

TLP137

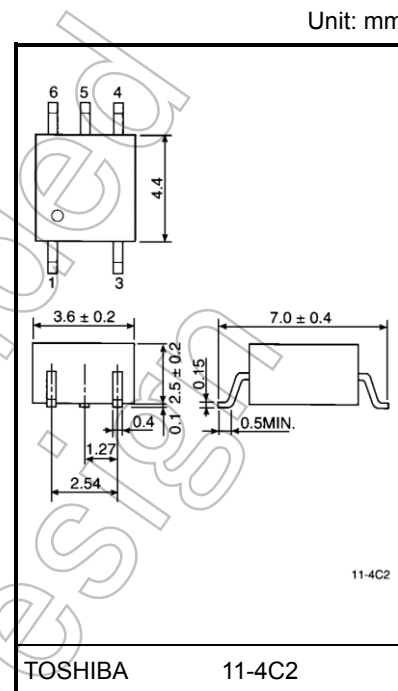
Programmable Controllers
AC / DC-Input Module
Telecommunication

The TOSHIBA mini flat coupler TLP137 is a small outline coupler, suitable for surface mount assembly.

TLP137 consists of an infrared emitting diode, optically coupled to a photo transistor, and provides high CTR at low input current.

- Collector-emitter voltage: 80 V (min.)
- Current transfer ratio: 100% (min.)
Rank BV: 200% (min.)
- Isolation voltage: 3750 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
File No.E67349

TLP137 base terminal is for the improvement of speed, reduction of dark current, and enable operation. Using by base terminal opening is easy to receive the outside noise.



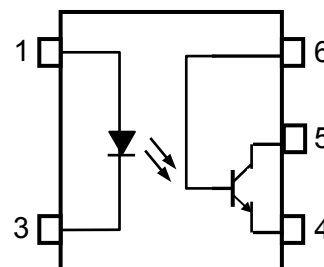
Weight: 0.09 g (typ.)

- Current transfer ratio

Classification	Current Transfer Ratio (min)			Marking Of Classification
	Ta = 25°C		Ta = -25 to 75°C	
	If = 1 mA VCE = 0.5 V	If = 0.5 mA VCE = 1.5 V	If = 1 mA VCE = 0.5 V	
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

Start of commercial production
1988-04

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	Forward current	I_F	50	mA
	Forward current derating (Ta ≥ 53°C)	$\Delta I_F/^\circ\text{C}$	-0.7	mA/°C
	Peak forward current (100μs pulse, 100pps)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation	P_D	100	mW
	Diode power dissipation derating (Ta ≥ 53°C)	$\Delta P_D/^\circ\text{C}$	-1.39	mW/°C
	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)	$\Delta P_C/^\circ\text{C}$	-1.5	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	P_T	200	mW	
Total package power dissipation derating (Ta ≥ 25°C)	$\Delta P_T/^\circ\text{C}$	-2.0	mW/°C	
Isolation voltage (AC, 60 s, 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.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	48	V
Forward current	I_F	—	1.6	25	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	-25	—	75	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

Electrical Characteristics (Ta = 25°C)

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

Coupled Electrical Characteristics (Ta = 25°C)

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

Coupled Electrical Characteristics (Ta = -25 to 75°C)

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

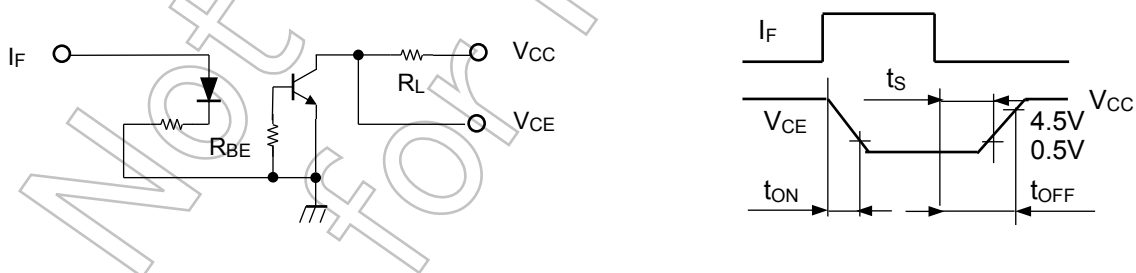
Isolation Characteristics (Ta = 25°C)

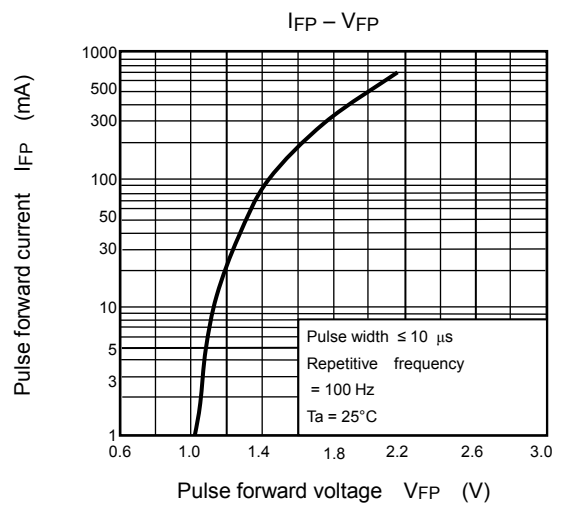
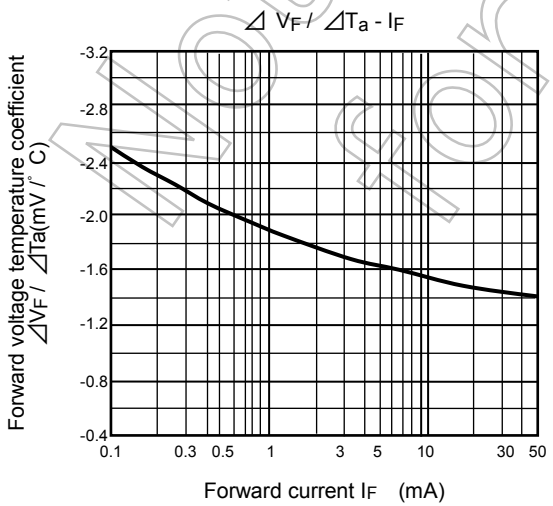
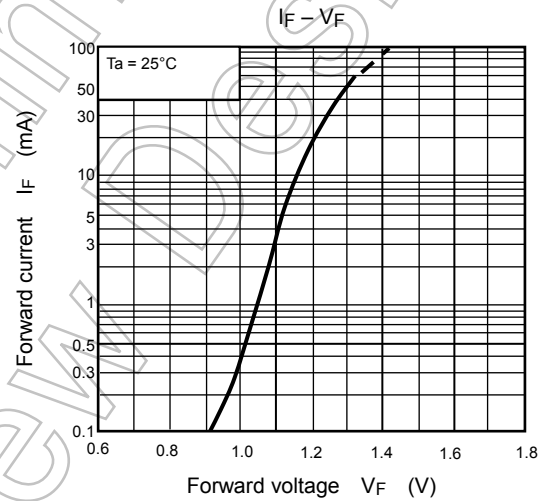
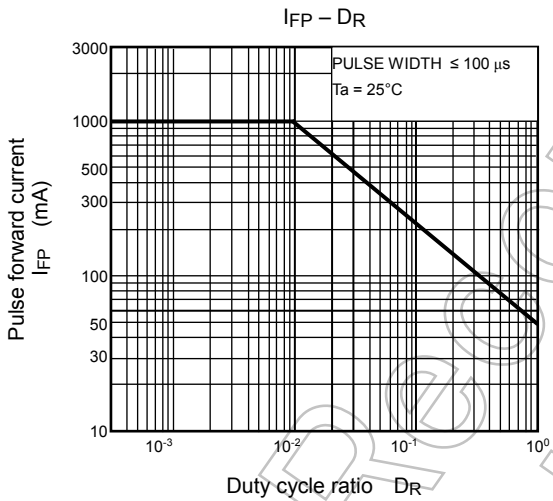
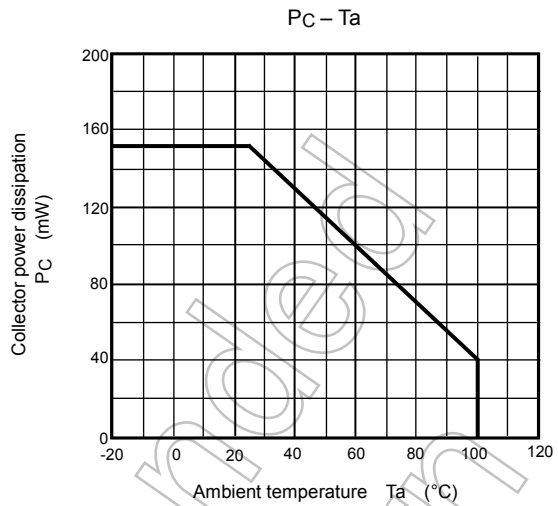
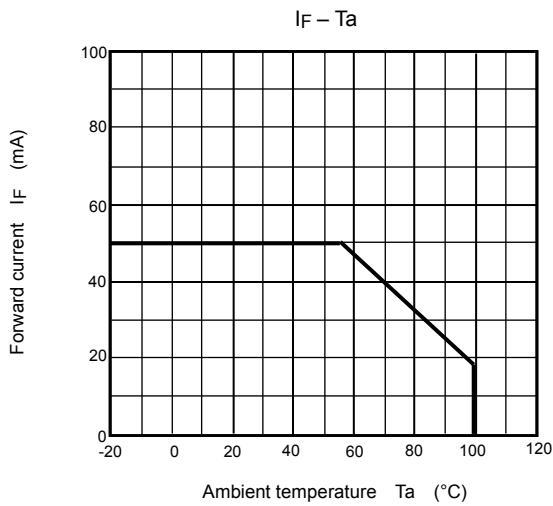
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C_S	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	R_S	$V = 500 \text{ V}, RH \leq 60 \%$	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BVs	AC, 60 s	3750	—	—	Vrms

Switching Characteristics (Ta = 25°C)

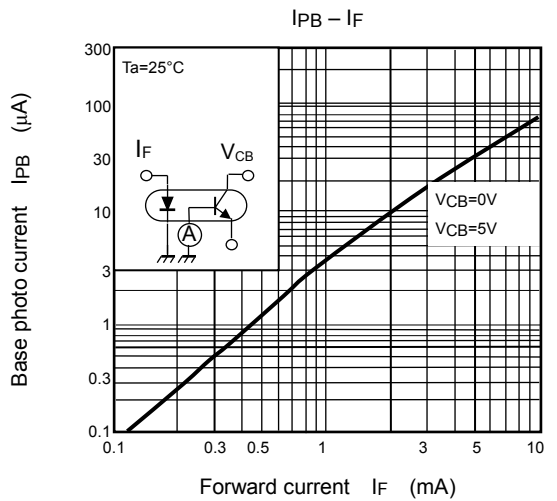
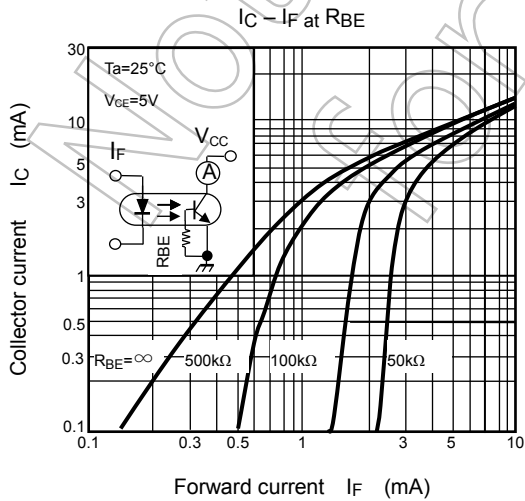
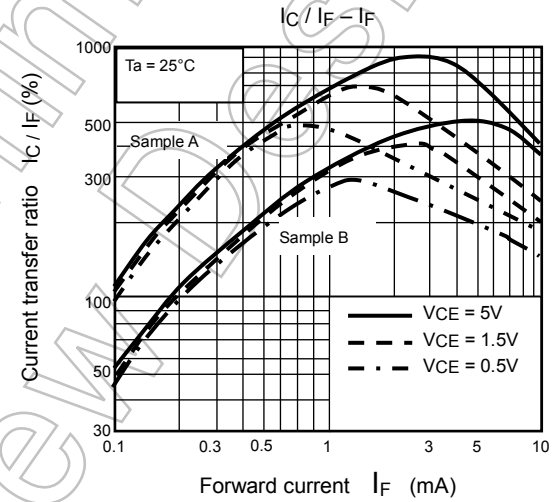
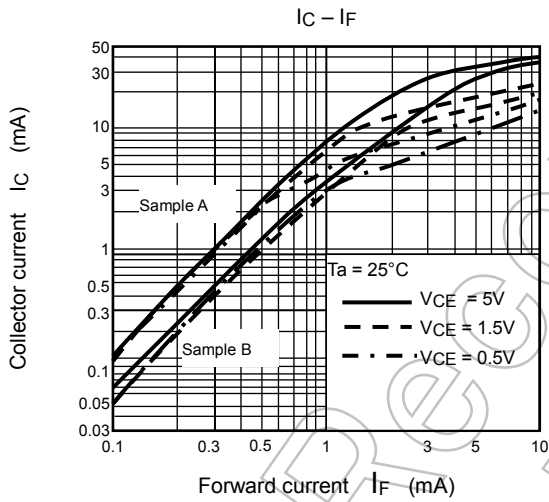
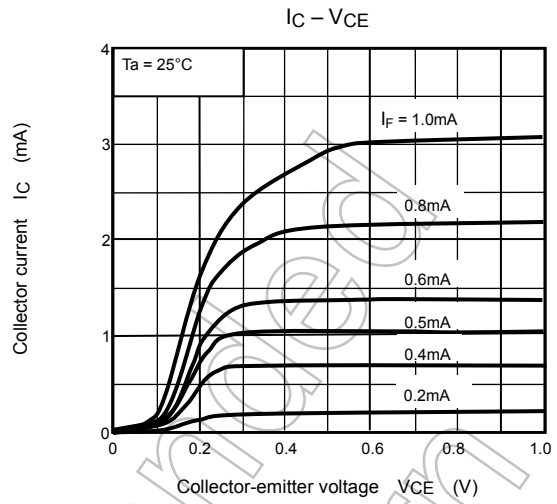
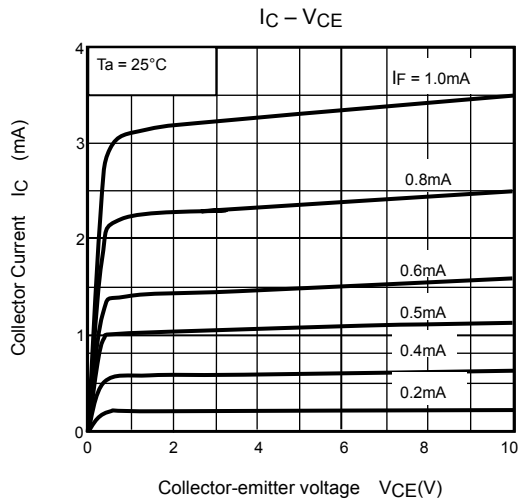
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	$V_{CC} = 10 \text{ V}, I_C = 2 \text{ mA}$ $R_L = 100 \Omega$	—	8	—	μs
Fall time	t_f		—	8	—	
Turn-on time	t_{on}		—	10	—	
Turn-off time	t_{off}		—	8	—	
Turn-on time	t_{ON}	$R_L = 4.7 \text{ k}\Omega$ (Fig.1) $R_{BE} = \text{OPEN}$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

Fig. 1 Switching time test circuit

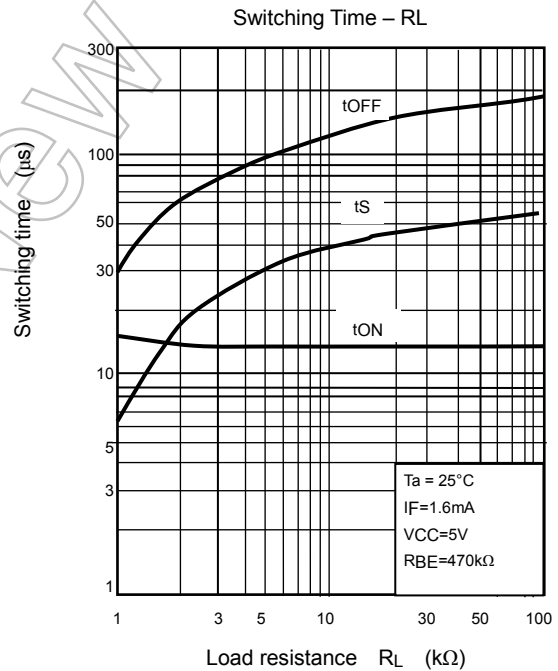
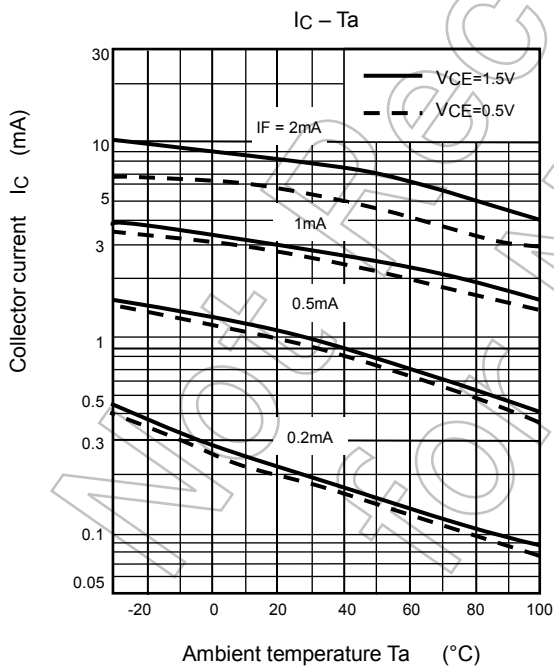
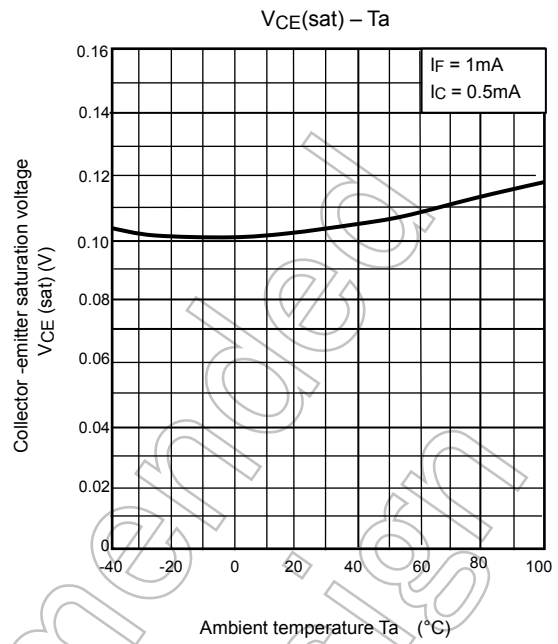
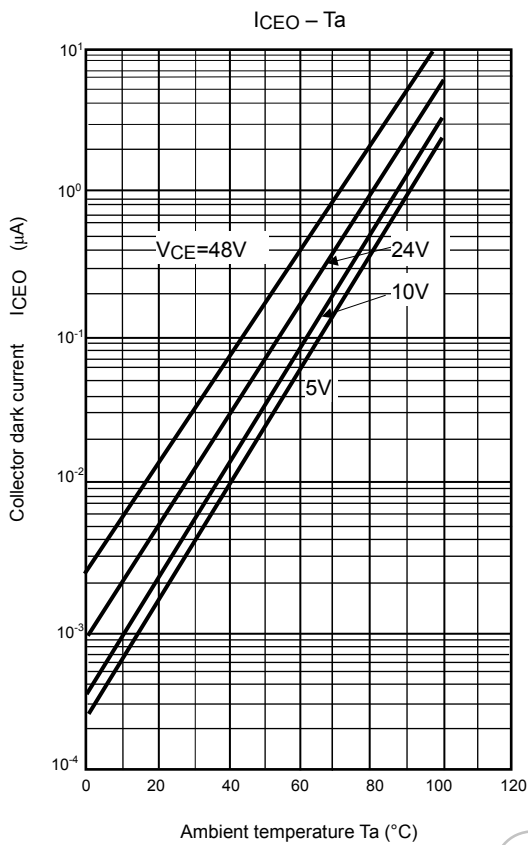




NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

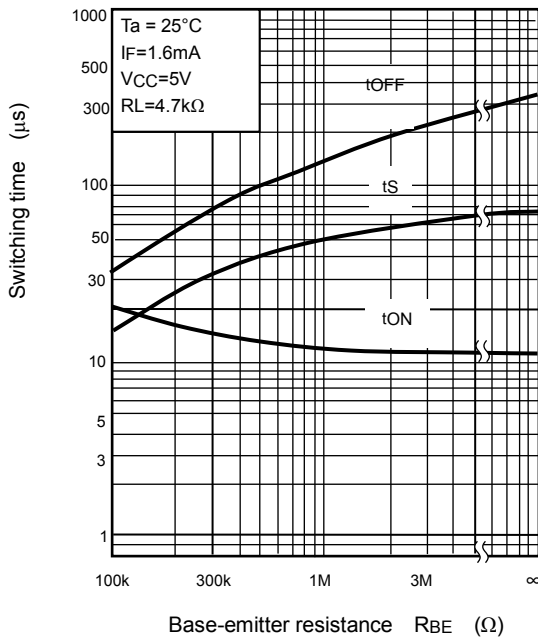


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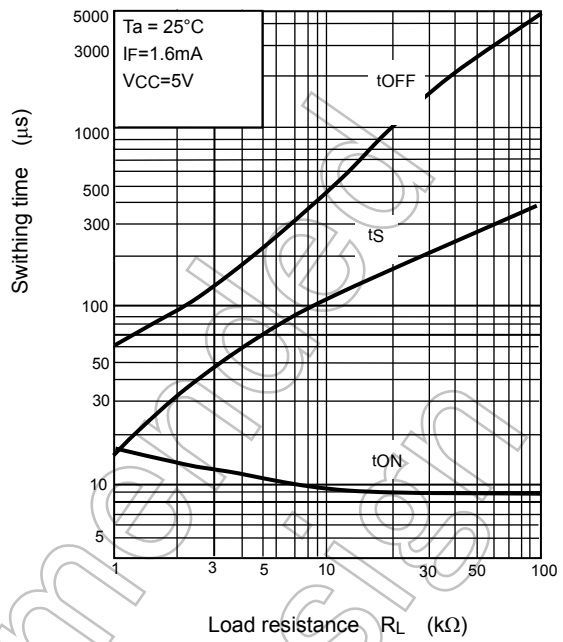


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Switching Time – RBE



Switching Time – R_L



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Not Recommended for New Design

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