

## 9-18GHz Frequency Multiplier

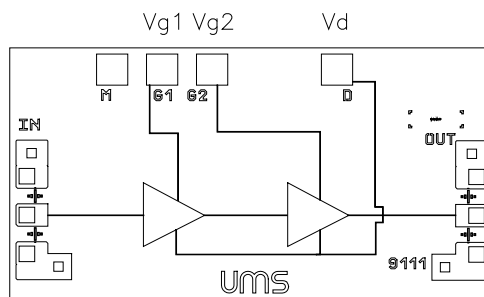
### GaAs Monolithic Microwave IC

#### Description

The CHX2089-99F is a cascaded times 2 frequency multiplier monolithic circuit.

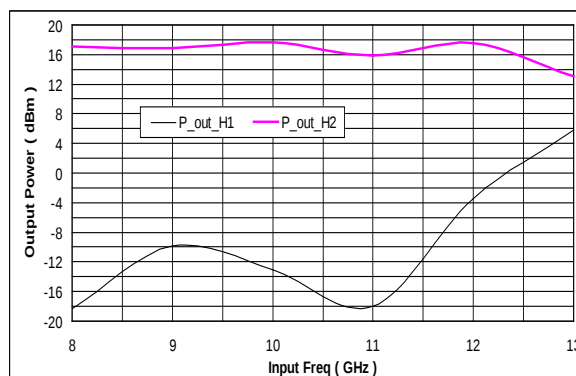
It is designed for a wide range of applications, from ISM to commercial communication systems. The backside of the chip is both RF and DC grounds. This helps simplify the assembly process.

The circuit is manufactured with a pHEMT process, 0.25 $\mu$ m gate length, via holes through the substrate, air bridges and electron beam gate lithography.



#### Main Features

- Broadband performances: 8-11.5GHz
- Pout(H2) = 15dBm @ Pin = 12dBm
- DC bias: Vd = 3.5Volt @ Id = 60mA
- Chip size: 1.62 x 0.89 x 0.10mm



#### Main Electrical Characteristics

Tamb.= +25°C

| Symbol | Parameter                           | Min | Typ | Max  | Unit |
|--------|-------------------------------------|-----|-----|------|------|
| Fin    | Input frequency range               | 8   | 9   | 11.5 | GHz  |
| Fout   | Output frequency range              | 16  | 18  | 23   | GHz  |
| Pin    | Input power                         |     | 12  | 15   | dBm  |
| Pout   | Output power for +12dBm input power | 11  | 15  |      | dBm  |

## Electrical Characteristics

Tamb = +25°C, Vd = 3.5V, Vg1 = -0.9V, Vg2 adjusted for Id=50 mA, no RF (Vg2 typ.= -0.3V).

| Symbol  | Parameter                           | Min | Typ | Max   | Unit |
|---------|-------------------------------------|-----|-----|-------|------|
| Fin     | Input frequency range               | 8   | 9   | 11.5  | GHz  |
| Fout    | Output frequency range              | 16  | 18  | 23    | GHz  |
| Pin     | Input power                         |     | 12  | 15    | dBm  |
| Pout    | Output power for +12dBm input power | 11  | 15  |       | dBm  |
| Is/Fo   | Fin rejection at the output         | 15  | 20  |       | dBc  |
| VSWRin  | Input VSWR                          |     |     | 2.0:1 |      |
| VSWRout | Output VSWR                         |     |     | 2.5:1 |      |
| Id      | Bias current without RF             |     | 50  | 70    | mA   |
| Id_RF   | Bias current with RF (Pin=12 dBm)   |     | 60  | 85    | mA   |

These values are representative of on-wafer measurements that are made without bonding wires at the RF ports.

## Absolute Maximum Ratings <sup>(1)</sup>

Tamb.= +25°C

| Symbol | Parameter                   | Values      | Unit |
|--------|-----------------------------|-------------|------|
| Vd     | Drain bias voltage          | 4           | V    |
| Id     | Drain bias current          | 90          | mA   |
| Vg     | Gate bias voltage           | -2 to +0.4  | V    |
| Pin    | Input power                 | 20          | dBm  |
| Ta     | Operating temperature range | -40 to +85  | °C   |
| Tstg   | Storage temperature range   | -55 to +150 | °C   |

<sup>(1)</sup> Operation of this device above any one of these parameters may cause permanent damage.

## Typical Bias Conditions

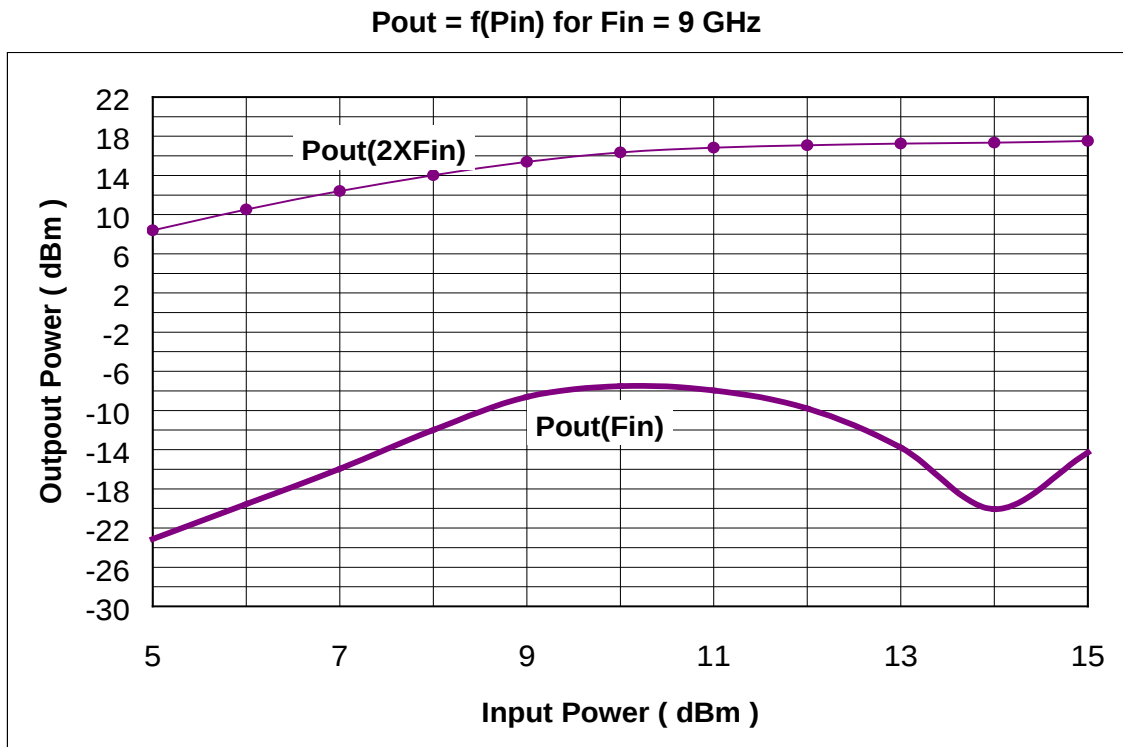
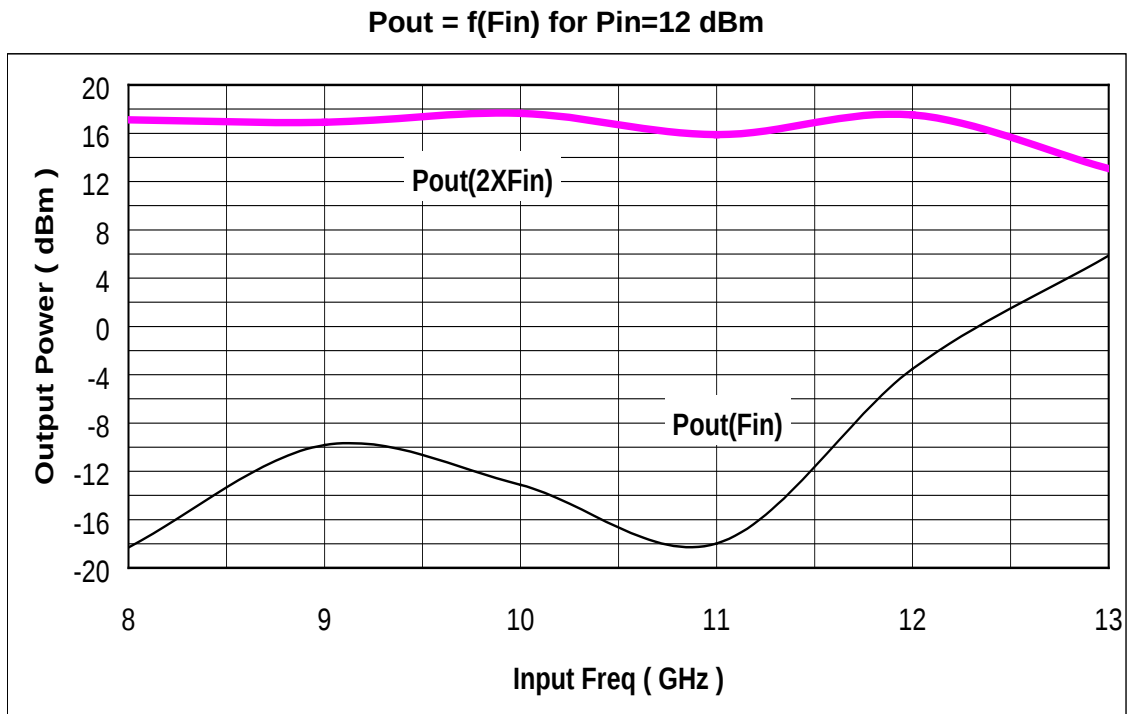
Tamb.= +25°C

| Symbol | Pad N° | Parameter                              | Values | Unit |
|--------|--------|----------------------------------------|--------|------|
| Vd     | D      | Positive Drain voltage                 | 3.5    | V    |
| Vg1    | G1     | Negative multiplier stage gate voltage | -0.9   | V    |
| Vg2    | G2     | Negative buffer stage gate voltage     | (-0.3) | V    |

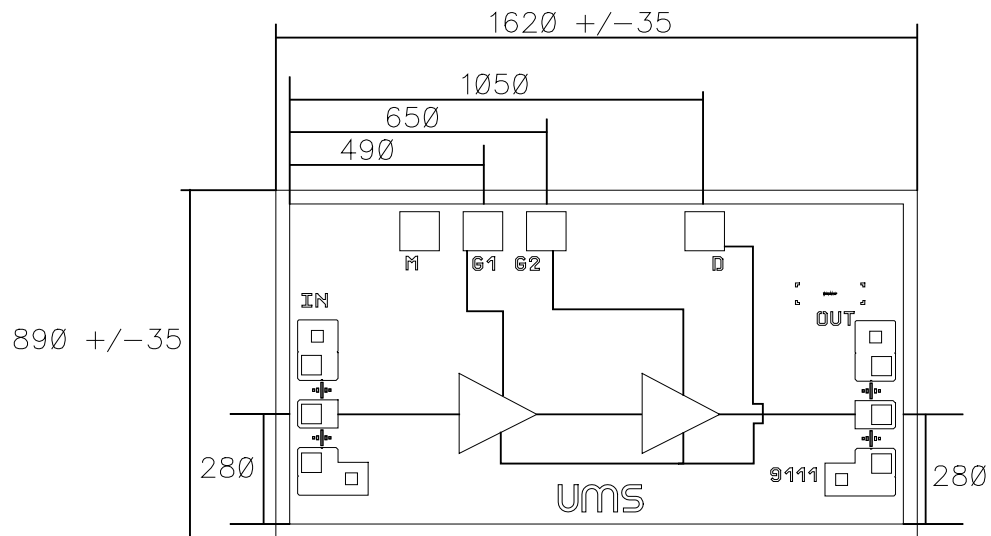
Vg2 should be adjusted to achieve Id = 50mA while no RF applied at the input.

### Typical on wafer Measurements

Tamb.= +25°C, Vd = 3.5V, Vg1 = -0.9V, Vg2 = -0.3V.



## Mechanical data

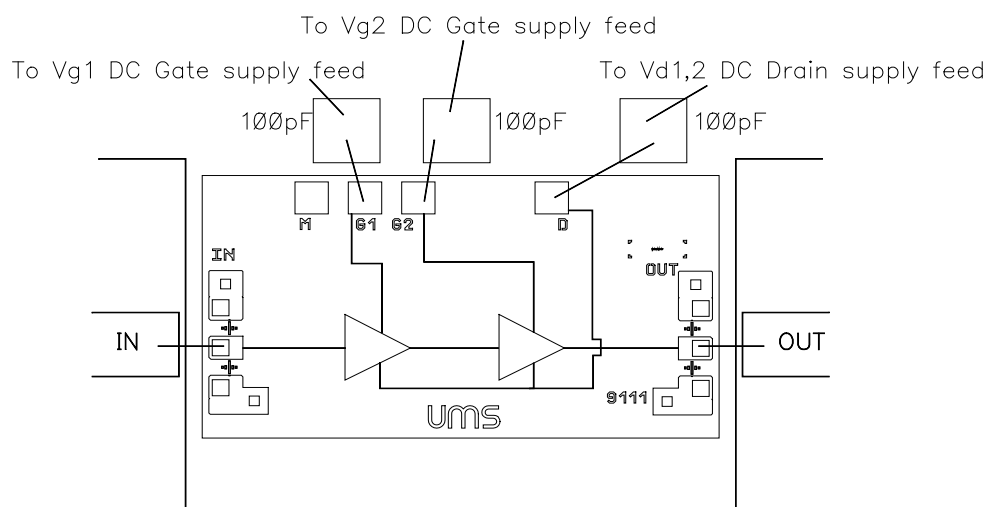


Chip thickness: 100 $\mu$ m.

Chip size: 890x1620  $\pm$  35 $\mu$ m

All dimensions are in micrometers

## Recommended assembly plan



Note: Supply feed should be bypassed. 25 $\mu$ m diameter gold wire is to be preferred.

## Recommended circuit bonding table

| Label | Type | Decoupling | Comment                      |
|-------|------|------------|------------------------------|
| D     | Vd   | 100pF      | Drain Supply                 |
| G1    | Vg1  | 100pF      | Multiplier Gate Supply       |
| G2    | Vg2  | 100pF      | Buffer amplifier Gate Supply |
| M     | GND  | NC         | No connection required       |

### 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.

### 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 <https://www.ums-rf.com>.

### Ordering Information

Chip form: CHX2089-99F/00

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