

# TLP280, TLP280-4

Programmable Controllers  
 AC/DC-Input Module  
 PC Card Modem (PCMCIA)

TLP280 and TLP280-4 is a very small and thin coupler, suitable for surface mount assembly in applications such as PCMCIA fax modem, programmable controllers.

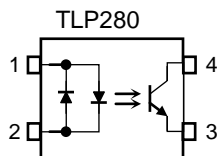
TLP280 and TLP280-4 consist of photo transistor, optically coupled to two gallium arsenide infrared emitting diodes connected inverse parallel, and can operate directly by AC input current.

- Collector-emitter voltage: 80 V (min)
- Current transfer ratio: 50% (min)  
 Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized: UL1577, file No. E67349
- cUL approved: CSA Component Acceptance Service No. 5A  
 File No.E67349

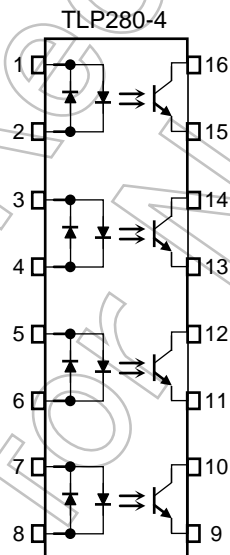
- Option (V4) type  
 VDE approved: EN60747-5-5

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

## Pin Configuration (top view)

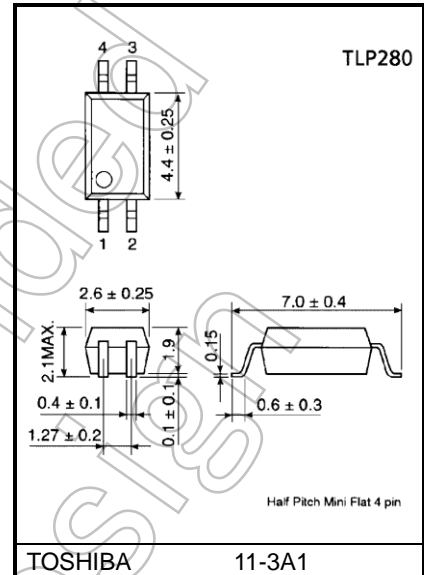


- 1 : Anode
- 2 : Cathode
- 3 : Emitter
- 4 : Collector



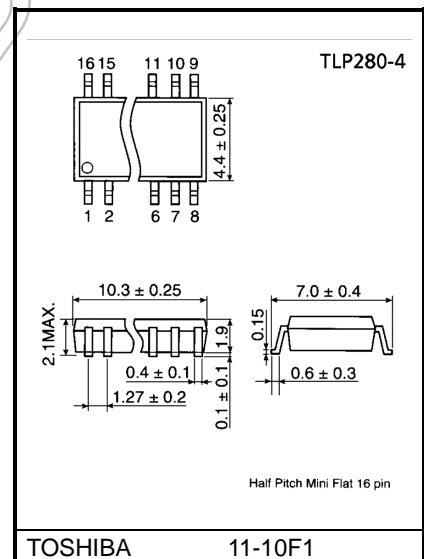
- 1,3,5,7 : Anode-Cathode
- 2,4,6,8 : Cathode Anode
- 9,11,13,15 : Emitter
- 10,12,14,16 : Collector

Unit: mm



Weight: 0.05 g (typ.)

Unit: mm



Weight: 0.19 g (typ.)

Start of commercial production  
 1996-03

## Current Transfer Ratio

Part Number	Classification (Note 1)	Current Transfer Ratio (%) ( $I_C / I_F$ )		Marking of Classification
		$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ\text{C}$		
		min	max	
TLP280	Blank	50	600	Blank, YE, GR, BL, GB
	Rank Y	50	150	YE
	Rank GR	100	300	GR
	Rank BL	200	600	BL
	Rank GB	100	600	GB, GR, BL
TLP280-4	Blank	50	600	Blank, GB
	Rank GB	100	600	GB

Note : For the supply status of TLP280 rank Y and BL products, please contact with our sales representative.

Note 1: When ordering product, please specify both the part number and the classification, e.g. TLP280(GB).

Note: Application type name for certification test, please use standard product type name, i.e.  
TLP280(GB): TLP280, TLP280-4(GB): TLP280-4.

## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280-4	
LED	Forward current	$I_F(\text{RMS})$	$\pm 50$		mA
	Forward current derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta I_F/^\circ\text{C}$	-0.7	-0.5	mA/ $^\circ\text{C}$
	Pulse forward current (100 $\mu\text{s}$ pulse, 100 pps)	$I_{FP}$	$\pm 1$		A
	Diode power dissipation	$P_D$	100	70	mW
	Diode power dissipation derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta P_D/^\circ\text{C}$	-1	-0.7	mW/ $^\circ\text{C}$
	Junction temperature	$T_j$	125		$^\circ\text{C}$
Detector	Collector-emitter voltage	$V_{CEO}$	80		V
	Emitter-collector voltage	$V_{ECO}$	7		V
	Collector current	$I_C$	50		mA
	Collector power dissipation (1 circuit)	$P_C$	150	100	mW
	Collector power dissipation derating ( $T_a \geq 25^\circ\text{C}$ ) (1 circuit)	$\Delta P_C/^\circ\text{C}$	-1.5	-1.0	mW/ $^\circ\text{C}$
	Junction temperature	$T_j$	125		$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 125		$^\circ\text{C}$
Operating temperature range		$T_{opr}$	-55 to 100		$^\circ\text{C}$
Lead soldering temperature (10 s)		$T_{sol}$	260		$^\circ\text{C}$
Total package power dissipation (1 circuit)		$P_T$	200	170	mW
Total package power dissipation derating ( $T_a \geq 25^\circ\text{C}$ ) (1 circuit)		$\Delta P_T/^\circ\text{C}$	-2.0	-1.7	mW/ $^\circ\text{C}$
Isolation voltage (AC, 60 s, R.H. $\leq 60\%$ ) (Note 1)		$BV_S$	2500		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.

## 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
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1 MHz	—	60	—	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 (Note 1)	I <sub>CEO</sub>	V <sub>CE</sub> = 48 V	—	0.01	0.1	μA
			Ambient light below (100 lx)	—	2	10	
			V <sub>CE</sub> = 48 V, Ta = 85°C	—	2	50	μA
Ambient light below (100 lx)	—	4	50				
Capacitance (collector to emitter)	C <sub>CE</sub>	V = 0 V, f = 1 MHz	—	10	—	pF	

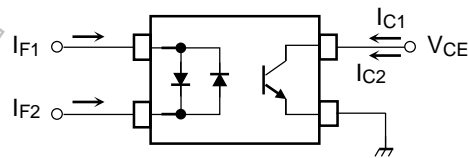
Note 1: Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

## 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	50	—	600	%
		Rank GB	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	—	60	—	%
		Rank GB	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	
Off-state collector current	I <sub>C(off)</sub>	V <sub>F</sub> = ±0.7 V, V <sub>CE</sub> = 48 V	—	—	10	μA
CTR symmetry	I <sub>C(ratio)</sub>	I <sub>C</sub> (I <sub>F</sub> = -5 mA) / I <sub>C</sub> (I <sub>F</sub> = 5 mA) (Note 1)	0.33	—	3	—

Note 1:

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



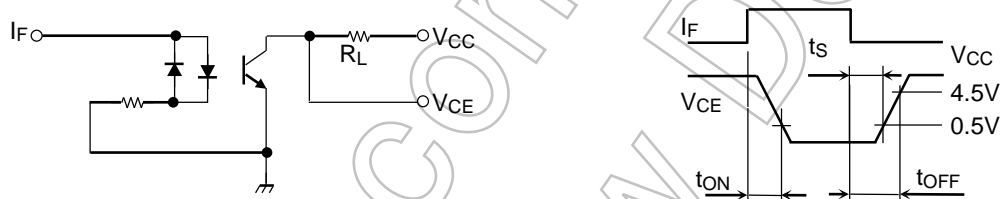
**Isolation Characteristics (Ta = 25°C)**

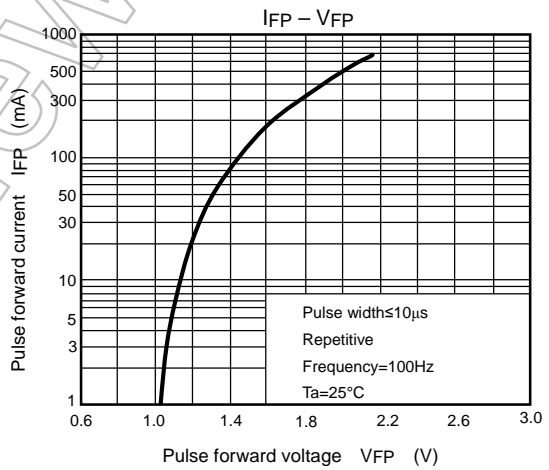
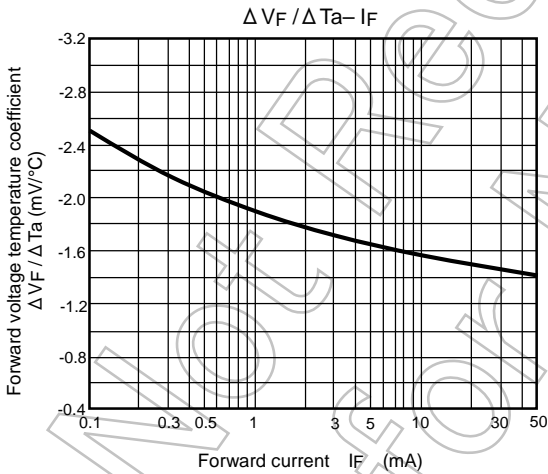
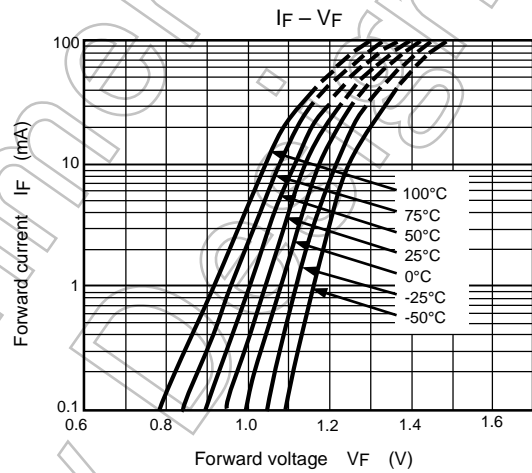
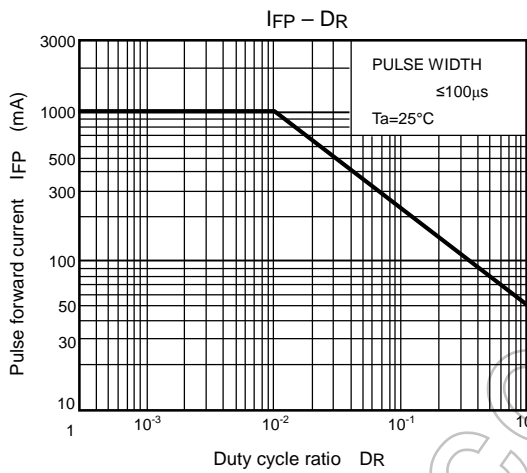
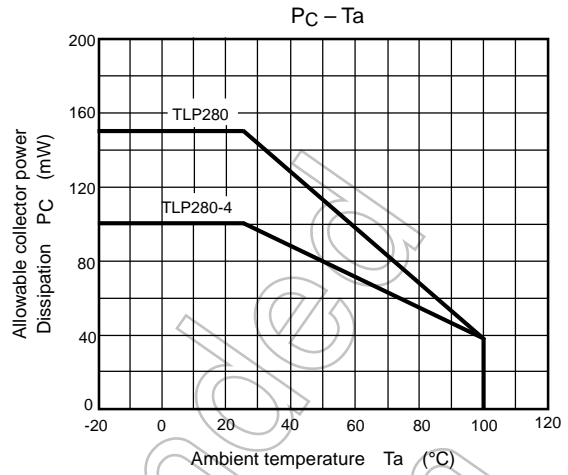
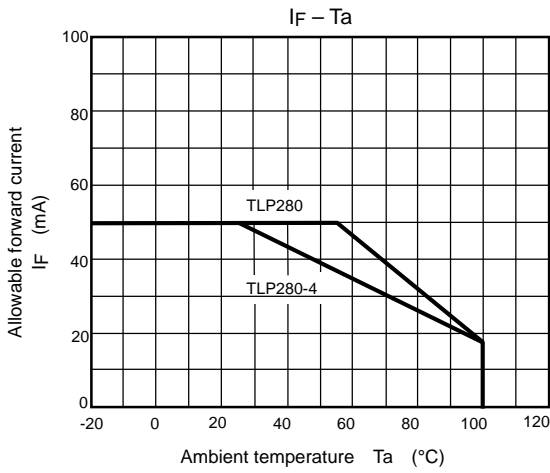
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	CS	VS = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500 V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BVS	AC, 60 s	2500	—	—	Vrms
		AC, 1 s, in oil	—	5000	—	
		DC, 60 s, in oil	—	5000	—	Vdc

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

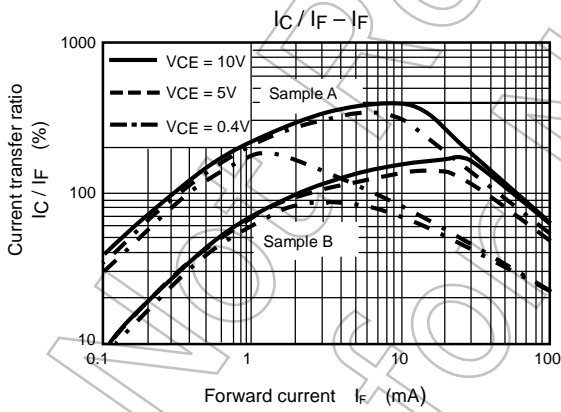
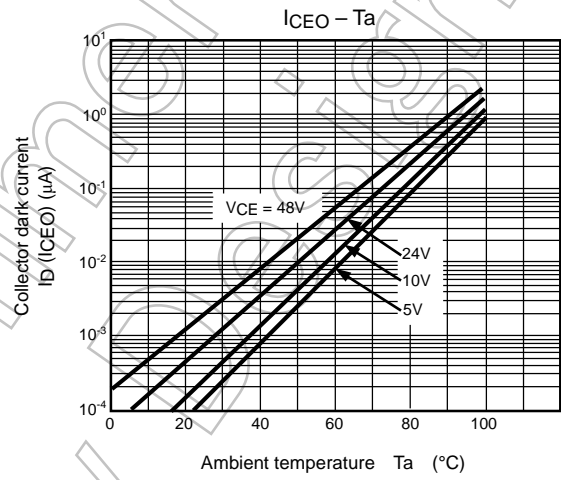
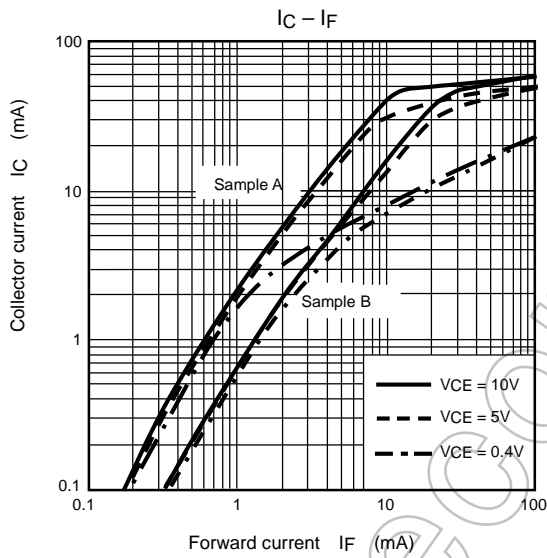
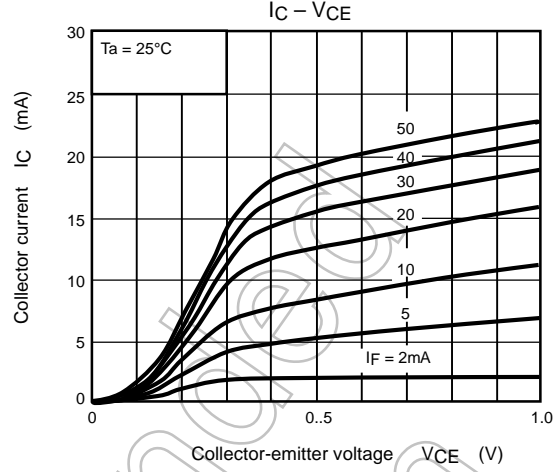
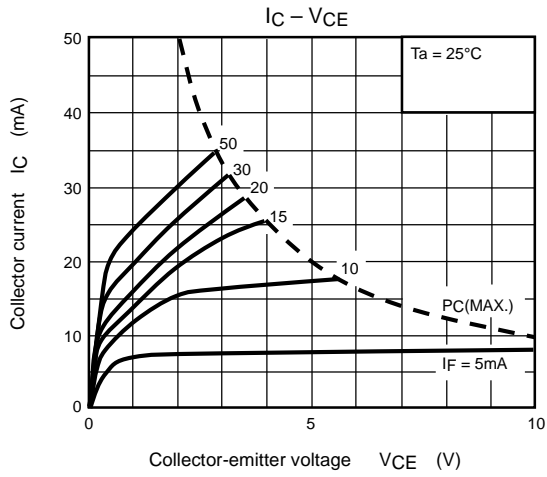
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	tr	VCC = 10 V, IC = 2 mA RL = 100 Ω	—	2	—	μs
Fall time	tf		—	3	—	
Turn-on time	ton		—	3	—	
Turn-off time	toff		—	3	—	
Turn-on time	tON	RL = 1.9 kΩ VCC = 5 V, IF = ±16 mA (Fig.1)	—	2	—	μs
Storage time	ts		—	25	—	
Turn-off time	tOFF		—	40	—	

Fig. 1: Switching time test circuit

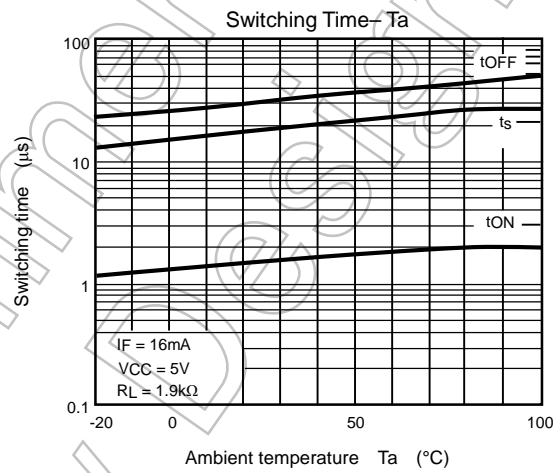
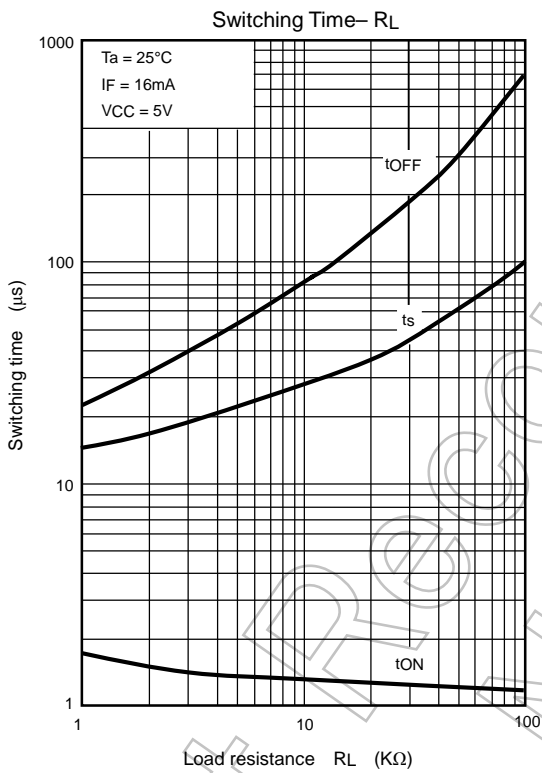
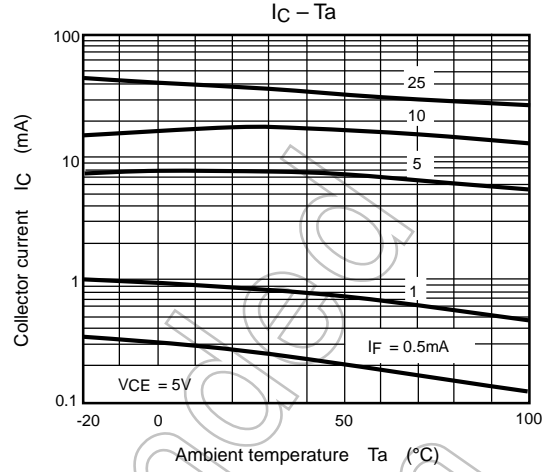
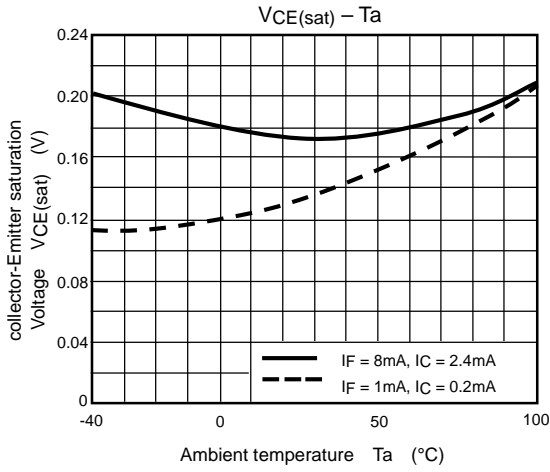




\*The above graphs show typical characteristic.



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