

December 23, 2022

NJG1187AKGC-A
GNSS High Gain Low Noise Amplifier

S-parameter, noise parameter simulation data
(Standard condition)
Ver. 1

- S-parameter simulation data
- Max gain, NFmin simulation data
- Gain circle simulation data
- NF circle simulation data
- s2p/s4p file
- s2p/s4p file extraction simulation circuit

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Approved by Susumu Takagi

Nisshinbo Micro Devices Inc.

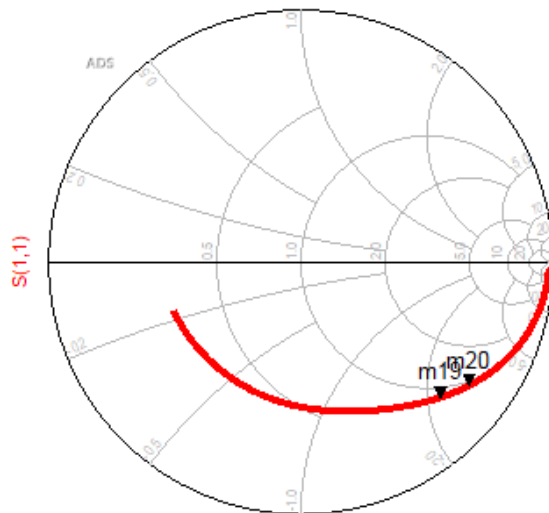
Electronic Devices Business Headquarters
Technology Development Division
RF Product Development Department
RFIC Design Section



■ S-parameter simulation data

Condition: $f=50\text{MHz}$ to 6GHz , $V_{DD}=3.3\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\Omega$

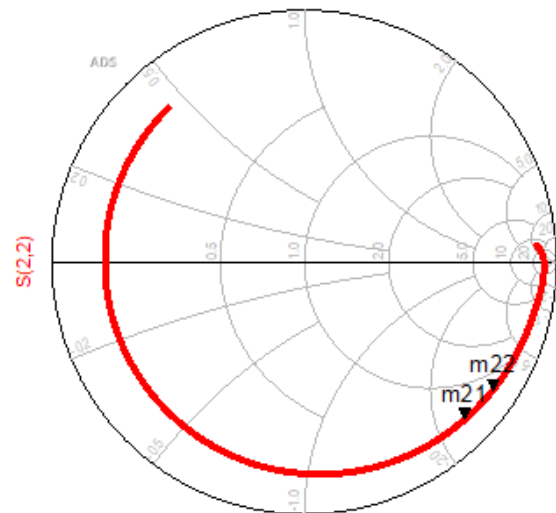
1st LNA (s2p file)



freq (50.00MHz to 6.000GHz)

m20
freq=1.225GHz
S(1,1)=0.827 / -36.337
impedance = $Z_0 * (0.901 - j2.787)$
m19
freq=1.575GHz
S(1,1)=0.771 / -44.128
impedance = $Z_0 * (0.833 - j2.201)$

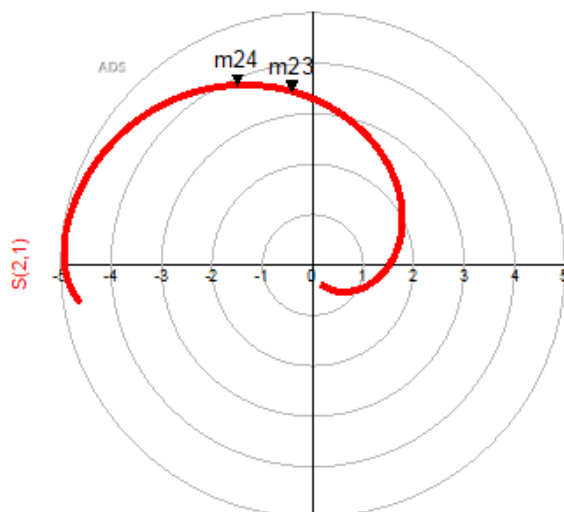
S11



freq (50.00MHz to 6.000GHz)

m22
freq=1.225GHz
S(2,2)=0.903 / -34.070
impedance = $Z_0 * (0.576 - j3.168)$
m21
freq=1.575GHz
S(2,2)=0.891 / -44.434
impedance = $Z_0 * (0.397 - j2.392)$

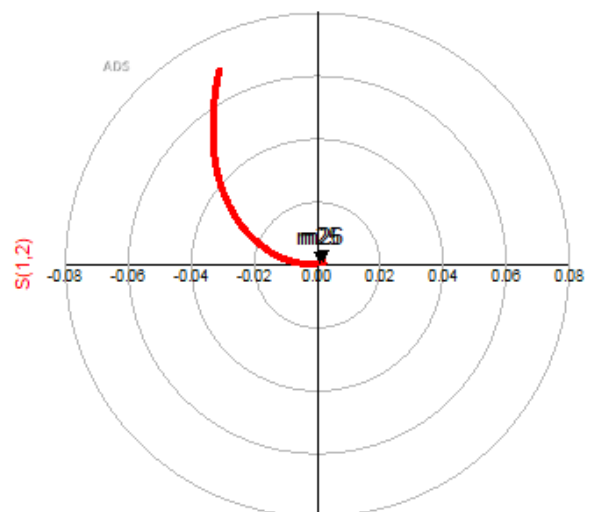
S22



freq (50.00MHz to 6.000GHz)

m24
freq=1.225GHz
S(2,1)=3.866 / 112.747
m23
freq=1.575GHz
S(2,1)=3.467 / 96.841

S21



freq (50.00MHz to 6.000GHz)

m26
freq=1.225GHz
S(1,2)=0.002 / 32.241
m25
freq=1.575GHz
S(1,2)=0.001 / 47.292

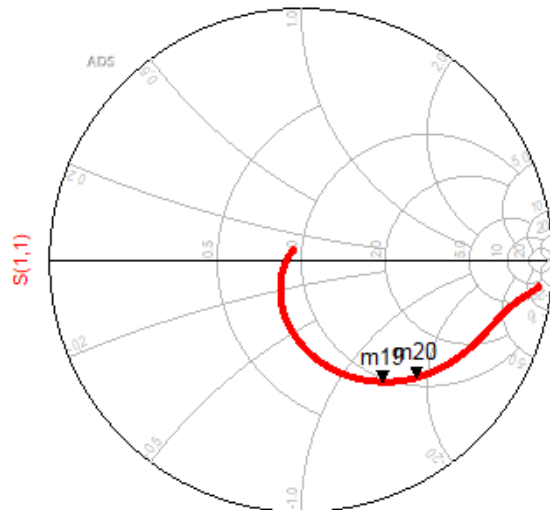
S12



■ S-parameter simulation data

Condition: $f=50\text{MHz}$ to 6GHz , $V_{DD}=3.3\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\Omega$

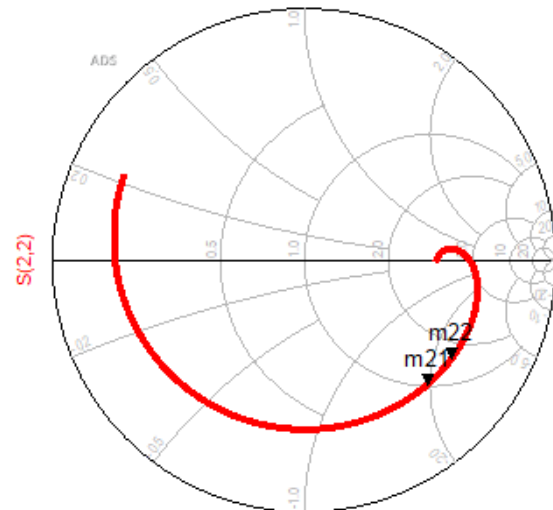
2nd LNA (s2p file)



freq (50.00MHz to 6.000GHz)

m20
freq=1.225GHz
S(1,1)=0.654 / -45.437
impedance = $Z_0 * (1.123 - j1.826)$
m19
freq=1.575GHz
S(1,1)=0.581 / -56.098
impedance = $Z_0 * (0.960 - j1.400)$

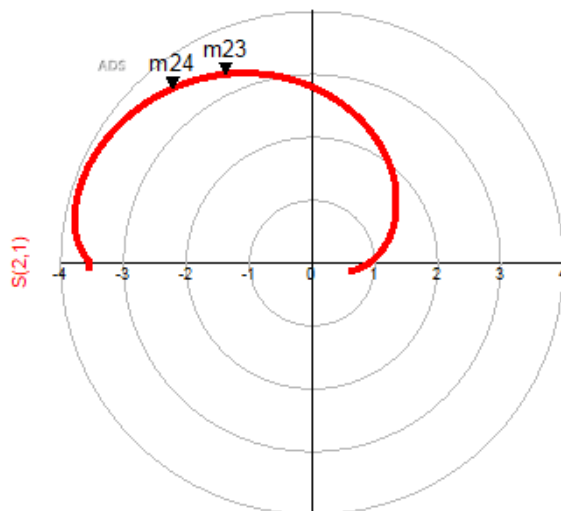
S11



freq (50.00MHz to 6.000GHz)

m22
freq=1.225GHz
S(2,2)=0.704 / -33.675
impedance = $Z_0 * (1.558 - j2.409)$
m21
freq=1.575GHz
S(2,2)=0.695 / -45.074
impedance = $Z_0 * (1.031 - j1.963)$

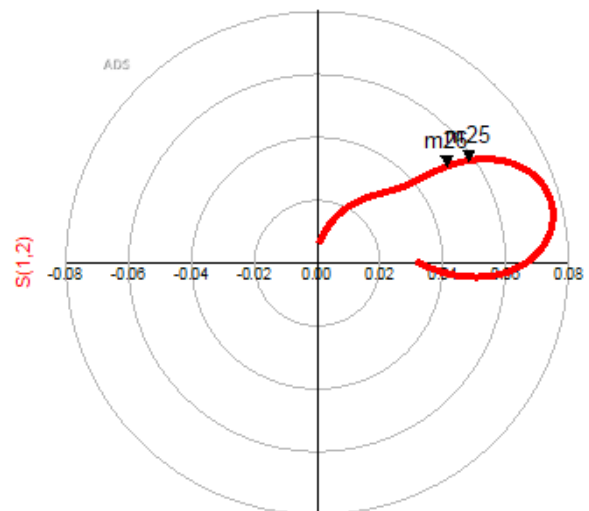
S22



freq (50.00MHz to 6.000GHz)

m24
freq=1.225GHz
S(2,1)=3.551 / 128.690
m23
freq=1.575GHz
S(2,1)=3.299 / 114.614

S21



freq (50.00MHz to 6.000GHz)

m26
freq=1.225GHz
S(1,2)=0.051 / 36.704
m25
freq=1.575GHz
S(1,2)=0.058 / 34.091

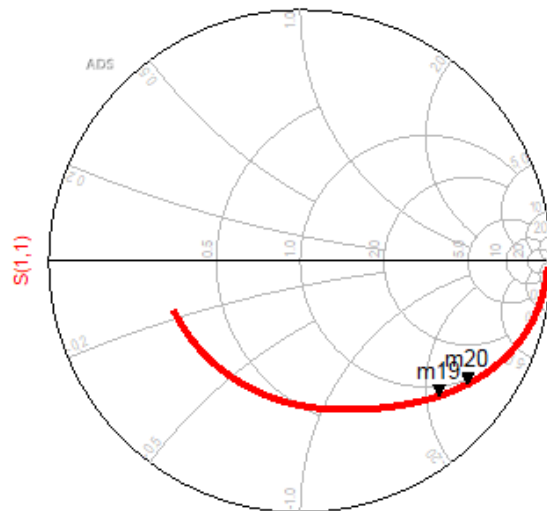
S12



■ S-parameter simulation data

Condition: f=50MHz to 6GHz, V_{DD}=3.3V, T_a=+25°C, Z_s=Z_l=50Ω

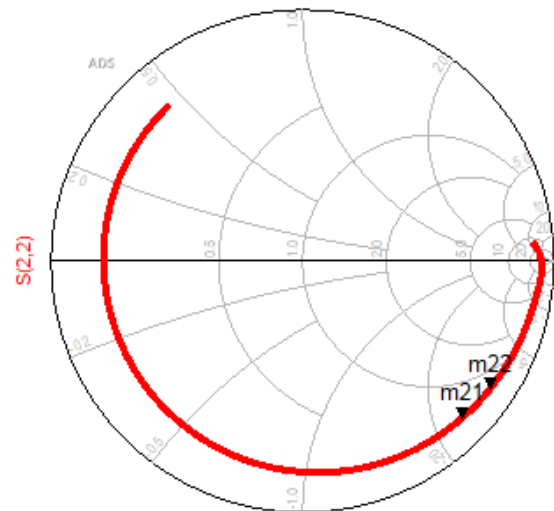
1st LNA (s4p file)



freq (50.00MHz to 6.000GHz)

m20
freq=1.225GHz
S(1,1)=0.827 / -36.335
impedance = Z0 * (0.901 -j2.787)
m19
freq=1.575GHz
S(1,1)=0.771 / -44.126
impedance = Z0 * (0.833 -j2.201)

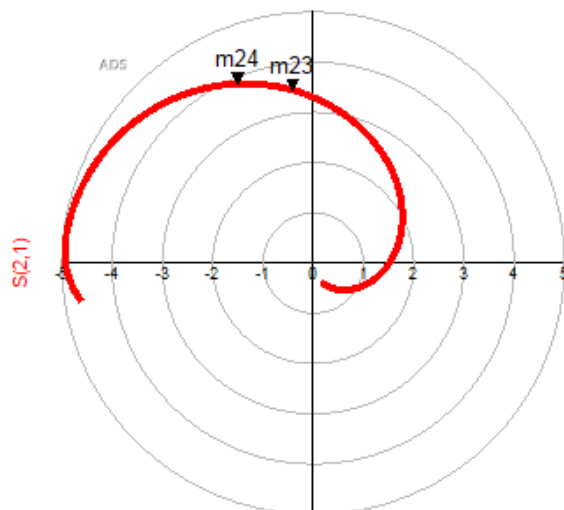
S11



freq (50.00MHz to 6.000GHz)

m22
freq=1.225GHz
S(2,2)=0.903 / -34.071
impedance = Z0 * (0.576 -j3.168)
m21
freq=1.575GHz
S(2,2)=0.891 / -44.433
impedance = Z0 * (0.397 -j2.392)

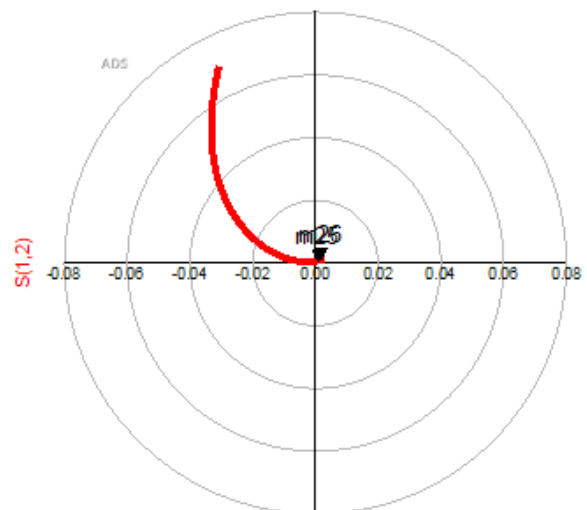
S22



freq (50.00MHz to 6.000GHz)

m24
freq=1.225GHz
S(2,1)=3.866 / 112.746
m23
freq=1.575GHz
S(2,1)=3.467 / 96.841

S21



freq (50.00MHz to 6.000GHz)

m26
freq=1.225GHz
S(1,2)=0.002 / 32.199
m25
freq=1.575GHz
S(1,2)=0.001 / 47.353

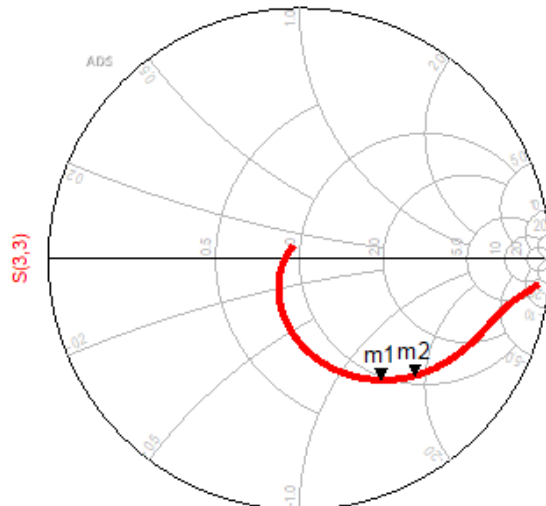
S12



■ S-parameter simulation data

Condition: $f=50\text{MHz}$ to 6GHz , $V_{DD}=3.3\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\Omega$

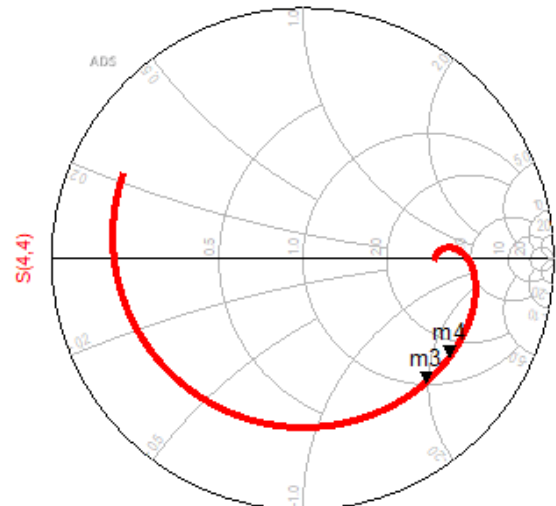
2nd LNA (*s4p file*)



freq (50.00MHz to 6.000GHz)

m2
freq=1.225GHz
S(3,3)=0.654 / -45.437
impedance = $Z_0 * (1.123 - j1.826)$
m1
freq=1.575GHz
S(3,3)=0.581 / -56.100
impedance = $Z_0 * (0.960 - j1.400)$

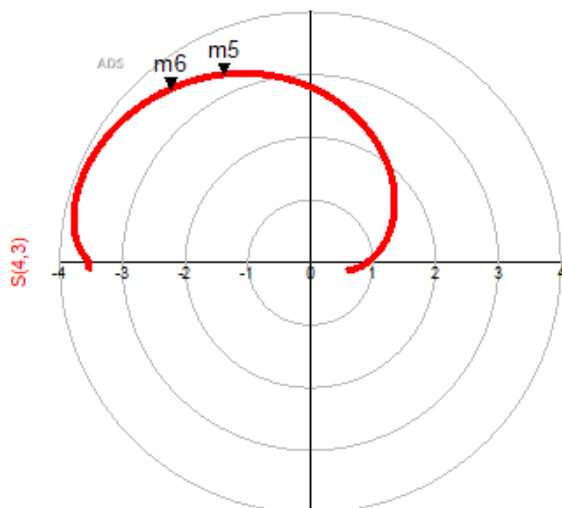
S33



freq (50.00MHz to 6.000GHz)

m4
freq=1.225GHz
S(4,4)=0.704 / -33.673
impedance = $Z_0 * (1.558 - j2.410)$
m3
freq=1.575GHz
S(4,4)=0.695 / -45.073
impedance = $Z_0 * (1.031 - j1.963)$

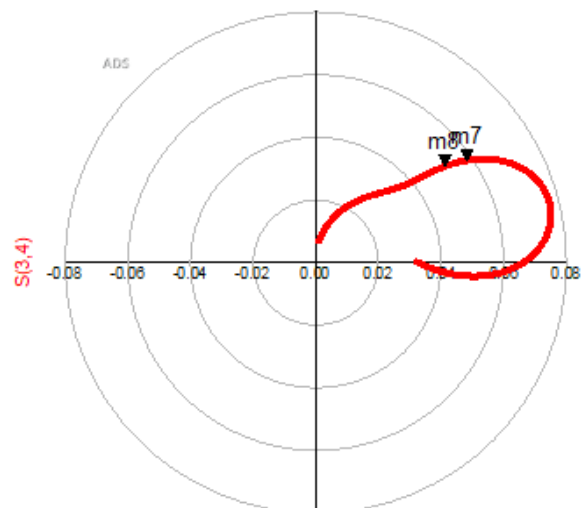
S44



freq (50.00MHz to 6.000GHz)

m6
freq=1.225GHz
S(4,3)=3.551 / 128.689
m5
freq=1.575GHz
S(4,3)=3.299 / 114.612

S43



freq (50.00MHz to 6.000GHz)

m8
freq=1.225GHz
S(3,4)=0.051 / 36.708
m7
freq=1.575GHz
S(3,4)=0.058 / 34.096

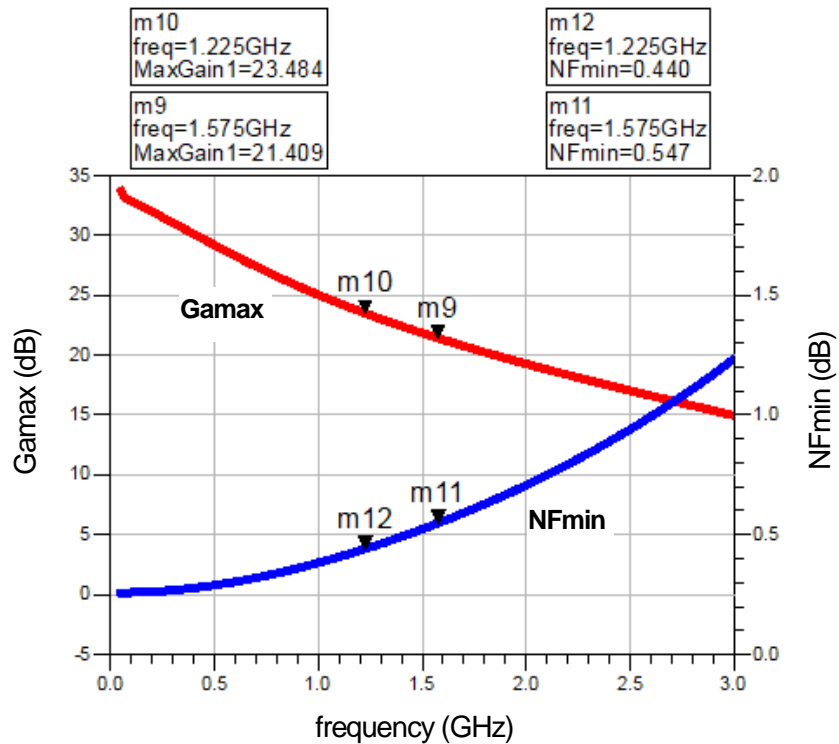
S34



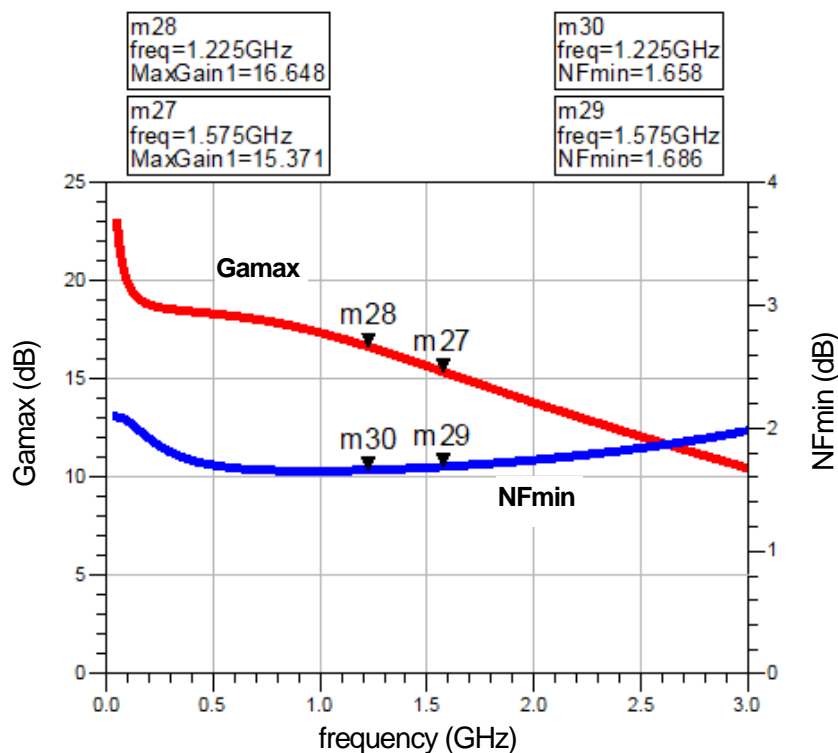
■ Max gain, NFmin simulation data

Condition: f=50MHz to 3GHz, V_{DD}=3.3V, T_a=+25°C, Z_s=Z_L=50Ω

1st LNA (s2p file)



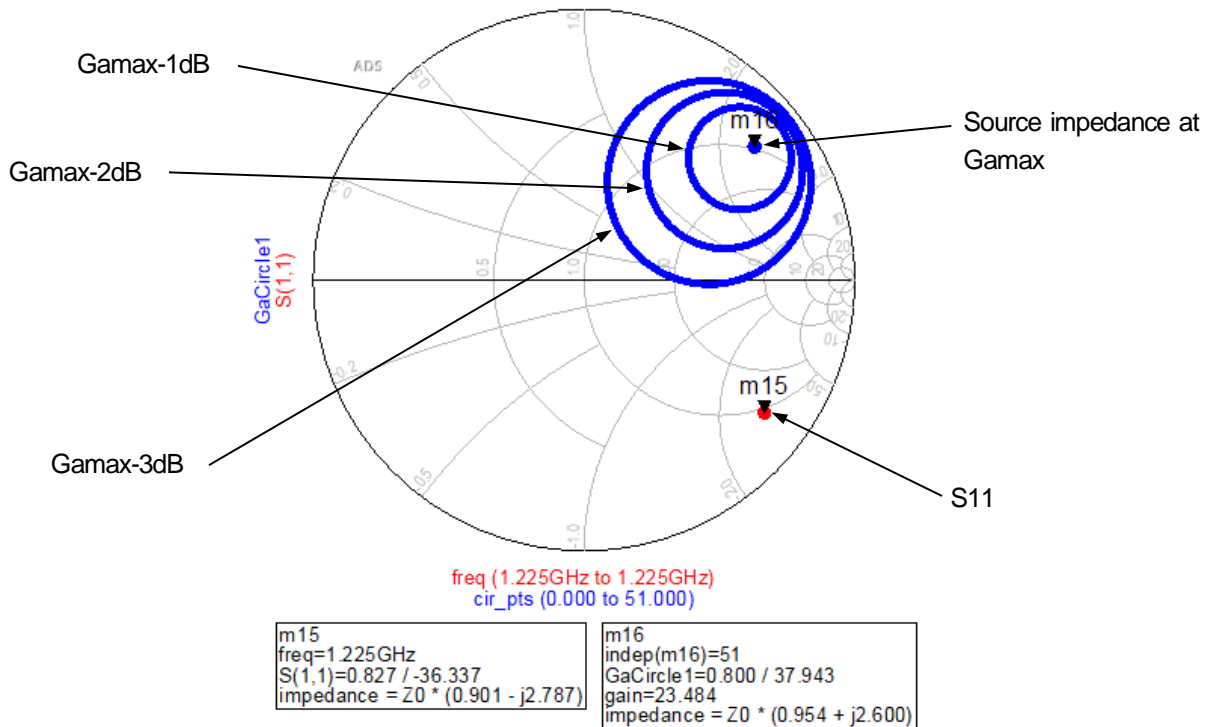
2nd LNA (s2p file)



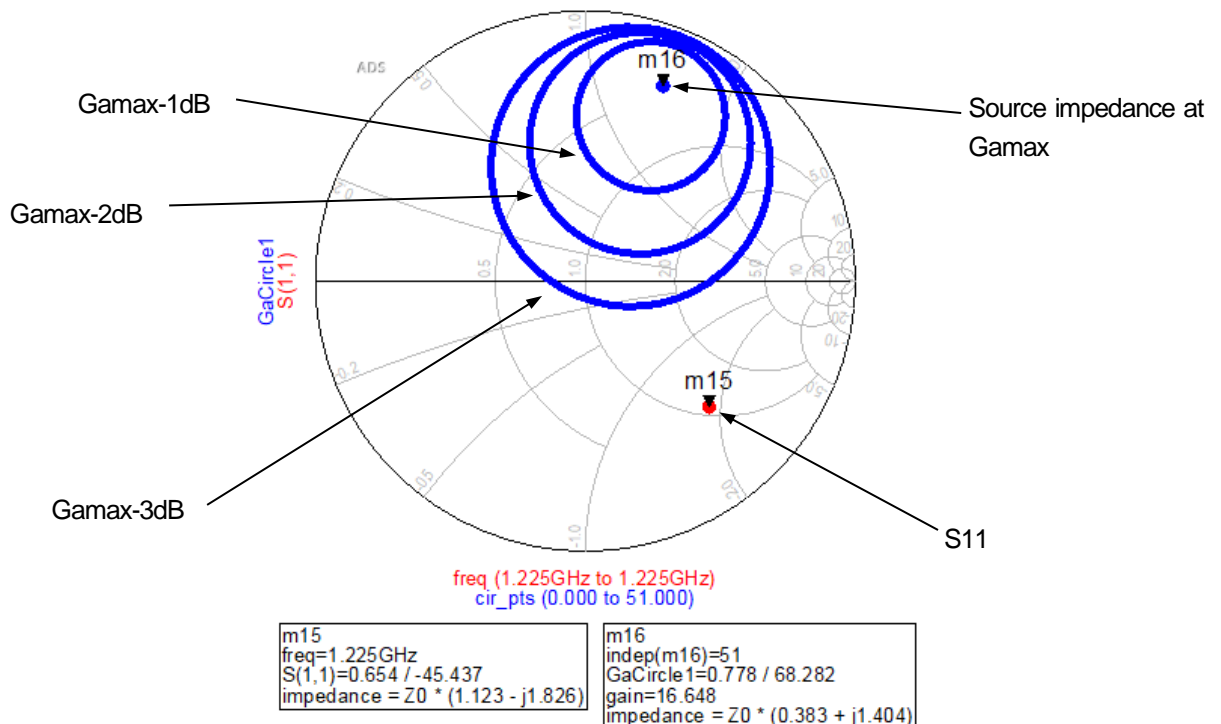
■ Gain circle simulation data (Source impedance)

Condition: **f=1225MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

1st LNA (s2p file)



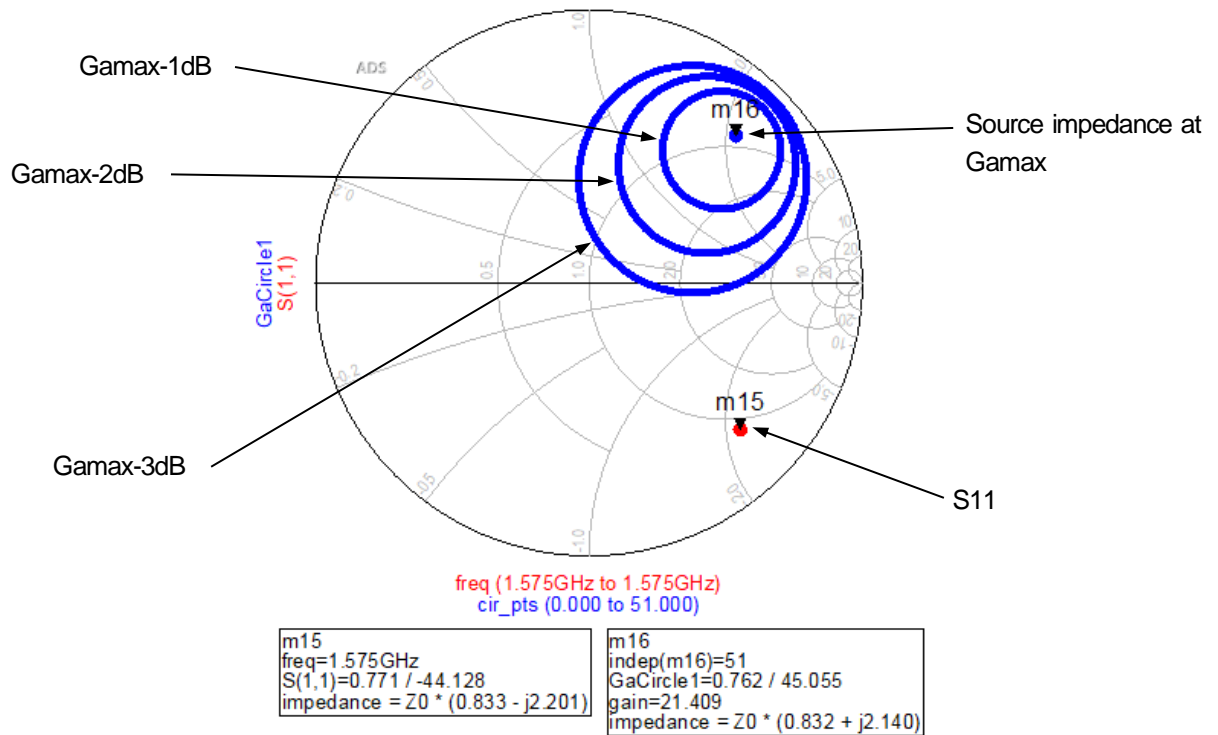
2nd LNA (s2p file)



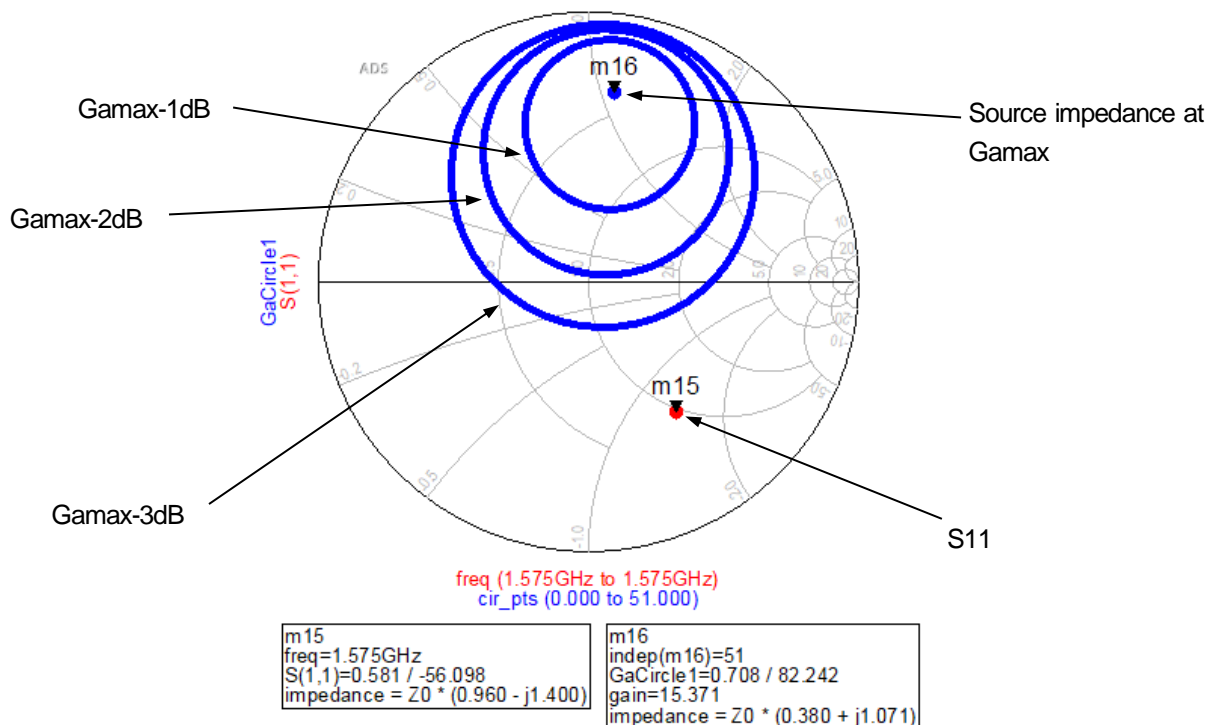
■ Gain circle simulation data (Source impedance)

Condition: **f=1575MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_S=Z_L=50\Omega$

1st LNA (s2p file)



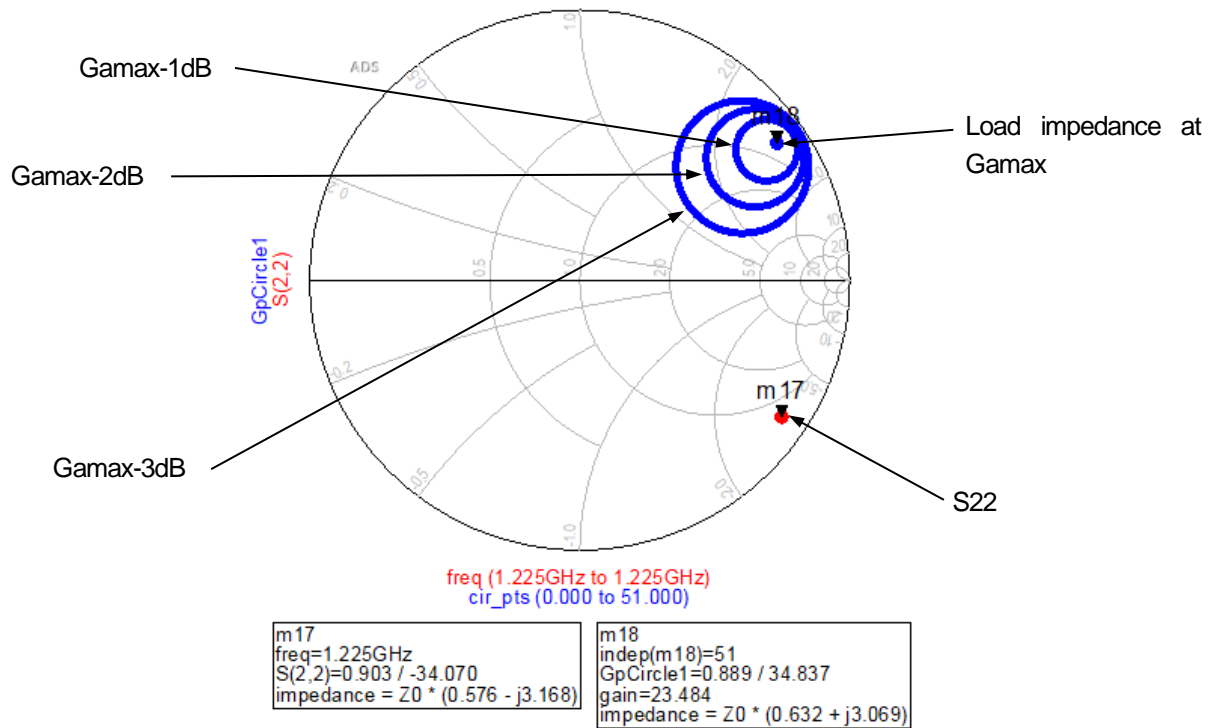
2nd LNA (s2p file)



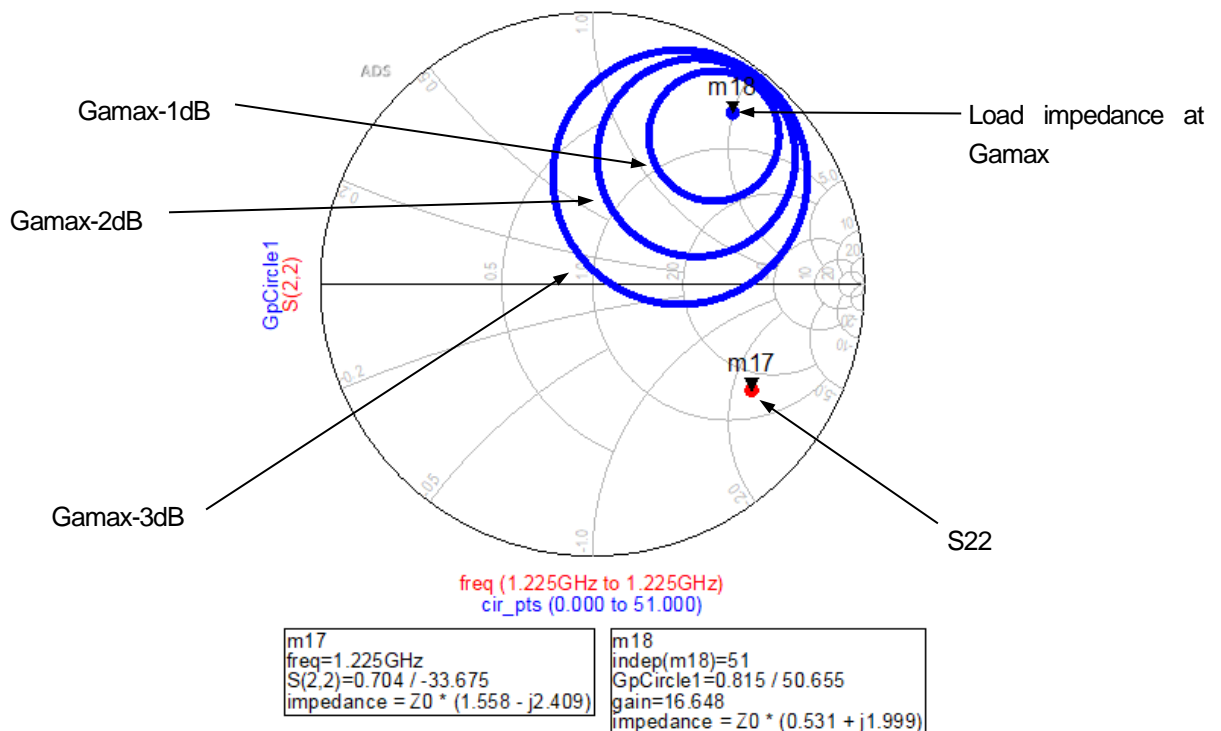
■ **Gain circle simulation data (Load impedance)**

Condition: **f=1225MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

1st LNA (s2p file)



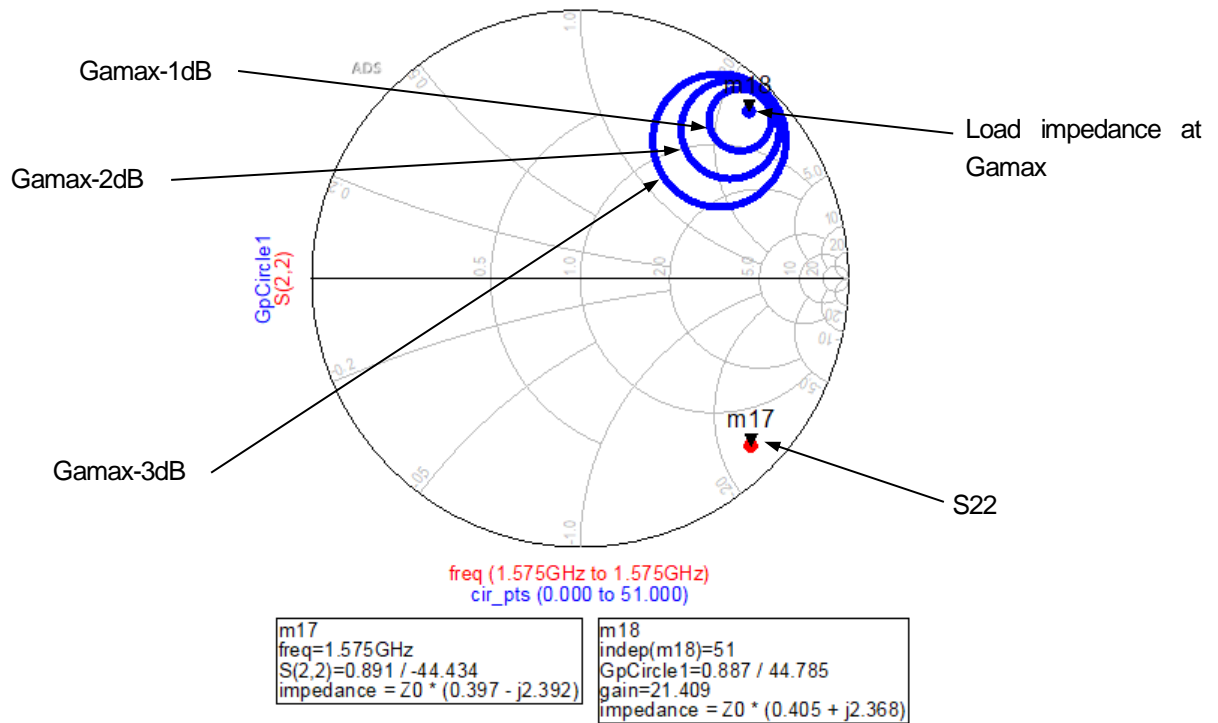
2nd LNA (s2p file)



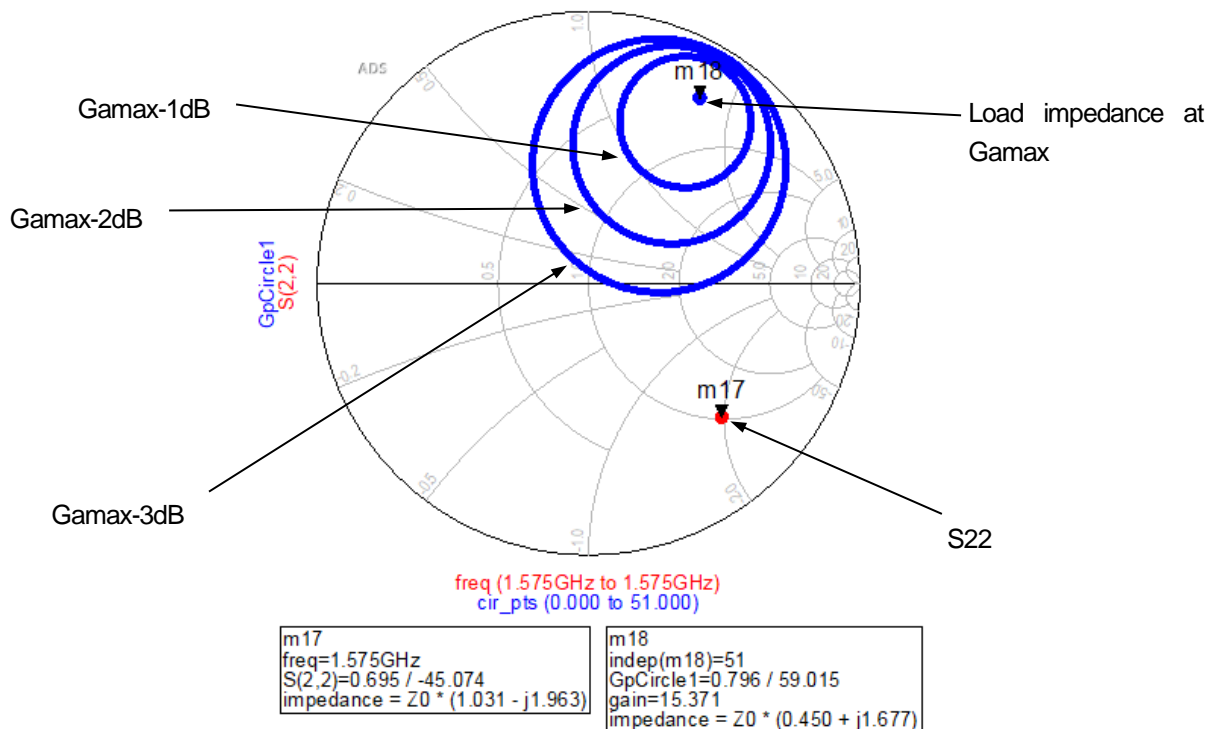
■ **Gain circle simulation data (Load impedance)**

Condition: **f=1575MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

1st LNA (s2p file)



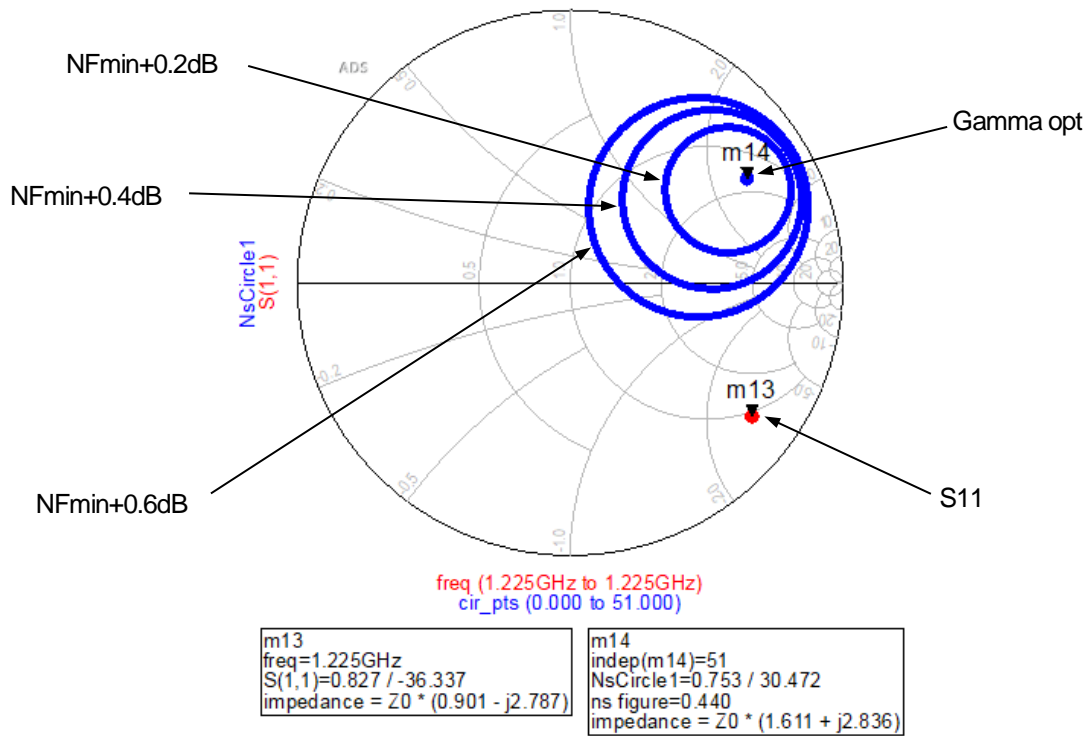
2nd LNA (s2p file)



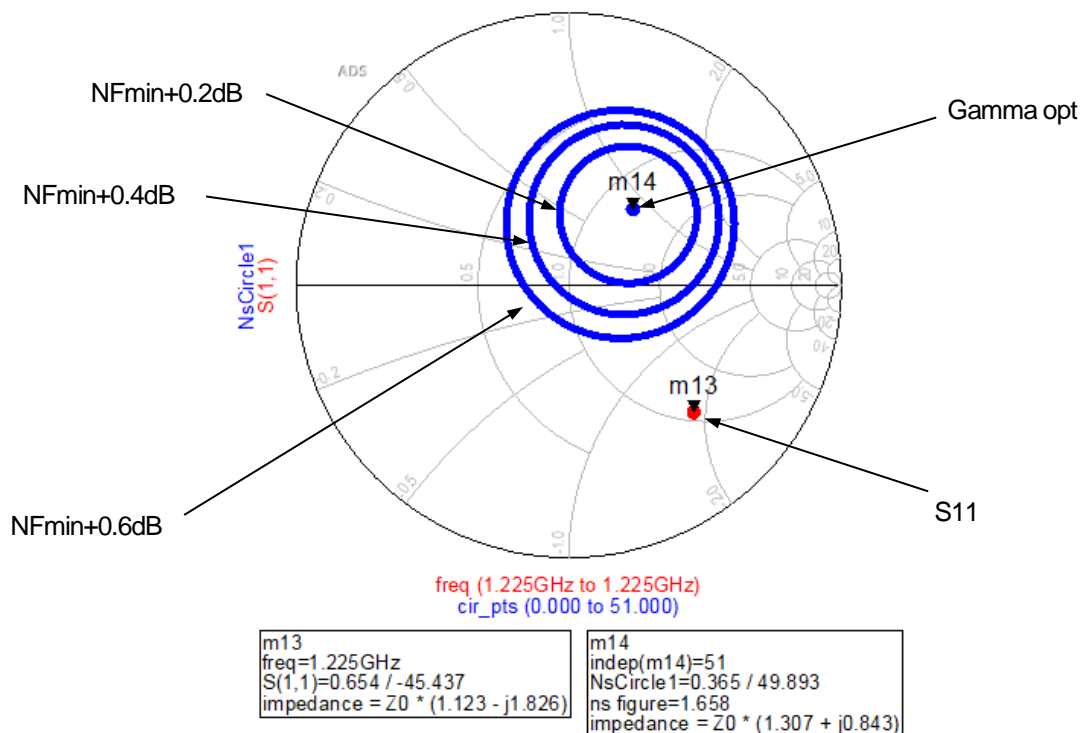
■ NF circle simulation data

Condition: **f=1225MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

1st LNA (s2p file)



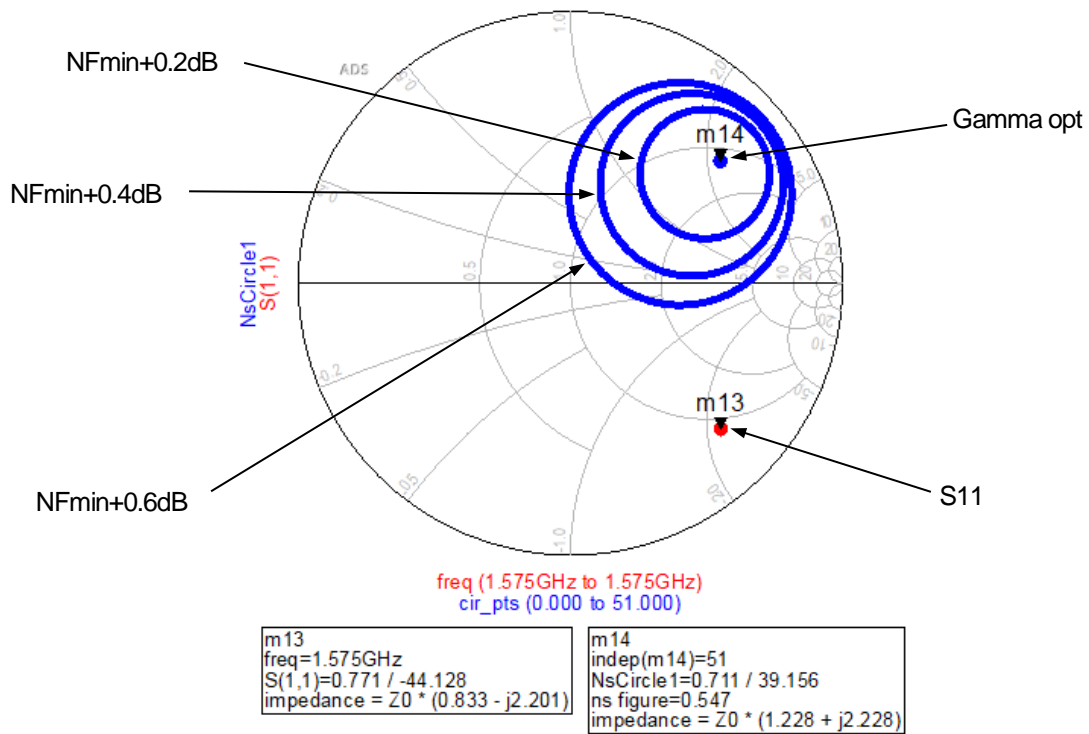
2nd LNA (s2p file)



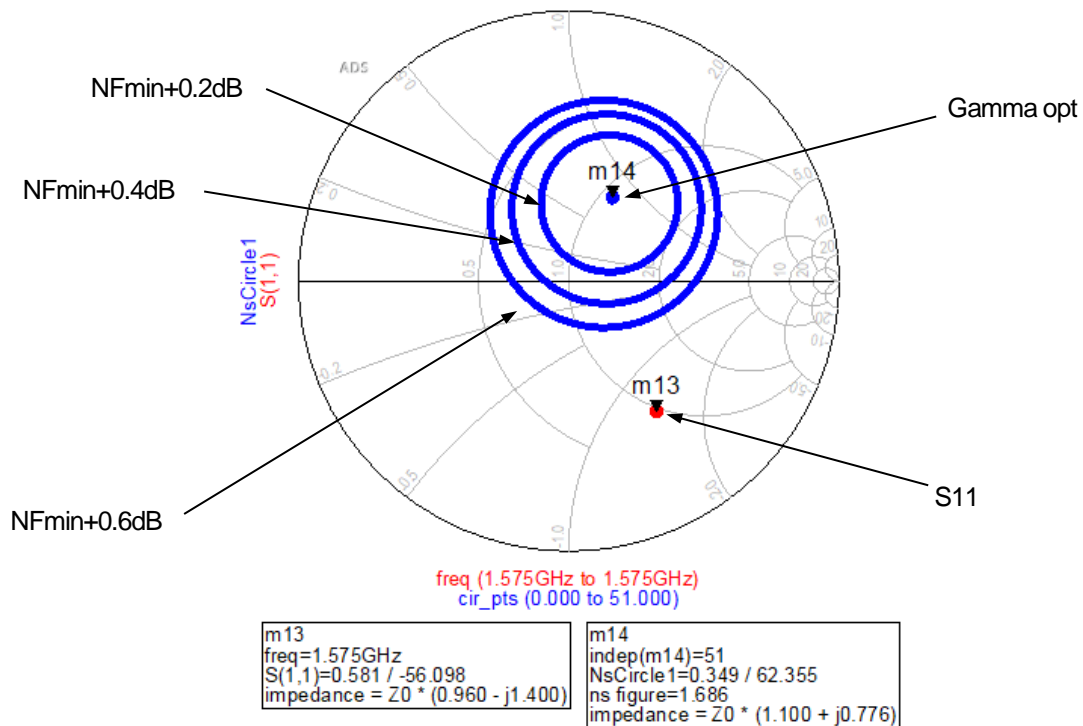
■ NF circle simulation data

Condition: **f=1575MHz**, $V_{DD}=3.3V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

1st LNA (s2p file)



2nd LNA (s2p file)



■ s2p/s4p fileSimulation condition

f=50MHz to 6GHz, Step=10MHz

Ta=+25°C,

Zs=Zl=50Ω

s2p file

V_{DD}=3.3V

I_{DD1}=4.5mA, I_{DD2}=3.5mA

s2p file at 1st LNA: NJG1187A_1stLNA_Spar_Ver0.s2p

s2p file at 2nd LNA: NJG1187A_2ndLNA_Spar_Ver0.s2p

s4p file

V_{DD}=3.3V

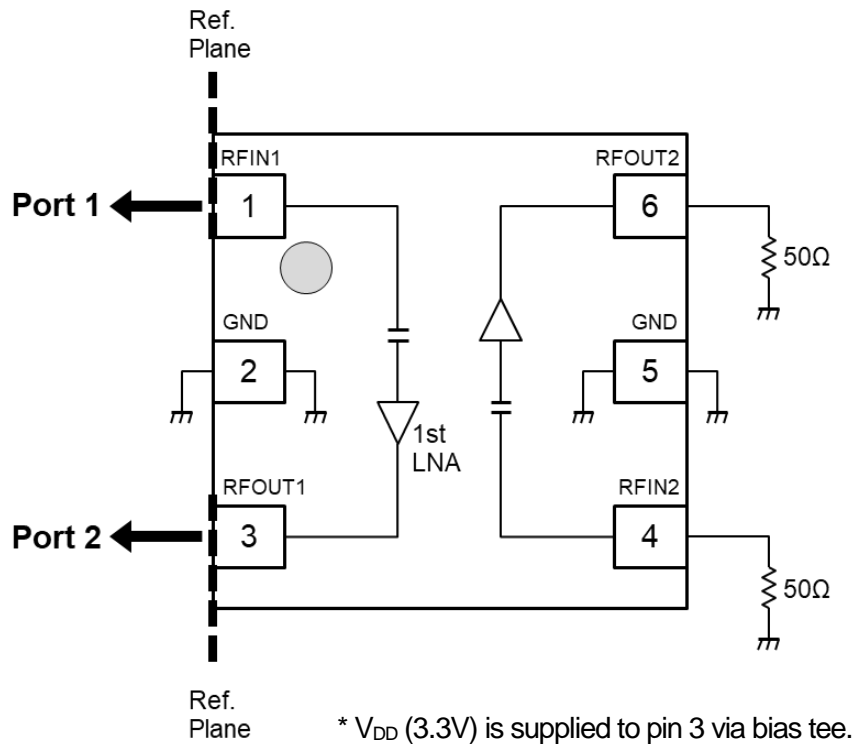
I_{DD1}=4.5mA, I_{DD2}=3.5mA

s4p file: NJG1187A_Spar_ver0.s4p

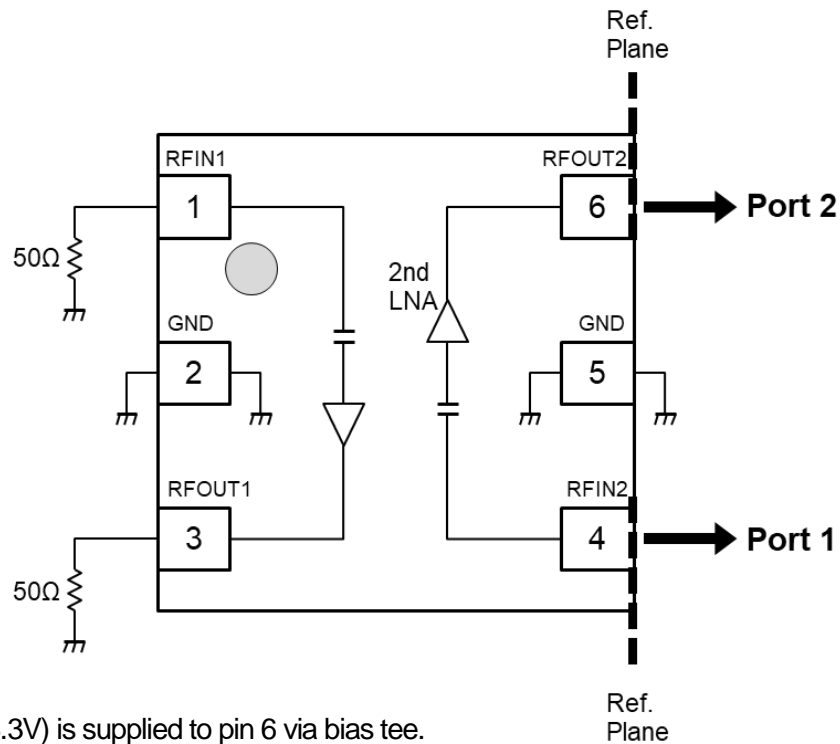


■ s2p file extraction simulation circuit

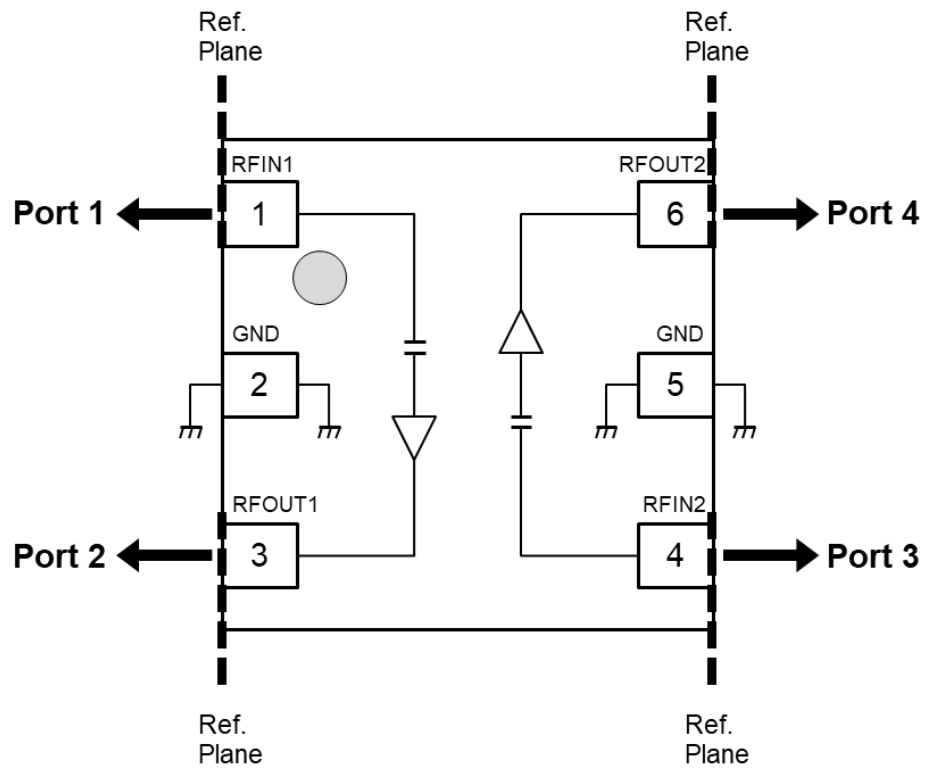
1st LNA



2nd LNA



■ s4p file extraction simulation circuit



* V_{DD} (3.3V) is supplied to pin 3 and pin 6 via bias tee.

