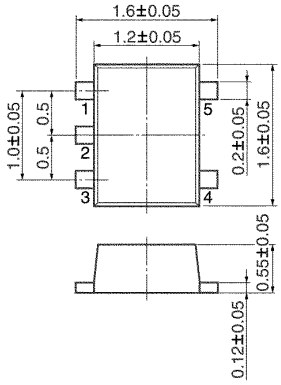
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor Built-in Transistor)

RN1707JE, RN1708JE, RN1709JE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- 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

Unit: mm



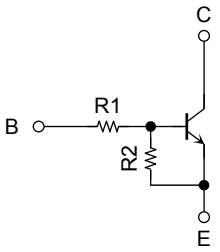
1.BASE1 (B1)
2.EMITTER (E)
3.BASE2 (B2)
4.COLLECTOR2 (C2)
5.COLLECTOR1 (C1)

ESV

JEDEC	—
JEITA	—
TOSHIBA	2-2P1D

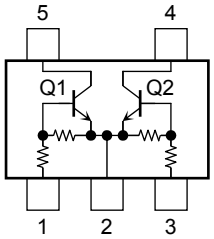
Weight:3mg (typ.)

Equivalent Circuit and Bias Resistor Values



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

Equivalent Circuit (top view)



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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1707JE to 1709JE	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1707JE	V_{EBO}	6	V
	RN1708JE		7	
	RN1709JE		15	
Collector current	RN1707JE to 1709JE	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 to150	°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

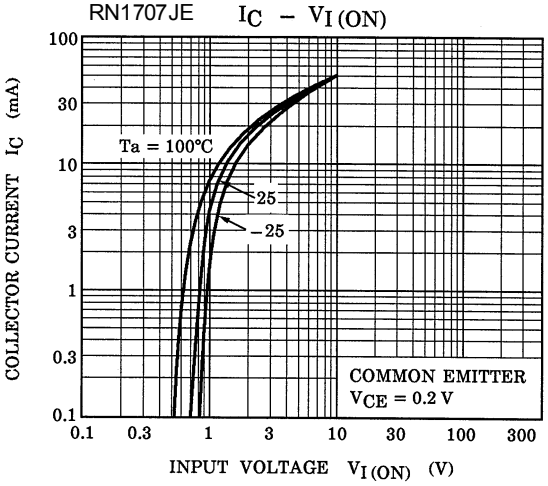
Start of commercial production
2000-06

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

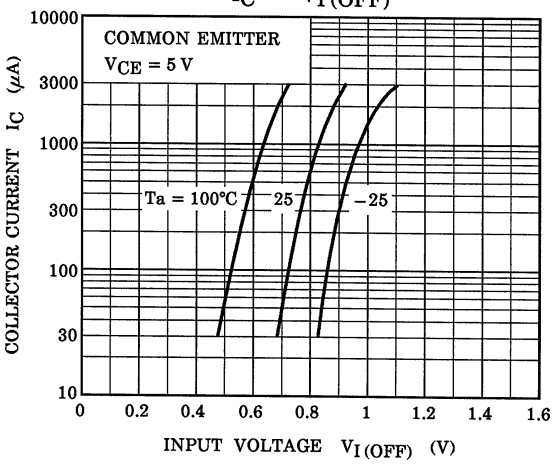
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1707JE to RN1709JE	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1707JE	I_{EBO}	V_{EB} = 6 V, I_C = 0	0.081	—	0.15	mA
	RN1708JE		V_{EB} = 7 V, I_C = 0	0.078	—	0.145	
	RN1709JE		V_{EB} = 15 V, I_C = 0	0.167	—	0.311	
DC current gain	RN1707JE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	80	—	—	—
	RN1708JE			80	—	—	
	RN1709JE			70	—	—	
Collector-emitter saturation voltage	RN1707JE to RN1709JE	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1707JE	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 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 V, I_C = 0.1 mA	0.5	—	1	V
	RN1708JE			0.6	—	1.16	
	RN1709JE			1.5	—	2.6	
Transition frequency	RN1707JE to RN1709JE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1707JE to RN1709JE	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 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

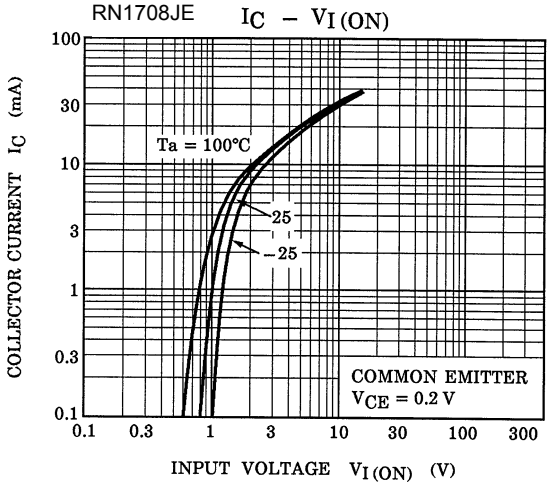
RN1707JE $I_C - V_{I(ON)}$



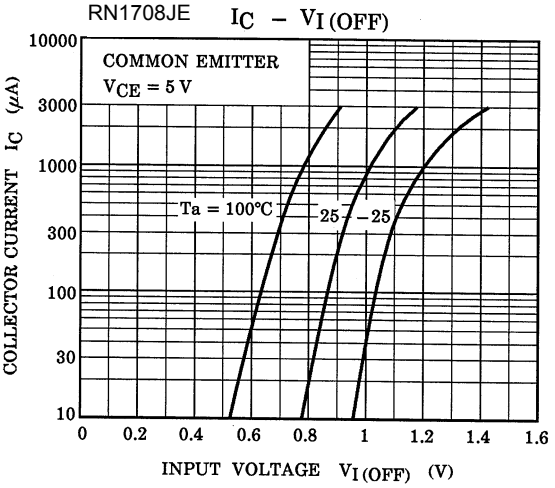
RN1707JE $I_C - V_{I(OFF)}$



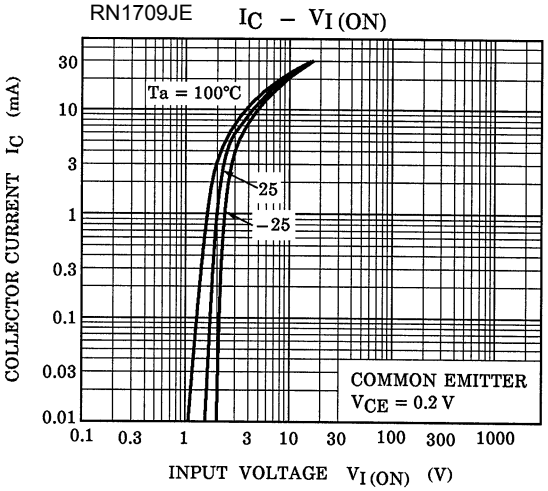
RN1708JE $I_C - V_{I(ON)}$



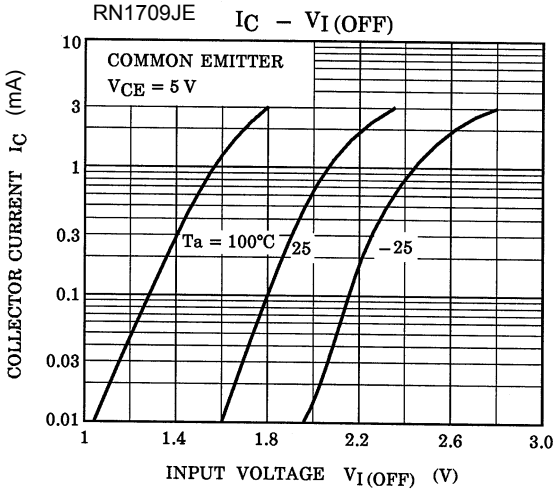
RN1708JE $I_C - V_{I(OFF)}$



RN1709JE $I_C - V_{I(ON)}$

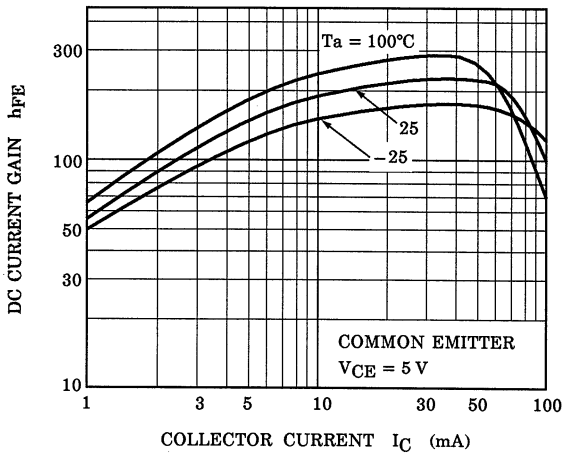


RN1709JE $I_C - V_{I(OFF)}$

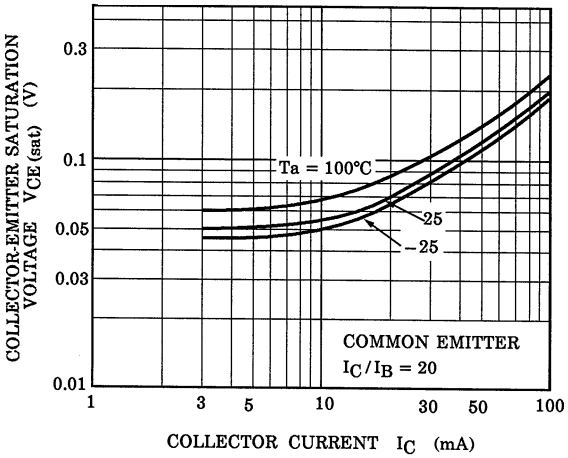


Q1, Q2 Common

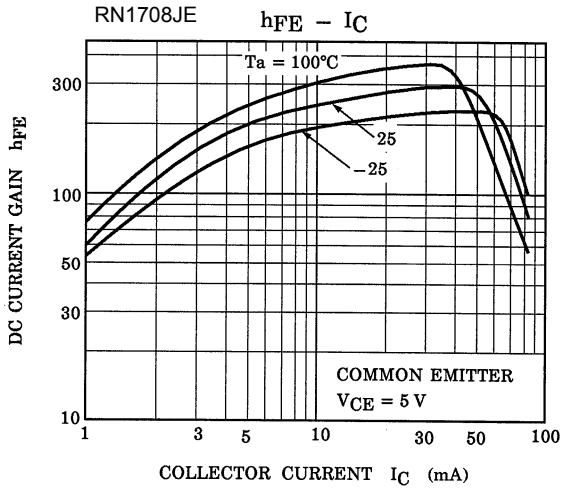
RN1707JE h_{FE} – I_C



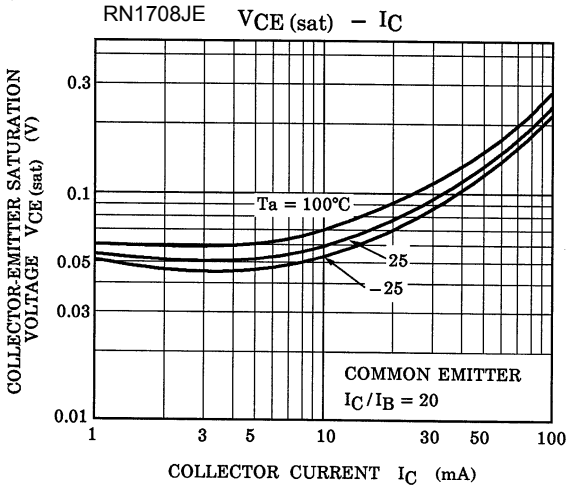
RN1707JE $V_{CE\,(sat)}$ – I_C



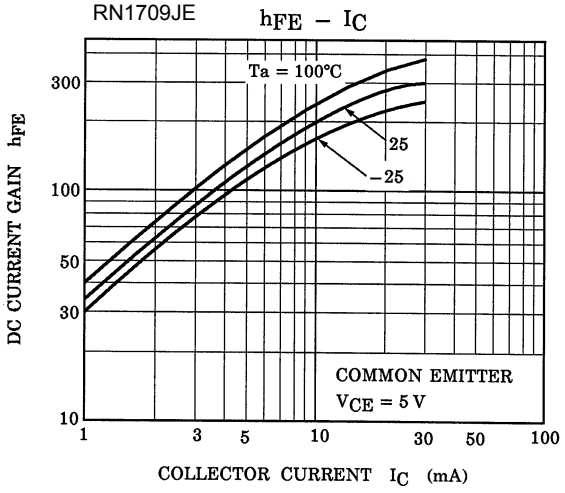
RN1708JE h_{FE} – I_C



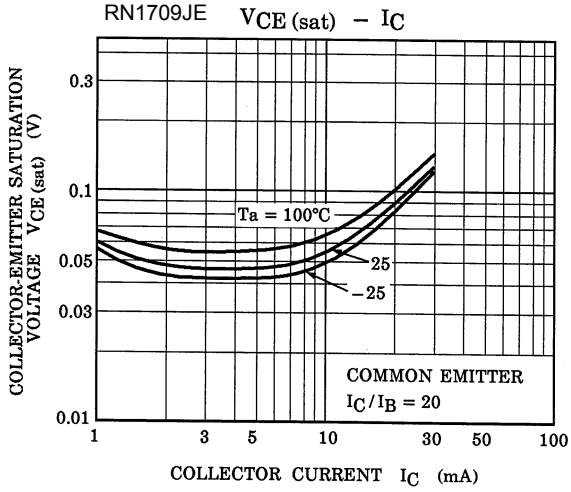
RN1708JE $V_{CE\,(sat)}$ – I_C



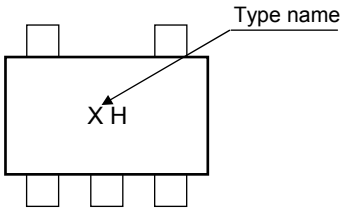
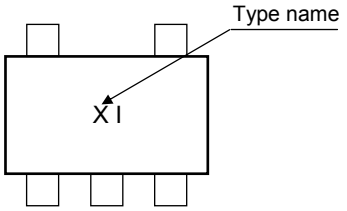
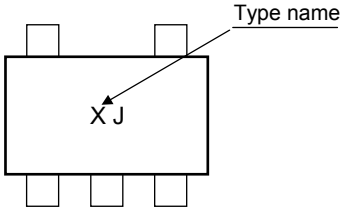
RN1709JE h_{FE} – I_C



RN1709JE $V_{CE\,(sat)}$ – I_C



Marking

Type Name	Marking
RN1707JE	
RN1708JE	
RN1709JE	

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