

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP180

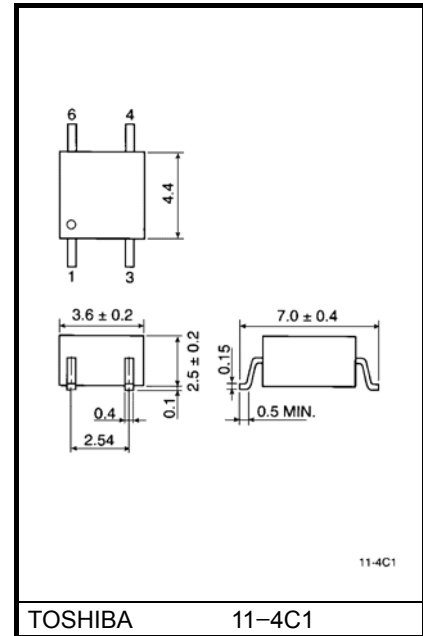
Telephone Use Equipment
Programmable Controllers
AC / DC-Input Module
Telecommunication

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: 3750 Vrms (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 (typ.)

Current Transfer Ratio

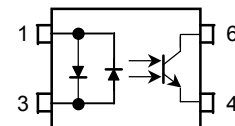
Classi- fication(*1)	Current Transfer Ratio		Marking Of Classification
	If = 5 mA, VCE = 5 V, Ta = 25°C		
	Min	Max	
Standard	50	600	Blank, YE, GR, BL , GB
Rank Y	50	150	YE
Rank GR	100	300	GR
Rank BL	200	600	BL
Rank GB	100	600	GB

*The product with the Rank Y and BL are limited in production.
For details, please contact your nearest Toshiba sales representative.

(*1): Ex. rank GB: TLP180 (GB)

(Note) Application type name for certification test,
please use standard product type name, i.e.
TLP180(GB): TLP180

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 \geq 53°C)	$\Delta I_F / ^\circ C$	-0.7	mA / °C
	Pulse forward current (Note 1)	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 \geq 25°C)	$\Delta P_C / ^\circ C$	-1.5	mW / °C
	Junction temperature	T_j	125	°C
Storage temperature range		T_{stg}	-55 to 125	°C
Operating temperature range		T_{opr}	-55 to 100	°C
Lead soldering temperature (10 s)		T_{sol}	260	°C
Total package power dissipation		P_T	200	mW
Total package power dissipation derating (Ta \geq 25°C)		$\Delta P_T / ^\circ C$	-2.0	mW / °C
Isolation voltage (AC, 1 min., R.H. \leq 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 \leq 100 μ s, f=100 Hz

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)

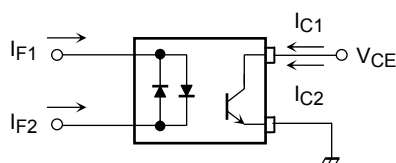
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	$I_F = \pm 10 \text{ mA}$	1.0	1.15	1.3	V
	Capacitance	C_T	$V = 0, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR) \text{ CEO}}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR) \text{ ECO}}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	I_{CEO}	$V_{\text{CE}} = 48 \text{ V}$ (ambient light below 1000 lx) (Note 3)	—	0.01 (2)	0.1 (10)	μA
			$V_{\text{CE}} = 48 \text{ V}$ (ambient light $T_a = 85^\circ\text{C}$ below 1000 lx) (Note 3)	—	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	$I_F = \pm 5 \text{ mA}, V_{\text{CE}} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = \pm 1 \text{ mA}, V_{\text{CE}} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	$V_{\text{CE}} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = \pm 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = \pm 1 \text{ mA}$	—	0.2	—	
		Rank GB	—	—	0.4	
Off-state collector current	$I_{\text{C(off)}}$	$V_F = \pm 0.7 \text{ V}, V_{\text{CE}} = 48 \text{ V}$	—	1	10	μA
CTR symmetry	$I_C (\text{ratio})$	$I_C (I_F = -5 \text{ mA}) / I_C (I_F = 5 \text{ mA})$ (Note 4)	0.33	1	3	—

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



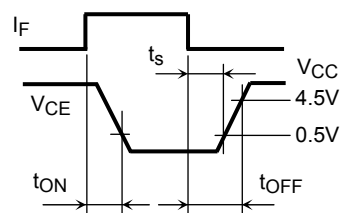
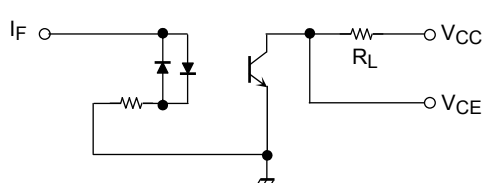
Isolation Characteristics (Ta = 25°C)

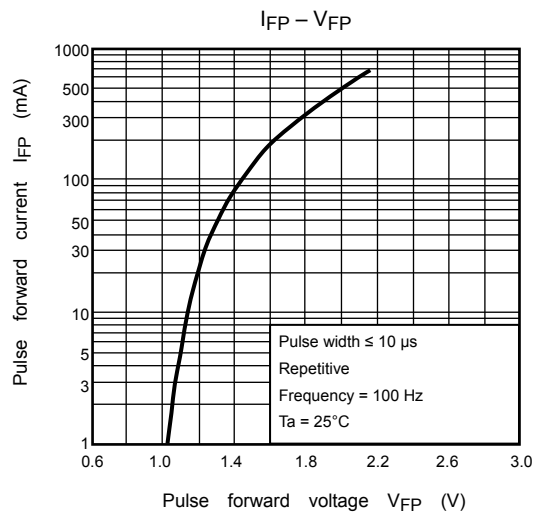
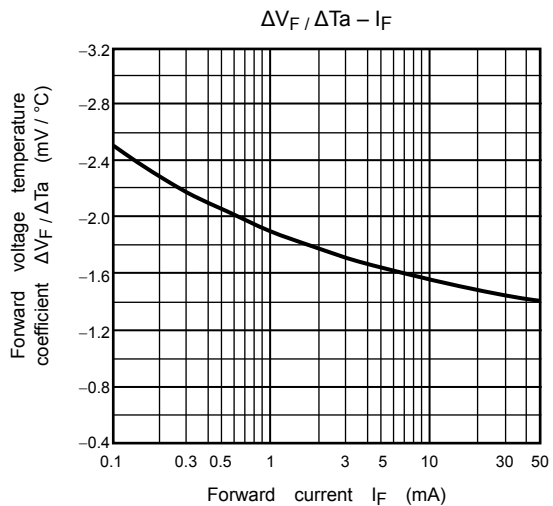
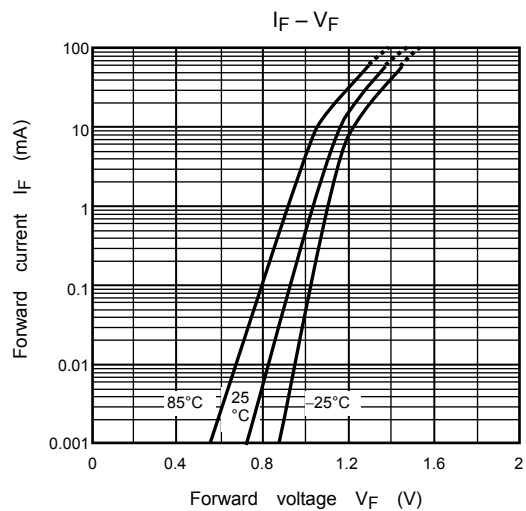
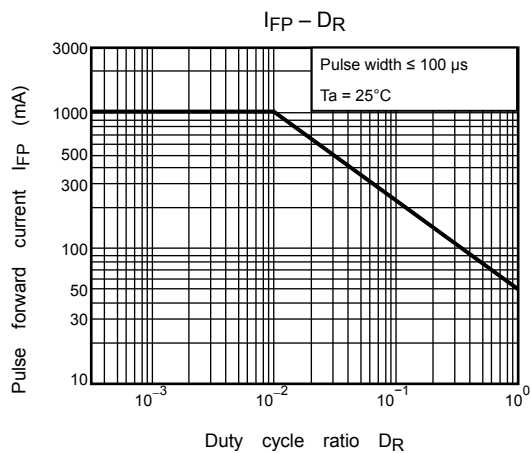
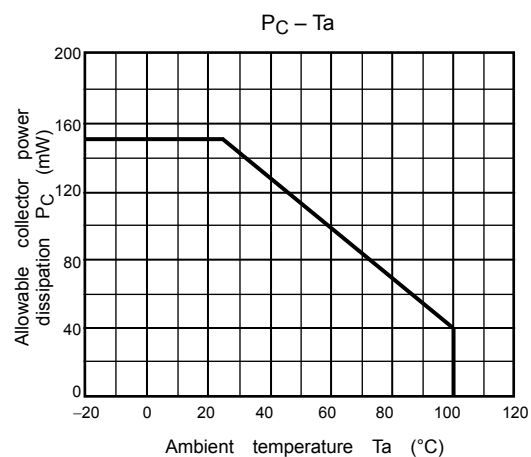
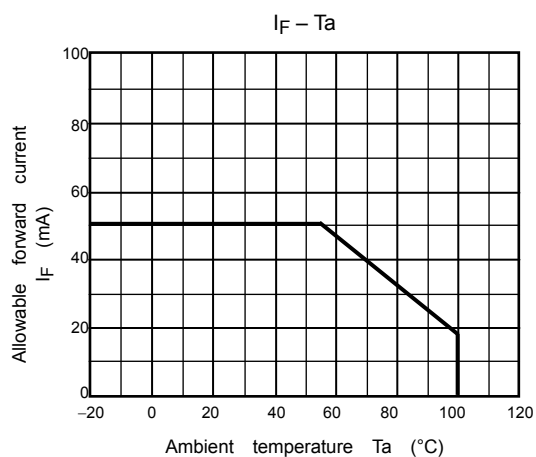
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S	V _S = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R _S	V _S = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	3750	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V _{dc}

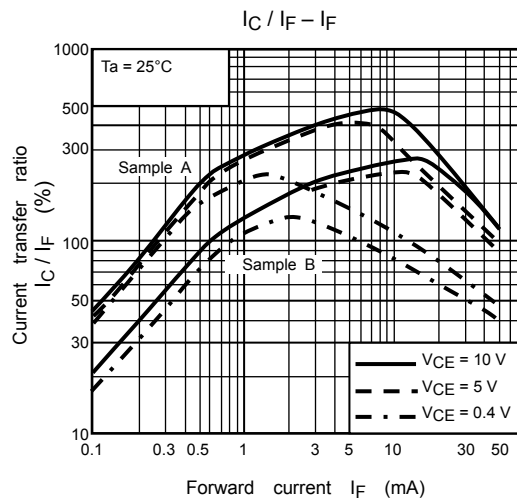
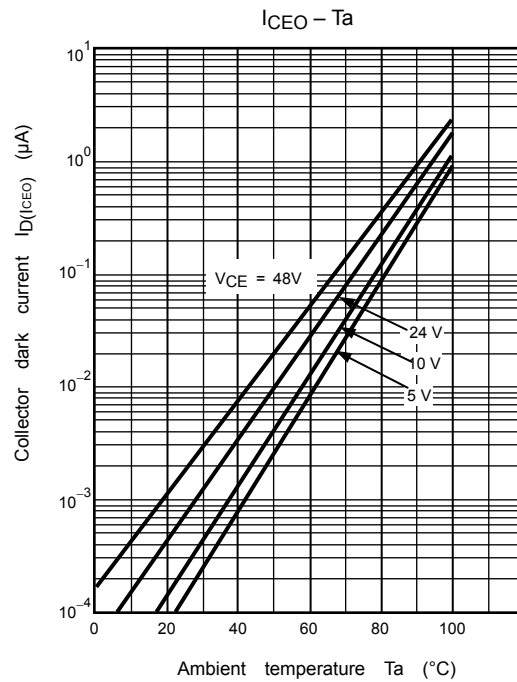
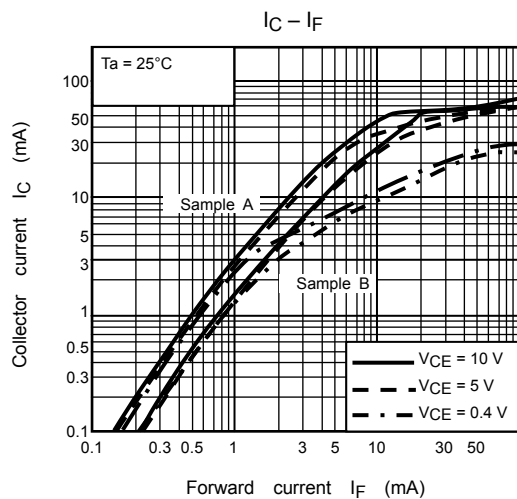
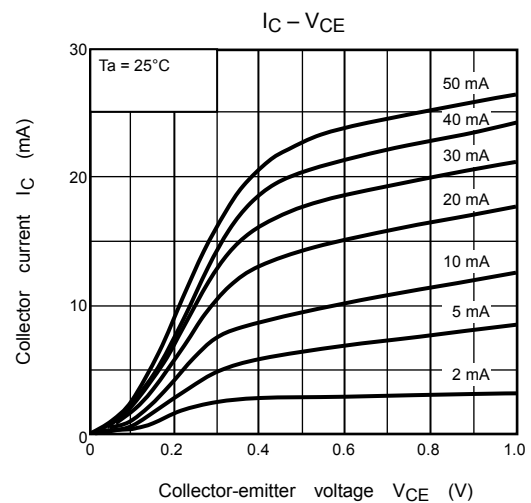
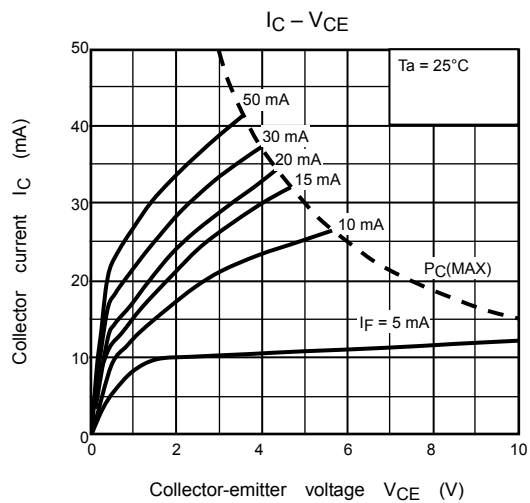
Switching Characteristics (Ta = 25°C)

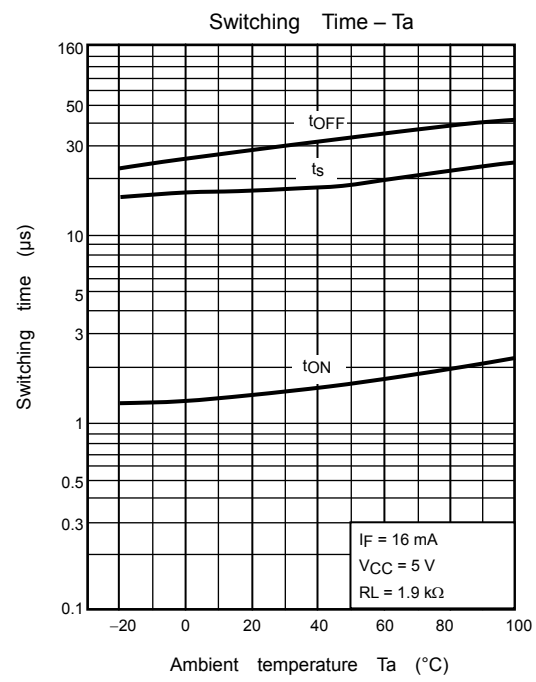
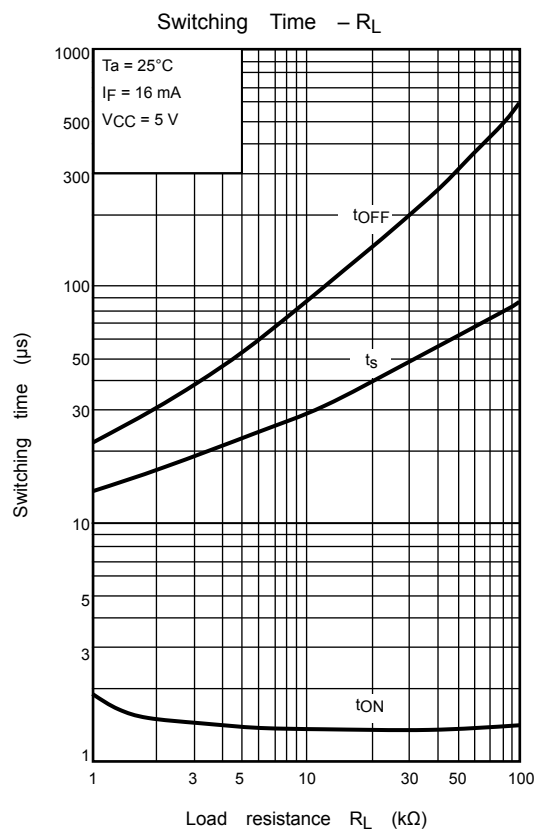
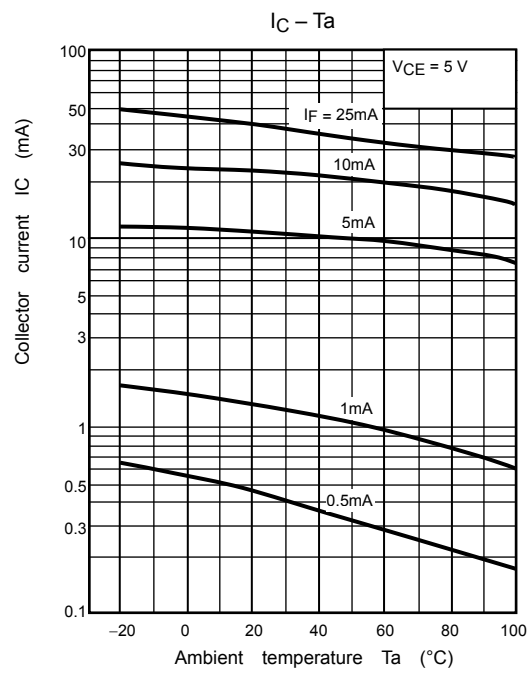
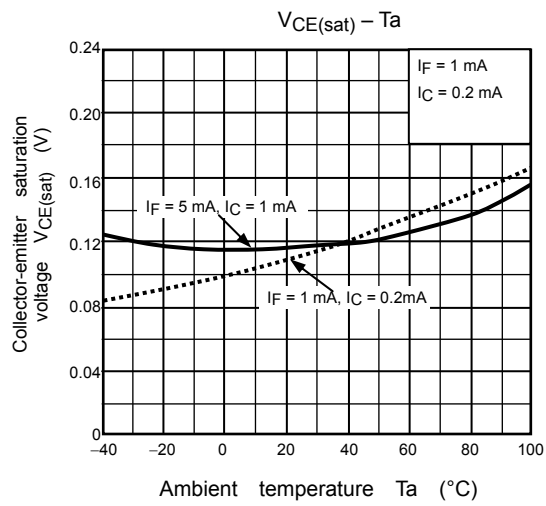
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t _r	V _{CC} = 10 V, I _C = 2 mA R _L = 100 Ω	—	2	—	μs
Fall time	t _f		—	3	—	
Turn-on time	t _{ON}		—	3	—	
Turn-off time	t _{OFF}		—	3	—	
Turn-on time	t _{ON}	R _L = 1.9 kΩ V _{CC} = 5 V, I _F = ±16 mA (Fig.1)	—	2	—	μs
Storage time	t _s		—	25	—	
Turn-off time	t _{OFF}		—	40	—	

Fig. 1: Switching time test circuit









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