

10-16GHz Medium Power Amplifier

GaAs Monolithic Microwave IC in SMD Ceramic Hermetic package

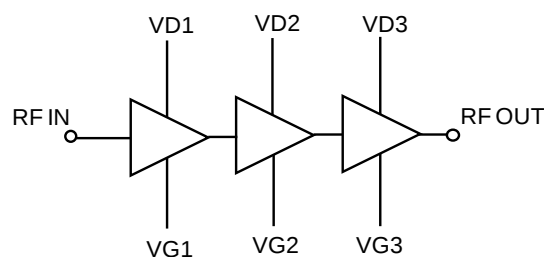
Description

The CHA5266-FAB is a three stage monolithic GaAs medium power amplifier in leadless surface mount hermetic metal ceramic 6x6mm² package.

It is designed for a wide range of applications, from military to commercial communication systems.

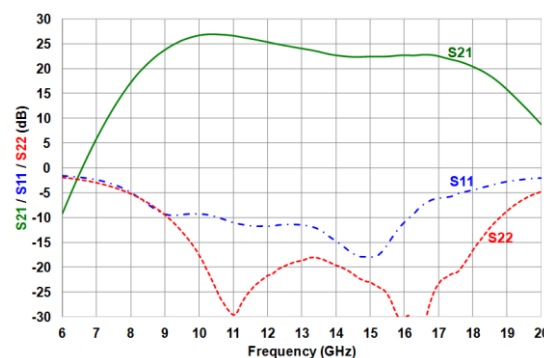
The circuit is manufactured with a pHEMT process, 0.25μm gate length, via holes through the substrate, air bridges and electron beam gate lithography.

It is supplied in RoHS compliant SMD package.



Main Features

- Broadband performances: 10-16GHz
- 24dB Linear Gain
- 26dBm output power @ 1dB comp.
- 35.5dBm output IP3
- DC bias: Vd = 5.0Volt @ Idq = 320mA
- 6x6mm² hermetic metal ceramic package



Main Electrical Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	10		16	GHz
Gain	Linear Gain		24		dB
P1dB	Output power @ 1dB compression		26		dBm
OIP3	Output IP3		35.5		dBm

Electrical Characteristics

Tamb.= +25°C, Vd = +5V / Idq=320mA

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	10		16	GHz
Gain	Linear Gain		24		dB
RL_in	Input Return Loss		11		dB
RL_out	Output Return Loss		20		dB
P1dB	Output power @ 1dB compression		26		dBm
Psat	Saturated output power		27.5		dBm
OIP3	Output IP3		35.5		dBm
Idq	Quiescent Drain current		320		mA
Vg	Gate Voltage		-0.35		V

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

Absolute Maximum Ratings ⁽¹⁾T_{amb.} = +25°C

Symbol	Parameter	Values	Unit
V _d	Drain bias voltage	7.0V	V
I _{dq}	Drain bias current	0.525	A
V _g	Gate bias voltage	-2 to 0	V
P _{in}	Input continuous power	20	dBm
T _j	Junction temperature	175	°C
T _a	Operating temperature range	-40 to +85	°C
T _{stg}	Storage temperature range	-55 to +150	°C

⁽¹⁾ Operation of this device above anyone of these parameters may cause permanent damage.

Recommended Biasing Options

Four biasing options are recommended

Biasing option 1	Standard biasing
	V _{d1} = V _{d2} = V _{d3} = 5.0V and V _{g1} = V _{g2} = V _{g3} tuned to get I _{dq} = 320mA at T _{amb.} = 25°C. Typical P _{1dB} = 26dBm / Typical OIP ₃ = 35.5dBm

Biasing option 2	Reduced voltage (V _d) compensated by higher current (I _{dq})
	V _{d1} = V _{d2} = V _{d3} = 4.5V and V _{g1} = V _{g2} = V _{g3} tuned to get I _{dq} = 360mA at T _{amb.} = 25°C. Typical P _{1dB} = 25.5dBm / Typical OIP ₃ = 35.5dBm

Biasing option 3	Reduced current (I _{dq})
	V _{d1} = V _{d2} = V _{d3} = 5.0V and V _{g1} = V _{g2} = V _{g3} tuned to get I _{dq} = 280mA at T _{amb.} = 25°C. Typical P _{1dB} = 25dBm / Typical OIP ₃ = 35dBm

Biasing option 4	Reduced voltage (V _d)
	V _{d1} = V _{d2} = V _{d3} = 4.5V and V _{g1} = V _{g2} = V _{g3} tuned to get I _{dq} = 320mA at T _{amb.} = 25°C. Typical P _{1dB} = 25.5dBm / Typical OIP ₃ = 35.5dBm

Device thermal performances

All the figures given in this section are obtained assuming that the packaged device is only cooled down by conduction through the package thermal pad (no convection mode considered).

The temperature is monitored at the package back-side interface (Tcase).

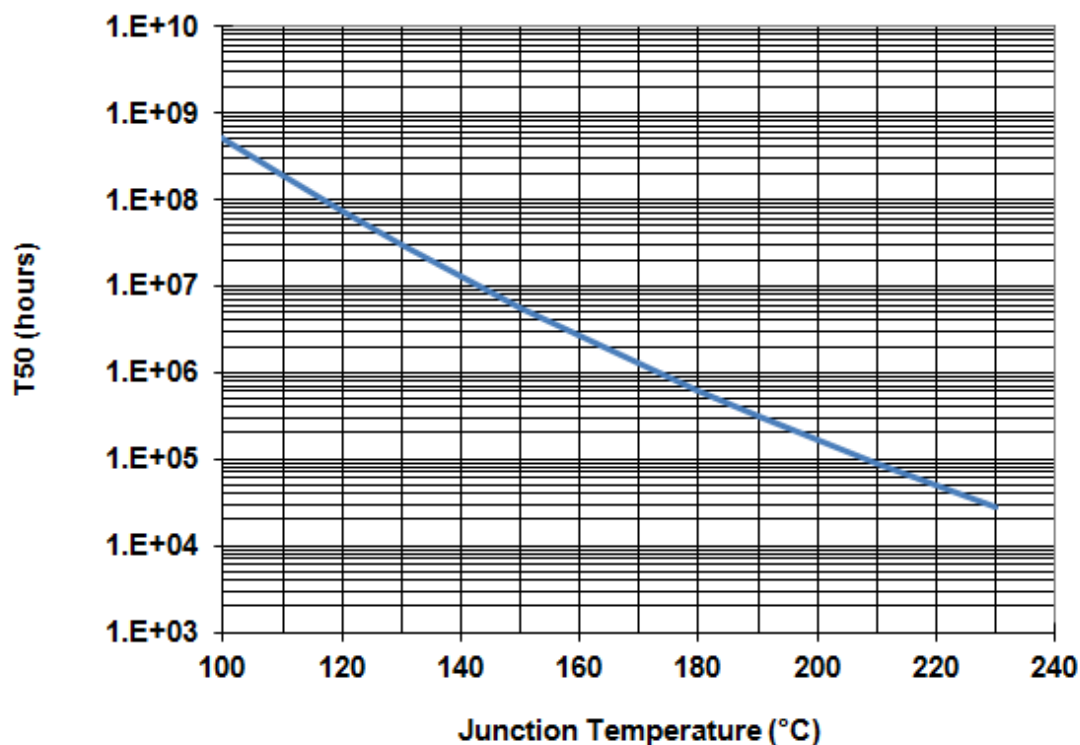
The system maximum temperature must be adjusted in order to guarantee that Tjunction remains below the maximum value specified in the Absolute Maximum Ratings table.

So, the system PCB must be designed to comply with this requirement.

Parameter	Biasing conditions	Tjunction (°C)	R _{TH} (°C/W)	T50 (hours)
R _{TH} ⁽¹⁾ Thermal Resistance (Junction to Case)	V _d = 5V I _{dq} = 290mA ⁽²⁾ P _{diss} = 1.46W	132	32	02E+07

⁽¹⁾ Assuming 85°C Tcase

⁽²⁾ I_{dq} at 85°C Tcase when V_g set to get I_{dq} = 320mA at 25°C Tcase



Typical Package Sij parameters

Tamb.= +25°C, Vd = +5V, Id = 320mA

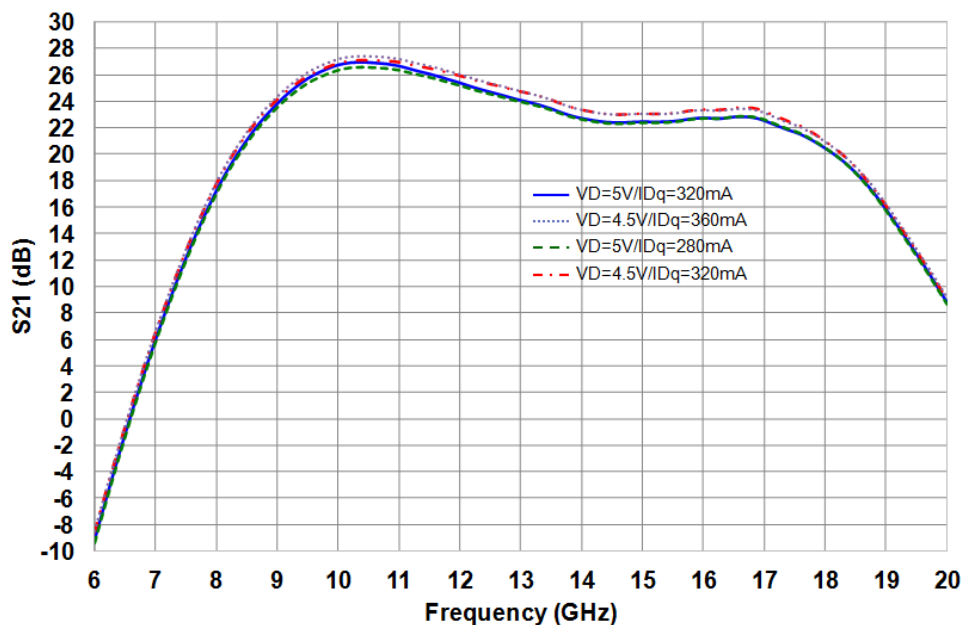
Freq (GHz)	S11 (dB)	PhS11 (°)	S12 (dB)	PhS12 (°)	S21 (dB)	PhS21 (°)	S22 (dB)	PhS22 (°)
2.0	-1.06	77.6	-66.06	-7.4	-36.32	176.2	-1.24	90.4
3.0	-1.08	31.9	-67.50	-53.4	-27.87	-38.5	-1.26	46.3
4.0	-1.14	-10.5	-73.22	-83.5	-32.79	-55.8	-1.36	0.6
5.0	-1.28	-50.4	-82.48	-111.4	-25.02	-49.3	-1.57	-46.8
6.0	-1.58	-89.7	-70.66	141.3	-9.18	-66.9	-1.95	-99.2
7.0	-2.39	-131.1	-66.11	105.9	5.96	-140.7	-3.02	-157.6
8.0	-4.94	-175.1	-59.25	64.2	17.22	117.0	-5.24	137.5
9.0	-9.32	159.5	-58.50	17.8	23.82	3.5	-9.50	64.8
10.0	-9.27	125.1	-56.02	12.7	26.74	-109.3	-17.62	-13.5
11.0	-11.04	49.9	-50.45	-33.6	26.66	147.2	-29.63	-27.7
12.0	-11.74	-34.4	-49.10	-87.2	25.38	58.2	-21.72	-61.7
13.0	-11.52	-96.4	-48.07	-141.9	24.07	-21.3	-18.66	-125.5
14.0	-14.77	-134.2	-48.46	171.8	22.70	-95.5	-19.67	168.0
15.0	-17.90	-115.9	-46.49	139.4	22.44	-166.2	-23.01	125.2
16.0	-10.93	-103.7	-43.76	80.3	22.72	116.2	-30.45	99.3
17.0	-6.09	-138.8	-45.51	13.0	22.53	26.8	-23.39	110.5
18.0	-4.46	-165.7	-48.27	17.4	20.43	-68.3	-16.60	64.6
19.0	-2.75	164.3	-48.35	-20.4	15.80	-167.4	-8.72	9.1
20.0	-2.05	128.3	-47.81	-49.4	8.78	107.0	-4.78	-44.8
21.0	-2.46	89.5	-52.98	-105.5	1.43	35.5	-2.82	-87.5
22.0	-2.76	43.0	-63.84	63.1	-5.52	-31.4	-1.88	-122.0
23.0	-3.31	-13.9	-62.88	17.0	-12.69	-94.8	-1.28	-151.0
24.0	-3.28	-74.3	-51.34	-56.4	-20.37	-153.4	-0.96	-176.5
25.0	-2.63	-126.3	-44.90	-76.9	-29.35	159.1	-0.74	161.7
26.0	-1.96	-166.4	-48.04	-62.3	-39.22	102.3	-0.51	142.1
27.0	-1.47	161.8	-49.38	-82.8	-49.55	39.0	-0.39	122.5
28.0	-1.16	134.6	-52.90	-135.9	-61.44	-30.6	-0.25	103.5
29.0	-0.90	109.4	-50.93	-166.0	-54.80	-155.5	-0.17	85.8
30.0	-0.84	85.1	-54.66	0.1	-54.18	-1.0	-0.15	68.8
31.0	-0.92	62.1	-46.56	-59.4	-46.55	-57.9	-0.22	51.9
32.0	-0.98	39.3	-49.17	-76.8	-47.97	-88.4	-0.38	34.8
33.0	-0.96	14.9	-43.55	-130.4	-43.64	-129.7	-0.38	17.4
34.0	-1.01	-11.5	-43.86	-123.3	-44.28	-120.3	-0.37	0.8
35.0	-1.09	-40.1	-43.13	-151.0	-43.28	-152.5	-0.46	-16.5
36.0	-1.22	-71.3	-42.50	-179.9	-42.32	-178.7	-0.50	-36.1
37.0	-1.37	-104.0	-45.54	177.8	-45.58	175.8	-0.51	-54.7
38.0	-1.44	-138.7	-45.04	170.6	-45.21	171.0	-0.58	-72.8
39.0	-1.46	-172.6	-44.50	146.3	-44.59	144.2	-0.59	-94.4
40.0	-1.33	153.7	-52.83	134.6	-53.51	138.0	-0.31	-116.9

Typical test fixture Measurements

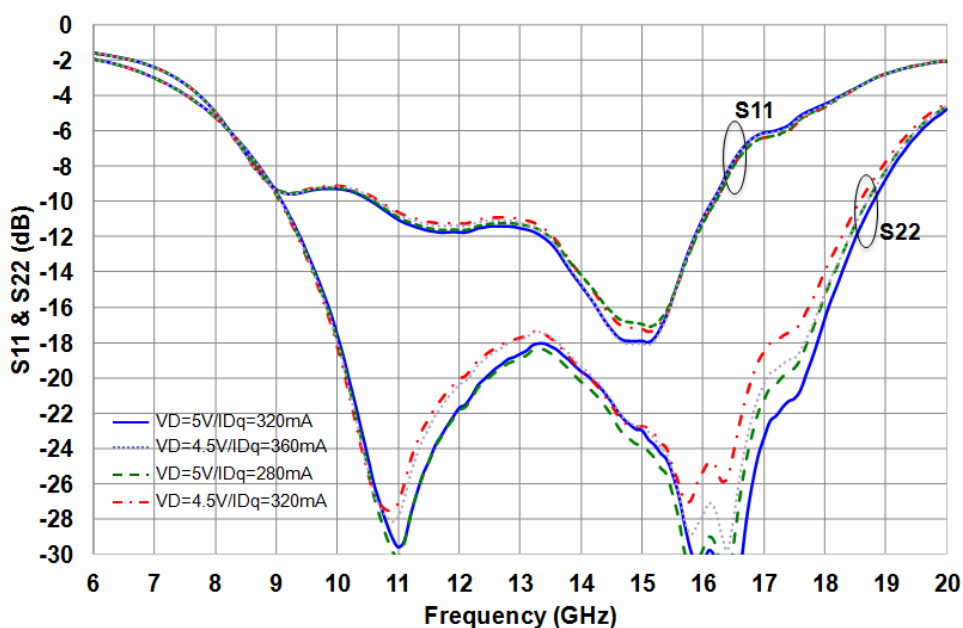
Tamb.= +25°C, Biasing conditions :

- | | |
|-------------------------------------|-------------------------------------|
| a) $V_d = +5.0V$, $I_{dQ} = 320mA$ | b) $V_d = +4.5V$, $I_{dQ} = 360mA$ |
| c) $V_d = +5V$, $I_{dQ} = 280mA$ | d) $V_d = +4.5V$, $I_{dQ} = 320mA$ |

S21 versus frequency for several biasing conditions

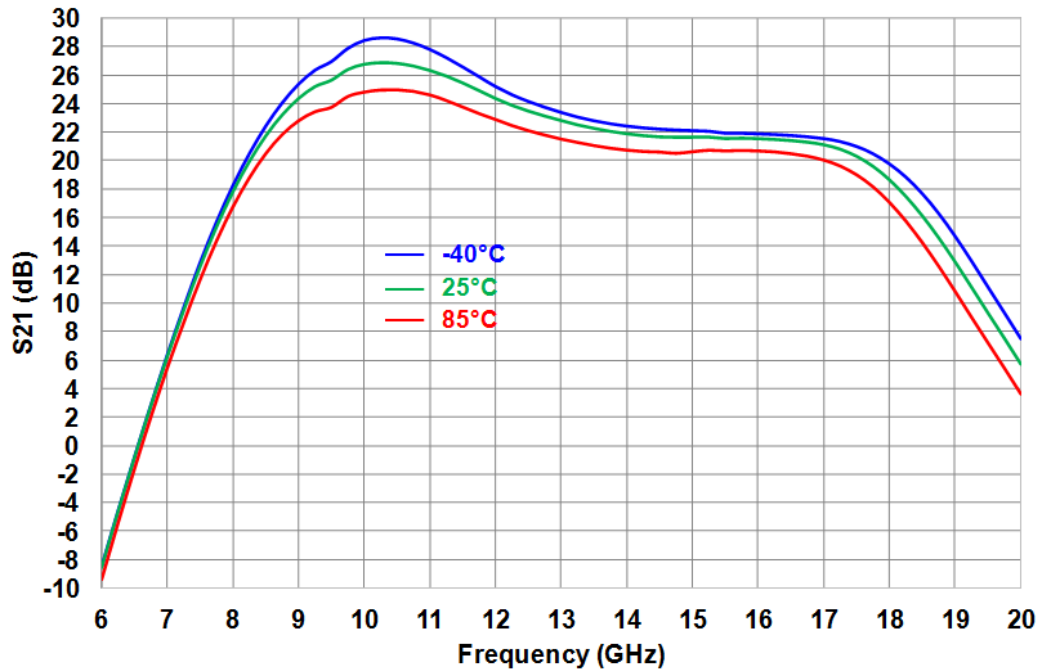


S11 and S22 versus frequency for several biasing conditions

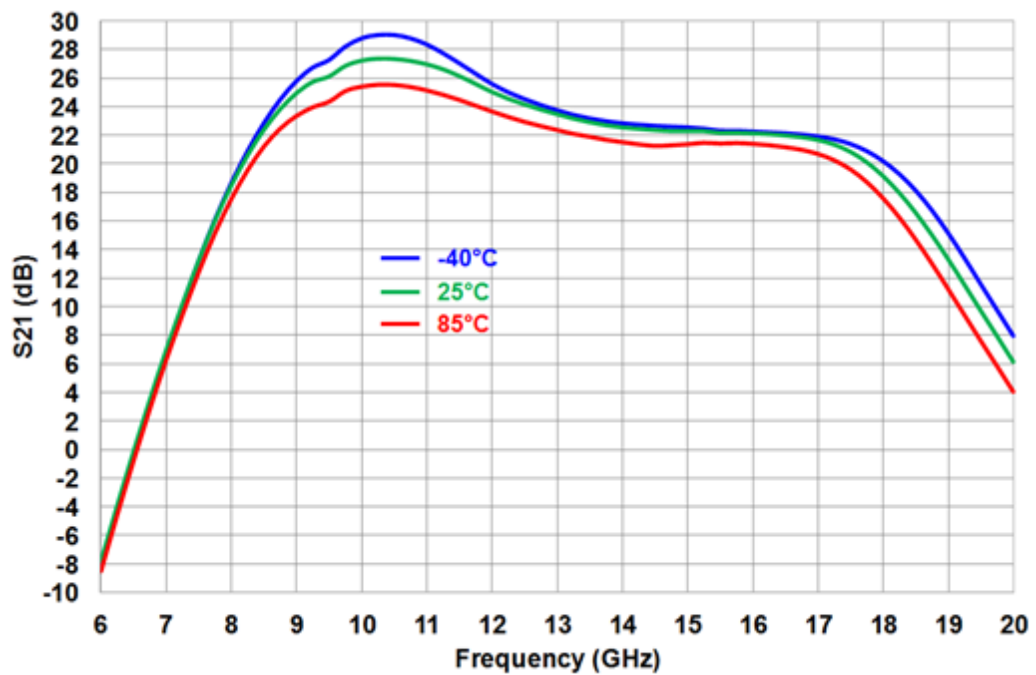


Typical test fixture Measurements

S21 versus frequency & temperature

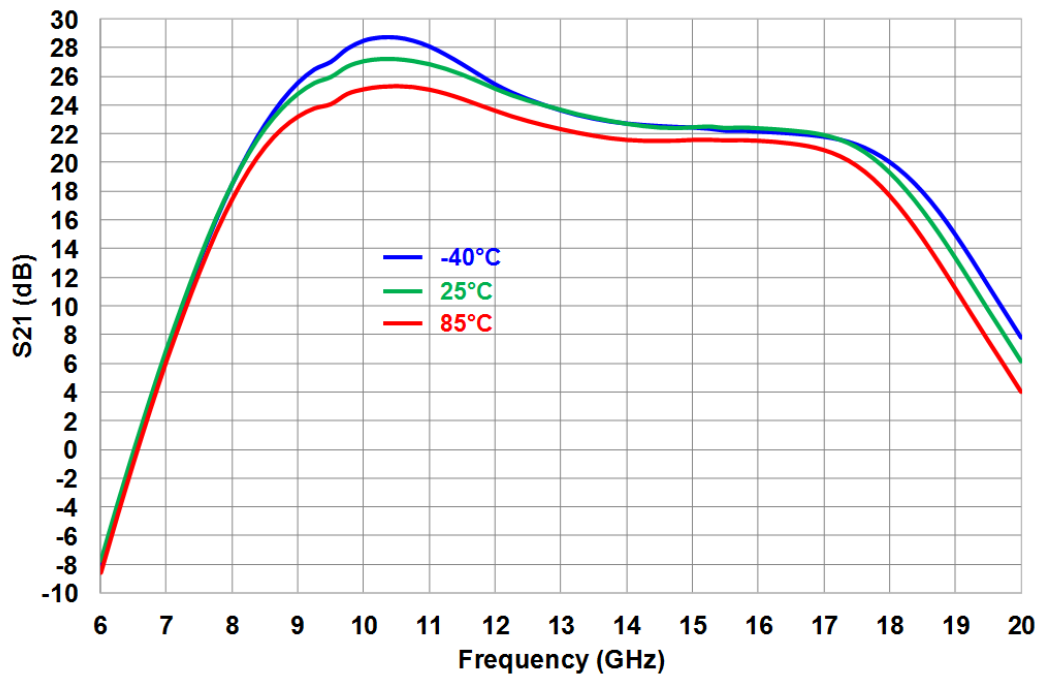
 $V_d = +5V / I_{dq} @ T_{case}=25^{\circ}C = 320mA$ 

S21 versus frequency & temperature

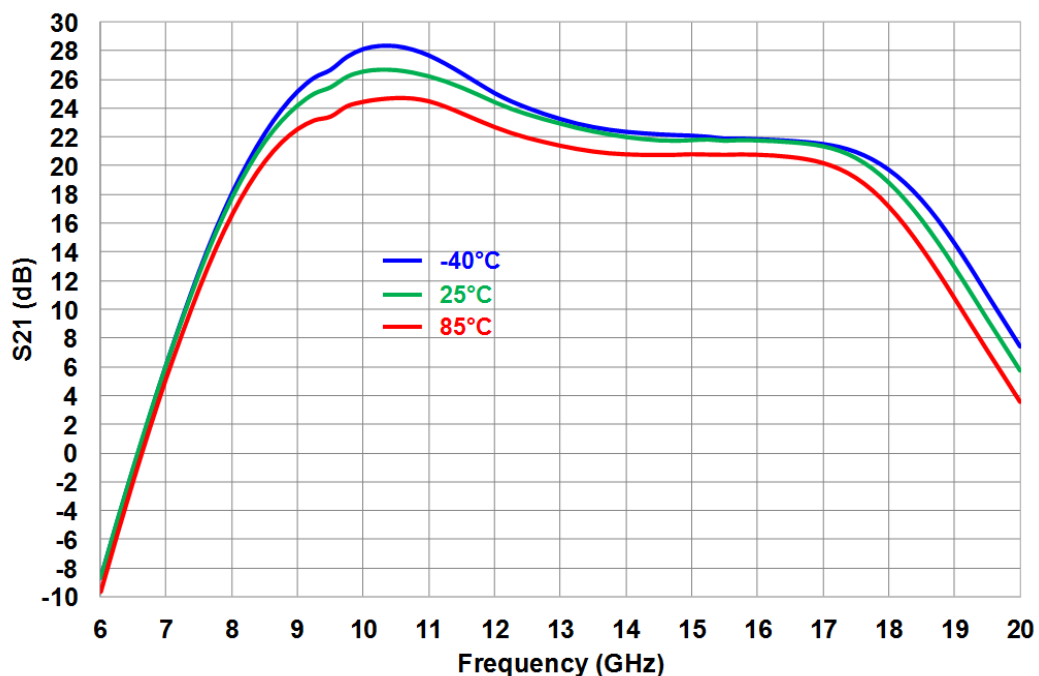
 $V_d = +4.5V / I_{dq} @ T_{case}=25^{\circ}C = 360mA$ 

Typical test fixture Measurements

S21 versus frequency & temperature

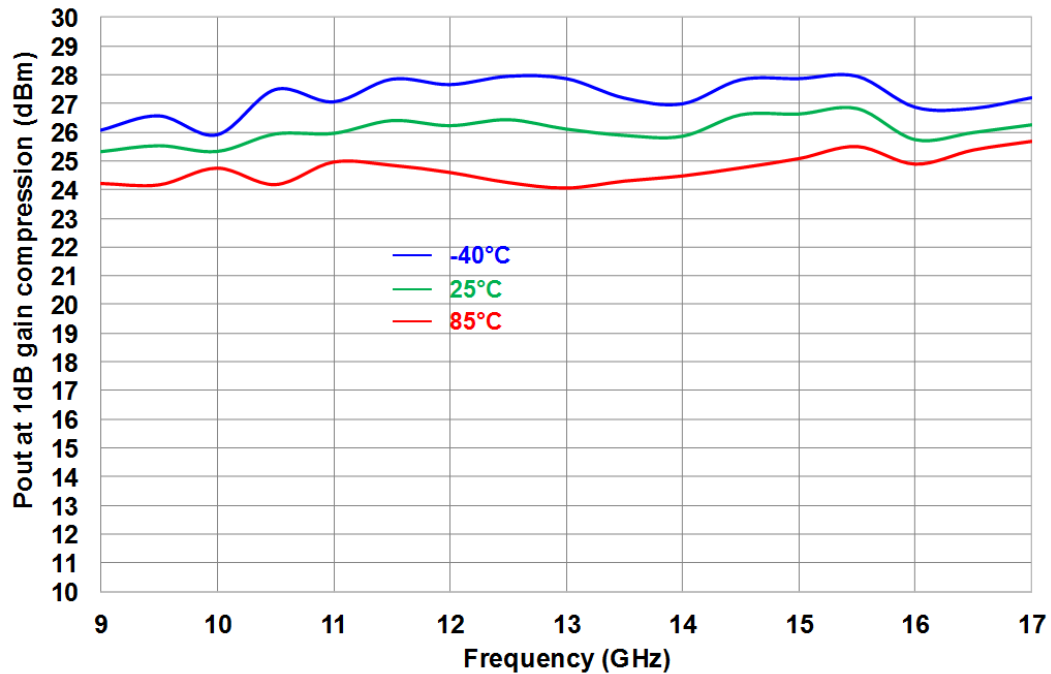
 $V_d = +4.5V / I_{dq} @ T_{case}=25^{\circ}C = 320mA$ 

S21 versus frequency & temperature

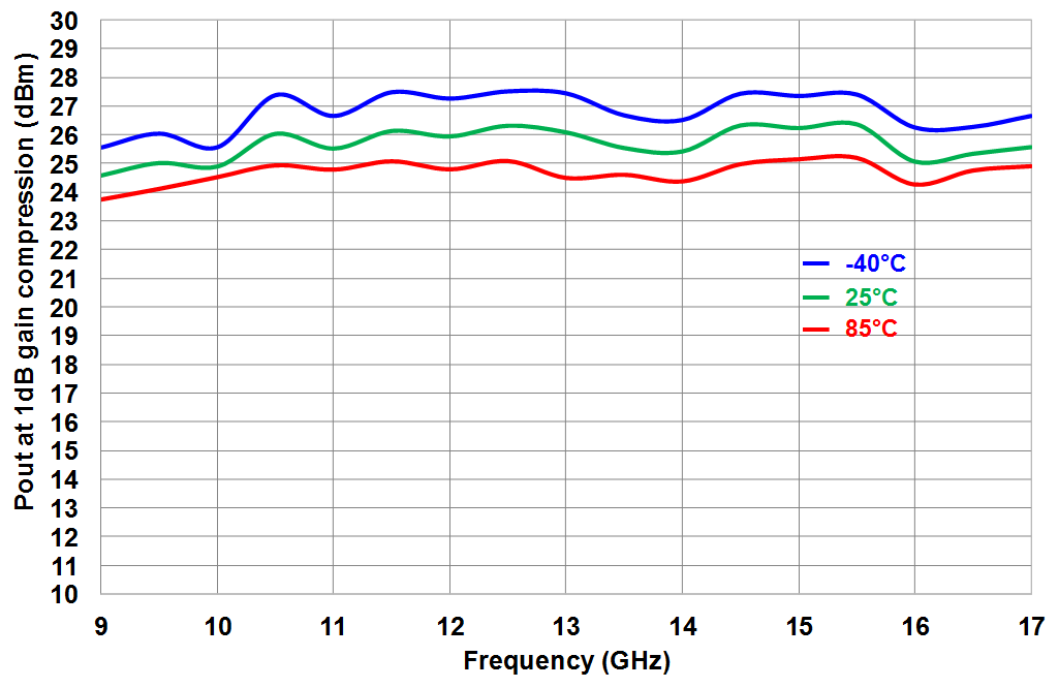
 $V_d = +5V / I_{dq} @ T_{case}=25^{\circ}C = 280mA$ 

Typical test fixture Measurements

Output power at 1dB gain compression

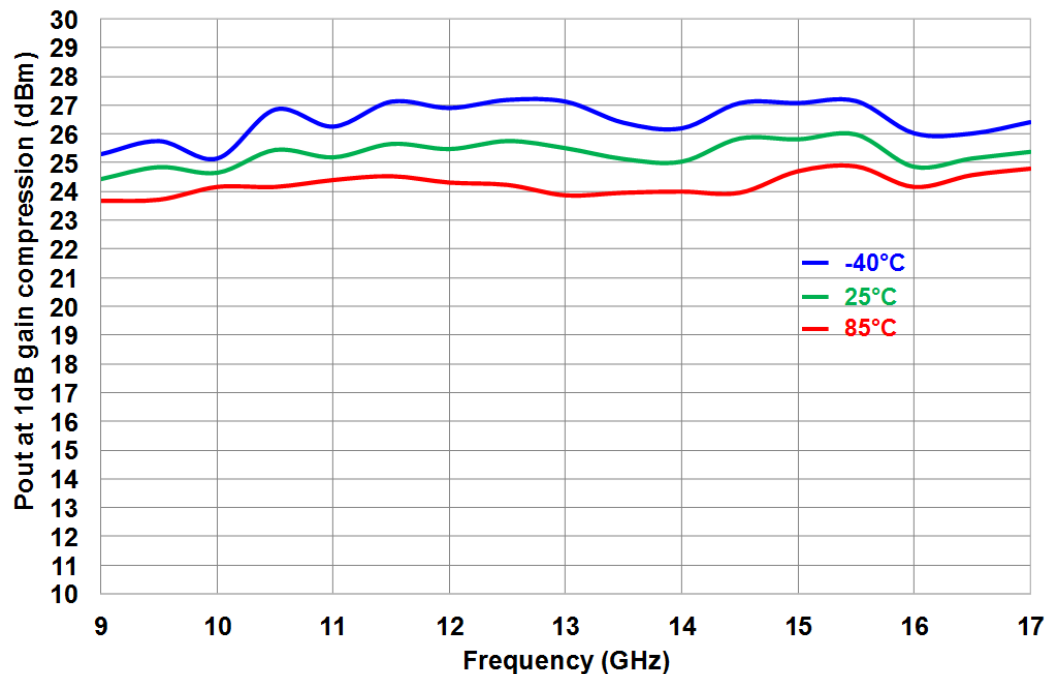
 $V_d = +5V / I_{dq} @ T_{case}=25^{\circ}C = 320mA$ 

Output power at 1dB gain compression

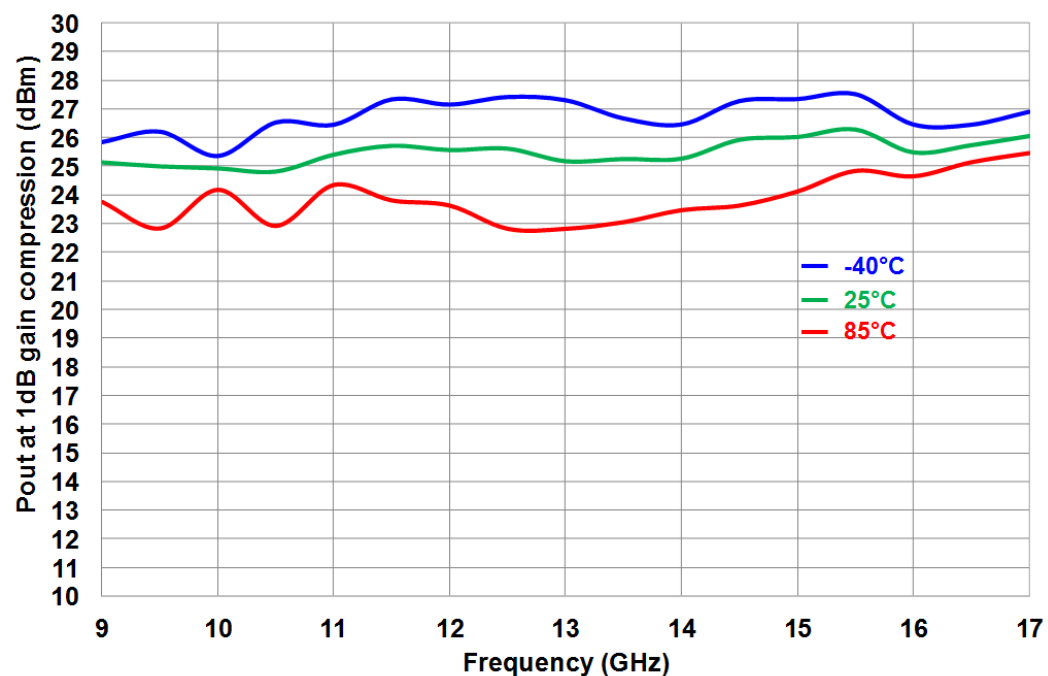
 $V_d = +4.5V / I_{dq} @ T_{case}=25^{\circ}C = 360mA$ 

Typical test fixture Measurements

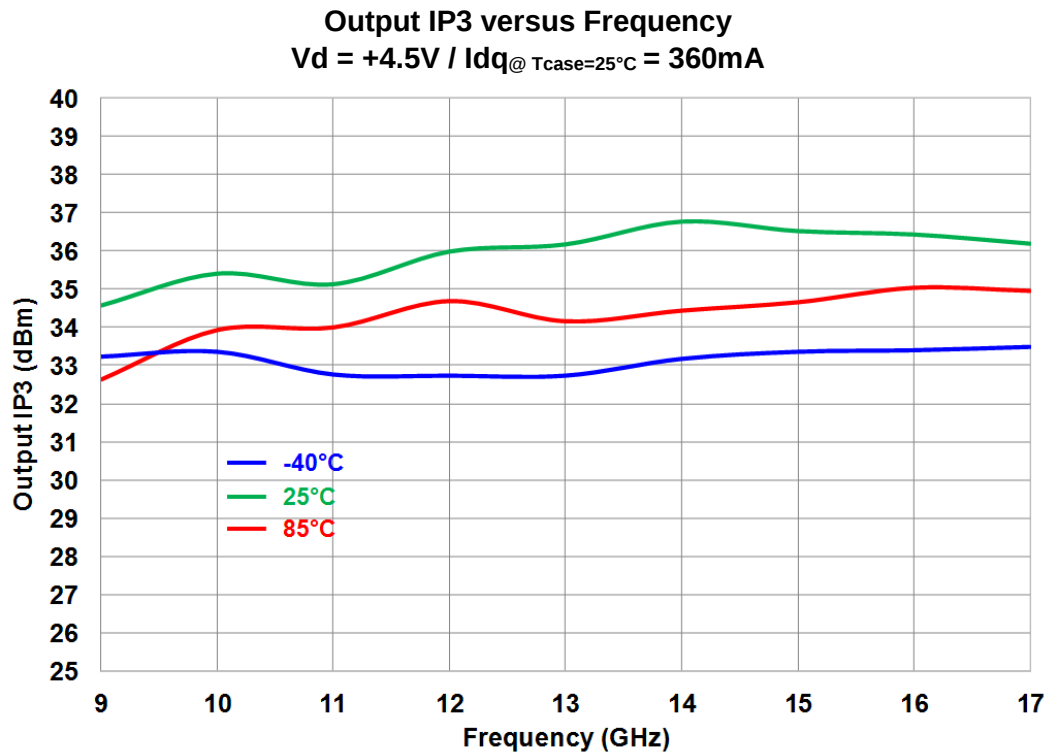
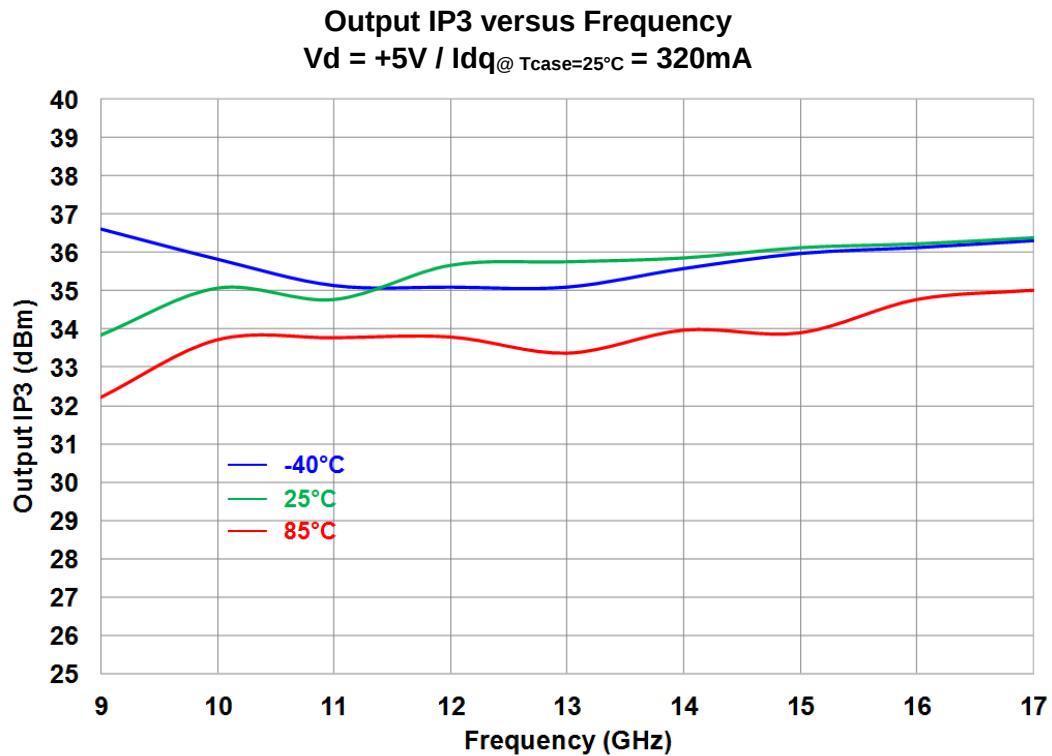
Output power at 1dB gain compression

 $V_d = +4.5V / I_{dq}@ T_{case}=25^{\circ}C = 320mA$ 

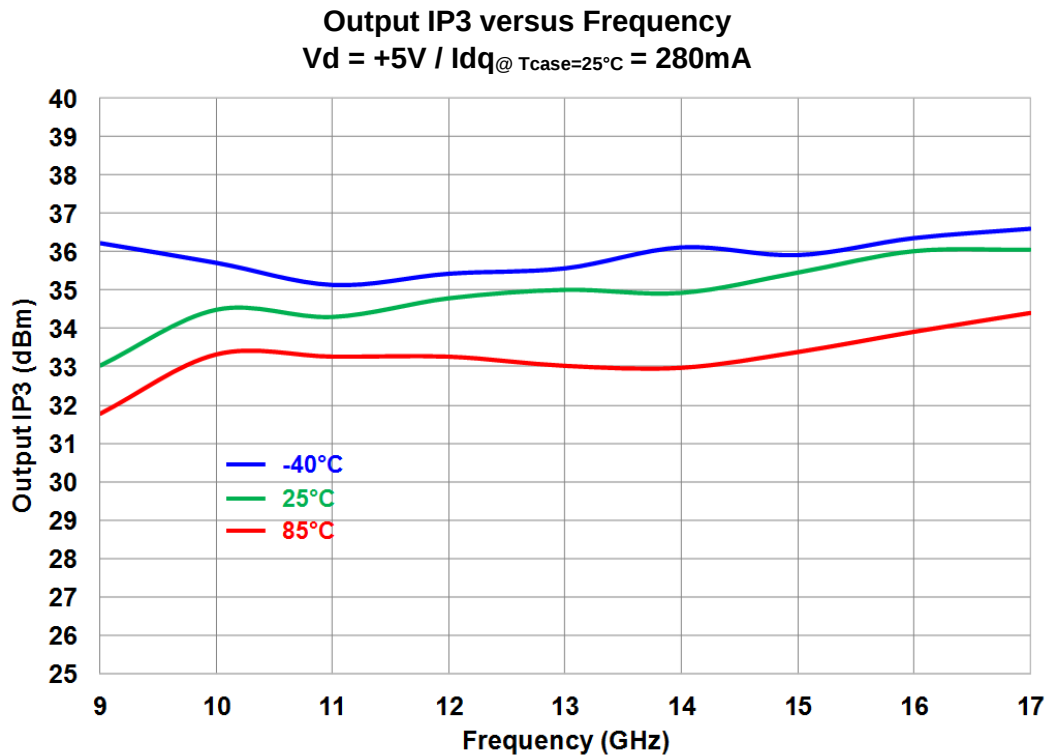
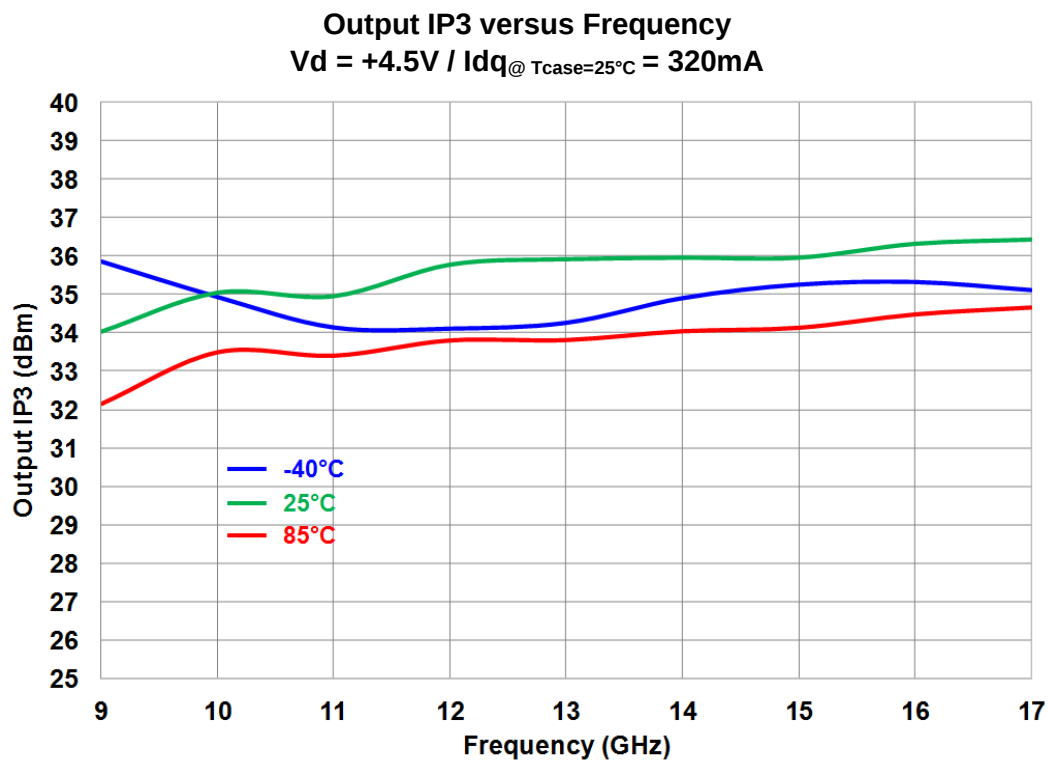
Output power at 1dB gain compression

 $V_d = +5V / I_{dq}@ T_{case}=25^{\circ}C = 280mA$ 

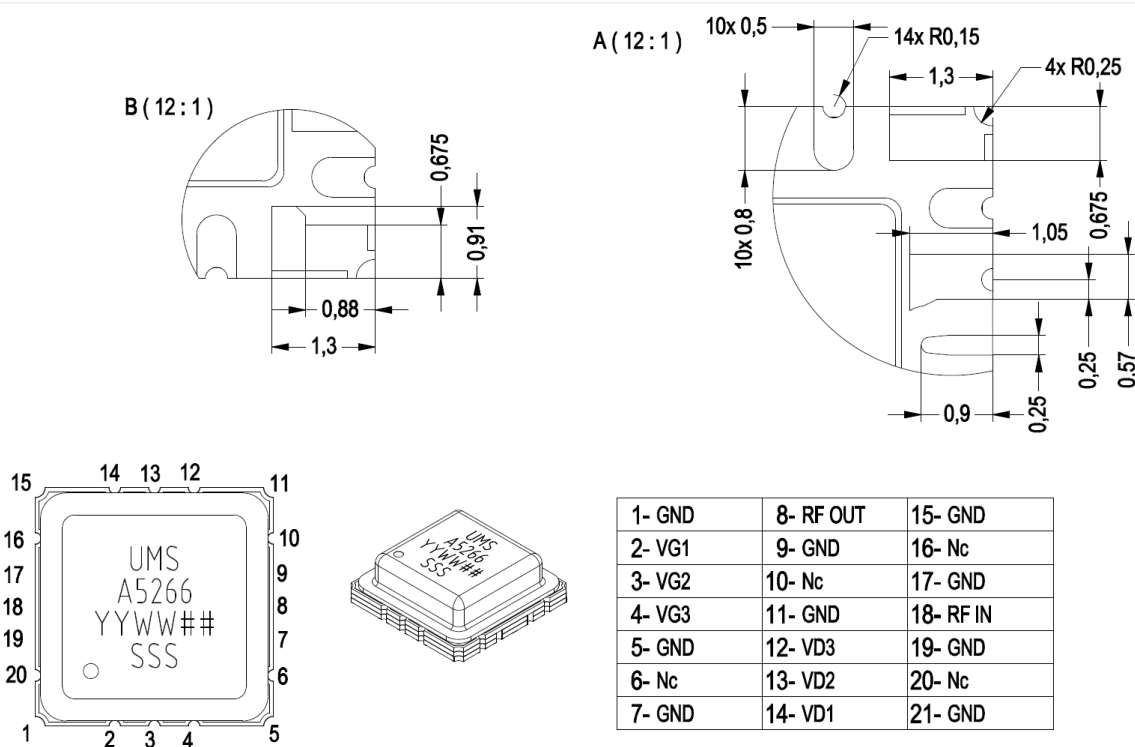
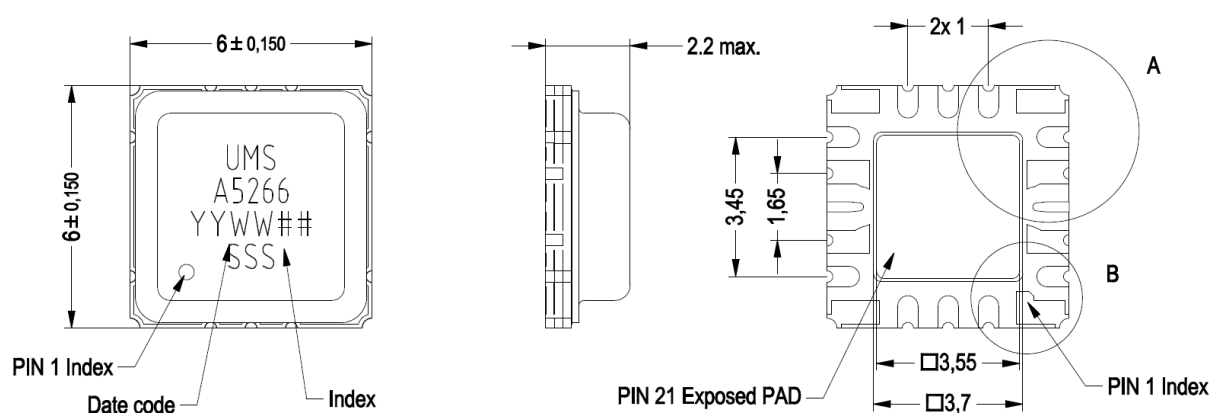
Typical test fixture Measurements



Typical test fixture Measurements



Package outline



Units : mm

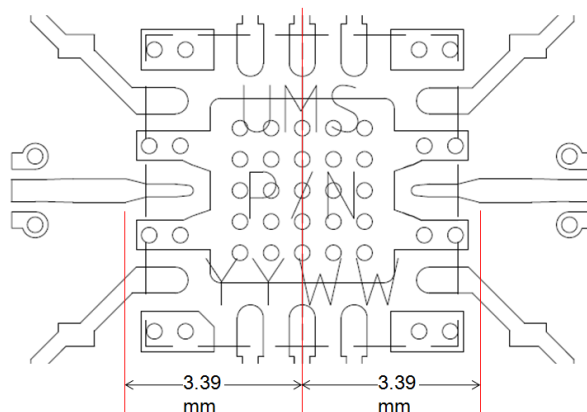
It is strongly recommended to ground all pins marked “Gnd” through the PCB board. Ensure that the PCB board is designed to provide the best possible ground to the package.

⁽¹⁾ The package outline drawing included to this data-sheet is given for indication. Refer to the application note AN0024 (<https://www.ums-rf.com>) for exact package dimensions.

(2) It is strongly recommended to ground all pins marked “Gnd” through the PCB board. Ensure that the PCB board is designed to provide the best possible ground to the package.

Definition of the Sij reference planes

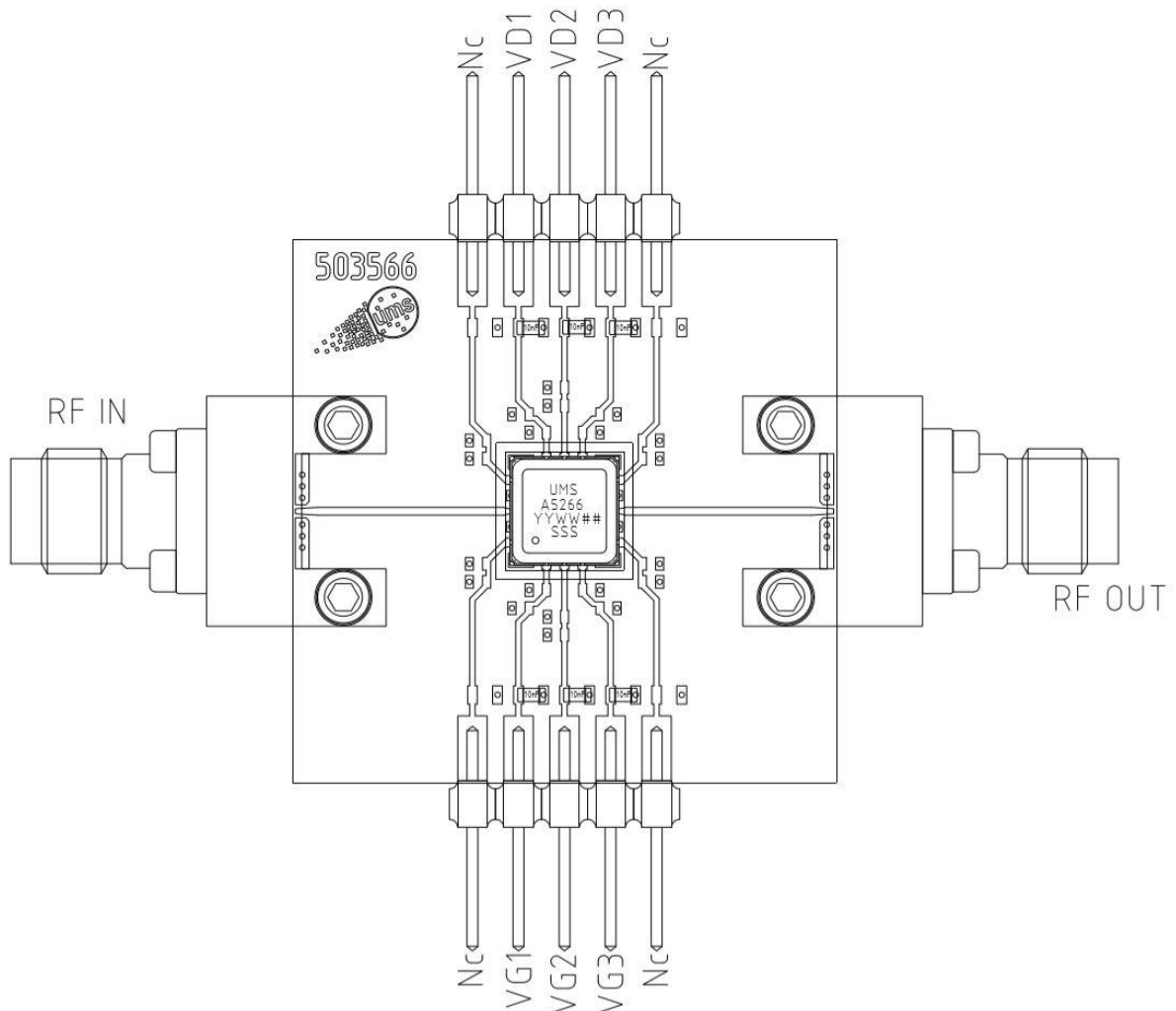
The reference planes used for Sij measurements given above are symmetrical from the symmetrical axis of the package (see drawing beside). The input and output reference planes are located at 3.39mm offset (input wise and output wise respectively) from this axis. Then, the given Sij parameters incorporate the land pattern of the evaluation motherboard recommended in paragraph "Evaluation motherboard".

**Package Information**

Parameter	Value
Package body material	RoHS-compliant
Lead finish	Gold
Hermetic sealing (fine leak compliant Mil-Std-883 Method 1014.10 Condition A4, tracer gas He at 1atm)	1×10^{-8} ccHe/s/atm

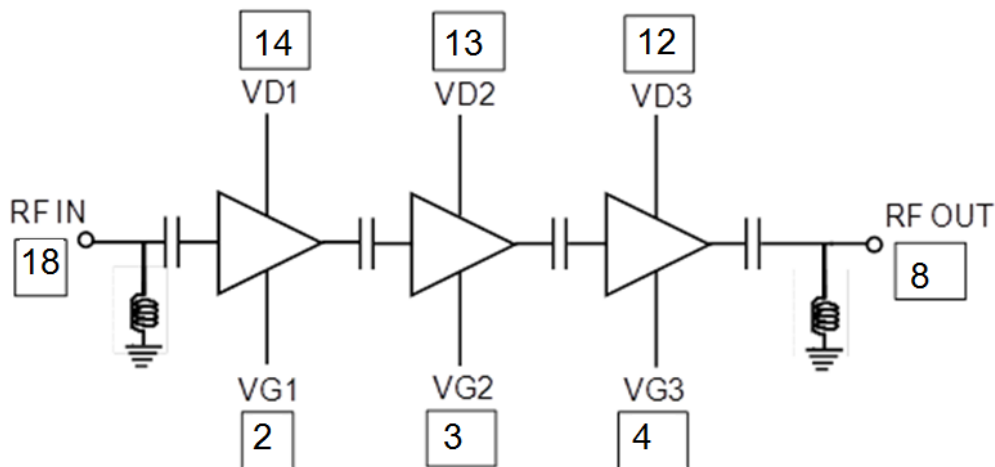
Evaluation board description

- 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 10nF are recommended on each DC access (Vg1 / Vg2 / Vg3 / Vd1 / Vd2 / Vd3)



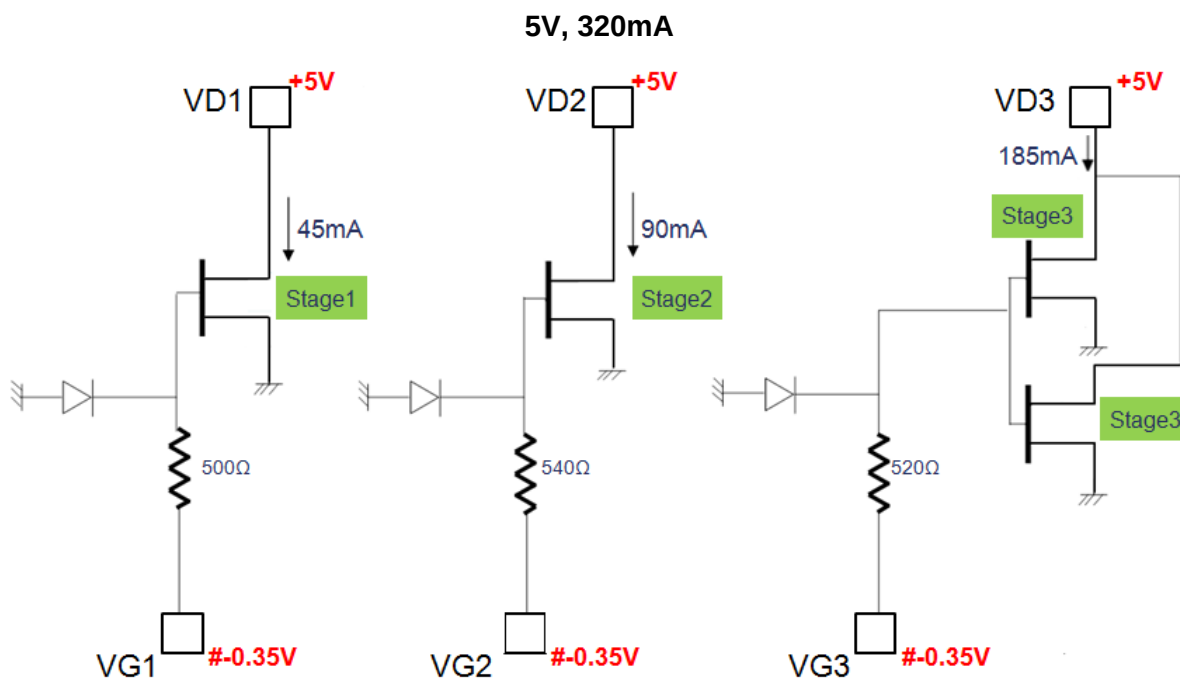
Notes

Due to ESD protection circuits on RF input and output, an external capacitance might be requested to isolate the product from external voltage that could be present on the RF accesses.



ESD protections are also implemented on gate and control accesses.

DC Schematic



Notes

Recommended package footprint for FAB Package

Refer to the application note AN0024 available at <https://www.ums-rf.com> for package footprint recommendations and exact package dimensions.

SMD mounting procedure for FAB Package

For the mounting process standard techniques involving solder paste and a suitable reflow process can be used. For further details, see application note AN0024 available at <https://www.ums-rf.com>.

Recommended environmental management

UMS products are compliant with the regulation in particular with the directives RoHS N°2011/65 and REACH N°1907/2006. More environmental data are available in the application note AN0019 also available at <https://www.ums-rf.com>.

Recommended ESD management

Refer to the application note AN0020 available at <https://www.ums-rf.com> for ESD sensitivity and handling recommendations for the UMS package products.

Ordering Information

FAB package:

CHA5266-FAB/XY

Waffle pack: XY = 24

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