

TENTATIVE

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP280, TLP280-4

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

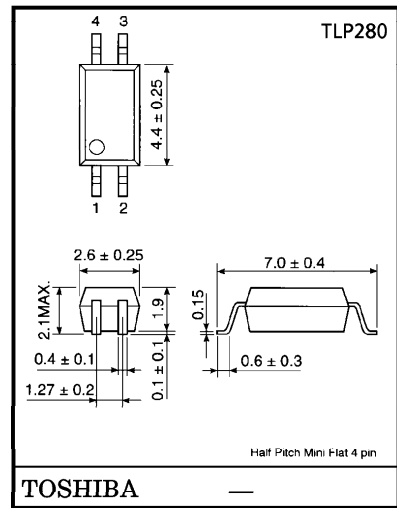
PC CARD MODEM (PCMCIA)

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.

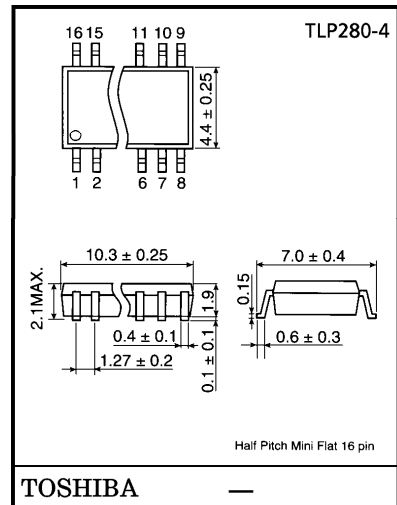
TLP280 and TLP280-4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current

- 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 : 1994,  
BS EN 41003 : 1997  
Certificate No.8143, 8144

Unit in mm



Weight : 0.05 g

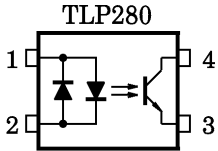


Weight : 0.19 g

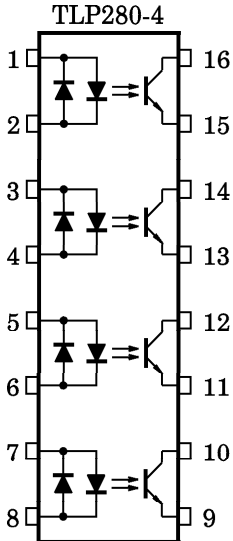
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PIN CONFIGURATION (Top view)



- 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

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING		UNIT
			TLP280	TLP280-4	
LED	Forward Current	$I_F$ (RMS)	$\pm 50$		mA
	Forward Current Derating	$\Delta I_F / ^\circ\text{C}$	$-0.7$ (Ta $\geq 53^\circ\text{C}$ )	$-0.5$ (Ta $\geq 25^\circ\text{C}$ )	mA / $^\circ\text{C}$
	Pulse Forward Current	$I_{FP}$	$\pm 1$ (100 $\mu\text{s}$ pulse, 100 pps)		A
	Junction Temperature	$T_j$	125		$^\circ\text{C}$
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 $\geq 25^\circ\text{C}$ ) (1 Circuit)	$\Delta P_C / ^\circ\text{C}$	$-1.5$	$-1.0$	mW / $^\circ\text{C}$
	Junction Temperature	$T_j$	125		$^\circ\text{C}$
	Storage Temperature Range	$T_{stg}$	$-55 \sim 125$		$^\circ\text{C}$
Operating Temperature Range	$T_{opr}$	$-55 \sim 100$		$^\circ\text{C}$	
Lead Soldering Temperature	$T_{sol}$	260 (10 s)		$^\circ\text{C}$	
Total Package Power Dissipation (1 Circuit)	$P_T$	200	170	mW	
Total Package Power Dissipation Derating (Ta $\geq 25^\circ\text{C}$ ) (1 Circuit)	$\Delta P_T / ^\circ\text{C}$	$-2.0$	$-1.7$	mW / $^\circ\text{C}$	
Isolation Voltage (Note)	$BV_S$	2500 (AC, 1 min., R.H. $\leq 60\%$ )		Vrms	

(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) :

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

ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Min	Typ.	Max	UNIT
Capacitance Input to Output	C <sub>S</sub>	V <sub>S</sub> = 0 V, 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> = 100 Ω	—	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 (Fig.1) V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16 mA	—	2	—	μs
Storage Time	t <sub>s</sub>		—	25	—	
Turn-Off Time	t <sub>OFF</sub>		—	40	—	

(Fig.1) : SWITCHING TIME TEST CIRCUIT

