

7-11GHz Low Noise Amplifier

GaAs Monolithic Microwave IC

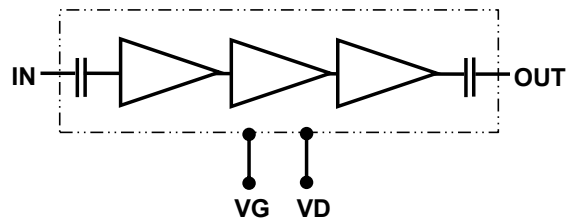
Description

The CHA1010-99F is a monolithic three-stage wide-band low noise amplifier.

It is designed for a wide range of applications, from military to commercial communication systems.

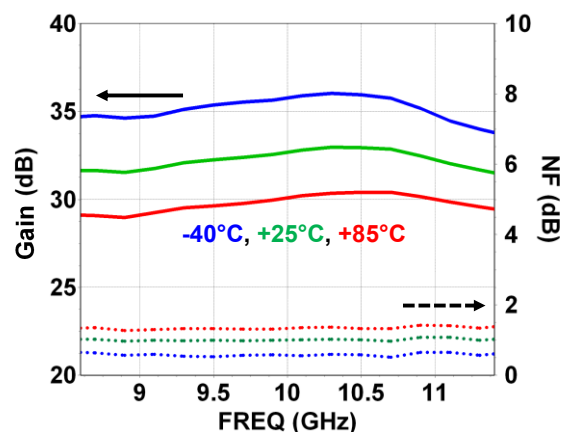
The circuit is manufactured with a pHEMT process, via holes through the substrate, air bridges and electron beam gate lithography.

It is available in chip form.



Main Features

- Broadband performance: 7-11GHz
- 1dB Noise Figure
- 32dB Linear Gain
- +5.5dBm Pout at 1dB gain compression
- DC bias: Vd=5Volt, Id=30mA
- Chip size 2.57x1.79x0.1mm



Main Electrical Characteristics

Tamb= +25°C. Vd = +5.0V

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	7		11	GHz
Gain	Linear Gain		32		dB
NF	Noise Figure		1.0		dB
Pout	Output Power @1dB compression		5.5		dBm

Electrical Characteristics

Tamb= +25°C. Vd = +5.0V

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	7.0		11.0	GHz
Gain	Linear Gain		32		dB
ΔG	Gain Flatness		1.1		dBpp
-	Linear Gain Variation over Temperature		0.06		dB/°C
NF	Noise Figure		1.0		dB
S11	Input Return Loss		-15		dB
S22	Output Return Loss		-15		dB
OP1dB	Output power at 1dB gain compression		5.5		dBm
IP1dB	Input power at 1dB gain compression		-24.5		dBm
Id	Drain Bias Current		30		mA
Vg	Gate Bias Voltage		-0.5		V
Rth_eq ⁽¹⁾	Chip's equivalent thermal resistance at +85°C		73		°C/W

These values are representative of on-test-fixture measurements that are made with bonding wires of typically 0.5nH at both RF accesses.

⁽¹⁾ Under linear regime

Absolute Maximum Ratings ⁽¹⁾

Tamb= +25°C

Symbol	Parameter	Values	Unit
Vd	Drain bias voltage	6.5V	V
Id	Drain bias current	120	mA
Vg	Gate bias voltage	-1.5 to +0.4	V
Ta	Operating temperature range	-40 to +85	°C
Tj	Operating temperature range	175	°C
Tstg	Storage temperature range	-55 to +150	°C
Pin	Maximum peak input power overdrive	-19	dBm

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

Typical Bias Conditions

Tamb= +25°C

Symbol	Pad N°	Parameter	Values	Unit
Vd	5	Drain Supply Voltage	5	V
Vg	2	Gate Supply Voltage	-0.5	V

Typical on-wafer Sij parameters

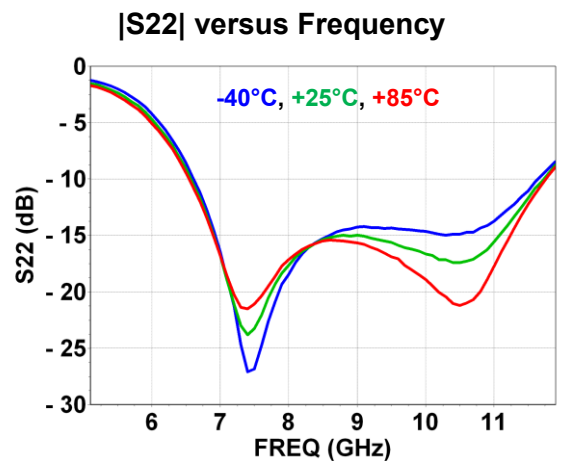
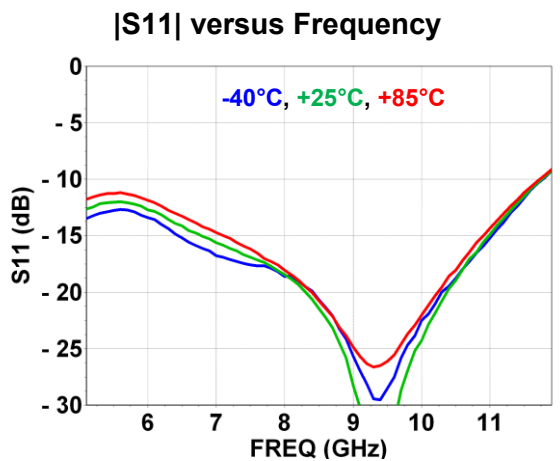
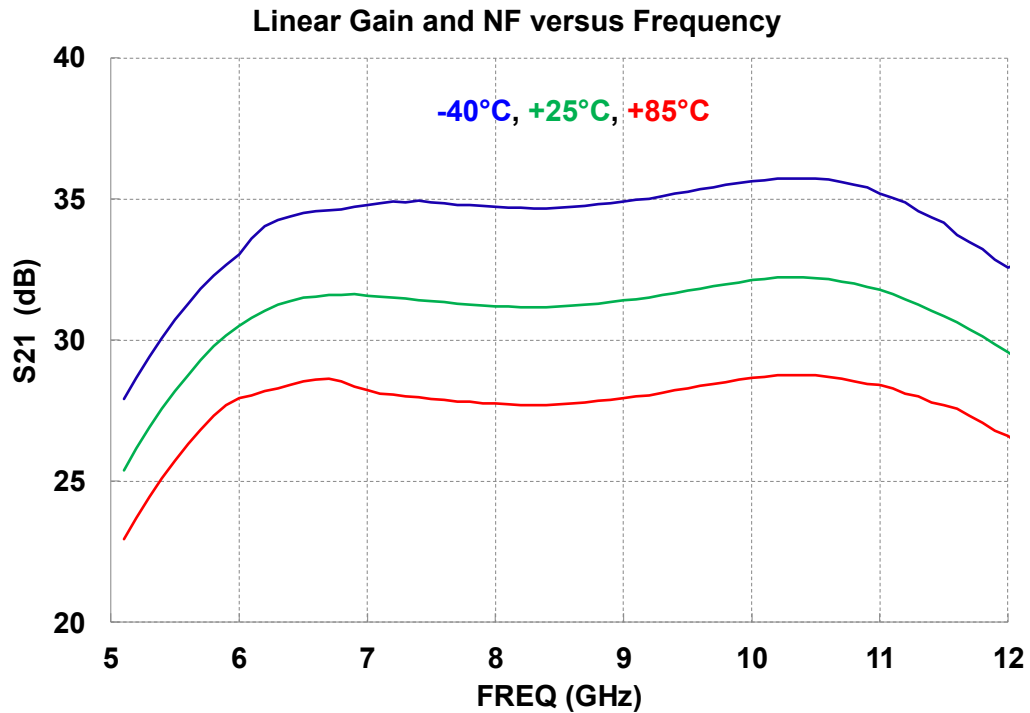
Tamb.= +25°C. Vd = +5.0V. Id = 30mA

Freq (GHz)	S11 (dB)	PhS11 (°)	S12 (dB)	PhS12 (°)	S21 (dB)	PhS21 (°)	S22 (dB)	PhS22 (°)
5.1	-10.80	-58.03	-61.90	54.37	24.94	-48.37	-0.85	-84.29
5.3	-10.27	-62.00	-72.70	-54.03	26.61	-68.12	-1.14	-89.70
5.5	-9.92	-67.59	-63.66	-4.19	27.86	-89.08	-1.54	-95.11
5.7	-9.92	-72.93	-61.58	18.47	28.84	-108.21	-2.04	-100.62
5.9	-9.66	-78.21	-65.24	12.09	29.63	-127.13	-2.79	-106.09
6.1	-9.85	-83.47	-65.51	39.48	30.27	-146.21	-3.62	-111.60
6.3	-10.13	-87.45	-59.20	-31.56	30.74	-165.09	-4.63	-116.21
6.5	-10.16	-90.49	-58.73	-35.20	31.05	177.63	-5.85	-119.81
6.7	-10.34	-93.78	-55.59	-13.19	31.21	160.10	-7.33	-121.26
6.9	-10.20	-97.39	-67.30	-50.15	31.43	143.99	-9.09	-119.57
7.1	-10.26	-101.77	-59.68	-65.41	31.36	128.38	-10.70	-114.95
7.3	-10.31	-105.80	-63.66	-31.66	31.33	113.37	-11.65	-105.90
7.5	-10.67	-109.76	-51.48	-88.44	31.30	99.60	-12.00	-96.04
7.7	-11.10	-113.74	-55.72	-86.69	31.09	85.75	-11.31	-88.97
7.9	-11.45	-117.43	-50.32	-103.79	31.05	73.30	-10.80	-84.16
8.1	-12.39	-121.38	-57.82	-122.16	30.90	60.95	-10.24	-83.85
8.3	-12.93	-125.60	-52.25	-141.54	30.83	49.35	-10.00	-83.94
8.5	-14.12	-127.28	-54.97	-136.25	30.75	38.01	-9.82	-85.55
8.7	-15.21	-127.93	-60.31	129.45	30.72	26.83	-9.76	-86.61
8.9	-16.29	-122.59	-50.91	-162.43	30.73	15.95	-9.60	-87.82
9.1	-17.91	-114.34	-53.37	-150.22	30.75	4.99	-9.64	-88.31
9.3	-18.81	-103.08	-48.96	-179.11	30.78	-5.88	-10.08	-87.75
9.5	-18.81	-85.05	-50.20	173.25	30.89	-16.93	-10.32	-86.63
9.7	-17.16	-69.65	-49.64	159.17	31.02	-28.25	-10.63	-83.94
9.9	-15.03	-62.94	-48.28	167.83	31.08	-39.79	-10.65	-80.45
10.1	-12.71	-58.78	-48.71	149.39	31.06	-51.58	-10.40	-76.19
10.3	-10.88	-58.57	-46.41	147.72	31.03	-63.64	-9.77	-71.78
10.5	-9.10	-63.80	-47.99	138.17	31.01	-75.79	-8.84	-68.03
10.7	-7.75	-69.54	-46.49	111.34	30.80	-88.79	-7.82	-68.69
10.9	-6.71	-75.16	-46.79	112.74	30.71	-101.44	-6.61	-70.32
11.1	-5.87	-81.57	-44.51	97.71	30.38	-113.83	-5.56	-74.27
11.3	-5.17	-88.93	-46.65	89.09	29.98	-126.08	-4.75	-79.34
11.5	-4.72	-95.15	-45.18	67.63	29.53	-138.05	-4.02	-85.08
11.7	-4.30	-101.65	-45.33	77.90	28.96	-149.65	-3.47	-90.47
11.9	-4.13	-107.78	-49.59	61.27	28.36	-160.85	-3.15	-96.41
12.1	-4.01	-113.39	-47.68	41.15	27.72	-171.46	-2.94	-103.14
12.3	-3.91	-118.52	-47.05	28.46	27.11	178.57	-2.68	-109.32
12.5	-3.87	-123.53	-47.04	24.79	26.44	168.70	-2.50	-115.44
12.7	-3.90	-127.82	-48.55	17.93	25.72	159.59	-2.48	-120.71

Typical Wide-Band Test Fixture Measurements

Temperature= -40°C, +25°C, +85°C

Vd = +5.0V, Id = 30mA, Vg ~ -0.5V

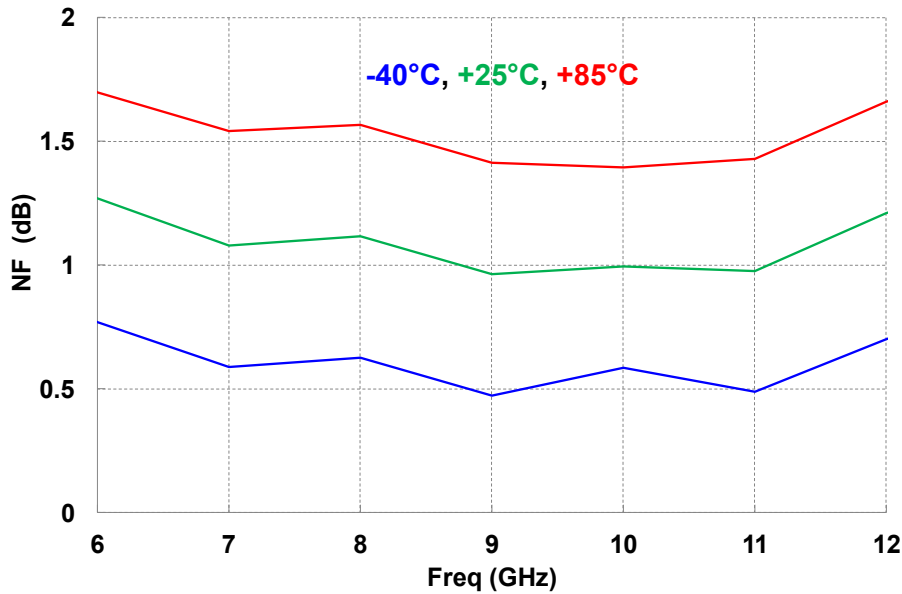


Typical Test Fixture Measurements

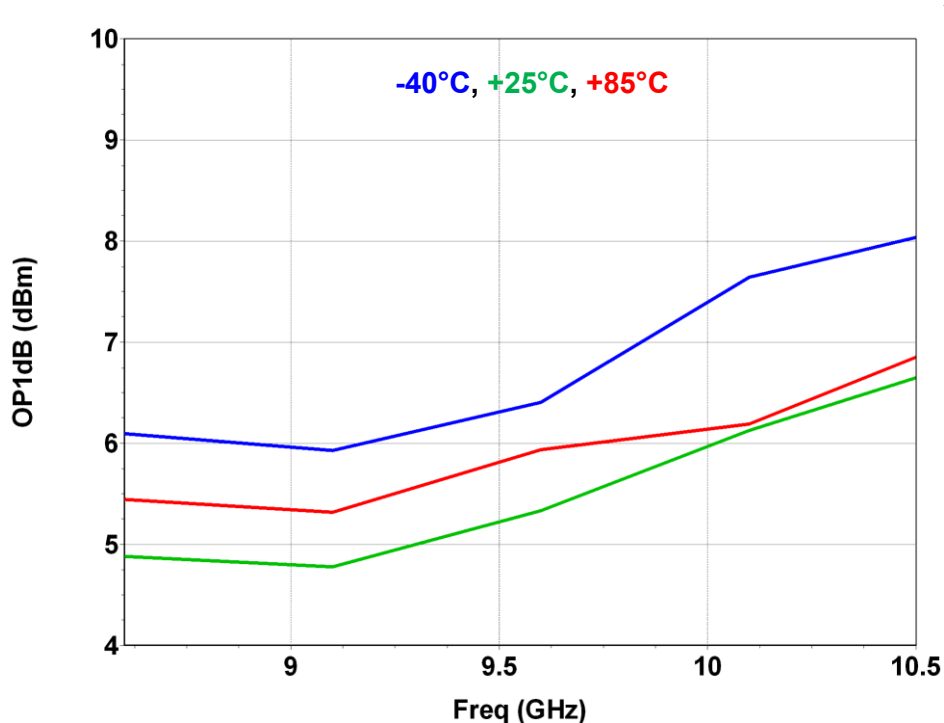
Temperature= -40°C, +25°C, +85°C

Vd = +5.0V, Id =30mA, Vg ~ -0.5V

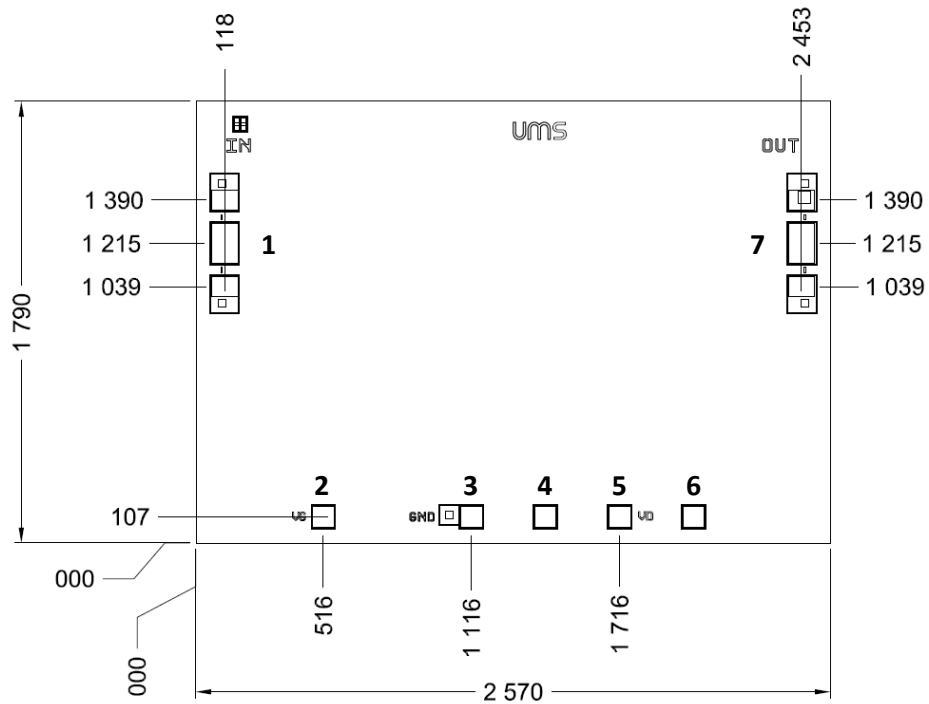
Noise Figure versus Frequency



Output 1dB Compression Point versus Frequency



Mechanical data

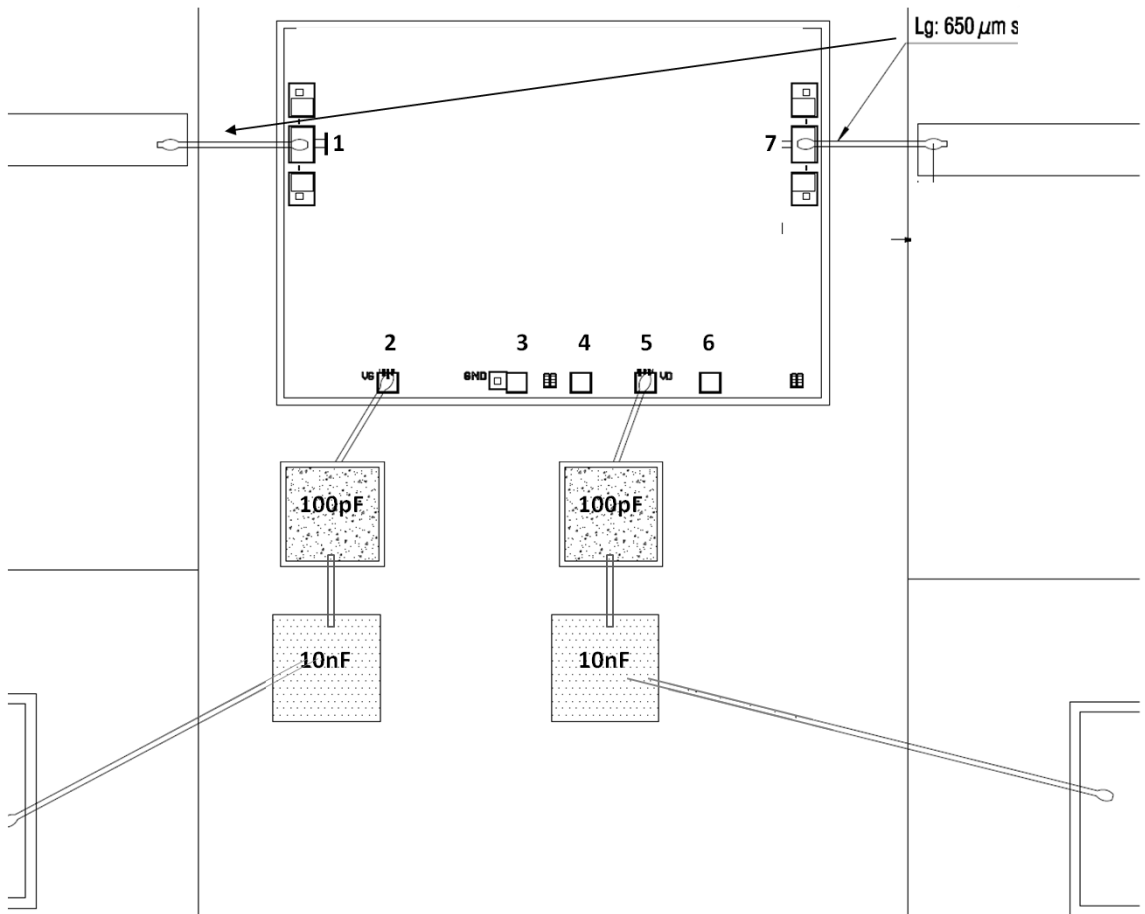


Units: μm
 Tol: $\pm 35 \mu\text{m}$
 Chip thickness: $100\mu\text{m}$.
 Chip size: $2570 \times 1790 \pm 35\mu\text{m}$
 All dimensions are in micrometers

RF pad (1,7) size= $100 \times 200\mu\text{m}^2$
 DC pad (2,3,4,5,6) size= $100 \times 100\mu\text{m}^2$

Pad number	Pad name	Description
1	IN	Input RF
2	VG	Gate Supply Voltage
3	GND	NC
4, 6	none	NC
5	VD	Drain Supply Voltage
7	OUT	Output RF

Recommended assembly plan



Note: 25μm-diameter gold wire and 25μm-wedge bonding are preferred.

Recommended circuit bonding table

Label	Type	Decoupling	Comment
VD	Vd	100pF & 10nF	Drain Supply
VG	Vg	100pF & 10nF	Gate Supply
IN	Input RF	N/A	Inductance~0.5nH (one golden bonding wire with 650μm length and 25μm diameter)
OUT	Output RF	N/A	Inductance~0.5nH (one golden bonding wire with 650μm length and 25μm diameter)

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:

CHA1010-99F/00

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