

NESG2021M05

NPN SiGe RF Transistor for Low Noise, High-Gain Amplification
Flat-Lead 4-Pin Thin-Type Super Minimold (M05)

R09DS0034EJ0300
Rev. 3.00
Jun 20, 2012

FEATURES

- This device is an ideal choice for low noise, high-gain at low current amplifications.
 - $NF = 0.9$ dB TYP., $G_a = 18.0$ dB TYP. @ $V_{CE} = 2$ V, $I_C = 3$ mA, $f = 2$ GHz
 - $NF = 1.3$ dB TYP., $G_a = 10.0$ dB TYP. @ $V_{CE} = 2$ V, $I_C = 3$ mA, $f = 5.2$ GHz
- Maximum stable power gain: $MSG = 22.5$ dB TYP. @ $V_{CE} = 3$ V, $I_C = 10$ mA, $f = 2$ GHz
- High breakdown voltage technology for SiGe Tr. adopted: V_{CEO} (absolute maximum ratings) = 5.0 V
- Flat-lead 4-pin thin-type super minimold (M05) package

<R> ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG2021M05	NESG2021M05-A	Flat-lead 4-pin thin-type super minimold (M05, 2012 PKG) (Pb-Free)	50 pcs (Non reel)	<ul style="list-style-type: none"> • 8 mm wide embossed taping • Pin 3 (Collector), Pin 4 (Emitter) face the perforation side of the tape
NESG2021M05-T1	NESG2021M05-T1-A		3 kpcs/reel	

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

ABSOLUTE MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	13.0	V
Collector to Emitter Voltage	V_{CEO}	5.0	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	35	mA
Total Power Dissipation	P_{tot} ^{Note}	175	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

Note: Mounted on $1.08\text{ cm}^2 \times 1.0\text{ mm}$ (t) glass epoxy PCB

CAUTION

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

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.

<R> **ELECTRICAL CHARACTERISTICS (T_A = +25°C)**

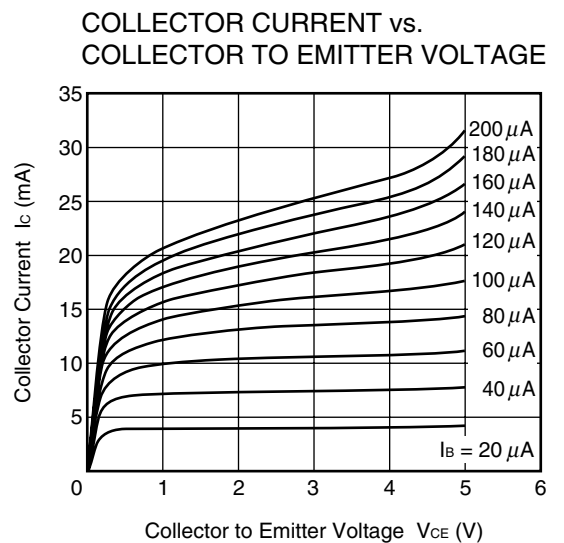
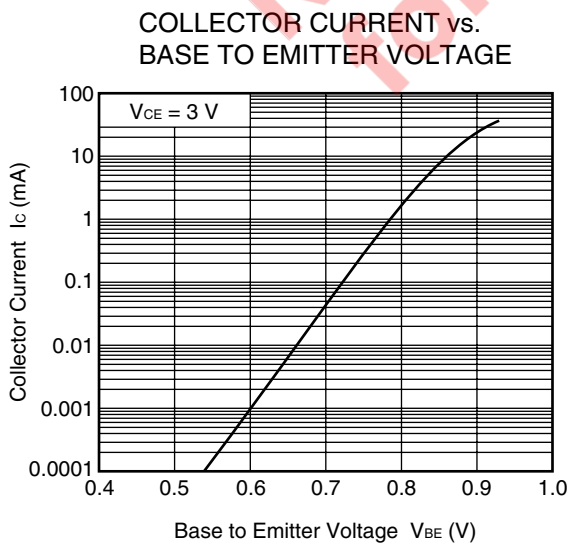
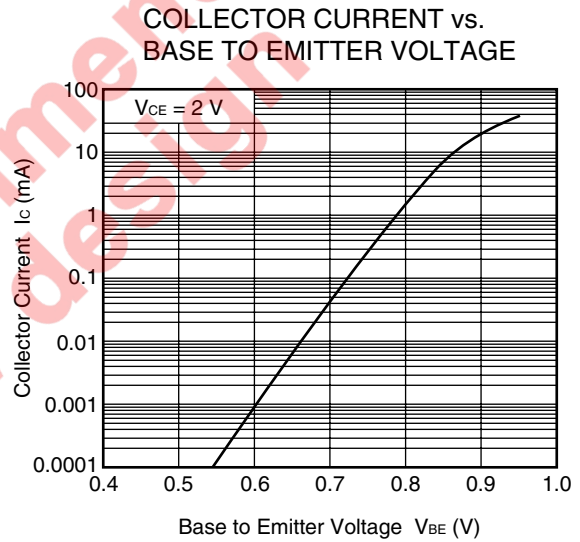
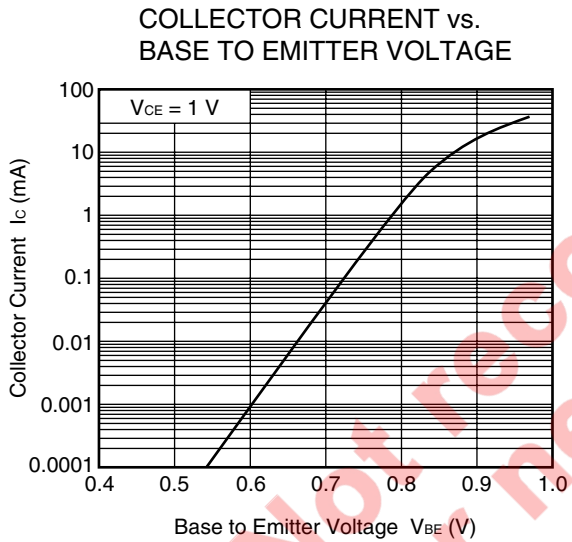
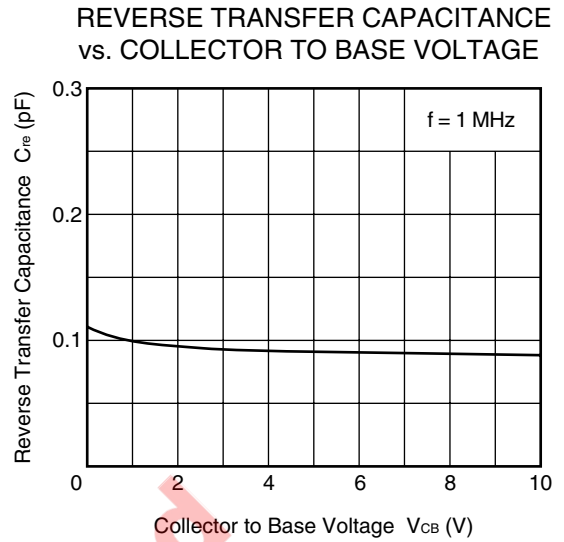
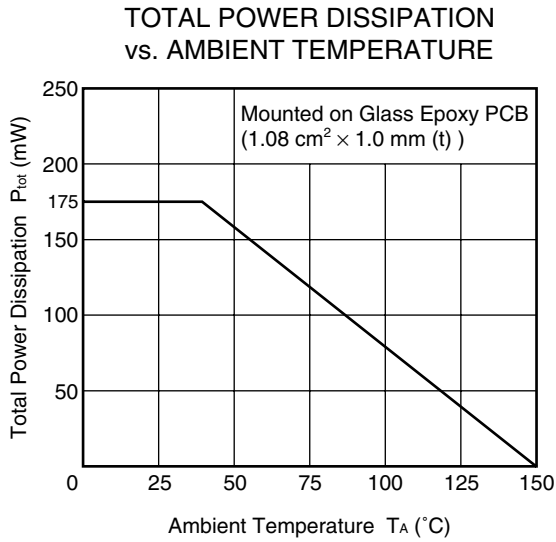
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I _{CBO}	V _{CB} = 5 V, I _E = 0	–	–	100	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 1 V, I _C = 0	–	–	100	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 2 V, I _C = 5 mA	130	190	260	–
RF Characteristics						
Gain Bandwidth Product	f _T	V _{CE} = 3 V, I _C = 10 mA, f = 2 GHz	20	25	–	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 3 V, I _C = 10 mA, f = 2 GHz	17.0	19.0	–	dB
Noise Figure (1)	NF	V _{CE} = 2 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	0.9	1.2	dB
Noise Figure (2)	NF	V _{CE} = 2 V, I _C = 3 mA, f = 5.2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	1.3	–	dB
Associated Gain (1)	G _a	V _{CE} = 2 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	15.0	18.0	–	dB
Associated Gain (2)	G _a	V _{CE} = 2 V, I _C = 3 mA, f = 5.2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	10.0	–	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 2 V, I _E = 0, f = 1 MHz	–	0.1	0.2	pF
Maximum Stable Power Gain	MSG ^{Note 3}	V _{CE} = 3 V, I _C = 10 mA, f = 2 GHz	20.0	22.5	–	dB
Gain 1 dB Compression Output Power	P _O (1 dB)	V _{CE} = 3 V, I _C = 12 mA, f = 2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	9.0	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP ₃	V _{CE} = 3 V, I _C = 12 mA, f = 2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	17.0	–	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

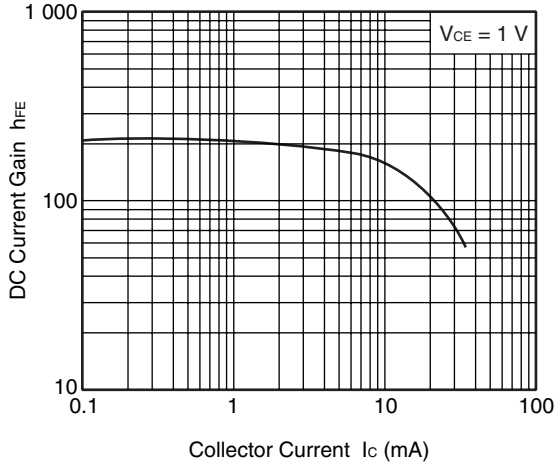
Rank	FB/YFB
Marking	T1G
h _{FE} Value	130 to 260

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

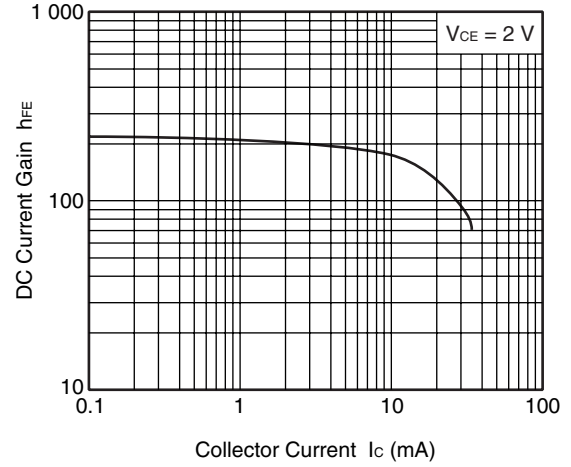


Remark The graph indicates nominal characteristics.

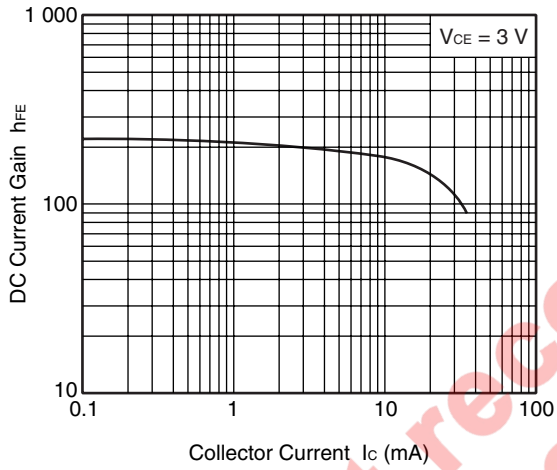
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



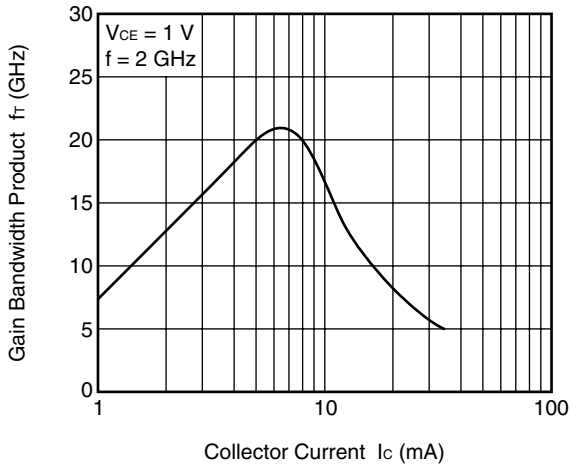
DC CURRENT GAIN vs.
COLLECTOR CURRENT



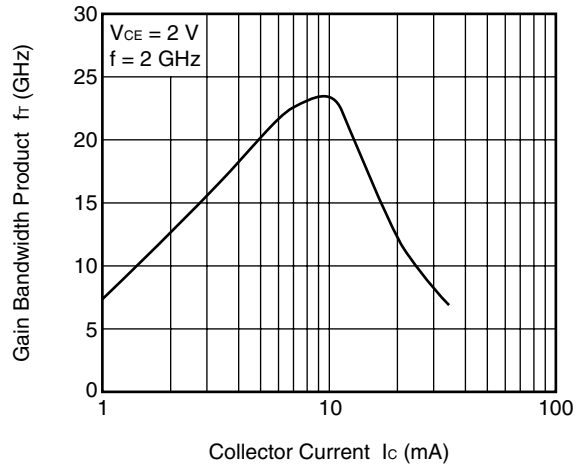
Remark The graph indicates nominal characteristics.

Not recommend
for new design

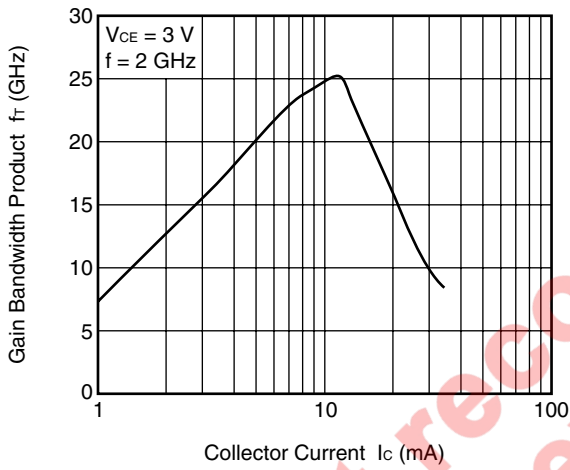
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



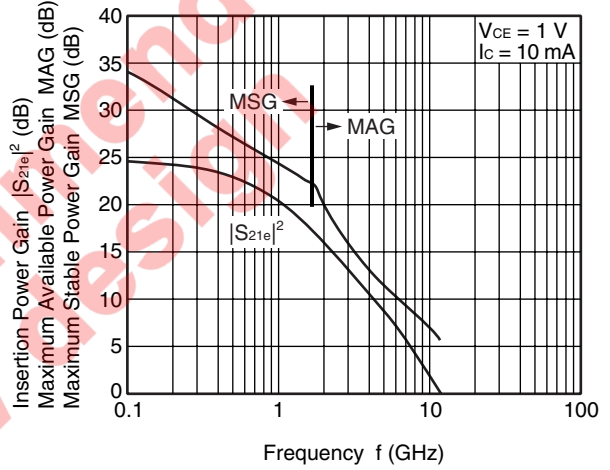
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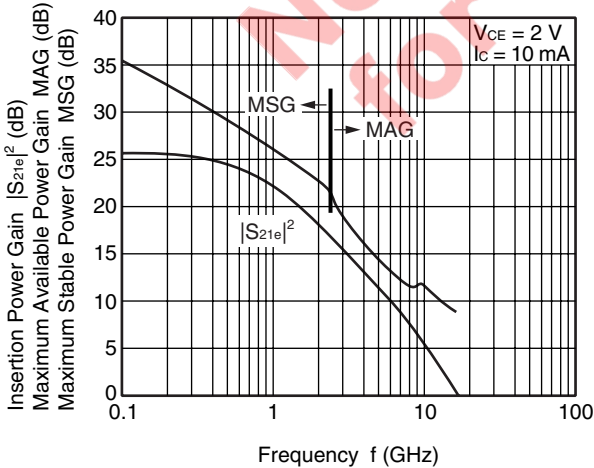
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



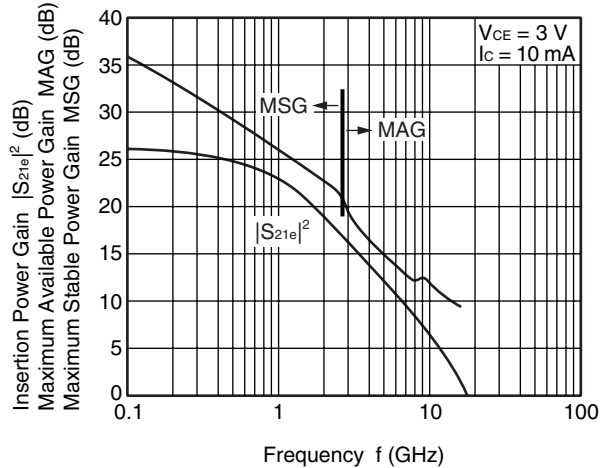
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

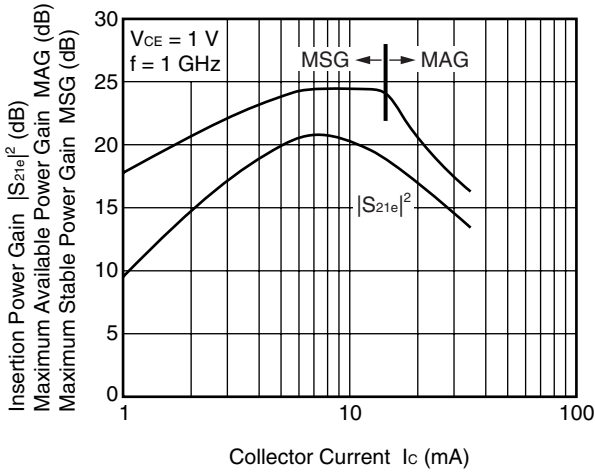


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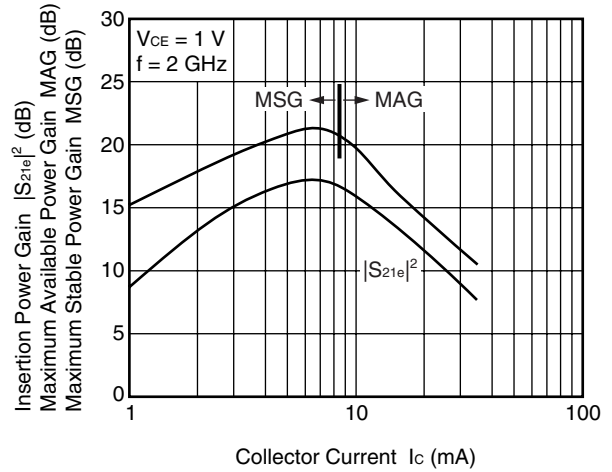


Remark The graph indicates nominal characteristics.

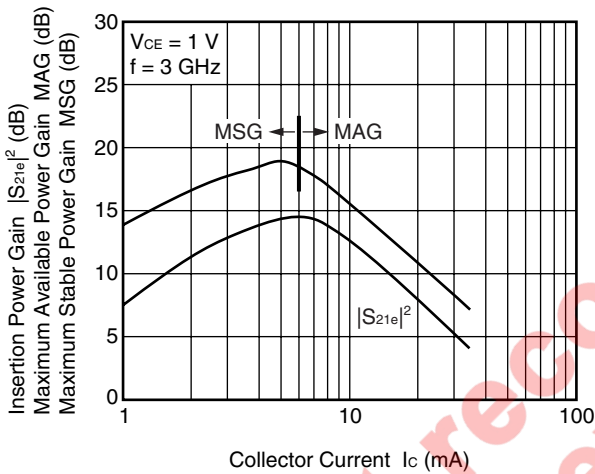
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



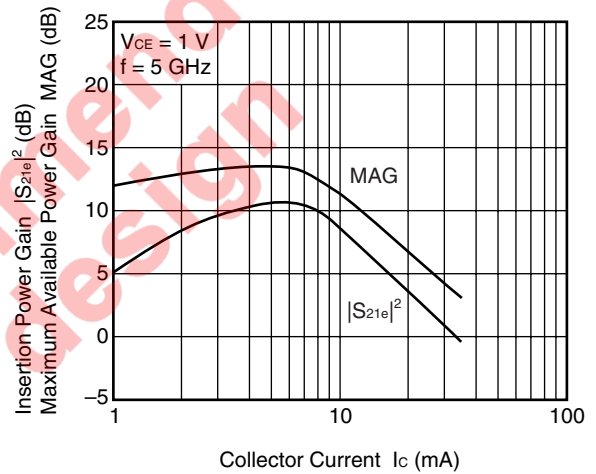
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



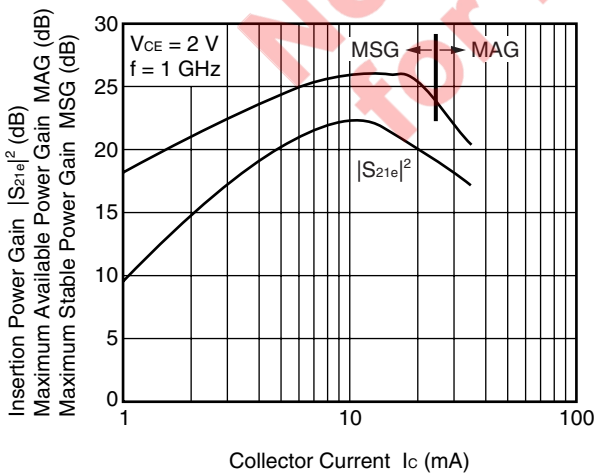
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



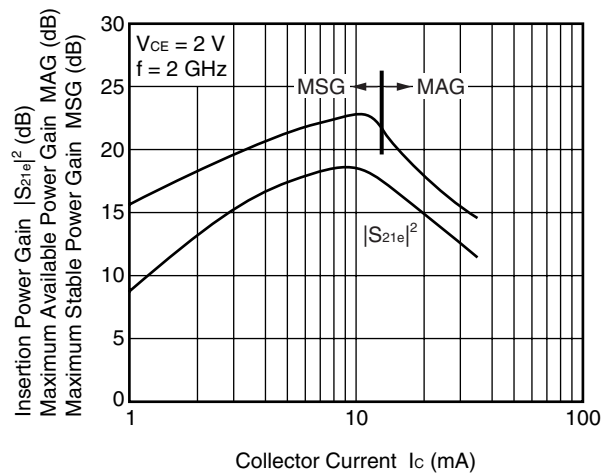
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

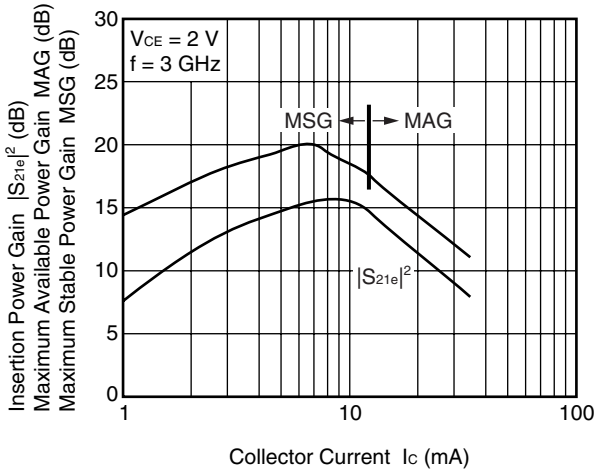


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

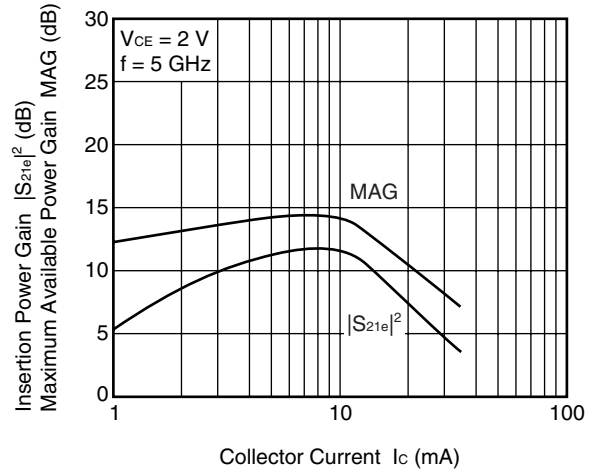


Remark The graph indicates nominal characteristics.

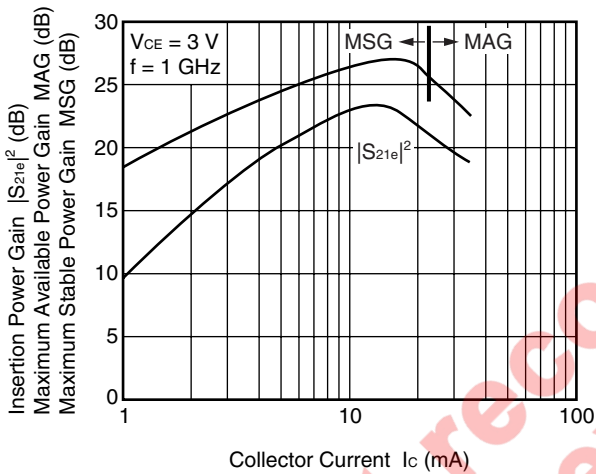
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



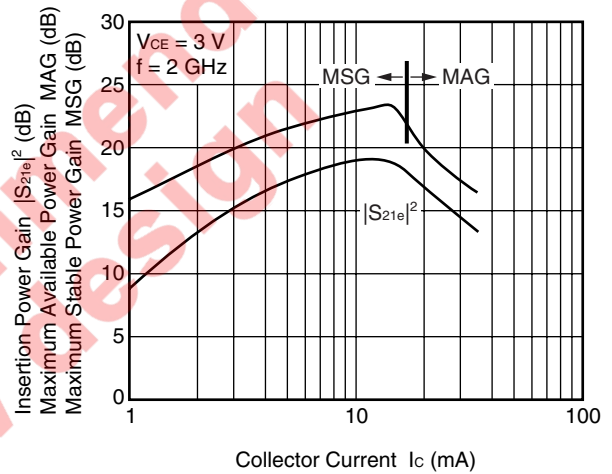
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



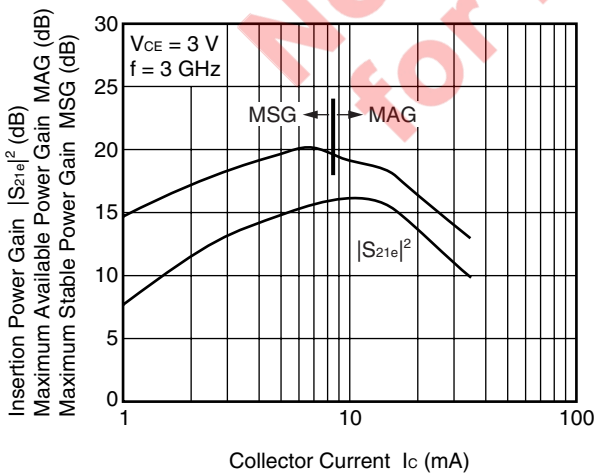
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



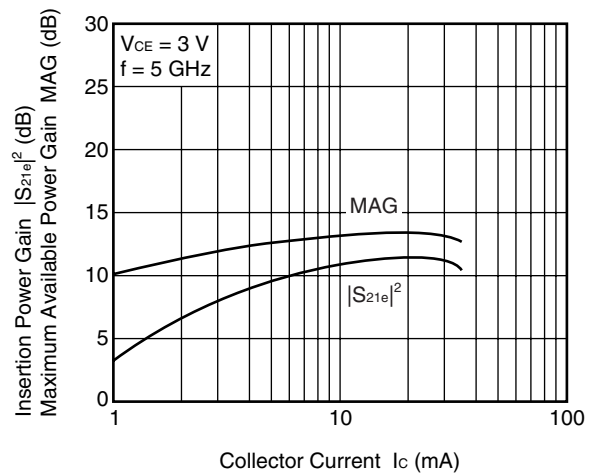
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

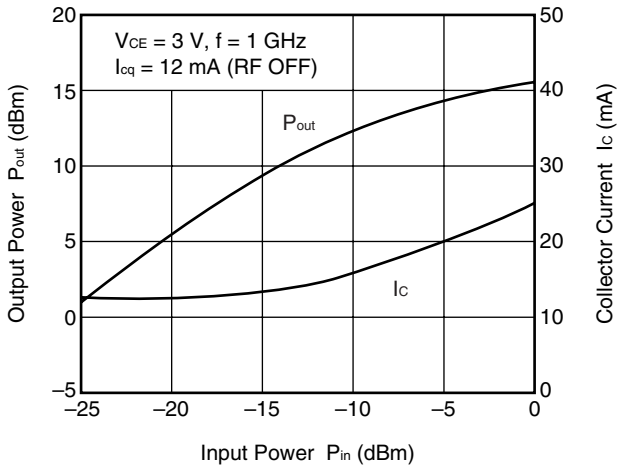


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT

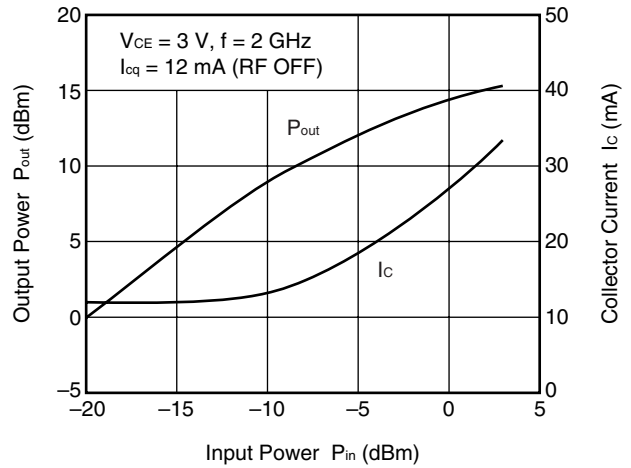


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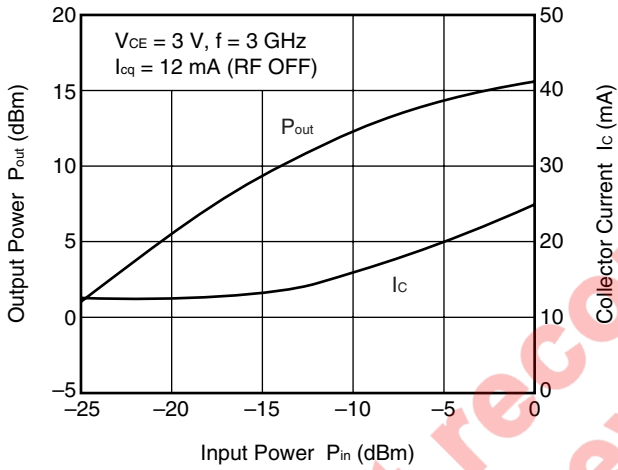
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



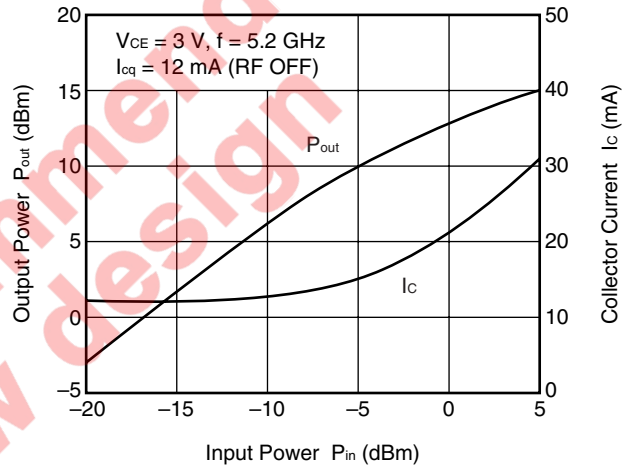
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

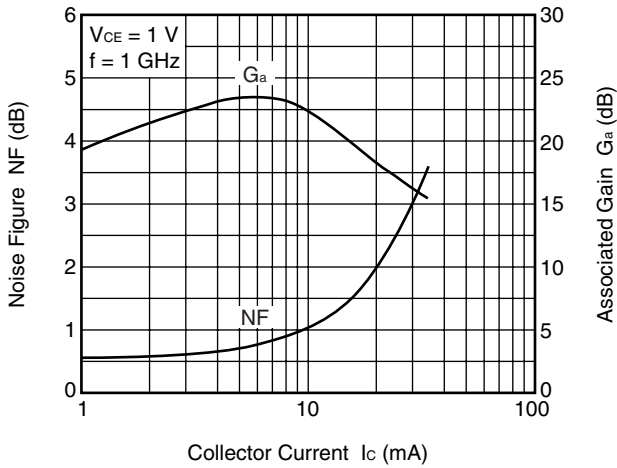


OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

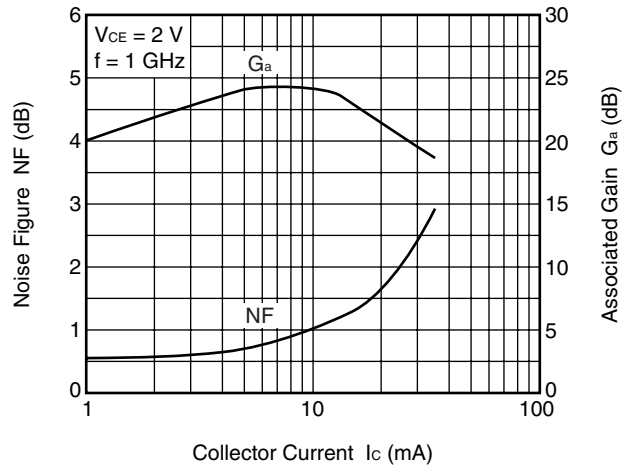


Remark The graph indicates nominal characteristics.

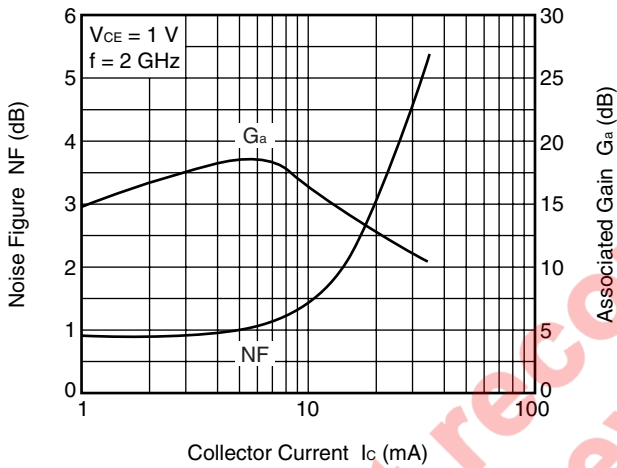
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



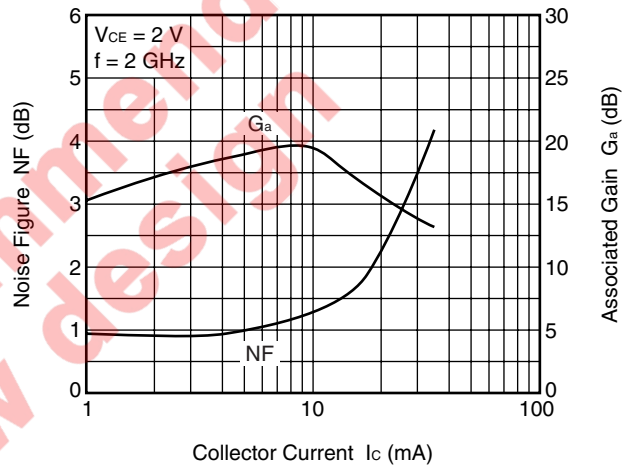
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



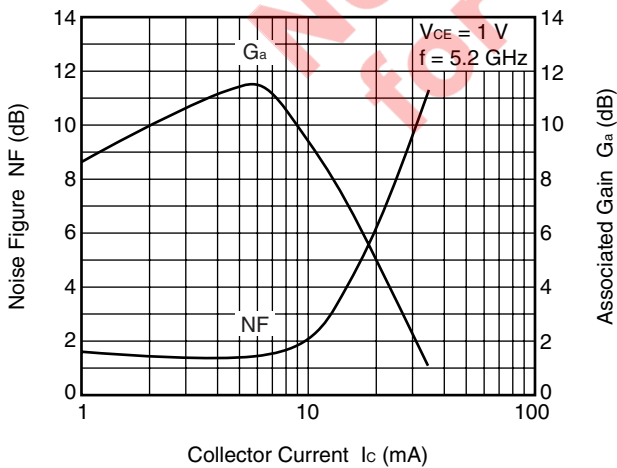
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



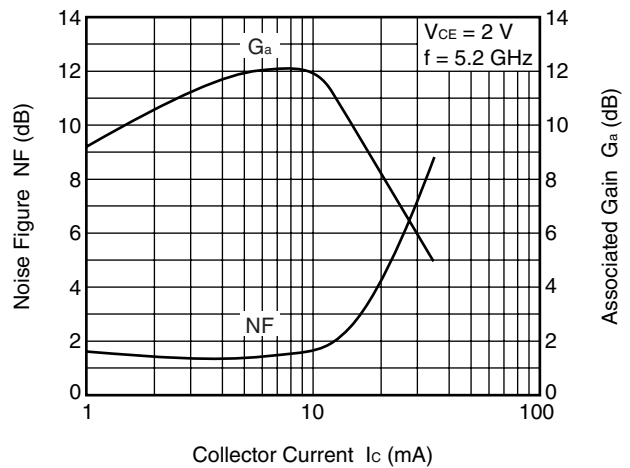
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

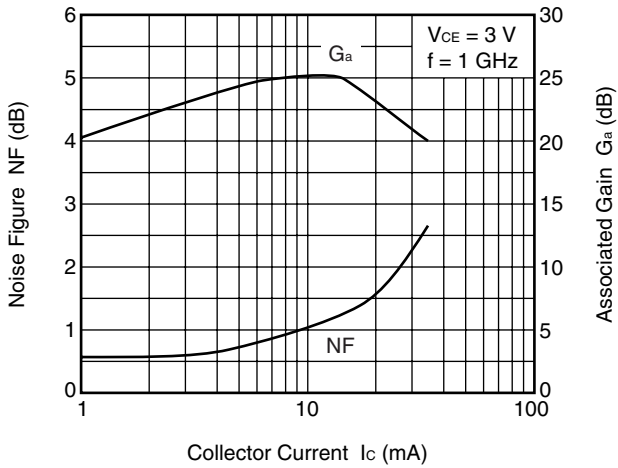


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

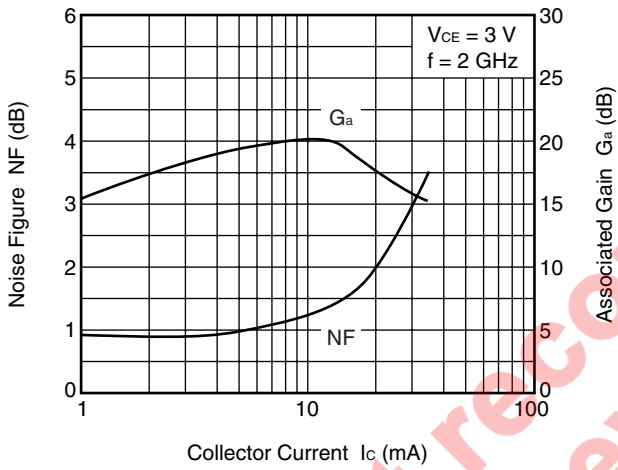


Remark The graph indicates nominal characteristics.

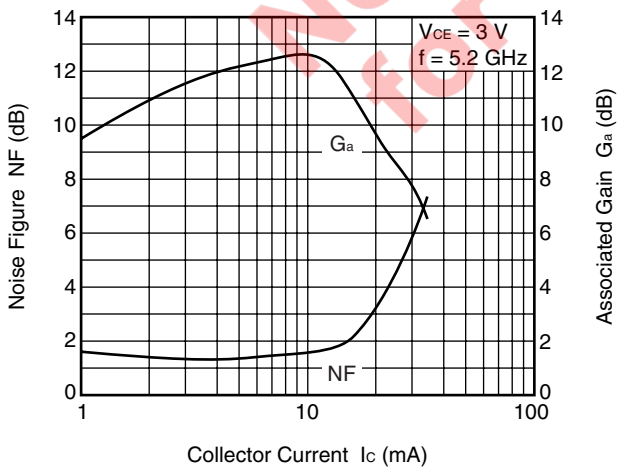
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

<R> **S-PARAMETERS**

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

Click here to download S-parameters.

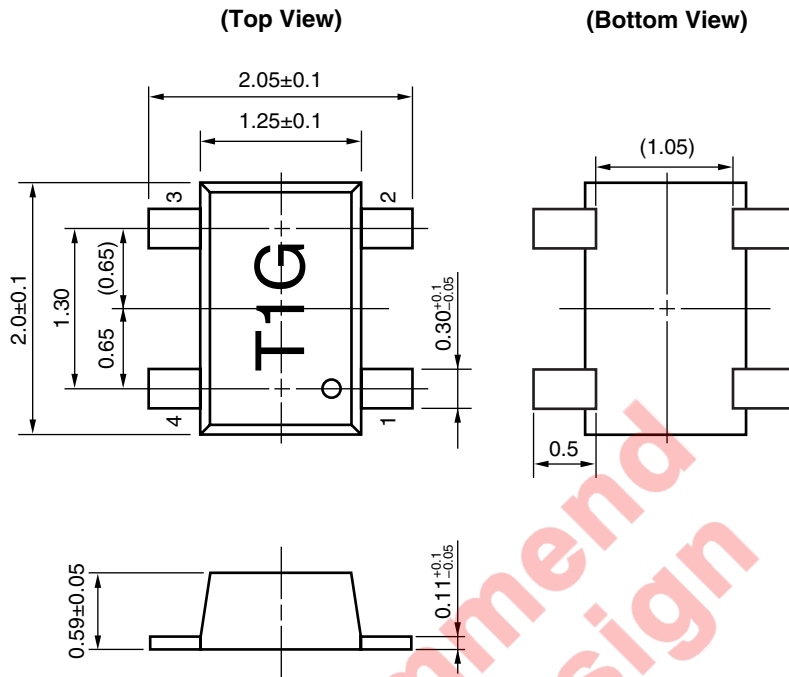
[Products] → [RF Devices] → [Device Parameters]

URL <http://www.renesas.com/products/microwave/>

**Not recommend
for new design**

<R> PACKAGE DIMENSIONS

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M05, 2012 PKG) (UNIT: mm)



PIN CONNENTION

- 1. Base
- 2. Emitter
- 3. Collector
- 4. Emitter

Remark () : Reference value

Not recommended for new design

Revision History	NESG2021M05 Data Sheet
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Rev.	Date	Description	
		Page	Summary
-	Mar 2003	-	Previous No. : PU10188EJ02V0DS
3.00	Jun 20, 2012	p.1	Modification of ORDERING INFORMATION
		p.2	Modification of ELECTRICAL CHARACTERISTICS
			Modification of h_{FE} CLASSIFICATION
		p.11	Modification of S-PARAMETERS
p.12	Modification of PACKAGE DIMENSIONS		

Not recommend
for new design

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