

July 7, 2023

NJG1159PHH
Front-End Module for
GPS, GLONASS, BeiDou and Galileo

SAW Filter S-parameter,
LNA S-parameter, noise parameter simulation data
(Standard condition)

Ver.2

- SAW Filter S-parameter simulation data
- LNA S-parameter simulation data
- LNA Max gain, NFmin simulation data
- LNA Gain circle simulation data (Source/Load impedance)
- SAW Filter simulation circuit
- LNA simulation circuit
- SAW Filter s2p file (S-parameter)
 - NJG1159_SAW_v2.s2p
- LNA s2p file (S-parameter, noise parameter)
 - s2p file at $V_{DD}=2.8V$: NJG1159_LNA_2r8V_v2.s2p
 - s2p file at $V_{DD}=1.8V$: NJG1159_LNA_1r8V_v2.s2p

Written by Takashi Hino

Approved by Susumu Takagi

Nisshinbo Micro Devices Inc.

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



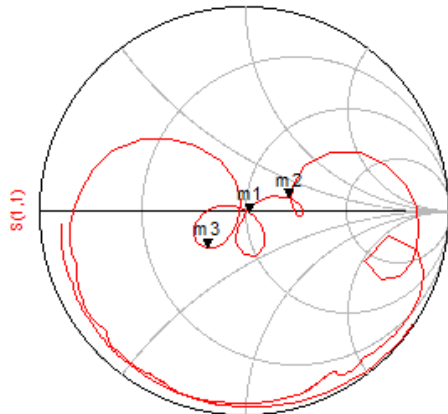
■ **Version history**

Version	Date	Description
0	May 22, 2014	Initial version
1	March 5, 2018	Changed frequency range and step of s2p (50MHz~6GHz, step 50MHz, 1400MHz~1700MHz, step 1MHz)
2	July 7, 2023	Changed document format to Nisshinbo Micro Devices Inc. from New Japan Radio Co., Ltd.



■ SAW Filter S-parameter simulation data

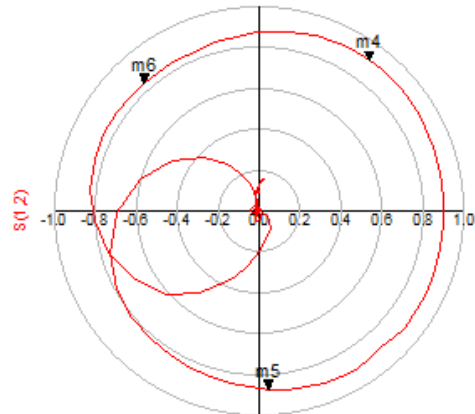
Condition: f=50MHz~6GHz, Ta=+25°C, Zs=Zl=50ohm



freq (50.00MHz to 8.000GHz)

m1 freq=1.575GHz S(1,1)=0.026 / -16.218 impedance = Z0 * (1.051 -j0.015)	m3 freq=1.559GHz S(1,1)=0.253 / -135.406 impedance = Z0 * (0.657 -j0.250)
m2 freq=1.606GHz S(1,1)=0.225 / 16.334 impedance = Z0 * (1.534 +j0.204)	

S11

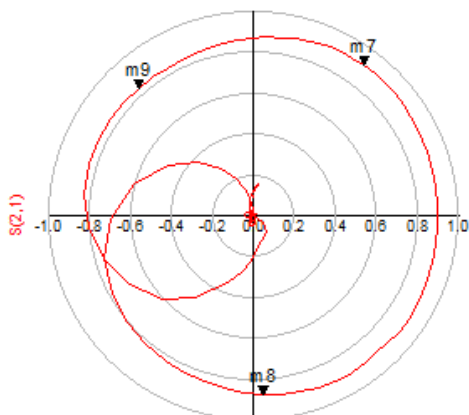


freq (50.00MHz to 8.000GHz)

m4 freq=1.575GHz S(1,2)=0.913 / 53.998	m6 freq=1.559GHz S(1,2)=0.841 / 131.806
m5 freq=1.606GHz S(1,2)=0.870 / -86.975	

S12

(unit:1.0)

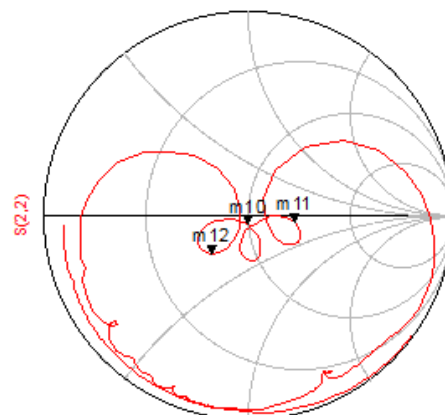


freq (50.00MHz to 8.000GHz)

m7 freq=1.575GHz S(2,1)=0.913 / 53.998	m9 freq=1.559GHz S(2,1)=0.841 / 131.806
m8 freq=1.606GHz S(2,1)=0.870 / -86.975	

S21

(unit:1.0)



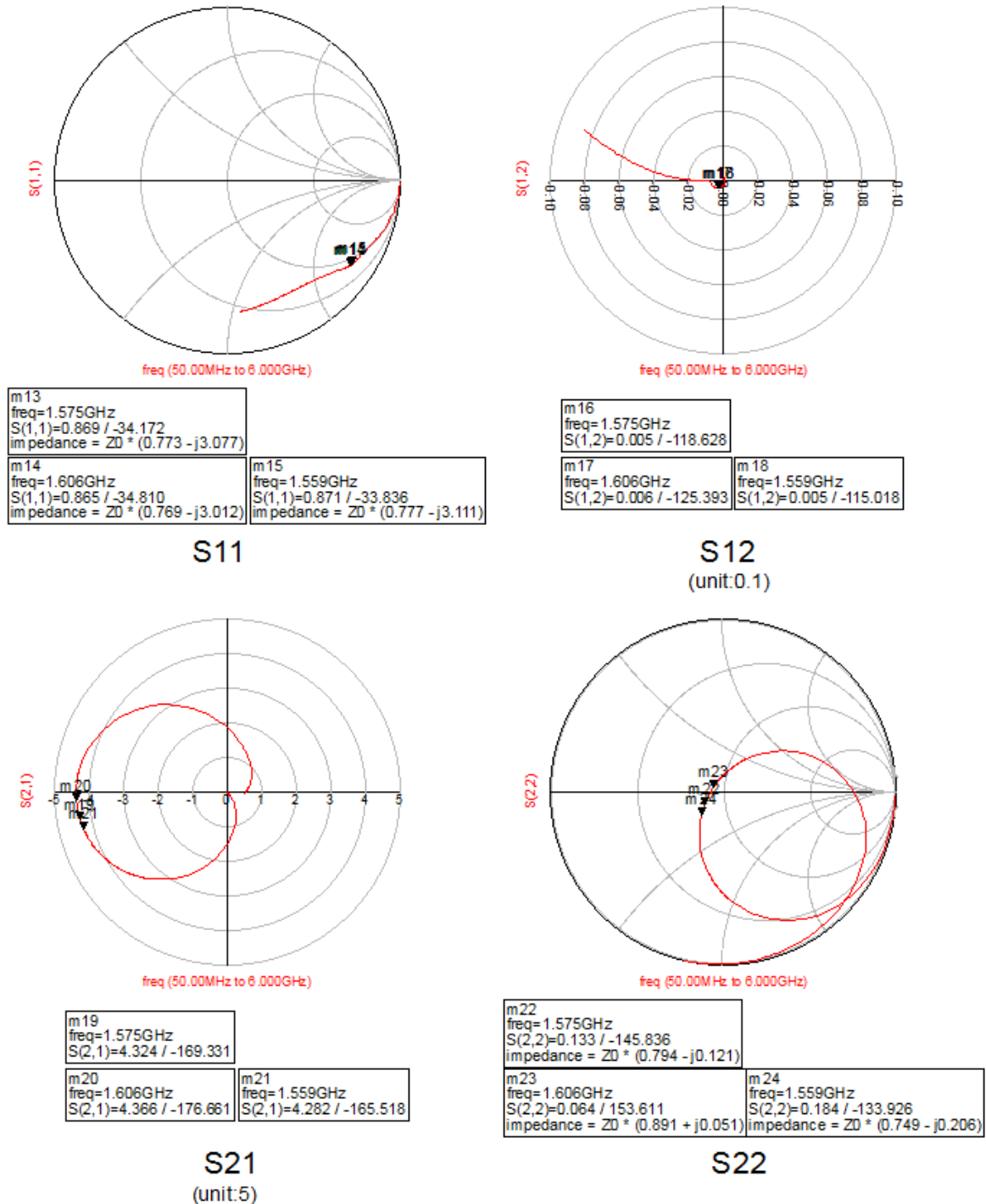
freq (50.00MHz to 8.000GHz)

m10 freq=1.575GHz S(2,2)=0.041 / -93.215 impedance = Z0 * (0.992 -j0.082)	m12 freq=1.559GHz S(2,2)=0.256 / -134.251 impedance = Z0 * (0.657 -j0.258)
m11 freq=1.606GHz S(2,2)=0.228 / -7.400 impedance = Z0 * (1.579 -j0.098)	

S22

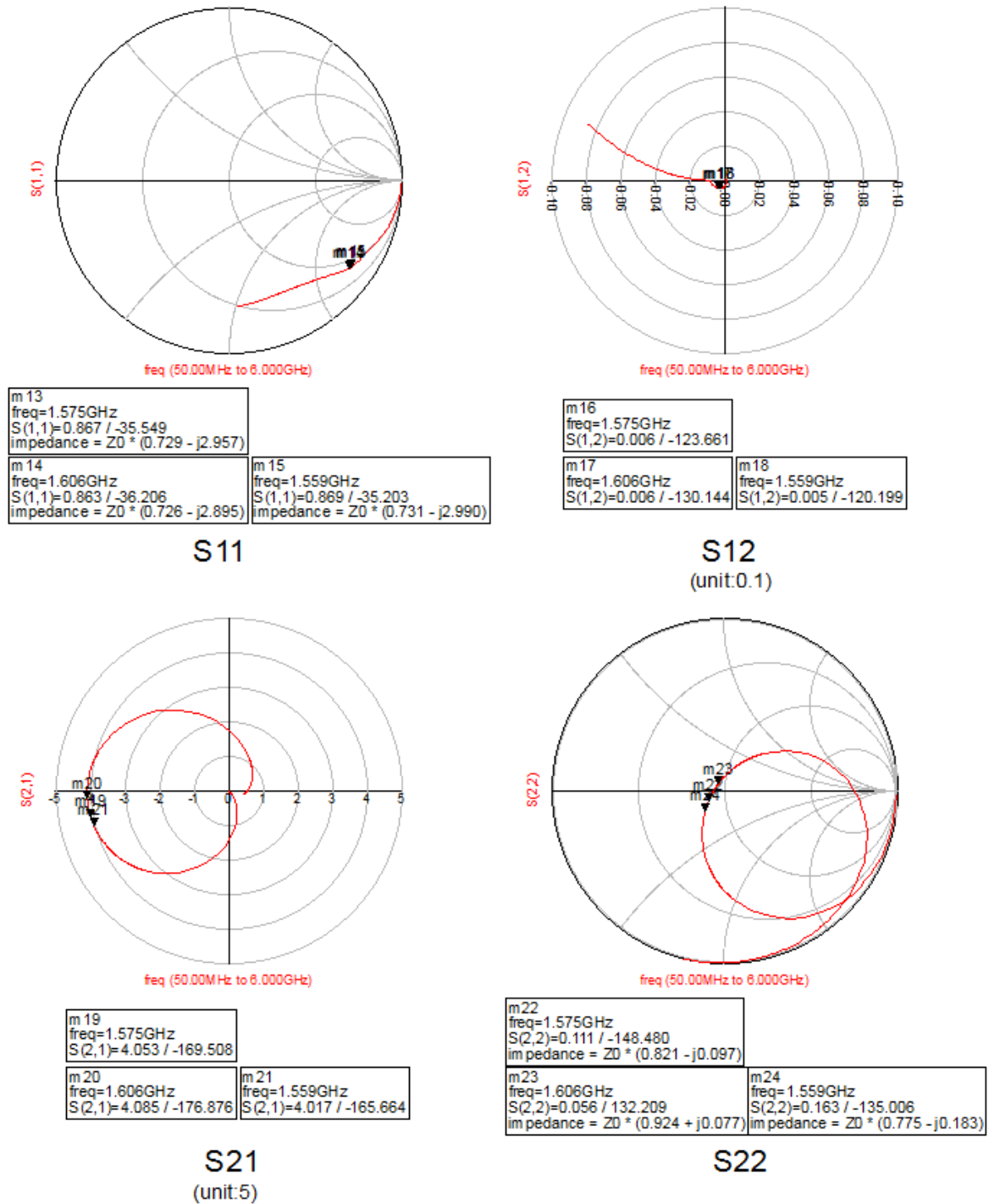
■ LNA S-parameter simulation data 1

Condition: $f=50\text{MHz}\sim 6\text{GHz}$, $V_{DD}=2.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



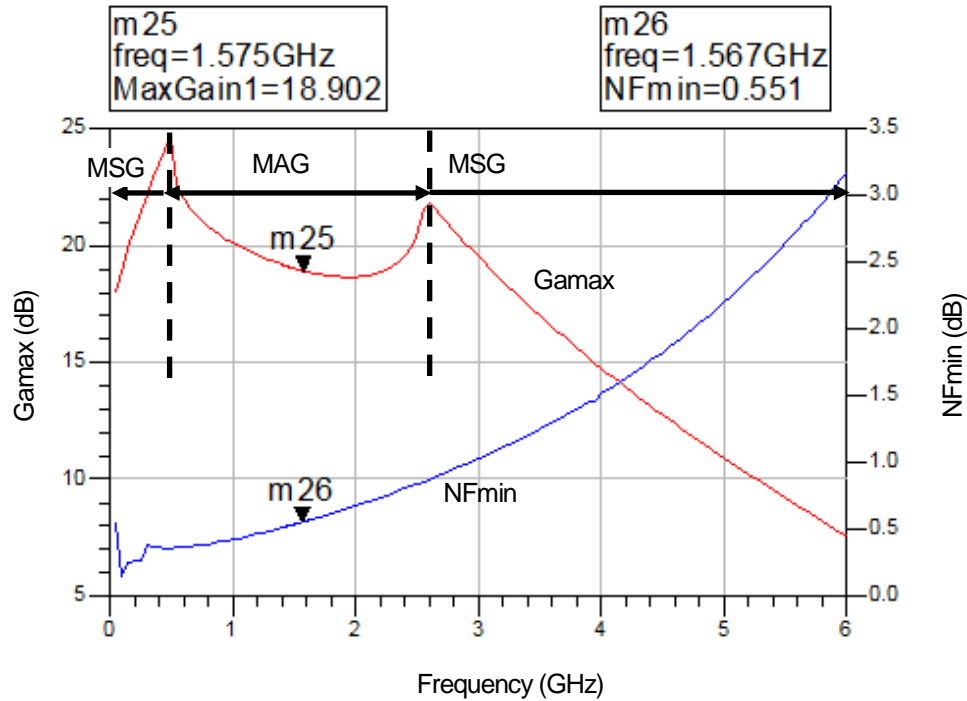
■ LNA S-parameter simulation data 2

Condition: f=50MHz~6GHz, $V_{DD}=1.8V$, $V_{CTL}=1.8V$, $T_a=+25^{\circ}C$, $Z_s=Z_l=50\Omega$

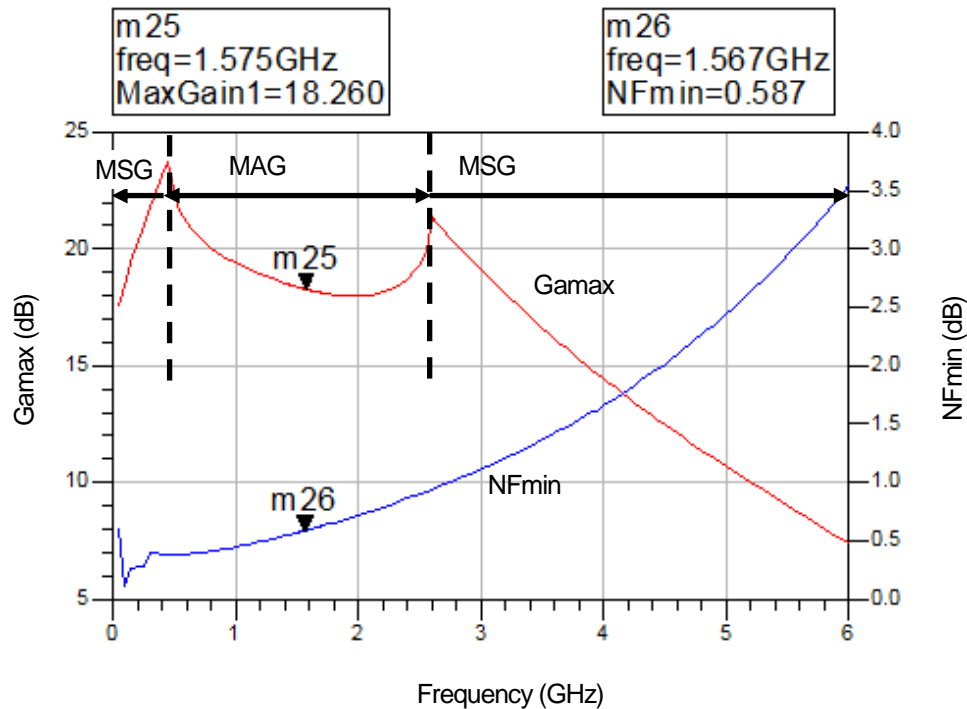


■ LNA Max gain, NFmin simulation data

Condition: $f=50\text{MHz}\sim 6\text{GHz}$, $V_{DD}=2.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$

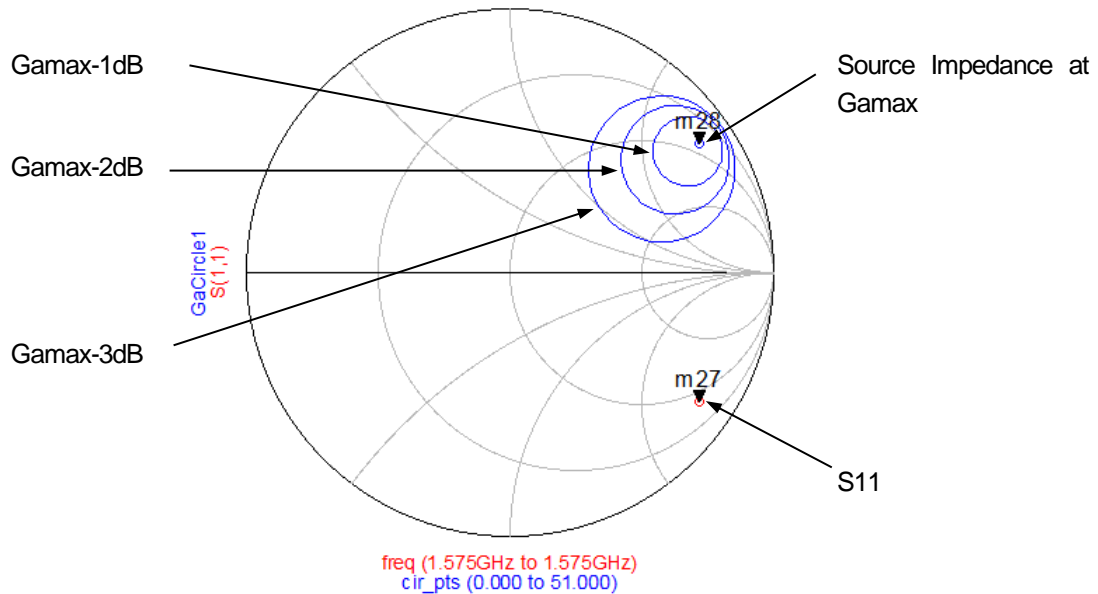


Condition: $f=50\text{MHz}\sim 6\text{GHz}$, $V_{DD}=1.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



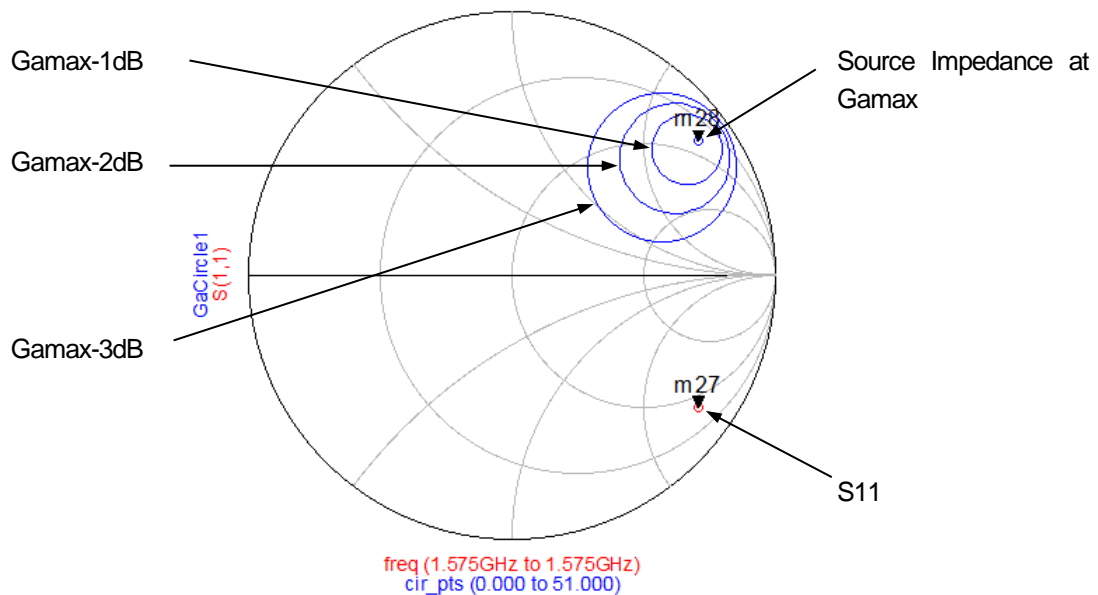
■ LNA Gain circle simulation data (Source impedance)

Condition: $f=1.575\text{GHz}$, $V_{DD}=2.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27	m28
freq=1.575GHz	indep(m28)=51
S(1,1)=0.869 / -34.172	GaCircle1=0.870 / 34.366
impedance = $Z_0 * (0.773 - j3.077)$	gain=18.901743
	impedance = $Z_0 * (0.759 + j3.063)$

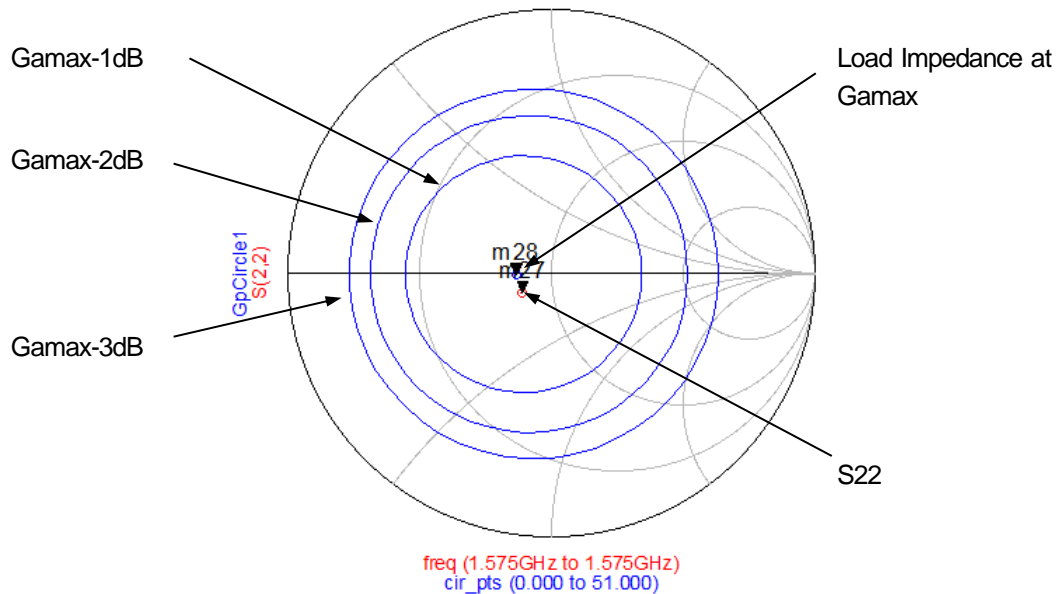
Condition: $f=1.575\text{GHz}$, $V_{DD}=1.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27	m28
freq=1.575GHz	indep(m28)=51
S(1,1)=0.867 / -35.549	GaCircle1=0.868 / 35.708
impedance = $Z_0 * (0.729 - j2.957)$	gain=18.260314
	impedance = $Z_0 * (0.718 + j2.947)$

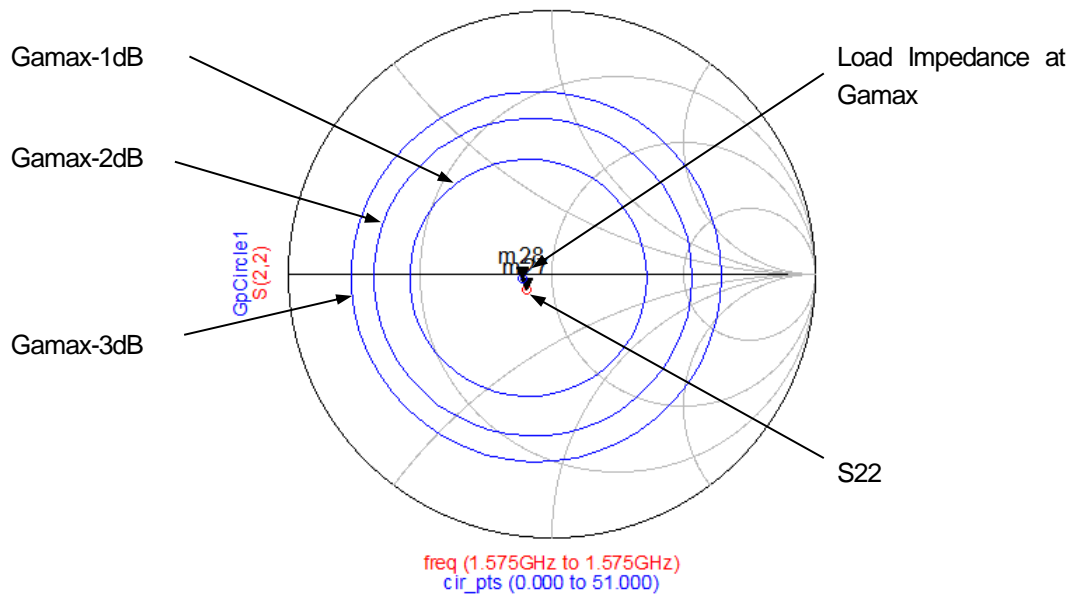
■ LNA Gain circle simulation data (Load impedance)

Condition: $f=1.575\text{GHz}$, $V_{DD}=2.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27 freq=1.575GHz $S(2,2)=0.133 / -145.836$ impedance = $Z_0 * (0.794 - j0.121)$	m28 indep(m28)=51 GpCircle1=0.134 / -178.672 gain=18.901743 impedance = $Z_0 * (0.764 - j0.005)$
--	---

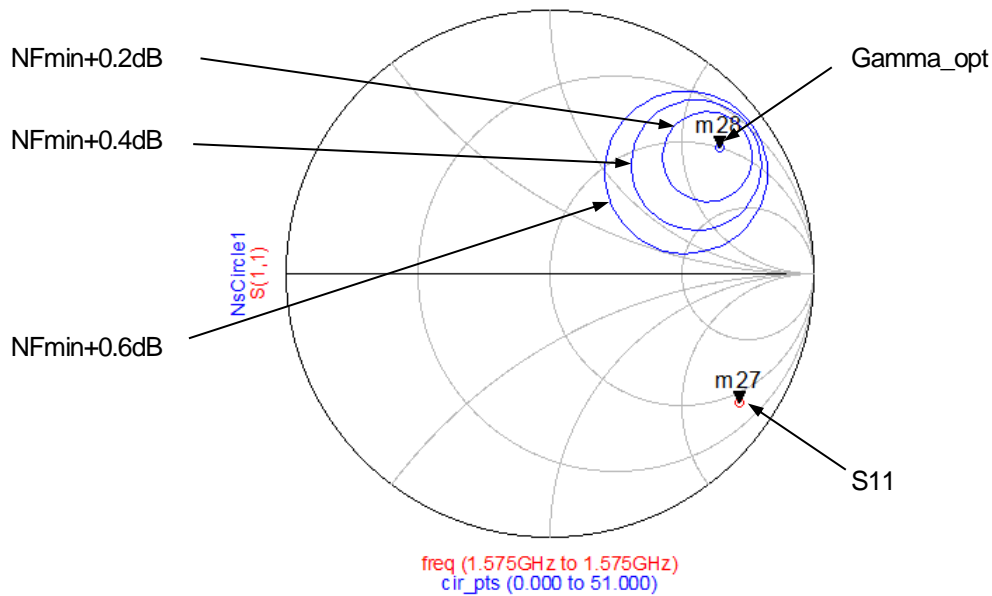
Condition: $f=1.575\text{GHz}$, $V_{DD}=1.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27 freq=1.575GHz $S(2,2)=0.111 / -148.480$ impedance = $Z_0 * (0.821 - j0.097)$	m28 indep(m28)=51 GpCircle1=0.114 / -170.736 gain=18.260314 impedance = $Z_0 * (0.797 - j0.030)$
--	---

■ LNA NF circle simulation data

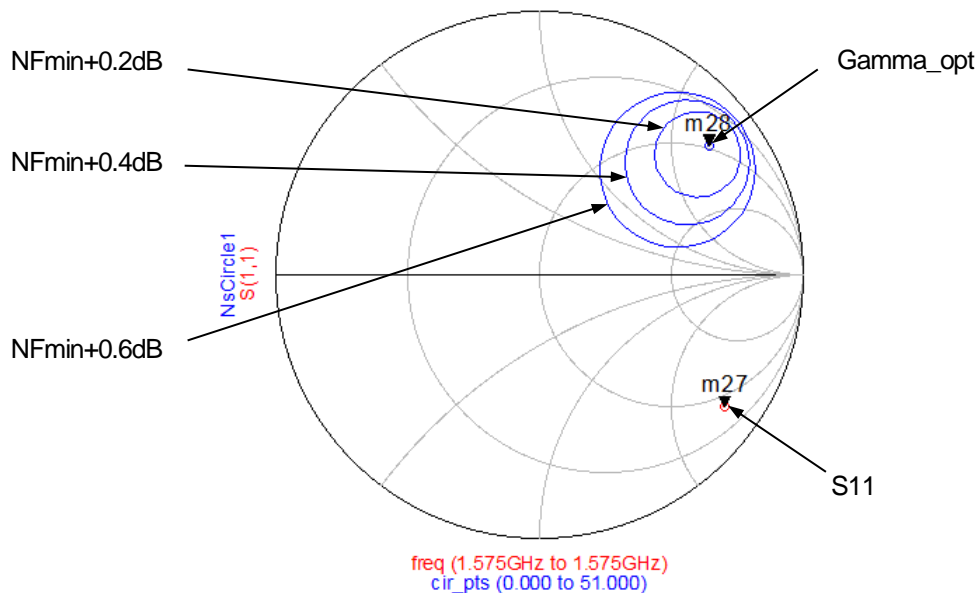
Condition: $f=1.575\text{GHz}$, $V_{DD}=2.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27
freq=1.575GHz
S(1,1)=0.869 / -34.172
impedance = $Z_0 * (0.773 - j3.077)$

m28
indep(m28)=51
NsCircle1=0.802 / 36.698
ns figure=0.552856
impedance = $Z_0 * (0.997 + j2.686)$

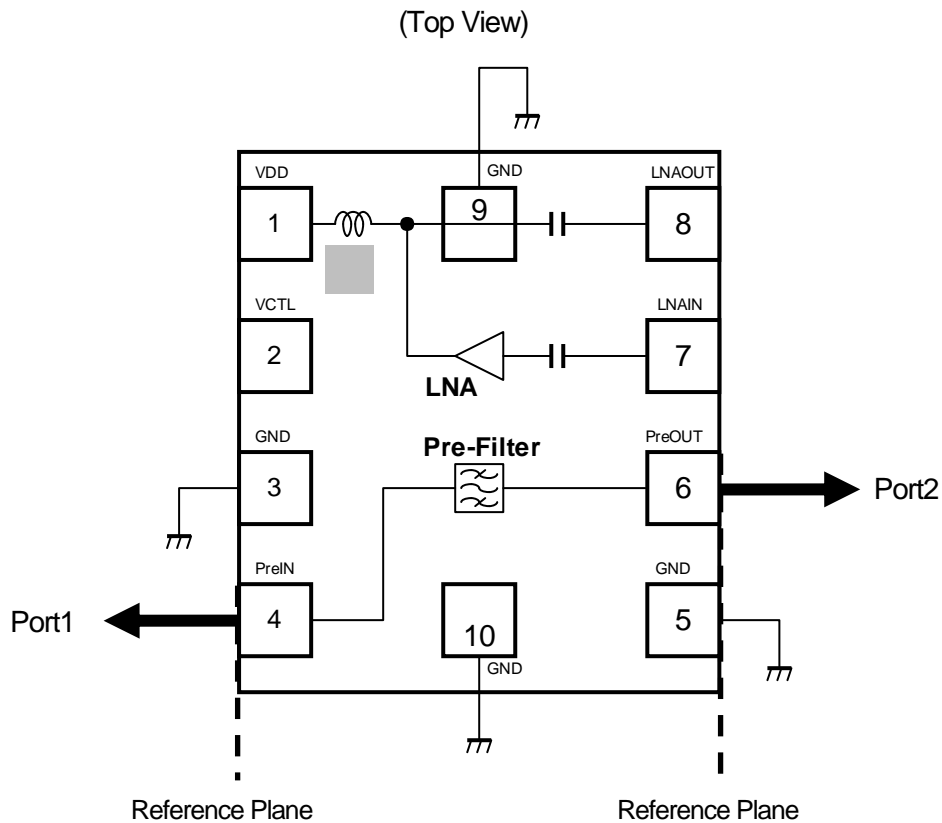
Condition: $f=1.575\text{GHz}$, $V_{DD}=1.8\text{V}$, $V_{CTL}=1.8\text{V}$, $T_a=+25^\circ\text{C}$, $Z_s=Z_l=50\text{ohm}$



m27
freq=1.575GHz
S(1,1)=0.867 / -35.549
impedance = $Z_0 * (0.729 - j2.957)$

m28
indep(m28)=51
NsCircle1=0.808 / 37.205
ns figure=0.589220
impedance = $Z_0 * (0.948 + j2.672)$

■ SAW Filter simulation circuit



■ LNA simulation circuit

