

TLP504A, -2

GaAs IRED & PHOTO-TRANSISTOR

(TLP504A)

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

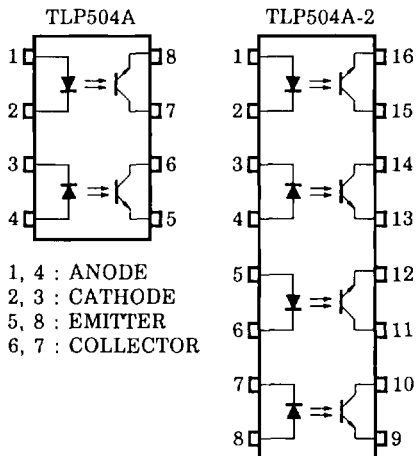
SOLID STATE RELAY

The TOSHIBA TLP504A and TLP504A-2 consists of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode.

The TLP504A offers two isolated channels in a eight lead plastic DIP package, while the TLP504A-2 provides four isolated channels in a sixteen plastic DIP package.

- Collector-Emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)
Rank GB : 100% (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577,
File No. E67349

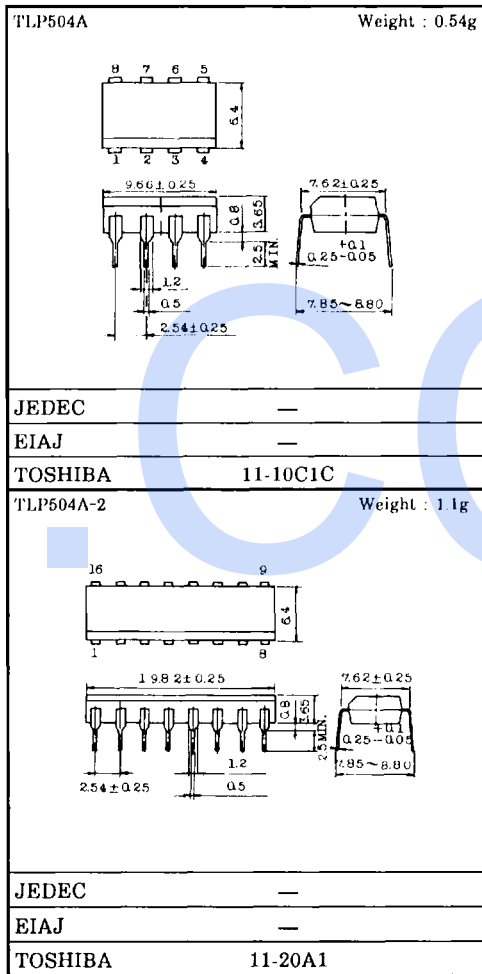
PIN CONFIGURATIONS (TOP VIEW)



1, 4 : ANODE
2, 3 : CATHODE
5, 8 : EMITTER
6, 7 : COLLECTOR

1, 4, 5, 8 : ANODE
2, 3, 6, 7 : CATHODE
9, 12, 13, 16 : EMITTER
10, 11, 14, 15 : COLLECTOR

Unit in mm



(TLP504A)

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | | UNIT |
|--|--|--------------------------------------|-------------------------|------------------|-------|
| | | | TLP504A | TLP504A-2 | |
| LED | Forward Current | I _F | 60 | 50 | mA |
| | Forward Current Derating | ΔI _F /°C | -0.7 (Ta ≥ 39°C) | -0.5 (Ta ≥ 25°C) | mA/°C |
| | Pulse Forward Current | I _{FP} | 1 (100μs pulse, 100pps) | | A |
| | Reverse Voltage | V _R | 5 | | V |
| | Junction Temperature | T _j | 125 | | °C |
| DETECTOR | Collector-Emitter Voltage | V _{CEO} | 55 | | V |
| | Emitter-Collector Voltage | V _{ECO} | 7 | | V |
| | Collector Current | I _C | 50 | | mA |
| | Collector Power Dissipation (1 Circuit) | P _C | 150 | 100 | mW |
| | Collector Power Dissipation Derating (1 Circuit Ta ≥ 25°C) | ΔP _C /°C | -1.5 | -1.0 | mW/°C |
| | Junction Temperature | T _j | 125 | | °C |
| | Storage Temperature Range | T _{stg} | -55~150 | | °C |
| Operating Temperature Range | T _{opr} | -55~100 | | °C | |
| Lead Soldering Temperature | T _{sol} | 260 (10 s) | | °C | |
| Total Package Power Dissipation | R _T | 250 | 150 | mW | |
| Total Package Power Dissipation Derating (Ta ≥ 25°C) | ΔP _T /°C | -2.5 | -1.5 | mW/°C | |
| Isolation Voltage | BV _S | 2500 (AC, 1 min., RH ≤ 60%) (Note 1) | | V _{rms} | |

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

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INDIVIDUAL 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 | μA |
| | Capacitance | C_T | $V = 0, f = 1\text{MHz}$ | — | 30 | — | pF |
| DETECTOR | Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C = 0.5\text{mA}$ | 55 | — | — | V |
| | Emitter-Collector Breakdown Voltage | $V_{(BR)ECO}$ | $I_E = 0.1\text{mA}$ | 7 | — | — | V |
| | Collector Dark Current | I_{CEO} | $V_{CE} = 24\text{V}$ | — | 10 | 100 | nA |
| | | | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ | — | 2 | 50 | μA |
| 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 | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$ Rank GB | 50 | — | 600 | % |
| | | | 100 | — | 600 | |
| Saturated CTR | $I_C / I_{F(\text{sat})}$ | $I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$ Rank GB | — | 60 | — | % |
| | | | 30 | — | — | |
| Collector-Emitter Saturation Voltage | $V_{CE(\text{sat})}$ | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$ $I_C = 0.2\text{mA}, I_F = 1\text{mA}$ Rank GB | — | — | 0.4 | V |
| | | | — | 0.2 | — | |
| | | | — | — | 0.4 | |

ISOLATION CHARACTERISTICS (Ta = 25°C)

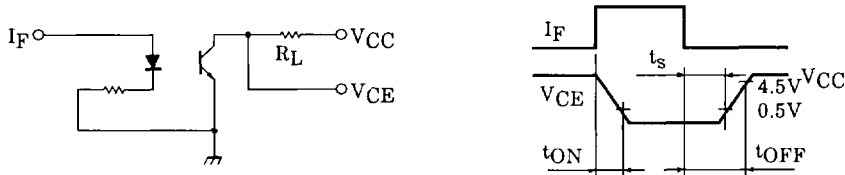
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------------------------|--------|----------------------------|--------------------|-----------|------|------------------|
| Capacitance Input to Output | C_S | $V_S = 0, f = 1\text{MHz}$ | — | 0.8 | — | pF |
| Isolation Resistance | R_S | $V_S = 500\text{V}$ | 5×10^{10} | 10^{14} | — | Ω |
| Isolation Voltage | BV_S | AC, 1 minute | 2500 | — | — | V_{rms} |
| | | AC, 1 second, in oil | — | 5000 | — | |
| | | DC, 1 minute, in oil | — | 5000 | — | Vdc |

(TLP504A)

SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------|-----------|---|------|------|------|---------|
| Rise Time | t_r | $V_{CC} = 10V, I_C = 2mA$ $R_L = 100\Omega$ | — | 2 | — | μs |
| Fall Time | t_f | | — | 3 | — | |
| Turn-on Time | t_{on} | | — | 3 | — | |
| Turn-off Time | t_{off} | | — | 3 | — | |
| Turn-on Time | t_{ON} | $R_L = 1.9k\Omega$ (Fig.1) $V_{CC} = 5V, I_F = 16mA$ | — | 2 | — | μs |
| Storage Time | t_s | | — | 15 | — | |
| Turn-off Time | t_{OFF} | | — | 25 | — | |

Fig.1 Switching Time Test Circuit

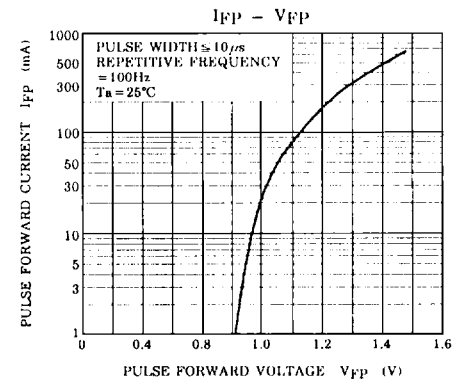
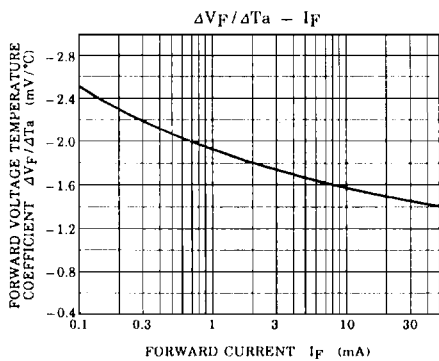
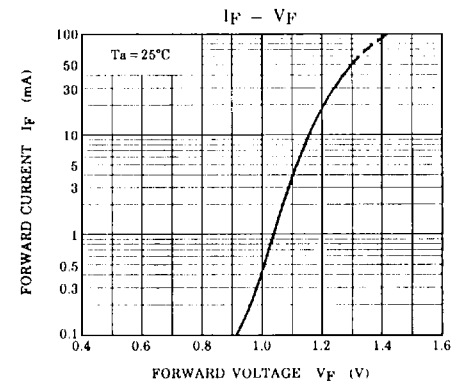
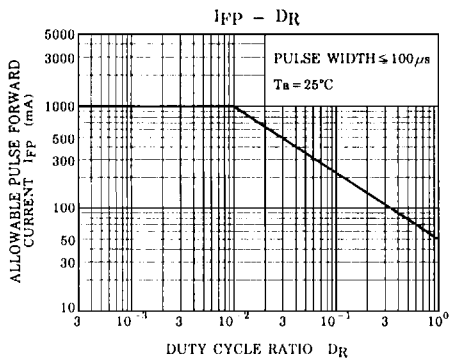
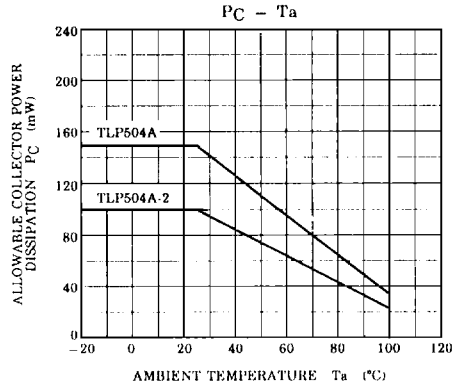
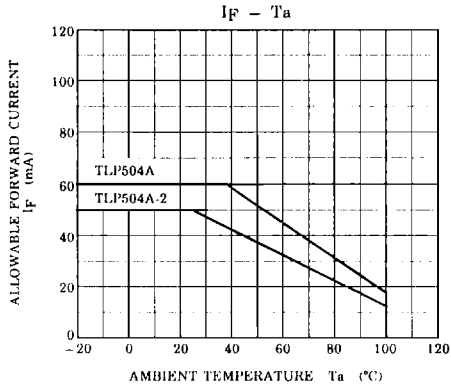


RECOMMENDED OPERATING CONDITIONS

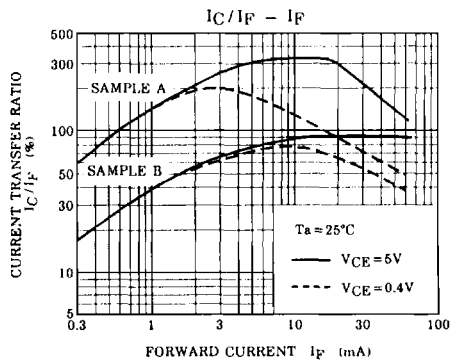
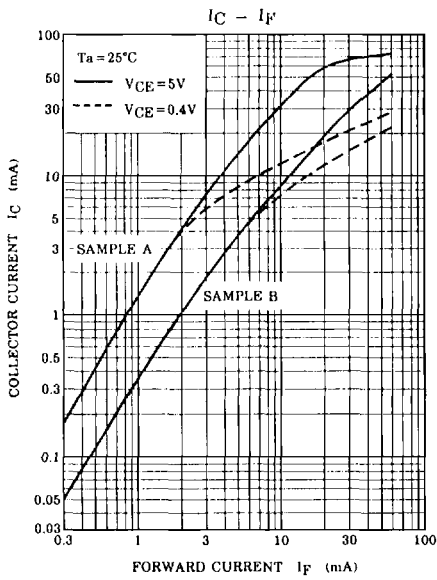
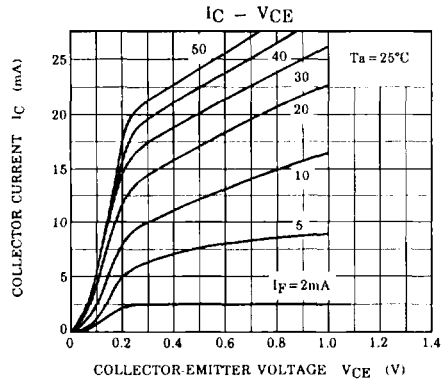
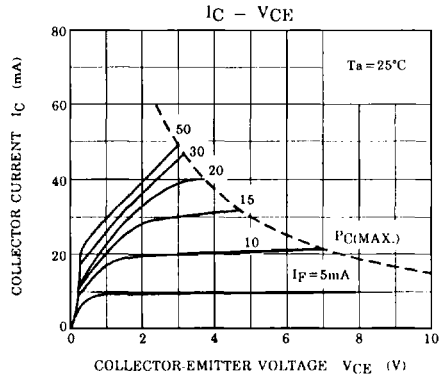
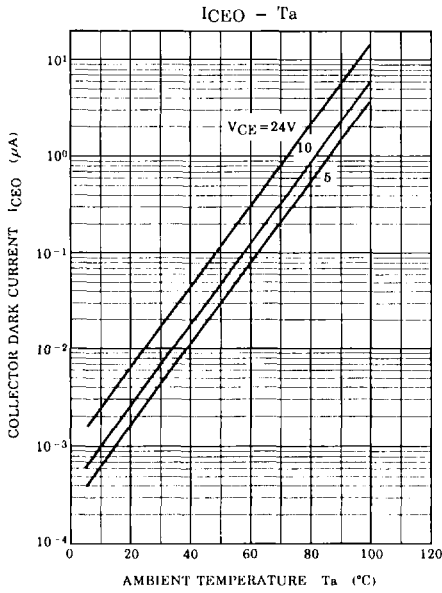
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-----------|------|------|------|------|
| Supply Voltage | V_{CC} | — | 5 | 24 | V |
| Forward Current | I_F | — | 16 | 20 | mA |
| Collector Current | I_C | — | 1 | 10 | mA |
| Operating Temperature | T_{opr} | -25 | — | 85 | °C |

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