

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

## RN1101/02/03/04/05/06

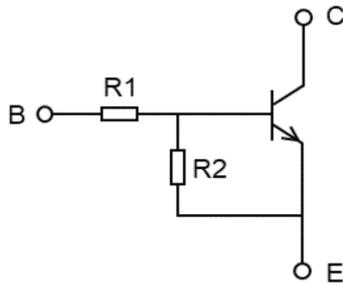
### 1. Applications

- 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 RN2101 to RN2106

### 3. Equivalent Circuit

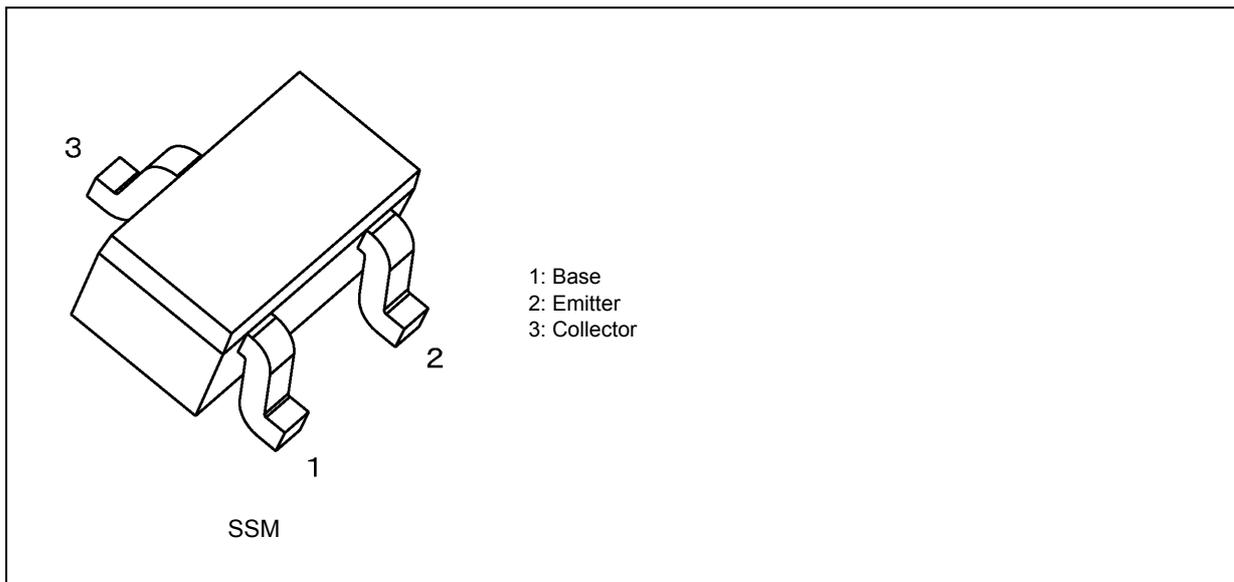


### 4. Bias Resistor Values

Part No.	R1 (k $\Omega$ )	R2 (k $\Omega$ )
RN1101	4.7	4.7
RN1102	10	10
RN1103	22	22
RN1104	47	47
RN1105	2.2	47
RN1106	4.7	47

Start of commercial production  
1990-12

### 5. Packaging and Pin Assignment



### 6. Orderable part number

Orderable part number		AEC-Q101	Note	Note
RN1101	RN1101,LF	—		General Use
	RN1101,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1101,LXHF	YES		Automotive Use
RN1102	RN1102,LF	—		General Use
	RN1102,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1102,LXHF	YES		Automotive Use
RN1103	RN1103,LF	—		General Use
	RN1103,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1103,LXHF	YES		Automotive Use
RN1104	RN1104,LF	—		General Use
	RN1104,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1104,LXHF	YES		Automotive Use
RN1105	RN1105,LF	—		General Use
	RN1105,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1105,LXHF	YES		Automotive Use
RN1106	RN1106,LF	—		General Use
	RN1106,LXGF	YES	(Note 1)	Unintended Use (Note 1)
	RN1106,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	RN1101 to RN1106	$V_{CBO}$	50	V
Collector-emitter voltage		$V_{CEO}$	50	
Emitter-base voltage	RN1101 to RN1104	$V_{EBO}$	10	
	RN1105,RN1106		5	
Collector current	RN1101 to RN1106	$I_C$	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	RN1101 to RN1106	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0\text{ mA}$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0\text{ mA}$	—	—	500	
Emitter cut-off current	RN1101	$I_{EBO}$	$V_{EB} = 10\text{ V}, I_C = 0\text{ mA}$	0.82	—	1.52	mA
	RN1102			0.38	—	0.71	
	RN1103			0.17	—	0.33	
	RN1104			0.082	—	0.15	
	RN1105		$V_{EB} = 5\text{ V}, I_C = 0\text{ mA}$	0.078	—	0.145	
	RN1106			0.074	—	0.138	
DC current gain	RN1101	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	30	—	—	—
	RN1102			50	—	—	
	RN1103			70	—	—	
	RN1104			80	—	—	
	RN1105			80	—	—	
	RN1106			80	—	—	
Collector-emitter saturation voltage	RN1101 to RN1106	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1101	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	1.1	—	2.0	V
	RN1102			1.2	—	2.4	
	RN1103			1.3	—	3.0	
	RN1104			1.5	—	5.0	
	RN1105			0.6	—	1.1	
	RN1106			0.7	—	1.3	
Input voltage (OFF)	RN1101 to RN1104	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	1.0	—	1.5	V
	RN1105, RN1106			0.5	—	0.8	
Transition frequency	RN1101 to RN1106	$f_T$	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1101 to RN1106	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	3	6	pF
Input resistance	RN1101	$R_1$	-	3.29	4.7	6.11	k $\Omega$
	RN1102			7	10	13	
	RN1103			15.4	22	28.6	
	RN1104			32.9	47	61.1	
	RN1105			1.54	2.2	2.86	
	RN1106			3.29	4.7	6.11	
Resistor ratio	RN1101 to RN1104	R1/R2	-	0.9	1.0	1.1	—
	RN1105			0.0421	0.0468	0.0515	
	RN1106			0.09	0.1	0.11	

9. Marking

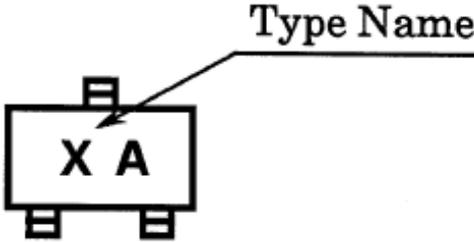


Fig. 9.1 Marking RN1101

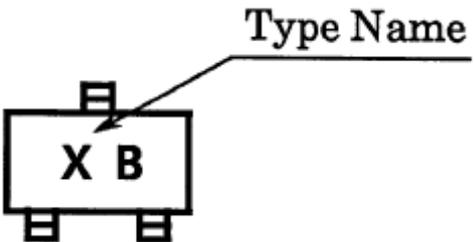


Fig. 9.2 Marking RN1102

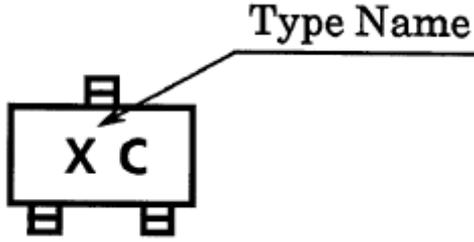


Fig. 9.3 Marking RN1103

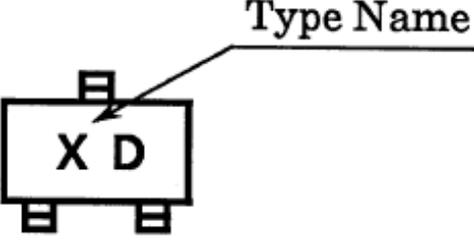


Fig. 9.4 Marking RN1104

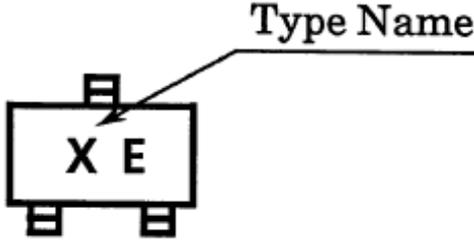


Fig. 9.5 Marking RN1105

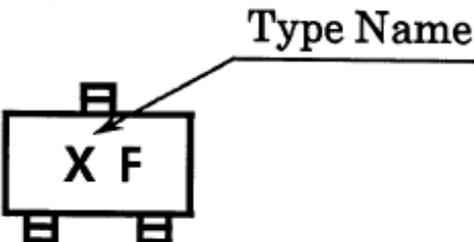


Fig. 9.6 Marking RN1106

## 10. Characteristics Curves (Note)

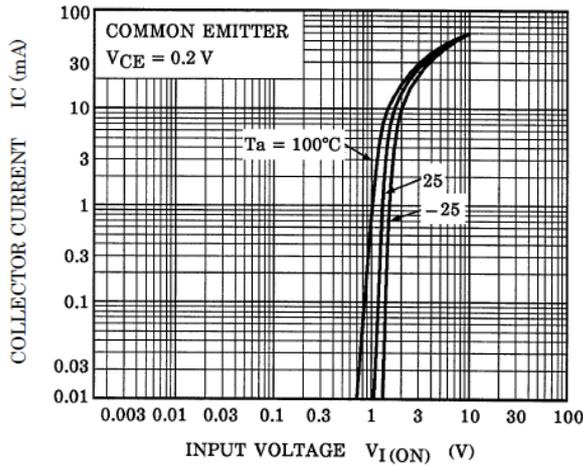


Fig. 10.1 RN1101  $I_C$ - $V_{I(ON)}$

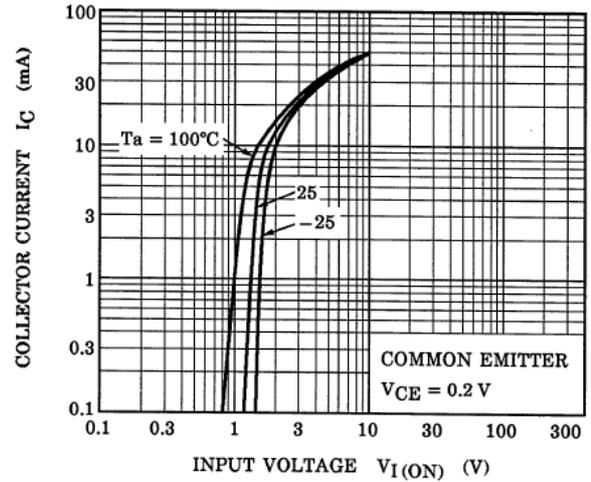


Fig. 10.2 RN1102  $I_C$ - $V_{I(ON)}$

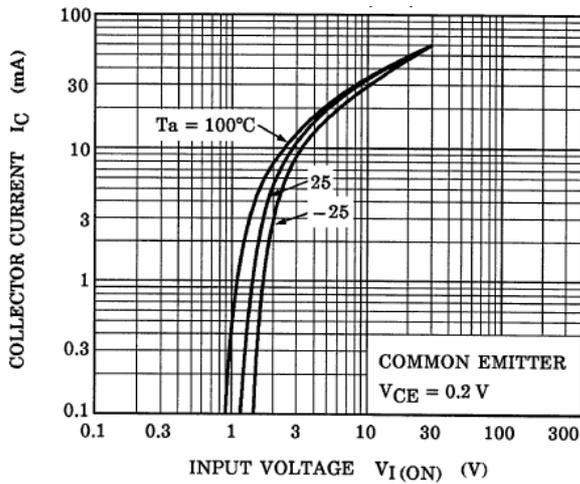


Fig. 10.3 RN1103  $I_C$ - $V_{I(ON)}$

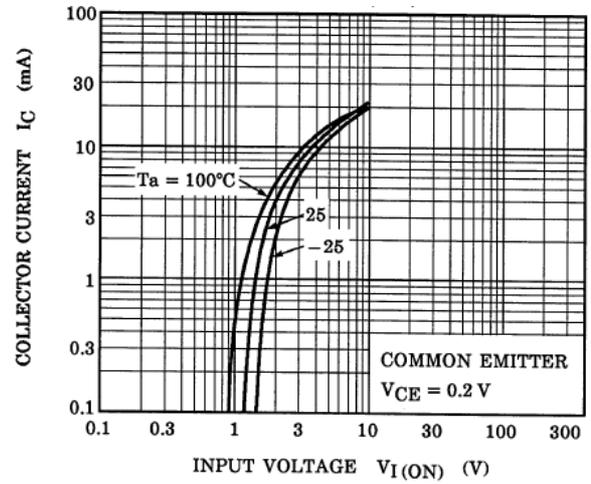


Fig. 10.4 RN1104  $I_C$ - $V_{I(ON)}$

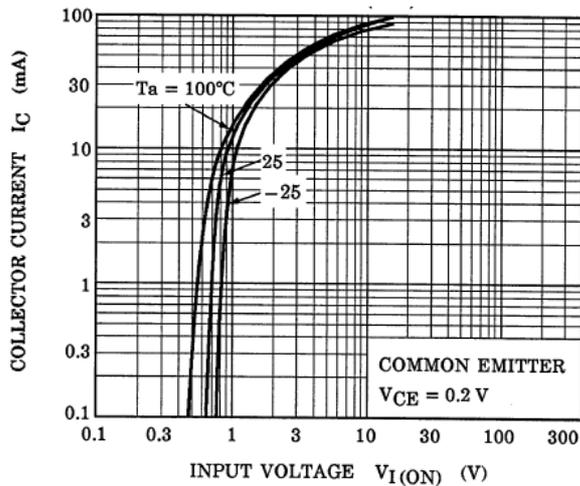


Fig. 10.5 RN1105  $I_C$ - $V_{I(ON)}$

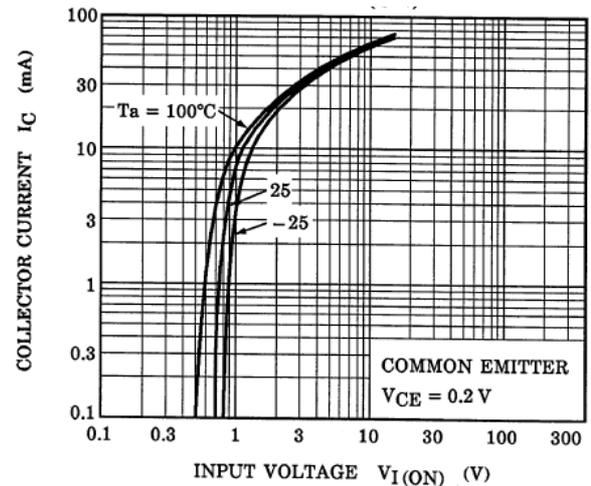


Fig. 10.6 RN1106  $I_C$ - $V_{I(ON)}$

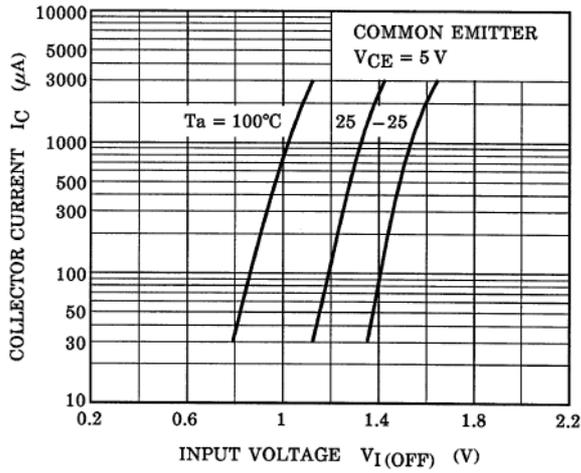


Fig. 10.7 RN1101 I<sub>C</sub>-V<sub>I(OFF)</sub>

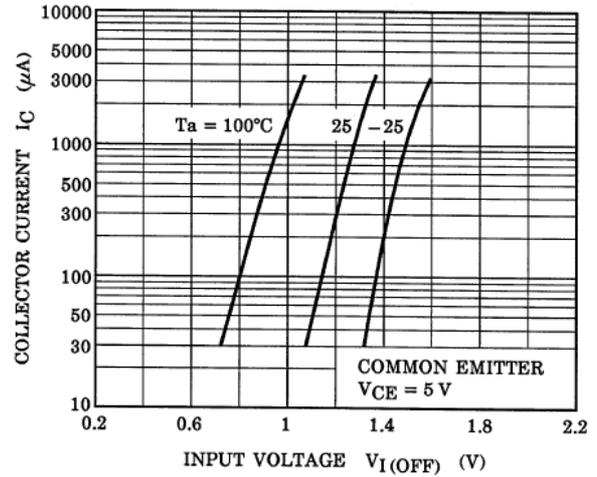


Fig. 10.8 RN1102 I<sub>C</sub>-V<sub>I(OFF)</sub>

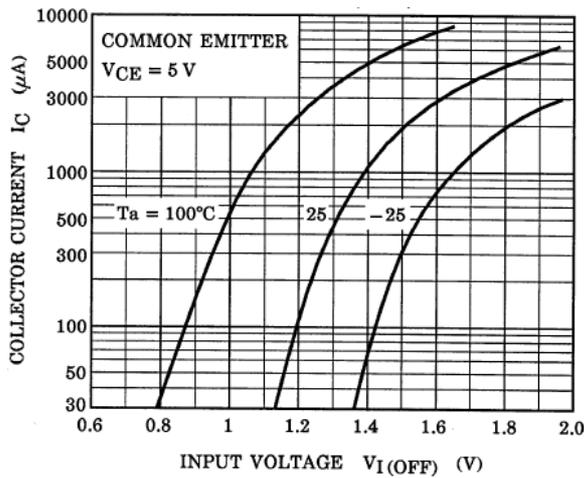


Fig. 10.9 RN1103 I<sub>C</sub>-V<sub>I(OFF)</sub>

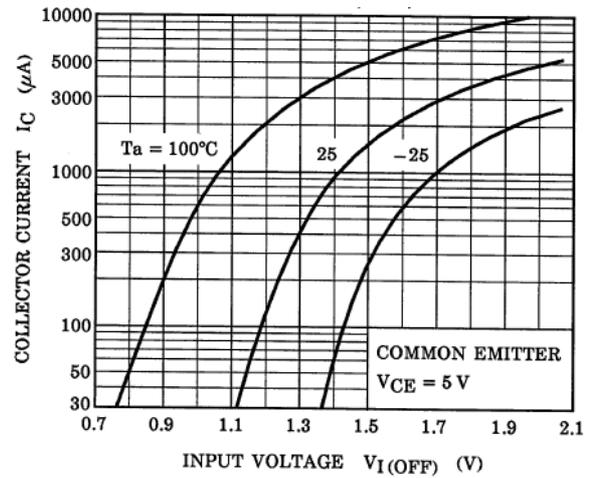


Fig. 10.10 RN1104 I<sub>C</sub>-V<sub>I(OFF)</sub>

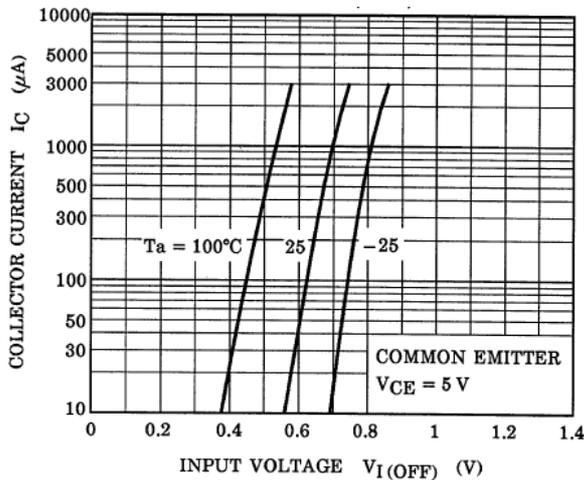


Fig. 10.11 RN1105 I<sub>C</sub>-V<sub>I(OFF)</sub>

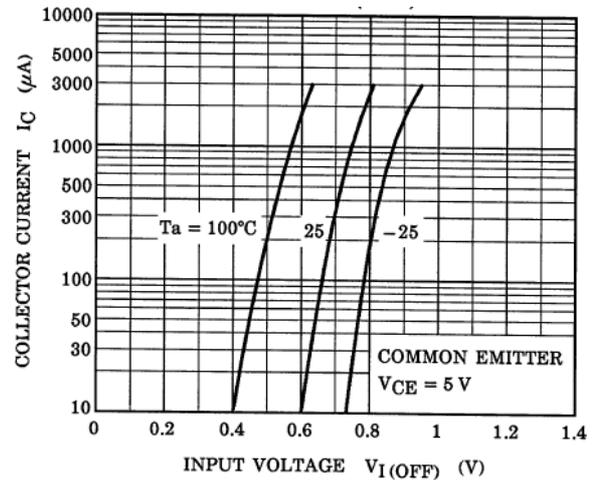


Fig. 10.12 RN1106 I<sub>C</sub>-V<sub>I(OFF)</sub>

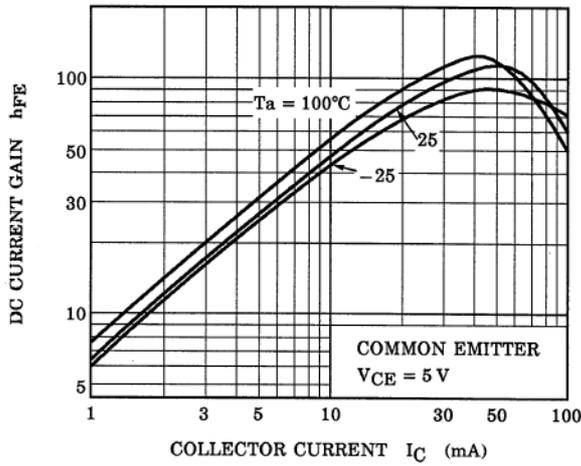


Fig. 10.13 RN1101  $h_{FE}-I_C$

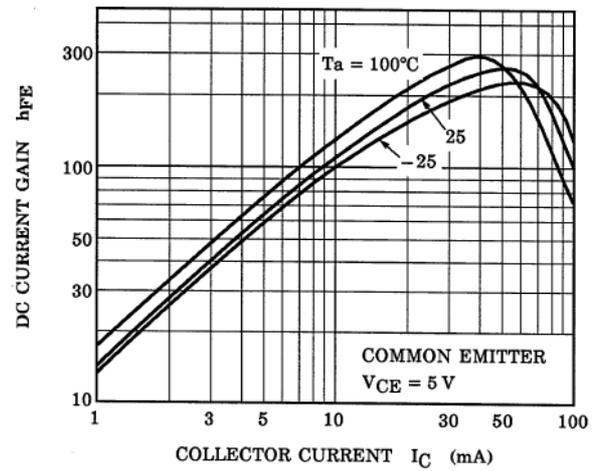


Fig. 10.14 RN1102  $h_{FE}-I_C$

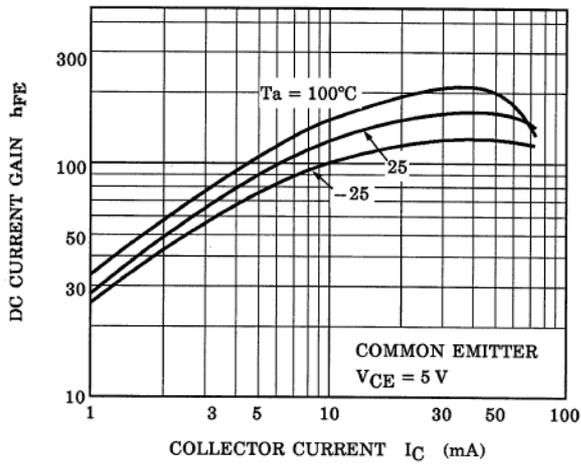


Fig. 10.15 RN1103  $h_{FE}-I_C$

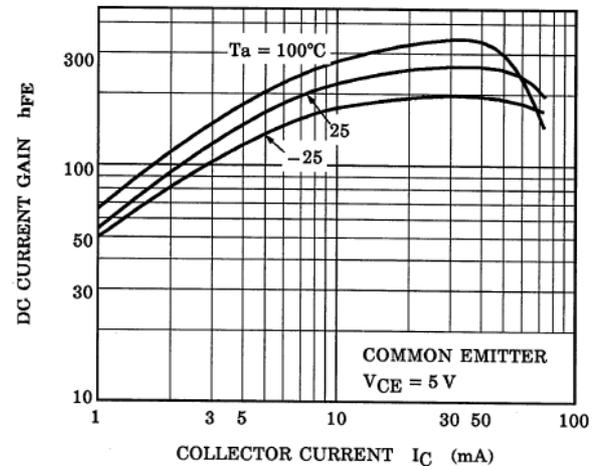


Fig. 10.16 RN1104  $h_{FE}-I_C$

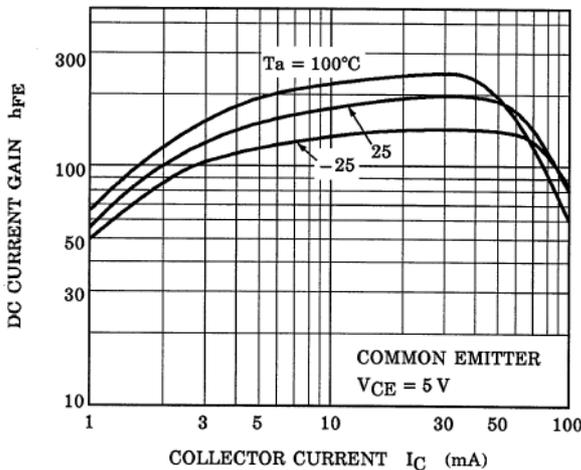


Fig. 10.17 RN1105  $h_{FE}-I_C$

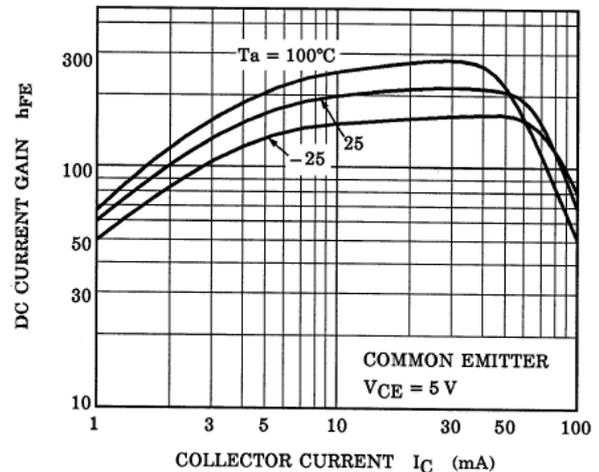


Fig. 10.18 RN1106  $h_{FE}-I_C$

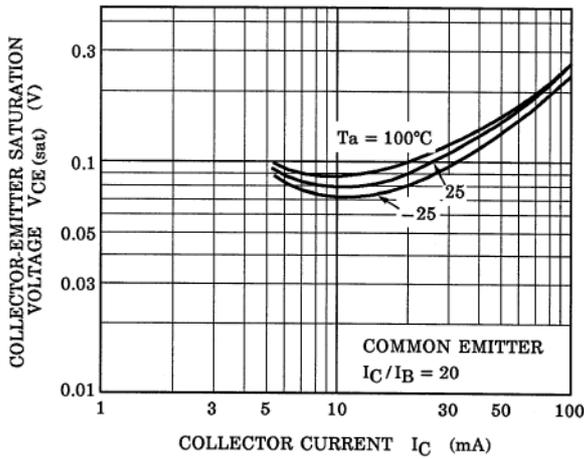


Fig. 10.19 RN1101  $V_{CE(sat)}-I_C$

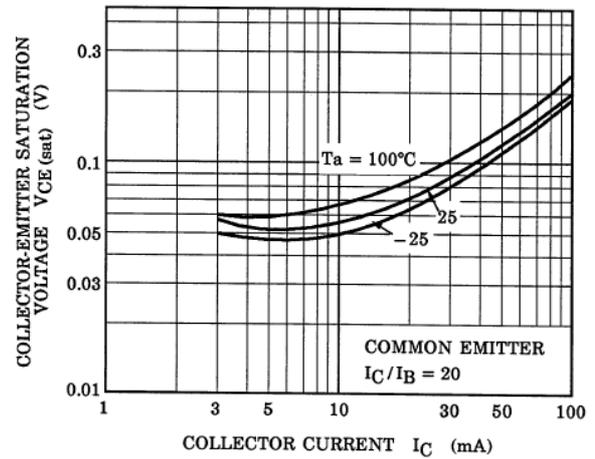


Fig. 10.20 RN1102  $V_{CE(sat)}-I_C$

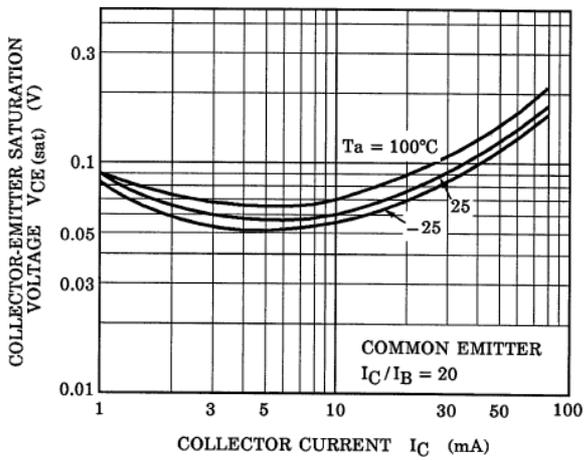


Fig. 10.21 RN1103  $V_{CE(sat)}-I_C$

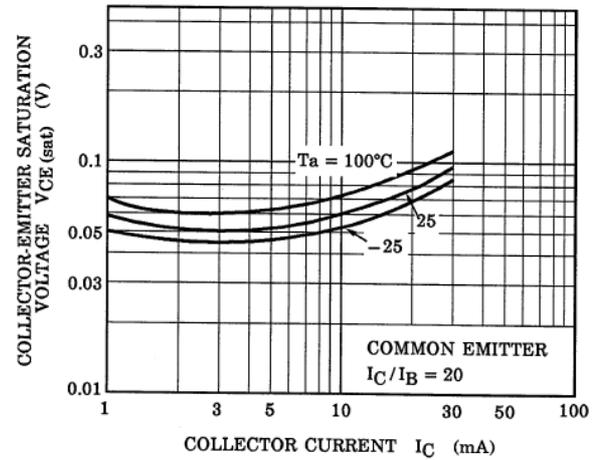


Fig. 10.22 RN1104  $V_{CE(sat)}-I_C$

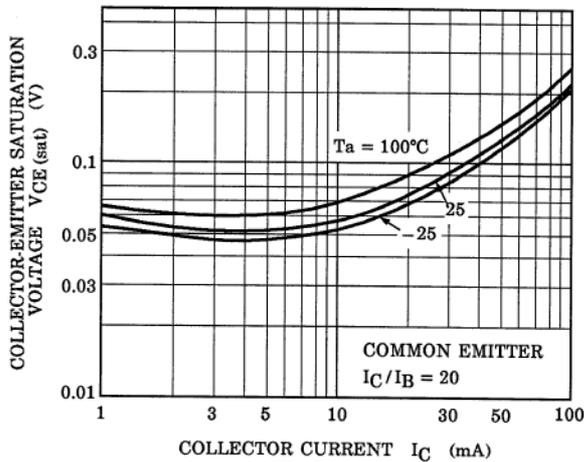


Fig. 10.23 RN1105  $V_{CE(sat)}-I_C$

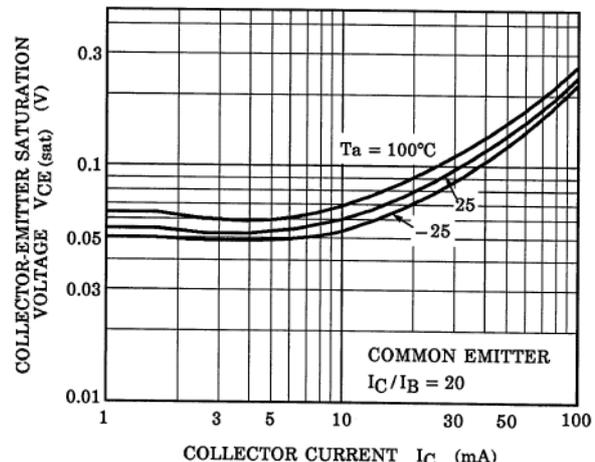


Fig. 10.24 RN1106  $V_{CE(sat)}-I_C$

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



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