

# TLP120

Programmable Controllers

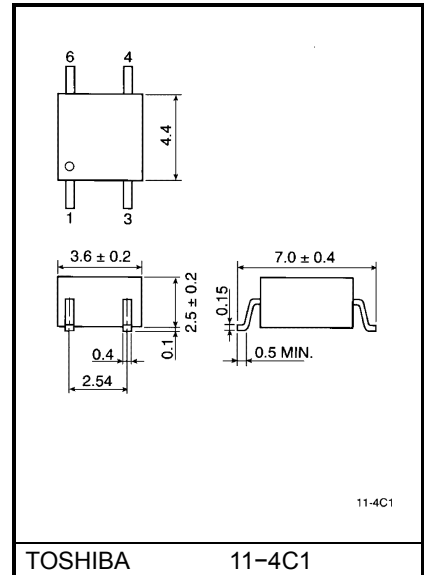
AC / DC-Input Module

Telecommunication

The TOSHIBA mini flat coupler TLP120 is a small outline coupler, suitable for surface mount assembly. TLP120 consists of a photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current.

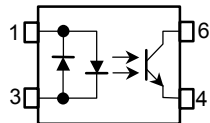
- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file no. E67349

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                              | $\Delta I_F / ^\circ C$ | -0.7 (Ta $\geq$ 53°C)             | mA / °C |
|   | Pulse forward current                                 | $I_{FP}$                | 1 (100 $\mu$ s pulse, 100pps)     | 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      |
|   | Collector power dissipation                           | $P_C$                   | 150                               | mW      |
|   | Collector power dissipation derating (Ta $\geq$ 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                                |   | $T_{sol}$               | 260 (10s)                         | °C      |
| Total package power dissipation                           |   | $P_T$                   | 200                               | mW      |
| Total package power dissipation derating (Ta $\geq$ 25°C) |   | $\Delta P_T / ^\circ C$ | -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       | $I_{F(RMS)}$ | —    | 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                     | $V_F$                      | $I_F = \pm 10 \text{ mA}$                       | 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) | $C_{CE}$                            | $V = 0, f = 1 \text{ MHz}$ | —   | 10   | —    | pF   |               |

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

| Characteristic                       | Symbol                   | Test Condition  | Min. | Typ. | Max. | Unit          |
|--------------------------------------|--------------------------|---|------|------|------|---------------|
| Current transfer ratio               | $I_C / I_F$              | $I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$<br>Rank GB   | 50   | —    | 600  | %             |
|                                      |                          |   | 100  | —    | 600  |               |
| Saturated CTR                        | $I_C / I_F (\text{sat})$ | $I_F = \pm 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$<br>Rank GB   | —    | 60   | —    | %             |
|                                      |                          |   | 30   | —    | —    |               |
| Collector-emitter saturation voltage | $V_{CE (\text{sat})}$    | $I_C = 2.4 \text{ mA}, I_F = \pm 8 \text{ mA}$<br>$I_C = 0.2 \text{ mA}, I_F = \pm 1 \text{ mA}$<br>Rank GB | —    | —    | 0.4  | V             |
|                                      |                          |   | —    | 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                         | $I_C (\text{ratio})$     | $I_C (I_F = -5 \text{ mA}) / I_C (I_F = 5 \text{ mA})$  | 0.33 | 1    | 3    | —             |

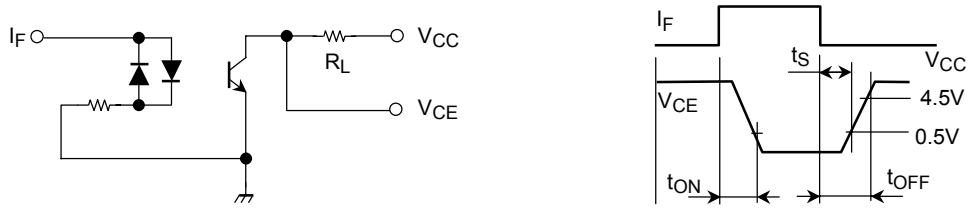
## Isolation Characteristics (Ta = 25°C)

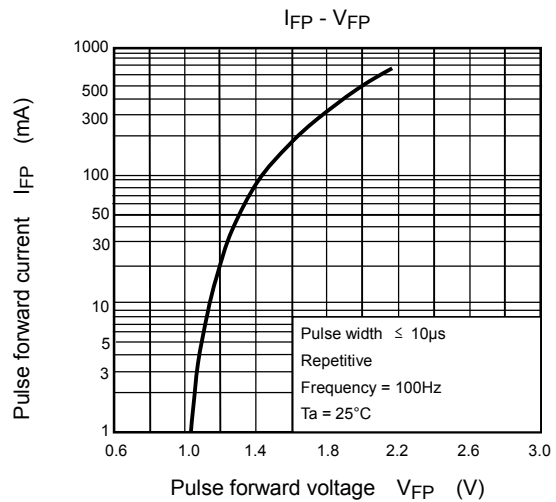
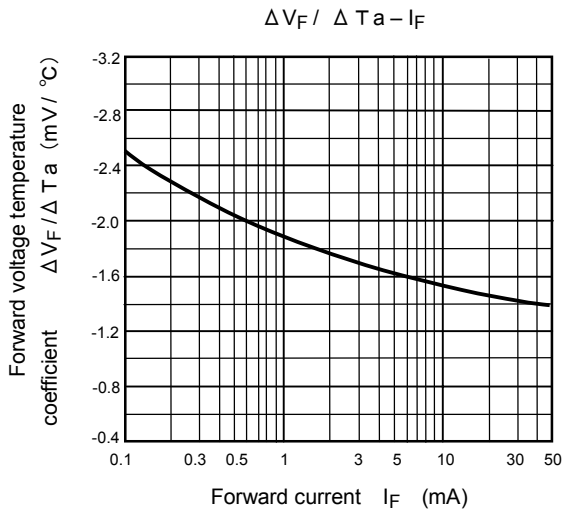
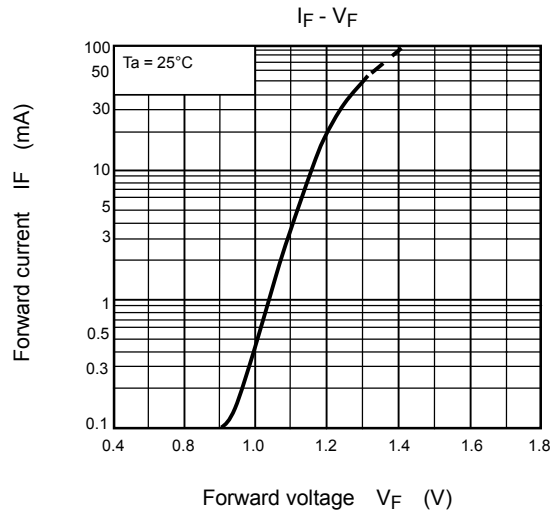
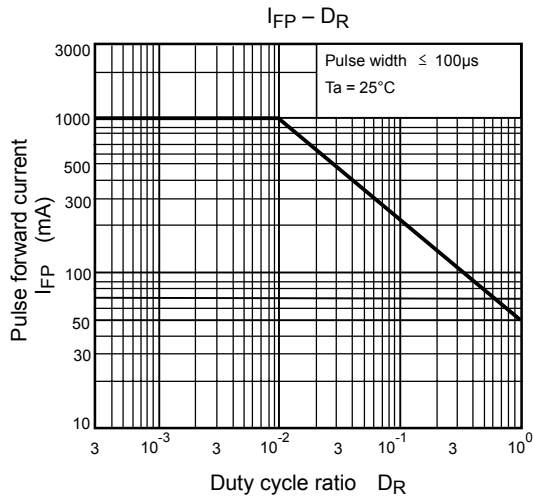
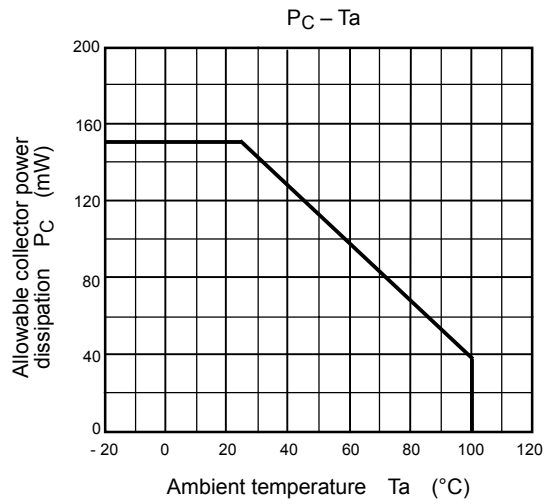
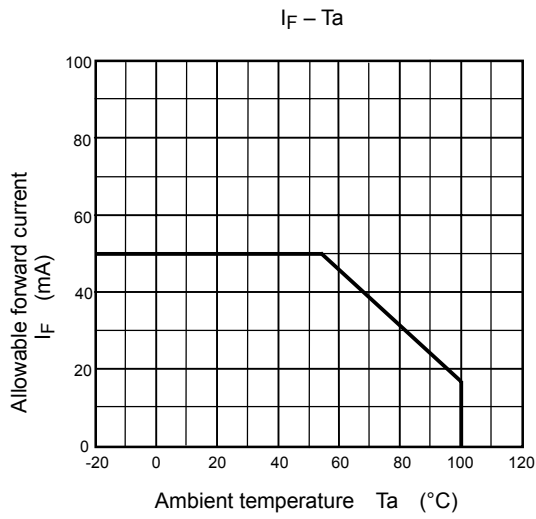
| Characteristic                | Symbol | Test Condition                               | Min.               | Typ.      | Max. | Unit             |
|-------------------------------|--------|--|--------------------|-----------|------|------------------|
| Capacitance (input to output) | $C_S$  | $V_S = 0, f = 1 \text{ MHz}$                 | —                  | 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     | —    | $V_{\text{dc}}$  |

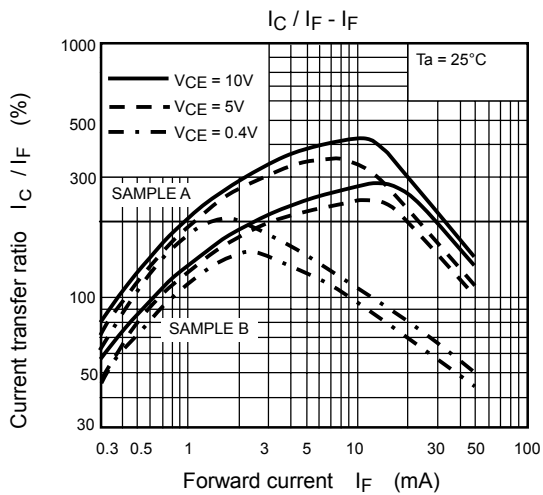
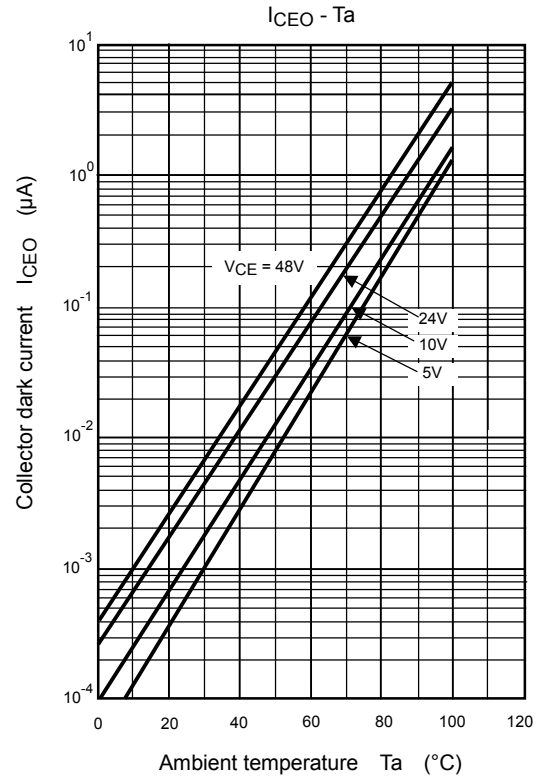
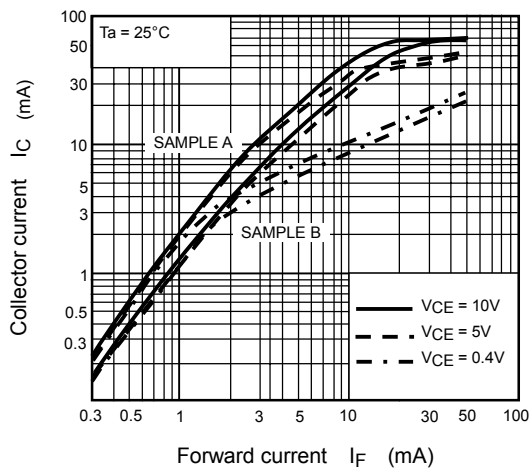
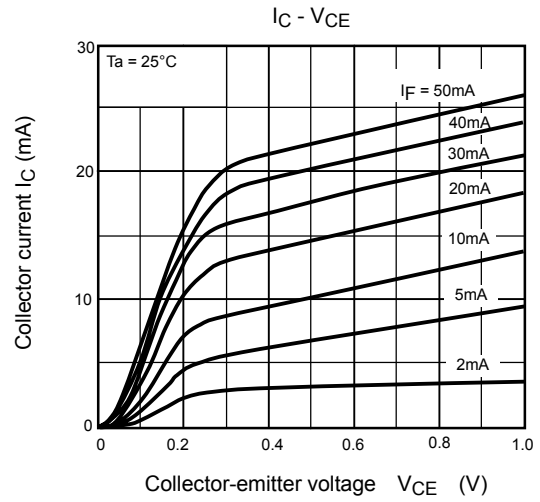
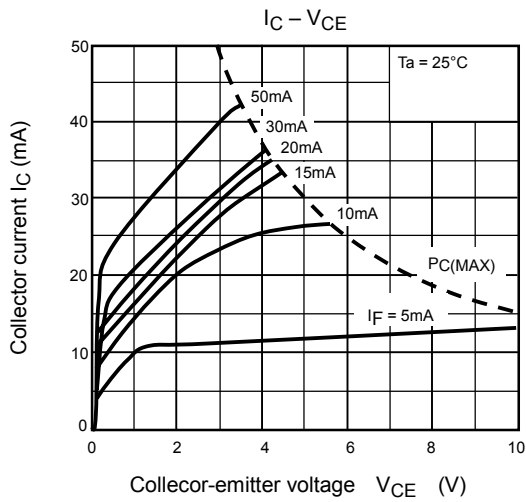
**Switching Characteristics (Ta = 25°C)**

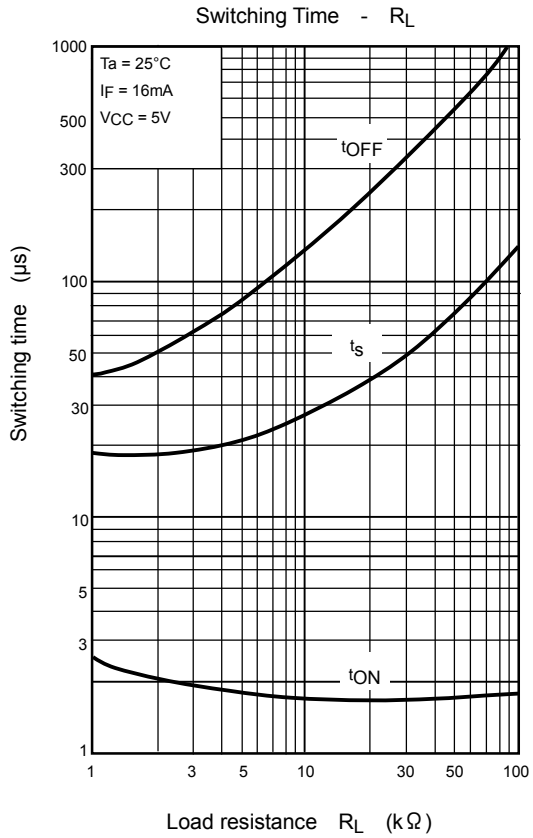
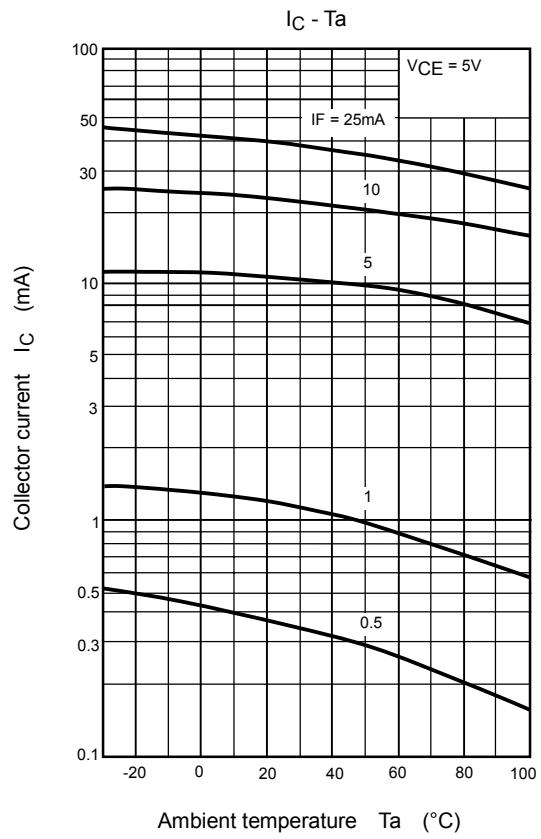
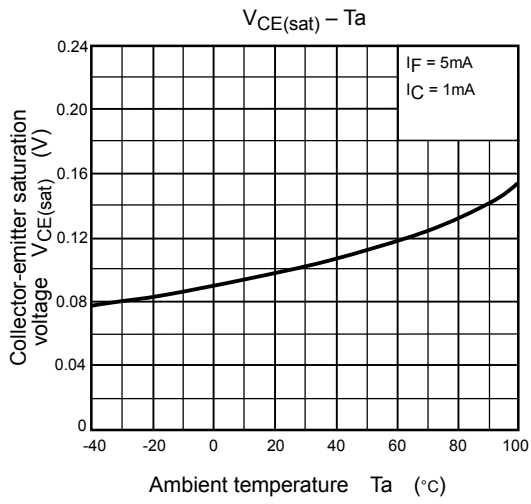
| Characteristic | Symbol    | Test Condition  | Min. | Typ. | Max. | Unit          |
|----------------|-----------|---|------|------|------|---------------|
| Rise time      | $t_r$     | $V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$<br>$R_L = 100\Omega$                      | —    | 2    | —    | $\mu\text{s}$ |
| 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>$V_{CC} = 5\text{ V}, I_F = \pm 16\text{ mA}$ (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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