

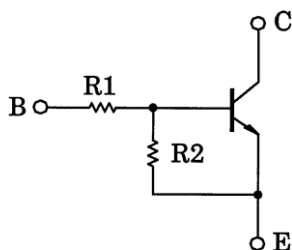
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN1301, RN1302, RN1303 RN1304, RN1305, RN1306

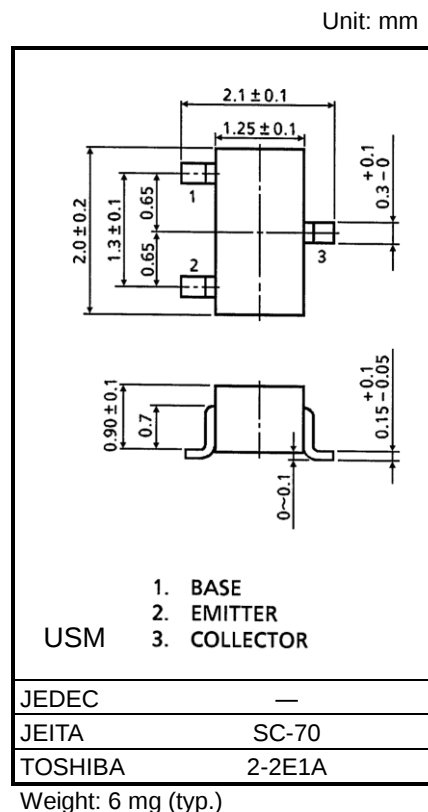
Switching, Inverter Circuit, Interface Circuit and Driver Circuit

- With built-in bias resistors.
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process and miniaturize equipment.
- Various resistance values are available to suit various circuit designs.
- Complementary to RN2301 to RN2306

Equivalent Circuit and Bias Resistor Values



Part No.	R1 (kΩ)	R2 (kΩ)
RN1301	4.7	4.7
RN1302	10	10
RN1303	22	22
RN1304	47	47
RN1305	2.2	47
RN1306	4.7	47



Absolute Maximum Ratings (Ta = 25°C)

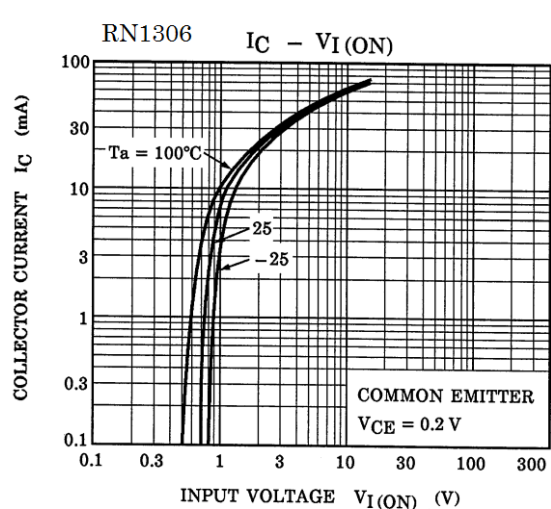
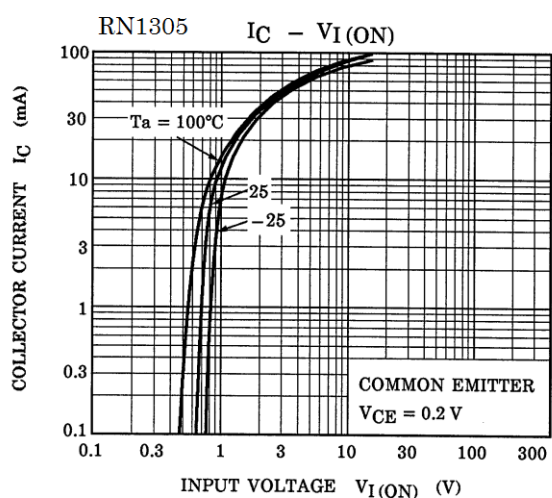
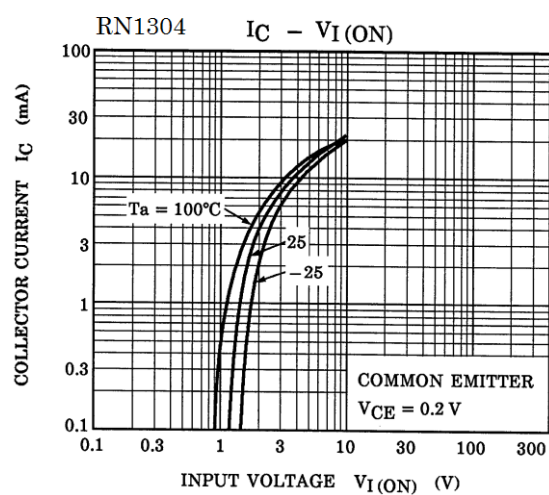
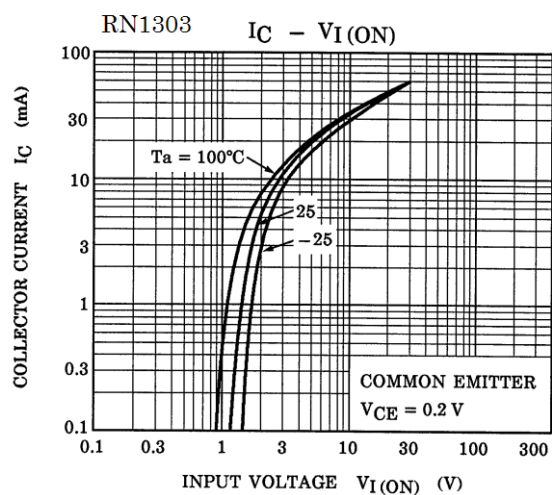
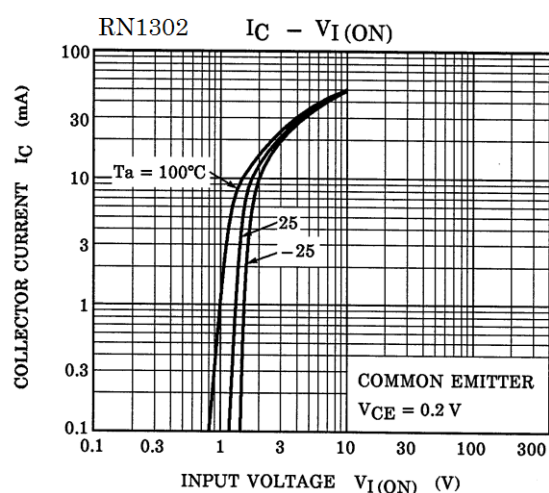
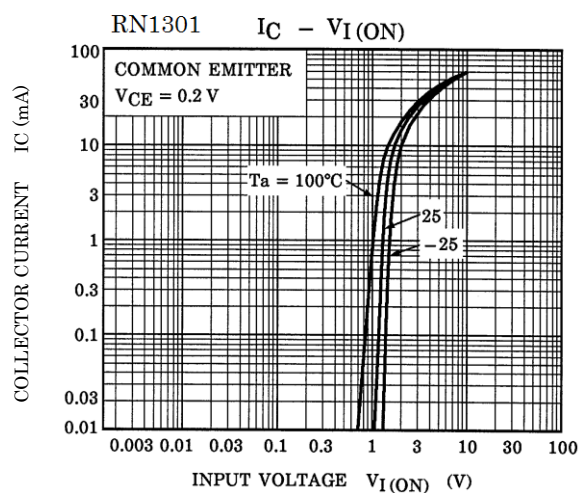
Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1301 to RN1306	V _{CB0}	50	V
Collector-emitter voltage		V _{CEO}	50	V
Emitter-base voltage	RN1301 to RN1304	V _{EB0}	10	V
	RN1305, RN1306		5	
Collector current	RN1301 to RN1306	I _C	100	mA
Collector power dissipation		P _C	100	mW
Junction temperature		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.).

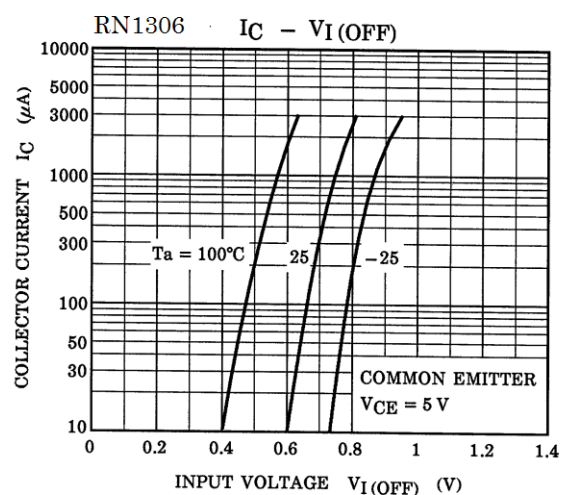
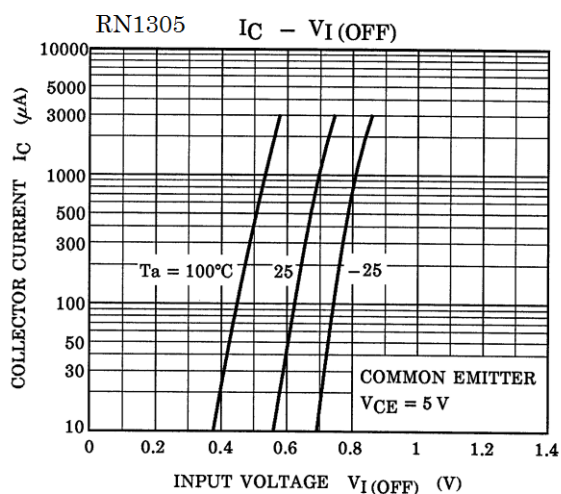
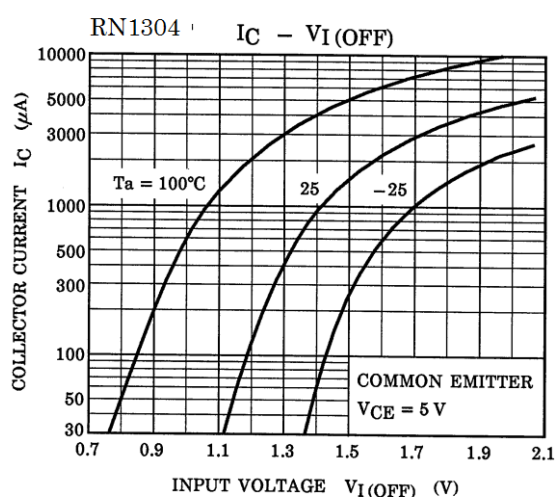
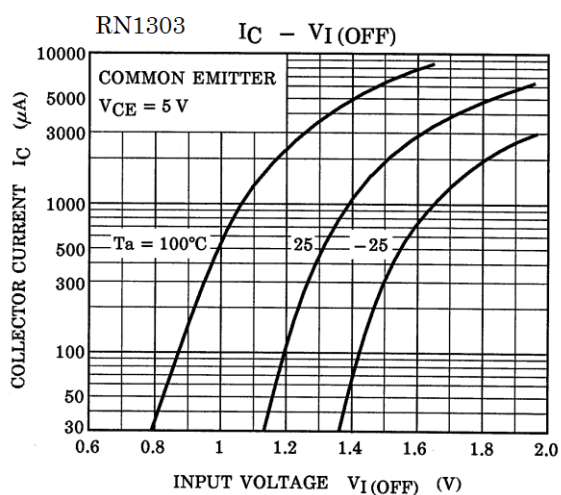
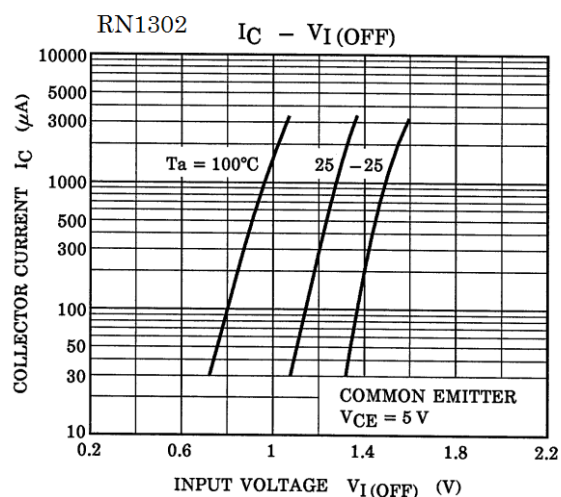
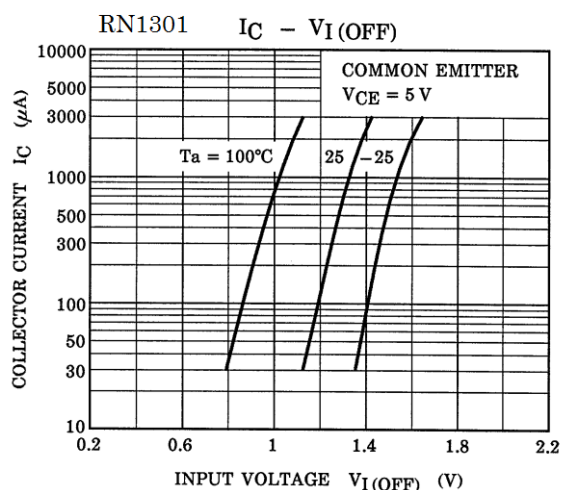
Start of commercial production
1987-09

Electrical Characteristics (Ta = 25°C)

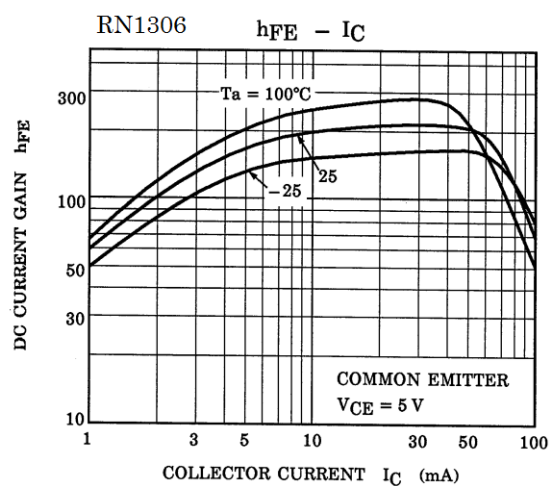
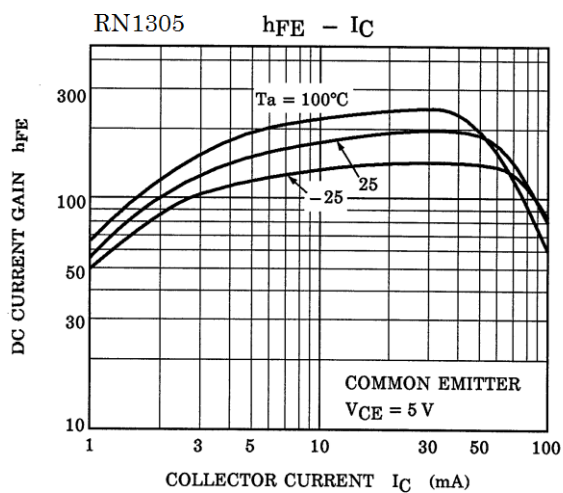
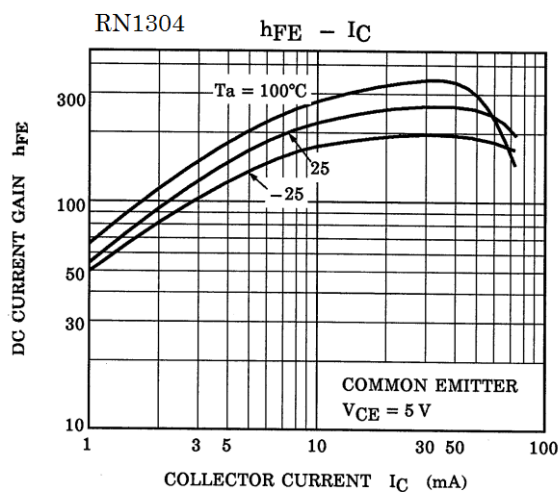
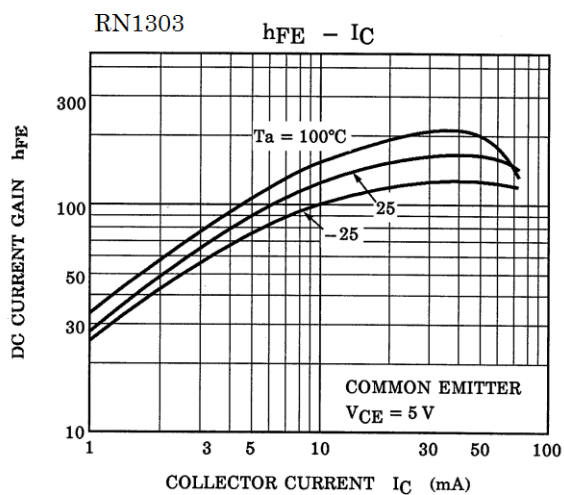
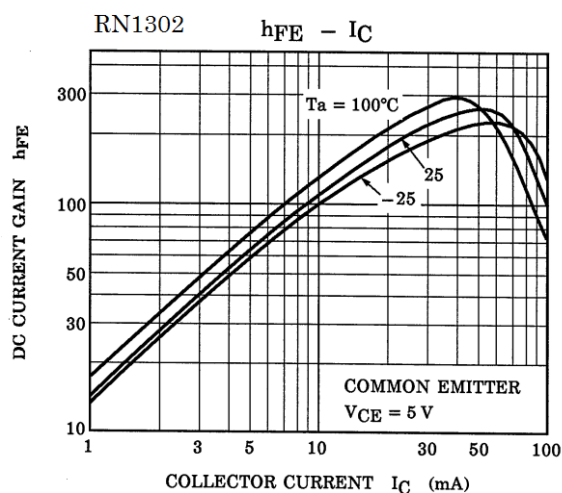
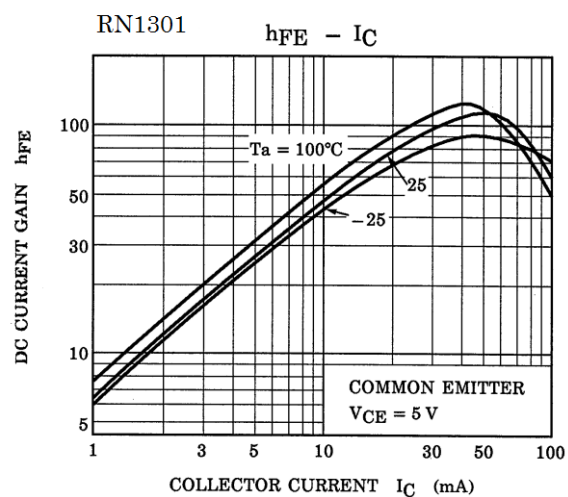
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1301 to 1306	I_{CBO}	—	$V_{CB} = 50 \text{ V}, I_E = 0 \text{ mA}$	—	—	100	nA
		I_{CEO}	—	$V_{CE} = 50 \text{ V}, I_B = 0 \text{ mA}$	—	—	500	
Emitter cut-off current	RN1301	I_{EBO}	—	$V_{EB} = 10 \text{ V}, I_C = 0 \text{ mA}$	0.82	—	1.52	mA
	RN1302		—		0.38	—	0.71	
	RN1303		—		0.17	—	0.33	
	RN1304		—		0.082	—	0.15	
	RN1305		—	$V_{EB} = 5 \text{ V}, I_C = 0 \text{ mA}$	0.078	—	0.145	
	RN1306		—		0.074	—	0.138	
DC current gain	RN1301	h_{FE}	—	$V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$	30	—	—	—
	RN1302		—		50	—	—	
	RN1303		—		70	—	—	
	RN1304		—		80	—	—	
	RN1305		—		80	—	—	
	RN1306		—		80	—	—	
Collector-emitter saturation voltage	RN1301 to RN1306	$V_{CE(sat)}$	—	$I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1301	$V_{I(ON)}$	—	$V_{CE} = 0.2 \text{ V}, I_C = 5 \text{ mA}$	1.1	—	2.0	V
	RN1302		—		1.2	—	2.4	
	RN1303		—		1.3	—	3.0	
	RN1304		—		1.5	—	5.0	
	RN1305		—		0.6	—	1.1	
	RN1306		—		0.7	—	1.3	
Input voltage (OFF)	RN1301 to RN1304	$V_{I(OFF)}$	—	$V_{CE} = 5 \text{ V}, I_C = 0.1 \text{ mA}$	1.0	—	1.5	V
	RN1305, RN1306		—		0.5	—	0.8	
Transition frequency	RN1301 to RN1306	f_T	—	$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1301 to RN1306	C_{ob}	—	$V_{CB} = 10 \text{ V}, I_E = 0 \text{ mA}, f = 1 \text{ MHz}$	—	3	6	pF
Input resistor	RN1301	R1	—	—	3.29	4.7	6.11	kΩ
	RN1302		—		7	10	13	
	RN1303		—		15.4	22	28.6	
	RN1304		—		32.9	47	61.1	
	RN1305		—		1.54	2.2	2.86	
	RN1306		—		3.29	4.7	6.11	
Resistor ratio	RN1301 to RN1304	R1/R2	—	—	0.9	1.0	1.1	—
	RN1305		—		0.0421	0.0468	0.0515	
	RN1306		—		0.09	0.1	0.11	



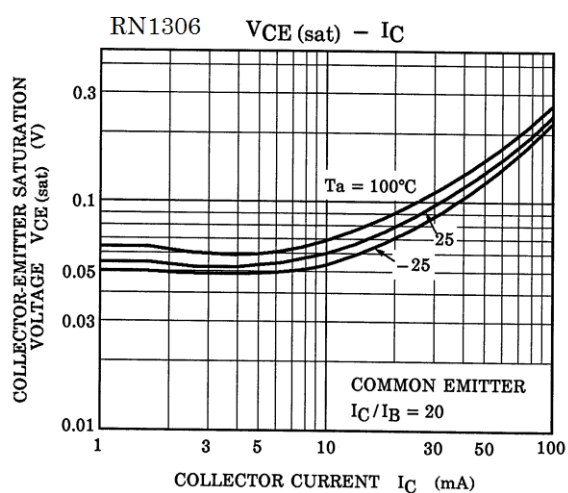
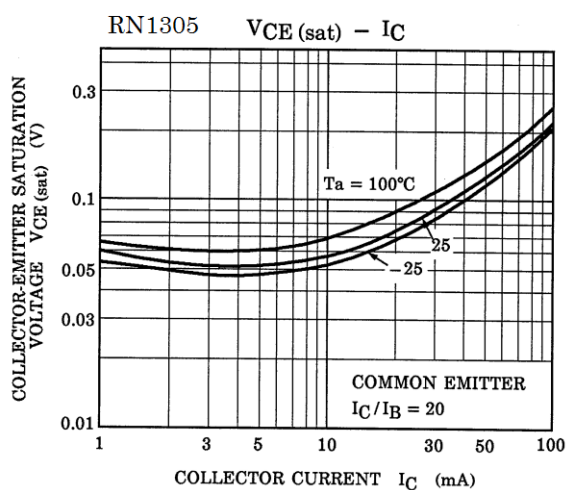
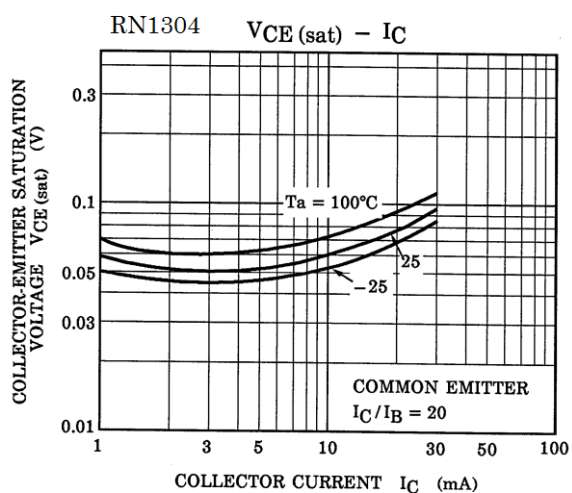
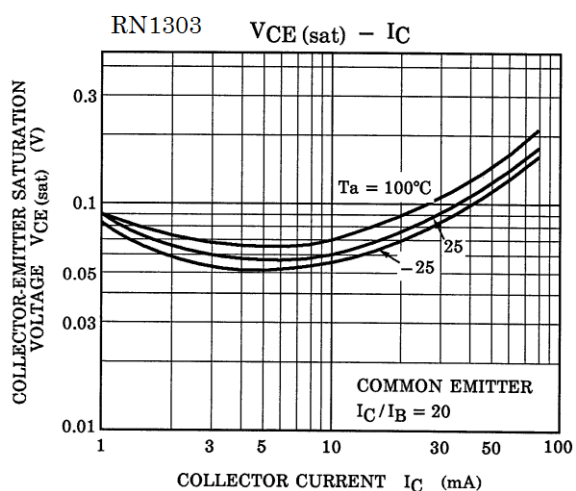
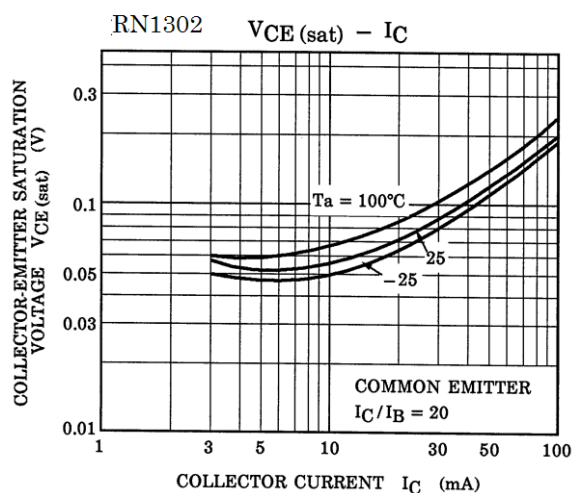
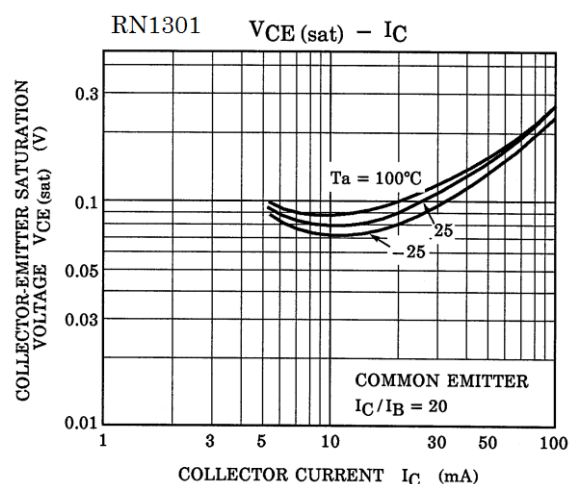
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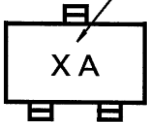
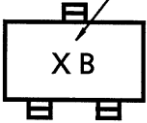
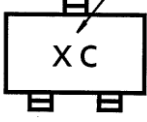
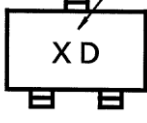
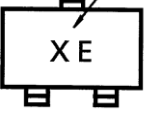
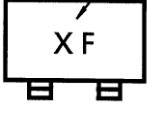


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Marking

Part No.	Marking
RN1301	Part No.(abbreviation code) 
RN1302	Part No.(abbreviation code) 
RN1303	Part No.(abbreviation code) 
RN1304	Part No.(abbreviation code) 
RN1305	Part No.(abbreviation code) 
RN1306	Part No.(abbreviation code) 

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