C-band Medium Power Amplifier

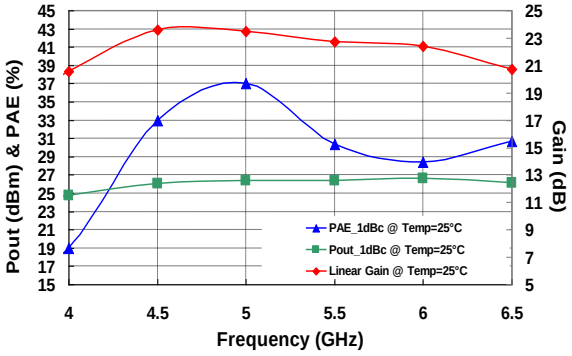
GaAs Monolithic Microwave IC in SMD leadless package

Description

The CHA4107-QDG is a monolithic two-stage GaAs medium power amplifier designed for C-band applications.
The MPA provides typically 25.5 dBm output power associated to 30% power added efficiency at 1dB gain compression.
It is supplied in RoHS compliant SMD package.

Main Features

- Frequency band: 4.5-6.5 GHz
- Output power: 25.5 dBm @ 1dBcomp
- Linear gain: 22.5 dB
- High PAE: 30% @ 1dBcomp
- Quiescent bias point: Vd=8V, Id=120mA
- 24L-QFN4x4
- MSL3



Main Characteristics

Tamb = 25°C, Vd = 8V, Id (Quiescent) = 120mA, Drain Pulse width= 50µs, Duty cycle = 10%

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	4.5		6.5	GHz
PAE_P-1dB	Power added efficiency @1dBcomp & 25°C		30		%
P-1dB	Output power @ 1dBcomp @ 25°C		25.5		dBm

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Electrical Characteristics

Tamb = +25°C,
Vd = 8V, Id (Quiescent) = 120mA, Drain Pulse width = 50µs, Duty cycle = 10%

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency	4.5		6.5	GHz
G	Small signal gain		22.5		dB
RLin	Input Return Loss		14	8	dB
RLout	Output Return Loss		10	8	dB
P_{-1dB}	Output power @ 1dBcomp		25.5		dBm
PAE_ P_{-1dB}	Power Added Efficiency @ 1dBcomp		30		%
Id_ P_{-1dB}	Supply drain current @ 1dBcomp		145		mA
P_{-3dB}	Output power @ 3dBcomp		26		dBm
PAE_ P_{-3dB}	Power Added Efficiency @ 3dBcomp		36		%
Id_ P_{-3dB}	Supply drain current @ 3dBcomp		160		mA
Vd1, Vd2	Drain supply voltage		8		V
Id	Supply quiescent current (1)		120		mA
Vg	Gate supply voltage		-0.8		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	170	mA
Id_sat	Supply current in saturation	200	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/dB of gain compression.
(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.

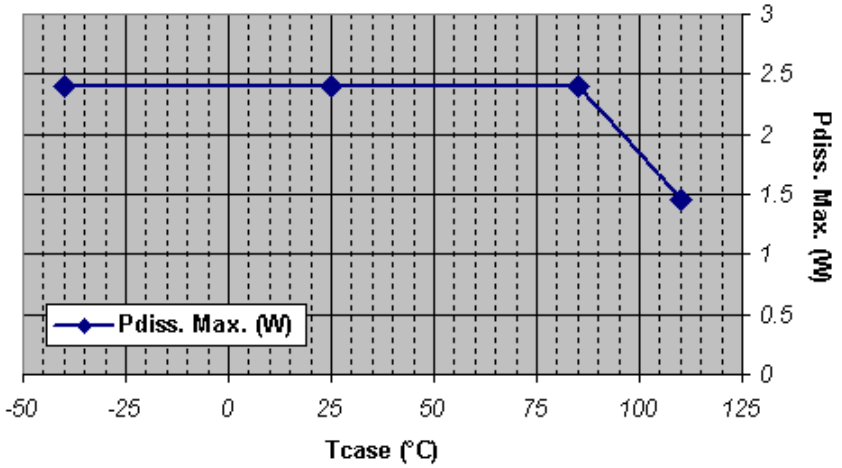
A derating must be applied on the dissipated power if the Tcase temperature can not be maintained below than the maximum temperature specified (see the curve Pdiss. Max) in order to guarantee the nominal device life time (MTTF).

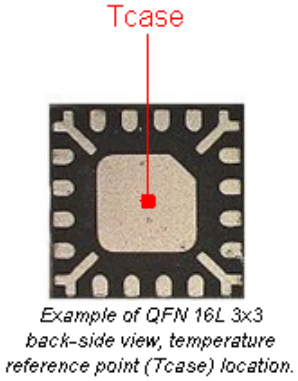
DEVICE THERMAL SPECIFICATION : CHA4107-QDG			
Recommended max. junction temperature (Tj max)	:	148	°C
Junction temperature absolute maximum rating	:	175	°C
Max. continuous dissipated power @ Tcase= 85 °C	:	2.4	W
=> Pdiss derating above Tcase(1)= 85 °C	:	38	mW/°C
Junction-Case thermal resistance (Rth J-C)(2)	:	<26	°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 of QFN 16L 3x3 back-side view, temperature reference point (Tcase) location.

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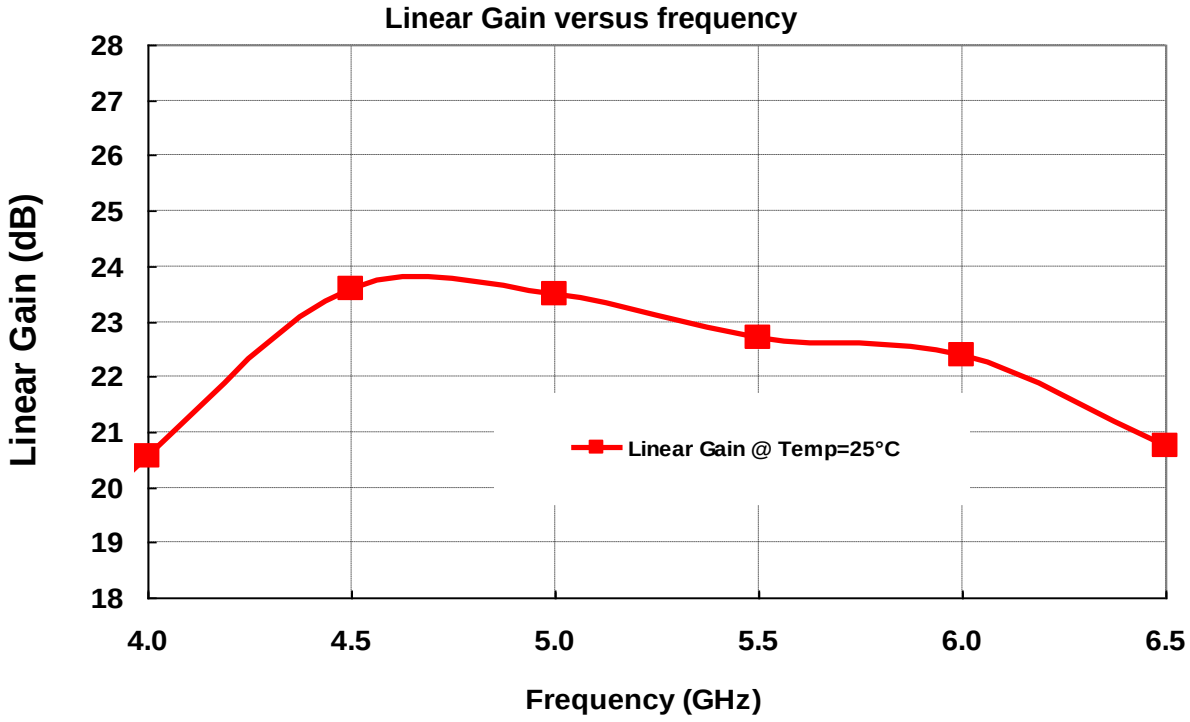
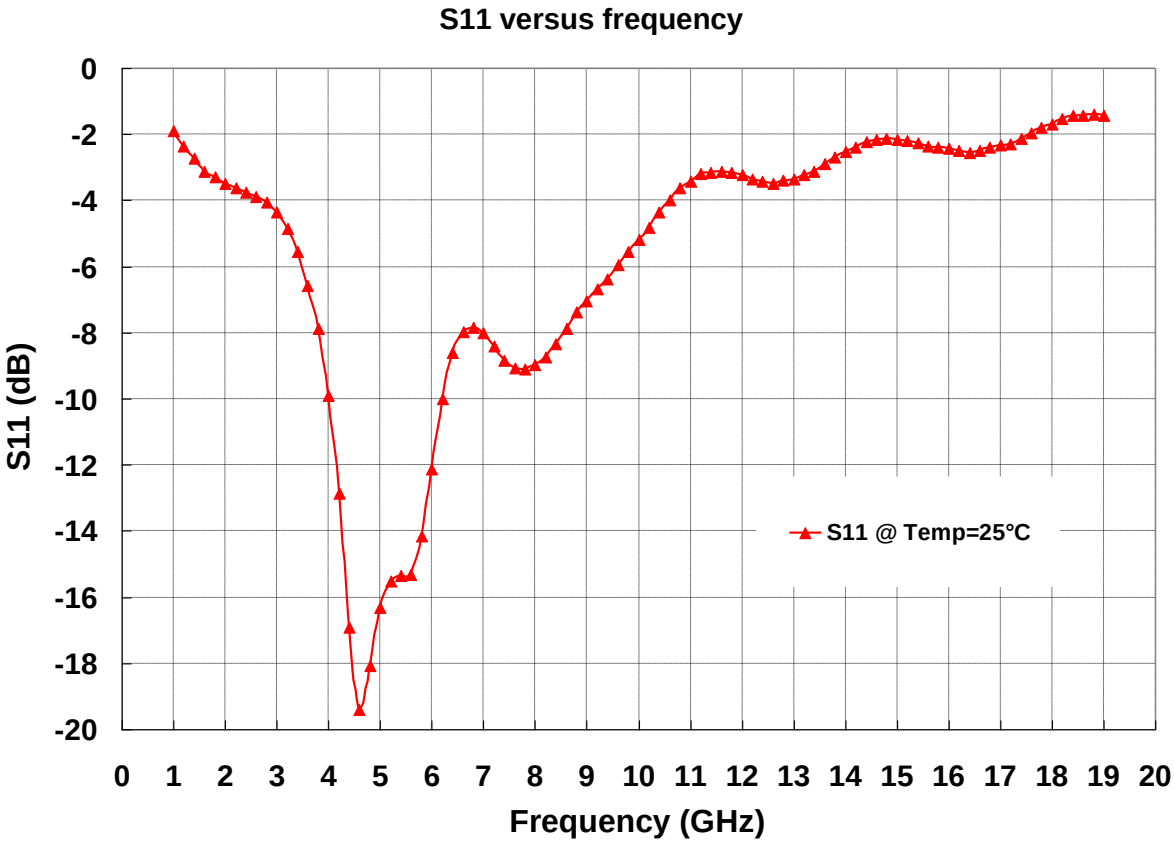
Typical Board Measurements

Vd = 8V, Id (Quiescent) = 120mA, Drain Pulse width = 50µs, Duty cycle = 10%





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Typical on board Measurements

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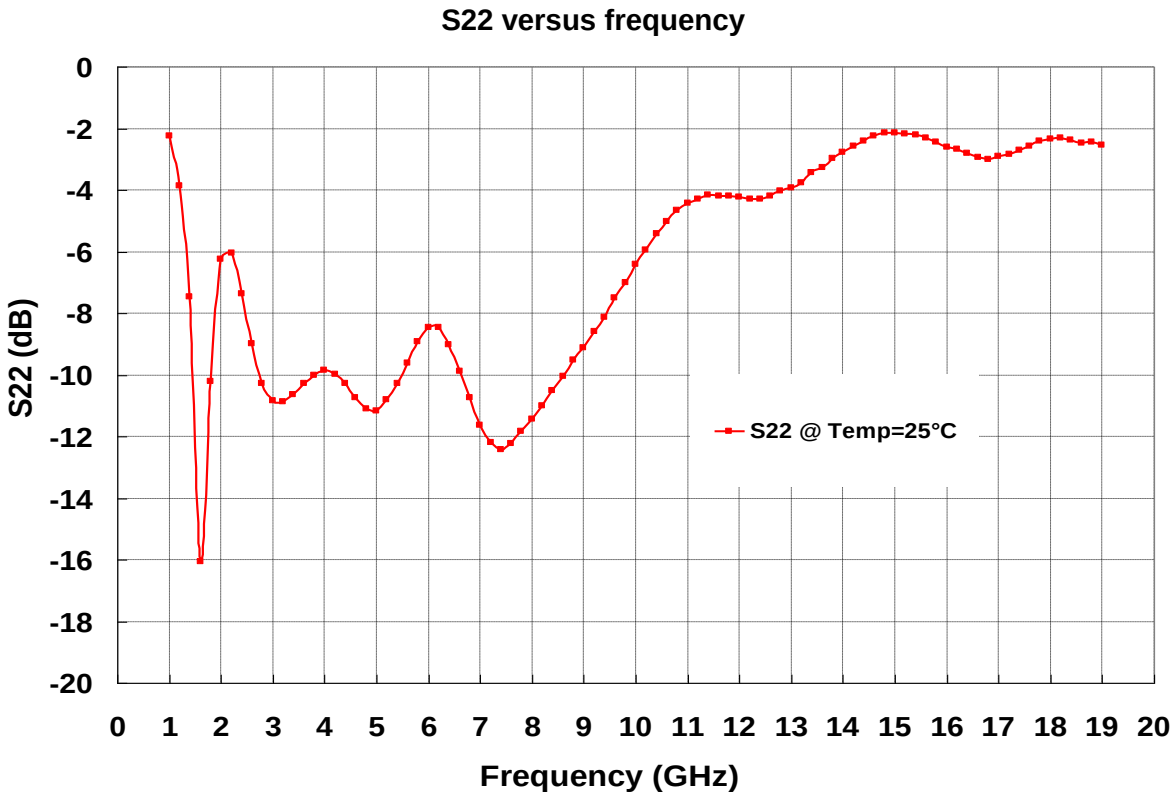

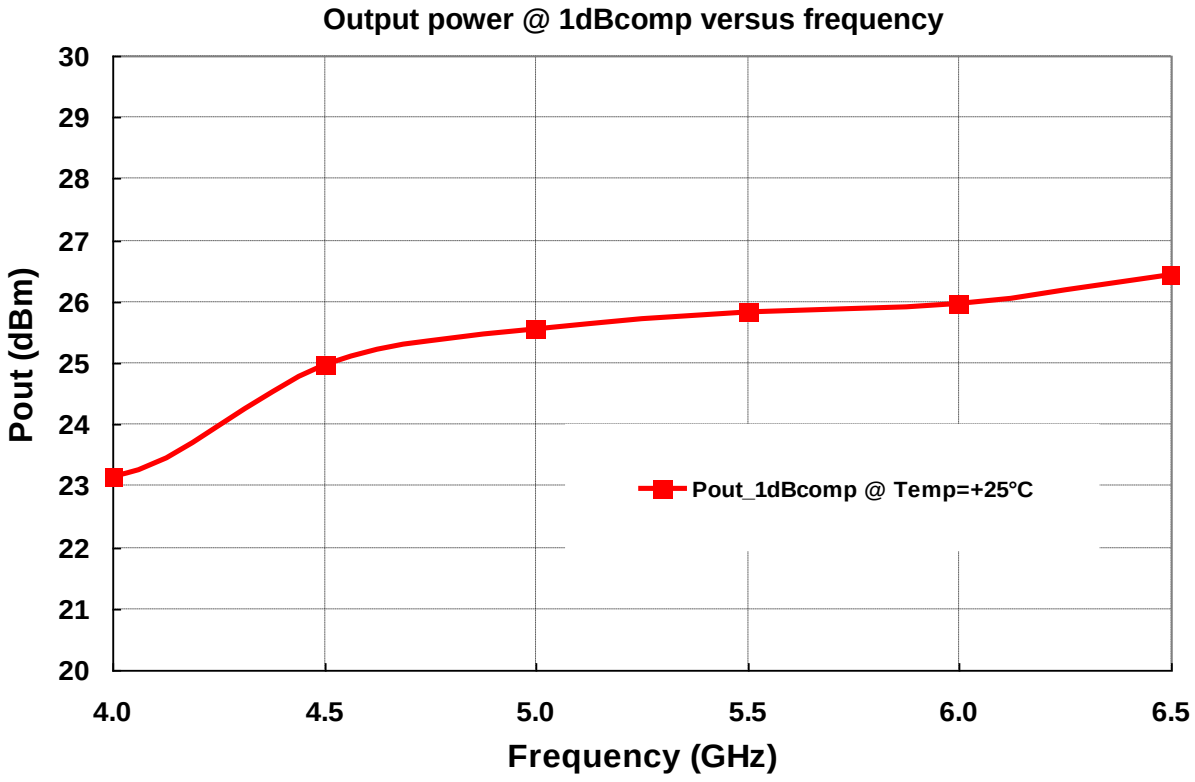

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Typical on board Measurements

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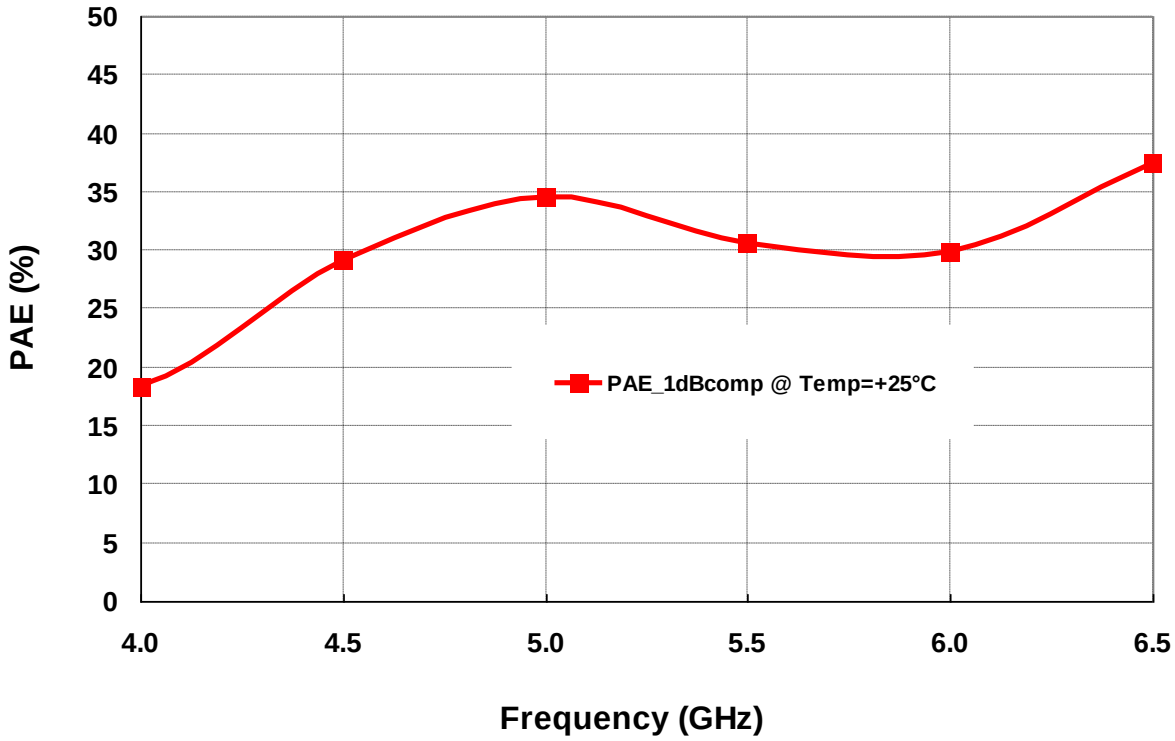
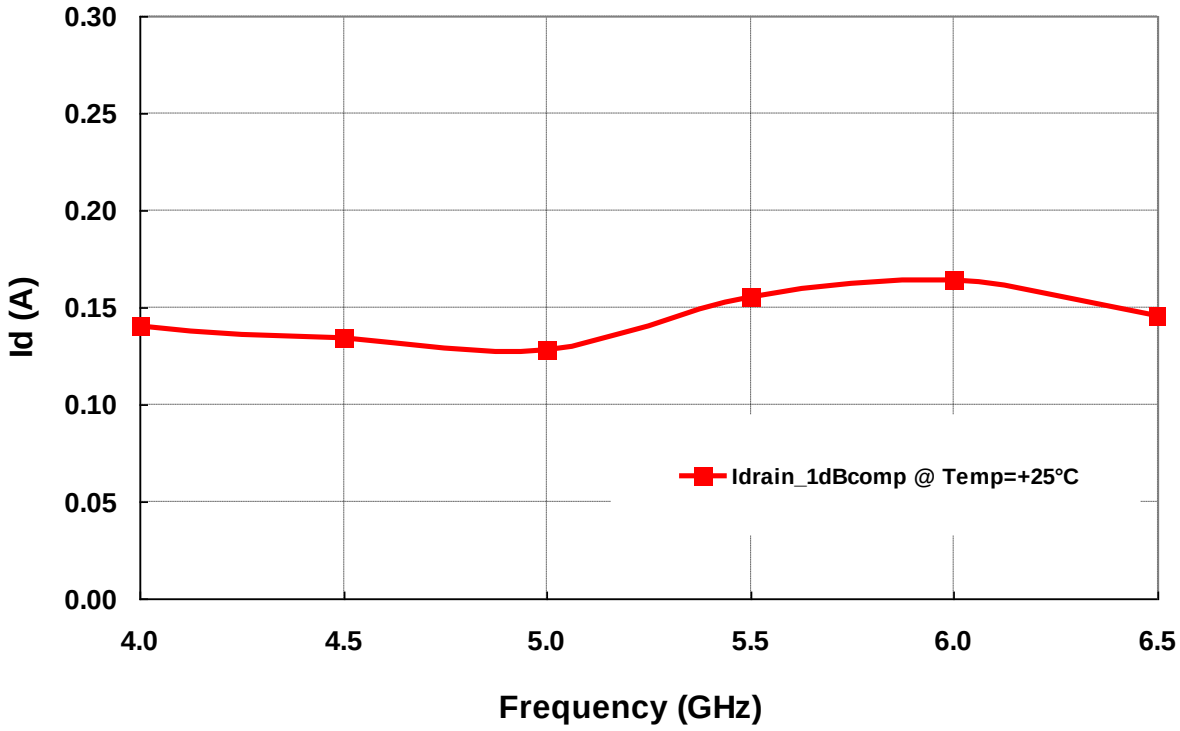
Power added efficiency @ 1dBcomp versus frequency



Drain Current @ 1dBcomp versus frequency



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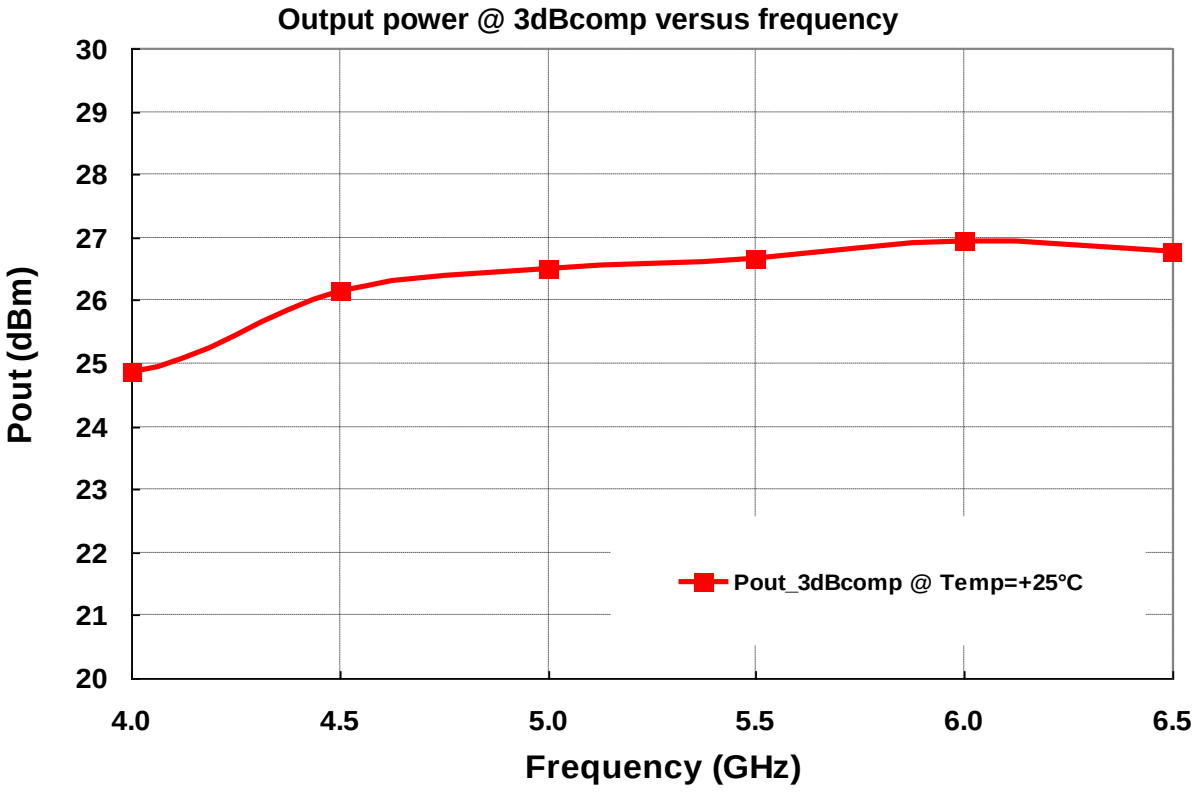

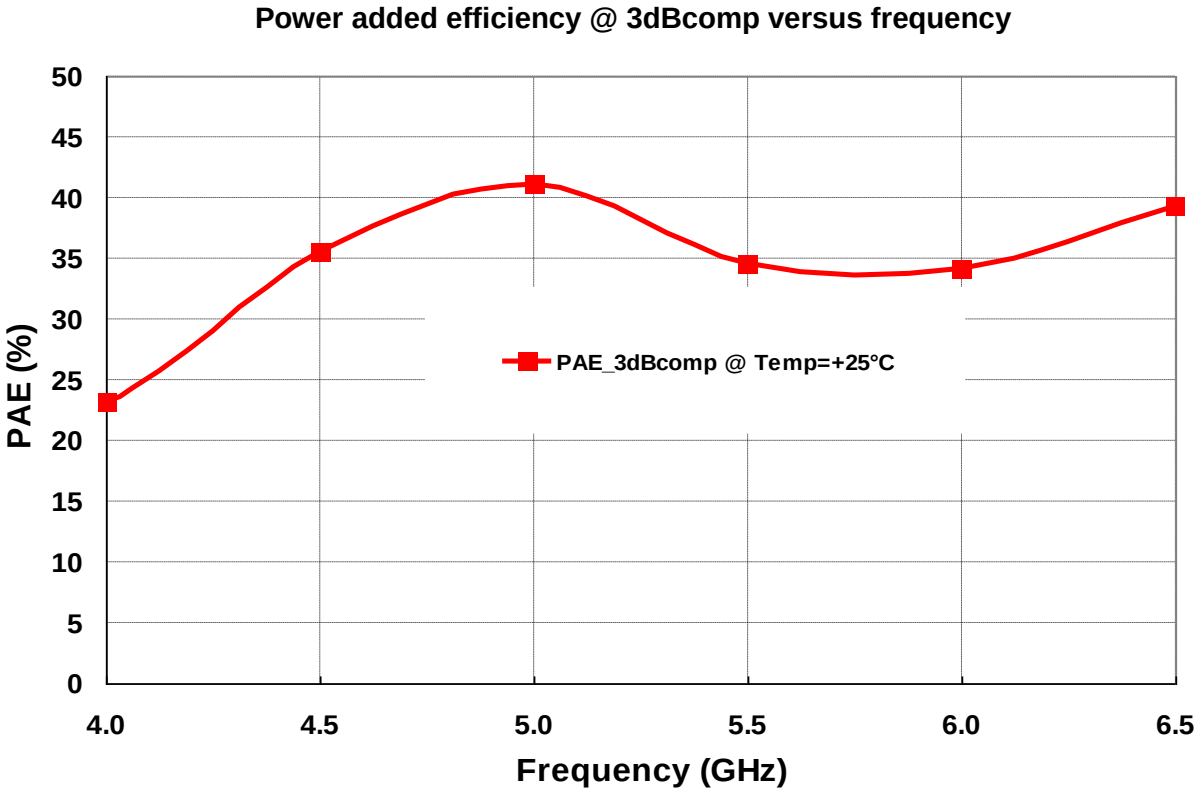

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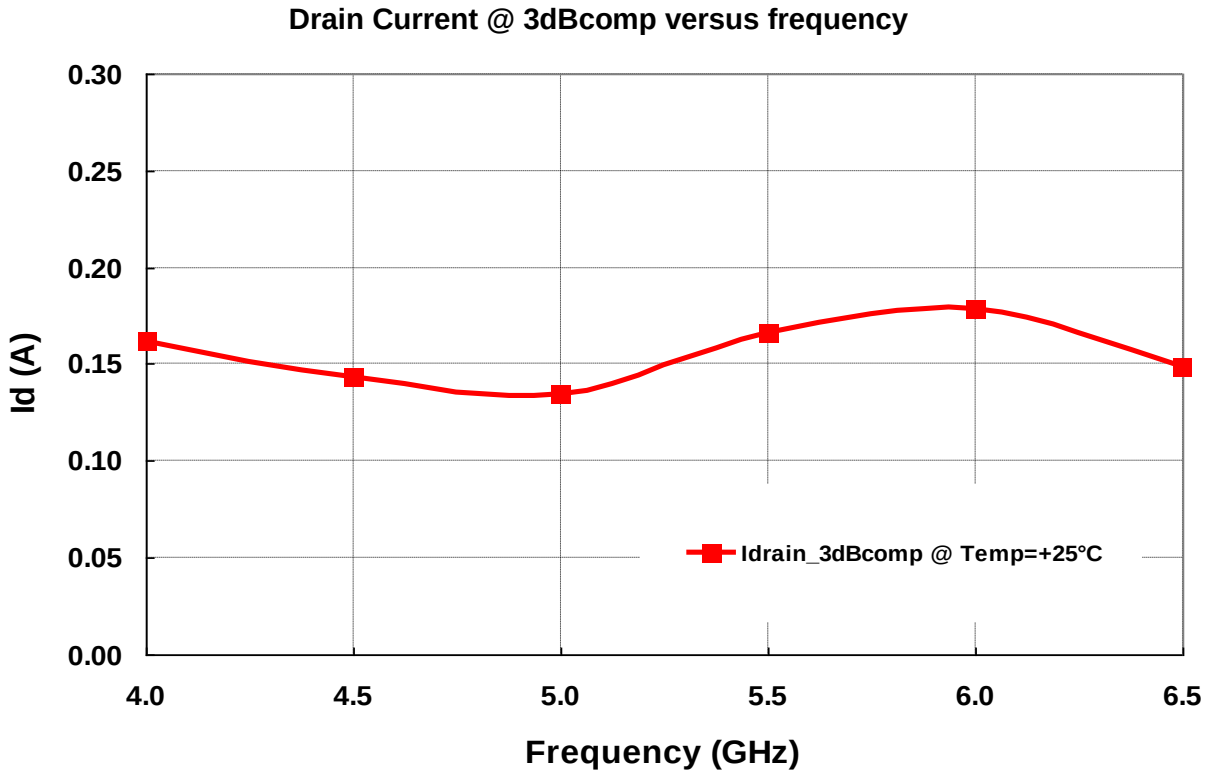

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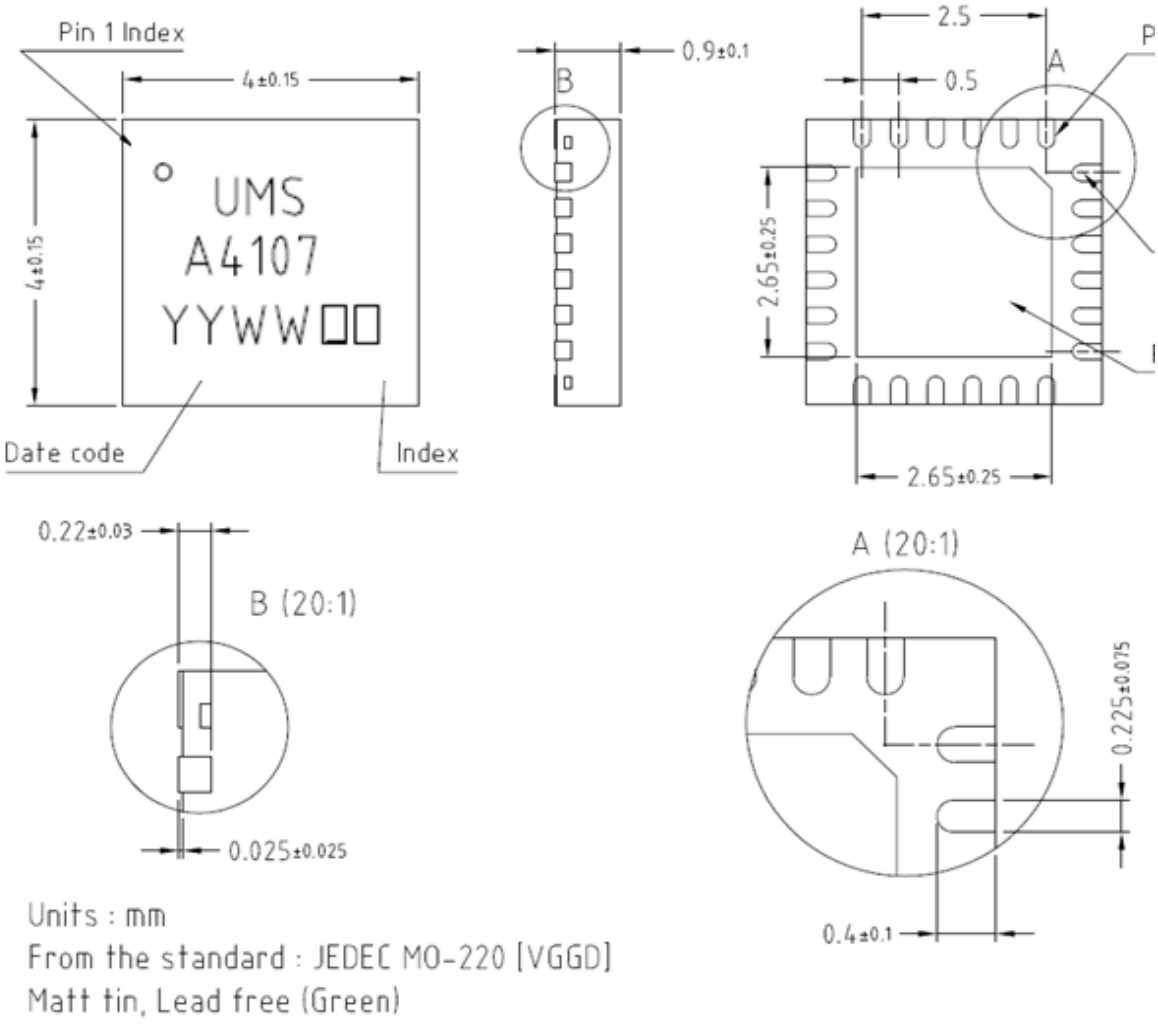
Package outline (1)



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

(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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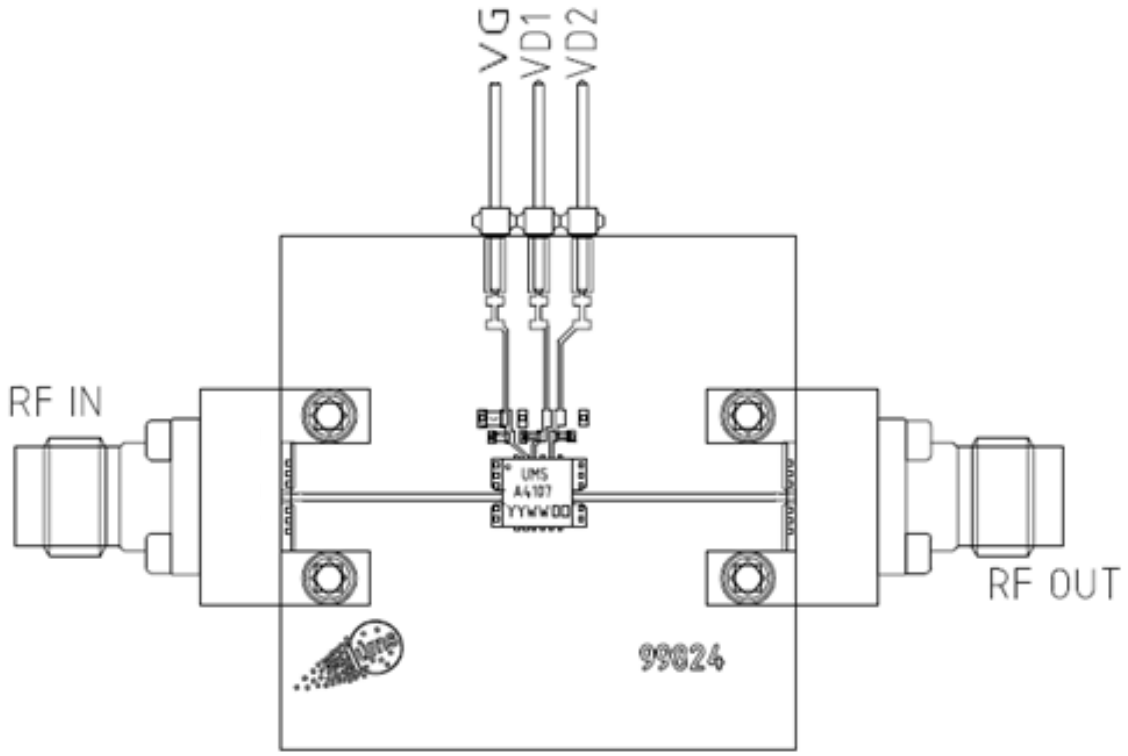
Evaluation mother board

■ 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.
■ In CW mode, decoupling capacitors of 10nF ±10% are recommended for Drain & Gate accesses.
■ In pulsed mode, decoupling capacitors of 100pF in parallel with decoupling capacitors of 1nF are recommended for Drain access. On Gate access, decoupling capacitors of 100pF and 1 µF in parallel are recommended.
■ See application note AN0017 for details.



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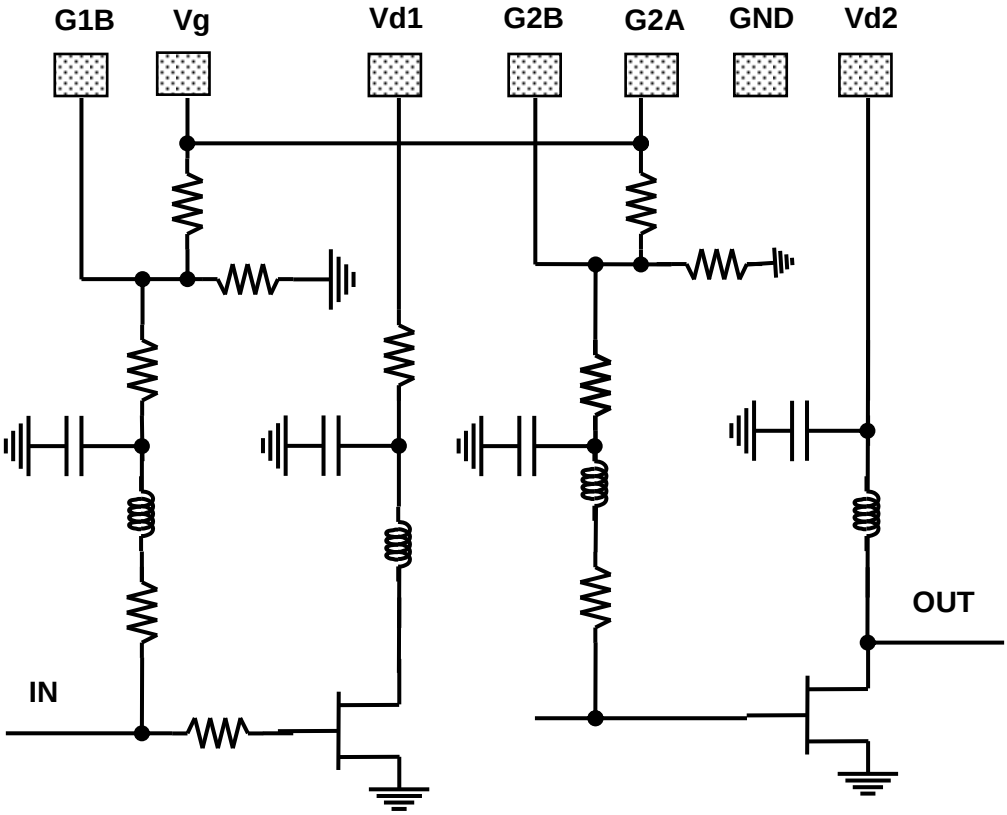
DC Schematic

Medium Power Amplifier: 8V, 120mA



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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:	CHA4107-QDG/XY	
	Stick: XY = 20	Tape & reel: XY = 21

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