

X-band Medium Power Amplifier GaAs Monolithic Microwave IC

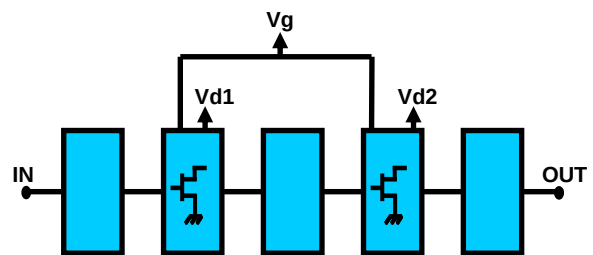
Description

The CHA5115-99F is a monolithic two-stage GaAs medium power amplifier designed for X-band applications.

The MPA provides typically 29dBm output power associated to 39% power added efficiency at 3dB gain compression.

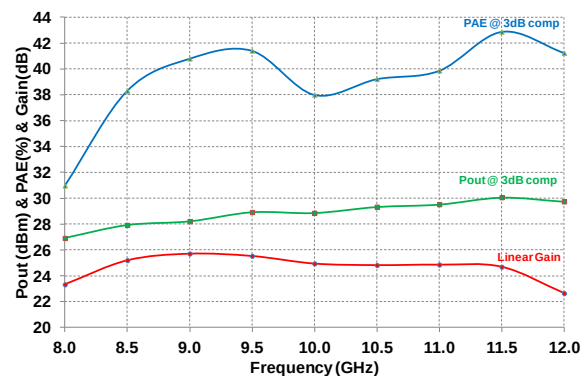
This device is manufactured using 0.25 μ m Power pHEMT process, including, via holes through the substrate and air bridges.

It is available in chip form.



Main Features

- 0.25 μ m Power pHEMT Technology
- Frequency band: 8-12GHz
- Output power: 29dBm @ 3dBcomp
- Linear gain: 25dB
- High PAE: 39% @ 3dBcomp
- Noise Factor: 5dB typ.
- Quiescent bias point: Vd=8V, Id=0.19A
- Chip size: 2.37x1.82x0.07mm



Main Characteristics

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

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	8		12	GHz
PAE_P _{-3dB}	Power added efficiency @ 3dB comp		39		%
P _{-3dB}	Output power @ 3dB comp		29		dBm

Main Characteristics on wafer

Tamb = +25°C,

Vd = 8V, Drain Pulse width = 100µs, Duty cycle = 20%

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency	8		12	GHz
G	Small signal gain		25		dB
RLin	Input Return Loss		10		dB
RLout	Output Return Loss		8		dB
P _{-1dB}	Output power @ 1dBcomp		28		dBm
P _{-3dB}	Output power @ 3dBcomp		29		dBm
PAE _{-P-3dB}	Power Added Efficiency @3dB comp		39		%
Id _{-P-3dB}	Supply drain current @3dB comp		250		mA
NF	Noise Factor		5		dB
Vd1, Vd2, Vd3	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	320	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.

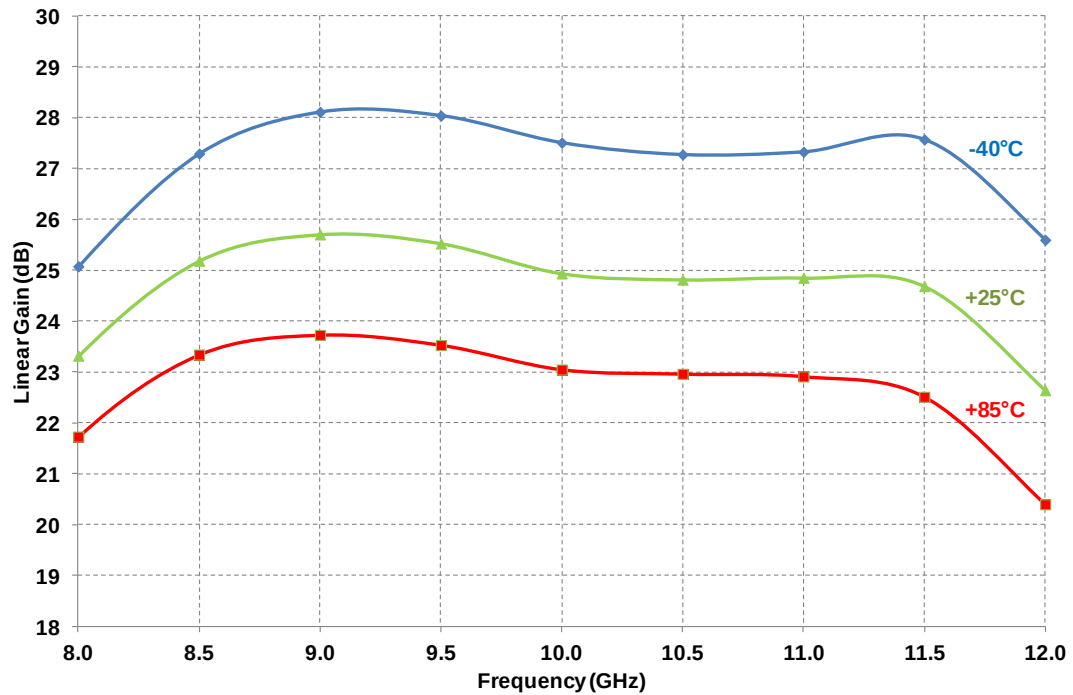
⁽³⁾ Without RF input power.

Typical on Jig Measurements

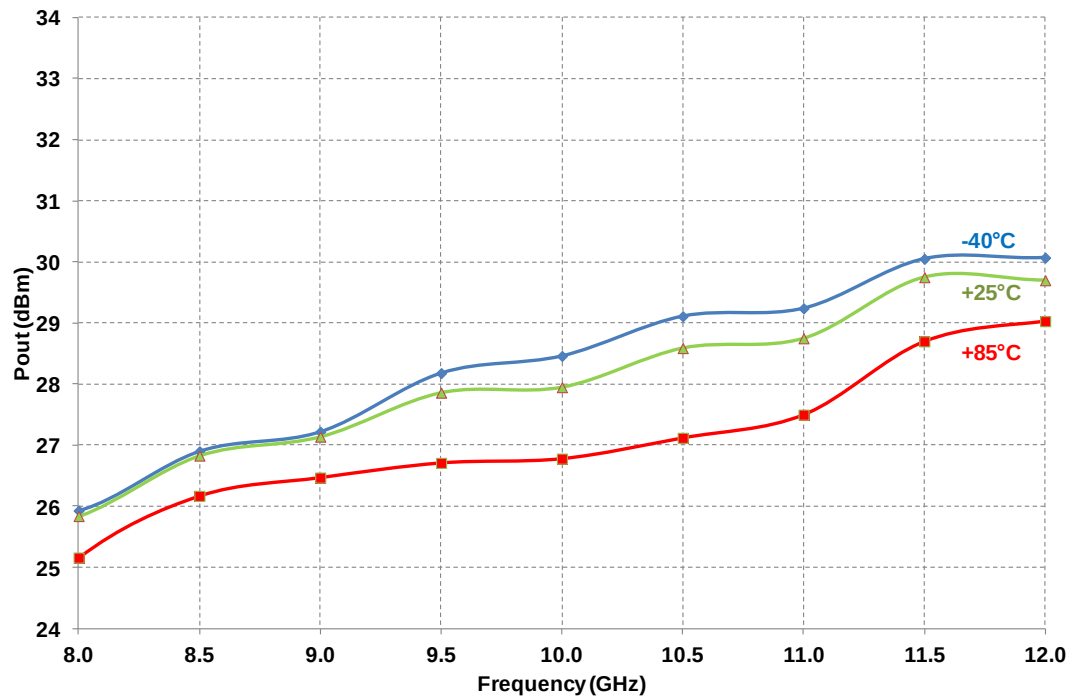
Tamb= -40°C/+25°C/+85°C;

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

Linear Gain versus frequency



Output Power @ 1dB comp versus frequency

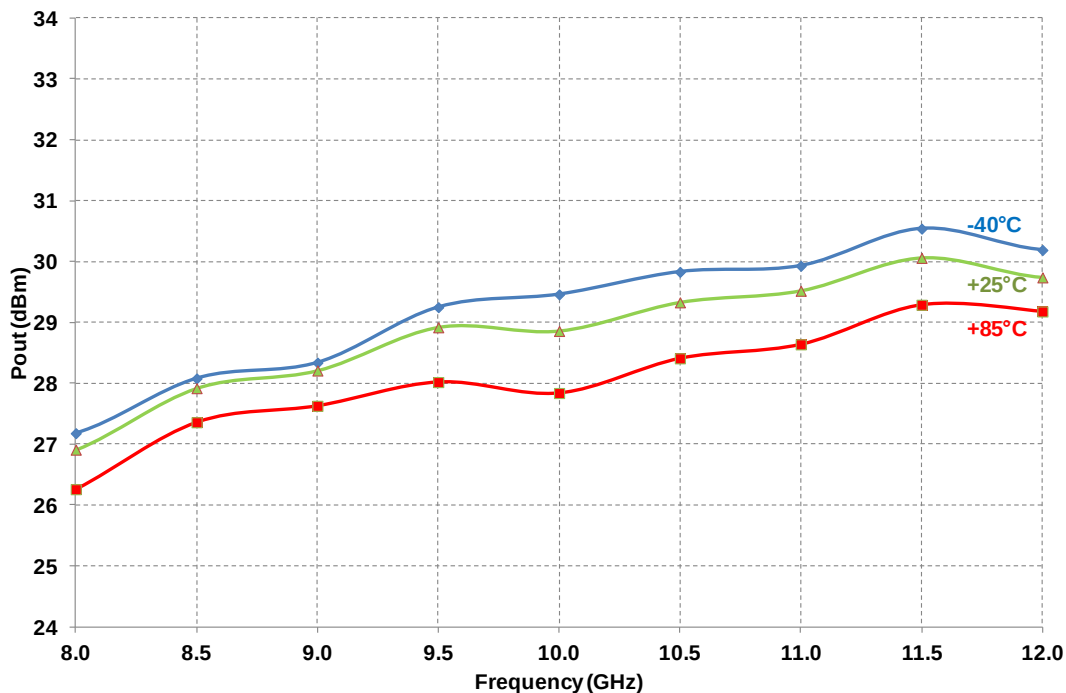


Typical on Jig Measurements

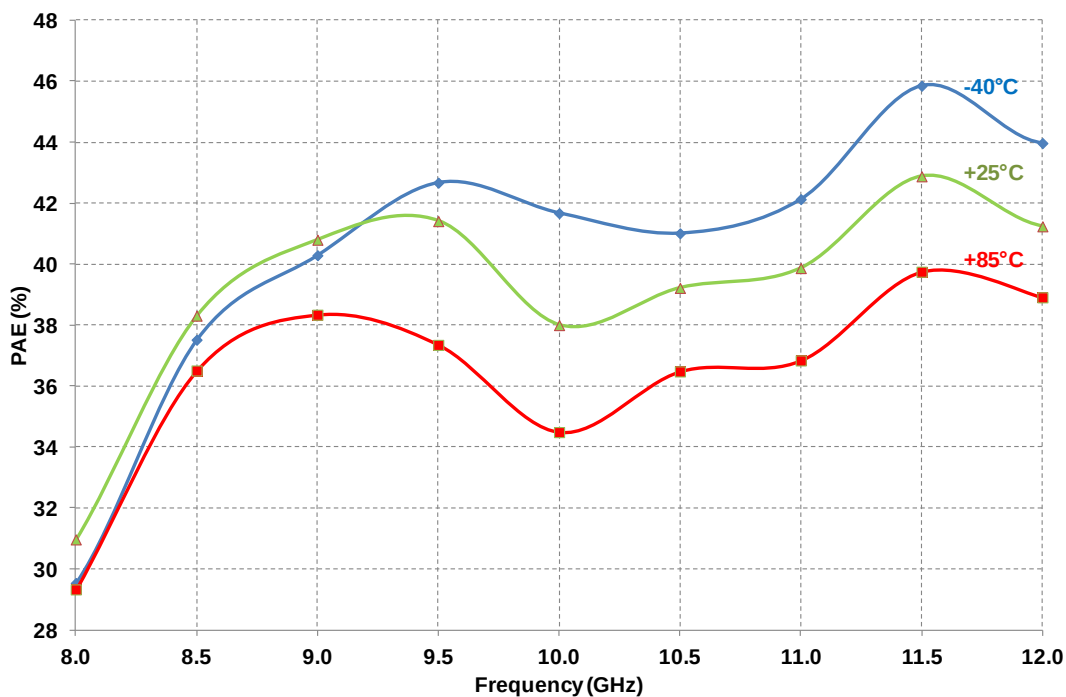
Tamb= -40°C/+25°C/+85°C;

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

Output Power @ 3dB comp versus frequency



Power added efficiency @ 3dBcomp versus frequency

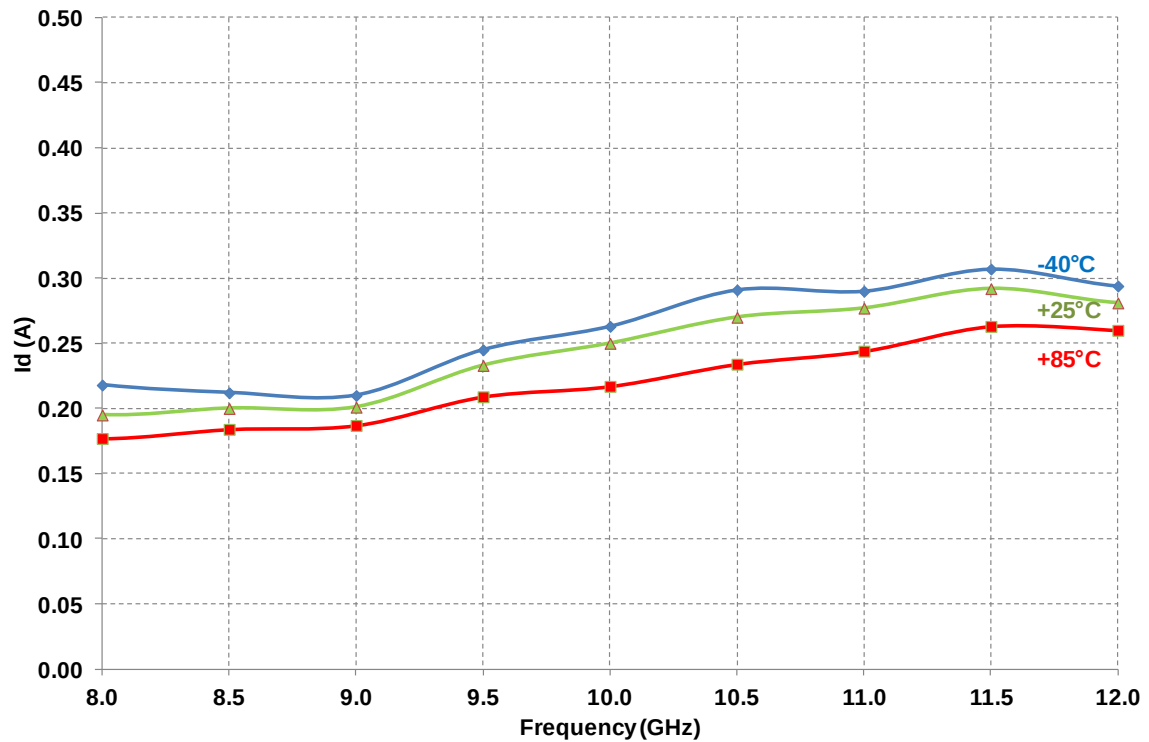


Typical on Jig Measurements

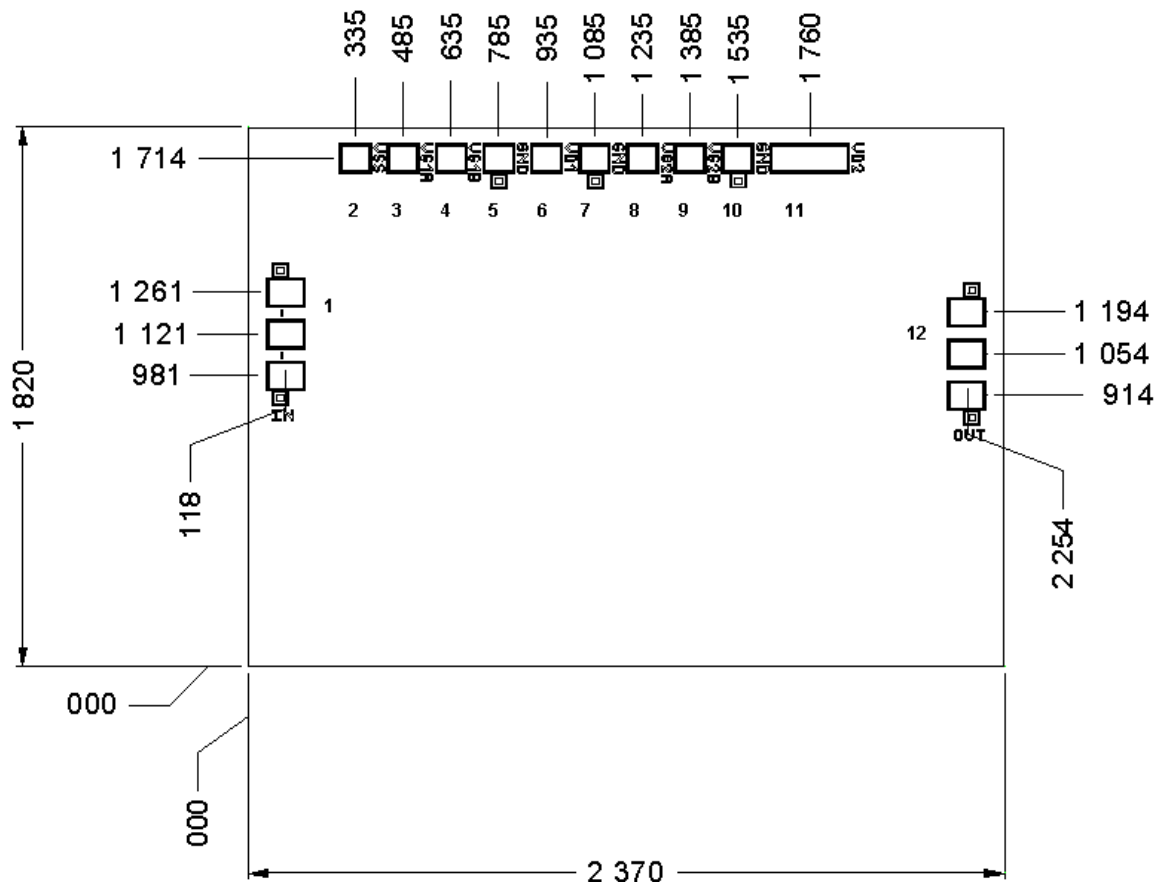
Tamb= -40°C/+25°C/+85°C;

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

Drain Current @ 3dBcomp versus frequency



Mechanical data



All dimensions are in micrometers

Chip size = 1820x2370 ±35μm

Chip thickness = 70μm ±10μm

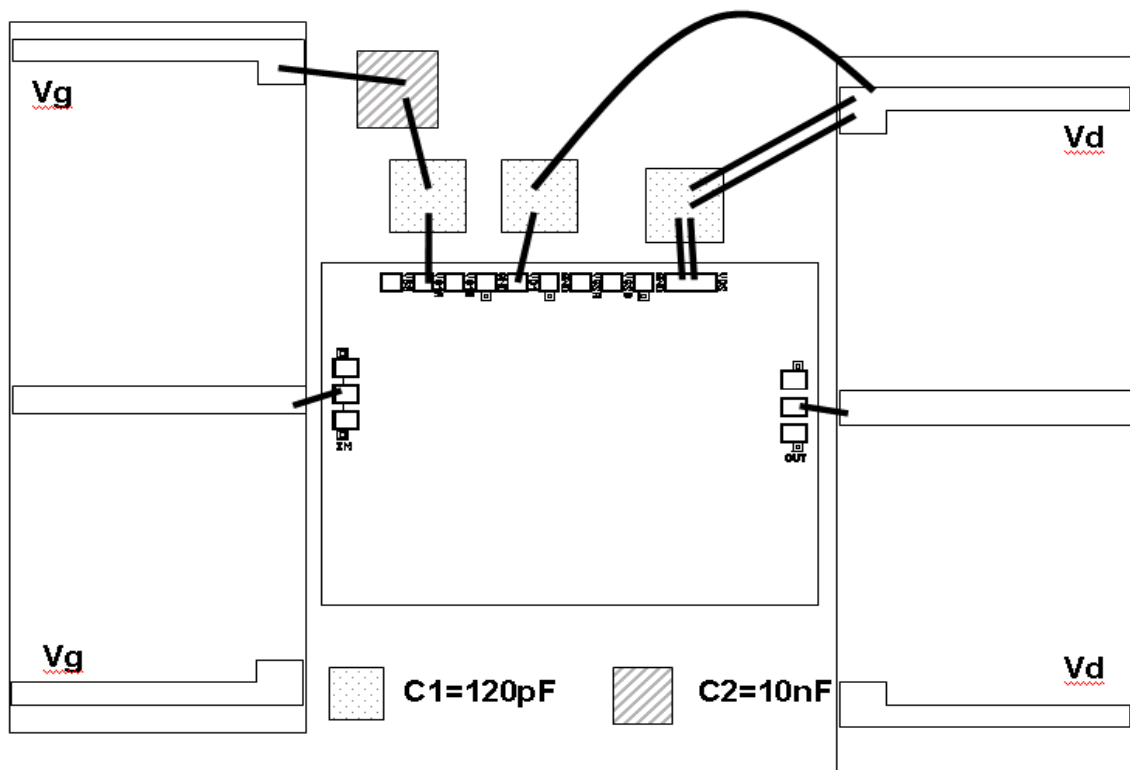
RF pads (1, 12) = 100 x 122μm²

DC pads (3, 6, 8, 11) = 100 x 100μm²

Chip width and length are given with a tolerance of ±35μm

Pin number	Pin name	Description
1	IN	Input RF
2, 4, 8, 9	VSS, VG1B, VG2A, VG2B	NC
3	VG1A	Vg
5, 7, 10	GND	Ground
6, 11	VD1, VD2	Vd
12	OUT	Output RF

Recommended assembly plan



Pads VG1A (pin 3) & VG2A (pin 8) are connected inside the chip, so the CHA5115 can be used without VG2A bias.

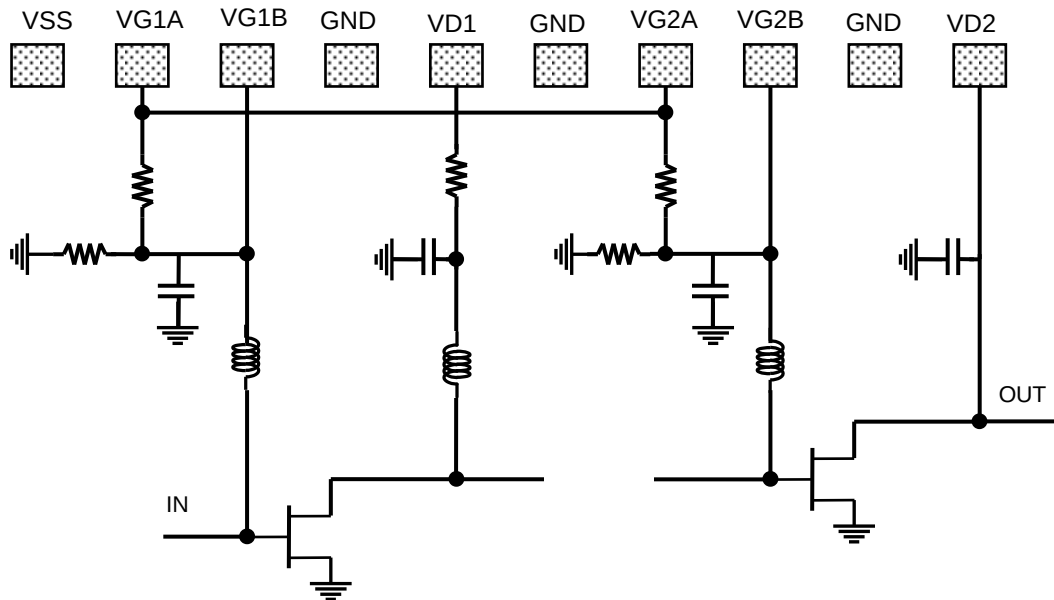
Equivalent RF Wire Bonding: 0.2nH (typical length of 200μm for a 25μm diameter wire).

Bonding recommendations

Port	Connection	External capacitor
IN	Inductance (Lbonding) = 0.3nH 1 gold wire with diameter of 25μm	
OUT	Inductance (Lbonding) = 0.3nH 1 gold wire with diameter of 25μm	
Vg	Inductance ≤ 1nH	C1 ~ 120pF, C2 ~ 10nF
Vd	Inductance ≤ 1nH	C1 ~ 120pF

DC Schematic

Medium Power Amplifier: 8V, 190mA



Notes

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 products.

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-gaas.com>.

Ordering Information

Chip form:

CHA5115-99F/00

Information furnished is believed to be accurate and reliable. However **United Monolithic Semiconductors S.A.S.** assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of **United Monolithic Semiconductors S.A.S.**. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. **United Monolithic Semiconductors S.A.S.** products are not authorised for use as critical components in life support devices or systems without express written approval from **United Monolithic Semiconductors S.A.S.**