

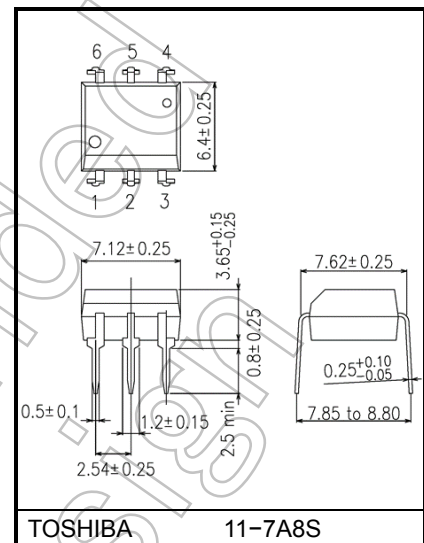
# TLP330

Programmable Controllers  
AC / DC-Input Module  
Telecommunication

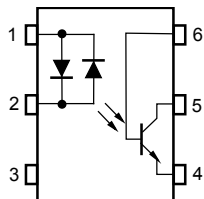
Unit: mm

The TOSHIBA TLP330 consists of a photo-transistor optically coupled to 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: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A  
File No.E67349



## Pin Configurations (top view)



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

Start of commercial production  
1986-03

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

Characteristics		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	±150	mA
	Forward current derating (Ta ≥ 25°C)	ΔI <sub>F</sub> /°C	-1.5	mA/°C
	Peak forward current (100μs pulse, 100pps)	I <sub>FP</sub>	±1	A
	Diode power dissipation	P <sub>D</sub>	200	mW
	Diode power dissipation derating (Ta ≥ 25°C)	ΔP <sub>D</sub> /°C	-2.0	mW/°C
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	55	V
	Collector-base voltage	V <sub>CBO</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	7	V
	Emitter-base voltage	V <sub>EBO</sub>	7	V
	Collector current	I <sub>C</sub>	80	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 to 125	°C
Operating temperature range		T <sub>opr</sub>	-55 to 100	°C
Lead soldering temperature (10 s)		T <sub>sol</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, 60 s, R.H. ≤ 60 %) (Note 1)		BV <sub>S</sub>	5000	V <sub>rms</sub>

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

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V <sub>CC</sub>	—	5	24	V
Forward current	I <sub>F(RMS)</sub>	—	20	120	mA
Collector current	I <sub>C</sub>	—	1	10	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)

Characteristics		Symbol	Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = ±100 mA	—	1.4	1.7	V
	Forward current	I <sub>F</sub>	V <sub>F</sub> = ±0.7V	—	2.5	20	μA
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1 MHz	—	100	—	pF
Detector	Collector-emitter breakdown voltage	V <sub>(BR) CEO</sub>	I <sub>C</sub> = 0.5 mA	55	—	—	V
	Emitter-collector breakdown voltage	V <sub>(BR) ECO</sub>	I <sub>E</sub> = 0.1 mA	7	—	—	V
	Collector-base breakdown voltage	V <sub>(BR) CBO</sub>	I <sub>C</sub> = 0.1 mA	80	—	—	V
	Emitter-base breakdown voltage	V <sub>(BR) EBO</sub>	I <sub>E</sub> = 0.1 mA	7	—	—	V
	Collector dark current	I <sub>CEO</sub>	V <sub>CE</sub> = 24 V	—	10	100	nA
			V <sub>CE</sub> = 24 V, T <sub>a</sub> = 85 °C	—	2	50	μA
	Collector dark current	I <sub>CER</sub>	V <sub>CE</sub> = 24 V, T <sub>a</sub> = 85 °C R <sub>BE</sub> = 1MΩ	—	0.5	10	μA
	Collector dark current	I <sub>CBO</sub>	V <sub>CE</sub> = 10V	—	0.1	—	nA
	DC forward current gain	h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.5mA	—	400	—	—
Capacitance (collector to emitter)	C <sub>CE</sub>	V = 0 V, f = 1.MHz	—	10	—	pF	

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

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = ±20 mA V <sub>CE</sub> = 1 V	25	—	—	%
	I <sub>C</sub> / I <sub>F</sub> (high)	I <sub>F</sub> = ±100 mA V <sub>CE</sub> = 1 V	20	—	80	%
Base photo-current	I <sub>PB</sub>	I <sub>F</sub> = ±5 mA, V <sub>CB</sub> = 5 V	—	10	—	μA
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = 2.4 mA, I <sub>F</sub> = 20 mA	—	—	0.4	V
		I <sub>C</sub> = 2.4 mA, I <sub>F</sub> = ±100 mA	—	—	0.4	
Off-state collector current	I <sub>C(off)</sub>	V <sub>F</sub> = ± 0.7 V, V <sub>CE</sub> = 24 V	—	1	10	μA
CTR symmetry	I <sub>C</sub> (ratio)	I <sub>C</sub> (I <sub>F</sub> = -20 mA) / I <sub>C</sub> (I <sub>F</sub> = +20 mA)	0.5	1	2	—

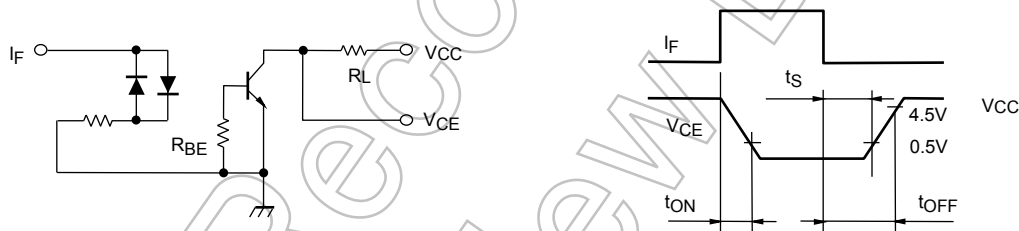
### Isolation Characteristics (Ta = 25°C)

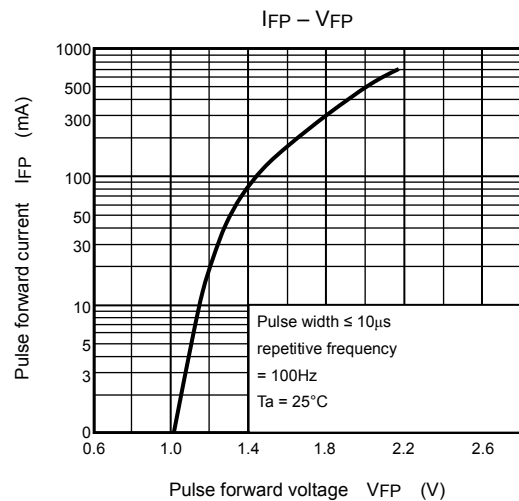
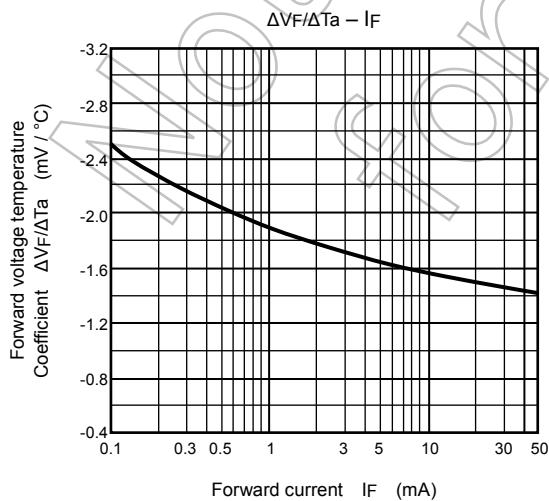
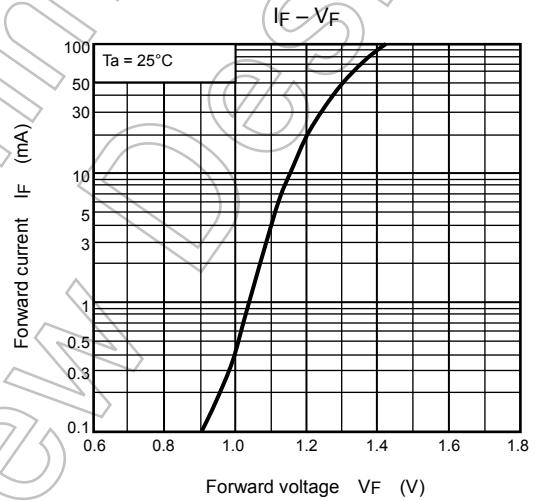
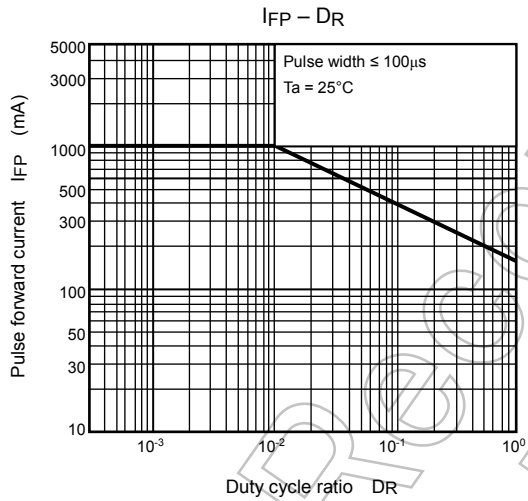
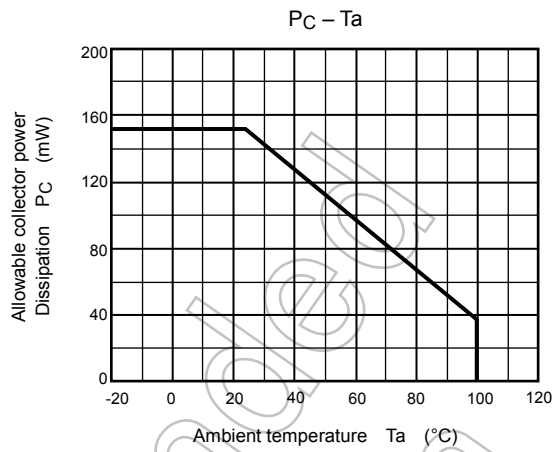
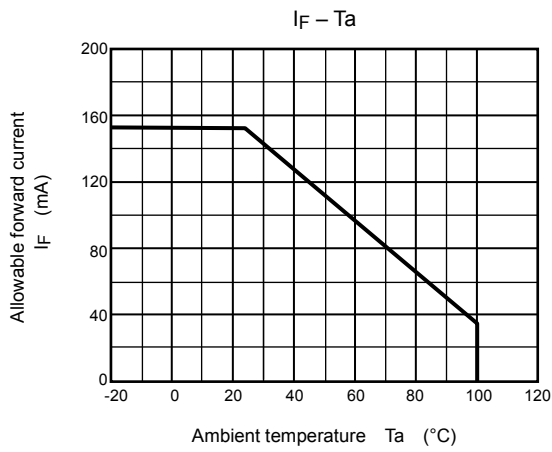
Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	Cs	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60 %	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	5000	—	—	V <sub>rms</sub>

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

Characteristics	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> = 100 Ω	—	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> = 220 kΩ 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





NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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