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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RENESAS

DATA SHEET

NPN SILICON GERMANIUM RF TRANSISTOR
NESG220033

NPN SiGe RF TRANSISTOR FOR UHF-BAND, LOW NOISE, LOW DISTORTION AMPLIFICATION 3-PIN MINIMOLD (33 PKG)

FEATURES

- The device is an ideal choice for low noise, low distortion amplification.
  NF = 0.75 dB TYP. @ V_{CE} = 5 V, I_C = 10 mA, f = 1 GHz
- $P_{O\ (1\ dB)}$ = 21.5 dBm TYP. @ V_{CE} = 5 V, $I_{C\ (set)}$ = 40 mA, f = 1 GHz
- OIP_3 = 35 dBm TYP. @ V_{CE} = 5 V, $I_{C\ (set)}$ = 40 mA, f = 1 GHz
- Maximum stable power gain: MSG =14.0 dB TYP. @ V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz
- SiGe HBT technology (UHS2) : f_T = 12.5 GHz
- This product is improvement of ESD of NESG2xxx series.
- 3-pin minimold (33 PKG)

ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG220033	NESG220033-A	3-pin minimold (33 PKG) (Pb-Free)	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 3 (Collector) face the perforation side of the tape
NESG220033-T1B	NESG220033-T1B-A		3 kpcs/reel	

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

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	5.5	V
Collector to Emitter Voltage	V_{CES}	13	V
Collector to Emitter Voltage	V_{CEO}	5.5	V
Base Current [Note 1]	I_B	36	mA
Collector Current	I_C	200	mA
Total Power Dissipation	P_{tot} [Note 2]	480	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

Notes 1. Depend on the ESD protect device.

2. Mounted on 3.8 cm × 9.0 cm × 0.8 mm (t) glass epoxy PWB

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

Document No. PU10766EJ03V0DS (3rd edition)
Date Published November 2009 NS
Printed in Japan

The mark <R> shows major revised points.

The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

THERMAL RESISTANCE (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Termal Resistance from Junction to Ambient [Note]	Rth_{j-a}	260	°C/W

Note Mounted on 3.8 cm × 9.0 cm × 0.8 mm (t) glass epoxy PWB

RECOMMENDED OPERATING RANGE (T_A = +25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
<R> Collector Current	I_C	–	40	–	mA

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 0.4 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} [Note 1]	V_{CE} = 5 V, I_C = 10 mA	140	180	260	–
RF Characteristics						
Gain Bandwidth Product	f_T	V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz	–	12.5	–	GHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz	11.0	13.0	–	dB
Noise Figure (1)	NF1	V_{CE} = 5 V, I_C = 10 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, Z_L = 50 Ω	–	0.75	1.15	dB
Noise Figure (2)	NF2	V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	0.9	–	dB
Associated Gain (1)	G_a1	V_{CE} = 5 V, I_C = 10 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, Z_L = 50 Ω	10.0	12.0	–	dB
Associated Gain (2)	G_a2	V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	13.5	–	dB
Reverse Transfer Capacitance	C_{re} [Note 2]	V_{CB} = 5 V, I_E = 0 mA, f = 1 MHz	–	0.7	0.9	pF
Maximum Stable Power Gain	MSG [Note 3]	V_{CE} = 5 V, I_C = 40 mA, f = 1 GHz	12.0	14.0	–	dB
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	V_{CE} = 5 V, $I_{C\ (set)}$ = 40 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	21.5	–	dBm
Output 3rd Order Intercept Point	OIP_3	V_{CE} = 5 V, $I_{C\ (set)}$ = 40 mA, f = 1 GHz, Δf = 1 MHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	35	–	dBm

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

2. Collector to base capacitance when the emitter grounded.

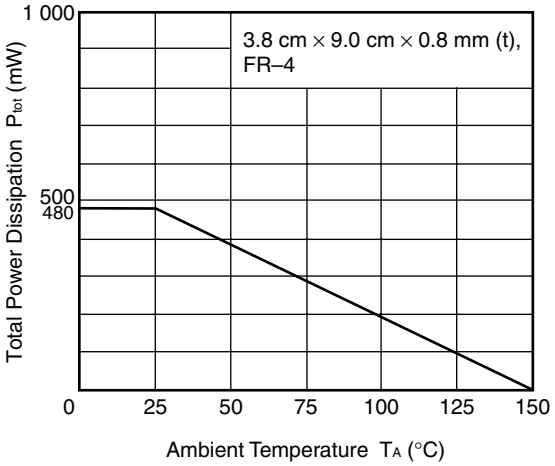
3. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

h_{FE} CLASSIFICATION

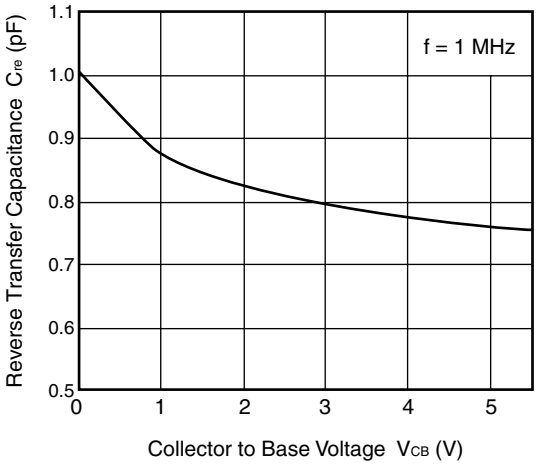
Rank	FB
Marking	R7B
h_{FE} Value	140 to 260

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

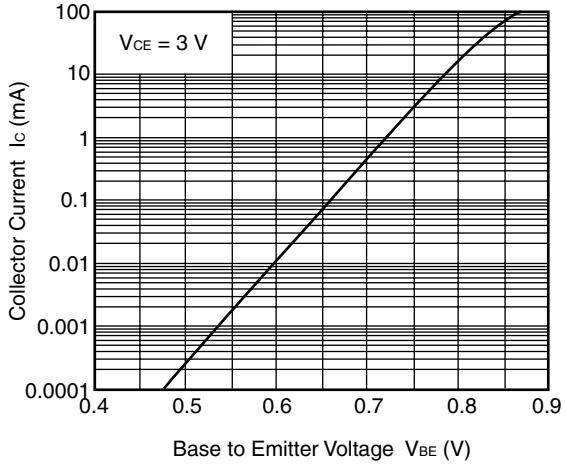
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



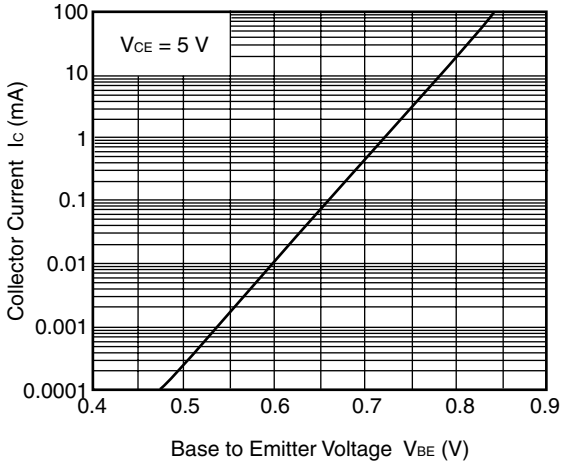
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



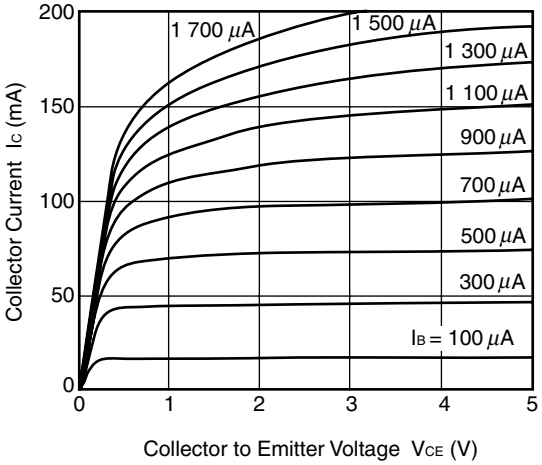
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

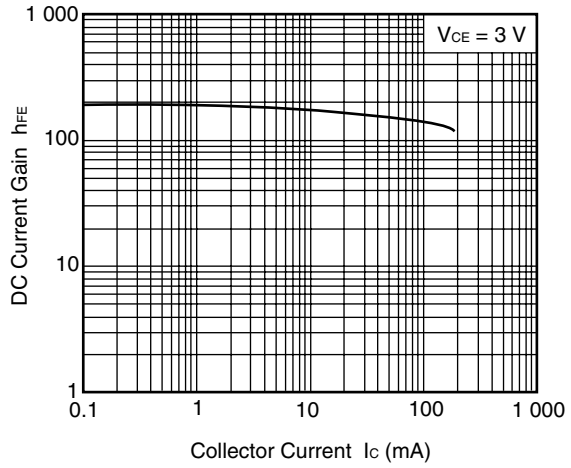


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

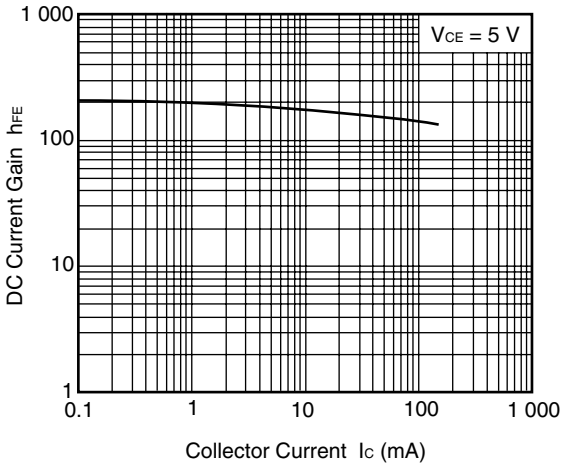


Remark The graphs indicate nominal characteristics.

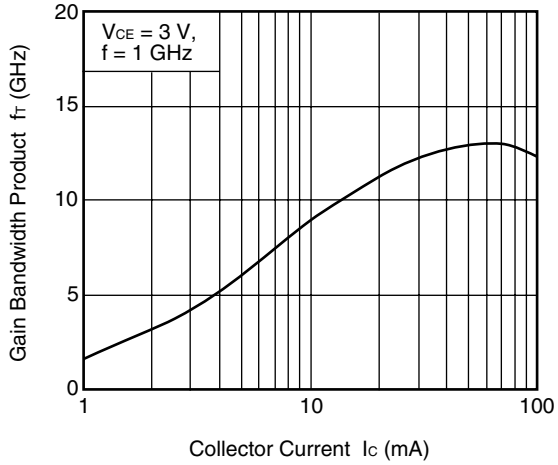
DC CURRENT GAIN vs.
COLLECTOR CURRENT



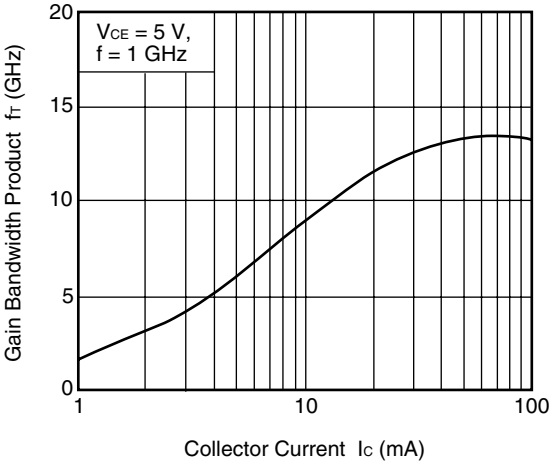
DC CURRENT GAIN vs.
COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT

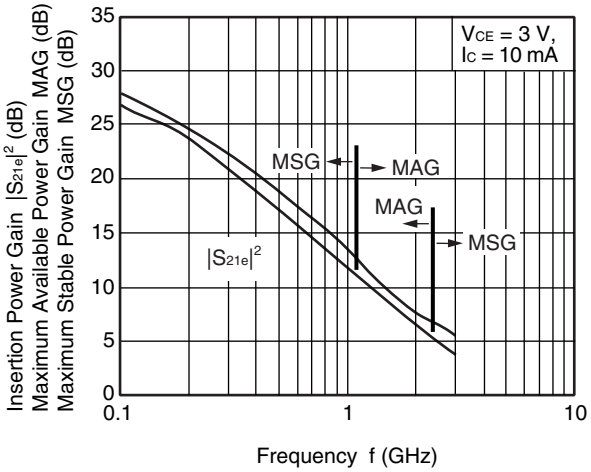


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT

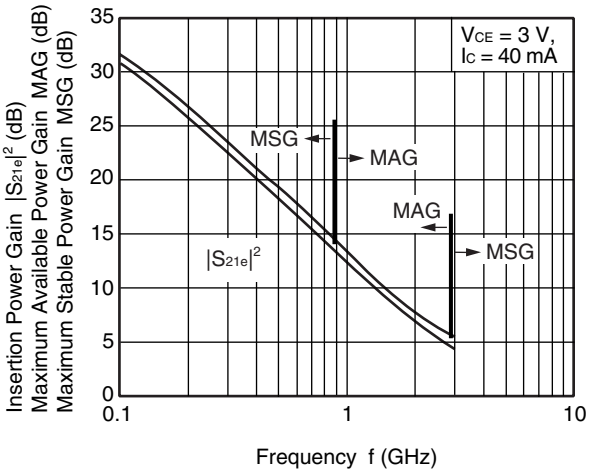


Remark The graphs indicate nominal characteristics.

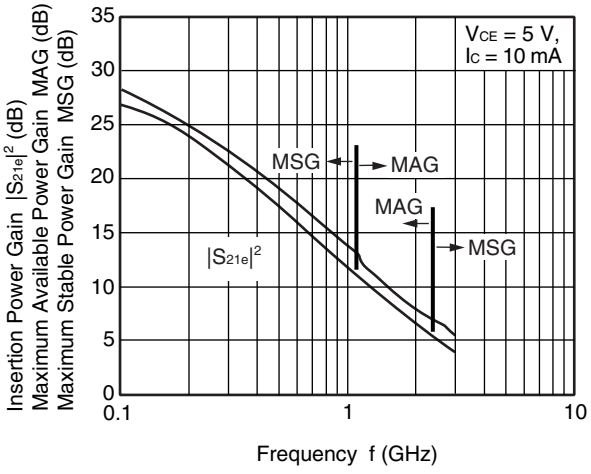
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



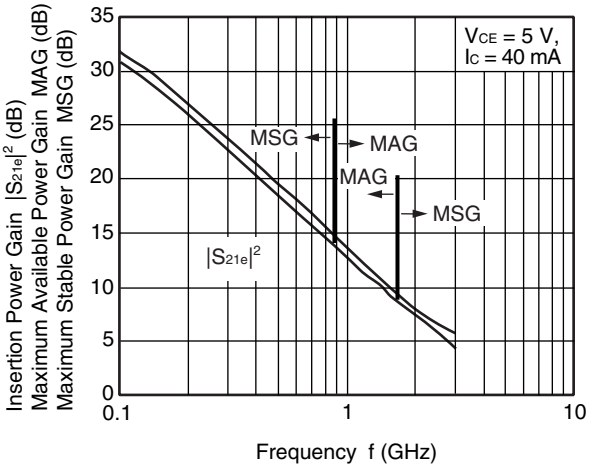
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



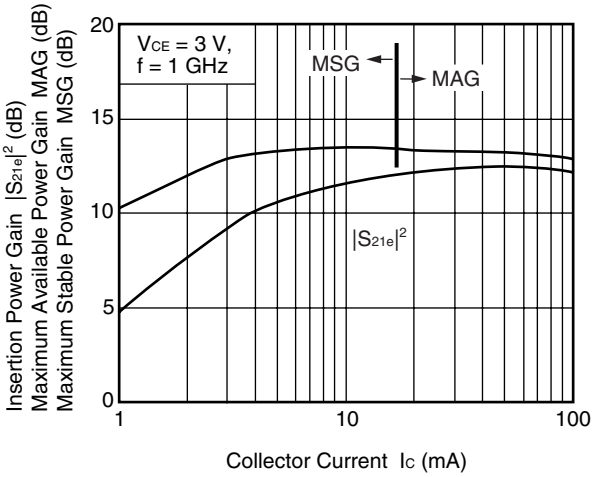
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



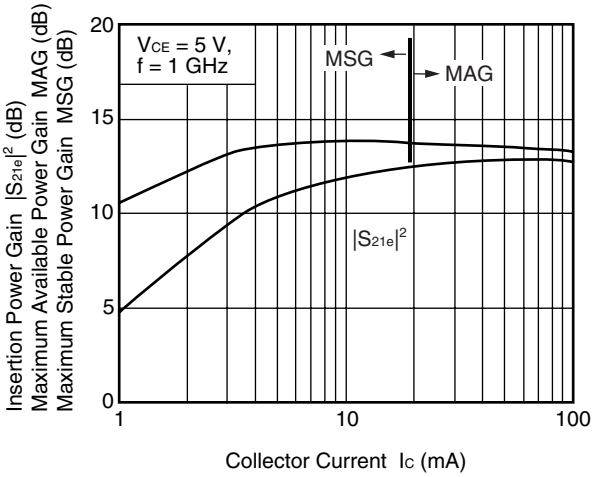
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

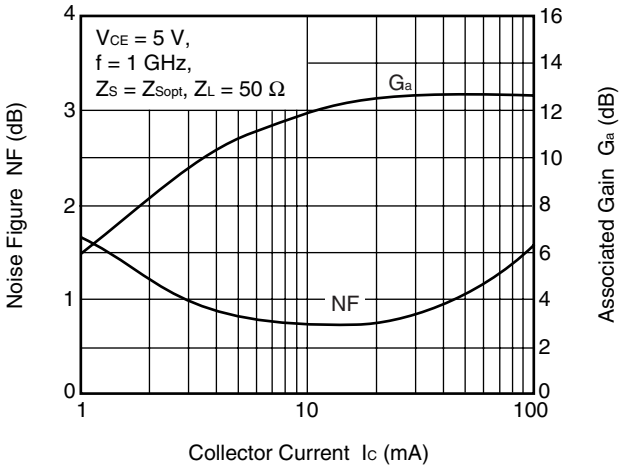


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

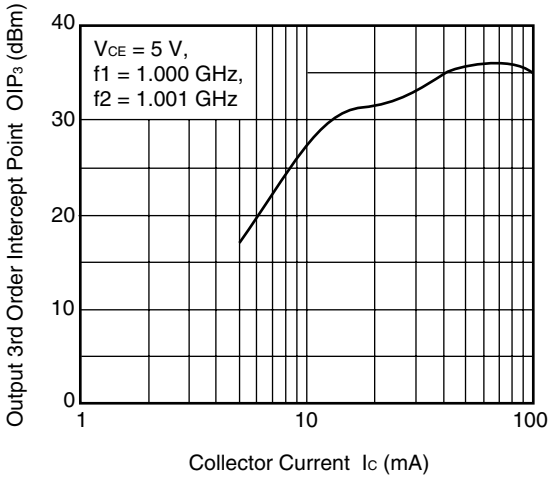


Remark The graphs indicate nominal characteristics.

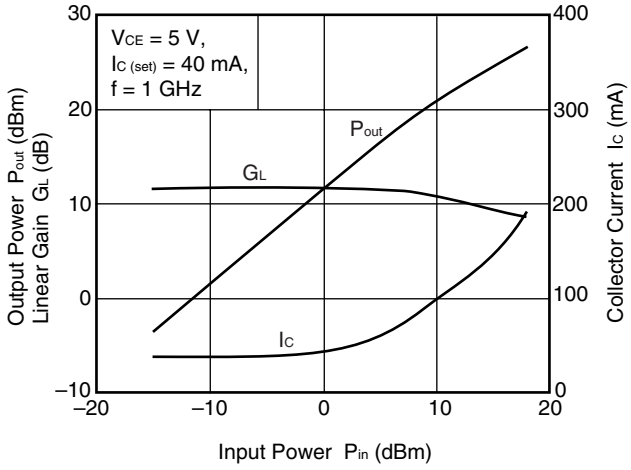
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



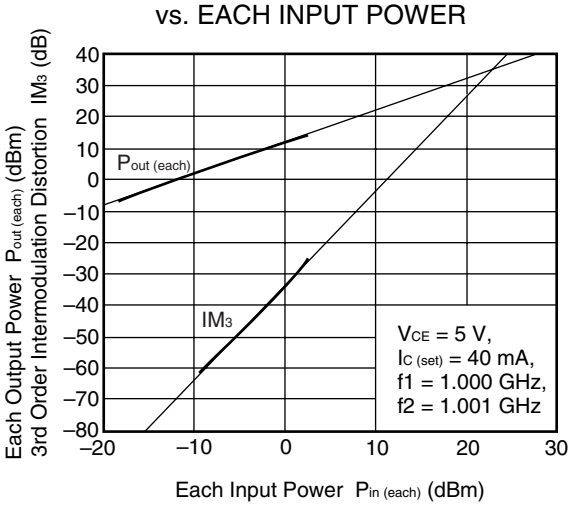
OUTPUT 3RD ORDER INTERCEPT POINT vs. COLLECTOR CURRENT



OUTPUT POWER, LINEAR GAIN, COLLECTOR CURRENT vs. INPUT POWER



EACH OUTPUT POWER, IM3 vs. EACH INPUT POWER



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S-PARAMETERS

S-parameters and noise parameters are provided on our Web site in a format (S2P) that enables the direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

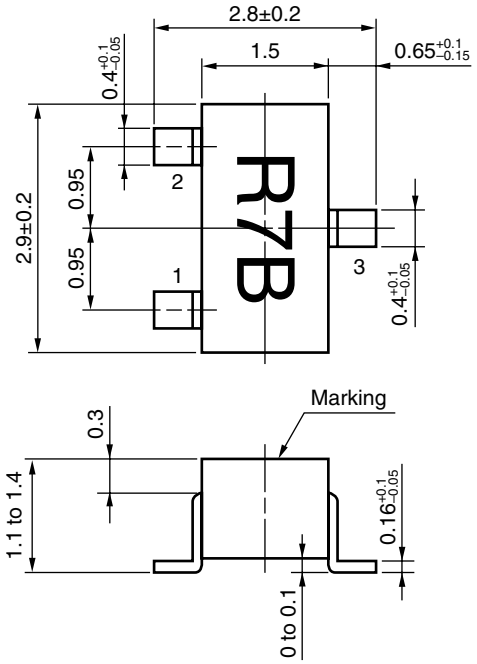
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.necel.com/microwave/en/

PACKAGE DIMENSIONS

3-PIN MINIMOLD (33 PKG) (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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