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

RN1314/15/16/17/18

1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

2. Features

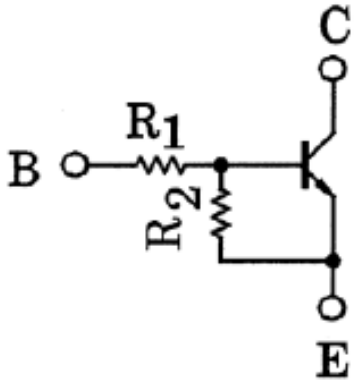
(1) AEC-Q101 qualified (Please see the orderable part number list)

(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 RN2314 to RN2318

3. Equivalent Circuit

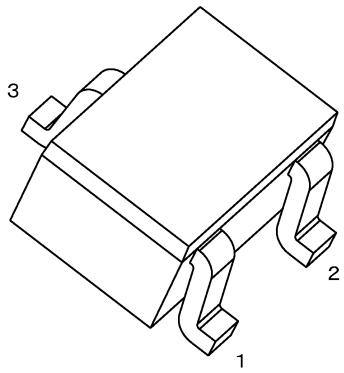


4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN1314	1	10
RN1315	2.2	10
RN1316	4.7	10
RN1317	10	4.7
RN1318	47	10

Start of commercial production
2002-11

5. Packaging and Pin Assignment



1: Base
2: Emitter
3: Collector

USM

6. Orderable part number

Orderable part number		AEC-Q101	Note	Note	
RN1314	RN1314,LF	—		General Use	
	RN1314,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	—	YES		Automotive Use	
RN1315	RN1315,LF	—		General Use	
	RN1315,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1315,LXHF	YES		Automotive Use	
RN1316	RN1316,LF	—		General Use	
	RN1316,LXGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1316,LXHF	YES		Automotive Use	
RN1317	RN1317(TE85L,F)	—		General Use	
	—	YES	(Note 1)	Unintended Use	(Note 1)
	—	YES		Automotive Use	
RN1318	RN1318(TE85L,F)	—		General Use	
	—	YES	(Note 1)	Unintended Use	(Note 1)
	—	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	RN1314～RN1318	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	
Emitter-base voltage	RN1314	V_{EBO}	5	V
	RN1315		6	
	RN1316		7	
	RN1317		15	
	RN1318		25	
Collector current	RN1314～RN1318	I_C	100	mA
Collector power dissipation		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).

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1314～RN1318	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	RN1314	I_{EBO}	V_{EB} = 5 V, I_C = 0 mA	0.35	—	0.65	mA
	RN1315		V_{EB} = 6 V, I_C = 0 mA	0.37	—	0.71	
	RN1316		V_{EB} = 7 V, I_C = 0 mA	0.36	—	0.68	
	RN1317		V_{EB} = 15 V, I_C = 0 mA	0.78	—	1.46	
	RN1318		V_{EB} = 25 V, I_C = 0 mA	0.33	—	0.63	
DC current gain	RN1314 ~ RN1316, RN1318	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	50	—	—	—
	RN1317			30	—	—	
Collector-emitter saturation voltage	RN1314～RN1318	$V_{CE(sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	RN1314	$V_{I(ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	0.6	—	2.0	V
	RN1315			0.7	—	2.5	
	RN1316			0.8	—	2.5	
	RN1317			1.5	—	3.5	
	RN1318			2.5	—	10.0	
Input voltage (OFF)	RN1314	$V_{I(OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	0.3	—	0.9	V
	RN1315			0.3	—	1.0	
	RN1316			0.3	—	1.1	
	RN1317			0.3	—	2.3	
	RN1318			0.5	—	5.7	
Transition frequency	RN1314～RN1318	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	RN1314～RN1318	C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	3.0	6.0	pF
Input resistance	RN1314	R_1	-	0.7	1.0	1.3	kΩ
	RN1315			1.54	2.2	2.86	
	RN1316			3.29	4.7	6.11	
	RN1317			7.0	10.0	13.0	
	RN1318			32.9	47.0	61.1	
Resistor ratio	RN1314	R1/R2	-	—	0.1	—	—
	RN1315			—	0.22	—	
	RN1316			—	0.47	—	
	RN1317			—	2.13	—	
	RN1318			—	4.7	—	

9. Marking

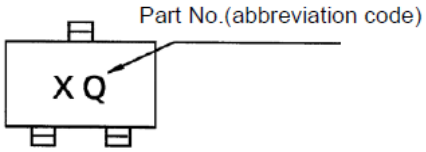


Fig. 9.1 Marking RN1314

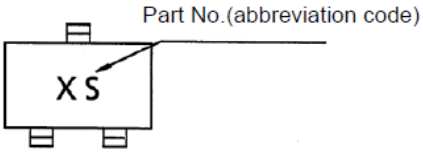


Fig. 9.2 Marking RN1315

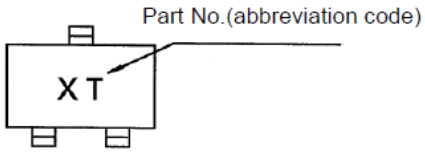


Fig. 9.3 Marking RN1316

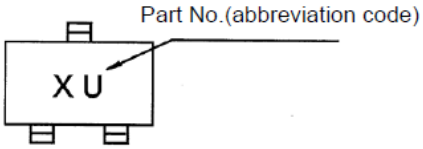


Fig. 9.4 Marking RN1317

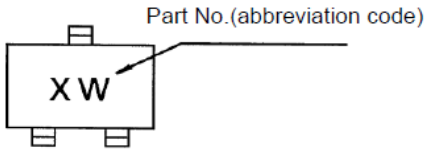


Fig. 9.5 Marking RN1318

10. Characteristics Curves (Note)

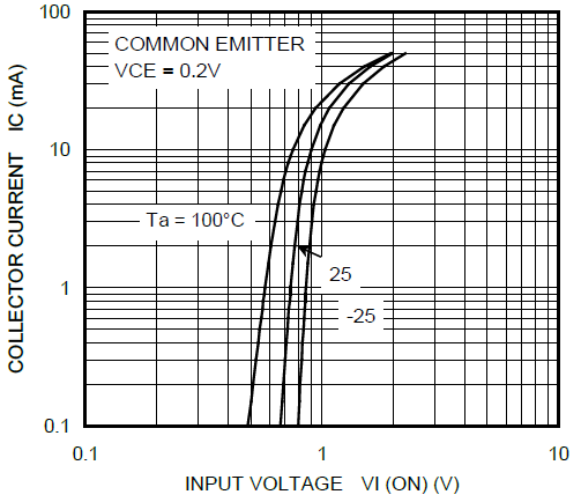


Fig. 10.1 RN1314 I_C-$V_{I(ON)}$

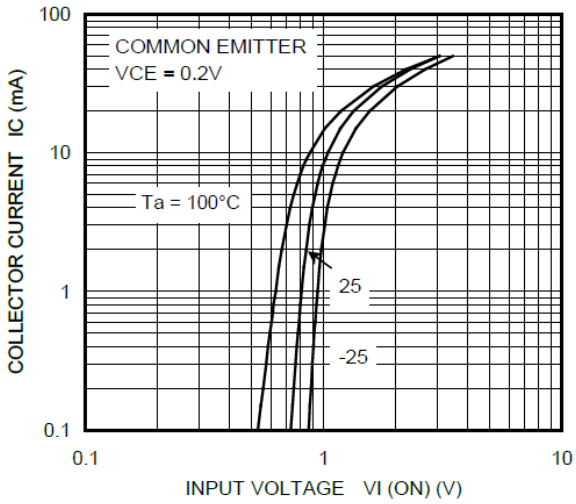


Fig. 10.2 RN1315 I_C-$V_{I(ON)}$

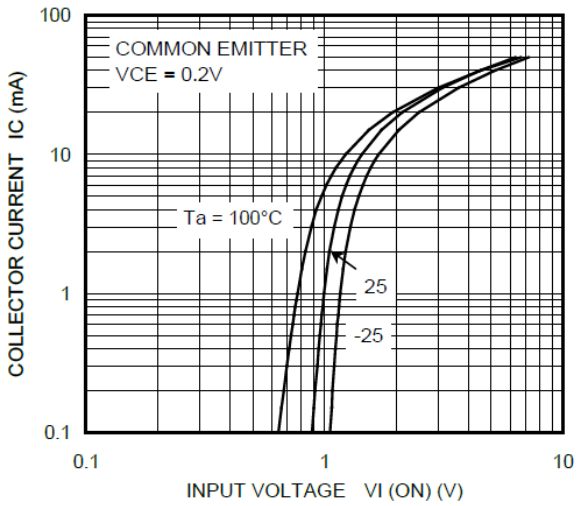


Fig. 10.3 RN1316 I_C-$V_{I(ON)}$

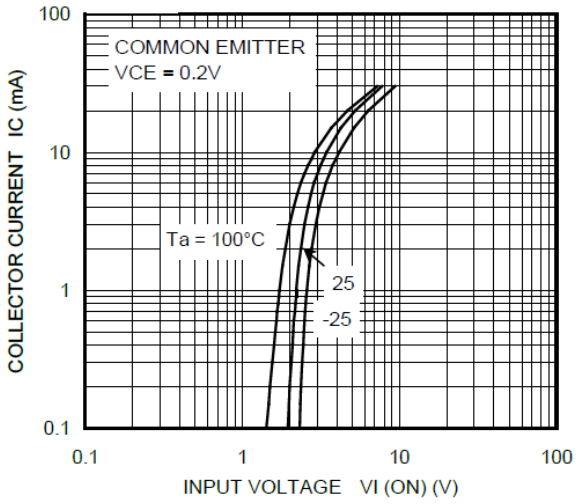


Fig. 10.4 RN1317 I_C-$V_{I(ON)}$

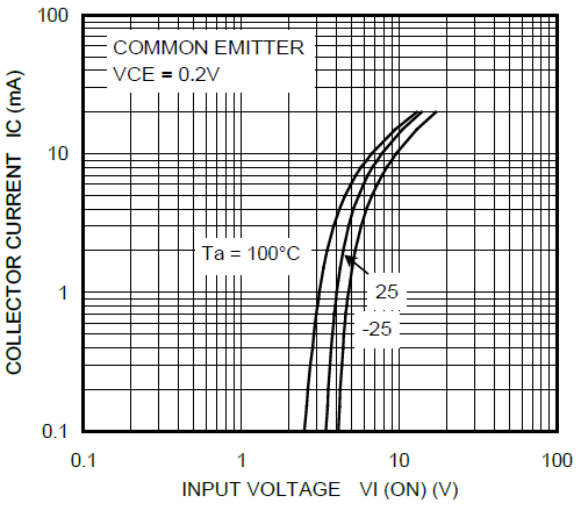


Fig. 10.5 RN1318 I_C-$V_{I(ON)}$

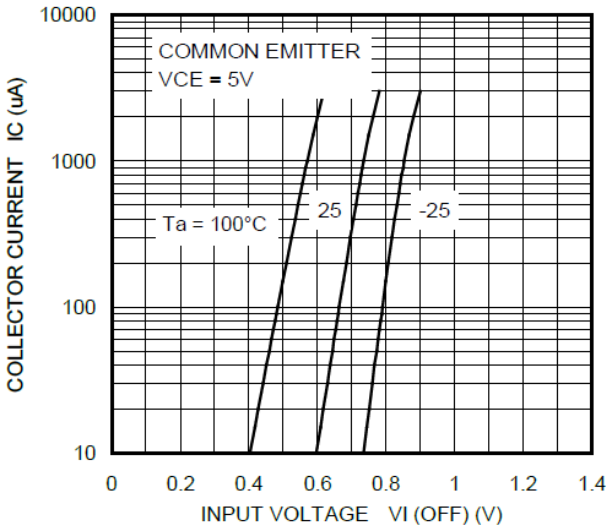


Fig. 10.6 RN1314 I_C-$V_{I(OFF)}$

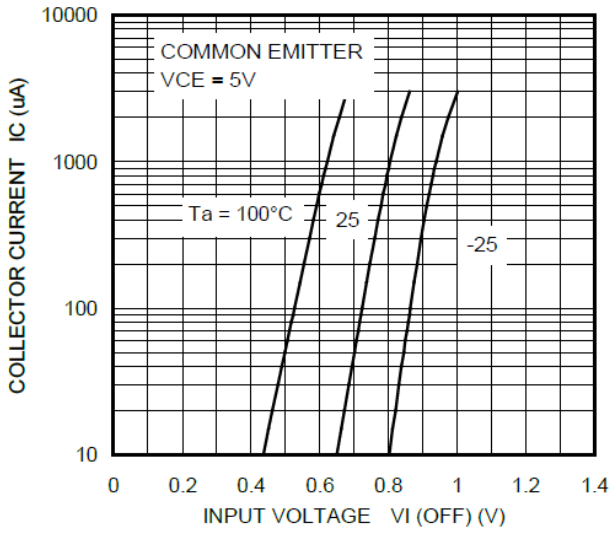


Fig. 10.7 RN1315 I_C-$V_{I(OFF)}$

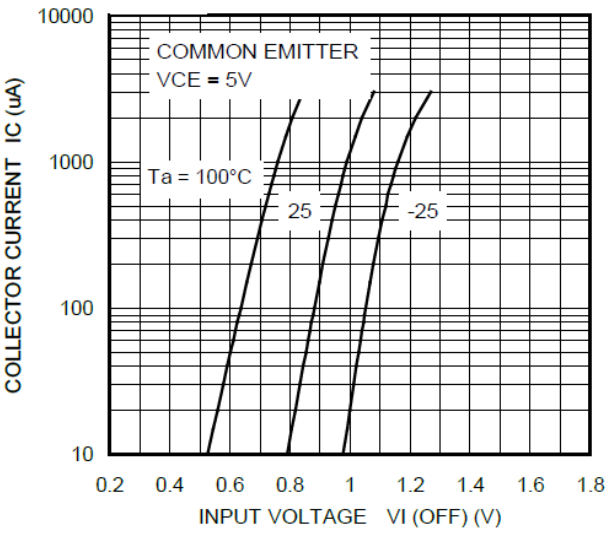


Fig. 10.8 RN1316 I_C-$V_{I(OFF)}$

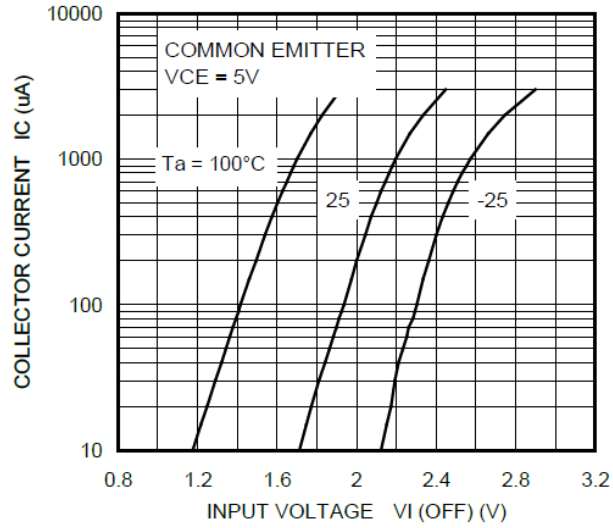


Fig. 10.9 RN1317 I_C-$V_{I(OFF)}$

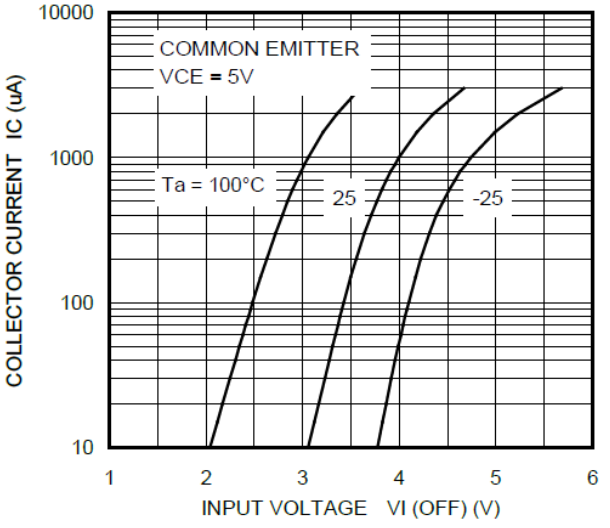


Fig. 10.10 RN1318 I_C-$V_{I(OFF)}$

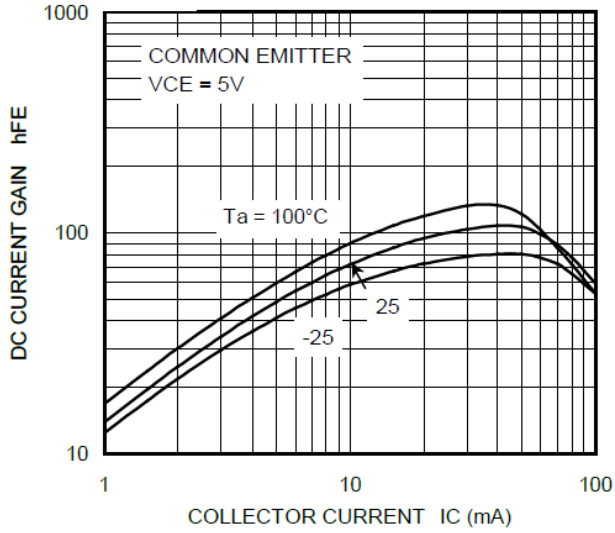


Fig. 10.11 RN1314 h_{FE}-I_C

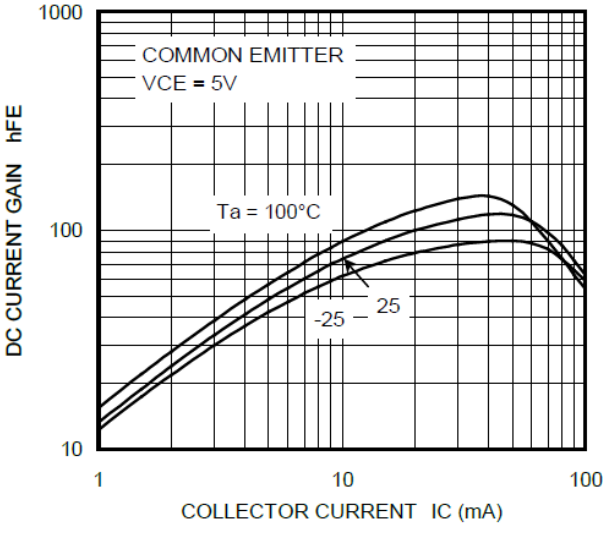


Fig. 10.12 RN1315 h_{FE}-I_C

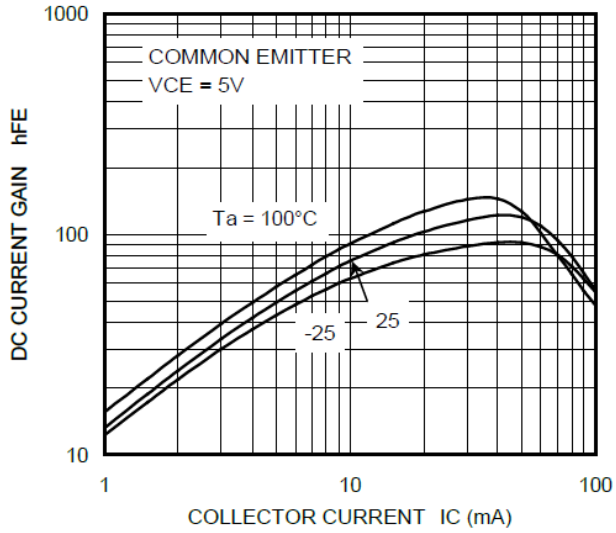


Fig. 10.13 RN1316 h_{FE}-I_C

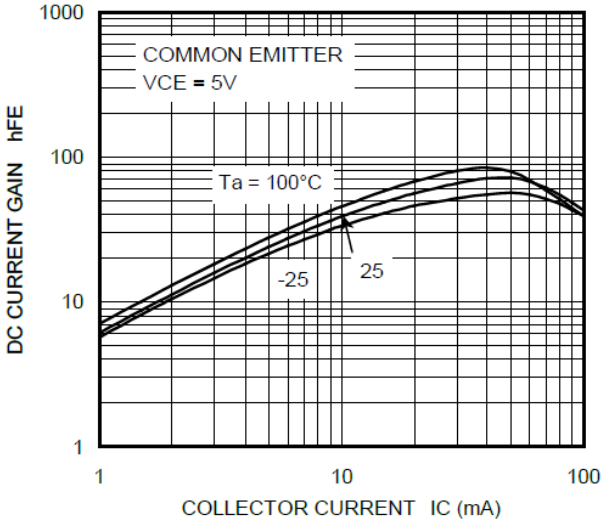


Fig. 10.14 RN1317 h_{FE}-I_C

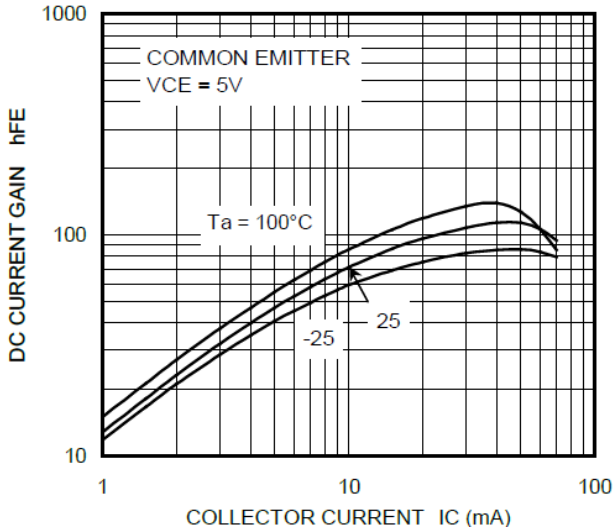


Fig. 10.15 RN1318 h_{FE}-I_C

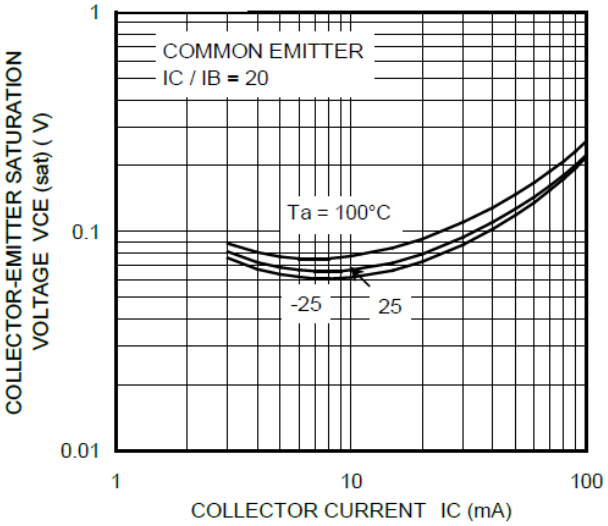


Fig. 10.16 RN1314 $V_{CE(sat)}$-I_C

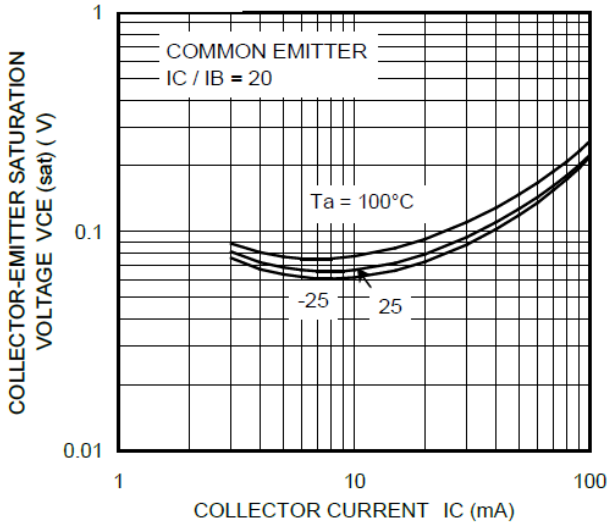


Fig. 10.17 RN1315 $V_{CE(sat)}$-I_C

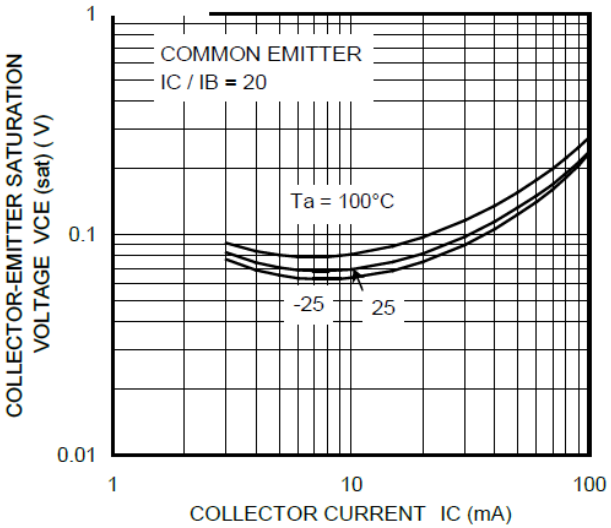


Fig. 10.18 RN1316 $V_{CE(sat)}$-I_C

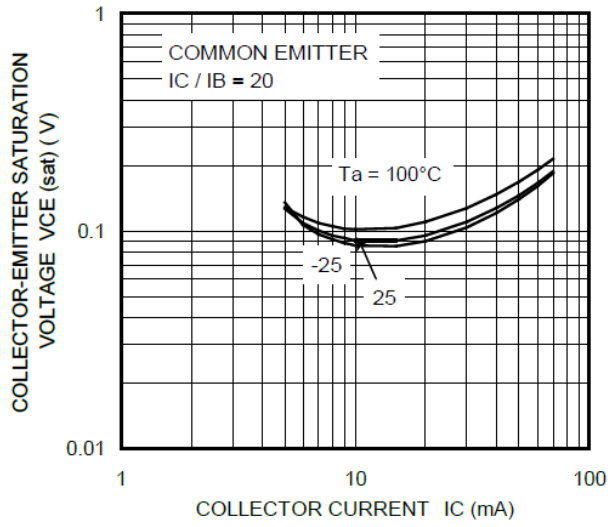


Fig. 10.19 RN1317 $V_{CE(sat)}$-I_C

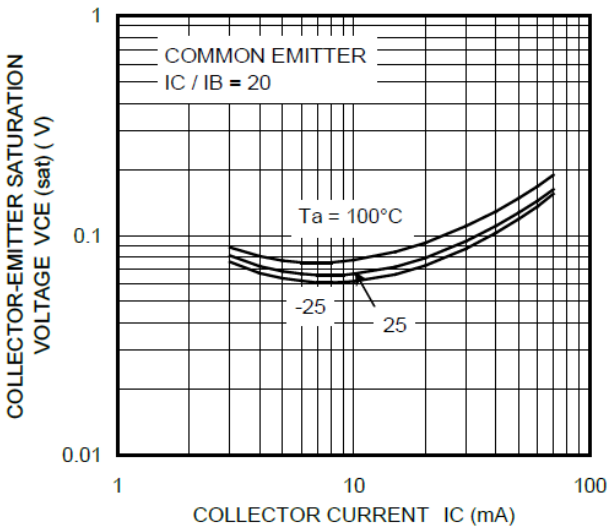
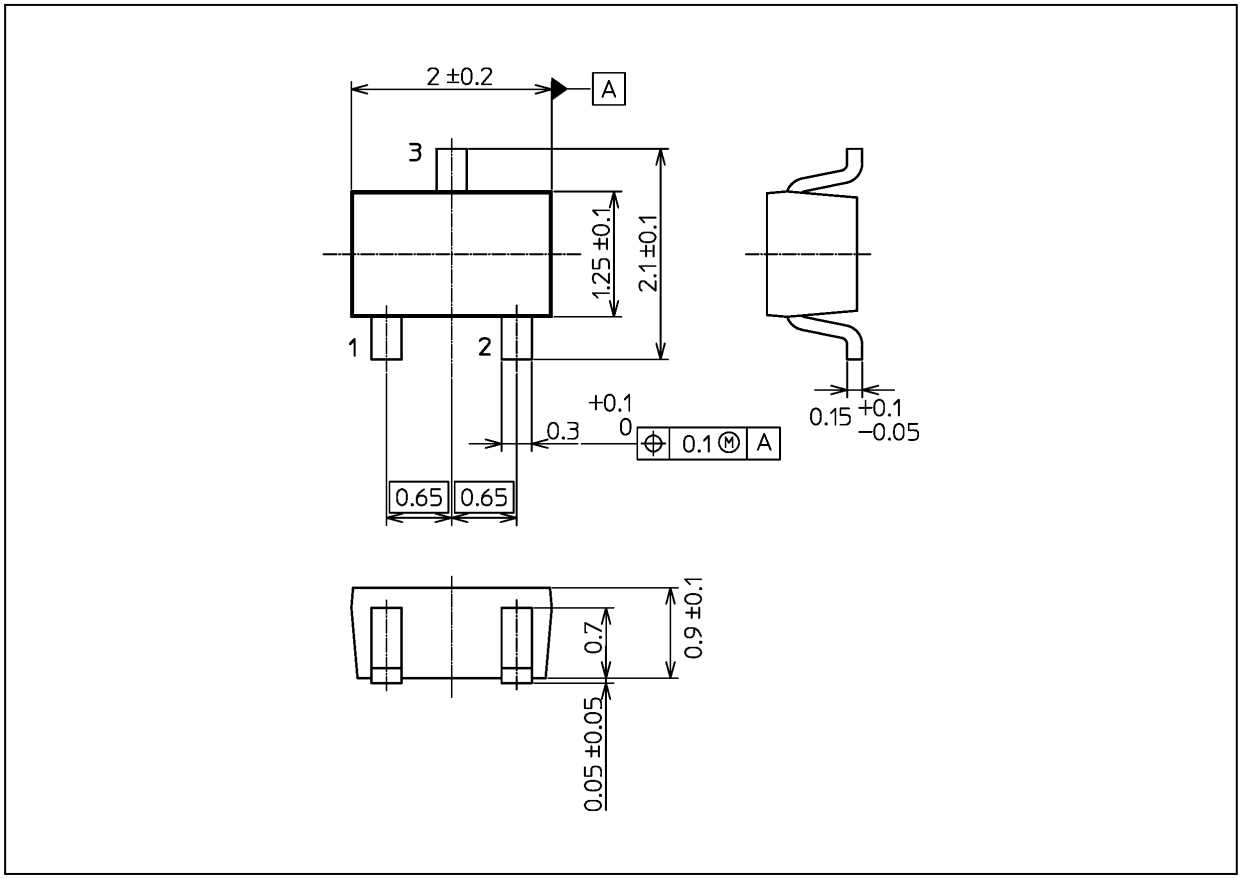


Fig. 10.20 RN1318 $V_{CE(sat)}$-I_C

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

Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

Package Name(s)
TOSHIBA: 2-2E1S
Nickname: USM

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