

TOSHIBA Photocoupler GaAs Ired &amp; 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

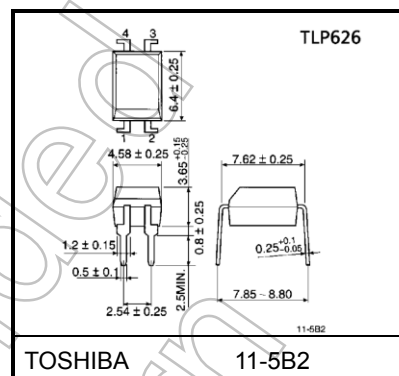
Classification (Note 1)	Current Transfer Ratio (min)			Marking of Classification
	Ta = 25°C		Ta = -25 to 75°C	
	If = ±1mA VCE = 0.5V	If = ±0.5mA VCE = 1.5V	If = ±1mA VCE = 0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, blank

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.

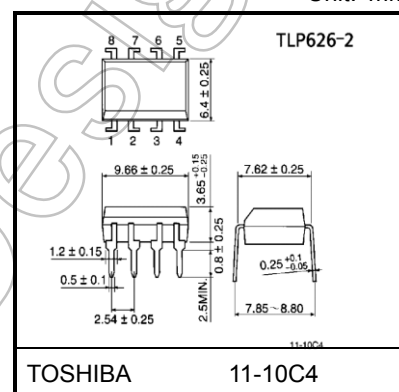
TLP626(BV): TLP626

Unit: mm



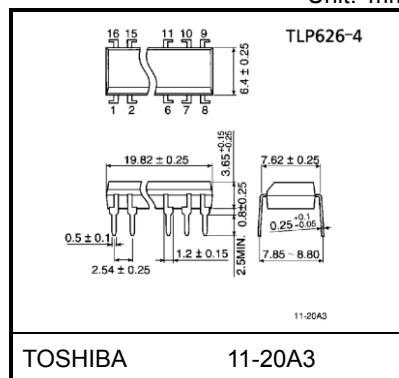
Weight: 0.26 g (typ.)

Unit: mm



Weight: 0.54 g (typ.)

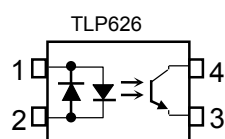
Unit: mm



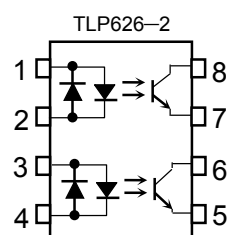
Weight: 1.1 g (typ.)

Start of commercial production  
1984-04

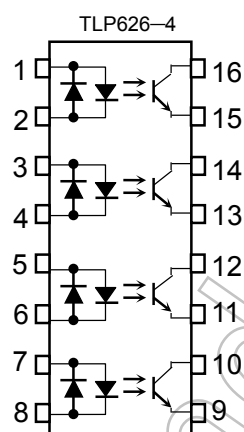
## Pin Configuration (top view)



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



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



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 <sub>F</sub>	60	50	mA
	Forward current derating	ΔI <sub>F</sub> / °C	-0.7 (Ta ≥ 39°C)	-0.5 (Ta ≥ 25°C)	mA / °C
	Pulse forward current	I <sub>FP</sub>	1 (100μs pulse, 100pps)		A
	Diode Power dissipation	P <sub>D</sub>	100	70	mW
	Diode Power dissipation derating	ΔP <sub>D</sub> / °C	-1.2 (Ta ≥ 39°C)	-0.7 (Ta ≥ 25°C)	mW / °C
	Junction temperature	T <sub>j</sub>	125		°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	55		V
	Emitter-collector voltage	V <sub>ECO</sub>	7		V
	Collector current	I <sub>C</sub>	50		mA
	Collector power dissipation (1 circuit)	P <sub>C</sub>	150	100	mW
	Collector power dissipation derating (Ta ≥ 25°C, 1 circuit)	ΔP <sub>C</sub> / °C	-1.5	-1.0	mW / °C
	Junction temperature	T <sub>j</sub>	125		°C
Storage temperature range		T <sub>stg</sub>	-55 to 125		°C
Operating temperature range		P <sub>opr</sub>	-55 to 100		°C
Lead soldering temperature		T <sub>sol</sub>	260 (10s)		°C
Total package power dissipation (1 circuit)		P <sub>T</sub>	250	150	mW
Total package power dissipation derating (Ta ≥ 25°C, 1 circuit)		ΔP <sub>T</sub> / °C	-2.5	-1.5	mW / °C
Isolation voltage (Note 1)		BV <sub>S</sub>	5000 (AC, 60 s, R.H. ≤ 60%)		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: LED side pins shorted together, and detector side pins shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>CC</sub>	—	5	24	V
Forward current	I <sub>F(RMS)</sub>	—	1.6	20	mA
Collector current	I <sub>C</sub>	—	1	10	mA
Operating temperature	T <sub>opr</sub>	-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)

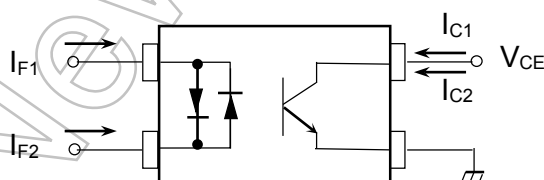
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = ±10mA	1.0	1.15	1.3	V
	Reverse current	I <sub>F</sub>	V <sub>F</sub> = ±0.7V	—	2.5	20	μA
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1MHz	—	60	—	pF
Detector	Collector-emitter breakdown voltage	V <sub>(BR)CEO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

Note 1

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



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 <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = 1mA, V <sub>CE</sub> = 0.5V rank BV(Note 1)	50	—	—	%
			100	—	—	
Low input CTR	I <sub>C</sub> / I <sub>F</sub> (low)	I <sub>F</sub> = 0.5mA, V <sub>CE</sub> = 1.5V rank BV(Note 1)	—	50	—	%
			—	100	—	

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

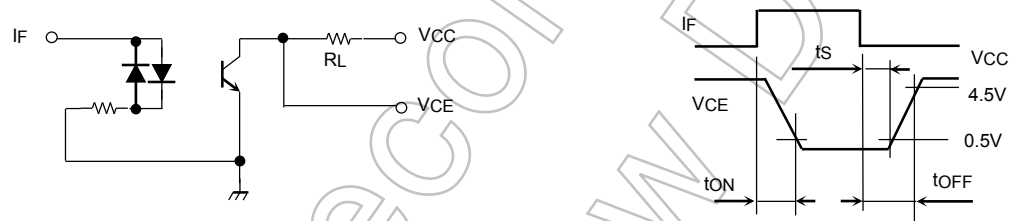
**Isolation Characteristics (Ta = 25°C)**

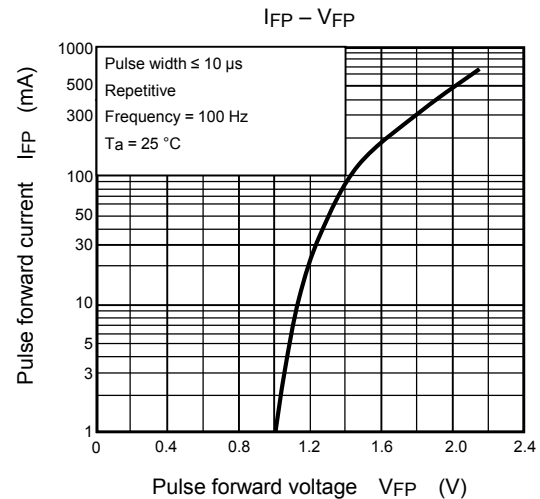
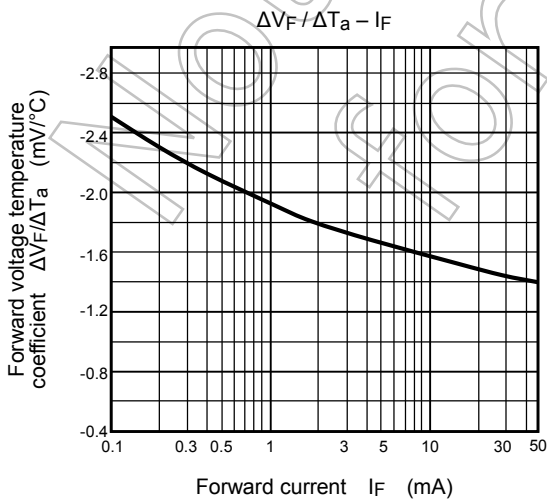
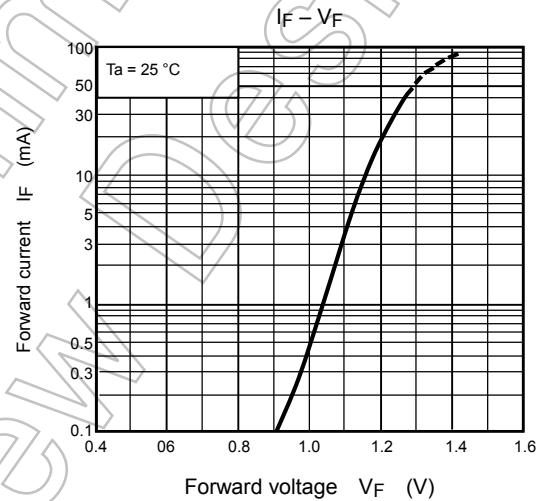
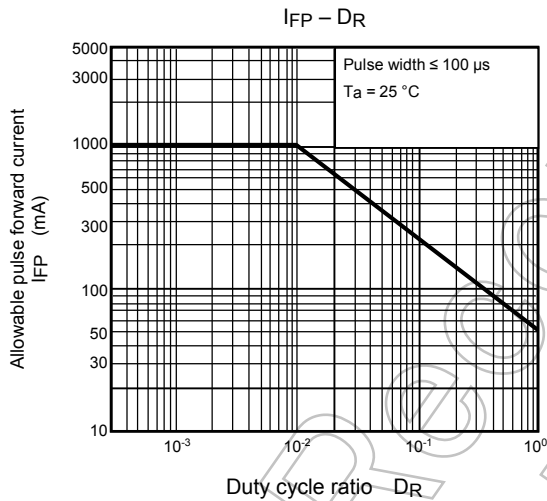
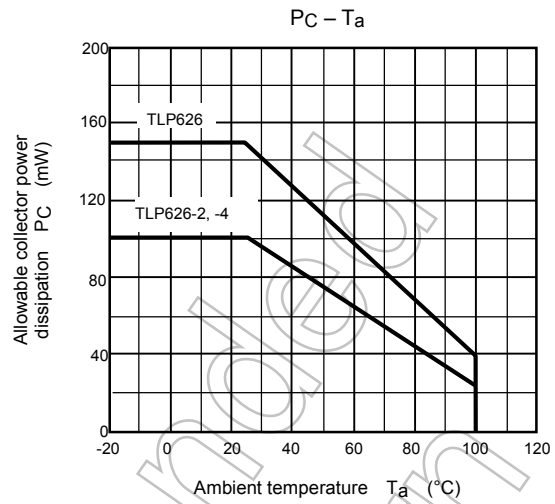
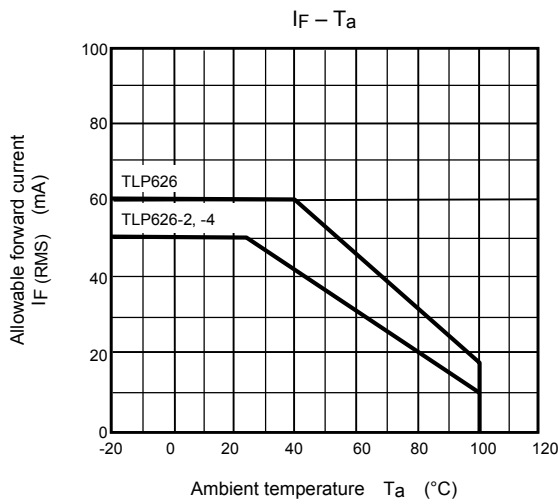
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	CS	VS = 0 V, f = 1MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500V, R.H.≤60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BVS	AC, 60 s	5000	—	—	Vrms
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	Vdc

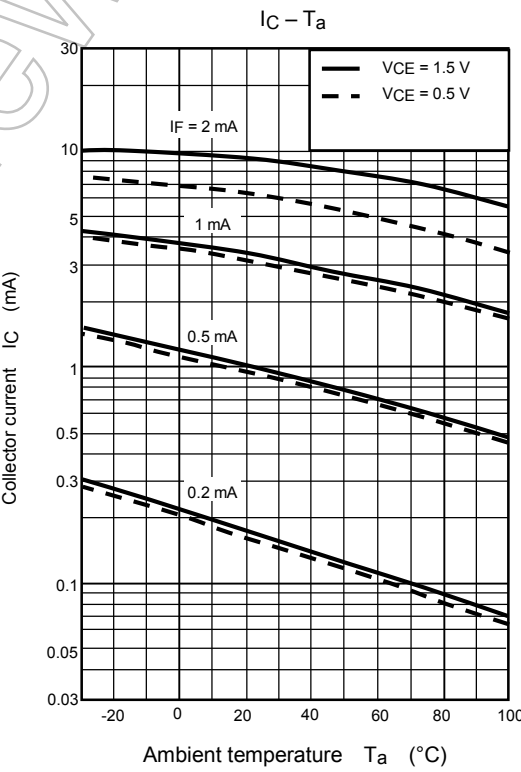
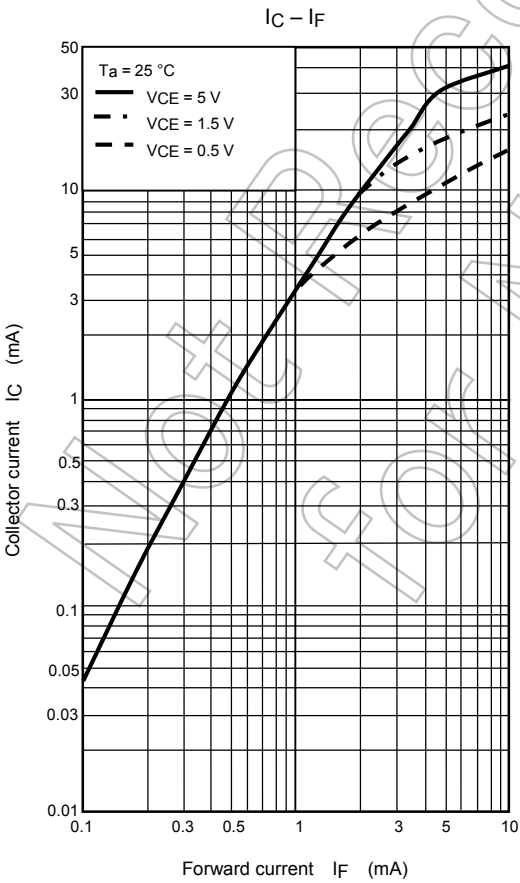
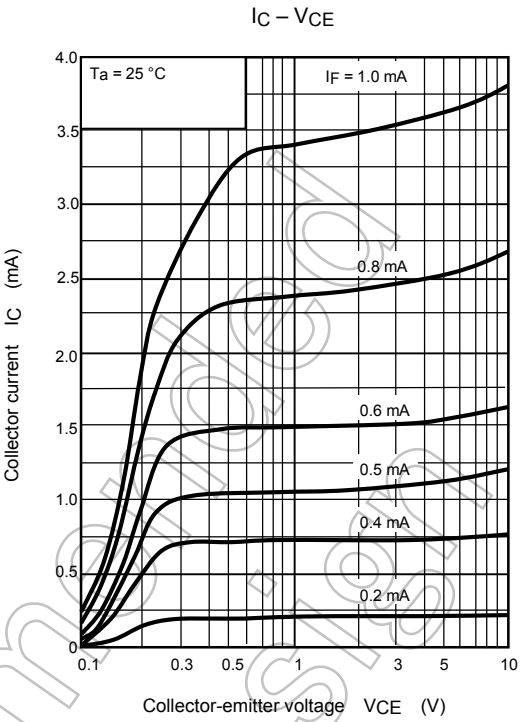
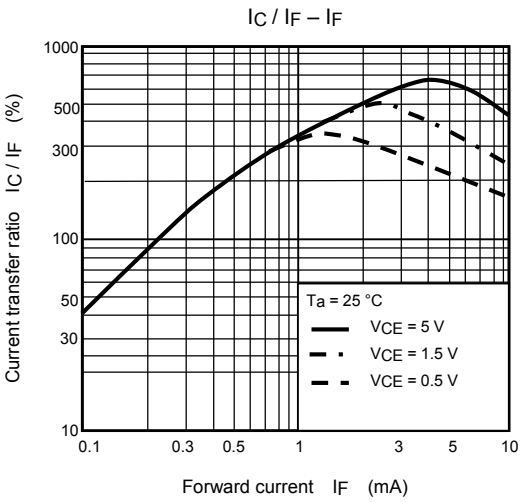
**Switching Characteristics (Ta = 25°C)**

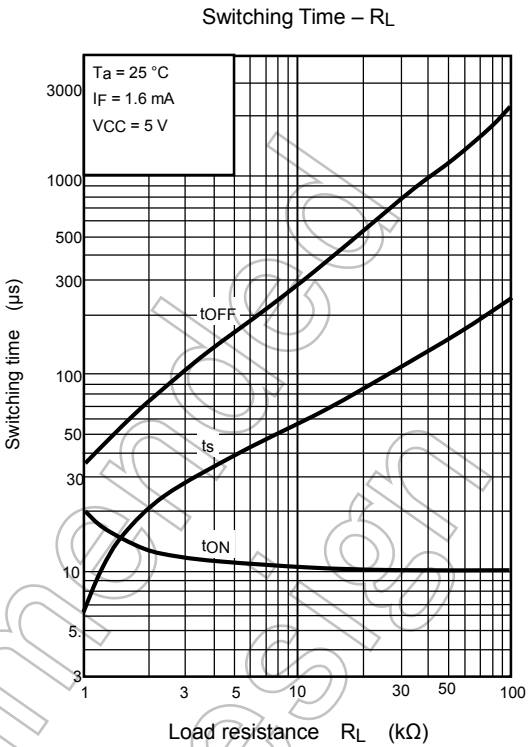
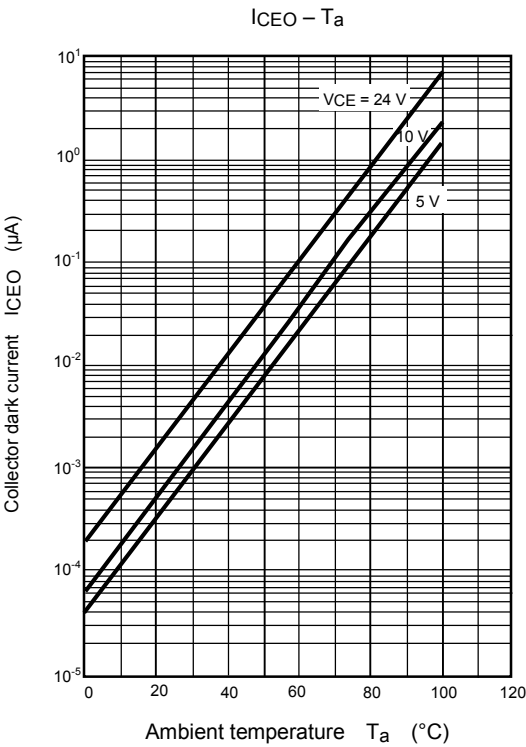
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	tr	VCC = 10V, IC = 2mA RL = 100Ω	—	8	—	μs
Fall time	tf		—	8	—	
Turn-on time	ton		—	10	—	
Turn-off time	toff		—	8	—	
Turn-on time	ton	RL = 4.7kΩ (Fig.1) VCC = 5 V, IF = ±1.6mA	—	10	—	μs
Storage time	ts		—	50	—	
Turn-off time	toff		—	300	—	

Fig. 1: Switching operating conditions











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