

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

# RN1314/15/16/17/18

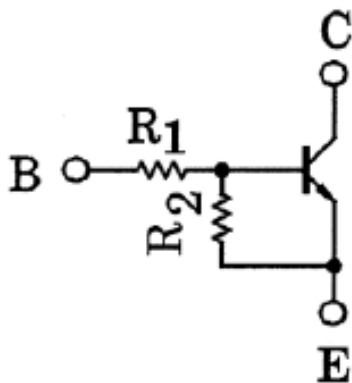
## 1. Applications

- 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

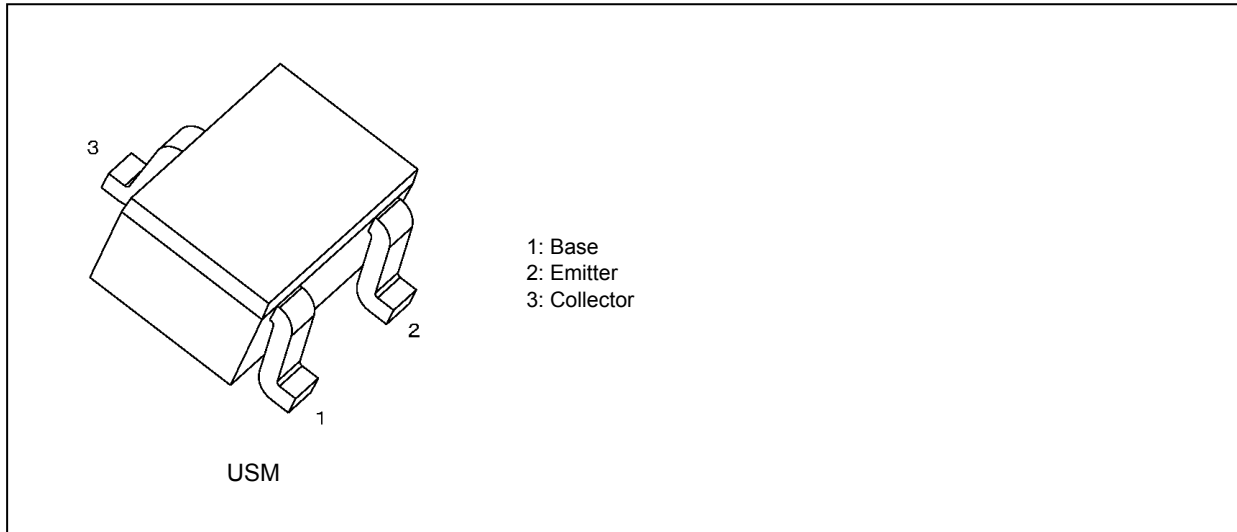


## 4. Bias Resistor Values

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



### 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, $T_a = 25\text{ }^\circ\text{C}$ )

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	$^\circ\text{C}$
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, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1314~ RN1318	$I_{CBO}$	$V_{CB} = 50\text{ V}, I_E = 0\text{ mA}$	—	—	100	nA
		$I_{CEO}$	$V_{CE} = 50\text{ V}, I_B = 0\text{ mA}$	—	—	500	
Emitter cut-off current	RN1314	$I_{EBO}$	$V_{EB} = 5\text{ V}, I_C = 0\text{ mA}$	0.35	—	0.65	mA
	RN1315		$V_{EB} = 6\text{ V}, I_C = 0\text{ mA}$	0.37	—	0.71	
	RN1316		$V_{EB} = 7\text{ V}, I_C = 0\text{ mA}$	0.36	—	0.68	
	RN1317		$V_{EB} = 15\text{ V}, I_C = 0\text{ mA}$	0.78	—	1.46	
	RN1318		$V_{EB} = 25\text{ V}, I_C = 0\text{ mA}$	0.33	—	0.63	
DC current gain	RN1314 - RN1316, RN1318	$h_{FE}$	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	50	—	—	—
	RN1317			30	—	—	
Collector-emitter saturation voltage	RN1314~ RN1318	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$	—	0.1	0.3	V
Input voltage (ON)	RN1314	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	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	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	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	$f_T$	$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	—	250	—	MHz
Collector output capacitance	RN1314~ RN1318	$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	3.0	6.0	pF
Input resistance	RN1314	$R_1$	-	0.7	1.0	1.3	k $\Omega$
	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

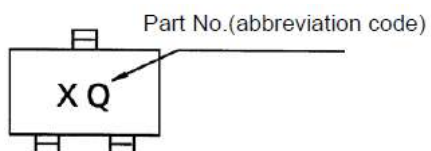


Fig. 9.1 Marking RN1314

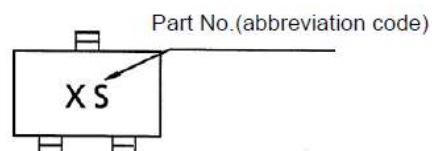


Fig. 9.2 Marking RN1315

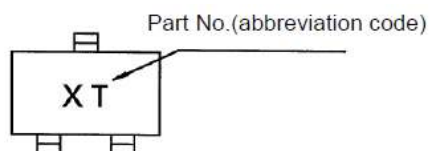


Fig. 9.3 Marking RN1316

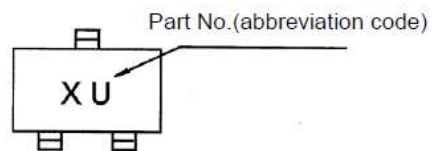


Fig. 9.4 Marking RN1317

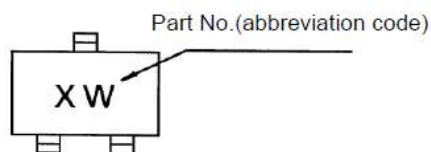


Fig. 9.5 Marking RN1318

### 10. Characteristics Curves (Note)

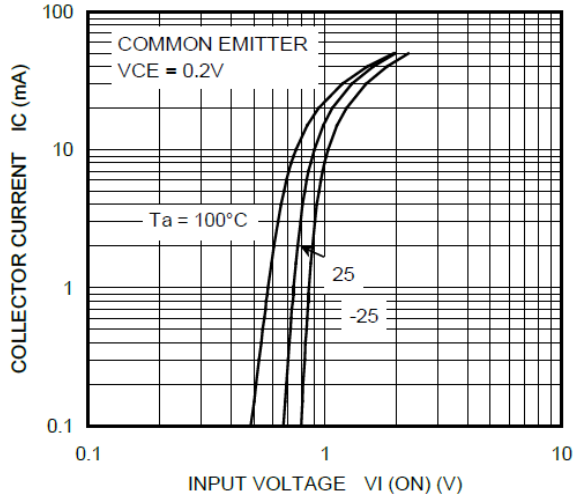


Fig. 10.1 RN1314  $I_C$ - $V_{I(ON)}$

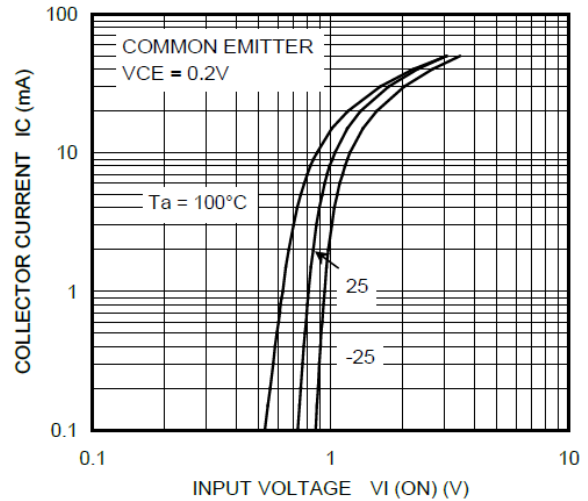


Fig. 10.2 RN1315  $I_C$ - $V_{I(ON)}$

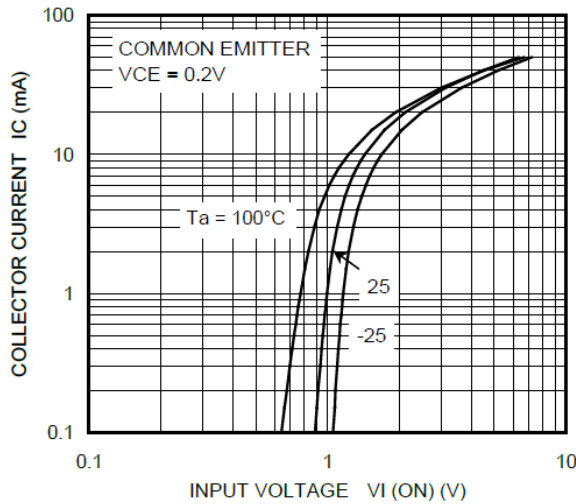


Fig. 10.3 RN1316  $I_C$ - $V_{I(ON)}$

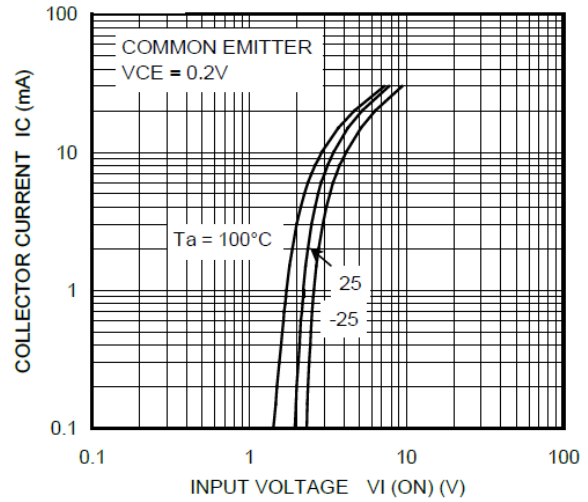


Fig. 10.4 RN1317  $I_C$ - $V_{I(ON)}$

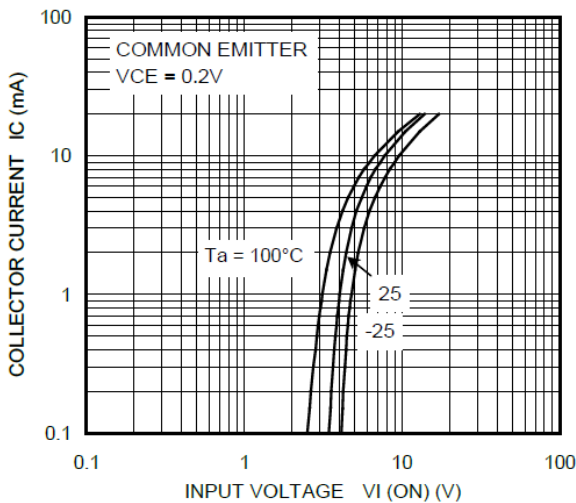


Fig. 10.5 RN1318  $I_C$ - $V_{I(ON)}$

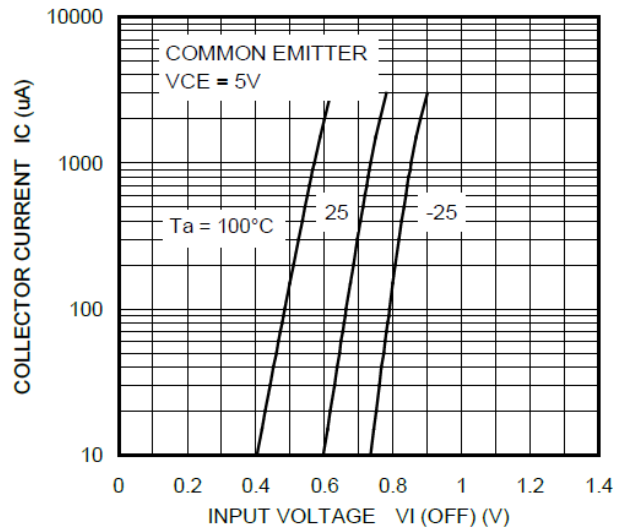


Fig. 10.6 RN1314  $I_C$ - $V_{I(OFF)}$

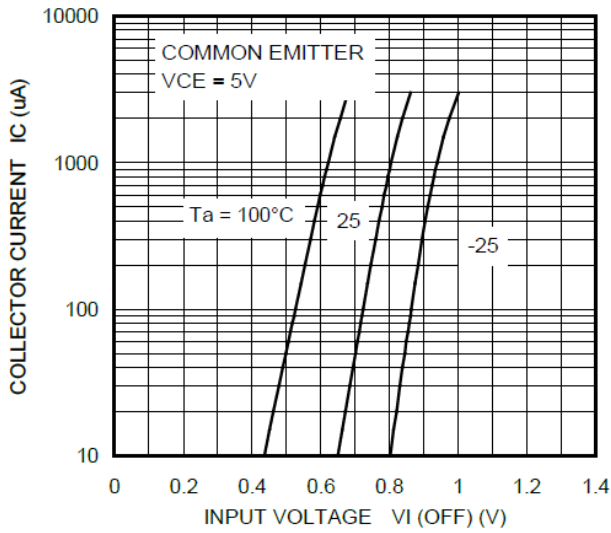


Fig. 10.7 RN1315  $I_C$ - $V_{I(OFF)}$

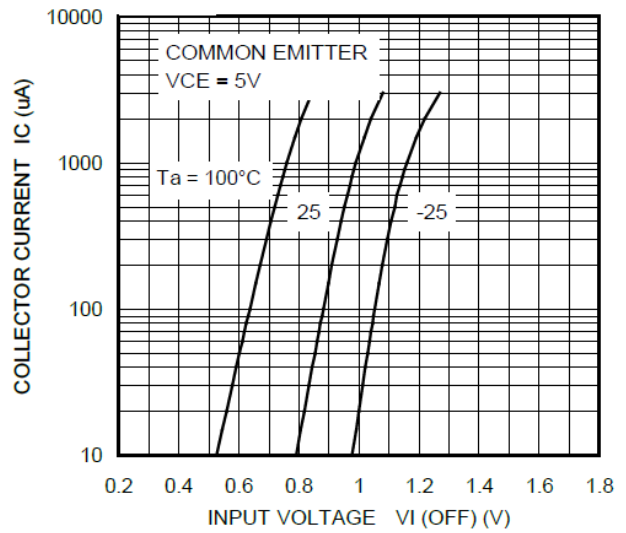


Fig. 10.8 RN1316  $I_C$ - $V_{I(OFF)}$

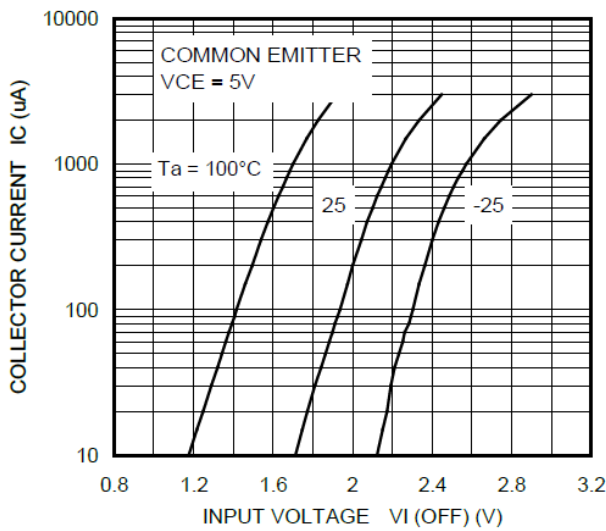


Fig. 10.9 RN1317  $I_C$ - $V_{I(OFF)}$

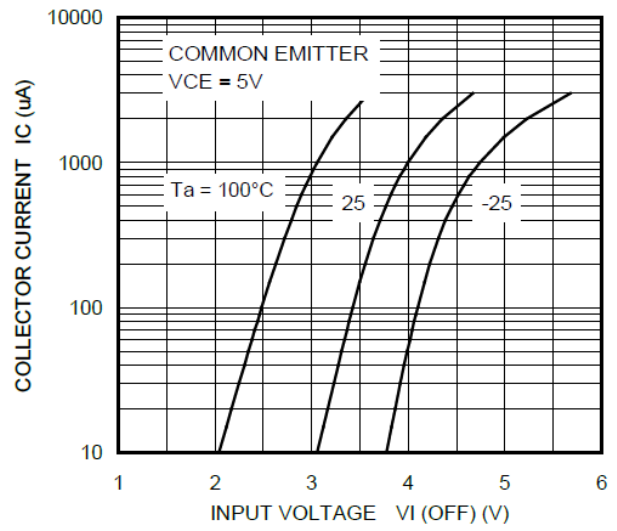


Fig. 10.10 RN1318  $I_C$ - $V_{I(OFF)}$

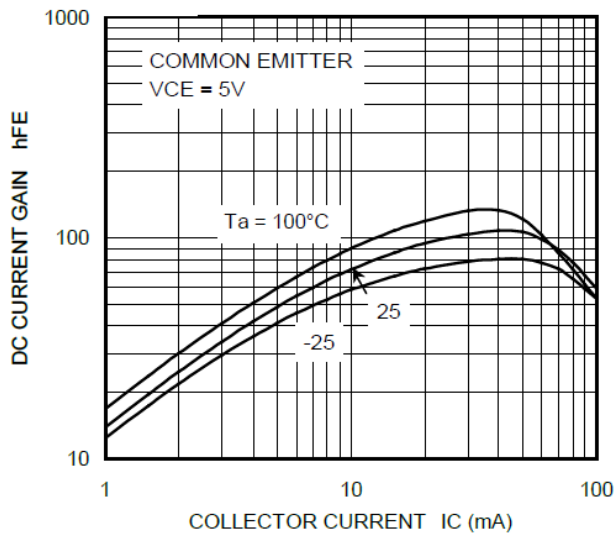


Fig. 10.11 RN1314  $h_{FE}$ - $I_C$

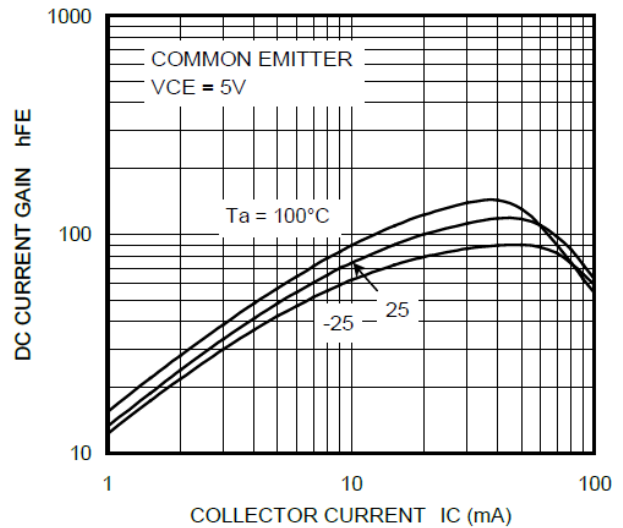


Fig. 10.12 RN1315  $h_{FE}$ - $I_C$

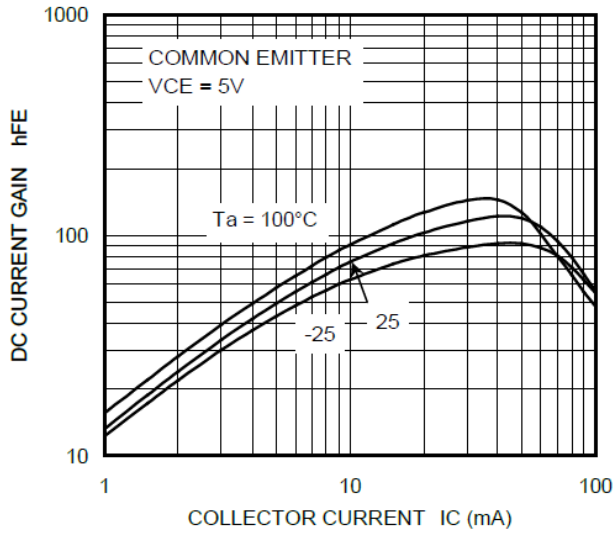


Fig. 10.13 RN1316  $h_{FE}-I_c$

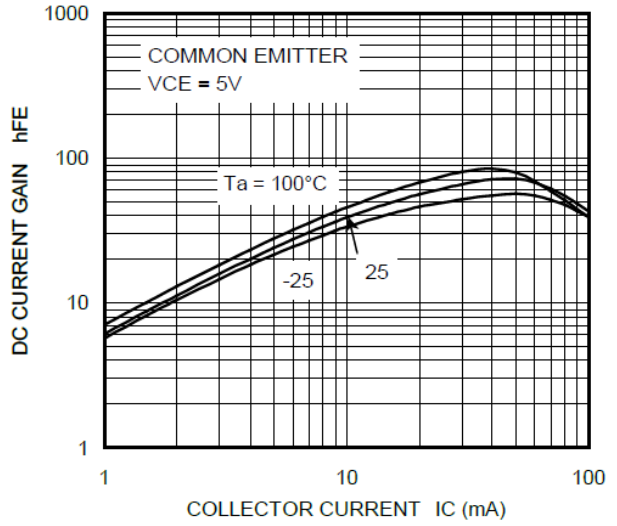


Fig. 10.14 RN1317  $h_{FE}-I_c$

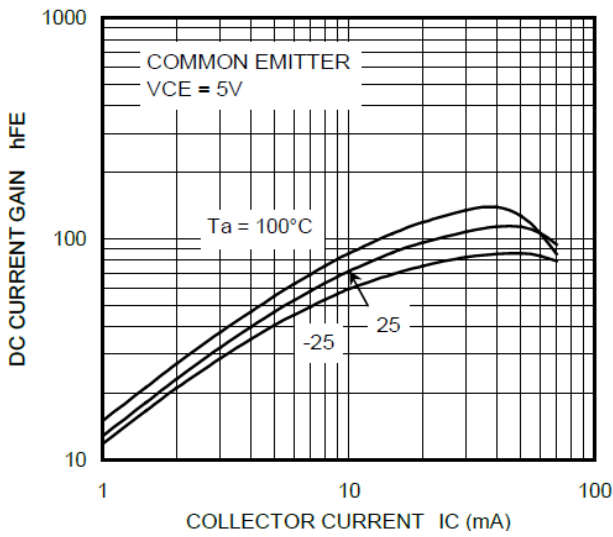


Fig. 10.15 RN1318  $h_{FE}-I_c$

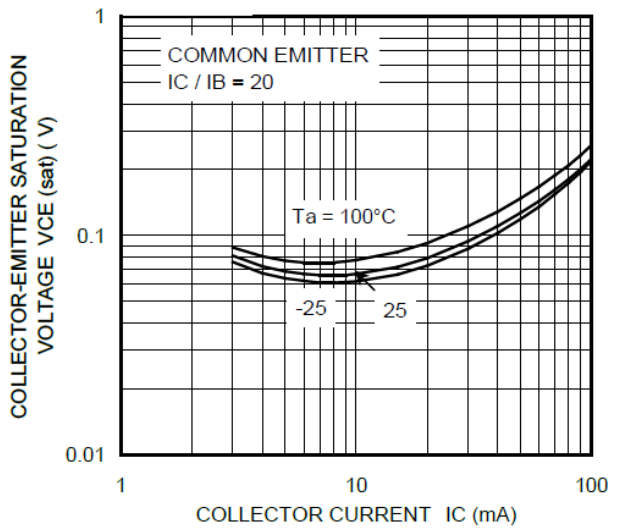


Fig. 10.16 RN1314  $V_{CE(sat)}-I_c$

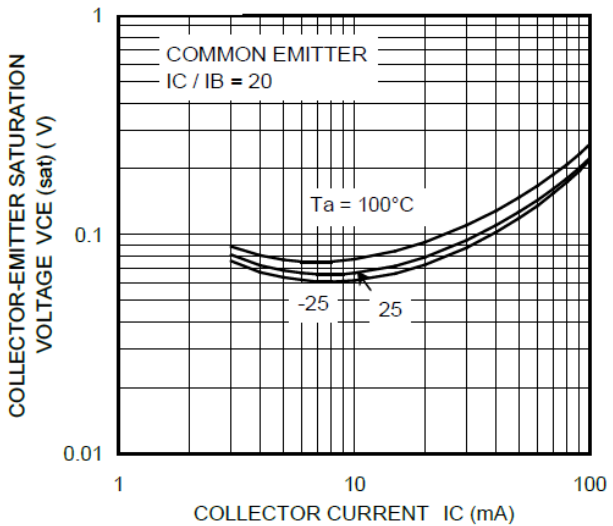


Fig. 10.17 RN1315  $V_{CE(sat)}-I_c$

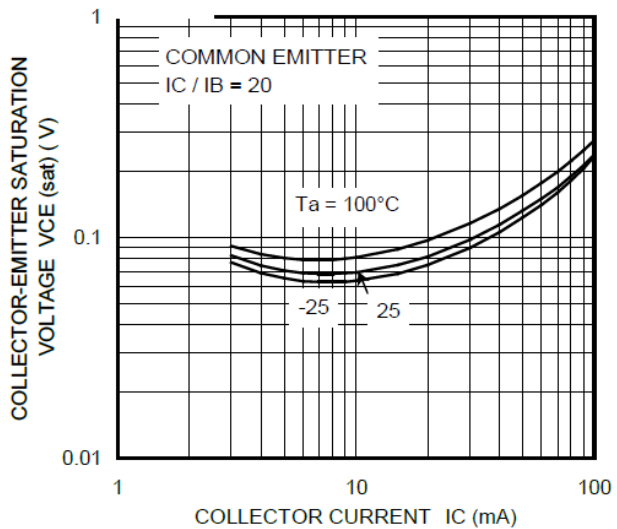


Fig. 10.18 RN1316  $V_{CE(sat)}-I_c$



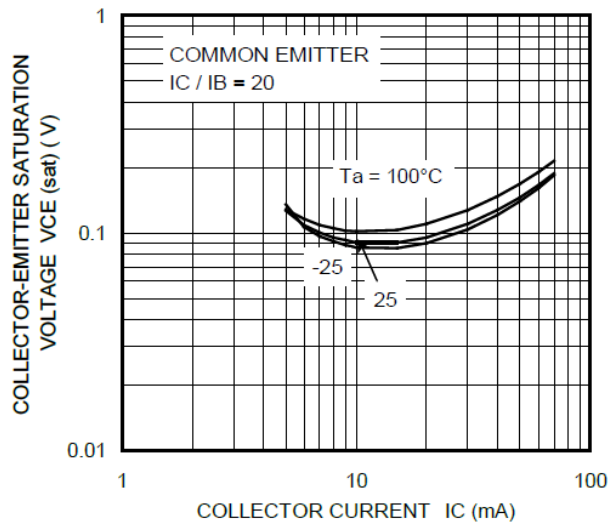


Fig. 10.19 RN1317  $V_{CE(sat)}$ - $I_C$

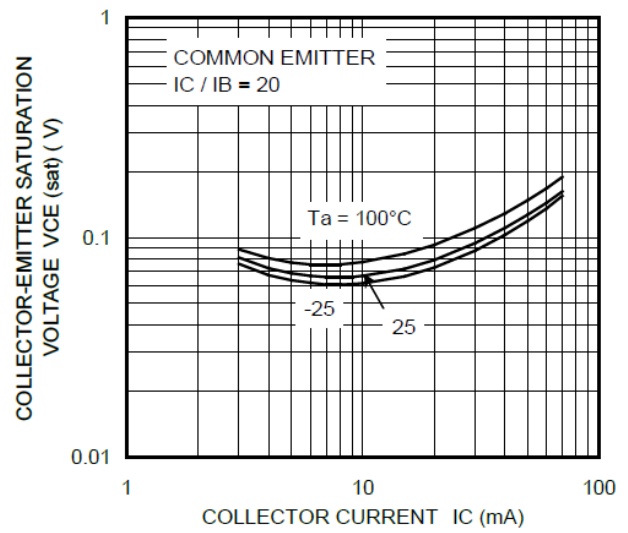
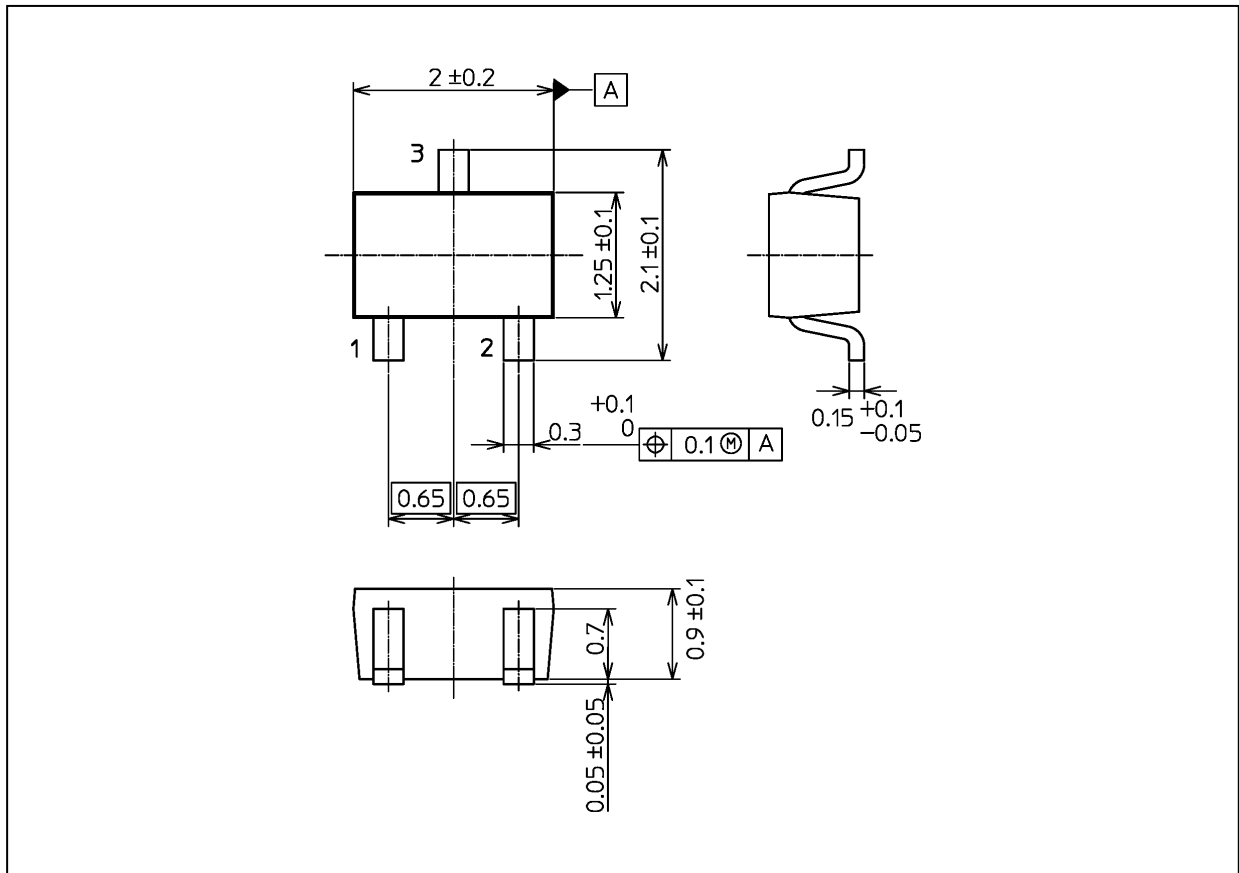


Fig. 10.20 RN1318  $V_{CE(sat)}$ - $I_C$

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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