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

RN1901FE/02FE/03FE/04FE/05FE/06FE

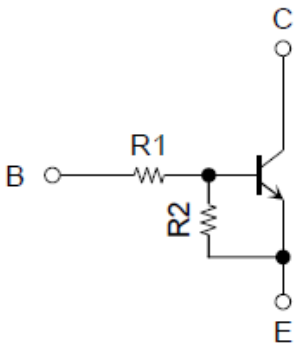
1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

2. Features

(1) AEC-Q101 qualified (Please see the orderable part number list)
(2) Small package (Dual type)
(3) The integrated bias resistor reduces the number of external parts required, making it possible to reduce system size and assembly time.
(4) Complementary to RN2901FE to RN2906FE

3. Equivalent Circuit



4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN1901FE	4.7	4.7
RN1902FE	10	10
RN1903FE	22	22
RN1904FE	47	47
RN1905FE	2.2	47
RN1906FE	4.7	47

Start of commercial production
2000-05

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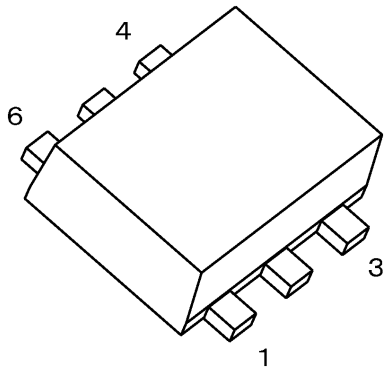
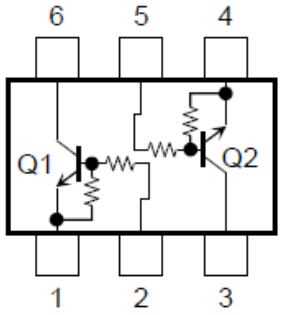
2021-12-23
Rev.3.0

5. Packaging and Pin Assignment



ES6



1: Emitter1
2: Base1
3: Collector2
4: Emitter2
5: Base2
6: Collector1

6. Orderable part number

Orderable part number		AEC-Q101	Note
RN1901FE	RN1901FE,LF	—	General Use
	RN1901FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1901FE,LXHF	YES	Automotive Use
RN1902FE	RN1902FE,LF	—	General Use
	RN1902FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1902FE,LXHF	YES	Automotive Use
RN1903FE	RN1903FE,LF	—	General Use
	RN1903FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1903FE,LXHF	YES	Automotive Use
RN1904FE	RN1904FE,LF	—	General Use
	RN1904FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1904FE,LXHF	YES	Automotive Use
RN1905FE	RN1905FE,LF	—	General Use
	RN1905FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1905FE,LXHF	YES	Automotive Use
RN1906FE	RN1906FE,LF	—	General Use
	RN1906FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN1906FE,LXHF	YES	Automotive Use

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

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7. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1901FE～RN1906FE	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	
Emitter-base voltage	RN1901FE～RN1904FE	V_{EBO}	10	
	RN1905FE,RN1906FE		5	
Collector current	RN1901FE～RN1906FE	I_C	100	mA
Collector power dissipation (Note 1)		P_C	100	mW
Junction temperature		T_j	150	°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).

Note 1: Total rating

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8. Electrical Characteristics (Unless otherwise specified, T_a = 25 °C) (Q1, Q2 Common)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1901FE～RN1906FE	I_{CBO}	V_{CB} = 50 V, I_E = 0 mA	—	—	100	nA
		I_{CEO}	V_{CE} = 50 V, I_B = 0 mA	—	—	500	
Emitter cut-off current	RN1901FE	I_{EBO}	V_{EB} = 10 V, I_C = 0 mA	0.82	—	1.52	mA
	RN1902FE			0.38	—	0.71	
	RN1903FE			0.17	—	0.33	
	RN1904FE			0.082	—	0.15	
	RN1905FE		V_{EB} = 5 V, I_C = 0 mA	0.078	—	0.145	
	RN1906FE			0.074	—	0.138	
DC current gain	RN1901FE	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	30	—	—	—
	RN1902FE			50	—	—	
	RN1903FE			70	—	—	
	RN1904FE			80	—	—	
	RN1905FE			80	—	—	
	RN1906FE			80	—	—	
Collector-emitter saturation voltage	RN1901FE～RN1906FE	$V_{CE(sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1901FE	$V_{I(ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	
	RN1902FE			1.2	—	2.4	
	RN1903FE			1.3	—	3.0	
	RN1904FE			1.5	—	5.0	
	RN1905FE			0.6	—	1.1	
	RN1906FE			0.7	—	1.3	
Input voltage (OFF)	RN1901FE～RN1904FE	$V_{I(OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	
	RN1905FE, RN1906FE			0.5	—	0.8	
Transition frequency	RN1901FE～RN1906FE	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1901FE～RN1906FE	C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	3	6	pF
Input resistance	RN1901FE	R_1	-	3.29	4.7	6.11	kΩ
	RN1902FE			7	10	13	
	RN1903FE			15.4	22	28.6	
	RN1904FE			32.9	47	61.1	
	RN1905FE			1.54	2.2	2.86	
	RN1906FE			3.29	4.7	6.11	
Resistor ratio	RN1901FE～RN1904FE	R1/R2	-	0.9	1.0	1.1	—
	RN1905FE			0.0421	0.0468	0.0515	
	RN1906FE			0.09	0.1	0.11	

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9. Marking

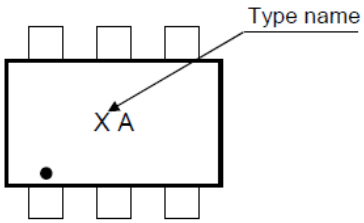

Fig. 9.1 Marking RN1901FE

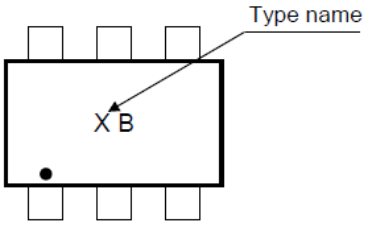

Fig. 9.2 Marking RN1902FE

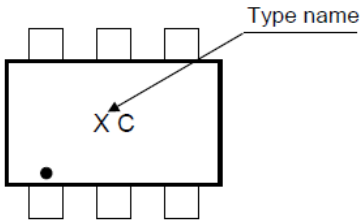

Fig. 9.3 Marking RN1903FE

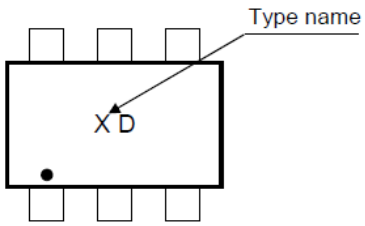

Fig. 9.4 Marking RN1904FE

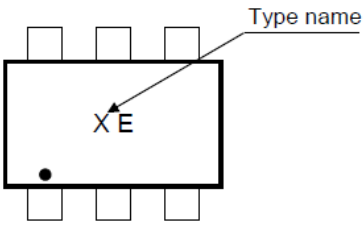

Fig. 9.5 Marking RN1905FE

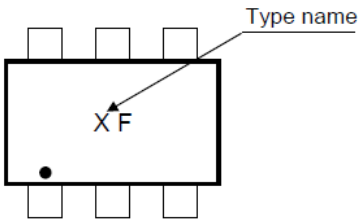

Fig. 9.6 Marking RN1906FE

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10. Characteristics Curves (Note)(Q1, Q2 Common)

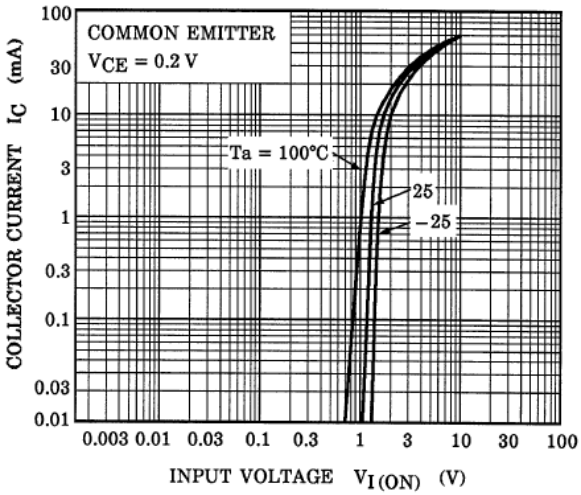

Fig. 10.1 RN1901FE I_C-$V_{I(ON)}$

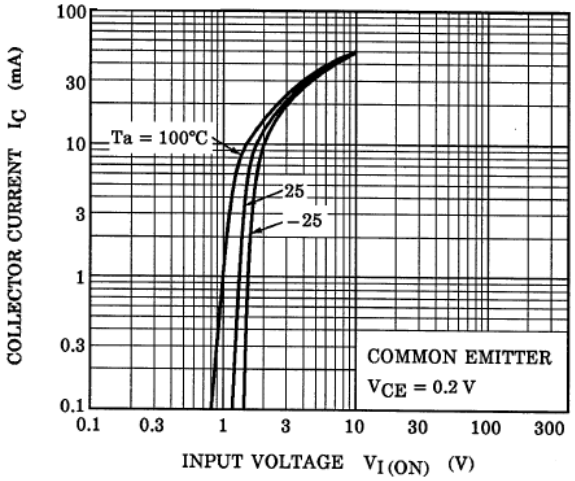

Fig. 10.2 RN1902FE I_C-$V_{I(ON)}$

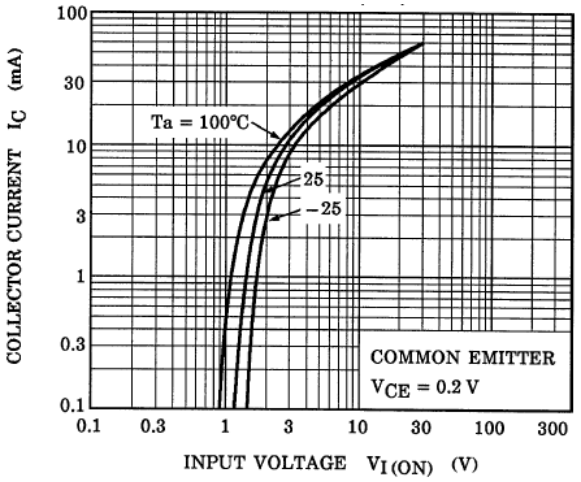

Fig. 10.3 RN1903FE I_C-$V_{I(ON)}$

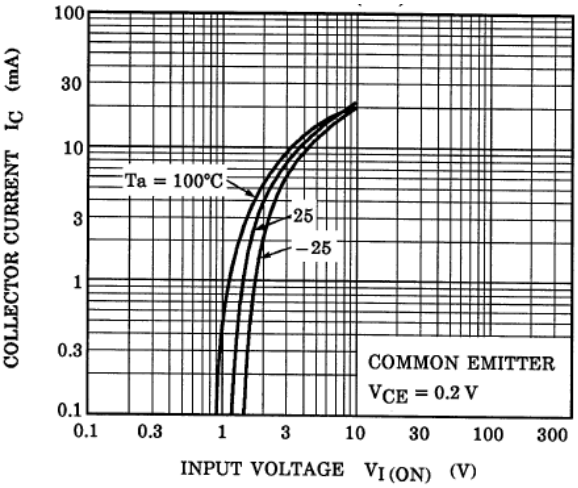

Fig. 10.4 RN1904FE I_C-$V_{I(ON)}$

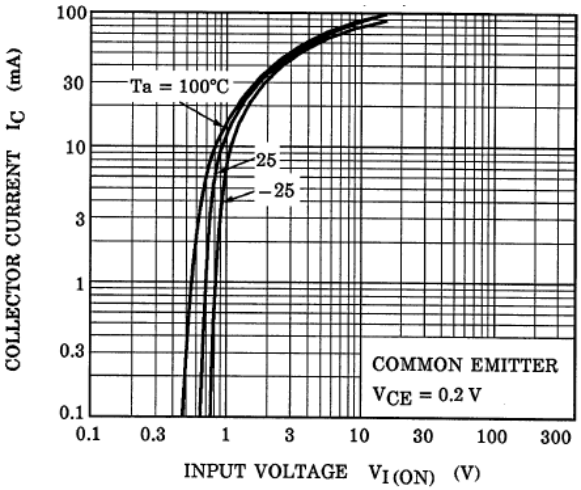

Fig. 10.5 RN1905FE I_C-$V_{I(ON)}$

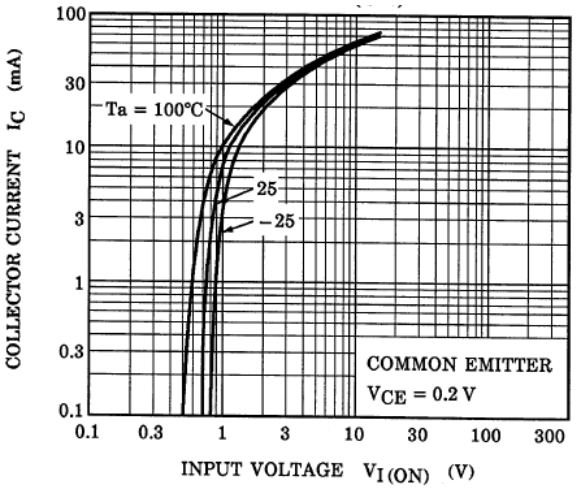

Fig. 10.6 RN1906FE I_C-$V_{I(ON)}$

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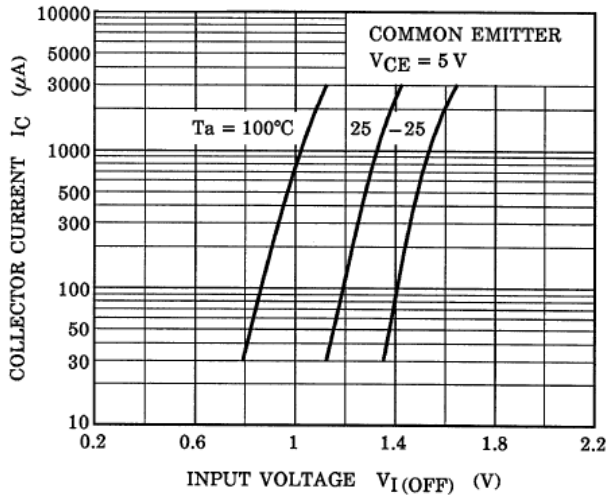

Fig. 10.7 RN1901FE I_C-$V_{I(OFF)}$

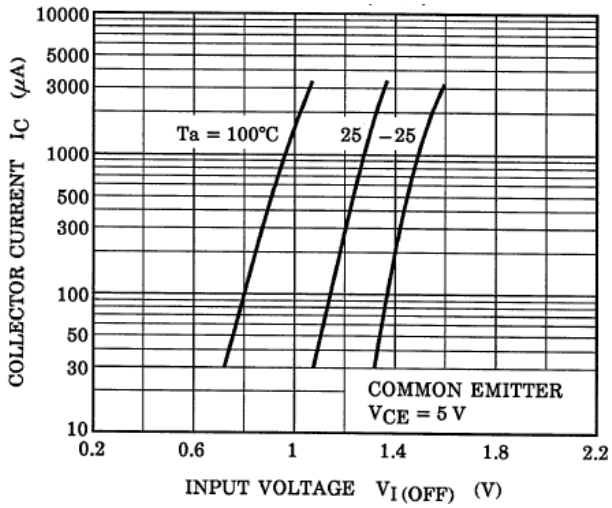

Fig. 10.8 RN1902FE I_C-$V_{I(OFF)}$

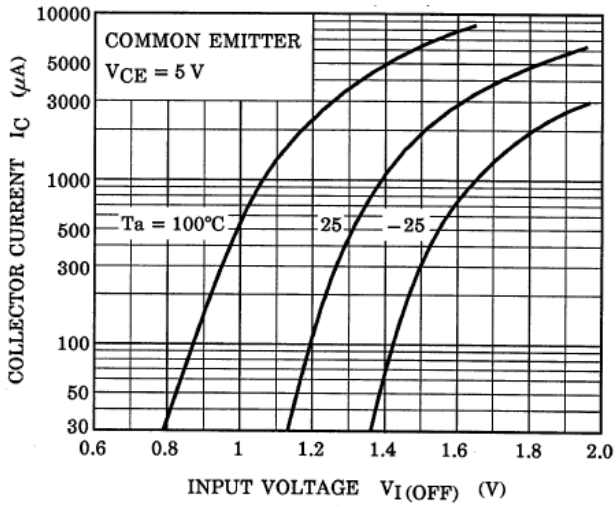

Fig. 10.9 RN1903FE I_C-$V_{I(OFF)}$

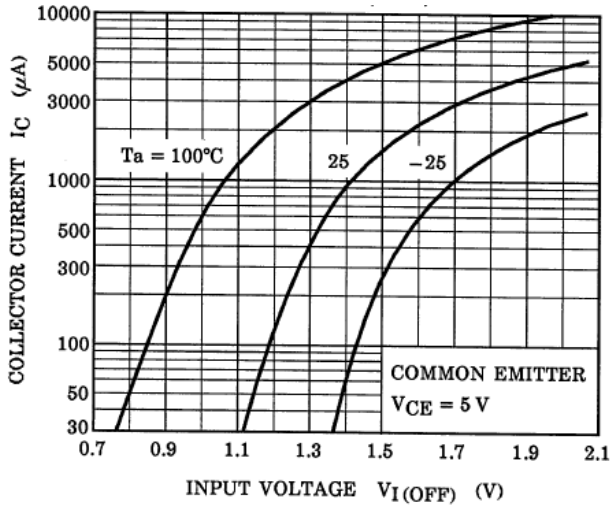

Fig. 10.10 RN1904FE I_C-$V_{I(OFF)}$

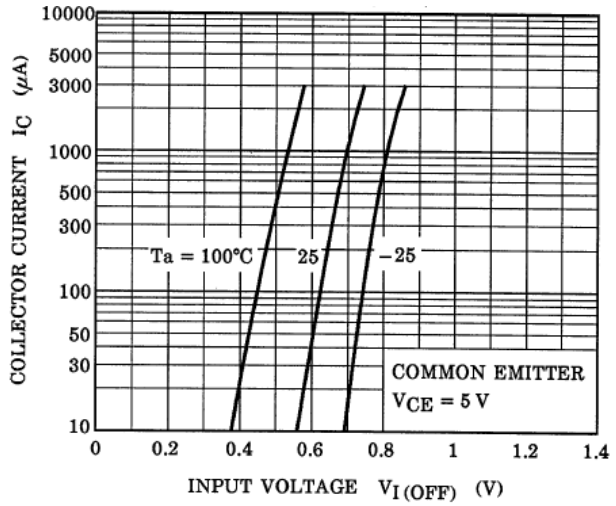

Fig. 10.11 RN1905FE I_C-$V_{I(OFF)}$

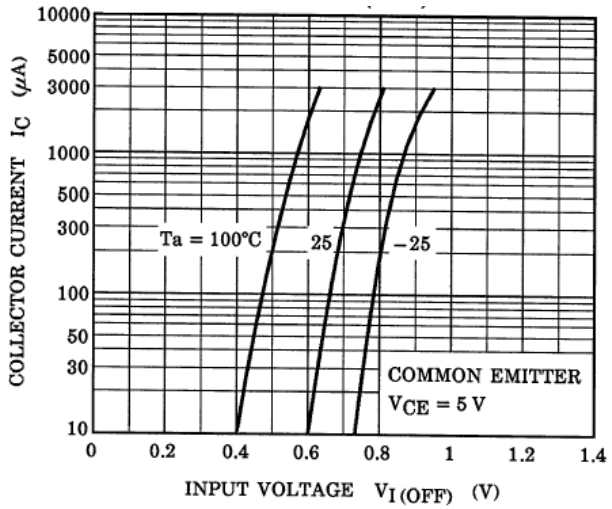

Fig. 10.12 RN1906FE I_C-$V_{I(OFF)}$

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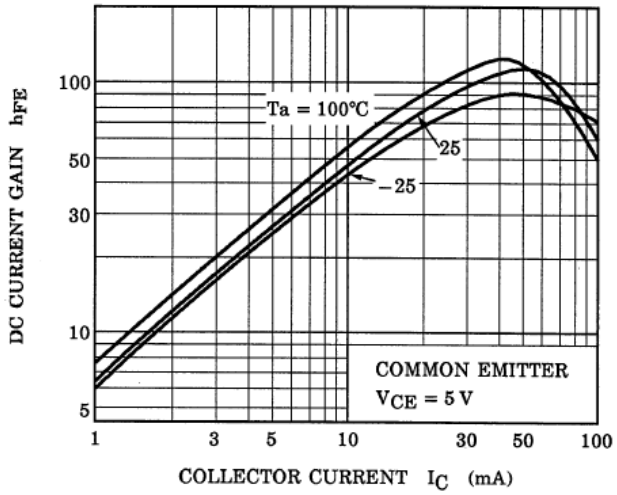

Fig. 10.13 RN1901FE h_{FE}-I_C

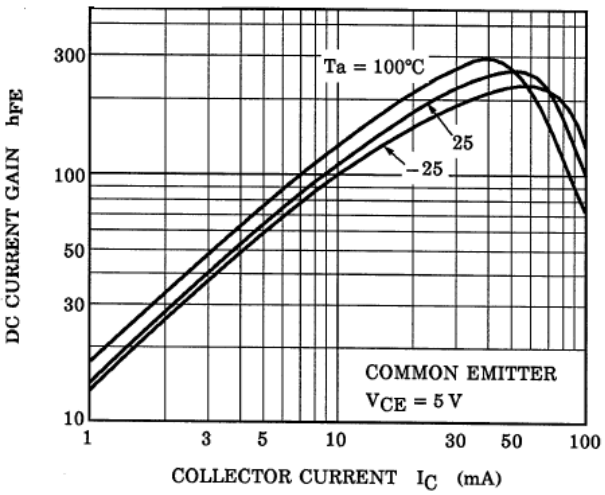

Fig. 10.14 RN1902FE h_{FE}-I_C

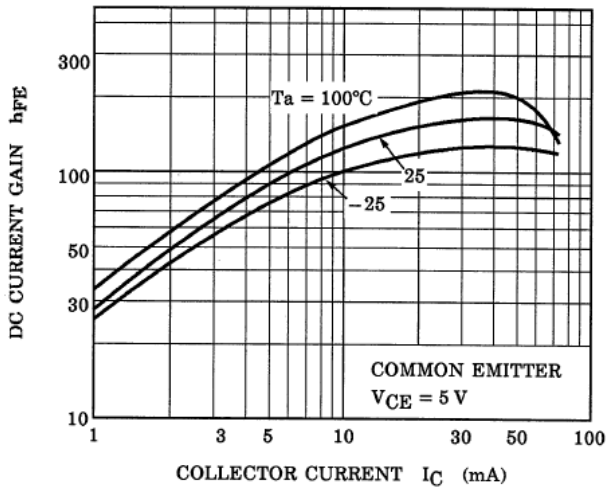

Fig. 10.15 RN1903FE h_{FE}-I_C

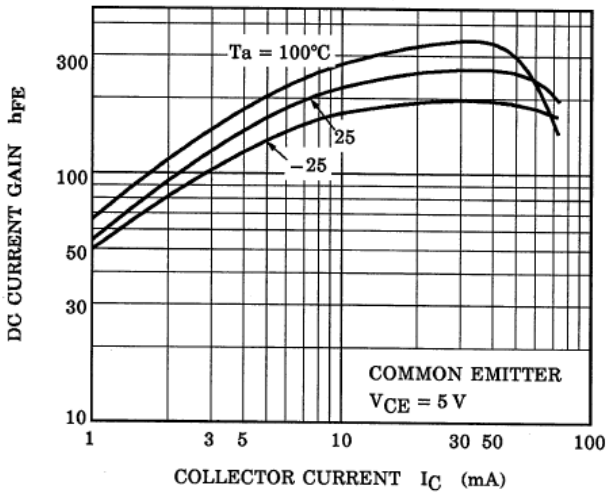

Fig. 10.16 RN1904FE h_{FE}-I_C

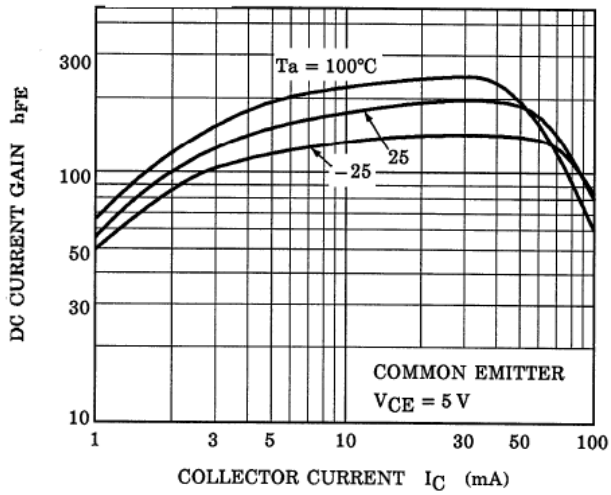

Fig. 10.17 RN1905FE h_{FE}-I_C

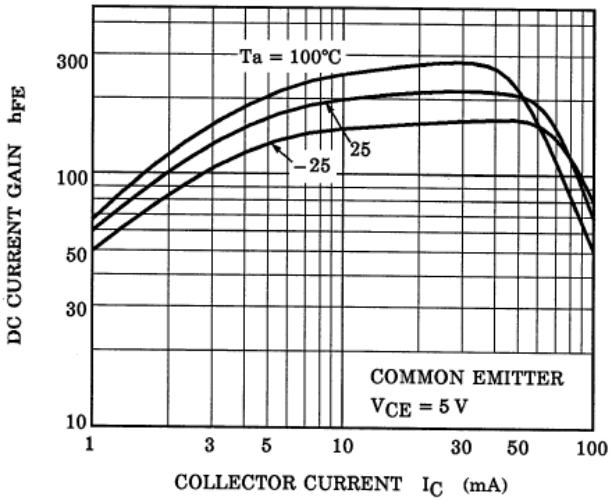

Fig. 10.18 RN1906FE h_{FE}-I_C

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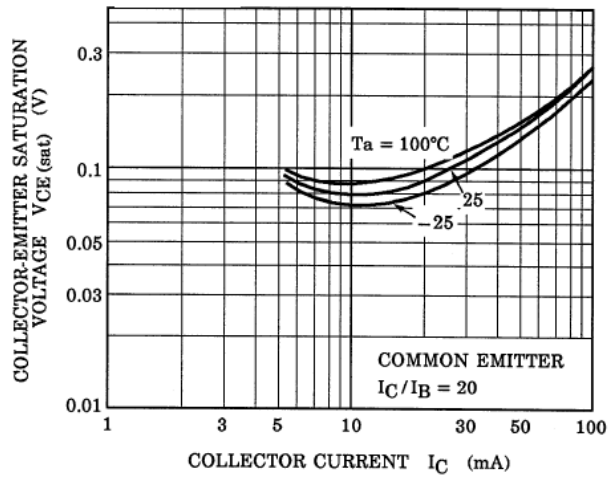

Fig. 10.19 RN1901FE $V_{CE(sat)}$-I_C

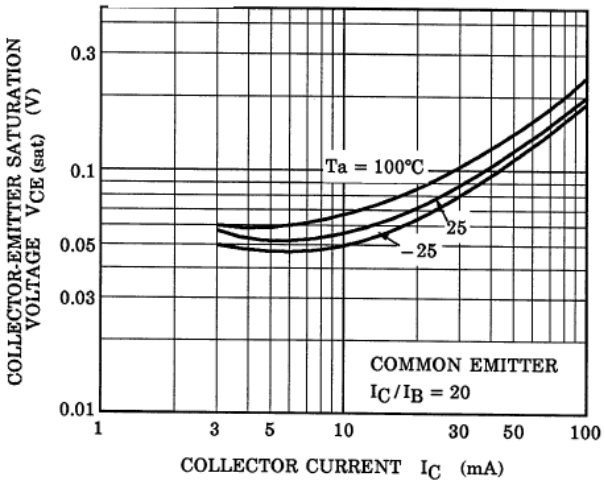

Fig. 10.20 RN1902FE $V_{CE(sat)}$-I_C

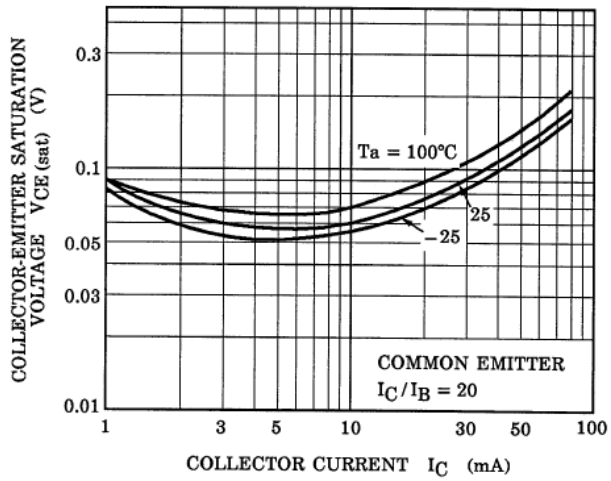

Fig. 10.21 RN1903FE $V_{CE(sat)}$-I_C

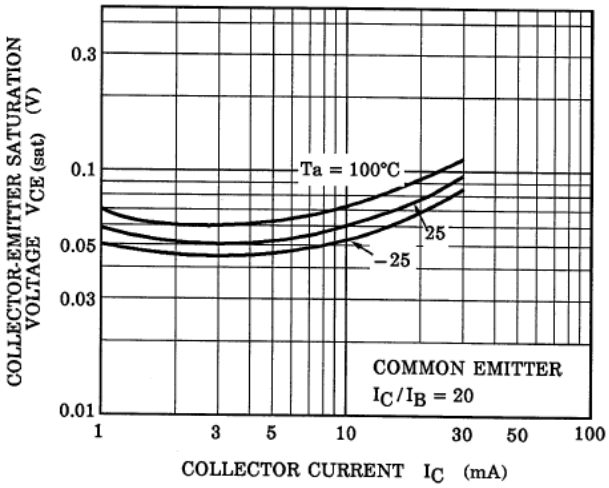

Fig. 10.22 RN1904FE $V_{CE(sat)}$-I_C

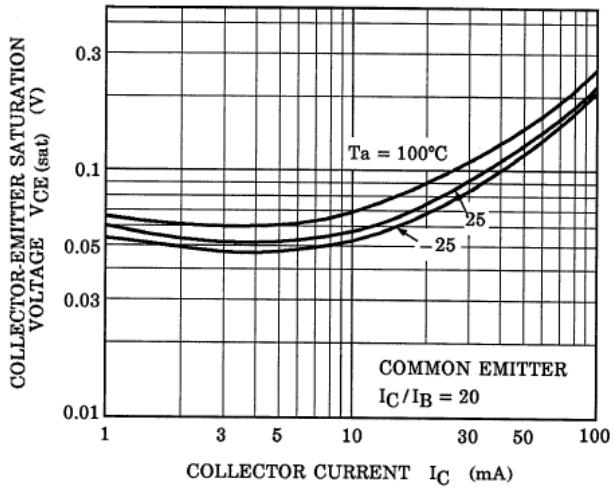

Fig. 10.23 RN1905FE $V_{CE(sat)}$-I_C

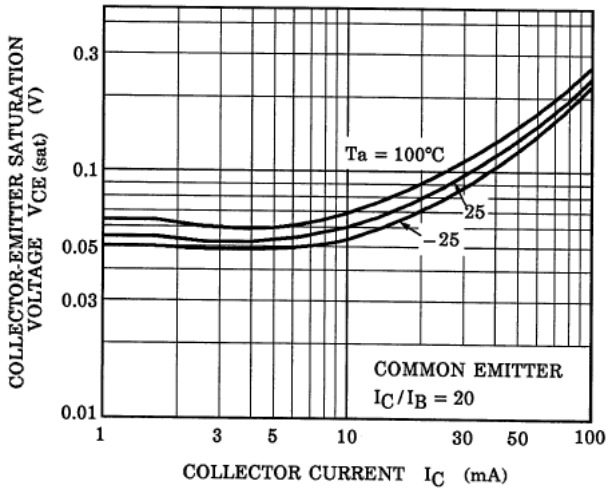

Fig. 10.24 RN1906FE $V_{CE(sat)}$-I_C

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

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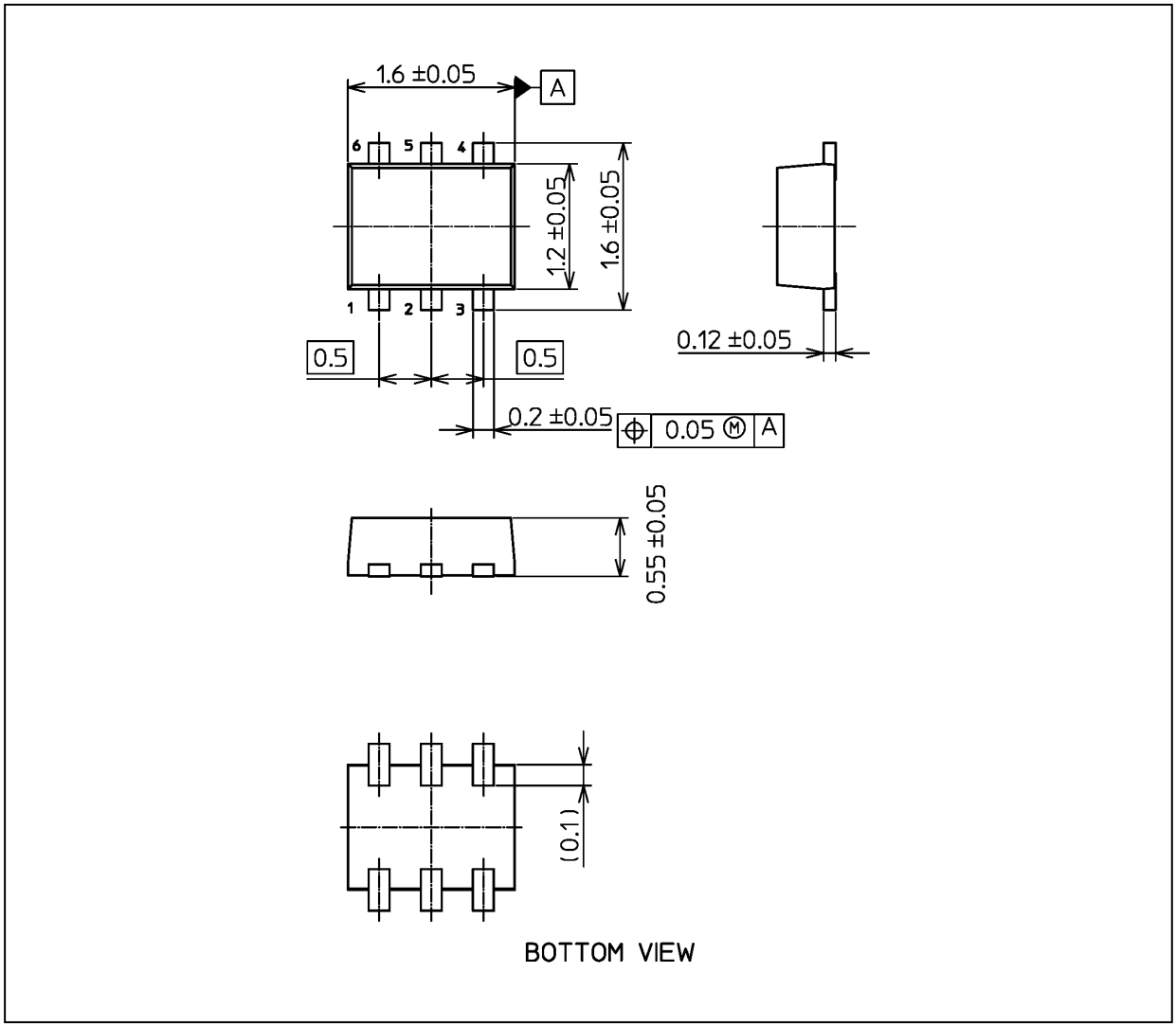
Package Dimensions

Unit: mm



Weight: 3.0 mg (typ.)

Package Name(s)
TOSHIBA: 1-2X1S
Nickname: ES6

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