

X Band HBT Driver Amplifier

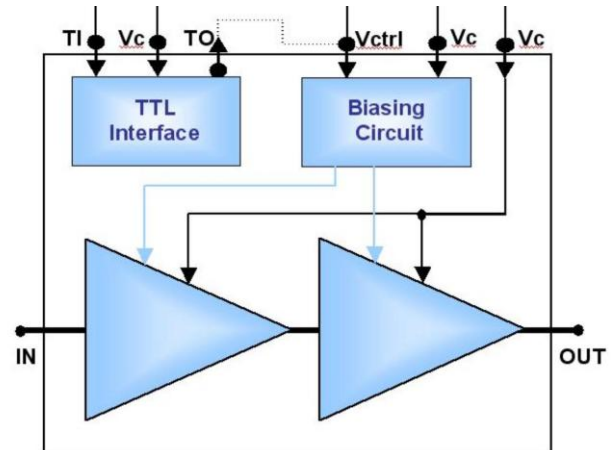
GaAs Monolithic Microwave IC

Description

The CHA5014 chip is a monolithic two-stage medium power amplifier designed for X band applications. Moreover this amplifier is relevant for systems that require an output power weakly sensitive to temperature.

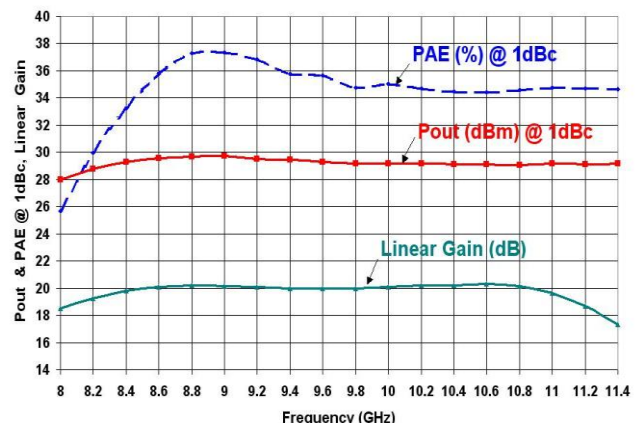
This device is manufactured using a GaInP HBT process, including, via holes through the substrate and air bridges. A nitride layer protects the transistors and the passive components.

A special control circuit is implemented to stabilize the output power in temperature.



Main Features

- 30dBm Saturated output power
- Temperature compensated Output power
- Two biasing modes:
 - Digital control thanks to TTL interface
 - Analog control thanks to Biasing circuit
- Quiescent bias point: 8.5V@230mA
- Chip size: 2.87 x 1.37 x 0.1mm³



Pout & PAE @ 1dBc and Linear Gain (Tamb 20°C)

Main Characteristics

Tamb = +20°C, Vc = +8.5V (Pulse 100µs 20%)

Symbol	Parameter	Min	Typ	Max	Unit
Fop	Operating frequency range	8.5		11	GHz
G	Small signal gain		20		dB
P1dB	Output power at 1dB gain compression		29		dBm
Icq	Power supply quiescent current		230		mA

ESD Protections: Electrostatic discharge sensitive device observe handling precautions!

Electrical Characteristics

Vc = +8.5V (Pulse 100µs 20%)

Symbol	Parameter	Min	Typ	Max	Unit
Top	Operating temperature range	-40		80	°C
Fop	Operating frequency range	8.5		11	GHz
G	Small signal gain at 20°C		20		dB
ΔG	Small signal gain flatness at 20°C		±0.25		dB
ΔG_T	Linear gain variation vs temperature		-0.03		dB/°C
P1dB	Output power at 1dB gain compression		29		dBm
Psat	Saturated output power		30		dBm
PAE_1dBc	PAe at 1dB gain compression at 20°C		35		%
dBS11	Input Return Loss		-12		dB
dBS22	Output Return Loss		-12		dB
Vc	Power supply voltage		8.5		V
Icq	Power supply quiescent current (1)		230		mA
Ic_1dBc	Consumption under 1dB gain compression		260		mA
Vctrl	Collector current control voltage		5		V
Ictrl	Biasing circuit consumption		5		mA
TI_Low	TTL input voltage low level	0		0.4	V
TI_High	TTL input voltage high level (1)	2.5		7.0	V
I_TI	TTL input current		1		mA

(1) For Vc = 8.5V, TTL interface settles Icq to 230mA when TI=TI_High. If needed, Icq can be tuned thanks to Vctrl if the analog biasing circuit is used.

Absolute Maximum Ratings (2)

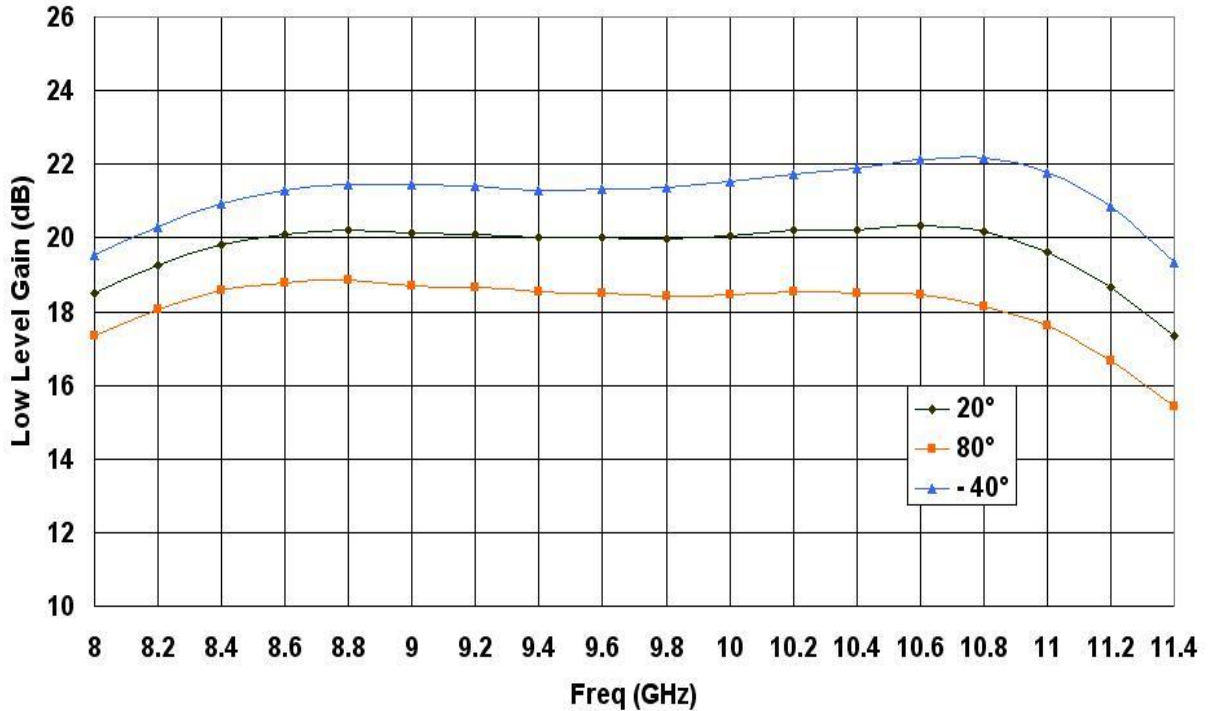
Tamb = 20°C

Symbol	Parameter	Values	Unit
Cmp	Compression level (3)	6	dB
Vc	Power supply voltage (4)	10	V
Icq	Power supply quiescent current	320	mA
Ic_sat	Power supply current in saturation	370	mA
Vctrl	Collector current control voltage	6	V
Ai	CTRL voltage (TI_low, TI_high)	-2 , +8	V
Tj	Maximum Junction temperature (5)	175	°C
Tstg	Storage temperature range	-55 to +150	°C

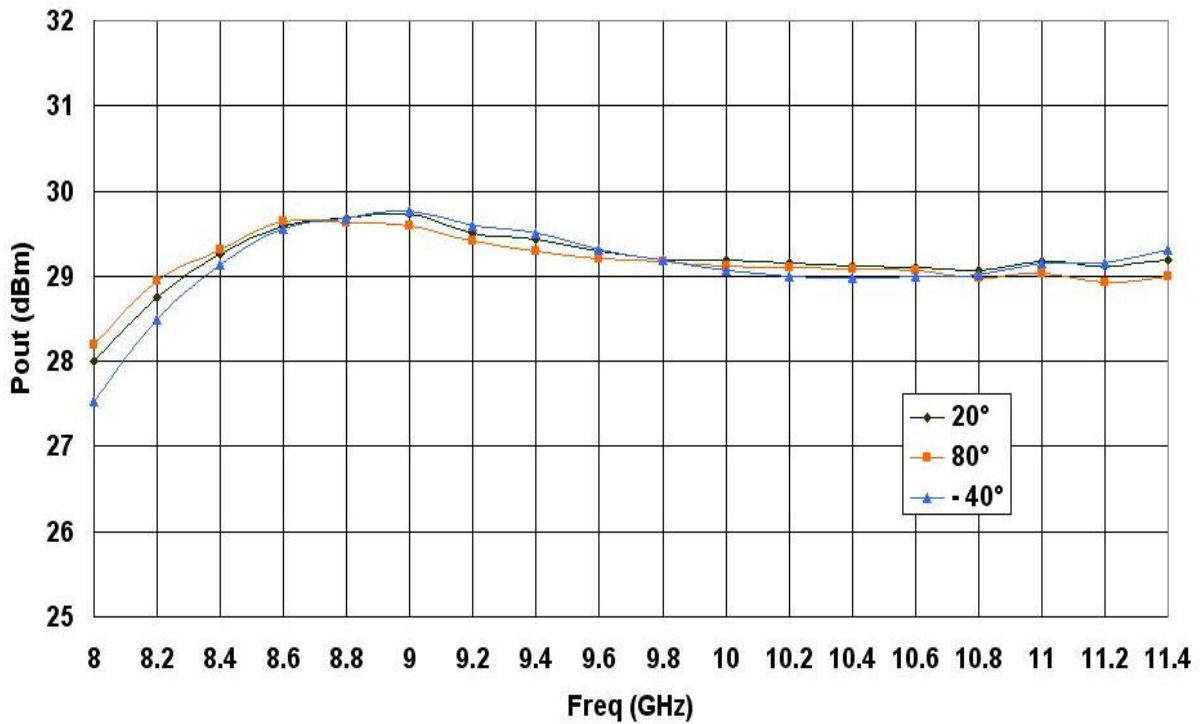
- (2) Operation of this device above anyone of these parameters may cause permanent damage.
- (3) For higher compression the level limit can be increased by decreasing the voltage Vc using the rate 0.5V/dBc. Compression level shall not be higher than 3dB at -40°C.
- (4) Without RF input power
- (5) Equivalent Thermal Resistance to Backside : 45°C/W

Typical measurement characteristics

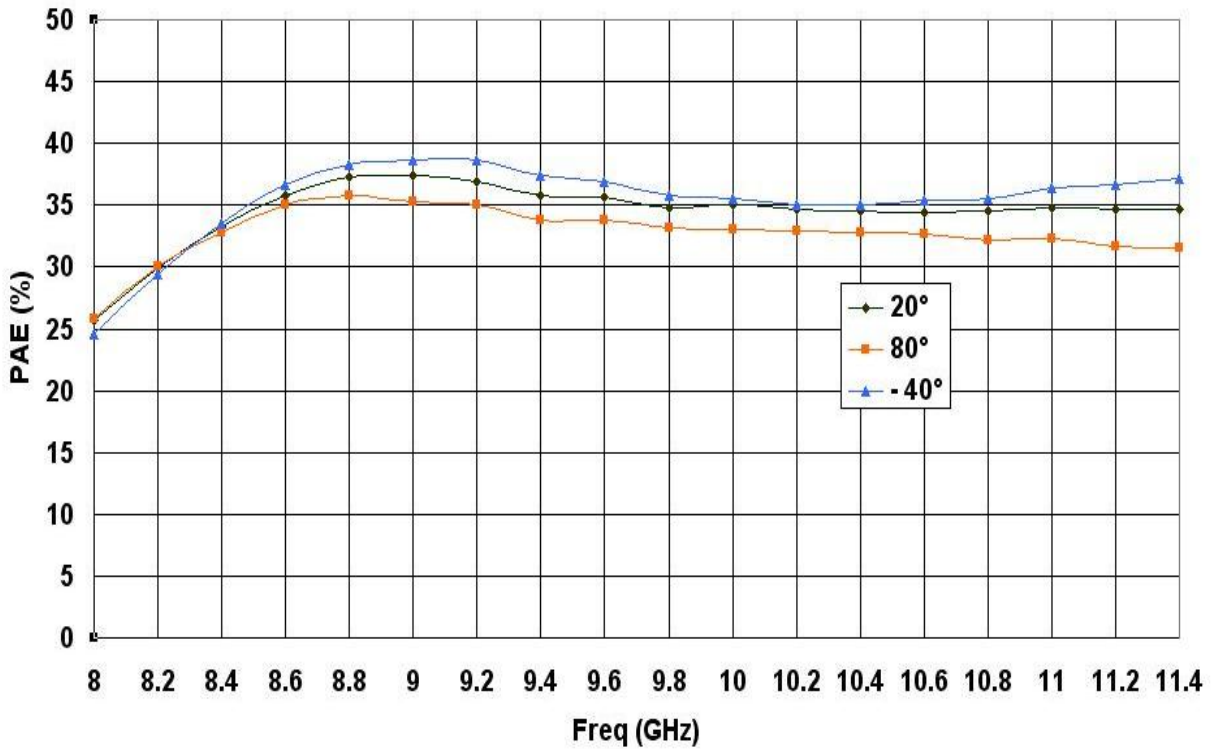
Tamb = 20°C, Vc = 8.5V, Ic (Quiescent) = 230mA Pulse = 100µs 20%



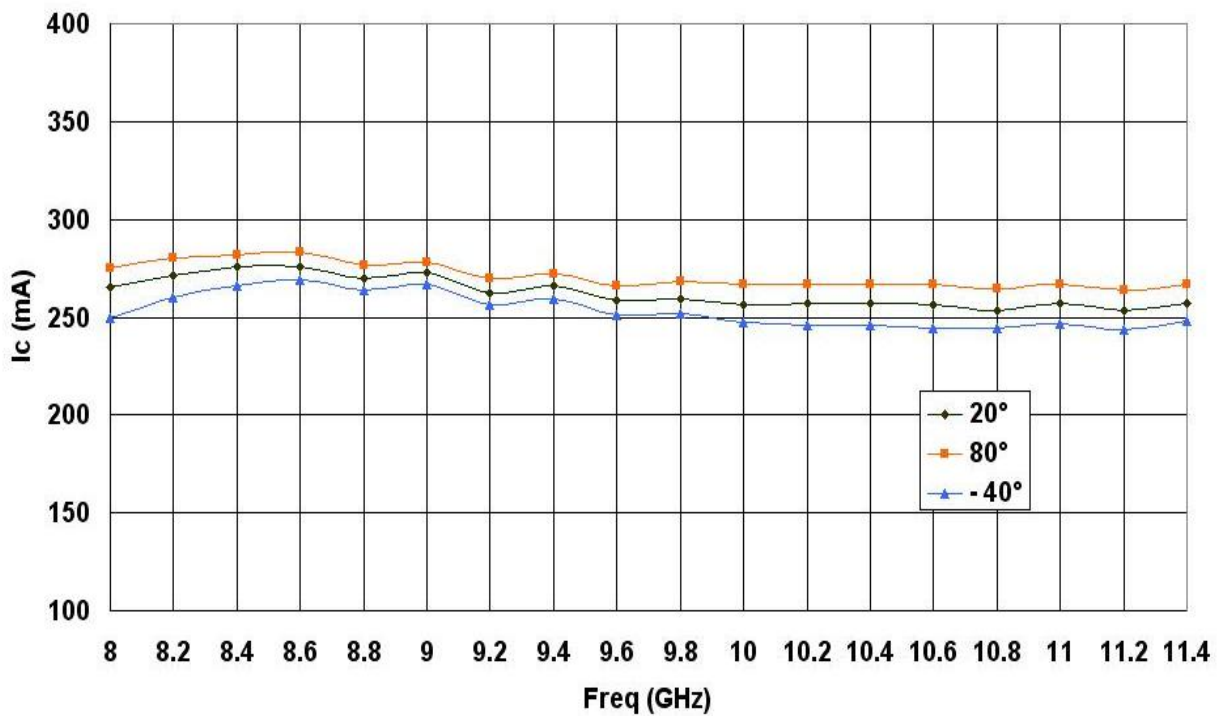
Linear gain versus frequency and temperature



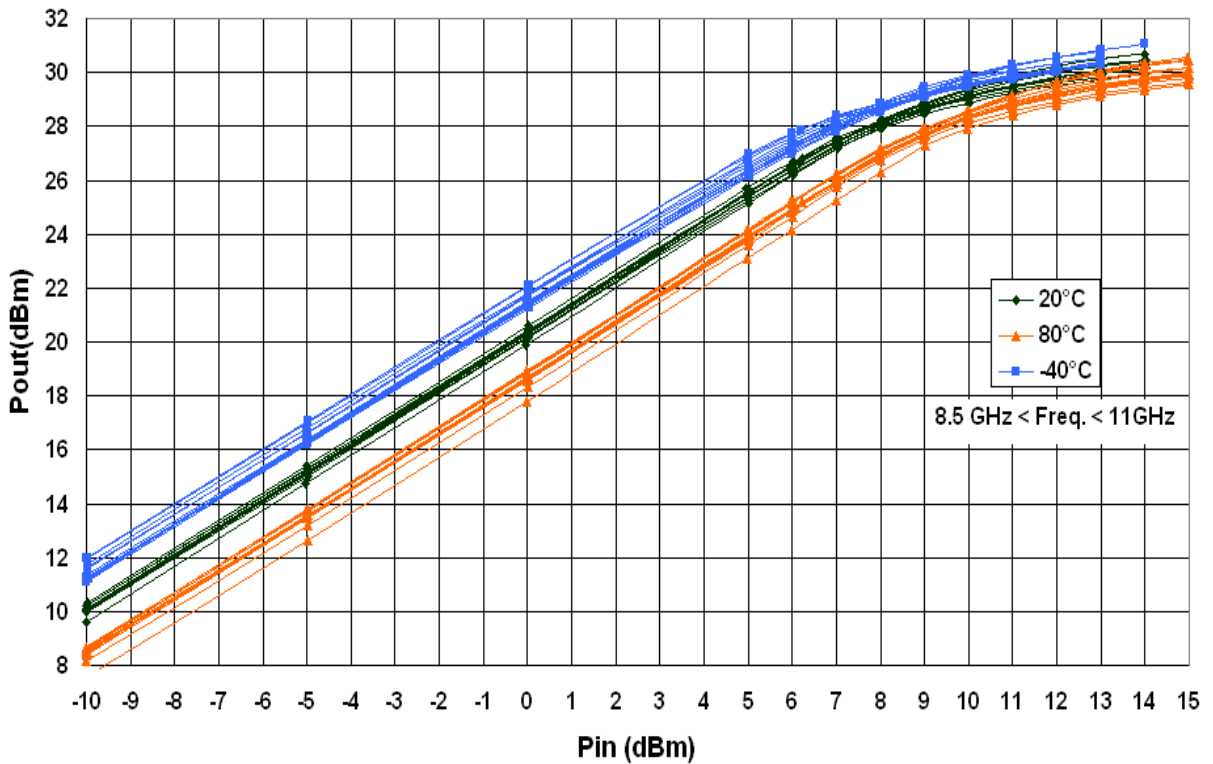
Output Power @ 1dB gain compression versus frequency and temperature



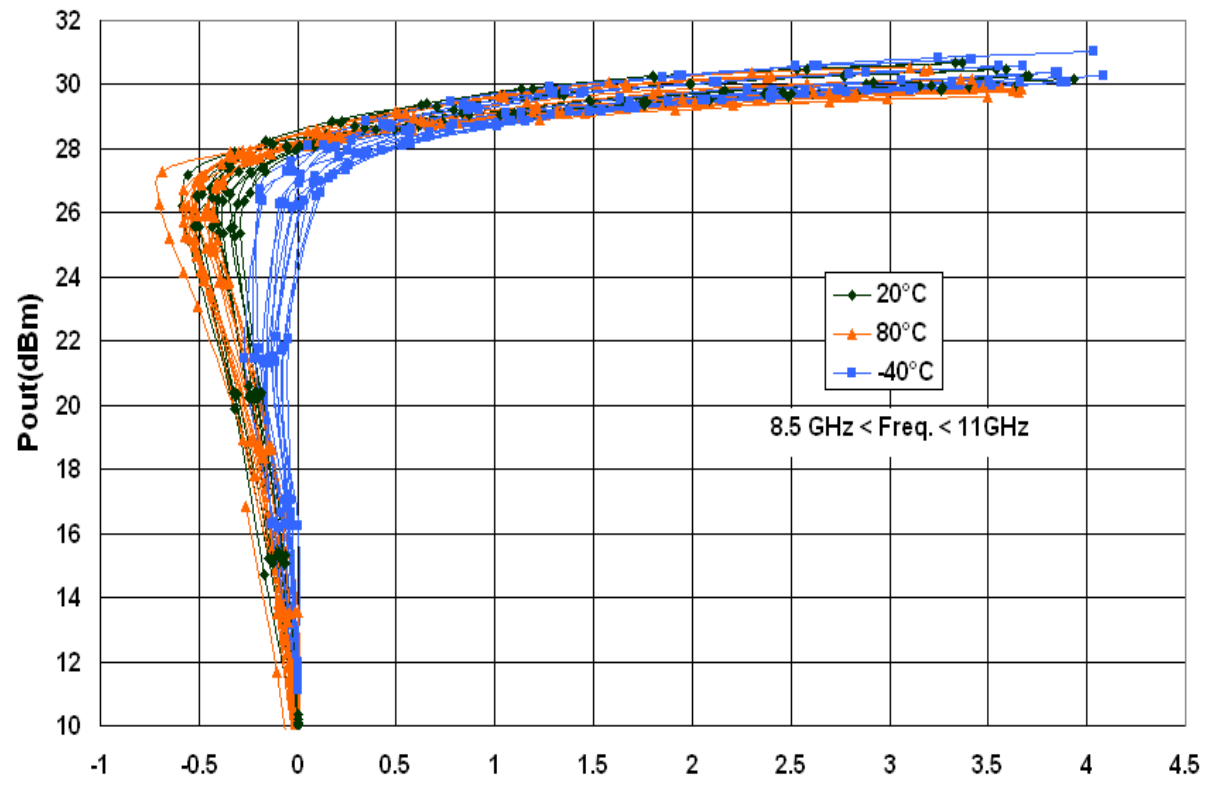
Power added efficiency@1dB gain compression versus frequency



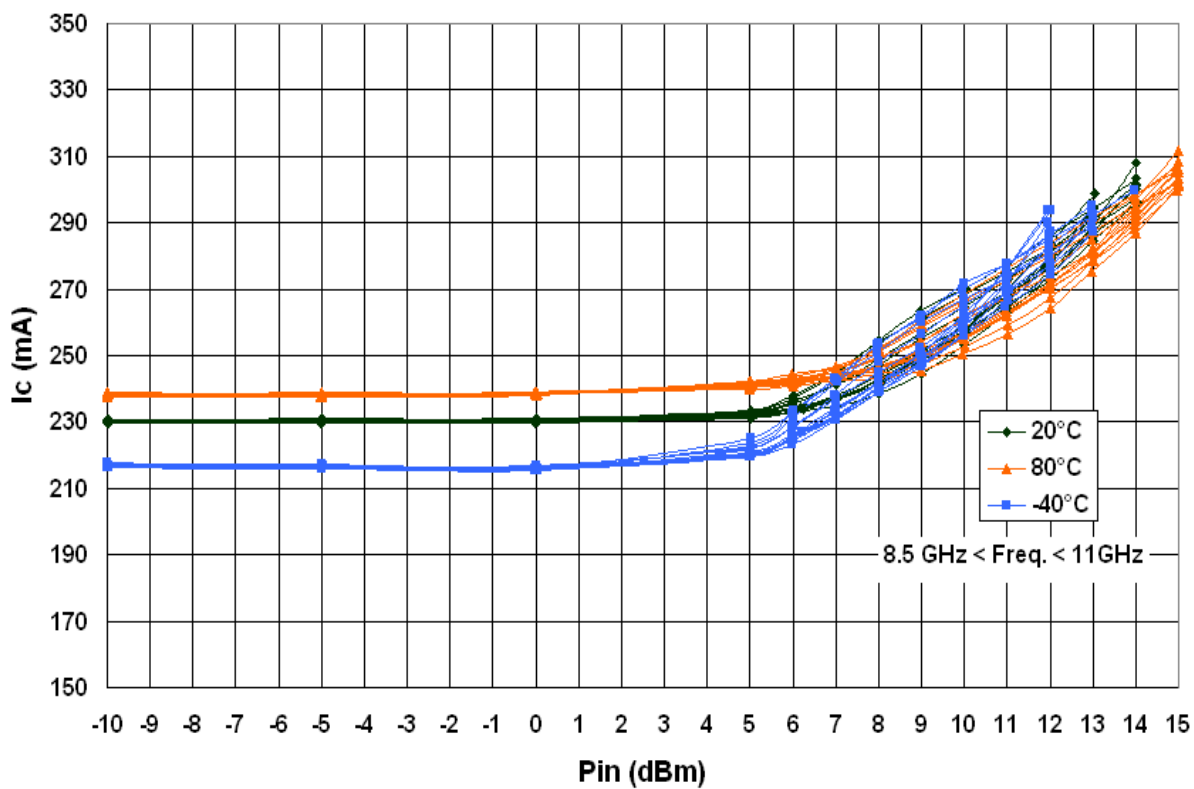
Collector current @ 1dB gain compression versus frequency



Output power versus Input power

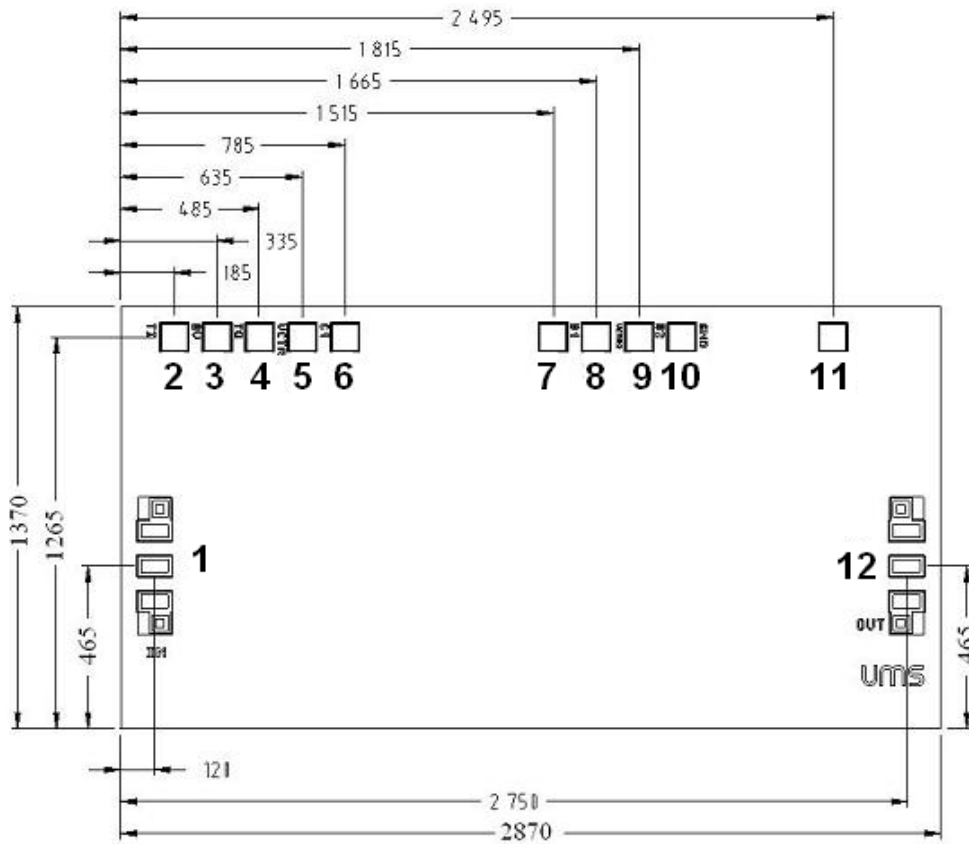


Output power versus gain compression



Collector current versus Input power

Chip Mechanical Data and Pin references



UNITS : μm
Tol : $\pm 35\mu\text{m}$

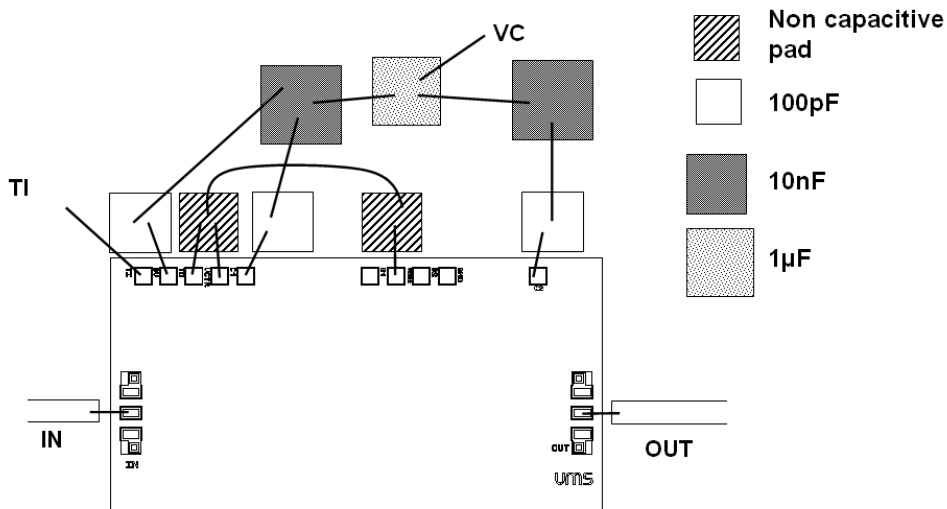
Chip thickness = $100 \pm 10\mu\text{m}$
RF pads (1, 12) = $118 \times 68\mu\text{m}^2$
DC pads (2, 3, 4, 5, 9, 6, 7, 8, 9, 10, 11) = $96 \times 96\mu\text{m}^2$

Pin number	Pin name	Description
1	IN	Input RF port
7, 9		NC
5, 8	Vctrl	Collector current control voltage
2	TI	TTL input
4	TO	TTL output
10	GND	Ground (NC)
3, 6, 11	Vc	Power supply voltage
12	OUT	Output RF port

Recommended ESD management

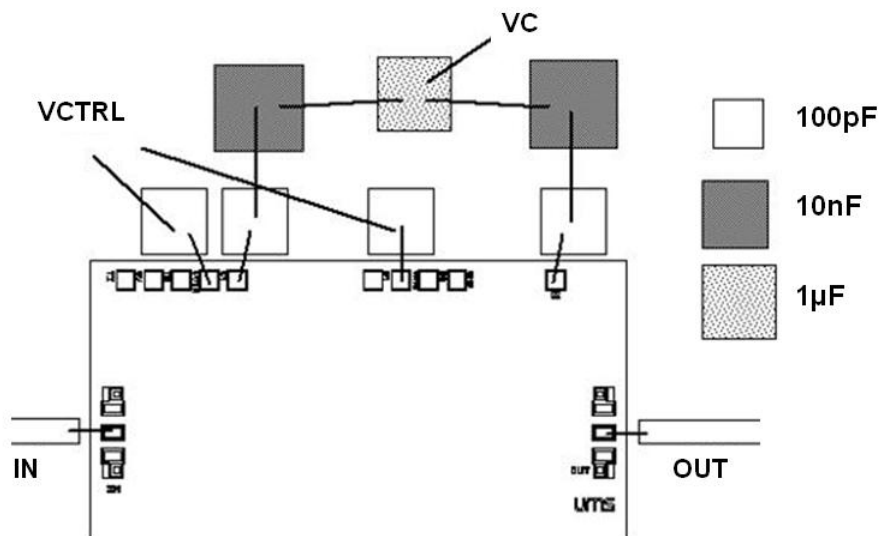
Refer to the application note AN0020 available at <http://www.ums-gaas.com> for ESD sensitivity and handling recommendations for the UMS products.

Assembly recommendations in test fixture (TTL interface)



Note: when the TTL interface is used for biasing, the pin TO (pin number 4) must be connected to the pins Vctrl (pins number 5 and 8).

Assembly recommendations in test fixture (using Biasing circuits)



Ordering Information

Chip form : CHA5014-99F/00

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