

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP180

Programmable Controllers

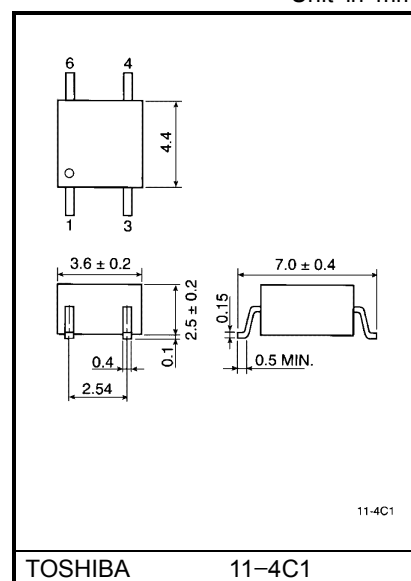
AC / DC-Input Module

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.

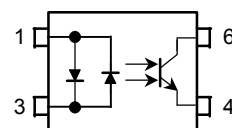
- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 50% (min.)
Rank GB: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file No. E67349

Unit in mm



Weight: 0.09 g

Pin Configuration (top view)



- 1: Anode, Cathode
- 3: Cathode, Anode
- 4: Emitter
- 6: Collector

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_{F(RMS)}$	±50	mA
	Forward current derating (Ta≥53°C)	$\Delta I_F / ^\circ C$	-0.7	mA / °C
	Pulse forward current (Note1)	I_{FP}	±1	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
	Power dissipation	P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_C / ^\circ C$	-1.5	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(10s)		T_{sol}	260	°C
Total package power dissipation		P_T	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		$\Delta P_T / ^\circ C$	-2.0	mW / °C
Isolation voltage (AC, 1min., R.H. ≤ 60%) (Note 2)		BV_S	3750	Vrms

Note 1: Pulse width ≤ 100μs, 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_{CC}	—	5	48	V
Forward current	$I_{F(RMS)}$	—	16	20	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	-25	—	85	°C

Electrical Characteristics (Ta = 25°C)

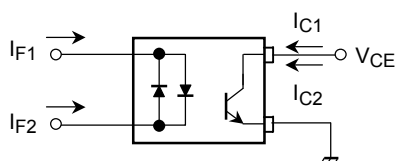
Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	$I_F = \pm 10 \text{ mA}$	1.0	1.15	1.3	V
	Capacitance	C_T	$V = 0, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR) CEO}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR) ECO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	I_{CEO}	$V_{CE} = 48 \text{ V}$ (ambient light below 1000Lx) (Note3)	—	0.01 (2)	0.1 (10)	μA
			$V_{CE} = 48 \text{ V}$ (ambient light $T_a = 85^\circ\text{C}$ below 1000Lx) (Note3)	—	2 (4)	50 (50)	μA
	Capacitance (collector to emitter)	C_{CE}	$V = 0, f = 1 \text{ MHz}$	—	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_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	$I_{C(\text{off})}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 48 \text{ V}$	—	1	10	μA
CTR symmetry	$I_C (\text{ratio})$	$I_C (I_F = -5 \text{ mA}) / I_C (I_F = 5 \text{ mA})$ (Note4)	0.33	1	3	—

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



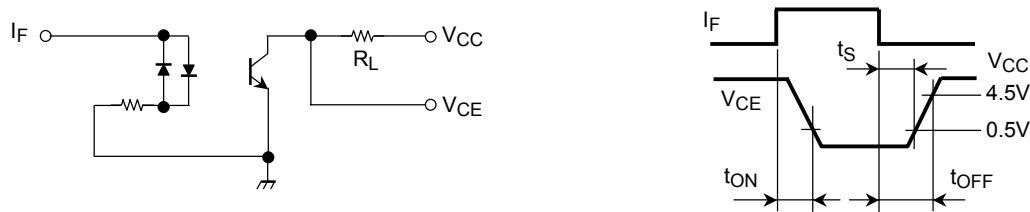
Isolation Characteristics (Ta = 25°C)

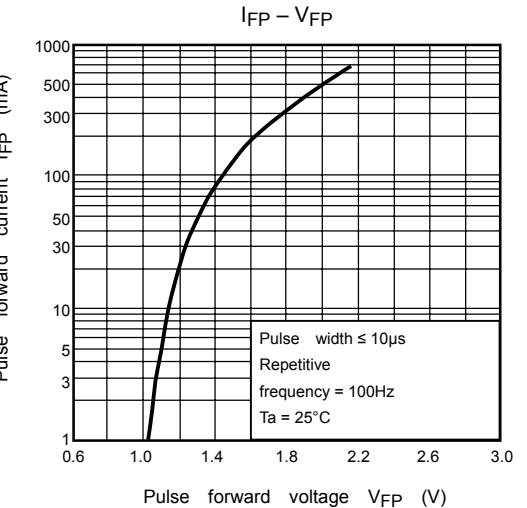
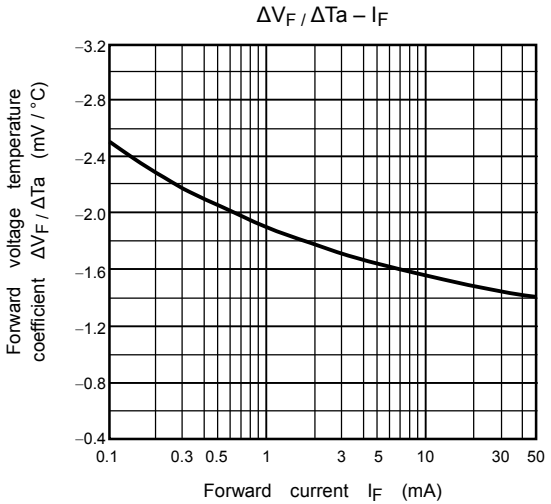
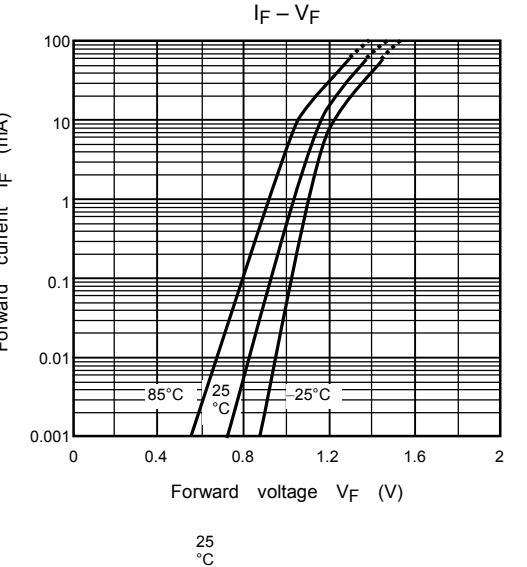
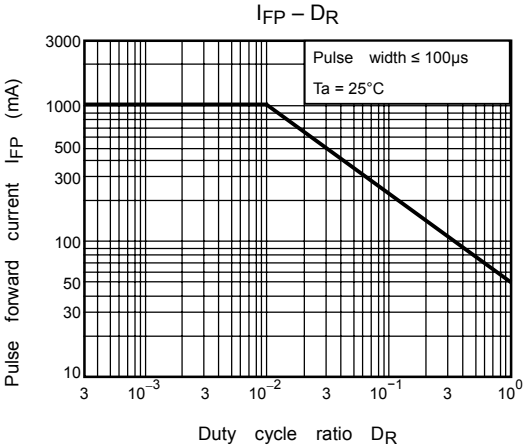
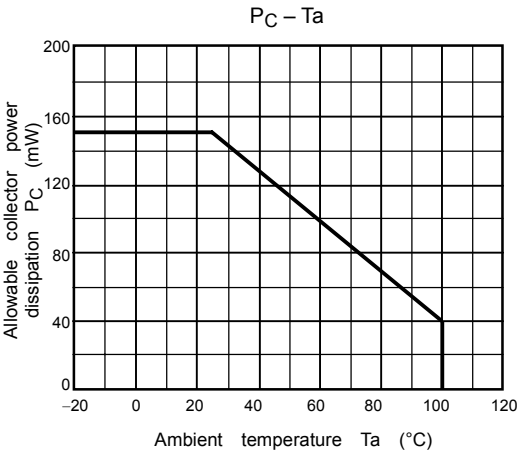
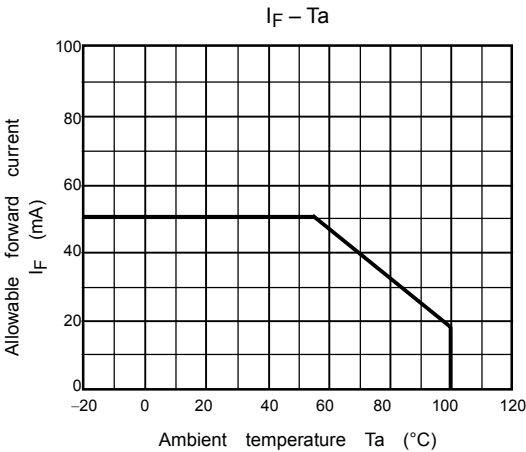
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	CS	VS = 0V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BVS	AC, 1 minute	3750	—	—	Vrms
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	Vdc

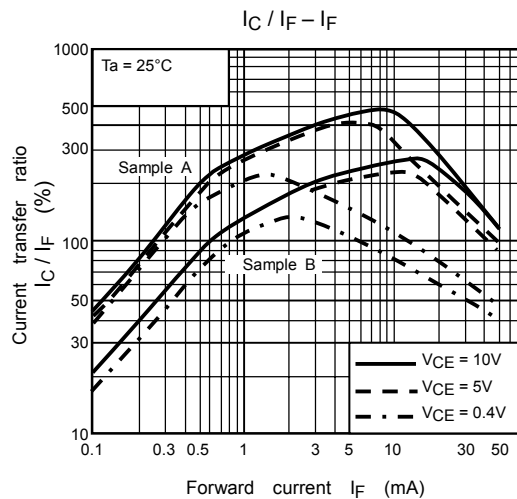
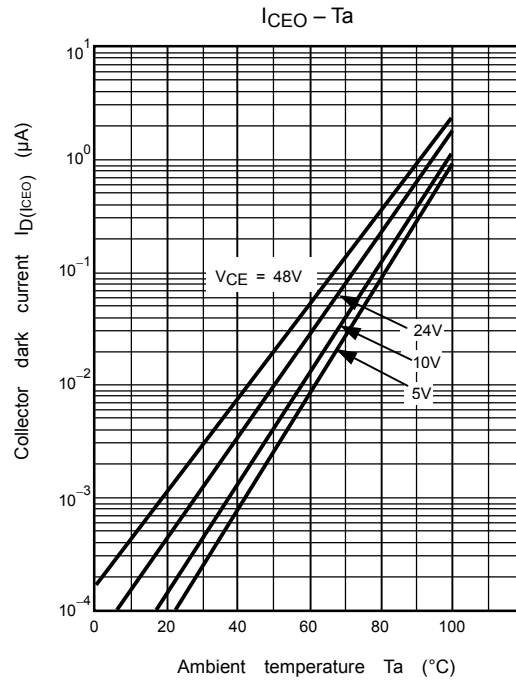
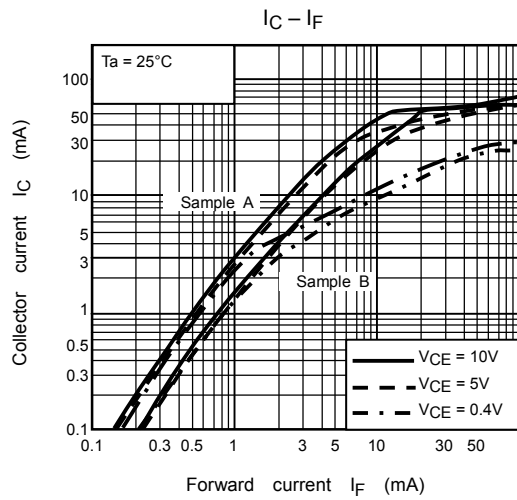
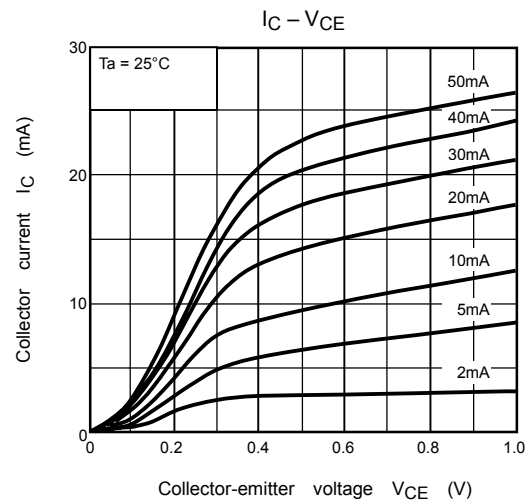
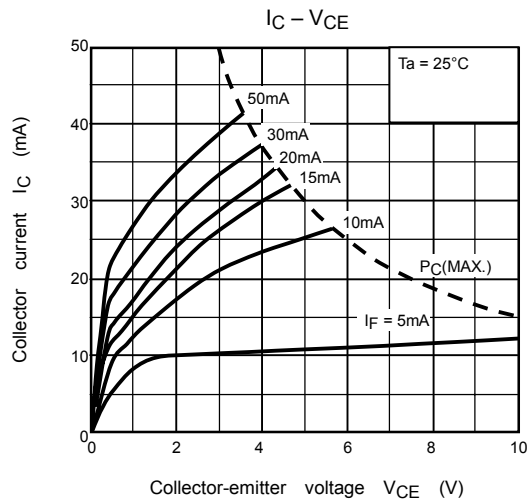
Switching Characteristics (Ta = 25°C)

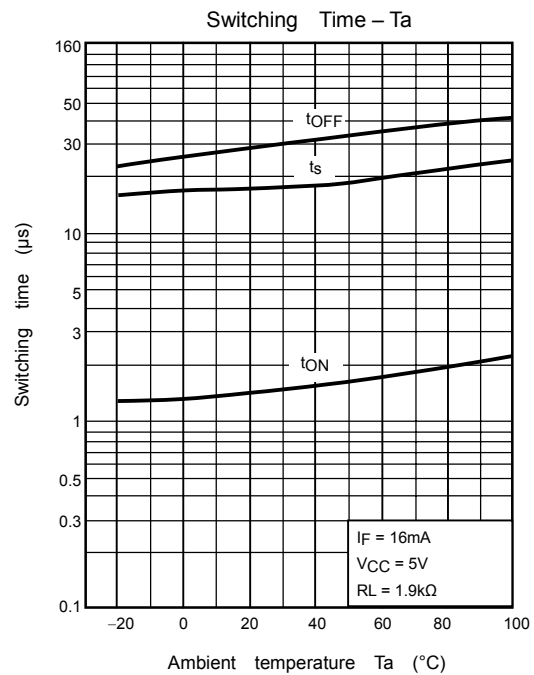
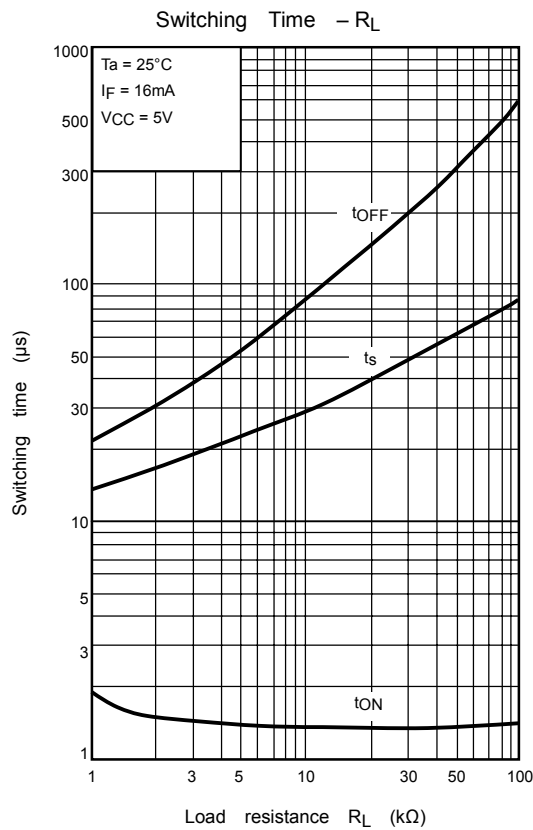
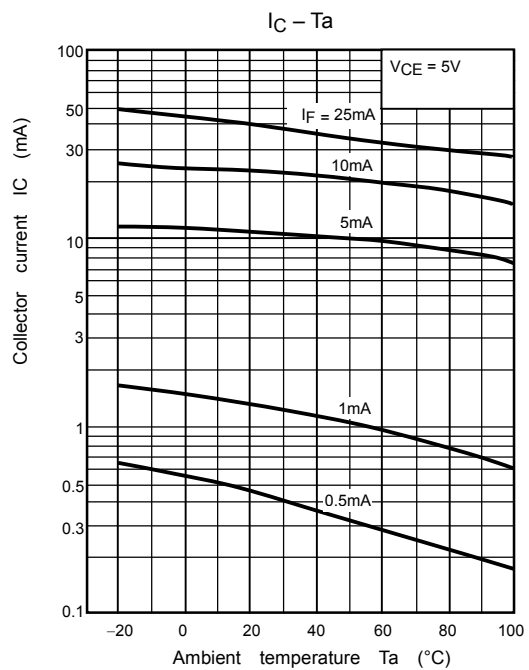
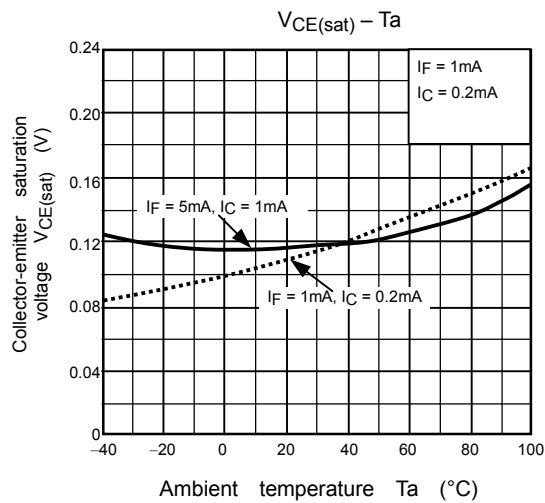
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	tr	VCC = 10 V, IC = 2 mA RL = 100Ω	—	2	—	μs
Fall time	tf		—	3	—	
Turn-on time	ton		—	3	—	
Turn-off time	toff		—	3	—	
Turn-on time	tON	RL = 1.9 kΩ VCC = 5 V, IF = ±16 mA (Fig.1)	—	2	—	μs
Storage time	ts		—	25	—	
Turn-off time	tOFF		—	40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

Fig. 1: Switching time test circuit









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