

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

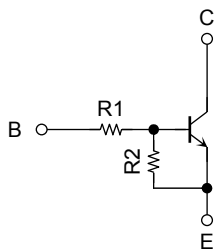
RN1701JE, RN1702JE, RN1703JE RN1704JE, RN1705JE, RN1706JE

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 Ω)	R2 (k Ω)
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)

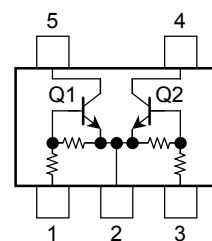
Characteristics	Symbol	Rating	Unit
Collector-base voltage	RN1701JE to 1706JE V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	RN1701JE to 1704JE V_{EBO}	10	V
	RN1705JE RN1706JE	5	
Collector current	I_C	100	mA
Collector power dissipation	RN1701JE to 1706JE P_C (Note 1)	100	mW
Junction 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)

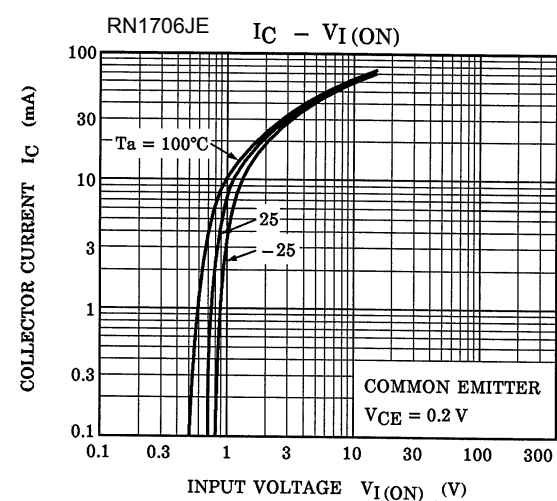
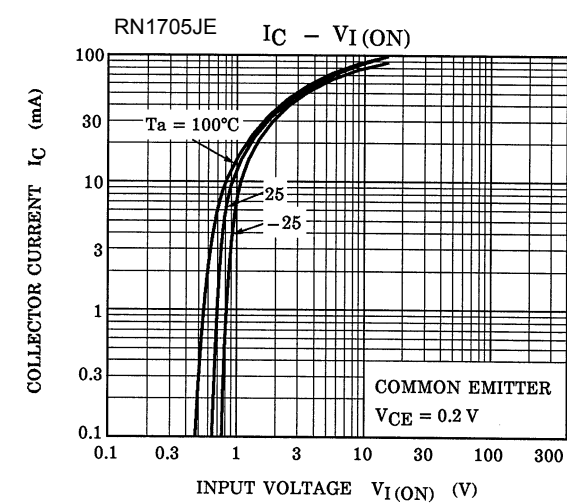
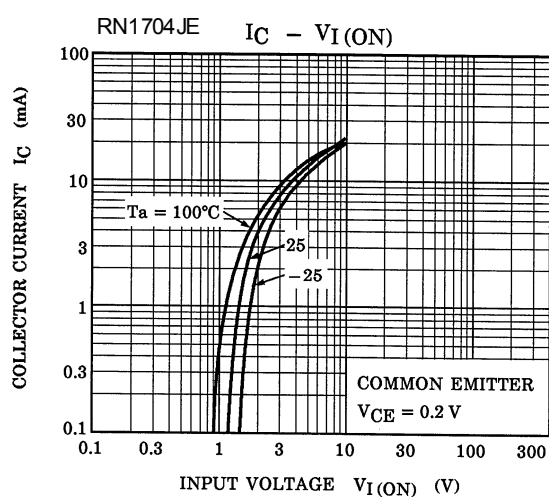
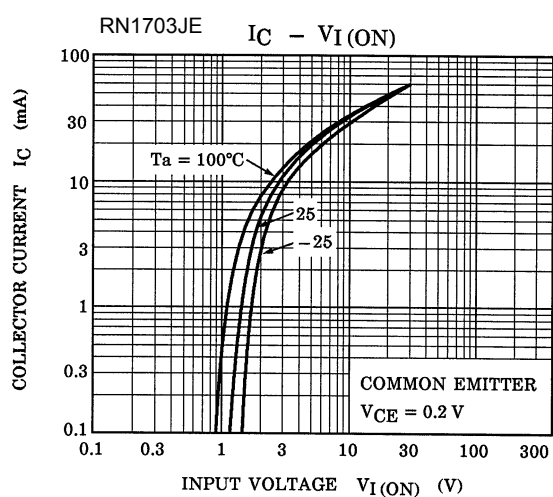
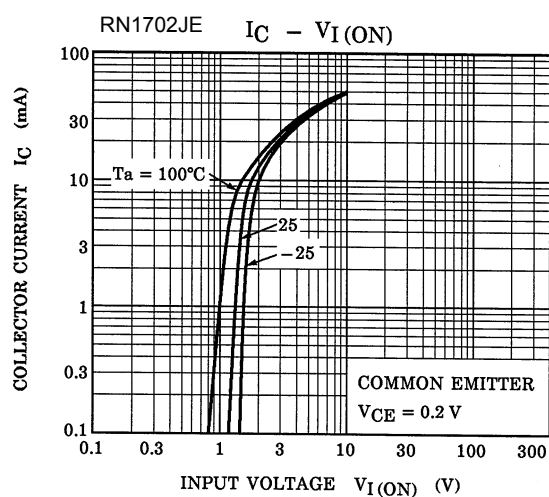
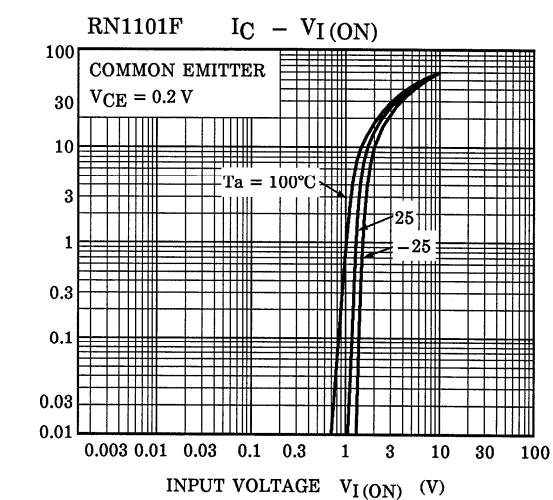


Start of commercial production
2000-06

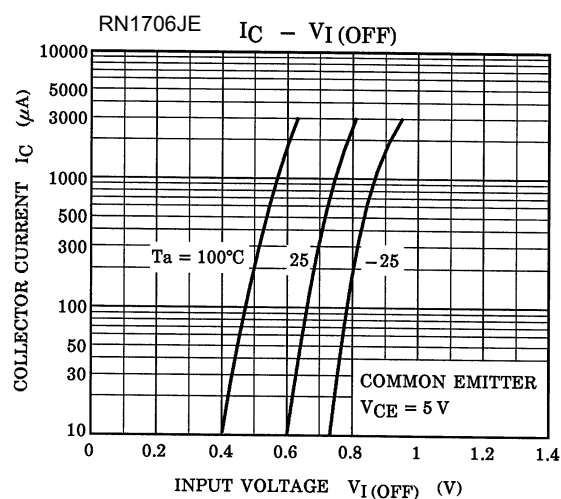
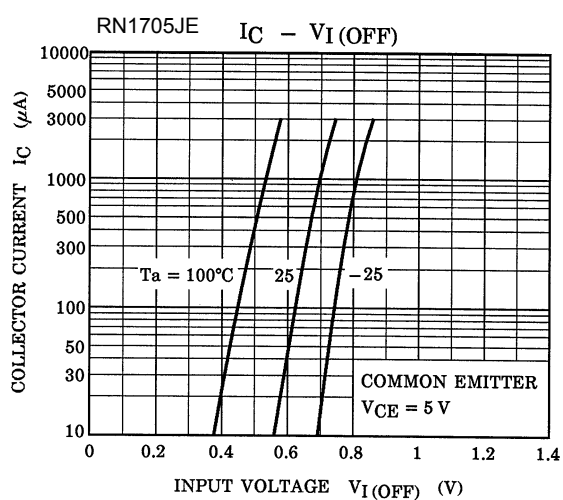
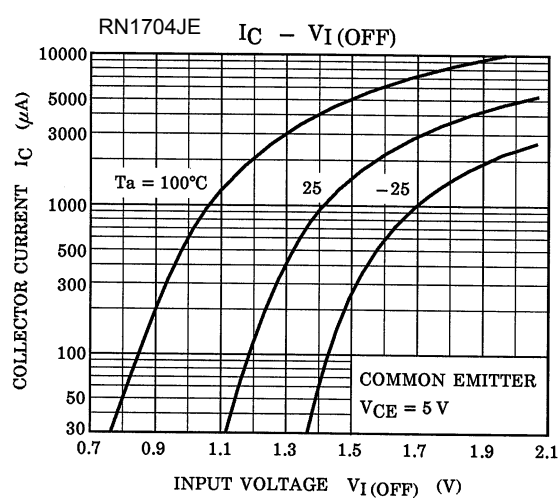
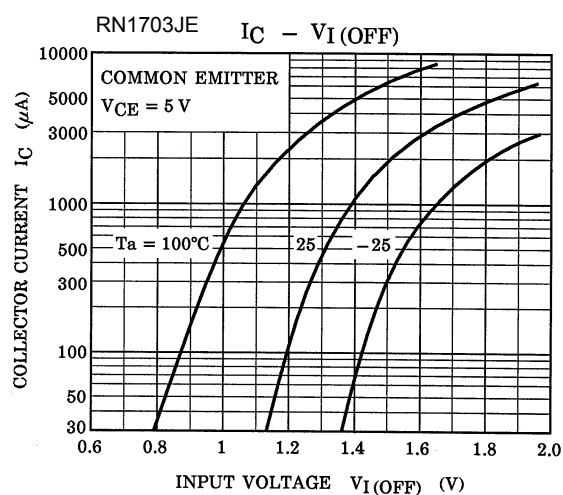
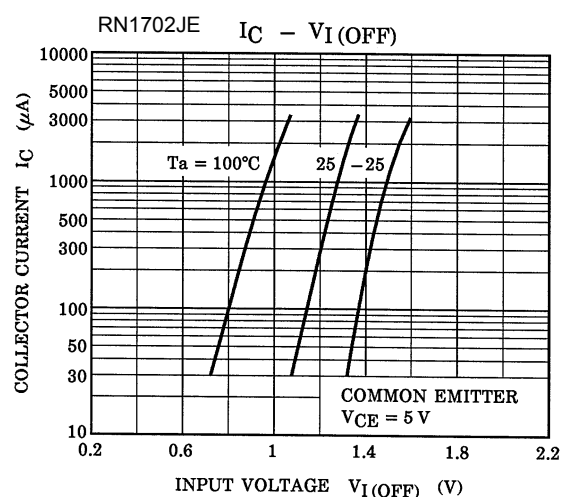
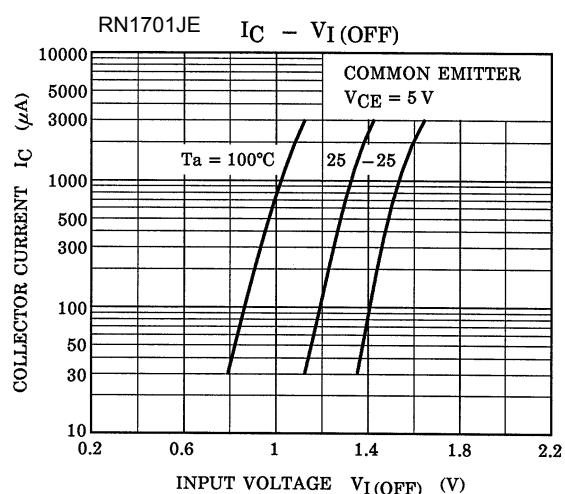
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

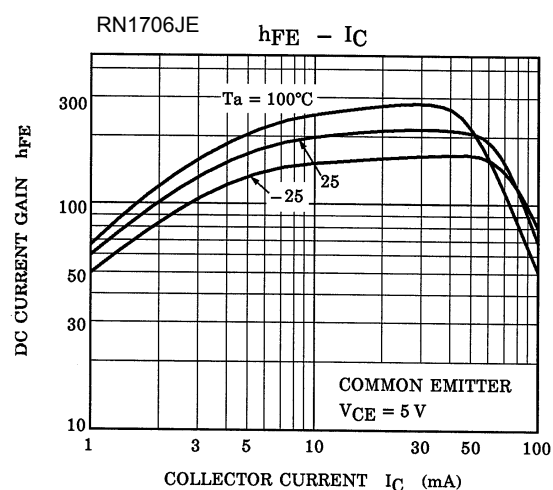
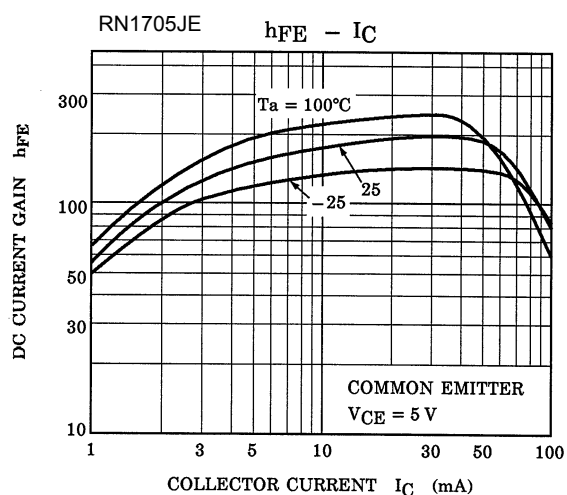
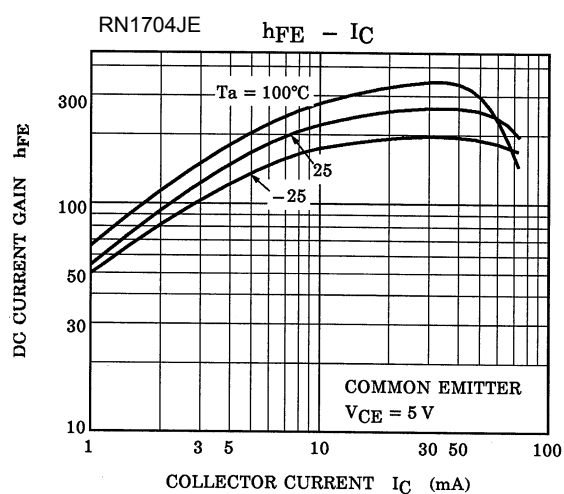
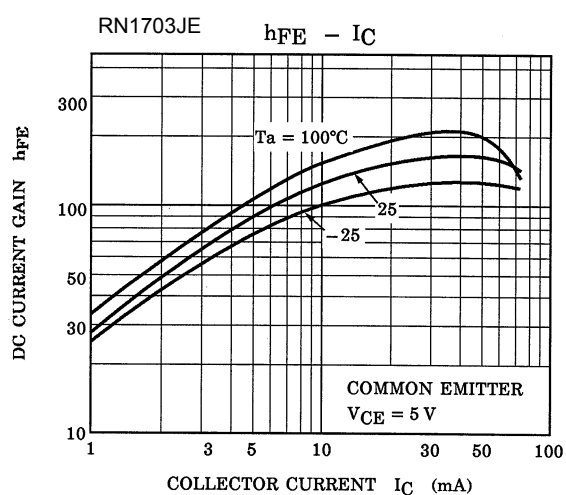
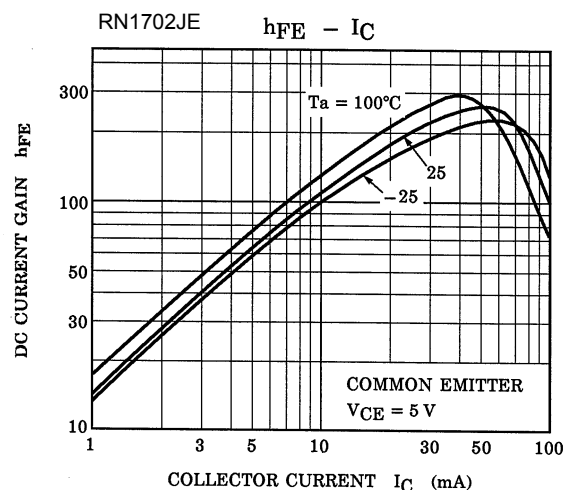
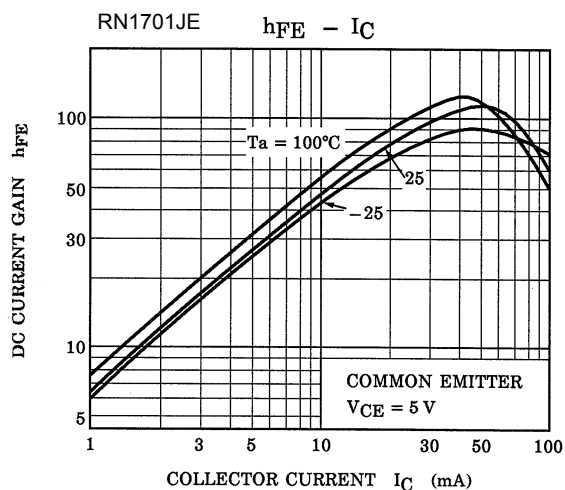
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1701JE to RN1706JE	I_{CBO}	$V_{CB} = 50\text{ V}, I_E = 0$	—	—	100	nA
		I_{CEO}	$V_{CE} = 50\text{ V}, I_B = 0$	—	—	500	
Emitter cut-off current	RN1701JE	I_{EBO}	$V_{EB} = 10\text{ V}, I_C = 0$	0.82	—	1.52	mA
	RN1702JE			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	kΩ
	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	

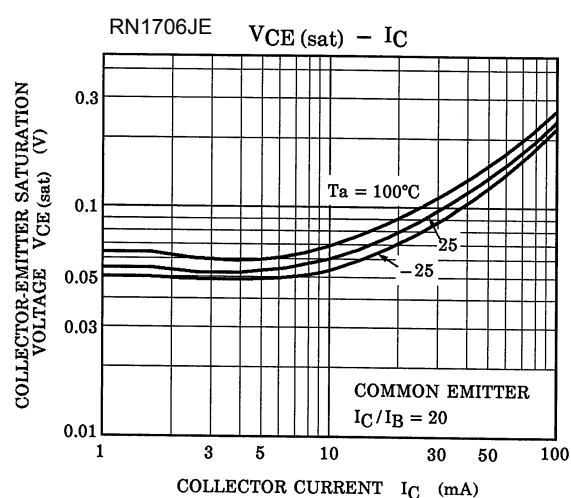
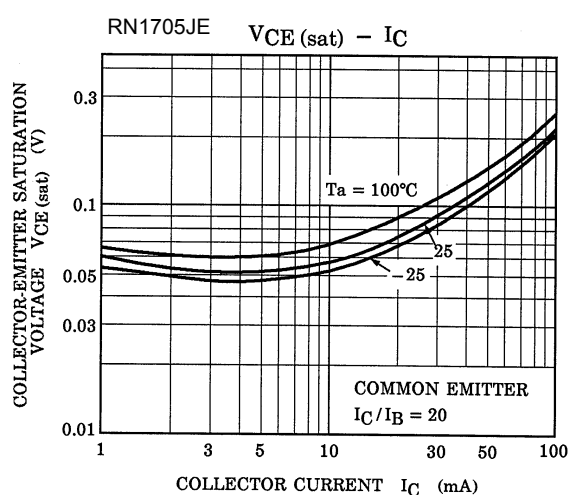
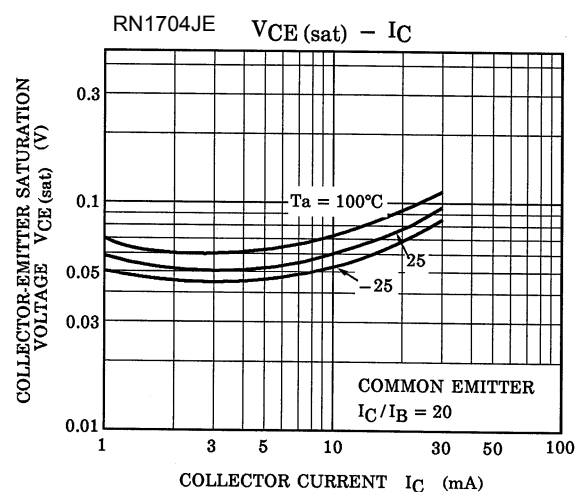
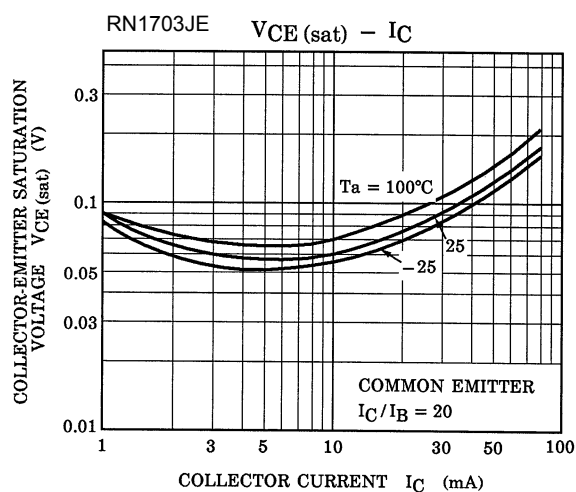
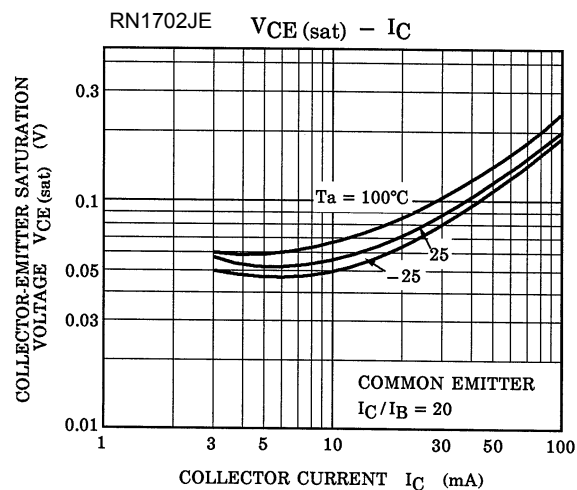
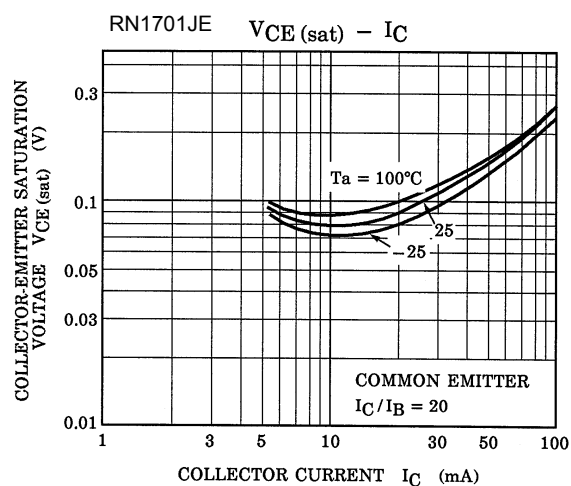
Q1, Q2 Common

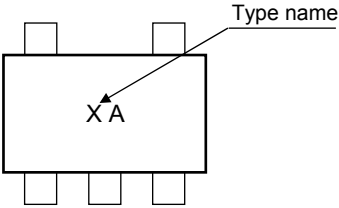
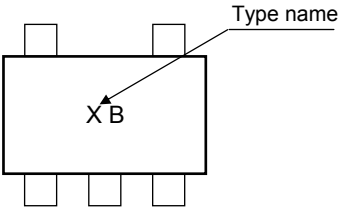
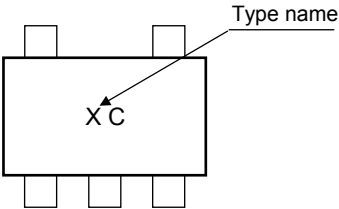
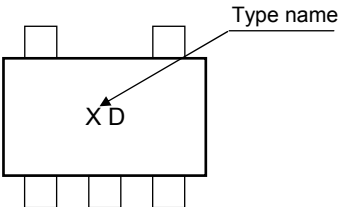
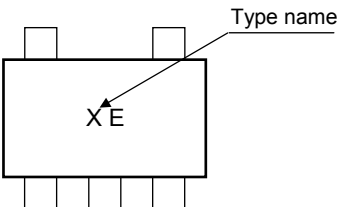
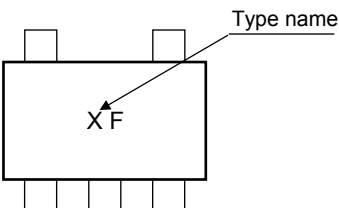


Q1, Q2 Common







Type Name	Marking
RN1701JE	
RN1702JE	
RN1703JE	
RN1704JE	
RN1705JE	
RN1706JE	

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