UP CONVERTER 144MHz / 2400MHz

F1OPA / F5JWF

11/11/2017

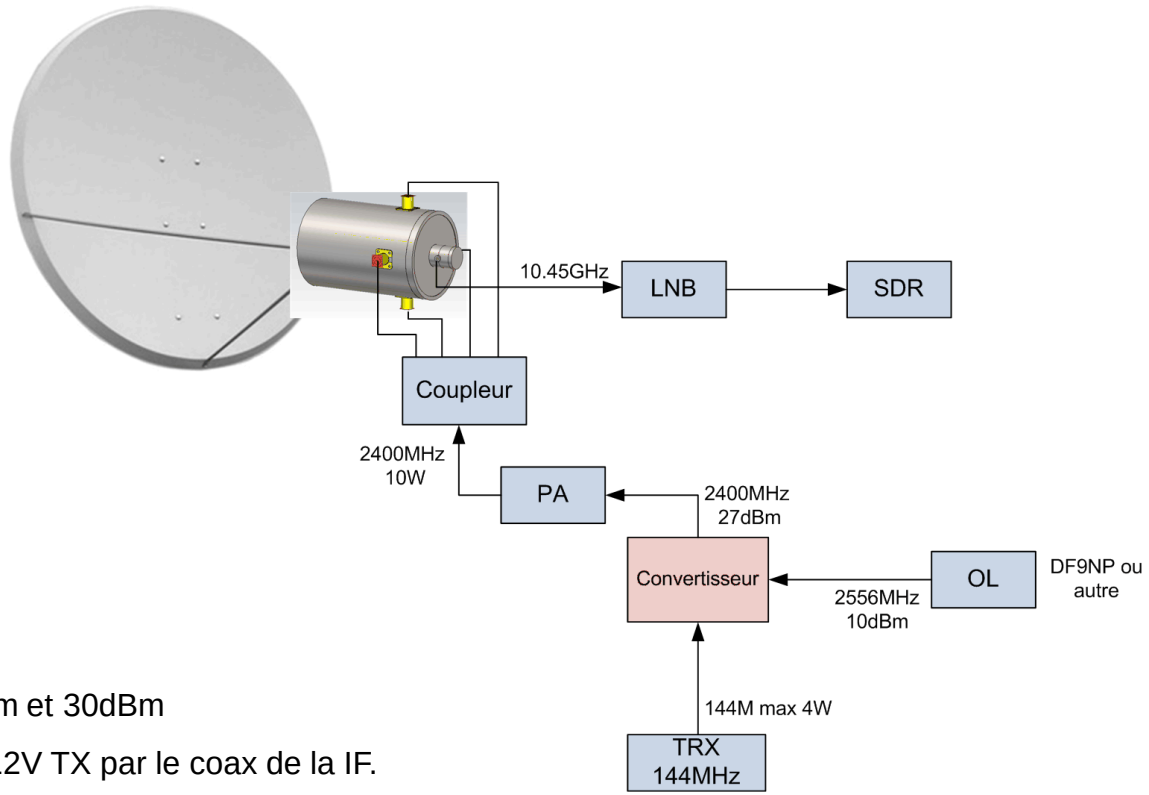
BUT :

UP CONVERTER pour la voie montante du futur satellite Es'Hail

Es'hail 2 will carry two "Phase 4" amateur radio transponders operating in the 2400 MHz and 10450 MHz bands. A 250 kHz bandwidth linear transponder intended for conventional analogue operations and an 8 MHz bandwidth transponder for experimental digital modulation schemes and DVB amateur television.

Narrowband Linear transponder
2400.050 - 2400.300 MHz Uplink
10489.550 - 10489.800 MHz Downlink

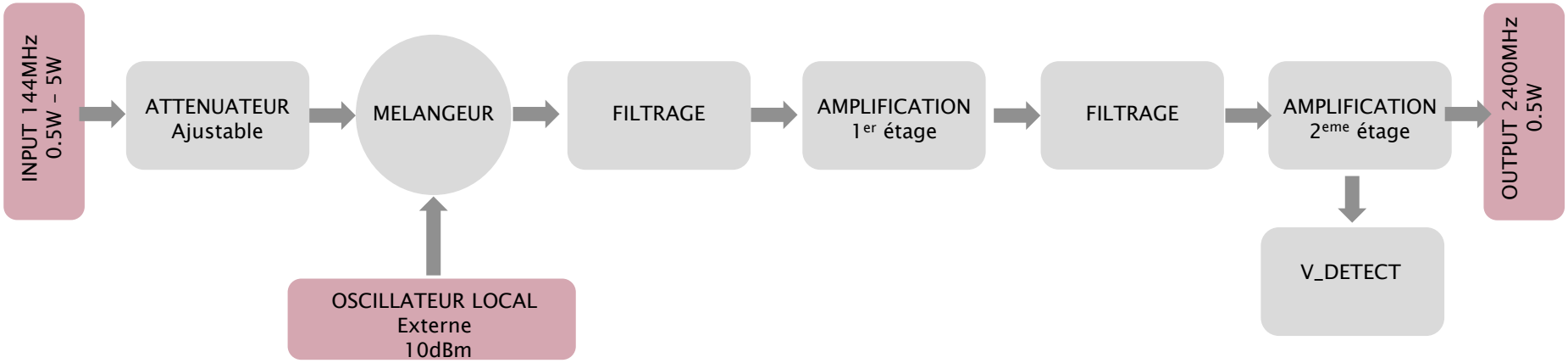
Wideband digital transponder
2401.500 - 2409.500 MHz Uplink
10491.000 - 10499.000 MHz Downlink



Contraintes fixées :

- IF : 144MHz (0.5W to 5W).
- PUISSANCE DE SORTIE : entre 27dBm et 30dBm
- Commutation PTT : 0V TX externe ou 12V TX par le coax de la IF.
- Sortie 0V TX pour piloter un PA externe
- BOITIER : Boitier fraisé pour améliorer la dissipation thermique (IF plus PA)

SYNOPTIQUE


INPUT 144MHz
0.5W - 5W
ATTENUATEUR
Ajustable
MELANGEUR
OSCILLATEUR LOCAL
Externe
10dBm
FILTRAGE
AMPLIFICATION
1er étage
FILTRAGE
AMPLIFICATION
2eme étage
V_DETECT
OUTPUT 2400MHz
0.5W

ATTENUATION IF ET MELANGE

Anaren

Model C10A50Z4

Surface Mount Termination

10 Watts, 50Ω

Features:

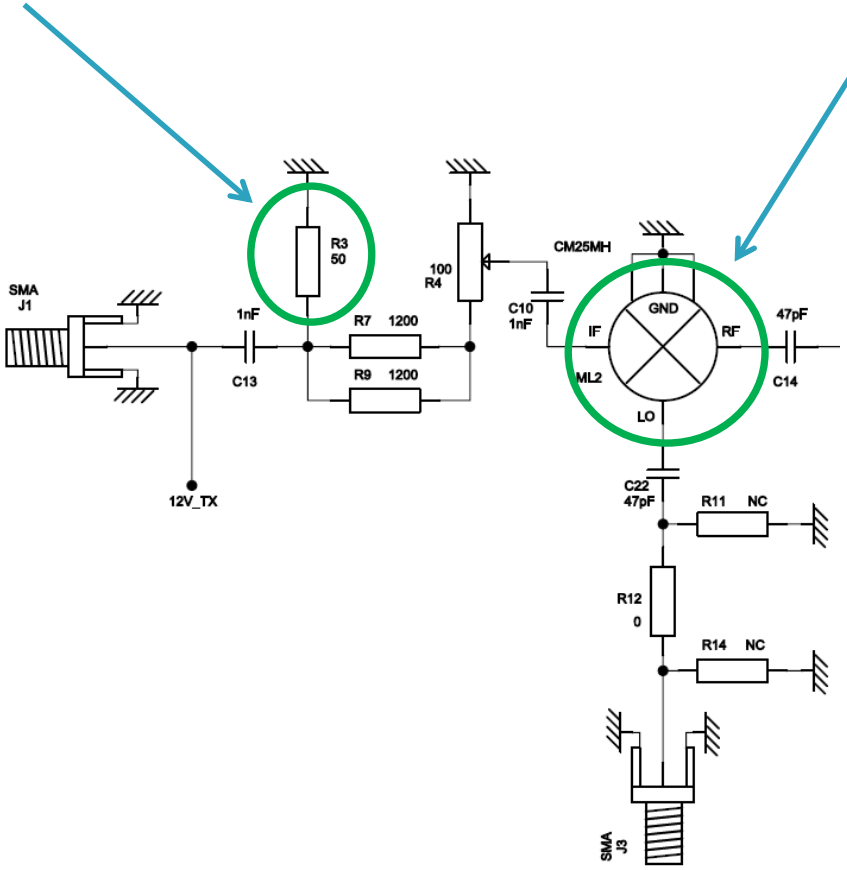
- RoHS Compliant
- 10 Watts
- DC – 3.0 GHz
- Al_2O_3 Ceramic
- Non-Nichrome Resistive Element
- Low VSWR
- 100% Tested

Surface Mount

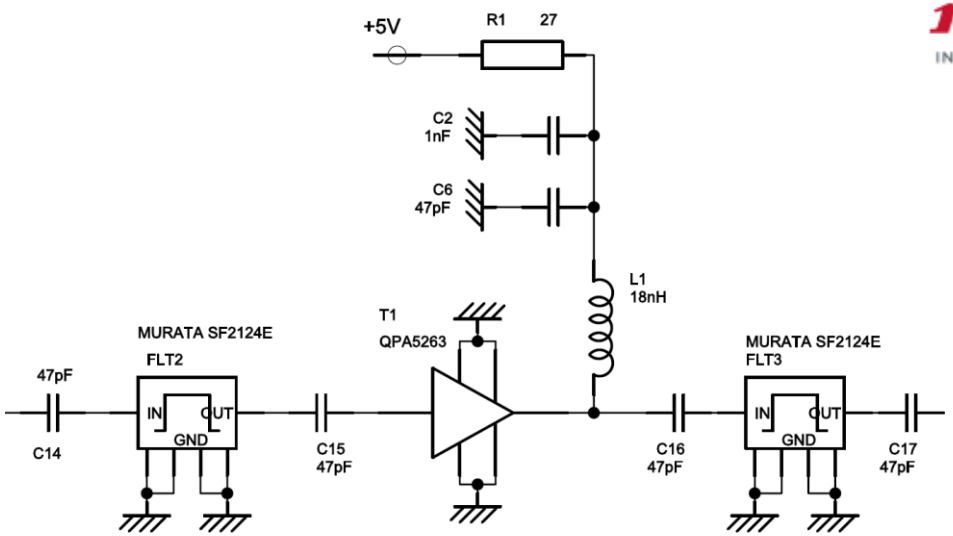
Frequency Mixer

Level 7 (LO Power +7 dBm) 2300 to 2700 MHz

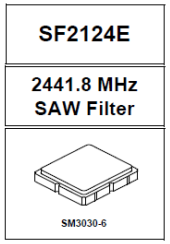
ADE-3G+



1er ETAGE AMPLIFICATION ET FILTRAGE



muRata
INNOVATOR IN ELECTRONICS



FLTRAGE PRODUITS DE MELANGES :

2 x Filtres SAW SF2421E

qorvo

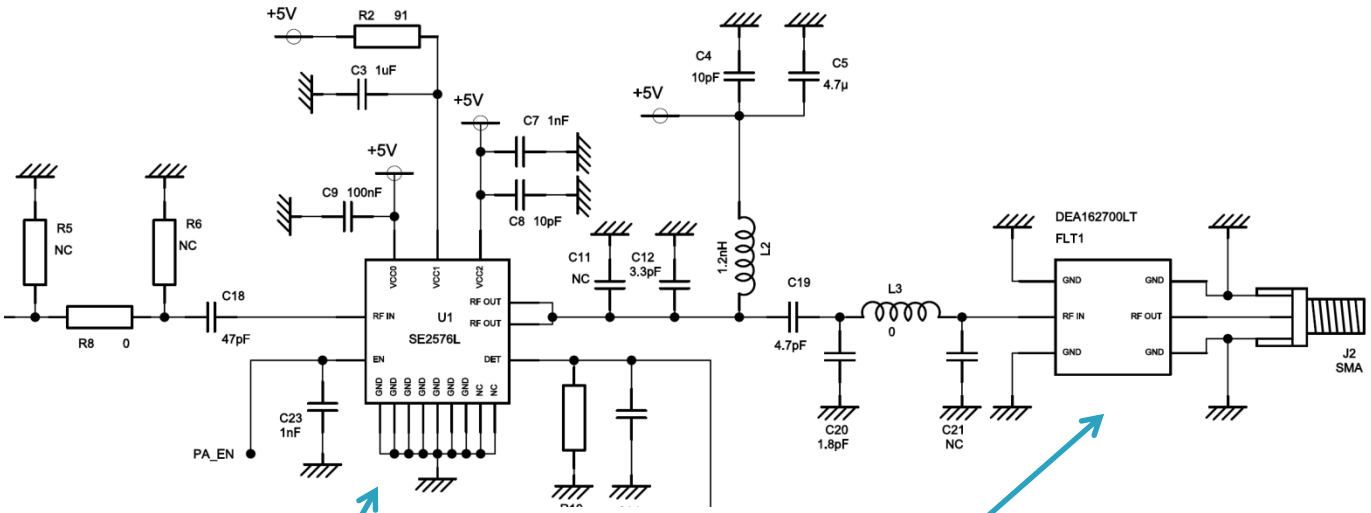
QPA4363A
DC – 4000 MHz Cascadable SiGe HBT Amplifier

AMPLIFICATEUR :

QORVO QPA4363A

6 Lead SOT-363 Package

2eme ETAGE AMPLIFICATION ET FILTRAGE



SKYWORKS

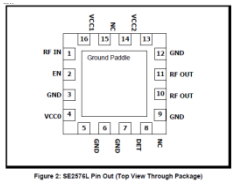


Figure 2: SE2576L Pin Out (Top View Through Package)

AMPLIFICATEUR

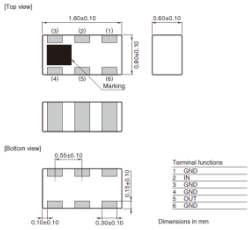
SE2576L

TDK

Multilayer Low Pass Filter

For 2400-2700MHz

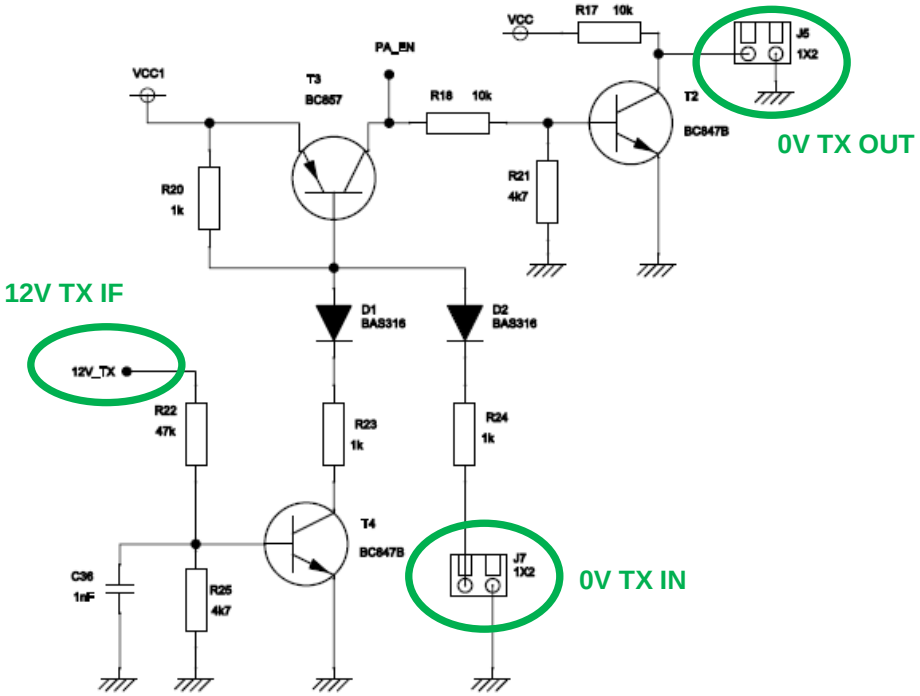
DEA162700LT-5014A1

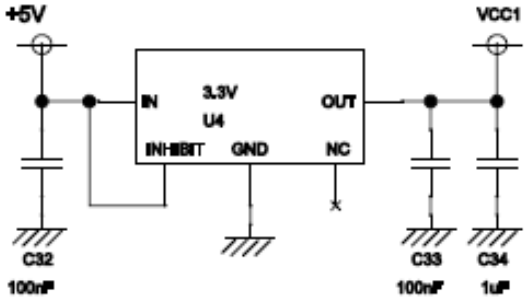


FLTRAGE HARMONIQUE

Filtre Passe Bas

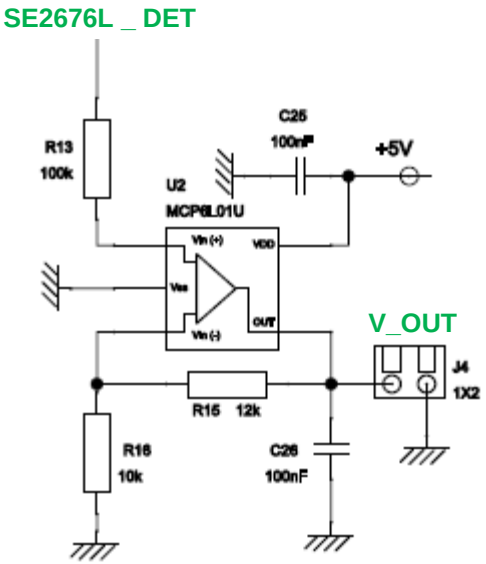
COMMUTATION





- **ENTREE COMMANDE** : 0V TX externe ou 12V_TX sur entrée IF.
- **SORTIE COMMANDE** : 0V TX OUT pour PA externe
- **COMMANDE PA_EN** : Polarisation du PA de sortie lors du passage en TX (+3.3V)

MONITORING DE LA PUISSANCE DE SORTIE

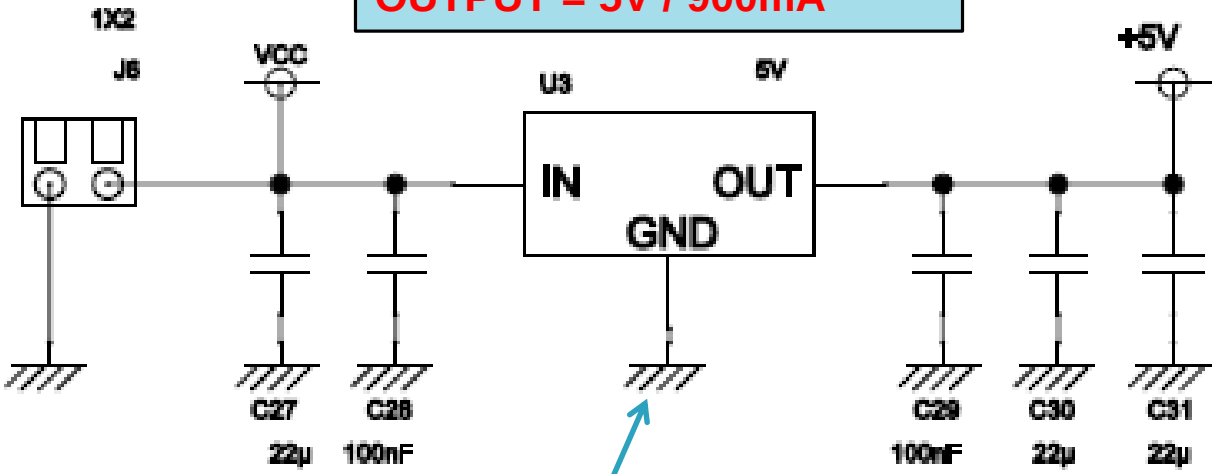


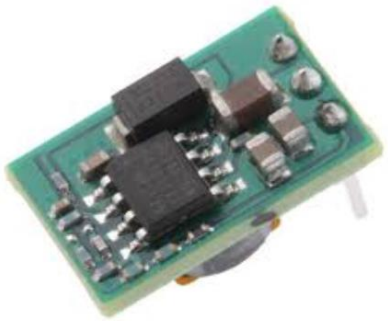
Utilisation d’un AOP :

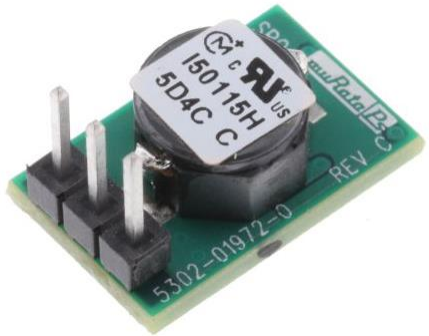
- Isolation de la sortie du SE2576L
- Amélioration de la dynamique de lecture.

ALIMENTATION

INPUT = 8 à 13V
OUTPUT = 5V / 900mA

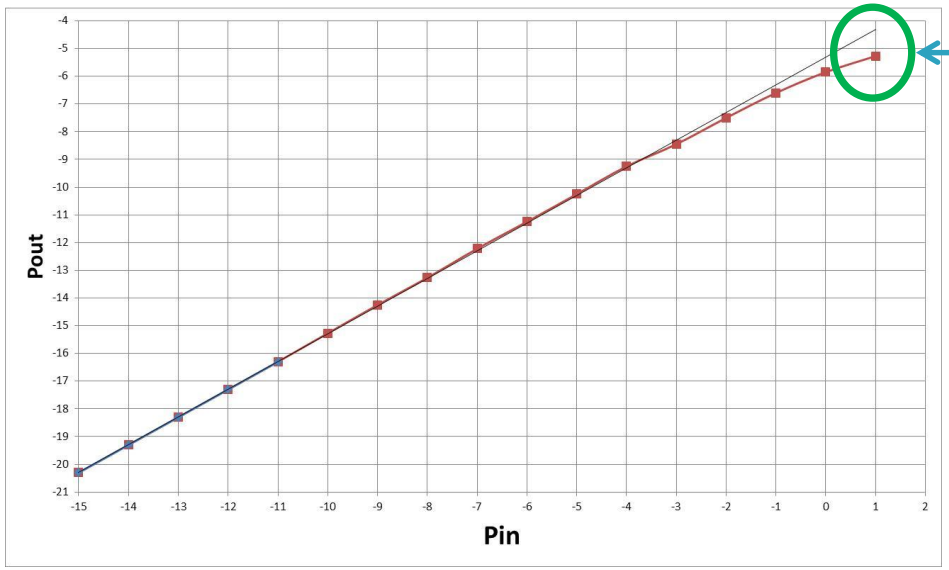




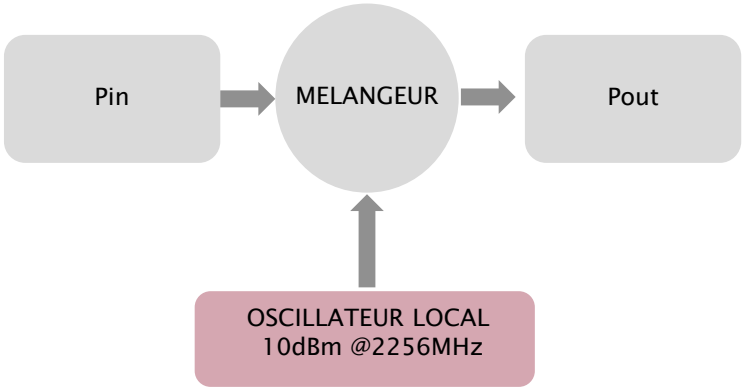


OKI-78SR-5/1.5-W36H-C

MESURE : FONCTION MELANGE

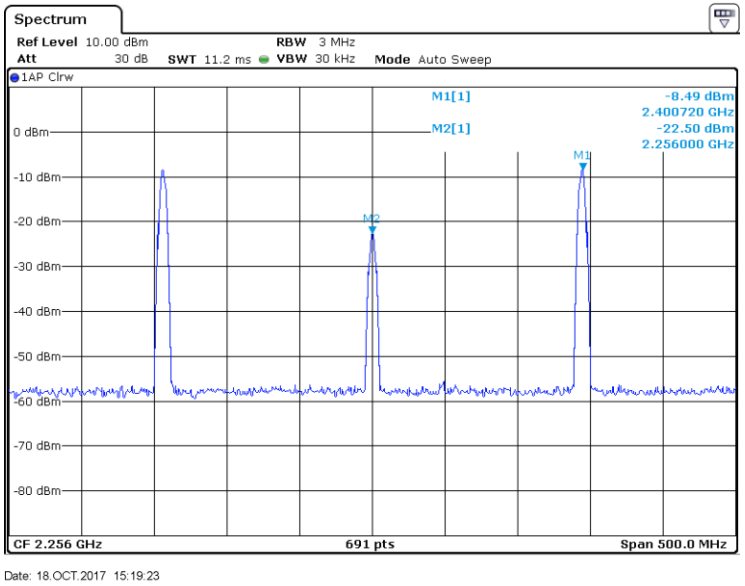


P1dB = 5.2dBm

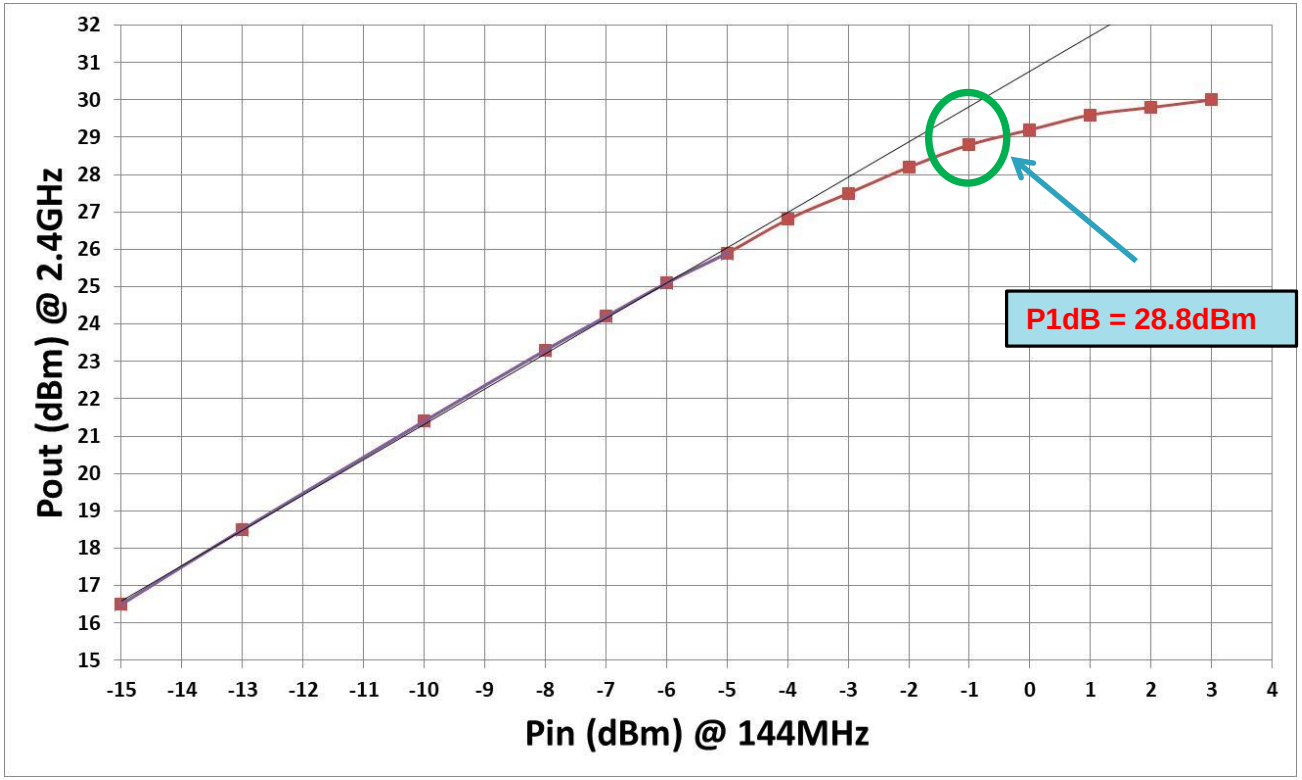


Pin =-3dBm :

- **Pout = -8.5dBm**
- **Gain Conv = -5.5dB**
- **Isolation LO/RF = 32.5dB**



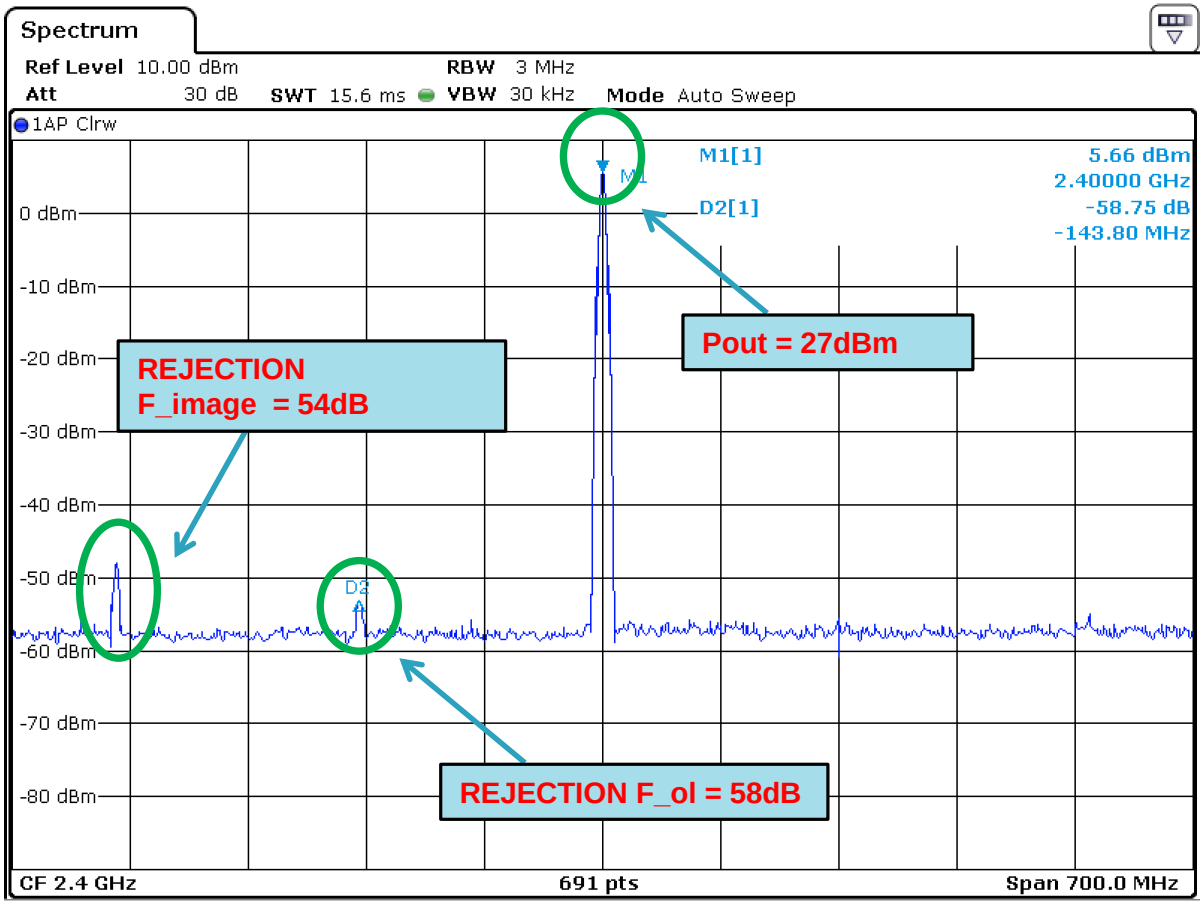
MESURE : UP CONVERTER COMPLET



Pin =-1dBm :

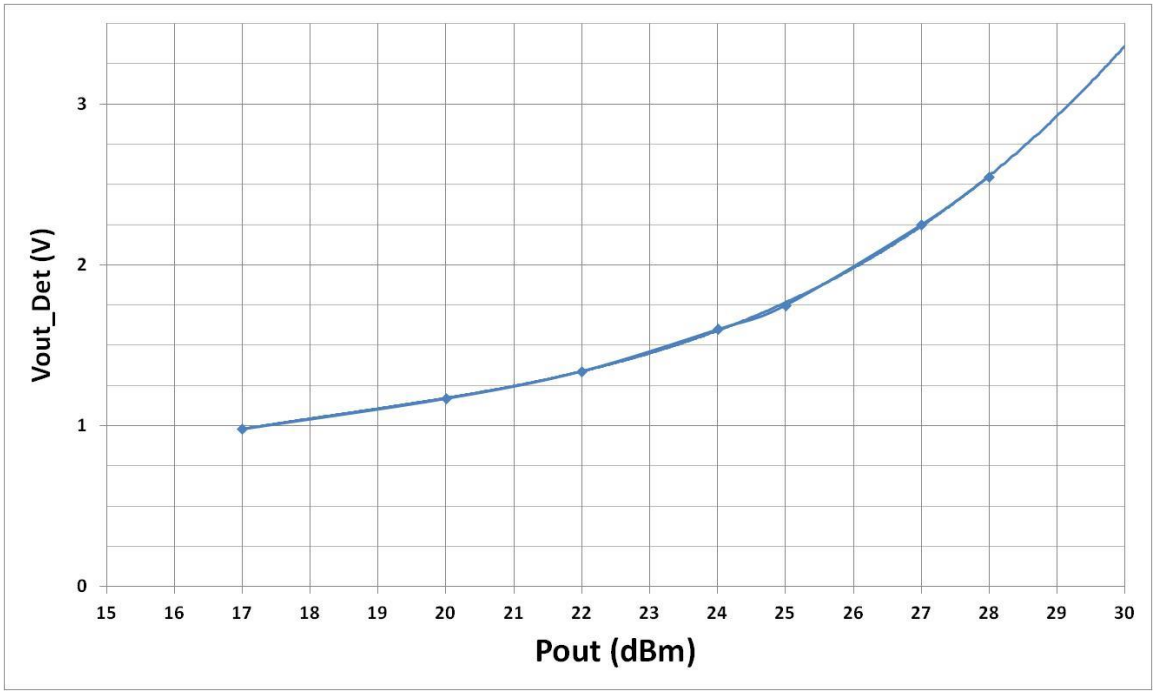
- **Pout = 28.8dBm**
- **P_H2 = -46dBm**
- **P_H3 = -52dBm**

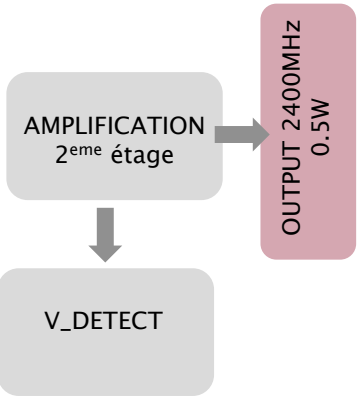
MESURE : UP CONVERTER COMPLET



Date: 18.OCT.2017 15:12:32

MESURE : FONCTION DETECTION





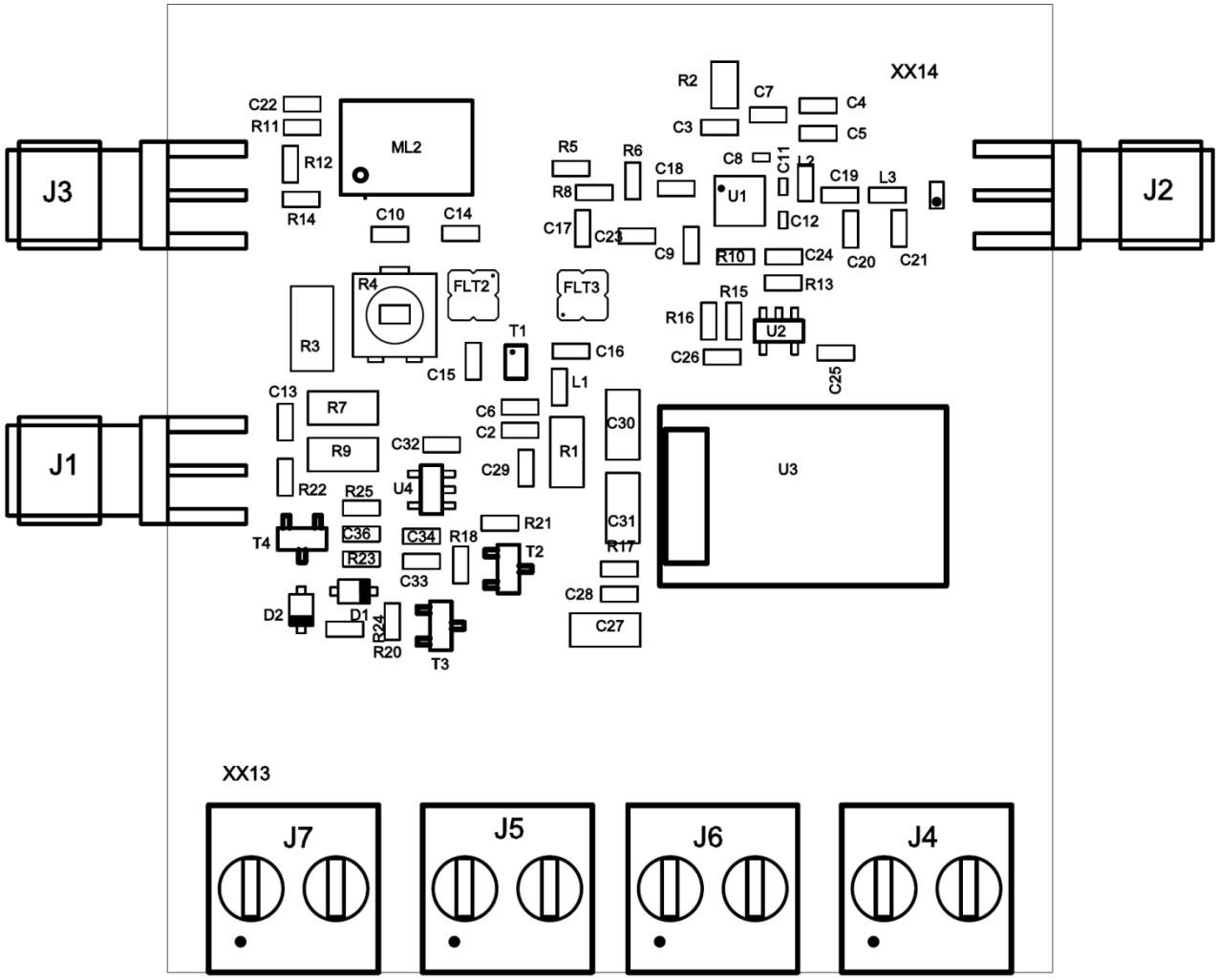
CONCLUSIONS

- Premiers résultats encourageant :
  - Montage compact
  - Partie mécanique qui favorise la dissipation et l'intégration.

- Evolutions pour la deuxième version :
  - Améliorer le routage pour augmenter la rejection de la fréquence OL et image.
  - Améliorer la rigidité du PCB au niveau des connecteurs à vis.
  - Optimiser le transfert de calories au niveau de l'amplificateur de sortie.

- A venir : Oscillateur local pour compléter l'offre.

PCB : Implantation de composants



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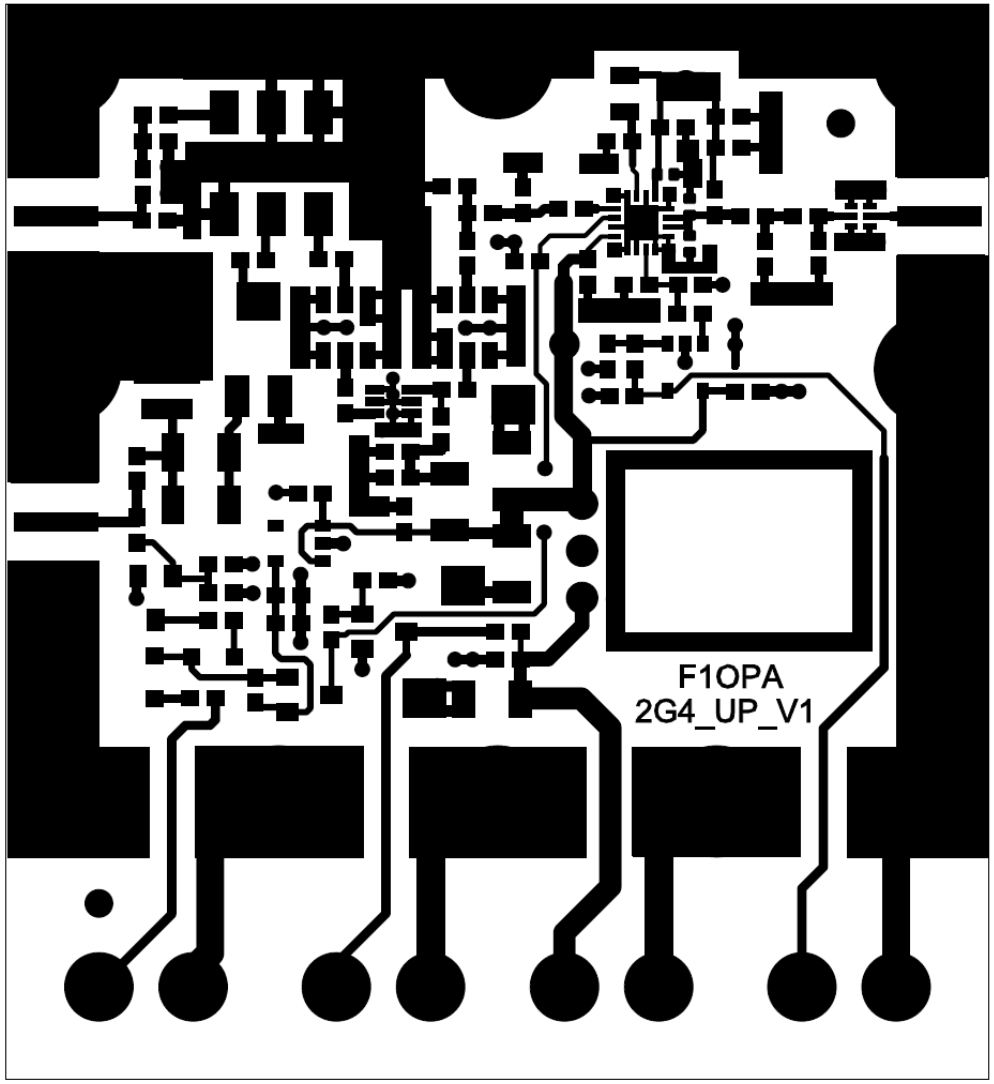
PCB : Routage



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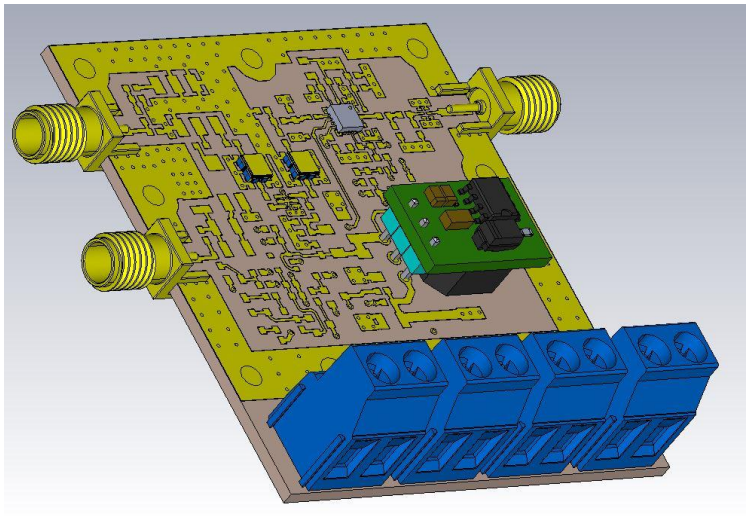
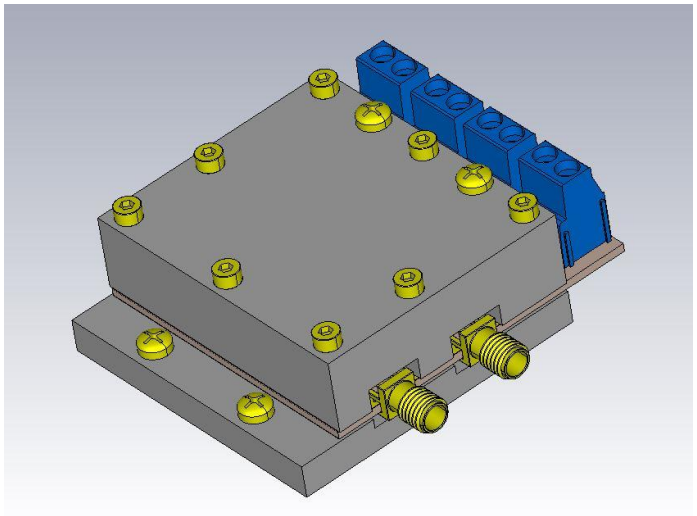
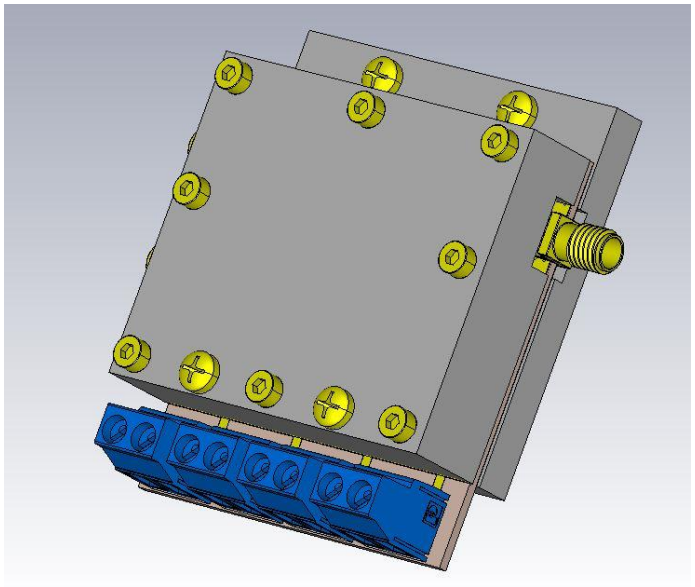
PCB : Vue 3D boitier, régulateur, bornier, …







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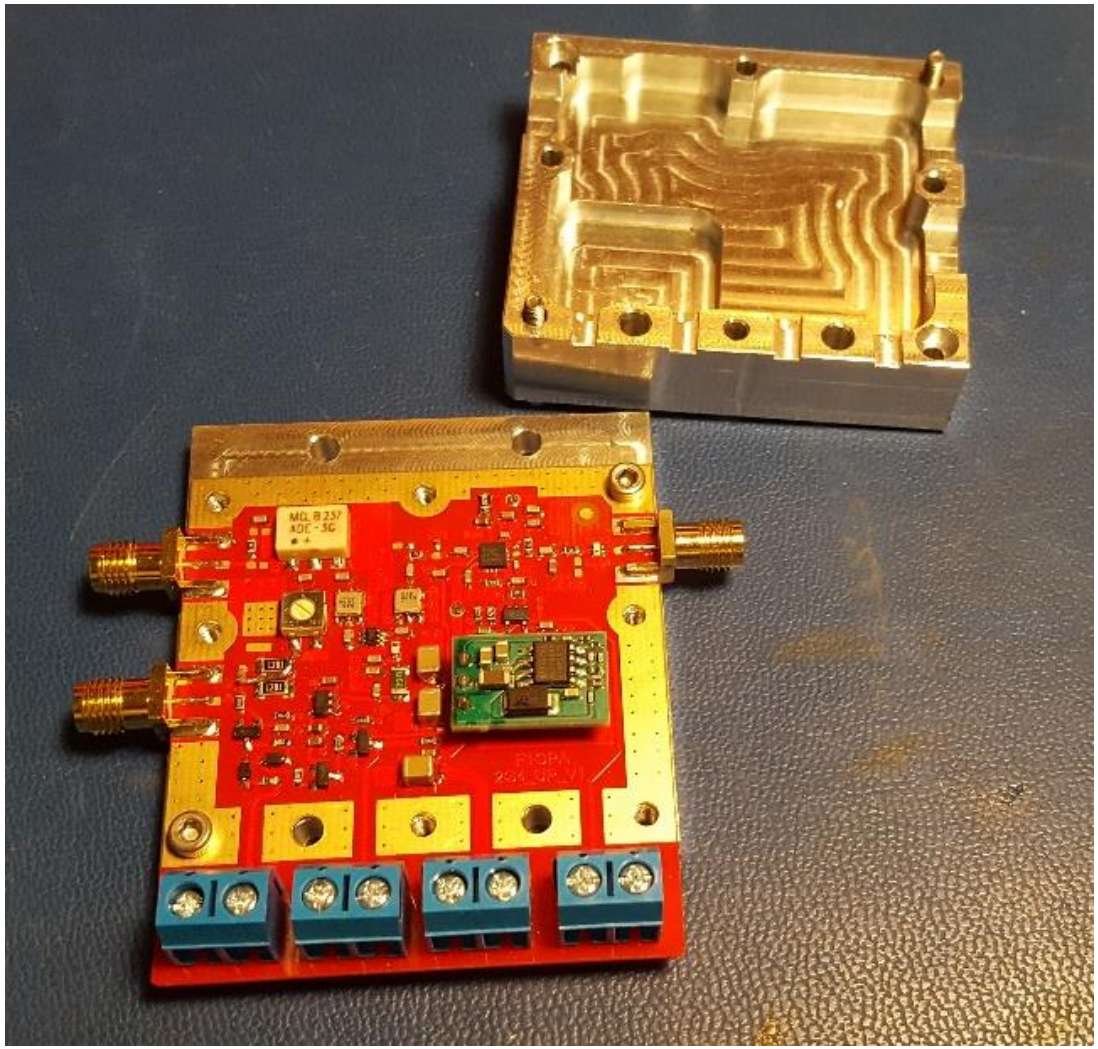
1er Proto



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