

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

## TLP126

Programmable Controllers

AC / DC-Input Module

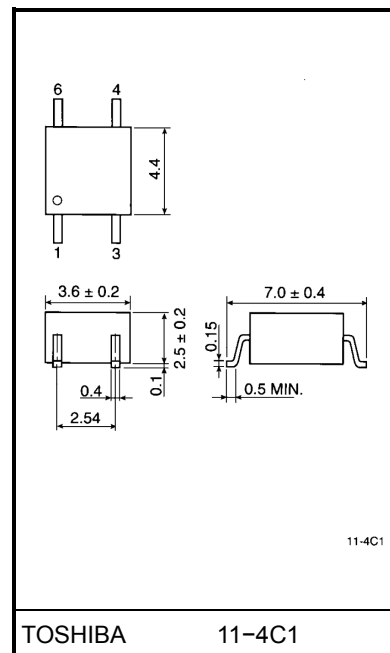
Telecommunication

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.

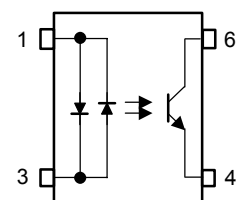
- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file No. E67349

Unit in mm



Weight: 0.09 g

### Pin Configurations (top view)



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

## 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 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   |

## 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   | —    | %    |

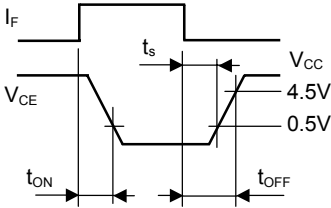
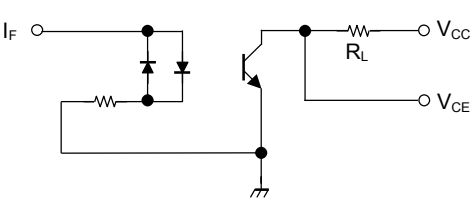
Isolation characteristics (Ta = 25°C)

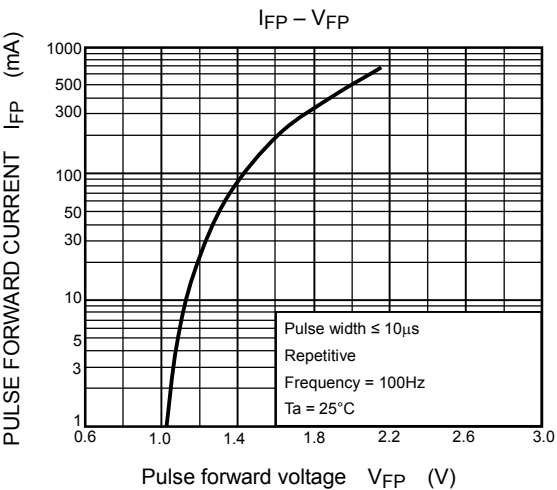
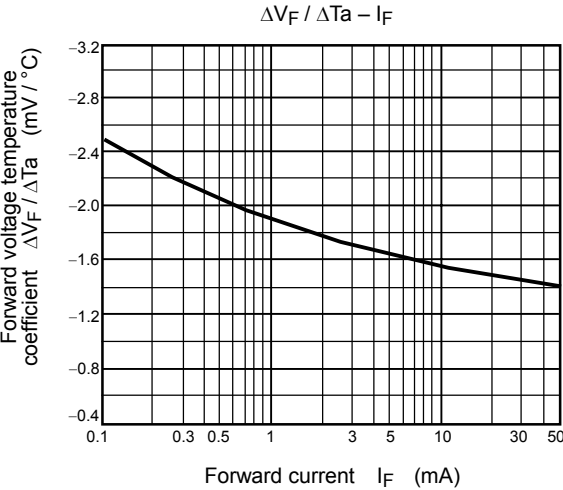
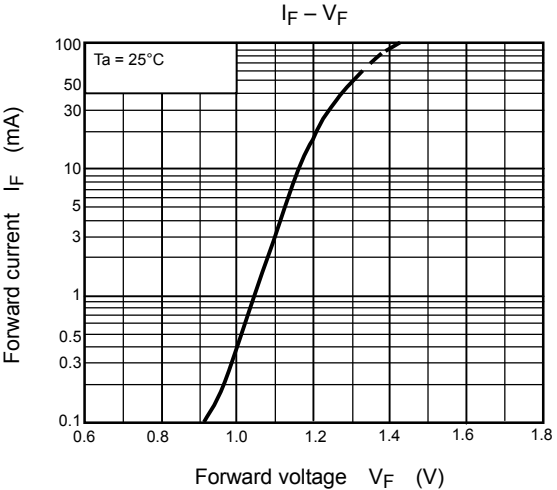
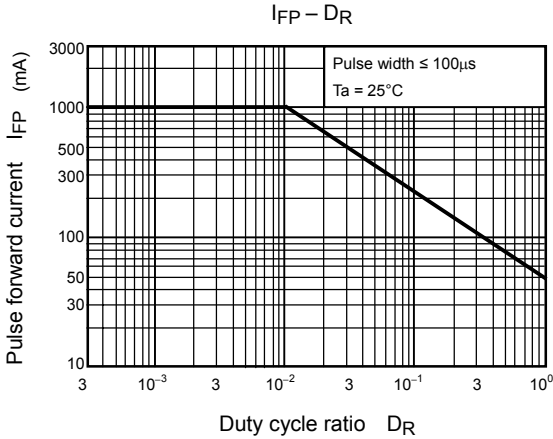
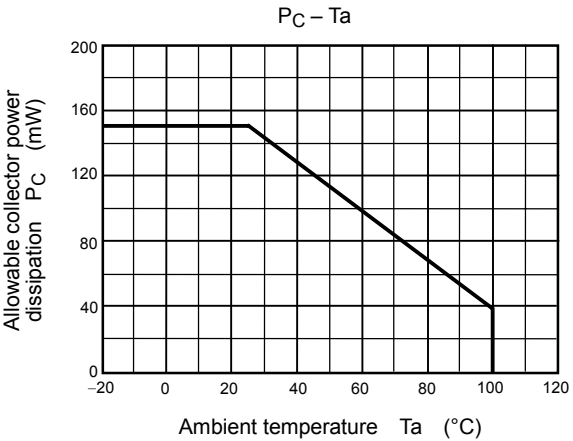
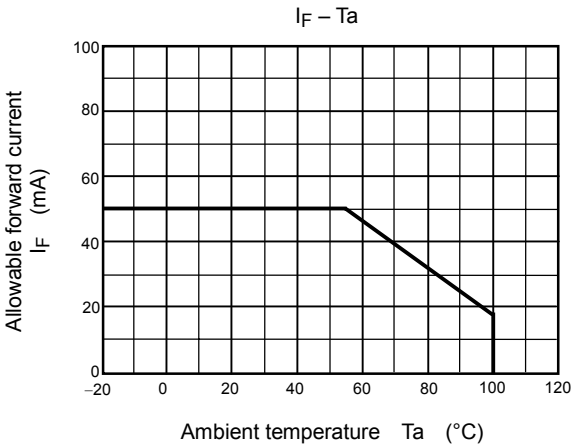
| Characteristic              | Symbol | Test Condition       | Min.               | Typ.             | Max. | Unit |
|-----------------------------|--------|----------------------|--------------------|------------------|------|------|
| Capacitance input to output | CS     | VS = 0, f = 1 MHz    | —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

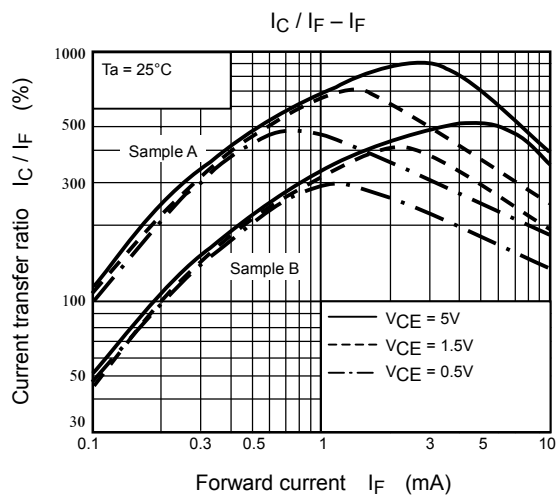
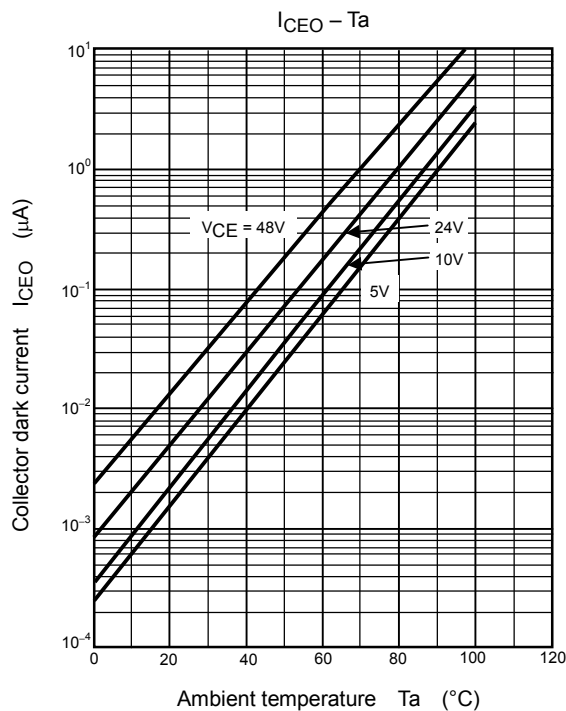
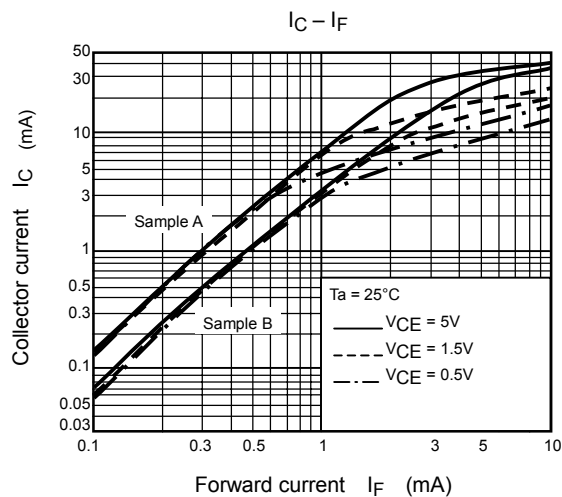
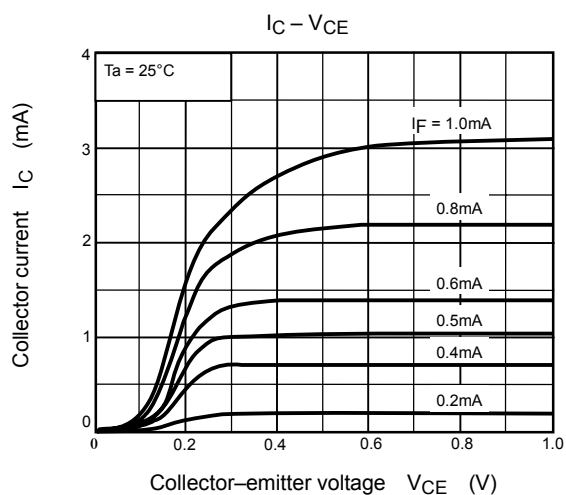
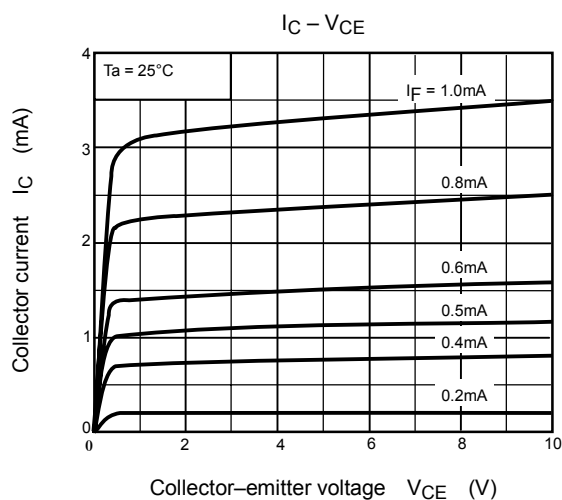
Switching Characteristics (Ta = 25°C)

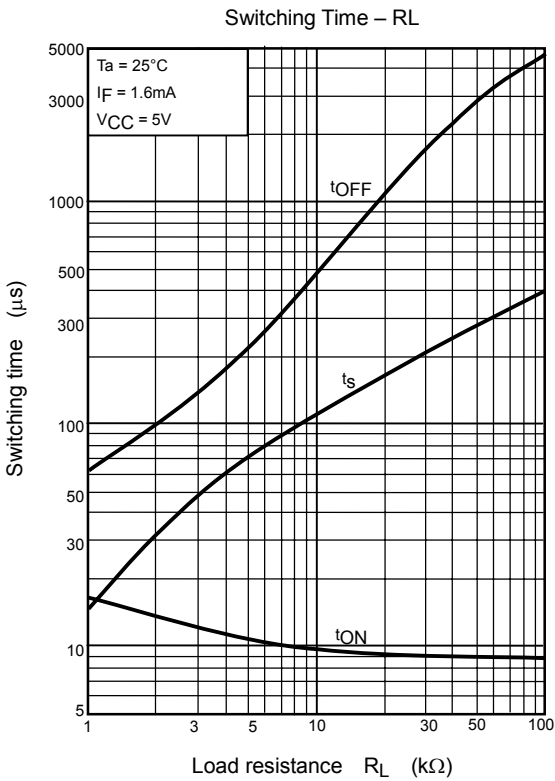
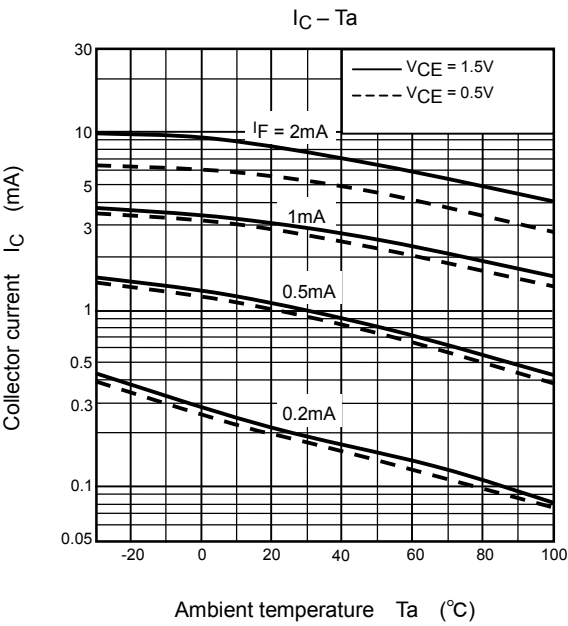
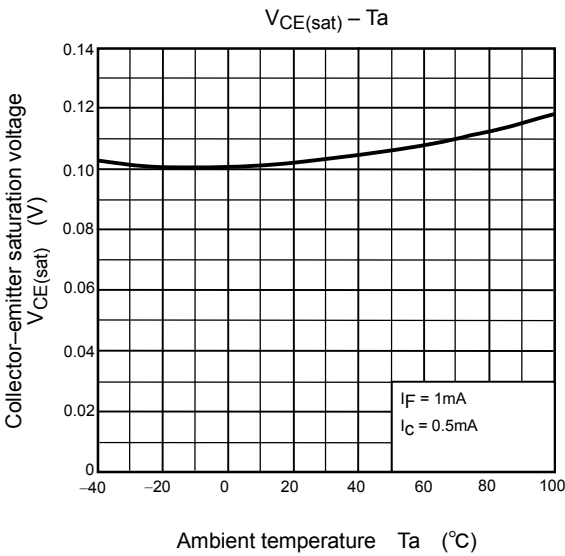
| Characteristic | Symbol | Test Condition                                 | Min. | Typ. | Max. | Unit |
|----------------|--------|------------------------------------------------|------|------|------|------|
| Rise time      | tr     | VCC = 10 V, IC = 2 mA<br>RL = 100Ω             | —    | 8    | —    | μs   |
| Fall time      | tf     |                                                | —    | 8    | —    |      |
| Turn-on time   | ton    |                                                | —    | 10   | —    |      |
| Turn-off time  | toff   |                                                | —    | 8    | —    |      |
| Turn-on time   | tON    | RL = 4.7 kΩ<br>VCC = 5 V, IF = ±1.6 mA (Fig.1) | —    | 10   | —    | μs   |
| Storage time   | ts     |                                                | —    | 50   | —    |      |
| Turn-off time  | tOFF   |                                                | —    | 300  | —    |      |

Fig. 1 Switching time test circuit









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