

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

# RN2901/02/03/04/05/06

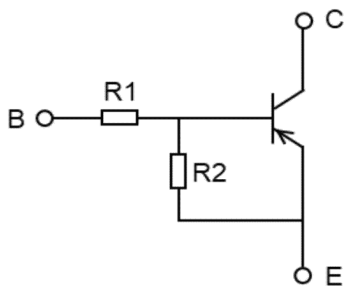
## 1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

## 2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) 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) Toshiba offers transistors with a wide range of resistance to accommodate various circuit designs.
- (5) Complementary to RN1901 to RN1906

## 3. Equivalent Circuit

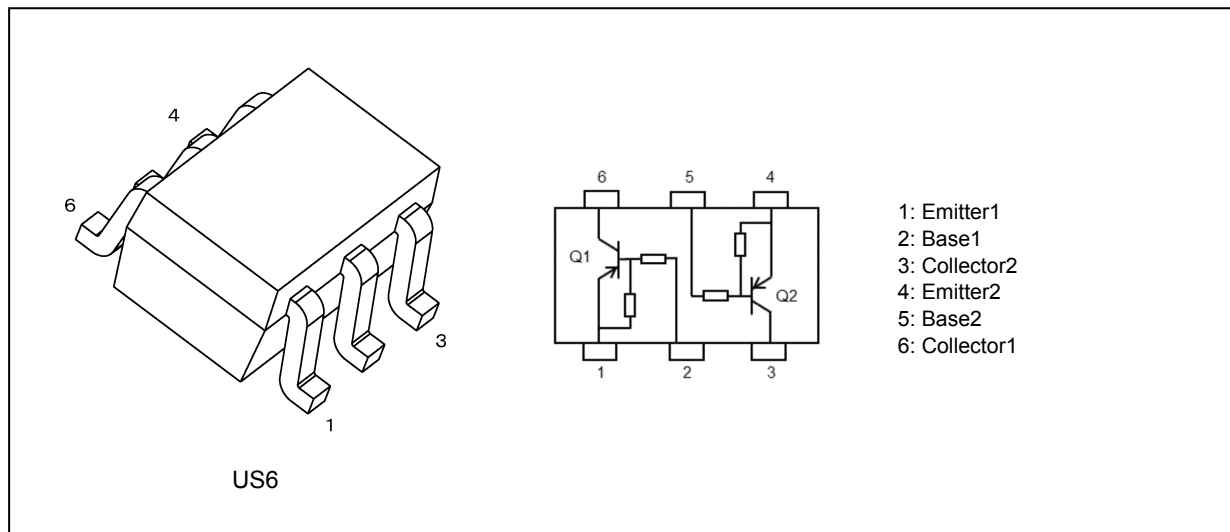


## 4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2901	4.7	4.7
RN2902	10	10
RN2903	22	22
RN2904	47	47
RN2905	2.2	47
RN2906	4.7	47

Start of commercial production  
1990-12

### 5. Packaging and Pin Assignment



### 6. Orderable part number

Orderable part number		AEC-Q101	Note
RN2901	RN2901,LF	—	General Use
	RN2901,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2901,LXHF	YES	Automotive Use
RN2902	RN2902,LF	—	General Use
	RN2902,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2902,LXHF	YES	Automotive Use
RN2903	RN2903,LF	—	General Use
	RN2903,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2903,LXHF	YES	Automotive Use
RN2904	RN2904,LF	—	General Use
	RN2904,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2904,LXHF	YES	Automotive Use
RN2905	RN2905,LF	—	General Use
	RN2905,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2905,LXHF	YES	Automotive Use
RN2906	RN2906,LF	—	General Use
	RN2906,LXGF	YES (Note 1)	Unintended Use (Note 1)
	RN2906,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, $T_a = 25\text{ °C}$ ) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit	
Collector-base voltage	RN2901 to RN2906	$V_{CBO}$	-50	V	
Collector-emitter voltage		$V_{CEO}$	-50		
Emitter-base voltage	RN2901 to RN2904	$V_{EBO}$	-10	V	
	RN2905,RN2906		-5		
Collector current	RN2901 to RN2906	$I_C$	-100	mA	
Collector power dissipation (Note 1)		$P_C$	200	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

### 8. Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ ) (Q1, Q2 Common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	RN2901 to RN2906	$I_{CBO}$	$V_{CB} = -50\text{ V}, I_E = 0\text{ mA}$	—	—	-100	nA
		$I_{CEO}$	$V_{CE} = -50\text{ V}, I_B = 0\text{ mA}$	—	—	-500	
Emitter cut-off current	RN2901	$I_{EBO}$	$V_{EB} = -10\text{ V}, I_C = 0\text{ mA}$	-0.82	—	-1.52	mA
	RN2902			-0.38	—	-0.71	
	RN2903			-0.17	—	-0.33	
	RN2904			-0.082	—	-0.15	
	RN2905	$V_{EB} = -5\text{ V}, I_C = 0\text{ mA}$	-0.078	—	-0.145		
	RN2906		-0.074	—	-0.138		
DC current gain	RN2901	$h_{FE}$	$V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$	30	—	—	—
	RN2902			50	—	—	
	RN2903			70	—	—	
	RN2904			80	—	—	
	RN2905			80	—	—	
	RN2906			80	—	—	
Collector-emitter saturation voltage	RN2901 to RN2906	$V_{CE(sat)}$	$I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$	—	-0.1	-0.3	V
Input voltage (ON)	RN2901	$V_{I(ON)}$	$V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$	-1.1	—	-2.0	V
	RN2902			-1.2	—	-2.4	
	RN2903			-1.3	—	-3.0	
	RN2904			-1.5	—	-5.0	
	RN2905			-0.6	—	-1.1	
	RN2906			-0.7	—	-1.3	
Input voltage (OFF)	RN2901 to RN2904	$V_{I(OFF)}$	$V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$	-1.0	—	-1.5	V
	RN2905, RN2906			-0.5	—	-0.8	
Transition frequency	RN2901 to RN2906	$f_T$	$V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$	—	200	—	MHz
Collector output capacitance	RN2901 to RN2906	$C_{ob}$	$V_{CB} = -10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	3	6	pF
Input resistance	RN2901	$R_1$	-	3.29	4.7	6.11	k $\Omega$
	RN2902			7	10	13	
	RN2903			15.4	22	28.6	
	RN2904			32.9	47	61.1	
	RN2905			1.54	2.2	2.86	
	RN2906			3.29	4.7	6.11	
Resistor ratio	RN2901 to RN2904	$R1/R2$	-	0.9	1.0	1.1	—
	RN2905			0.0421	0.0468	0.0515	
	RN2906			0.09	0.1	0.11	

## 9. Marking

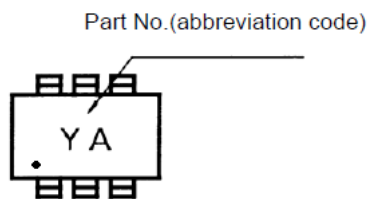


Fig. 9.1 Marking RN2901

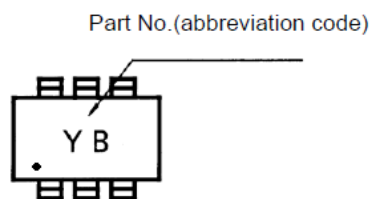


Fig. 9.2 Marking RN2902

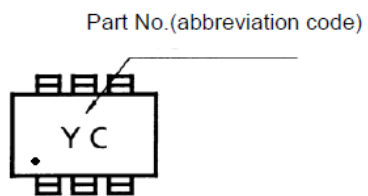


Fig. 9.3 Marking RN2903

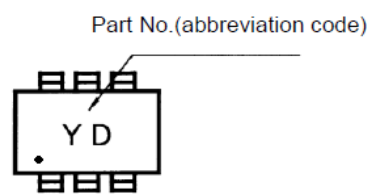


Fig. 9.4 Marking RN2904

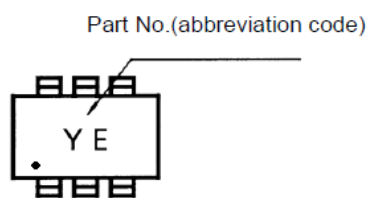


Fig. 9.5 Marking RN2905

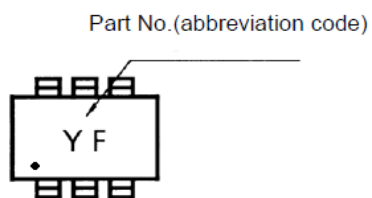


Fig. 9.6 Marking RN2906

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

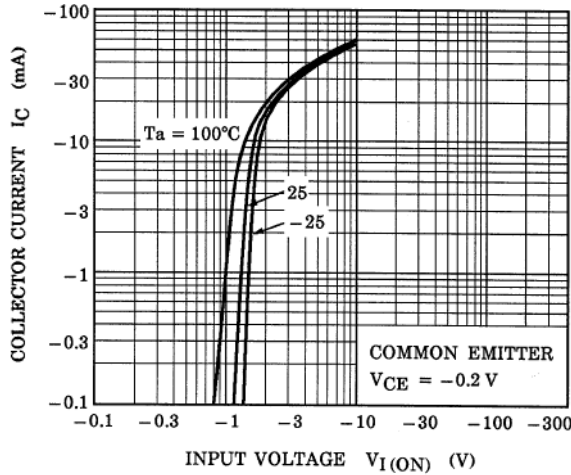


Fig. 10.1 RN2901  $I_C$ - $V_{I(ON)}$

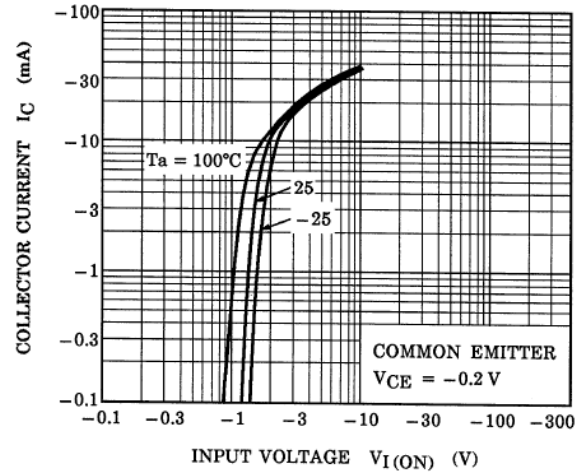


Fig. 10.2 RN2902  $I_C$ - $V_{I(ON)}$

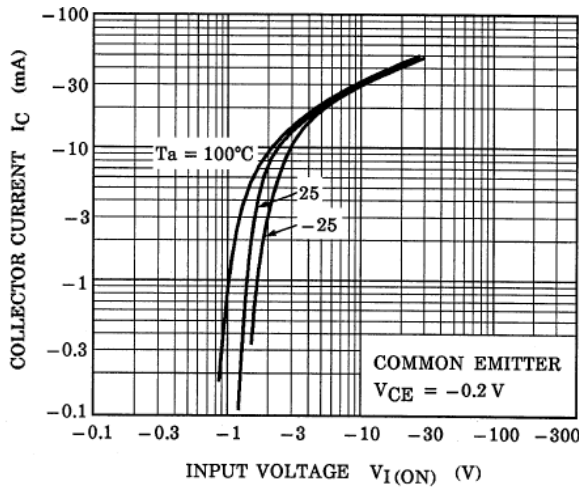


Fig. 10.3 RN2903  $I_C$ - $V_{I(ON)}$

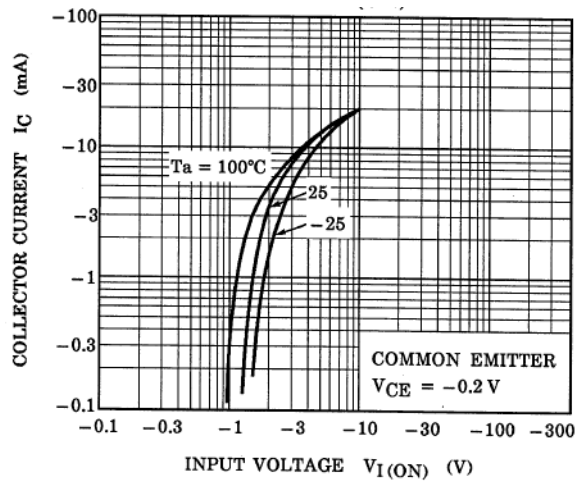


Fig. 10.4 RN2904  $I_C$ - $V_{I(ON)}$

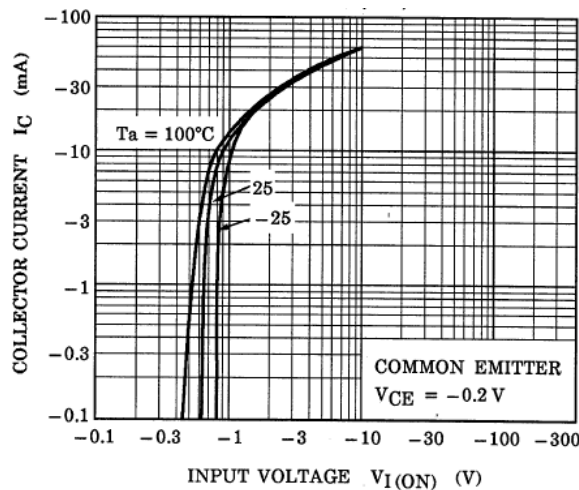


Fig. 10.5 RN2905  $I_C$ - $V_{I(ON)}$

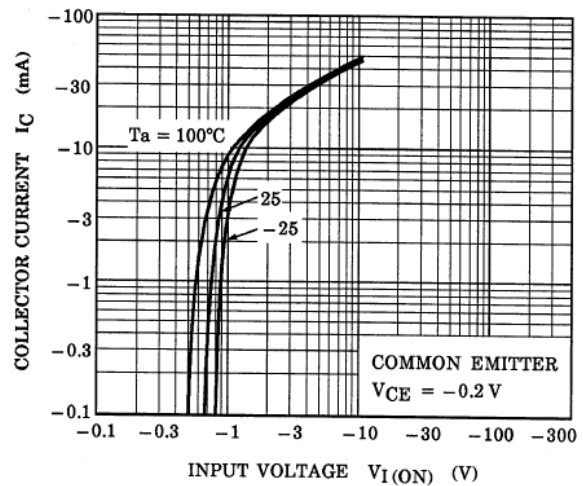


Fig. 10.6 RN2906  $I_C$ - $V_{I(ON)}$

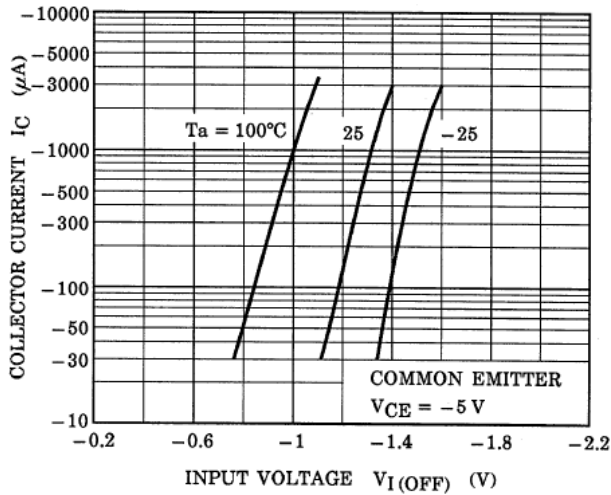


Fig. 10.7 RN2901  $I_C$ - $V_{I(OFF)}$

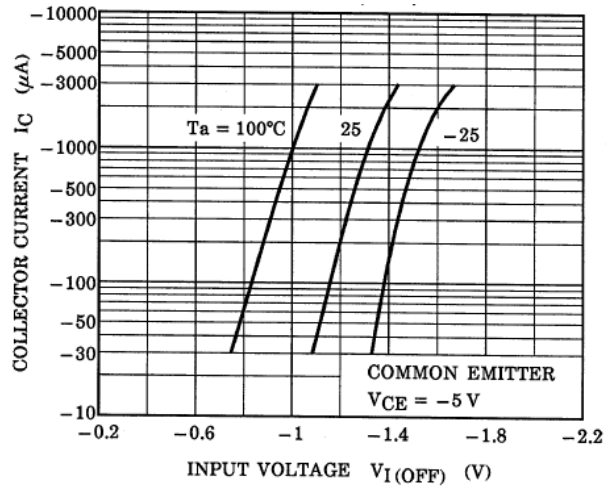


Fig. 10.8 RN2902  $I_C$ - $V_{I(OFF)}$

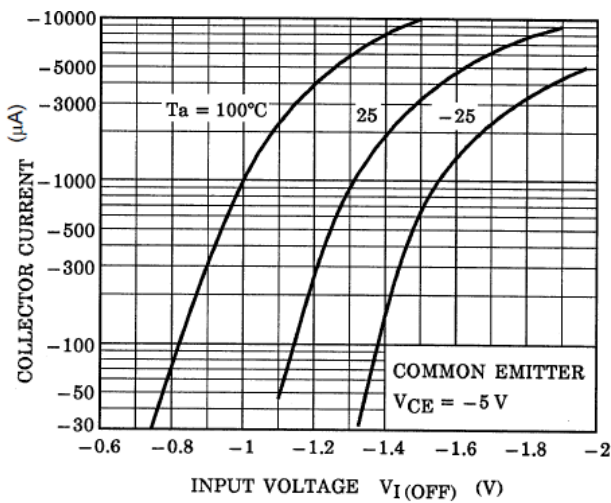


Fig. 10.9 RN2903  $I_C$ - $V_{I(OFF)}$

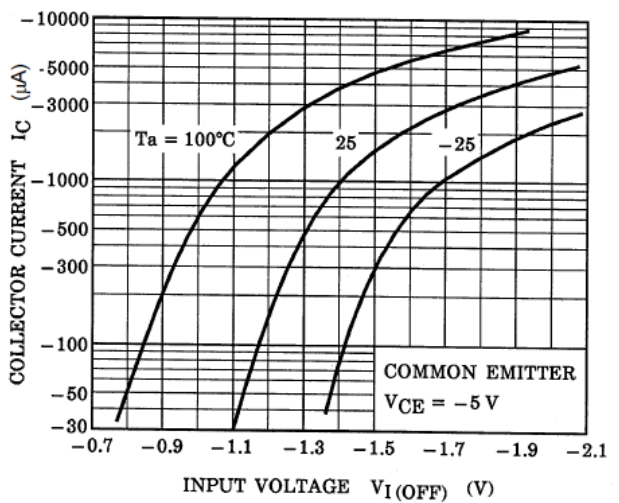


Fig. 10.10 RN2904  $I_C$ - $V_{I(OFF)}$

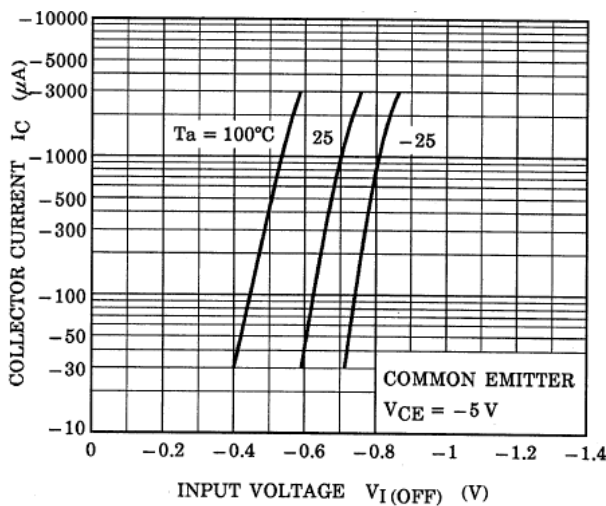


Fig. 10.11 RN2905  $I_C$ - $V_{I(OFF)}$

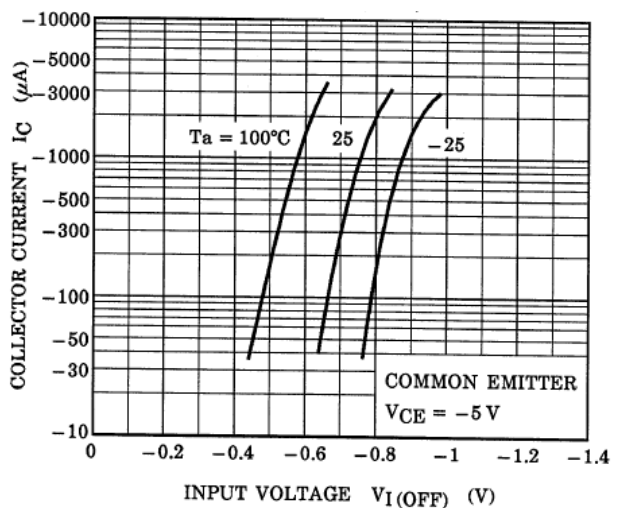


Fig. 10.12 RN2906  $I_C$ - $V_{I(OFF)}$



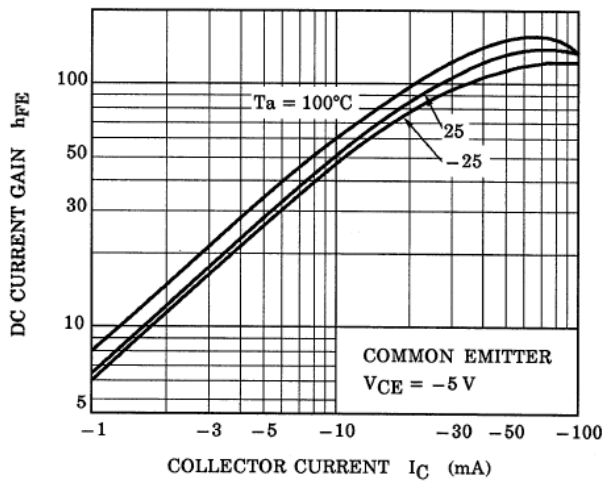


Fig. 10.13 RN2901  $h_{FE-IC}$

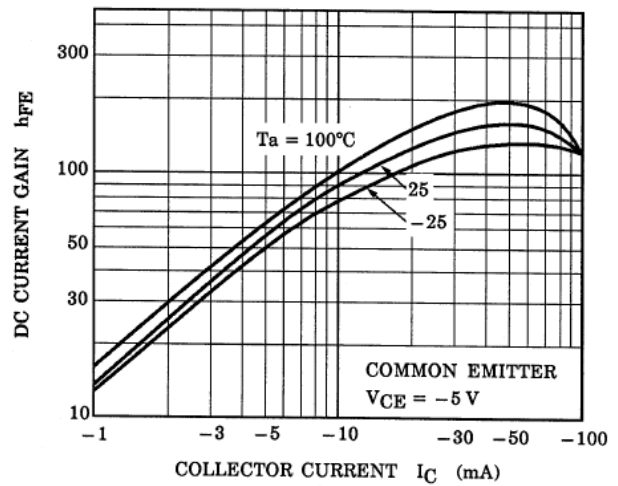


Fig. 10.14 RN2902  $h_{FE-IC}$

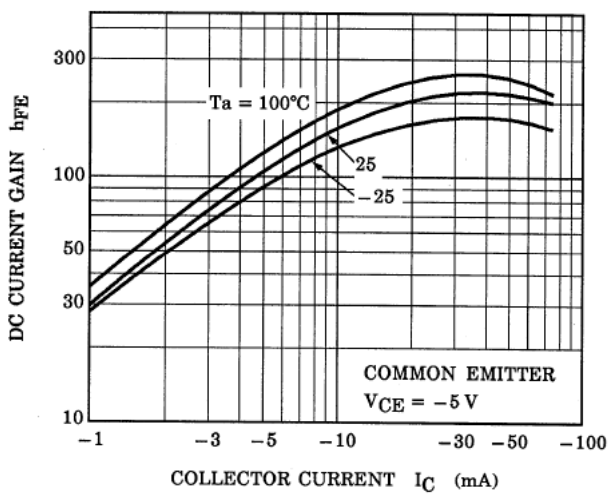


Fig. 10.15 RN2903  $h_{FE-IC}$

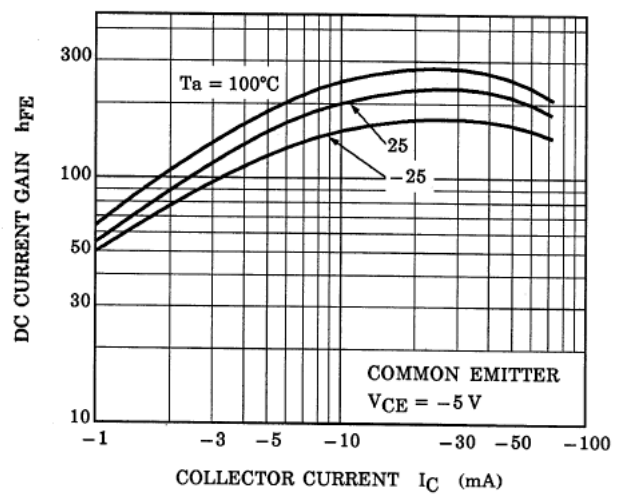


Fig. 10.16 RN2904  $h_{FE-IC}$

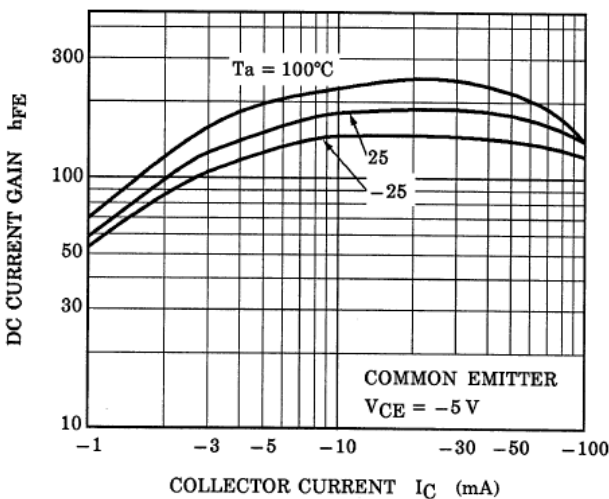


Fig. 10.17 RN2905  $h_{FE-IC}$

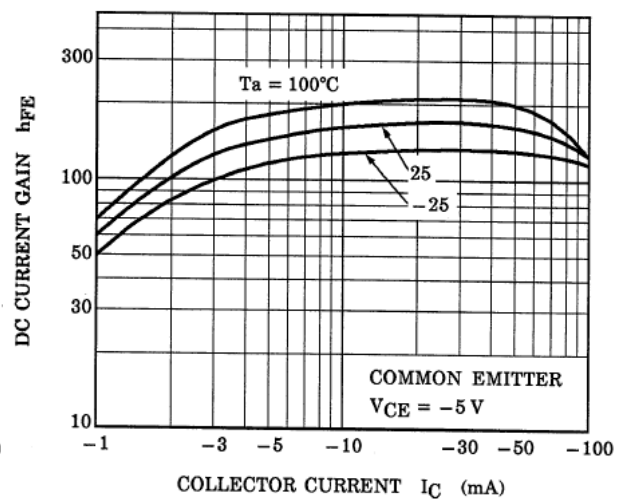


Fig. 10.18 RN2906  $h_{FE-IC}$



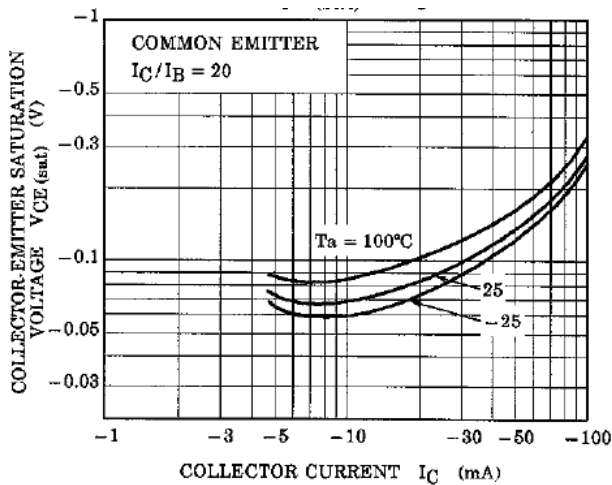


Fig. 10.19 RN2901  $V_{CE(sat)}$ - $I_C$

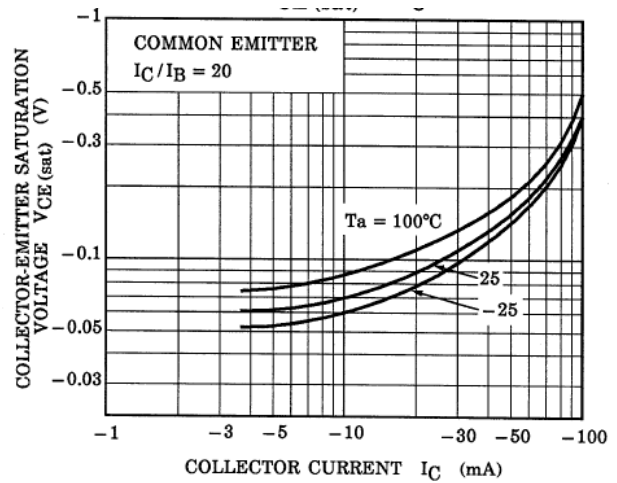


Fig. 10.20 RN2902  $V_{CE(sat)}$ - $I_C$

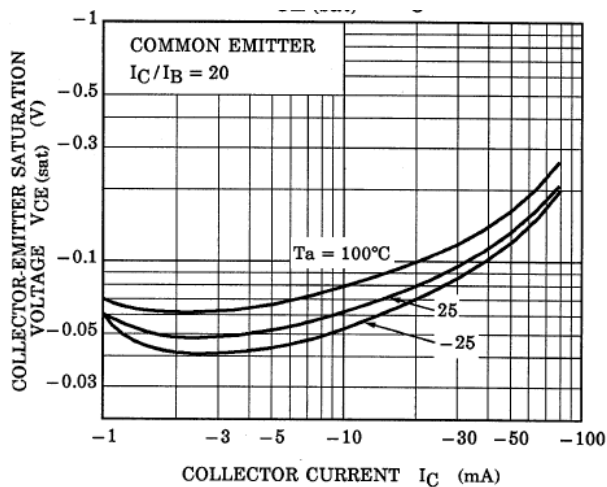


Fig. 10.21 RN2903  $V_{CE(sat)}$ - $I_C$

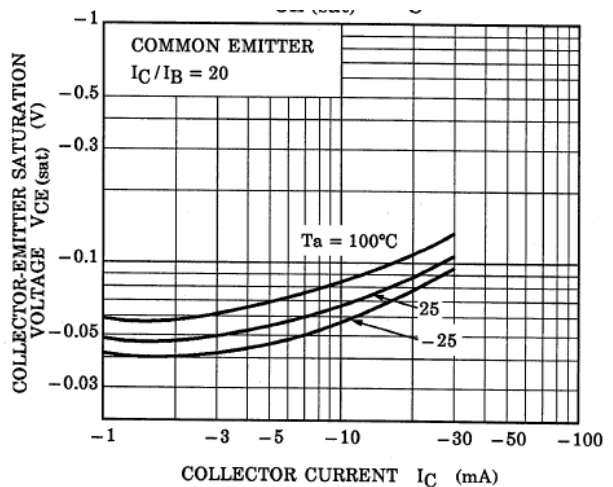


Fig. 10.22 RN2904  $V_{CE(sat)}$ - $I_C$

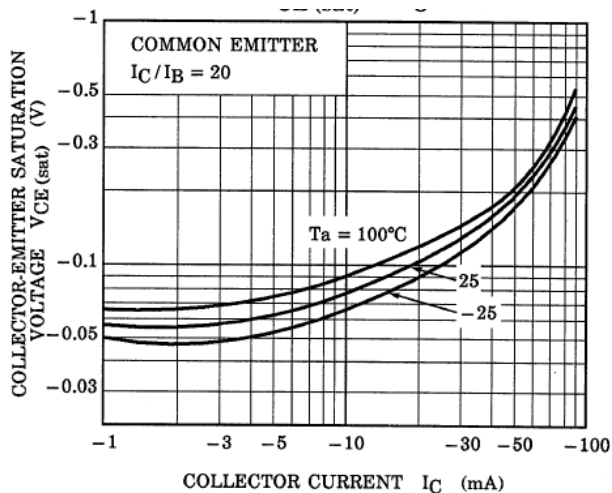


Fig. 10.23 RN2905  $V_{CE(sat)}$ - $I_C$

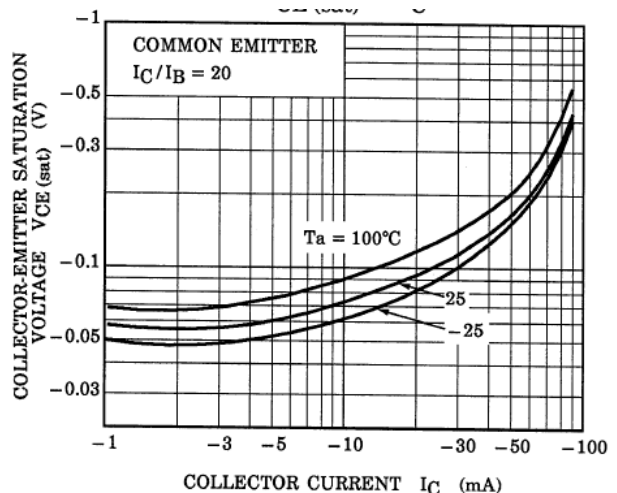
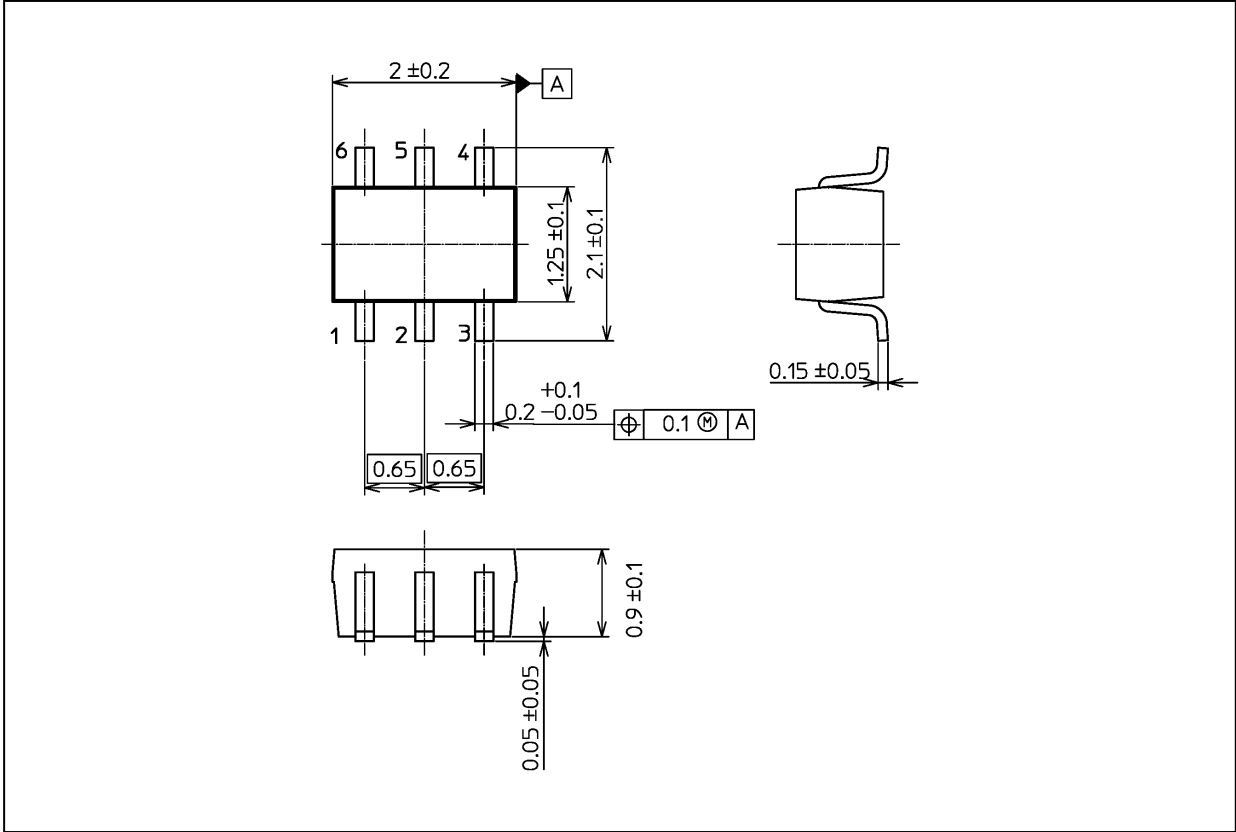


Fig. 10.24 RN1206  $V_{CE(sat)}$ - $I_C$

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

Package Dimensions

Unit: mm



Weight: 6.8 mg (typ.)

Package Name(s)
Nickname: US6

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