

Making **Wireless** —
Making **3G**

I-Sample Overview



Technology for Innovators™

 **TEXAS INSTRUMENTS**

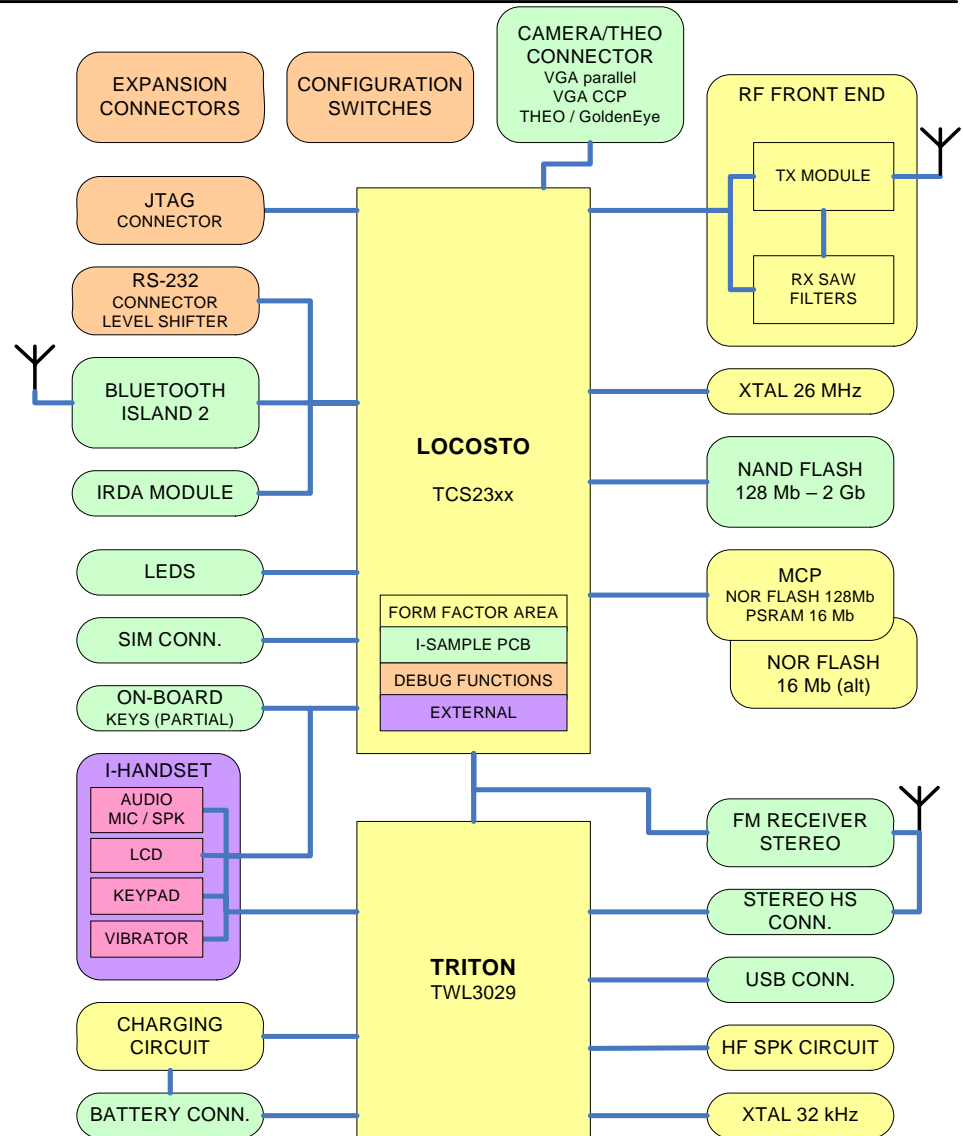
I-sample – Overview

Block Diagram

The reference design area holds components that are essential part of the modem functionality of the design

I-sample includes a number of typical peripherals for an advanced Locosto design.

I-sample also includes a number of development / debug functions.



I-sample – Overview

I-sample Kit

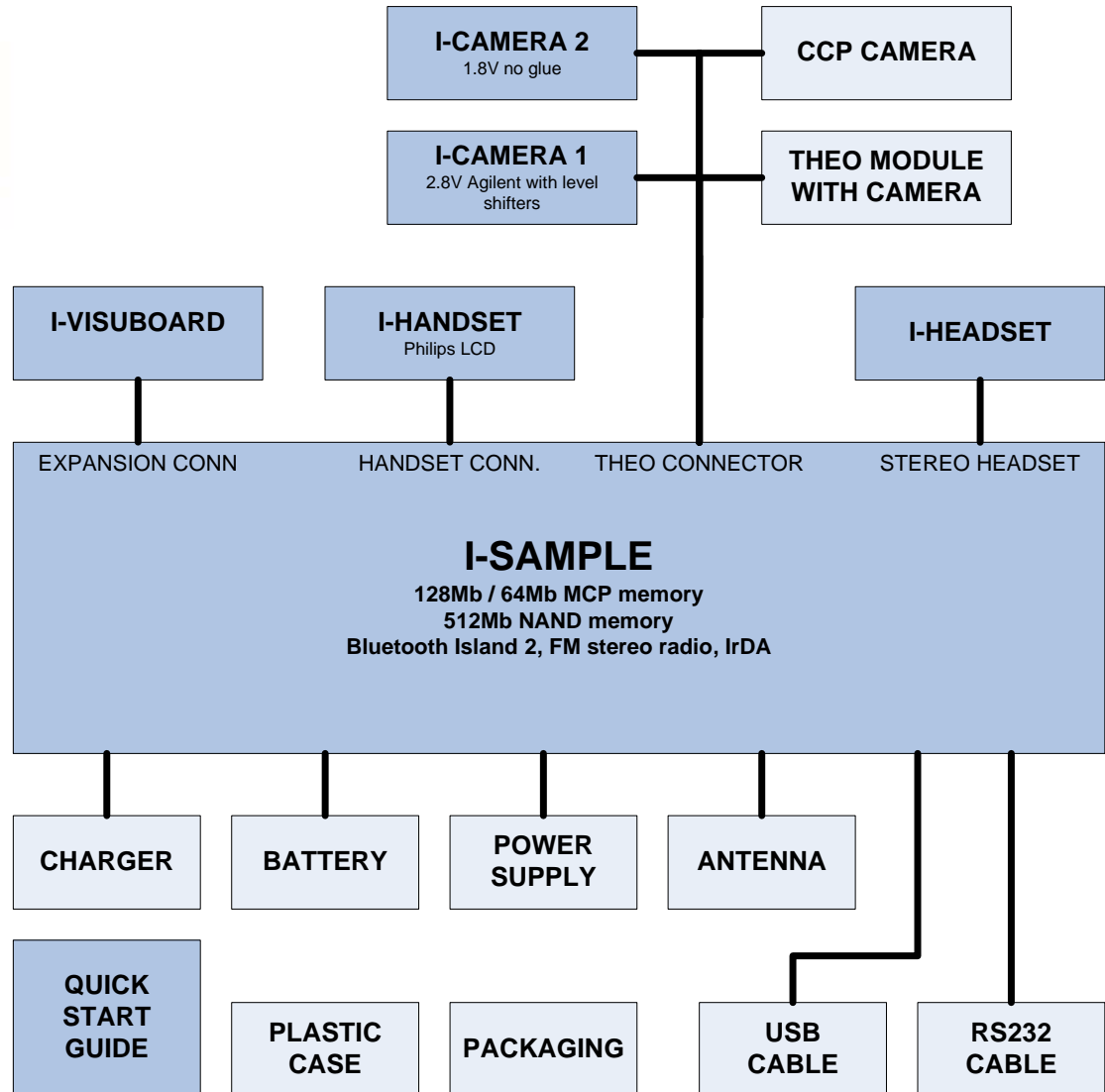
Development platform
and reference design

I-Handset with keypad,
audio, color LCD (QCIF+
176x220 pixels)

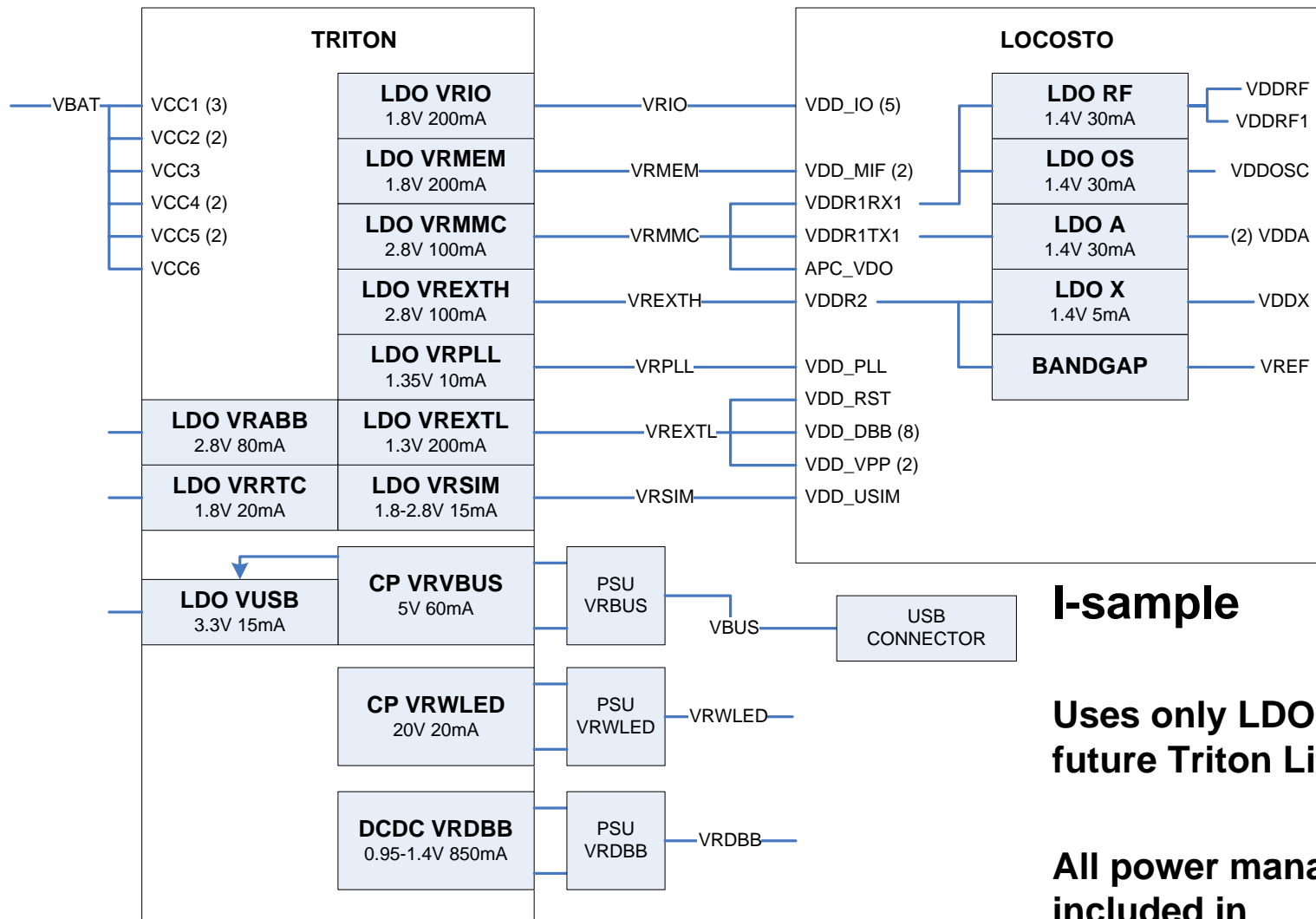
I-Visuboard for full access
to signals, incl. 16 LEDs for
debug.

I-Camera I: Agilent with
level shifters for E-sample
software reuse

I-Camera II: TBD Locosto
compliant 1.8V Camera.



I-sample – Power Management

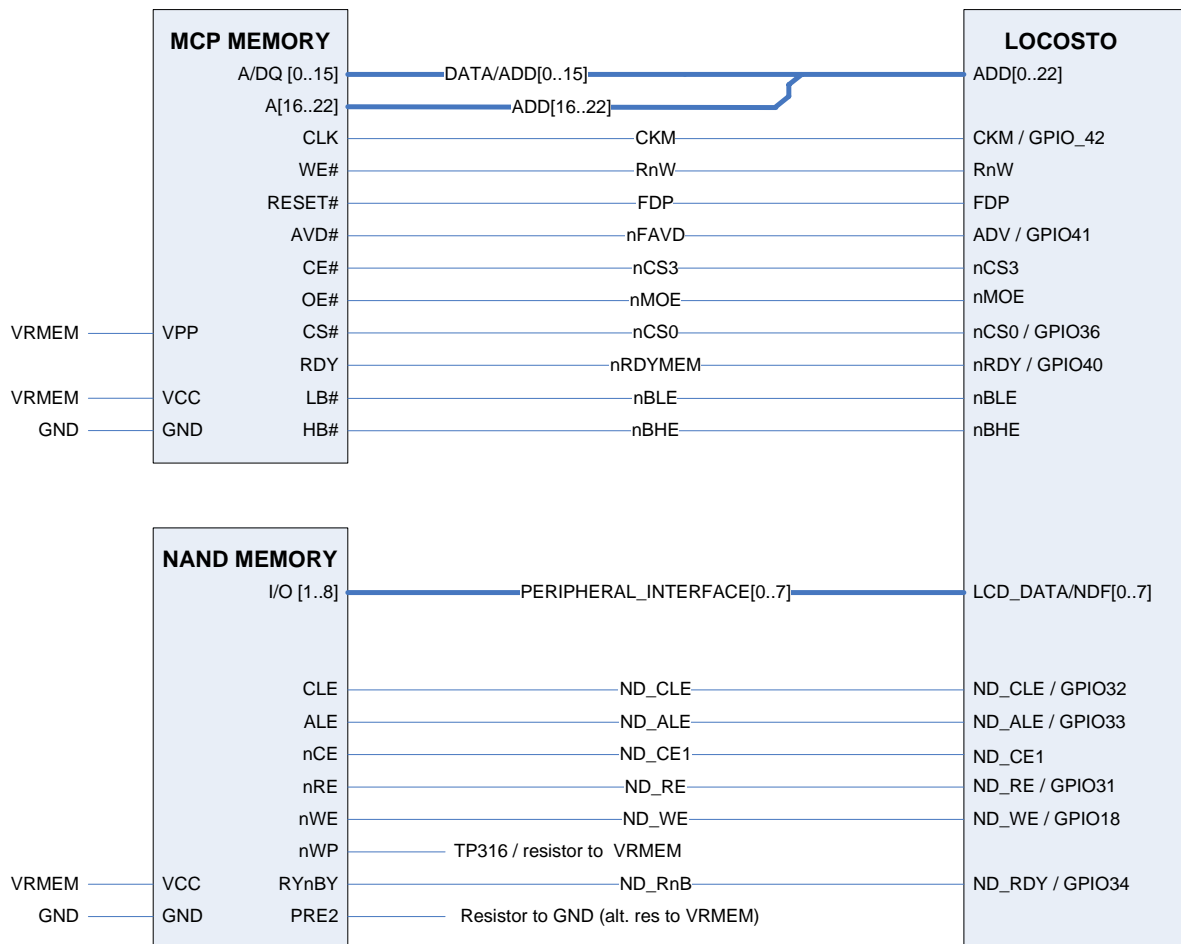


I-sample

Uses only LDOs (for future Triton Lite)

All power management is included in Locosto/Triton

I-sample – Memory



Memory NOR/RAM

Multiplexed address/data, 1.8V interface. 52MHz burst mode

For low-feature phones (Locosto Lite) only external NOR flash is needed (16-32Mb)

For Locosto Plus a MCP memory is used. Example 128-16Mb - depending on feature set.

I-sample uses MCP 128-64 for development purposes

All mentioned devices are footprint compatible.

Memory NAND (optional)

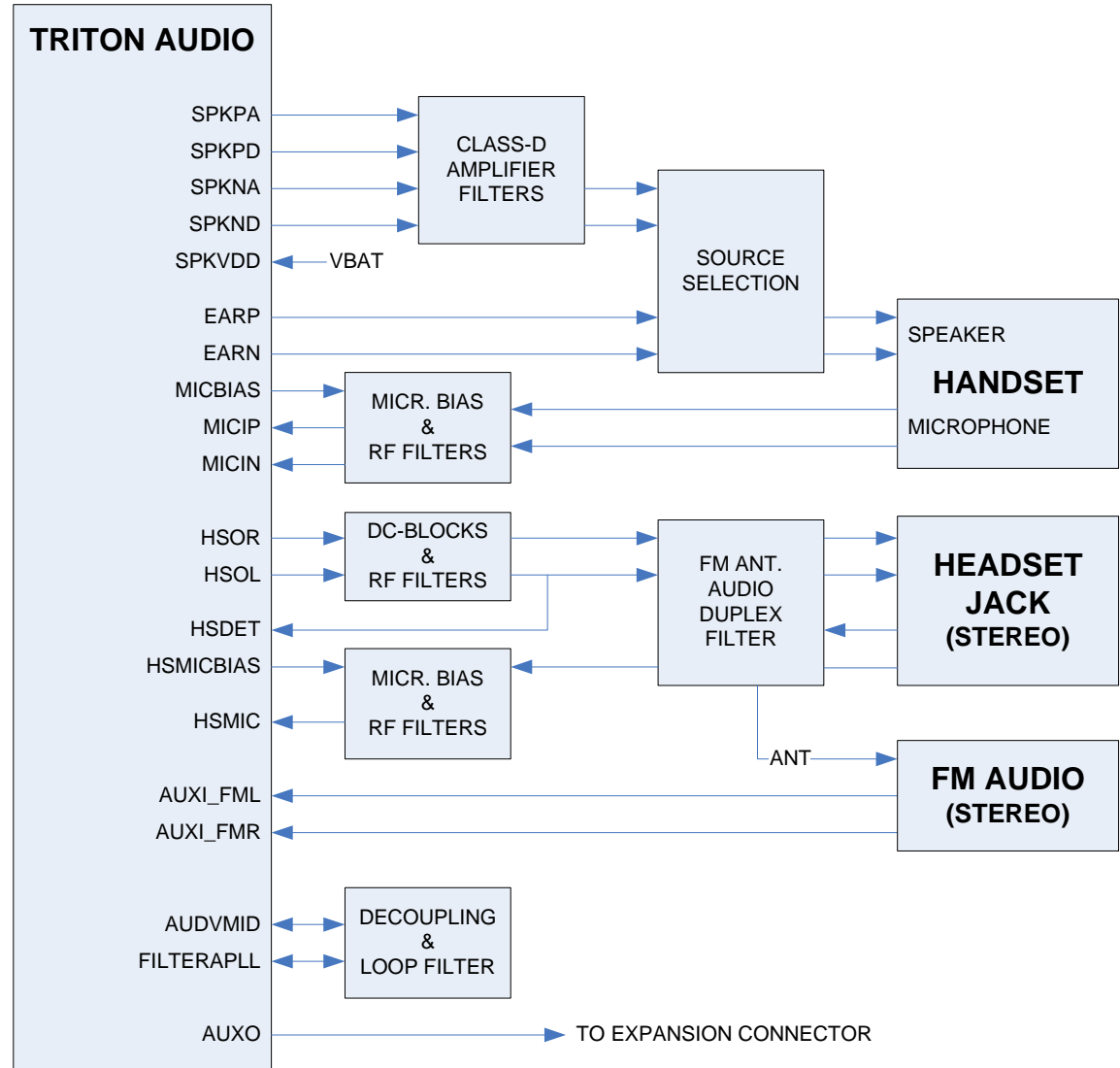
I-sample supports 1.8V, 128Mb – 2Gb (512Mb mounted)

I-sample – Audio

Triton Audio

Use of class-D low impedance speaker amplifier is optional – will require external LC filters

I-sample uses standard stereo headset with support for hook switch



I-sample – Charging

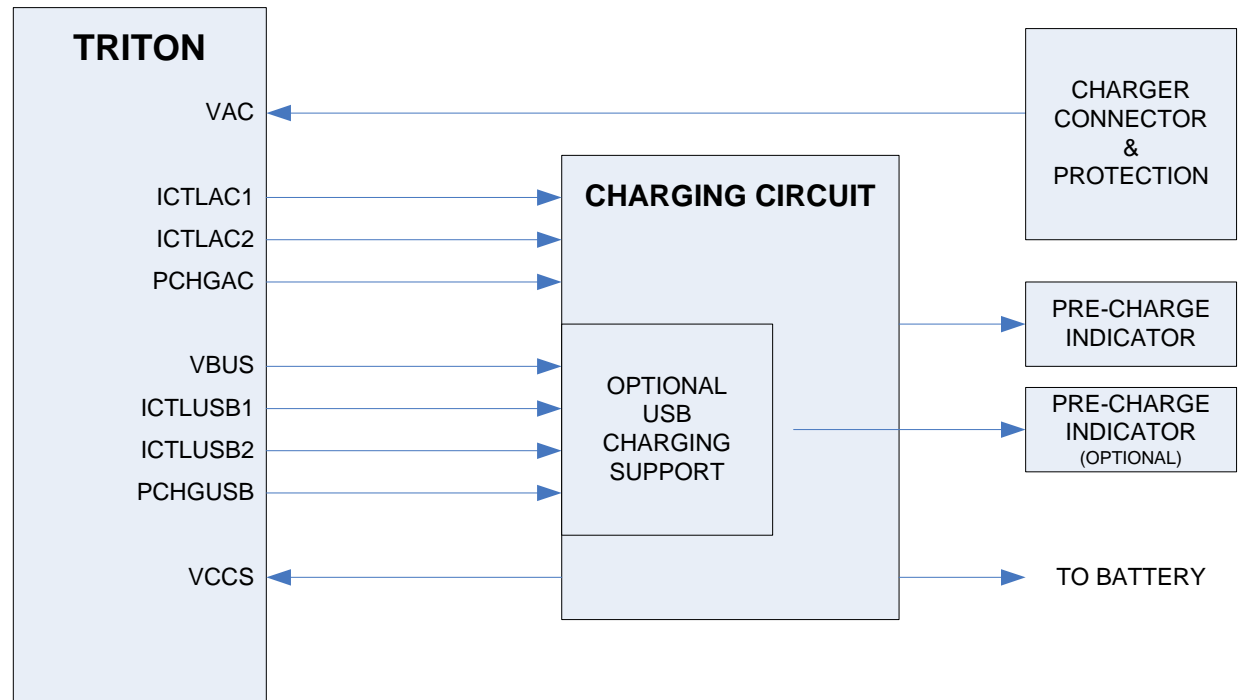
I-sample

Supports both regulated and low cost unregulated chargers

USB charging is optional

Unregulated charger and standard 600mA Li-Ion cell secures low cost power solution.

Battery has NTC and ID resistor for lowest cost – no fuel-gauge ICs in standard solution.



I-sample – RF Front-End

I-sample

TX-module based solution

Low cost. Follows market trends for 2006-2007

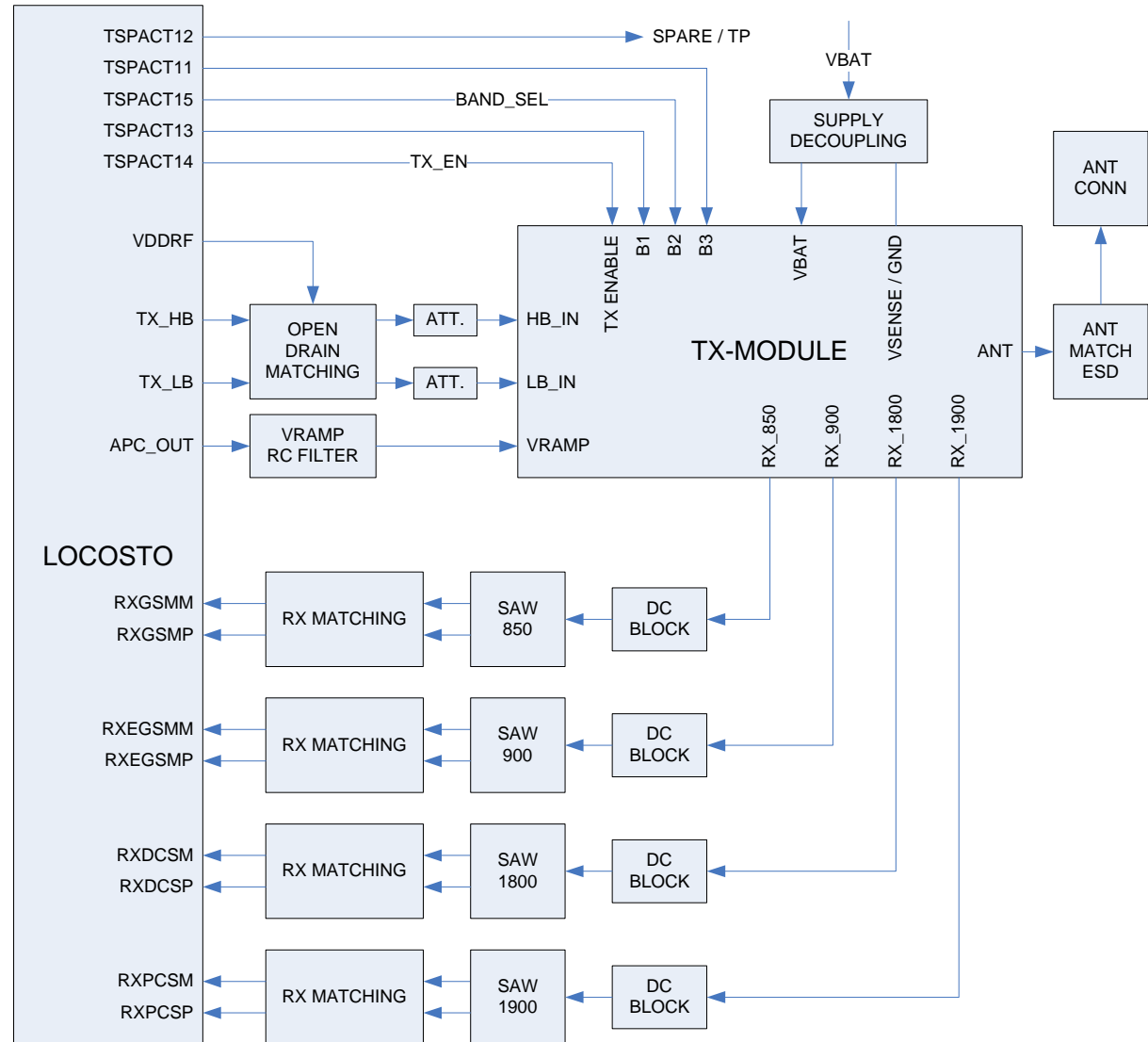
Dual-band RFFE: 2.23\$

Quad-band RFFE: 2.65\$

State-of-the-art RX insertion loss

High flexibility. Reference design will be FTA'ed as quad-band solution.

Customer can tailor other variants by removing RX path components.



I-sample Rev. 1.0

I-sample 1.0 (TI internal version)

SMA RF, DC, Charger connectors

JTAG port (3.3VIO) for Locosto

RS-232 port

Configuration switches

Battery Connector

Handset Connector

Camera Module Connector

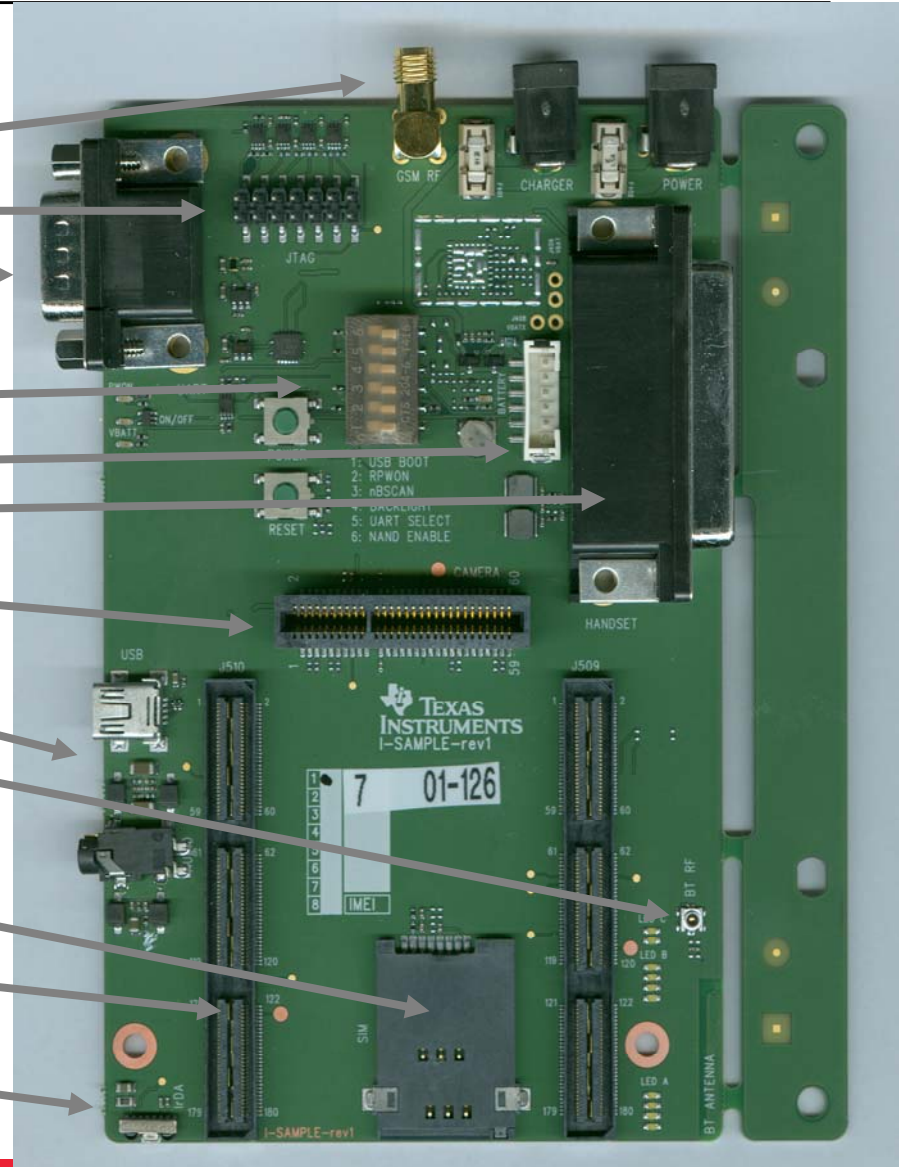
USB / Stereo HS Audio

BT Test connector

SIM (push-in type)

Expansion Connectors

IRDa (FIR)



I-sample Rev. 1.0

I-sample 1.0 (TI internal version)

Reference Design Area (RF Front-End)

Reference Design Area (DBB, RF)

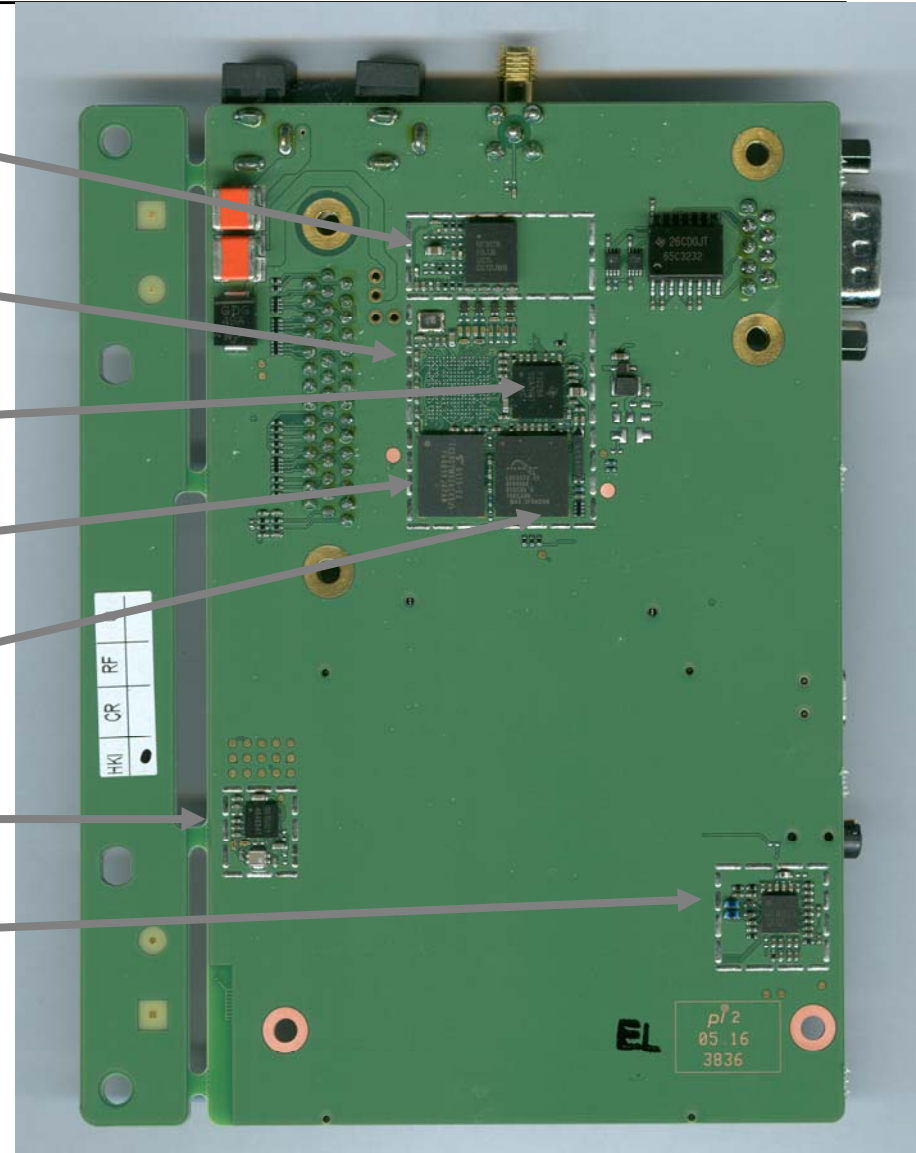
Triton

NAND Flash Storage

MCP (128M-NOR / 64M-PsRAM)

Bluetooth Island-2 ®

FM Stereo Radio



I-sample Rev. 1.0 (Reference Design Area)

KEY COMPONENTS

RFMD RF3178G (PA, power reg., switch)

SAW filters 1411 size

26MHz XTAL (3225 size)

Locosto (Digital RF, digital baseband)

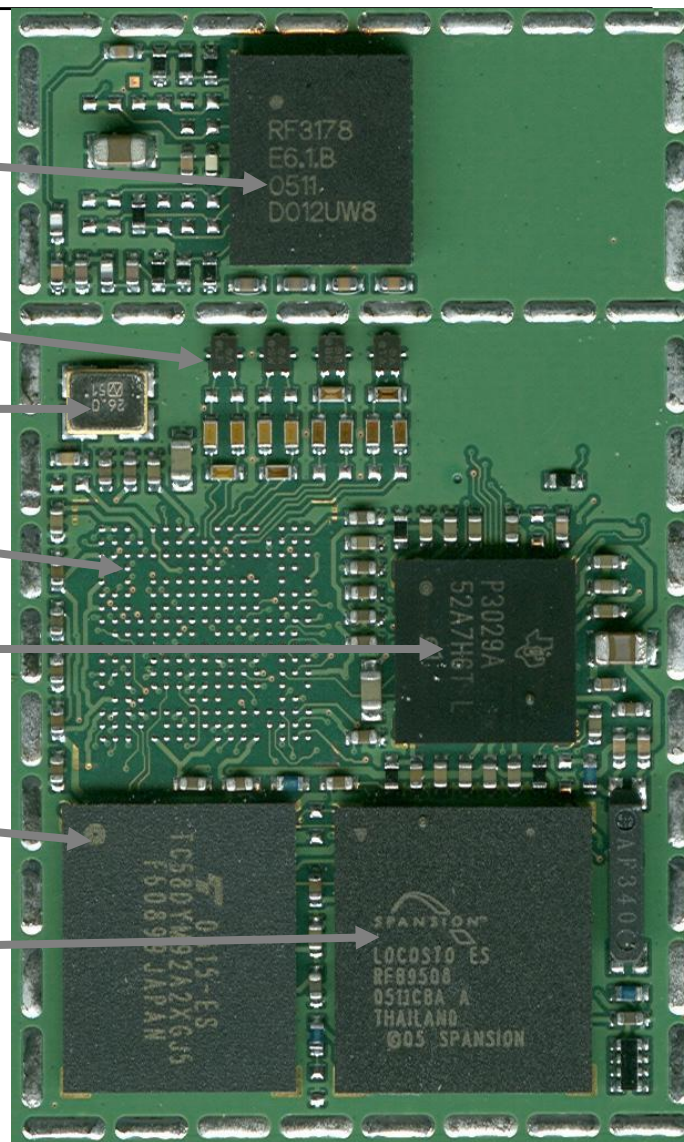
Triton (analog baseband, power mmgt.)

NAND Flash Storage

Toshiba 512Mb used

MCP (128k-NOR / 64k-PSRAM)

Spansion part used.



FLOORPLAN

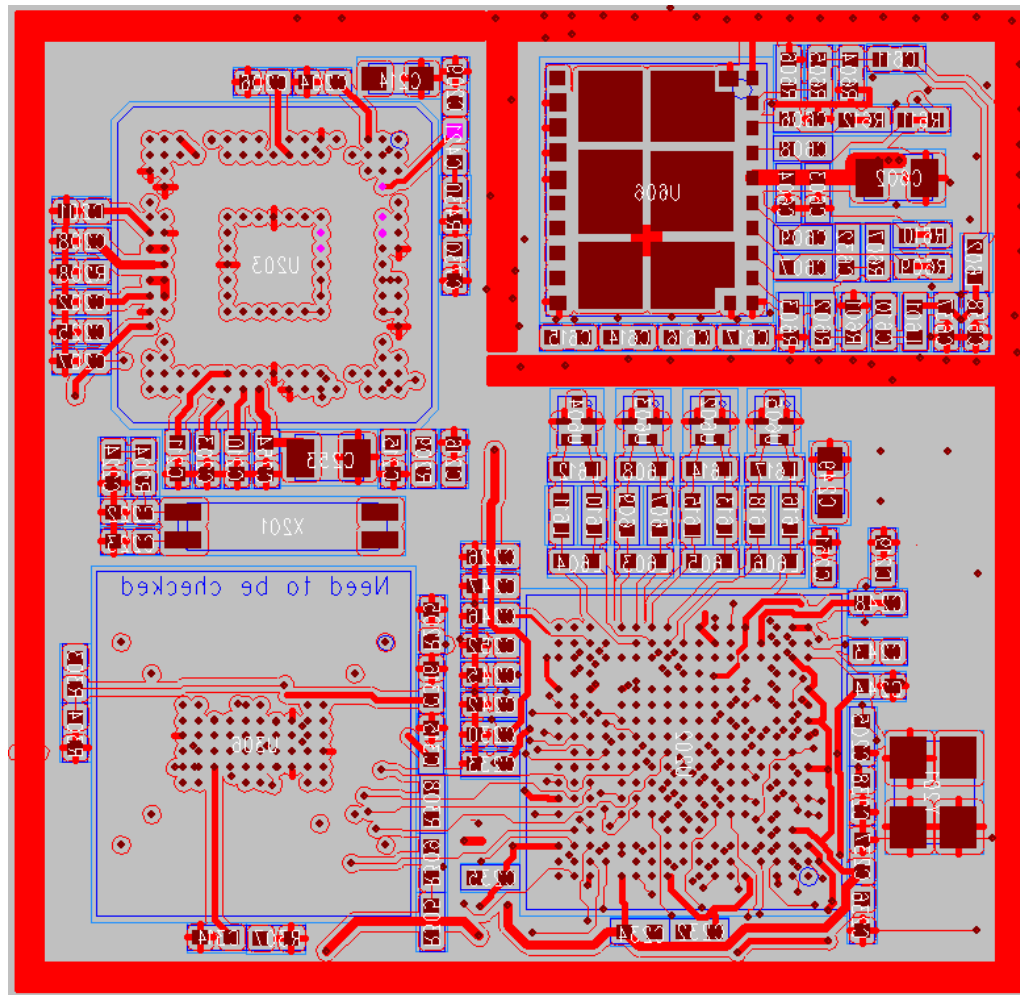
Mirrored view (PCB rev. 3.0)

Triton Lite used here 10x10 !!

NAND Flash outside shield

Size 30.5 x 29.5 mm (900 mm²)
inside shield can (Quad band).

Rev.1 size 24.1x 41.1mm (991 mm²)



I-sample – PCB Build-up

PCB Strategy

I-sample uses 2-4-2 structure, but reference design area can be ported to 2-2-2 structure for customer designs.

Reference design uses primarily layers 8-7-6-3

For customer designs layers 1-2 can be used.

PCB material and components are compliant with RoHS and WEEE.

Via Type	Layer	Min. Via Land	Drilled Hole	Comments
THROUGH	1 to 8	600u	300u	Min. ann. ring 150u
BLIND LASER	1 to 2/8 to 7	250u	100u {entry}	Min. ann. ring 75u
BLIND LASER	2 to 3/7 to 6	250u	100u {entry}	Min. ann. ring 75u
BURIED	3 to 6	500u	200u	Min. ann. ring 150u

min. Trackwidth 0.075mm min. Spacing 0.0875mm

PCB Build-Up Drawing: All dimensions below are finished values

TOPSIDE

1

2

3

4

5

6

7

8

BOTTOMSIDE

Layer 1 to 2

Layer 2 to 3

Layer 7 to 8

Layer 8 to 7

Buried 3 to 6

Through 1 to 8

Blind Laser holes must be filled

Buried holes must be filled

Imm Sn 1.5u +0 -0.5
Cu Plated min. 13u +17/-0
Foil Cu 12u
PP FR4 LDP 85u +/- 15u
Cu Plated min. 13u +17/-0
Foil Cu 12u
PP FR4 LDP 85u +/- 15u
Cu Plated min. 13u +17/-0
Foil 12u
PP FR4 FR4 10Cu +/- 20u
Base Cu 17u
Core FR4 880u +/- 51u
Base Cu 17u
PP FR4 FR4 150u +/- 25u
Foil 12u
Cu Plated min. 13u +17/-0
PP FR4 LDP 85u +/- 15u
Foil Cu 12u
Cu Plated min. 13u +17/-0
PP FR4 LDP 85u +/- 15u
Foil Cu 12u
Cu Plated min. 13u +17/-0
Imm Sn 1.5u +0 -0.5

I-sample – PCB Build-up

I-Sample/Locosto Plus Reference design PCB Structure

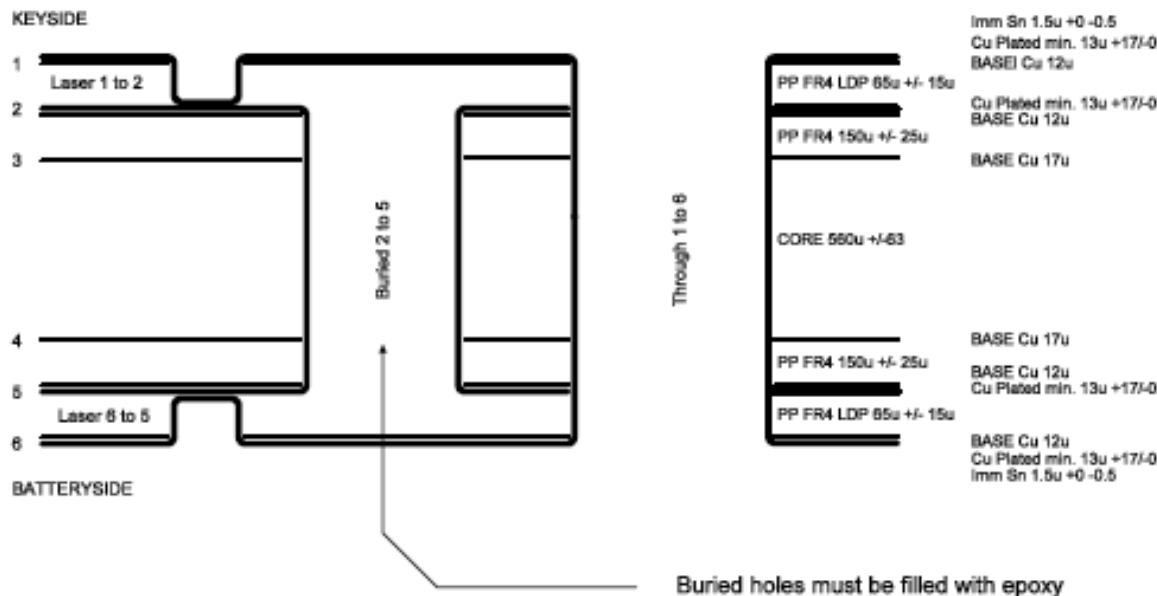
- An 8 layer symmetric PCB build up
- All FR4 material
- 2 HDI layes, FR4 LDP for laser vias on each side
- Buried 3 to 6 vias
- Through 1 to 8 vias
- Core material is adjustable in thickness

Layer Usage:

- Layer 1 – Keyboard, Display, SMD, Signal
- Layer 2 – Signal and power supply
- Layer 3 – GND
- Layer 4 – Signal,
- Layer 5 – Signal or GND
- Layer 6 – Signal, defined Impedance, sensitive Signals
(Audio, Clocks, SIM)
- Layer 7 – Signal, partial GND for Audio etc.
- Layer 8 - BB SMD, RF SMD, Signal

I-sample – PCB Build-up

Locosto-Lite PCB Structure



I-sample – PCB Build-up

Locosto-Lite PCB Structure

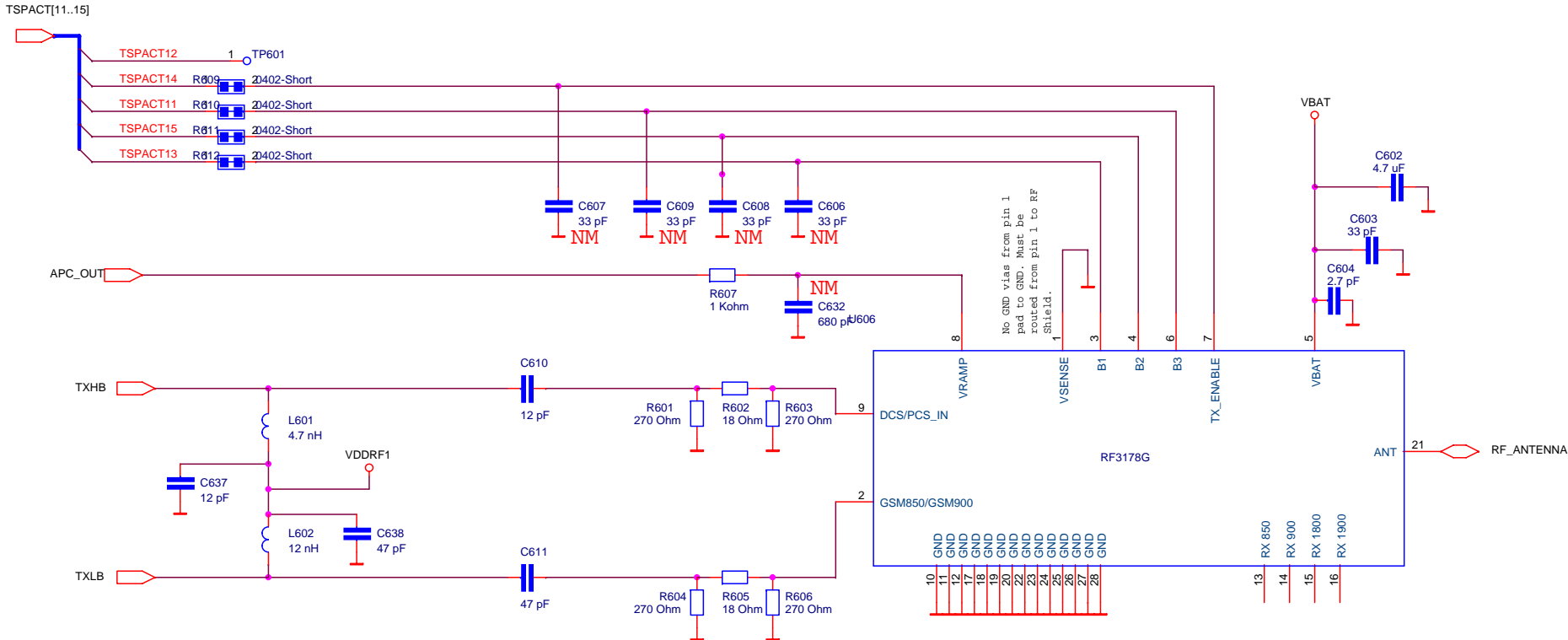
- An 6 layer symmetric PCB build up
- All FR4 material
- 1 HDI layer, FR4 LDP for laser vias on each side
- Buried 2 to 4 vias
- Through 1 to 6 vias
- Core material is adjustable in thickness to meet customer requirements of PCB thickness

Layer Usage:

- Layer 1 – Keyboard, Display, SMD, Signal
- Layer 2 – Signal and power supply
- Layer 3 – GND
- Layer 4 – Signal, defined Impedance, sensitive Signals
(Audio, Clocks, SIM)
- Layer 5 – Signal, GND for audio shielding
- Layer 6 – BB SMD, RF SMD, Signal

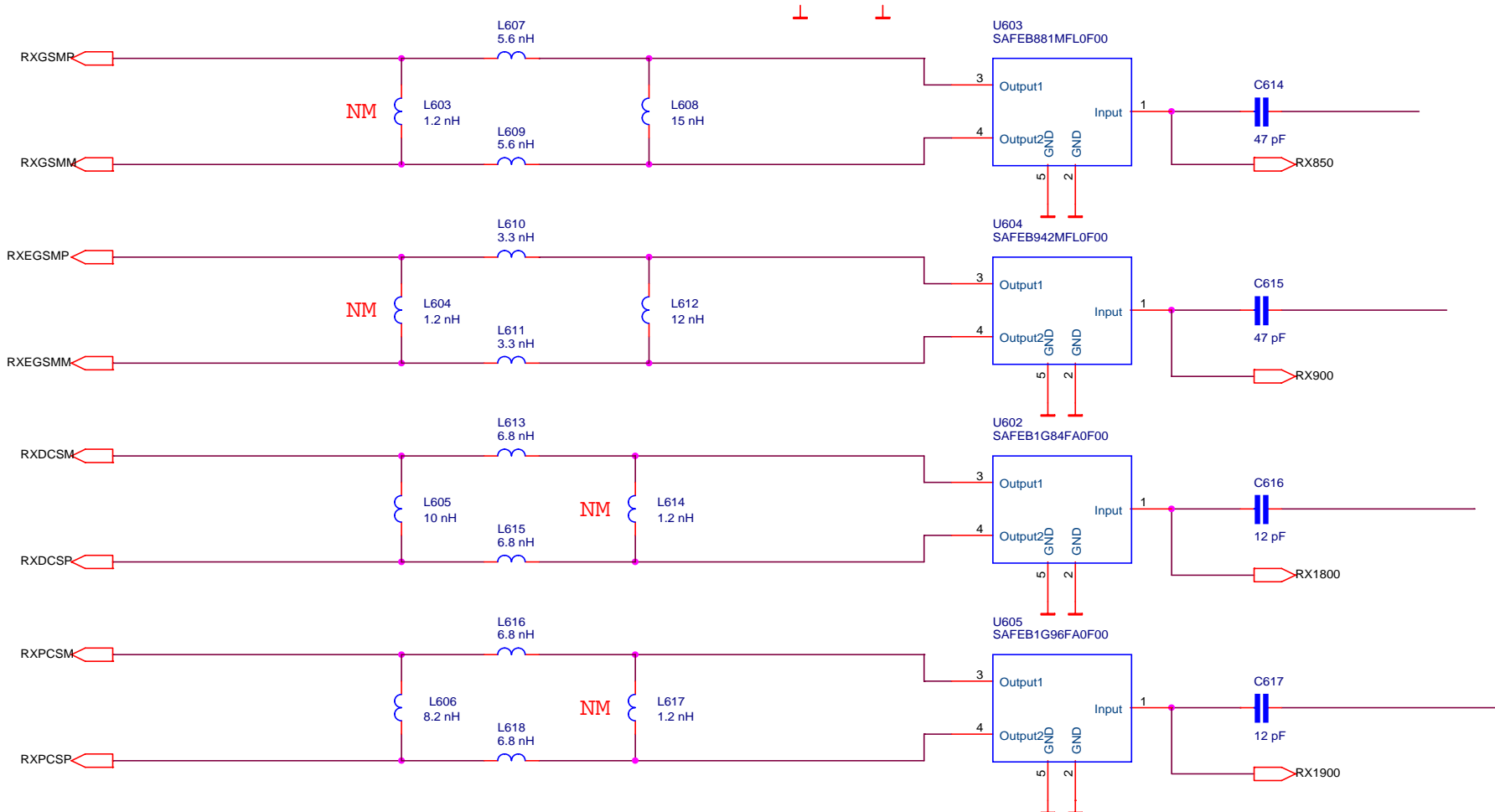
Power can be routed on any signal layer

I-sample – RF TX schematic



- TX module implementation secures low component count.
- When testing I-sample effort will be made to further reduce component count.

I-sample – RF RX schematic



- Discrete implementation gives full flexibility to customers regarding frequency bands
- DC-blocks necessary due to DC (VBAT) level on RX ports.

I-sample Performance - Targets

RF

TX performance with solid margin to specifications

GPRS Class 10

RX sensitivity better than -109.5dBm all bands

Optimized standby time – depends on power source

THANK YOU