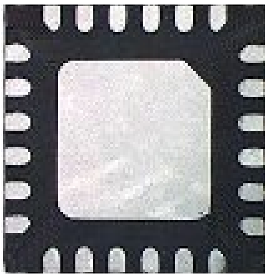
C-band Medium Power Amplifier

GaAs Monolithic Microwave IC in SMD leadless package

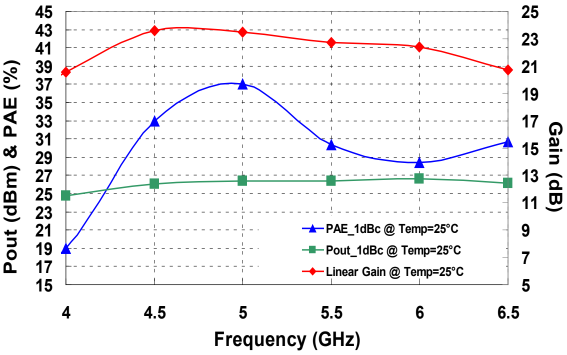
Description

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



Main Features

- Frequency band: 4.5-6.5GHz
- Output power: 25.5dBm @ 1dBcomp
- Linear gain: 22.5dB
- High PAE: 30% @ 1dBcomp
- Pin max=15 dBm
- 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

Electrical Characteristics

Tcase = +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 drain quiescent current (1)		120		mA
Vg	Gate supply voltage		-0.8		V

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

Recommended Operating Ratings

Symbol	Parameter	Values	Unit
Vd	Supply voltage on drain	8	V
Ig	Gate current	10	mA
Tj	Maximum junction temperature	175	°C

Tcase=+25°C. Operation of this device above anyone of these parameters may degrade the component lifetime.

Absolute Maximum Ratings (1)

Symbol	Parameter	Values	Unit
Cmp	Compression level (2)	6	dB
Vd	Drain voltage	9.5	V
Id	Drain quiescent current	170	mA
Id_sat	Drain current in saturation	200	mA
Vg	Gate voltage	[-3.0; 0]	V
Pin	Maximum peak input power overdrive	15	dBm
Tstg	Storage temperature range	-55 to +150	°C
Top	Operating temperature range	-40 to +85	°C

Tcase=+25°C

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

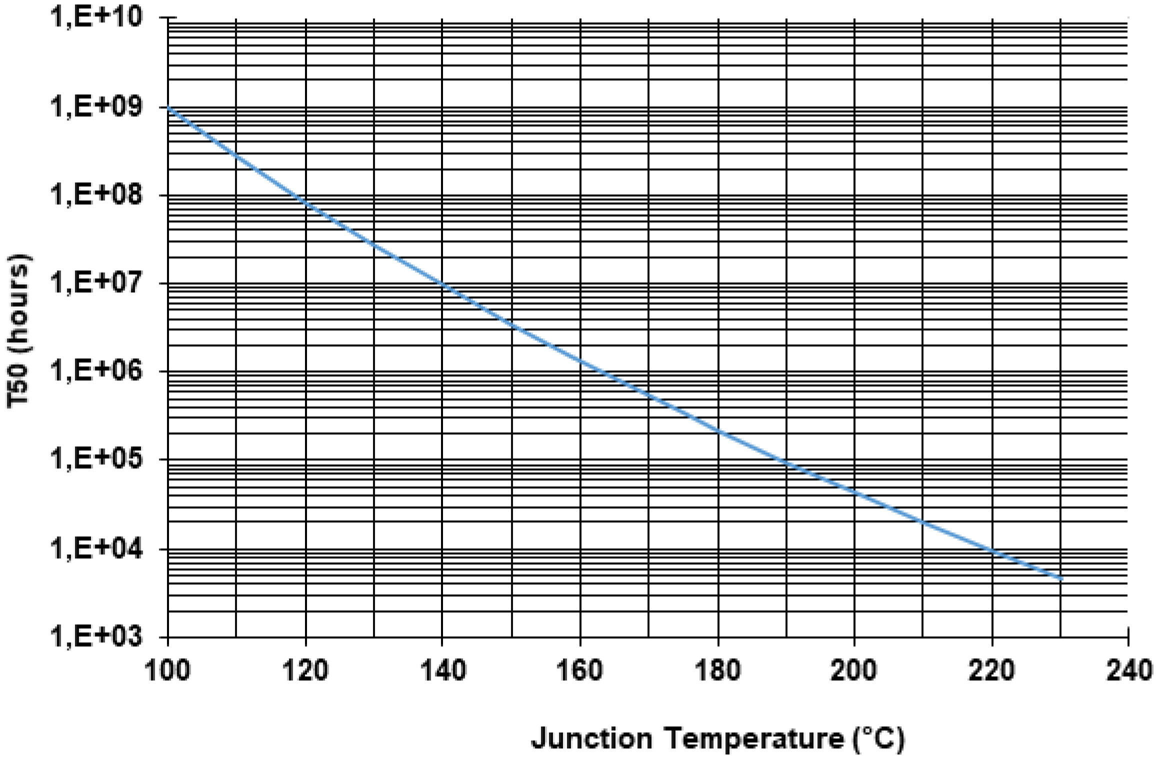
(2) For higher compression the level limit can be increased by decreasing the voltage Vd using the rate 0.5V/dB of gain compression.

Device Thermal Performance

All the figures given in this section are obtained assuming that the die is only cooled down by conduction through the package case.
The temperature is monitored at the QFN backside interface (T_{case}).
For nominal operation, the system's maximum temperature must be adjusted to ensure that the junction temperature ($T_{junction}$) remains below the maximum value specified in the Recommended Operating Ratings table.
The system PCB must be designed to comply with this requirement.

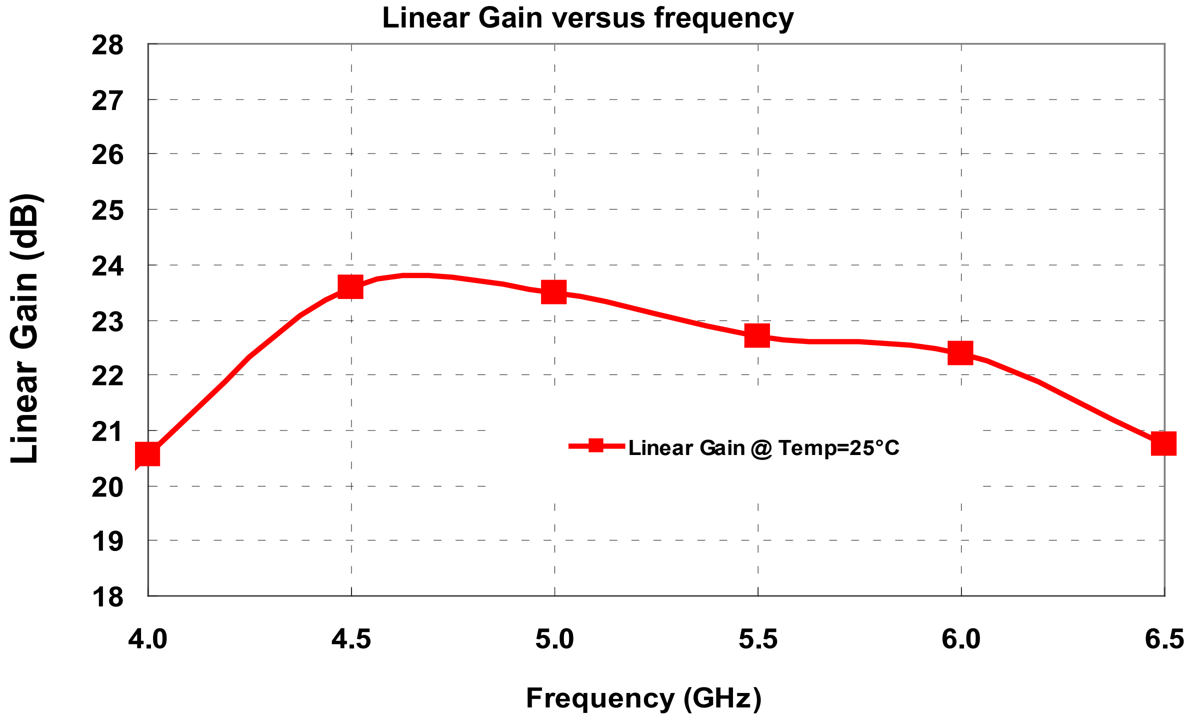
Parameter	Conditions	$T_{junction}$ (°C)	RTH (°C/W)	T50 (hours)
RTH (1) Thermal Resistance (Junction to Case)	CW Mode: Low level input power Vd = 8V, Pdiss=0.8W	176	114	3.15E+05
	Pulse mode (25µs/10%): Low level input power Vd = 8V, Pdiss=0.8W	157	90	1.79E+06
	CW Mode: saturation (3dB gain compression) Vd = 8V, Pdiss=0.77W	167	115	7.04E+05
	Pulse mode (25µs/10%): saturation Vd = 8V, Pdiss=0.77W	154	97	2.38E+06

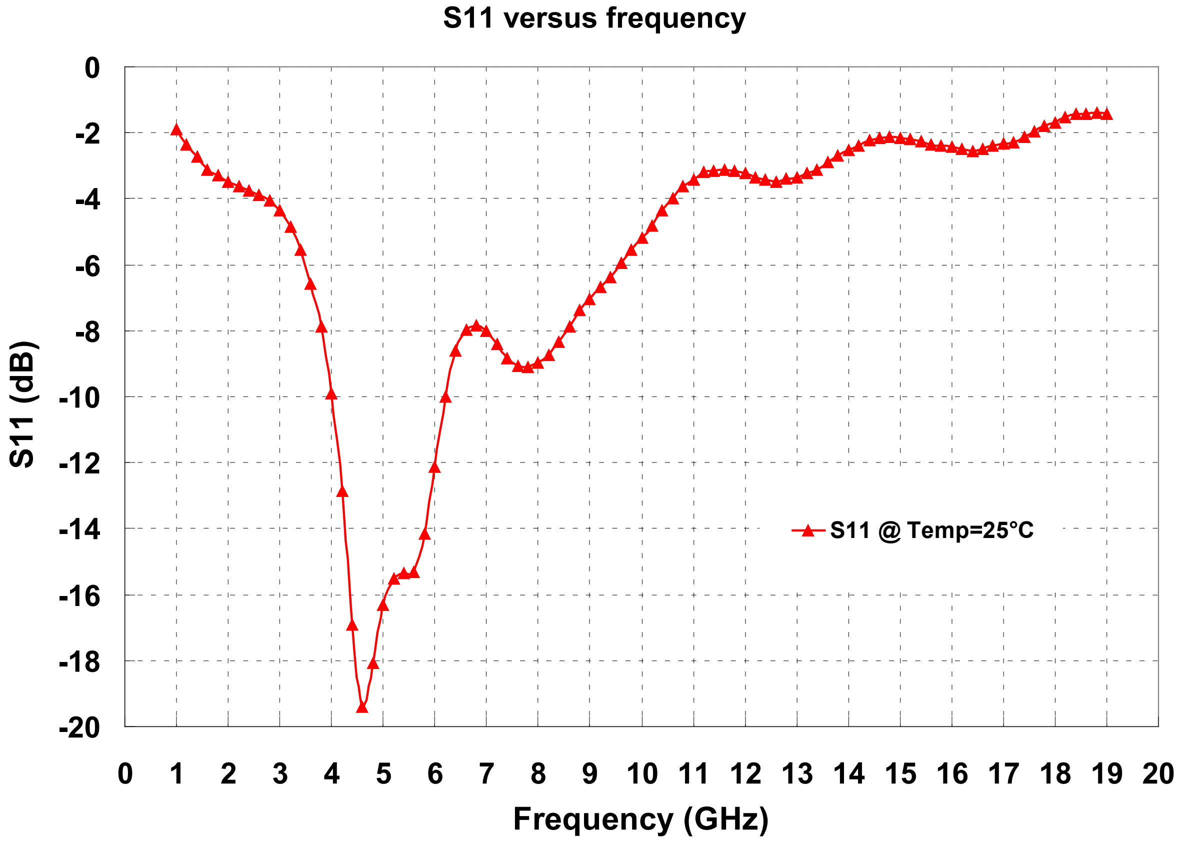
(1) Assuming 85°C on T_{case}.



Typical Board Measurements

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





Typical on board Measurements

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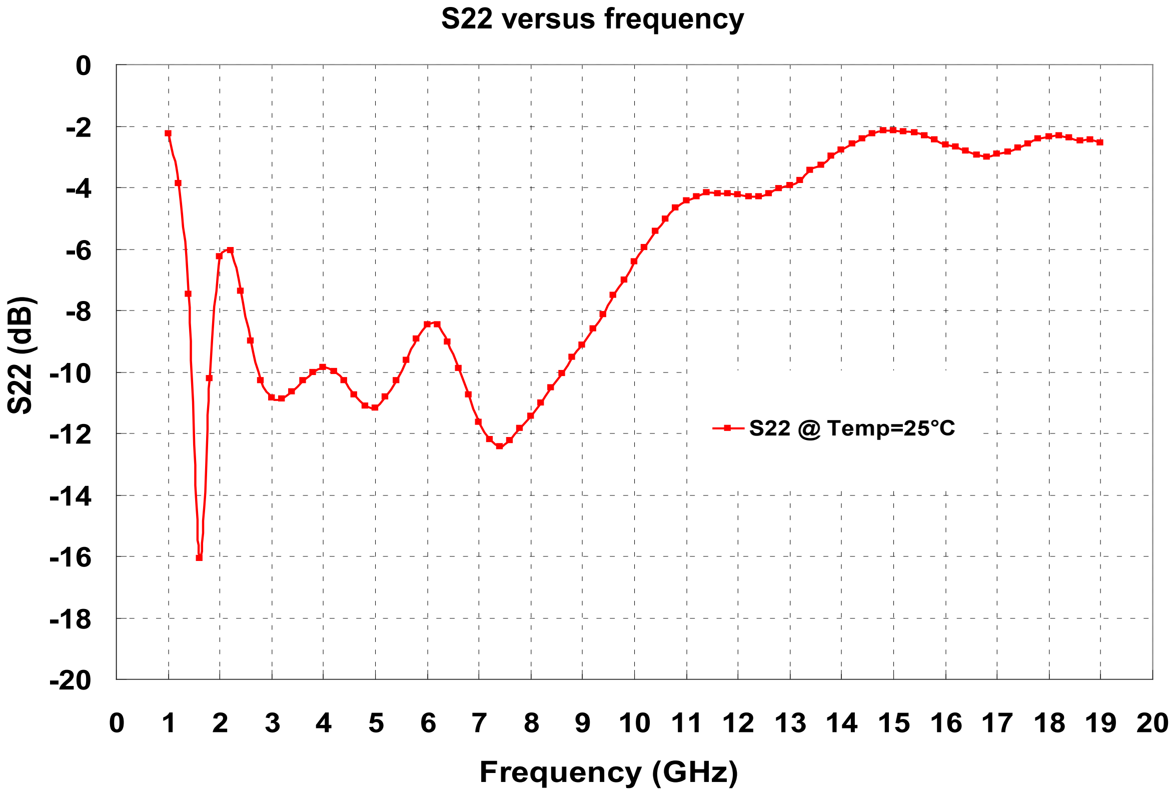

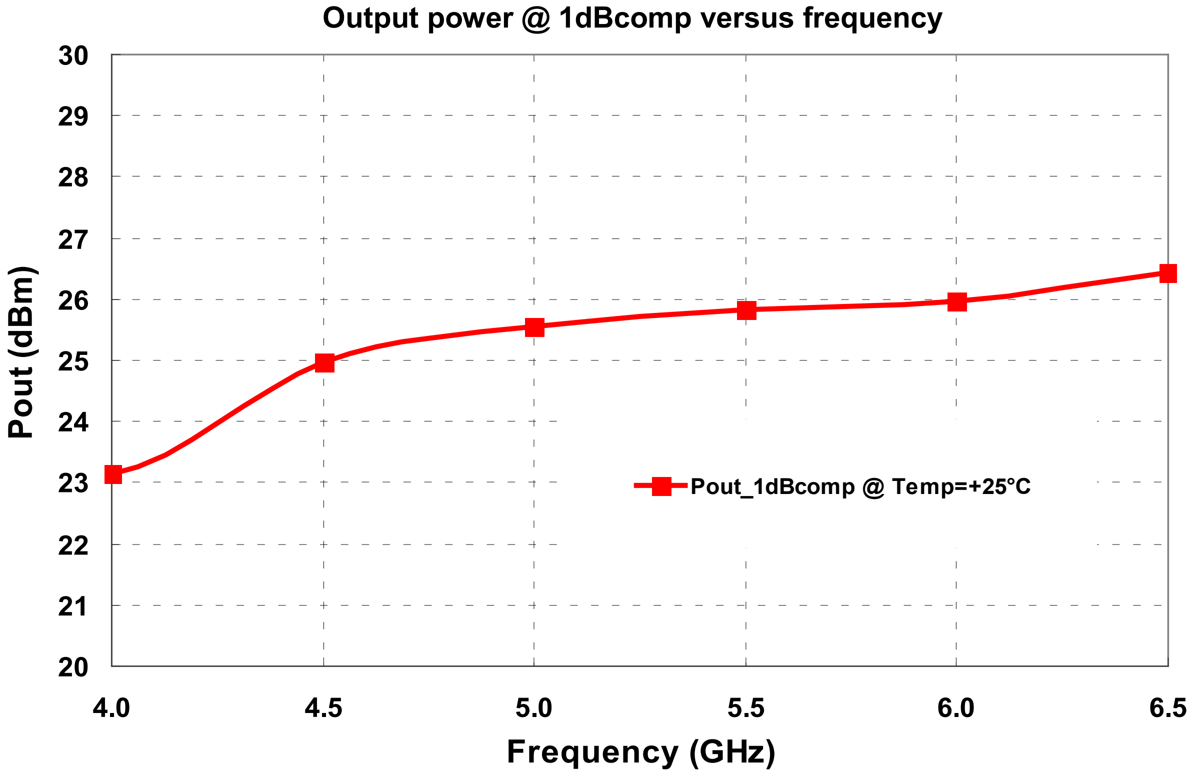

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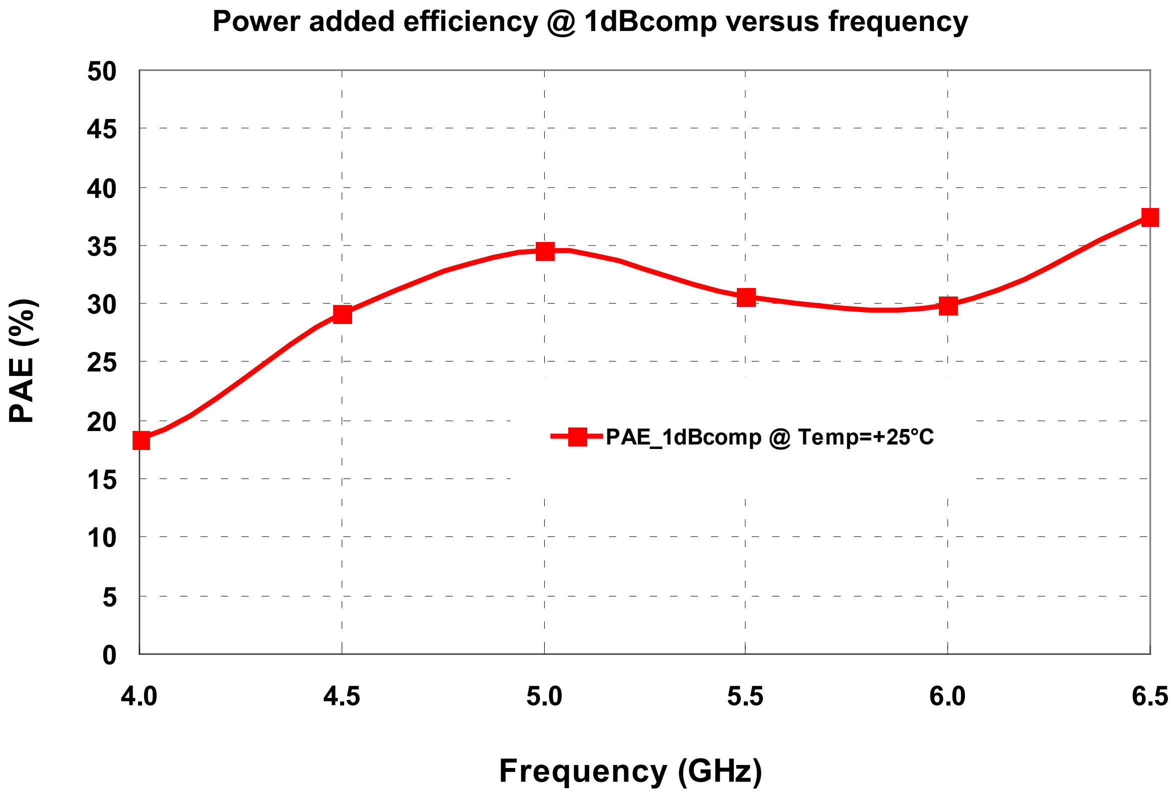

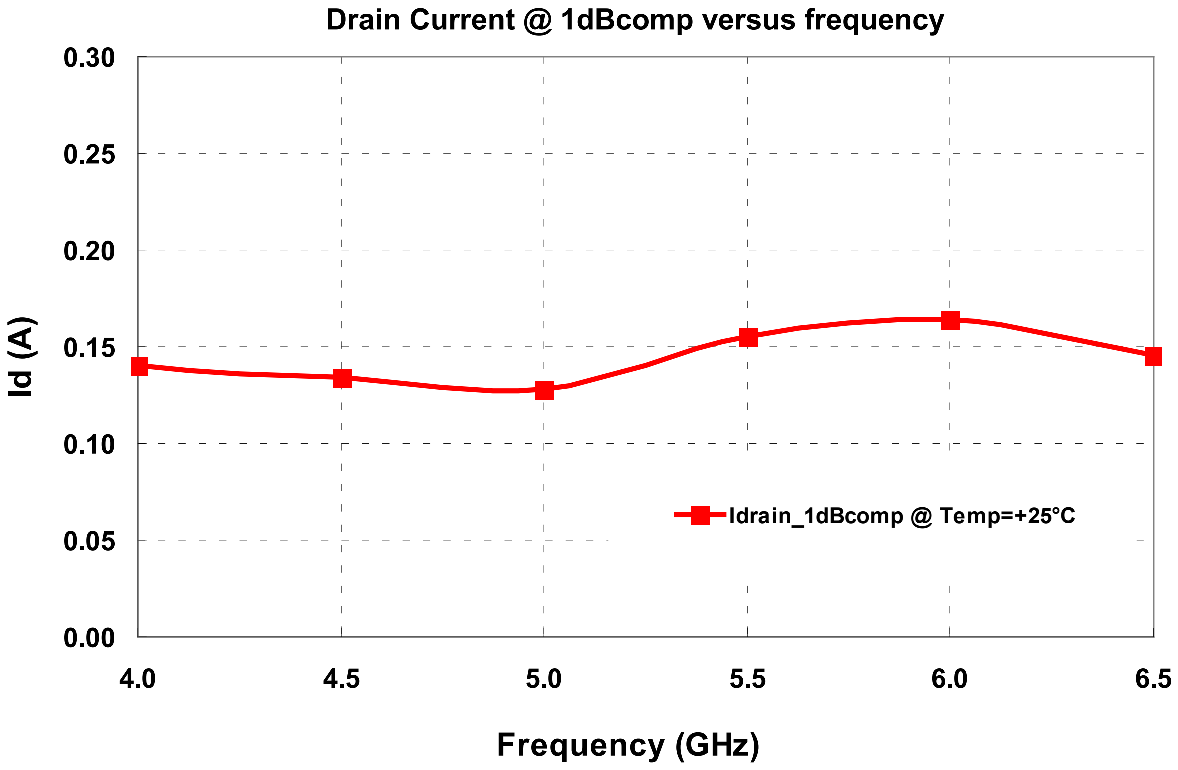

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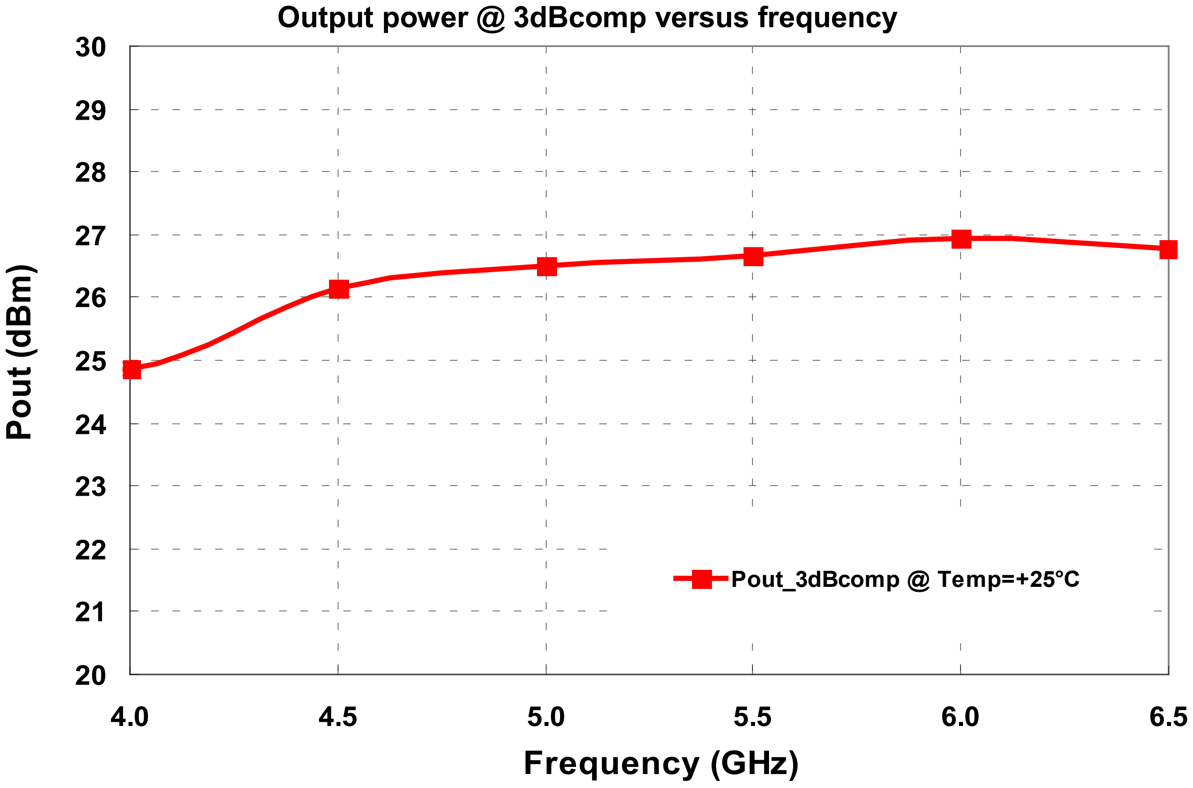

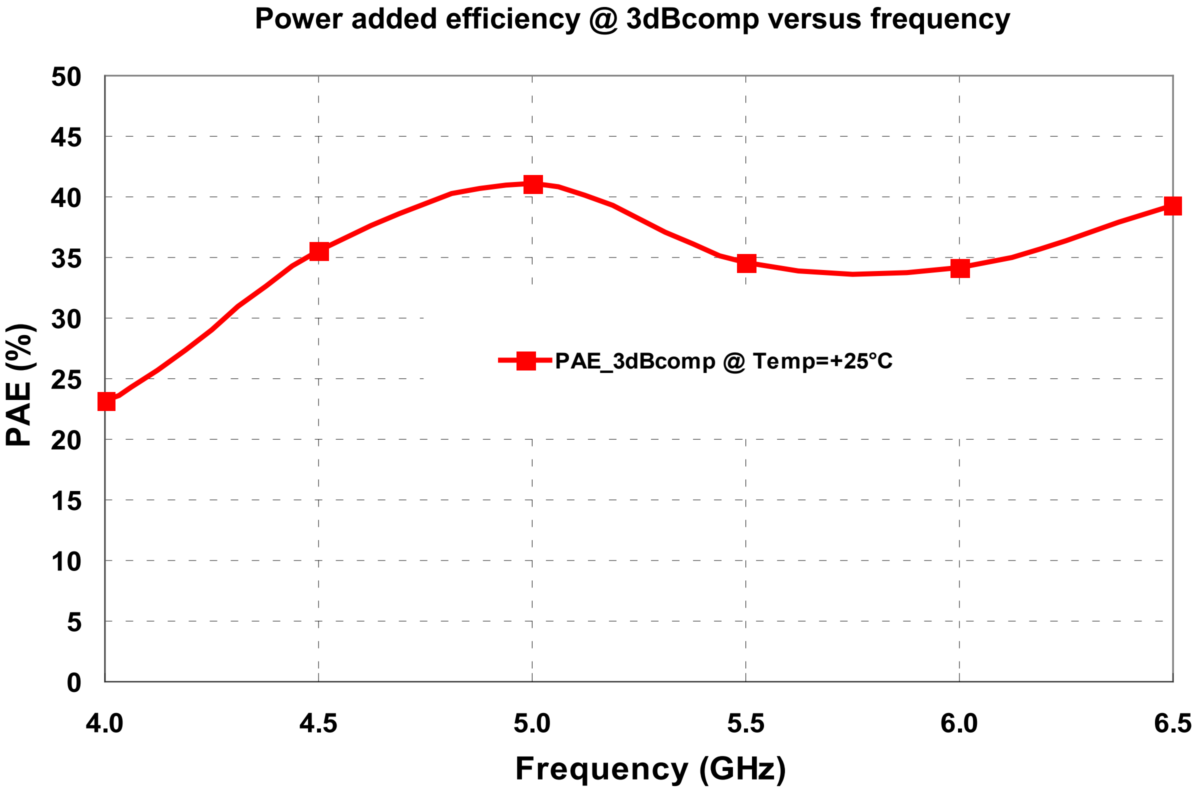

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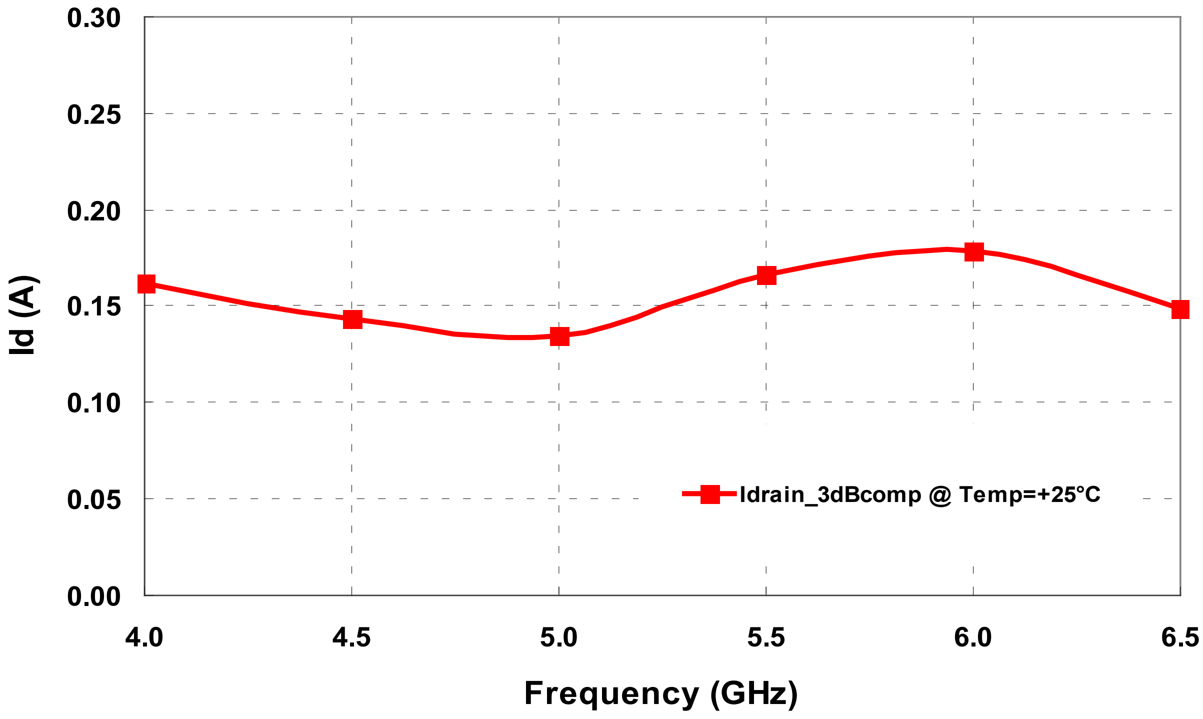
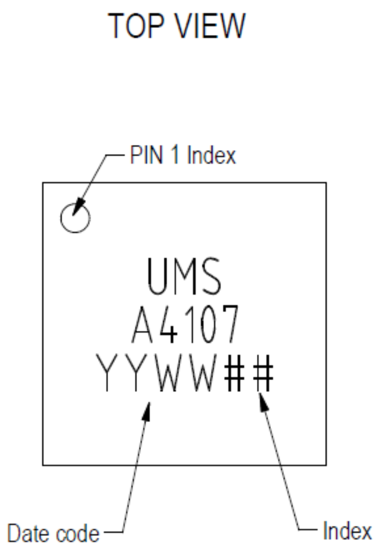
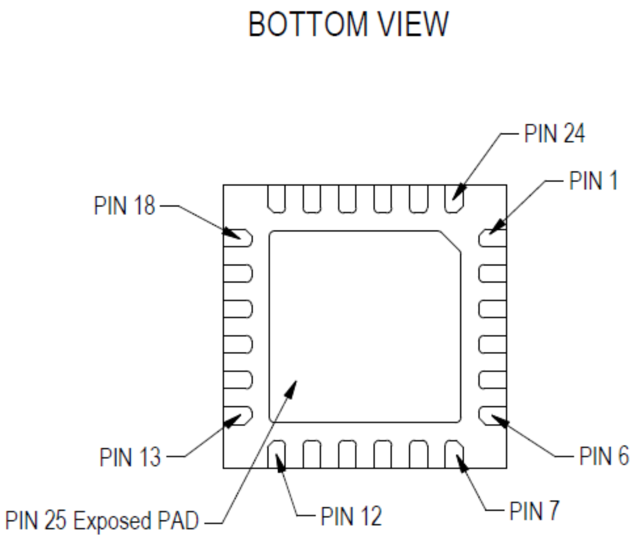
Drain Current @ 3dBcomp versus frequency



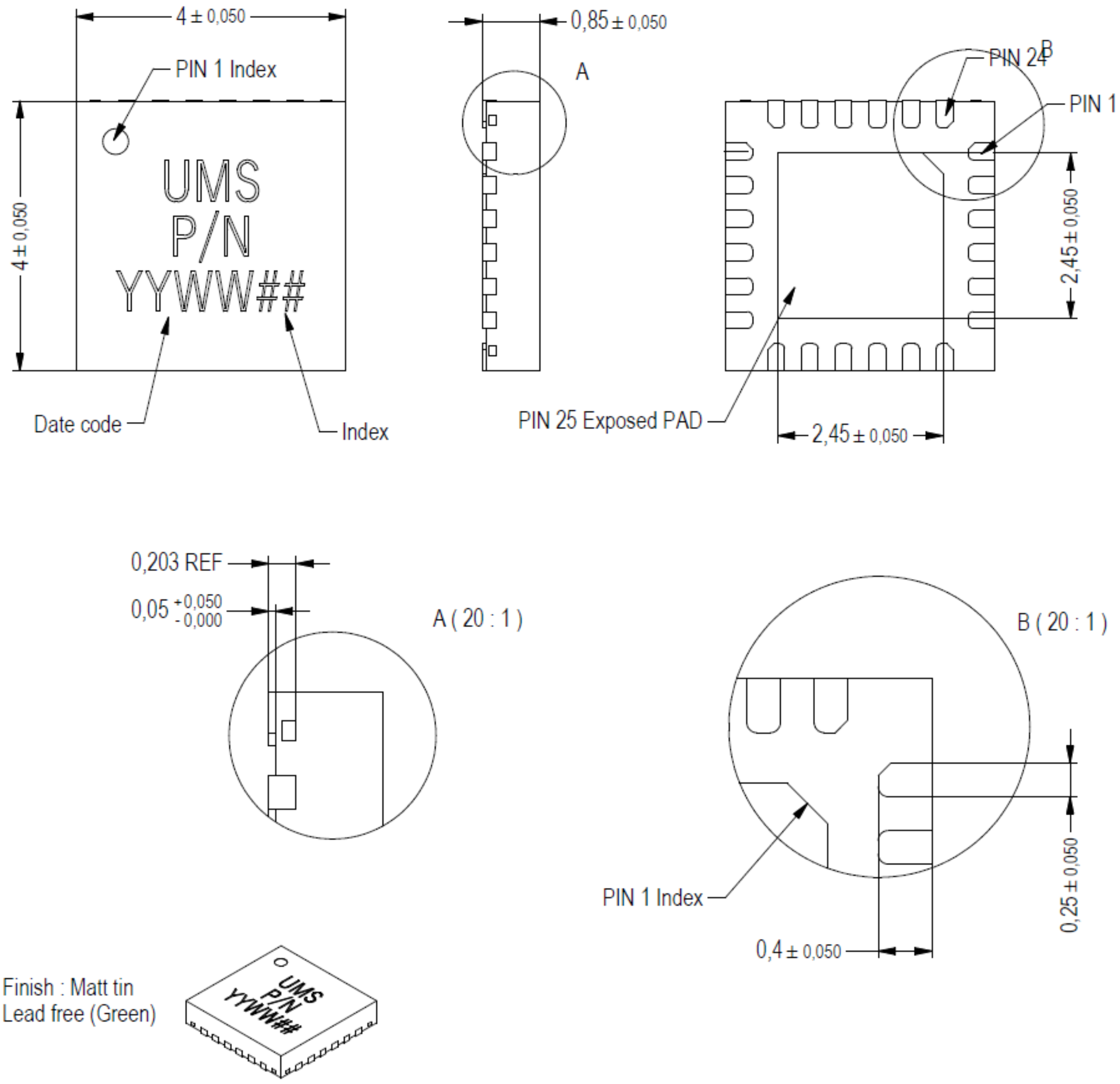
Package outline





	1- Nc	9- Nc	17- Gnd
	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

Package outline dimensions and tolerances



Finish : Matt tin
Lead free (Green)

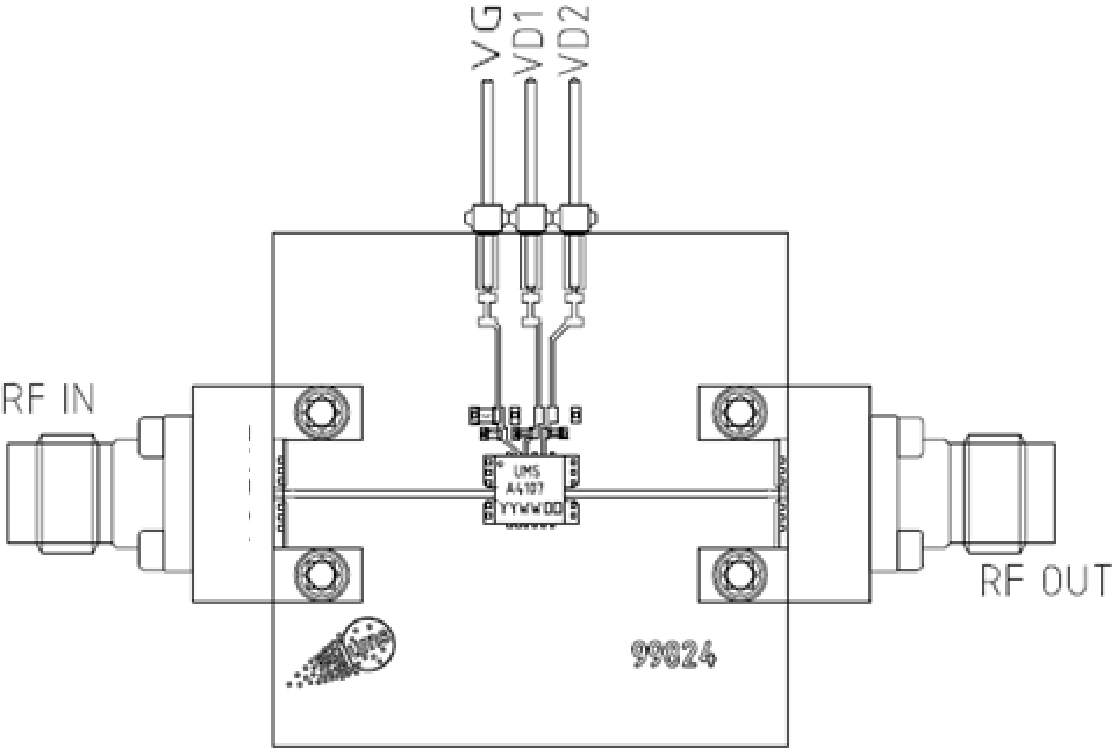
Package dimensions are provided in mm.

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

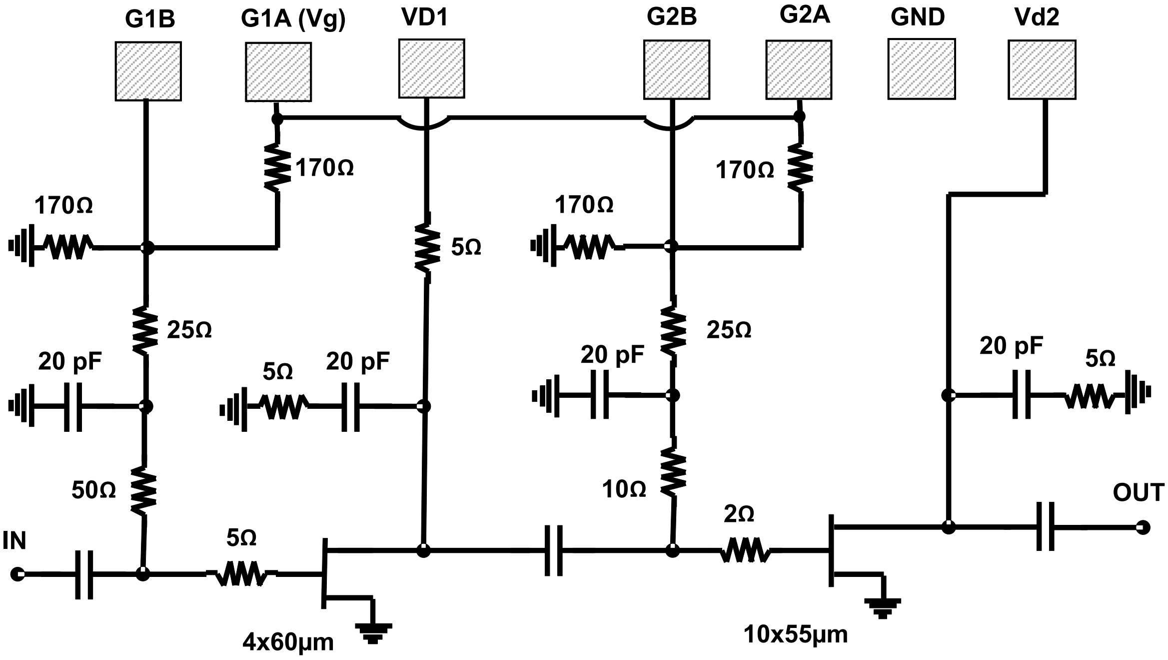
Evaluation board

- 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.



DC Schematic

Medium Power Amplifier: 8V, 120mA



Notes

Recommended package footprint

Refer to the application note AN0017 available at https://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.

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.

Ordering Information

QFN 4x4 package: CHA4107-QDG/XY
Stick: XY = 20 Tape & reel: XY = 21

Evaluation board: EDG-CHA4107-QDG