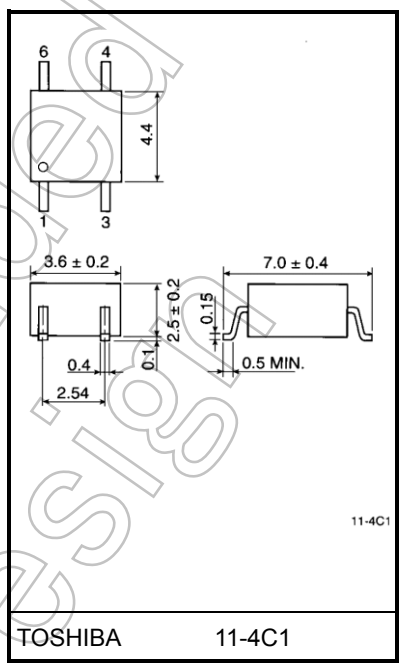
TOSHIBA Photocoupler IRED & Photo-Transistor

TLP181

Office Machine
Programmable Controllers
AC Adapter
I/O Interface Board

Unit: mm



TOSHIBA 11-4C1

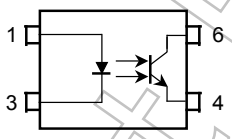
Weight: 0.09 g (Typ.)

The TOSHIBA mini flat coupler TLP181 is a small outline coupler, suitable for surface mount assembly.
TLP181 consist of a photo transistor optically coupled to an infrared emitting diode. Since TLP181 is smaller than DIP package, it's suitable for high-density surface mounting applications such as programmable controllers.

- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)
  Rank GB: 100% (min)
- Isolation voltage: 3750 Vrms (min)
- Operation Temperature: -55 to 110 ˚C
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349
- VDE-approved: EN 60747-5-5 (Note 1)

Note 1: When a VDE approved type is needed,
please designate the **Option(V4)**.

Pin Configuration (top view)



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

Start of commercial production
1993-05

Current Transfer Ratio

Classification (Note 1)	Current Transfer Ratio (%) (I_C/I_F) I_F = 5mA, V_{CE} = 5V, Ta = 25°C		Marking Of Classification
	Min	Max	
Blank	50	600	Blank ,Y■,YE,G,G■,GR,B,BL,GB
Rank Y	50	150	YE, Y■
Rank GR	100	300	GR, G, G■
Rank BL	200	600	BL, B
Rank GB	100	600	GB , GR , G, G■, BL , B
Rank YH	75	150	Y■
Rank GRL	100	200	G
Rank GRH	150	300	G■
Rank BLL	200	400	B

Note 1: EX, Rank GB: TLP181 (GB)

Note: Application, type name for certification test, please use standard product type name, i, e.
TLP181 (GB): TLP181

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	50	mA
	Forward current detating (Ta ≥ 89°C)	ΔI_F/°C	-1.4	mA/°C
	Pulse forward current (100μs pulse, 100pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation	P_D	100	mW
	Diode power dissipation derating (Ta ≥ 89°C)	ΔP_D/°C	-2.8	mW/°C
	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
	Collector power dissipation	P_C	150	mW
	Collector power dissipation derating (Ta ≥ 25°C)	ΔP_C/°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 110	°C
Lead soldering temperature (10 s)		T_{sol}	260	°C
Total package power dissipation		P_T	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T/°C	-2.0	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 1)		BV_S	3750	V_{rms}

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: Device considered a two-terminal device: Pin1, 3 shorted together and pins 4, 6 shorted together

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	48	V
Forward current	I_F	—	16	20	mA
Collector current	I_C	—	1	10	mA

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 = 10 mA	1.0	1.15	1.3	V
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 0.5 mA	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 48 V, (Ambient light below 1000 lx) (Note 1)	—	0.01 (2)	0.1 (10)	μA
			V_{CE} = 48 V, Ta = 85 °C, (Ambient light below 1000 lx) (Note 1)	—	2 (4)	50 (50)	μA
	Capacitance (collector to emitter)	C_{CE}	V = 0 V, f = 1 MHz	—	10	—	pF

Note 1: 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 = 5 mA, V_{CE} = 5 V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	$I_C/I_{F(sat)}$	IF = 1 mA, V_{CE} = 0.4 V	—	60	—	%
		Rank GB	30	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 2.4 mA, I_F = 8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = 1 mA	—	0.2	—	
		Rank GB	—	—	0.4	
Off-state collector current	$I_{C(off)}$	V_F = 0.7 V, V_{CE} = 48 V	—	1	10	μA

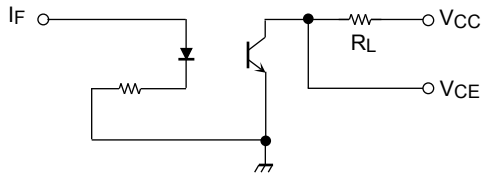
Isolation Characteristics (Ta = 25°C)

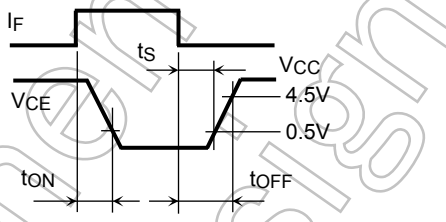
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C_S	V_S = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V, R.H. ≤ 60 %	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	3750	—	—	V_{rms}

Switching Characteristics (Ta = 25°C)

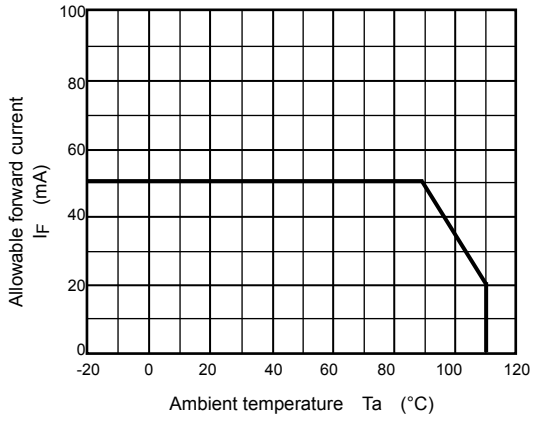
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100 Ω	—	2	—	μs
Fall time	t_f		—	3	—	
Turn-on time	t_{on}		—	3	—	
Turn-off time	t_{off}		—	3	—	
Turn-on time	t_{ON}	R_L = 1.9 kΩ (Fig.1) V_{CC} = 5 V, I_F = 16 mA	—	2	—	μs
Storage time	t_s		—	25	—	
Turn-off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

Fig. 1 Switching time test circuit

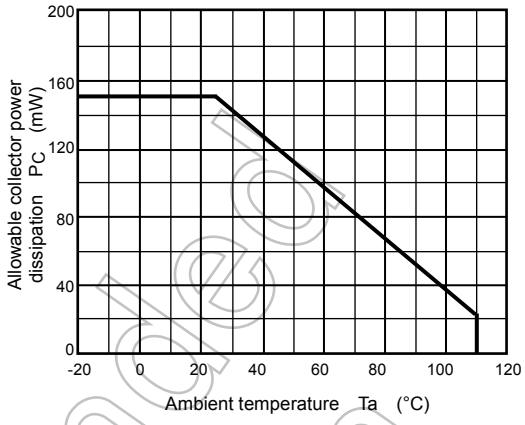




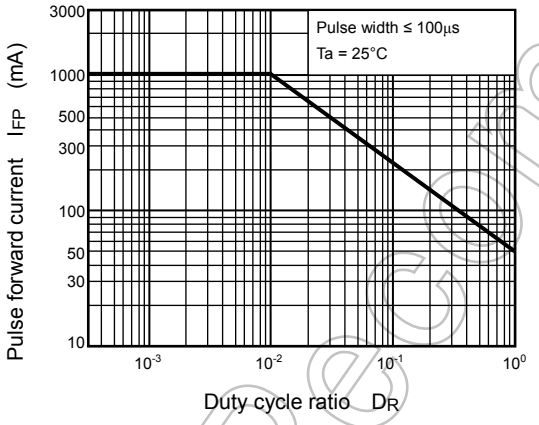
I_F – Ta



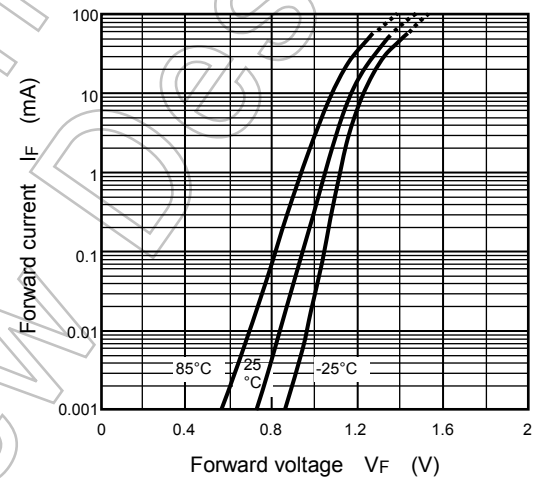
P_C – Ta



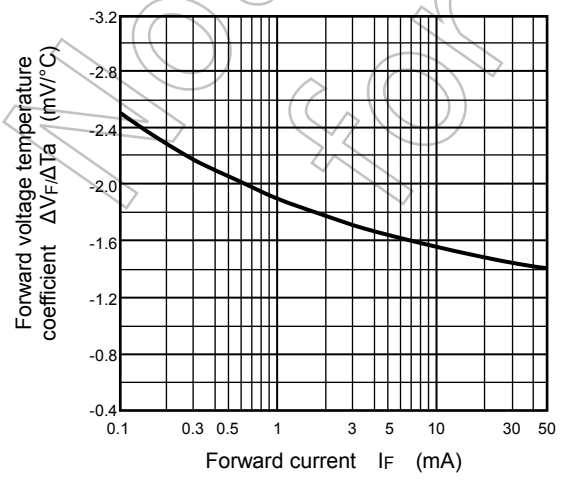
I_{FP} – D_R



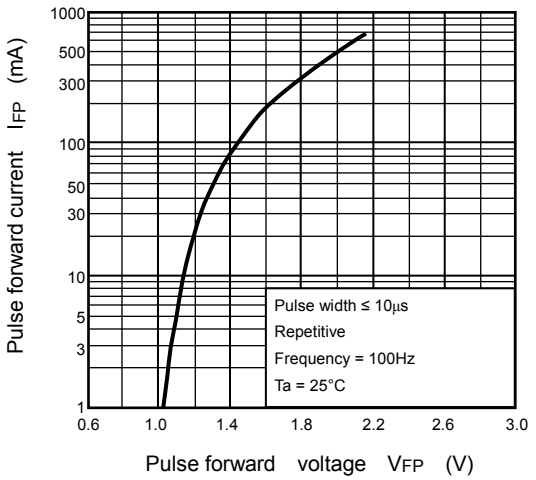
I_F – V_F



$\Delta V_F/\Delta Ta$ – I_F

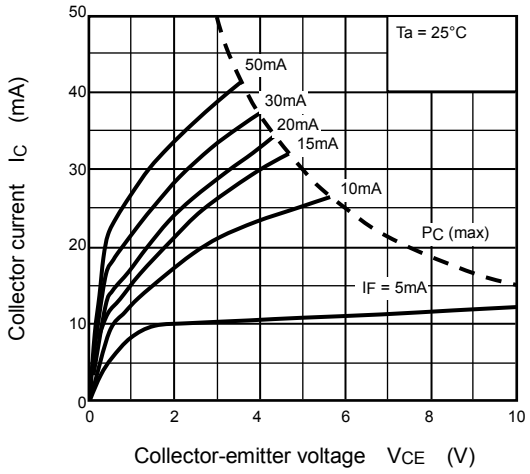


I_{FP} – V_{FP}

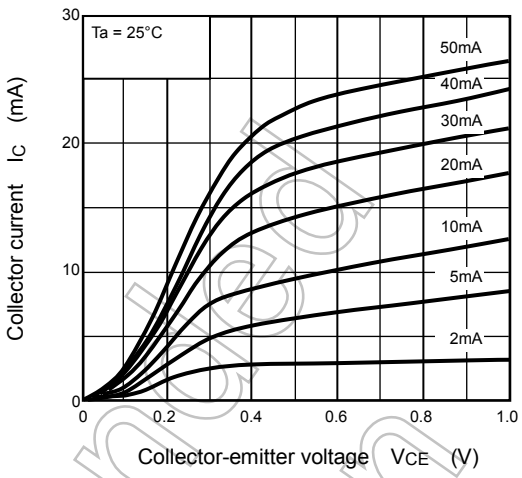


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

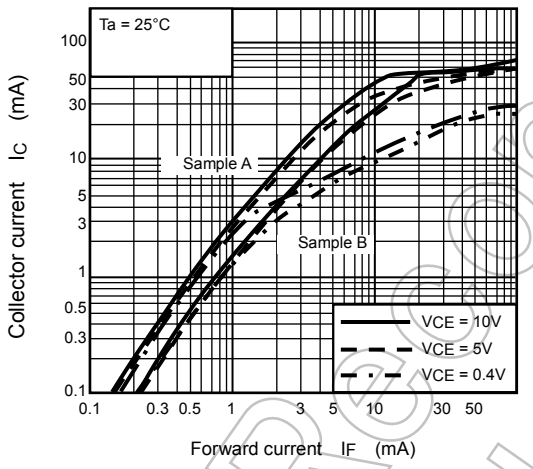
$I_C - V_{CE}$



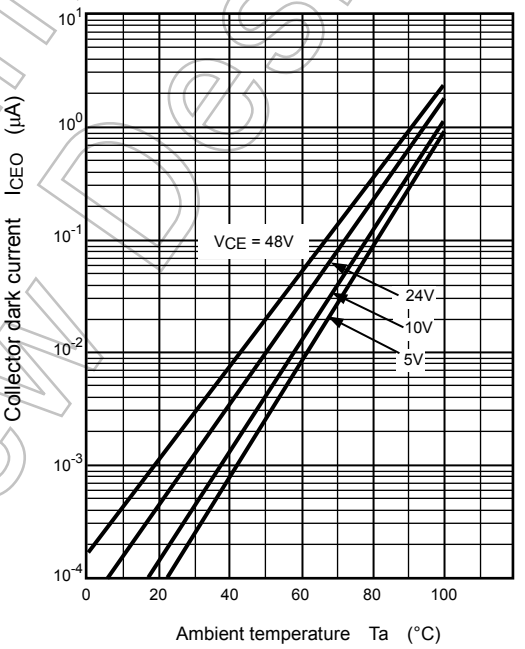
$I_C - V_{CE}$



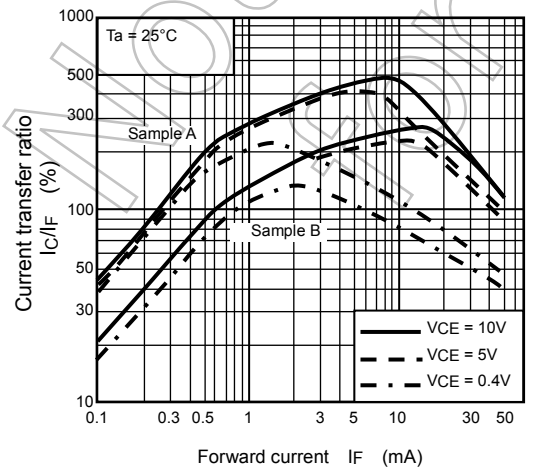
$I_C - I_F$



$I_{CEO} - Ta$



$I_C/I_F - I_F$



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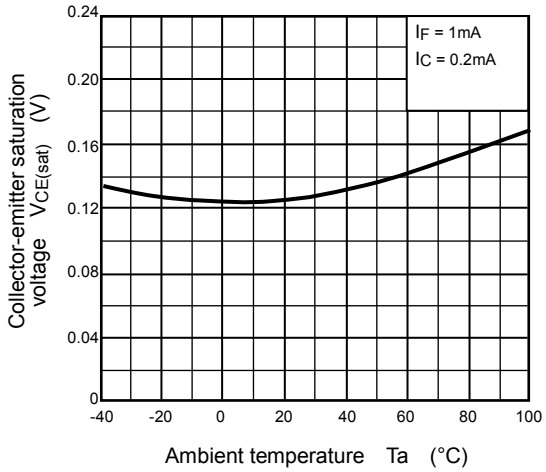
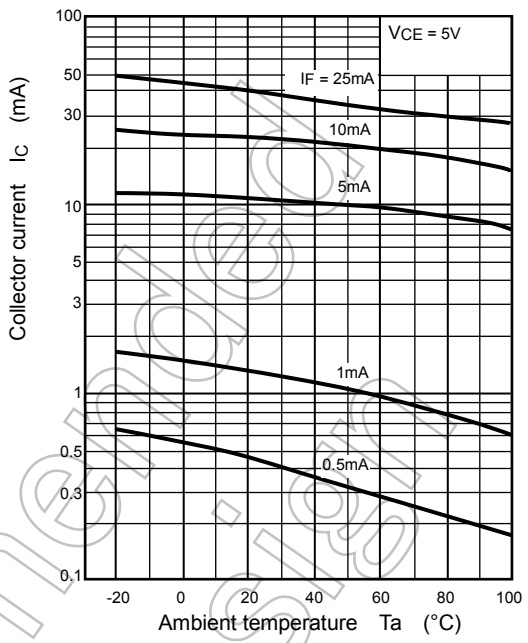
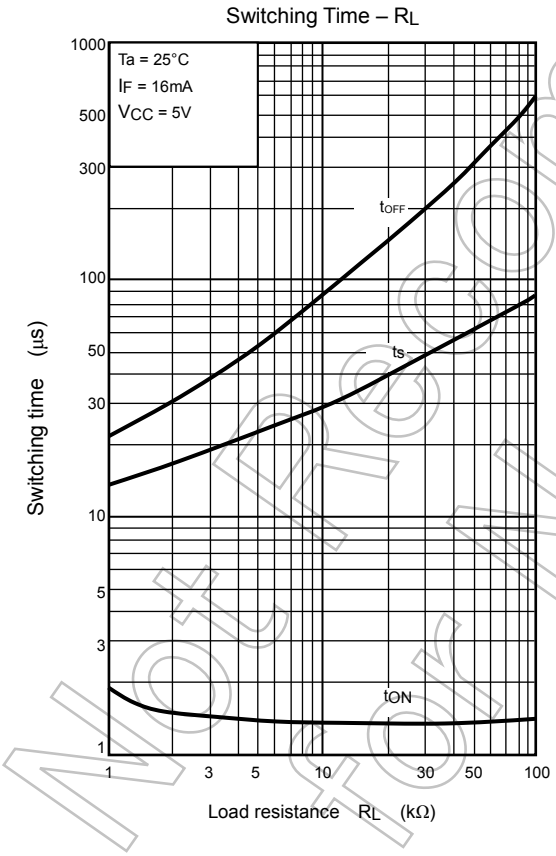
$V_{CE(sat)}$ – Ta



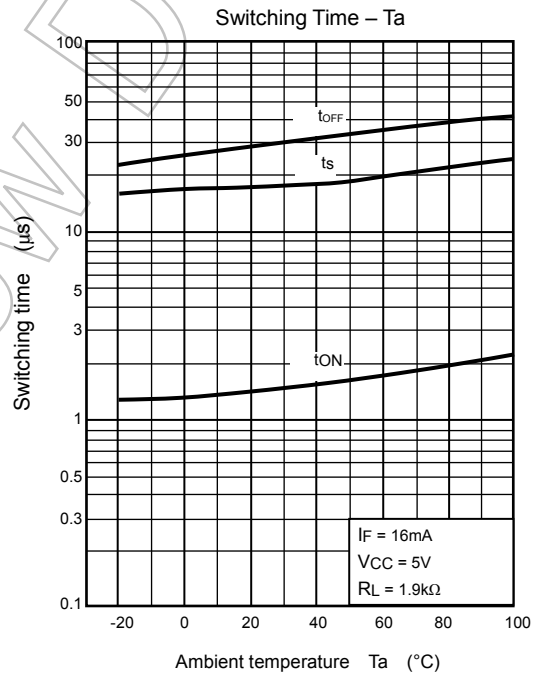
I_C – Ta



Switching Time – R_L



Switching Time – Ta



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