

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP124

Office Machine

Programmable Controllers

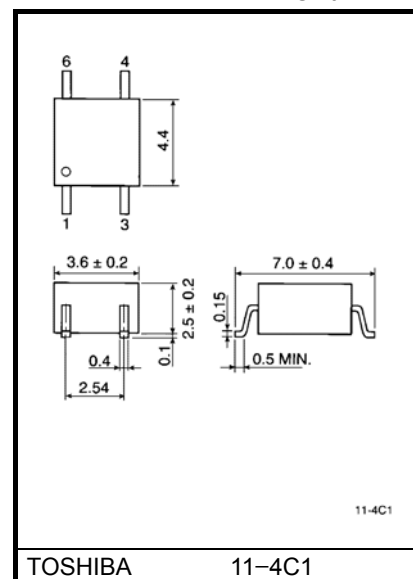
AC / DC-Input Module

Telecommunication

The TOSHIBA mini flat coupler TLP124 is a small outline coupler, suitable for surface mount assembly. TLP124 consists of a photo transistor optically coupled to a gallium arsenide infrared emitting diode.

- Collector-emitter voltage: 80 V min.
- Current transfer ratio: 100% min.  
Rank BV: 200% min.
- Isolation voltage: 3750Vrms min.
- UL recognized: UL1577, file No. E67349

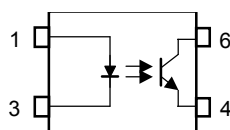
Unit in mm



TOSHIBA 11-4C1

Weight: 0.09g (typ.)

## Pin Configurations (top view)



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

## Current Transfer Ratio

Classification	Current Transfer Ratio (min.)			Marking Of Classification
	Ta = 25°C		Ta = -25~75°C	
	I <sub>F</sub> = 1mA V <sub>CE</sub> = 0.5V	I <sub>F</sub> = 0.5mA V <sub>CE</sub> = 1.5V	I <sub>F</sub> = 1mA V <sub>CE</sub> = 0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, Blank

(Note) Application type name for certification test, please use standard product type name, i. e.  
TLP124 (BV): TLP124

## Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	50	mA
	Forward current derating	ΔI <sub>F</sub> / °C	-0.7 (Ta ≥ 53°C)	mA / °C
	Peak forward current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	7	V
	Collector current	I <sub>C</sub>	50	mA
	Peak collector current (10ms pulse, 100pps)	I <sub>CP</sub>	100	mA
	Power dissipation	P <sub>C</sub>	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction temperature	T <sub>j</sub>	125	°C
Storage temperature range		T <sub>stg</sub>	-55~125	°C
Operating temperature range		T <sub>opr</sub>	-55~100	°C
Lead soldering temperature (10s)		T <sub>sol</sub>	260	°C
Total package power dissipation		P <sub>T</sub>	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-2.0	mW / °C
Isolation voltage (AC, 1min., R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	3750	V <sub>rms</sub>

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, 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	$I_F$	—	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.

Individual Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = 10\text{ mA}$	1.0	1.15	1.3	V
	Reverse Current	$I_R$	$V_R = 5\text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1\text{ MHz}$	—	30	—	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	$I_D$	$V_{CE} = 48\text{ V}$	—	10	100	nA
			$V_{CE} = 48\text{ V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
	Capacitance collector to emitter	$C_{CE}$	$V = 0, f = 1\text{ MHz}$	—	12	—	pF

Coupled Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 1\text{ mA}, V_{CE} = 0.5\text{ V}$ Rank BV	100	—	1200	%
			200	—	1200	
Low input CTR	$I_C / I_F (\text{low})$	$I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ Rank BV	50	—	—	%
			100	—	—	
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = 0.5\text{ mA}, I_F = 1\text{ mA}$	—	—	0.4	V
		$I_C = 1\text{ mA}, I_F = 1\text{ mA}$ Rank BV	—	0.2	—	
			—	—	0.4	
Off-state collector current	$I_{C(\text{off})}$	$V_F = 0.7\text{ V}, V_{CE} = 48\text{ V}$	—	—	10	$\mu\text{A}$

Coupled Electrical Characteristics ( $T_a = -25\sim 75^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 1\text{ mA}, V_{CE} = 0.5\text{ V}$ Rank BV	50	—	—	%
			100	—	—	%
Low input CTR	$I_C / I_F (\text{low})$	$I_F = 0.5\text{ mA}, V_{CE} = 1.5\text{ V}$ Rank BV	—	50	—	%
			—	100	—	%

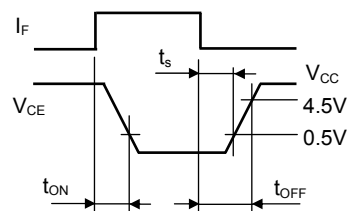
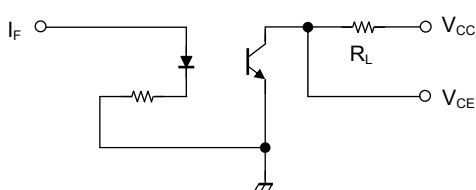
## Isolation Characteristics (Ta = 25°C)

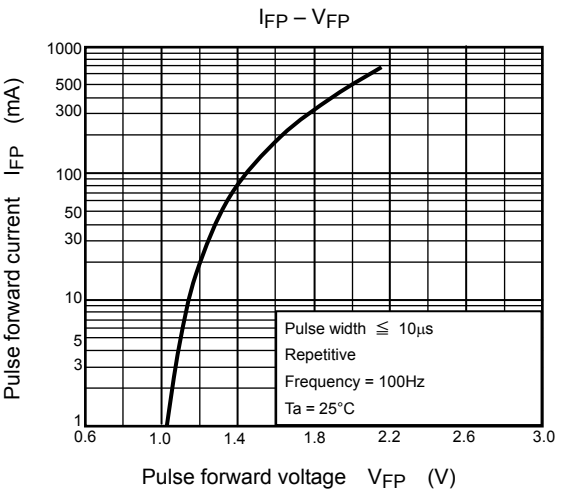
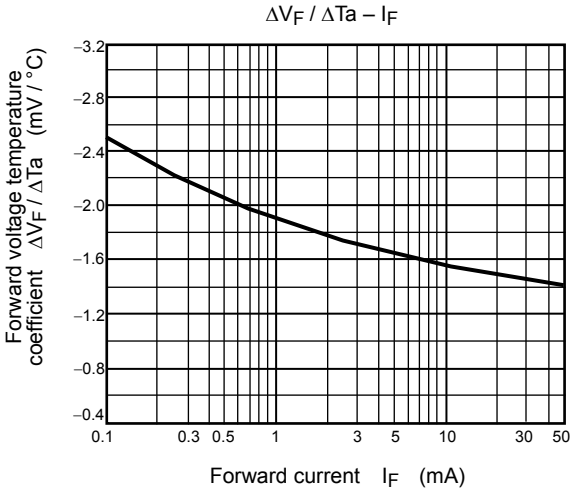
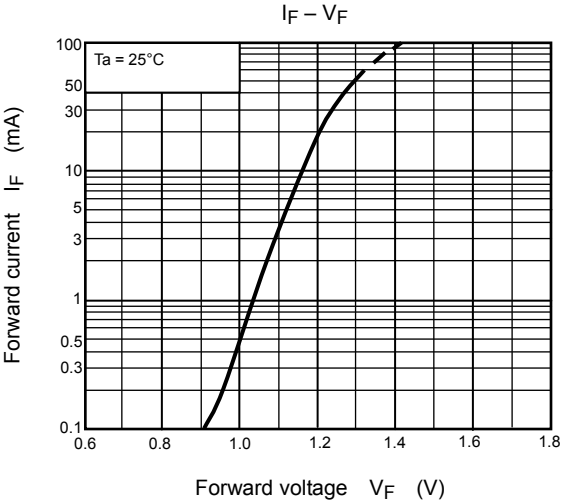
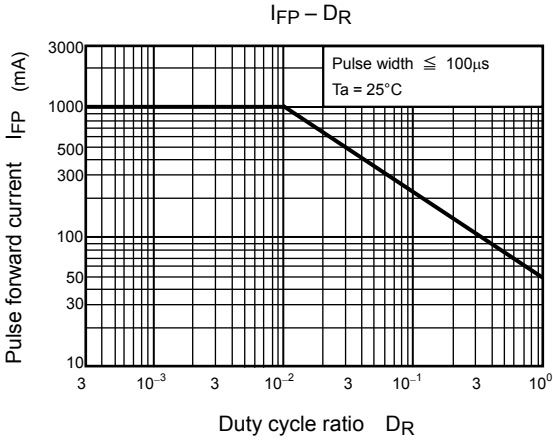
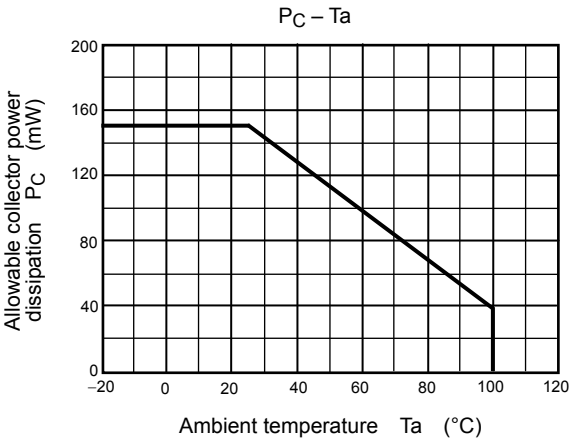
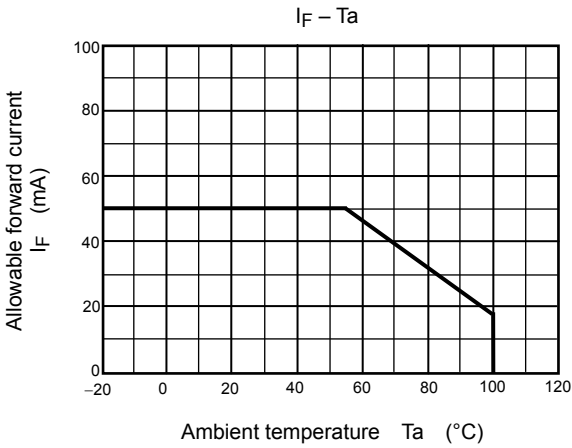
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	3750	—	—	V <sub>rms</sub>
		AC, 1 s, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

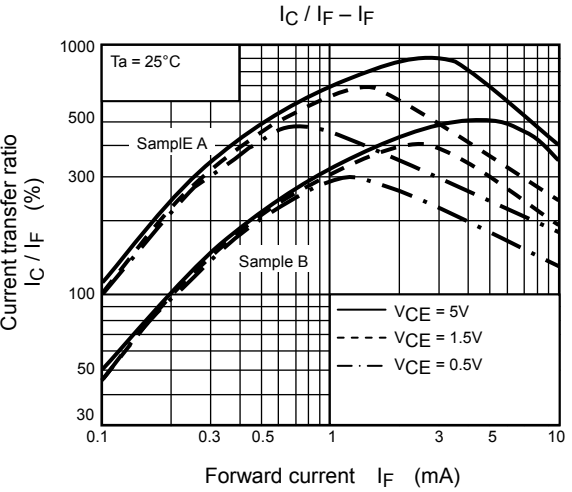
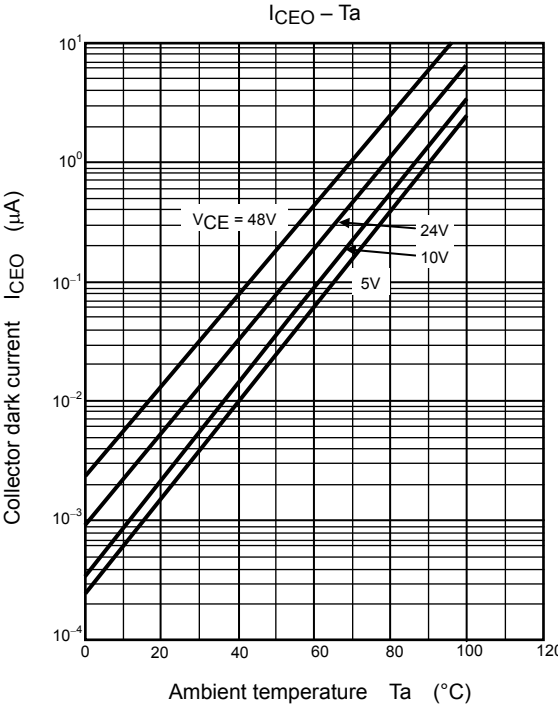
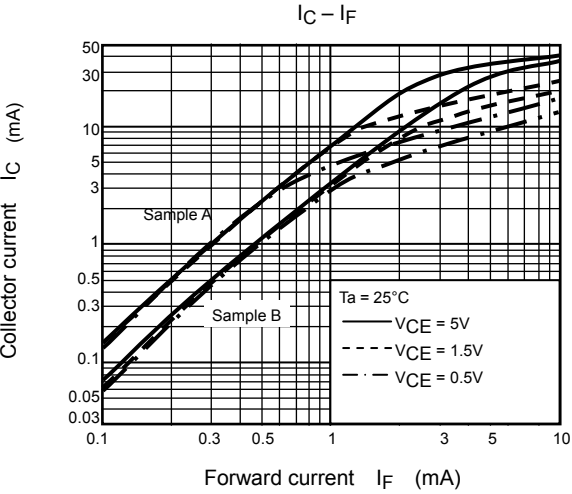
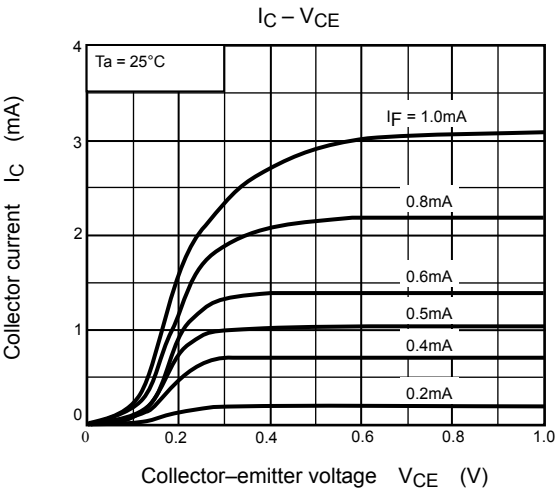
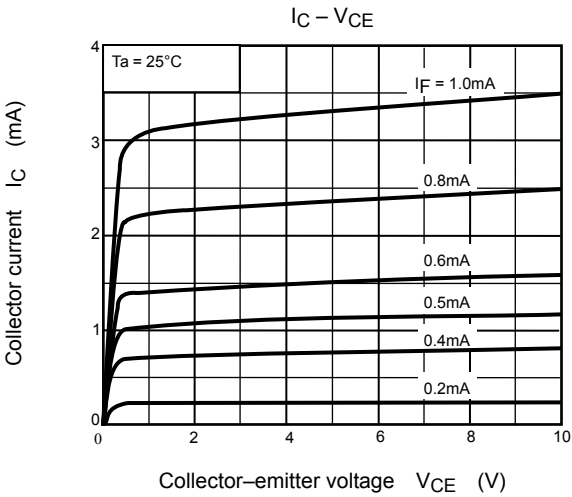
## Switching Characteristics (Ta = 25°C)

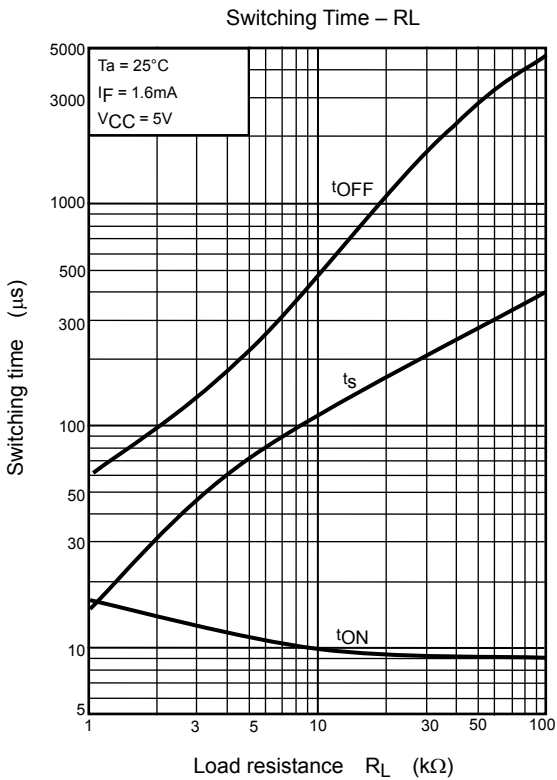
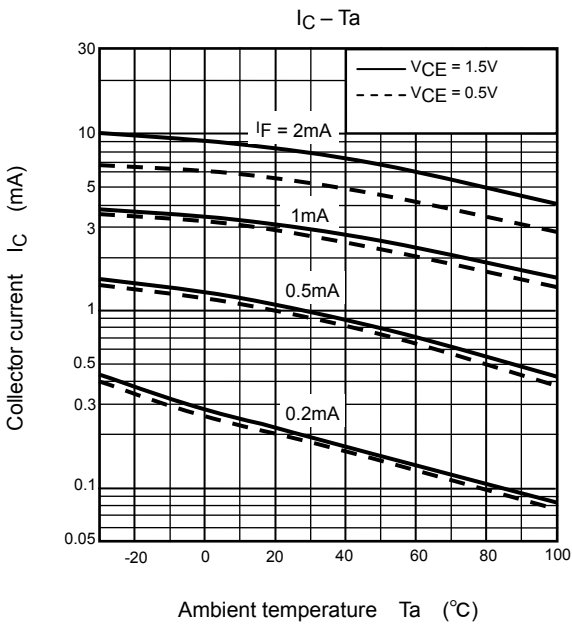
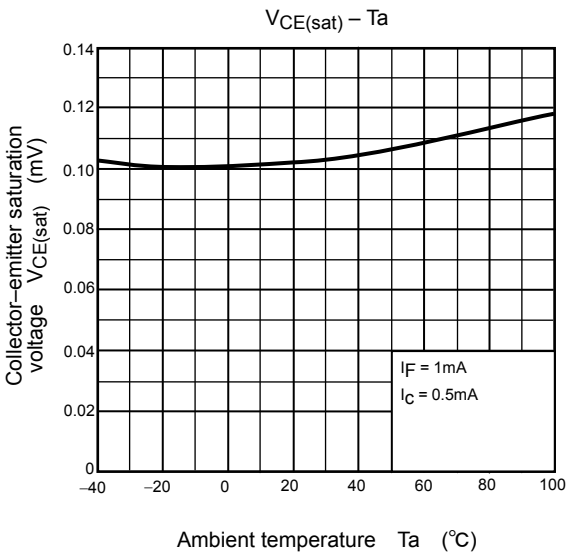
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA R <sub>L</sub> = 100Ω	—	8	—	μs
Fall time	t <sub>f</sub>		—	8	—	
Turn-on time	t <sub>ON</sub>		—	10	—	
Turn-off time	t <sub>OFF</sub>		—	8	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 4.7 kΩ V <sub>CC</sub> = 5 V, I <sub>F</sub> = 1.6 mA (Fig.1)	—	10	—	μs
Storage time	t <sub>s</sub>		—	50	—	
Turn-off time	t <sub>OFF</sub>		—	300	—	

Fig. 1 Switching time test circuit









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