

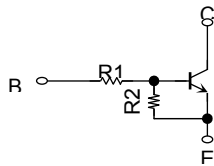
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

## RN1967FS,RN1968FS,RN1969FS

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

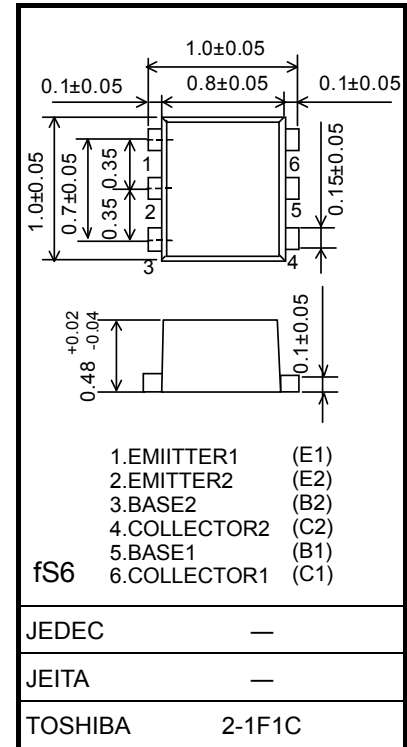
- Two devices are incorporated into a fine pitch Small Mold (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2967FS~RN2969FS

### Equivalent Circuit and Bias Resistor Values



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

Unit: mm



Weight: 0.001 g (typ.)

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

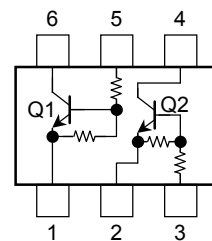
Characteristics	Symbol	Rating	Unit
Collector-base voltage	RN1967FS~1969FS	$V_{CBO}$	20 V
Collector-emitter voltage		$V_{CEO}$	20 V
Emitter-base voltage	RN1967FS	$V_{EBO}$	6 V
	RN1968FS		7 V
	RN1969FS		15 V
Collector current	$I_C$	50 mA	
Collector power dissipation	RN1967FS~RN1969FS	$P_C$ (Note 1)	50 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

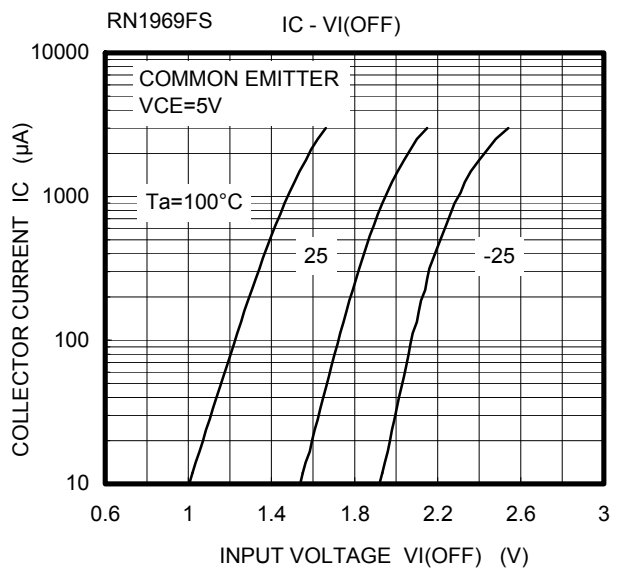
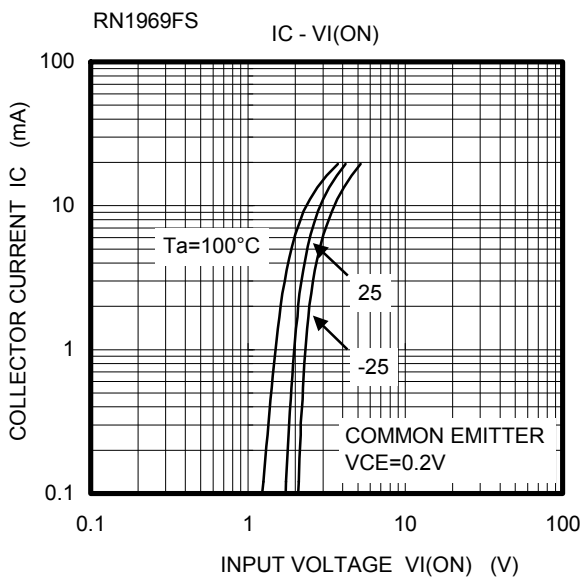
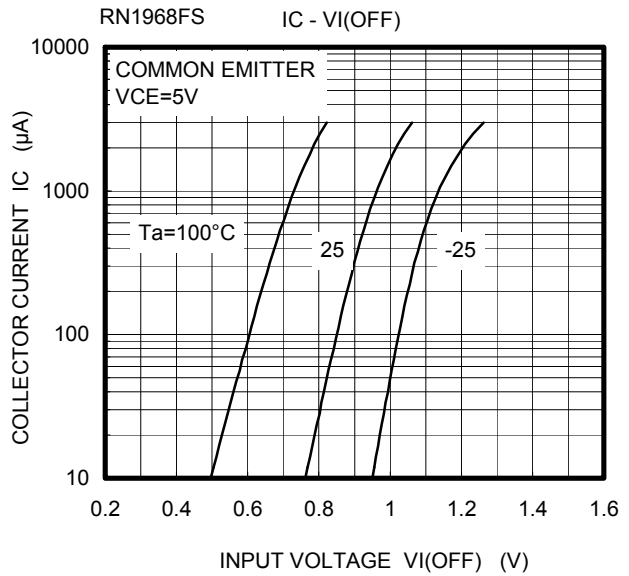
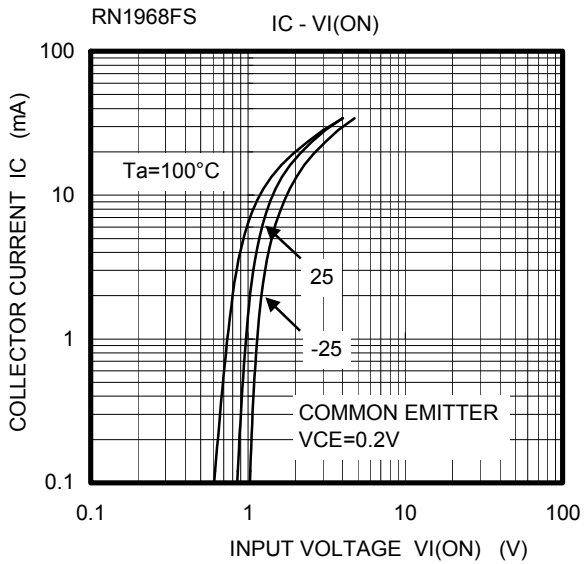
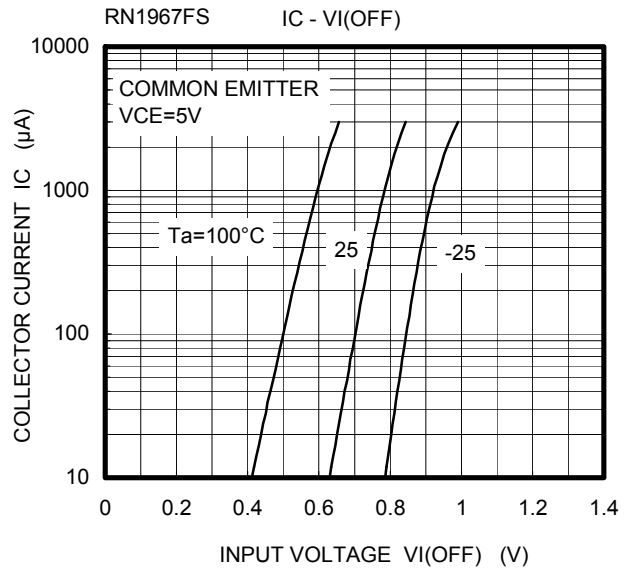
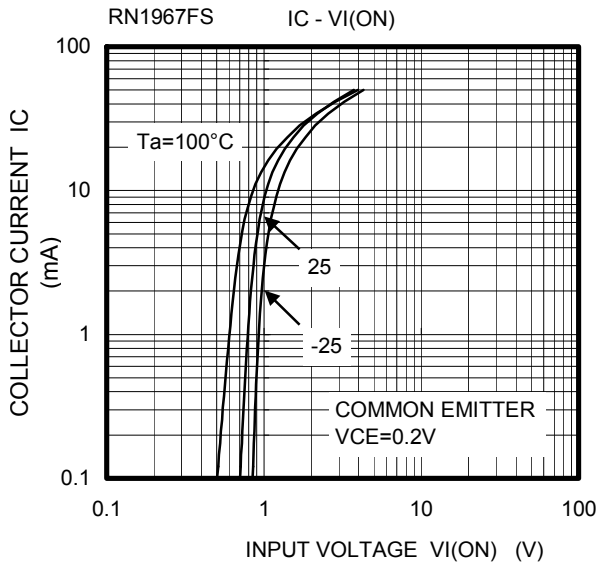
### Equivalent Circuit (top view)



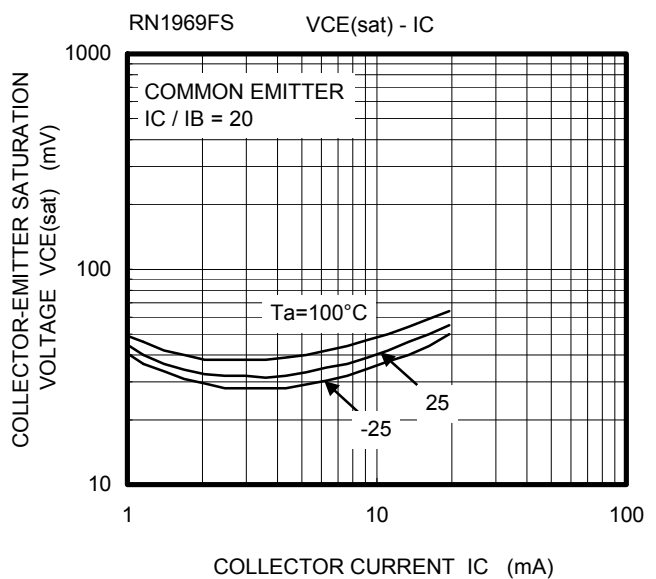
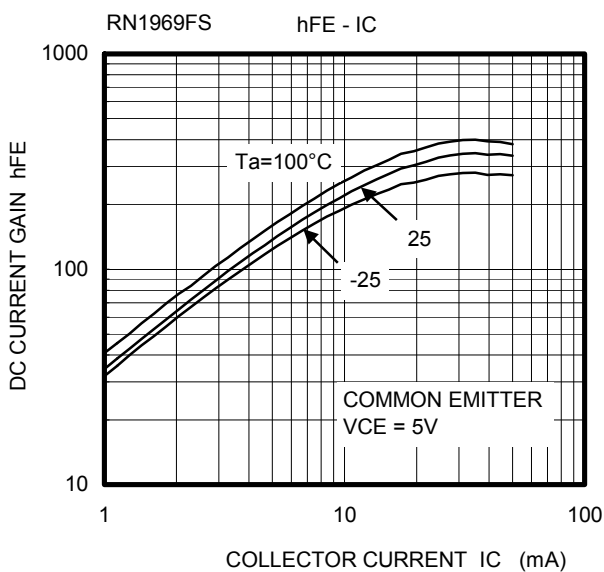
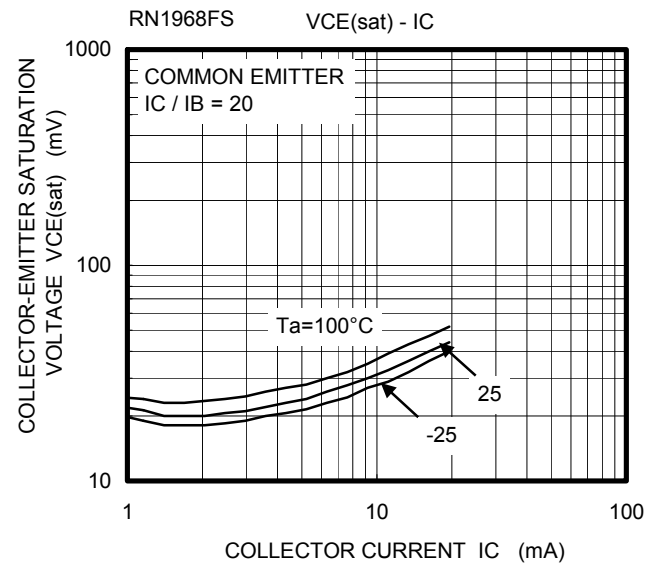
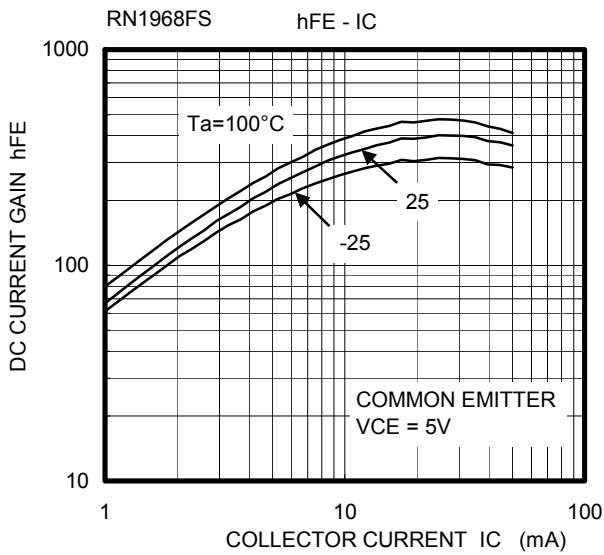
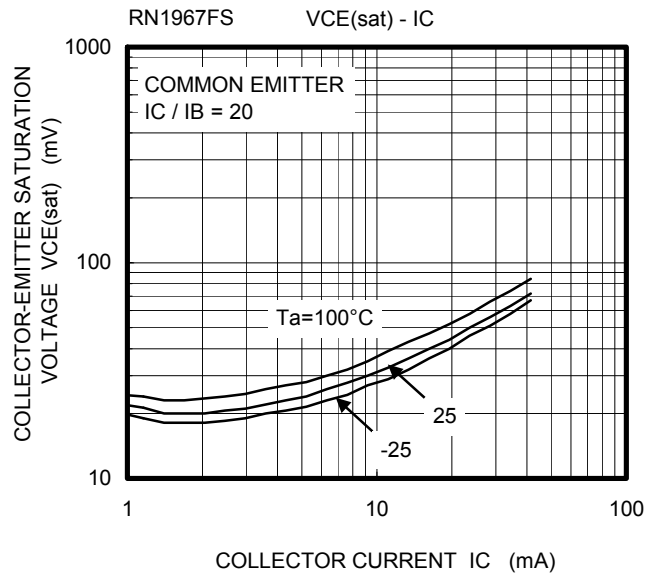
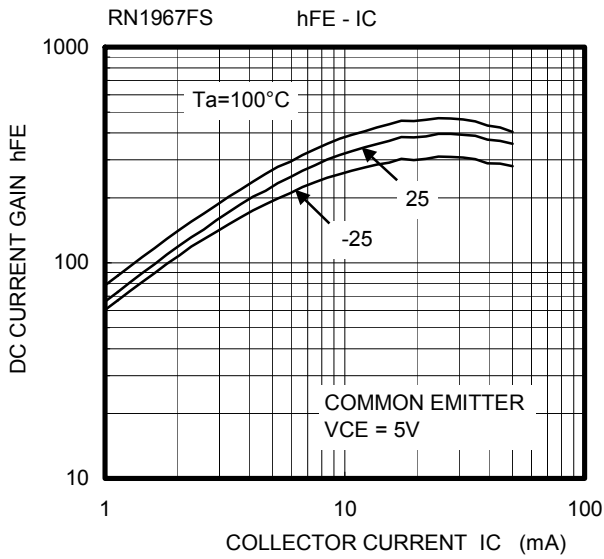
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

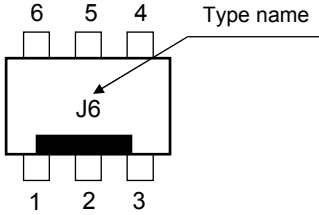
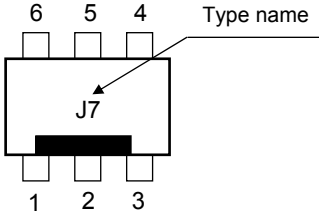
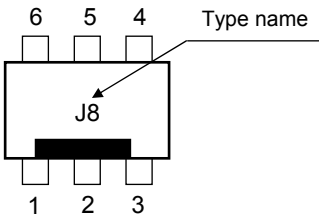
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1967FS~1969FS	$I_{CBO}$	$V_{CB} = 20\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 20\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1967FS	$I_{EBO}$	$V_{EB} = 6\text{ V}, I_C = 0$	0.088	—	0.131	mA
	RN1968FS			0.085	—	0.126	
	RN1969FS			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	$V_I(ON)$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.7	—	1.5	V
	RN1968FS			0.8	—	2.2	
	RN1969FS			1.6	—	5.0	
Input voltage (OFF)	RN1967FS	$V_I(OFF)$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	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	k $\Omega$
	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	
RN1968FS	
RN1969FS	

**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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