TOSHIBA PHOTOCOUPLER  GaAs IRED & PHOTO-TRIAC

TLP3041, TLP3042, TLP3043

OFFICE MACHINE
HOUSEHOLD USE EQUIPMENT
TRIAC DRIVER
SOLID STATE RELAY

The TOSHIBA TLP3041, TLP3042 and TLP3043 consist of a zero voltage crossing turn-on photo-triac optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.

- **Peak Off-State Voltage**: 400V (Min.)
- **Trigger LED Current**: 15mA (Max.) (TLP3041)
  10mA (Max.) (TLP3042)
  5mA (Max.) (TLP3043)
- **On-State Current**: 100mA (Max.)
- **UL Recognized**: UL1577, File No. E67349
- **Isolation Voltage**: 5000Vrms (Min.)
- **Option (D4) type**: VDE Approved
  - DIN VDE0884 / 08.87,
  - Certificate No. 68329

  **Maximum Operating Insulation Voltage**: 630VpK
  **Highest Permissible Over Voltage**: 6000VpK

  *(Note) When a VDE0884 approved type is needed, please designate the “Option (D4)”*

- **Creepage Distance**: 7.0mm (Min.)
- **Clearance**: 7.0mm (Min.)
- **Insulation Thickness**: 0.5mm (Min.)

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- 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 ensure beforehand that they will not cause the malfunction or failure of their equipment or impair safety. Further, the buyer must determine the suitability of TOSHIBA products for their equipment or applications on their own.

- 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.
### MAXIMUM RATINGS (Ta = 25°C)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>RATING</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Current</td>
<td>IP</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Forward Current Derating (Ta ≥ 53°C)</td>
<td>ΔIP/°C</td>
<td>-0.7</td>
<td>mA/°C</td>
</tr>
<tr>
<td>Peak Forward Current (100μs pulse, 100pps)</td>
<td>IPFP</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>PD</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Power Dissipation Derating (Ta ≥ 25°C)</td>
<td>ΔPD/°C</td>
<td>-1.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>VR</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>TJ</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>Off-State Output Terminal Voltage</td>
<td>VDRM</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>On-State RMS Current</td>
<td>ITP(RMS)</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>On-State Current Derating (Ta ≥ 25°C)</td>
<td>ΔIT/°C</td>
<td>-1.1</td>
<td>mA/°C</td>
</tr>
<tr>
<td>Peak On-State Current (100μs pulse, 120pps)</td>
<td>ITP</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>Peak Nonrepetitive Surge Current (Pw=10ms, DC=10%)</td>
<td>ITSM</td>
<td>1.2</td>
<td>A</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>PD</td>
<td>300</td>
<td>mW</td>
</tr>
<tr>
<td>Power Dissipation Derating (Ta ≥ 25°C)</td>
<td>ΔPD/°C</td>
<td>-4.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>TJ</td>
<td>115</td>
<td>°C</td>
</tr>
</tbody>
</table>

#### DETECTOR

| Storage Temperature Range              | Tstg   | -55~150 | °C    |
| Operating Temperature Range            | Topr   | -40~100 | °C    |
| Lead Soldering Temperature (10s)       | Tsol   | 260     | °C    |
| Total Package Power Dissipation        | PT     | 330     | mW    |
| Total Package Power Dissipation Derating (Ta ≥ 25°C) | ΔPT/°C | -4.4   | mW/°C |
| Isolation Voltage (AC, 1 min., R.H. ≤ 60%) (Note 1) | BVs   | 5000    | Vrms  |

(Note 1) Device considered a two terminal device: Pins 1, 2 and 3 shorted together and pins 4 and 6 shorted together.

### RECOMMENDED OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VAC</td>
<td>—</td>
<td>—</td>
<td>120</td>
<td>Vac</td>
</tr>
<tr>
<td>Forward Current</td>
<td>IF*</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>mA</td>
</tr>
<tr>
<td>Peak On-State Current</td>
<td>ITOP</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Topr</td>
<td>-25</td>
<td>—</td>
<td>85</td>
<td>°C</td>
</tr>
</tbody>
</table>

※ In the case of TLP3042
### INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Voltage</td>
<td>$V_F$</td>
<td>$I_F=10mA$</td>
<td>1.0</td>
<td>1.15</td>
<td>1.3</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Current</td>
<td>$I_R$</td>
<td>$V_R=5V$</td>
<td>---</td>
<td>---</td>
<td>10</td>
<td>$\mu$A</td>
</tr>
<tr>
<td>Capacitance</td>
<td>$C_T$</td>
<td>$V=0$, $f=1MHz$</td>
<td>---</td>
<td>10</td>
<td>---</td>
<td>pF</td>
</tr>
<tr>
<td>Peak Off-State Current</td>
<td>$I_{DRM}$</td>
<td>$V_{DRM}=400V$</td>
<td>---</td>
<td>10</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>Peak On-State Voltage</td>
<td>$V_{TM}$</td>
<td>$I_{TM}=100mA$</td>
<td>---</td>
<td>1.7</td>
<td>3.0</td>
<td>V</td>
</tr>
<tr>
<td>Holding Current</td>
<td>$I_H$</td>
<td>--</td>
<td>---</td>
<td>0.6</td>
<td>---</td>
<td>mA</td>
</tr>
<tr>
<td>Critical Rate of Rise of Off-State Voltage</td>
<td>$\frac{dv}{dt}$</td>
<td>$V_{in}=120V_{rms}$, $Ta=85°C$ (Fig.1)</td>
<td>200</td>
<td>500</td>
<td>---</td>
<td>V/$\mu$s</td>
</tr>
<tr>
<td>Critical Rate of Rise of Commutating Voltage</td>
<td>$\frac{dv}{dt}(c)$</td>
<td>$V_{in}=30V_{rms}$, $I_T=15mA$ (Fig.1)</td>
<td>---</td>
<td>0.2</td>
<td>---</td>
<td>V/$\mu$s</td>
</tr>
</tbody>
</table>

### COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger LED Current</td>
<td>$I_{PT}$</td>
<td>$V_T=3V$</td>
<td>---</td>
<td>---</td>
<td>15</td>
<td>mA</td>
</tr>
<tr>
<td>Inhibit Voltage</td>
<td>$V_{IH}$</td>
<td>$I_F=\text{Rated } I_{PT}$</td>
<td>---</td>
<td>---</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>Leakage in Inhibited State</td>
<td>$I_{IH}$</td>
<td>$I_F=\text{Rated } I_{PT}$, $V_T=\text{Rated } V_{DRM}$</td>
<td>---</td>
<td>100</td>
<td>300</td>
<td>$\mu$A</td>
</tr>
<tr>
<td>Capacitance Input to Output</td>
<td>$C_S$</td>
<td>$V_S=0$, $f=1MHz$</td>
<td>---</td>
<td>0.8</td>
<td>---</td>
<td>pF</td>
</tr>
<tr>
<td>Isolation Resistance</td>
<td>$R_S$</td>
<td>$V_S=500V$ (R.H. $\leq 60%$)</td>
<td>$5\times10^{10}$</td>
<td>$10^{14}$</td>
<td>---</td>
<td>$\Omega$</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>$BVS$</td>
<td>AC, 1 minute</td>
<td>5000</td>
<td>---</td>
<td>---</td>
<td>$V_{rms}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC, 1 second (in oil)</td>
<td>---</td>
<td>10000</td>
<td>---</td>
<td>$V_{de}$</td>
</tr>
</tbody>
</table>

Fig.1 $dv/dt$ TEST CIRCUIT

![Fig.1 $dv/dt$ TEST CIRCUIT](image)