

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

RN1412,RN1413

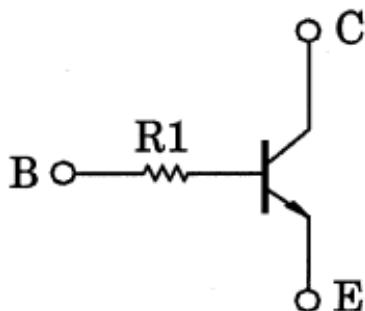
1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

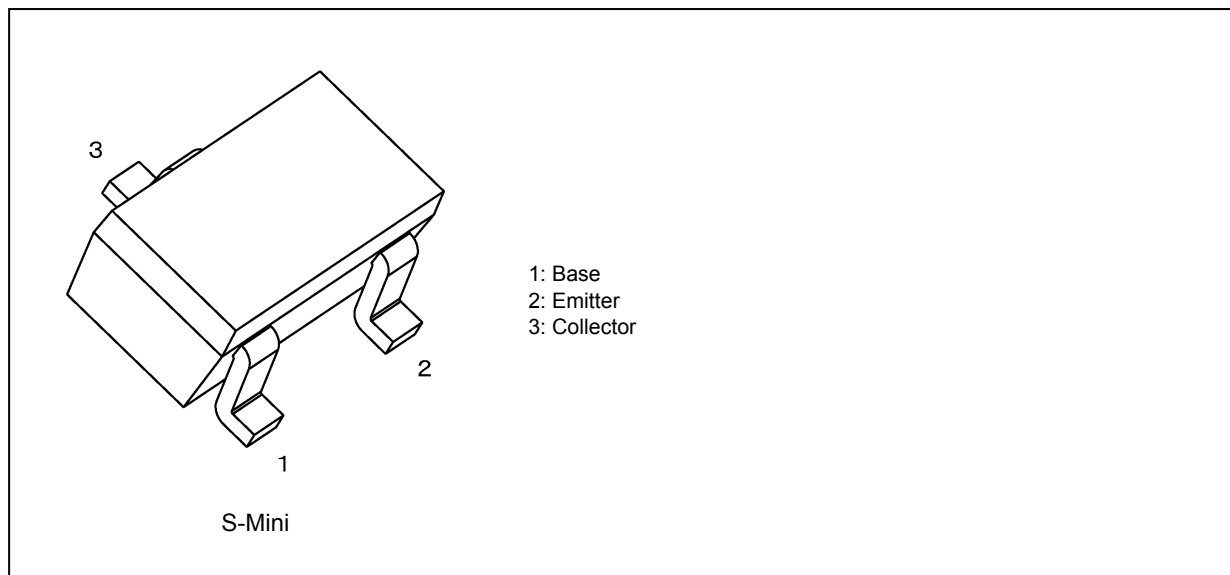
2. Features

- (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 RN2412,RN2413

3. Equivalent Circuit



4. Packaging and Pin Assignment



Start of commercial production

1994-01

5. Orderable part number

Orderable part number		AEC-Q101	Note	Note
RN1412	RN1412,LF	—		General Use
	RN1412,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1412,LXHF	YES		Automotive Use
RN1413	RN1413,LF	—		General Use
	RN1413,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1413,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, $T_a = 25^\circ\text{C}$)

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	200	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	
DC current gain	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 1\text{ mA}$	120	—	700	—
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	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	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	RN1412	R_1	-	15.4	22	k Ω
	RN1413			32.9	47	

8. Marking

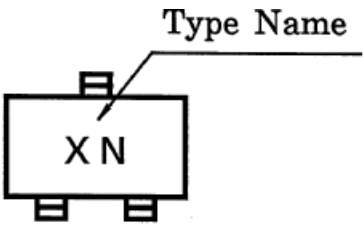


Fig. 8.1 Marking RN1412

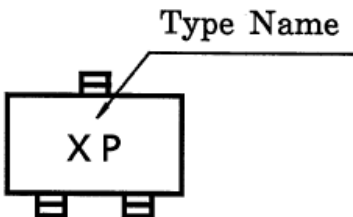


Fig. 8.2 Marking RN1413

9. Characteristics Curves (Note)

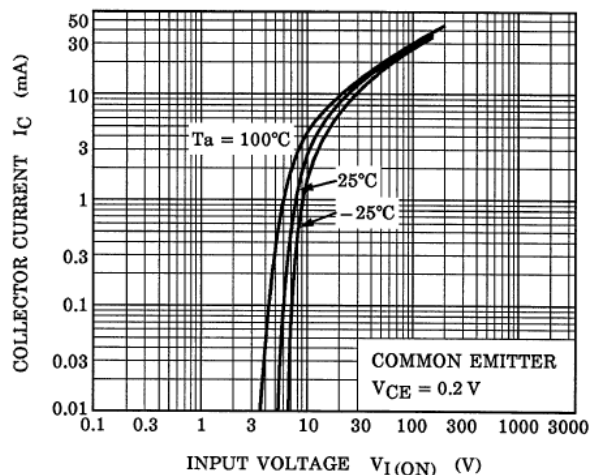


Fig. 9.1 RN1412 I_C - $V_{I(ON)}$

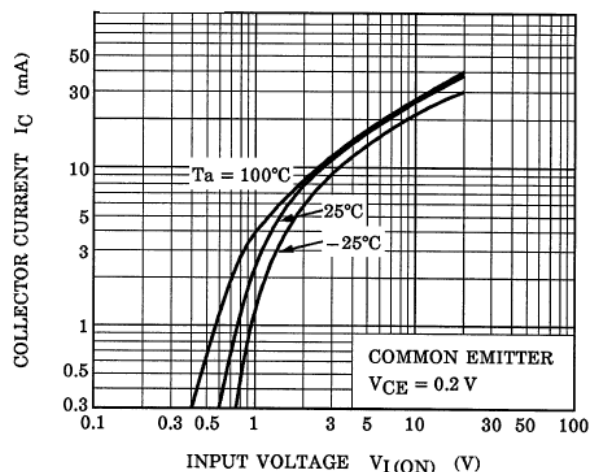


Fig. 9.2 RN1413 I_C - $V_{I(ON)}$

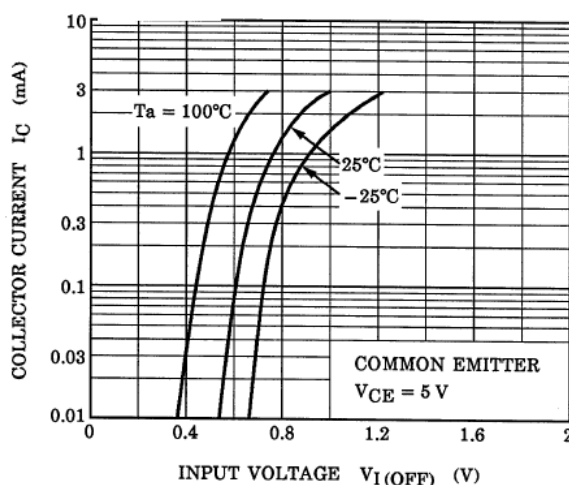


Fig. 9.3 RN1412 I_C - $V_{I(OFF)}$

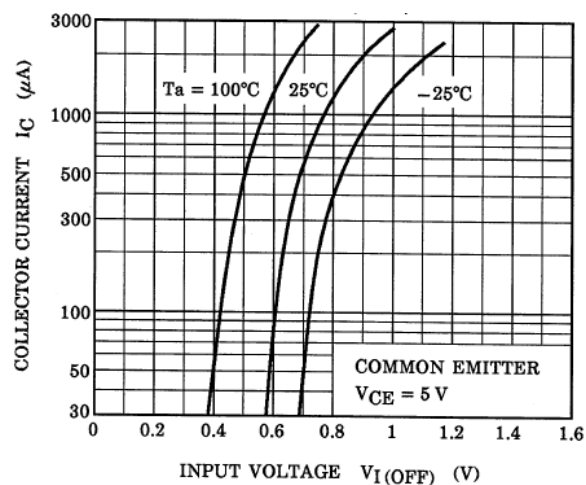


Fig. 9.4 RN1413 I_C - $V_{I(OFF)}$

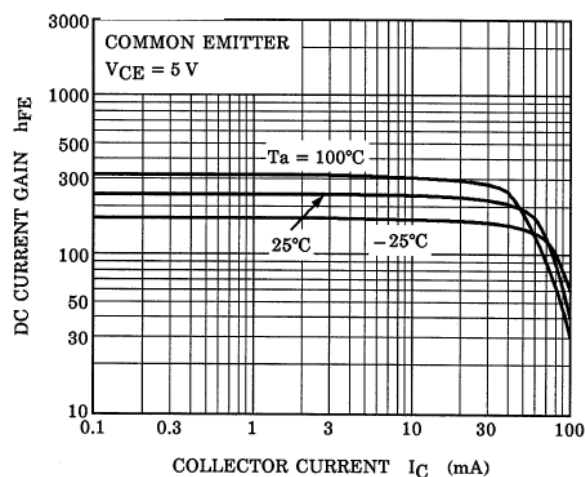


Fig. 9.5 RN1412 h_{FE} - I_C

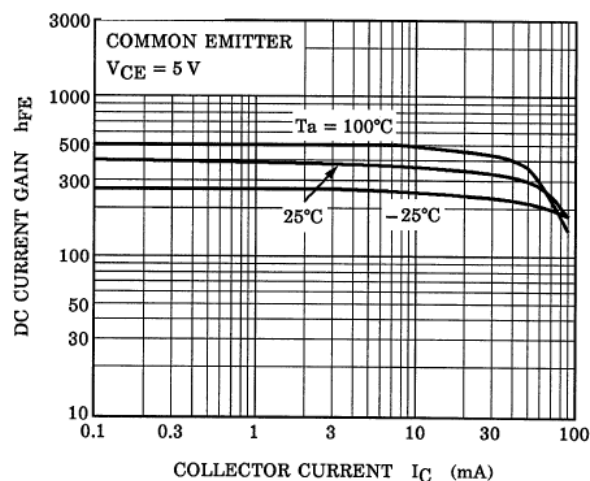


Fig. 9.6 RN1413 h_{FE} - I_C

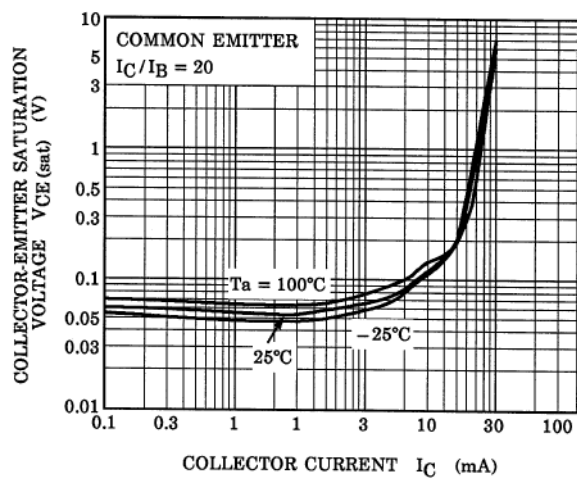


Fig. 9.7 RN1412 $V_{CE(sat)}-I_C$

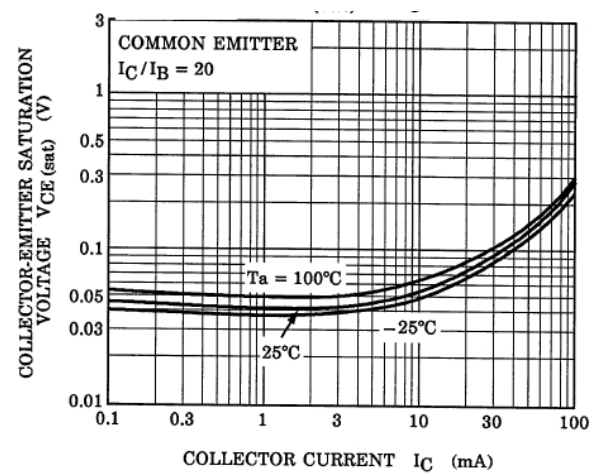
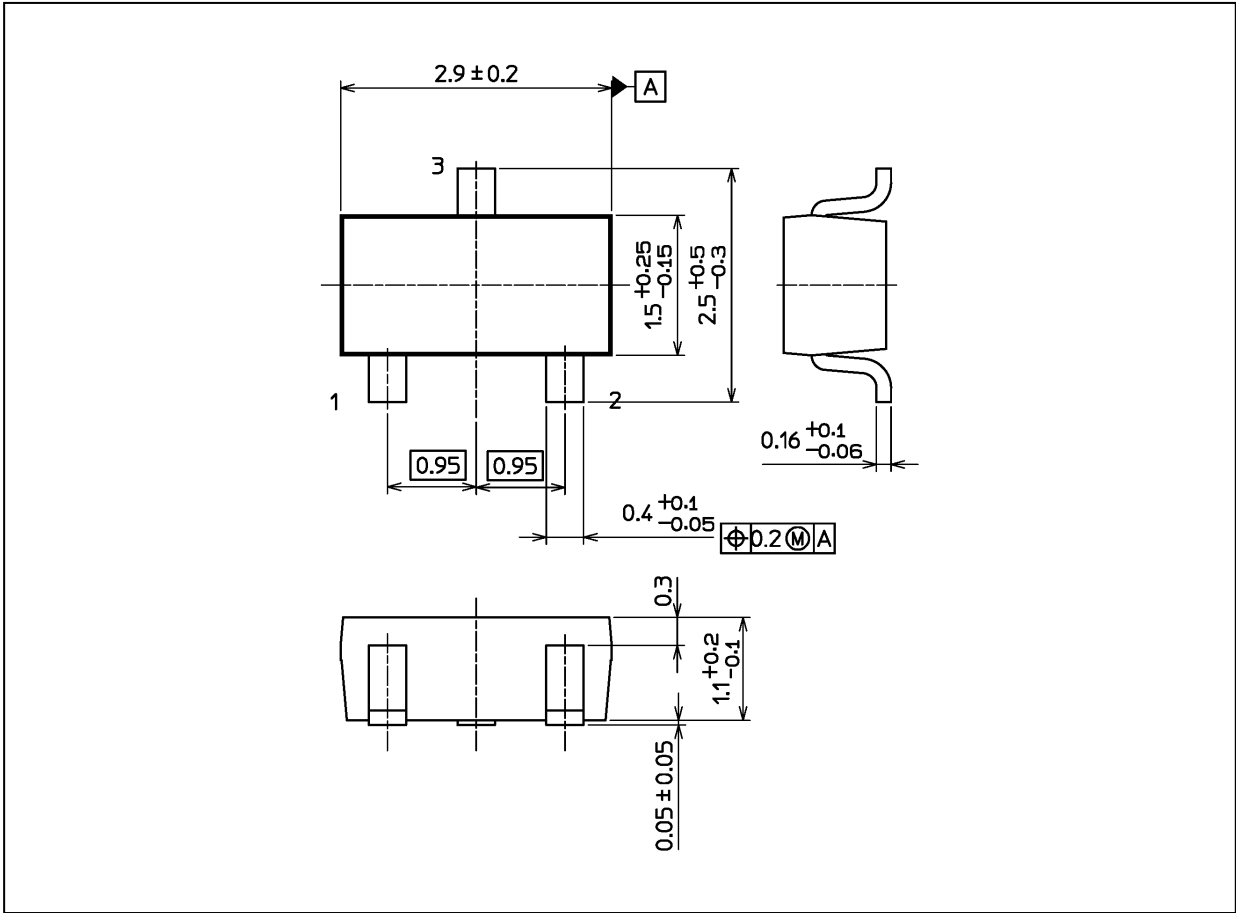


Fig. 9.8 RN1413 $V_{CE(sat)}-I_C$

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

Package Dimensions

Unit: mm



Weight: 12 mg (typ.)

Package Name(s)
TOSHIBA: 2-3F1S
Nickname: S-Mini

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