

VO3280 VCO series

Wideband Fundamental Voltage Controlled Oscillator

General Description

The VO3280 VCO is a drop-in Voltage Controlled Oscillator intended for any application where size and performance is important.

Wideband and Low Noise are optimized, still appreciating low current consumption and high output power.

The VO3280 VCO series is also available in various packages with SMA connectors and solder pins.

To make the assembly easier, the VCO can be equipped with wires and ribbons in the factory. Consult Sivers IMA for details. Application notes described in this document are applicable on all VCO's in this series.

The VCO's are manufactured in a class 10.000 clean room.

Features

- High Bandwidth
- Low Noise
- High Linearity
- Medium High Power
- Extended temperature range
- Hermetically sealed
- Drop-in or in housing (VO4280)
- Standard housings available
- Custom housings available
- Custom frequency ranges
- Coplanar RF port available (VO3284)

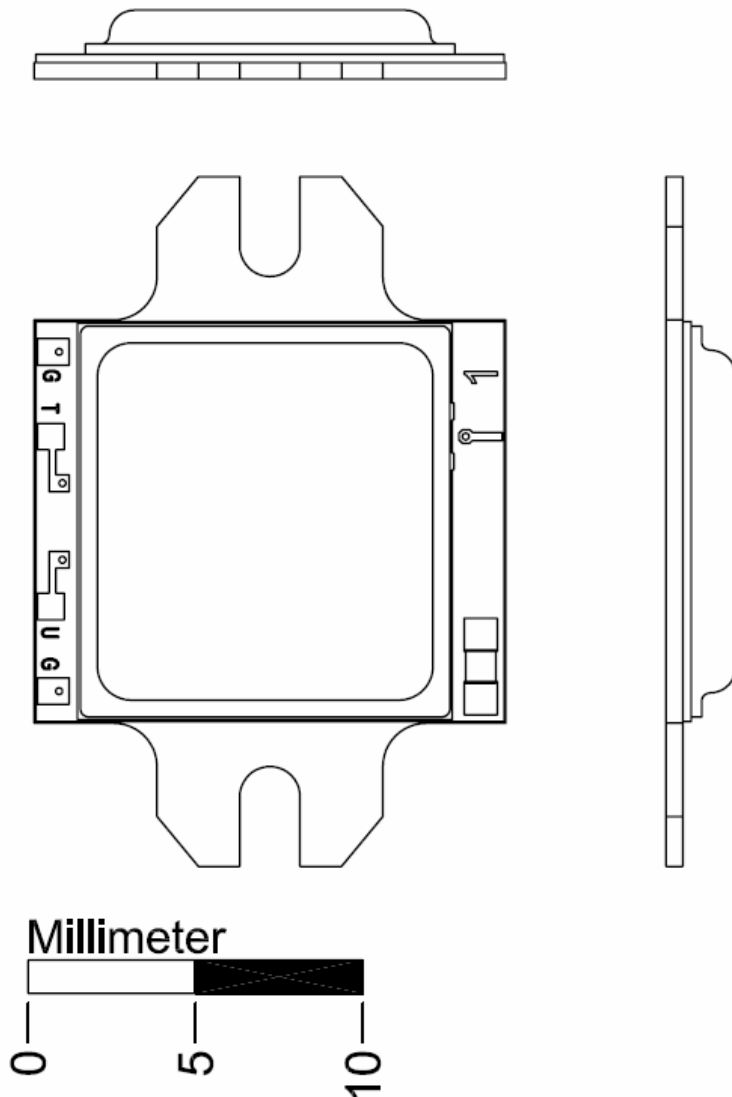
Standard Models

- | | | |
|--------------|-------------|-------|
| • VO3280S/01 | 2-3GHz | 15dBm |
| • VO3280S/00 | 3-5GHz | 15dBm |
| • VO3280C/00 | 5-8,4GHz | 15dBm |
| • VO3280X/00 | 8,4-13,5GHz | 15dBm |
| • VO3280P/00 | 13,5-20GHz | 15dBm |

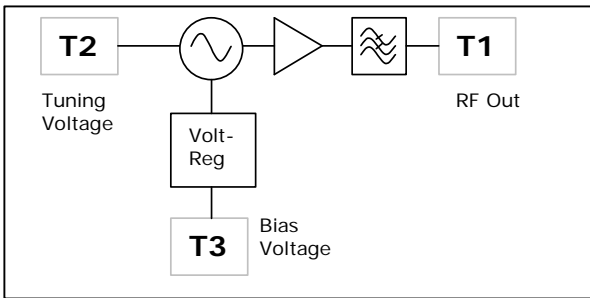
See www.siversima.com for other frequencies and output power.

Contact information

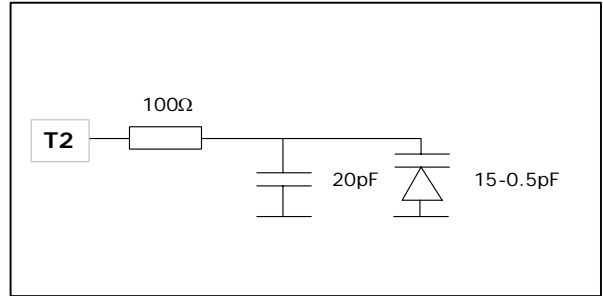
SiversIMA is known for custom products. For special requests or other questions, contact your local sales representative or SiversIMA directly. SiversIMAs R&D department will be happy to answer any questions. See www.siversima.com for contact information.



Block Diagram VCO



Tuning Interface



Connections

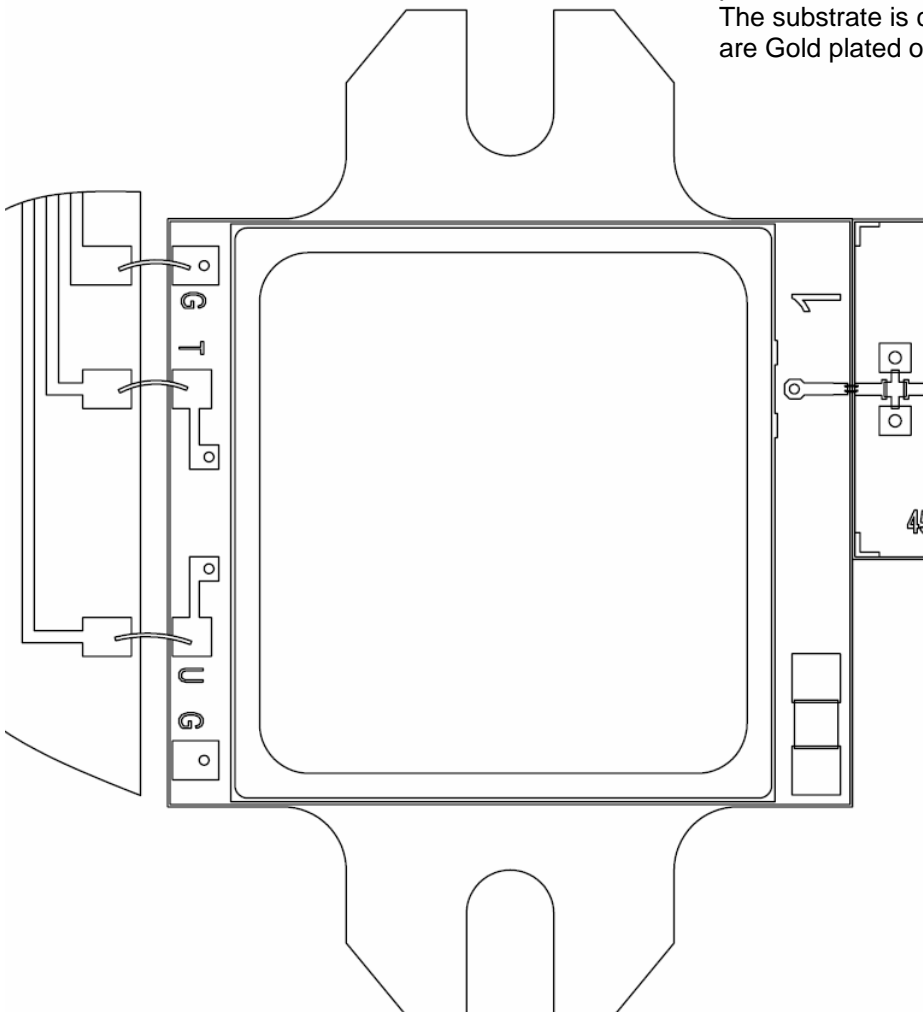
All connections should be wire or ribbon bonded. Use of wedgebonder or parallel gap welder is recommended. Temperature during assembly should not exceed 200°C. Conductive adhesive could be used as an option. **Do not attempt to solder any connections.** The shape and quality of the RF output bond, **both** stripline and ground, is crucial. See details below for your application.

Wire recommendations

- RF output 2x25μm gold wire **or**
1x250μm gold ribbon
- Tune input 75μm gold wire
- Bias input 75μm gold wire
- Ground through carrier

Material

The Carrier and Lid is made of Kovar, Gold plated over a barrier of Nickel. The substrate is ceramic and the connections are Gold plated on Tantalum Nitride.



Assembly example with 75μm wires on Bias(U) and Tune(T). RF output is bonded with two 25μm wires. Ground(G) wire is optional as the VCO is grounded through the carrier.

Electrical Requirements and Features

Bias

Even though the VCO is fitted with an internal regulator, a low noise power supply and proper bias filtering is important to obtain a low noise RF signal. Avoid using a switched (switch-mode) power supply directly on the bias input, or be extra careful with the bias filtering. A linear power supply is recommended. A 100nF capacitor close to the bias connection is preferred.

Tune

The oscillators Tuning Input Voltage is somewhere between 0V and +20V. See the individual Test Reports for exact Tuning v.s. Frequency characteristics. Normally the tuning current is below 100 μ A. There is some RF-leakage on the Tune and Bias terminals.

On demand, the tuning bandwidth can be adjusted to >100MHz.

S- and C-band oscillators are normally temperature compensated bipolar oscillators that will not oscillate below 2V tuning voltage.

If the oscillator should be running at all times, i.e. idle in a PLL, the tuning voltage should be kept above 2V in order to keep the PLL locked.

RF output

The RF output is a 250 μ m wide stripline, $Z_0=50\Omega$. The RF out is AC-coupled with a 10pF cap.

A built in lowpass filter reduces the harmonic to better than -25dBc.

Since this is a fundamental oscillator, there are no sub harmonics.

Higher harmonics are generally lower than the second harmonics.

The VO3280 series provides up to +18dBm output power.

A coplanar GSG output (Ground-Signal-Ground) is available.

Documentation

All SiversIMAs products are delivered with full Test Report in digital form. The Test Report contains all measured data and graphs, showing the VCO's Tuning and Power characteristics, as well as Noise Performance.

The products are also delivered with Certificate of Conformity (CoC) and Certificate of Origin (CoO) upon request.

VCO Selection Guide

Standard ⁽¹⁾ Frequency Band	Drop-in ⁽²⁾ Stripline	Drop-in ⁽²⁾ Coplanar	SMA – SMA Housing	SMA – Solder Pin Housing
2-3 GHz	VO3280S/01	VO3284S/01	VO4280S/01	VO4283S/01
3-5 GHz	VO3280S/00	VO3284S/00	VO4280S/00	VO4283S/00
5-8,4 GHz	VO3280C/00	VO3284C/00	VO4280C/00	VO4283C/00
8,4-13,5 GHz	VO3280X/00	VO3284X/00	VO4280X/00	VO4283X/00
13,5-20 GHz	VO3280P/00	VO3284P/00	VO4280P/00	VO4283P/00

⁽¹⁾ See www.siversima.com for other frequency bands and outline drawings.

⁽²⁾ Could be assembled with conductive epoxy, but special bond tools such as parallel gap welder or wedge bonder is recommended.

Application Recommendations

General.

Avoid use of thermal compound.

Use a minimum of screw-lock adhesive in order to prevent it from entering between the carrier and heat sink.

The heat sink should be able to dissipate 4 Watts, keeping the base temperature below 65°C, unless the VCO is ordered with an extended temperature range.

Operating temperatures up to +85°C and -45°C is available.

Application where the VCO is connected to a coaxial connector

Mechanical design.

The radius between the bottom and wall should be kept below 100µm.

See Figure 1 and mechanical drawing AN3280_1.

Preparations.

SMA contacts should be assembled and the VCO prepared with wires or ribbon before it is mounted in place. This will make the connections easier. The ribbon and wires could be pre-mounted in factory. Contact Sivers IMA.

The RF output connection is most important. Extra effort should be used above 12GHz. Make sure that the signal ground path is as short as possible. The VCO's carrier and the receiving units ground plane should be in good physical contact. The gap should not exceed 100µm. If conductive epoxy is used to ensure contact, be careful not to contaminate the substrate around the RF stripline. If there is necessary to remove any residue on the substrate, avoid using metal tools, as this will contaminate the substrate with metal instead.

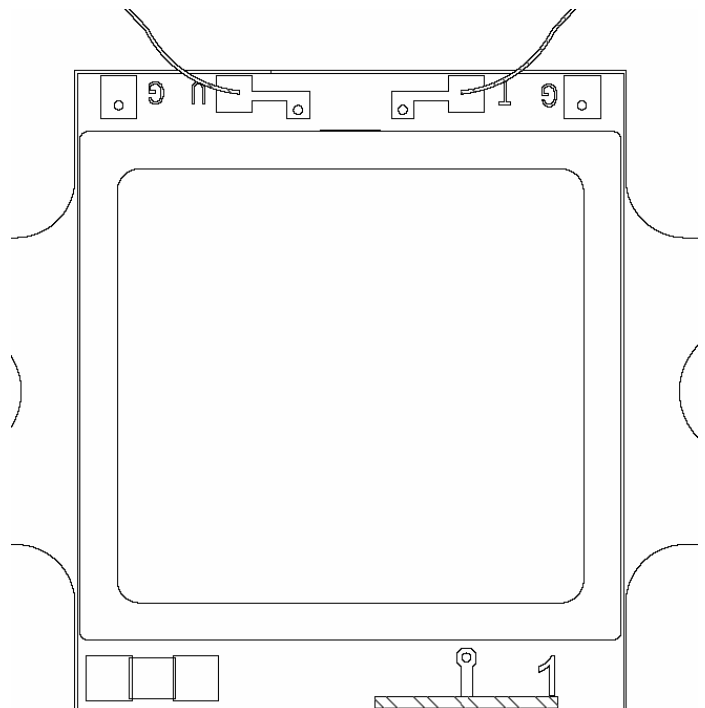


Figure 2. Pre-mounted ribbon on RF output for connection to i.e. coaxial center pin and 75µm wires on Bias and Tune pads.

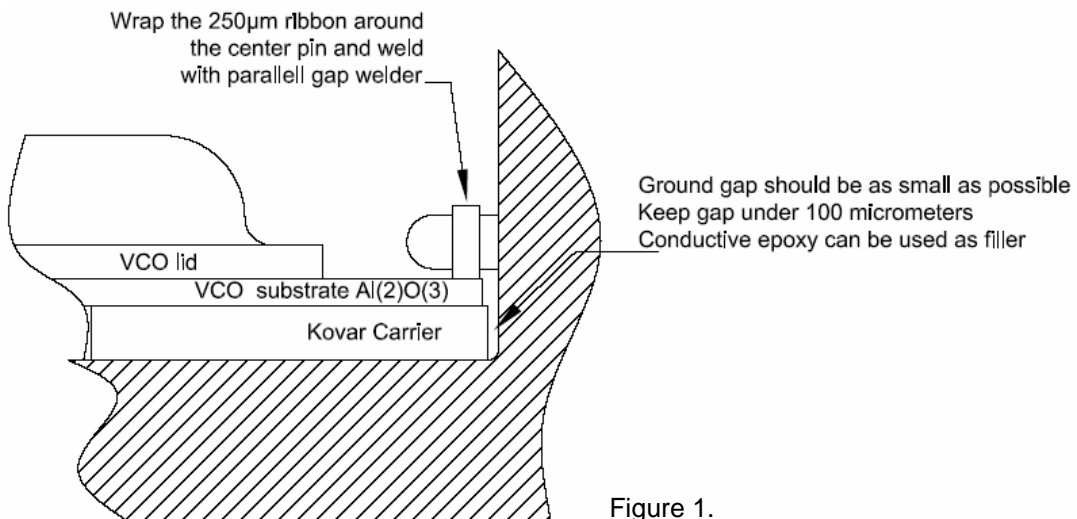


Figure 1.

Connecting the VCO to a aluminium oxide substrate

Mechanical design

The VCO's substrate and the receiving substrate should be in the same level to keep the RF output bonds short.

It is important to keep the distance between the signal grounds short.

See Figures 3a, 3b and mechanical drawing AN3280_2 for details.

Two examples of assembly

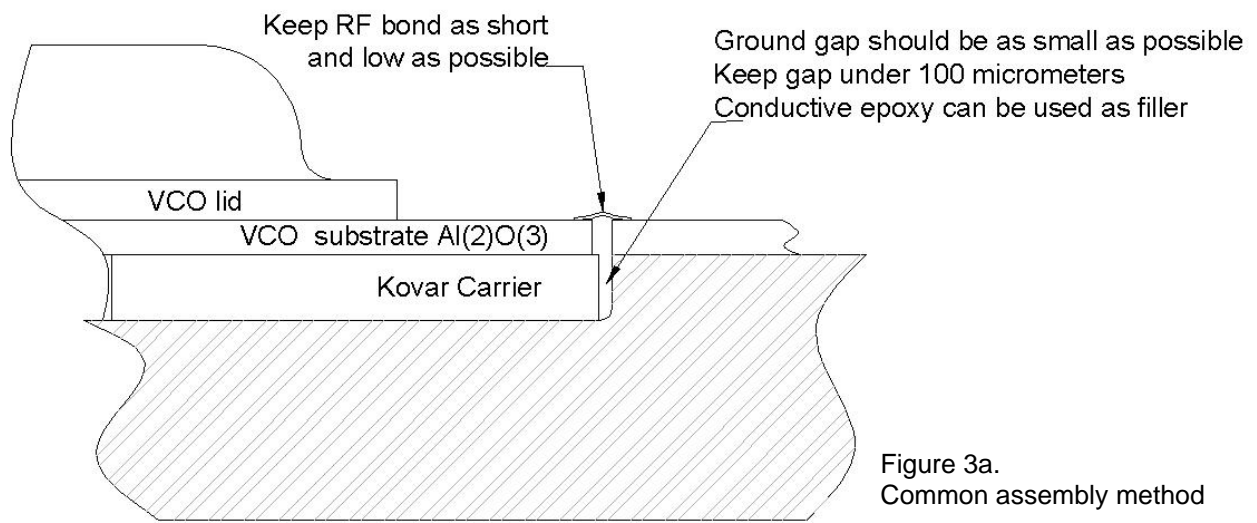


Figure 3a.
Common assembly method

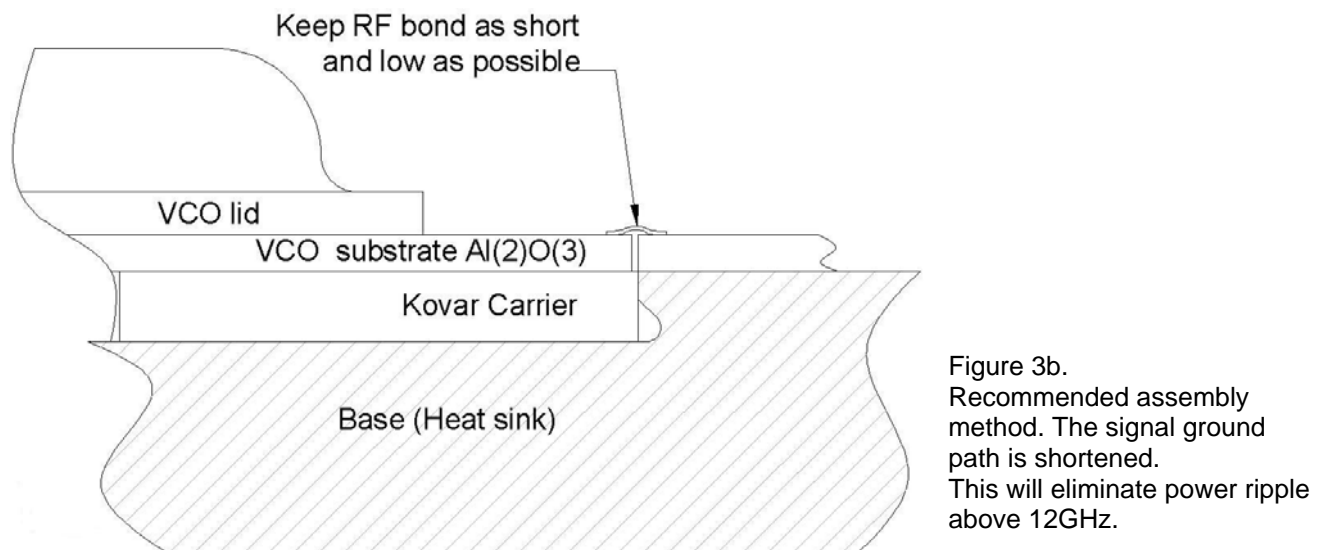


Figure 3b.
Recommended assembly method. The signal ground path is shortened. This will eliminate power ripple above 12GHz.

Connecting to a mixed PCB i.e. FR4 and Rogers.

This is probably the most common application. A VCO is connected to a high frequency PCB, such as Rogers 3003, providing high frequency capabilities.

The main concern is the distance between the VCO and the receiving PCB. Make sure that the VCO and PCB is assembled as close to each other as possible. See Figure 4.

The FR4 should have ground plane vias close to the VCO, providing good signal ground to the Rogers substrate.

The Drop-in coplanar type VCO (VO3284 series) is ideal for this type of application.

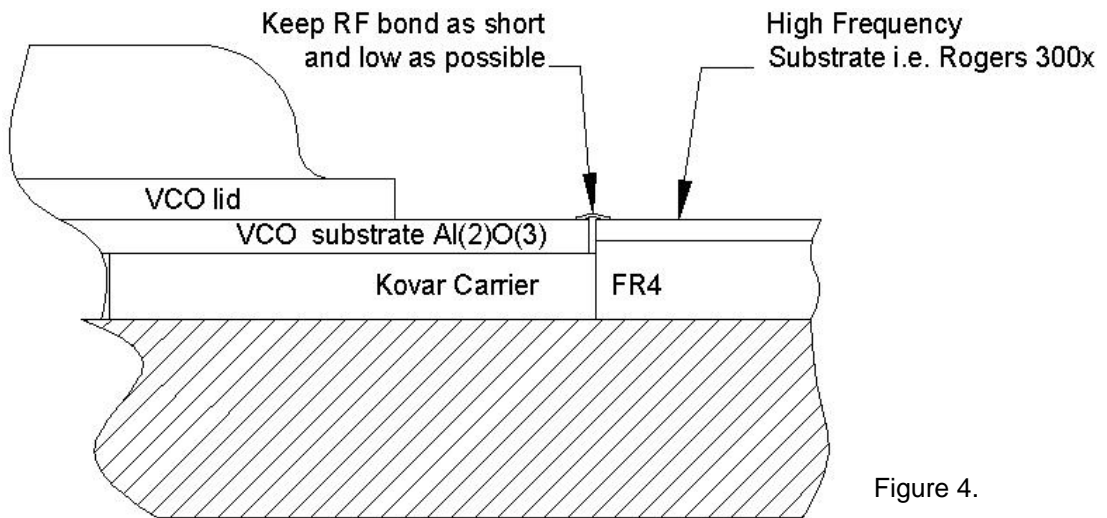
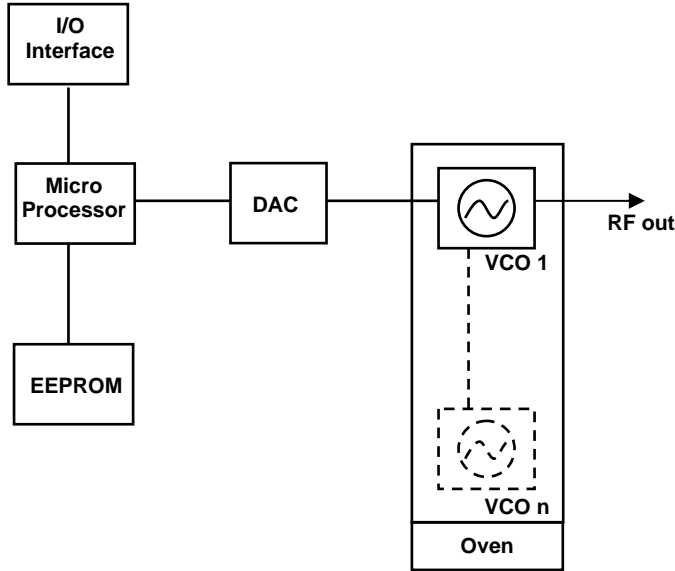


Figure 4.

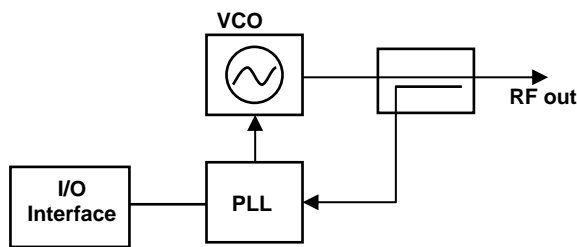
Application examples



DTO (Digitally Tuned Oscillator) example.

The table of calibrated frequency values is stored in the EEPROM.

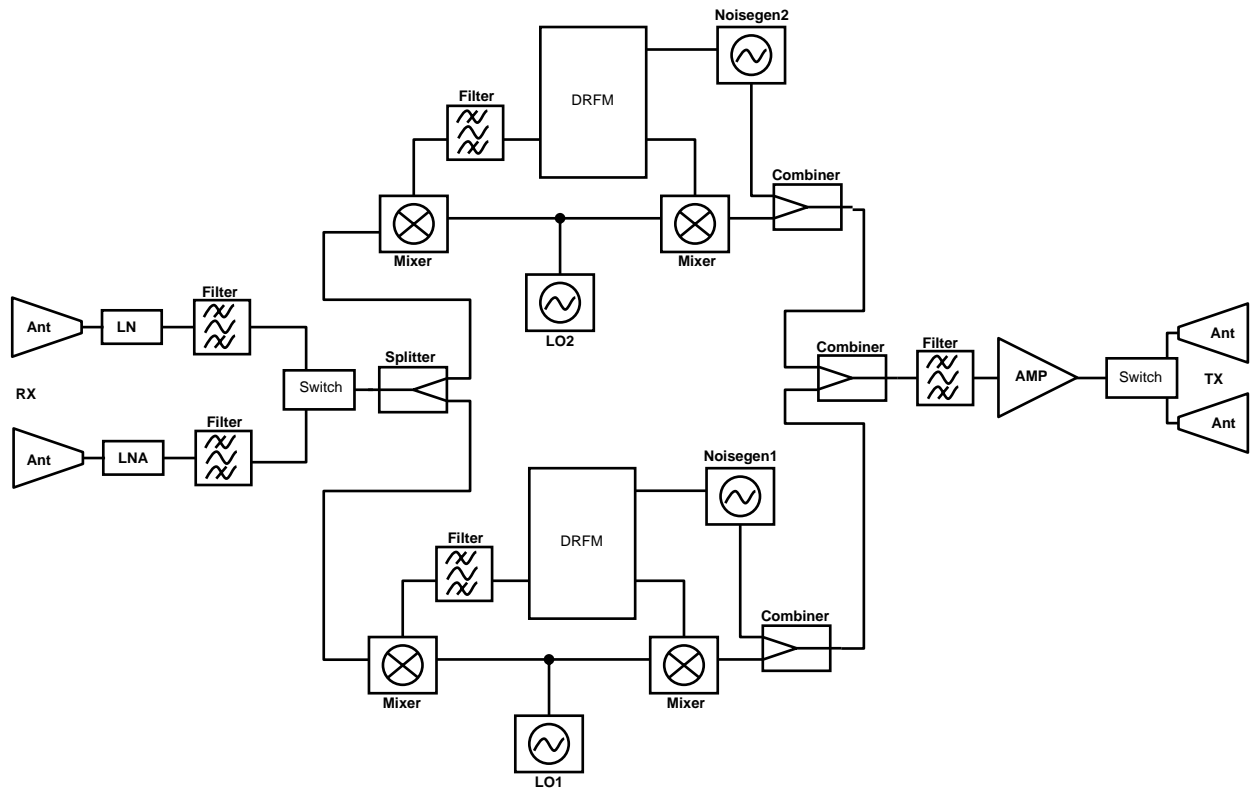
Temperature drift is eliminated thanks to the fact that the VCO is temperature stabilized either with an oven set for e.g. 55°C, or a Peltier thermoelectric module set for e.g. 35°C.



Synthesizer example.

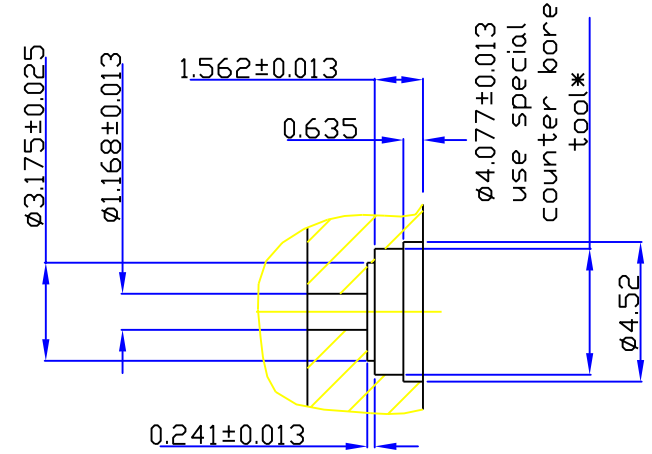
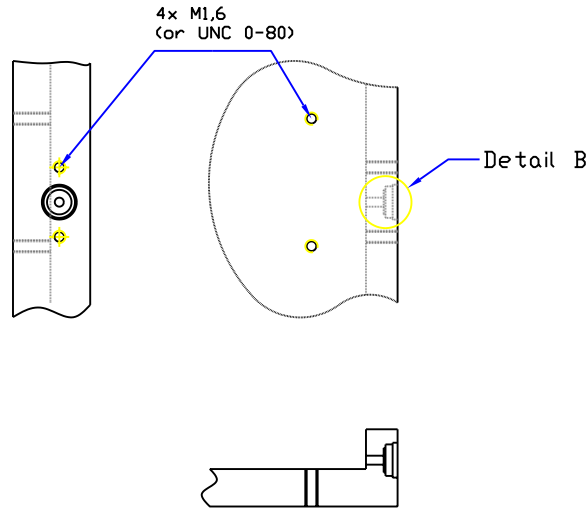
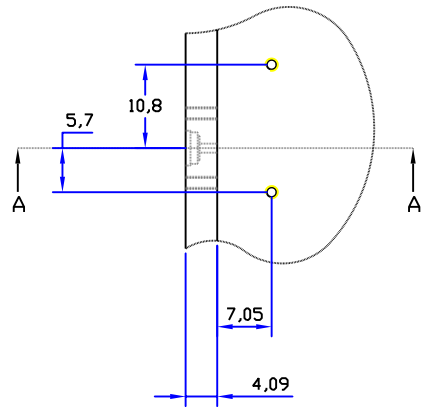
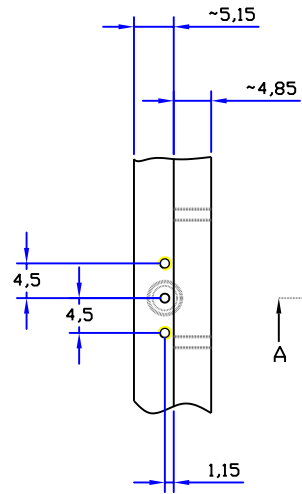
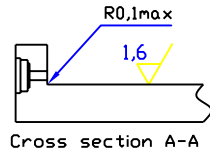
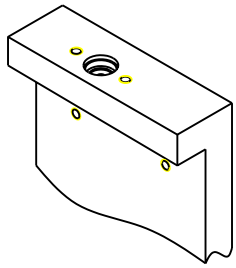
Provides high accuracy and eliminates the need for calibration.

The Synthesizer has no temperature drift.



Example of double Coherent Radar Jammer with Noise Generator, where both LO's and Noise sources are VO3280 series VCO's.

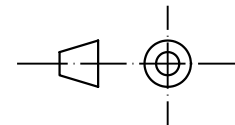
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*Counter bore tool T-291-4 for seal 0,020" C/C, 0,158" DIA from Southwest Microwave, Inc.

Recommended part list for SMA connector

Pos	Description	Part#	Manufacturer
1	50 Ohm hermetic seal	290-02G	Southwest
2	SMA Jack 2-hole flange	214-522SF	Southwest
3			
4			

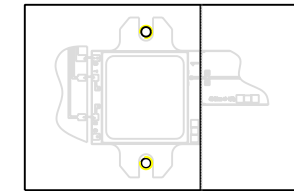
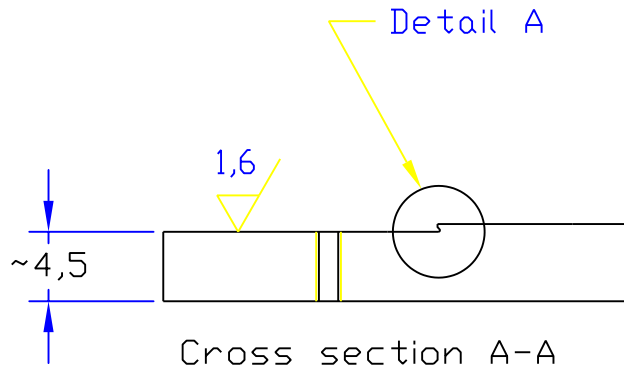


All dimensions in mm

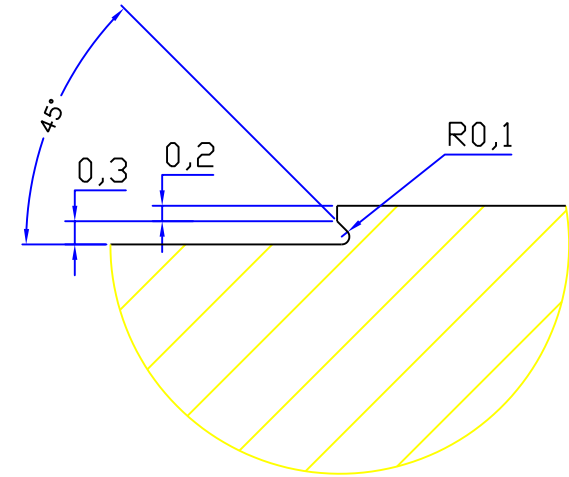
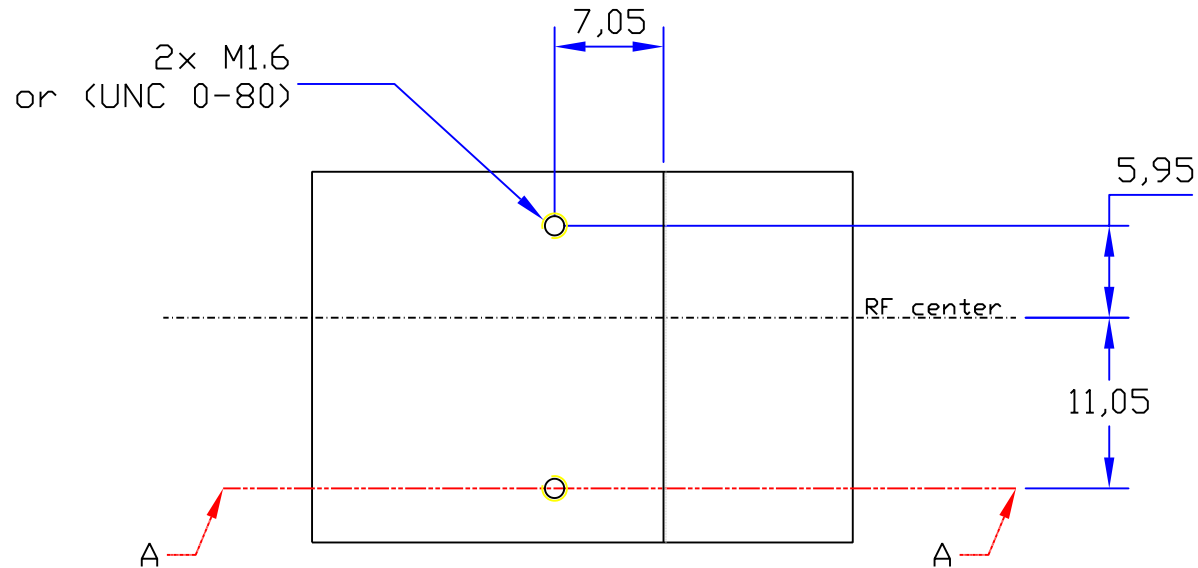
Tolerances +/-0.05 mm unless otherwise stated

Design	RC	Product	V03280_/_	Scale	1:1	Design rev.	A
Drawn	RC	Description	Mechanical interface for SMA connector		Release date		
 www.siversima.com					Drawing no.		Page
					AN3280_1 rev A		1/1
		164 29	Kista	Sweden			

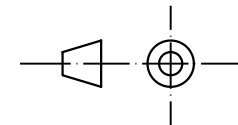
A B C D E



Assy scale 1:1



Detail A
Scale 10:1

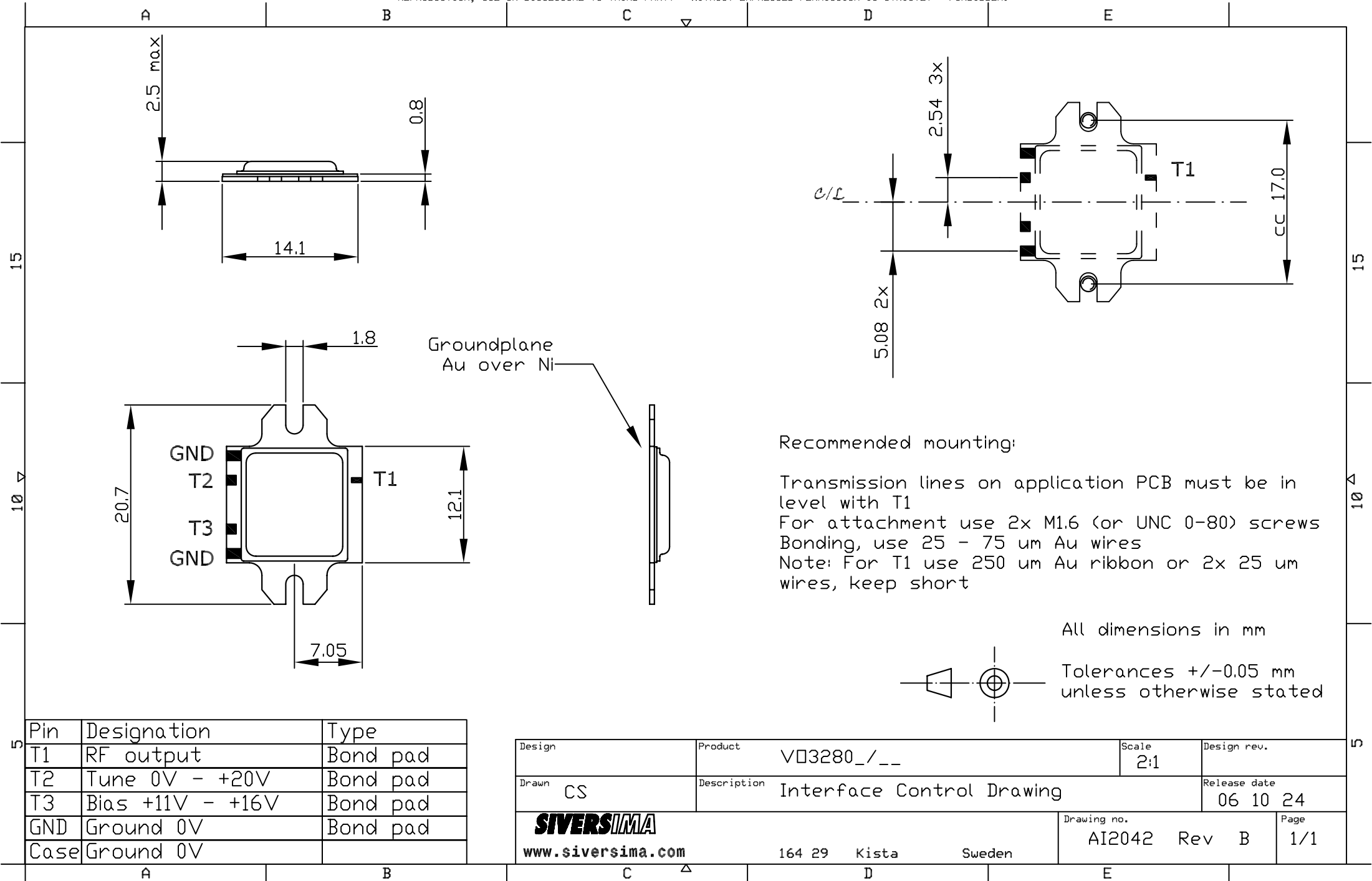


All dimensions in mm

Tolerances +/-0.05 mm
unless otherwise stated

Design RC	Product V03280_/_	Scale 1:1	Design rev. A
Drawn RC	Description Mechanical interface for 10 mil substrate	Release date 2007 11 18	
SIVERSIMA www.siversima.com		Drawing no. AN3280_2 rev A	Page 1/1
		164 29 Kista Sweden	

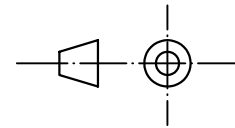
A B C D E



Recommended mounting:

Transmission lines on application PCB must be in level with T1
 For attachment use 2x M1.6 (or UNC 0-80) screws
 Bonding, use 25 - 75 um Au wires
 Note: For T1 use 250 um Au ribbon or 2x 25 um wires, keep short

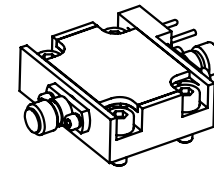
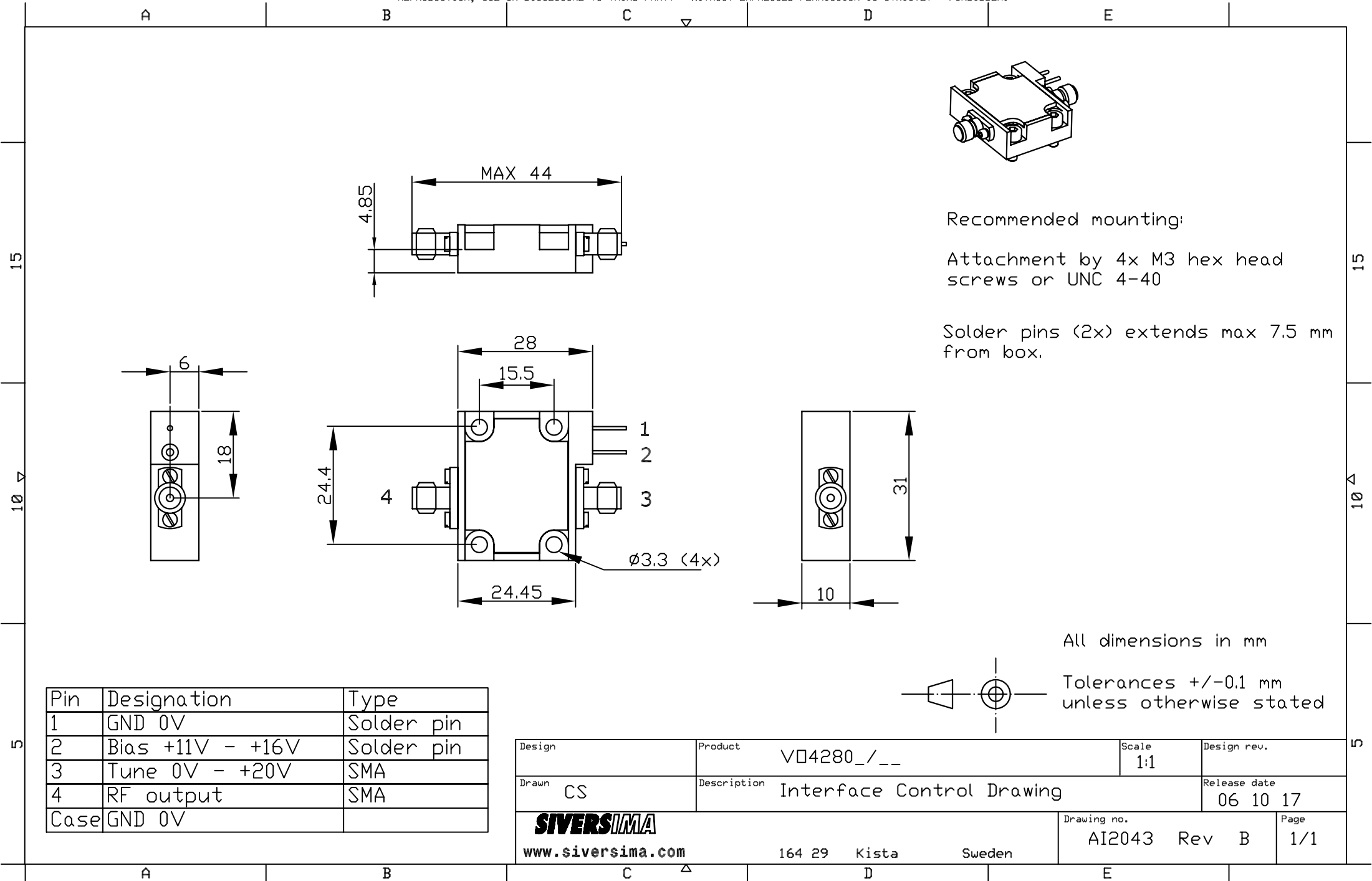
All dimensions in mm



Tolerances +/-0.05 mm unless otherwise stated

Pin	Designation	Type
T1	RF output	Bond pad
T2	Tune 0V - +20V	Bond pad
T3	Bias +11V - +16V	Bond pad
GND	Ground 0V	Bond pad
Case	Ground 0V	

Design	Product	Scale	Design rev.
	VO3280_/__	2:1	
Drawn	Description	Release date	
CS	Interface Control Drawing	06 10 24	
SIVERSIMA		Drawing no.	Page
www.siversima.com		AI2042 Rev B	1/1
164 29 Kista Sweden			



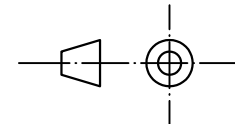
Recommended mounting:

Attachment by 4x M3 hex head screws or UNC 4-40

Solder pins (2x) extends max 7.5 mm from box.

All dimensions in mm

Tolerances +/-0.1 mm unless otherwise stated



Pin	Designation	Type
1	GND 0V	Solder pin
2	Bias +11V - +16V	Solder pin
3	Tune 0V - +20V	SMA
4	RF output	SMA
Case	GND 0V	

Design	Product	Scale	Design rev.
Drawn	Description	1:1	
CS	Interface Control Drawing		Release date
SIVERSIMA		06 10 17	
www.siversima.com		164 29 Kista Sweden	Page
		AI2043 Rev B	1/1