

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

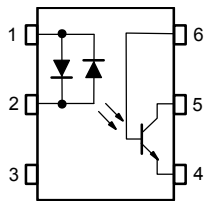
# TLP330

Programmable Controllers  
 AC / DC-Input Module  
 Telecommunication

The TOSHIBA TLP330 consists of a photo-transistor optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel in a six lead plastic DIP package. This is suitable for application of AC input current up to 150mA.

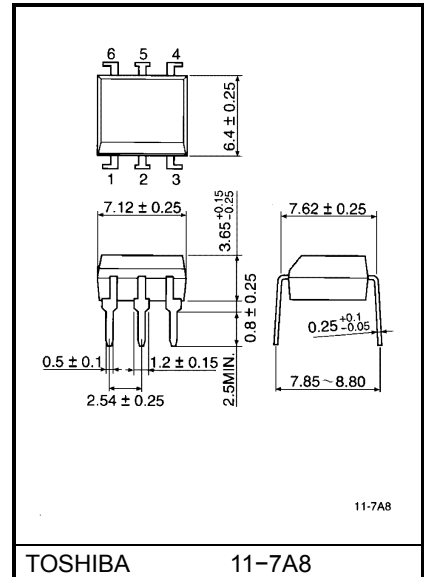
- If maximum rating:  $\pm 150\text{mA}$
- Collector-Emitter voltage: 55V(min.)
- Current transfer ratio: 25% (min.) ( $I_F = \pm 20\text{mA}$ )
- Isolation voltage: 5000Vrms (min.)
- UL recognized: UL1577, file no. E67349

### Pin Configurations (top view)



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

Unit in mm



Weight: 0.39 g

## Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_F$	$\pm 150$	mA
	Forward current derating (Ta $\geq 25^\circ\text{C}$ )	$\Delta I_F / ^\circ\text{C}$	-1.5	mA / °C
	Peak forward current (100 $\mu\text{s}$ pulse, 100pps)	$I_{FP}$	$\pm 1$	A
	Junction temperature	$T_j$	125	°C
Detector	Collector-emitter voltage	$V_{CEO}$	55	V
	Collector-base voltage	$V_{CBO}$	80	V
	Emitter-collector voltage	$V_{ECO}$	7	V
	Emitter-base voltage	$V_{EBO}$	7	V
	Collector current	$I_C$	80	mA
	Power dissipation	$P_C$	150	mW
	Power dissipation derating (Ta $\geq 25^\circ\text{C}$ )	$\Delta P_C / ^\circ\text{C}$	-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 $\geq 25^\circ\text{C}$ )		$\Delta P_T / ^\circ\text{C}$	-2.5	mW / °C
Isolation voltage (AC, 1 min, R.H. $\leq 60\%$ ) (Note 1)		$BV_S$	5000	Vrms

(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.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	—	5	24	V
Forward current	$I_{F(RMS)}$	—	20	120	mA
Collector current	$I_C$	—	1	10	mA
Operating temperature	$T_{opr}$	-25	—	85	°C

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

Characteristic		Symbol	Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = \pm 100 \text{ mA}$	—	1.4	1.7	V
	Forward current	$I_F$	$V_F = \pm 0.7 \text{ V}$	—	2.5	20	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	100	—	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	$V_{(BR)CBO}$	$I_C = 0.1 \text{ mA}$	80	—	—	V
	Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 0.1 \text{ mA}$	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	$I_{CER}$	$V_{CE} = 24 \text{ V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1 \text{ M}\Omega$	—	0.5	10	$\mu\text{A}$
	Collector dark current	$I_{CBO}$	$V_{CE} = 10 \text{ V}$	—	0.1	—	nA
	DC forward current gain	$h_{FE}$	$V_{CE} = 5 \text{ V}, I_C = 0.5 \text{ mA}$	—	400	—	—
Capacitance (collector to emitter)	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	

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

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = \pm 20 \text{ mA}, V_{CE} = 1 \text{ V}$	25	—	—	%
	$I_C / I_{F(\text{high})}$	$I_F = \pm 100 \text{ mA}, V_{CE} = 1 \text{ V}$	20	—	80	%
Base photo-current	$I_{PB}$	$I_F = \pm 5 \text{ mA}, V_{CB} = 5 \text{ V}$	—	10	—	$\mu\text{A}$
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = 2.4 \text{ mA}, I_F = 20 \text{ mA}$	—	—	0.4	V
		$I_C = 2.4 \text{ mA}, I_F = \pm 100 \text{ mA}$	—	—	0.4	
Off-state collector current	$I_{C(\text{off})}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 24 \text{ V}$	—	1	10	$\mu\text{A}$
CTR symmetry	$I_C(\text{ratio})$	$I_C(I_F = -20 \text{ mA}) / I_C(I_F = +20 \text{ mA})$	0.5	1	2	—

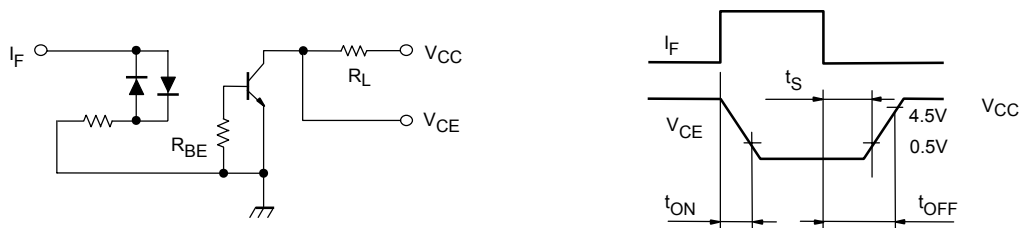
**Isolation Characteristics (Ta = 25°C)**

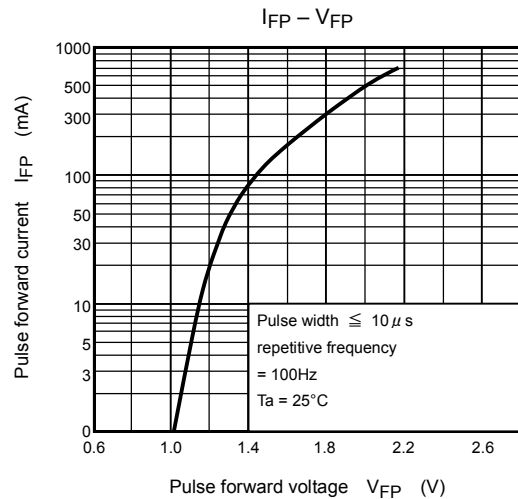
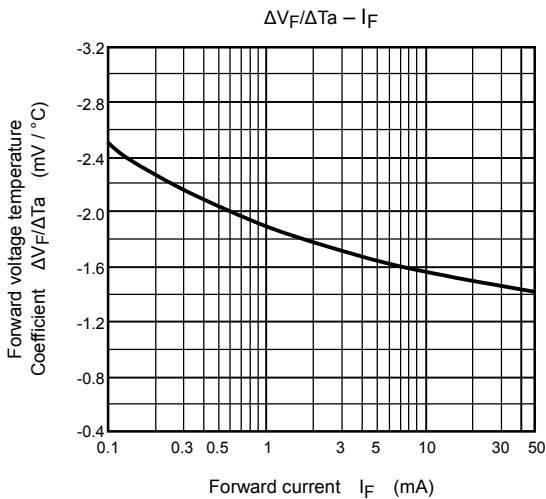
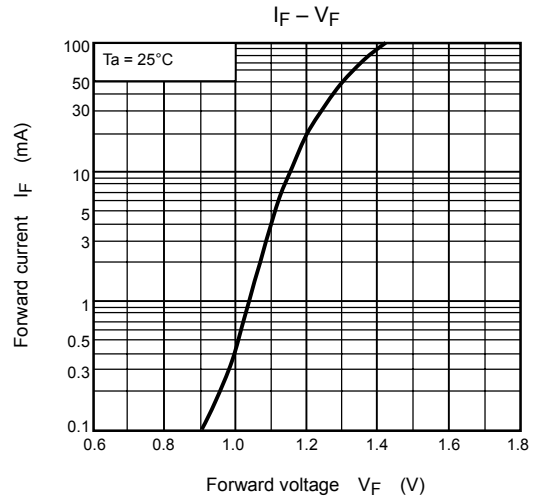
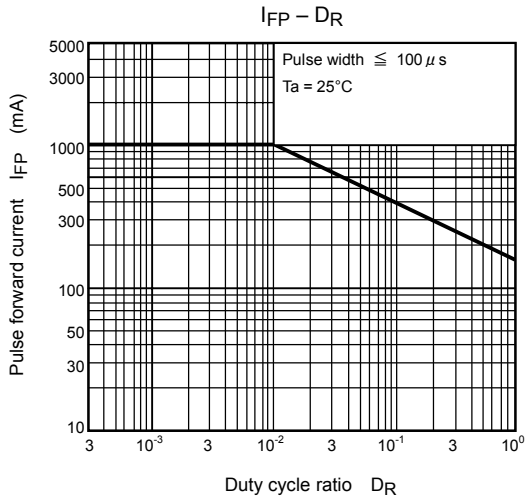
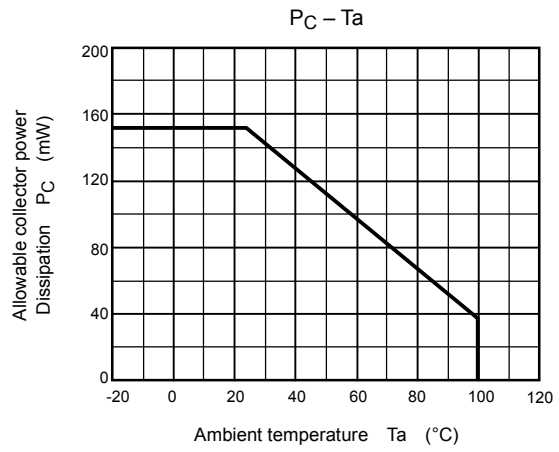
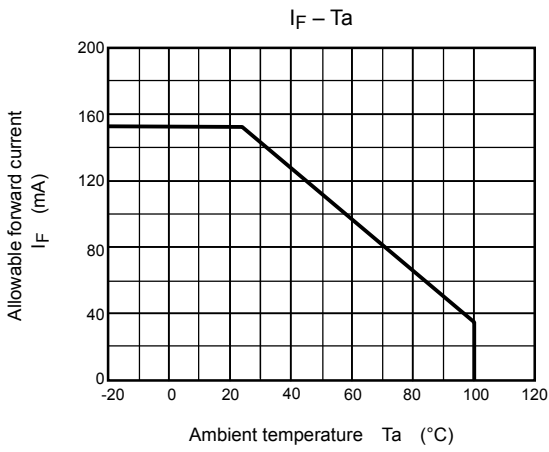
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	5000	—	—	Vrms
		AC, 1 second, in oil	—	10000	—	Vrms
		DC, 1 minute, in oil	—	10000	—	Vdc

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

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V I <sub>C</sub> = 2 mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ (Fig.1) R <sub>BE</sub> = OPEN V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16 mA	—	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> = 1.9 kΩ (Fig.1) R <sub>BE</sub> = 220kΩ V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16 mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	12	—	
Turn-off time	t <sub>OFF</sub>		—	20	—	

Fig. 1 Switching time test circuit





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