Low Phase Noise C band HBT VCO

GaAs Monolithic Microwave IC

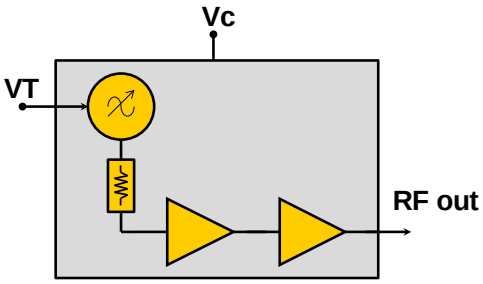
Description

The CHV1206a98F is a low phase noise C band HBT voltage controlled oscillator that integrates negative resistor, varactors and buffer amplifiers. It provides an excellent phase noise of 100dBc/Hz at 100kHz offset.

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

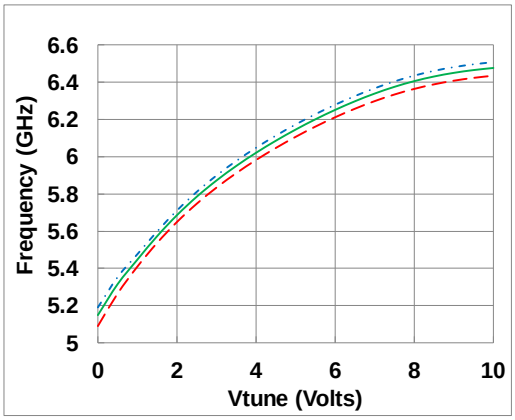
The circuit is fully integrated on InGaP HBT process: 2µm emitter length, via holes through the substrate and high Q passive elements.

It is available in chip form.



Main Features

- C-band VCO + C 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	5.35		6.1	GHz
P_out	Output power on RF_out port		8.5		dBm
PN_100	SSB Phase Noise @ F_out @ 100KHz offset		100		dBc/Hz

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Electrical Characteristics

Tamb.= +25°C, Vd = +3V

Symbol	Parameter	Min	Typ	Max	Unit
F_out	Output frequency range	5.35		6.1	GHz
V_Tune	Voltage Tuning range	0		10	V
	Tuning sensitivity	110		275	MHz/V
	Frequency drift rate		0.9		MHz/°C
H1	Harmonics ½ F_out rejection		58		dBc
H3	Harmonics 3/2 F_out rejection		56		dBc
H4	Harmonics 2 F_out rejection		28		dBc
PN_10	SSB Phase Noise given @ F_out @ 10 kHz		-78		dBc/Hz
PN_100	SSB Phase Noise given @ F_out @ 100 kHz		-100		dBc/Hz
	Output (RF_Out) Return loss		12		dB
	Pulling into 2:1 VSWR for all phases		0.3		MHz
	Pushing vs Vc		13		MHz/V
P_out	Output Power on RF_out port		8.5		dBm
	Output power variation vs Tuning Voltage		1.2		dB
Vc	Positive supply voltage		3	3.5	V
I_Vc	Positive supply current		75		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.

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Absolute Maximum Ratings (1)

Tamb.= +25°C

Symbol	Parameter	Values	Unit
VT	Tuning voltage	15	V
Vd	Drain bias voltage	4	V
Id	Drain bias current	110	mA
Tj	Junction temperature	175	°C
Ta	Operating temperature range	-40 to +85	°C
Tstg	Storage temperature range	-55 to +150	°C

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

Typical Bias Conditions

Tamb.= +25°C

Symbol	Pad Nº	Parameter	Values	Unit
Vc	VC	Positive voltage supply	3	V
VT	VT	Tuning Voltage	0 to 10	V

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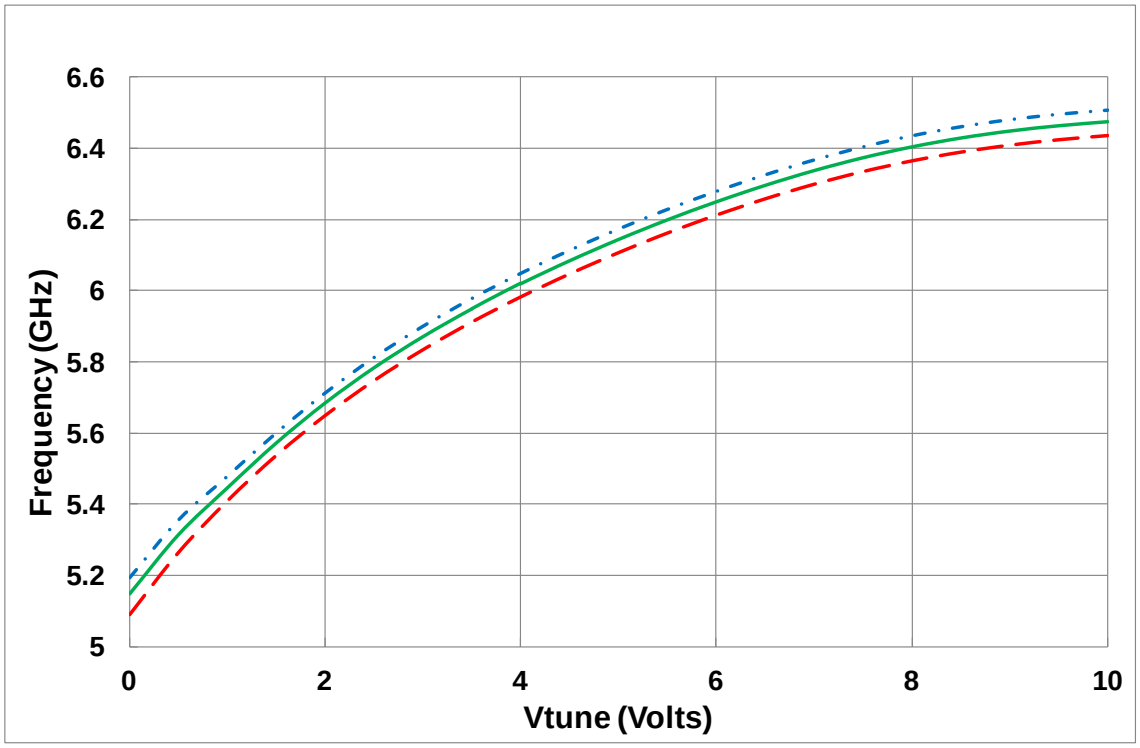
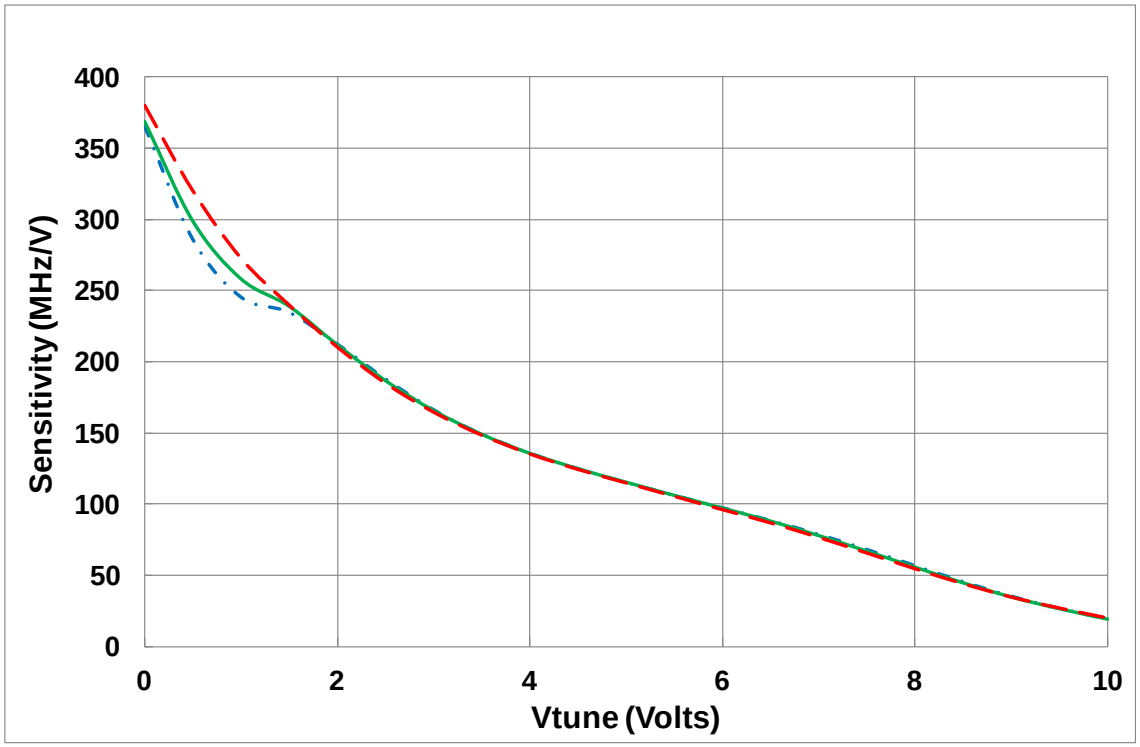
Typical Measurements on Boards

Temperature = -20, +25, +85°C, Vd = +3.0V, Id = 75mA

Output frequency versus Vtune



Sensitivity versus Vtune



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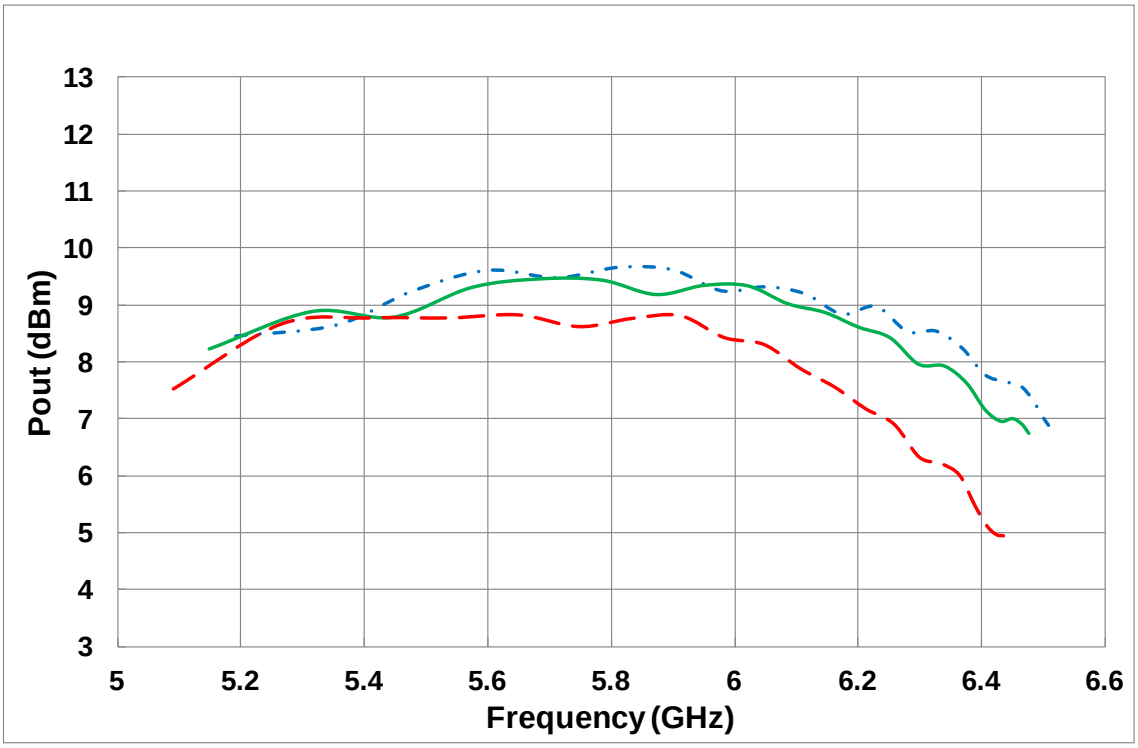
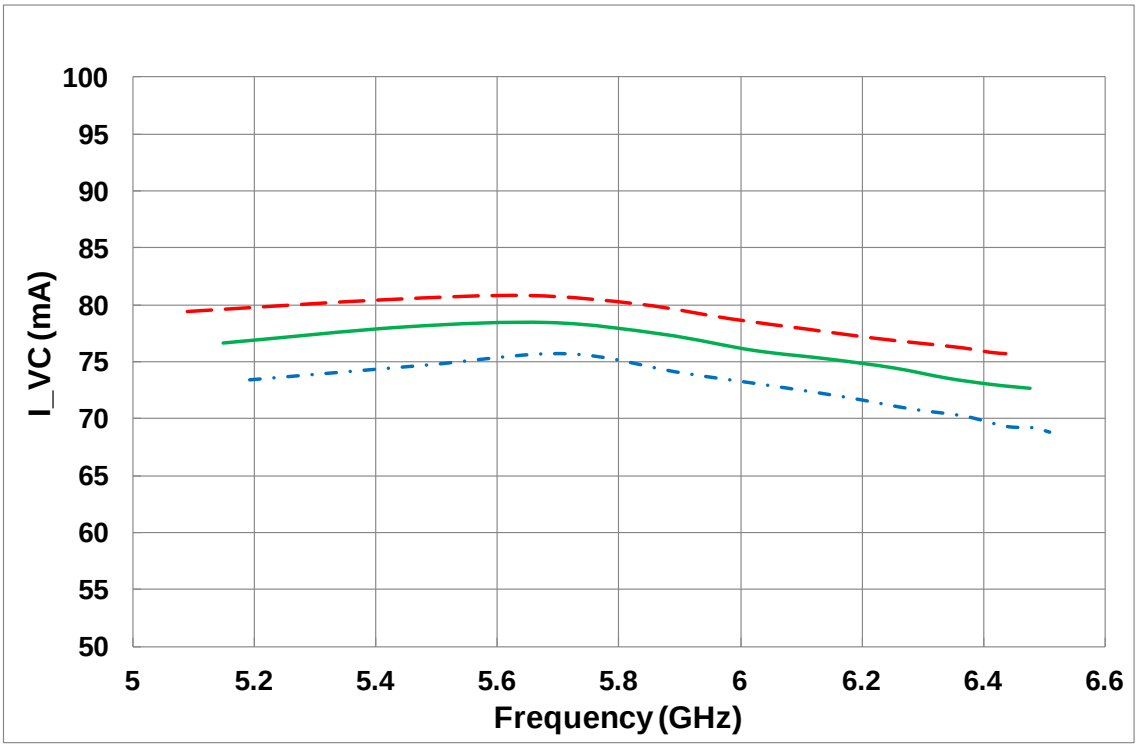
Typical Measurements on Boards

Temperature = -20, +25, +85°C Vd = +3.0V, Id = 75mA

Output power versus frequency



Positive current versus frequency



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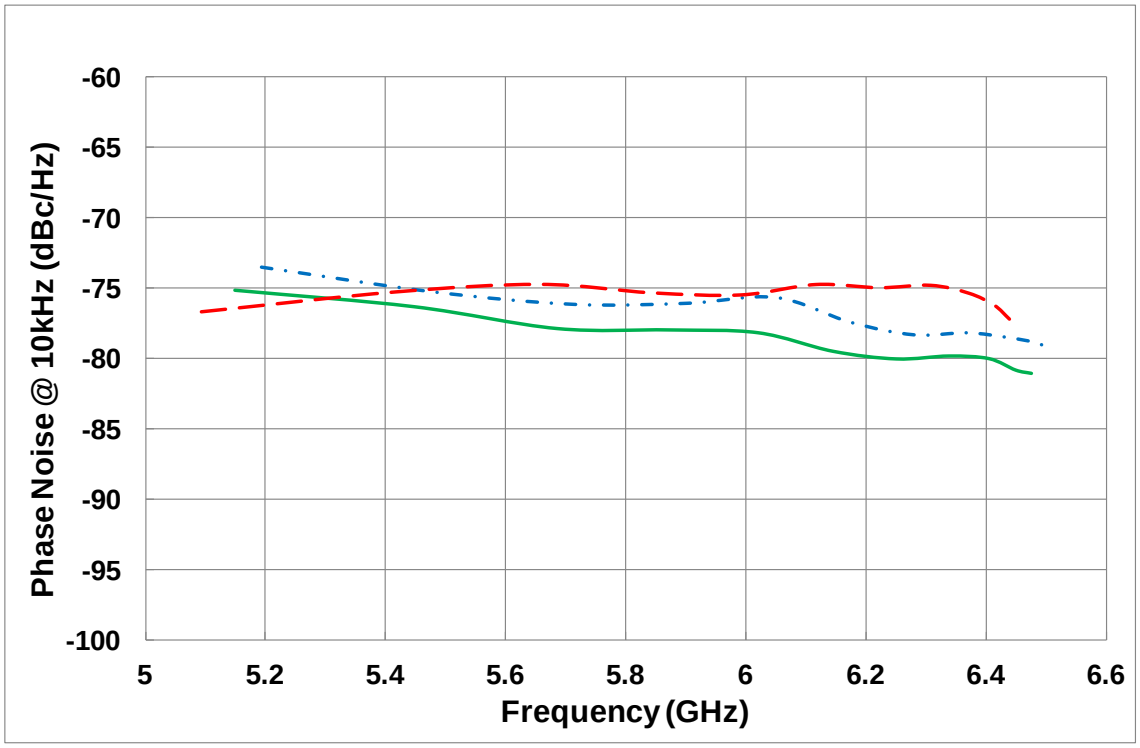
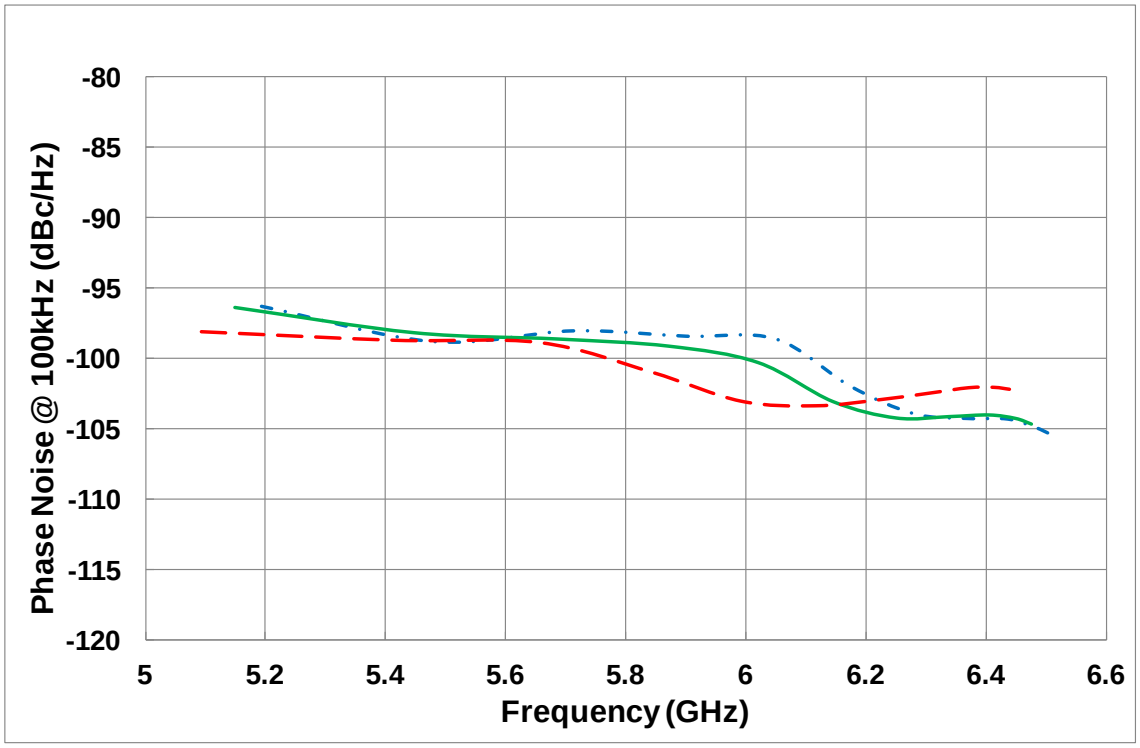
Typical Measurements on Boards

Temperature = -20, +25, +85°C, Vd = +3.0V, Id = 75mA

Phase Noise @ 10kHz versus frequency



Phase Noise @ 100kHz versus frequency



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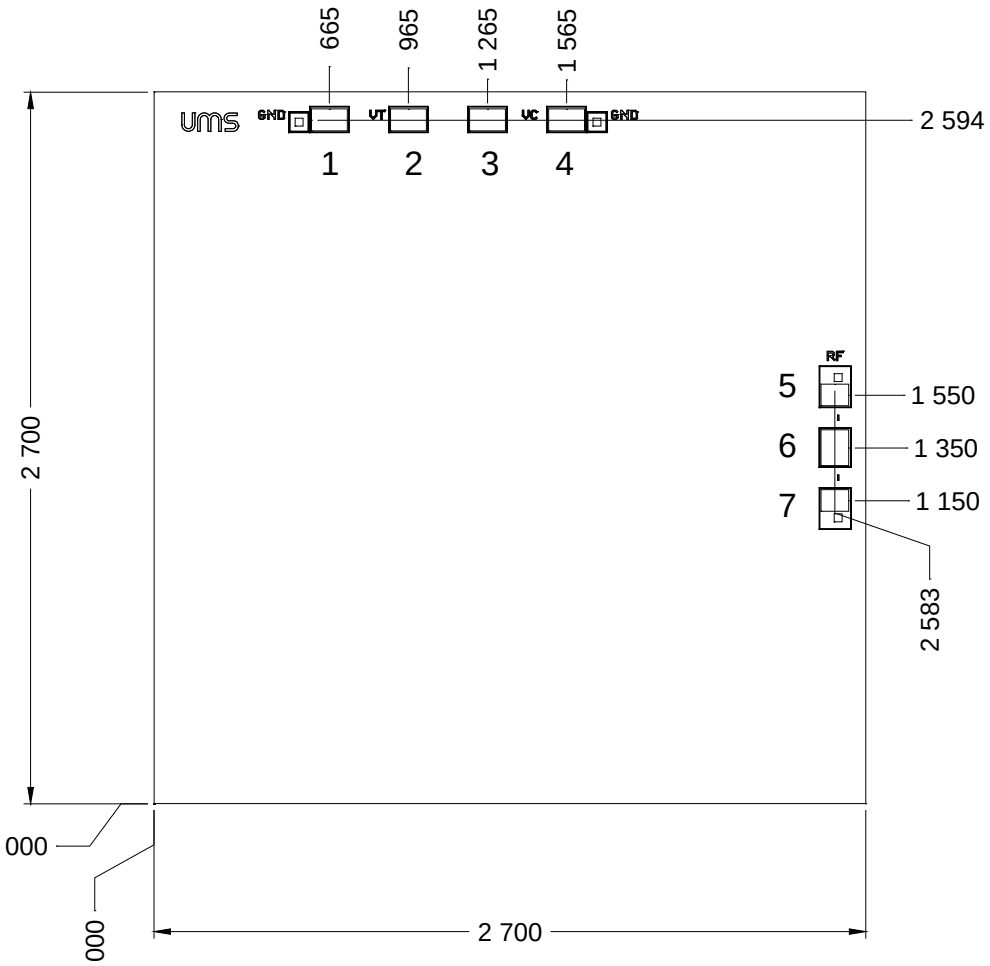
Mechanical data



UNITS : µm
Tol : ± 35µm

All dimensions are in micrometers
Chip size = 2700 x 2700
Chip thickness = 100µm ±10µm
RF pad = 105 x 136µm² (BCB opening)
DC pads = 136 x 83µm² (BCB opening)
Chip width and length are given with a tolerance of ±35µm

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

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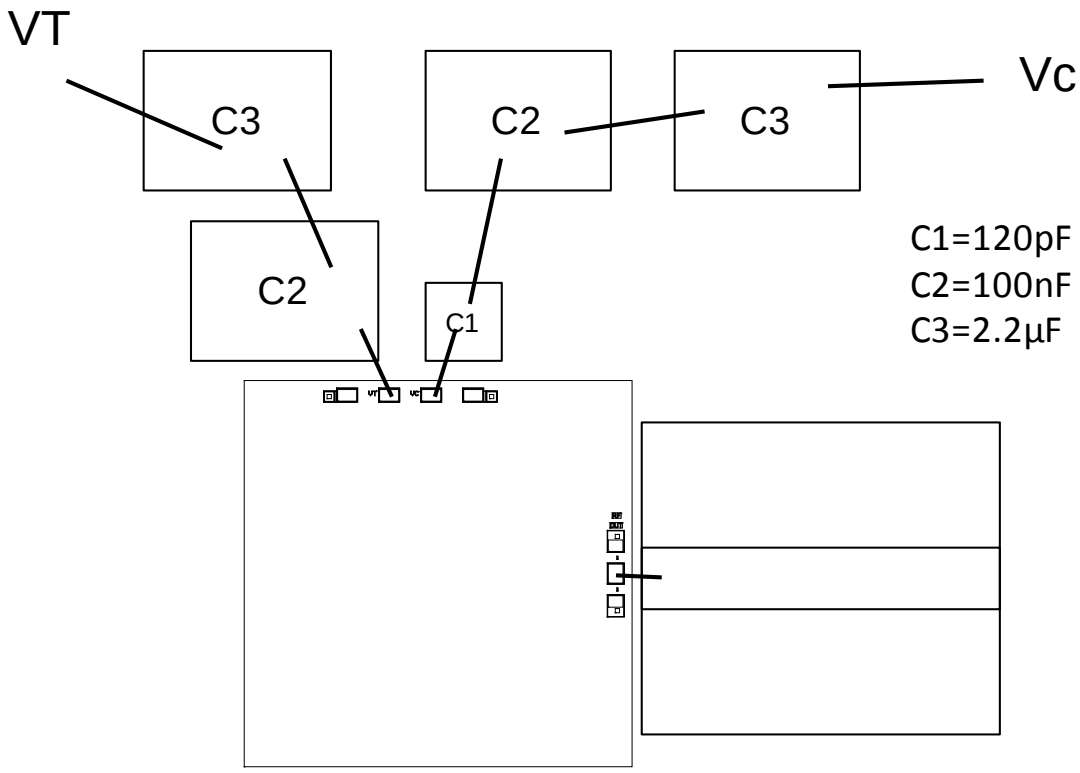
Recommended assembly plan



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

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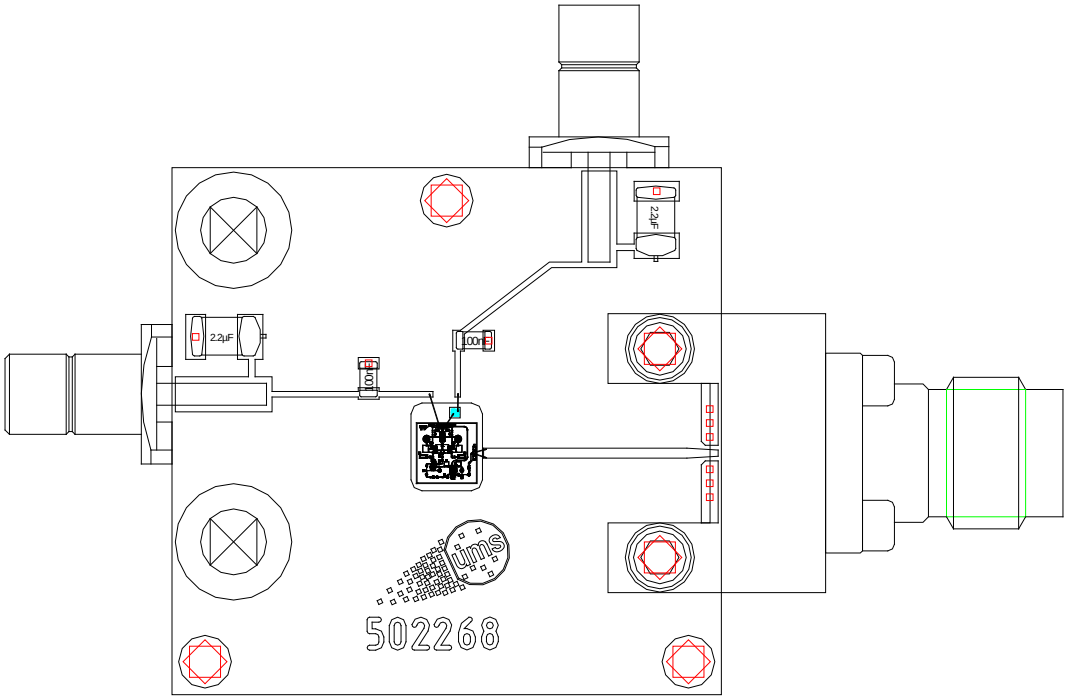
Evaluation mother board

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



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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:	CHV1206a98F/00

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