TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

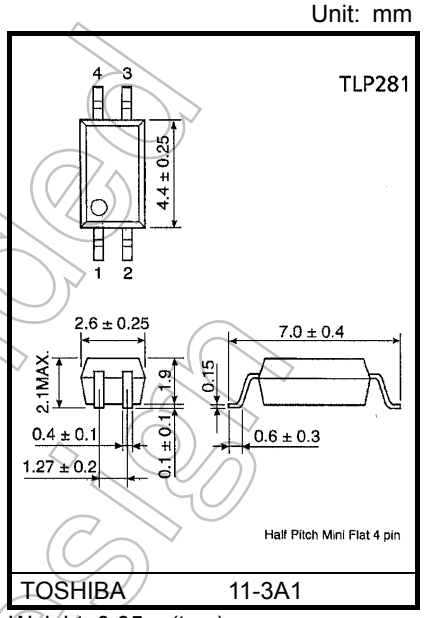
TLP281, TLP281-4

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.

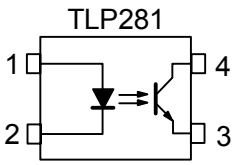
- Collector-Emitter Voltage : 80 V (min)
- Current Transfer Ratio : 50% (min)
  Rank GB : 100% (min)
- Isolation Voltage : 2500 Vrms (min)
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS EN 60065: 2002,
  : BS EN 60950-1: 2002
  Certificate No. 8143, 8144

Unit: mm

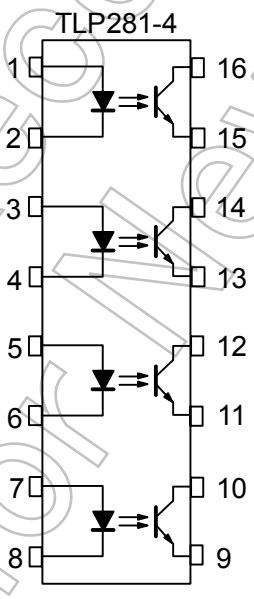


Weight: 0.05 g (typ.)

Pin Configuration (top view)

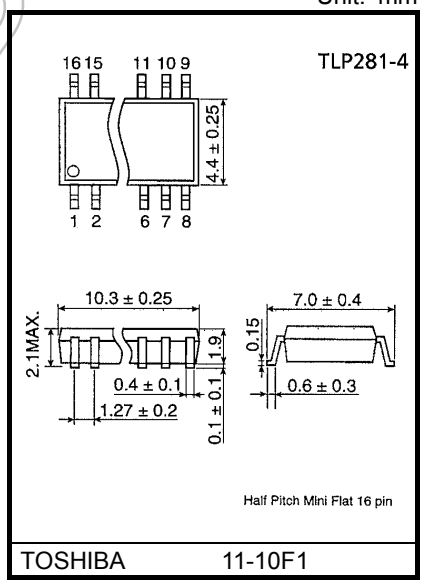


1:ANODE
2:CATHODE
3:EMITTER
4:COLLECTOR



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.)

Start of commercial production
1996/03

Current Transfer Ratio

TYPE	Classification(*1)	Current Transfer Ration (%) (I_C / I_F) I_F = 5 mA, V_{CE} = 5 V, Ta = 25°C		Marking of Classification
		Min	Max	
TLP281	Blank	50	600	Blank,Y■,YE,G,G■,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■
	Rank GRL	100	200	G
	Rank GRH	150	300	G■
	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	ΔI_F /°C	−0.7 (Ta≥53°C)	−0.5 (Ta≥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≥25°C) (1 Circuit)	ΔP_C /°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≥25°C) (1 Circuit)		ΔP_T /°C	−2.0	−1.7	mW /°C
Isolation Voltage	(Note 2)	BV_S	2500(AC,1min,R.H.≤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 ≤ 100μs, frequency 100Hz

(Note 2) AC, 1 minute, R.H.≤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	μA
	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	—	0.01	0.1	μA
			V_{CE} = 48 V, Ambient Light Below (100 ℓx) (Note 4)	—	2	10	μA
			V_{CE} = 48 V, Ta = 85°C	—	2	50	μA
			V_{CE} = 48 V, Ambient Light Below (100 ℓx) (Note 4)	—	4	50	μA
	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 mA, V_{CE} = 5 V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = 1 mA, VCE = 0.4 V	—	60	—	%
		Rank GB	30	—	—	
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = 8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = 1 mA	—	0.2	—	
		Rank GB	—	—	0.4	
Off-State Collector Current	$I_{C\ (off)}$	V_F = 0.7 V, V_{CE} = 48 V	—	—	10	μA

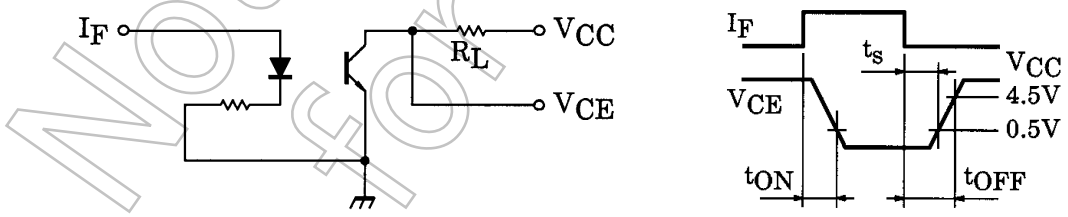
Isolation Characteristics (Ta = 25°C)

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

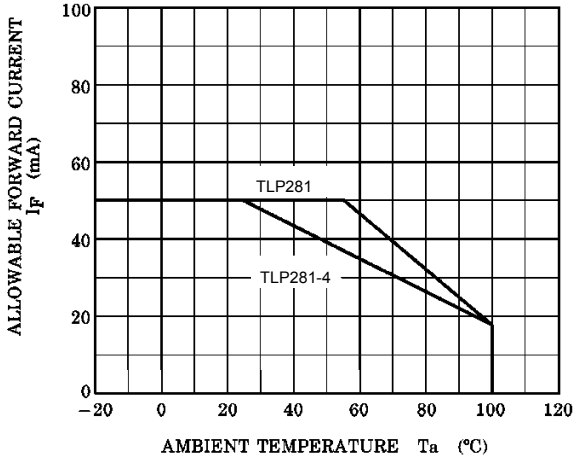
Switching Characteristics (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Rise Time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	2	—	μs
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 kΩ (Fig.1) V_{CC} = 5 V, I_F = 16 mA	—	2	—	μs
Storage Time	t_s		—	25	—	
Turn-Off Time	t_{OFF}		—	40	—	

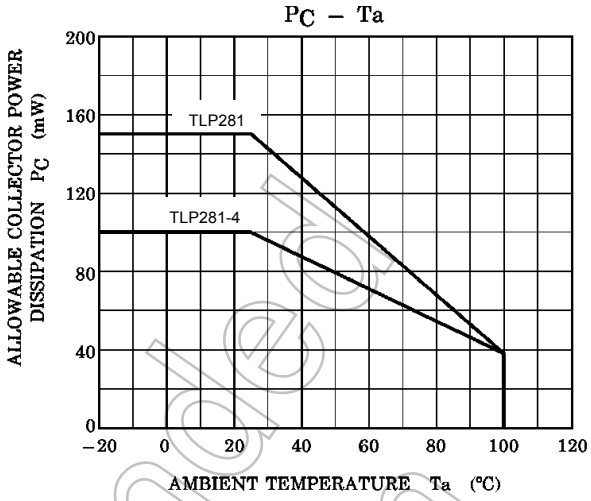
(Fig.1) SWITCHING TIME TEST CIRCUIT



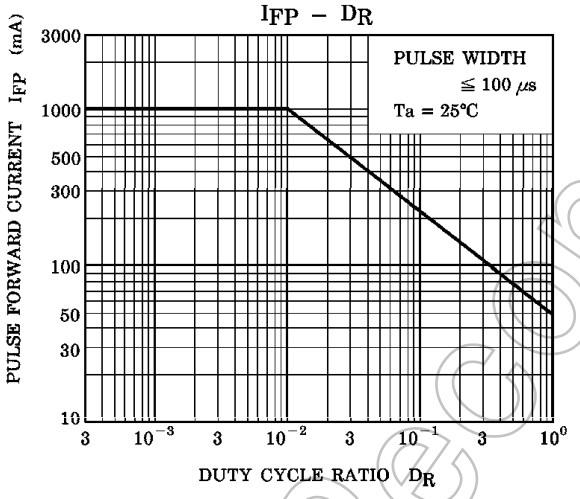
I_F – Ta



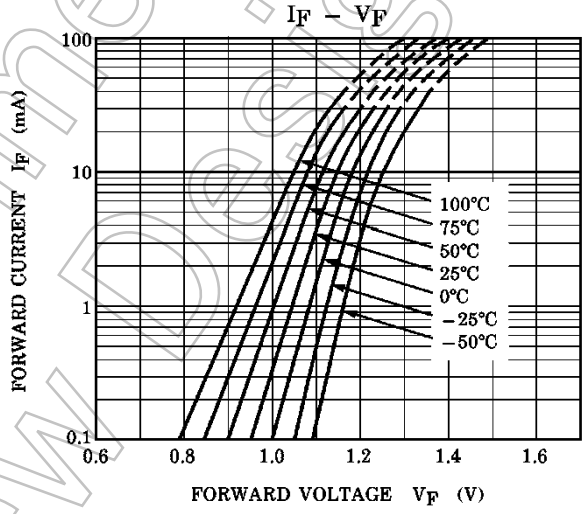
P_C – Ta



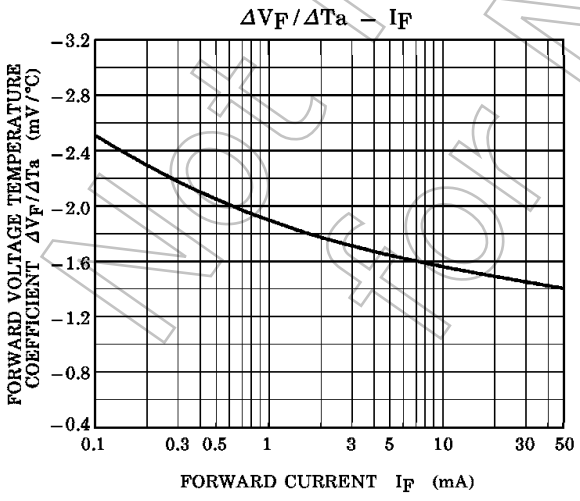
I_{FP} – D_R



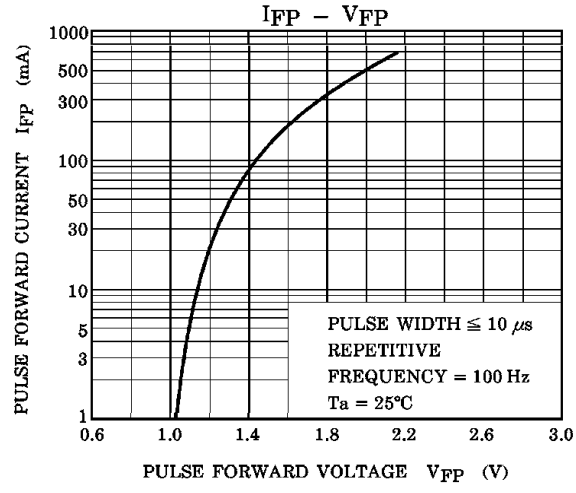
I_F – V_F



$\Delta V_F / \Delta Ta$ – I_F

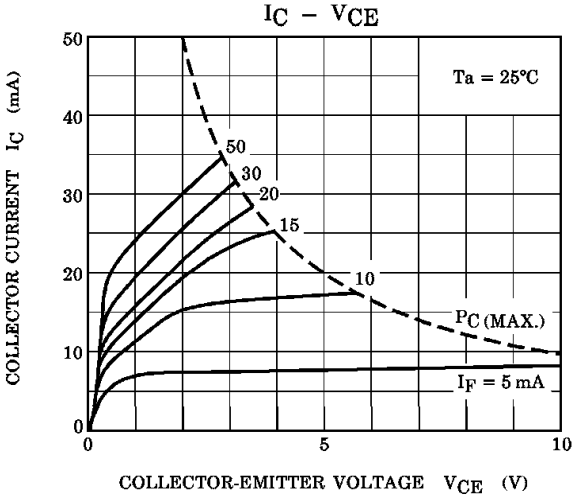


I_{FP} – V_{FP}

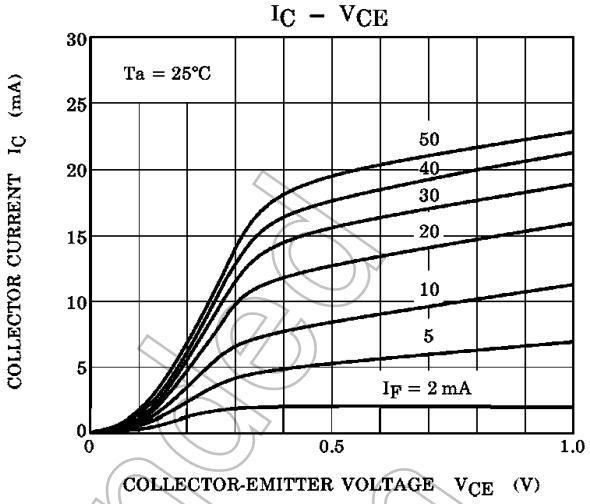


*The above graphs show typical characteristic.

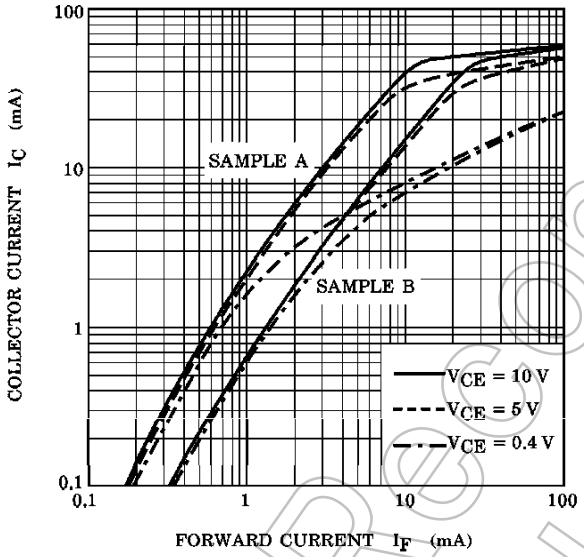
$I_C - V_{CE}$



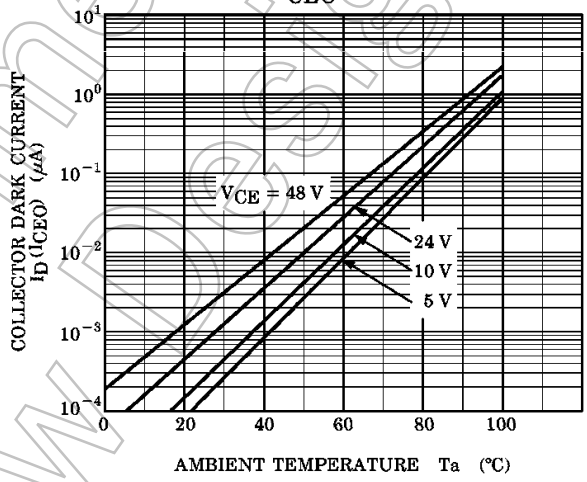
$I_C - V_{CE}$



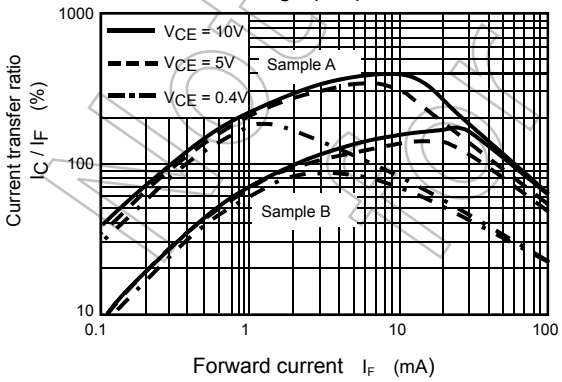
$I_C - I_F$



$I_{CEO} - Ta$



$I_C / I_F - I_F$



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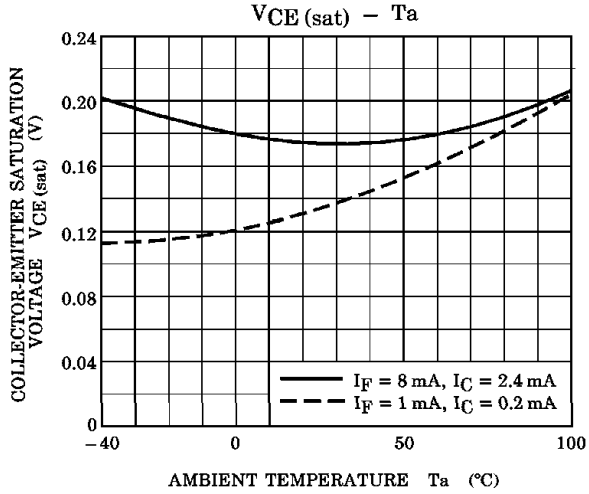

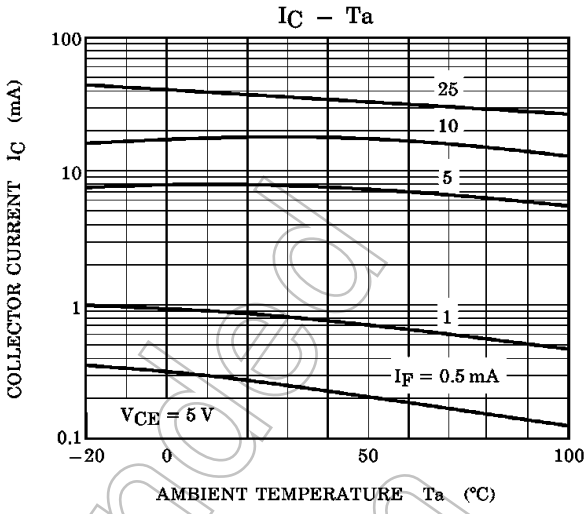

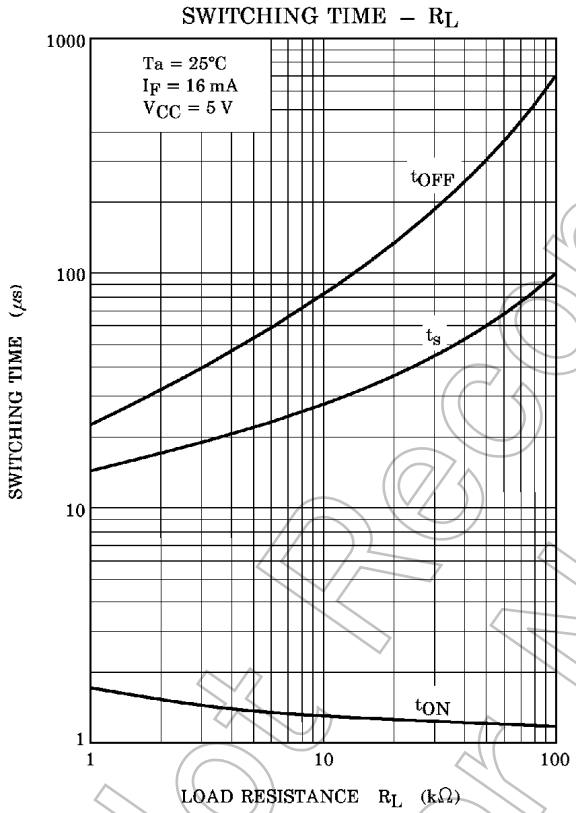

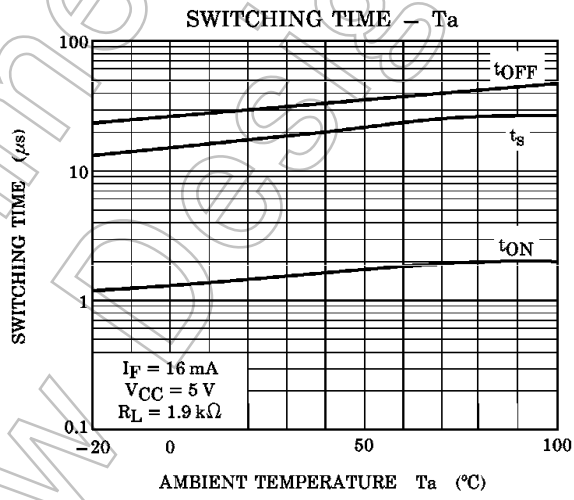

*The above graphs show typical characteristic.

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