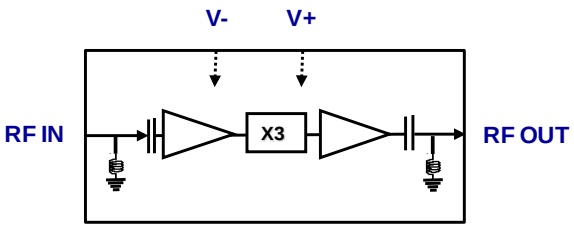
# 13.5-40.5GHz Frequency Multiplier

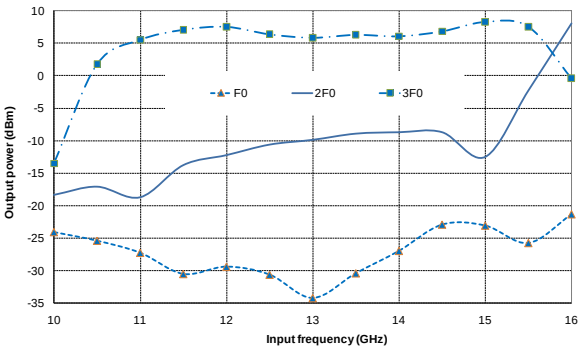
## GaAs Monolithic Microwave IC

The CHX1191-98F is a monolithic time three multiplier which integrates input and output buffer.
The output frequency from 33.7 to 43.5GHz, combined with an output power of 6dBm make of this circuit a very versatile multiplier for telecommunication, specifically for E-band LO chain system.
Moreover it integrates ESD protection. The overall power supply is of +5V/ 80mA.
It is developed on a robust 0.15µm gate length pHEMT process, and will be available as a bare die.




## Main Features

- Broadband performances: 11.25-14.5GHz
- 6dBm Pout for -1dBm input power
- DC bias: V+=5 Volts, V- = -5V@Id=80mA
- Chip size 1.77x0.94x0.1mm




## Main Electrical Characteristics

Tamb.= +25°C

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Fin | Input frequency range | 11.25 | | 14.5 | GHz |
| Fout | Output frequency range | 33.75 | | 43.5 | GHz |
| Pin | Input power | | -1 | | dBm |
| Pout_H3 | 3rd harmonic output power | | 6 | | dBm |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## Electrical Characteristics

Tamb.= +25°C, Vd = +5.0V

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Fin | Input frequency range | 11.25 | | 14.5 | GHz |
| Fout | Output frequency range | 33.75 | | 43.5 | GHz |
| Pin | Input power | | -1 | | dBm |
| Pout_H3 | 3rd harmonic output power | | 6 | | dBm |
| Rej_H1 | Fundamental rejection | | 35 | | dBc |
| Rej_H2 | 2nd harmonic rejection | | 15 | | dBc |
| RL _in | Input return loss | | -12 | | dB |
| RL_out | Output return loss | | -12 | | dB |
| V+ | DC positive voltage | | +5 | | V |
| V- | DC negative voltage | | -5 | | V |
| Id | DC current | | 80 | | mA |

These values are representative of test fixture measurements with RF bonding around 0.15nH

## Absolute Maximum Ratings (1)

Tamb.= +25°C

| Symbol | Parameter | Values | Unit |
|---|---|---|---|
| V+ | Positive bias voltage | 5.5 | V |
| V- | Negative bias current | -6 | V |
| Id | DC current | 120 | mA |
| Pin | Maximum input power | +4 | dBm |
| Tj | Junction temperature | 175 | °C |
| Ta | Operating temperature range | -40 to +95 | °C |
| Tstg | Storage temperature range | -55 to +150 | °C |

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



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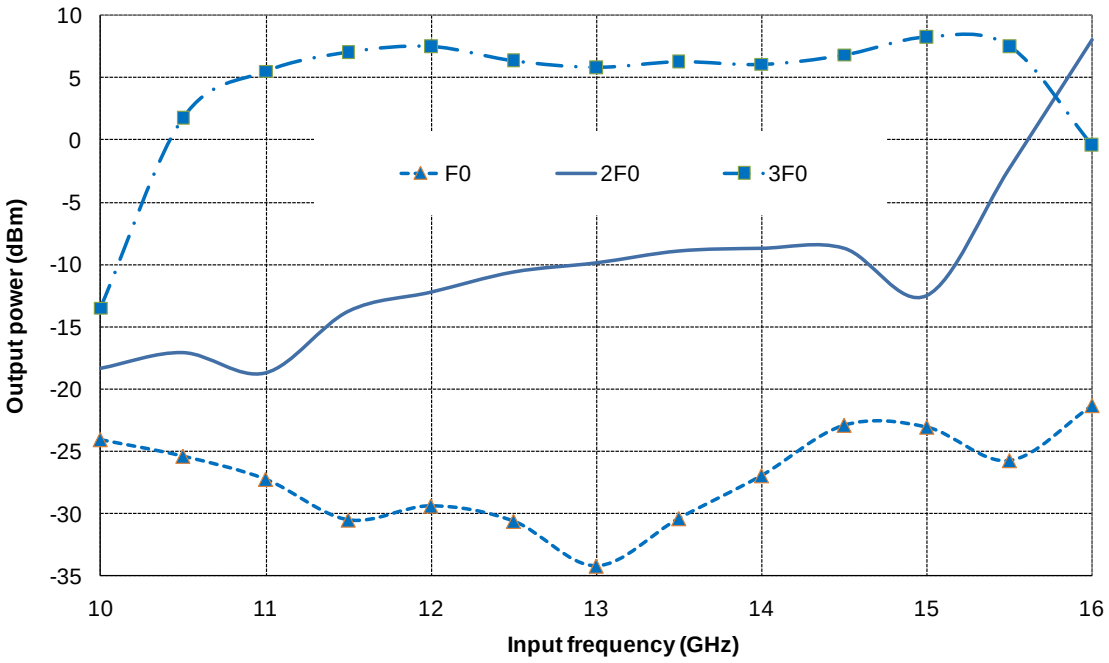
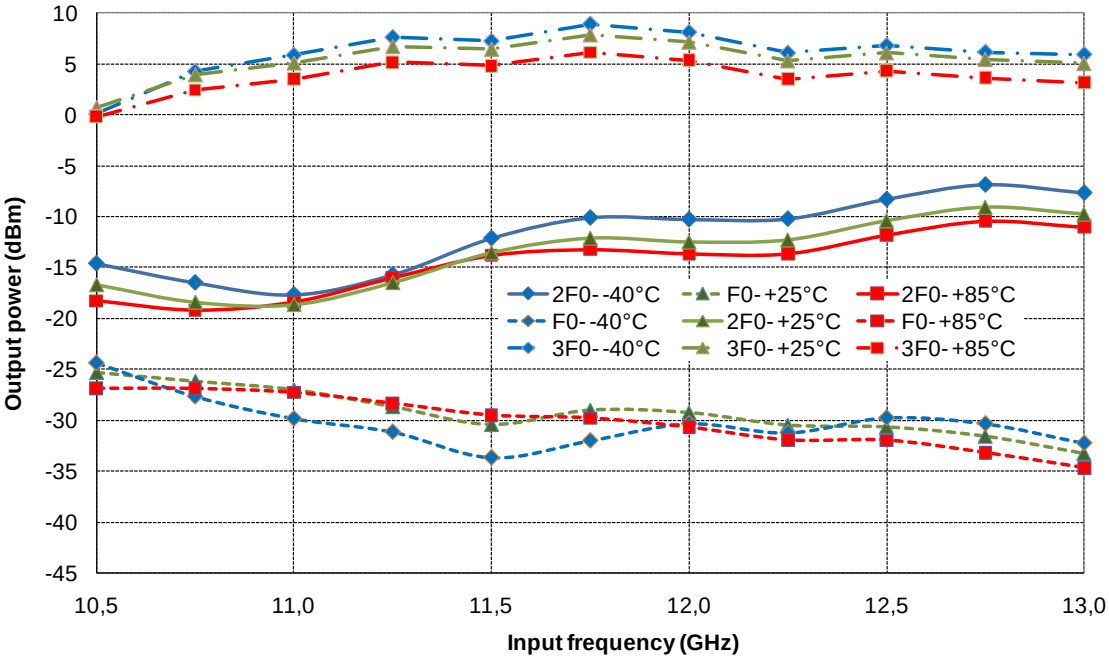
## Typical Test Fixture Measurements

Tamb.= +25°C, V+ = +5.0V, Id = 80mA

**Harmonic output power versus frequency**
**Pin= -1dBm**




**Harmonic output power versus temperature**
**Pin= -1dBm**



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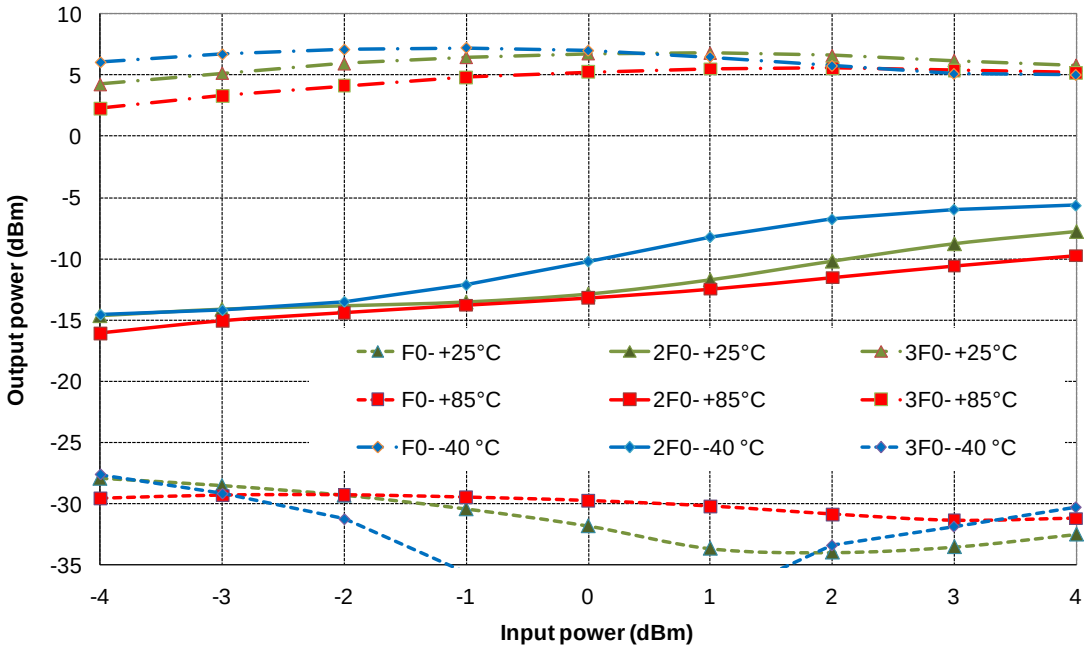
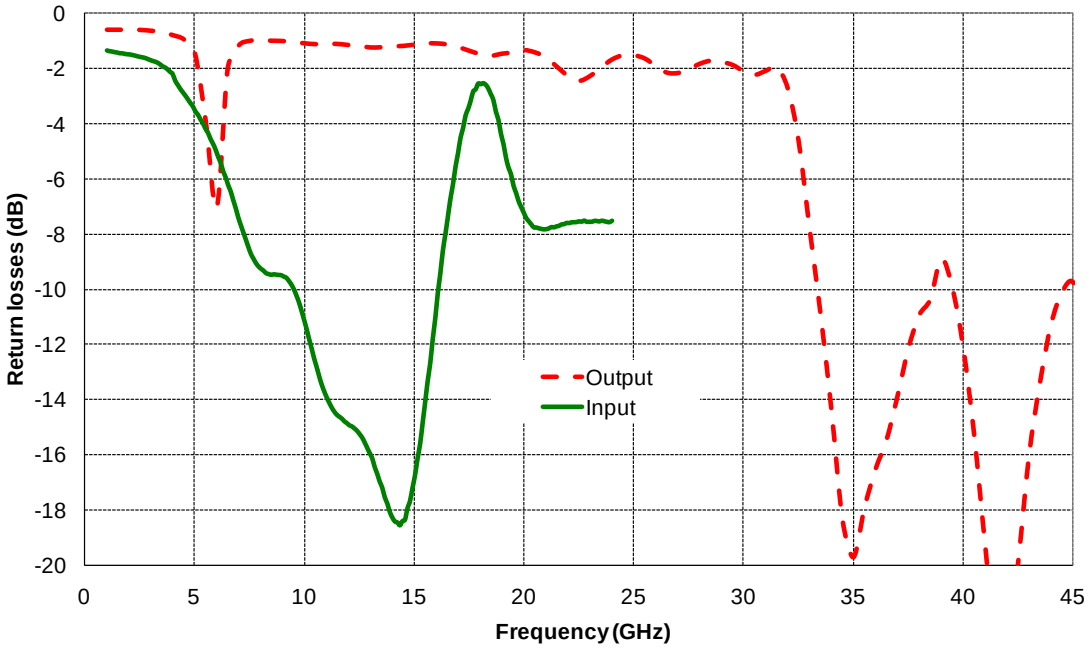
## Typical Test Fixture Measurements

Tamb.= +25°C, V+ = +5.0V, Id = 80mA

**Harmonic output power versus input power**
**F0=11.5GHz**




**Input & Output return loss**



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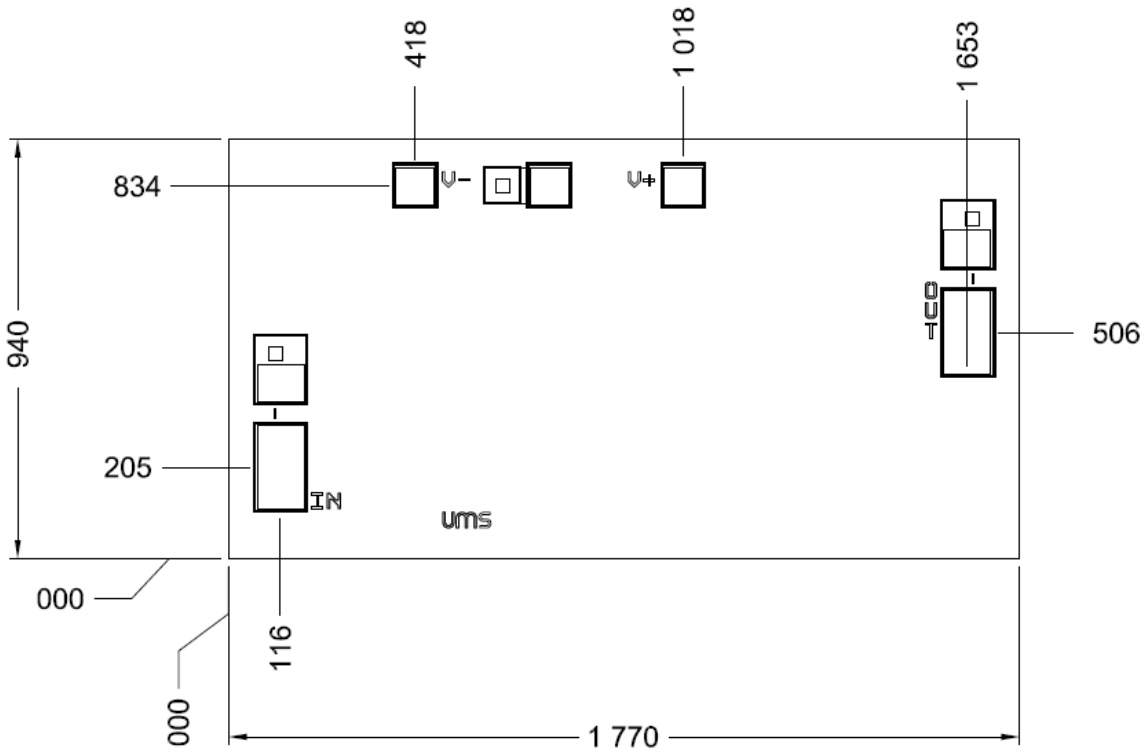
## Mechanical data




Chip thickness: 100µm.

Chip size: 1770x940 ±35µm

All dimensions are in micrometers



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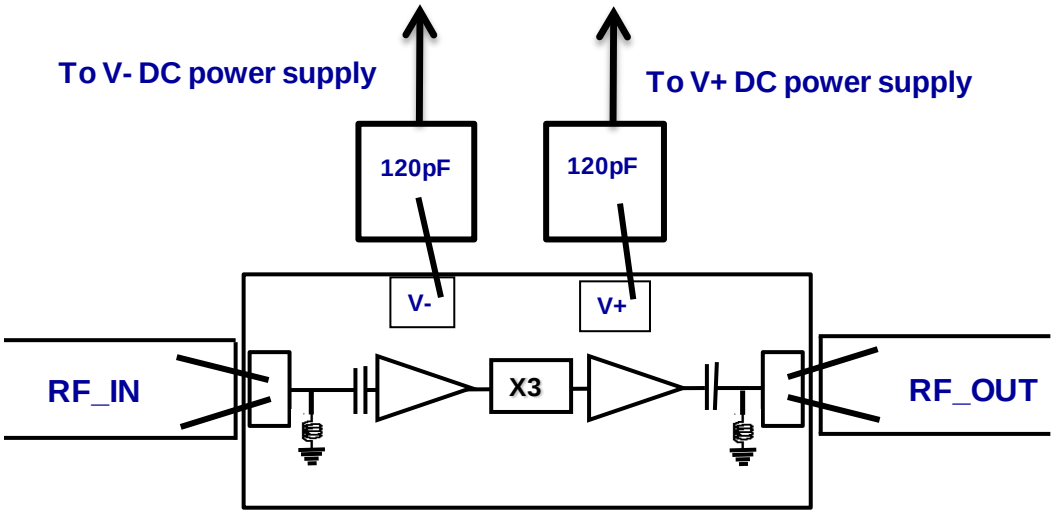
## Recommended assembly plan




25µm wedge bonding is preferred

Note: Supply feed should be bypassed. 25µm diameter gold wire is preferred.
Two wires are recommended to minimize the equivalent self inductance.
(0.15nH should be targeted).

## Recommended circuit bonding table

| Label | Type | Decoupling | Comment |
|---|---|---|---|
| RF_IN | | Required if external voltage | Inductance (Lbonding) = 0.3nH<br>Two wires: length 0.6mm |
| RF_OUT | | Required if external voltage | Inductance (Lbonding) = 0.3nH<br>Two wires: length 0.6mm |
| V+ | Vd | 120pF | Drain Supply |
| V+ | Vg | 120pF | Gate Supply |



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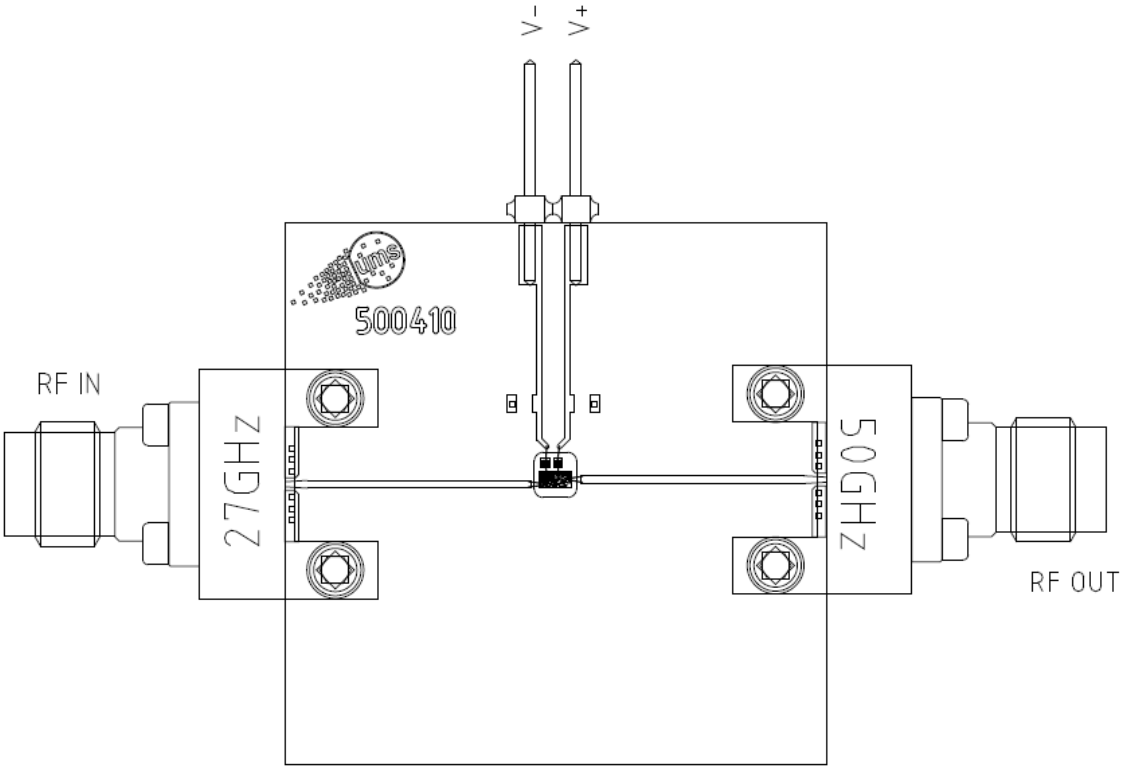
## Evaluation mother board

- Compatible with the proposed footprint.
- Based on typically Ro4003 / 8mils or equivalent.
- Decoupling capacitors of 120pF ±10% are recommended for all DC accesses.



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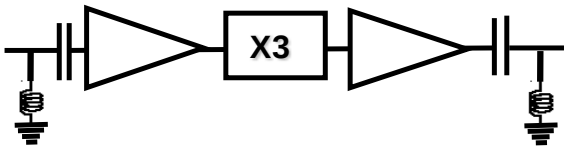
## Notes

Due to ESD protection circuits on RF input and output, an external capacitance might be requested to isolate the product from external voltage that could be present on the RF accesses.




Due to BCB coating on the chip, epoxy die attached is required.



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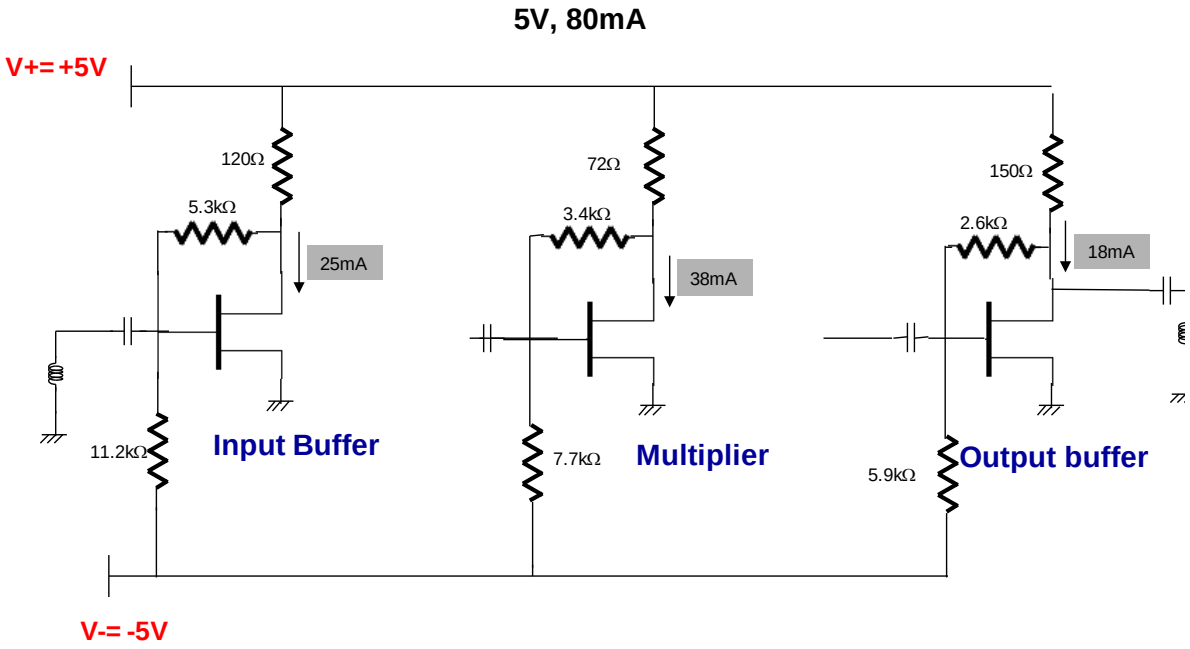
## DC Schematic



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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.

## 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: | CHX1191-98F/00 |





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