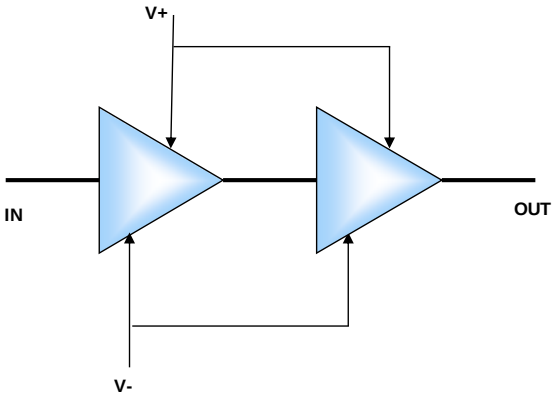
2-4GHz Driver

GaAs Monolithic Microwave IC

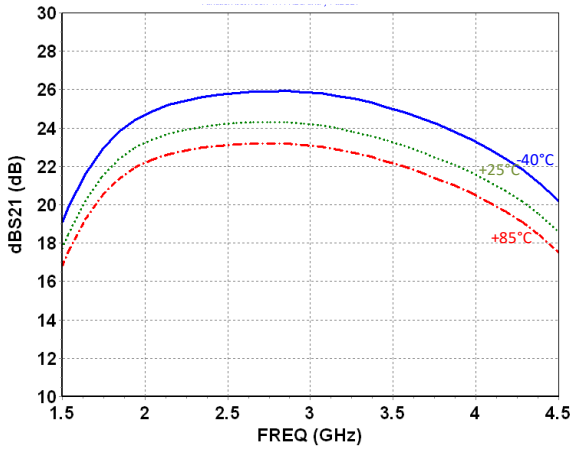
Description

The CHA4105-99F is a monolithic two-stage driver amplifier delivering 24dBm output power @ 1dB gain compression in the 2-4GHz frequency range.
It is designed for a wide range of applications, from military to commercial communication systems.
The circuit is manufactured with a pHEMT process, 0.25µm gate length, via holes through the substrate, air bridges and electron beam gate lithography.
It is available in chip form.



Main Features

- Broadband performances: 2-4GHz
- 24dBm @ 1dB gain compression
- 23dB Gain
- DC bias: V+ = 5V ; V- = -5V
- DC power consumption: 180mA
- Chip size: 1.74 x 1.6 x 0.1 mm



Main Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	2		4	GHz
Gain	Linear Gain		23		dB
P_1dB	Output Power @1dB comp.		24		dBm

ESD Protections: Electrostatic discharge sensitive device. Observe handling precautions!

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Main Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
Freq	Frequency range	2		4	GHz
Gain	Linear Gain		23		dB
RL_in	Input Return Loss		15		dB
RL_out	Output Return Loss		18		dB
P_1dB	Output power @ 1dB gain compression		24		dBm
PAE_1dB	Power Added Efficiency @ 1dBcomp.		28		%
Psat	Output power at saturation		25.5		dBm
V+	Positive supply voltage		5		V
V-	Negative supply voltage		-5		V
I+	Positive supply quiescent current (1)		180		mA
I-	Negative supply quiescent current		5		mA
I+_1dB	Positive current @ 1dB gain compression		220		mA

These values are representative of onboard measurements as defined on the drawing in paragraph "Evaluation mother board".

(1) Parameter can be adjusted by tuning of V-.

Absolute Maximum Ratings (1)

Tamb.= +25°C

Symbol	Parameter	Values	Unit
V+	Positive supply voltage	6.5V	V
I+	Positive supply quiescent current	240	mA
V-	Negative supply voltage	-3.75	V
Tj	Junction temperature (2)	175	°C
Cmp	Compression level	6	dB
I+_sat	Supply current in saturation	320	mA
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) Thermal Resistance channel to ground paddle = 89°C/W for T= +85°C.

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Typical on-wafer Sij parameters

Tamb.= +25°C, V+ = +8V, I+ = 180mA

Freq (GHz)	S11 (dB)	PhS11 (°)	S12 (dB)	PhS12 (°)	S21 (dB)	PhS21 (°)	S22 (dB)	PhS22 (°)
0.10	-0.36	-6.99	-69.84	178.30	-33.96	-95.60	-0.58	-15.89
0.50	-1.29	-27.40	-39.33	-1.72	-11.29	117.70	-1.96	-72.56
1.00	-1.94	-61.11	-39.27	-124.00	-1.79	146.90	-6.02	-141.70
1.50	-8.45	-129.10	-40.31	125.30	17.67	68.32	-14.87	154.80
2.00	-19.45	-9.13	-42.17	33.05	22.70	-40.78	-39.04	-50.42
2.50	-16.35	-40.67	-42.04	-40.67	23.65	-119.90	-20.64	-64.11
3.00	-27.33	-65.04	-41.93	-107.90	23.97	167.90	-19.19	-97.03
3.50	-18.68	37.43	-42.83	-173.80	23.21	98.09	-24.13	-50.70
4.00	-19.87	-55.35	-44.60	126.30	21.53	30.41	-14.51	-33.10
4.50	-9.94	160.10	-46.99	66.06	18.51	-37.00	-9.41	-46.44
5.00	-4.07	106.30	-50.19	1.40	13.84	-95.76	-6.39	-63.91
5.50	-2.17	74.95	-54.83	-50.90	9.24	-141.90	-4.74	-79.58
6.00	-1.47	54.99	-57.93	-75.28	5.80	176.20	-3.73	-92.33
6.50	-1.27	41.32	-56.29	-107.10	3.30	127.00	-3.02	-102.30
7.00	-1.01	32.22	-59.51	-174.20	-1.03	63.07	-2.30	-110.50
7.50	-0.65	23.53	-73.34	139.70	-8.82	11.05	-1.71	-119.30
8.00	-0.48	15.71	-65.74	-158.40	-16.52	-22.61	-1.30	-127.50
8.50	-0.41	9.02	-70.70	76.88	-23.22	-47.81	-0.98	-134.70
9.00	-0.34	3.12	-75.00	-91.93	-28.39	-70.68	-0.76	-141.20
9.50	-0.28	-2.20	-67.47	23.62	-33.03	-93.57	-0.57	-147.30
10.00	-0.23	-7.02	-57.14	-31.86	-36.77	-111.10	-0.45	-153.30

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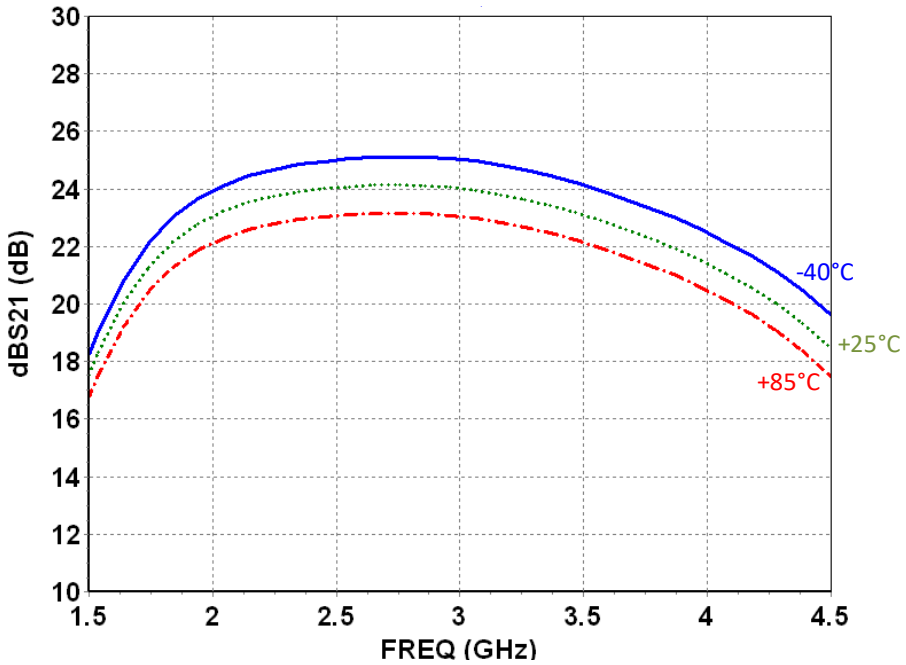
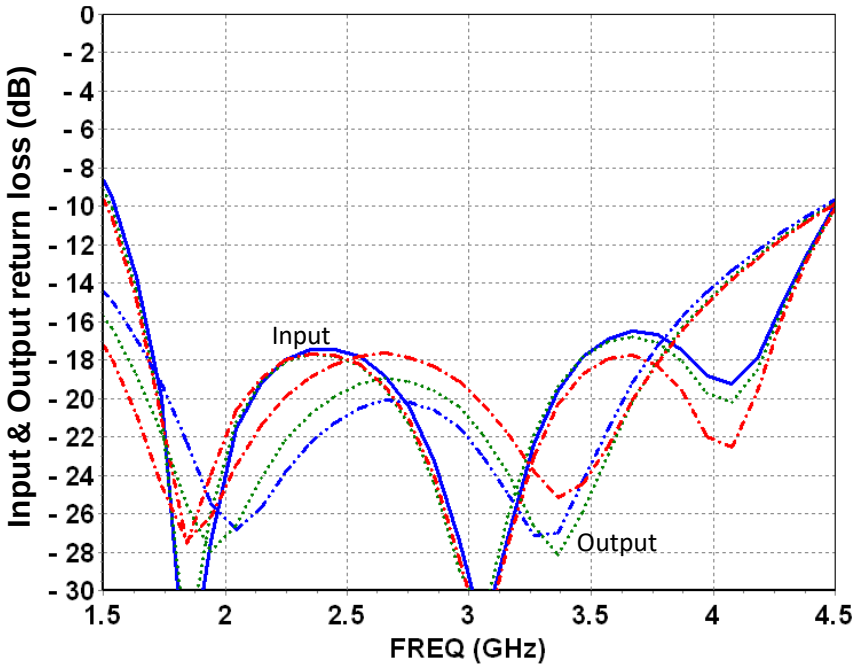
Typical Test fixture Measurements

V+ = +5V, V- = -5V, I+ = 180mA, I- = 2mA

Linear Gain



In/out Return Loss



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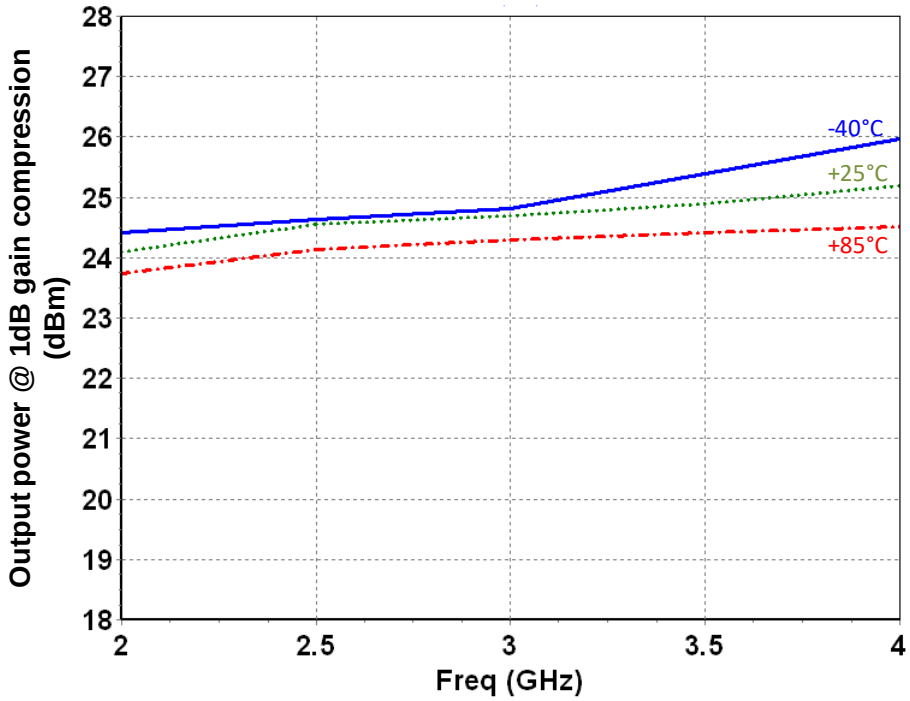
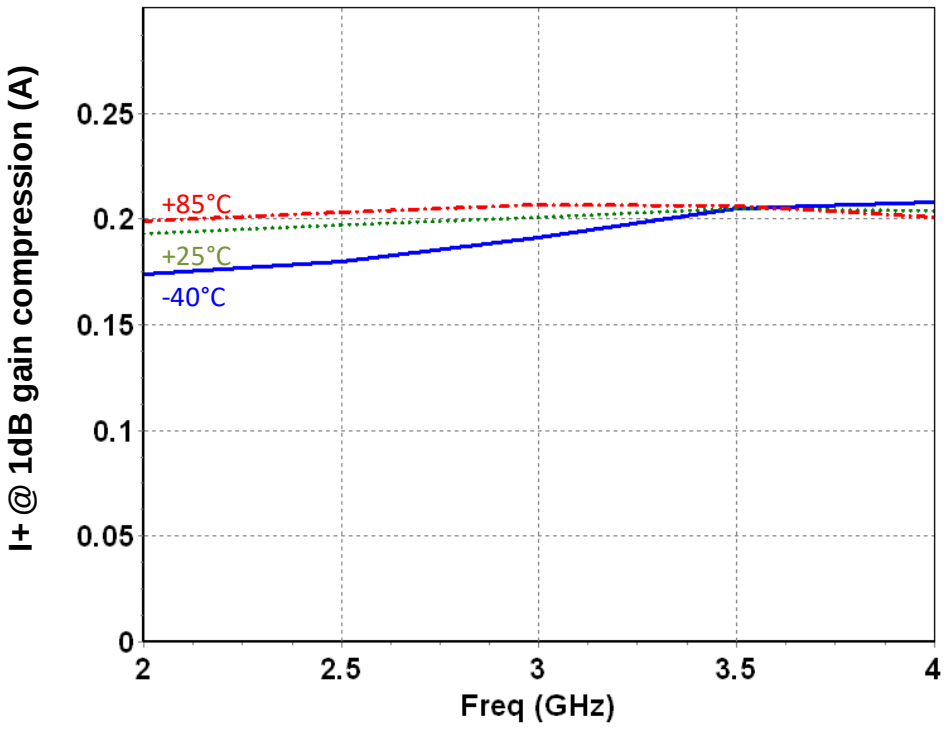
V+ = +5V, V- = -5V, I+ = 180mA, I- = 2mA

Output power @ 1dB gain compression versus Frequency & Temperature



Positive supply current @ 1dB gain compression versus Frequency & Temperature



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Typical Test fixture Measurements

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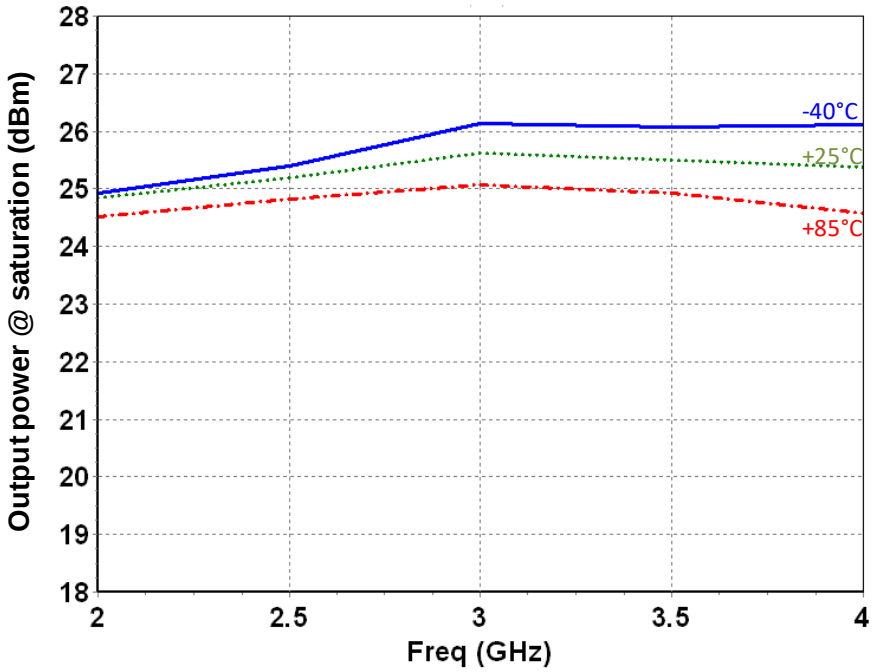
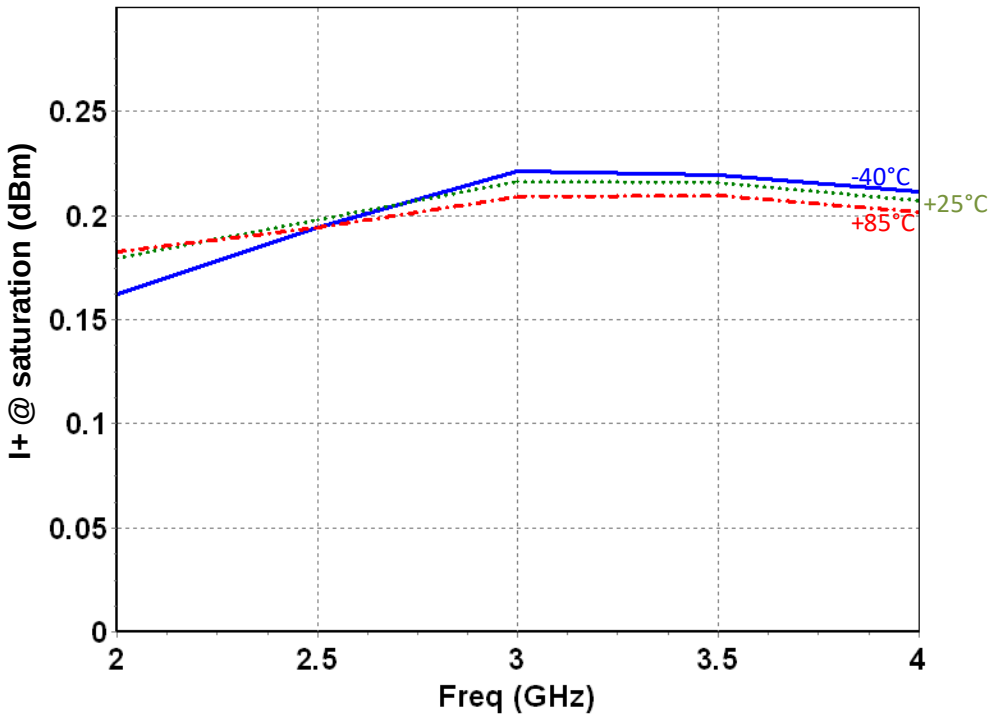
Output power @ saturation versus Frequency & Temperature



Positive supply current @ saturation versus Frequency & Temperature



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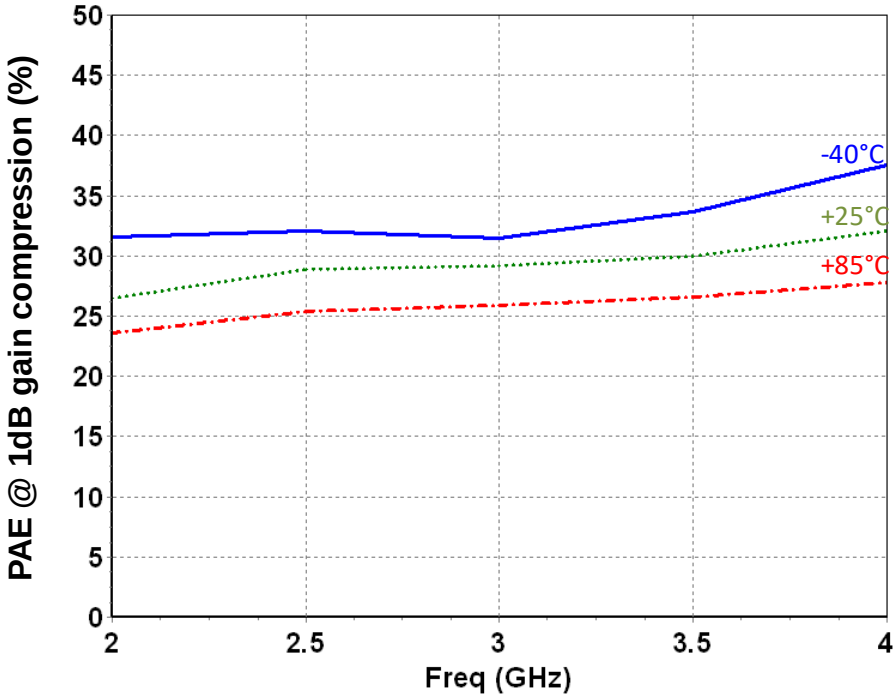
Typical Test fixture Measurements

V+ = +5V, V- = -5V, I+ = 180mA, I- = 2mA

Power Added Efficiency (PAE) @ 1dB gain compression versus Frequency & Temperature



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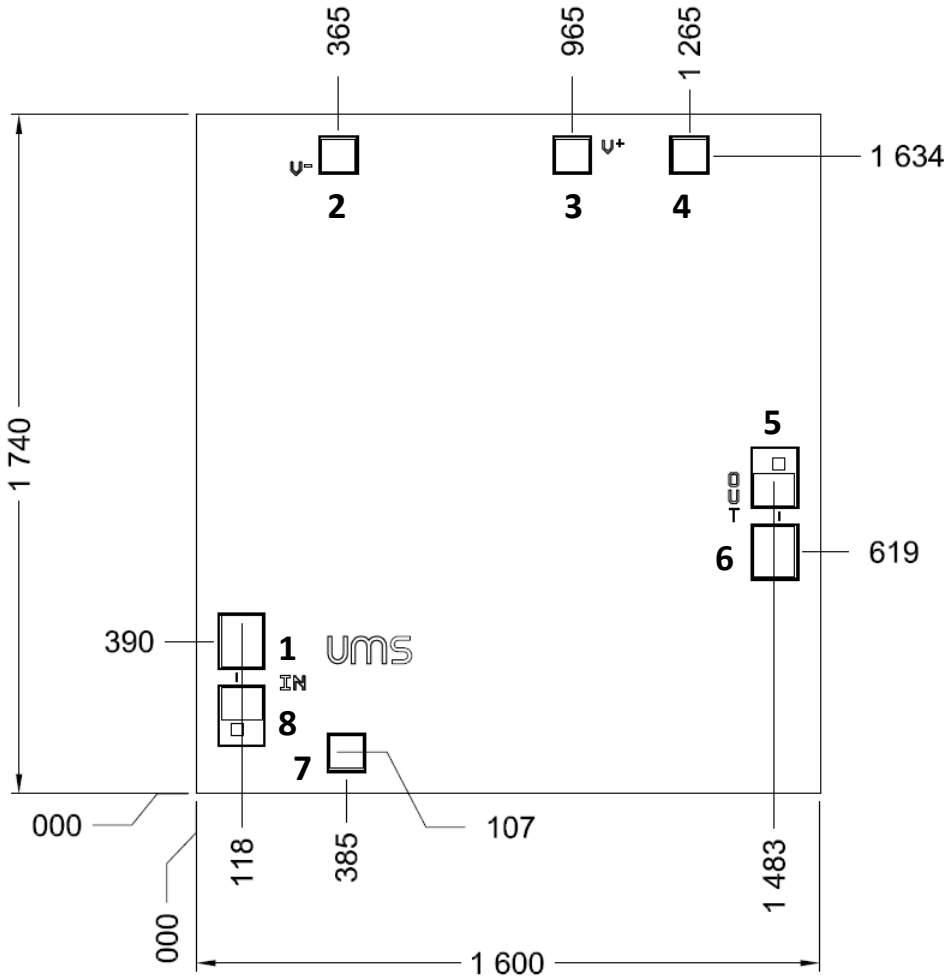
Mechanical data



All dimensions are in micrometers
Chip size = 1740x1600 ±35µm
Chip thickness = 100µm ±10µm
RF pads (1, 6) = 122 x 144µm²
DC pads (2, 3, 4) = 100 x 100µm²

Pin number	Pin name	Description
1	IN	Input RF
2	-V	Gate supply voltage
3	+V	Drain supply voltage
4, 5, 7, 8	GND	Ground (no bonding required)
6	OUT	Output RF

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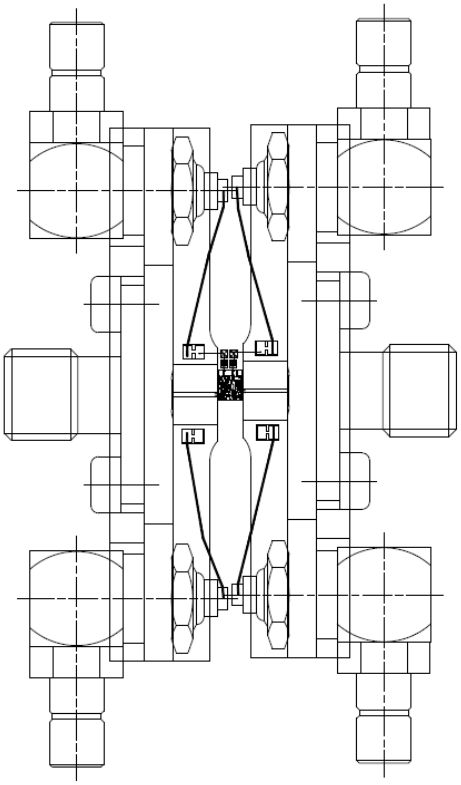
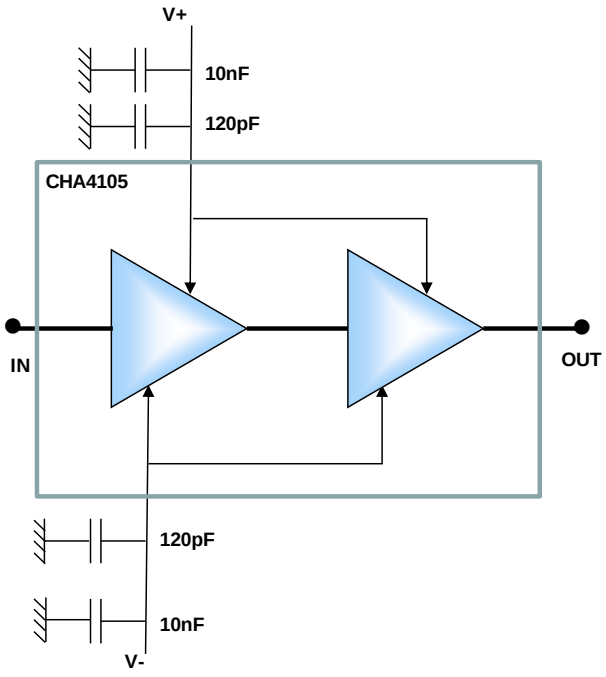
Test fixture 61498835



Recommended assembly plan



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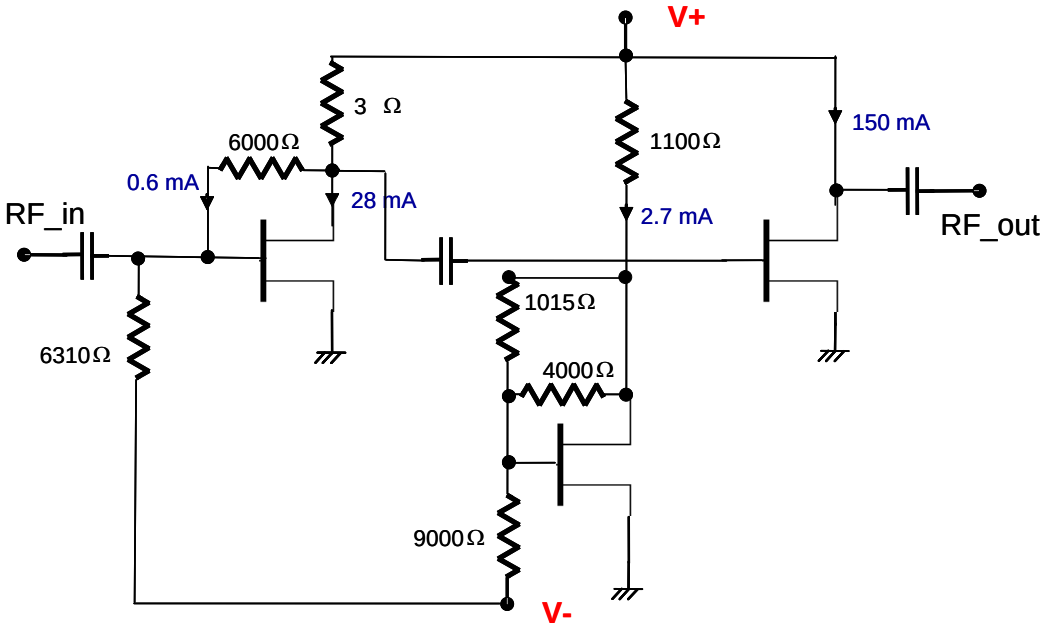
Bonding recommendations

The RF, DC and modulation port inter-connections should be done according to the following table:

Port	Connection
IN (pad 1)	Inductance (Lbonding) = 0.3nH 400µm length with wire diameter of 25 µm x2
OUT (pad 6)	Inductance (Lbonding) = 0.3nH 400µm length with wire diameter of 25 µm x2
DC pads to 1st decoupling level for single bonding	Inductance (Lbonding) =0.8nH one wire: diameter 25µm, length 1mm
1st decoupling level to 2nd decoupling level for single bonding	Inductance (Lbonding) =0.8nH one wire: diameter 25µm, length 1mm

DC Schematic

Driver : 5V, 180mA



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Notes

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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 products.

Ordering Information

Chip form:	CHA4105-99F/00

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