

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRIAC

## TLP3021(S),TLP3022(S),TLP3023(S)

OFFICE MACHINE  
HOUSEHOLD USE EQUIPMENT  
TRIAC DRIVER  
SOLID STATE RELAY

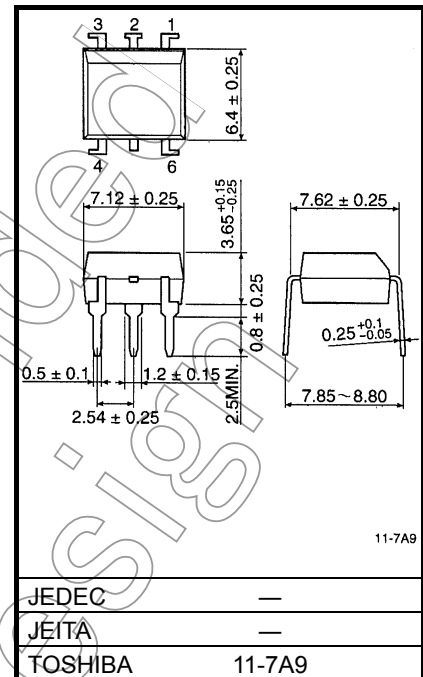
The TOSHIBA TLP3021 (S), TLP3022 (S) and TLP3023 (S) consist of photo-triac optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.

- Peak Off-State Voltage : 400 V (min)
- Trigger LED Current : 15 mA (max) (TLP3021(S))  
10 mA (max) (TLP3022(S))  
5 mA (max) (TLP3023(S))
- On-State Current : 100 mA (max)
- Isolation Voltage : 5000Vrms(Min)
- UL Recognized : UL1577,File No.E67349
- SEMKO Approved : SS EN60065  
SS EN60950, File No.9841105
- BSI Approved : BS EN60065, File No.8385  
BS EN60950, File No.8386
- Option (D4) type  
VDE approved: DIN EN60747-5-2  
Approved No. 40009302  
Maximum operating insulation voltage: 890VPK  
Highest permissible over voltage: 8000VPK  
(Note):When a EN60747-5-2 approved type is needed,  
please designate the "Option (D4)"

### Construction Mechanical Rating

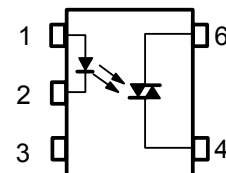
|                      | 7.62 mm pich<br>Standard Type | 10.16 mm pich<br>TLPxxxxF Type |
|----------------------|-------------------------------|--------------------------------|
| Creepage Distance    | 7.0 mm (Min)                  | 8.0 mm (Min)                   |
| Clearance            | 7.0 mm (Min)                  | 8.0 mm (Min)                   |
| Insulation Thickness | 0.5 mm (Min)                  | 0.5 mm (Min)                   |

Unit: mm



Weight: 0.39g (typ.)

### Pin Configuration (top view)



- 1: Anode
- 2: Cathode
- 3: N.C.
- 4: Terminal 1
- 6: Terminal 2

## Absolute Maximum Ratings (Ta=25°C)

| CHARACTERISTIC                                     |                                             | SYMBOL                        | RATING     | UNIT    |
|----------------------------------------------------|---------------------------------------------|-------------------------------|------------|---------|
| LED                                                | Forward Current                             | $I_F$                         | 50         | mA      |
|                                                    | Forward Current Derating (Ta≥53°C)          | $\Delta I_F / ^\circ\text{C}$ | -0.7       | mA / °C |
|                                                    | Peak Forward Current (100μs pulse, 100pps)  | $I_{FP}$                      | 1          | A       |
|                                                    | Power Dissipation                           | $P_D$                         | 100        | mW      |
|                                                    | Power Dissipation Derating (Ta≥25°C)        | $\Delta P_D / ^\circ\text{C}$ | -1.0       | mW / °C |
|                                                    | Reverse Voltage                             | $V_R$                         | 5          | V       |
|                                                    | Junction Temperature                        | $T_J$                         | 125        | °C      |
| DETECTOR                                           | Off-State Output Terminal Voltage           | $V_{DRM}$                     | 400        | V       |
|                                                    | On-State RMS Current                        | $I_{T(RMS)}$                  | 100        | mA      |
|                                                    |                                             |                               | 50         |         |
|                                                    | On-State Current Derating (Ta≥25°C)         | $\Delta I_T / ^\circ\text{C}$ | -1.1       | mA / °C |
|                                                    | Peak On-State Current (100μs pulse, 120pps) | $I_{TP}$                      | 2          | A       |
|                                                    | Peak Nonrepetitive Surge Current (Pw=10ms)  | $I_{TSM}$                     | 1.2        | A       |
|                                                    | Power Dissipation                           | $P_D$                         | 300        | mW      |
|                                                    | Power Dissipation Derating (Ta≥25°C)        | $\Delta P_D / ^\circ\text{C}$ | -4.0       | mW / °C |
|                                                    | Junction Temperature                        | $T_j$                         | 115        | °C      |
|                                                    | Storage Temperature Range                   | $T_{stg}$                     | -55 to 150 | °C      |
|                                                    | Operating Temperature Range                 | $T_{opr}$                     | -40 to 100 | °C      |
| Lead Soldering Temperature (10s)                   |                                             | $T_{sol}$                     | 260        | °C      |
| Total Package Power Dissipation                    |                                             | $P_T$                         | 330        | mW      |
| Total Package Power Dissipation Derating (Ta≥25°C) |                                             | $\Delta P_T / ^\circ\text{C}$ | -4.4       | mW / °C |
| Isolation Voltage (AC, 1min., R.H.≤60%) (Note 2)   |                                             | $BV_S$                        | 5000       | Vrms    |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

## Recommended Operating Conditions

| CHARACTERISTIC        | SYMBOL    | MIN. | TYP. | MAX. | UNIT            |
|-----------------------|-----------|------|------|------|-----------------|
| Supply Voltage        | $V_{AC}$  | —    | —    | 120  | V <sub>ac</sub> |
| Forward Current       | $I_F$     | 15   | 20   | 25   | mA              |
| Peak On-State Current | $I_{TP}$  | —    | —    | 1    | A               |
| Operating Temperature | $T_{opr}$ | -25  | —    | 85   | °C              |

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

\*In The case of TLP3022

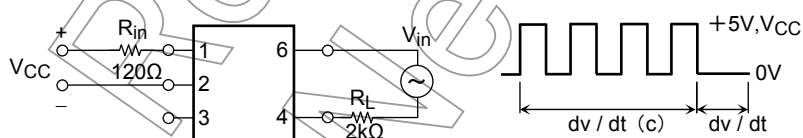
## Individual Electrical Characteristics (Ta=25°C)

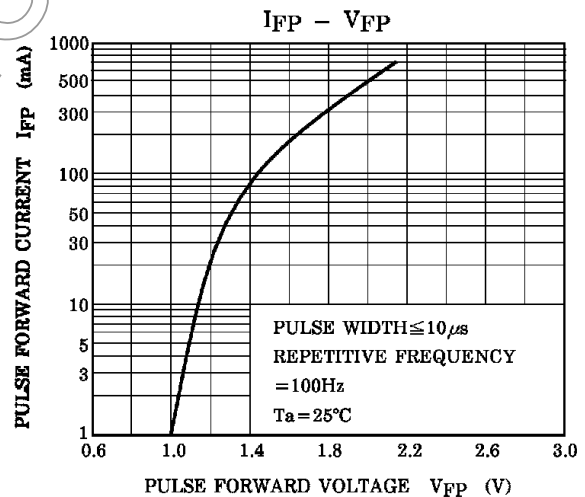
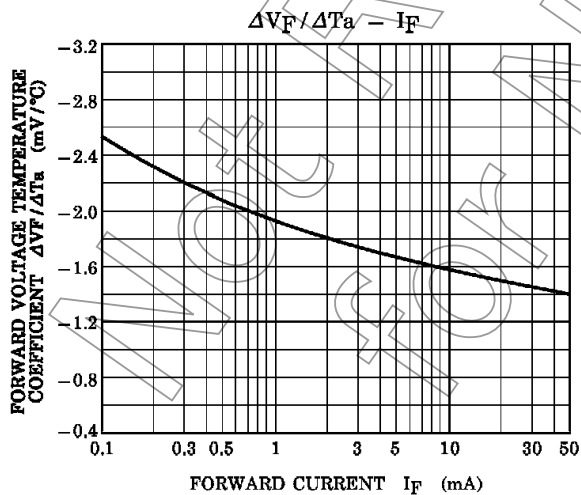
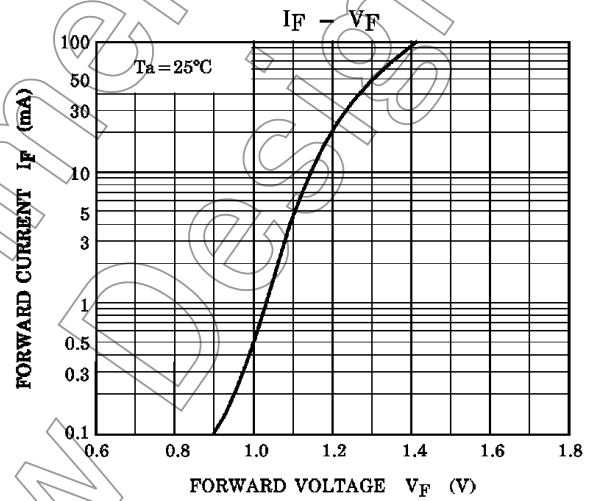
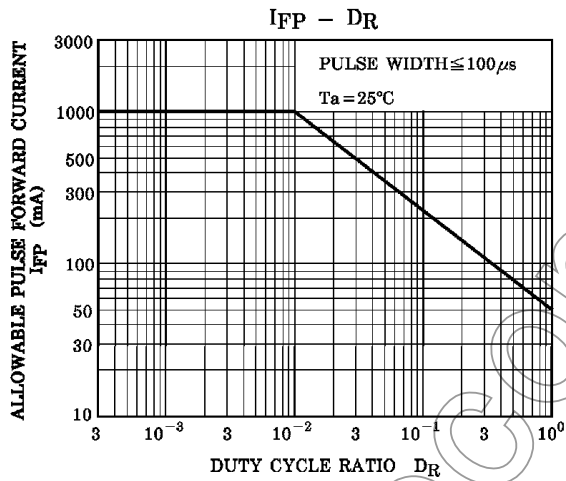
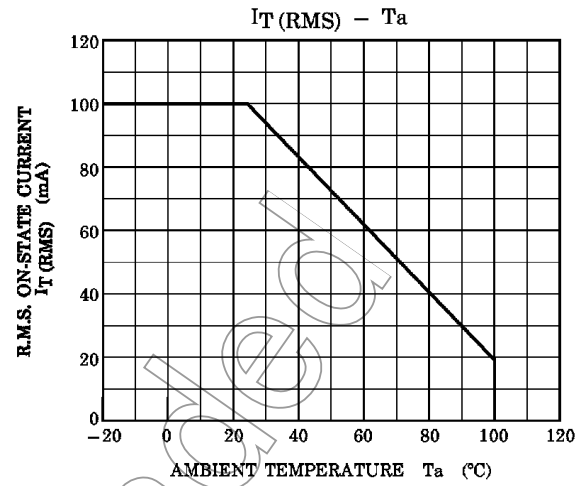
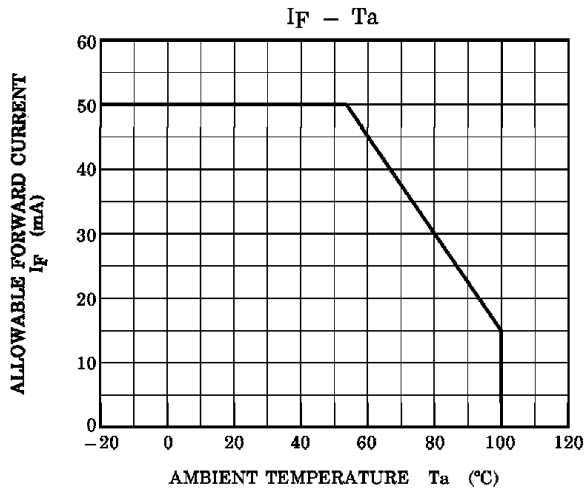
| CHARACTERISTIC |                                              | SYMBOL           | TEST CONDITION                                                   | MIN. | TYP. | MAX. | UNIT                   |
|----------------|----------------------------------------------|------------------|------------------------------------------------------------------|------|------|------|------------------------|
| 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   | $\mu\text{A}$          |
|                | Capacitance                                  | $C_T$            | $V = 0, f = 1\text{MHz}$                                         | —    | 10   | —    | pF                     |
| DETECTOR       | Peak Off-State Current                       | $I_{\text{DRM}}$ | $V_{\text{DRM}} = 400\text{V}$                                   | —    | 10   | 1000 | nA                     |
|                | Peak On-State Voltage                        | $V_{\text{TM}}$  | $I_{\text{TM}} = 100\text{mA}$                                   | —    | 1.7  | 3.0  | V                      |
|                | Holding Current                              | $I_H$            | —                                                                | —    | 0.6  | —    | mA                     |
|                | Critical Rate of Rise of Off-State Voltage   | $dv/dt$          | $V_{\text{in}} = 120\text{Vrms}, T_a = 85^\circ\text{C}$ (Fig.1) | 200  | 500  | —    | $\text{V}/\mu\text{s}$ |
|                | Critical Rate of Rise of Commutating Voltage | $dv/dt(c)$       | $V_{\text{in}} = 30\text{Vrms}, I_T = 15\text{mA}$ (Fig.1)       | —    | 0.2  | —    | $\text{V}/\mu\text{s}$ |

## Coupled Electrical Characteristics (Ta=25°C)

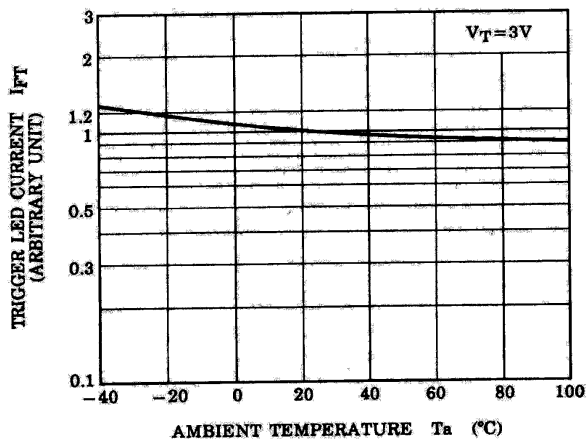
| CHARACTERISTIC                |            | SYMBOL          | TEST CONDITION                              | MIN.               | TYP.      | MAX. | UNIT     |
|-------------------------------|------------|-----------------|---------------------------------------------|--------------------|-----------|------|----------|
| Trigger LED Current           | TLP3021(S) | $I_{\text{FT}}$ | $V_T = 3\text{V}$                           | —                  | —         | 15   | mA       |
|                               | TLP3022(S) |                 |                                             | —                  | 5         | 10   |          |
|                               | TLP3023(S) |                 |                                             | —                  | —         | 5    |          |
| Capacitance (Input to Output) |            | $C_S$           | $V_S = 0, f = 1\text{MHz}$                  | —                  | 0.8       | —    | pF       |
| Isolation Resistance          |            | $R_S$           | $V_S = 500\text{V} (\text{R.H.} \leq 60\%)$ | $5 \times 10^{10}$ | $10^{14}$ | —    | $\Omega$ |
| Isolation Voltage             |            | $BV_S$          | AC, 1minute                                 | 5000               | —         | —    | Vrms     |
|                               |            |                 | AC, 1second, in oil                         | —                  | 10000     | —    |          |
|                               |            |                 | DC, 1minute, in oil                         | —                  | 10000     | —    | Vdc      |

Fig. 1  $dv/dt$  test circuit

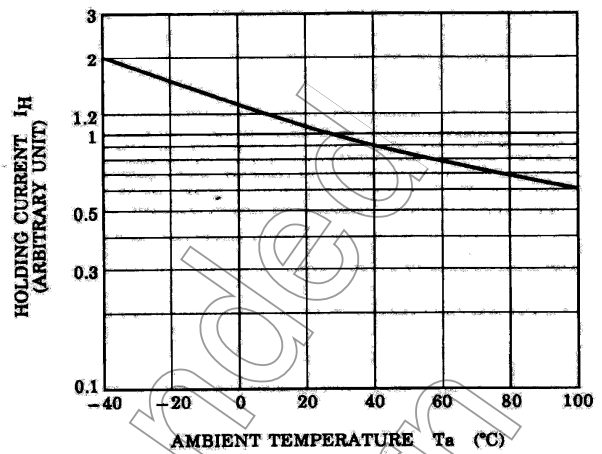




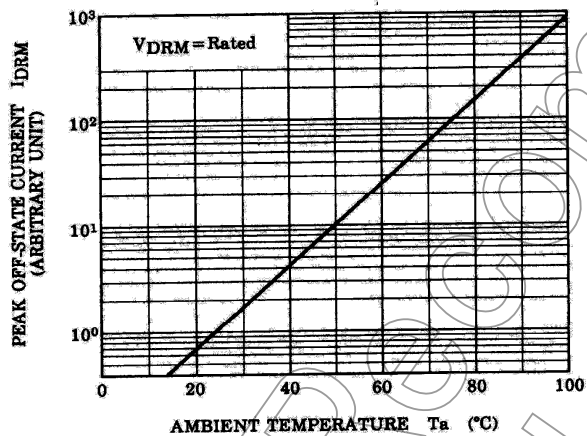
NORMALIZED  $I_{FT} - T_a$



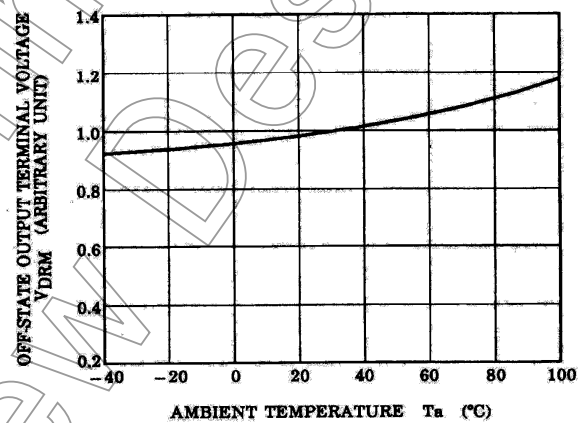
NORMALIZED  $I_H - T_a$



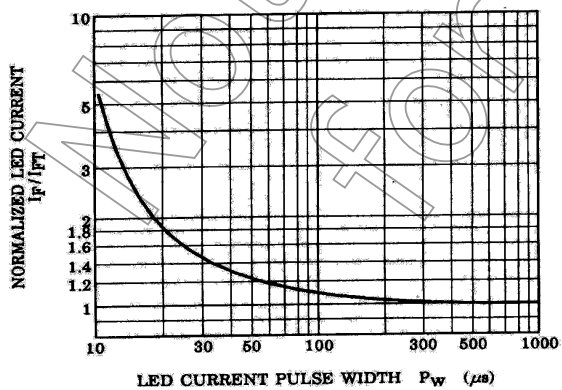
NORMALIZED  $I_{DRM} - T_a$



NORMALIZED  $V_{DRM} - T_a$



NORMALIZED LED CURRENT  
- LED CURRENT PULSE WIDTH



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