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UM10772

User Manual BFU5xx series starter kits

Rev. 1 — 21 January 2014

User manual

Document information

Info	Content
Keywords	BFU520, BFU530, BFU550, BFU520A, BFU530A, BFU550A, BFU520W, BFU530W, BFU550W, BFU520X, BFU530X, BFU550X, BFU520XR, BFU530XR, BFU550XR, amplifier, LNA, Wide Band Amplifier, PCB layout, Assembly drawings
Abstract	Document that describes the PCB's and SW content as delivered in the BFU5xx series transistor starter kit



Revision history

Rev	Date	Description
1	2014-01-21	First publication

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1. Introduction

The BFU5xxX transistor family is designed to meet the latest requirements on high frequency applications (up to approximately 1.5 GHz) such as communication, automotive and industrial equipment.

As soon as fast, low noise analogue signal processing is required, combined with medium to high voltage swings, the BFU5xxX transistors are the perfect choice. Due to the high gain at low supply current those types can also be applied very well in battery fed equipment.

Compared to previous Philips / NXP transistor generations and competitor products, improvements on gain, noise and thermal properties are realized. BFU5xxX transistors will be available in various packages.

The transistors will be promoted with a full promotion package, called “starter kits” (one kit type per package-type). Those kits include two PCB’s (one with grounded emitter, one with emitter degeneration provision), RF connectors, transistors and simulation model parameters required to perform simulations. See the overview of available starter kits in the table below.

Table 1. Customer evaluation kits

Transistor Types	Evaluation Kit
BFU520, BFU530, BFU550	OM7962, starter kit SOT143
BFU520X, BFU530X, BFU550X	OM7963, starter kit SOT143X
BFU520XR, BFU530XR, BFU550XR	OM7964, starter kit SOT143XR
BFU520A, BFU530A, BFU550A	OM7961, starter kit SOT23
BFU520W, BFU530W, BFU550W	OM7960, starter kit SOT323

Table 2. Application Notes

Transistor Type	Application Notes (433MHz LNA; 866MHz LNA)
BFU520	AN11427; AN11428
BFU530	AN11429; AN11430
BFU550	AN11431; AN11432
BFU520A	AN11377; AN11378
BFU530A	AN11379; AN11380
BFU550A	AN11381; AN11382
BFU520W	AN11421; AN11422
BFU530W	AN11423; AN11424
BFU550W	AN11425; AN11426
BFU520X	AN11433; AN11434
BFU530X	AN11435; AN11436
BFU550X	AN11437; AN11438
BFU520XR	AN11439; AN11440
BFU530XR	AN11441; AN11442
BFU550XR	AN11443; AN11444

2. Content of the starter kits

The starter kits contains following items:

- 1) 10 transistors of BFU520W
- 2) 10 transistors of BFU530W
- 3) 10 transistors of BFU550W
- 4) One generic Printed Circuit Board for amplifier design with grounded emitter
- 5) One generic Printed Circuit Board for amplifier design using feedback via emitter
- 6) 4 SMA connectors
- 7) 2 DC connectors
- 8) A USB memory stick containing Application notes, models, datasheets, S parameter data

2.1 The starter kit

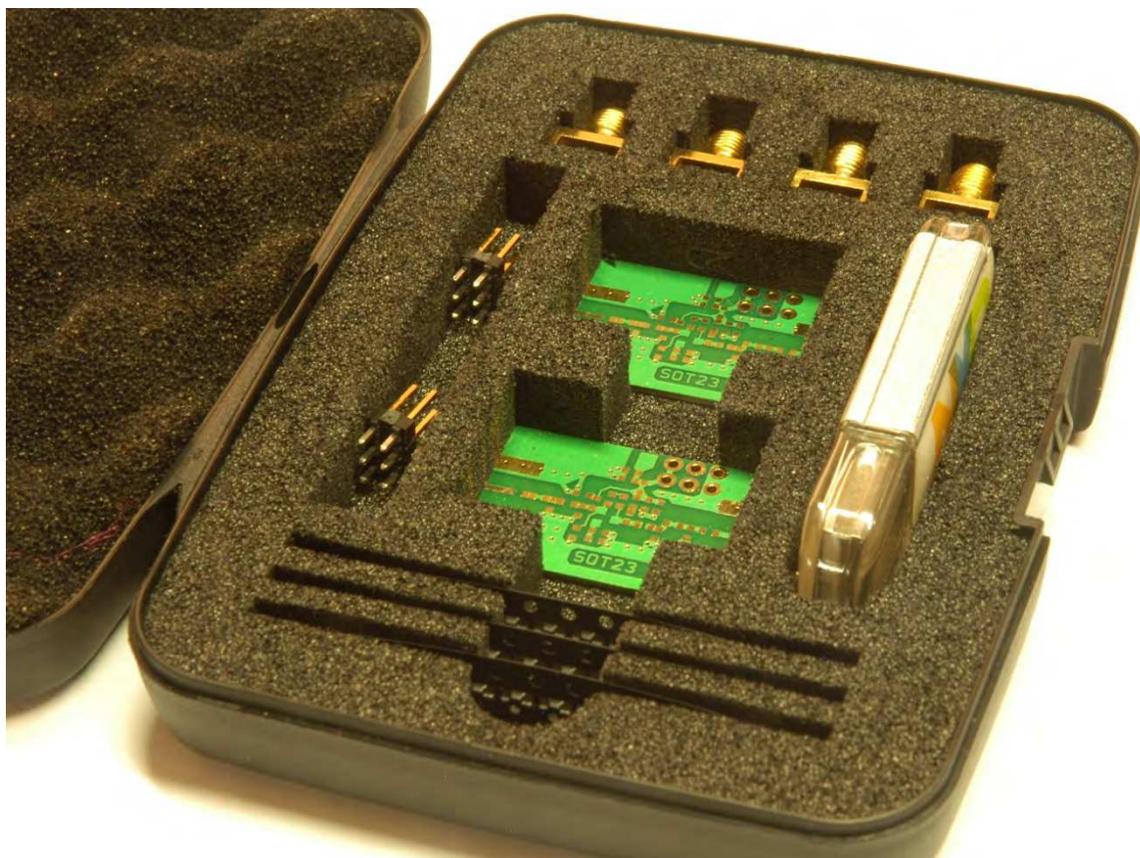


Fig 1. BFU5xx series starter kit

2.2 PCB's example for BFU5xx series LNA

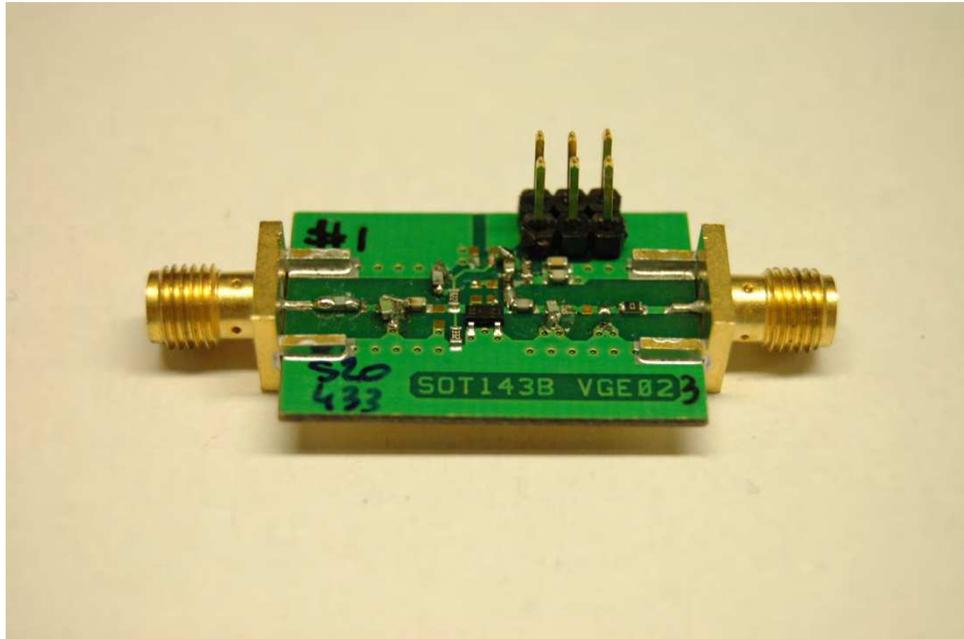


Fig 2. PCB's BFU5-- series populated board, example 433MHz LNA in SOT143 package

3. Target applications for starter kit PCB's

Basically the PCB's are designed to accommodate an RF amplifier. These could be:

- 1) LNA's
- 2) Generic RF Amplifiers, small signal, small band
- 3) Wide band amplifiers (by applying feedback)
- 4) Amplifiers for large signal (using for example BFU550 types).

3.1 Basic schematic for Grounded Emitter versions (VGE0x)

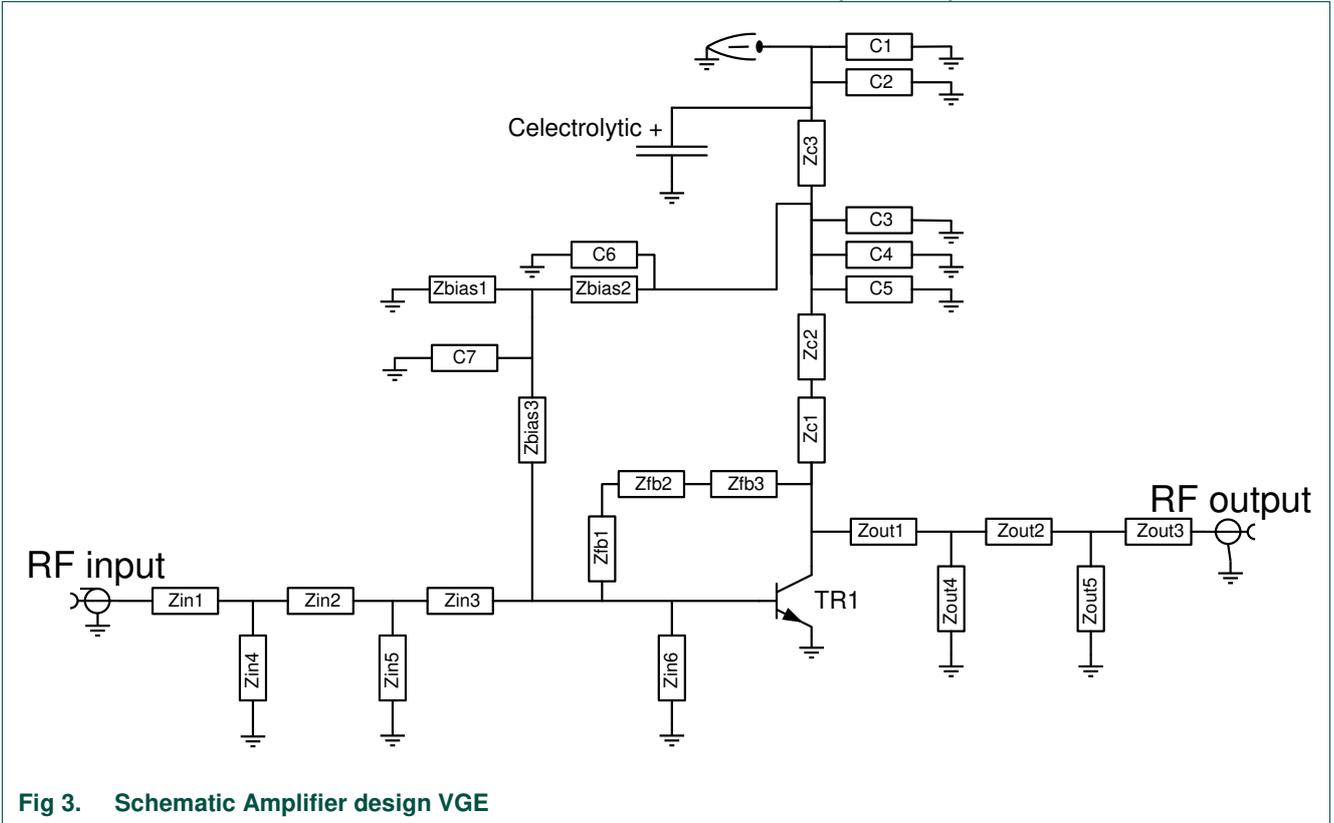


Fig 3. Schematic Amplifier design VGE

Remarks:

- Not all components are required, depends on amplifier/matching configuration
- Input and output considered to be 50 Ohms characteristic impedance (SMA type)
- Generic PI or T matching network at input and output possible
- Basically on all BFU5xx series amplifier EVB's this schematic is applied, small variations on implementation are possible

3.2 Basic schematic for Emitter Degeneration version (VED0x)

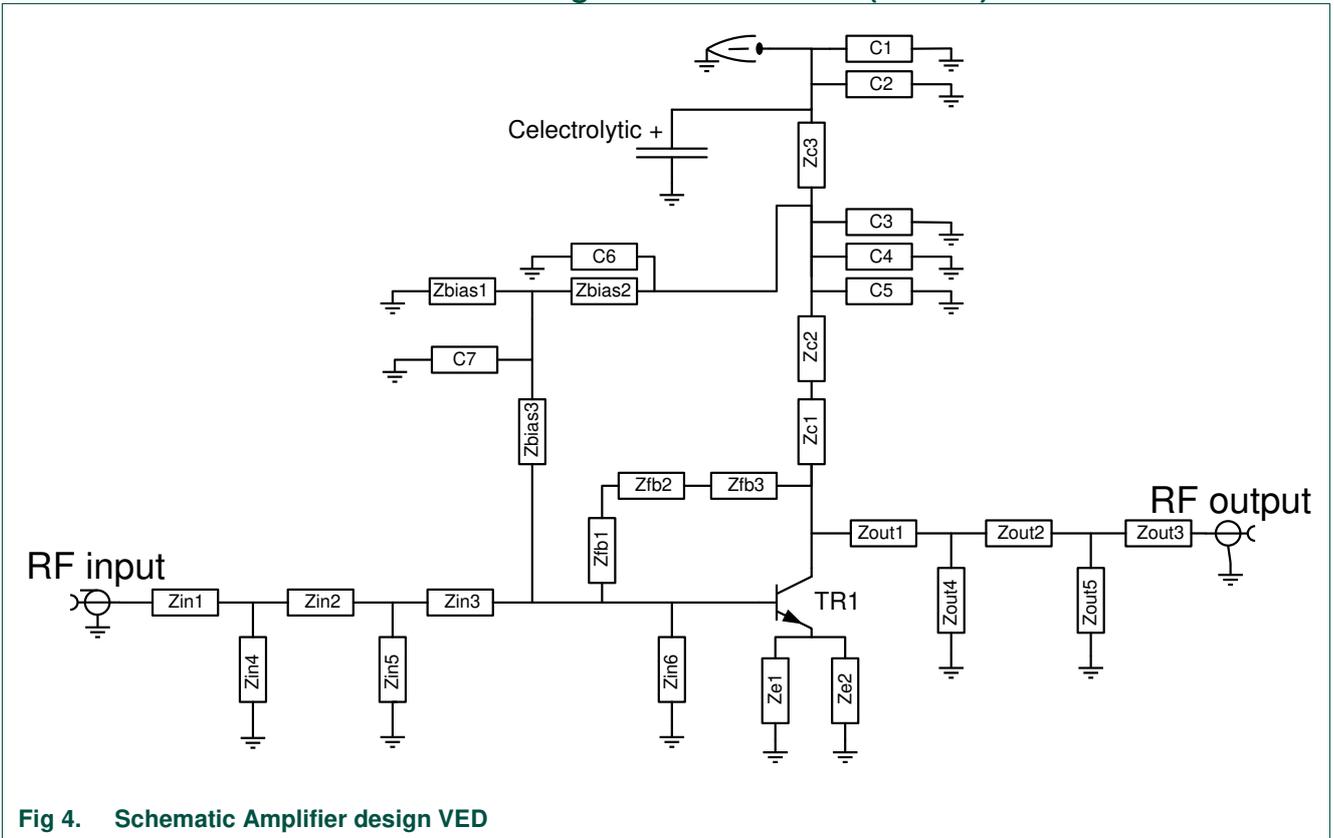


Fig 4. Schematic Amplifier design VED

- Remarks:
- Not all components are required, depends on amplifier/matching configuration
 - Input and output considered to be 50 Ohms characteristic impedance (SMA type)
 - Two parallel components from emitter to GND enable to split DC/AC
 - Generic PI or T matching network at input and output possible

Basically on all BFU5xx series amplifier EVB's this schematic is applied, small variations on implementation are possible

4. PCB drawings for all versions

On all PCB's, except SOT143XR types the same circuit can be applied. On all PCB's except the SOT323, 0603 footprints for capacitors/inductors/resistors are implemented. For SOT323 types this is reduced to 0402 because of the smaller size transistor package.

4.1 Layer stack



Fig 5. Applied PCB layout stack

4.2 SOT323 Grounded Emitter

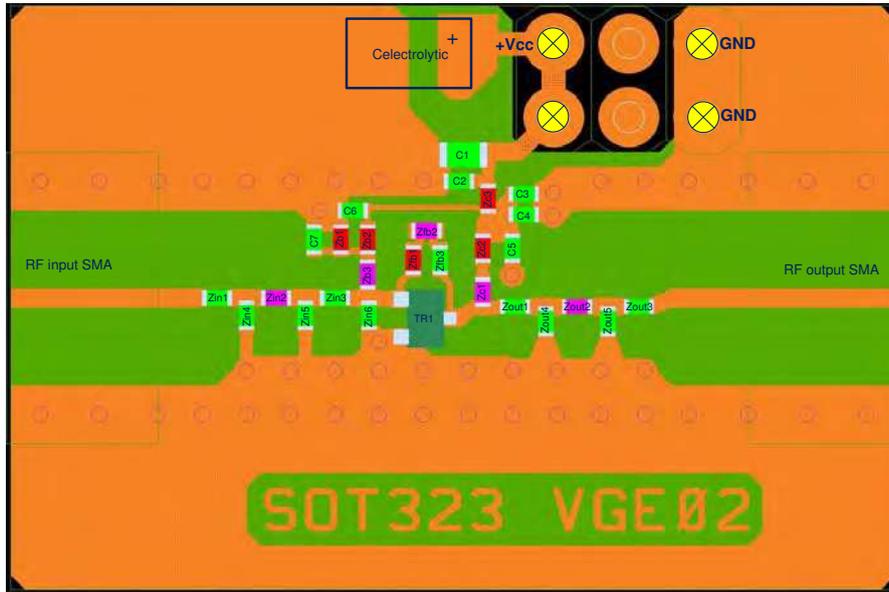


Fig 6. PCB Assembly drawing Amplifier design VGE

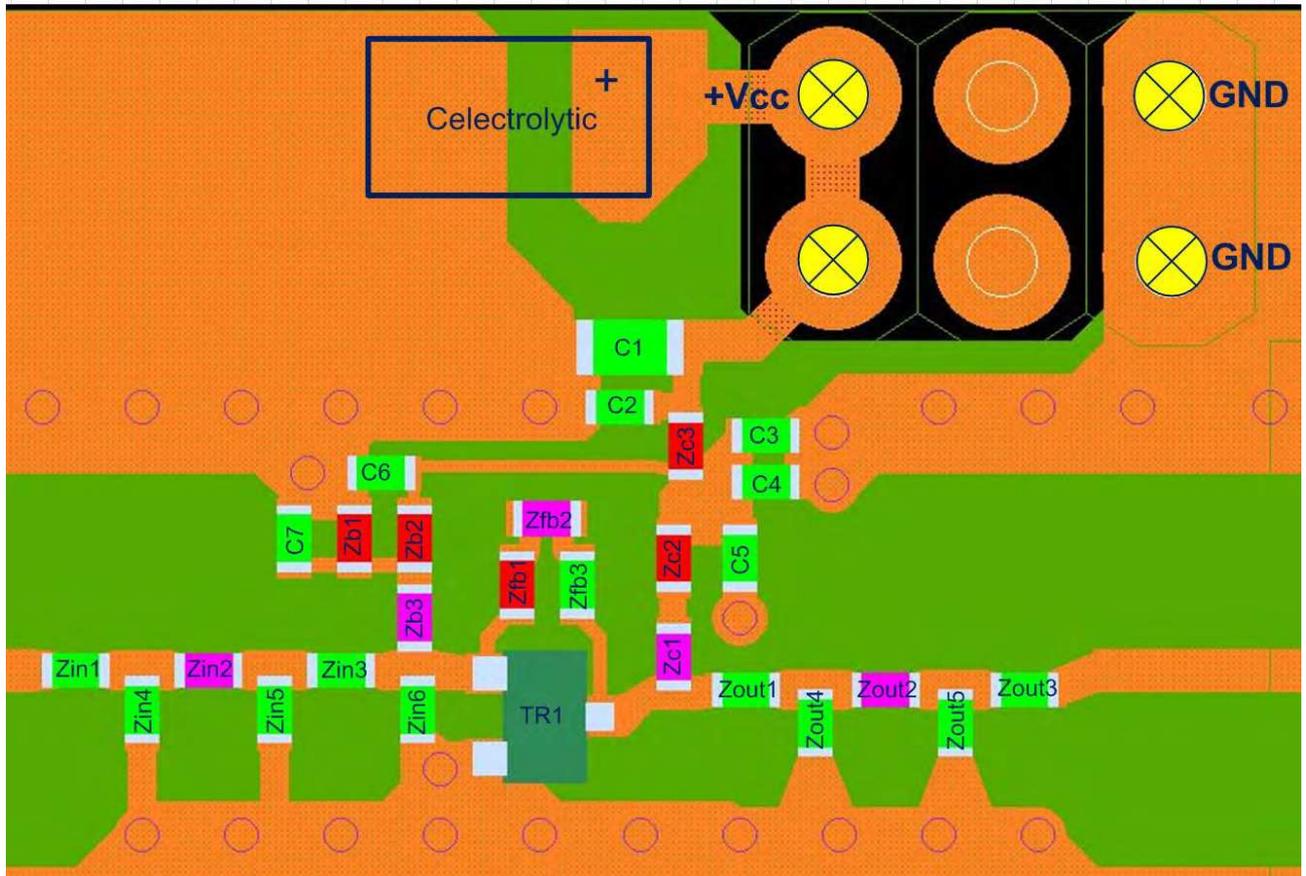


Fig 7. PCB Assembly drawing Amplifier design VGE zoomed in

4.3 SOT323 Emitter Degeneration

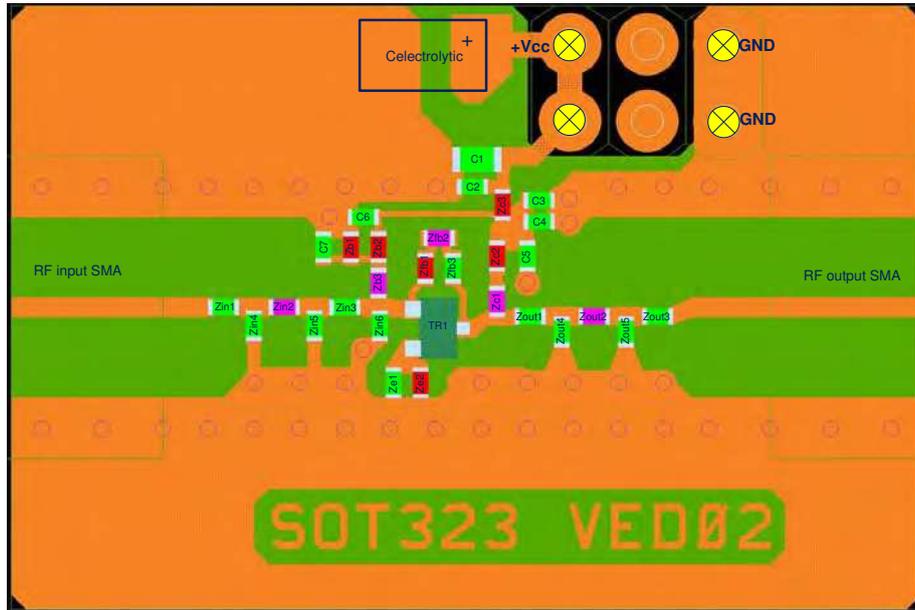


Fig 8. PCB Assembly drawing Amplifier design VED

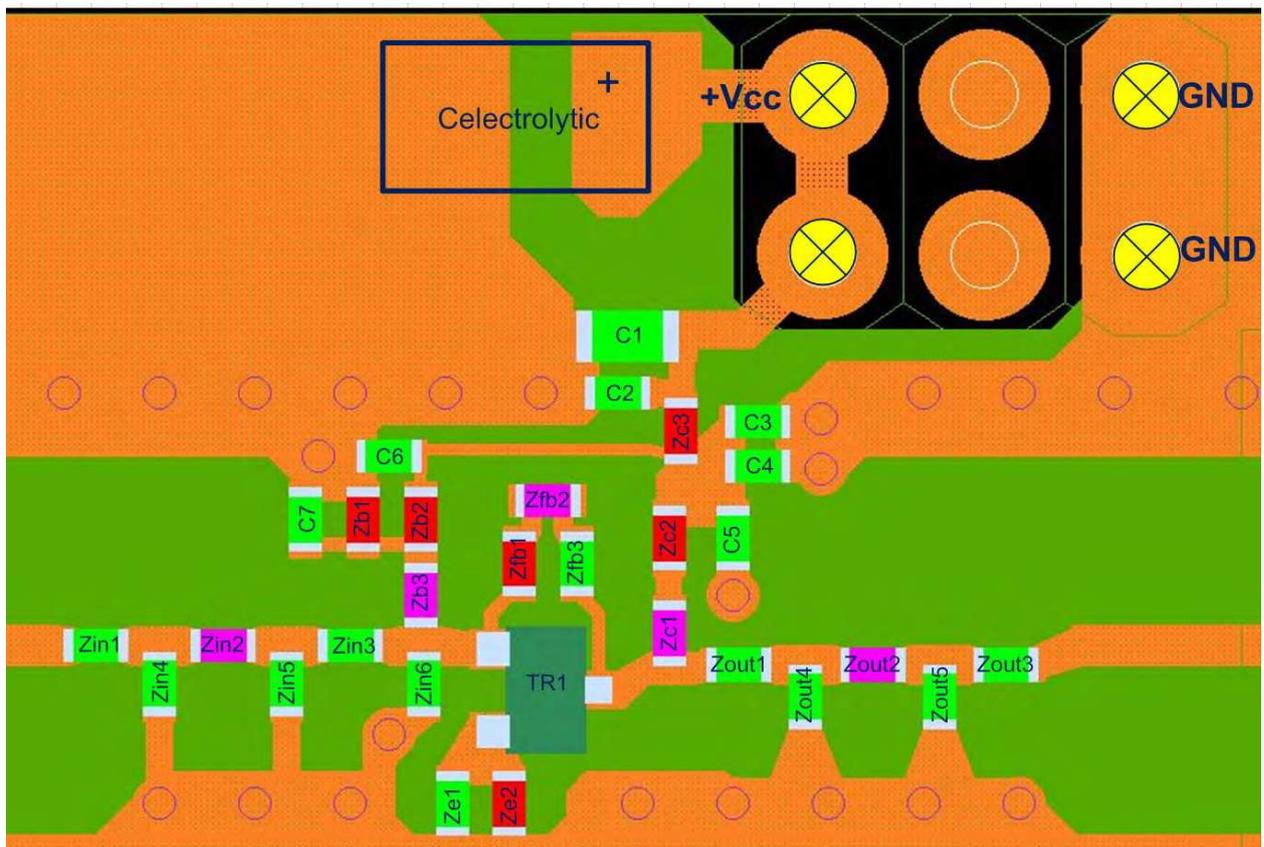


Fig 9. PCB Assembly drawing Amplifier design VED zoomed in

4.4 SOT23 Grounded Emitter

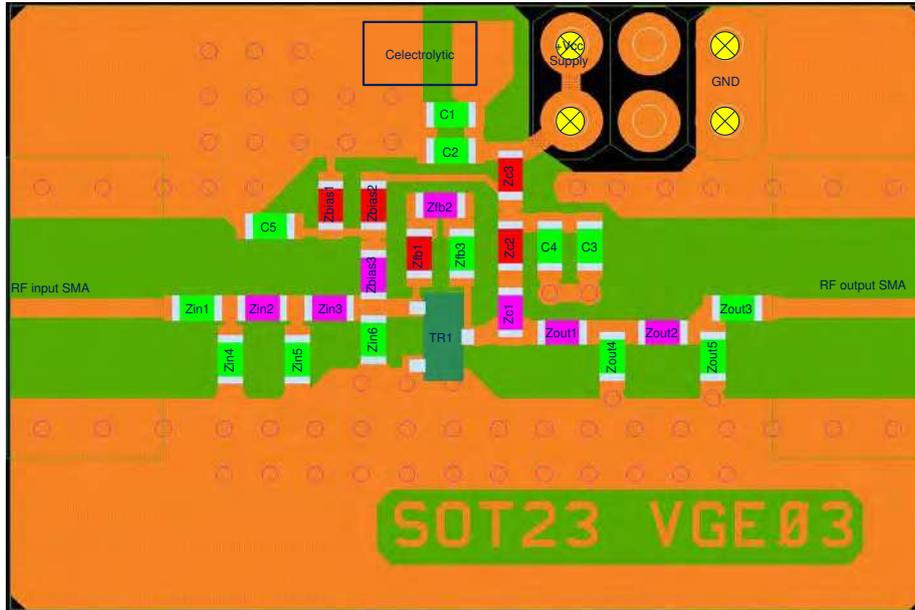


Fig 10. PCB Assembly drawing Amplifier design VGE

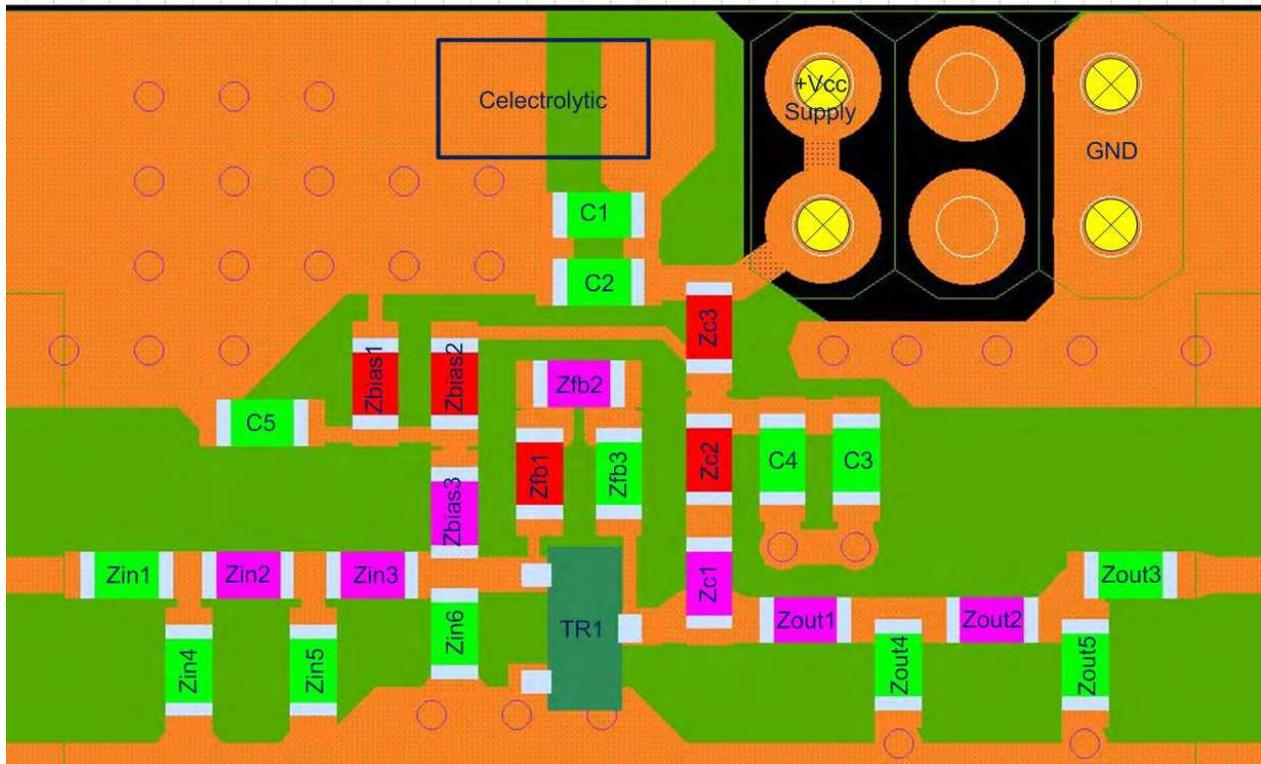


Fig 11. PCB Assembly drawing Amplifier design VGE zoomed in

4.5 SOT23 Emitter Degeneration

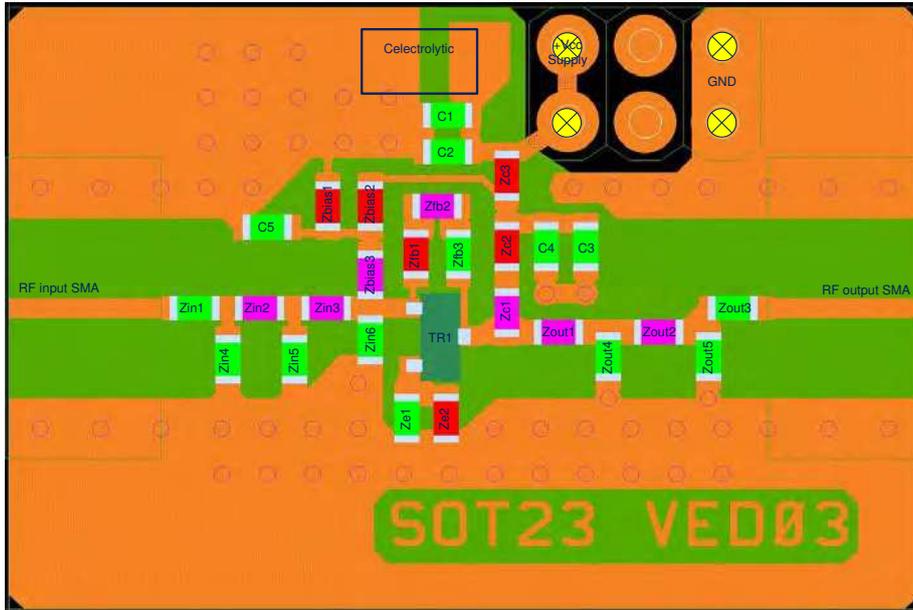


Fig 12. PCB Assembly drawing Amplifier design VED

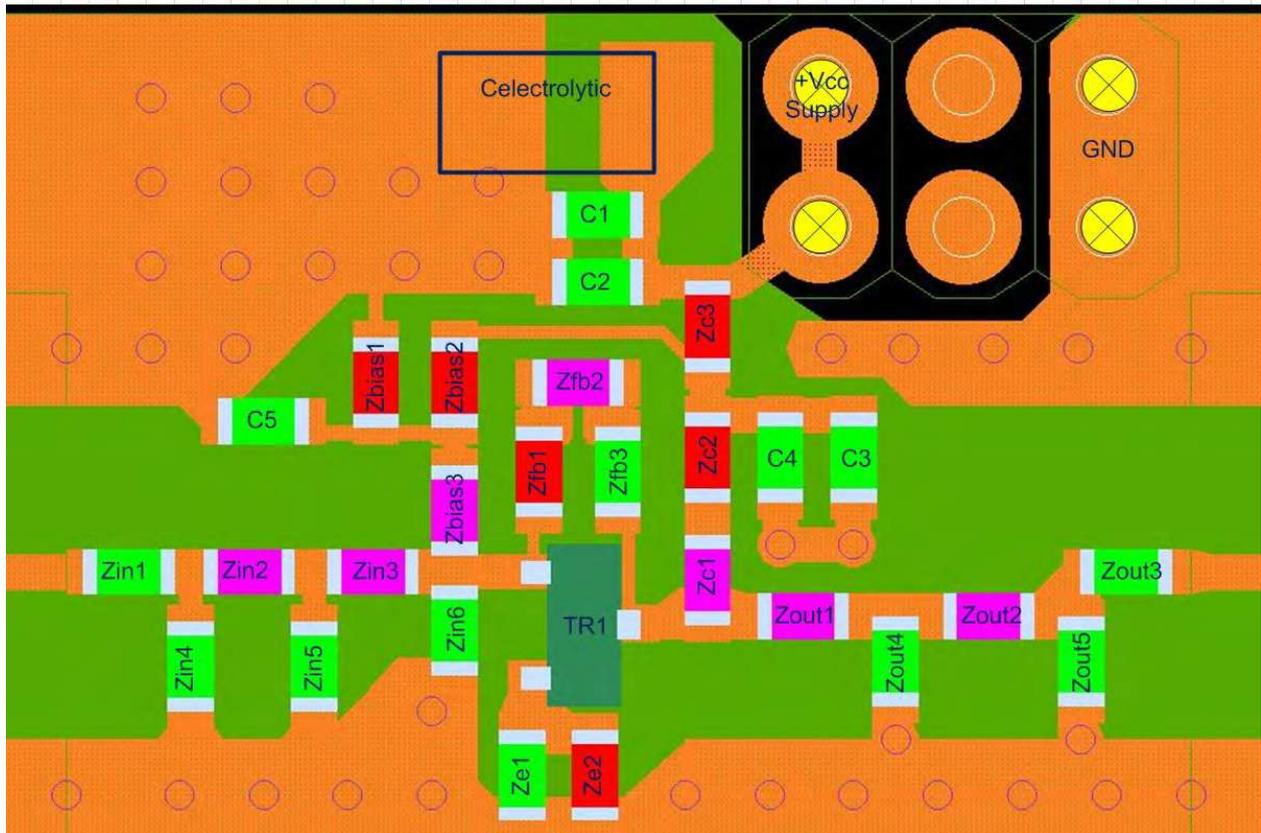


Fig 13. PCB Assembly drawing Amplifier design VED zoomed in

4.6 SOT143 Grounded Emitter

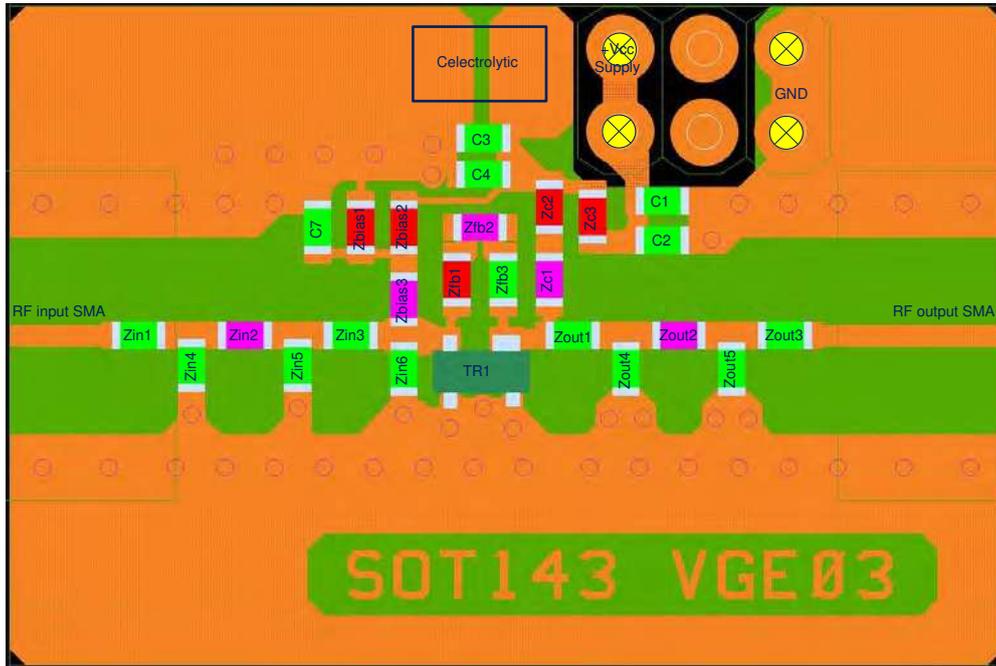


Fig 14. PCB Assembly drawing Amplifier design VGE

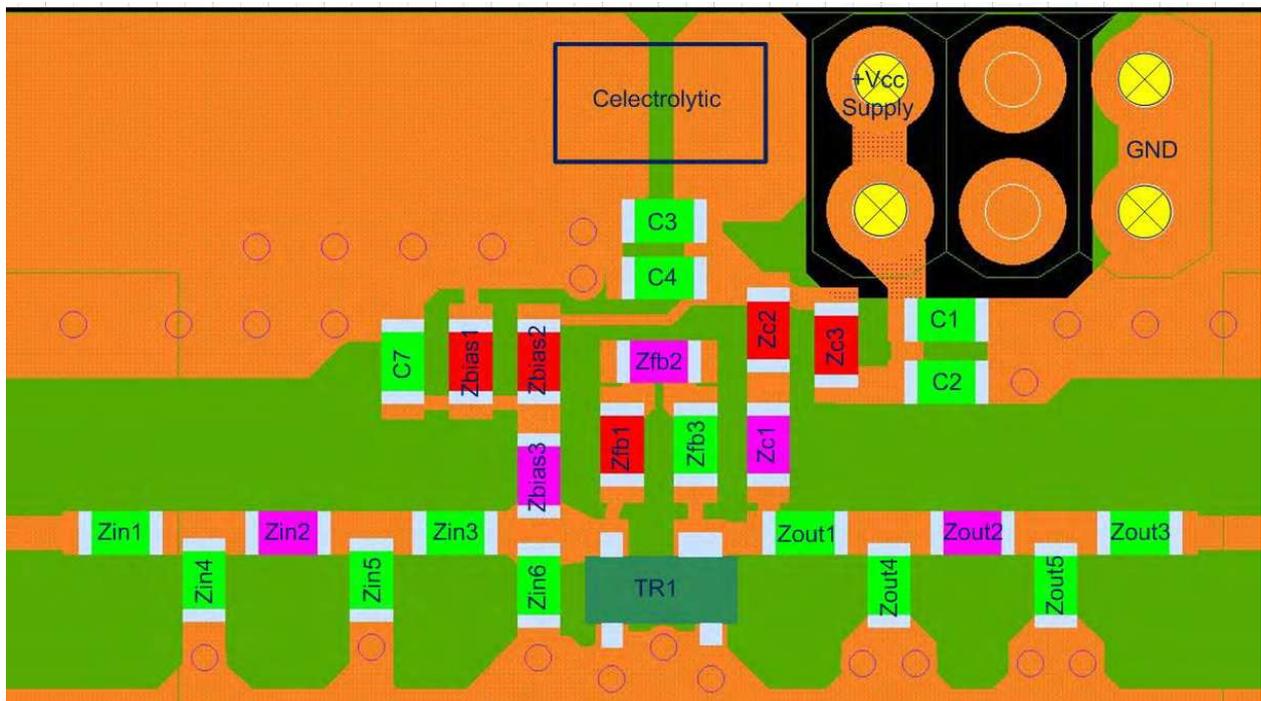


Fig 15. PCB Assembly drawing Amplifier design VGE zoomed in

4.7 SOT143 Emitter Degeneration

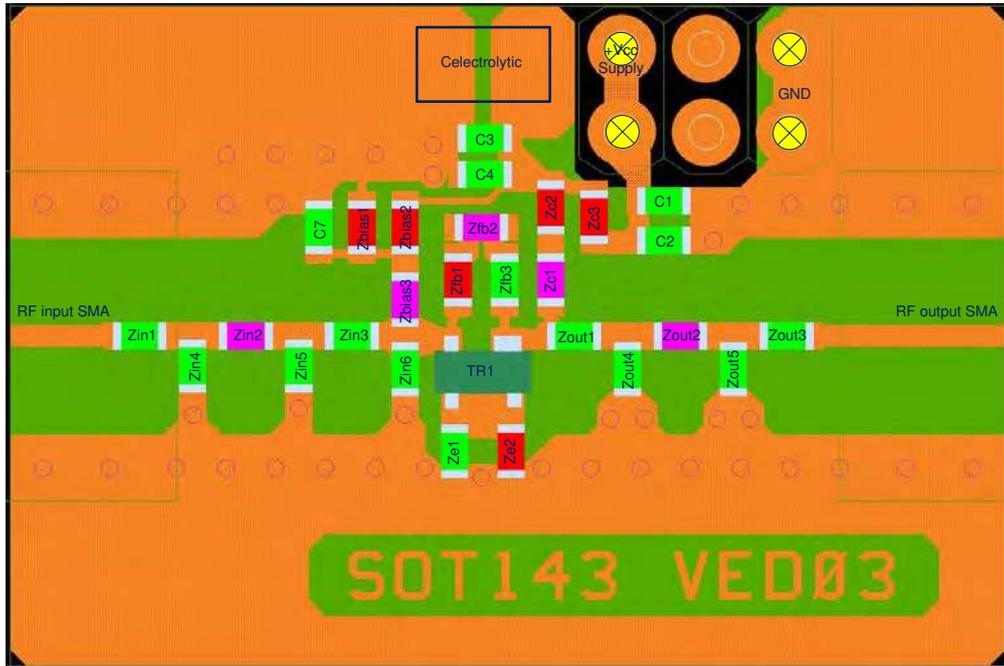


Fig 16. PCB Assembly drawing Amplifier design VED

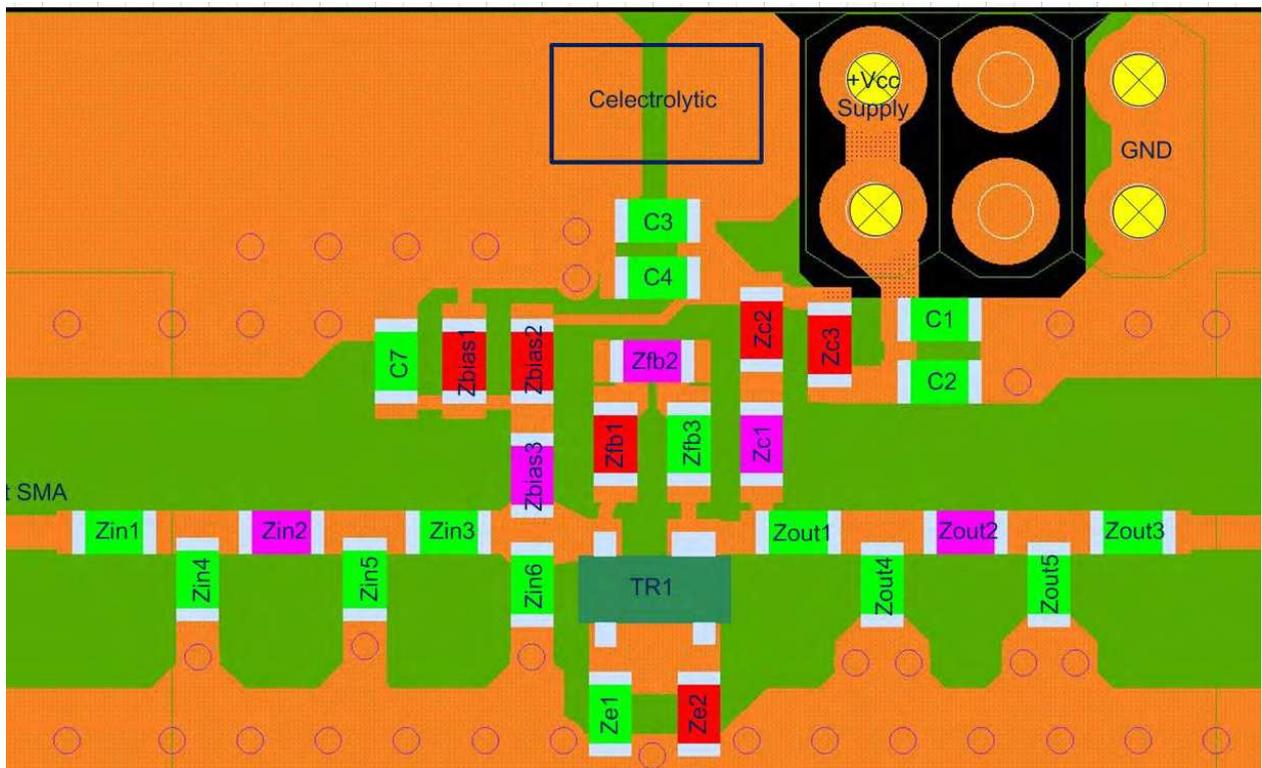


Fig 17. PCB Assembly drawing Amplifier design VED zoomed in

4.8 SOT143X Grounded Emitter

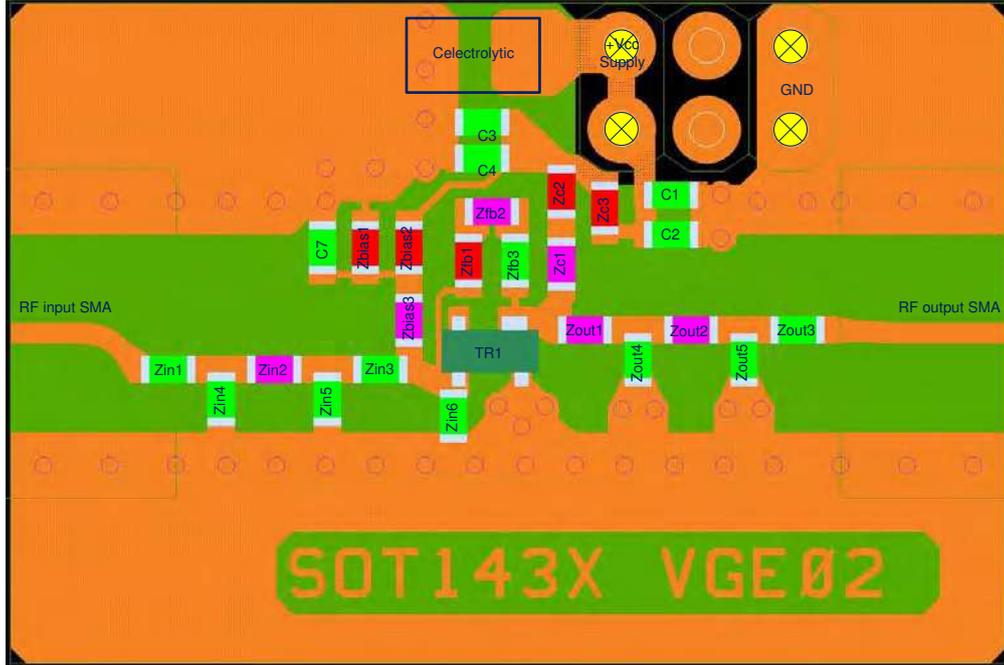


Fig 18. PCB Assembly drawing Amplifier design VGE

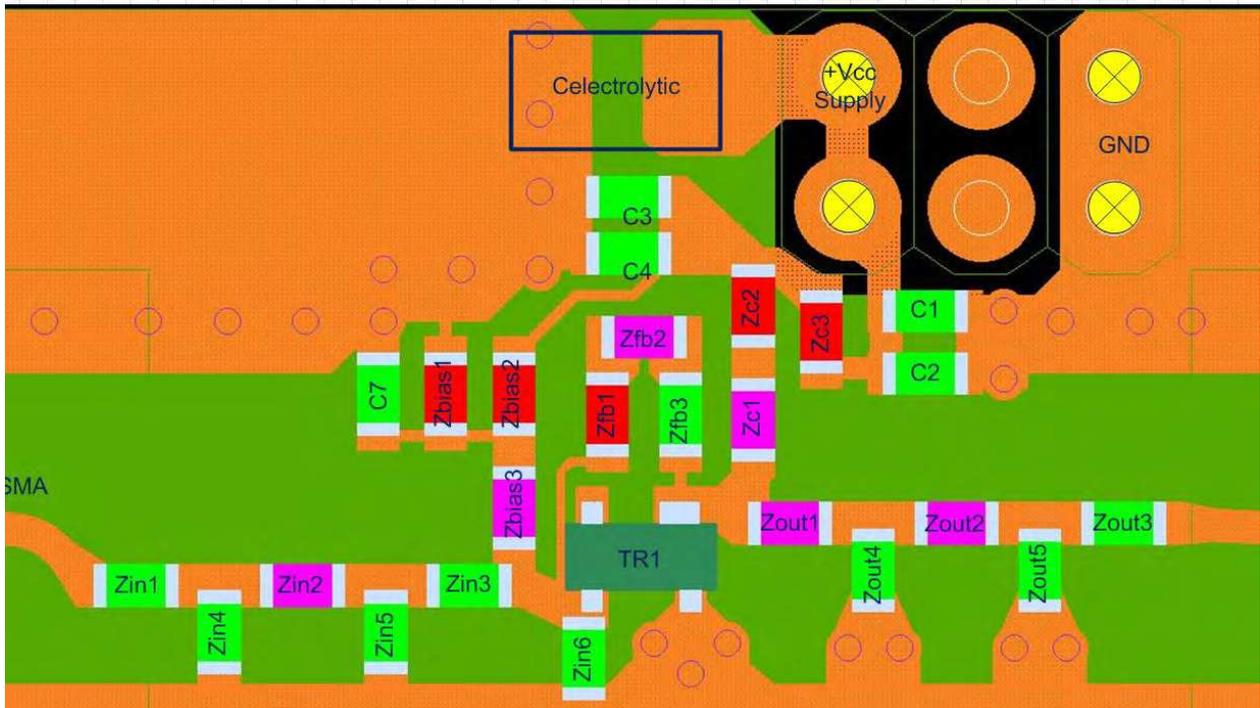


Fig 19. PCB Assembly drawing Amplifier design VGE zoomed in

4.9 SOT143X Emitter Degeneration

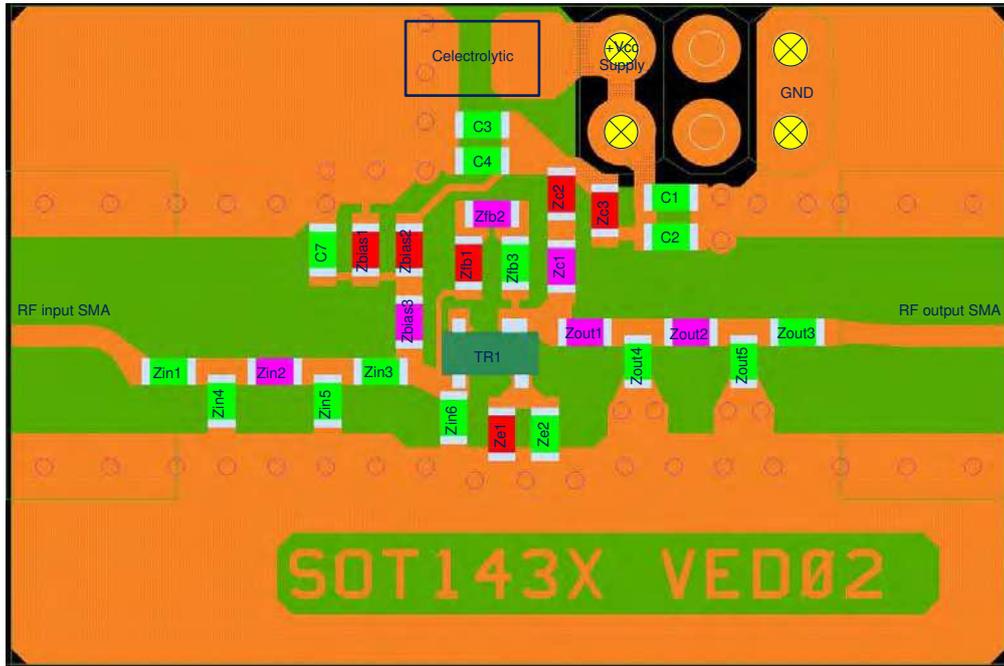


Fig 20. PCB Assembly drawing Amplifier design VED

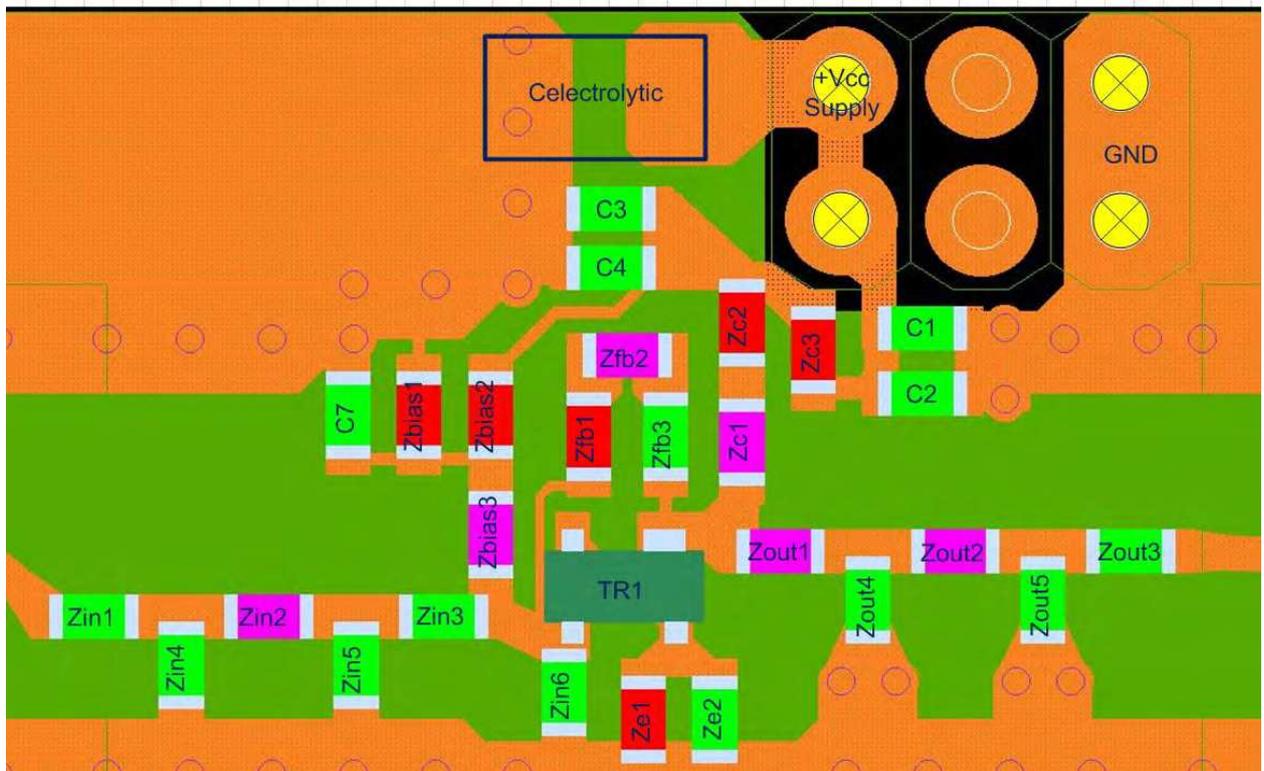


Fig 21. PCB Assembly drawing Amplifier design VED zoomed in

4.10 SOT143XR types, schematics

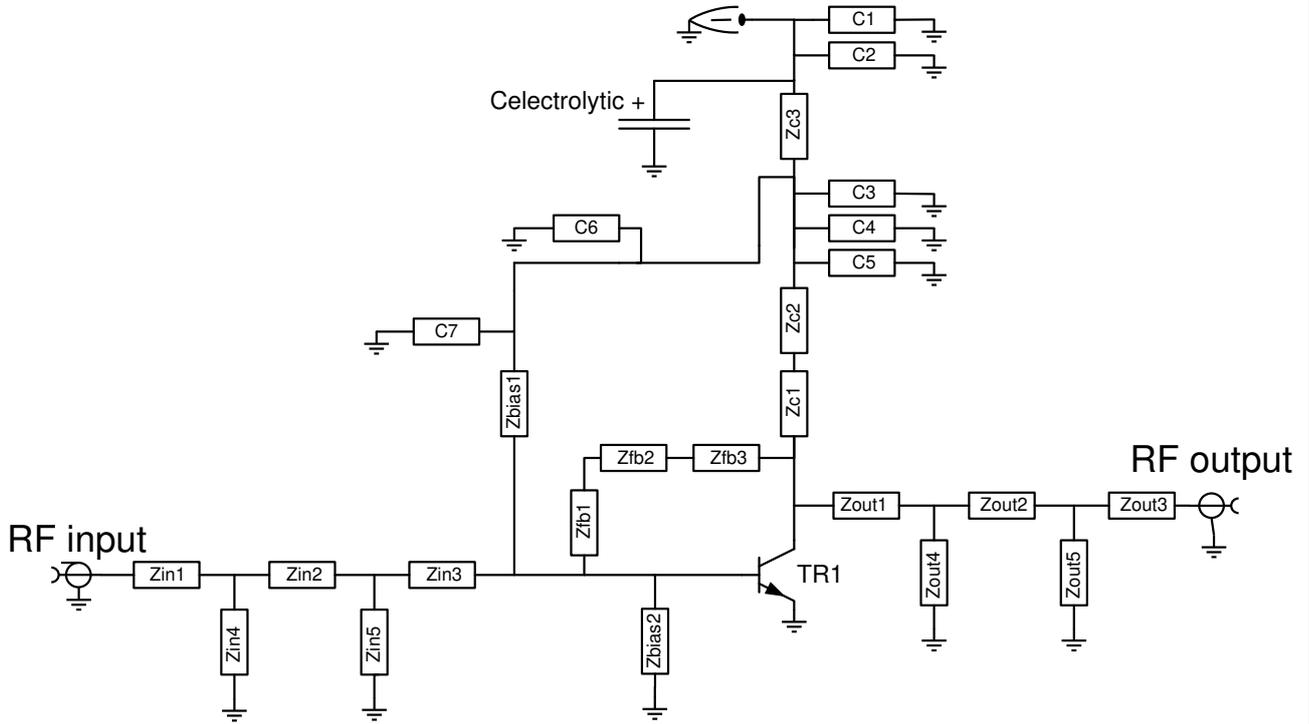


Fig 22. Generic schematic used for SOT143XR Vge types, small differences in DC biasing

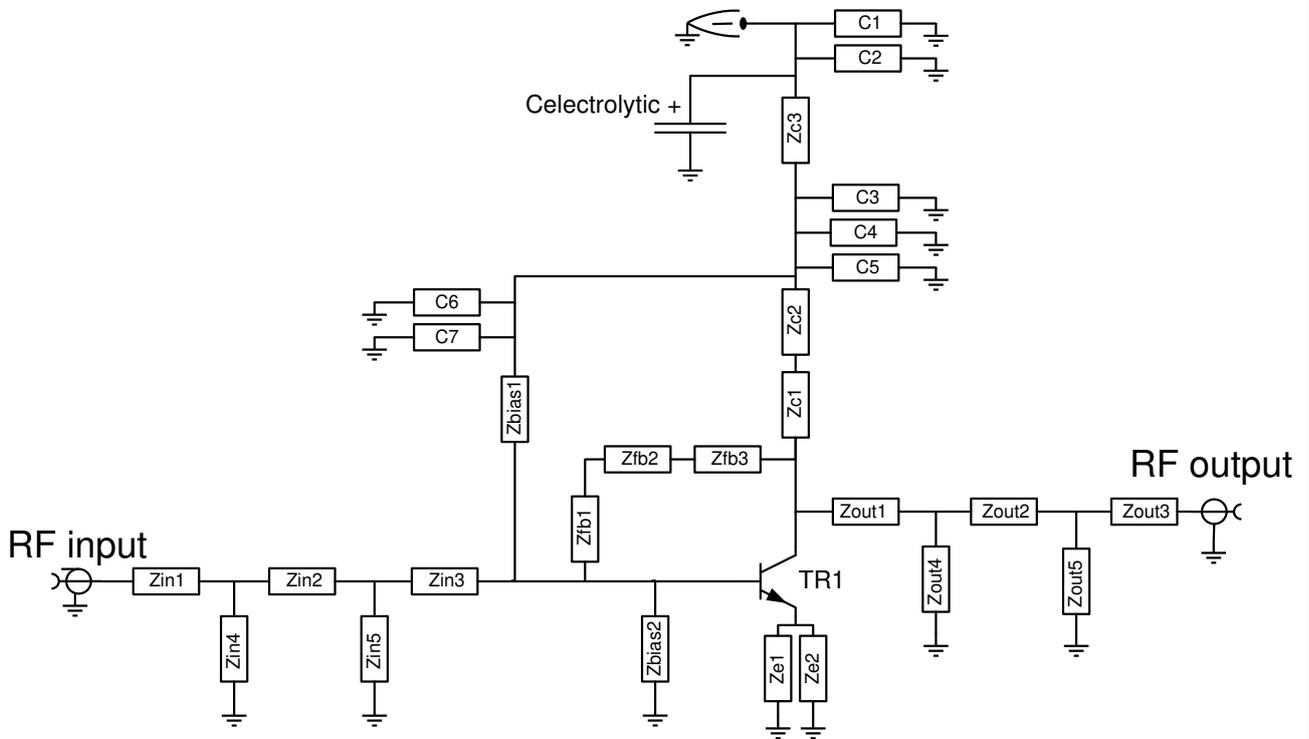


Fig 23. Generic schematic used for SOT143XR Ved types, small differences in DC biasing

4.11 SOT143XR Grounded Emitter

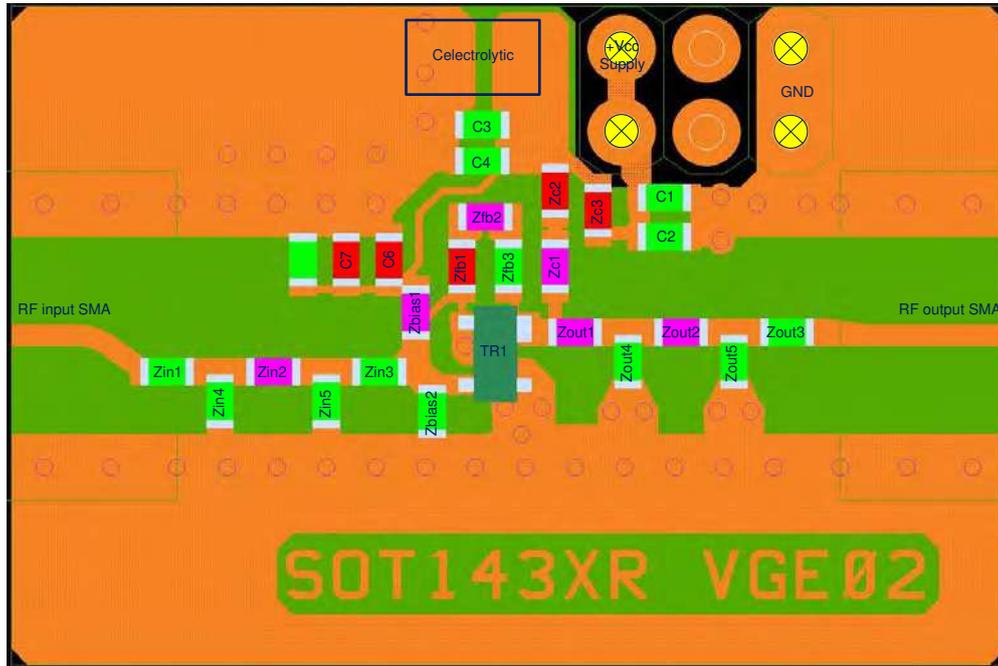


Fig 24. PCB Assembly drawing Amplifier design VGE

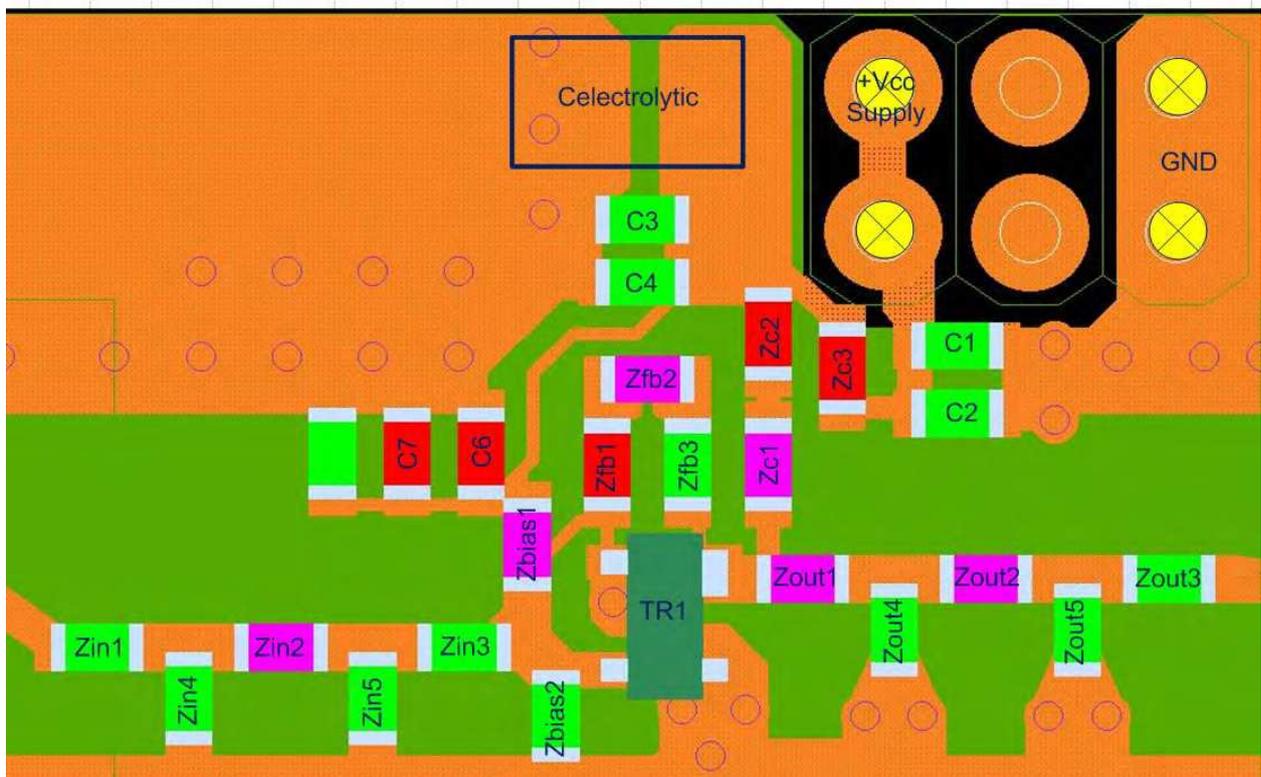


Fig 25. PCB Assembly drawing Amplifier design VGE zoomed in

4.12 SOT143XR Emitter Degeneration

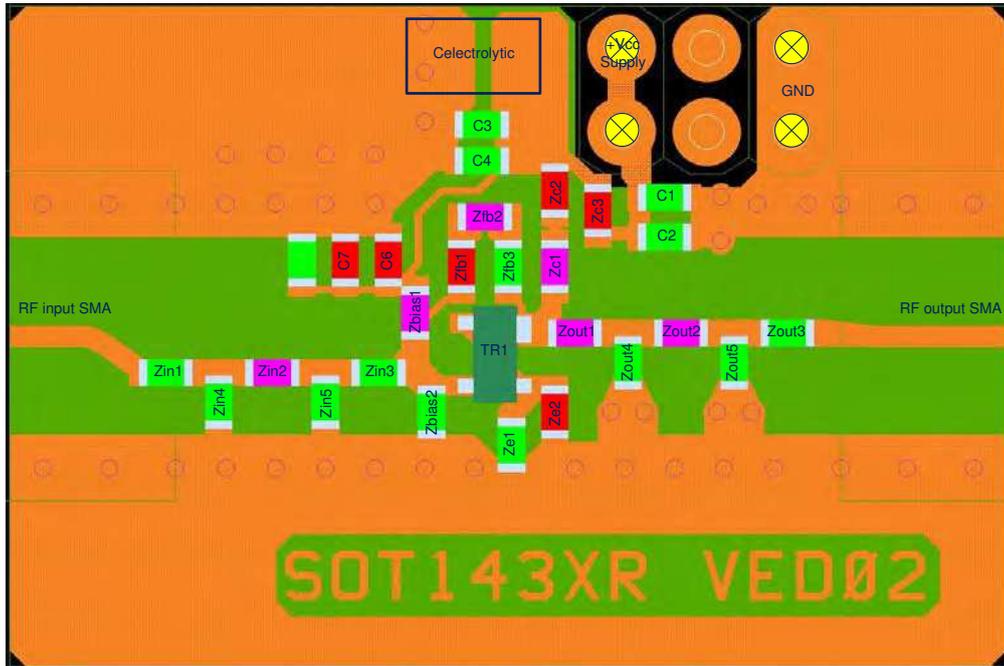


Fig 26. PCB Assembly drawing Amplifier design VED

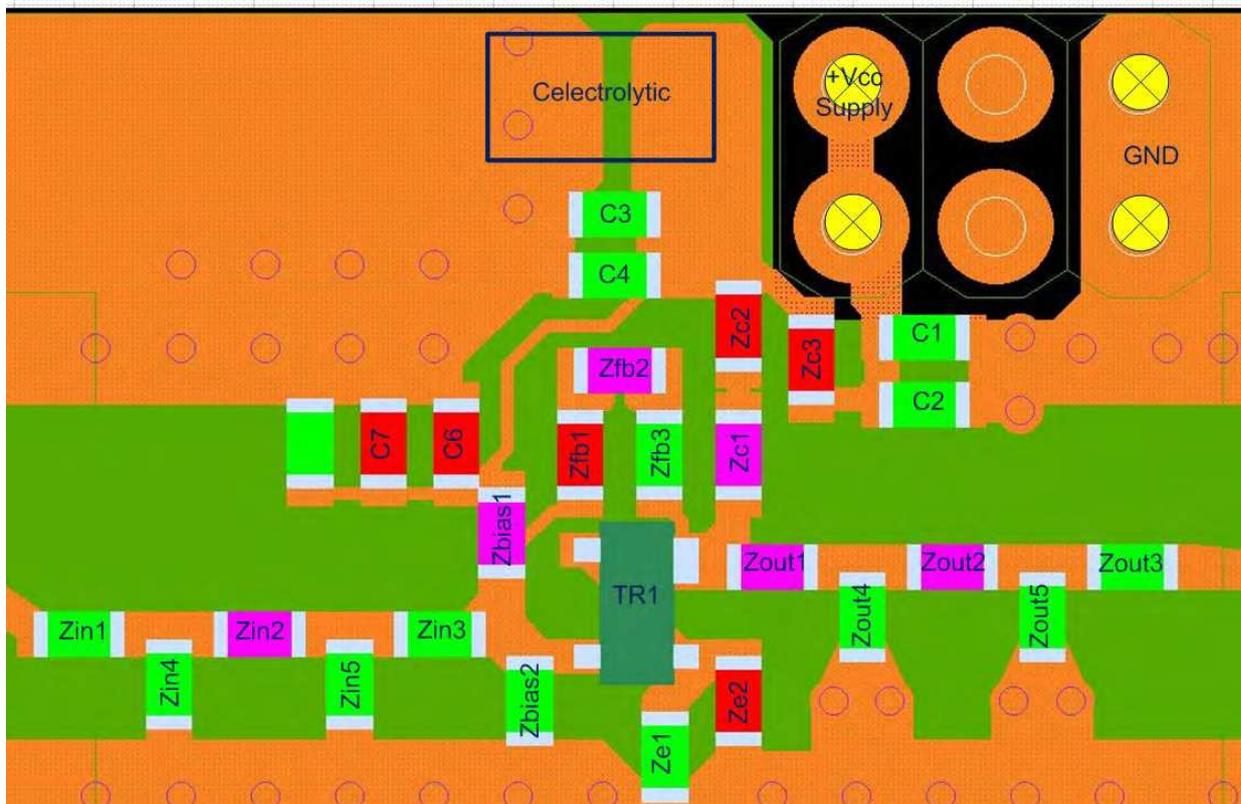


Fig 27. PCB Assembly drawing Amplifier design VED zoomed in

5. USB memory device: content

5.1 Product Datasheets

15 Datasheets for all BFU520, 530 and 550 types that are commercially available.

5.2 Files for in-circuit Simulations

Mextram, Spice, S-parameters 400MHz - 2GHz with Noise, 40MHz - 6GHz no noise, instruction manual for installing the ADS design-kit

5.3 Product Application Notes

Application notes as listed in table 2.

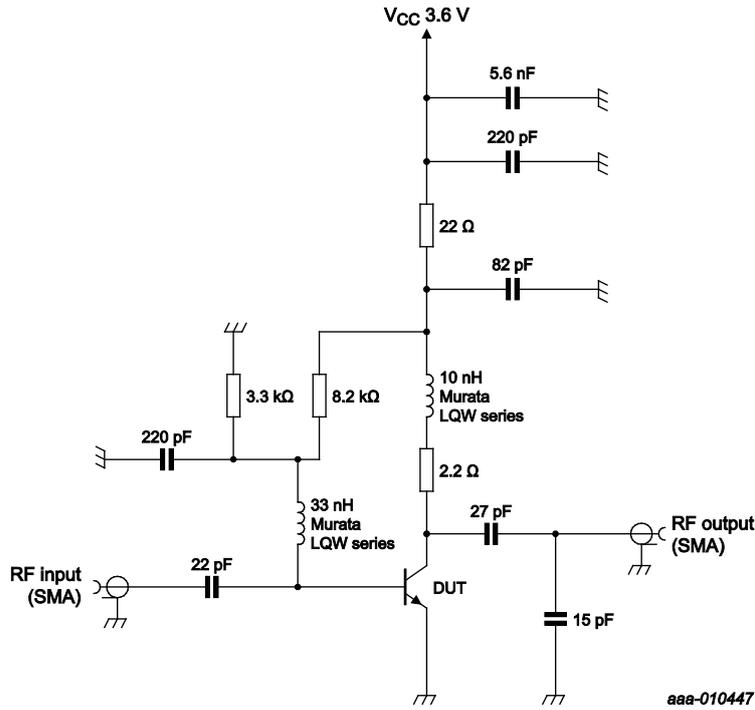
5.4 Design files from PCB's

DXF files of all EVB's, created by ADS.

6. Example amplifier designs

Some examples that can be used as starting point, for more detailed description, measurement and simulation results please refer to NXP application notes on BFU5xx series. Basic schematic for Grounded Emitter version (VGE0x) can be found in the next sections.

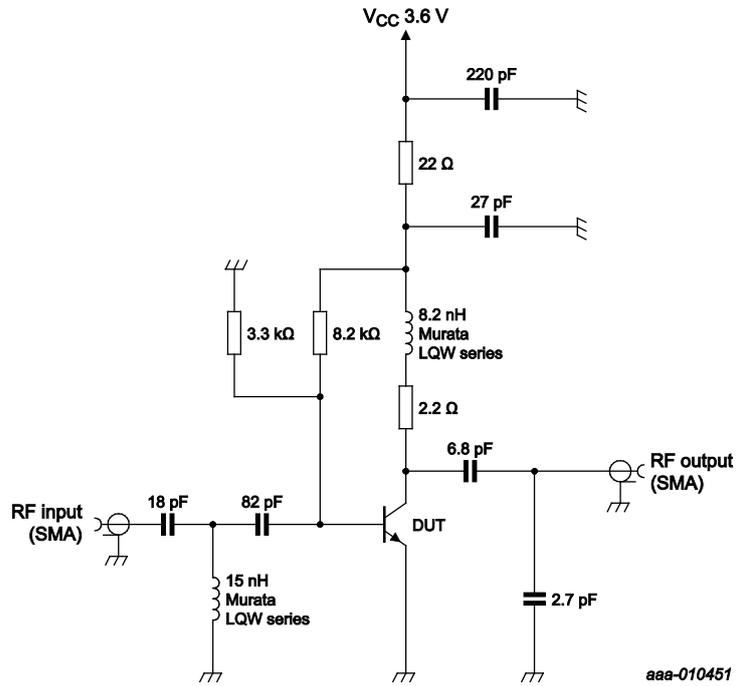
6.1 433MHz LNA using BFU520A



aaa-010447

Fig 28. 433MHz LNA using BFU520A

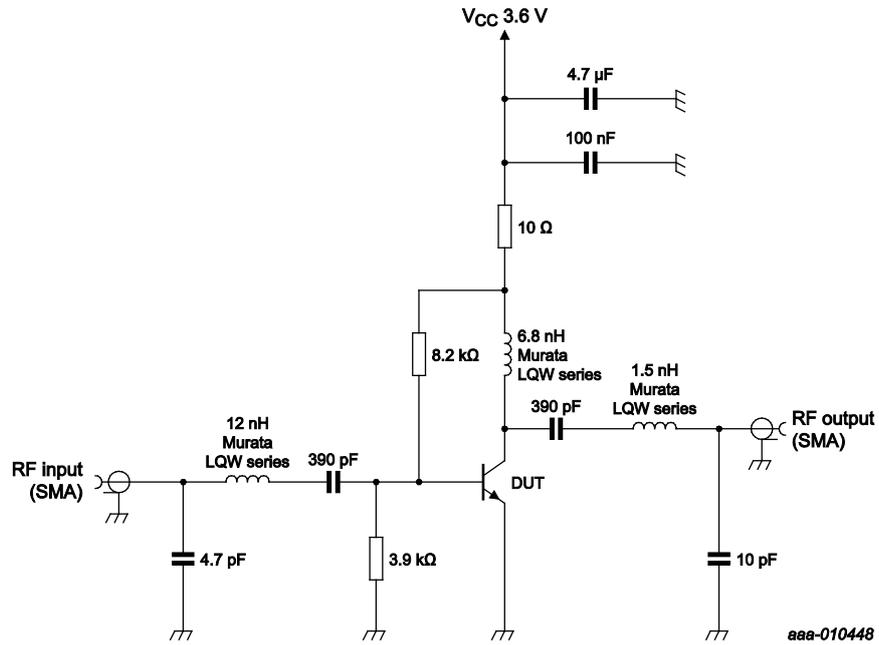
6.2 866MHz LNA using BFU520A



aaa-010451

Fig 29. 866MHz LNA using BFU520A

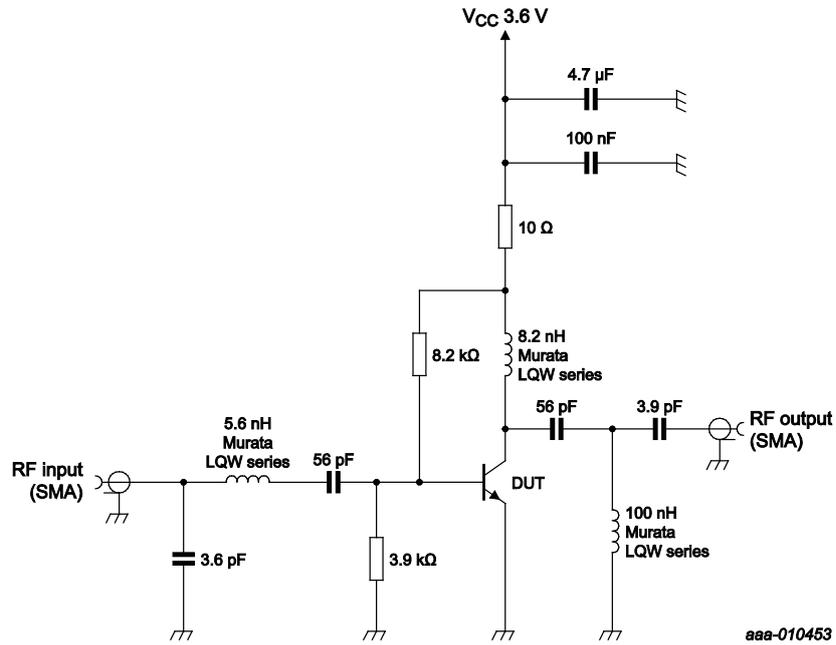
6.3 433MHz LNA using BFU530A



aaa-010448

Fig 30. 433MHz LNA using BFU530A

6.4 866MHz LNA using BFU530A



aaa-010453

Fig 31. 866MHz LNA using BFU530A