

April 13, 2022

NJG1186PJL
GNSS L5/E5/B2/G3/L2C
Pre Filter + LNA
Front-End Module

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

Ver.1

- 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)
NJG1186_SAW_v0.s2p
- LNA s2p file (S-parameter, noise parameter)
s2p file at $V_{DD} = 2.8 \text{ V}$: NJG1186_LNA_2r8V_v0.s2p
s2p file at $V_{DD} = 1.8 \text{ V}$: NJG1186_LNA_1r8V_v0.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



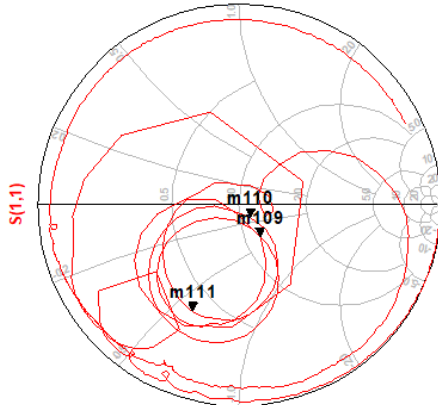
■ Version history

Version	Date	Description
0	April 15, 2021	Initial version
1	April 13, 2022	Updated header and footer of document.



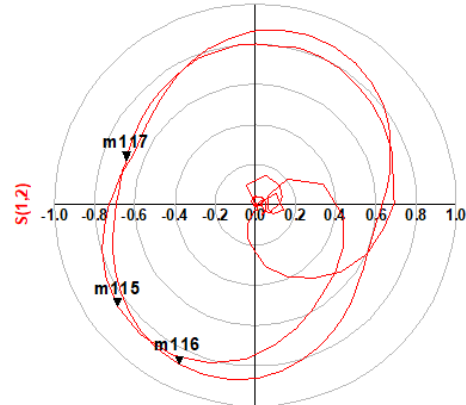
■ SAW Filter S-parameter simulation data

Condition: $f = 50 \text{ MHz to } 6 \text{ GHz}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$



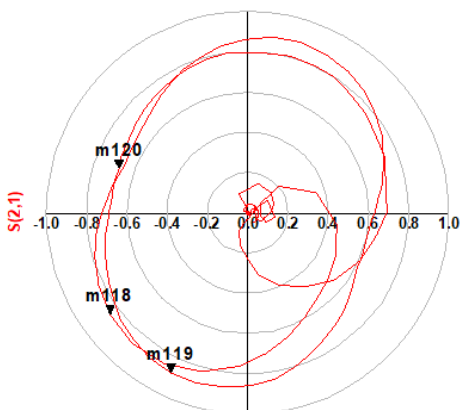
freq (50.00MHz to 6.000GHz)

m109
freq=1.164GHz
S(1,1)=0.188 / -56.560
impedance = $Z_0 * (1.165 - j0.378)$
m110
freq=1.214GHz
S(1,1)=0.084 / -46.135
impedance = $Z_0 * (1.115 - j0.136)$
m111
freq=1.228GHz
S(1,1)=0.576 / -113.640
impedance = $Z_0 * (0.373 - j0.588)$



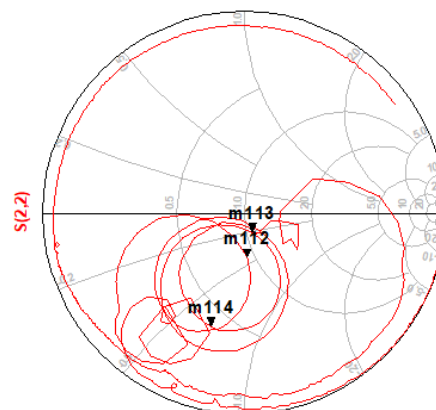
freq (50.00MHz to 6.000GHz)

m115
freq=1.164GHz
S(1,2)=0.851 / -143.525
m116
freq=1.214GHz
S(1,2)=0.879 / -115.562
m117
freq=1.228GHz
S(1,2)=0.677 / 161.093



freq (50.00MHz to 6.000GHz)

m118
freq=1.164GHz
S(2,1)=0.851 / -143.516
m119
freq=1.214GHz
S(2,1)=0.879 / -115.533
m120
freq=1.228GHz
S(2,1)=0.677 / 161.093

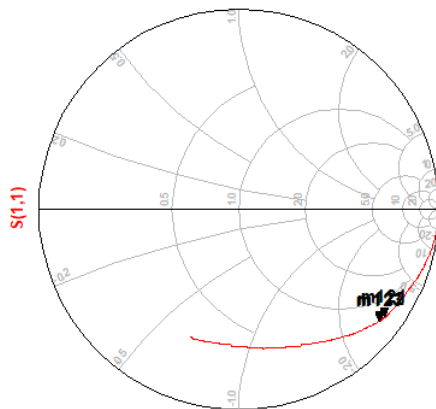


freq (50.00MHz to 6.000GHz)

m112
freq=1.164GHz
S(2,2)=0.221 / -85.883
impedance = $Z_0 * (0.935 - j0.433)$
m113
freq=1.214GHz
S(2,2)=0.107 / -66.662
impedance = $Z_0 * (1.067 - j0.211)$
m114
freq=1.228GHz
S(2,2)=0.586 / -106.212
impedance = $Z_0 * (0.393 - j0.674)$

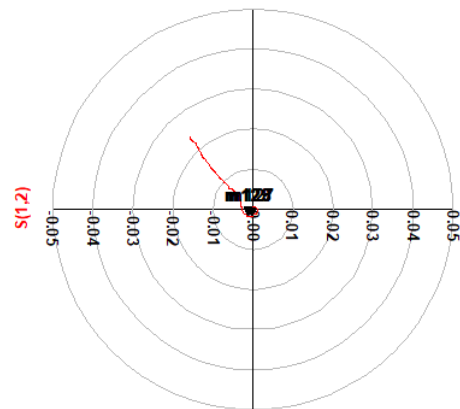
■ LNA S-parameter simulation data 1

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



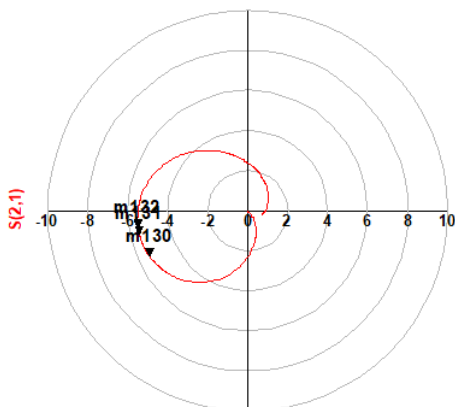
freq (50.00MHz to 6.000GHz)

m121
freq=1.164GHz
S(1,1)=0.906 / -36.441
mpedance = Z0 * (0.494 - j2.964)
m122
freq=1.214GHz
S(1,1)=0.900 / -37.965
mpedance = Z0 * (0.488 - j2.832)
m123
freq=1.228GHz
S(1,1)=0.898 / -38.385
mpedance = Z0 * (0.488 - j2.797)



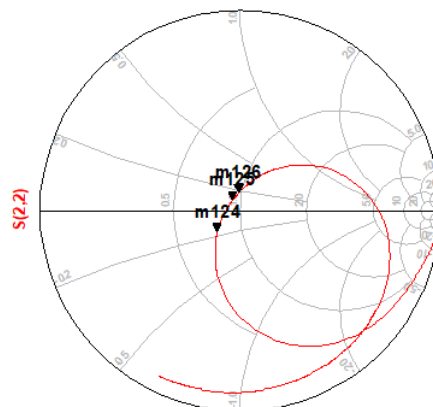
freq (50.00MHz to 6.000GHz) (unit:0.05)

m127
freq=1.164GHz
S(1,2)=0.002 / -103.339
m128
freq=1.214GHz
S(1,2)=0.002 / -123.036
m129
freq=1.228GHz
S(1,2)=0.002 / -128.037



freq (50.00MHz to 6.000GHz) (unit:10)

m130
freq=1.164GHz
S(2,1)=5.417 / -155.042
m131
freq=1.214GHz
S(2,1)=5.556 / -167.489
m132
freq=1.228GHz
S(2,1)=5.561 / -170.859

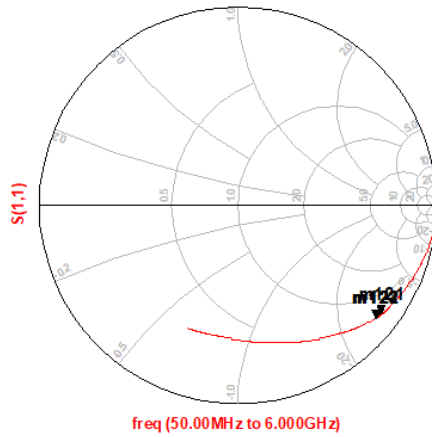


freq (50.00MHz to 6.000GHz)

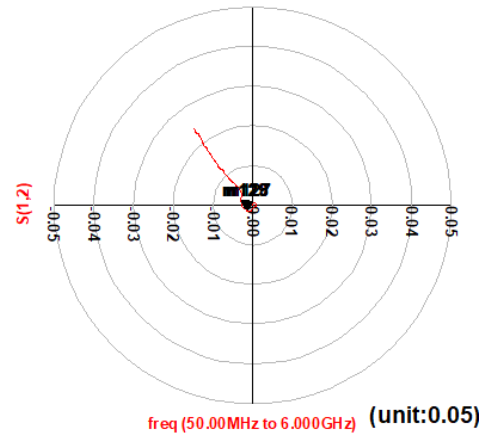
m124
freq=1.164GHz
S(2,2)=0.158 / -136.173
mpedance = Z0 * (0.778 - j0.175)
m125
freq=1.214GHz
S(2,2)=0.064 / 126.870
mpedance = Z0 * (0.921 + j0.095)
m126
freq=1.228GHz
S(2,2)=0.089 / 94.970
mpedance = Z0 * (0.970 + j0.173)

■ LNA S-parameter simulation data 2

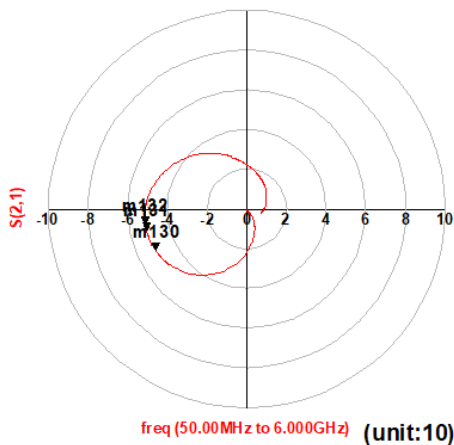
Condition: $f = 50 \text{ MHz to } 6 \text{ GHz}$, $V_{DD} = 1.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$



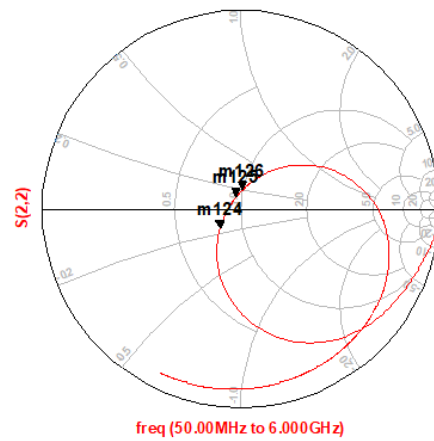
m121	freq=1.164GHz
S(1,1)=0.909 / -37.325	
impedance = Z0 * (0.459 - j2.896)	
m122	freq=1.214GHz
S(1,1)=0.902 / -38.867	
impedance = Z0 * (0.458 - j2.767)	
m123	freq=1.228GHz
S(1,1)=0.899 / -39.288	
impedance = Z0 * (0.459 - j2.733)	



m127	freq=1.164GHz
S(1,2)=0.002 / -132.457	
m128	freq=1.214GHz
S(1,2)=0.002 / -149.114	
m129	freq=1.228GHz
S(1,2)=0.002 / -153.286	



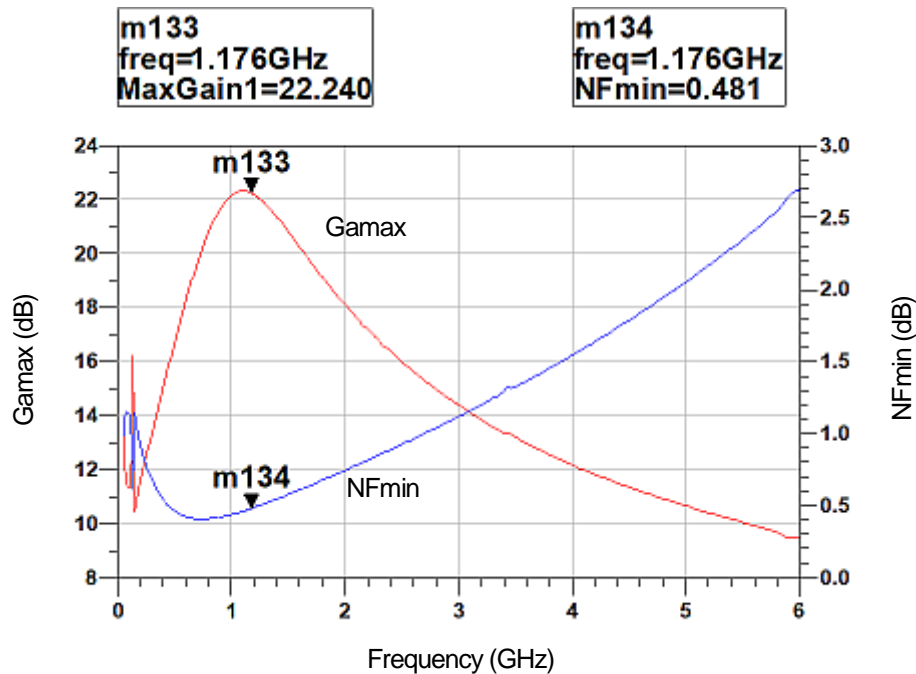
m130	freq=1.164GHz
S(2,1)=5.038 / -155.288	
m131	freq=1.214GHz
S(2,1)=5.158 / -167.764	
m132	freq=1.228GHz
S(2,1)=5.160 / -171.133	



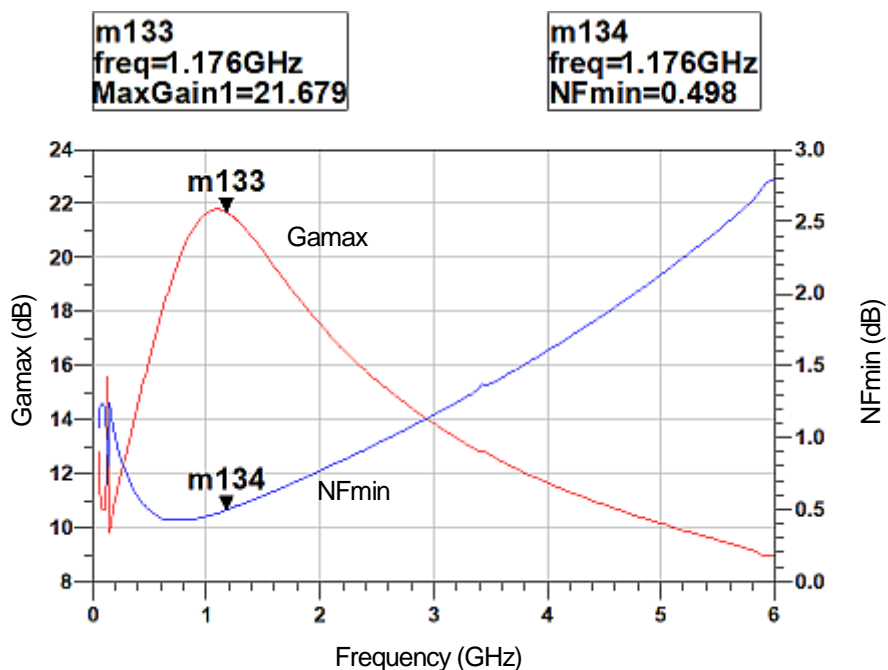
m124	freq=1.164GHz
S(2,2)=0.145 / -136.550	
impedance = Z0 * (0.795 - j0.162)	
m125	freq=1.214GHz
S(2,2)=0.063 / 113.513	
impedance = Z0 * (0.945 + j0.110)	
m126	freq=1.228GHz
S(2,2)=0.094 / 86.017	
impedance = Z0 * (0.995 + j0.188)	

■ LNA Max gain, NFmin simulation data

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

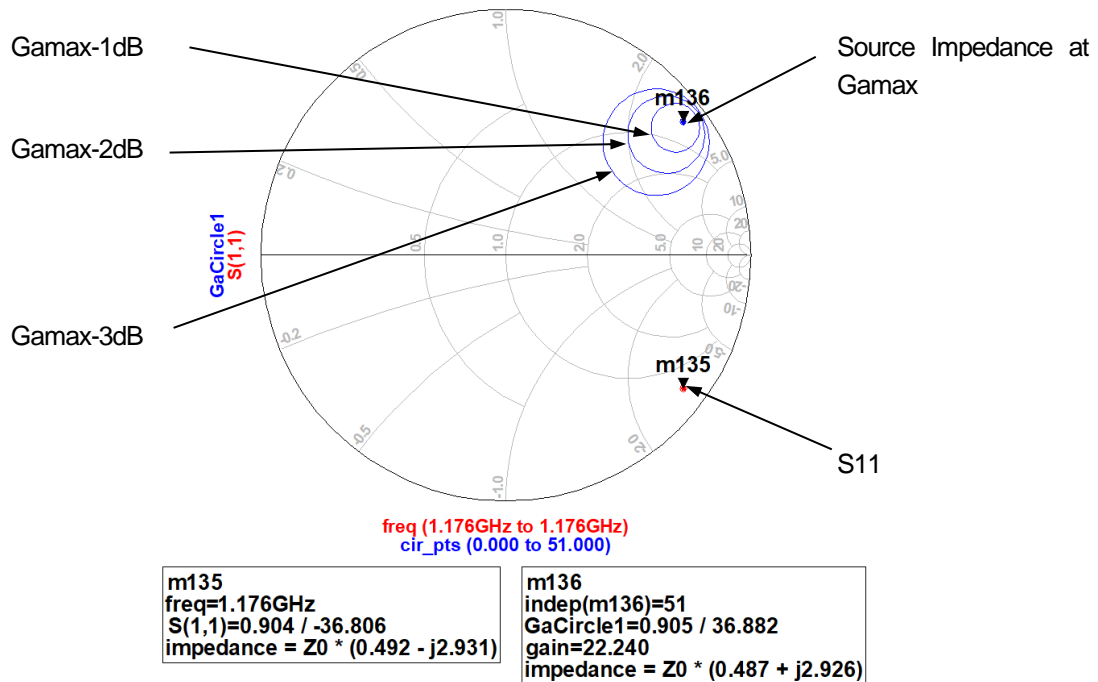


Condition: $f = 50 \text{ MHz}$ to 6 GHz , $V_{DD} = 1.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$

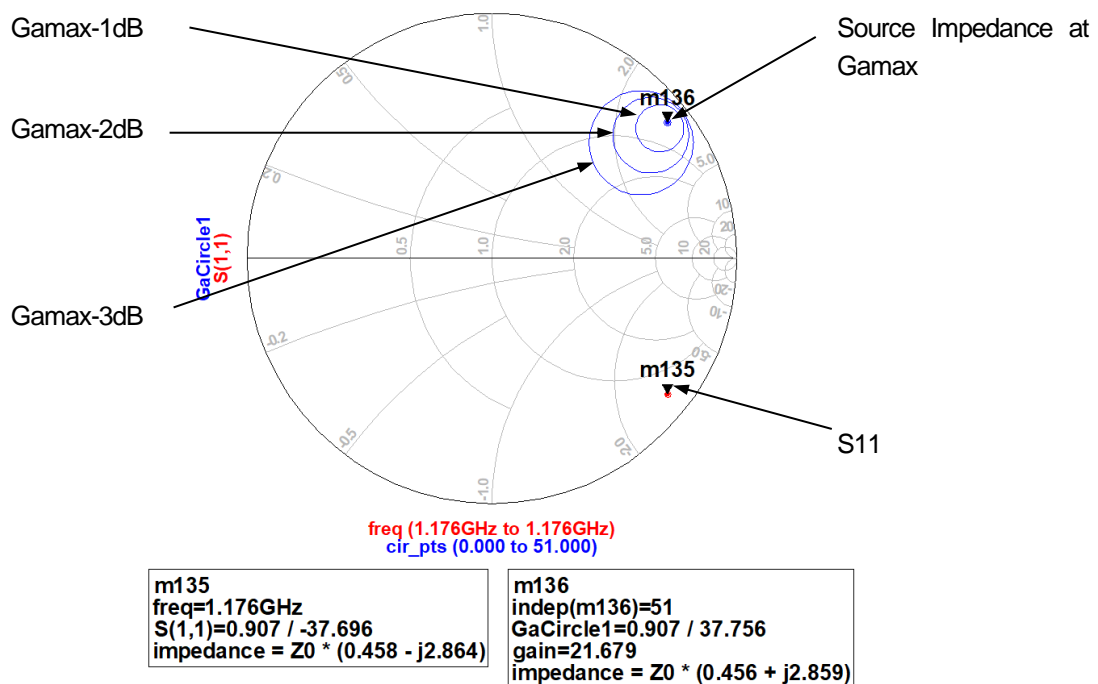


■ LNA Gain circle simulation data (Source impedance)

Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 2.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$

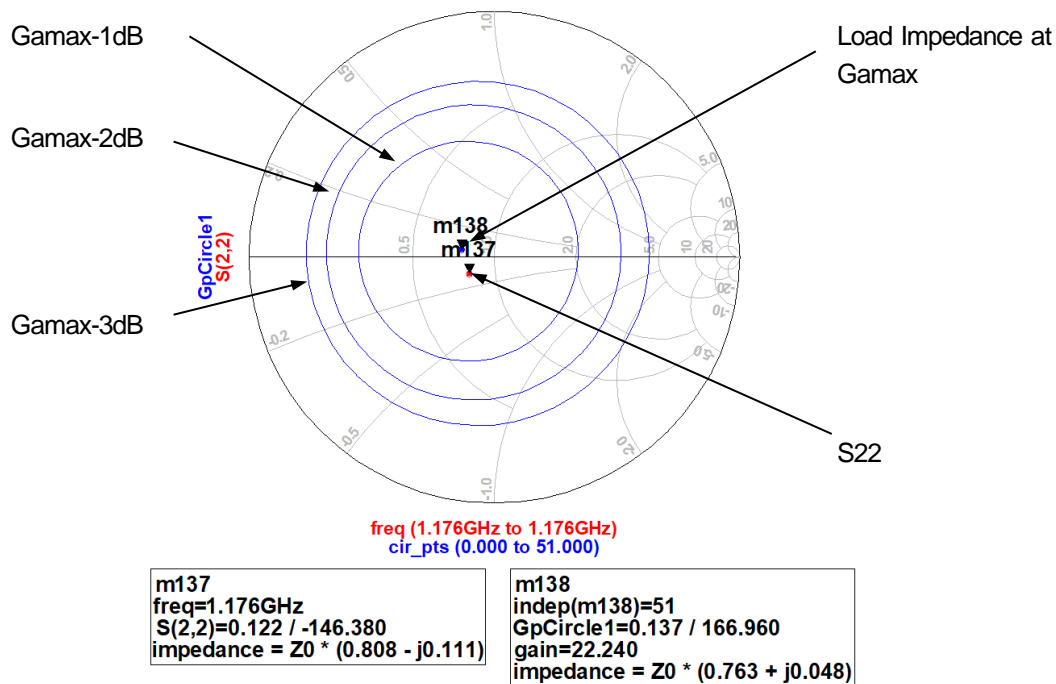


Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 1.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$

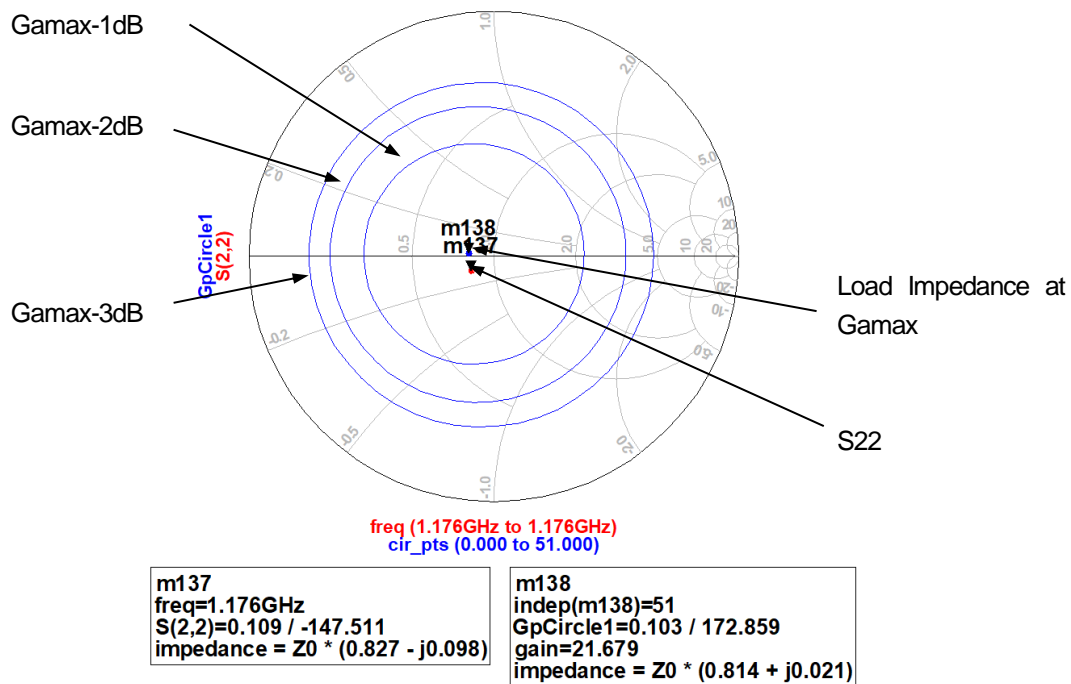


■ **LNA Gain circle simulation data (Load impedance)**

Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 2.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$

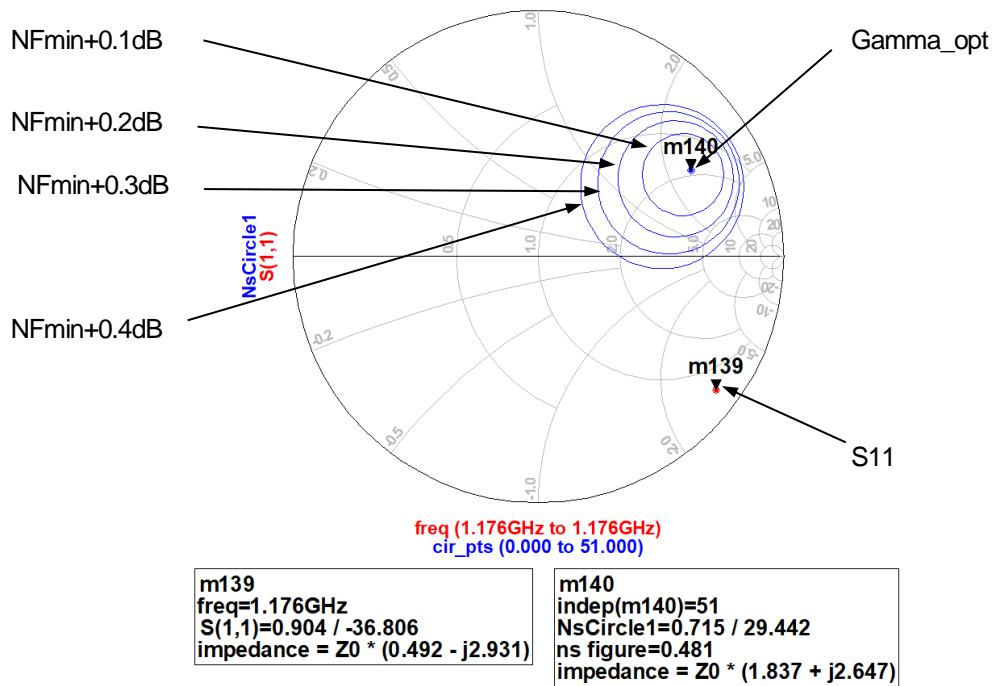


Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 1.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$

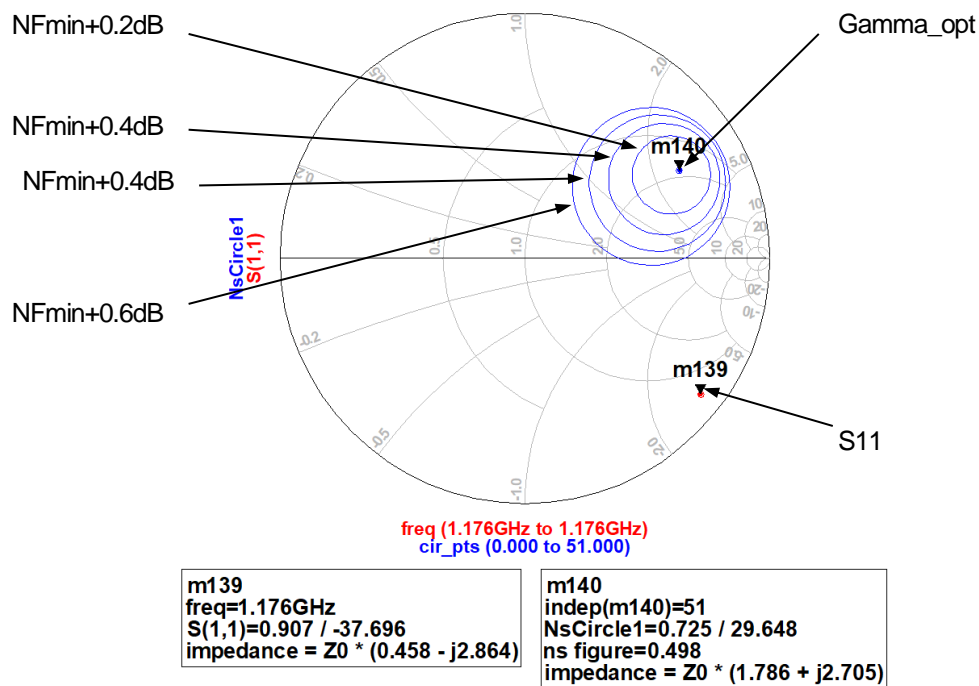


■ LNA NF circle simulation data

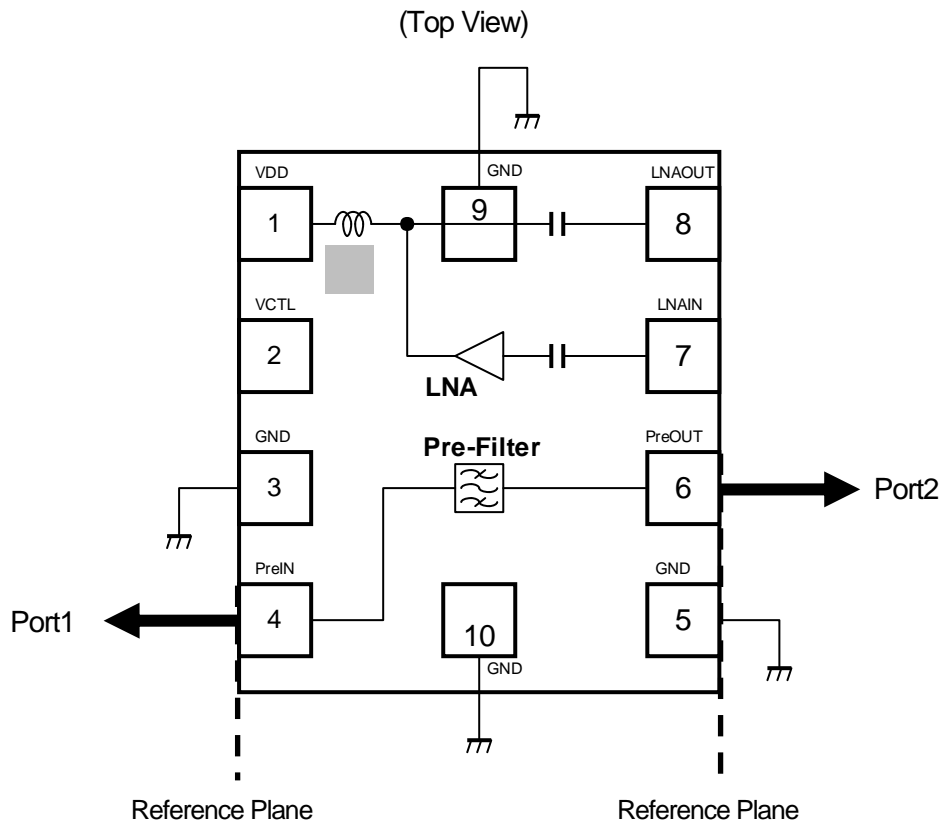
Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 2.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$



Condition: $f = 1.176 \text{ GHz}$, $V_{DD} = 1.8 \text{ V}$, $V_{CTL} = 1.8 \text{ V}$, $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \text{ ohm}$



■ SAW Filter simulation circuit



■ LNA simulation circuit

