

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP570, TLP571

PROGRAMMABLE CONTROLLERS

AC/DC - INPUT MODULE

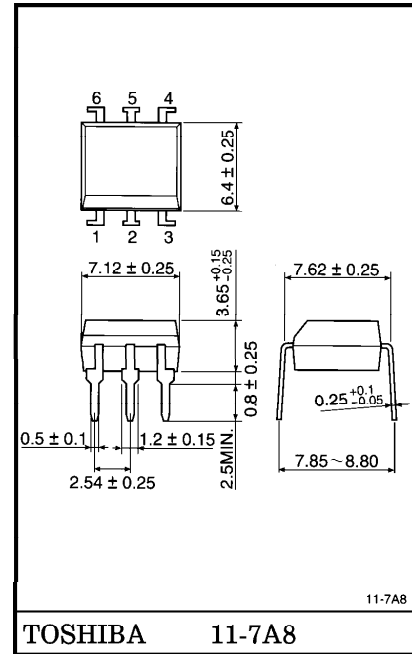
SOLID STATE RELAY

The TOSHIBA TLP570 and TLP571 consist of a darlington connected photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.

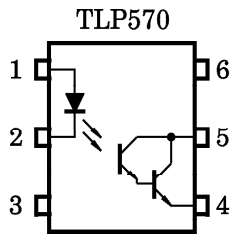
TLP570 is no-base internal connection for high-EMI environments.

- Collector-Emitter Voltage : 35V (Min.)
- Current Transfer Ratio : 1000% (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

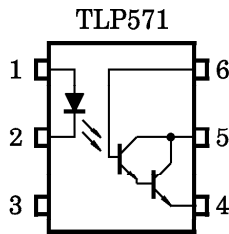
Unit in mm



**PIN CONFIGURATIONS (TOP VIEW)**



- 1 : ANODE
- 2 : CATHODE
- 3 : NC
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : NC



- 1 : ANODE
- 2 : CATHODE
- 3 : NC
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : BASE

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	I <sub>F</sub>	70	mA
	Forward Current Derating (Ta ≥ 25°C)	ΔI <sub>F</sub> / °C	-0.7	mA / °C
	Peak Forward Current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Reverse Voltage	V <sub>R</sub>	5	V
	Junction Temperature	T <sub>j</sub>	125	°C
DETECTOR	Collector-Emitter Voltage	V <sub>CEO</sub>	35	V
	Collector-Base Voltage (TLP571)	V <sub>CB0</sub>	80	V
	Emitter-Collector Voltage	V <sub>ECO</sub>	7	V
	Emitter-Base Voltage (TLP571)	V <sub>EBO</sub>	7	V
	Collector Current	I <sub>C</sub>	150	mA
	Power Dissipation	P <sub>C</sub>	150	mW
	Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction Temperature	T <sub>j</sub>	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 (10s)		T <sub>sold</sub>	260	°C
Total Package Power Dissipation		P <sub>T</sub>	250	mW
Total Package Power Dissipation Derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-2.5	mW / °C
Isolation Voltage (AC, 1min., R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	2500	V <sub>rms</sub>

(Note 1) Device considered a two terminal : Pins 1, 2 and 3 shorted together and pins 4, 5 and 6 shorted together.

## RECOMMENDS OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>CC</sub>	—	5	24	V
Forward Current	I <sub>F</sub>	—	16	25	mA
Collector Current	I <sub>C</sub>	—	—	50	mA
Operating Temperature	T <sub>opr</sub>	-25	—	85	°C

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	$V_{(BR)CEO}$	$I_C = 1\text{mA}$	35	—	—	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector-Base Breakdown Voltage (TLP571)	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$	80	—	—	V
	Emitter-Base Breakdown Voltage (TLP571)	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector Dark Current	$I_{CEO}$	$V_{CE} = 24\text{V}$	—	10	200	nA
			$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$	—	—	300	$\mu\text{A}$
	Collector Dark Current (TLP571)	$I_{CER}$	$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ $R_{BE} = 10\text{M}\Omega$	—	0.5	10	$\mu\text{A}$
	Collector Dark Current (TLP571)	$I_{CBO}$	$V_{CB} = 10\text{V}$	—	0.01	—	nA
	DC Forward Current Gain (TLP571)	$h_{FE}$	$V_{CE} = 5\text{V}, I_C = 10\text{mA}$	—	50k	—	—
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	$I_C / I_F$	$I_F = 1\text{mA}, V_{CE} = 1\text{V}$	1000	2000	—	%
Saturated CTR	$I_C / I_F(\text{sat})$	$I_F = 10\text{mA}, V_{CE} = 1\text{V}$	500	—	—	%
Base Photo-Current (TLP571)	$I_{PB}$	$I_F = 1\text{mA}, V_{CB} = 1\text{V}$	—	2	—	$\mu\text{A}$
Collector-Emitter Saturation Voltage	$V_{CE(\text{sat})}$	$I_C = 10\text{mA}, I_F = 1\text{mA}$	—	—	1.0	V
		$I_C = 100\text{mA}, I_F = 10\text{mA}$	0.3	—	1.2	

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, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	2500	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	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> =10mA R <sub>L</sub> =100Ω	—	40	—	μs
Fall Time	t <sub>f</sub>		—	30	—	
Turn-on Time	t <sub>ON</sub>		—	45	—	
Turn-off Time	t <sub>OFF</sub>		—	35	—	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> =180Ω (Fig.1)	—	5	—	μs
Storage Time	t <sub>s</sub>	R <sub>BE</sub> =OPEN	—	20	—	
Turn-off Time	t <sub>OFF</sub>	V <sub>CC</sub> =10V, I <sub>F</sub> =10mA	—	100	—	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> =180Ω (Fig.1)	—	5	—	μs
Storage Time	t <sub>s</sub>	R <sub>BE</sub> =10MΩ (TLP571)	—	15	—	
Turn-off Time	t <sub>OFF</sub>	V <sub>CC</sub> =10V, I <sub>F</sub> =10mA	—	60	—	

Fig.1 SWITCHING TIME TEST CIRCUIT

