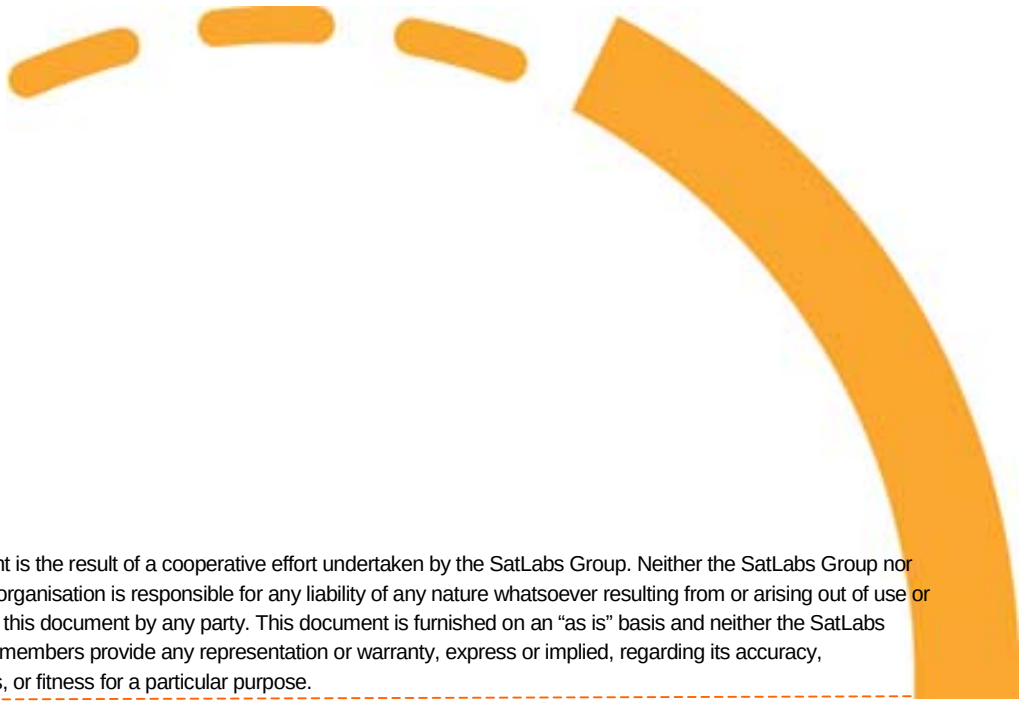
2 Watt Ku-band DVB-RCS transmitter power MMIC

Version 1.0



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1. Introduction

This document describes the draft version specification of a MMIC device for the transmitter section of a low cost Ku-band DVB-RCS terminal. The document is a proposal to the members of ESA SatLabs Group WG#1.

2. MMIC device spec & features

Target spec: see annex

The device will have following features:

- SMD package. This package will have a base plate which acts as heat spreader and electrical ground. The base plate will be large enough to support good thermal properties when soldered onto a MIC substrate with an array of thermal via's.

- Unconditional stability. The device will not self-oscillate under any circumstance, even when loaded into an impedance with reflection coefficient = 1, any phase.

- Very low noise in RX band. The MMIC circuitry will be designed in a way that the noise density on the output in the RX band [10.7- 12.8 GHz] is low enough to enable no output filter in the transmitter. The maximum acceptable noise density is determined by the RX noise floor and OMT isolation. The absence of output filtering improves the overall O/P power budget and simplifies the transmitter concept.

- Highest efficiency. With modern 0.25 µm PHEMT technology, a PAE of over 30% can be achieved. High efficiency is important to the total material usage of the transmitter mechanics [w.r.t the cooling fin area requirement].

3. MMIC device price target

The cost price target is concluded based on following consideration:

- Technology: GaAs 0.25 µm PHEMT
- Estimated die area: 2.5 mm²

- Die cost: 5 Euro [@ 2 USD/mm²]
- SMD package 5 Euro
- Testing & packaging 1 Euro
- NRE 0 Euro [ESA subsidized]
- Vendor's gross margin 4 Euro

- MMIC price target 15 Euro/pc [@ 100kpcs]

TARGET SPECIFICATION v1.0						
2 Watt Ku-band SSPA MMIC device						
parameter	**symbol**	**min**	**typ**	**max**	**unit**	**conditions**
Frequency range	f	13.75		14.50	GHz	package baseplate @ 25 °C unless noted differently
Linear gain, in-band	G	22		24	dB	
Linear gain, RX-band	G			10	dB	10.7 - 12.8 GHz
Gain vs. temperature	dG/dT			-0.04	dB/K	in linear mode
Gain flatness over frequency range	dG			± 0.5 pp	dB	in linear mode
Noise figure	F			5	dB	
Noise output power density in RX band: 10.7 - 12.8 GHz	Pn,RX			-160	dBm/Hz	input 50 Ohm terminated
3rd order IP on output	IP3o	41			dBm	
Output power level @ SR** > 17 dBc	Po	34			dBm	operational output power
Output power vs. temperature	dPo/dT			-0.01	dBm/K	
Input return loss into 50 Ohm	RLi	10			dB	
Output return loss into 50 Ohm	RLo	15			dB	
Supply voltage positive rail	Vdd		tbd		V	
Supply voltage negative rail	Vgg		tbd		V	
Power added efficiency	PAE	25			%	@ operational output power
Reliability		1.E+06			h	package baseplate @ 60 °C
Package			SMD			for reflow soldering into softboard microstrip application environment
** Spectral Regrowth level [SSB]						

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