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

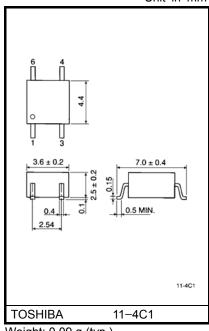
Current Transfer Ratio

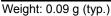
Classi- fication(*1)		nsfer Ratio = 5 V, Ta = 25°C Max	Marking Of Classification
Standard	50	600	Blank, YE, GR, BL , GB
Rank Y	50	150	YE
Rank GR	100	300	GR
Rank BL	200	600	BL
Rank GB	100	600	GB

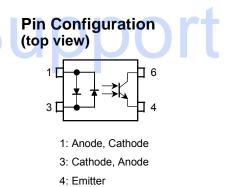
* The product with the Rank Y and BL are limited in production. For details, please contact your nearest Toshiba sales representative.

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

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







6: Collector

Absolute Maximum Ratings (Ta = 25°C)

	Characteristic	Symbol	Rating	Unit
	Forward current	I _{F(RMS)}	±50	mA
Q	Forward current detating (Ta≥53°C)	ΔI _F / °C	-0.7	mA / °C
LED	Pulse forward current (Note 1)	I _{FP}	±1	А
	Junction temperature	Tj	125	°C
	Collector-emitter voltage	V _{CEO}	80	V
	Emitter-collector voltage	V _{ECO}	7	V
ctor	Collector current	Ι _C	50	mA
Detector	Power dissipation	P _C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP _C / °C	-1.5	mW / °C
	Junction temperature	Tj	125	°C
Stor	rage temperature range	T _{stg}	–55 to 125	°C
Ope	erating temperature range	T _{opr}	–55 to 100	°C
Lea	d soldering temperature (10 s)	T _{sol}	260	°C
Tota	al package power dissipation	PT	200	mW
Tota	al package power dissipation derating (Ta \ge 25°C)	ΔP _T / °C	-2.0	mW / °C
Isol	ation voltage (AC,1 min., R.H. ≤ 60%) (Note 2)	BVS	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 ≤ 100 µs,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	Тур.	Max	Unit
Supply voltage	V _{CC}	_	5	48	V
Forward current	I _{F(RMS)}	_	16	20	mA
Collector current	IC	_	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)

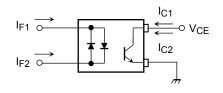
	Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
LED	Forward voltage	V _F	I _F = ±10 mA	1.0	1.15	1.3	V
ш	Capacitance	CT	V = 0, f = 1 MHz	_	60	_	pF
	Collector–emitter breakdown voltage	V _(BR) CEO	I _C = 0.5 mA	80		_	V
L	Emitter–collector breakdown voltage	V _{(BR) ECO}	I _E = 0.1 mA	7	_	_	V
Detector	Collector dark current	V _{CE} = 48 V (ambient light below 1000 {x) (Note 3)	_	0.01 (2)	0.1 (10)	μA	
		ICEO	V _{CE} = 48 V (ambient light Ta = 85°C below 1000 {x) (Note 3)	_	2 (4)	50 (50)	μΑ
	Capacitance (collector to emitter)	C _{CE}	V = 0, f = 1 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	Тур.	Max	Unit
Current transfer ratio	Ic / IF	I_F = ±5 mA, V_{CE} = 5 V	50	_	600	%
	IC / IF	Rank GB	100	_	600	70
Saturated CTR	I _C / I _{F (sat)}	IF = ±1 mA, V _{CE} = 0.4 V	_	60	_	%
Saturated CTR		Rank GB	30		_	70
	V _{CE (sat)}	I_{C} = 2.4 mA, I_{F} = ±8 mA	_	_	0.4	
Collector–emitter saturation voltage		I _C = 0.2 mA, I _F = ±1 mA	_	0.2		V
, , , , , , , , , , , , , , , , , , ,		Rank GB	_	_	0.4	
Off-state collector current	I _{C(off)}	V_{F} = ± 0.7 V, V_{CE} = 48 V	_	1	10	μA
CTR symmetry	I _{C (ratio)}	I _C (I _F = -5 mA) / I _C (I _F = 5 mA) (Note 4)	0.33	1	3	_

Note 4: $I_C(ratio) = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5V)}{I_C1(I_F = I_{F1}, V_{CE} = 5V)}$



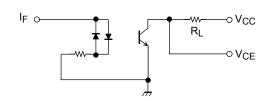
Isolation Characteristics (Ta = 25°C)

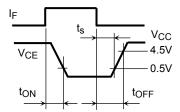
Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Capacitance input to output	CS	V _S = 0 V, f = 1 MHz	_	0.8	_	pF
Isolation resistance	R _S	V _S = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	_	Ω
	BVS	AC, 1 minute	3750	_	_	V
Isolation voltage		AC, 1 second, in oil	_	10000	_	V _{rms}
		DC, 1 minute, in oil	_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

Switching Characteristics (Ta = 25°C)

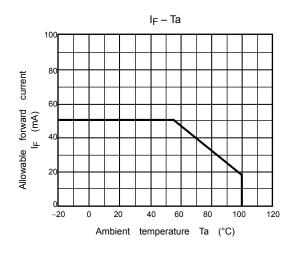
Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Rise time	t _r	V_{CC} = 10 V, I _C = 2 mA R _L = 100 Ω	_	2	_	
Fall time	t _f		_	3	_	μs
Turn–on time	t _{ON}		_	3	_	
Turn–off time	tOFF		_	3	_	
Turn–on time	t _{ON}		_	2	_	
Storage time	ts	$\begin{array}{l} R_{L} = 1.9 \ k\Omega \qquad (Fig.1) \\ V_{CC} = 5 \ V, \ I_{F} = \pm 16 \ mA \end{array}$	_	25	_	μs
Turn-off time	tOFF		_	40	_	

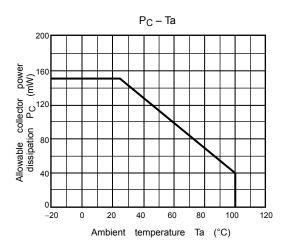
Fig. 1: Switching time test circuit

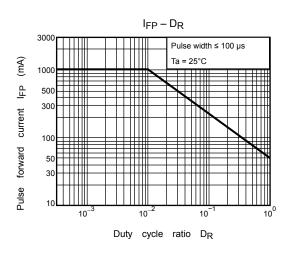


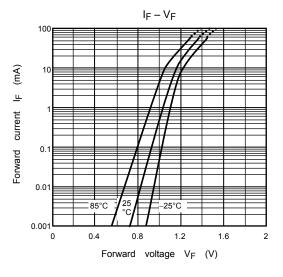


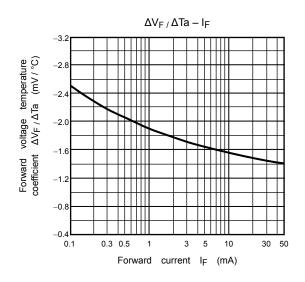
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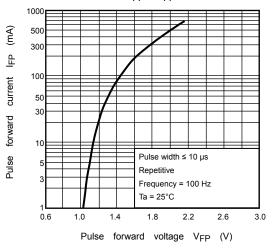




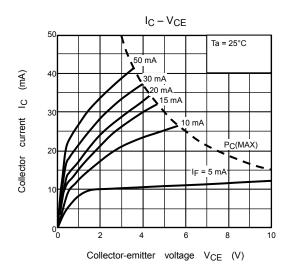


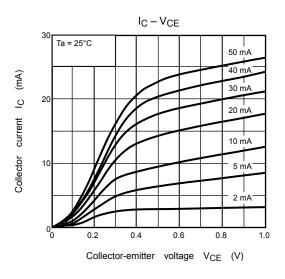


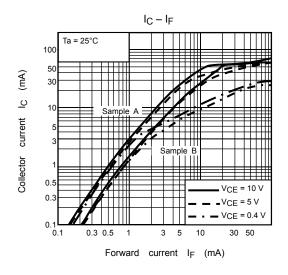
IFP – VFP

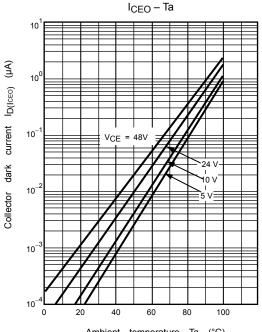


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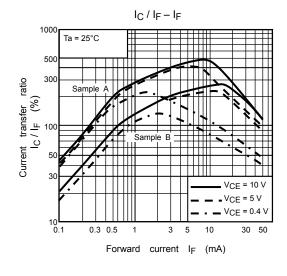




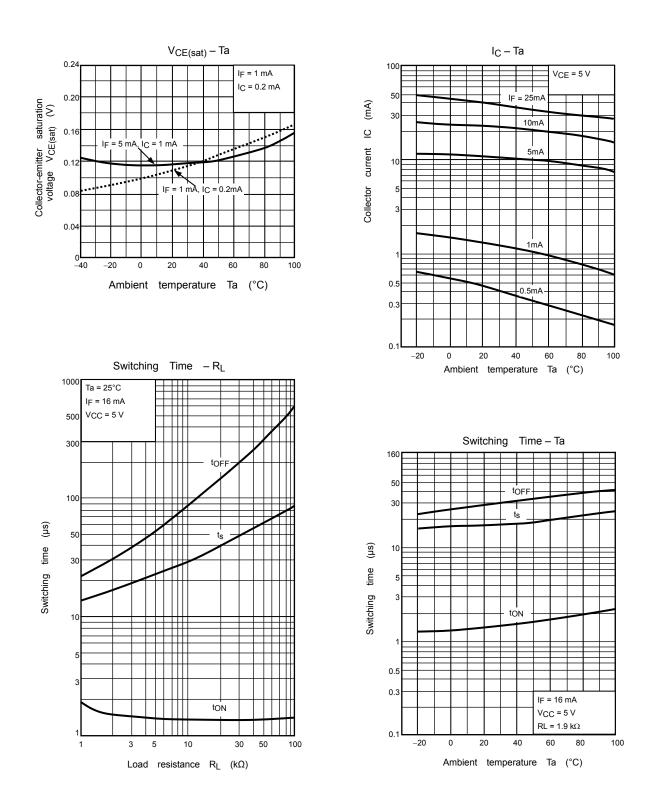




Ambient temperature Ta (°C)



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