

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

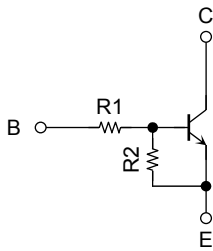
## RN1701JE, RN1702JE, RN1703JE RN1704JE, RN1705JE, RN1706JE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

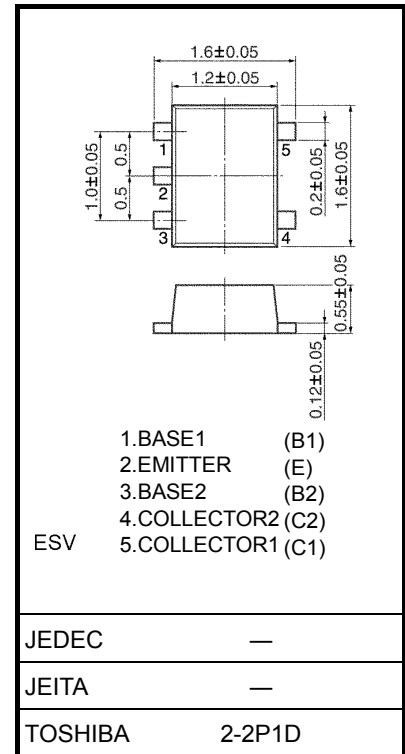
Unit: mm

- Two devices are incorporated into an Extreme-Super-Mini (5 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.
- A wide range of resistor values is available for use in various circuit designs.
- Complementary to RN2701JE to RN2706JE

### Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1701JE	4.7	4.7
RN1702JE	10	10
RN1703JE	22	22
RN1704JE	47	47
RN1705JE	2.2	47
RN1706JE	4.7	47

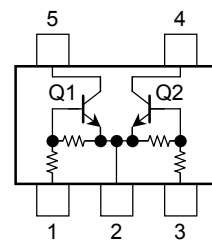


Weight: 0.003 g (typ.)

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1701JE to 1706JE	V <sub>CBO</sub>	50	V
Collector-emitter voltage		V <sub>CEO</sub>	50	V
Emitter-base voltage	RN1701JE to 1704JE	V <sub>EBO</sub>	10	V
	RN1705JE RN1706JE		5	
Collector current	RN1701JE to 1706JE	I <sub>C</sub>	100	mA
Collector power dissipation		P <sub>C</sub> (Note 1)	100	mW
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55 to 150	°C

### Equivalent Circuit (top view)



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.).

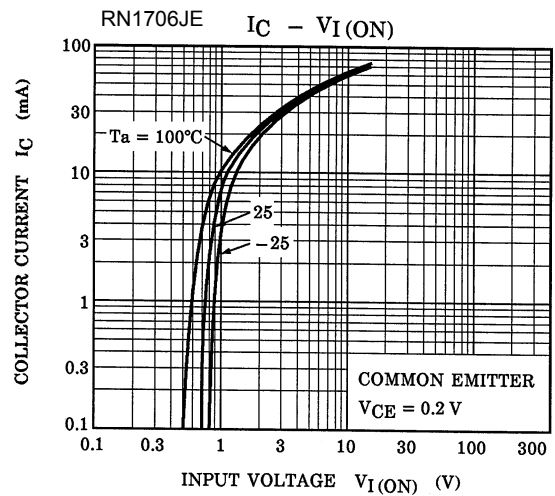
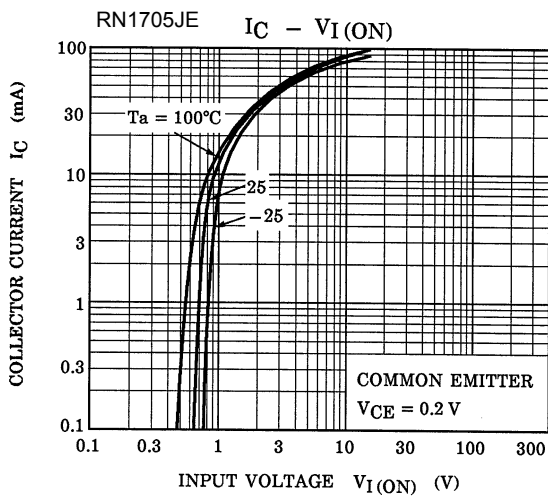
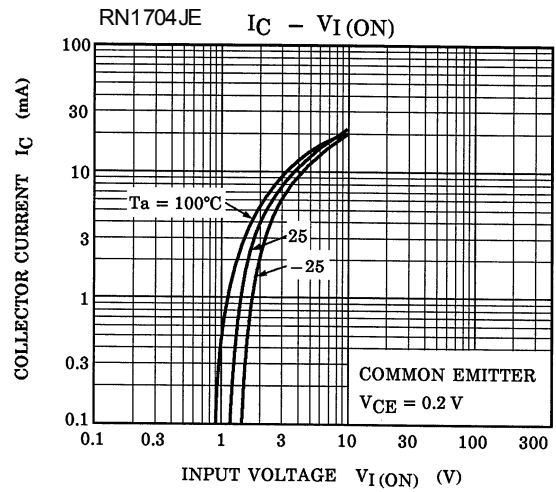
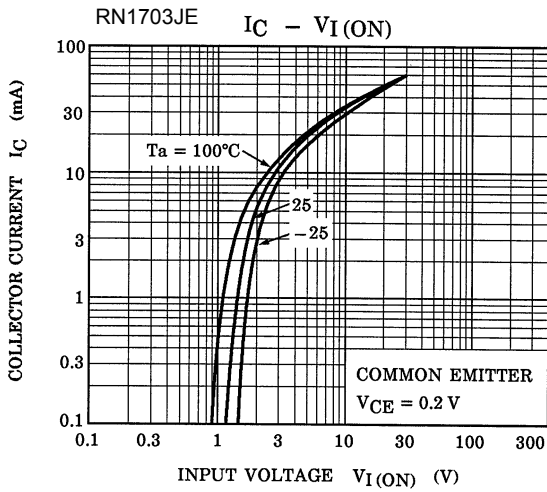
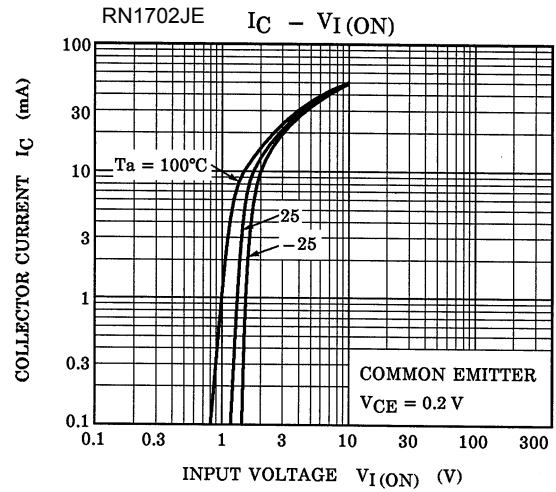
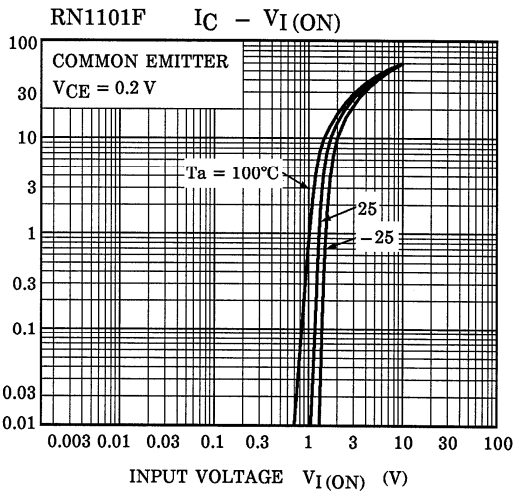
Note 1: Total rating

Start of commercial production  
2000-06

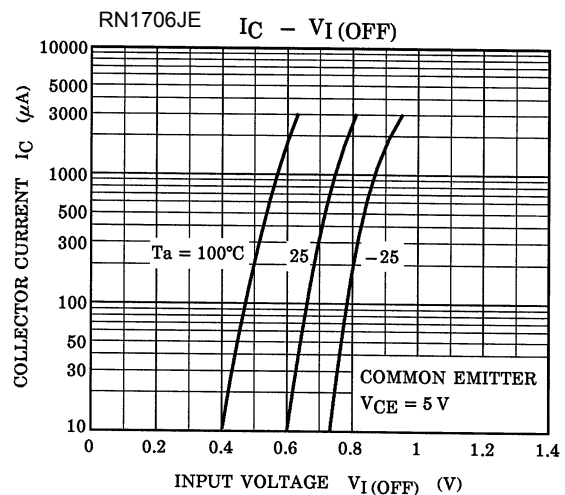
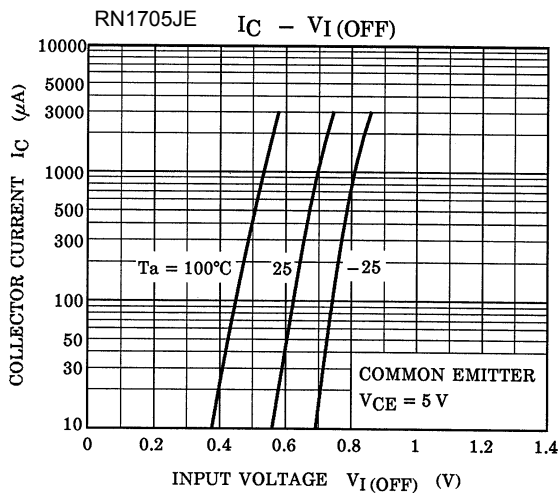
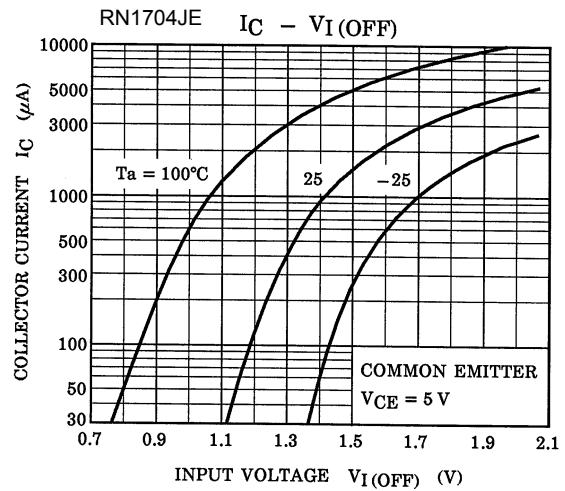
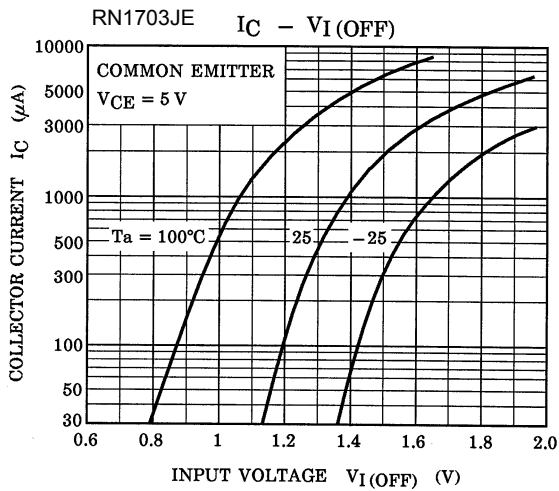
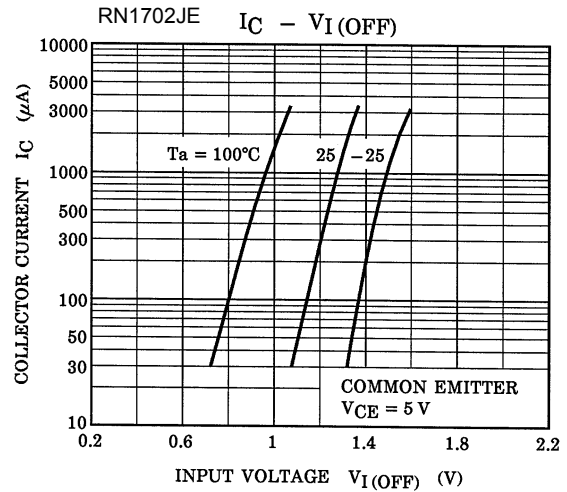
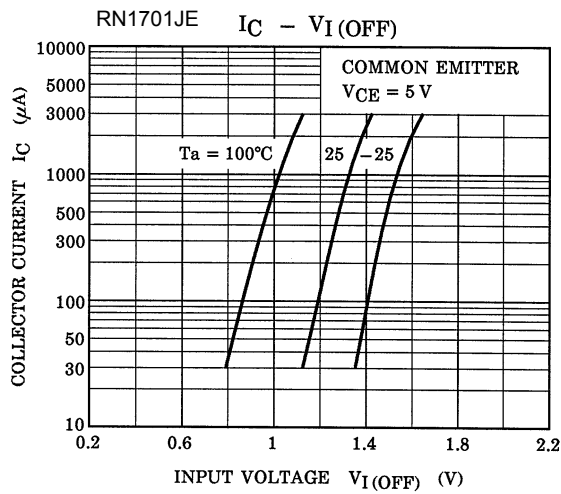
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

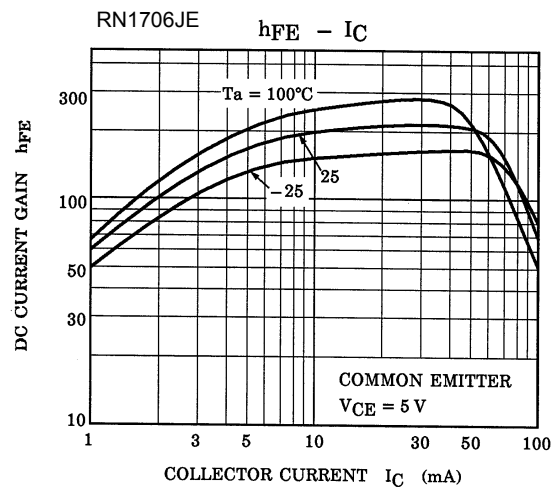
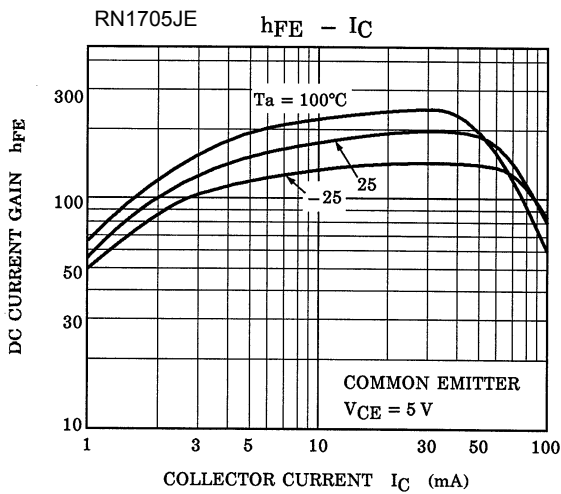
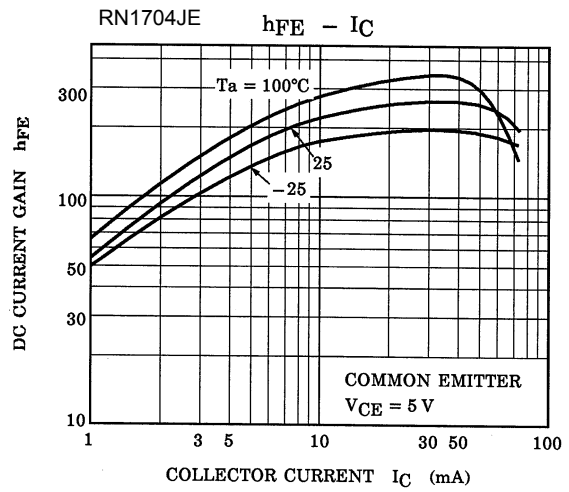
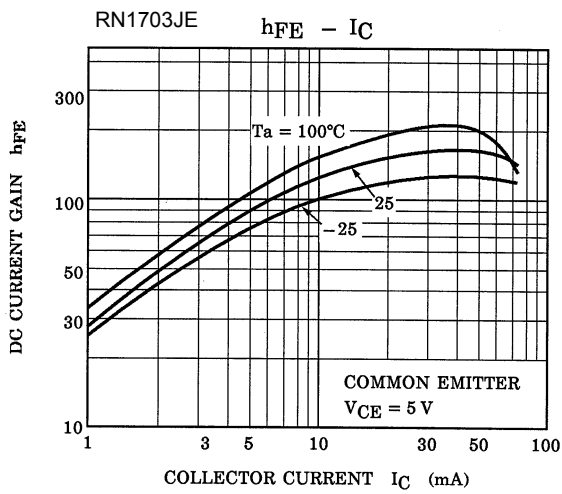
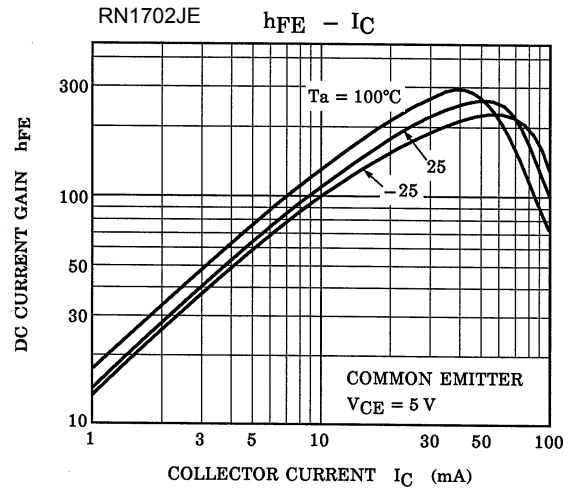
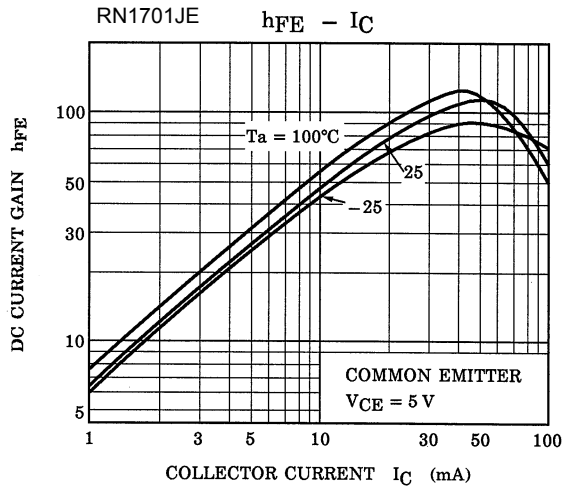
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1701JE to RN1706JE	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1701JE	$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0$	0.82	—	1.52	mA
	RN1702JE			0.38	—	0.71	
	RN1703JE			0.17	—	0.33	
	RN1704JE			0.082	—	0.15	
	RN1705JE	$V_{EB} = 5\text{ V}, I_C = 0$	0.078	—	0.145		
	RN1706JE		0.074	—	0.138		
DC current gain	RN1701JE	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	30	—	—	
	RN1702JE			50	—	—	
	RN1703JE			70	—	—	
	RN1704JE			80	—	—	
	RN1705JE			80	—	—	
	RN1706JE			80	—	—	
Collector-emitter saturation voltage	RN1701JE to RN1706JE	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1701JE	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.1	—	2.0	V
	RN1702JE			1.2	—	2.4	
	RN1703JE			1.3	—	3.0	
	RN1704JE			1.5	—	5.0	
	RN1705JE			0.6	—	1.1	
	RN1706JE			0.7	—	1.3	
Input voltage (OFF)	RN1701JE to RN1704JE	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.0	—	1.5	V
	RN1705JE, RN1706JE			0.5	—	0.8	
Transition frequency	RN1701JE to RN1706JE	$f_T$	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1701JE to RN1706JE	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	3	6	pF
Input resistor	RN1701JE	$R_1$	—	3.29	4.7	6.11	k $\Omega$
	RN1702JE			7	10	13	
	RN1703JE			15.4	22	28.6	
	RN1704JE			32.9	47	61.1	
	RN1705JE			1.54	2.2	2.86	
	RN1706JE			3.29	4.7	6.11	
Resistor ratio	RN1701JE to RN1704JE	$R_1/R_2$	—	0.9	1.0	1.1	
	RN1705JE			0.0421	0.0468	0.0515	
	RN1706JE			0.09	0.1	0.11	

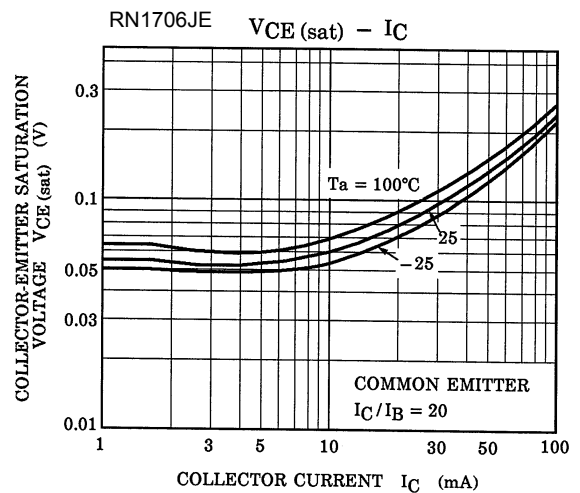
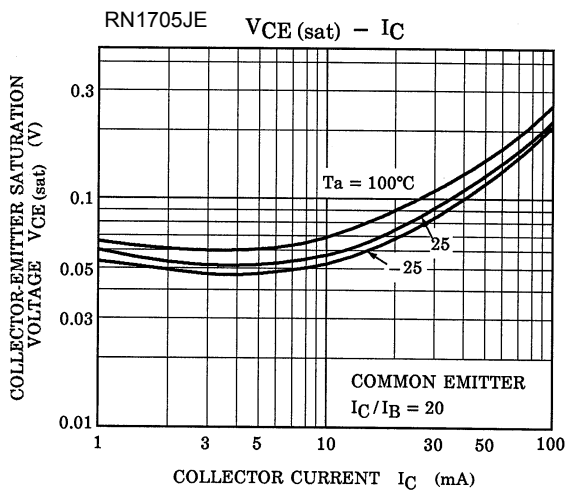
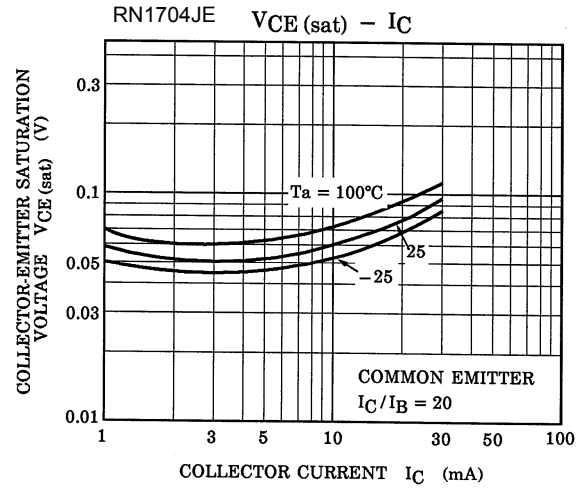
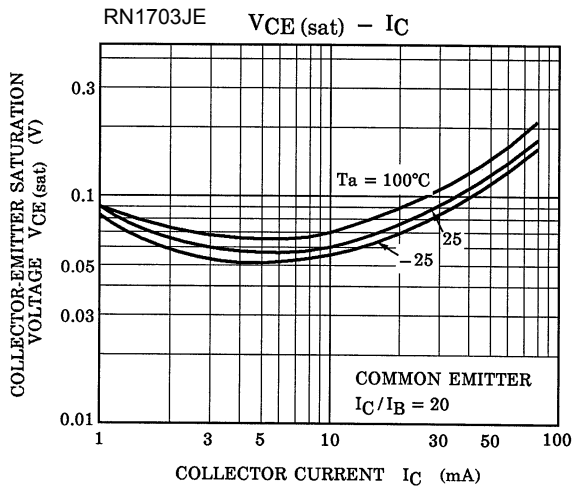
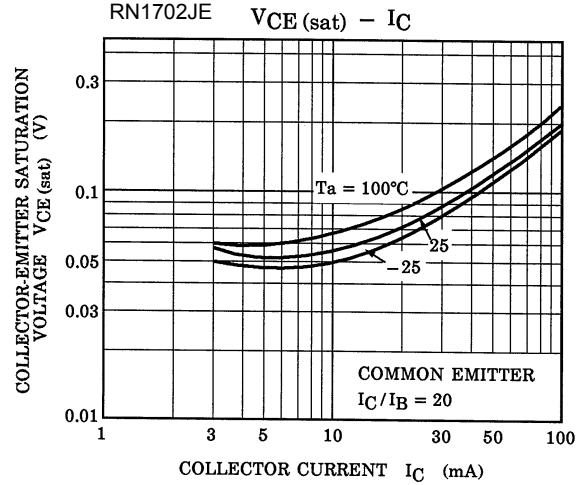
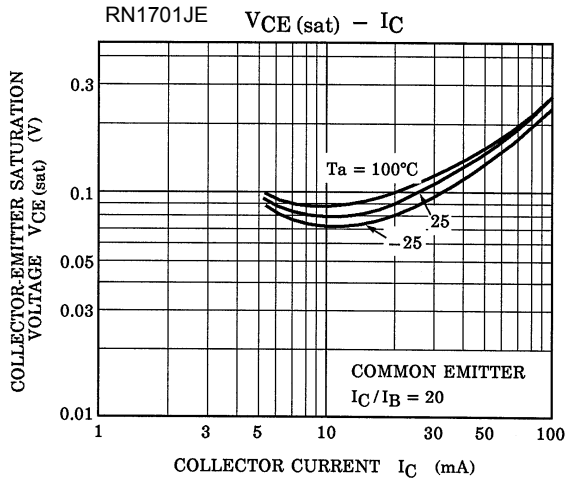
## Q1, Q2 Common

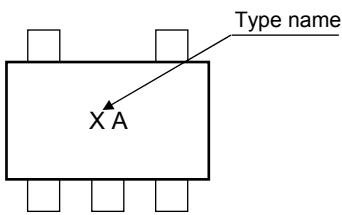
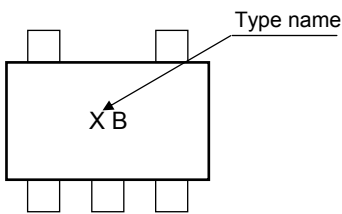
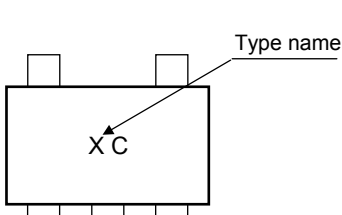
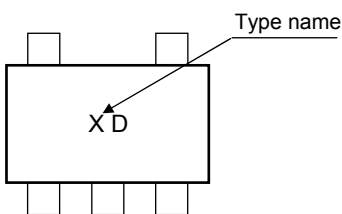
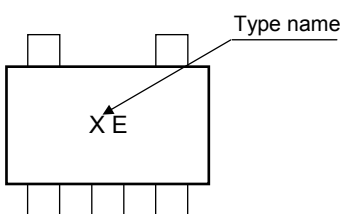
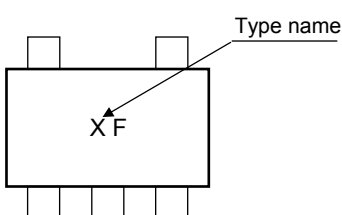


## Q1, Q2 Common







Type Name	Marking
RN1701JE	
RN1702JE	
RN1703JE	
RN1704JE	
RN1705JE	
RN1706JE	

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