

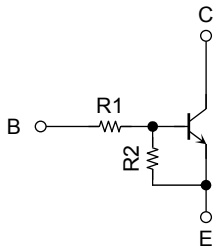
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor Built-in Transistor)

## RN1907FE, RN1908FE, RN1909FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

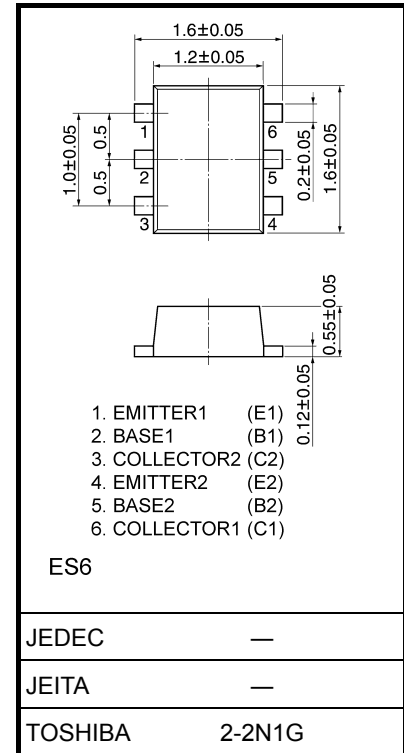
- Two devices are incorporated into an Extreme-Super-Mini (6-pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.
- Complementary to RN2907FE~RN2909FE

### Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1907FE	10	47
RN1908FE	22	47
RN1909FE	47	22

Unit: mm



Weight: 0.003 g (typ.)

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

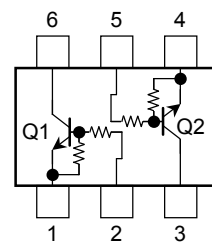
Characteristics	Symbol	Rating	Unit
Collector-base voltage	RN1907FE~RN1909FE	V <sub>CB0</sub>	50 V
Collector-emitter voltage	RN1907FE~RN1909FE	V <sub>CEO</sub>	50 V
Emitter-base voltage	RN1907FE	6	V
	RN1908FE	7	
	RN1909FE	15	
Collector current	RN1907FE~RN1909FE	I <sub>C</sub>	100 mA
Collector power dissipation	RN1907FE~RN1909FE	P <sub>C</sub> (Note 1)	100 mW
Junction temperature	RN1907FE~RN1909FE	T <sub>j</sub>	150 °C
Storage temperature range	RN1907FE~RN1909FE	T <sub>stg</sub>	-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

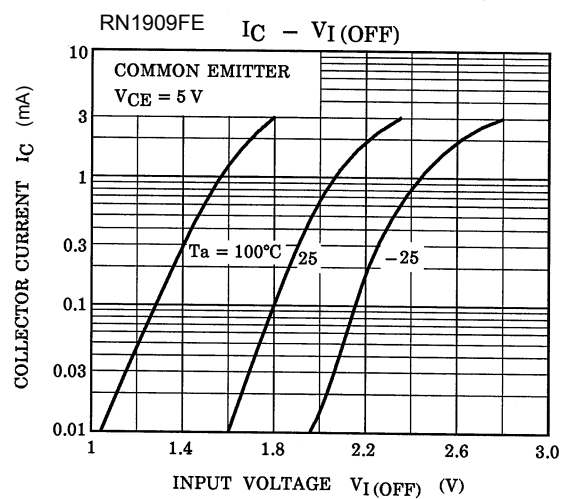
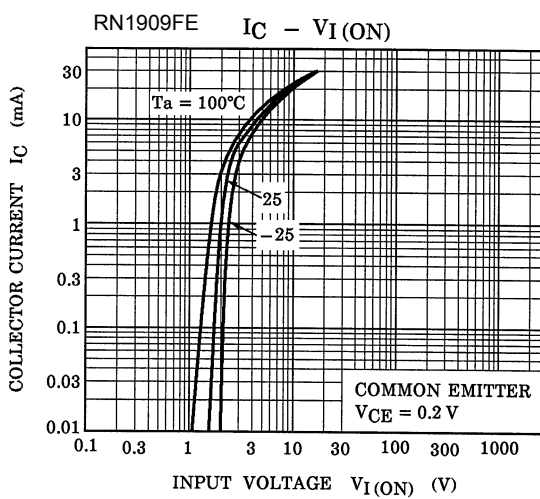
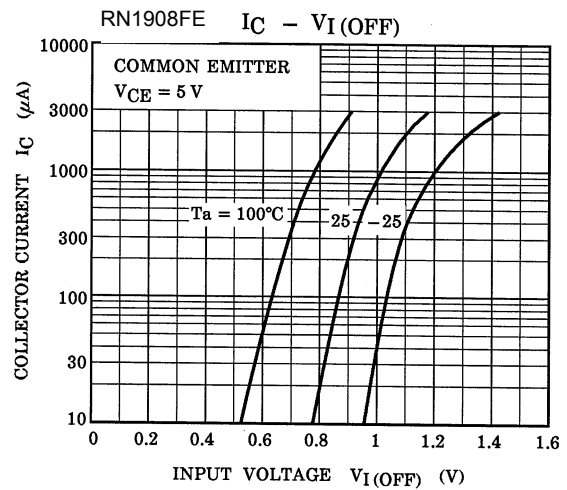
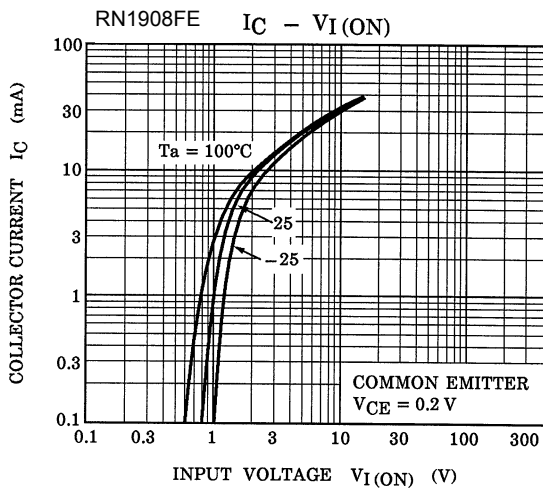
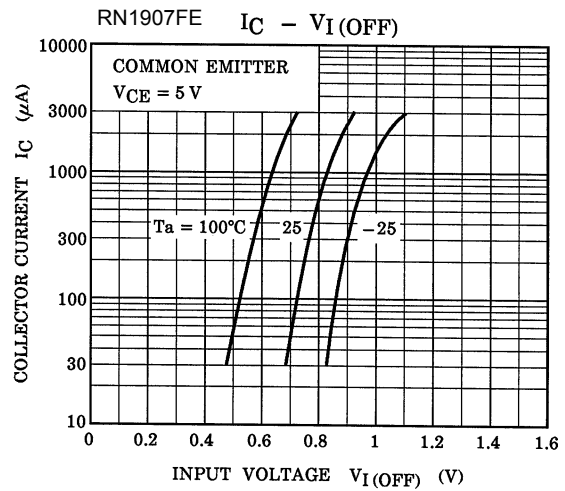
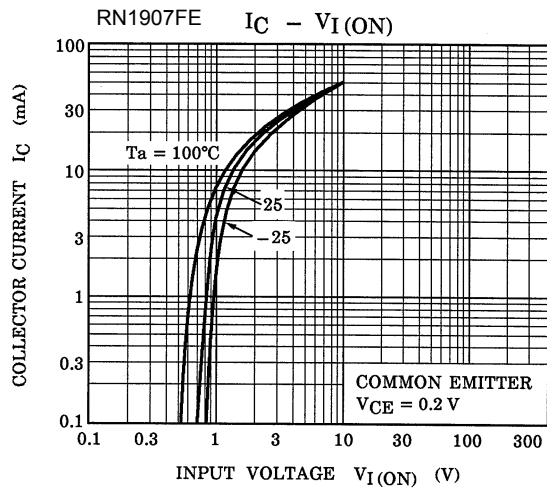
### Equivalent Circuit (top view)



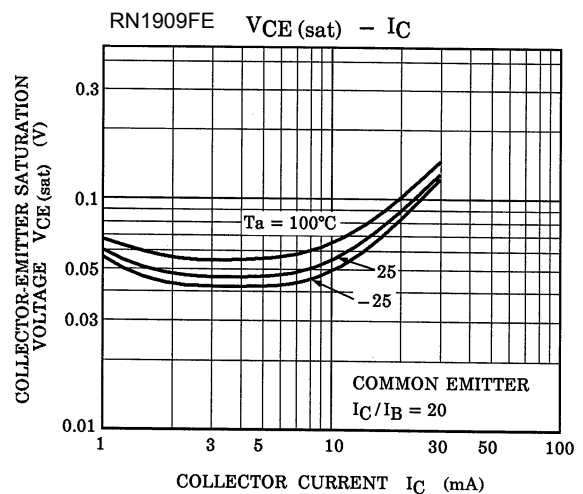
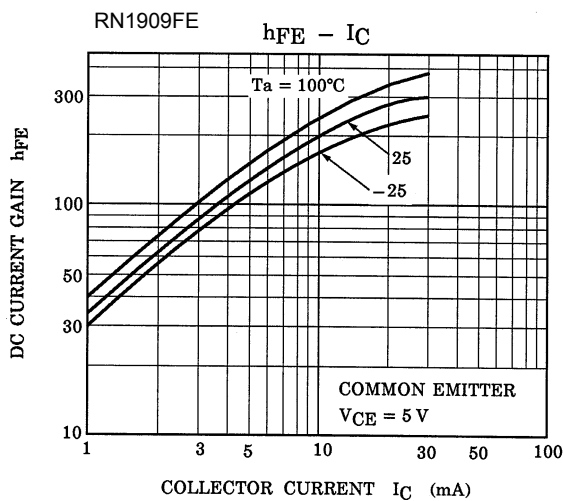
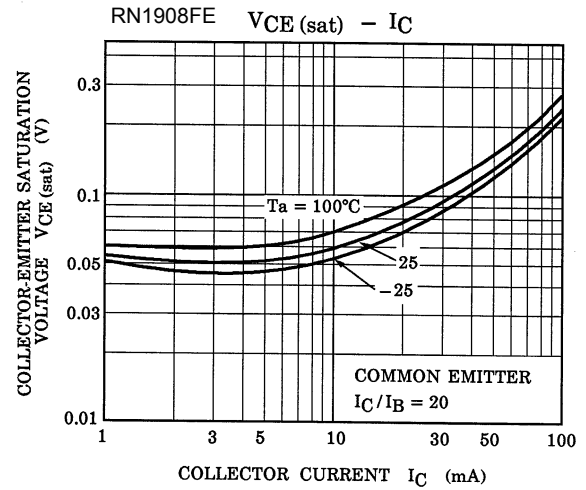
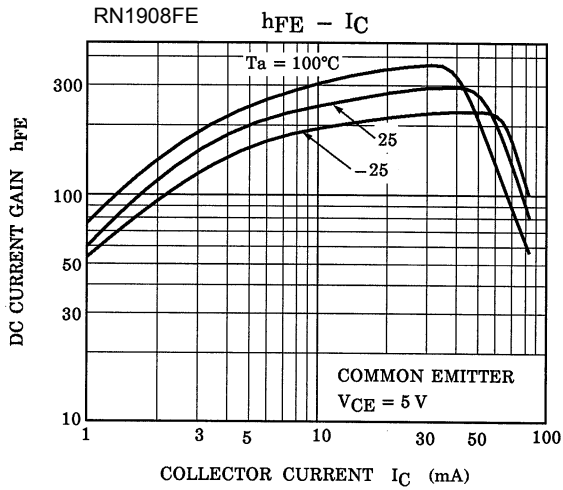
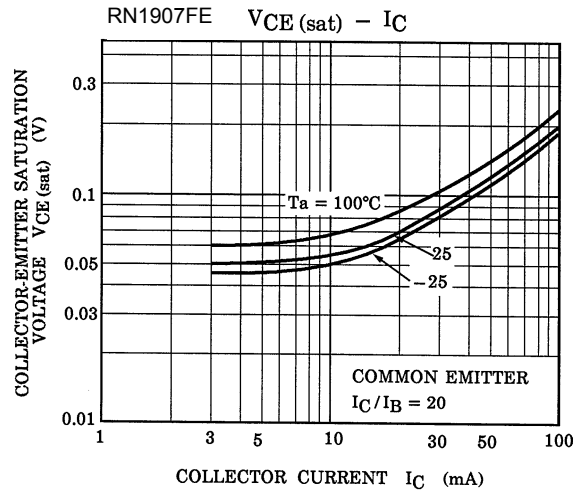
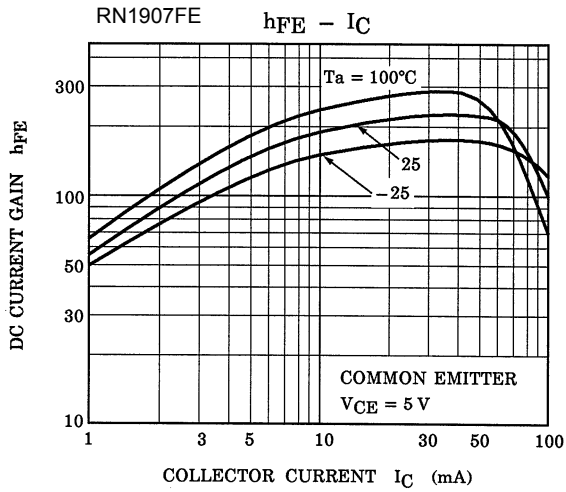
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

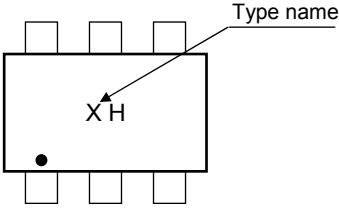
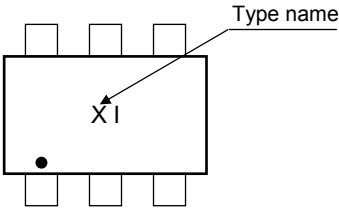
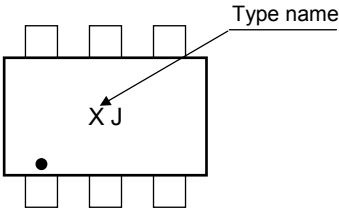
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1907FE~1909FE	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1907FE	$I_{EBO}$	$V_{EB} = 6\text{ V}, I_C = 0$	0.081	—	0.15	mA
	RN1908FE		$V_{EB} = 7\text{ V}, I_C = 0$	0.078	—	0.145	
	RN1909FE		$V_{EB} = 15\text{ V}, I_C = 0$	0.167	—	0.311	
DC current gain	RN1907FE	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	80	—	—	
	RN1908FE			80	—	—	
	RN1909FE			70	—	—	
Collector-emitter saturation voltage	RN1907FE~1909FE	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1907FE	$V_I(ON)$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.7	—	1.8	V
	RN1908FE			1.0	—	2.6	
	RN1909FE			2.2	—	5.8	
Input voltage (OFF)	RN1907FE	$V_I(OFF)$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.5	—	1	V
	RN1908FE			0.6	—	1.16	
	RN1909FE			1.5	—	2.6	
Transition frequency	RN1907FE~1909FE	$f_T$	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1907FE~1909FE	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	6	pF
Input resistor	RN1907FE	R1	—	7	10	13	kΩ
	RN1908FE			15.4	22	28.6	
	RN1909FE			32.9	47	61.1	
Resistor ratio	RN1907FE	R1/R2	—	0.191	0.213	0.232	
	RN1908FE			0.421	0.468	0.515	
	RN1909FE			1.92	2.14	2.35	

## Q1, Q2 Common



Q1, Q2 Common



Type Name	Marking
RN1907FE	 A diagram of a rectangular component with six pins (three on top, three on bottom). The marking 'XH' is printed in the center. A small black dot is located at the bottom-left corner. An arrow labeled 'Type name' points to the 'H' in 'XH'.
RN1908FE	 A diagram of a rectangular component with six pins (three on top, three on bottom). The marking 'XI' is printed in the center. A small black dot is located at the bottom-left corner. An arrow labeled 'Type name' points to the 'I' in 'XI'.
RN1909FE	 A diagram of a rectangular component with six pins (three on top, three on bottom). The marking 'XJ' is printed in the center. A small black dot is located at the bottom-left corner. An arrow labeled 'Type name' points to the 'J' in 'XJ'.

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