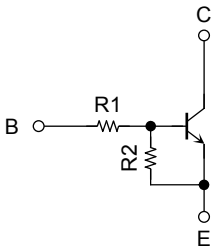
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN1961FE, RN1962FE, RN1963FE RN1964FE, RN1965FE, RN1966FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

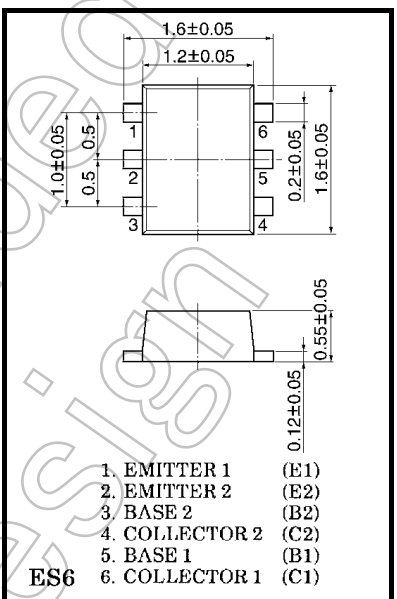
- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2961FE to RN2966FE

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1961FE	4.7	4.7
RN1962FE	10	10
RN1963FE	22	22
RN1964FE	47	47
RN1965FE	2.2	47
RN1966FE	4.7	47

Unit: mm



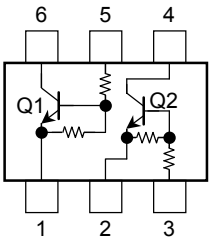
JEDEC	—
JEITA	—
TOSHIBA	2-2N1A

Weight: 3mg (typ.)

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

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1961FE to 1966FE	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1961FE to 1964FE	V_{EBO}	10	V
	RN1965FE RN1966FE		5	
Collector current	RN1961FE to 1966FE	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 to150	°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

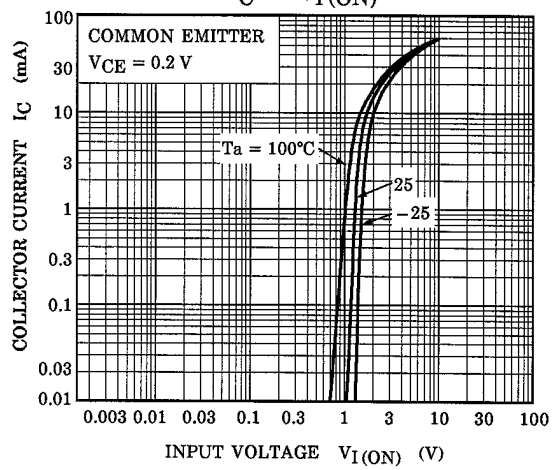
Start of commercial production
2000-05

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

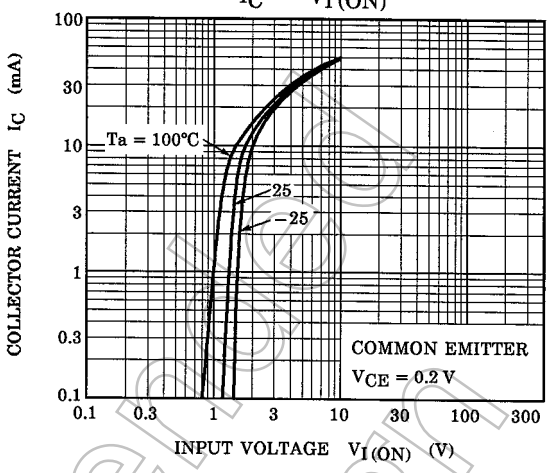
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1961FE to RN1966FE	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1961FE	I_{EBO}	V_{EB} = 10 V, I_C = 0	0.82	—	1.52	mA
	RN1962FE			0.38	—	0.71	
	RN1963FE			0.17	—	0.33	
	RN1964FE			0.082	—	0.15	
	RN1965FE		V_{EB} = 5 V, I_C = 0	0.078	—	0.145	
	RN1966FE			0.074	—	0.138	
DC current gain	RN1961FE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	30	—	—	—
	RN1962FE			50	—	—	
	RN1963FE			70	—	—	
	RN1964FE			80	—	—	
	RN1965FE			80	—	—	
	RN1966FE			80	—	—	
Collector-emitter saturation voltage	RN1961FE to RN1966FE	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1961FE	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	V
	RN1962FE			1.2	—	2.4	
	RN1963FE			1.3	—	3.0	
	RN1964FE			1.5	—	5.0	
	RN1965FE			0.6	—	1.1	
	RN1966FE			0.7	—	1.3	
Input voltage (OFF)	RN1961FE to RN1964FE	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	V
	RN1965FE, RN1966FE			0.5	—	0.8	
Transition frequency	RN1961FE to RN1966FE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1961FE to RN1966FE	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	3	6	pF
Input resistor	RN1961FE	R1	—	3.29	4.7	6.11	kΩ
	RN1962FE			7	10	13	
	RN1963FE			15.4	22	28.6	
	RN1964FE			32.9	47	61.1	
	RN1965FE			1.54	2.2	2.86	
	RN1966FE			3.29	4.7	6.11	
Resistor ratio	RN1961FE to RN1964FE	R1/R2	—	0.9	1.0	1.1	—
	RN1965FE			0.0421	0.0468	0.0515	
	RN1966FE			0.09	0.1	0.11	

Q1, Q2 Common

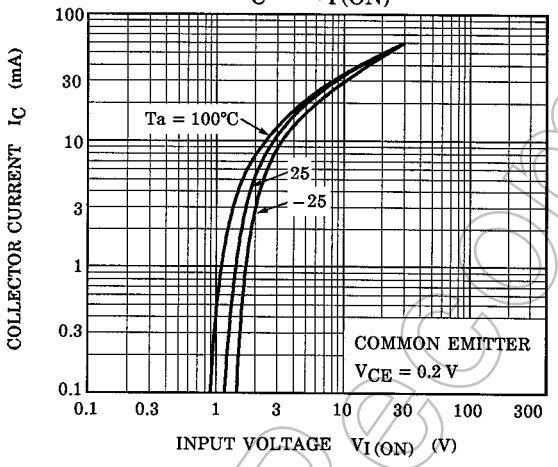
RN1961FE $I_C - V_{I(ON)}$



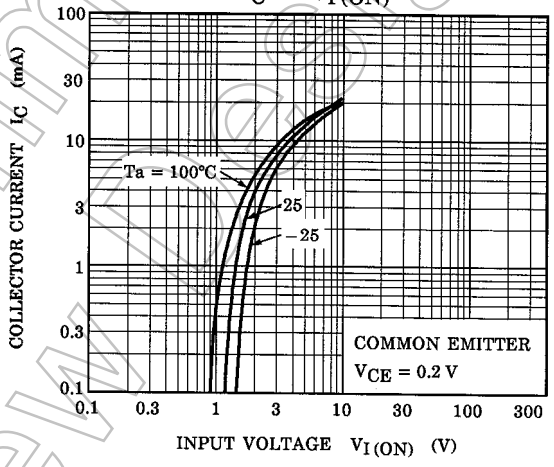
RN1962FE $I_C - V_{I(ON)}$



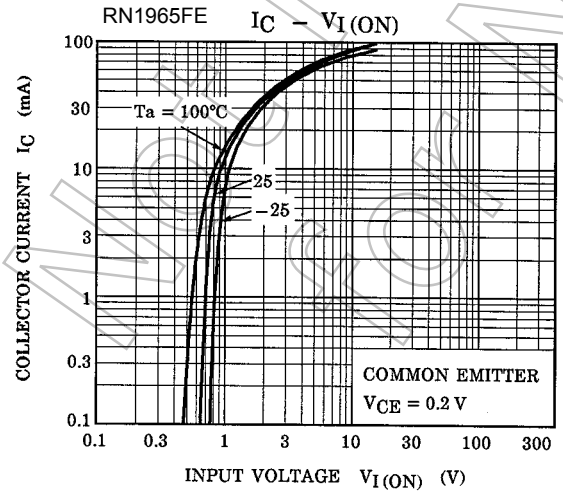
RN1963FE $I_C - V_{I(ON)}$



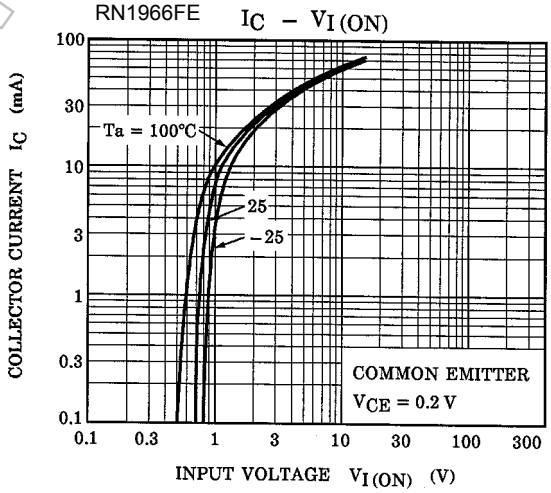
RN1964FE $I_C - V_{I(ON)}$



RN1965FE $I_C - V_{I(ON)}$

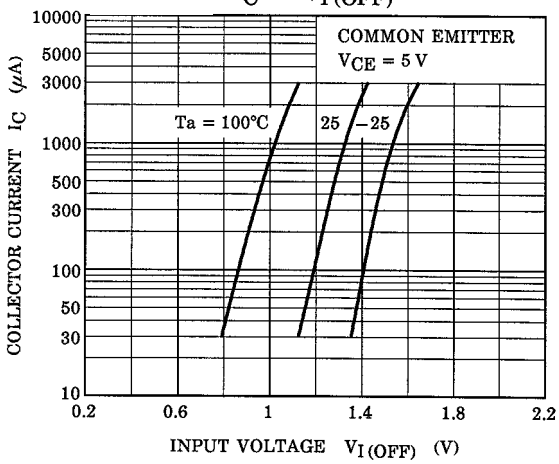


RN1966FE $I_C - V_{I(ON)}$

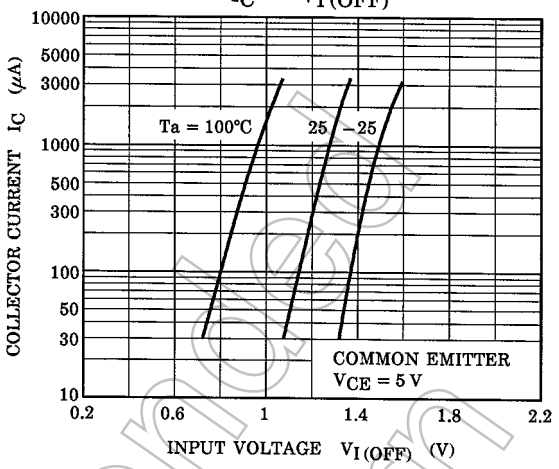


Q1, Q2 Common

RN1961FE $I_C - V_{I(OFF)}$



RN1962FE $I_C - V_{I(OFF)}$



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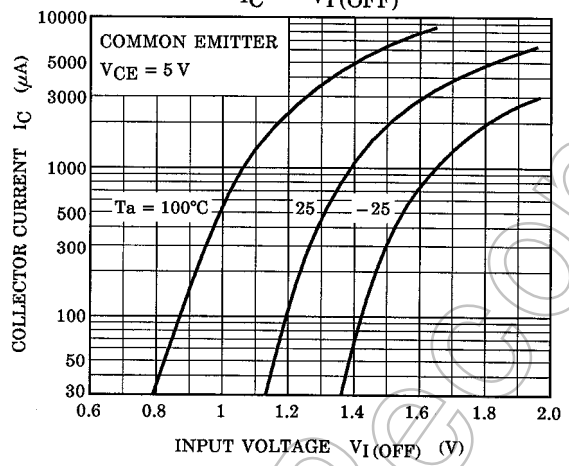

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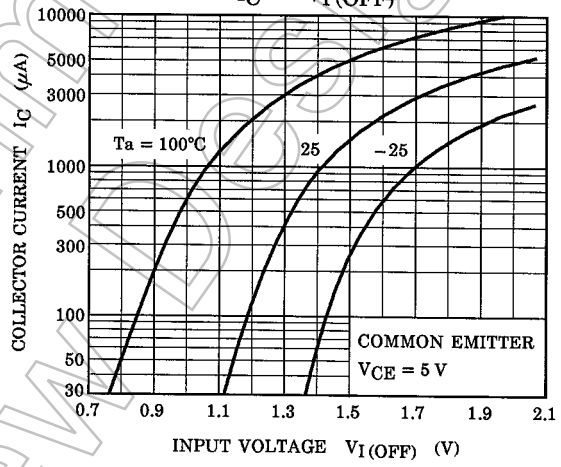

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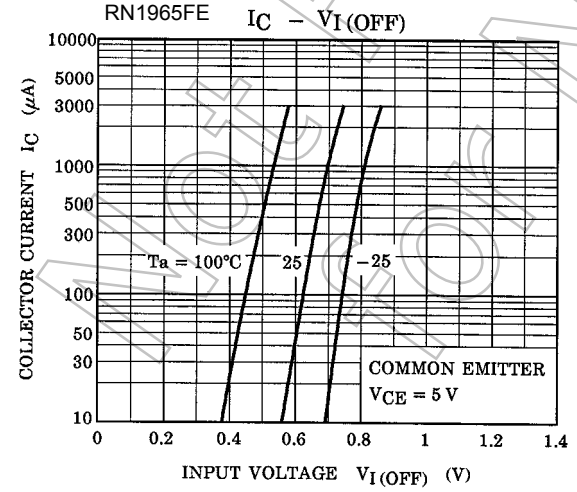
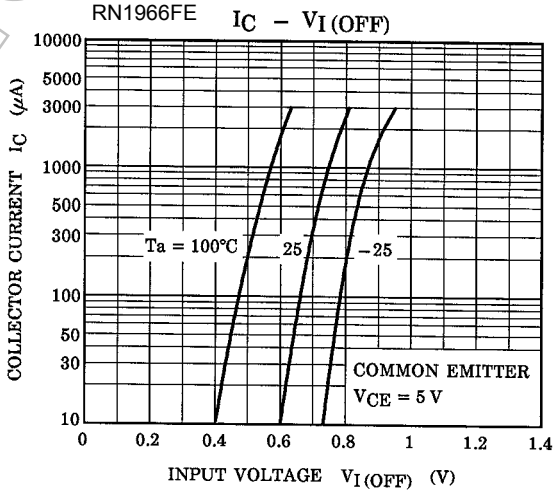
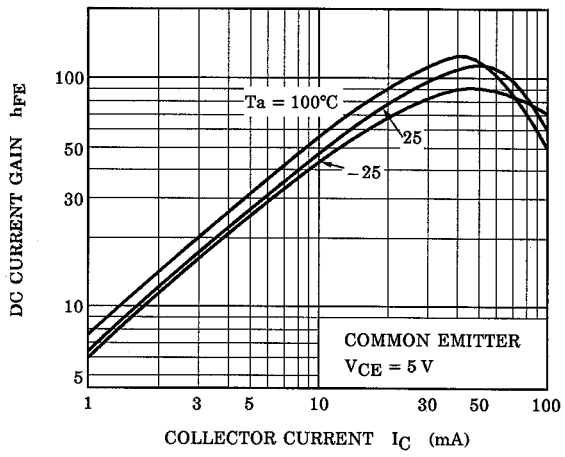


RN1966FE $I_C - V_{I(OFF)}$

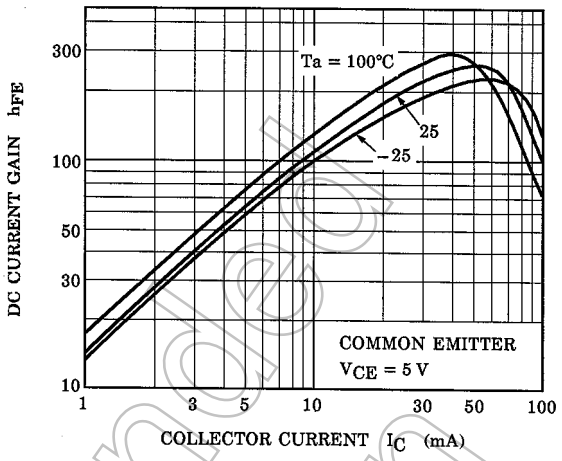


Q1,Q2 Common

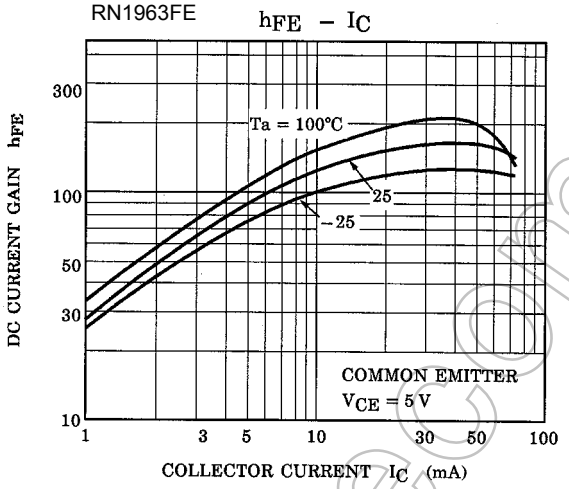
RN1961FE h_{FE} – I_C



RN1962FE h_{FE} – I_C



RN1963FE h_{FE} – I_C



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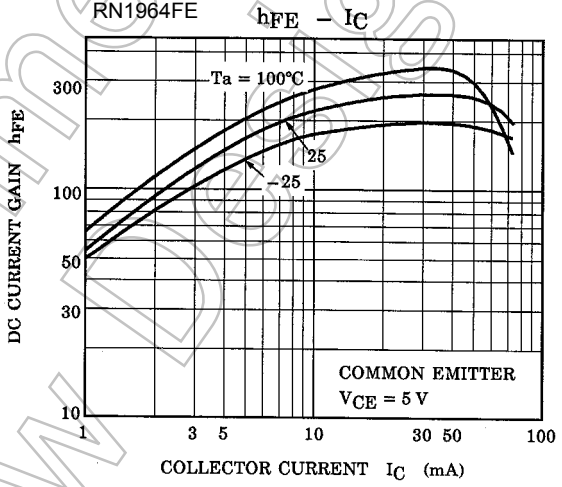
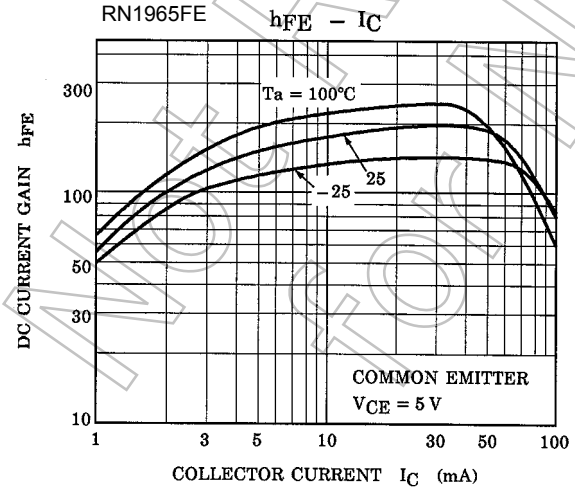
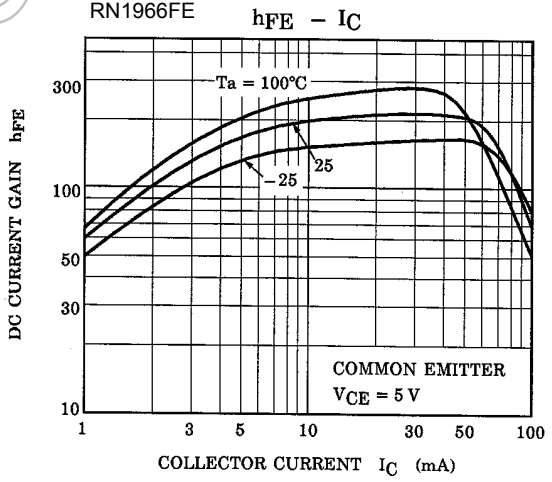


RN1965FE h_{FE} – I_C

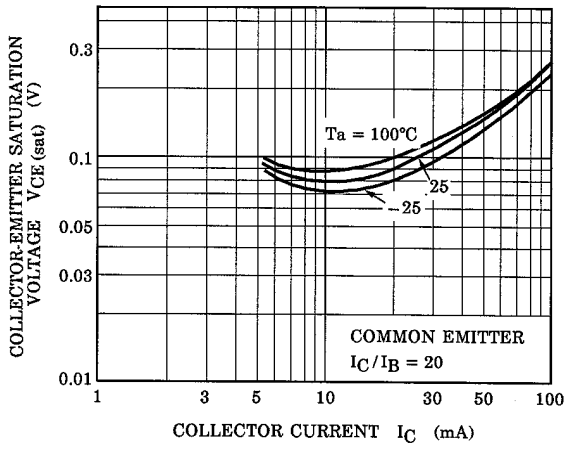


RN1966FE h_{FE} – I_C



Q1,Q2 Common

RN1961FE $V_{CE\,(sat)} - I_C$



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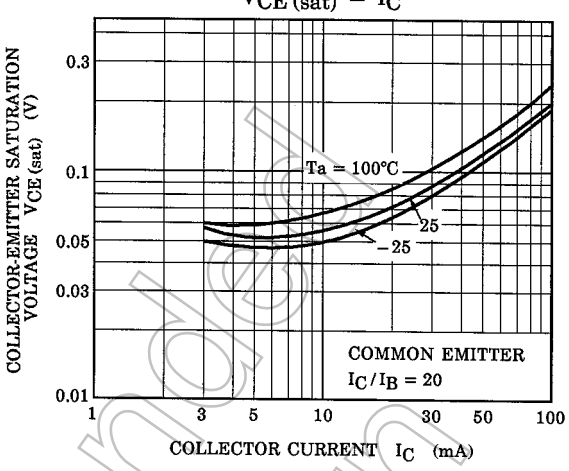
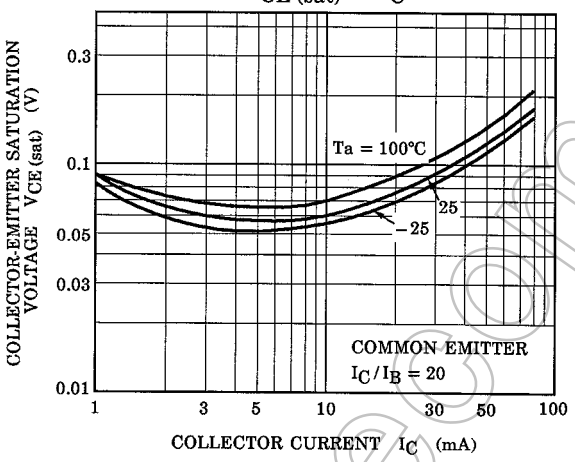
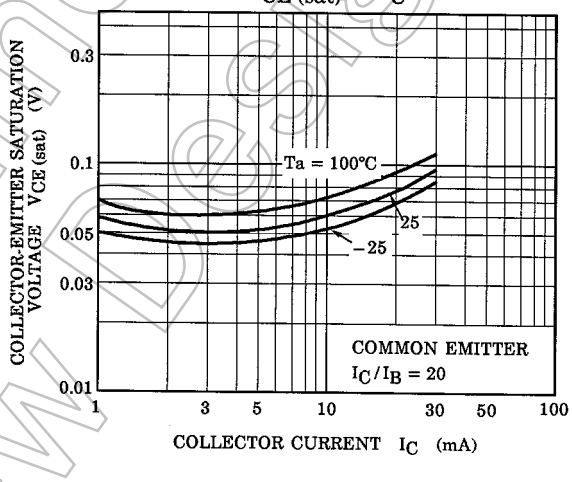


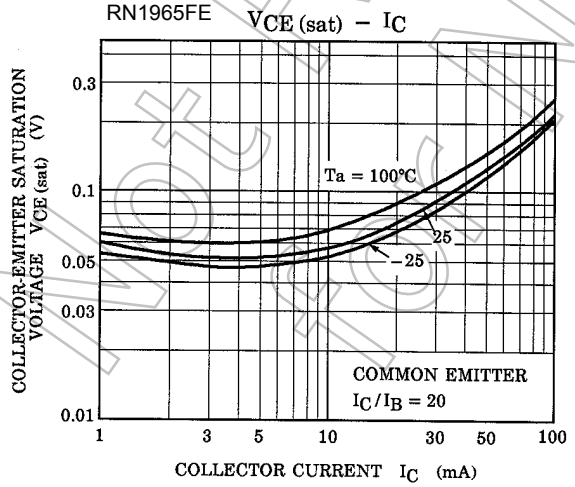
RN1963FE $V_{CE\,(sat)} - I_C$



RN1964FE $V_{CE\,(sat)} - I_C$



RN1965FE $V_{CE\,(sat)} - I_C$



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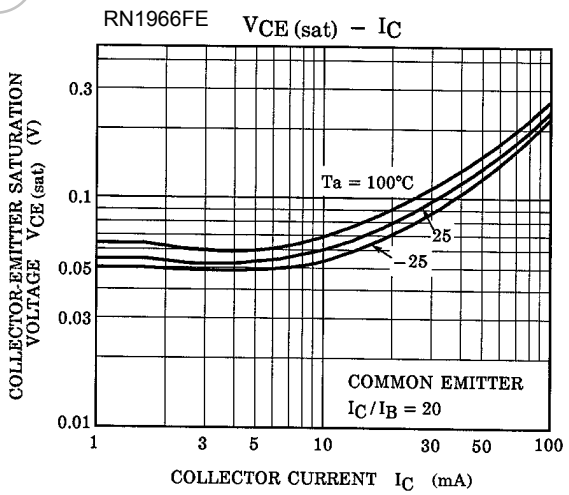
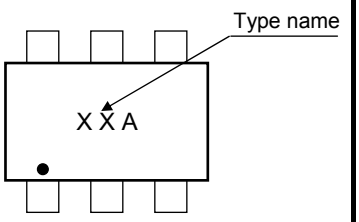
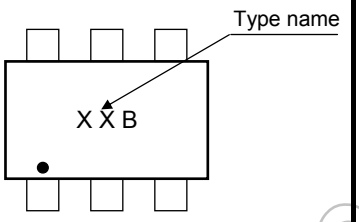
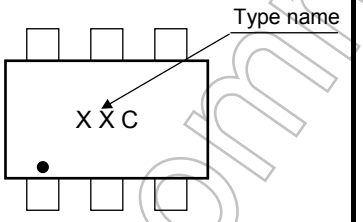
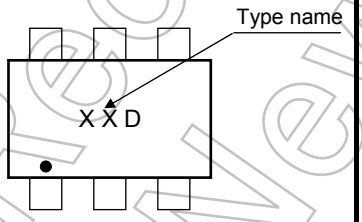
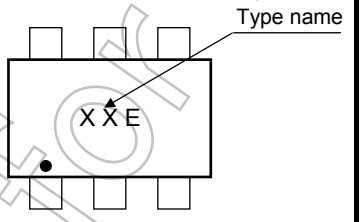
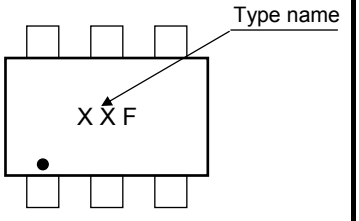


Marking

Type Name	Marking
RN1961FE	
RN1962FE	
RN1963FE	
RN1964FE	
RN1965FE	
RN1966FE	

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