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

RN2101MFV/02MFV/03MFV/04MFV/05MFV/06MFV

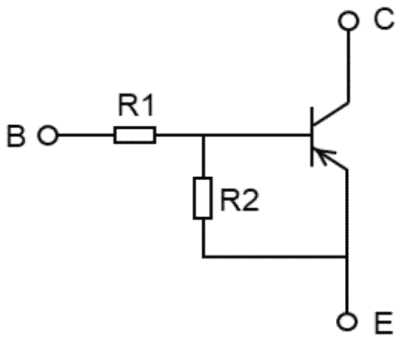
1. Applications

- 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 RN1101MFV to RN1106MFV

3. Equivalent Circuit

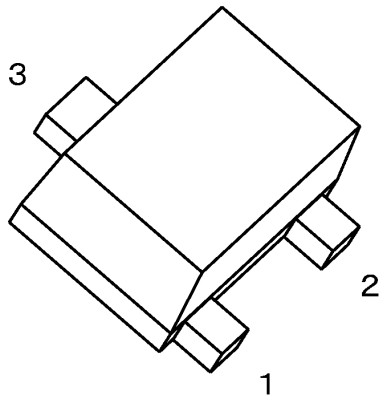


4. Bias Resistor Values

Part No.	R1 (kΩ)	R2 (kΩ)
RN2101MFV	4.7	4.7
RN2102MFV	10	10
RN2103MFV	22	22
RN2104MFV	47	47
RN2105MFV	2.2	47
RN2106MFV	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	
RN2101MFV	RN2101MFV,L3F	—		General Use	
	RN2101MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2101MFV,L3XHF	YES		Automotive Use	
RN2102MFV	RN2102MFV,L3F	—		General Use	
	RN2102MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2102MFV,L3XHF	YES		Automotive Use	
RN2103MFV	RN2103MFV,L3F	—		General Use	
	RN2103MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2103MFV,L3XHF	YES		Automotive Use	
RN2104MFV	RN2104MFV,L3F	—		General Use	
	RN2104MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2104MFV,L3XHF	YES		Automotive Use	
RN2105MFV	RN2105MFV,L3F	—		General Use	
	RN2105MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2105MFV,L3XHF	YES		Automotive Use	
RN2106MFV	RN2106MFV,L3F	—		General Use	
	RN2106MFV,L3XGF	YES	(Note 1)	Unintended Use	(Note 1)
	RN2106MFV,L3XHF	YES		Automotive Use	

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

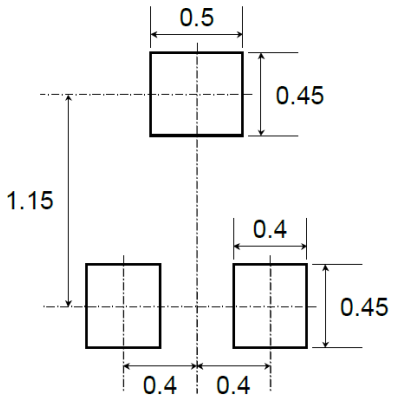
7. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2101MFV to RN2106MFV	V_{CBO}	-50	V
Collector-emitter voltage		V_{CEO}	-50	
Emitter-base voltage	RN2101MFV to RN2104MFV	V_{EBO}	-10	
	RN2105MFV,RN2106MFV		-5	
Collector current	RN2101MFV to RN2106MFV	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	RN2101MFV to RN2106MFV	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	RN2101MFV	I_{EBO}	V_{EB} = -10 V, I_C = 0 mA	-0.82	—	-1.52	mA
	RN2102MFV			-0.38	—	-0.71	
	RN2103MFV			-0.17	—	-0.33	
	RN2104MFV			-0.082	—	-0.15	
	RN2105MFV		V_{EB} = -5 V, I_C = 0 mA	-0.078	—	-0.145	
	RN2106MFV			-0.074	—	-0.138	
DC current gain	RN2101MFV	h_{FE}	V_{CE} = -5 V, I_C = -10 mA	30	—	—	—
	RN2102MFV			50	—	—	
	RN2103MFV			70	—	—	
	RN2104MFV			80	—	—	
	RN2105MFV			80	—	—	
	RN2106MFV			80	—	—	
Collector-emitter saturation voltage	RN2101MFV to RN2106MFV	$V_{CE(sat)}$	I_C = -5 mA, I_B = -0.5 mA	—	-0.1	-0.3	V
Input voltage (ON)	RN2101MFV	$V_{I(ON)}$	V_{CE} = -0.2 V, I_C = -5 mA	-1.1	—	-2.0	V
	RN2102MFV			-1.2	—	-2.4	
	RN2103MFV			-1.3	—	-3.0	
	RN2104MFV			-1.5	—	-5.0	
	RN2105MFV			-0.6	—	-1.1	
	RN2106MFV			-0.7	—	-1.3	
Input voltage (OFF)	RN2101MFV to RN2104MFV	$V_{I(OFF)}$	V_{CE} = -5 V, I_C = -0.1 mA	-1.0	—	-1.5	V
	RN2101MFV to RN2106MFV			-0.5	—	-0.8	
Transition frequency	RN2101MFV to RN2106MFV	f_T	V_{CE} = -10 V, I_C = -5 mA	—	250	—	MHz
Collector output capacitance	RN2101MFV to RN2106MFV	C_{ob}	V_{CB} = -10 V, I_E = 0 mA, f = 1 MHz	—	0.9	—	pF
Input resistance	RN2101MFV	R_1	-	3.29	4.7	6.11	kΩ
	RN2102MFV			7	10	13	
	RN2103MFV			15.4	22	28.6	
	RN2104MFV			32.9	47	61.1	
	RN2105MFV			1.54	2.2	2.86	
	RN2106MFV			3.29	4.7	6.11	
Resistor ratio	RN2101MFV to RN2104MFV	R1/R2	-	0.8	1.0	1.2	—
	RN2105MFV			0.0376	0.0468	0.0562	
	RN2106MFV			0.08	0.1	0.12	

10. Marking

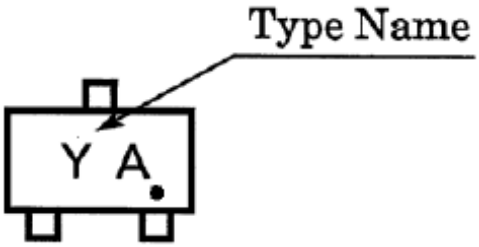


Fig. 10.1 Marking RN2101MFV

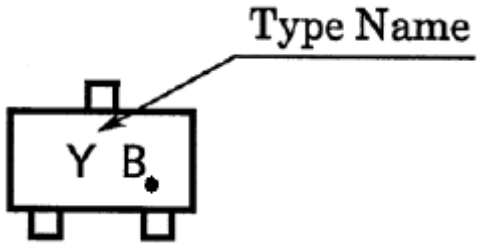


Fig. 10.2 Marking RN2102MFV

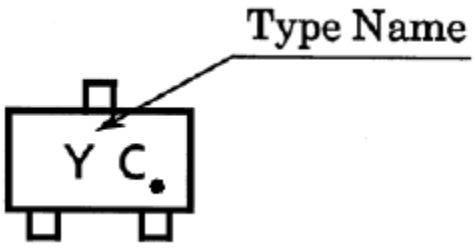


Fig. 10.3 Marking RN2103MFV

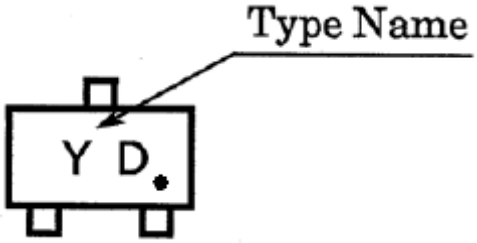


Fig. 10.4 Marking RN2104MFV

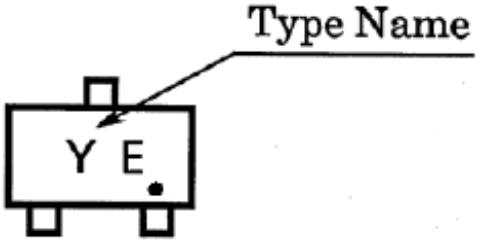


Fig. 10.5 Marking RN2105MFV

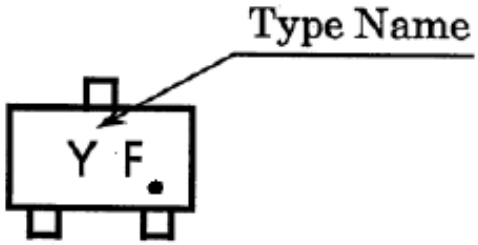


Fig. 10.6 Marking RN2106MFV

11. Characteristics Curves (Note)

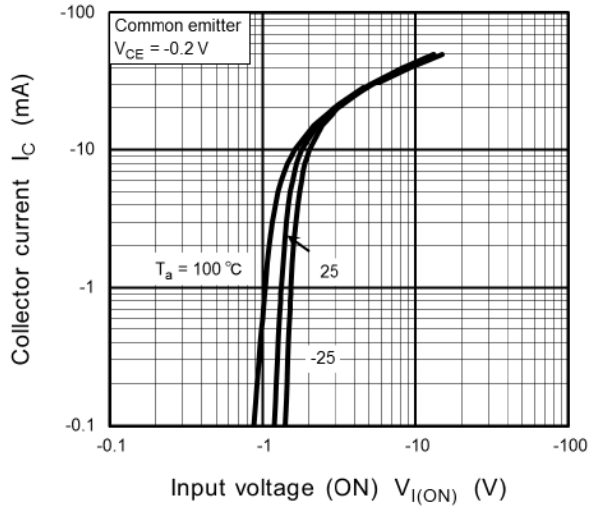


Fig. 11.1 RN2101MFV I_C-$V_{I(ON)}$

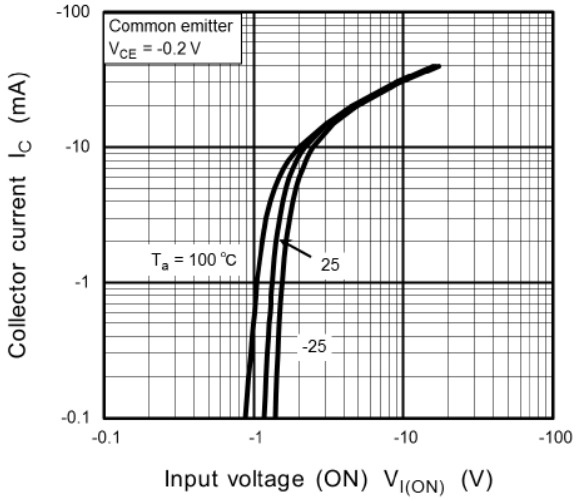


Fig. 11.2 RN2102MFV I_C-$V_{I(ON)}$

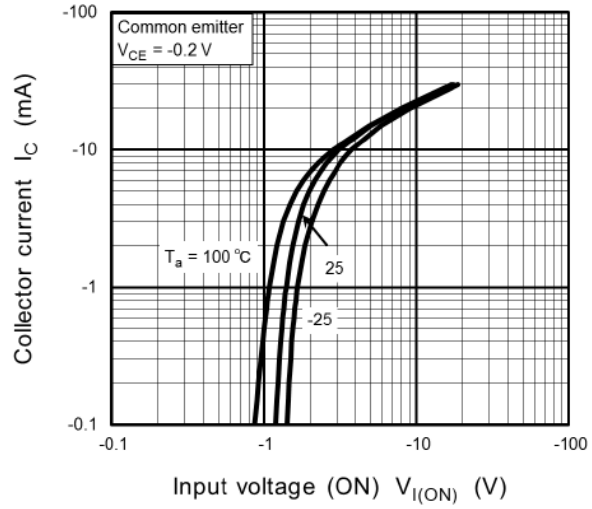


Fig. 11.3 RN2103MFV I_C-$V_{I(ON)}$

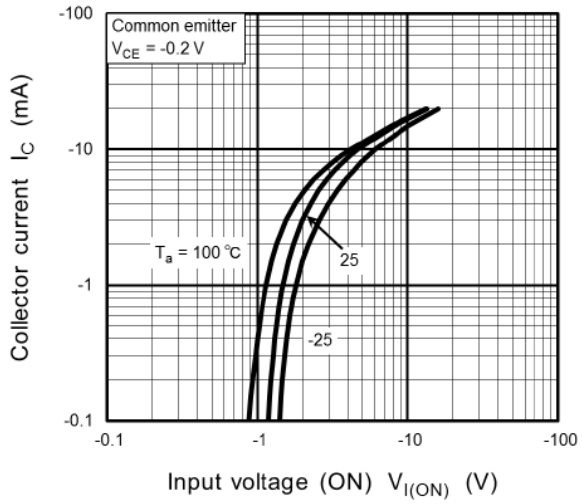


Fig. 11.4 RN2104MFV I_C-$V_{I(ON)}$

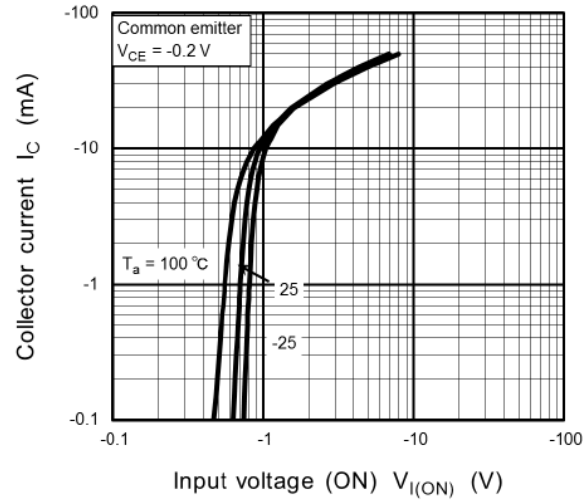


Fig. 11.5 RN2105MFV I_C-$V_{I(ON)}$

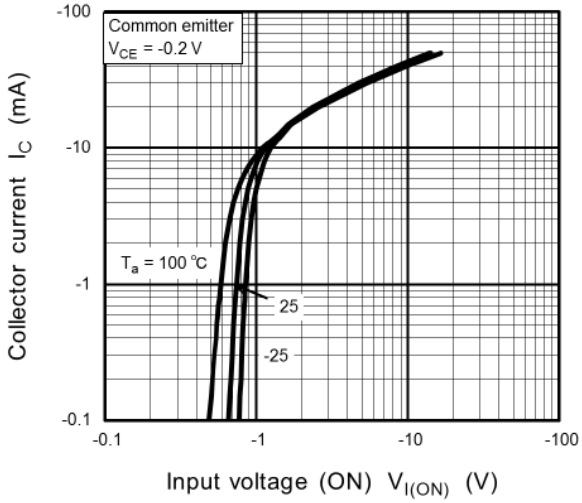


Fig. 11.6 RN2106MFV I_C-$V_{I(ON)}$

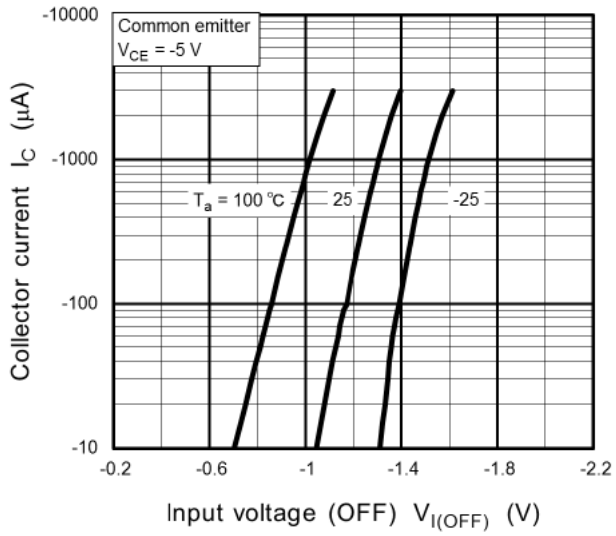


Fig. 11.7 RN2101MFV I_C-$V_{I(OFF)}$

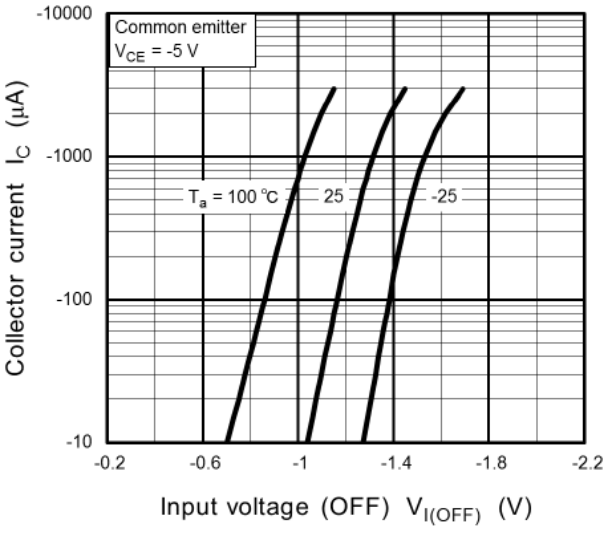


Fig. 11.8 RN2102MFV I_C-$V_{I(OFF)}$

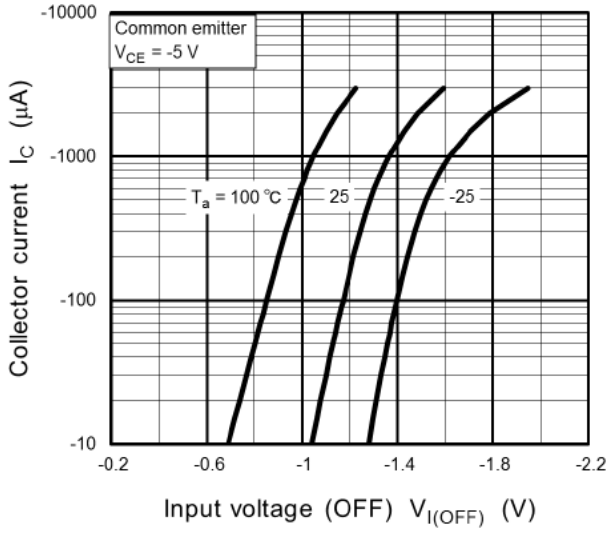


Fig. 11.9 RN2103MFV I_C-$V_{I(OFF)}$

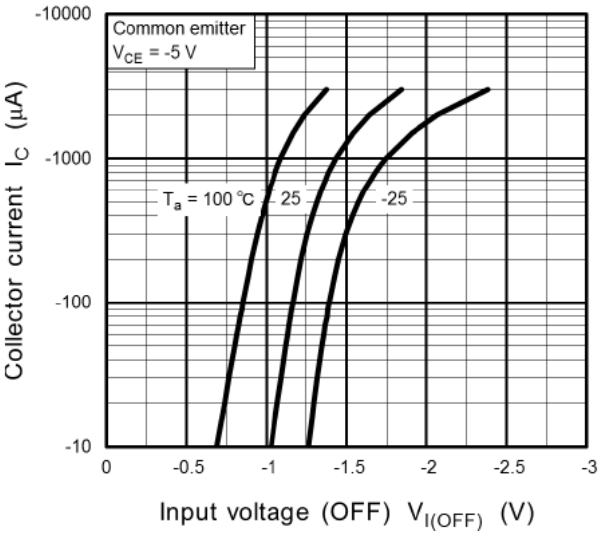


Fig. 11.10 RN2104MFV I_C-$V_{I(OFF)}$

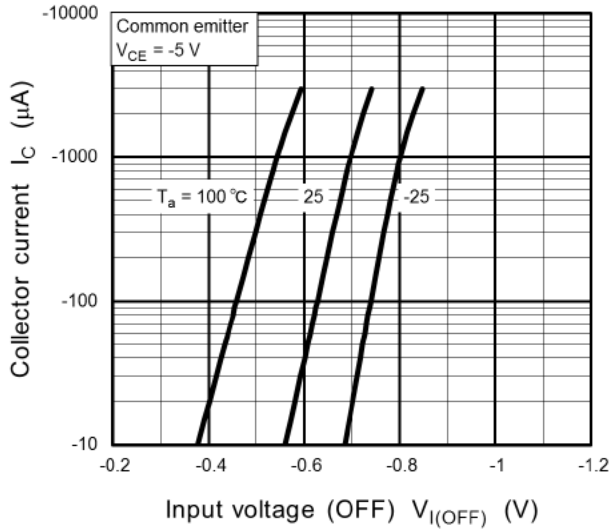


Fig. 11.11 RN2105MFV I_C-$V_{I(OFF)}$

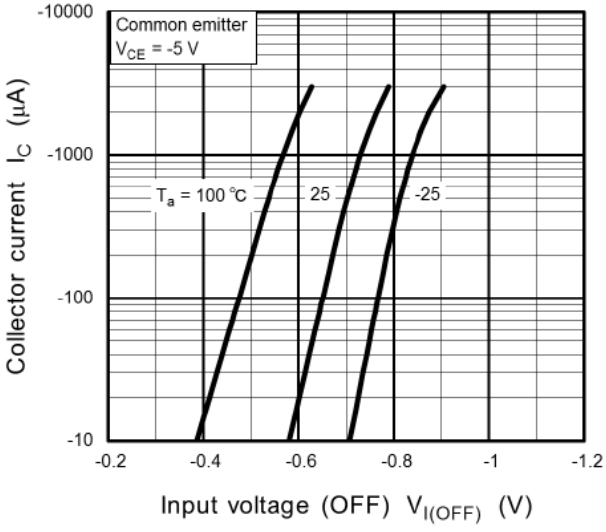


Fig. 11.12 RN2106MFV I_C-$V_{I(OFF)}$

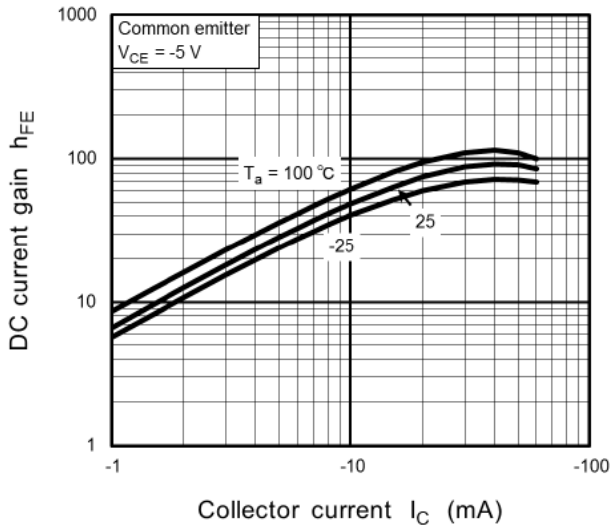


Fig. 11.13 RN2101MFV h_{FE}-I_C

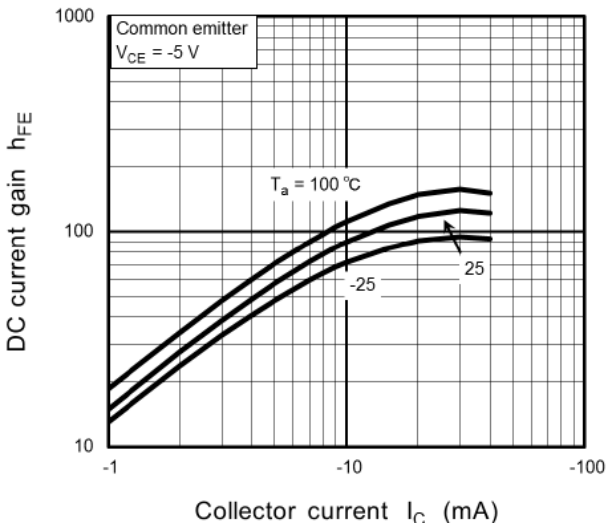


Fig. 11.14 RN2102MFV h_{FE}-I_C

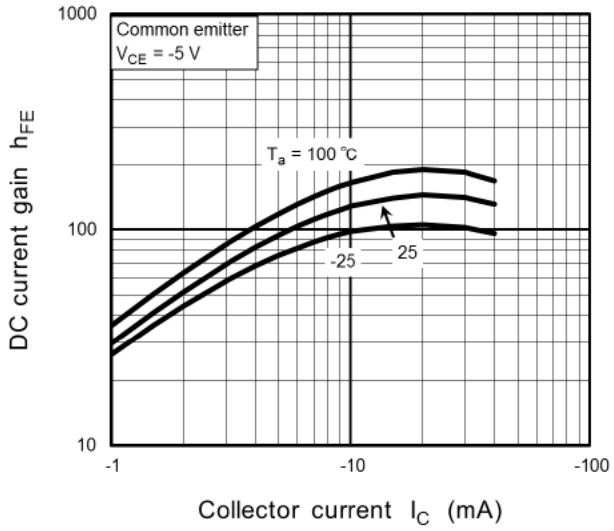


Fig. 11.15 RN2103MFV h_{FE}-I_C

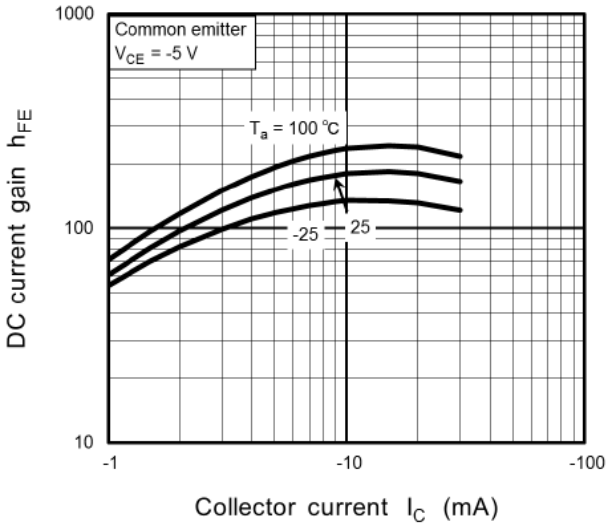


Fig. 11.16 RN2104MFV h_{FE}-I_C

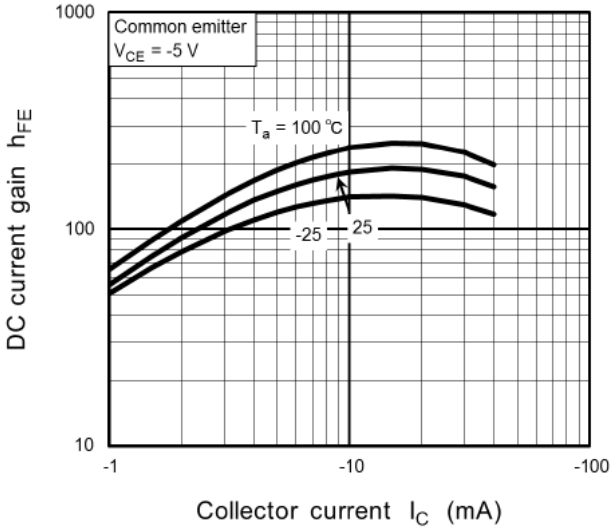


Fig. 11.17 RN2105MFV $h_{FE(sat)}$-I_C

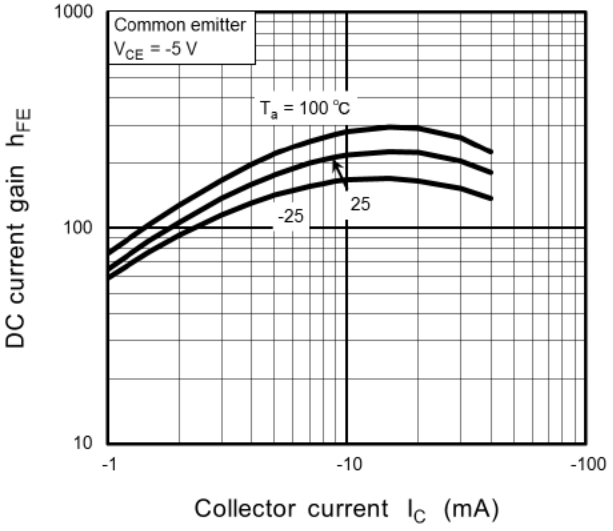


Fig. 11.18 RN2106MFV h_{FE}-I_C

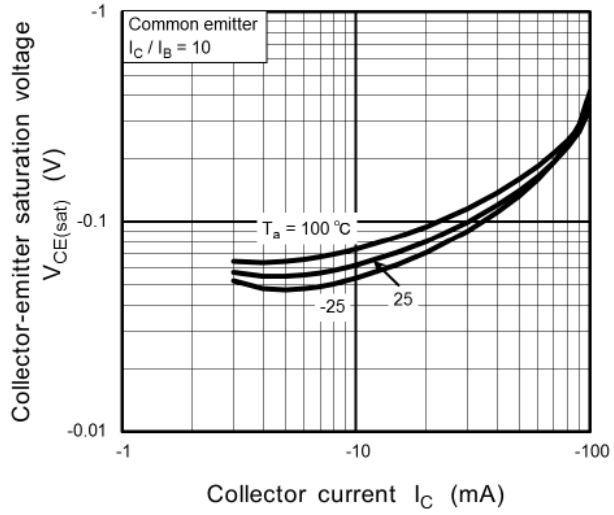


Fig. 11.19 RN2101MFV $V_{CE(sat)}$-I_C

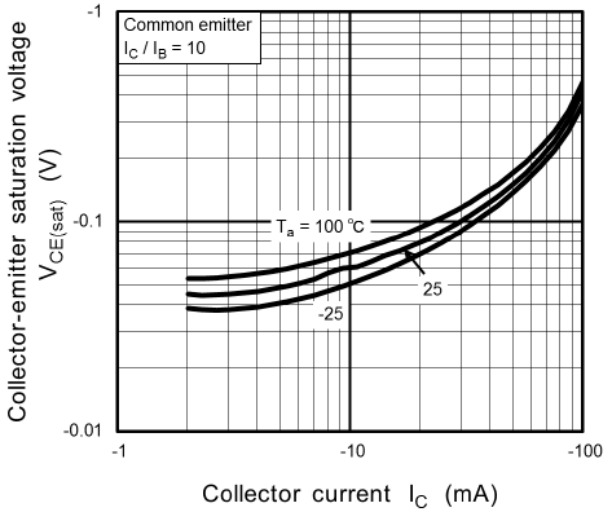


Fig. 11.20 RN2102MFV $V_{CE(sat)}$-I_C

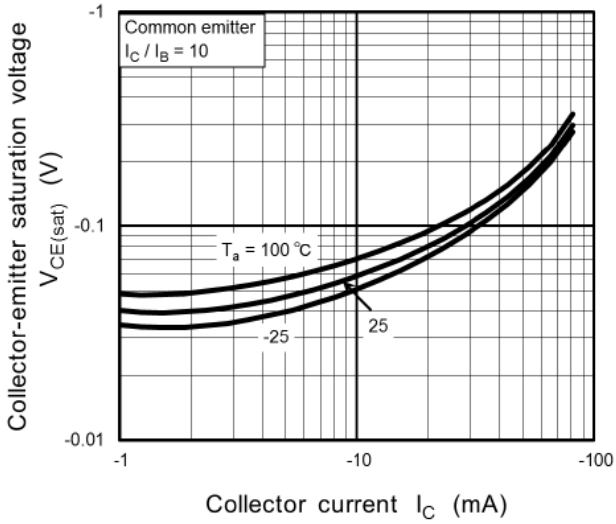


Fig. 11.21 RN2103MFV $V_{CE(sat)}$-I_C

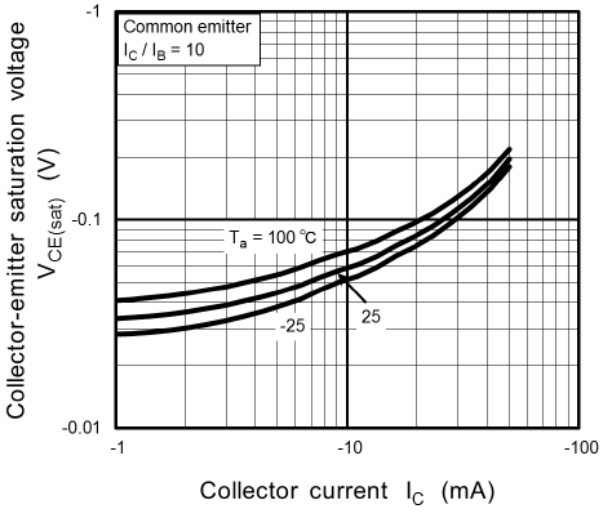


Fig. 11.22 RN2104MFV $V_{CE(sat)}$-I_C

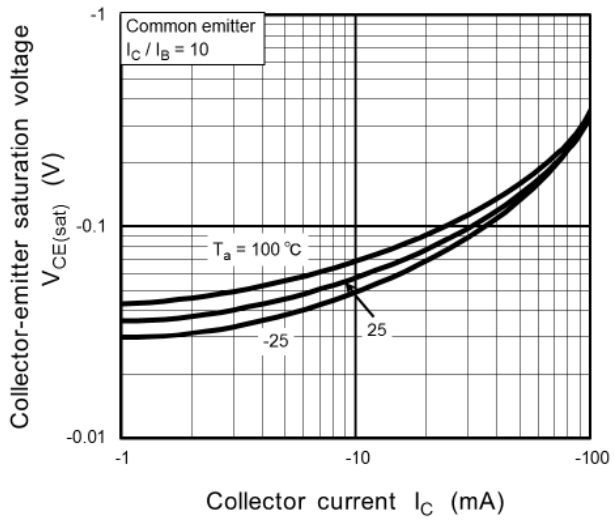


Fig. 11.23 RN2105MFV $V_{CE(sat)}$-I_C

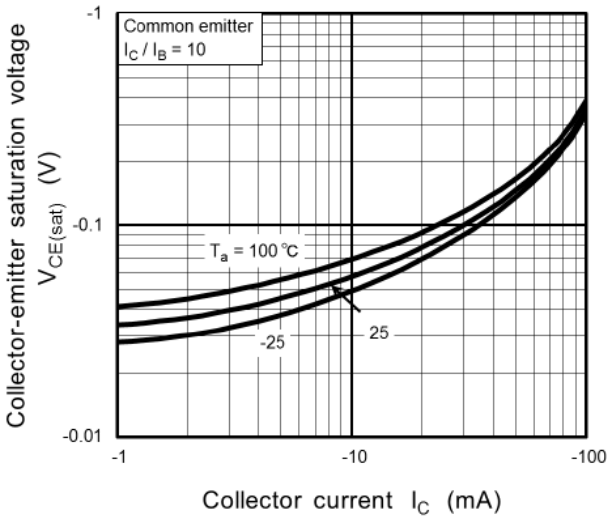
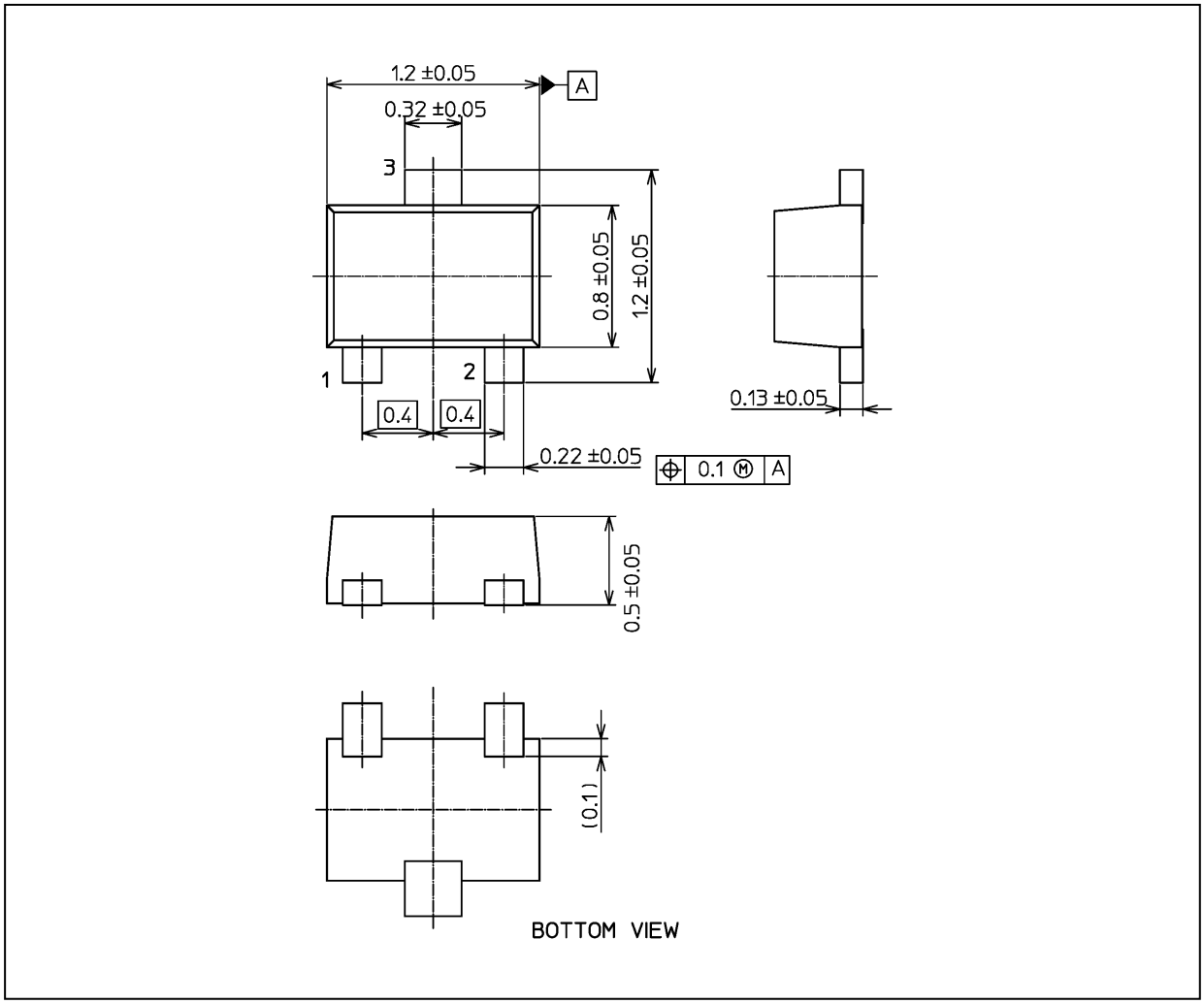


Fig. 11.24 RN2106MFV $V_{CE(sat)}$-I_C

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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