

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP281, TLP281-4

## PROGRAMMABLE CONTROLLERS

### AC/DC-INPUT MODULE

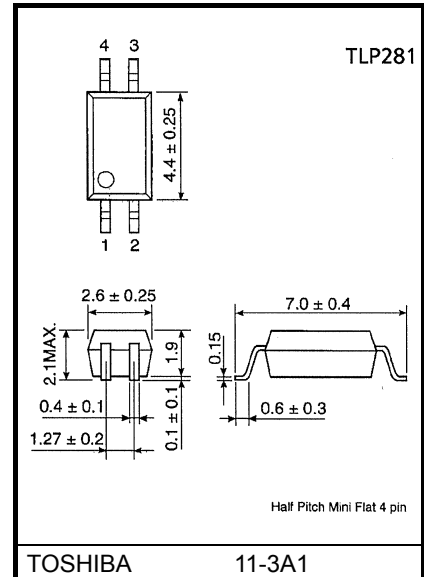
### PC CARD MODEM(PCMCIA)

TLP281 and TLP281-4 is a very small and thin coupler, suitable for surface mount assembly in applications such as PCMCIA Fax modem, programmable controllers.

TLP281 and TLP281-4 consist of photo transistor, optically coupled to a gallium arsenide infrared emitting diode.

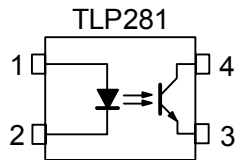
- Collector-Emitter Voltage : 80 V (MIN)
- Current Transfer Ratio : 50% (MIN)  
Rank GB : 100% (MIN)
- Isolation Voltage : 2500 Vrms (MIN)
- UL Recognized : UL1577 , File No. E67349
- BSI Approved : BS EN 60065: 2002,  
: BS EN 60950-1: 2002  
Certificate No. 8143, 8144

Unit : mm

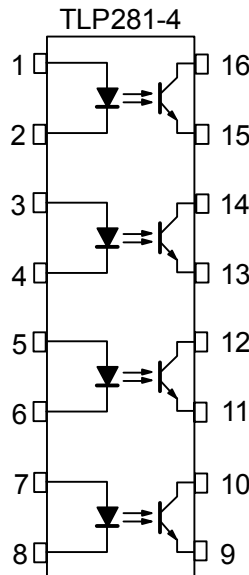


Weight: 0.05 g (typ.)

### Pin Configuration (top view)

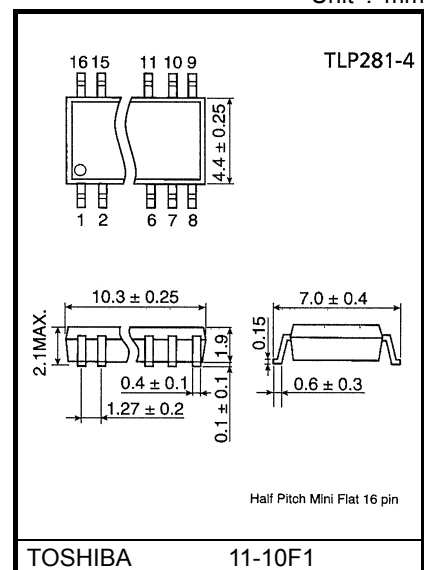


- 1: ANODE
- 2: CATHODE
- 3: EMITTER
- 4: COLLECTOR



- 1,3,5,7 : ANODE
- 2,4,6,8 : CATHODE
- 9,11,13,15 : EMITTER
- 10,12,14,16 : COLLECTOR

Unit : mm



Weight: 0.19 g (typ.)

## Current Transfer Ratio

TYPE	Classification(*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	
TLP281	Blank	50	600	Blank, Y <sup>■</sup> , YE, G, G <sup>■</sup> , GR, B, BL, GB
	Rank Y	50	150	YE
	Rank GR	100	300	GR
	Rank BL	200	600	BL
	Rank GB	100	600	GB
	Rank YH	75	150	Y <sup>■</sup>
	Rank GRL	100	200	G
	Rank GRH	150	300	G <sup>■</sup>
	Rank BLL	200	400	B
TLP281-4	Blank	50	600	Blank, GB
	Rank GB	100	600	GB

\*1: Ex. rank GB: TLP281 (GB)

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

TLP281 (GB): TLP281, TLP281-4 (GB): TLP281-4

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

CHARACTERISTIC		SYMBOL	RATING		UNIT
			TLP281	TLP281-4	
LED	Forward Current	$I_F$	50		mA
	Forward Current Derating	$\Delta I_F / ^\circ\text{C}$	-0.7 (Ta $\geq$ 53°C)	-0.5 (Ta $\geq$ 25°C)	mA / °C
	Pulse Forward Current (Note 1)	$I_{FP}$	1		A
	Reverse Voltage	$V_R$	5		V
	Junction Temperature	$T_j$	125		°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 (Ta $\geq$ 25°C) (1 Circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / °C
	Junction Temperature	$T_j$	125		°C
Operating Temperature Range		$T_{opr}$	-55 to 100		°C
Storage Temperature Range		$T_{stg}$	-55 to 125		°C
Lead Soldering Temperature		$T_{sol}$	260 (10s)		°C
Total Package Power Dissipation (1 Circuit)		$P_T$	200	170	mW
Total Package Power Dissipation Derating (Ta $\geq$ 25°C) (1 Circuit)		$\Delta P_T / ^\circ\text{C}$	-2.0	-1.7	mW / °C
Isolation Voltage (Note 2)		$BV_S$	2500(AC, 1min, R.H. $\leq$ 60%)		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) Pulse width  $\leq$  100 $\mu$ s, frequency 100Hz

(Note 2) AC, 1 minute, R.H. $\leq$ 60%, Device considered a two terminal device : LED side pins shorted together and DETECTOR side pins shorted together.

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

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	$V_F$	$I_F = 10$ mA	1.0	1.15	1.3	V
	Reverse Current	$I_R$	$V_R = 5$ V	—	—	10	$\mu$ A
	Capacitance	$C_T$	$V = 0, f = 1$ MHz	—	30	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 0.5$ mA	80	—	—	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	$I_E = 0.1$ mA	7	—	—	V
	Collector Dark Current (Note 3)	$I_{CEO}$	$V_{CE} = 48$ V, Ambient Light Below (100 lx) (Note 4)	—	0.01 (2)	0.1 (10)	$\mu$ A
			$V_{CE} = 48$ V, Ta = 85°C Ambient Light Below (100 lx) (Note 4)	—	2 (4)	50 (50)	$\mu$ A
Capacitance (Collector to Emitter)	$C_{CE}$	$V = 0, f = 1$ MHz	—	10	—	pF	

(Note 3) Because of the construction, leak current might be increased by ambient light.

Please use photocoupler with less ambient light.

(Note 4) Irradiation to marking side using standard light bulb.

## 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	—	
Off-State Collector Current	$I_C (\text{off})$	$V_F = 0.7 \text{ V}, V_{CE} = 48 \text{ V}$	—	—	10	$\mu\text{A}$

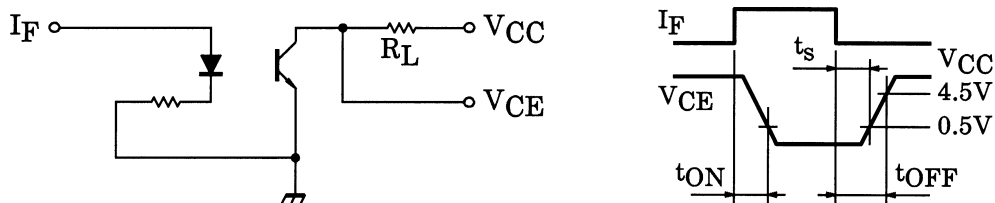
## Isolation Characteristics (Ta = 25°C)

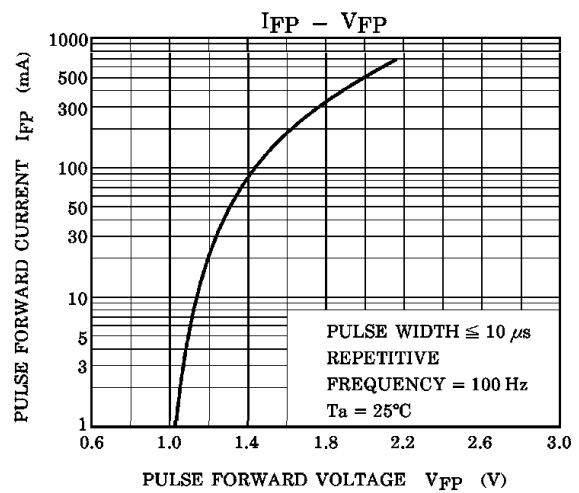
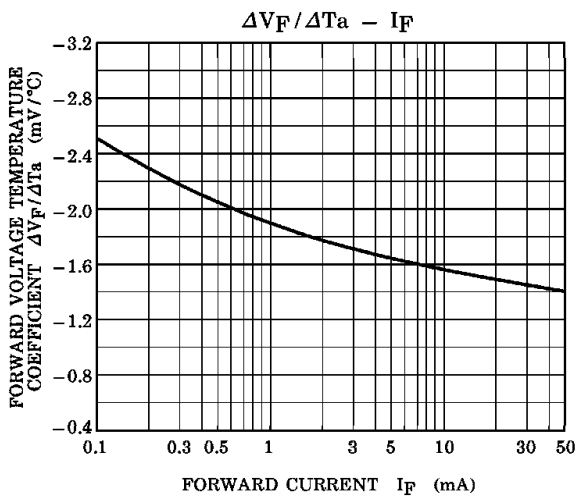
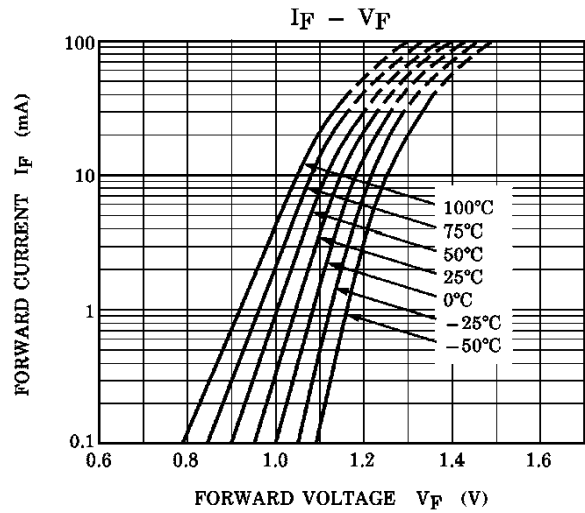
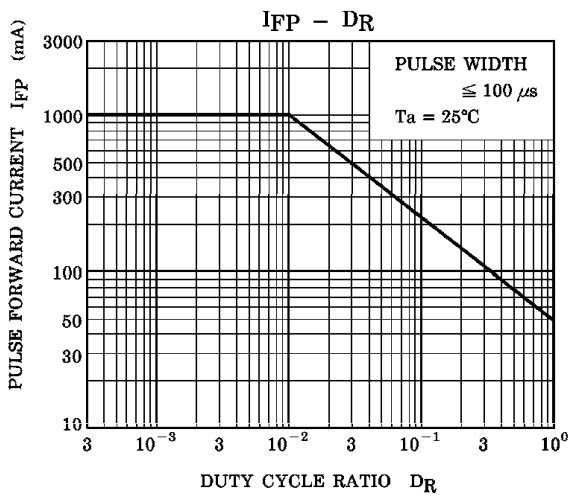
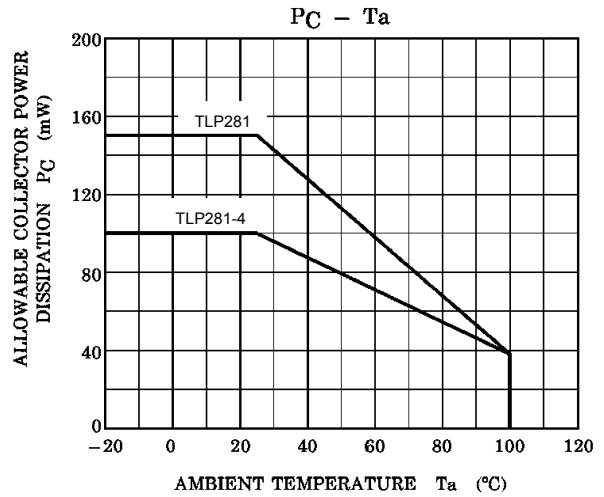
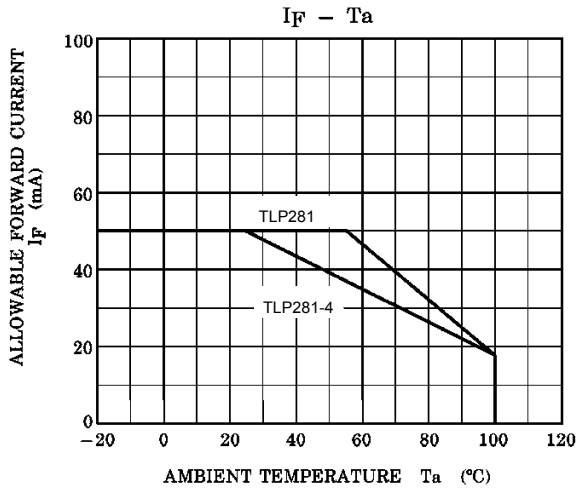
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance (Input to Output)	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation Resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation Voltage	$BV_S$	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second, in OIL	—	5000	—	Vdc
		DC, 1 minute, in OIL	—	5000	—	Vdc

## Switching Characteristics (Ta = 25°C)

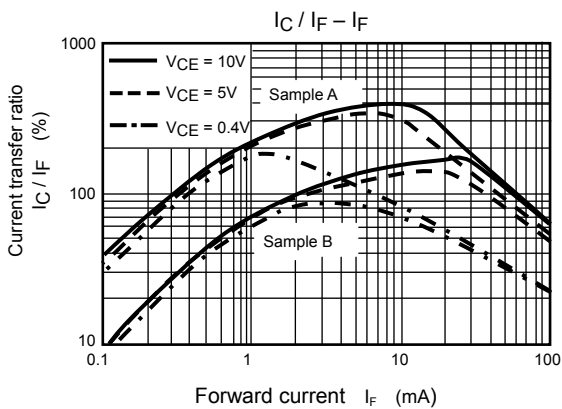
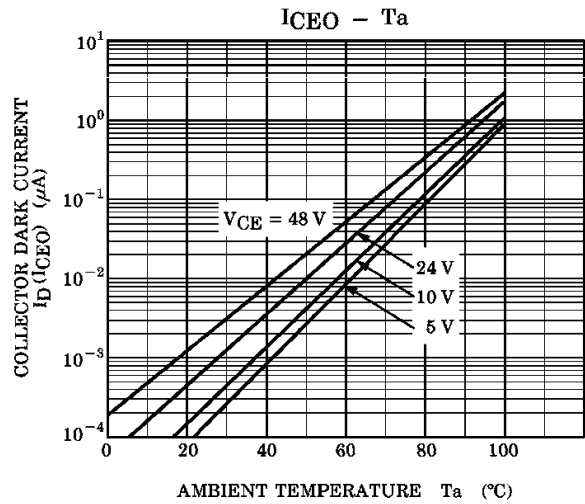
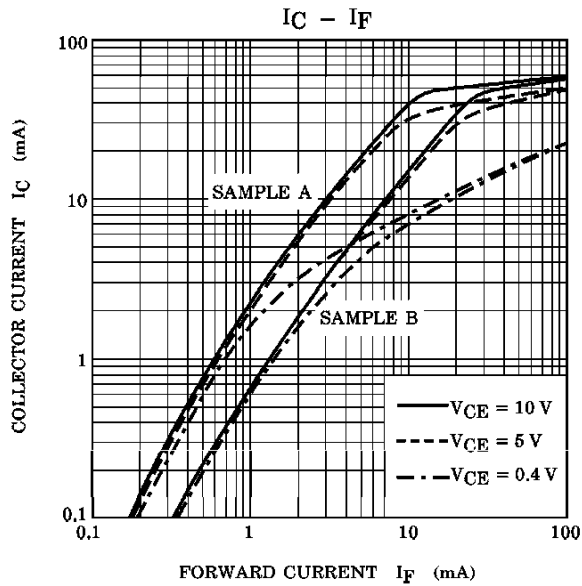
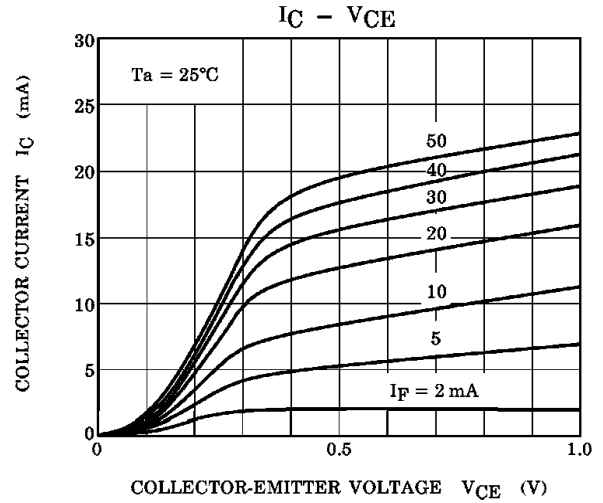
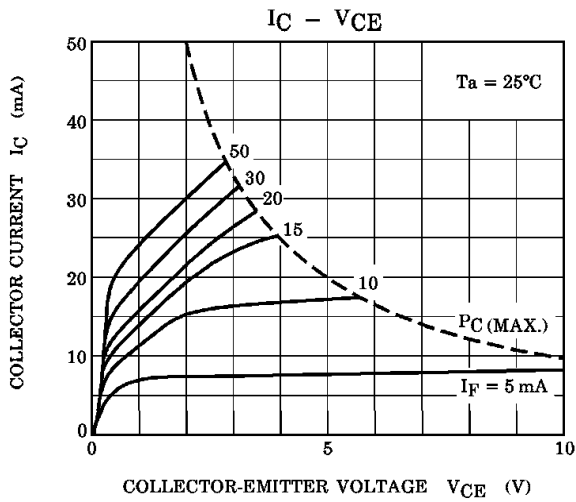
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	$t_r$	$V_{CC} = 10 \text{ V}, I_C = 2 \text{ mA}$ $R_L = 100 \Omega$	—	2	—	$\mu\text{s}$
Fall Time	$t_f$		—	3	—	
Turn-On Time	$t_{on}$		—	3	—	
Turn-Off Time	$t_{off}$		—	3	—	
Turn-On Time	$t_{ON}$	$R_L = 1.9 \text{ k}\Omega$ (Fig.1) $V_{CC} = 5 \text{ V}, I_F = 16 \text{ mA}$	—	2	—	$\mu\text{s}$
Storage Time	$t_s$		—	25	—	
Turn-Off Time	$t_{OFF}$		—	40	—	

(Fig.1) SWITCHING TIME TEST CIRCUIT

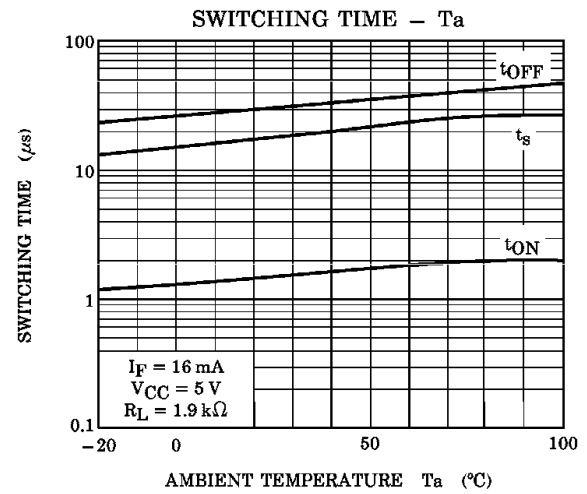
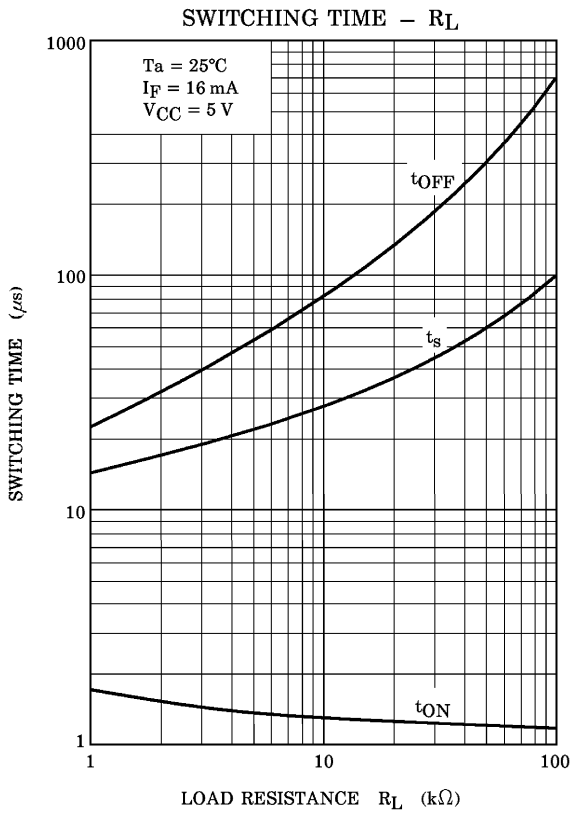
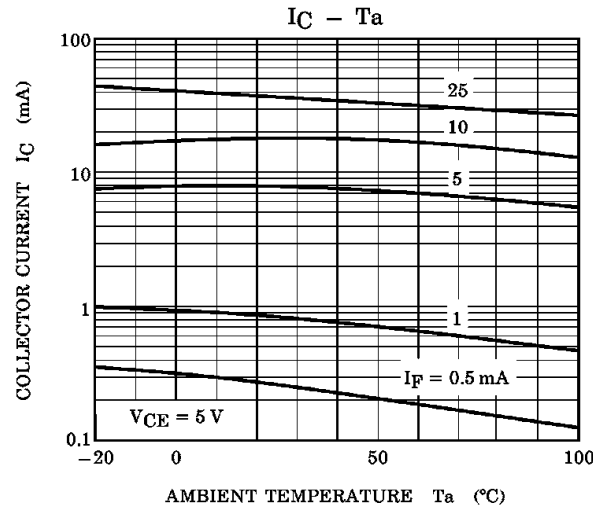
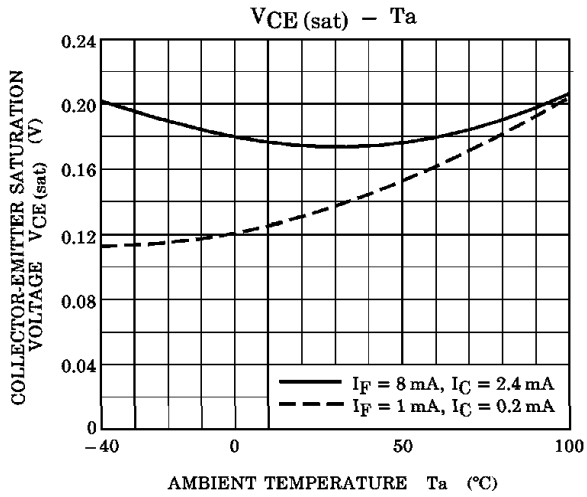




\*The above graphs show typical characteristic.



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