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

RN2901FE/02FE/03FE/04FE/05FE/06FE

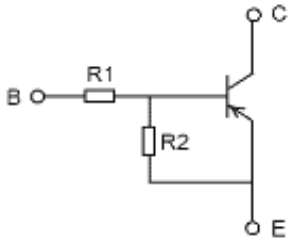
1. Applications

- 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 RN1901FE to RN1906FE

3. Equivalent Circuit



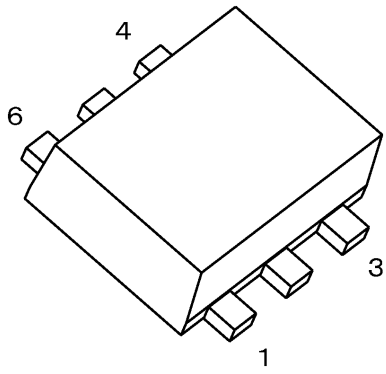
4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2901FE	4.7	4.7
RN2902FE	10	10
RN2903FE	22	22
RN2904FE	47	47
RN2905FE	2.2	47
RN2906FE	4.7	47

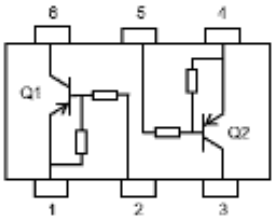
Start of commercial production
2000-05

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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
RN2901FE	RN2901FE,LF	—	General Use
	RN2901FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2901FE,LXHF	YES	Automotive Use
RN2902FE	RN2902FE,LF	—	General Use
	RN2902FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2902FE,LXHF	YES	Automotive Use
RN2903FE	RN2903FE,LF	—	General Use
	RN2903FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2903FE,LXHF	YES	Automotive Use
RN2904FE	RN2904FE,LF	—	General Use
	RN2904FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2904FE,LXHF	YES	Automotive Use
RN2905FE	RN2905FE,LF	—	General Use
	RN2905FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2905FE,LXHF	YES	Automotive Use
RN2906FE	RN2906FE,LF	—	General Use
	RN2906FE,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2906FE,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	RN2901FE to RN2906FE	V_{CBO}	-50	V
Collector-emitter voltage		V_{CEO}	-50	
Emitter-base voltage	RN2901FE to RN2904FE	V_{EBO}	-10	V
	RN2905FE,RN2906FE		-5	
Collector current	RN2901FE to RN2906FE	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	RN2901FE to RN2906FE	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	RN2901FE	I_{EBO}	V_{EB} = -10 V, I_C = 0 mA	-0.82	—	-1.52	mA
	RN2902FE			-0.38	—	-0.71	
	RN2903FE			-0.17	—	-0.33	
	RN2904FE			-0.082	—	-0.15	
	RN2905FE		V_{EB} = -5 V, I_C = 0 mA	-0.078	—	-0.145	
	RN2906FE			-0.074	—	-0.138	
DC current gain	RN2901FE	h_{FE}	V_{CE} = -5 V, I_C = -10 mA	30	—	—	—
	RN2902FE			50	—	—	
	RN2903FE			70	—	—	
	RN2904FE			80	—	—	
	RN2905FE			80	—	—	
	RN2906FE			80	—	—	
Collector-emitter saturation voltage	RN2901FE to RN2906FE	$V_{CE(sat)}$	I_C = -5 mA, I_B = -0.25 mA	—	-0.1	-0.3	V
Input voltage (ON)	RN2901FE	$V_{I(ON)}$	V_{CE} = -0.2 V, I_C = -5 mA	-1.1	—	-2.0	V
	RN2902FE			-1.2	—	-2.4	
	RN2903FE			-1.3	—	-3.0	
	RN2904FE			-1.5	—	-5.0	
	RN2905FE			-0.6	—	-1.1	
	RN2906FE			-0.7	—	-1.3	
Input voltage (OFF)	RN2901FE to RN2904FE	$V_{I(OFF)}$	V_{CE} = -5 V, I_C = -0.1 mA	-1.0	—	-1.5	V
	RN2905FE, RN2906FE			-0.5	—	-0.8	
Transition frequency	RN2901FE to RN2906FE	f_T	V_{CE} = -10 V, I_C = -5 mA	—	200	—	MHz
Collector output capacitance	RN2901FE to RN2906FE	C_{ob}	V_{CB} = -10 V, I_E = 0 mA, f = 1 MHz	—	3	6	pF
Input resistance	RN2901FE	R_1	-	3.29	4.7	6.11	kΩ
	RN2902FE			7	10	13	
	RN2903FE			15.4	22	28.6	
	RN2904FE			32.9	47	61.1	
	RN2905FE			1.54	2.2	2.86	
	RN2906FE			3.29	4.7	6.11	
Resistor ratio	RN2901FE to RN2904FE	R1/R2	-	0.9	1.0	1.1	—
	RN2905FE			0.0421	0.0468	0.0515	
	RN2906FE			0.09	0.1	0.11	

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9. Marking

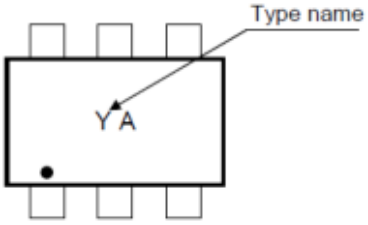


Fig. 9.1 Marking RN2901FE

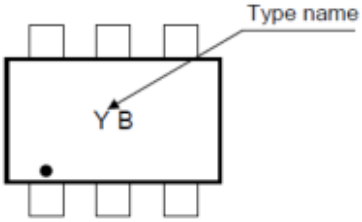


Fig. 9.2 Marking RN2902FE

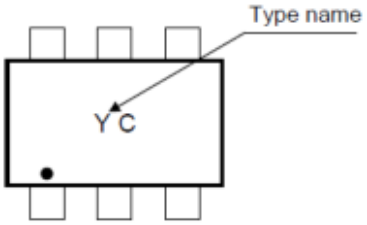


Fig. 9.3 Marking RN2903FE

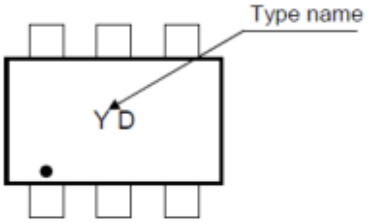


Fig. 9.4 Marking RN2904FE

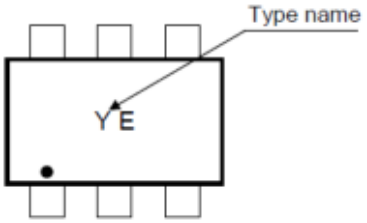


Fig. 9.5 Marking RN2905FE

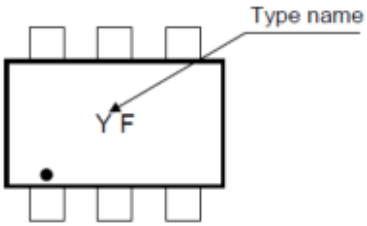


Fig. 9.6 Marking RN2906FE

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

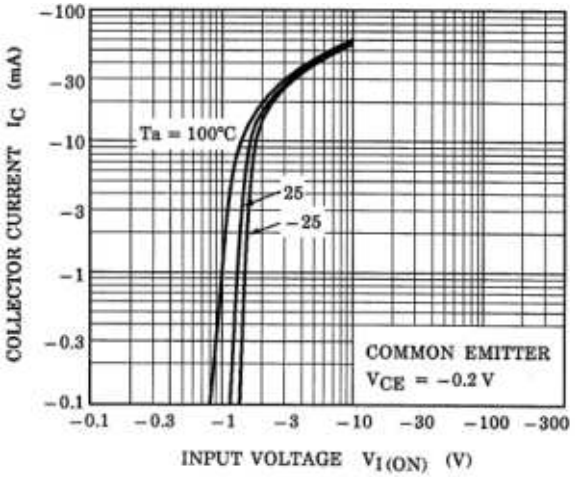


Fig. 10.1 RN2901FE I_C-$V_{I(ON)}$

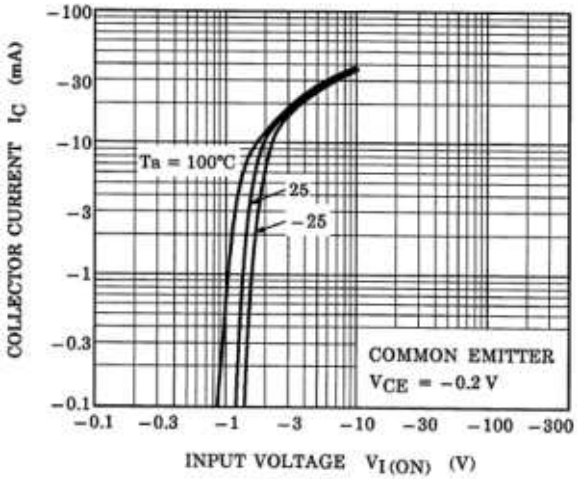


Fig. 10.2 RN2902FE I_C-$V_{I(ON)}$

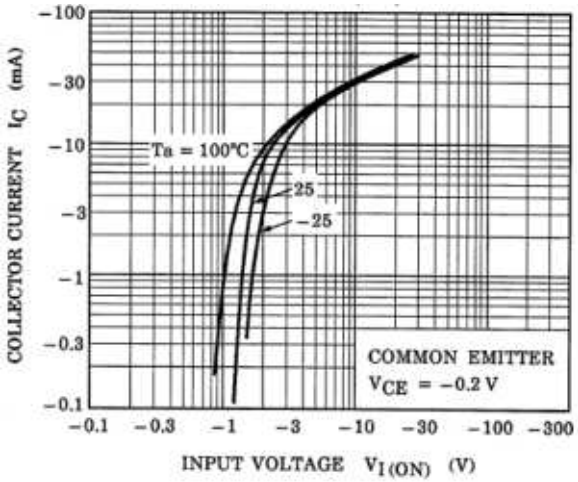


Fig. 10.3 RN2903FE I_C-$V_{I(ON)}$

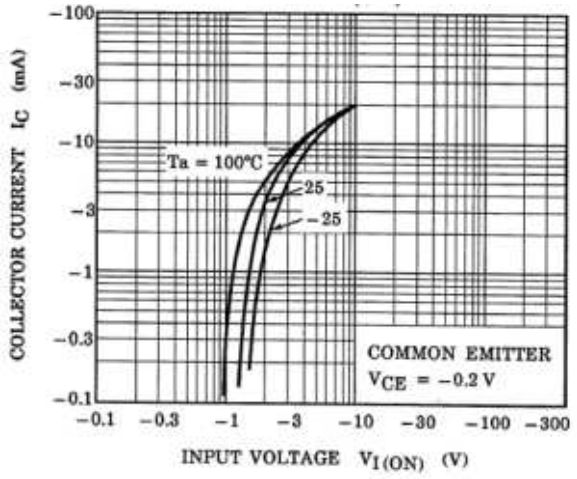


Fig. 10.4 RN2904FE I_C-$V_{I(ON)}$

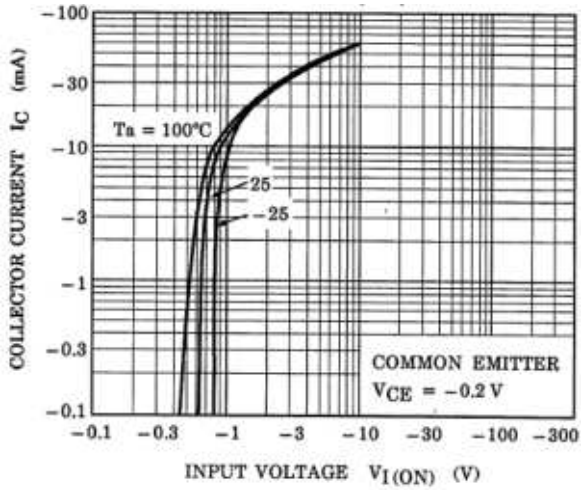


Fig. 10.5 RN2905FE I_C-$V_{I(ON)}$

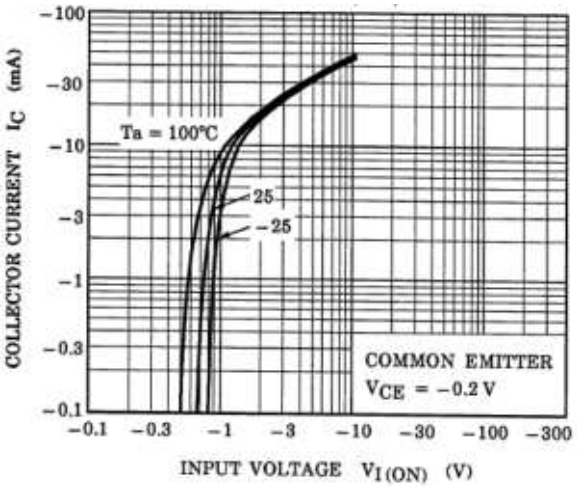


Fig. 10.6 RN2906FE I_C-$V_{I(ON)}$

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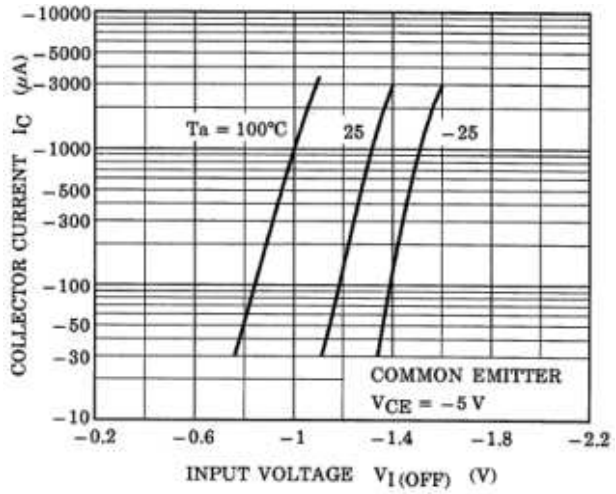


Fig. 10.7 RN2901FE I_C-$V_{I(OFF)}$

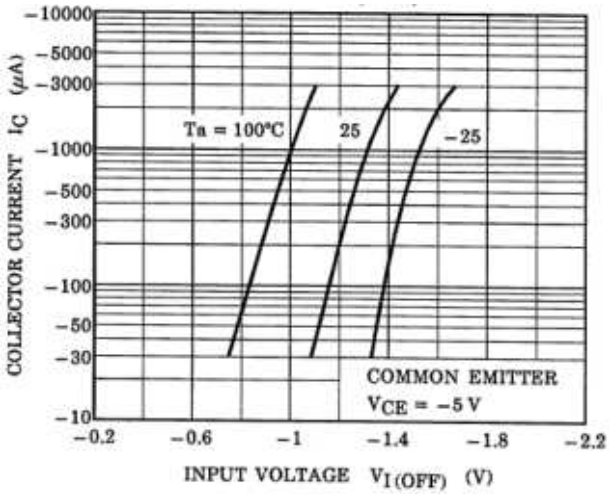


Fig. 10.8 RN2902FE I_C-$V_{I(OFF)}$

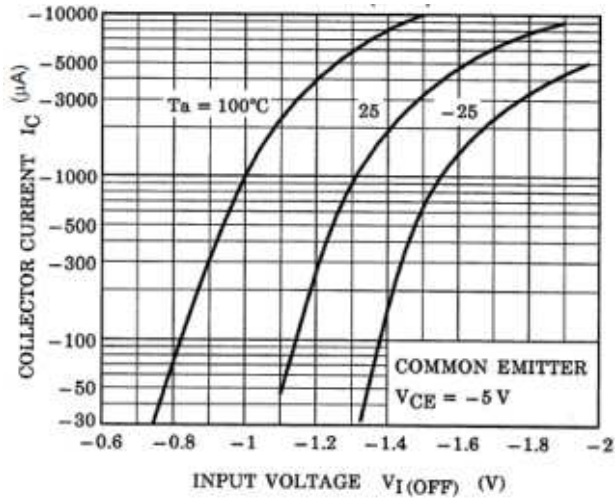


Fig. 10.9 RN2903FE I_C-$V_{I(OFF)}$

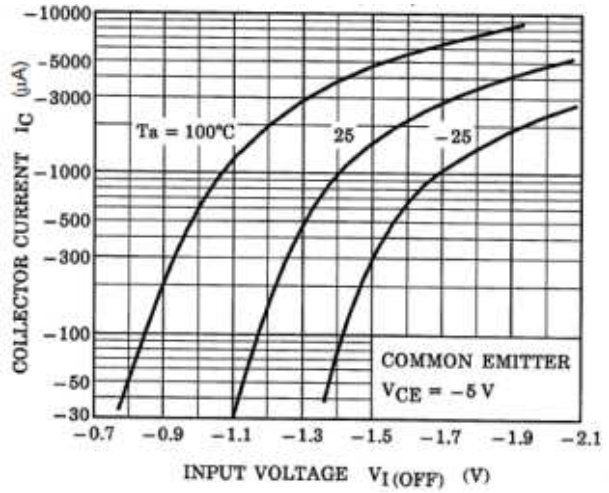


Fig. 10.10 RN2904FE I_C-$V_{I(OFF)}$

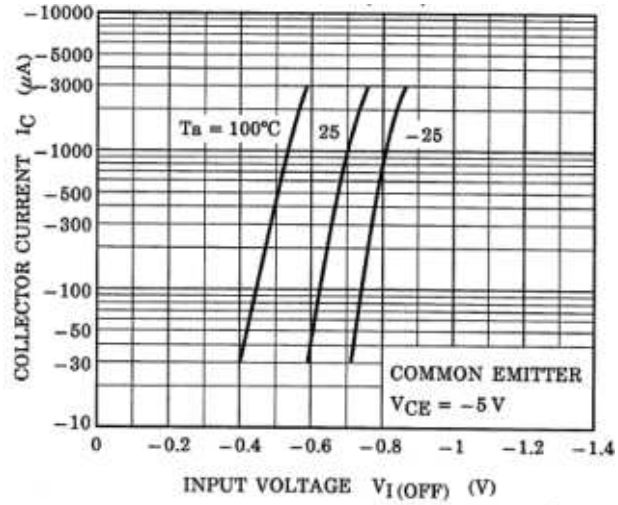


Fig. 10.11 RN2905FE I_C-$V_{I(OFF)}$

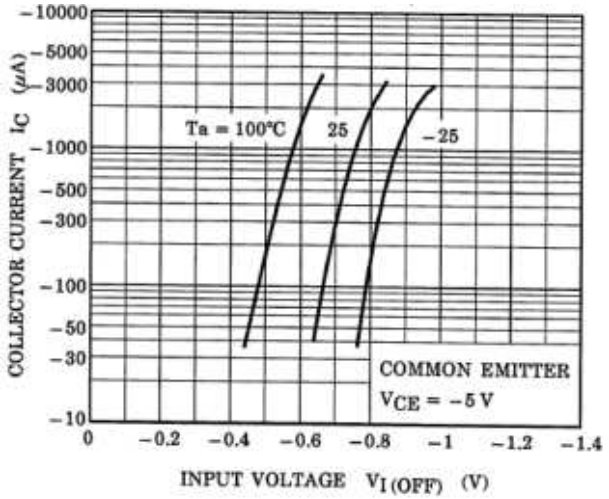


Fig. 10.12 RN2906FE I_C-$V_{I(OFF)}$

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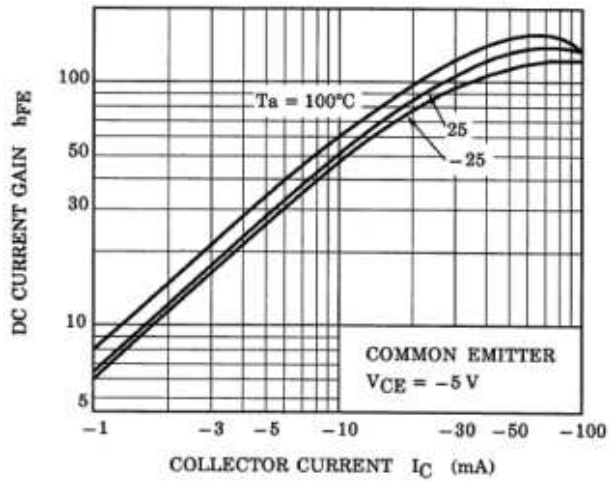


Fig. 10.13 RN2901FE h_{FE}-I_C

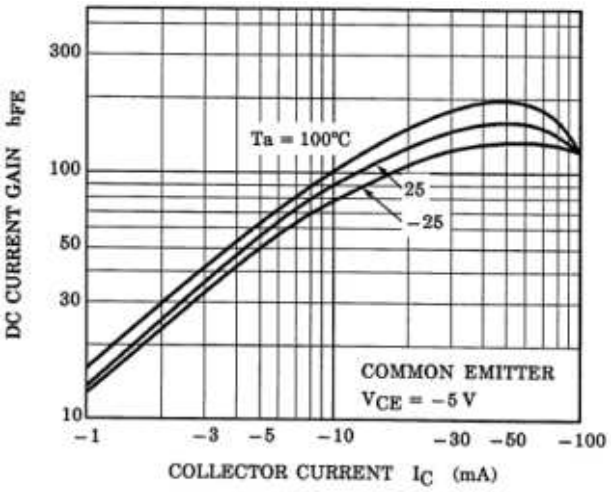


Fig. 10.14 RN2902FE h_{FE}-I_C

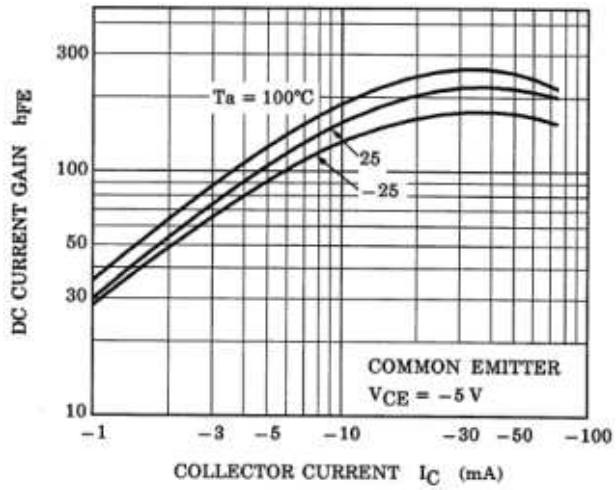


Fig. 10.15 RN2903FE h_{FE}-I_C

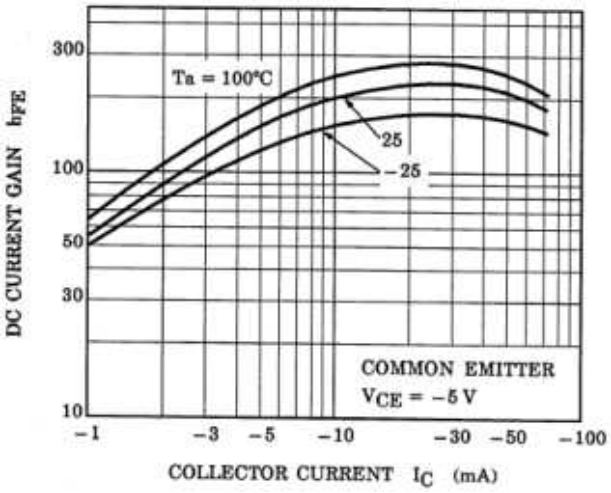


Fig. 10.16 RN2904FE h_{FE}-I_C

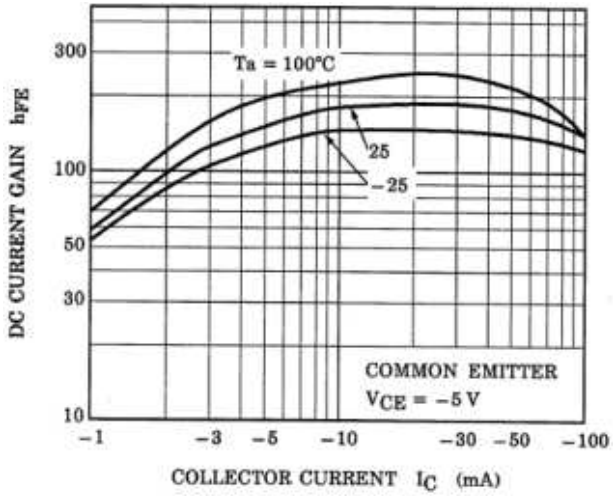


Fig. 10.17 RN2905FE h_{FE}-I_C

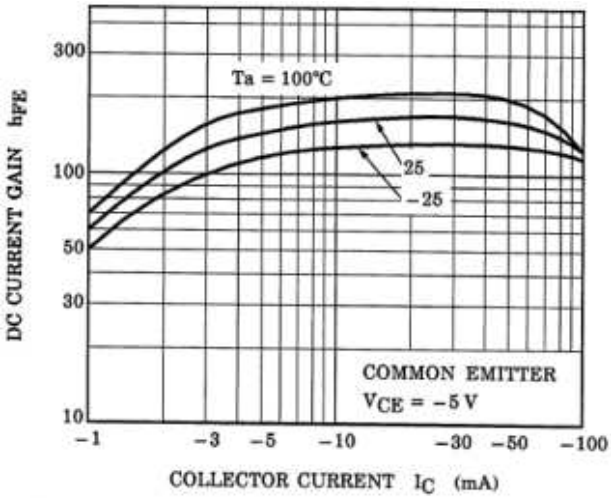


Fig. 10.18 RN2906FE h_{FE}-I_C

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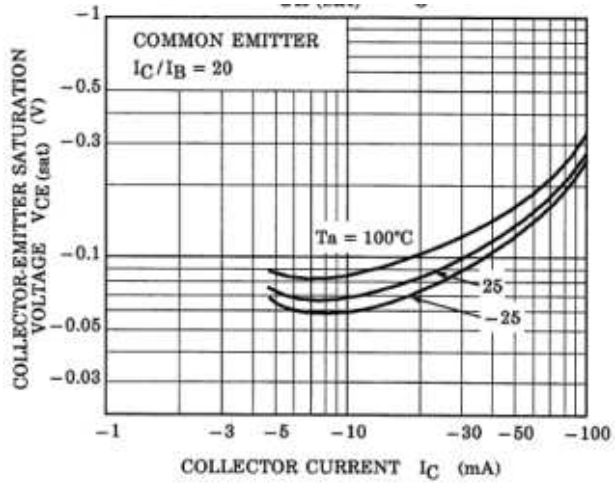


Fig. 10.19 RN2901FE $V_{CE(sat)}$-I_C

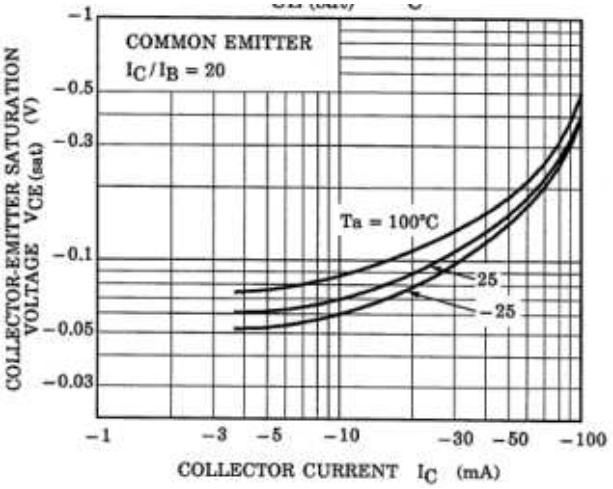


Fig. 10.20 RN2902FE $V_{CE(sat)}$-I_C

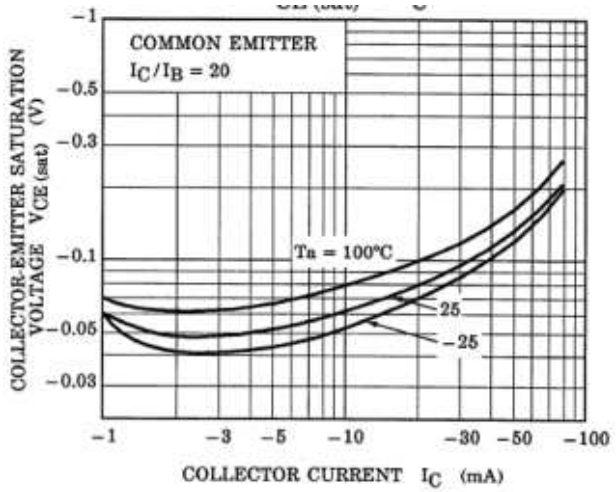


Fig. 10.21 RN2903FE $V_{CE(sat)}$-I_C

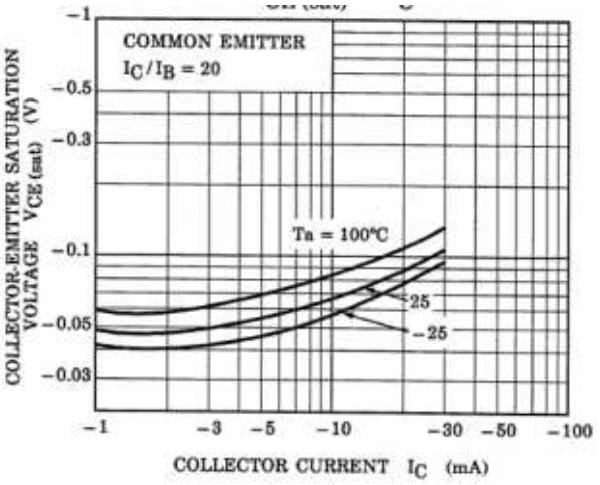


Fig. 10.22 RN2904FE $V_{CE(sat)}$-I_C

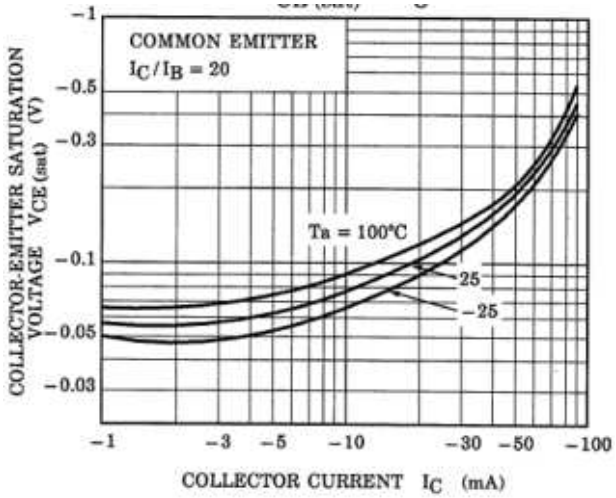


Fig. 10.23 RN2905FE $V_{CE(sat)}$-I_C

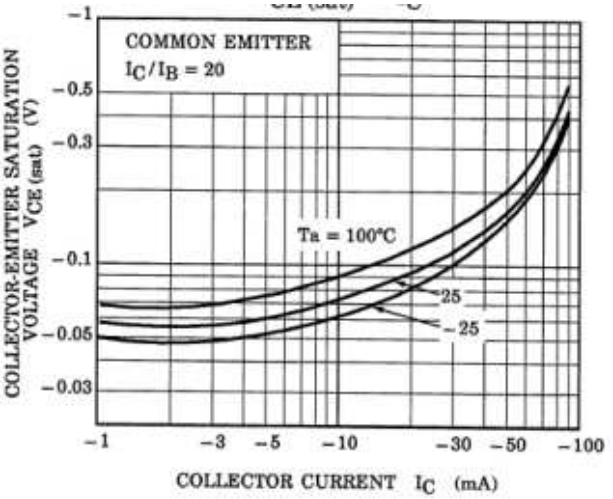


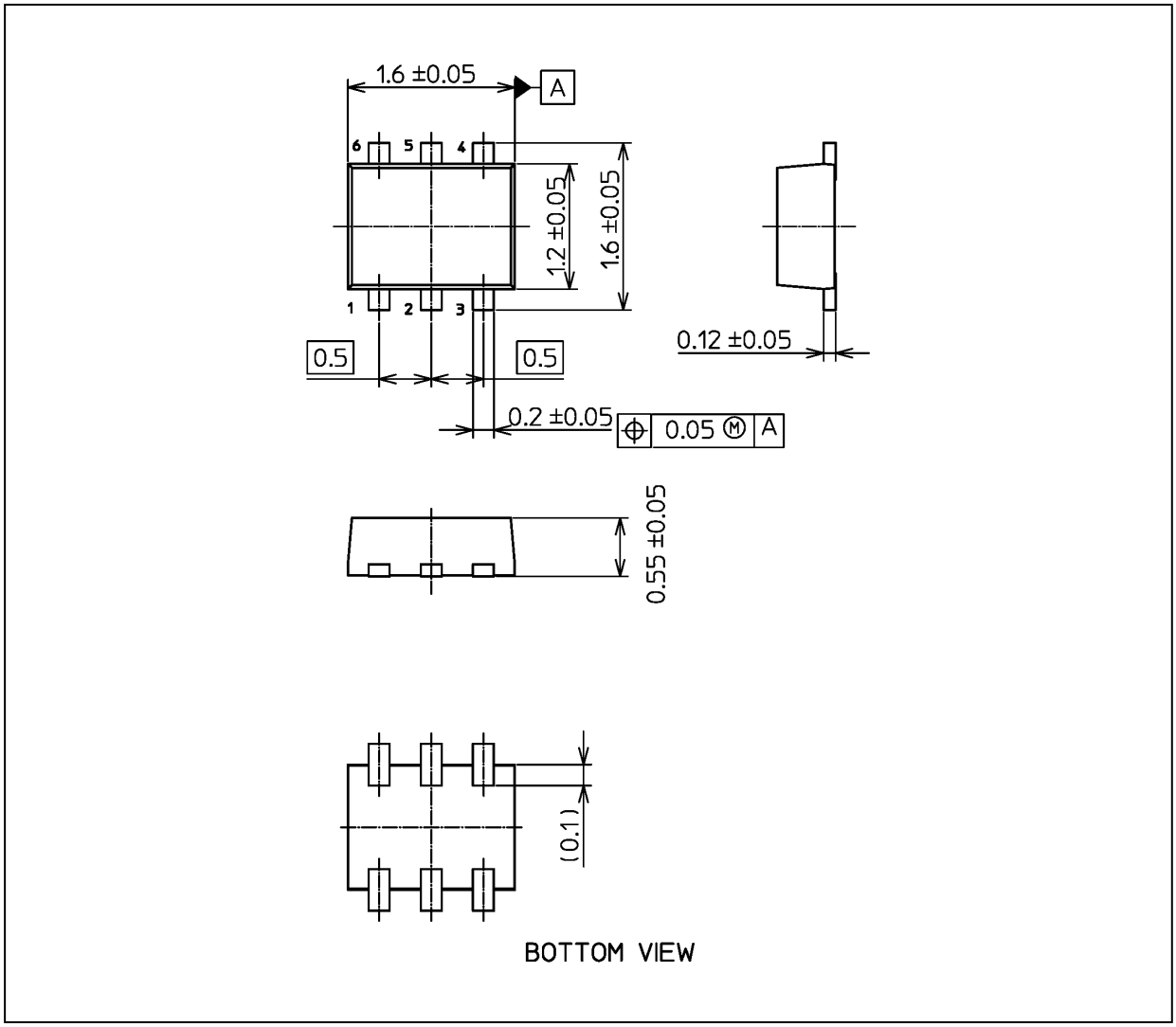
Fig. 10.24 RN1206FE $V_{CE(sat)}$-I_C

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)
Nickname: ES6

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Hardware, software and systems described in this document are collectively referred to as "Product".

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