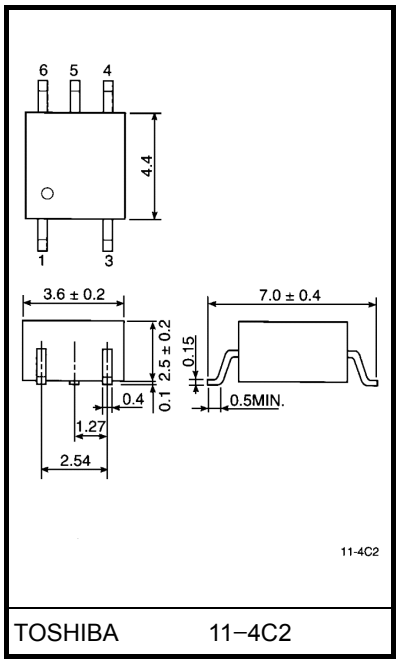
TOSHIBA Photocoupler GaAs IRed & Photo−Transistor

TLP137

Office Machine
Programmable Controllers
AC / DC−Input Module
Telecommunication

Unit in mm



TOSHIBA 11−4C2

Weight: 0.09 g

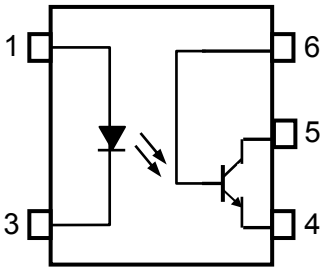
The TOSHIBA mini flat coupler TLP137 is a small outline coupler, suitable for surface mount assembly.
TLP137 consists of a gallium arsenide infrared emitting diode, optically coupled to a photo transistor, and provides high CTR at low input current.
TLP137 base terminal is for the improvement of speed, reduction of dark current, and enable operation.

- Collector−emitter voltage: 80V(min.)
- Current transfer ratio: 100%(min.)
  Rank BV: 200%(min.)
- Isolation voltage: 3750Vrms(min.)
- UL recognized: UL1577, file No. E67349
- Current transfer ratio

Classi−fication	Current Transfer Ratio (min.)			Marking Of Classi−fication
	Ta = 25°C		Ta =−25~75°C	
	I_F = 1mA V_{CE} = 0.5V	I_F = 0.5mA V_{CE} = 1.5V	I_F = 1mA V_{CE} = 0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, Blank

(Note) Application type name for certification test,
please use standard product type name, i.e.
TLP137 (BV): TLP137

Pin Configurations (top view)



1 : Anode
3 : Cathode
4 : Emitter
5 : Collector
6 : Base

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	50	mA
	Forward current derating (Ta ≥ 53°C)	ΔI_F / °C	−0.7	mA / °C
	Peak forward current (100μs pulse, 100pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Junction temperature	T_j	125	°C
Detector	Collector−emitter voltage	V_{CEO}	80	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
	Peak collector current (10ms pulse, 100pps)	I_{CP}	100	mA
	Power dissipation	P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP_C / °C	−1.5	mW / °C
	Junction temperature	T_j	125	°C
Storage temperature range		T_{stg}	−55~125	°C
Operating temperature range		T_{opr}	−55~100	°C
Lead soldering temperature (10s)		T_{sol}	260	°C
Total package power dissipation		P_T	200	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T / °C	−2.0	mW / °C
Isolation voltage (AC, 1min., RH ≤ 60%)	(Note 1)	BV_S	3750	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: Pins 1 and 3 shorted together and pins 4, 5 and 6 shorted together.

Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	I_F = 10mA	1.0	1.15	1.3	V
	Reverse current	I_R	V_R = 5V	—	—	10	μA
	Capacitance	C_T	V = 0, f = 1MHz	—	30	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 0.5mA	80	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)ECO}$	I_E = 0.1mA	7	—	—	V
	Collector−base breakdown voltage	$V_{(BR)CBO}$	I_C = 0.1mA	80	—	—	V
	Emitter−base breakdown voltage	$V_{(BR)EBO}$	I_E = 0.1mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 48V	—	10	100	nA
			V_{CE} = 48V, Ta = 85°C	—	2	50	μA
	Collector dark current	I_{CER}	V_{CE} = 48V, Ta = 85°C R_{BE} = 1MΩ	—	0.5	10	μA
	Collector dark current	I_{CBO}	V_{CB} = 10V	—	0.1	—	nA
	DC forward current gain	h_{FE}	V_{CE} = 5V, I_C = 0.5mA	—	1000	—	—
	Capacitance (collector to emitter)	C_{CE}	V= 0, f = 1MHz	—	12	—	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	I_C / I_F	I_F = 1mA, V_{CE} = 0.5V	100	—	1200	%
		Rank BV	200	—	1200	
Low input CTR	I_C / $I_{F(low)}$	I_F = 0.5mA, V_{CE} = 1.5V	50	—	—	%
		Rank BV	100	—	—	
Base photo−current	I_{PB}	I_F = 1mA, V_{CB} = 5V	—	5	—	μA
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.5mA, I_F = 1mA	—	—	0.4	V
		I_C = 1mA, I_F = 1mA	—	0.2	—	
		Rank BV	—	—	0.4	
Off−state collector current	$I_{C(off)}$	V_F = 0.7V, V_{CE} = 48V	—	—	10	μA

Coupled Electrical Characteristics (Ta = −25~75°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	I_C / I_F	I_F = 1mA, V_{CE} = 0.5V	50	—	—	%
		Rank BV	100	—	—	
Low input CTR	I_C / $I_{F(low)}$	I_F = 0.5mA, V_{CE} = 1.5V	—	50	—	%
		Rank BV	—	100	—	

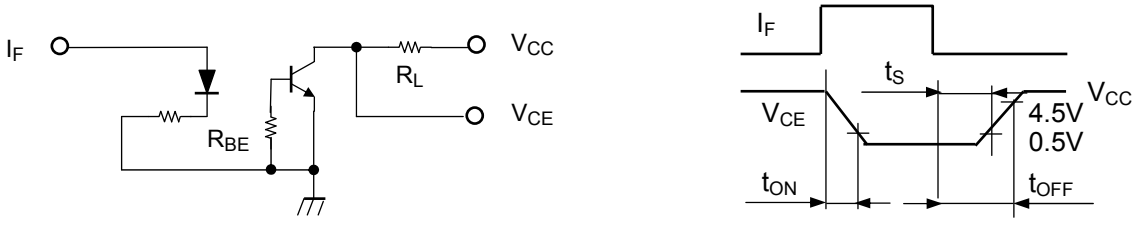
Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C_S	V_S = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R_S	V = 500V	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1minute	3750	—	—	Vrms
		AC, 1second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	Vdc

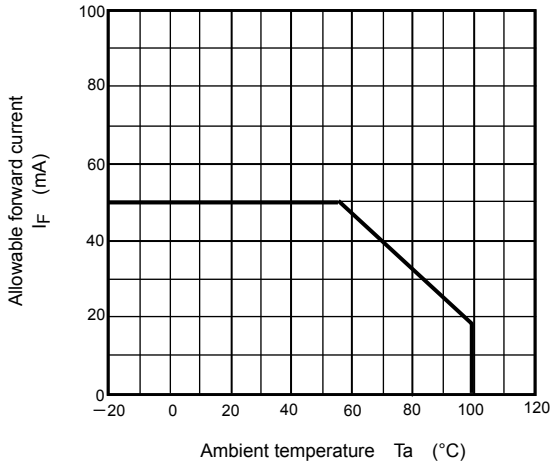
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	V_{CC} = 10V, I_C = 2mA R_L = 100Ω	—	8	—	μs
Fall time	t_f		—	8	—	
Turn−on time	t_{on}		—	10	—	
Turn−off time	t_{off}		—	8	—	
Turn−on time	t_{ON}	R_L = 4.7 kΩ (Fig.1) R_{BE} = OPEN V_{CC} = 5 V, I_F = 1.6mA	—	10	—	μs
Storage time	t_S		—	50	—	
Turn-off time	t_{OFF}		—	300	—	
Turn−on time	t_{ON}	R_L = 4.7kΩ (Fig.1) R_{BE} = 470kΩ V_{CC} = 5 V, I_F = 1.6mA	—	12	—	μs
Storage time	t_S		—	30	—	
Turn-off time	t_{OFF}		—	100	—	

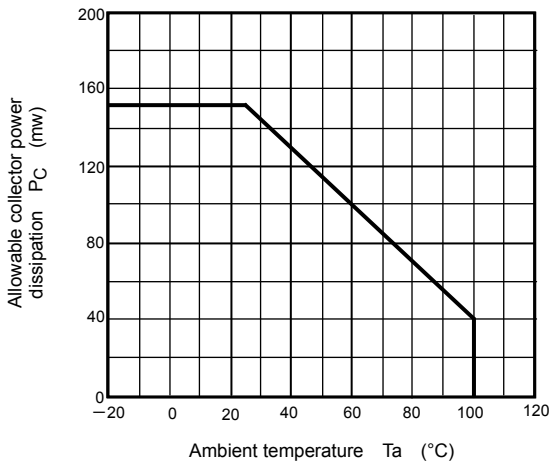
Fig. 1 Switching time test circuit



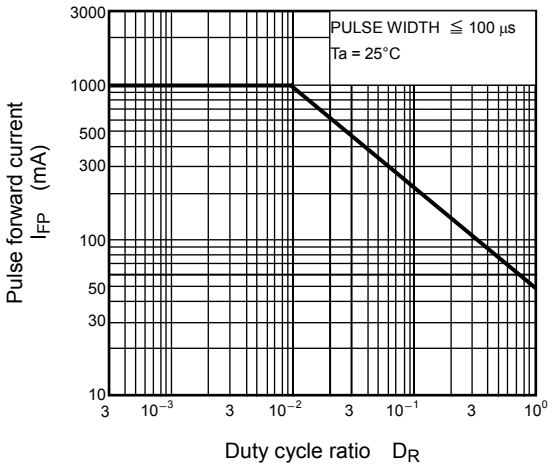
I_F – Ta



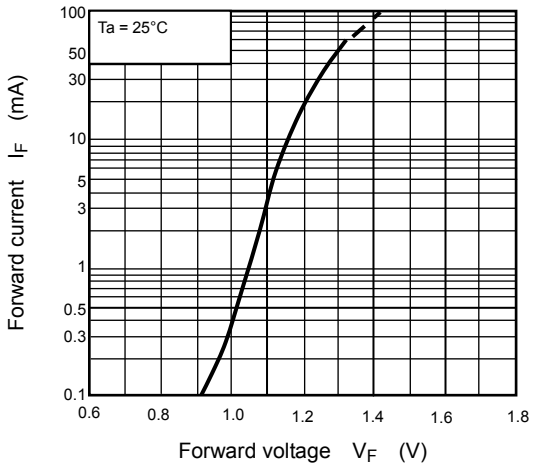
P_C – Ta



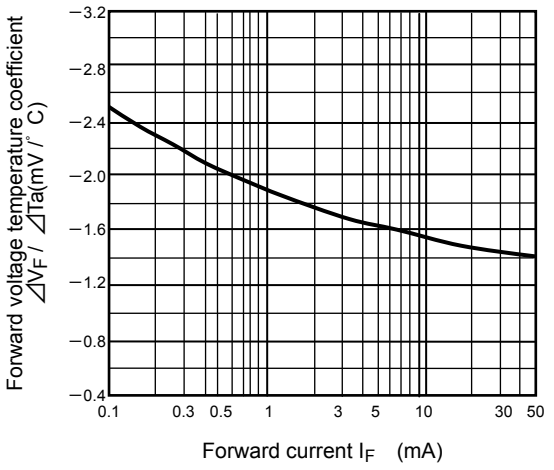
I_{FP} – D_R



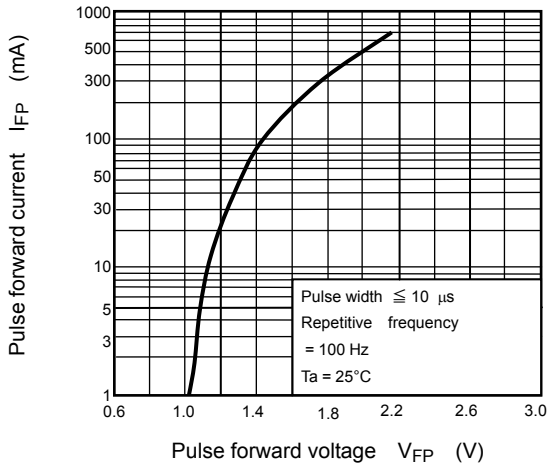
I_F – V_F



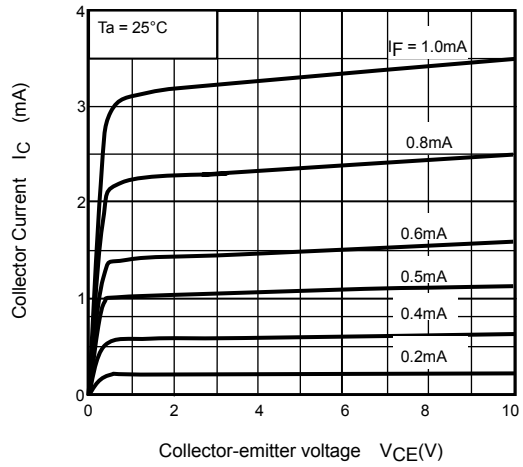
$\Delta V_F / \Delta T_a$ – I_F



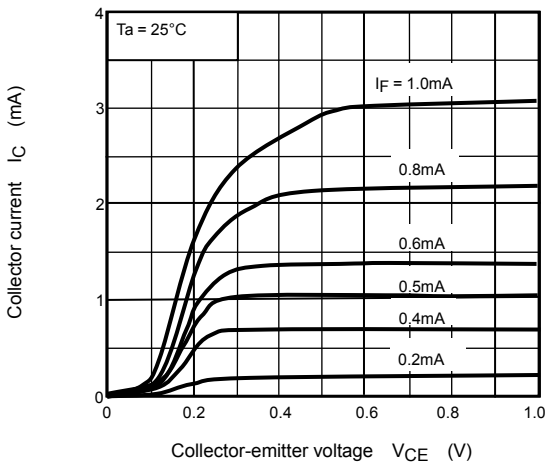
I_{FP} – V_{FP}



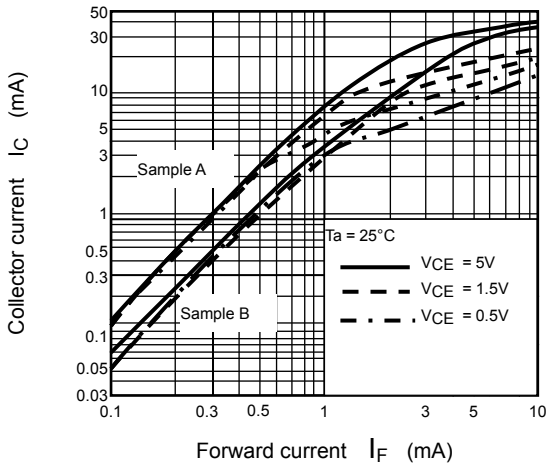
$I_C - V_{CE}$



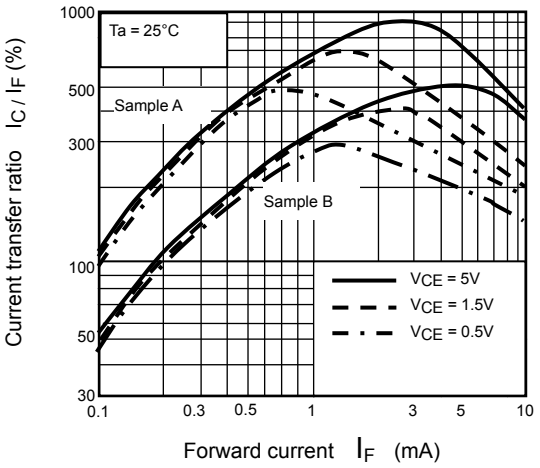
$I_C - V_{CE}$



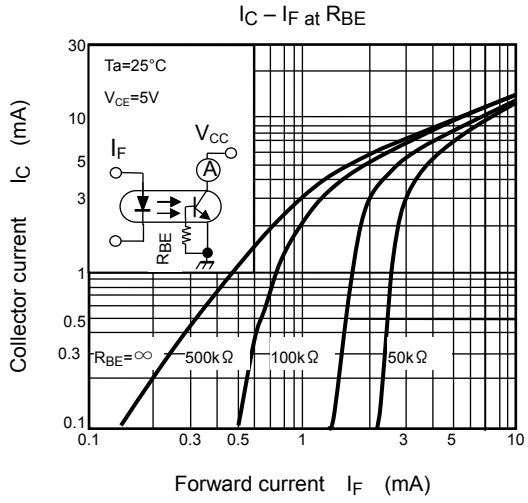
$I_C - I_F$



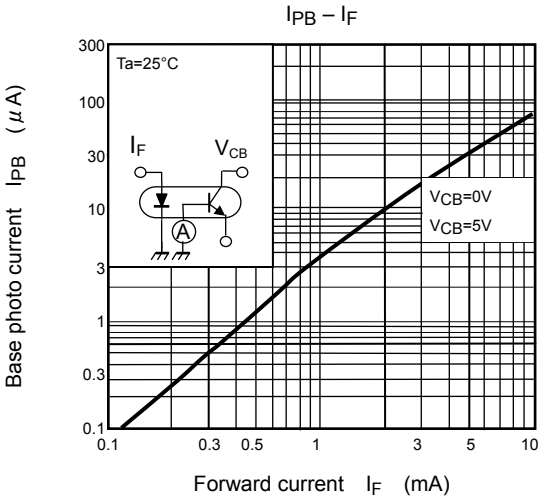
$I_C / I_F - I_F$



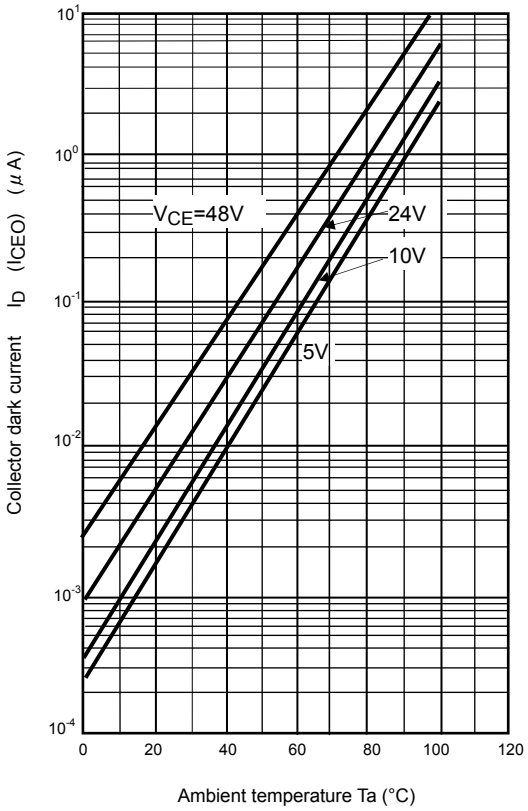
$I_C - I_F$ at R_{BE}



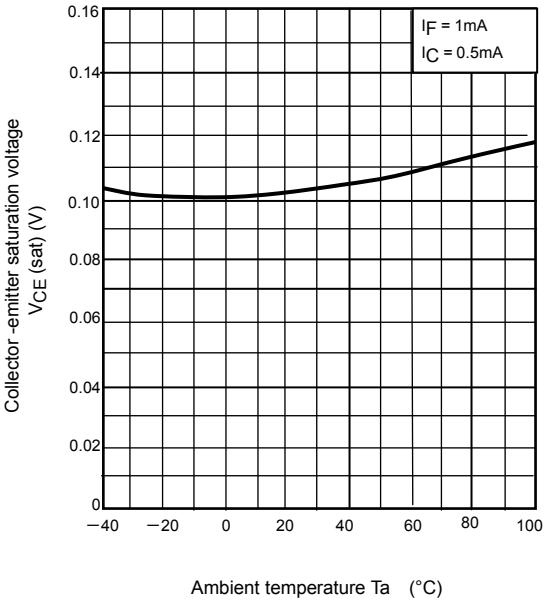
$I_{PB} - I_F$



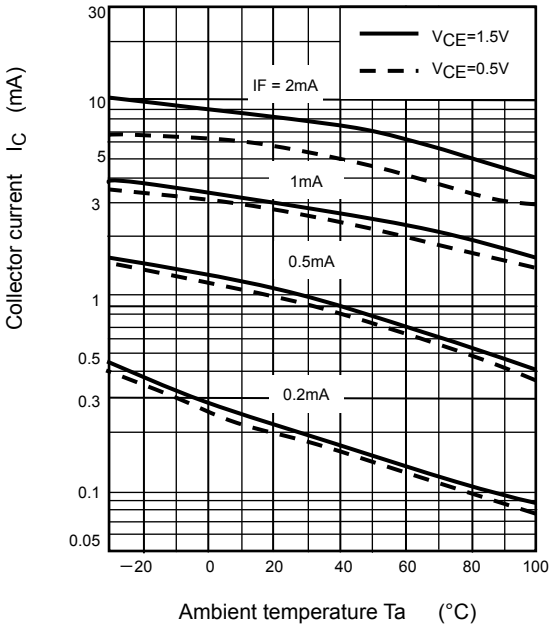
I_{CEO} – Ta



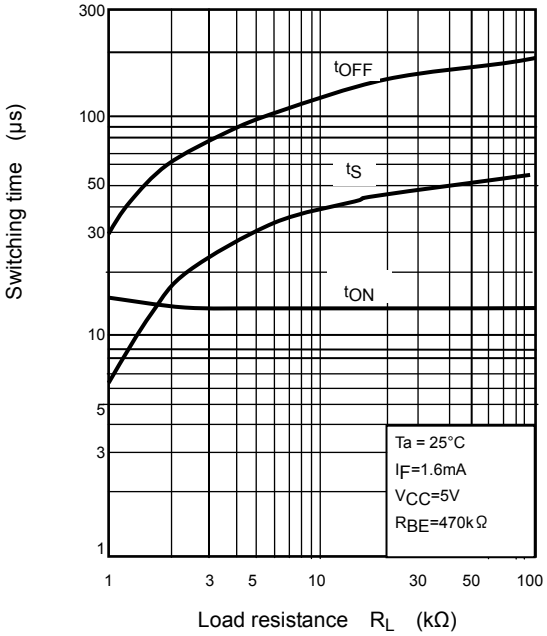
V_{CE}(sat) – Ta



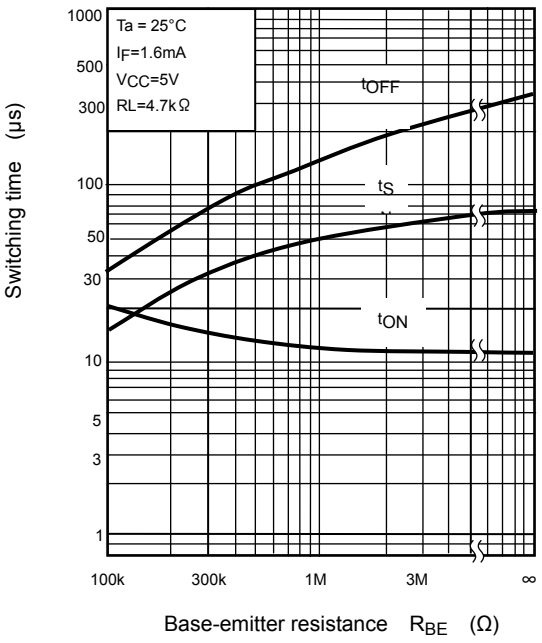
I_C – Ta



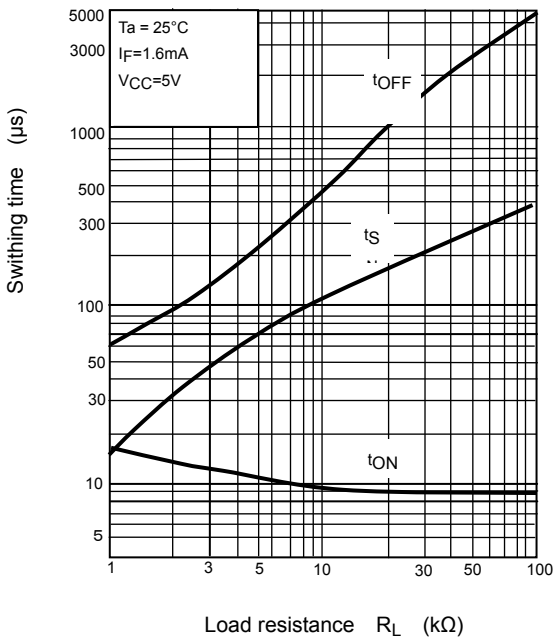
Switching Time – RL



Switching Time – R_{BE}



Switching Time – R_L



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20070701-EN

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