

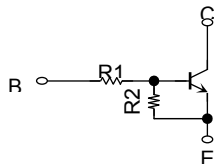
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN1967FS,RN1968FS,RN1969FS

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

- Two devices are incorporated into a fine pitch Small Mold (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count.
Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2967FS~RN2969FS

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1967FS	10	47
RN1968FS	22	47
RN1969FS	47	22

Unit: mm	
1.EMITTER1 (E1)	
2.EMITTER2 (E2)	
3.BASE2 (B2)	
4.COLLECTOR2 (C2)	
5.BASE1 (B1)	
6.COLLECTOR1 (C1)	
fS6	
JEDEC	—
JEITA	—
TOSHIBA	2-1F1C

Weight: 0.001 g (typ.)

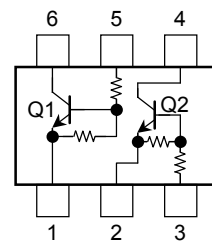
Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1967FS~ 1969FS	V _{CBO}	20	V
Collector-emitter voltage		V _{CEO}	20	V
Emitter-base voltage	RN1967FS	V _{EBO}	6	V
	RN1968FS		7	
	RN1969FS		15	
Collector current	RN1967FS~ RN1969FS	I _C	50	mA
Collector power dissipation		P _C (Note 1)	50	mW
Junction temperature		T _j	150	°C
Storage temperature range		T _{stg}	−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

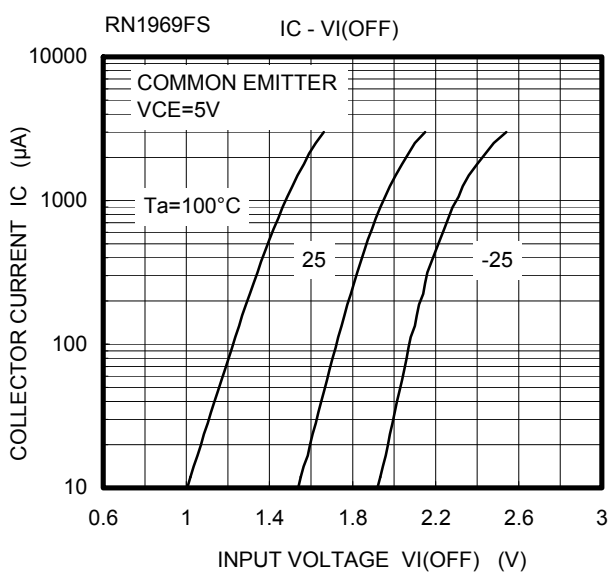
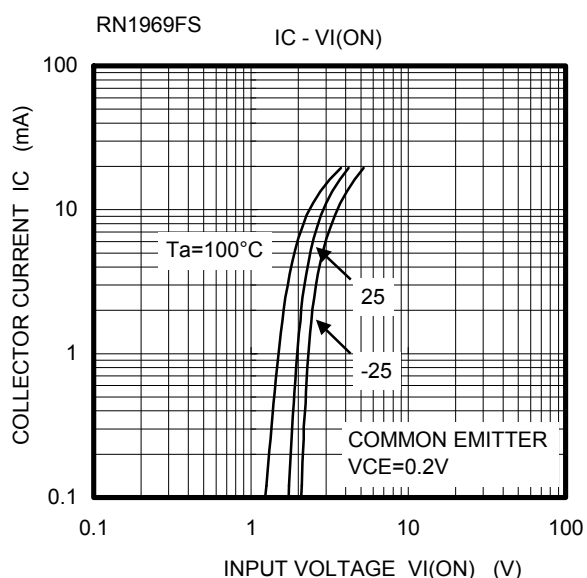
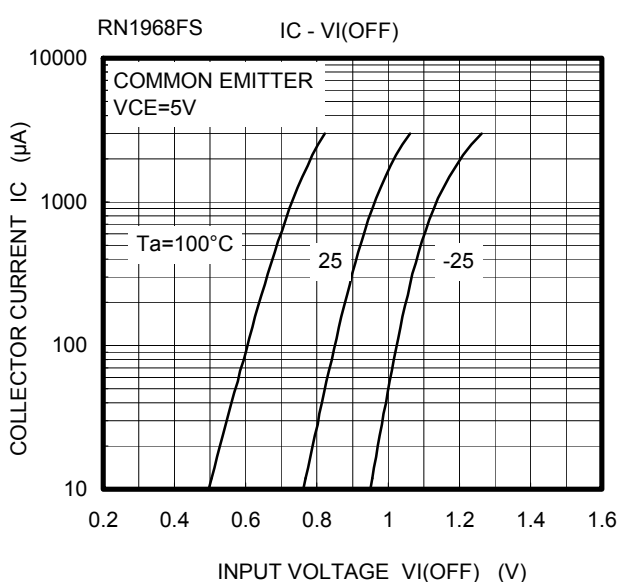
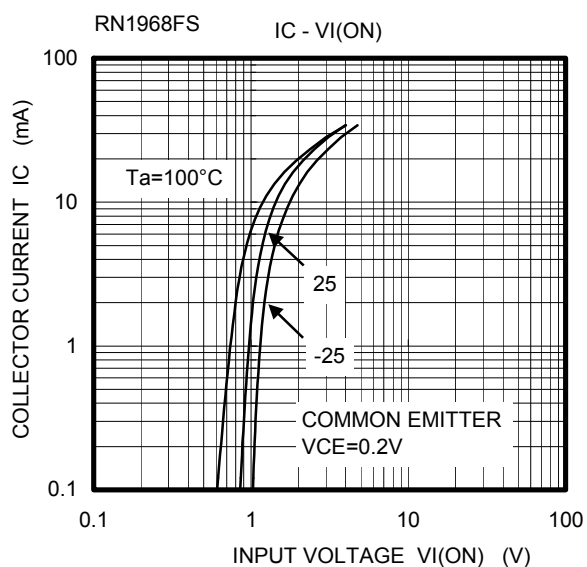
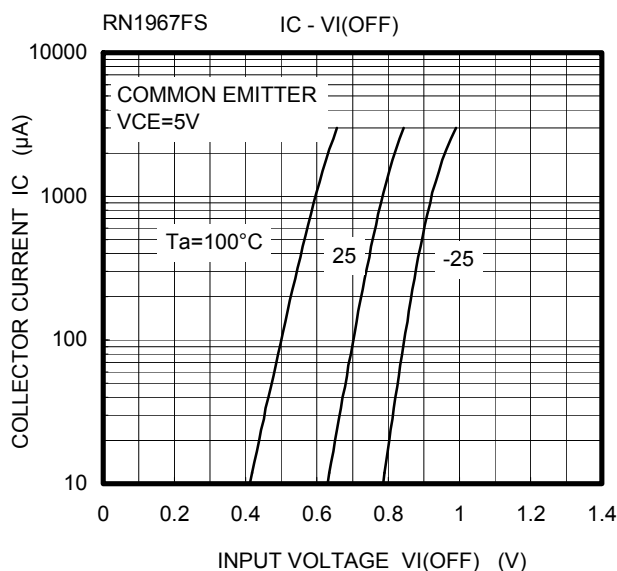
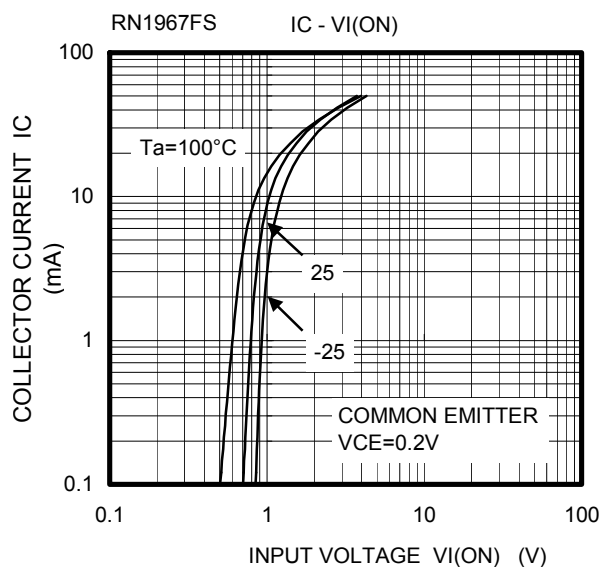
Equivalent Circuit (top view)



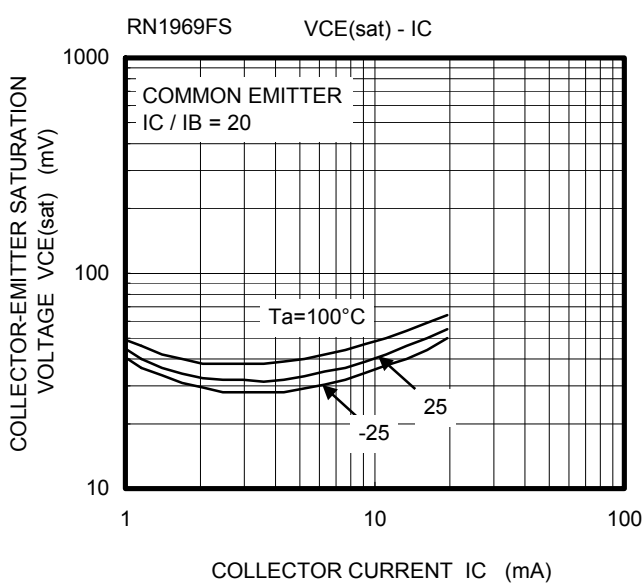
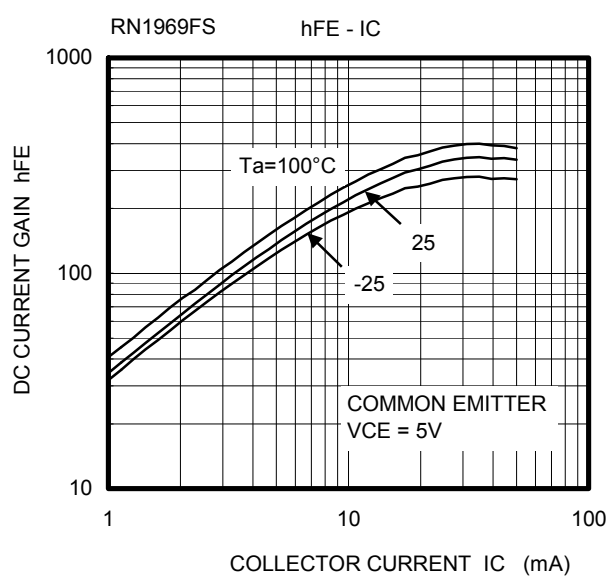
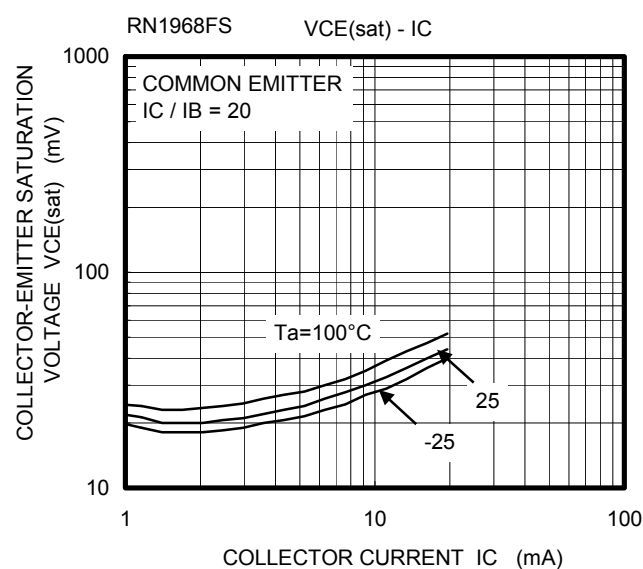
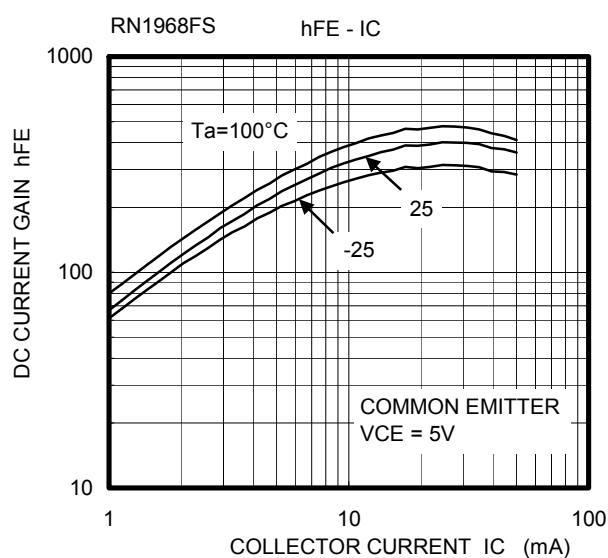
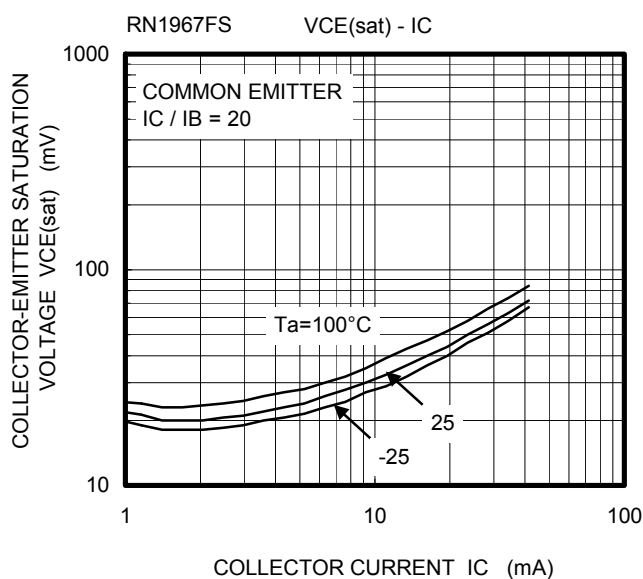
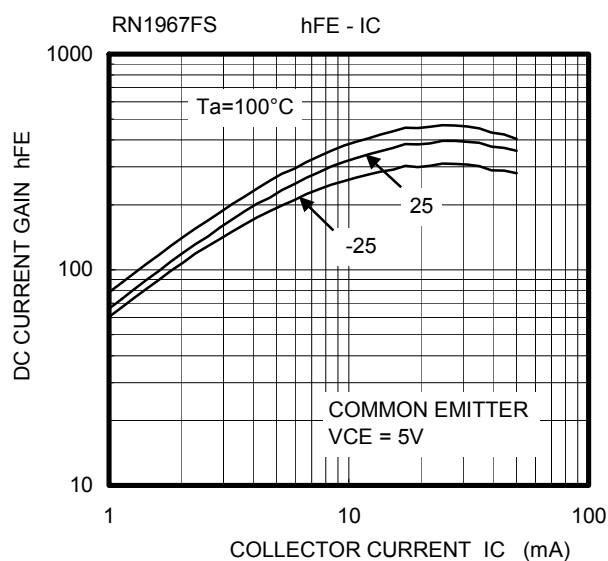
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

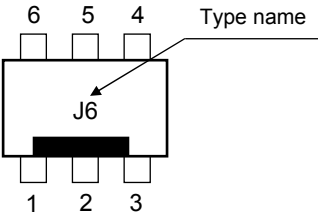
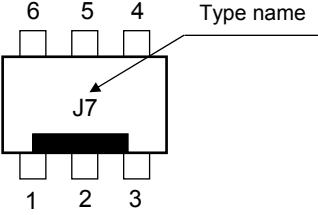
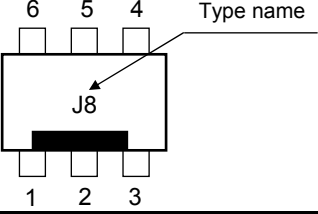
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1967FS~1969FS	I_{CBO}	$V_{CB} = 20\text{ V}, I_E = 0$	—	—	100	nA
		I_{CEO}	$V_{CE} = 20\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1967FS	I_{EBO}	$V_{EB} = 6\text{ V}, I_C = 0$	0.088	—	0.131	mA
	RN1968FS		$V_{EB} = 7\text{ V}, I_C = 0$	0.085	—	0.126	
	RN1969FS		$V_{EB} = 15\text{ V}, I_C = 0$	0.182	—	0.271	
DC current gain	RN1967FS	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	120	—	—	
	RN1968FS			120	—	—	
	RN1969FS			100	—	—	
Collector-emitter saturation voltage	RN1967FS~1969FS	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	—	0.15	V
Input voltage (ON)	RN1967FS	$V_I(\text{ON})$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.7	—	1.5	V
	RN1968FS			0.8	—	2.2	
	RN1969FS			1.6	—	5.0	
Input voltage (OFF)	RN1967FS	$V_I(\text{OFF})$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.5	—	1.0	V
	RN1968FS			0.6	—	1.1	
	RN1969FS			1.3	—	2.6	
Collector output capacitance	RN1967FS~1969FS	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF
Input resistor	RN1967FS	R1	—	8	10	12	kΩ
	RN1968FS			17.6	22	26.4	
	RN1969FS			37.6	47	56.4	
Resistor ratio	RN1967FS	R1/R2	—	0.17	0.213	0.255	
	RN1968FS			0.374	0.468	0.562	
	RN1969FS			1.71	2.14	2.56	

(Q1,Q2 common)



(Q1,Q2 common)



Type Name	Marking
RN1967FS	 A diagram of a 6-pin component. The top pins are labeled 6, 5, and 4 from left to right. The bottom pins are labeled 1, 2, and 3 from left to right. A black rectangular marking is located between pins 1 and 2. An arrow points from the text 'Type name' to the marking. The marking itself contains the text 'J6'.
RN1968FS	 A diagram of a 6-pin component. The top pins are labeled 6, 5, and 4 from left to right. The bottom pins are labeled 1, 2, and 3 from left to right. A black rectangular marking is located between pins 1 and 2. An arrow points from the text 'Type name' to the marking. The marking itself contains the text 'J7'.
RN1969FS	 A diagram of a 6-pin component. The top pins are labeled 6, 5, and 4 from left to right. The bottom pins are labeled 1, 2, and 3 from left to right. A black rectangular marking is located between pins 1 and 2. An arrow points from the text 'Type name' to the marking. The marking itself contains the text 'J8'.

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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