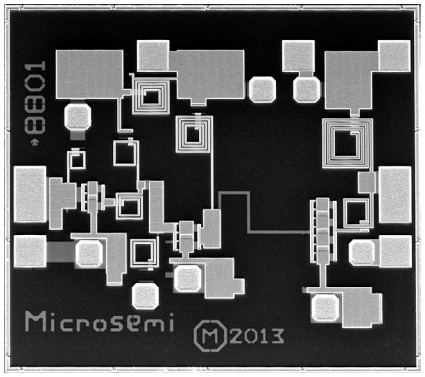
5-20GHz, 20dBm P_{3dB}, 18dB Gain Wideband Amplifier

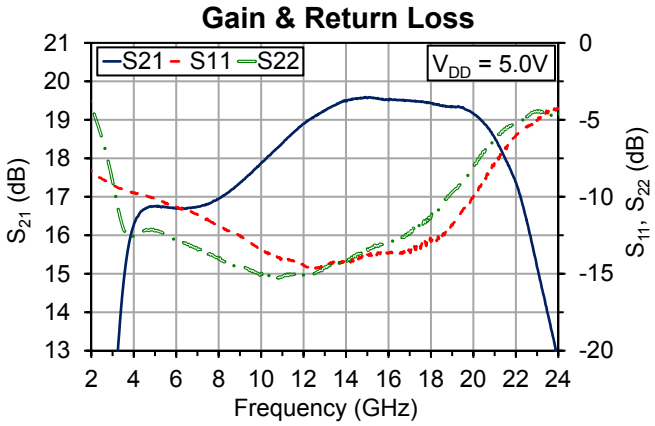
Features

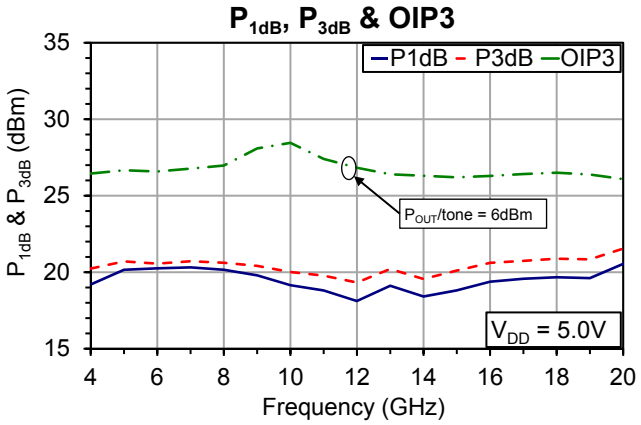
- 18dB gain with positive gain slope at 5V
- 19dB gain with positive gain slope at 3.3V
- 19dBm P_{1dB} with 26dBm OIP3 at 5V
- ±1dB power flatness
- Input and Output matched to 50Ω
- 1.35mm x 1.5mm x 0.1mm die size



Applications

- Instrumentation
- Electronic warfare
- Microwave communications
- Radar





Typical Performance (CW, Typical Device, RF Probe): T_A = 25°C, V_{D1} = V_{D2} = 5V

Parameter	Min	Typ	Max	Units
Frequency	5	-	20	GHz
Small Signal Gain	17.0	18.5	19.5	dB
Input Return Loss	10	12	14	dB
Output Return Loss	8	13	15	dB
Output Power, P_{1dB}	18.0	19.0	20.5	dBm
Output Power P_{3dB}	19.3	20.0	21.5	dBm
Output IP3	-	26	-	dBm
Drain Current	-	105	-	mA

Table 1: Absolute Maximum Ratings, Not Simultaneous

Parameter	Value	Units
Drain Voltage (V_{D1}, V_{D2})	+5.5	V
Input Power (P_{IN})	24	dBm
Operating Channel Temperature	150[1]	°C
Operating Ambient Temperature (T_A)	-55 to +85	°C
Storage Temperature	-65 to 150	°C
Thermal Resistasnce, Channel to Die Backside	TBD (80 est)	°C/W

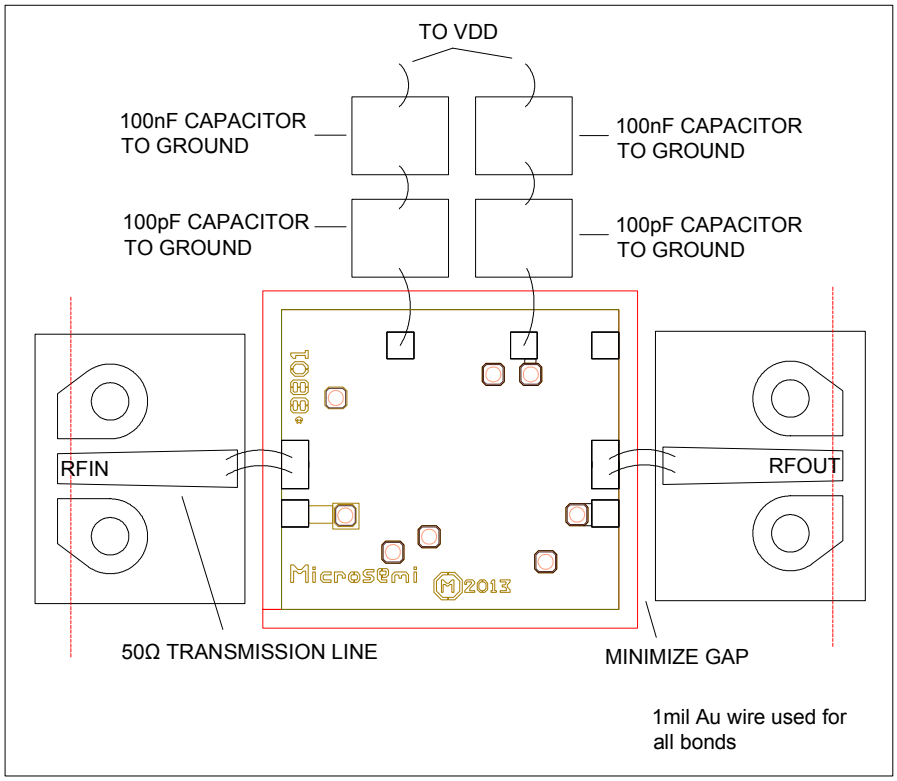
[1] MTTF > 10^8 hours at T_C = 150°C

Caution, ESD Sensitive Device

Table 2: Specifications (CW, 100% Test): T_A = 25°C, V_{D1} = V_{D2} = 5V

Parameter	Frequency	Min	Max	Units
I_{DD}	-	-	160	mA
Small Signal Gain	6GHz	13.5	-	dB
Output Power, P_{1dB}	6GHz	17.5	-	dBm
Small Signal Gain	18GHz	16.5	-	dB
Output Power, P_{1dB}	18GHz	17.5	-	dBm

RF Probe Measurement Set-Up With Reference Planes[1]

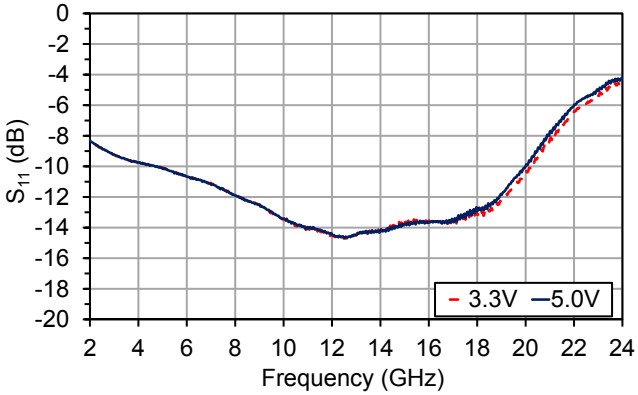


[1] Reference planes are the same for S-parameter files downloadable on www.microsemi.com/mmics

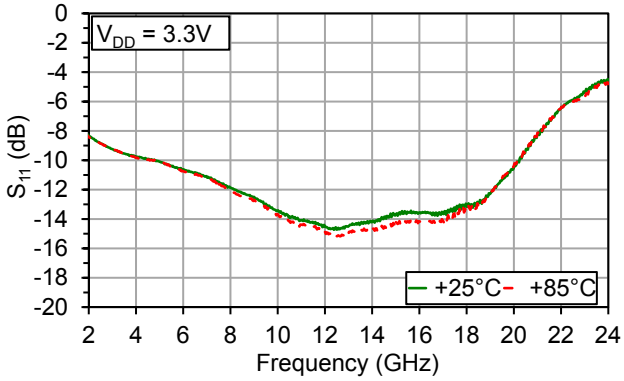
Typical Performance, RF Probe

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

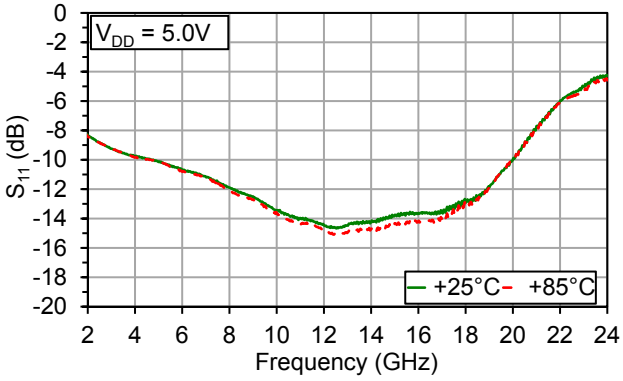
S_{11} Over V_{DD}



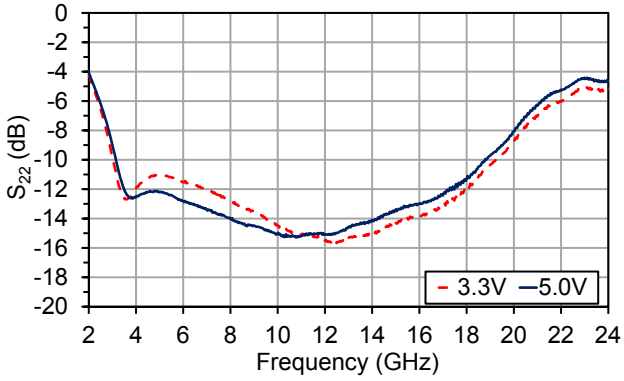
S_{11} Over Temperature, V_{DD} = 3.3V



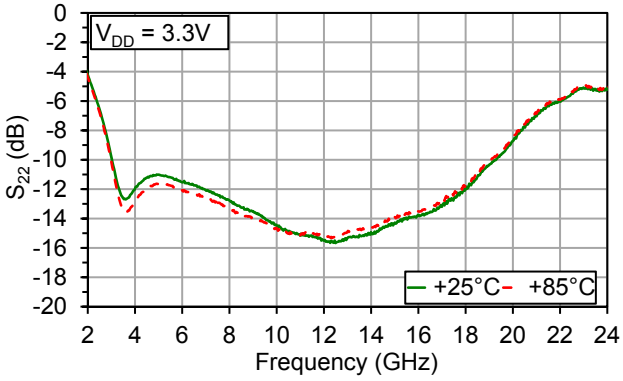
S_{11} Over Temperature, V_{DD} = 5.0V



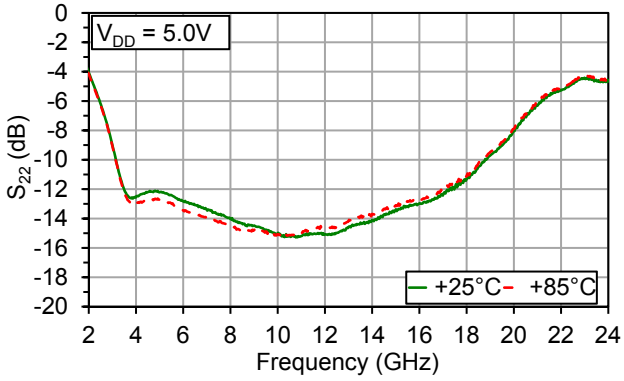
S_{22} Over V_{DD}



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



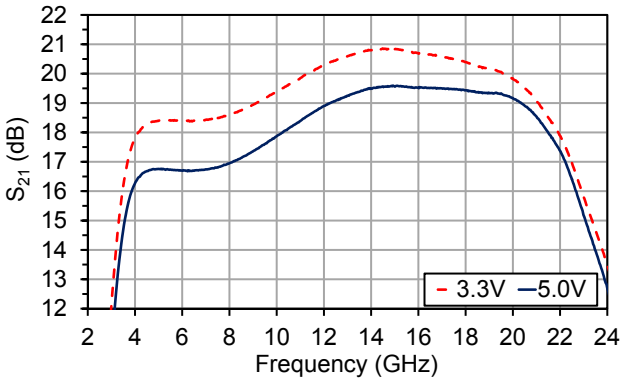
S_{22} Over Temperature, V_{DD} = 5.0V



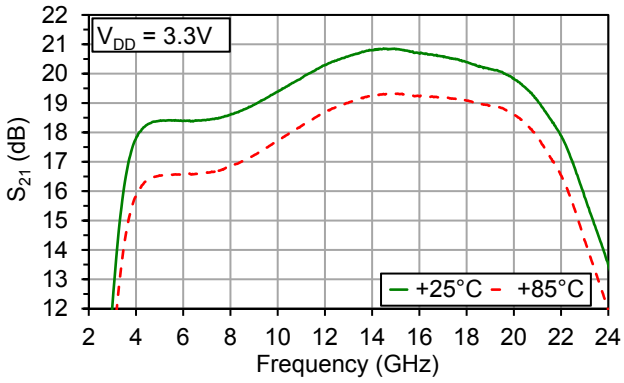
Typical Performance, RF Probe

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

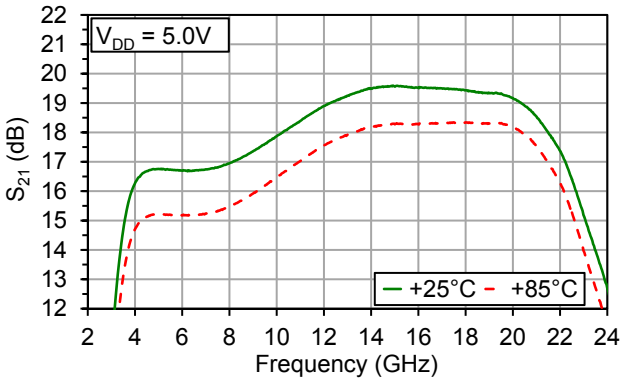
S_{21} Over V_{DD}



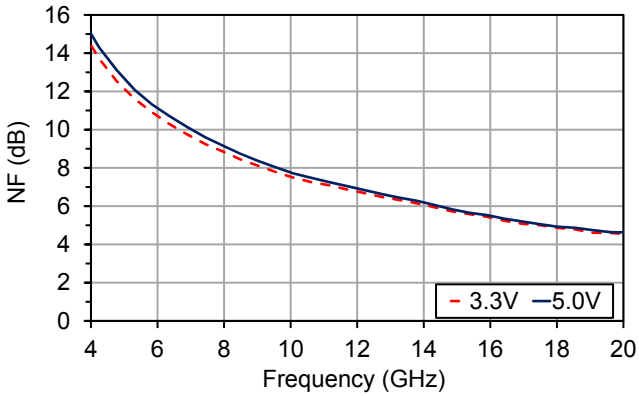
S_{21} Over Temperature, V_{DD} = 3.3V



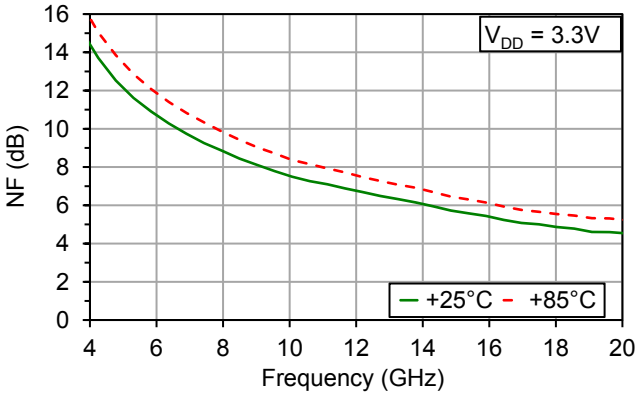
S_{21} Over Temperature, V_{DD} = 5.0V



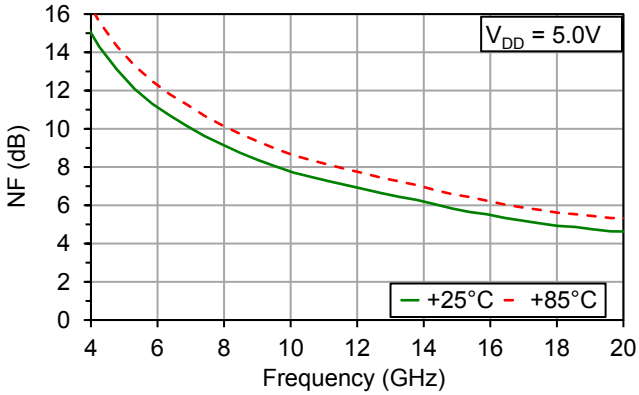
NF Over V_{DD}



NF Over Temperature, V_{DD} = 3.3V



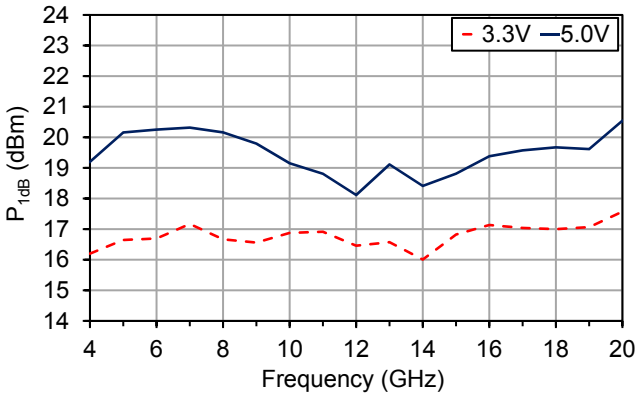
NF Over Temperature, V_{DD} = 5.0V



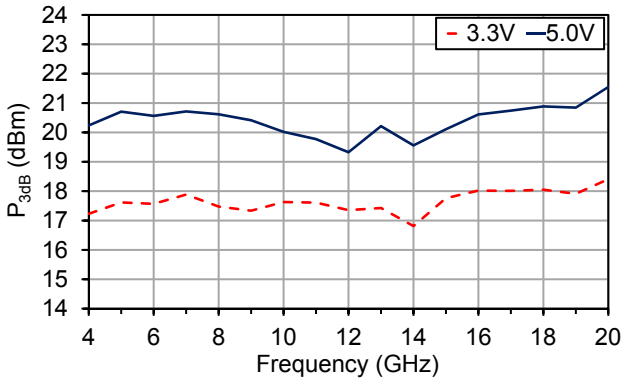
Typical Performance, RF Probe

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

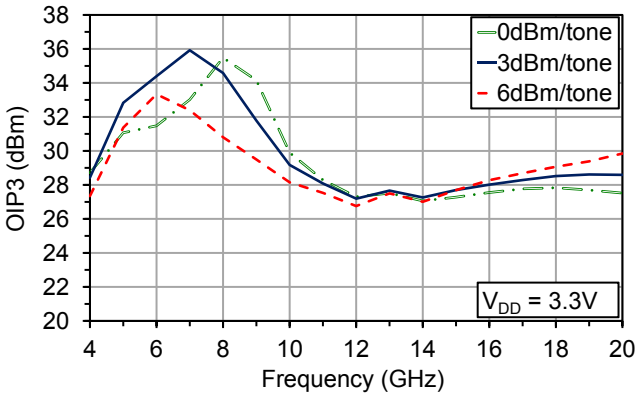
P_{1dB} Over V_{DD}



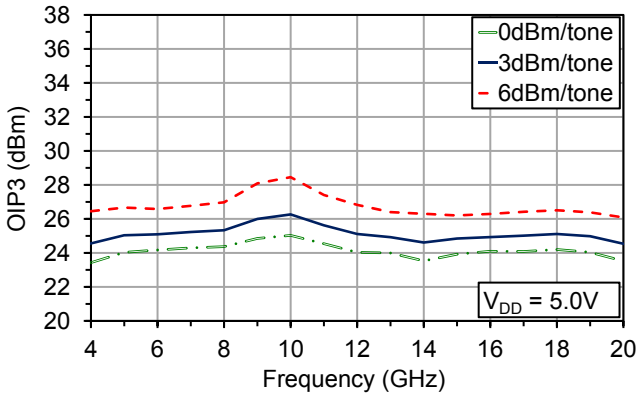
P_{3dB} Over V_{DD}



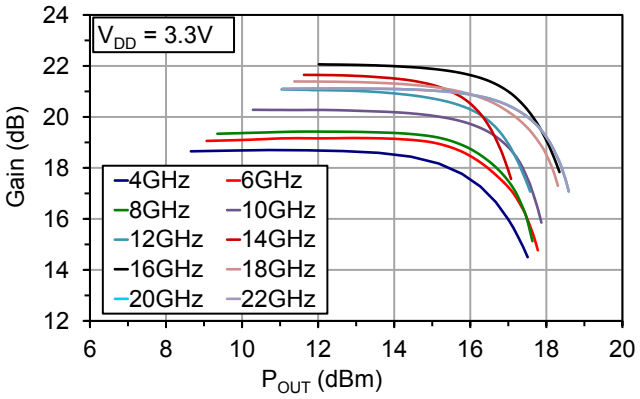
OIP3, V_{DD} = 3.3V



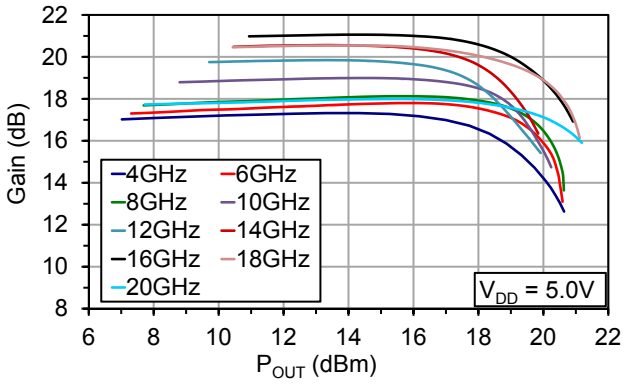
OIP3, V_{DD} = 5.0V



Power Sweep, V_{DD} = 3.3V



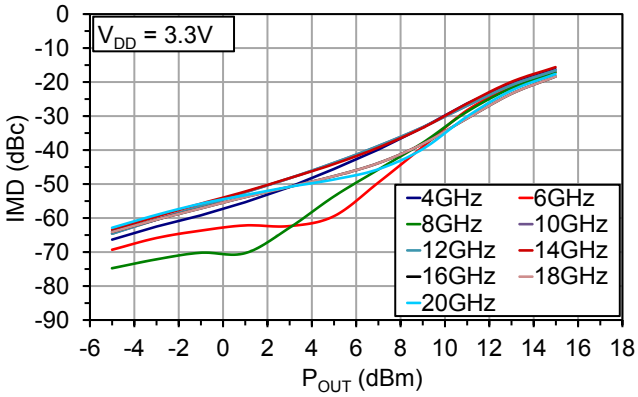
Power Sweep, V_{DD} = 5.0V



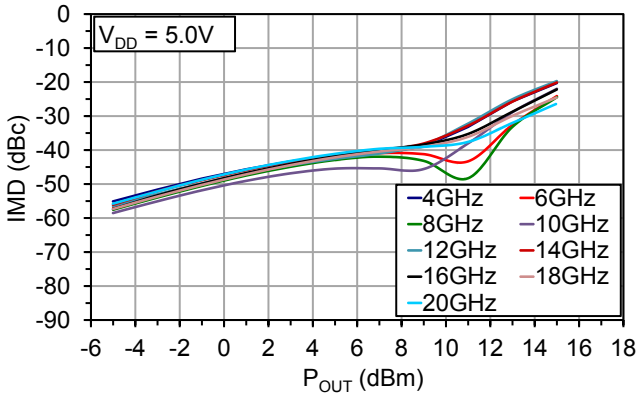
Typical Performance, RF Probe

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

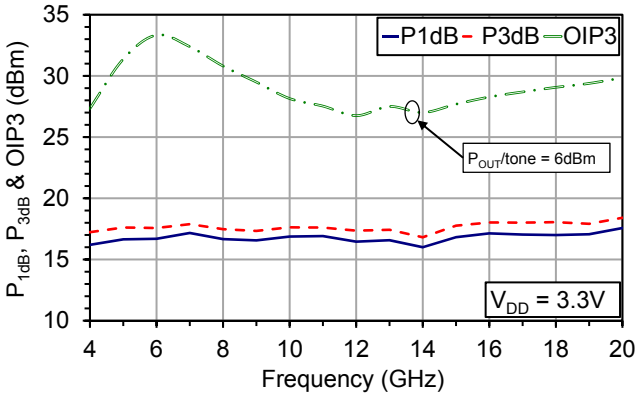
IMD Sweep, V_{DD} = 3.3V



IMD Sweep, V_{DD} = 5.0V

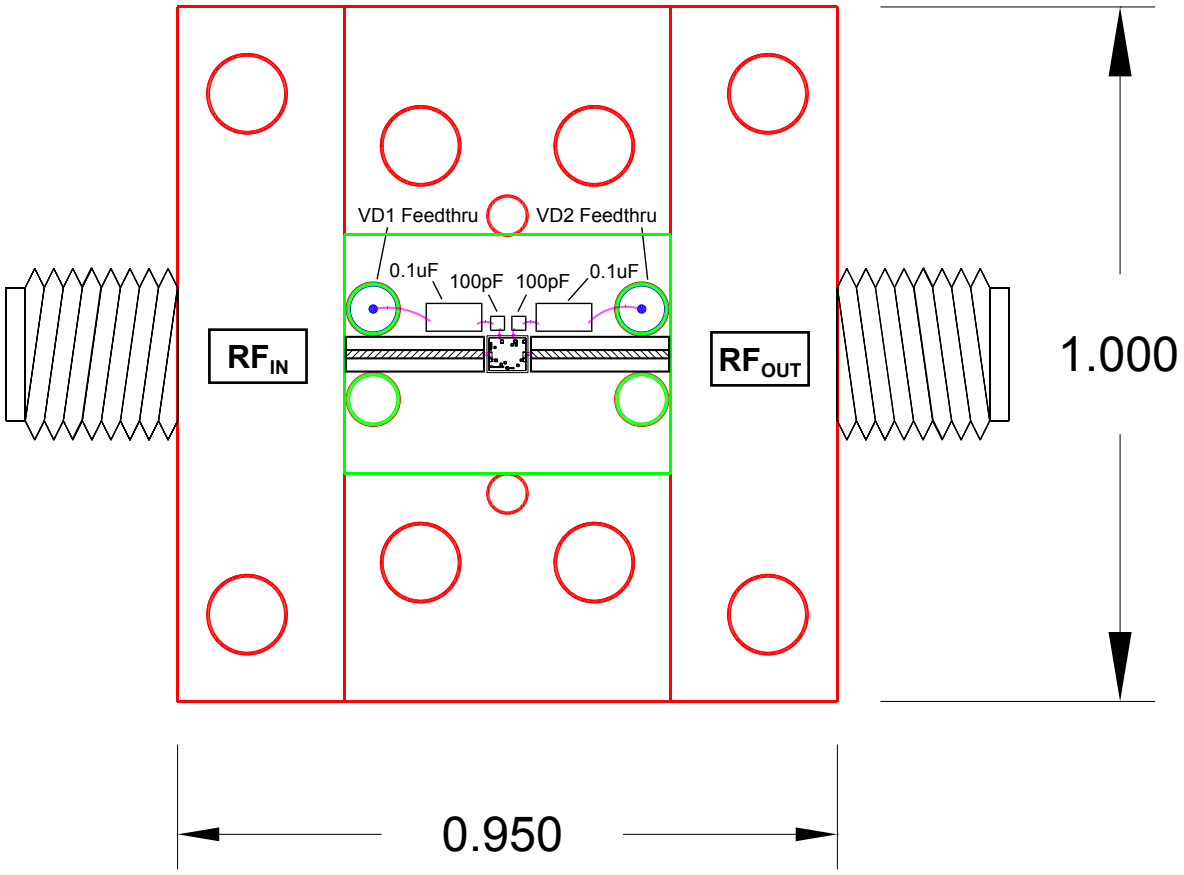


Power and OIP3, V_{DD} = 3.3V



Connectorized Test Fixture

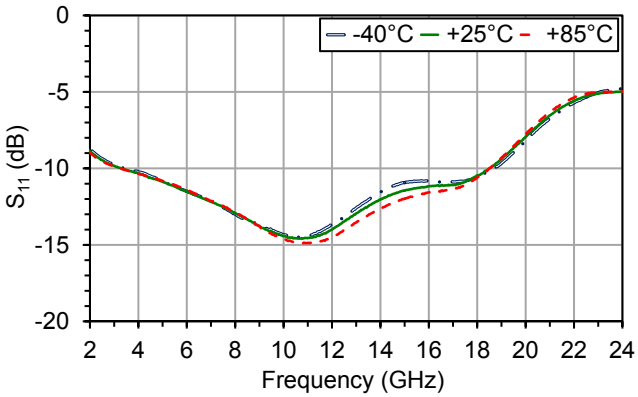
With SMK 2.92mm Connectors



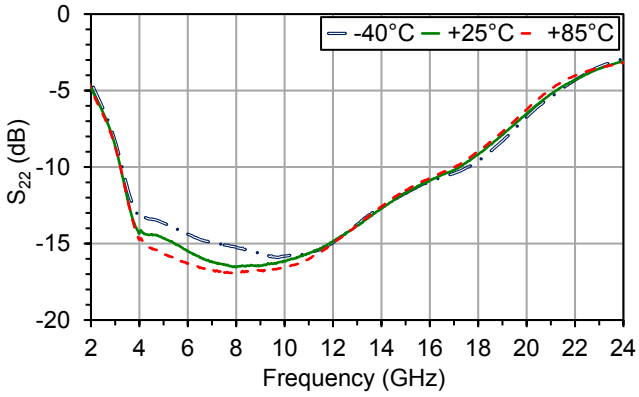
Typical Performance, Connectorized Test Fixture

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

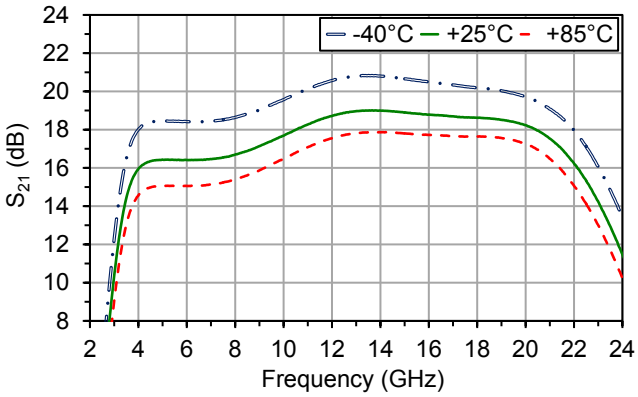
S_{11} Over Temperature



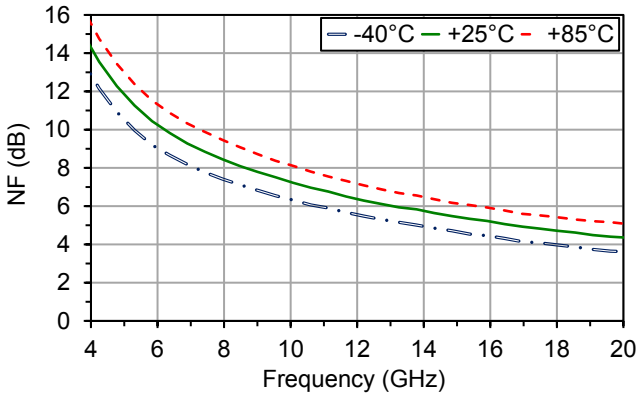
S_{22} Over Temperature



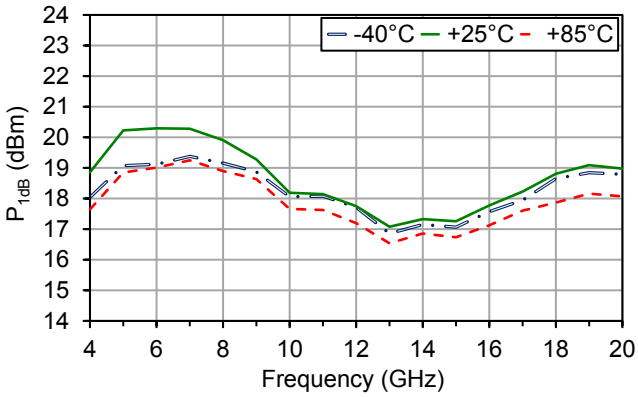
S_{21} Over Temperature



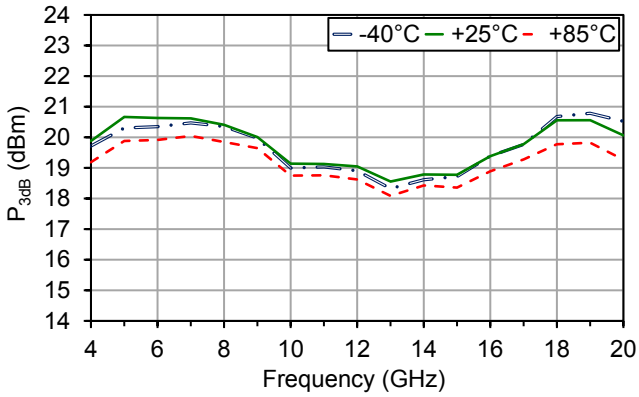
NF Over Temperature



P_{1dB} Over Temperature



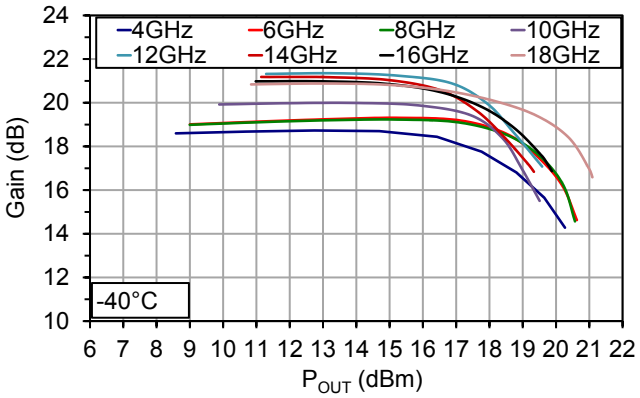
P_{3dB} Over Temperature



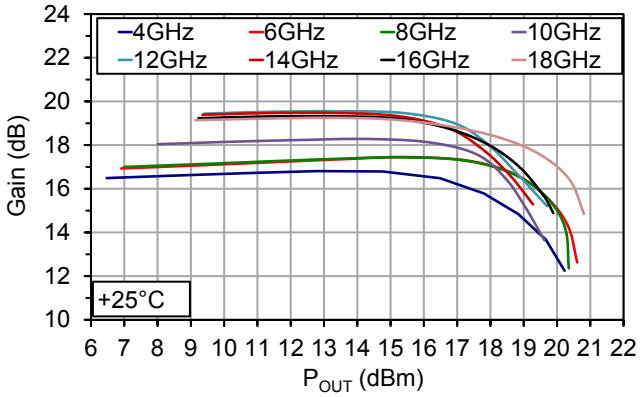
Typical Performance, Connectorized Test Fixture

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

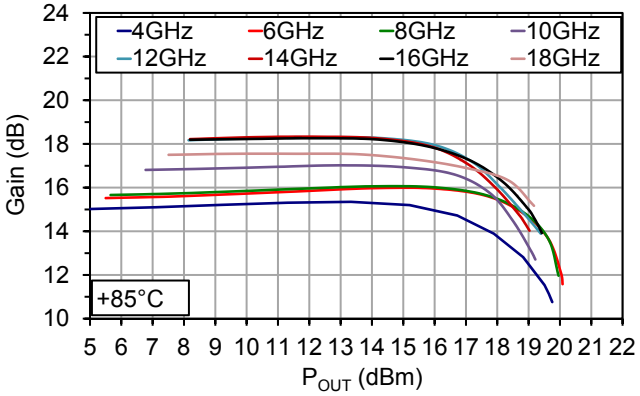
Power Sweep, -40°C



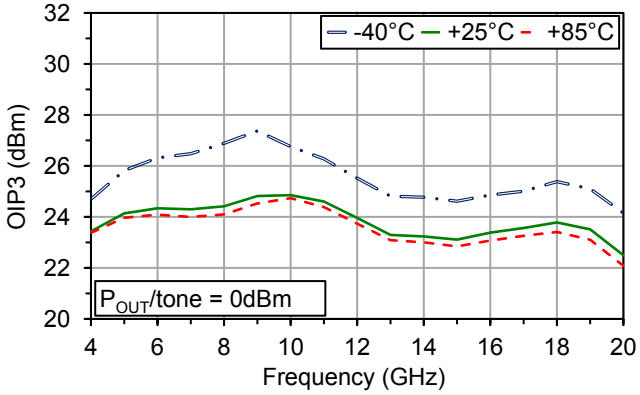
Power Sweep, +25°C



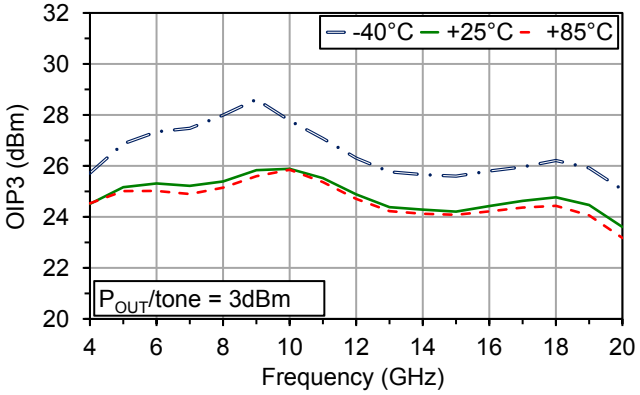
Power Sweep, +85°C



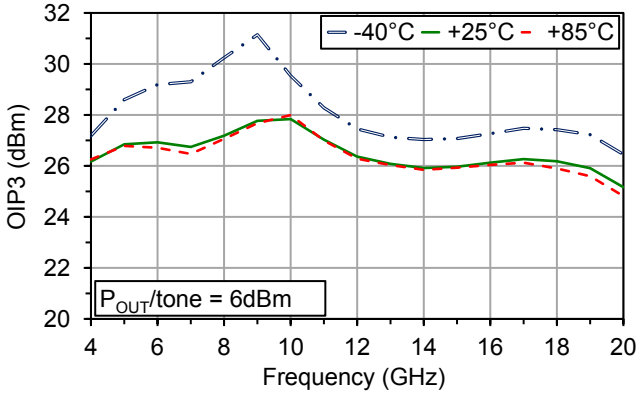
OIP3, P_{OUT}/tone = 0dBm



OIP3, P_{OUT}/tone = 3dBm



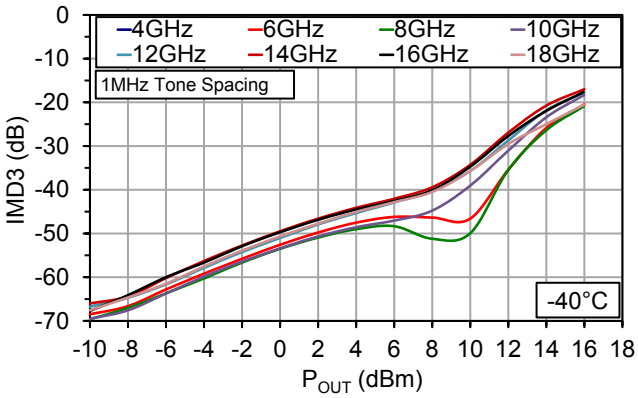
OIP3, P_{OUT}/tone = 6dBm



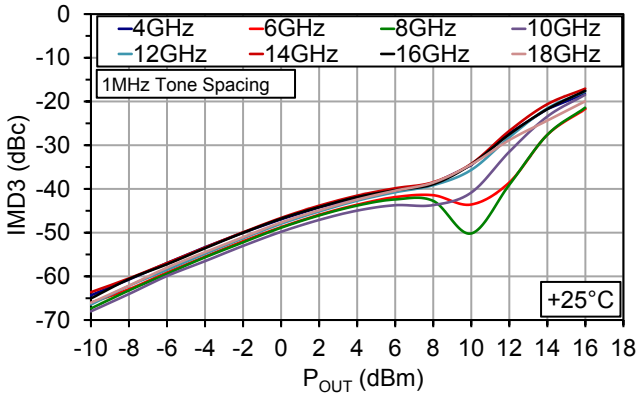
Typical Performance, Connectorized Test Fixture

V_{D1} = V_{D2} = 5V, I_{DD} = 105mA, T_A = 25°C unless otherwise noted

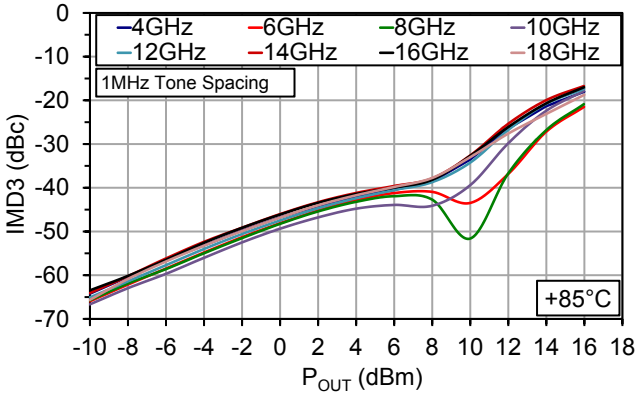
IMD3 Sweep, -40°C



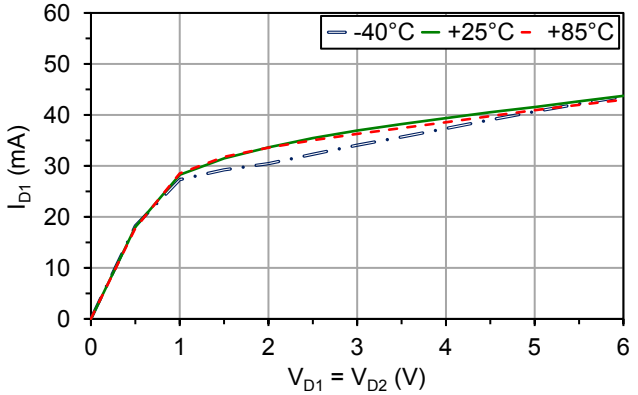
IMD3 Sweep, +25°C



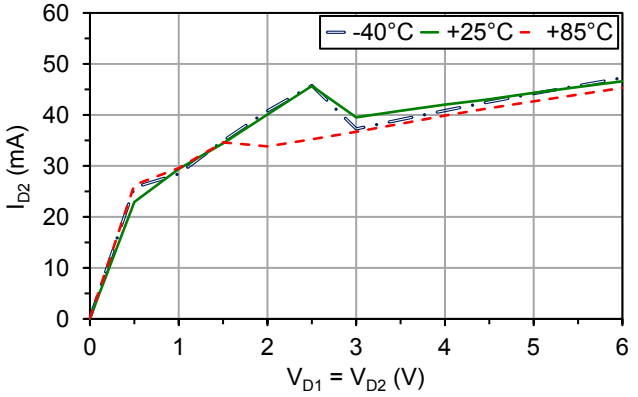
Power Sweep, +85°C



DC, I_{D1}



DC, I_{D2}



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).

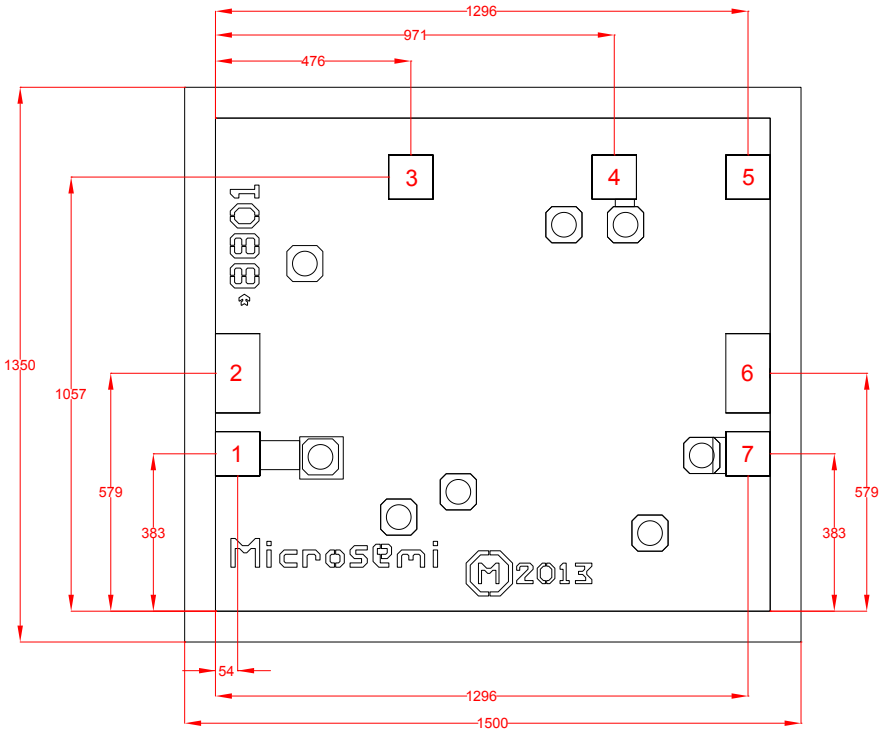


Table 3: Pad Descriptions

Pad #	Description	Pad Dimensions (µm)
1, 4, 7	Ground	100 x 100
2	RF_{IN}, Pad is AC coupled	100 x 190
6	RF_{OUT}, Pad is AC coupled	100 x 190
3	V_{D1}	100 x 100
5	V_{D2}	100 x 100

Biasing

MMA002AA is self-biased. Apply 5V to V_{D1} and V_{D2}. Bias sequence does not matter.

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