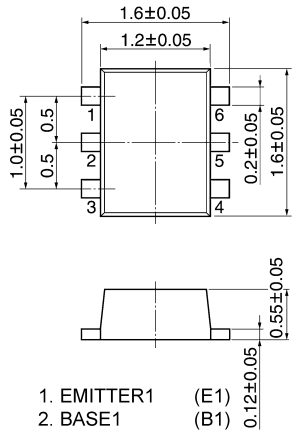
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor Built-in Transistor)

RN1901FE, RN1902FE, RN1903FE
RN1904FE, RN1905FE, RN1906FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6-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.
- Complementary to RN2901FE to RN2906FE

Unit: mm

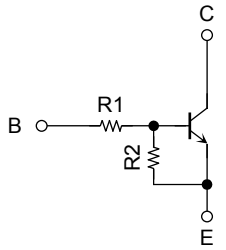


ES6

JEDEC	—
JEITA	—
TOSHIBA	2-2N1G

Weight: 3 mg (typ.)

Equivalent Circuit and Bias Resistor Values

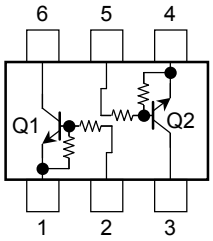


Type No.	R1 (kΩ)	R2 (kΩ)
RN1901FE	4.7	4.7
RN1902FE	10	10
RN1903FE	22	22
RN1904FE	47	47
RN1905FE	2.2	47
RN1906FE	4.7	47

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1901FE to RN1906FE	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1901FE to RN1904FE	V_{EBO}	10	V
	RN1905FE, RN1906FE		5	
Collector current	RN1901FE to RN1906FE	I_C	100	mA
Collector power dissipation		P_C (Note 1)	100	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−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).

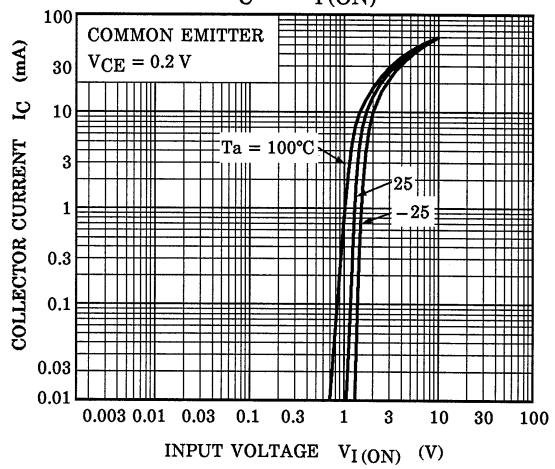
Note 1: Total rating

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

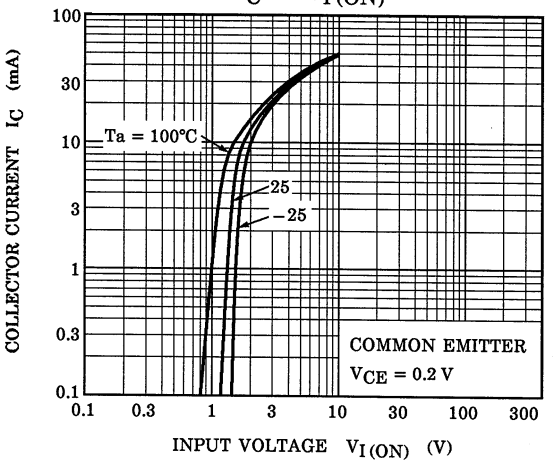
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1901FE to 1906FE	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1901FE	I_{EBO}	V_{EB} = 10 V, I_C = 0	0.82	—	1.52	mA
	RN1902FE			0.38	—	0.71	
	RN1903FE			0.17	—	0.33	
	RN1904FE			0.082	—	0.15	
	RN1905FE		V_{EB} = 5 V, I_C = 0	0.078	—	0.145	
	RN1906FE			0.074	—	0.138	
DC current gain	RN1901FE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	30	—	—	
	RN1902FE			50	—	—	
	RN1903FE			70	—	—	
	RN1904FE			80	—	—	
	RN1905FE			80	—	—	
	RN1906FE			80	—	—	
Collector-emitter saturation voltage	RN1901FE to 1906FE	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1901FE	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	V
	RN1902FE			1.2	—	2.4	
	RN1903FE			1.3	—	3.0	
	RN1904FE			1.5	—	5.0	
	RN1905FE			0.6	—	1.1	
	RN1906FE			0.7	—	1.3	
Input voltage (OFF)	RN1901FE to 1904FE	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	V
	RN1905FE, 1906FE			0.5	—	0.8	
Transition frequency	RN1901FE to 1906FE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1901FE to 1906FE	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	3	6	pF
Input resistor	RN1901FE	R1	—	3.29	4.7	6.11	kΩ
	RN1902FE			7	10	13	
	RN1903FE			15.4	22	28.6	
	RN1904FE			32.9	47	61.1	
	RN1905FE			1.54	2.2	2.86	
	RN1906FE			3.29	4.7	6.11	
Resistor ratio	RN1901FE to 1904FE	R1/R2	—	0.9	1.0	1.1	
	RN1905FE			0.0421	0.0468	0.0515	
	RN1906FE			0.09	0.1	0.11	

Q1, Q2 Common

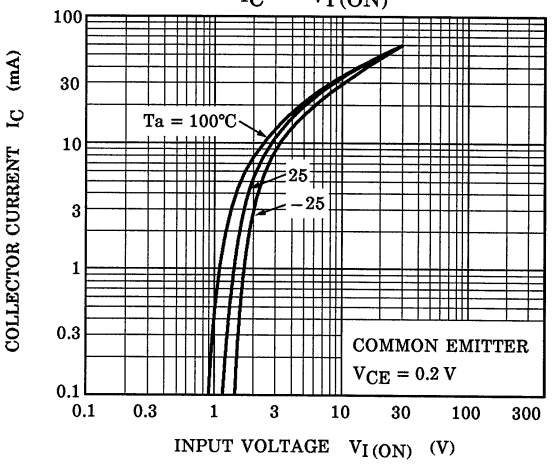
RN1901FE $I_C - V_{I(ON)}$



RN1902FE $I_C - V_{I(ON)}$



RN1903FE $I_C - V_{I(ON)}$



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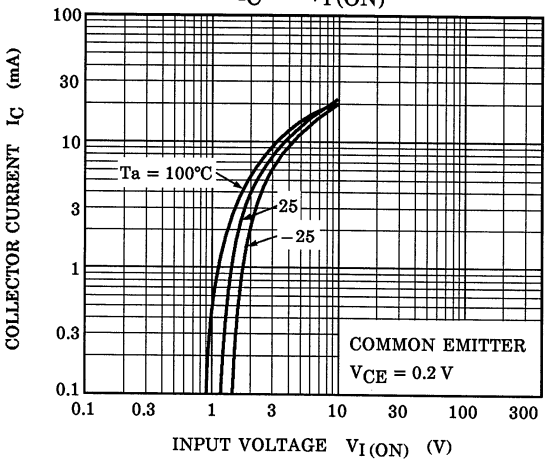

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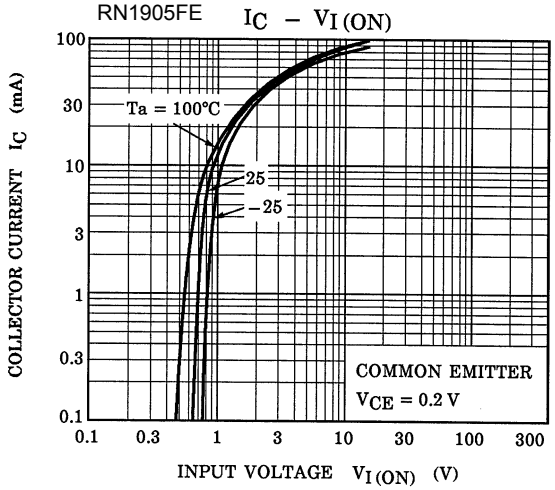

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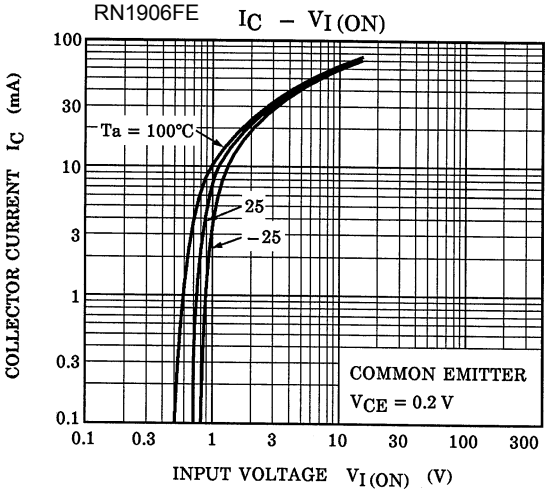
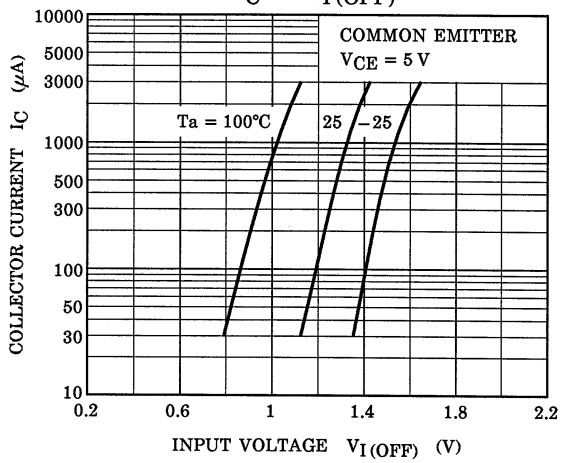


Q1, Q2 Common

RN1901FE $I_C - V_{I(OFF)}$



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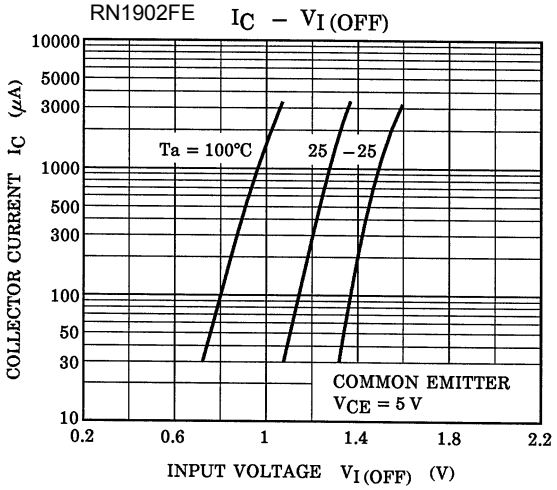

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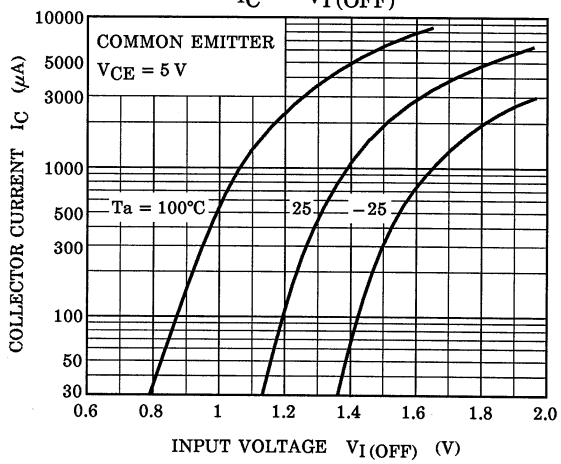

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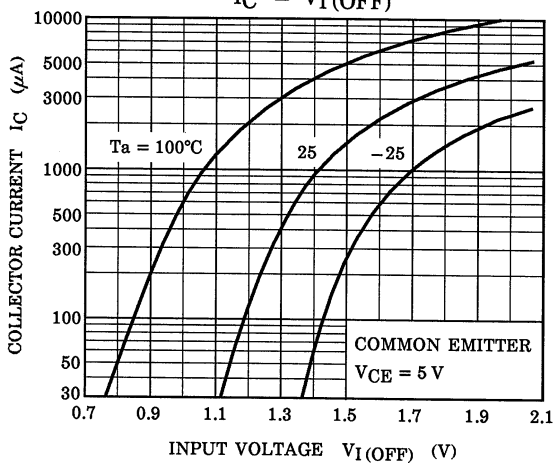

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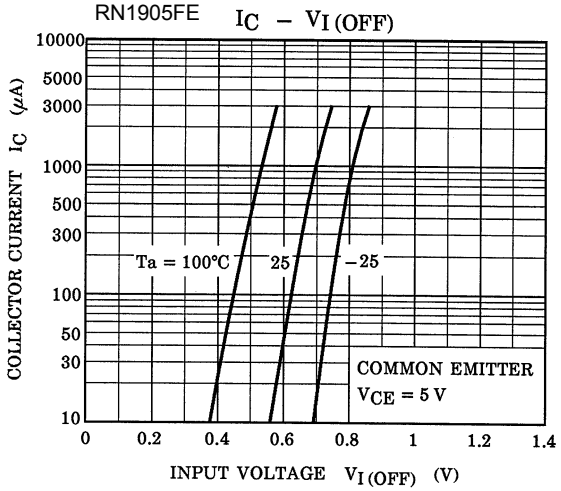

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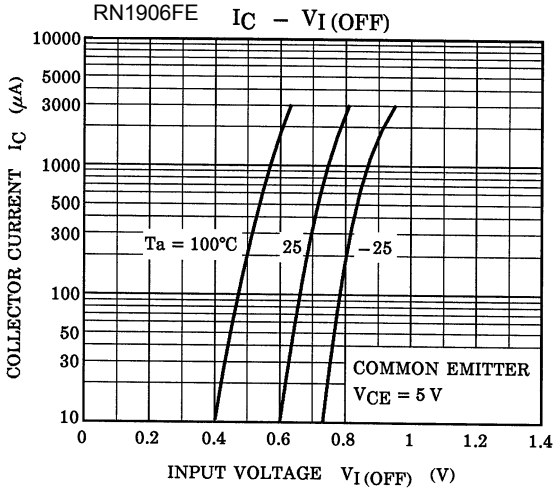
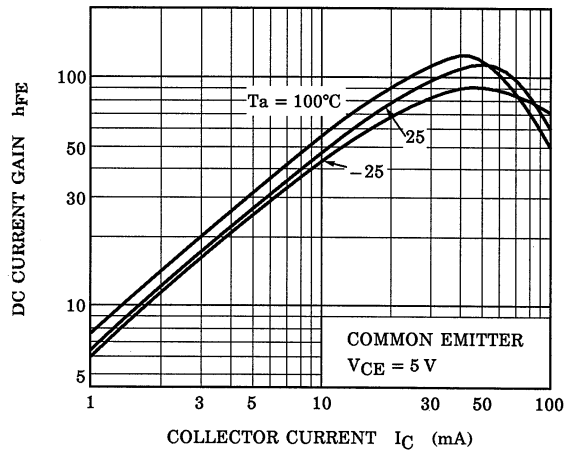


RN1901FE h_{FE} – I_C



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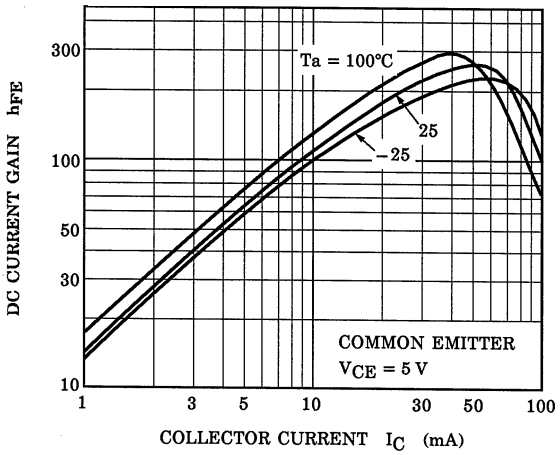

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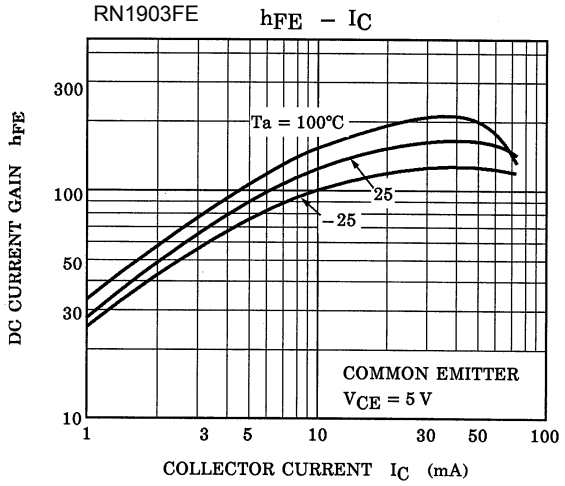

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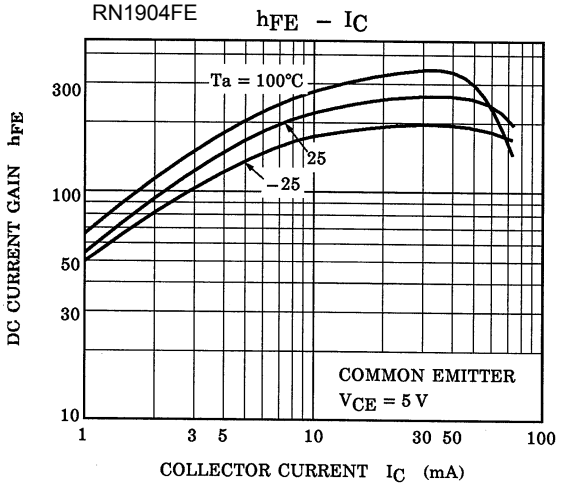

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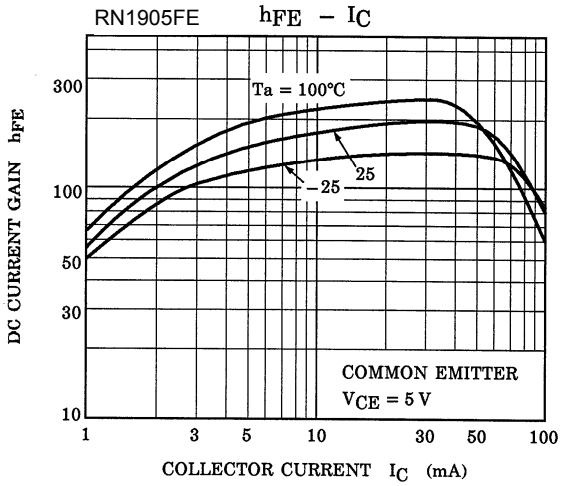
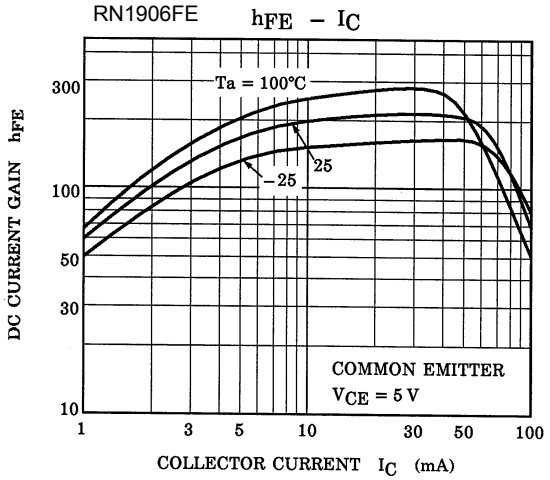
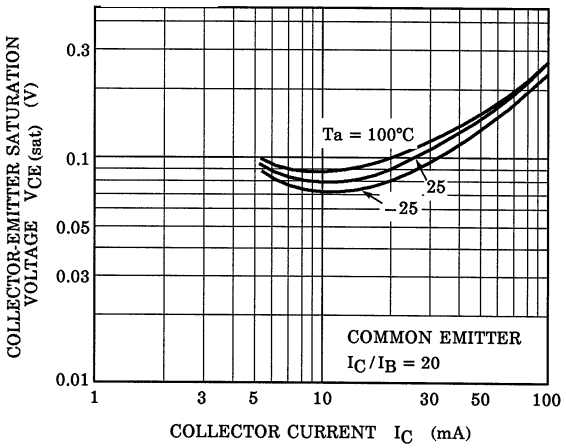


RN1906FE h_{FE} – I_C



RN1901FE $V_{CE\,(sat)} - I_C$



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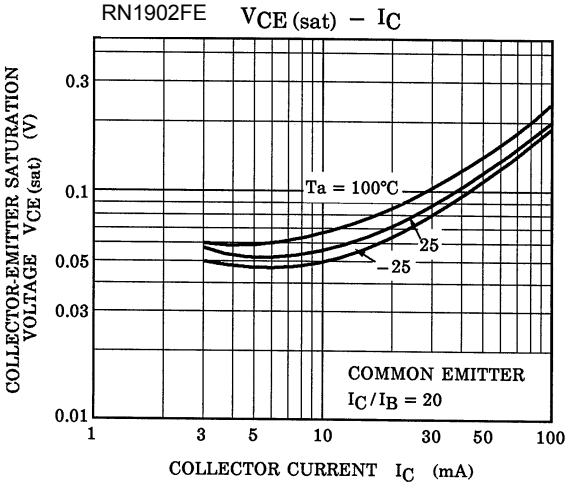

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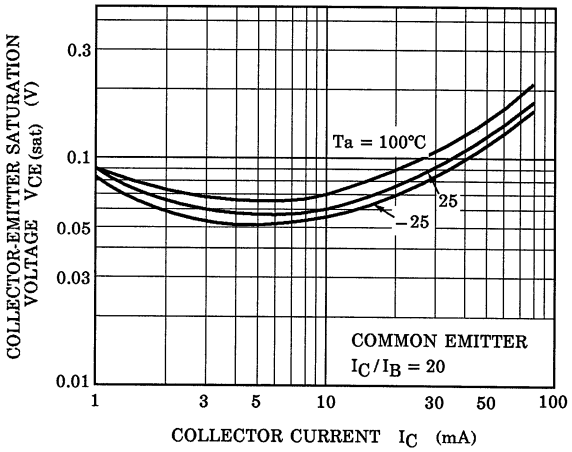

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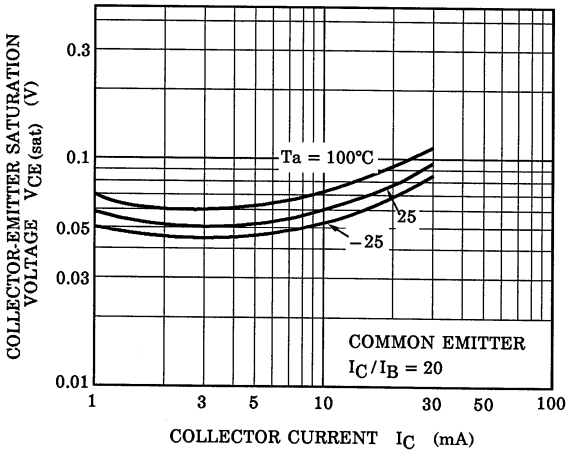

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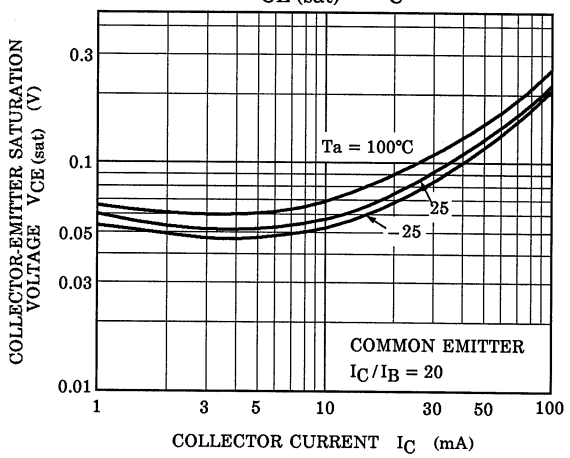

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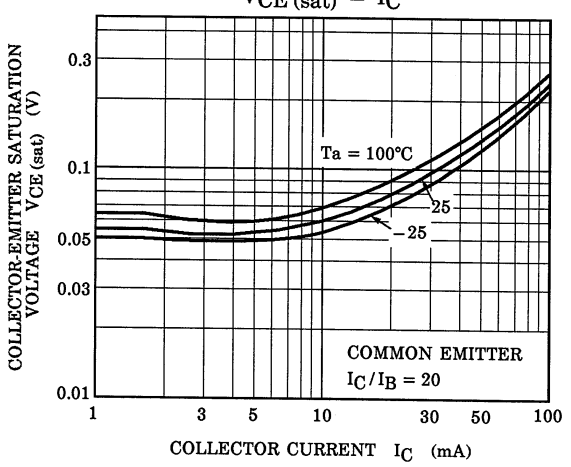
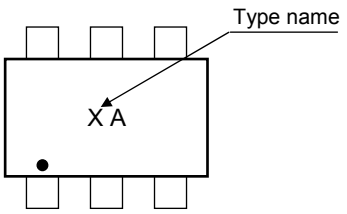
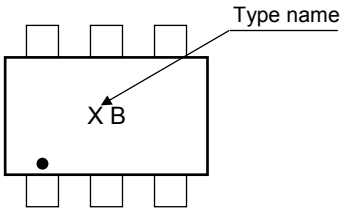
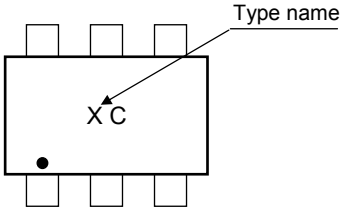
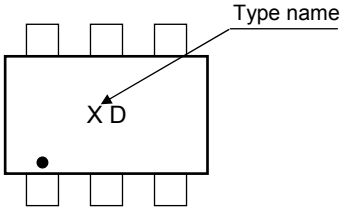
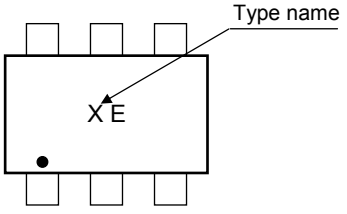
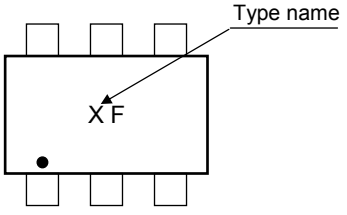


Marking

Type Name	Marking
RN1901FE	
RN1902FE	
RN1903FE	
RN1904FE	
RN1905FE	
RN1906FE	

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