TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

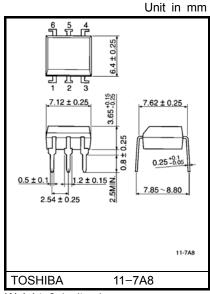
# **TLP371, TLP372**

Office Machine
Household Use Equipment
Telecommunication
Solid State Relay
Programmable Controllers

The TOSHIBA TLP371 and TLP372 consists of a gallium arsenide infrared emitting diode optically coupled to a darlington connected photo–transistor which has an integrated base–emitter resistor to optimize switching speed and elevated temperature characteristics in a six lead plastic DIP package.

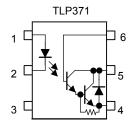
TLP372 is no-base internal connection for high-EMI environments.

- Current transfer ratio: 1000% (min) (I<sub>F</sub> = 1mA)
- Isolation voltage: 5000 Vrms (min)
- UL recognized: UL1577, file no. E67349

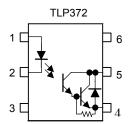


Weight: 0.4g (typ.)

#### Pin Configurations (top view)



- 1 : Anode
- 2: Cathode
- 3: NC
- 4 : Emitter
- 5 : Collector
- 6: Base



- 1 : Anode
- 2 : Cathode
- 3:NC
- 4 : Emitter
- 5 : Collector
- 6 : NC



#### Absolute Maximum Ratings (Ta = 25°C)

	Characteristic	Symbol	Rating	Unit
	Forward current	lF	60	mA
LED	Forward current derating (Ta ≥ 39°C)	ΔI <sub>F</sub> / °C	-0.7	mA / °C
	Peak forward current (100µs pulse, 100pps)	I <sub>FP</sub>	1	Α
	Reverse voltage	V <sub>R</sub>	5	V
	Junction temperature	Tj	125	°C
	Collector-emitter voltage	V <sub>CEO</sub>	300	V
	Collector-base voltage (TLP371)	V <sub>CBO</sub>	300	V
	Emitter-collector voltage	V <sub>ECO</sub>	0.3	V
ctor	Emitter-base voltage (TLP371)	V <sub>EBO</sub>	7	V
Detector	Collector current	Ic	150	mA
	Power dissipation	PC	300	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-3.0	mW / °C
	Junction temperature	Tj	125	°C
Storage temperature range		T <sub>stg</sub>	-55~125	°C
Operating temperature range		T <sub>opr</sub>	-55~100	°C
Lead soldering temperature (10 s)		T <sub>sold</sub>	260	°C
Total package power dissipation		P <sub>T</sub>	350	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-3.5	mW / °C
Isola	ation voltage (AC, 1min., R.H. ≤ 60%) (Note 1)	BVS	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 1: Device considered a two terminal device: Pins 1, 2 and 3 shorted together and pins 4,5 and 6 shorted together.

#### **Recommended Operating Conditions**

Characteristic	Symbol	Min	Тур.	Max	Unit
Supply voltage	V <sub>CC</sub>	_	_	200	V
Forward current	lF	_	16	25	mA
Collector current	IC	_	_	120	mA
Operating temperature	T <sub>opr</sub>	-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.



# Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA	1.0	1.15	1.3	V
LED	Reverse current	I <sub>R</sub>	V <sub>R</sub> = 5 V	_	_	10	μΑ
	Capacitance	C <sub>T</sub>	V = 0, f = 1 MHz	_	30	_	pF
	Collector–emitter breakdown voltage	V <sub>(BR)</sub> CEO	I <sub>C</sub> = 0.1 mA	300	_	_	V
	Emitter-collector breakdown voltage	V <sub>(BR)</sub> ECO	I <sub>E</sub> = 0.1 mA	0.3	_	_	V
	Collector–base breakdown voltage (TLP371)	V <sub>(BR)</sub> CBO	I <sub>C</sub> = 0.1 mA	300	_	_	V
	Emitter-base breakdown voltage (TLP371)	V <sub>(BR)</sub> EBO	I <sub>E</sub> = 0.1 mA	7	_	_	V
Detector		current I <sub>CEO</sub>	V <sub>CE</sub> = 200 V	_	10	200	nA
Dete	Collector dark current		V <sub>CE</sub> = 200 V Ta = 85 °C	_	_	20	μΑ
	Collector dark current (TLP371)	I <sub>CER</sub>	V <sub>CE</sub> = 200 V Ta = 85 °C, R <sub>BE</sub> = 10 MΩ	_	0.5	10	μА
	Collector dark current (TLP371)	I <sub>CBO</sub>	V <sub>CE</sub> = 200 V	_	0.1	_	nA
	DC forward current gain (TLP371)	h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA	_	7000	_	_
	Capacitance (collecter to emitter)	C <sub>CE</sub>	V = 0, f = 1 MHz	_	10	_	pF

# Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	MIn	Тур.	Max	Unit
Current transfer ratio	I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 1 V	1000	4000	_	%
Saturated CTR	I <sub>C</sub> / I <sub>F (sat)</sub>	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1 V	500	_	_	%
Base photo-current (TLP371)	I <sub>PB</sub>	I <sub>F</sub> = 1 mA, V <sub>CB</sub> = 1 V	_	6	_	μΑ
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = 10 mA, I <sub>F</sub> = 1 mA	_	_	1.0	V
		I <sub>C</sub> = 100 mA, I <sub>F</sub> = 10 mA	0.3	_	1.2	V



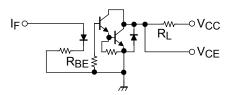
# Isolation Characteristics (Ta = 25°C)

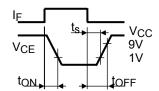
Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Capacitance (input to output)	CS	V <sub>S</sub> = 0, f = 1 MHz	_	0.8	_	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V	5×10 <sup>10</sup>	10 <sup>14</sup>	_	Ω
	BVS	AC, 1 minute	5000	_	_	V
Isolation voltage		AC, 1 second, in oil	_	10000	_	V <sub>rms</sub>
		DC, 1 minute, in oil	_	10000	_	V <sub>dc</sub>

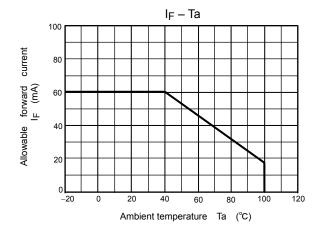
# **Switching Characteristics (Ta = 25°C)**

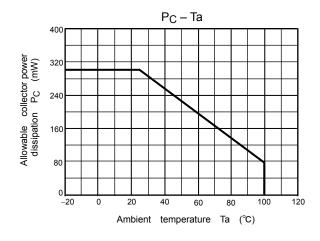
Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Rise time	t <sub>r</sub>		_	40	_	
Fall time	t <sub>f</sub>	V <sub>CC</sub> = 10 V	_	15	_	lie.
Turn-on time	t <sub>on</sub>	$I_C = 10 \text{ mA}$ $R_L = 100\Omega$	_	50	_	μs
Turn-off time	t <sub>off</sub>		_	15	_	
Turn-on time	t <sub>ON</sub>	$R_L = 180\Omega$ (Fig.1)	_	3	_	
Storage time	t <sub>S</sub>	R <sub>BE</sub> = OPEN	_	45	_	μs
Turn-off time	t <sub>OFF</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 16 mA	_	90	_	
Turn-on time	t <sub>ON</sub>	$R_L = 180\Omega$ (Fig.1)	_	5	_	
Storage time	t <sub>S</sub>	$R_{BE} = 10 M\Omega(TLP371)$	_	40	_	μs
Turn-off time	t <sub>OFF</sub>	V <sub>CC</sub> = 10 V, I <sub>F</sub> = 16 mA	_	80	_	

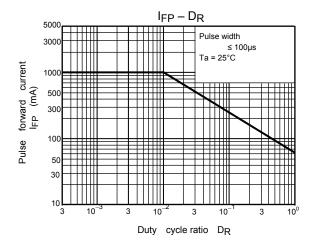
Fig.1: Switching time test circuit

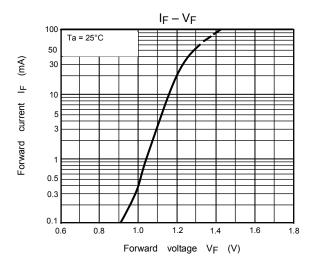


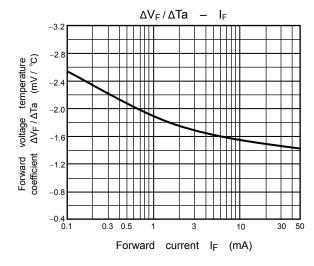


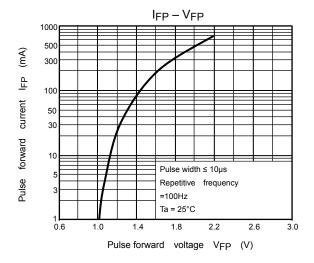




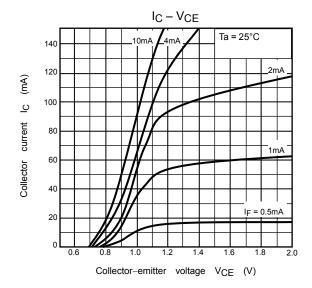


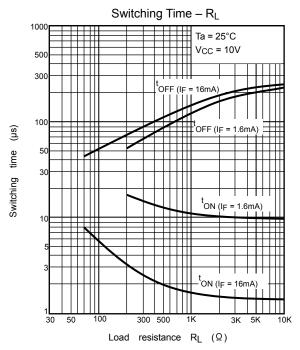


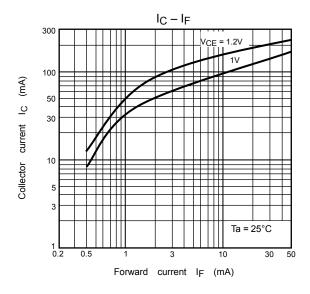


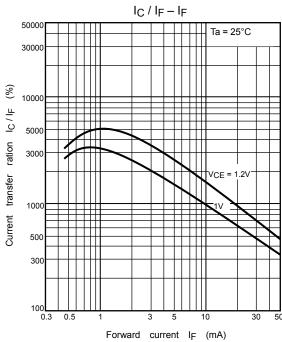


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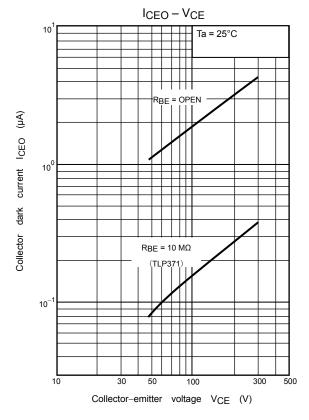


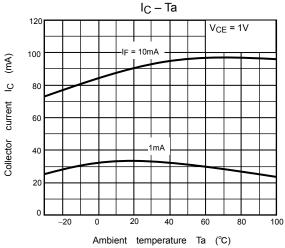


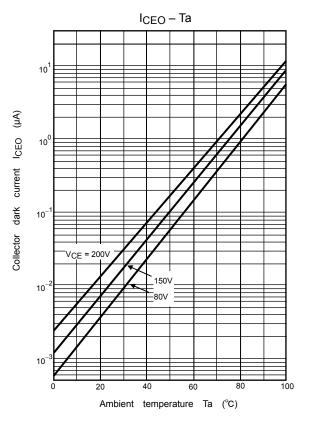


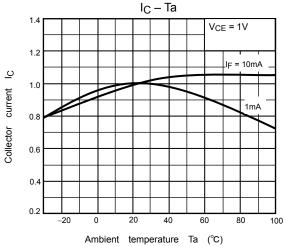


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