

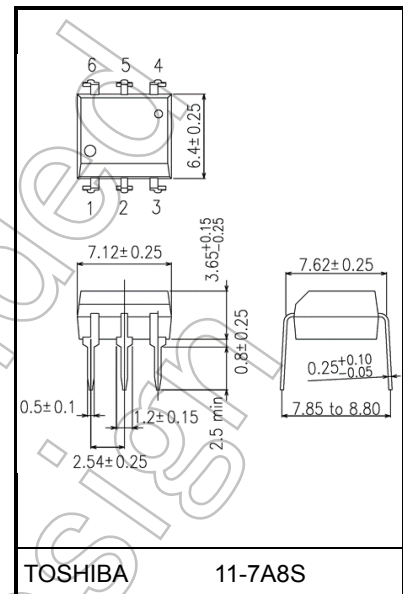
# TLP630

Unit: mm

Programmable Controllers  
AC / DC-Input Module  
Telecommunication

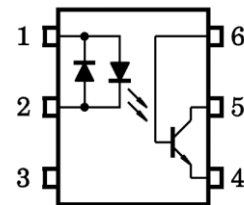
The TOSHIBA TLP630 consists of a photo-transistor optically coupled to two infrared emitting diode connected inverse parallel in a six lead plastic DIP package.

- Collector-emitter voltage: 55 V (min)
- Current transfer ratio: 50% (min)  
Rank GB: 100% (min)
- Isolation voltage: 5000 Vrms (min)
- UL-recognized: UL1577, File No.E67349



Weight: 0.4 g (typ.)

### Pin Configurations (top view)



- 1 : ANODE, CATHODE
- 2 : CATHODE, ANODE
- 3 : N.C.
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : BASE

Start of commercial production  
1983-05

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

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_{F(RMS)}$	60	mA
	Forward current derating (Ta ≥ 39°C)	$\Delta I_F / ^\circ C$	-0.7	mA / °C
	Peak forward current (100 μs pulse, 100 pps)	$I_{FPT}$	±1	A
	Diode power dissipation	$P_D$	100	mW
	Diode power dissipation derating (Ta ≥ 39 °C)	$\Delta P_D / ^\circ C$	-1.2	mW/°C
Detector	Collector-emitter voltage	$V_{CEO}$	55	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
	Power dissipation	$P_C$	150	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_C / ^\circ C$	-1.5	mW / °C
Operating temperature range		$T_{opr}$	-55 to 100	°C
Storage temperature range		$T_{stg}$	-55 to 125	°C
Lead soldering temperature (10 s)		$T_{sol}$	260	°C
Junction temperature		$T_j$	125	°C
Total package power dissipation		$P_T$	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		$\Delta P_T / ^\circ C$	-2.5	mW / °C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 1)		$BV_S$	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 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	$V_{CC}$	—	5	24	V
Forward current	$I_{F(RMS)}$	—	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 (Ta = 25°C)

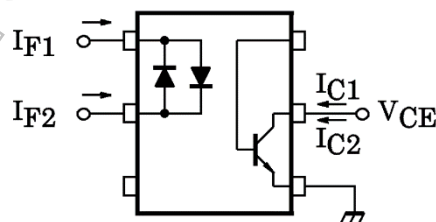
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Forward current	$I_F$	$V_F = 0.7 \text{ V}$	—	2.5	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5 \text{ mA}$	55	—	—	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	$I_{CEO}$	$V_{CE} = 24 \text{ V}$	—	10	100	nA
			$V_{CE} = 24 \text{ V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
	Collector dark current	$I_{CBO}$	$V_{CB} = 10 \text{ V}$	—	0.1	—	nA
Capacitance (collector to emitter)	$C_{CE}$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	10	—	pF	

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

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	$I_C / I_F$	$I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_{F(\text{sat})}$	$I_F = \pm 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Base photo-current	$I_{PB}$	$I_F = \pm 5 \text{ mA}, V_{CB} = 5 \text{ V}$	—	10	—	$\mu\text{A}$
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = 2.4 \text{ mA}, I_F = \pm 8 \text{ mA}$	—	—	0.4	V
Off-state collector current	$I_{C(\text{off})}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 24 \text{ V}$	—	1	10	$\mu\text{A}$
CTR symmetry	$I_{C(\text{ratio})}$	$I_C(I_F = -5 \text{ mA}) / I_C(I_F = +5 \text{ mA})$ (Note 1)	0.33	1	3	—

Note 1:

$$I_{C(\text{ratio})} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5\text{V})}{I_{C1}(I_F = I_{F1}, V_{CE} = 5\text{V})}$$



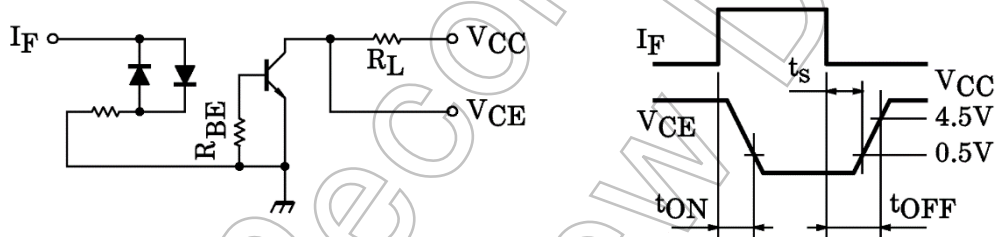
### Isolation Characteristics (Ta = 25°C)

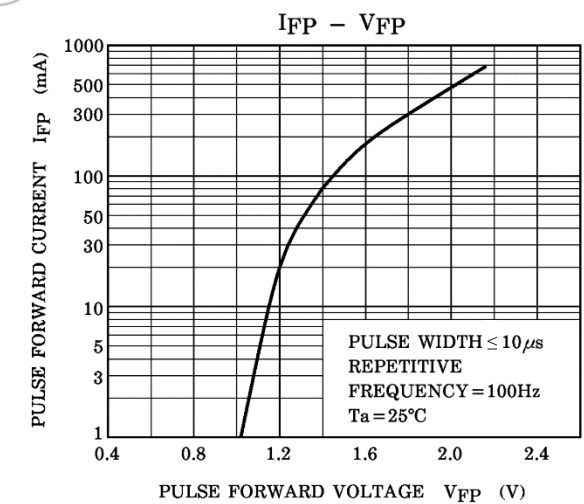
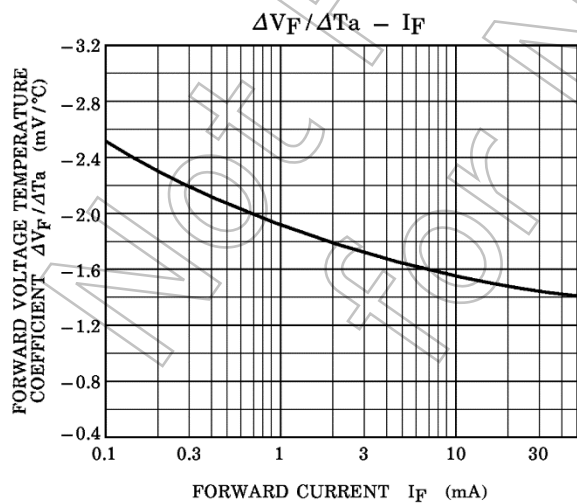
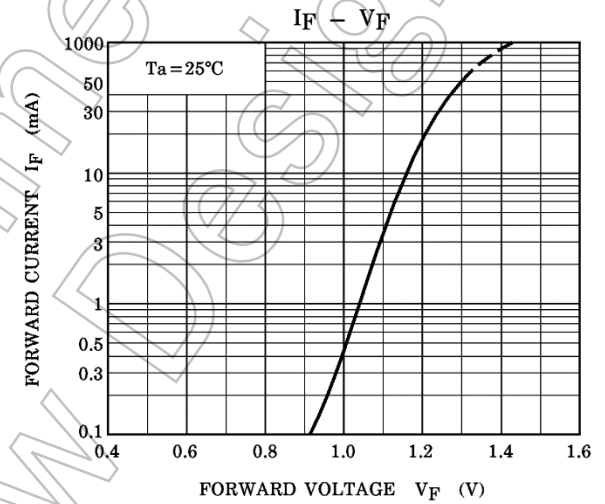
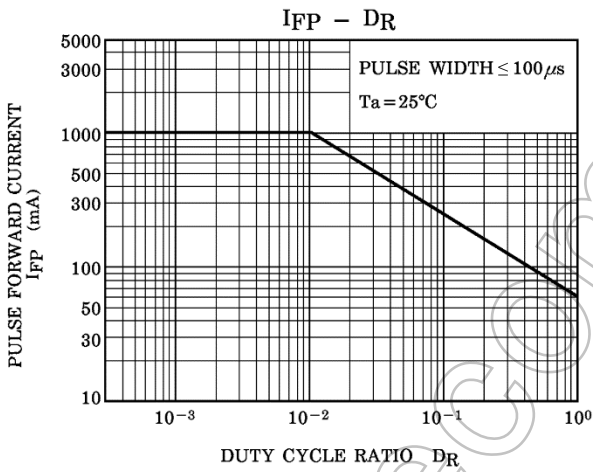
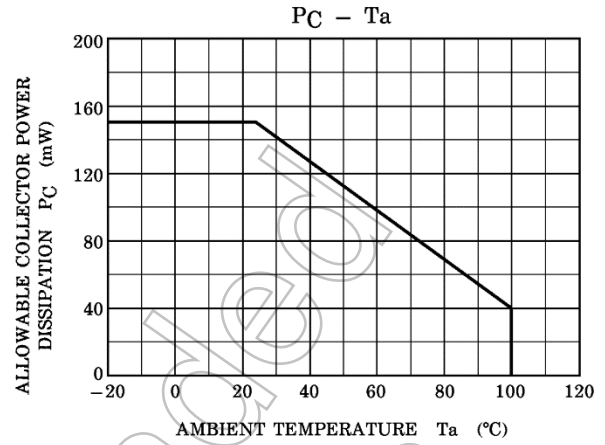
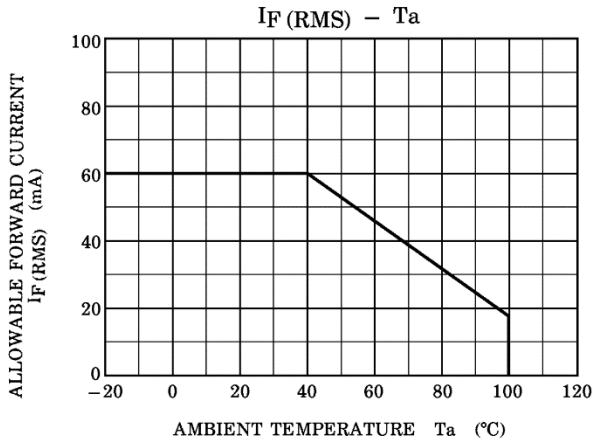
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60 %	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	5000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

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

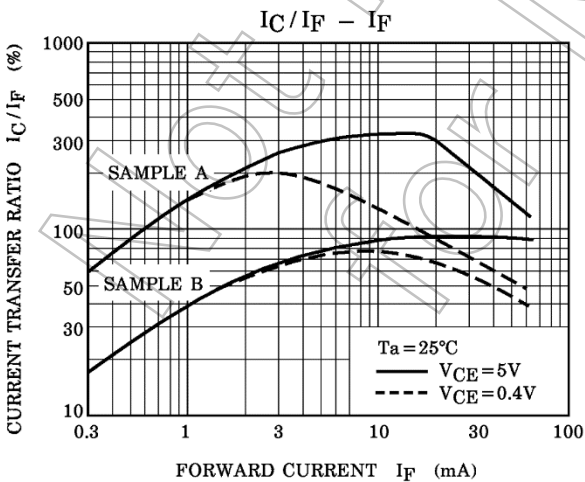
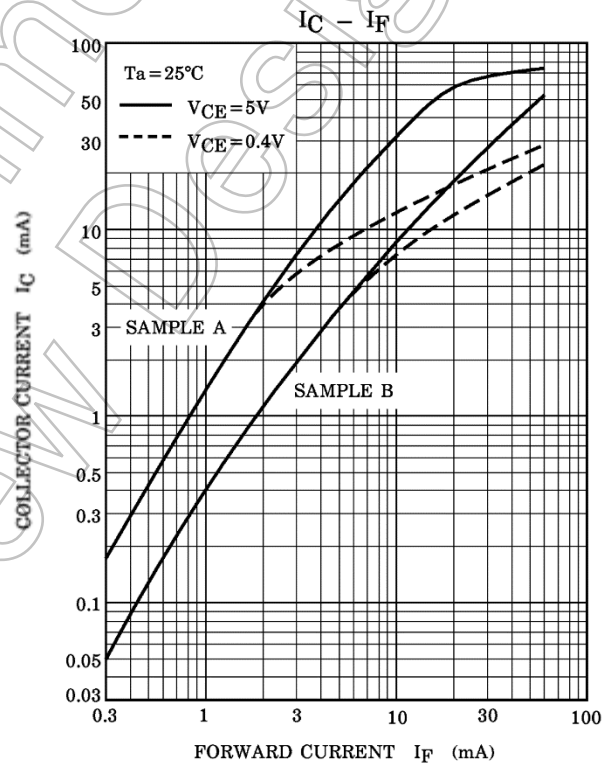
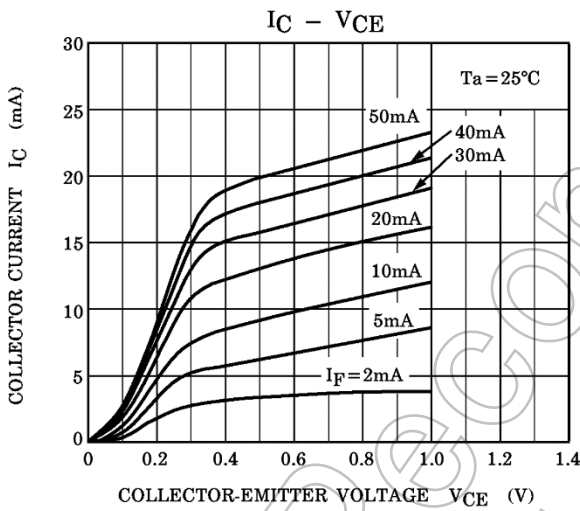
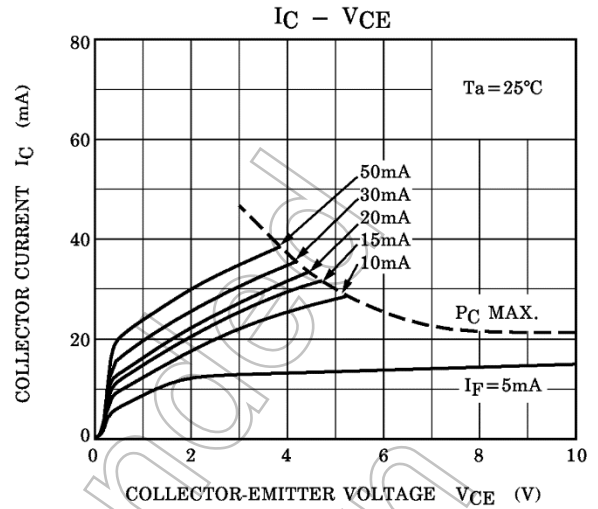
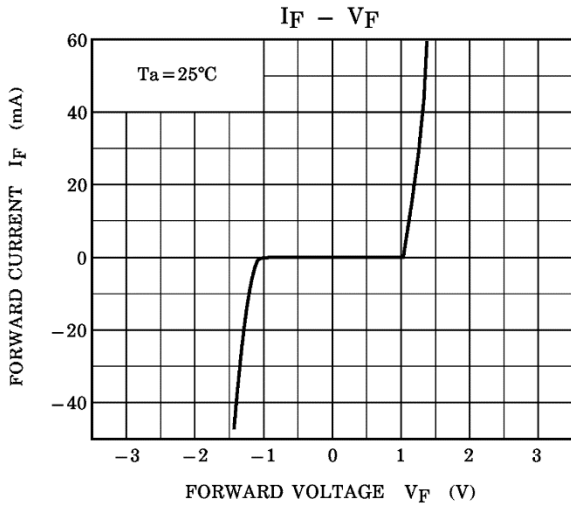
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100 Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>		—	3	—	
Turn-off time	t <sub>OFF</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ (Fig. 1) 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>		—	15	—	
Turn-off time	t <sub>OFF</sub>		—	25	—	
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>		—	12	—	
Turn-off time	t <sub>OFF</sub>		—	20	—	

Fig. 1: Switching time test circuit

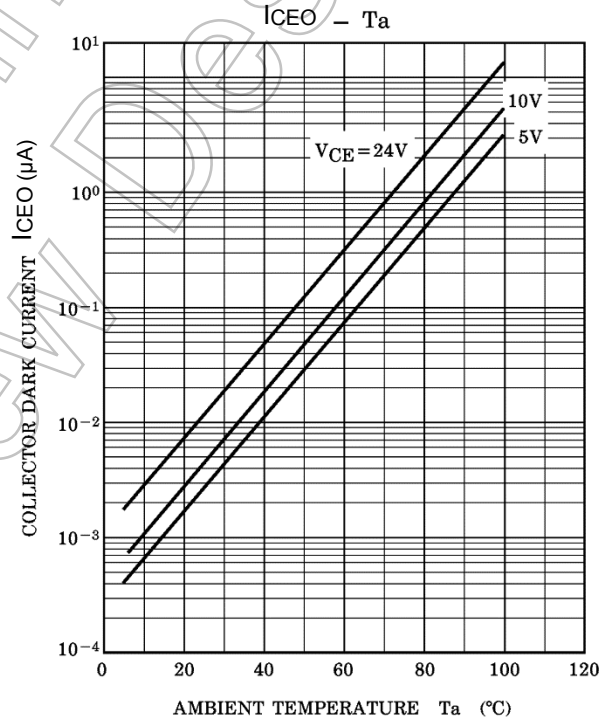
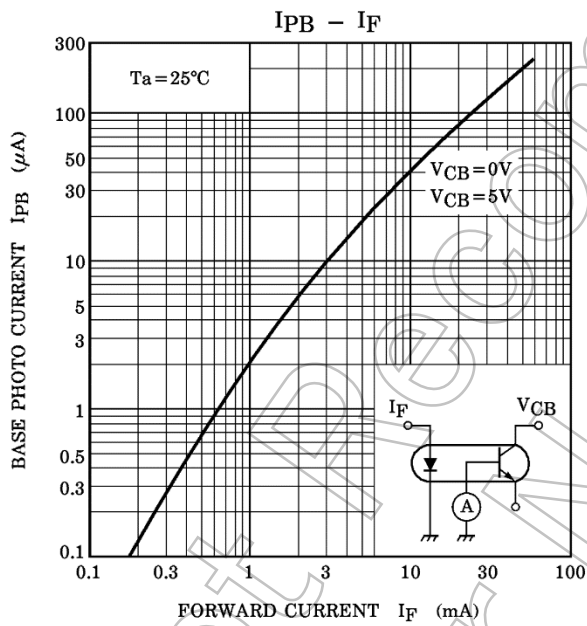
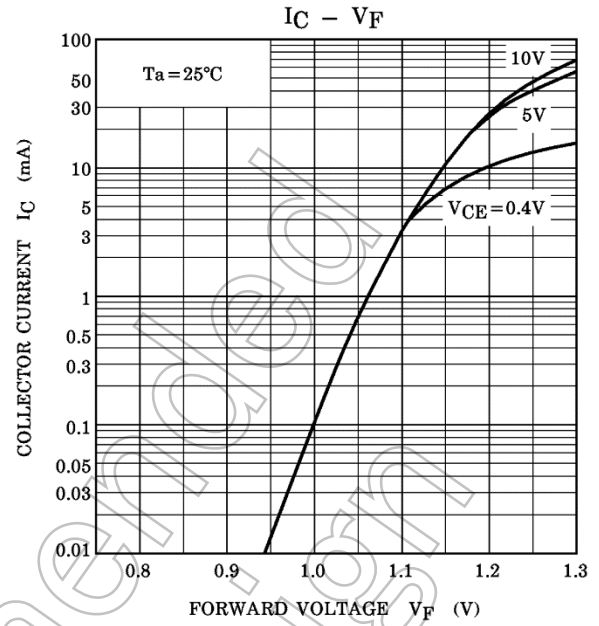
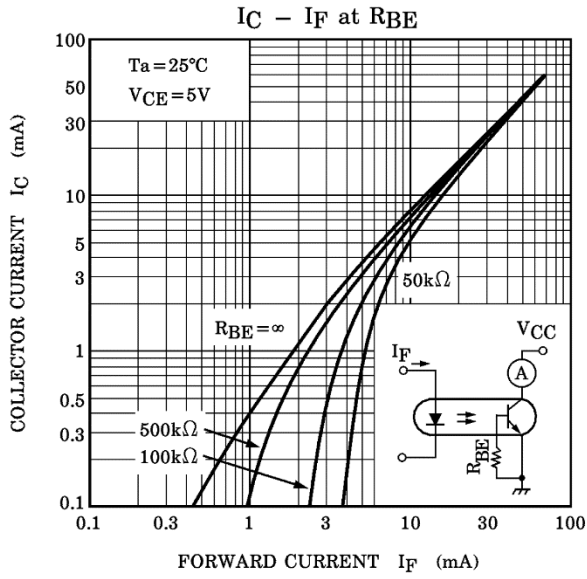




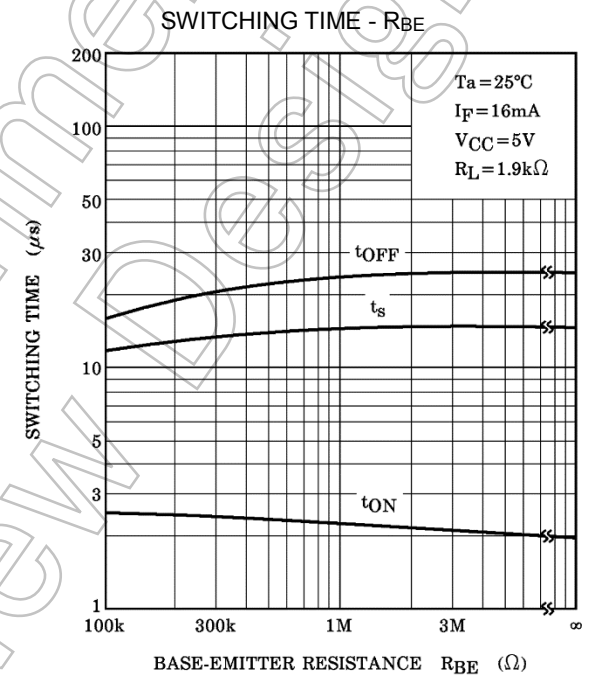
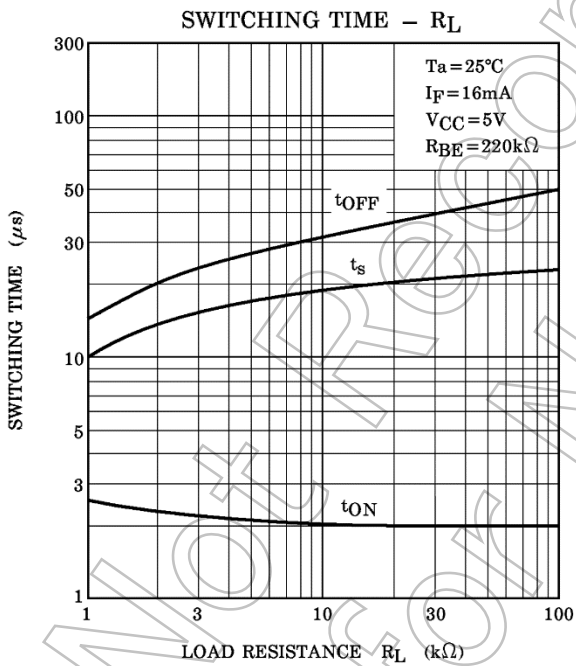
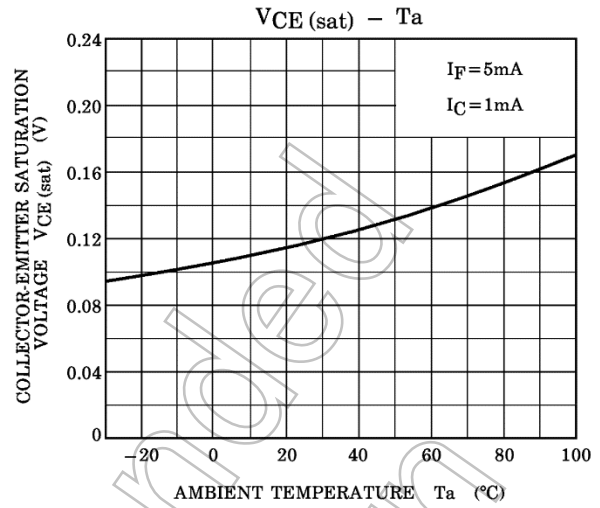
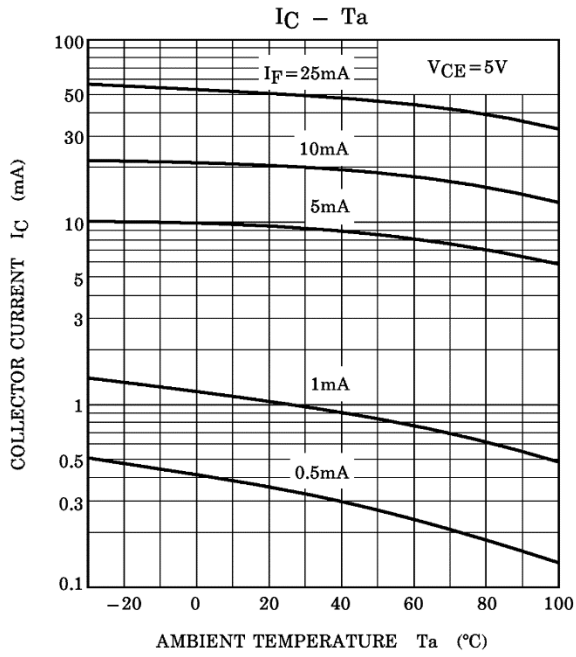
NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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