

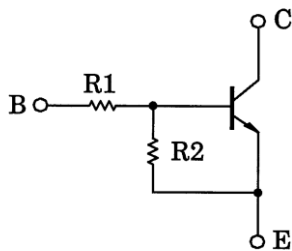
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

# RN1301, RN1302, RN1303 RN1304, RN1305, RN1306

Switching, Inverter Circuit, Interface Circuit and Driver Circuit

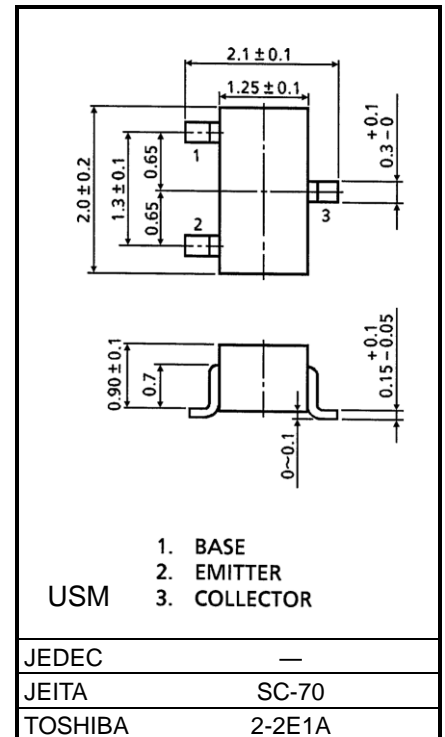
- With built-in bias resistors.
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process and miniaturize equipment.
- Various resistance values are available to suit various circuit designs.
- Complementary to RN2301 to RN2306

### 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

Unit: mm



Weight: 6 mg (typ.)

### Absolute Maximum Ratings (Ta = 25°C)

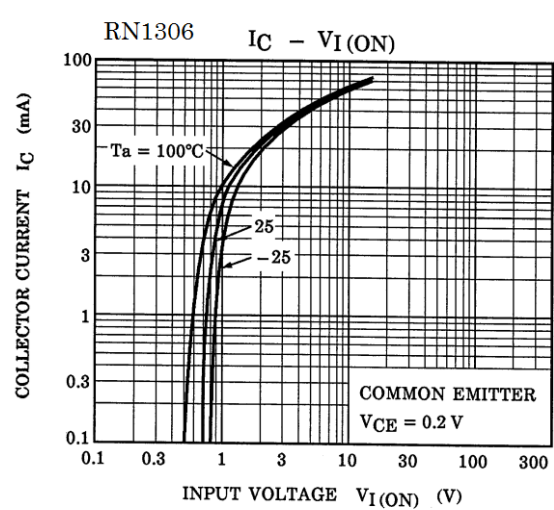
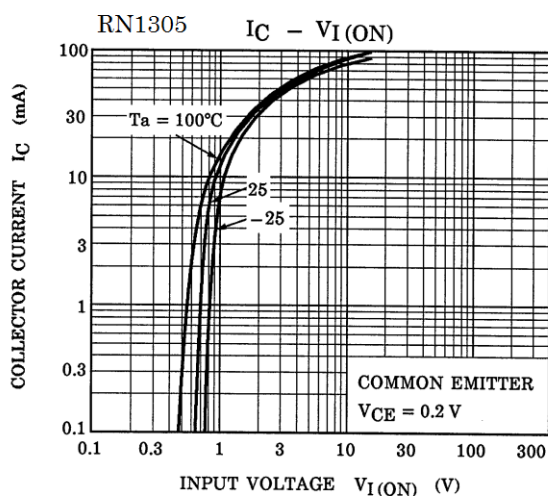
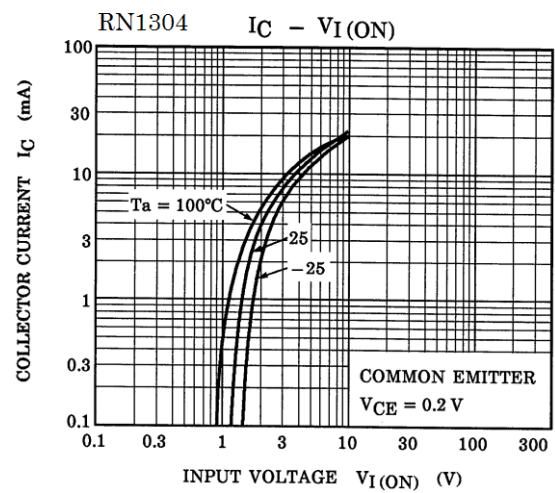
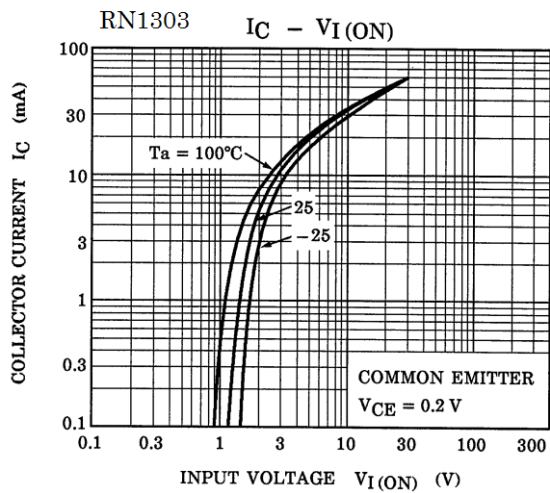
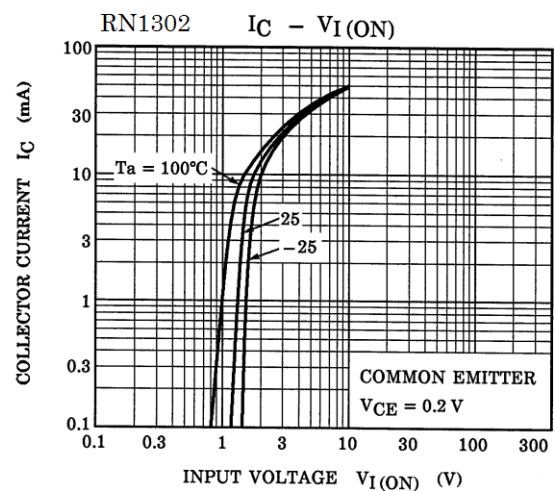
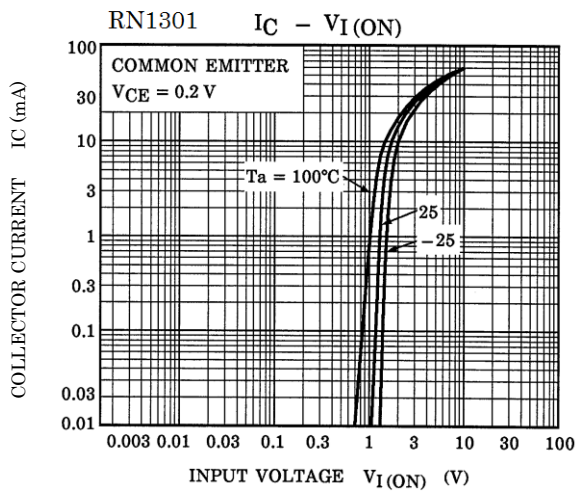
Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN1301 to RN1306	V <sub>CBO</sub>	50	V
Collector-emitter voltage		V <sub>CEO</sub>	50	V
Emitter-base voltage	RN1301 to RN1304	V <sub>EBO</sub>	10	V
	RN1305, RN1306		5	
Collector current	RN1301 to RN1306	I <sub>C</sub>	100	mA
Collector power dissipation		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).

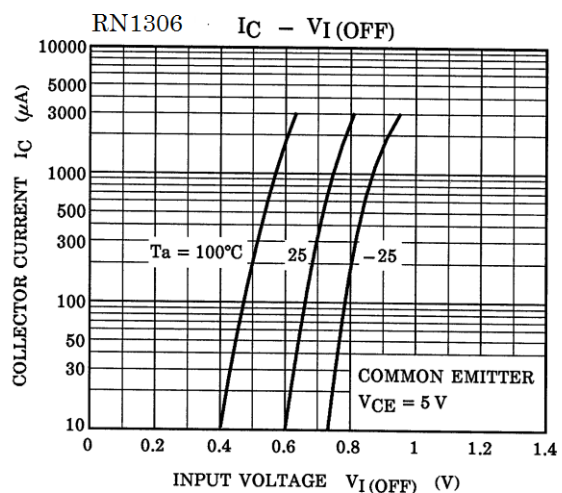
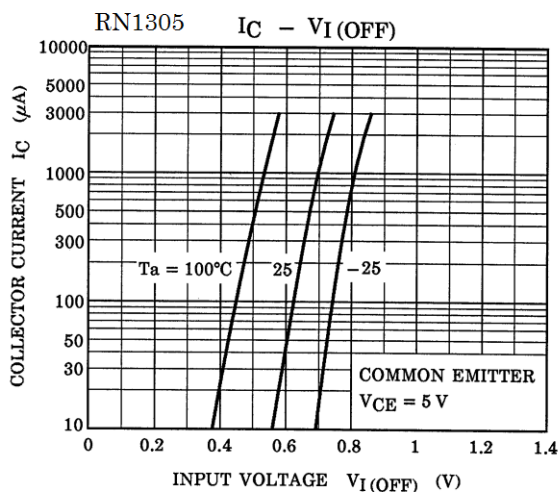
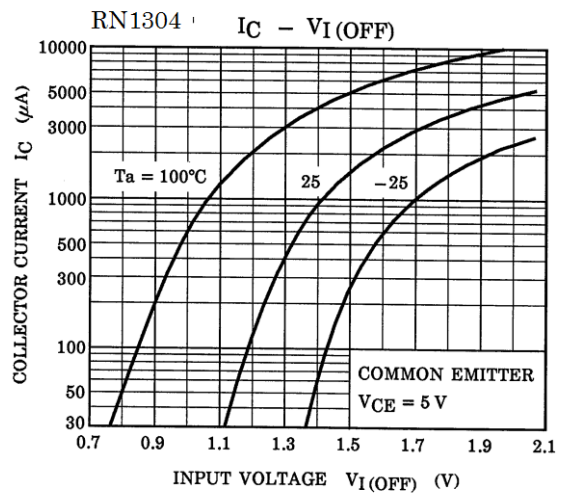
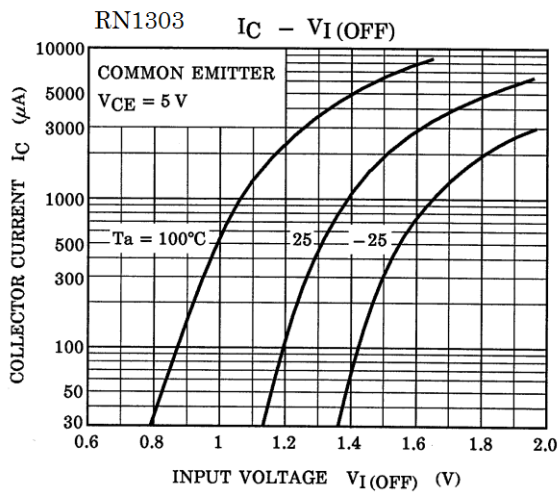
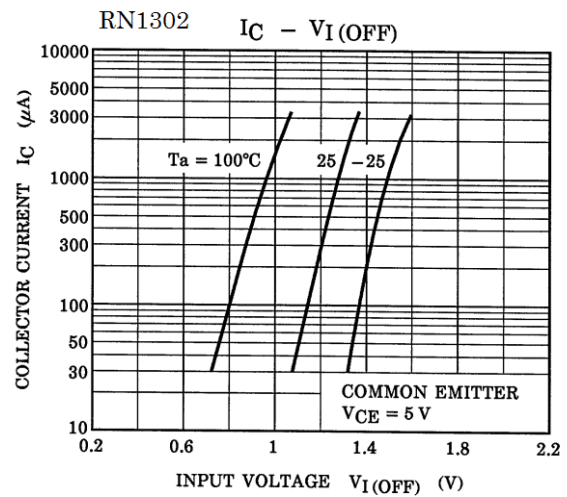
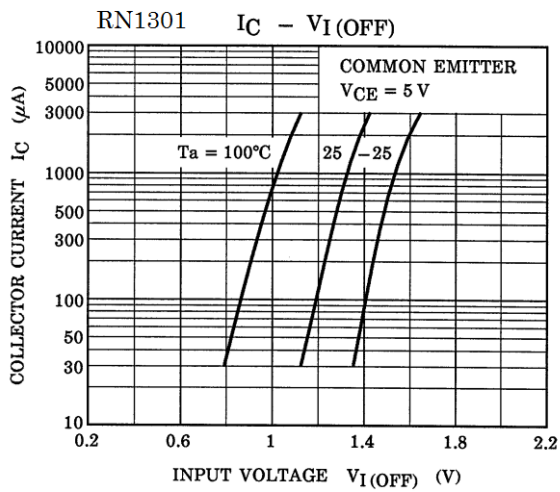
Start of commercial production  
1987-09

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

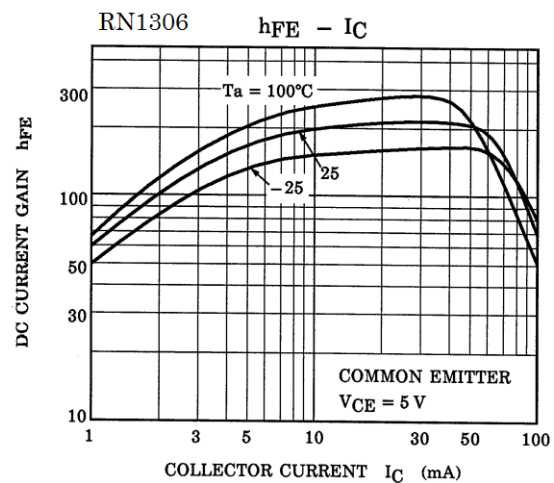
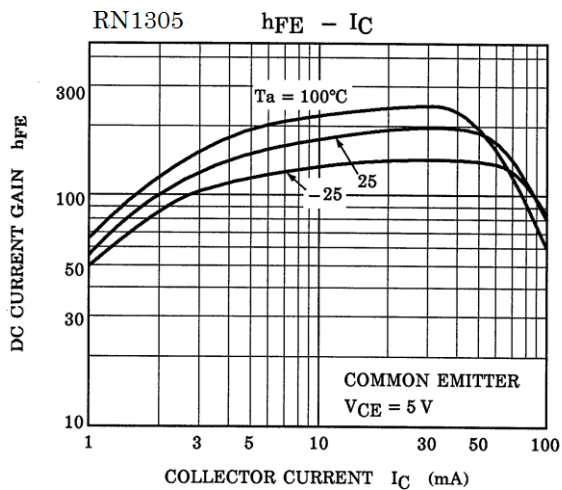
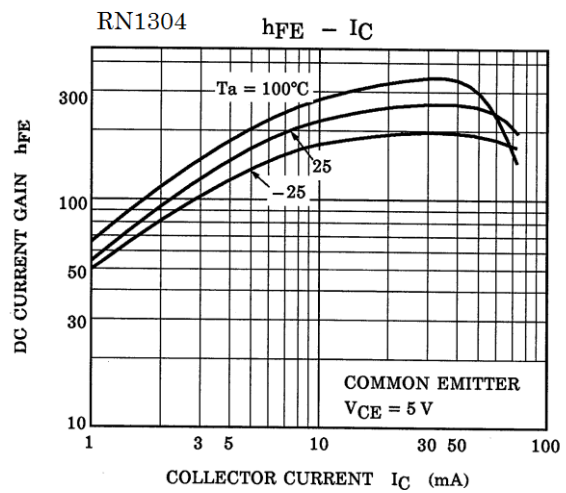
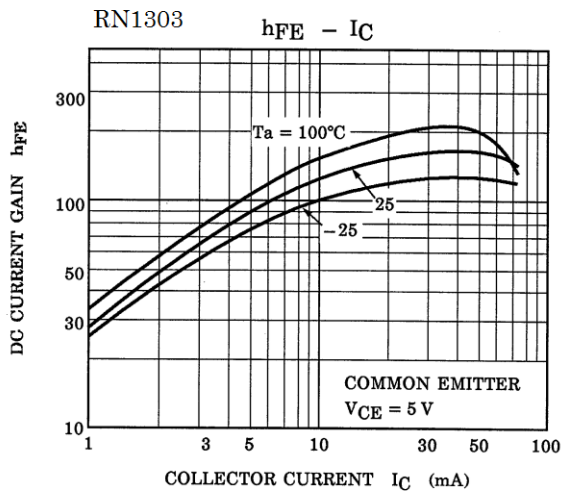
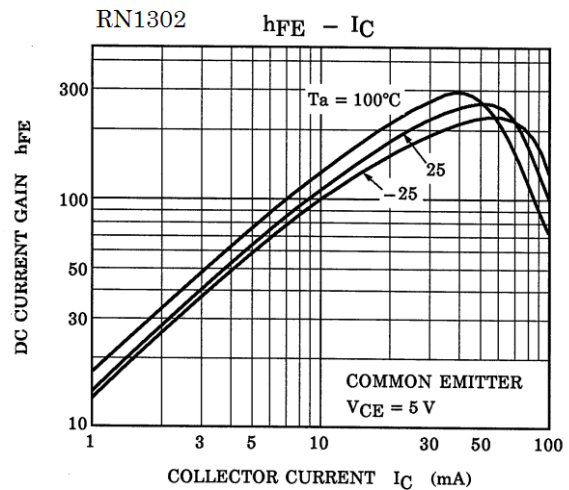
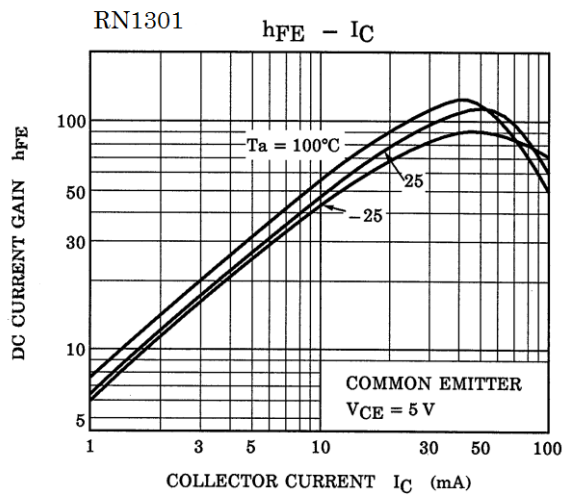
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1301 to 1306	ICBO	—	V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0 mA	—	—	100	nA
		ICEO	—	V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0 mA	—	—	500	
Emitter cut-off current	RN1301	IEBO	—	V <sub>EB</sub> = 10 V, I <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	R <sub>1</sub>	—	—	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	R <sub>1</sub> /R <sub>2</sub>	—	—	0.9	1.0	1.1	—
	RN1305		—		0.0421	0.0468	0.0515	
	RN1306		—		0.09	0.1	0.11	



The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

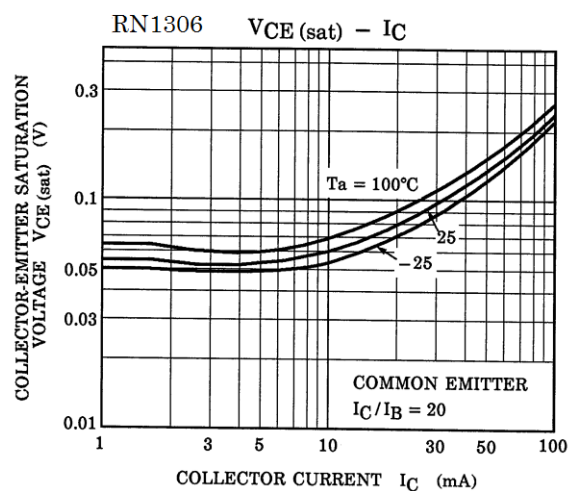
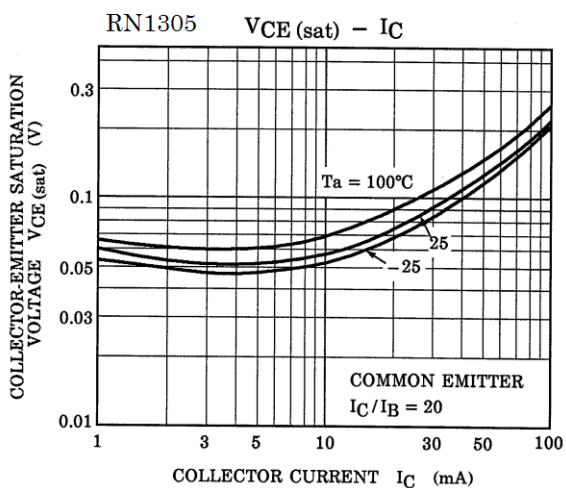
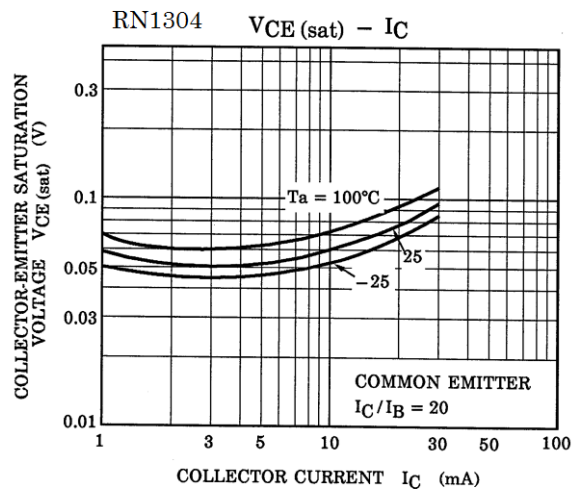
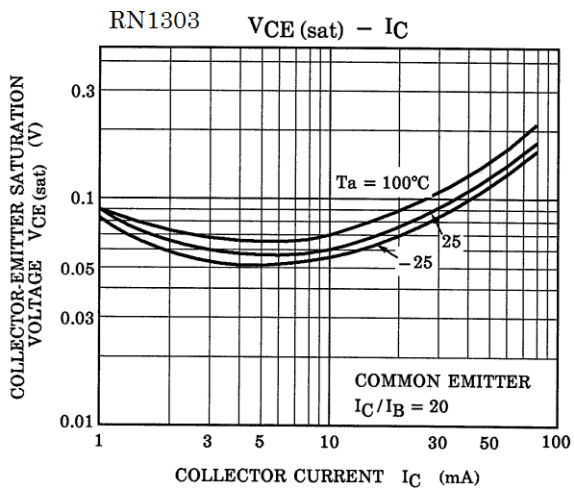
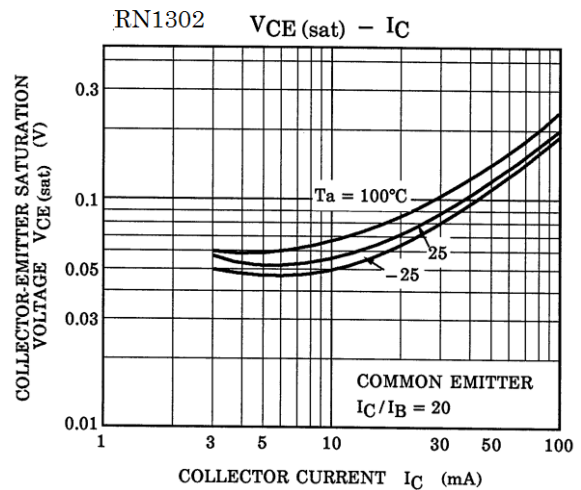
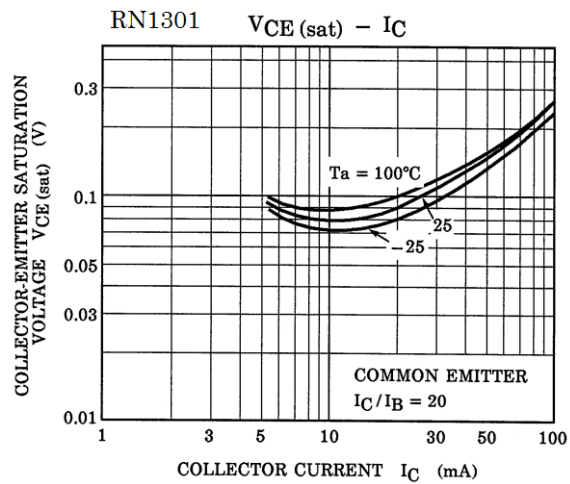


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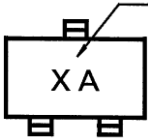
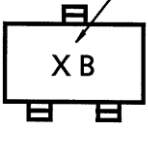
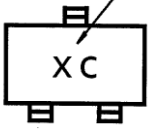
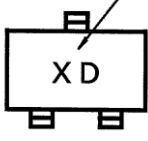
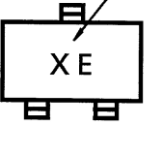
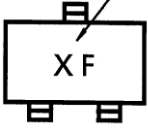
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### Marking

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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