

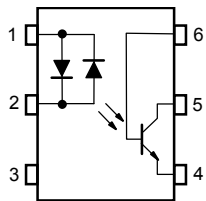
# TLP330

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.

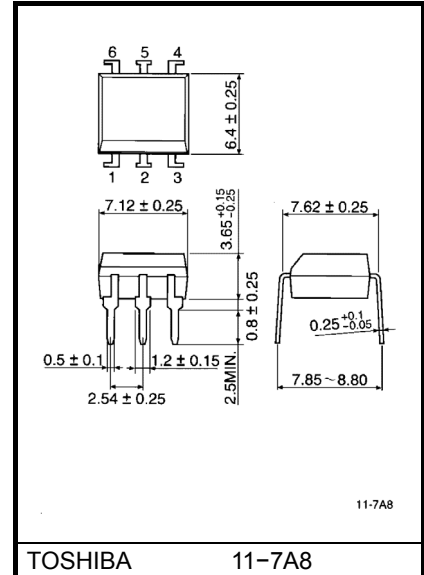
- If maximum rating:  $\pm 150\text{mA}$
- Collector-Emitter voltage:  $55\text{V}(\text{min.})$
- Current transfer ratio:  $25\%(\text{min.})(I_F = \pm 20\text{mA})$
- Isolation voltage:  $5000\text{Vrms}(\text{min.})$
- UL recognized: UL1577, file no. E67349

### Pin Configurations (top view)



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

Unit in mm



TOSHIBA 11-7A8  
 Weight: 0.39 g

## Absolute 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: 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.	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

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	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	—

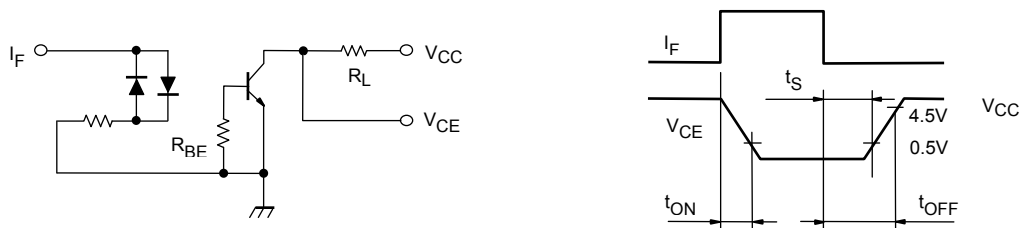
**Isolation Characteristics (Ta = 25°C)**

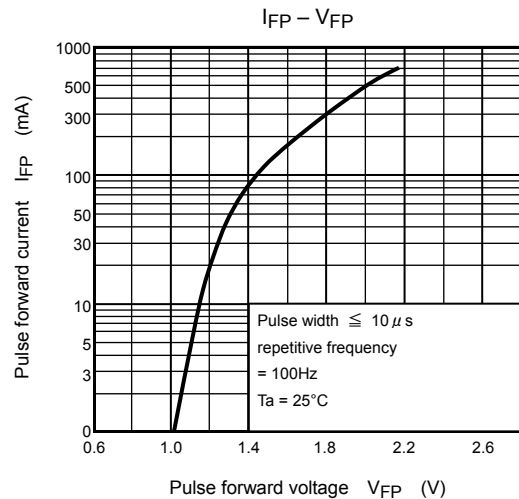
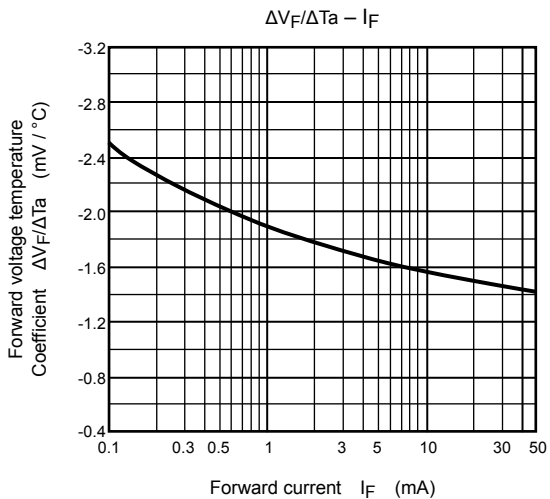
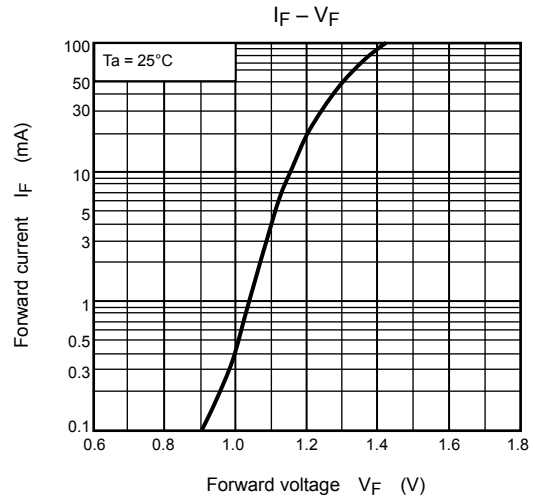
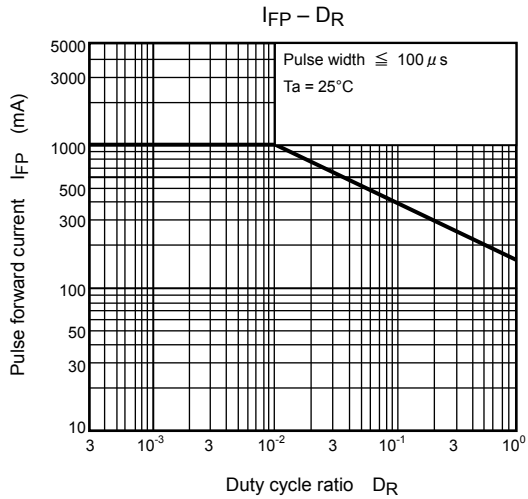
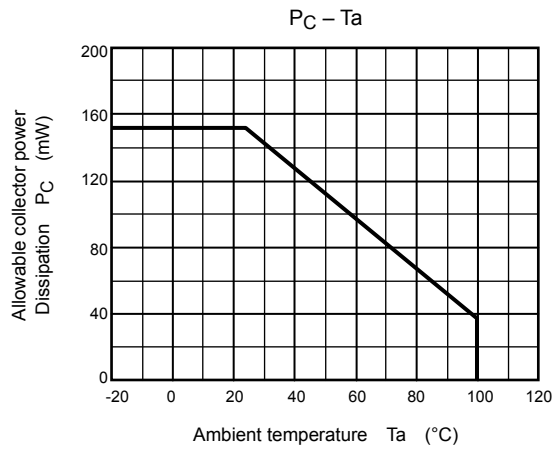
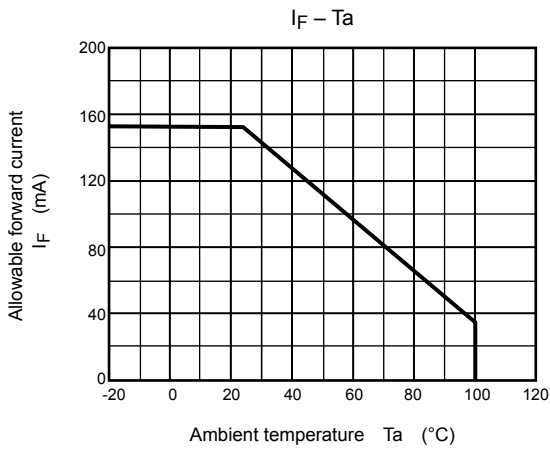
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute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