

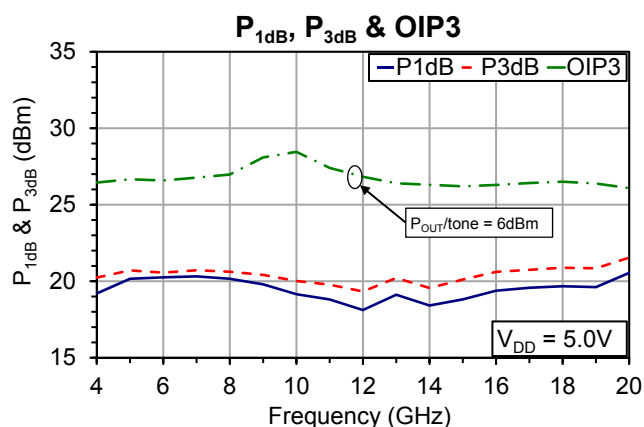
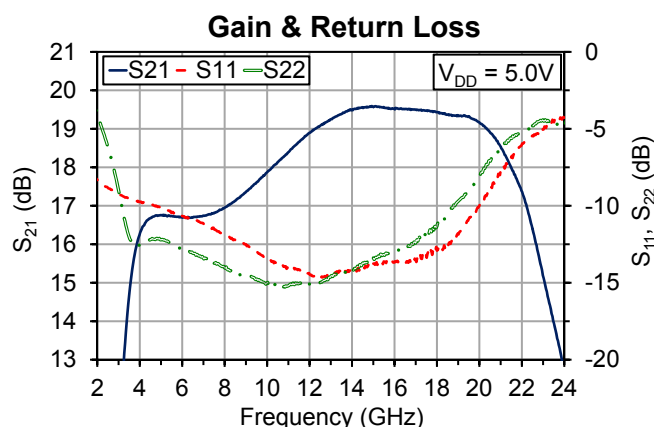
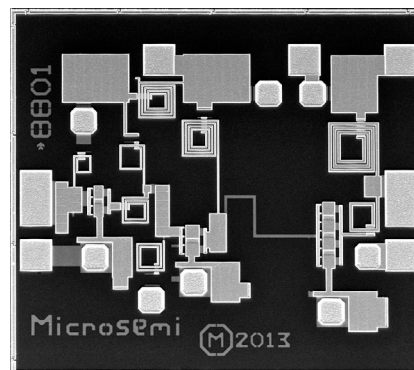
## 5-20GHz, 20dBm $P_{3dB}$ , 18dB Gain Wideband Amplifier

### 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
- $\pm 1$ dB power flatness
- Input and Output matched to 50 $\Omega$
- 1.35mm x 1.5mm x 0.1mm die size

### Applications

- Instrumentation
- Electronic warfare
- Microwave communications
- Radar



**Typical Performance (CW, Typical Device, RF Probe):**  $T_A = 25^\circ\text{C}$ ,  $V_{D1} = V_{D2} = 5\text{V}$

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 <sup>1</sup>	°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

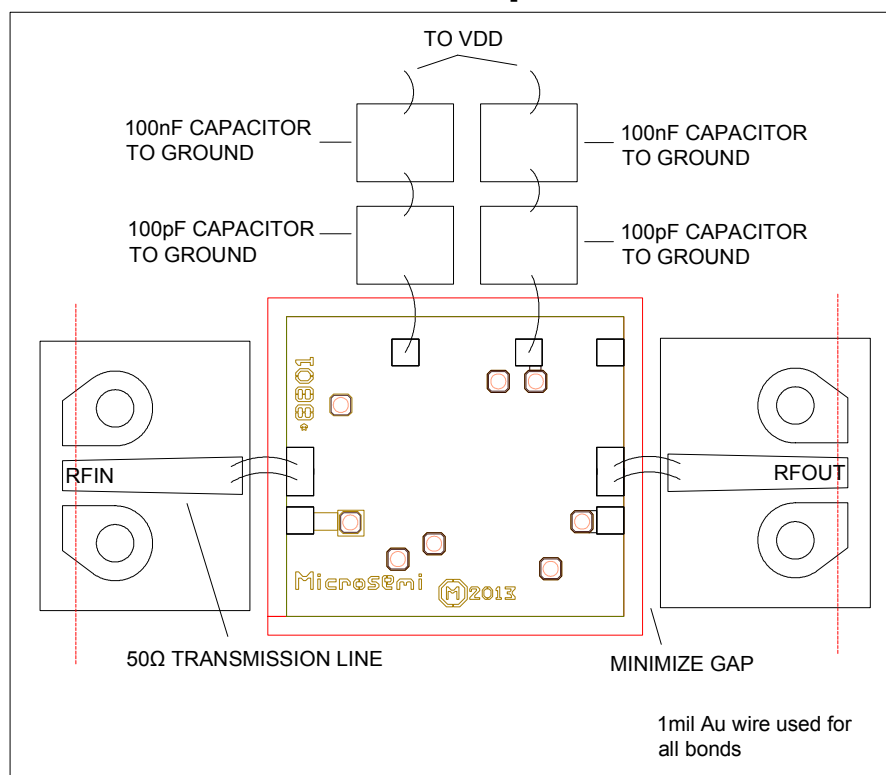
<sup>1</sup> MTTF > 10<sup>8</sup> hours at  $T_C = 150^\circ\text{C}$ 


Caution, ESD  
Sensitive Device

**Table 2: Specifications (CW, 100% Test):  $T_A = 25^\circ\text{C}$ ,  $V_{D1} = V_{D2} = 5\text{V}$** 

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

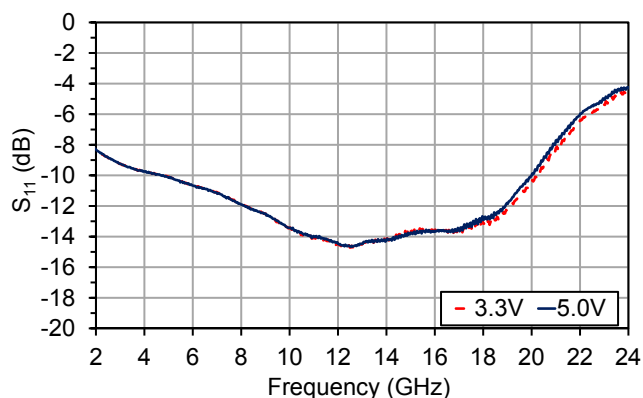
## RF Probe Measurement Set-Up With Reference Planes<sup>1</sup>


<sup>1</sup> Reference planes are the same for S-parameter files downloadable on [www.microsemi.com/mmics](http://www.microsemi.com/mmics)

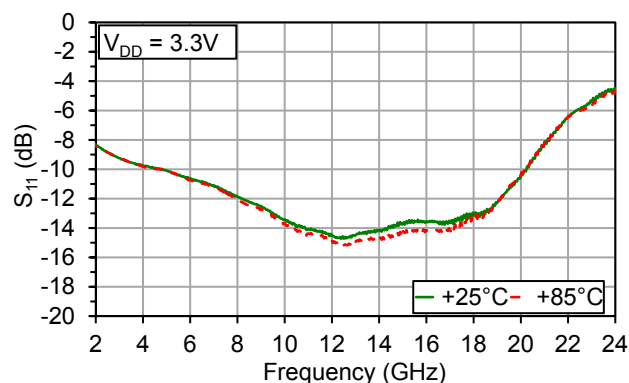
## Typical Performance, RF Probe

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

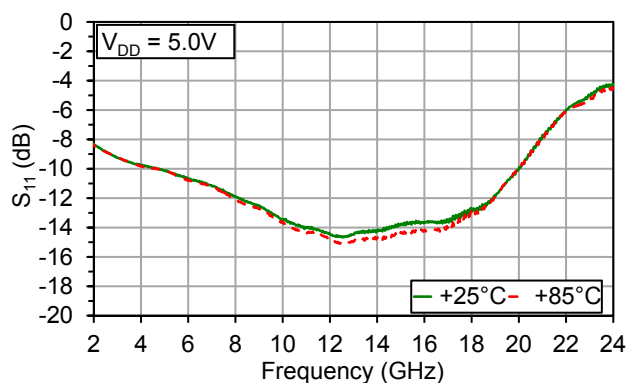
**$S_{11}$  Over  $V_{DD}$**



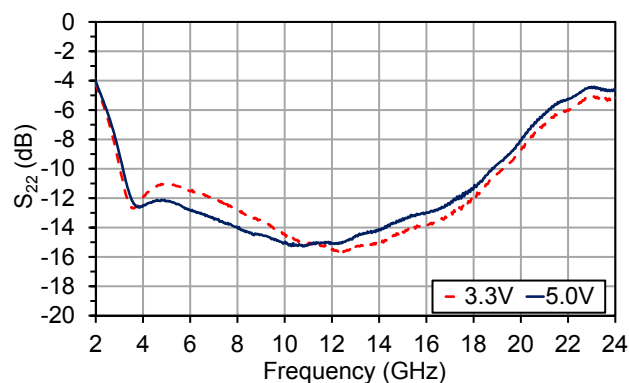
**$S_{11}$  Over Temperature,  $V_{DD} = 3.3V$**



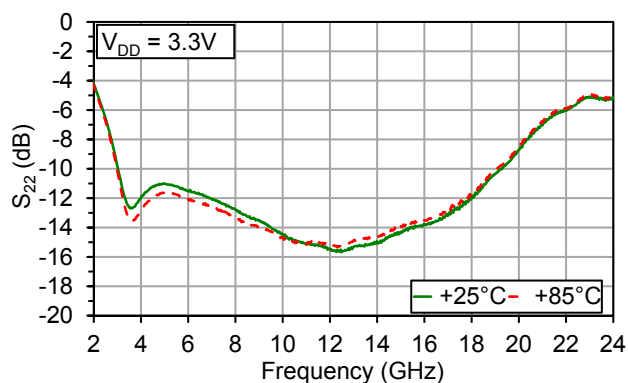
**$S_{11}$  Over Temperature,  $V_{DD} = 5.0V$**



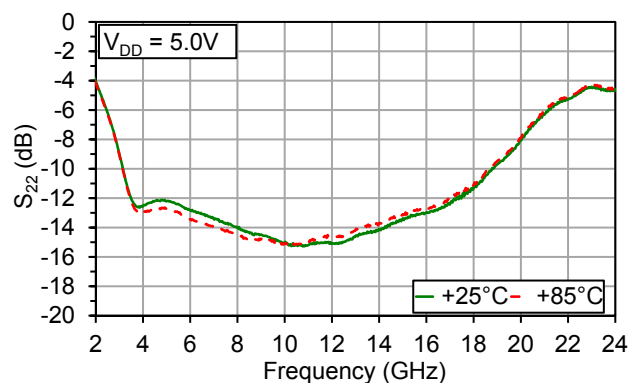
**$S_{22}$  Over  $V_{DD}$**



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



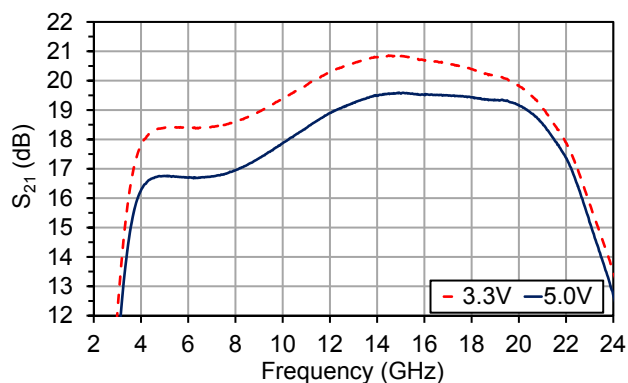
**$S_{22}$  Over Temperature,  $V_{DD} = 5.0V$**



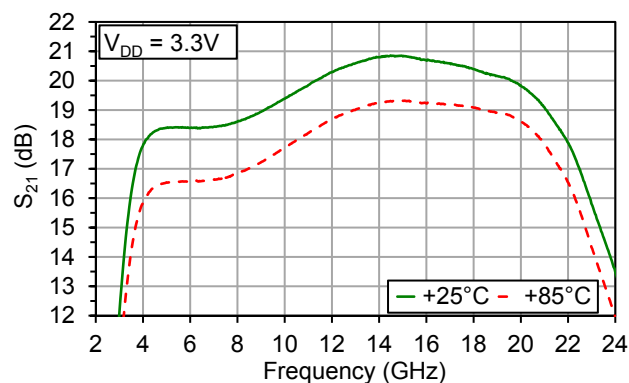
## Typical Performance, RF Probe

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

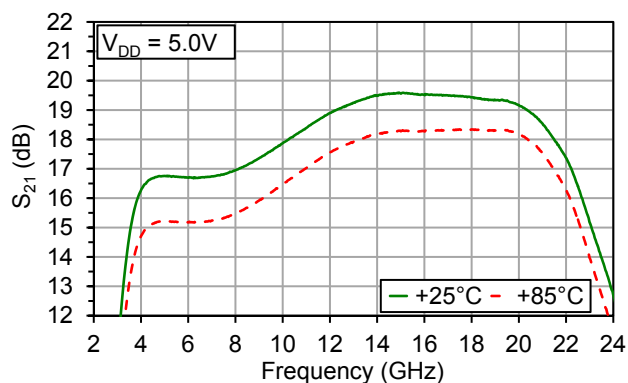
**$S_{21}$  Over  $V_{DD}$**



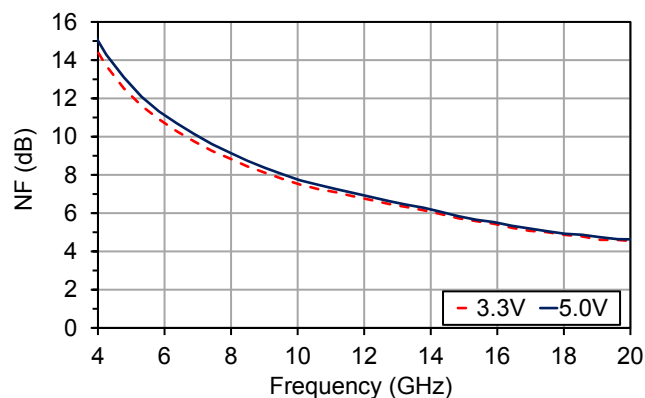
**$S_{21}$  Over Temperature,  $V_{DD} = 3.3V$**



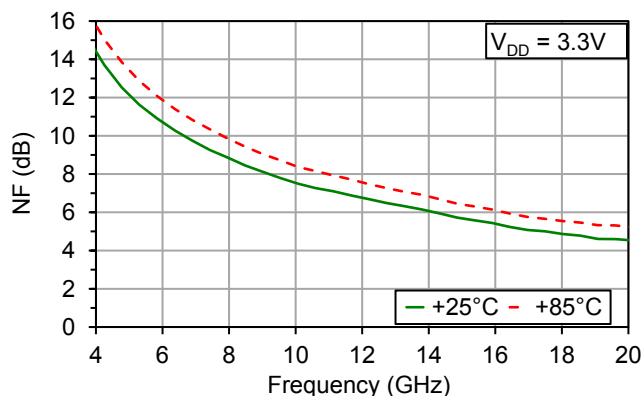
**$S_{21}$  Over Temperature,  $V_{DD} = 5.0V$**



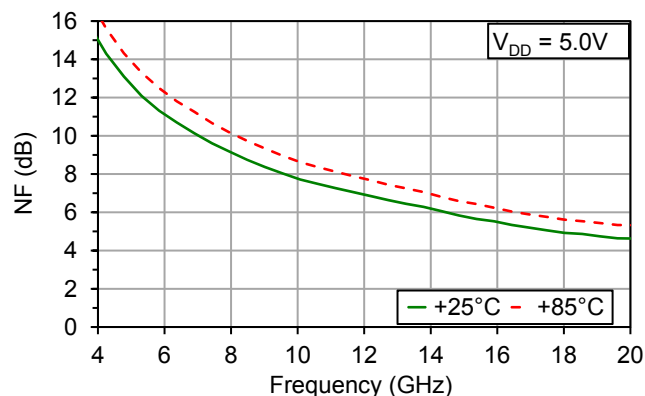
**NF Over  $V_{DD}$**



**NF Over Temperature,  $V_{DD} = 3.3V$**



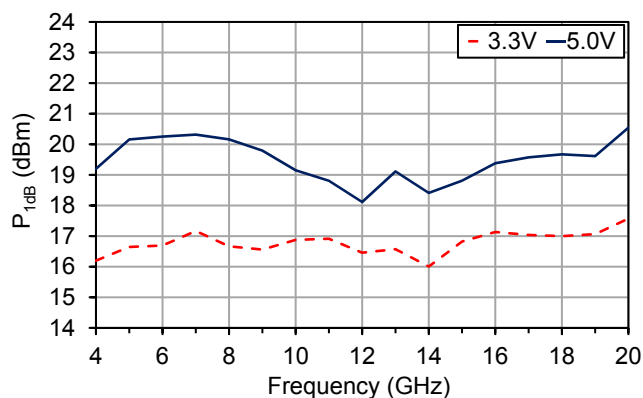
**NF Over Temperature,  $V_{DD} = 5.0V$**



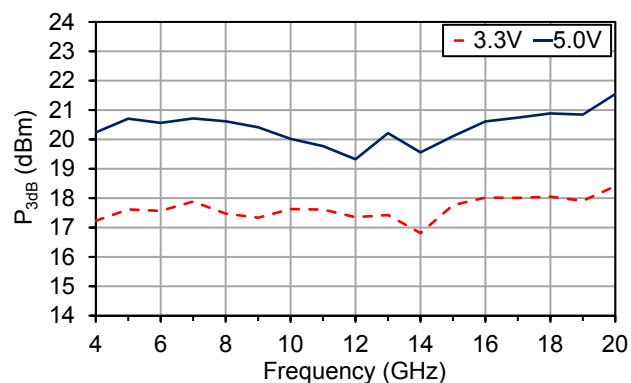
## Typical Performance, RF Probe

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

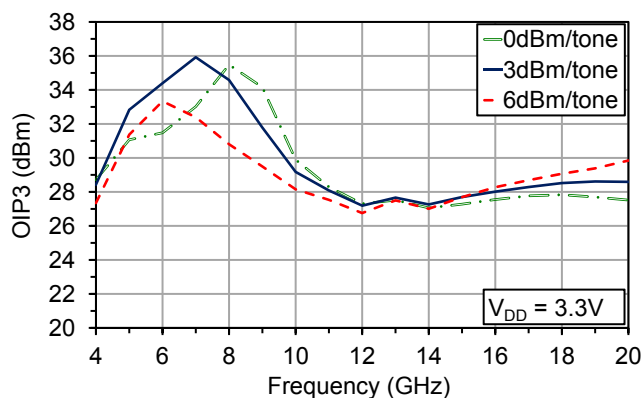
**$P_{1dB}$  Over  $V_{DD}$**



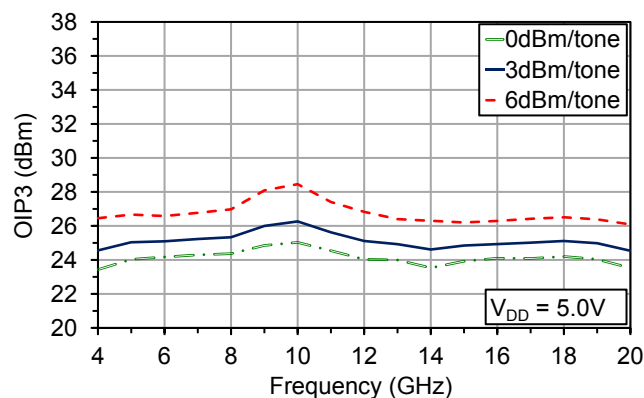
**$P_{3dB}$  Over  $V_{DD}$**



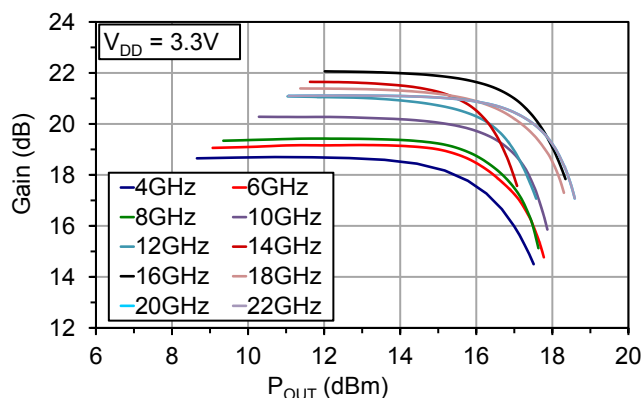
**OIP3,  $V_{DD} = 3.3V$**



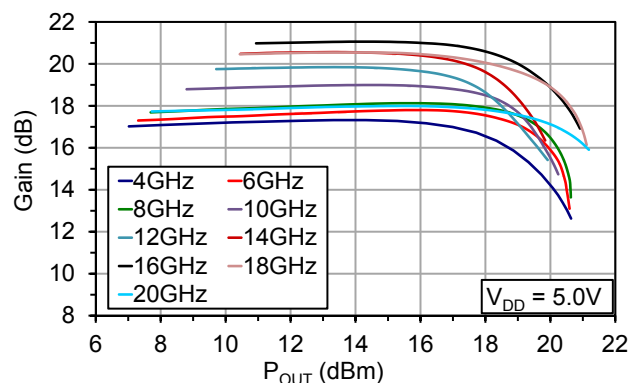
**OIP3,  $V_{DD} = 5.0V$**



**Power Sweep,  $V_{DD} = 3.3V$**



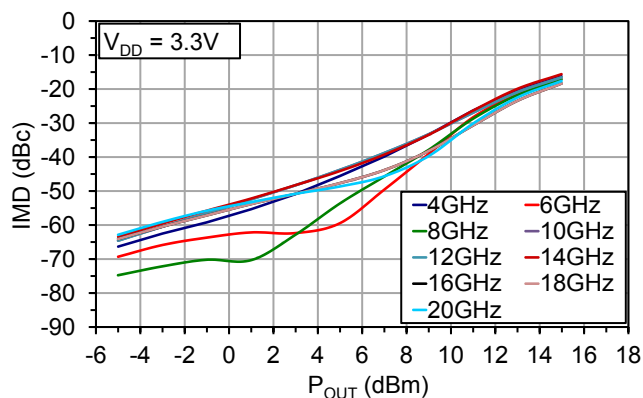
**Power Sweep,  $V_{DD} = 5.0V$**



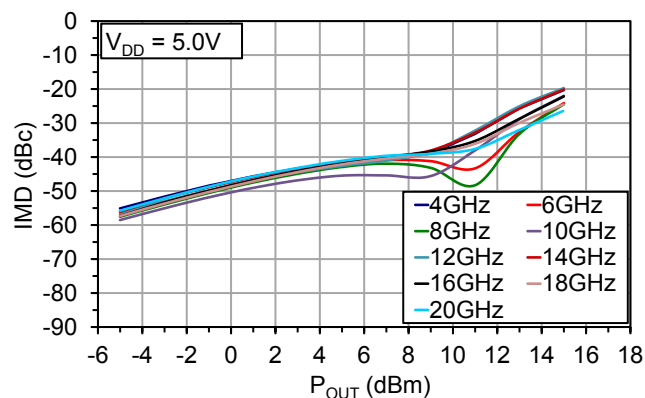
## Typical Performance, RF Probe

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

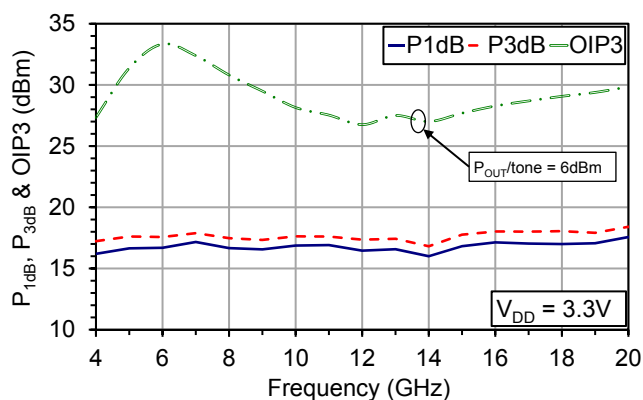
**IMD Sweep,  $V_{DD} = 3.3V$**



**IMD Sweep,  $V_{DD} = 5.0V$**

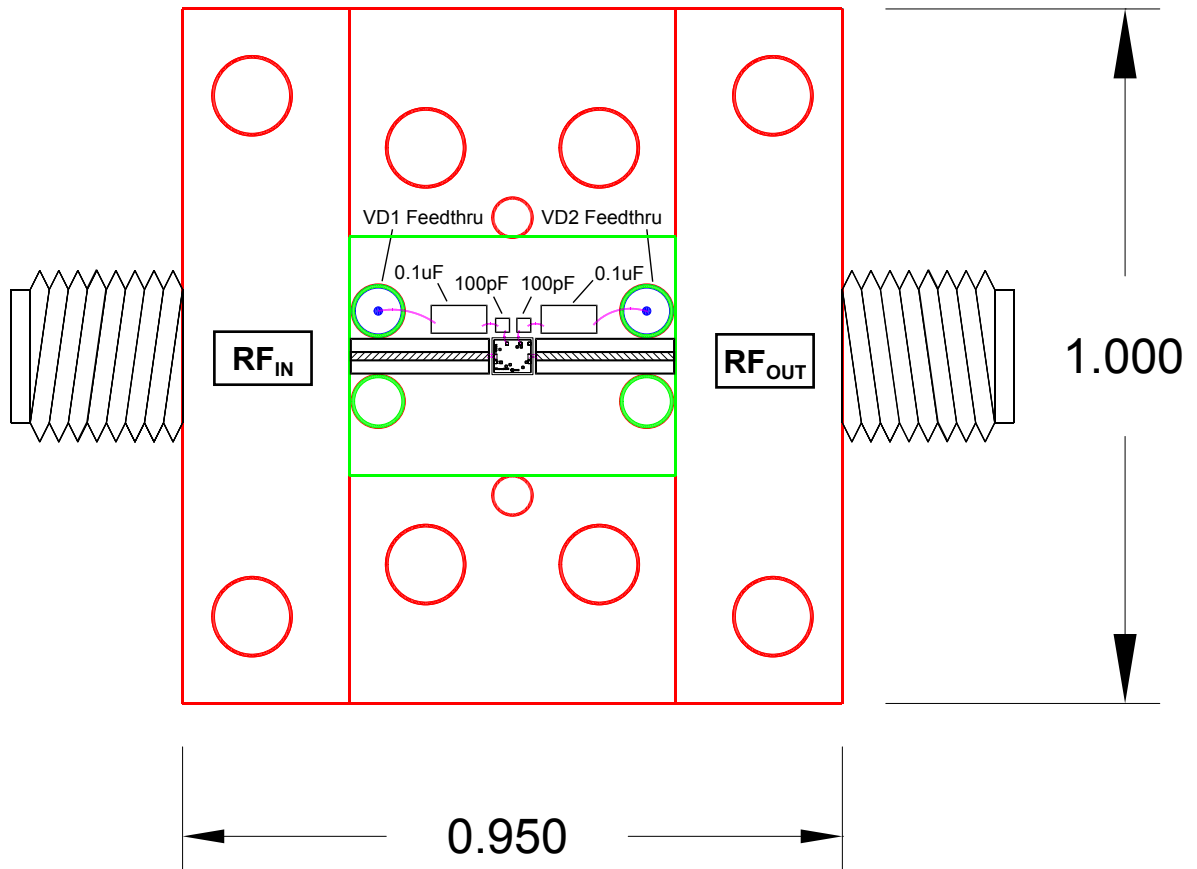


**Power and OIP3,  $V_{DD} = 3.3V$**



## Connectorized Test Fixture

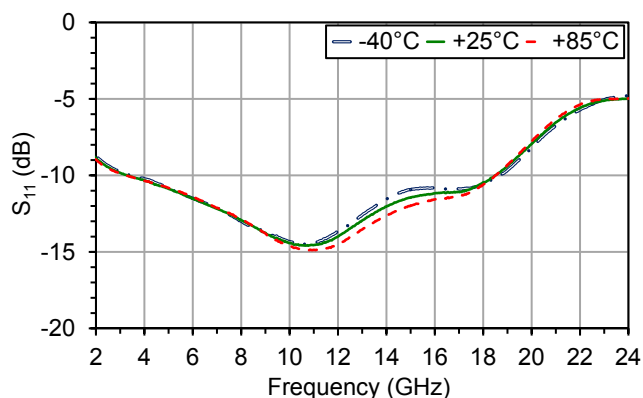
With SMK 2.92mm Connectors



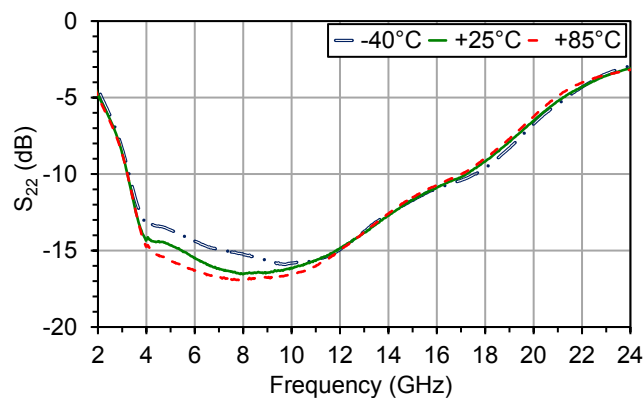
## Typical Performance, Connectorized Test Fixture

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

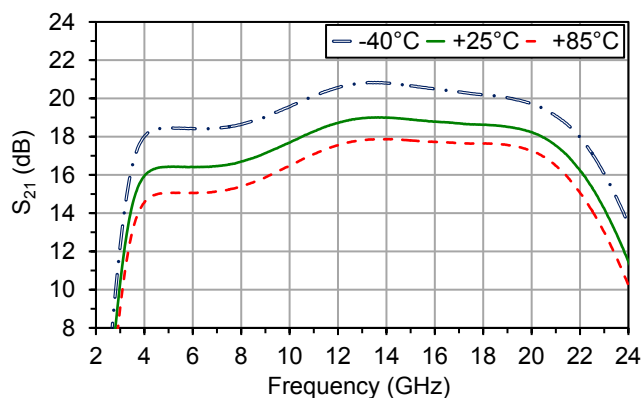
**$S_{11}$  Over Temperature**



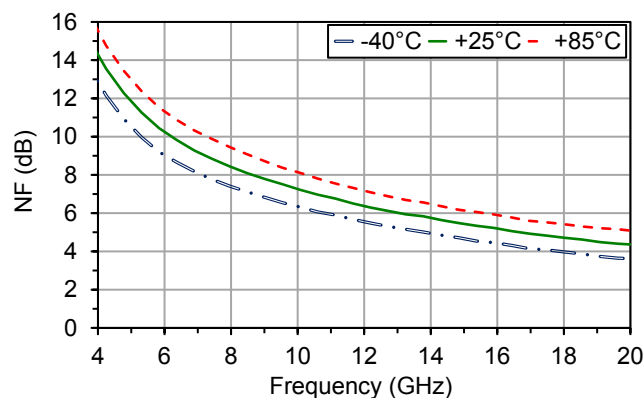
**$S_{22}$  Over Temperature**



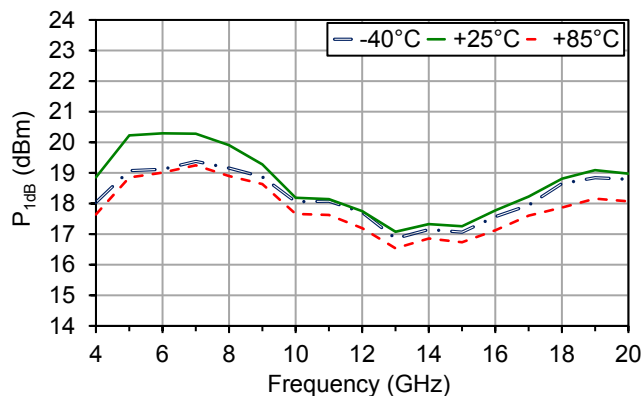
**$S_{21}$  Over Temperature**



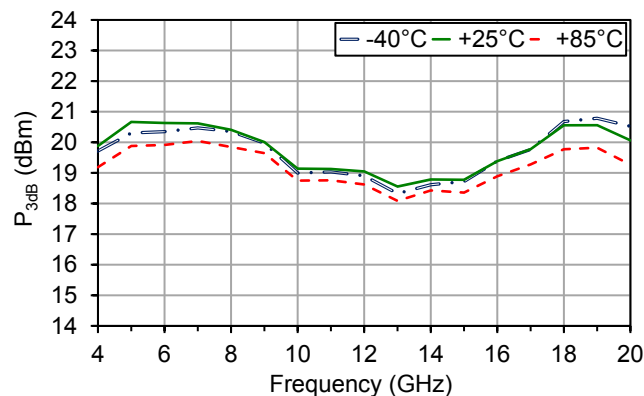
**NF Over Temperature**



**$P_{1dB}$  Over Temperature**



**$P_{3dB}$  Over Temperature**

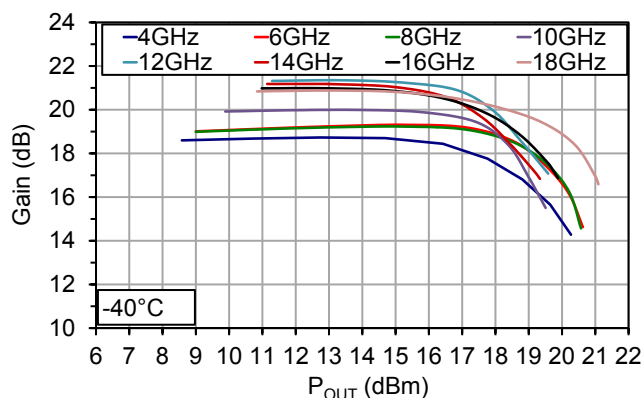




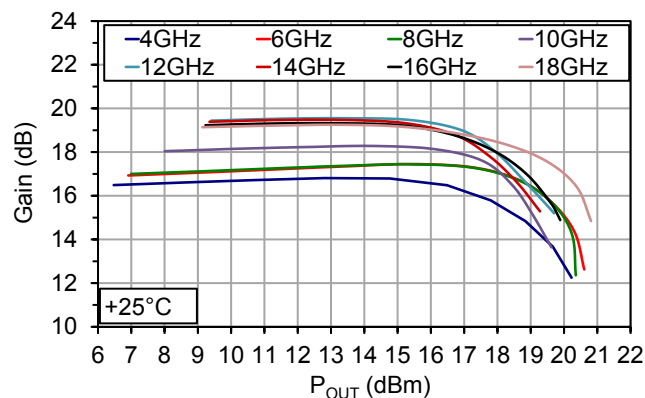
## Typical Performance, Connectorized Test Fixture

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted

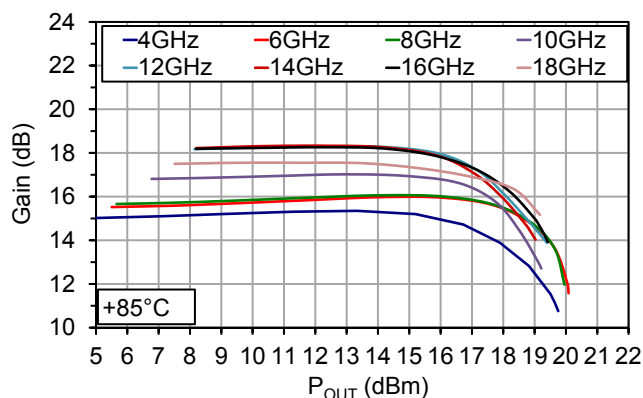
**Power Sweep,  $-40^\circ C$**



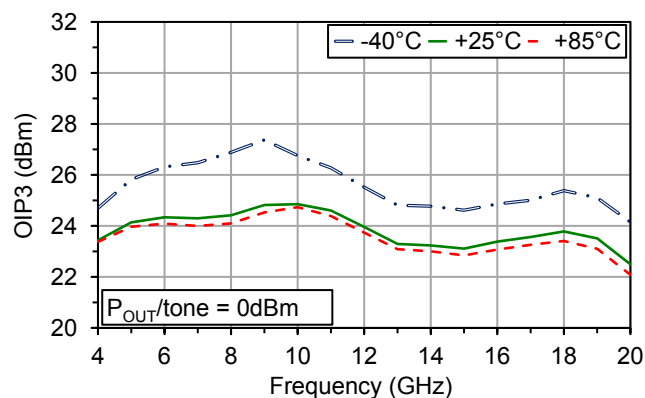
**Power Sweep,  $+25^\circ C$**



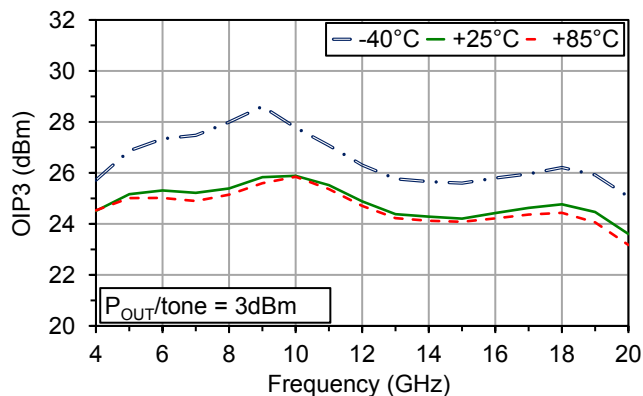
**Power Sweep,  $+85^\circ C$**



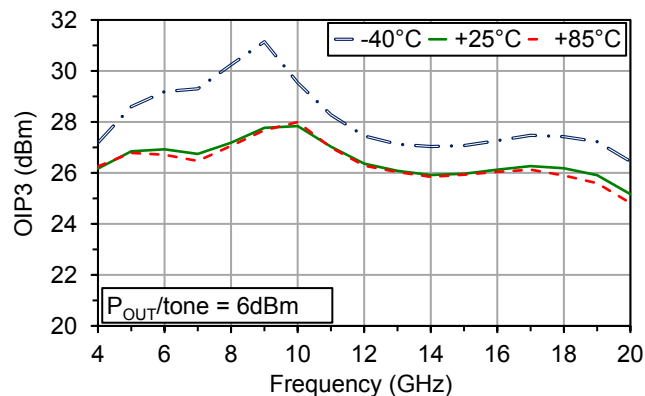
**OIP3,  $P_{OUT}/tone = 0dBm$**



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

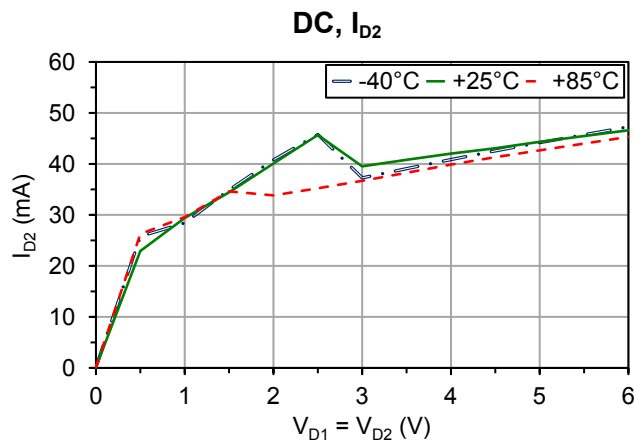
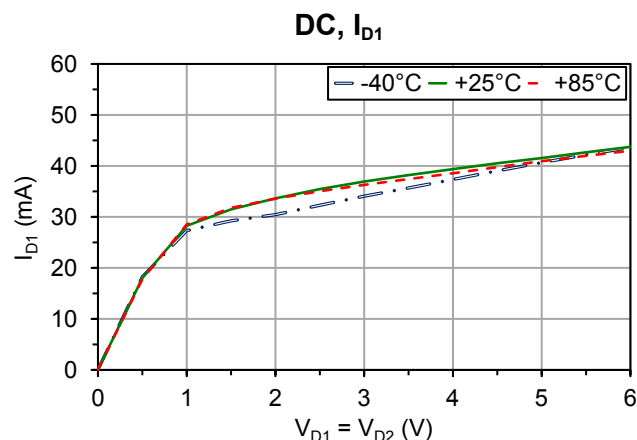
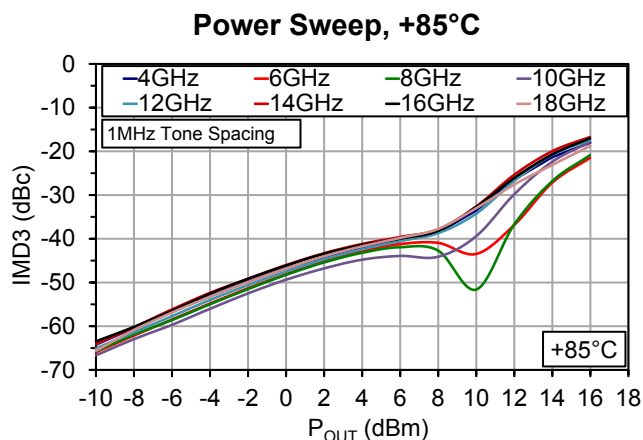
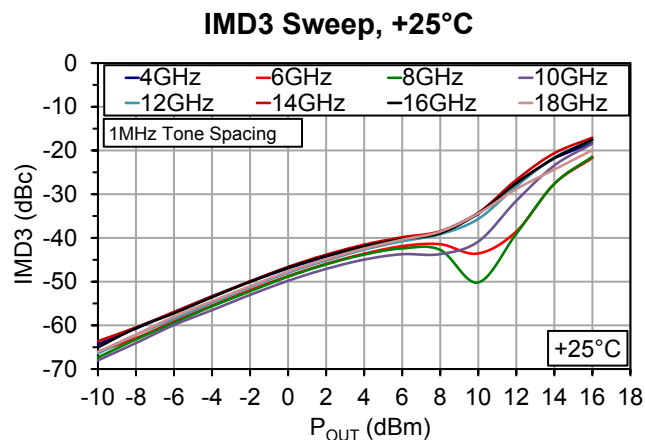
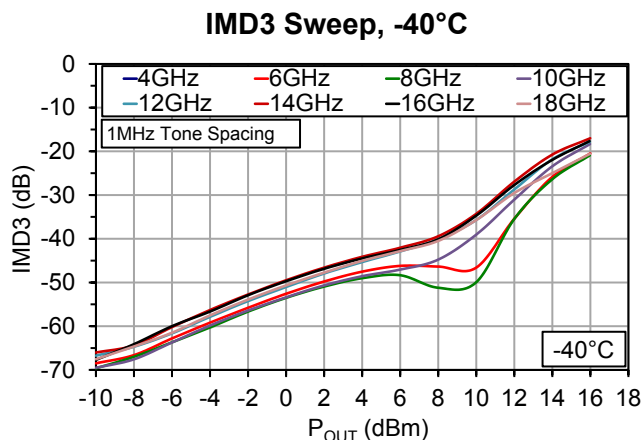


**OIP3,  $P_{OUT}/tone = 6dBm$**



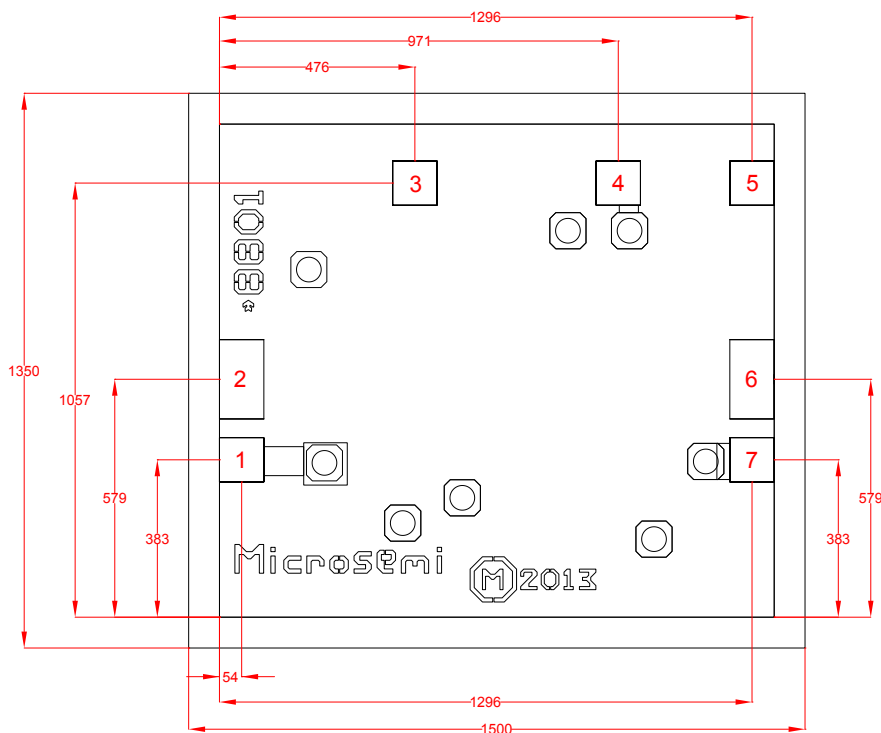
## Typical Performance, Connectorized Test Fixture

$V_{D1} = V_{D2} = 5V$ ,  $I_{DD} = 105mA$ ,  $T_A = 25^\circ C$  unless otherwise noted



### 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](http://www.microsemi.com/mmics)).



**Table 3: Pad Descriptions**

Pad #	Description	Pad Dimensions ( $\mu\text{m}$ )
1, 4, 7	Ground	100 x 100
2	RF <sub>IN</sub> , Pad is AC coupled	100 x 190
6	RF <sub>OUT</sub> , Pad is AC coupled	100 x 190
3	V <sub>D1</sub>	100 x 100
5	V <sub>D2</sub>	100 x 100

### Biasing

MMA002AA is self-biased. Apply 5V to V<sub>D1</sub> and V<sub>D2</sub>. Bias sequence does not matter.

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