

Low Phase Noise S band HBT VCO

GaAs Monolithic Microwave IC

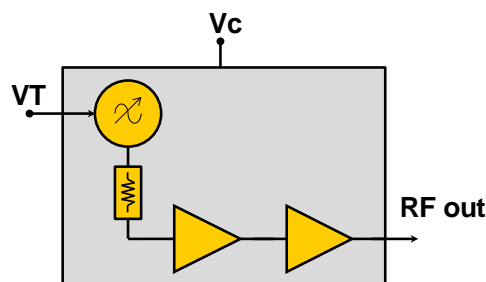
Description

The CHV1203a98F is a low phase noise S band HBT voltage controlled oscillator that integrates negative resistor, varactors and buffer amplifiers. It provides an excellent phase noise of 108dBc/Hz at 100kHz offset.

It is designed for a wide range of applications, from space to commercial communication systems.

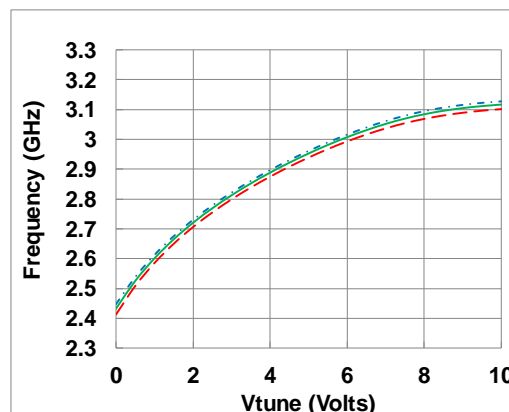
The circuit is fully integrated on InGaP HBT process: 2µm emitter length, via holes through the substrate and high Q passive elements.

It is available in chip form.



Main Features

- S-band VCO + S buffers
- Fully integrated VCO (no need for external resonator)
- Low phase noise
- High frequency stability
- On chip self-biased devices
- Available in bare die
- Chip size: 2.7x2.7x0.1mm



Main Electrical Characteristics

Tamb.= +25°C

Symbol	Parameter	Min	Typ	Max	Unit
F_out	Output frequency range on RF_out port	2.6		3	GHz
P_out	Output power on RF_out port		8		dBm
PN_100	SSB Phase Noise @ F_out @ 100kHz offset		108		dBc/Hz

Electrical Characteristics

Tamb.= +25°C, Vd = +3V

Symbol	Parameter	Min	Typ	Max	Unit
F_out	Output frequency range	2.6		3	GHz
V_Tune	Voltage Tuning range	0		10	V
	Tuning sensitivity	40		110	MHz/V
	Frequency drift rate		0.3		MHz/°C
H1	Harmonics 1/2 F_out rejection		43		dBc
H3	Harmonics 3/2 F_out rejection		35		dBc
H4	Harmonics 2 F_out rejection		35		dBc
PN_10	SSB Phase Noise given @ F_out @ 10 kHz		-85		dBc/Hz
PN_100	SSB Phase Noise given @ F_out @ 100 kHz		-108		dBc/Hz
	Output (RF_Out) Return Loss		12		dB
	Pulling into 2:1 VSWR for all phases		0.1		MHz
	Pushing vs Vc		14		MHz/V
P_out	Output Power on RF_out port		8		dBm
	Output power variation vs Tuning Voltage		0.8		dB
Vc	Positive supply voltage		3	3.5	V
I_Vc	Positive supply current		50		mA

These values are representative of measurements on board that are made with bonding wires at the RF port.

A bonding wire of typically 0.3nH will improve the matching at the accesses.

Absolute Maximum Ratings ⁽¹⁾T_{amb.} = +25°C

Symbol	Parameter	Values	Unit
V _T	Tuning voltage	15	V
V _d	Drain bias voltage	4	V
I _d	Drain bias current	100	mA
T _j	Junction temperature	175	°C
T _a	Operating temperature range	-40 to +85	°C
T _{stg}	Storage temperature range	-55 to +150	°C

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

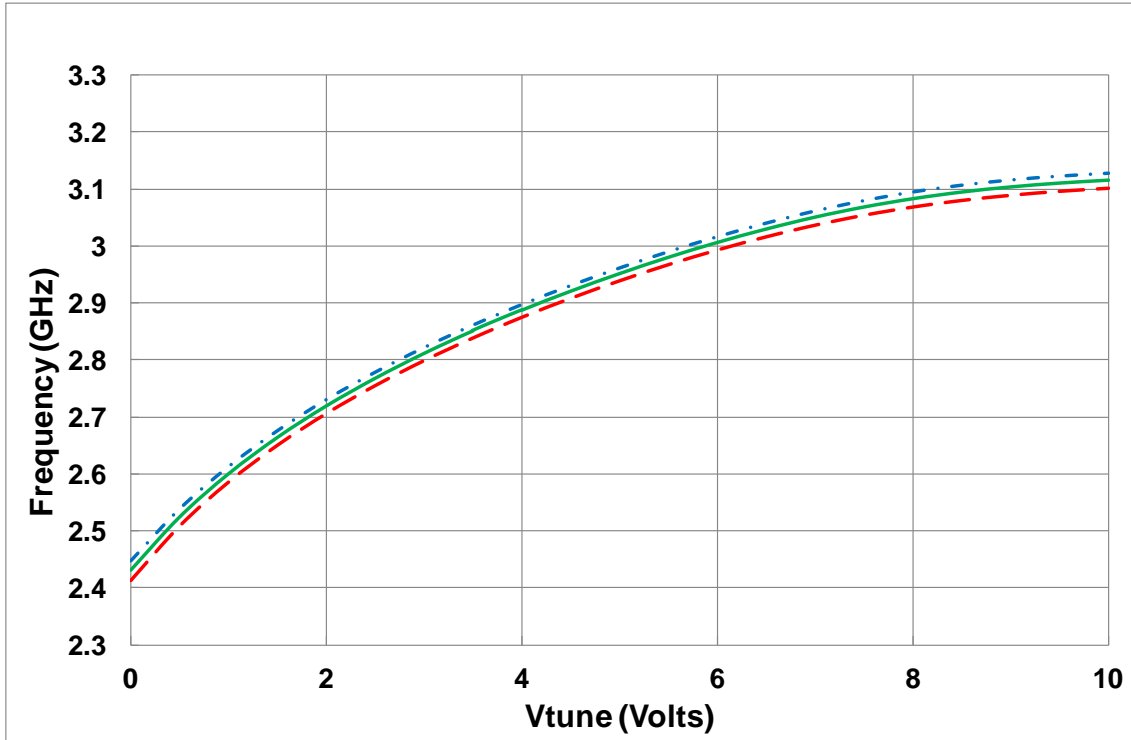
Typical Bias ConditionsT_{amb.} = +25°C

Symbol	Pad N°	Parameter	Values	Unit
V _c	VC	Positive voltage supply	3	V
V _T	VT	Tuning Voltage	0 to 10	V

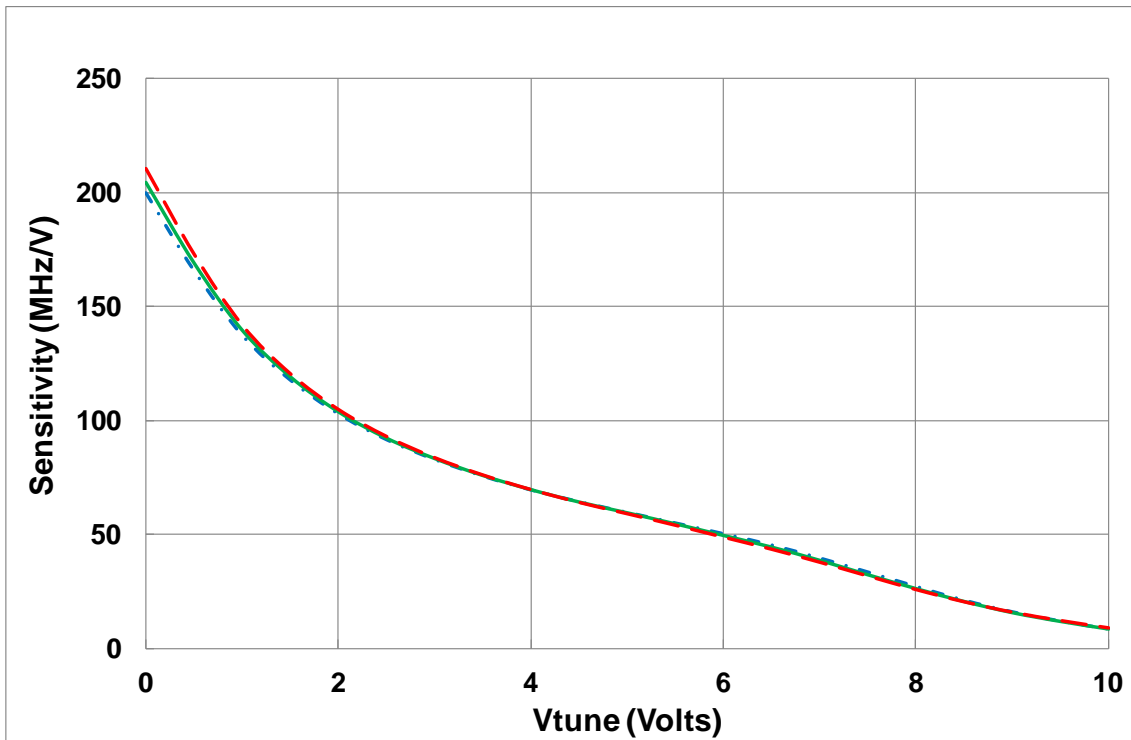
Typical Measurements on Boards

Temperature = -20, +25, +85°C, Vd = +3.0V, Id = 50mA

Output frequency versus Vtune



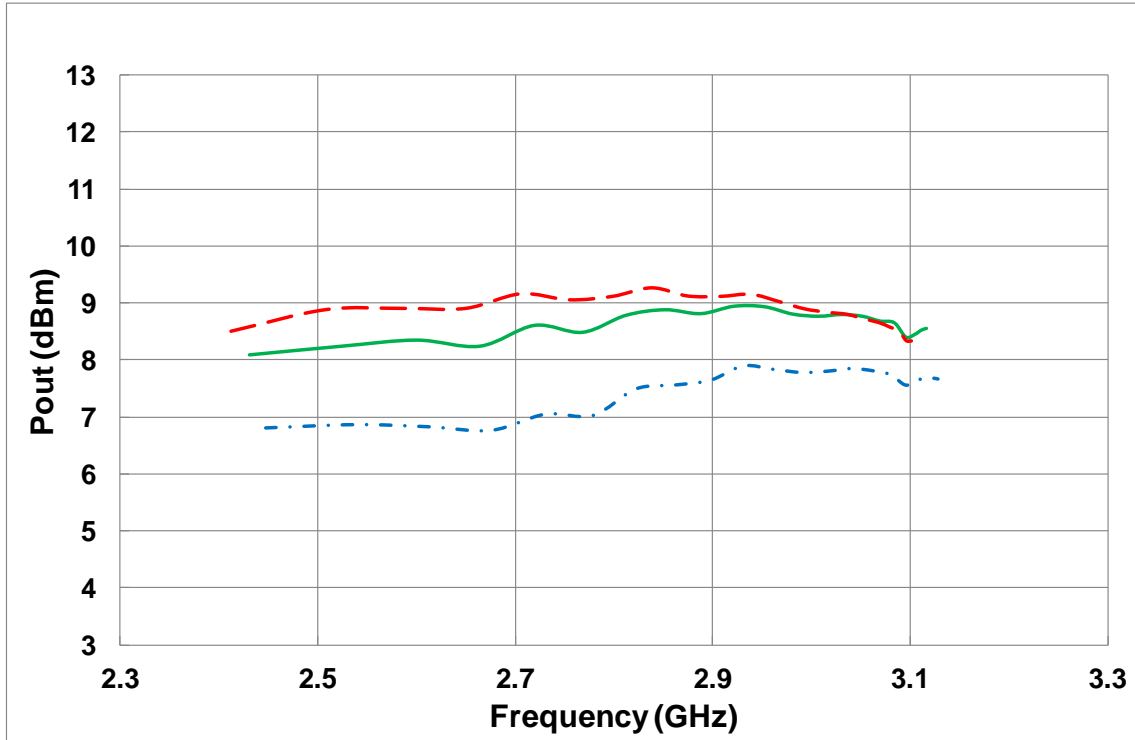
Sensitivity versus Vtune



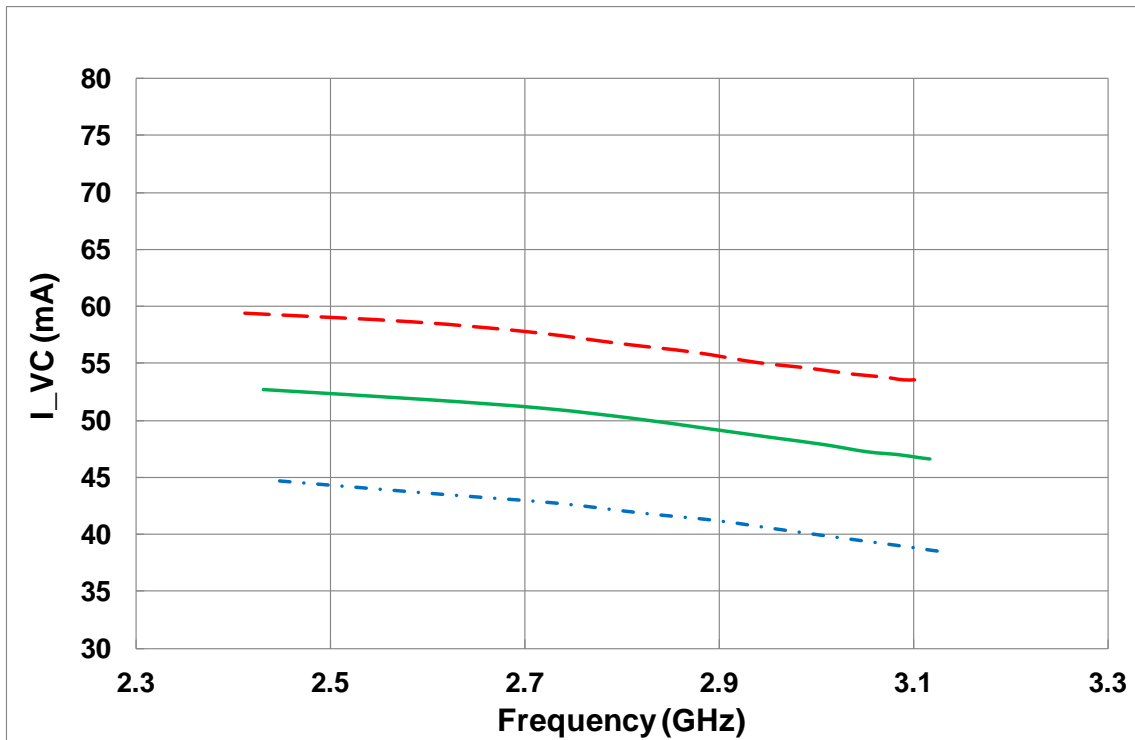
Typical Measurements on Boards

Temperature = -20, +25, +85°C, Vd = +3.0V, Id = 50mA

Output power versus frequency



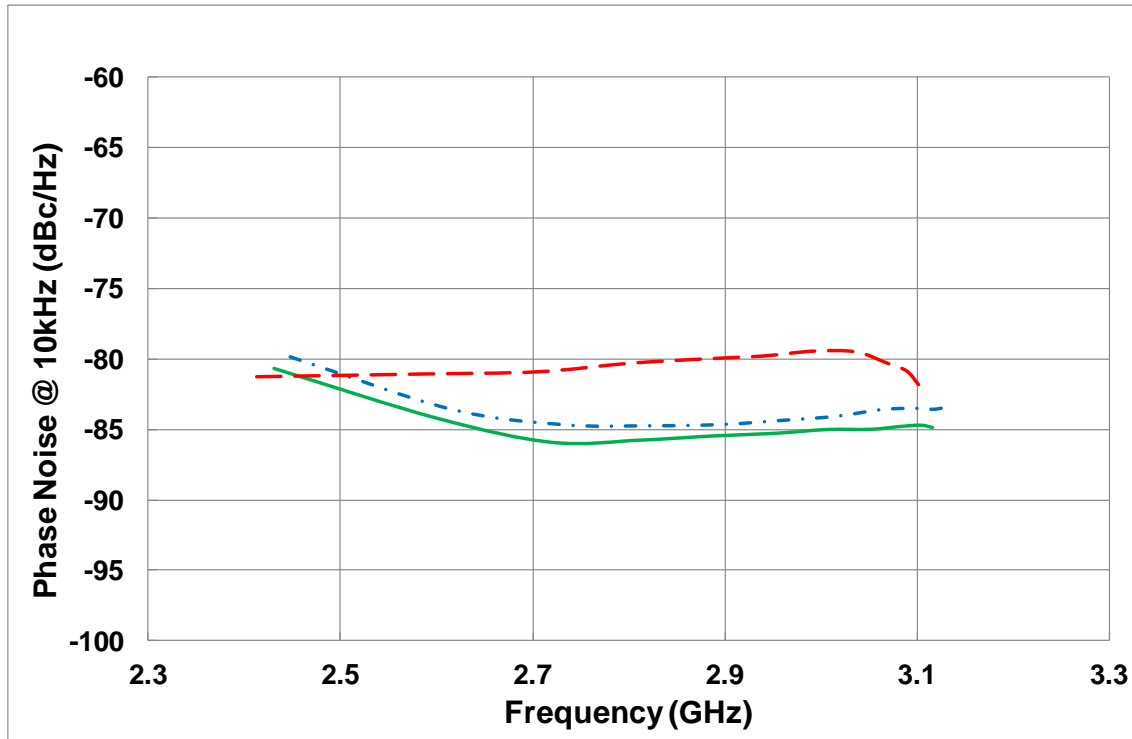
Positive current versus frequency



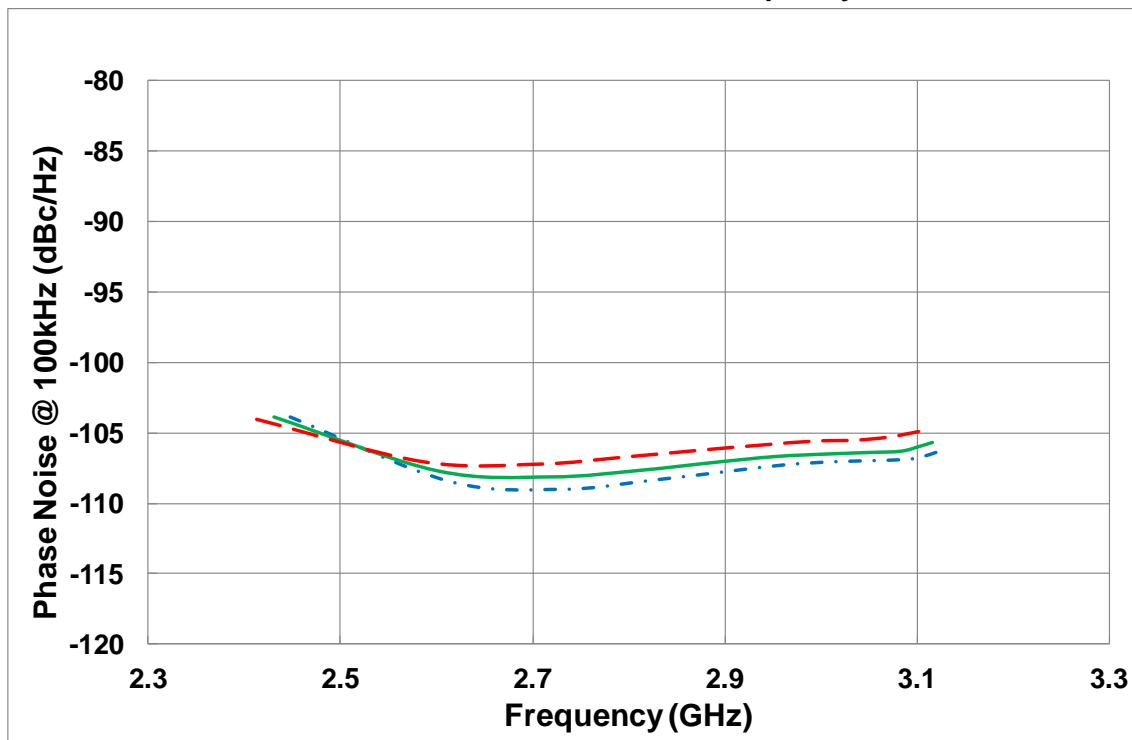
Typical Measurements on Boards

Temperature = -20, +25, +85°C, Vd = +3.0V, Id = 50mA

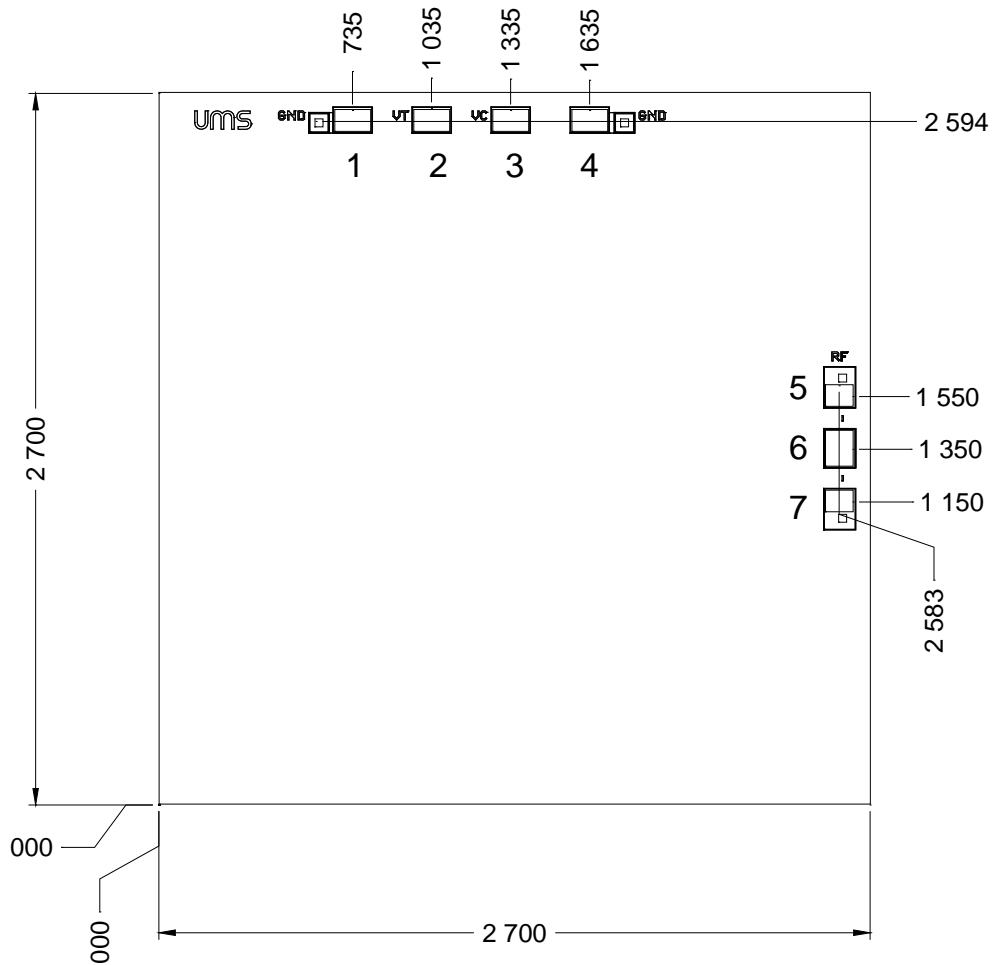
Phase Noise @ 10kHz versus frequency



Phase Noise @ 100kHz versus frequency



Mechanical data

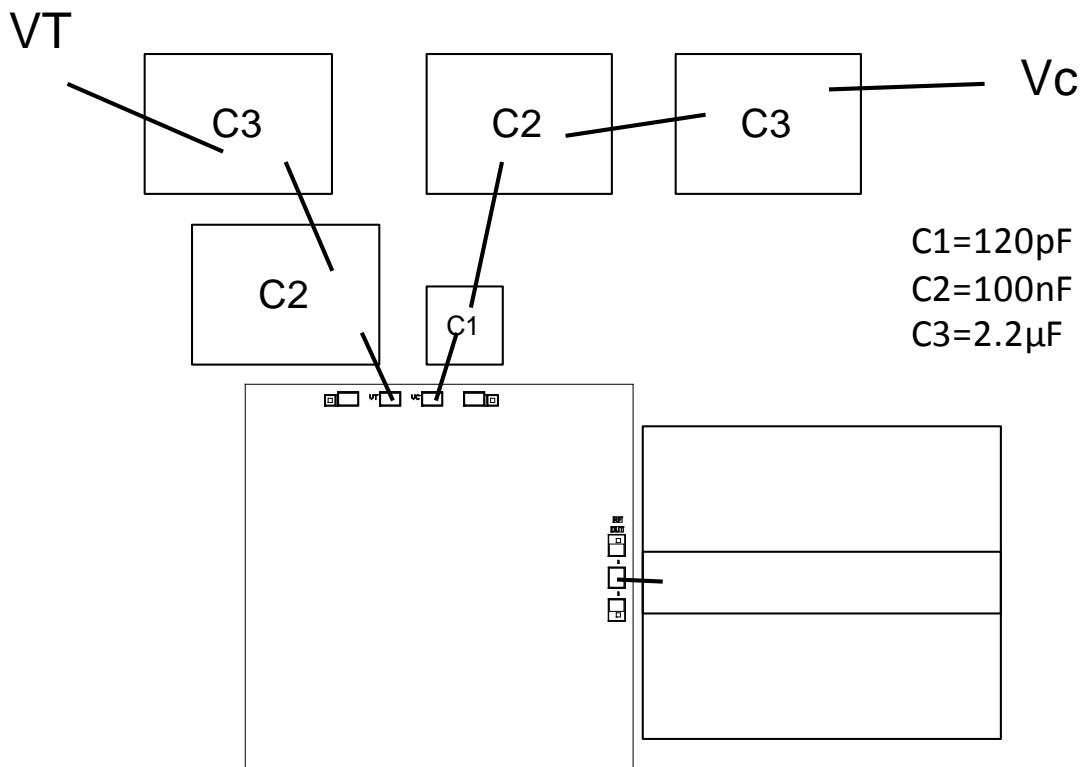


UNITS : μm
Tol : $\pm 35\mu\text{m}$

All dimensions are in micrometers
 Chip size = 2700 x 2700
 Chip thickness = $100\mu\text{m} \pm 10\mu\text{m}$
 RF pad = $105 \times 136\mu\text{m}^2$ (BCB opening)
 DC pads = $136 \times 83\mu\text{m}^2$ (BCB opening)
 Chip width and length are given with a tolerance of $\pm 35\mu\text{m}$

PAD Number	Name	Description
6	RF OUT	Output RF port
1, 4, 5, 7	GND	Ground (NC)
2	VT	Varactor Tuning voltage
3	VC	Positive supply voltage

Recommended assembly plan



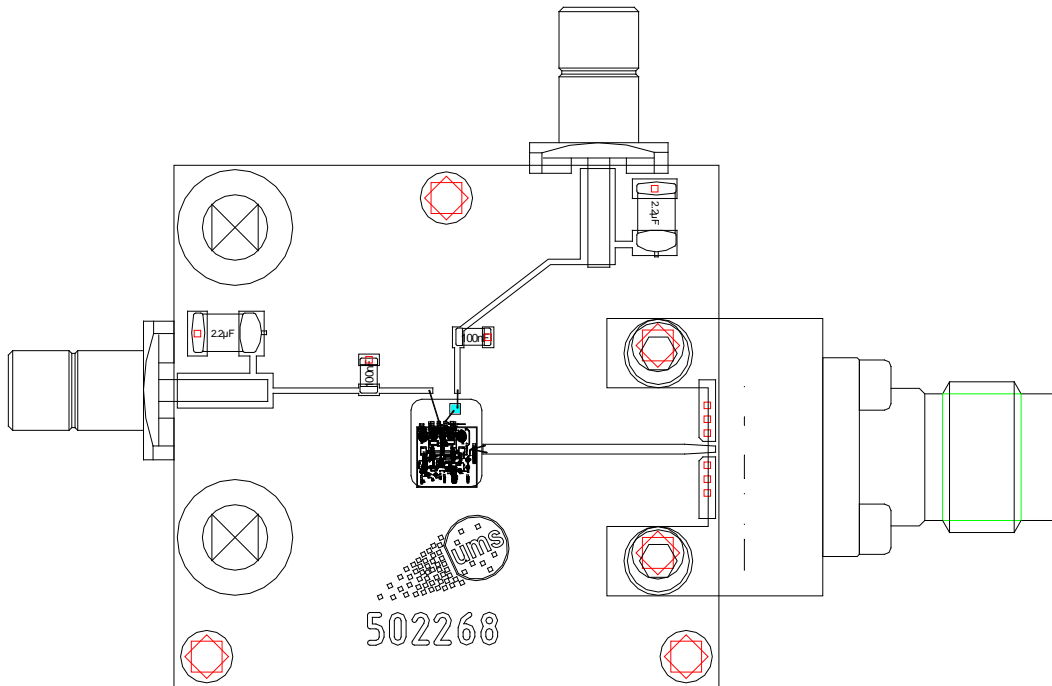
Note: 25μm diameter gold wire wedge bonding is to be preferred.

Recommended circuit bonding table

Label	Type	Decoupling	Comment
RF OUT	RF	Not required	VCO output port
VC	Vc	120pF & 100nF & 2.2μF	Collector Supply
VT	VT	100nF & 2.2μF	Varactor Supply

Evaluation mother board

- Based on typically Ro4003 / 8mils or equivalent.
- Decoupling capacitors of 120nF, 100nF $\pm 10\%$ and 2.2 μ F $\pm 10\%$ are recommended for all DC accesses.



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: CHV1203a98F/00

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