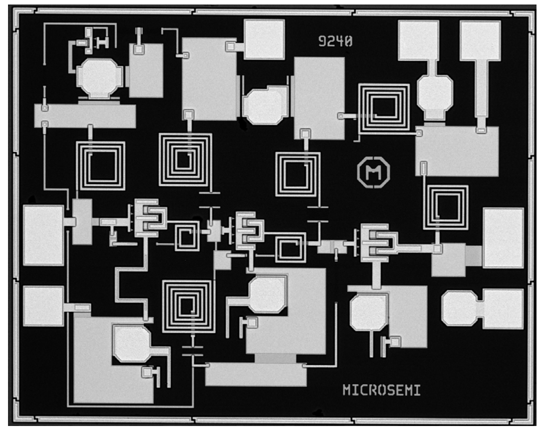
6-18GHz, 21dB Gain, 1.5dB NF
Low Noise Amplifier

Features

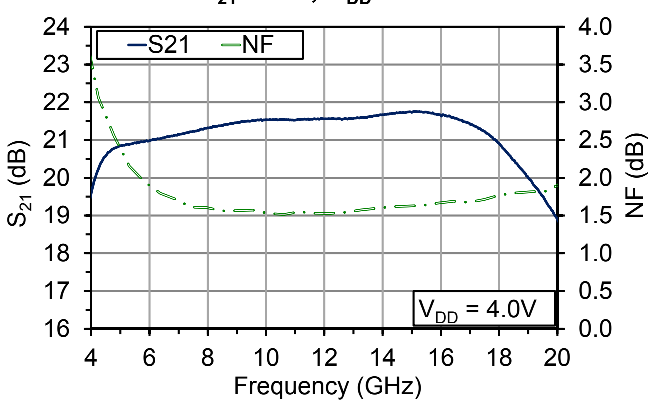
- 16dBm P_{SAT} with 1.5dB NF and 21.5dB gain typical from 6-18GHz
- Gain flatness < +/-0.5dB
- Input and Output matched to 50Ω
- Self biased for simple biasing, small solution size and ease of manufacture
- +24dBm maximum input power rating
- 1.1mm x 1.36mm x 0.1mm die size



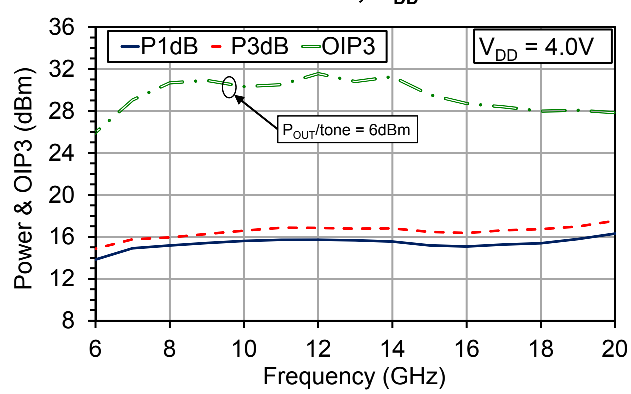
Applications

- Instrumentation
- Electronic warfare
- Microwave communications

S_{21} & NF, V_{DD} = 4.0V



Power & OIP3, V_{DD} = 4.0V



Typical Performance (CW, Typical Device, RF Probe): T_A=25°C, $V_{D1,2}$ = 4V

Parameter	Min	Typ	Max	Units
Frequency	6	-	18	GHz
Small Signal Gain	21.0	-	21.7	dB
Noise Figure	1.5	1.6	1.8	dB
Output Power, P_{1dB}	14.0	15.0	15	dBm
Output Power P_{SAT}	15.0	16.0	17	dBm
Output IP3	26	29	31	dBm
Drain Current		105		mA

Table 1: Absolute Maximum Ratings, Not Simultaneous

Parameter	Rating	Units
Drain Voltage (V_D)	+4.5	V
Input Power (P_{IN})	24	dBm
Channel Temperature (T_C)	150[1]	°C
Operating Ambient Temperature (T_A)	-55 to +85	°C
Storage Temperature	-65 to +150	°C
Thermal Resistance, Channel to Die Backside	TBD (140 est)	°C/W

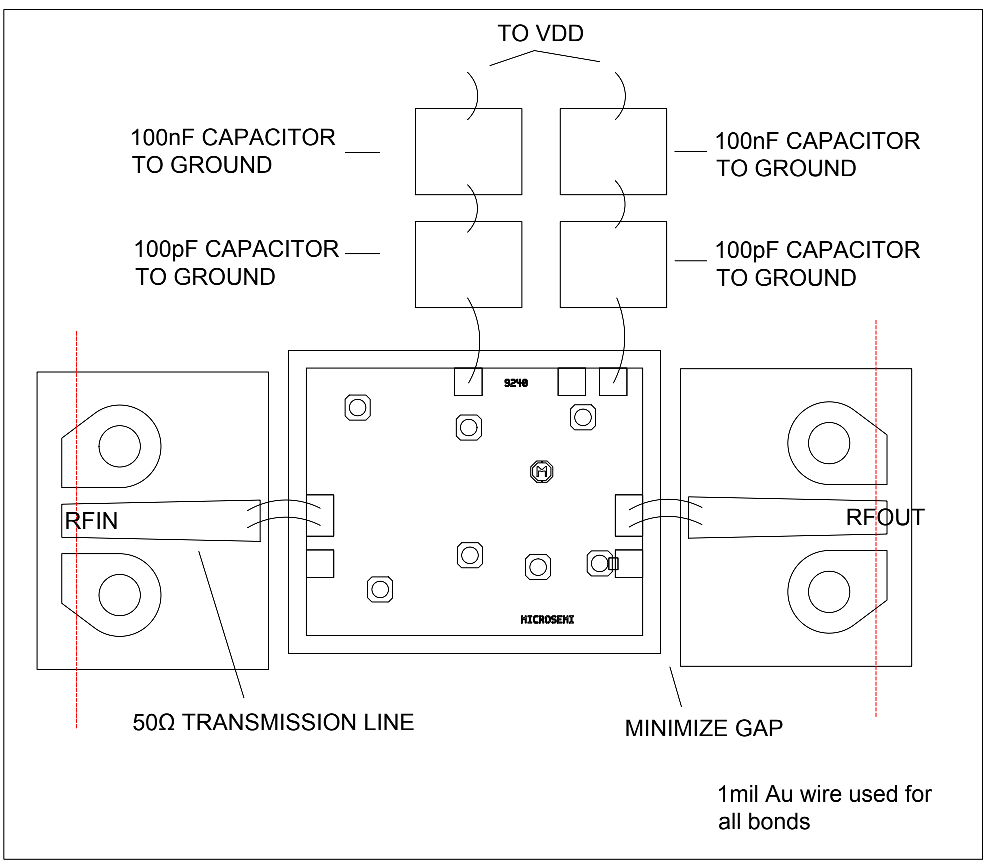
[1] MTTF @ T_C = 150°C > 10^7 hours

Caution, ESD Sensitive Device

Table 2: Specifications (CW, 100% Test): T_A = 25°C, V_{DD} = 4V, I_{DD} = 100mA

Parameter	Frequency	Min	Typ	Max	Units
Small Signal Gain	18GHz	18.0	21.0	-	dB
Output Power, P_{1dB}	18GHz	-	1.8	2.3	dBm

RF Probe Measurement Set-Up With Reference Planes[2]

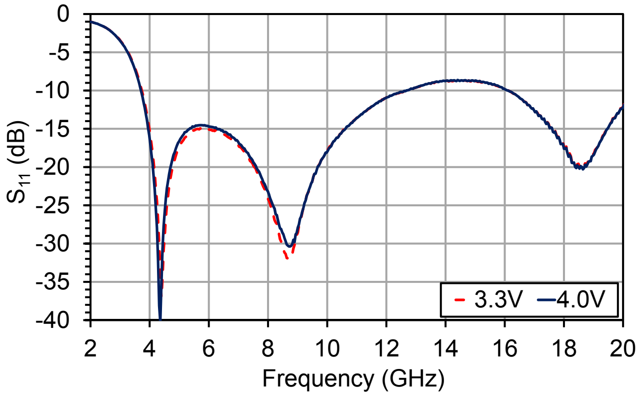


[2] Reference planes are the same for S-parameter files downloadable on www.microsemi.com/mmics

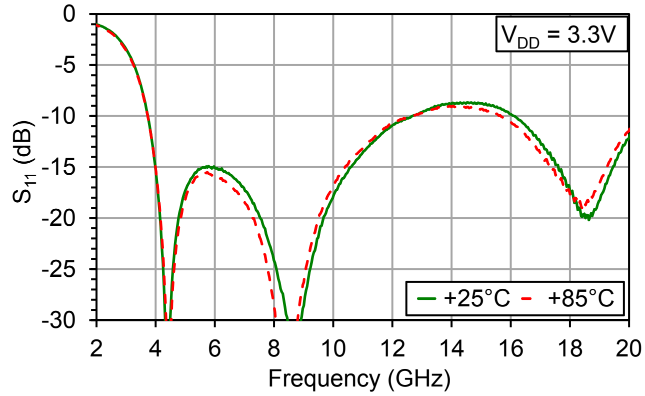
Typical Performance, RF Probe

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

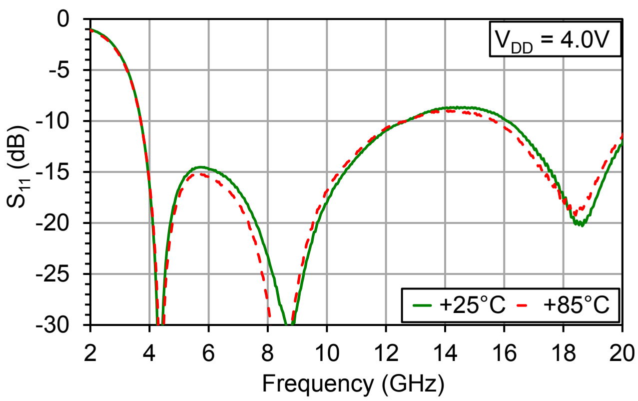
S_{11} Over V_{DD}



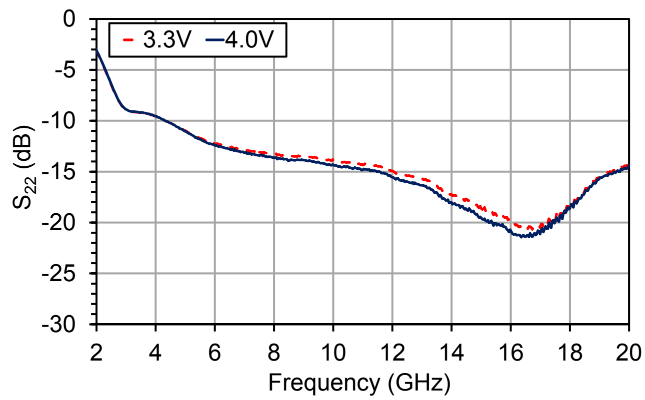
S_{11} Over Temperature, V_{DD} = 3.3V



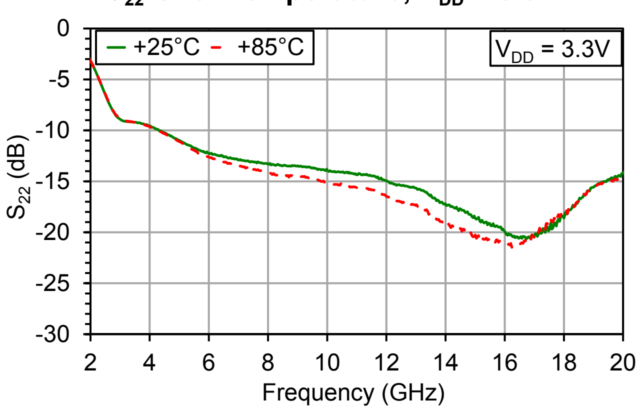
S_{11} Over Temperature, V_{DD} = 4.0V



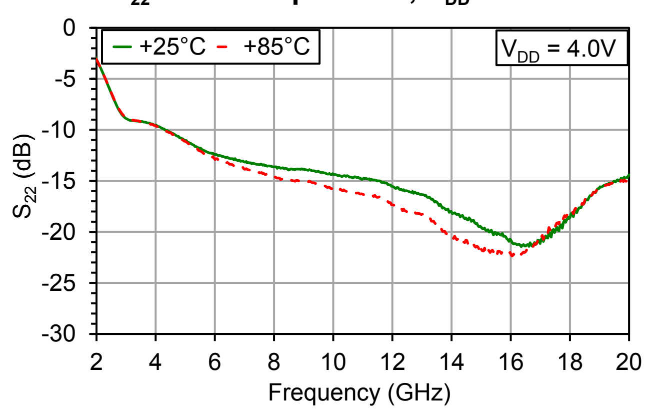
S_{22} Over V_{DD}



S_{22} Over Temperature, V_{DD} = 3.3V

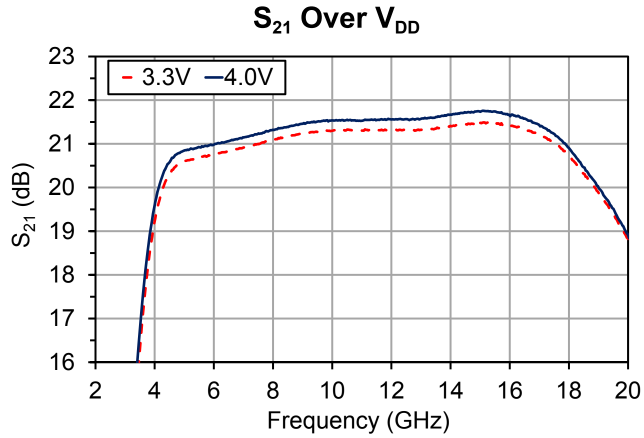


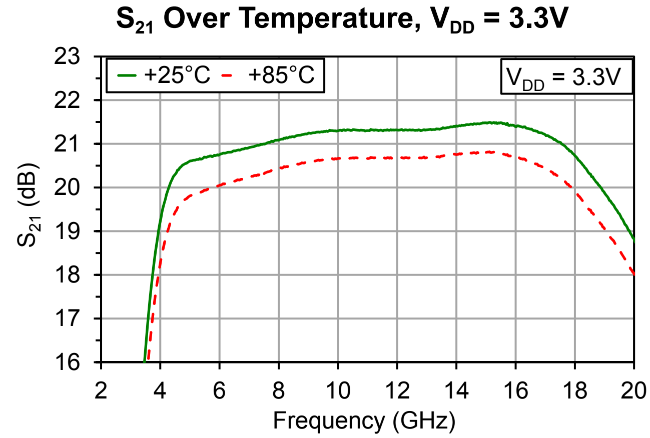
S_{22} Over Temperature, V_{DD} = 4.0V

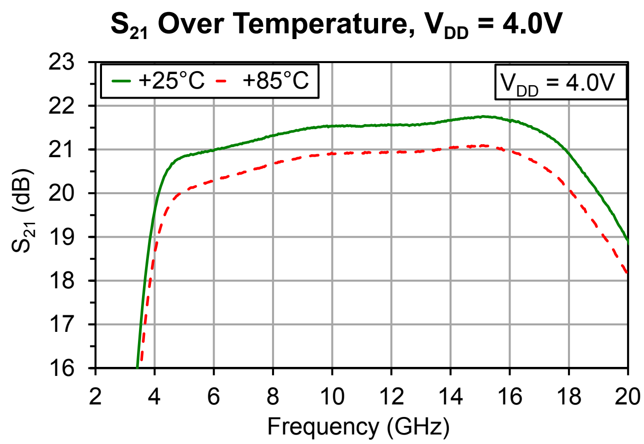


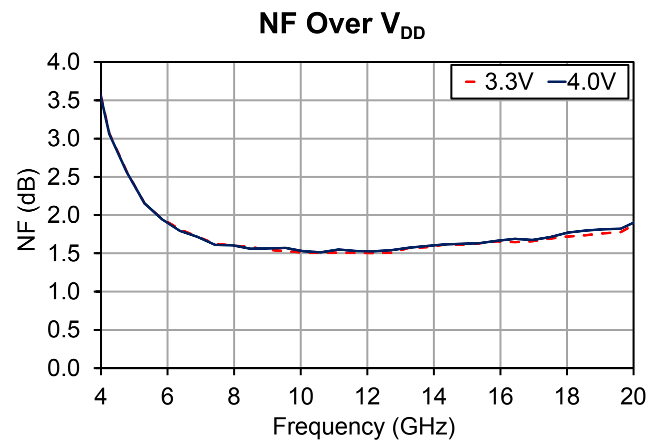
Typical Performance, RF Probe

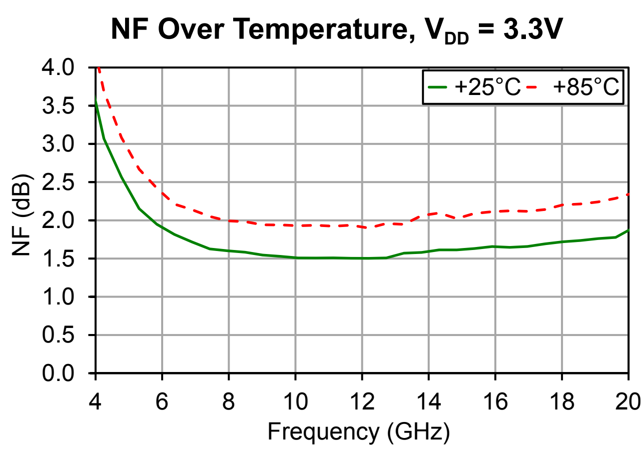
V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

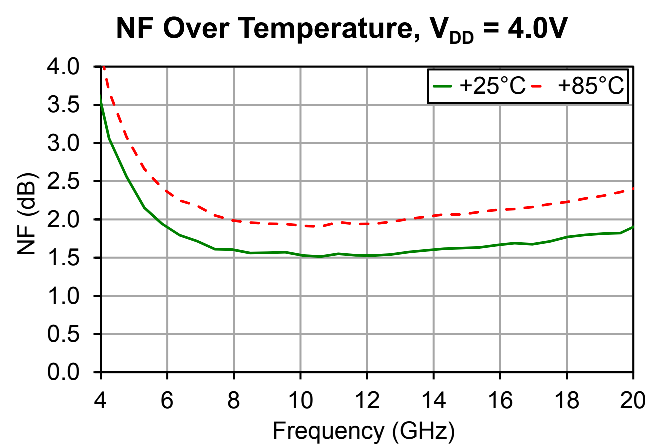








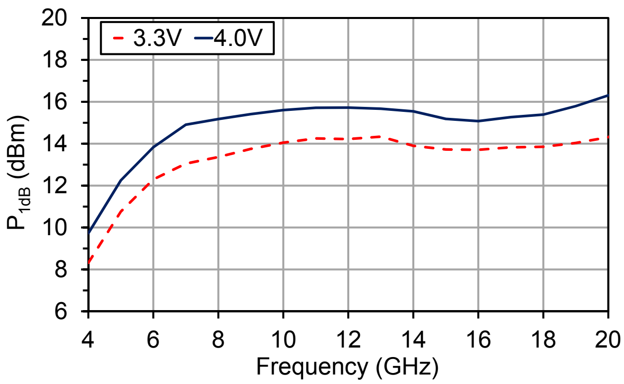




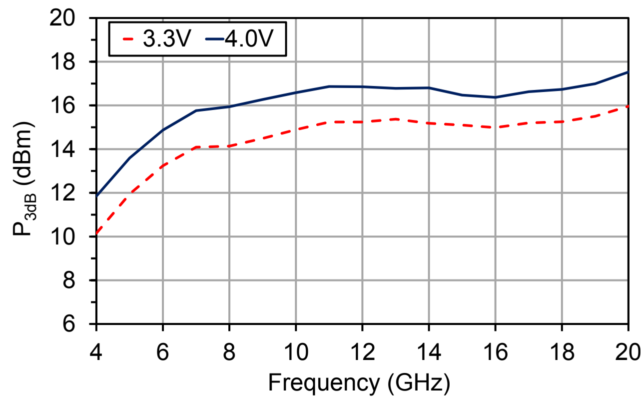
Typical Performance, RF Probe

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

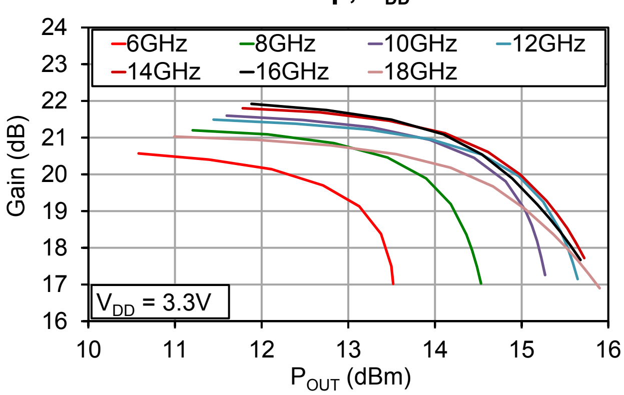
P_{1dB} Over V_{DD}



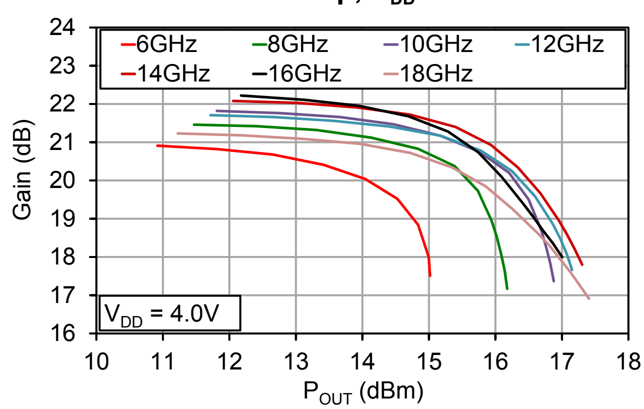
P_{3dB} Over V_{DD}



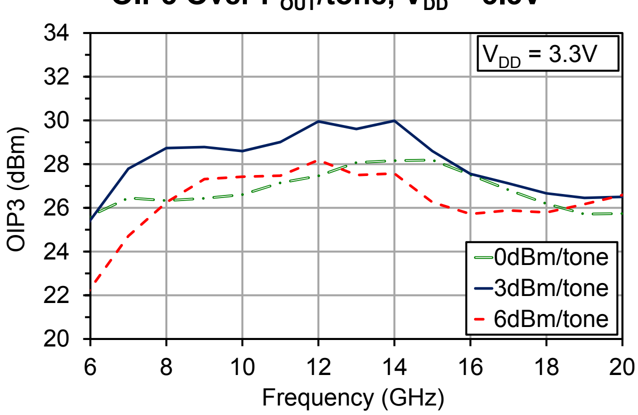
Power Sweep, V_{DD} = 3.3V



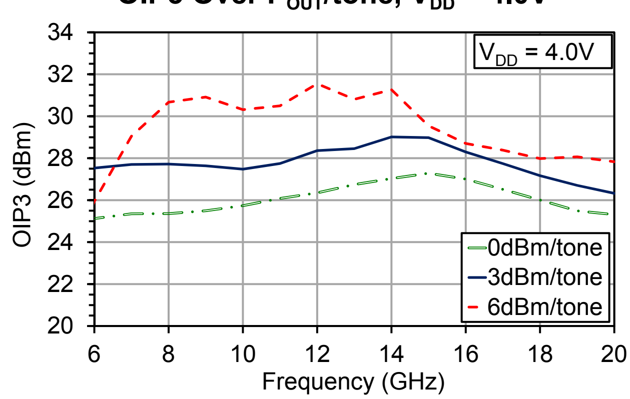
Power Sweep, V_{DD} = 4.0V



OIP3 Over P_{OUT}/tone, V_{DD} = 3.3V[3]



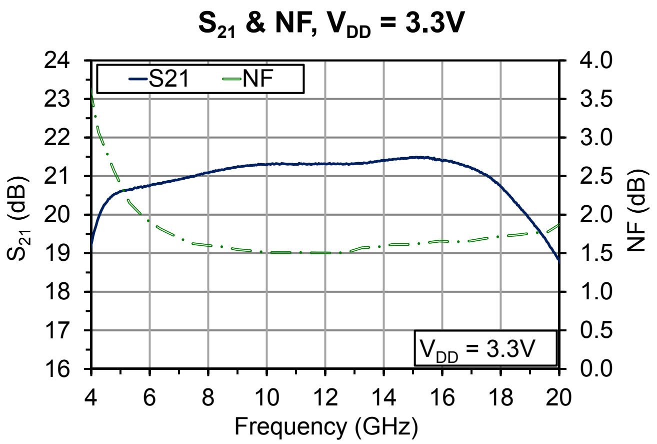
OIP3 Over P_{OUT}/tone, V_{DD} = 4.0V[3]

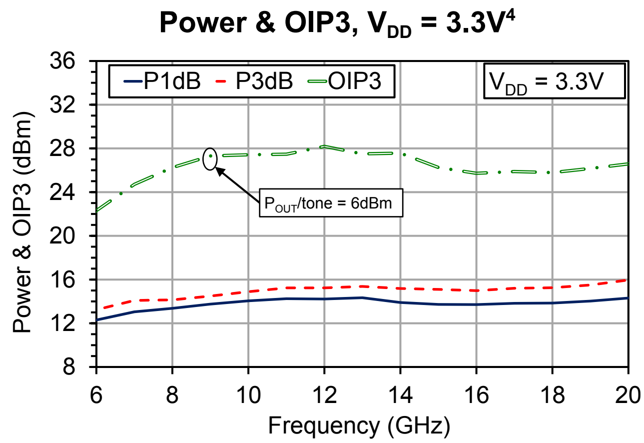


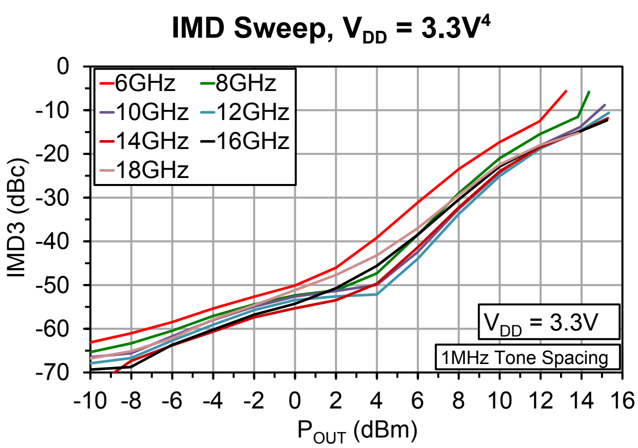
[3] OIP3 over P_{OUT}/tone can be adjusted using V_{D1} and V_{D2}

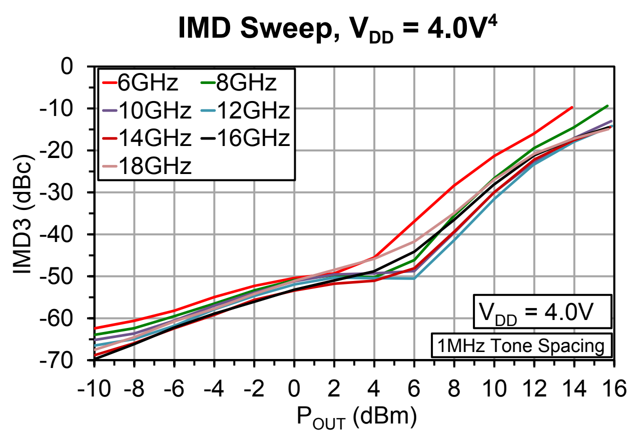
Typical Performance, RF Probe

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted





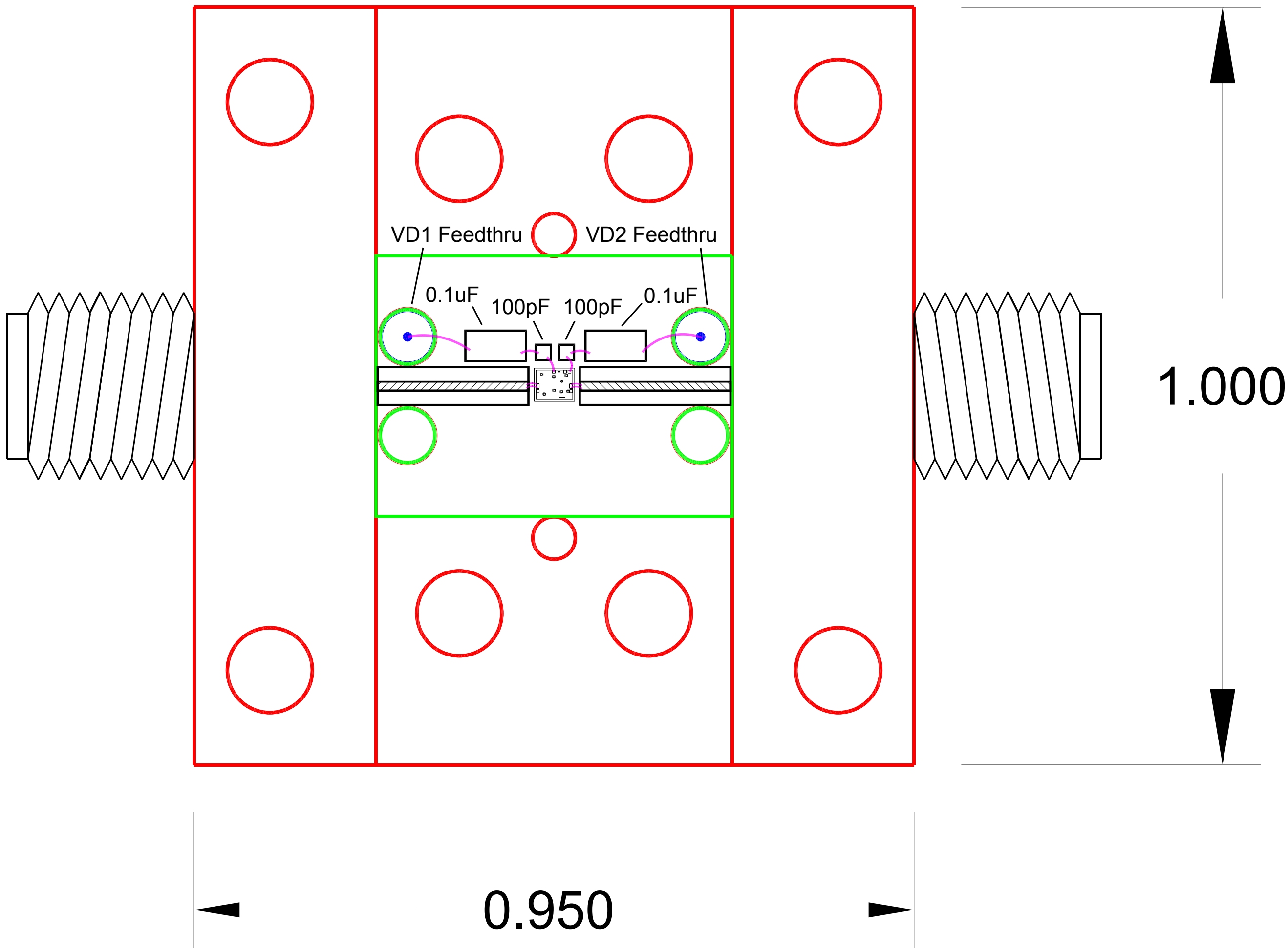




[4] OIP3 over P_{OUT}/tone can be adjusted using V_{D1} and V_{D2}

Connectorized Test Fixture

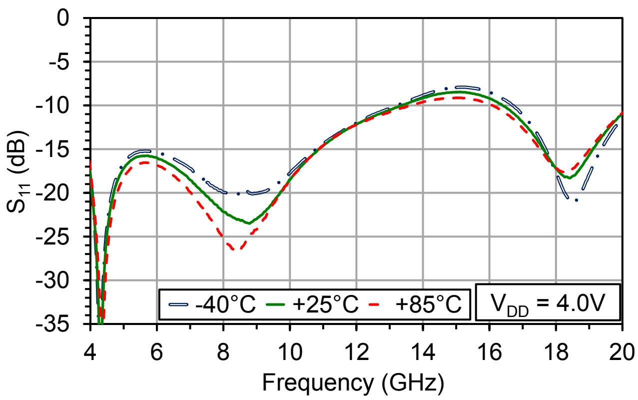
With 2.92mm Connectors



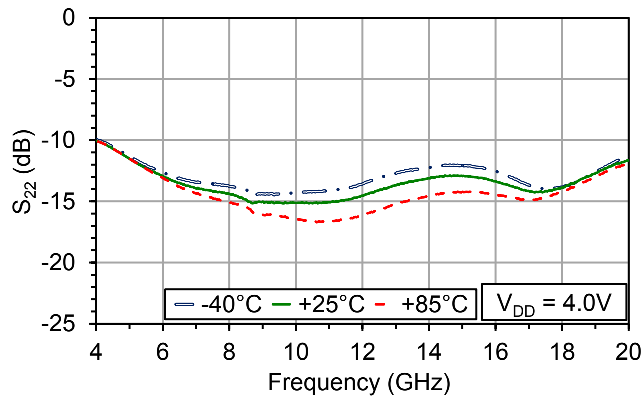
Typical Performance, Connectorized Test Fixture

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

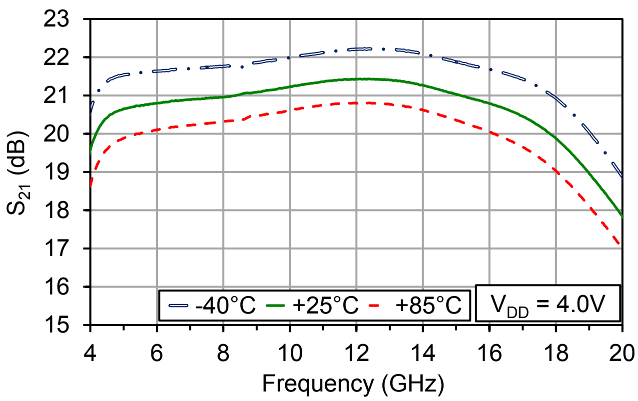
S_{11} Over Temperature



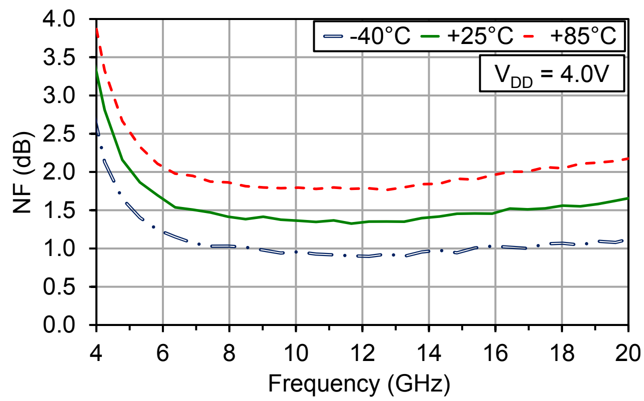
S_{22} Over Temperature



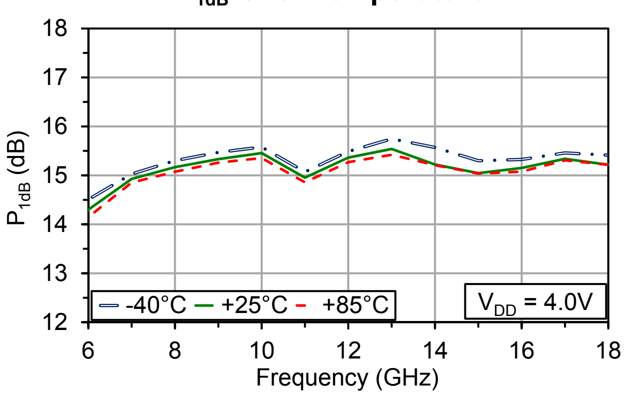
S_{21} Over Temperature



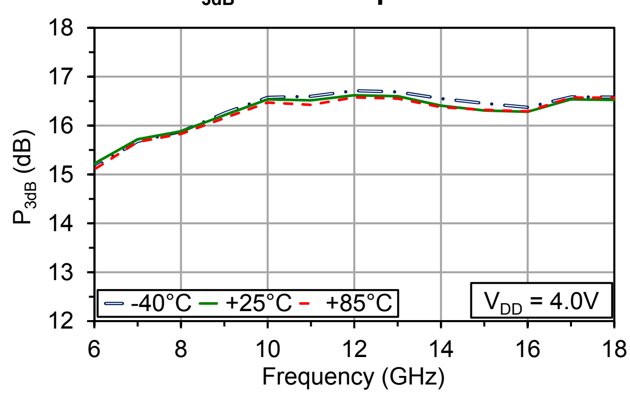
NF Over Temperature



P_{1dB} Over Temperature

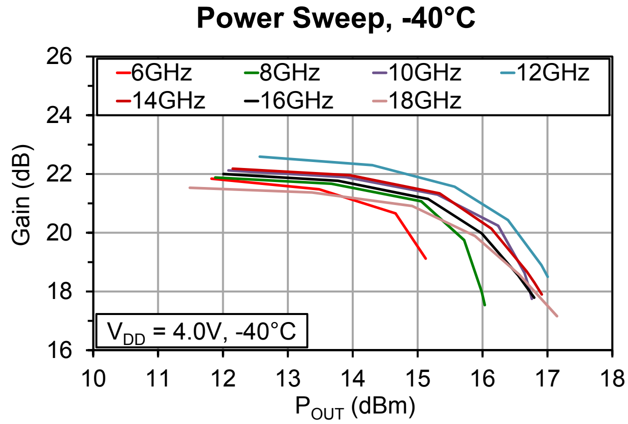


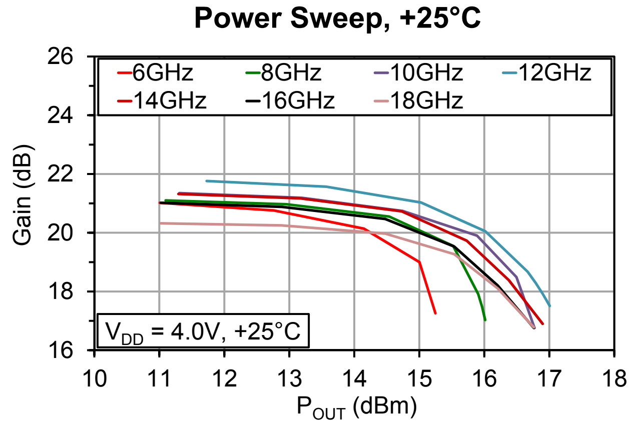
P_{3dB} Over Temperature

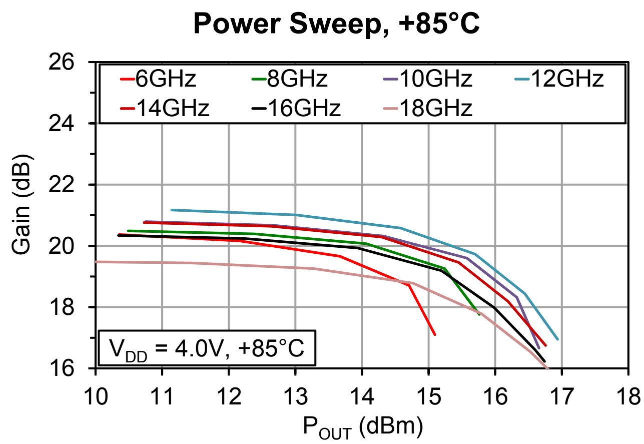


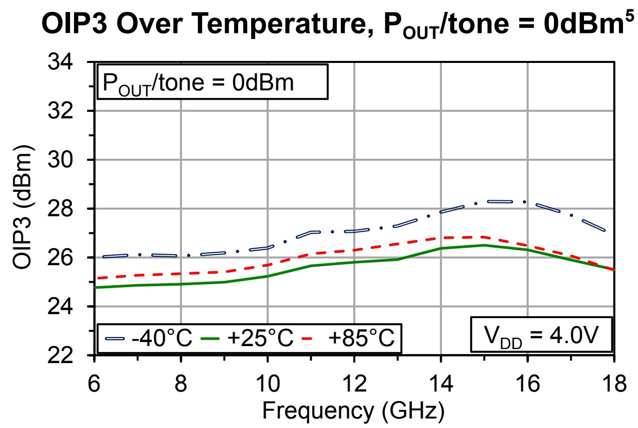
Typical Performance, Connectorized Test Fixture

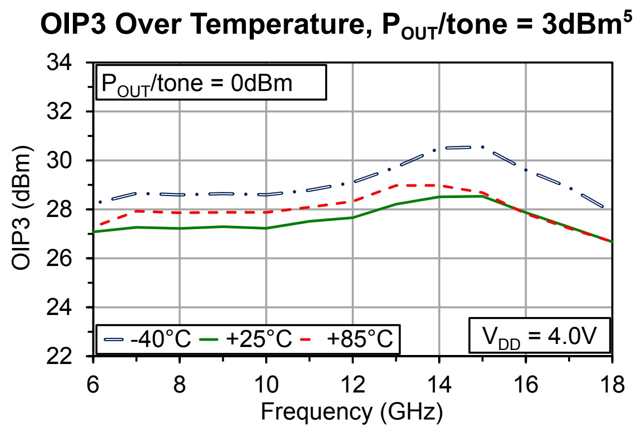
V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

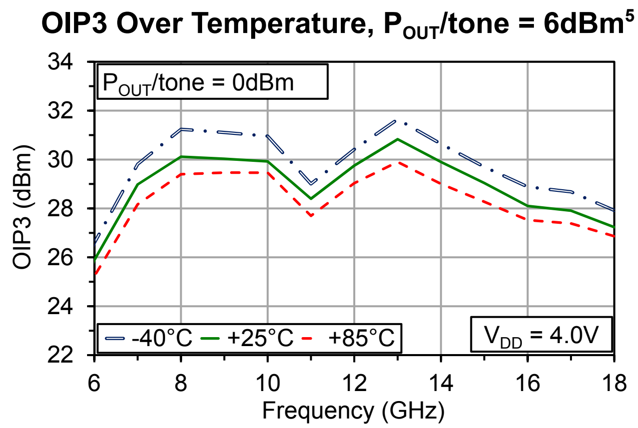










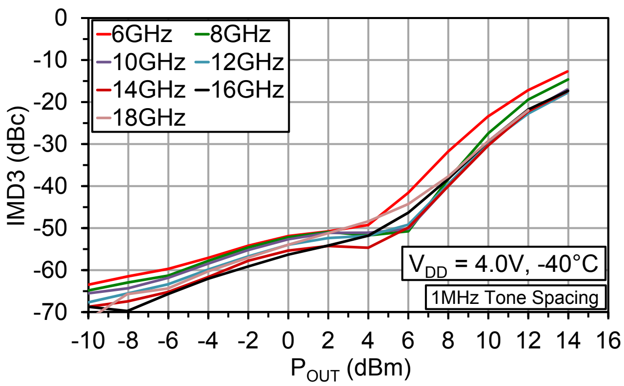


[5] OIP3 over P_{OUT}/tone can be adjusted using V_{D1} and V_{D2}

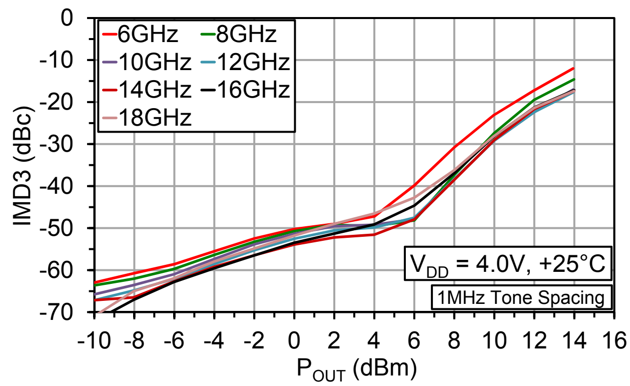
Typical Performance, Connectorized Test Fixture

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

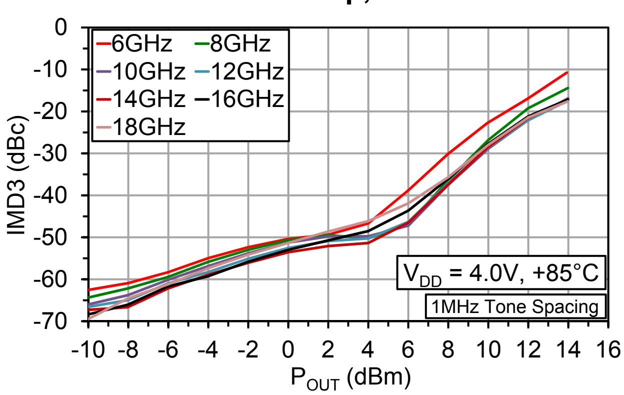
IMD3 Sweep, -40°C[6]



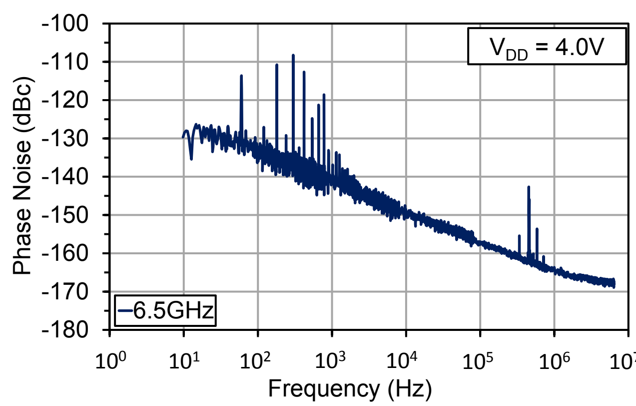
IMD3 Sweep, +25°C[6]



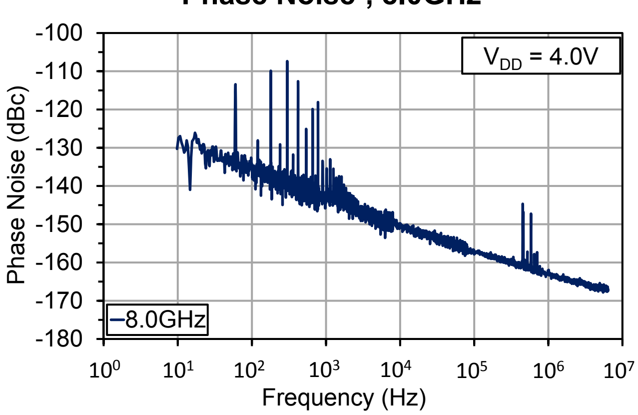
IMD3 Sweep, +85°C[6]



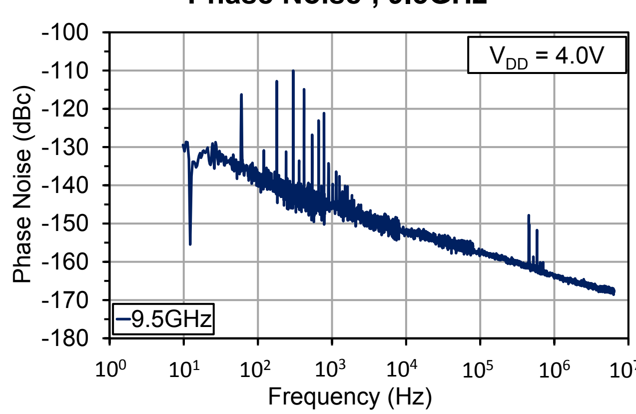
Phase Noise[7], 6.5GHz



Phase Noise[7], 8.0GHz



Phase Noise[7], 9.5GHz



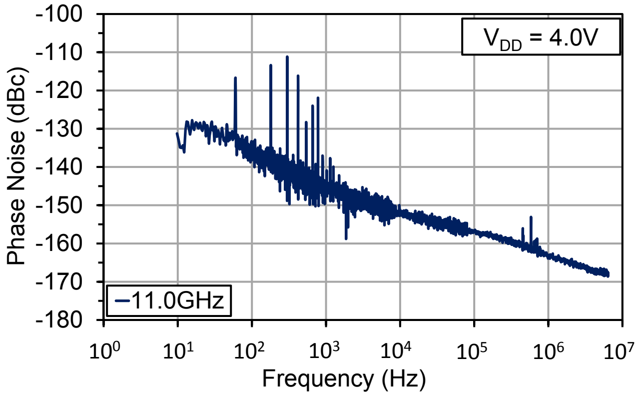
[6] OIP3 over P_{OUT}/tone can be adjusted using V_{D1} and V_{D2}

[7] Visit www.microsemi.com/mmics for application note on phase noise measurement at Microsemi

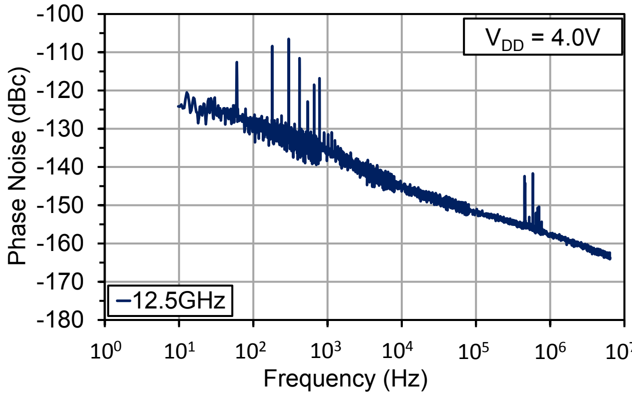
Typical Performance, Connectorized Test Fixture

V_{DD} = 4V, I_{DD} = 105, T_A=25°C unless otherwise noted

Phase Noise[8], 11.0GHz



Phase Noise[8], 12.5GHz



[8] Visit www.microsemi.com/mmics for application note on phase noise measurement at Microsemi

Chip layout showing pad locations.

All dimensions are in microns. Die thickness is 100 microns. Backside metal is gold, bond pad metal is gold. Refer to Die Handling Application Note MM-APP-0001 (visit www.microsemi.com/mmics).

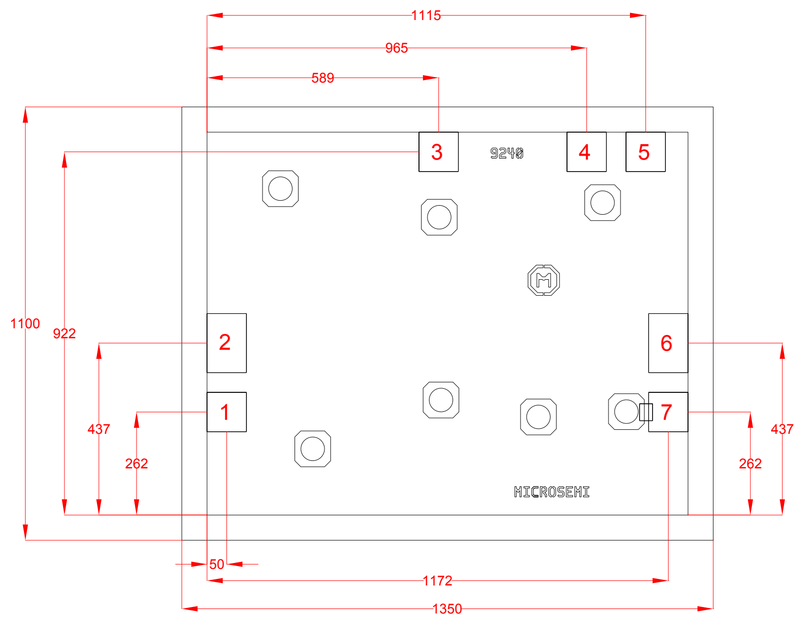


Table 3: Pad Descriptions

Pad #	Description	Pad Dimensions (µm)
1, 4, 7	Ground	100 x 100
2	RF_{IN}, pad is AC coupled	100 x 150
3	V_{D1}	100 x 100
5	V_{D2}	100 x 100
6	RF_{OUT} , pad is AC coupled	100 x 150

Biasing

MMA004AA is a self-biased device with positive supply. Apply V_{DD} to pad 3 and 5. V_{D1} and V_{D2} should be RF isolated from each other. Bias sequence does not matter.

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