To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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NPN SILICON RF TRANSISTOR
2SC4228

NPN EPITAXIAL SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW-NOISE AMPLIFICATION 3-PIN SUPER MINIMOLD

DESCRIPTION

The 2SC4228 is a low supply voltage transistor designed for VHF, UHF low noise amplifier.

It is suitable for a high density surface mount assembly since the transistor has been applied 3-pin super minimold package.

FEATURES

★ • Low noise : NF = 1.9 dB TYP. @ V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz
- High gain : $|S_{21e}|^2$ = 7.5 dB TYP. @ V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz
- 3-pin super minimold package

★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC4228	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC4228-T1	3 kpcs/reel	• Pin 3 (Collector) face the perforation side of the tape

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	20	V
Collector to Emitter Voltage	V_{CEO}	10	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	35	mA
Total Power Dissipation	P_{tot} Note	150	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note Free air

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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Date Published December 2003 CP(K)
Printed in Japan

The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I_{CBO}	V_{CB} = 10 V, I_E = 0 mA	–	–	1.0	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0 mA	–	–	1.0	μA
DC Current Gain	h_{FE} Note 1	V_{CE} = 3 V, I_C = 5 mA	50	100	250	–
RF Characteristics						
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	5.5	8.0	–	GHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	5.5	7.5	–	dB
Noise Figure	NF	V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	–	1.9	3.2	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 3 V, I_E = 0 mA, f = 1 MHz	–	0.3	0.7	pF

Notes 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

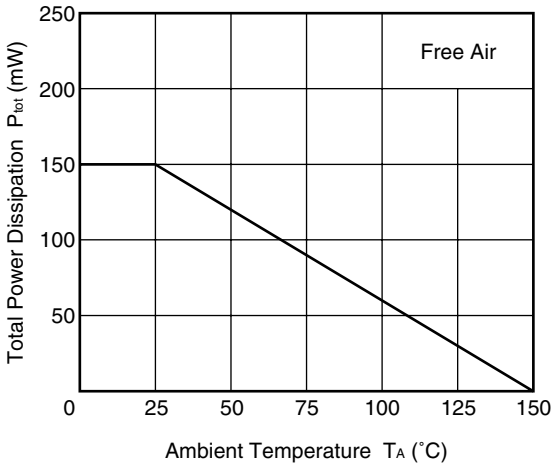
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

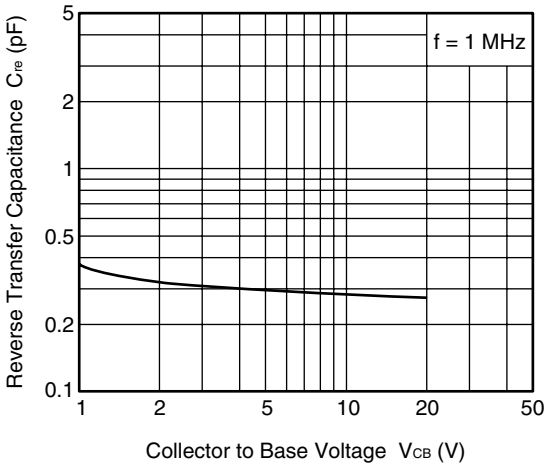
Rank	R43	R44	R45
Marking	R43	R44	R45
h_{FE} Value	50 to 100	80 to 160	125 to 250

TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

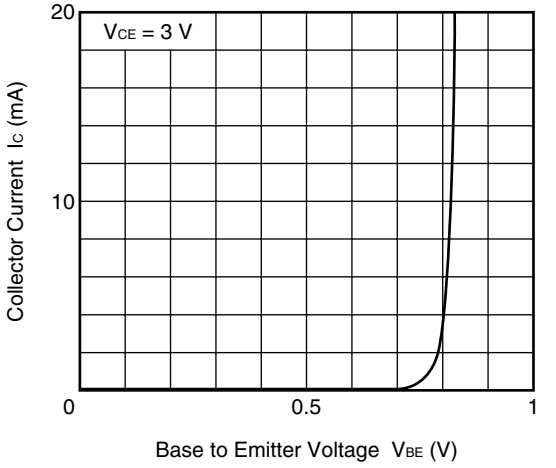
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



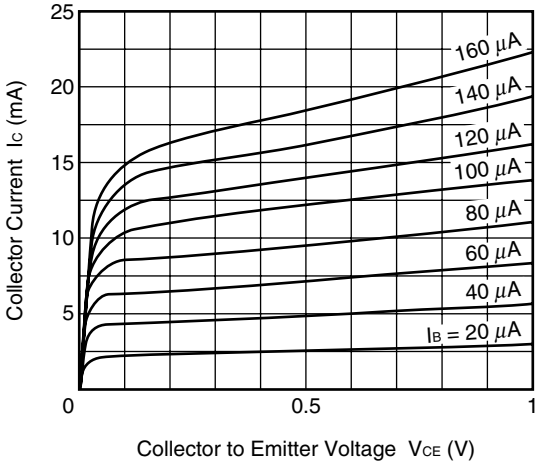
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



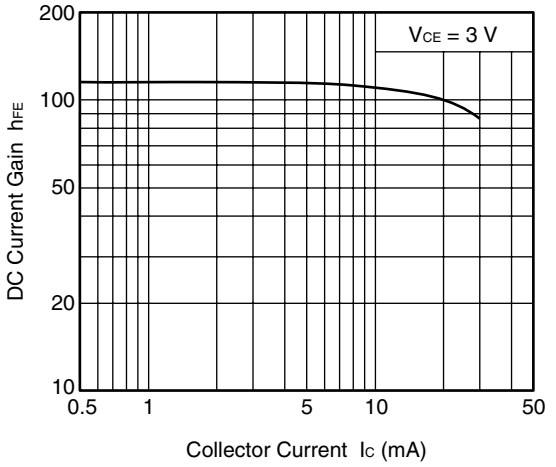
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



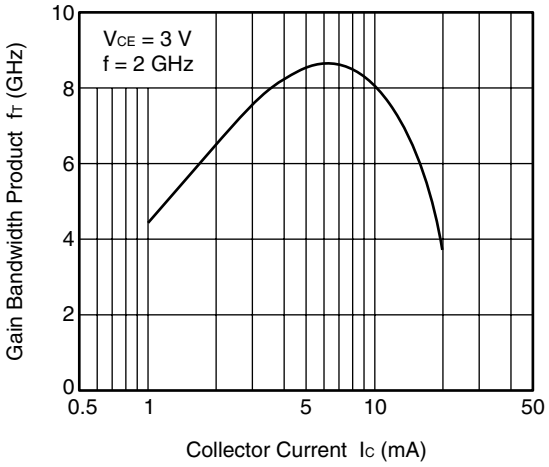
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



DC CURRENT GAIN vs. COLLECTOR CURRENT

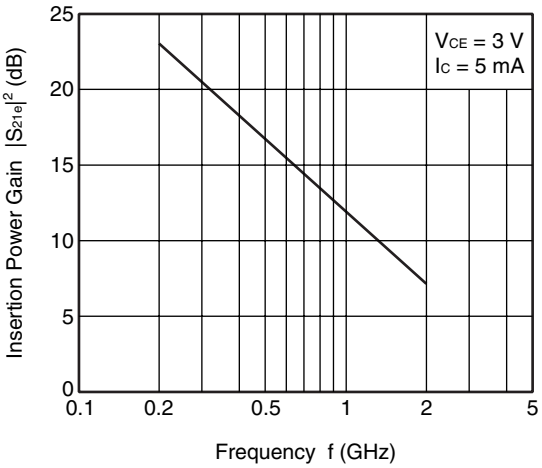


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

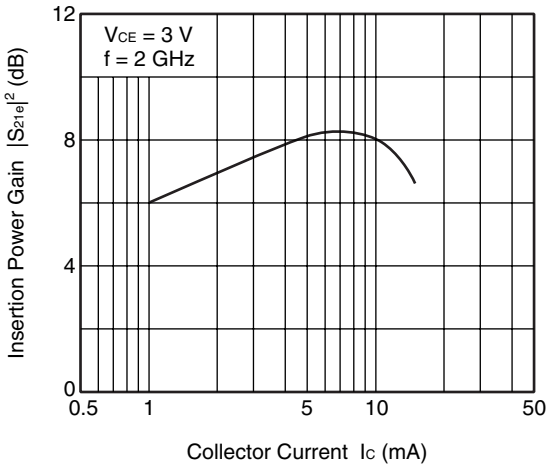


Remark The graphs indicate nominal characteristics.

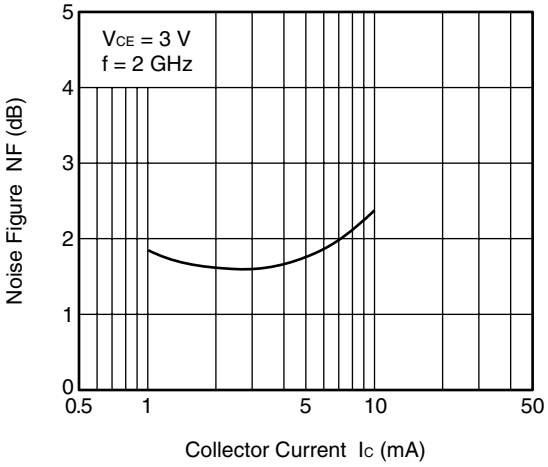
INSERTION POWER GAIN vs. FREQUENCY



INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

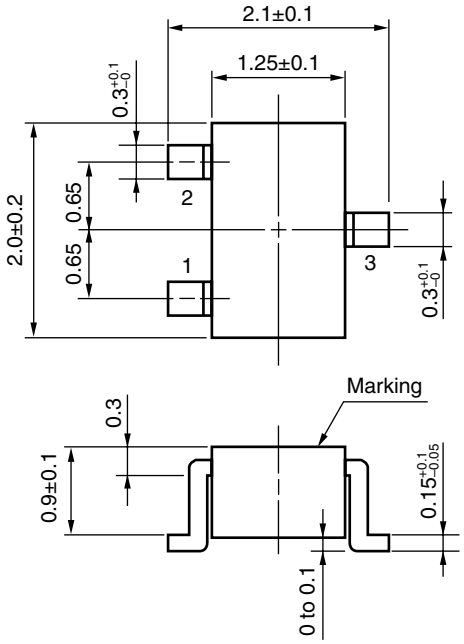
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.ncsd.necel.com/

PACKAGE DIMENSIONS

3-PIN SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

(EIAJ : SC-70)

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