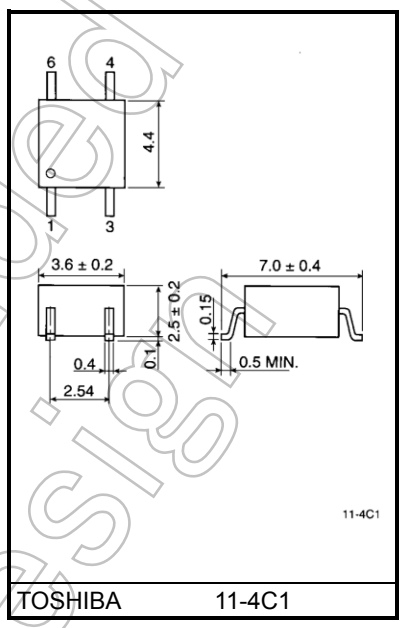
TOSHIBA Photocoupler IRED & Photo-Transistor

TLP126

Programmable Controllers
AC / DC-Input Module
Telecommunication

Unit: mm



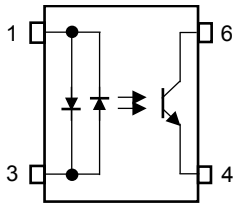
TOSHIBA 11-4C1

Weight: 0.09 g (typ.)

The TOSHIBA mini flat coupler TLP126 is a small outline coupler, suitable for surface mount assembly.
TLP126 consists of a photo transistor, optically coupled to two infrared emitting diodes connected inverse parallel, and provides high CTR at low AC input current.

- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 100% (min)
- Isolation voltage: 3750 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349

Pin Configurations (top view)



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

Start of commercial production
1988-04

Absolute Maximum Ratings (Ta = 25°C)

Characteristics			Symbol	Rating	Unit
LED	Forward current		$I_{F(RMS)}$	50	mA
	Forward current derating	(Ta ≥ 53°C)	ΔI_F/°C	-0.7	mA/°C
	Peak forward current	(100 μs pulse,100 pps)	I_{FP}	1	A
	Diode power dissipation		P_D	100	mW
	Diode power dissipation derating	(Ta ≥ 53°C)	ΔP_D/°C	-1.39	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
	Peak collector current	(10 ms pulse,100 pps)	I_{CP}	100	mA
	Power dissipation		P_C	150	mW
	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 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 ≥ 25°C)			ΔP_T/°C	-2.0	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %)		(Note 1)	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: Device considered a two terminal device: Pins1, and 3 shorted together and 4 and 6 shorted together.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	48	V
Forward current	$I_{F(RMS)}$	—	1.6	20	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	-25	—	75	°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)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = ±10 mA	1.0	1.15	1.3	V
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	60	—	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	—	10	100	nA
			V_{CE} = 48 V, Ta = 85 °C	—	2	50	μA
	Capacitance collector to emitter	C_{CE}	V = 0 V, f = 1 MHz	—	12	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

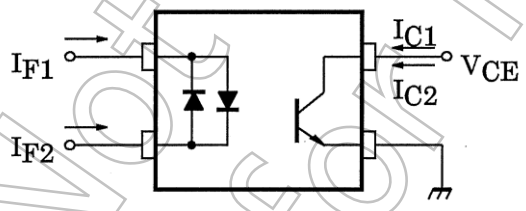
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C/I_F	I_F = ±1 mA, V_{CE} = 0.5 V	100	—	1200	%
Low input CTR	$I_C/I_{F(low)}$	IF = ±0.5 mA, V_{CE} = 1.5 V	50	—	—	%
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.5 mA, I_F = ±1 mA	—	—	0.4	V
		I_C = 1 mA, I_F = ±1 mA	—	0.2	—	
Off-state collector current	$I_{C(off)}$	V_F = ± 0.7 V, V_{CE} = 48 V	—	1	10	μA
CTR symmetry	$I_{C(ratio)}$	$I_C(I_F$ = -1 mA) / $I_C(I_F$ = 1 mA) (Note 2)	0.3	—	3	—

Coupled Electrical Characteristics (Ta = -25 to 75°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C/I_F	I_F = ±1 mA, V_{CE} = 0.5 V	50	—	—	%
Low input CTR	$I_C/I_{F(low)}$	I_F = ±0.5 mA, V_{CE} = 1.5 V	—	50	—	%

Note 2:

$$I_{C(ratio)} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5V)}{I_{C1}(I_F = I_{F1}, V_{CE} = 5V)}$$



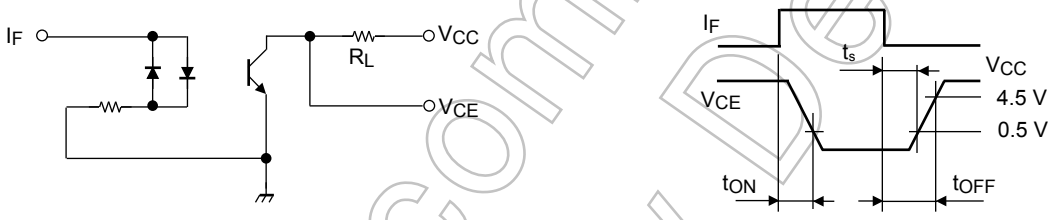
Isolation characteristics (Ta = 25°C)

Characteristics	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, 60 s	3750	—	—	Vrms

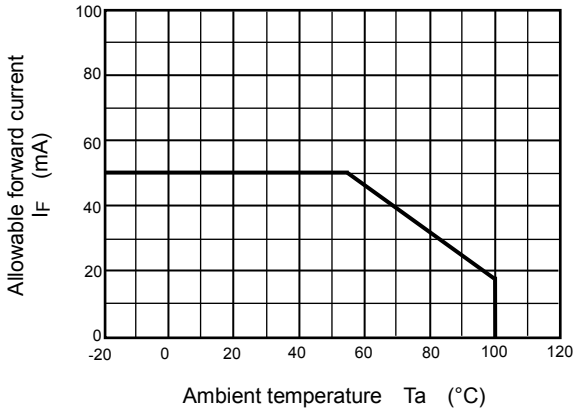
Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	8	—	μs
Fall time	t_f		—	8	—	
Turn-on time	t_{on}		—	10	—	
Turn-off time	t_{off}		—	8	—	
Turn-on time	t_{ON}	V_{CC} = 5 V, I_F = ±1.6 mA R_L = 4.7 kΩ (Fig.1)	—	10	—	μs
Storage time	t_s		—	50	—	
Turn-off time	t_{OFF}		—	300	—	

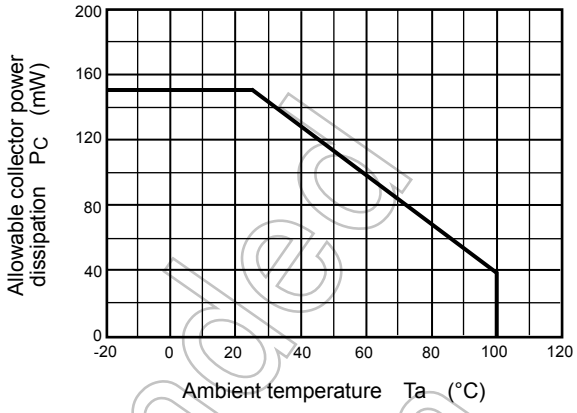
Fig. 1 Switching time test circuit



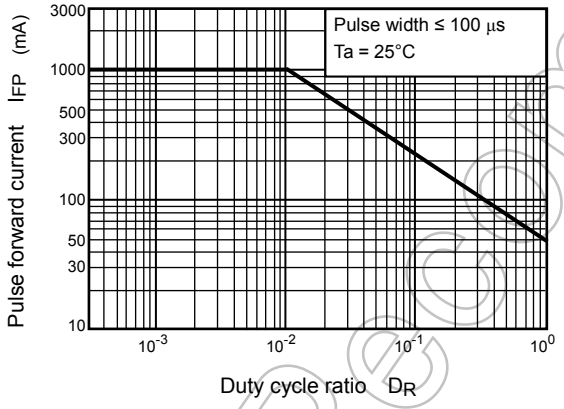
I_F – Ta



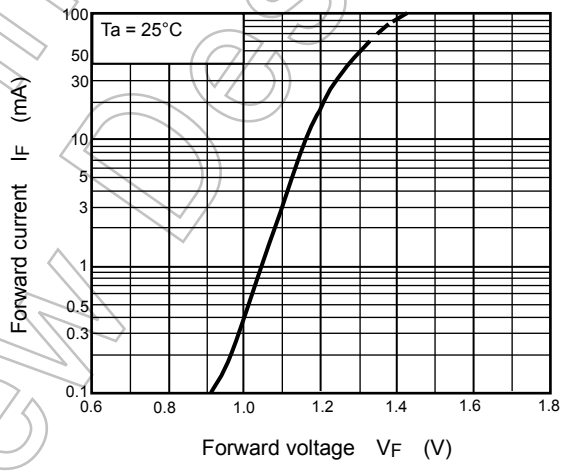
P_C – Ta



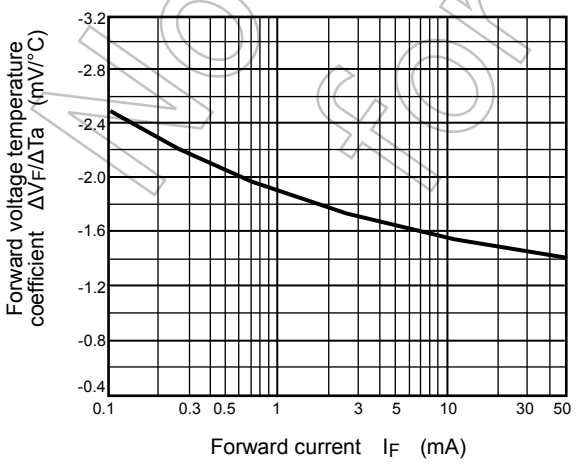
I_{FP} – D_R



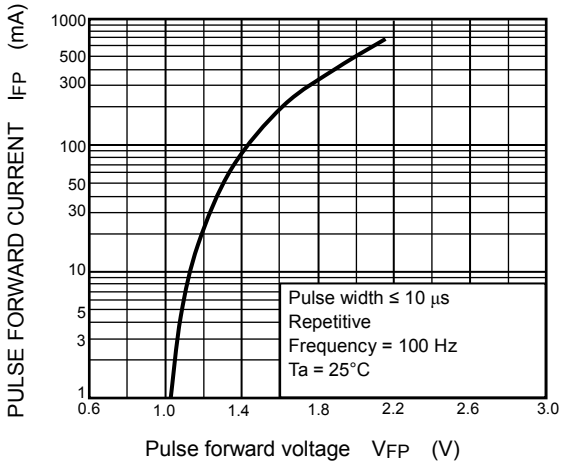
I_F – V_F



$\Delta V_F/\Delta Ta$ – I_F

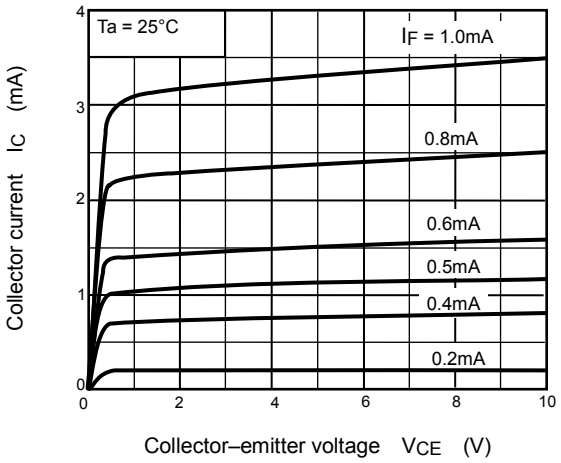


I_{FP} – V_{FP}

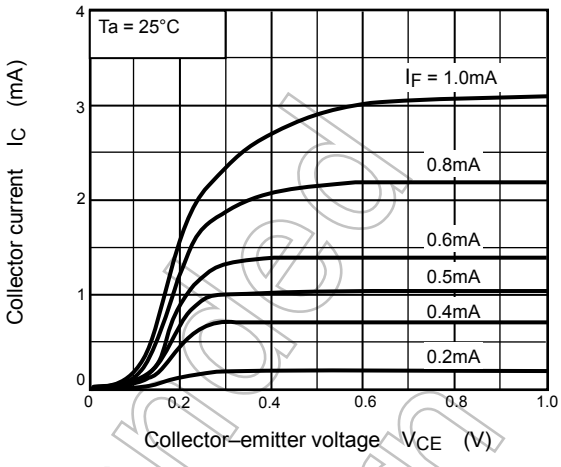


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

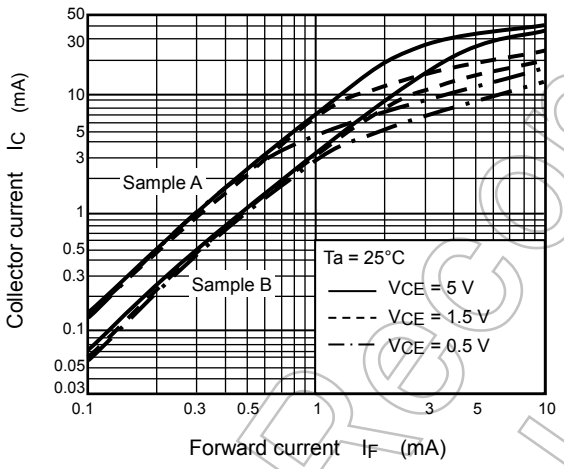
$I_C - V_{CE}$



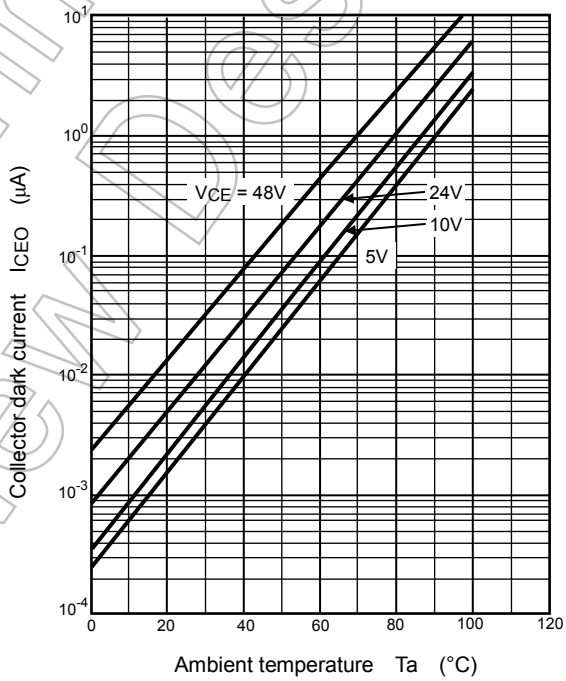
$I_C - V_{CE}$



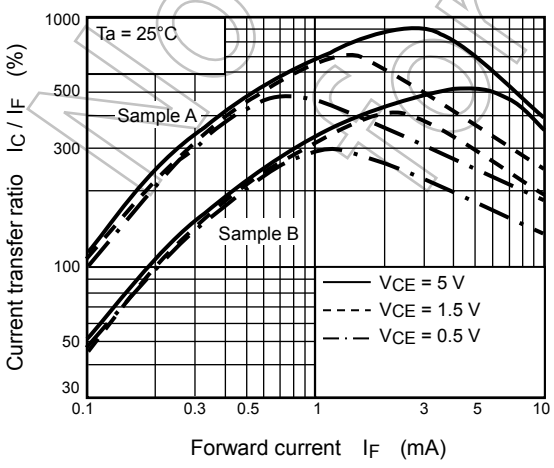
$I_C - I_F$



$I_{CEO} - Ta$



$I_C / I_F - I_F$



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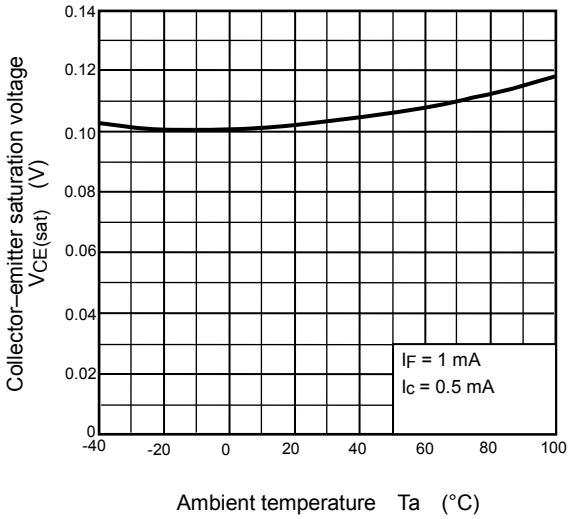
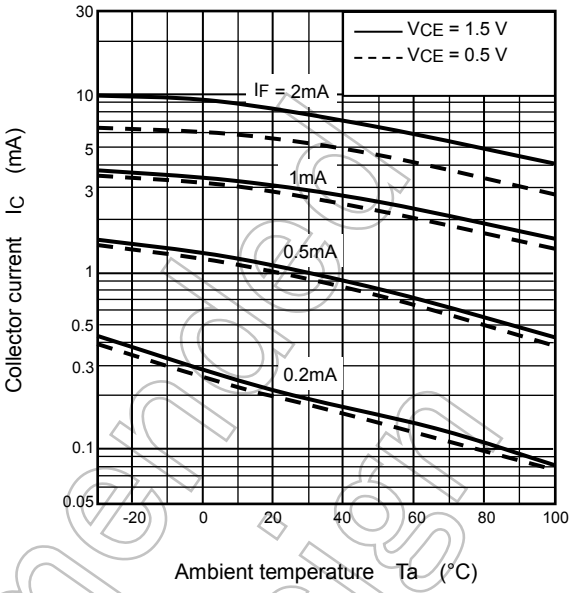
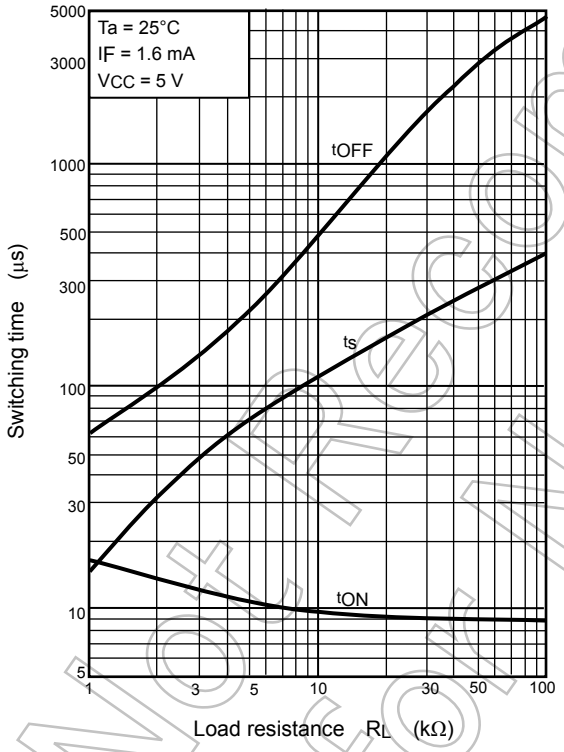
$V_{CE(sat)}$ – Ta



I_C – Ta



Switching Time – RL



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