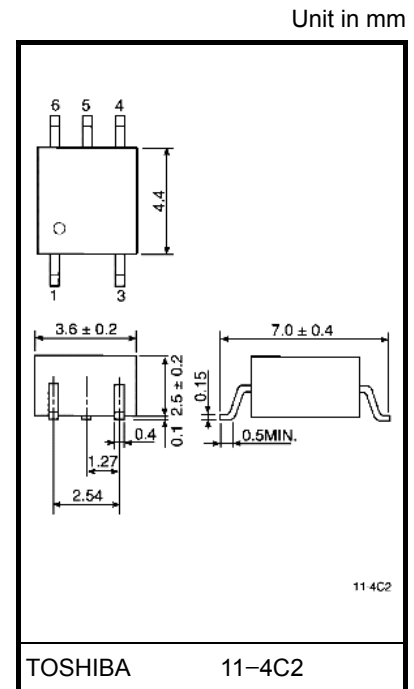


# TLP137

Office Machine  
 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 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

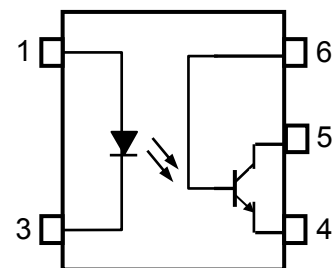


Weight: 0.09 g

Classi- fication	Current Transfer Ratio (min.)			Marking Of Classi- fication
	Ta = 25°C		Ta = -25~75°C	
	If = 1mA VCE = 0.5V	If = 0.5mA VCE = 1.5V	If = 1mA VCE = 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)	$\Delta I_F / ^\circ\text{C}$	-0.7	mA / °C
	Peak forward current (100µs pulse, 100pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	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		$T_{stg}$	-55~125	°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)		$\Delta P_T / ^\circ\text{C}$	-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	$V_F$	$I_F = 10\text{mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5\text{V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1\text{MHz}$	—	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	$\mu\text{A}$
	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	$\mu\text{A}$
	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)	$C_{CE}$	$V = 0, f = 1\text{MHz}$	—	12	—	pF

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

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

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

Characteristic	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	—	

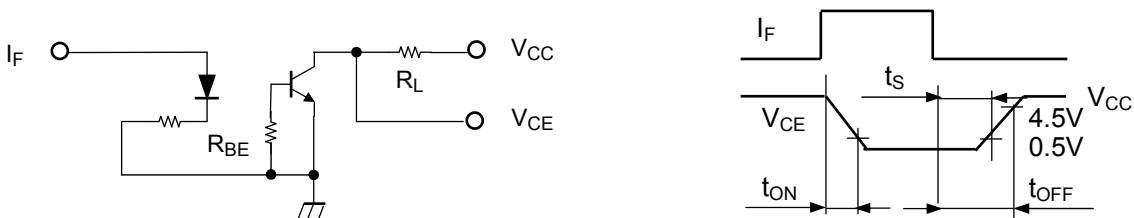
## Isolation Characteristics (Ta = 25°C)

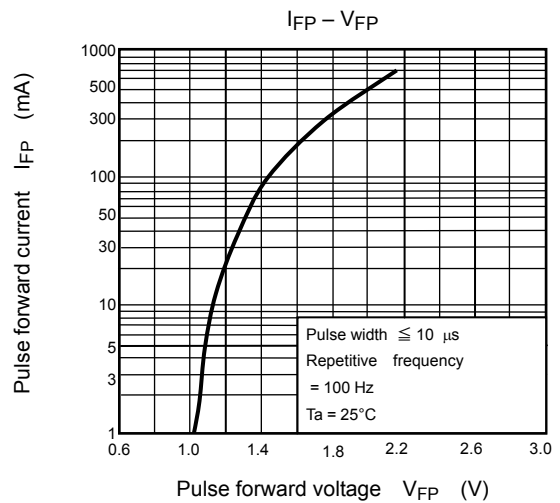
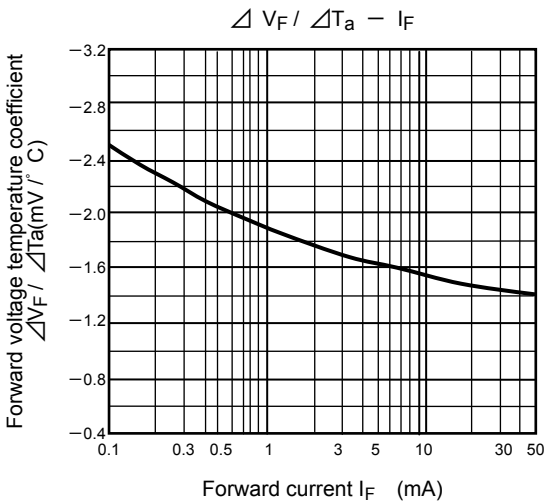
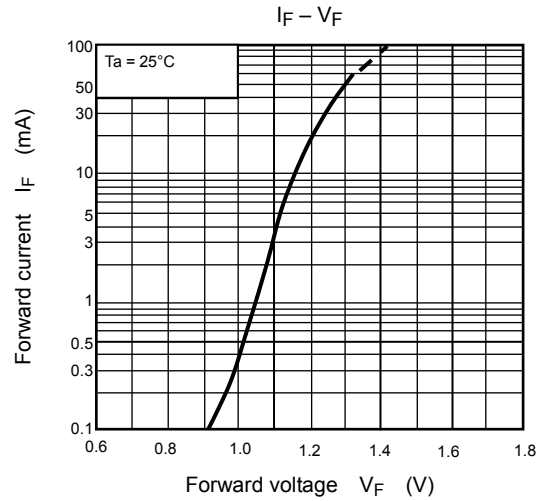
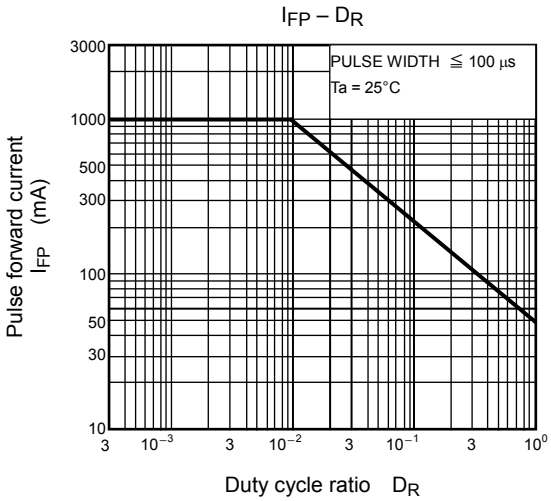
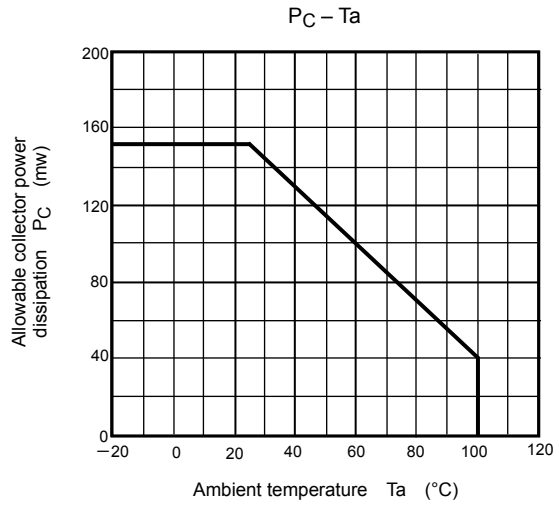
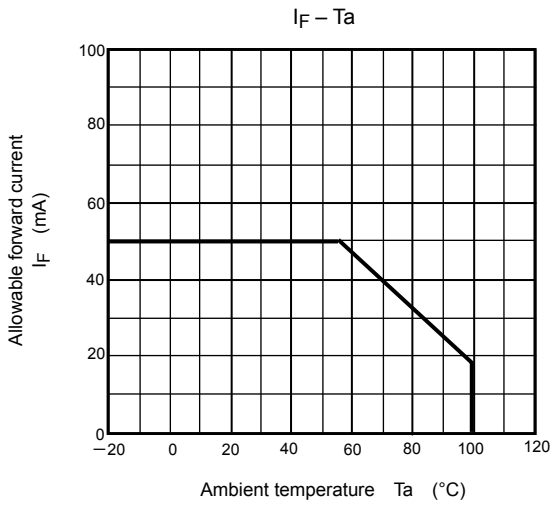
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	$C_S$	$V_S = 0, f = 1\text{MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V = 500\text{V}$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1minute	3750	—	—	Vrms
		AC, 1second, in oil	—	10000	—	
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

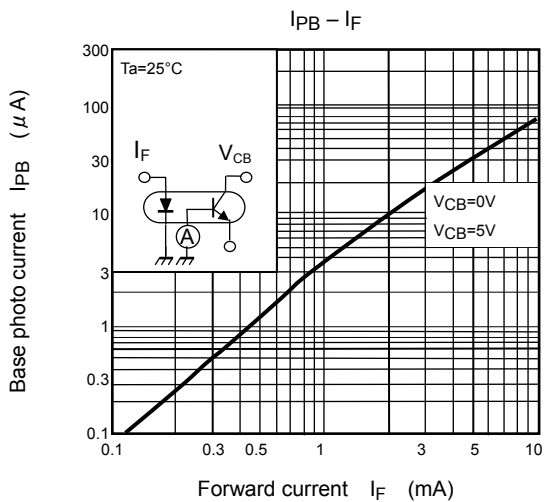
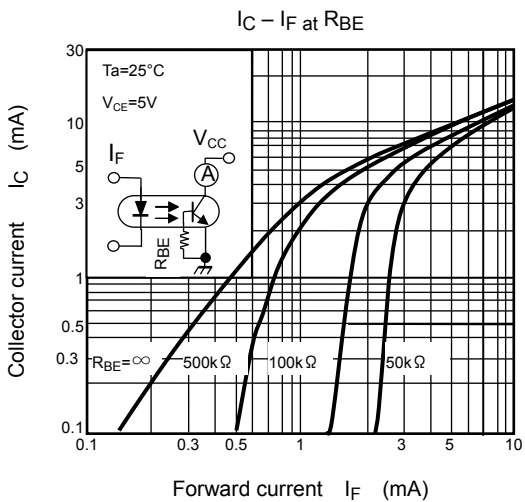
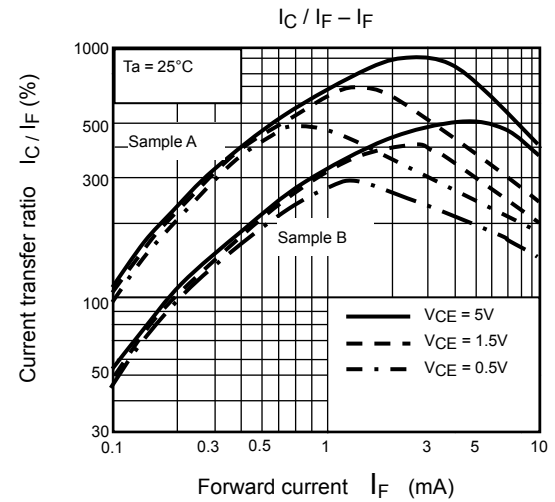
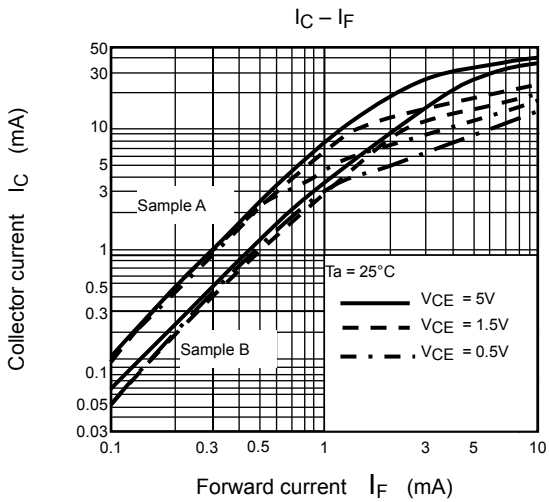
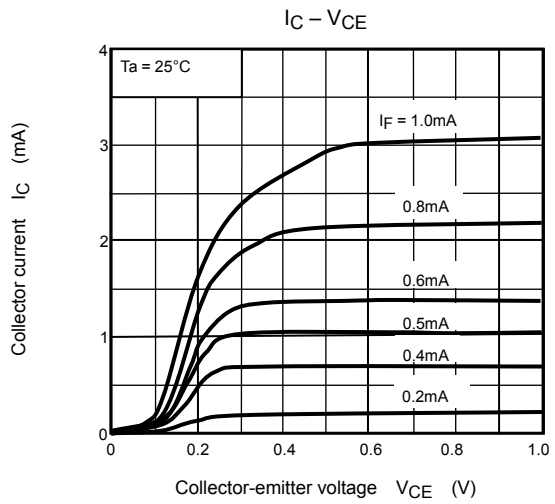
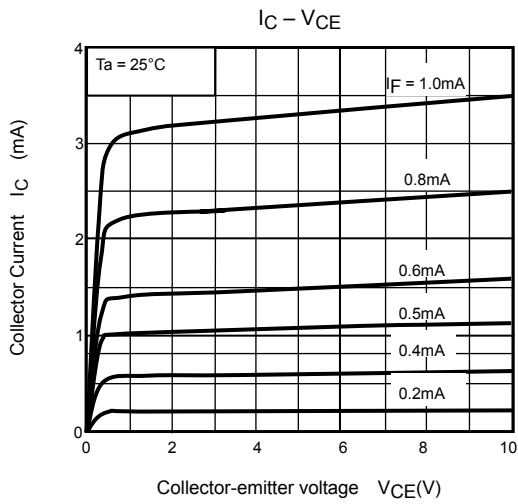
## Switching Characteristics (Ta = 25°C)

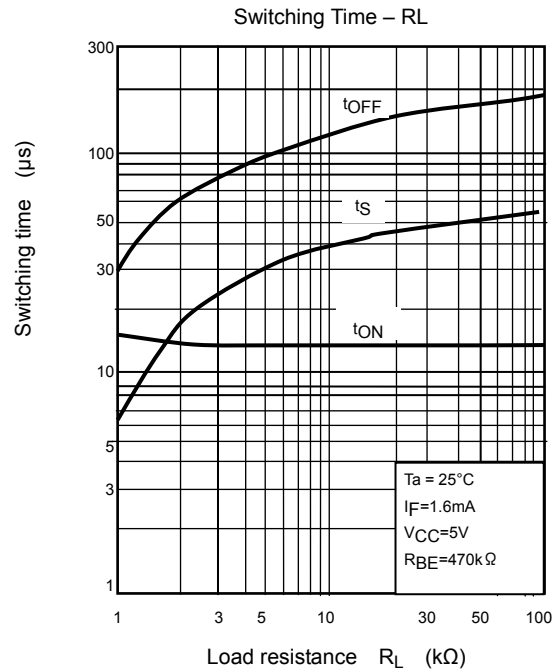
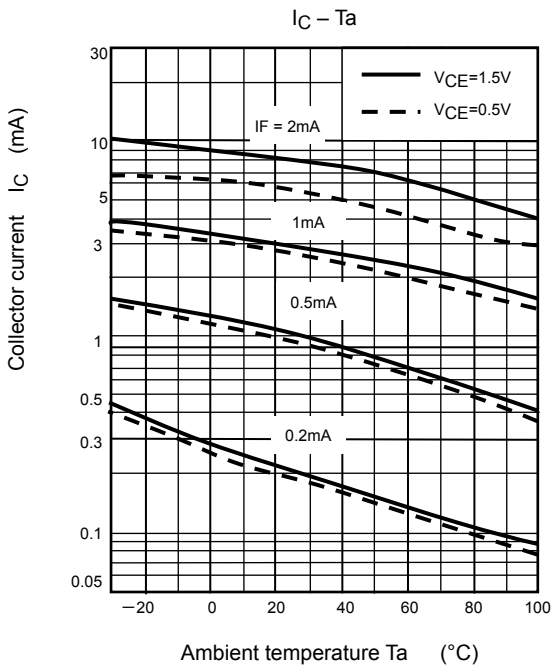
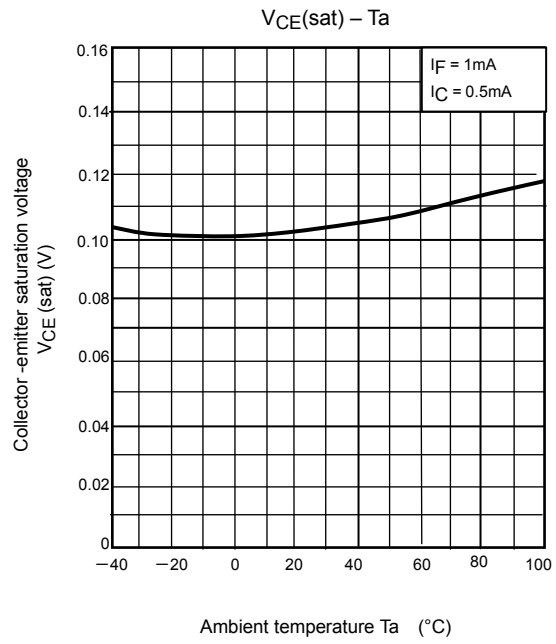
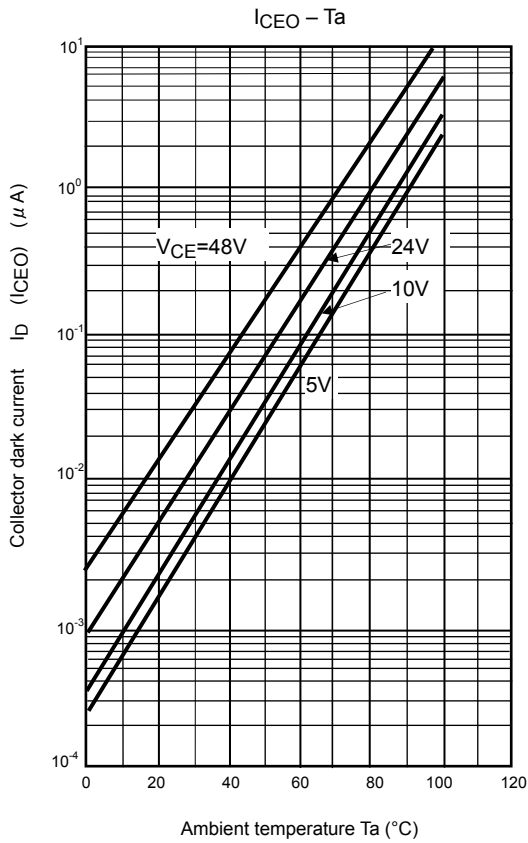
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	$t_r$	$V_{CC} = 10\text{V}, I_C = 2\text{mA}$ $R_L = 100\Omega$	—	8	—	$\mu\text{s}$
Fall time	$t_f$		—	8	—	
Turn-on time	$t_{on}$		—	10	—	
Turn-off time	$t_{off}$		—	8	—	
Turn-on time	$t_{ON}$	$R_L = 4.7\text{k}\Omega$ (Fig.1) $R_{BE}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

Fig. 1 Switching time test circuit

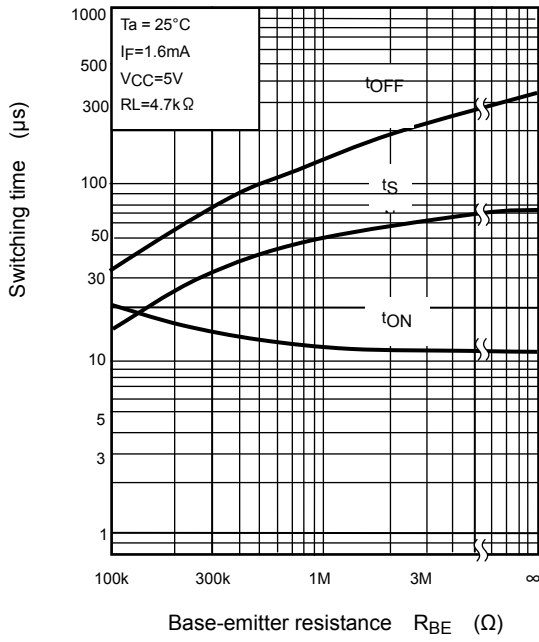




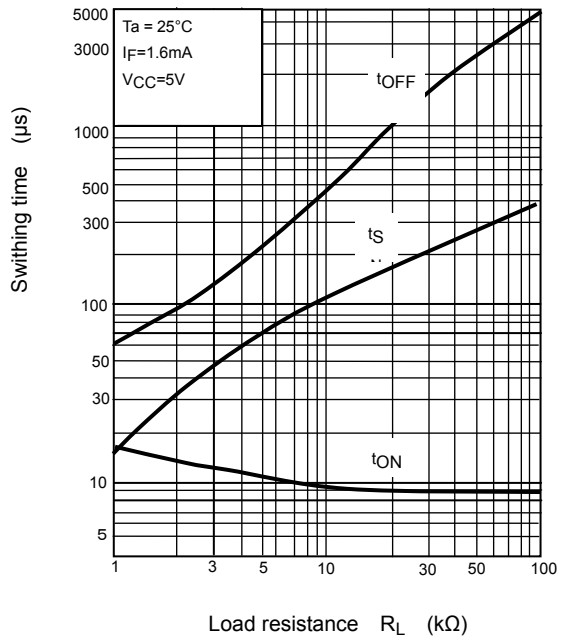




Switching Time –  $R_{BE}$



Switching Time –  $R_L$





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