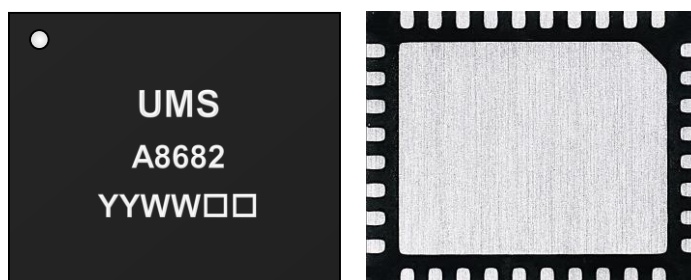


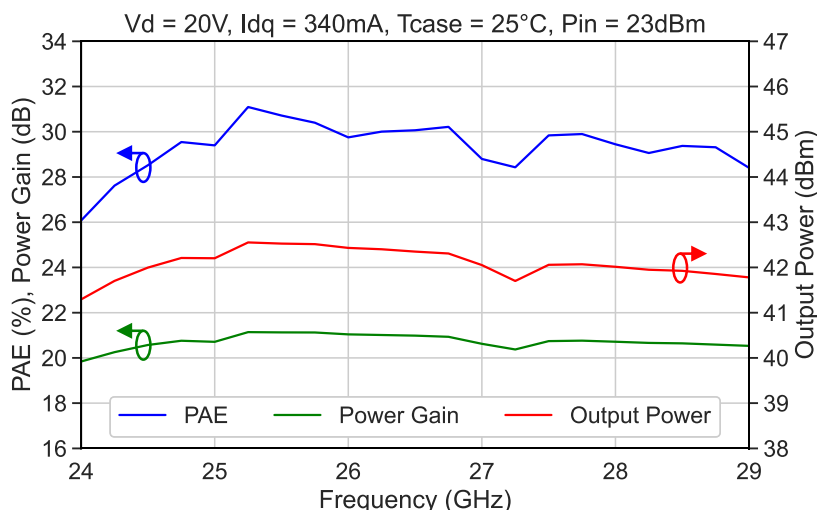
Advanced Information: AI2521

24-27.5GHz 16W Power Amplifier

GaN Monolithic Microwave IC



The CHA8682-QWA is a 3-stage high power amplifier operating between 24 and 27.5GHz and providing typically 16W of saturated output power associated to 29% of Power Added Efficiency. It exhibits 8W of linear power with -25dBc IMD3 at 10MHz bandwidth. This HPA is dedicated to 5G and Satcom applications and well suited for a wide range of microwave applications and systems. The circuit is manufactured on a robust GaN-on-SiC HEMT process and is available in RoHS compliant QFN plastic package. Input and output are 50Ω matched.



Electrical Characteristics

Tcase = 25°C, Vd = 20V, Idq = 340mA, CW mode (Tcase: Package backside temperature)

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	24		27.5	GHz
Gain	Linear gain		27		dB
Pout	Output power (Pin = 23dBm)		42		dBm
PAE	Power Added Efficiency		29		%
Id	Drain current (Pin = 23dBm)		2.8		A
S11	Input return loss		-8		dB
S22	Output return loss		-12		dB
Idq	Quiescent current		340		mA
Vd	Drain voltage		20		V

These values are representative of on-board measurements as defined on the drawing in the Measurement Reference Planes section.

Absolute Maximum Ratings ⁽¹⁾

Tcase = 25°C

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	25	V
Idq	Quiescent drain current (without RF signal)	1000	mA
Vg	Gate bias voltage	-7 to -1.5	V
Pin	Maximum input power	30	dBm

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

Recommended Operating Range ^{(2), (3)}

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	18 to 22	V
Idq	Quiescent drain current (without RF signal)	300 to 700	mA
Vg	Gate bias voltage	-5 to -2.5	V
Tj	Maximum junction temperature ⁽⁴⁾	200	°C
Pin	Maximum input power	28	dBm

⁽²⁾ Electrical performance is defined for specified test conditions.

⁽³⁾ Electrical performance is not guaranteed over all recommended operating conditions.

⁽⁴⁾ See Device Thermal Performance section.

Temperature Range

Tcase	Operating temperature range	-40 to +85	°C
Tstg	Storage temperature range	-55 to +150	°C

Advanced Information

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Subject to change without notice

Typical Bias Conditions

Tcase = 25°C

Symbol	Pin Number	Description	Value	Unit
Vg	3, 5, 8, 19, 22, 24	Gate voltage	-3	V
Vd	1, 4, 6, 21, 23, 26	Drain voltage	20	V

“Power ON” Sequence

1. Bias HPA gate voltage at Vg close to Vpinch-off (Typically: Vg ≈ -5V)
2. Apply Vd bias voltage (Typically: Vd = 20V)
3. Increase gate voltage Vg up to quiescent bias drain current Idq
4. Apply RF signal

“Power OFF” Sequence

1. Turn off RF signal
2. Bias HPA gate voltage at Vg close to Vpinch-off (Typically: Vg ≈ -5V)
3. Check that quiescent bias drain current Idq is close to 0mA
4. Turn Vd bias voltage to 0V
5. Check that quiescent bias drain current Idq is close to 0mA
6. Turn Vg bias voltage to 0V

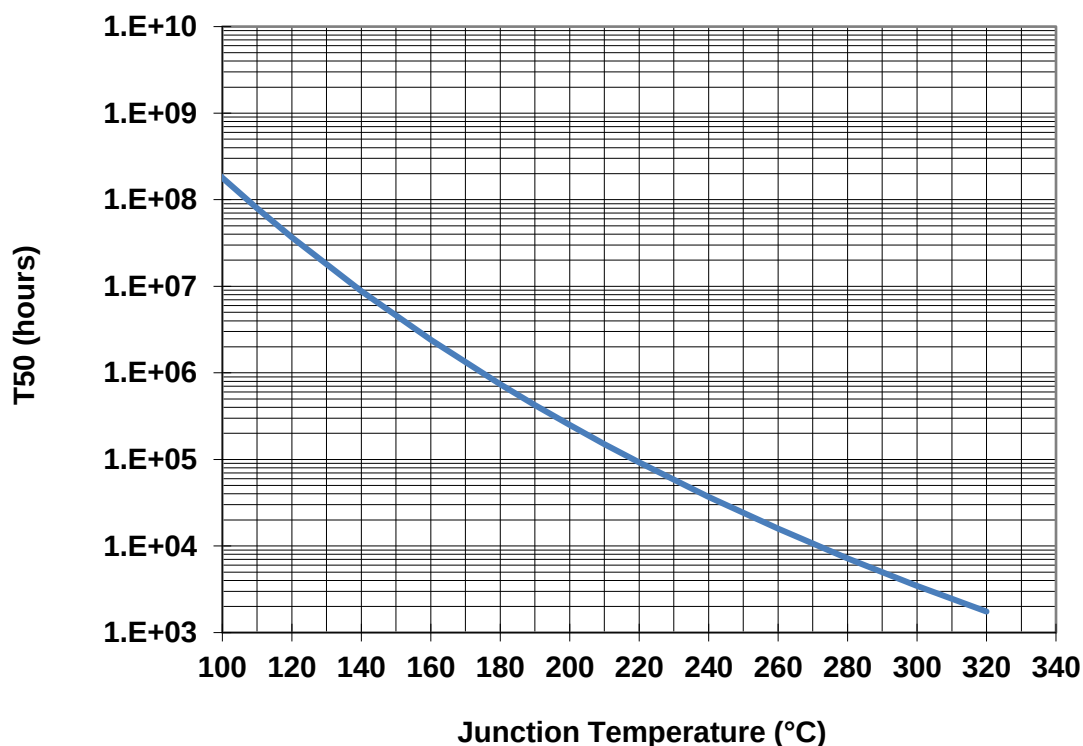
Advanced Information

Device Thermal Performance

All the figures given in this section are obtained assuming that the QFN 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 Recommended Operating Range table. The system PCB must be designed to comply with this requirement.

Parameter	Conditions	Tjunction (°C)	Rth (°C/W)	T50 (hours)
Rth ⁽¹⁾ Thermal Resistance (Junction to package backside)	Vd = 20V Idq = 340mA Pin = 30dBm Pdis = 50.9W	193	2.14	3.4E+05

⁽¹⁾ Assuming Tcase = 85°C



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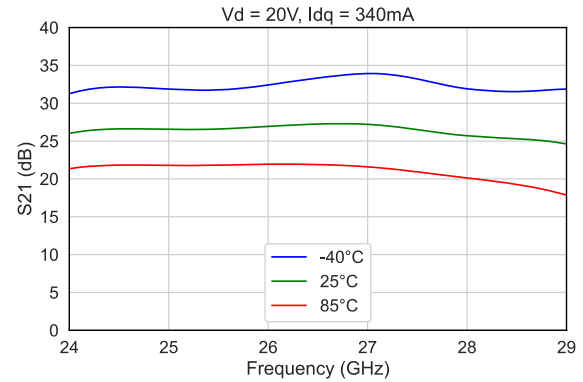
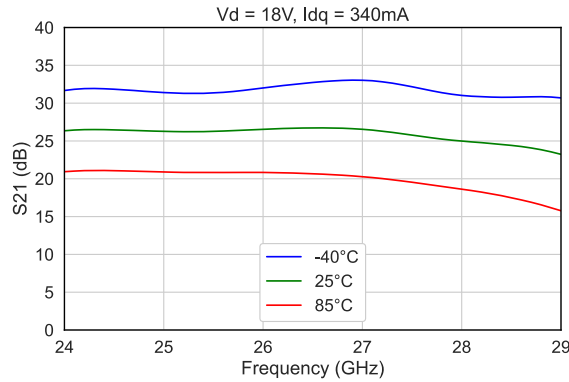
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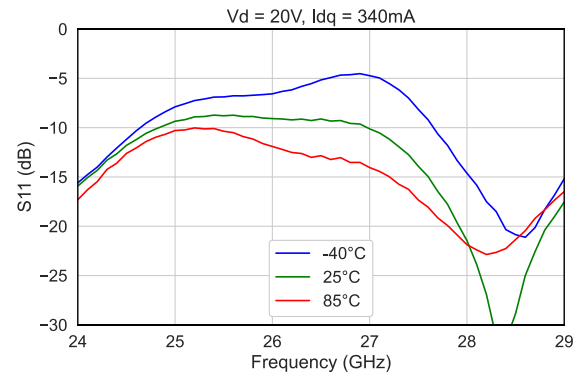
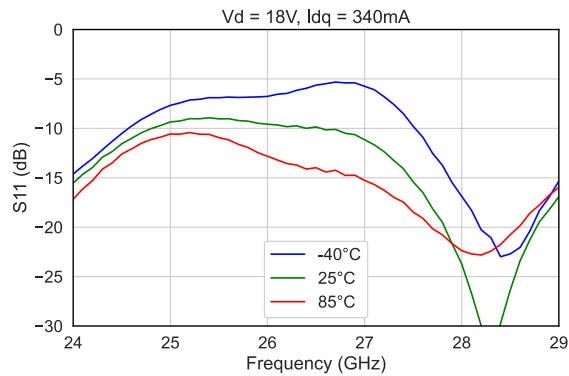
Typical Board Measurements: Small Signal Performance

Test conditions: CW, $V_d = 18 / 20V$, $I_{dq} = 340mA$, $T_{case} = -40^{\circ}C / 25^{\circ}C / 85^{\circ}C$

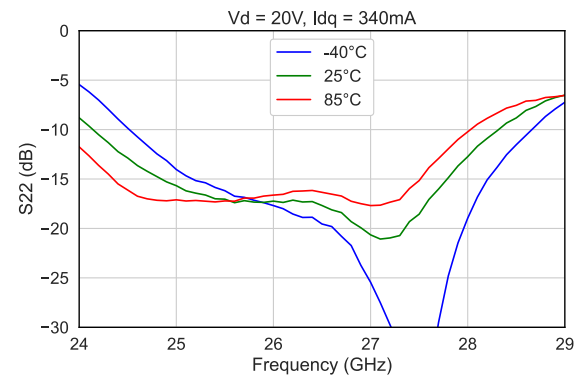
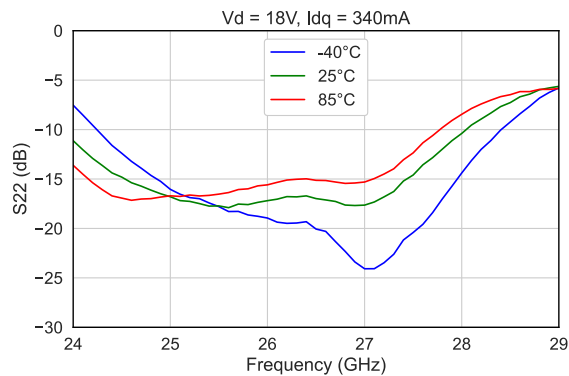
Linear Gain vs. Freq. and Temperature



Input Return Loss vs. Freq. and Temperature



Output Return Loss vs. Freq. and Temperature



Advanced Information

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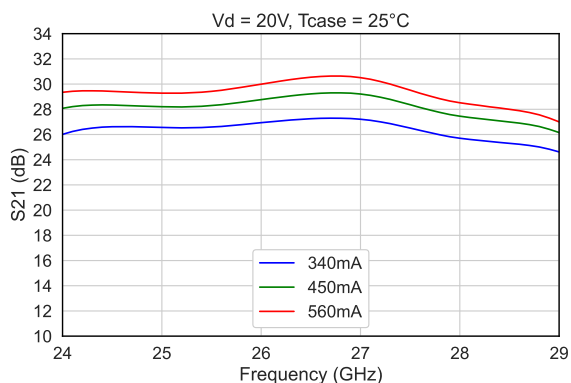
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Subject to change without notice

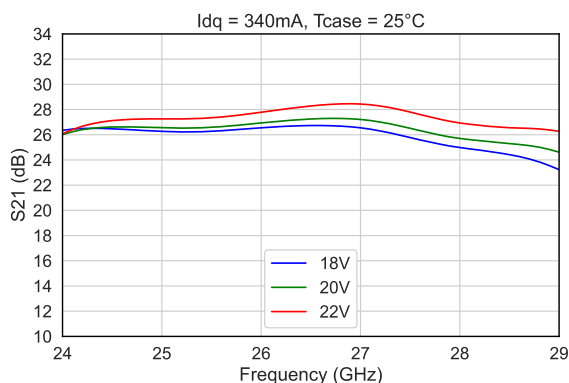
Typical Board Measurements: Small Signal Performance

Test conditions: CW, Tcase = 25°C

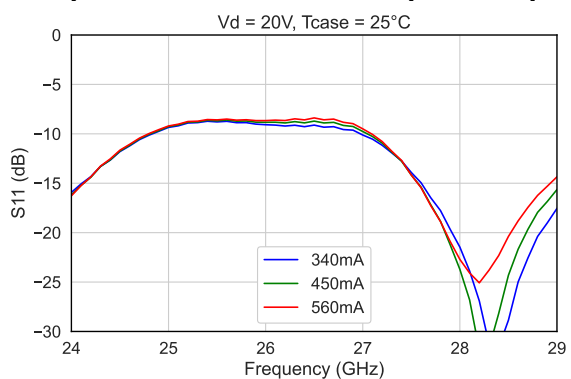
Linear Gain vs. Freq. and Idq



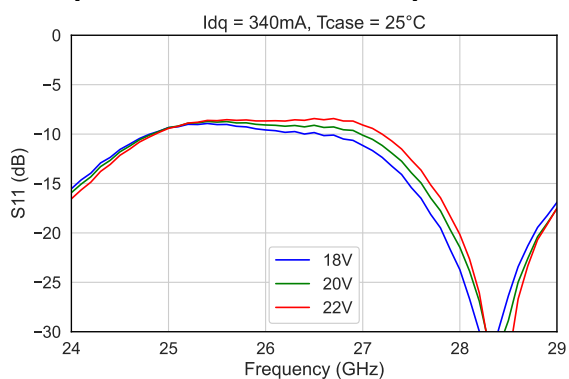
Linear Gain vs. Freq. and Vd



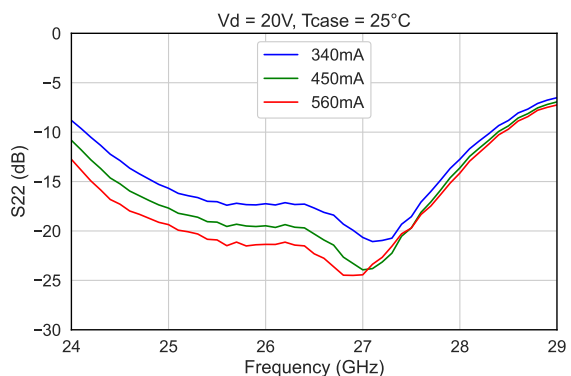
Input Return Loss vs. Freq. and Idq



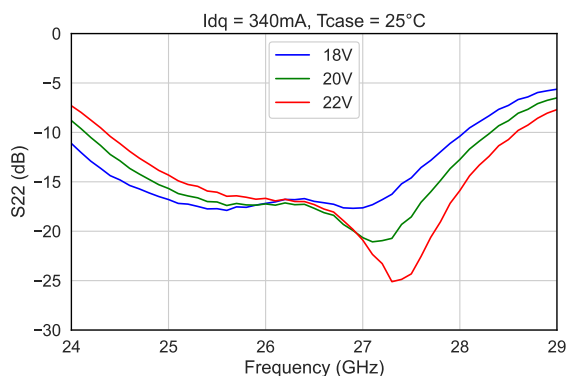
Input Return Loss vs. Freq. and Vd



Output Return Loss vs. Freq. and Idq



Output Return Loss vs. Freq. and Vd



Advanced Information

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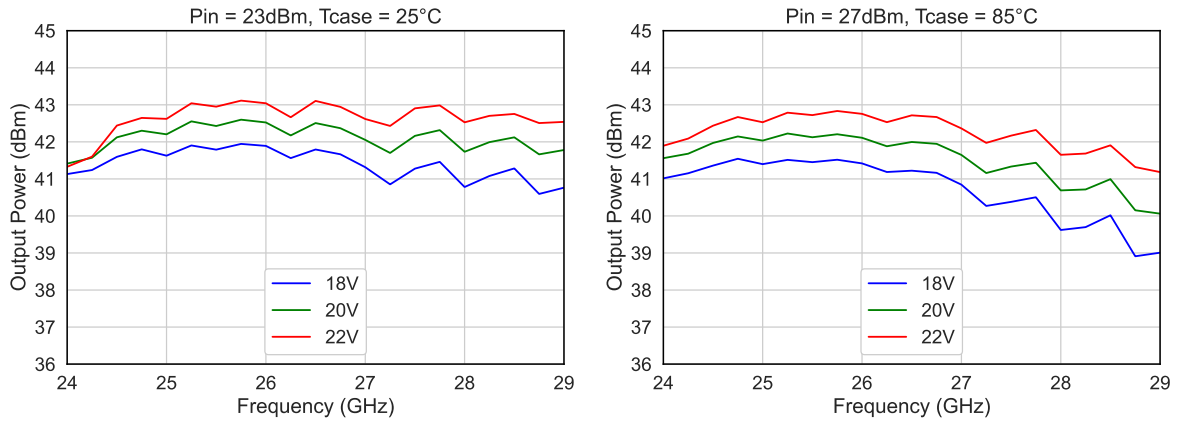
6/24

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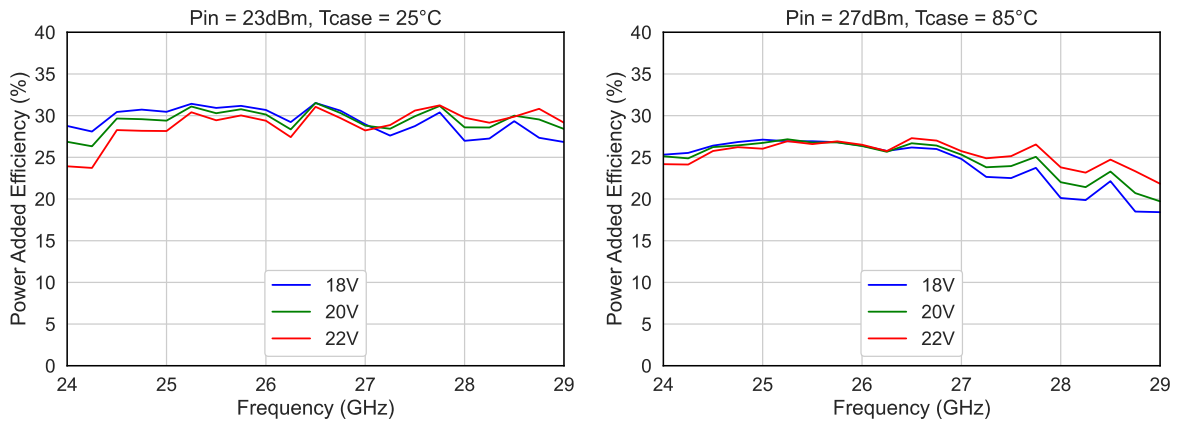
Typical Board Measurements: Large Signal Performance

Test conditions: CW, $V_d = 18 / 20 / 22\text{V}$, $I_{dq} = 340\text{mA}$, $T_{case} = 25^\circ\text{C} / 85^\circ\text{C}$

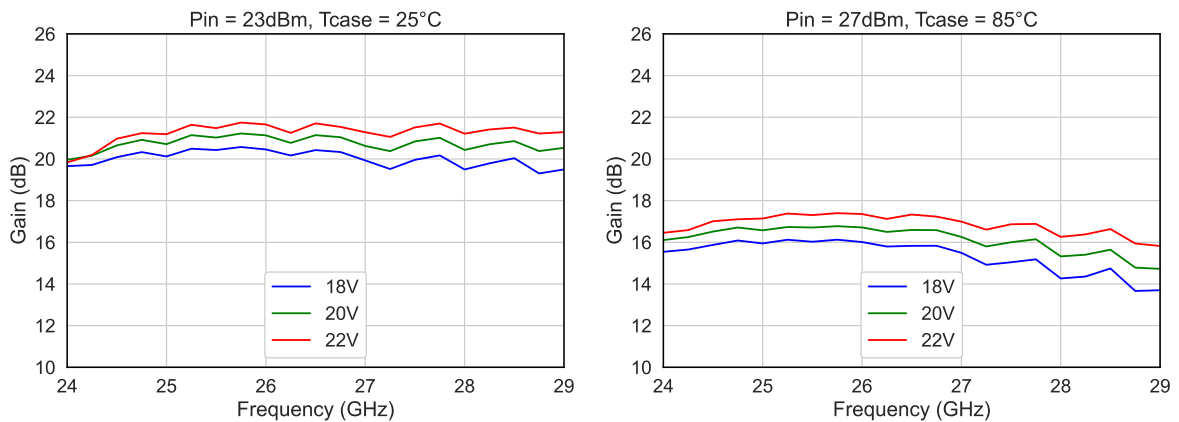
Output Power vs. Freq. and Drain Voltage



Power Added Efficiency vs. Freq. and Drain Voltage



Gain vs. Freq. and Drain Voltage



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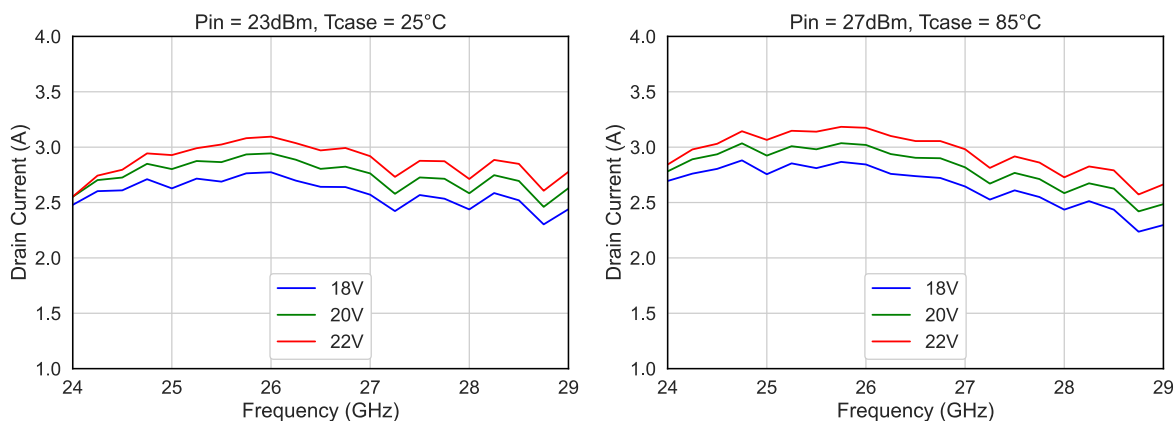
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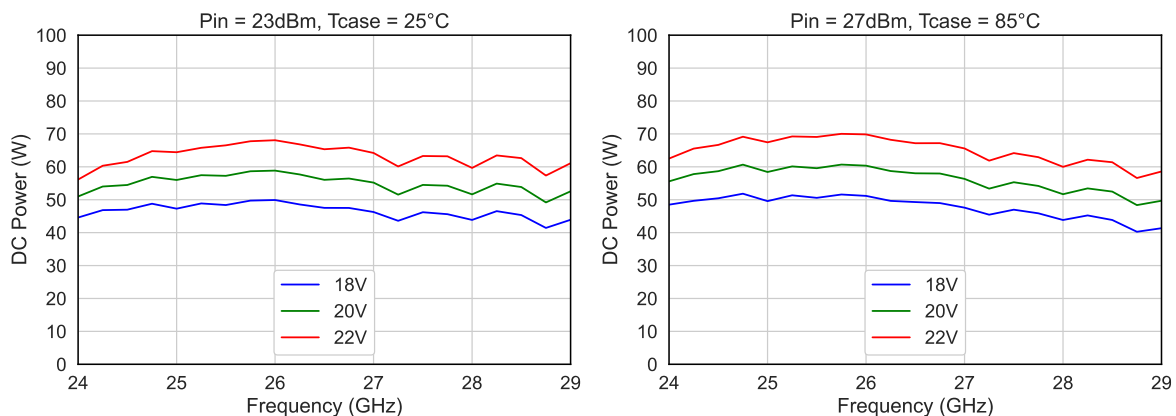
Typical Board Measurements: Large Signal Performance

Test conditions: CW, $V_d = 18 / 20 / 22\text{V}$, $I_{dq} = 340\text{mA}$, $T_{case} = 25^\circ\text{C} / 85^\circ\text{C}$

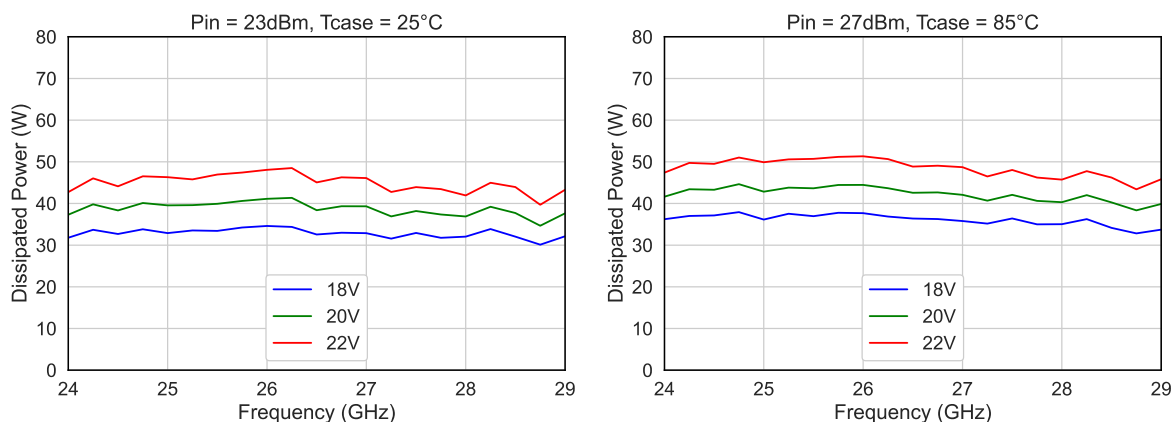
Drain Current vs. Freq. and Drain Voltage



DC Power Consumption vs. Freq. and Drain Voltage



Dissipated Power vs. Freq. and Drain Voltage



Advanced Information

Ref.: AI25216285 - 12 Oct 26

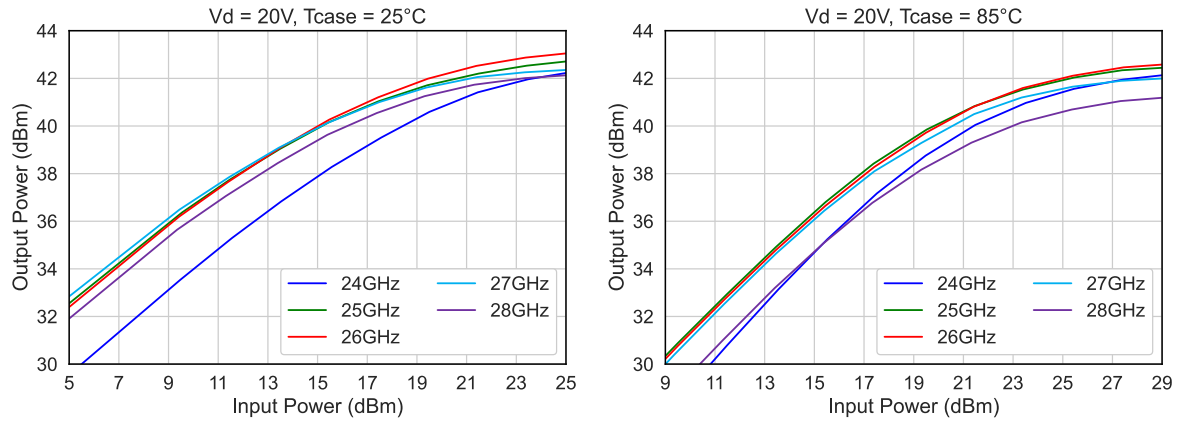
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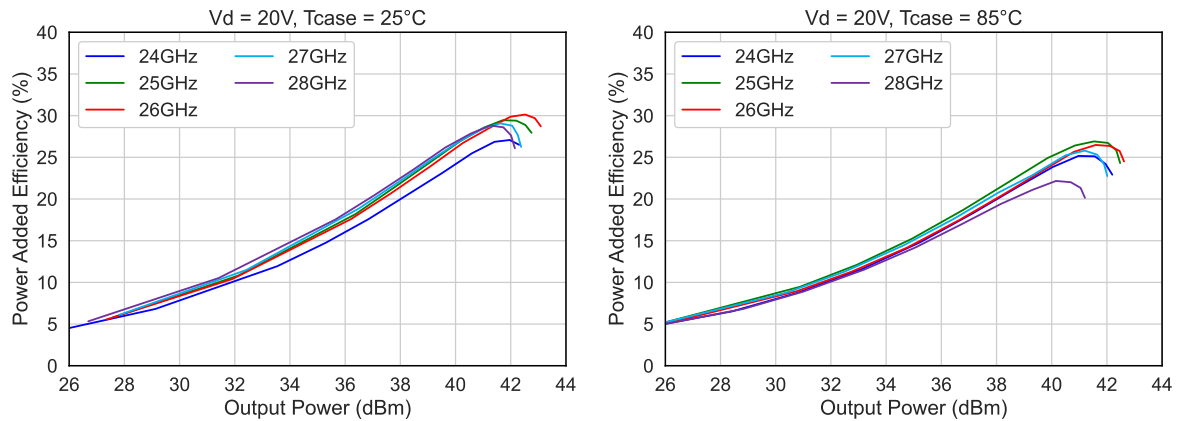
Typical Board Measurements: Large Signal Performance

Test conditions: CW, $V_d = 20V$, $I_{dq} = 340mA$, $T_{case} = 25^\circ C / 85^\circ C$

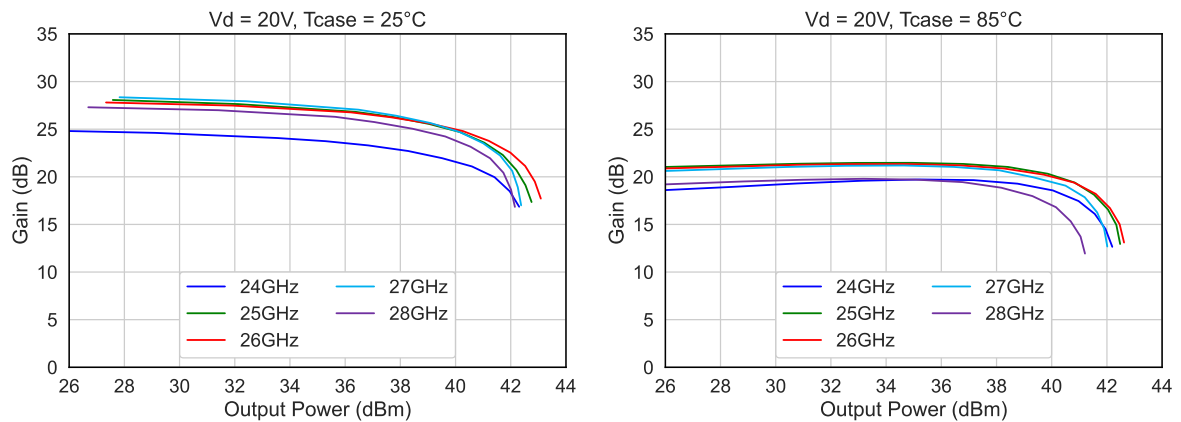
Output Power vs. Input Power and Freq.



Power Added Efficiency vs. Output Power and Freq.



Gain vs. Output Power and Freq.



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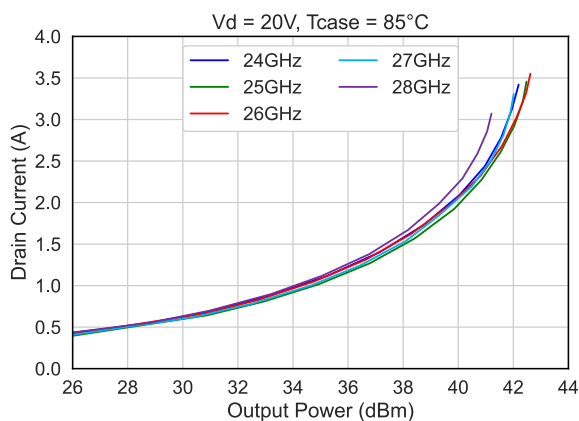
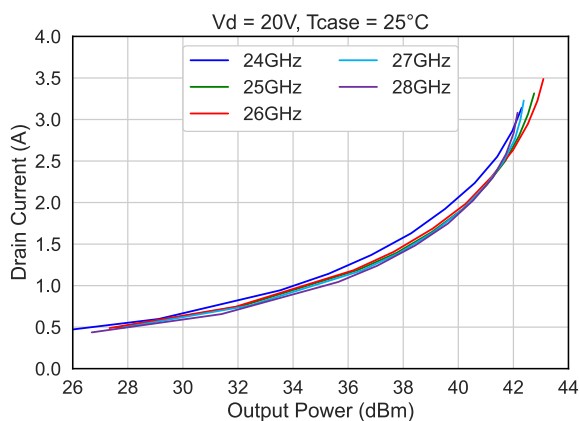
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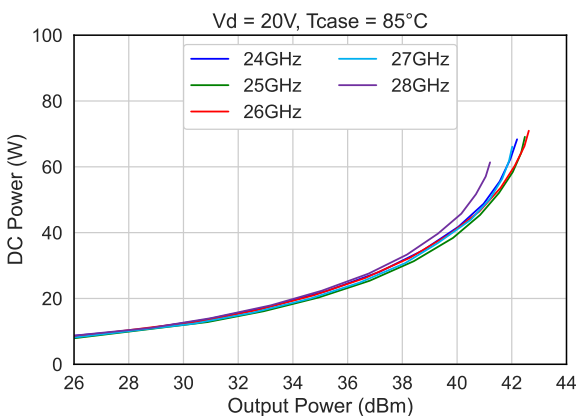
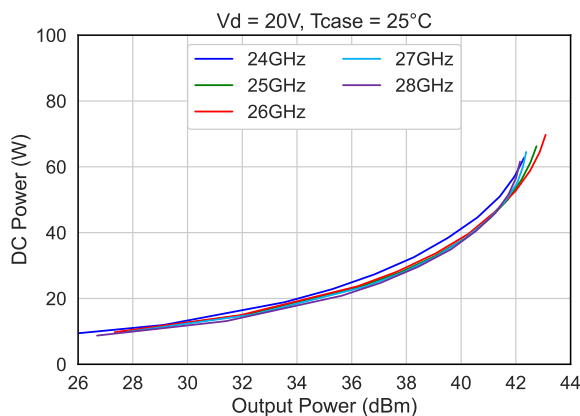
Typical Board Measurements: Large Signal Performance

Test conditions: CW, $V_d = 20V$, $I_{dq} = 340mA$, $T_{case} = 25^\circ C / 85^\circ C$

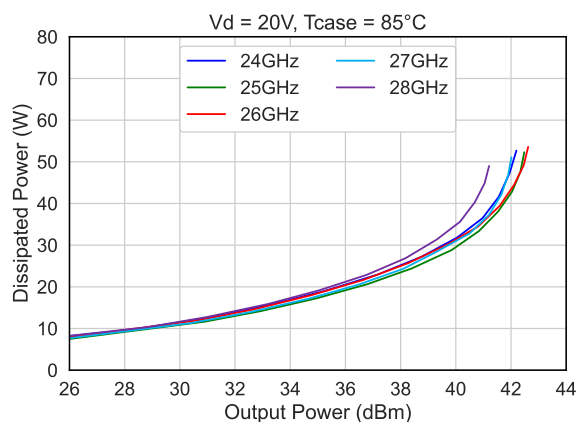
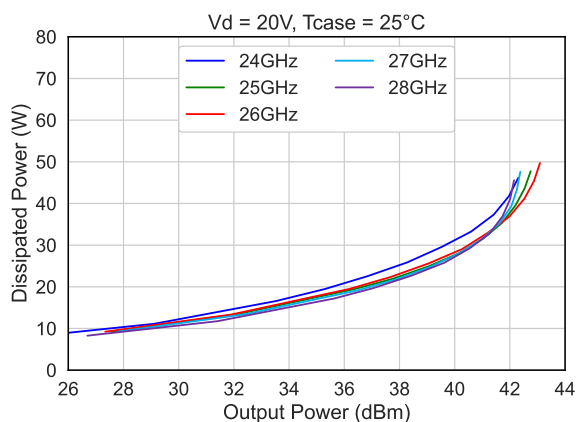
Drain Current vs. Output Power and Freq.



DC Power Consumption vs. Output Power and Freq.



Dissipated Power vs. Output Power and Freq.

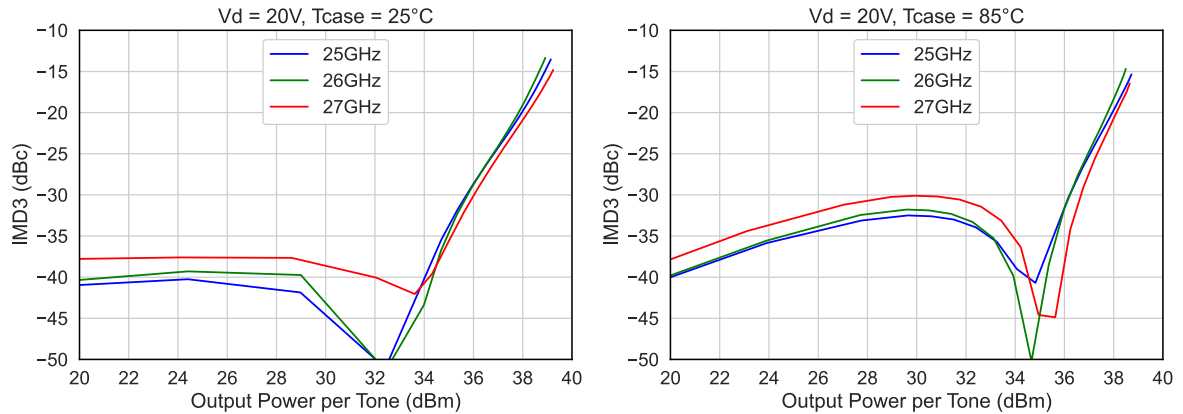


Advanced Information

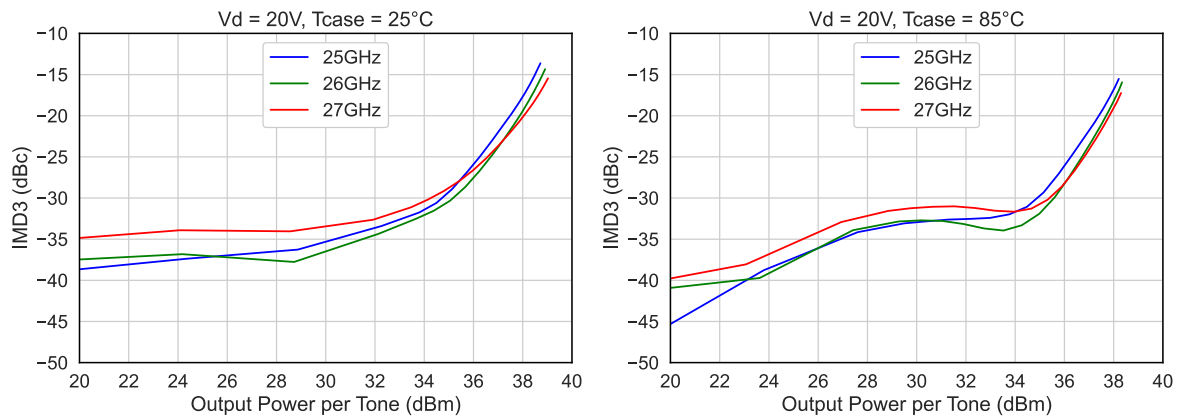
Typical Board Measurements: Intermodulation Distortion

Test conditions: 2-tones CW measurements, $V_d = 20V$, $I_{dq} = 340mA$, $T_{case} = 25^\circ C / 85^\circ C$

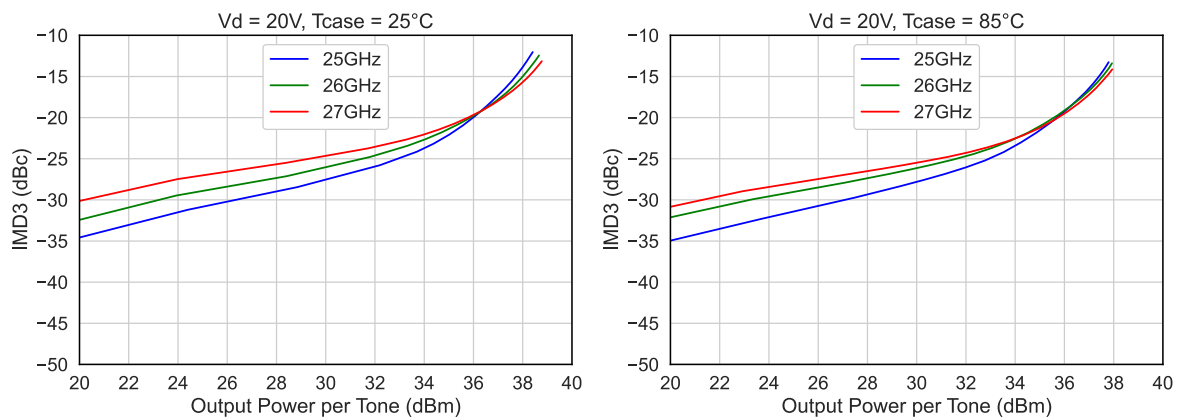
IMD3 at 10MHz Tone Separation vs. Output Power per Tone and Freq.



IMD3 at 100MHz Tone Separation vs. Output Power per Tone and Freq.



IMD3 at 200MHz Tone Separation vs. Output Power per Tone and Freq.



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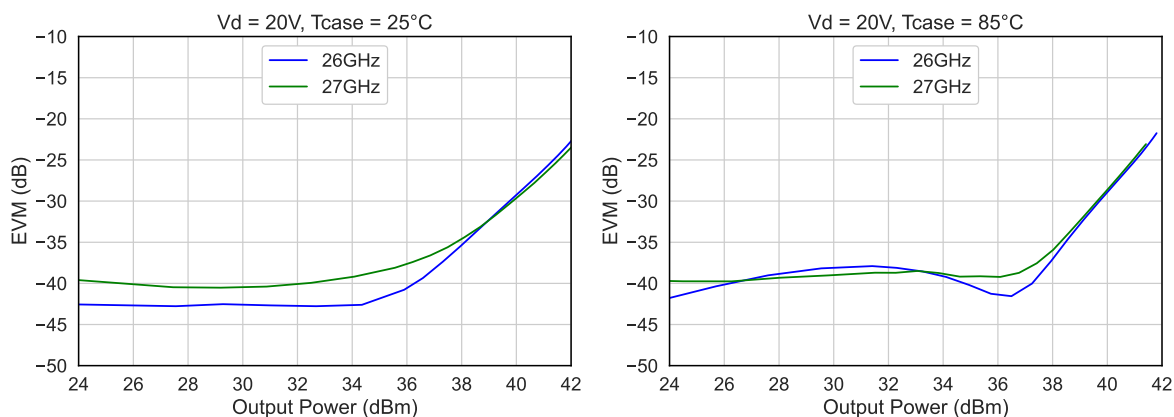
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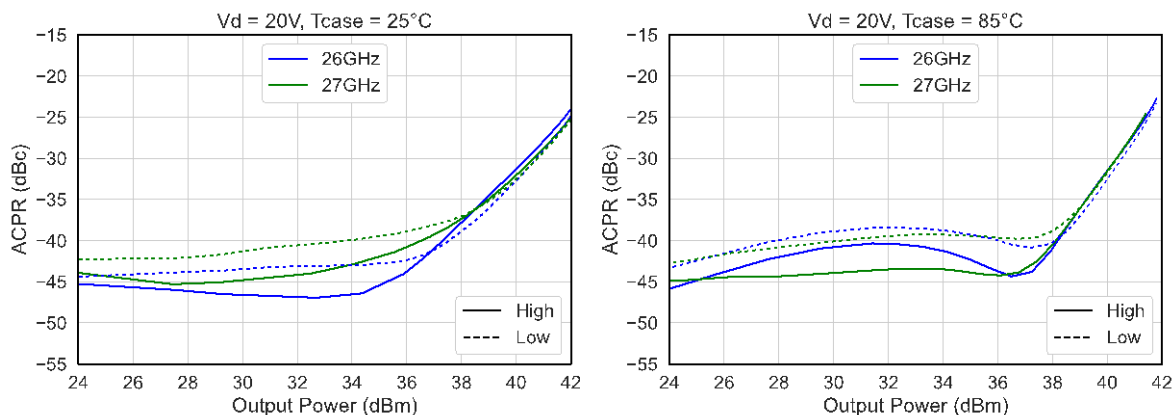
Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 8PSK, BW = 30MHz, Roll-off = 0.2, PAPR = 5.0dB

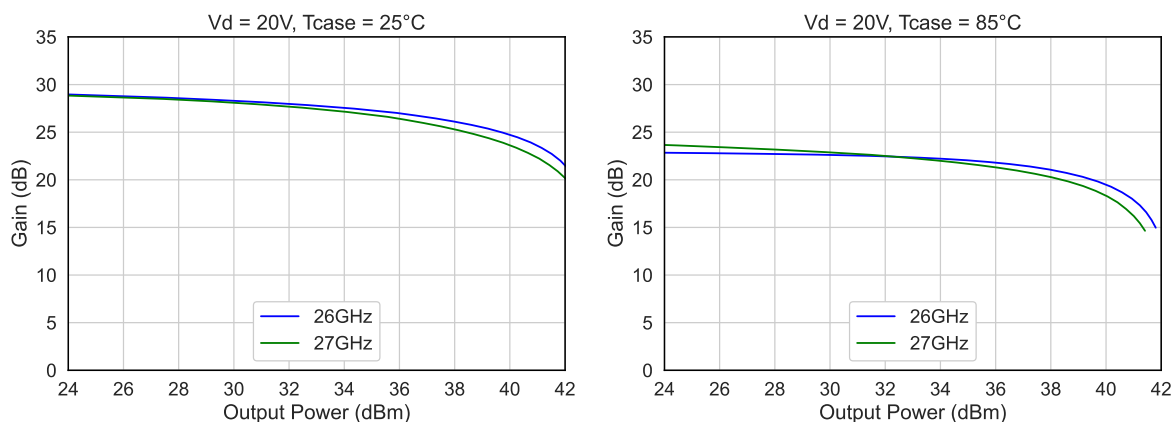
EVM vs. Output Power and Freq.



ACPR vs. Output Power and Freq.



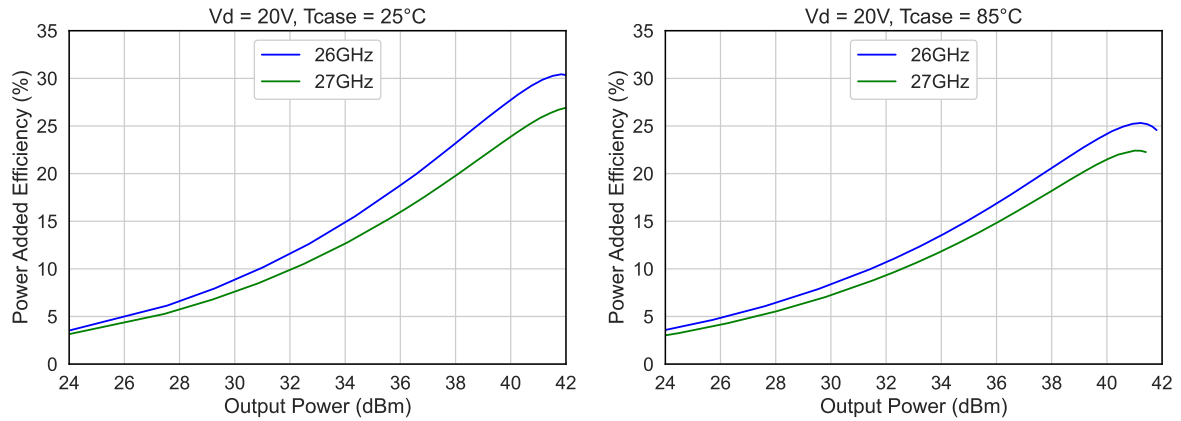
Gain vs. Output Power and Freq.



Advanced Information

Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 8PSK, BW = 30MHz, Roll-off = 0.2, PAPR = 5.0dB

Power Added Efficiency vs. Output Power and Freq.**Advanced Information**

Ref. : AI25216285 - 12 Oct 26

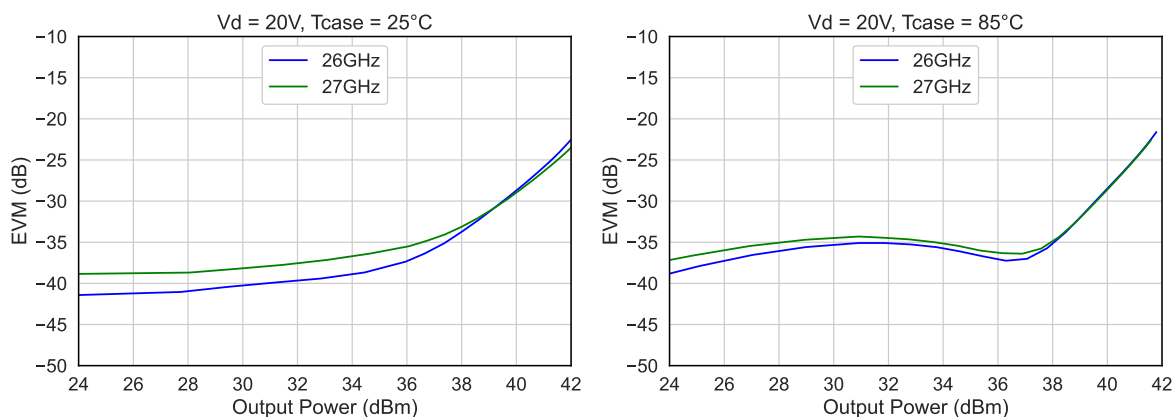
13/24

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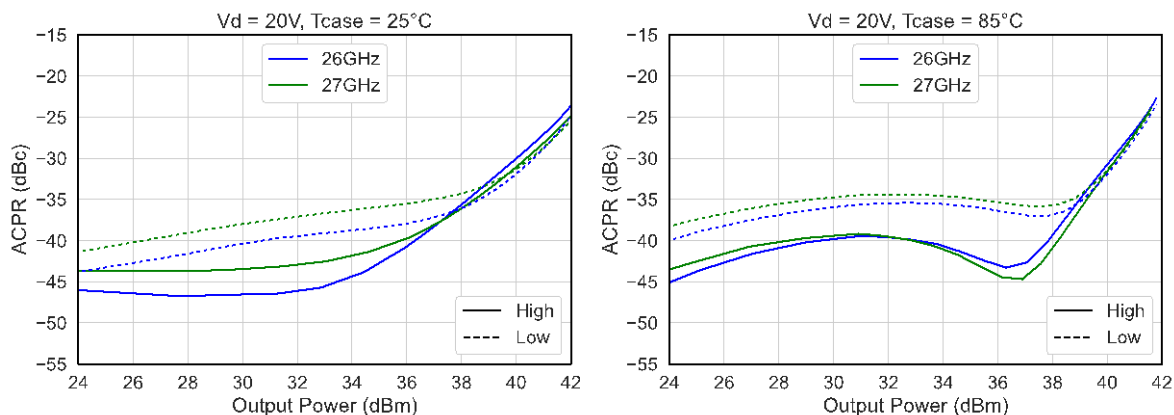
Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 8PSK, BW = 100MHz, Roll-off = 0.2, PAPR = 5.0dB

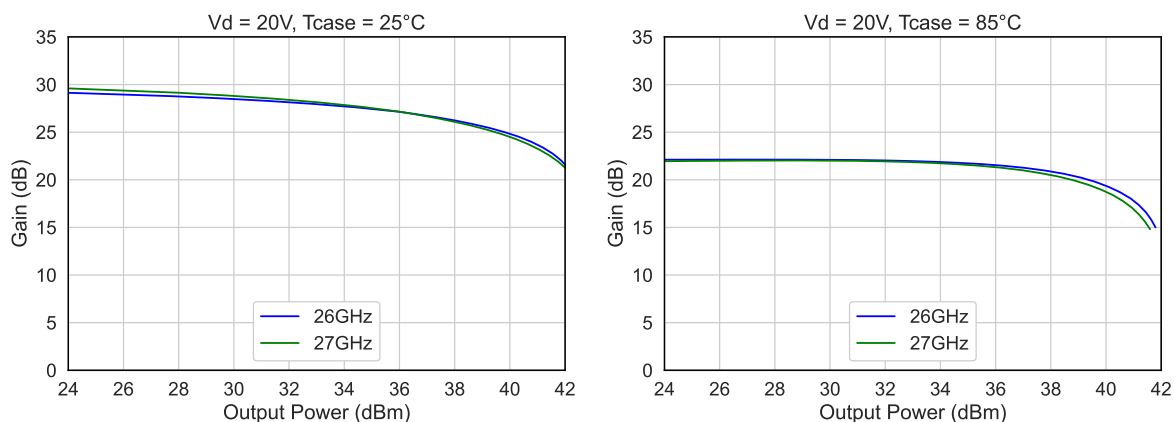
EVM vs. Output Power and Freq.



ACPR vs. Output Power and Freq.



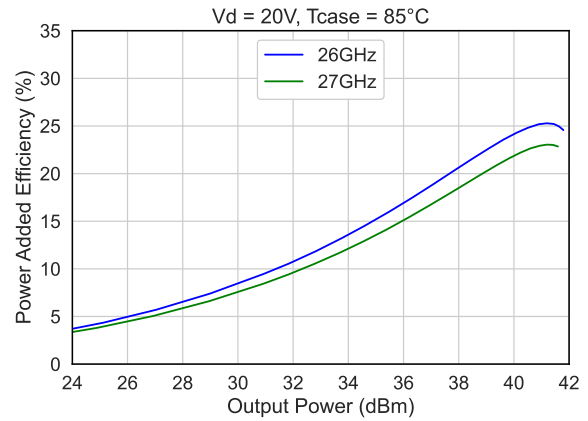
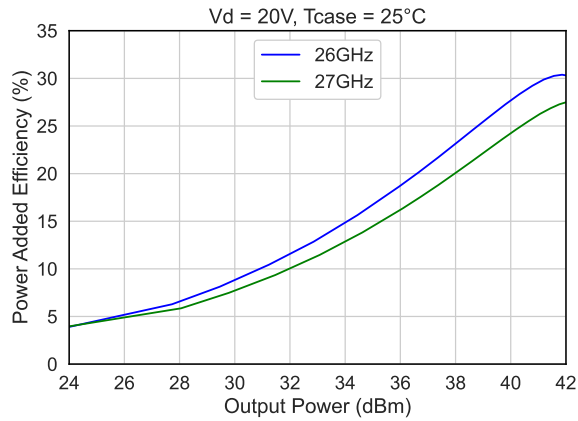
Gain vs. Output Power and Freq.



Advanced Information

Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 8PSK, BW = 100MHz, Roll-off = 0.2, PAPR = 5.0dB

Power Added Efficiency vs. Output Power and Freq.**Advanced Information**

Ref. : AI25216285 - 12 Oct 26

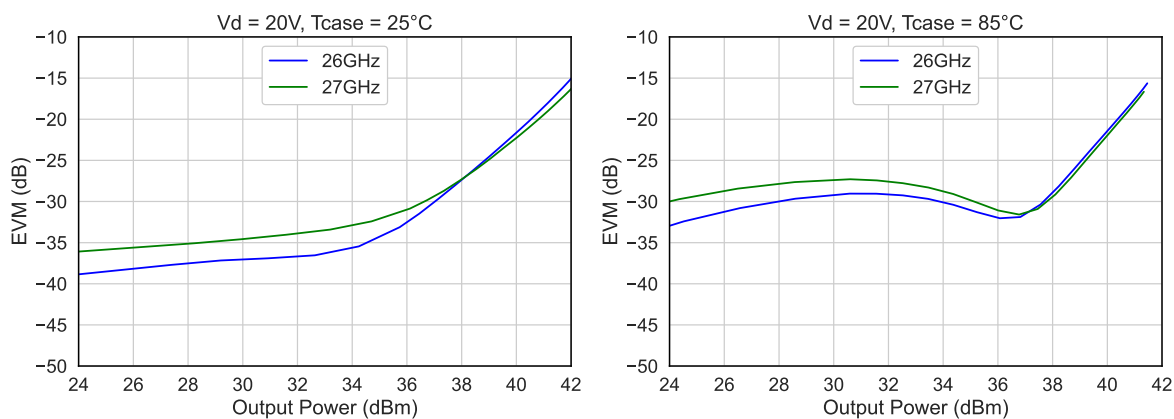
15/24

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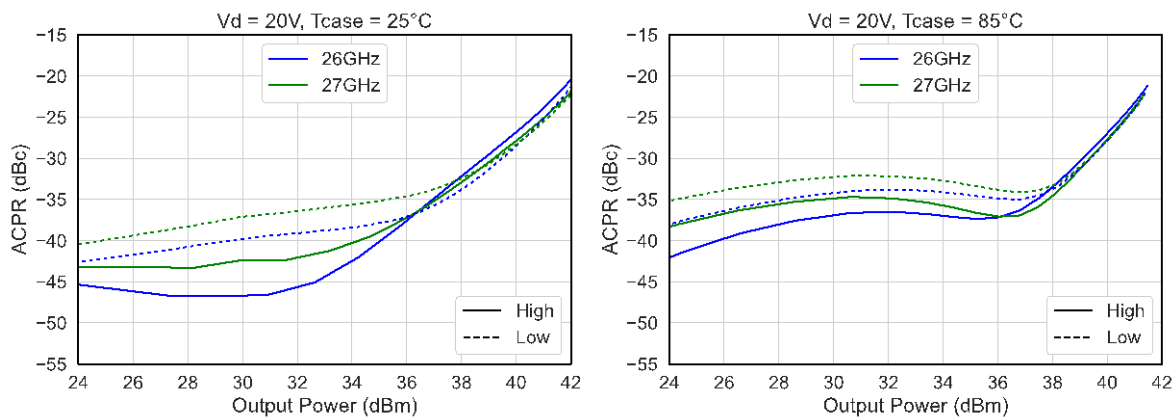
Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 256QAM, BW = 100MHz, Roll-off = 0.2, PAPR = 7.2dB

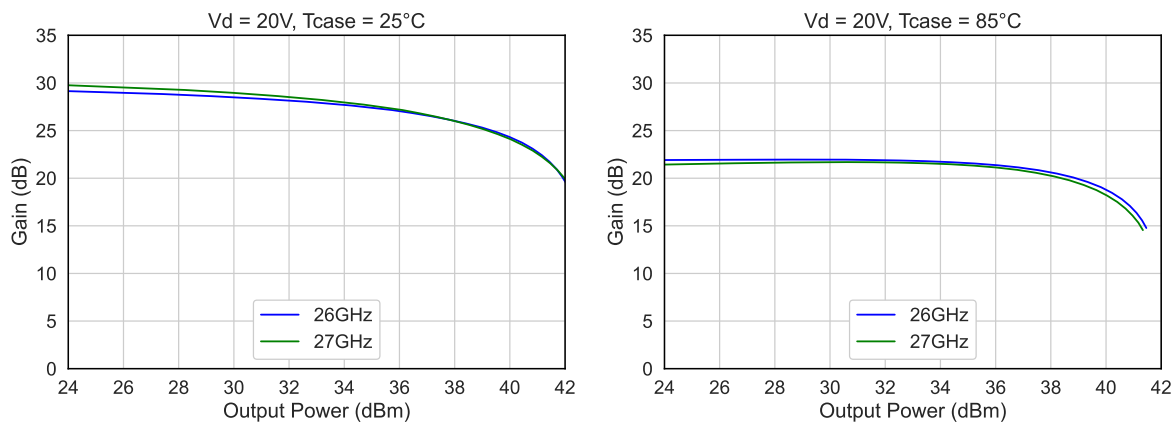
EVM vs. Output Power and Freq.



ACPR vs. Output Power and Freq.



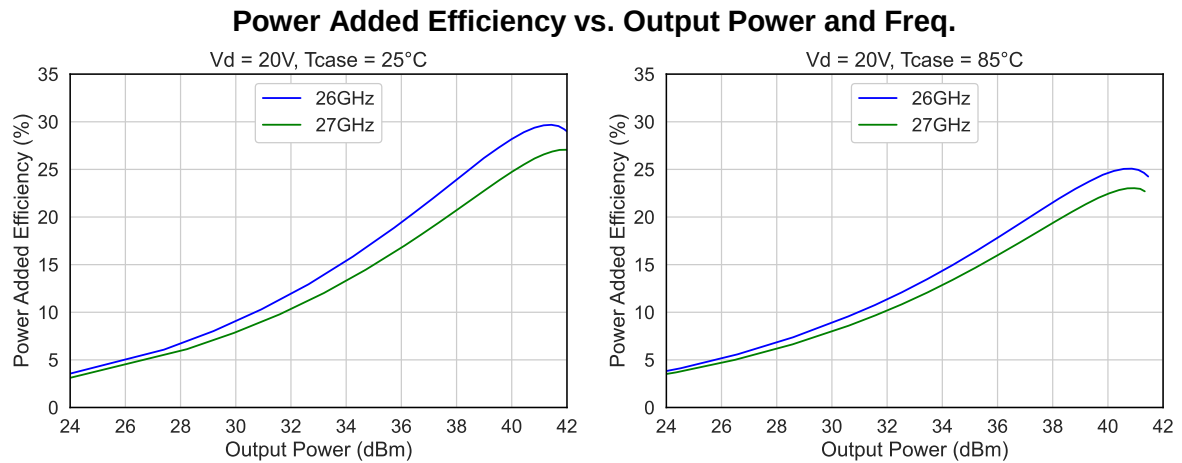
Gain vs. Output Power and Freq.



Advanced Information

Typical Board Measurements: Modulated Measurements

Test conditions: $V_d = 20V$, $I_{dq} = 340mA$, 256QAM, BW = 100MHz, Roll-off = 0.2, PAPR = 7.2dB

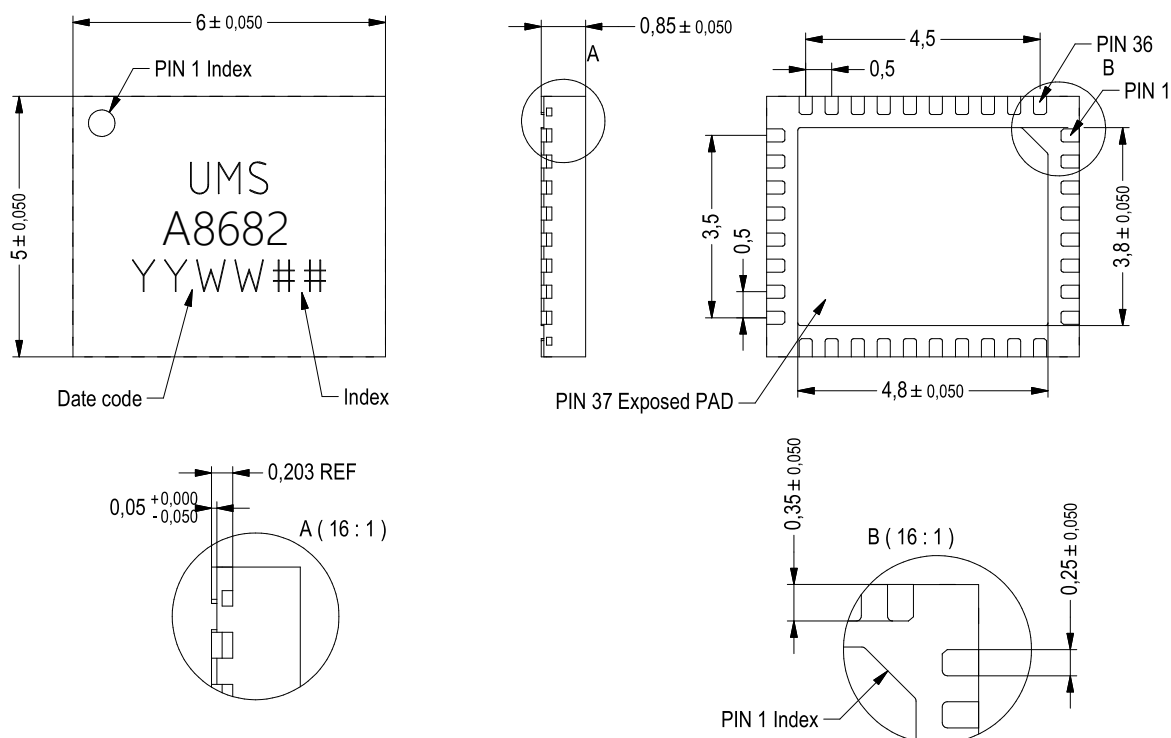
**Advanced Information**

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Subject to change without notice

Package Outline⁽¹⁾



Ni-Pd-Au-Ag, Lead Free	(Green)	1	VD3	14	RF IN	27	NC
Units:	mm	2	NC	15	GND ⁽²⁾	28	NC
From the standard:	JEDEC	3	VG3	16	NC	29	NC
	MO-220 VHJD	4	VD2	17	NC	30	GND ⁽²⁾
NC: Not Connected		5	VG2	18	NC	31	RF OUT
		6	VD1	19	VG1	32	GND ⁽²⁾
		7	GND ⁽²⁾	20	GND ⁽²⁾	33	NC
		8	VG1	21	VD1	34	NC
		9	NC	22	VG2	35	NC
		10	NC	23	VD2	36	NC
		11	NC	24	VG3	37	GND ⁽²⁾
		12	NC	25	NC		
		13	GND ⁽²⁾	26	VD3		

⁽¹⁾ Refer to the application note AN0017 (<https://www.ums-rf.com>) for general consideration and recommendations for molded plastic QFN/DFN packages.

⁽²⁾ It is strongly recommended to ground all pins identified as GND through the PCB. Ensure that the PCB is designed to provide the best possible ground to the package.

Advanced Information

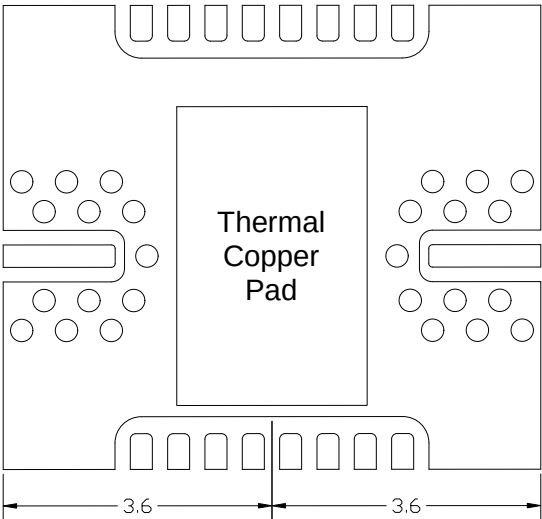
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Subject to change without notice

Measurement Reference Planes

The measurements reference planes are symmetrical from the symmetrical axis of the package as defined on the drawing beside. The input and output reference planes are located at 3.6mm offset (input wise and output wise respectively) from this axis.



ESD Sensitivity

Parameter	Classification	Standard
Human Body Model (HBM)	1A	ANSI/ESDA/JEDEC JS-001

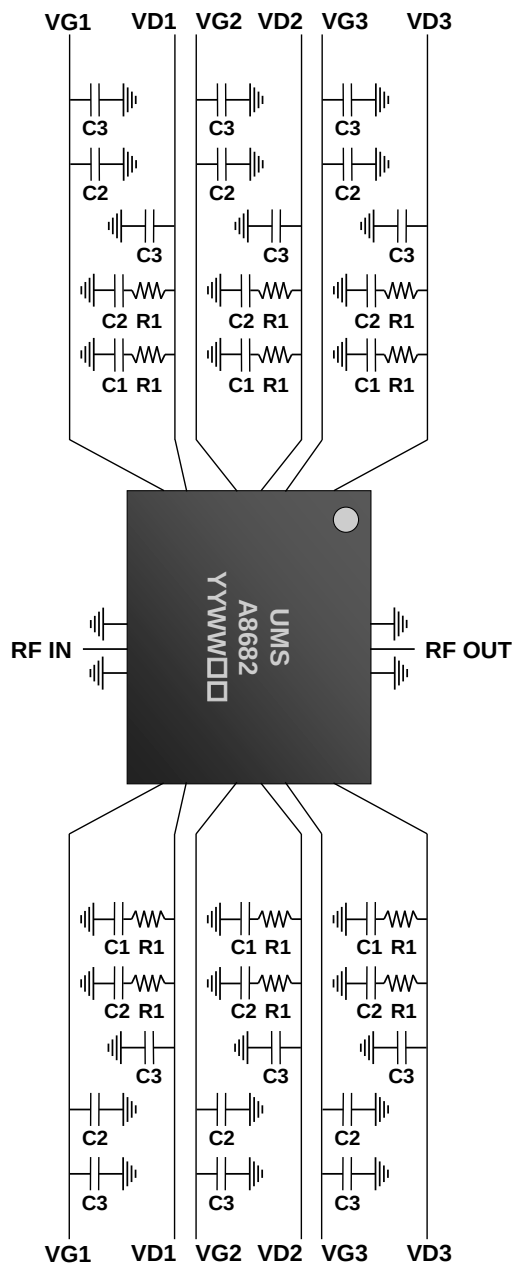
Package Information

Parameter	Value
Package body material	RoHS-compliant
	Low stress Injection Molded Plastic
Lead finish	100% Ni-Pd-Au-Ag
MSL Rating	MSL3

Advanced Information



Recommended Assembly Plan



Note : Drain (VD's) and Gate (VG's) must be biased from both sides.

Bill of Materials

Component	Value	Description
C1	120pF	CAP, 120pF, ±10%, 50V, 0402
C2	10nF	CAP, 10nF, ±10%, 50V, 0402
C3	1μF	CAP, 1μF, ±10%, 50V, 0603
R1	10Ω	RES, 10Ohm, ±1%, 1/16W, 0402

Advanced Information

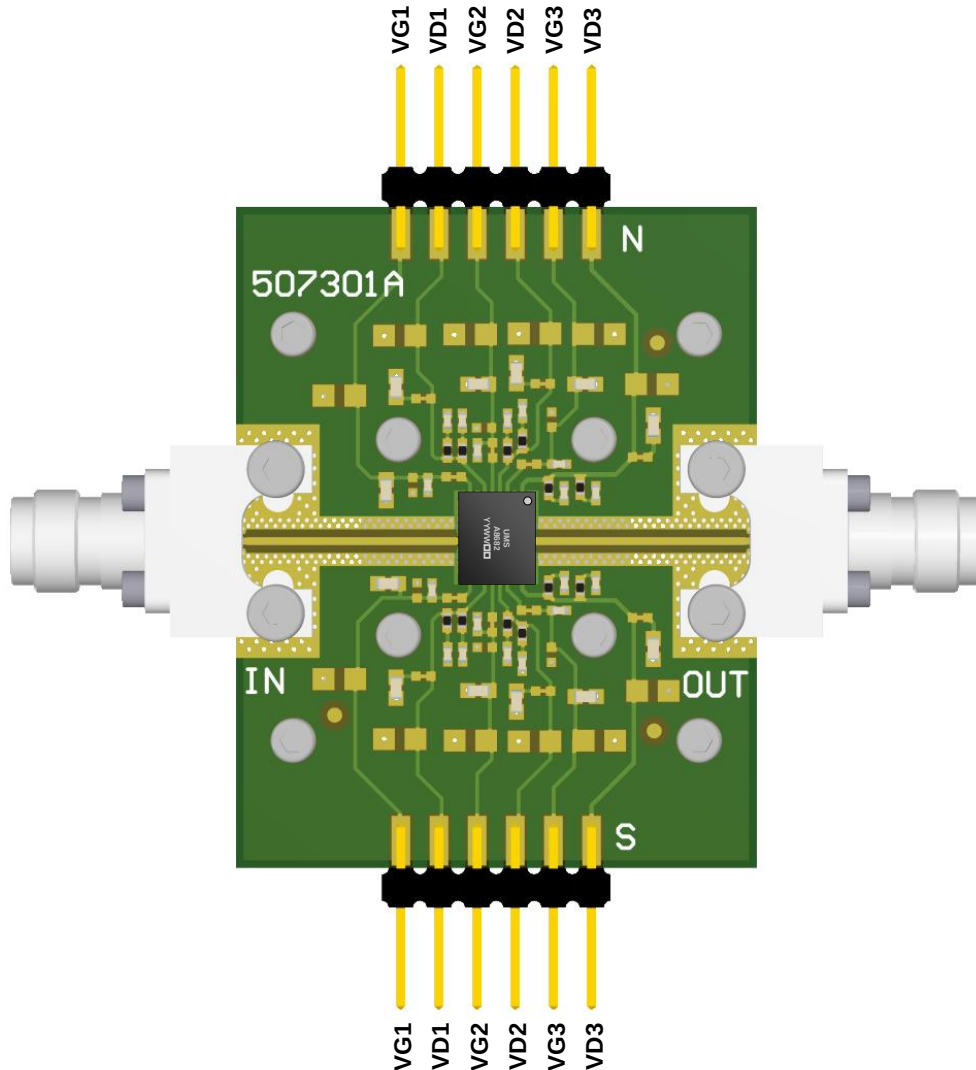
Ref. : AI25216285 - 12 Oct 26

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Subject to change without notice

Evaluation Board (EVB)

- Compatible with the proposed footprint.
- Based on 10mils RT6035HTC or equivalent.
- Recommended for the implementation of this product on a module board.
- See application note AN0031 for details.



Note: All board measurements are performed using **shielded cables**, even for DC bias, to ensure safe operation.

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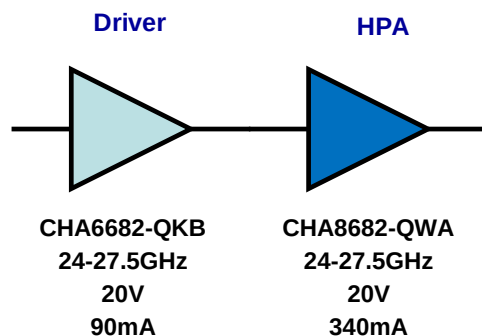


Recommended UMS Power chain

The CHA8682-QWA is recommended with the CHA6682-QKB as driver.

Total Gain: > 50dB

For more information about the CHA6682-QKB, see our web site www.ums-rf.com



Advanced Information

Recommended Package Footprint

Refer to the application note AN0017 available at <https://www.ums-rf.com> for package footprint 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 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.

Description of Evaluation Board

Refer to the application note AN0031 available at <https://www.ums-rf.com> for the description of Evaluation Board for Packaged Die and recommendations for this UMS package product.

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

Advanced Information

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Notes

Sampling request reference

QFN 6x5 package: ES-CHA8682-QWA/20
Evaluation board: EVB-CHA8682-QWA

Contact us

Web site: <https://www.ums-rf.com>
e.mail: mktsales@ums-rf.com

Phone: +33 (1) 69 86 32 00 (France)
+1 (781) 791-5078 (USA)
+65 9298 8316 (Singapore)

Advanced Information

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