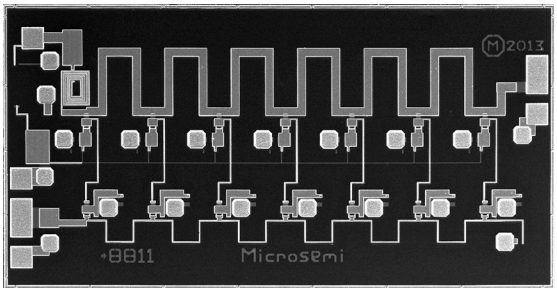
# 2-22GHz, 13dB Gain Low-Noise Wideband Distributed Amplifier

## Features

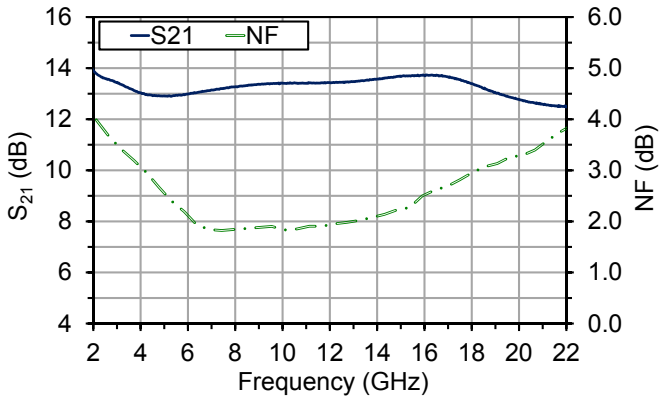
- >15dBm $P_{1dB}$ with 1.8dB NF and 13dB gain at 10GHz
- Gain flatness ~ +/-0.75dB
- <2dB NF from 6-12GHz
- Single supply voltage of +5V @ 50mA
- Input and Output matched to 50Ω
- 1.5mm x 2.82mm x 0.1mm die size



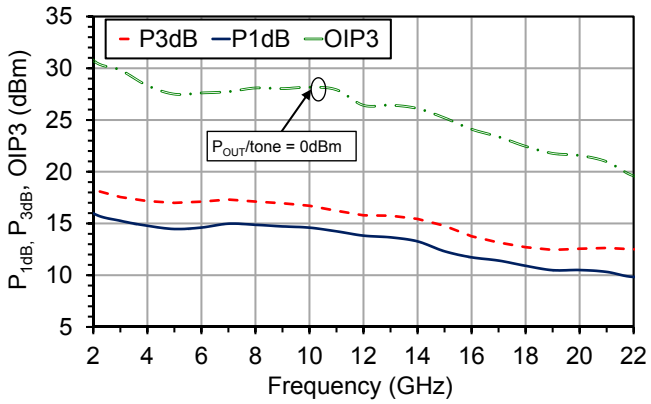

## Applications

- Instrumentation
- Electronic warfare
- Microwave communications
- Radar

**Gain & NF**




**Power & OIP3**




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

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency | 2 | - | 22 | GHz |
| Small Signal Gain | 12.5 | - | 14.0 | dB |
| Noise Figure | 1.8 | 2.5 | 4.0 | dB |
| Output Power, $P_{1dB}$ | 10 | 13 | 16 | dBm |
| Output Power, $P_{3dB}$ | 12 | 15 | 18 | dBm |
| Output IP3 | 19 | 26 | 31 | dBm |
| Drain Current | | 50 | | mA |

**Table 1: Absolute Maximum Ratings, Not Simultaneous**

| Parameter | Rating | Units |
|---|---|---|
| Drain Voltage ($V_D$) | +8 | 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 | 40 | °C/W |

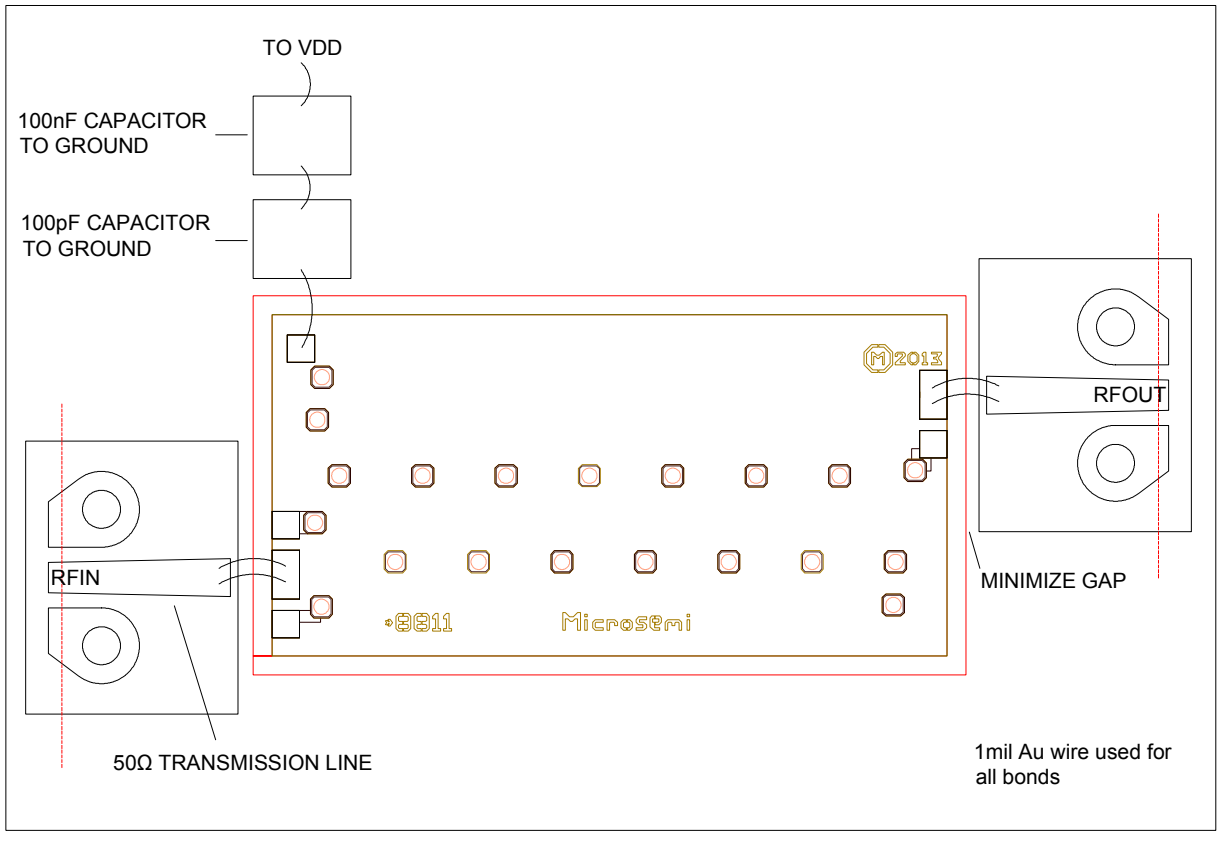
[1] MTTF > $10^8$ hours at $T_C$ = 150°C

Caution, ESD Sensitive Device

**Table 2: Specifications (CW, 100% Test): $T_A$ = 25°C, $V_{DD}$ = 5V, $I_{DD}$ = 65mA**

| Parameter | Frequency | Min | Max | Units |
|---|---|---|---|---|
| $I_{DD}$ | - | - | 90 | mA |
| Small Signal Gain | 20GHz | 11.0 | - | dB |
| Output Power, $P_{1dB}$ | 20GHz | 8.5 | - | dBm |

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

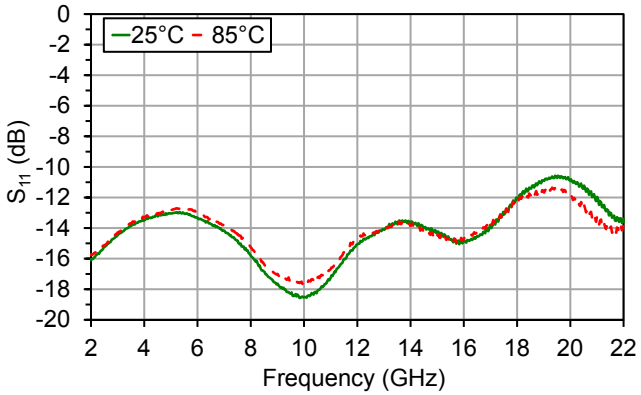



[2] Reference planes are the same for S-parameter files downloadable on www.microsemi.com/mmics

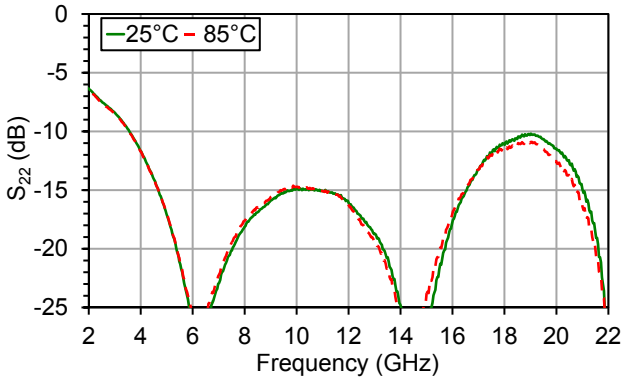
# Typical Performance, RF Probe

$V_{DD}$ = 5V, $I_{DD}$ = 50mA, $T_A$ = 25°C unless otherwise noted

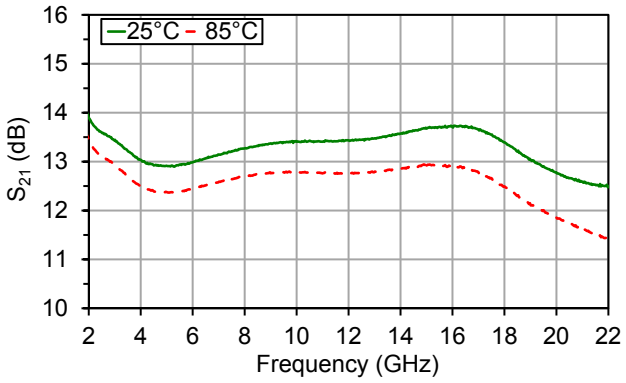
### $S_{11}$ Over Temperature



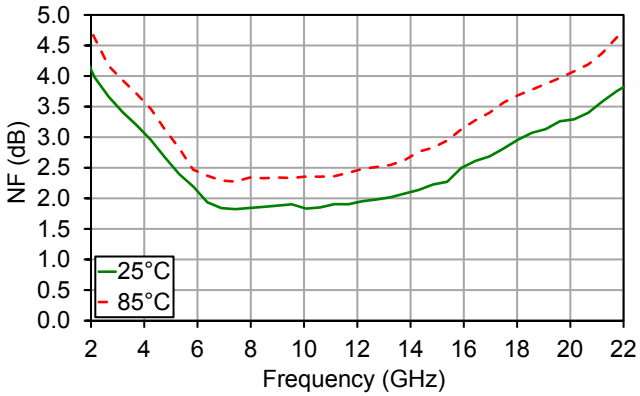

### $S_{22}$ Over Temperature



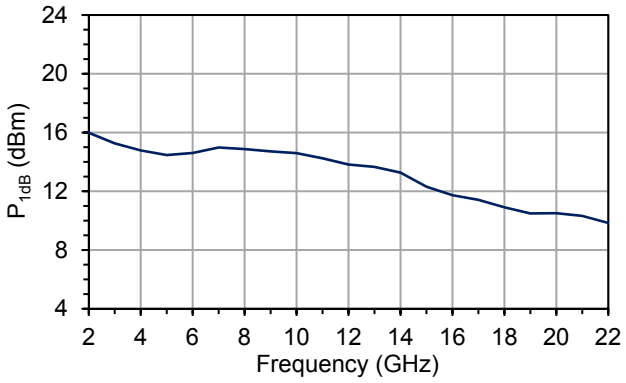

### $S_{21}$ Over Temperature



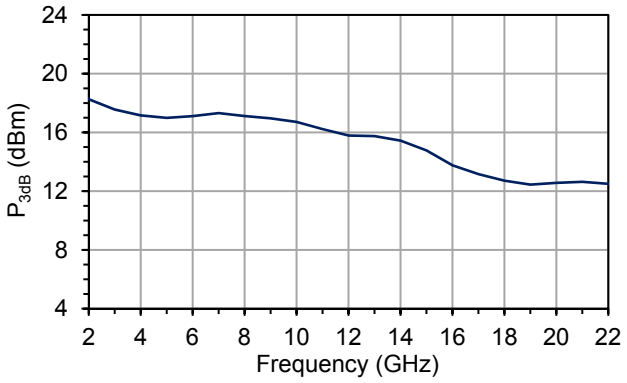

### NF Over Temperature




### $P_{1dB}$ Over Frequency



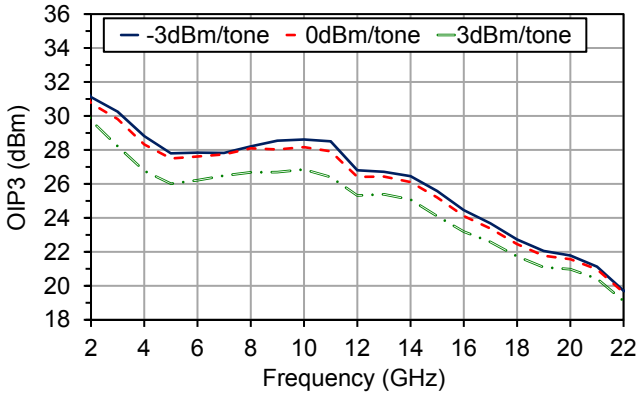

### $P_{3dB}$ Over Frequency



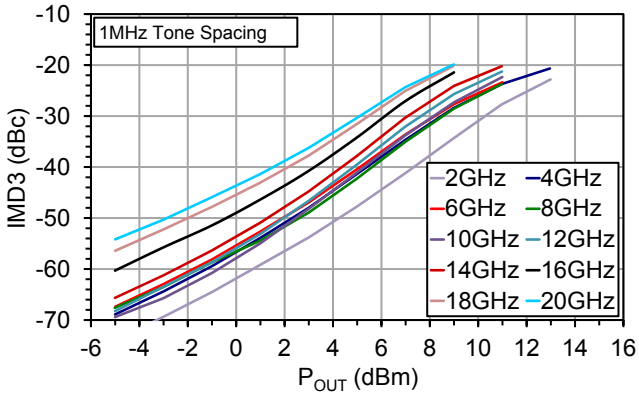
# Typical Performance, RF Probe

$V_{DD}$ = 5V, $I_{DD}$ = 50mA, $T_A$ = 25°C unless otherwise noted

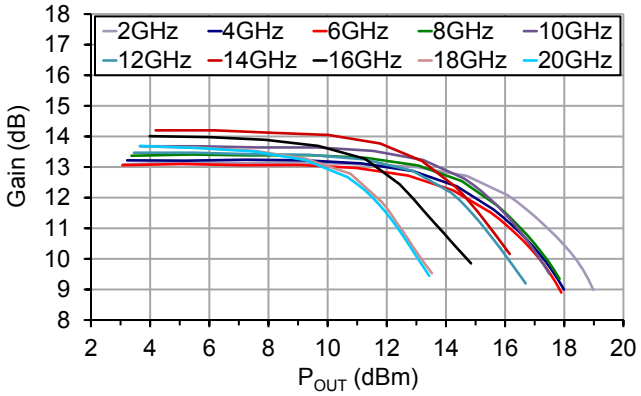
### OIP3 Over Frequency




### IMD Sweep Over Frequency

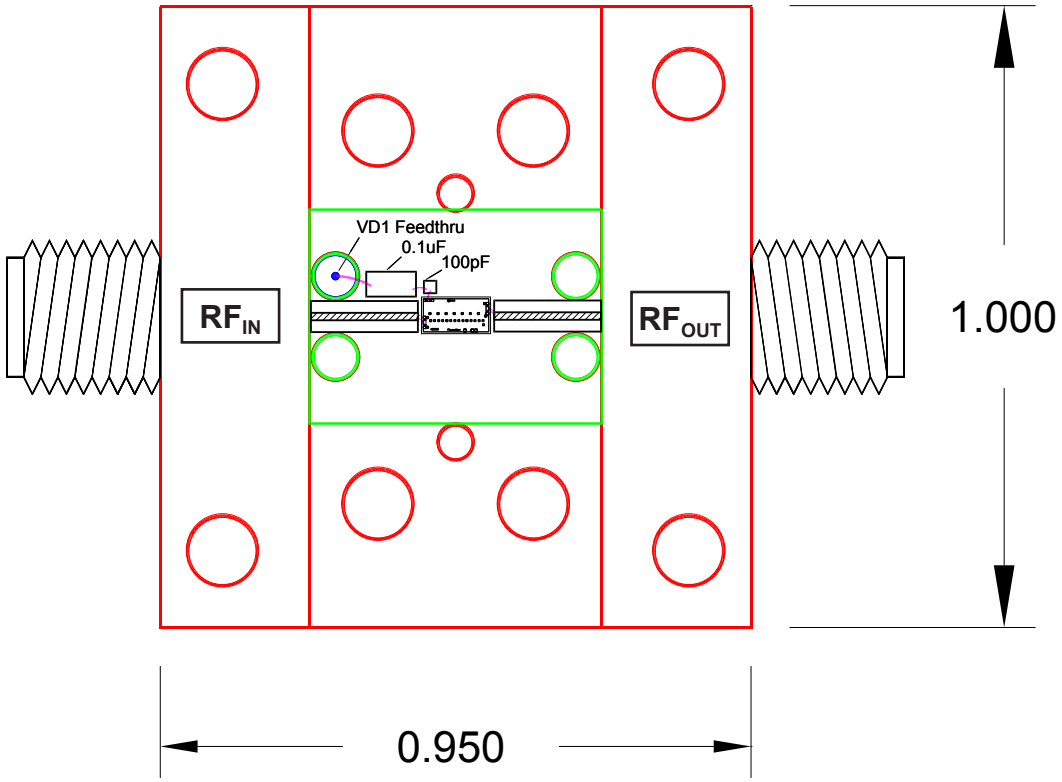



### Power Sweep Over Frequency



## Connectorized Test Fixture

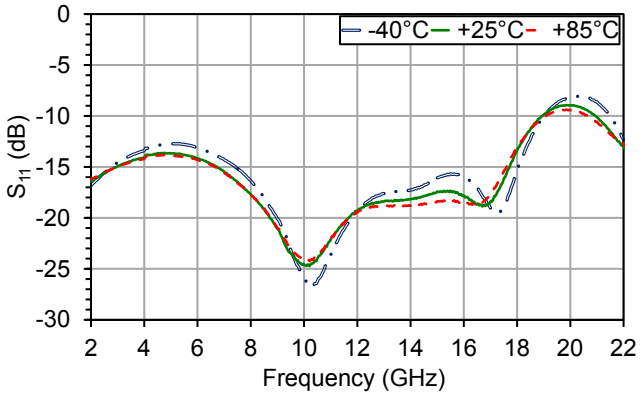
With SMK 2.92mm Connectors



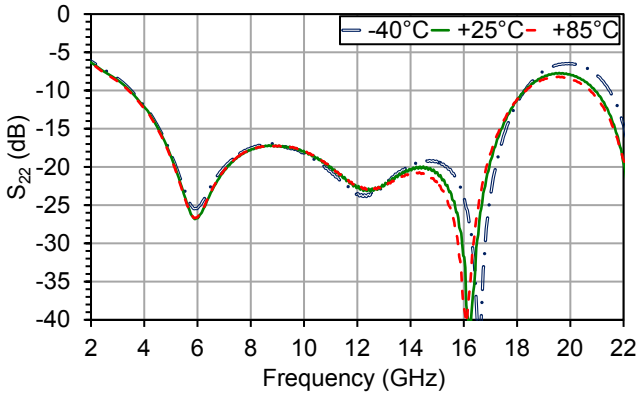
# Typical Performance, Connectorized Test Fixture

$V_{DD}$ = 5V, $I_{DD}$ = 50mA, $T_A$ = 25°C unless otherwise noted

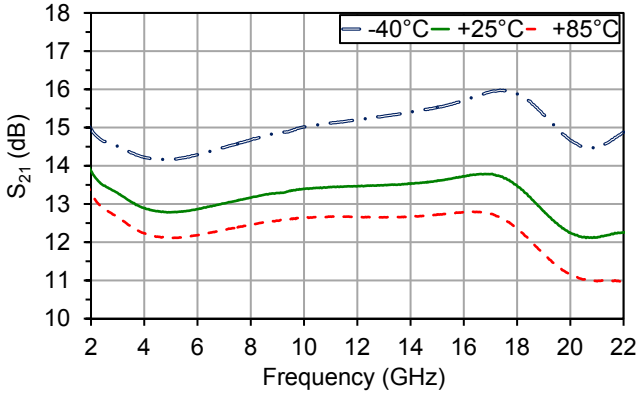
### $S_{11}$ Over Temperature



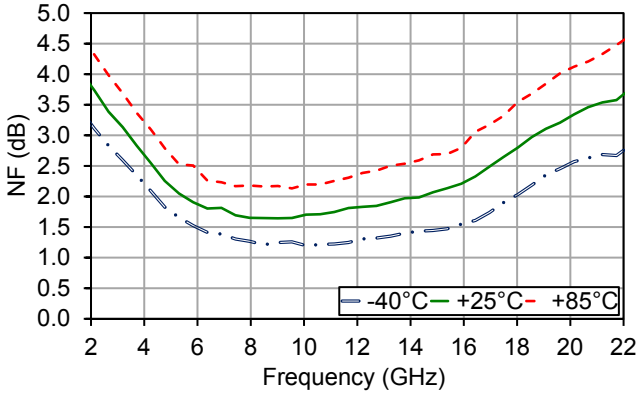

### $S_{22}$ Over Temperature



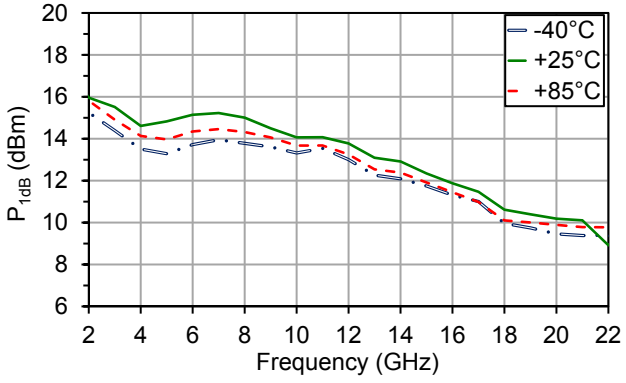

### $S_{21}$ Over Temperature



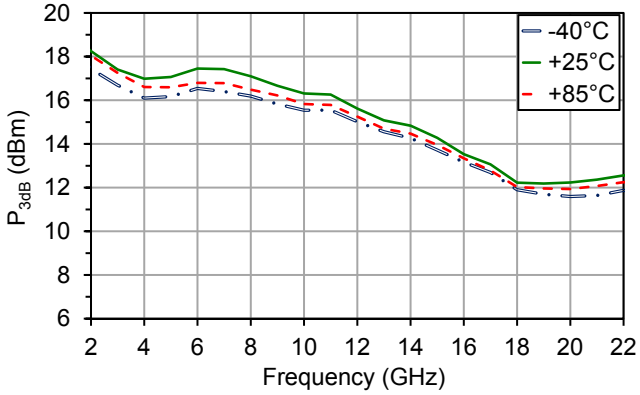

### NF Over Temperature




### $P_{1dB}$ Over Frequency



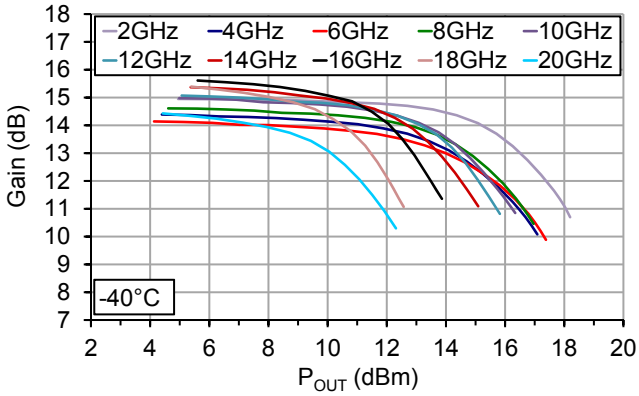

### $P_{3dB}$ Over Frequency



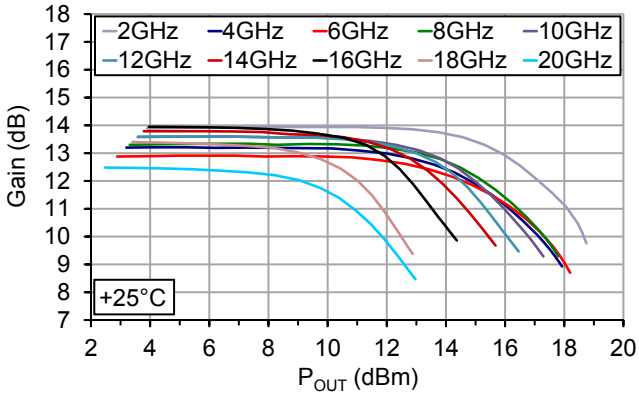
# Typical Performance, Connectorized Test Fixture

$V_{DD}$ = 5V, $I_{DD}$ = 50mA, $T_A$ = 25°C unless otherwise noted

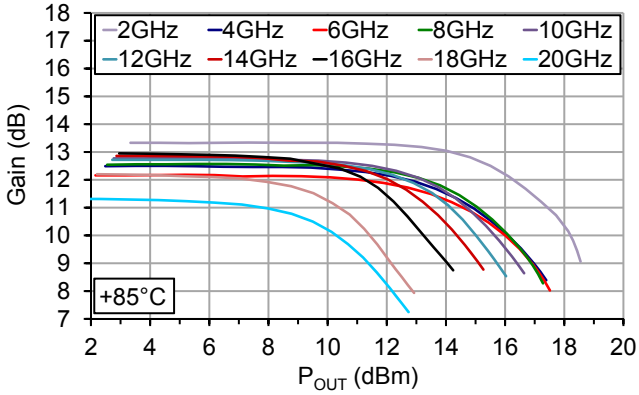
### Power Sweep, -40°C



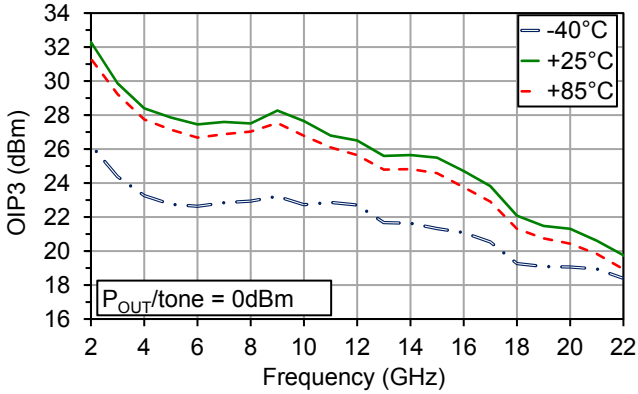

### Power Sweep, +25°C



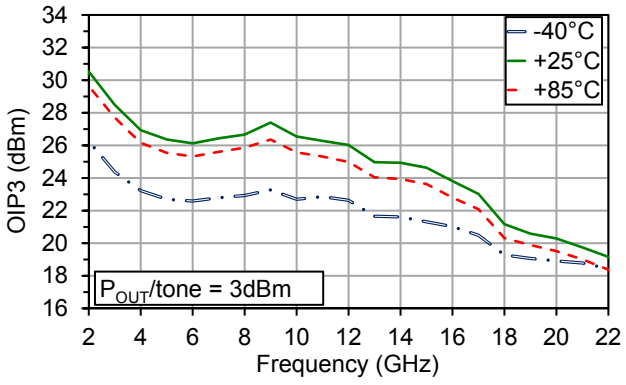

### Power Sweep, +85°C



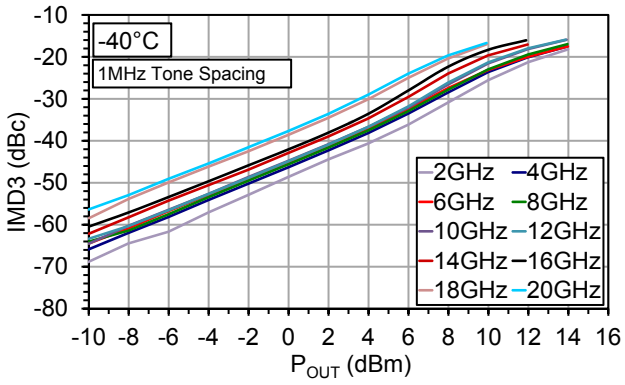

### OIP3, $P_{OUT}$/tone = 0dBm




### OIP3, $P_{OUT}$/tone = 3dBm



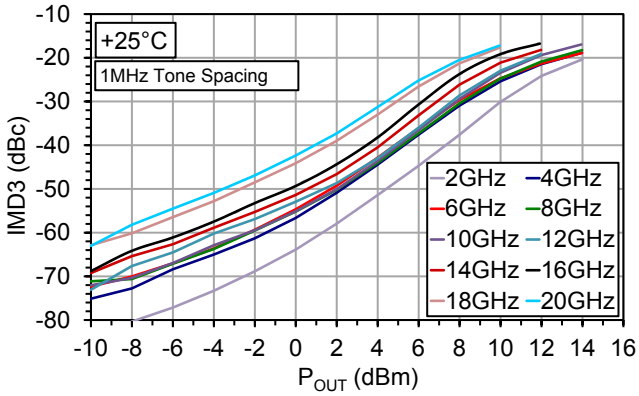

### IMD3 Sweep, -40°C



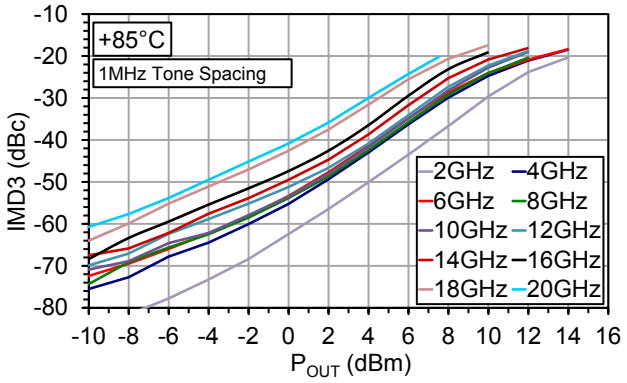
# Typical Performance, Connectorized Test Fixture

$V_{DD}$ = 5V, $I_{DD}$ = 50mA, $T_A$ = 25°C unless otherwise noted

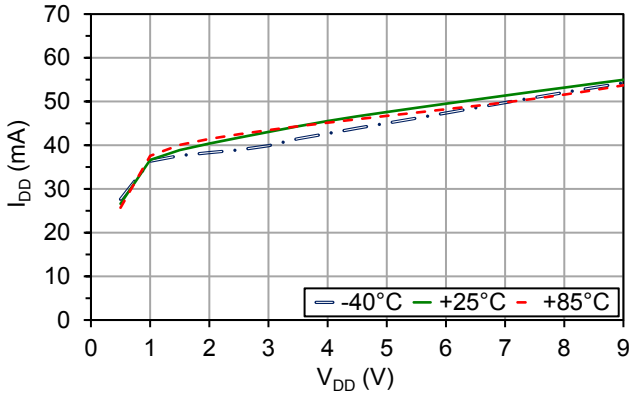
**IMD3 Sweep, +25°C**




**IMD3 Sweep, +85°C**




**DC**



**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).

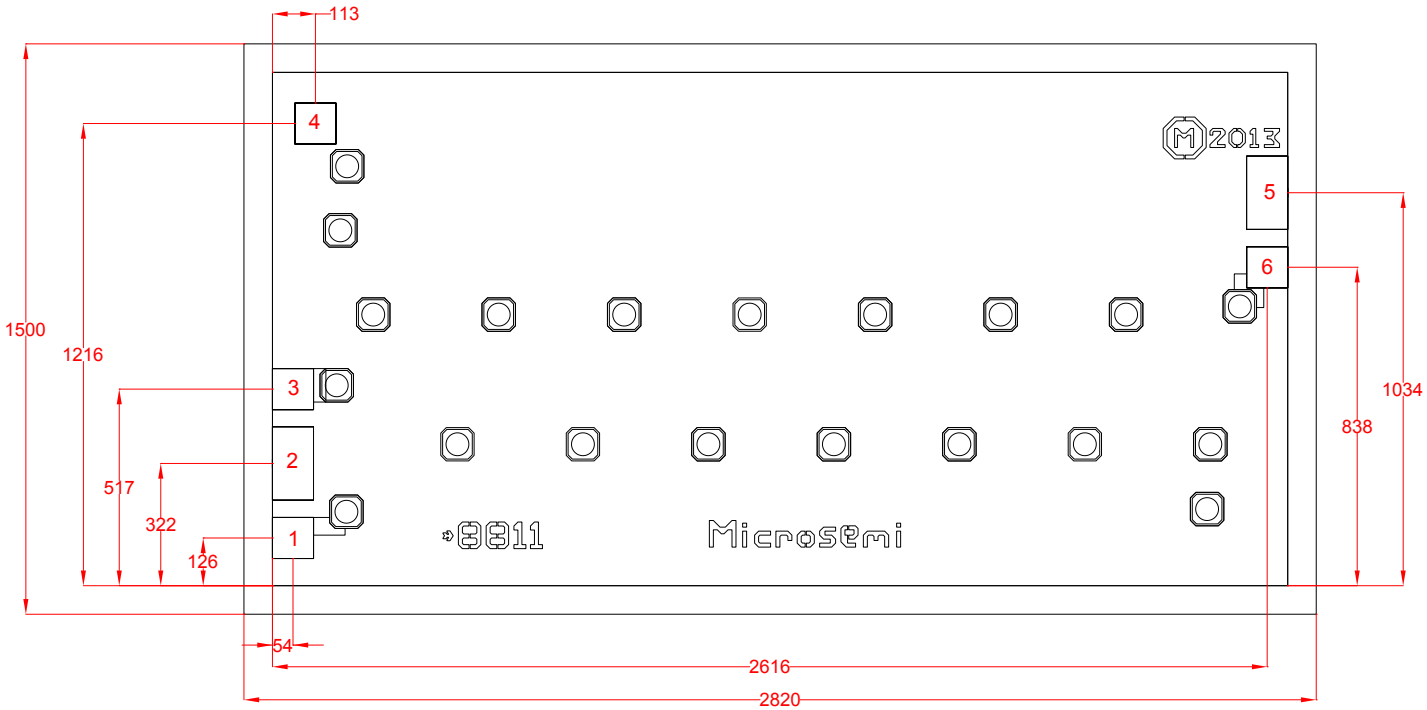



**Table 3: Pad Descriptions**

| Pad # | Descrtiption | Pad Dimensions (µm) |
|---|---|---|
| 1, 3, 6 | Ground | 100 x 100 |
| 2 | $RF_{IN}$, Pad is AC Coupled | 100 x 190 |
| 5 | $RF_{OUT}$, Pad is AC Coupled | 100 x 190 |
| 4 | $V_{DD}$ | 100 x 100 |

**Biasing**

MMA003AA is a self-biased device with single positive supply. Apply $V_{DD}$ to pad 4.

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