

# TLP120, -4

GaAs IRED & PHOTO-TRANSISTOR

(TLP120)

PROGRAMMABLE CONTROLLERS

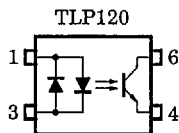
AC/DC-INPUT MODULE

TELECOMMUNICATION

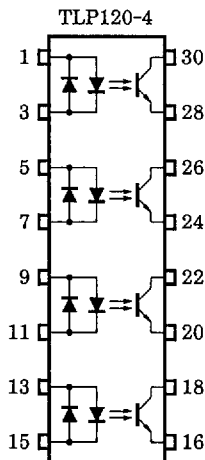
The TOSHIBA MINI FLAT COUPLER TLP120 and TLP120-4 is a small outline coupler, suitable for surface mount assembly. TLP120 and TLP120-4 consists of a photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current. The TLP120-4 provides four isolated channels in a plastic DIP package.

- Collector-Emitter Voltage : 80V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 3750Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATIONS (TOP VIEW)

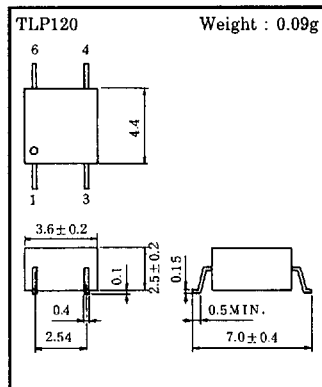


1 : ANODE  
CATHODE  
3 : CATHODE  
ANODE  
4 : EMITTER  
6 : COLLECTOR

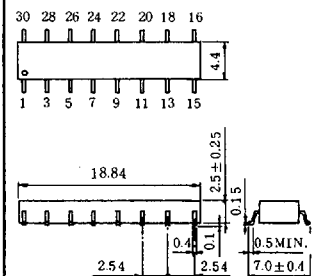


1, 5, 9, 13 : ANODE  
CATHODE  
3, 7, 11, 15 : CATHODE  
ANODE  
16, 20, 24, 28 : EMITTER  
18, 22, 26, 30 : COLLECTOR

Unit in mm



|          |                |
|----------|----------------|
| JEDEC    | —              |
| EIAJ     | —              |
| TOSHIBA  | 11-4C1         |
| TLP120-4 | Weight : 0.44g |



|         |         |
|---------|---------|
| JEDEC   | —       |
| EIAJ    | —       |
| TOSHIBA | 11-19B1 |

(TLP120)

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

| CHARACTERISTIC                                                                         |                                                                                    | SYMBOL                        | RATING                                      |                                    | UNIT                  |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------|------------------------------------|-----------------------|
|                                                                                        |                                                                                    |                               | TLP120                                      | TLP120-4                           |                       |
| LED                                                                                    | Forward Current                                                                    | $I_F(\text{RMS})$             | 50                                          |                                    | mA                    |
|                                                                                        | Forward Current Derating                                                           | $\Delta I_F / ^\circ\text{C}$ | $-0.7 (T_a \geq 53^\circ\text{C})$          | $-0.5 (T_a \geq 25^\circ\text{C})$ | mA / $^\circ\text{C}$ |
|                                                                                        | Pulse Forward Current                                                              | $I_{FP}$                      | 1 (100 $\mu\text{s}$ pulse, 100pps)         |                                    | A                     |
|                                                                                        | Junction Temperature                                                               | $T_j$                         | 125                                         |                                    | $^\circ\text{C}$      |
| DETECTOR                                                                               | Collector-Emitter Voltage                                                          | $V_{CEO}$                     | 80                                          |                                    | V                     |
|                                                                                        | Emitter-Collector Voltage                                                          | $V_{ECO}$                     | 7                                           |                                    | V                     |
|                                                                                        | Collector Current                                                                  | $I_C$                         | 50                                          |                                    | mA                    |
|                                                                                        | Collector Power Dissipation<br>(1 Circuit)                                         | $P_C$                         | 150                                         | 100                                | mW                    |
|                                                                                        | Collector Power Dissipation<br>Derating ( $T_a \geq 25^\circ\text{C}$ , 1 Circuit) | $\Delta P_C / ^\circ\text{C}$ | -1.5                                        | -1.0                               | mW / $^\circ\text{C}$ |
|                                                                                        | Junction Temperature                                                               | $T_j$                         | 125                                         |                                    | $^\circ\text{C}$      |
|                                                                                        | Storage Temperature Range                                                          | $T_{stg}$                     | $-55 \sim 125$                              |                                    | $^\circ\text{C}$      |
| Operating Temperature Range                                                            |                                                                                    | $T_{opr}$                     | $-55 \sim 100$                              |                                    | $^\circ\text{C}$      |
| Lead Soldering Temperature                                                             |                                                                                    | $T_{sold}$                    | 260 (10 sec.)                               |                                    | $^\circ\text{C}$      |
| Total Package Power Dissipation                                                        |                                                                                    | $P_T$                         | 200                                         | 170                                | mW                    |
| Total Package Power Dissipation<br>Derating ( $T_a \geq 25^\circ\text{C}$ , 1 Circuit) |                                                                                    | $\Delta P_T / ^\circ\text{C}$ | -2.0                                        | -1.7                               | mW / $^\circ\text{C}$ |
| Isolation Voltage                                                                      |                                                                                    | $BVS$                         | 3750 (AC, 1 min., $RH \leq 60\%$ ) (Note 1) |                                    | Vrms                  |

Note 1 : Device considered a two terminal device : LED side pins shorted together and DETECTOR side pins shorted together.

(TLP120)

**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 | $V_{CE(\text{sat})}$      | $I_C = 2.4\text{mA}, I_F = \pm 8\text{mA}$              | —    | —    | 0.4  | V             |
|                                      |                           | $I_C = 0.2\text{mA}, I_F = \pm 1\text{mA}$<br>Rank GB   | —    | 0.2  | —    |               |
|                                      |                           |                                                         | —    | —    | 0.4  |               |
| 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        | $R_S$  | $V_S = 500\text{V}$        | $5 \times 10^{10}$ | $10^{14}$ | —    | $\Omega$         |
| Isolation Voltage           | $BV_S$ | AC, 1 minute               | 3750               | —         | —    | $V_{\text{rms}}$ |
|                             |        | AC, 1 second, in oil       | —                  | 10000     | —    |                  |
|                             |        | DC, 1 minute, in oil       | —                  | 10000     | —    | $V_{\text{dc}}$  |

(TLP120)

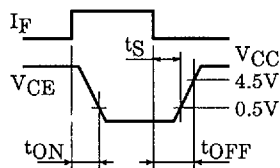
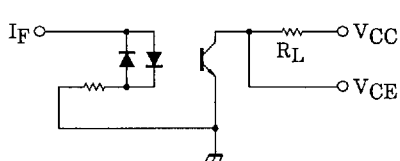
SWITCHING CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

| 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   | $t_{ON}$  | $R_L = 1.9\text{k}\Omega$ (Fig.1)<br>$V_{CC} = 5\text{V}$ , $I_F = \pm 16\text{mA}$ | —    | 2    | —    | $\mu\text{s}$ |
| Storage Time   | $t_s$     |                                                                                     | —    | 25   | —    |               |
| Turn-off Time  | $t_{OFF}$ |                                                                                     | —    | 40   | —    |               |

## RECOMMENDED OPERATING CONDITIONS

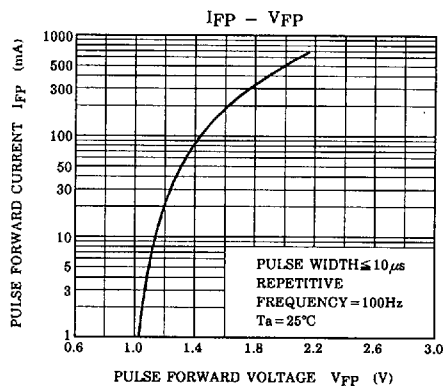
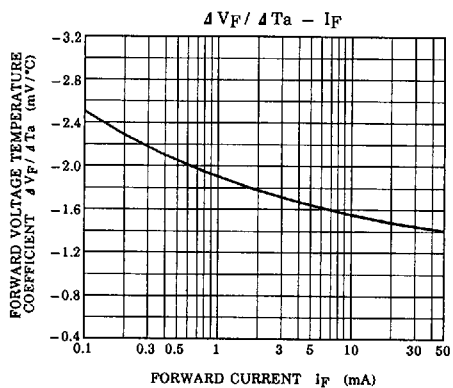
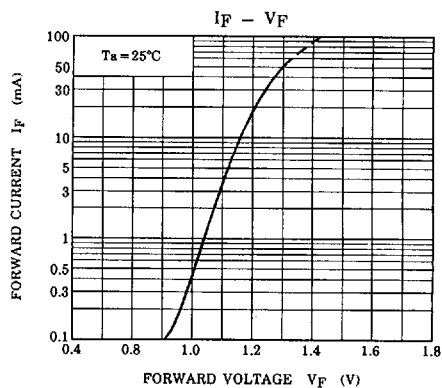
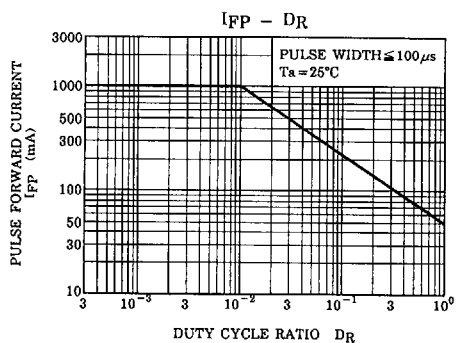
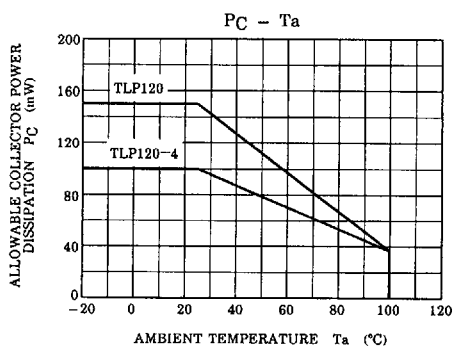
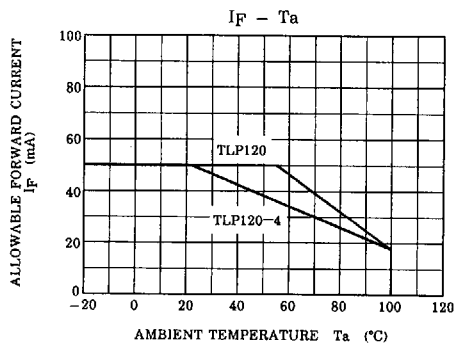
| CHARACTERISTIC        | SYMBOL       | MIN. | TYP. | MAX. | UNIT             |
|-----------------------|--------------|------|------|------|------------------|
| Supply Voltage        | $V_{CC}$     | —    | 5    | 48   | V                |
| Forward Current       | $I_{F(RMS)}$ | —    | 16   | 20   | mA               |
| Collector Current     | $I_C$        | —    | 1    | 10   | mA               |
| Operating Temperature | $T_{opr}$    | -25  | —    | 85   | $^\circ\text{C}$ |

Fig.1 SWITCHING TIME TEST CIRCUIT

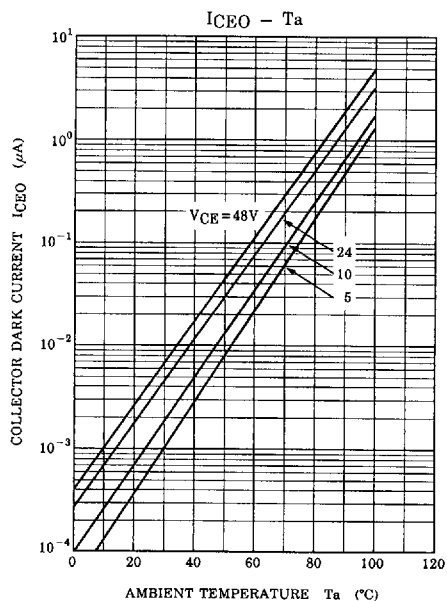
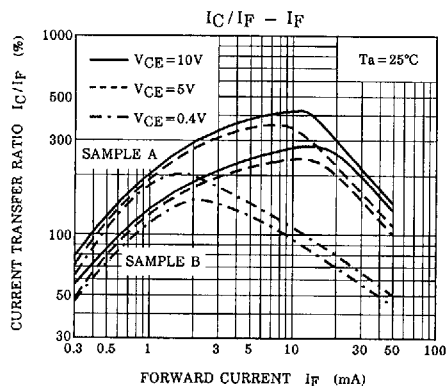
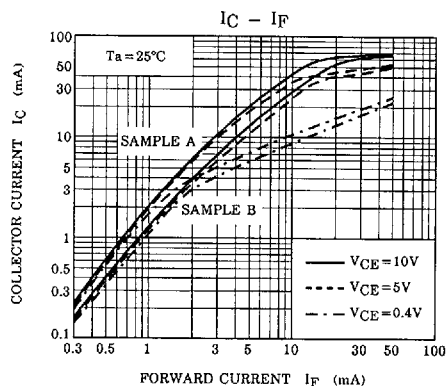
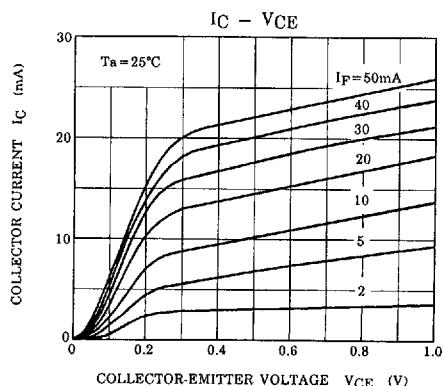
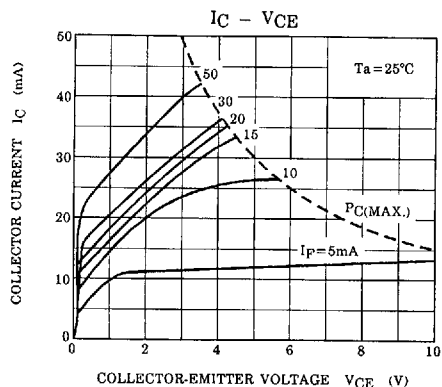


# TLP120,-4

(TLP120)



(TLP120)



# TLP120, -4

(TLP120)

