

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

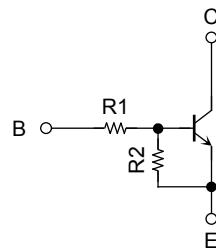
RN4988FE

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

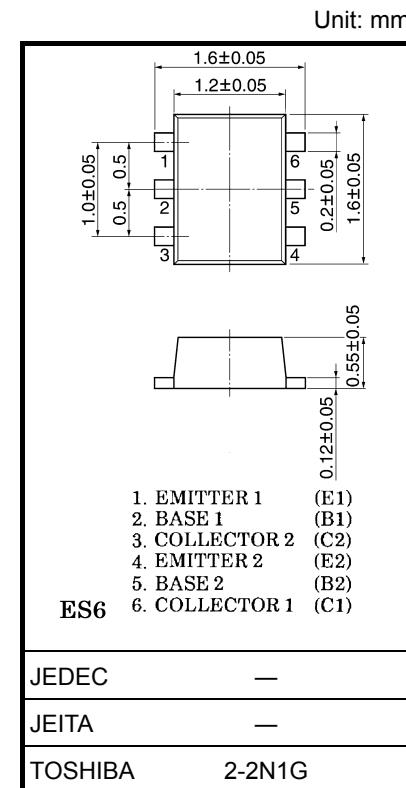
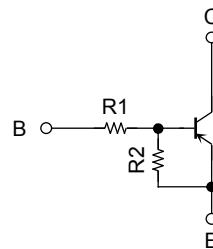


R1: 22 kΩ

R2: 47 kΩ

(Q1, Q2 common)

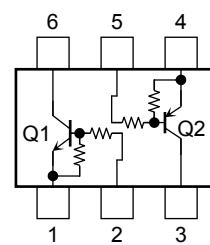
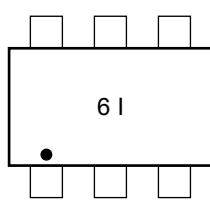
Q2



Weight: 0.003 g (typ.)

Marking

Equivalent Circuit (top view)



Start of commercial production
2000-05

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	100	mA

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	-50	V
Collector-emitter voltage	V_{CEO}	-50	V
Emitter-base voltage	V_{EBO}	-7	V
Collector current	I_C	-100	mA

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

Characteristics	Symbol	Rating	Unit
Collector power dissipation	P_C (Note 1)	100	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-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	Typ.	Max	Unit
Collector cut-off current	I _{CBO}	V _{CB} = 50 V, I _E = 0	—	—	100	nA
	I _{CEO}	V _{CE} = 50 V, I _B = 0	—	—	500	
Emitter cut-off current	I _{EBO}	V _{EB} = 7 V, I _C = 0	0.078	—	0.145	mA
DC current gain	h _{FE}	V _{CE} = 5 V, I _C = 10 mA	80	—	—	
Collector-emitter saturation voltage	V _{CE} (sat)	I _C = 5 mA, I _B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	V _I (ON)	V _{CE} = 0.2 V, I _C = 5 mA	1.0	—	2.6	V
Input voltage (OFF)	V _I (OFF)	V _{CE} = 5 V, I _C = 0.1 mA	0.6	—	1.16	V
Transition frequency	f _T	V _{CE} = 10 V, I _C = 5 mA	—	250	—	MHz
Collector output capacitance	C _{ob}	V _{CB} = 10 V, I _E = 0, f = 1 MHz	—	3	6	pF

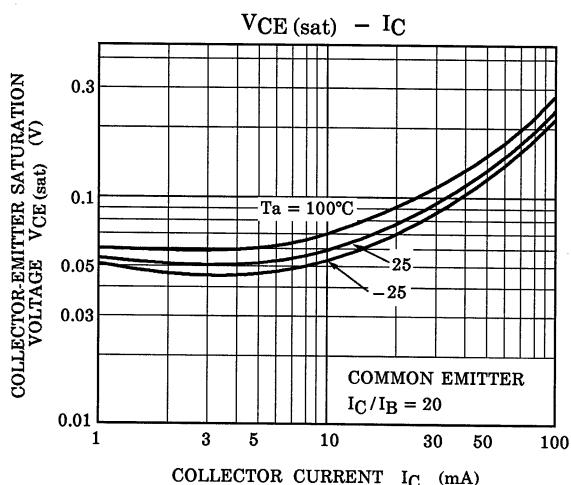
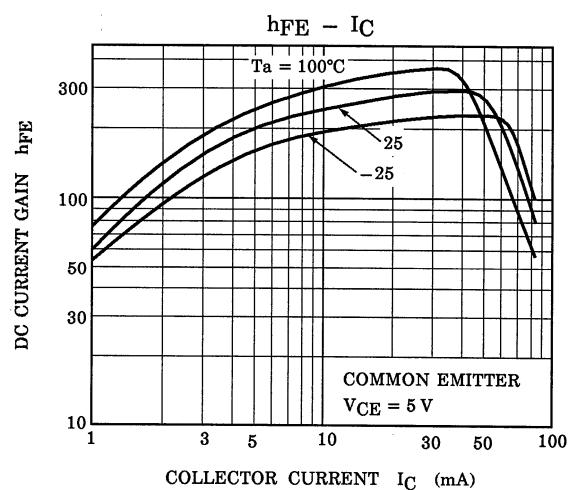
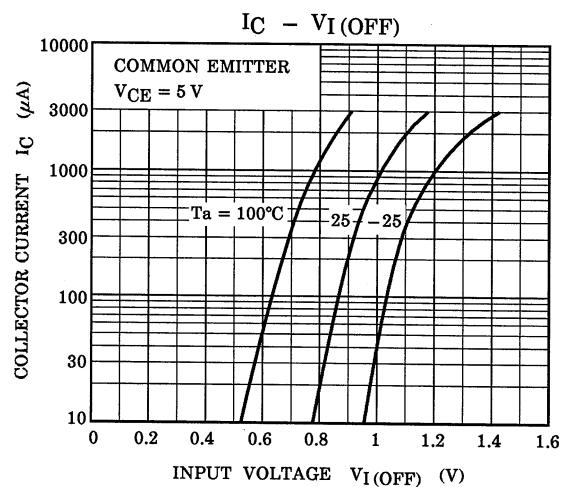
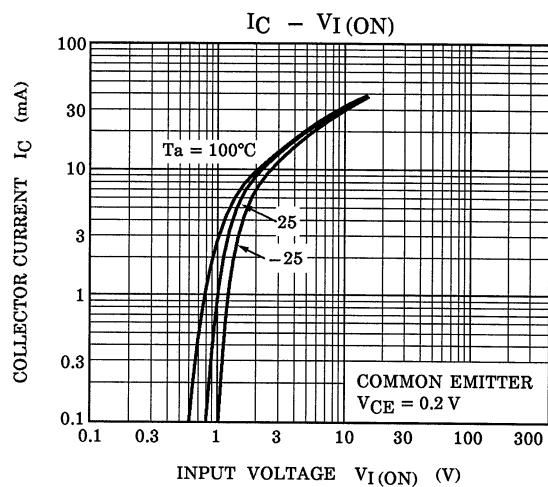
Electrical Characteristics (Ta = 25°C) (Q2)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I _{CBO}	V _{CB} = -50 V, I _E = 0	—	—	-100	nA
	I _{CEO}	V _{CE} = -50 V, I _B = 0	—	—	-500	
Emitter cut-off current	I _{EBO}	V _{EB} = -7 V, I _C = 0	-0.078	—	-0.145	mA
DC current gain	h _{FE}	V _{CE} = -5 V, I _C = -10 mA	80	—	—	
Collector-emitter saturation voltage	V _{CE} (sat)	I _C = -5 mA, I _B = -0.25 mA	—	-0.1	-0.3	V
Input voltage (ON)	V _I (ON)	V _{CE} = -0.2 V, I _C = -5 mA	-1.0	—	-2.6	V
Input voltage (OFF)	V _I (OFF)	V _{CE} = -5 V, I _C = -0.1 mA	-0.6	—	-1.16	V
Transition frequency	f _T	V _{CE} = -10 V, I _C = -5 mA	—	200	—	MHz
Collector output capacitance	C _{ob}	V _{CB} = -10 V, I _E = 0, f = 1 MHz	—	3	6	pF

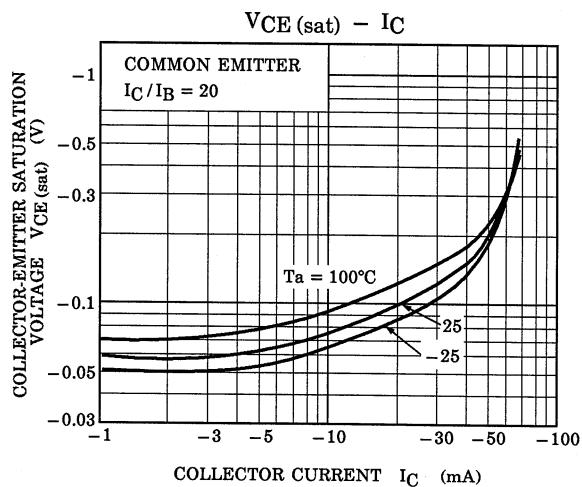
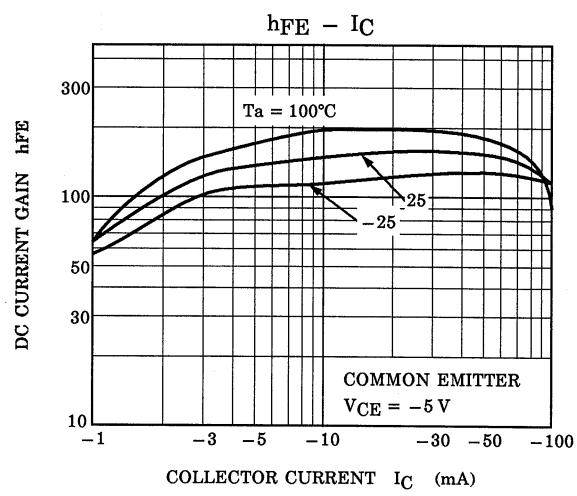
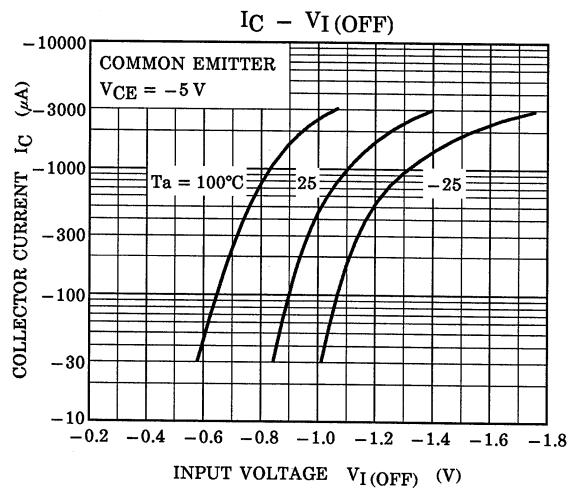
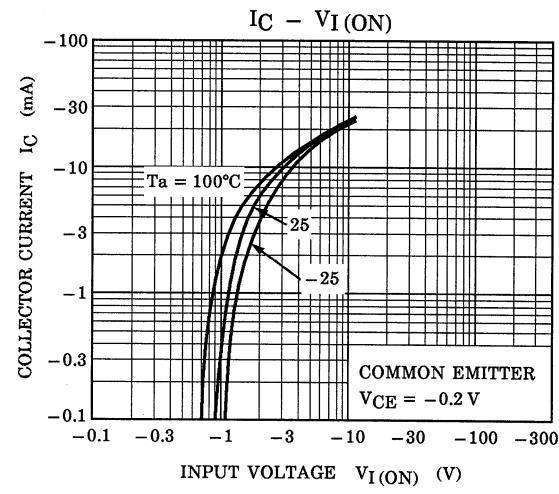
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input resistor	R ₁	—	15.4	22	28.6	kΩ
Resistor ratio	R ₁ /R ₂	—	0.421	0.468	0.515	

Q1



Q2



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