

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

RN1307/08/09

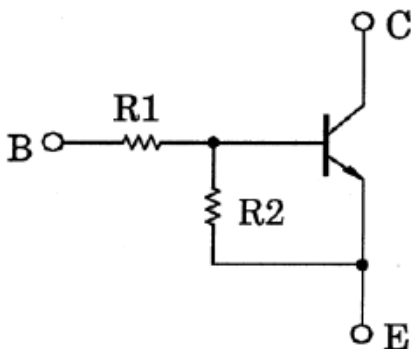
1. Applications

- 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 RN2307 to RN2309

3. Equivalent Circuit



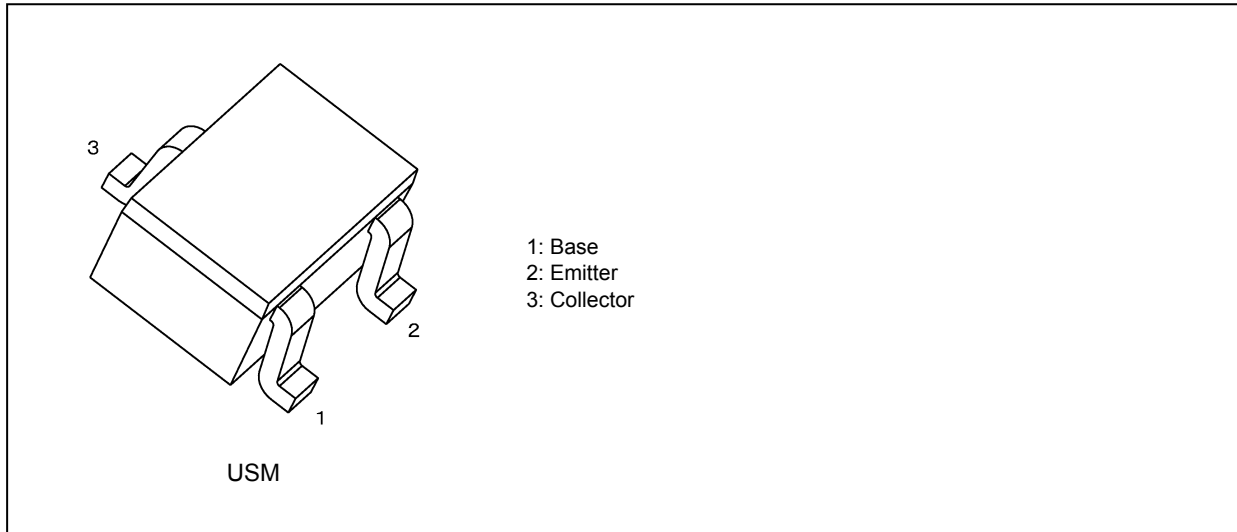
4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN1307	10	47
RN1308	22	47
RN1309	47	22

Start of commercial production

1988-04

5. Packaging and Pin Assignment



6. Orderable part number

Orderable part number		AEC-Q101	Note	Note
RN1307	RN1307,LF	—		General Use
	RN1307,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1307,LXHF	YES		Automotive Use
RN1308	RN1308,LF	—		General Use
	RN1308,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1308,LXHF	YES		Automotive Use
RN1309	RN1309,LF	—		General Use
	RN1309,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1309,LXHF	YES		Automotive Use

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

7. 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	RN1307	V_{EBO}	6	V
	RN1308		7	
	RN1309		15	
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	

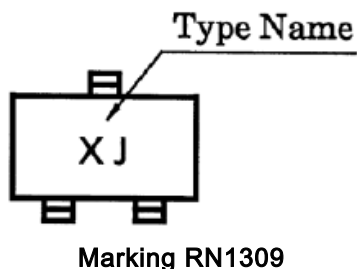
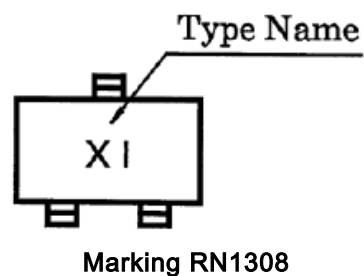
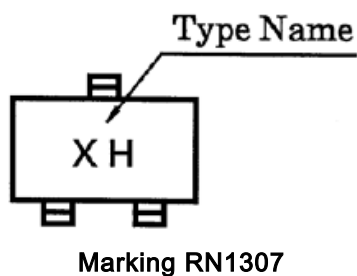
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

8. 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
		I_{CEO}	$V_{CE} = 50\text{ V}, I_B = 0\text{ mA}$	—	—	500	
Emitter cut-off current	RN1307	I_{EBO}	$V_{EB} = 6\text{ V}, I_C = 0\text{ mA}$	0.081	—	0.15	mA
	RN1308			0.078	—	0.145	
	RN1309			0.167	—	0.311	
DC current gain	RN1307	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	80	—	—	—
	RN1308			80	—	—	
	RN1309			70	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1307	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.7	—	1.8	V
	RN1308			1.0	—	2.6	
	RN1309			2.2	—	5.8	
Input voltage (OFF)	RN1307	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.5	—	1.0	V
	RN1308			0.6	—	1.16	
	RN1309			1.5	—	2.6	
Transition frequency		f_T	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	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	RN1307	R_1	-	7	10	13	k Ω
	RN1308			15.4	22	28.6	
	RN1309			32.9	47	61.1	
Resistor ratio	RN1307	R1/R2	-	0.191	0.213	0.232	—
	RN1308			0.421	0.468	0.515	
	RN1309			1.92	2.14	2.35	

9. Marking



10. Characteristics Curves (Note)

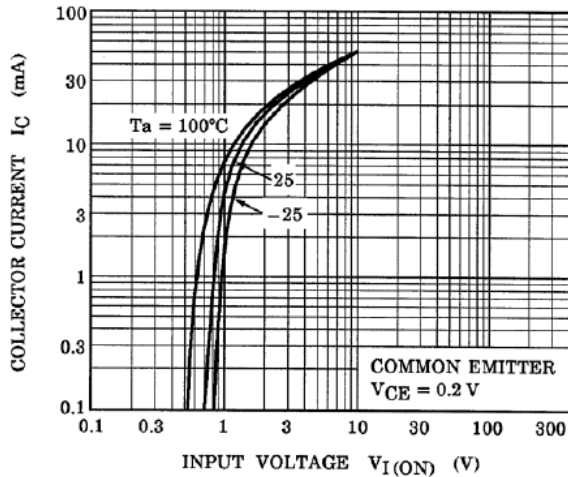


Fig. 10.1 RN1307 I_C - $V_{I(ON)}$

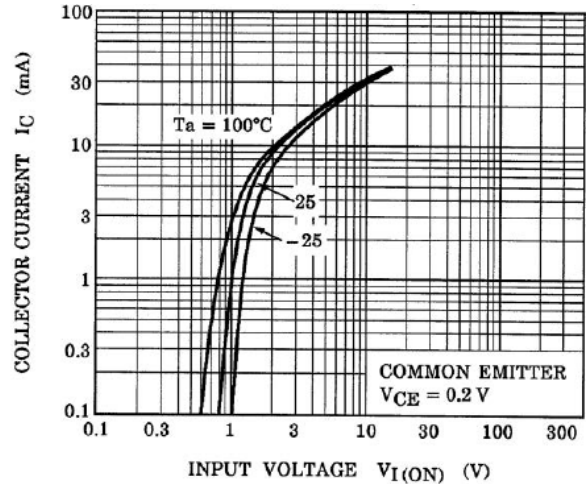


Fig. 10.2 RN1308 I_C - $V_{I(ON)}$

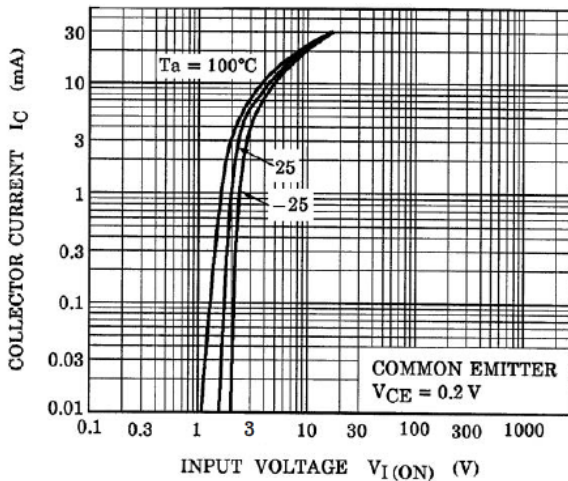


Fig. 10.3 RN1309 I_C - $V_{I(ON)}$

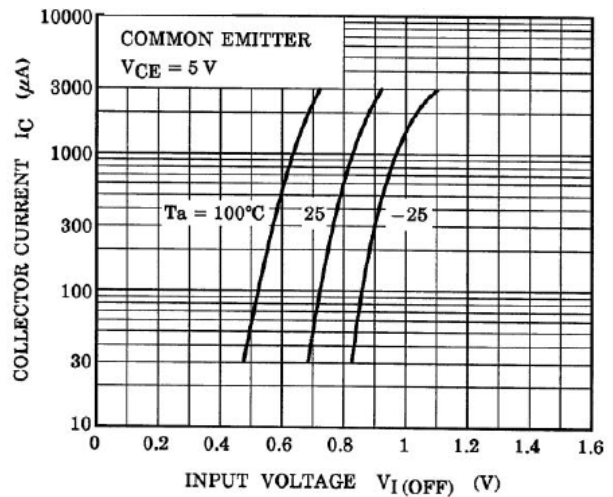


Fig. 10.4 RN1307 I_C - $V_{I(OFF)}$

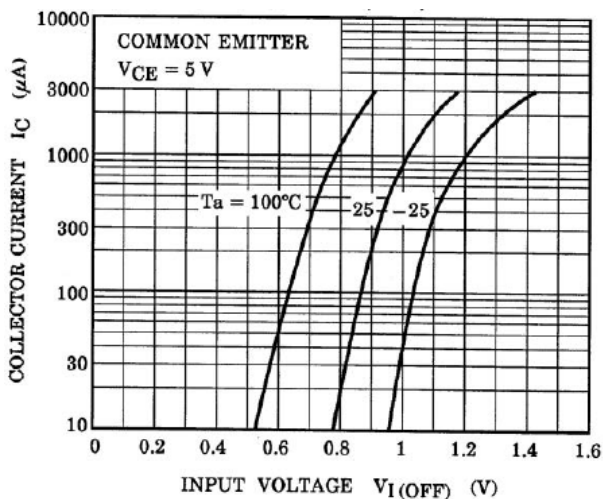


Fig. 10.5 RN1308 I_C - $V_{I(OFF)}$

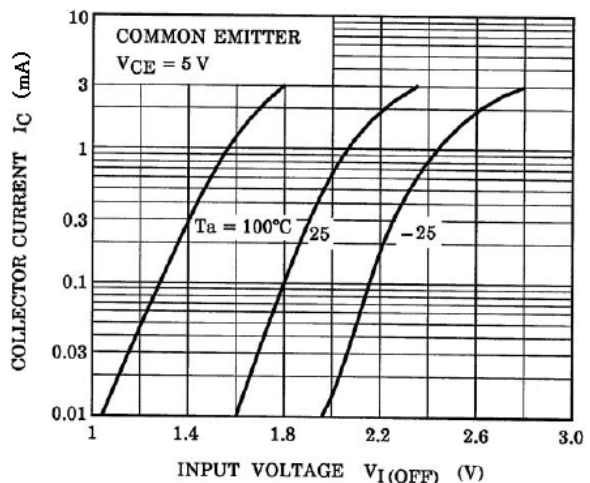


Fig. 10.6 RN1309 I_C - $V_{I(OFF)}$

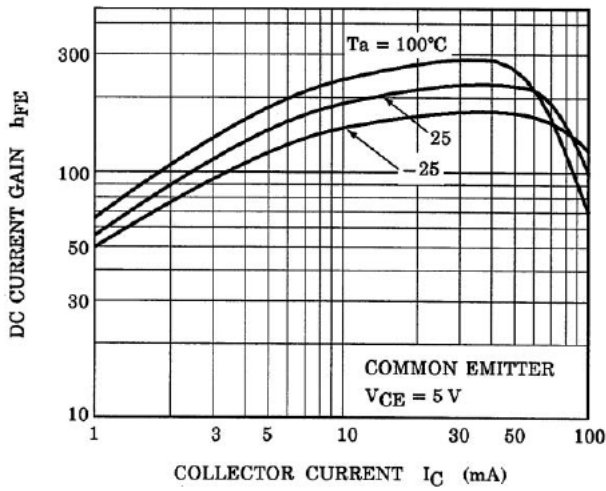


Fig. 10.7 RN1307 h_{FE} - I_C

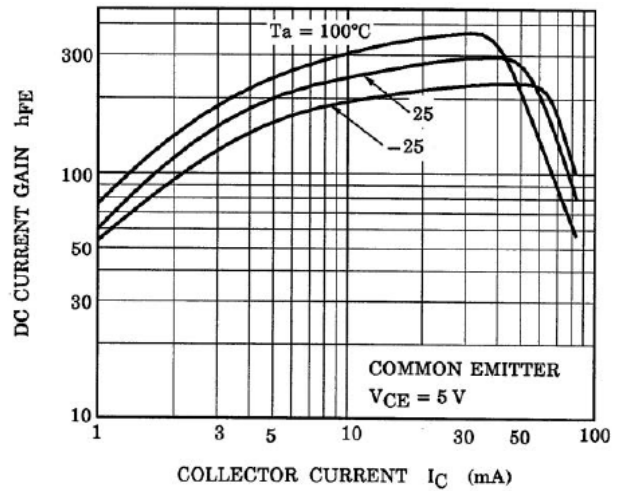


Fig. 10.8 RN1308 h_{FE} - I_C

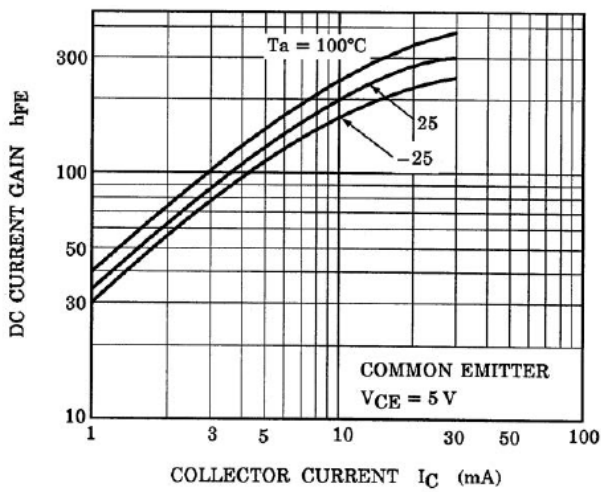
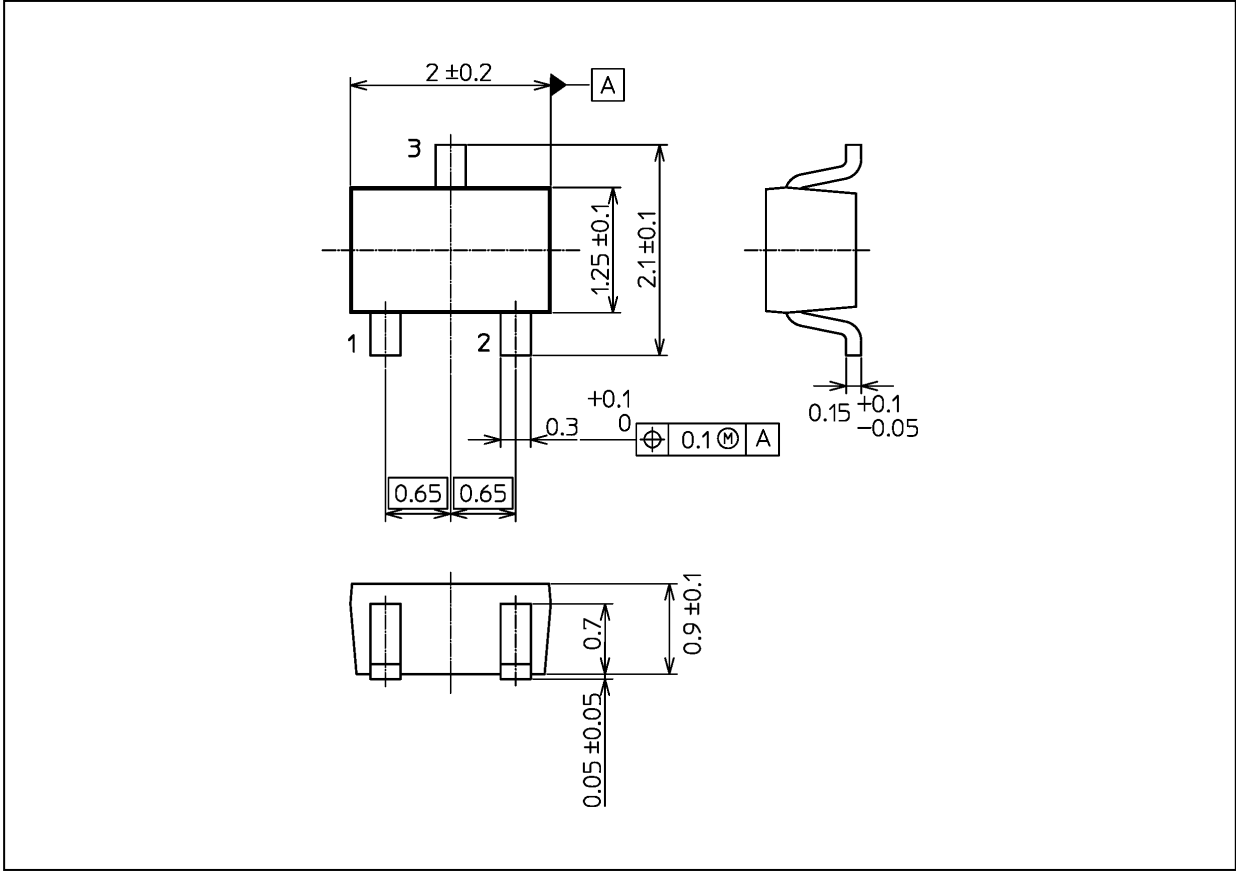


Fig. 10.9 RN1309 h_{FE} - I_C

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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