

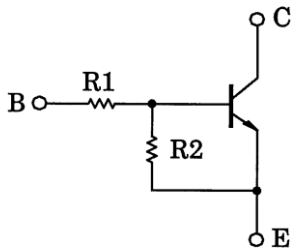
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

# RN1301, RN1302, RN1303 RN1304, RN1305, RN1306

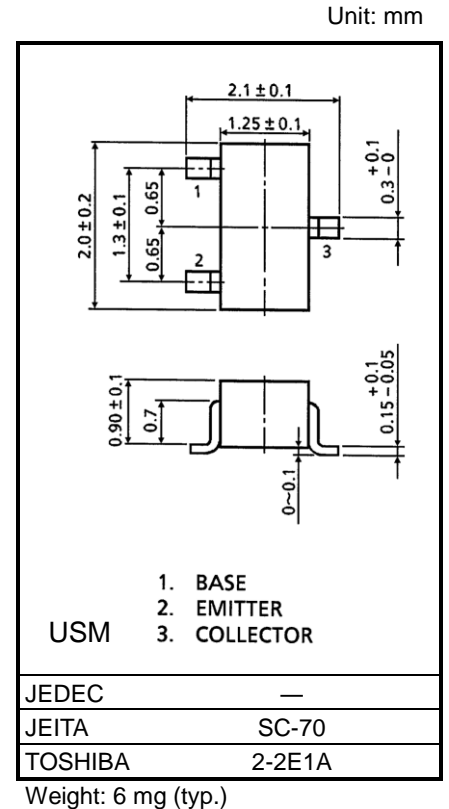
Switching, Inverter Circuit, Interface Circuit and Driver Circuit

- 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)

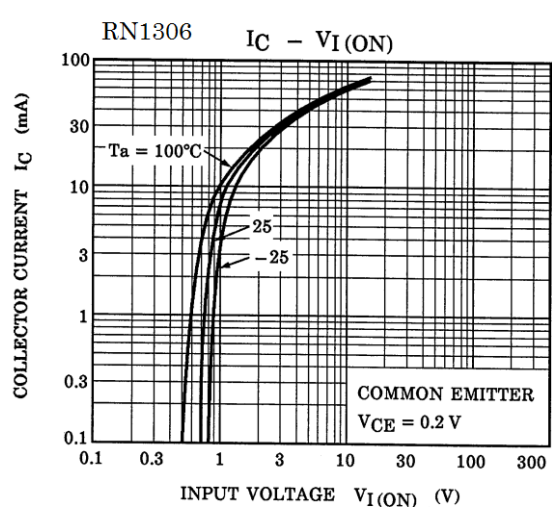
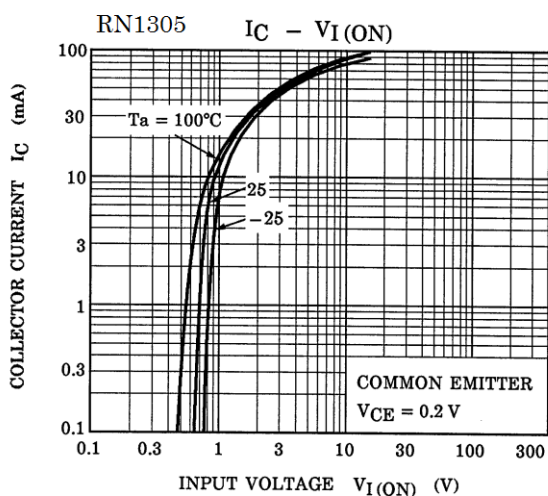
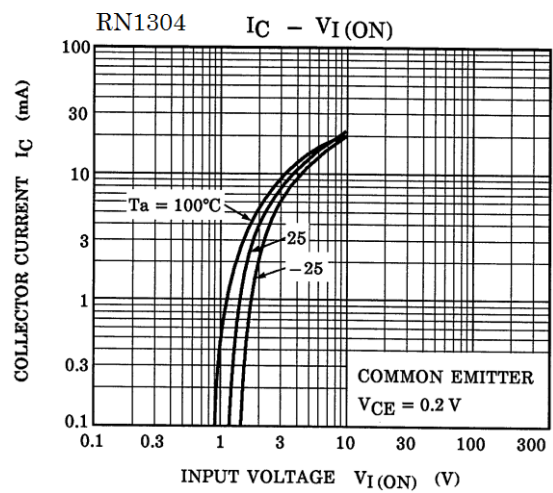
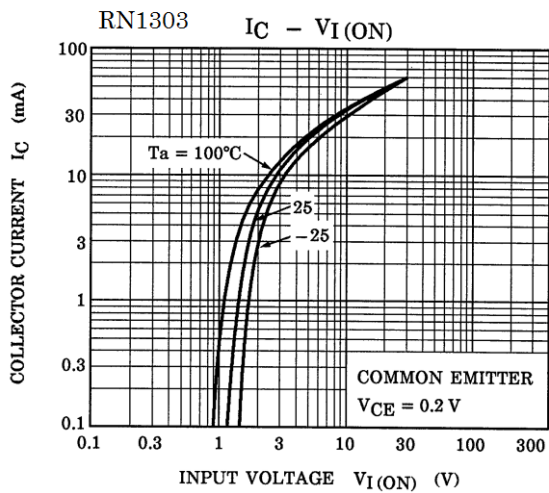
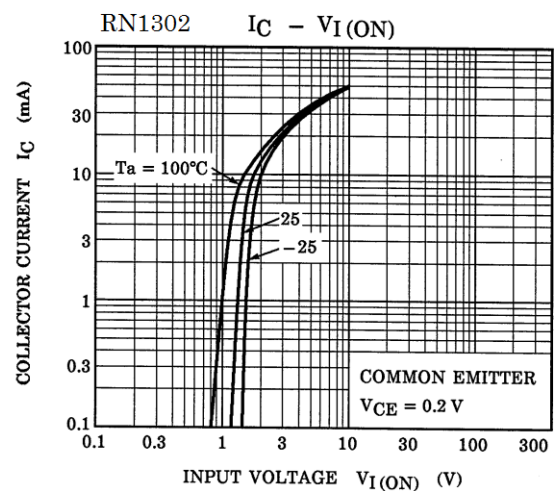
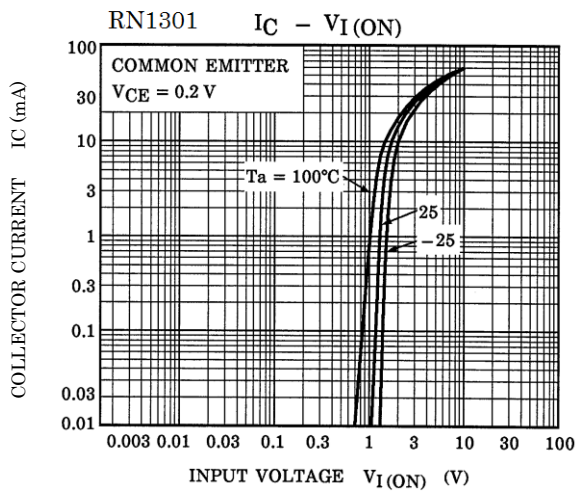
Characteristic	Symbol	Rating	Unit	
Collector-base voltage	RN1301 to RN1306	V <sub>CBO</sub>	50	V
Collector-emitter voltage		V <sub>CEO</sub>	50	V
Emitter-base voltage	RN1301 to RN1304	V <sub>EBO</sub>	10	V
	RN1305, RN1306		5	
Collector current	RN1301 to RN1306	I <sub>C</sub>	100	mA
Collector power dissipation		P <sub>C</sub>	100	mW
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-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).

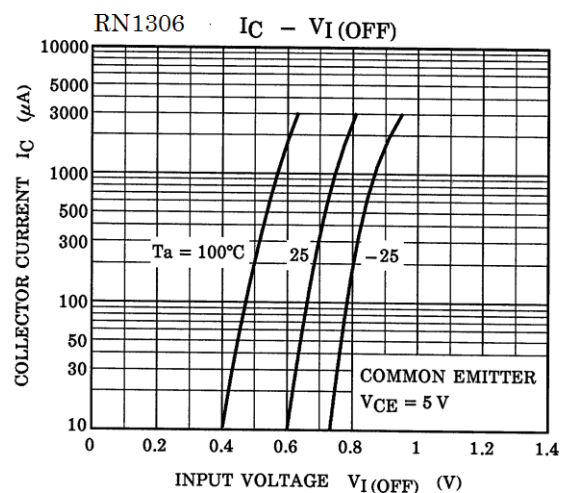
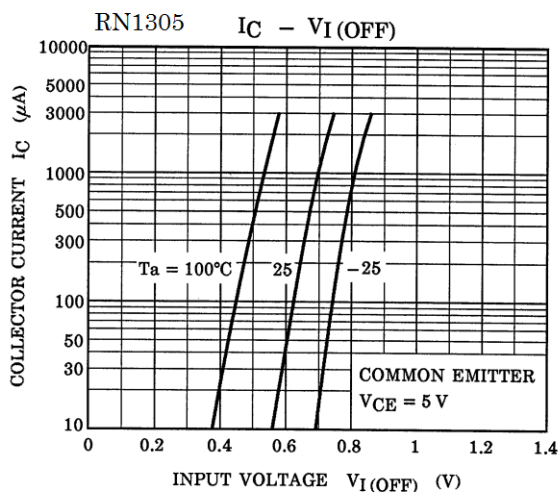
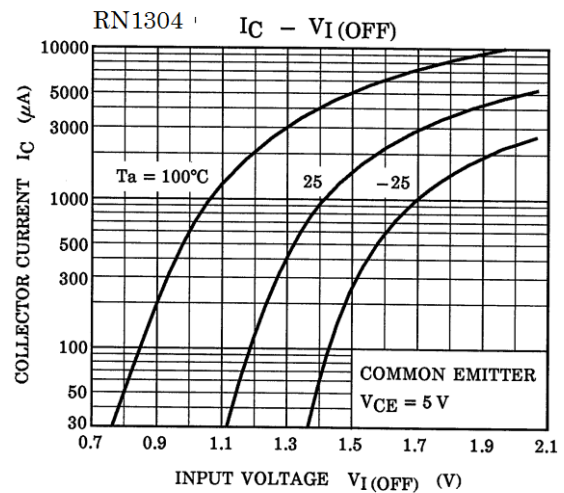
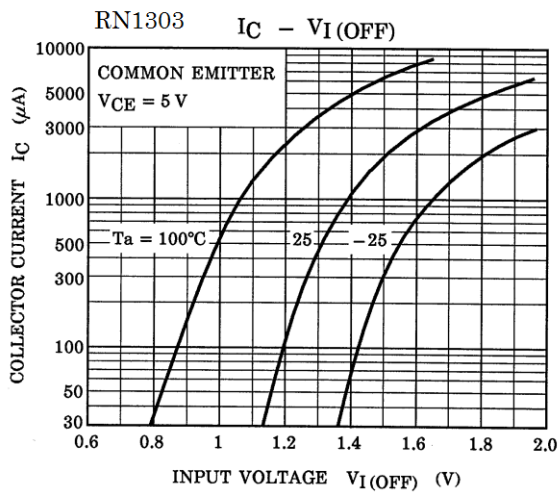
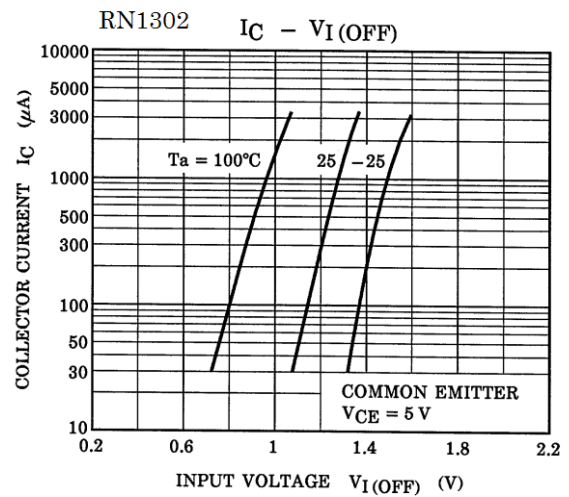
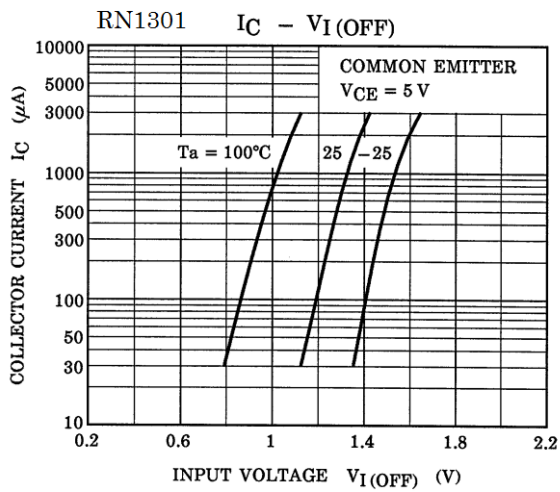
Start of commercial production  
1987-09

### Electrical Characteristics (Ta = 25°C)

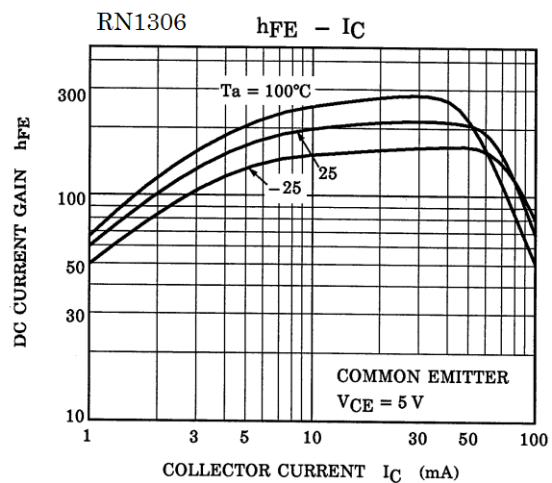
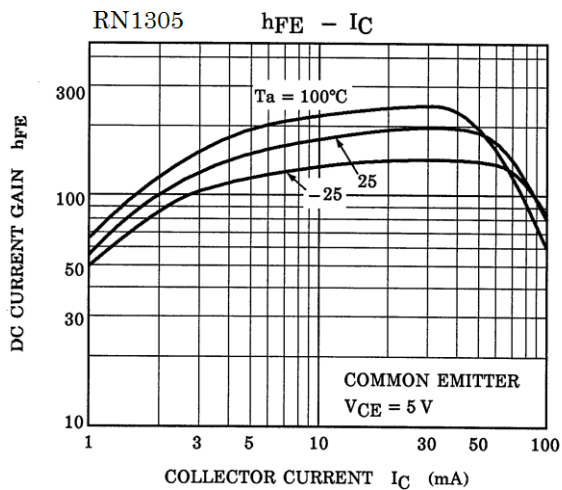
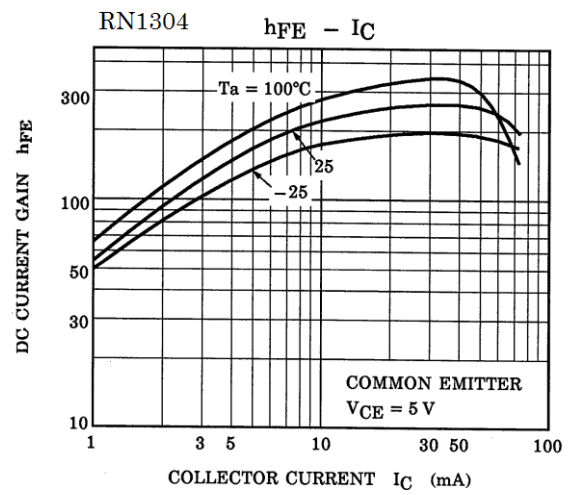
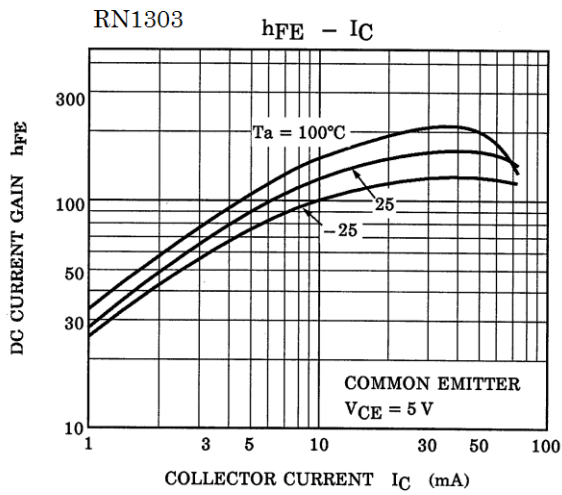
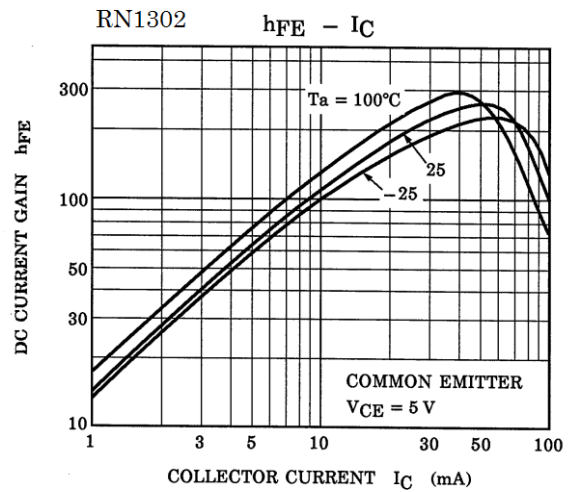
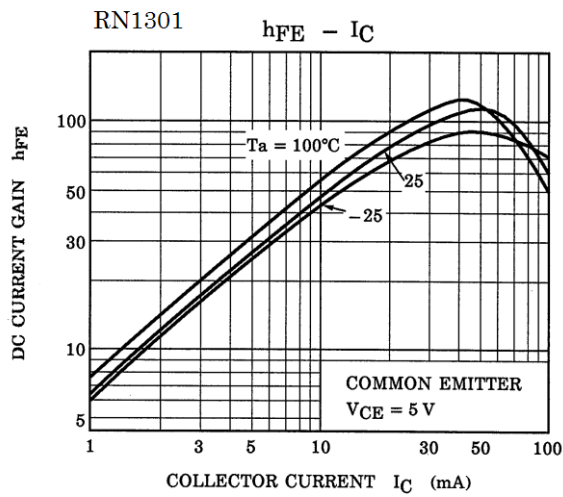
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1301 to 1306	ICBO	—	V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0 mA	—	—	100	nA
		ICEO	—	V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0 mA	—	—	500	
Emitter cut-off current	RN1301	IEBO	—	V <sub>EB</sub> = 10 V, I <sub>C</sub> = 0 mA	0.82	—	1.52	mA
	RN1302		—		0.38	—	0.71	
	RN1303		—		0.17	—	0.33	
	RN1304		—	V <sub>EB</sub> = 5 V, I <sub>C</sub> = 0 mA	0.082	—	0.15	
	RN1305		—		0.078	—	0.145	
	RN1306		—		0.074	—	0.138	
DC current gain	RN1301	h <sub>FE</sub>	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA	30	—	—	—
	RN1302		—		50	—	—	
	RN1303		—		70	—	—	
	RN1304		—		80	—	—	
	RN1305		—		80	—	—	
	RN1306		—		80	—	—	
Collector-emitter saturation voltage	RN1301 to RN1306	V <sub>CE (sat)</sub>	—	I <sub>C</sub> = 5 mA, I <sub>B</sub> = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1301	V <sub>I (ON)</sub>	—	V <sub>CE</sub> = 0.2 V, I <sub>C</sub> = 5 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 <sub>I (OFF)</sub>	—	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.1 mA	1.0	—	1.5	V
	RN1305, RN1306		—		0.5	—	0.8	
Transition frequency	RN1301 to RN1306	f <sub>T</sub>	—	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA	—	250	—	MHz
Collector output capacitance	RN1301 to RN1306	C <sub>ob</sub>	—	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1 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	



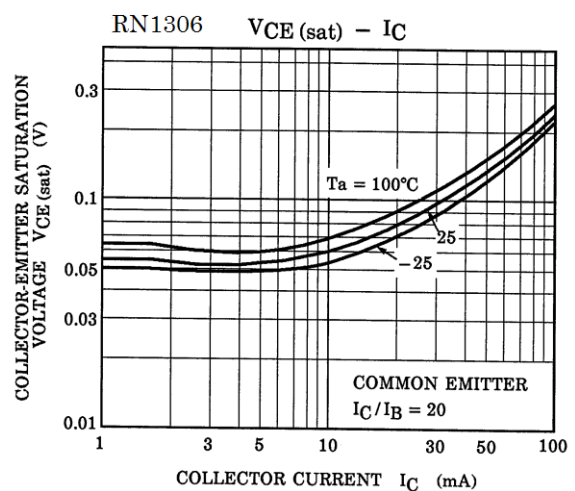
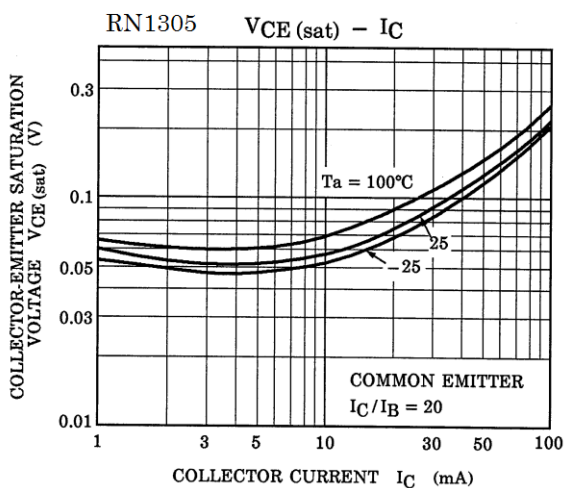
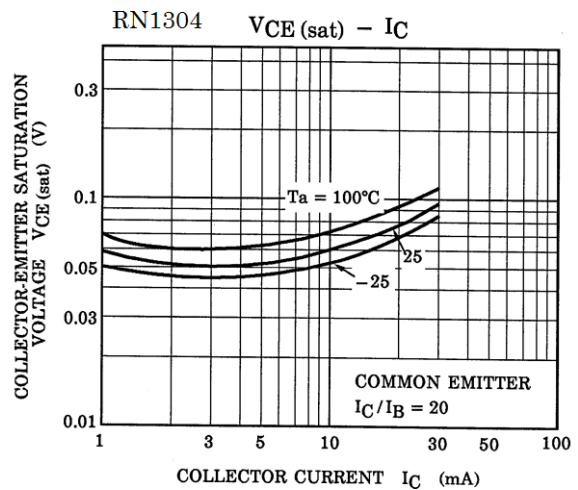
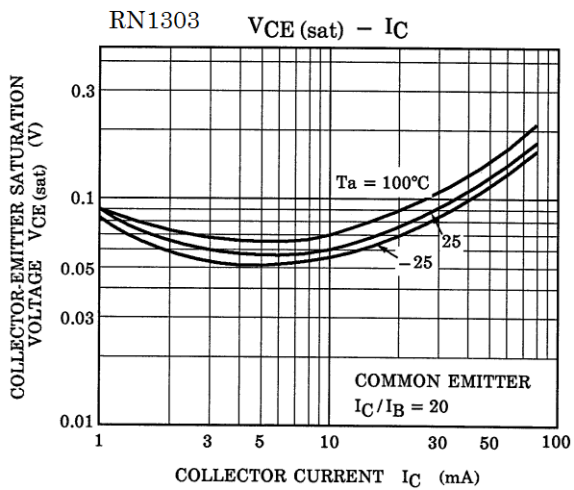
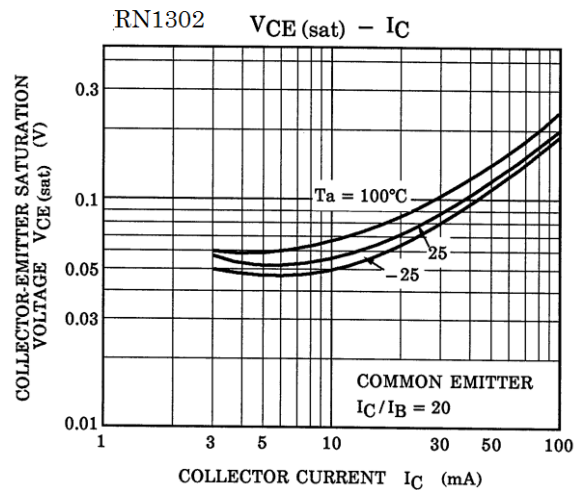
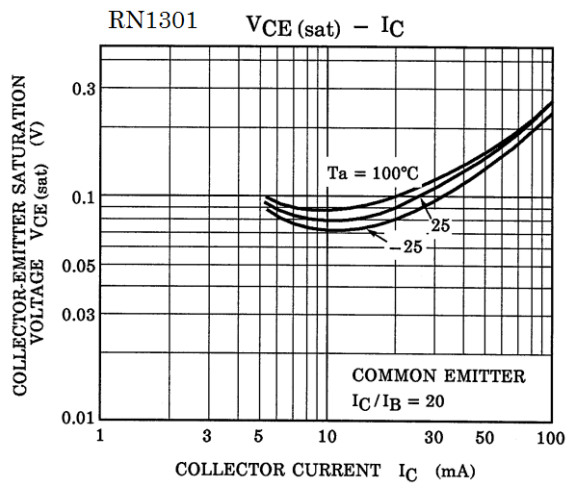
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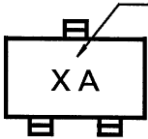
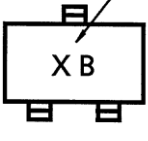
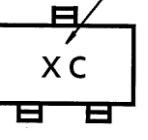
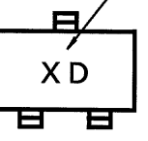
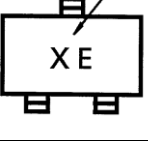
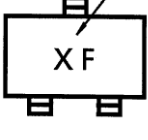


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### Marking

Part No.	Marking
RN1301	<p data-bbox="571 349 831 376">Part No.(abbreviation code)</p> 
RN1302	<p data-bbox="571 580 831 607">Part No.(abbreviation code)</p> 
RN1303	<p data-bbox="571 810 831 837">Part No.(abbreviation code)</p> 
RN1304	<p data-bbox="571 1041 831 1068">Part No.(abbreviation code)</p> 
RN1305	<p data-bbox="571 1272 831 1299">Part No.(abbreviation code)</p> 
RN1306	<p data-bbox="571 1503 831 1529">Part No.(abbreviation code)</p> 

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