

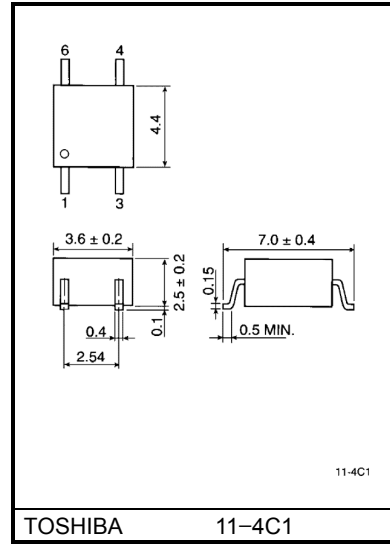
# TLP180

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.

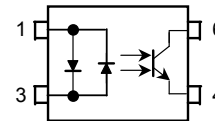
- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 50% (min.)  
 Rank GB: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065:2002, certificate no.8285  
 BS EN60950-1:2002, certificate no.8286

Unit in mm



Weight: 0.09 g

### Pin Configuration (top view)



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

**Absolute 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: 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 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

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

## Electrical Characteristics (Ta = 25°C)

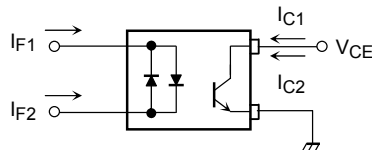
Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = \pm 10 \text{ mA}$	1.0	1.15	1.3	V
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR) CEO}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown 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)	$\mu\text{A}$
			$V_{CE} = 48 \text{ V}$ (ambient light $T_a = 85^\circ\text{C}$ below 1000Lx) (Note3)	—	2 (4)	50 (50)	$\mu\text{A}$
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	$V_{CE} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = \pm 8 \text{ mA}$ $I_C = 0.2 \text{ mA}, I_F = \pm 1 \text{ mA}$ Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-state collector current	$I_{C(\text{off})}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 48 \text{ V}$	—	1	10	$\mu\text{A}$
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	—

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



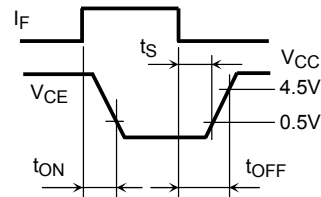
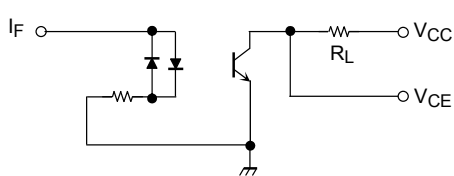
## Isolation Characteristics (Ta = 25°C)

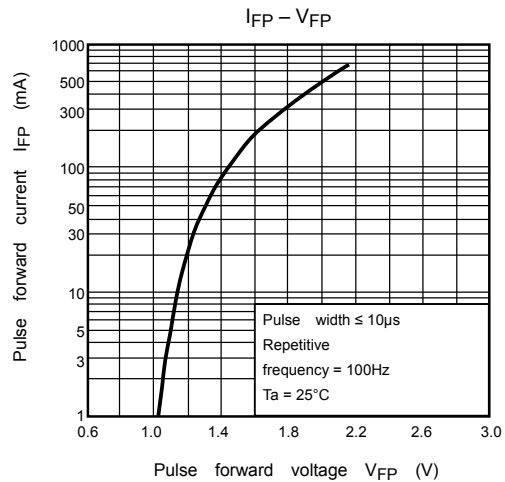
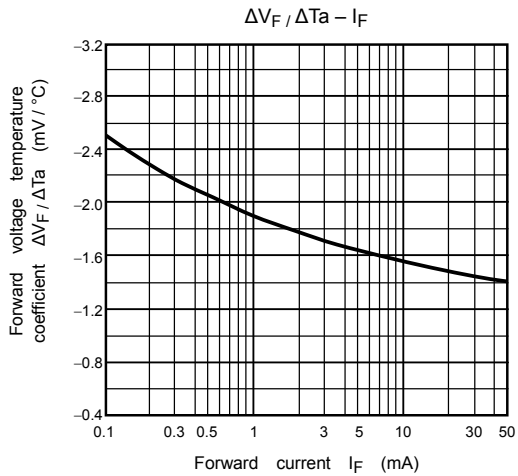
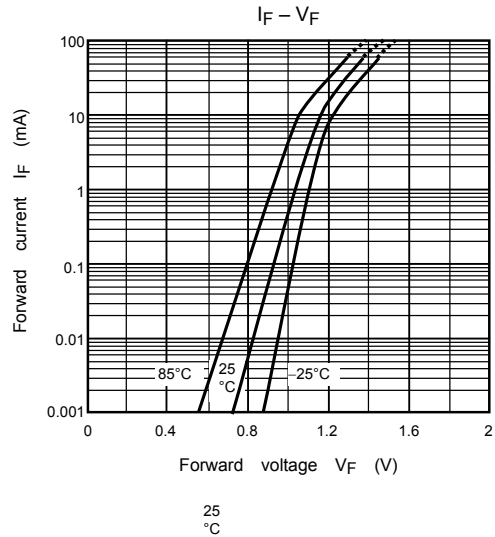
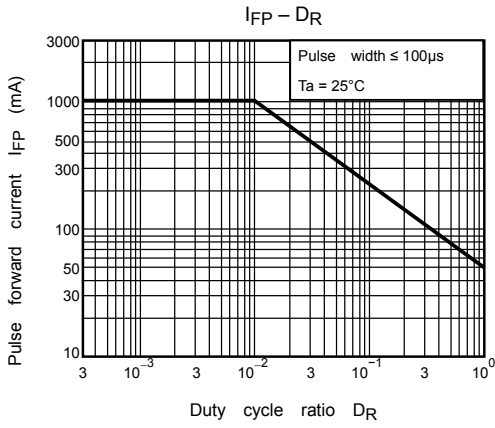
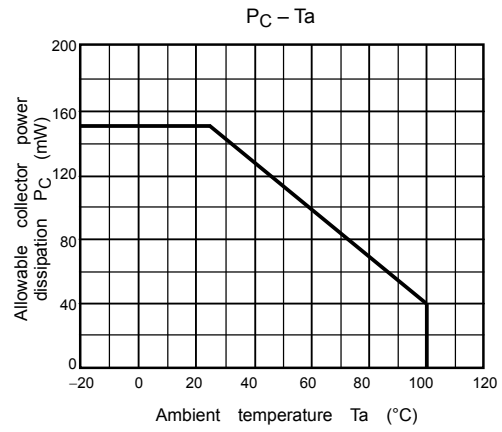
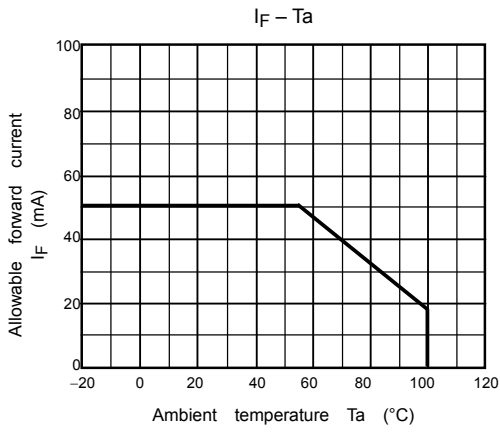
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	$C_S$	$V_S = 0V, f = 1\text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500\text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	3750	—	—	$V_{rms}$
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	$V_{dc}$

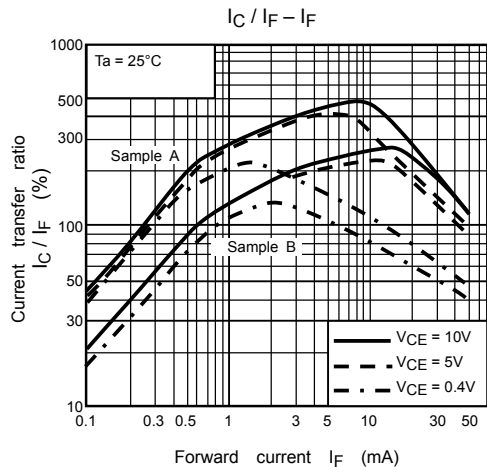
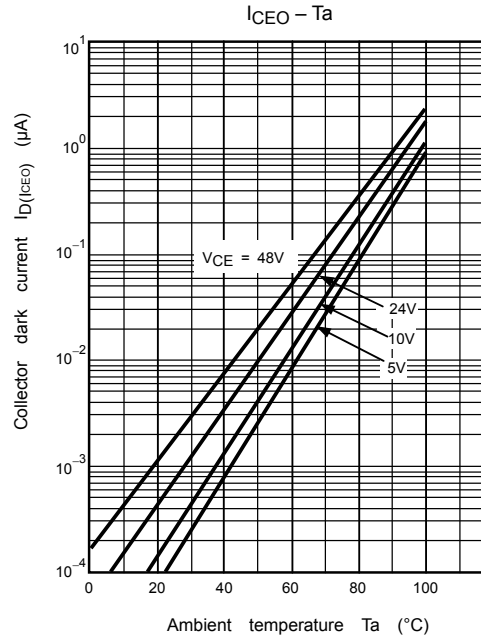
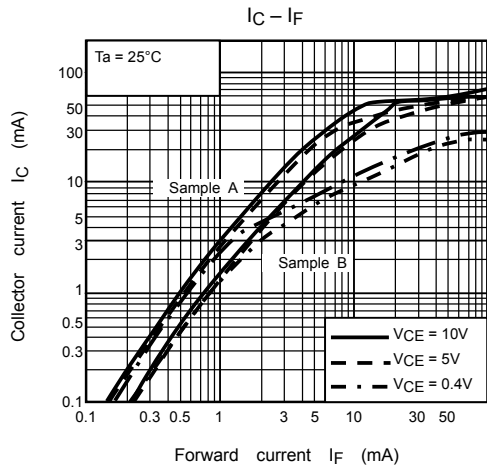
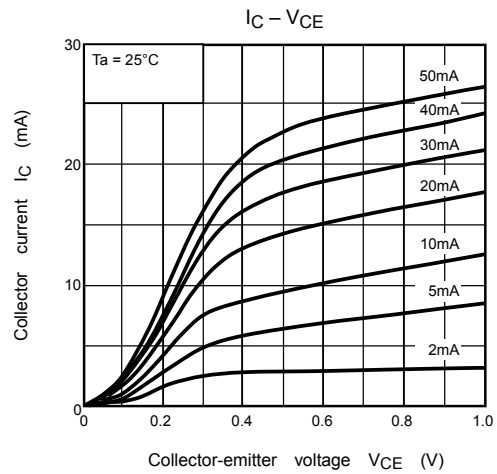
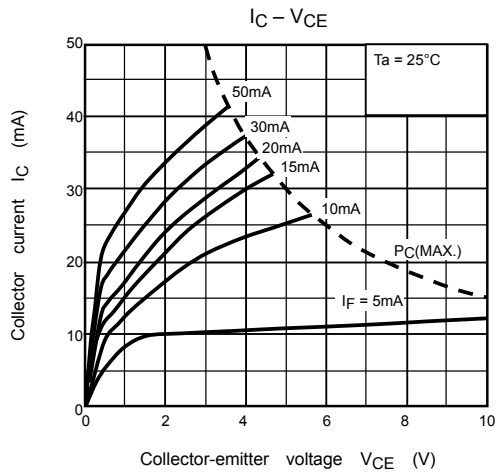
## Switching Characteristics (Ta = 25°C)

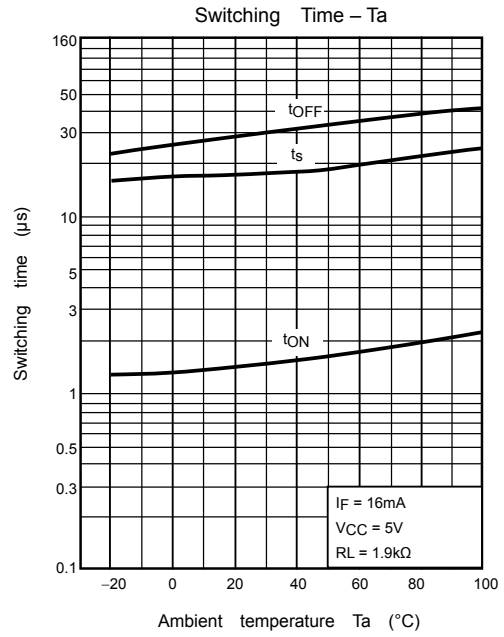
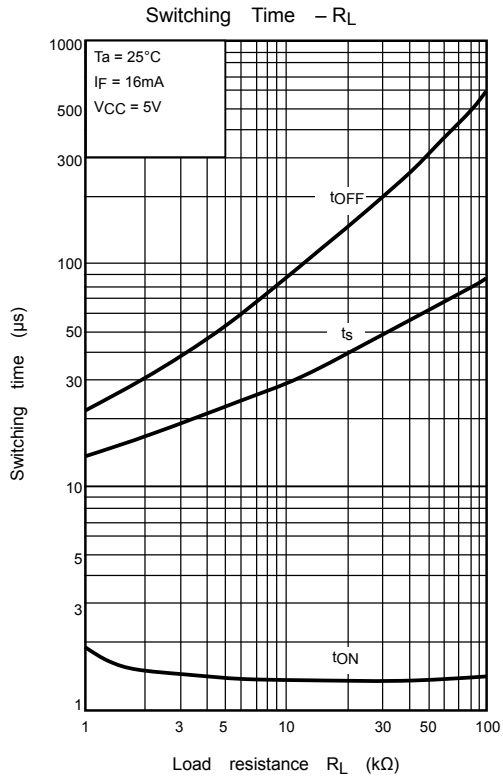
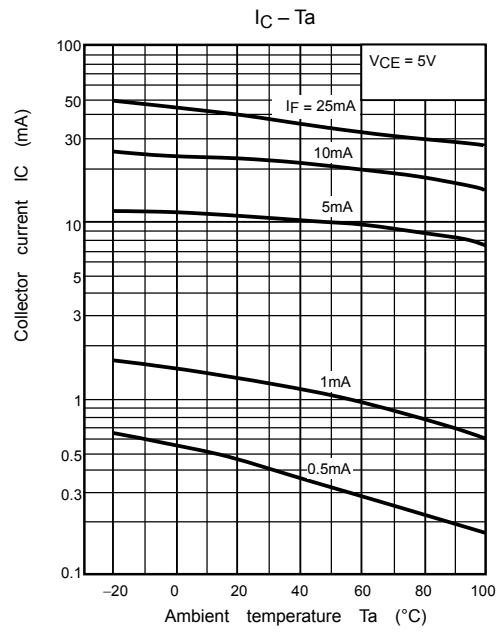
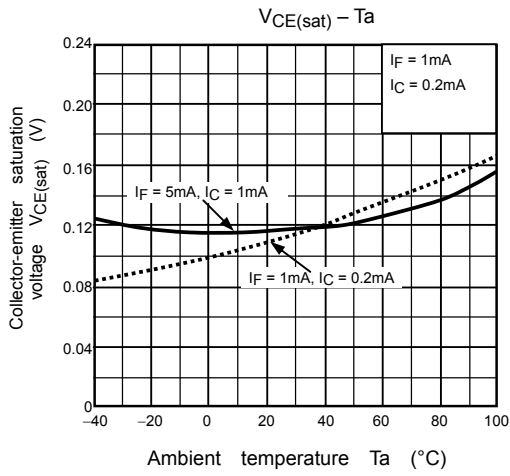
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = \pm 16\text{ mA}$ (Fig.1)	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	25	—	
Turn-off time	$t_{OFF}$		—	40	—	

Fig. 1: Switching time test circuit









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