

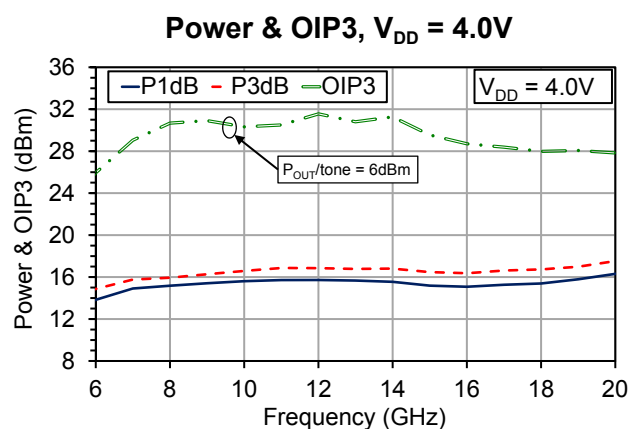
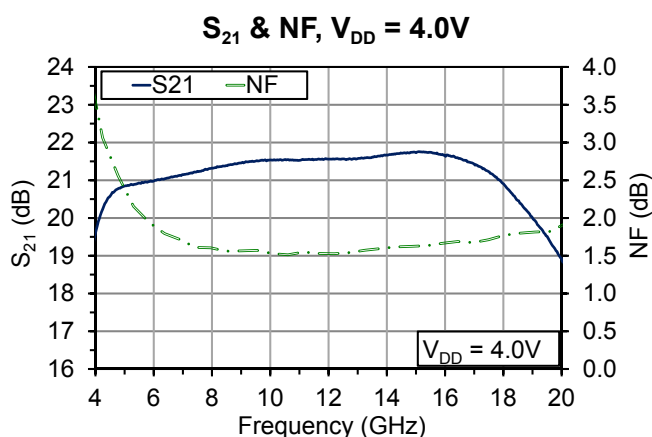
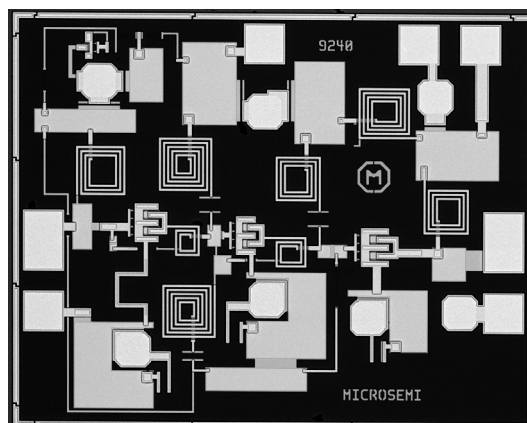
6-18GHz, 21dB Gain, 1.5dB NF Low Noise Amplifier

Features

- 16dBm P_{SAT} with 1.5dB NF and 21.5dB gain typical from 6-18GHz
- Gain flatness $< \pm 0.5$ dB
- Input and Output matched to 50 Ω
- 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



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

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

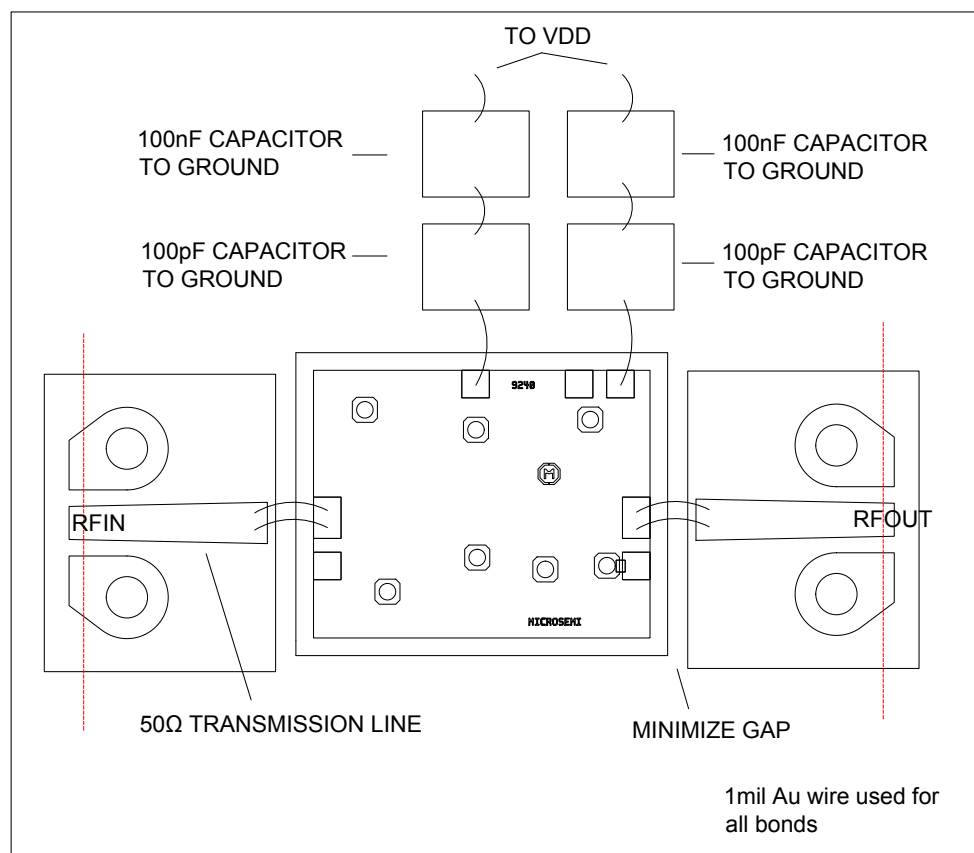
Parameter	Rating	Units
Drain Voltage (V_D)	+4.5	V
Input Power (P_{IN})	24	dBm
Channel Temperature (T_C)	150 ¹	°C
Operating Ambient Temperature (T_A)	-55 to +85	°C
Storage Temperature	-65 to +150	°C
Thermal Resistance, Channel to Die Backside	TBD (140 est)	°C/W

¹ MTTF @ $T_C = 150^\circ\text{C} > 10^7$ hours

Caution, ESD Sensitive Device
Table 2: Specifications (CW, 100% Test): $T_A = 25^\circ\text{C}$, $V_{DD} = 4\text{V}$, $I_{DD} = 100\text{mA}$

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

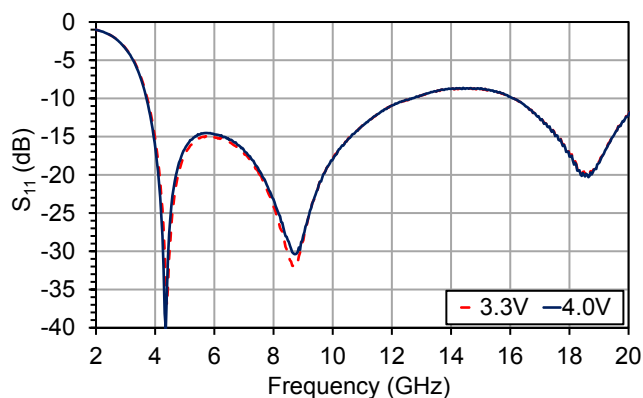
RF Probe Measurement Set-Up With Reference Planes²


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

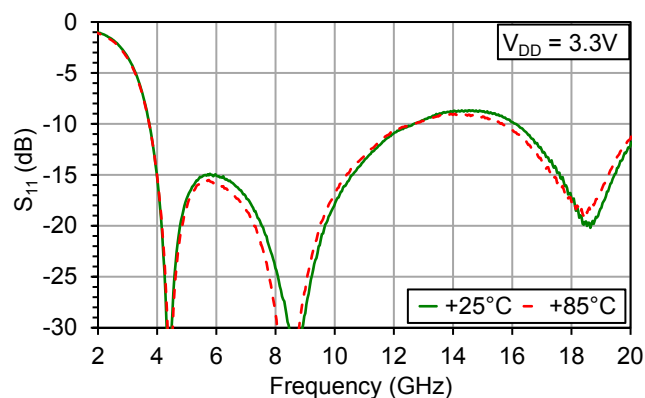
Typical Performance, RF Probe

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

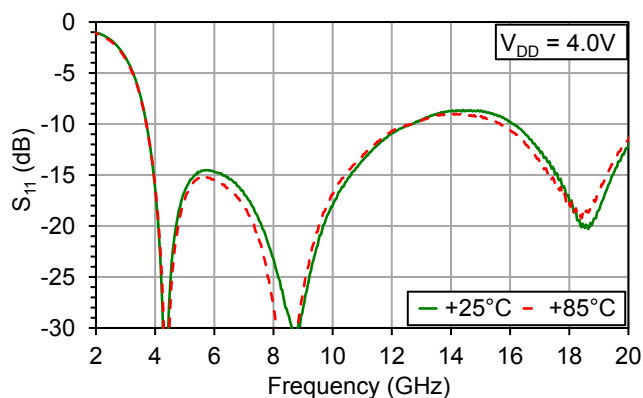
S_{11} Over V_{DD}



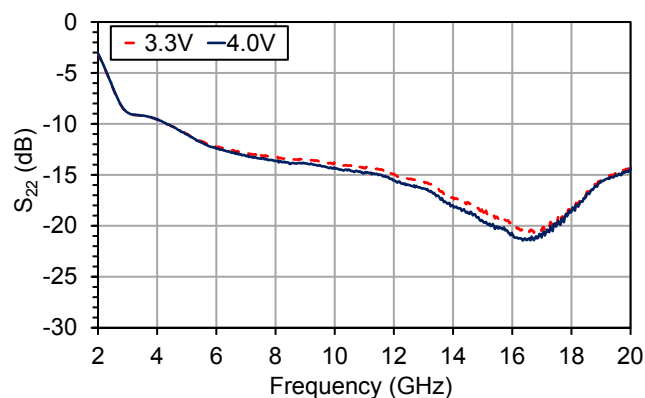
S_{11} Over Temperature, $V_{DD} = 3.3V$



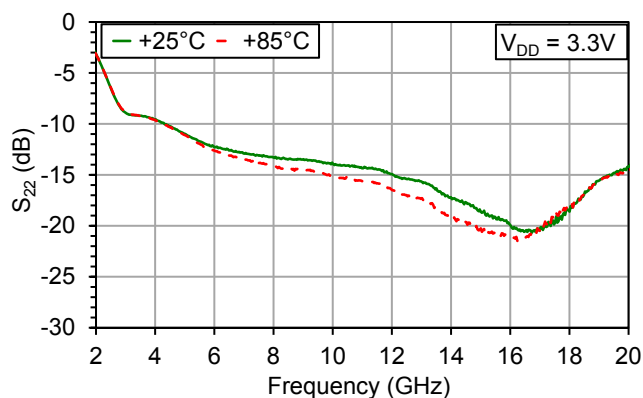
S_{11} Over Temperature, $V_{DD} = 4.0V$



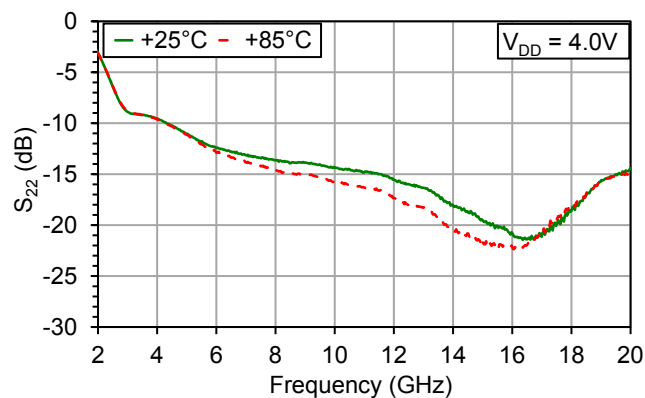
S_{22} Over V_{DD}



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

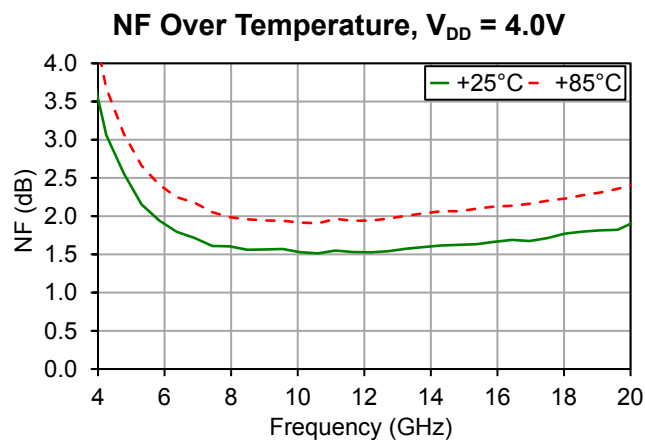
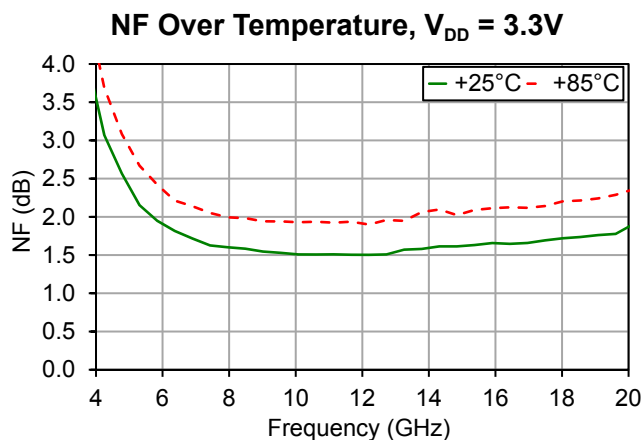
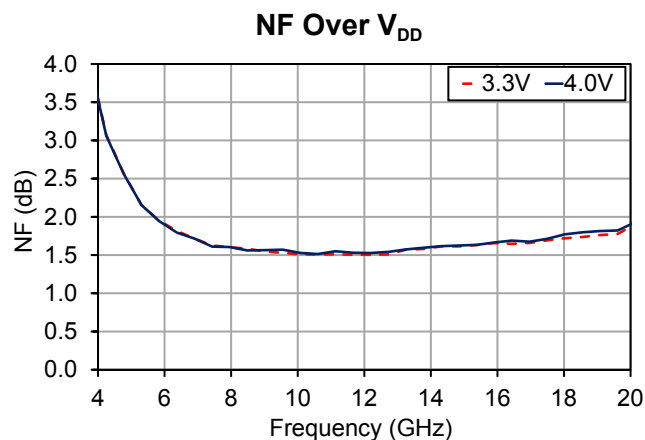
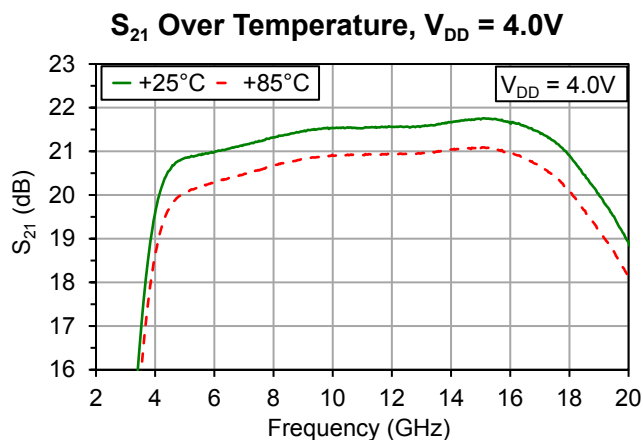
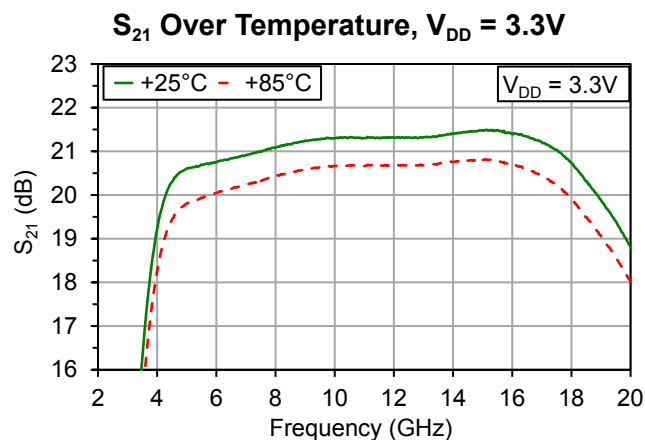
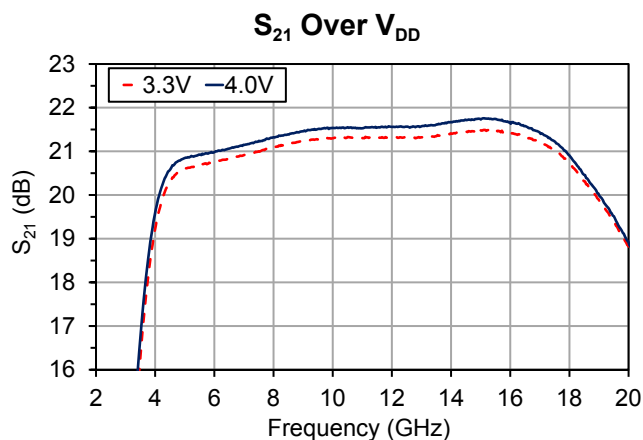


S_{22} Over Temperature, $V_{DD} = 4.0V$



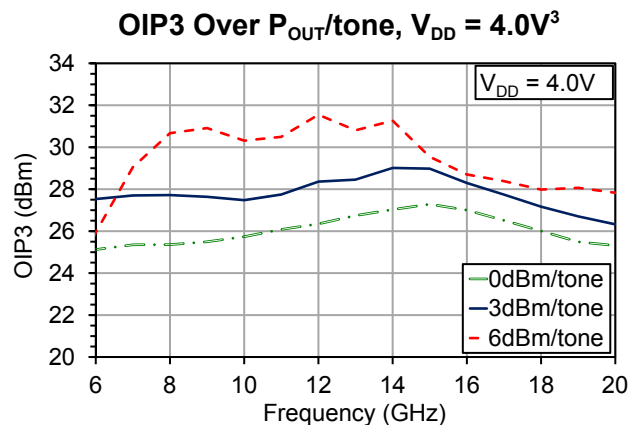
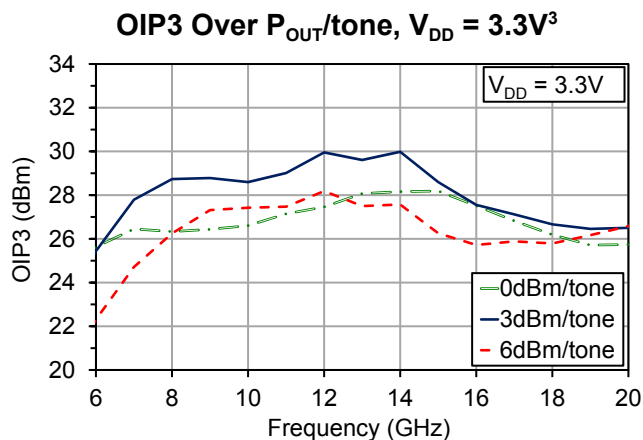
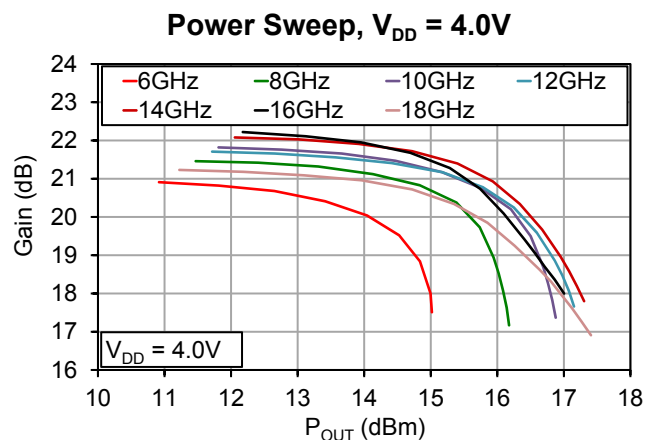
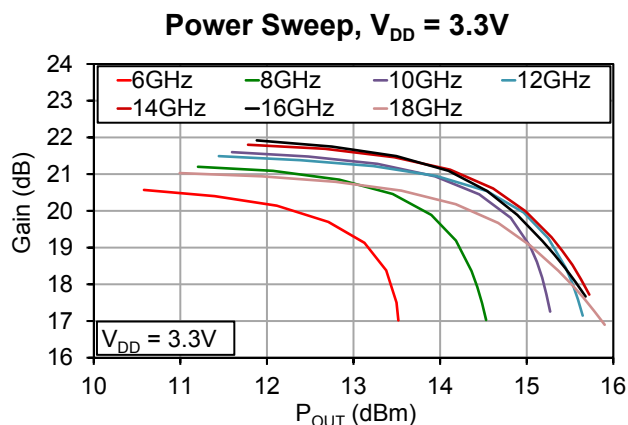
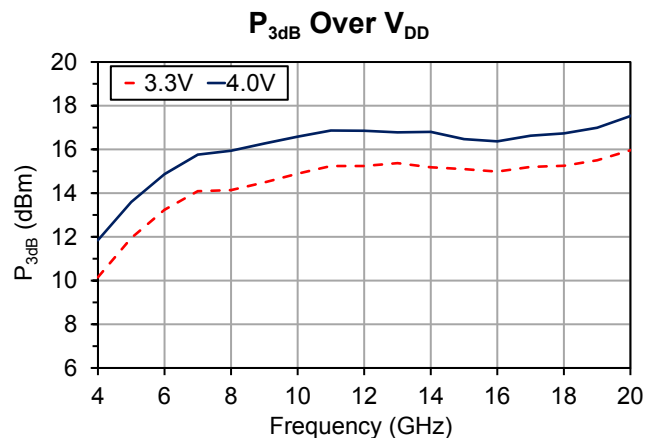
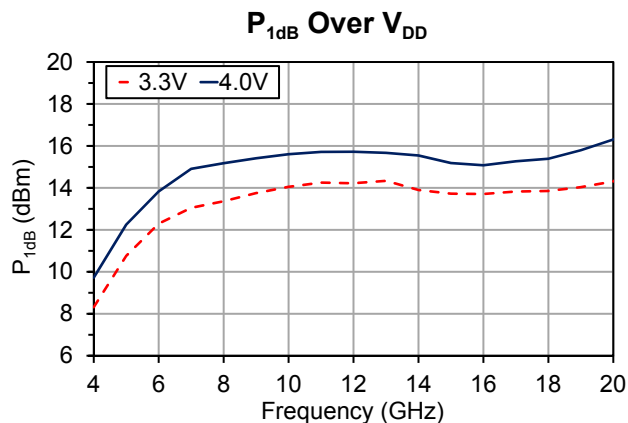
Typical Performance, RF Probe

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted



Typical Performance, RF Probe

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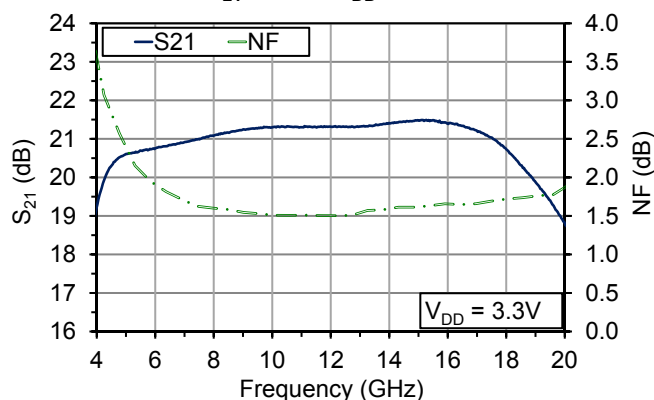


³ OIP3 over P_{OUT}/tone can be adjusted using V_{D1} and V_{D2}

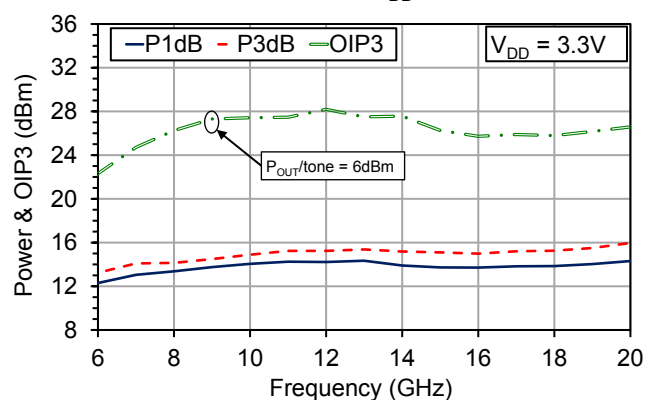
Typical Performance, RF Probe

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

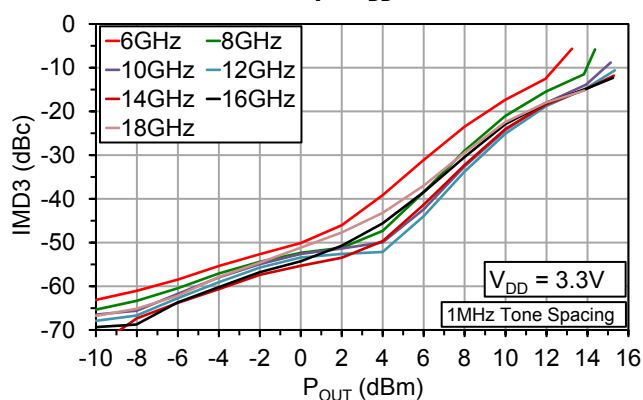
S_{21} & NF, $V_{DD} = 3.3V$



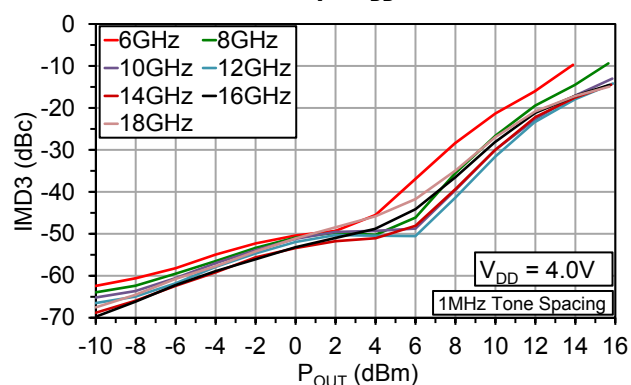
Power & OIP3, $V_{DD} = 3.3V^4$



IMD Sweep, $V_{DD} = 3.3V^4$



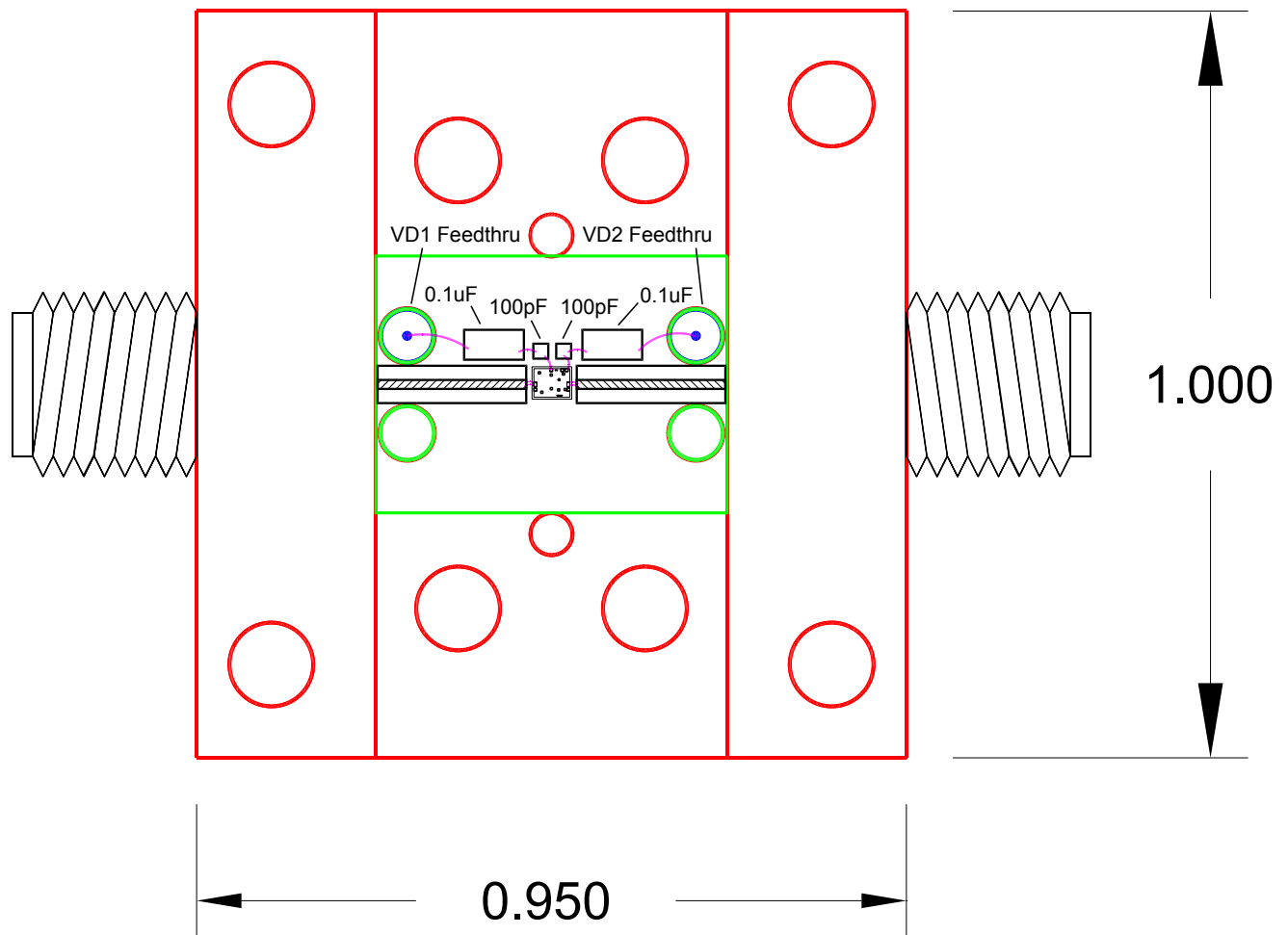
IMD Sweep, $V_{DD} = 4.0V^4$



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

Connectorized Test Fixture

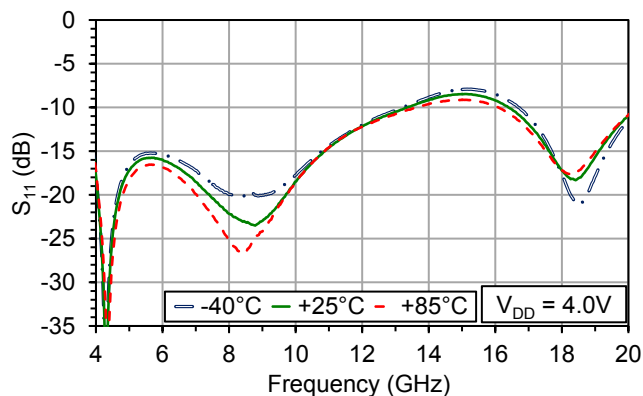
With 2.92mm Connectors



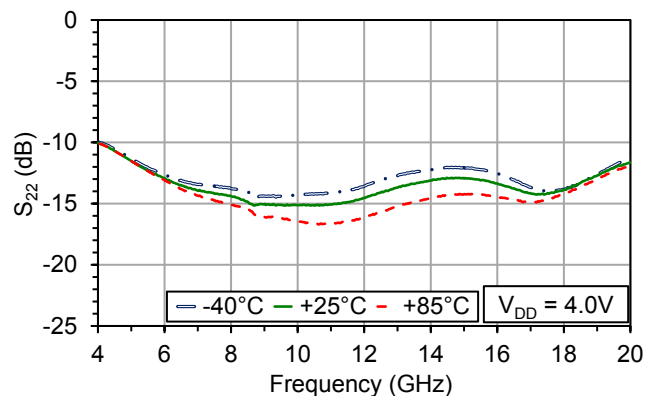
Typical Performance, Connectorized Test Fixture

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

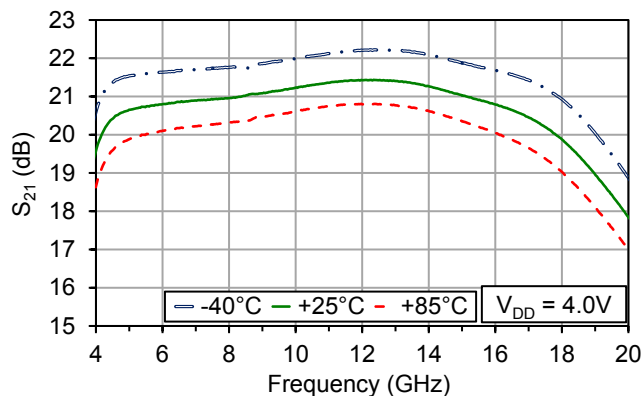
S_{11} Over Temperature



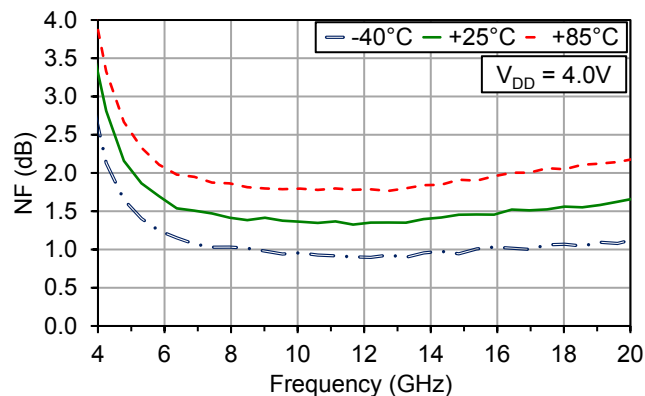
S_{22} Over Temperature



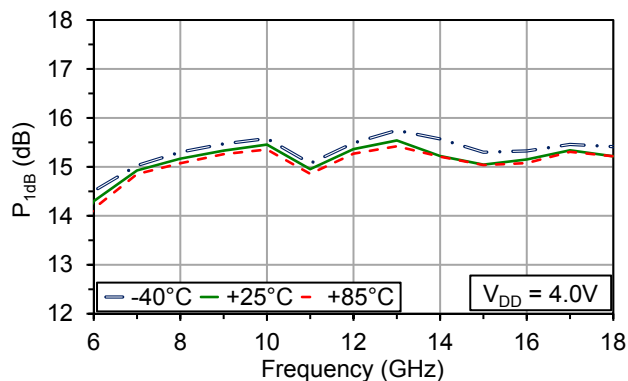
S_{21} Over Temperature



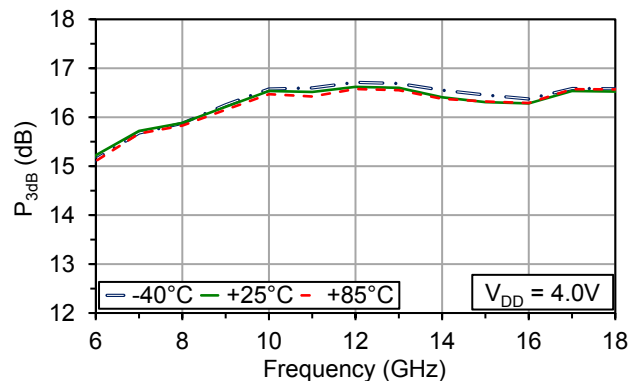
NF Over Temperature



P_{1dB} Over Temperature



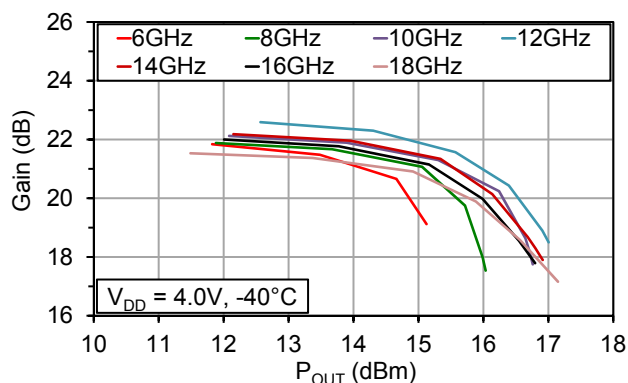
P_{3dB} Over Temperature



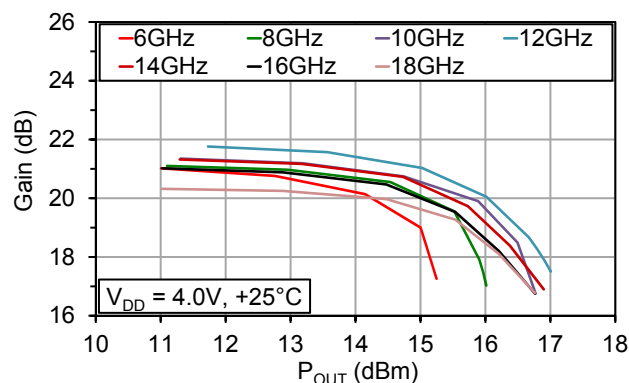
Typical Performance, Connectorized Test Fixture

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

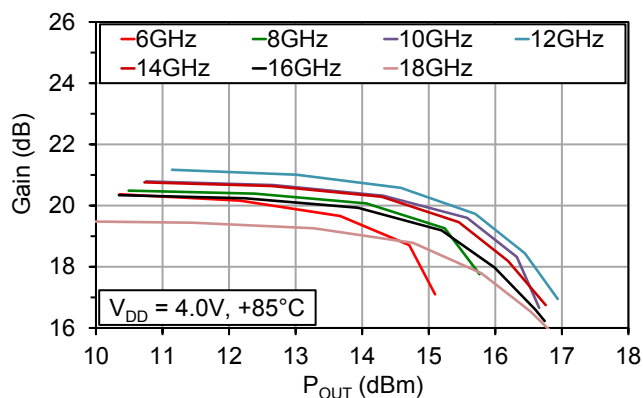
Power Sweep, $-40^\circ C$



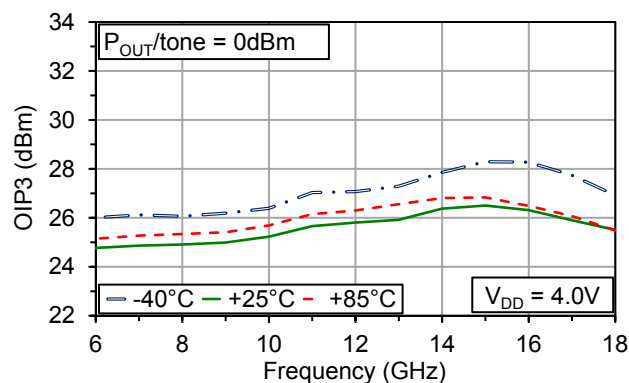
Power Sweep, $+25^\circ C$



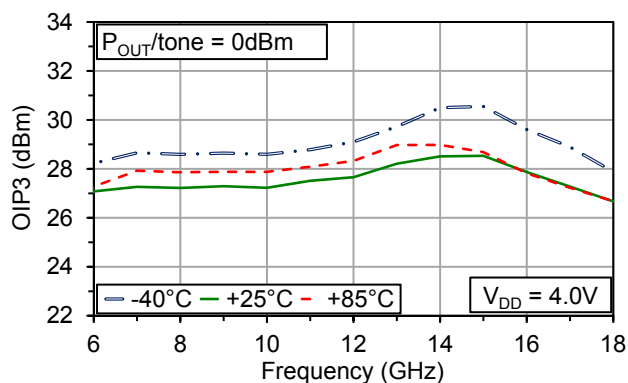
Power Sweep, $+85^\circ C$



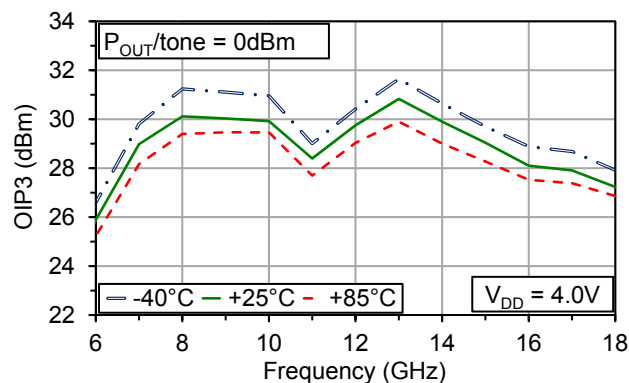
OIP3 Over Temperature, $P_{OUT}/tone = 0dBm^5$



OIP3 Over Temperature, $P_{OUT}/tone = 3dBm^5$



OIP3 Over Temperature, $P_{OUT}/tone = 6dBm^5$

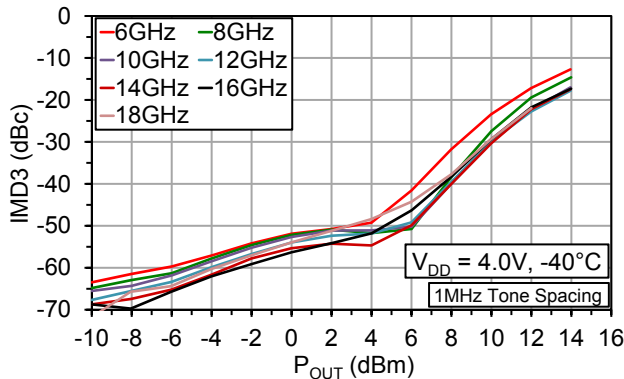


⁵ OIP3 over $P_{OUT}/tone$ can be adjusted using V_{D1} and V_{D2}

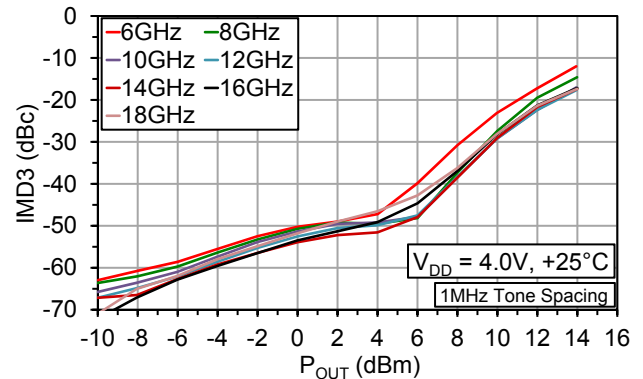
Typical Performance, Connectorized Test Fixture

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

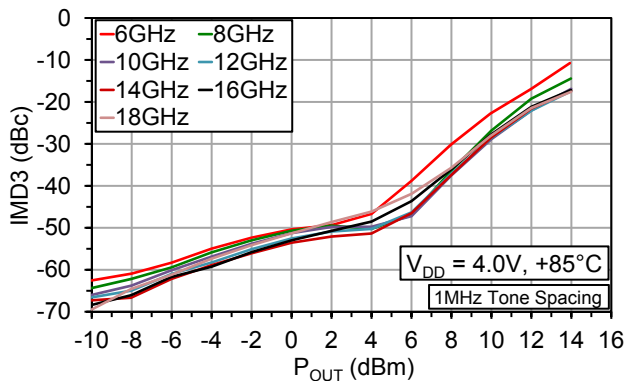
IMD3 Sweep, $-40^\circ C$ ⁶



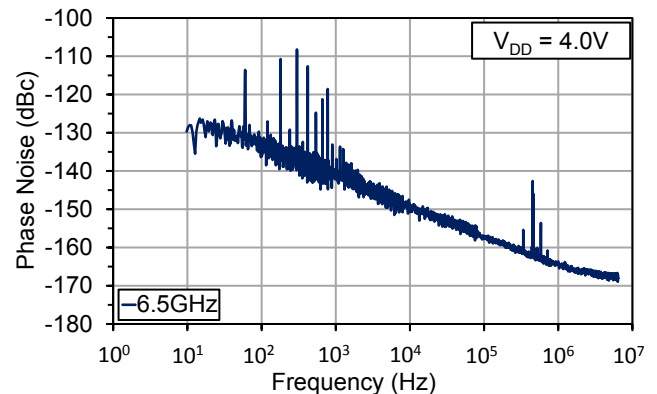
IMD3 Sweep, $+25^\circ C$ ⁶



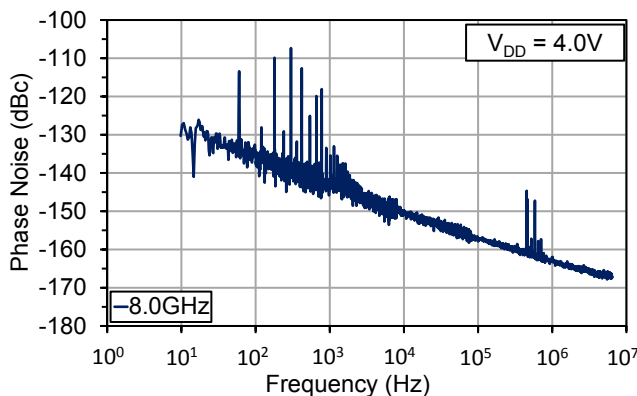
IMD3 Sweep, $+85^\circ C$ ⁶



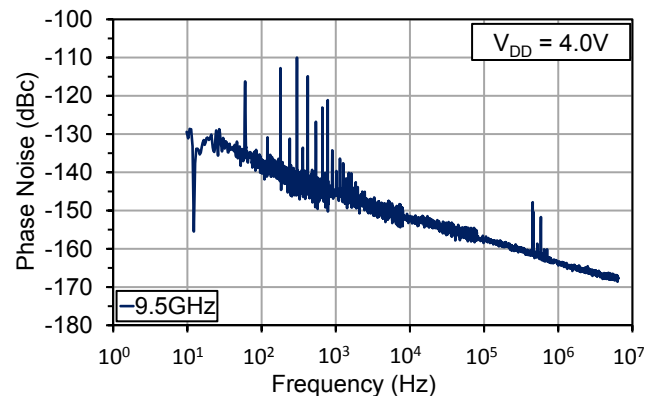
Phase Noise⁷, 6.5GHz



Phase Noise⁷, 8.0GHz



Phase Noise⁷, 9.5GHz



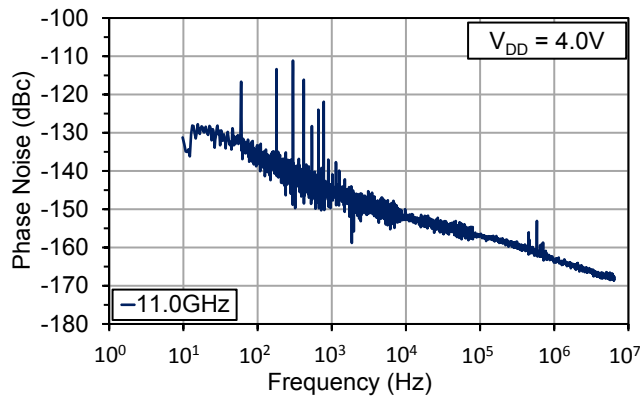
⁶ OIP3 over P_{OUT} /tone can be adjusted using V_{D1} and V_{D2}

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

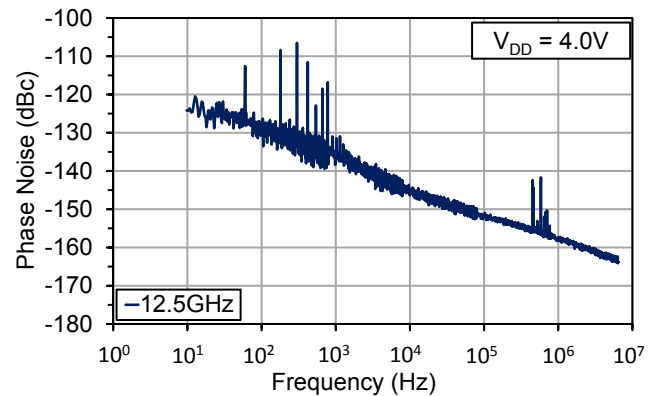
Typical Performance, Connectorized Test Fixture

$V_{DD} = 4V$, $I_{DD} = 105$, $T_A = 25^\circ C$ unless otherwise noted

Phase Noise⁸, 11.0GHz



Phase Noise⁸, 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).

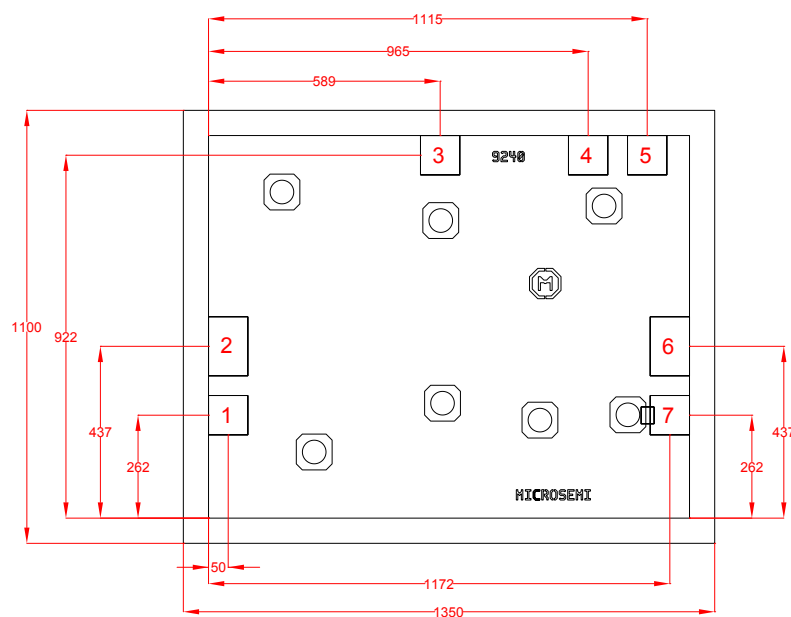


Table 3: Pad Descriptions

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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