2SC5508

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
2SC5508	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
2SC5508-T2	2SC5508-T2-A	3 kpcs/reel		
2SC5508-T2B	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°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	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note Free air.

THERMAL RESISTANCE

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

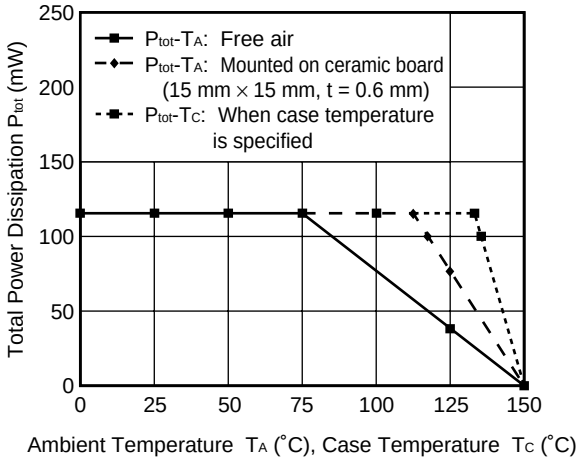
h_{FE} CLASSIFICATION

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

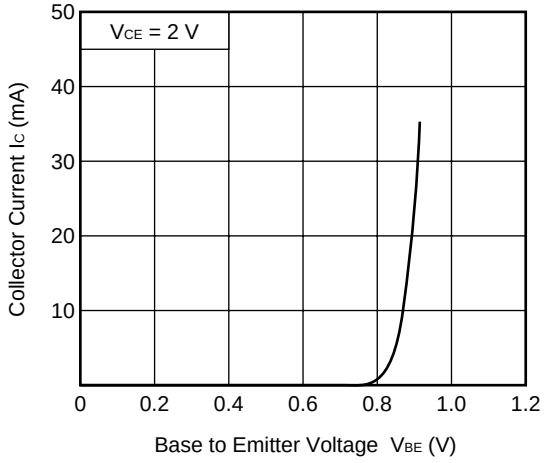
TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

Thermal/DC Characteristics

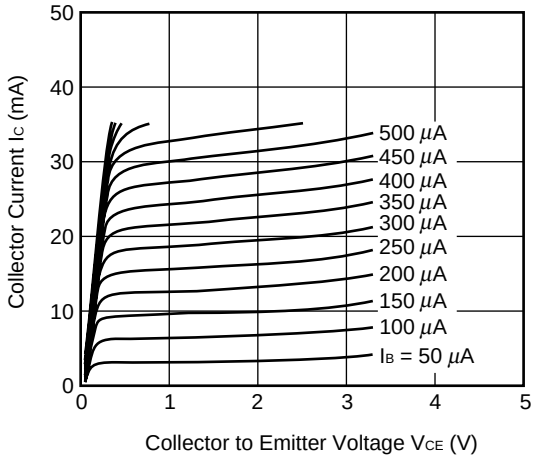
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE, CASE TEMPERATURE



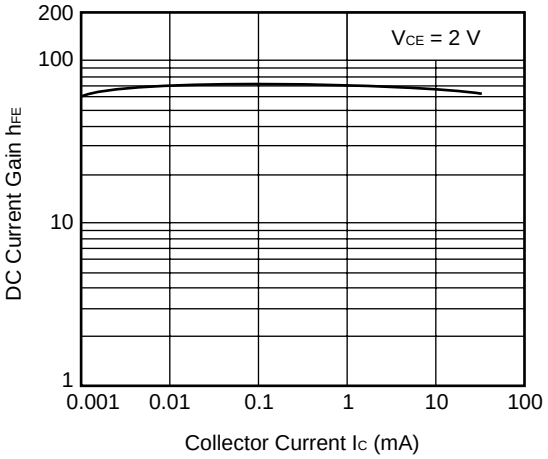
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

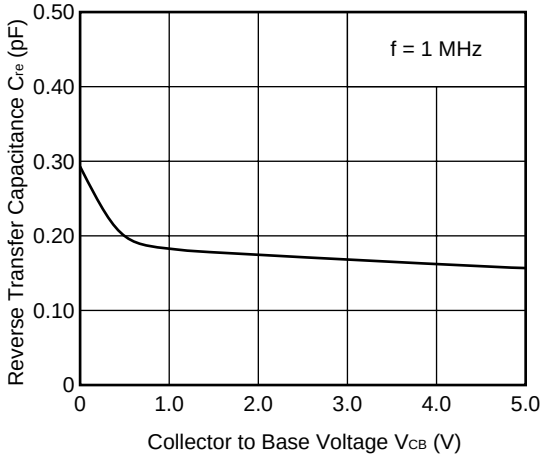


DC CURRENT GAIN vs. COLLECTOR CURRENT

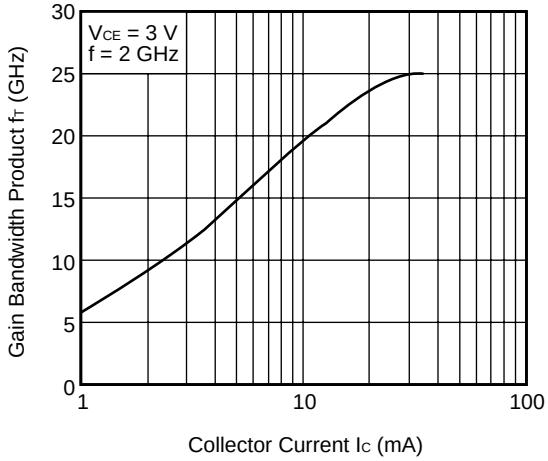


Capacitance/f_T Characteristics

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



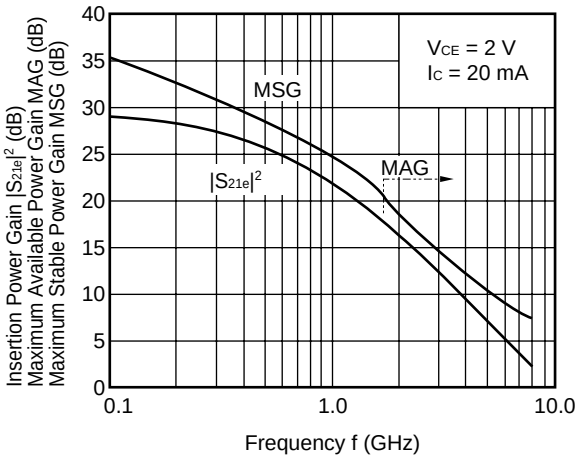
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



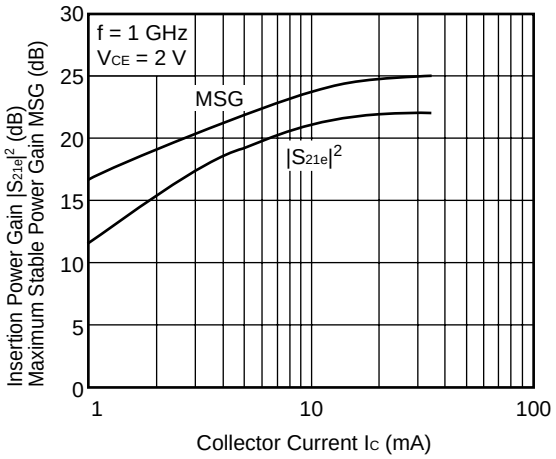
Remark The graphs indicate nominal characteristics.

Gain Characteristics

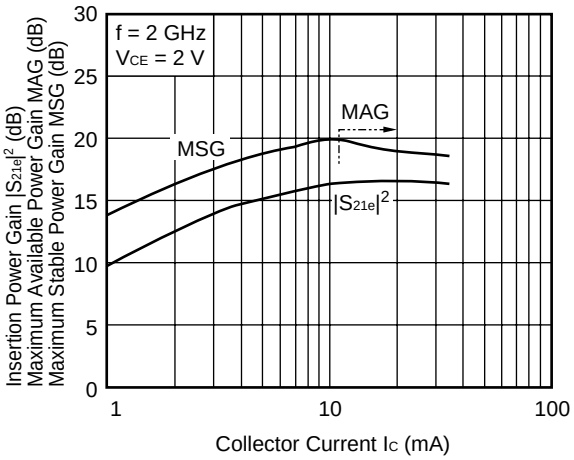
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MSG vs. COLLECTOR CURRENT

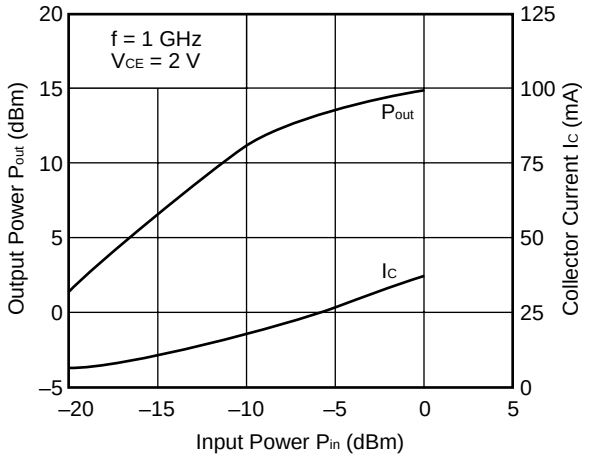


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

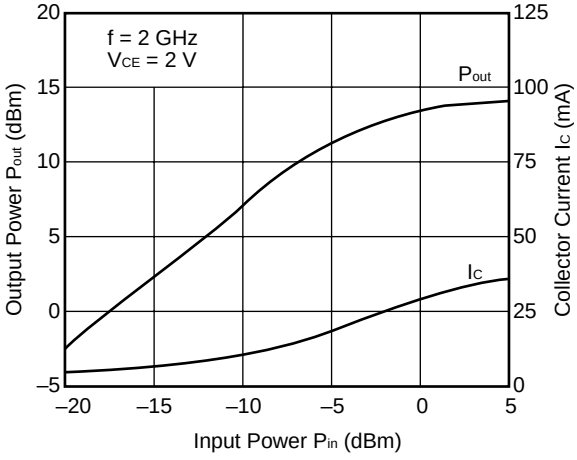


Output Characteristics

OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



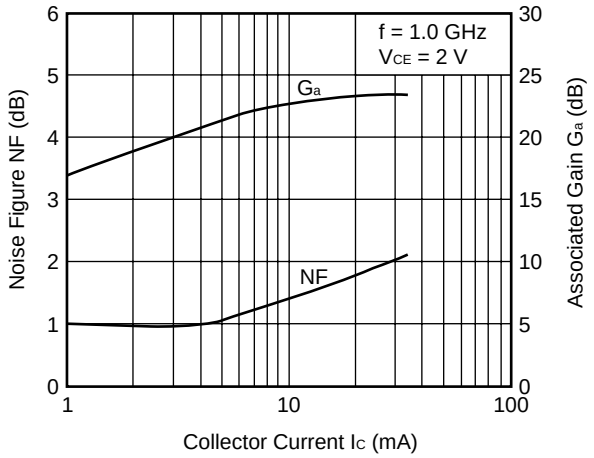
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



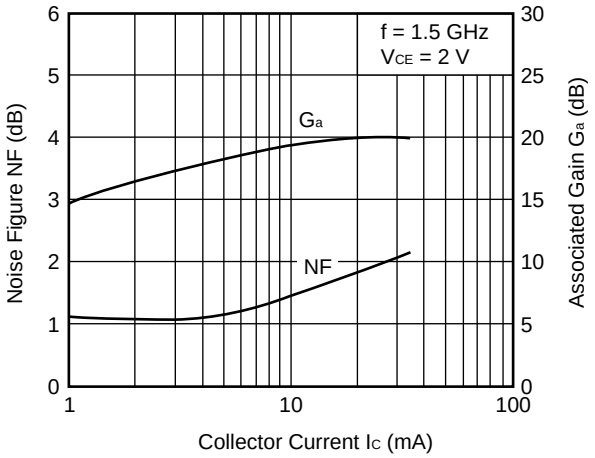
Remark The graphs indicate nominal characteristics.

Noise Characteristics

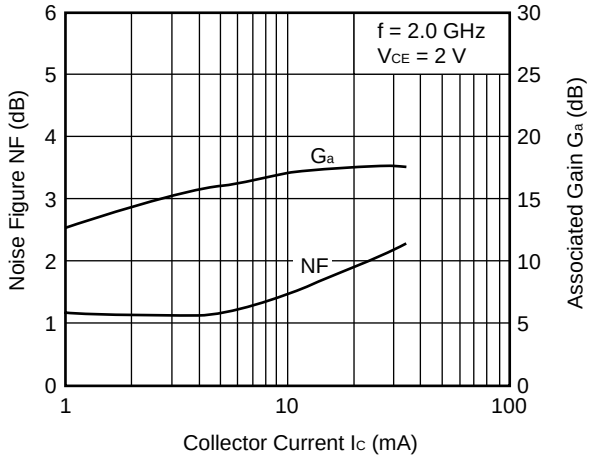
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



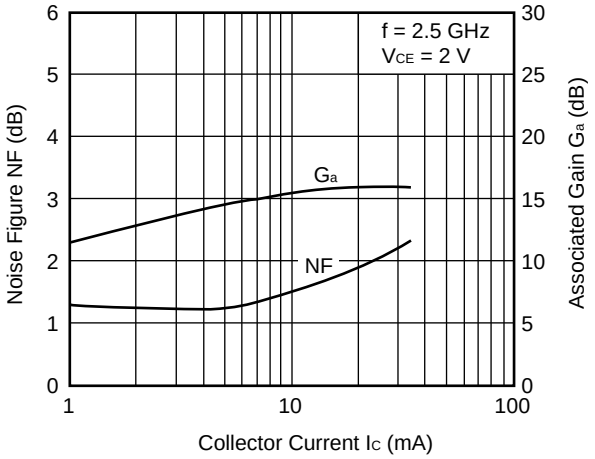
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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.

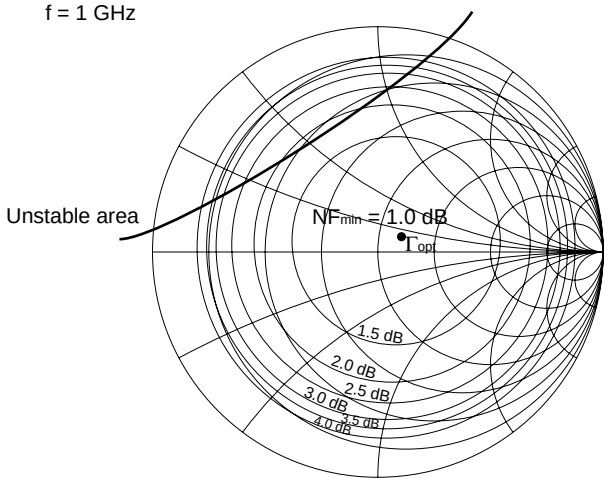
Click here to download S-parameters.

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

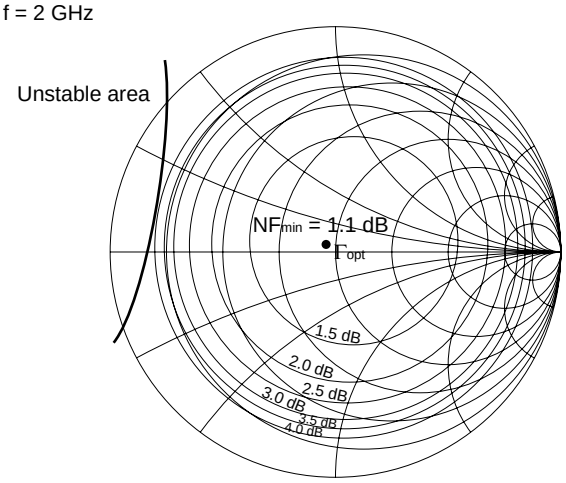
URL http://www.renesas.com/products/microwave/

EQUAL NF CIRCLE

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



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



NOISE PARAMETERS

V_{CE} = 2 V, I_C = 3 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 V, I_C = 5 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 V, I_C = 10 mA

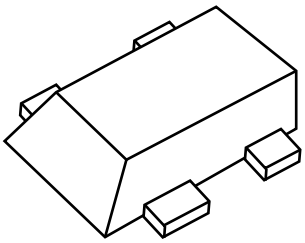
f (GHz)	NF_{min} (dB)	G_a (dB)	Γ_{opt}		Rn/50
			MAG.	ANG.	
0.8	1.28	23.7	0.07	–159.4	0.13
0.9	1.29	23.0	0.07	–157.5	0.13
1.0	1.30	22.3	0.08	–155.7	0.13
1.5	1.37	19.3	0.13	–149.2	0.13
1.8	1.41	17.8	0.16	–146.1	0.13
1.9	1.43	17.3	0.17	–145.0	0.13
2.0	1.44	16.9	0.19	–143.9	0.13
2.5	1.51	15.3	0.25	–136.7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

V_{CE} = 2 V, I_C = 20 mA

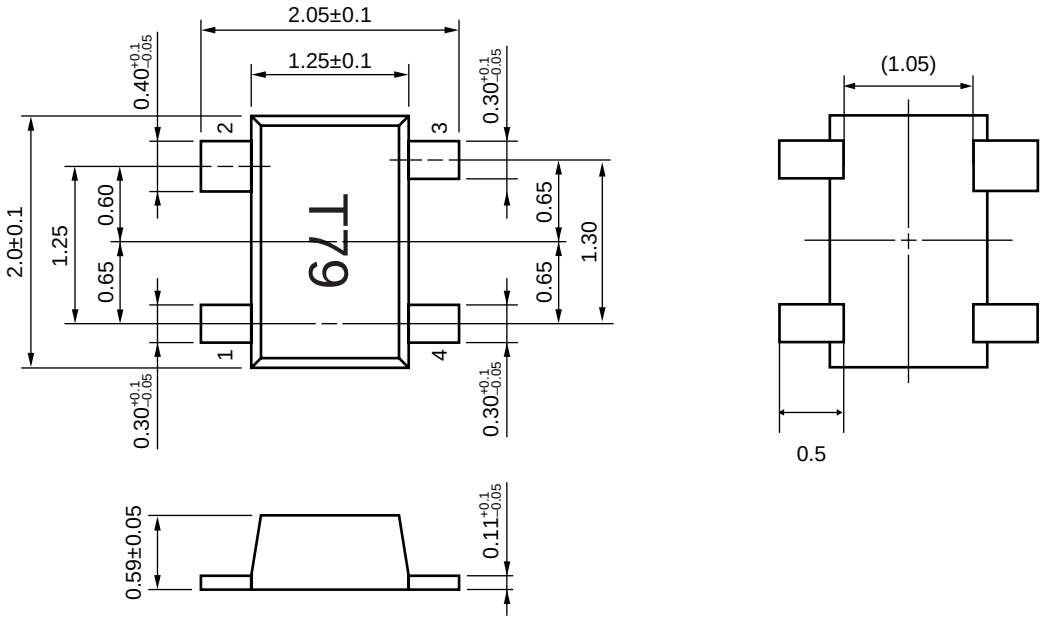
f (GHz)	NF_{min} (dB)	G_a (dB)	Γ_{opt}		Rn/50
			MAG.	ANG.	
0.8	1.59	24.5	0.26	–158.1	0.12
0.9	1.61	23.7	0.26	–155.5	0.13
1.0	1.63	23.0	0.27	–153.1	0.13
1.5	1.72	19.9	0.30	–142.6	0.14
1.8	1.78	18.3	0.33	–137.3	0.15
1.9	1.79	17.9	0.34	–135.7	0.06
2.0	1.81	17.5	0.35	–134.1	0.16
2.5	1.90	15.8	0.40	–126.5	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	2SC5508 Data Sheet

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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[Colophon 2.2]