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

RN1101MFV/02MFV/03MFV/04MFV/05MFV/06MFV

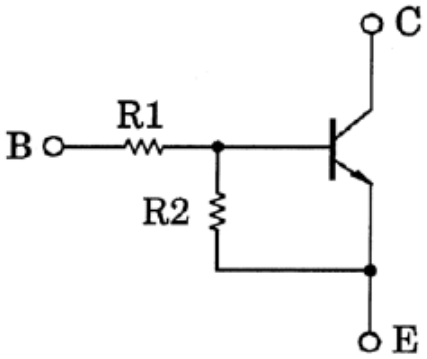
1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

2. Features

(1) AEC-Q101 qualified (Please see the orderable part number list)
(2) Ultra-small package, suited to very high density mounting
(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 RN2101MFV to RN2106MFV

3. Equivalent Circuit

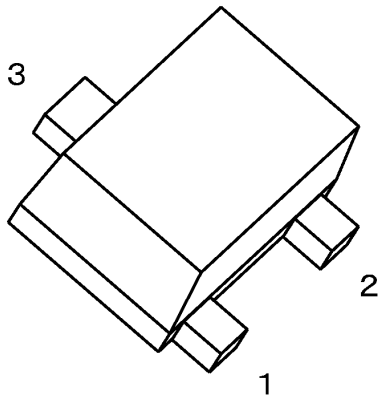


4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN1101MFV	4.7	4.7
RN1102MFV	10	10
RN1103MFV	22	22
RN1104MFV	47	47
RN1105MFV	2.2	47
RN1106MFV	4.7	47

Start of commercial production
2005-02

5. Packaging and Pin Assignment



1: Base
2: Emitter
3: Collector

VESM

6. Orderable part number

Orderable part number		AEC-Q101	Note	Note	
RN1101MFV	RN1101MFV,L3F	—		General Use	
	RN1101MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1101MFV,L3XHF	YES		Automotive Use	
RN1102MFV	RN1102MFV,L3F	—		General Use	
	RN1102MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1102MFV,L3XHF	YES		Automotive Use	
RN1103MFV	RN1103MFV,L3F	—		General Use	
	RN1103MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1103MFV,L3XHF	YES		Automotive Use	
RN1104MFV	RN1104MFV,L3F	—		General Use	
	RN1104MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1104MFV,L3XHF	YES		Automotive Use	
RN1105MFV	RN1105MFV,L3F	—		General Use	
	RN1105MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1105MFV,L3XHF	YES		Automotive Use	
RN1106MFV	RN1106MFV,L3F	—		General Use	
	RN1106MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN1106MFV,L3XHF	YES		Automotive Use	

Note 1: For more information, please contact our sales or use the inquiry form on our website.

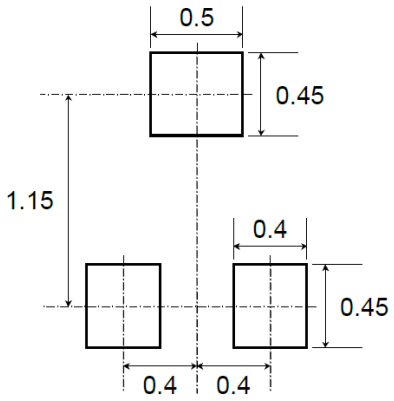
7. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN1101MFV～RN1106MFV	V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	
Emitter-base voltage	RN1101MFV～RN1104MFV	V_{EBO}	10	
	RN1105MFV,RN1106MFV		5	
Collector current	RN1101MFV～RN1106MFV	I_C	100	mA
Collector power dissipation		P_C (Note 1)	150	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: Mounted on an FR4 board (25.4 mm × 25.4 mm × 1.6 mm)

8. Land Pattern Dimensions (for reference only)



Unit: mm

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN1101MFV～RN1106MFV	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	RN1101MFV	I_{EBO}	V_{EB} = 10 V, I_C = 0 mA	0.82	—	1.52	mA
	RN1102MFV			0.38	—	0.71	
	RN1103MFV			0.17	—	0.33	
	RN1104MFV			0.082	—	0.15	
	RN1105MFV		V_{EB} = 5 V, I_C = 0 mA	0.078	—	0.145	
	RN1106MFV			0.074	—	0.138	
DC current gain	RN1101MFV	h_{FE}	V_{CE} = 5 V, I_C = 10 mA	30	—	—	—
	RN1102MFV			50	—	—	
	RN1103MFV			70	—	—	
	RN1104MFV			80	—	—	
	RN1105MFV			80	—	—	
	RN1106MFV			80	—	—	
Collector-emitter saturation voltage	RN1101MFV～RN1106MFV	$V_{CE(sat)}$	I_C = 5 mA, I_B = 0.5 mA	—	0.1	0.3	V
Input voltage (ON)	RN1101MFV	$V_{I(ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	1.1	—	2.0	V
	RN1102MFV			1.2	—	2.4	
	RN1103MFV			1.3	—	3.0	
	RN1104MFV			1.5	—	5.0	
	RN1105MFV			0.6	—	1.1	
	RN1106MFV			0.7	—	1.3	
Input voltage (OFF)	RN1101MFV～RN1104MFV	$V_{I(OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	1.0	—	1.5	V
	RN1105MFV, RN1106MFV			0.5	—	0.8	
Collector output capacitance	RN1101MFV～RN1106MFV	C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	0.7	—	pF
Input resistance	RN1101MFV	R_1	-	3.29	4.7	6.11	kΩ
	RN1102MFV			7	10	13	kΩ
	RN1103MFV			15.4	22	28.6	
	RN1104MFV			32.9	47	61.1	
	RN1105MFV			1.54	2.2	2.86	
	RN1106MFV			3.29	4.7	6.11	
Resistor ratio	RN1101MFV～RN1104MFV	R1/R2	-	0.8	1.0	1.2	—
	RN1105MFV			0.0376	0.0468	0.0562	
	RN1106MFV			0.08	0.1	0.12	

10. Marking

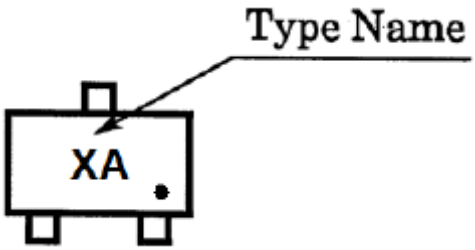


Fig. 10.1 Marking RN1101MFV

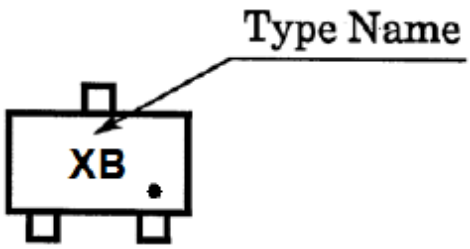


Fig. 10.2 Marking RN1102MFV

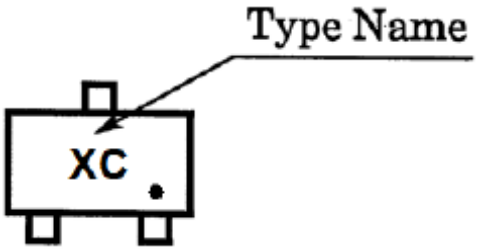


Fig. 10.3 Marking RN1103MFV

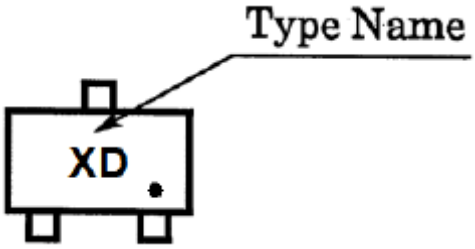


Fig. 10.4 Marking RN1104MFV

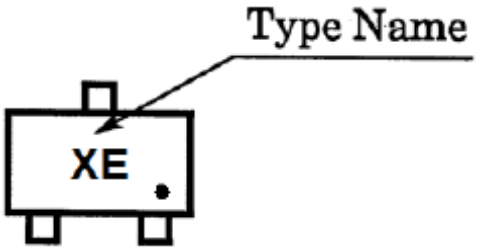


Fig. 10.5 Marking RN1105MFV

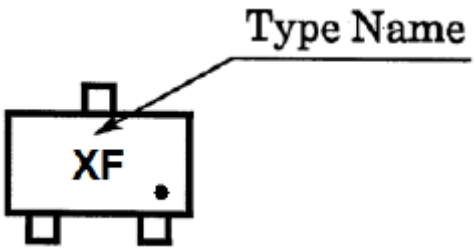


Fig. 10.6 Marking RN1106MFV

11. Characteristics Curves (Note)

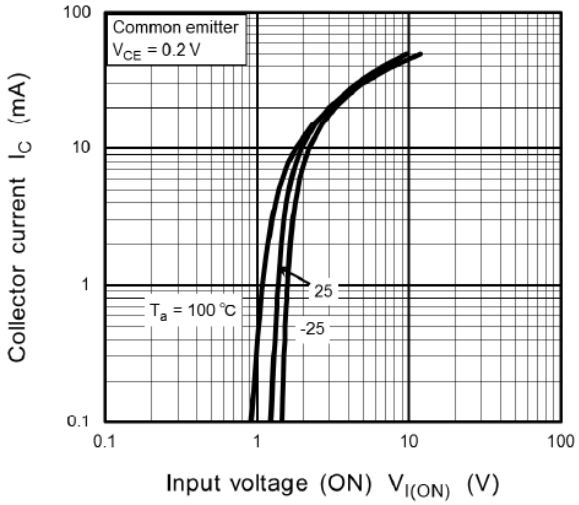


Fig. 11.1 RN1101MFV I_C-$V_{I(ON)}$

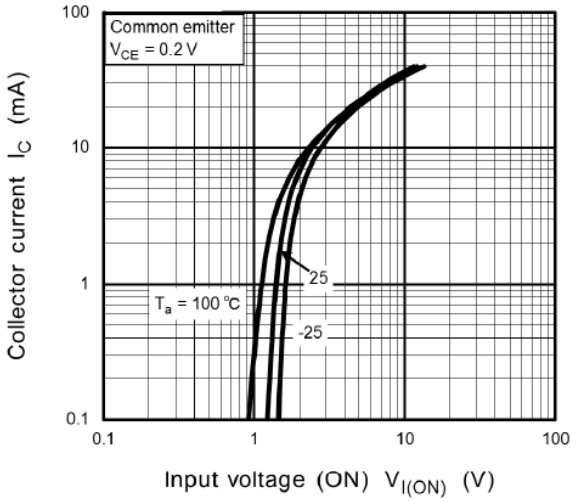


Fig. 11.2 RN1102MFV I_C-$V_{I(ON)}$

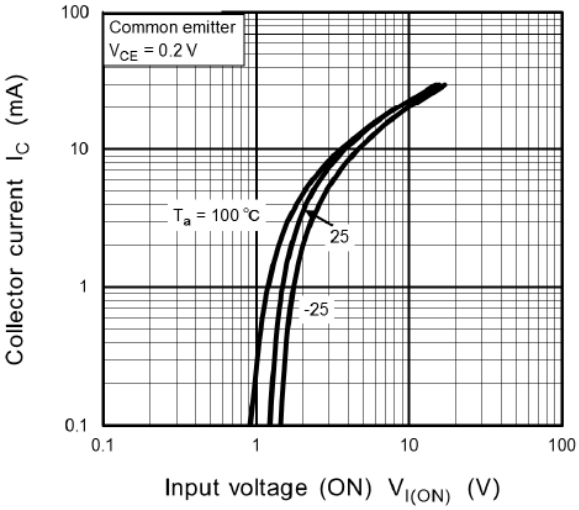


Fig. 11.3 RN1103MFV I_C-$V_{I(ON)}$

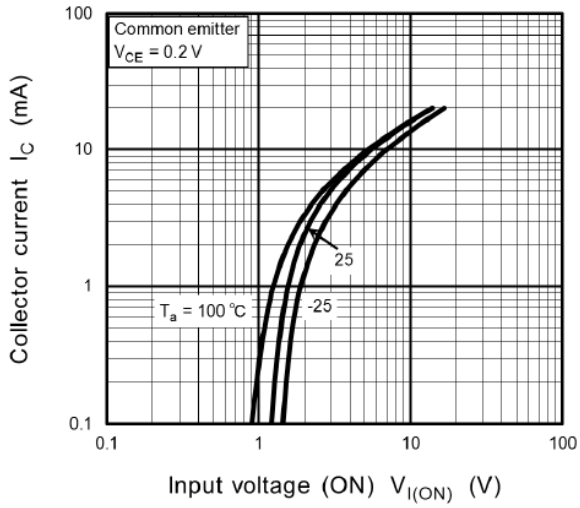


Fig. 11.4 RN1104MFV I_C-$V_{I(ON)}$

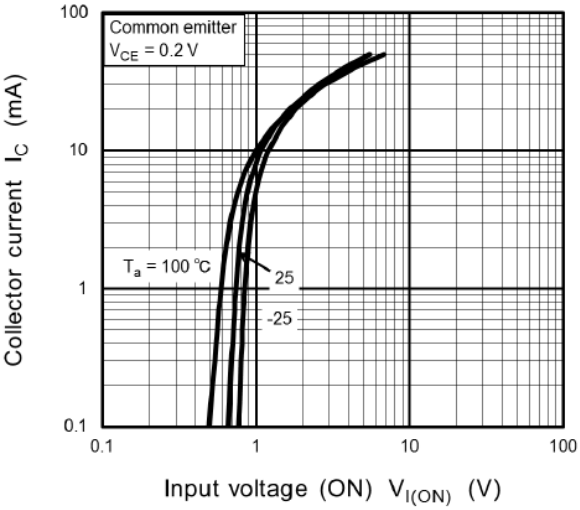


Fig. 11.5 RN1105MFV I_C-$V_{I(ON)}$

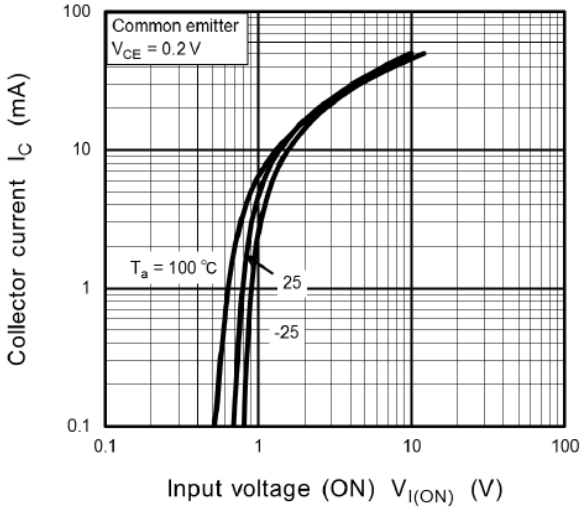


Fig. 11.6 RN1106MFV I_C-$V_{I(ON)}$

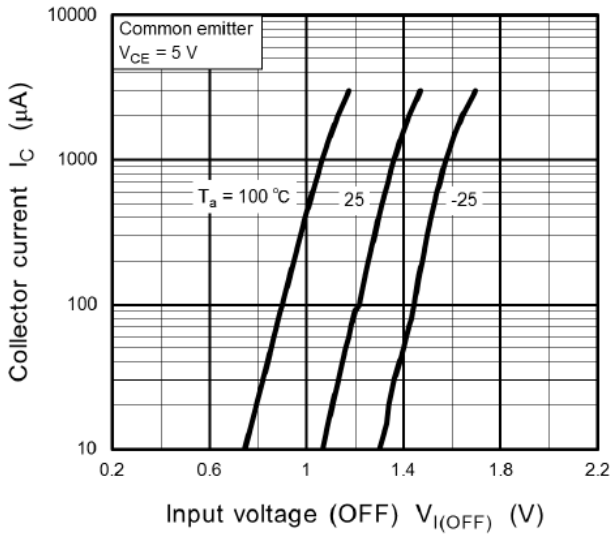


Fig. 11.7 RN1101MFV I_C-$V_{I(OFF)}$

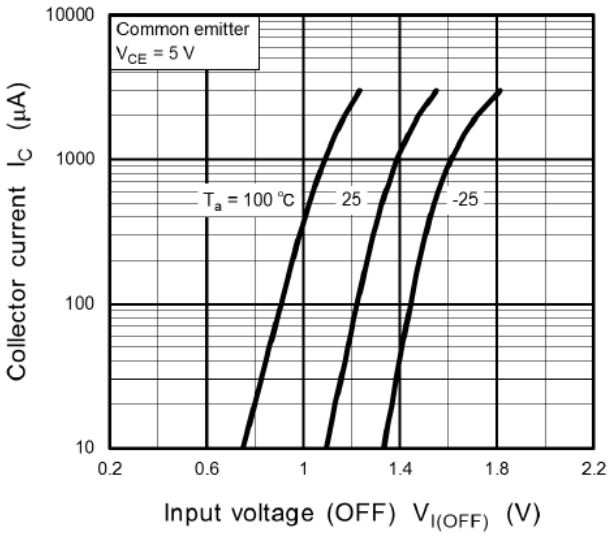


Fig. 11.8 RN1102MFV I_C-$V_{I(OFF)}$

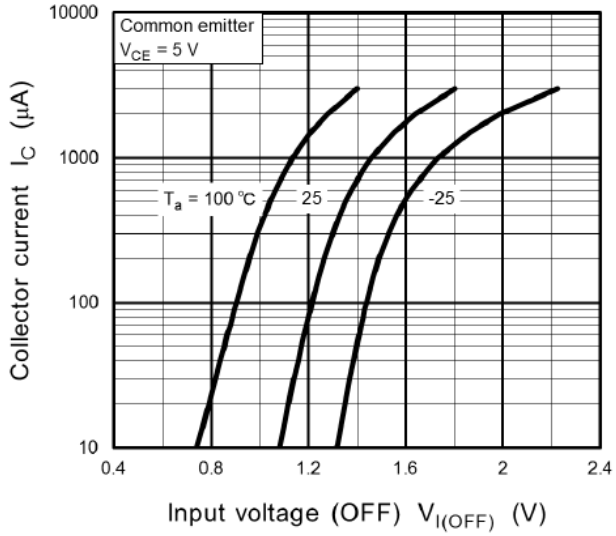


Fig. 11.9 RN1103MFV I_C-$V_{I(OFF)}$

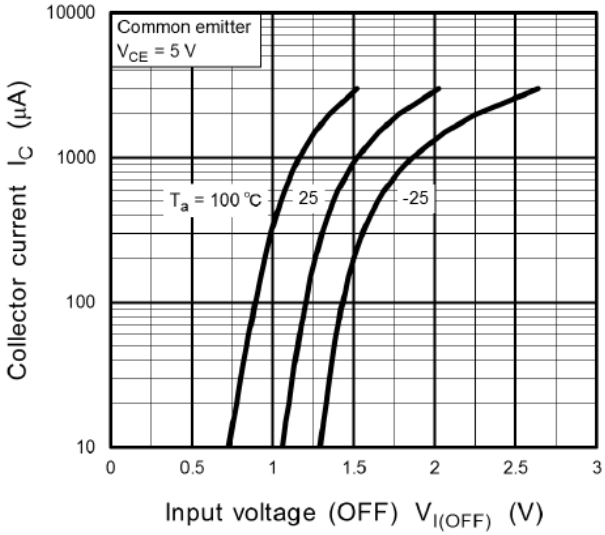


Fig. 11.10 RN1104MFV I_C-$V_{I(OFF)}$

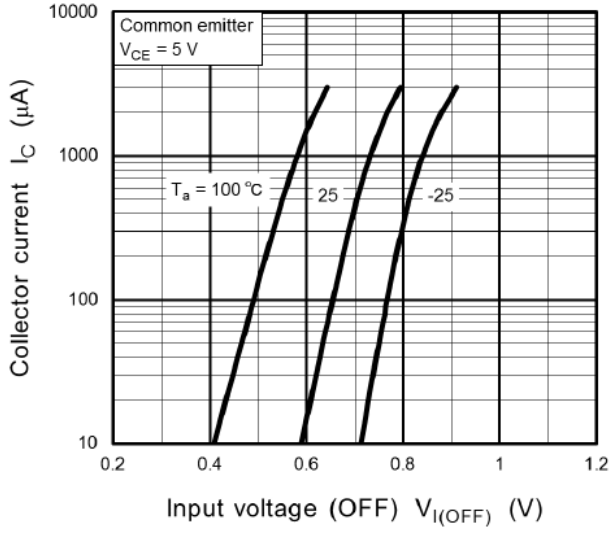


Fig. 11.11 RN1105MFV I_C-$V_{I(OFF)}$

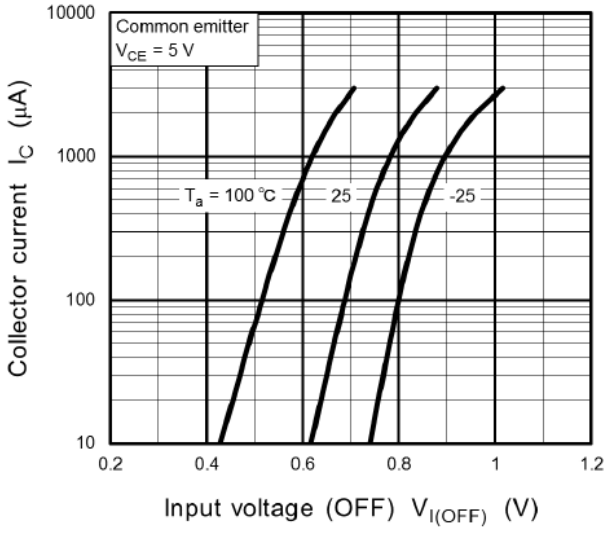


Fig. 11.12 RN1106MFV I_C-$V_{I(OFF)}$

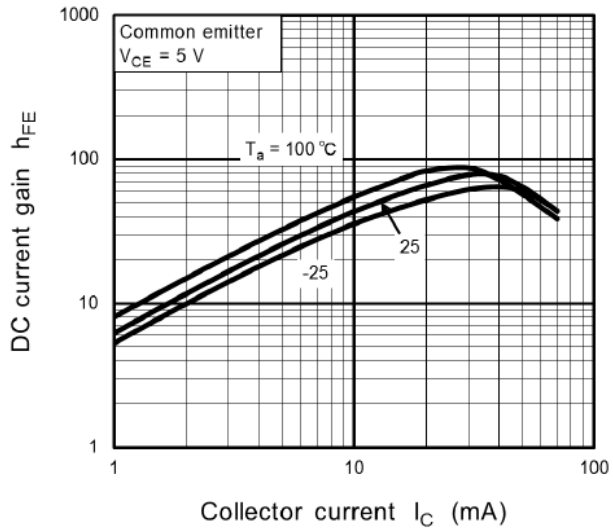


Fig. 11.13 RN1101MFV h_{FE}-I_C

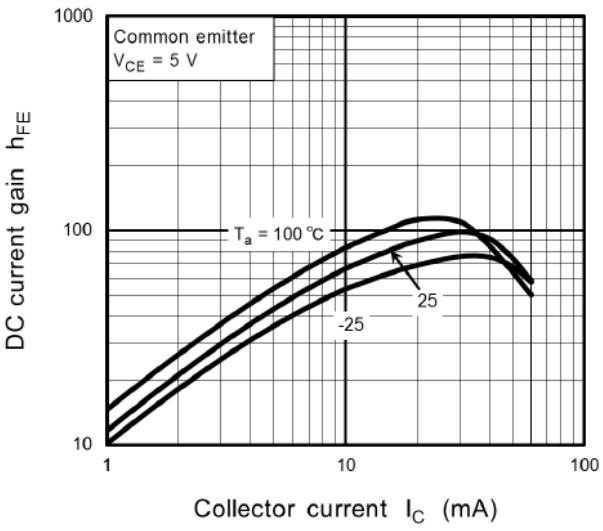


Fig. 11.14 RN1102MFV h_{FE}-I_C

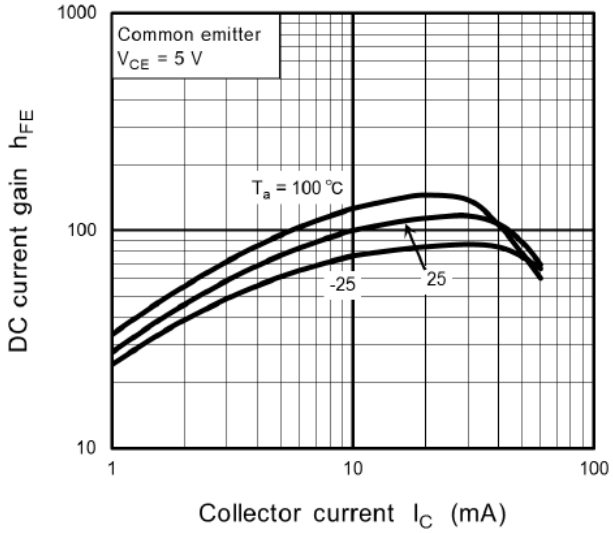


Fig. 11.15 RN1103MFV h_{FE}-I_C

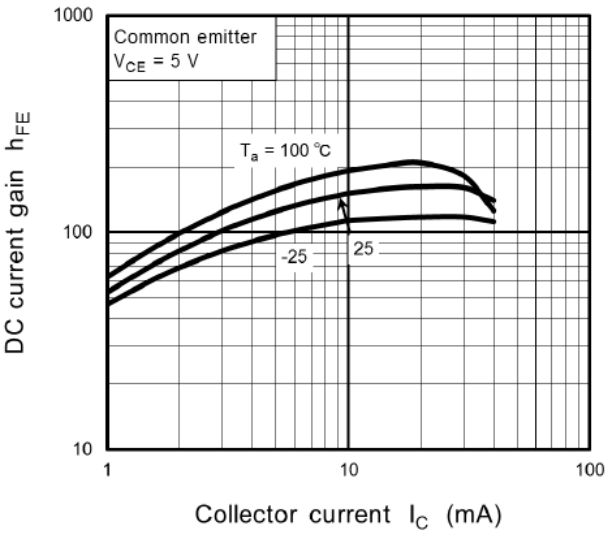


Fig. 11.16 RN1104MFV h_{FE}-I_C

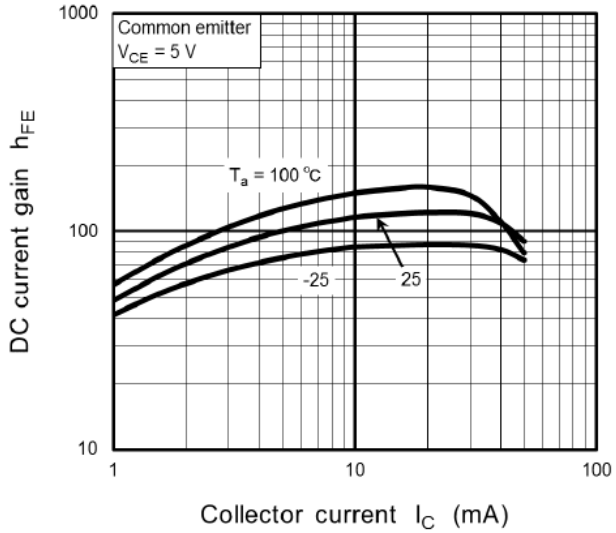


Fig. 11.17 RN1105MFV $h_{FE(sat)}$-I_C

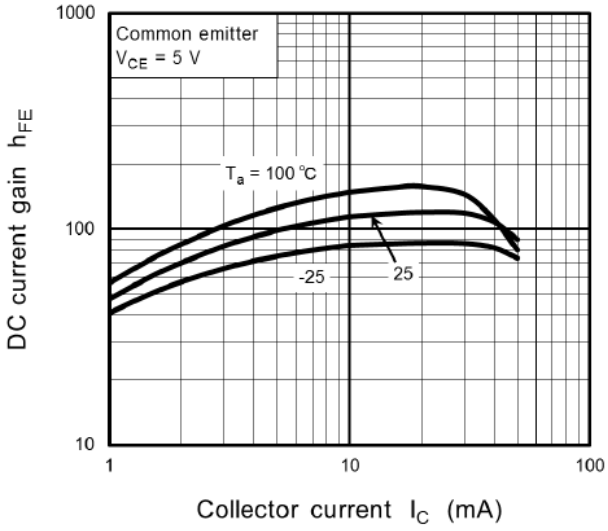


Fig. 11.18 RN1106MFV h_{FE}-I_C

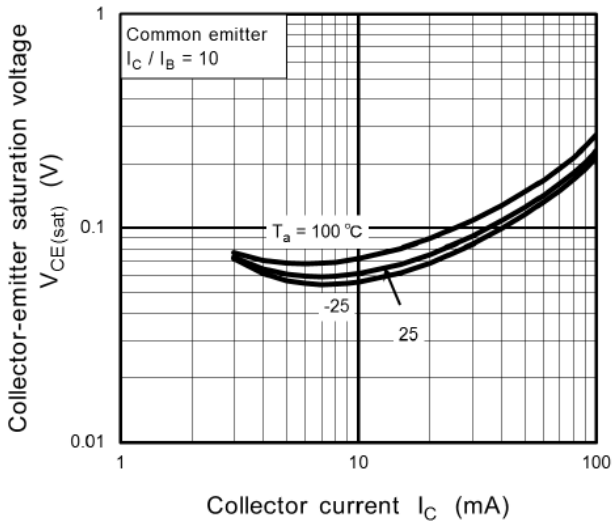


Fig. 11.19 RN1101MFV $V_{CE(sat)}$-I_C

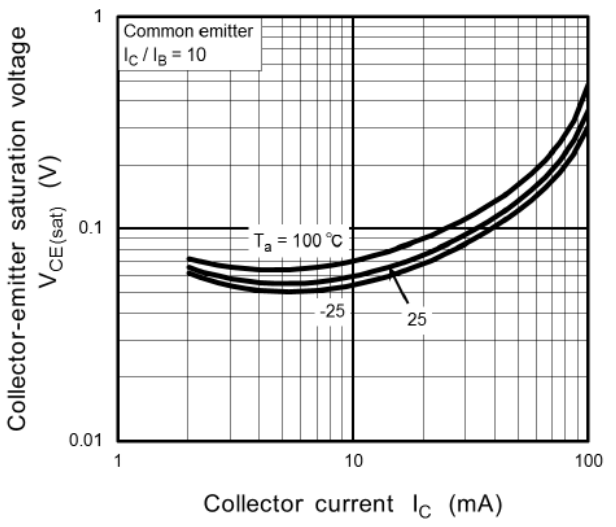


Fig. 11.20 RN1102MFV $V_{CE(sat)}$-I_C

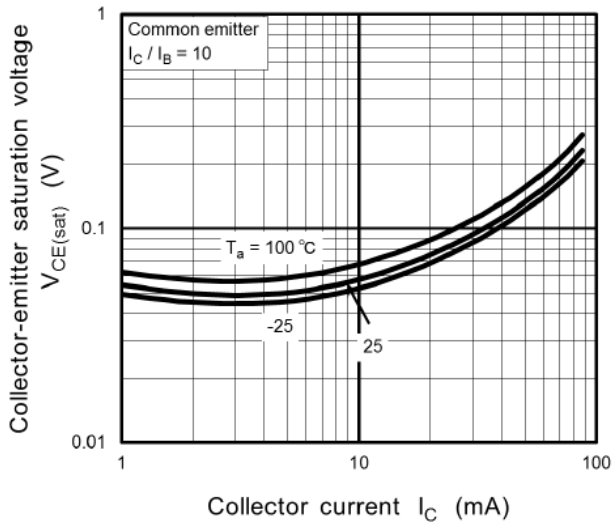


Fig. 11.21 RN1103MFV $V_{CE(sat)}$-I_C

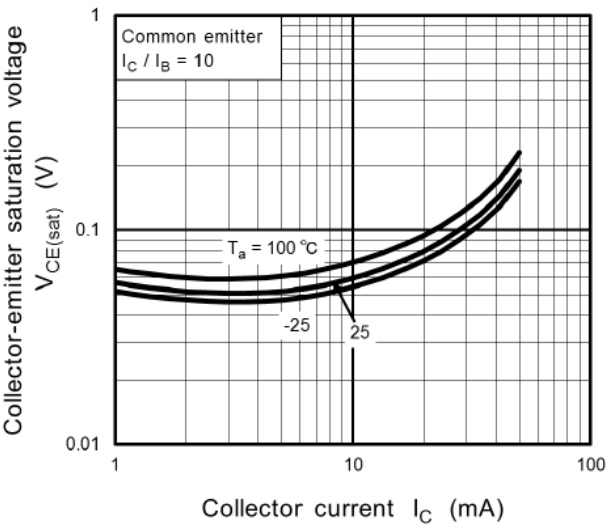


Fig. 11.22 RN1104MFV $V_{CE(sat)}$-I_C

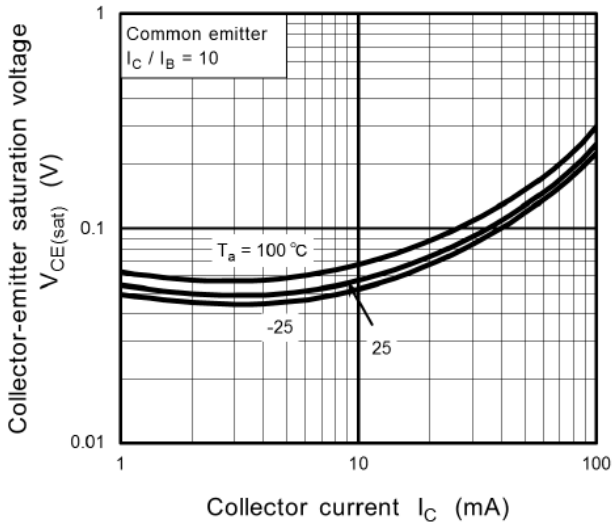


Fig. 11.23 RN1105MFV $V_{CE(sat)}$-I_C

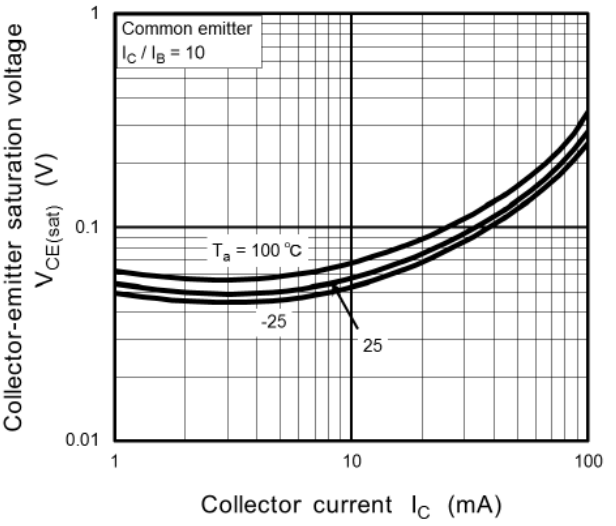
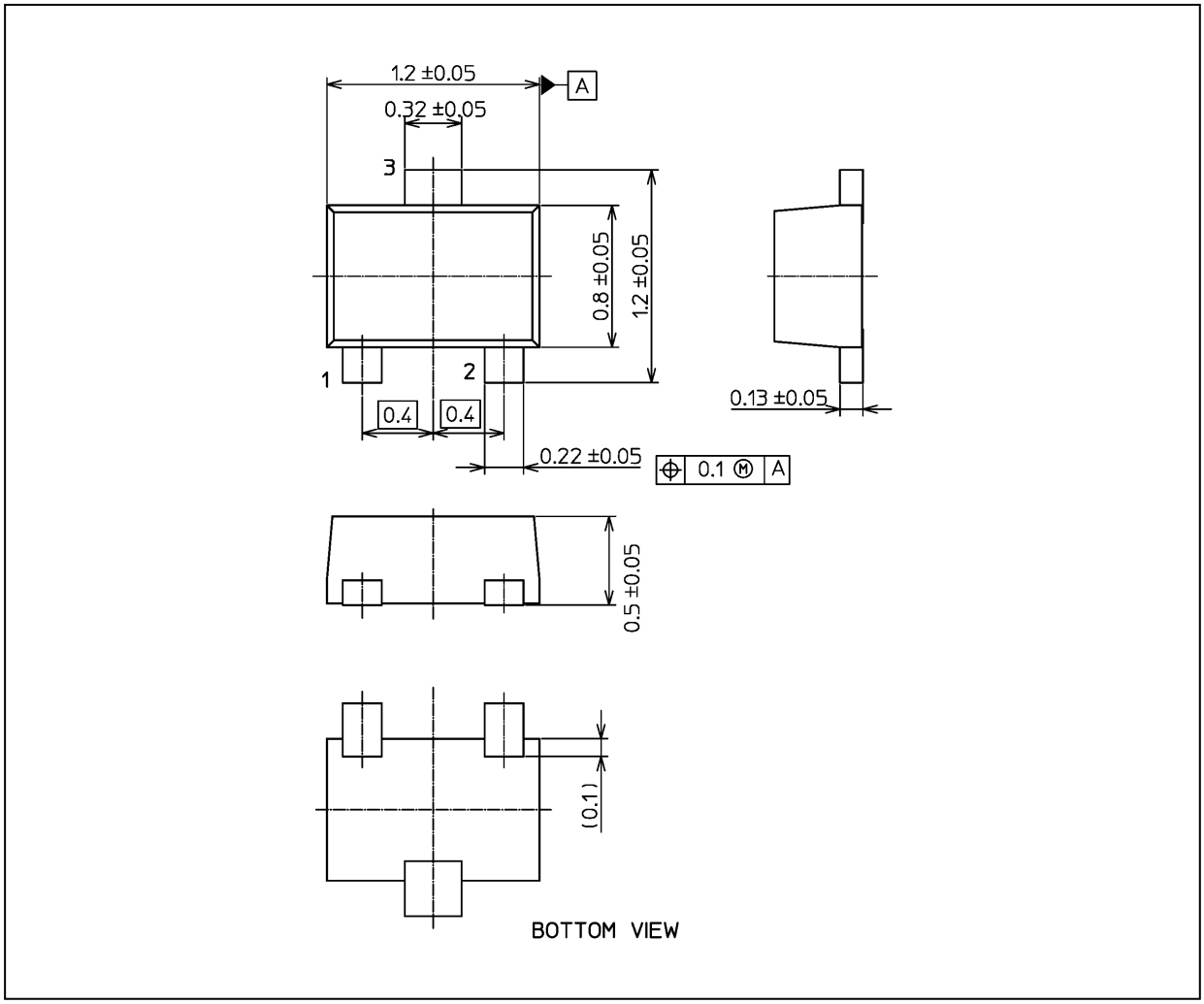


Fig. 11.24 RN1106MFV $V_{CE(sat)}$-I_C

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)
TOSHIBA: 1-1Q1S
Nickname: VESM

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