

Deploying Cobham VCOs

Buffering, Mounting and Power Supplies

2011 Datasheet Prelim

COBHAM

The most important thing we build is trust

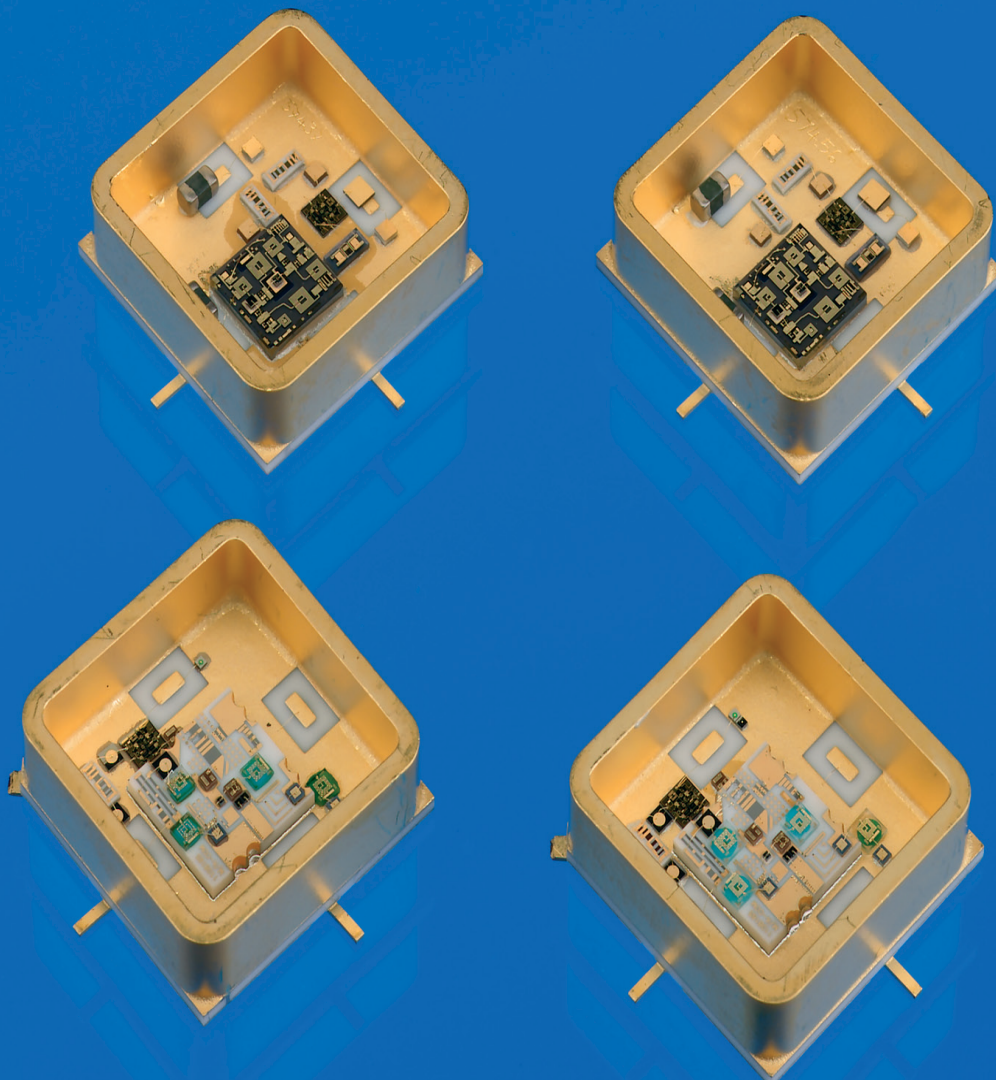
Introduction

Voltage Controlled Oscillators (VCOs) are essential building blocks for signal generation where fast tuning is required. Cobham MAL's line of Aerospace and Defence VCOs deliver excellent tuning linearity and low phase noise: critical parameters when designing Phase Locked Loops (PLL.)

To obtain the best performance from Cobham MAL VCOs, it is important to use best practice Radio Frequency (RF) design techniques.

This application note discusses three important aspects of designing with Cobham MAL VCOs:

- Output loading: Proper termination of VCO RF outputs to maximise performance.
- Mounting: Outline drawings for Cobham MAL T08 and SMT-T08 VCOs. Recommended pad layout for SMT-T08 devices.
- Power supplies: Minimising power supply noise.



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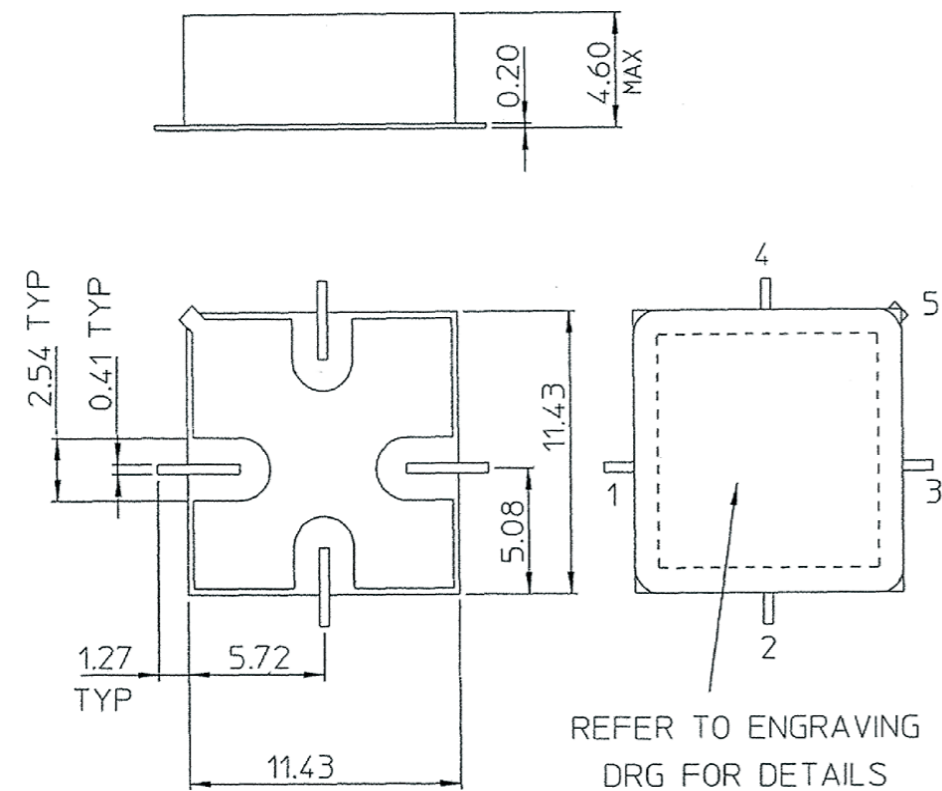
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SMT-T08 Layout

The manufacturing advantages of Surface Mount Technology (SMT) can be utilised with Cobham MAL's SMT-T08 packaged VCOs.

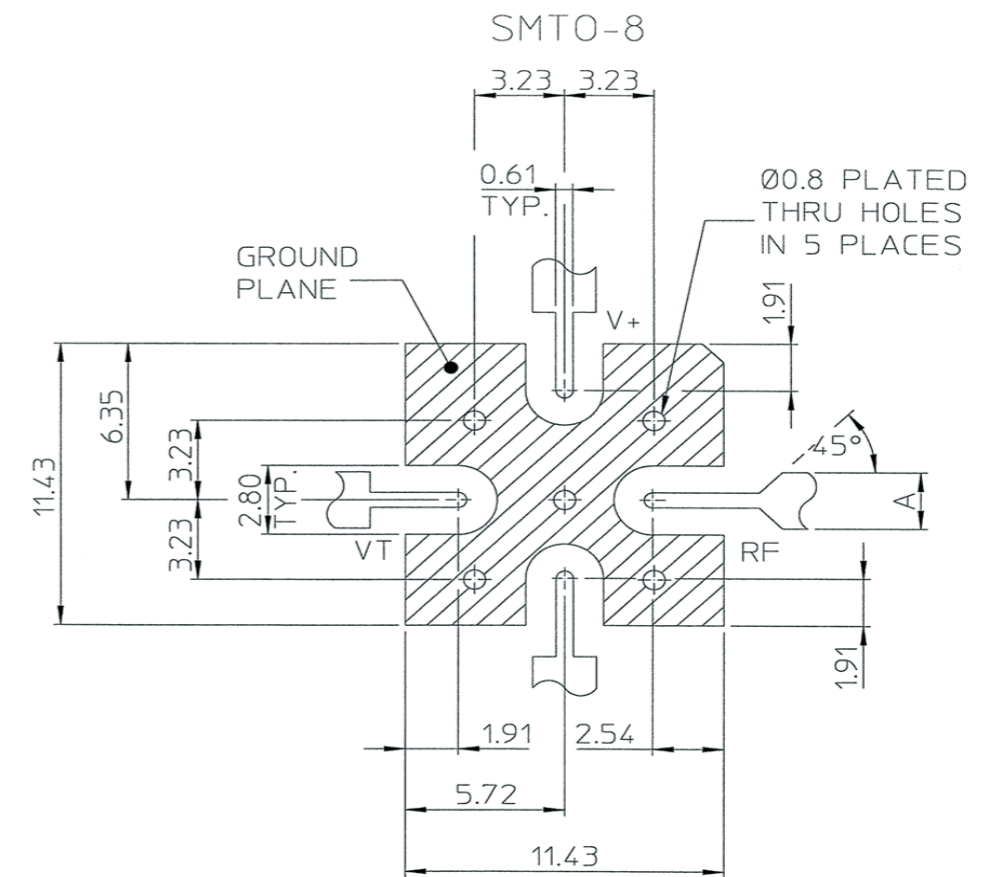
A Cobham MAL SMT-T08 VCO outline drawing is shown in Figure 3.



PIN Number	1	2	3	4	5
Signal	V+	V _{Tune}	GND	RF _{OUT}	Case GND

Figure 3 SMT-T08 Outline Drawing

Figure 4 shows the recommended pad layout for the SMT-T08 package style. For reflow soldering recommendations contact Cobham MAL Ltd.



PWB MATERIAL	'A' DIM
0.015" ALUMINA	0.381
0.025" 6010 RT/DUROID	0.610
0.031" 5080 RT/DUROID	2.413
0.062" G-10/FR4	2.667

Figure 4 SMT-T08 Recommended pad layout

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Power Supplies

Noisy power supply lines can degrade the output phase noise performance of low noise VCOs. Additionally, it is recommended to put Deploying Cobham VCO Buffering, Mounting and Power Supplies RF bypass circuitry on the power supply line to prevent RF from the VCO feeding into the power supply line.

All VCOs have a performance characteristic of 'pushing.' 'Pushing' is measured in MHz / V, and gives the output frequency change for a change in supply voltage i.e. the output frequency may be modulated by the power supplies. Any spurious or noise products, on the supply lines, will directly modulate the output of the VCO unless they are adequately filtered.

In complex sub-systems, many components will access the power supply lines, creating the possibility of an 'infected' output signal. To counter-act this, it is good practice to supply a dedicated voltage regulator for the VCO. This should be as close as possible to the power supply pin of the VCO, to reduce the track length available to pick noise up. The regulator should be set-up following the manufacturer's recommendations. Regulators will be a source of noise (like all active devices), so it is important to use a low noise device to minimise degradation of the VCO output.

Simpler decoupling may be realised by using a large decoupling capacitor. When using RF components, such as a VCO, it can be useful to use a number of capacitors in parallel. Large value (e.g. >10 μ F) electrolytic capacitors (e.g. Tantalum) help remove low frequency products. Though these capacitors should also remove higher frequency products, it is good practice to use some smaller value capacitors in parallel, of a material such as COG (NPO) or PPS (See Figure 5.) These materials are very stable and work well at blocking RF signals, but for large value capacitances they become physically large.

Conclusion

Cobham MAL VCOs feature low noise and excellent tuning linearity. With due consideration of the design of interfacing circuitry (output loading and power supplies), these devices contribute to excellent system performance.

Unfiltered power supplies can produce undesired products in the VCO output spectrum. Careful attention to this design area helps to ensure that a well-designed system is not let down by noise and cross-talk appearing on the output spectrum.

Similarly, the effect of adjacent system elements on VCO performance must be considered. Additional isolation from buffering elements will mitigate the poor match often associated with microwave mixers.

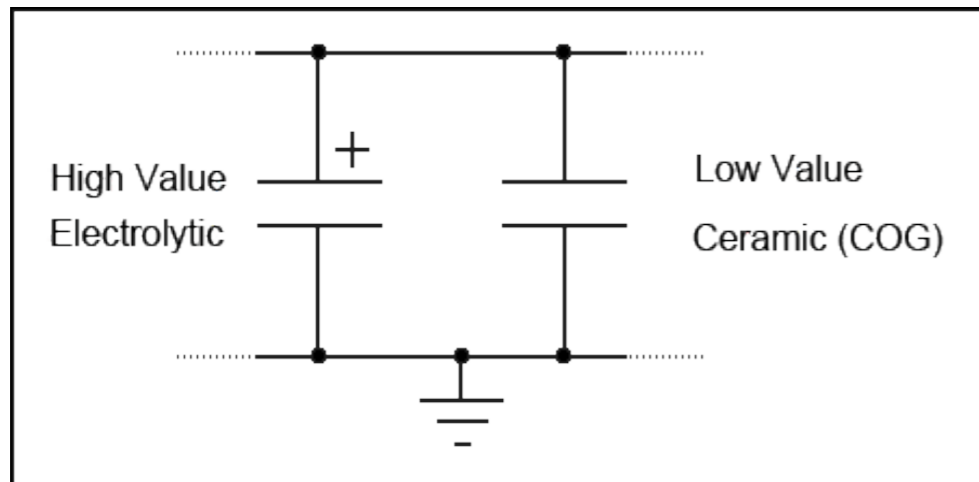


Figure 5 Electrolytic and high performance capacitors in parallel

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