



2-20GHz Wideband Receivers.

Introduction

The recent advances in high frequency sampling technologies have opened up a new range of solutions for traditional wideband receiver solutions in for example ELINT applications.

The capabilities to capture an RF signal's frequency and amplitude characteristics, without employing traditional conversion techniques, has lead to simpler and lower costs receiver architectures thus enabling more receivers per system and cross correlation between the outputs of those receivers. Complex frequency plans, switchable filtered paths, involved compensation schemes and expensive frequency sources to drive multiple mixers can all be constrained to history.

Whilst the number of sources for these components remains low at present Linwave can offer flexible solutions that maximise the capabilities of those components currently available and provide an upgrade path as new solutions are introduced to the market place.

Analysis

The current primary solution provider for high frequency sampling chips is US based. The components are readily available and not subject to licensing controls.

The inherent sensitivity of their lead offering is though currently relatively low, when compared to its analogue cousins, thus requiring a level of low noise pre-amplification of the incoming signal in order to mitigate this loss. It is common though with most wideband receiver applications for a level of gain to routinely be required in ELINT applications due to the large dynamic range of signals potentially being received; so this requirement for low noise gain is not unusual. Relatively low loss wideband RF amplifiers are also readily available to meet these requirements and do not present a significant challenge to a provider such as Linwave experienced designing with these component types.

Having the capability to vary this gain additionally allows dynamic optimisation of the receiver's characteristics and this can be achieved with COTS variable gain amplifiers from the same family as the low noise amplifiers utilised above.

Careful consideration is required for the gain, frequency compensation and compression characteristics of the RF chain in order to avoid the SFDR being compromised with high gain low noise components, variable gain components, frequency and thermally variable components and lossy components all included in the main RF signal path. Linwave has proven experience is realising solutions to balance these conflicting requirements and additionally provide tailored gain solutions for the low frequency output to match the input requirements of for example a following ADC.

Lastly the current sampling chipsets are required to be driven by a balanced differential drive and uniquely Linwave also has a proprietary technology allowing wideband splitting of the input signal in a surface mount package a fraction the size of the competitor's connectorised solutions.

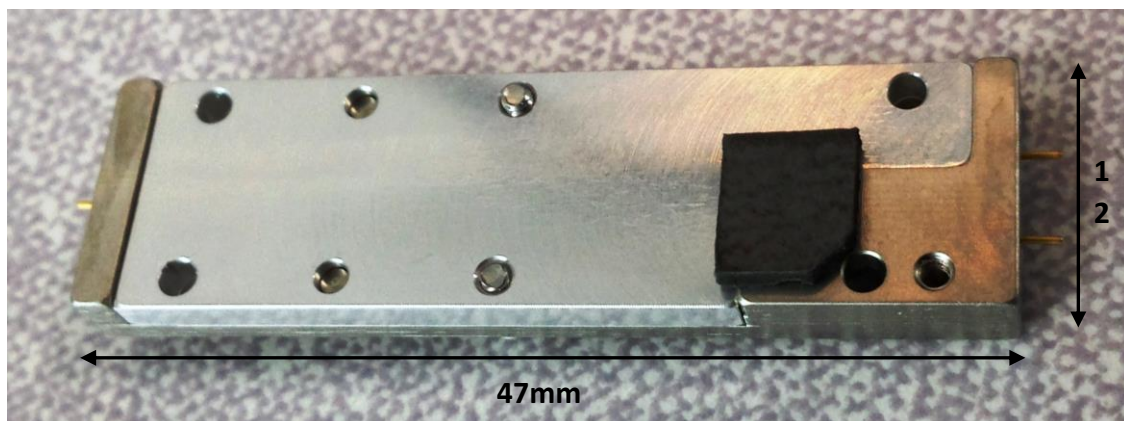


Figure 1. 2-20GHz Wide band Splitter

Linwave Capability

Linwave has significant design experience of wide band analogue and direct conversion technologies to provide compact high performance modules.

The preferred design methodology would be a surface mount on laminate. Linwave has full design and manufacturing capability to produce these type of products.

Figure 1 below shows a current solution with an RF input and I.F output and the third interface being a clock reference. Linwave can include an in built sampling clock referenced to a system master clock or provide an interface for the system to inject this signal



Figure 2. 2-20GHz Wide band receiver



The above design additionally employs in built BITE for the RF path and a microprocessor to allow remote control and configuration plus remote communication allowing for example internal voltages, temperatures clock modes to be read back via the back plane interface.

Figure 3 below shows an example of the electronics design and layout capabilities for such an electronics subassembly.



Figure 3. Wideband receiver microprocessor electronics driver assembly

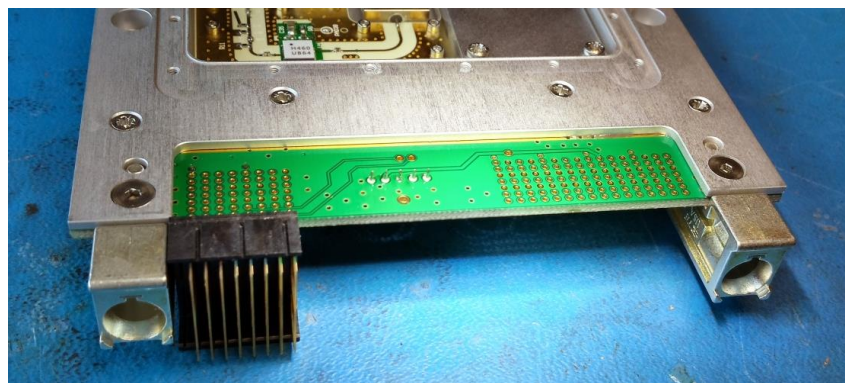


Figure 4. Bespoke backplane interface

Linwave has a long history developing integrated microwave modules of various types and the new wideband receivers now coming to market builds on that history of high complexity, high performance, small form factor at commercially challenging prices.



Conclusion

Using commercially available direct conversion components it is now possible to design and manufacture wide band high frequency RF down converters on a small form factor without the necessity for complex signal sources and the necessity to incorporate elaborate frequency schemes, switchable filtering paths and elaborate gain compensations to achieve industry standard performance.