

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP330

Programmable Controllers

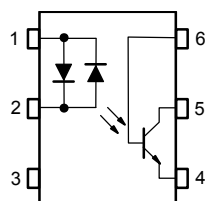
AC / DC-Input Module

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.

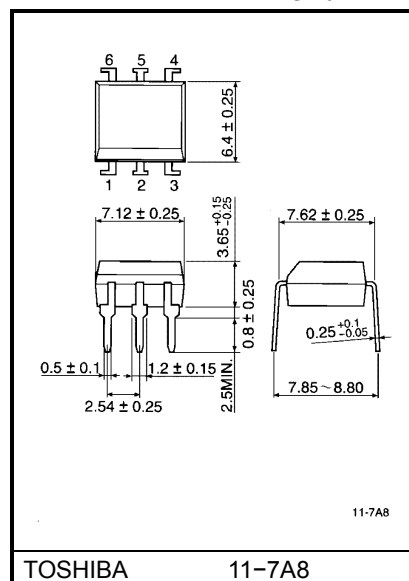
- If maximum rating: $\pm 150\text{mA}$
- Collector-Emitter voltage: $55\text{V}(\text{min.})$
- Current transfer ratio: 25% (min.) ($I_F = \pm 20\text{mA}$)
- Isolation voltage: $5000\text{Vrms}(\text{min.})$
- UL recognized: UL1577, file no. E67349

Pin Configurations (top view)



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

Unit in mm



Weight: 0.39 g

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	± 150	mA
	Forward current derating (Ta $\geq 25^\circ\text{C}$)	$\Delta I_F / ^\circ\text{C}$	-1.5	mA / $^\circ\text{C}$
	Peak forward current (100 μs pulse, 100pps)	I_{FP}	± 1	A
	Junction temperature	T_J	125	$^\circ\text{C}$
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 / $^\circ\text{C}$
	Junction temperature	T_J	125	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55~125	$^\circ\text{C}$
Operating temperature range		T_{opr}	-55~100	$^\circ\text{C}$
Lead soldering temperature (10s)		T_{sol}	260	$^\circ\text{C}$
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 / $^\circ\text{C}$
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	$^\circ\text{C}$

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	μA
	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	μA
	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	μA
	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	—	μA
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	μA
CTR symmetry	$I_C(\text{ratio})$	$I_C(I_F = -20 \text{ mA})$ $/ I_C(I_F = +20 \text{ mA})$	0.5	1	2	—

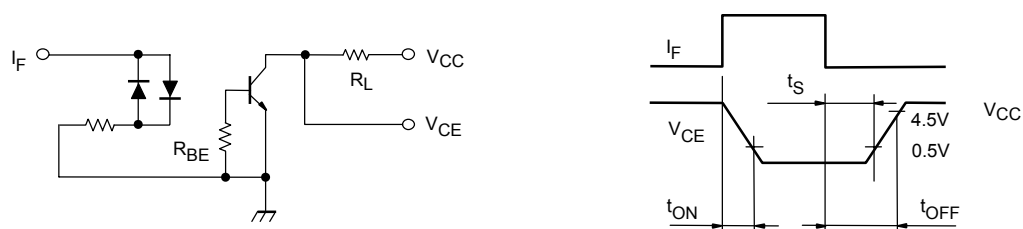
Isolation Characteristics (Ta = 25°C)

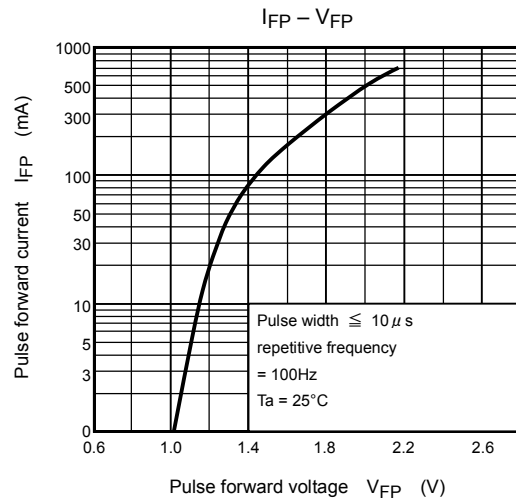
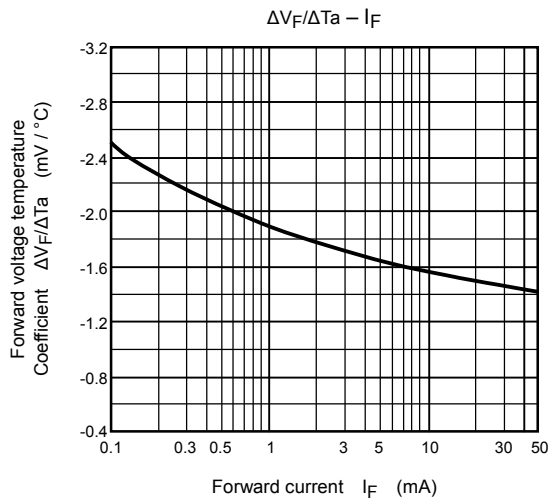
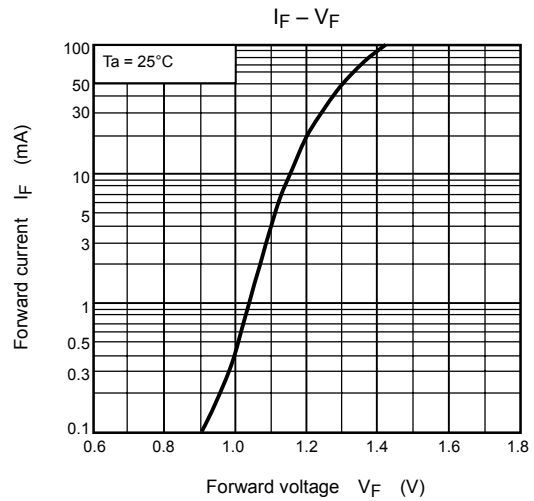
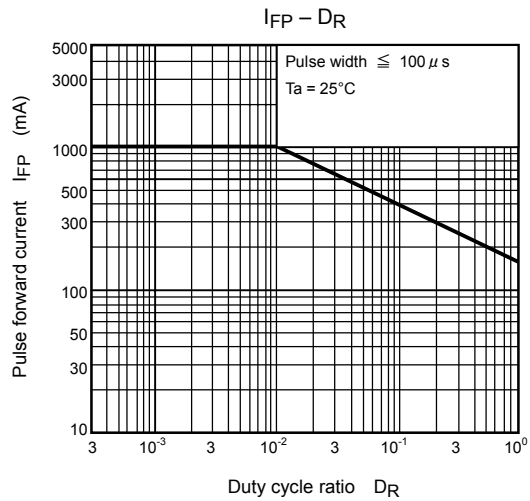
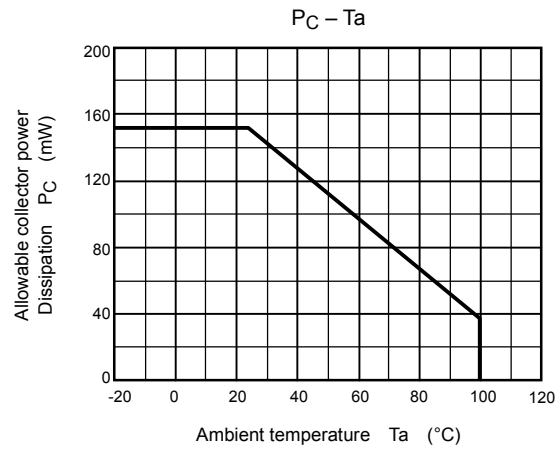
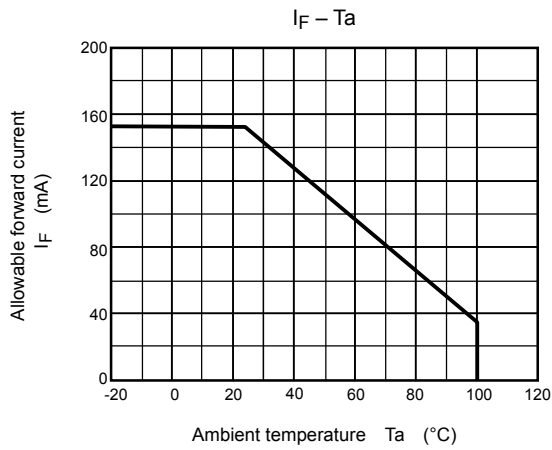
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C _S	V _S = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R _S	V _S = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	5000	—	—	Vrms
		AC, 1 second, in oil	—	10000	—	Vrms
		DC, 1 minute, in oil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

Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t _r	V _{CC} = 10 V I _C = 2 mA R _L = 100Ω	—	2	—	μs
Fall time	t _f		—	3	—	
Turn-on time	t _{on}		—	3	—	
Turn-off time	t _{off}		—	3	—	
Turn-on time	t _{ON}	R _L = 1.9 kΩ (Fig.1) R _{BE} = OPEN V _{CC} = 5 V, I _F = ±16 mA	—	2	—	μs
Storage time	t _s		—	15	—	
Turn-off time	t _{OFF}		—	25	—	
Turn-on time	t _{ON}	R _L = 1.9 kΩ (Fig.1) R _{BE} = 220kΩ V _{CC} = 5 V, I _F = ±16 mA	—	2	—	μs
Storage time	t _s		—	12	—	
Turn-off time	t _{OFF}		—	20	—	

Fig. 1 Switching time test circuit





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