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

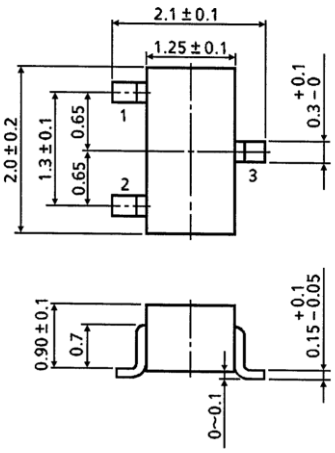
RN2301, RN2302, RN2303
RN2304, RN2305, RN2306

Switching, Inverter Circuit, Interface Circuit and Driver Circuit

- AEC-Q101 Qualified (Note1)
- 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 RN1301 to RN1306

Note1: For detail information, please contact our sales representative.

Unit: mm



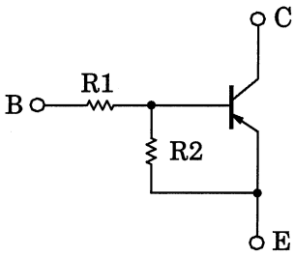
1. BASE
2. EMITTER
3. COLLECTOR

USM

JEDEC	—
JEITA	SC-70
TOSHIBA	2-2E1A

Weight: 0.006g (typ.)

Equivalent Circuit



Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2301	4.7	4.7
RN2302	10	10
RN2303	22	22
RN2304	47	47
RN2305	2.2	47
RN2306	4.7	47

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN2301 to RN2306	V_{CBO}	−50	V
Collector-emitter voltage		V_{CEO}	−50	V
Emitter-base voltage	RN2301 to RN2304	V_{EBO}	−10	V
	RN2305, RN2306		−5	
Collector current	RN2301 to RN2306	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

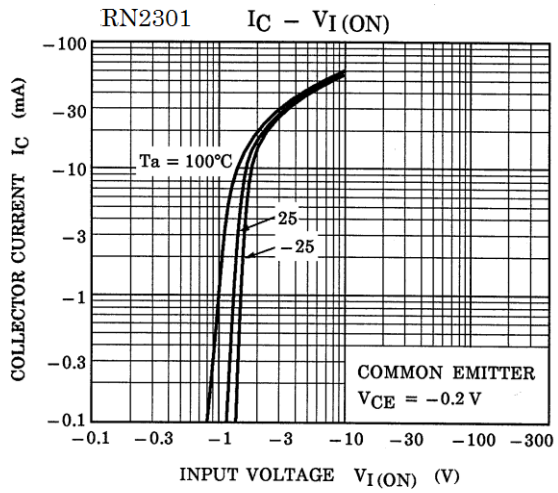
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

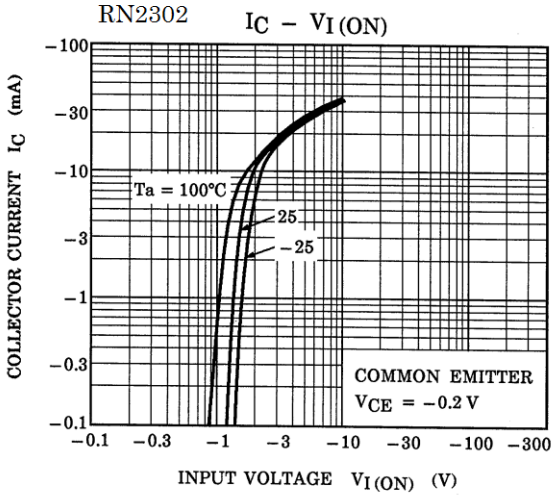
Start of commercial production
1987-09

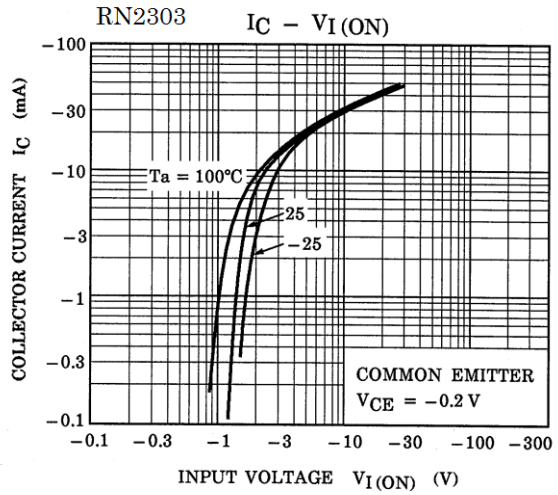
Electrical Characteristics (Ta = 25°C)

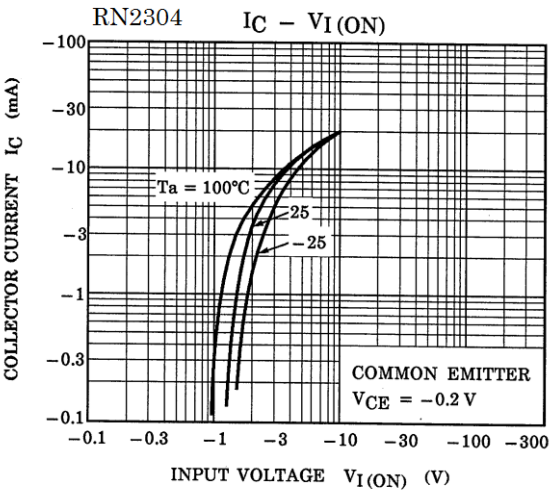
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2301 to RN2306	I_{CBO}	V_{CB} = −50 V, I_E = 0 mA	—	—	−100	nA
		I_{CEO}	V_{CE} = −50 V, I_B = 0 mA	—	—	−500	
Emitter cut-off current	RN2301	I_{EBO}	V_{EB} = −10 V, I_C = 0 mA	−0.82	—	−1.52	mA
	RN2302			−0.38	—	−0.71	
	RN2303			−0.17	—	−0.33	
	RN2304			−0.082	—	−0.15	
	RN2305		V_{EB} = −5 V, I_C = 0 mA	−0.078	—	−0.145	
	RN2306			−0.074	—	−0.138	
DC current gain	RN2301	h_{FE}	V_{CE} = −5 V, I_C = −10 mA	30	—	—	—
	RN2302			50	—	—	
	RN2303			70	—	—	
	RN2304			80	—	—	
	RN2305			80	—	—	
	RN2306			80	—	—	
Collector-emitter saturation voltage	RN2301 to RN2306	$V_{CE\ (sat)}$	I_C = −5 mA, I_B = −0.25 mA	—	−0.1	−0.3	V
Input voltage (ON)	RN2301	$V_{I\ (ON)}$	V_{CE} = −0.2 V, I_C = −5 mA	−1.1	—	−2.0	V
	RN2302			−1.2	—	−2.4	
	RN2303			−1.3	—	−3.0	
	RN2304			−1.5	—	−5.0	
	RN2305			−0.6	—	−1.1	
	RN2306			−0.7	—	−1.3	
Input voltage (OFF)	RN2301 to RN2304	$V_{I\ (OFF)}$	V_{CE} = −5 V, I_C = −0.1 mA	−1.0	—	−1.5	V
	RN2305, RN2306			−0.5	—	−0.8	
Transition frequency	RN2301 to RN2306	f_T	V_{CE} = −10 V, I_C = −5 mA	—	200	—	MHz
Collector output capacitance	RN2301 to RN2306	C_{ob}	V_{CB} = −10 V, I_E = 0 mA f = 1 MHz	—	3	6	pF
Input resistor	RN2301	R1	—	3.29	4.7	6.11	kΩ
	RN2302			7	10	13	
	RN2303			15.4	22	28.6	
	RN2304			32.9	47	61.1	
	RN2305			1.54	2.2	2.86	
	RN2306			3.29	4.7	6.11	
Resistor ratio	RN2301 to RN2304	R1/R2	—	0.9	1.0	1.1	—
	RN2305			0.0421	0.0468	0.0515	
	RN2306			0.09	0.1	0.11	

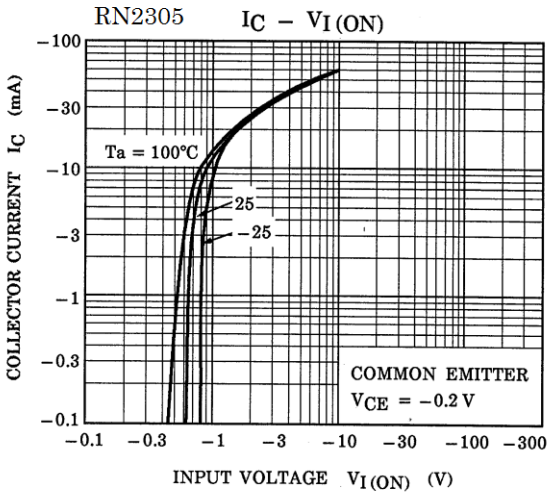
Characteristics Curves

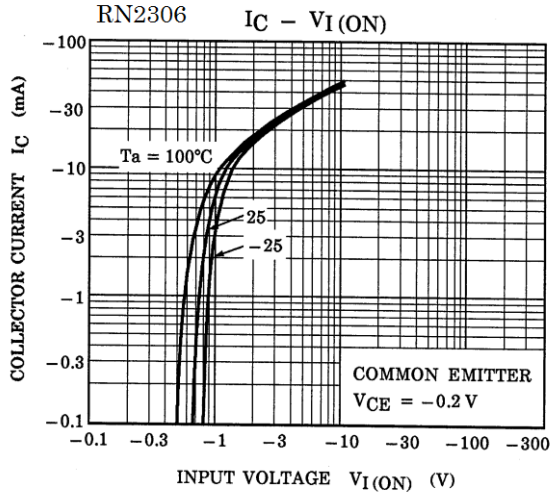












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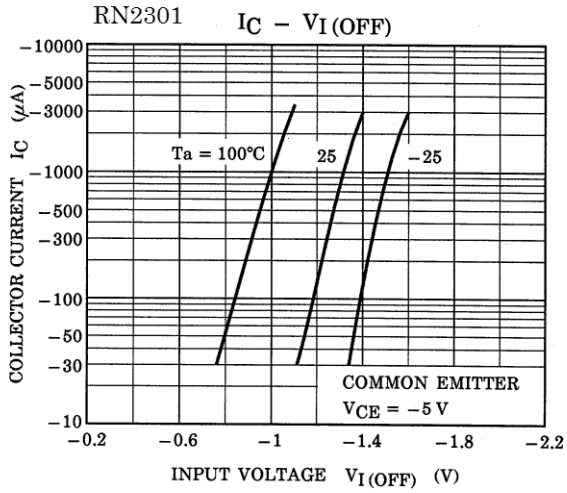

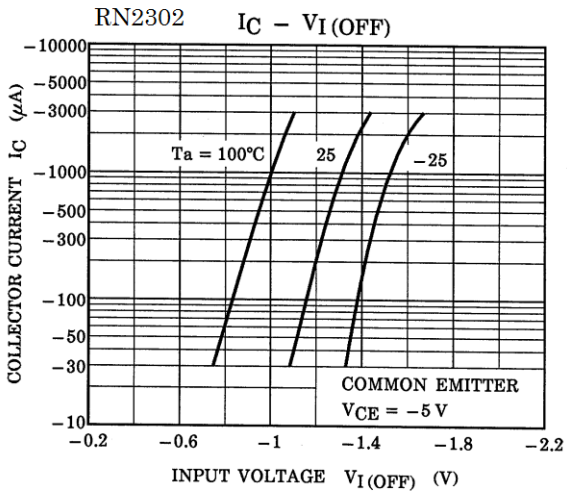

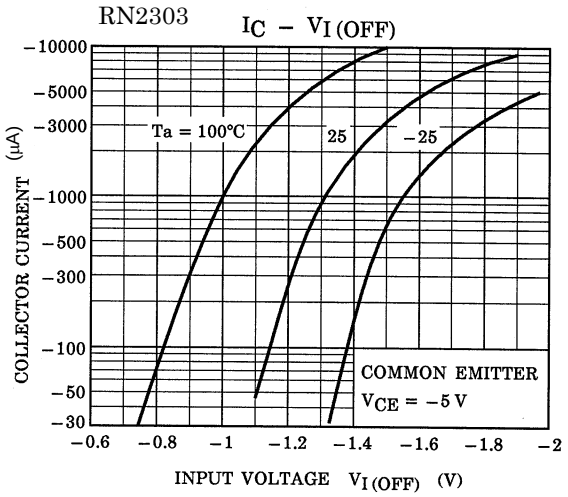

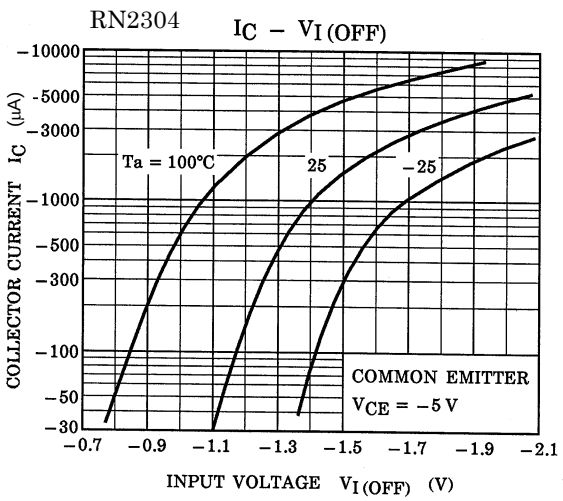

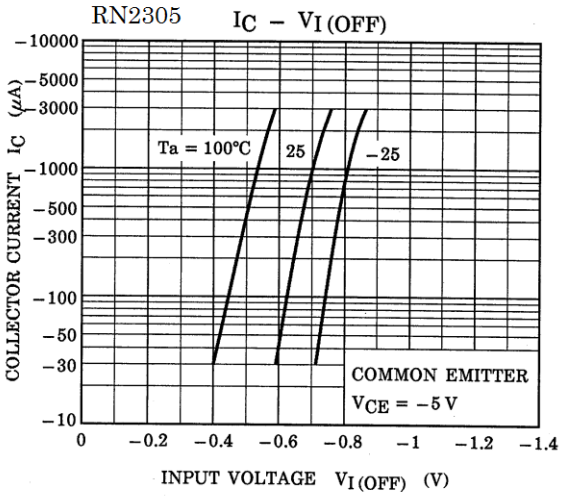

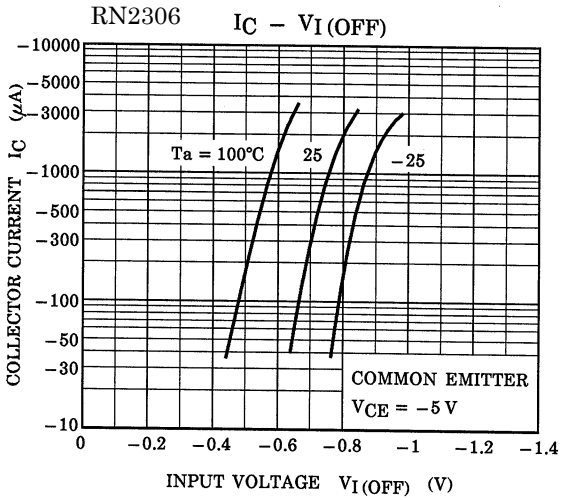

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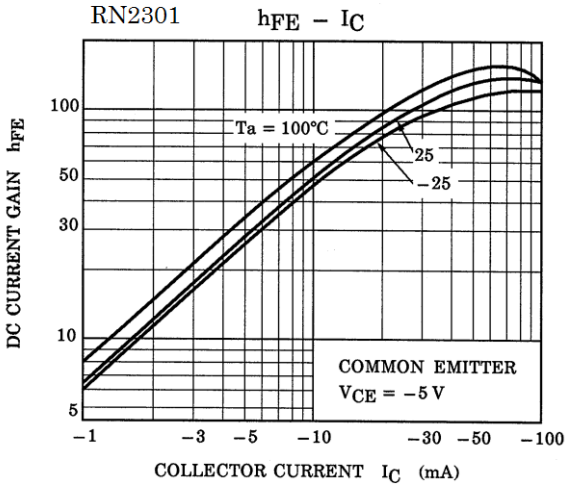

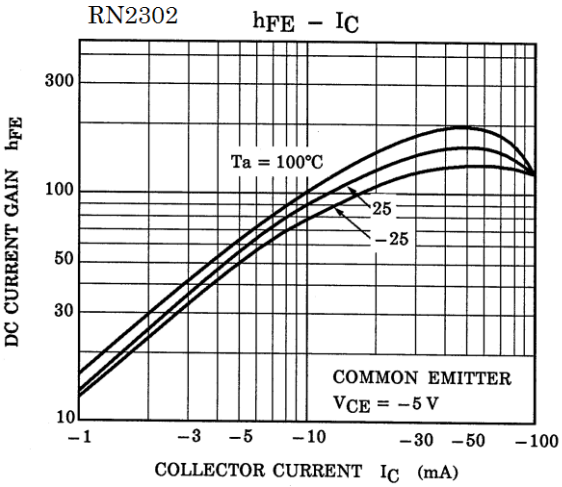

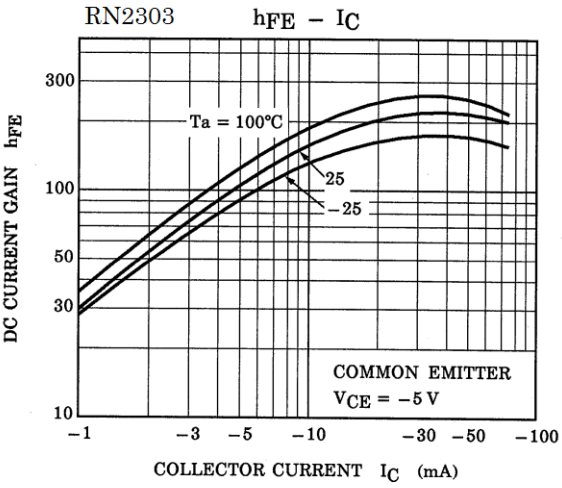

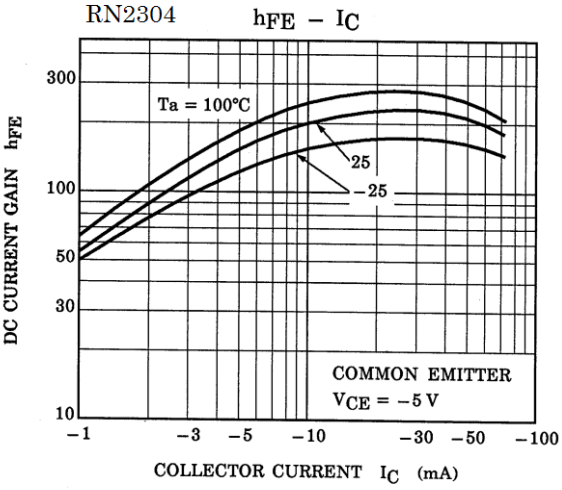

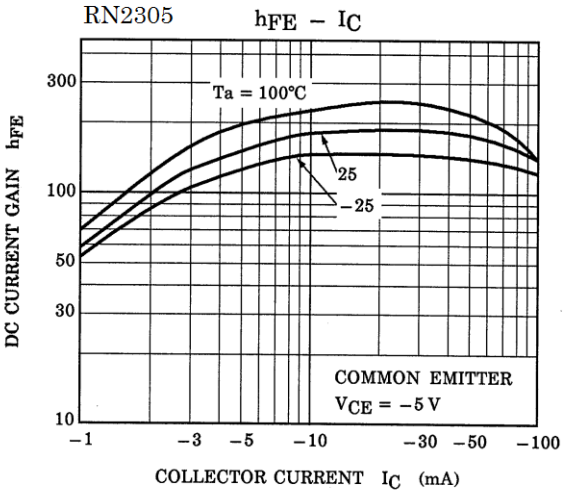

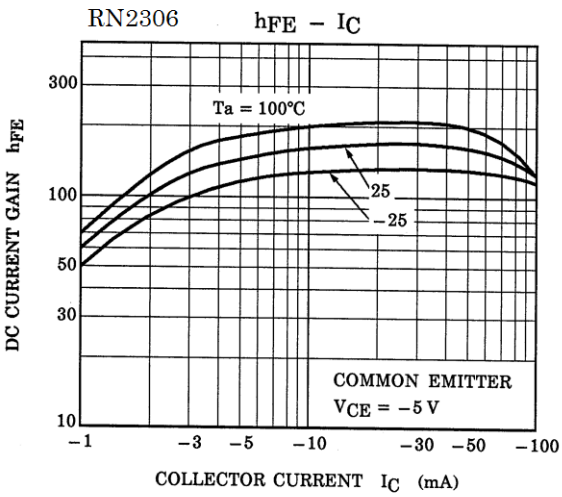

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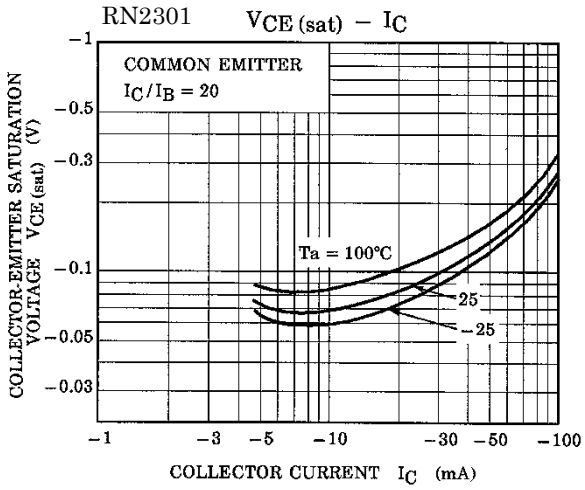

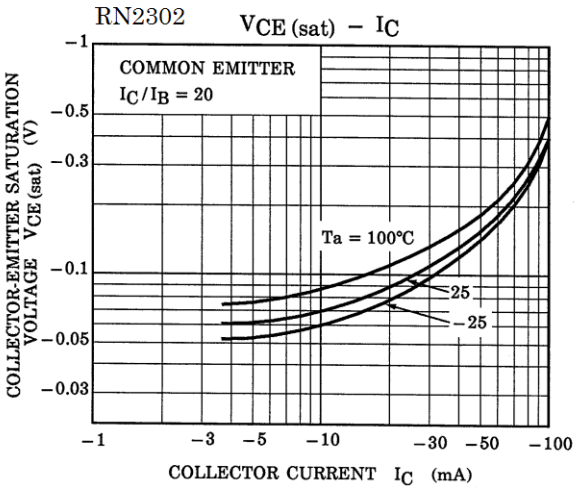

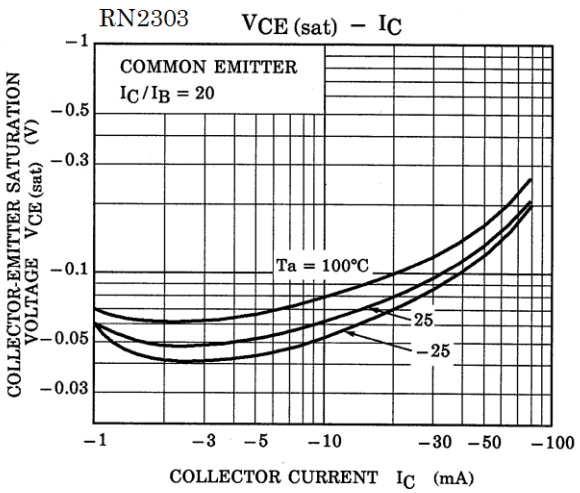

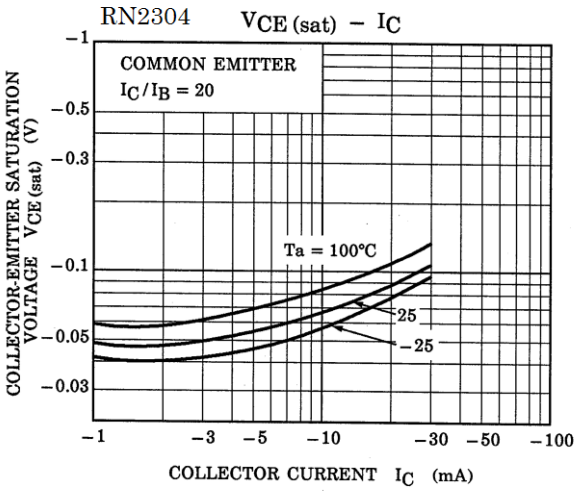

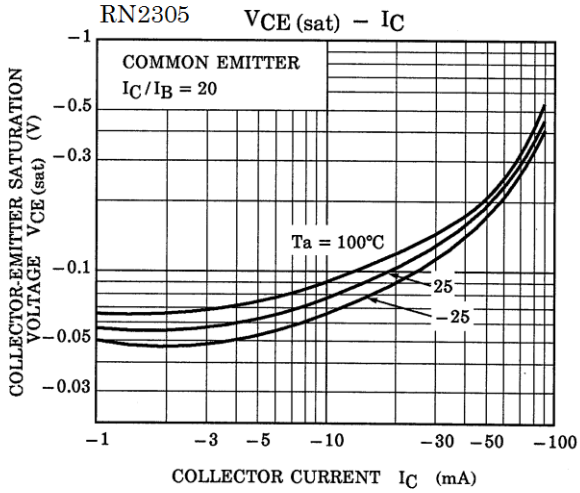

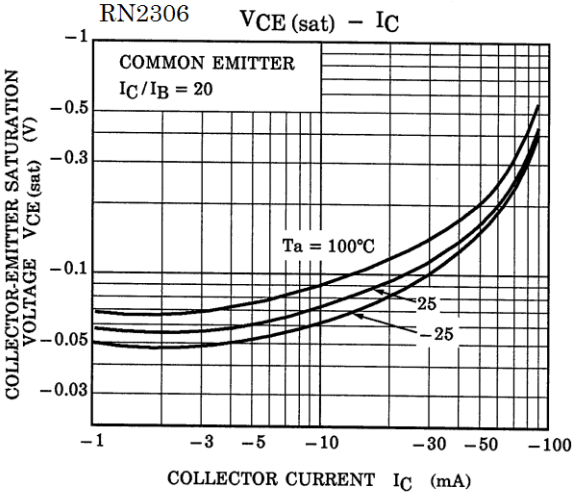

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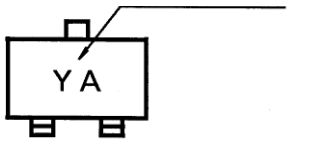
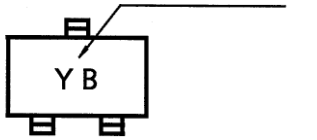
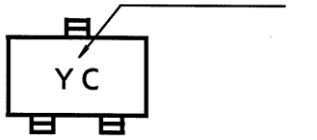
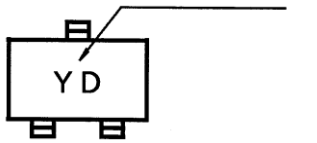
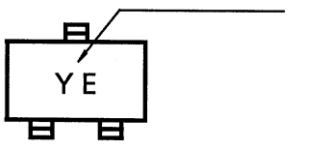
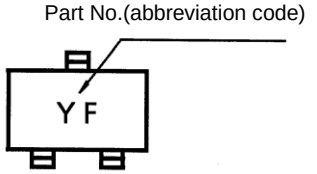
Marking

Part No.	Marking
RN2301	Part No.(abbreviation code) 
RN2302	Part No.(abbreviation code) 
RN2303	Part No.(abbreviation code) 
RN2304	Part No.(abbreviation code) 
RN2305	Part No.(abbreviation code) 
RN2306	Part No.(abbreviation code) 

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