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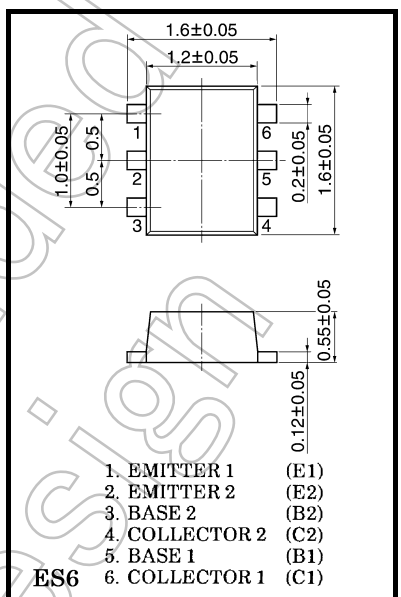
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN1967FE, RN1968FE, RN1969FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2967FE to RN2969FE

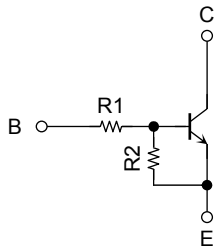
Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-2N1A

Weight: 3mg (typ.)

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN1967FE	10	47
RN1968FE	22	47
RN1969FE	47	22

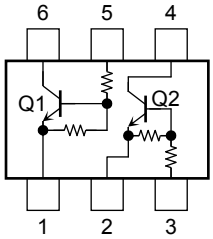
Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage	RN1967FE	V_{EBO}	6	V
	RN1968FE		7	
	RN1969FE		15	
Collector current		I_C	100	mA
Collector power dissipation		P_C (Note 1)	100	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to150	°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).

Note 1: Total rating

Equivalent Circuit (top view)



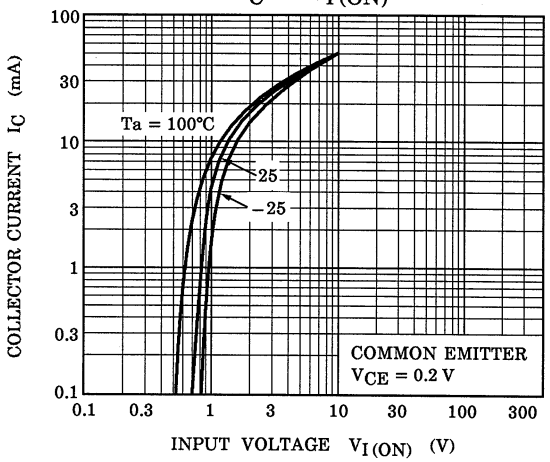
Start of commercial production
2000-05

Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

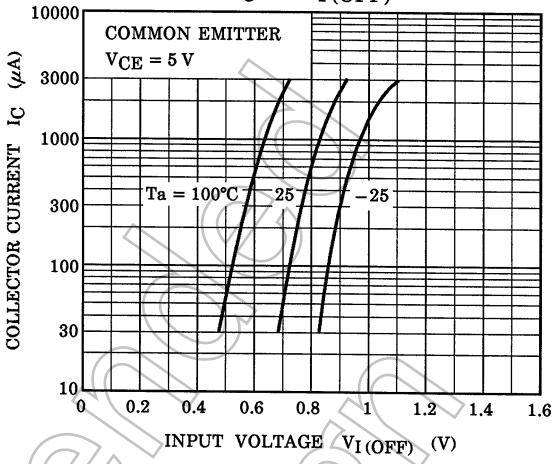
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1967FE to 1969FE	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0	—	—	500	
Emitter cut-off current	RN1967FE	I_{EBO}	V_{EB} = 6 V, I_C = 0	0.081	—	0.15	mA
	RN1968FE		V_{EB} = 7 V, I_C = 0	0.078	—	0.145	
	RN1969FE		V_{EB} = 15 V, I_C = 0	0.167	—	0.311	
DC current gain	RN1967FE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	80	—	—	—
	RN1968FE			80	—	—	
	RN1969FE			70	—	—	
Collector-emitter saturation voltage	RN1967FE to 1969FE	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1967FE	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	0.7	—	1.8	V
	RN1968FE			1.0	—	2.6	
	RN1969FE			2.2	—	5.8	
Input voltage (OFF)	RN1967FE	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	0.5	—	1.0	V
	RN1968FE			0.6	—	1.16	
	RN1969FE			1.5	—	2.6	
Transition frequency	RN1967FE to 1969FE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1967FE to 1969FE	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	3	6	pF
Input resistor	RN1967FE	R1	—	7	10	13	kΩ
	RN1968FE			15.4	22	28.6	
	RN1969FE			32.9	47	61.1	
Resistor ratio	RN1967FE	R1/R2	—	0.191	0.213	0.232	—
	RN1968FE			0.421	0.468	0.515	
	RN1969FE			1.92	2.14	2.35	

Q1, Q2 Common

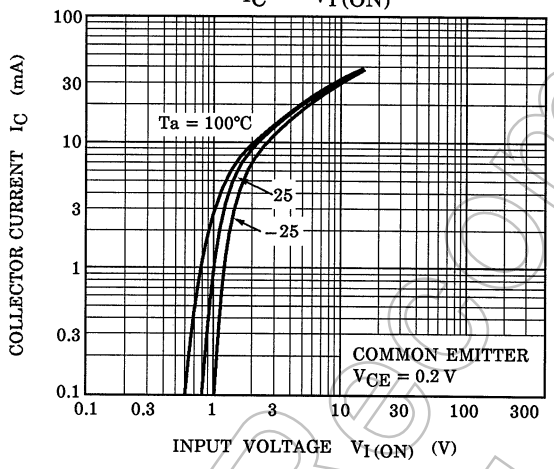
RN1967FE $I_C - V_{I(ON)}$



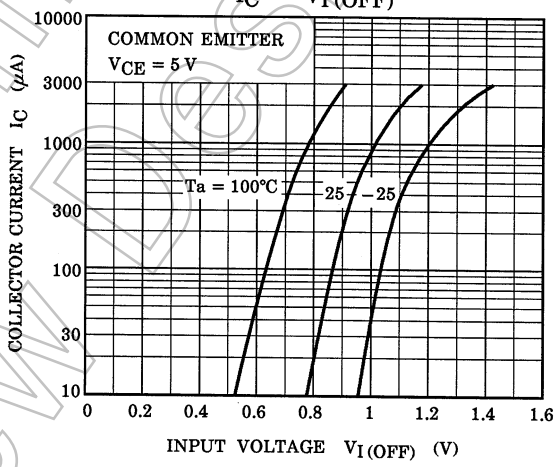
RN1967FE $I_C - V_{I(OFF)}$



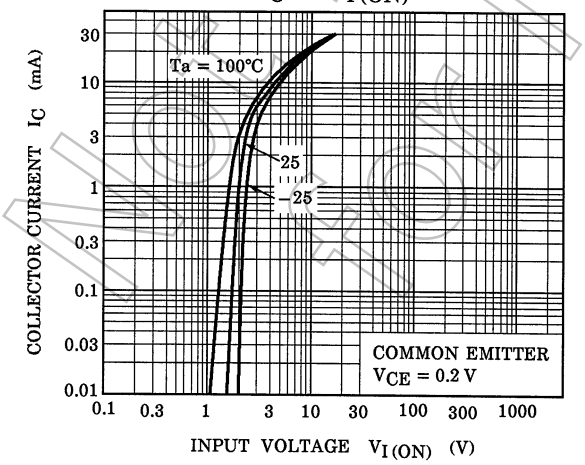
RN1968FE $I_C - V_{I(ON)}$



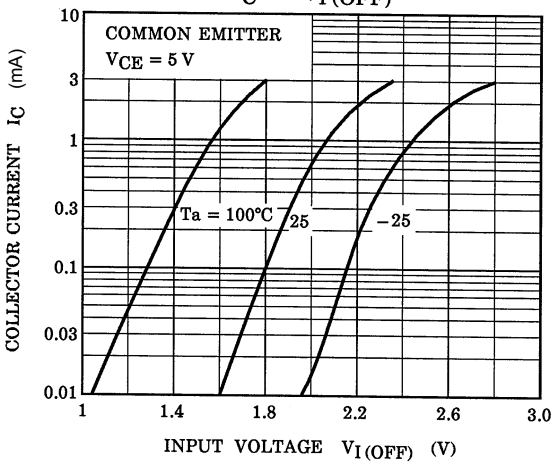
RN1968FE $I_C - V_{I(OFF)}$



RN1969FE $I_C - V_{I(ON)}$

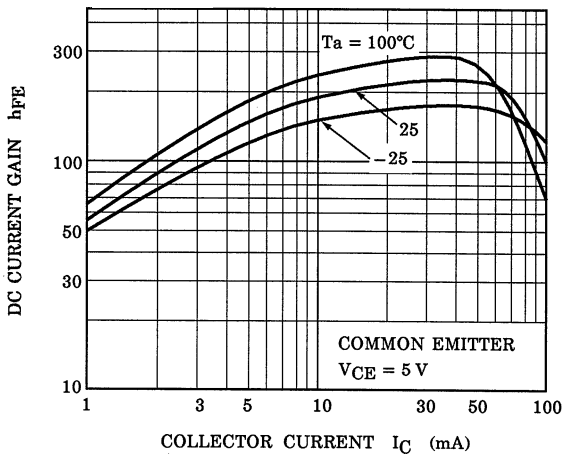


RN1969FE $I_C - V_{I(OFF)}$

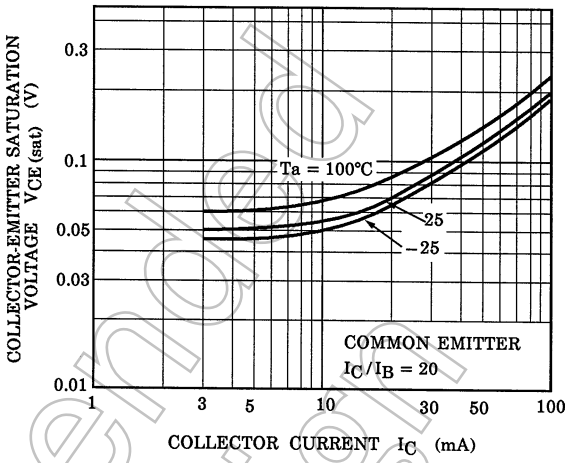


Q1, Q2 Common

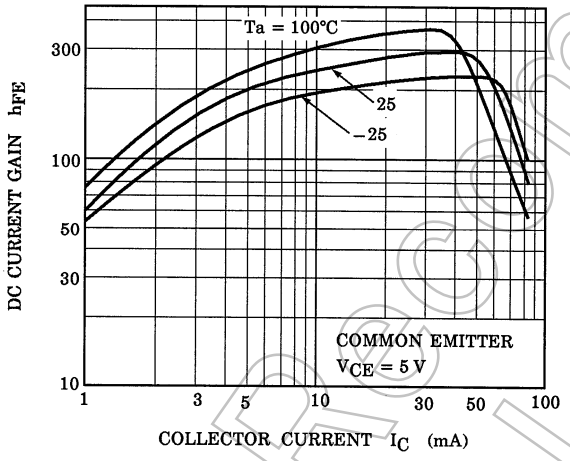
RN1967FE h_{FE} – I_C



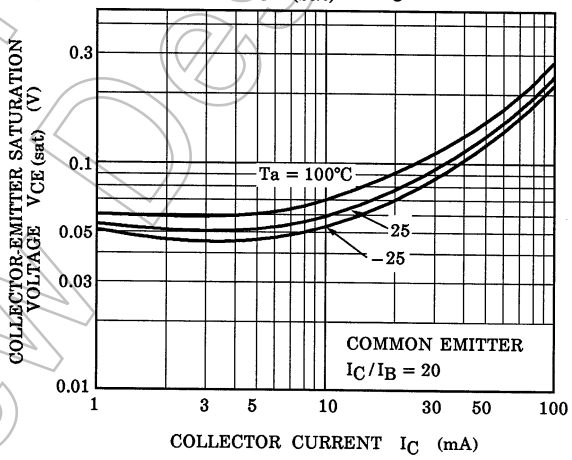
RN1967FE $V_{CE\,(sat)}$ – I_C



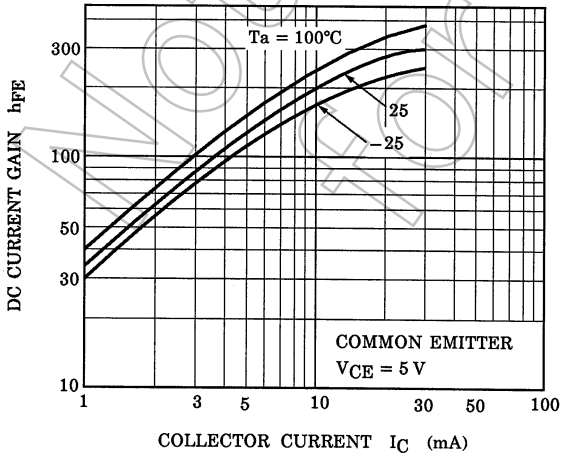
RN1968FE h_{FE} – I_C



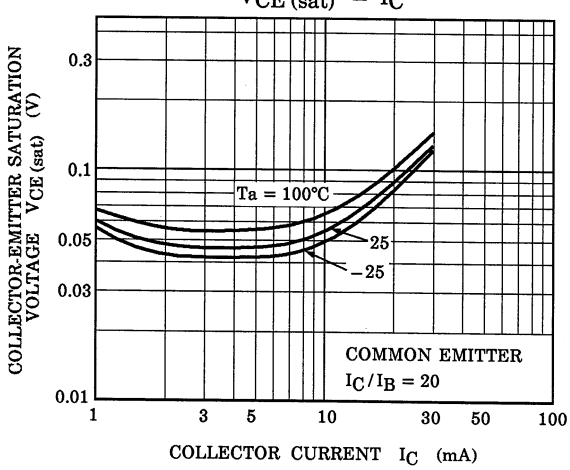
RN1968FE $V_{CE\,(sat)}$ – I_C



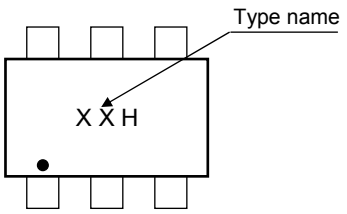
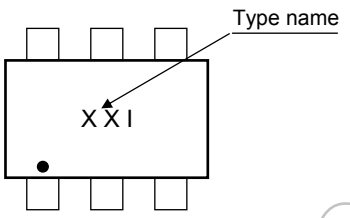
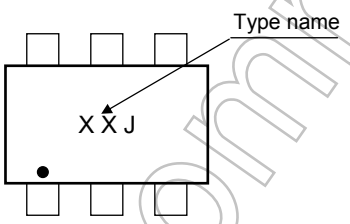
RN1969FE h_{FE} – I_C



RN1969FE $V_{CE\,(sat)}$ – I_C



Marking

Type Name	Marking
RN1967FE	
RN1968FE	
RN1969FE	

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