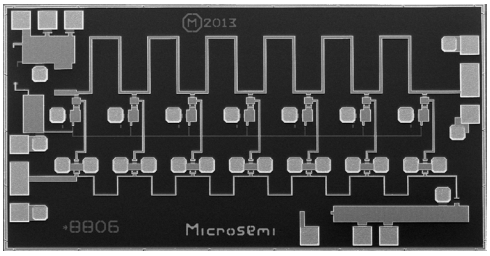
DC-22GHz, 16dB Gain Low-Noise Wideband Distributed Amplifier

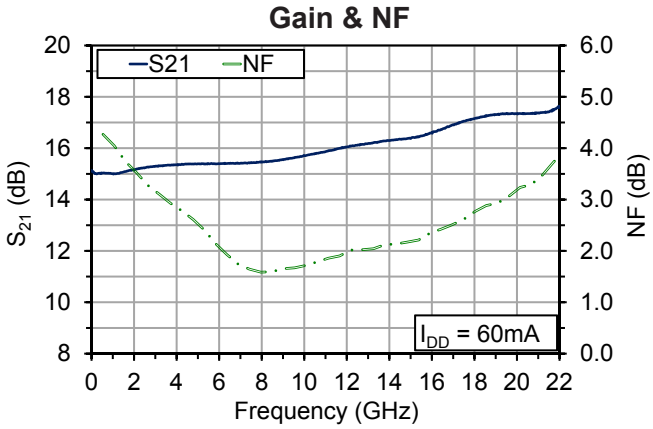
Features

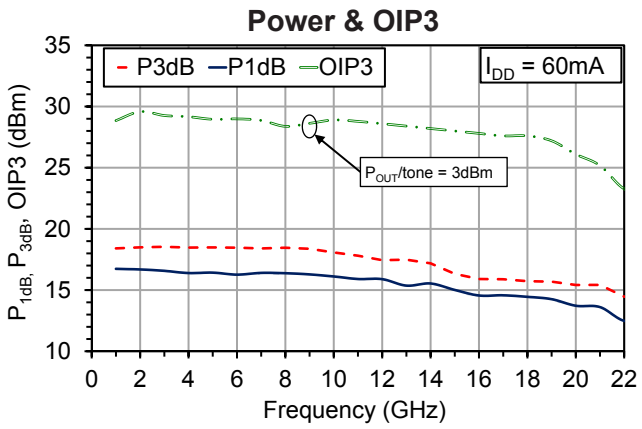
- Excellent combination of wide bandwidth, low noise and high associated gain
- 1.7dB NF with >15.5dB gain at 10GHz
- Output IP3 ~26-29dBm
- Input and output matched to 50Ω
- 100% DC and RF tested
- Chip size: 2.82mm x 1.50mm x 0.1mm



Applications

- Instrumentation
- Electronic warfare
- Microwave communications
- Radar





Typical Performance (CW, Typical Device, RF Probe): T_A = 25°C, V_{DD} = 8V, I_{DD} = 60mA[1]

Parameter	DC - 6GHz	6 - 18GHz	18 - 22GHz	Units
Small Signal Gain	15	16	17	dB
Noise Figure	3.0	2.0	3.2	dB
Output Return Loss	15	15	12	dB
Output Power, P_{1dB}	16	15	13	dBm
Output Power P_{3dB}	18	17	15	dBm
Output IP3	29	28	25	dBm

[1] Adjust V_{GG} to set I_{DD} = 60mA, typical value is -0.5V. Recommend I_{DD} ~ 45mA for improved stability down to -55°C

Table 1: Absolute Maximum Ratings, Not Simultaneous

Parameter	Rating	Units
Drain Voltage (V_{DD})	+9	V
Gate Voltage (V_{GG})	-2 to 0	V
Input Power (P_{IN})	20	dBm
Channel Temperature (T_C)	150[2]	°C
Operating Ambient Temperature (T_A)	-55 to +85	°C
Storage Temperature	-65 to +150	°C
Thermal Resistance, Channel to Die Backside (R_{TH})	40	°C/W

[2] MTTF > 10^8 hours at T_C = 150°C

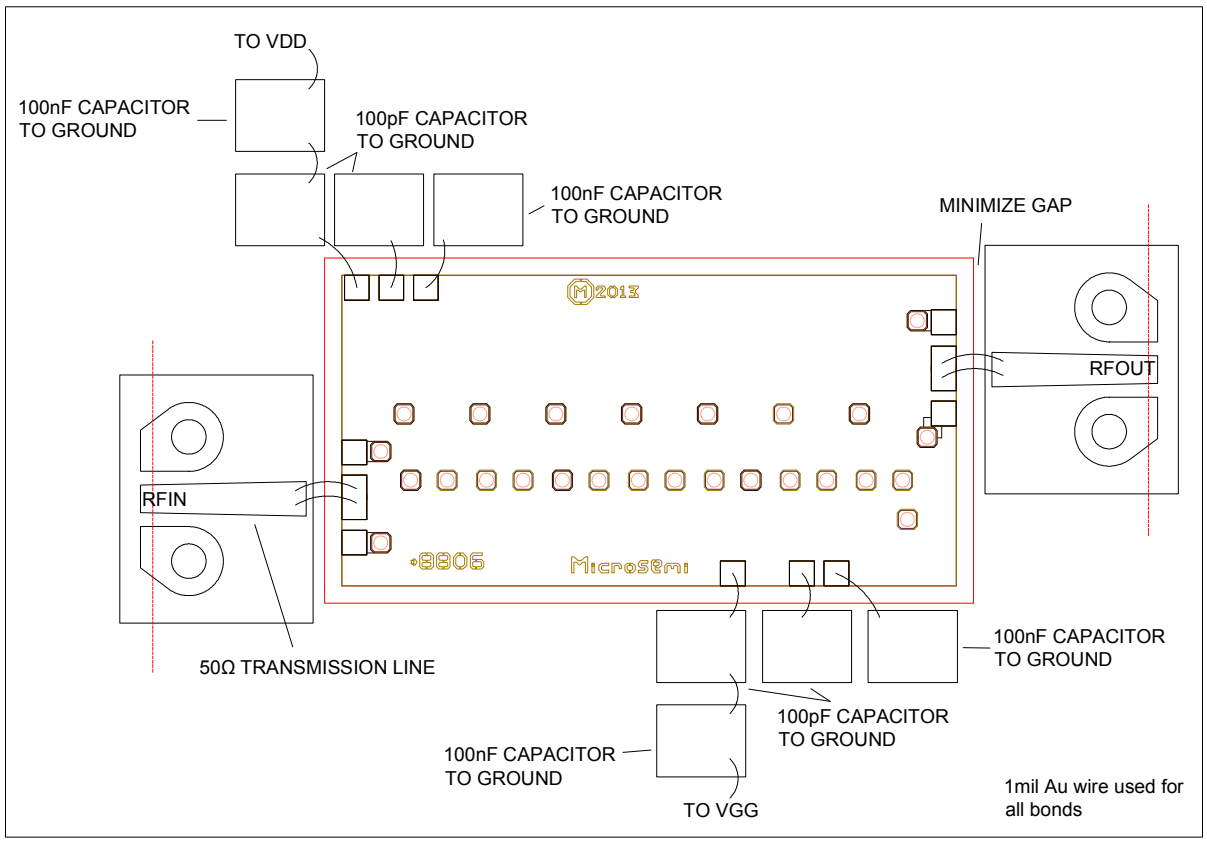
Caution, ESD Sensitive Device

Table 2: Specifications (CW, 100% Test): T_A = 25°C, V_{DD} = 8V, I_{DD} = 60mA[3]

Parameter	Frequency	Min	Typ	Max	Units
Small Signal Gain	20GHz	14.5	17	-	dB
Output Power, P_{1dB}	20GHz	12	14	-	dBm

[3] Adjust V_{GG} to get I_{DD} = 60mA, typical value is -0.5V

RF Probe Measurement Set-Up With Reference Planes[4]



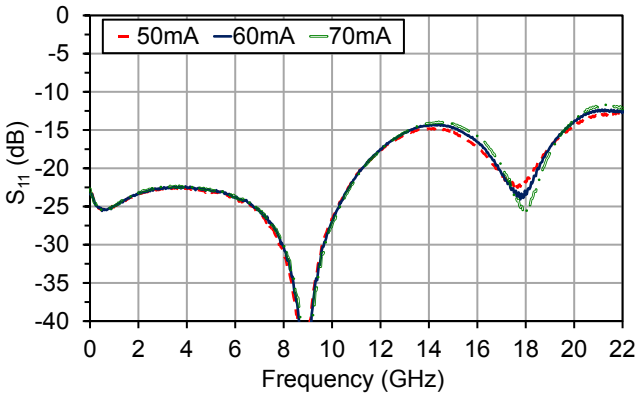
External DC blocks maybe required, refer to Table 3 for more information.

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

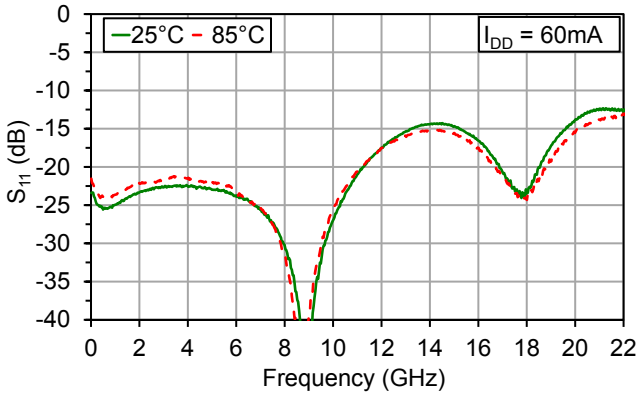
Typical Performance, RF Probe

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

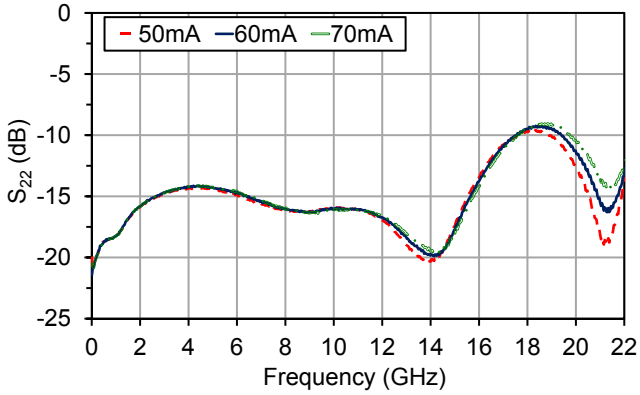
S_{11} Over Bias Current



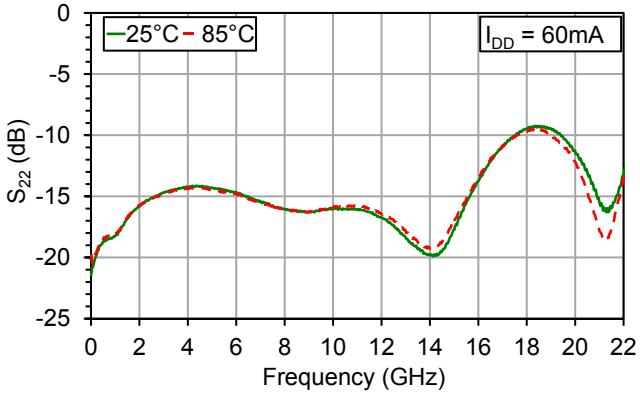
S_{11} Over Temperature



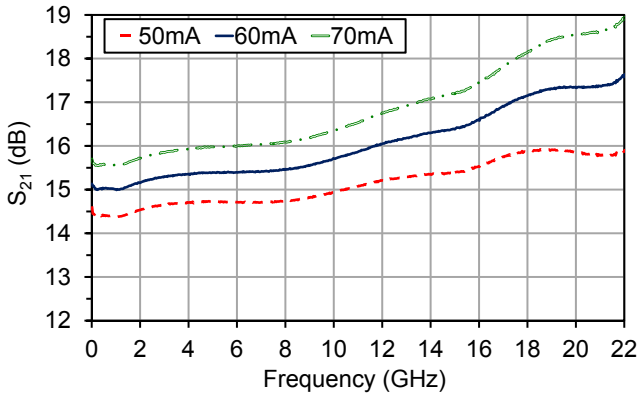
S_{22} Over Bias Current



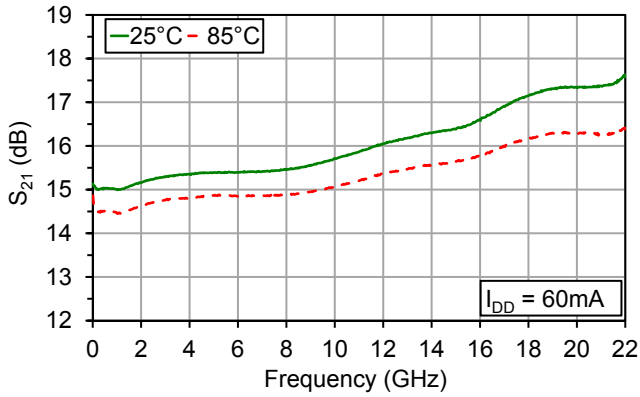
S_{22} Over Temperature



S_{21} Over Bias Current



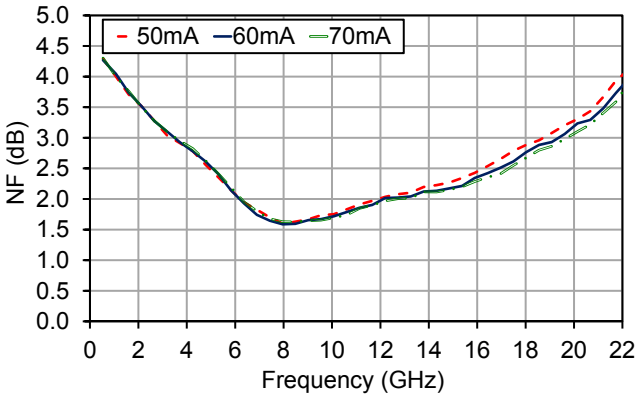
S_{21} Over Temperature



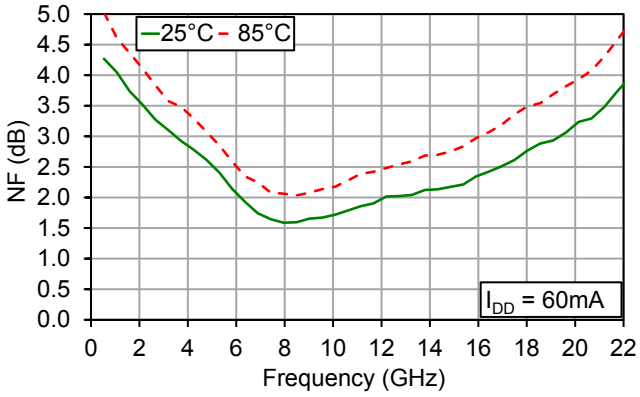
Typical Performance, RF Probe

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

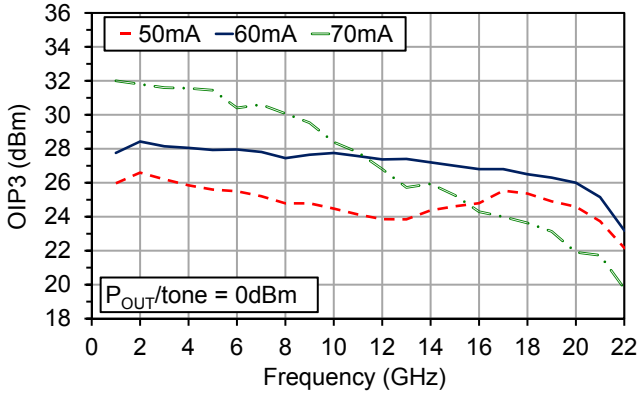
Noise Figure Over Bias Current



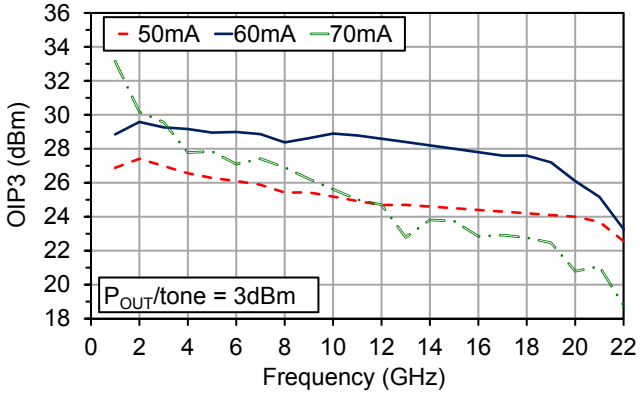
Noise Figure Over Temperature



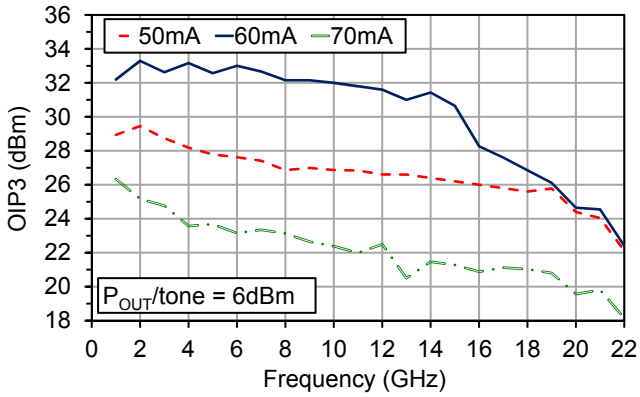
OIP3 Over Bias Current, 0dBm/tone



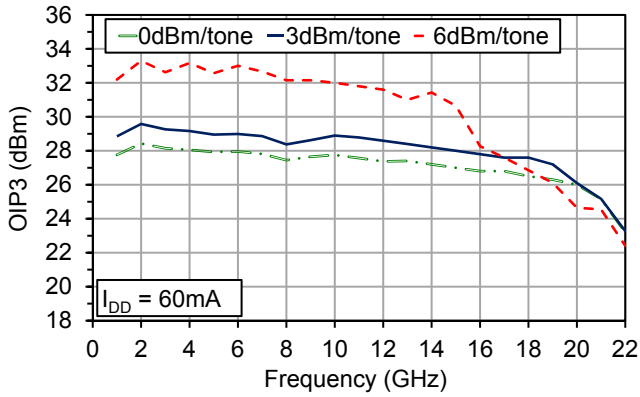
OIP3 Over Bias Current, 3dBm/tone



OIP3 Over Bias Current, 6dBm/tone



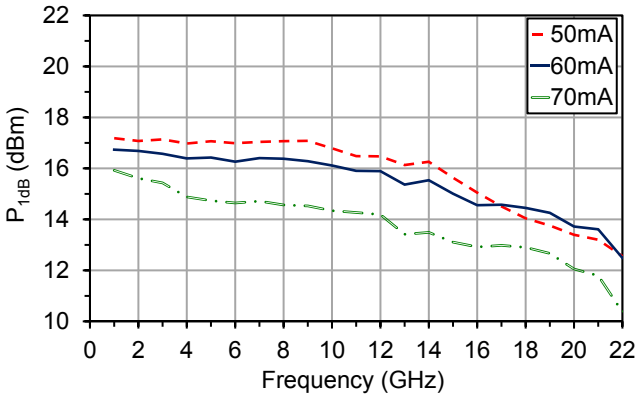
OIP3 Over Output Power Per Tone



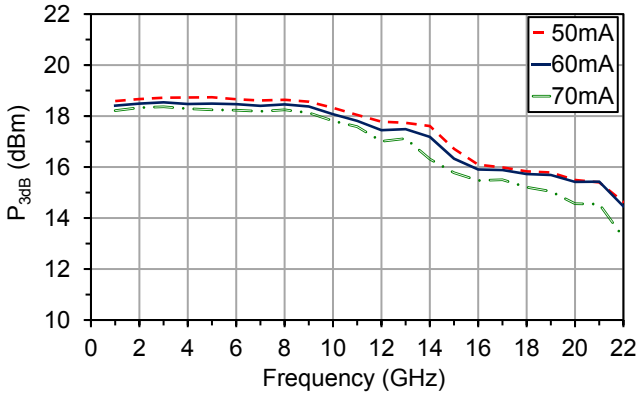
Typical Performance, RF Probe

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

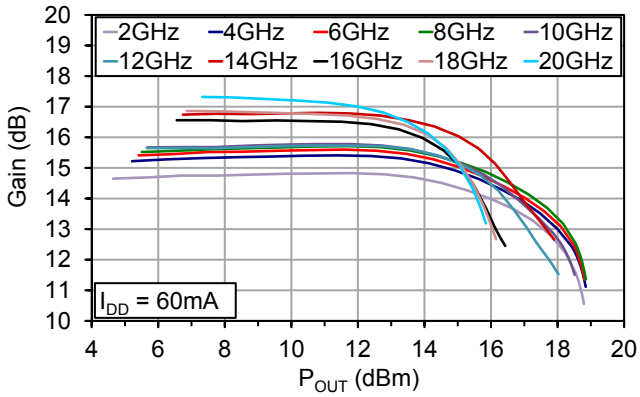
P_{1dB} Over Bias Current



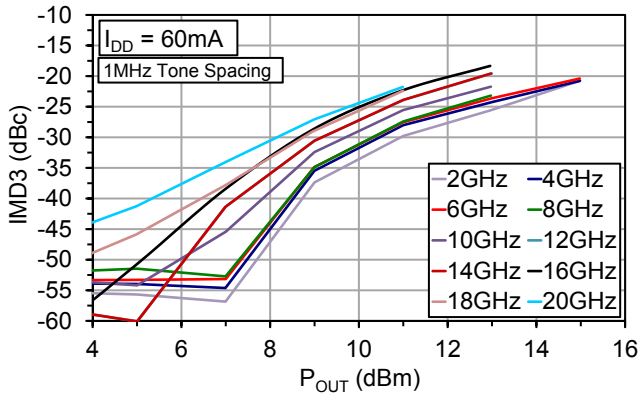
P_{3dB} Over Bias Current



Power Sweep

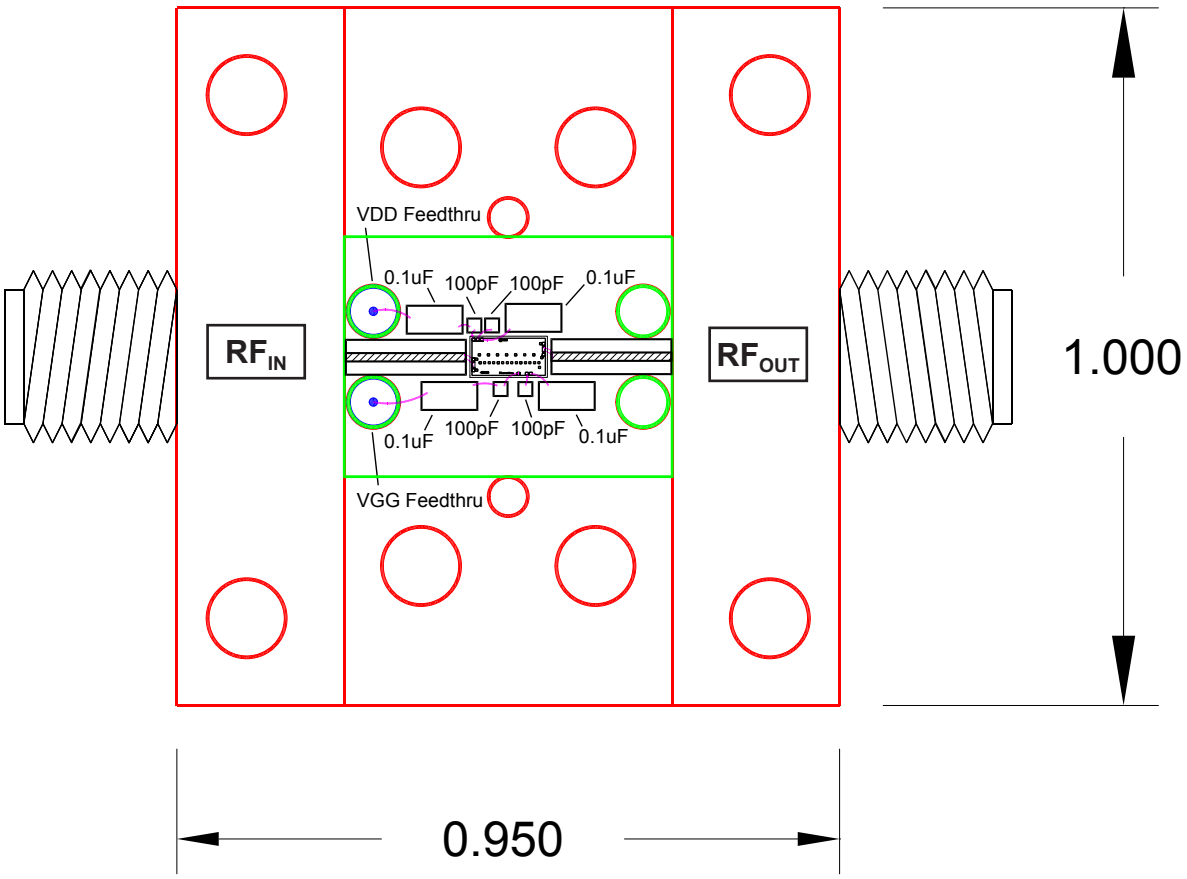


IMD3 Sweep



Connectorized Test Fixture

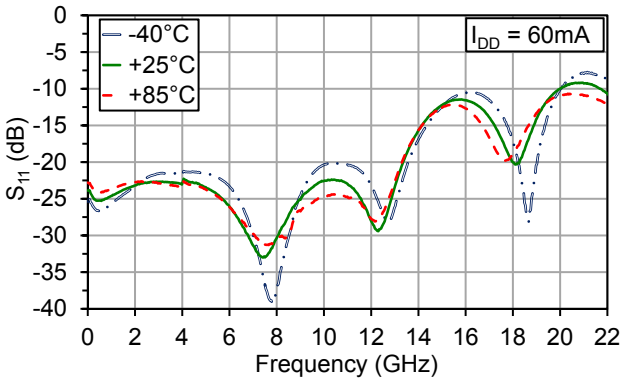
With SMK 2.92mm Connectors



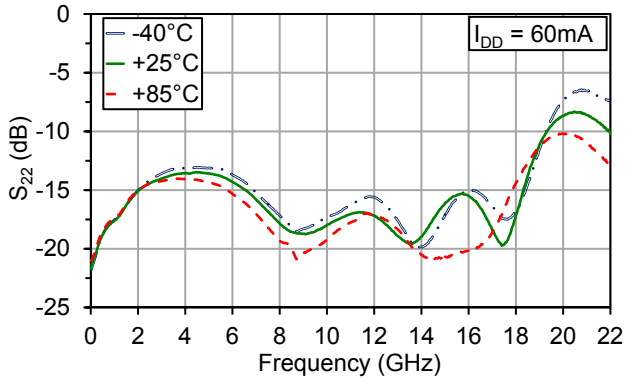
Typical Performance, Connectorized Test Fixture

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

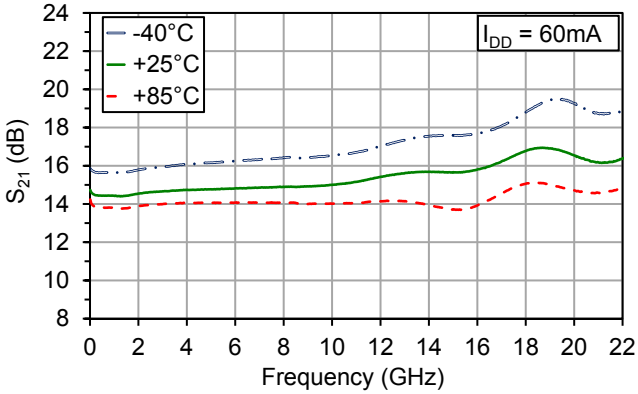
S_{11} Over Temperature



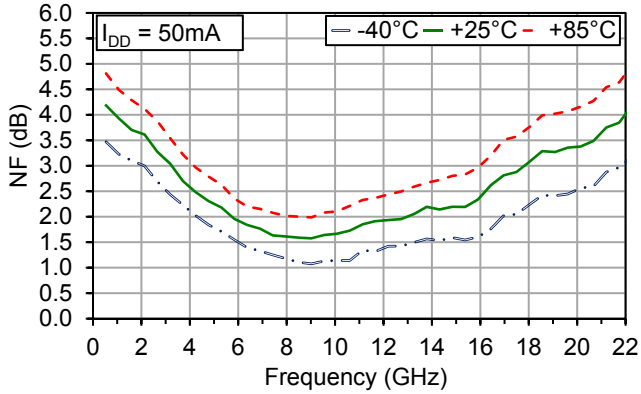
S_{22} Over Temperature



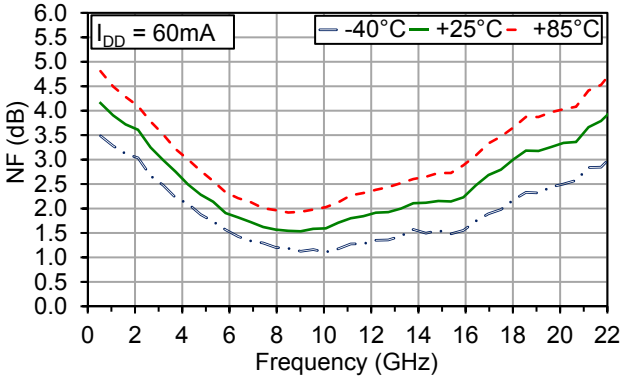
S_{21} Over Temperature



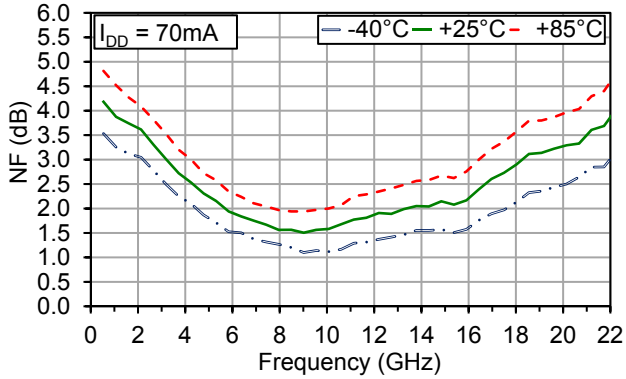
NF Over Temperature, I_{DQ} = 50mA



NF Over Temperature, I_{DQ} = 60mA



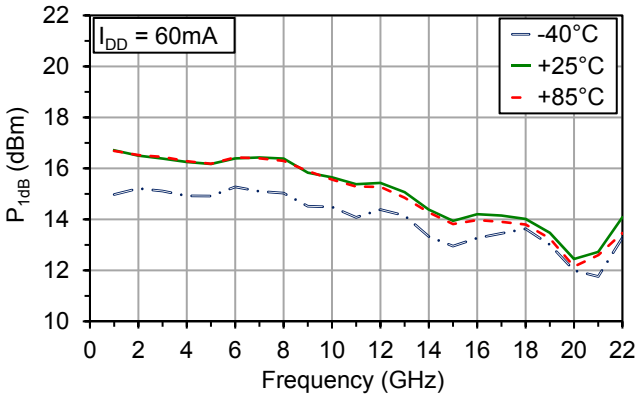
NF Over Temperature, I_{DQ} = 70mA



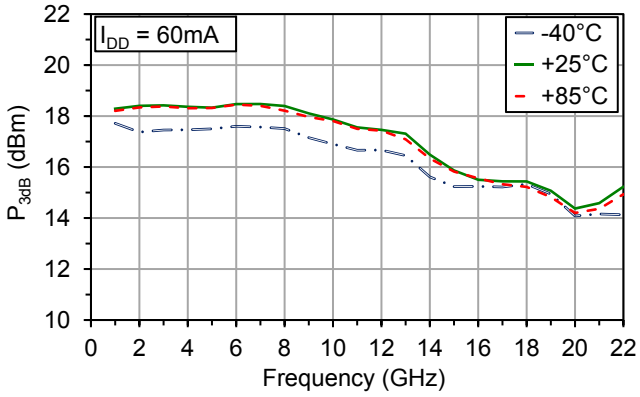
Typical Performance, Connectorized Test Fixture

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

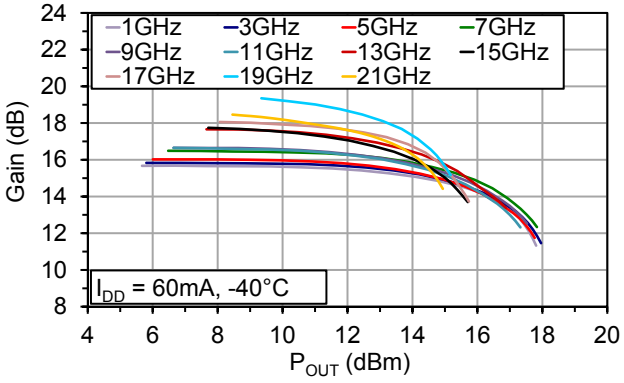
P_{1dB} Over Temperature



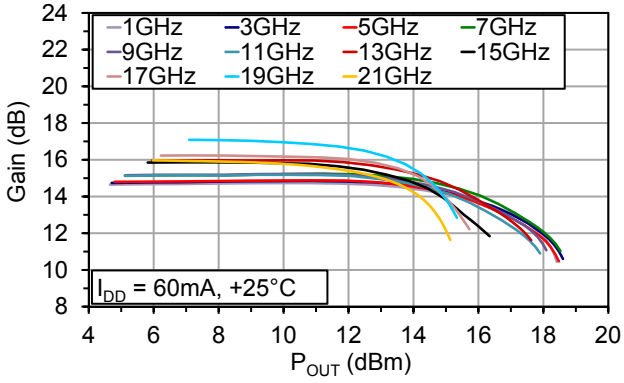
P_{3dB} Over Temperature



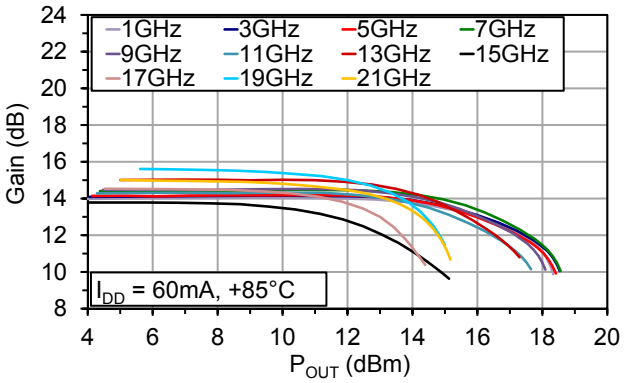
Power Sweep, -40°C



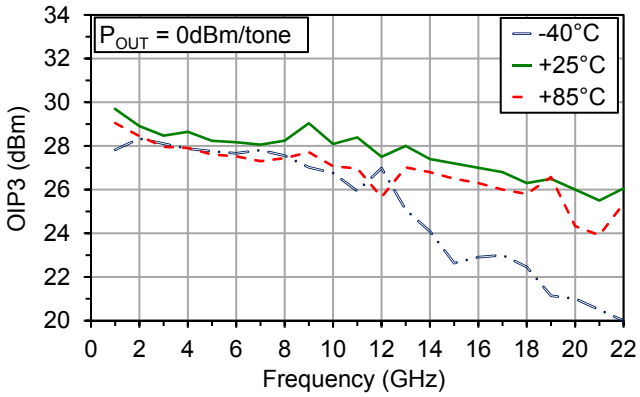
Power Sweep, +25°C



Power Sweep, +85°C



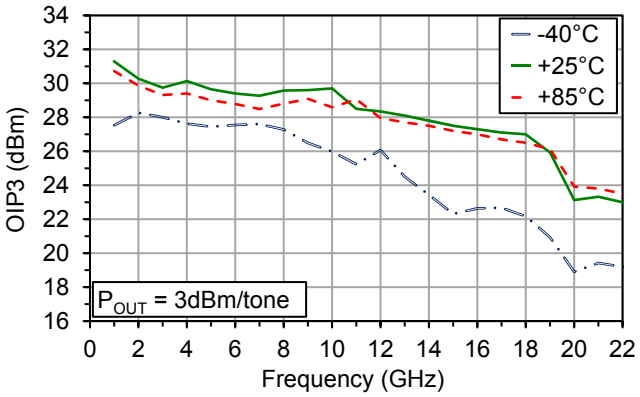
OIP3 Over Temperature, 0dBm/tone



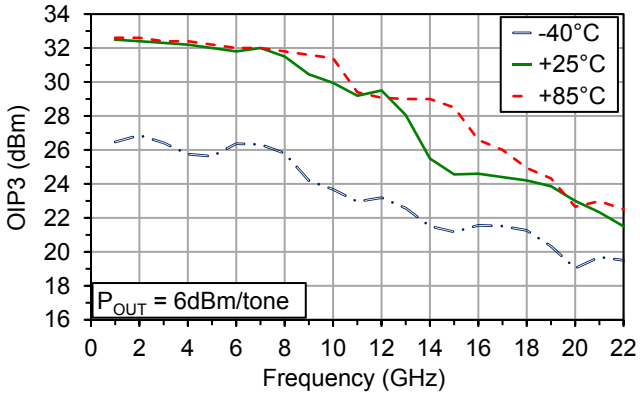
Typical Performance, Connectorized Test Fixture

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

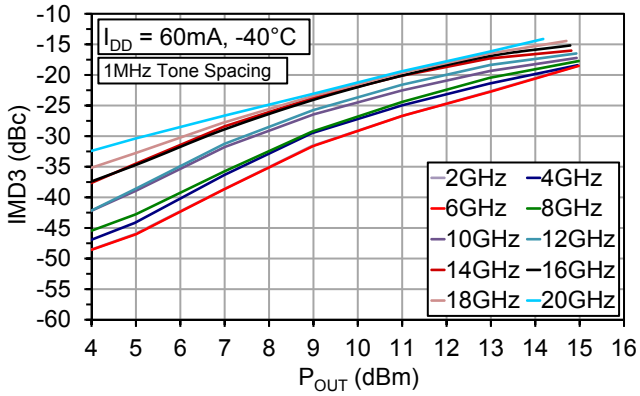
OIP3 Over Temperature, 3dBm/tone



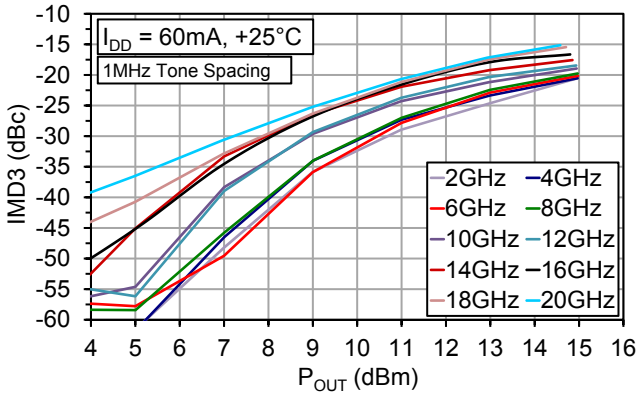
OIP3 Over Temperature, 6dBm/tone



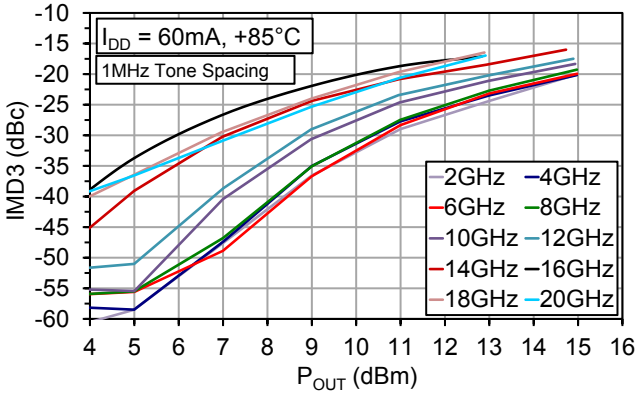
IMD Sweep, -40°C



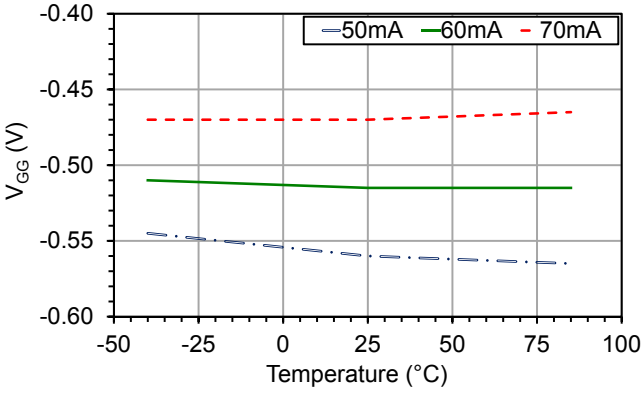
IMD Sweep, +25°C



IMD Sweep, +85°C



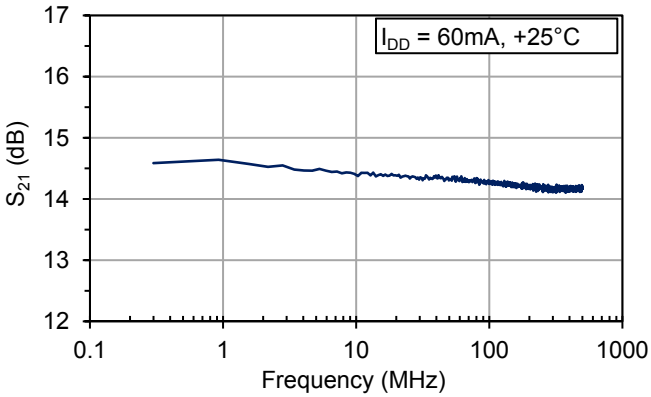
V_{GG} Over Temperature



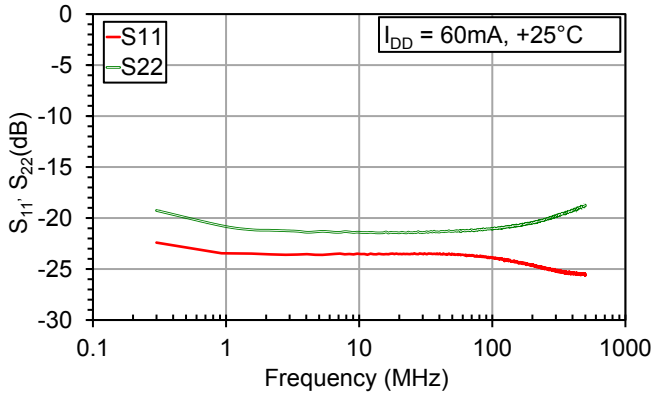
Typical Performance, Connectorized Test Fixture

V_{DS} = 8V, I_{DQ} = 60mA, T_A = 25°C unless otherwise noted

Low-Frequency S_{21}



Low-Frequency S_{11}, S_{22}



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).

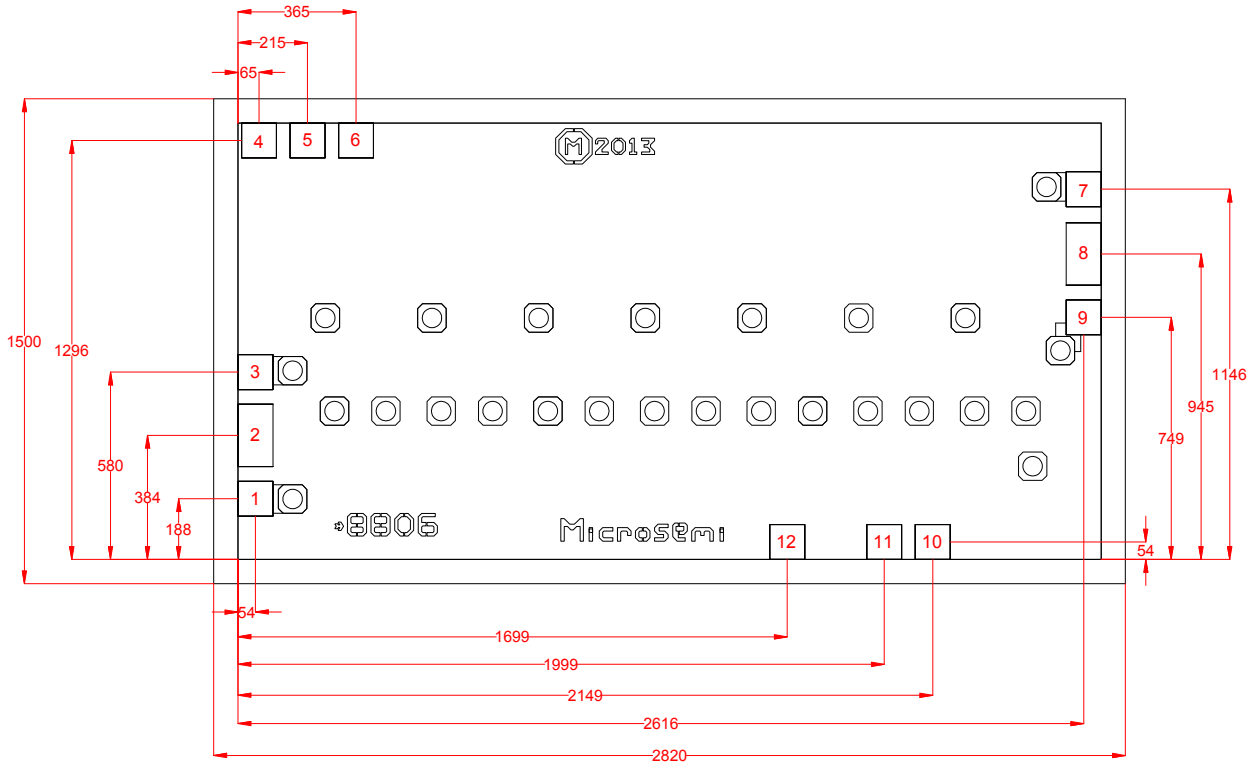


Table 3: Pad Descriptions

Pad #	Description	Pad Dimensions (µm)
1, 3, 7, 9	Ground	100 x 100
2	RF_{IN}, Pad Is DC Coupled. Use External DC block	100 x 190
8	RF_{OUT}, Pad Is DC Coupled. Use External DC Block	100 x 190
4	V_{DD}	100 x 100
12	V_{GG}	100 x 100
5, 6, 10, 11	Low Frequency Terminations	100 x 100
Die Backside	Must be connected to ground	-

Biasing

1. Set V_{GG} = -2V
2. Set V_{DD} = 8V
3. Adjust V_{GG} to set I_{DD}

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