

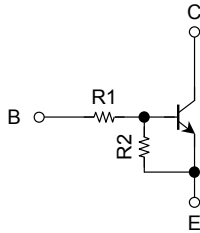
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

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

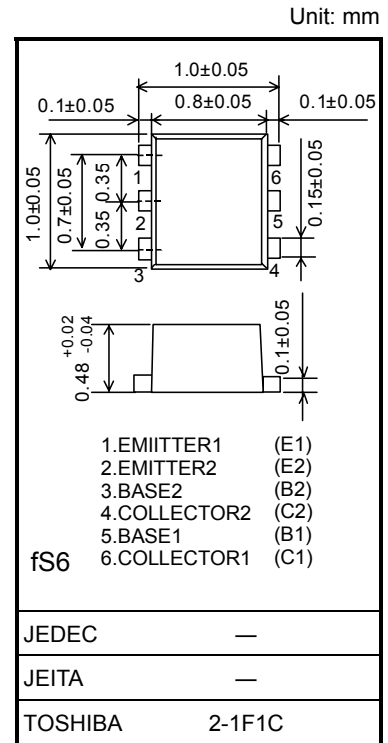
Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications

- 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



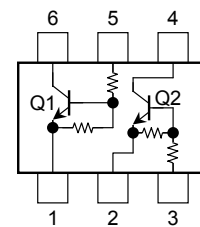
Weight: 0.001g (typ.)

### 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)	50	mW
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55~150	°C

Note: Total rating

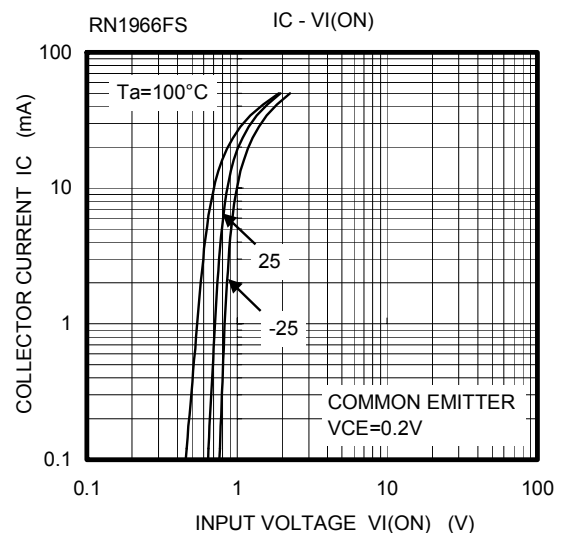
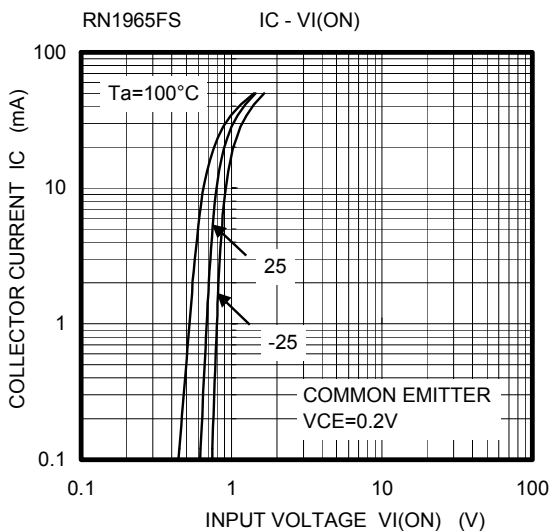
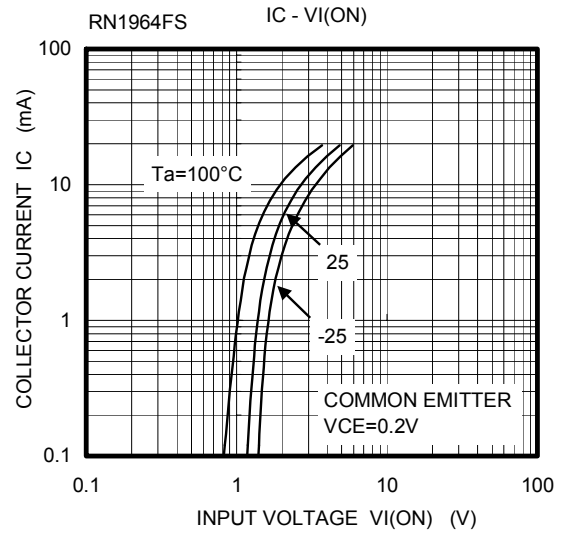
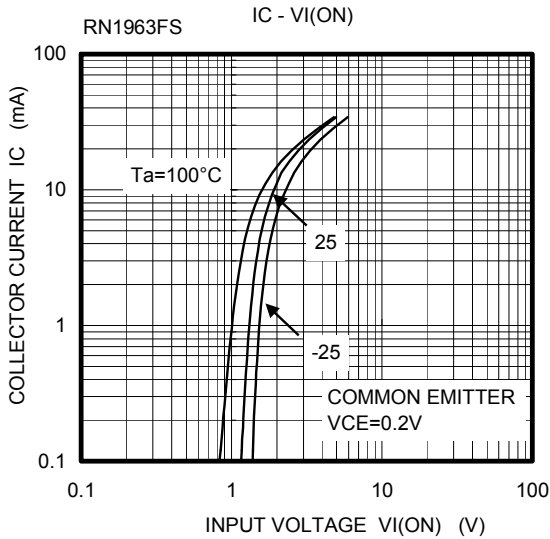
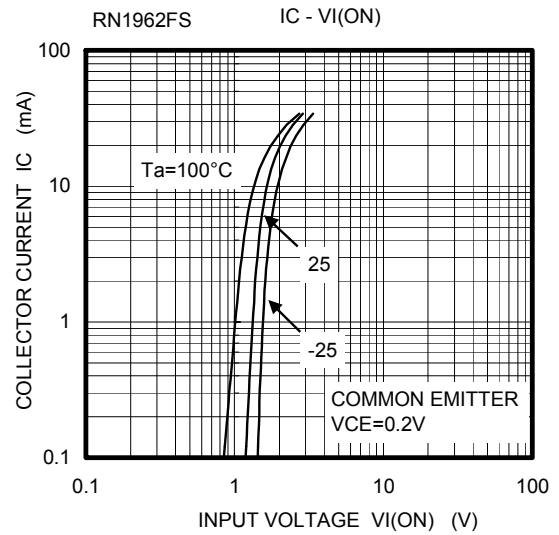
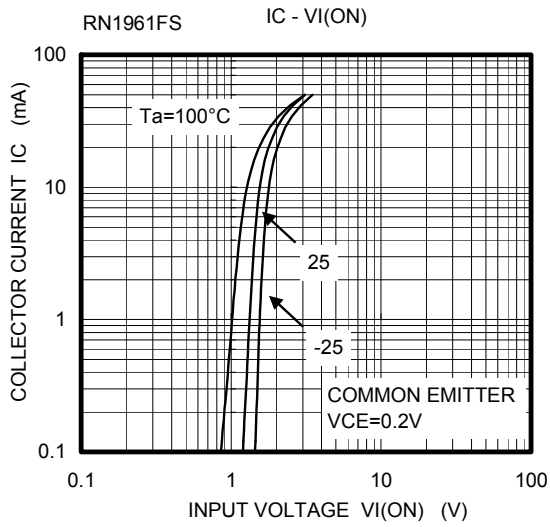
### Equivalent Circuit (top view)



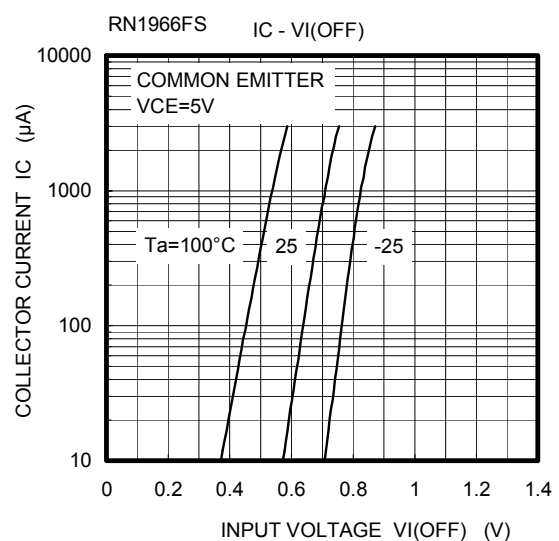
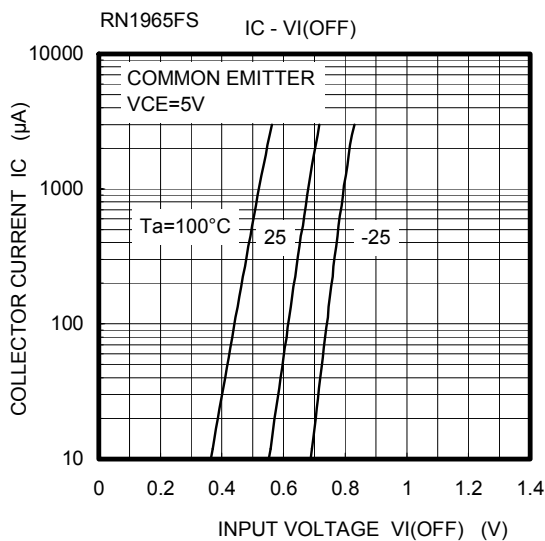
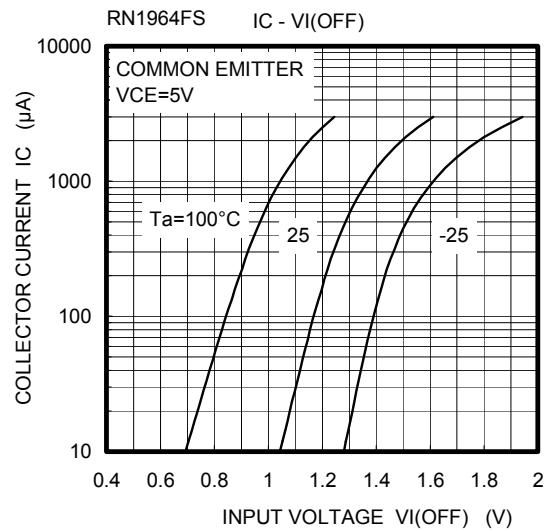
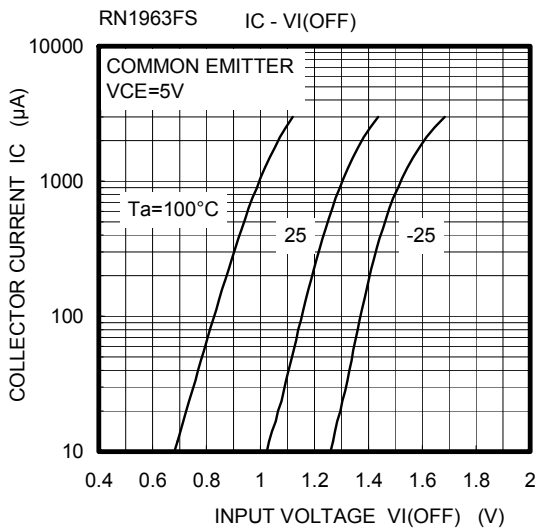
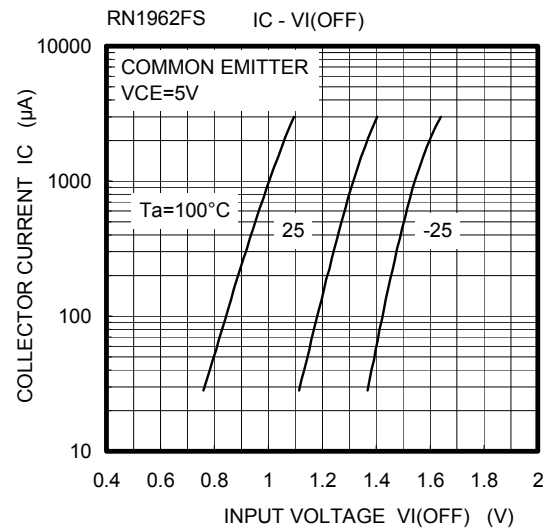
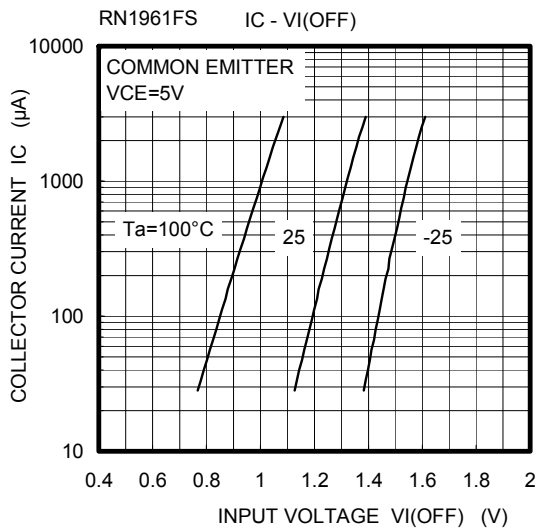
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

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	

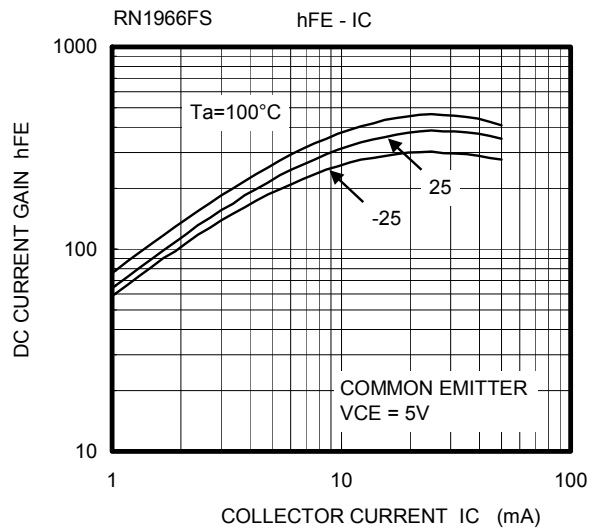
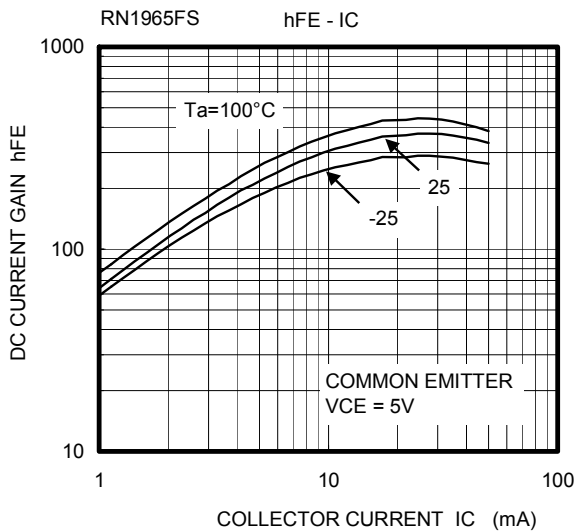
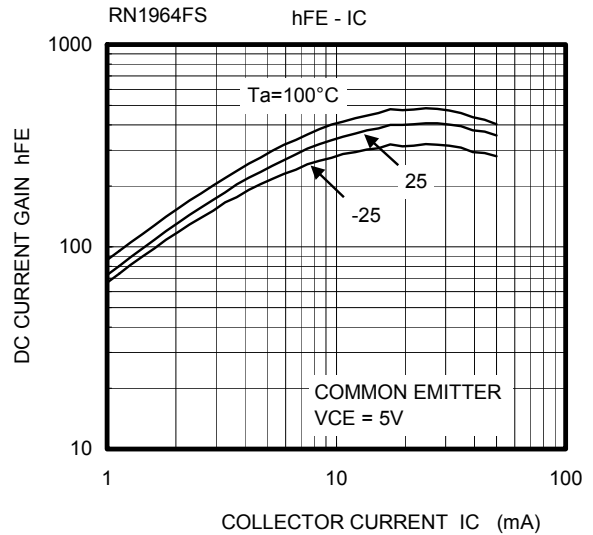
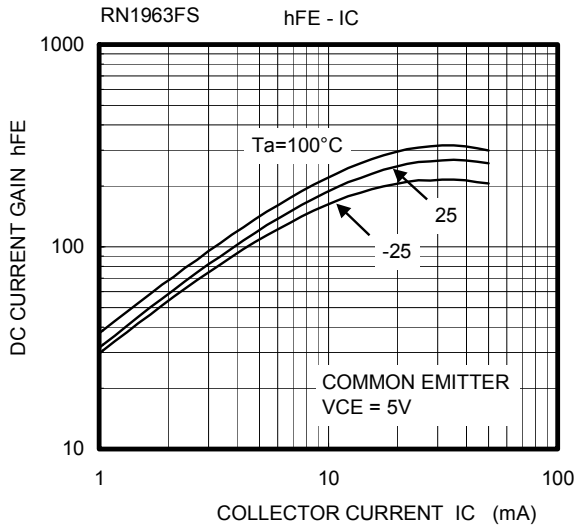
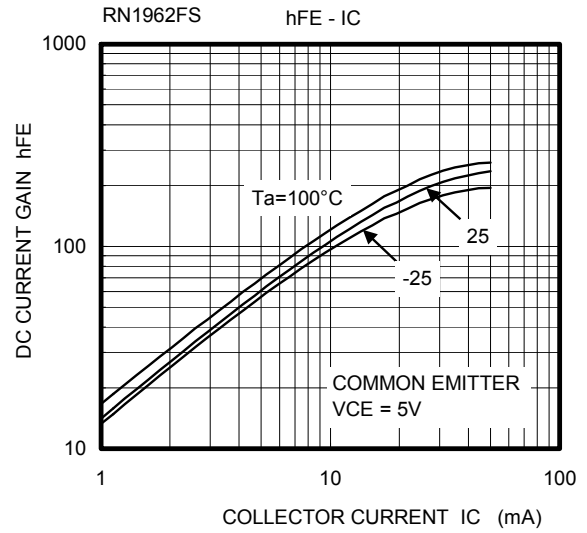
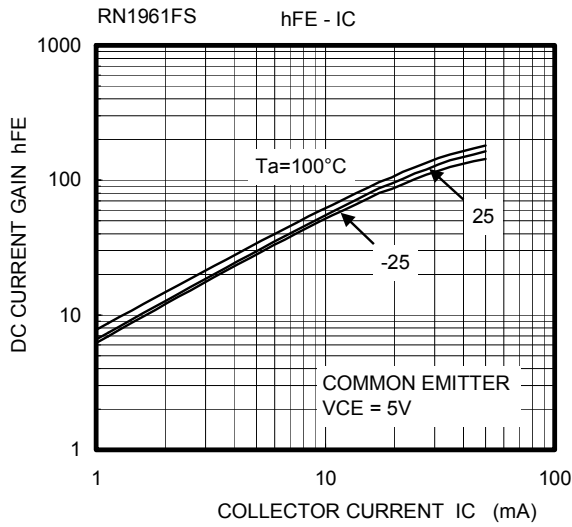
(Q1,Q2 common)



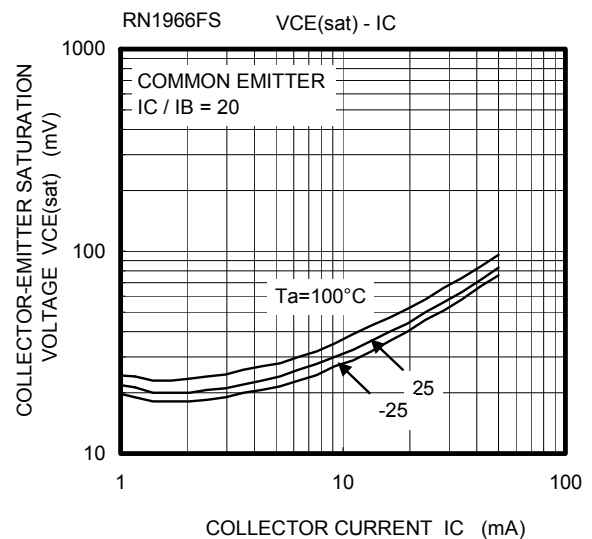
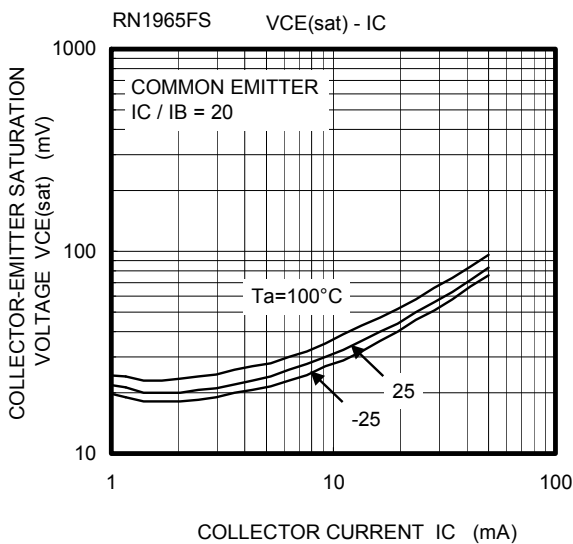
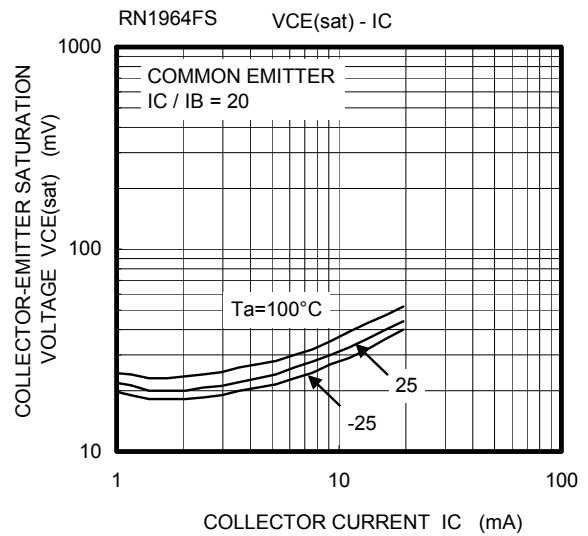
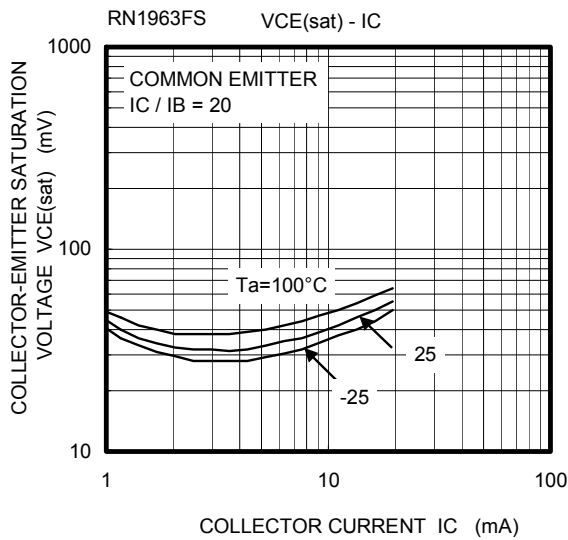
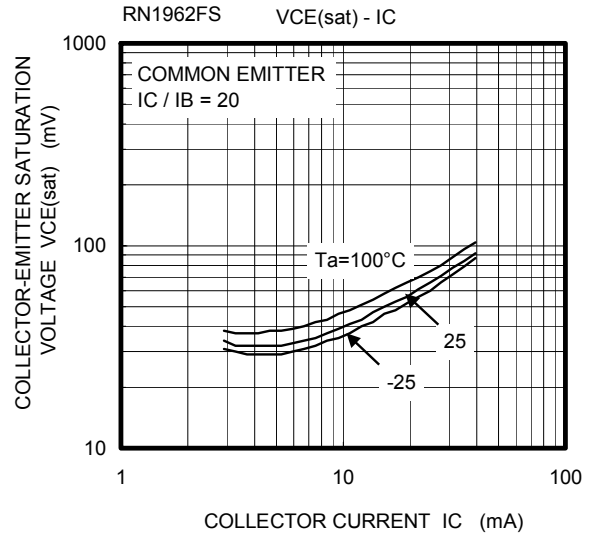
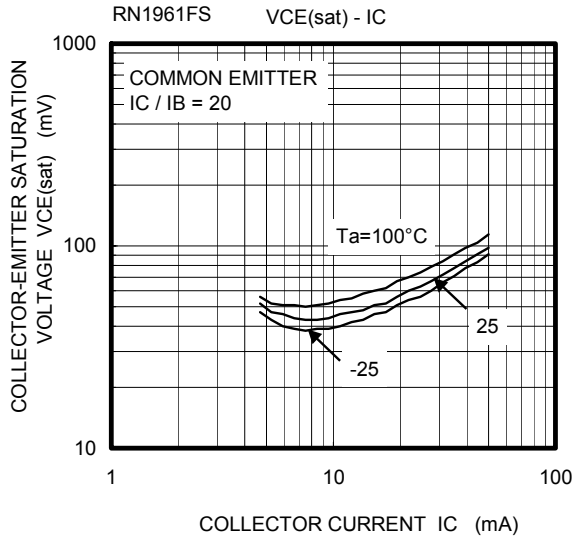
(Q1,Q2 common)



(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.

**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.