

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

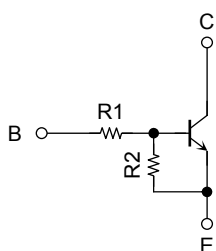
RN1707JE, RN1708JE, RN1709JE

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

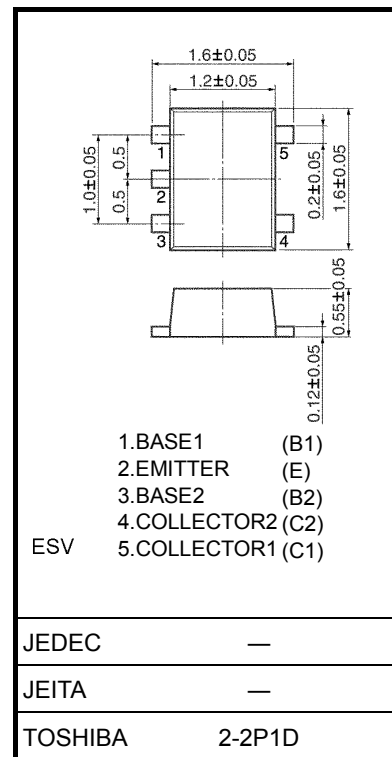
Unit: mm

- Two devices are incorporated into an Extreme-Super-Mini (5-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.
- A wide range of resistor values is available to use in various circuit designs.
- Complementary to RN2707JE to RN2709JE

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1707JE	10	47
RN1708JE	22	47
RN1709JE	47	22

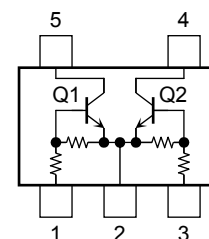


Weight: 3mg (typ.)

Equivalent Circuit (top view)

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

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	6	V
		7	
		15	
Collector current	I_C	100	mA
Collector power dissipation	P_C (Note 1)	100	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55 to 150	°C



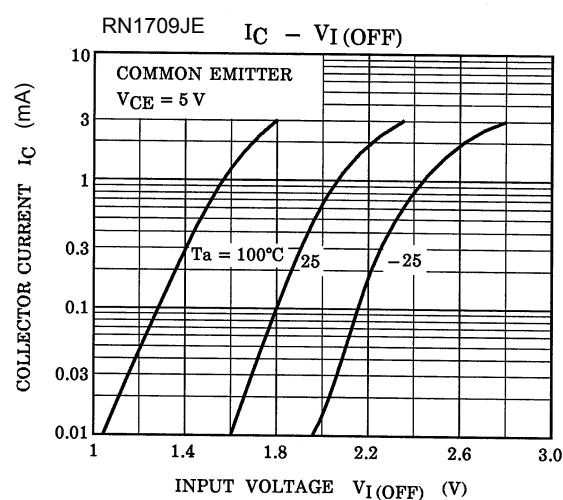
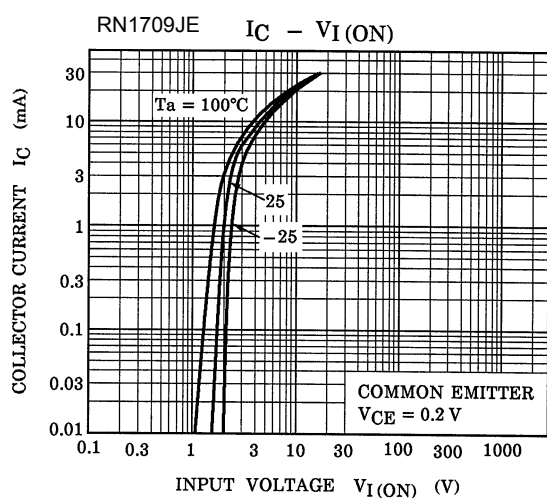
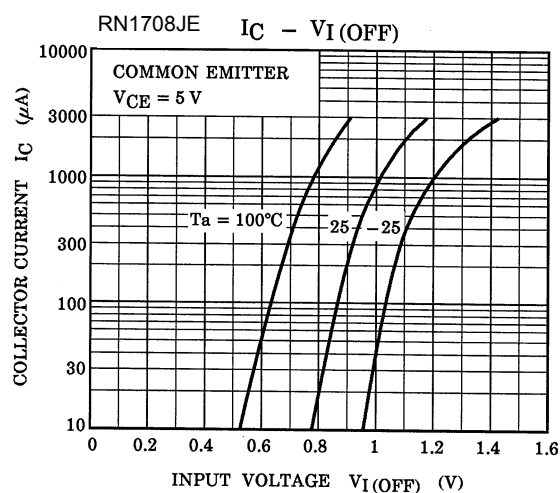
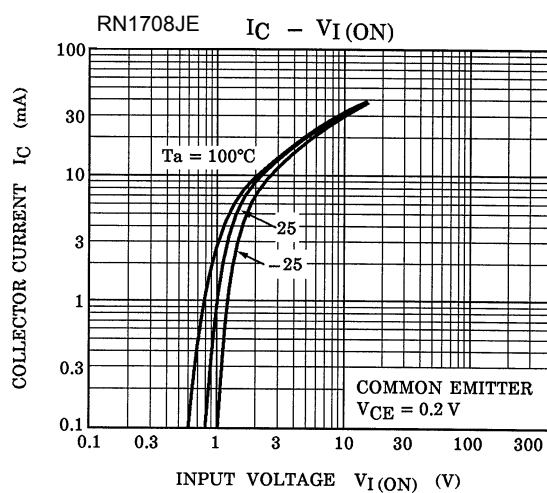
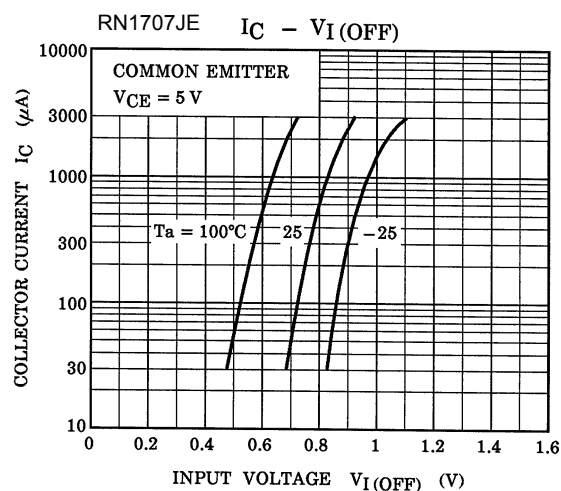
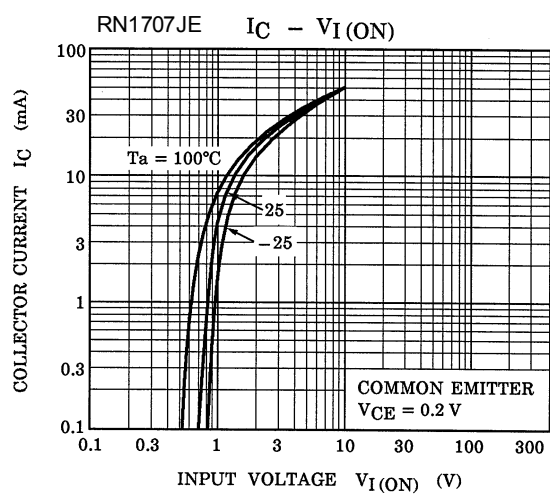
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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

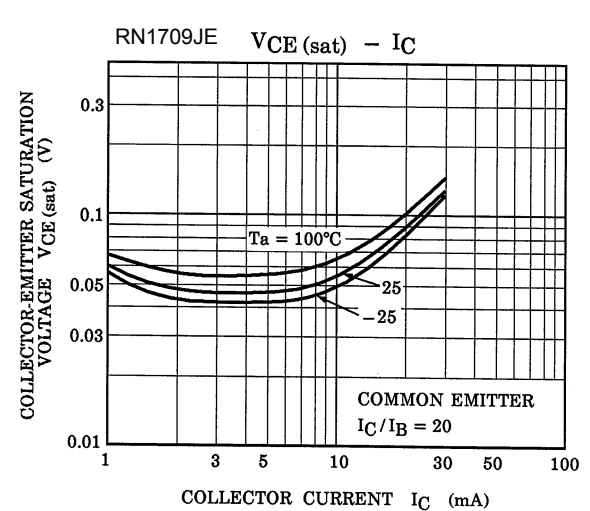
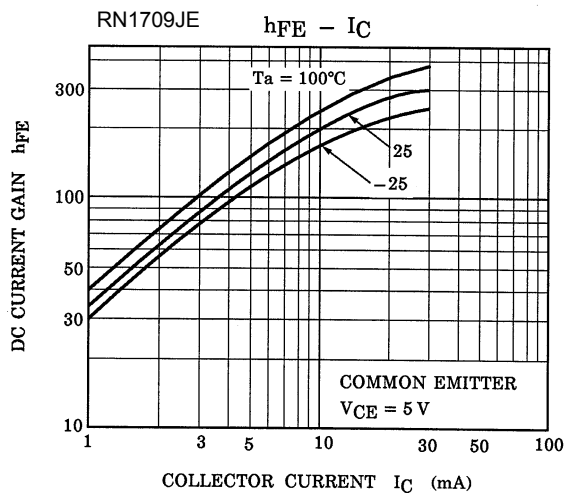
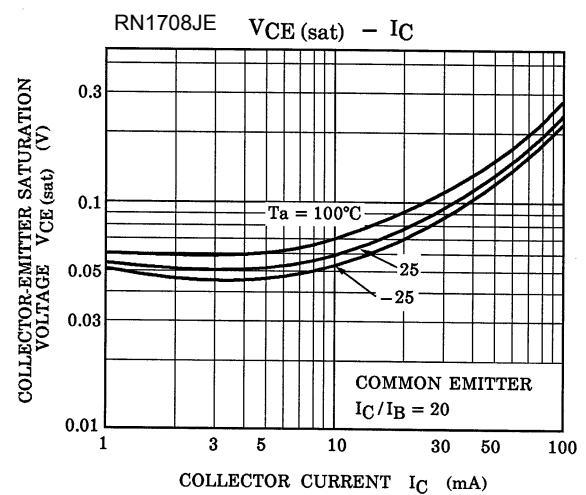
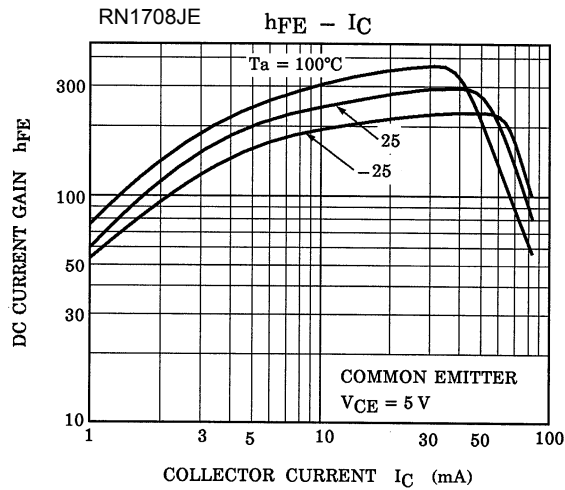
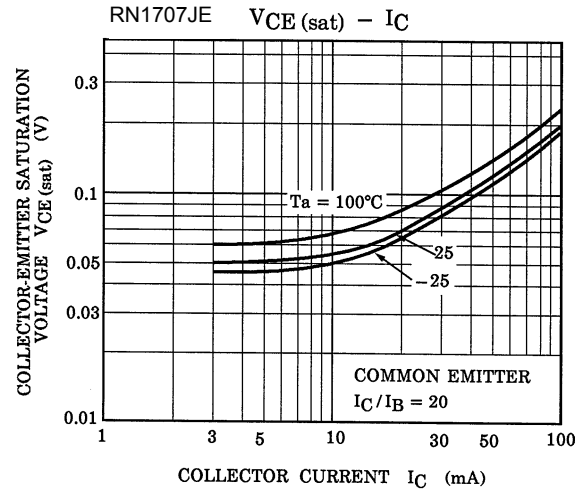
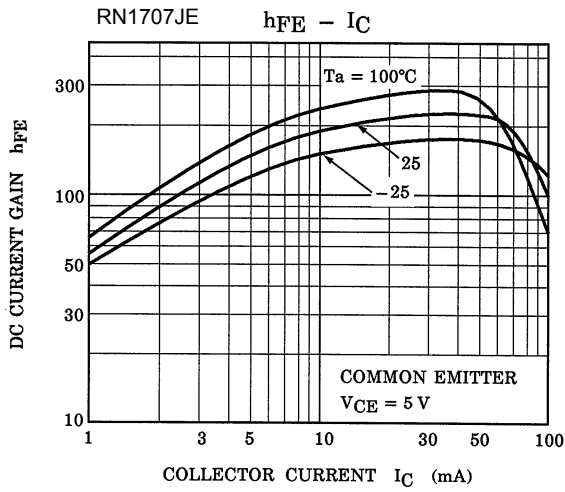
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1707JE to 1709JE	I_{CBO}	$V_{CB} = 50 \text{ V}, I_E = 0$	—	—	100	nA
		I_{CEO}	$V_{CE} = 50 \text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1707JE	I_{EBO}	$V_{EB} = 6 \text{ V}, I_C = 0$	0.081	—	0.15	mA
	RN1708JE		$V_{EB} = 7 \text{ V}, I_C = 0$	0.078	—	0.145	
	RN1709JE		$V_{EB} = 15 \text{ V}, I_C = 0$	0.167	—	0.311	
DC current gain	RN1707JE	h_{FE}	$V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$	80	—	—	—
	RN1708JE			80	—	—	
	RN1709JE			70	—	—	
Collector-emitter saturation voltage	RN1707JE to 1709JE	$V_{CE(sat)}$	$I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1707JE	$V_I(ON)$	$V_{CE} = 0.2 \text{ V}, I_C = 5 \text{ mA}$	0.7	—	1.8	V
	RN1708JE			1.0	—	2.6	
	RN1709JE			2.2	—	5.8	
Input voltage (OFF)	RN1707JE	$V_I(OFF)$	$V_{CE} = 5 \text{ V}, I_C = 0.1 \text{ mA}$	0.5	—	1	V
	RN1708JE			0.6	—	1.16	
	RN1709JE			1.5	—	2.6	
Transition frequency	RN1707JE to 1709JE	f_T	$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1707JE to 1709JE	C_{ob}	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	—	3	6	pF
Input resistor	RN1707JE	R1	—	7	10	13	kΩ
	RN1708JE			15.4	22	28.6	
	RN1709JE			32.9	47	61.1	
Resistor ratio	RN1707JE	R1/R2	—	0.191	0.213	0.232	—
	RN1708JE			0.421	0.468	0.515	
	RN1709JE			1.92	2.14	2.35	

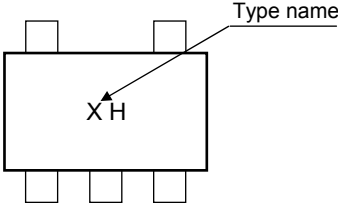
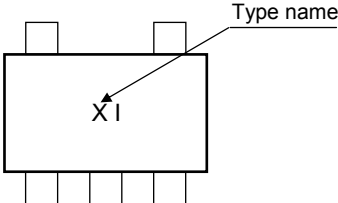
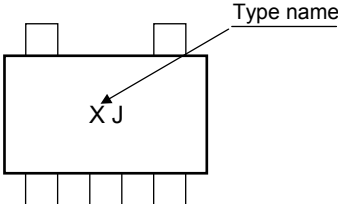
Q1, Q2 Common



Q1, Q2 Common



Marking

Type Name	Marking
RN1707JE	 The diagram shows a rectangular component with four pins on the top and three on the bottom. An arrow points from the text 'Type name' to the top-right pin. The marking 'XH' is located in the center of the component.
RN1708JE	 The diagram shows a rectangular component with four pins on the top and three on the bottom. An arrow points from the text 'Type name' to the top-right pin. The marking 'XI' is located in the center of the component.
RN1709JE	 The diagram shows a rectangular component with four pins on the top and three on the bottom. An arrow points from the text 'Type name' to the top-right pin. The marking 'XJ' is located in the center of the component.

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