

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

RN2707JE, RN2708JE, RN2709JE

Unit: mm

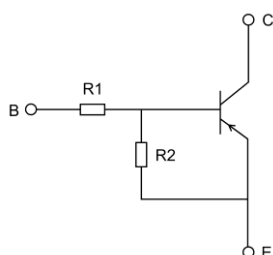
1. Applications

- Switching
- Inverter Circuit,
- Interface Circuit
- Driver Circuit

2. Features

- 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 are available for use in various circuit designs.
- Complementary to RN1707JE to RN1709JE

3. Equivalent Circuit and Bias Resistor Values



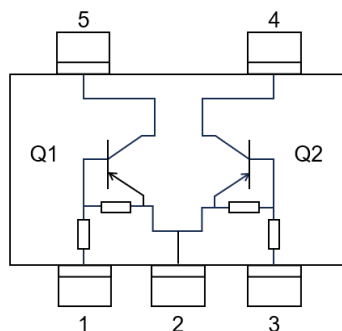
Type No.	R1 (kΩ)	R2 (kΩ)
RN2707JE	10	47
RN2708JE	22	47
RN2709JE	47	22

1.BASE1	(B1)
2.EMITTER	(E)
3.BASE2	(B2)
4.COLLECTOR2 (C2)	
5.COLLECTOR1 (C1)	
ESV	
JEDEC	—
JEITA	—
TOSHIBA	—

Weight: 3 mg (typ.)

Start of commercial production
2000-06

4. Equivalent Circuit (Top View)



5. Absolute Maximum Ratings (Note) ($T_a = 25^{\circ}\text{C}$) (Q1, Q2 common)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2707JE to 2709JE	V_{CBO}	-50	V
Collector-emitter voltage		V_{CEO}	-50	V
Emitter-base voltage	RN2707JE	V_{EBO}	-6	V
	RN2708JE		-7	
	RN2709JE		-15	
Collector current	RN2707JE to 2709JE	I_C	-100	mA
Collector power dissipation		P_C (Note 1)	100	mW
Junction temperature		T_j	150	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^{\circ}\text{C}$

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.

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2707JE to RN2709JE	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	RN2707JE	I_{EBO}	$V_{EB} = -6\text{ V}, I_C = 0$	-0.081	—	-0.15	mA
	RN2708JE		$V_{EB} = -7\text{ V}, I_C = 0$	-0.078	—	-0.145	
	RN2709JE		$V_{EB} = -15\text{ V}, I_C = 0$	-0.167	—	-0.311	
DC current gain	RN2707JE	h_{FE}	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	80	—	—	—
	RN2708JE			80	—	—	
	RN2709JE			70	—	—	
Collector-emitter saturation voltage	RN2707JE to RN2709JE	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V
Input voltage (ON)	RN2707JE	$V_{I(ON)}$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-0.7	—	-1.8	V
	RN2708JE			-1.0	—	-2.6	
	RN2709JE			-2.2	—	-5.8	
Input voltage (OFF)	RN2707JE	$V_{I(OFF)}$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-0.5	—	-1.0	V
	RN2708JE			-0.6	—	-1.16	
	RN2709JE			-1.5	—	-2.6	
Transition frequency	RN2707JE to RN2709JE	f_T	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz
Collector output capacitance	RN2707JE to RN2709JE	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	6	pF
Input resistor	RN2707JE	R1	—	7	10	13	kΩ
	RN2708JE			15.4	22	28.6	
	RN2709JE			32.9	47	61.1	
Resistor ratio	RN2707JE	R1 / R2	—	0.191	0.213	0.232	—
	RN2708JE			0.421	0.468	0.515	
	RN2709JE			1.92	2.14	2.35	

7. Characteristics Curves (Note) (Q1, Q2 Common)

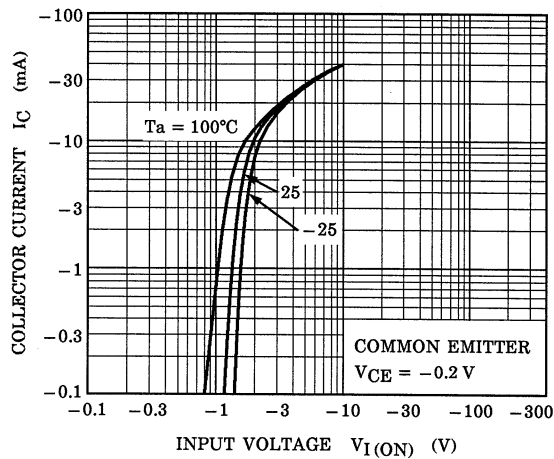


Fig 7.1 RN2707JE $I_C - V_{I(ON)}$

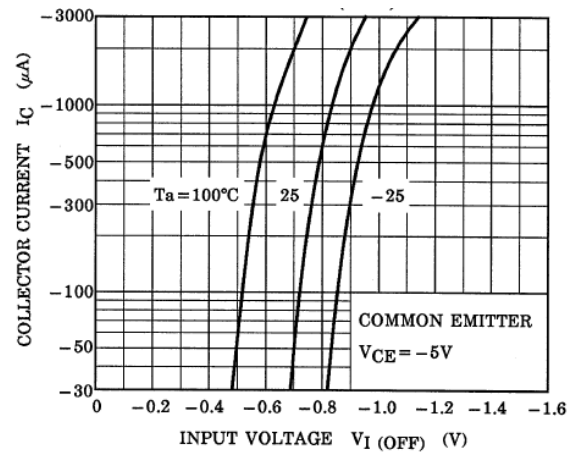


Fig 7.2 RN2707JE $I_C - V_{I(OFF)}$

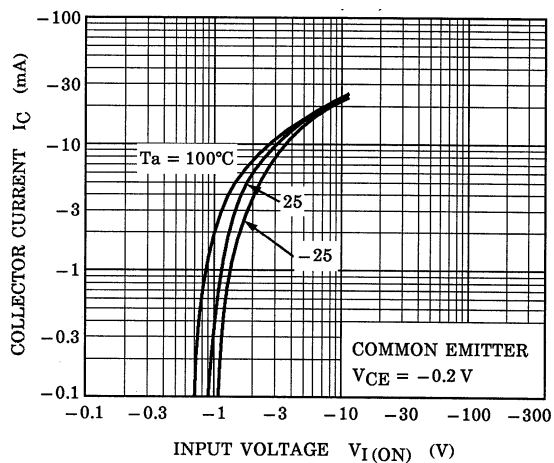


Fig 7.3 RN2708JE $I_C - V_{I(ON)}$

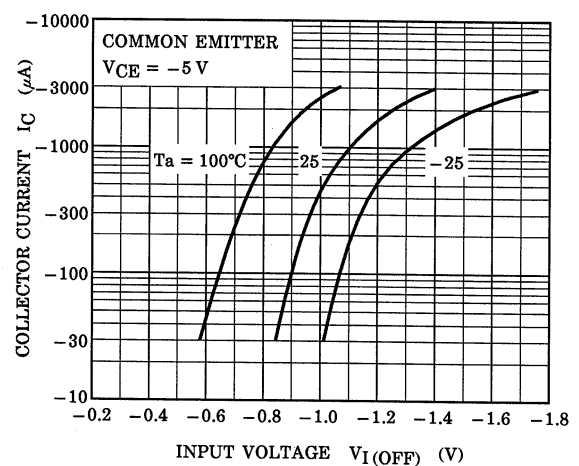


Fig 7.4 RN2708JE $I_C - V_{I(OFF)}$

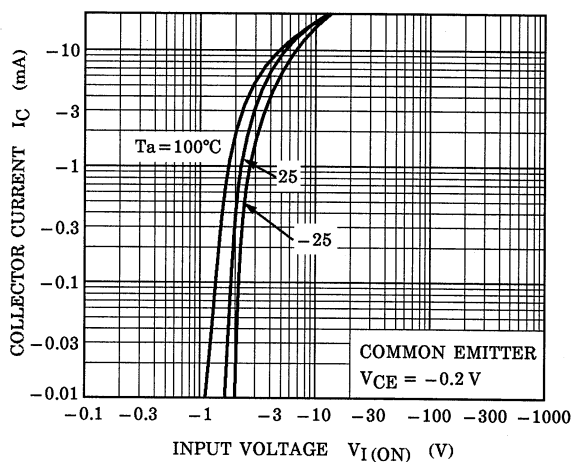


Fig 7.5 RN2709JE $I_C - V_{I(ON)}$

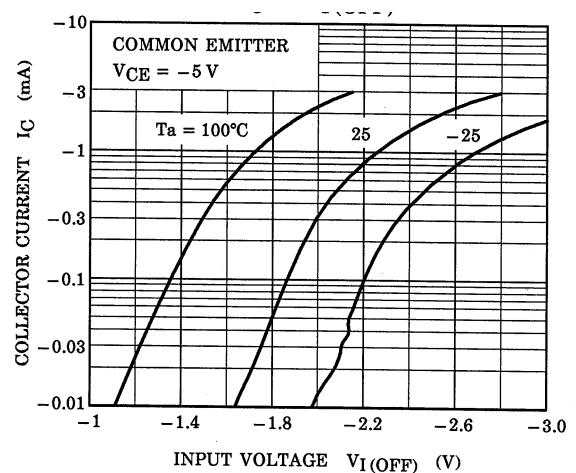


Fig 7.6 RN2709JE $I_C - V_{I(OFF)}$

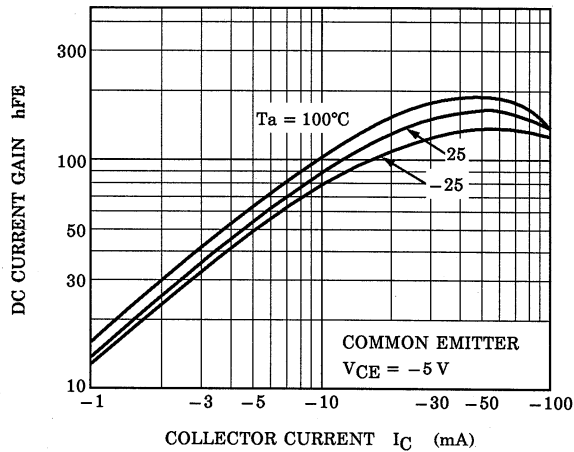


Fig 7.7 RN2707JE $h_{FE} - I_C$

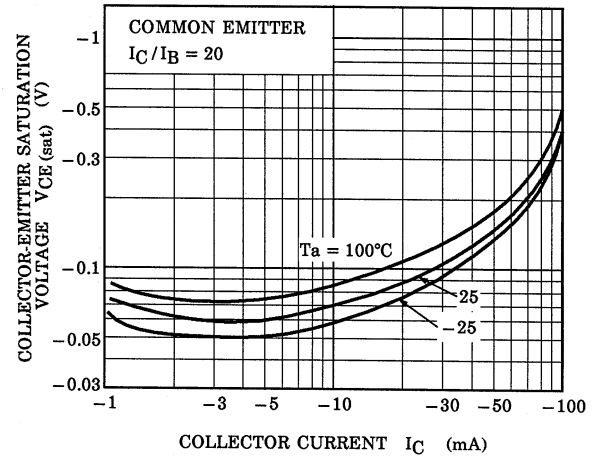


Fig 7.8 RN2707JE $V_{CE(sat)} - I_C$

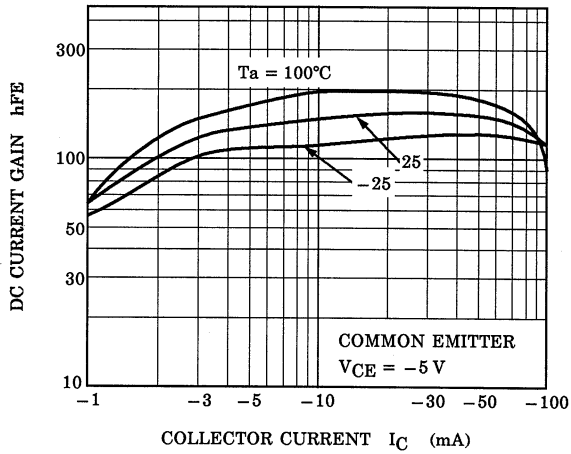


Fig 7.9 RN2708JE $h_{FE} - I_C$

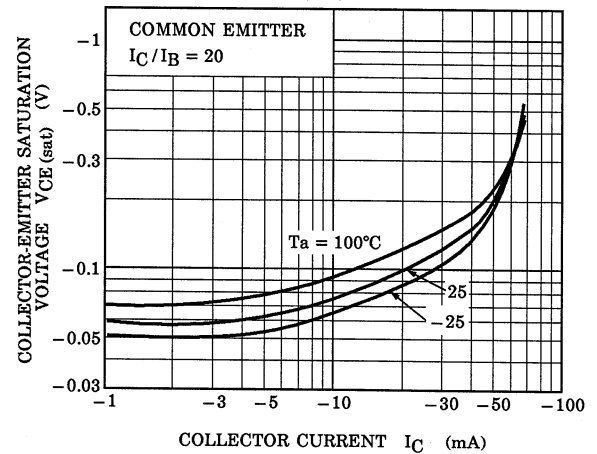


Fig 7.10 RN2708JE $V_{CE(sat)} - I_C$

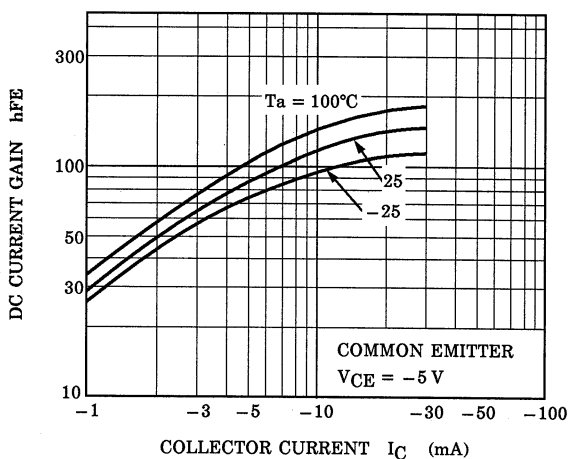


Fig 7.11 RN2709JE $h_{FE} - I_C$

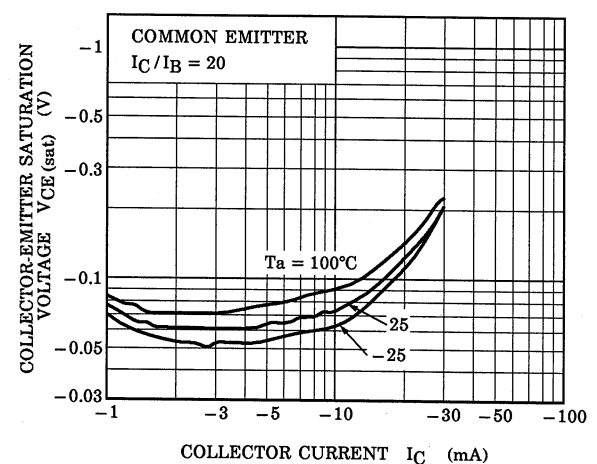
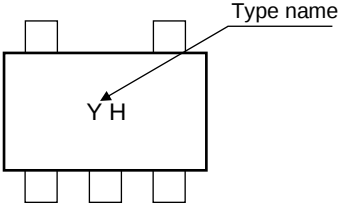
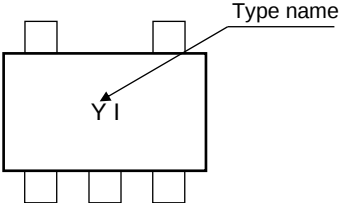
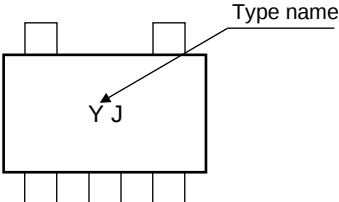


Fig 7.12 RN2709JE $V_{CE(sat)} - I_C$

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

8. Marking

Type Name	Marking
RN2707JE	 A diagram of a rectangular component with four pins on the top and three on the bottom. The marking 'YH' is in the center. An arrow points from the text 'Type name' to the 'Y' in 'YH'.
RN2708JE	 A diagram of a rectangular component with four pins on the top and three on the bottom. The marking 'YI' is in the center. An arrow points from the text 'Type name' to the 'Y' in 'YI'.
RN2709JE	 A diagram of a rectangular component with four pins on the top and three on the bottom. The marking 'YJ' is in the center. An arrow points from the text 'Type name' to the 'Y' in 'YJ'.

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