

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

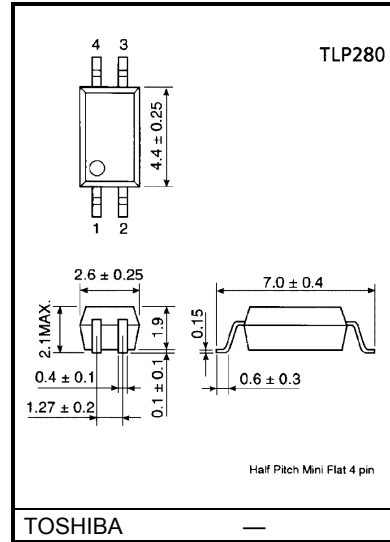
# TLP280, TLP280-4

Programmable Controllers  
 AC/DC-Input Module  
 PC Card Modem (PCMCIA)

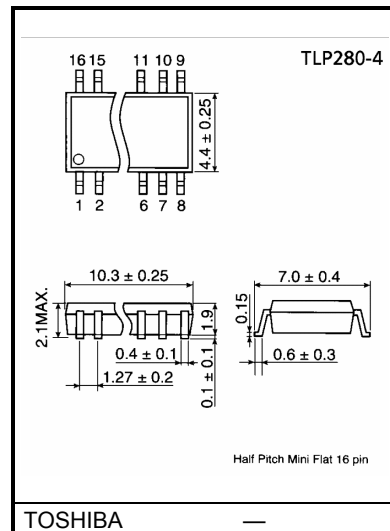
TLP280 and TLP280-4 is a very small and thin coupler, suitable for surface mount assembly in applications such as PCMCIA fax modem, programmable controllers.  
 TLP280 and TLP280-4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, 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

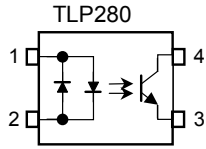


Weight: 0.05 g

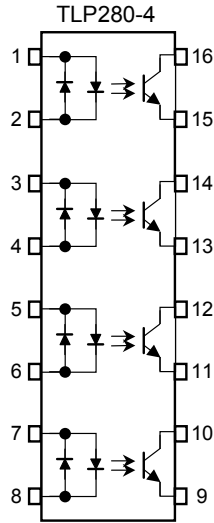


Weight: 0.19 g

**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 ≥ 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)	$\Delta P_C / ^\circ C$	-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)	$\Delta P_T / ^\circ C$	-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.

## 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)	$\mu\text{A}$
			$V_{CE} = 48 \text{ V}$ , $T_a = 85^\circ\text{C}$ Ambient light below (100 lx)	—	2 (4)	50 (50)	$\mu\text{A}$
Capacitance (collector to emitter)	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	

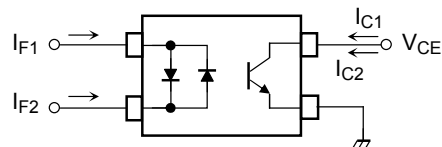
(Note 1): Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

## 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	$V_{CE} (\text{sat})$	$I_C = 2.4 \text{ mA}$ , $I_F = \pm 8 \text{ mA}$ $I_C = 0.2 \text{ mA}$ , $I_F = \pm 1 \text{ mA}$ Rank GB	—	—	0.4	V
			—	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	$\mu\text{A}$
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):

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



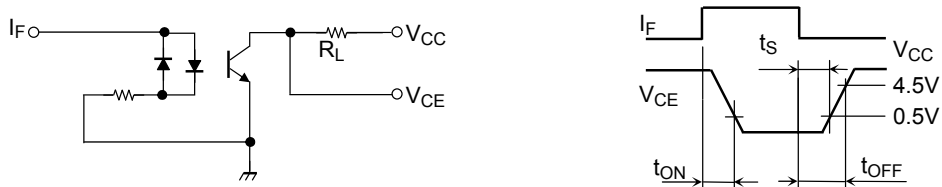
**Isolation Characteristics (Ta = 25°C)**

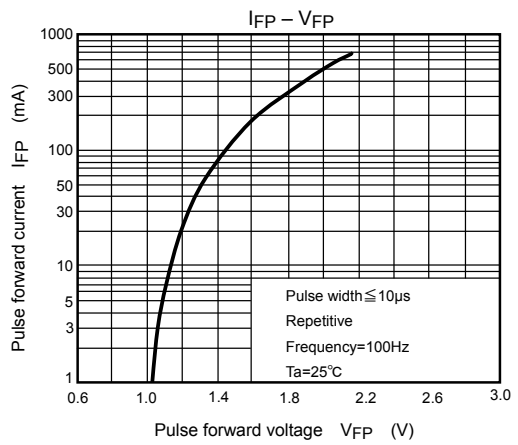
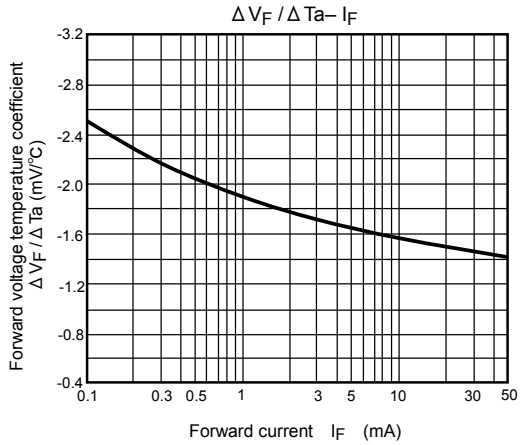
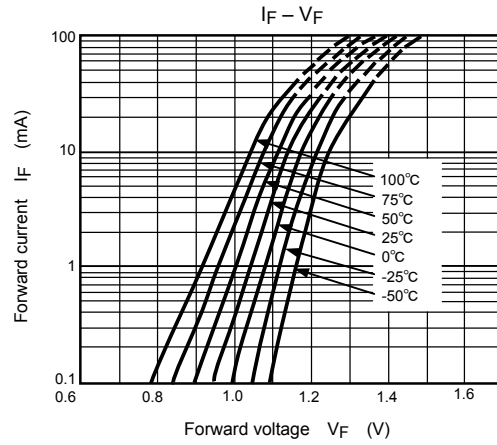
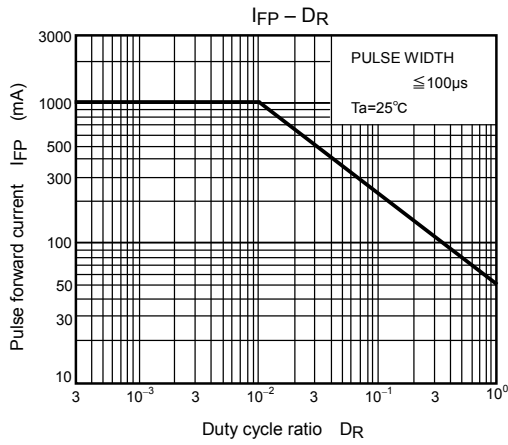
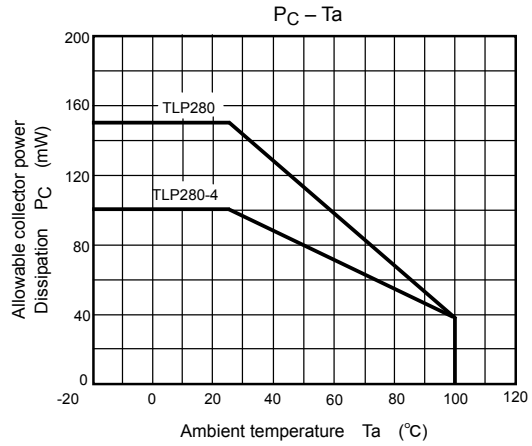
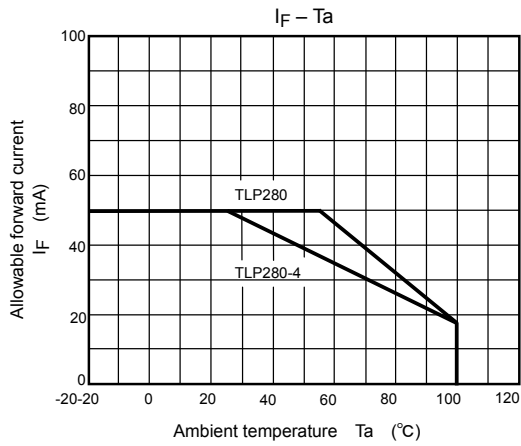
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> = 0V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	2500	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V <sub>dc</sub>

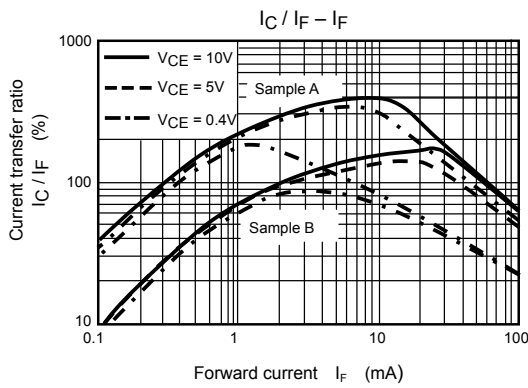
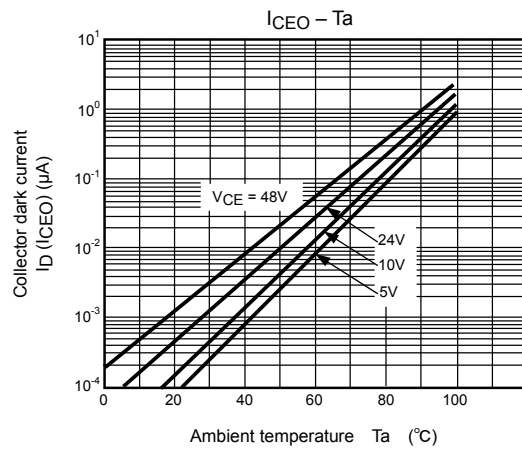
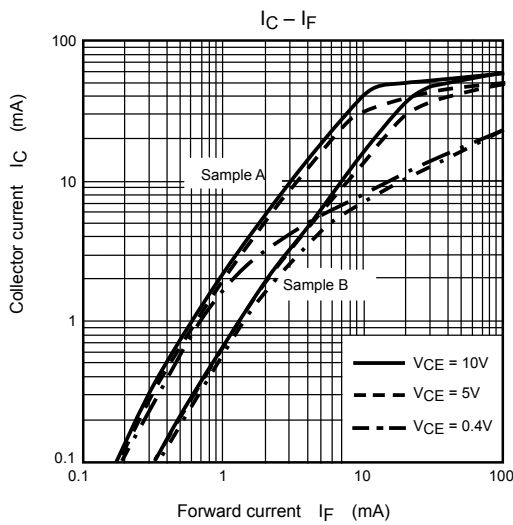
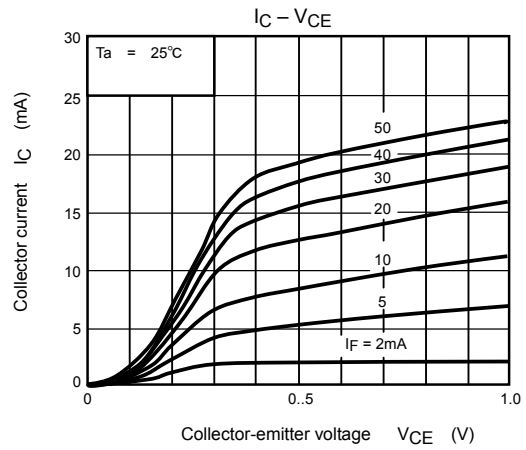
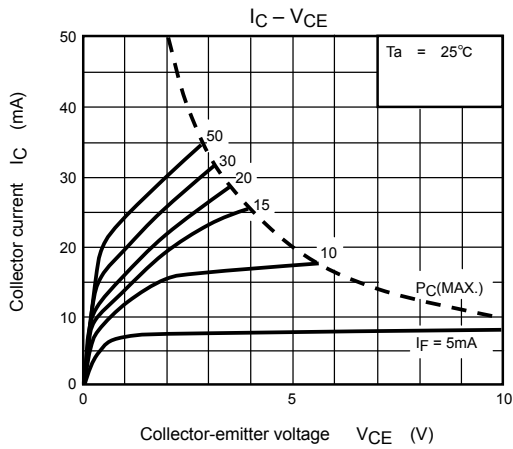
**Switching Characteristics (Ta = 25°C)**

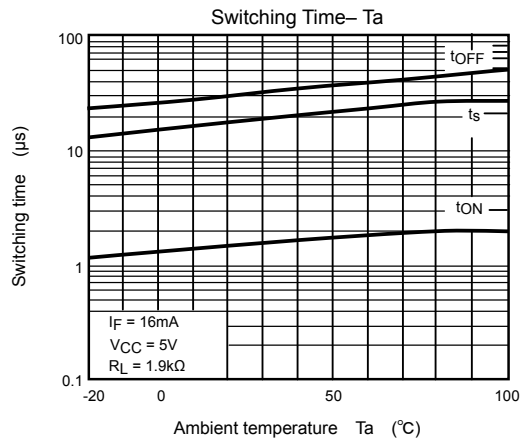
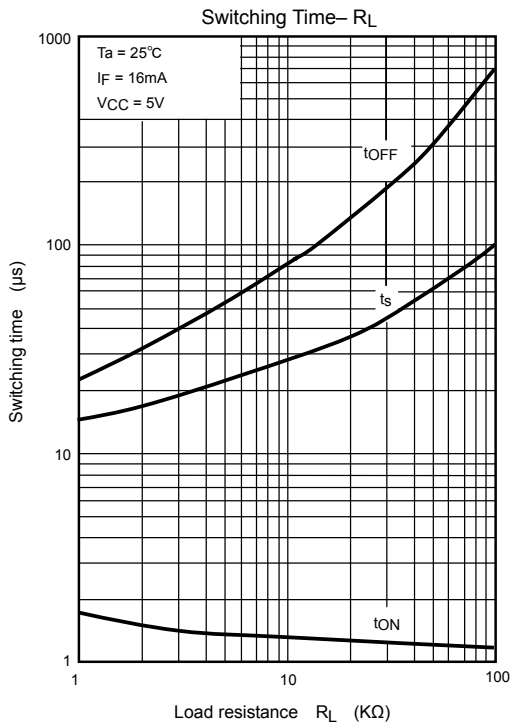
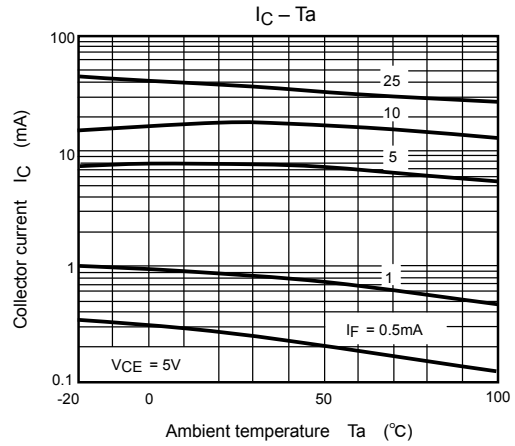
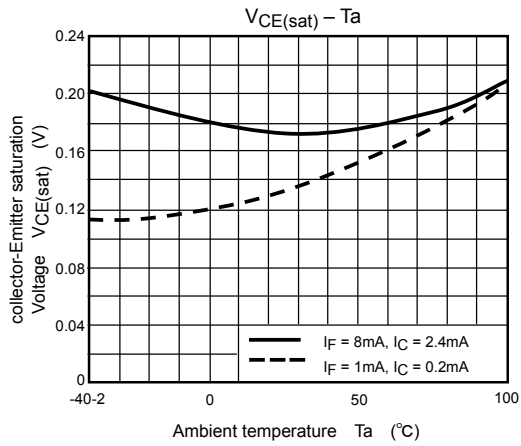
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16 mA (Fig.1)	—	2	—	μs
Storage time	t <sub>s</sub>		—	25	—	
Turn-off time	t <sub>OFF</sub>		—	40	—	

(Fig. 1): Switching time test circuit











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20070701-EN

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