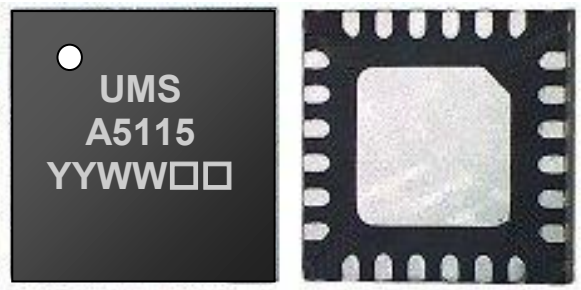
X-band Medium Power Amplifier

GaAs Monolithic Microwave IC

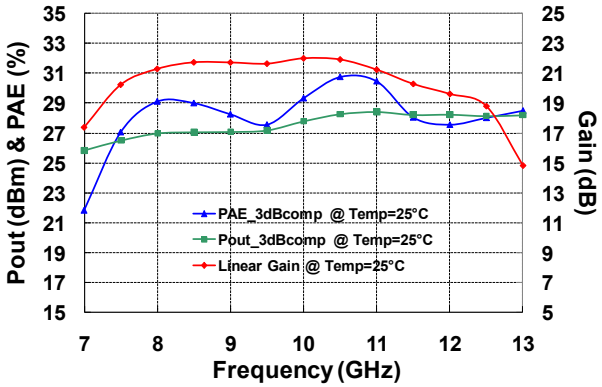
Description

The CHA5115-QDG is a monolithic two-stage GaAs medium power amplifier designed for X-band applications.
The MPA provides typically 28dBm output power associated to 30% power added efficiency at 3dB gain compression.
It is supplied in RoHS compliant SMD package.



Main Features

- Frequency band: 8-12GHz
- Output power: 28dBm @ 3dBcomp
- Linear gain: 21.5dB
- High PAE: 30% @ 3dBcomp
- Quiescent bias point: Vd=8V, Id=190mA
- 24L-QFN4x4
- MSL3



Main Characteristics

Tamb = 20°C, Vd = 8V, Id (Quiescent) = 190mA, Drain Pulse width=100µs, Duty cycle = 20%

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	8		12	GHz
PAE_P-3dB	Power added efficiency @3dBcomp & 20°C		30		%
P-3dB	Output power @ 3dBcomp @ 20°C		28		dBm

United Monolithic Semiconductors S.A.S.
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Electrical Characteristics

Tamb = +25°C,
Vd = 8V, Id (Quiescent) = 190mA, Drain Pulse width = 100µs, Duty cycle = 20%

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency	8		12	GHz
G	Small signal gain		21.5		dB
RLin	Input Return Loss		11	9	dB
RLout	Output Return Loss		10	7	dB
P_{-1dB}	Output power @ 1dBcomp		27		dBm
PAE_ P_{-1dB}	Power Added Efficiency @ 1dBcomp		26		%
Id_ P_{-1dB}	Supply drain current @ 1dBcomp		240		mA
P_{-3dB}	Output power @ 3dBcomp		28		dBm
PAE_ P_{-3dB}	Power Added Efficiency @ 3dBcomp		30		%
Id_ P_{-3dB}	Supply drain current @ 3dBcomp		250		mA
Vd1, Vd2	Drain supply voltage		8		V
Id	Supply quiescent current (1)		190		mA
Vg	Gate supply voltage		-1		V

(1) Parameter can be adjusted by tuning of Vg.

Absolute Maximum Ratings (1)

Tamb.= +25°C

Symbol	Parameter	Values	Unit
Cmp	Compression level (2)	6	dB
Vd	Supply voltage (3)	9.5	V
Id	Supply quiescent current	240	mA
Id_sat	Supply current in saturation	300	mA
Vg	Supply voltage	-0.6	V
Tj	Maximum junction temperature	175	°C
Tstg	Storage temperature range	-55 to +150	°C
Top	Operating temperature range	-40 to +85	°C

(1) Operation of this device above anyone of these parameters may cause permanent damage.
(2) For higher compression the level limit can be increased by decreasing the voltage Vd using the rate 0.5V/dBcomp.
(3) Without RF input power.

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Device thermal performances

All the figures given in this section are obtained assuming that the QFN device is cooled down only by conduction through the package thermal pad (no convection mode considered). The temperature is monitored at the package back-side interface (Tcase) as shown below. The system maximum temperature must be adjusted in order to guarantee that Tcase remains below than the maximum value specified in the next table. So, the system PCB must be designed to comply with this requirement.

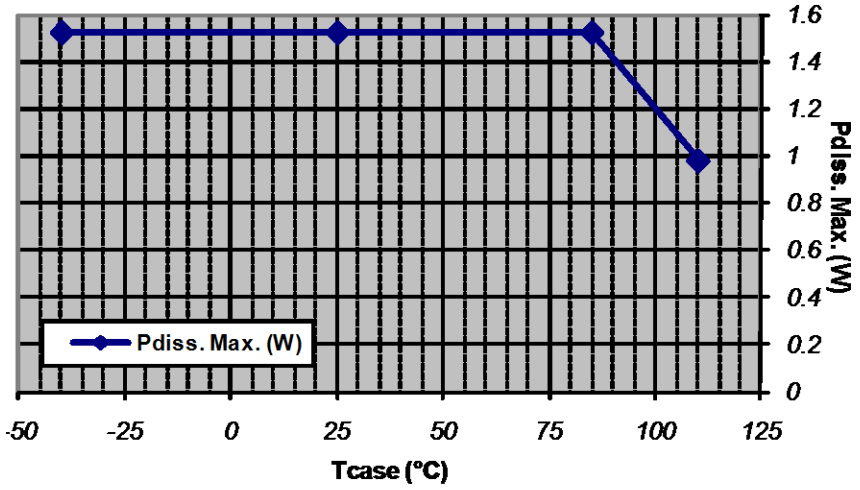
A derating must be applied on the dissipated power if the Tcase temperature can not be maintained below than the maximum temperature specified (see the curve Pdiss. Max) in order to guarantee the nominal device life time (MTTF).

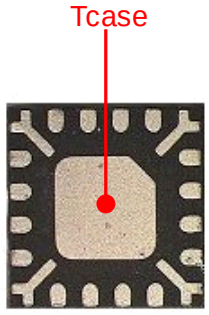
DEVICE THERMAL SPECIFICATION : CHA5115-QDG		
Recommended max. junction temperature (Tj max)	:	155 °C
Junction temperature absolute maximum rating	:	175 °C
Max. continuous dissipated power @ Tcase= 85 °C	:	1.52 W
=> Pdiss derating above Tcase(1)= 85 °C	:	22 mW/°C
Junction-Case thermal resistance (Rth J-C)(2)	:	<46 °C/W
Min. package back side operating temperature(3)	:	-40 °C
Max. package back side operating temperature(3)	:	85 °C
Min. storage temperature	:	-55 °C
Max. storage temperature	:	150 °C

(1) Derating at junction temperature constant = Tj max

*(2) Rth J-C is calculated for a worst case where the **hottest junction** of the MMIC is considered.*

(3) Tcase=Package back side temperature measured under the die-attach-pad (see the drawing below).





Example: QFN 16L 3x3
Location of temeprature reference point (Tcase) on package's bottom side

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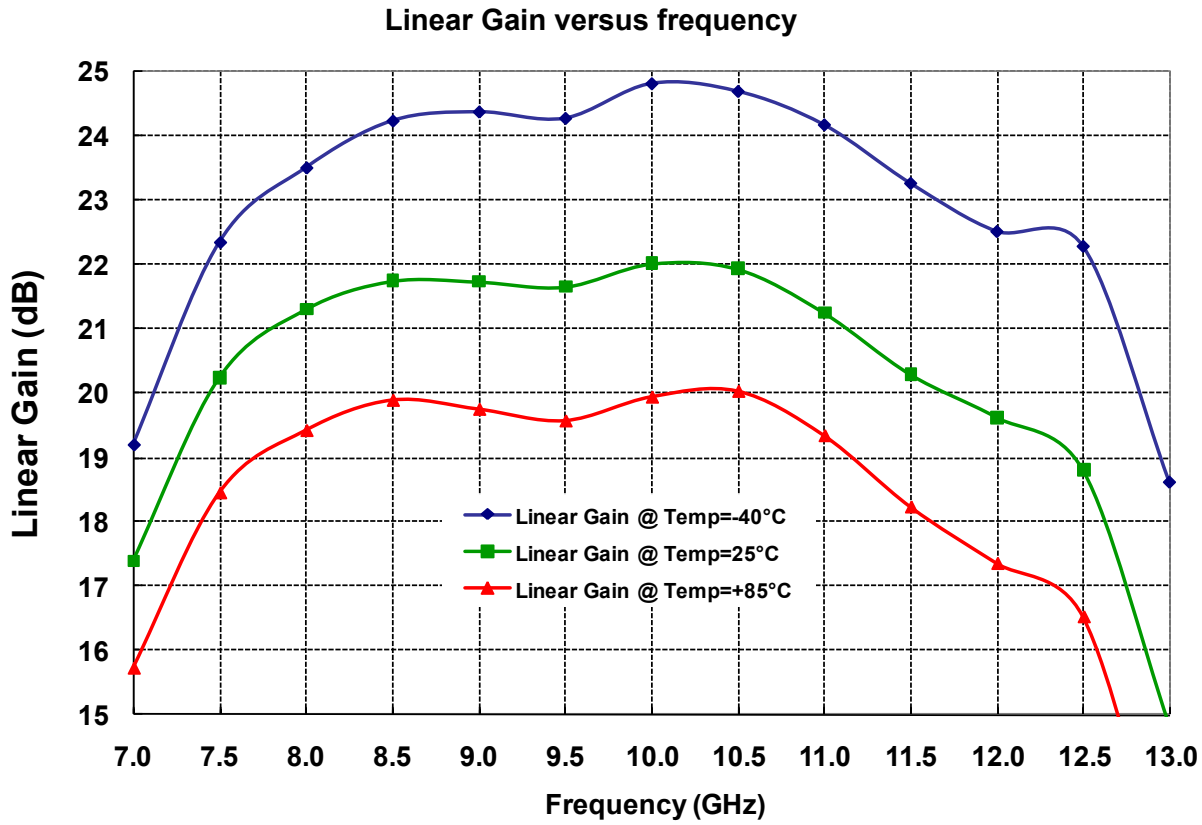
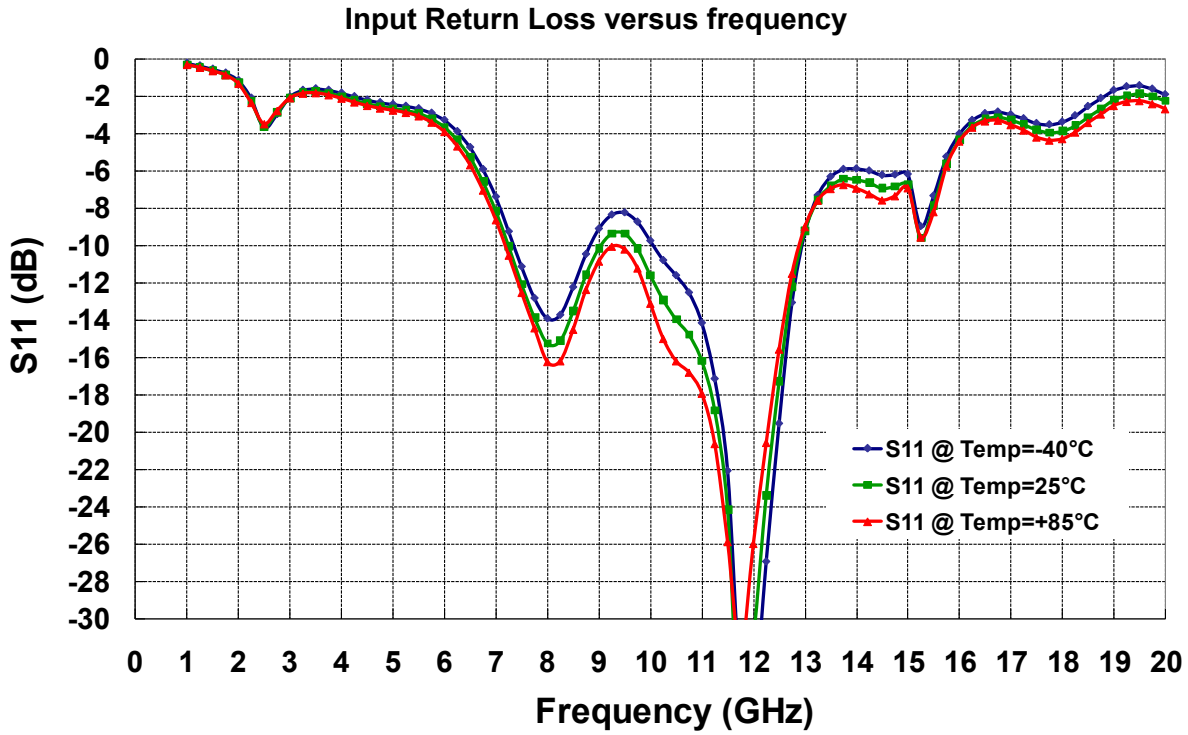
Typical Board Measurements

Vd = 8V, Id (Quiescent) = 190mA, Drain Pulse width = 100µs, Duty cycle = 20%





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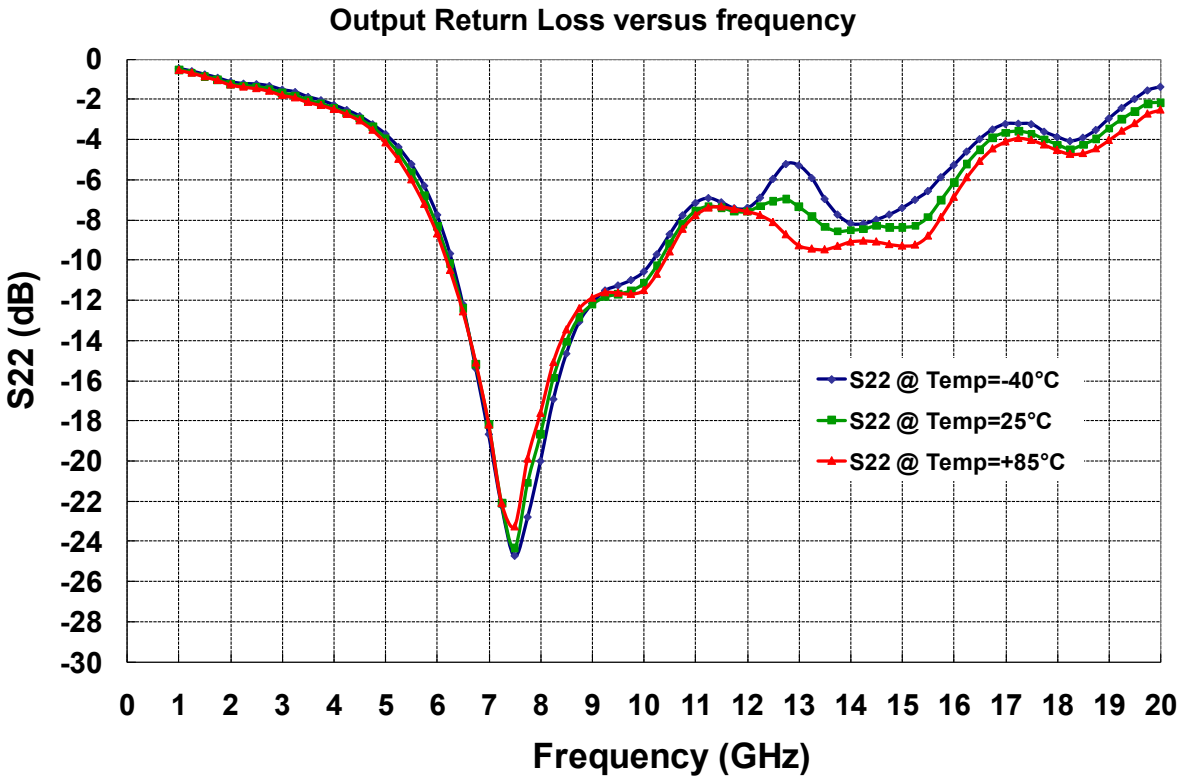
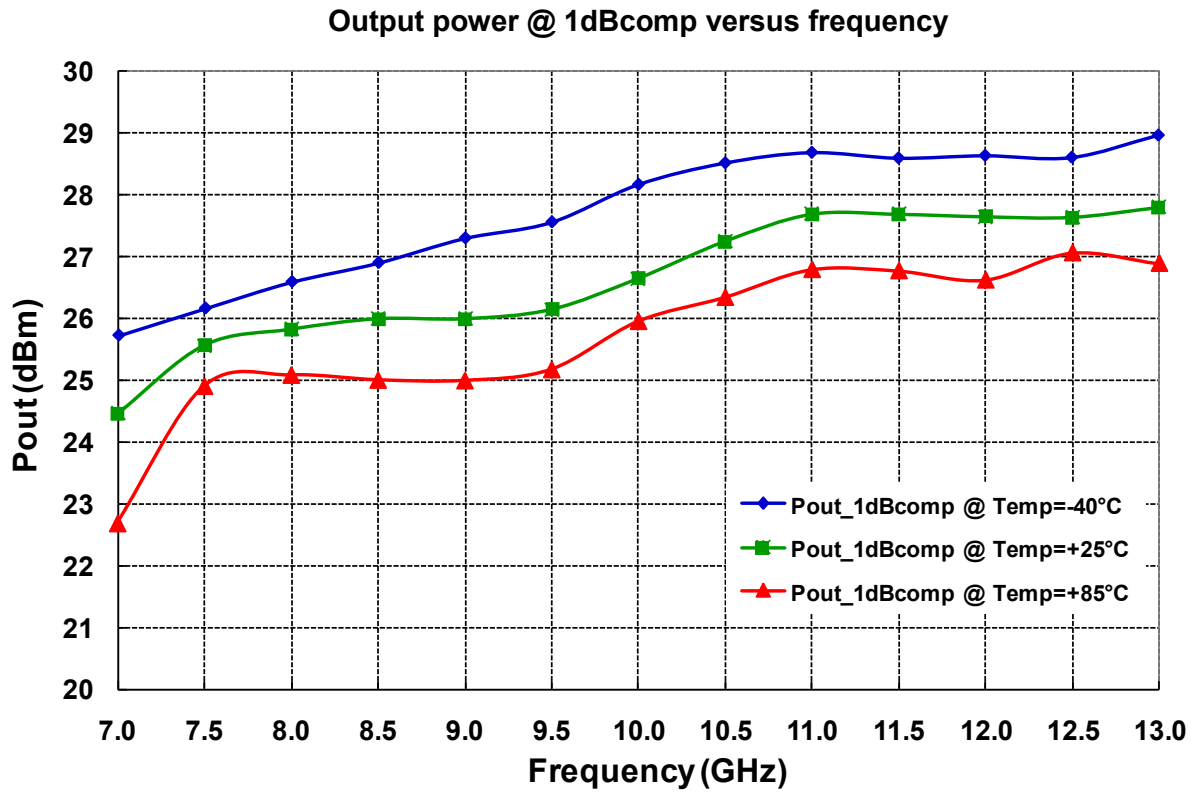
Typical on board Measurements

Vd = 8V, Id (Quiescent) = 190mA, Drain Pulse width = 100µs, Duty cycle = 20%





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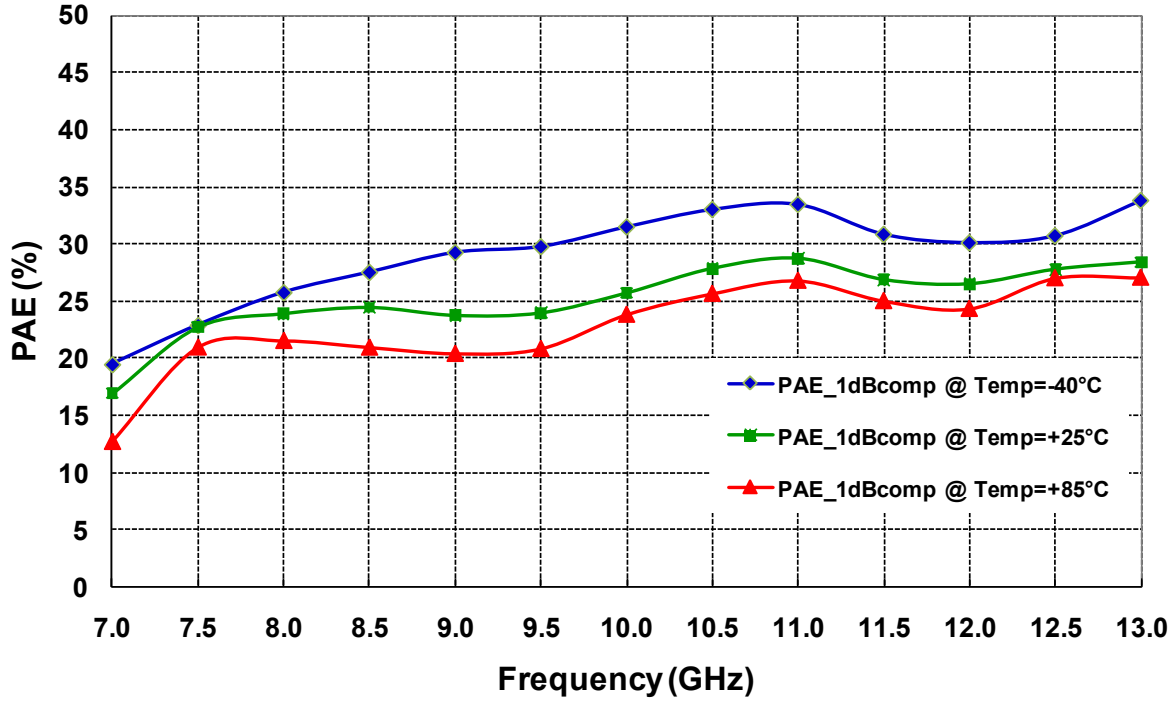
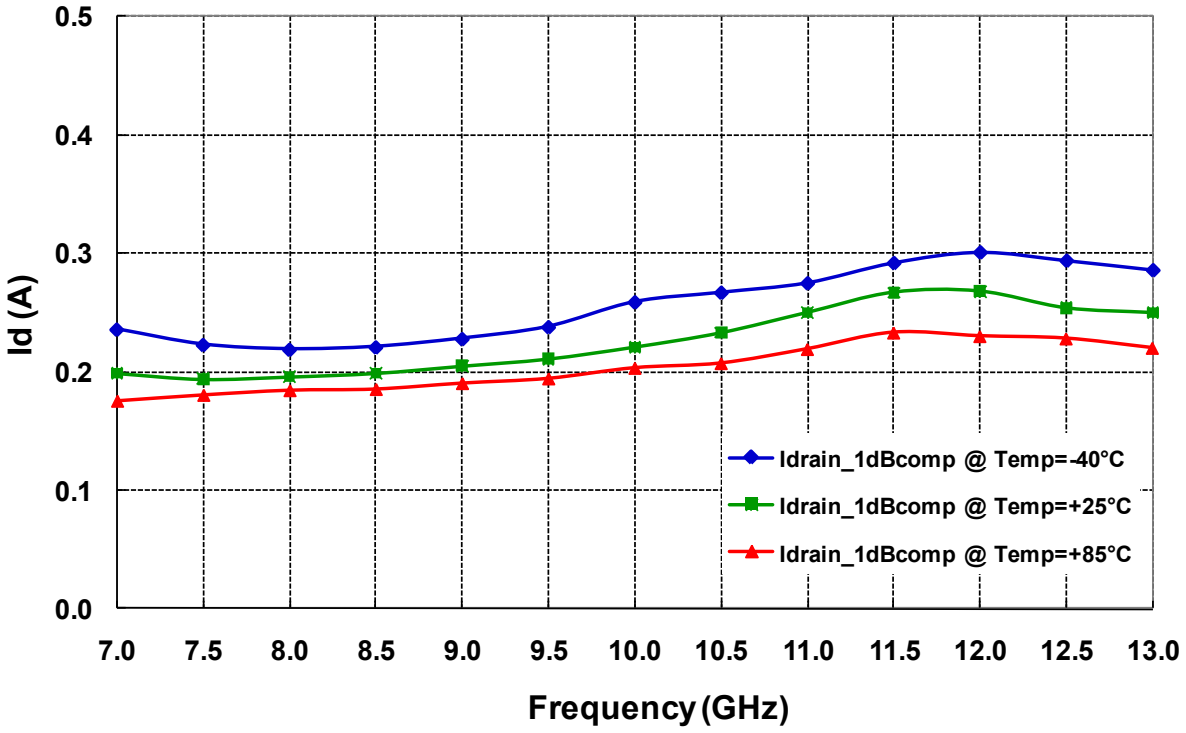
Typical on board Measurements

Vd = 8V, Id (Quiescent) = 190mA, Drain Pulse width = 100µs, Duty cycle = 20%

Power added efficiency @ 1dBcomp versus frequency



Drain Current @ 1dBcomp versus frequency



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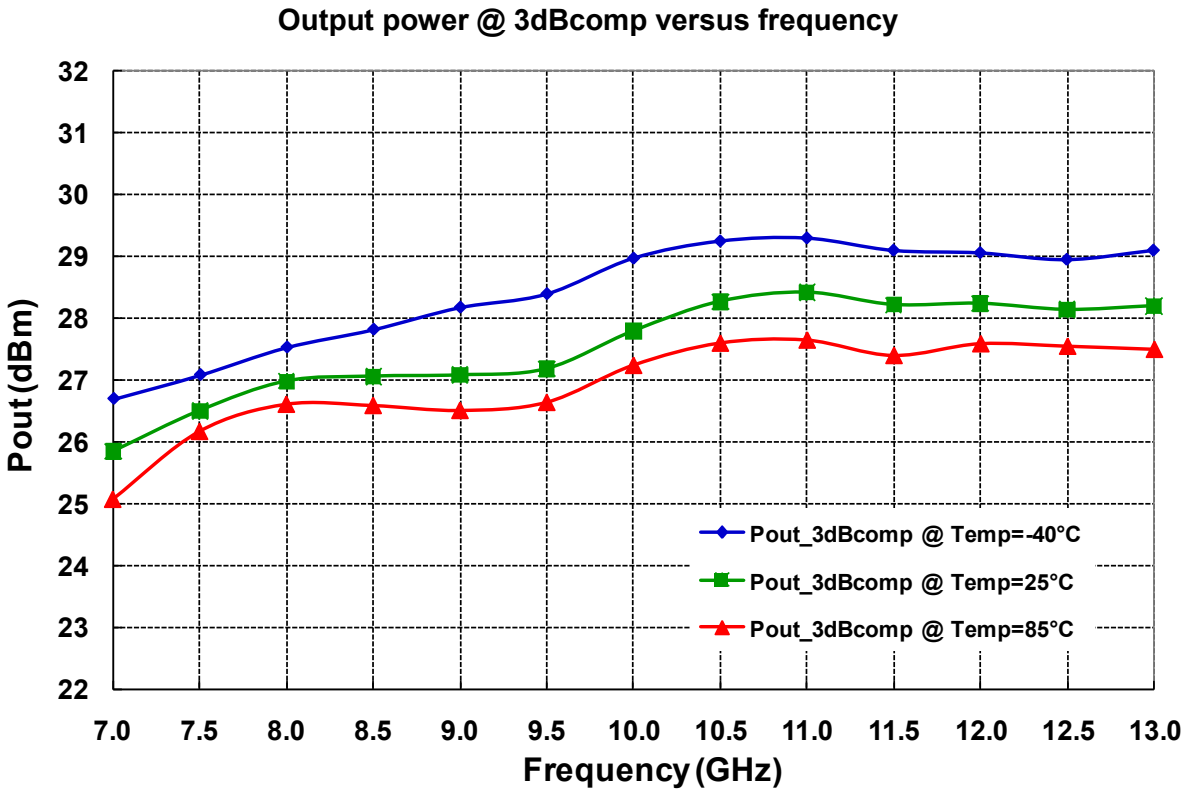

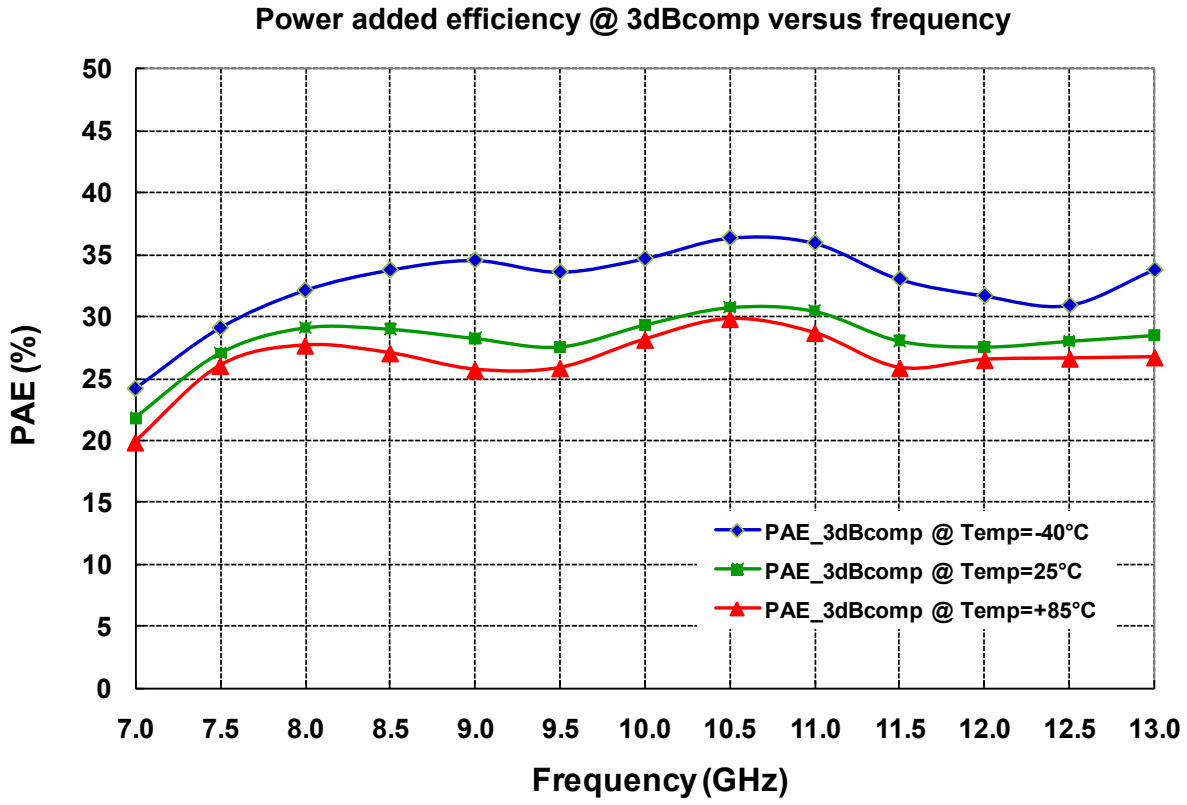

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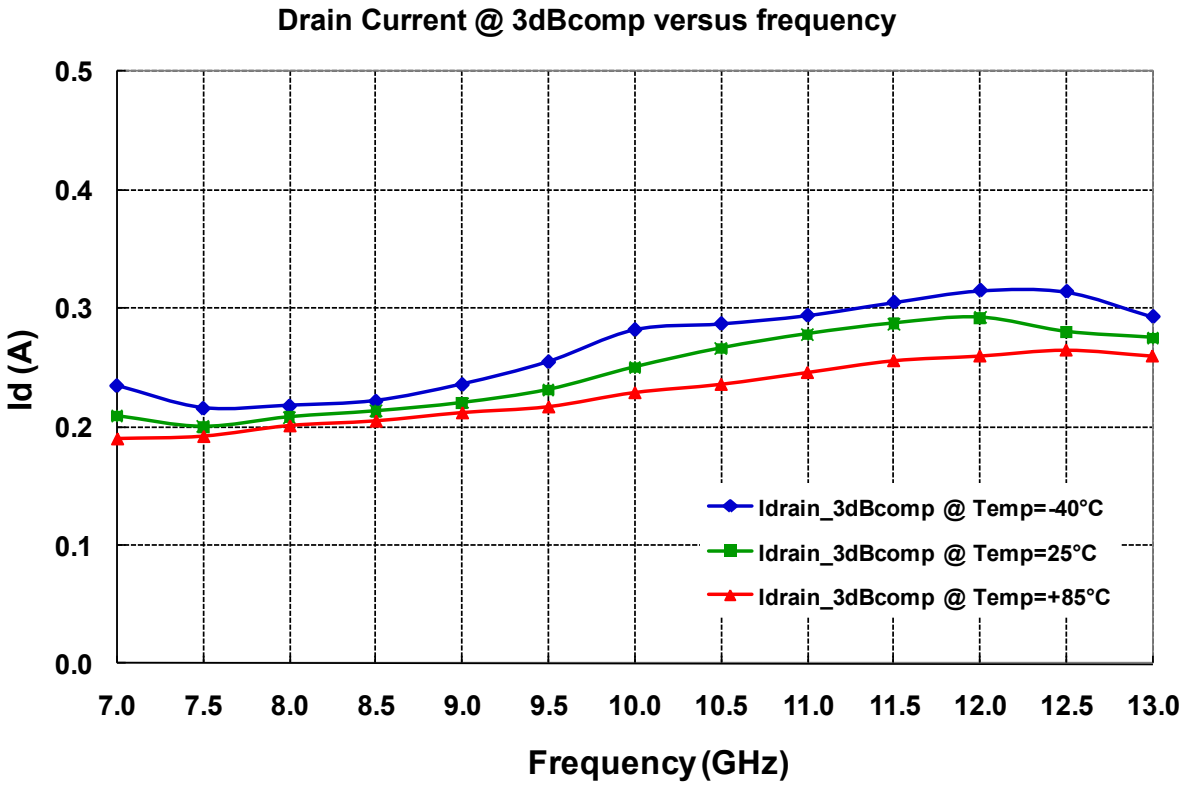

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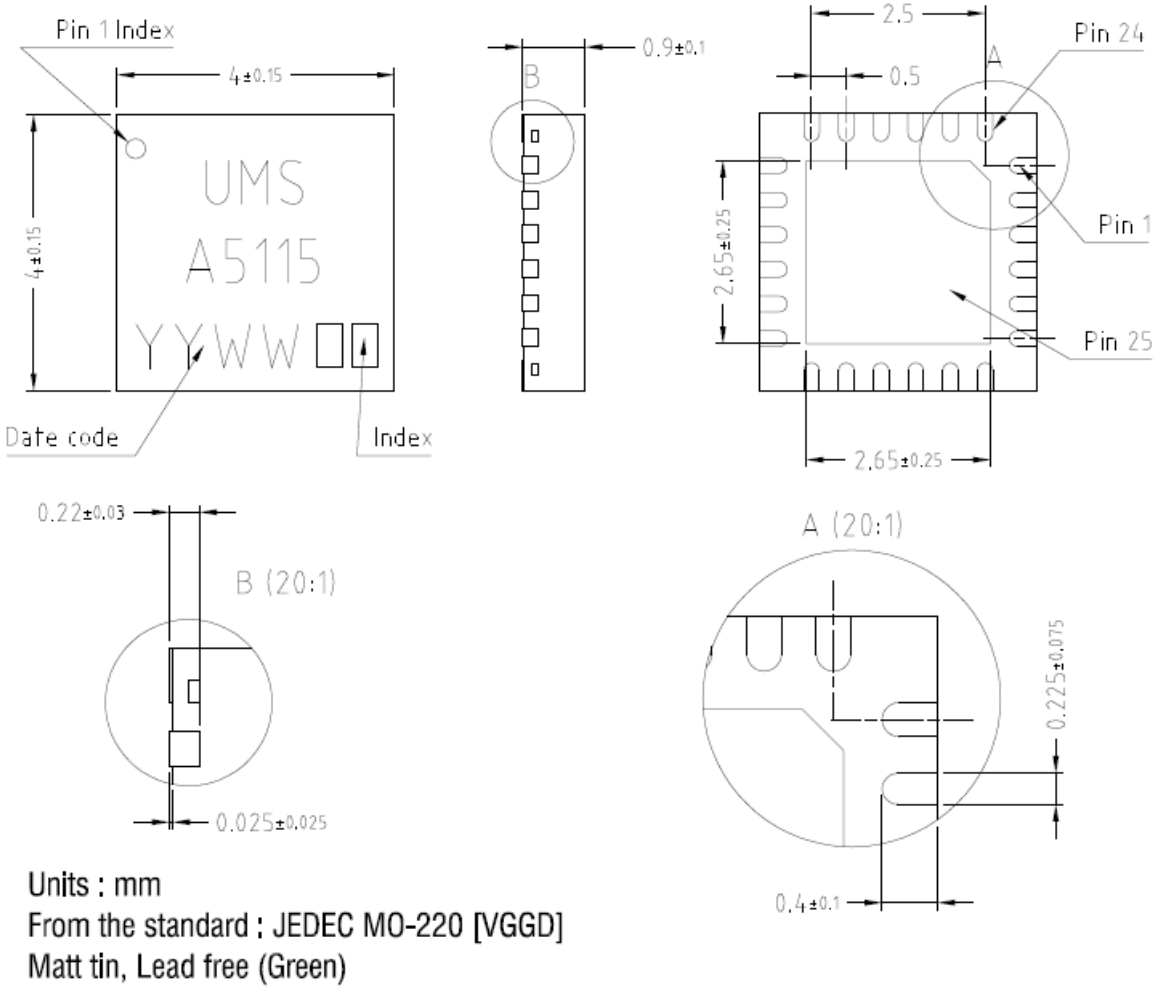
Package outline (1)



Units : mm
From the standard : JEDEC MO-220 [VGGD]
Matt tin, Lead free (Green)

Matt tin. Lead Free	(Green)	1-	Nc	11-	Gnd	21-	Nc
Units :	mm	2-	Gnd(2)	12-	Vg	22-	Nc
From the standard :	JEDEC MO-220	3-	Gnd	13-	Gnd	23-	Nc
	(VGGD)	4-	RF OUT	14-	Gnd	24-	Nc
25-	GND	5-	Gnd	15-	RF IN		
		6-	Gnd	16-	Gnd		
		7-	Vd2	17-	Gnd		
		8-	Gnd	18-	Nc		
		9-	Gnd	19-	Nc		
		10-	Vd1	20-	Nc		

(1) The package outline drawing included to this data-sheet is given for indication. Refer to the application note AN0017 (http://www.ums-gaas.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.

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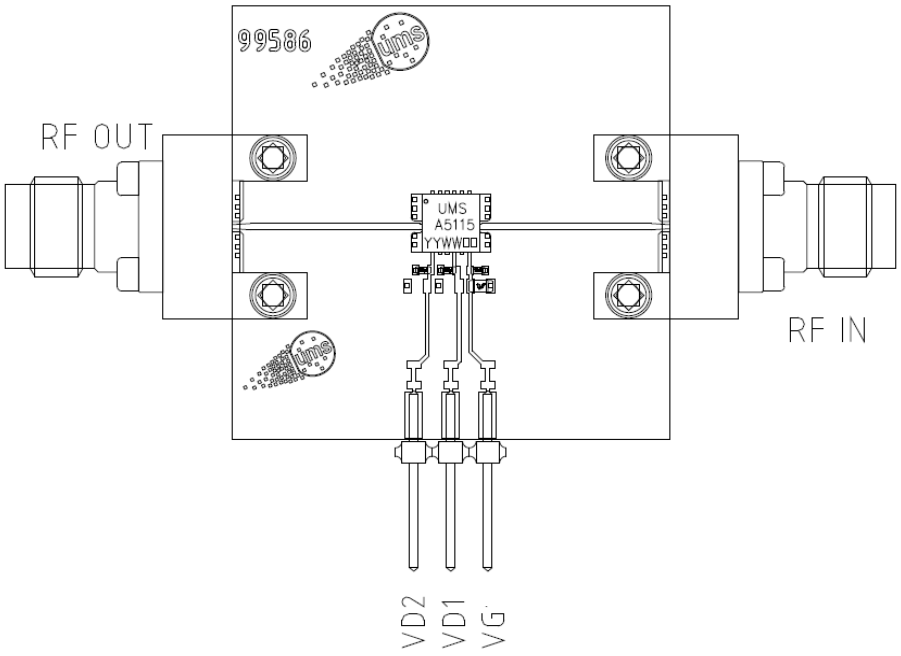
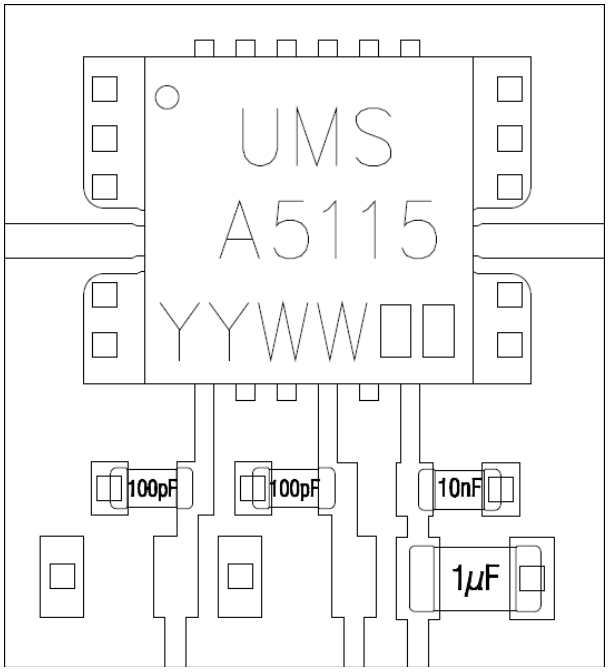
Evaluation mother board (CHA5115-QDG/BOA)

- 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% on drains; and 10nF ±10% and 1µF ±10% on gate are recommended for all DC accesses.
- When using CW mode, decoupling capacitors of 10nF ±10% on drains are recommended.
- See application note AN0017 for details.





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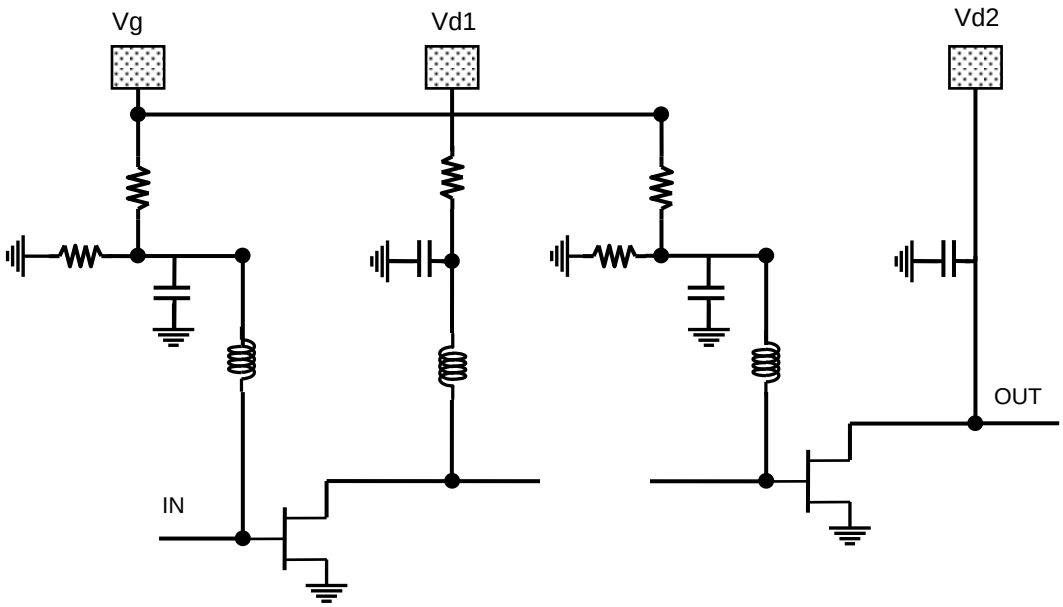
DC Schematic

Medium Power Amplifier: 8V, 190mA



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Recommended package footprint

Refer to the application note AN0017 available at http://www.ums-gaas.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.

Recommended environmental management

Refer to the application note AN0019 available at http://www.ums-gaas.com for environmental data on UMS package products.

Recommended ESD management

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

Ordering Information

QFN 4x4 RoHS compliant package:	CHA5115-QDG/XY	
	Stick: XY = 20	Tape & reel: XY = 21

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