

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

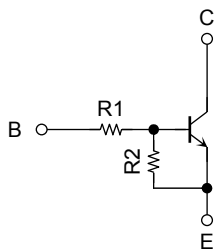
## RN1701JE, RN1702JE, RN1703JE RN1704JE, RN1705JE, RN1706JE

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 (k $\Omega$ )	R2 (k $\Omega$ )
RN1701JE	4.7	4.7
RN1702JE	10	10
RN1703JE	22	22
RN1704JE	47	47
RN1705JE	2.2	47
RN1706JE	4.7	47

1.BASE1 (B1)	
2.EMITTER (E)	
3.BASE2 (B2)	
4.COLLECTOR2 (C2)	
5.COLLECTOR1 (C1)	
ESV	
JEDEC	—
JEITA	—
TOSHIBA	2-2P1D

Weight: 0.003 g (typ.)

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

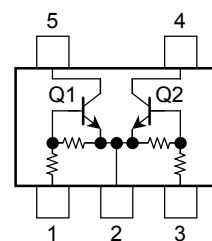
Characteristics	Symbol	Rating	Unit
Collector-base voltage	RN1701JE to 1706JE $V_{CBO}$	50	V
Collector-emitter voltage	$V_{CEO}$	50	V
Emitter-base voltage	RN1701JE to 1704JE $V_{EBO}$	10	V
	RN1705JE RN1706JE	5	
Collector current	$I_C$	100	mA
Collector power dissipation	RN1701JE to 1706JE $P_C$ (Note 1)	100	mW
Junction temperature	$T_j$	150	°C
Storage temperature range	$T_{stg}$	−55 to 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)

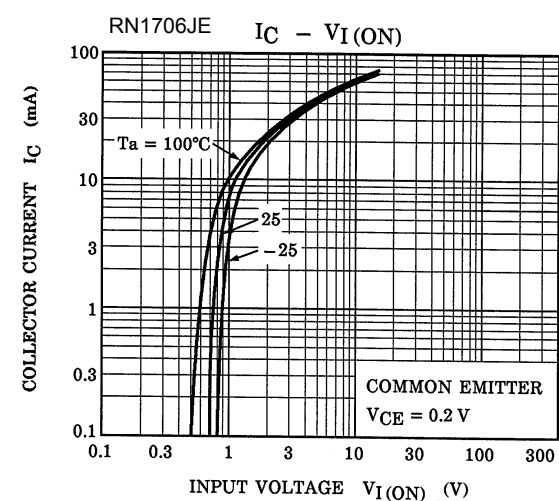
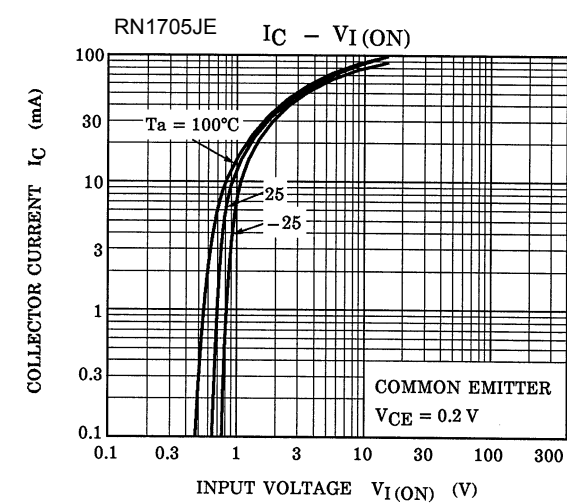
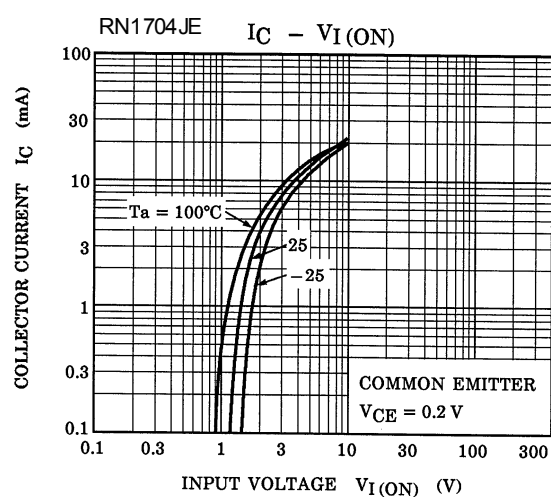
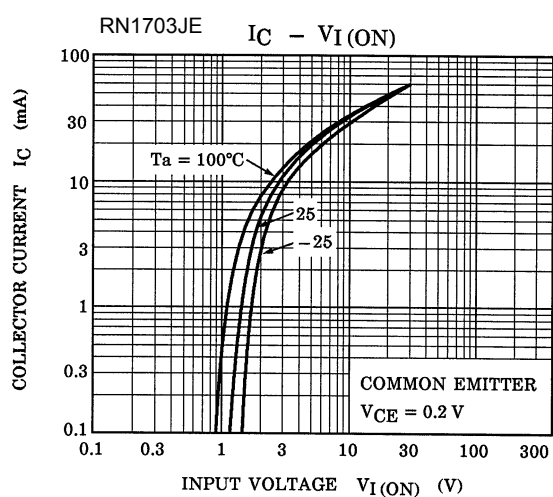
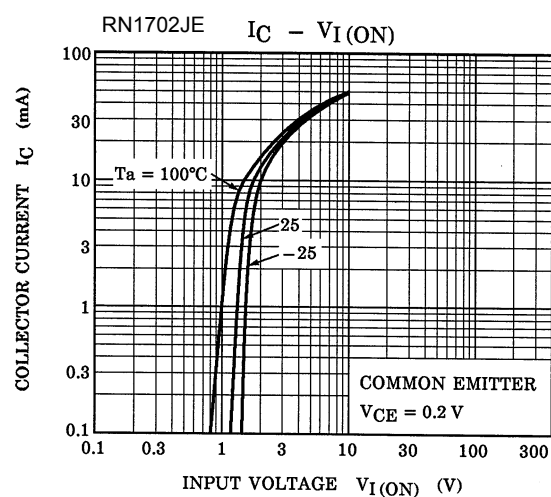
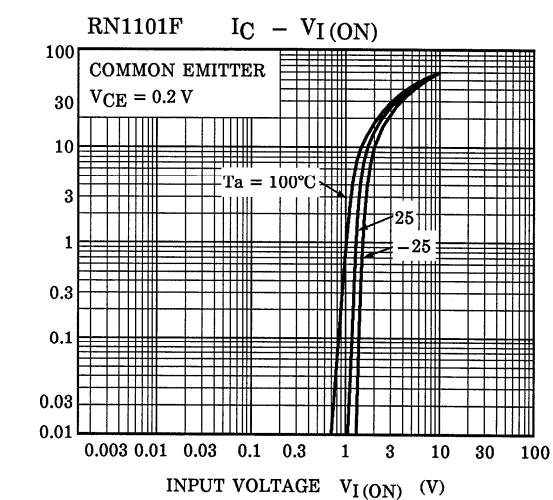


Start of commercial production  
2000-06

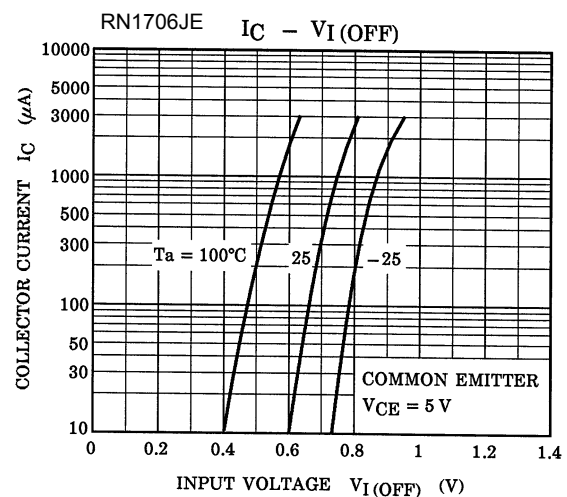
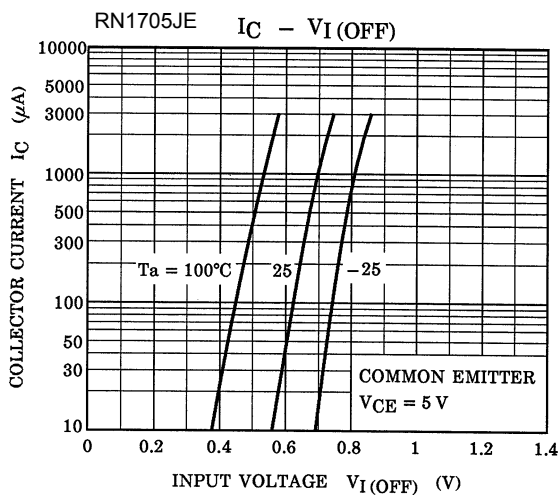
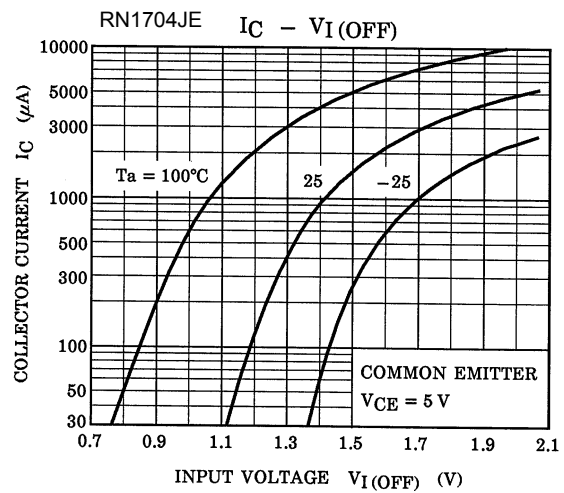
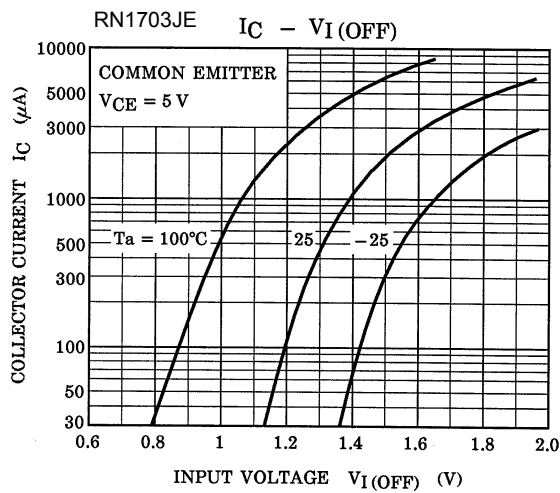
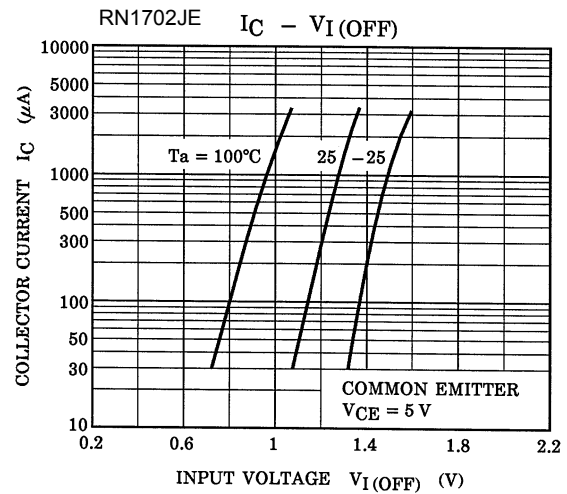
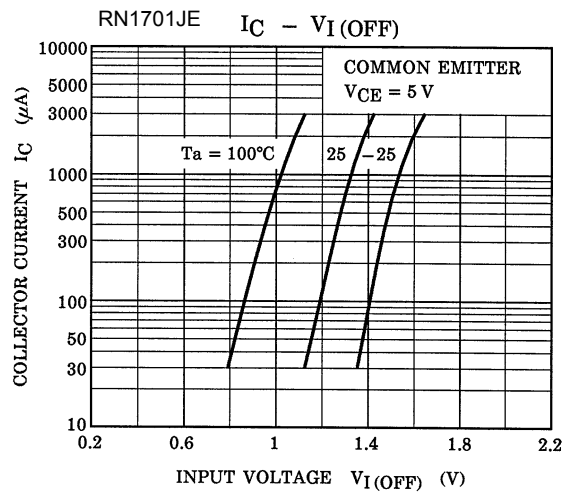
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

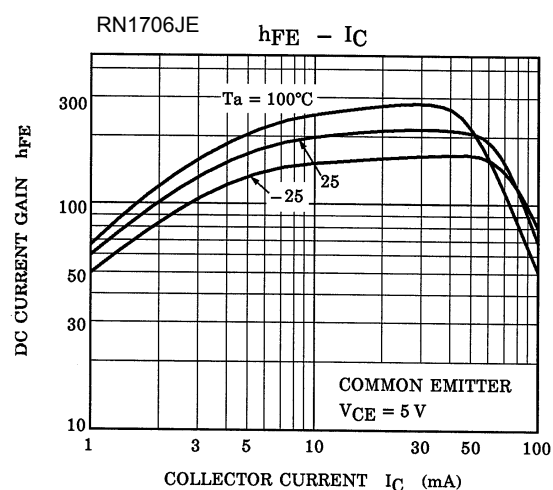
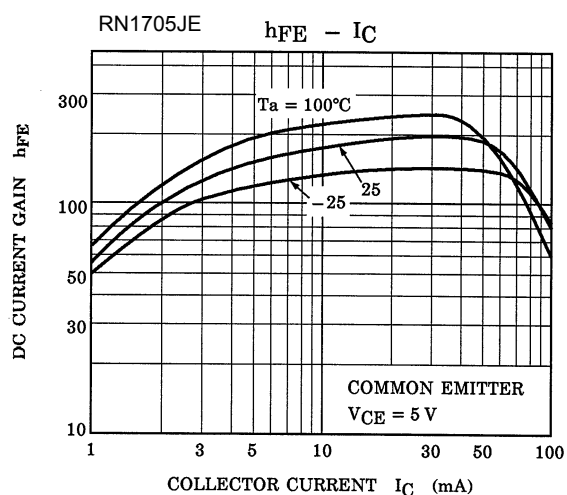
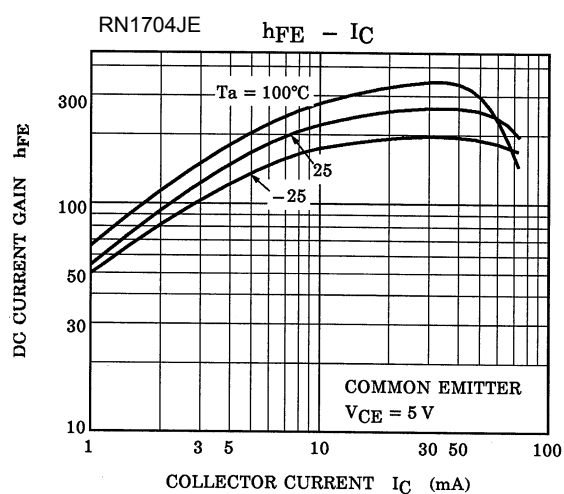
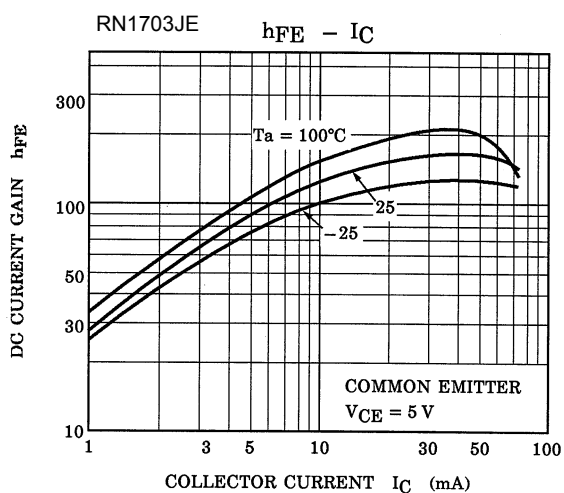
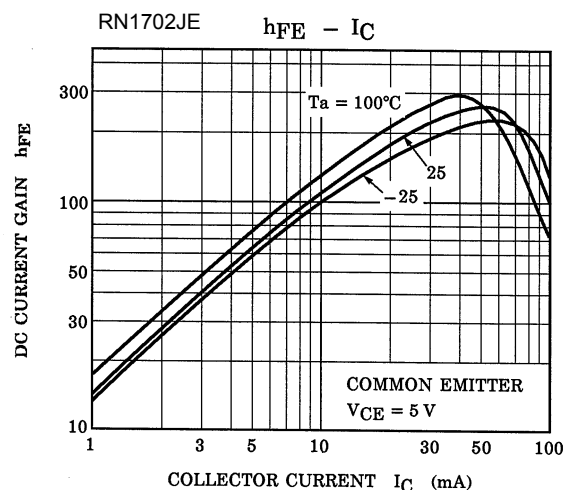
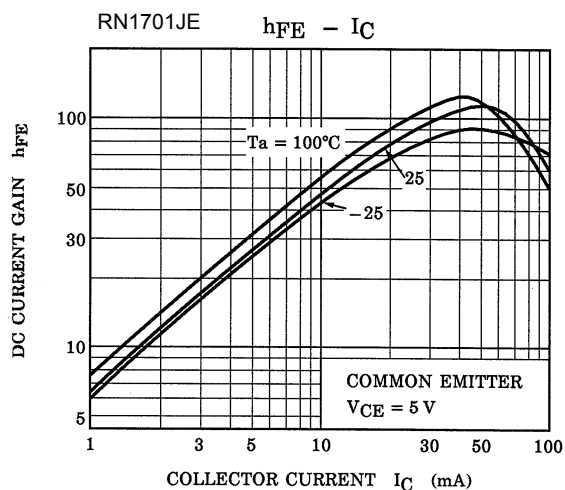
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1701JE to RN1706JE	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1701JE	$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0$	0.82	—	1.52	mA
	RN1702JE			0.38	—	0.71	
	RN1703JE			0.17	—	0.33	
	RN1704JE			0.082	—	0.15	
	RN1705JE	$I_{EBO}$	$V_{EB} = 5\text{ V}, I_C = 0$	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	R1	—	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	R1/R2	—	0.9	1.0	1.1	
	RN1705JE			0.0421	0.0468	0.0515	
	RN1706JE			0.09	0.1	0.11	

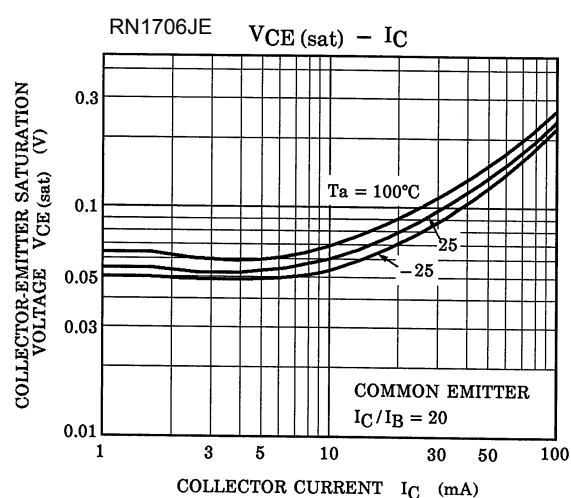
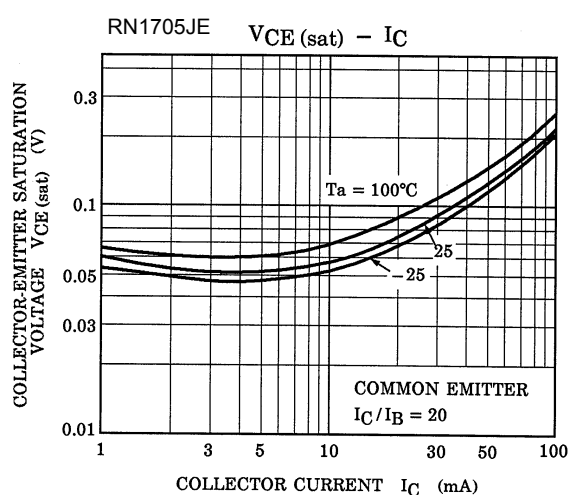
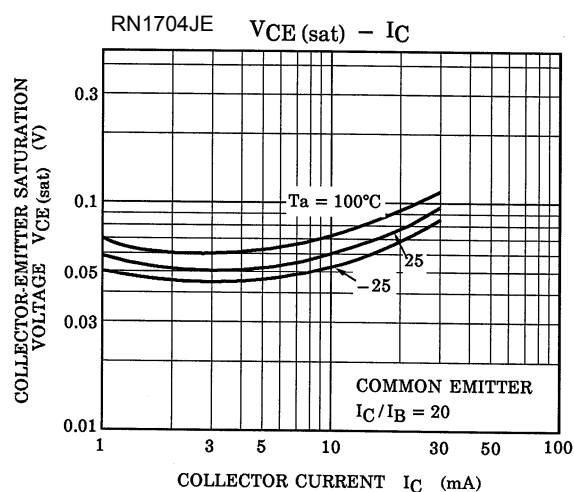
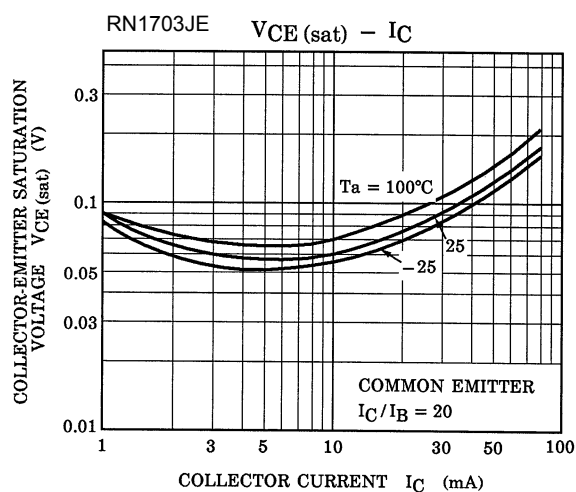
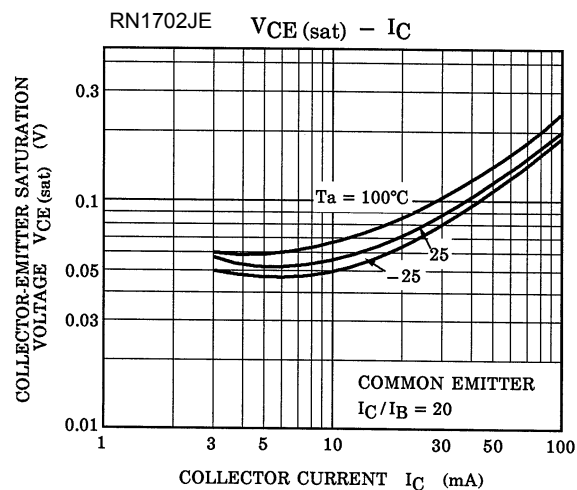
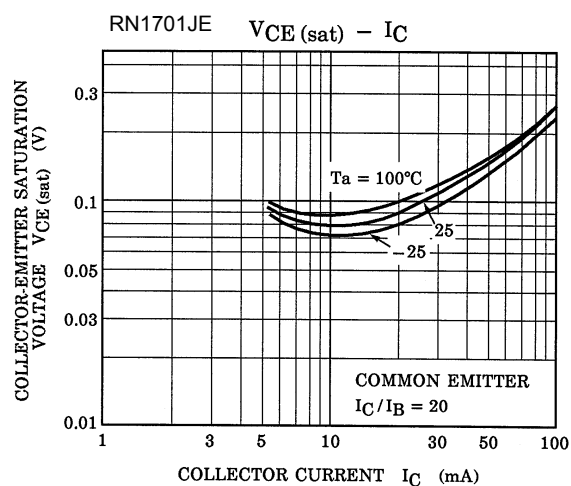
## Q1, Q2 Common

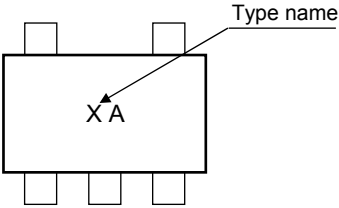
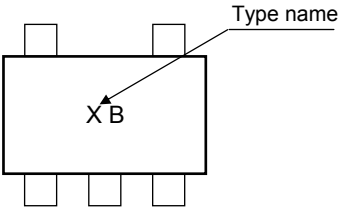
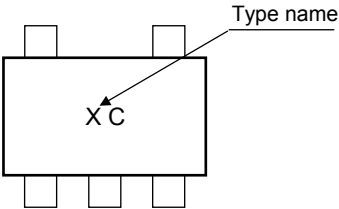
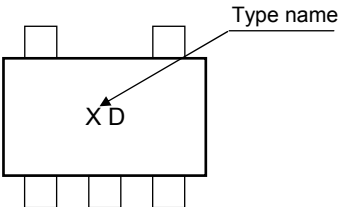
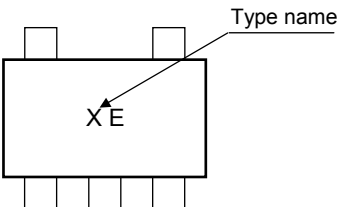
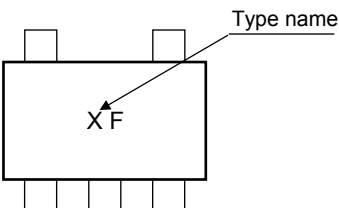


## Q1, Q2 Common







Type Name	Marking
RN1701JE	
RN1702JE	
RN1703JE	
RN1704JE	
RN1705JE	
RN1706JE	

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