

# TLP127

Programmable Controllers

DC-Output Module

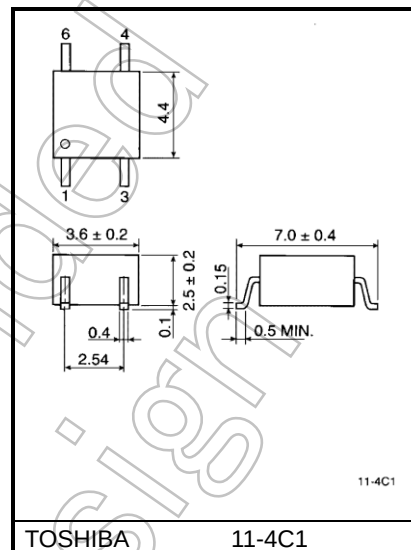
Telecommunication

Unit: mm

The TOSHIBA mini-flat coupler TLP127 is a small outline coupler, suitable for surface mount assembly.

TLP127 consists of an infrared emitting diode, optically coupled to a Darlington photo transistor with an integral base-emitter resistor.

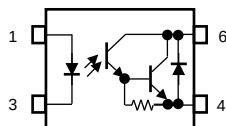
- Collector-emitter voltage : 300 V (min)
- Current transfer ratio : 1000 % (min)
- Isolation voltage : 2500 Vrms (min)
- UL-recognized : UL 1577, File No. E67349
- cUL-recognized : CSA Component Acceptance Service No.5A  
File No.E67349
- VDE-approved : EN 60747-5-5 (Note 1)



Weight: 0.09 g (typ.)

Note 1: When a VDE approved type is needed, please designate the **Option (V4)**.

## Pin Configurations (top view)



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

Start of commercial production  
1988-04

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

| Characteristic                                          |                                                     | Symbol              | Rating     | Unit             |
|---------------------------------------------------------|-----------------------------------------------------|---------------------|------------|------------------|
| LED                                                     | Forward current                                     | I <sub>F</sub>      | 50         | mA               |
|                                                         | Forward current derating<br>(Ta ≥ 53°C)             | ΔI <sub>F</sub> /°C | -0.7       | mA/°C            |
|                                                         | Pulse forward current<br>(100 μs pulse, 100 pps)    | I <sub>FP</sub>     | 1          | A                |
|                                                         | Reverse voltage                                     | V <sub>R</sub>      | 5          | V                |
|                                                         | Diode power dissipation                             | P <sub>D</sub>      | 100        | mW               |
|                                                         | Diode power dissipation derating<br>(Ta ≥ 53°C)     | ΔP <sub>D</sub> /°C | -1.39      | mW/°C            |
|                                                         | Junction temperature                                | T <sub>j</sub>      | 125        | °C               |
| Detector                                                | Collector-emitter voltage                           | V <sub>CEO</sub>    | 300        | V                |
|                                                         | Emitter-collector voltage                           | V <sub>ECO</sub>    | 0.3        | V                |
|                                                         | Collector current                                   | I <sub>C</sub>      | 150        | mA               |
|                                                         | Collector power dissipation                         | P <sub>C</sub>      | 150        | mW               |
|                                                         | Collector power dissipation derating<br>(Ta ≥ 25°C) | ΔP <sub>C</sub> /°C | -1.5       | mW/°C            |
|                                                         | Junction temperature                                | T <sub>j</sub>      | 125        | °C               |
|                                                         | Storage temperature range                           | T <sub>stg</sub>    | -55 to 125 | °C               |
| Operating temperature range                             |                                                     | T <sub>opr</sub>    | -55 to 100 | °C               |
| Lead soldering temperature (10 s)                       |                                                     | T <sub>sol</sub>    | 260        | °C               |
| Total package power dissipation                         |                                                     | P <sub>T</sub>      | 200        | mW               |
| Total package power dissipation derating<br>(Ta ≥ 25°C) |                                                     | ΔP <sub>T</sub> /°C | -2.0       | mW/°C            |
| Isolation voltage<br>(AC, 60 s, R.H. ≤ 60 %) (Note 1)   |                                                     | BVs                 | 2500       | V <sub>rms</sub> |

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: Pins 1, 3 shorted together and pins 4, 6 shorted together.

## Recommended Operating Conditions

| Characteristic        | Symbol           | Min | Typ. | Max | Unit |
|-----------------------|------------------|-----|------|-----|------|
| Supply voltage        | V <sub>CC</sub>  | —   | —    | 200 | V    |
| Forward current       | I <sub>F</sub>   | —   | 16   | 25  | mA   |
| Collector current     | I <sub>C</sub>   | —   | —    | 120 | mA   |
| Operating temperature | T <sub>opr</sub> | -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.

## 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                         | $C_T$         | $V = 0 \text{ V}, f = 1 \text{ MHz}$             | —   | 30   | —   | pF            |
| Detector       | Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C = 0.1 \text{ mA}$                           | 300 | —    | —   | V             |
|                | Emitter-collector breakdown voltage | $V_{(BR)ECO}$ | $I_E = 0.1 \text{ mA}$                           | 0.3 | —    | —   | V             |
|                | Collector dark current              | $I_{CEO}$     | $V_{CE} = 200 \text{ V}$                         | —   | 10   | 200 | nA            |
|                |                                     |               | $V_{CE} = 200 \text{ V}, T_a = 85^\circ\text{C}$ | —   | —    | 20  | $\mu\text{A}$ |
|                | Capacitance collector to emitter    | $C_{CE}$      | $V = 0 \text{ V}, f = 1 \text{ MHz}$             | —   | 12   | —   | pF            |

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

| Characteristic                       | Symbol                | Test Condition                                | Min  | Typ. | Max | Unit          |
|--------------------------------------|-----------------------|-----------------------------------------------|------|------|-----|---------------|
| Current transfer ratio               | $I_C/I_F$             | $I_F = 1 \text{ mA}, V_{CE} = 1 \text{ V}$    | 1000 | 4000 | —   | %             |
| Saturated CTR                        | $I_C/I_F(\text{sat})$ | $I_F = 10 \text{ mA}, V_{CE} = 1 \text{ V}$   | 500  | —    | —   | %             |
| Collector-emitter saturation voltage | $V_{CE(\text{sat})}$  | $I_C = 10 \text{ mA}, I_F = 1 \text{ mA}$     | —    | —    | 1.0 | V             |
|                                      |                       | $I_C = 100 \text{ mA}, I_F = 10 \text{ mA}$   | 0.3  | —    | 1.2 |               |
| Off-state collector current          | $I_{C(\text{off})}$   | $V_F = 0.7 \text{ V}, V_{CE} = 200 \text{ V}$ | —    | —    | 20  | $\mu\text{A}$ |

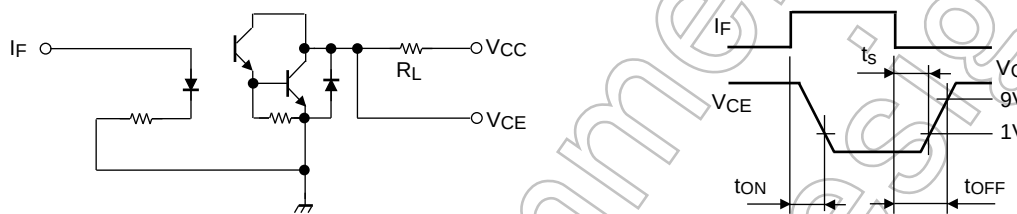
## Isolation Characteristics (Ta = 25°C)

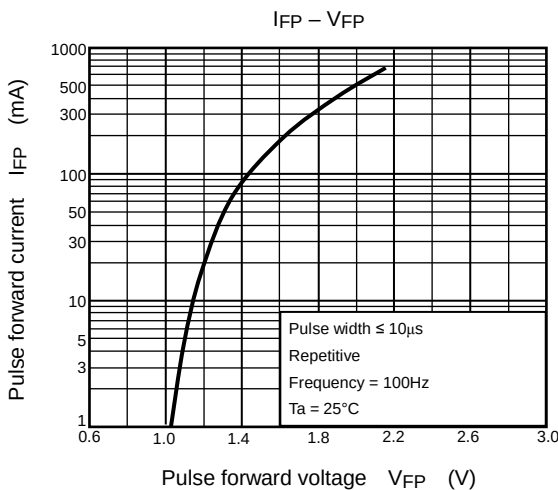
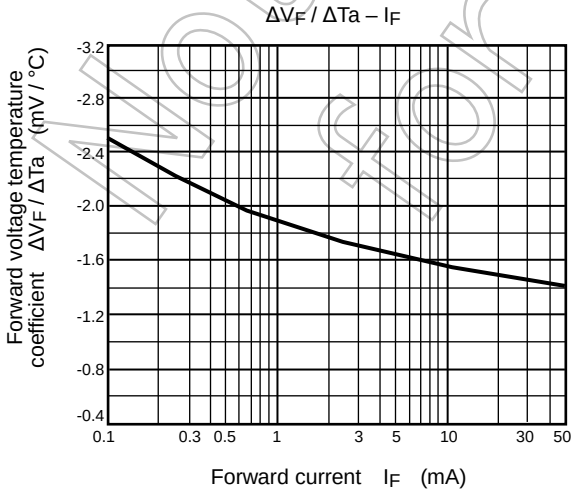
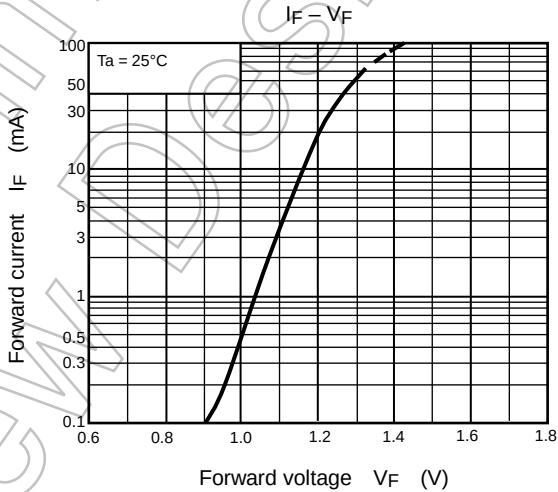
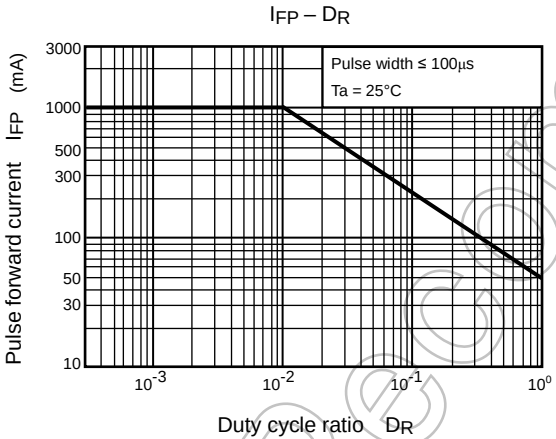
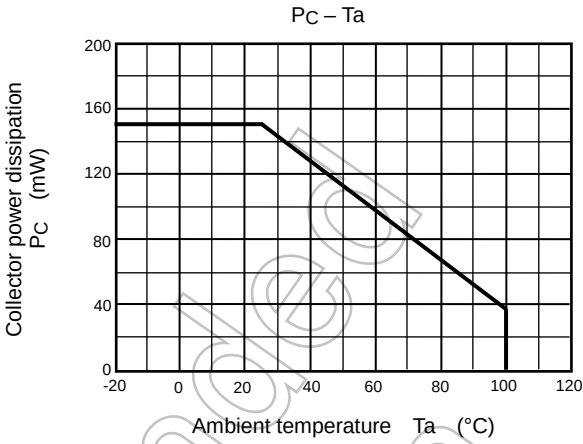
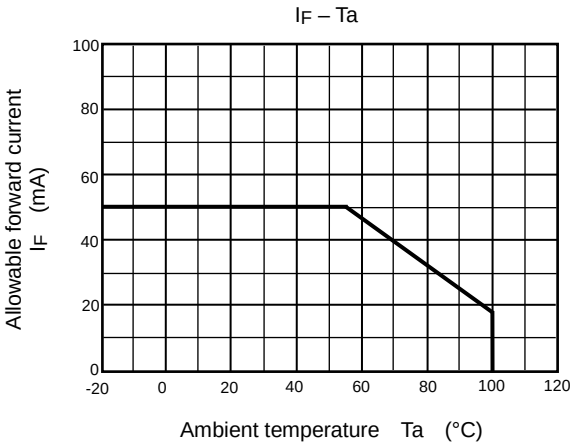
| Characteristic                | Symbol | Test Condition                               | Min                | Typ.      | Max | Unit             |
|-------------------------------|--------|----------------------------------------------|--------------------|-----------|-----|------------------|
| Capacitance (input to output) | $C_S$  | $V_S = 0 \text{ V}, f = 1 \text{ MHz}$       | —                  | 0.8       | —   | pF               |
| Isolation resistance          | $R_S$  | $V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$ | $5 \times 10^{10}$ | $10^{14}$ | —   | $\Omega$         |
| Isolation voltage             | $BV_S$ | AC, 60 s                                     | 2500               | —         | —   | $V_{\text{rms}}$ |

Switching Characteristics (Ta = 25°C)

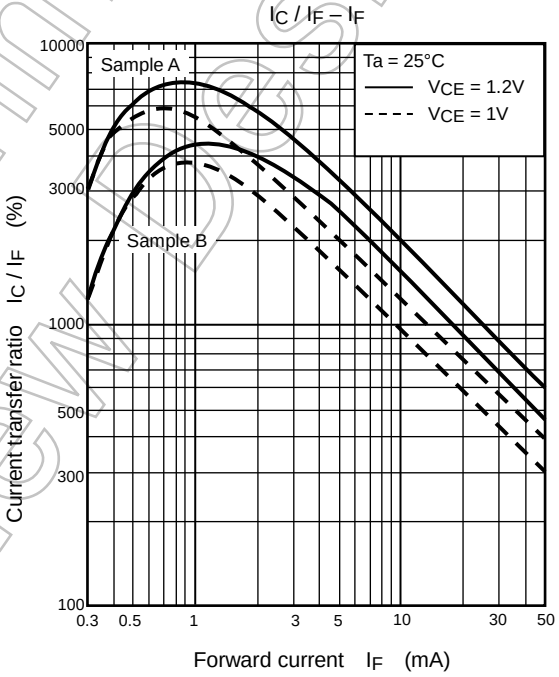
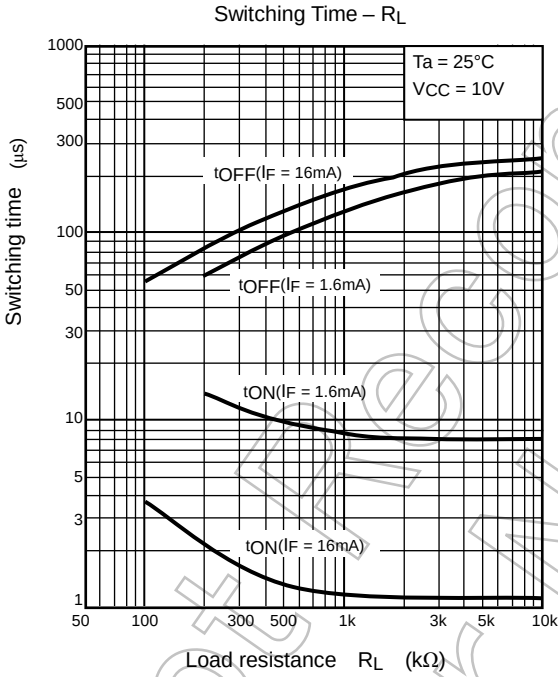
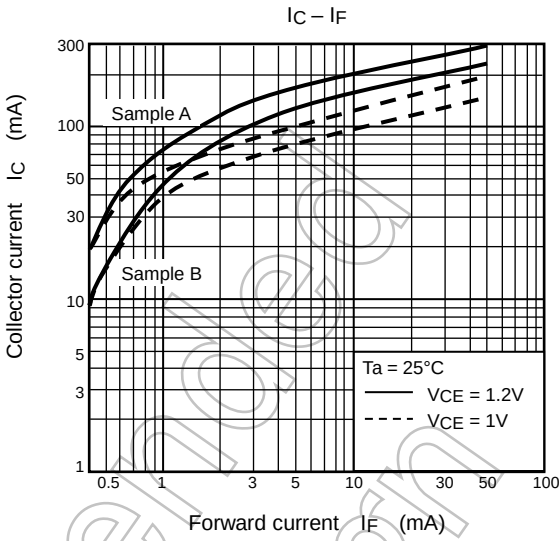
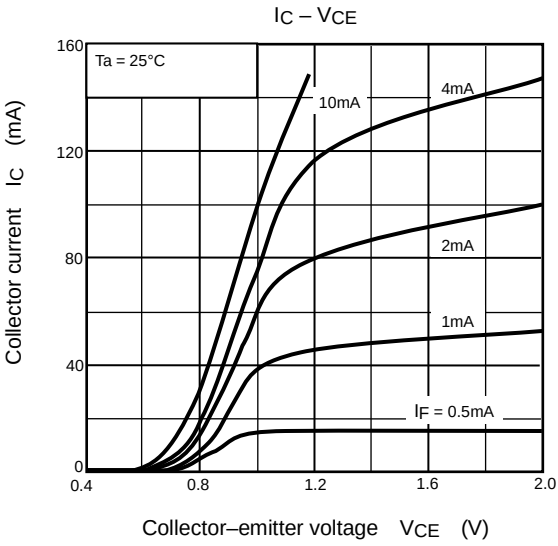
| Characteristic | Symbol    | Test Condition                                                               | Min | Typ. | Max | Unit          |
|----------------|-----------|------------------------------------------------------------------------------|-----|------|-----|---------------|
| Rise time      | $t_r$     | $V_{CC} = 10\text{ V}, I_C = 10\text{ mA}$<br>$R_L = 100\ \Omega$            | —   | 40   | —   | $\mu\text{s}$ |
| Fall time      | $t_f$     |                                                                              | —   | 15   | —   |               |
| Turn-on time   | $t_{on}$  |                                                                              | —   | 50   | —   |               |
| Turn-off time  | $t_{off}$ |                                                                              | —   | 15   | —   |               |
| Turn-on time   | $t_{ON}$  | $R_L = 180\ \Omega$<br>$V_{CC} = 10\text{ V}, I_F = 16\text{ mA}$<br>(Fig.1) | —   | 5    | —   | $\mu\text{s}$ |
| Storage time   | $t_s$     |                                                                              | —   | 40   | —   |               |
| Turn-off time  | $t_{OFF}$ |                                                                              | —   | 80   | —   |               |

Fig.1: Switching time test circuit

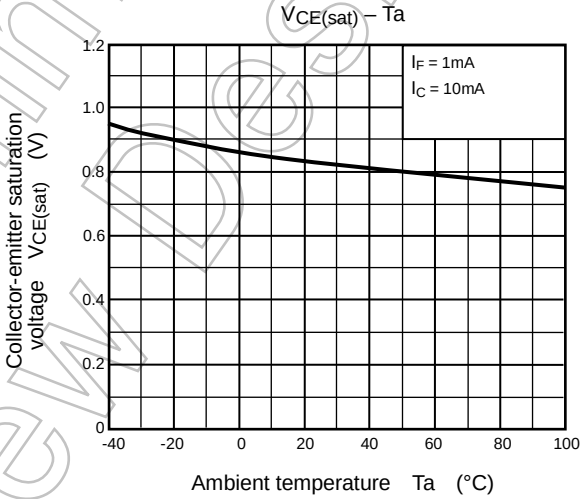
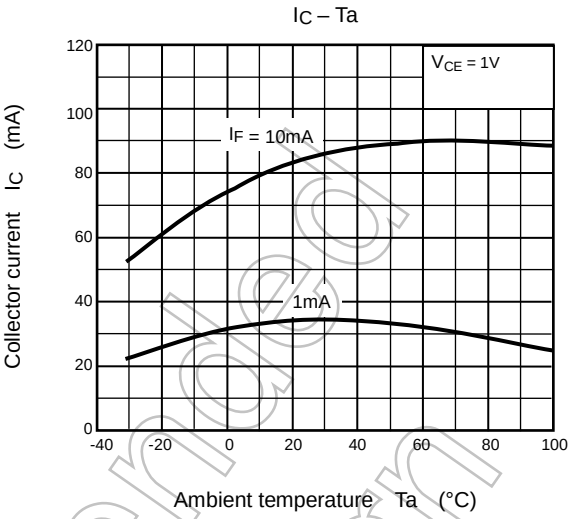
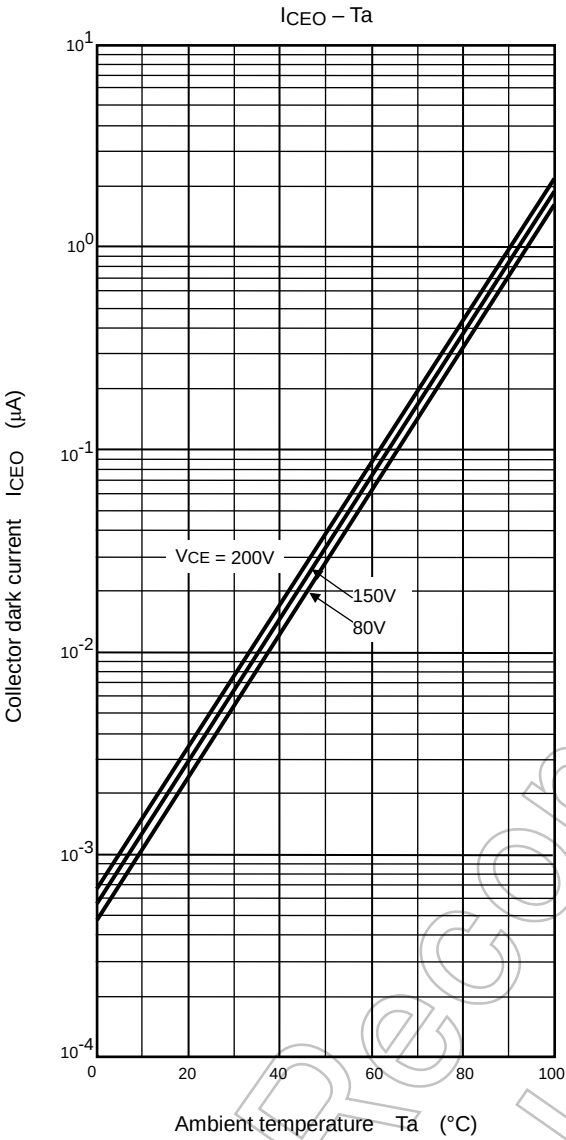




NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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