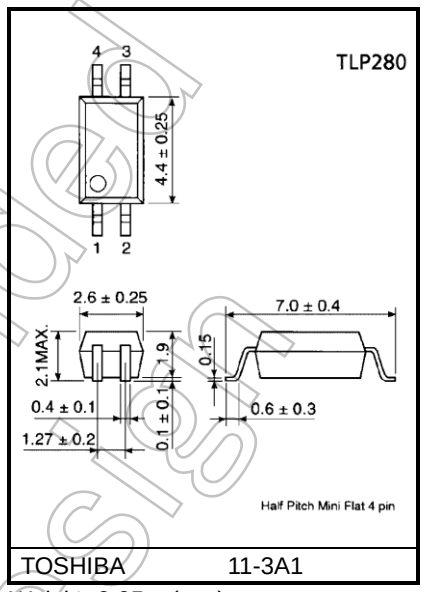
TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP280, TLP280-4

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

Unit: mm



TOSHIBA 11-3A1

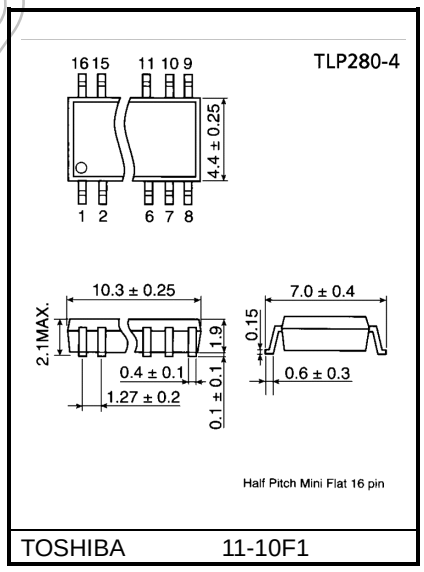
Weight: 0.05 g (typ.)

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)”

Unit: mm

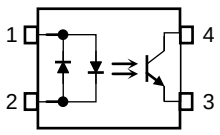


TOSHIBA 11-10F1

Weight: 0.19 g (typ.)

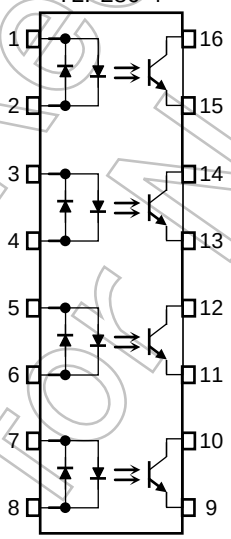
Pin Configuration (top view)

TLP280



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

TLP280-4



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

Start of commercial production
1996-03

Not Recommended for New Design

Current Transfer Ratio

Part Number	Classification (Note 1)	Current Transfer Ratio (%) (I_C / I_F) I_F = 5 mA, V_{CE} = 5 V, Ta = 25°C		Marking of Classification
		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 (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP280	TLP280-4	
LED	Forward current	$I_{F(RMS)}$	±50		mA
	Forward current derating (Ta ≥25°C)	ΔI_F/°C	-0.7	-0.5	mA/°C
	Pulse forward current (100 μs pulse, 100 pps)	I_{FP}	±1		A
	Diode power dissipation	P_D	100	70	mW
	Diode power dissipation derating (Ta ≥25°C)	ΔP_D/°C	-1	-0.7	mW/°C
	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
Storage temperature range		T_{stg}	-55 to 125		°C
Operating temperature range		T_{opr}	-55 to 100		°C
Lead soldering temperature (10 s)		T_{sol}	260		°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 (AC, 60 s, R.H.≤ 60%) (Note 1)		BV_S	2500		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: Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Not Recommended for New Design

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
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	60	—	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 1)	I_{CEO}	V_{CE} = 48 V	—	0.01	0.1	μA
			Ambient light below (100 ℓx)	—	2	10	
			V_{CE} = 48 V, Ta = 85°C	—	2	50	μA
			Ambient light below (100 ℓx)	—	4	50	
	Capacitance (collector to emitter)	C_{CE}	V = 0 V, f = 1 MHz	—	10	—	pF

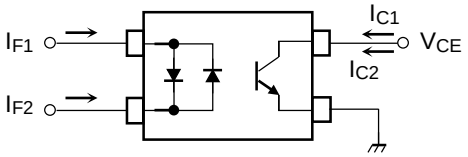
Note 1: Because of the construction, leak current might be increased by ambient light. Please use photocoupler with less ambient light.

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	MIn	Typ.	Max	Unit
Current transfer ratio	I_C/I_F	I_F = ±5 mA, V_{CE} = 5 V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	$I_C/I_{F(sat)}$	I_F = ±1 mA, V_{CE} = 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
CTR symmetry	$I_{C(ratio)}$	I_C (I_F = -5 mA) / I_C (I_F = 5 mA) (Note 1)	0.33	—	3	—

Note 1:

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



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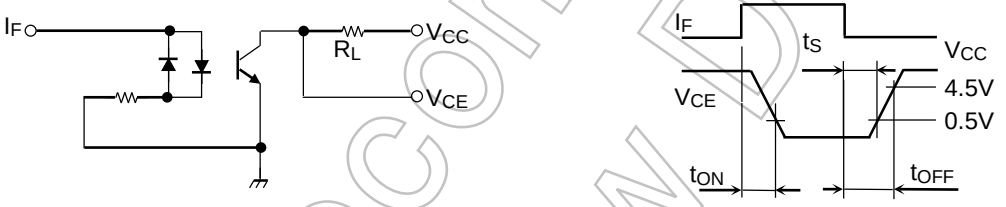
Isolation Characteristics (Ta = 25°C)

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, 60 s	2500	—	—	V_{rms}
		AC, 1 s, in oil	—	5000	—	
		DC, 60 s, in oil	—	5000	—	V_{dc}

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 = 100 Ω	—	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



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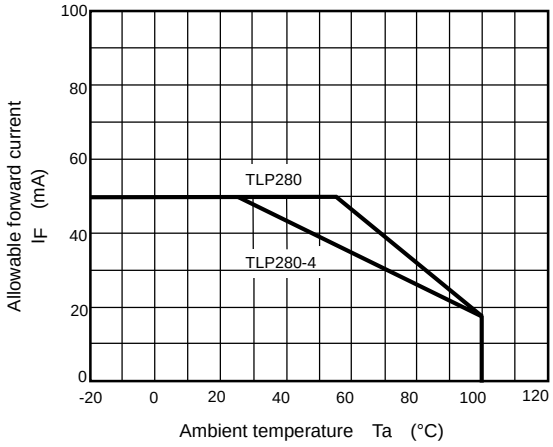
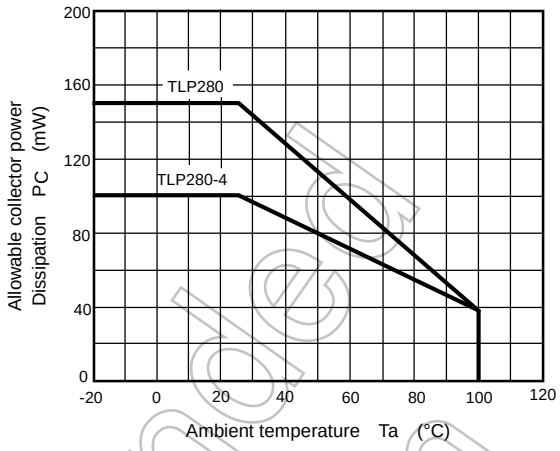
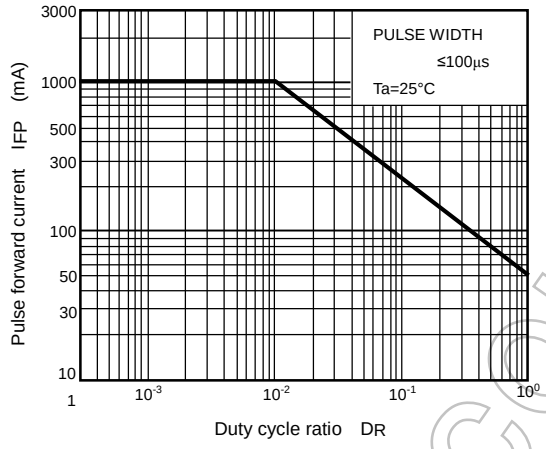
I_F – Ta



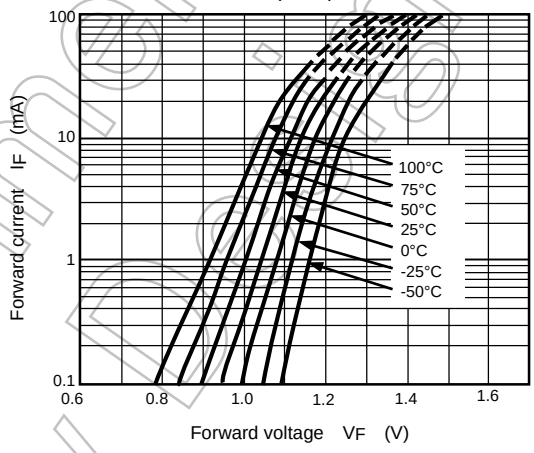
P_C – Ta



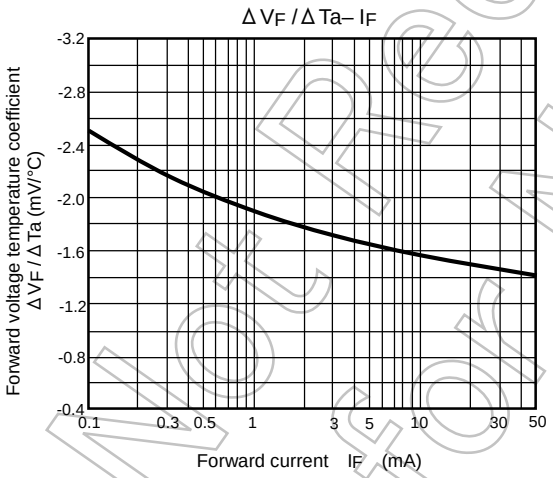
I_{FP} – D_R



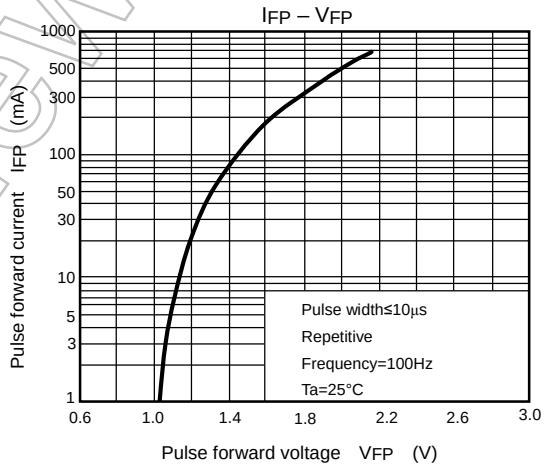
I_F – V_F



$\Delta V_F / \Delta Ta$ – I_F



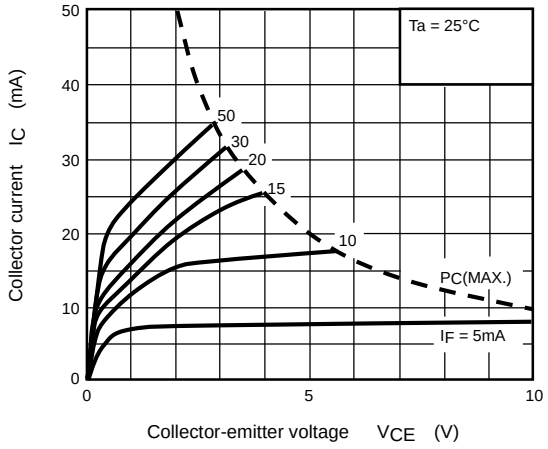
I_{FP} – V_{FP}



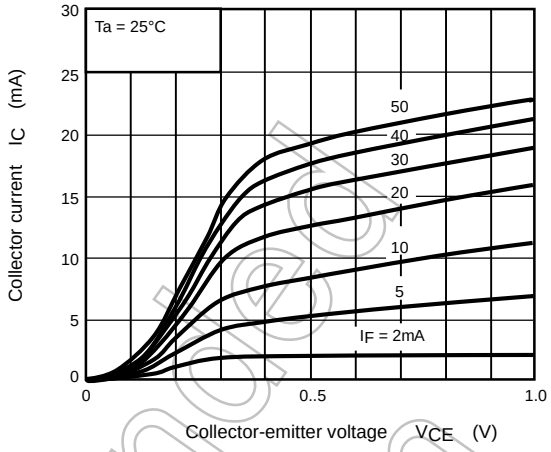
*The above graphs show typical characteristic.

Not Recommended for New Design

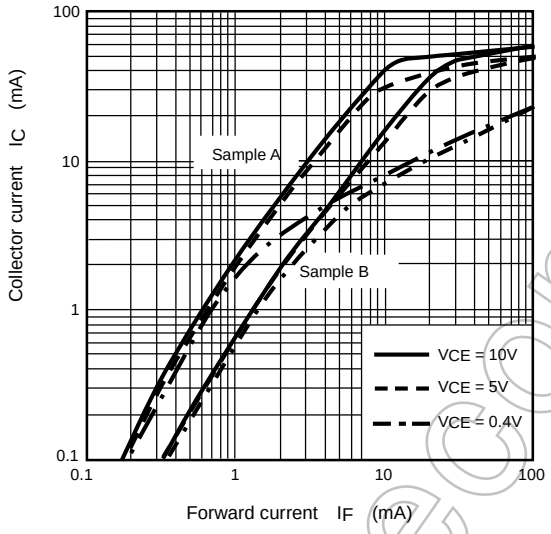
$I_C - V_{CE}$



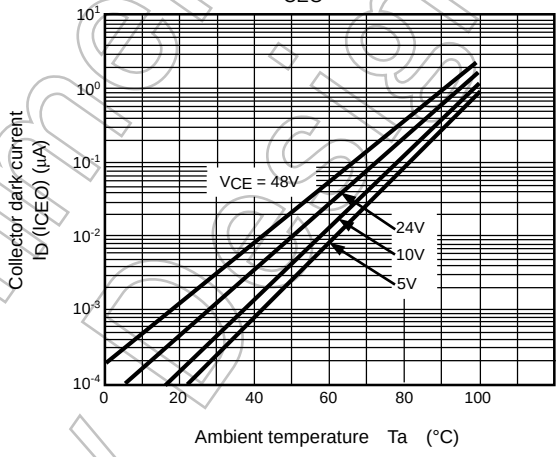
$I_C - V_{CE}$



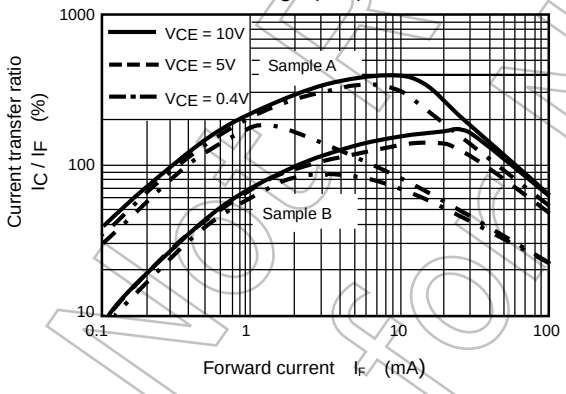
$I_C - I_F$



$I_{CEO} - Ta$



$I_C / I_F - I_F$



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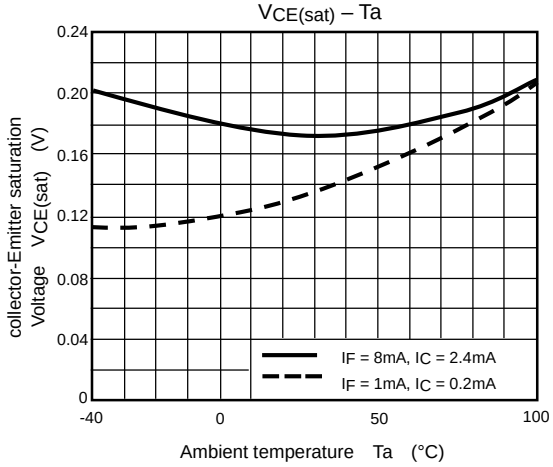
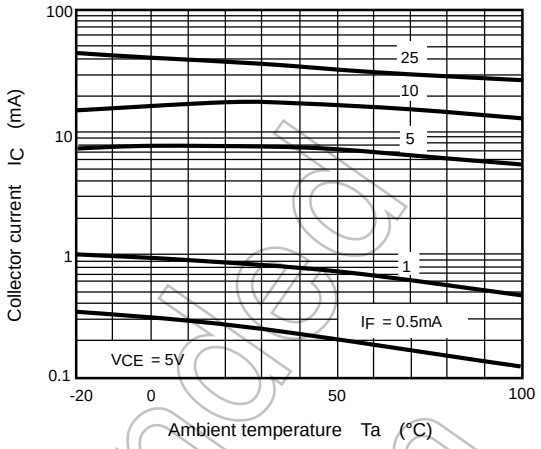
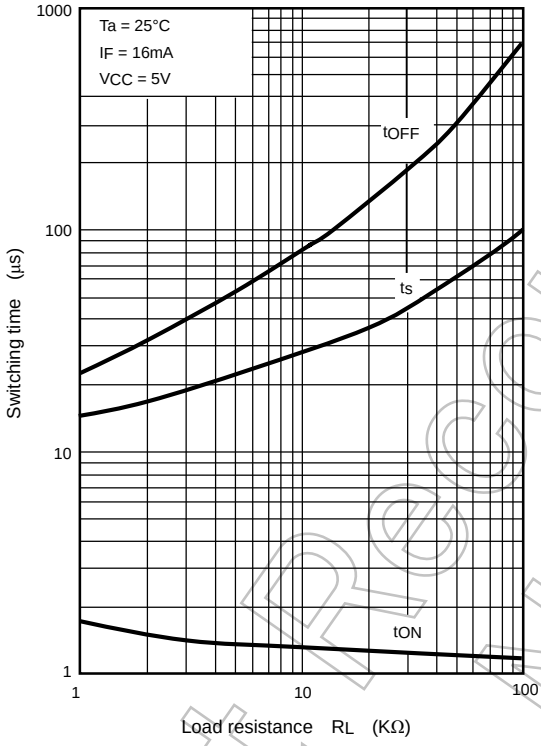
$V_{CE(sat)}$ – Ta



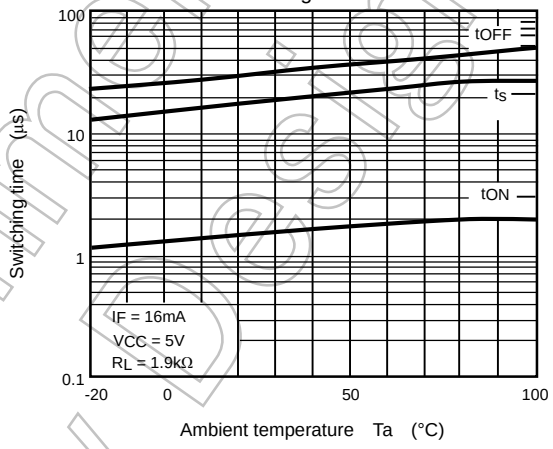
I_C – Ta



Switching Time– R_L



Switching Time– Ta



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