

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

# RN2307/08/09

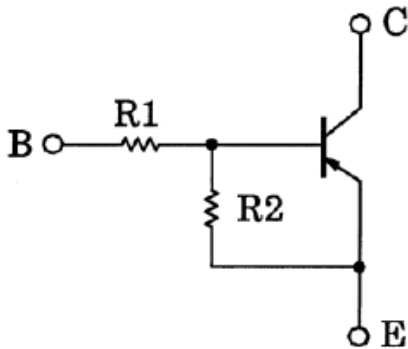
## 1. Applications

- 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 RN1307 to RN1309

## 3. Equivalent Circuit



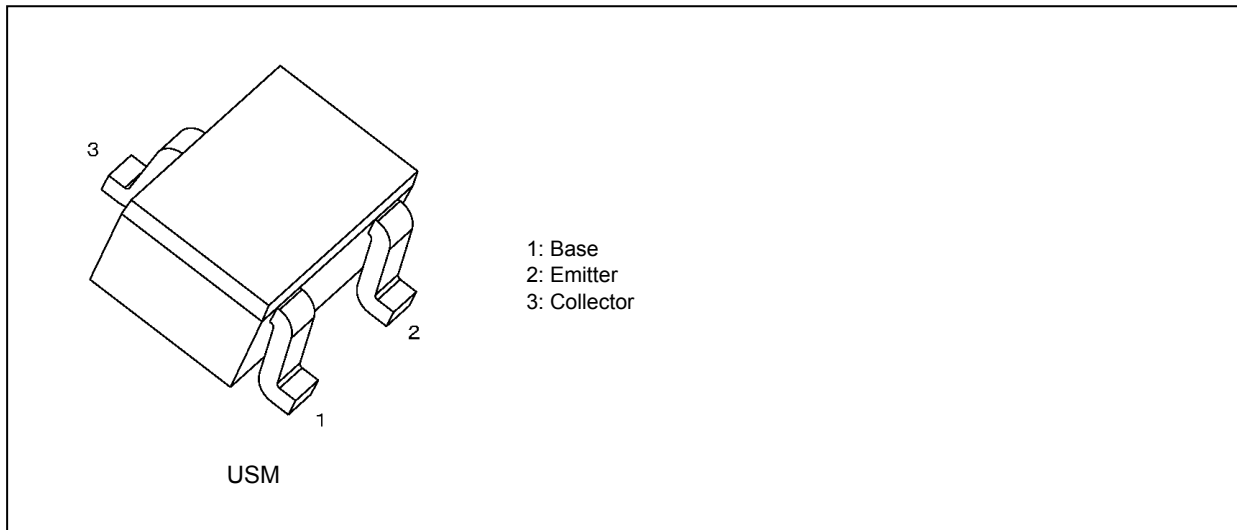
## 4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2307	10	47
RN2308	22	47
RN2309	47	22

Start of commercial production

1988-04

### 5. Packaging and Pin Assignment



### 6. Orderable part number

Orderable part number		AEC-Q101	Note	Note
RN2307	RN2307,LF	—		General Use
	RN2307,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN2307,LXHF	YES		Automotive Use
RN2308	RN2308,LF	—		General Use
	RN2308,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN2308,LXHF	YES		Automotive Use
RN2309	RN2309,LF	—		General Use
	RN2309,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN2309,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	V
Emitter-base voltage	RN2307	$V_{EBO}$	-6	V
	RN2308		-7	
	RN2309		-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	RN2307~ RN2309	$I_{CBO}$	$V_{CB} = -50\text{ V}, I_E = 0\text{ mA}$	—	—	-100	nA
		$I_{CEO}$	$V_{CE} = -50\text{ V}, I_B = 0\text{ mA}$	—	—	-500	
Emitter cut-off current	RN2307	$I_{EBO}$	$V_{EB} = -6\text{ V}, I_C = 0\text{ mA}$	-0.081	—	-0.15	mA
	RN2308			-0.078	—	-0.145	
	RN2309			-0.167	—	-0.311	
DC current gain	RN2307	$h_{FE}$	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	80	—	—	—
	RN2308			80	—	—	
	RN2309			70	—	—	
Collector-emitter saturation voltage	RN2307~ RN2309	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V
Input voltage (ON)	RN2307	$V_{I(ON)}$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-0.7	—	-1.8	V
	RN2308			-1.0	—	-2.6	
	RN2309			-2.2	—	-5.8	
Input voltage (OFF)	RN2307	$V_{I(OFF)}$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-0.5	—	-1.0	V
	RN2308			-0.6	—	-1.16	
	RN2309			-1.5	—	-2.6	
Transition frequency	RN2307~ RN2309	$f_T$	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz
Collector output capacitance	RN2307~ RN2309	$C_{ob}$	$V_{CB} = -10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	3	6	pF
Input resistance	RN2307	$R_1$	-	7	10	13	k $\Omega$
	RN2308			15.4	22	28.6	
	RN2309			32.9	47	61.1	
Resistor ratio	RN2307	R1/R2	-	0.191	0.213	0.232	—
	RN2308			0.421	0.468	0.515	
	RN2309			1.92	2.14	2.35	

### 9. Marking

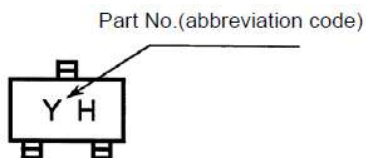


Fig. 9.1 Marking RN2307

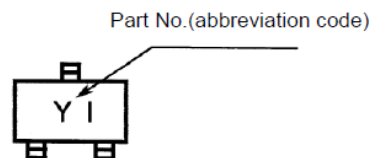


Fig. 9.2 Marking RN2308

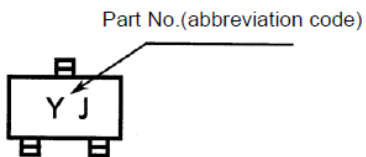


Fig. 9.3 Marking RN2309

### 10. Characteristics Curves (Note)

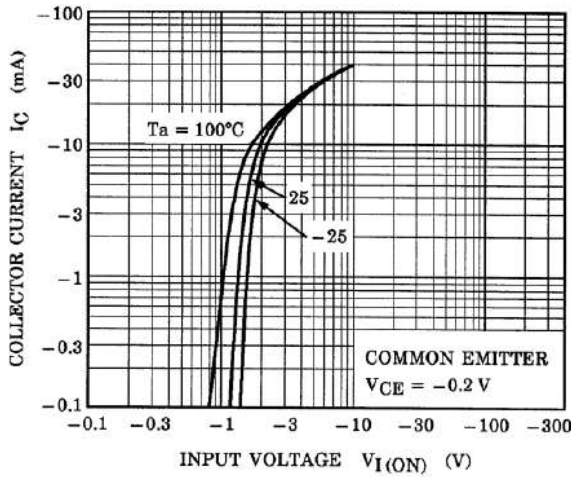


Fig. 10.1 RN2307  $I_C$ - $V_{I(ON)}$

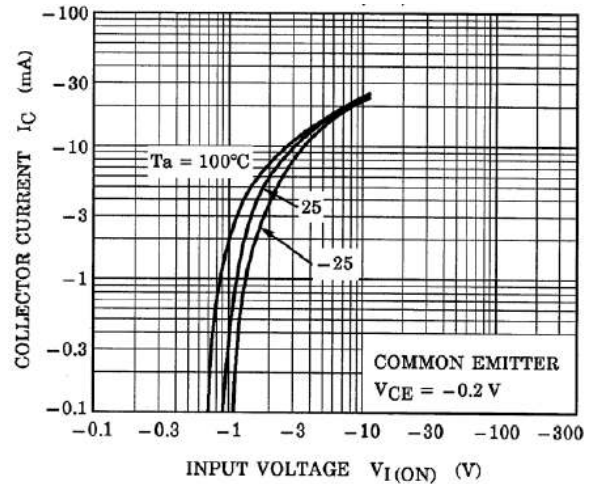


Fig. 10.2 RN2308  $I_C$ - $V_{I(ON)}$

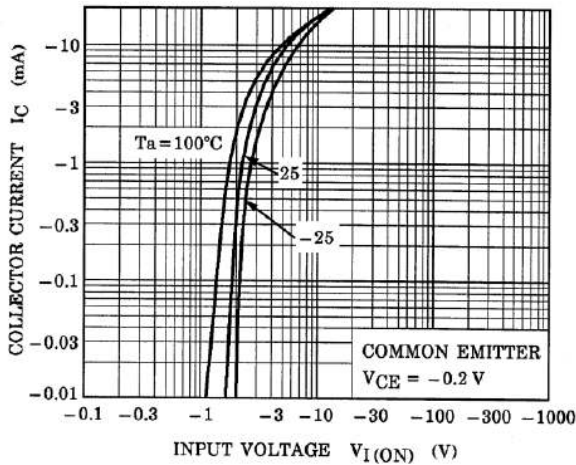


Fig. 10.3 RN2309  $I_C$ - $V_{I(ON)}$

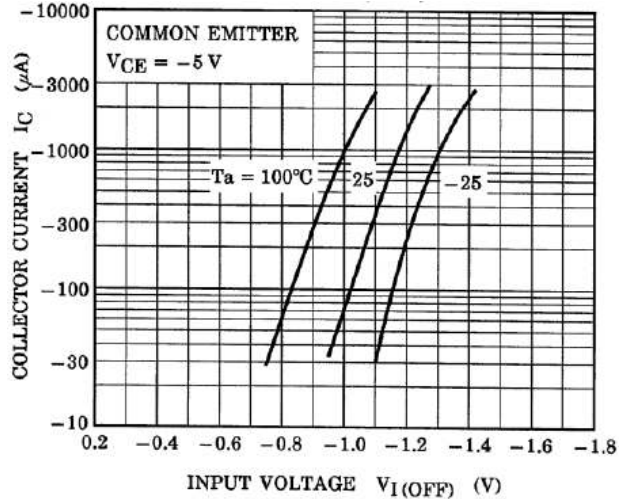


Fig. 10.4 RN2307  $I_C$ - $V_{I(OFF)}$

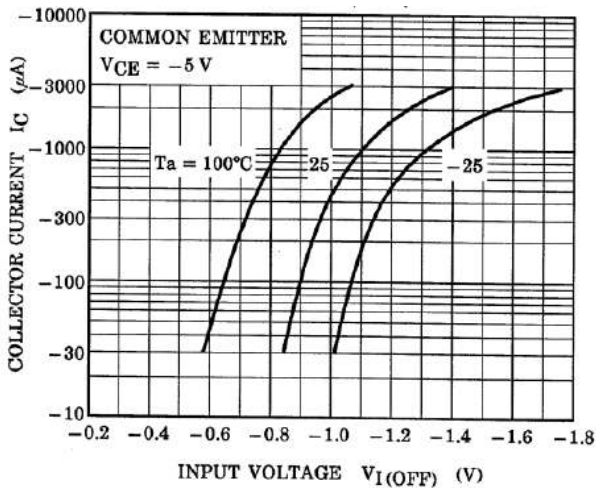


Fig. 10.5 RN2308  $I_C$ - $V_{I(OFF)}$

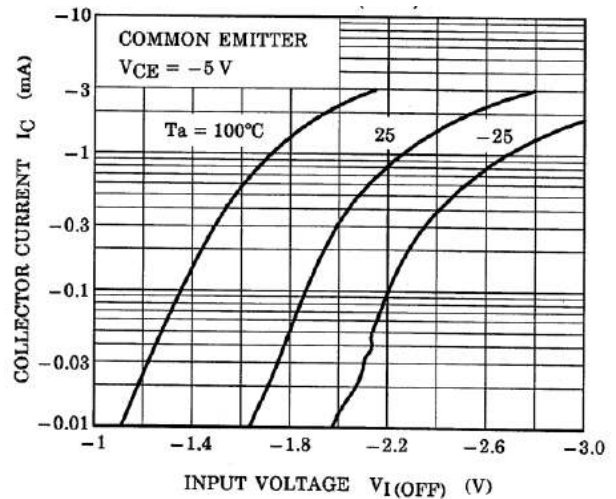


Fig. 10.6 RN2309  $I_C$ - $V_{I(OFF)}$

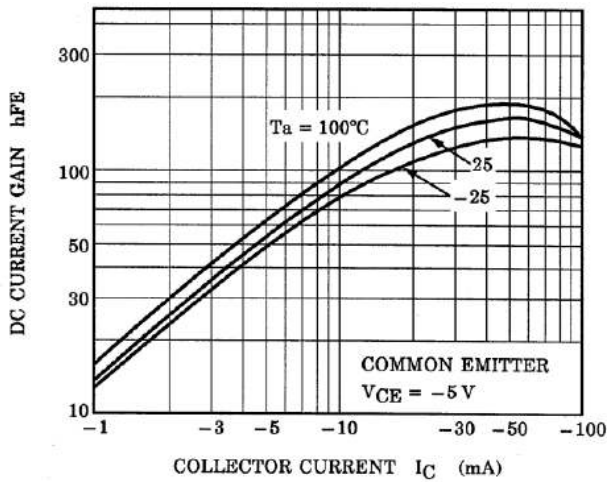


Fig. 10.7 RN2307  $h_{FE}$ - $I_C$

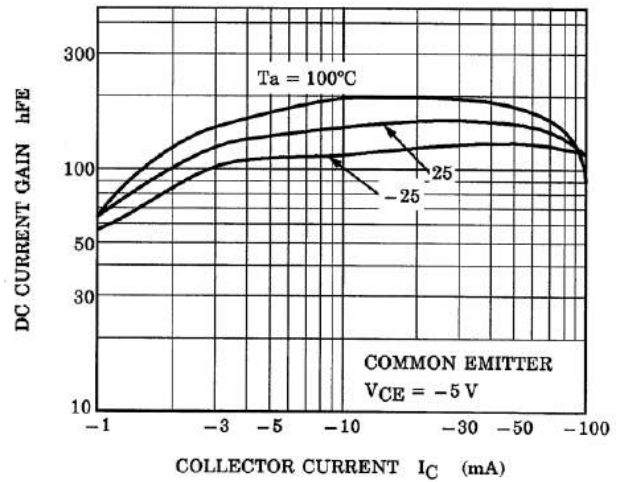


Fig. 10.8 RN2308  $h_{FE}$ - $I_C$

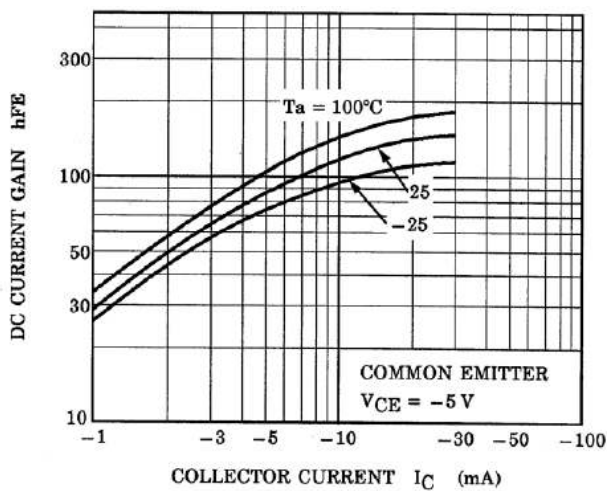


Fig. 10.9 RN2309  $h_{FE}$ - $I_C$

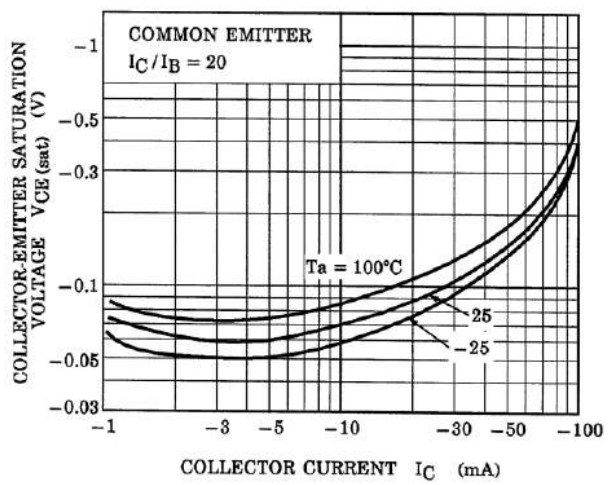


Fig. 10.10 RN2307  $V_{CE(sat)}$ - $I_C$

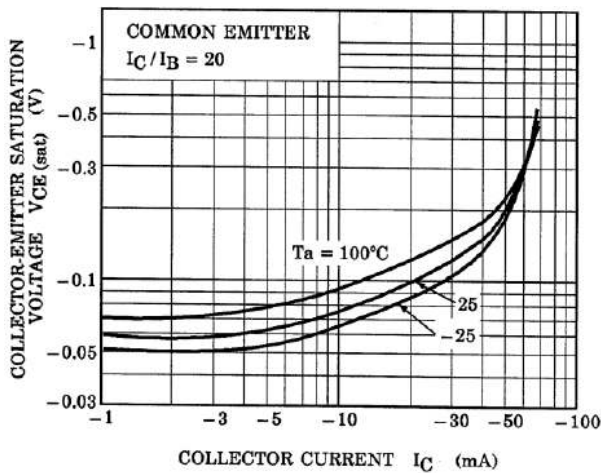


Fig. 10.11 RN2308  $V_{CE(sat)}$ - $I_C$

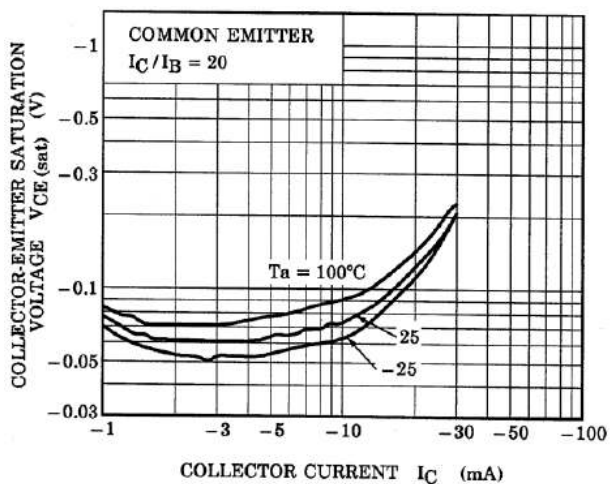


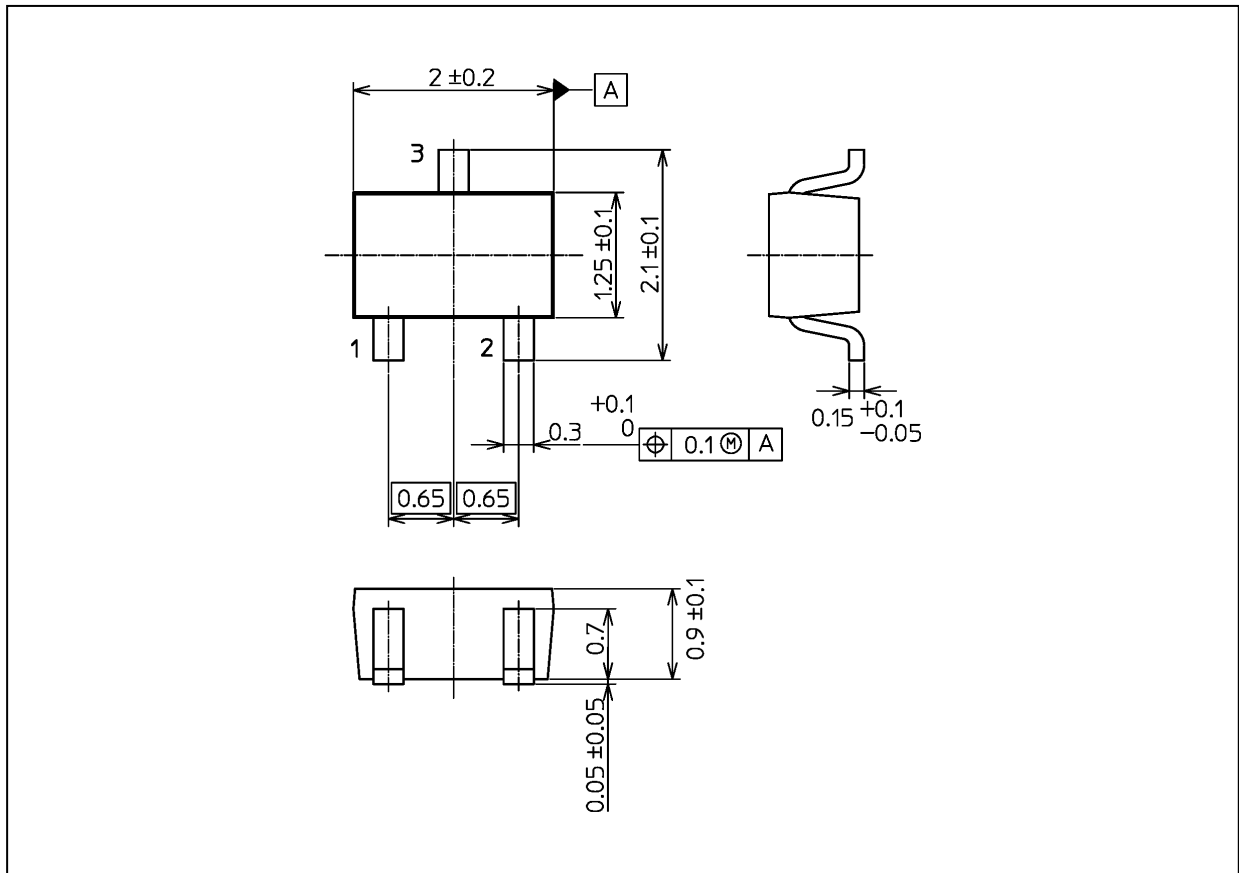
Fig. 10.12 RN2309  $V_{CE(sat)}$ - $I_C$

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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