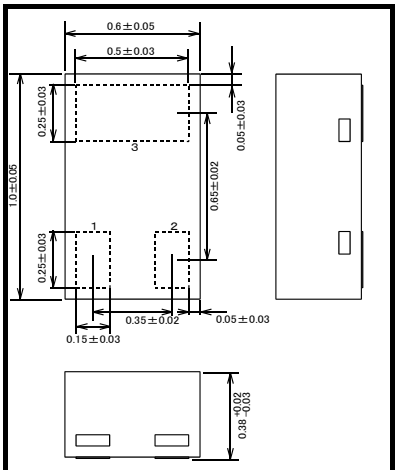
TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN2101CT, RN2102CT, RN2103CT RN2104CT, RN2105CT, RN2106CT

Switching Applications
Inverter Circuit Applications
Interface Circuit Applications
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 RN1101CT to RN1106CT

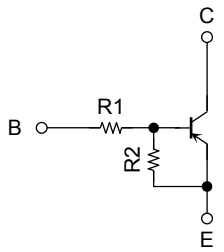
Unit: mm



CST3	1.BASE 2.EMITTER 3.COLLECOTR
JEDEC	—
JEITA	—
TOSHIBA	2-1J1A

Weight: 0.75 mg (typ.)

Equivalent Circuit and Bias Resistor Values



Type No.	R1 (kΩ)	R2 (kΩ)
RN2101CT	4.7	4.7
RN2102CT	10	10
RN2103CT	22	22
RN2104CT	47	47
RN2105CT	2.2	47
RN2106CT	4.7	47

Absolute Maximum Ratings (Ta = 25°C)

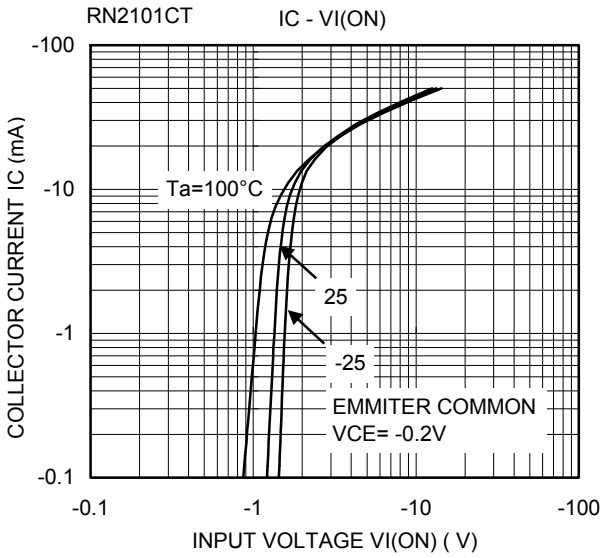
Characteristics		Symbol	Rating	Unit
Collector-base voltage	RN2101CT to 2106CT	V_{CBO}	−20	V
Collector-emitter voltage		V_{CEO}	−20	V
Emitter-base voltage	RN2101CT to 2104CT	V_{EBO}	−10	V
	RN2105CT, 2106CT		−5	
Collector current	RN2101CT to 2106CT	I_C	−50	mA
Collector power dissipation		P_C	50	mW
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

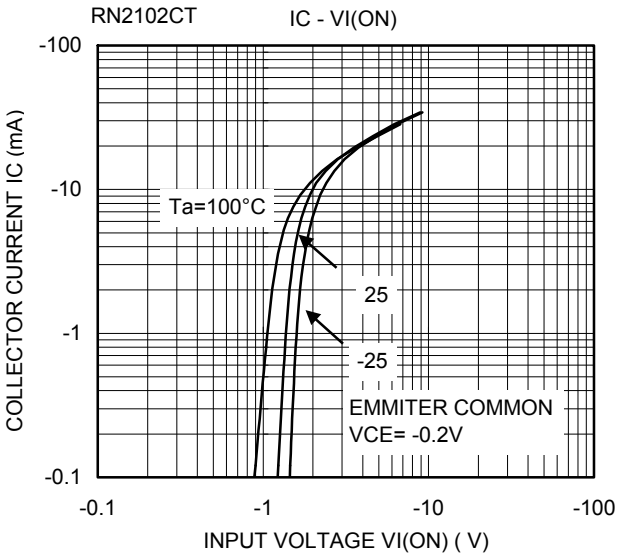
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e.operatingtemperature/current/voltage, etc.) are 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).

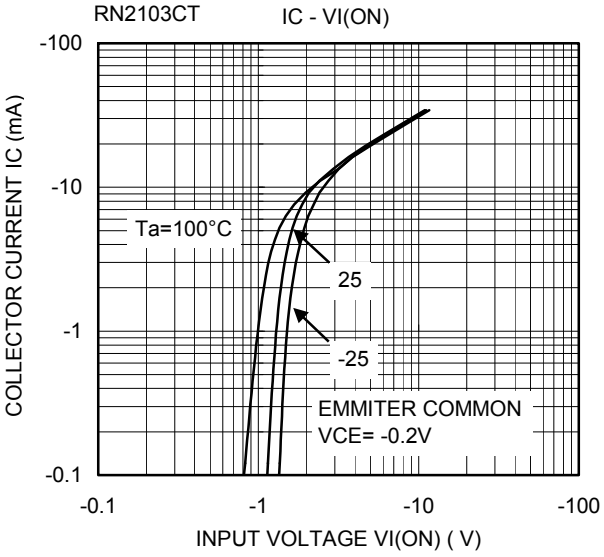
Start of commercial production
2004-10

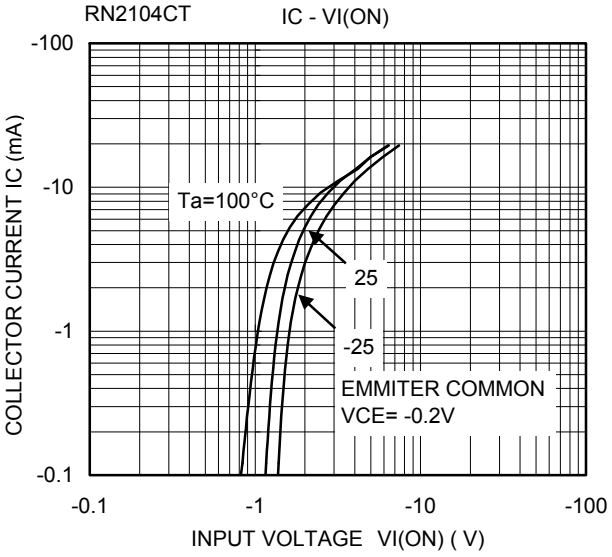
Electrical Characteristics (Ta = 25°C)

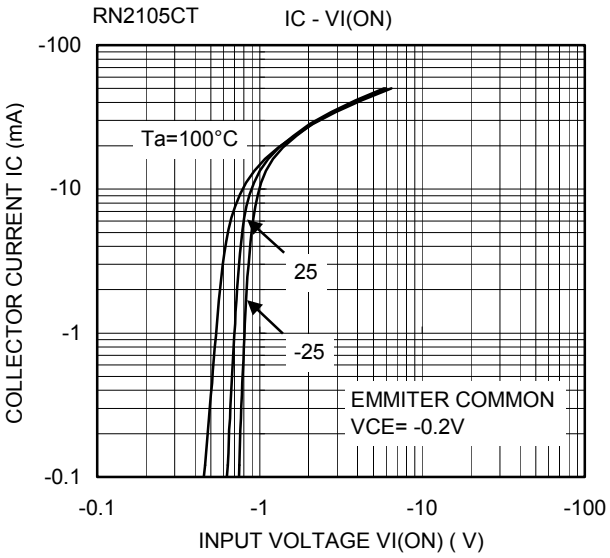
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	RN2101CT to 2106CT	I_{CBO}	V_{CB} = –20 V, I_E = 0	—	—	–100	nA
		I_{CEO}	V_{CE} = –20 V, I_B = 0	—	—	–500	
Emitter cut-off current	RN2101CT	I_{EBO}	V_{EB} = –10 V, I_C = 0	–0.89	—	–1.33	mA
	RN2102CT			–0.41	—	–0.63	
	RN2103CT			–0.18	—	–0.29	
	RN2104CT			–0.088	—	–0.133	
	RN2105CT		V_{EB} = –5 V, I_C = 0	–0.085	—	–0.127	
	RN2106CT			–0.08	—	–0.121	
DC current gain	RN2101CT	h_{FE}	V_{CE} = –5 V, I_C = –10 mA	30	—	—	
	RN2102CT			60	—	—	
	RN2103CT			100	—	—	
	RN2104CT			120	—	—	
	RN2105CT			120	—	—	
	RN2106CT			120	—	—	
Collector-emitter saturation voltage	RN2101CT to 2106CT	$V_{CE\ (sat)}$	I_C = –5 mA, I_B = –0.25 mA	—	—	–0.15	V
Input voltage (ON)	RN2101CT	$V_{I\ (ON)}$	V_{CE} = –0.2 V, I_C = –5 mA	–1.0	—	–2.0	V
	RN2102CT			–1.0	—	–2.2	
	RN2103CT			–1.1	—	–2.7	
	RN2104CT			–1.2	—	–3.6	
	RN2105CT			–0.6	—	–1.1	
	RN2106CT			–0.6	—	–1.2	
Input voltage (OFF)	RN2101CT to 2104CT	$V_{I\ (OFF)}$	V_{CE} = –5 V, I_C = –0.1 mA	–0.8	—	–1.5	V
	RN2105CT, 2106CT			–0.4	—	–0.8	
Collector output capacitance	RN2101CT to 2106CT	C_{ob}	V_{CB} = –10 V, I_E = 0, f = 1 MHz	—	1.2	—	pF
Input resistor	RN2101CT	R1	—	3.76	4.7	5.64	kΩ
	RN2102CT			8	10	12	
	RN2103CT			17.6	22	26.4	
	RN2104CT			37.6	47	56.4	
	RN2105CT			1.76	2.2	2.64	
	RN2106CT			3.76	4.7	5.64	
Resistor ratio	RN2101CT to 2104CT	R1/R2	—	0.8	1.0	1.2	
	RN2105CT			0.0376	0.0468	0.0562	
	RN2106CT			0.08	0.1	0.12	

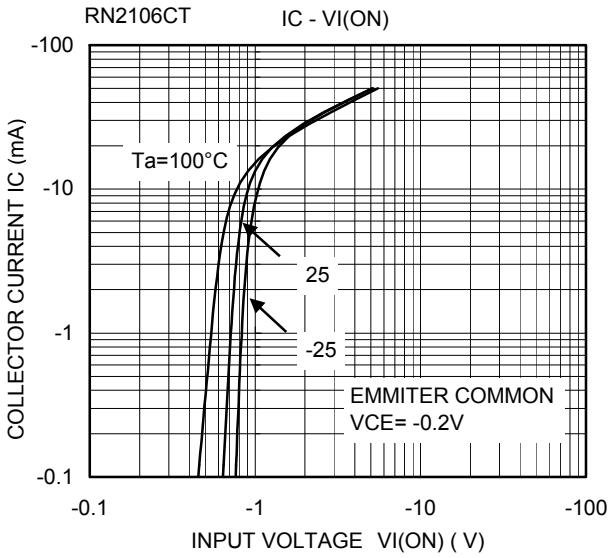

RN2101CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

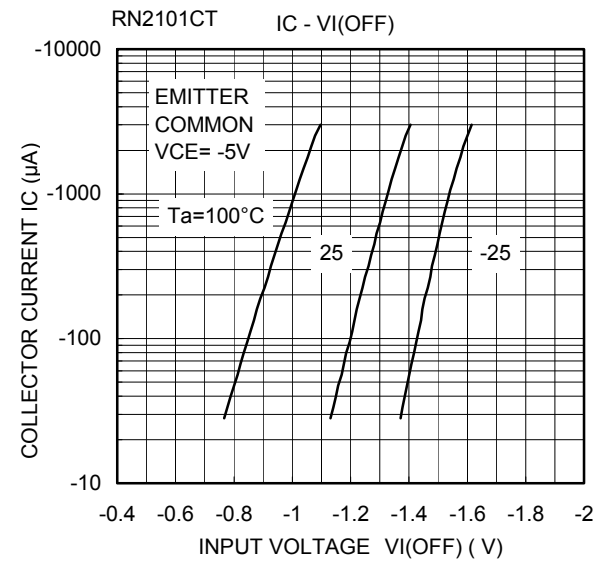

RN2102CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

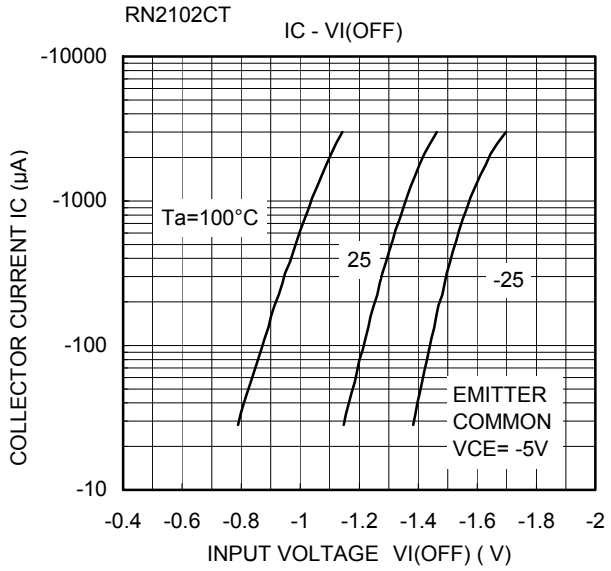

RN2103CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

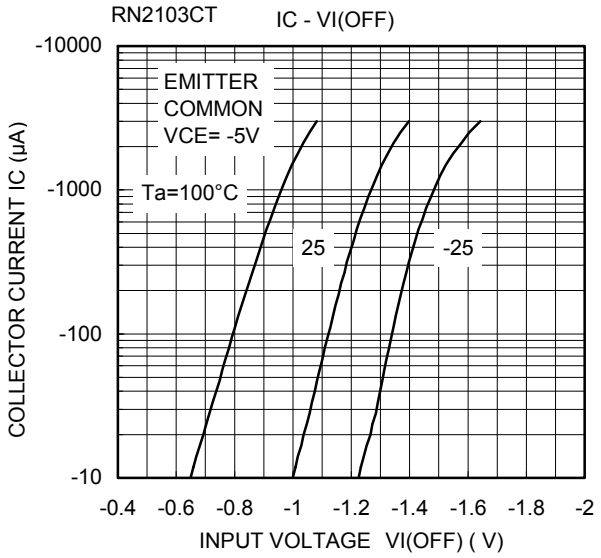

RN2104CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

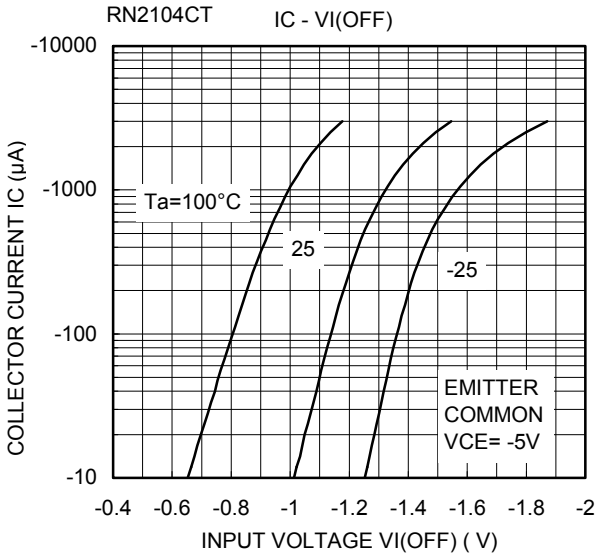

RN2105CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

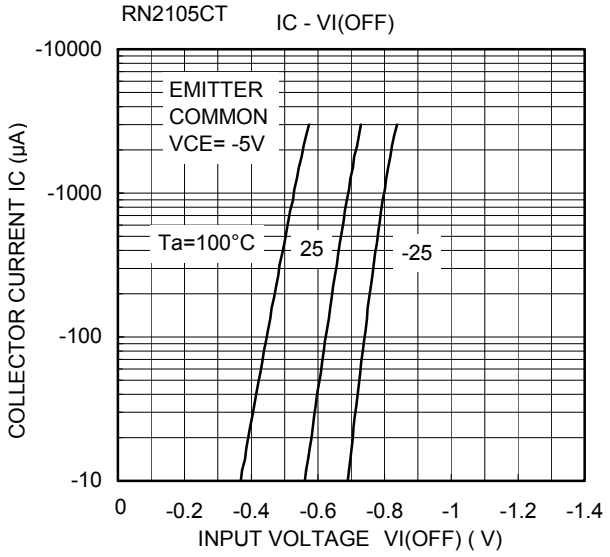

RN2106CT
IC - VI(ON)
COLLECTOR CURRENT IC (mA)
INPUT VOLTAGE VI(ON) (V)
Ta=100°C
25
-25
EMMITER COMMON
VCE= -0.2V
-100
-10
-1
-0.1
-0.1
-1
-10
-100

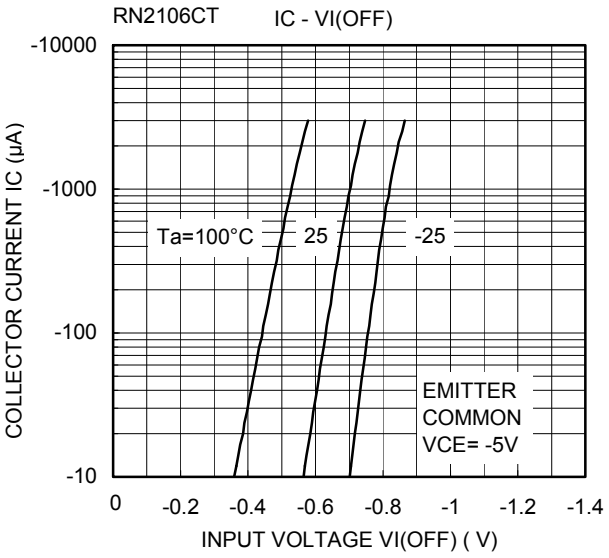

RN2101CT
IC - VI(OFF)
EMITTER
COMMON
VCE= -5V
Ta=100°C
25
-25
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
-0.4 -0.6 -0.8 -1 -1.2 -1.4 -1.6 -1.8 -2
INPUT VOLTAGE VI(OFF) (V)

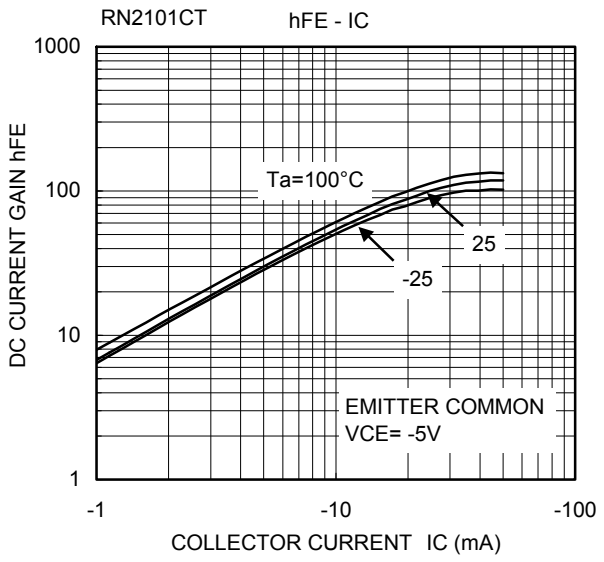

RN2102CT
IC - VI(OFF)
Ta=100°C
25
-25
EMITTER
COMMON
VCE= -5V
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
-0.4 -0.6 -0.8 -1 -1.2 -1.4 -1.6 -1.8 -2
INPUT VOLTAGE VI(OFF) (V)

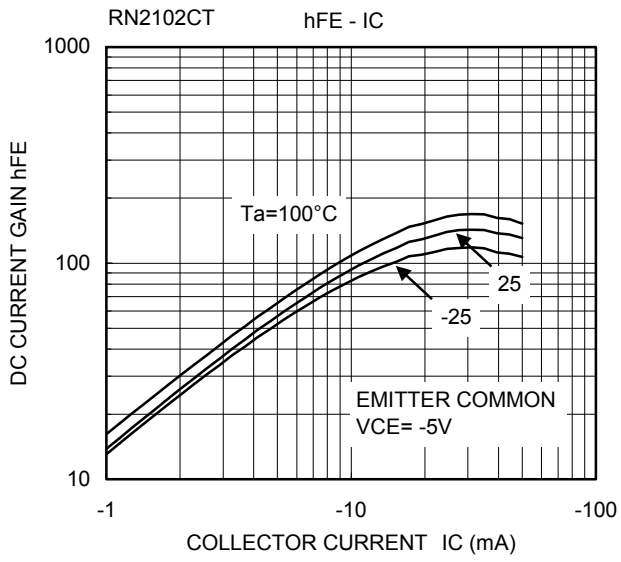

RN2103CT
IC - VI(OFF)
EMITTER
COMMON
VCE= -5V
Ta=100°C
25
-25
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
-0.4 -0.6 -0.8 -1 -1.2 -1.4 -1.6 -1.8 -2
INPUT VOLTAGE VI(OFF) (V)

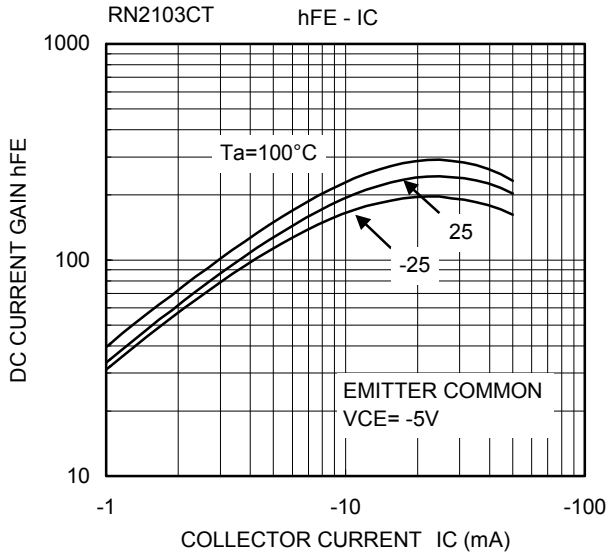

RN2104CT
IC - VI(OFF)
Ta=100°C
25
-25
EMITTER
COMMON
VCE= -5V
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
-0.4 -0.6 -0.8 -1 -1.2 -1.4 -1.6 -1.8 -2
INPUT VOLTAGE VI(OFF) (V)

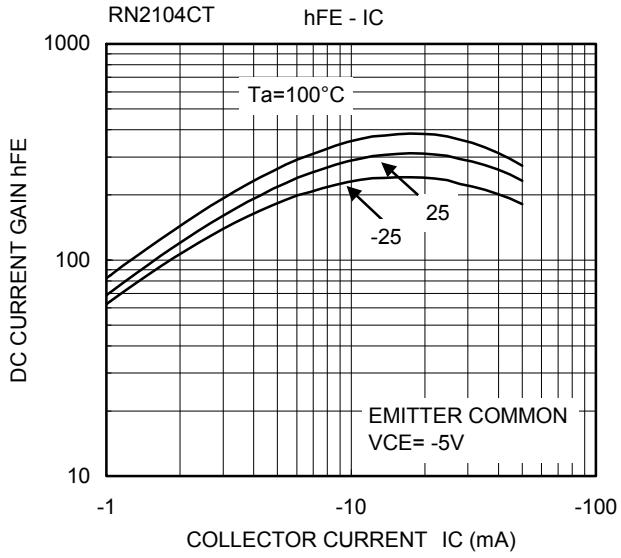

RN2105CT
IC - VI(OFF)
EMITTER
COMMON
VCE= -5V
Ta=100°C
25
-25
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
0 -0.2 -0.4 -0.6 -0.8 -1 -1.2 -1.4
INPUT VOLTAGE VI(OFF) (V)

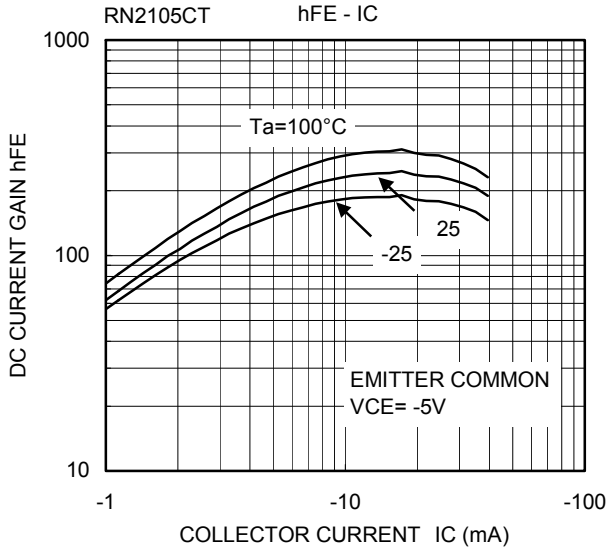

RN2106CT
IC - VI(OFF)
Ta=100°C
25
-25
EMITTER
COMMON
VCE= -5V
COLLECTOR CURRENT IC (μA)
-10000
-1000
-100
-10
0 -0.2 -0.4 -0.6 -0.8 -1 -1.2 -1.4
INPUT VOLTAGE VI(OFF) (V)

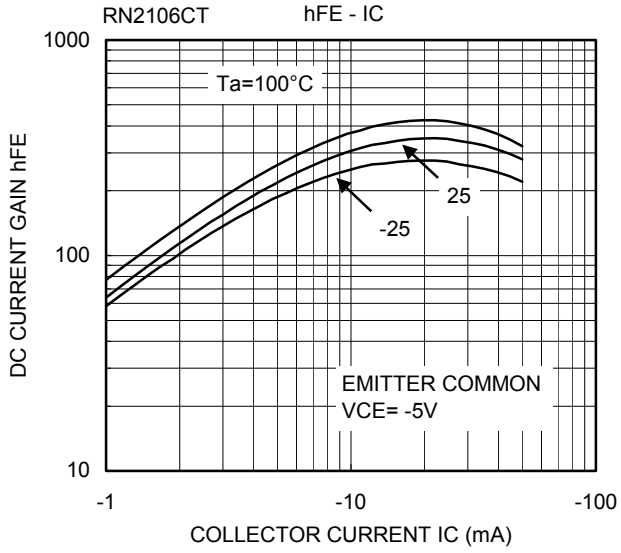

RN2101CT
hFE - IC
1000
100
10
1
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

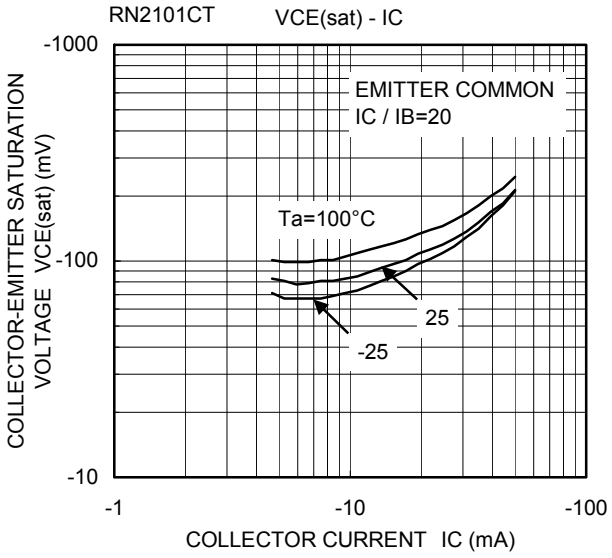

RN2102CT
hFE - IC
1000
100
10
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

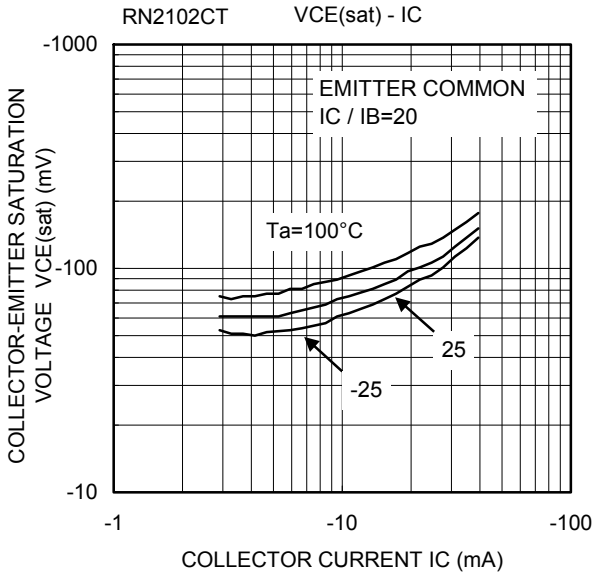

RN2103CT
hFE - IC
1000
100
10
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

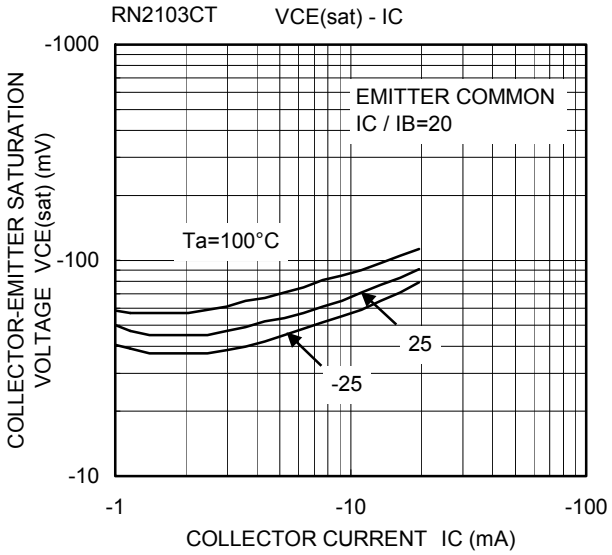

RN2104CT
hFE - IC
1000
100
10
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

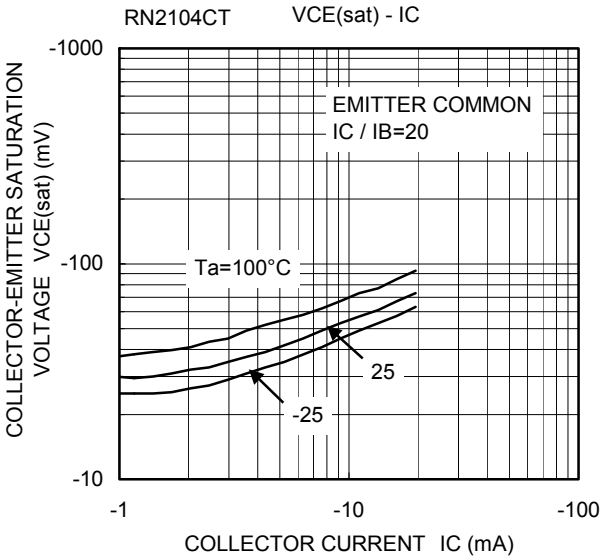

RN2105CT
hFE - IC
1000
100
10
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

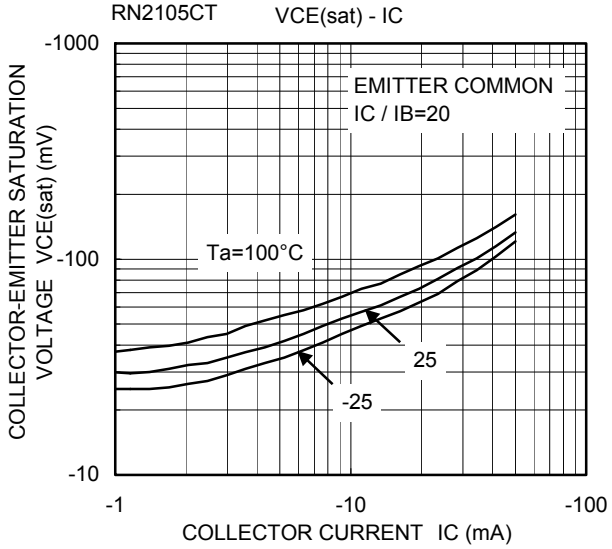

RN2106CT
hFE - IC
1000
100
10
DC CURRENT GAIN hFE
Ta=100°C
25
-25
EMITTER COMMON
VCE= -5V
-1
-10
-100
COLLECTOR CURRENT IC (mA)

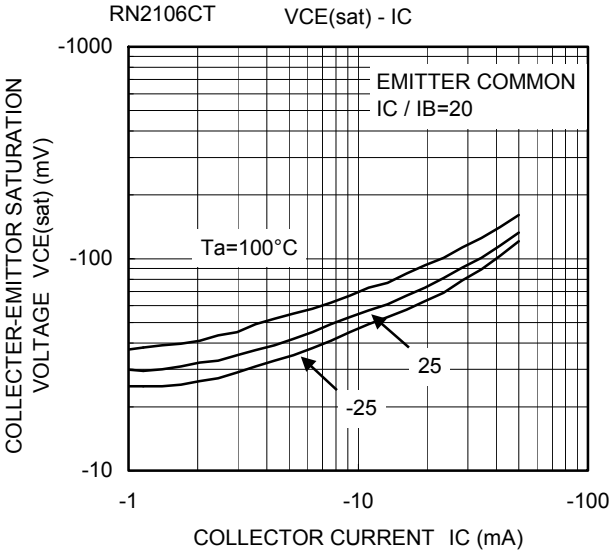

RN2101CT
VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)

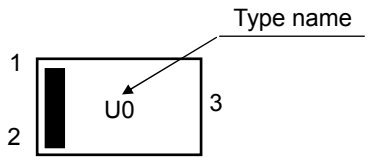
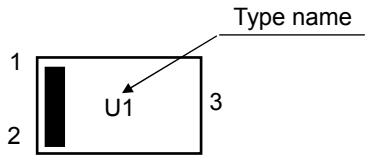
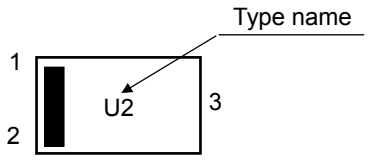
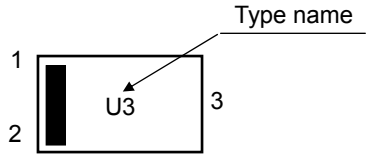
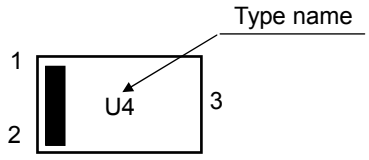
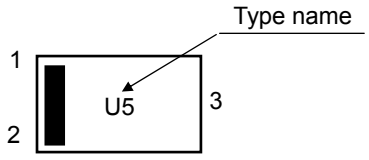

RN2102CT
VCE(sat) - IC
EMITTER COMMON
IC / IB=20
Ta=100°C
25
-25
COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (mV)
-1000
-100
-10
-1
-10
-100
COLLECTOR CURRENT IC (mA)


RN2103CT
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)


RN2104CT
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)


RN2105CT
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)


RN2106CT
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
RN2101CT	
RN2102CT	
RN2103CT	
RN2104CT	
RN2105CT	
RN2106CT	

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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