

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

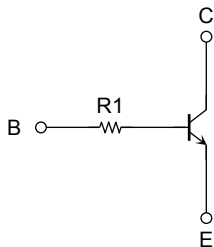
RN4991FS

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

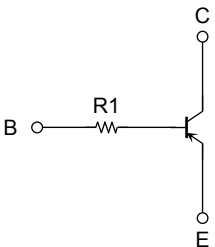
- Two devices are incorporated into a fine pitch small mold (6-pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

Equivalent Circuit and Bias Resistor Values

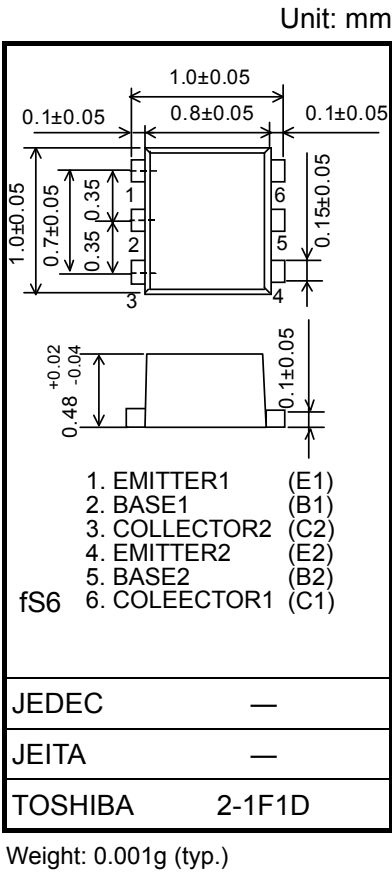
Q1



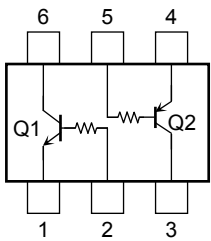
Q2



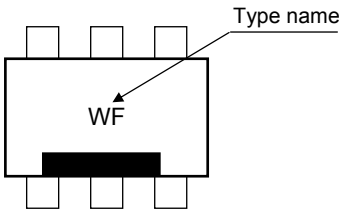
R1: 10kΩ
(Q1, Q2 common)



Equivalent Circuit (top view)



Marking



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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	20	V
Collector-emitter voltage	V _{CEO}	20	V
Emitter-base voltage	V _{EBO}	5	V
Collector current	I _C	50	mA

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	–20	V
Collector-emitter voltage	V _{CEO}	–20	V
Emitter-base voltage	V _{EBO}	–5	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
Emitter cut-off current	I_{EBO}	$V_{EB} = 5\text{ V}, I_C = 0$	—	—	100	nA
DC current gain	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 1\text{ mA}$	300	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	—	0.15	V
Collector output capacitance	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

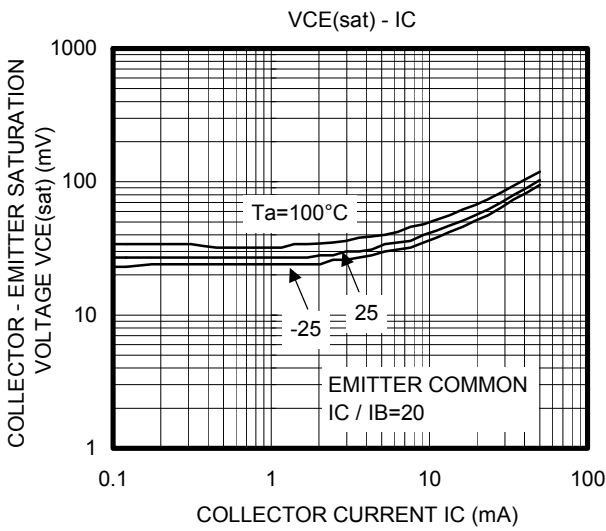
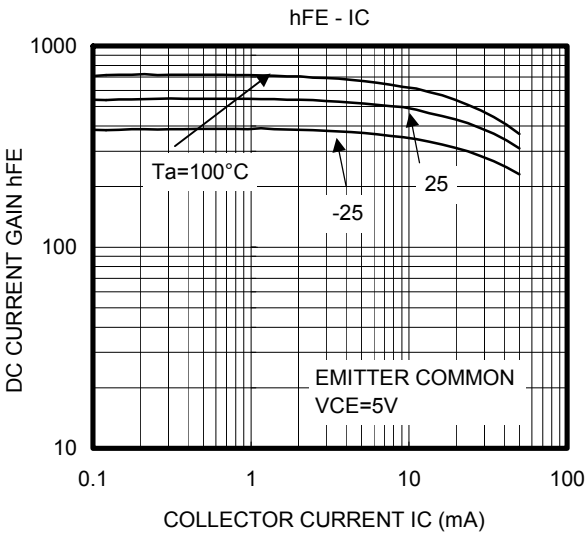
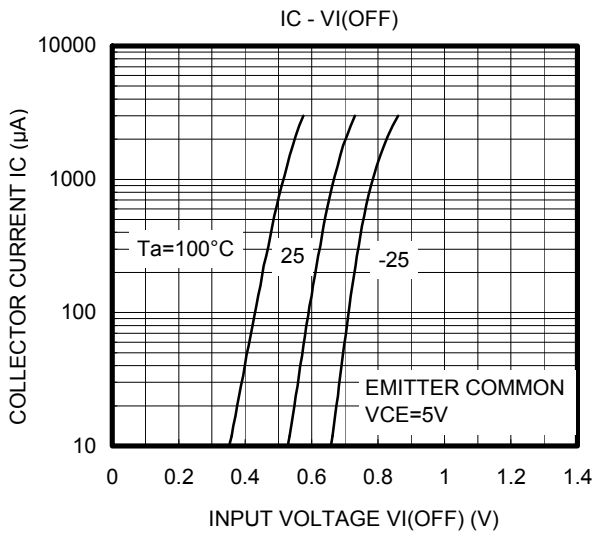
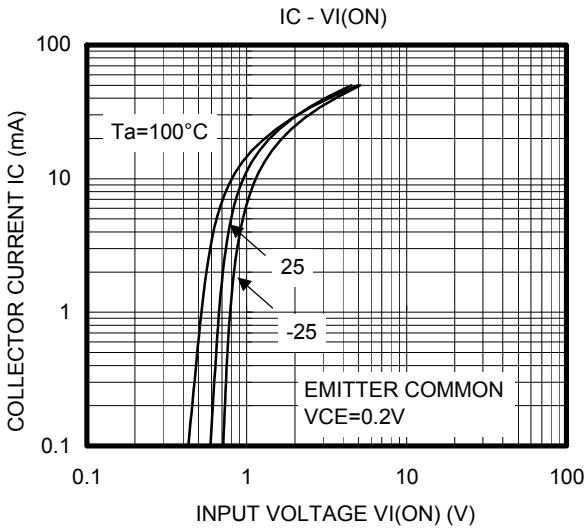
Electrical Characteristics (Ta = 25°C) (Q2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = -20\text{ V}, I_E = 0$	—	—	-100	nA
Emitter cut-off current	I_{EBO}	$V_{EB} = -5\text{ V}, I_C = 0$	—	—	-100	nA
DC current gain	h_{FE}	$V_{CE} = -5\text{ V}, I_C = -1\text{ mA}$	300	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	—	-0.15	V
Collector output capacitance	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF

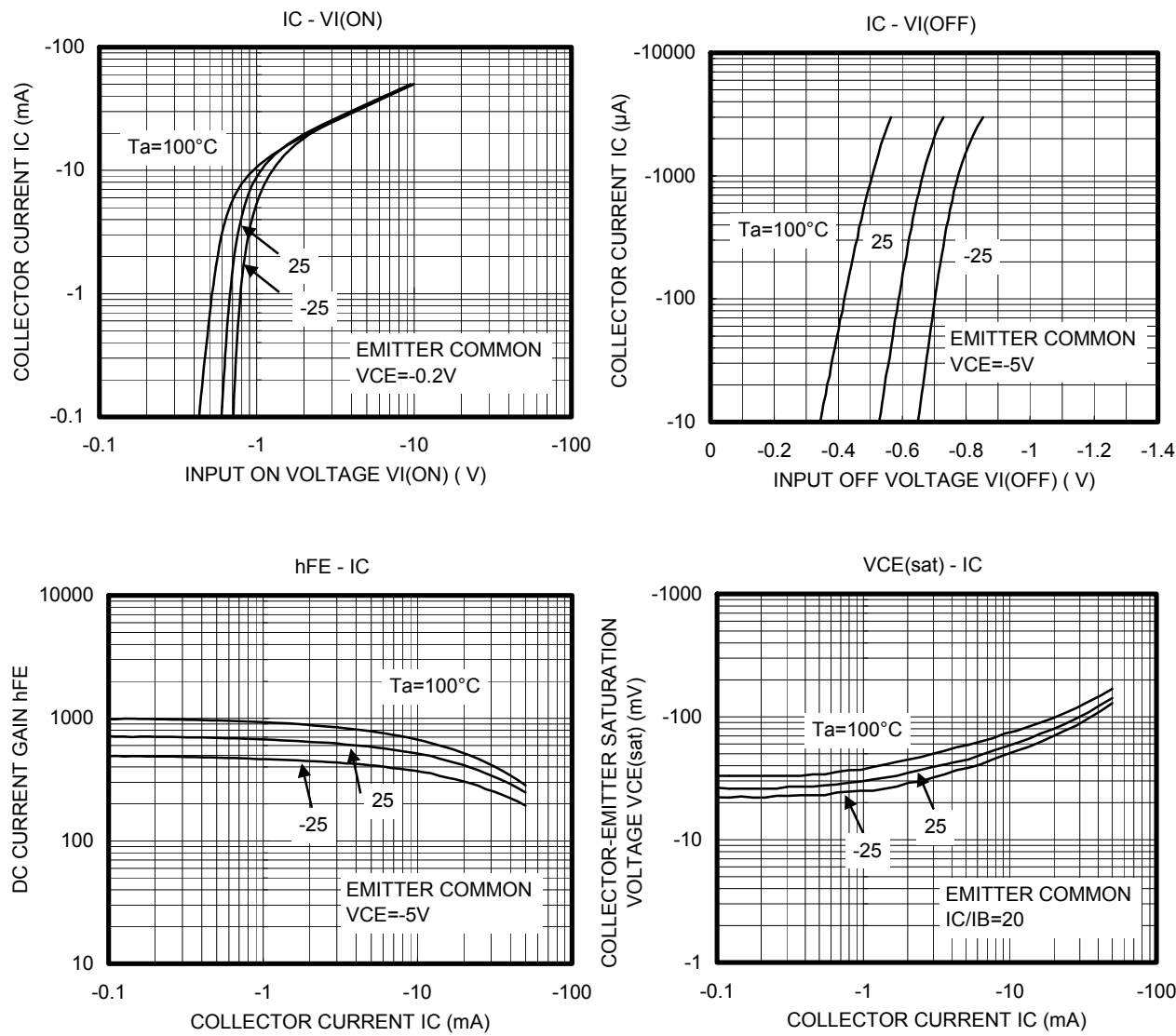
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input resistor	R1	—	8	10	12	k Ω

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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