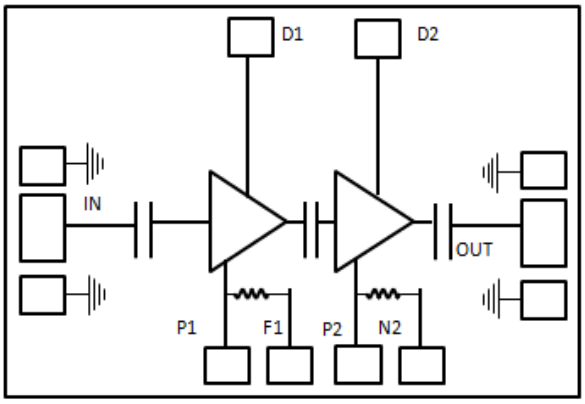
Advanced Information: AI1801

5.8-17GHz Low Noise Amplifier

GaAs Monolithic Microwave IC

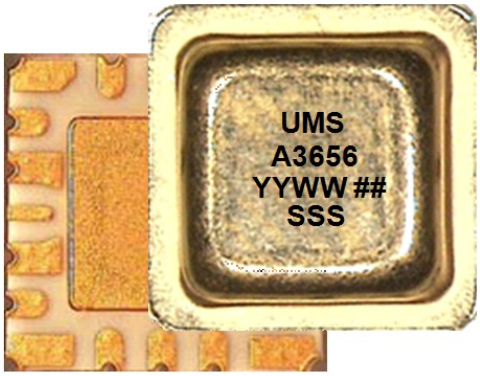


UMS has developed a two-stage self-biased wide band monolithic Low Noise Amplifier in leadless surface mount hermetic metal ceramic 6x6mm² package. It operates from 5.8 to 17GHz.

It is designed for Space application and it is well suited a wide range of applications, such as electronic warfare, X-Ku Point to Point Radio, and test instrumentation.

The circuit is manufactured with a pHEMT process, 0.25µm gate length, via holes through the substrate, air bridges and electron beam gate lithography.

It is also available in a standard surface mount 20 leads QFN3x3. All forms are compliant with the regulation in particular with the directives RoHS N°2011/65 and REACh N°1907/2006.



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Electrical Characteristics

Tamb.= +25°C, Vd1 = Vd2 = +3.3V, P1, N2 = GND (1)

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	5.8		17.0	GHz
Gain	Linear Gain		20.0		dB
NF	Noise Figure		1.75		dB
IRL	Input Return Loss		8		dB
ORL	Output Return Loss		10		dB
P_{1dB}	Output power for 1dB Gain Compression		14.5		dBm
OIP3	Output Third Order Intercept		24.5		dBm
Id	Drain bias current		70		mA

These values are representative of onboard measurements as defined on the drawing in paragraph "Evaluation mother board".

(1) Pins F1 & P2 are not connected

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Absolute Maximum Ratings (1)

Tamb. = +25°C

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage (VD1 & VD2)	4.5V	V
Pin	Maximum CW input power overdrive	2	dBm
Ta	Operating temperature range (chip backside)	-40 to 85	°C
Tstg	Storage temperature range	-55 to +150	°C

(1) Operation of this device above anyone of these parameters may cause permanent damage: these maximum ratings parameters could not be cumulated.
These are stress ratings only, and functional operation of the device at these conditions is not implied.

Recommended Biasing Options

Three biasing options are recommended

Biasing option 1	Standard biasing
	D1 = D2 = 3.3V and Id = 70mA P1 = N2 = GND and F1 = P2 = Not connected At Tamb. =25°C : Typ. Gain = 20.0dB / Typ. P1dB = 14.5dBm / Typ. OIP3 = 24.5dBm

Biasing option 2	Compromise Id & P1dB
	D1 = D2 = 3.3V and Id = 64mA P2 = GND and F1 = P1 = P2 = Not connected At Tamb. =25°C : Typ. Gain = 20.0dB / Typ. P1dB = 14.0dBm / Typ. OIP3 = 24.0dBm

Biasing option 3	Reduced current (Id)
	D1 = D2 = 3.3 V and Id = 47mA F1 = P1 = N2 = P2 = Not connected At Tamb. =25°C : Typ. Gain = 19.0dB / Typ. P1dB = 12.5dBm / Typ. OIP3 = 23.0dBm

It is possible to bias D1 = D2 = 3.0V on these biasing options, with (as compared to 3.3V):

Id	-2	mA
Gain	-0.2	dB
P1dB	-0.5	mA
OIP3	-0.7	dBm
Tj	-4	°C

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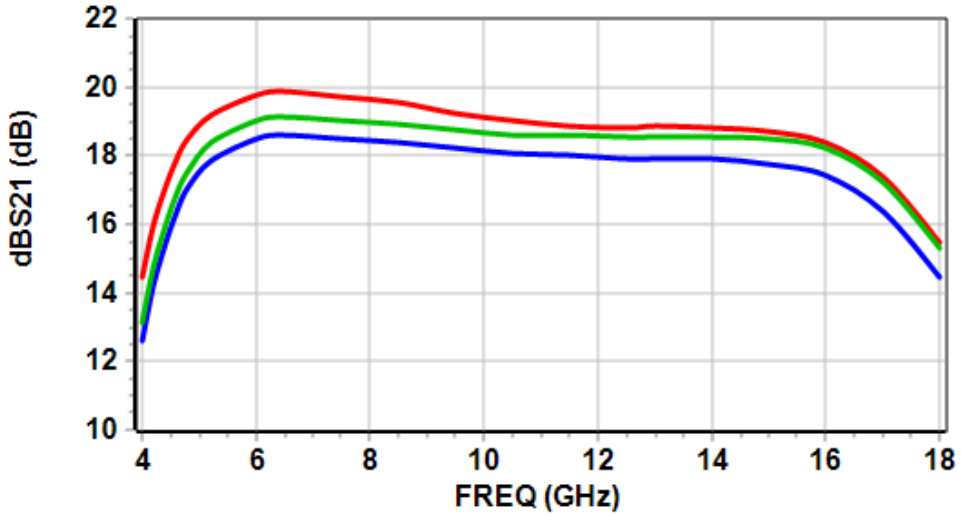
Typical Board Measurements

Tamb.= +25°C, Vd1 = Vd2 =+3.3V, 3 biasing options to get :

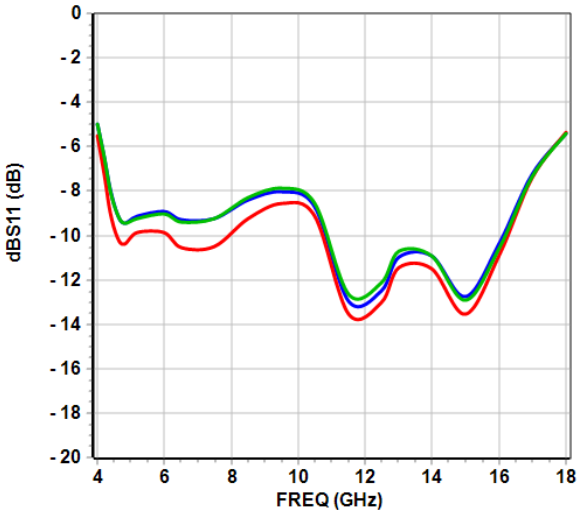
Idq = 47mA (F1 = P1 = N2 = P2 = Not connected)
Idq = 64mA (P2 = GND and F1 = P1 = P2 = Not connected)
Idq = 70mA (P1 = N2 = GND and F1 = P2 = Not connected)

These values are representative of onboard measurements as defined on the drawing in paragraph "Evaluation mother board".

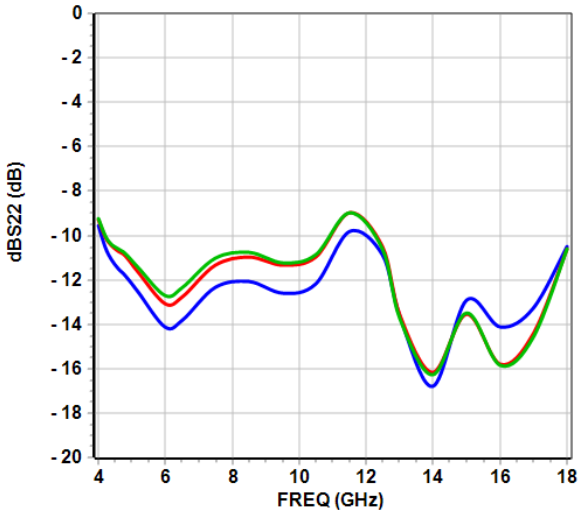
Linear Gain versus Frequency and Idq



Input Return Loss vs. Frequency and Idq



Output Return Loss vs. Frequency and Idq



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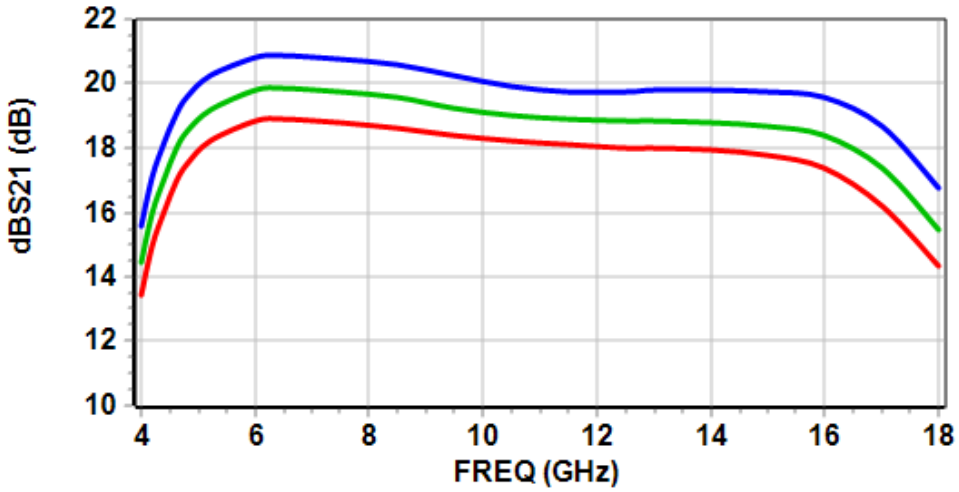
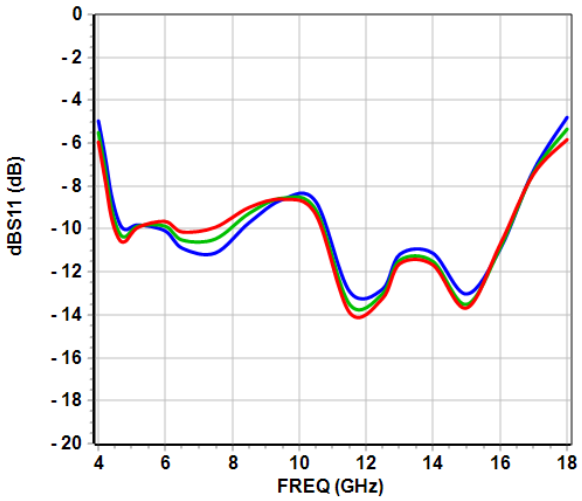
Typical Board Measurements

Tamb.= +25°C, Vd1 = Vd2 =+3.3V, P1 = N2 = GND and F1 = P2 = Not Connected set in order to get Idq =70mA

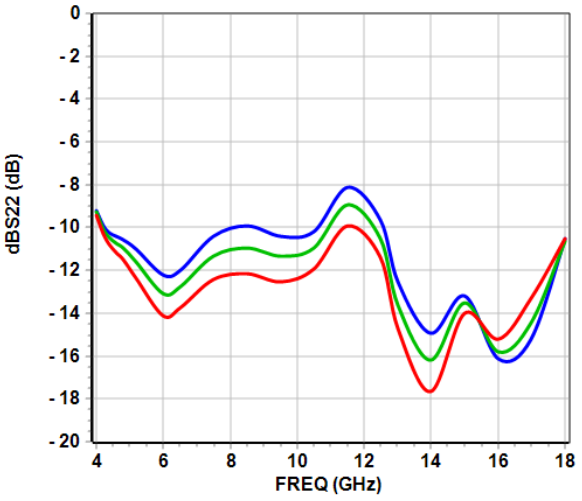
Linear Gain versus Frequency and Temperature
(-40, +25, +85°C)



Input Return Loss vs. Frequency and Temperature
(-40, +25, +85°C)



Output Return Loss vs. Frequency and Temperature
(-40, +25, +85°C)



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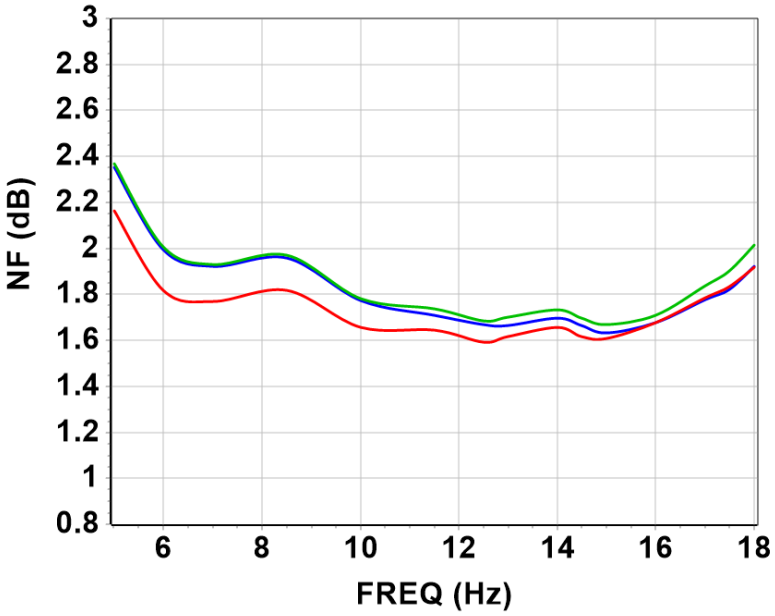
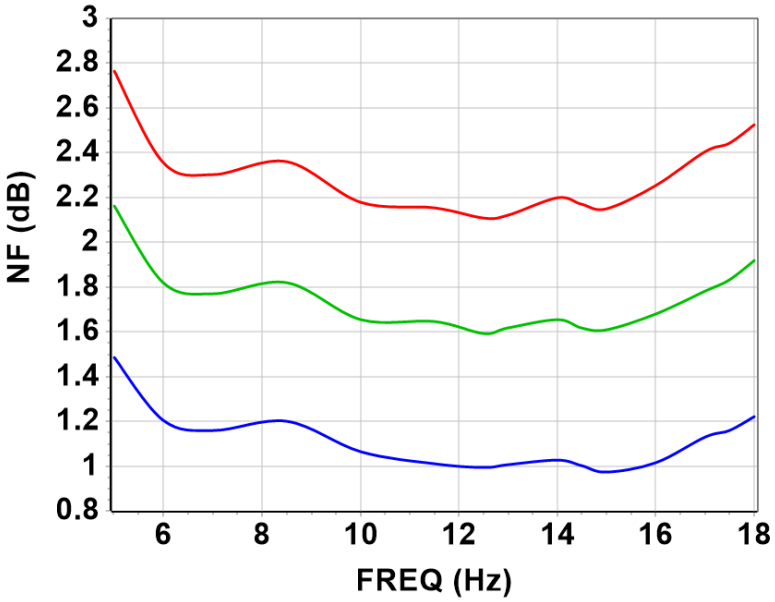
Idq = 70mA (P1 = N2 = GND and F1 = P2 = Not connected)

Noise Figure versus Frequency and Idq (-40, +25, +85°C)



Noise Figure versus Frequency and Temperature

P1 = N2 = GND and F1 = P2 = NC set in order to get Idq =70mA (-40, +25, +85°C)



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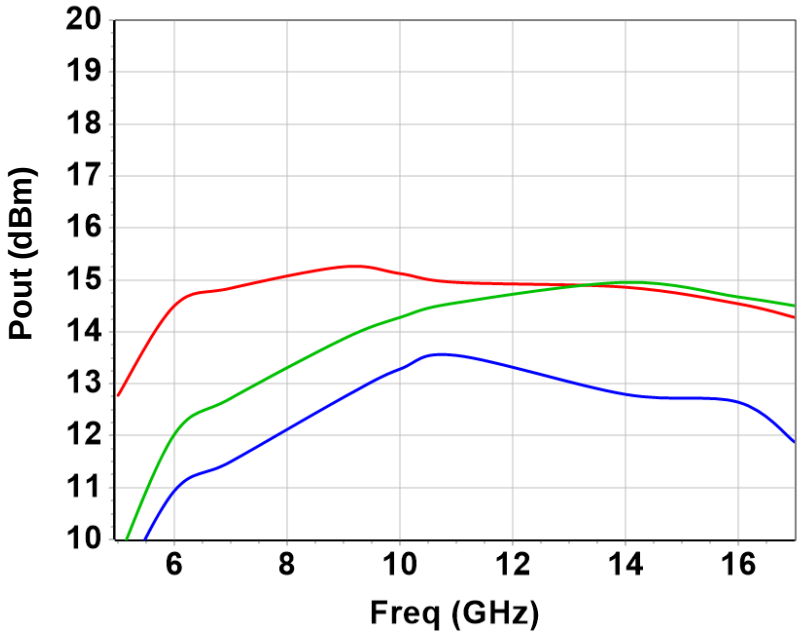
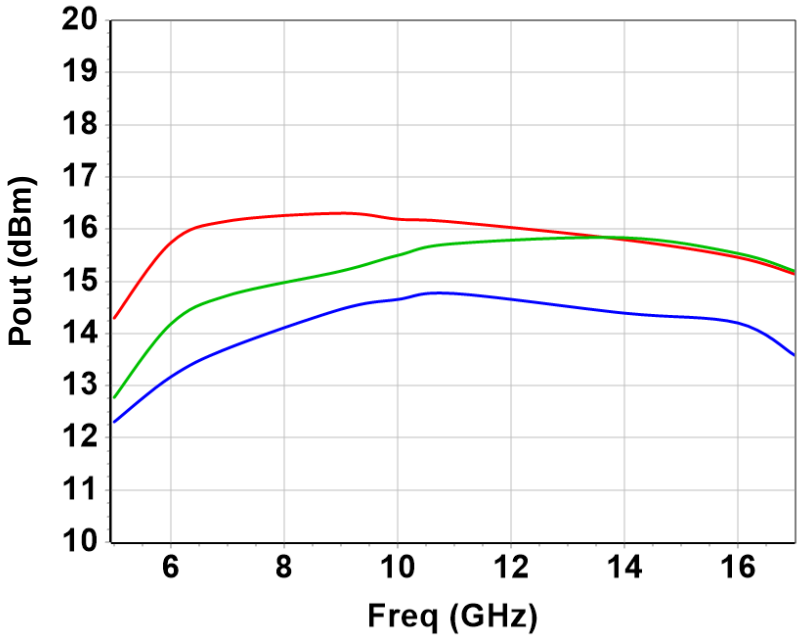
Pout 1dB versus Frequency and Idq



Pout Sat versus Frequency and Idq



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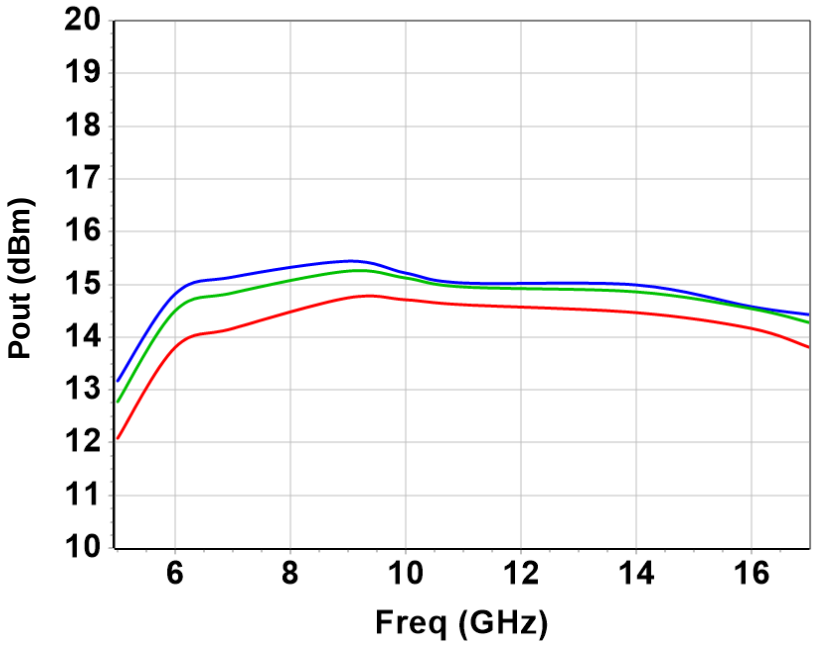
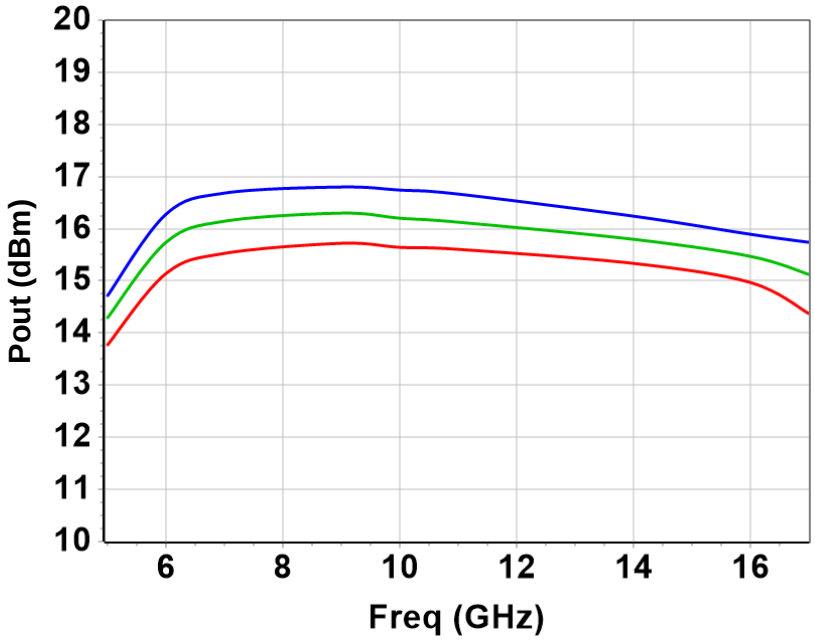
Typical Board Measurements

Tamb.= +25°C, Vd1 = Vd2 =+3.3V, P1 = N2 = GND and F1 = P2 = Not Connected set in order to get Idq =70mA

Pout 1dB versus Frequency and Temperature
(-40, +25, +85°C)



Pout Sat versus Frequency and Temperature
(-40, +25, +85°C)



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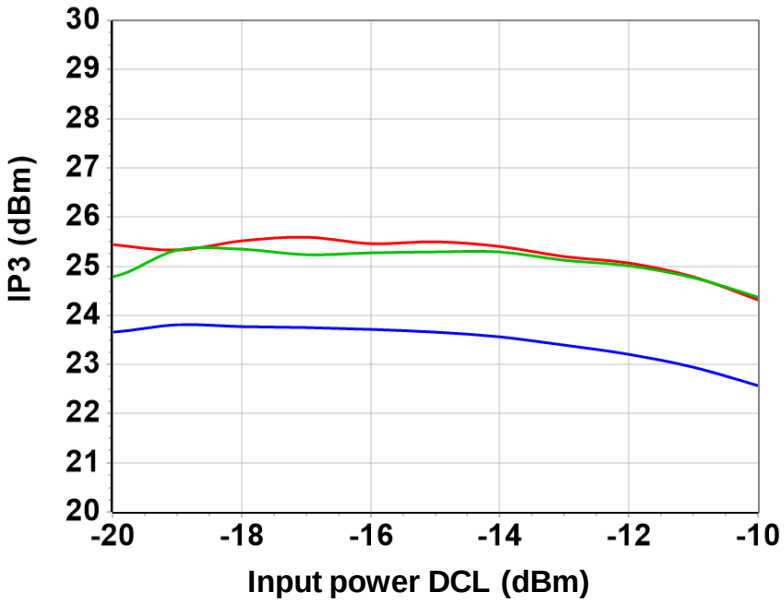
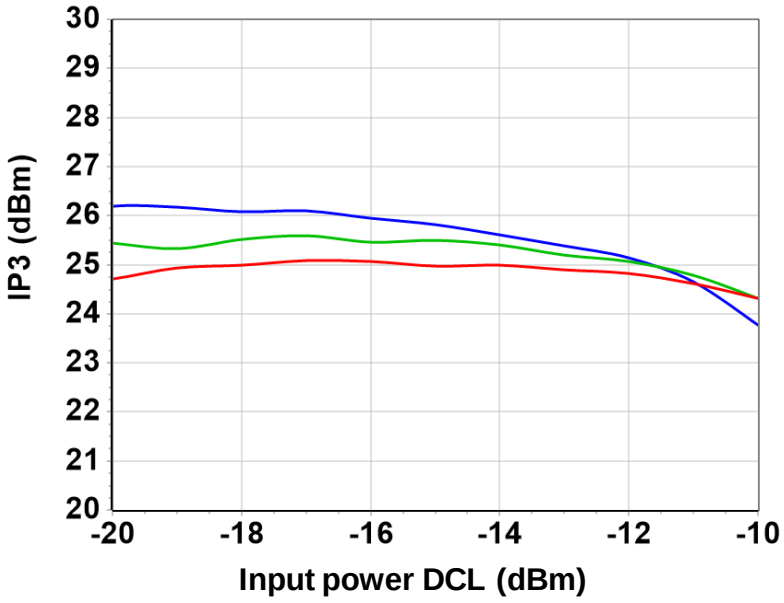
Idq = 64mA (P2 = GND and F1 = P1 = P2 = Not connected)
Idq = 70mA (P1 = N2 = GND and F1 = P2 = Not connected)

Output TOI (dBm) versus Pin and Idq @12GHz



Output TOI (dBm) versus Frequency and Temperature

P1 = N2 = GND and F1 = P2 = NC set in order to get Idq =70mA (-40, +25, +85°C)



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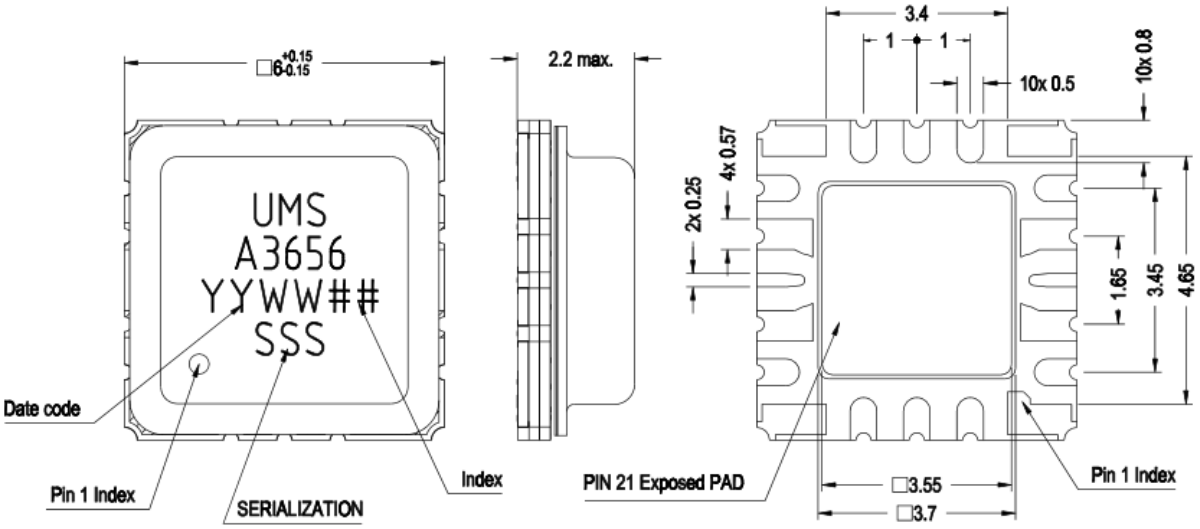
Mechanical data



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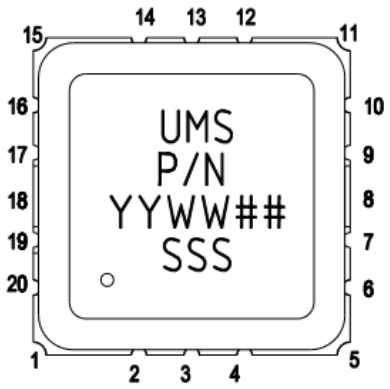

1- GND	8- RF OUT	15- GND
2- P1	9- GND	16- Nc
3- F1	10- Nc	17- GND
4- P2	11- GND	18- RF IN
5- GND	12- VD2	19- GND
6- N2	13- Nc	20- Nc
7- GND	14- VD1	21- GND

All dimensions are in millimeters

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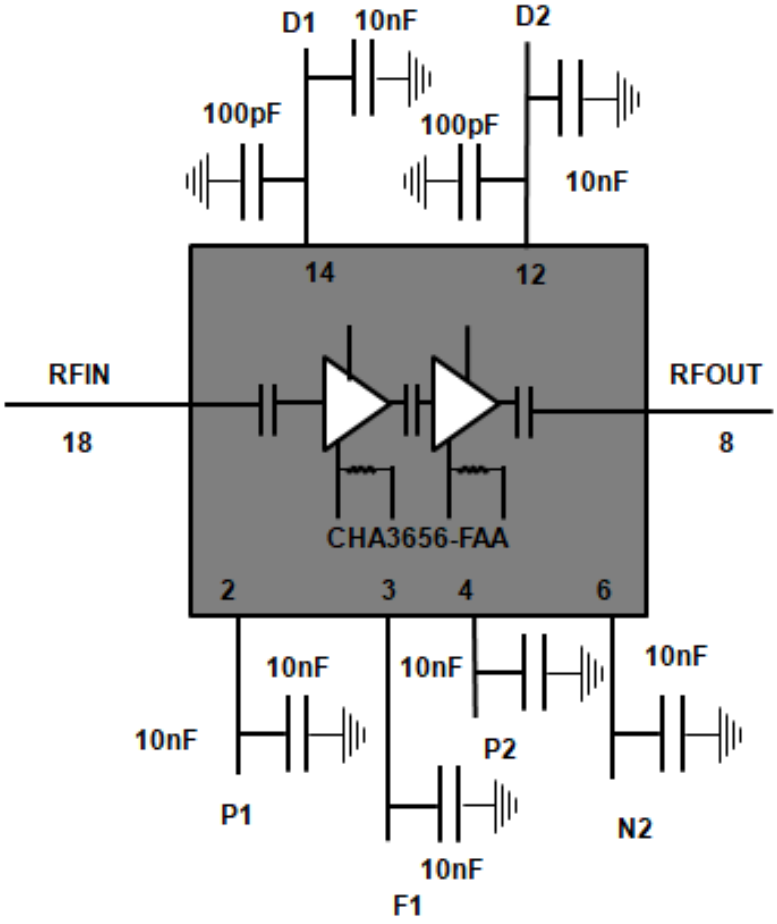
Application Circuit:



Pin Description:

Pin	Symbol	Description
1, 5, 7, 8, 9, 11, 15, 17, 19, 21 (exposed PAD)	GND	Must be grounded properly, internal connections to ground are made
10, 13, 16, 20	NC	No internal connections
18	RF IN	RF input
2	P1	DC Source voltage 1st stage
3	F1	DC Source voltage 1st stage
4	P2	DC Source voltage 2nd stage
6	N2	DC Source voltage 2nd stage
8	RF OUT	RF output
12	D2	Vd2: DC Drain voltage 2nd stage
14	D1	Vd1: DC Drain voltage 1st stage

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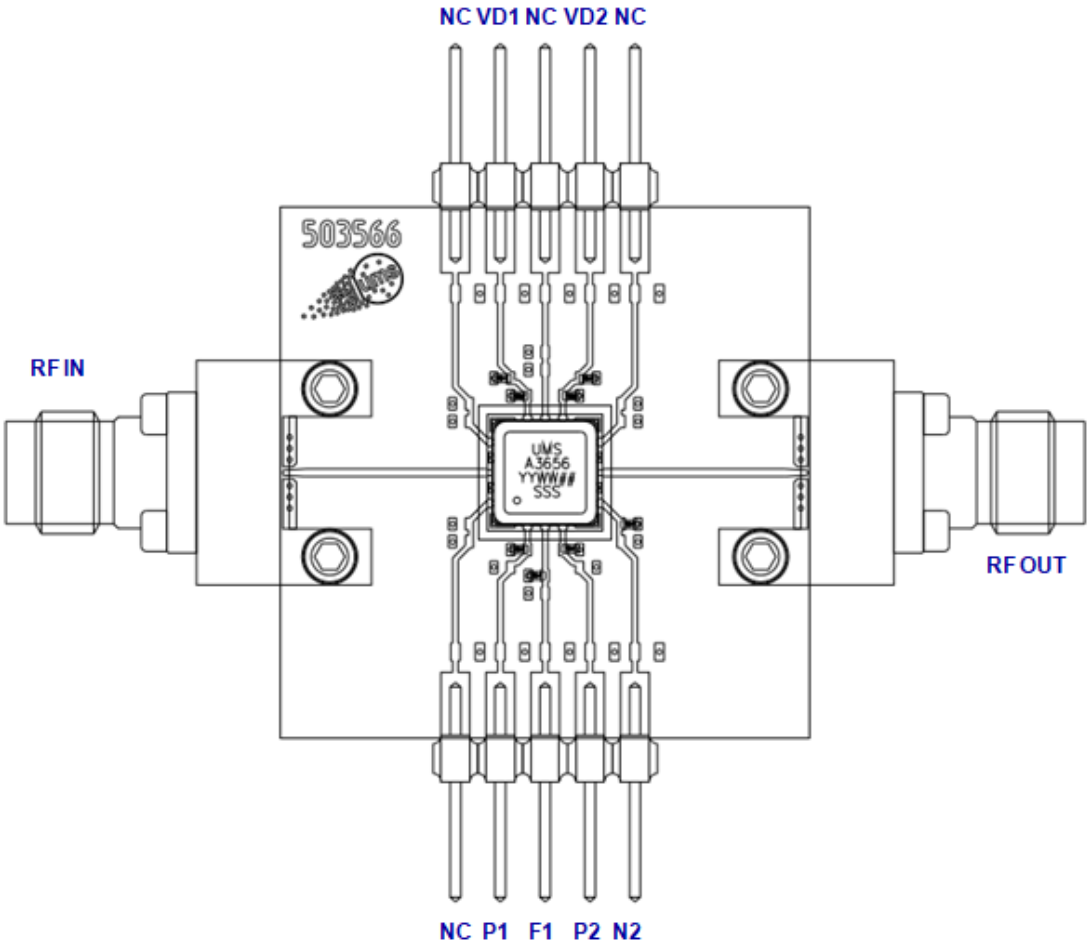
Evaluation mother board

- Compatible with the proposed footprint.
- Based on typically Ro4003 / 8mils or equivalent.
- Using a micro-strip to coplanar transition to access the package.
- Recommended for the implementation of this product on a module board.
- Decoupling capacitors of 100pF ±5% and 10nF ±10% are recommended for all DC accesses.
- Recommended for the implementation of this product on a module board.



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