

NE662M04 / 2SC5508 JEITA Part No.

Data Sheet

NPN SILICON RF TRANSISTOR

FOR LOW-NOISE, HIGH-GAIN AMPLIFICATION

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04)

R09DS0055EJ0200

Rev.2.00

Mar 5, 2013

FEATURES

- Ideal for low-noise, high-gain amplification applications
- $NF = 1.1$ dB TYP., $G_a = 16$ dB TYP. @ $V_{CE} = 2$ V, $I_C = 5$ mA, $f = 2$ GHz
- Maximum available power gain: $MAG = 19$ dB TYP. @ $V_{CE} = 2$ V, $I_C = 20$ mA, $f = 2$ GHz
- $f_T = 25$ GHz technology adopted
- Flat-lead 4-pin thin-type super minimold (M04) package

<R> ORDERING INFORMATION

Part Number	Order Number	Quantity	Package	Supplying Form
NE662M04 2SC5508	NE662M04-A 2SC5508-A	50 pcs (Non reel)	Flat-lead 4-pin thin-type super minimold (M04) (Pb-Free)	• 8 mm wide embossed taping • Pin 1 (Emitter), Pin 2 (Collector) face the perforation side of the tape
NE662M04-T2 2SC5508-T2	NE662M04-T2-A 2SC5508-T2-A	3 kpcs/reel		
NE662M04-T2B 2SC5508-T2B	NE662M04-T2B-A 2SC5508-T2B-A	15 kpcs/reel		

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

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	15	V
Collector to Emitter Voltage	V_{CEO}	3.3	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_C	35	mA
Total Power Dissipation	P_{tot} Note	115	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

Note Free air.

THERMAL RESISTANCE

Parameter	Symbol	Ratings	Unit
Junction to Case Resistance	$R_{th\ j-c}$	150	$^\circ\text{C} / \text{W}$
Junction to Ambient Resistance	$R_{th\ j-a}$	650	$^\circ\text{C} / \text{W}$

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.

ELECTRICAL CHARACTERISTICS (T_A = +25 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I _{CBO}	V _{CB} = 5 V, I _E = 0	–	–	200	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 1 V, I _C = 0	–	–	200	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 2 V, I _C = 5 mA	50	70	100	–
RF Characteristics						
Gain Bandwidth Product	f _T	V _{CE} = 3 V, I _C = 30 mA, f = 2 GHz	20	25	–	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 2 V, I _C = 20 mA, f = 2 GHz	14	17	–	dB
Noise Figure	NF	V _{CE} = 2 V, I _C = 5 mA, f = 2 GHz, Z _S = Z _{opt}	–	1.1	1.5	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 2 V, I _E = 0, f = 1 MHz	–	0.18	0.24	pF
Maximum Available Power Gain	MAG ^{Note 3}	V _{CE} = 2 V, I _C = 20 mA, f = 2 GHz	–	19	–	dB
Maximum Stable Power Gain	MSG ^{Note 4}	V _{CE} = 2 V, I _C = 20 mA, f = 2 GHz	–	20	–	dB
Gain 1 dB Compression Output Power	P _{O (1 dB)}	V _{CE} = 2 V, I _C = 20 mA ^{Note 5} , f = 2 GHz	–	11	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP ₃	V _{CE} = 2 V, I _C = 20 mA ^{Note 5} , f = 2 GHz	–	22	–	dBm

- Notes**
1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
 2. Collector to base capacitance when the emitter grounded
 3. $MAG = \left| \frac{S_{21}}{S_{12}} \right| (K - \sqrt{K^2 - 1})$
 4. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$
 5. Collector current when P_{O (1 dB)} is output

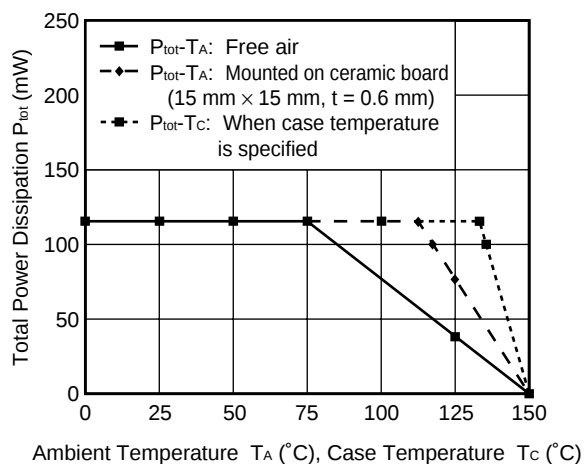
h_{FE} CLASSIFICATION

Rank	FB/YFB
Marking	T79
h _{FE} Value	50 to 100

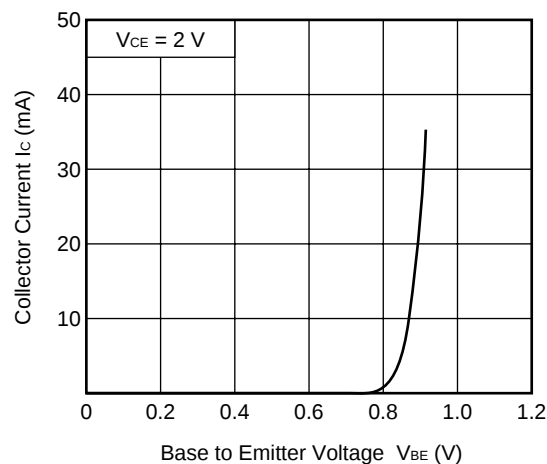
TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified)

Thermal/DC Characteristics

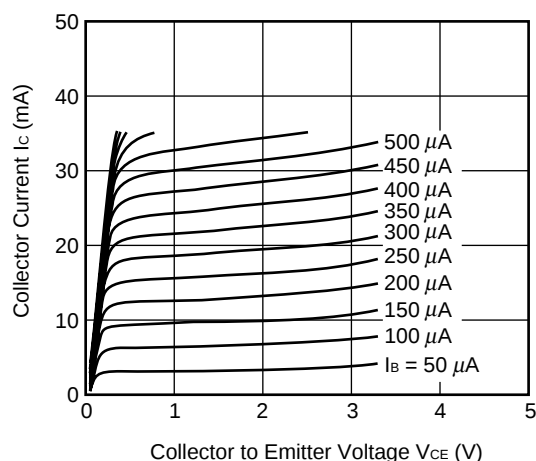
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE, CASE TEMPERATURE



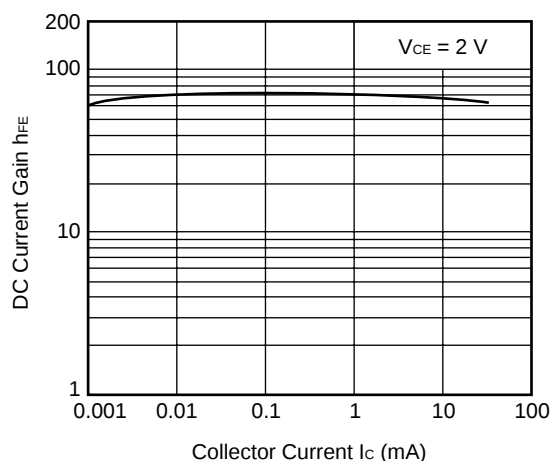
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

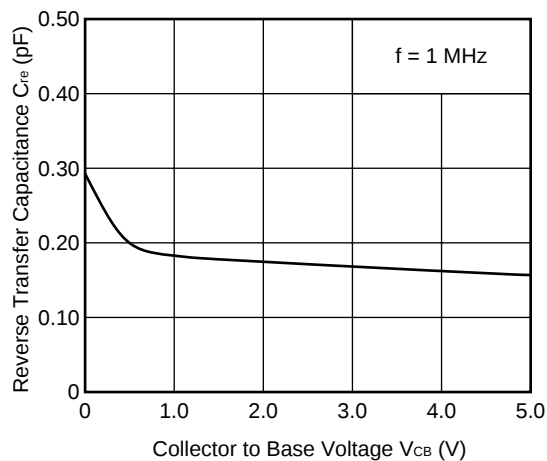


DC CURRENT GAIN vs. COLLECTOR CURRENT

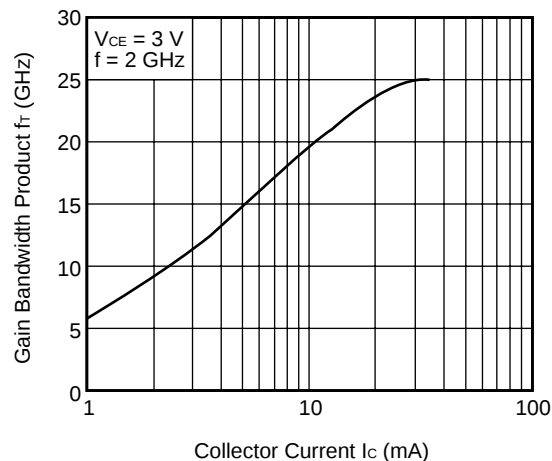


Capacitance/ f_T Characteristics

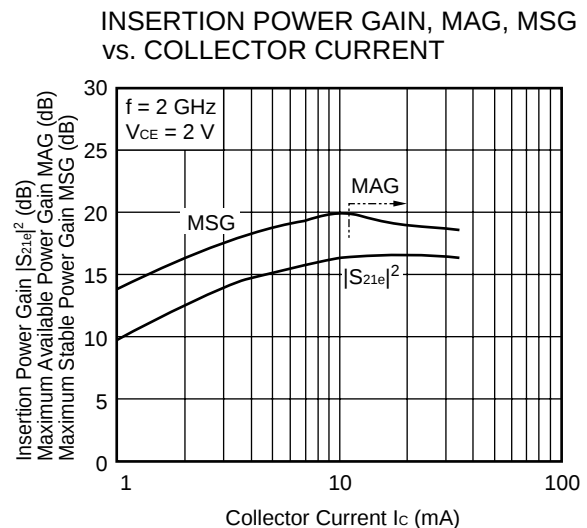
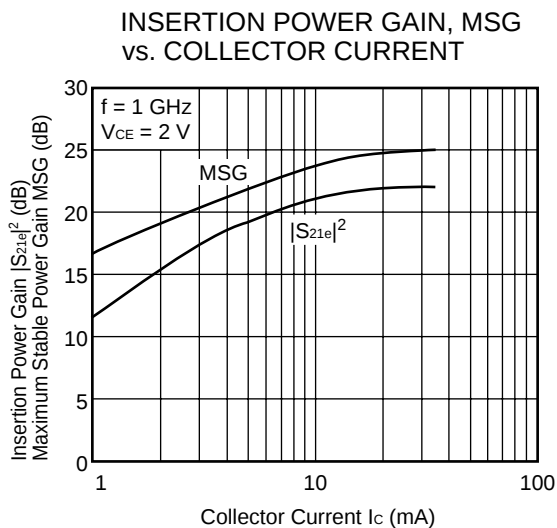
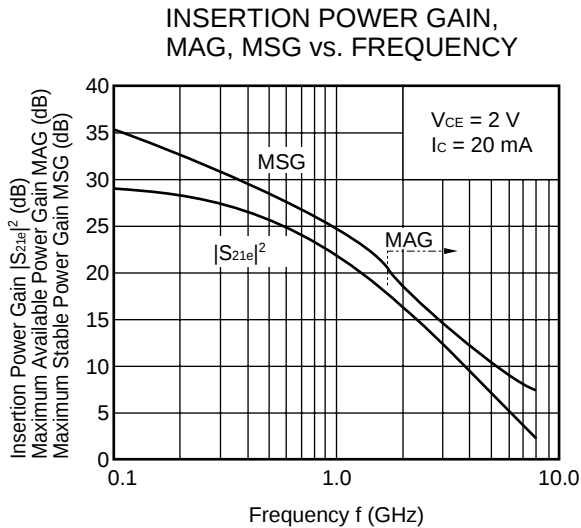
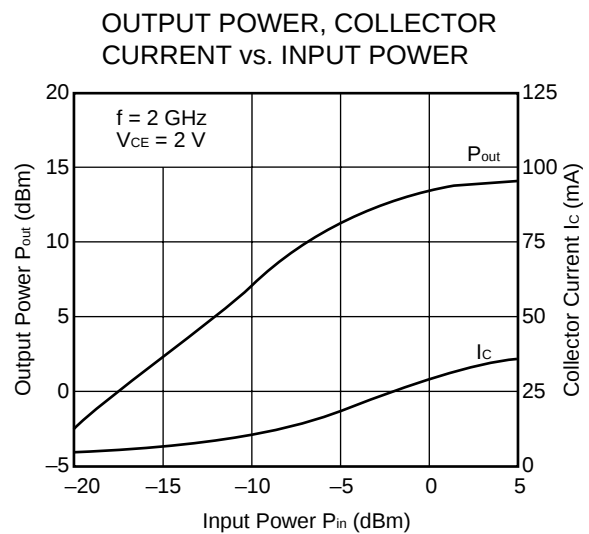
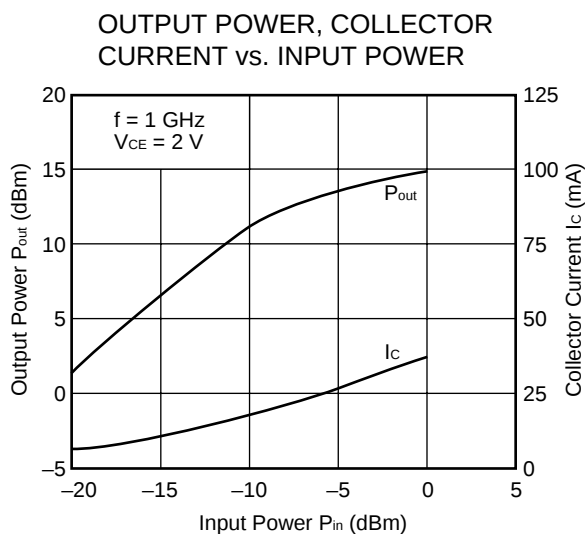
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

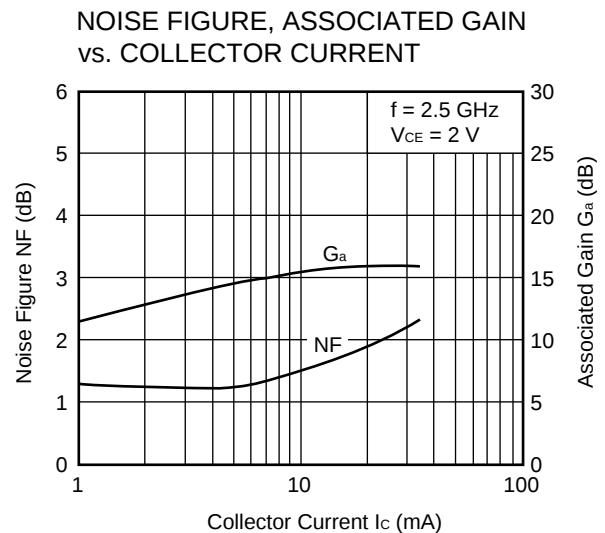
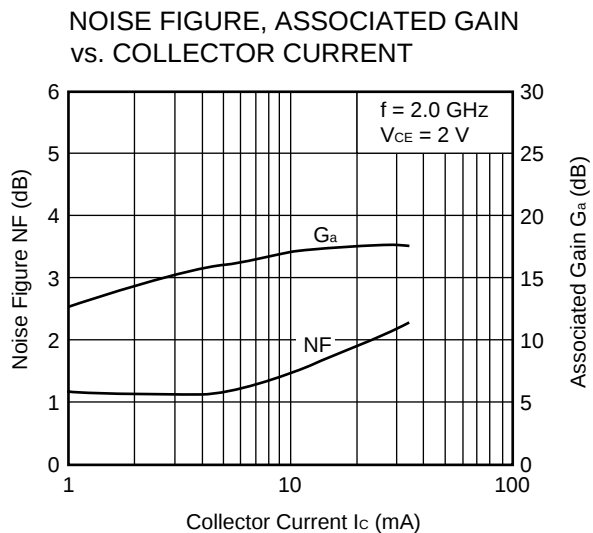
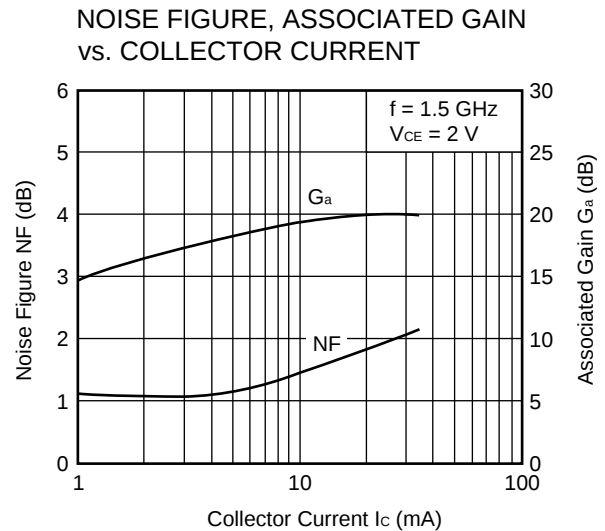
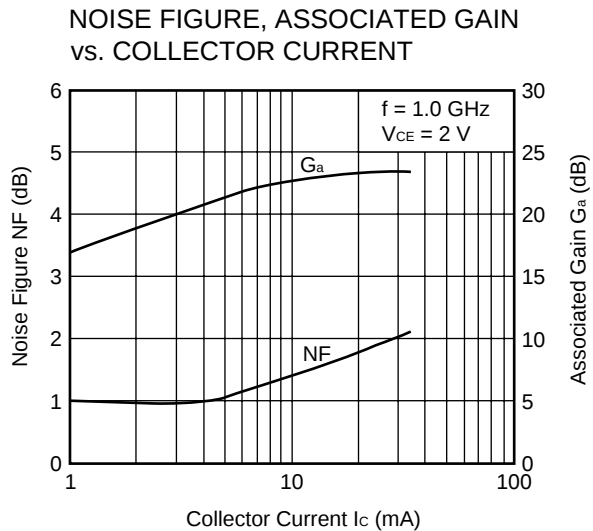


Remark The graphs indicate nominal characteristics.

Gain Characteristics**Output Characteristics**

Remark The graphs indicate nominal characteristics.

Noise Characteristics



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 of keyboard inputs.

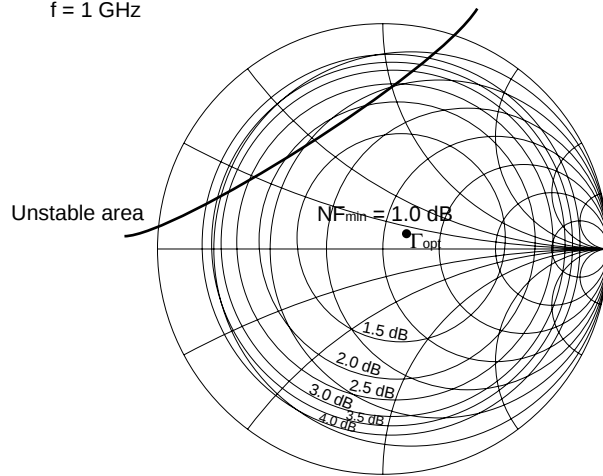
Click here to download S-parameters.

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

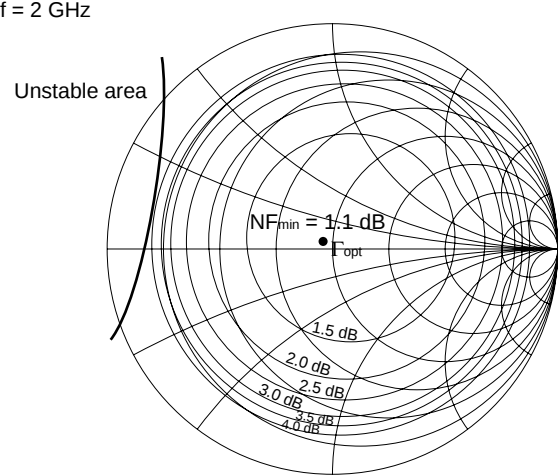
URL <http://www.renesas.com/products/microwave/>

EQUAL NF CIRCLE

$V_{CE} = 2\text{ V}$
 $I_C = 5\text{ mA}$
 $f = 1\text{ GHz}$



$V_{CE} = 2\text{ V}$
 $I_C = 5\text{ mA}$
 $f = 2\text{ GHz}$



NOISE PARAMETERS

 $V_{CE} = 2\text{ V}$, $I_C = 3\text{ mA}$

f (GHz)	NF _{min} (dB)	G _a (dB)	Γ _{opt}		Rn/50
			MAG.	ANG.	
0.8	0.78	21.4	0.26	31.7	0.17
0.9	0.80	20.7	0.26	32.7	0.17
1.0	0.82	20.0	0.26	34.7	0.17
1.5	0.93	17.0	0.23	57.0	0.16
1.8	1.00	15.6	0.20	78.0	0.14
1.9	1.02	15.2	0.19	86.0	0.14
2.0	1.04	14.8	0.19	94.2	0.13
2.5	1.15	13.5	0.20	138.3	0.10

 $V_{CE} = 2\text{ V}$, $I_C = 5\text{ mA}$

f (GHz)	NF _{min} (dB)	G _a (dB)	Γ _{opt}		Rn/50
			MAG.	ANG.	
0.8	0.93	22.5	0.12	28.1	0.15
0.9	0.94	21.8	0.12	28.8	0.15
1.0	0.96	21.1	0.12	31.7	0.15
1.5	1.03	18.1	0.09	71.1	0.14
1.8	1.07	16.7	0.08	106.2	0.13
1.9	1.09	16.3	0.08	118.5	0.13
2.0	1.10	15.9	0.08	130.5	0.12
2.5	1.17	14.3	0.14	-179.7	0.11

 $V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$

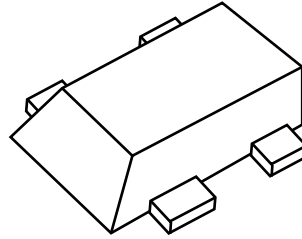
f (GHz)	NF _{min} (dB)	G _a (dB)	Γ _{opt}		Rn/50
			MAG.	ANG.	
0.8	1.28	23.7	0.07	-159.4	0.13
0.9	1.29	23.0	0.07	-157.5	0.13
1.0	1.30	22.3	0.08	-155.7	0.13
1.5	1.37	19.3	0.13	-149.2	0.13
1.8	1.41	17.8	0.16	-146.1	0.13
1.9	1.43	17.3	0.17	-145.0	0.13
2.0	1.44	16.9	0.19	-143.9	0.13
2.5	1.51	15.3	0.25	-136.7	0.13

 $V_{CE} = 2\text{ V}$, $I_C = 20\text{ mA}$

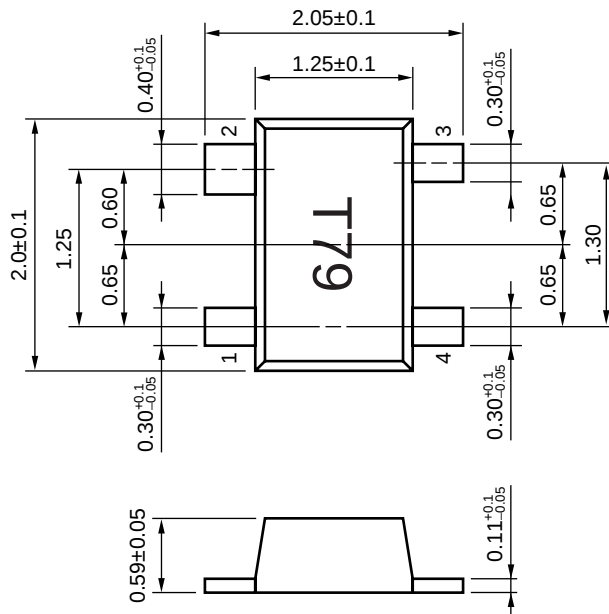
f (GHz)	NF _{min} (dB)	G _a (dB)	Γ _{opt}		Rn/50
			MAG.	ANG.	
0.8	1.59	24.5	0.26	-158.1	0.12
0.9	1.61	23.7	0.26	-155.5	0.13
1.0	1.63	23.0	0.27	-153.1	0.13
1.5	1.72	19.9	0.30	-142.6	0.14
1.8	1.78	18.3	0.33	-137.3	0.15
1.9	1.79	17.9	0.34	-135.7	0.06
2.0	1.81	17.5	0.35	-134.1	0.16
2.5	1.90	15.8	0.40	-126.5	0.18

<R> PACKAGE DIMENSIONS

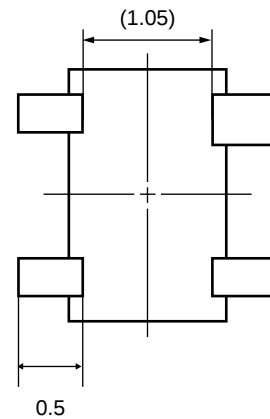
FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) PACKAGE (UNIT: mm)



(Top View)



(Bottom View)



PIN CONNECTIONS

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

Revision History	NE662M04 / 2SC5508 Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Sep 9, 2004	–	First edition issued
2.00	Mar 5, 2013	Throughout	Renesas format is applied to this data sheet.
		p.1	ORDERING INFORMATION is modified.
		p.5	Up to date S-PARAMETERS.
		p.8	Added a drawing backside to PACKAGE DIMENSIONS.

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