TOSHIBA Photocoupler IRED & Photo-Transistor

TLP624, TLP624-2, TLP624-4

Programmable Controllers
AC/DC-Input Module
Telecommunication

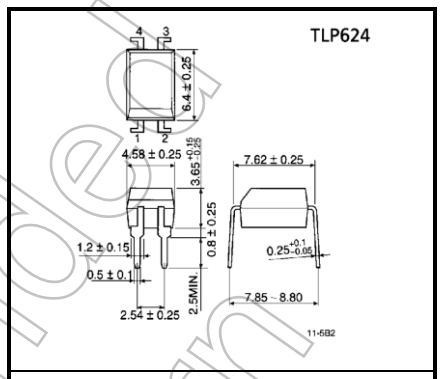
The TOSHIBA TLP624, -2 and -4 consist of an infrared emitting diode optically coupled to a photo-transistor.
The TLP624-2 offers two isolated channels in an eight lead plastic DIP, while the TLP624-4 provides four isolated channels in a sixteen plastic DIP.

- Collector-emitter voltage: 55 V (min)
- Isolation voltage: 5000 Vrms (min)
- 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(D4)**.

- Note: Application type name for certification test, please use standard product type name, i.e.
  TLP624(BV): TLP624
  TLP624-2(BV): TLP624-2

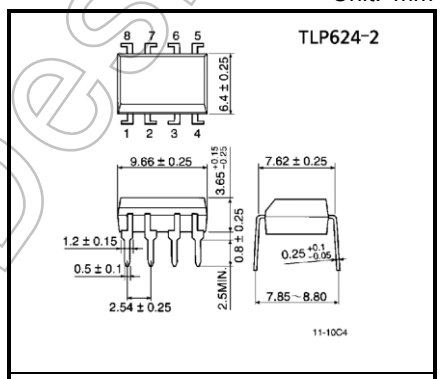
Unit: mm



TOSHIBA	11-5B2

Weight: 0.26 g (typ.)

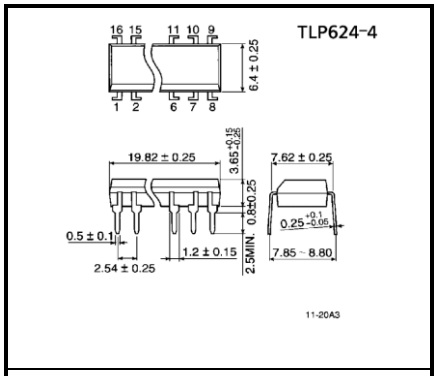
Unit: mm



TOSHIBA	11-10C4

Weight: 0.54 g (typ.)

Unit: mm



TOSHIBA	11-20A3

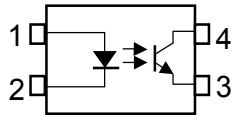
Weight: 1.1 g (typ.)

Classification	Current Transfer Ratio(min)			Marking of classification
	Ta = 25°C		Ta=-25 to 75°C	
	I_F=1mA V_{CE}=0.5V	I_F=0.5mA V_{CE}=1.5V	I_F=1mA V_{CE}=0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, blank

Start of commercial production
1986-04

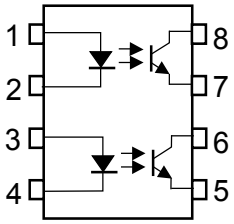
Pin Configurations (top view)

TLP624



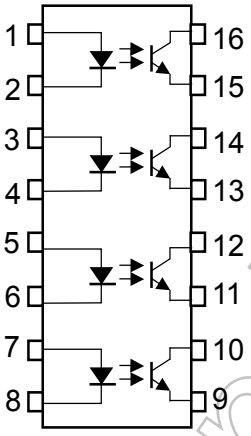
1. Anode
2. Cathode
3. Emitter
4. Collector

TLP624–2



1,3 : Anode
2,4 : Cathode
5,7 : Emitter
6,8 : Collector

TLP624–4



1,3,5,7: Anode
2,4,6,8: Cathode
9,11,13,15: Emitter
10,12,14,16: Collector

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP624	TLP624-2 TLP624-4	
LED	Forward current	I_F	60	50	mA
	Forward current detating	ΔI_F / °C	-0.7(Ta ≥ 39°C)	-0.5(Ta ≥ 25°C)	mA / °C
	Pulse forward current	I_{FP}	1 (100μs, pulse, 100pps)		A
	Diode Power dissipation	P_D	100	70	mW
	Diode Power dissipation derating	ΔP_D / °C	-1.2(Ta ≥ 39°C)	-0.7(Ta ≥ 25°C)	mW / °C
	Reverse voltage	V_R	5		V
	Junction temperature	T_j	125		°C
Detector	Collector-emitter voltage	V_{CEO}	55		V
	Emitter-collector voltage	V_{ECO}	7		V
	Collector current	I_C	50		mA
	Collector power dissipation (1 circuit)	P_C	150	100	mW
	Collector power dissipation derating (Ta ≥ 25°C, 1 circuit)	ΔP_C / °C	-1.5	-1.0	mW / °C
	Junction temperature	T_j	125		°C
Storage temperature range		T_{stg}	-55 to 125		°C
Operating temperature range		P_{opr}	-55 to 100		°C
Lead soldering temperature		T_{sol}	260 (10 s)		°C
Total package power dissipation (1 circuit)		P_T	250	150	mW
Total package power dissipation derating (Ta ≥ 25°C, 1 circuit)		ΔP_T / °C	-2.5	-1.5	mW / °C
Isolation voltage	(Note 1)	BV_S	5000 (AC, 60 s, R.H.≤60 %)		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: LED side pins shorted together, and detector side pins shorted together.

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	24	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.

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	55	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24 V	—	10	100	nA
			V_{CE} = 24 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)

Characteristic	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	%
		Rank BV	200	—	1200	
Low input CTR	I_C / $I_{F\ (low)}$	I_F = 0.5 mA, V_{CE} = 1.5 V	50	—	—	%
		Rank BV	100	—	—	
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	—	
		Rank BV	—	—	0.4	

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

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

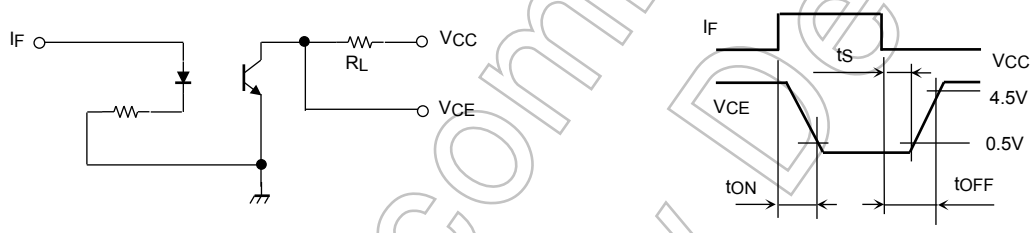
Isolation Characteristics (Ta = 25°C)

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, 60 s	5000	—	—	Vrms

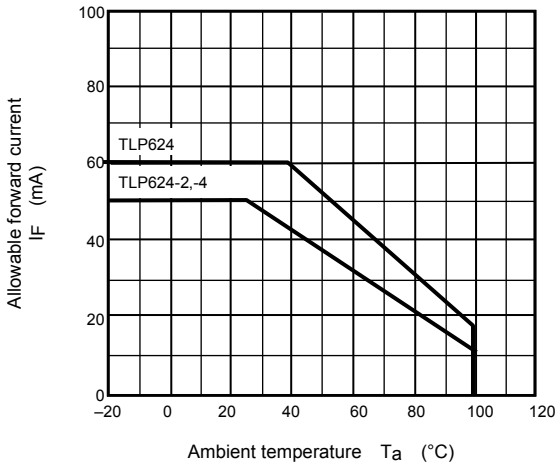
Switching Characteristics (Ta = 25°C)

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

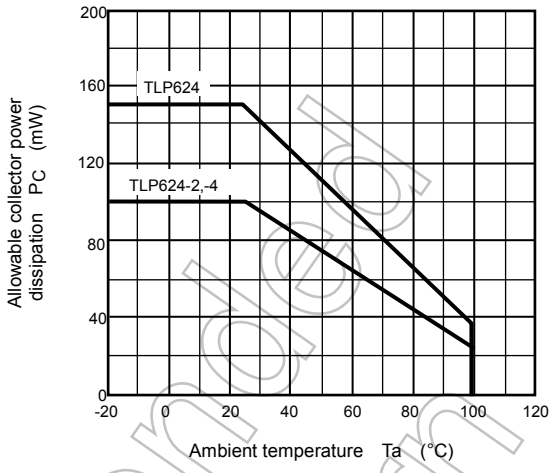
Fig. 1 Switching time test circuit



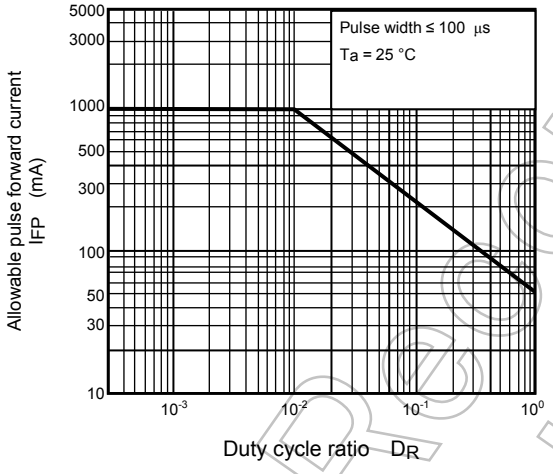
$I_F - T_a$



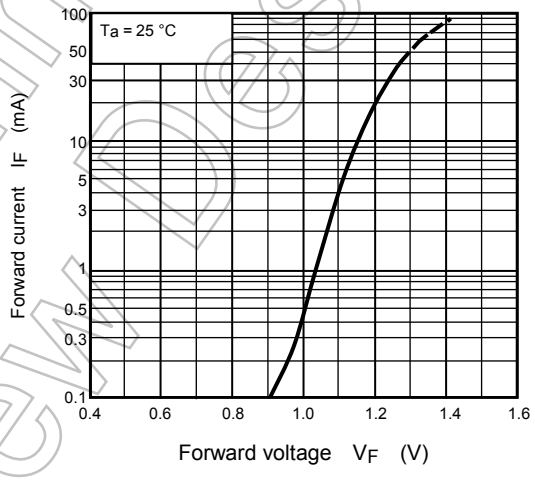
$P_C - T_a$



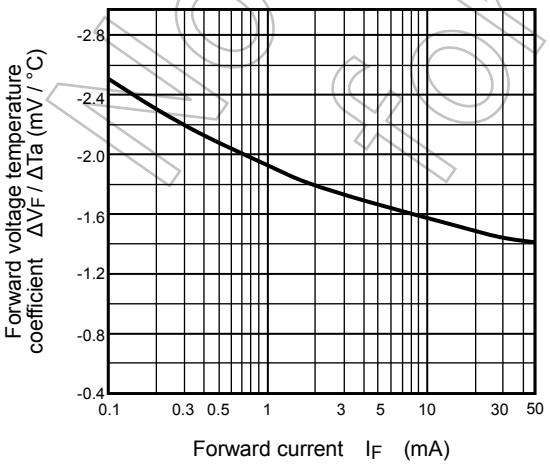
$I_{FP} - D_R$



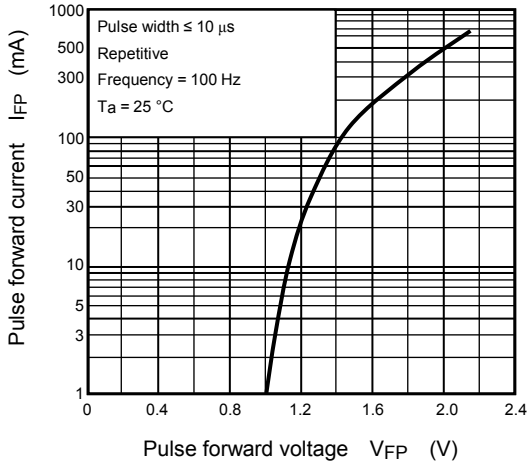
$I_F - V_F$



$\Delta V_F / \Delta Ta - I_F$

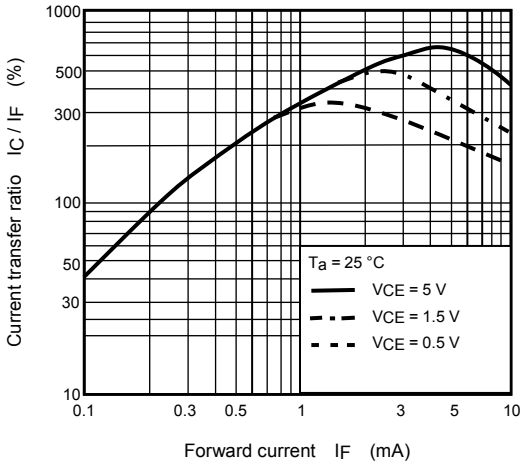


$I_{FP} - V_{FP}$

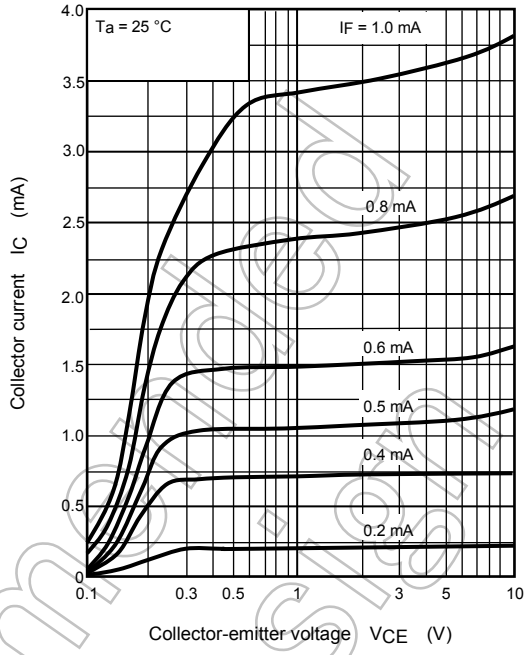


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

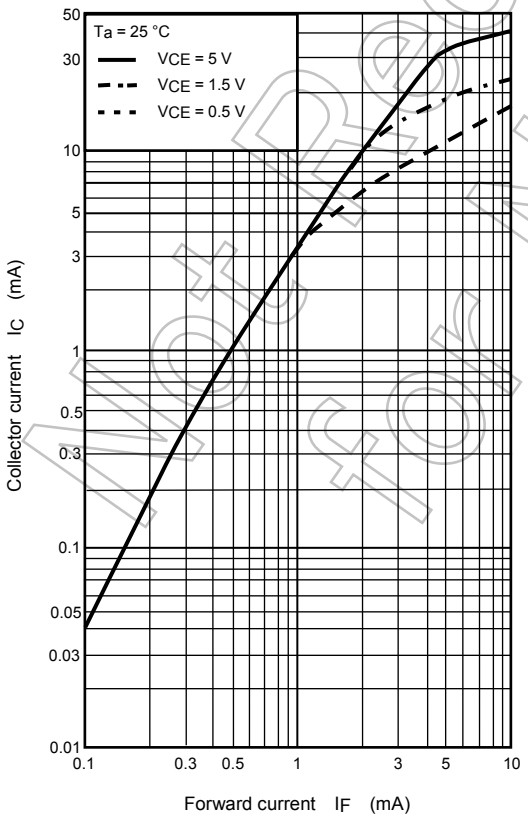
$I_C / I_F – I_F$



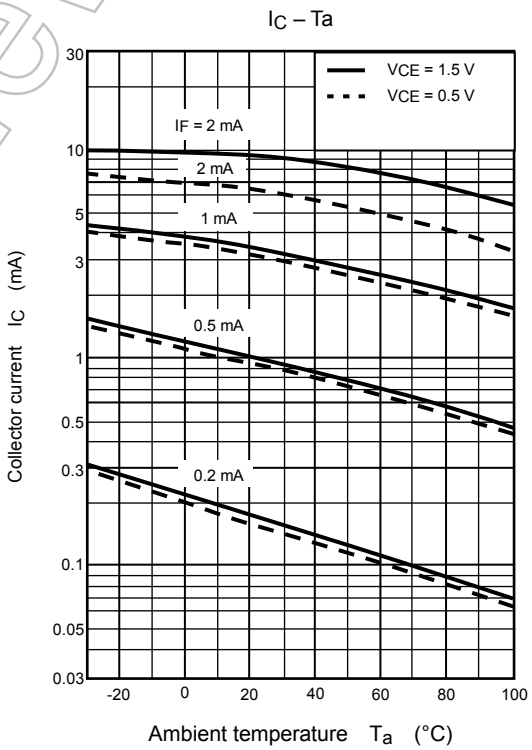
$I_C – V_{CE}$



$I_C – I_F$



$I_C – Ta$



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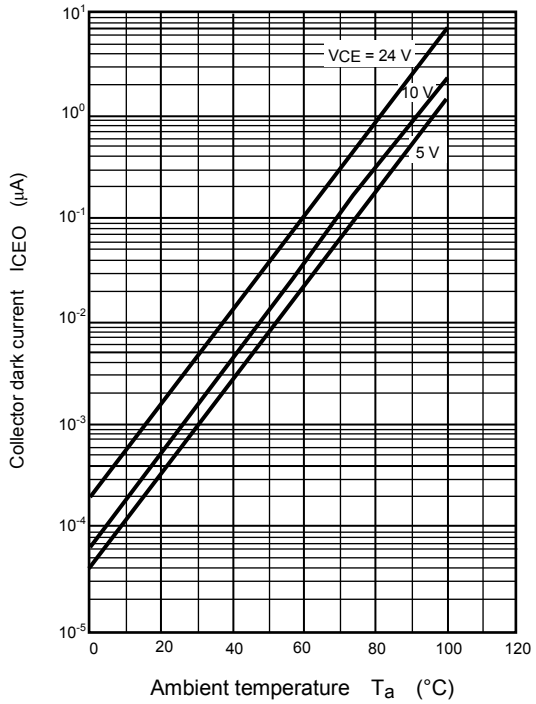
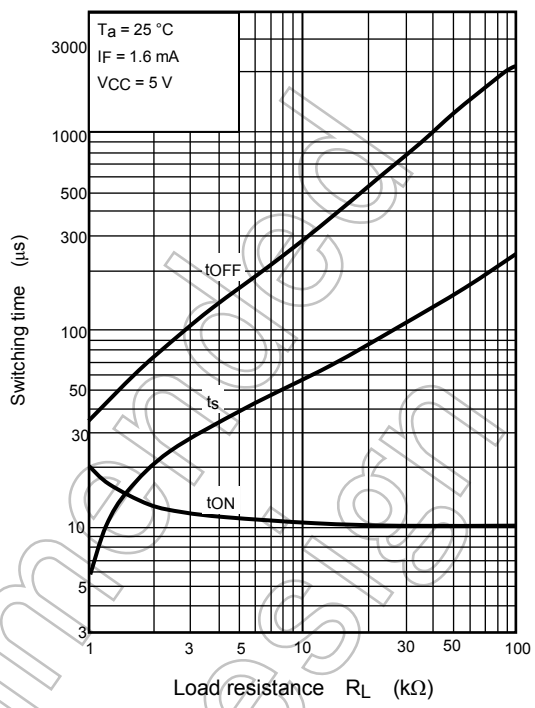
$I_{CEO} - T_a$



Switching Time – R_L



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