

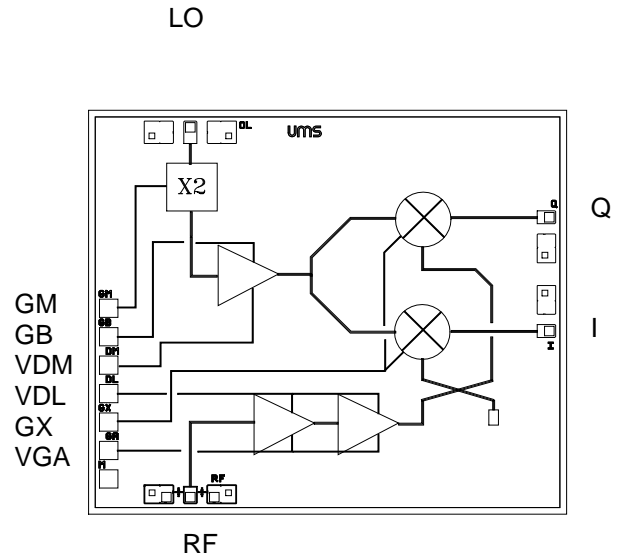
# 36-40GHz Integrated Down Converter

## GaAs Monolithic Microwave IC

### Description

The CHR2296 is a multifunction chip which integrates a LO time two multiplier, a balanced cold FET mixer, and a RF LNA. It is designed for a wide range of applications, typically commercial communication systems. The backside of the chip is both RF and DC grounds. This helps simplify the assembly process.

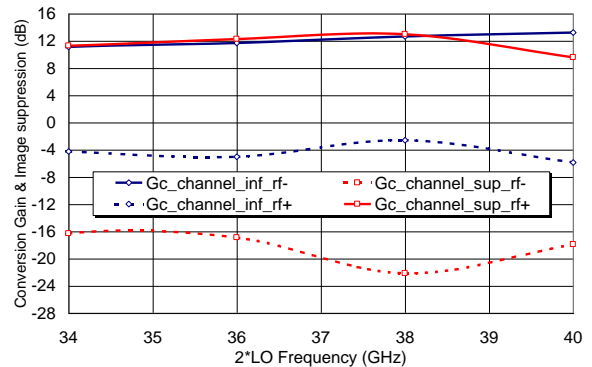
The circuit is manufactured with a pHEMT process, 0.25µm gate length, via holes through the substrate, air bridges and electron beam gate lithography. It is available in chip form.



### Main Features

- Broadband performances: 36-40GHz
- 11 dB conversion gain
- 5dB noise figure, for IF>0.1GHz
- 10dBm LO input power
- -10dBm RF input power (1dB gain comp.)
- Low DC power consumption, 110mA@3.5V
- Chip size: 2.49 X 1.97 X 0.10mm

Typical on wafer measurement:  
Conversion Gain & Image suppression  
@ IF=1GHz



### Main Characteristics

Tamb. = 25°C

Symbol	Parameter	Min	Typ	Max	Unit
F <sub>RF</sub>	RF frequency range	36		40	GHz
F <sub>LO</sub>	LO frequency range	17		20	GHz
F <sub>IF</sub>	IF frequency range	DC		1.5	GHz
G <sub>c</sub>	Conversion gain	9	11		dB

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

## Electrical Characteristics for Broadband Operation

Tamb = +25°C, Vd = 3.5V

Symbol	Parameter	Min	Typ	Max	Unit
F <sub>RF</sub>	RF frequency range	36		40	GHz
F <sub>LO</sub>	LO frequency range	17		20	GHz
F <sub>IF</sub>	IF frequency range	DC		1.5	GHz
G <sub>c</sub>	Conversion gain <sup>(1)</sup>	9	11		dB
NF	Noise Figure, for IF>0.1GHz <sup>(1)</sup>		5		dB
P <sub>LO</sub>	LO Input power		+10		dBm
Img Sup	Image Suppression	13	15		dBc
P1dB	Input power at 1dB gain compression		-10		dBm
LO VSWR	Input LO VSWR <sup>(1)</sup>		2.0:1		
RF VSWR	Input RF VSWR <sup>(1)</sup>		3.0:1		
I <sub>d</sub>	Bias current <sup>(2)</sup>		110		mA

(1) On Wafer measurements

(2) Current source biasing network is recommended. Optimum performances for I<sub>dm</sub> = 50mA and I<sub>dl</sub> = 60mA

## Absolute Maximum Ratings

Tamb. = 25°C (1)

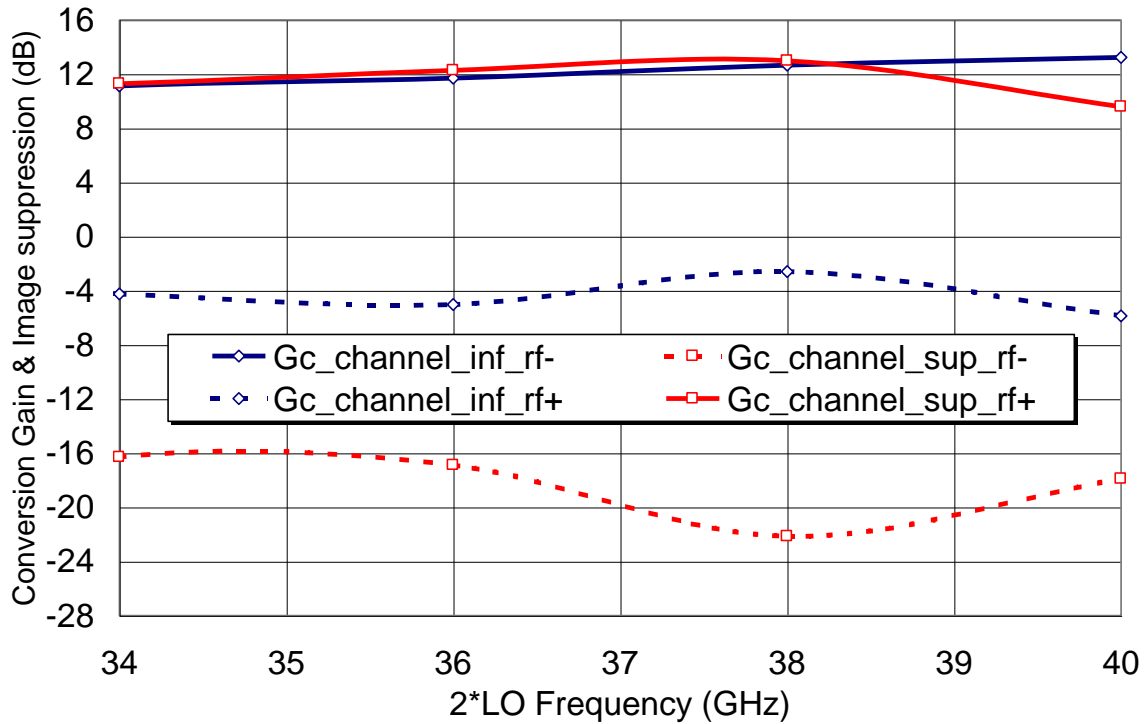
Symbol	Parameter	Values	Unit
V <sub>d</sub>	Maximum drain bias voltage	4.0	V
I <sub>d</sub>	Maximum drain bias current	200	mA
V <sub>g</sub>	Gate bias voltage	-2.0 to +0.4	V
V <sub>gd</sub>	Minimum negative gate drain voltage ( V <sub>g</sub> – V <sub>d</sub> )	-5	V
P <sub>in</sub>	Maximum peak input power overdrive (2)	+15	dBm
T <sub>ch</sub>	Maximum channel temperature	175	°C
T <sub>a</sub>	Operating temperature range	-40 to +85	°C
T <sub>stg</sub>	Storage temperature range	-55 to +125	°C

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

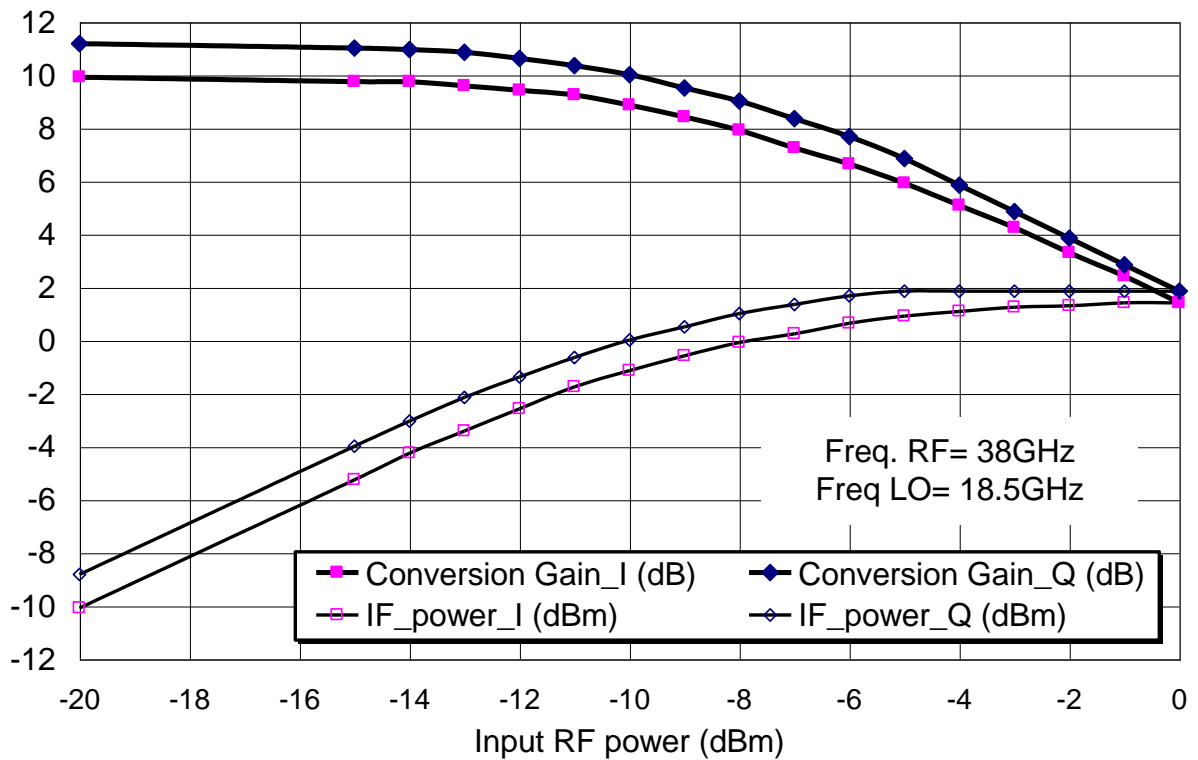
(2) Duration < 1s.

Typical On-wafer Measurements

Bias Conditions :  $V_{dm}= V_{dl}= 3.5 V$ ,  $V_{gm}= -0.9V$ ,  $V_{gb}= -0.4V$ ,  $V_{gx}= -0.8V$ ,  $V_{ga}= -0.5V$

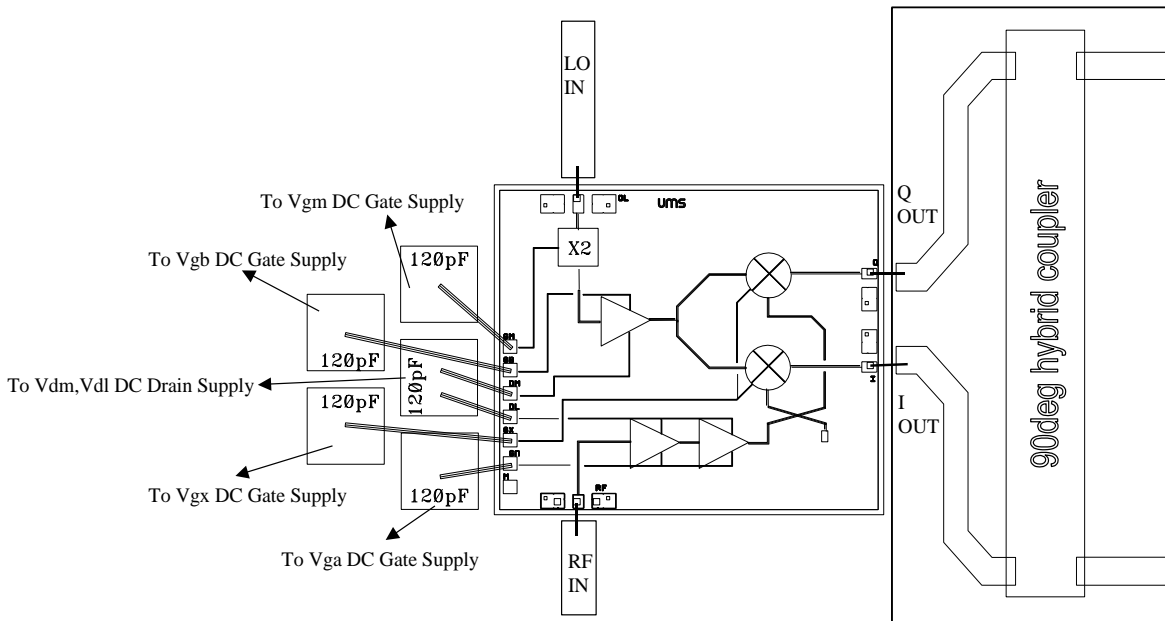


Conversion gain & Image suppression with a 90° IQ combiner @ IF=1GHz

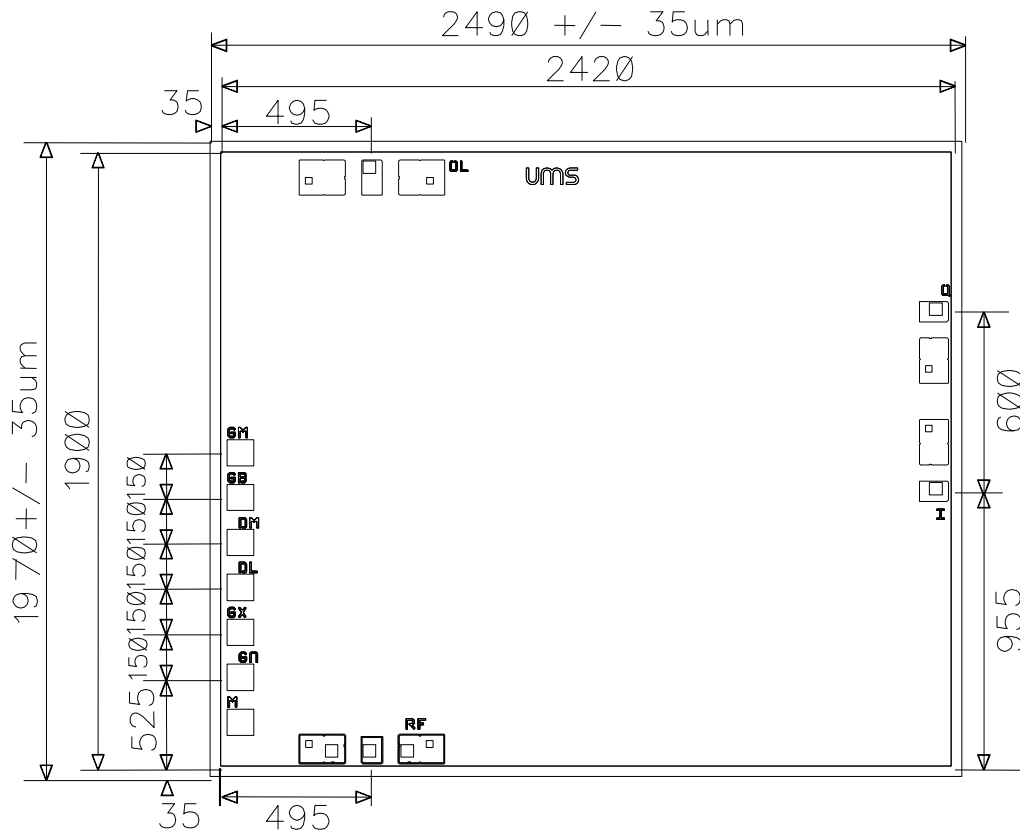


Input RF compression by channel

Chip Assembly and Mechanical Data



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



**Bonding pad positions**  
(Chip thickness: 100µm. All dimensions are in micrometers)

**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.

## Ordering Information

Chip form:                                      CHR2296-99F/00

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