

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP521-1, TLP521-2, TLP521-4

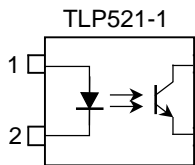
Unit: mm

Programmable Controllers  
AC/DC-Input Module  
Solid State Relay

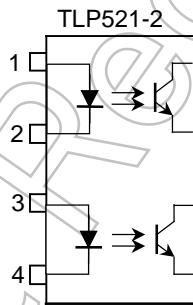
The TOSHIBA TLP521-1, -2 and -4 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP521-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP521-4 provides four isolated channels in a sixteen plastic DIP package.

- Collector-emitter voltage: 55 V (min)
- Current transfer ratio: 50% (min)  
Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized: UL1577, file no. E67349
- c-UL recognized: CSA Component Acceptance Service No. 5A  
File No. E67349

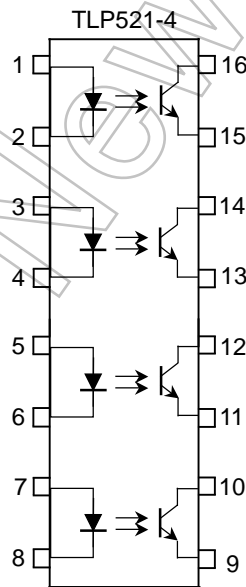
### Pin Configurations (top view)



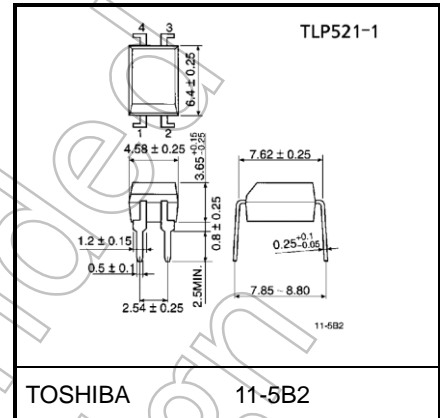
1 : Anode  
2 : Cathode  
3 : Emitter  
4 : Collector



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

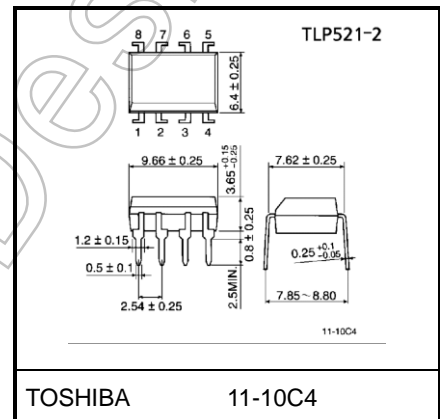


1, 3, 5, 7 : Anode  
2, 4, 6, 8 : Cathode  
9, 11, 13, 15 : Emitter  
10, 12, 14, 16 : Collector



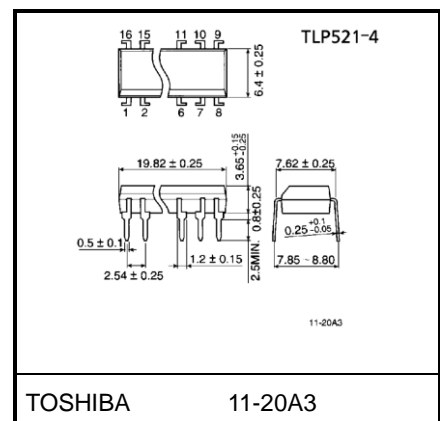
TOSHIBA 11-5B2

Weight: 0.26 g (typ.)



TOSHIBA 11-10C4

Weight: 0.54 g (typ.)



TOSHIBA 11-20A3

Weight: 1.1 g (typ.)

Start of commercial production  
1979-05

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

Characteristic	Symbol	Rating		Unit	
		TLP521-1	TLP521-2 TLP521-4		
LED	Forward current	IF	70	50	mA
	Forward current derating	$\Delta I_F/^\circ\text{C}$	-0.93 (Ta ≥ 50°C)	-0.5 (Ta ≥ 25°C)	mA/°C
	Pulse forward current (100 μs pulse, 100 pps)	IFP	1		A
	Reverse voltage	VR	5		V
	Diode power dissipation	PD	150	100	mW
	Diode power dissipation derating	$\Delta P_D/^\circ\text{C}$	-2.0 (Ta ≥ 50°C)	-1.0 (Ta ≥ 25°C)	mW/°C
	Junction temperature	Tj	125		°C
Detector	Collector-emitter voltage	VCEO	55		V
	Emitter-collector voltage	VECO	7		V
	Collector current	IC	50		mA
	Collector power dissipation (1 circuit)	PC	100		mW
	Collector power dissipation derating (1 circuit) (Ta ≥ 25°C)	$\Delta P_C/^\circ\text{C}$	-1.0		mW/°C
	Junction temperature	Tj	125		°C
Storage temperature range	Tstg	-55 to 125		°C	
Operating temperature range	Topr	-55 to 100		°C	
Lead soldering temperature (10 s)	Tsol	260		°C	
Total package power dissipation (1 circuit)	PT	250	150	mW	
Total package power dissipation derating (1 circuit) (Ta ≥ 25°C)	$\Delta P_T/^\circ\text{C}$	-2.5	-1.5	mW/°C	
Isolation voltage (AC, 60 s, R.H. ≤ 60%) (Note 1)	BVS	2500		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: LED side pins shorted together and detector side pins shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	VCC	—	5	24	V
Forward current	IF	—	16	25	mA
Collector current	IC	—	1	10	mA
Operating temperature	Topr	-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.

## Current transfer ratio

Type	Classification (Note 1)	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	
TLP521-1	Blank	50	600	Blank, Y <sup>■</sup> , YE, G, G <sup>■</sup> , GR, B, BL, GB
	Rank Y	50	150	YE, Y <sup>■</sup>
	Rank GR	100	300	GR, G, G <sup>■</sup>
	Rank BL	200	600	BL, B
	Rank GB	100	600	GB, GR, G, G <sup>■</sup> , BL, B
	Rank YH	75	150	Y <sup>■</sup>
	Rank GRL	100	200	G
	Rank GRH	150	300	G <sup>■</sup>
	Rank BLL	200	600	B
TLP521-2	Blank	50	600	Blank, GR, BL, GB
	Rank GB	100	600	GB, GR, BL
	Rank GR	100	300	GR
	Rank BL	200	600	BL
TLP521-4	Blank	50	600	Blank, GB
	Rank GB	100	600	GB

Note 1: Ex. rank GB: TLP521-1 (GB)

Note: Application type name for certification test, please use standard product type name, i.e.  
TLP521-1 (GB): TLP521-1, TLP521-2 (GB): TLP521-2

Not Recommended for New Design

## Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA	1.0	1.15	1.3	V
	Reverse current	I <sub>R</sub>	V <sub>R</sub> = 5 V	—	—	10	μA
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1 MHz	—	30	—	pF
Detector	Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 0.5 mA	55	—	—	V
	Emitter-collector breakdown voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1 mA	7	—	—	V
	Collector dark current	I <sub>CEO</sub>	V <sub>CE</sub> = 24 V	—	10	100	nA
			V <sub>CE</sub> = 24 V, Ta = 85°C	—	2	50	μA
Capacitance (collector to emitter)	C <sub>CE</sub>	V = 0 V, f = 1 MHz	—	10	—	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> = 5 mA, V <sub>CE</sub> = 5 V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I <sub>C</sub> /I <sub>F(sat)</sub>	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 0.4 V Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 2.4 mA, I <sub>F</sub> = 8 mA	—	—	0.4	V
		I <sub>C</sub> = 0.2 mA, I <sub>F</sub> = 1 mA	—	0.2	—	
		Rank GB	—	—	0.4	

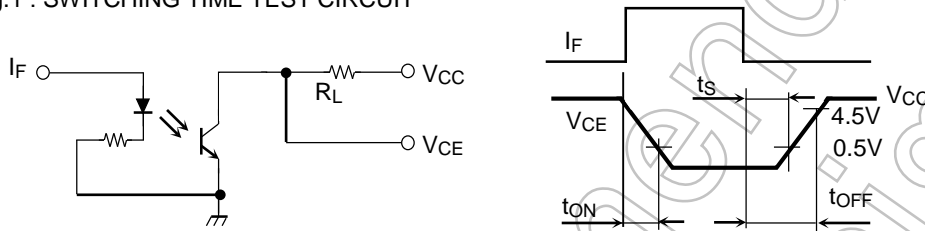
## Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	2500	—	—	V <sub>rms</sub>
		AC, 1 s, in oil	—	5000	—	
		DC, 60 s, in oil	—	5000	—	V <sub>dc</sub>

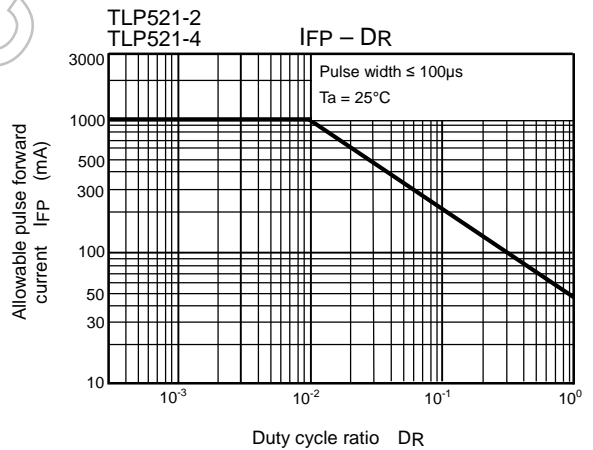
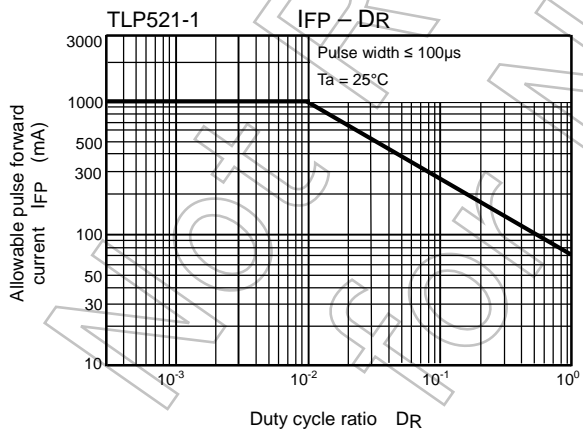
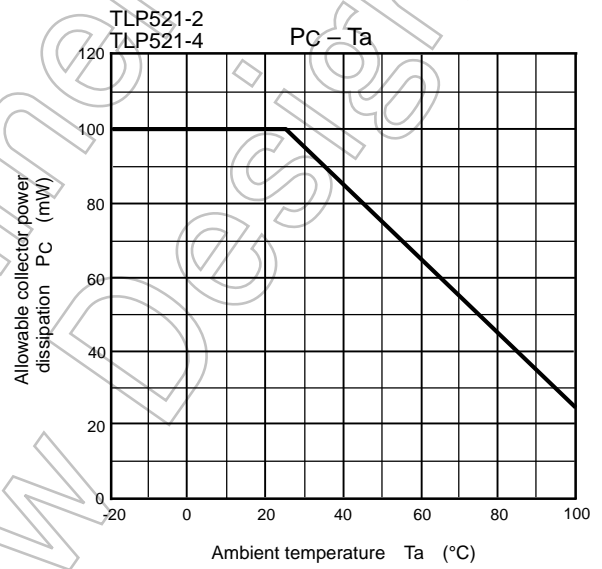
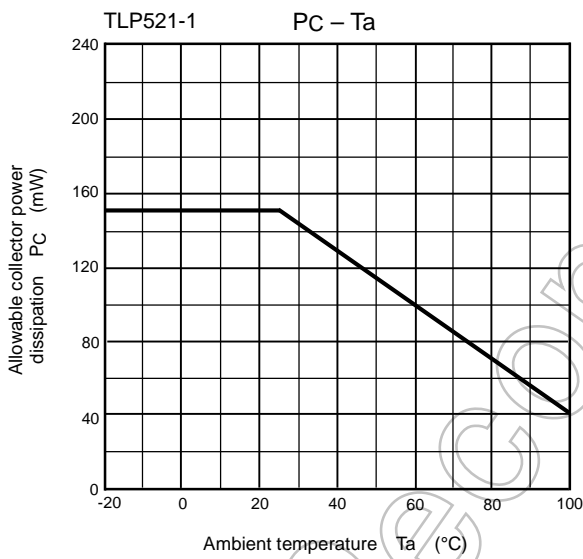
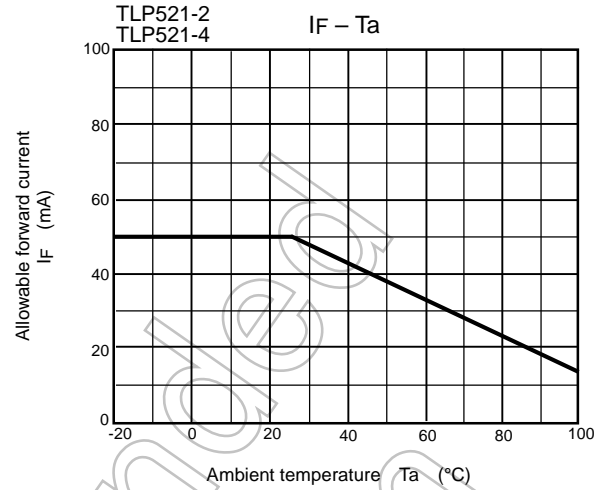
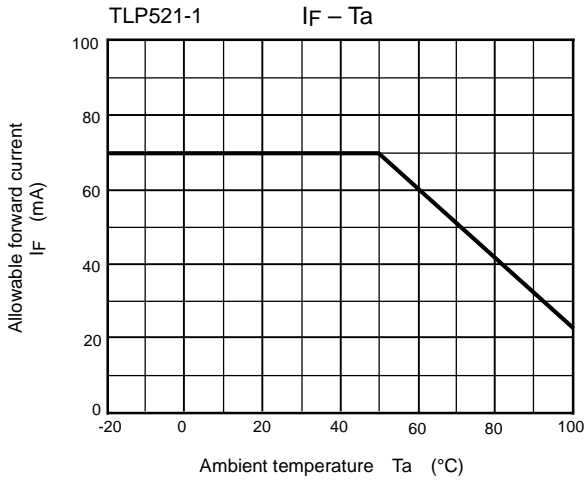
**Switching Characteristics (Ta = 25°C)**

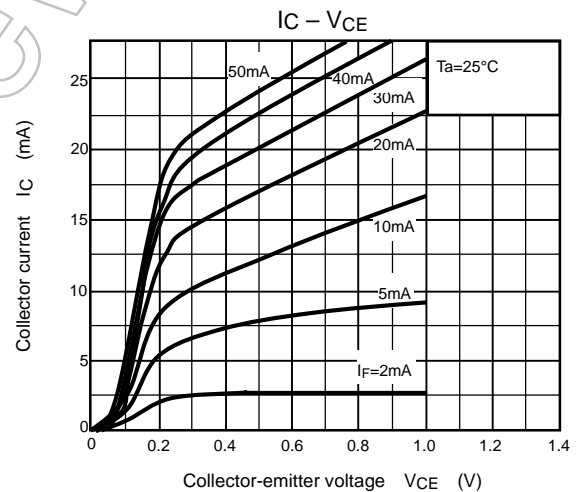
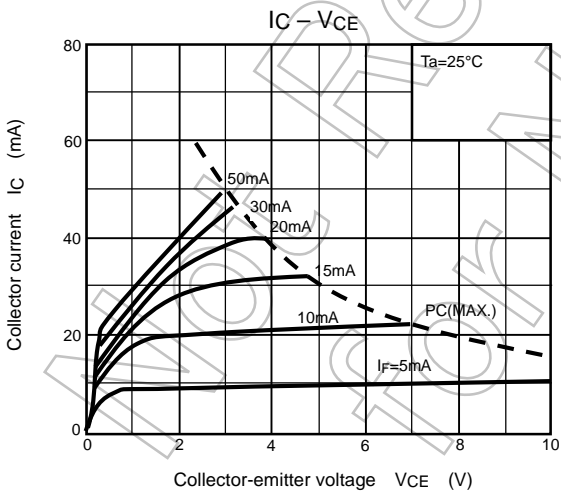
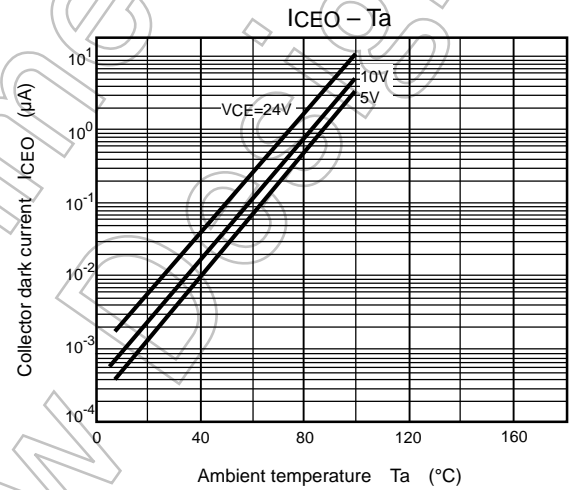
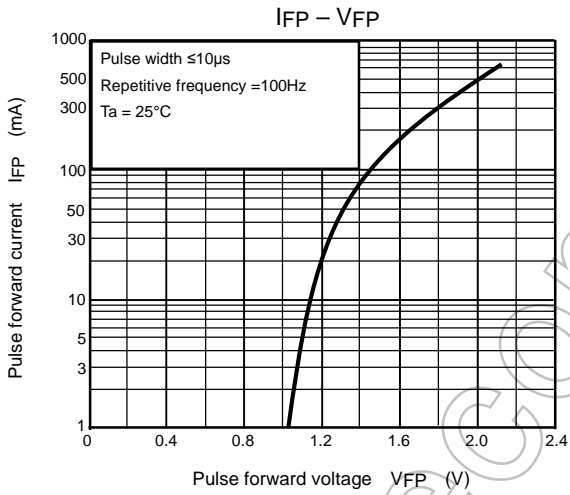
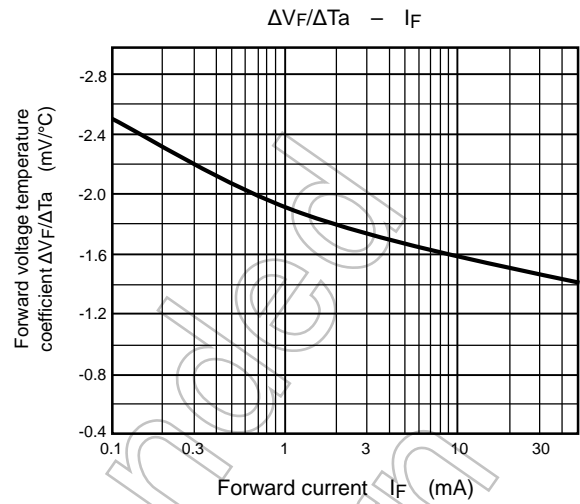
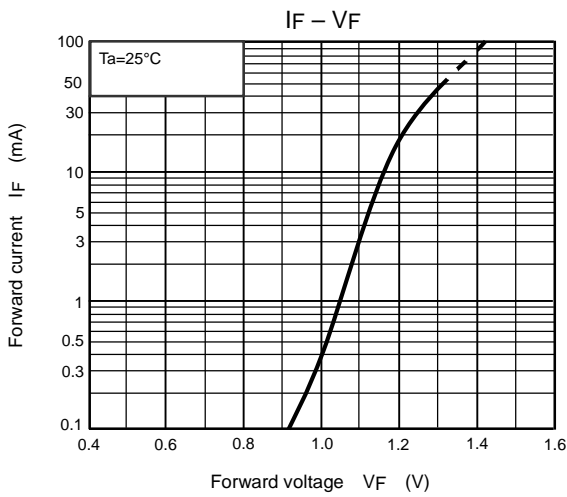
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}$ $I_C = 2\text{ mA}$ $R_L = 100\Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$ (Fig.1)	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	15	—	
Turn-off time	$t_{OFF}$		—	25	—	

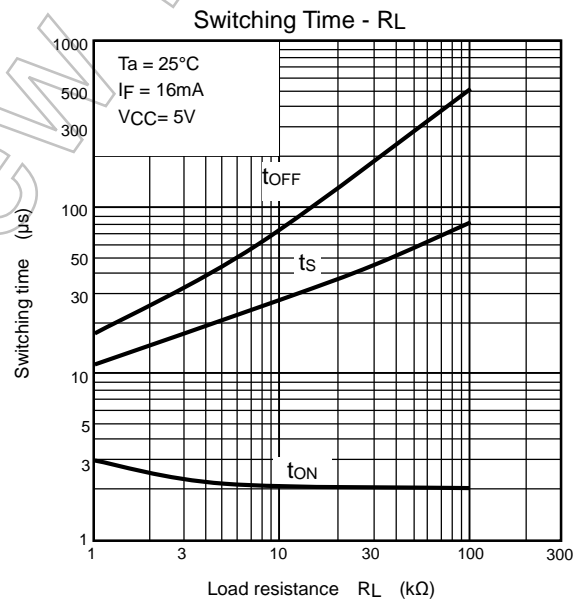
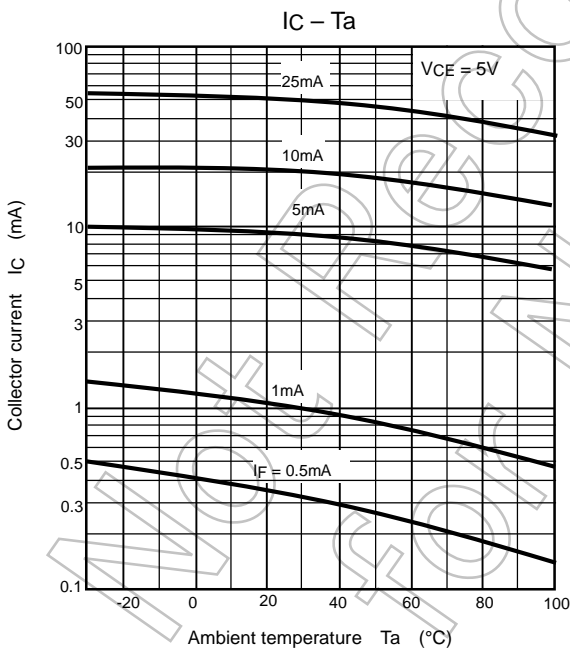
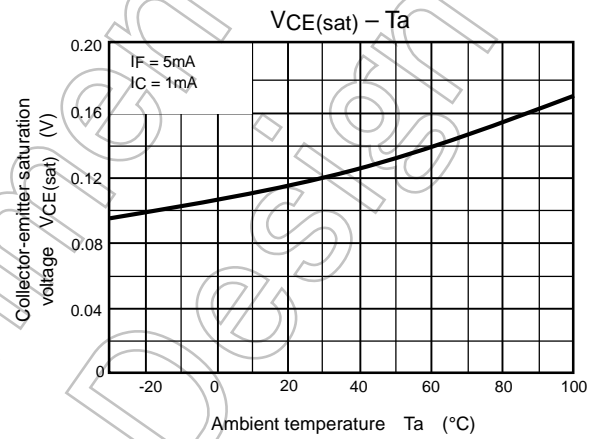
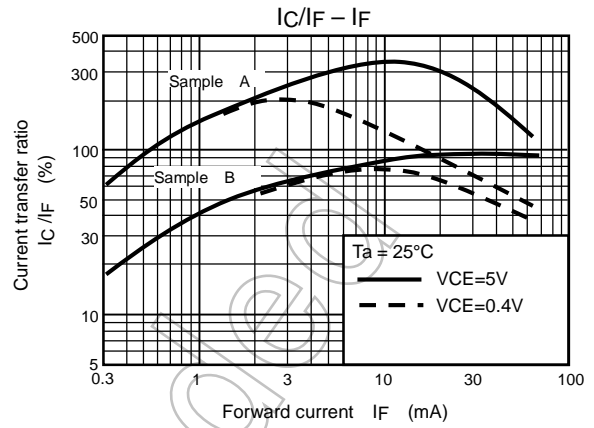
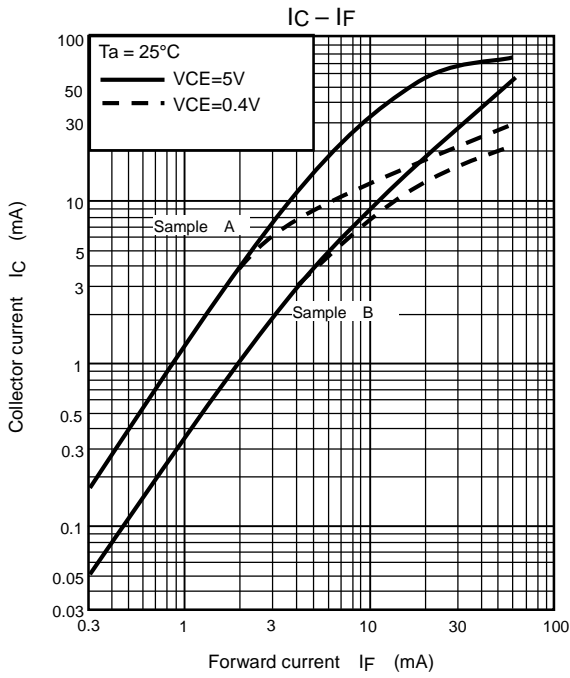
Fig.1 : SWITCHING TIME TEST CIRCUIT



Not Recommended for New Design









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