

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

RN2310,RN2311

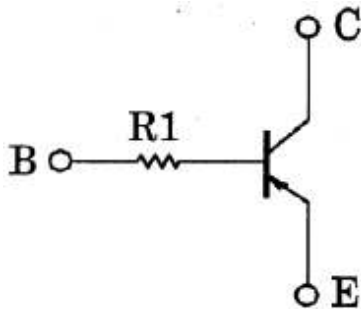
1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

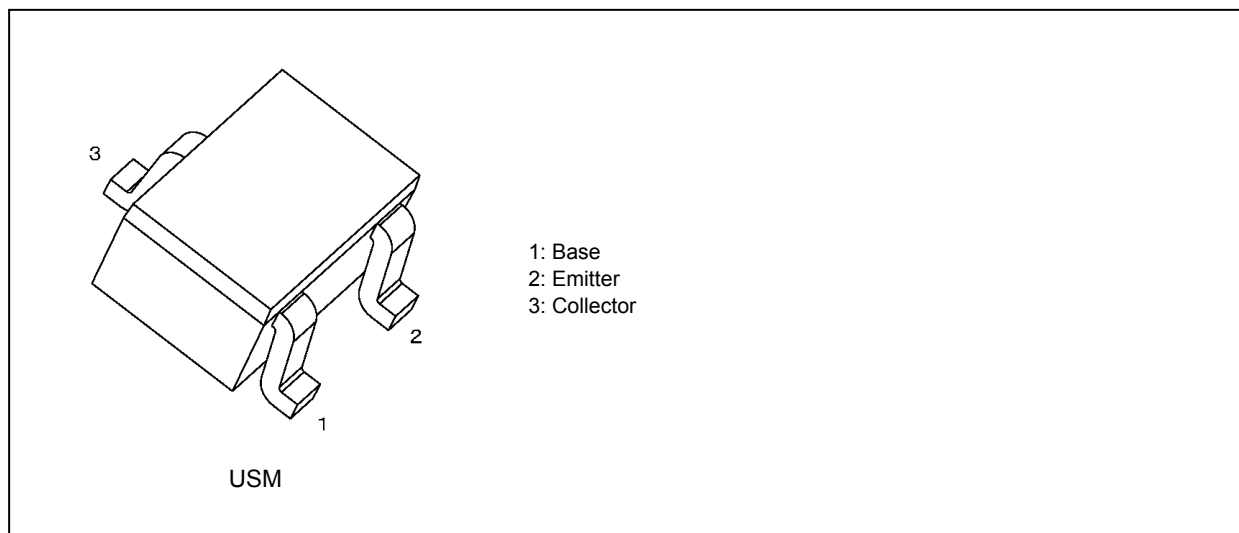
2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) The integrated bias resistor reduces the number of external parts required, making it possible to reduce system size and assembly time.
- (3) Toshiba offers transistors with a wide range of resistance to accommodate various circuit designs.
- (4) Complementary to RN1310 to RN1311

3. Equivalent Circuit



4. Packaging and Pin Assignment



Start of commercial production

1987-07

5. Orderable part number

Orderable part number		AEC-Q101	Note	Note
RN2310	RN2310,LF	—		General Use
	RN2310,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN2310,LXHF	YES		Automotive Use
RN2311	RN2311,LF	—		General Use
	RN2311,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN2311,LXHF	YES		Automotive Use

Note 1: For more information, please contact our sales or use the inquiry form on our website.

6. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	-50	V
Collector-emitter voltage	V_{CEO}	-50	
Emitter-base voltage	V_{EBO}	-5	
Collector current	I_C	-100	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to 150	

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).

7. Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	I_{CBO}	$V_{CB} = -50\text{ V}, I_E = 0\text{ mA}$	—	—	-100	nA	
Emitter cut-off current	I_{EBO}	$V_{EB} = -5\text{ V}, I_C = 0\text{ mA}$	—	—	-100	nA	
DC current gain	h_{FE}	$V_{CE} = -5\text{ V}, I_C = -1\text{ mA}$	120	—	400	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V	
Transition frequency	f_T	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz	
Collector output capacitance	C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	3	6	pF	
Input resistance	RN2310	R_1	-	3.29	4.7	6.11	k Ω
	RN2311			7	10	13	

8. Marking

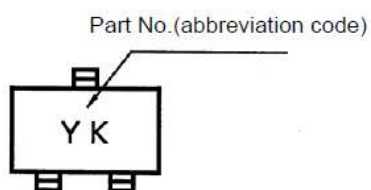


Fig. 8.1 Marking RN2310

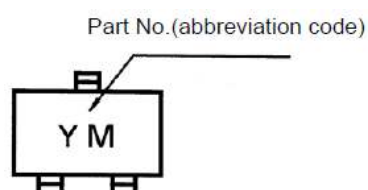


Fig. 8.2 Marking RN2311

9. Characteristics Curves (Note)

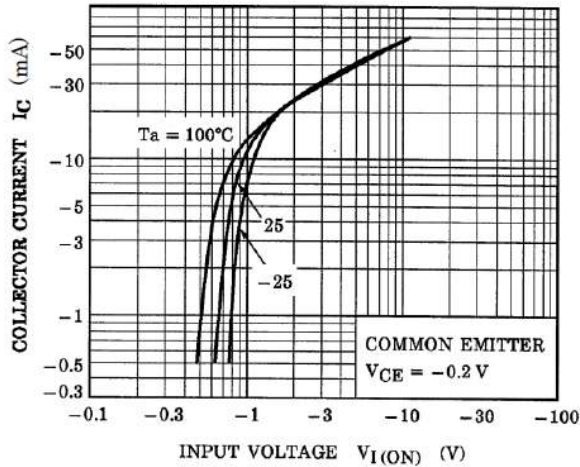


Fig. 9.1 RN2310 I_C - $V_{I(ON)}$

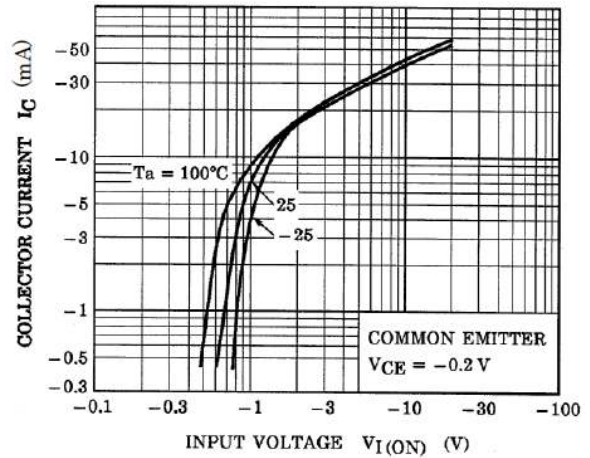


Fig. 9.2 RN2311 I_C - $V_{I(ON)}$

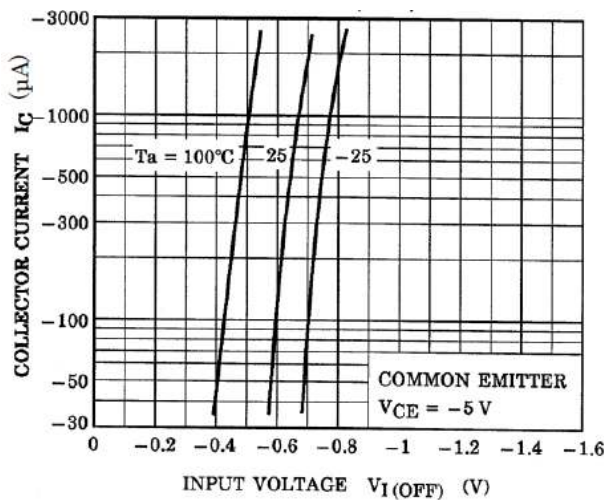


Fig. 9.3 RN2310 I_C - $V_{I(OFF)}$

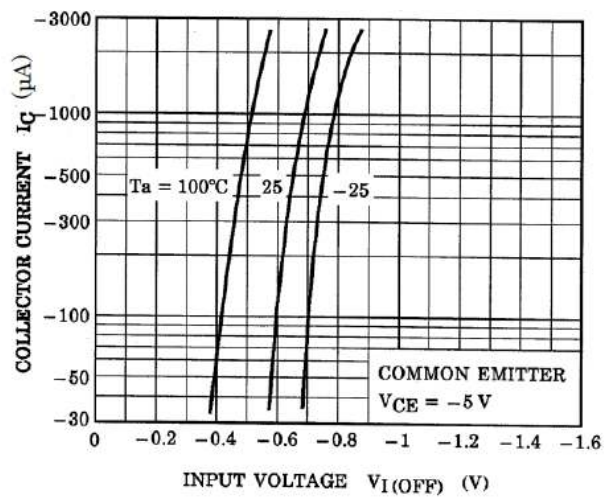


Fig. 9.4 RN2311 I_C - $V_{I(OFF)}$

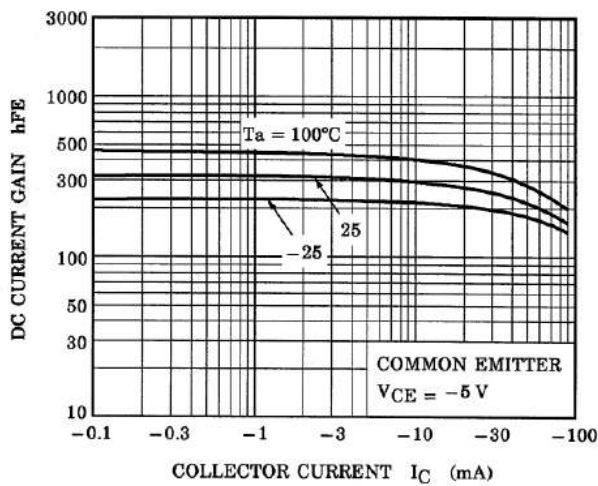


Fig. 9.5 RN2310 h_{FE} - I_C

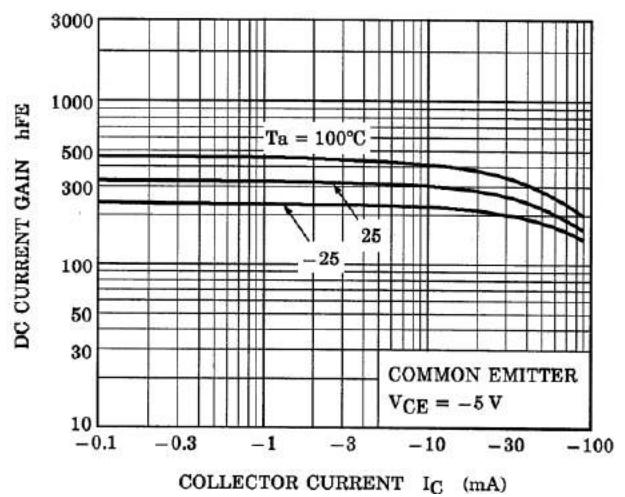


Fig. 9.6 RN2311 h_{FE} - I_C

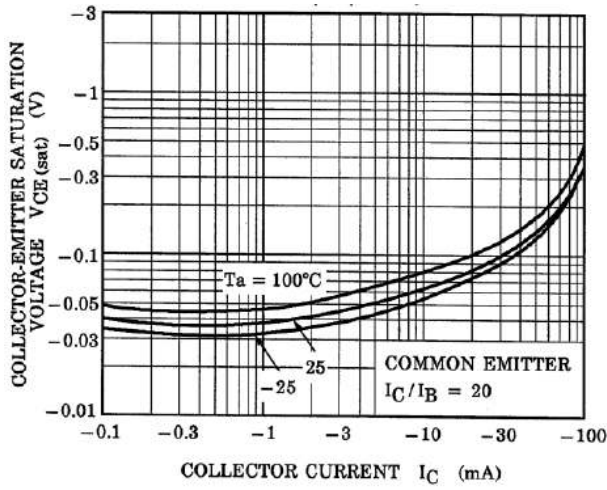


Fig. 9.7 RN2310 $V_{CE(sat)}-I_C$

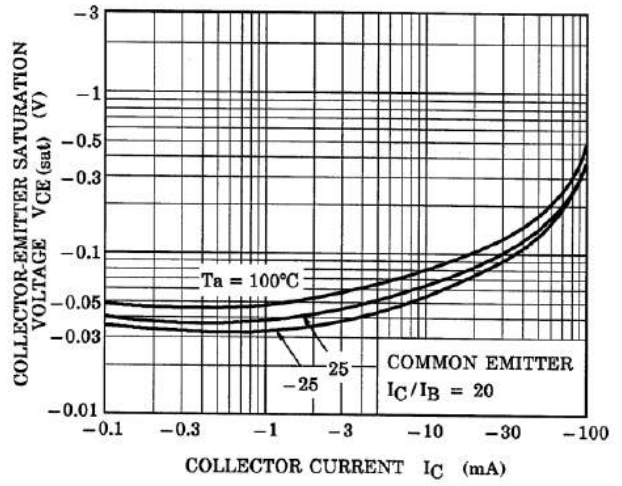
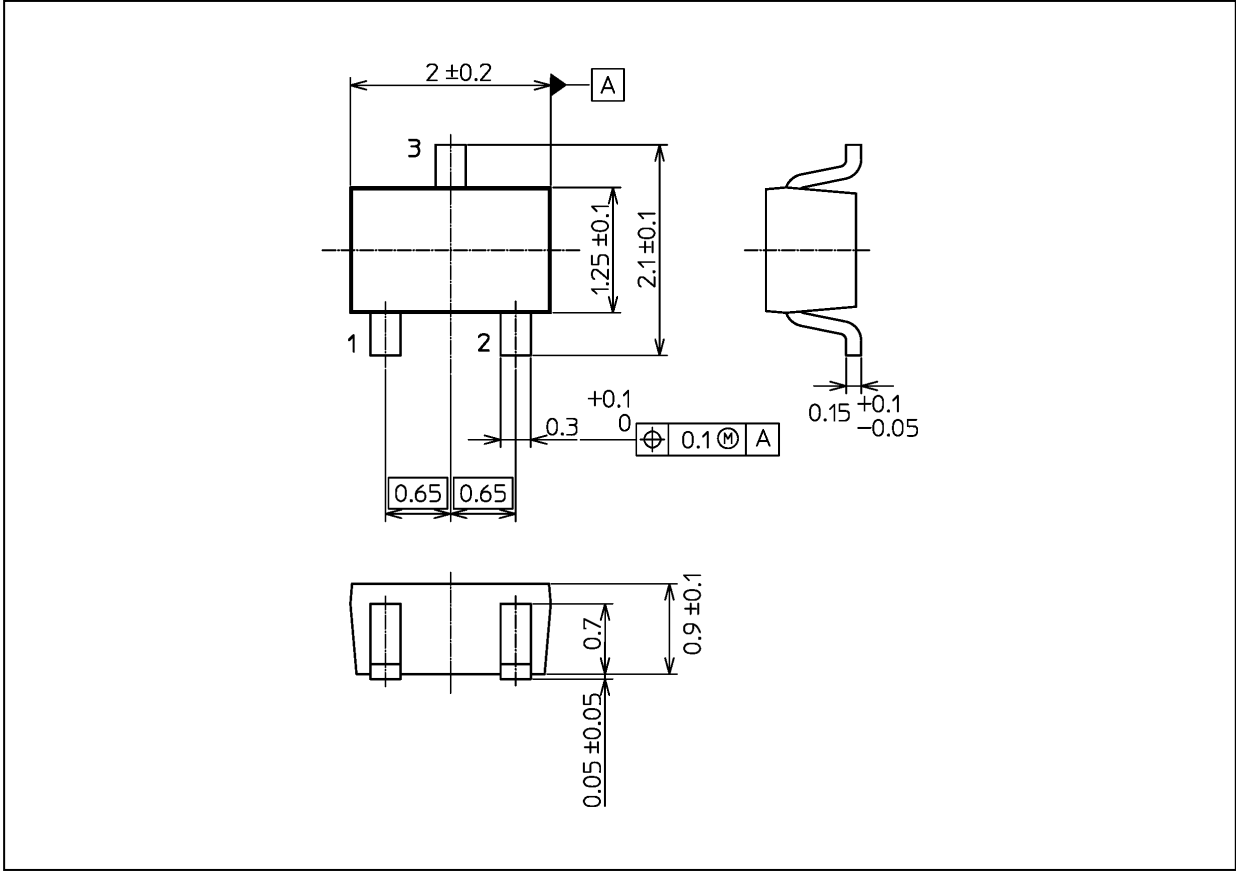


Fig. 9.8 RN2311 $V_{CE(sat)}-I_C$

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

Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

Package Name(s)
TOSHIBA: 2-2E1S
Nickname: USM

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