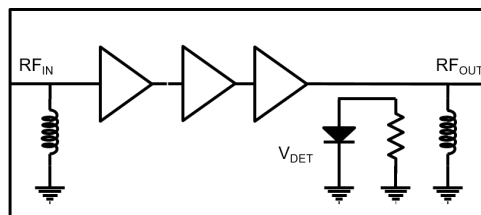


Advanced Information: AI2214

24-27.5GHz 4W HPA

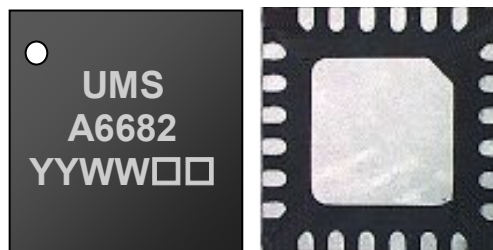
GaN Monolithic Microwave IC in QFN package



The CHA6682-QKB is a three-stage GaN High Power Amplifier in the frequency band 24-27.5GHz. This HPA typically provides 4W output power associated to 26% of Power Added Efficiency. The circuit exhibits a typical small signal gain of 25dB. The overall power supply is 20V/140mA. It includes a RF output power detector.

This HPA is dedicated to telecommunication applications and well suited for a wide range of microwave applications and systems including 5G, Satcom and Radar.

The product is developed on a robust GaN on SiC HEMT process and is available in QFN plastic package. The input and output are matched to 50Ω and integrate ESD RF protection.



Electrical Characteristics

Tcase= +25°C, Vd = +20V, (Tcase: QFN backside temperature)

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	24		27.5	GHz
Gain	Linear Gain		25		dB
S ₁₁	Input return loss		-8		dB
S ₂₂	Output return loss		-11		dB
P _{sat}	Saturated output Power		36		dBm
PAE	Power Added Efficiency		26		%
Idq	Quiescent Current		140		mA
Vc	Detector control voltage		5		V
Vref-Vdet	Detector Measurement up to Psat	5		1500	mV

“Power ON” sequence

1. Ground the device
2. Set the gate voltage to -5V
3. Apply the drain voltage Vd (typically 20V)
4. Set Vc bias voltage to 5V for detector biasing
5. Increase Vg up to quiescent bias drain current Idq
6. Apply RF signal

“Power OFF” sequence

1. Turn off RF signal
2. Decrease the gate voltage to -5V
3. Decrease the drain voltage to 0V
4. Set Vc bias voltage to 0V
5. Turn off Vd supply
6. Turn off Vg supply

Absolute Maximum Ratings ⁽¹⁾

Tcase= +25°C (Tcase: QFN backside temperature)

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	27	V
Id	Drain bias current	1	A
Vg	Gate bias voltage	-7 to -2	V
Pin	Maximum peak input power overdrive	25	dBm

⁽¹⁾ Operation of this device above any one of these parameters may cause permanent damage.**Recommended Operating Range** ^{(2), (3)}

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	20	V
Idq	Quiescent drain current	140	mA
Pin	Maximum recommended input power ⁽²⁾	22	dBm
Tj	Junction temperature ⁽²⁾	200	°C

⁽²⁾ Electrical performances are defined for specified test conditions⁽³⁾ Electrical performances are not guaranteed over all recommended operating conditions**Temperature Range**

Symbol	Parameter	Values	Unit
Tcase	Operating temperature	-40 to 85	°C
Tstg	Storage temperature range	-55 to +150	°C

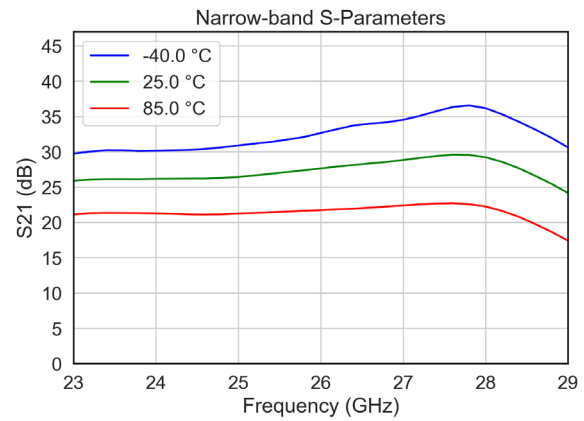
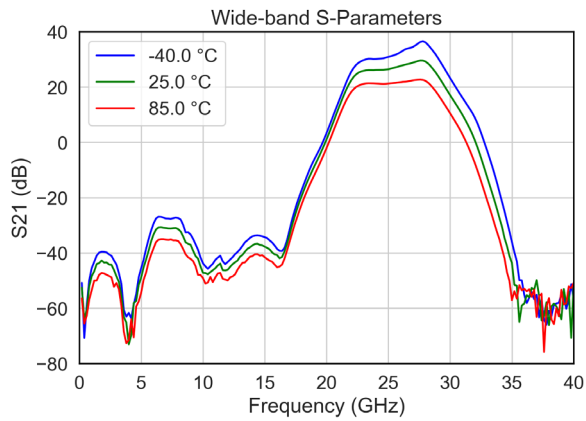
Advanced Information

Typical Board Measurements

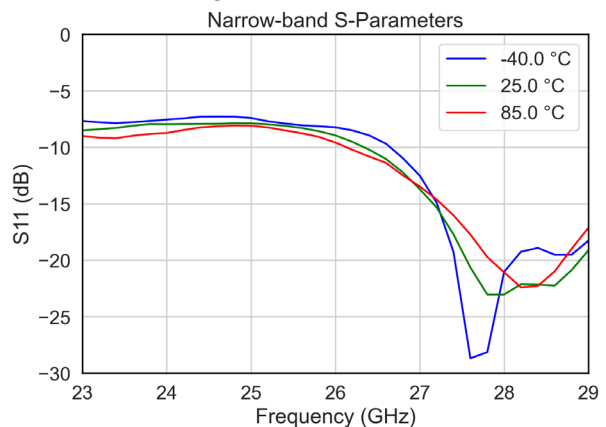
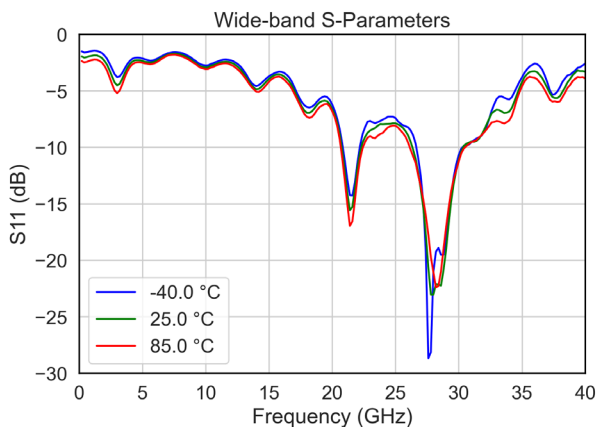
Tcase= -40°C, +25°C, +85°C, Vd = 20V, Idq = 140mA

Measurements are given in the QFN access plans

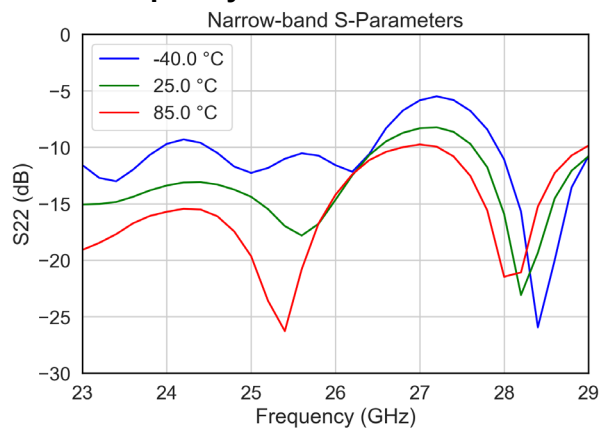
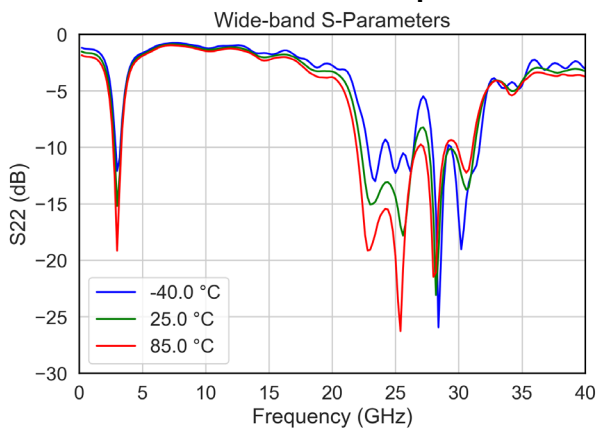
Linear Gain vs. Frequency



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



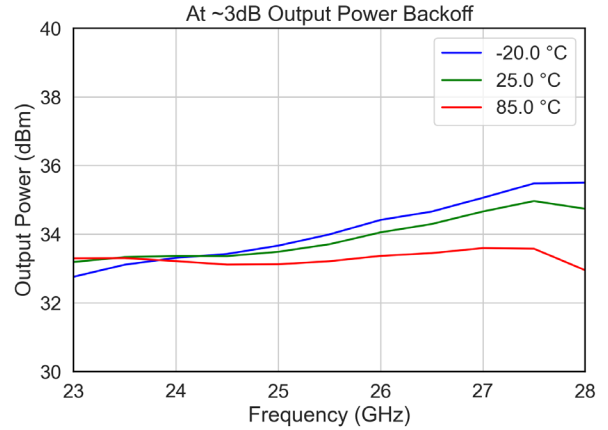
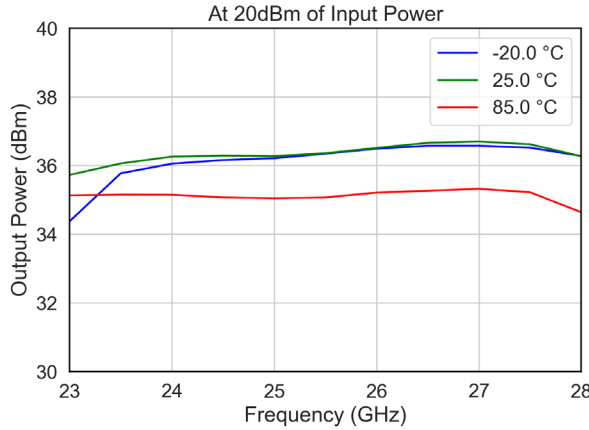
Advanced Information

Typical Board Measurements

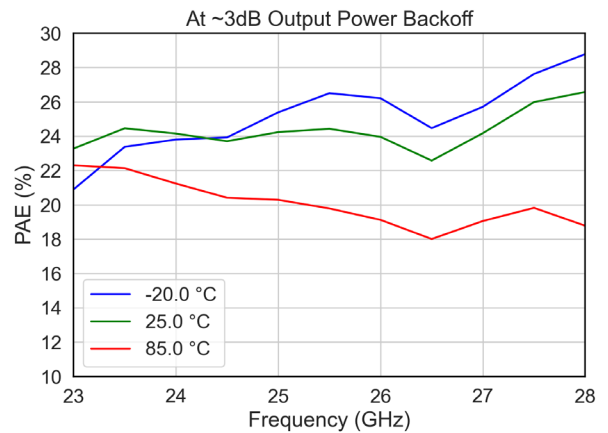
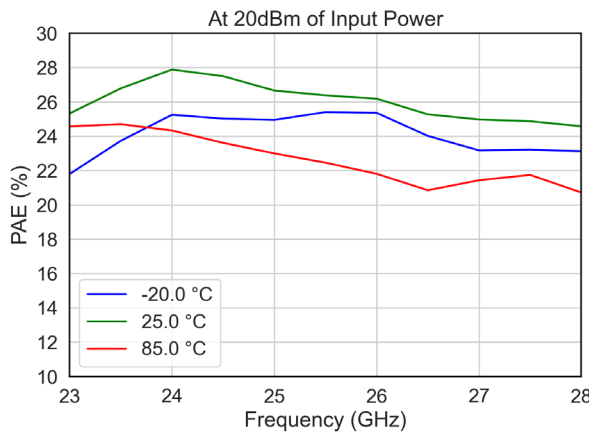
Tcase= -20°C, +25°C, +85°C, Vd = +20V, Id = 140mA

Measurements are given in the QFN access plans

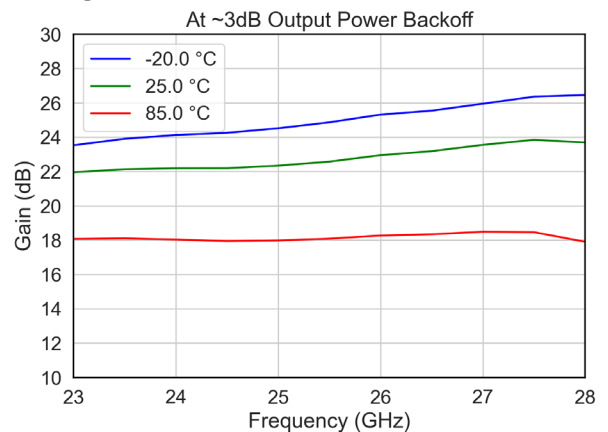
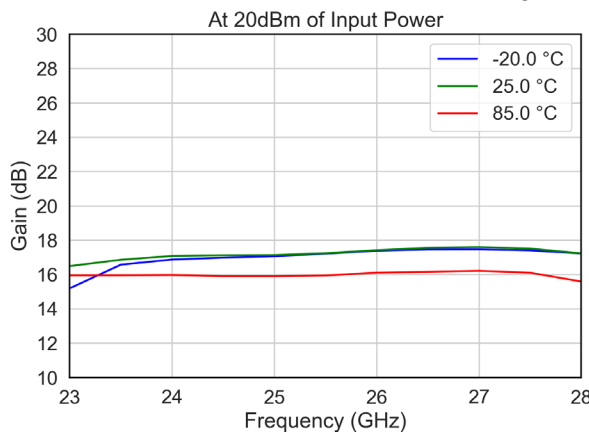
Output Power vs. Frequency and package backside Temp.



Power Added Efficiency vs. Frequency and package backside Temp.



Gain vs. Frequency and package backside Temp.



Advanced Information

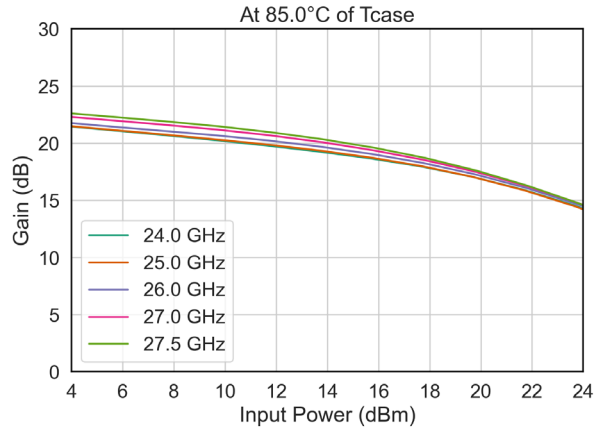
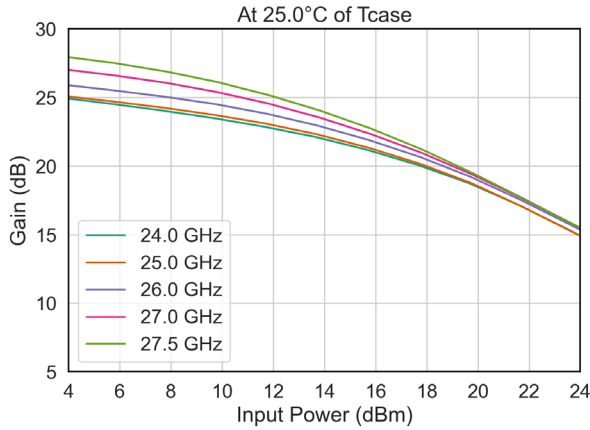


Typical Board Measurements

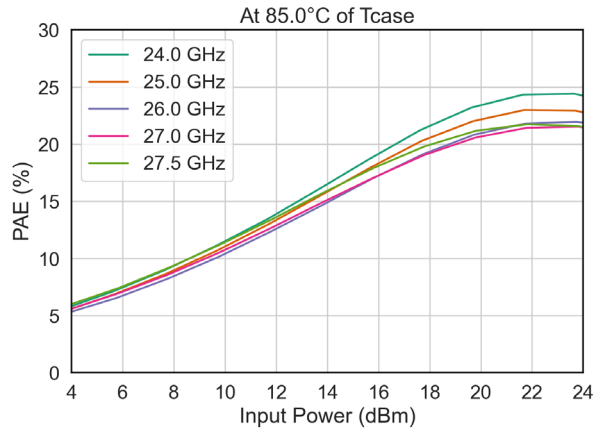
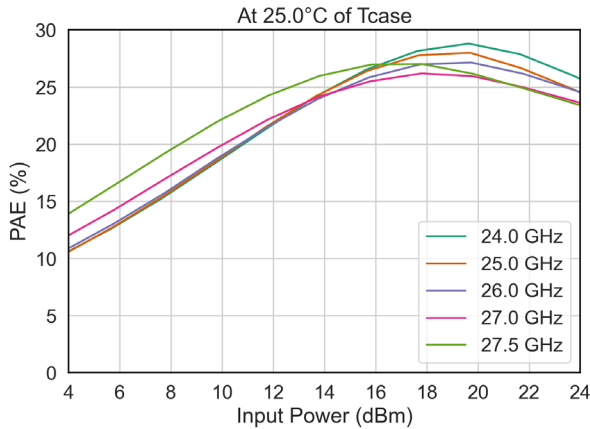
Tcase= +25°C, Vd = +20V, Id = 140mA

Measurements are given in the QFN access plans

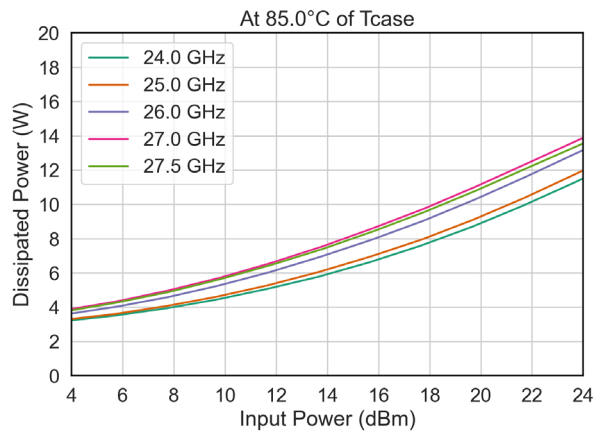
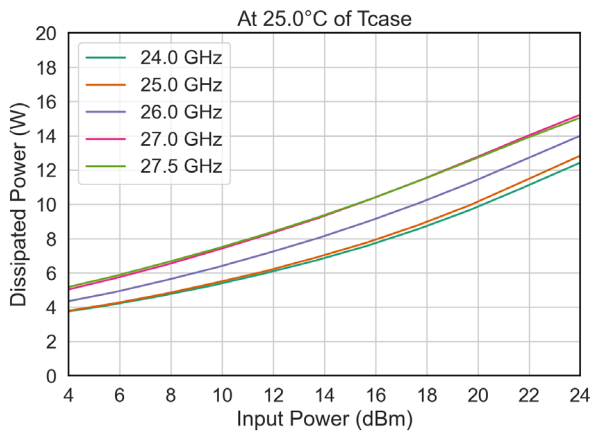
Gain vs. Input Power vs. Frequency



Power Added Efficiency vs. Input Power vs. Frequency



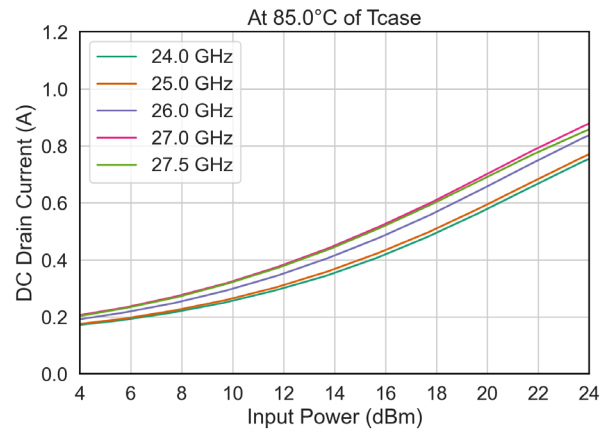
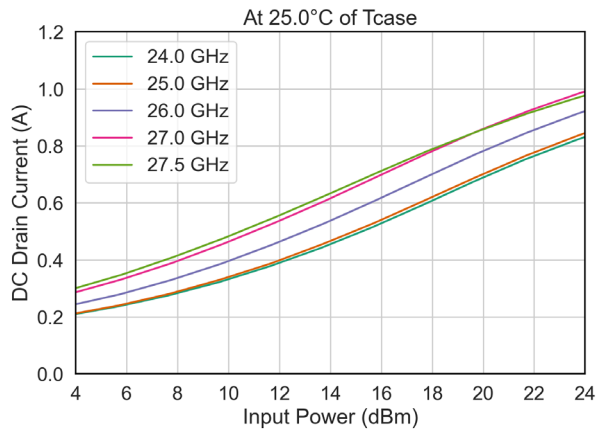
Dissipated Power vs. Input Power vs. Frequency



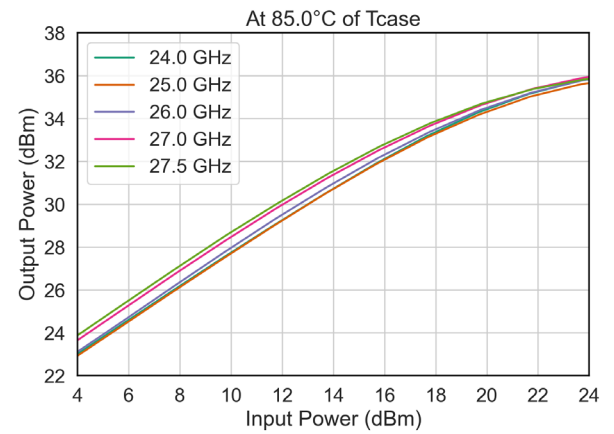
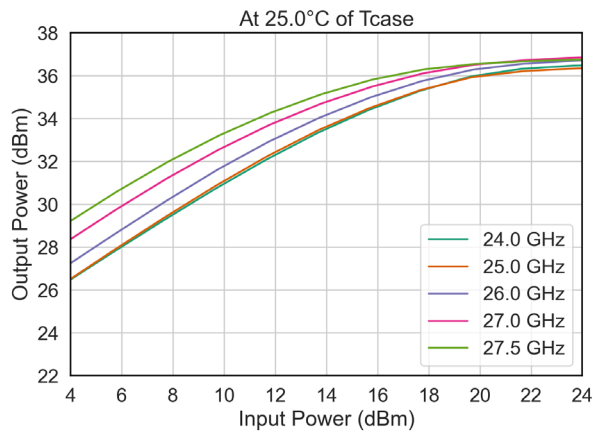
Advanced Information



DC Drain Current vs. Input Power vs. Frequency



Output Power vs. Input Power vs. Frequency



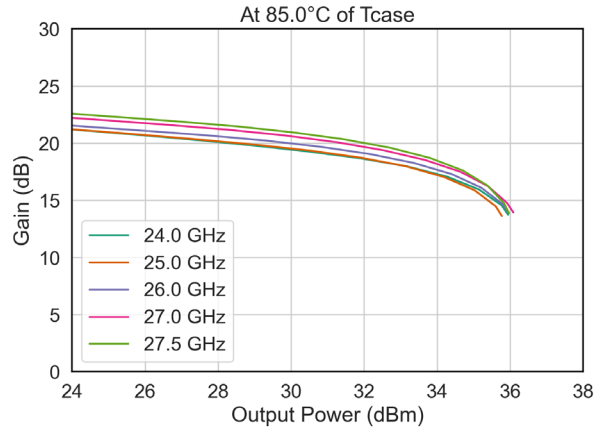
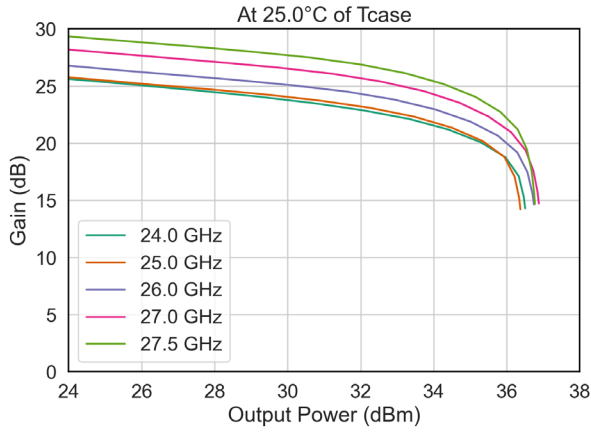
Advanced Information



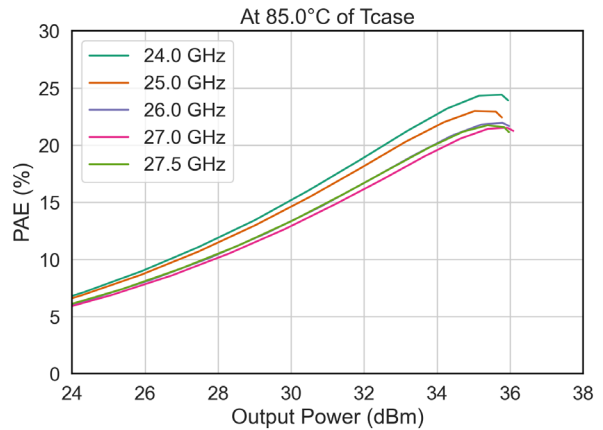
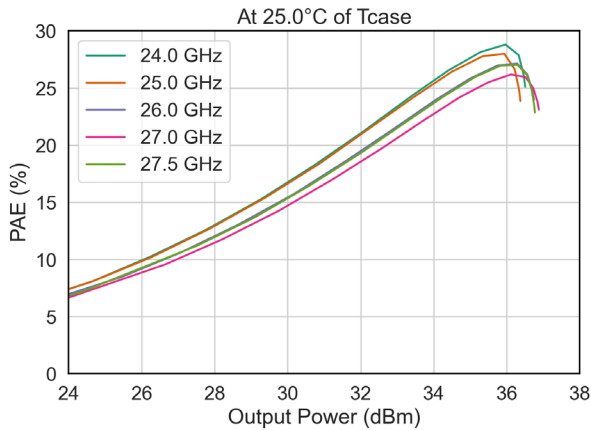
Typical Board Measurements

Tcase= +25°C, Vd = +20V, Pin = 20dBm, Id = 140mA

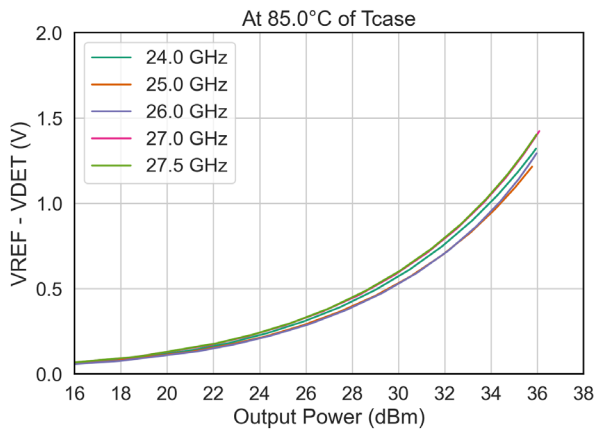
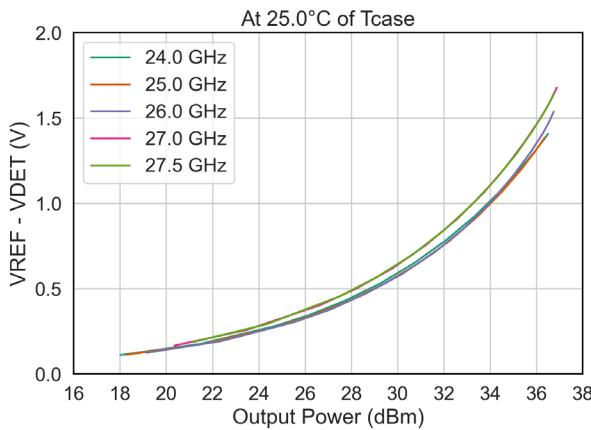
Gain vs. Output Power vs. Frequency



Power Added Efficiency Gain vs. Output Power vs. Frequency

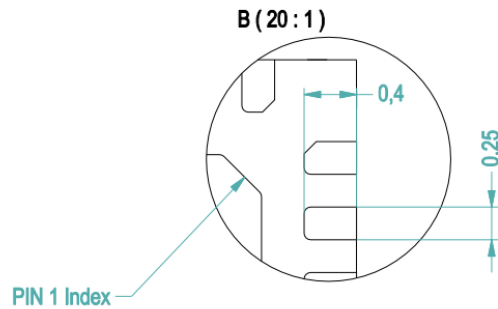
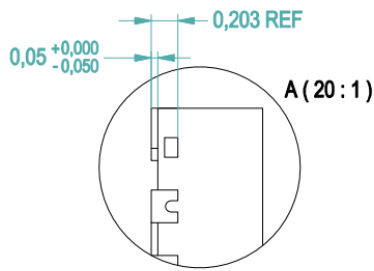
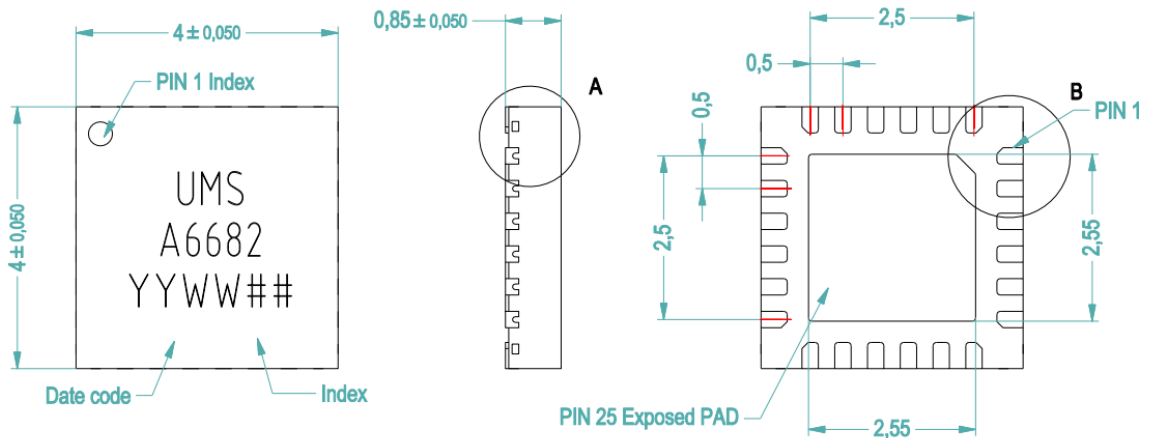


Vref-Vdet (V) Gain vs. Output Power vs. Frequency

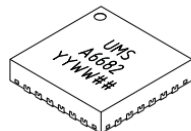


Advanced Information

Package outline



Units : mm
 Finish : NiPdAuAg
 Lead free (Green)



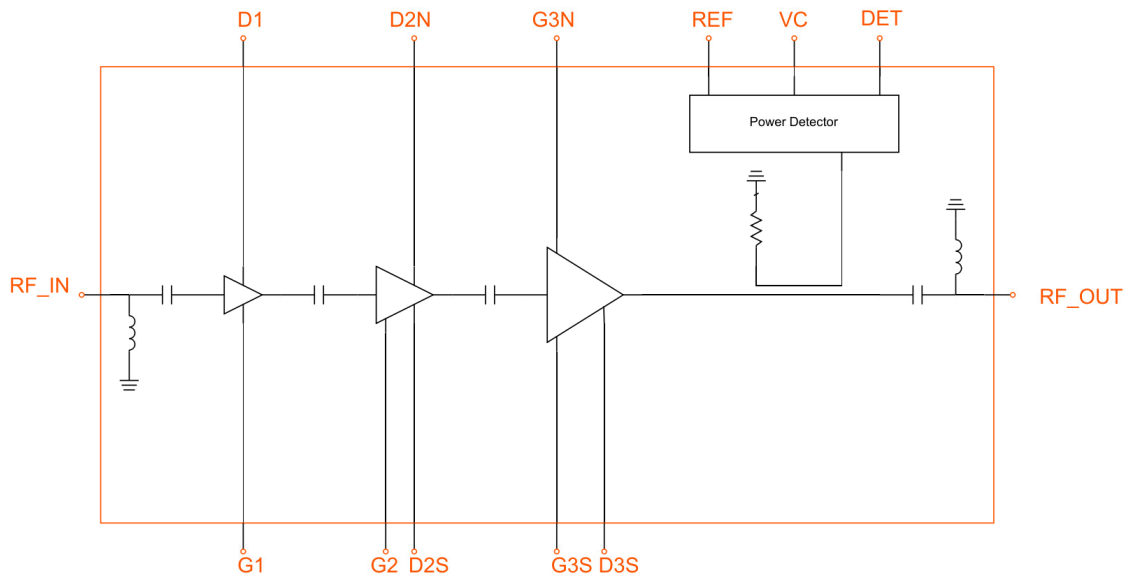
Finish:	NiPdAuAg Lead Free (Green)	1- NC	10- D3S	19- DET
Units :	mm	2- NC	11- GND ⁽¹⁾	20- VC
From the standard :	JEDEC MO-220	3- GND ⁽¹⁾	12- RF out	21- REF
NC:	Not Connected	4- RF in	13- NC	22- G3N
		5- GND ⁽¹⁾	14- GND ⁽¹⁾	23- D2N
		6- NC	15- RF out	24- D1
		7- G1	16- GND ⁽¹⁾	25- GND ⁽¹⁾
		8- G2	17- NC	
		9- D2S	18- NC	

⁽¹⁾ 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.

Advanced Information

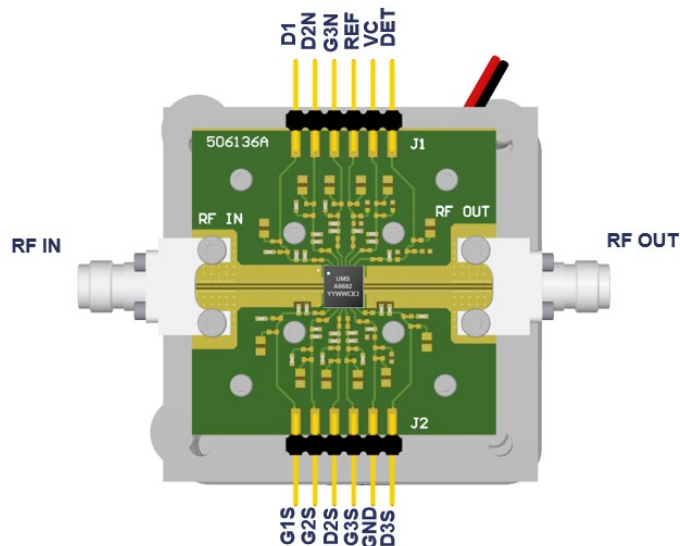


DC Schematic



Evaluation 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 120pF, 10nF and 1μF ±10% are recommended for all DC pins.
- See application note AN0017 for details.
- To ensure safe operation, all measurements must be performed using **shielded cables, even for DC bias**.



Advanced Information

24-27.5GHz 4W HPA

AI2214
March 2024

Notes

Advanced Information

Ref. : AI22144086 - 26 Mar 24

11/12

Subject to change without notice

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Recommended package footprint

Refer to the application note AN0017 available at <http://www.ums-rf.com> for package foot print recommendations.

SMD mounting procedure

For the mounting process standard techniques involving solder paste and a suitable reflow process can be used. For further details, see application note AN0017 available at <http://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 <http://www.ums-rf.com>.

Recommended ESD management

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

Maturity Level

Maturity Level	Product status	Documentation	Reliability	Usage in a system
Lab Sample (LS)	Decision to develop the product is not confirmed	Technical Information	No commitment	Lab demonstrator
Engineering Sample (ES)	Design may change	Advanced Information	The design is within the recommended temperature, current and voltage ranges as regards the technology used.	Engineering demonstrator
Product Representative Unit (PRU)	Design is frozen	Data-sheet	Tests results are available on the foreseen product or on an similar one	Production

Sampling request reference

Package: ES-CHA6682-QKB
 Demo board: EDG-CHA6682-QKB

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Advanced Information

