

TOSHIBA PHOTOCOUPLER GaAs IRED &amp; PHOTO-TRANSISTOR

# TLP121

OFFICE MACHINE

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

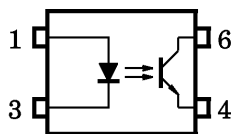
TELECOMMUNICATION

The TOSHIBA MINI FLAT COUPLER TLP121 is a small outline coupler, suitable for surface mount assembly.

TLP121 consists of a photo transistor, optically coupled to a gallium arsenide infrared emitting diode.

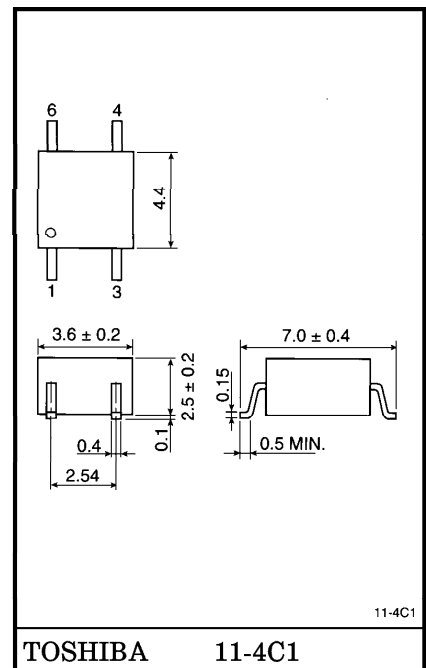
- Collector-Emitter Voltage : 80V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 3750Vrms (Min.)
- UL Recognized : UL 1577, File No. E67349

PIN CONFIGURATIONS (TOP VIEW)



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

Unit in mm



Weight : 0.09g

## CURRENT TRANSFER RATIO

| TYPE   | CLASSIFICATION<br>*1 | CURRENT TRANSFER<br>RATIO (%)<br>(I <sub>C</sub> / I <sub>F</sub> ) |      | MARKING OF CLASSIFICATION      |
|--------|----------------------|---------------------------------------------------------------------|------|--------------------------------|
|        |                      | I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V, T <sub>a</sub> = 25°C   |      |                                |
|        |                      | MIN.                                                                | MAX. |                                |
| TLP121 | (None)               | 50                                                                  | 600  | BLANK, Y, Y■, G, G■, B, B■, GB |
|        | Rank Y               | 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 : TLP121 (GB)

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

TLP121 (GB) : TLP121

## 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                                 | $I_{FP}$                      | 1 (100 $\mu\text{s}$ pulse, 100pps) | 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                           | $P_C$                         | 150                                 | mW      |
|                                                           | Collector Power Dissipation Derating (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 (Note 1)                                |                                                       | $BV_S$                        | 3750 (AC, 1min., R.H. $\leq$ 60%)   | Vrms    |

(Note 1) Device considered a two terminal device : Pins 1, 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   |

## INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC |                                     | SYMBOL               | TEST CONDITION                             | MIN. | TYP. | MAX. | UNIT |
|----------------|-------------------------------------|----------------------|--------------------------------------------|------|------|------|------|
| LED            | Forward Voltage                     | V <sub>F</sub>       | I <sub>F</sub> =10mA                       | 1.0  | 1.15 | 1.3  | V    |
|                | Reverse Current                     | I <sub>R</sub>       | V <sub>R</sub> =5V                         | —    | —    | 10   | μA   |
|                | Capacitance                         | C <sub>T</sub>       | V=0, f=1MHz                                | —    | 30   | —    | pF   |
| DETECTOR       | Collector-Emitter Breakdown Voltage | V <sub>(BR)CEO</sub> | I <sub>C</sub> =0.5mA                      | 80   | —    | —    | V    |
|                | Emitter-Collector Breakdown Voltage | V <sub>(BR)ECO</sub> | I <sub>E</sub> =0.1mA                      | 7    | —    | —    | V    |
|                | Collector Dark Current              | I <sub>CEO</sub>     | V <sub>CE</sub> =48V                       | —    | 10   | 100  | nA   |
|                |                                     |                      | V <sub>CE</sub> =48V, T <sub>a</sub> =85°C | —    | 2    | 50   | μA   |
|                | Capacitance (Collector to Emitter)  | C <sub>CE</sub>      | V=0, f=1MHz                                | —    | 10   | —    | pF   |

## COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                       | SYMBOL                    | TEST CONDITION                                      | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------------|---------------------------|-----------------------------------------------------|------|------|------|---------------|
| Current Transfer Ratio               | $I_C / I_F$               | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$<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 | $V_{CE(\text{sat})}$      | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$              | —    | —    | 0.4  | V             |
|                                      |                           | $I_C = 0.2\text{mA}, I_F = 1\text{mA}$<br>Rank GB   | —    | 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   | $\mu\text{A}$ |

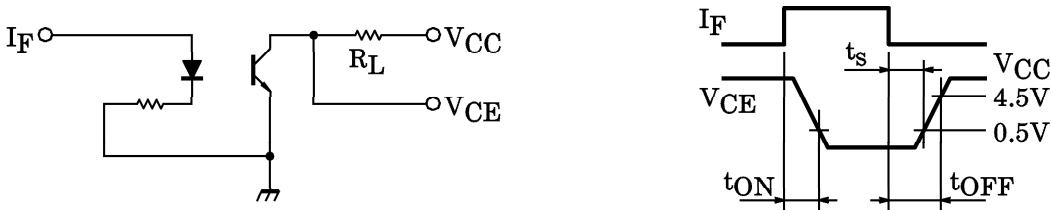
## ISOLATION CHARACTERISTICS (Ta = 25°C)

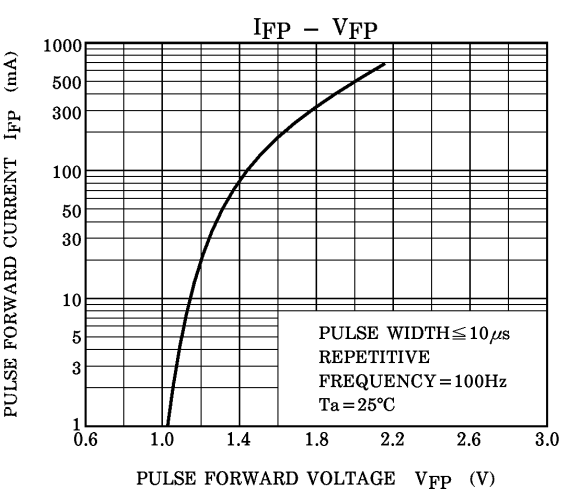
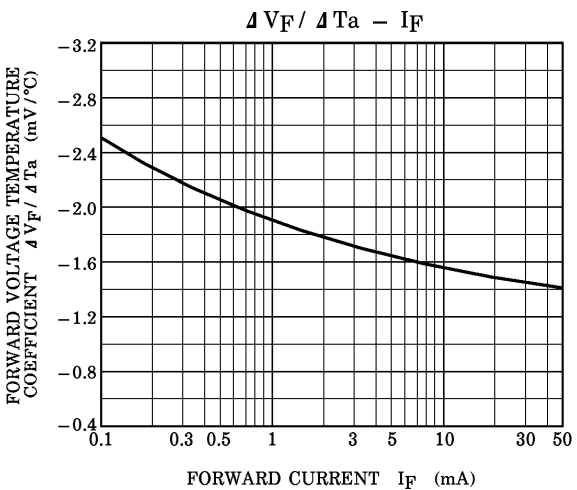
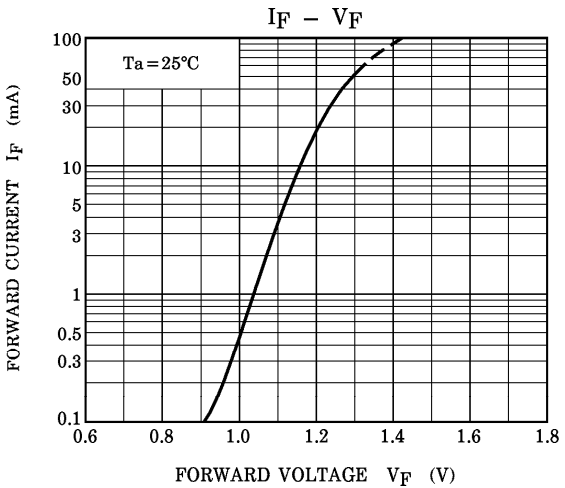
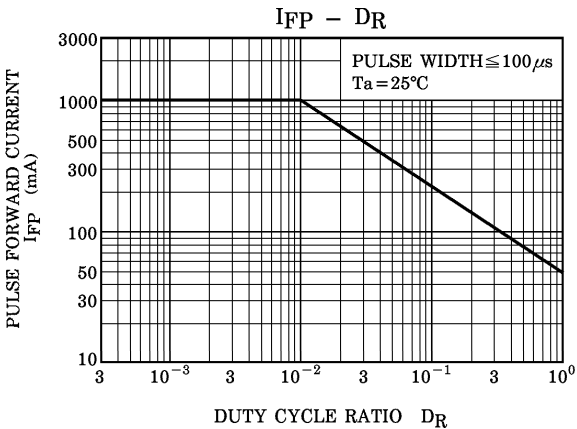
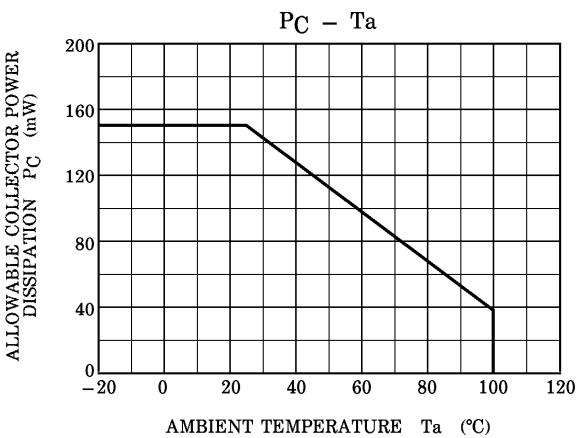
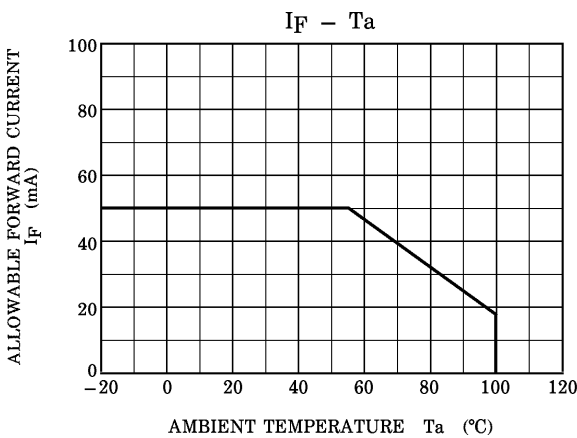
| CHARACTERISTIC                | SYMBOL | TEST CONDITION                             | MIN.               | TYP.      | MAX. | UNIT             |
|-------------------------------|--------|--------------------------------------------|--------------------|-----------|------|------------------|
| Capacitance (Input to Output) | $C_S$  | $V_S = 0, f = 1\text{MHz}$                 | —                  | 0.8       | —    | pF               |
| Isolation Resistance          | $R_S$  | $V_S = 500\text{V}, \text{R.H.} \leq 60\%$ | $5 \times 10^{10}$ | $10^{14}$ | —    | $\Omega$         |
| Isolation Voltage             | $BV_S$ | AC, 1 minute                               | 3750               | —         | —    | $V_{\text{rms}}$ |
|                               |        | AC, 1 second, in oil                       | —                  | 10000     | —    |                  |
|                               |        | DC, 1 minute, in oil                       | —                  | 10000     | —    | Vdc              |

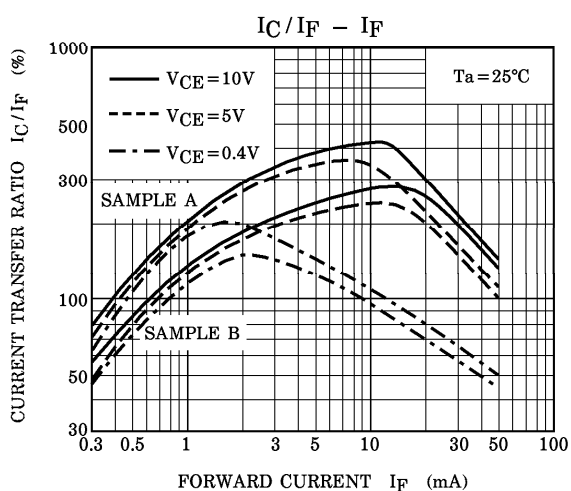
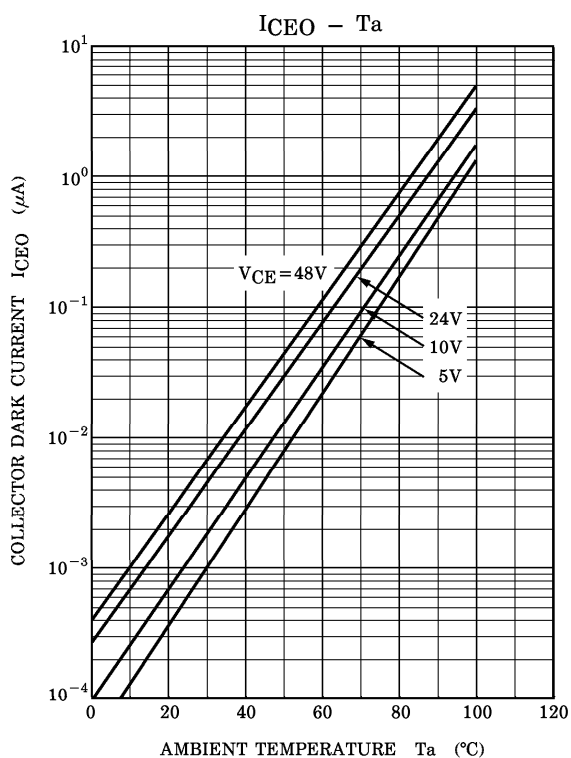
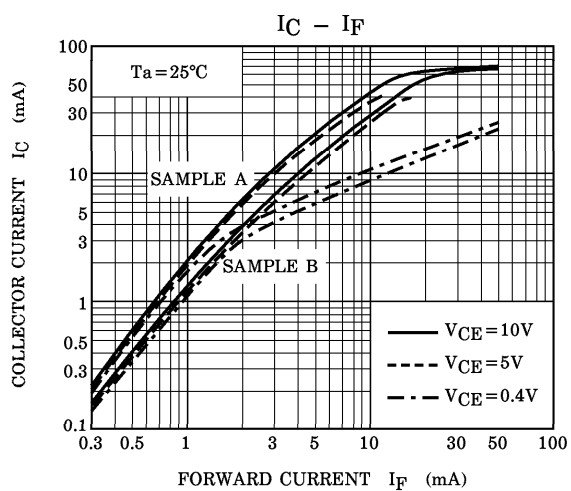
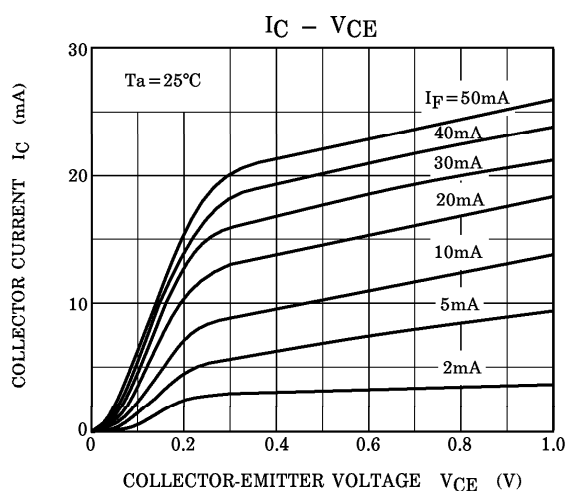
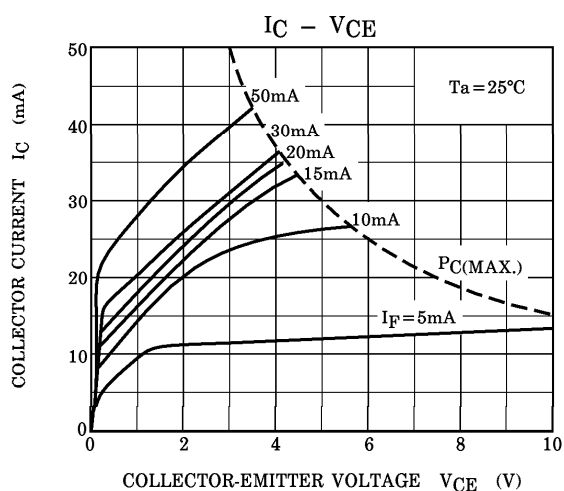
SWITCHING CHARACTERISTICS (Ta = 25°C)

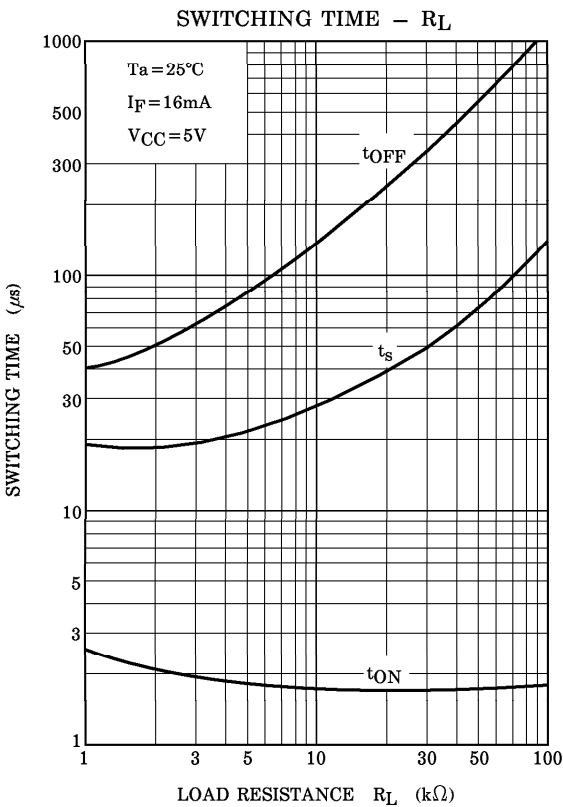
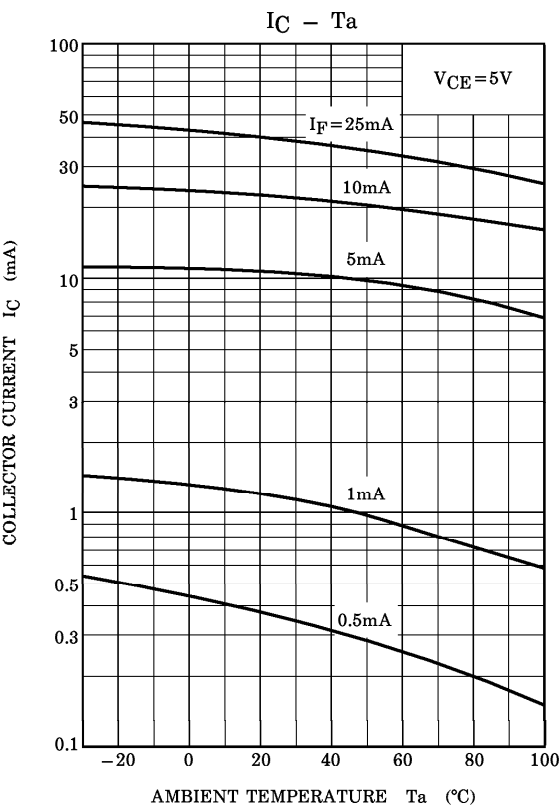
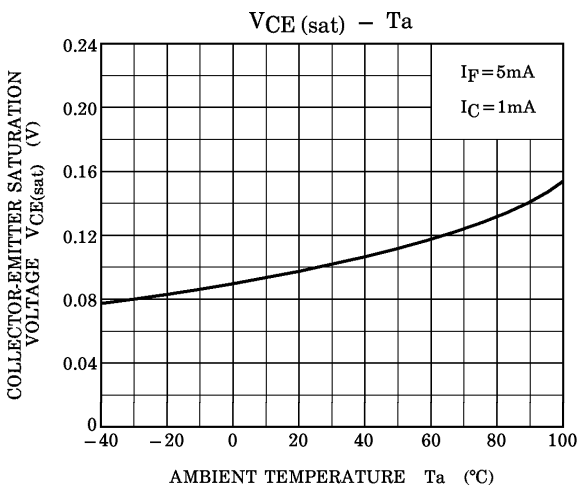
| CHARACTERISTIC | SYMBOL    | TEST CONDITION                                          | MIN. | TYP. | MAX. | UNIT    |
|----------------|-----------|---------------------------------------------------------|------|------|------|---------|
| Rise Time      | $t_r$     | $V_{CC} = 10V, I_C = 2mA$<br>$R_L = 100\Omega$          | —    | 2    | —    | $\mu s$ |
| Fall Time      | $t_f$     |                                                         | —    | 3    | —    |         |
| Turn-on Time   | $t_{on}$  |                                                         | —    | 3    | —    |         |
| Turn-off Time  | $t_{off}$ |                                                         | —    | 3    | —    |         |
| Turn-on Time   | $t_{ON}$  | $R_L = 1.9k\Omega$ (Fig.1)<br>$V_{CC} = 5V, I_F = 16mA$ | —    | 2    | —    | $\mu s$ |
| Storage Time   | $t_s$     |                                                         | —    | 25   | —    |         |
| Turn-off Time  | $t_{OFF}$ |                                                         | —    | 40   | —    |         |

Fig.1 SWITCHING TIME TEST CIRCUIT









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000707EBC

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