

# TLP181

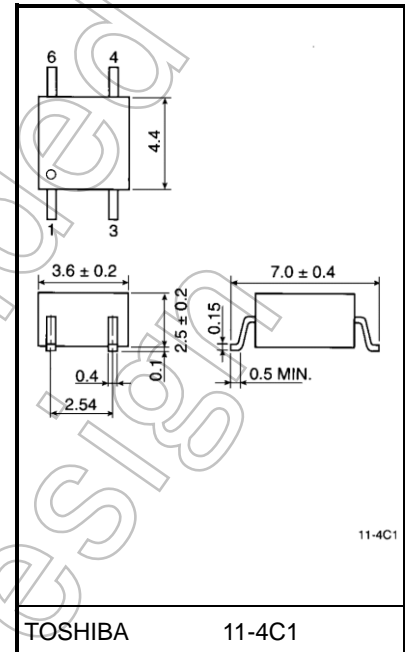
Office Machine  
 Programmable Controllers  
 AC Adapter  
 I/O Interface Board

Unit: mm

The TOSHIBA mini flat coupler TLP181 is a small outline coupler, suitable for surface mount assembly. TLP181 consist of a photo transistor optically coupled to a gallium arsenide infrared emitting diode. Since TLP181 is smaller than DIP package, it's suitable for high-density surface mounting applications such as programmable controllers.

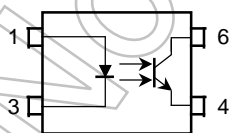
- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)  
 Rank GB: 100% (min)
- Isolation voltage: 3750 Vrms (min)
- Operation Temperature: -55 to 110 °C
- Safety Standards  
 UL recognized: UL1577, File No. E67349  
 cUL recognized: CSA Component Acceptance Service No. 5A  
 File No.E67349
- Option (V4) type  
 VDE approved : EN60747-5-5  
 Maximum Operating Insuration Voltage: 565 Vpk  
 Highest Permissible Overvoltage: 6000 Vpk

Note: When a EN60747-5-5 approved type is needed,  
 Please designate "Option(V4)"



Weight: 0.09 g (Typ.)

### Pin Configuration (top view)



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

Start of commercial production  
 1993-05

## Current Transfer Ratio

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	
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	400	B

Note 1: EX, Rank GB: TLP181 (GB)

Note: Application, type name for certification test, please use standard product type name, i. e.  
TLP181 (GB): TLP181

Not Recommended for New Design

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

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	50	mA
	Forward current derating (Ta ≥ 89°C)	ΔI <sub>F</sub> /°C	-1.4	mA/°C
	Pulse forward current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	Diode power dissipation	P <sub>D</sub>	100	mW
	Diode power dissipation derating (Ta ≥ 89°C)	ΔP <sub>D</sub> /°C	-2.8	mW/°C
	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
	Collector power dissipation	P <sub>C</sub>	150	mW
	Collector power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> /°C	-1.5	mW/°C
	Junction temperature	T <sub>j</sub>	125	°C
Storage temperature range		T <sub>stg</sub>	-55 to 125	°C
Operating temperature range		T <sub>opr</sub>	-55 to 110	°C
Lead soldering temperature (10 s)		T <sub>sol</sub>	260	°C
Total package power dissipation		P <sub>T</sub>	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP <sub>T</sub> /°C	-2.0	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	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: Pin1, 3 shorted together and pins 4, 6 shorted together

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V <sub>CC</sub>	—	5	48	V
Forward current	I <sub>F</sub>	—	16	20	mA
Collector current	I <sub>C</sub>	—	1	10	mA

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> = 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	80	—	—	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> = 48 V, ( Ambient light below 1000 lx) (Note 1)	—	0.01 (2)	0.1 (10)	μA
			V <sub>CE</sub> = 48 V, Ta = 85°C, ( Ambient light below 1000 lx) (Note 1)	—	2 (4)	50 (50)	μA
Capacitance (collector to emitter)	C <sub>CE</sub>	V = 0 V, f = 1 MHz	—	10	—	pF	

Note 1: Please use standard electric lamp to light up the device's marking surface.

## 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 I <sub>C</sub> = 0.2 mA, I <sub>F</sub> = 1 mA Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-state collector current	I <sub>C(off)</sub>	V <sub>F</sub> = 0.7 V, V <sub>CE</sub> = 48 V	—	1	10	μA

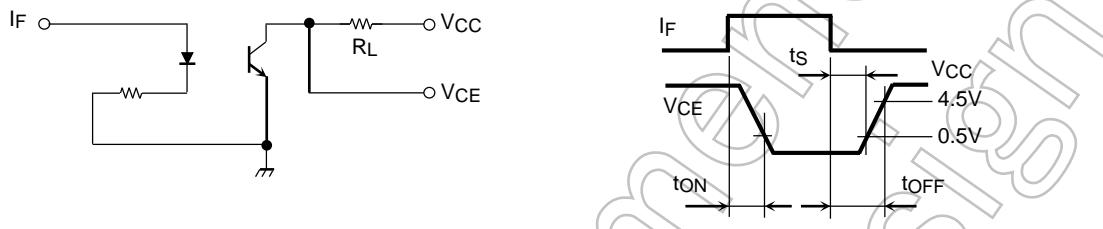
## Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60%	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	3750	—	—	V <sub>rms</sub>
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	V <sub>dc</sub>

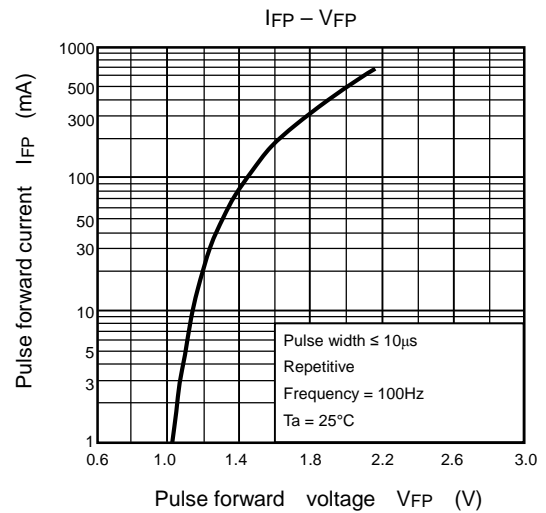
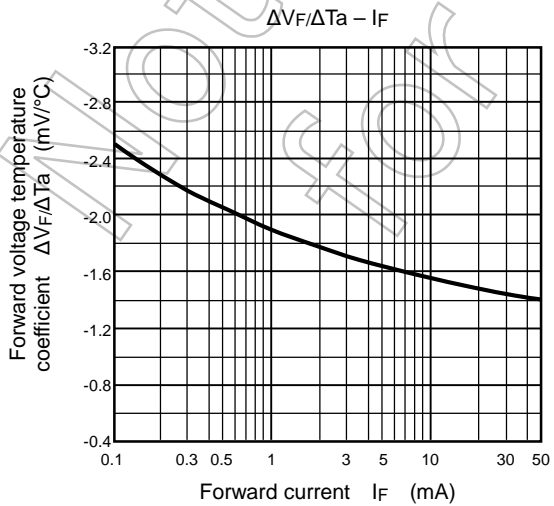
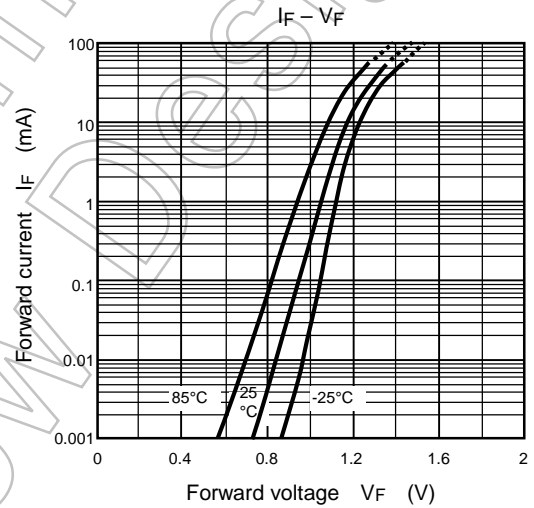
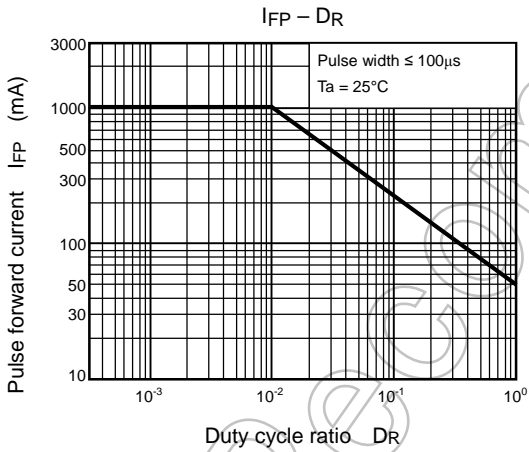
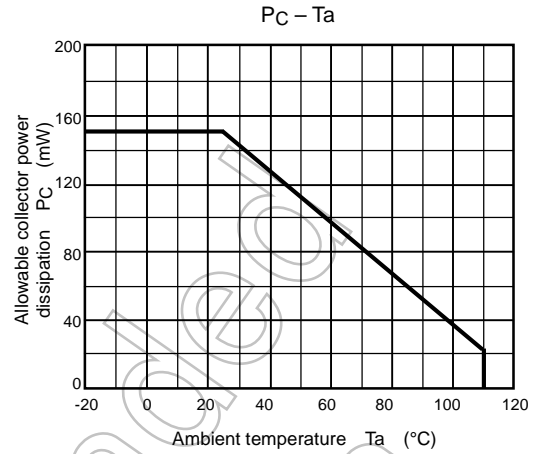
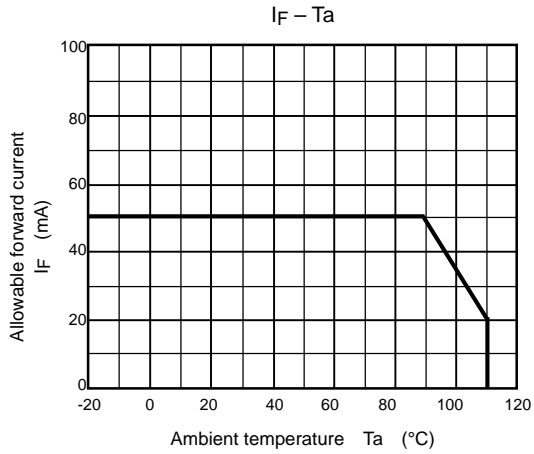
**Switching Characteristics (Ta = 25°C)**

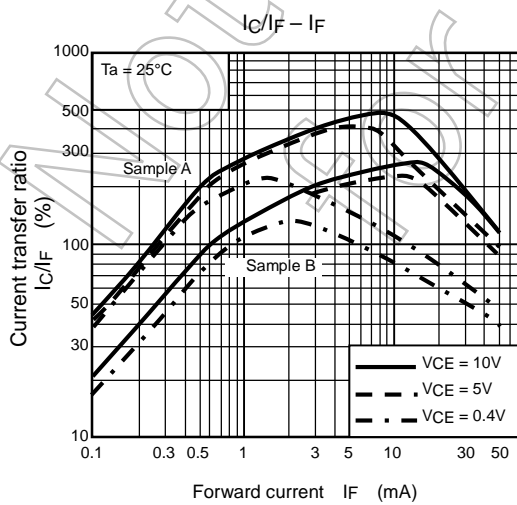
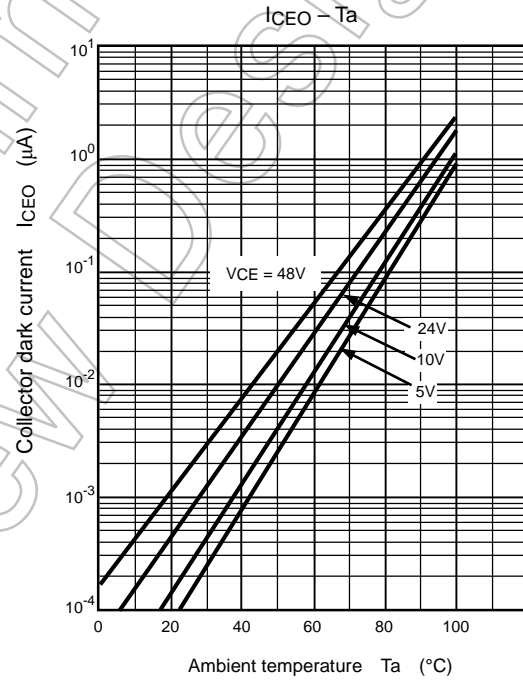
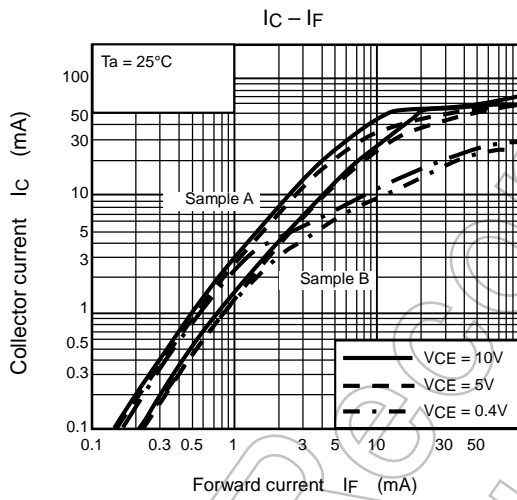
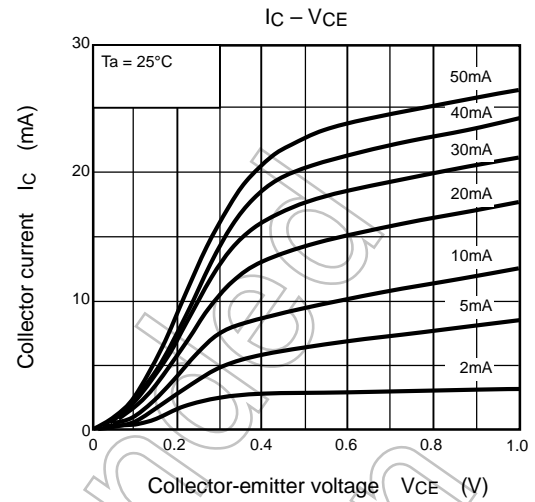
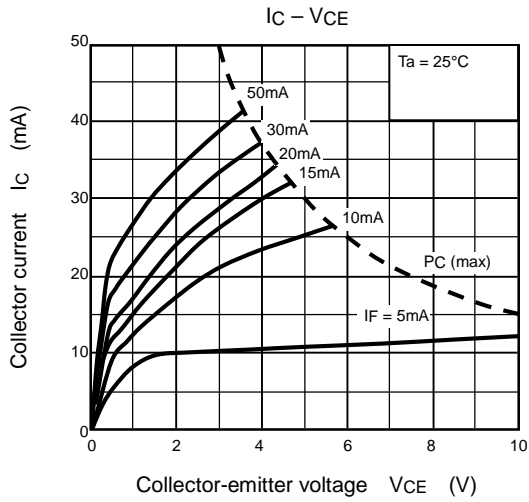
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}$ , $I_C = 2\text{ mA}$ $R_L = 100\Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}$ , $I_F = 16\text{ mA}$ (Fig.1)	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	25	—	
Turn-off time	$t_{OFF}$		—	40	—	

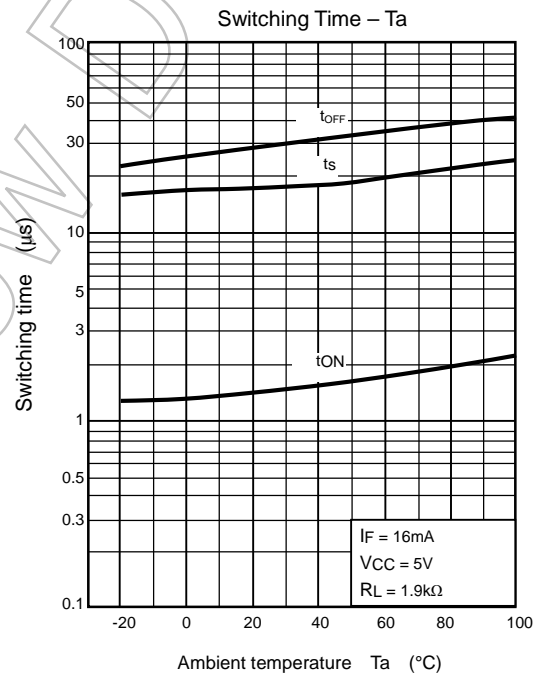
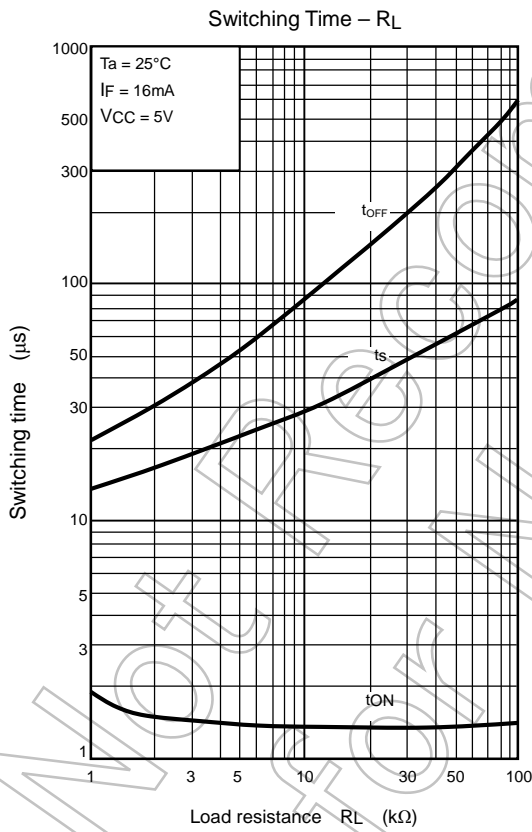
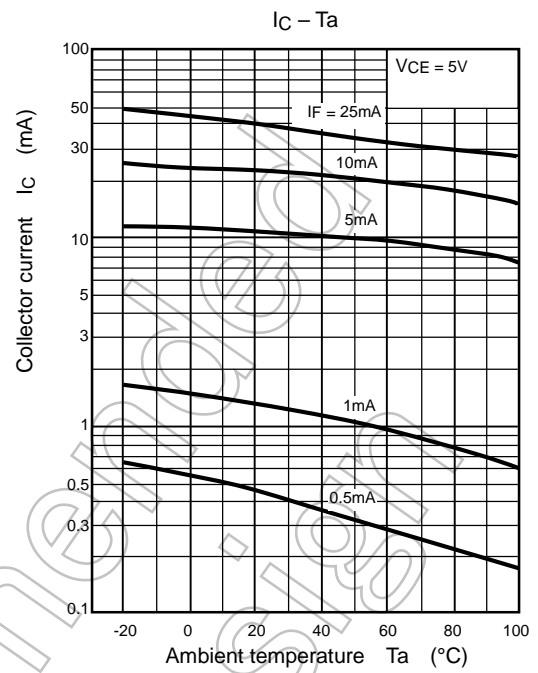
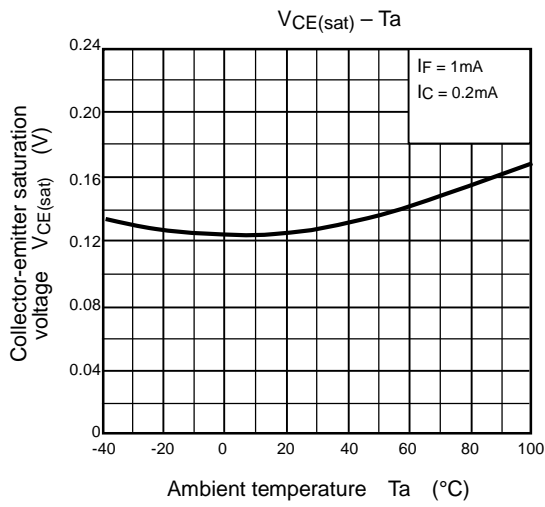
Fig. 1 Switching time test circuit



Not Recommended for New Design









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