TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

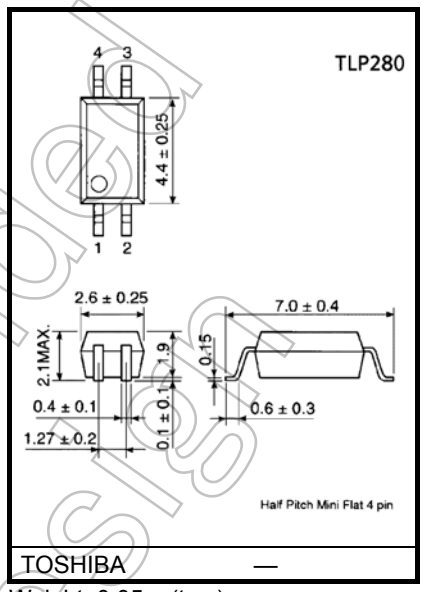
TLP280,TLP280−4

Programmable Controllers

AC/DC−Input Module

PC Card Modem (PCMCIA)

Unit in mm

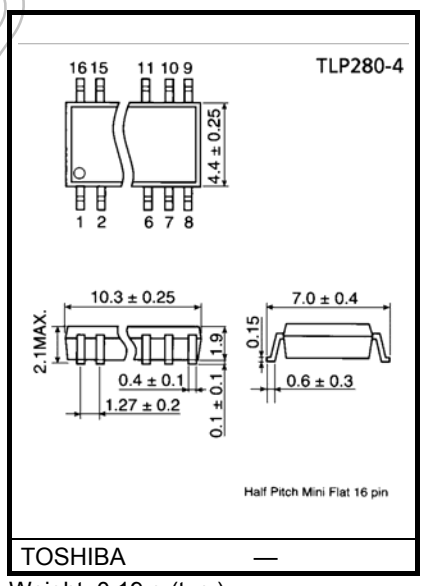


Weight: 0.05 g (typ.)

TLP280 and TLP280−4 is a very small and thin coupler, suitable for surface mount assembly in applications such as PCMCIA fax modem, programmable controllers.

TLP280 and TLP280−4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current

- Collector−emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)
  Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN 60065: 2002,
  BS EN 60950-1: 2002
  Certificate No. 8143, 8144

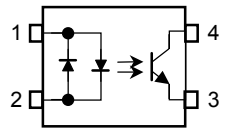


Weight: 0.19 g (typ.)

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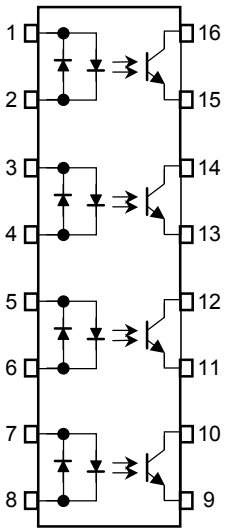
Pin Configuration (top view)

TLP280



1 : Anode
Cathode
2 : Cathode
Anode
3 : Emitter
4 : Collector

TLP280-4



1,3,5,7 : Anode-
Cathode
2,4,6,8 : Cathode
Anode
9,11,13,15 : Emitter
10,12,14,16 : Collector

Not Recommended for New Design

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280−4	
LED	Forward current	$I_{F(RMS)}$	±50		mA
	Forward current derating	ΔI_F /°C	−0.7 (Ta ≥ 53°C)	−0.5 (Ta ≥ 25°C)	mA /°C
	Pulse forward current	I_{FP}	±1 (100μs pulse, 100pps)		A
	Junction temperature	T_j	125		°C
Detector	Collector−emitter voltage	V_{CEO}	80		V
	Emitter−collector voltage	V_{ECO}	7		V
	Collector current	I_C	50		mA
	Collector power dissipation (1 circuit)	P_C	150	100	mW
	Collector power dissipation derating (Ta ≥ 25°C) (1 circuit)	ΔP_C /°C	−1.5	−1.0	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		T_{sol}	260 (10s)		°C
Total package power dissipation (1 circuit)		P_T	200	170	mW
Total package power dissipation derating (Ta ≥ 25°C) (1 circuit)		ΔP_T /°C	−2.0	−1.7	mW /°C
Isolation voltage (Note)		BV_S	2500 (AC, 1min., R.H.≤ 60%)		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): Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Not Recommended for New Design

Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
LED	Forward voltage	V_F	I_F = ±10 mA	1.0	1.15	1.3	V
	Capacitance	C_T	V = 0, f = 1 MHz	—	60	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5 mA	80	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current (Note 1)	I_{CEO}	V_{CE} = 48 V, Ambient light below (100 1x)	—	0.01 (2)	0.1 (10)	μA
			V_{CE} = 48 V, Ta = 85°C Ambient light below (100 1x)	—	2 (4)	50 (50)	μA
	Capacitance (collector to emitter)	C_{CE}	V = 0, f = 1 MHz	—	10	—	pF

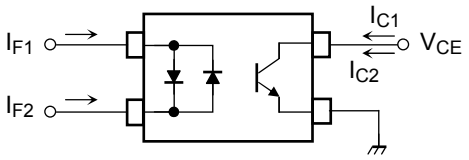
(Note 1): Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	MIn	Typ.	Max	Unit
Current transfer ratio	I_C / I_F	I_F = ±5 mA, V_{CE} = 5 V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = ±1 mA, V_{CE} = 0.4 V	—	60	—	%
		Rank GB	30	—	—	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = ±8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = ±1 mA	—	0.2	—	
		Rank GB	—	—	0.4	
Off−state collector current	$I_{C(off)}$	V_F = ± 0.7 V, V_{CE} = 48 V	—	—	10	μA
CTR symmetry	$I_{C\ (ratio)}$	I_C (I_F = −5 mA) / I_C (I_F = 5 mA) (Note 2)	0.33	—	3	—

(Note 2):

$$I_{C(ratio)} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5V)}{I_{C1}(I_F = I_{F1}, V_{CE} = 5V)}$$



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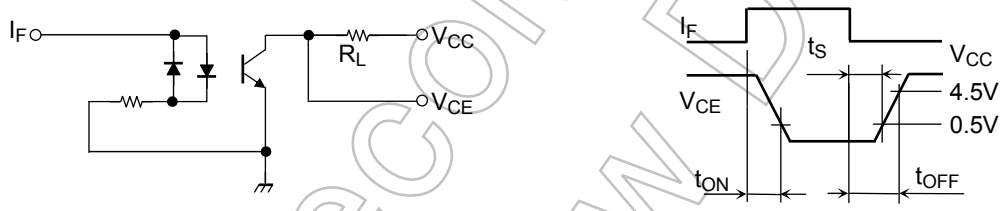
Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0V, 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	2500	—	—	V_{rms}
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V_{dc}

Switching Characteristics (Ta = 25°C)

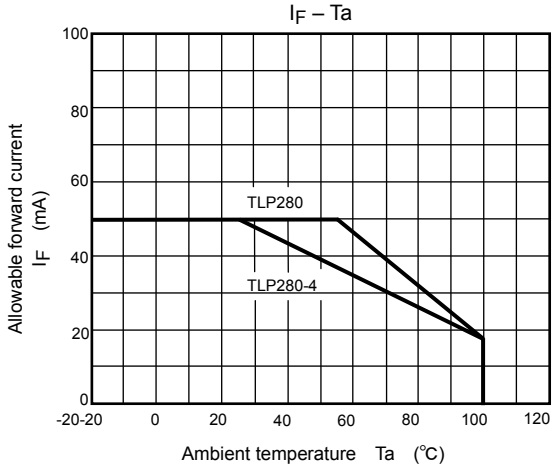
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	2	—	μs
Fall time	t_f		—	3	—	
Turn−on time	t_{on}		—	3	—	
Turn−off time	t_{off}		—	3	—	
Turn−on time	t_{ON}	R_L = 1.9 kΩ (Fig.1) V_{CC} = 5 V, I_F = ±16 mA	—	2	—	μs
Storage time	t_s		—	25	—	
Turn−off time	t_{OFF}		—	40	—	

(Fig. 1): Switching time test circuit

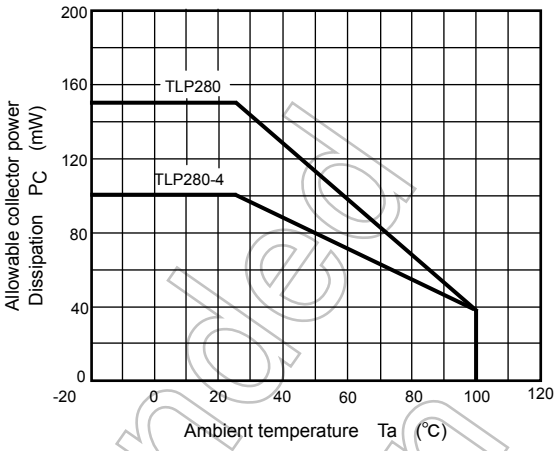


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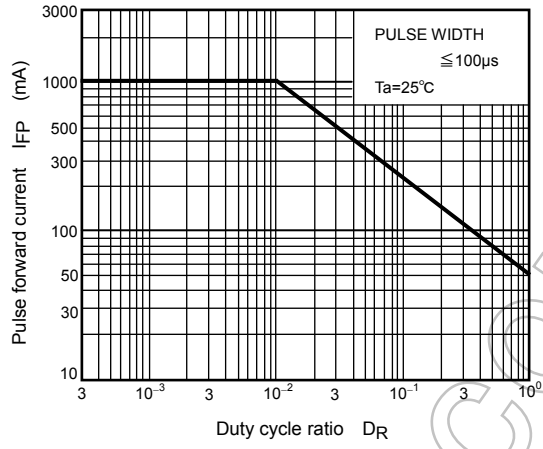
I_F – Ta



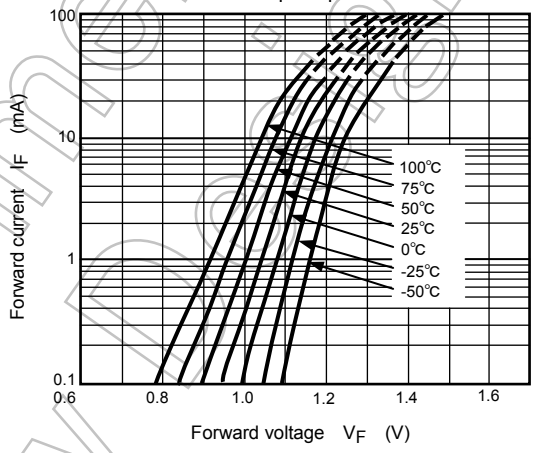
P_C – Ta



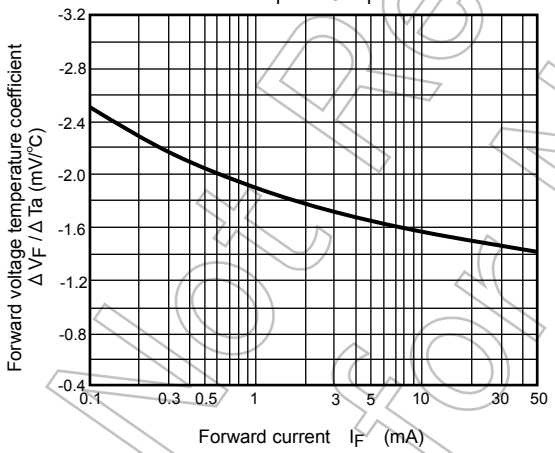
I_{FP} – D_R



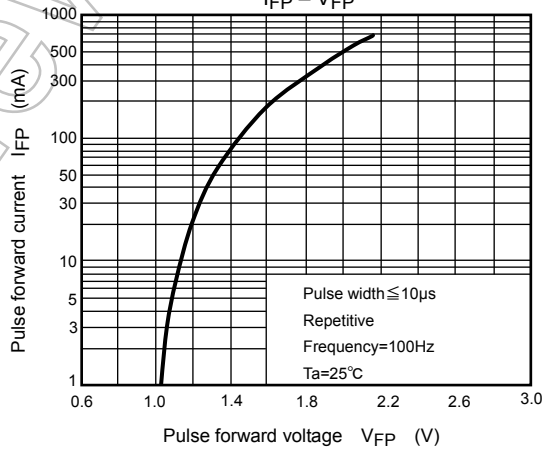
I_F – V_F



$\Delta V_F / \Delta Ta$ – I_F

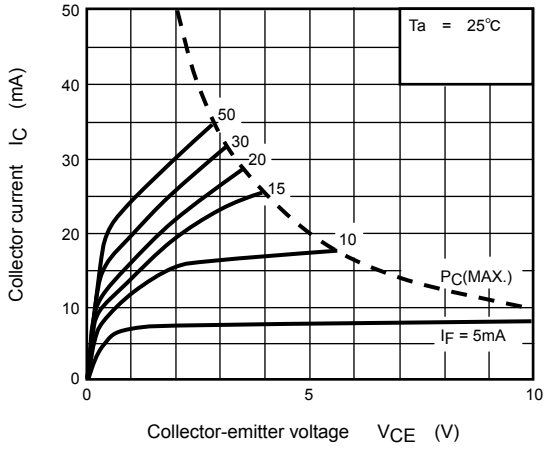


I_{FP} – V_{FP}

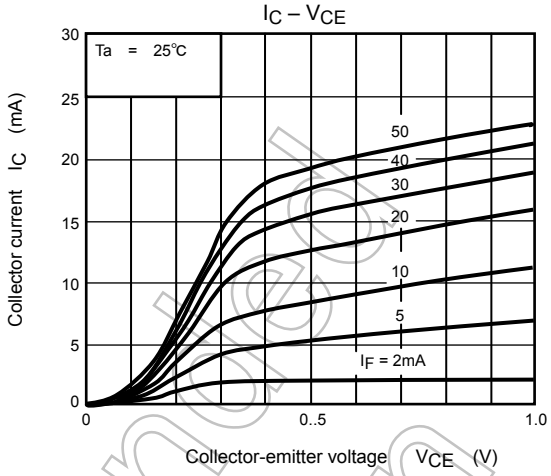


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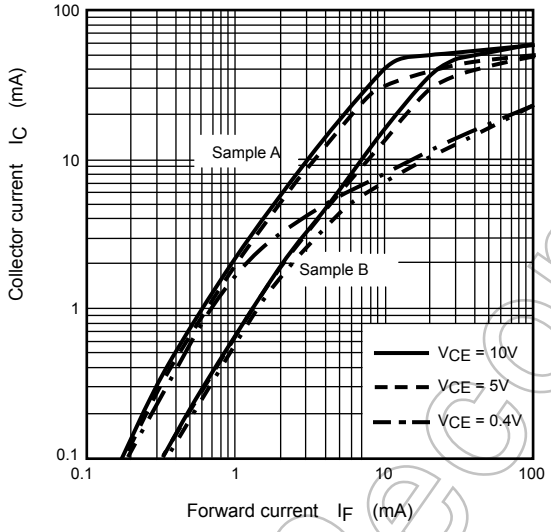
$I_C - V_{CE}$



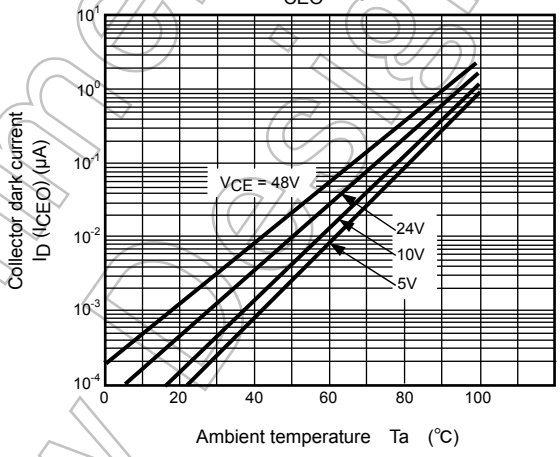
$I_C - V_{CE}$



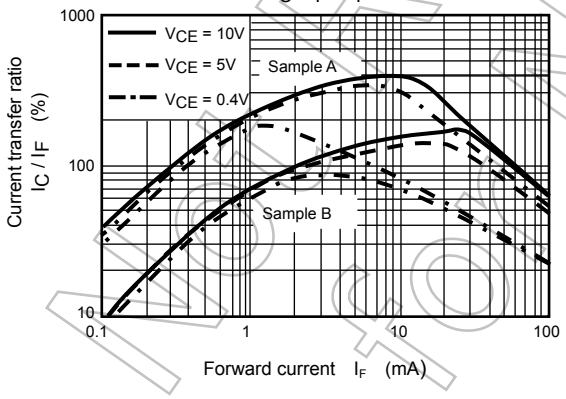
$I_C - I_F$



$I_{CEO} - Ta$

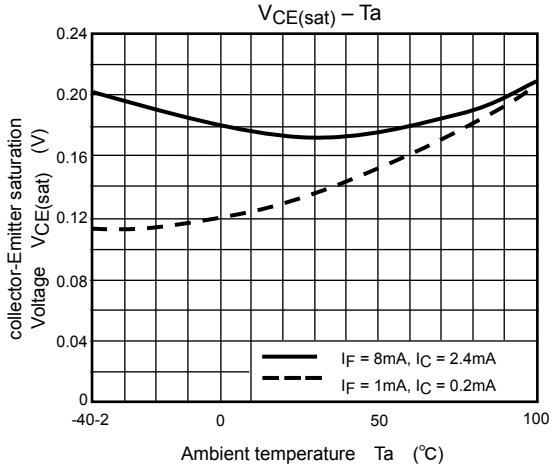


$I_C / I_F - I_F$

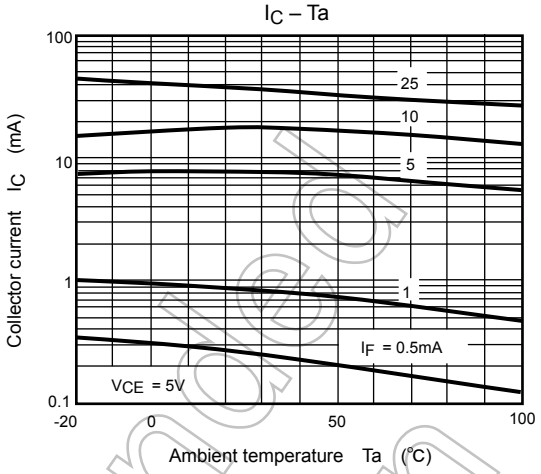


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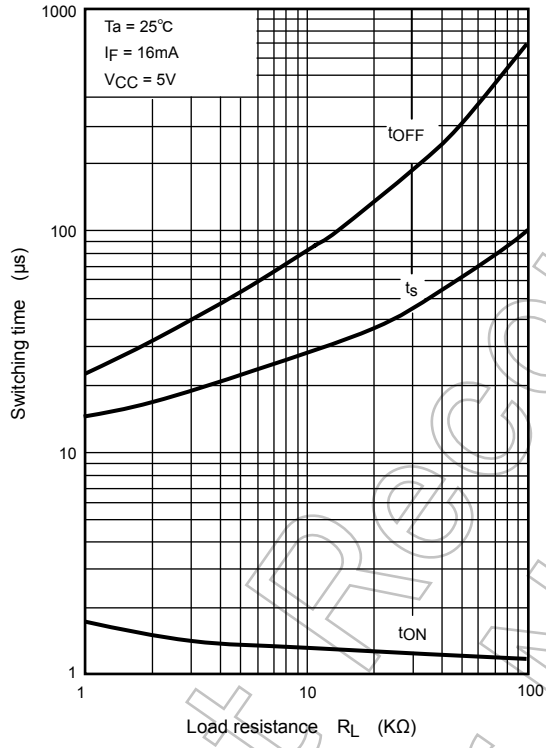
$V_{CE(sat)}$ – Ta



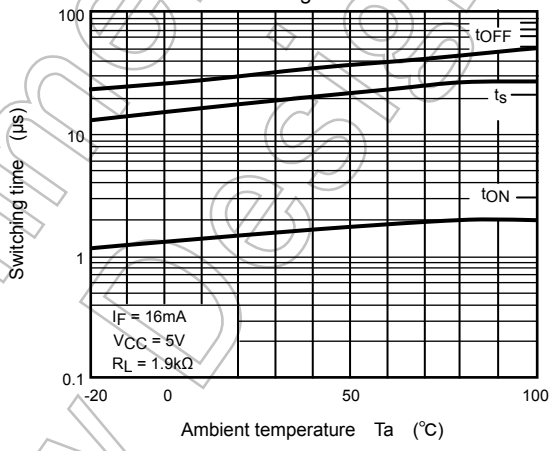
I_C – Ta



Switching Time– R_L



Switching Time– Ta



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