7-12GHz LNA

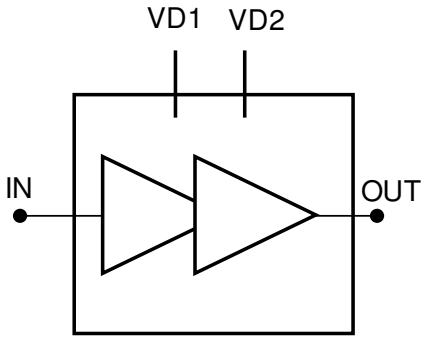
GaAs Monolithic Microwave IC

Description

The CHA2110-98F is a monolithic two-stages wide band low noise amplifier circuit. It is self-biased.
It is designed for military, space and telecommunication systems.

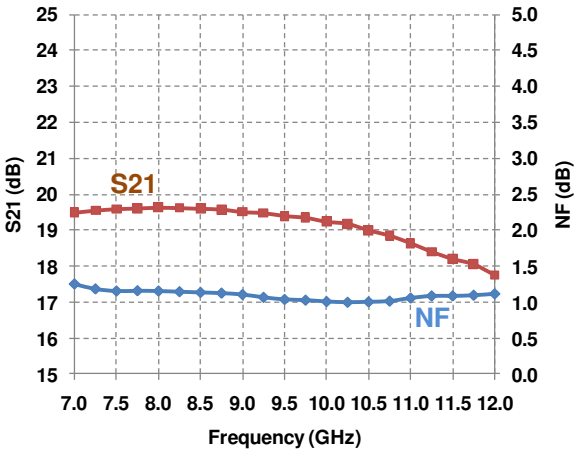
The circuit is manufactured with a pHEMT process, 0.25µm gate length, via holes through the substrate, and air bridges.

It is available in chip form.



Main Features

- Broadband performances: 7-12GHz
- Linear gain: 19dB
- Return Losses: 12dB
- Noise Figure: 1.2dB
- Output power @ 1dBcomp: 11dBm
- DC bias: Vd=4 Volt@Id=45mA
- Chip size 1.93x1.3x0.1mm



Gain and NF versus frequency

Main Electrical Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	7		12	GHz
Gain	Linear Gain		19		dB
NF	Noise Figure		1.2		dB
Pout	Output Power @1dB comp (f=10GHz)		11		dBm

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Electrical Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	7		12	GHz
Gain	Linear Gain		19		dB
NF	Noise Figure		1.2		dB
RL_in	Input return losses		-12		dB
RL_out	Output return losses		-12		dB
P1dB	Output power at 1dB comp (f=10GHz)		11		dBm
IP3	3rd order interception point (f=10GHz)		21		dB
Vd	Drain supply voltage (self biased)		4		V
Id	Drain supply current		45		mA

These values are representative of measurements on test fixture.

Absolute Maximum Ratings (1)

Tamb.= +25°C

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	5V	V
Id	Drain bias current	70	mA
Tj	Junction temperature	175	°C
Ta	Operating temperature range	-40 to +85	°C
Tstg	Storage temperature range	-55 to +150	°C

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

Typical Bias Conditions

Tamb.= +25°C

Symbol	Pad N°	Parameter	Values	Unit
Vd	VD1, VD2	Drain supply voltage	4	V

The circuit is self-biased.

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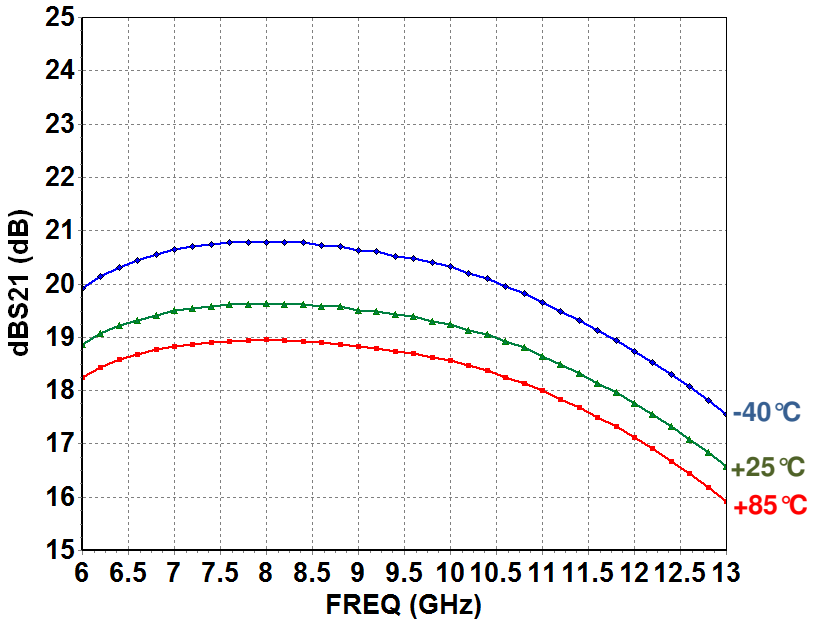
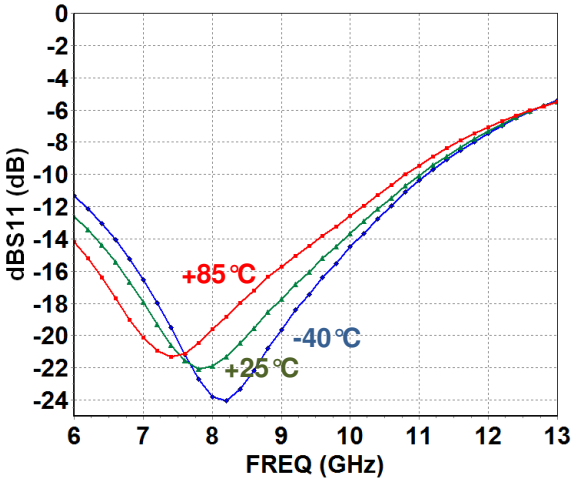
Test fixture Measurements

T=[-40°C ; +25°C ; +85°C], Vd = +4V, Id = 45mA

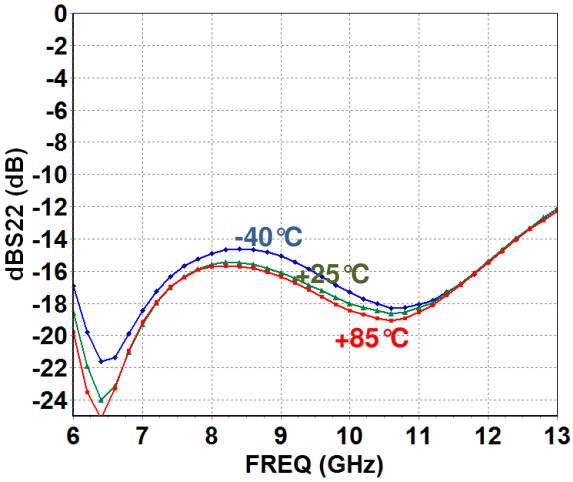
S21 versus frequency



Input return loss



Output Return loss



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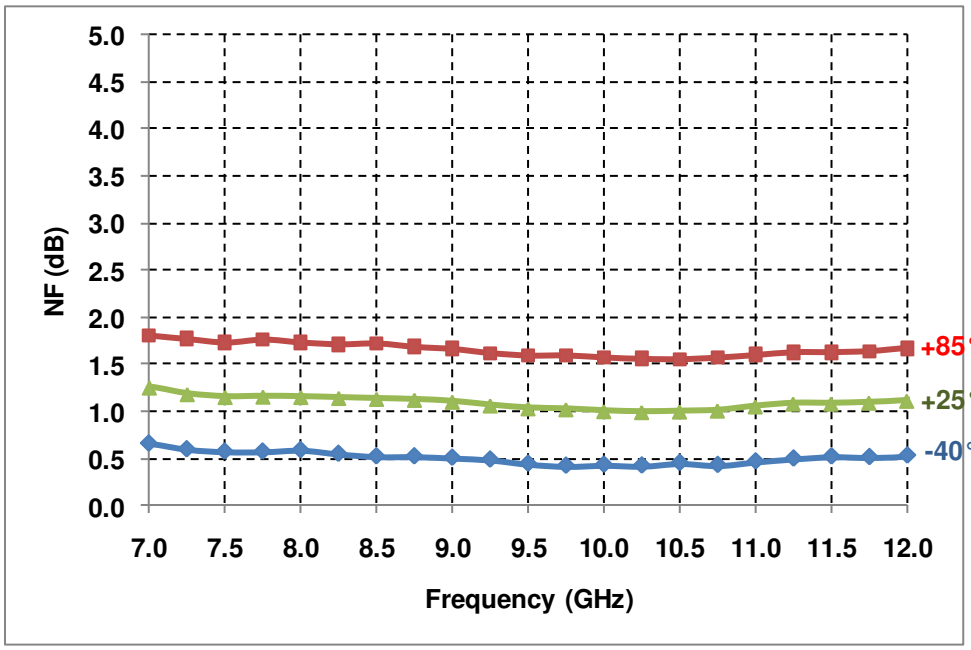
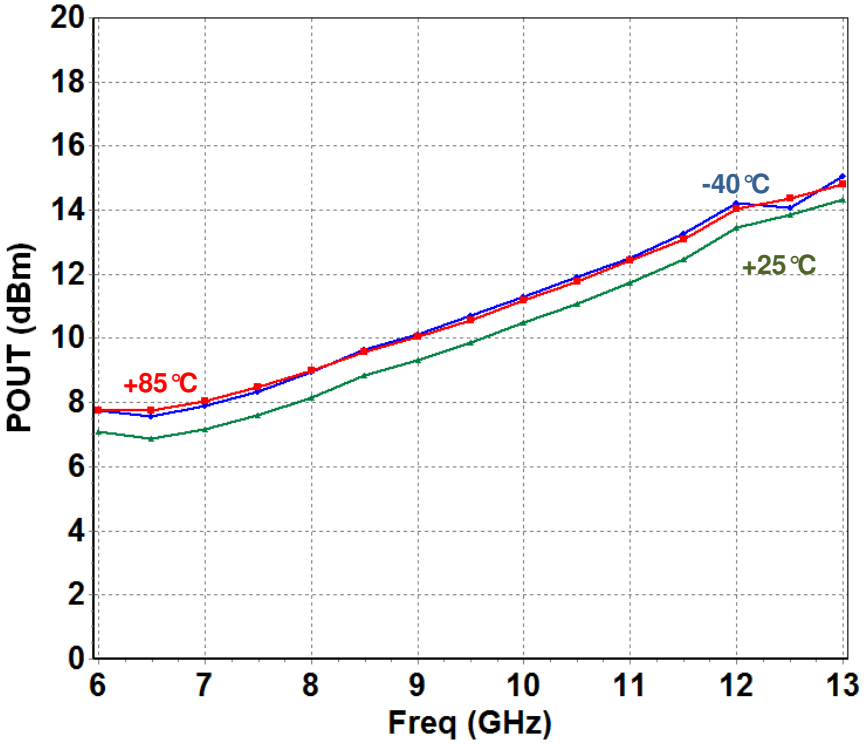
Test fixture Measurements

T=[-40°C ; +25°C ; +85°C], Vd = +4V, Id = 45mA

Noise Figure versus frequency



P1dB versus frequency



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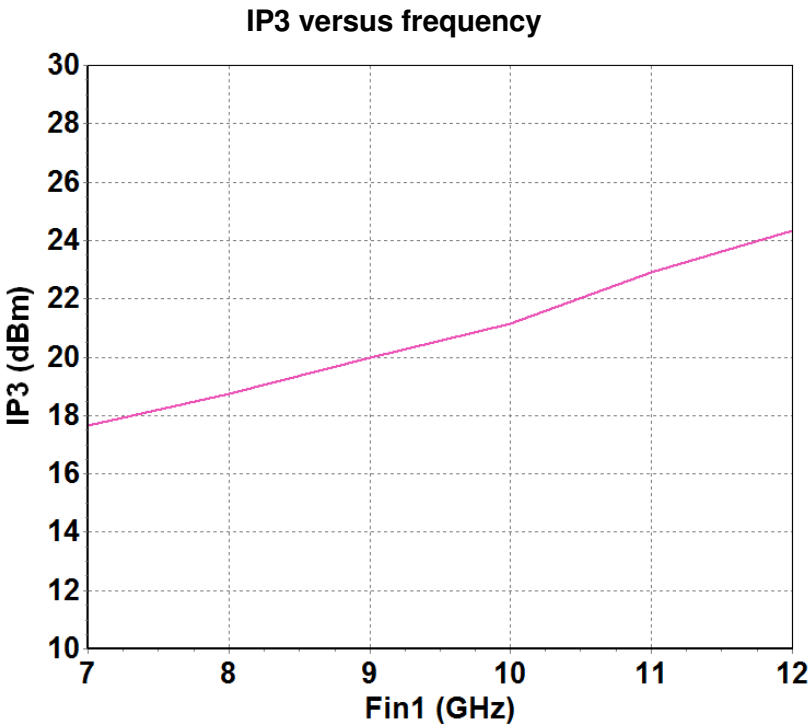
Test fixture Measurements

Tamb=+25°C, Vd = +4V, Id = 45mA



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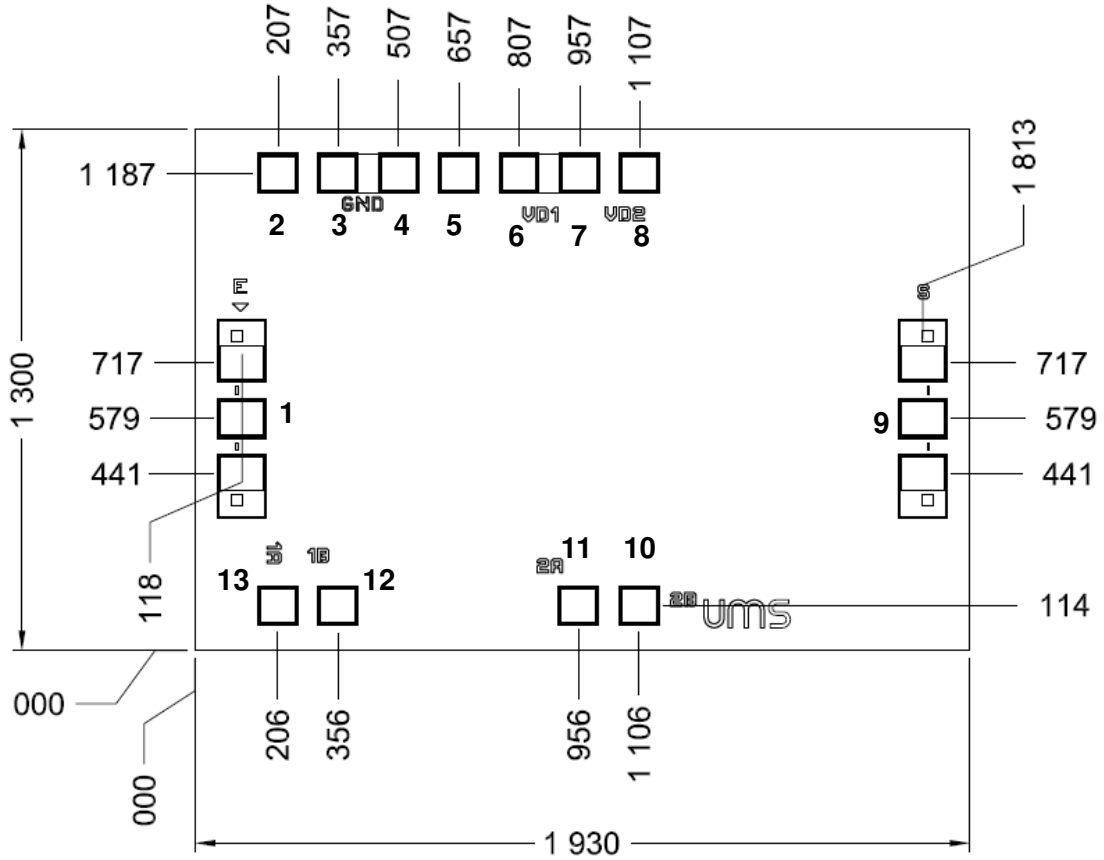
Mechanical data



Chip thickness: 100µm.
Chip size: 1300x1930 ±35µm
All dimensions are in micrometers

RF pads (1, 9) = 100x120µm²
DC pads (2,3,4,5,6,7,8,10,11,12,13) = 100x100µm²

Pin number	Pin name	Description
1	E	Input RF
2	none	NC
3, 4	GND	NC
5	none	NC
6, 7	VD1	Vd
8	VD2	Vd
9	S	Output RF
10	2B	NC
11	2A	NC
12	1B	NC
13	1A	NC

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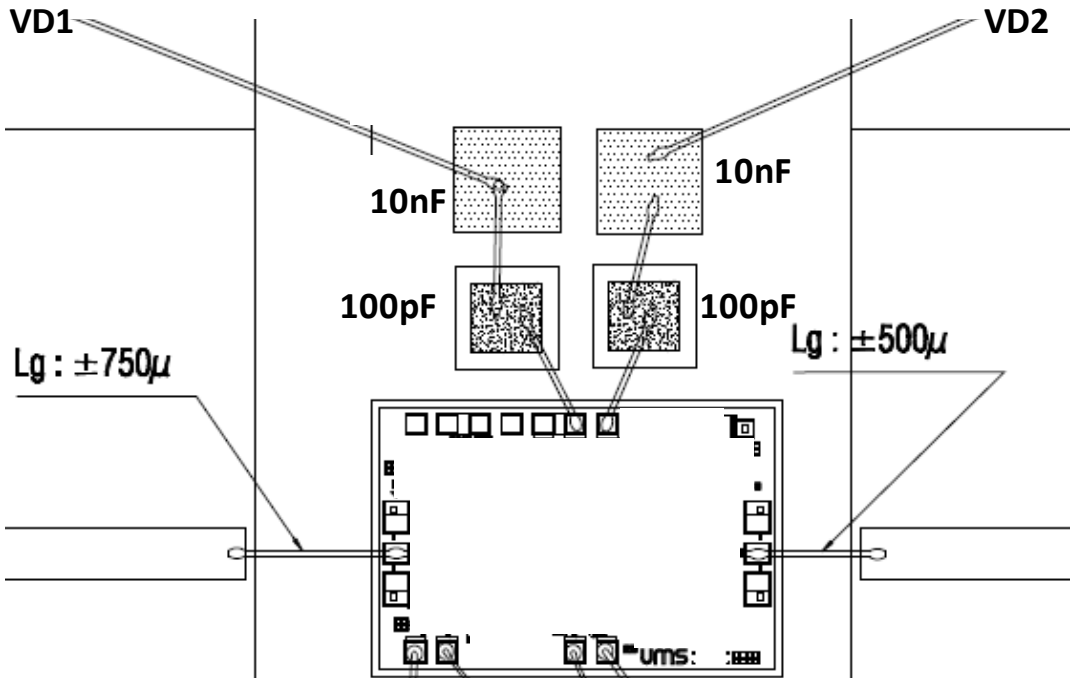
Recommended assembly plan



Note: Supply feed should be bypassed. 25µm diameter gold wire is to be preferred.

Recommended circuit bonding table

Label	Type	Decoupling	Comment
E	Input RF	N/A	Inductance (Lbonding≈750µm) = 0.6nH, 1 gold wire with diameter of 25µm
Vd1, Vd2	Vd	100pF & 10nF	Drain Supply Inductance ≤ 1nH
S	Output RF	N/A	Inductance (Lbonding≈500µm) = 0.4nH, 1 gold wire with diameter of 25µm

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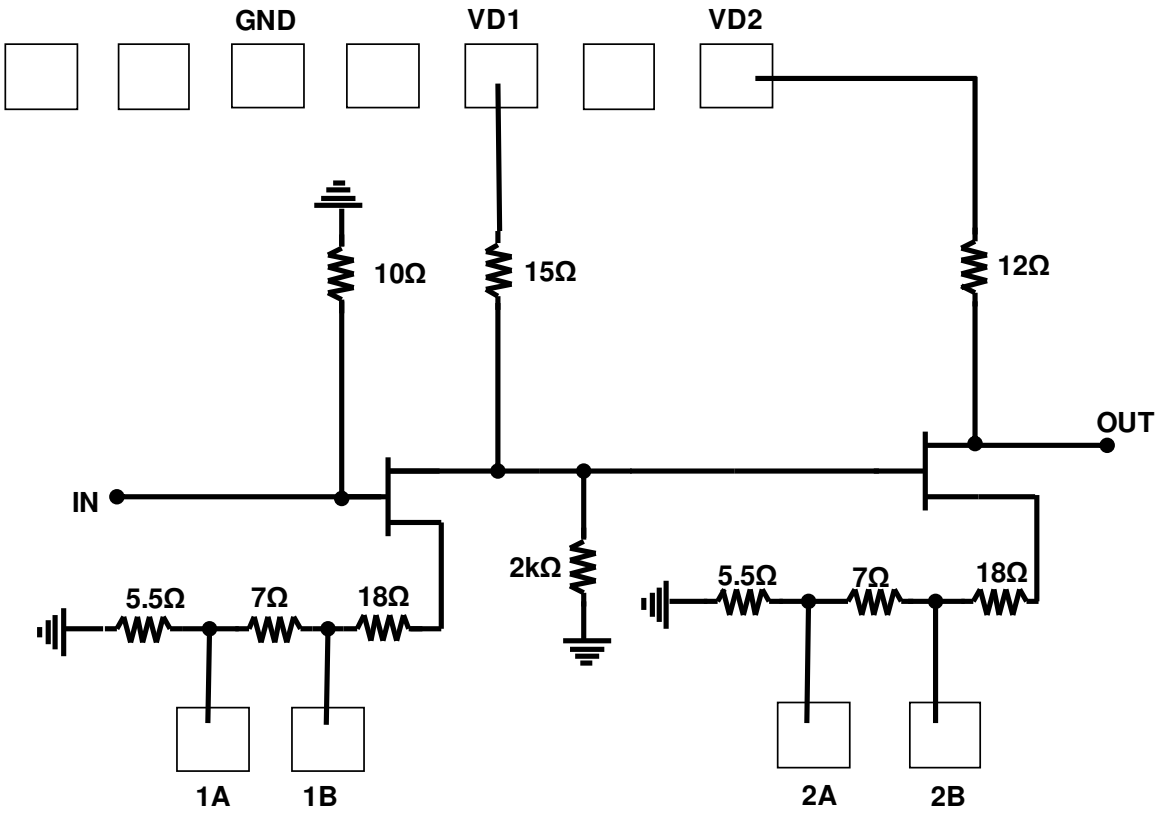
Chip biasing options

This chip is self-biased, and flexibility is provided by the access to number of pads. The internal DC electrical schematic is given in order to use these pads in a safe way.



The requirement is :
Not to exceed Vds = 3.5Volt (internal Drain to Source voltage).

We propose three standard biasing :

Low Noise and low consumption:	Vd = 4V. The pads 1A, 1B, 2A and 2B are non-connected (NC). Idd = 45mA & Pout-1dB = +11dBm Typical (f=10GHz).
Low Noise and higher gain:	Vd = 4V and 1A or 1B grounded. All the other pads non connected (NC). Idd = 55mA & Pout-1dB = +11dBm Typical (f=10GHz)
Low Noise and higher output power:	Vd = 4V and 2A or 2B grounded. All the other pads non connected (NC). Idd = 55mA & Pout-1dB = +13dBm Typical (f=10GHz)

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Note

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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:	CHA2110-98F/00

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