

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRIAC

## TLP3020, TLP3021, TLP3022, TLP3023

OFFICE MACHINE  
 HOUSEHOLD USE EQUIPMENT  
 TRIAC DRIVER  
 SOLID STATE RELAY

The TOSHIBA TLP3020, TLP3021, TLP3022 and TLP3023 consist of a photo-triac optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.

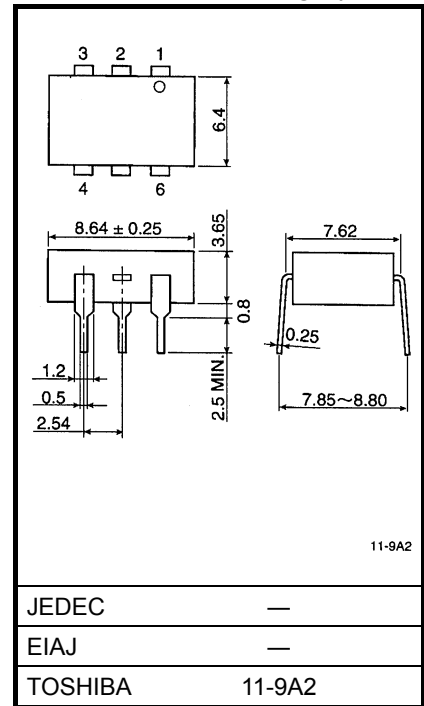
- Peak Off-State Voltage : 400 V (Min.)
- Trigger LED Current : 30mA (Max.) (TLP3020)  
 15 mA (Max.) (TLP3021)  
 10 mA (Max.) (TLP3022)  
 5 mA (Max.) (TLP3023)
- On-State Current : 100 mA (Max.)
- UL Recognized : UL1577, File No. E67349
- Isolation Voltage : 5000 Vrms (Min.)
- Option (D4) Type
- VDE Approved : DIN EN 60747-5-2,  
 Certificate No. 40009302

Maximum Operating Insulation Voltage: 630 VPK  
 Highest Permissible Over Voltage: 6000 VPK

**Note:** When a EN 60747-5-2 approved type is needed, please designate the "Option (D4) "

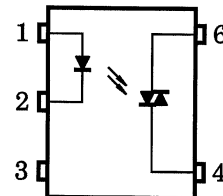
	7.62mm pich standard type	10.16 mm pich (LF2) type
● Creepage Distance :	7.0 mm (Min.)	8.0 mm (Min.)
Clearance :	7.0 mm (Min.)	8.0 mm (Min.)
Insulation Thickness :	0.5 mm (Min.)	0.5 mm (Min.)

Unit: mm



Weight: 0.44g

### 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-Stage RMS Current	$I_T(\text{RMS})$	Ta=25°C 100	mA
	Current		Ta=70°C 50	
	On-Stage Current Derating (Ta ≥ 25°C)	$\Delta I_T/^\circ\text{C}$	-1.1	mA/°C
	Peak On-Stage Current (100μs pulse, 120pps)	$I_{TP}$	2	A
	Peak Nonrepetitive Surge Current (P <sub>W</sub> =10ms, DC=10%)	$I_{TSM}$	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 ~ 150	°C	
Operating Temperature Range	$T_{opr}$	-40 ~ 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, 1 min., R.H. ≤ 60%) (Note 1)	$BV_S$	5000	V <sub>rms</sub>	

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

## Recommended Operating Conditions

CHARACTERISTICS	SYMBOL	MIN	TYP.	MAX	UNIT
Supply Voltage	$V_{AC}$	—	—	120	V <sub>ac</sub>
Forward Current	$I_F^*$	15	20	25	mA
Peak On-Stage 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

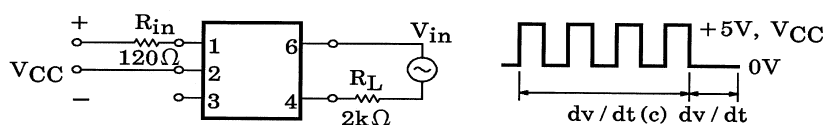
## Individual Electrical Characteristics (Ta=25°C)

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	$I_{DRM}$	$V_{DRM}=400\text{V}$	—	10	100	nA
	Peak On-Stage Voltage	$V_{TM}$	$I_{TM}=100\text{mA}$	—	1.7	3.0	V
	Holding Current	$I_H$	—	—	0.6	—	mA
	Critical Rate of Rise of Off-State Voltage	$dv / dt$	$V_{in}=120\text{Vrms}, T_a=85^\circ\text{C}$ (Fig.1)	200	500	—	$\text{V}/\mu\text{s}$
	Critical Rate of Rise of Commutating Voltage	$dv / dt(c)$	$V_{in}=30\text{Vrms}, I_F=15\text{mA}$ (Fig.1)	—	0.2	—	$\text{V}/\mu\text{s}$

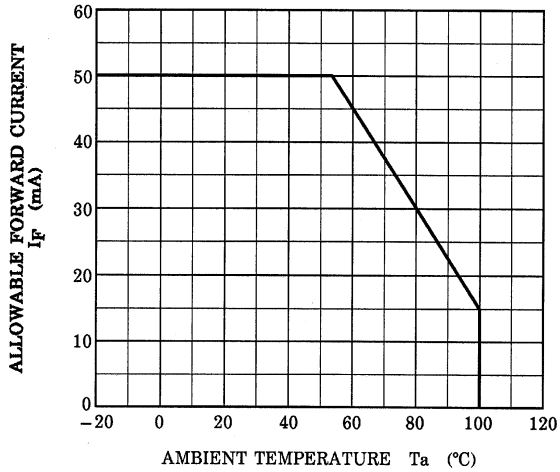
## Coupled Electrical Characteristics (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Trigger LED Current	TLP3020	$I_{FT}$	$V_T=3\text{V}$	—	—	30	mA
	TLP3021			—	—	15	
	TLP3022			—	5	10	
	TLP3023			—	—	5	
Capacitance Input to Output		$C_S$	$V_S=0, f=1\text{MHz}$	—	0.8	—	pF
Isolation Resistance		$R_S$	$V_S=500\text{V}$ (R.H. $\leq 60\%$ )	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation Voltage		$B_{VS}$	AC, 1 minute	—	—	—	$V_{rms}$
			AC, 1 second (in oil)	—	10000	—	$V_{dc}$
			DC, 1 minute (in oil)	—	10000	—	

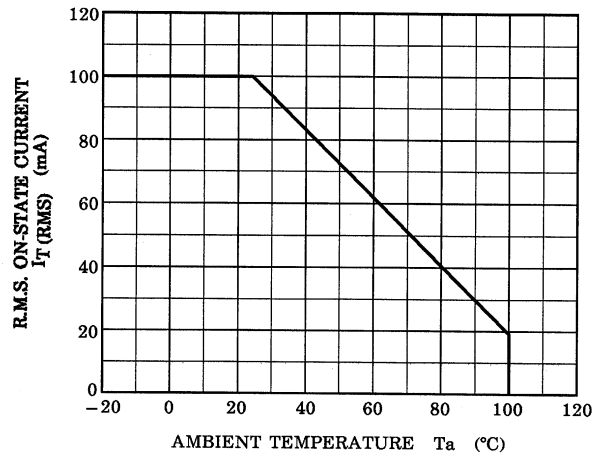
Fig. 1  $dv/dt$  TEST CIRCUIT



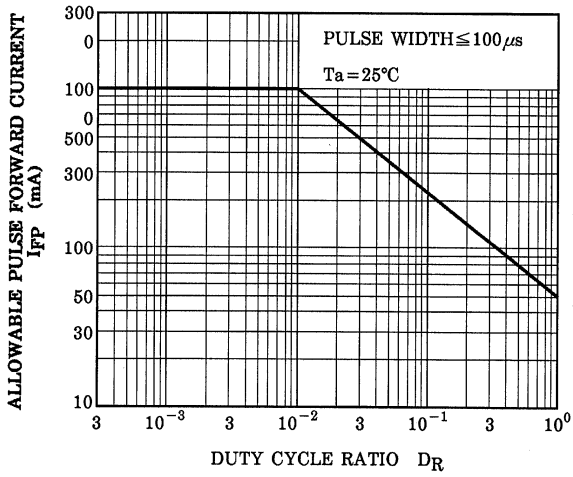
$I_F - T_a$



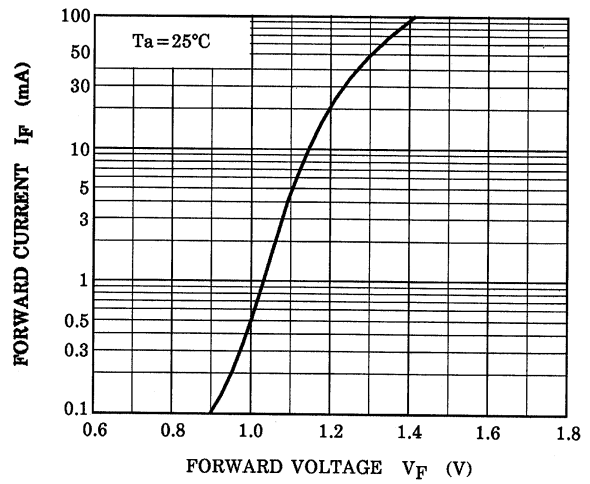
$I_T (RMS) - T_a$



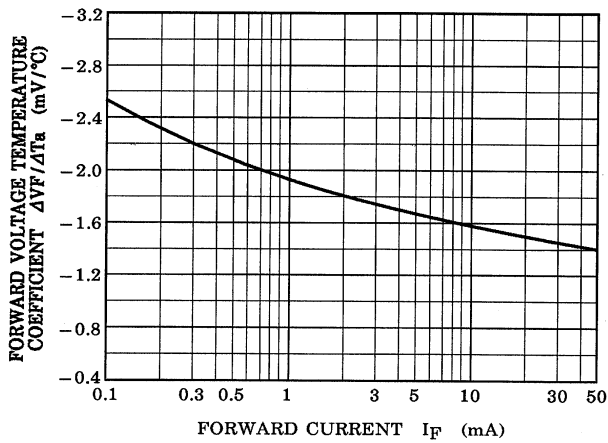
$I_{FP} - D_R$



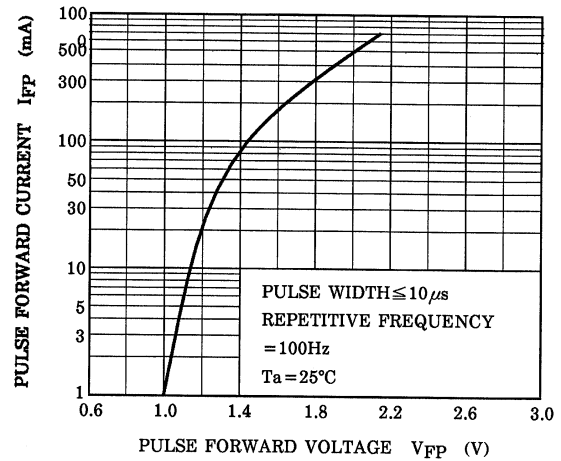
$I_F - V_F$



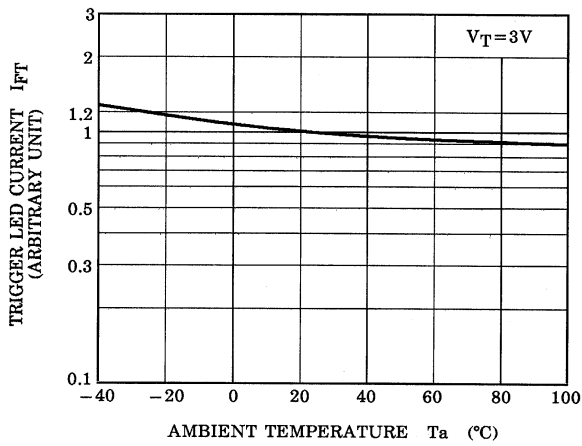
$\Delta V_F / \Delta T_a - I_F$



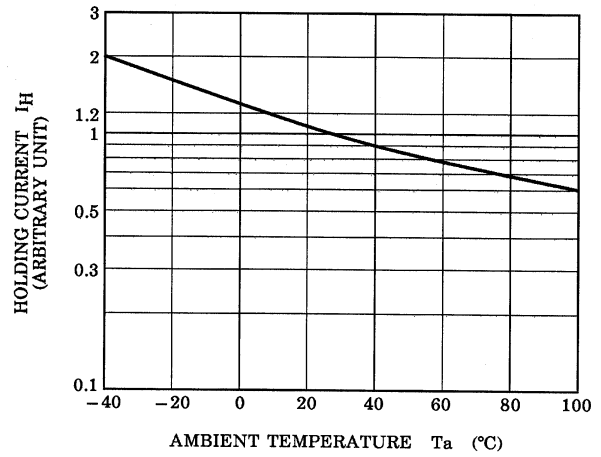
$I_{FP} - V_{FP}$



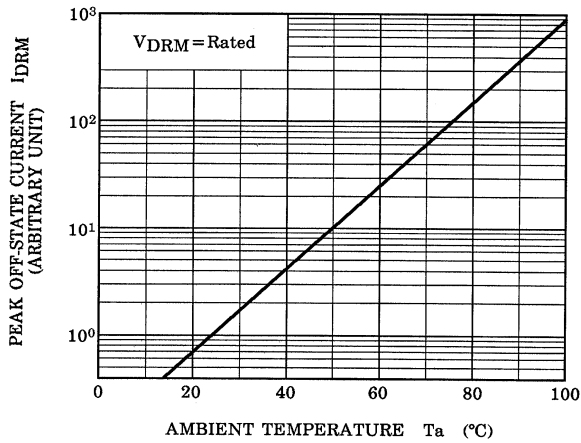
NORMALIZED  $I_{FT} - T_a$



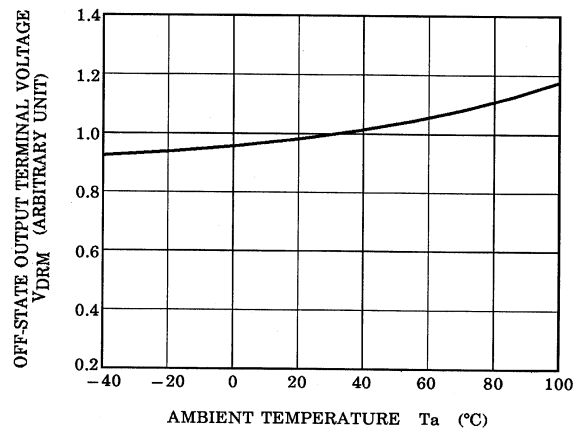
NORMALIZED  $I_H - T_a$



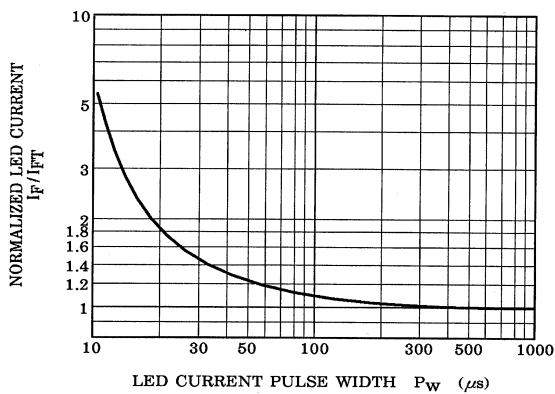
NORMALIZED  $I_{DRM} - T_a$



NORMALIZED  $V_{DRM} - T_a$



NORMALIZED LED CURRENT  
- LED CURRENT PULSE WIDTH



**RESTRICTIONS ON PRODUCT USE**

20070701-EN

- The information contained herein is subject to change without notice.
- 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.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patents or other rights of TOSHIBA or the third parties.
- GaAs(Gallium Arsenide) is used in this product. The dust or vapor is harmful to the human body. Do not break, cut, crush or dissolve chemically.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.