TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP626, TLP626-2, TLP626-4

Programmable Controllers
AC / DC-Input Module
Telecommunication

The TOSHIBA TLP626, -2 and -4 consist of gallium arsenide infrared emitting diodes connected in inverse parallel, optically coupled to a photo-transistor. The TLP626-2 offers two isolated channels in an eight lead plastic DIP, while the TLP626-4 provides four isolated channels in a sixteen plastic DIP.

- Collector-emitter voltage: 55 V (min)
- Isolation voltage: 5000 Vrms (min)
- UL recognized: UL1577, file no.E67349
- cUL recognized : CSA Component Acceptance Service No. 5A
  File No.E67349
- Option (D4) type
  VDE approved : EN60747-5-5
  Maximum operating insulation voltage: 890 Vpk
  Highest permissible over voltage: 8000 Vpk

  Note: When an EN 60747-5-5 approved type is needed, please designate the "Option(D4)".

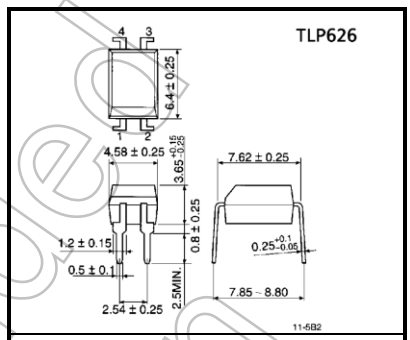
Current transfer ratio

Classification (Note 1)	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

Note 1: Only TLP626 is applied to BV rank items.

Note: Application type name for certification test, please use standard product type name, i.e.
TLP626(BV): TLP626

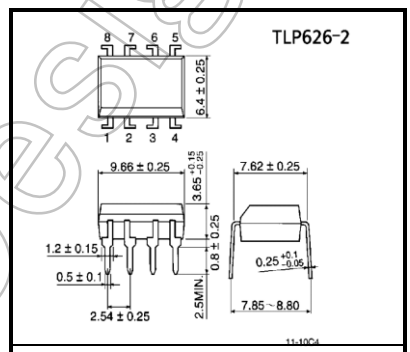
Unit: mm



TOSHIBA 11-5B2

Weight: 0.26 g (typ.)

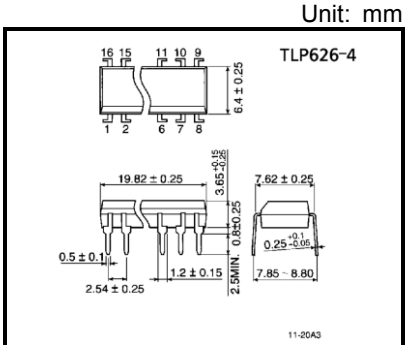
Unit: mm



TOSHIBA 11-10C4

Weight: 0.54 g (typ.)

Unit: mm



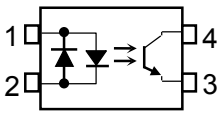
TOSHIBA 11-20A3

Weight: 1.1 g (typ.)

Start of commercial production
1984-04

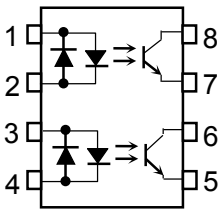
Pin Configuration (top view)

TLP626



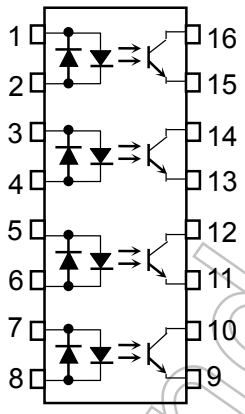
1 : Anode
Cathode
2 : Cathode
Anode
3 : Emitter
4 : Collector

TLP626—2



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

TLP626—4



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

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP626	TLP626-2 TLP626-4	
LED	Forward current	I_F	60	50	mA
	Forward current derating	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
	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 (10s)		°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: 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	$I_{F(RMS)}$	—	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)

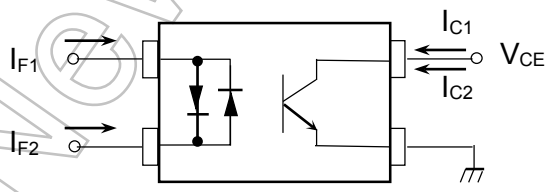
	Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = ±10mA	1.0	1.15	1.3	V
	Reverse current	I_F	V_F = ±0.7V	—	2.5	20	μA
	Capacitance	C_T	V = 0 V, f = 1MHz	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 0.5mA	55	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24V	—	10	100	nA
			V_{CE} = 24V, Ta = 85°C	—	2	50	μA
	Capacitance collector to emitter	C_{CE}	V=0 V, f=1MHz	—	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 = ±1mA, V_{CE} = 0.5V	100	—	1200	%
		rank BV(Note 2)	200	—	1200	
Low input CTR	I_C / $I_{F(low)}$	I_F = ±0.5mA, V_{CE} = 1.5V	50	—	—	%
		rank BV(Note 2)	100	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.5mA, I_F = ±1mA	—	—	0.4	V
		I_C = 1mA, I_F = ±1mA	—	0.2	—	
		rank BV(Note 2)	—	—	0.4	
Off-state collector current	$I_{C(off)}$	V_F = ±0.7V, V_{CE} = 24V	—	1	10	μA
CTR symmetry (Note 1)	$I_{C(ratio)}$	I_C(I_F = -1mA) / I_C(I_F = 1mA)	0.5	—	2	—

Note 1

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



Note 2: Only TLP626 is applied to BV rank items.

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

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

Note 1: Only TLP626 is applied to BV rank items.

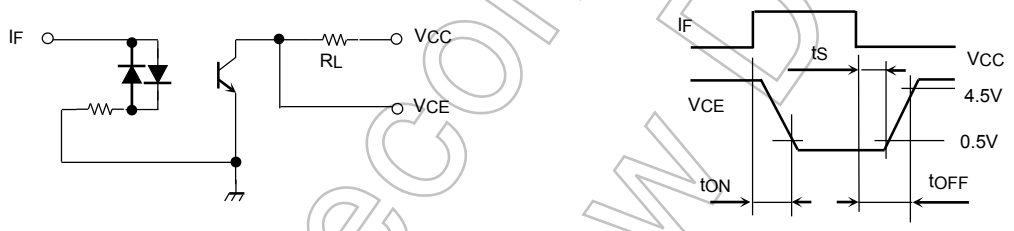
Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0 V, f = 1MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500V, R.H.≤60%	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	5000	—	—	Vrms
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	Vdc

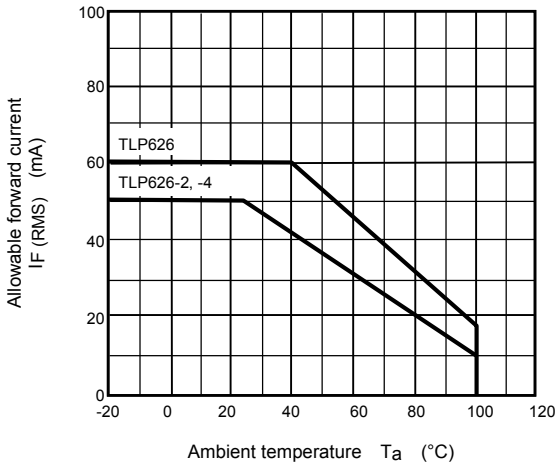
Switching Characteristics (Ta = 25°C)

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 = 4.7kΩ (Fig.1) V_{CC} = 5 V, I_F = ±1.6mA	—	10	—	μs
Storage time	t_s		—	50	—	
Turn-off time	t_{OFF}		—	300	—	

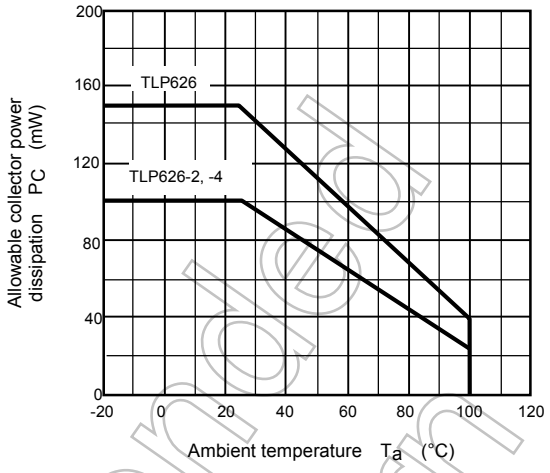
Fig. 1: Switching operating conditions



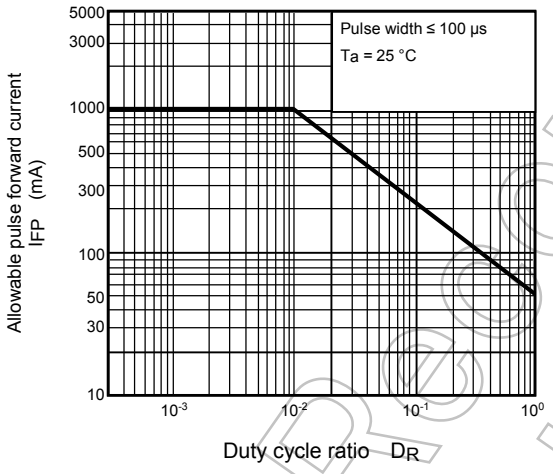
$I_F - T_a$



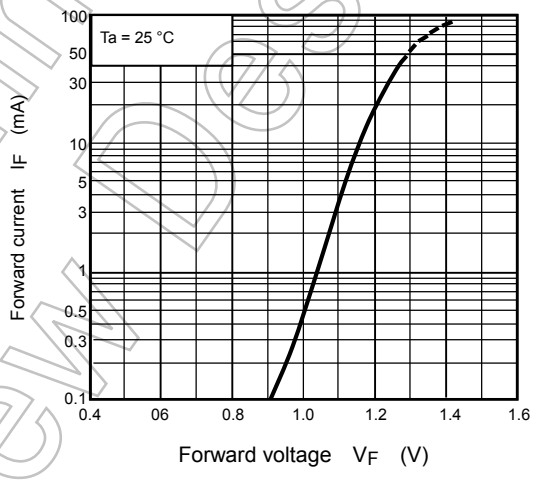
$P_C - T_a$



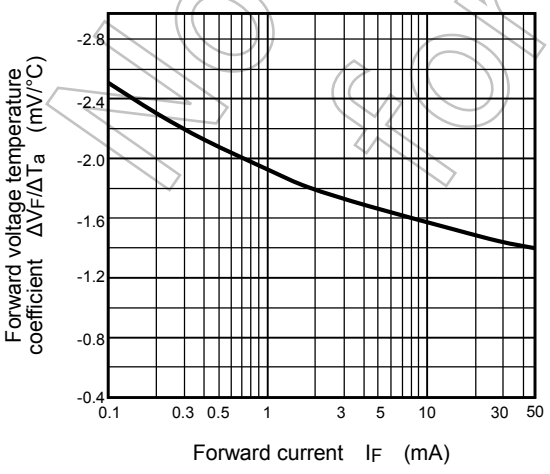
$I_{FP} - D_R$



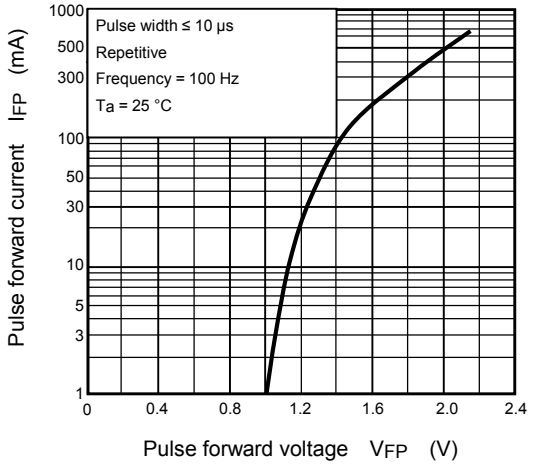
$I_F - V_F$



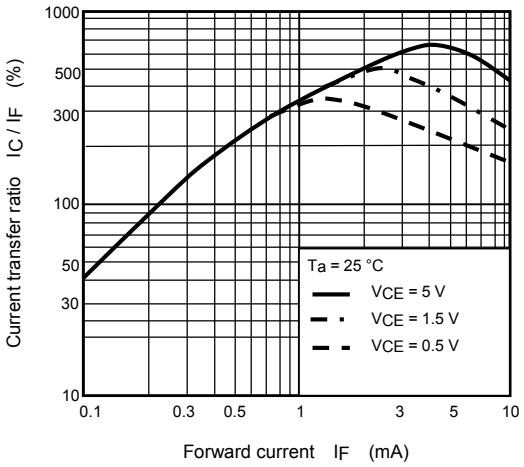
$\Delta V_F / \Delta T_a - I_F$



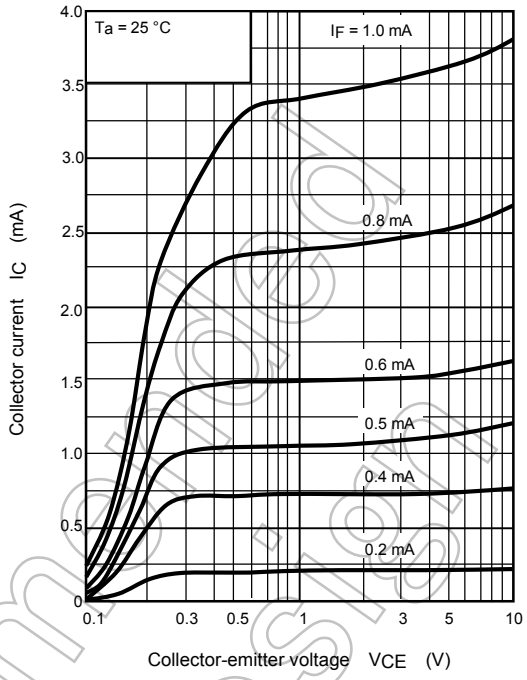
$I_{FP} - V_{FP}$



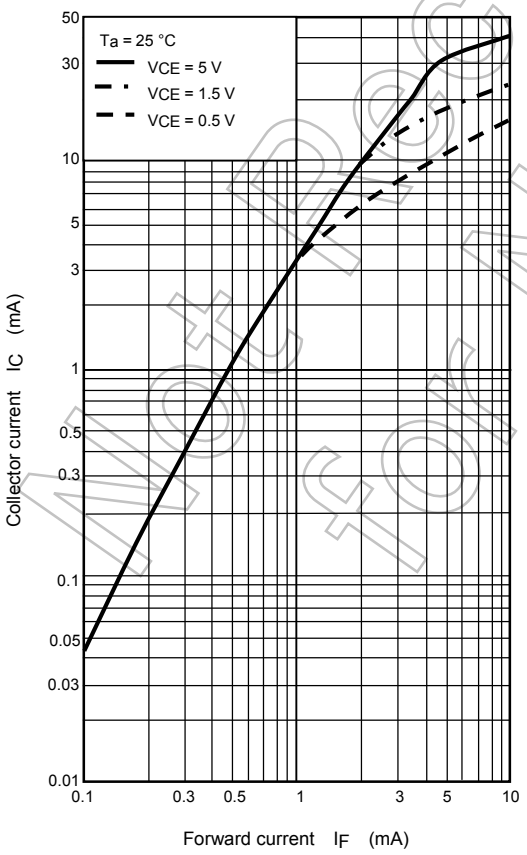
$I_C / I_F - I_F$



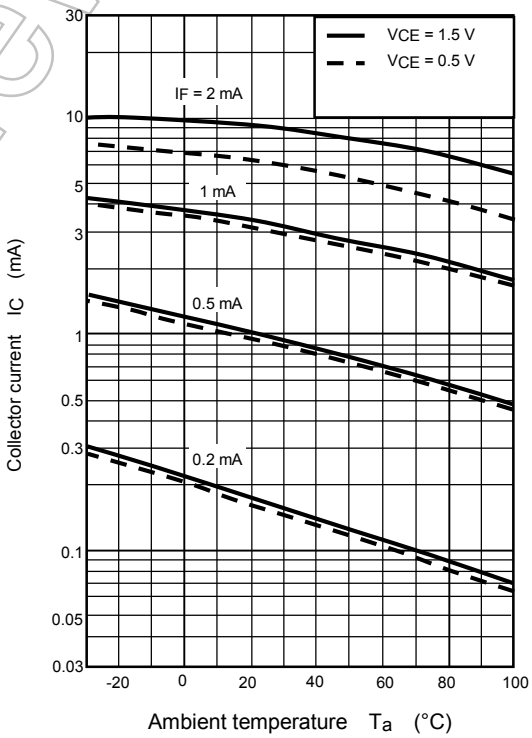
$I_C - V_{CE}$



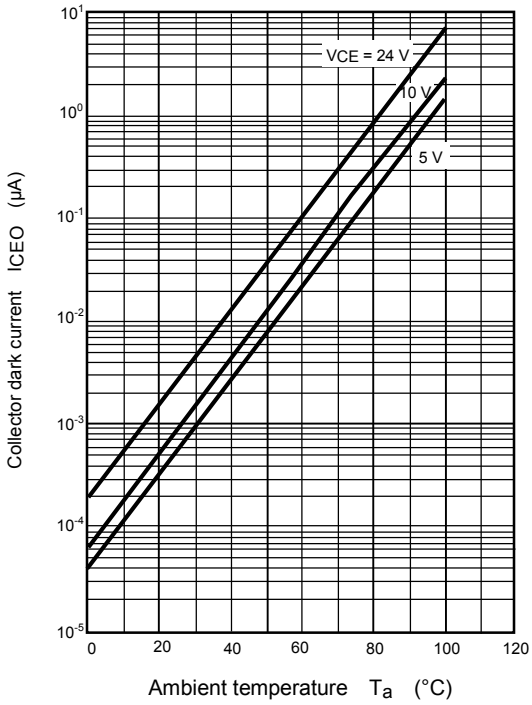
$I_C - I_F$



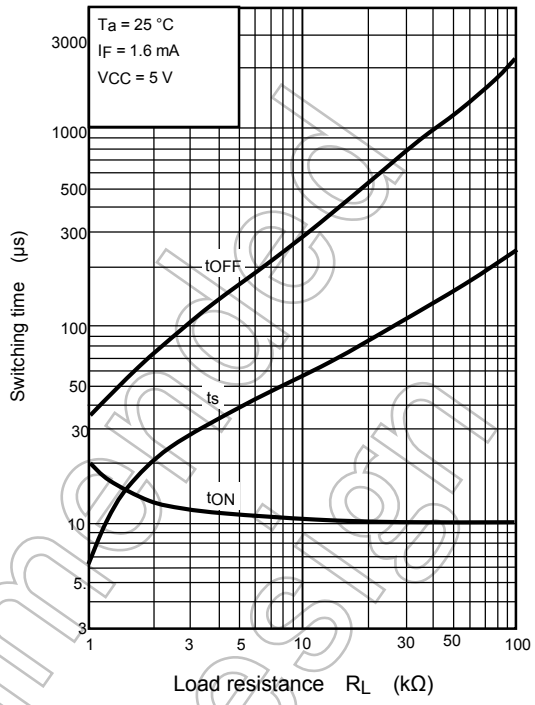
$I_C - T_a$



I_{CEO} – T_a



Switching Time – R_L



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