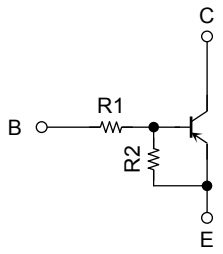
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN2101FS,RN2102FS,RN2103FS RN2104FS,RN2105FS,RN2106FS

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

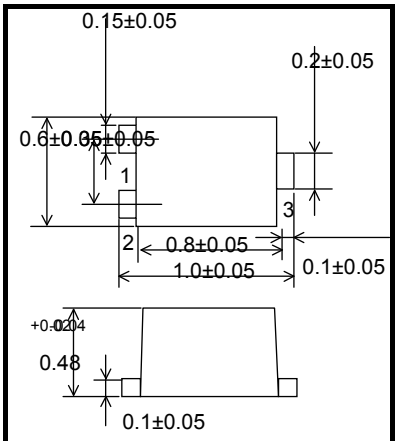
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN1101FS~RN1106FS

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN2101FS	4.7	4.7
RN2102FS	10	10
RN2103FS	22	22
RN2104FS	47	47
RN2105FS	2.2	47
RN2106FS	4.7	47

Unit: mm



fSM

1.BASE
2.EMITTER
3.COLLECOTR

JEDEC	—
JEITA	—
TOSHIBA	2-1E1A

Weight: 0.0006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

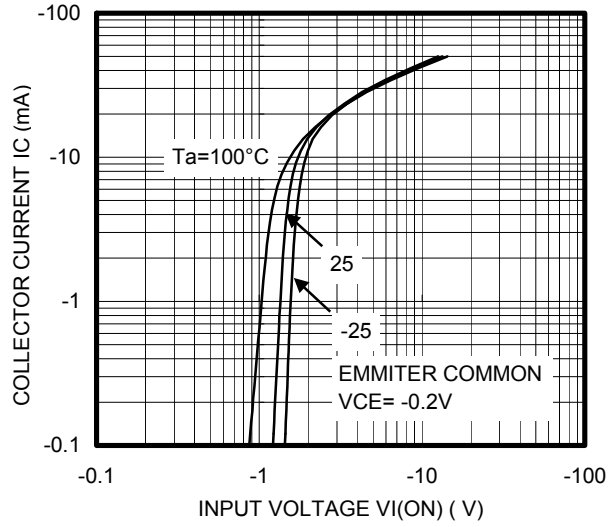
Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2101FS~2106FS	V_{CBO}	−20	V
Collector-emitter voltage		V_{CEO}	−20	V
Emitter-base voltage	RN2101FS~2104FS	V_{EBO}	−10	V
	RN2105FS, 2106FS		−5	
Collector current	RN2101FS~2106FS	I_C	−50	mA
Collector power dissipation		P_C	50	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55~150	°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).

Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2101FS~2106FS	I_{CBO}	V_{CB} = –20 V, I_E = 0	—	—	–100	nA
		I_{CEO}	V_{CE} = –20 V, I_B = 0	—	—	–500	
Emitter cut-off current	RN2101FS	I_{EBO}	V_{EB} = –10 V, I_C = 0	–0.89	—	–1.33	mA
	RN2102FS			–0.41	—	–0.63	
	RN2103FS			–0.18	—	–0.29	
	RN2104FS			–0.088	—	–0.133	
	RN2105FS		V_{EB} = –5 V, I_C = 0	–0.085	—	–0.127	
	RN2106FS			–0.08	—	–0.121	
DC current gain	RN2101FS	h_{FE}	V_{CE} = –5 V, I_C = –10 mA	30	—	—	
	RN2102FS			60	—	—	
	RN2103FS			100	—	—	
	RN2104FS			120	—	—	
	RN2105FS			120	—	—	
	RN2106FS			120	—	—	
Collector-emitter saturation voltage	RN2101FS~2106FS	$V_{CE\ (sat)}$	I_C = –5 mA, I_B = –0.25 mA	—	—	–0.15	V
Input voltage (ON)	RN2101FS	$V_{I\ (ON)}$	V_{CE} = –0.2 V, I_C = –5 mA	–1.0	—	–2.0	V
	RN2102FS			–1.0	—	–2.2	
	RN2103FS			–1.1	—	–2.7	
	RN2104FS			–1.2	—	–3.6	
	RN2105FS			–0.6	—	–1.1	
	RN2106FS			–0.6	—	–1.2	
Input voltage (OFF)	RN2101FS~2104FS	$V_{I\ (OFF)}$	V_{CE} = –5 V, I_C = –0.1 mA	–0.8	—	–1.5	V
	RN2105FS, 2106FS			–0.4	—	–0.8	
Collector output capacitance	RN2101FS~2106FS	C_{ob}	V_{CB} = –10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF
Input resistor	RN2101FS	R1	—	3.76	4.7	5.64	kΩ
	RN2102FS			8	10	12	
	RN2103FS			17.6	22	26.4	
	RN2104FS			37.6	47	56.4	
	RN2105FS			1.76	2.2	2.64	
	RN2106FS			3.76	4.7	5.64	
Resistor ratio	RN2101FS~2104FS	R1/R2	—	0.8	1.0	1.2	
	RN2105FS			0.0376	0.0468	0.0562	
	RN2106FS			0.08	0.1	0.12	

RN2101FS IC - VI(ON)



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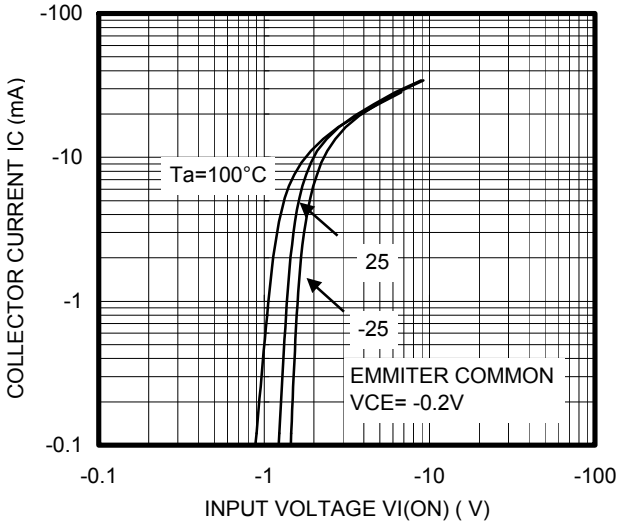

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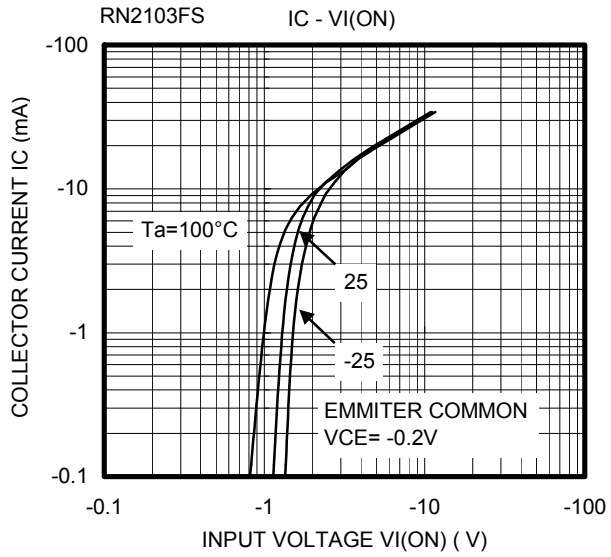

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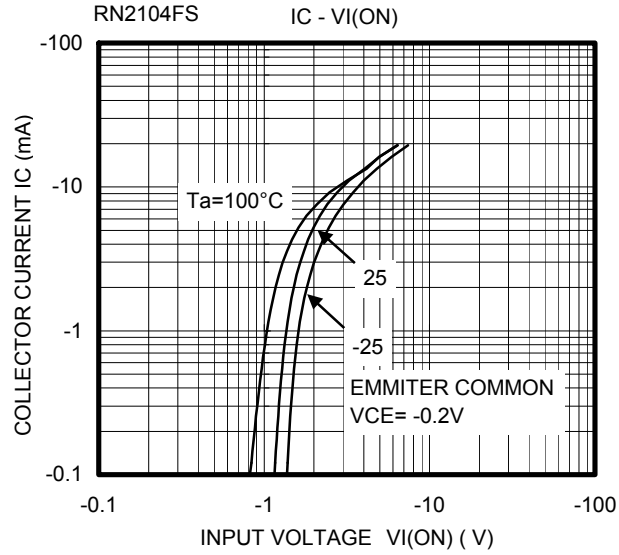

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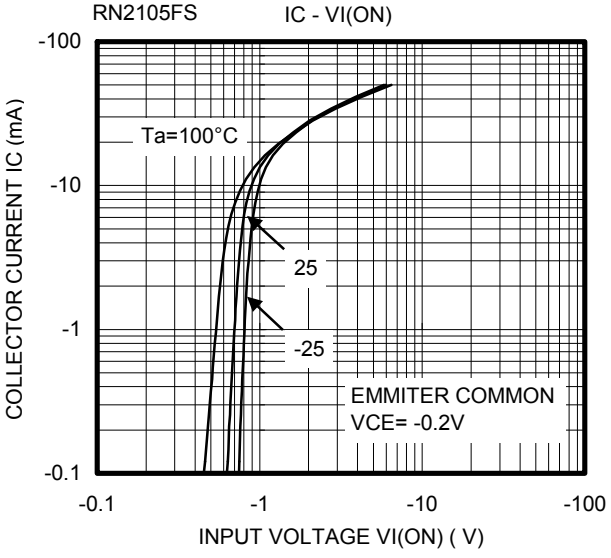

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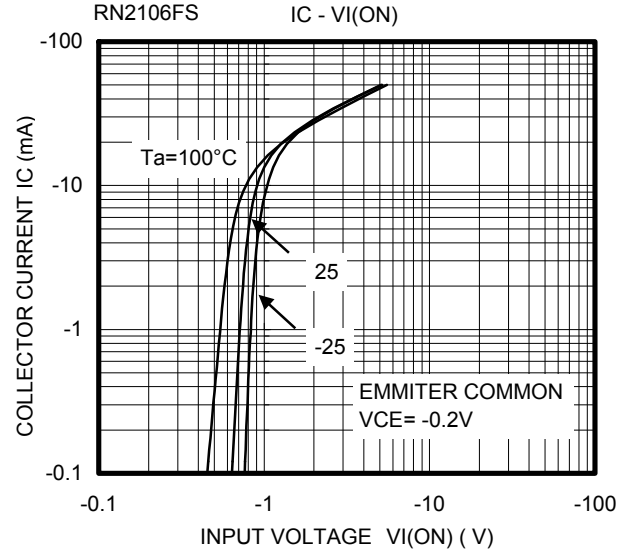
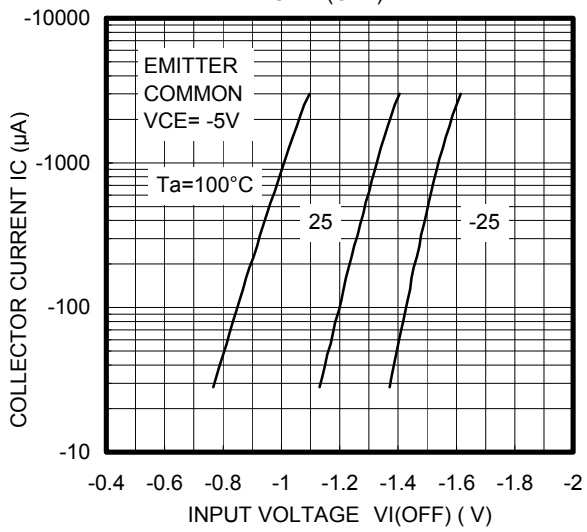


RN2101FS IC - VI(OFF)



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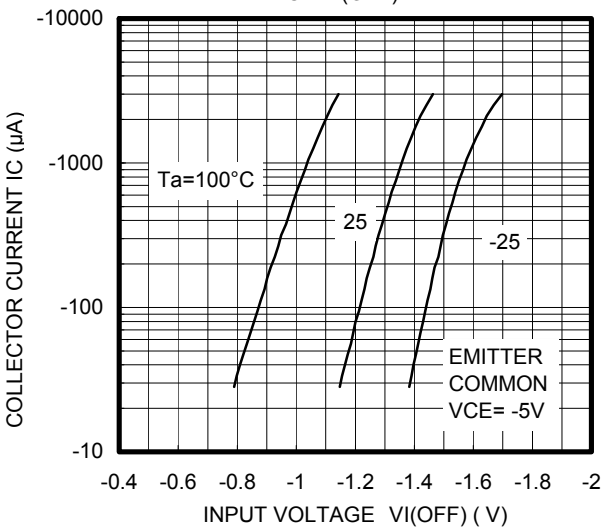

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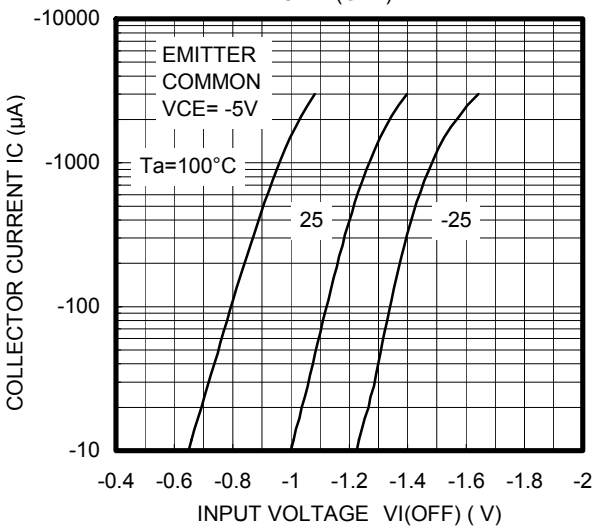

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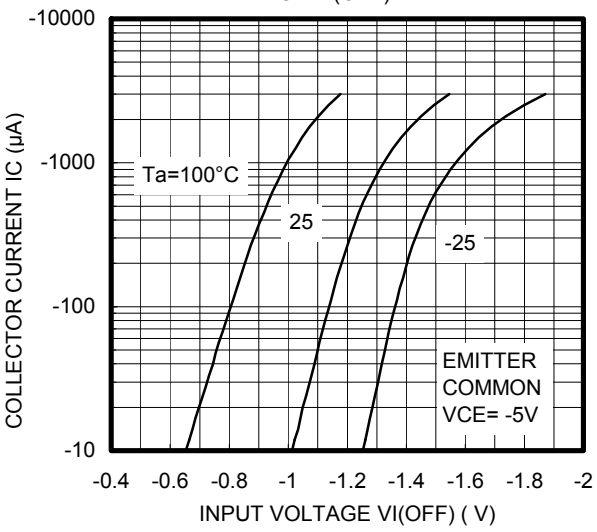

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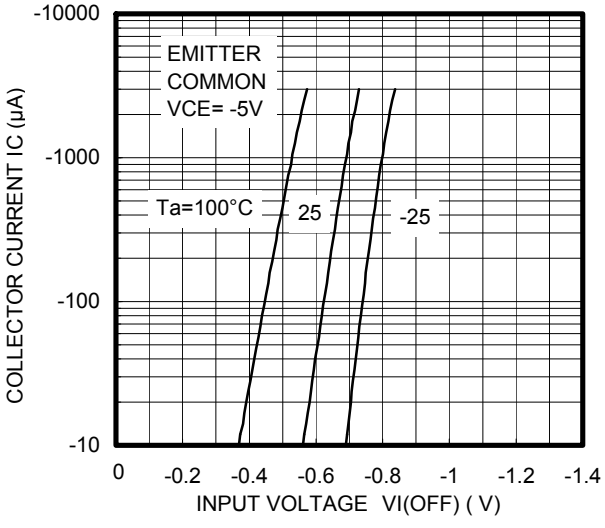

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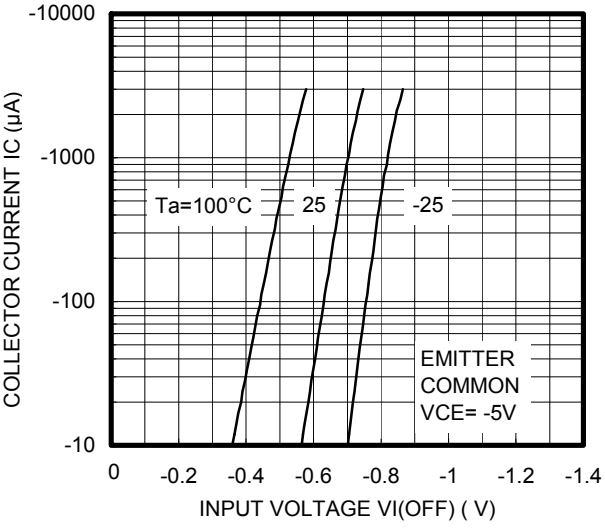
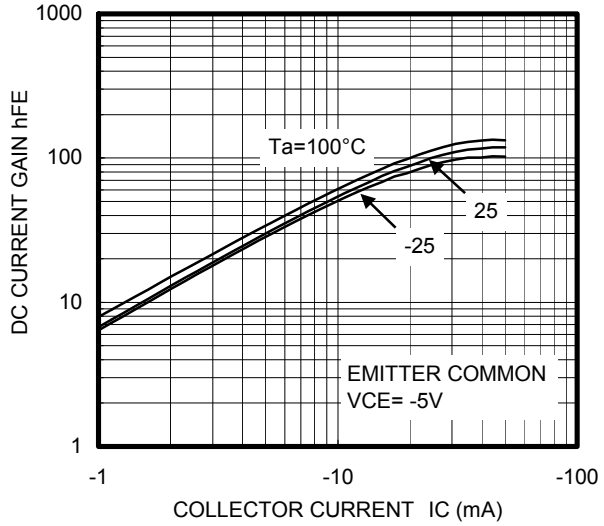


RN2101FS hFE - IC



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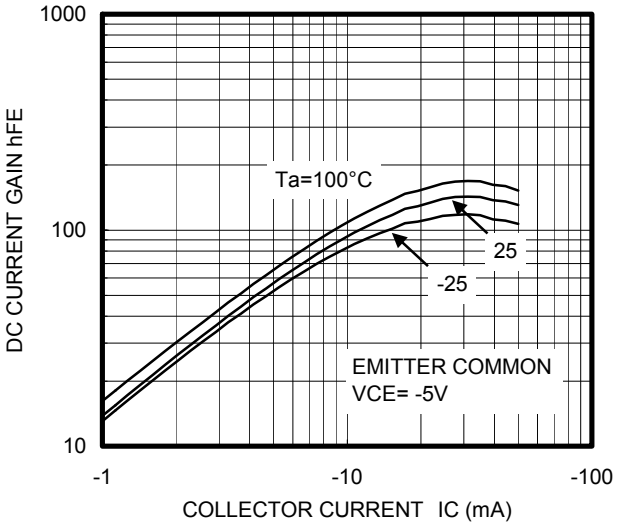

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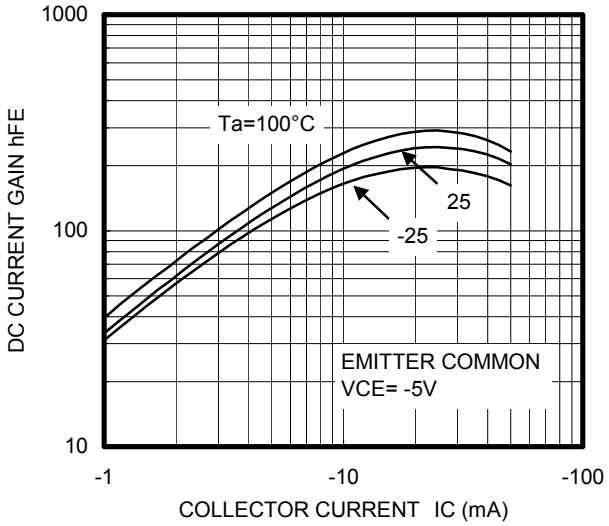

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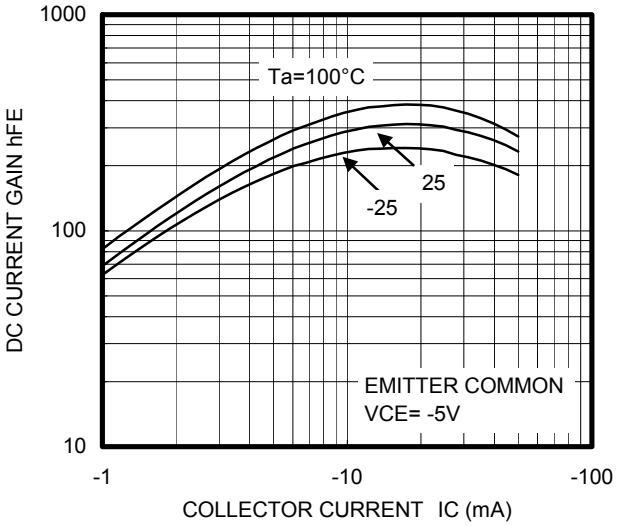

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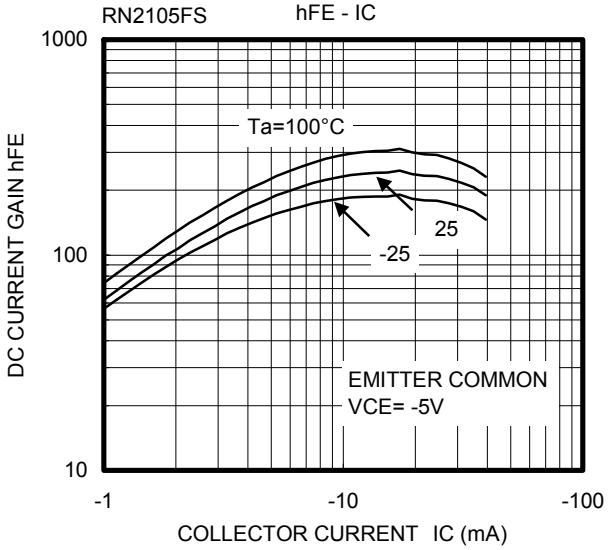

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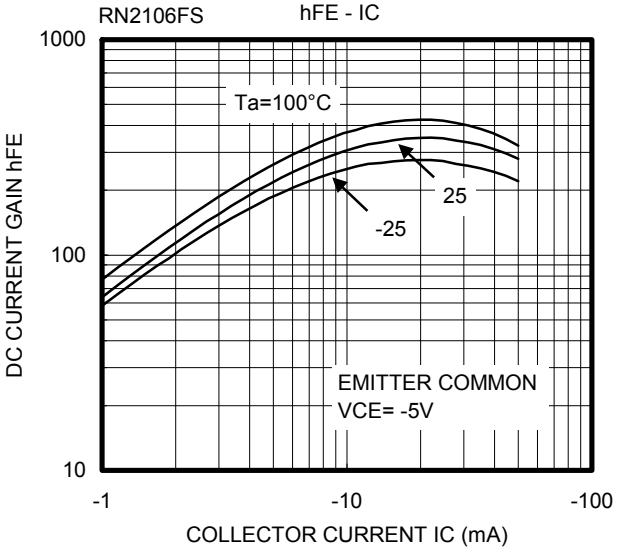
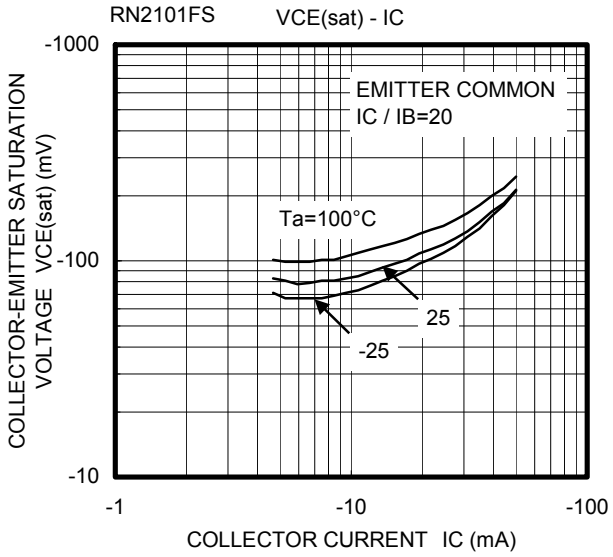
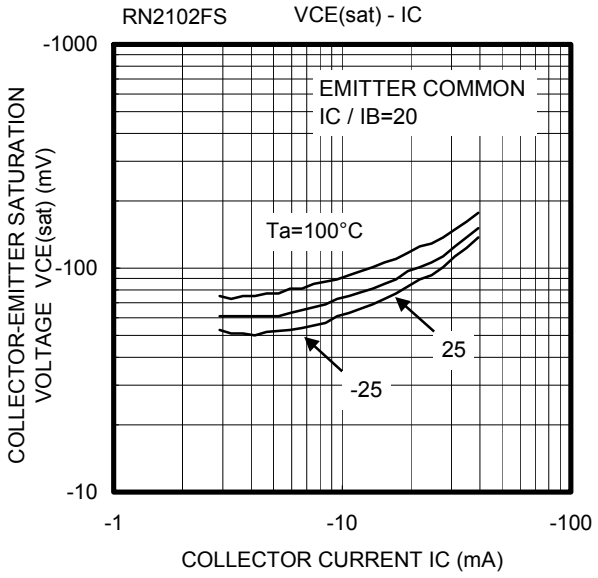
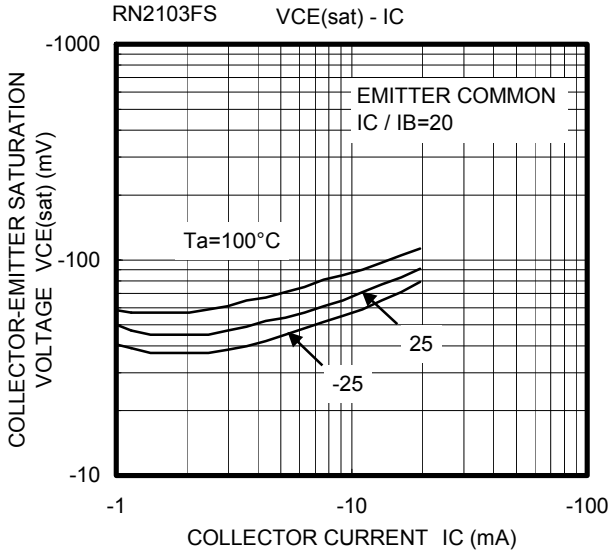
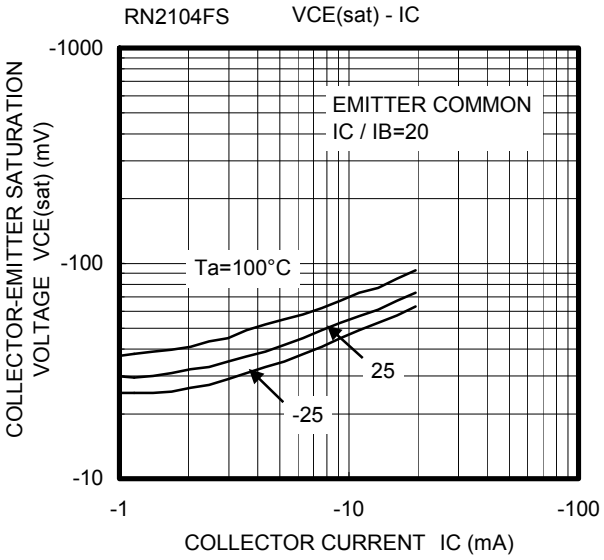



RN2101FS VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2102FS VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2103FS VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2104FS VCE(sat) - IC
EMITTER COMMON
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Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
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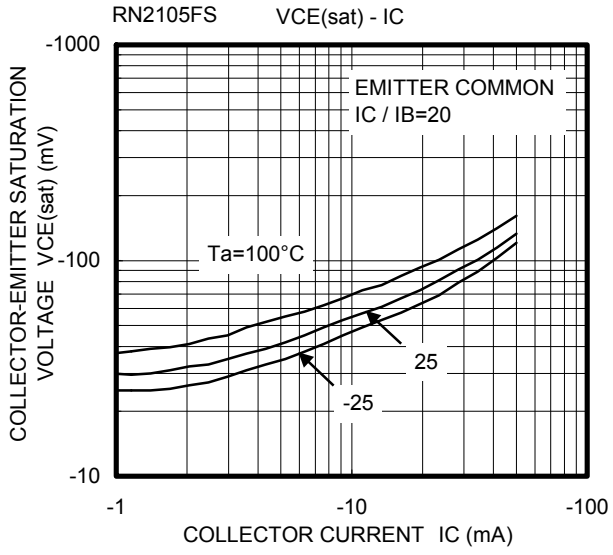
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2105FS VCE(sat) - IC
EMITTER COMMON
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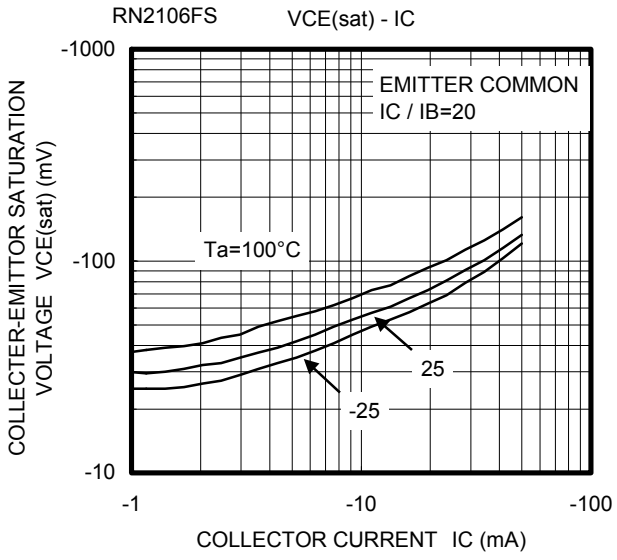
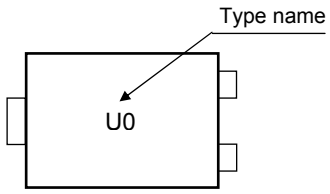
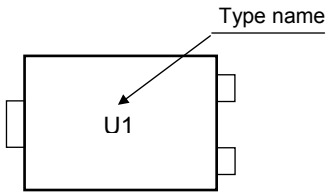
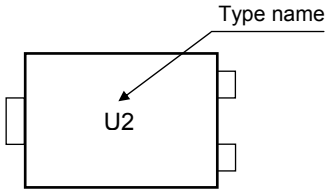
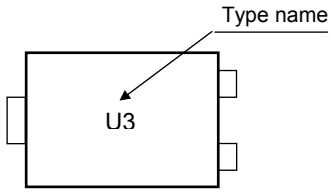
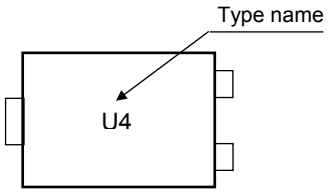
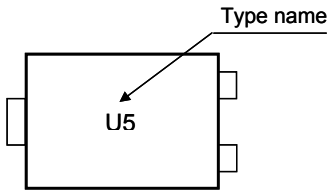
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2106FS VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTER-EMITTOR SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)

Type Name	Marking
RN2101FS	
RN2102FS	
RN2103FS	
RN2104FS	
RN2105FS	
RN2106FS	

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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