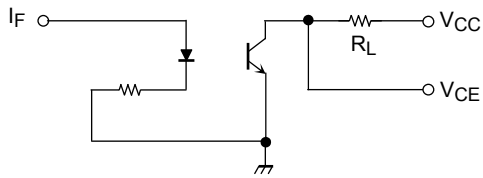
## Isolation Characteristics (Ta = 25°C)

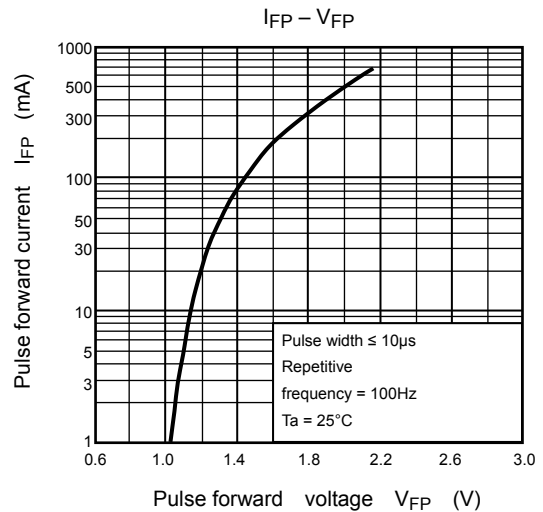
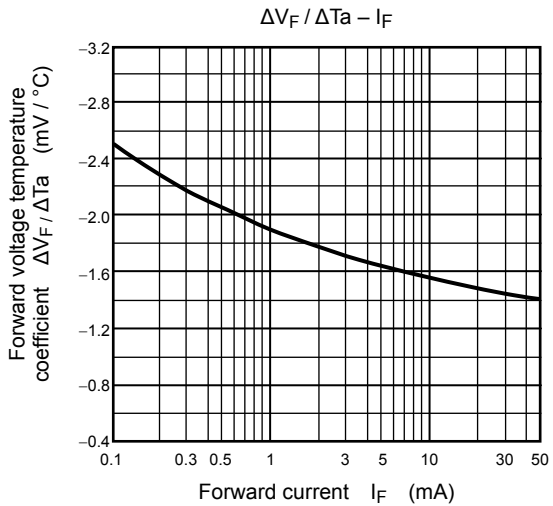
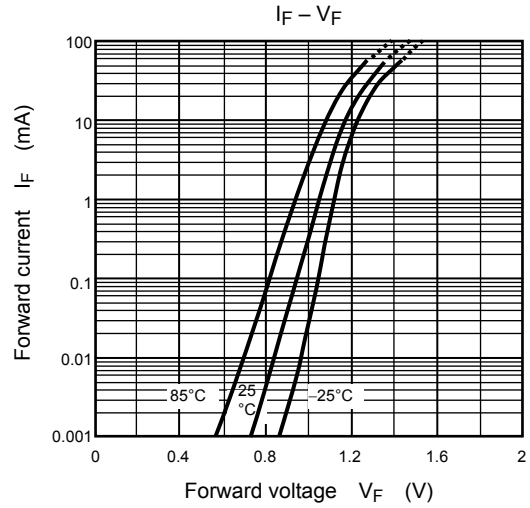
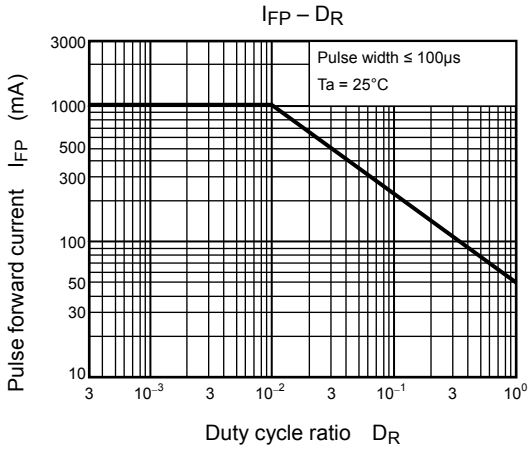
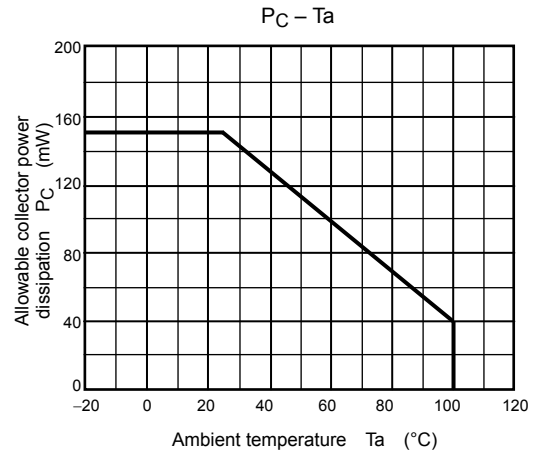
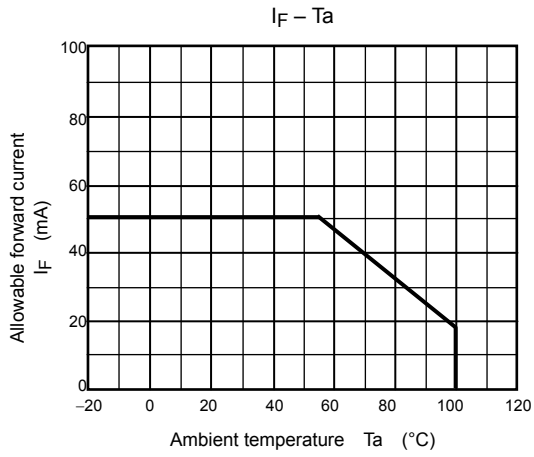
| Characteristic                | Symbol | Test Condition                                | Min.               | Typ.      | Max. | Unit             |
|-------------------------------|--------|---|--------------------|-----------|------|------------------|
| Capacitance (input to output) | $C_S$  | $V_S = 0 \text{ V}, f = 1 \text{ MHz}$        | —                  | 0.8       | —    | pF               |
| Isolation resistance          | $R_S$  | $V_S = 500 \text{ V}, \text{ R.H.} \leq 60\%$ | $1 \times 10^{12}$ | $10^{14}$ | —    | $\Omega$         |
| Isolation voltage             | $BV_S$ | AC, 1 minute                                  | 3750               | —         | —    | $V_{\text{rms}}$ |
|                               |        | AC, 1 second, in oil                          | —                  | 10000     | —    |                  |
|                               |        | DC, 1 minute, in oil                          | —                  | 10000     | —    | $V_{\text{dc}}$  |

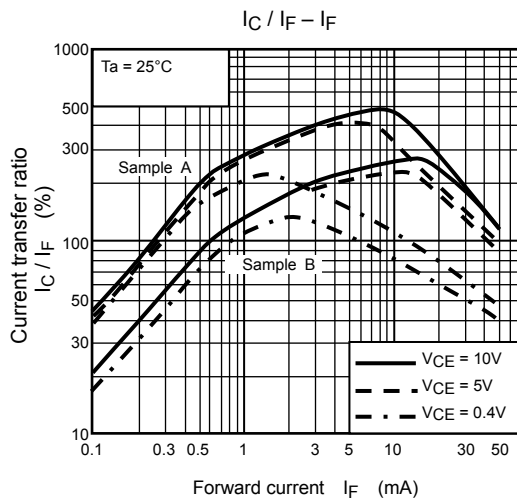
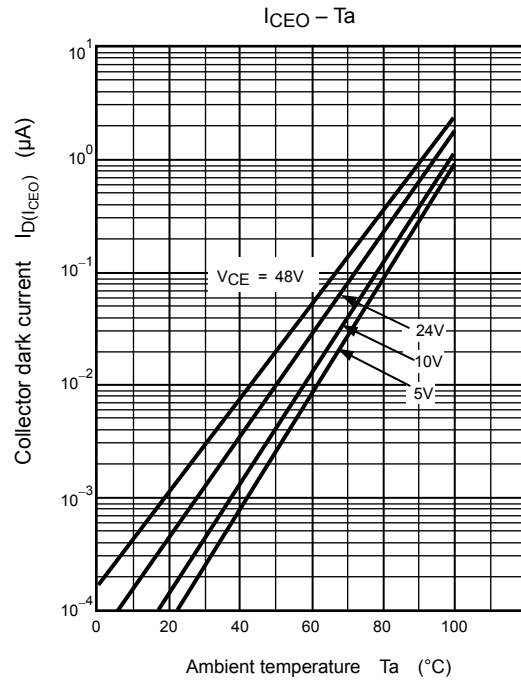
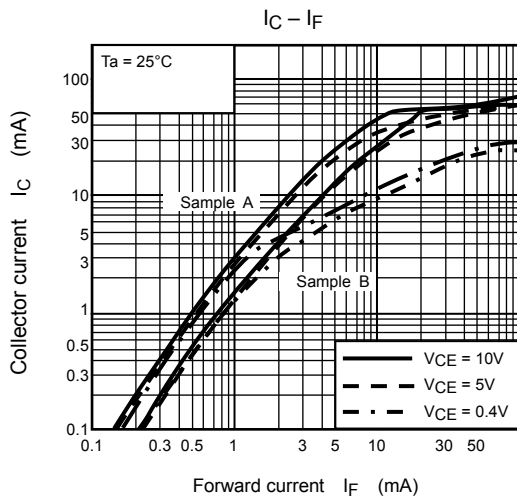
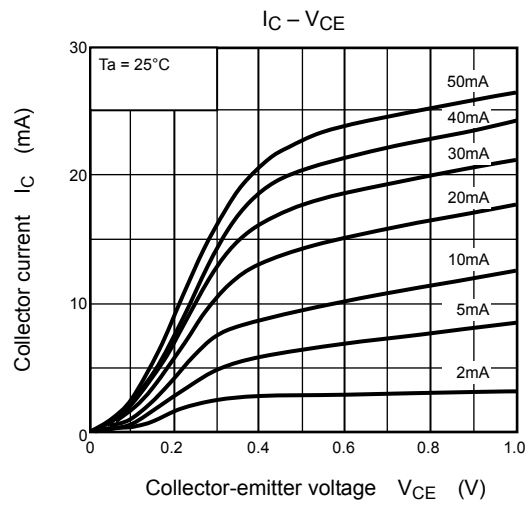
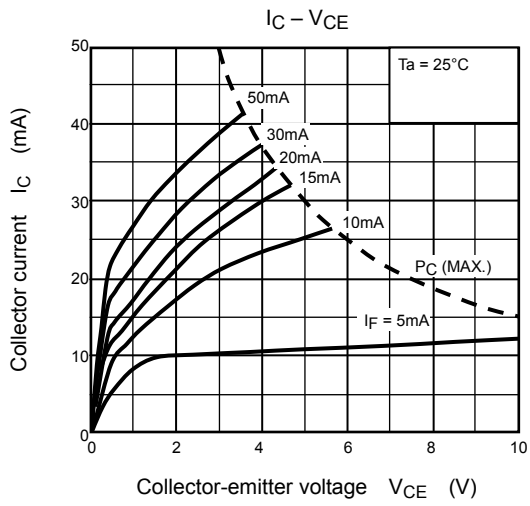
**Switching Characteristics (Ta = 25°C)**

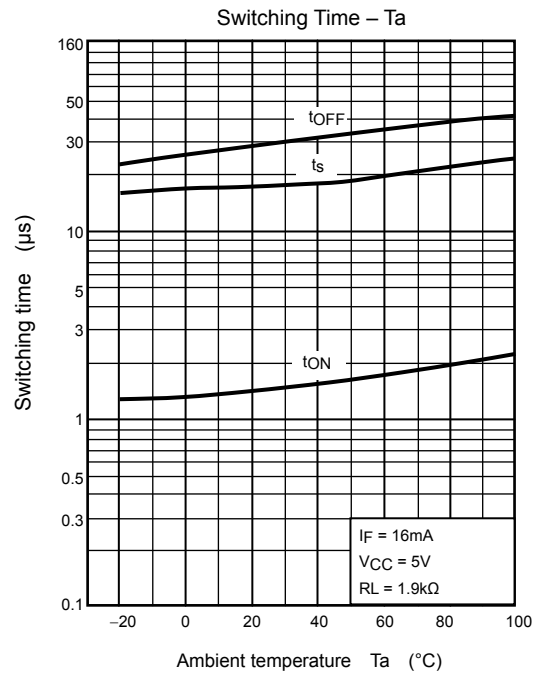
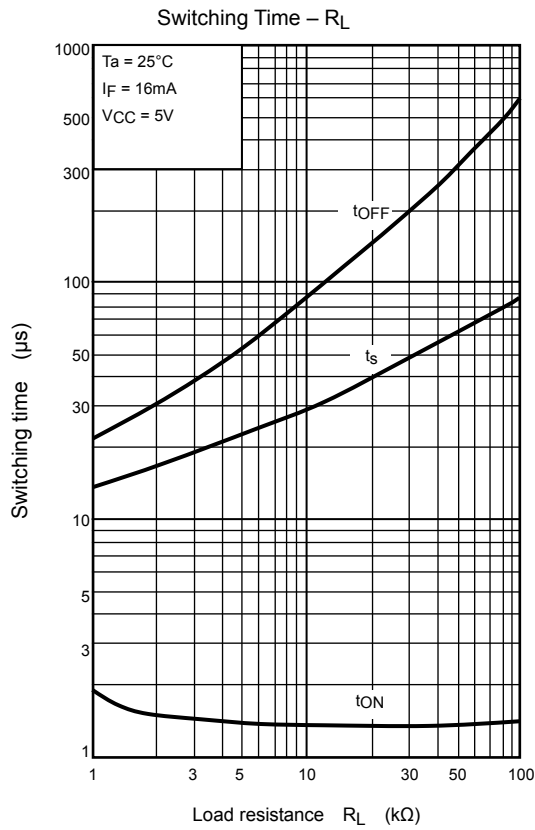
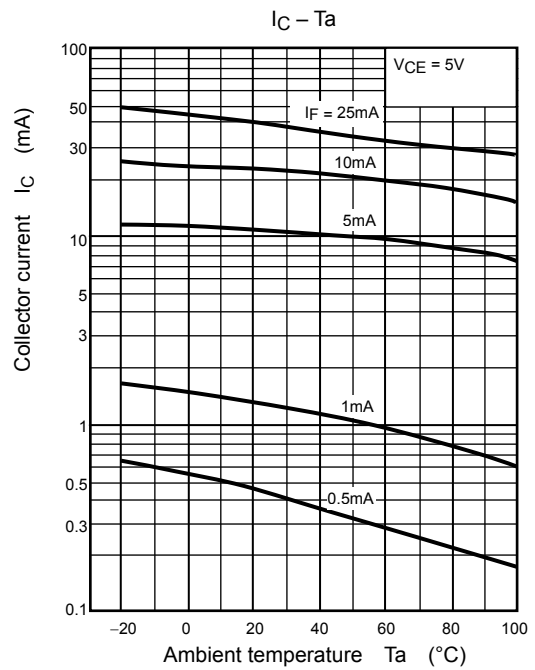
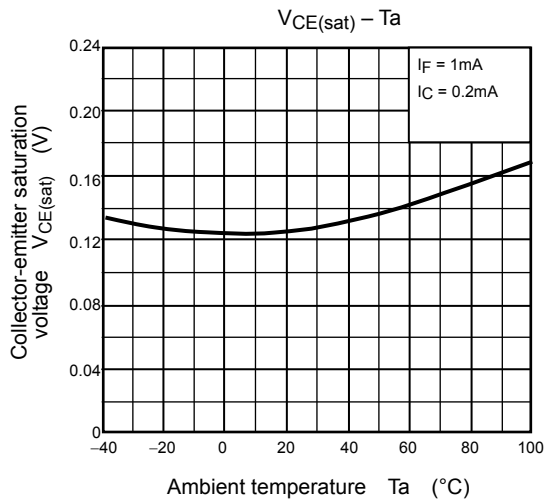
| Characteristic | Symbol    | Test Condition   | Min. | Typ. | Max. | Unit          |
|----------------|-----------|--|------|------|------|---------------|
| Rise time      | $t_r$     | $V_{CC} = 10\text{ V}$ , $I_C = 2\text{ mA}$<br>$R_L = 100\Omega$                  | —    | 2    | —    | $\mu\text{s}$ |
| Fall time      | $t_f$     |  | —    | 3    | —    |               |
| Turn-on time   | $t_{on}$  |  | —    | 3    | —    |               |
| Turn-off time  | $t_{off}$ |  | —    | 3    | —    |               |
| Turn-on time   | $t_{ON}$  | $R_L = 1.9\text{ k}\Omega$<br>$V_{CC} = 5\text{ V}$ , $I_F = 16\text{ mA}$ (Fig.1) | —    | 2    | —    | $\mu\text{s}$ |
| Storage time   | $t_s$     |  | —    | 25   | —    |               |
| Turn-off time  | $t_{OFF}$ |  | —    | 40   | —    |               |

Fig. 1 Switching time test circuit











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20070701-EN

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