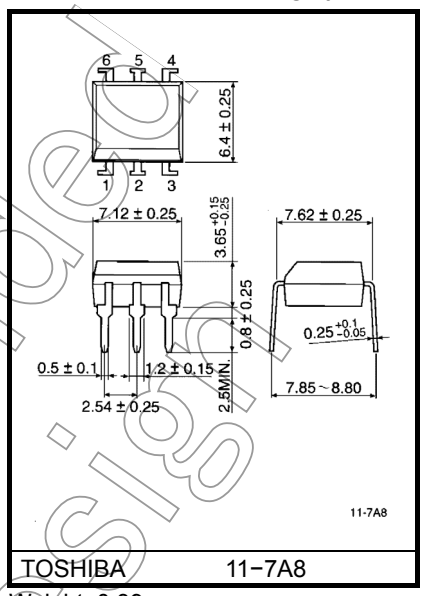
TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

TLP330

Programmable Controllers
AC / DC−Input Module
Telecommunication

Unit in mm



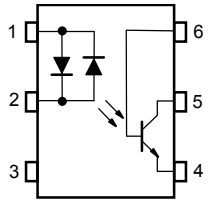
TOSHIBA 11−7A8

Weight: 0.39 g

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: ±150mA
- Collector−Emitter voltage: 55V(min.)
- Current transfer ratio: 25% (min.)(I_F = ±20mA)
- 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

Absolute Maximum Ratings (Ta = 25°C)

	Characteristic	Symbol	Rating	Unit
LED	Forward current	I_F	±150	mA
	Forward current derating (Ta ≥ 25°C)	ΔI_F /°C	−1.5	mA /°C
	Peak forward current (100μs pulse,100pps)	I_{FP}	±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 ≥ 25°C)	ΔP_C /°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≥25°C)		ΔP_T /°C	−2.5	mW /°C
Isolation voltage (AC, 1 min, R.H. ≤ 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 = ±100 mA	—	1.4	1.7	V
	Forward current	I_F	V_F= ±0.7V	—	2.5	20	μA
	Capacitance	C_T	V = 0, f = 1 MHz	—	100	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5 mA	55	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector−base breakdown voltage	$V_{(BR)\ CBO}$	I_C = 0.1 mA	80	—	—	V
	Emitter−base breakdown voltage	$V_{(BR)\ EBO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24 V	—	10	100	nA
			V_{CE} = 24 V, Ta = 85°C	—	2	50	μA
	Collector dark current	I_{CER}	V_{CE} = 24 V, Ta = 85°C R_{BE} = 1MΩ	—	0.5	10	μA
	Collector dark current	I_{CBO}	V_{CE} = 10V	—	0.1	—	nA
	DC forward current gain	h_{FE}	V_{CE} = 5 V, I_C = 0.5mA	—	400	—	—
	Capacitance (collector to emitter)	C_{CE}	V = 0, f = 1 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 = ±20 mA V_{CE} = 1 V	25	—	—	%
	I_C / $I_{F(high)}$	I_F = ±100 mA V_{CE} = 1 V	20	—	80	%
Base photo−current	I_{PB}	I_F = ±5 mA, V_{CB} = 5 V	—	10	—	μA
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = 20 mA	—	—	0.4	V
		I_C = 2.4 mA, I_F = ±100 mA	—	—	0.4	
Off−state collector current	$I_{C(off)}$	V_F = ± 0.7V, V_{CE} = 24 V	—	1	10	μA
CTR symmetry	$I_{C\ (ratio)}$	I_C (I_F = −20mA) / I_C (I_F = +20mA)	0.5	1	2	—

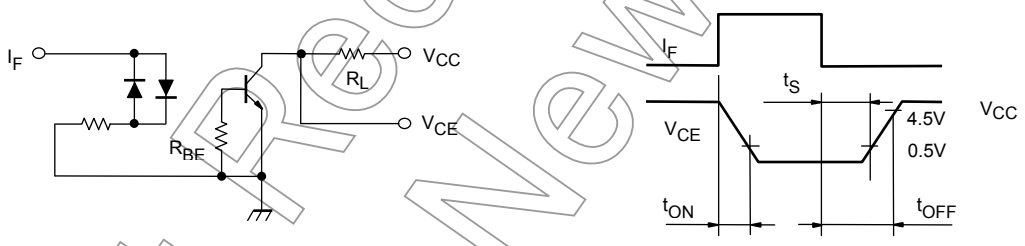
Isolation Characteristics (Ta = 25°C)

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

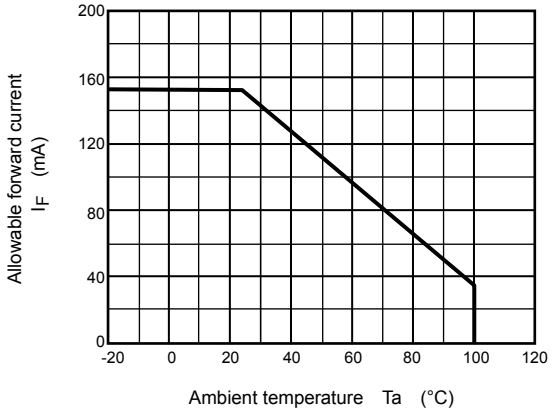
Switching Characteristics (Ta = 25°C)

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	—	

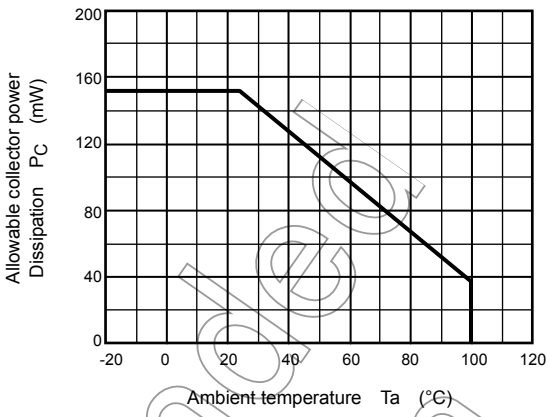
Fig. 1 Switching time test circuit



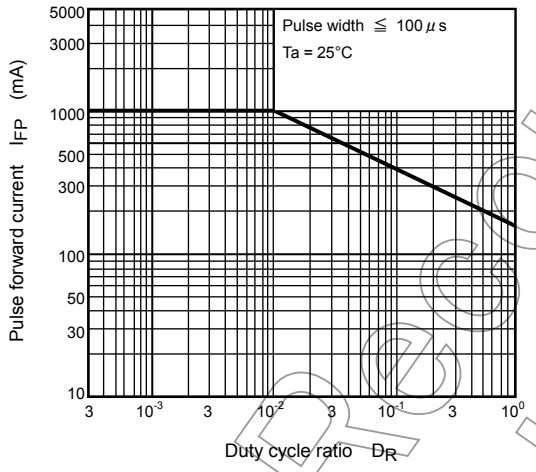
I_F – Ta



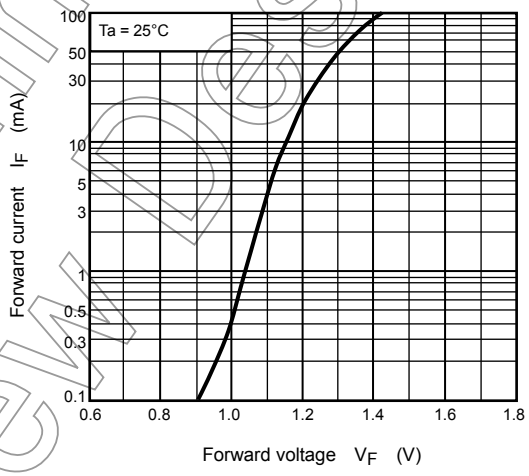
P_C – Ta



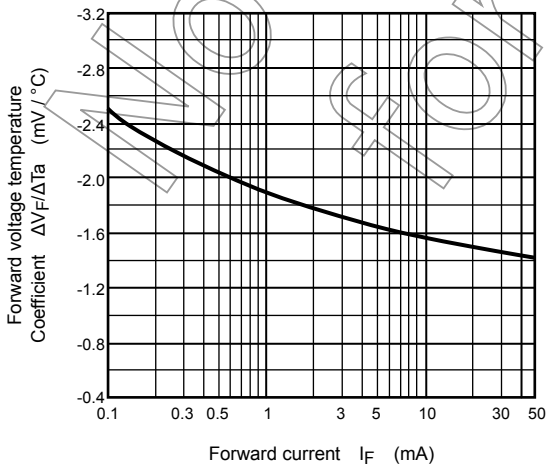
I_{FP} – D_R



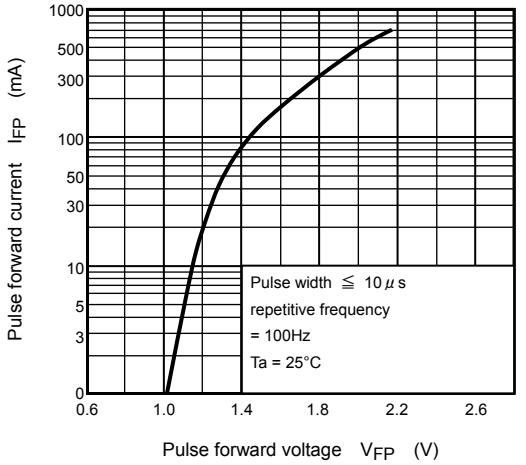
I_F – V_F



$\Delta V_F/\Delta Ta$ – I_F



I_{FP} – V_{FP}



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