

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP280, TLP280-4

Programmable Controllers

AC/DC-Input Module

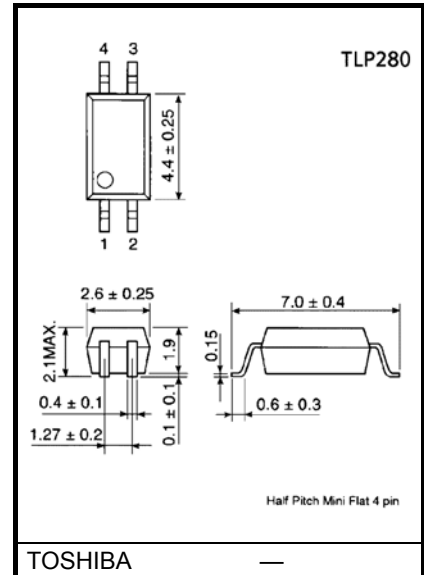
PC Card Modem (PCMCIA)

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.

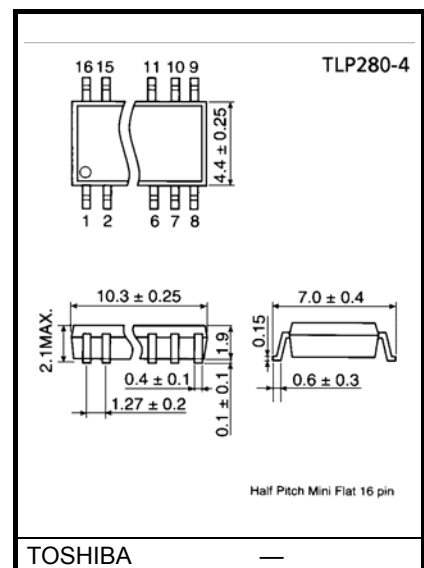
TLP280 and TLP280-4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current

- 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

Unit in mm

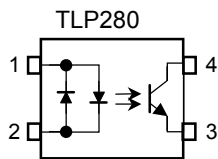


Weight: 0.05 g (typ.)

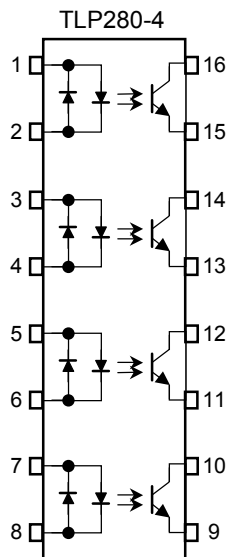


Weight: 0.19 g (typ.)

Pin Configuration (top view)



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



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

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280-4	
LED	Forward current	$I_{F(RMS)}$	± 50		mA
	Forward current derating	$\Delta I_F / ^\circ C$	-0.7 (Ta $\geq 53^\circ C$)	-0.5 (Ta $\geq 25^\circ C$)	mA / $^\circ C$
	Pulse forward current	I_{FP}	± 1 (100 μs pulse, 100pps)		A
	Junction temperature	T_j	125		$^\circ C$
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 $\geq 25^\circ C$) (1 circuit)	$\Delta P_C / ^\circ C$	-1.5	-1.0	mW / $^\circ C$
	Junction temperature	T_j	125		$^\circ C$
Storage temperature range		T_{stg}	-55~125		$^\circ C$
Operating temperature range		T_{opr}	-55~100		$^\circ C$
Lead soldering temperature		T_{sol}	260 (10s)		$^\circ C$
Total package power dissipation (1 circuit)		P_T	200	170	mW
Total package power dissipation derating (Ta $\geq 25^\circ C$) (1 circuit)		$\Delta P_T / ^\circ C$	-2.0	-1.7	mW / $^\circ C$
Isolation voltage (Note)		BV_S	2500 (AC, 1min., R.H. $\leq 60\%$)		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.

Individual Electrical Characteristics (Ta = 25°C)

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

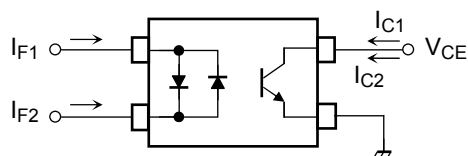
(Note 1): Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

Coupled Electrical Characteristics (Ta = 25°C)

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

(Note 2):

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



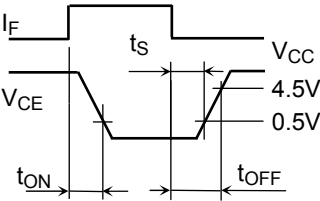
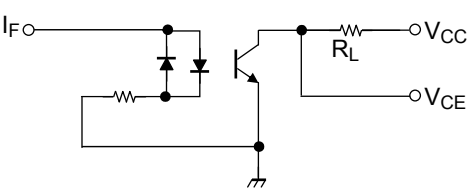
Isolation Characteristics (Ta = 25°C)

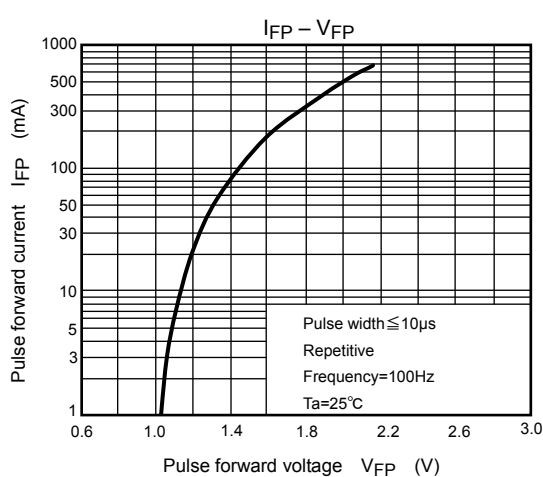
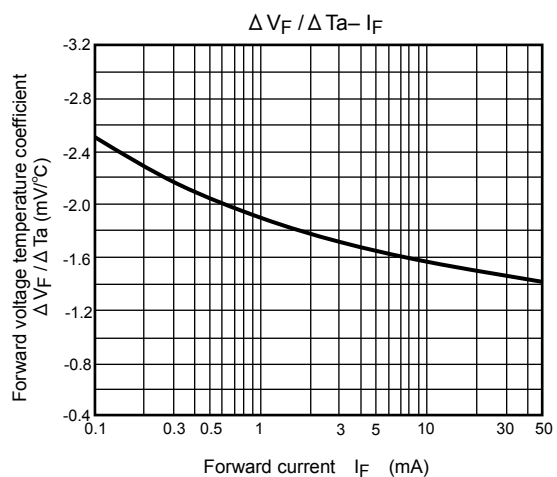
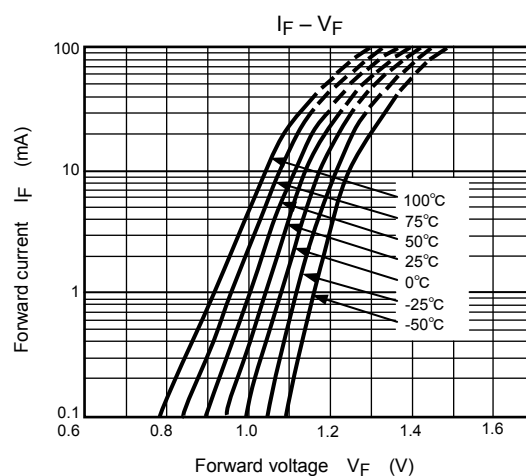
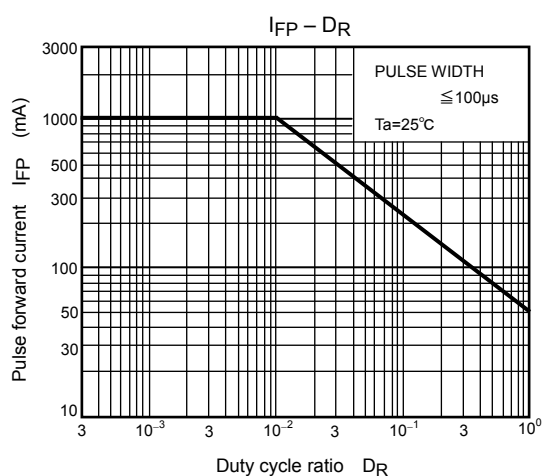
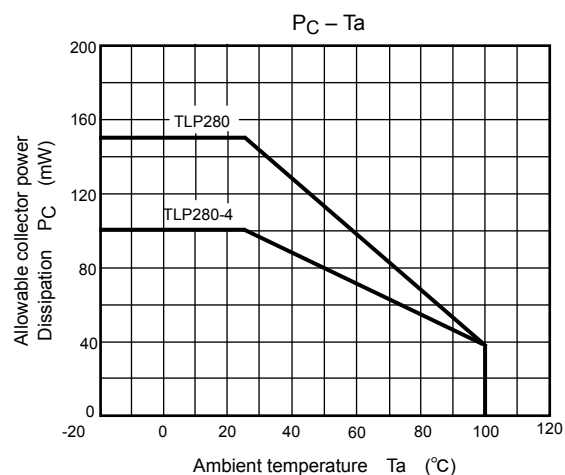
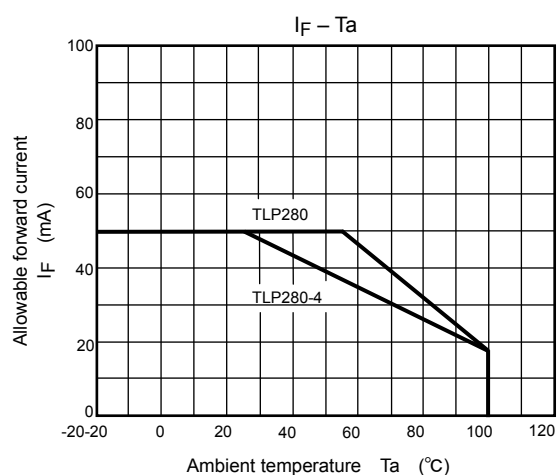
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	CS	VS = 0V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BVS	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	Vdc

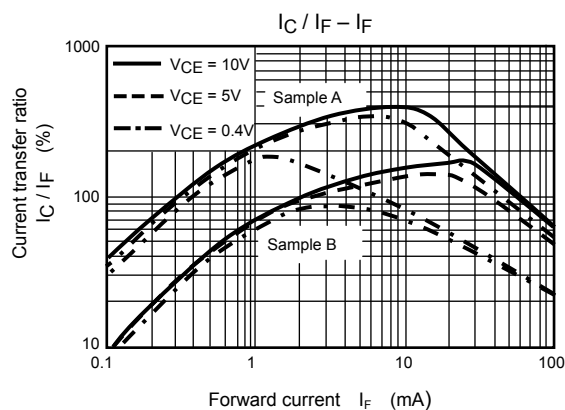
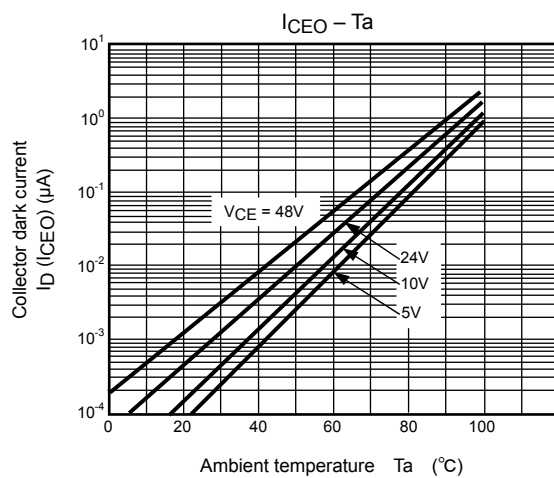
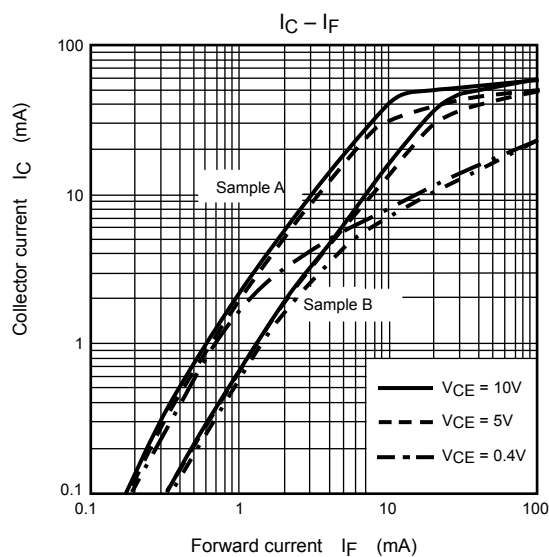
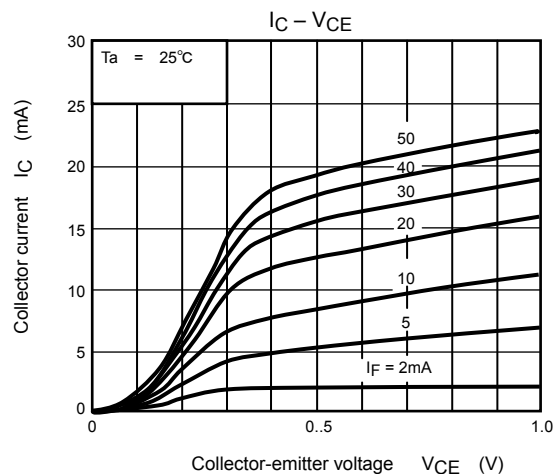
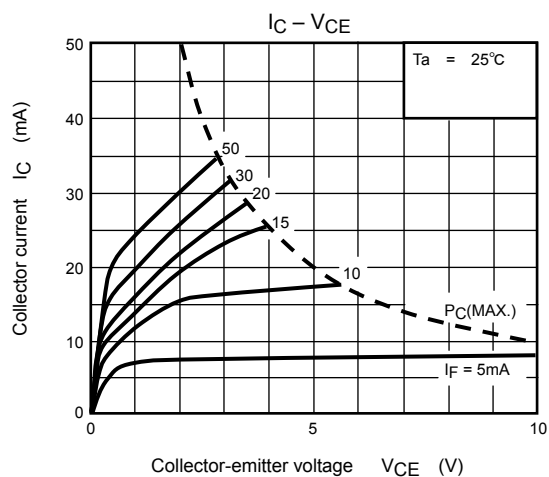
Switching Characteristics (Ta = 25°C)

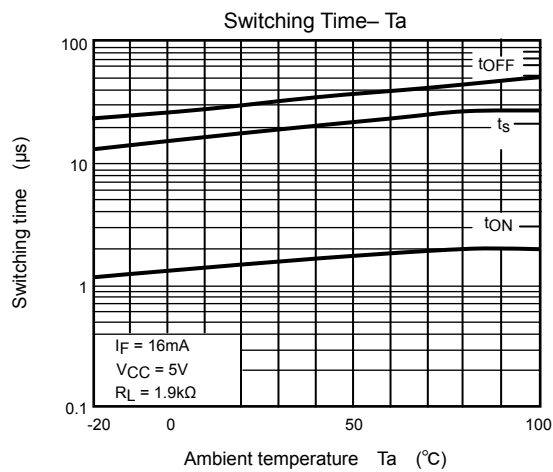
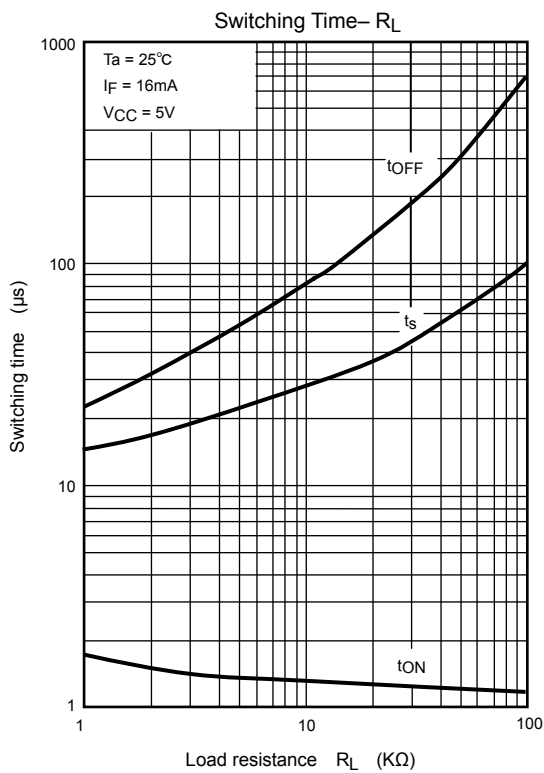
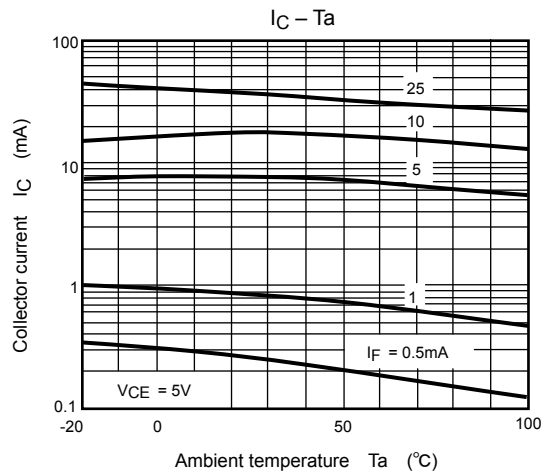
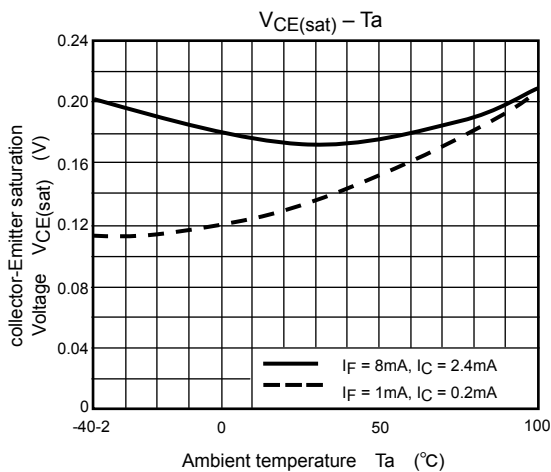
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	tr	VCC = 10 V, IC = 2 mA RL = 100Ω	—	2	—	μs
Fall time	tf		—	3	—	
Turn-on time	ton		—	3	—	
Turn-off time	toff		—	3	—	
Turn-on time	tON	RL = 1.9 kΩ VCC = 5 V, IF = ±16 mA (Fig.1)	—	2	—	μs
Storage time	ts		—	25	—	
Turn-off time	tOFF		—	40	—	

(Fig. 1): Switching time test circuit









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