

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

TLP521-1, TLP521-2, TLP521-4

PROGRAMMABLE CONTROLLERS

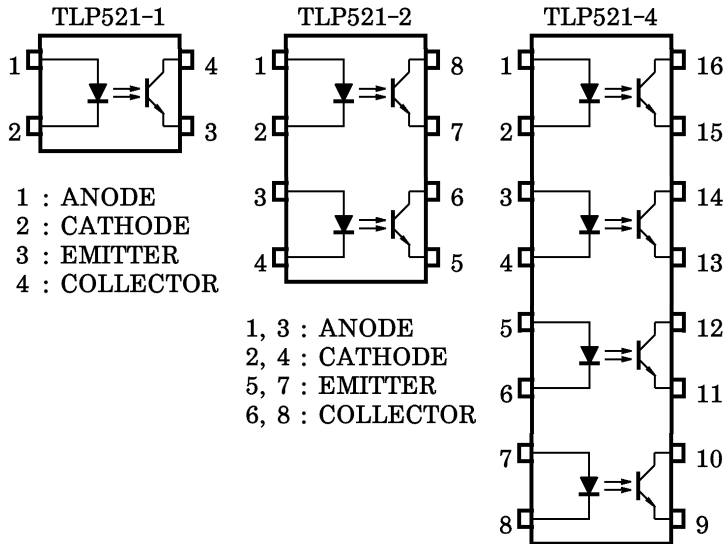
AC/DC-INPUT MODULE

SOLID STATE RELAY

The TOSHIBA TLP521-1, -2 and -4 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP521-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP521-4 provides four isolated channels in a sixteen plastic DIP package.

- Collector-Emitter Voltage : 55 V (min)
- Current Transfer Ratio : 50% (min)
Rank GB : 100% (min)
- Isolation Voltage : 2500 Vrms (min)
- UL Recognized
made in Japan : UL1577, File No. E67349
made in Thailand : UL1577, File No. E152349

PIN CONFIGURATIONS (TOP VIEW)

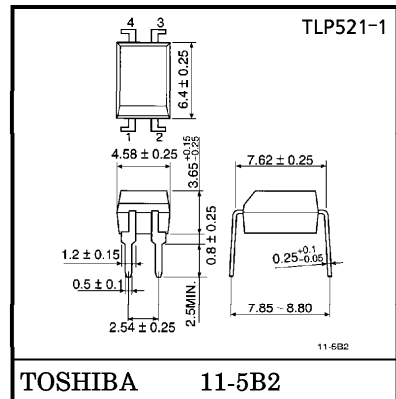


1 : ANODE
2 : CATHODE
3 : EMITTER
4 : COLLECTOR

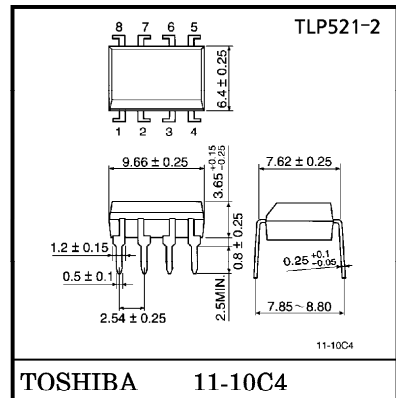
1, 3 : ANODE
2, 4 : CATHODE
5, 7 : EMITTER
6, 8 : COLLECTOR

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

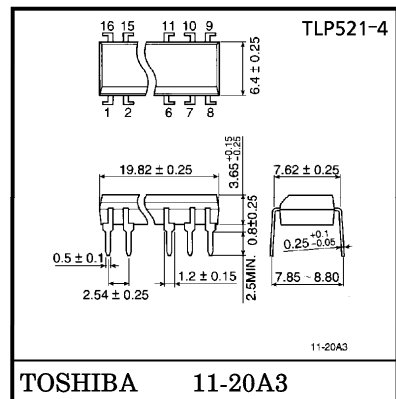
Unit in mm



Weight : 0.26 g



Weight : 0.54 g



Weight : 1.1 g

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● TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..

● The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.

MAXIMUM RATINGS (Ta = 25°C)

| | CHARACTERISTIC | SYMBOL | RATING | | UNIT |
|--|---|---|------------------------------|-----------------------|---------|
| | | | TLP521-1 | TLP521-2 TLP521-4 | |
| LED | Forward Current | I_F | 70 | 50 | mA |
| | Forward Current Derating | $\Delta I_F / ^\circ\text{C}$ | -0.93 (Ta \geq 50°C) | -0.5 (Ta \geq 25°C) | mA / °C |
| | Pulse Forward Current | I_{FP} | 1 (100 μ pulse, 100 pps) | | 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) | $\Delta P_C / ^\circ\text{C}$ | -1.5 | -1.0 | 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 (10 s) | | °C | |
| Total Package Power Dissipation | P_T | 250 | 150 | mW | |
| Total Package Power Dissipation Derating (Ta \geq 25°C) | $\Delta P_T / ^\circ\text{C}$ | -2.5 | -1.5 | mW / °C | |
| Isolation Voltage | BV_S | 2500 (AC, 1 min., 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 | 25 | mA |
| Collector Current | I_C | — | 1 | 10 | mA |
| Operating Temperature | T_{opr} | -25 | — | 85 | °C |

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- 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 the foreign exchange and foreign trade laws.
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- The information contained herein is subject to change without notice.

| TYPE | CLASSI- FICATION (*1) | CURRENT TRANSFER RATIO (%) (I_C / I_F) | | MARKING OF CLASSIFICATION |
|----------|--------------------------|--|-----|---|
| | | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ\text{C}$ | | |
| | | Min | Max | |
| TLP521 | A | 50 | 600 | BLANK, Y, Y [■] , G, G [■] , B, B [■] , GB |
| | Rank Y | 50 | 150 | Y, Y [■] |
| | Rank GR | 100 | 300 | G, G [■] |
| | Rank BL | 200 | 600 | B, B [■] |
| | Rank GB | 100 | 600 | G, G [■] , B, B [■] , GB |
| TLP521-2 | A | 50 | 600 | BLANK, GR, BL, GB |
| TLP521-4 | Rank GB | 100 | 600 | GR, BL, GB |

*1 : Ex. Rank GB : TLP521-1 (GB)

(Note) : Application type name for certification test, please use standard product type name, i.e.
 TLP521-1 (GB) : TLP521-1, TLP521-2 (GB) : TLP521-2

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 | $V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$ | — | 10^{11} | — | Ω |
| Isolation Voltage | BV_S | AC, 1 minute | 2500 | — | — | Vrms |
| | | 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 | $V_{CC} = 10\text{ V}$ $I_C = 2\text{ mA}$ $R_L = 100\ \Omega$ | — | 2 | — | μs |
| Fall Time | t_f | | — | 3 | — | |
| Turn-on Time | t_{on} | | — | 3 | — | |
| Turn-off Time | t_{off} | | — | 3 | — | |
| Turn-on Time | t_{ON} | $R_L = 1.9\text{ k}\Omega$ (Fig.1) $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$ | — | 2 | — | μs |
| Storage Time | t_s | | — | 15 | — | |
| Turn-off Time | t_{OFF} | | — | 25 | — | |

Fig.1 : SWITCHING TIME TEST CIRCUIT

