

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

TLP504A, TLP504A-2

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

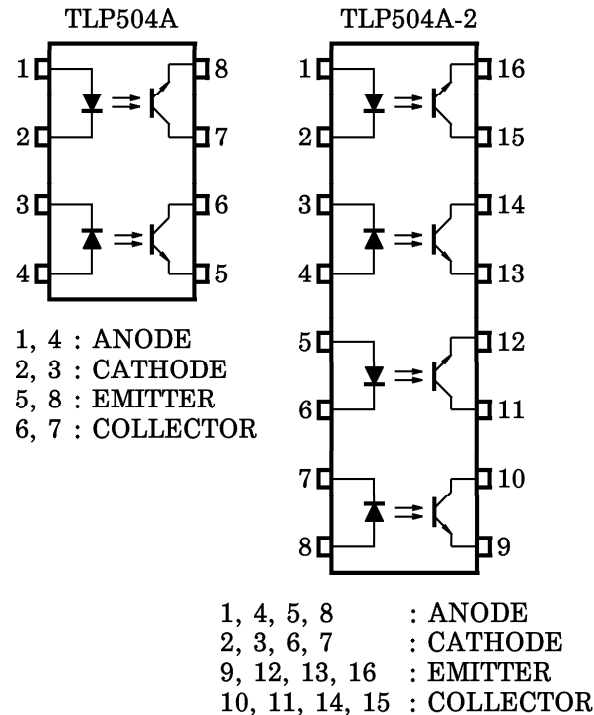
SOLID STATE RELAY

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

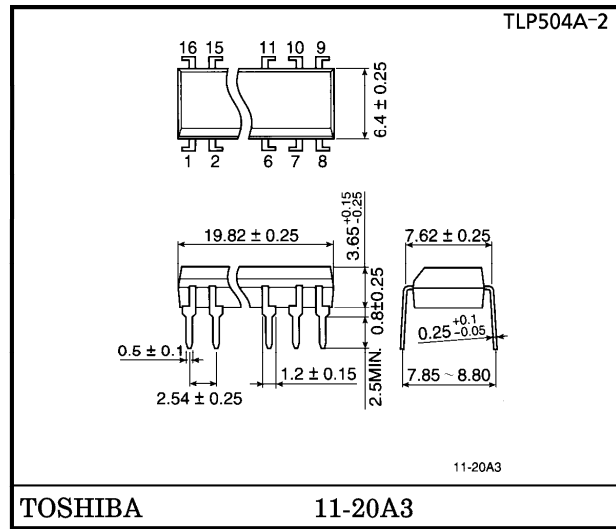
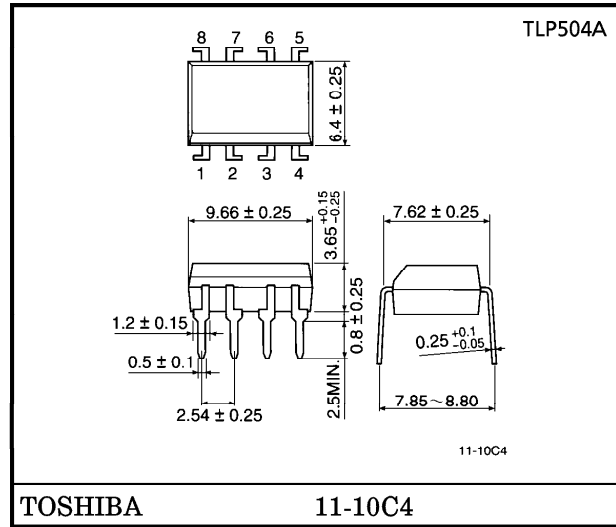
The TLP504A offers two isolated channels in a eight lead plastic DIP package, while the TLP504A-2 provides four isolated channels in a sixteen plastic DIP package.

- 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)



Unit in mm



961001EBC2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | | UNIT |
|---|---|-------------------------|--|-----------------------|---------|
| | | | TLP504A | TLP504A-2 | |
| LED | Forward Current | I_F | 60 | 50 | mA |
| | Forward Current Derating | $\Delta I_F / ^\circ C$ | -0.7 (Ta \geq 39°C) | -0.5 (Ta \geq 25°C) | mA / °C |
| | Pulse Forward Current | I_{FP} | 1 (100 μ s 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 \geq 25°C) | $\Delta P_C / ^\circ C$ | -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 (10s) | | °C |
| Total Package Power Dissipation | | R_T | 250 | 150 | mW |
| Total Package Power Dissipation Derating (Ta \geq 25°C) | | $\Delta P_T / ^\circ C$ | -2.5 | -1.5 | mW / °C |
| Isolation Voltage | | BV_S | 2500 (AC, 1min., R.H. \leq 60%) (Note 1) | | Vrms |

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

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 |

961001EBC2'

- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
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- The information contained herein is subject to change without notice.

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 | $V_{CE(\text{sat})}$ | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$ | — | — | 0.4 | V |
| | | $I_C = 0.2\text{mA}, I_F = 1\text{mA}$ Rank GB | — | 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 |

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

