

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP180

PROGRAMMABLE CONTROLLERS

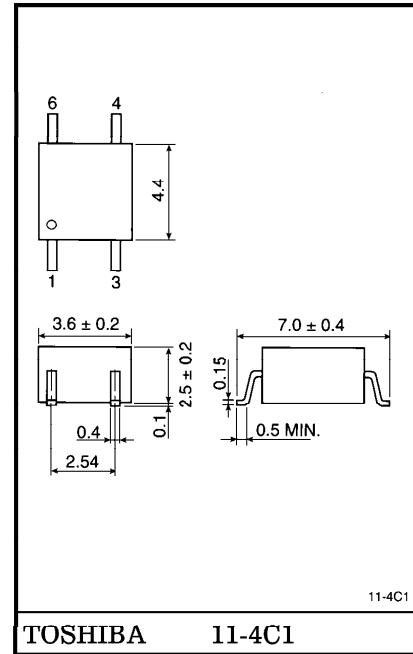
AC/DC-INPUT MODULE

TELECOMMUNICATION

The TOSHIBA MINI FLAT COUPLER TLP180 is a small outline coupler, suitable for surface mount assembly. TLP180 consist of a photo transistor, optically coupled to a gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current.

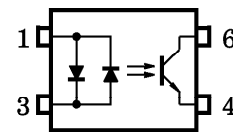
- Collector-Emitter Voltage : 80V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 3750V<sub>rms</sub> (Min.)
- UL Recognized : UL1577, File No. E67349

Unit in mm



Weight : 0.09g

PIN CONFIGURATION (TOP VIEW)



- 1 : ANODE, CATHODE
- 3 : CATHODE, ANODE
- 4 : EMITTER
- 6 : COLLECTOR

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● Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	I <sub>F</sub> (RMS)	±50	mA
	Forward Current Derating (Ta ≥ 53°C)	ΔI <sub>F</sub> / °C	-0.7	mA / °C
	Pulse Forward Current (Note 1)	I <sub>FP</sub>	±1	A
	Junction Temperature	T <sub>j</sub>	125	°C
DETECTOR	Collector-Emitter Voltage	V <sub>CEO</sub>	80	V
	Emitter-Collector Voltage	V <sub>ECO</sub>	7	V
	Collector Current	I <sub>C</sub>	50	mA
	Power Dissipation	P <sub>C</sub>	150	mW
	Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction Temperature	T <sub>j</sub>	125	°C
Storage Temperature Range		T <sub>stg</sub>	-55~125	°C
Operating Temperature Range		T <sub>opr</sub>	-55~100	°C
Lead Soldering Temperature (10s)		T <sub>sol</sub>	260	°C
Total Package Power Dissipation		P <sub>T</sub>	200	mW
Total Package Power Dissipation Derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-2.0	mW / °C
Isolation Voltage (AC, 1 min., R.H. ≤ 60%) (Note 2)		BV <sub>S</sub>	3750	V <sub>rms</sub>

Note 1 : Pulse width ≤ 100 μs, f = 100Hz

Note 2 : Device considered a two terminal device : Pins 1 and 3 shorted together and 4 and 6 shorted together.

## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>CC</sub>	—	5	48	V
Forward Current	I <sub>F</sub> (RMS)	—	16	20	mA
Collector Current	I <sub>C</sub>	—	1	10	mA
Operating Temperature	T <sub>opr</sub>	-25	—	85	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

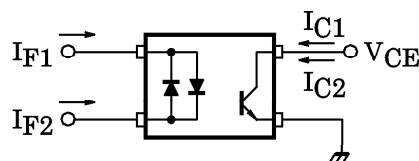
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = ±10mA	1.0	1.15	1.3	V
	Capacitance	C <sub>T</sub>	V = 0, f = 1MHz	—	60	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	V (BR) CEO	I <sub>C</sub> = 0.5mA	80	—	—	V
	Emitter-Collector Breakdown Voltage	V (BR) ECO	I <sub>E</sub> = 0.1mA	7	—	—	V
	Collector Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 48V (Ambient Light) Below 1000 lx (Note 3)	—	0.01 (2)	0.1 (10)	μA
			V <sub>CE</sub> = 48V (Ambient Light) Ta = 85°C Below 1000 lx (Note 3)	—	2 (4)	50 (50)	μA
Capacitance (Collector to Emitter)	C <sub>CE</sub>	V = 0, f = 1MHz	—	10	—	pF	

Note 3 : Please use standard electric lamp to light up the device's marking surface.

COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = ±5mA, V <sub>CE</sub> = 5V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I <sub>C</sub> / I <sub>F</sub> (sat)	I <sub>F</sub> = ±1mA, V <sub>CE</sub> = 0.4V Rank GB	—	60	—	%
			30	—	—	
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = ±8mA I <sub>C</sub> = 0.2mA, I <sub>F</sub> = ±1mA Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-State Collector Current	I <sub>C</sub> (off)	V <sub>F</sub> = ±0.7V, V <sub>CE</sub> = 48V	—	1	10	μA
CTR Symmetry	I <sub>C</sub> (ratio)	I <sub>C</sub> (I <sub>F</sub> = -5mA) / I <sub>C</sub> (I <sub>F</sub> = 5mA) (Note 4)	0.33	1	3	—

$$\text{Note 4 : } I_C (\text{ratio}) = \frac{I_{C2} (I_F = I_{F2}, V_{CE} = 5V)}{I_{C1} (I_F = I_{F1}, V_{CE} = 5V)}$$



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=1MHz	—	0.8	—	pF
Isolation Resistance	R <sub>S</sub>	V <sub>S</sub> =500V, R.H.≤60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	3750	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

SWICHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t <sub>r</sub>	V <sub>CC</sub> =10V, I <sub>C</sub> =2mA 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> =1.9kΩ (Fig.1) V <sub>CC</sub> =5V, I <sub>F</sub> =±16mA	—	2	—	μs
Storage Time	t <sub>s</sub>		—	25	—	
Turn-Off Time	t <sub>OFF</sub>		—	40	—	

Fig.1 : Switching time test circuit

