

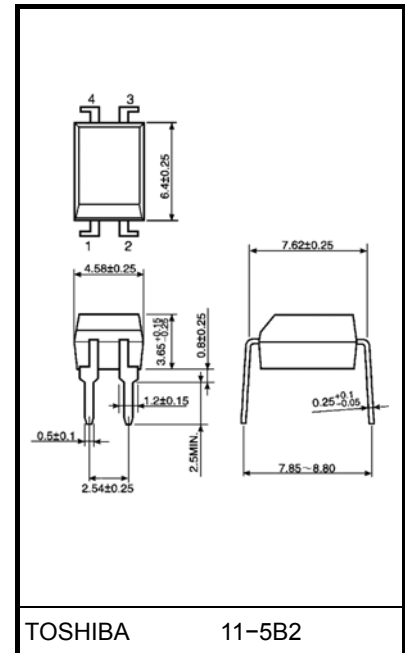
# TLP421

- Office Equipment
- Household Appliances
- Solid State Relays
- Switching Power Supplies
- Various Controllers
- Signal Transmission Between Different Voltage Circuits

The TOSHIBA TLP421 consists of a silicone photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a four lead plastic DIP (DIP4) with having high isolation voltage (AC: 5kVRMS (min)).

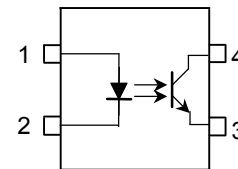
- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)
- Isolation voltage: 5000V<sub>rms</sub> (min.)
- UL recognized: UL1577
- BSI approved: BS EN60065: 2002  
Approved no.8411  
BS EN60950-1: 2002  
Approved no.8412
- SEMKO approved: EN60065, EN60950, EN60335  
Approved no.9910249/01

Unit in mm



Weight: 0.26 g (typ.)

### Pin Configurations (top view)



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

- Option(D4)type  
TÜV approved: DIN EN 60747-5-2  
Approved no. R9950202  
Maximum operating insulation voltage: 890V<sub>PK</sub>  
Maximum permissible overvoltage: 8000V<sub>PK</sub>

**(Note): When a EN 60747-5-2 approved type is needed, please designate the “Option(D4)”**

Making the VDE application: DIN EN 60747-5-2

- Construction mechanical rating

	7.62mm Pitch Typical Type	10.16mm Pitch TLPxxxF Type
Creepage distance	7.0mm(min)	8.0mm(min)
Clearance	7.0mm(min)	8.0mm(min)
Insulation thickness	0.4mm(min)	0.4mm(min)

## Current Transfer Ratio

Type	Classi- fication (*1)	Current Transfer Ratio (%) ( $I_C / I_F$ )		Marking Of Classification
		$I_F = 5mA, V_{CE} = 5V, T_a = 25^\circ C$		
		Min	Max	
TLP421	(None)	50	600	Blank, Y, Y+, G, G+, B, B+, GB
	Rank Y	50	150	Y, Y+
	Rank GR	100	300	G, G+
	Rank BL	200	600	B, B+
	Rank GB	100	600	G, G+, B, B+, GB

(\*1): Ex. rank GB: TLP421 (GB)

(Note): Application type name for certification test, please use standard product type name, i. e.  
TLP421 (GB): TLP421

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

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	60	mA
	Forward current derating(Ta ≥ 39°C)	ΔI <sub>F</sub> / °C	-0.7	mA / °C
	Pulse forward current (Note 2)	I <sub>FP</sub>	1	A
	Power dissipation	P <sub>D</sub>	100	mW
	Power dissipation derating	ΔP <sub>D</sub> / °C	-1.0	mW / °C
	Reverse voltage	V <sub>R</sub>	5	V
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	7	V
	Collector current	I <sub>C</sub>	50	mA
	Power dissipation(single circuit)	P <sub>C</sub>	150	mW
	Power dissipation derating (Ta ≥ 25°C)(single circuit)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction temperature	T <sub>j</sub>	125	°C
Operating temperature range		T <sub>opr</sub>	-55~100	°C
Storage temperature range		T <sub>stg</sub>	-55~125	°C
Lead soldering temperature (10s)		T <sub>sol</sub>	260	°C
Total package power dissipation		P <sub>T</sub>	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-2.5	mW / °C
Isolation voltage (Note 3)		BV <sub>S</sub>	5000	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 2): 100μs pulse, 100Hz frequency

(Note 3): AC, 1 min., R.H.≤ 60%. Apply voltage to LED pin and detector pin together.

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>CC</sub>	—	5	24	V
Forward current	I <sub>F</sub>	—	16	25	mA
Collector current	I <sub>C</sub>	—	1	10	mA
Operating temperature	T <sub>opr</sub>	-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	1.2	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	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 dark current	$I_D(I_{CEO})$	$V_{CE} = 24 \text{ V}$ (ambient light below 1000 lx)	—	0.01 (0.1)	0.1 (10)	$\mu\text{A}$
			$V_{CE} = 24 \text{ V}$ (ambient light $T_a = 85^\circ\text{C}$ below 1000 lx)	—	0.6 (1)	50 (50)	$\mu\text{A}$
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	—	—	
Collector-emitter saturation voltage	$V_{CE}(\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$ $I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$ Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	

## Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}$	$1 \times 10^{12}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	5000	—	—	$V_{\text{rms}}$
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	Vdc

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$ (Fig.1)	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	25	—	
Turn-off time	$t_{OFF}$		—	50	—	

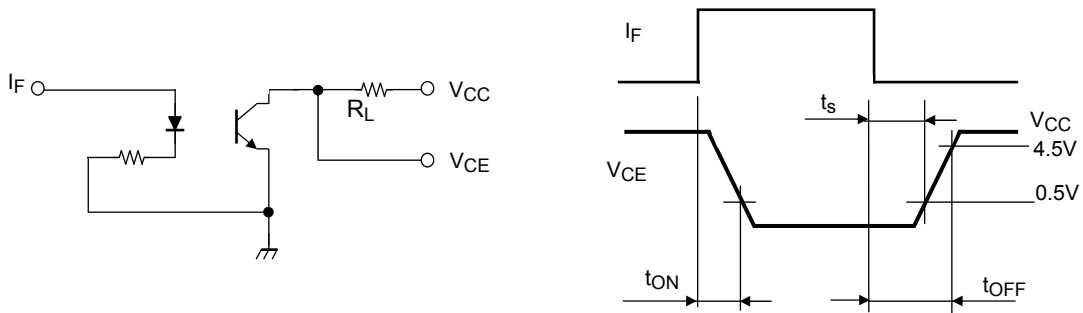
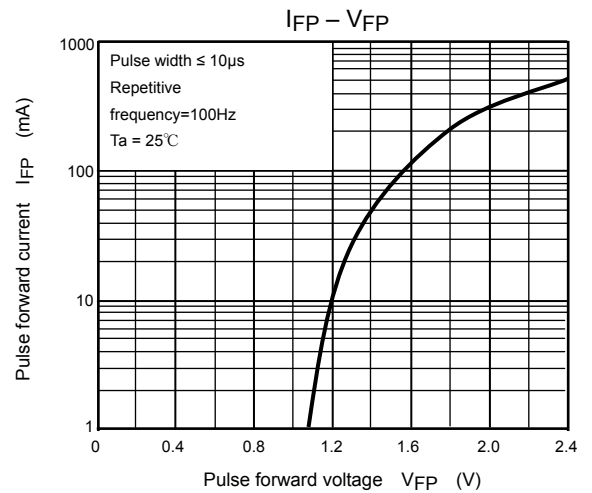
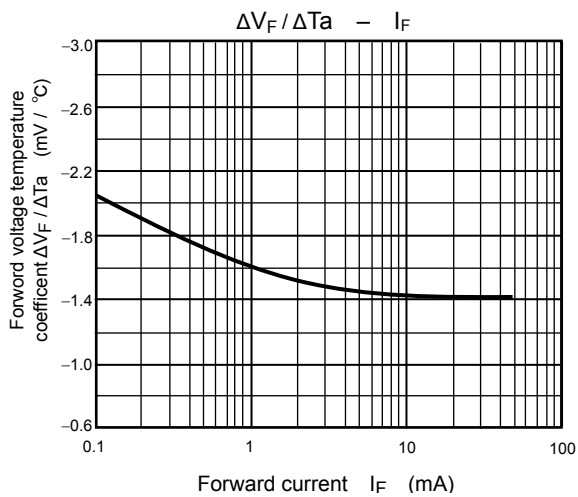
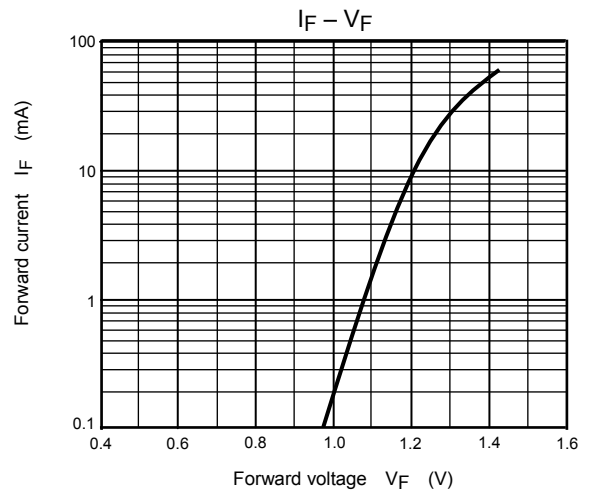
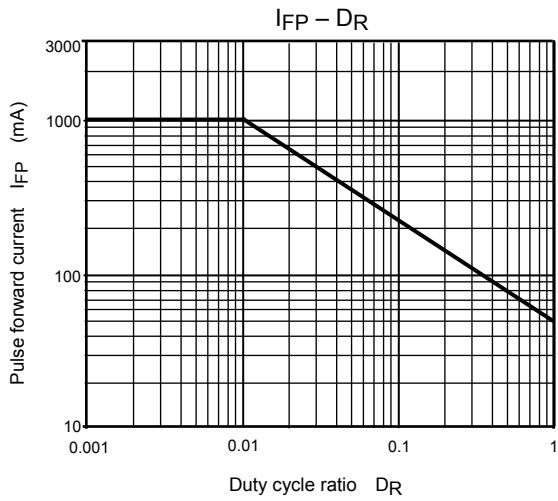
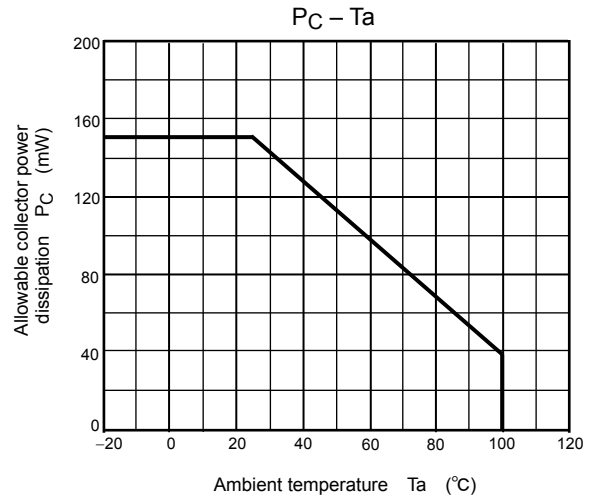
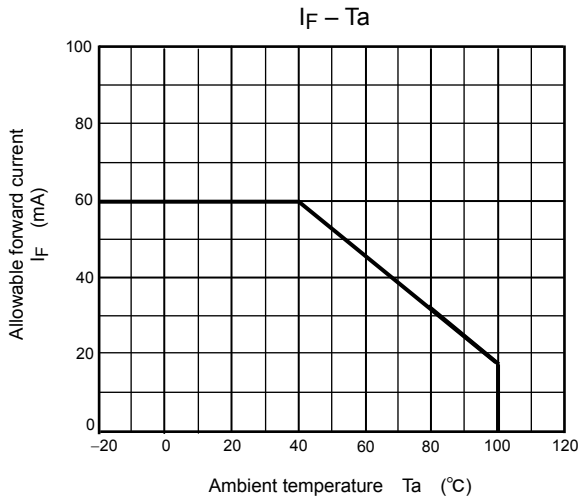
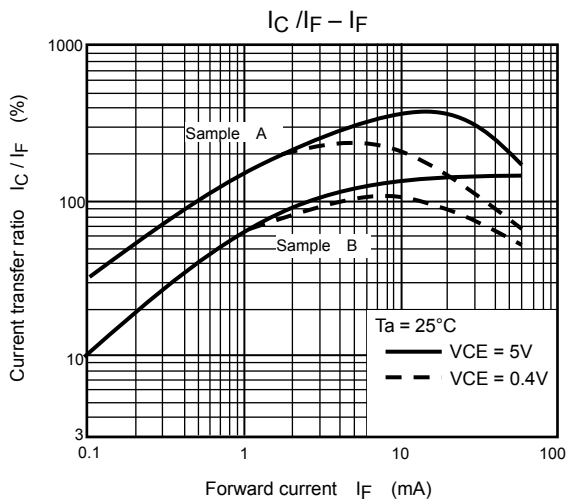
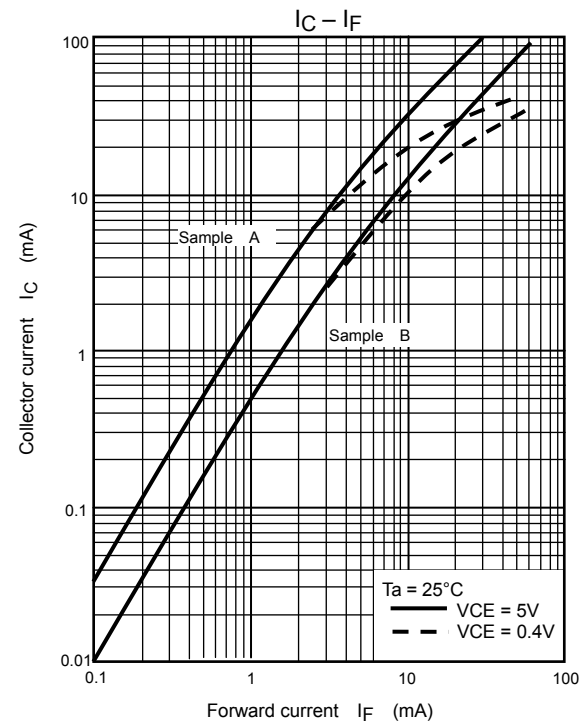
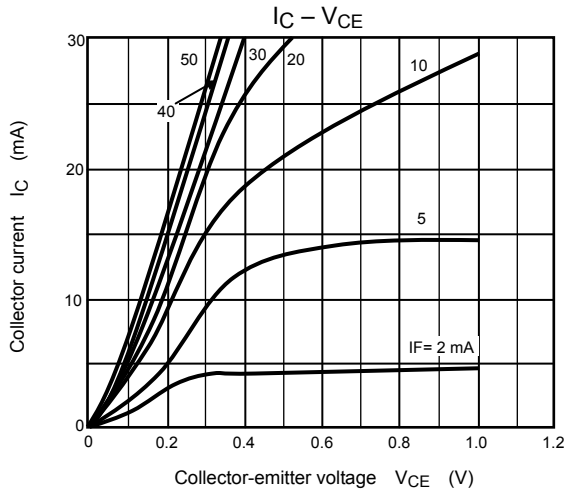
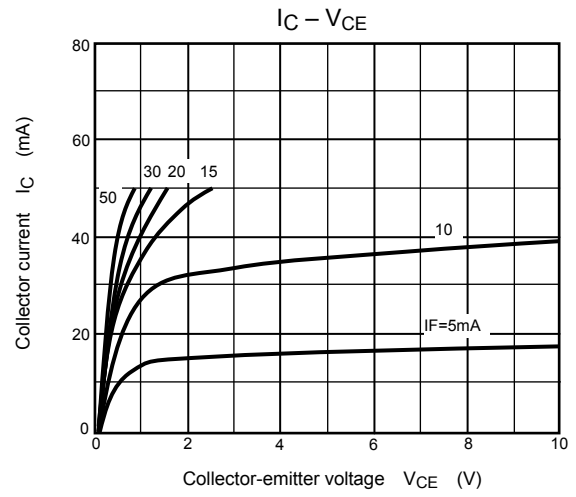
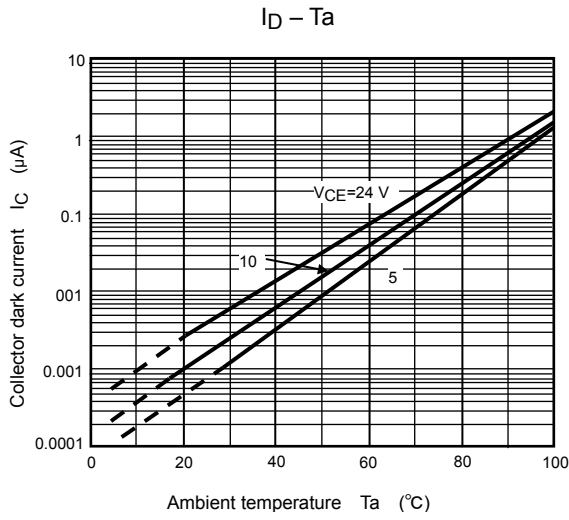
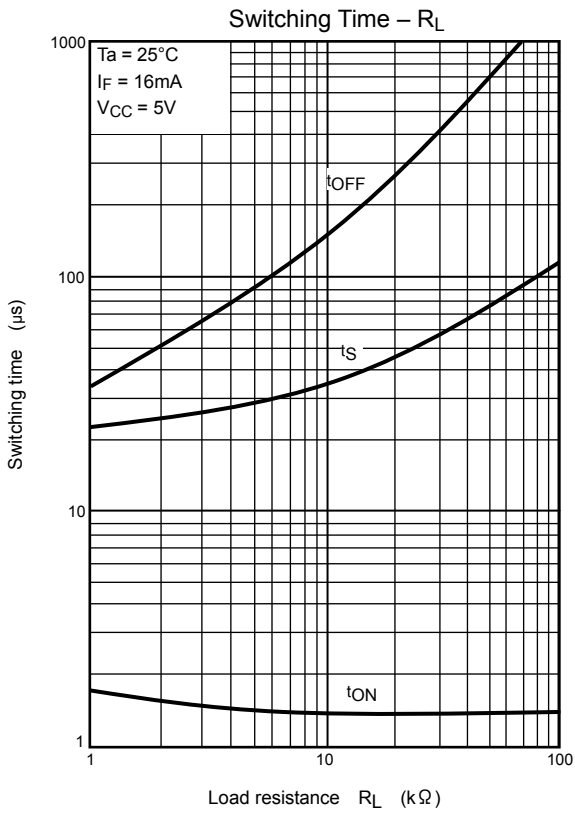
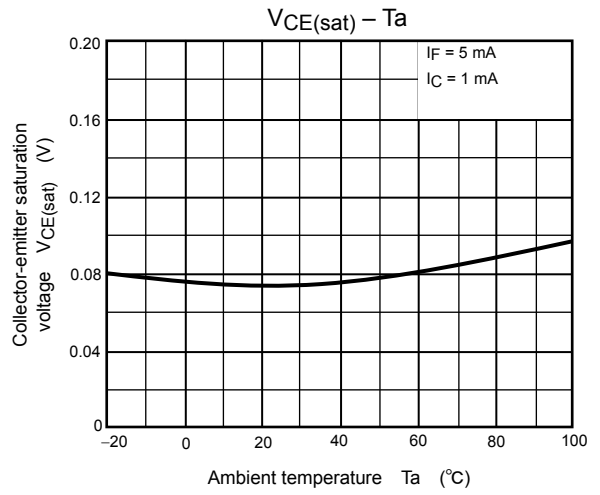
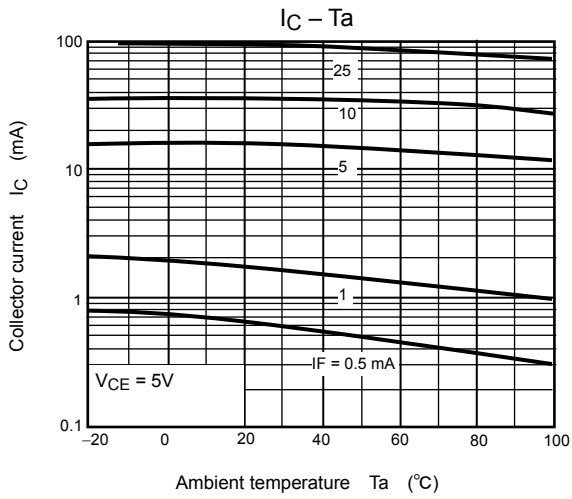


Fig.1 Switching time test circuit









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