

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP731, TLP732

OFFICE MACHINE  
HOUSEHOLD USE EQUIPMENT  
SOLID STATE RELAY  
SWITCHING POWER SUPPLY

The TOSHIBA TLP731 and TLP732 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.

TLP732 is no-base internal connection for high-EMI environments.

- Collector-Emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS EN60065 : 1994  
Certificate No. 6617  
BS EN60950 : 1992  
Certificate No. 7366

Isolation Voltage : 4000V<sub>rms</sub> (Min.)

- Option (D4) type  
VDE Approved : DIN VDE0884/08.87,  
Certificate No. 65640

Maximum Operating Insulation Voltage : 630V<sub>PK</sub>

Highest Permissible Over Voltage : 6000V<sub>PK</sub>

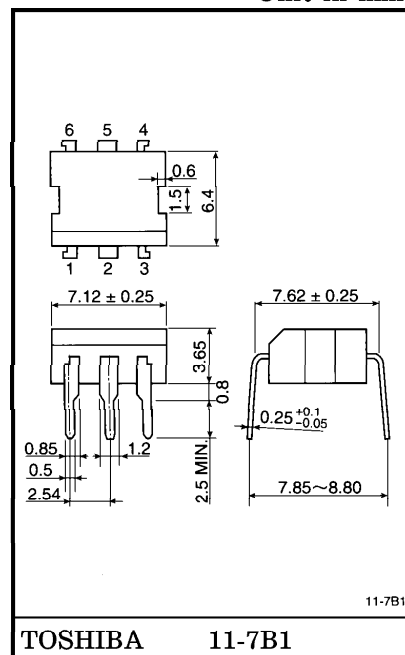
(Note) When a VDE0884 approved type is needed, please designate the "Option (D4)"

7.62mm pich  
standard type

10.16mm pich  
(LF2) type

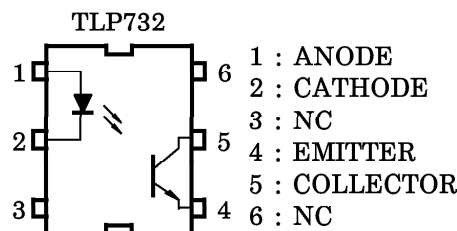
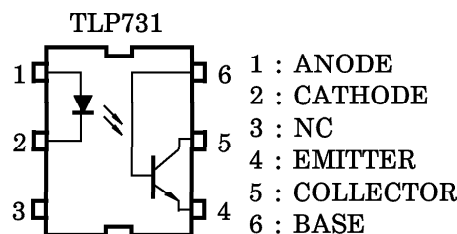
- Creepage Distance : 7.0mm (Min.)      8.0mm (Min.)
- Clearance : 7.0mm (Min.)      8.0mm (Min.)
- Insulation Thickness : 0.5mm (Min.)      0.5mm (Min.)

Unit in mm



Weight : 0.35g

PIN CONFIGURATIONS (TOP VIEW)



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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 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
LED	Forward Current	$I_F$	60	mA
	Forward Current Derating (Ta ≥ 39°C)	$\Delta I_F / ^\circ\text{C}$	-0.7	mA / °C
	Peak Forward Current (100 $\mu$ s 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	Collector-Emitter Voltage	$V_{CEO}$	55	V
	Collector-Base Voltage (TLP731)	$V_{CBO}$	80	V
	Emitter-Collector Voltage	$V_{ECO}$	7	V
	Emitter-Base Voltage (TLP731)	$V_{EBO}$	7	V
	Collector Current	$I_C$	50	mA
	Power Dissipation	$P_C$	150	mW
	Power Dissipation Derating (Ta ≥ 25°C)	$\Delta P_C / ^\circ\text{C}$	-1.5	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 (10s)		$T_{sol}$	260	°C
Total Package Power Dissipation		$P_T$	250	mW
Total Package Power Dissipation Derating (Ta ≥ 25°C)		$\Delta P_T / ^\circ\text{C}$	-2.5	mW / °C
Isolation Voltage (AC, 1 min., R.H. ≤ 60%)		$BV_S$	4000	$V_{rms}$

## 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 foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- 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	$\mu\text{A}$
	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-Base Breakdown Voltage (TLP731)	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$	80	—	—	V
	Emitter-Base Breakdown Voltage (TLP731)	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$	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	$\mu\text{A}$
	Collector Dark Current (TLP731)	$I_{CER}$	$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1\text{M}\Omega$	—	0.5	10	$\mu\text{A}$
	Collector Dark Current (TLP731)	$I_{CBO}$	$V_{CB} = 10\text{V}$	—	0.1	—	nA
	DC Forward Current Gain (TLP731)	$h_{FE}$	$V_{CE} = 5\text{V}, I_C = 0.5\text{mA}$	—	400	—	—
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	—	—	
Base Photo-Current (TLP731)	$I_{PB}$	$I_F = 5\text{mA}, V_{CB} = 5\text{V}$	—	10	—	$\mu\text{A}$
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 <sub>S</sub>	V <sub>S</sub> =0, f=1MHz	—	0.8	—	pF
Isolation Resistance	R <sub>S</sub>	V <sub>S</sub> =500V	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	4000	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall Time	t <sub>f</sub>		—	3	—	
Turn-on Time	t <sub>on</sub>		—	3	10	
Turn-off Time	t <sub>off</sub>		—	3	10	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) R <sub>BE</sub> = OPEN V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	—	2	—	μs
Storage Time	t <sub>s</sub>		—	15	—	
Turn-off Time	t <sub>OFF</sub>		—	25	—	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) R <sub>BE</sub> = 220kΩ (TLP731) V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	—	2	—	μs
Storage Time	t <sub>s</sub>		—	12	—	
Turn-off Time	t <sub>OFF</sub>		—	20	—	

Fig. 1 SWITCHING TIME TEST CIRCUIT

