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

RN2414/15/16/17/18

1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

2. Features

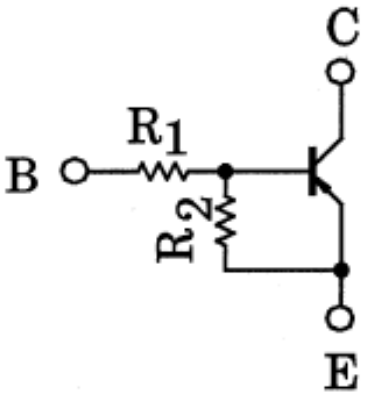
(1) AEC-Q101 qualified (Please see the orderable part number list)

(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 RN1414 to RN1418

3. Equivalent Circuit

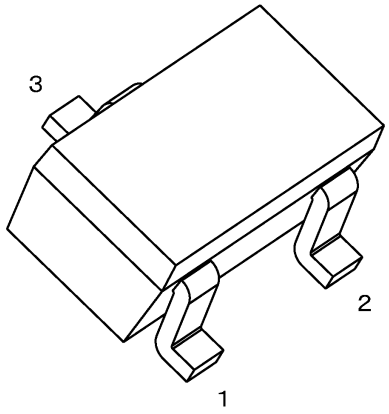


4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2414	1	10
RN2415	2.2	10
RN2416	4.7	10
RN2417	10	4.7
RN2418	47	10

Start of commercial production
1994-08

5. Packaging and Pin Assignment



1: Base
2: Emitter
3: Collector

S-Mini

6. Orderable part number

Orderable part number		AEC-Q101	Note	Note	
RN2414	RN2414(TE85L,F)	—		General Use	
	—	YES	(Note 1)	Unintended Use	(Note 1)
RN2415	RN2415,LF	—		General Use	
	RN2415,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2415,LXHF	YES		Automotive Use	
RN2416	RN2416,LF	—		General Use	
	RN2416,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2416,LXHF	YES		Automotive Use	
RN2417	RN2417,LF	—		General Use	
	RN2417,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2417,LXHF	YES		Automotive Use	
RN2418	RN2418,LF	—		General Use	
	RN2418,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2418,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 °C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2414～RN2418	V_{CBO}	-50	V
Collector-emitter voltage		V_{CEO}	-50	
Emitter-base voltage	RN2414	V_{EBO}	-5	V
	RN2415		-6	
	RN2416		-7	
	RN2417		-15	
	RN2418		-25	
Collector current	RN2414～RN2418	I_C	-100	mA
Collector power dissipation		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).

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2414～RN2418	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	RN2414	I_{EBO}	V_{EB} = -5 V, I_C = 0 mA	-0.35	—	-0.65	mA
	RN2415		V_{EB} = -6 V, I_C = 0 mA	-0.37	—	-0.71	
	RN2416		V_{EB} = -7 V, I_C = 0 mA	-0.36	—	-0.68	
	RN2417		V_{EB} = -15 V, I_C = 0 mA	-0.78	—	-1.46	
	RN2418		V_{EB} = -25 V, I_C = 0 mA	-0.33	—	-0.63	
DC current gain	RN2414 ~ RN2416, RN2418	h_{FE}	V_{CE} = -5 V, I_C = -10 mA	50	—	—	—
	RN2417			30	—	—	
Collector-emitter saturation voltage	RN2414～RN2418	$V_{CE(sat)}$	I_C = -5 mA, I_B = -0.25 mA	—	-0.1	-0.3	V
Input voltage (ON)	RN2414	$V_{I(ON)}$	V_{CE} = -0.2 V, I_C = -5 mA	-0.5	—	-2.0	V
	RN2415			-0.6	—	-2.5	
	RN2416			-0.7	—	-2.5	
	RN2417			-1.5	—	-3.5	
	RN2418			-2.5	—	-10.0	
Input voltage (OFF)	RN2414	$V_{I(OFF)}$	V_{CE} = -5 V, I_C = -0.1 mA	-0.3	—	-0.9	V
	RN2415			-0.3	—	-1.0	
	RN2416			-0.3	—	-1.1	
	RN2417			-0.3	—	-3.0	
	RN2418			-0.5	—	-5.7	
Transition frequency	RN2414～RN2418	f_T	V_{CE} = -10 V, I_C = -5 mA	—	200	—	MHz
Collector output capacitance	RN2414～RN2418	C_{ob}	V_{CB} = -10 V, I_E = 0 mA, f = 1 MHz	—	3.0	6.0	pF
Input resistance	RN2414	R_1	-	0.7	1.0	1.3	kΩ
	RN2415			1.54	2.2	2.86	
	RN2416			3.29	4.7	6.11	
	RN2417			7.0	10.0	13.0	
	RN2418			32.9	47.0	61.1	
Resistor ratio	RN2414	R1/R2	-	—	0.1	—	—
	RN2415			—	0.22	—	
	RN2416			—	0.47	—	
	RN2417			—	2.13	—	
	RN2418			—	4.7	—	

9. Marking

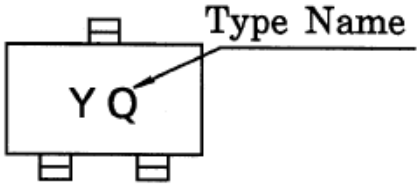


Fig. 9.1 Marking RN2414

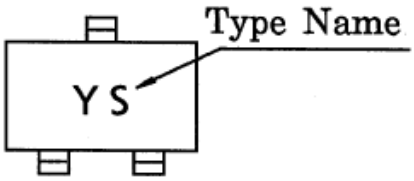


Fig. 9.2 Marking RN2415

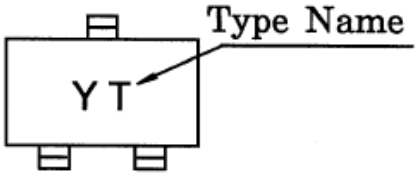


Fig. 9.3 Marking RN2416

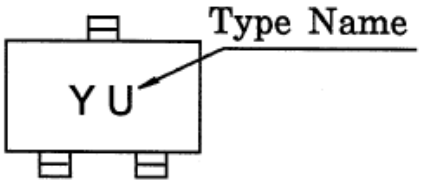


Fig. 9.4 Marking RN2417

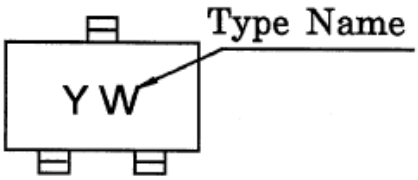


Fig. 9.5 Marking RN2418

10. Characteristics Curves (Note)

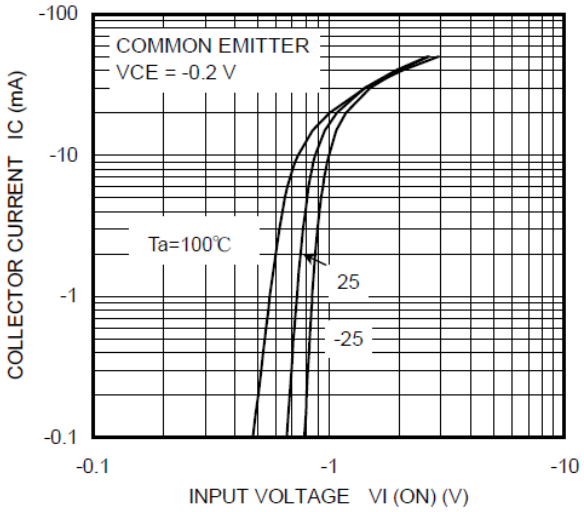


Fig. 10.1 RN2414 I_C-$V_{I(ON)}$

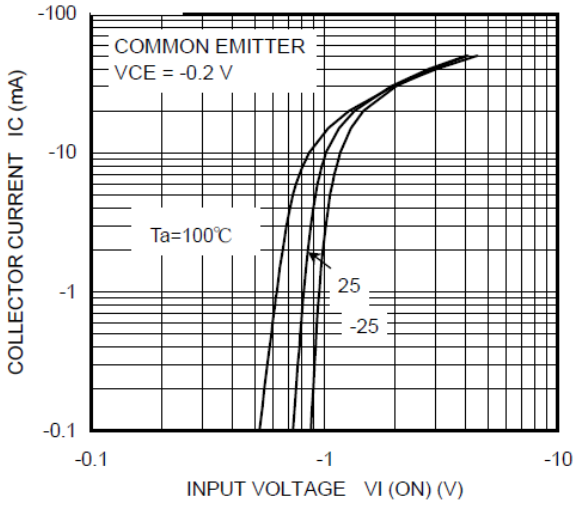


Fig. 10.2 RN2415 I_C-$V_{I(ON)}$

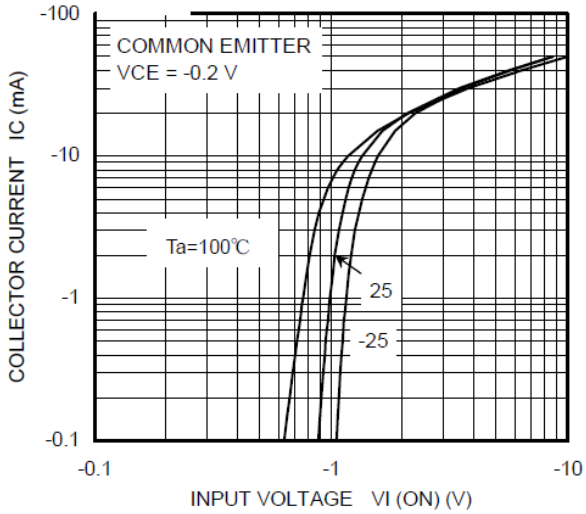


Fig. 10.3 RN2416 I_C-$V_{I(ON)}$

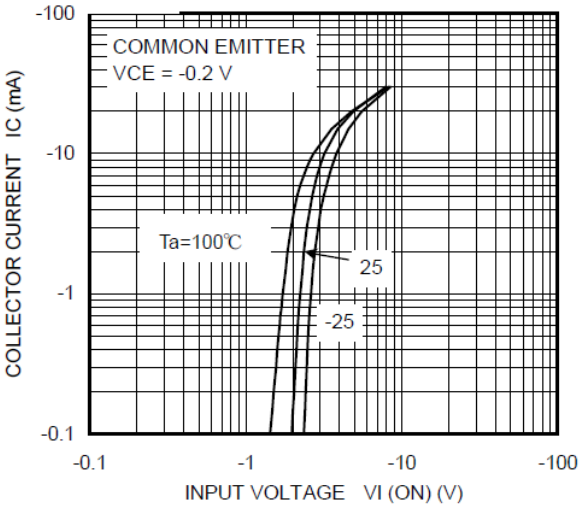


Fig. 10.4 RN2417 I_C-$V_{I(ON)}$

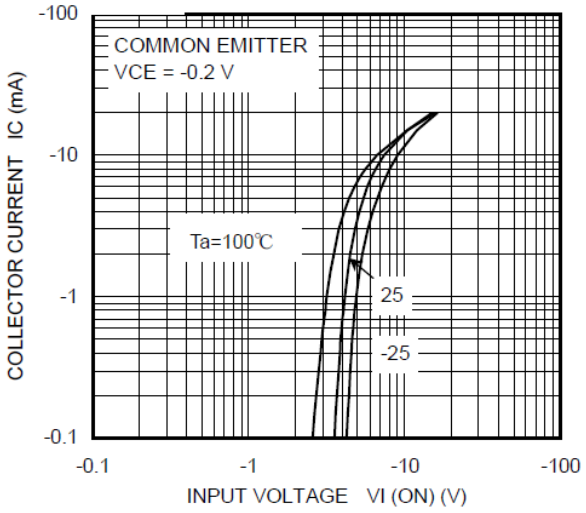


Fig. 10.5 RN2418 I_C-$V_{I(ON)}$

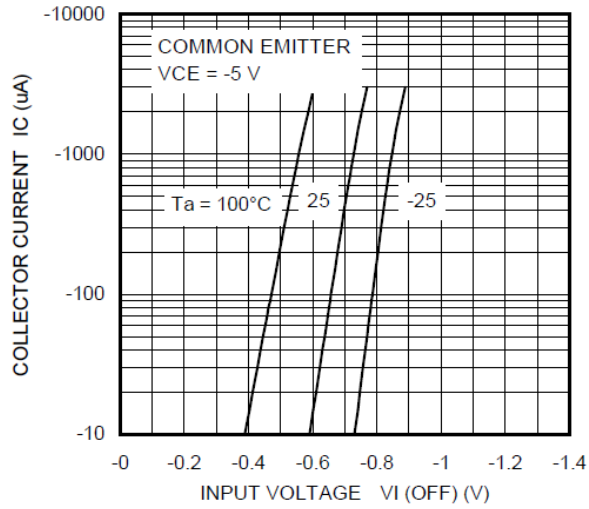


Fig. 10.6 RN2414 I_C-$V_{I(OFF)}$

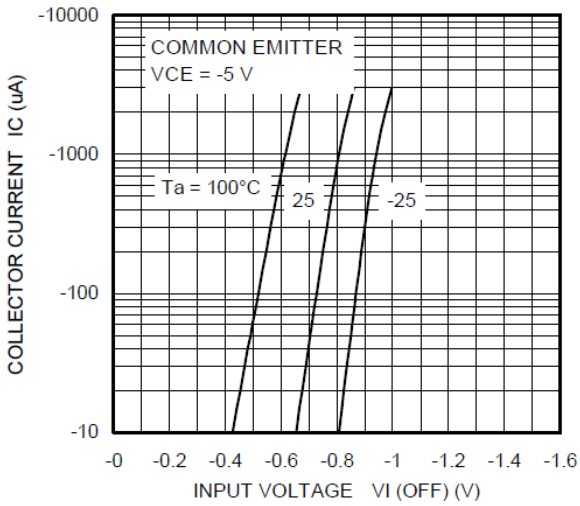


Fig. 10.7 RN2415 I_C-$V_{I(OFF)}$

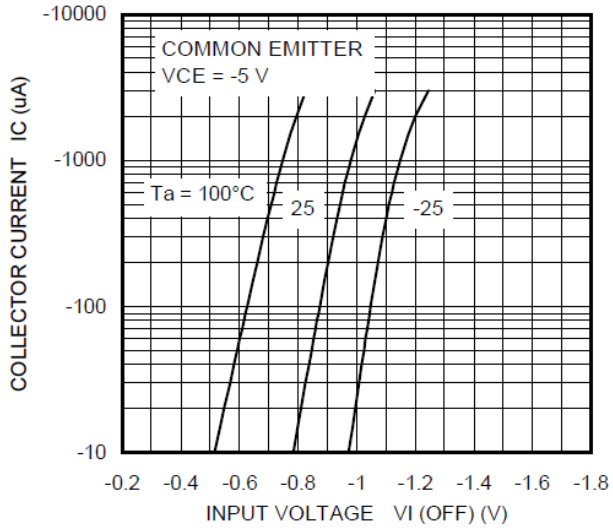


Fig. 10.8 RN2416 I_C-$V_{I(OFF)}$

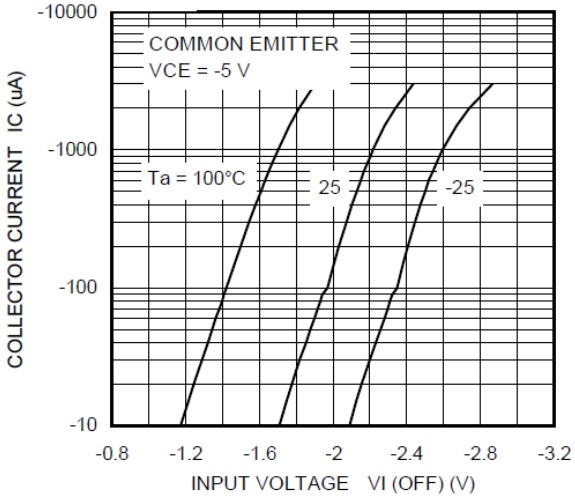


Fig. 10.9 RN2417 I_C-$V_{I(OFF)}$

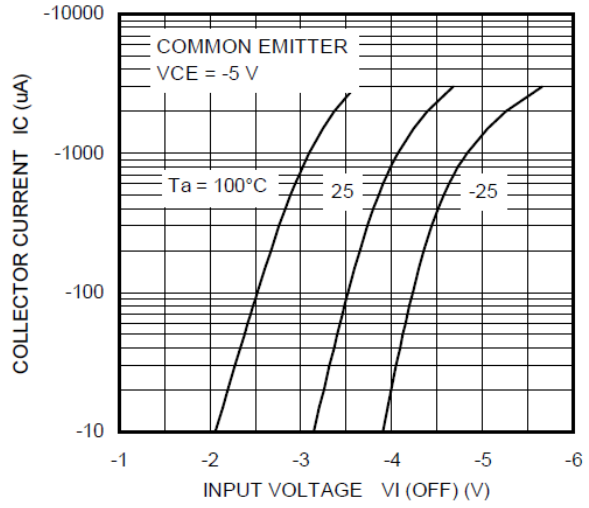


Fig. 10.10 RN2418 I_C-$V_{I(OFF)}$

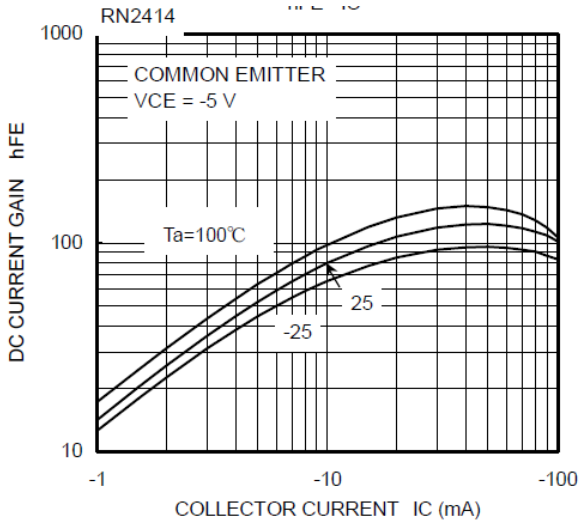


Fig. 10.11 RN2414 h_{FE}-I_C

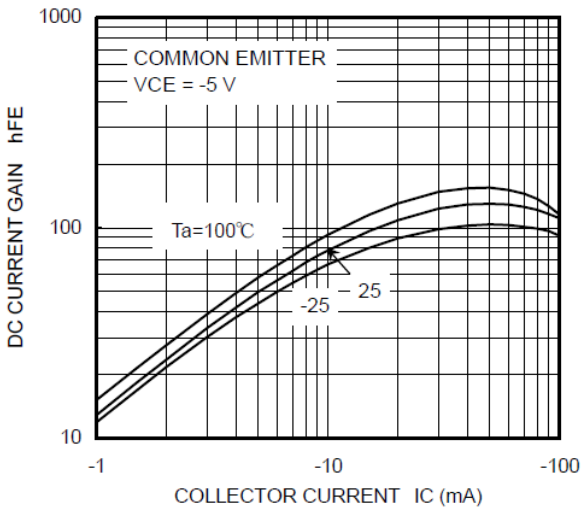


Fig. 10.12 RN2415 h_{FE}-I_C

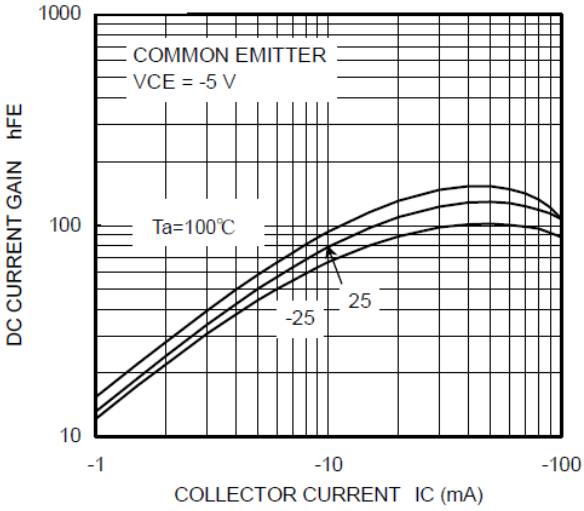


Fig. 10.13 RN2416 h_{FE}-I_C

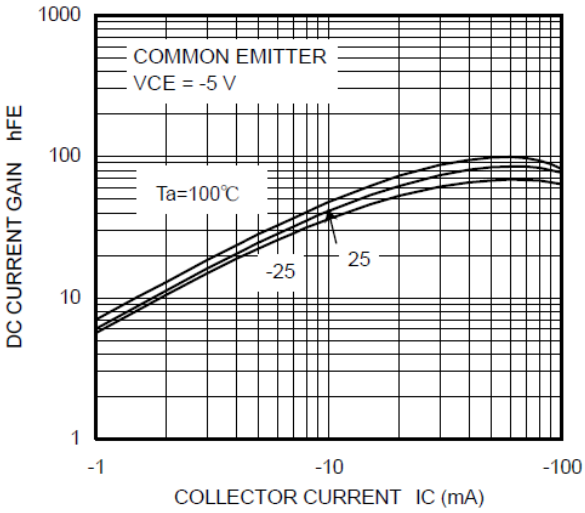


Fig. 10.14 RN2417 h_{FE}-I_C

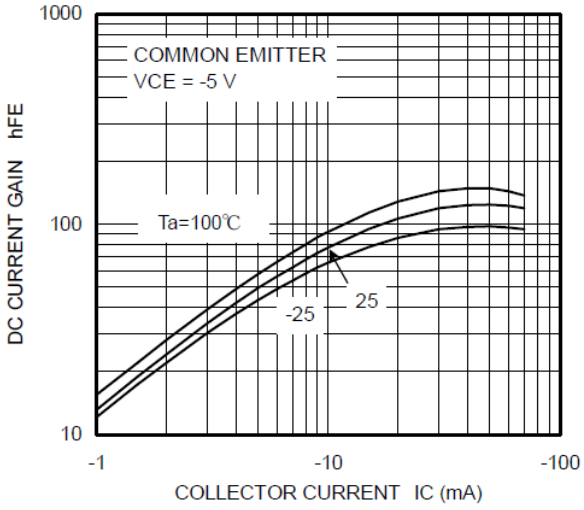


Fig. 10.15 RN2418 h_{FE}-I_C

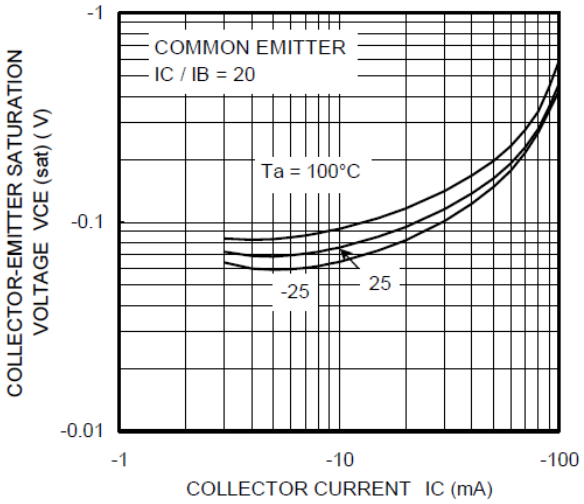


Fig. 10.16 RN2414 $V_{CE(sat)}$-I_C

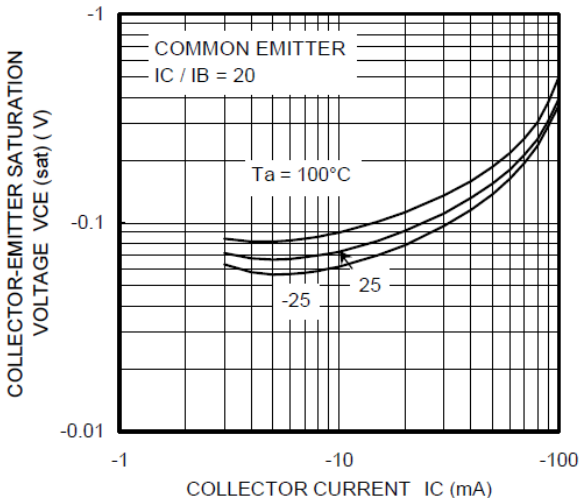


Fig. 10.17 RN2415 $V_{CE(sat)}$-I_C

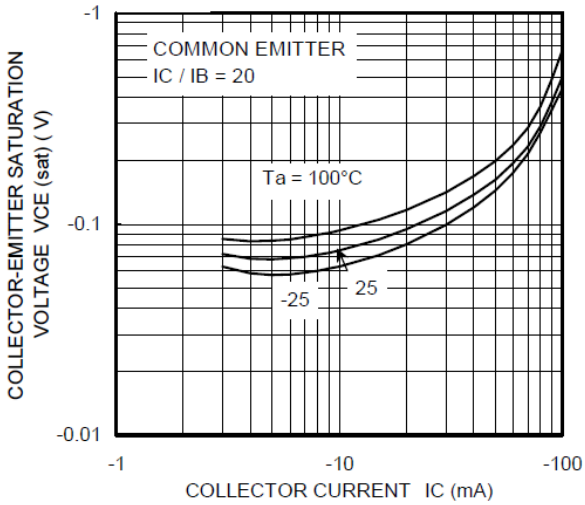


Fig. 10.18 RN2416 $V_{CE(sat)}$-I_C

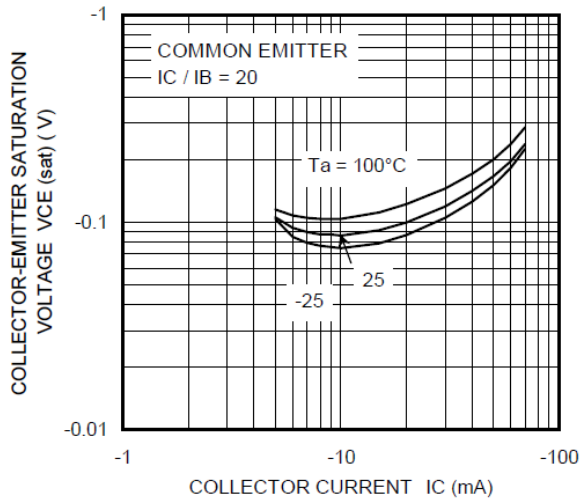


Fig. 10.19 RN2417 $V_{CE(sat)}$-I_C

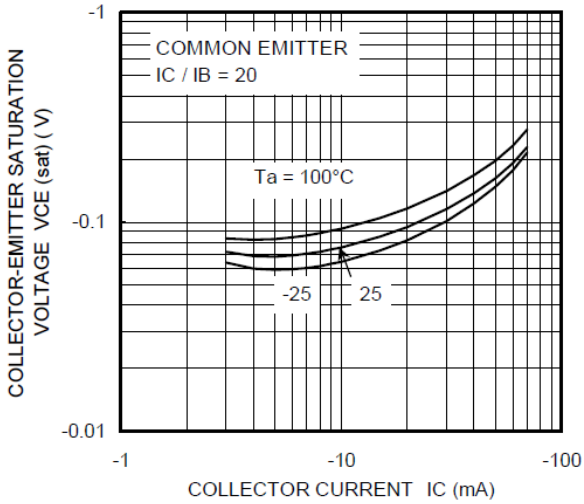
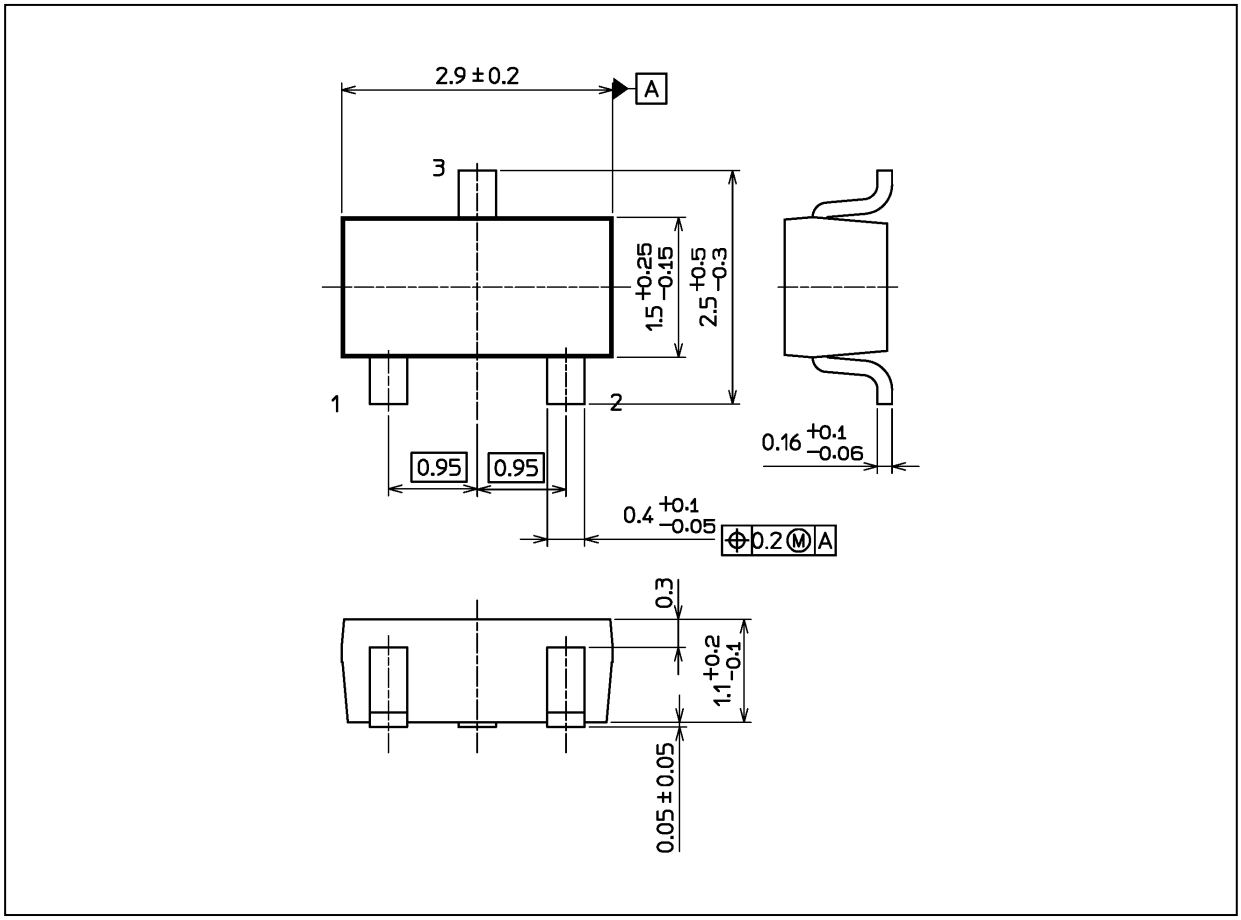


Fig. 10.20 RN2418 $V_{CE(sat)}$-I_C

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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