

TOSHIBA Transistor Silicon NPN · PNP Epitaxial Type  
(PCT process) (Bias Resistor built-in Transistor)

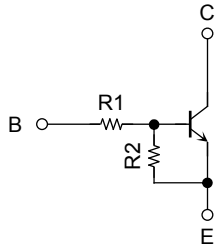
# RN4988FS

Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications

- Two devices are incorporated into a fine pitch Small Mold (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**

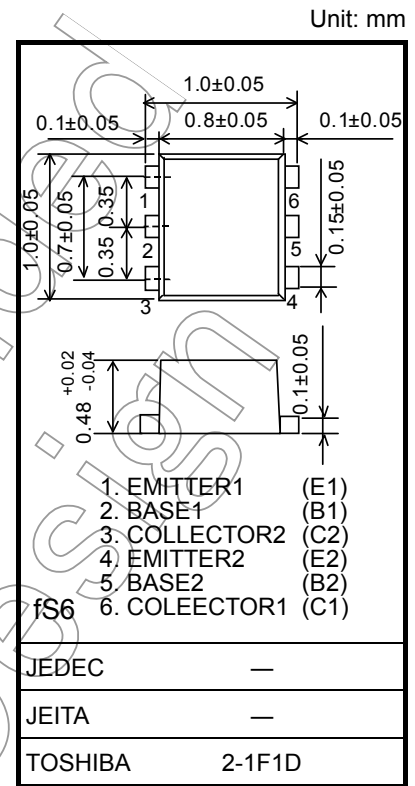
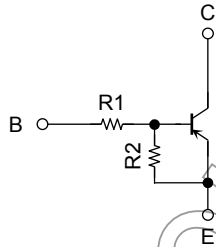


R1: 22 kΩ

R2: 47 kΩ

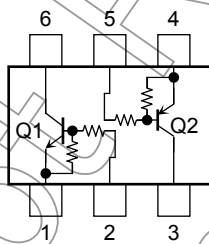
(Q1, Q2 common)

**Q2**

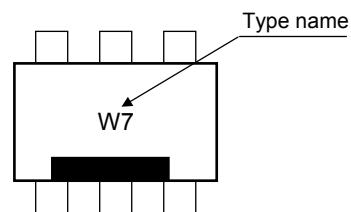


Weight:0.001g (typ.)

## Equivalent Circuit (top view)



## Marking



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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</sub>	20	V
Collector-emitter voltage	V <sub>CEO</sub>	20	V
Emitter-base voltage	V <sub>EBO</sub>	7	V
Collector current	I <sub>C</sub>	50	mA

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</sub>	-20	V
Collector-emitter voltage	V <sub>CEO</sub>	-20	V
Emitter-base voltage	V <sub>EBO</sub>	-7	V
Collector current	I <sub>C</sub>	-50	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P <sub>C</sub> (Note 1)	50	mW
Junction temperature	T <sub>j</sub>	150	°C
Storage temperature range	T <sub>stg</sub>	-55~150	°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	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 20\text{ V}, I_E = 0$	—	—	100	nA
	$I_{CEO}$	$V_{CE} = 20\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 7\text{ V}, I_C = 0$	0.085	—	0.126	mA
DC current gain	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	120	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	—	0.15	V
Input voltage (ON)	$V_I(ON)$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.8	—	2.2	V
Input voltage (OFF)	$V_I(OFF)$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.6	—	1.1	V
Collector output capacitance	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

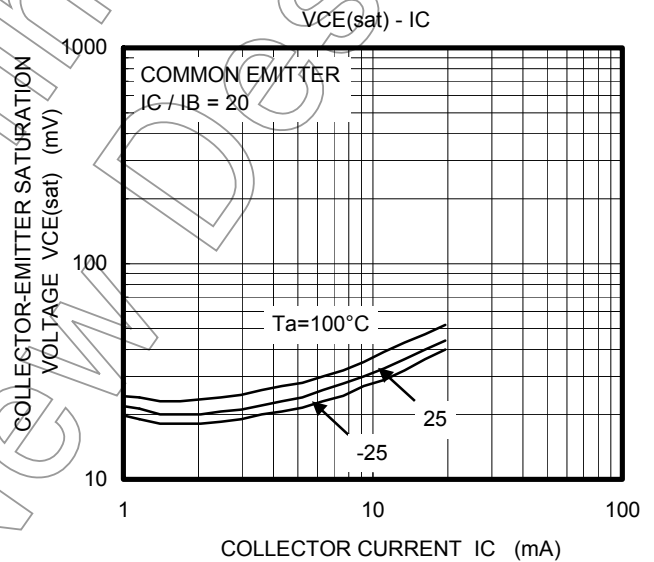
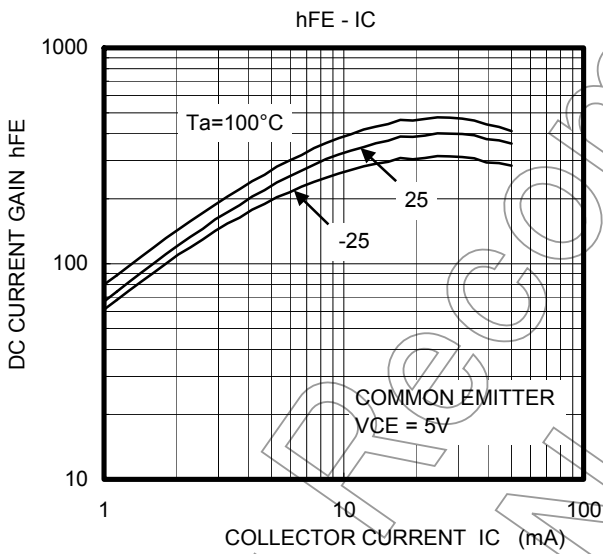
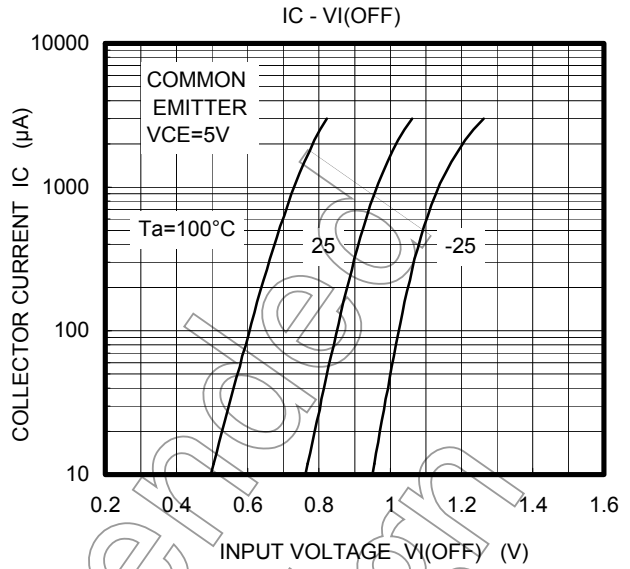
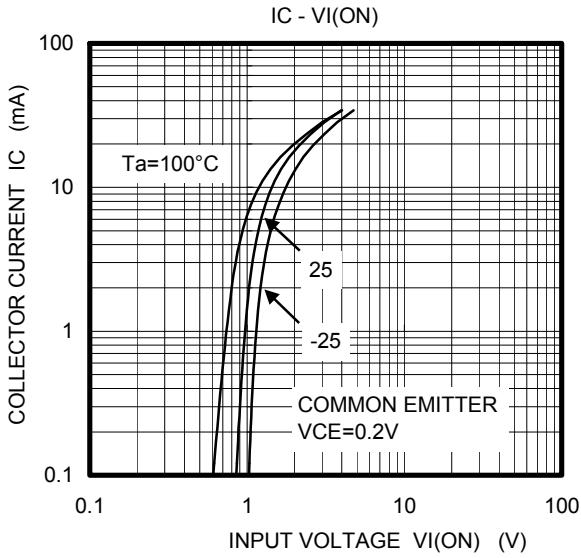
## Electrical Characteristics (Ta = 25°C) (Q2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = -20\text{ V}, I_E = 0$	—	—	-100	nA
	$I_{CEO}$	$V_{CE} = -20\text{ V}, I_B = 0$	—	—	-500	
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -7\text{ V}, I_C = 0$	-0.085	—	-0.126	mA
DC current gain	$h_{FE}$	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	120	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	—	-0.15	V
Input voltage (ON)	$V_I(ON)$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-0.8	—	-2.2	V
Input voltage (OFF)	$V_I(OFF)$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-0.6	—	-1.1	V
Collector output capacitance	$C_{ob}$	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

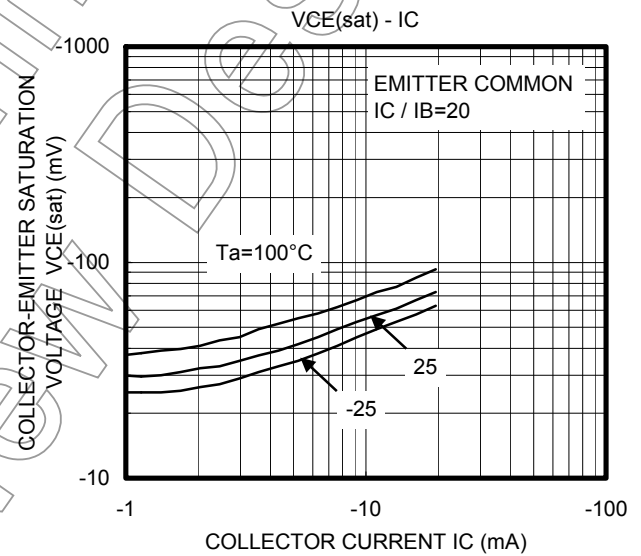
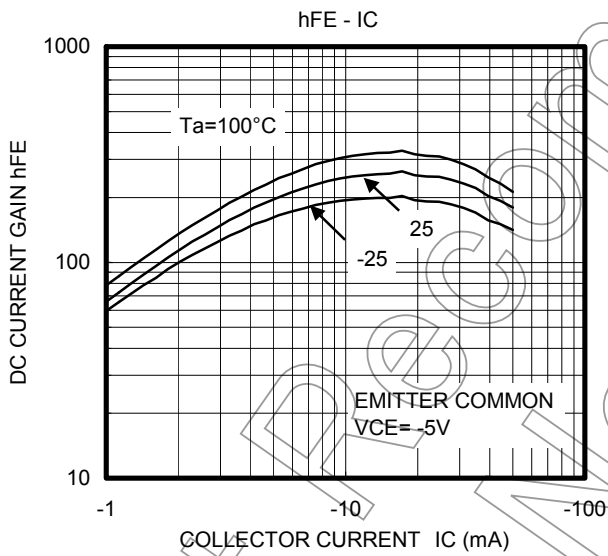
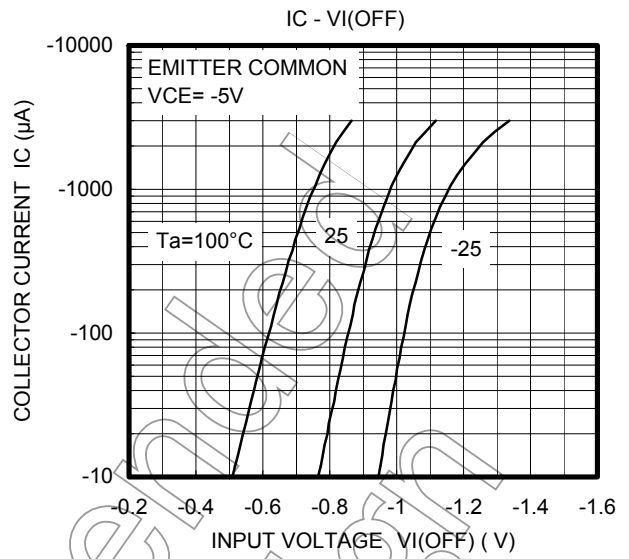
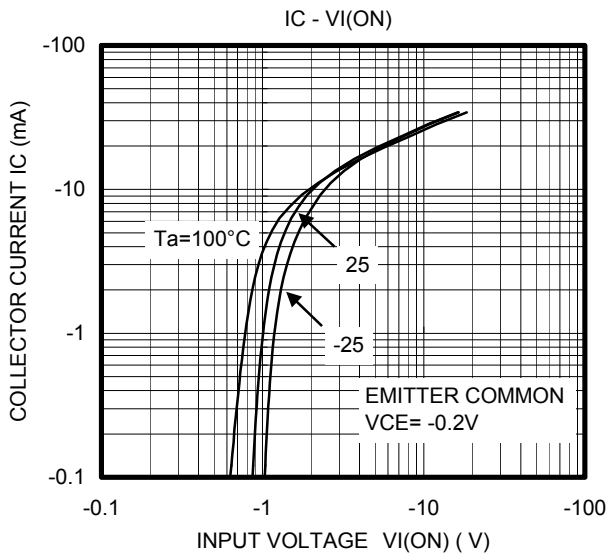
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	17.6	22	26.4	k $\Omega$
Resistor ratio	R1/R2	—	0.374	0.468	0.562	

**Q1**



**Q2**



**Handling Precaution**

Before handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against static electricity. Operators should wear anti-static clothing, and containers and other objects that come direct contact with devices should be made of anti-static materials.

Not Recommended  
for New Design

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