

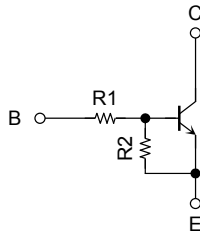
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

## RN1961FS, RN1962FS, RN1963FS RN1964FS, RN1965FS, RN1966FS

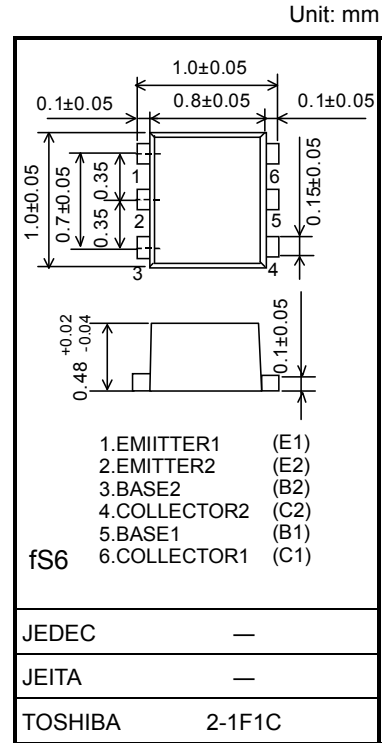
Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications

- 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 RN2961FS~RN2966FS

### Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1961FS	4.7	4.7
RN1962FS	10	10
RN1963FS	22	22
RN1964FS	47	47
RN1965FS	2.2	47
RN1966FS	4.7	47



Weight: 0.001 g (typ.)

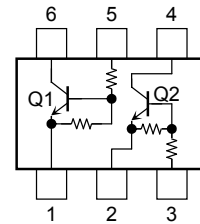
### Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1961FS~1966FS	V <sub>CBO</sub>	20	V
Collector-emitter voltage		V <sub>CEO</sub>	20	V
Emitter-base voltage	RN1961FS~1964FS	V <sub>EBO</sub>	10	V
	RN1965FS, 1966FS		5	
Collector current	RN1961FS~RN1966FS	I <sub>C</sub>	50	mA
Collector power dissipation		P <sub>C</sub> (Note 1)	50	mW
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature range		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

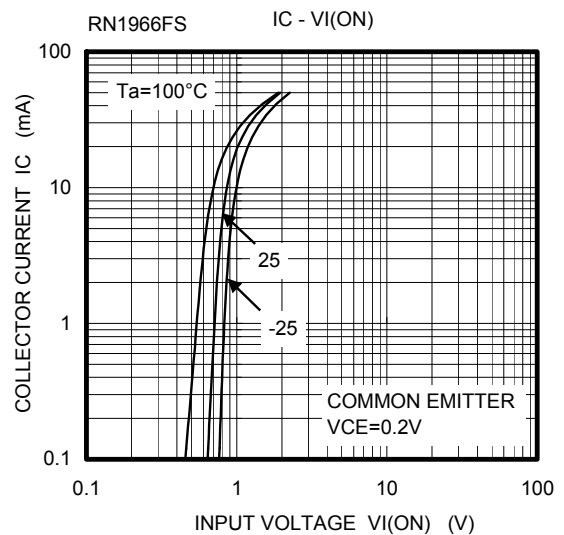
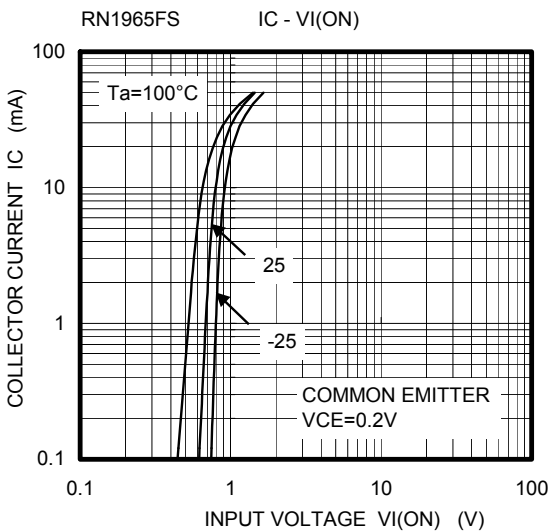
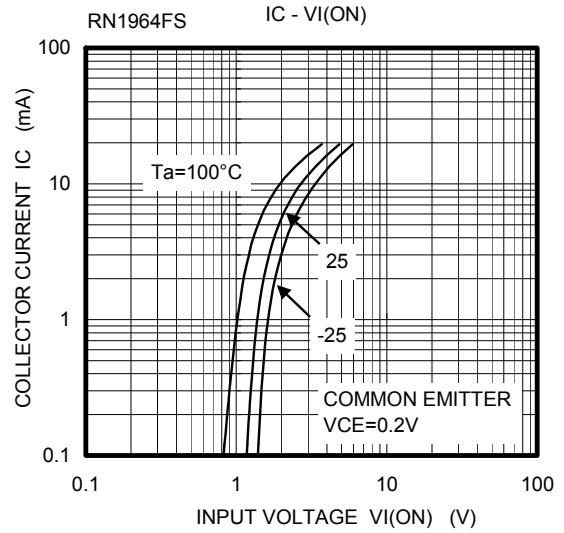
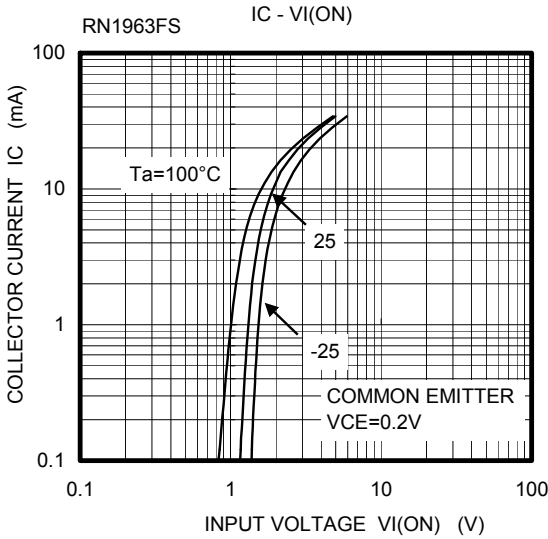
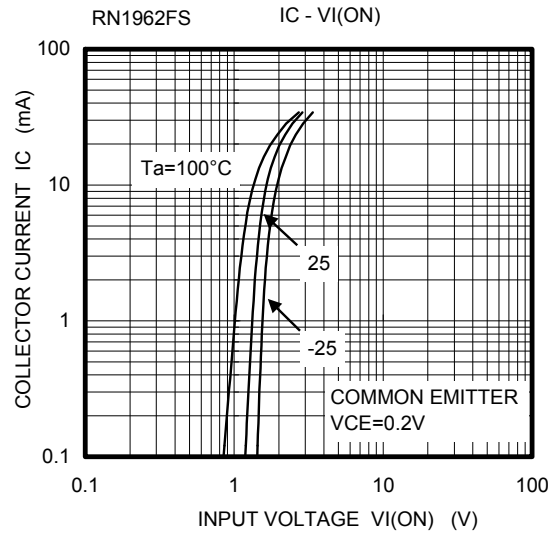
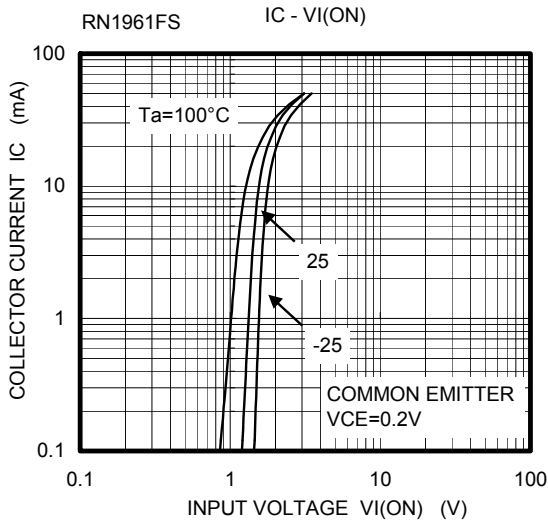
### Equivalent Circuit (top view)



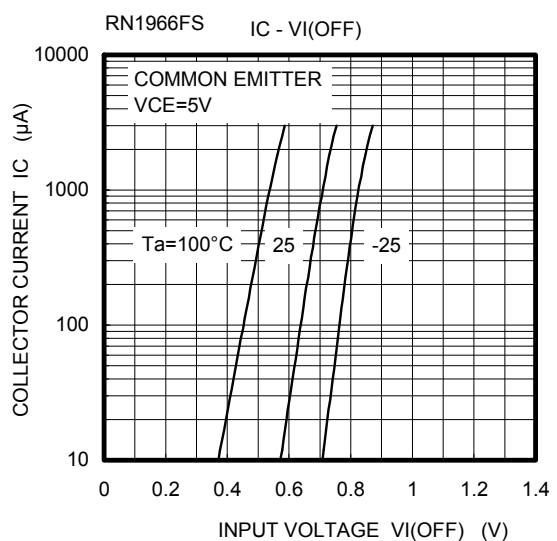
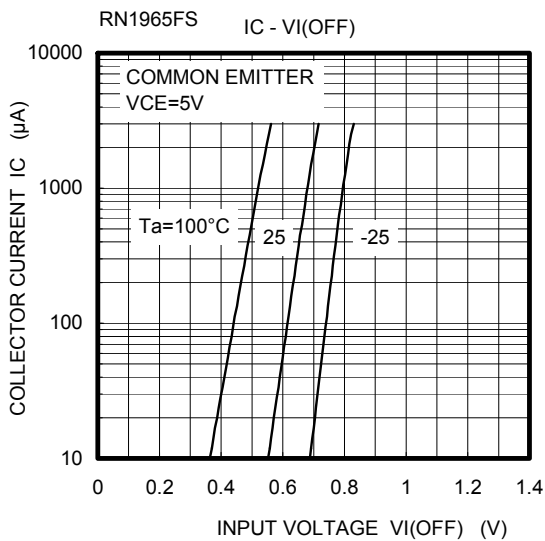
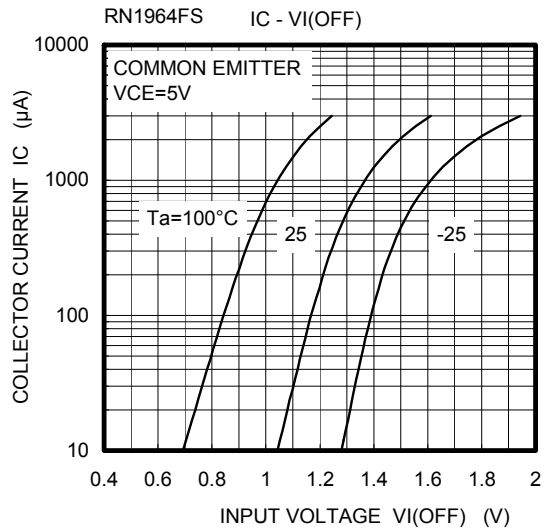
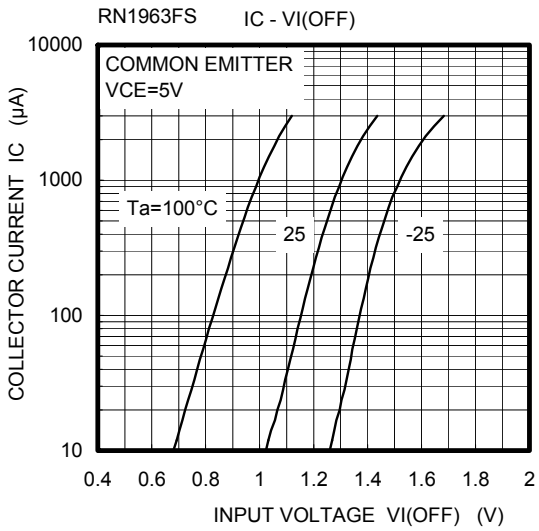
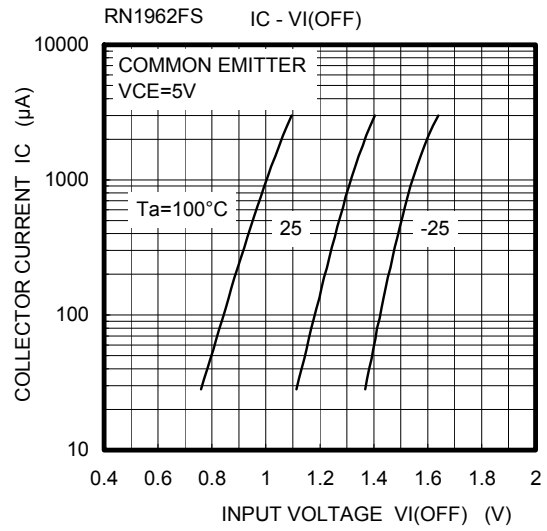
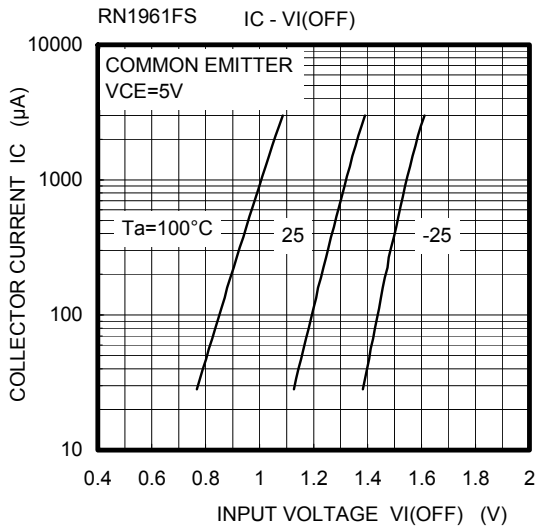
**Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)**

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1961FS~1966FS	$I_{CBO}$	$V_{CB} = 20\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 20\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1961FS	$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0$	0.89	—	1.33	mA
	RN1962FS			0.41	—	0.63	
	RN1963FS			0.18	—	0.29	
	RN1964FS			0.088	—	0.133	
	RN1965FS	$V_{EB} = 5\text{ V}, I_C = 0$	0.085	—	0.127		
	RN1966FS		0.08	—	0.121		
DC current gain	RN1961FS	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	30	—	—	
	RN1962FS			60	—	—	
	RN1963FS			100	—	—	
	RN1964FS			120	—	—	
	RN1965FS			120	—	—	
	RN1966FS			120	—	—	
Collector-emitter saturation voltage	RN1961FS~1966FS	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	—	0.15	V
Input voltage (ON)	RN1961FS	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.0	—	2.0	V
	RN1962FS			1.0	—	2.2	
	RN1963FS			1.1	—	2.7	
	RN1964FS			1.2	—	3.6	
	RN1965FS			0.6	—	1.1	
	RN1966FS			0.6	—	1.2	
Input voltage (OFF)	RN1961FS~1964FS	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.8	—	1.5	V
	RN1965FS, 1966FS			0.4	—	0.8	
Collector output capacitance	RN1961FS~1966FS	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	1.2	—	pF
Input resistor	RN1961FS	R1	—	3.76	4.7	5.64	kΩ
	RN1962FS			8	10	12	
	RN1963FS			17.6	22	26.4	
	RN1964FS			37.6	47	56.4	
	RN1965FS			1.76	2.2	2.64	
	RN1966FS			3.76	4.7	5.64	
Resistor ratio	RN1961FS~1964FS	R1/R2	—	0.8	1.0	1.2	
	RN1965FS			0.0376	0.0468	0.0562	
	RN1966FS			0.08	0.1	0.12	

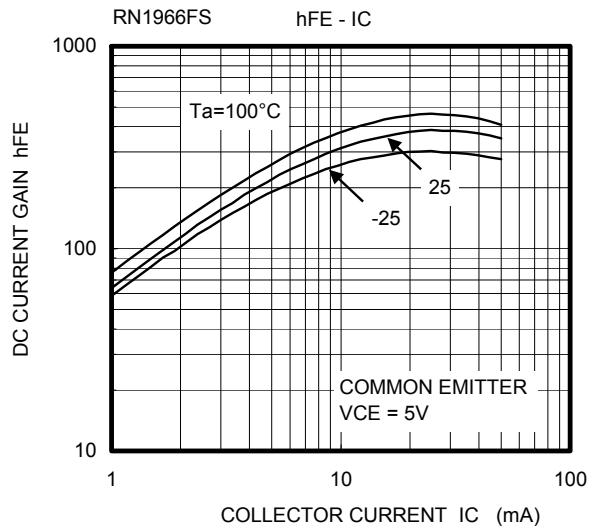
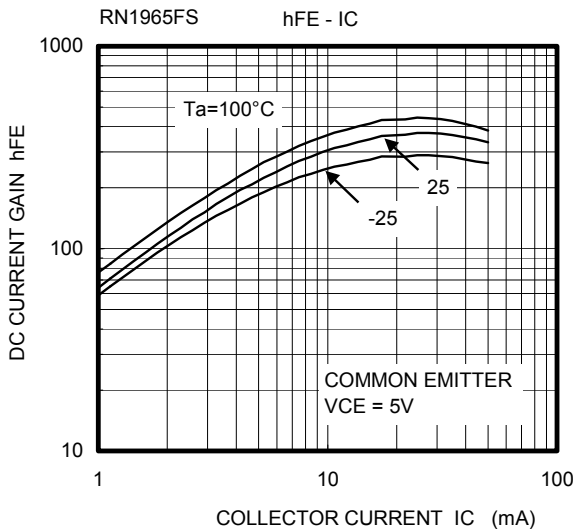
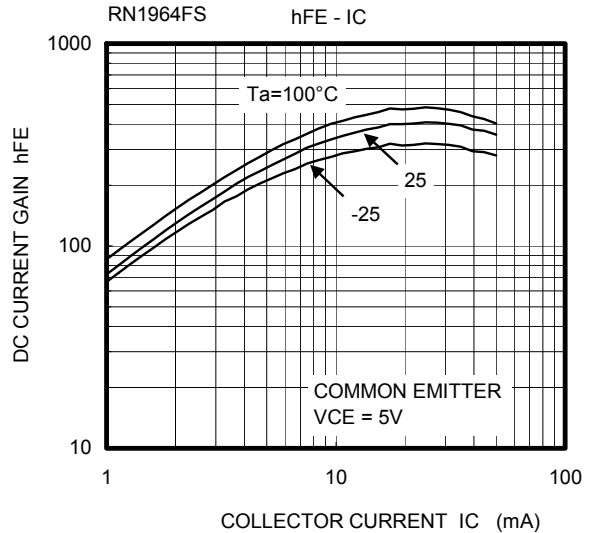
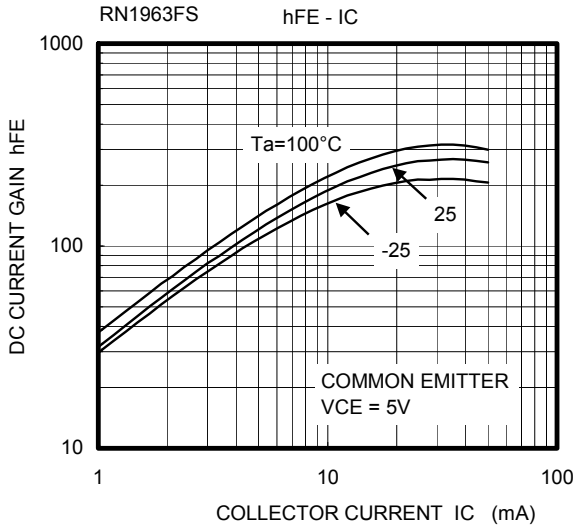
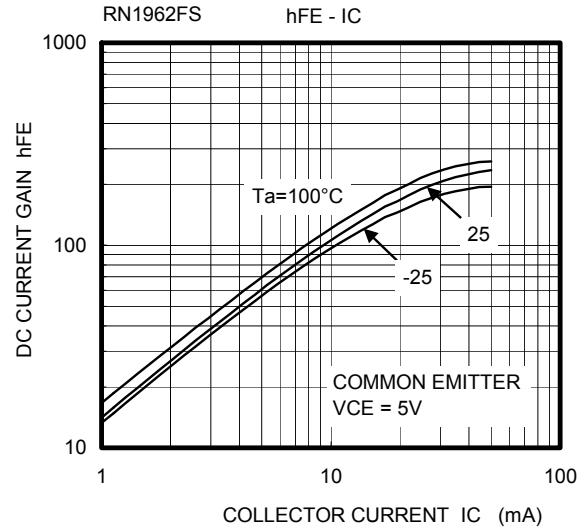
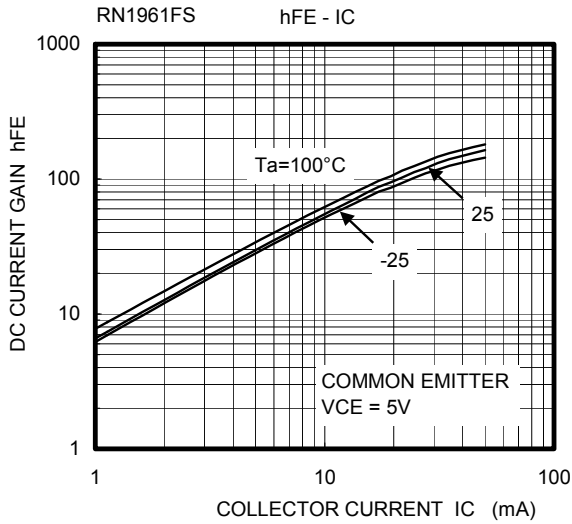
(Q1,Q2 common)



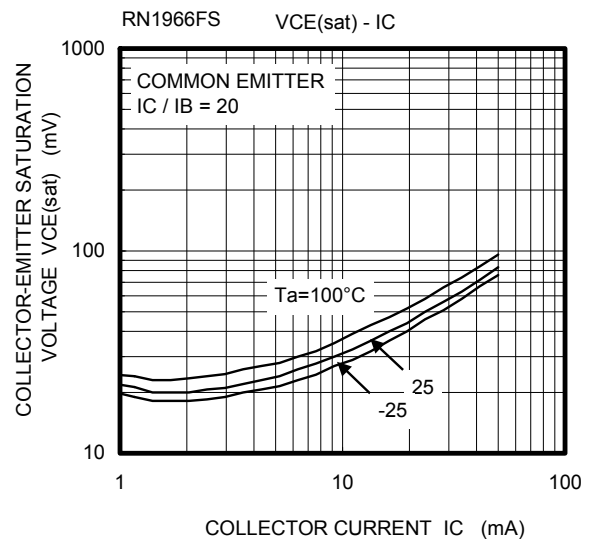
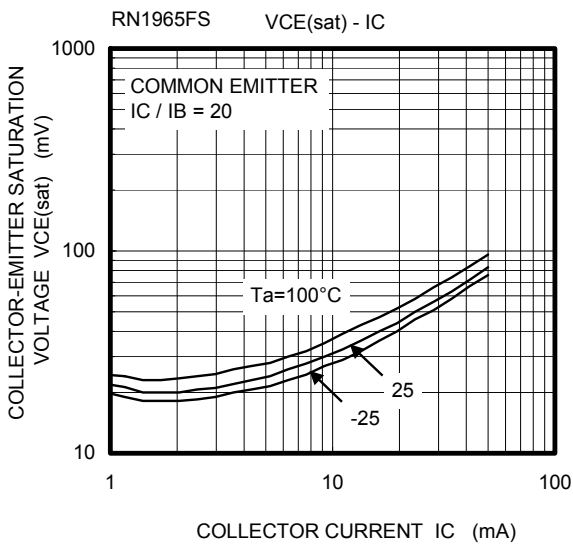
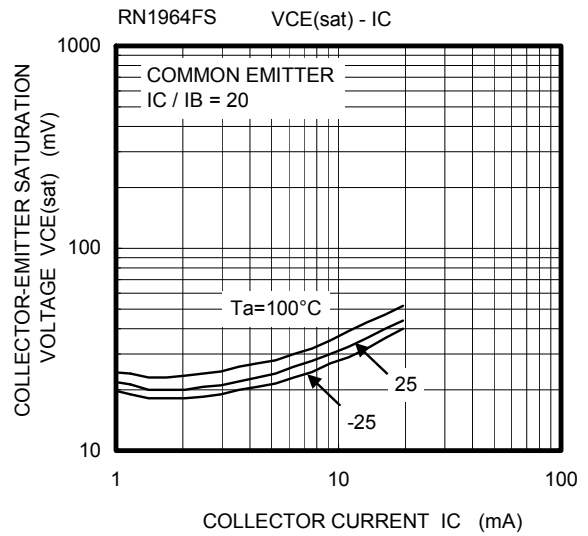
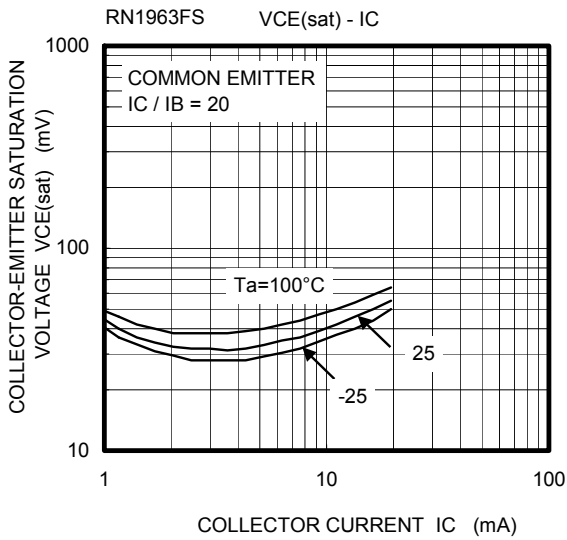
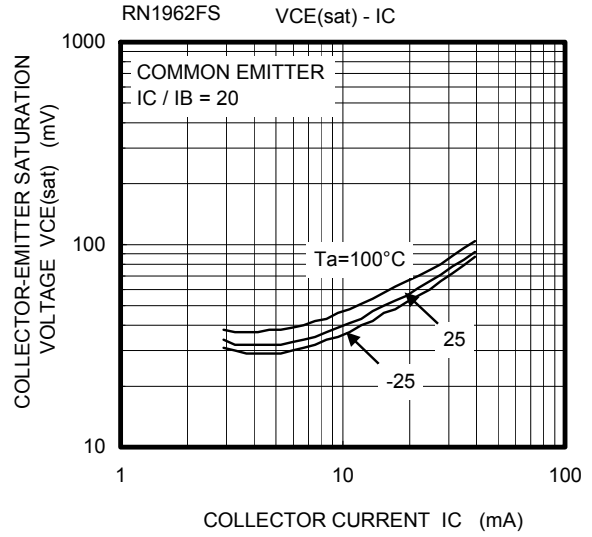
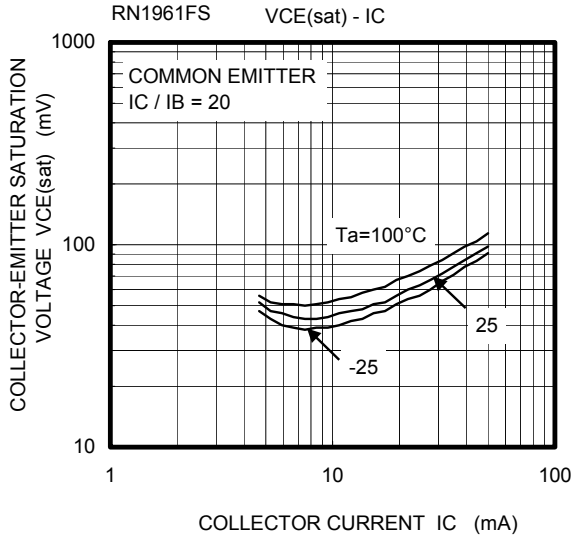
(Q1,Q2 common)



(Q1,Q2 common)



(Q1,Q2 common)



Type Name	Marking
RN1961FS	
RN1962FS	
RN1963FS	
RN1964FS	
RN1965FS	
RN1966FS	

**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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