

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP131

Unit in mm

Office Machine

Programmable Controllers

AC / DC-Input Module

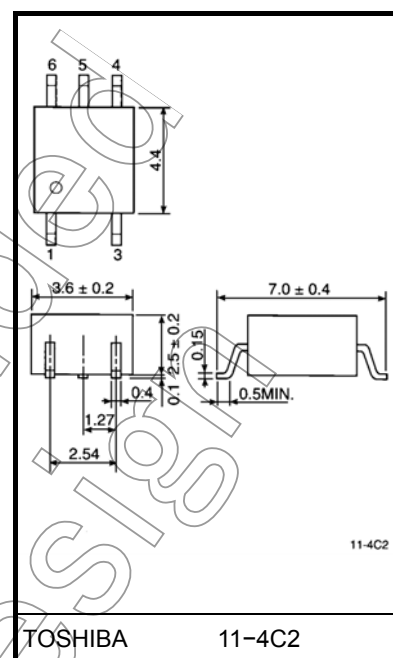
Telecommunication

The TOSHIBA mini flat coupler TLP131 is a small outline coupler, suitable for surface mount assembly.

TLP131 consists of a photo transistor, optically coupled to a gallium arsenide infrared emitting diode.

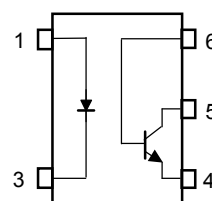
- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)
- Isolation voltage: 3750Vrms (min.)
- UL recognized: UL1577, file No. E67349

TLP131 base terminal is for the improvement of speed, reduction of dark current, and enable operation.



Weight: 0.09 g (typ.)

## Pin Configurations (top view)



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

## Current Transfer Ratio

Type	Classification	Current Transfer Ratio (%) (I <sub>C</sub> / I <sub>F</sub> )		Marking Of Classification
		I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V, T <sub>a</sub> = 25°C		
		Min.	Max.	
TLP131	(None)	50	600	BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB
	Rank Y	50	150	Y, Y <sup>■</sup>
	Rank GR	100	300	G, G <sup>■</sup>
	Rank GB	100	600	G, G <sup>■</sup> , B, B <sup>■</sup> , GB

Note: Application type name for certification test, please use standard product type name, i.e.  
TLP131(GB): TLP131

Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_F$	50	mA
	Forward current derating ( $T_a \geq 53^\circ\text{C}$ )	$\Delta I_F / ^\circ\text{C}$	-0.7	mA / $^\circ\text{C}$
	Peak forward current (100 $\mu\text{s}$ pulse, 100pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Junction temperature	$T_j$	125	$^\circ\text{C}$
Detector	Collector-emitter voltage	$V_{CEO}$	80	V
	Collector-base voltage	$V_{CBO}$	80	V
	Emitter-collector voltage	$V_{ECO}$	7	V
	Emitter-base voltage	$V_{EBO}$	7	V
	Collector current	$I_C$	50	mA
	Peak collector current (10ms pulse, 100pps)	$I_{CP}$	100	mA
	Power dissipation	$P_C$	150	mW
	Power dissipation derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta P_C / ^\circ\text{C}$	-1.5	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		$T_{opr}$	-55~100	$^\circ\text{C}$
Lead soldering temperature (10s)		$T_{sol}$	260	$^\circ\text{C}$
Total package power dissipation		$P_T$	200	mW
Total package power dissipation derating ( $T_a \geq 25^\circ\text{C}$ )		$\Delta P_T / ^\circ\text{C}$	-2.0	mW / $^\circ\text{C}$
Isolation voltage (AC, 1min., RH $\leq$ 60%) (Note 1)		$BV_S$	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: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	—	5	48	V
Forward current	$I_F$	—	16	25	mA
Collector current	$I_C$	—	1	10	mA
Operating temperature	$T_{opr}$	-25	—	85	°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	$V_{(BR)CEO}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 0.1 \text{ mA}$	80	—	—	V
	Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	collector dark current	$I_{CEO}$	$V_{CE} = 48 \text{ V}$	—	10	100	nA
			$V_{CE} = 48 \text{ V}, T_a = 85^\circ\text{C}$	—	2	50	μA
	Collector dark current	$I_{CER}$	$V_{CE} = 48 \text{ V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1 \text{ M}\Omega$	—	0.5	10	μA
	Collector dark current	$I_{CBO}$	$V_{CB} = 10 \text{ V}$	—	0.1	—	nA
	DC forward current gain	$h_{FE}$	$V_{CE} = 5 \text{ V}, I_C = 0.5 \text{ mA}$	—	400	—	—
	Capacitance (collector to emitter)	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Base photo-current	$I_{PB}$	$I_F = 5 \text{ mA}, V_{CB} = 5 \text{ V}$	—	10	—	μA
Collector-emitter saturation voltage	$V_{CE} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$ Rank GB	—	0.2	—	
			—	—	0.4	
Off-state collector current	$I_C (\text{off})$	$I_F = 0.7 \text{ mA}, V_{CE} = 48 \text{ V}$	—	1	10	μA

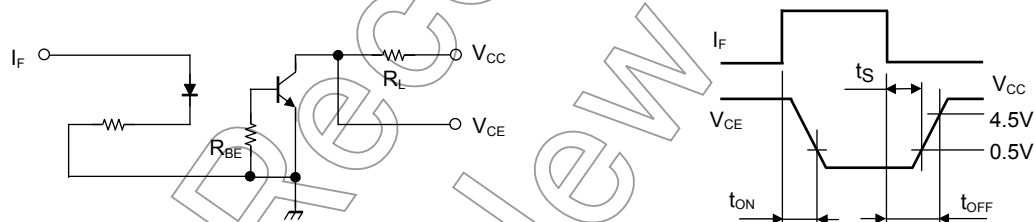
## Isolation Characteristics (Ta = 25°C)

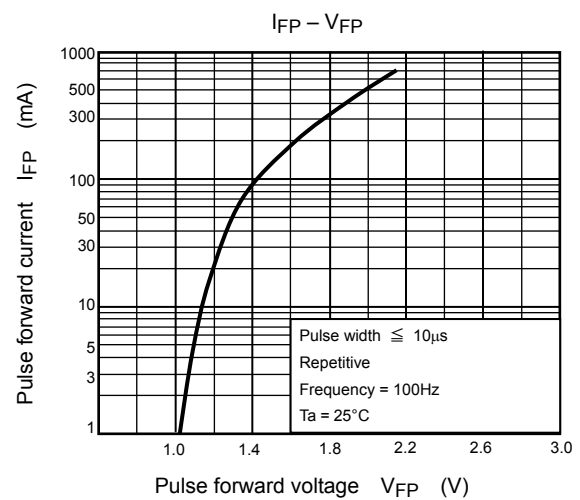
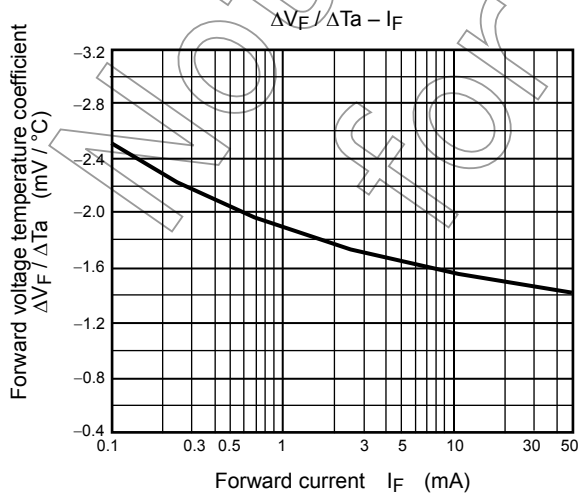
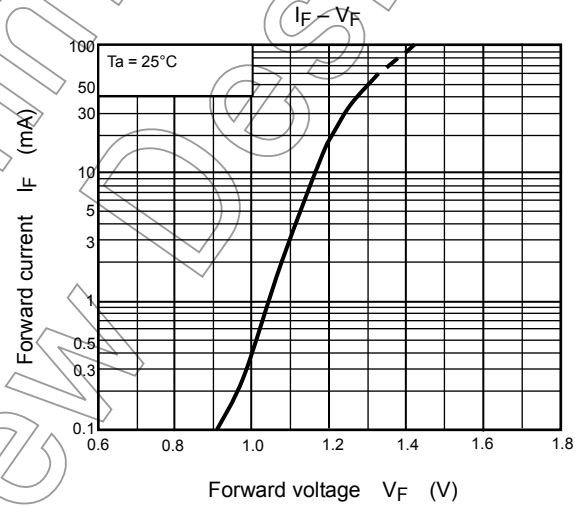
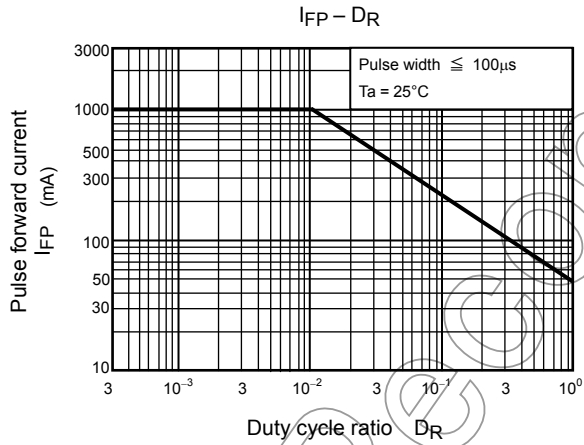
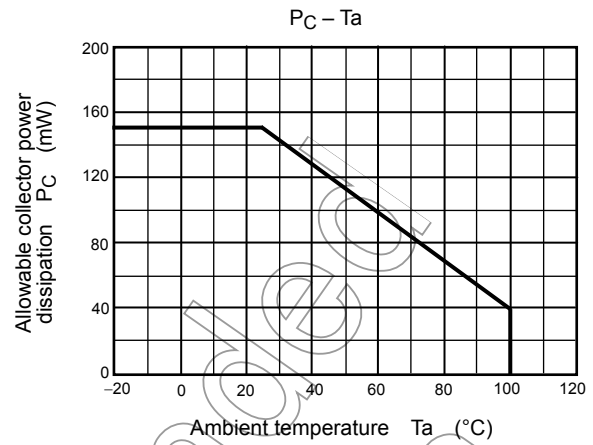
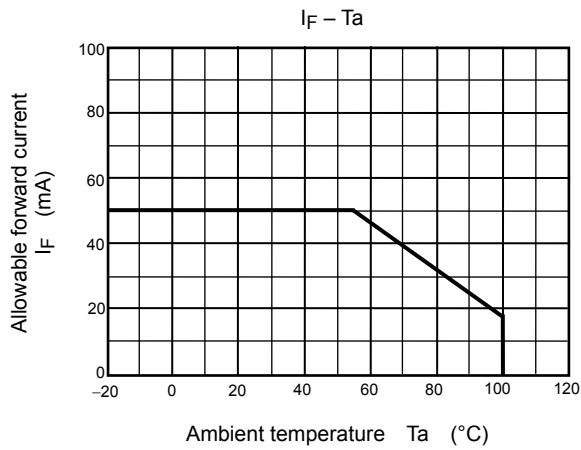
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	3750	—	—	Vrms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

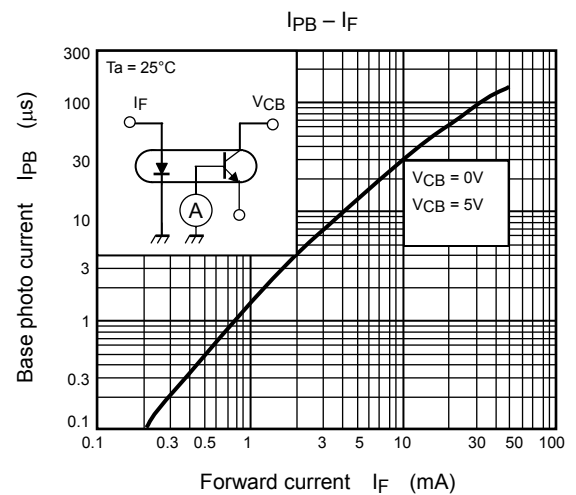
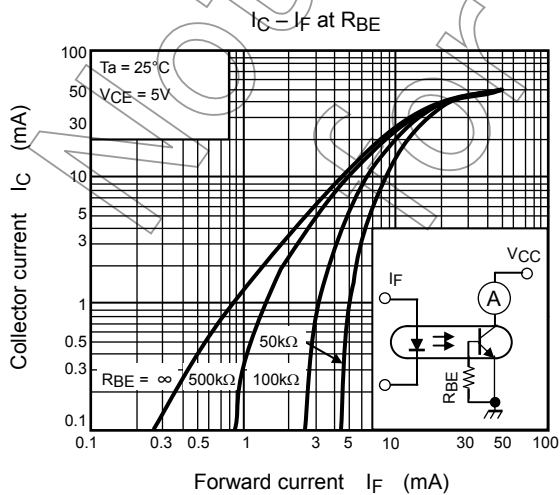
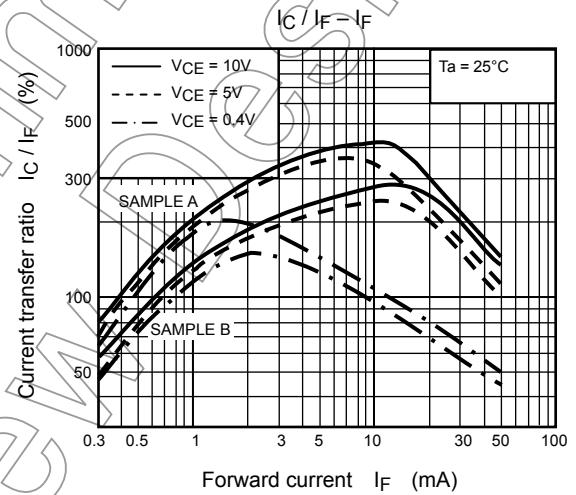
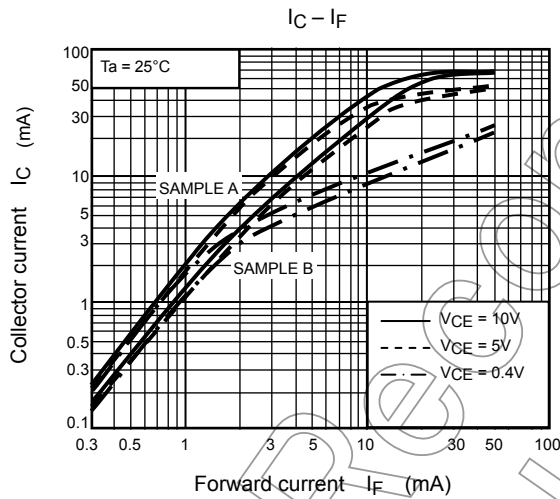
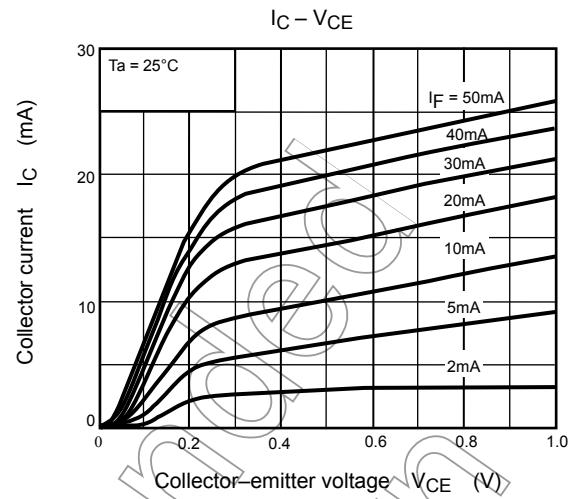
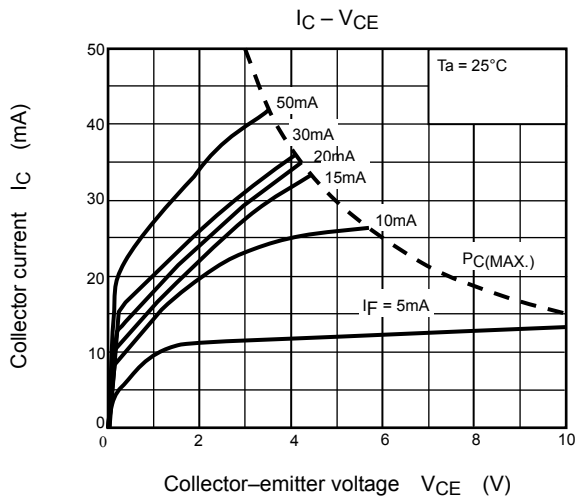
## Switching Characteristics (Ta = 25°C)

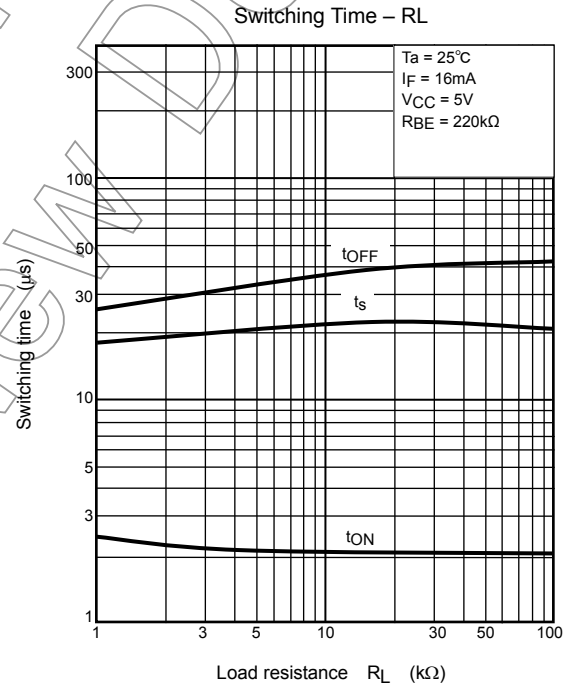
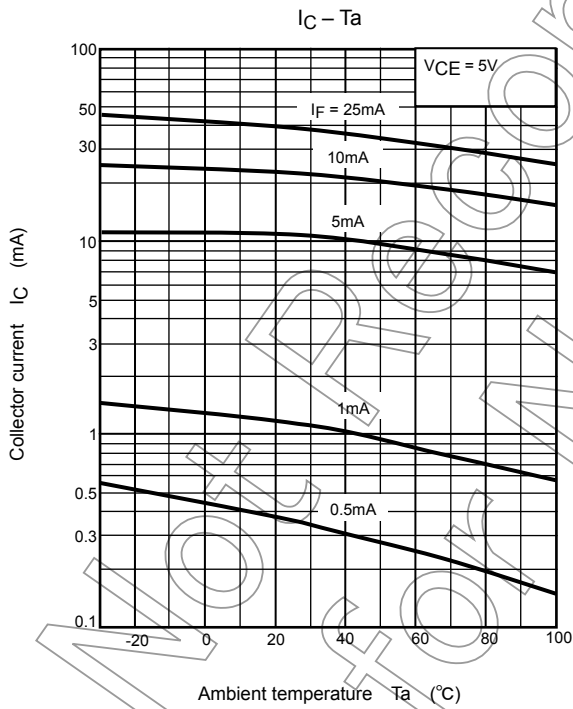
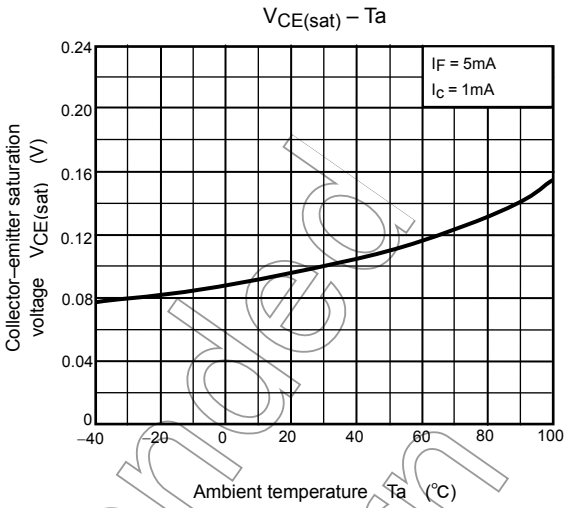
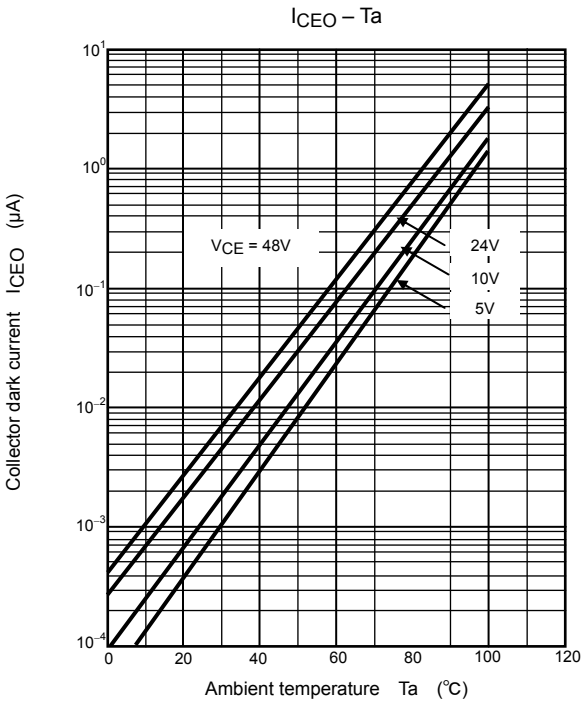
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V, I <sub>C</sub> = 2 mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ (%) (Fig. 1) R <sub>BE</sub> = OPEN V <sub>CC</sub> = 5 V, I <sub>F</sub> = 16 mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	25	—	
Turn-off time	t <sub>OFF</sub>		—	40	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ (%) (Fig. 1) R <sub>BE</sub> = 220 kΩ V <sub>CC</sub> = 5 V, I <sub>F</sub> = 16 mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	20	—	
Turn-off time	t <sub>OFF</sub>		—	30	—	

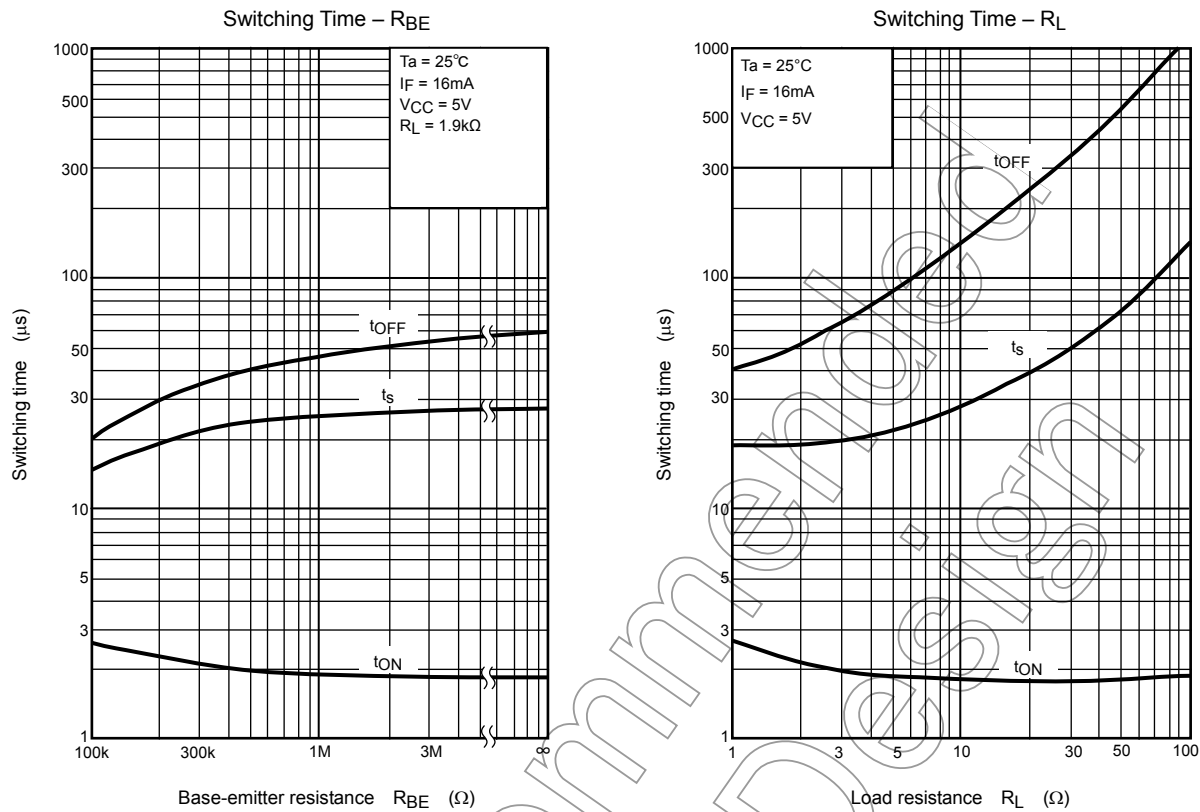
Fig. 1 Switching time test circuit













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