

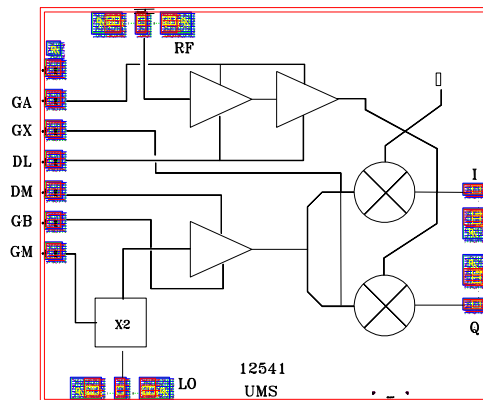
# 12-16GHz Integrated Down Converter

## GaAs Monolithic Microwave IC

### Description

The CHR2391 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 to simplify the assembly process.

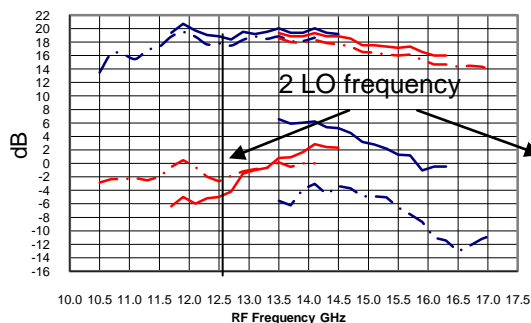
The circuit is manufactured with a pHEMT process, 0.25µm gate length, via holes through the substrate and air bridges. It is available in chip form.



### Main Features

- Broadband performances: 12.0-16.0GHz
- 15 dB conversion gain
- 2dB noise figure, for IF>0.1GHz
- 10dBm LO input power
- -10dBm RF input power (1dB gain comp.)
- Low DC power consumption, 100mA@3.5V
- Chip size: 2.49 X 2.13 X 0.10mm

Typical on wafer measurement:  
Conversion Gain & Image suppression  
@ IF=0.9 & 1.5GHz



### Main Characteristics

Tamb. = 25°C

| Symbol          | Parameter          | Min  | Typ | Max  | Unit |
|-----------------|--------------------|------|-----|------|------|
| F <sub>RF</sub> | RF frequency range | 12   |     | 16   | GHz  |
| F <sub>LO</sub> | LO frequency range | 5.25 |     | 7.25 | GHz  |
| F <sub>IF</sub> | IF frequency range | DC   |     | 1.5  | GHz  |
| G <sub>c</sub>  | Conversion gain    | 13   | +15 |      | dB   |

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

## Electrical Characteristics for Broadband Operation

Tamb = +25°C, Vd = 3.5V ,Idl=50mA, Idm=50mA

| Symbol          | Parameter                           | Min  | Typ   | Max  | Unit |
|-----------------|-------------------------------------|------|-------|------|------|
| F <sub>RF</sub> | RF frequency range                  | 12   |       | 16   | GHz  |
| F <sub>LO</sub> | LO frequency range                  | 5.25 |       | 7.25 | GHz  |
| F <sub>IF</sub> | IF frequency range                  | DC   |       | 1.5  | GHz  |
| G <sub>c</sub>  | Conversion gain (1)                 | +13  | +15   |      | dB   |
| NF              | Noise Figure, for IF>0.1GHz (1)     |      | 2     | 2.5  | dB   |
| P <sub>LO</sub> | LO Input power                      |      | +10   | +13  | dBm  |
| Img Sup         | Image Suppression                   |      | 15    |      | dBc  |
| P1dB            | Input power at 1dB gain compression |      | -10   |      | dBm  |
| IP3             | Input IP3                           |      | 2.5   |      | dBm  |
| LO VSWR         | Input LO VSWR (1)                   |      | 2.0:1 |      |      |
| RF VSWR         | Input RF VSWR (1)                   |      | 2.0:1 |      |      |
| Id              | Bias current (2)                    |      | 100   | 130  | mA   |

(1) On Wafer measurements

(2) Current source biasing network is recommended.

Optimum performances are obtained for Idm=50mA (Id consumption of the X2+buffer; vgb≈-0.4V) and Idl=50mA (Id consumption for the Ina; Vga≈-0.4V)

## Absolute Maximum Ratings

Tamb. = 25°C (1)

| Symbol | Parameter                                 | Values       | Unit |
|--------|---|--------------|------|
| Vd     | Maximum drain bias voltage                | 4.0          | V    |
| Id     | Maximum drain bias current                | 180          | mA   |
| Vg     | Gate bias voltage                         | -2.0 to +0.4 | V    |
| Vdg    | Maximum drain to gate voltage ( Vd – Vg)  | +5           | V    |
| Pin    | Maximum RF peak input power overdrive (2) | -5           | dBm  |
| Tch    | Maximum channel temperature               | 175          | °C   |
| Ta     | Operating temperature range               | -40 to +85   | °C   |
| Tstg   | Storage temperature range                 | -55 to +125  | °C   |

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

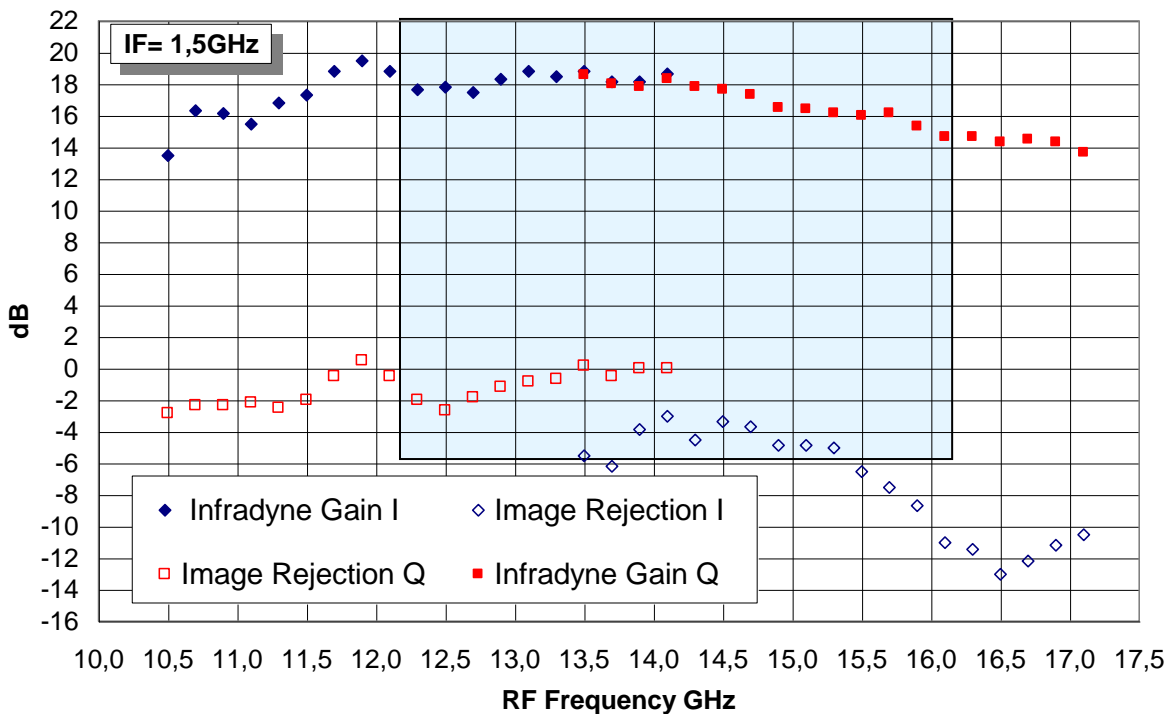
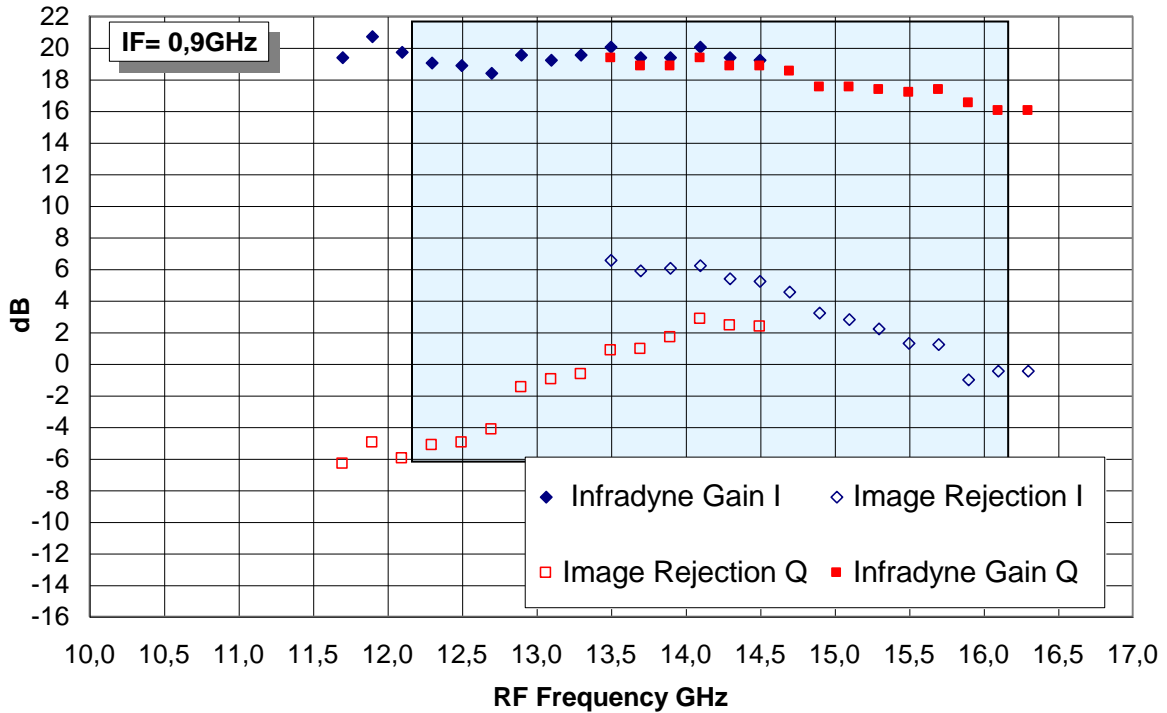
(2) Duration < 1s.

**Typical On-wafer Measurements**

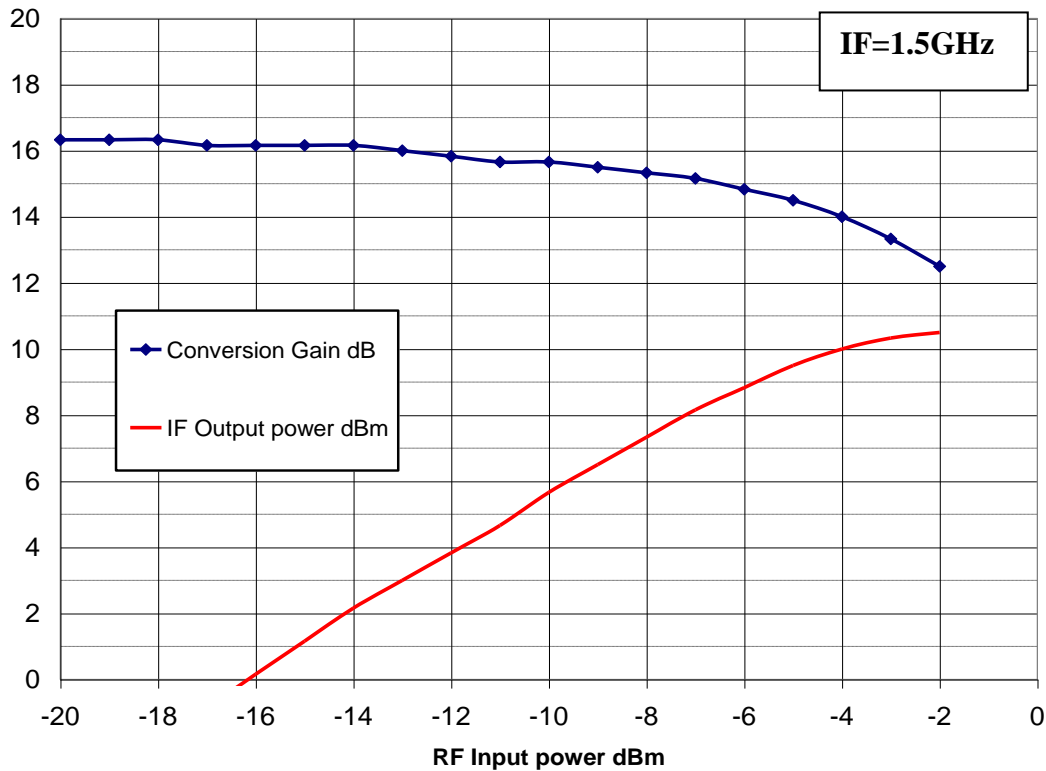
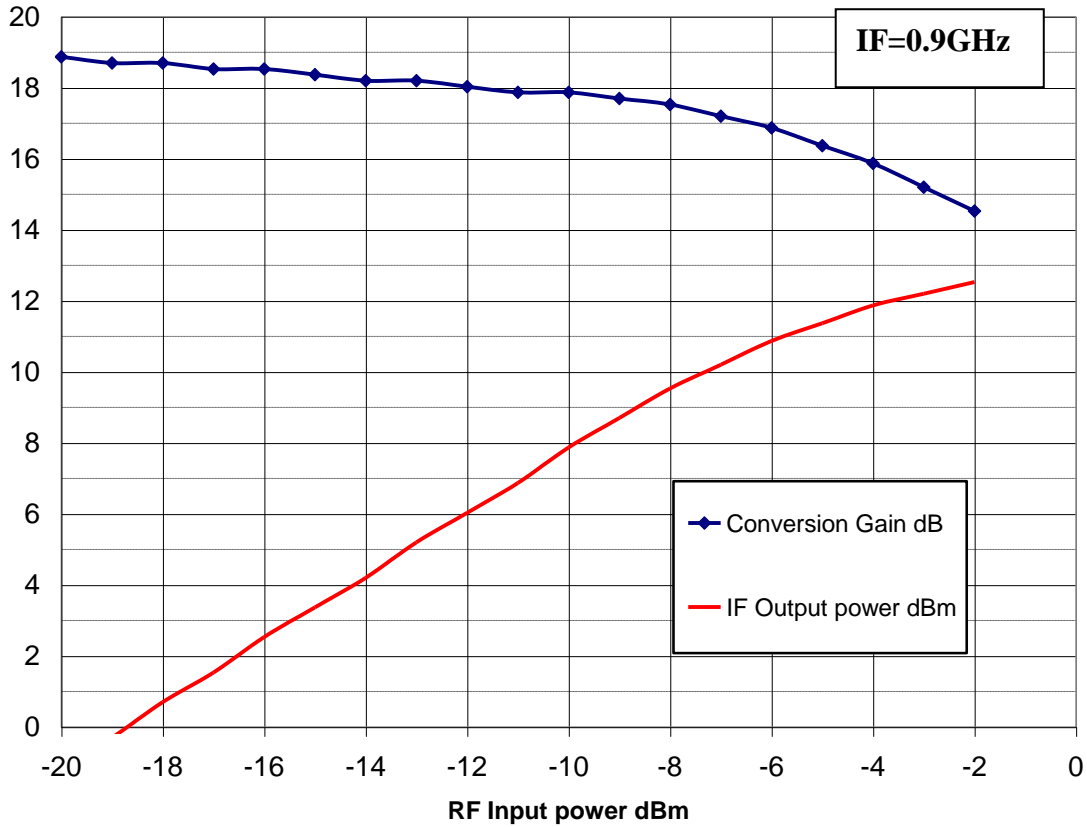
Bias Conditions:

V<sub>dm</sub>= V<sub>dI</sub>= 3.5 V, I<sub>dI</sub>= I<sub>dm</sub>= 50mA( V<sub>ga</sub>=v<sub>gb</sub>≈-0.4V), V<sub>gm</sub>= -0.7V, V<sub>gx</sub>= -0.6V

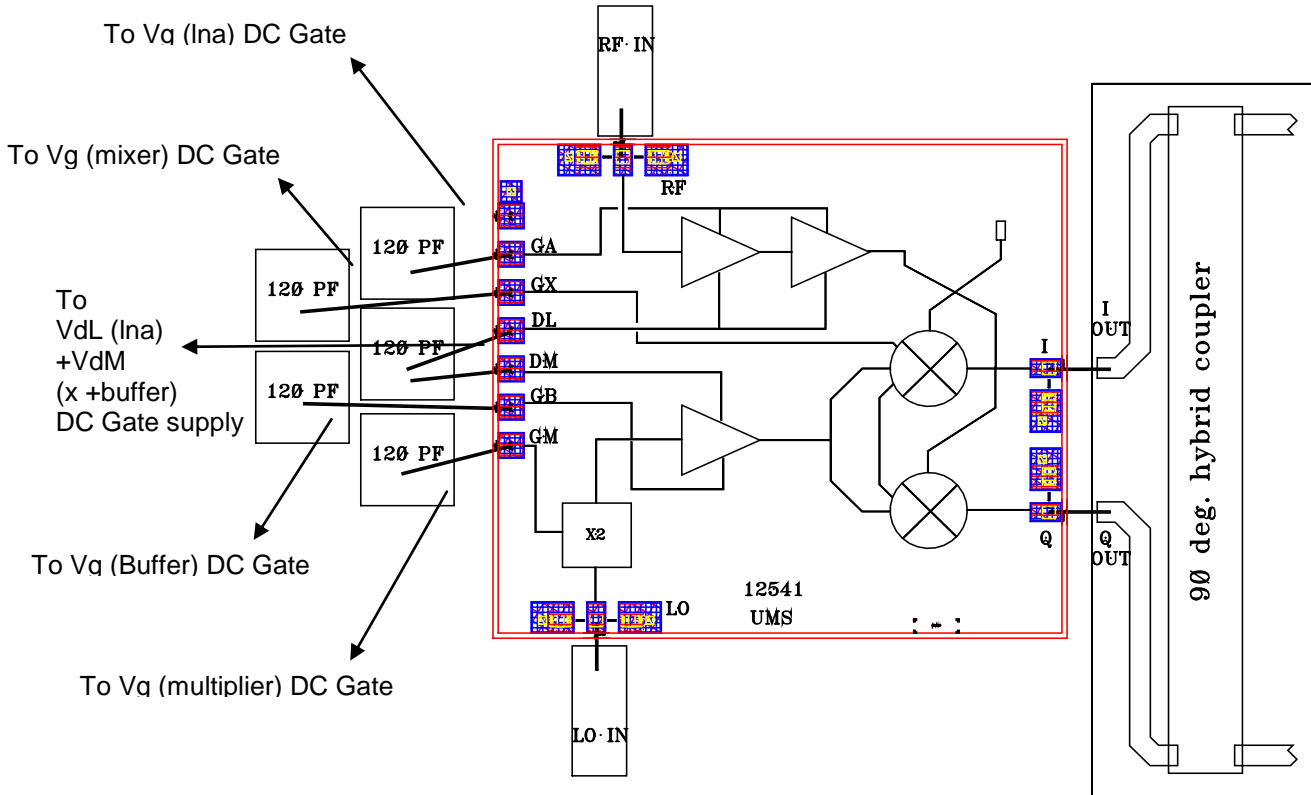
Conversion gain & Image suppression with a 90° IQ combiner



Gain compression versus RF input power



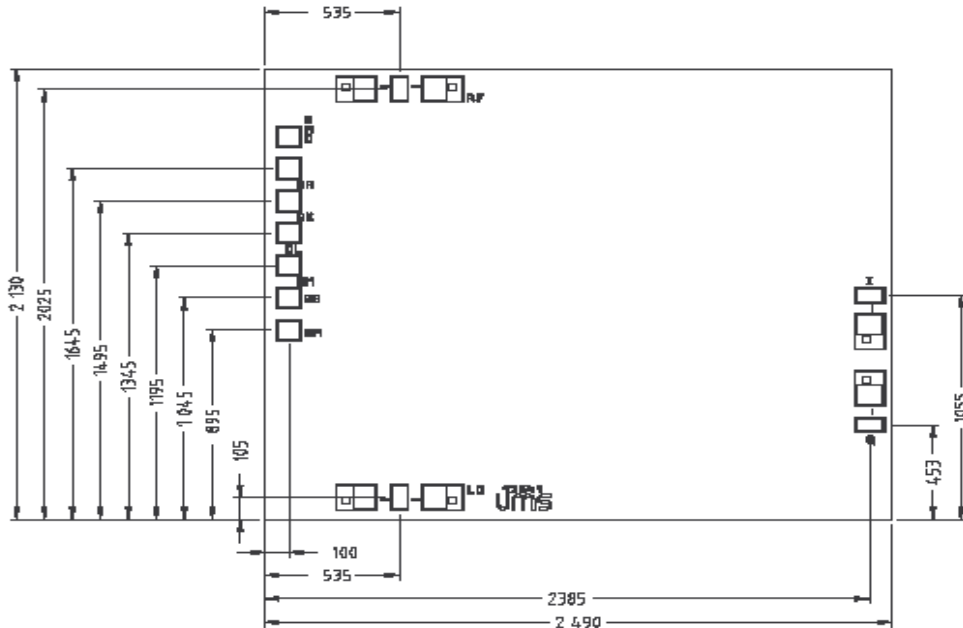
**Chip Assembly and Mechanical Data**



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

**Bonding pad positions**

Chip thickness: 100µm



Unit: µm  
Tol : + / - 35µm

## Ordering Information

Chip form : CHR2391-99F/00

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