

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP131

Unit: mm

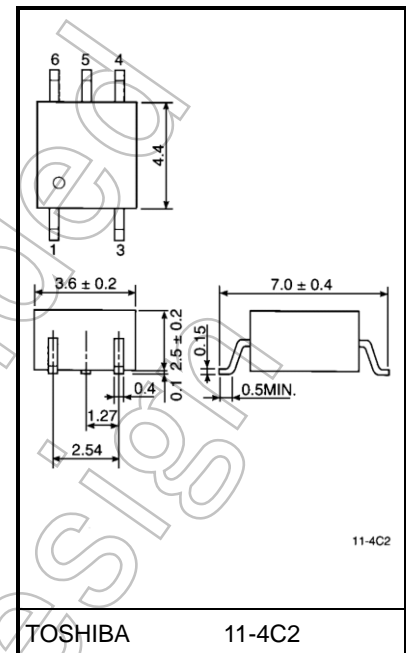
Programmable Controllers  
AC / DC-Input Module  
Telecommunication

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.

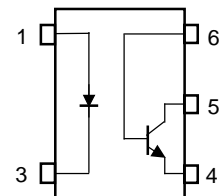
- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)  
Rank GB: 100% (min)
- Isolation voltage: 3750 Vrms (min)
- UL recognized: UL1577, file No. E67349
- c-UL approved :CSA Component Acceptance Service  
No. 5A, File No.E67349

TLP131 base terminal is for the improvement of speed, reduction of dark current, and enable operation. Using by base terminal opening is easy to receive the outside noise.



Weight: 0.09 g (typ.)

## Pin Configurations (top view)



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

Start of commercial production  
1988-04

## Current Transfer Ratio

Classification	Current Transfer Ratio (%) (Ic/I <sub>F</sub> )		Marking Of Classification
	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V, T <sub>a</sub> = 25°C		
	Min	Max	
Blank	50	600	Blank, Y, Y <sup>■</sup> , YE, G, G <sup>■</sup> , GR, B, B <sup>■</sup> , BL, GB
Rank Y	50	150	YE
Rank GR	100	300	GR
Rank BL	200	600	BL
Rank GB	100	600	GB
Rank YH	75	150	Y <sup>■</sup>
Rank GRL	100	200	G
Rank GRH	150	300	G <sup>■</sup>
Rank BLL	200	400	B

Note: Please ask your local retailer about the devices with Rank Y or Rank BL.

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

**Absolute Maximum Ratings (Ta = 25°C)**

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_F$	50	mA
	Forward current derating (Ta ≥ 53°C)	$\Delta I_F/^\circ\text{C}$	-0.7	mA/°C
	Peak forward current (100 μs pulse, 100 pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Diode power dissipation	PD	100	mW
	Diode power dissipation derating (Ta ≥ 53°C)	$\Delta PD/^\circ\text{C}$	-1.39	mW/°C
	Junction temperature	$T_j$	125	°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 (10 ms pulse, 100 pps)	$I_{CP}$	100	mA
	Power dissipation	$P_C$	150	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_C/^\circ\text{C}$	-1.5	mW/°C
	Junction temperature	$T_j$	125	°C
Storage temperature range		$T_{stg}$	-55 to 125	°C
Operating temperature range		$T_{opr}$	-55 to 100	°C
Lead soldering temperature (10s)		$T_{sol}$	260	°C
Total package power dissipation		$P_T$	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		$\Delta P_T/^\circ\text{C}$	-2.0	mW/°C
Isolation voltage (AC, 60 s, RH ≤ 60%) (Note 1)		$BVS$	3750	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: 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.

Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

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	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0\text{ V}, f = 1\text{ MHz}$	—	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	$\mu\text{A}$
	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	$\mu\text{A}$
	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)	$C_{CE}$	$V = 0\text{ V}, f = 1\text{ MHz}$	—	10	—	pF

Coupled Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

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

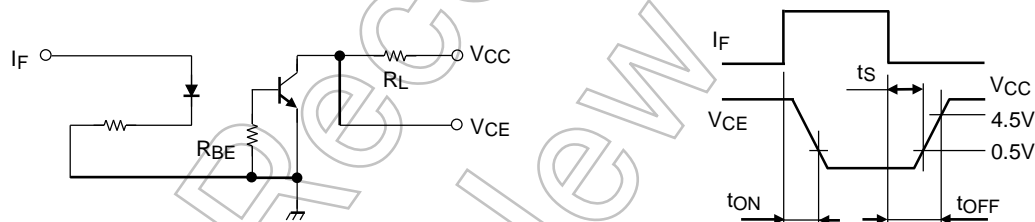
## Isolation Characteristics (Ta = 25°C)

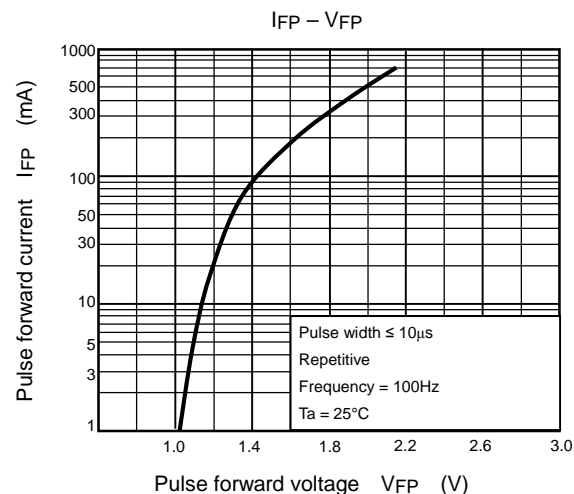
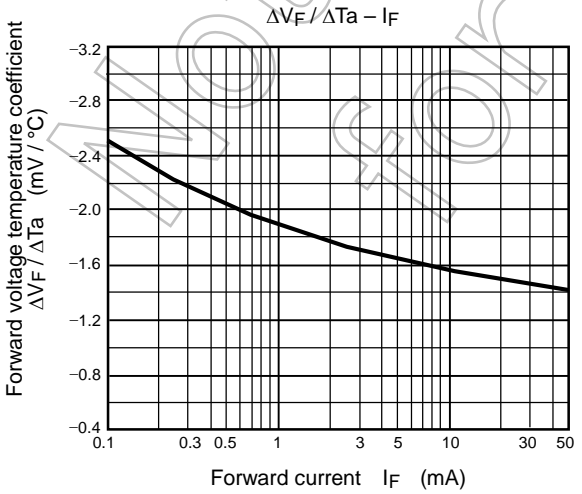
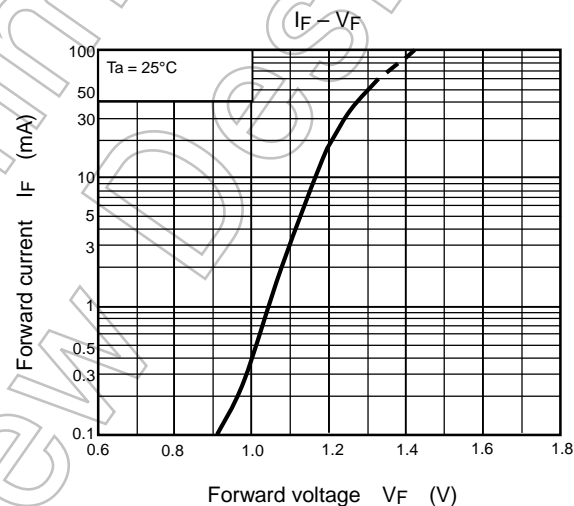
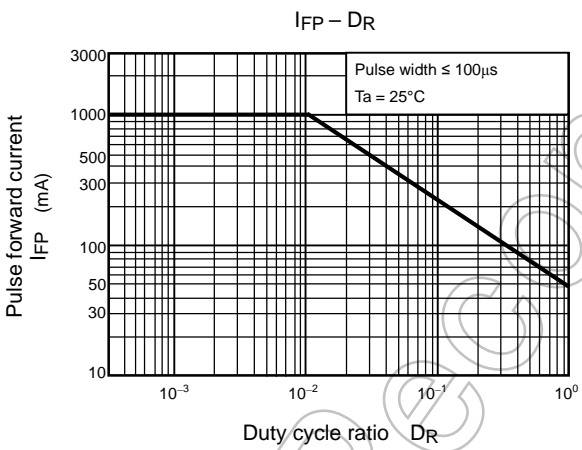
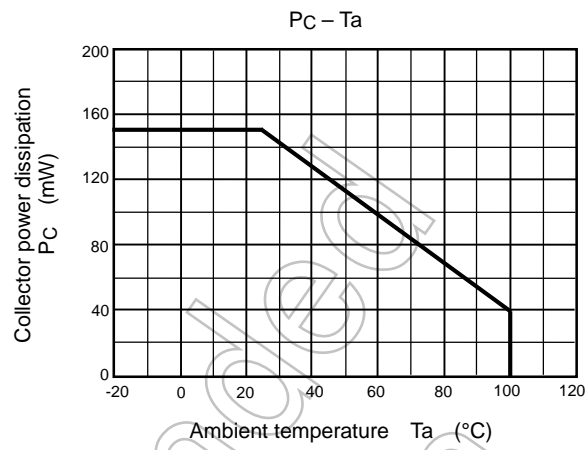
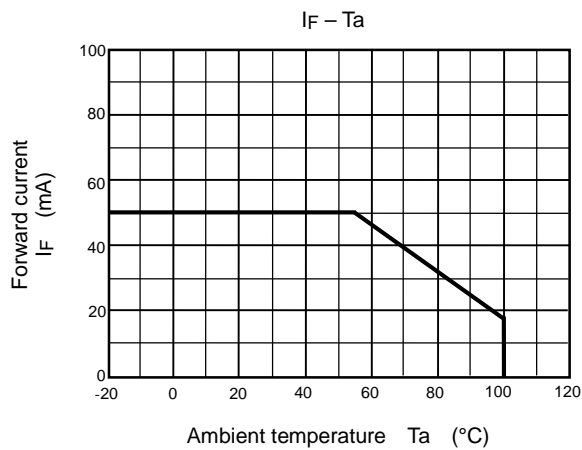
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	CS	VS = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500 V, RH ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BVS	AC, 60 s	3750	—	—	Vrms
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	Vdc

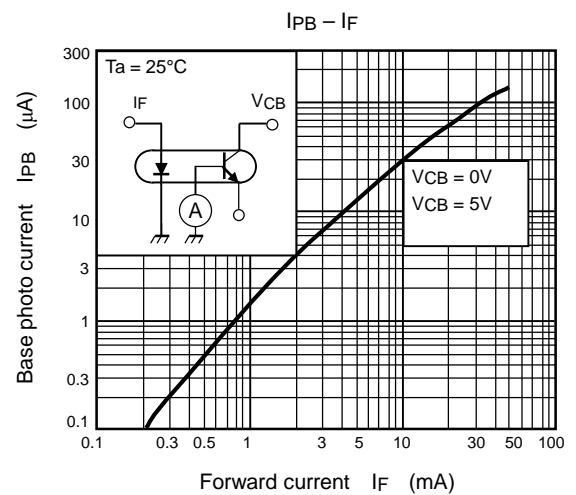
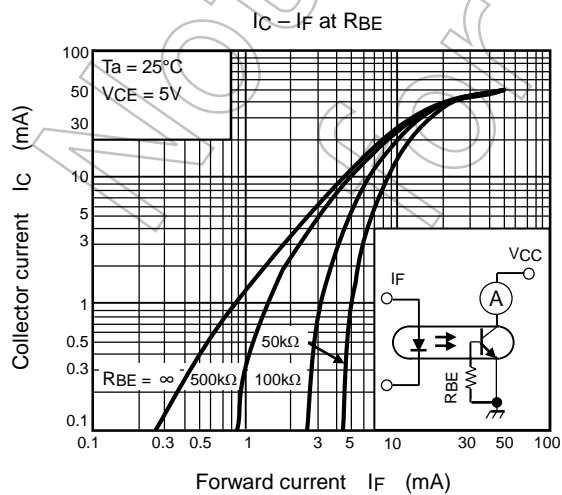
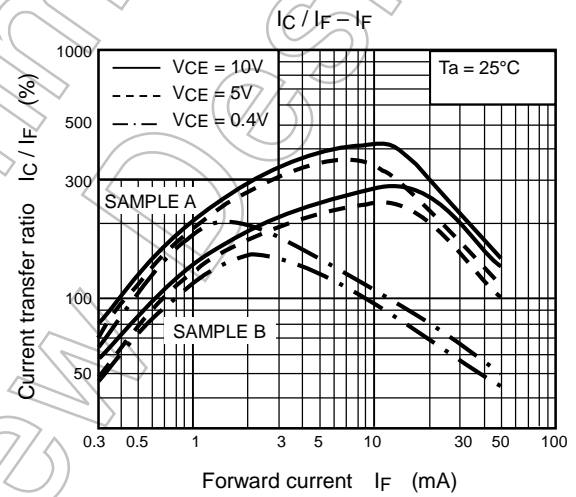
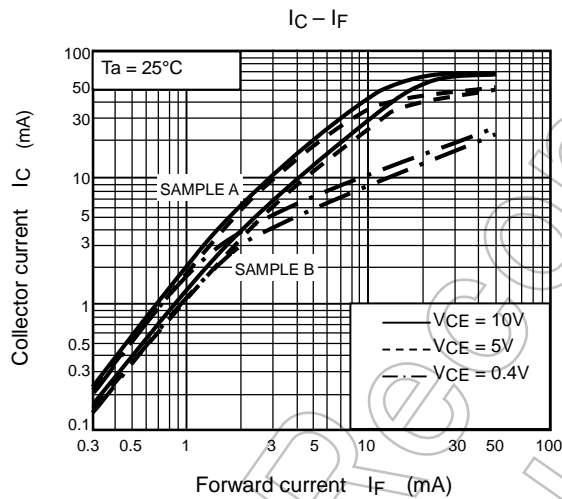
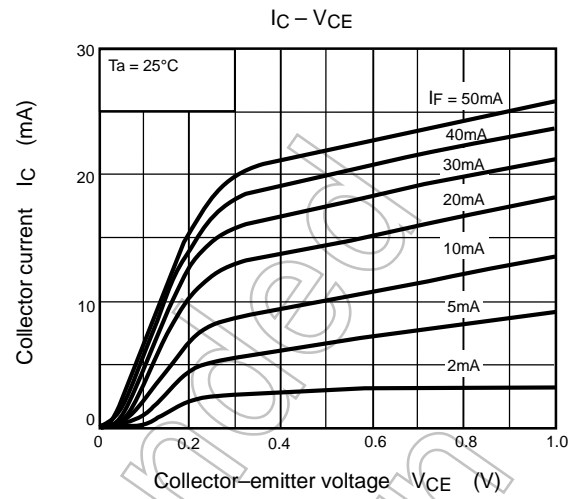
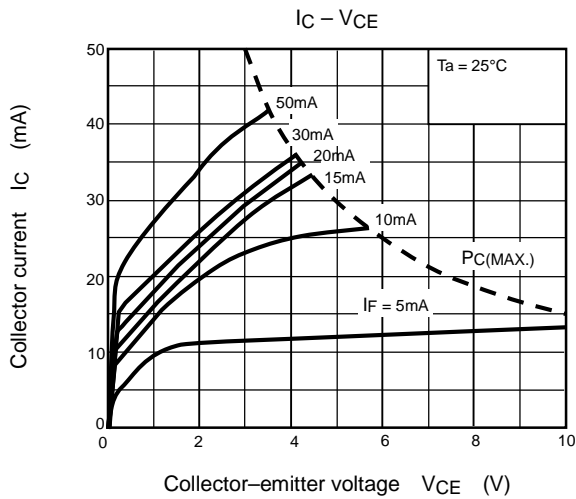
## Switching Characteristics (Ta = 25°C)

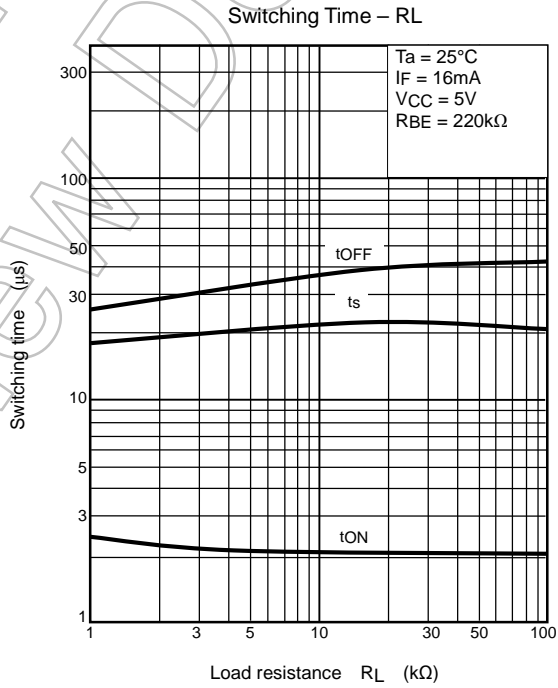
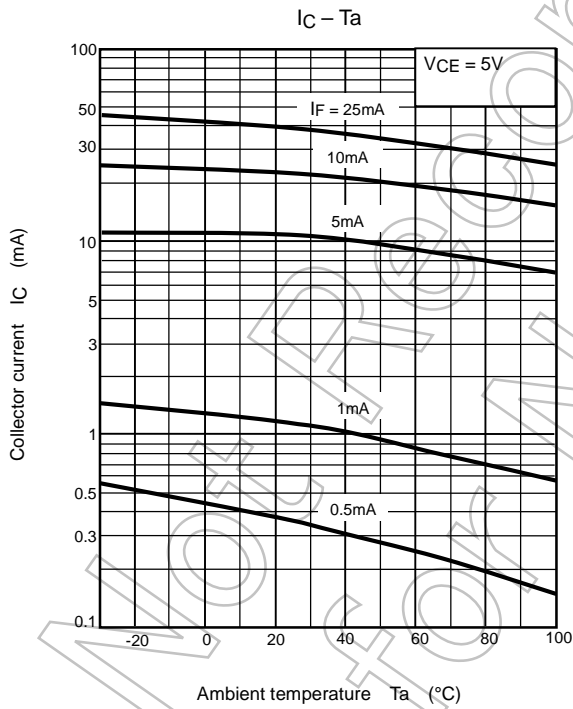
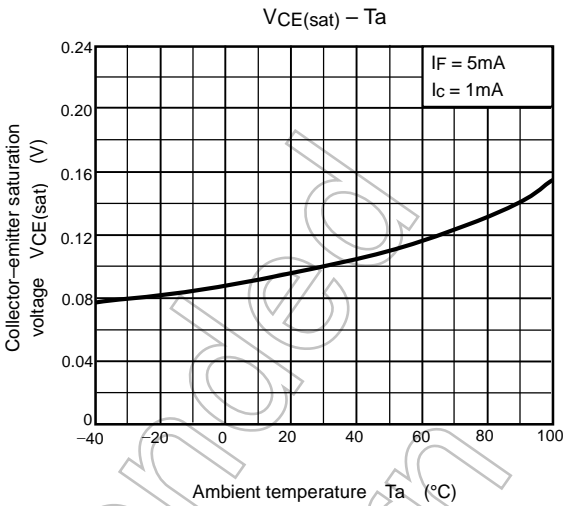
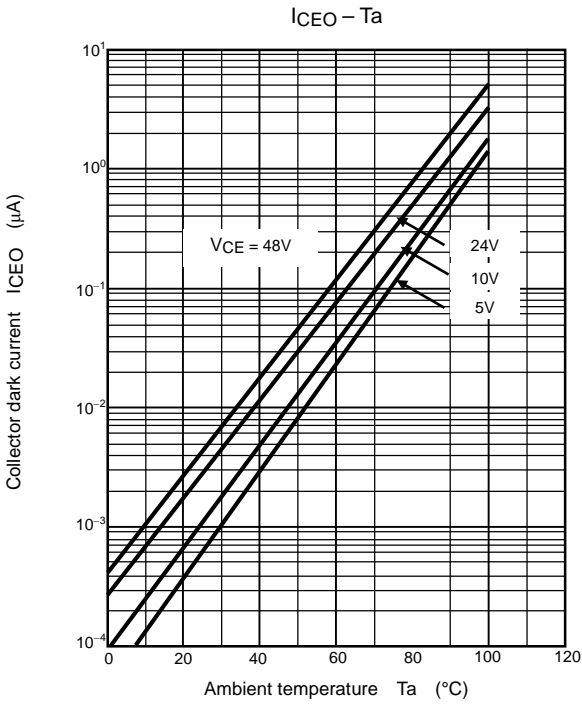
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t <sub>r</sub>	VCC = 10 V, I <sub>C</sub> = 2 mA R <sub>L</sub> = 100 Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> =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

Fig. 1 Switching time test circuit

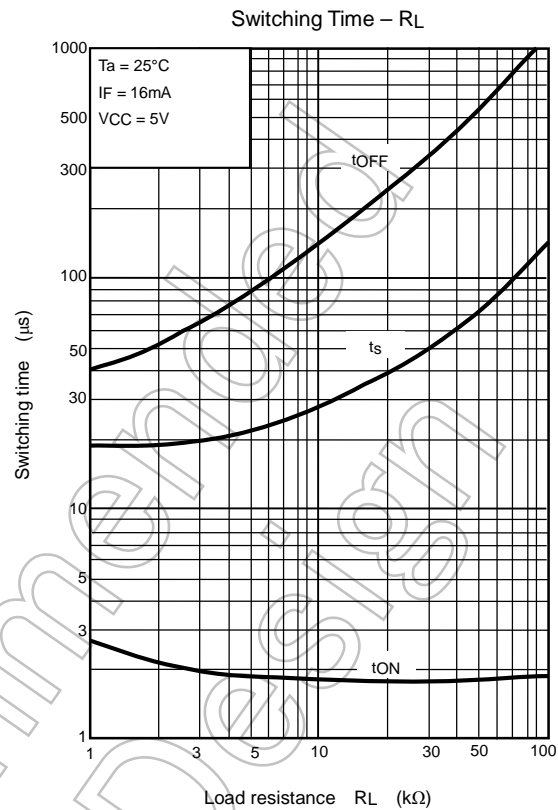
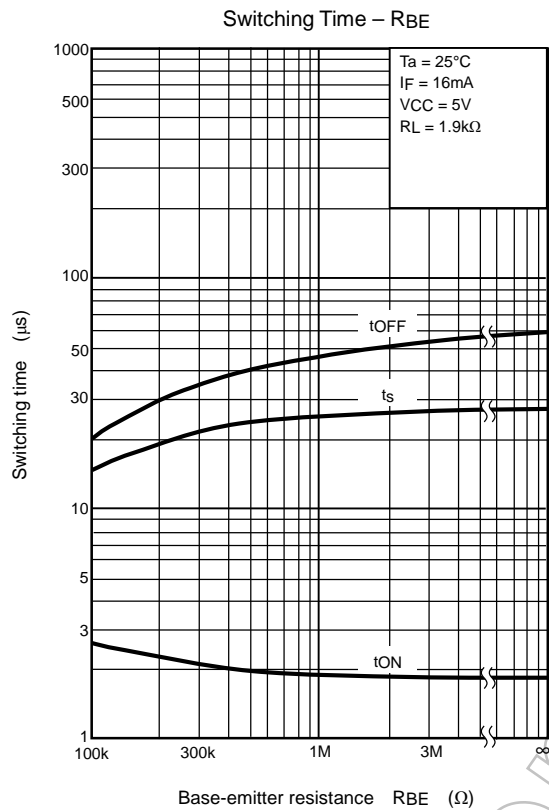












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