

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

RN1114MFV to RN1118MFV

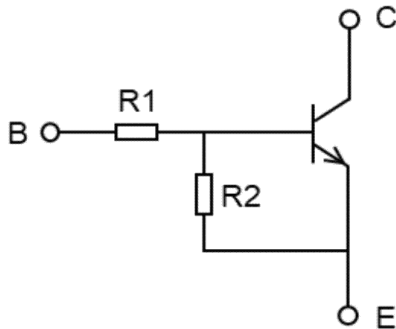
1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

2. Features

- (1) Ultra-small package, suited to very high density mounting
- (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 RN2114MFV to 2118MFV

3. Equivalent Circuit

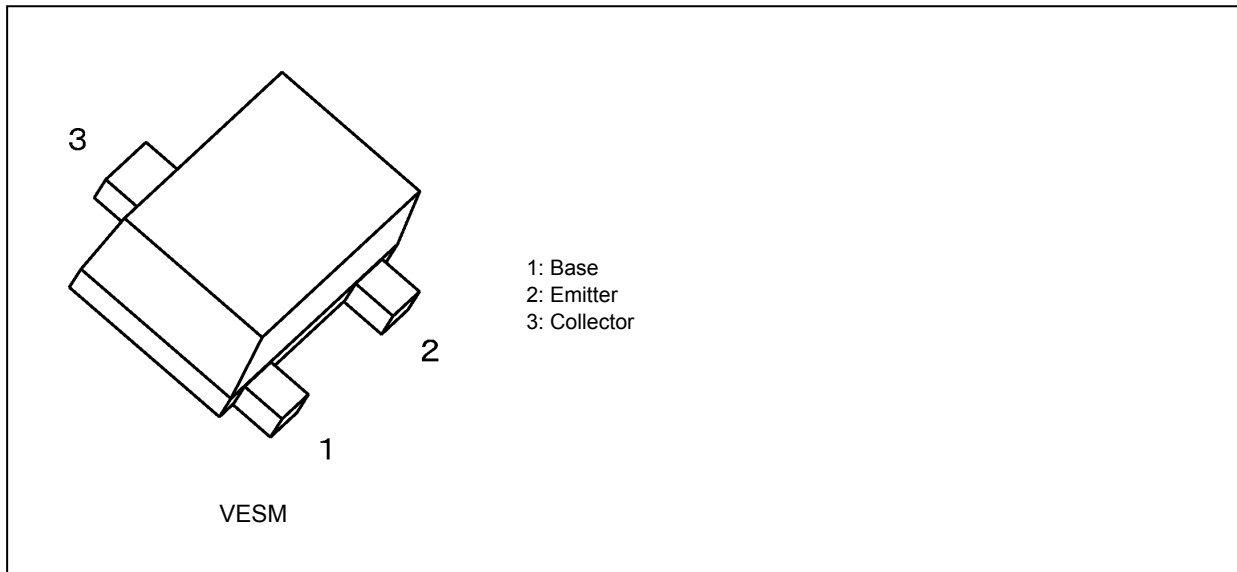


4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN1114MFV	1	10
RN1115MFV	2.2	10
RN1116MFV	4.7	10
RN1117MFV	10	4.7
RN1118MFV	47	10

Start of commercial production
2005-09

5. Packaging and Pin Assignment



6. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

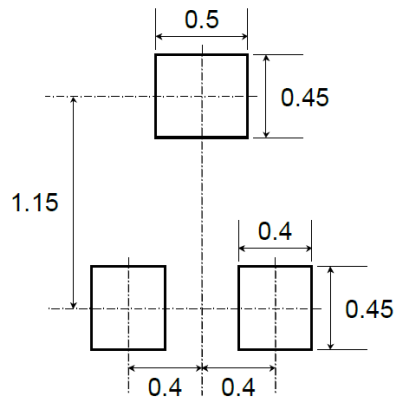
Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1114MFV to RN1118MFV	V_{CBO}	50	V
Collector-emitter voltage	RN1114MFV to RN1118MFV	V_{CEO}	50	V
Emitter-base voltage	RN1114MFV	V_{EBO}	5	V
	RN1115MFV		6	
	RN1116MFV		7	
	RN1117MFV		15	
	RN1118MFV		25	
Collector current	RN1114MFV to RN1118MFV	I_C	100	mA
Collector power dissipation	RN1114MFV to RN1118MFV	P_C (Note 1)	150	mW
Junction temperature	RN1114MFV to RN1118MFV	T_j	150	$^\circ\text{C}$
Storage temperature	RN1114MFV to RN1118MFV	T_{stg}	-55 to 150	$^\circ\text{C}$

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: Mounted on an FR4 board (25.4 mm × 25.4 mm × 1.6 mm)

7. Land Pattern Dimensions (for reference only)



Unit: mm

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	RN1114MFV to RN1118MFV	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	RN1114MFV	I_{EBO}	$V_{EB} = 5\text{ V}, I_C = 0\text{ mA}$	0.35	—	0.65	mA	
	RN1115MFV			$V_{EB} = 6\text{ V}, I_C = 0\text{ mA}$	0.37	—		0.71
	RN1116MFV			$V_{EB} = 7\text{ V}, I_C = 0\text{ mA}$	0.36	—		0.68
	RN1117MFV			$V_{EB} = 15\text{ V}, I_C = 0\text{ mA}$	0.78	—		1.46
	RN1118MFV			$V_{EB} = 25\text{ V}, I_C = 0\text{ mA}$	0.33	—		0.63
DC current gain	RN1114MFV to RN1116MFV	h_{FE}	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	50	—	—	—	
	RN1117MFV			30	—	—		
	RN1118MFV			50	—	—		
Collector-emitter saturation voltage	RN1114MFV to RN1118MFV	$V_{CE(sat)}$	$I_C = 5\text{ mA}, I_B = 0.5\text{ mA}$	—	0.1	0.3	V	
Input voltage (ON)	RN1114MFV	$V_{I(ON)}$	$V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$	0.6	—	2.0	V	
	RN1115MFV			0.7	—	2.5		
	RN1116MFV			0.8	—	2.5		
	RN1117MFV			1.5	—	3.5		
	RN1118MFV			2.5	—	10.0		
Input voltage (OFF)	RN1114MFV	$V_{I(OFF)}$	$V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$	0.3	—	0.9	V	
	RN1115MFV			0.3	—	1.0		
	RN1116MFV			0.3	—	1.1		
	RN1117MFV			0.3	—	2.3		
	RN1118MFV			0.5	—	5.7		
Collector output capacitance	RN1114MFV to RN1118MFV	C_{ob}	$V_{CB} = 10\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	0.7	—	pF	
Input resistance	RN1114MFV	R_1	—	0.7	1.0	1.3	k Ω	
	RN1115MFV			1.54	2.2	2.86		
	RN1116MFV			3.29	4.7	6.11		
	RN1117MFV			7	10	13		
	RN1118MFV			32.9	47	61.1		
Resistor ratio	RN1114MFV	R1/R2	—	—	0.1	—	—	
	RN1115MFV			—	0.22	—		
	RN1116MFV			—	0.47	—		
	RN1117MFV			—	2.13	—		
	RN1118MFV			—	4.7	—		

9. Marking

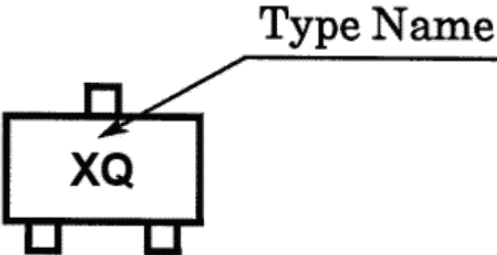


Fig. 9.1 Marking RN1114MFV

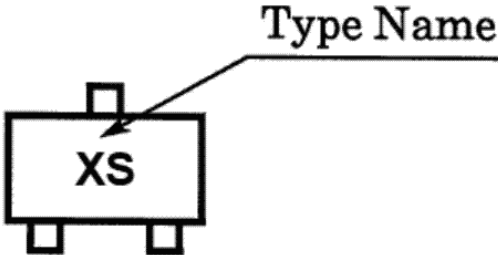


Fig. 9.2 Marking RN1115MFV

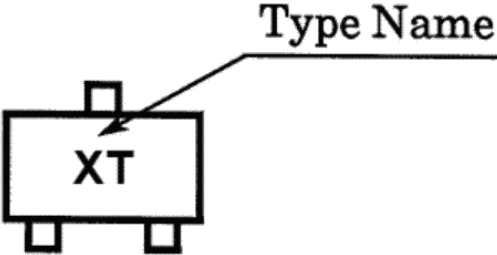


Fig. 9.3 Marking RN1116MFV

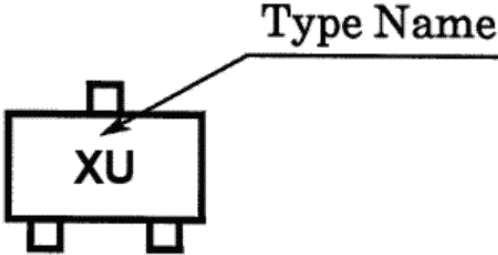


Fig. 9.4 Marking RN1117MFV

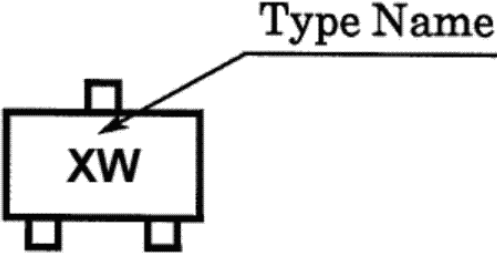


Fig. 9.5 Marking RN1118MFV

10. Characteristics Curves (Note)

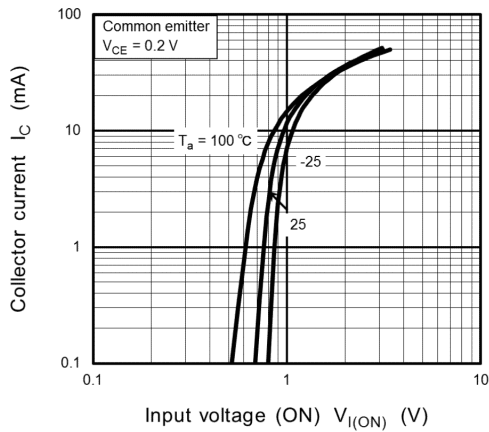


Fig. 10.1 RN1114MFV I_C - $V_{I(ON)}$

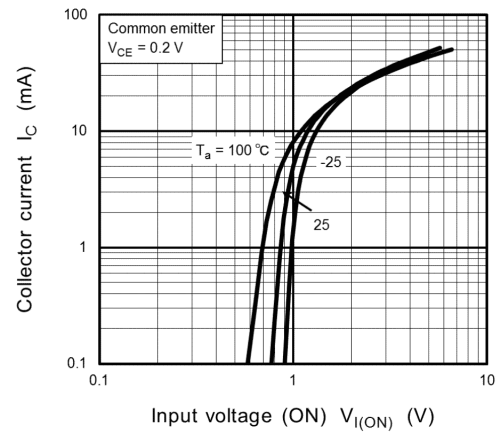


Fig. 10.2 RN1115MFV I_C - $V_{I(ON)}$

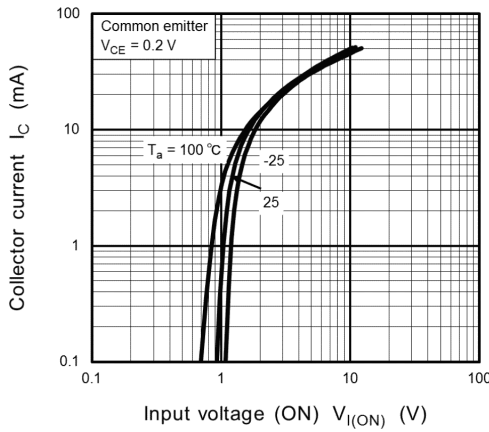


Fig. 10.3 RN1116MFV I_C - $V_{I(ON)}$

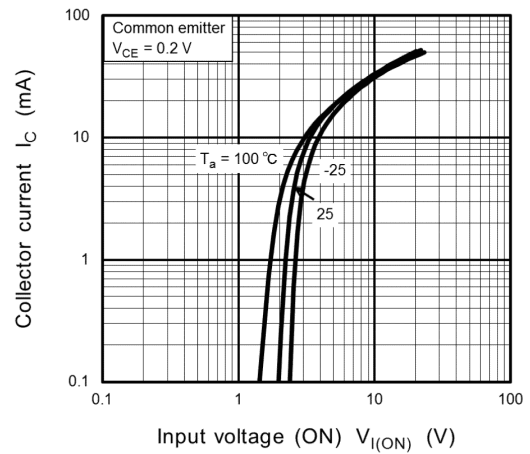


Fig. 10.4 RN1117MFV I_C - $V_{I(ON)}$

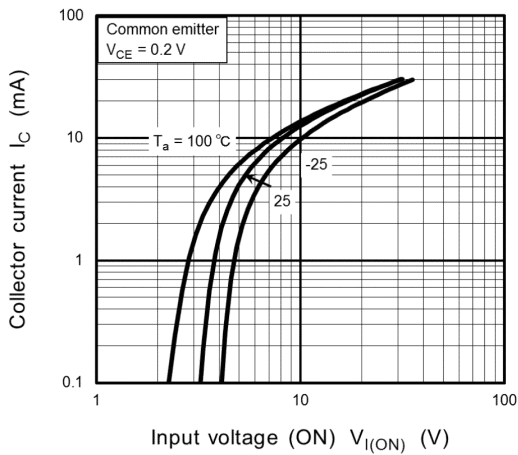


Fig. 10.5 RN1118MFV I_C - $V_{I(ON)}$

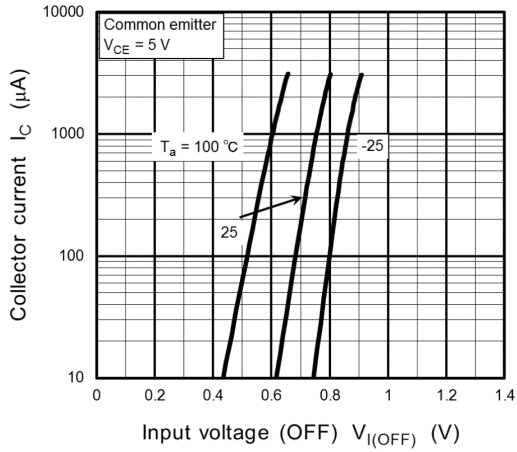


Fig. 10.6 RN1114MFV I_C-V_{I(OFF)}

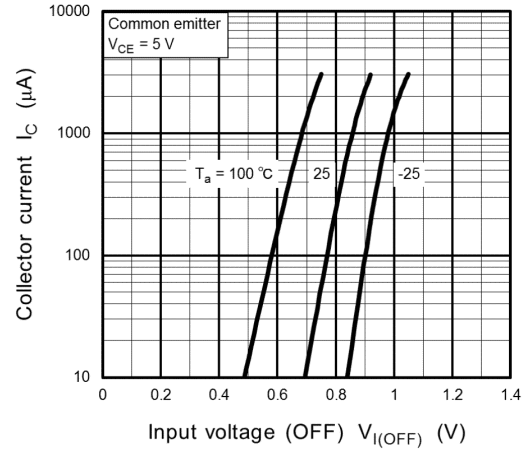


Fig. 10.7 RN1115MFV I_C-V_{I(OFF)}

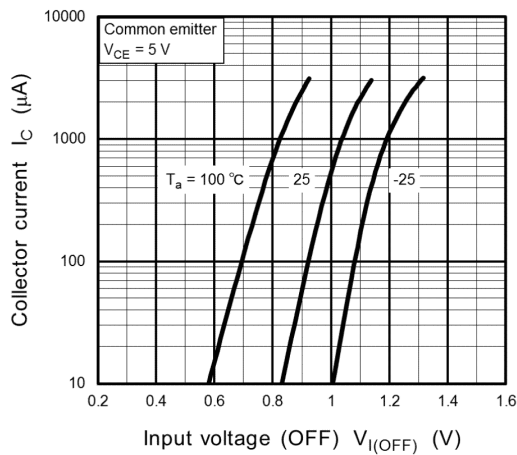


Fig. 10.8 RN1116MFV I_C-V_{I(OFF)}

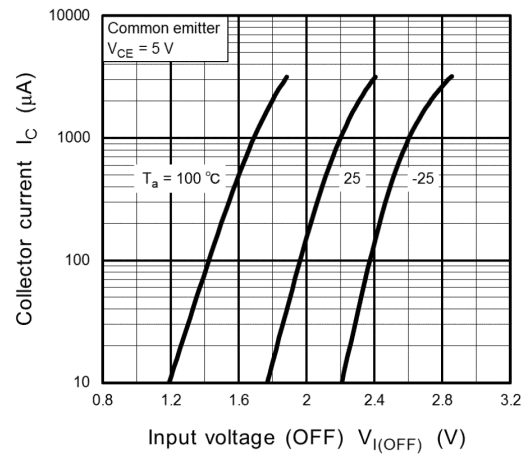


Fig. 10.9 RN1117MFV I_C-V_{I(OFF)}

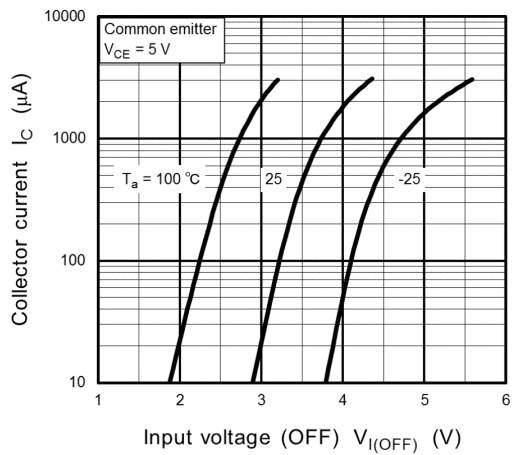


Fig. 10.10 RN1118MFV I_C-V_{I(OFF)}

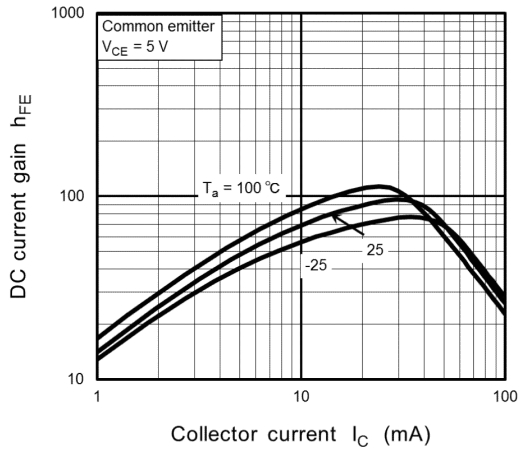


Fig. 10.11 RN1114MFV h_{FE} - I_C

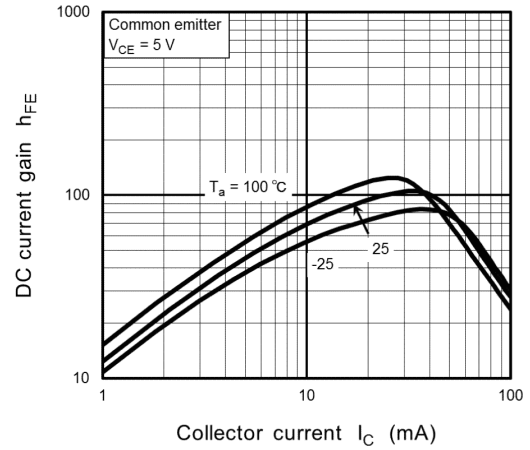


Fig. 10.12 RN1115MFV h_{FE} - I_C

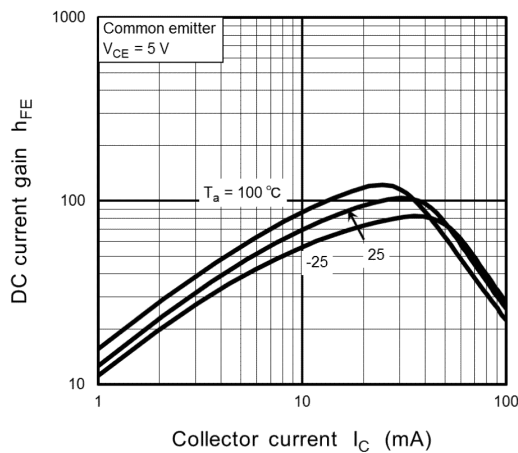


Fig. 10.13 RN1116MFV h_{FE} - I_C

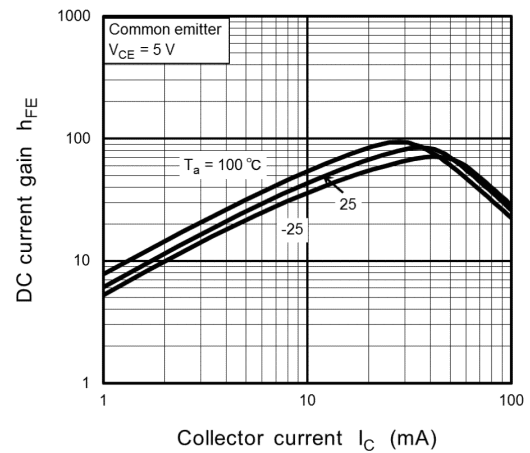


Fig. 10.14 RN1117MFV h_{FE} - I_C

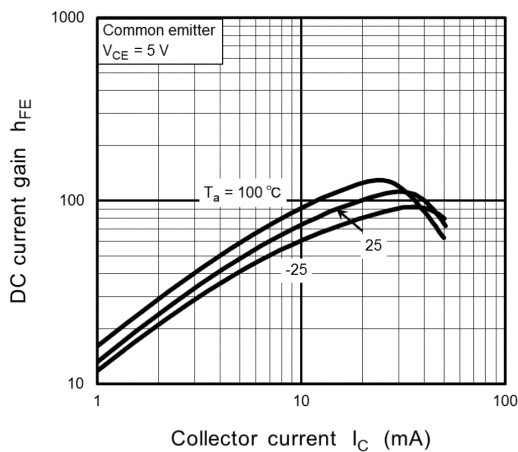


Fig. 10.15 RN1118MFV h_{FE} - I_C

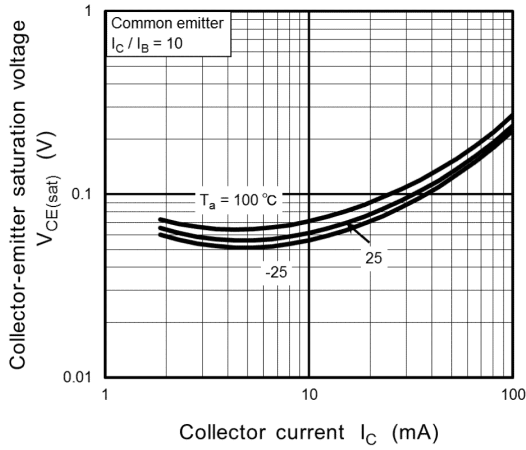


Fig. 10.16 RN1114MFV $V_{CE(sat)}$ - I_C

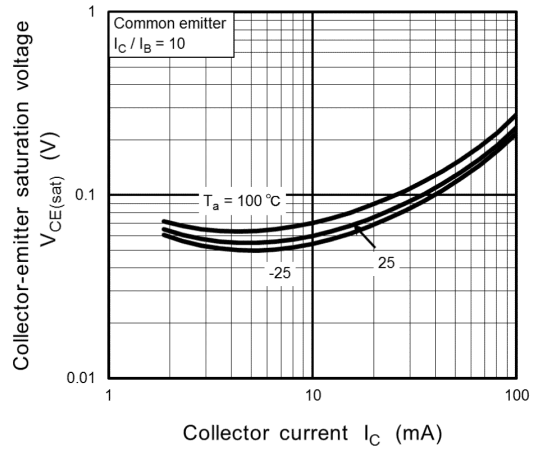


Fig. 10.17 RN1115MFV $V_{CE(sat)}$ - I_C

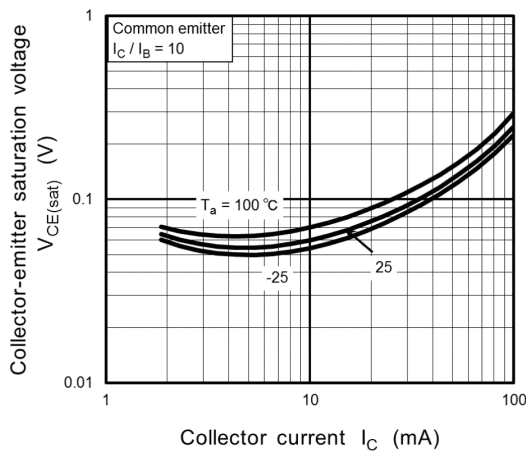


Fig. 10.18 RN1116MFV $V_{CE(sat)}$ - I_C

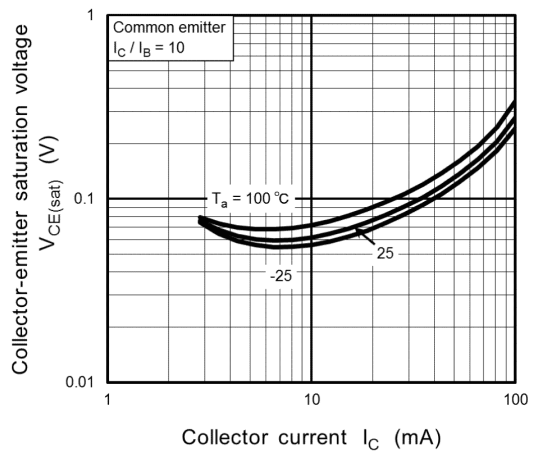


Fig. 10.19 RN1117MFV $V_{CE(sat)}$ - I_C

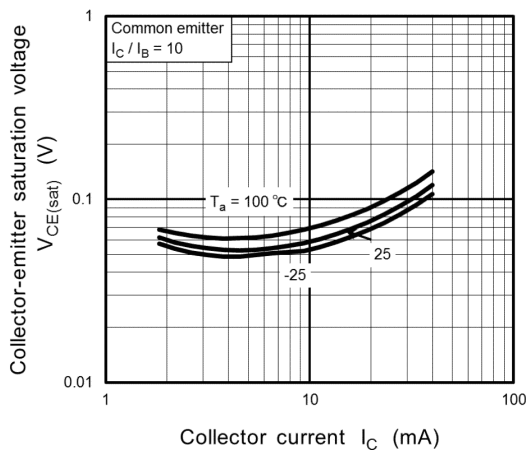
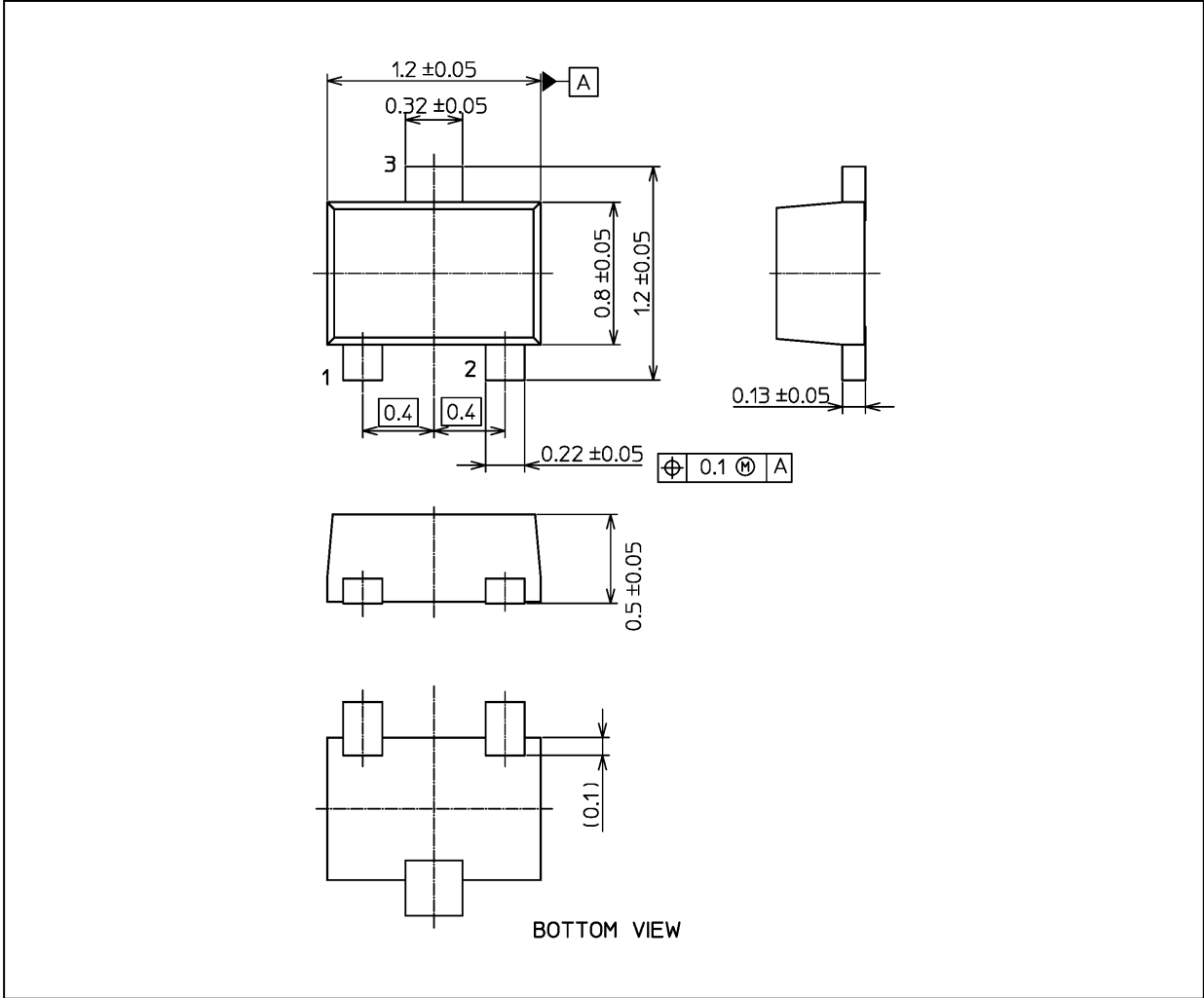


Fig. 10.20 RN1118MFV $V_{CE(sat)}$ - I_C

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

Package Dimensions

Unit: mm



Weight: 1.5 mg (typ.)

Package Name(s)
Nickname: VESM

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