TOSHIBA Transistor Silicon NPN · PNP Epitaxial Type (PCT Process) (Bias Resistor Built-in Transistor)

# **RN4981FE**

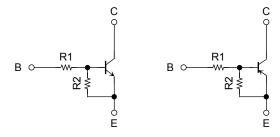
# Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count.
   Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

#### **Equivalent Circuit and Bias Resistor Values**

Q1

Q2

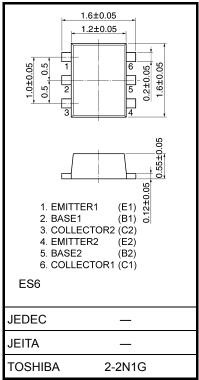


R1:  $4.7 \text{ k}\Omega$ 

R2:  $4.7 \text{ k}\Omega$ 

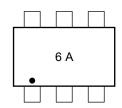
(Q1, Q2 common)

Unit: mm

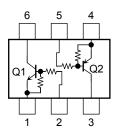


Weight: 0.003 g (typ.)

#### Marking



#### **Equivalent Circuit (top view)**



**RN4981FE** 

#### Absolute Maximum Ratings (Ta = 25°C) (Q1)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	50	V
Collector-emitter voltage	V <sub>CEO</sub>	50	V
Emitter-base voltage	V <sub>EBO</sub>	10	V
Collector current	Ic	100	mA

#### Absolute Maximum Ratings (Ta = 25°C) (Q2)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-50	V
Collector-emitter voltage	V <sub>CEO</sub>	-50	V
Emitter-base voltage	V <sub>EBO</sub>	-10	V
Collector current	IC	-100	mA

#### Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P <sub>C</sub> (Note)	100	mW
Junction temperature	Tj	150	°C
Storage temperature range	T <sub>stg</sub>	-55 to 150	°C

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: Total rating

## Electrical Characteristics (Ta = 25°C) (Q1)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	$V_{CB} = 50 \text{ V}, I_{E} = 0$	_	_	100	nA
	I <sub>CEO</sub>	$V_{CE} = 50 \text{ V}, I_{B} = 0$	_	_	500	ПА
Emitter cut-off current	I <sub>EBO</sub>	V <sub>EB</sub> = 10 V, I <sub>C</sub> = 0	0.82	_	1.52	mA
DC current gain	h <sub>FE</sub>	$V_{CE} = 5 \text{ V}, I_{C} = 10 \text{ mA}$	30	_	_	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	$I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$	_	0.1	0.3	V
Input voltage (ON)	V <sub>I (ON)</sub>	$V_{CE} = 0.2 \text{ V}, I_{C} = 5 \text{ mA}$	1.1	_	2.0	V
Input voltage (OFF)	V <sub>I (OFF)</sub>	$V_{CE} = 5 \text{ V}, I_{C} = 0.1 \text{ mA}$	1.0	_	1.5	V
Transition frequency	f <sub>T</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA	_	250	_	MHz
Collector output capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1 MHz	_	3	6	pF

### Electrical Characteristics (Ta = 25°C) (Q2)

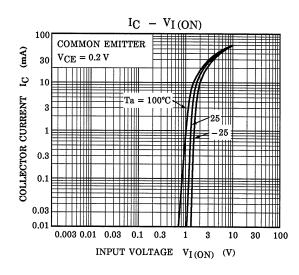
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	$V_{CB} = -50 \text{ V}, I_E = 0$	_	_	-100	nA
	I <sub>CEO</sub>	$V_{CE} = -50 \text{ V}, I_B = 0$	_		-500	
Emitter cut-off current	I <sub>EBO</sub>	$V_{EB} = -10 \text{ V}, I_{C} = 0$	-0.82	_	-1.52	mA
DC current gain	h <sub>FE</sub>	$V_{CE} = -5 \text{ V}, I_{C} = -10 \text{ mA}$	30			
Collector-emitter saturation voltage	V <sub>CE (sat)</sub>	$I_C = -5 \text{ mA}, I_B = -0.25 \text{ mA}$		-0.1	-0.3	>
Input voltage (ON)	V <sub>I (ON)</sub>	$V_{CE} = -0.2 \text{ V}, I_{C} = -5 \text{ mA}$	-1.1		-2.0	>
Input voltage (OFF)	V <sub>I (OFF)</sub>	$V_{CE} = -5 \text{ V}, I_{C} = -0.1 \text{ mA}$	-1.0		-1.5	>
Transition frequency	f <sub>T</sub>	$V_{CE} = -10 \text{ V}, I_{C} = -5 \text{ mA}$	_	200		MHz
Collector output capacitance	C <sub>ob</sub>	$V_{CB} = -10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	_	3	6	pF

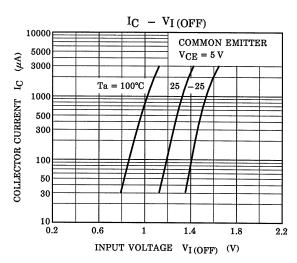
#### Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

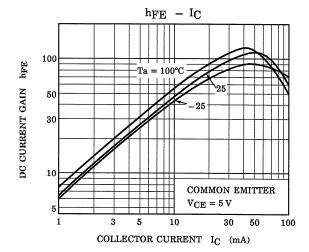
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input resistor	R1	_	3.29	4.7	6.11	kΩ
Resistor ratio	R1/R2	_	0.9	1.0	1.1	

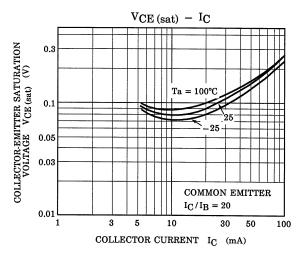
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Q1

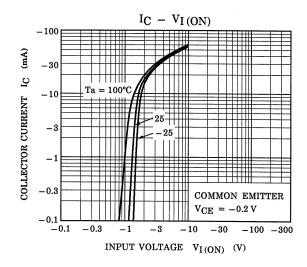


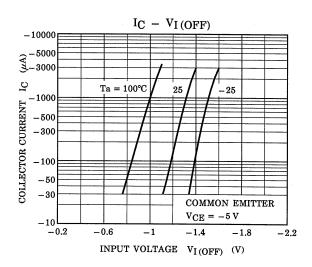


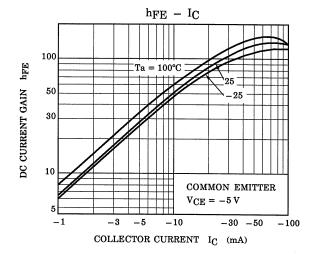


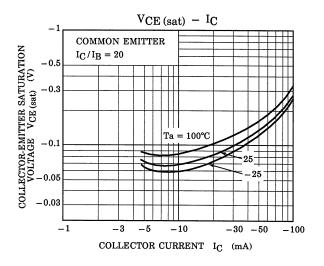


Q2









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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: http://oceanchips.ru/

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А