

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

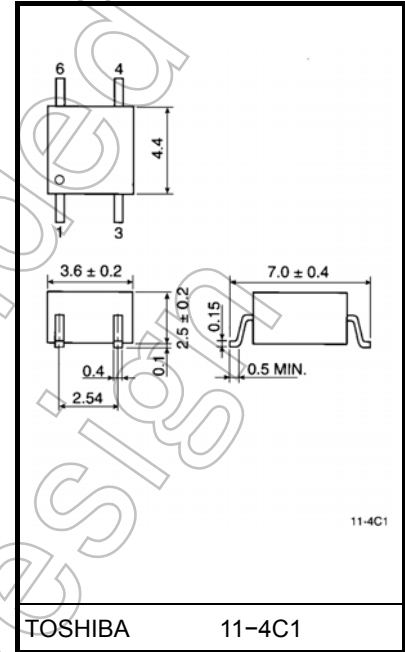
# TLP126

Programmable Controllers  
 AC / DC-Input Module  
 Telecommunication

The TOSHIBA mini flat coupler TLP126 is a small outline coupler, suitable for surface mount assembly. TLP126 consists of a photo transistor, optically coupled to a gallium arsenide infrared emitting diode connected inverse parallel, and provides high CTR at low AC input current.

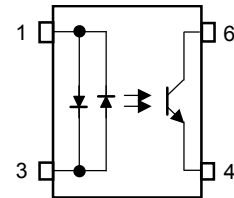
- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file No. E67349

Unit in mm



Weight: 0.09 g (typ.)

### Pin Configurations (top view)



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

Not Recommended for New Designs

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

| Characteristic                                       |   | Symbol                  | Rating  | Unit    |
|--|---|-------------------------|---------|---------|
| LED  | Forward current                           | $I_{F(RMS)}$            | 50      | mA      |
|  | Forward current derating (Ta ≥ 53°C) Δ    | $\Delta I_F / ^\circ C$ | -0.7    | mA / °C |
|  | Peak forward current(100μs pulse,100pps)  | $I_{FP}$                | 1       | A       |
|  | 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      |
|  | Peak collector current(10ms pulse,100pps) | $I_{CP}$                | 100     | mA      |
|  | Power dissipation                         | $P_C$                   | 150     | mW      |
|  | Power dissipation derating (Ta ≥ 25°C)    | $\Delta P_C / ^\circ C$ | -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(10 sec.)                  |   | $T_{sold}$              | 260     | °C      |
| Total package power dissipation                      |   | $P_T$                   | 200     | mW      |
| Total package power dissipation derating (Ta ≥ 25°C) |   | $\Delta P_T / ^\circ C$ | -2.0    | mW / °C |
| Isolation voltage (AC, 1min., 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: Pins1, and 3 shorted together and 4 and 6 shorted together.

## Recommended Operating Conditions

| Characteristic        | Symbol       | Min. | Typ. | Max. | Unit |
|-----------------------|--------------|------|------|------|------|
| Supply voltage        | $V_{CC}$     | —    | 5    | 48   | V    |
| Forward current       | $I_{F(RMS)}$ | —    | 1.6  | 20   | mA   |
| Collector current     | $I_C$        | —    | 1    | 10   | mA   |
| Operating temperature | $T_{opr}$    | -25  | —    | 75   | °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                     | $V_F$                      | $I_F = \pm 10 \text{ mA}$                       | 1.0  | 1.15 | 1.3  | V             |
|                                  | Capacitance                         | $C_T$                      | $V = 0, f = 1 \text{ MHz}$                      | —    | 60   | —    | 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              | $I_{CEO}$                  | $V_{CE} = 48 \text{ V}$                         | —    | 10   | 100  | nA            |
|                                  |                                     |                            | $V_{CE} = 48 \text{ V}, T_a = 85^\circ\text{C}$ | —    | 2    | 50   | $\mu\text{A}$ |
| Capacitance collector to emitter | $C_{CE}$                            | $V = 0, f = 1 \text{ MHz}$ | —   | 12   | —    | pF   |               |

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

| Characteristic                       | Symbol                   | Test Condition   | Min. | Typ. | Max. | Unit          |
|--------------------------------------|--------------------------|--|------|------|------|---------------|
| Current transfer ratio               | $I_C / I_F$              | $I_F = \pm 1 \text{ mA}, V_{CE} = 0.5 \text{ V}$       | 100  | —    | 1200 | %             |
| Low input CTR                        | $I_C / I_F (\text{low})$ | $I_F = \pm 0.5 \text{ mA}, V_{CE} = 1.5 \text{ V}$     | 50   | —    | —    | %             |
| Collector-emitter saturation voltage | $V_{CE} (\text{sat})$    | $I_C = 0.5 \text{ mA}, I_F = \pm 1 \text{ mA}$         | —    | —    | 0.4  | V             |
|                                      |                          | $I_C = 1 \text{ mA}, I_F = \pm 1 \text{ mA}$           | —    | 0.2  | —    |               |
| Off-state collector current          | $I_{C(\text{off})}$      | $V_F = \pm 0.7 \text{ V}, V_{CE} = 48 \text{ V}$       | —    | 1    | 10   | $\mu\text{A}$ |
| CTR symmetry                         | $I_C (\text{ratio})$     | $I_C (I_F = -1 \text{ mA}) / I_C (I_F = 1 \text{ mA})$ | 0.3  | —    | 3    | —             |

**Coupled Electrical Characteristics (Ta = -25~75°C)**

| Characteristic         | Symbol                   | Test Condition                                 | Min. | Typ. | Max. | Unit |
|------------------------|--------------------------|--|------|------|------|------|
| Current transfer ratio | $I_C / I_F$              | $I_F = 1 \text{ mA}, V_{CE} = 0.5 \text{ V}$   | 50   | —    | —    | %    |
| Low input CTR          | $I_C / I_F (\text{low})$ | $I_F = 0.5 \text{ mA}, V_{CE} = 1.5 \text{ V}$ | —    | 50   | —    | %    |

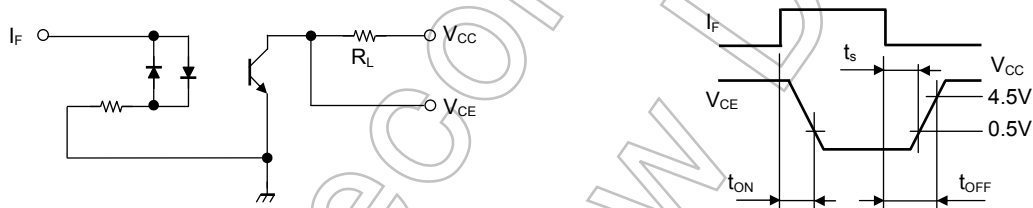
**Isolation characteristics (Ta = 25°C)**

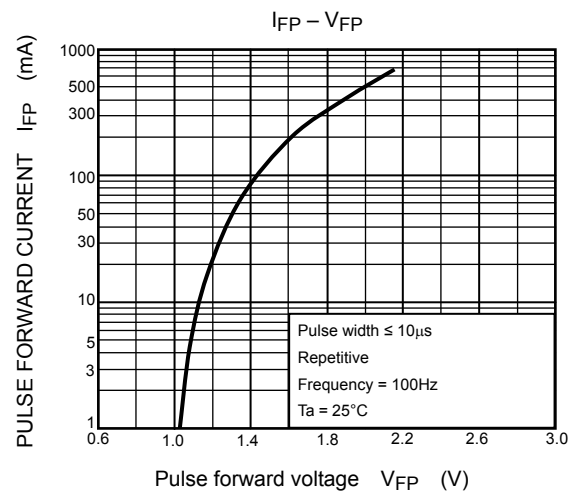
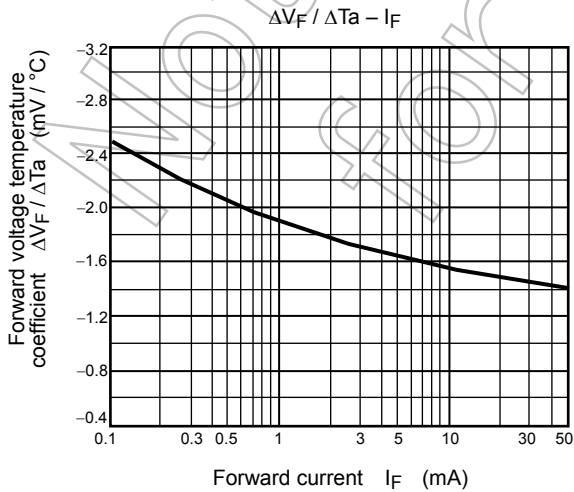
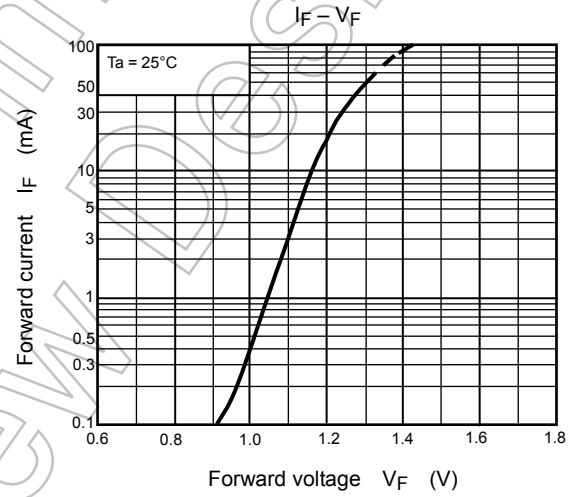
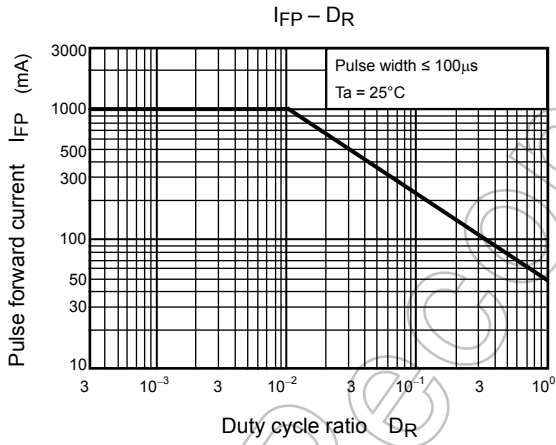
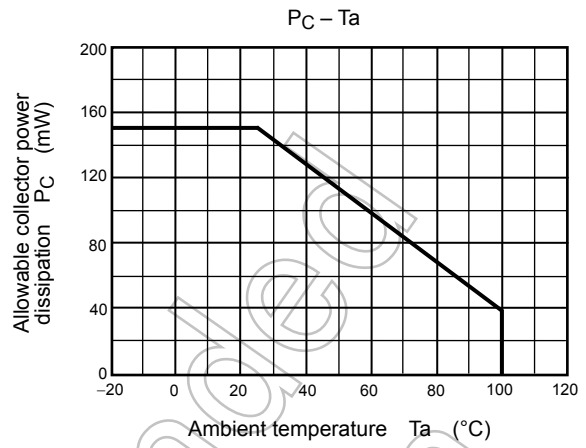
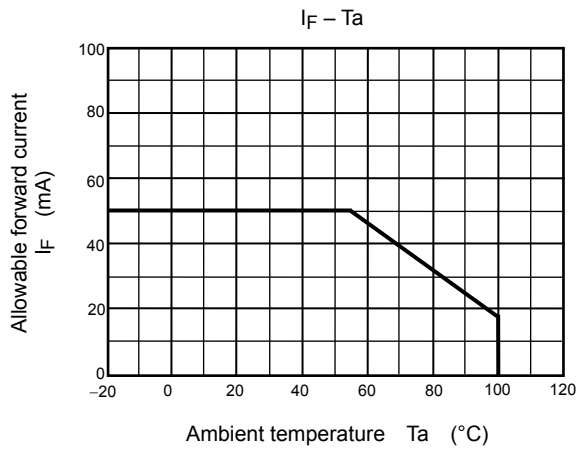
| Characteristic              | Symbol          | Test Condition                | Min.               | Typ.             | Max. | Unit |
|-----------------------------|-----------------|-------------------------------|--------------------|------------------|------|------|
| Capacitance input to output | C <sub>S</sub>  | V <sub>S</sub> = 0, f = 1 MHz | —                  | 0.8              | —    | pF   |
| Isolation resistance        | R <sub>S</sub>  | V <sub>S</sub> = 500 V        | 5×10 <sup>10</sup> | 10 <sup>14</sup> | —    | Ω    |
| Isolation voltage           | BV <sub>S</sub> | AC, 1 minute                  | 3750               | —                | —    | Vrms |
|                             |                 | AC, 1 second, in oil          | —                  | 10000            | —    |      |
|                             |                 | DC, 1 minute, in oil          | —                  | 10000            | —    | Vdc  |

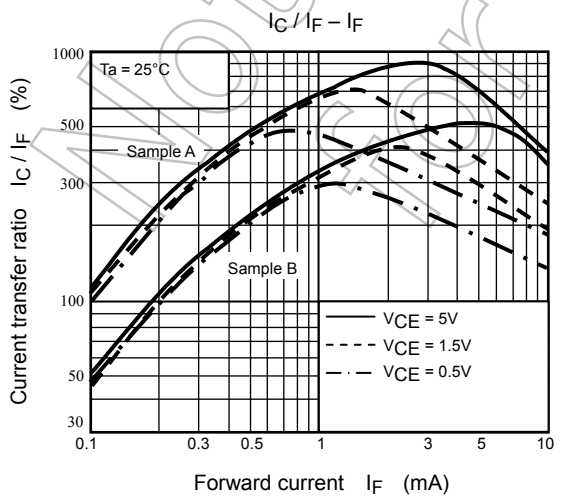
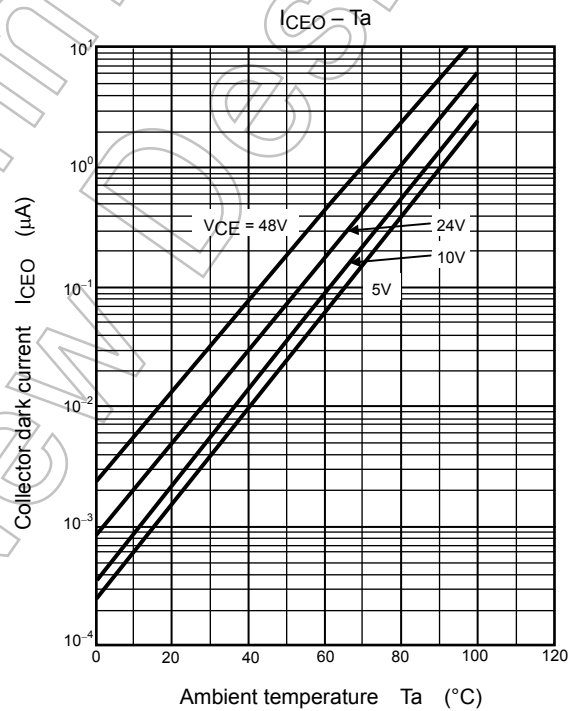
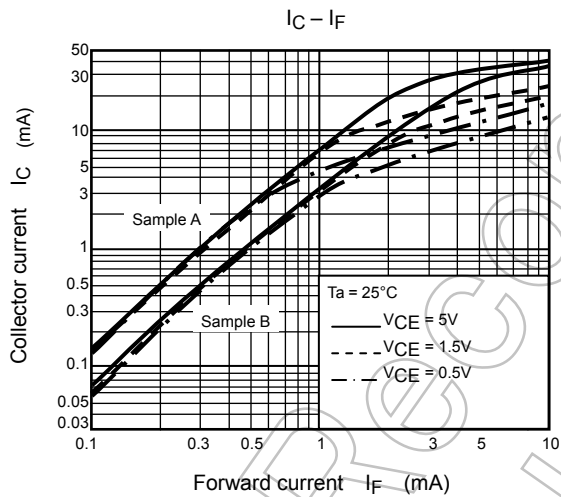
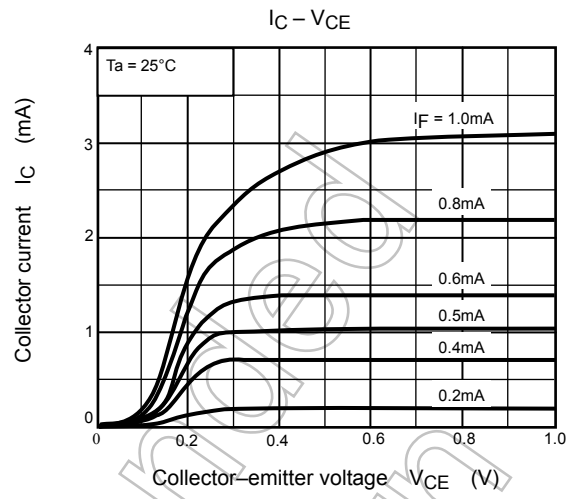
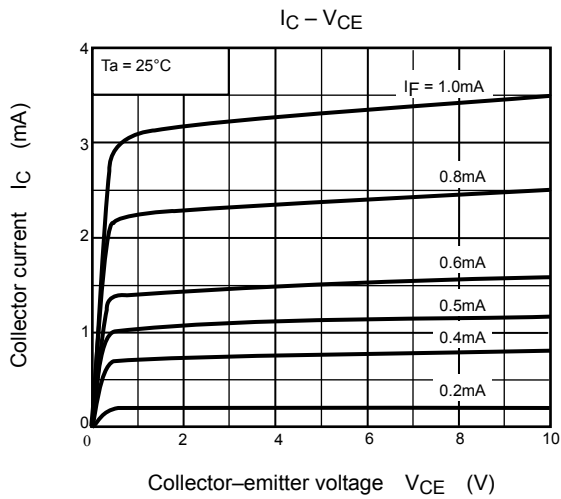
**Switching Characteristics (Ta = 25°C)**

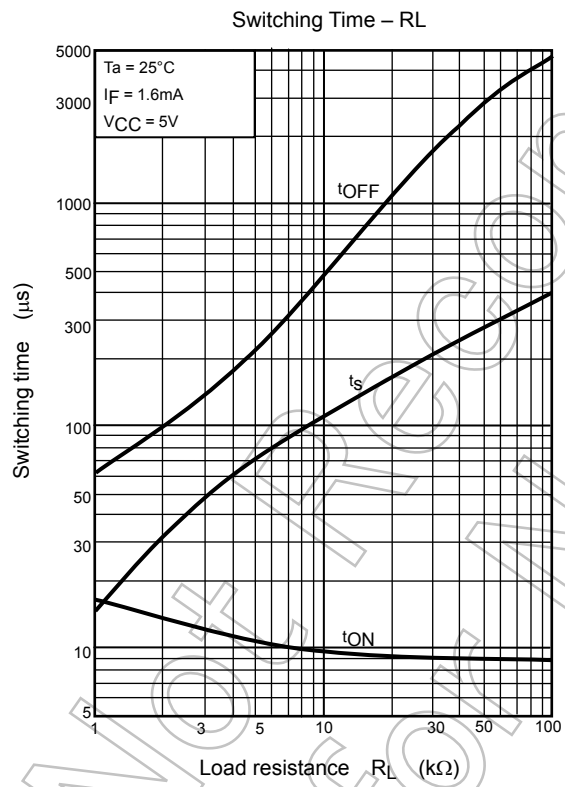
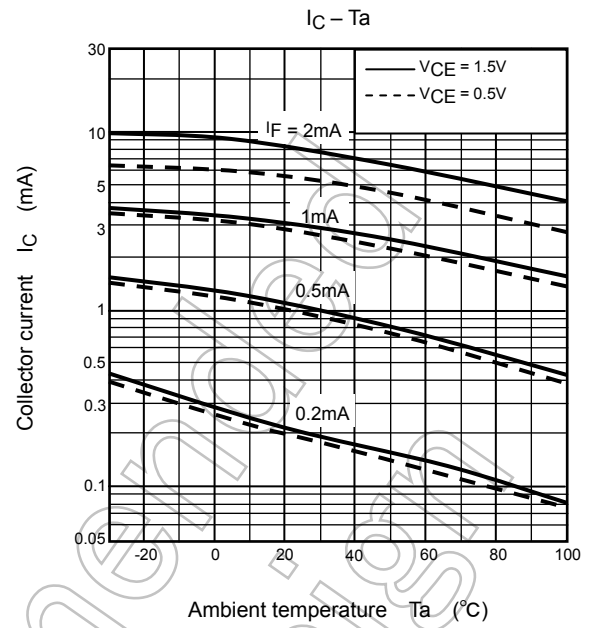
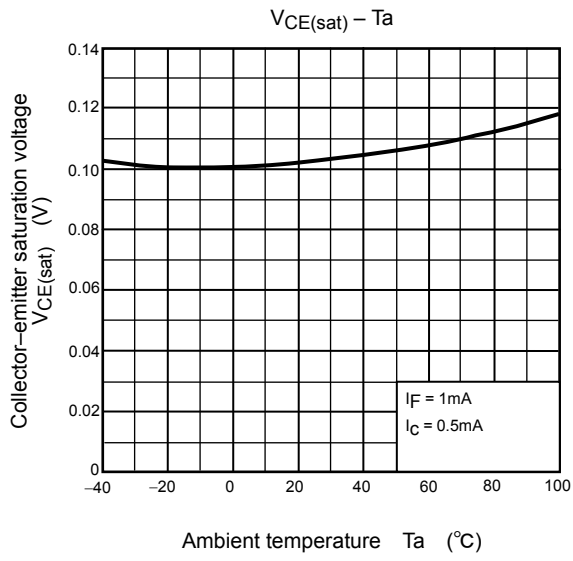
| Characteristic | Symbol           | Test Condition   | Min. | Typ. | Max. | Unit |
|----------------|------------------|--|------|------|------|------|
| Rise time      | t <sub>r</sub>   | V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA<br>R <sub>L</sub> = 100Ω             | —    | 8    | —    | μs   |
| Fall time      | t <sub>f</sub>   |  | —    | 8    | —    |      |
| Turn-on time   | t <sub>on</sub>  |  | —    | 10   | —    |      |
| Turn-off time  | t <sub>off</sub> |  | —    | 8    | —    |      |
| Turn-on time   | t <sub>ON</sub>  | R <sub>L</sub> = 4.7 kΩ (Fig.1)<br>V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±1.6 mA | —    | 10   | —    | μs   |
| Storage time   | t <sub>s</sub>   |  | —    | 50   | —    |      |
| Turn-off time  | t <sub>OFF</sub> |  | —    | 300  | —    |      |

Fig. 1 Switching time test circuit









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