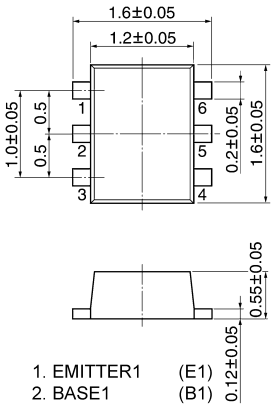
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor Built-in Transistor)

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

Unit: mm



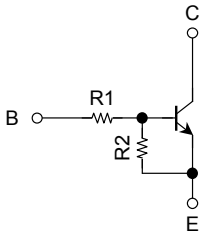
1. EMITTER1 (E1)
2. BASE1 (B1)
3. COLLECTOR2 (C2)
4. EMITTER2 (E2)
5. BASE2 (B2)
6. COLLECTOR1 (C1)

ES6

JEDEC	—
JEITA	—
TOSHIBA	2-2N1G

Weight: 0.003 g (typ.)

Equivalent Circuit and Bias Resistor Values



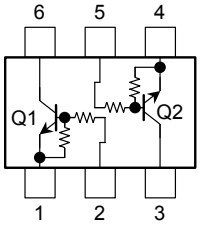
Type No.	R1 (kΩ)	R2 (kΩ)
RN1907FE	10	47
RN1908FE	22	47
RN1909FE	47	22

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1907FE~ RN1909FE	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1907FE	V_{EBO}	6	V
	RN1908FE		7	
	RN1909FE		15	
Collector current	RN1907FE~ RN1909FE	I_C	100	mA
Collector power dissipation		P_C (Note)	100	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Note: Total rating

Equivalent Circuit (top view)



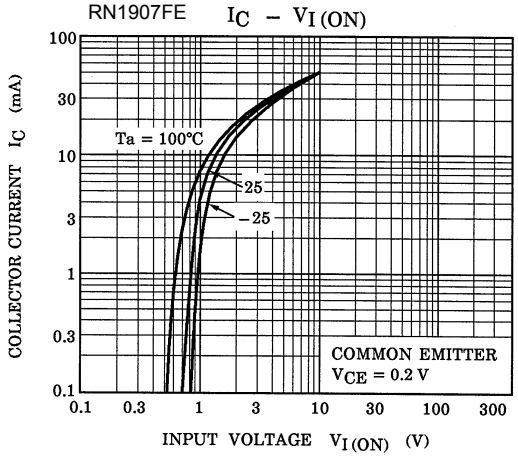
Downloaded from Elcodis.com electronic components distributor

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

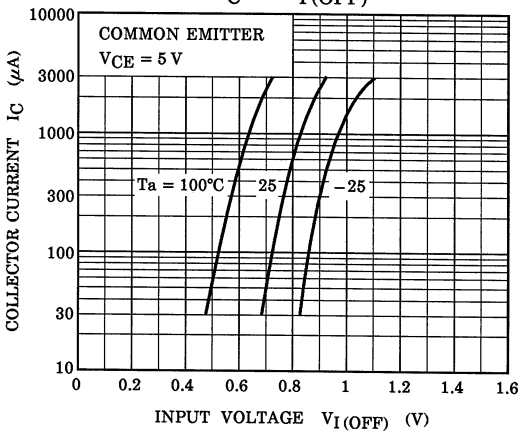
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1907FE~1909FE	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1907FE	I_{EBO}	V_{EB} = 6 V, I_C = 0	0.081	—	0.15	mA
	RN1908FE		V_{EB} = 7 V, I_C = 0	0.078	—	0.145	
	RN1909FE		V_{EB} = 15 V, I_C = 0	0.167	—	0.311	
DC current gain	RN1907FE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	80	—	—	
	RN1908FE			80	—	—	
	RN1909FE			70	—	—	
Collector-emitter saturation voltage	RN1907FE~1909FE	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1907FE	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 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 V, I_C = 0.1 mA	0.5	—	1	V
	RN1908FE			0.6	—	1.16	
	RN1909FE			1.5	—	2.6	
Transition frequency	RN1907FE~1909FE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1907FE~1909FE	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 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	

Downloaded from Elcodis.com electronic components distributor

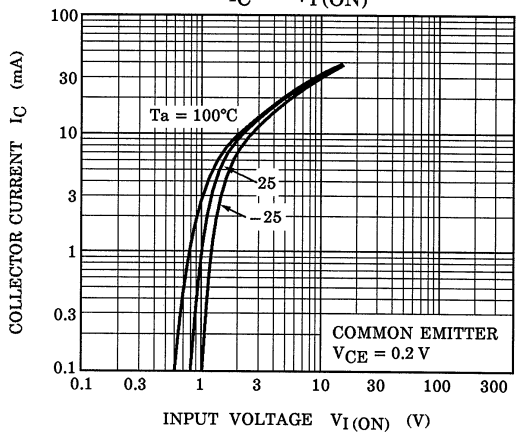
RN1907FE I_C – $V_{I(ON)}$



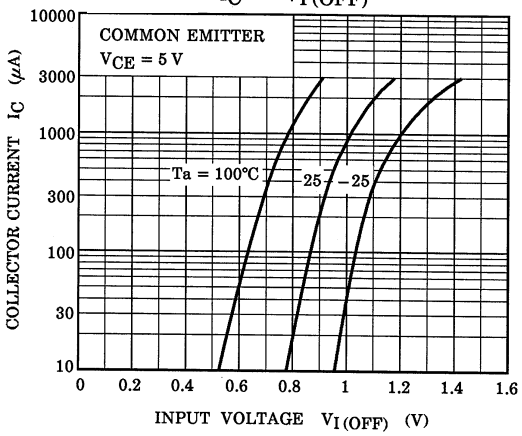
RN1907FE I_C – $V_{I(OFF)}$



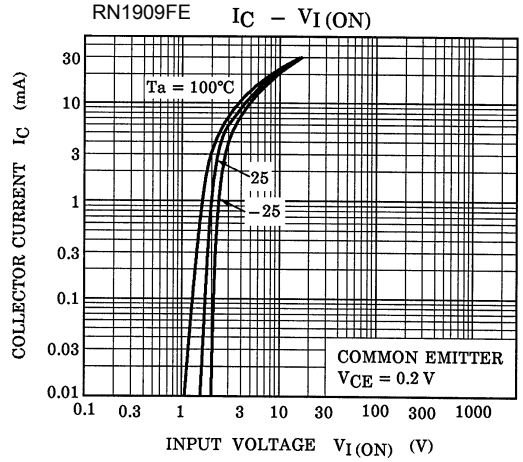
RN1908FE I_C – $V_{I(ON)}$



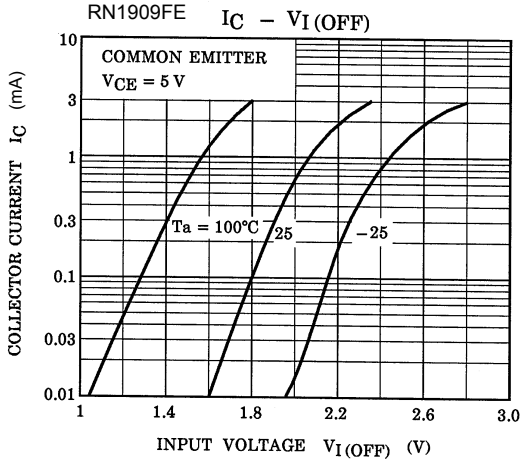
RN1908FE I_C – $V_{I(OFF)}$



RN1909FE I_C – $V_{I(ON)}$

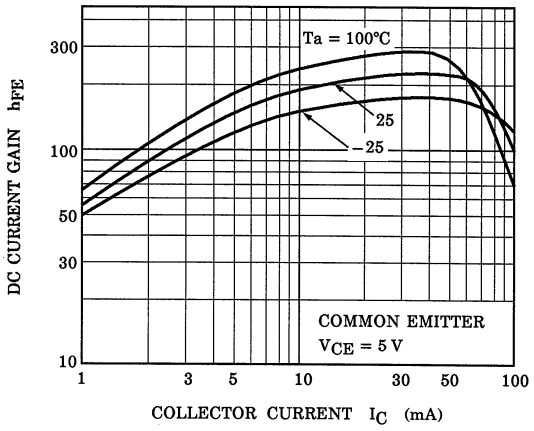


RN1909FE I_C – $V_{I(OFF)}$

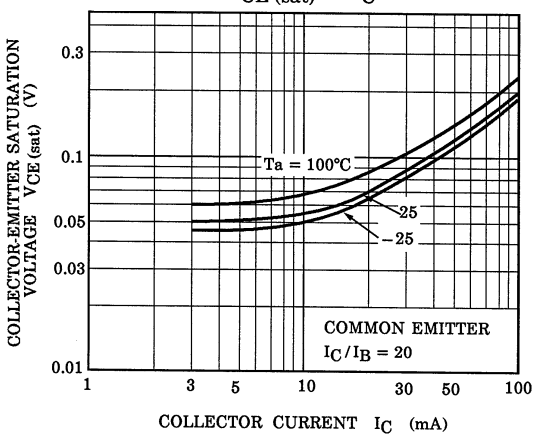


Downloaded from Elcodis.com electronic components distributor

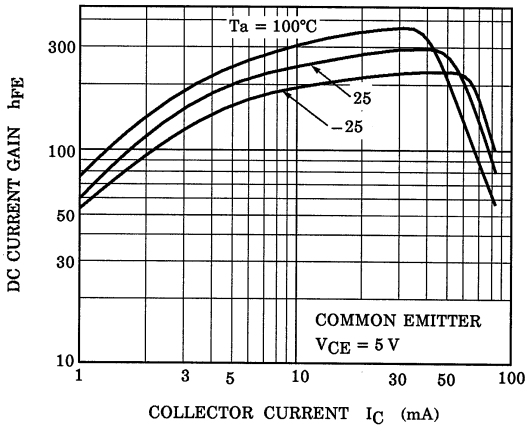
RN1907FE h_{FE} – I_C



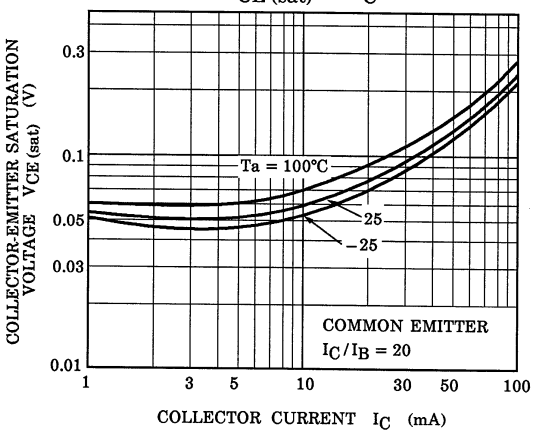
RN1907FE $V_{CE\,(sat)}$ – I_C



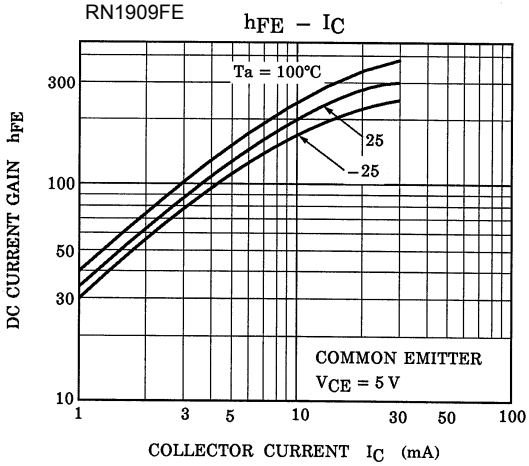
RN1908FE h_{FE} – I_C



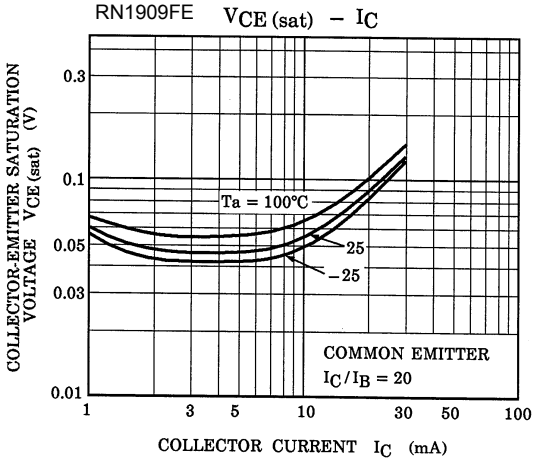
RN1908FE $V_{CE\,(sat)}$ – I_C



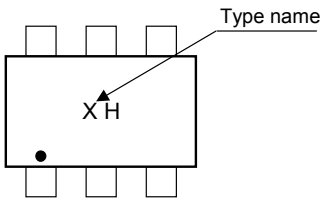
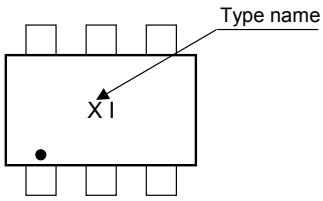
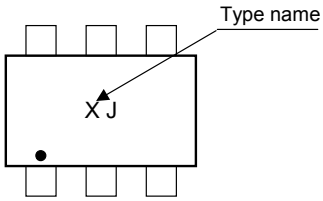
RN1909FE h_{FE} – I_C



RN1909FE $V_{CE\,(sat)}$ – I_C



Downloaded from Elcodis.com electronic components distributor

Type Name	Marking
RN1907FE	
RN1908FE	
RN1909FE	

Downloaded from Elcodis.com electronic components distributor

RESTRICTIONS ON PRODUCT USE

030619EAA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.

Downloaded from Elcodis.com electronic components distributor