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
NESG250134

NPN SiGe RF TRANSISTOR FOR MEDIUM OUTPUT POWER AMPLIFICATION (800 mW) 3-PIN POWER MINIMOLD (34 PKG)

FEATURES

- This product is suitable for medium output power (800 mW) amplification
  P_O = 29 dBm TYP. @ V_{CE} = 3.6 V, P_{in} = 15 dBm, f = 460 MHz
  P_O = 29 dBm TYP. @ V_{CE} = 3.6 V, P_{in} = 20 dBm, f = 900 MHz
- MSG (Maximum Stable Gain) = 23 dB TYP., @ V_{CE} = 3.6 V, Ic = 100 mA, f = 460 MHz
- Using UHS2-HV process (SiGe technology), V_{CBO} (ABSOLUTE MAXIMUM RATINGS) = 20 V
- 3-pin power minimold (34 PKG)

★ ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG250134	NESG250134-AZ	3-pin power minimold (Pb-Free) Note1, 2	25 pcs (Non reel)	• Magazine case
NESG250134-T1	NESG250134-T1-AZ		1 kpcs/reel	• 12 mm wide embossed taping • Pin 2 (Emitter) face the perforation side of the tape

Notes 1. Contains lead in the part except the electrode terminals.

2. With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

Remark To order evaluation samples, contact your nearby sales office.
Unit sample quantity is 25 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}	9.2	V
Emitter to Base Voltage	V_{EBO}	2.8	V
Collector Current	Ic	500	mA
★ Total Power Dissipation	P_{tot} Note	1.9	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

Note Mounted on 34.2 $cm^2 \times 0.8$ mm (t) glass epoxy PWB

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

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Date Published October 2004 CP(K)
Printed in Japan

The mark ★ shows major revised points.

★ THERMAL RESISTANCE (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Termal Resistance from Junction to Ambient[Note]	Rth_{j-a}	65	°C/W

Note Mounted on 34.2 $cm^2 \times 0.8$ mm (t) glass epoxy PWB

RECOMMENDED OPERATING RANGE (T_A = +25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Collector to Emitter Voltage	V_{CE}	–	3.6	4.5	V
Collector Current	I_C	–	400	500	mA
Input Power[Note]	P_{in}	–	12	17	dBm

Note Input power under conditions of $V_{CE} \leq 4.5$ V, f = 460 MHz

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	–	–	1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 0.5 V, I_C = 0 mA	–	–	1	μA
DC Current Gain	h_{FE} Note 1	V_{CE} = 3 V, I_C = 100 mA	80	120	180	–
RF Characteristics						
Gain Bandwidth Product	f_T	V_{CE} = 3.6 V, I_C = 100 mA, f = 460 MHz	–	10	–	GHz
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3.6 V, I_C = 100 mA, f = 460 MHz	–	19	–	dB
Maximum Satble Gain	MSG Note 2	V_{CE} = 3.6 V, I_C = 100 mA, f = 460 MHz	–	23	–	dB
Linner gain (1)	G_L	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 460 MHz, P_{in} = 0 dBm	16	19	–	dB
Linner gain (2)	G_L	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 900 MHz, P_{in} = 0 dBm	–	16	–	dB
Output Power (1)	Po	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 460 MHz, P_{in} = 15 dBm	27	29	–	dBm
Output Power (2)	Po	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 900 MHz, P_{in} = 20 dBm	–	29	–	dBm
Collector Efficiency (1)	η_c	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 460 MHz, P_{in} = 15 dBm	–	60	–	%
Collector Efficiency (2)	η_c	V_{CE} = 3.6 V, $I_{C(set)}$ = 30 mA (RF OFF), f = 900 MHz, P_{in} = 20 dBm	–	60	–	%

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

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

h_{FE} CLASSIFICATION

Rank	FB
Marking	SN
h_{FE} Value	80 to 180

★ 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.

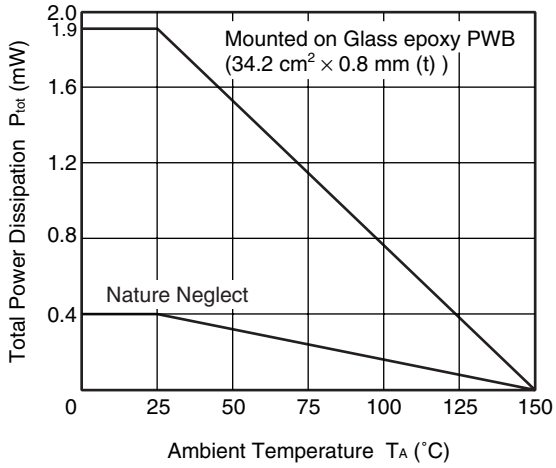
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

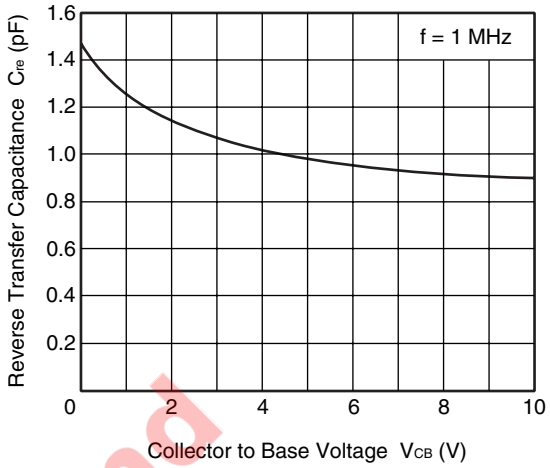
URL http://www.ncsd.necel.com/

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

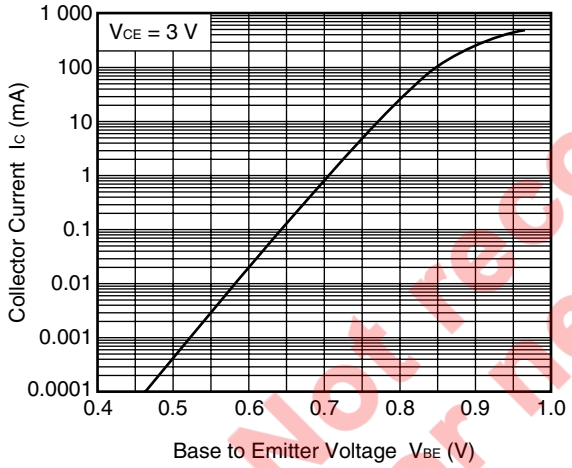
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



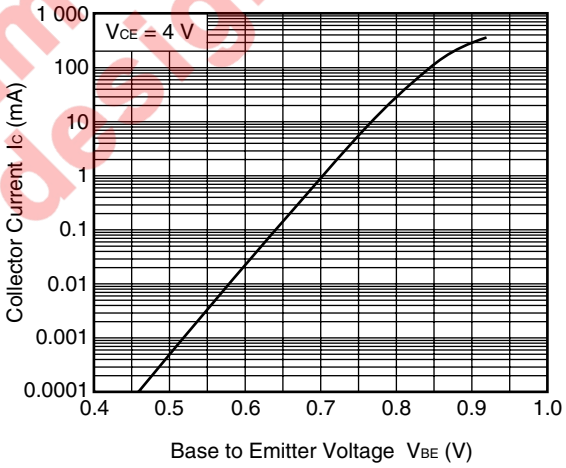
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



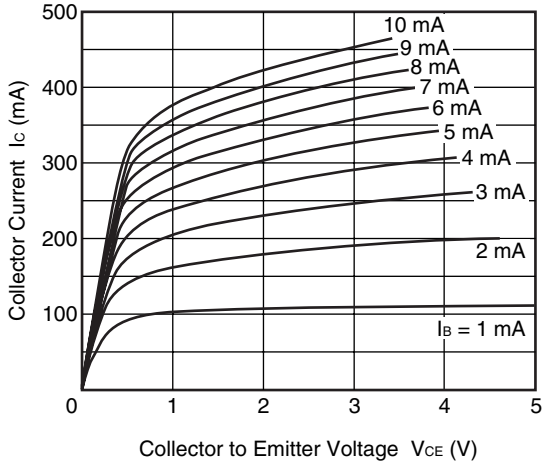
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

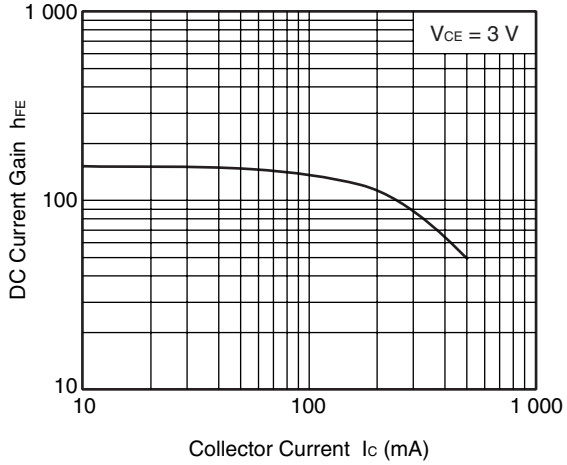


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

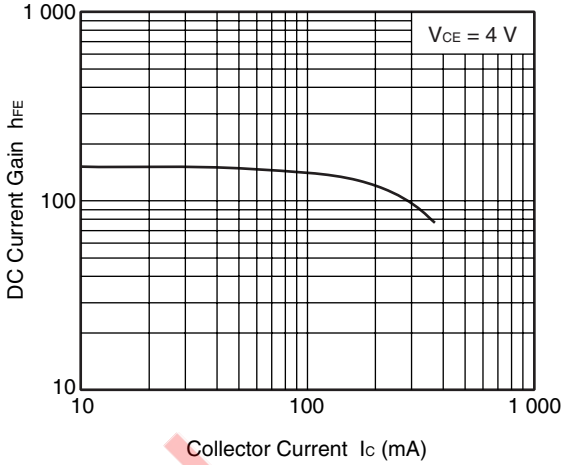


Remark The graphs indicate nominal characteristics.

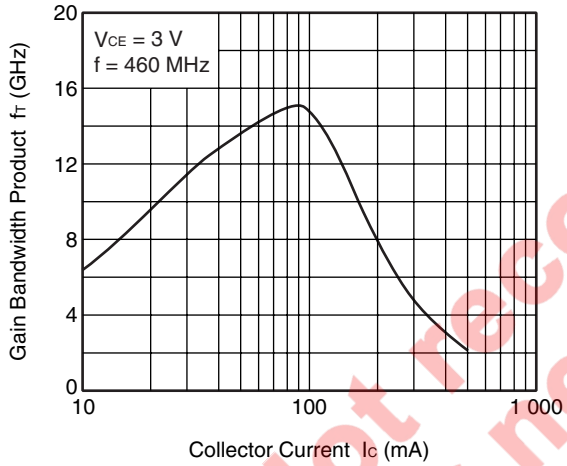
DC CURRENT GAIN vs.
COLLECTOR CURRENT



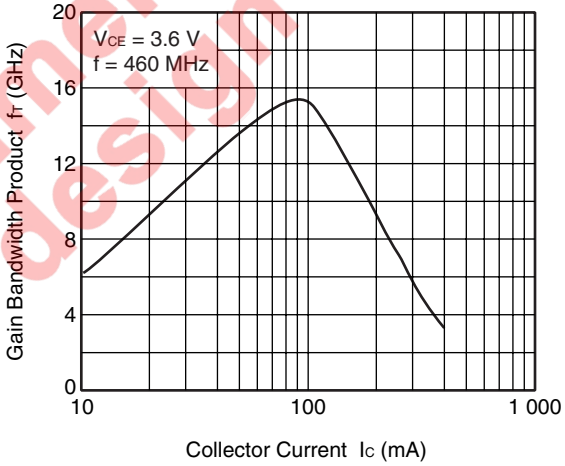
DC CURRENT GAIN vs.
COLLECTOR CURRENT



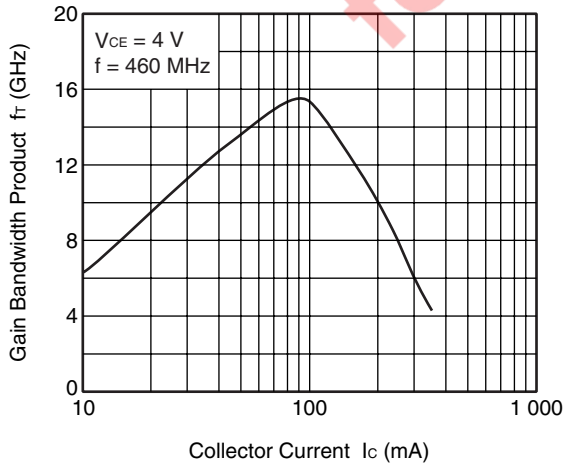
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



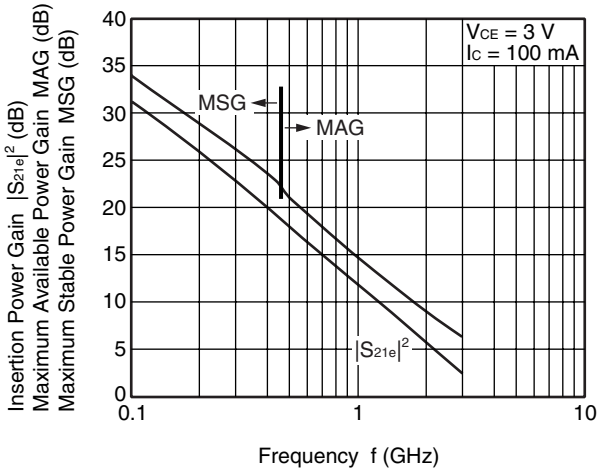
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT

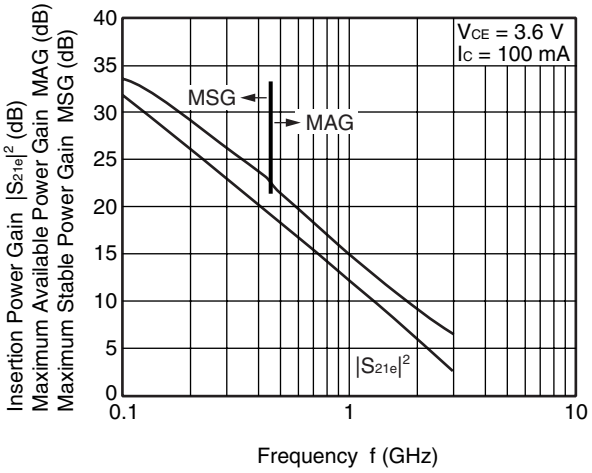


INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

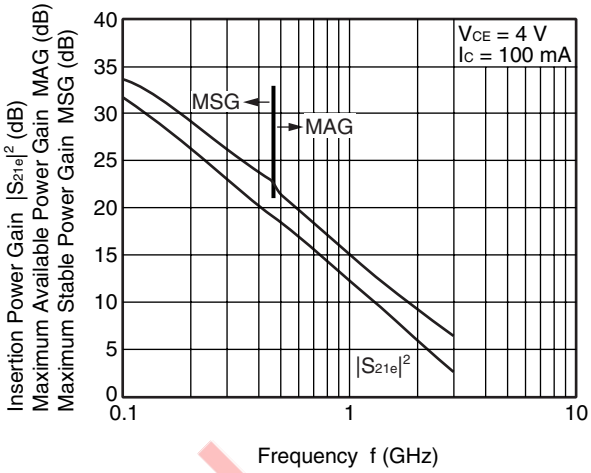


Remark The graphs indicate nominal characteristics.

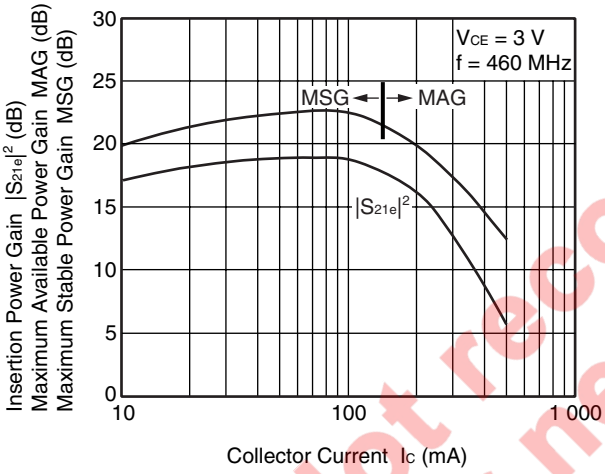
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



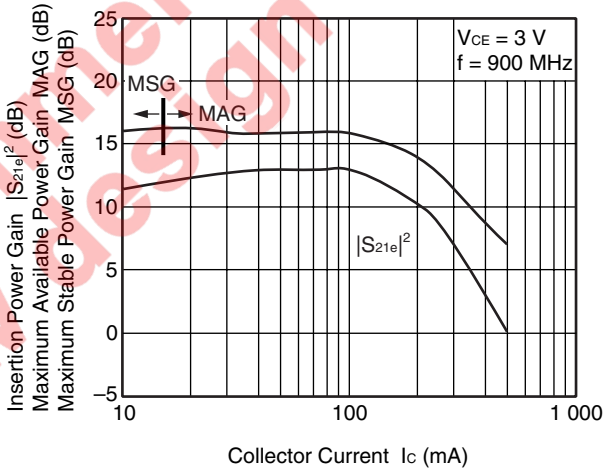
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



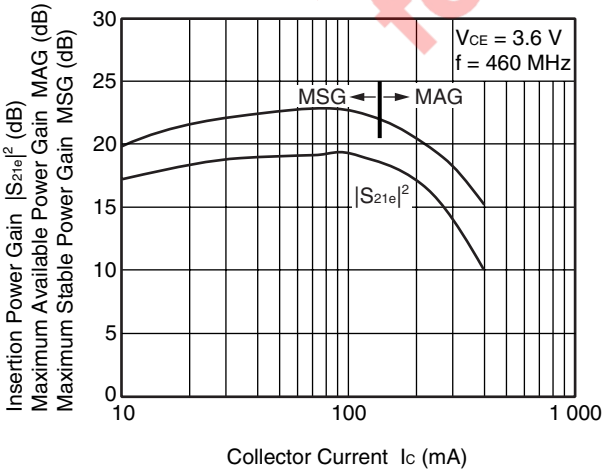
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



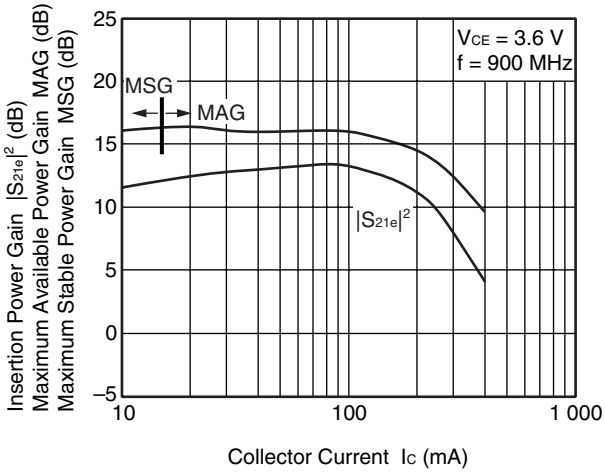
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



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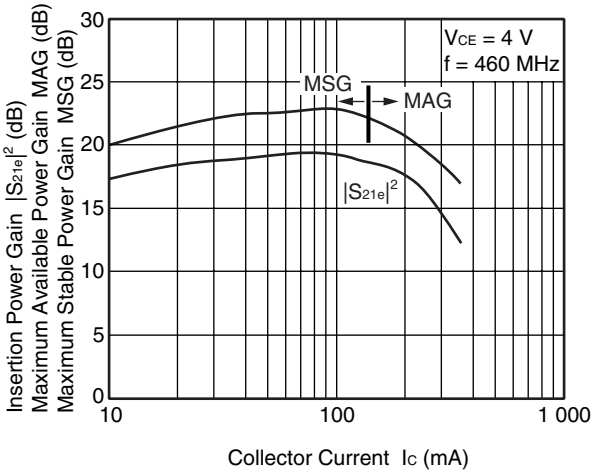
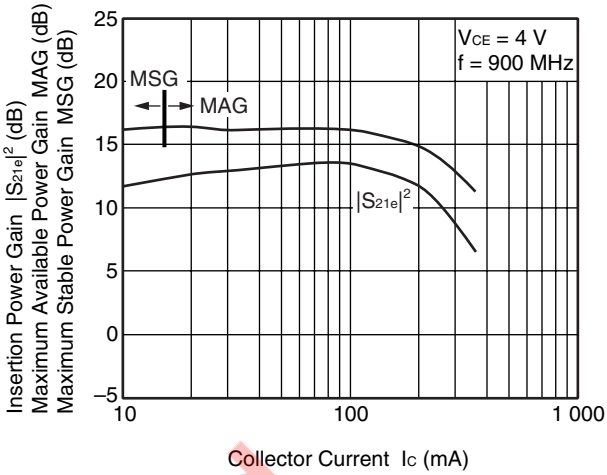
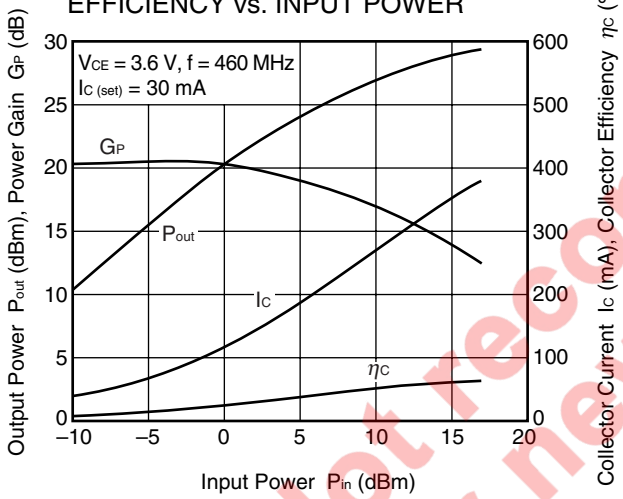
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



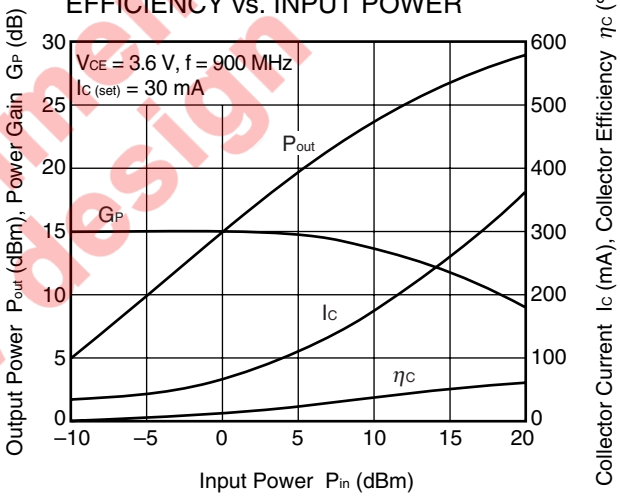
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



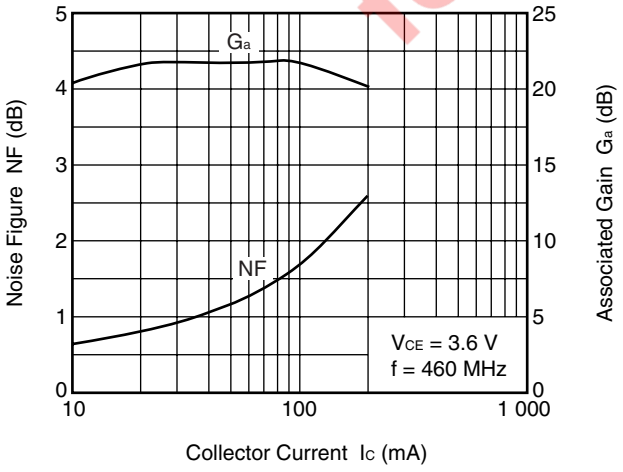
OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER



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

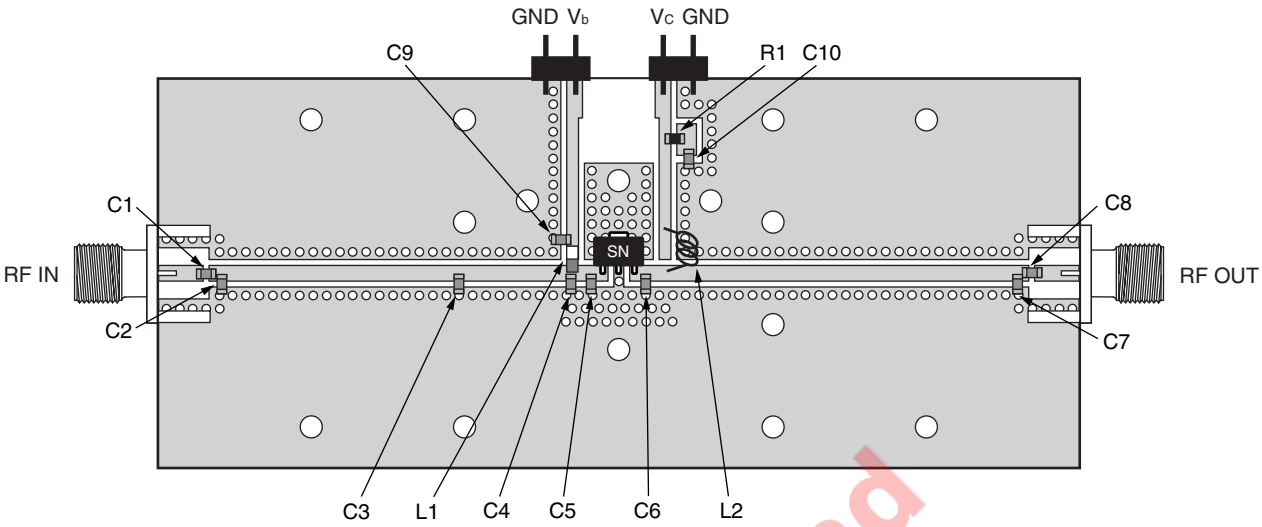


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

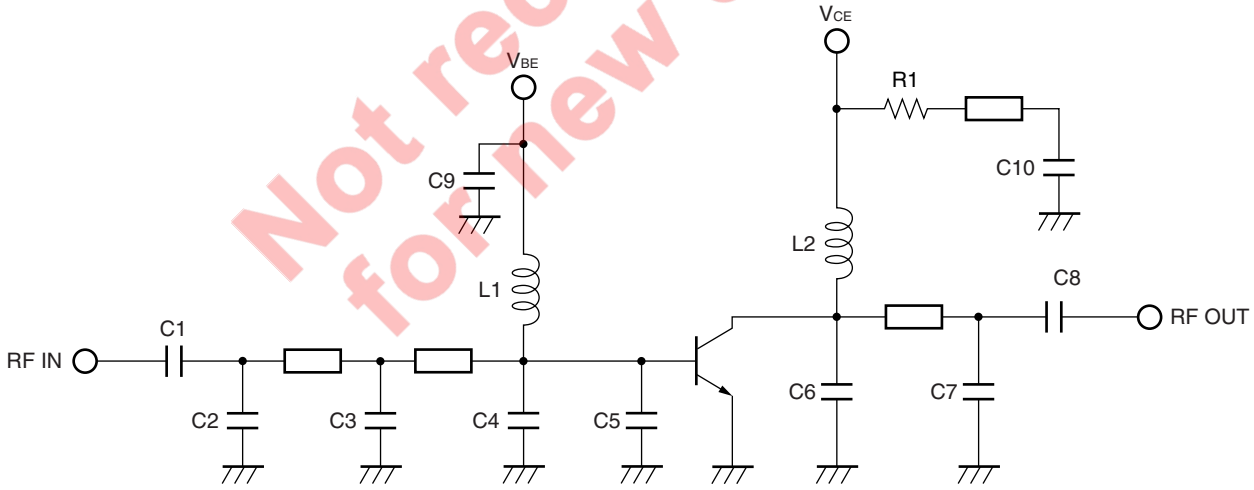
PA EVALUATION BOARD (f = 460 MHz)



Notes

1. 38 × 90 mm, t = 0.8 mm double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ○: Through holes

PA EVALUATION CIRCUIT (f = 460 MHz)



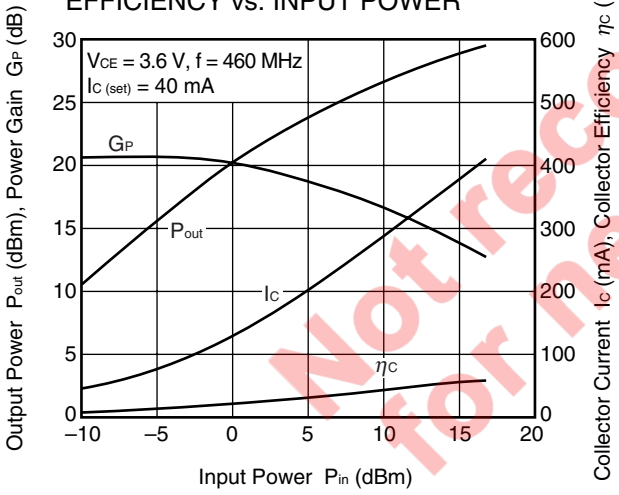
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

COMPONENT LIST

	Value	Maker
C1	30 pF	Murata
C2	6 pF	Murata
C3, C4	7 pF	Murata
C5	3 pF	Murata
C6	0.5 pF	Murata
C7	5 pF	Murata
C8	10 pF	Murata
C9, C10	100 nF	Murata
L1	100 nH	Toko
L2	3 nH	Toko
R1	30 Ω	SSM

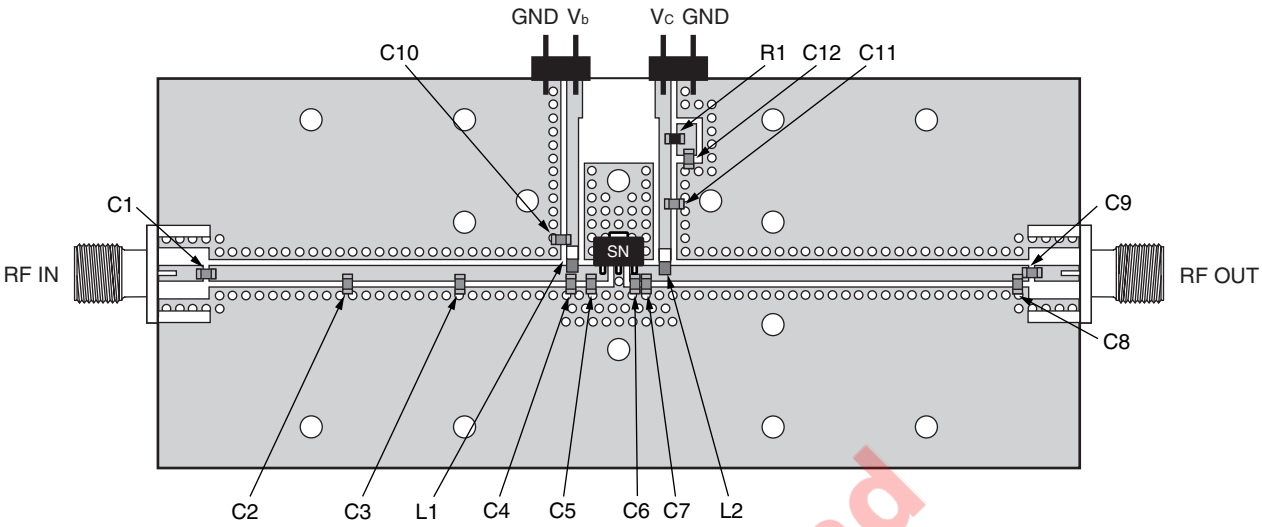
PA EVALUATION CIRCUIT TYPICAL CHARACTERISTICS

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



Remark The graph indicates nominal characteristics.

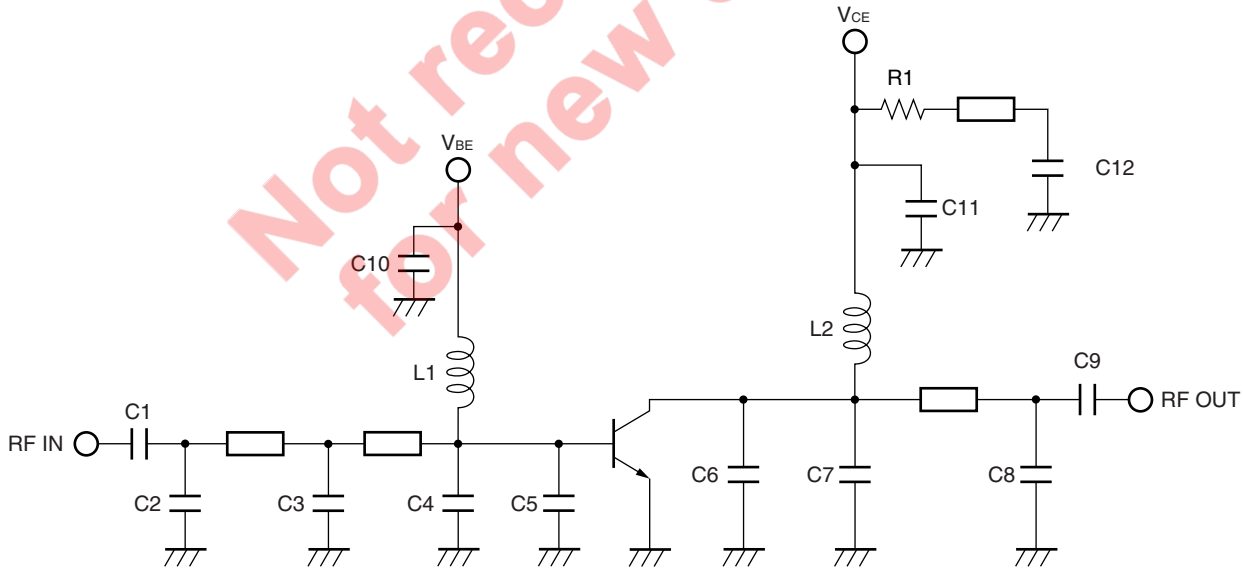
DISTORTION EVALUATION BOARD (f = 460 MHz)



Notes

1. 38 × 90 mm, t = 0.8 mm, double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ○: Through holes

DISTORTION EVALUATION CIRCUIT (f = 460 MHz)



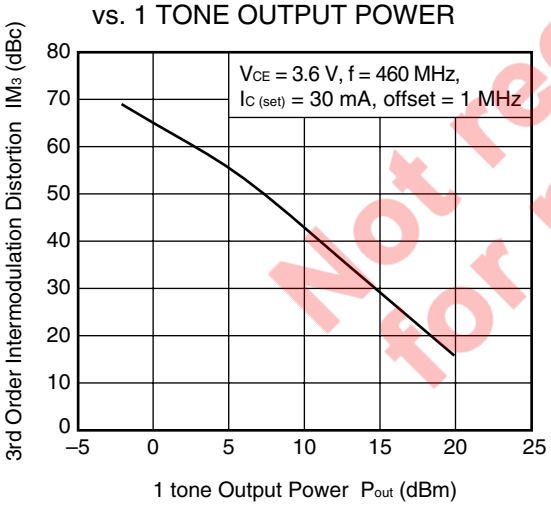
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

COMPONENT LIST

	Value	Maker
C1	47 pF	Murata
C2	12 pF	Murata
C3, C4	7 pF	Murata
C5	3 pF	Murata
C6	6 pF	Murata
C7	0.5 pF	Murata
C8	5 pF	Murata
C9	51 pF	Murata
C10, C12	100 nF	Murata
C11	1 μF	Murata
L1	100 nH	Toko
L2	15 nH	Toko
R1	30 Ω	SSM

DISTORTION EVALUATION CIRCUIT TYPICAL CHARACTERISTICS

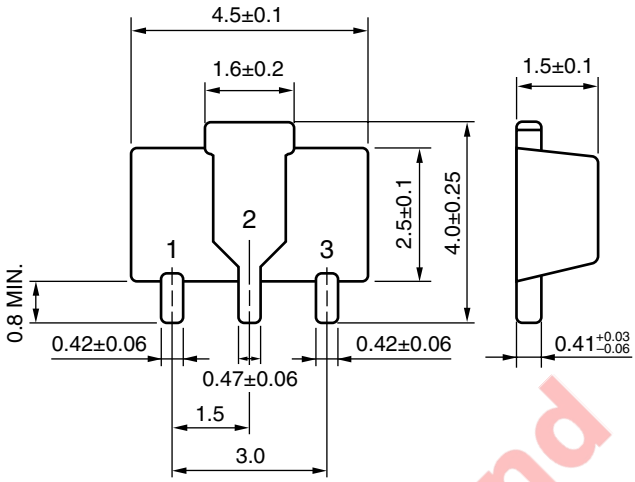
3RD ORDER
INTERMODULATION DISTORTION
vs. 1 TONE OUTPUT POWER



Remark The graph indicates nominal characteristics.

PACKAGE DIMENSIONS

3-PIN POWER MINIMOLD (34 PKG) (UNIT: mm)



PIN CONNECTIONS

1. Collector
2. Emitter
3. Base

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