

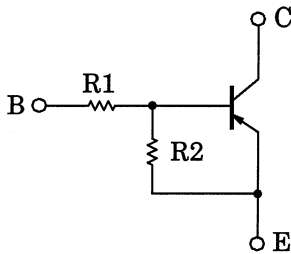
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN2301, RN2302, RN2303 RN2304, RN2305, RN2306

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN1301 to RN1306

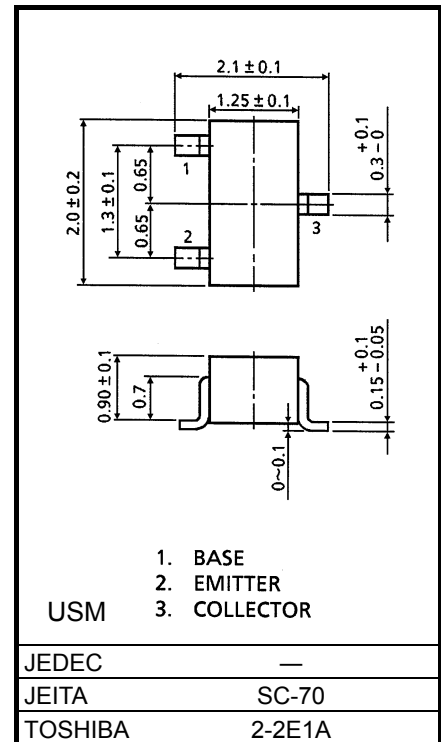
Equivalent Circuit



Bias Resistor Values

Type 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

Unit: mm



Weight: 0.006g

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-base voltage	RN2301 to RN2306	V _{CB0}	-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

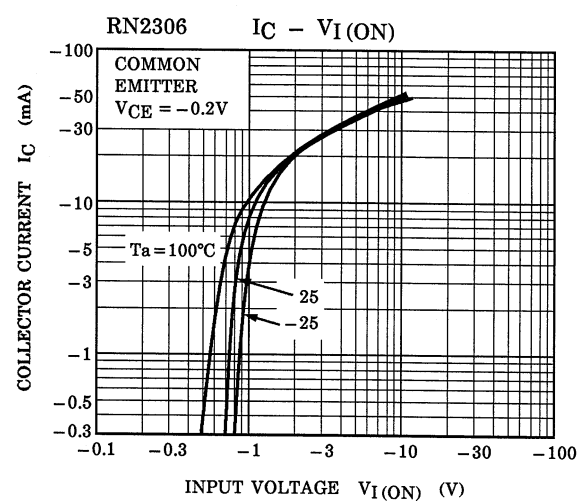
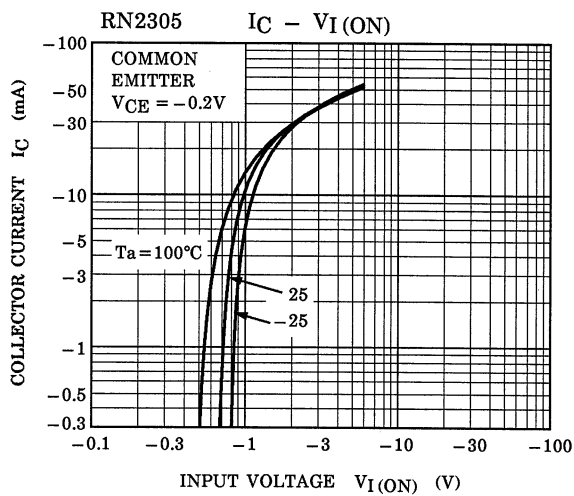
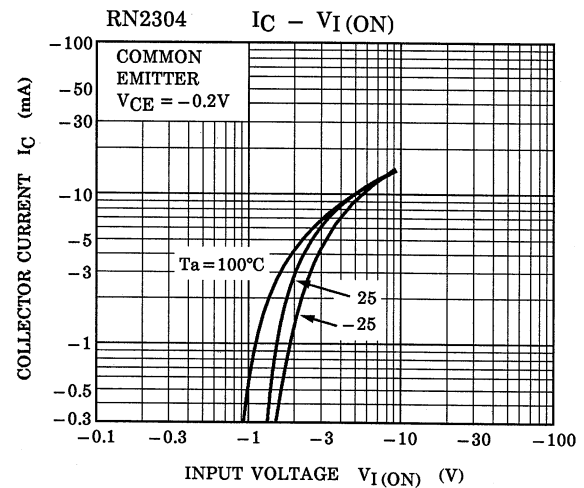
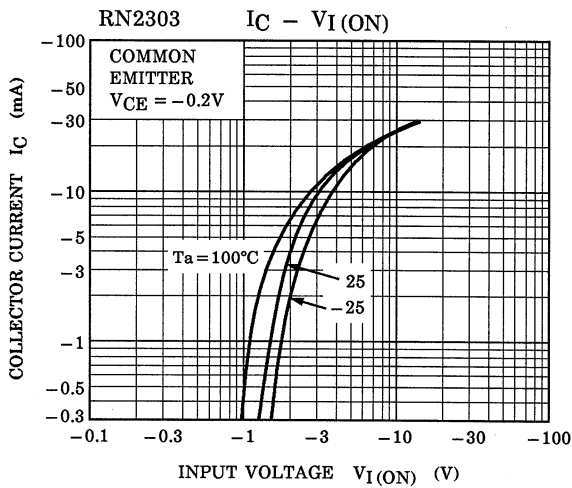
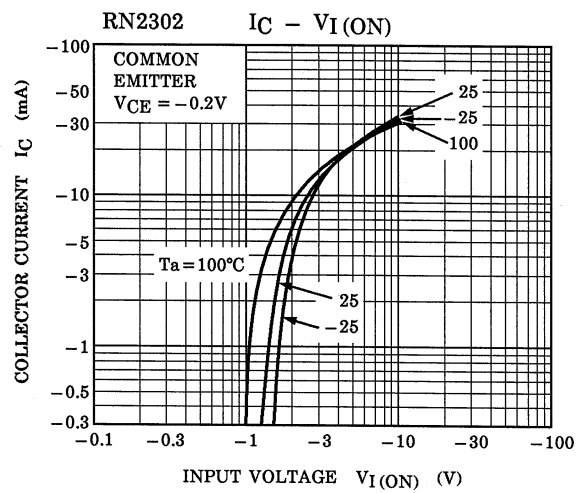
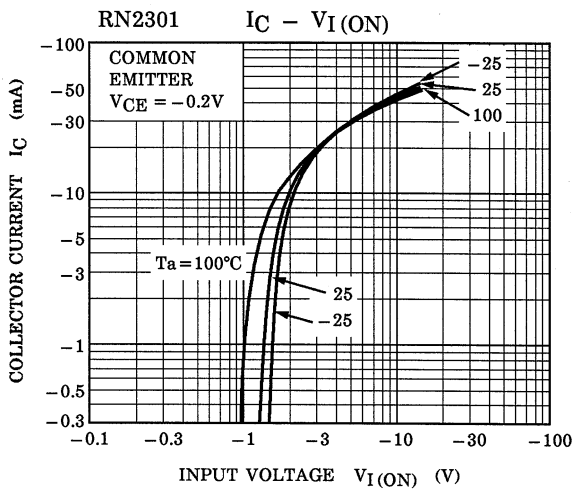
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

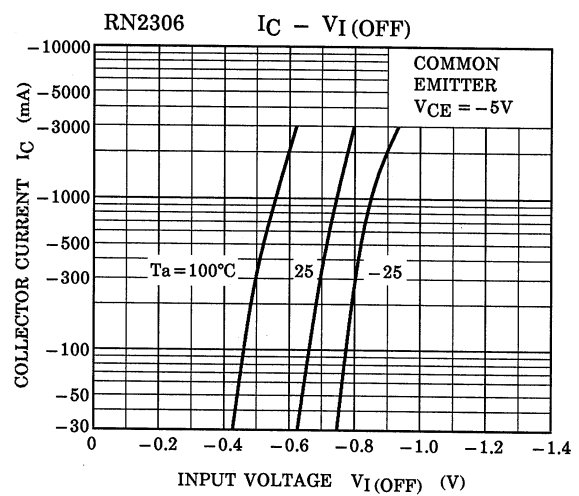
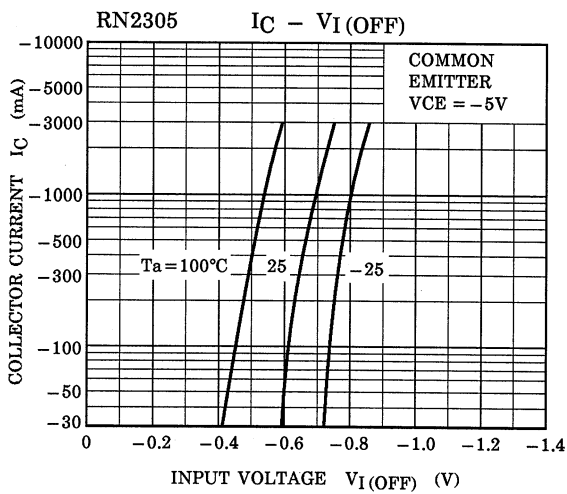
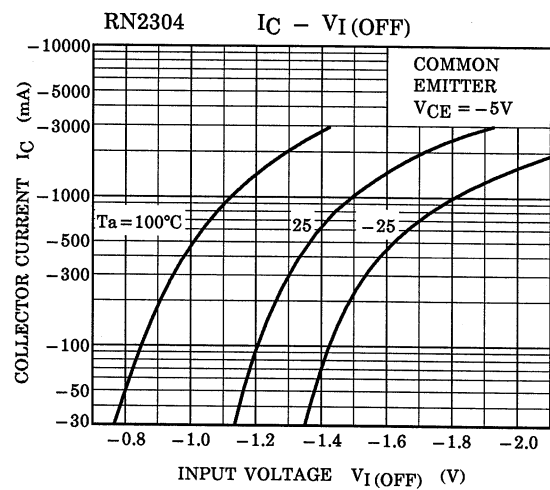
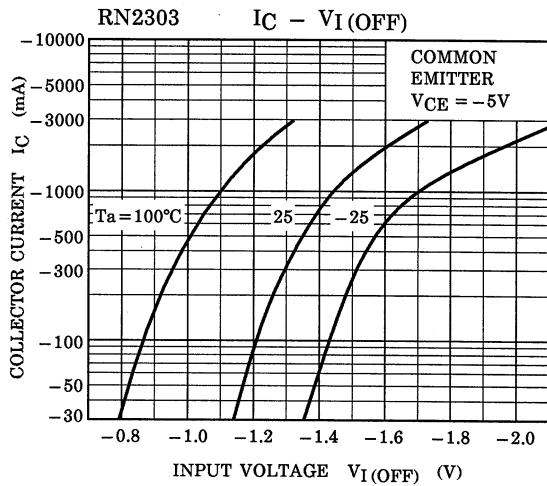
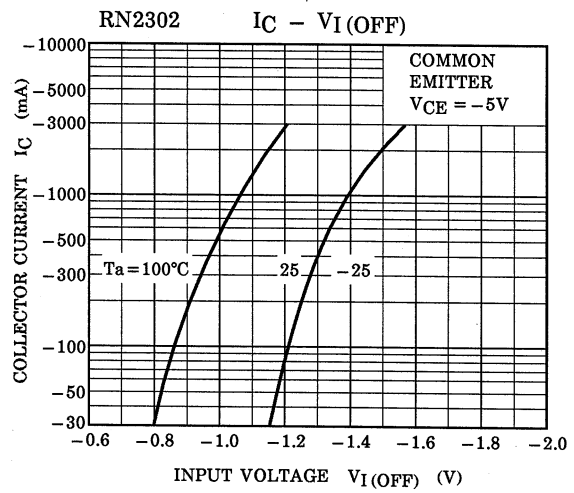
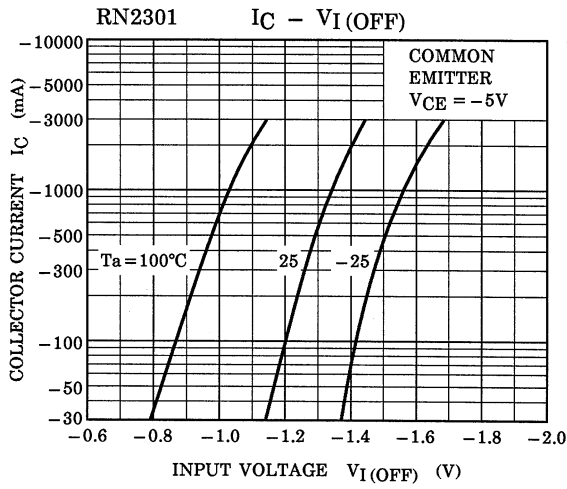
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

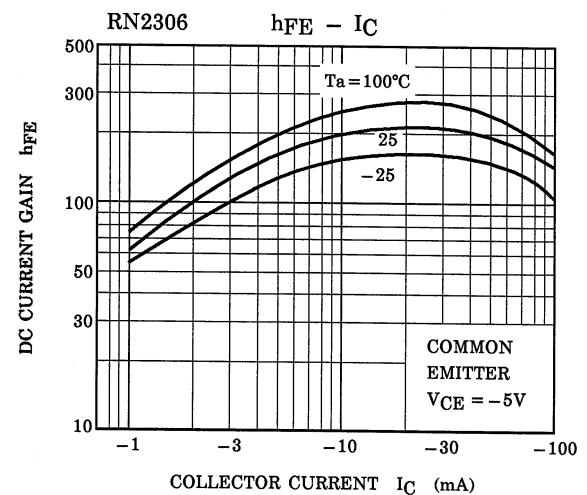
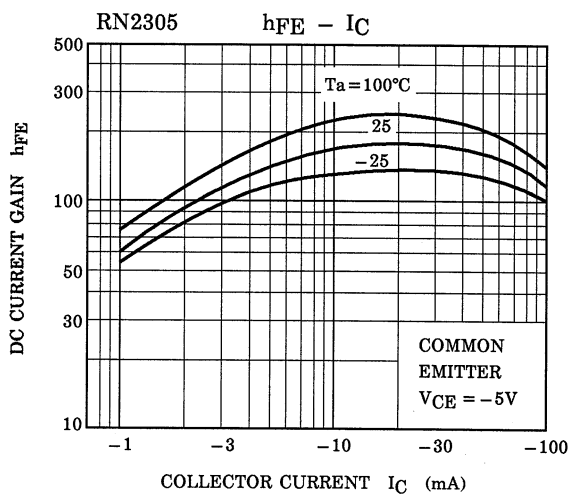
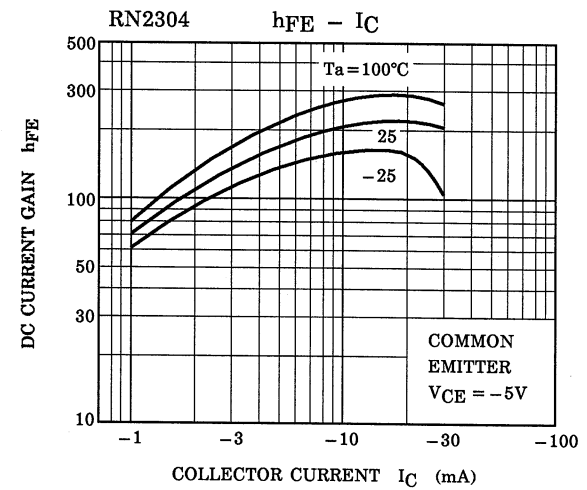
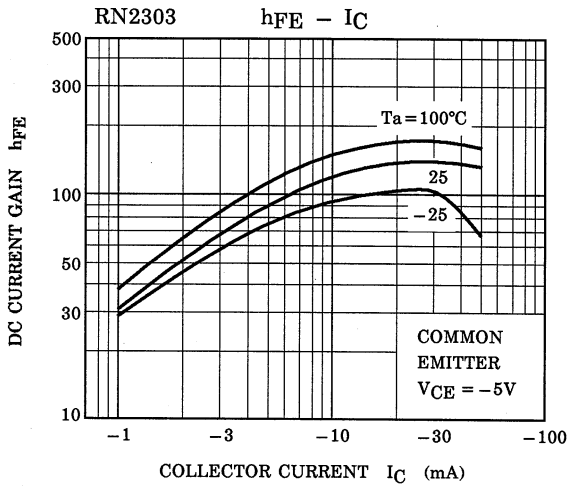
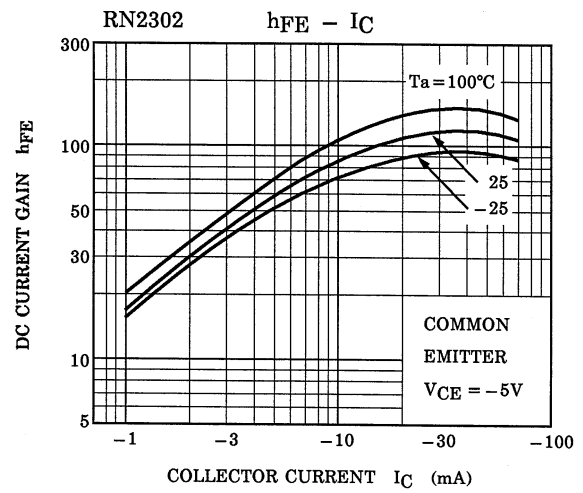
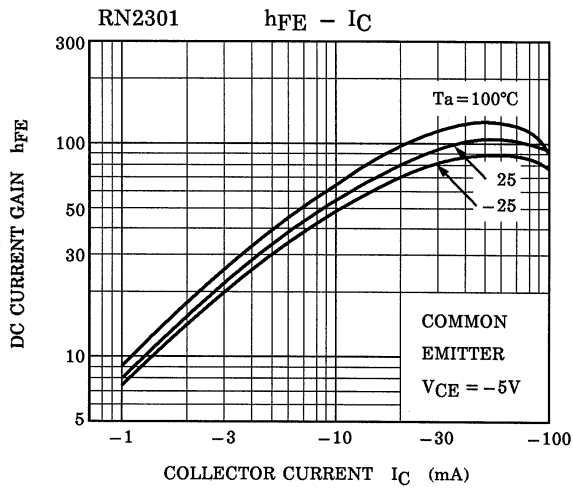
Start of commercial production
1987-09

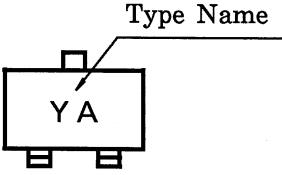
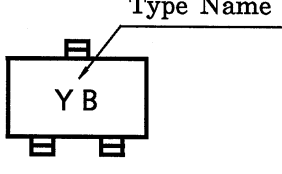
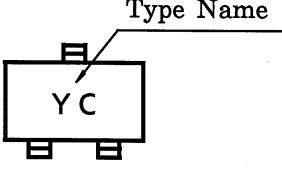
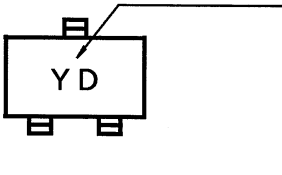
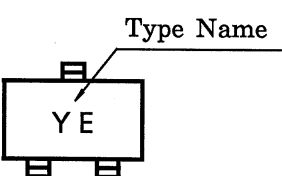
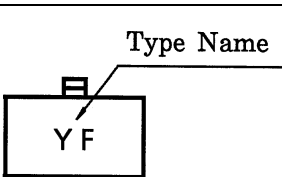
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2301 to 2306	I_{CBO}	—	$V_{CB} = -50V, I_E = 0$	—	—	-100	nA
		I_{CEO}	—	$V_{CE} = -50V, I_B = 0$	—	—	-500	
Emitter cut-off current	RN2301	I_{EBO}	—	$V_{EB} = -10V, I_C = 0$	-0.82	—	-1.52	mA
	RN2302		—		-0.38	—	-0.71	
	RN2303		—		-0.17	—	-0.33	
	RN2304		—	-0.082	—	-0.15		
	RN2305		—	$V_{EB} = -5V, I_C = 0$	-0.078	—	-0.145	
	RN2306		—		-0.074	—	-0.138	
DC current gain	RN2301	h_{FE}	—	$V_{CE} = -5V, I_C = -10mA$	30	—	—	—
	RN2302		—		50	—	—	
	RN2303		—		70	—	—	
	RN2304		—		80	—	—	
	RN2305		—		80	—	—	
	RN2306		—		80	—	—	
Collector-emitter saturation voltage	RN2301 to 2306	$V_{CE(sat)}$	—	$I_C = -5mA, I_B = -0.25mA$	—	-0.1	-0.3	V
Input voltage (ON)	RN2301	$V_I(ON)$	—	$V_{CE} = -0.2V, I_C = -5mA$	-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 2304	$V_I(OFF)$	—	$V_{CE} = -5V, I_C = -0.1mA$	-1.0	—	-1.5	V
	RN2305, 2306		—		-0.5	—	-0.8	
Transition frequency	RN2301 to 2306	f_T	—	$V_{CE} = -10V, I_C = -5mA$	—	200	—	MHz
Collector output capacitance	RN2301 to 2306	C_{ob}	—	$V_{CB} = -10V, I_E = 0$ $f = 1MHz$	—	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 2304	R1/R2	—	—	0.9	1.0	1.1	—
	RN2305		—		0.0421	0.0468	0.0515	
	RN2306		—		0.09	0.1	0.11	







Type Name	Marking
RN2301	
RN2302	
RN2303	
RN2304	
RN2305	
RN2306	

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