

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP624, TLP624-2, TLP624-4

Programmable Controllers
AC/DC-Input Module
Telecommunication

The TOSHIBA TLP624, -2 and -4 consist of a gallium arsenide 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: 55V (min)
- Current transfer ratio

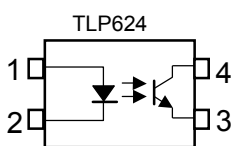
Classification	Current Transfer Ratio(min)			Marking of classification
	Ta = 25°C			
	I _F =1mA V _{CE} =0.5V	I _F =0.5mA V _{CE} =1.5V	I _F =1mA V _{CE} =0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, blank

- Isolation voltage: 5000V_{rms} (min)
- UL recognized: UL1577, file No.E67349
- BSI approved: BS EN60065: 2002 Certificate No.7426
BS EN60950-1: 2002 Certificate No.7427
- Note: Application type name for certification test, please use standard product type name, i.e.

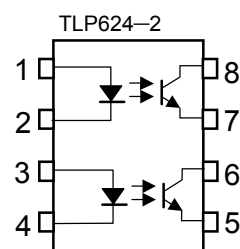
TLP624(BV): TLP624

TLP624-2(BV): TLP624-2

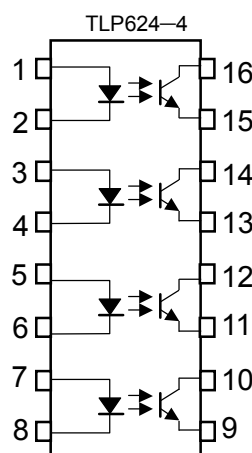
Pin Configurations (top view)



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

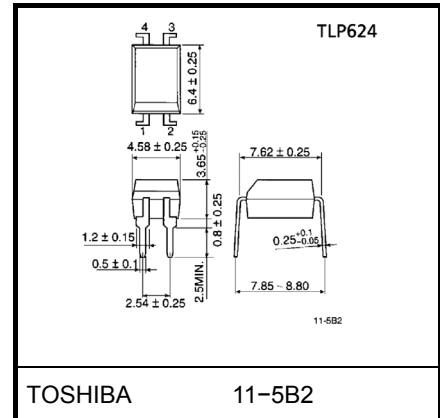


- 1,3 : Anode
- 2,4 : Cathode
- 5,7 : Emitter
- 6,8 : Collector



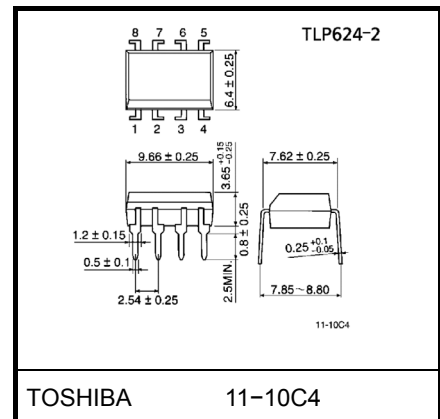
- 1,3,5,7: Anode
- 2,4,6,8: Cathode
- 9,11,13,15: Emitter
- 10,12,14,16: Collector

Unit: mm



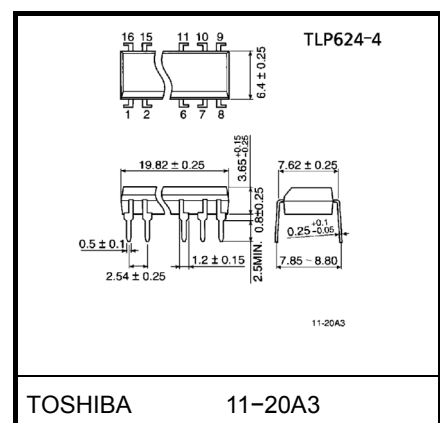
TOSHIBA 11-5B2

Weight: 0.26 g (typ.)



TOSHIBA 11-10C4

Weight: 0.54 g (typ.)



TOSHIBA 11-20A3

Weight: 1.1 g (typ.)

Start of commercial production
1986/04

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	$\Delta I_F / ^\circ\text{C}$	$-0.7(T_a \geq 39^\circ\text{C})$	$-0.5(T_a \geq 25^\circ\text{C})$	mA / $^\circ\text{C}$
	Pulse forward current	I_{FP}	1 (100 μs , pulse, 100pps)		A
	Power dissipation (1 circuit)	P_D	100	70	mW
	Power dissipation derating (Ta $\geq 25^\circ\text{C}$, 1 circuit)	$\Delta P_D / ^\circ\text{C}$	-1.0	-0.7	mW / $^\circ\text{C}$
	Reverse voltage	V_R	5		V
	Junction temperature	T_j	125		$^\circ\text{C}$
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 $\geq 25^\circ\text{C}$, 1 circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / $^\circ\text{C}$
	Junction temperature	T_j	125		$^\circ\text{C}$
	Storage temperature range	T_{stg}	-55~125		$^\circ\text{C}$
Operating temperature range	P_{opr}	-55~100		$^\circ\text{C}$	
Lead soldering temperature	T_{sol}	260 (10s)		$^\circ\text{C}$	
Total package power dissipation (1 circuit)	P_T	250	150	mW	
Total package power dissipation derating (Ta $\geq 25^\circ\text{C}$, 1 circuit)	$\Delta P_T / ^\circ\text{C}$	-2.5	-1.5	mW / $^\circ\text{C}$	
Isolation voltage (Note 1)	BV_S	5000 (AC, 1 minute, R.H. $\leq 60\%$)		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	$^\circ\text{C}$

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 (Ta = 25°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	μA
	Capacitance	C_T	$V = 0, f = 1\text{MHz}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5\text{mA}$	55	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector dark current	I_{CEO}	$V_{CE} = 24\text{V}$	—	10	100	nA
			$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$	—	2	50	μA
Capacitance collector to emitter	C_{CE}	$V=0, f=1\text{MHz}$	—	12	—	pF	

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C / I_F	$I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$ 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	$V_{CE} (\text{sat})$	$I_C = 0.5\text{mA}, I_F = 1\text{mA}$ $I_C = 1\text{mA}, I_F = 1\text{mA}$ Rank BV	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	

Coupled Electrical Characteristics (Ta = -25°C~75°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	—	

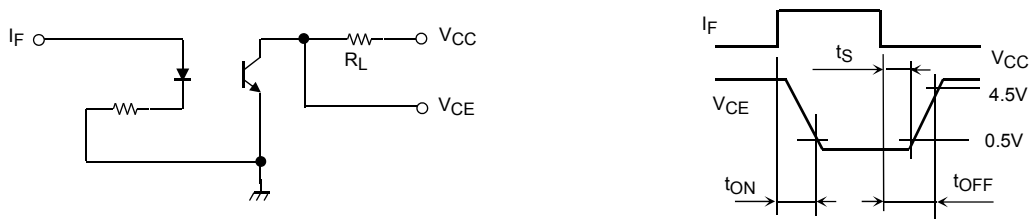
Isolation Characteristics (Ta = 25°C)

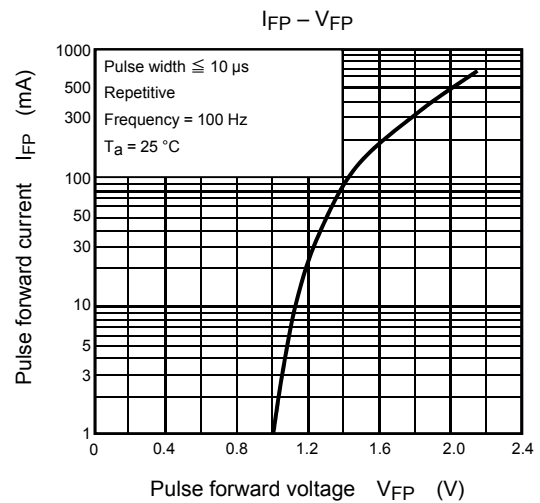
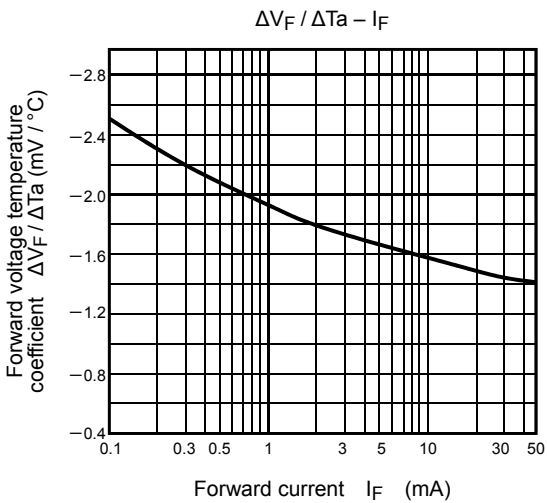
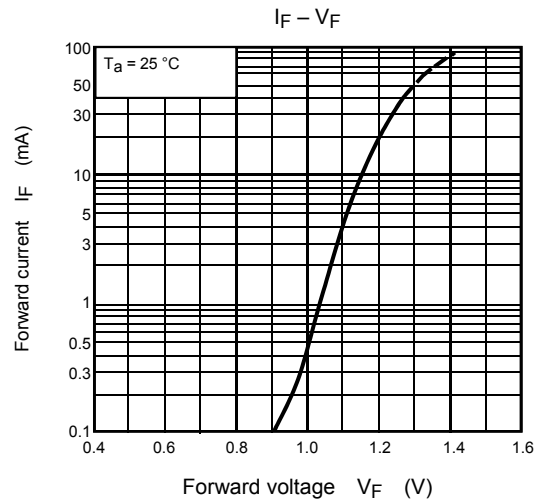
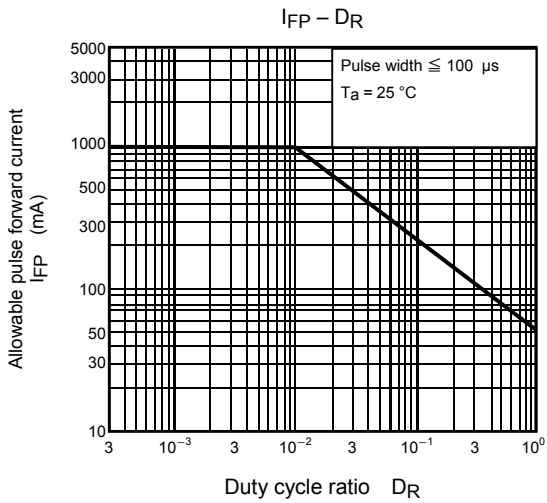
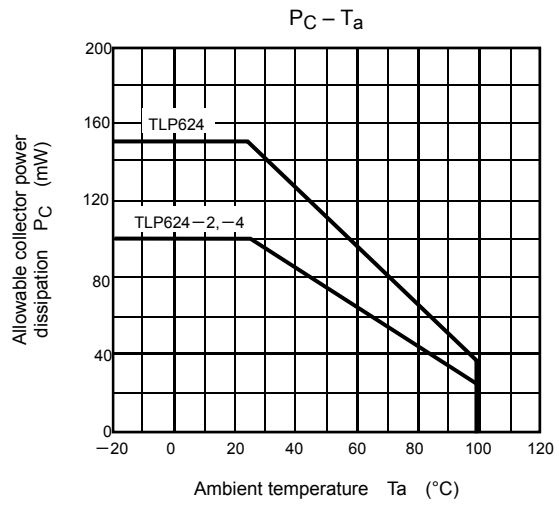
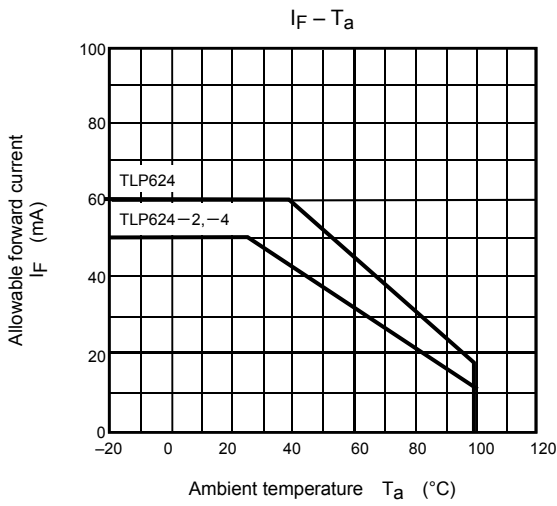
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C _S	V _S = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R _S	V _S = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1minute	5000	—	—	V _{rms}
		AC, 1second, in oil	—	10000	—	—
		DC, 1 minute, in oil	—	10000	—	—

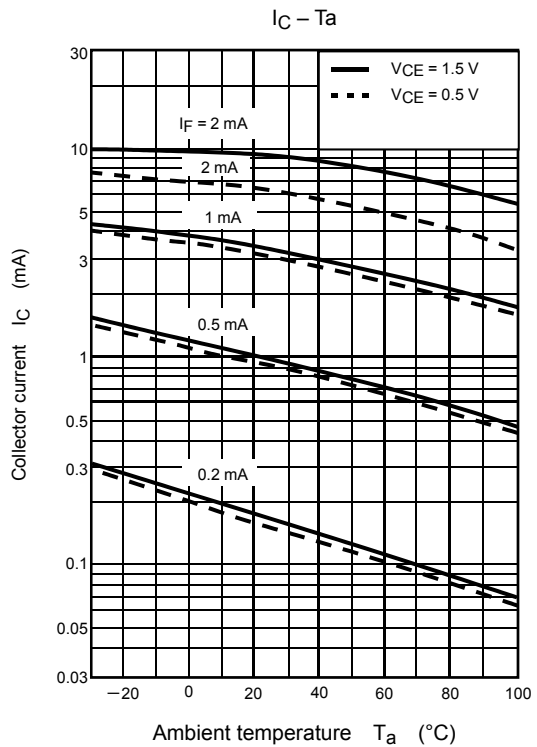
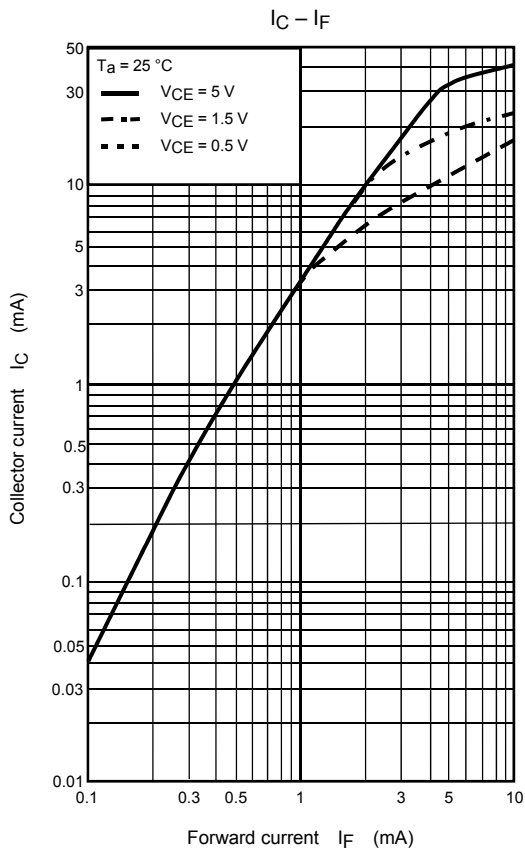
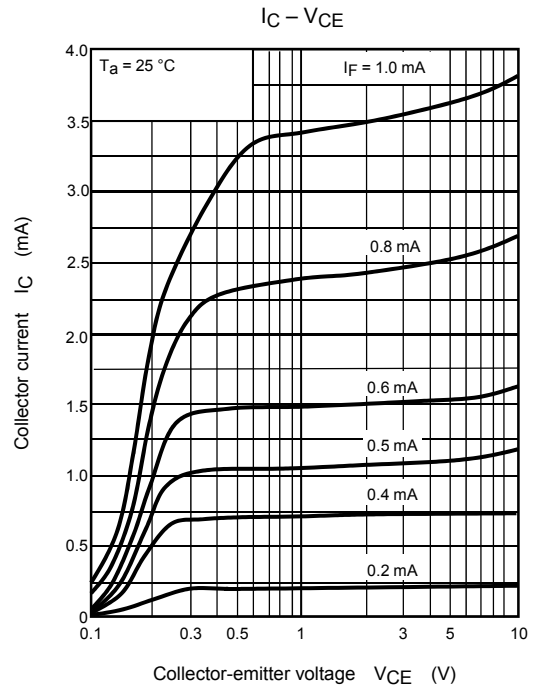
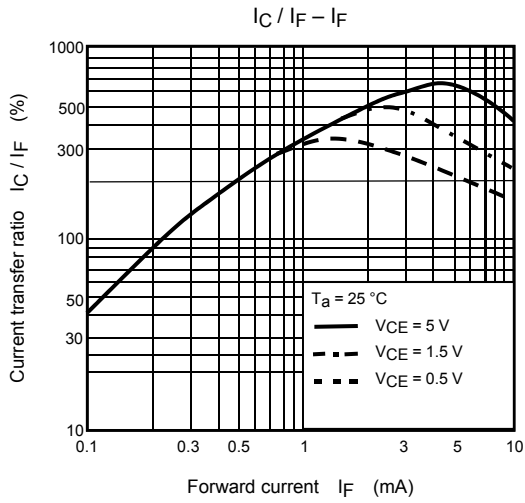
Switching Characteristics (Ta = 25°C)

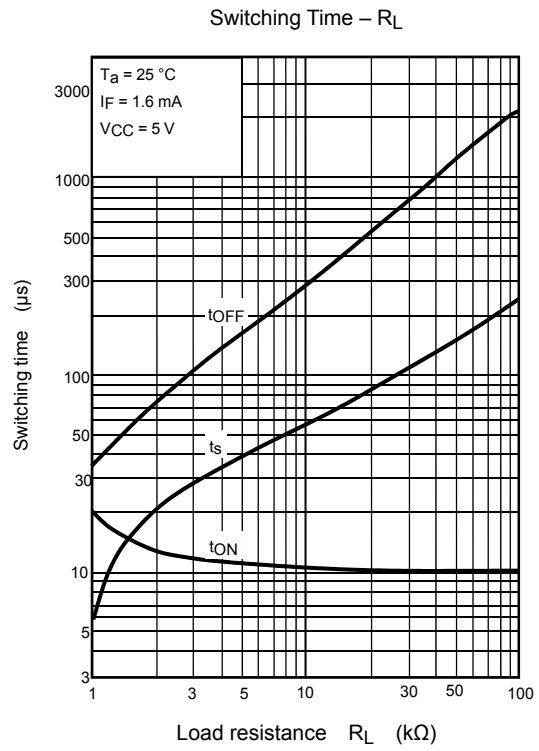
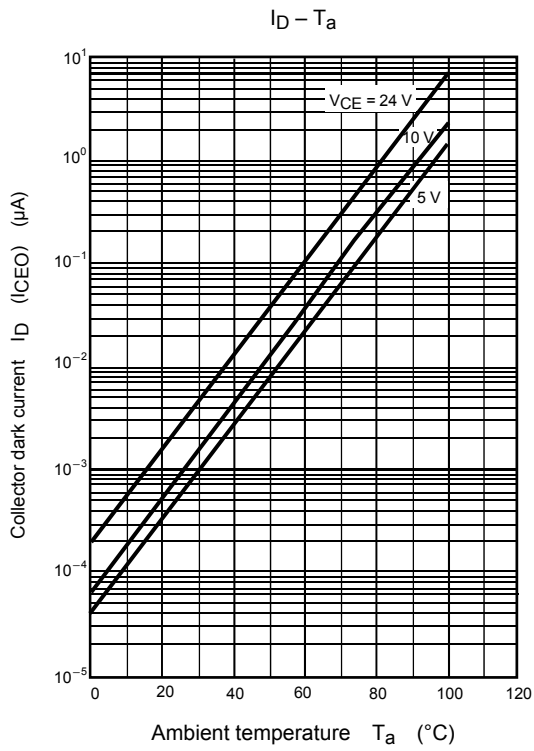
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t _r	V _{CC} = 10V, I _C = 2mA R _L = 100Ω	—	8	—	μs
Fall time	t _f		—	8	—	
Turn-on time	t _{on}		—	10	—	
Turn-off time	t _{off}		—	8	—	
Turn-on time	t _{ON}	R _L = 4.7 kΩ (Fig.1) V _{CC} = 5 V, I _F = 1.6mA	—	10	—	μs
Storage time	t _S		—	50	—	
Turn-off time	t _{OFF}		—	300	—	

Fig. 1 Switching time test circuit









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