

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

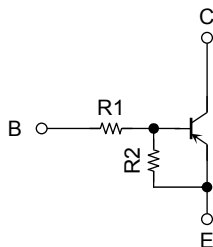
## RN2401, RN2402, RN2403 RN2404, RN2405, RN2406

Unit: mm

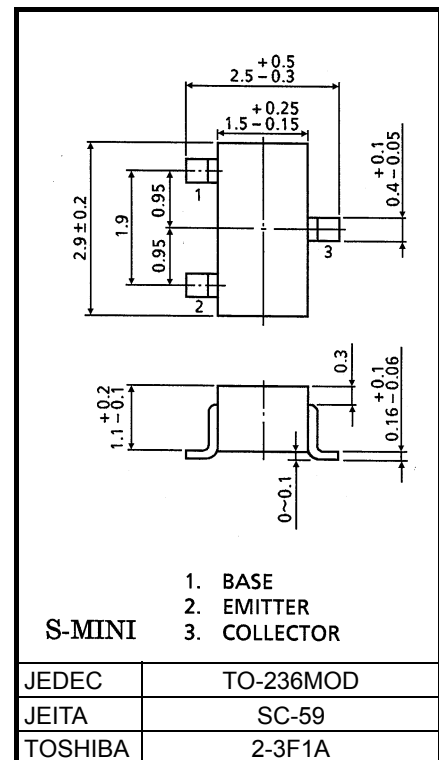
Switching, Inverter Circuit, Interface Circuit  
and Driver Circuit Applications

- With built-in bias resistors
- Simplified circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN1401 to 1406

### Equivalent Circuit Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN2401	4.7	4.7
RN2402	10	10
RN2403	22	22
RN2404	47	47
RN2405	2.2	47
RN2406	4.7	47



Weight: 12mg (typ.)

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	RN2401 to 2406	V <sub>CBO</sub>	-50 V
Collector-emitter voltage			
Emitter-base voltage	RN2401 to 2404	V <sub>EBO</sub>	-10 V
	RN2405, 2406		-5 V
Collector current	RN2401 to 2406	I <sub>C</sub>	-100 mA
Collector power dissipation		P <sub>C</sub>	200 mW
Junction temperature		T <sub>j</sub>	150 °C
Storage temperature range		T <sub>stg</sub>	-55 to 150 °C

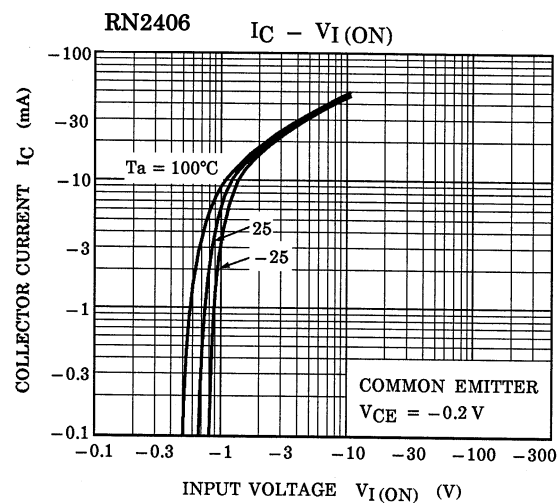
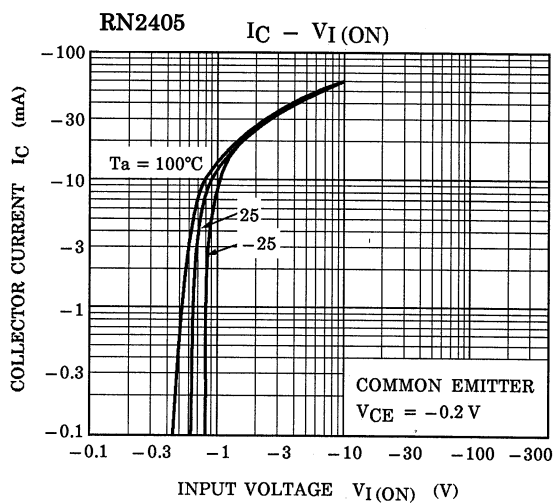
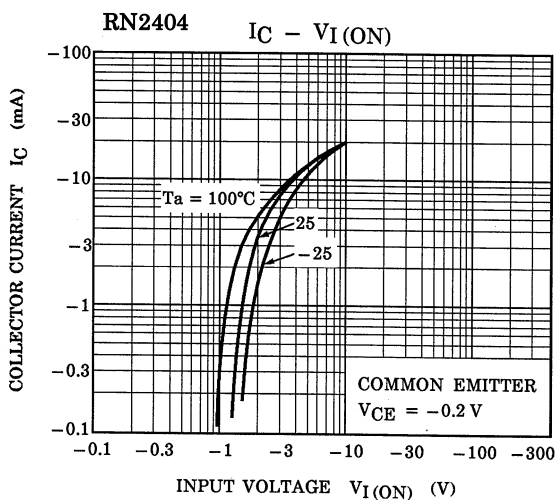
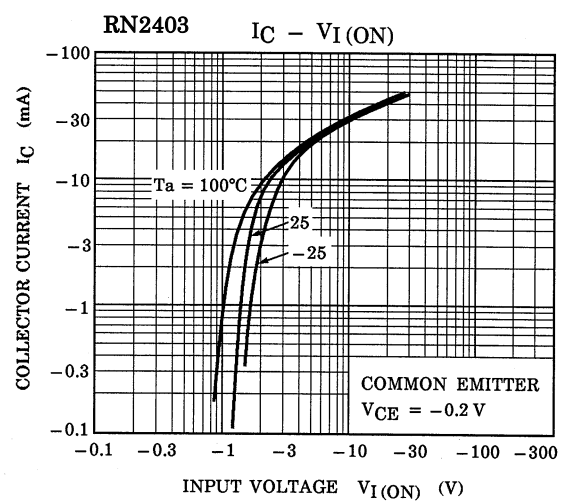
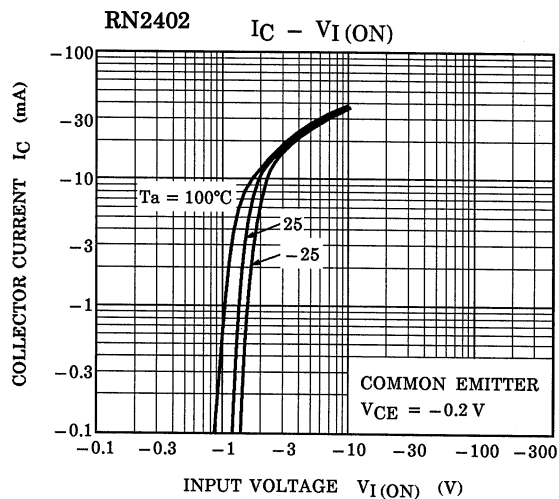
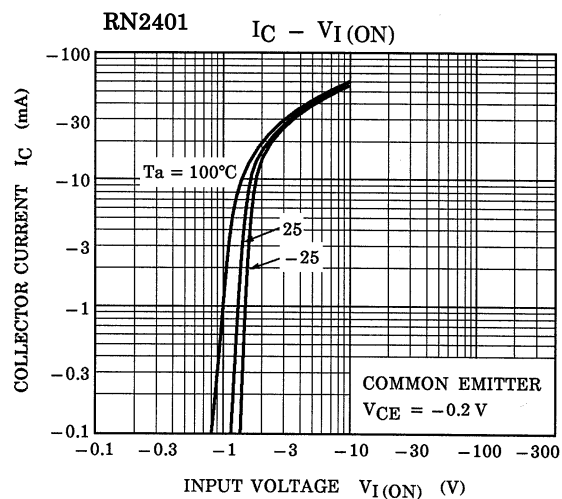
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

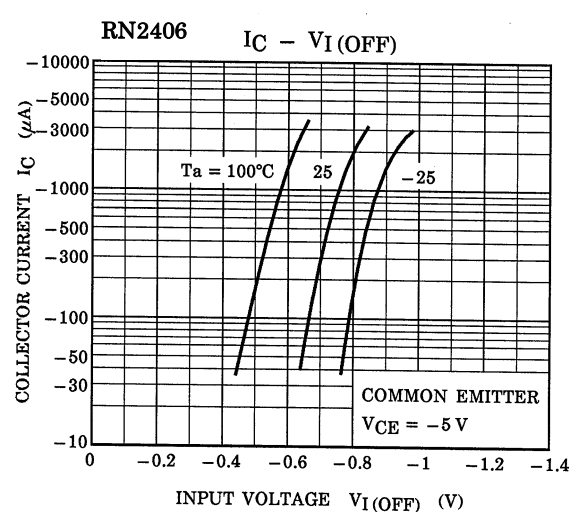
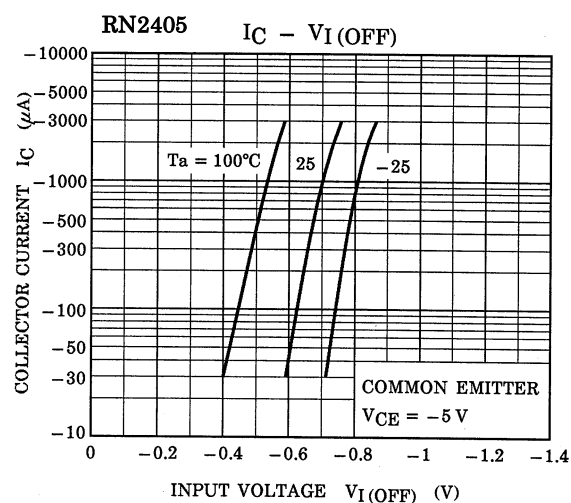
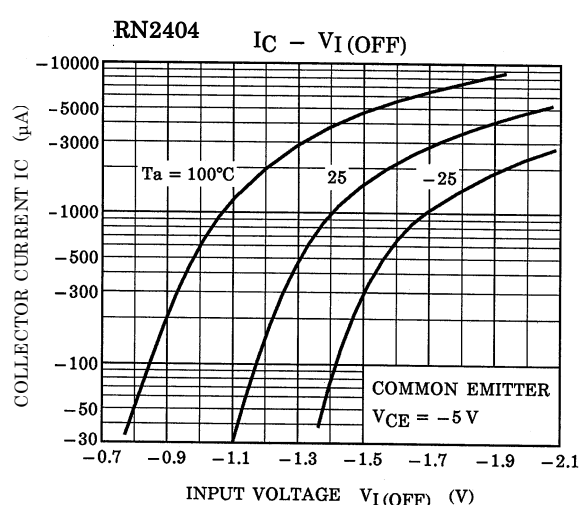
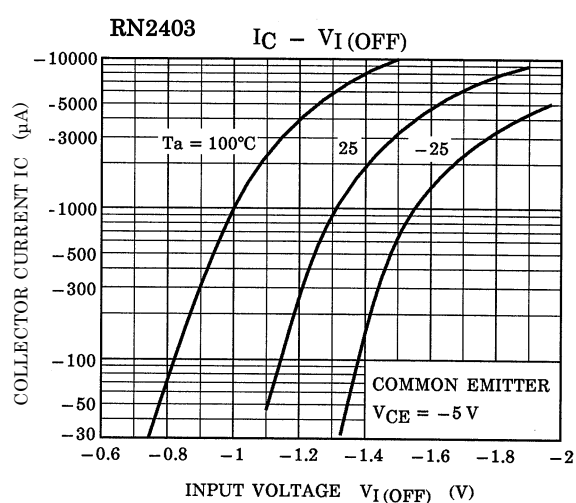
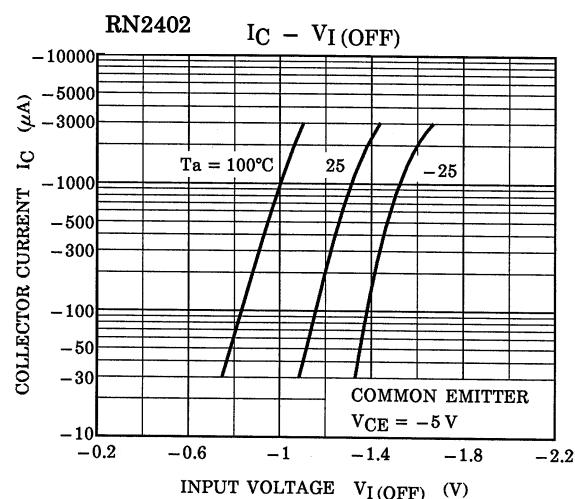
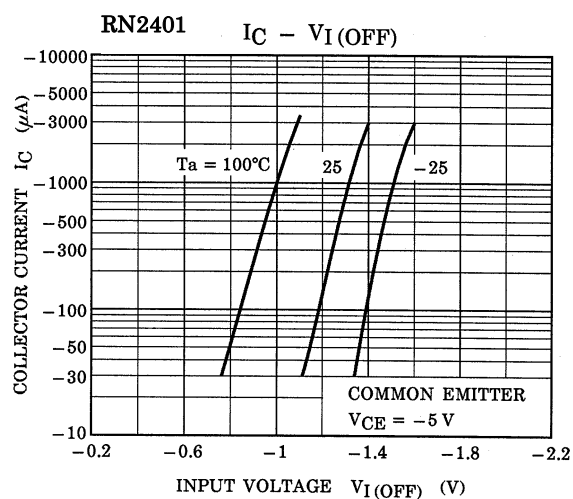
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

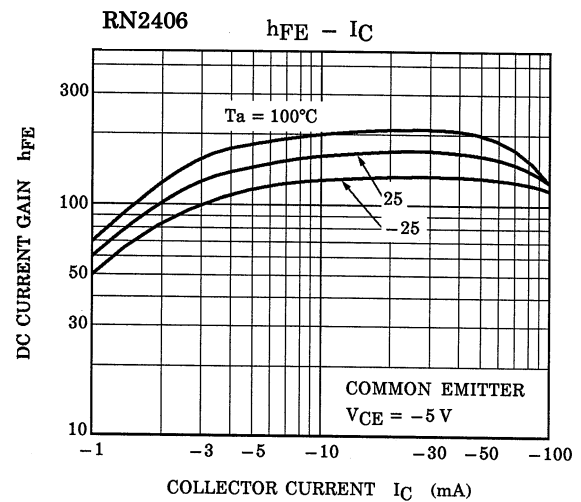
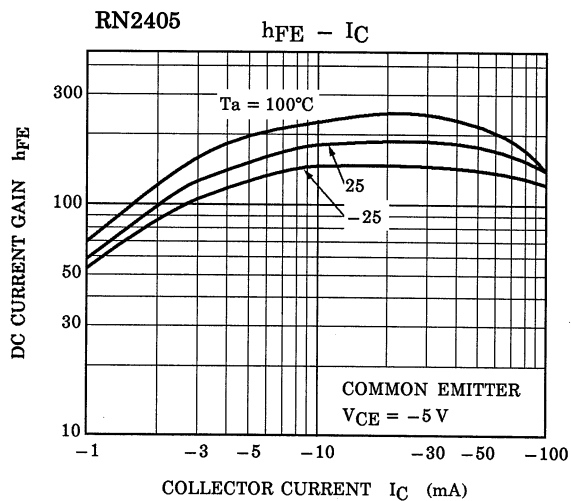
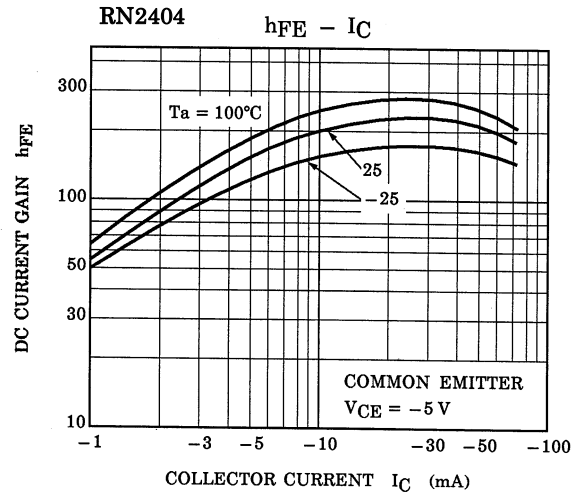
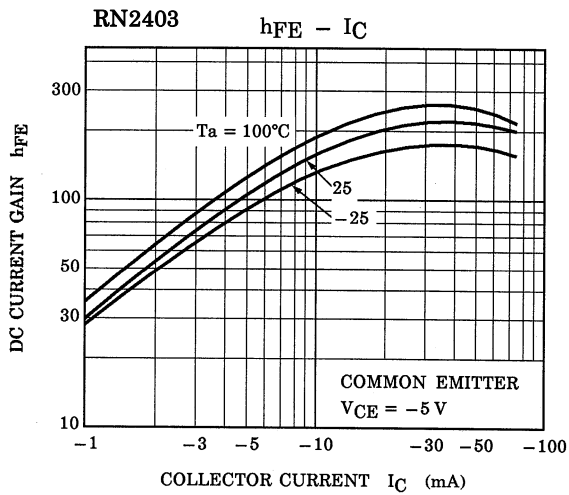
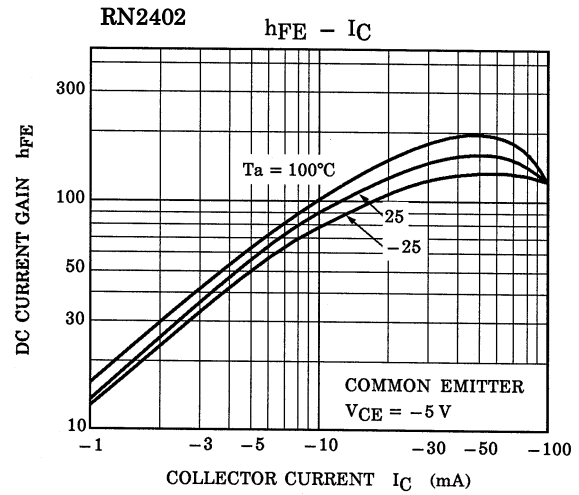
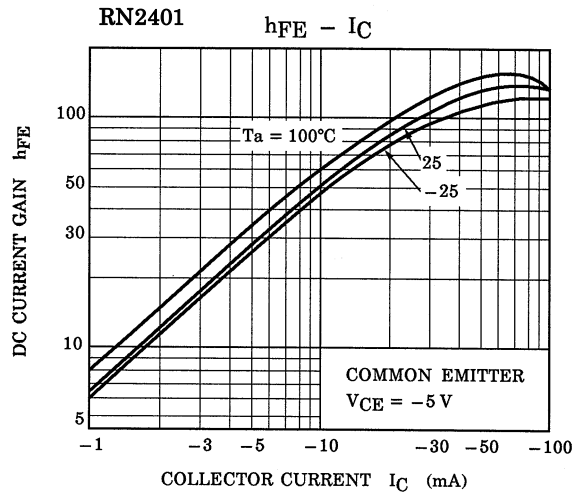
Start of commercial production  
1983-06

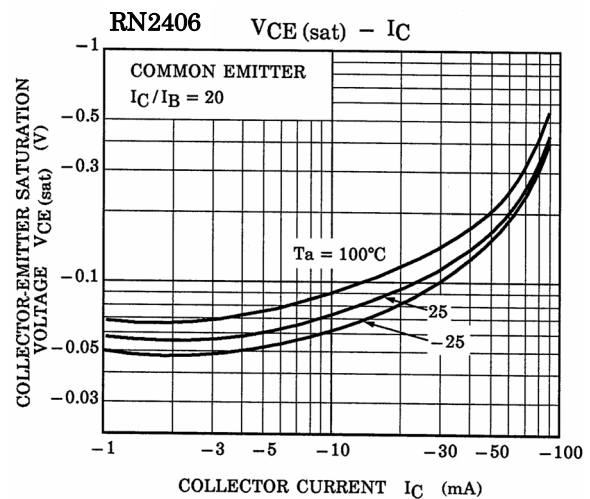
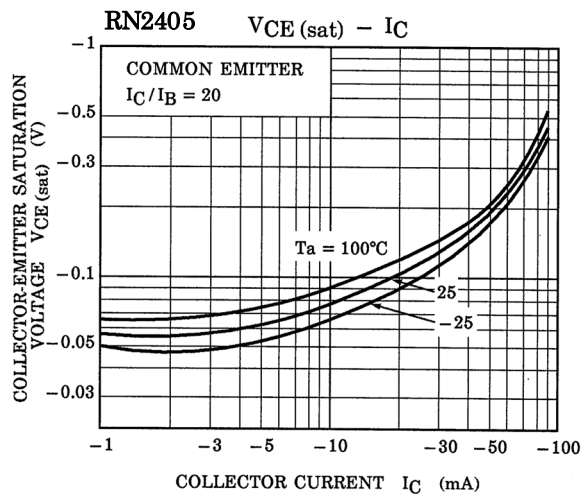
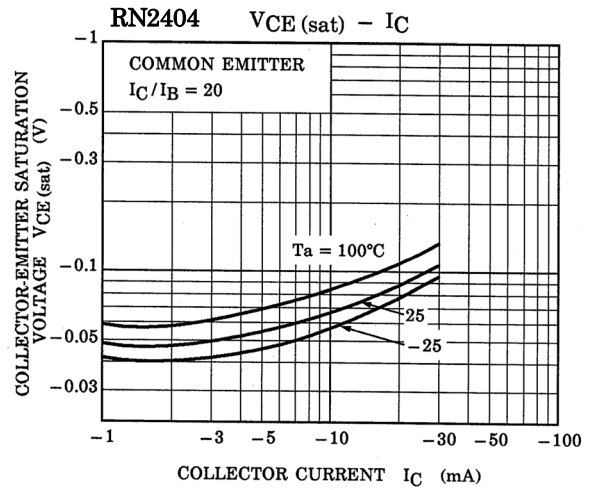
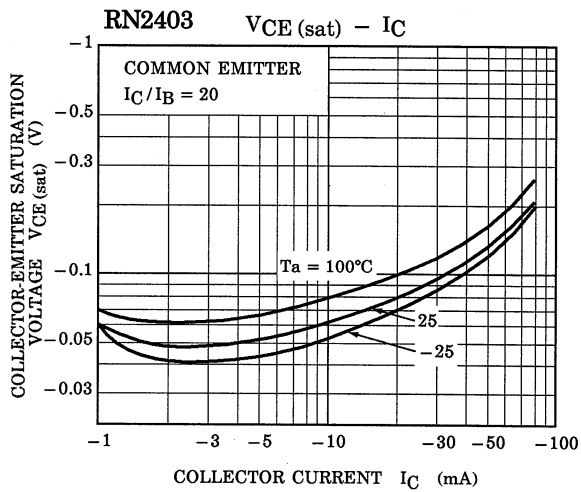
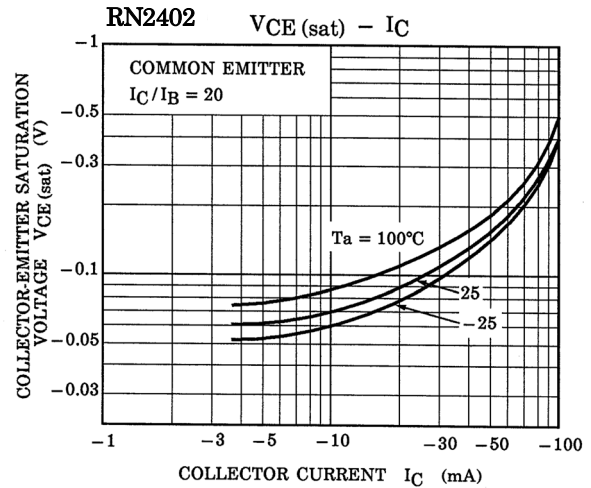
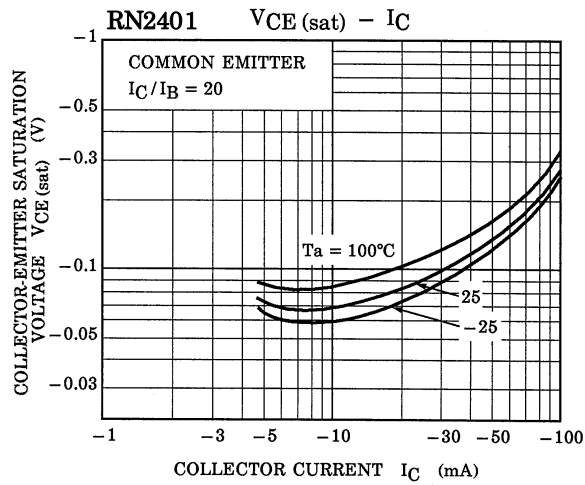
**Electrical Characteristics (Ta = 25°C)**

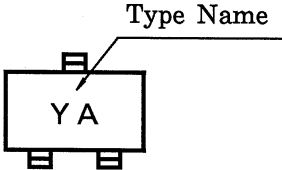
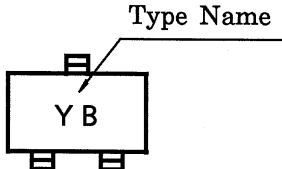
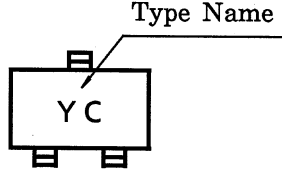
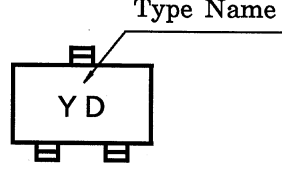
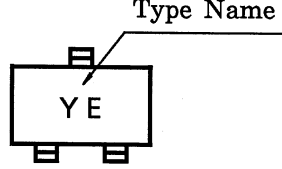
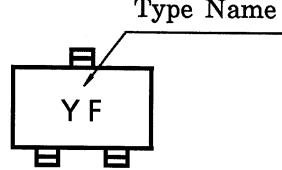
Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2401 to 2406	$I_{CBO}$	—	$V_{CB} = -50\text{ V}, I_E = 0$	—		-100	nA
		$I_{CEO}$	—	$V_{CE} = -50\text{ V}, I_B = 0$	—	—	-500	
Emitter cut-off current	RN2401	$I_{EBO}$	—	$V_{EB} = -10\text{ V}, I_C = 0$	-0.82	—	-1.52	mA
	RN2402		—		-0.38	—	-0.71	
	RN2403		—		-0.17	—	-0.33	
	RN2404		—		-0.082	—	-0.15	
	RN2405		—	$V_{EB} = -5\text{ V}, I_C = 0$	-0.078	—	-0.145	
	RN2406		—		-0.074	—	-0.138	
DC current gain	RN2401	$h_{FE}$	—	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	30	—	—	—
	RN2402		—		50	—	—	
	RN2403		—		70	—	—	
	RN2404		—		80	—	—	
	RN2405		—		80	—	—	
	RN2406		—		80	—	—	
Collector-emitter saturation voltage	RN2401 to 2406	$V_{CE(sat)}$	—	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V
Input voltage (ON)	RN2401	$V_I(ON)$	—	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-1.1	—	-2.0	V
	RN2402		—		-1.2	—	-2.4	
	RN2403		—		-1.3	—	-3.0	
	RN2404		—		-1.5	—	-5.0	
	RN2405		—		-0.6	—	-1.1	
	RN2406		—		-0.7	—	-1.3	
Input voltage (OFF)	RN2401 to 2404	$V_I(OFF)$	—	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-1.0	—	-1.5	V
	RN2405, 2406		—		-0.5	—	-0.8	
Transition frequency	RN2401 to 2406	$f_T$	—	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz
Collector output capacitance	RN2401 to 2406	$C_{ob}$	—	$V_{CB} = -10\text{ V}, I_E = 0$ $f = 1\text{ MHz}$	—	3	6	pF
Input resistor	RN2401	R1	—	—	3.29	4.7	6.11	kΩ
	RN2402		—		7	10	13	
	RN2403		—		15.4	22	28.6	
	RN2404		—		32.9	47	61.1	
	RN2405		—		1.54	2.2	2.86	
	RN2406		—		3.29	4.7	6.11	
Resistor ratio	RN2401 to 2404	R1/R2	—	—	0.9	1.0	1.1	—
	RN2405		—		0.0421	0.0468	0.0515	
	RN2406		—		0.09	0.1	0.11	









Type Name	Marking
RN2401	
RN2402	
RN2403	
RN2404	
RN2405	
RN2406	

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