

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

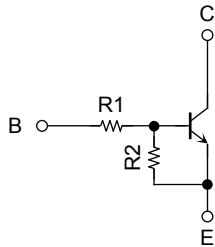
RN4989FS

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

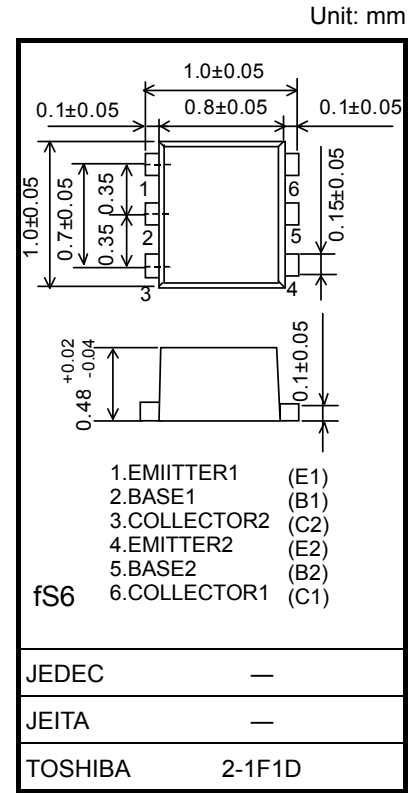
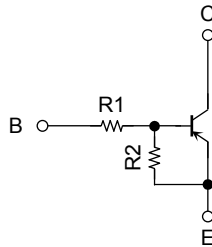


R1: 47 kΩ

R2: 22 kΩ

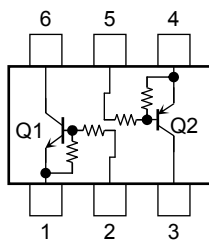
(Q1, Q2 common)

Q2

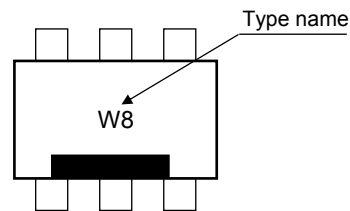


Weight: 0.001g (typ.)

Equivalent Circuit (top view)



Marking



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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CB0}	20	V
Collector-emitter voltage	V _{CEO}	20	V
Emitter-base voltage	V _{EBO}	15	V
Collector current	I _C	50	mA

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CB0}	-20	V
Collector-emitter voltage	V _{CEO}	-20	V
Emitter-base voltage	V _{EBO}	-15	V
Collector current	I _C	-50	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P _C (Note 1)	50	mW
Junction temperature	T _j	150	°C
Storage temperature range	T _{stg}	-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}	$V_{EB} = 15\text{ V}, I_C = 0$	0.182	—	0.271	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)	$V_I(ON)$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.6	—	5.0	V
Input voltage (OFF)	$V_I(OFF)$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.3	—	2.6	V
Collector output capacitance	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

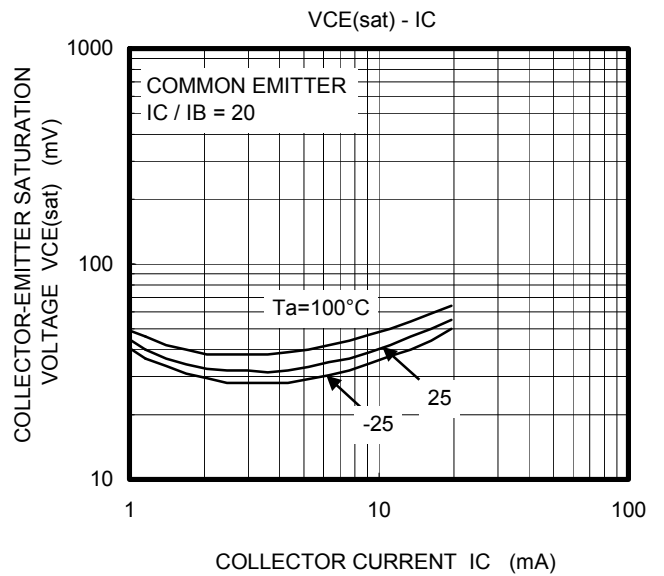
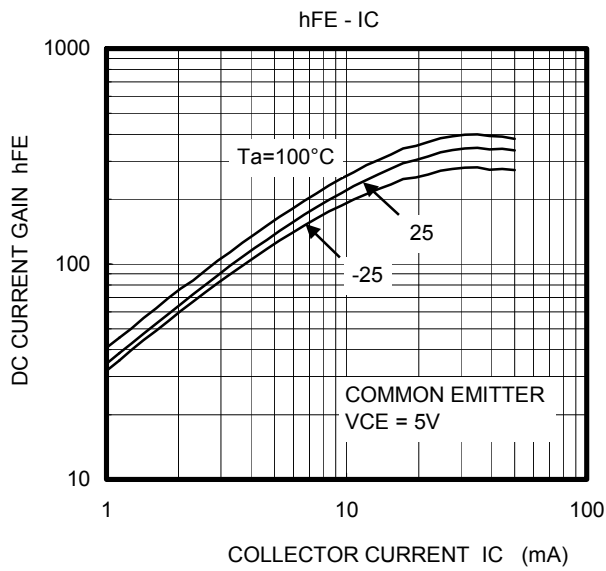
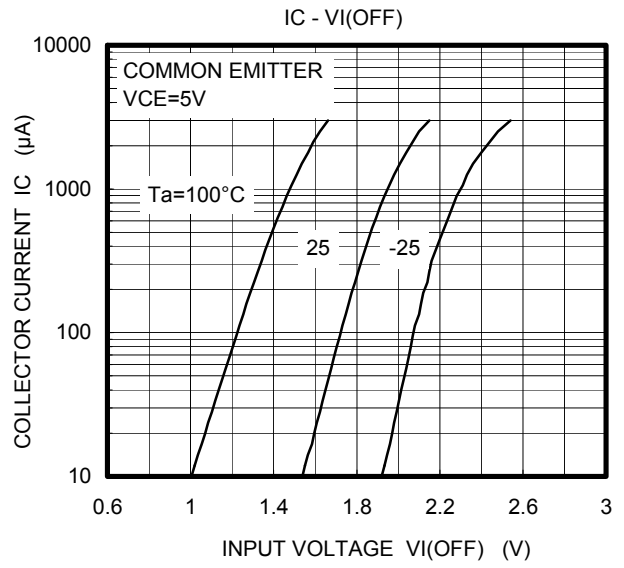
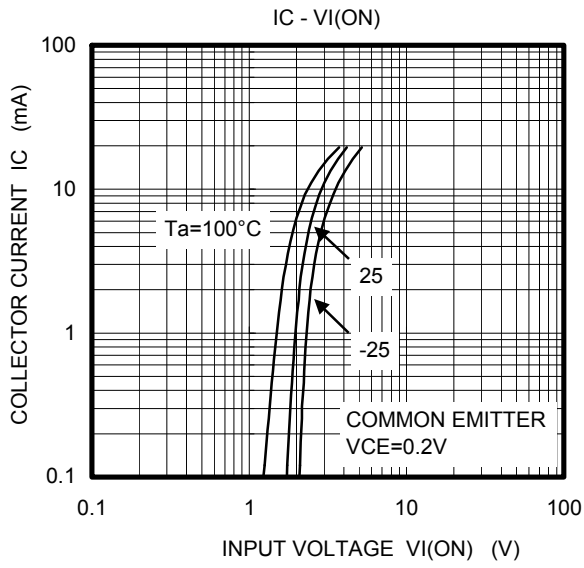
Electrical Characteristics (Ta = 25°C) (Q2)

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}	$V_{EB} = -15\text{ V}, I_C = 0$	-0.182	—	-0.271	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)	$V_I(ON)$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-1.6	—	-5.0	V
Input voltage (OFF)	$V_I(OFF)$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-1.3	—	-2.6	V
Collector output capacitance	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

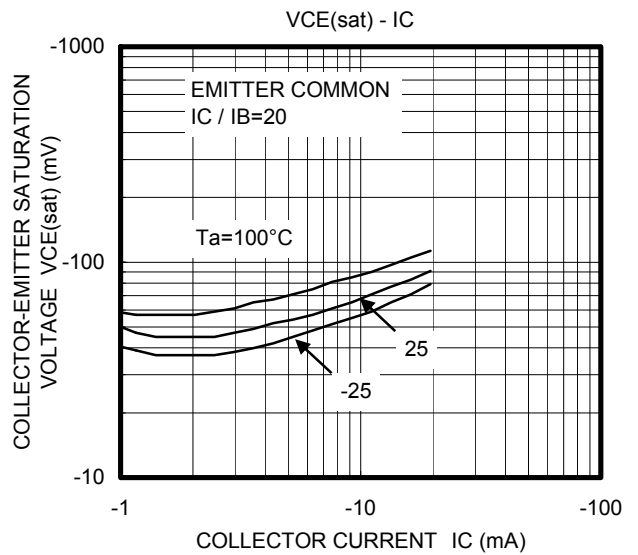
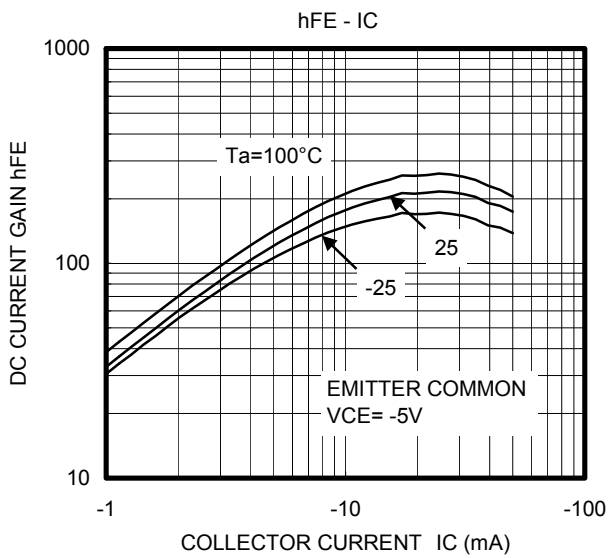
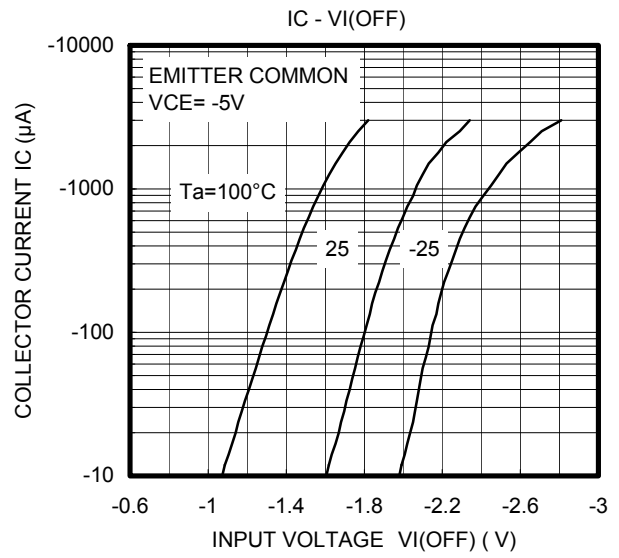
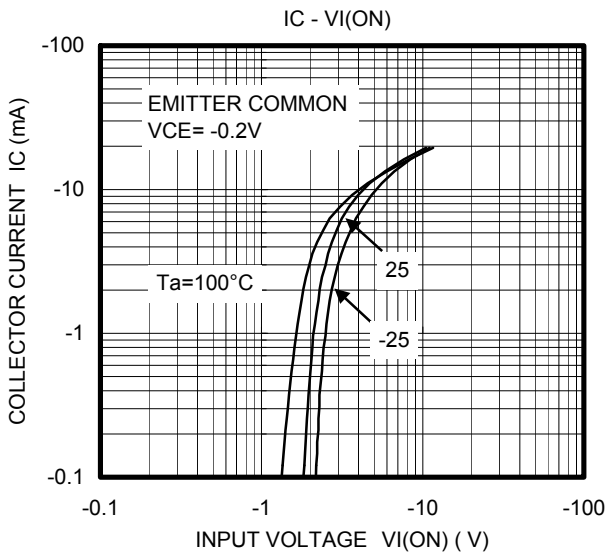
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	37.6	47	56.4	k Ω
Resistor ratio	R1/R2	—	1.71	2.14	2.56	

Q1



Q2



Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic discharge. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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