BP30 Globe 6 User Manual

Edition 2005

Published by Neonseven s.r.l.,
Viale Stazione di Prosecco, 15
34010 Sgonico (Trieste) Italy

For questions on technology, delivery and prices please contact the Neonseven Offices in Italy Sgonico and Gorizia

Attention Please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact Neonseven.

Neonseven technologies may only be used in life-support devices or systems with the express written approval of Neonseven, if a failure of such technologies can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Table of Contents

1. Document Mission

This User Manual provides a description of the basic platform Globe 6 and all information necessary for a successful integration of the system into the application of the customer.

2. Glossary

Abbreviation / Term	Explanation / Definition
ADC	Analog-to-Digital Converter
AFC	Automatic Frequency Correction
A-GPS	Assisted Global Positioning System
ASC	Asynchronous Serial Interface Controller
CAPCOM	Capture Compare
CIF	Common Intermediate Format (ITU video standard)
CMOS	Complementary Metal Oxide Semiconductor
CSTN	Color Super Twisted Nematic
DAC	Digital-to-Analog Converter
DAI	Digital Audio Interface
DCS	Digital Cellular System 1800MHz (aka GSM1800)
DCXO	Digital Controlled Crystal Oscillator
DSP	Digital Signal Processor
EBU	External Bus Interface Unit
EDR	Enhanced Data Rate
E-GSM	Extended Global System for Mobile Communications
EMC	Electromagnetic Compatibility
eSCO	Extended Synchronous Connection-Oriented (logical transport)
ESD	Electro Static Discharge
FEM	Front-End Module
FM	Frequency Modulation
GSM	Global System for Mobile Communications
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
HCI	Host Controller Interface
HSCSD	High Speed Circuit Switched Data
I2C	Inter-Integrated Circuit
I2S	Inter IC Sound

I/Q	Inphase and Quadrature
IrDA	Infrared Data Association
JTAG	Joint Test Action Group
LCD	Liquid Crystal Display
LDO	Low-Dropout
LED	Light Emitting Diode
Li-ion	Lithium ion batteries
LNA	Low Noise Amplifier
MCU	Micro Controller Unit
µSD	Micro Secure Digital Flash Memory Card
MMS	Multimedia Messaging Service
MP3	Moving Picture Experts Group Layer-3 Audio
PA	Power Amplifier
PCB	Printed Circuit Board
PCS	Personal Communications Systems 1900MHz (aka GSM1900)
PCM	Pulse Code Modulation
PoC	Push to Talk Over Cellular
PSRAM	Pseudo-Static Random Access Memory
PTT	Push-To-Talk
RGB	Red-Green-Blue
RF	Radio Frequency
RTC	Real Time Clock
SAW	Surface Acoustic(al) Wave
SCO	Synchronous Connection-Oriented (logical transport)
SD	Sigma-Delta
SSC	Serial Synchronous Interface Controller
SIM	Subscriber Identity Module
SIR	Serial Infrared Mode
SMA	SubMiniature version A connector
SPI	Serial Peripheral Interface
TDMA	Time Division Multiple Access
TFT	Thin Film Transistor
UART	Universal Asynchronous Receiver-Transmitter
WAP	Wireless Application Protocol
WLAN	Wireless Local Area Network

3. Scope of Product

The BP30 *Globe6* provides a hardware environment to the BP30 platform. It enables evaluation of the functionalities and quick customization of the system, a cost-optimized basic phone, mainly voice centric but including some “basic and commodity” data and application features as GPRS, WAP, MMS and simple Java applications.

Globe6 incorporate all the electronic for support of main features within an embedded form-factor shape that might be cut-out to demonstrate one possible clam-shell phone final application. Embedded antenna printed on PCB and realistic plastic case help to verify the radiated performances.

Globe6 quality is intended to be enough to be able to run the complete application software system and able to pass most of the tests required by the regulations.

The main building blocks of the platform are E-GOLDradio (Baseband Processor and RF Transceiver, Infineon PMB7870), and E-POWERlite (Power Management, Infineon PMB6814).

With only the SIM card support, Flash memory, the RF CMOS Power Amplifier (Infineon PMB6293), and Front-End (Epcos DGM081 Quad Band) it is possible to have a minimal configuration, called modem.

By adding the display, the keyboard, backlight LED’s, the microphone and the speaker it is possible to have simple voice-centric mobile phone.

Besides the advanced Infineon solutions, *Globe6* is equipped with many standard and optional mobile phone peripherals. With dual display module, Bluetooth radio interface, FM radio receiver, stereo MP3 decoder, stereo audio DAC with integrated headphone amplifier, a quality speaker, voice memo, microSD card connector, IrDA interface, PTT key, a vibrator, an embedded A-GPS subsystem, is possible to build a medium level mobile phone. In addition to that, *Globe6* can be fitted with camera module as well.

4. Product Environment

Modem

- Infineon E-GOLDradio PMB7870 GSM/GPRS Single Chip Solution that integrates Baseband System and Quad-Band GSM850/E-GSM/DCS/PCS RF Transceiver for voice and data applications.
- Infineon PMB6293 Quad-Band GSM850/E-GSM/DCS/PCS Power Amplifier Module based on 0.13µm CMOS technology, with integrated power controller.
- Epcos DGM081 Quad-Band Antenna Switch Module with integrated SAW filters and external RX matching components for GSM850/E-GSM/DCS/PCS Receiver.
- Possibility to use PCB printed quad band printed antenna or SMA Interface connector for RF output.

Memory

- Intel Multi-Chip Package 128Mbits Wireless Flash and 32Mbits PSRAM.
- Additional Infineon 32Mbits Sync Burst CellularRAM (outside phone design).
- Additional Intel 32Mbits Wireless Flash Memory for banking (outside phone design).
- Additional M-Systems 256Mbits Flash Memory Mobile DiskOnChip (outside phone design).
- Additional Samsung 1GBits NAND Flash Memory (outside phone design).
- Additional Samsung 4GBits NAND Flash Memory (outside phone design).
- External Memory Daughterboard connector.

Power Management

- Infineon E-POWERlite PMB6814. All the modem power rails are supplied by E-POWERlite.
- 5V Low-Noise Switched-Capacitor Boost Regulator to supply LEDs and displays backlight.
- 3.3V Low-Noise LDO Regulator to supply fast serial ports voltage translators (outside phone design).
- 3.0V Low-Noise LDO Regulator to supply optional microSD card (outside phone design).
- 2.85V Low-Noise LDO Regulator to supply GPS subsystem (GPS LNA and Hammerhead).
- Power supply connectors for 5V AC/DC adapter, connected to the input of a Low Noise LDO Voltage Regulator with 3.8-4.0V output voltage (VBAT).
- Battery connector.

Interfaces

- SIM card holder supporting 1.8V and 3V card type via E-POWERlite.
- System connector on phone part for charging, external accessory supporting and serial data I/O with handshake signals.
- Two RS232 interfaces: Serial Port 0 with hardware handshake signals; Serial Port 1 with software flow control. Both of them are accessible on SubD-9 connectors and supports high speed dataflow.
- SIR IrDA transceiver. IrDA is mutually exclusive with Serial Port 0.
- Debug connectors (JTAG) for C166S MCU and for TEAKlite DSP debug tools.
- Connector for Lautherbach analyzer adaptation head (Power Trace).
- Connector for BlueMoon UniCellular compact flash card (external board).
- Connector for multimedia expansion (Graphical companion chip, Touchscreen, WLAN, etc).

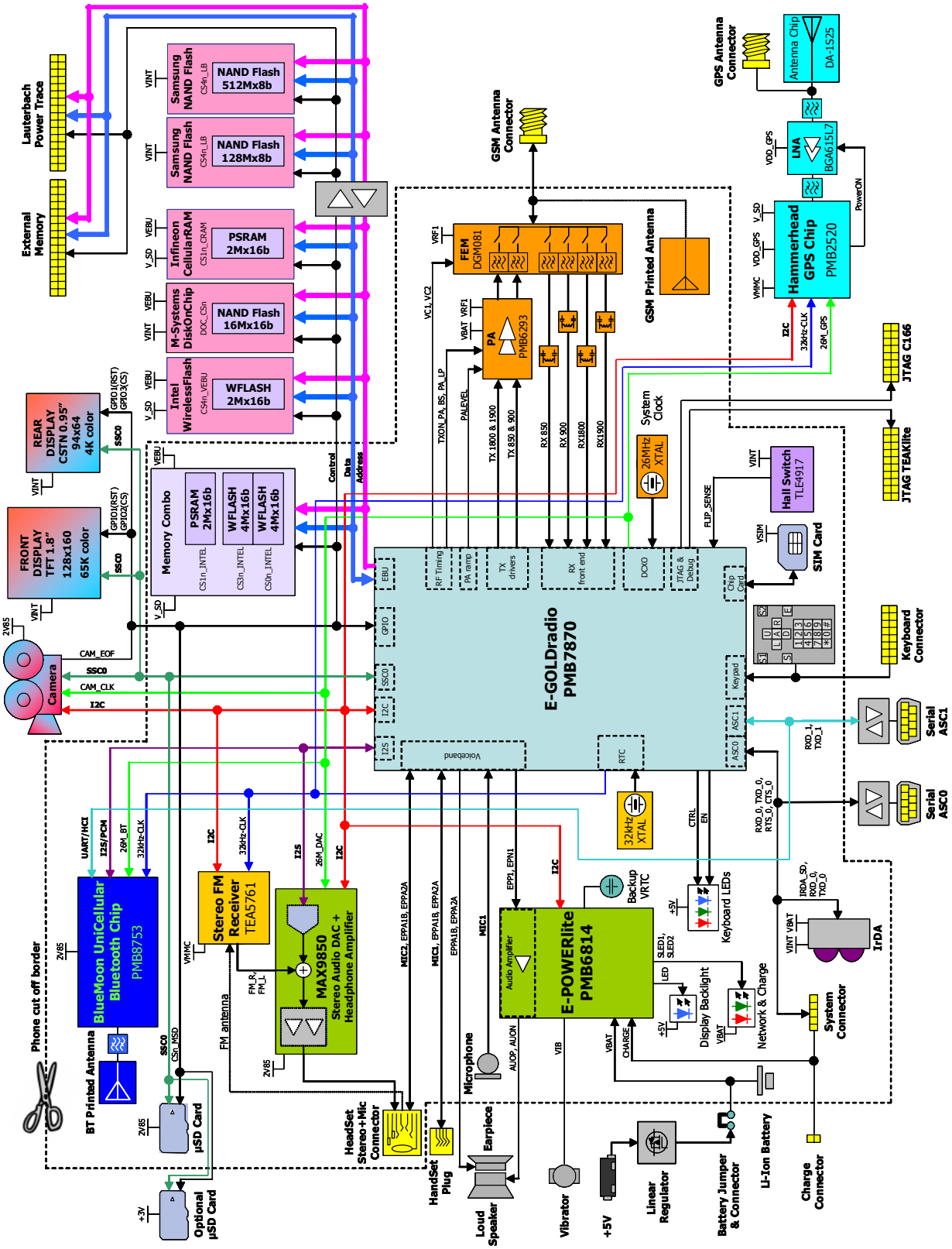
Man-Machine Interface

- Realistic phone keypad with four-directional and center-push keys.
- Power on button and external reset button (outside phone design).
- Additional Jolly Key mapped for fast application access (Vodafone Live, PoC, etc).
- Connector for external keypad.
- Dual display module for clam shell design with front 1.8'' (128x160) 65k colors TFT LCD panel and rear 0.95'' (96x64) 4k colors CSTN LCD panel, both with serial mode interface.
- CIF camera.
- Possibility to mount a vibrator motor driven by E-POWERlite.
- Keyrin 1813-TW2 dual outputs, mechanical assembled Loudspeaker/Earpiece.
- 5-pole plug for stereo headset with external microphone.
- 4-pole plug for handset (outside phone design).
- Full color spectrum LEDs. Color control via PWM through E-GOLDradio CAPCOM output.

Miscellaneous Features

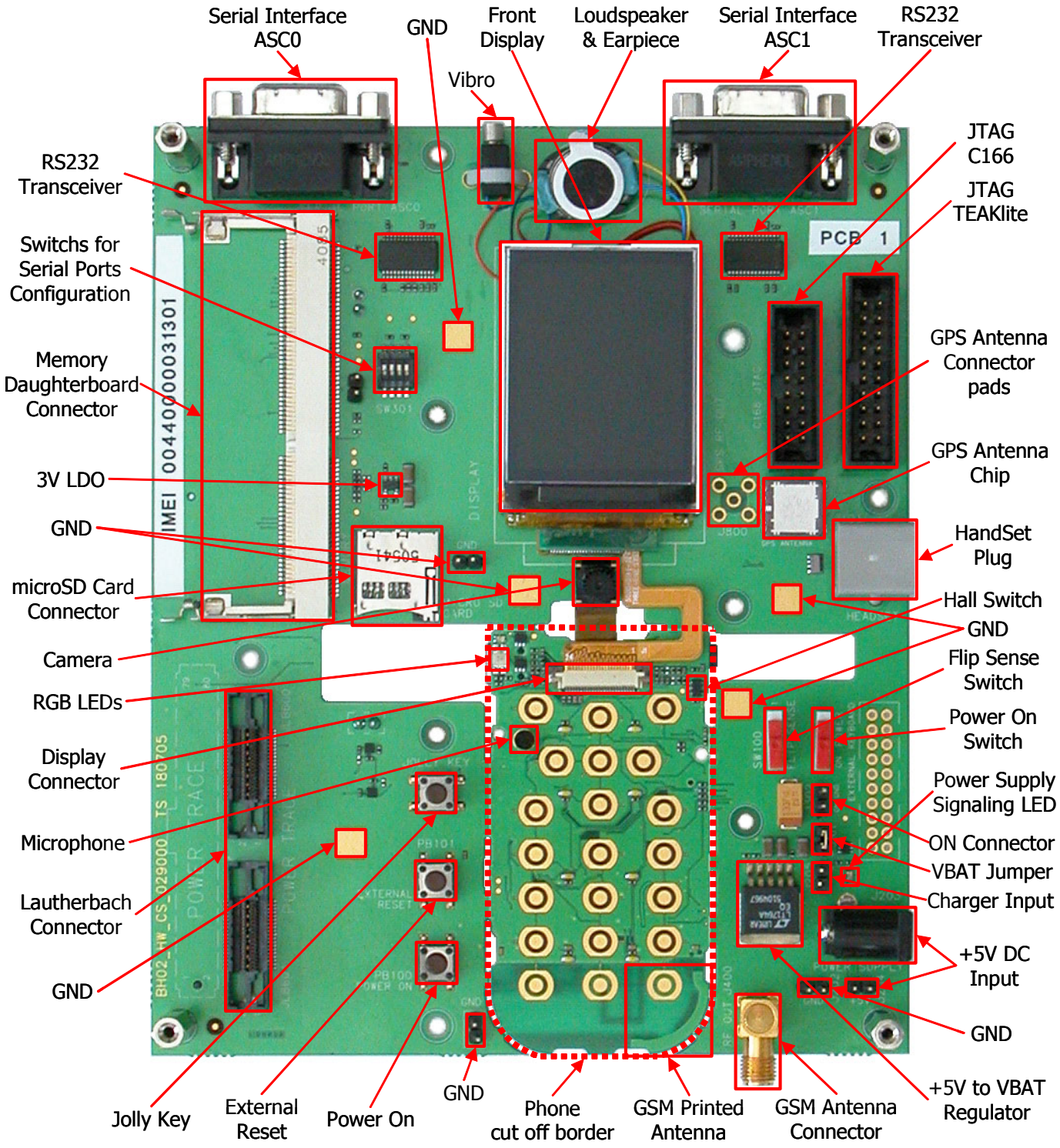
- Philips TEA5761UK Low Power FM Radio Receiver.
- Maxim MAX9850 Stereo Audio DAC with integrated Headphone Amplifier and Volume Controls.
- Infineon PMB8753 BlueMoon UniCellular Single-Chip Bluetooth with PCB printed antenna.
- Two MicroSD (TransFlash) card connectors (SPI compatible mode).
- Infineon PMB2520 Hammerhead A-GPS Single-Chip Device, Infineon BGA615L7 GPS Low Noise Amplifier, FDK DA-5T33N GPS Chip Antenna and SMA connector for external GPS antenna.
- Hall Sensor for clam shell closure detection and Flip Sense Switch to simulate clam shell closure.
- Stereo MP3 decoder.
- 40 tones polyphonic ring tones support.

4.1. Block Diagram

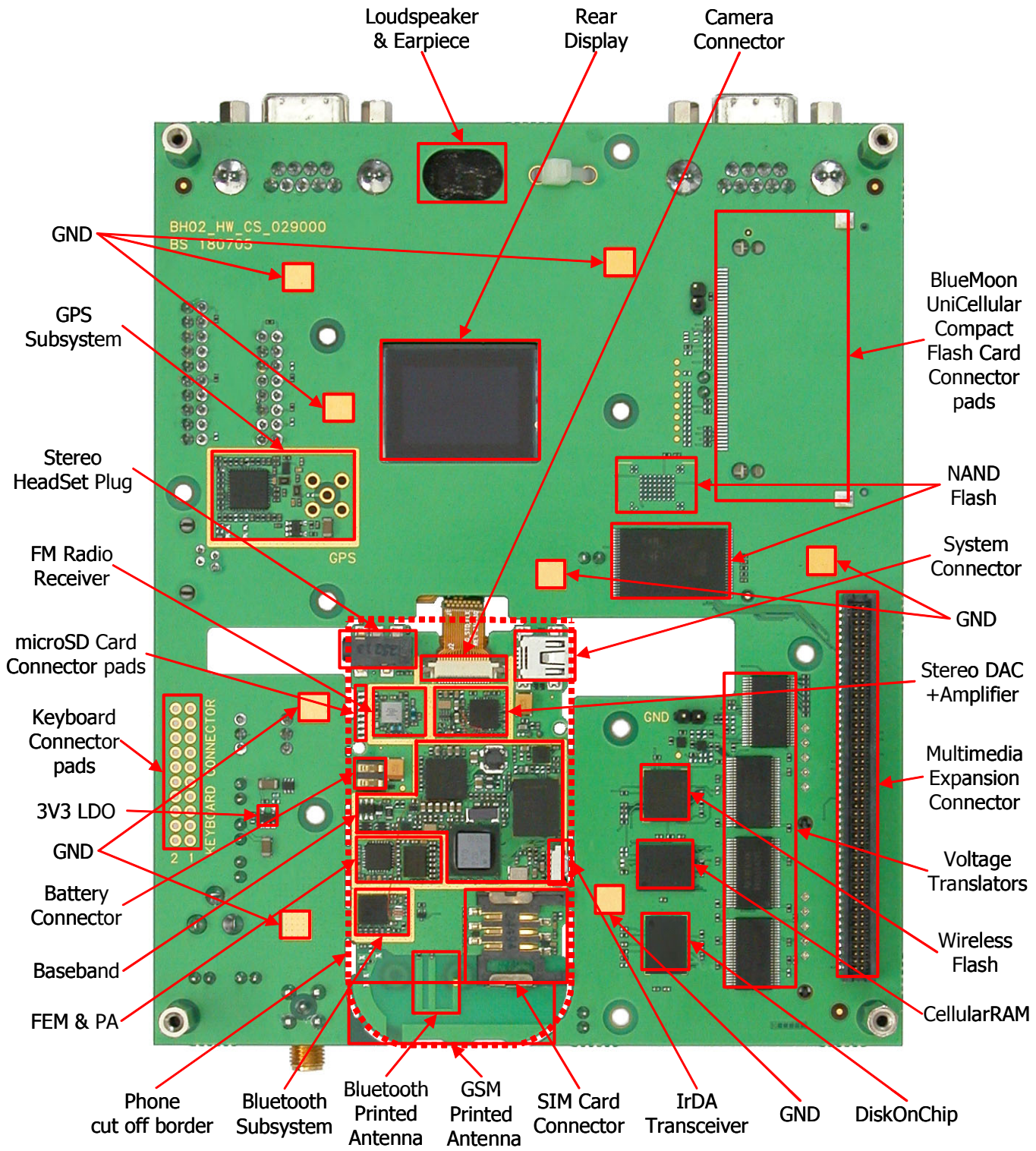


4.2. Board Population

Top Side

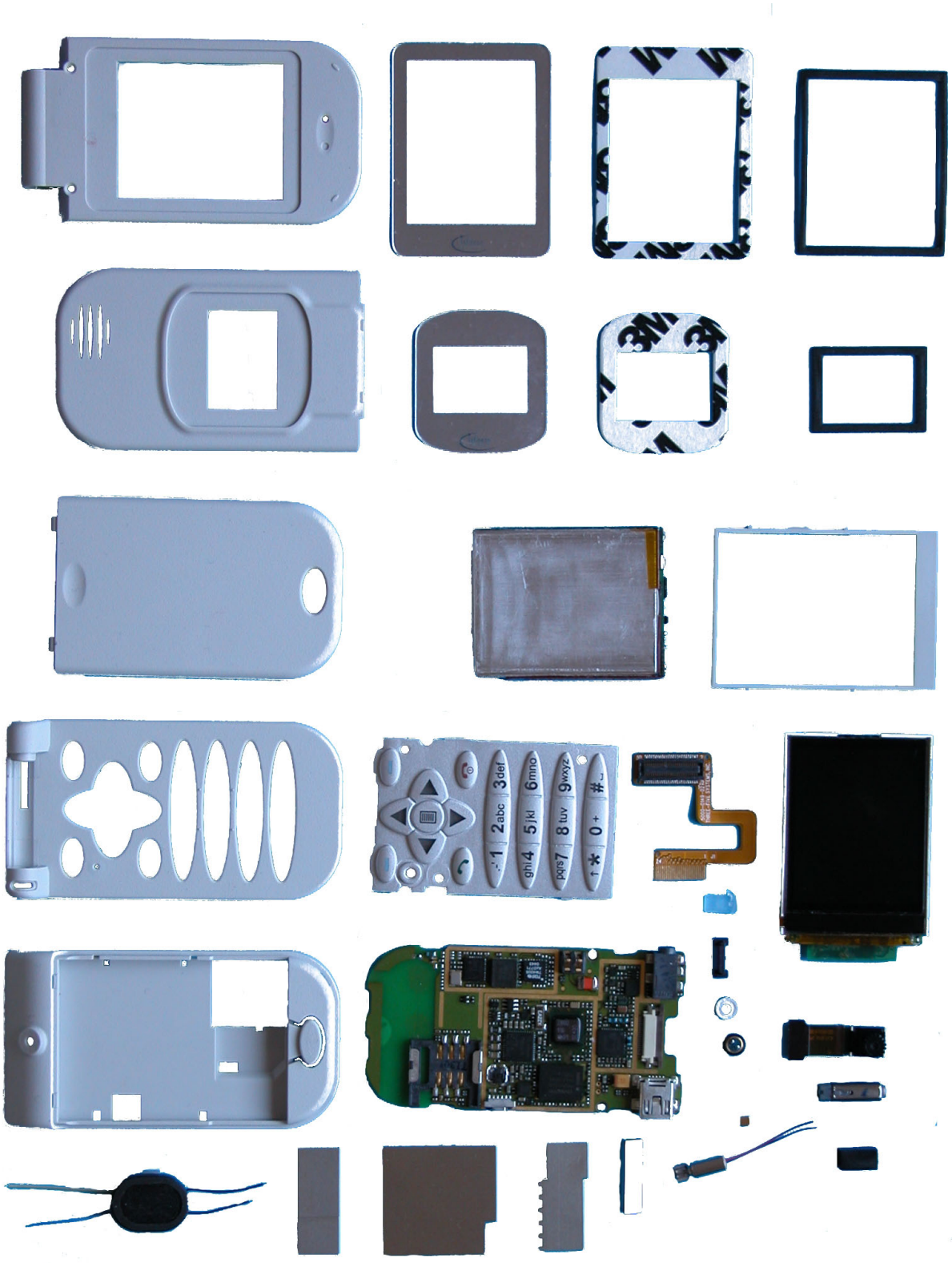


Bottom Side


Loudspeaker & Earpiece
Rear Display
Camera Connector
GND
GPS Subsystem
Stereo HeadSet Plug
FM Radio Receiver
microSD Card Connector pads
Keyboard Connector pads
3V3 LDO
GND
Battery Connector
Baseband
FEM & PA
BlueMoon UniCellular Compact Flash Card Connector pads
NAND Flash
System Connector
GND
Stereo DAC +Amplifier
Multimedia Expansion Connector
Voltage Translators
Wireless Flash
CellularRAM
Phone cut off border
Bluetooth Subsystem
Bluetooth Printed Antenna
GSM Printed Antenna
SIM Card Connector
IrDA Transceiver
GND
DiskOnChip
BH02_HW_CS_029000
GPS
KEYBOARD CONNECTOR
GND

Complete cut out phone

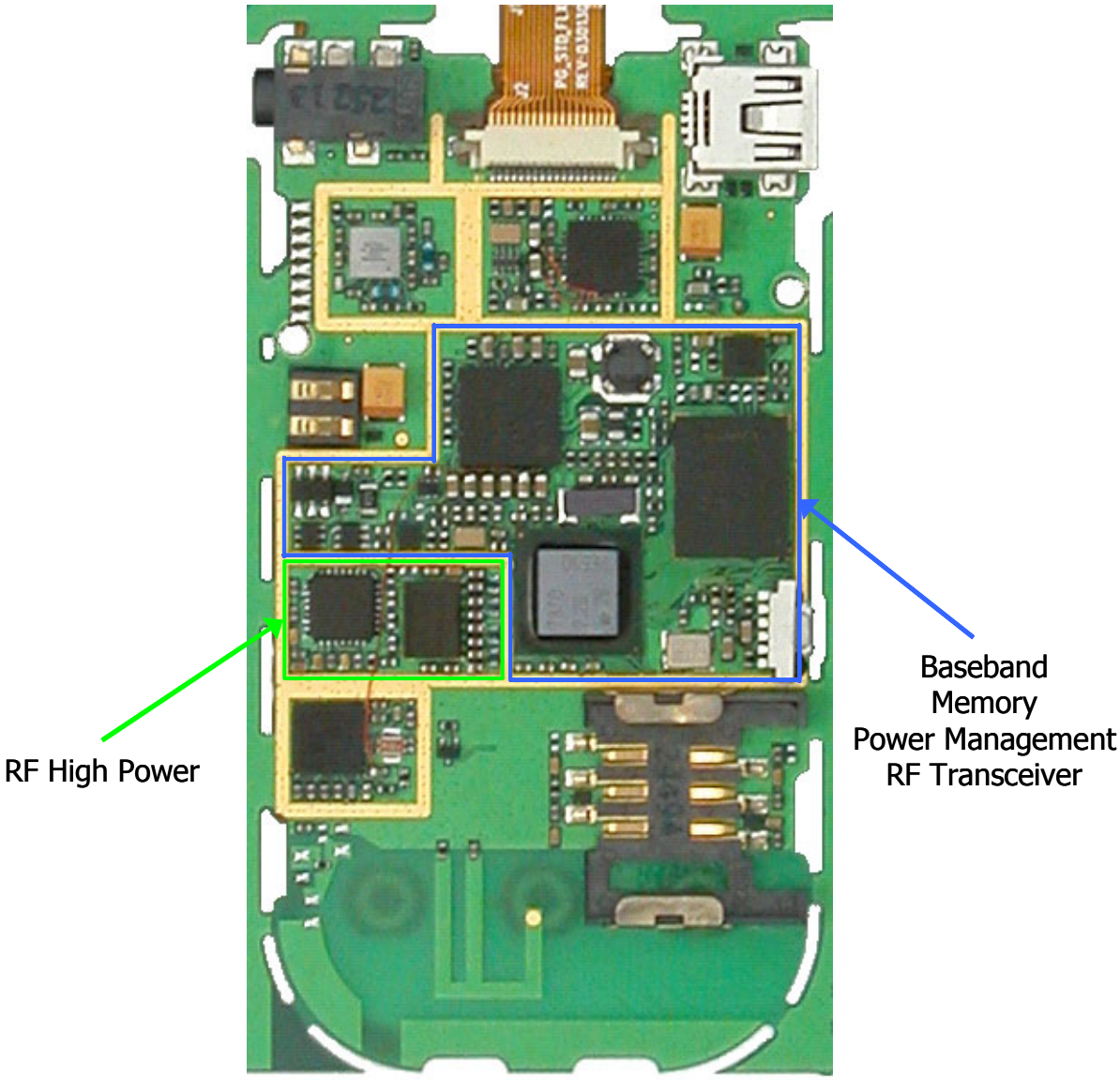
Parts to compose a cut out phone



5. Product Functions

5.1. GSM Modem

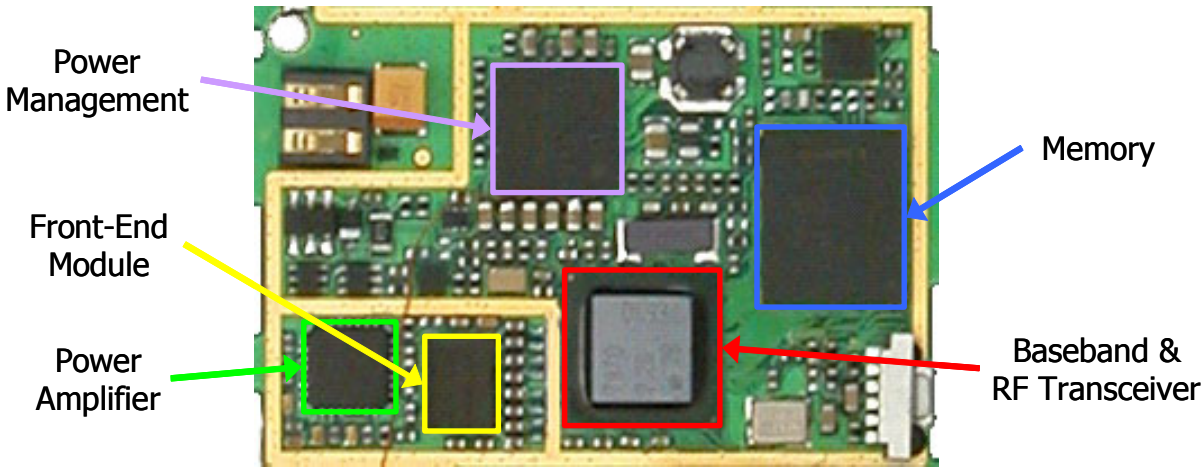
The modem part provides with minimal component's list all functionality necessary for voice and data transmission over GSM and GPRS network.
One of the goal of *Globe6* is the placement and routing of GSM/GPRS modem on a single face of 6 layers only PCB. The modem is divided in two separated areas surrounded by traces on which metal boxes can be soldered. The first area encloses the RF high power components (PA, antenna switch) and the remaining passive components of the transceiver; the second area groups baseband processor, memory, crystals and power management unit. The shield height can be limited to 2 mm external.



The modem is based on the following main components:

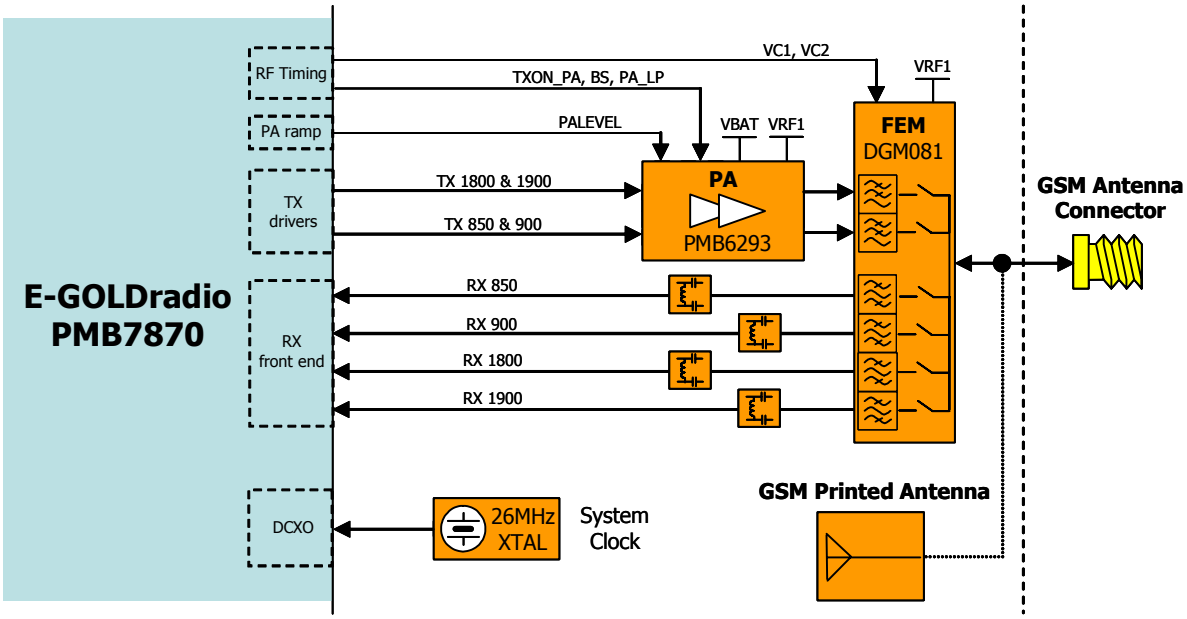
- Infineon E-GOLDradio PMB7870 GSM/GPRS Single Chip Solution that integrates Baseband System and Quad-Band GSM850/E-GSM/DCS/PCS RF Transceiver for voice and data applications
- Infineon E-POWERlite PMB6814 Power and Battery Management IC
- Intel Multi-Chip Memory that integrates 128Mbits 1.8V Wireless Flash and 32Mbits 1.8V PSRAM
- Infineon PMB6293 Quad-Band GSM850/E-GSM/DCS/PCS Power Amplifier Module based on 0.13µm CMOS technology, with integrated power controller.
- Epcos DGM081 Quad-Band Antenna Switch Module with integrated SAW filters and external RX matching components for GSM850/E-GSM/DCS/PCS Receiver.

Please refer to the Producer's datasheets for detailed specifications.



5.2. RF Transceiver and RF High Power

The E-GOLDradio features a fully integrated quad-band RF transceiver for GSM850/E-GSM/DCS/PCS that consists of a constant gain direct conversion receiver with an analog I/Q baseband interface, a fully integrated sigma delta synthesizer with HSCSD and GPRS capability, a fully integrated quad-band RF oscillator, a quad-band digital GMSK modulator, and a digitally controlled crystal oscillator with three outputs. This configuration allows a very low power design with a reduced count of external components.
Timing are provided by the built-in GSM Timer Unit of E-GOLDradio; the antenna switch and PA are commanded via trigger signal TXON_PA, BandSelect, PA_LP, VC1, VC2.
The E-GOLDradio provides two different RF TX outputs respectively for 850/900 and 1800/1900 bands. Infineon PMB6293 CMOS PA amplifies these signals maintaining two separate paths.
The PA is directly connected to the VBAT as analog supply and to the VRF1 as digital supply. The power ramp control is provided by E-GOLDradio to the PA module, which has a built-in power controller.
Quad Band Epcos antenna switch integrates saw filters. It is connected to the RX inputs of E-GOLDradio through external matching components for all the RX paths.
The RF I/O signal is by default provided to 50ohm SMA connector. Printed antenna is selectable as RF I/O interface by soldering some matching components.



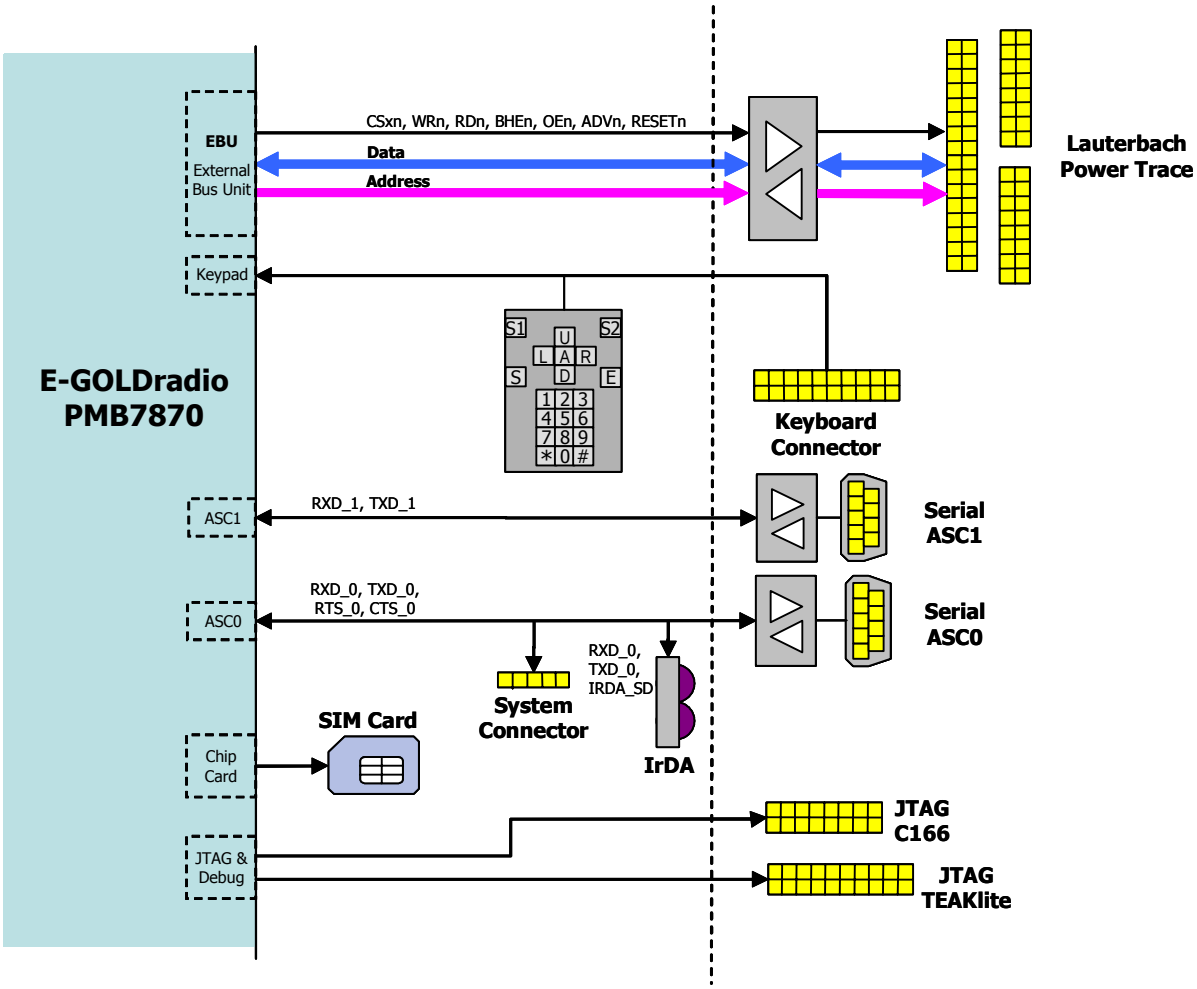
5.3. Baseband

Globe6 baseband system provides all necessary interfaces for design a realistic phone and additional interface for hardware/software designing and debugging.
Phone design includes the following interfaces:

- SIM card holder supporting 1.8 and 3V card type.
- Realistic phone keyboard with four-directional and center-push keys.
- IrDA transceiver fully SIR compliant, supporting bit rates up to 115kbit/s. It shares Serial Port 0 lines.
- System connector on phone with serial data I/O with handshake signals.

Outside phone design there are the following interfaces:

- 2x RS232: ASC0 with hardware handshake signals and ASC1 with software flow control. Both of them are accessible on SubD-9 connectors and supports high speed dataflow.
- Debug connectors (JTAG) for C166S MCU and for TEAKlite DSP debug tools.
- Connector for Lautherbach analyzer adaptation head (Power Trace).
- Connector for external keyboard.



5.4. Memory

GSM modem is equipped with Intel RD38F2240WWYTQW18 Multi-Chip Memory combo:
- 2 x 64Mbits Wireless Flash
- Top 8kbit sector of parameters for boot
- 14ns Sync / 65ns Async speed
- 32Mbits PSRAM (Pseudo-Static RAM)
- 1.8V voltage core and I/O
- 88-Ball (80-Active Ball) Stacked-CSP (Stacked Chip Scale Package)

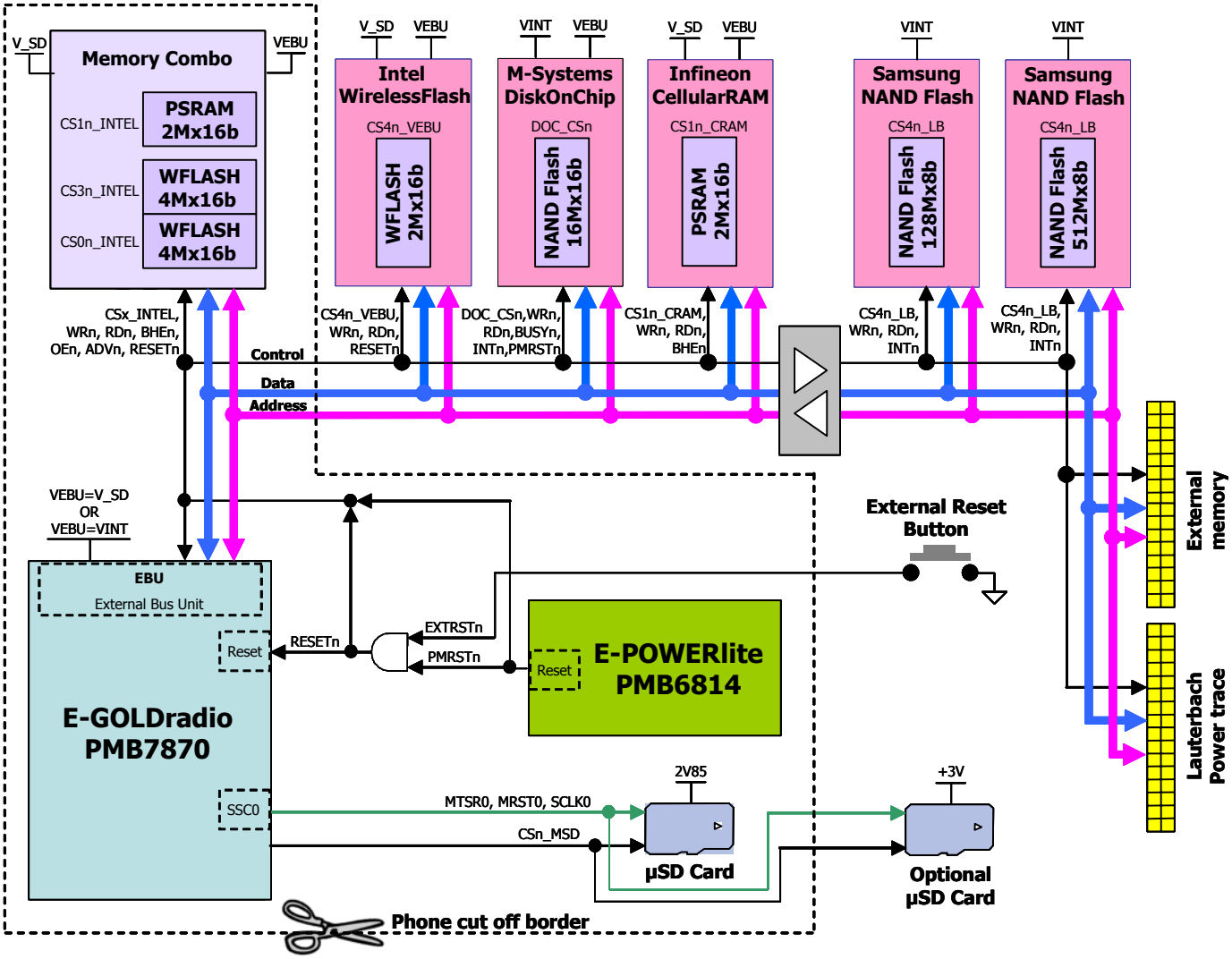
The oversized performances allow supporting the more demanding code, while providing mean for simulating more realistic choice of memories for BP30 platform, through increasing the software wait states inside the code running on the target.
Additional benefit is given by direct interfaces between E-GOLDradio and memory bank, both sharing the same voltage domain, V_SD=1.8V provided by E-POWERlite.

Additional chips are mounted outside embedded phone design for alternative memory configuration:
- Intel PH28F320W18TD60 32Mbit 1.8V Wireless Flash Memory
- Infineon HYE18P32160AC 32Mbit 1.8V CellularRAM
- M-Systems Mobile DiskOnChip P3 256Mbits 1.8V-I/O 3V-Core Flash Disk
- Samsung K9K1G08U0B 1GBits 3V NAND Flash Memory
- Samsung K9K4G08U0M 4GBits 3V NAND Flash Memory

This memory configuration is selectable by changing 0Ohm /Not Mounted resistors and performs realistic design for low end phone.

To provide maximum flexibility in the memory choice address, data and control busses are connected to standard 144 pins SO DIMM memory connector so every memory solution should be tested with a daughter board design. Between busses and SO DIMM memory connector there are some buffers powered with V_EBU which ensure that busses are not overloaded.

Furthermore also two MicroSD (TransFlash) card connectors are mounted on BP30 platform: one inside embedded phone design and one outside. MicroSD (TransFlash) card shall be used to store multimedia data and is connected to the baseband system through SPI compatible mode.

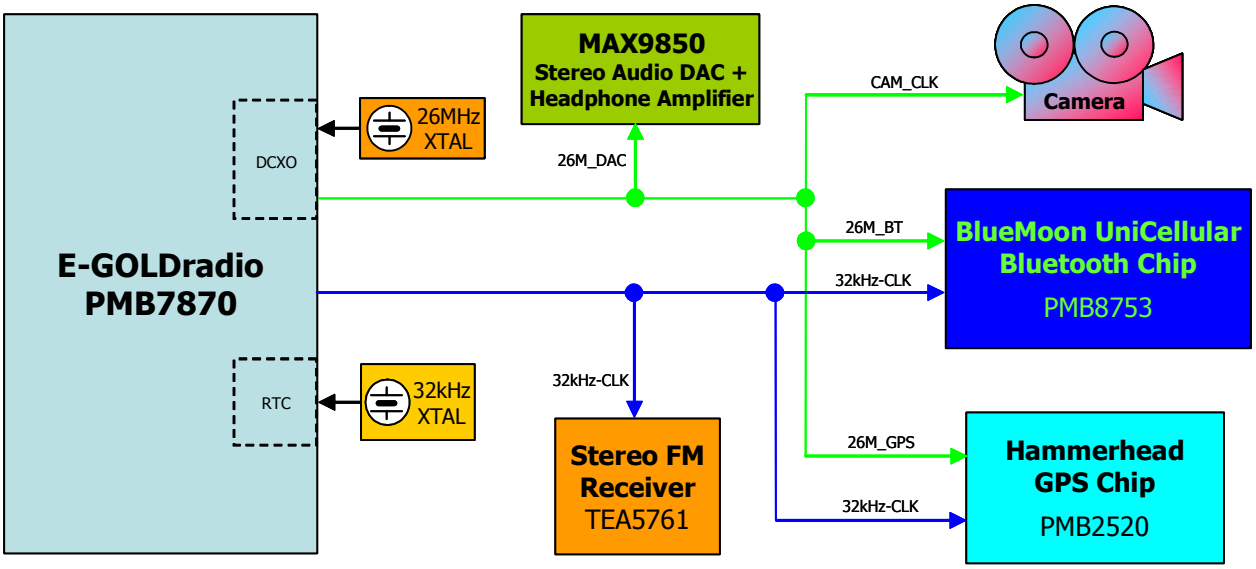

V_SD
VEBU
Memory Combo
CS1n_INTEL
PSRAM 2Mx16b
CS3n_INTEL
WFLASH 4Mx16b
CS0n_INTEL
WFLASH 4Mx16b
Intel WirelessFlash
CS4n_VEBU
WFLASH 2Mx16b
VINT
M-Systems DiskOnChip
DOC_CSn
NAND Flash 16Mx16b
Infineon CellularRAM
CS1n_CRAM
PSRAM 2Mx16b
Samsung NAND Flash
CS4n_LB
NAND Flash 128Mx8b
Samsung NAND Flash
CS4n_LB
NAND Flash 512Mx8b
CSx_INTEL, WRn, RDn, BHEn, OEn, ADVn, RESETn
CS4n_VEBU, WRn, RDn, RESETn
DOC_CSn,WRn, RDn,BUSYn, INTn,PMRSTn
CS1n_CRAM, WRn, RDn, BHEn
CS4n_LB, WRn, RDn, INTn
CS4n_LB, WRn, RDn, INTn
Control
Data
Address
External memory
VEBU=V_SD OR VEBU=VINT
External Reset Button
EBU
External Bus Unit
Reset
RESETn
EXTRSTn
PMRSTn
Reset
E-POWERlite PMB6814
E-GOLDradio PMB7870
SSC0
MTSR0, MRST0, SCLK0
CSn_MSD
2V85
µSD Card
+3V
Optional µSD Card
Lauterbach Power trace
Phone cut off border

5.5. Clock

The E-GOLDradio integrates a power full clocking scheme which facilitates flexibility during normal operation mode combined with minimized power dissipation during standby and sleep mode. Two separate clocks are provided: a 26 MHz and a 32.768 KHz.

The RF part of E-GOLDradio generates the 26MHz master clock with a fully integrate digital controlled crystal oscillator (DCXO), whose signal is used as a reference frequency for GSM baseband processor, for the fractional-N sigma-delta frequency synthesizer in the RX and TX operation mode, and for two additional RF subsystems (Bluetooth and GPS) via two output buffers (FSYS2 and FSYS3).
The DCXO is supplied by VRF2: powering it up activates the 26MHz clock. The only external component needed is a quartz crystal.

The Real Time Clock (RTC) is implemented with a 32 KHz quartz crystal for E-GOLDradio internal oscillator.

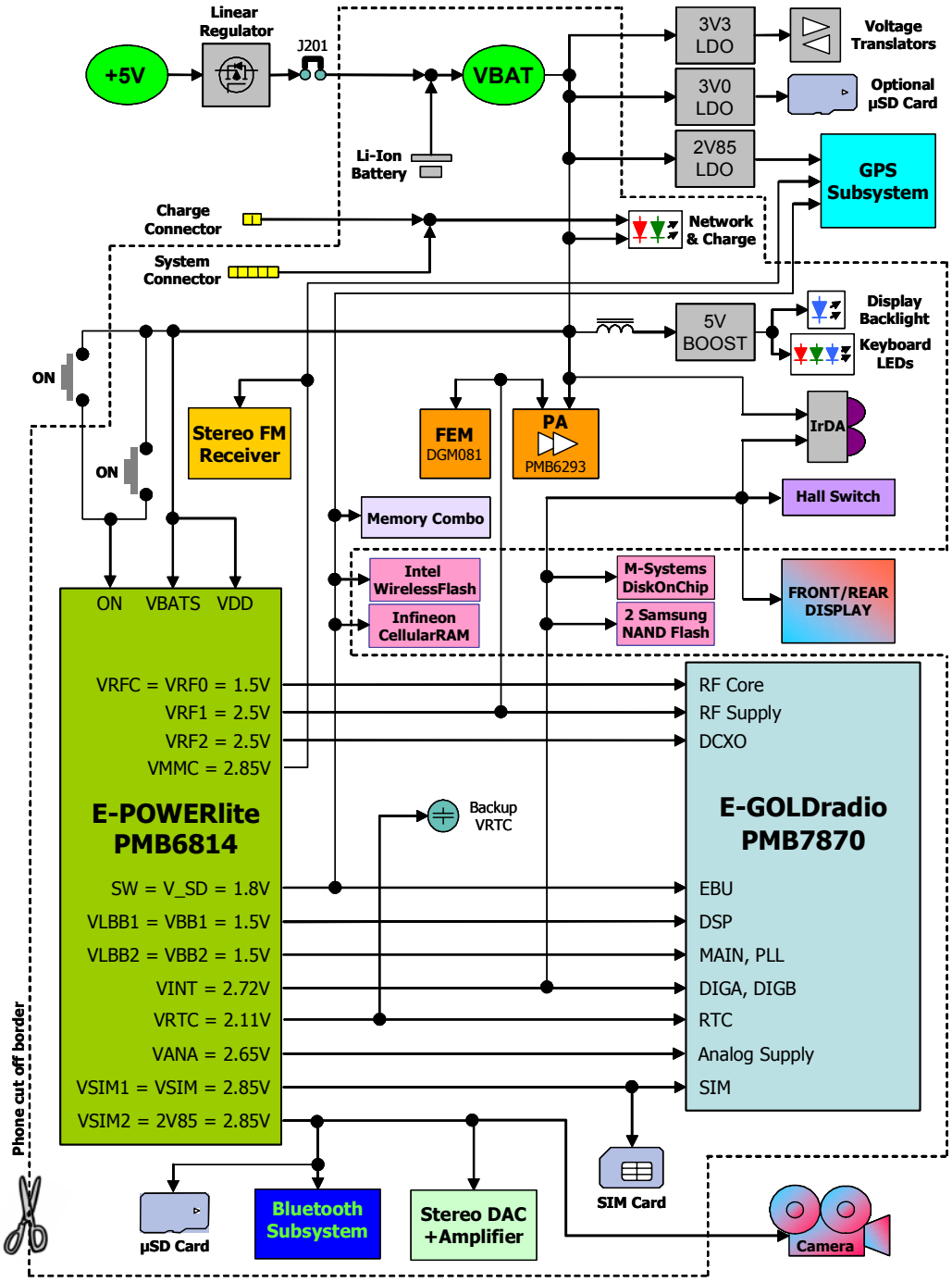


5.6. Power supply

The on board power supply has been thought to be derived all from battery voltage obtained ether by:

- an external 5V AC/DC adapter, which voltage supply is reduced to 3.8-4V by a discrete on-board linear regulator and then applied to the VBAT supply rail through J201 jumper.
- direct battery voltage injection from an external power supply to VBAT pin header connector.

The modem starting from this VBAT voltage derives all the needed voltage levels to supply the different circuit parts by the power management IC Infineon E-POWERlite PMB6814.



The supply domain might have different setting and they are programmed via a dedicated EP_I2C bus (implemented with sw driver) by E-GOLDradio at startup. All the other programming of the E-POWERlite are performed in the same way. Please refer to the Infineon datasheets for detailed specifications.
E-POWERlite should be pin-to-pin compatible with S/M-POWER PMB6811.

Supply name	Supply domain	Voltage level	Supplied Devices / Remarks
SDBB	V_SD	1.92 V 1.86 V **1.80 V** 1.50 V	Step-Down converter. Input for LBB1, LBB2 and LRFC. Supply for External Bus Unit of E-GOLDradio, Memories and Core Voltage Regulator of PMB2520 (Hammerhead AGPS Single Chip Device)
LBB1	VBB1	**1.50 V** 1.65 V	E-GOLDradio DSP (TEAKlite) supply (supplied by SDBB)
LBB2	VBB2	**1.50 V** 1.65 V	E-GOLDradio core supply including C166S MCU (supplied by SDBB)
LANA	VANA	**2.65 V**	Supply for analog part in E-GOLDradio
LINT	VINT	**2.72 V**	Supply for various parts in E-GOLDradio (I2C, I2S, SSC, ASC, Keypad, JTAG, RF Control Unit, GSM TDMA Timer), Front/Rear Display, Memories, IrDA (LEDA), Hall Switch
LSIM1	VSIM	**2.85 V** 1.8 V	Supply for SIM interface
LSIM2	2V85	**2.85 V**	Supply for Camera, MAX9850 (Stereo Audio DAC with Headphone Amplifier), microSD Card (inside phone design) and main supply for PMB8753 (BlueMoon UniCellular Bluetooth Single Chip Device)
LRTC	VRTC	**2.11 V**	Ultra-low zero-load current. Supply for Real Rime Clock
LRFC	VRF0	**1.50 V**	Supply for E-GOLDradio RF Part (supplied by SDBB)
LRF1	VRF1	**2.50 V**	Supply for E-GOLDradio RF Part, Antenna Switch and digital supply for PMB6293 (Quad Band Power Amplifier)
LRF2	VRF2	2.70 V **2.50 V**	Supply for E-GOLDradio DCXO
LMMC	VMMC	**2.85 V** 1.80 V	Supply for FM Receiver, PLL and LP Voltage Regulator of PMB2520 (Hammerhead A-GPS Single Chip Device)

Table 5.1: E-POWERlite supply

The PA is directly supply by the battery voltage. Two hot spots can be considered: the PA, and the E-POWERlite. The heat dissipation is based on the thermal resistance reduction around these two components by using a large number of vias in those regions.

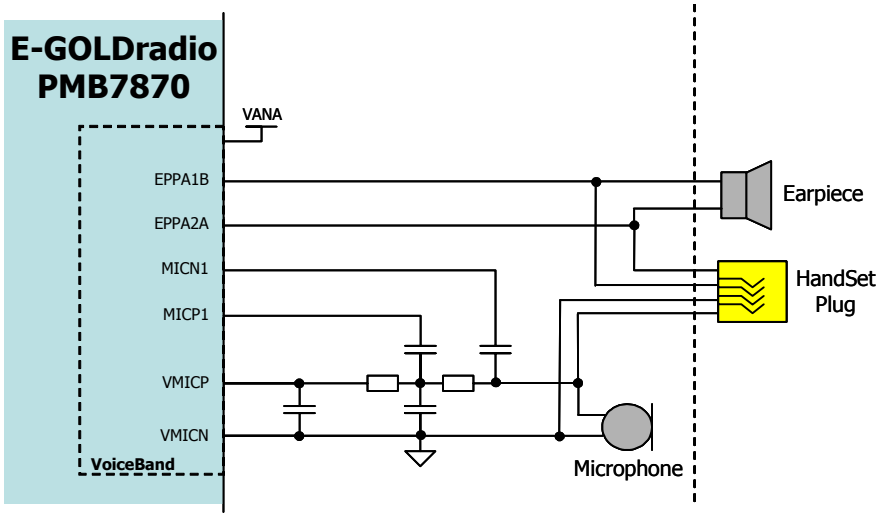
Additional regulators are included in the reference design:
- 5V Low-Noise Switched-Capacitor Boost Regulator to supply LEDs and display backlight.
- 3.3V Low-Noise LDO to supply the fast serial ports voltage translators.
- 3.0V Low-Noise LDO to supply optional microSD card (outside phone design).
- 2.85V Low-Noise LDO to supply GPS subsystem (GPS LNA and Hammerhead).

5.7. Voiceband

Handset Mode

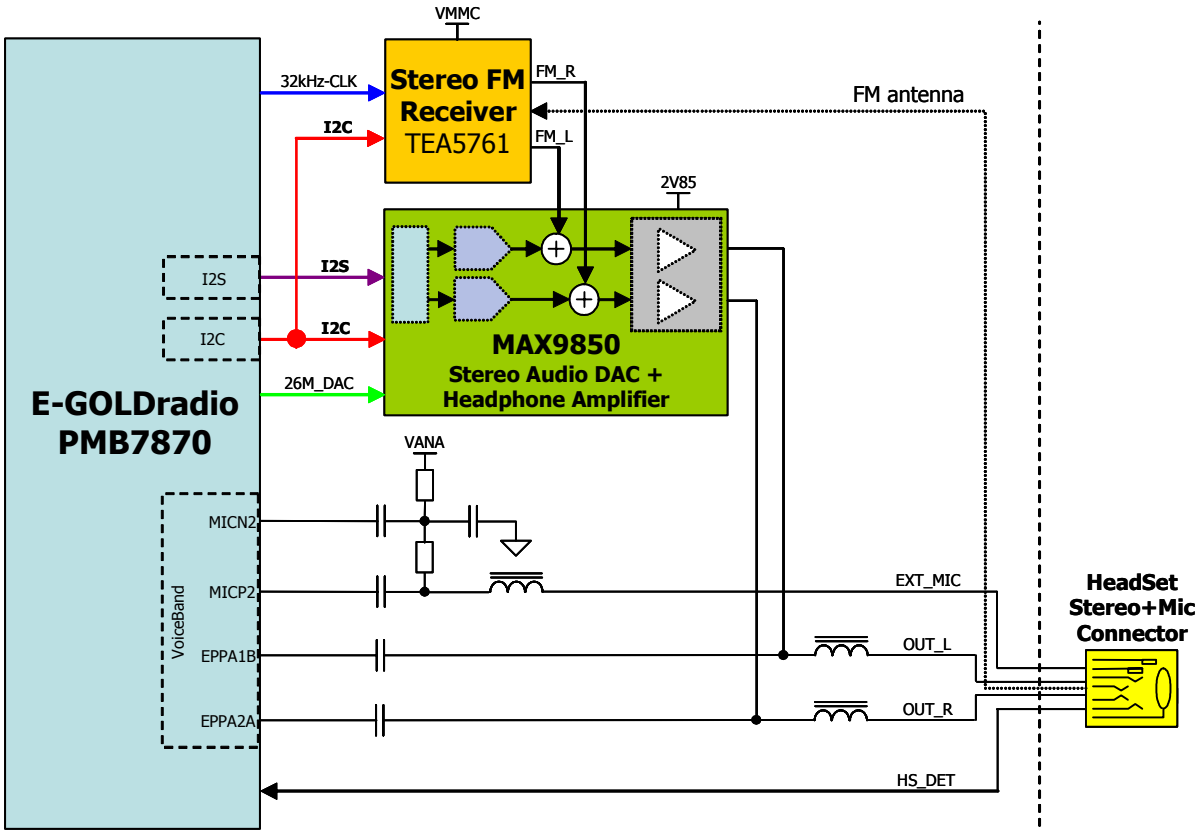
The normal voiceband functional mode of the phone is completely handled by E-GOLDradio:

- Microphone bias current is provided by internal regulator VMIC
- Microphone signal is directly connected to input MICP1/MICN1
- Earpiece is directly driven by EPPA1B/EPPA2A outputs and it's connected by pass-through wires on the top of the display module.
- Additional Handset Plug is located outside phone design.



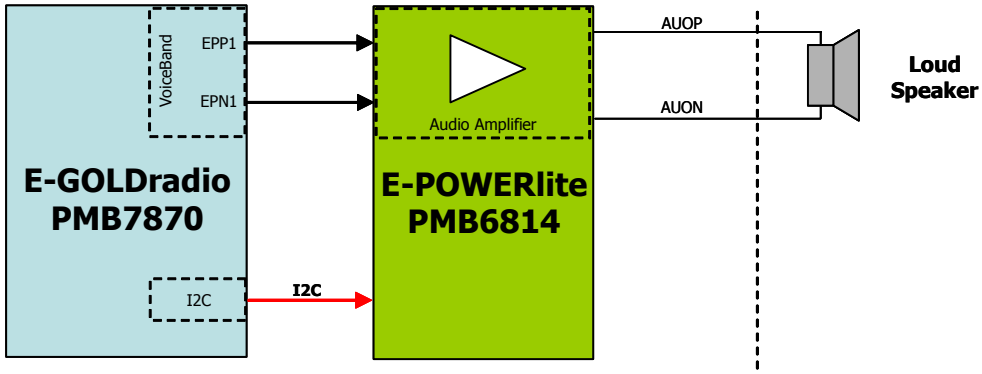
Hands-Free

In hands-free mode several hardware connections allow multiple mode of operation.
In standard mode, the microphone signal comes from the external stereo head-set device and is connected to MICP2/MICN2 inputs of E-GOLDradio. Voice output from E-GOLDradio EPPA1B/EPPA2A are connected to OUT_L/OUT_R lines of the head-set connector and then to the external audio device.
The platform supports extra sources for audio signal that could be audible on earpieces in hands-free operation. The digital serial audio interface I2S of the E-GOLDradio is connected to the MAX9850, a stereo audio DAC with headphone amplifier. The amplified analog signals are then connected to the OUT_L/OUT_R lines of the head-set connector and then to the external audio device.
The MAX9850 is used like a mixer: the stereo audio amplifier is shared also with the Philips TEA5761UK FM Radio Receiver.
In viva voice mode of operation, the output signal of EPP1/EPN1 is amplified by the built-in Audio amplifier of EPOWERlite, and then applied to the Loudspeaker output.
Loudspeaker (mechanical assembled with earpiece) is connected by pass-through wires on the top of the display module.



Ringer Mode

The ringer tones are generated by E-GOLDradio built-in generator and then they are amplified by the built-in Audio amplifier of E-POWERlite before being applied to loudspeaker.

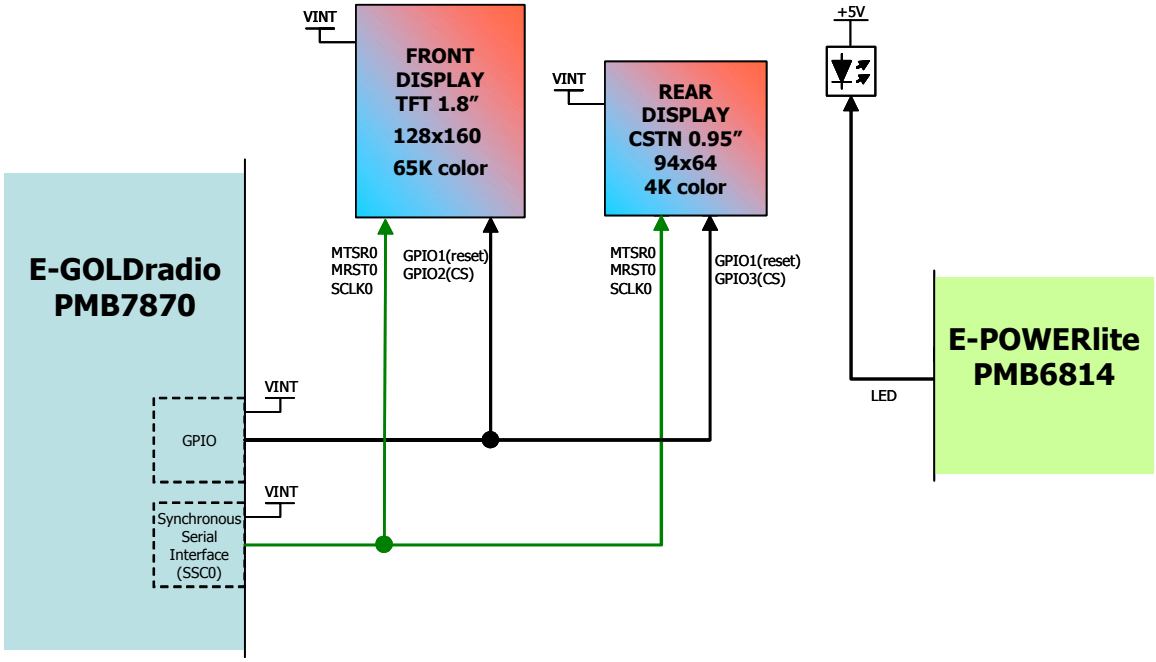


5.8. Display

Globe6 is equipped with Three-Five Systems 6040-0057-05 dual display module witch has the following characteristics:

- Front transmissive 128 x 160, TFT a-Si active matrix, color LCD capable of displaying 65K true colors and 260k dithered colors in 1.8" diagonal format.
- Rear transflective 96 x 64, .CSTN passive matrix, color LCD capable of displaying 4k colors in 0.95" diagonal format.
- Shared light guide optical system and four common anode backlight LEDs.
- Hitachi HD66773 integrated controller for front LCD.
- Solomon Systech SSD1788 integrated controller for rear LCD.
- Custom-made flex connection cable between display module and *Globe6* for realistic clam-shell design.

Both displays are directly connected by serial interface to the E-GOLDradio and to VINT supply domain. Backlighting is connected to +5v supply rail, commanded at cathode by E-POWERlite.



5.9. Camera

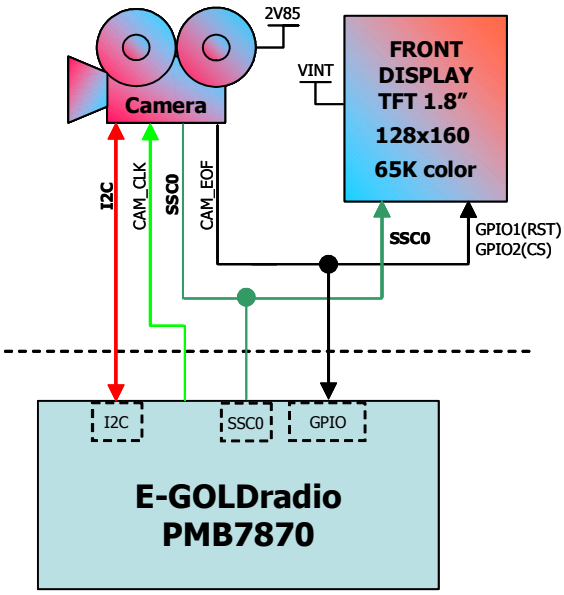
Globe6 is equipped with Agilent ADCM-1700-0000 CMOS camera module witch has the following characteristics:
- 352x288 landscape CIF resolution with 24 bit color depth
- 15 frames per second at CIF resolution
- Single 2.8V power supply with 42mW typical absorption.
- Fully configurable image processor with resizing, mirroring, sub sampling and panning capabilities.

Camera system in *Globe6* can basically do three main operations:

Preview (viewfinder mode)
In this scenario the image captured by the camera is transferred serially to the display without EGOLDradio real-time processing. This is possible since the camera (see specifications) has and internal scaler and data formatter that means which the camera has some processing capabilities and is able to downscale the input image to a size suited for the display and is able to change the format of outputs to one able to be displayed directly by the display.

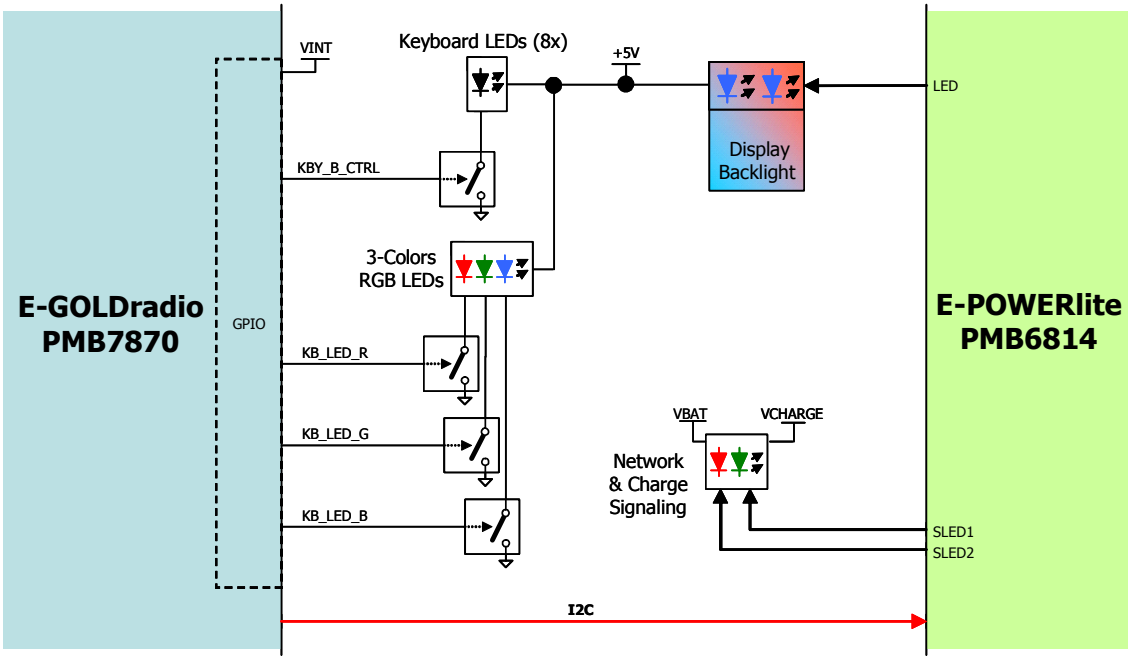
Snapshot (photo storage in temporary memory)
In this scenario the latest integral image from the camera remains stored in the display video memory.

Photo transfer
During this phase the image from the display memory is transferred to E-GOLDradio using synchronous serial port and then E-GOLDradio is able to move it to the system memory for successive elaboration.



5.10. Led

Globe6 is equipped with several LEDs for implementation of standard phones signaling, plus latest RGB 3-color LED for product customization.



Network and charge LEDs

Standard dual color Red/Green LED is connected to E-POWERlite, for exploiting the built-in driving capability of Infineon Power Management IC. The LEDs status is programmed by E-GOLDradio through I2C bus. Additional diode net is used to signal the charging when battery is in deep discharged condition.

Displays Backlight

The Backlighting LEDs of the display modules have a direct anode connection to the step up voltage +5V and are driven on the cathode through E-POWERlite ad-hoc open collector port, fully exploiting the built-in driving capability of Infineon Power Management IC. The Backlight status is programmed by EGOLDradio through the I2C bus.

Keyboard LEDs

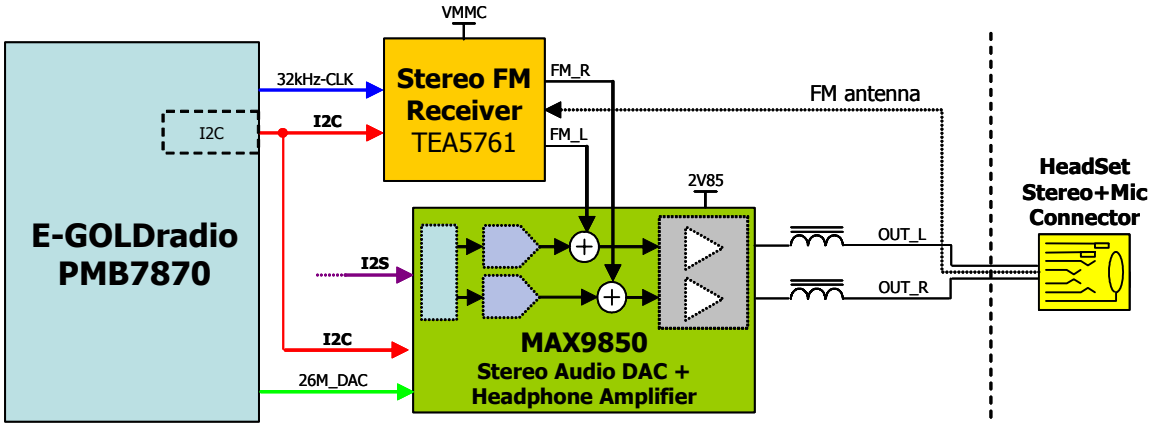
Eight white LEDs are provided for lightening of the keyboard. Their intensity should be set through PWM (Pulse Width Modulation) duty cycle. Intensity commands come from E-GOLDradio and pass through suitable transistors interface. Anode currents are set by mean of resistors on each line.

3-Color RGB LED

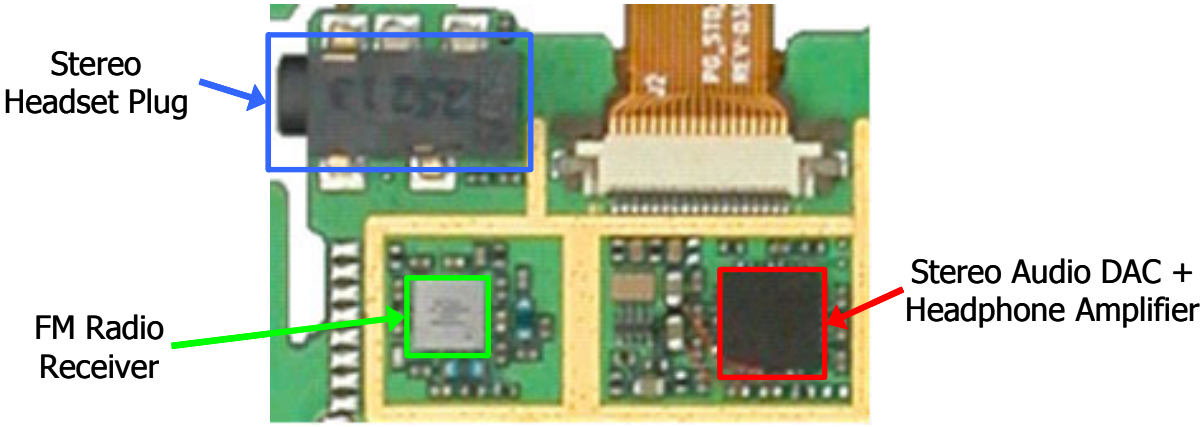
The 3-Color LED is provided for product customization. Independent commands are provided for each color, intensity should be set through PWM duty cycle. All the commands come from E-GOLDradio and pass through suitable transistors interface.

5.11. FM Radio

In the reference design there is an integrated FM radio which is based on the IC Philips TEA5761UK. The IC is controlled via I2C bus from E-GOLDradio and receives a 32kHz clock reference from E-GOLDradio.



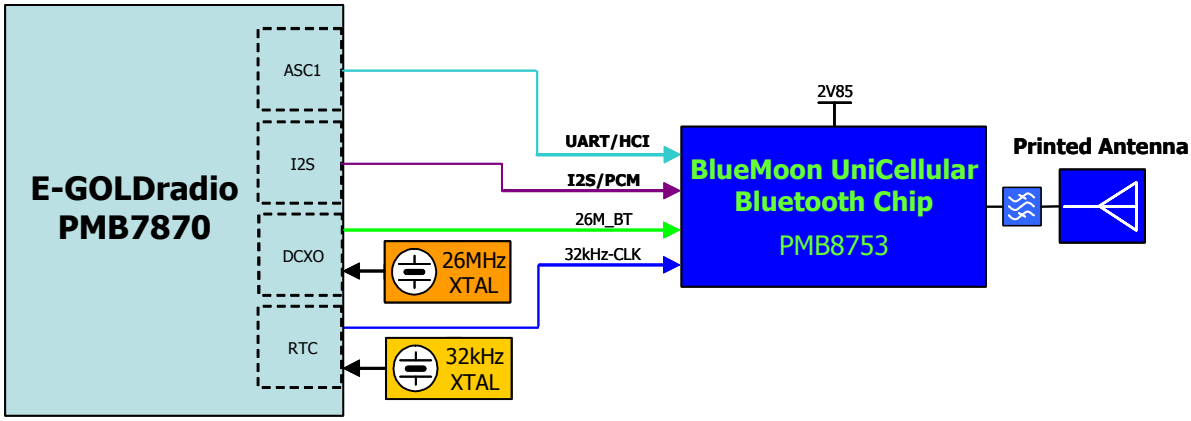
The layout on the evaluation board can be seen in the following picture.



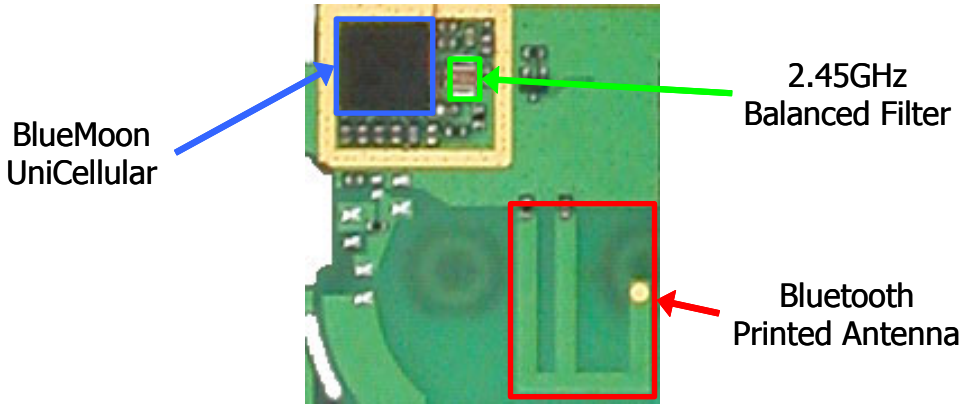
The TEA5761UK delivers the output stereo audio signal to the Stereo Audio Headphone Amplifier of the MAX9850 that is controlled via I2C bus from E-GOLDradio (volume and mute).

5.12. Bluetooth

Inside the phone form factor of the *Globe6* there is a Bluetooth subsystem which is based on the Infineon PMB8753 BlueMoon UniCellular IC that supports all features in the Bluetooth 2.0 + EDR, 1.2 and 1.1 specifications, including Enhanced Data Rate up to 3 Mbit/s, piconet with seven slaves, scatternet with two slave roles while still being visible, SCO and eSCO with hardware accelerated audio signal processing.
BlueMoon is provided with on-chip voltage regulators, integrated antenna switch, integrated LNA with excellent blocking and intermodulation performance.
The BP30 integrated solution connects the BlueMoon chipset to the E-GOLDradio through two main interfaces: the UART related to the HCI interface at the BlueMoon side is connected to the ASC0 of the EGOLDradio which sends HCI commands and receives HCI events with a three wire connection (HW flow control); the E-GOLDradio I2S interface is connected to the BlueMoon audio interface and set in PCM mode for supporting voice data. BlueMoon receives a 26MHz reference clock from FSYS2 output buffer of the E-GOLDradio DCXO and also a 32kHz low power clock from E-GOLDradio RTC.

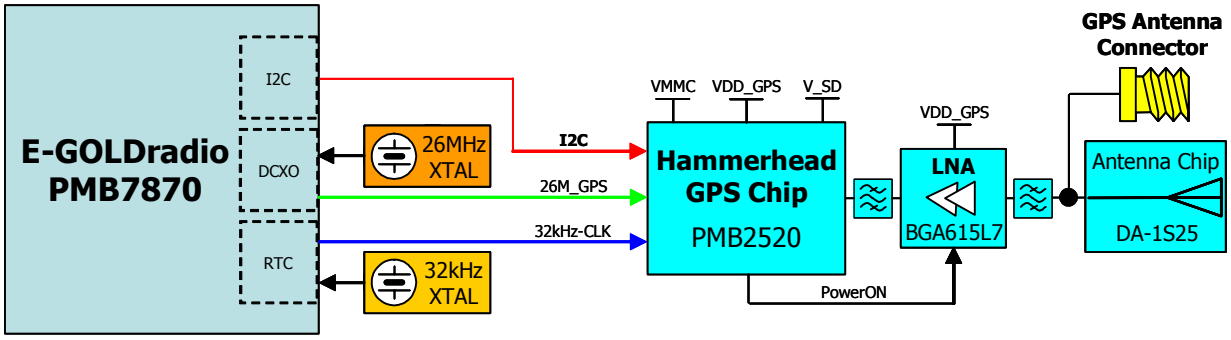


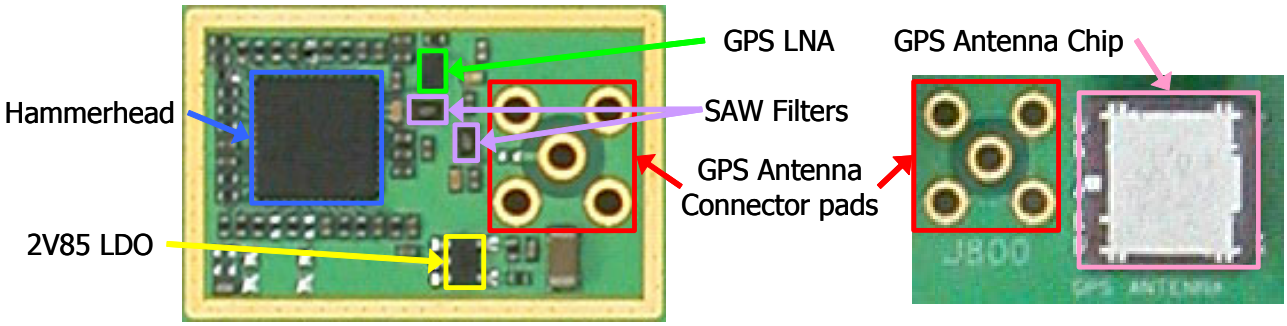
LNA inputs are connected to a Printed antenna through an Epcos B69893M2447E183 2.45GHz filter with balanced impedance to Infineon BlueMoon.



5.13. GPS

BP30 is equipped, outside phone form factor, with PMB 2520 Hammerhead GPS IC that is the Infineon Technologies and Global Locate´s next generation IC solution for GPS. The Hammerhead GPS single chip device enables the realization of a cost efficient GPS solution by integrating the complete radio frequency front-end as well as the signal processing functionality in a single die.
Hammerhead IC allows the usage of assistance data by supporting A-GPS standards and achieves enhanced sensitivity values at the LNA input as is required for indoor applications.
A sophisticated dynamic power management scheme supports several low-power modes which gives the lowest possible energy usage per fix. GPS subsystem is supplied by a 2.85V (=VDD_GPS) LDO voltage regulator for the Hammerhead RF part and LNA, by V_SD for Hammerhead core and by VMMC for PLL and low-power domain.
The *Globe6* provides two solutions for the GPS antenna: a FDK DA-5T33N GPS antenna chip or a SMA connector for external GPS antenna. These RF inputs are connected to the Infineon BGA615L7 GPS LNA through the Epcos B9000 GPS 1575.42 MHz SAW filter. LNA is then connected to the I/Q mixers inputs of Hammerhead through the Epcos B7840 GPS 1575.42 MHz SAW balun.
The Hammerhead is controlled via I2C bus from E-GOLDradio and receives a 26MHz reference clock from FSYS3 output buffer of the DCXO and also a 32kHz low power clock from E-GOLDradio RTC.





GPS Subsystem Bottom Side **GPS Subsystem Top Side**

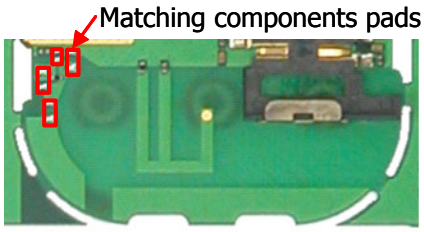
5.14. IrDA

An onboard IrDA transceiver provides wireless access to the board. The transceiver is SIR compliant, supporting bit rates up to 115kbit/s.
Please note that IrDA is parallel line to serial port 0.

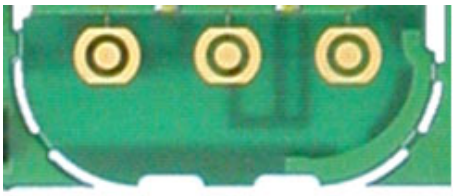
5.15. Printed Antenna

Quad band GSM 850/900 and DCS/PCS antenna is printed on the PCB and can be used to demonstrate the radiated performance in a realistic clam shell phone design.
Printed antenna may be selected as RF interface by soldering same matching components. Their values have to be chosen referring to the plastics design because it influences electromagnetic field.

Warning:	**printed antenna was designed to operate in stand alone phone configuration (phone cut off from Globe6). Its radiation characteristic changes in complete Globe6 configuration and it is not usable as RF interface.**



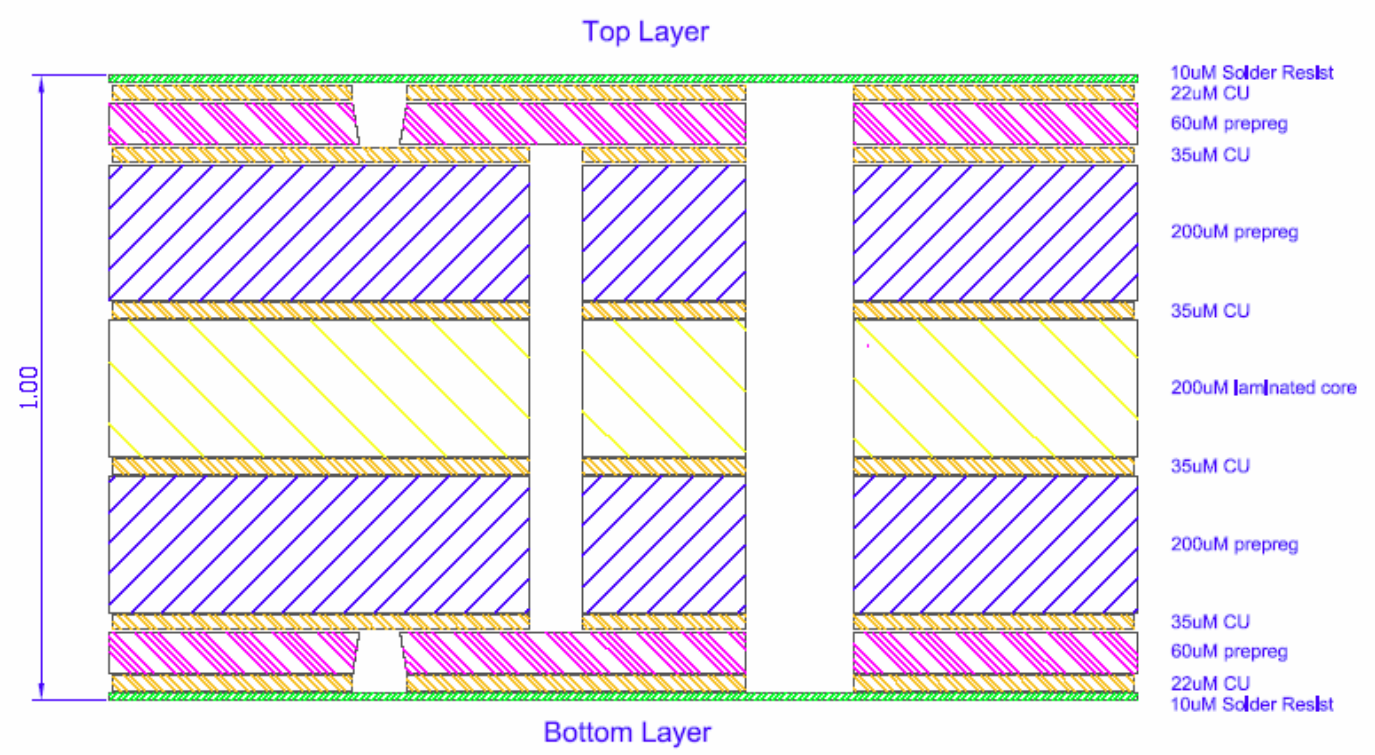
Printed Antenna Bottom Side



Printed Antenna Top Side

5.16. Lay-up and Shielding

The *Globe6* GSM/GPRS modem is placed and routed on a single face of 6 layers build up printed circuit board. Electronics parts are placed on both sides. The RF connections traces dimensions are calculated to achieve the wanted characteristic impedance and are placed on Layer4. Layer 3 is full ground. Layer5 is also mostly RF ground under sensible RF parts, with suitable clearance over components pads. The VBATT track is routed on Layer2 and Layer5. Quad band printed antenna elements are on Layer6 and Layer1.
The following picture shows the lay-up main dimensions.

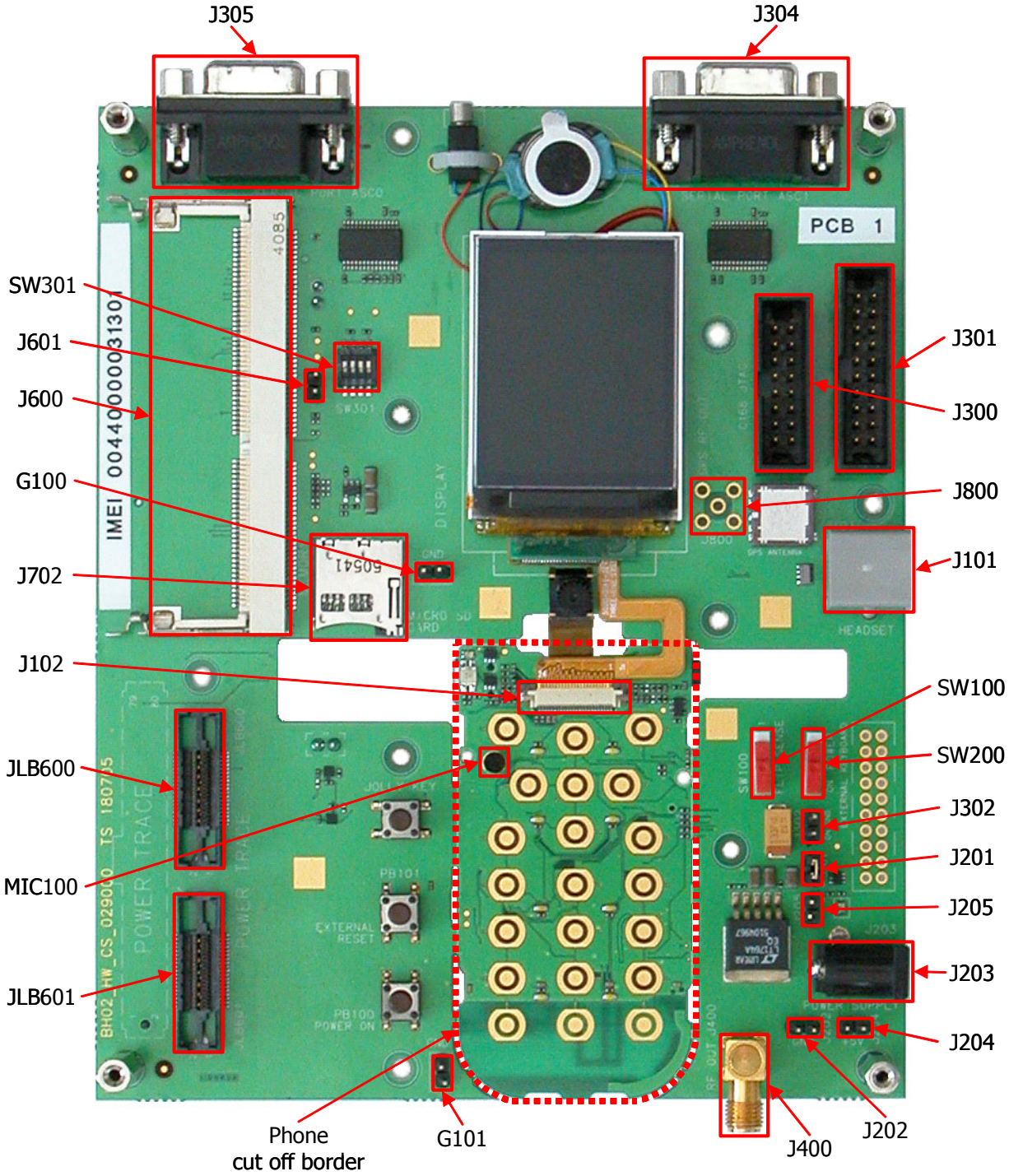


Surface Finishing: Chemical Gold Plate Ni 5 uM / Au 0.1 uM

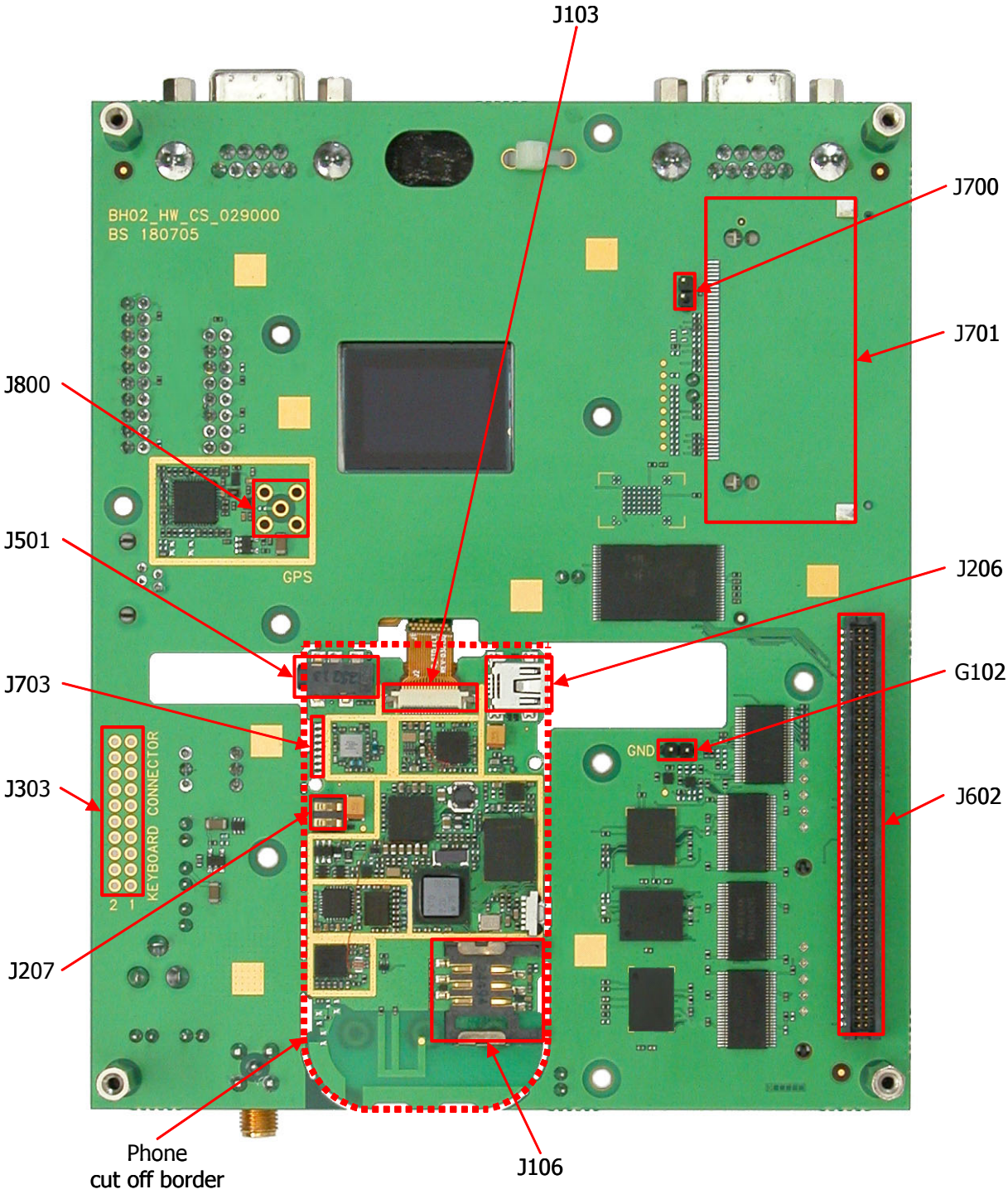
6. User Interfaces

Refer to the following picture for an overview of the HW interfaces:

Top Side



Bottom Side


J103
J700
J701
J800
J501
J206
J703
G102
J303
J602
J207
Phone
cut off border
J106
BH02_HW_CS_029000
BS 180705
GPS
GND
KEYBOARD CONNECTOR
2 1

J101: Handset audio

A standard RC-11 connector is provided for connection of a handset. This handset emulates the integrated microphone and speaker of a normal mobile phone.

J102: Display connector

Display connector provides to the front and rear LCD modules the connection to SSC0 fast serial interface. Moreover also control signals like chip select, reset and backlight leds control are provided.
To the pass through display pads are provided control signal for loudspeaker, earpiece and vibrator motor.

J102: Main display connector	
Signal	**Pin**
VINT	1
MTSR0	2
MRST0	3
SCLK0	4
DISP_RSTn	5
MTSR0	6
SCLK0	7
DISP_CS_TFTn	8
DISP_CS_CSTNn	9
GND	10
VINT	11
+5V	12
LED1-	13
LED2-	14
LED3-	15
LED4-	16
AUOP	17
AUOP	18
AUON	19
GND	20
EPPA2A	21
EPPA1B	22
VIB	23
GND	24

J103: Camera connector

The connector J103 has been thought to support a serial camera module connected to the high-speed serial interface SSC0 and the I2C bus of the E-GOLDradio.

J103: Camera connector			
Signal	**Pin**	**Pin**	**Signal**
GND	1	2	2V85
SDA	3	4	SCL
2V85	5	6	nc
SCLK0	7	8	nc
nc	9	10	nc
nc	11	12	nc
nc	13	14	nc
MTSR0	15	16	CAM_EOF
CAM_CLK	17	18	GND

J106: SIM

A SIM holder with a lock mechanism is provided on J106.

J201, J202, J203, J204: Power supply

Connection of +5V DC power supply is provided through a jack connector J203 with AC/DC converter.
Alternatively the power supply can be fed through a dual 2.54mm pin header connector J204 (+5V) and J202 (GND).
The +5V are lowered via a discrete linear regulator to a typical battery voltage of 3.8 V.
A jumper on J201 feeds the VBAT input point for the overall board. If this jumper is missing, is not possible to power on the board, even if the +5V are correctly supplied.
Alternatively a battery or a +3.8V typ DC supply could be connected directly to J207 (see its section).

J203, J204-J202: Power Supply				
	Min	**Typ**	**Max**	**Unit**
Input Voltage		+5		V
Input Current	5		2400	mA

J205: Charger input

A 2.54mm pin header connector has been included for connection of a charger. This allows the *Globe6* to control charging of a battery connected to J205, using the E-POWERlite charge control circuit.
When using this input for battery charging, the electrical specifications must be observed.

J205: Charger input				
	Min	**Typ**	**Max**	**Unit**
Input Voltage	4.8		6	V
Input Current			1200	mA

J206: System connector

A system connector has been considered with serial port (ASC0 with TX, RX and also handshake signals for programming capabilities), charge and external accessory support. Note that the logical levels of serial port are 0V and 2.7V (VINT).

J206: System connector	
Pin	**Signal**
1	VCHARGE
2	TXD_0
3	RXD_0
4	RTS_0
5	CTS_0

J207: Battery connector

A dedicated battery connector inside phone design has been provided in addition to the power supply connectors. This interface enables connection mobile phone battery to platform, development and testing of battery charger and/or support circuits and sw. It is also possible to measure power consumption.

J207: Battery connector				
	Min	**Typ**	**Max**	**Unit**
Input Voltage	3.5	3.7	4.2	V
Input Current	5		1800	mA

Warning: **Careful attention to battery voltage must be paid when using this connector J207, since no HW protection is provided!**

J207: Battery connector	
Pin	**Signal**
1	VBAT
2	GND

J300, J301: JTAG debug connectors

JTAG interface enable connection of JTAG emulator and E-GOLDradio. With this tool is possible to “see” what processor is doing. It is useful tool for debugging of SW and HW.

J300: JTAG debugger C166			
Signal	**Pin**	**Pin**	**Signal**
TMS	1	2	VINT
TDO	3	4	GND
nc	5	6	GND
TDI	7	8	EXTRSTn
TRSTn	9	10	TRIG_out
TCK	11	12	GND
TRIG_in	13	14	nc
nc	15	16	nc

J301: JTAG debugger TEAKlite			
Signal	**Pin**	**Pin**	**Signal**
VINT	1	2	nc
TRSTn	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
Pull down	11	12	GND
TDO	13	14	GND
EXTRSTn	15	16	GND
TRIG_in	17	18	GND
TRIG_out	19	20	GND

The Lauterbach ICD debugger is connected to J300 for C166S MCU debug and to J301 for TEAKlite DSP debugging. The connector contains the JTAG interface and the VINT power supply for E-GOLDradio GPIO for signal level reference.

J302: Ground On connector

Ground On connector provides the possibility to turn on the *Globe6* with a closure to ground command.

J302: Ground On connector	
Pin	**Signal**
1	Power on
2	GND

J303: External keyboard connector

All the keyboard interface signals from the E-GOLDradio are brought out on J303. This enables connection of an external keyboard with up to 24 keys, which can be decoded using an ordinary keyboard scan matrix scheme. On the same connector the control signals for 3-color LED are also available.

J303: External keyboard			
Signal	**Pin**	**Pin**	**Signal**
VBAT	1	2	ON
KEYIN0	3	4	KEYIN1
KEYIN2	5	6	KEYIN3
nc	7	8	nc
nc	9	10	KEYOUT0
KEYOUT1	11	12	KEYOUT2
KEYOUT3	13	14	KEYOUT4
KEYOUT5	15	16	+5V
KB_LED_R	17	18	KB_LED_G
KB_LED_B	19	20	GND

J304: Serial data ASC1

J304: Serial Data ASC1			
Signal	**Pin**	**Pin**	**Signal**
nc	1	6	nc
TXD_1	2	7	nc
RXD_1	3	8	nc
nc	4	9	nc
GND	5		

The ASC1 UART of the E-GOLDradio is connected to J304 allowing connection to a PC for SW low level trace. The interface is fully RS-232 compliant; flow control must be implemented in SW.

J305: Serial data ASC0

J305: Serial Data ASC0			
Signal	**Pin**	**Pin**	**Signal**
DCD	1	6	(DSR)*
TXD_0	2	7	CTS_0
RXD_0	3	8	RTS_0
DTR	4	9	Ring**
GND	5		

* DSR hardwired to asserted state
** can be set with SW301 switch 2 to low or high level

The ASC0 UART of E-GOLDradio is connected to J305 through a voltage translator from 2.7V (VINT domain) to 3.3V allowing connection to a PC for SW download and debug with PhoneTool SW, etc.
The interface is fully RS-232 compliant and supports full HW flow control. The onboard level shifters can be disabled to prevent signal conflicts. Since secondary HW flow control signals are shared with other control functions, switch SW301 can disconnect these signals from the RS-232 transceiver.

J400: GSM Antenna connector

A 50 Ohm SMA connector is provided as antenna connector for GSM functionality.

Warning:	**Operating the GSM/GPRS transmitter without a proper antenna connection or RF termination (e.g. by the Phonetool non-signalling mode) may result in permanent damages!**

J800: GPS Antenna connector

A 50 Ohm SMA connector is provided as antenna connector for GPS functionality. The external antenna is selectable in place of the antenna chip by moving C823 to C835 pads.

J501: Stereo headset with microphone

Two 2.5mm jack sockets are provided for use with stereo headsets. The socket has a microphone connection as well, allowing usage also of stereo headsets with microphone. The connector features detection of insertion, SEND/END key press and stereo/mono indication.

J600: External memory daughterboard connector

J600: External memory daughterboard connector							
Signal	**Pin**	**Pin**	**Signal**	**Signal**	**Pin**	**Pin**	**Signal**
GND	1	2	GND	RESETn_LB	73	74	nc
DL0	3	4	nc	GND	75	76	GND
DL1	5	6	OEn_CS2n_LB	nc	77	78	nc
DL2	7	8	nc	nc	79	80	tp604
DL3	9	10	nc	V_EBU	81	82	V_EBU
V5V	11	12	V5V	nc	83	84	tp603
DL4	13	14	RDn_LB	nc	85	86	tp603
DL5	15	16	WRn_LB	nc	87	88	tp603
DL6	17	18	Nc	nc	89	90	tp603
DL7	19	20	ADVn_uP_LB	GND	91	92	GND
GND	21	22	GND	nc	93	94	AL15
AL0	23	24	nc	nc	95	96	AL16
BHEn_LB	25	26	nc	nc	97	98	AL17
V5V	27	28	V5V	nc	99	100	AL18
AL1	29	30	AL4	V5V	101	102	V5V
AL2	31	32	AL5	AL7	103	104	AL8
AL3	33	34	AL6	AL9	105	106	nc
GND	35	36	GND	GND	107	108	GND
DL8	37	38	tp600	AL10	109	110	nc
DL9	39	40	Nc	AL11	111	112	nc
DL10	41	42	V_EBU	V5V	113	114	V5V
DL11	43	44	READY_LB	nc	115	116	AL10
V5V	45	46	V5V	nc	117	118	AL11
DL12	47	48	CS0n_LB	GND	119	120	GND
DL13	49	50	OEn_CS2n_LB	nc	121	122	AL13
DL14	51	52	CS3n_LB	nc	123	124	AL14
DL15	53	54	CS4n_LB	nc	125	126	AL19
GND	55	56	GND	nc	127	128	AL20
RESETn_LB	57	58	tp601	V5V	129	130	V5V
nc	59	60	tp602	nc	131	132	AL21
nc	61	62	CLK_OUT_LB	nc	133	134	AL22
V5V	63	64	V5V	nc	135	136	AL23
nc	65	66	Nc	nc	137	138	VBB2
WRn_LB	67	68	Nc	GND	139	140	GND
CS1n_LB	69	70	AL12	VBB2	141	142	VBB2
nc	71	72	J601	V5V	143	144	V5V

Notes: J601-pin1 connected to J600-pin72, J601-pin2 connected to V_EBU; tp604 connected to a pull-up resistor to V_EBU.

J602: Multimedia expansion connector

J602: Multimedia expansion connector								
Signal	**Pin**	**Pin**	**Signal**		**Signal**	**Pin**	**Pin**	**Signal**
GND	1	2	DL0		GND	51	52	GND
DL1	3	4	DL2		RDn_LB	53	54	nc
DL3	5	6	DL4		WRn_LB	55	56	BHEn_LB
DL5	7	8	DL6		V_LB	57	58	V_LB
DL7	9	10	GND		AL16	59	60	AL17
DL9	11	12	DL8		GND	61	62	GND
DL11	13	14	DL10		AL18	63	64	AL19
DL13	15	16	DL12		AL20	65	66	AL21
DL15	17	18	DL14		AL22	67	68	AL23
GND	19	20	AL0		GND	69	70	GND
AL1	21	22	AL2		CS0n_LB	71	72	CS1n_LB
AL3	23	24	AL4		OEn_CS2n_LB	73	74	CS3n_LB
AL5	25	26	AL6		CS4n_LB	75	76	RXD_1
AL7	27	28	GND		CLK_OUT_LB	77	78	TXD_1
AL9	29	30	AL8		GND	79	80	GND
AL11	31	32	AL10		CSn_MSD	81	82	CLK0_S2_LB
AL13	33	34	AL12		MTSR0	83	84	WA0_S2_LB
AL15	35	36	AL14		SCLK0	85	86	TX_S2_LB
VBAT	37	38	V_SD		MRST0	87	88	RX_S2_LB
VBAT	39	40	V_SD		GND	89	90	GND
VBAT	41	42	VINT		CAM_EOF	91	92	DISP_RSTn
V_LB	43	44	V_LB		RESETn_LB	93	94	DISP_CS_TFTn
V_LB	45	46	V_LB		GND	95	96	DISP_CS_CSTNn
SDA	47	48	SCL		TXD_0	97	98	RXD_0
V_LB	49	50	V_LB		CTS_0	99	100	RTS_0

J701: BlueMoon UniCellular compact flash card connector

J701: BMU CF-card connector			
Signal	**Pin**	**Pin**	**Signal**
GND	1	26	GND
CTS_0	2	27	TXD_0
RTS_0	3	28	RXD_0
WA0_S2	4	29	TX_S2
CLK0_S2	5	30	RX_S2
VDD	6	31	VDD
VDD	7	32	VDD
VDD	8	33	nc
VDD	9	34	VDDPCM
VDDPCM	10	35	VDDUART
nc	11	36	nc
VDDSUP	12	37	VDDSUP
nc	13	38	nc
VDD	14	39	VDDPM
RTS_0	15	40	BT_RSTn
nc	16	41	nc
CTS_0	17	42	nc
J700	18	43	nc
nc	19	44	nc
FM_CLK	20	45	nc
OSC_EXT_EN	21	46	26M_BT
nc	22	47	nc
nc	23	48	nc
nc	24	49	nc
VDD	25	50	nc

Notes: J700-pin1 connected to J701-pin18, J700-pin2 connected to GND; VDD could be connected to V_SD or to 2V85 or to VINT through a 0ohm jumper; VDDPM could be connected to VBB2 through a 0ohm jumper; VDDPCM could be connected to 2V85 or to VINT through a 0ohm jumper; VDDUART could be connected to 2V85 or to VINT through a 0ohm jumper; VDDSUP could be connected to 2V85 or to VINT through a 0ohm jumper.

J702, J703: microSD memory cards connectors

J702, J703: microSD connectors	
Pin	**Signal**
1	RSV
2	CS
3	DI
4	VDD
5	SCLK
6	GND
7	DO
8	RSV

Notes: VDD pin of J703 (microSD connector inside phone design) is connected to 2V85; VDD pin of J702 (microSD connector outside phone design) is connected to 3V LDO voltage regulator output; RSV pins are connected to pull-up resistors to VINT; CS pins are connected to CSn_MSD; DI pins are connected to MTSR0; DO pins are connected to MRST0; SCLK pins are connected to SCLK0.

JLB600, JLB601: Lautherbach Power Trace connectors

JLB600 and JLB601 are the two connectors used on newer head adapters from Lautherbach. Voltage translators are used to adapt the supply domain requirement to achieve functionality.

JLB600: Lautherbach			
Signal	**Pin**	**Pin**	**Signal**
nc	1	2	nc
GND	3	4	GND
AL16	5	6	AL17
AL18	7	8	AL19
AL20	9	10	AL21
AL22	11	12	AL23
GND	13	14	GND
CLK_OUT_LB	15	16	CLK_OUT_LB
GND	17	18	GND
nc	19	20	nc
nc	21	22	nc
nc	23	24	nc
nc	25	26	nc
nc	27	28	BHEn_LB
WRn_LB	29	30	RDn_LB
V_LB	31	32	V_LB
CS0n_LB	33	34	CS1n_LB
OEn_CS2n_LB	35	36	CS3n_LB
CS_MA3_LB	37	38	GND

JLB601: Lautherbach			
Signal	**Pin**	**Pin**	**Signal**
GND	1	2	GND
DL0	3	4	DL1
DL2	5	6	DL3
DL4	7	8	DL5
DL6	9	10	DL7
DL8	11	12	DL9
DL10	13	14	DL11
DL12	15	16	DL13
DL14	17	18	DL15
GND	19	20	GND
AL0	21	22	AL1
AL2	23	24	AL3
AL4	25	26	AL5
AL6	27	28	AL7
AL8	29	30	AL9
AL10	31	32	AL11
AL12	33	34	AL13
AL14	35	36	AL15
GND	37	38	GND

G100, G101, G102: Ground connectors

G100, G101 and G102 are dual 2.54mm pin header connectors with 2 pins shorted to GND (like the J202 connector).

MIC100: Microphone contacts

MIC100 provides two pads for connect a preamplified microphone.

SP1: Earpiece

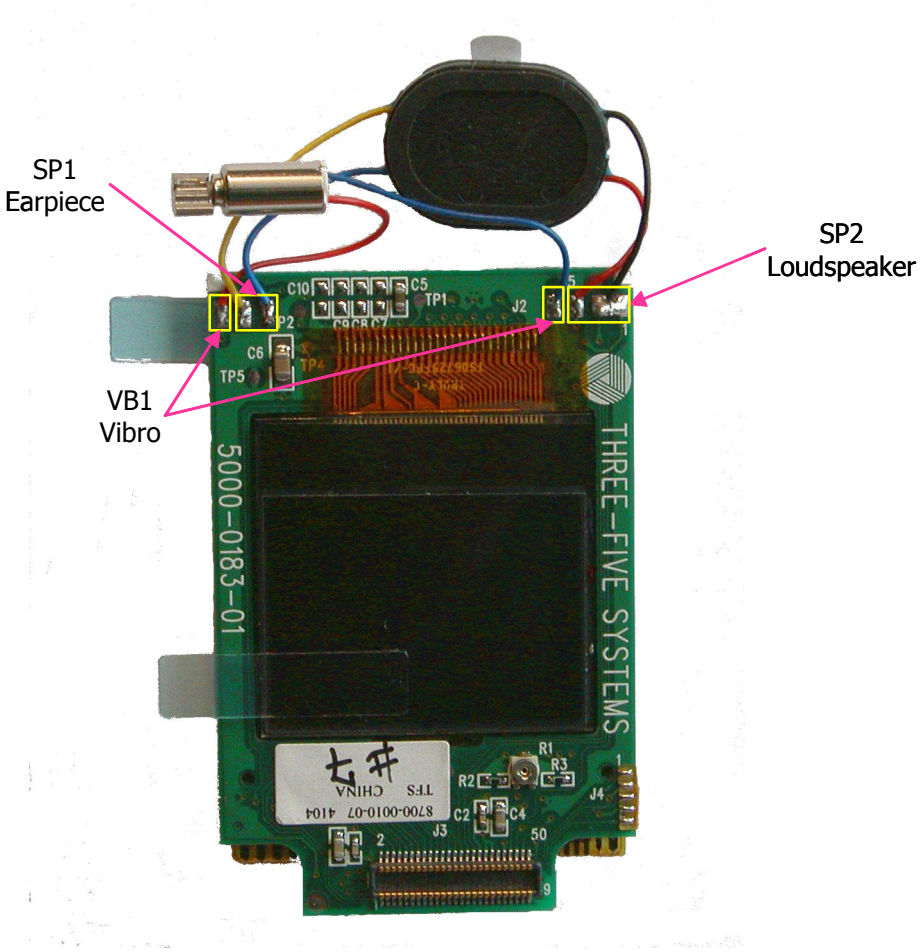
SP1 provides access to the driver outputs for earpiece applications. It is located on the top of display module.

SP2: Loudspeaker

SP2 provides access to the driver outputs for 8 Ohm speaker for loud speaking applications. It is located on the top of display module.

VB1: Vibro contacts

The vibrator motor is controlled through E-POWERlite. VB1 contacts are located on the top of display module.

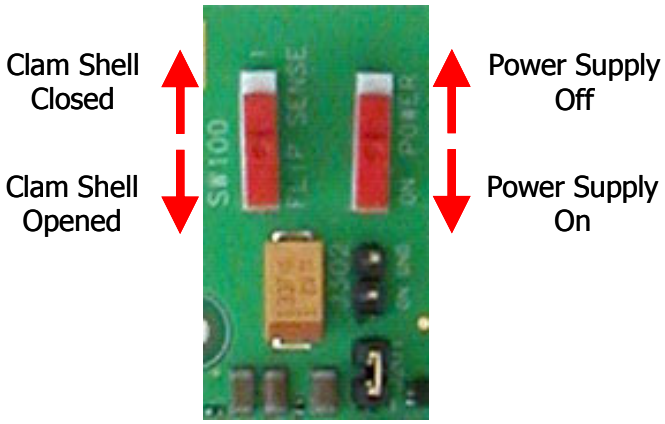


SW100: Flip Sense switch

Flip Sense switch provides the capabilities to simulate the clam-shell closure. Flip-sense signal is parallel with the output of the hall sensor.

SW100: Power On switch

Power On switch provides the capabilities to disable the VBAT feeding from a +5V DC supply, with the shutdown of the discrete linear step-down regulator. If a +5V DC supply is used, the switch must be set to the position ON. If a battery is used, the switch should be set to the position ON or to the other.



SW301: Serial Port Configuration dipswitch

SW301 configures serial ASC0, serial ASC1 and IRDA operation modes according to the following table:

SW301: Serial Port Configuration dipswitch		
SW	**State**	**Mode**
1	ON	RX ASC1 ACTIVE
	OFF	RX ASC1 INACTIVE
2	ON	RING ASC0 = 0
	OFF	RING ASC0 = 1
3	ON	RX ASC0 ACTIVE
	OFF	IRDA ACTIVE, RX ASC0 INACTIVE
4	ON	TX ASC0 ASC1 ACTIVE
	OFF	TX ASC0 ASC1 INACTIVE

Default configuration is: SW[0..4]= ON, ON, ON, ON.

To use IRDA configure SW301 to SW[0..4]= X, X, OFF, OFF (X= don't care).
Note that IRDA and Serial Port on J305 are mutually exclusive.

To use ASC0 on System Connector J206 configure SW301 to SW[0..4]=X, X, OFF, OFF.

7. Schematic

The board schematic design is presented on 8 pages.

On **Page 1** is placed the section of E-GOLDradio application which exploits the full analog section (I/Q interface and Power Ramping, measurement ADC for battery and temperature sensing, 26MHz master clock input and AFC control, voiceband). E-GOLDradio pins/ball mapping might be also found on this page, related to RF controls and timing (3-wire interface, trigger signals), SIM interface, JTAG and Debug, Asynchronous Serial Communication interface ASC0 and ASC1 mapping, Synchronous Serial Interface SSC0, I2C-bus, I2S-bus, GPIO.
Other functions/interfaces implemented on **Page 1** are:
- audio microphone and speaker for normal voiceband operation
- connector for the displays
- camera connector
- SIM holder connector
- handset plug connector
- hall sensor and flip sense switch
- power on button and external reset button

The **Page 2** schematic shows the mapping of E-GOLDradio supply domains and the E-GOLDradio external bus unit (EBU) data/address/control signals connection to the memory RAM/Flash combo.
On the same **Page 2** is placed the full Power Management section, namely:
- E-POWERlite, including all the supply domains plus charger circuitry and the built-in audio amplifier
- the connector for +5V DC supply input
- the discrete linear step-down regulator to VBAT
- jumper J201 toward VBAT interface
- the battery connector itself
- charger input connector
- discrete regulator (3V3)
- Switched Capacitor Boost Regulator 5V
- System connector interface

On **Page 3** the following function/interfaces are implemented:
- keypad symbols and mapping
- external keyboard connector
- twice RS232 interfaces (ASC0 and ASC1) with level translators
- IrDA transceiver
- connectors for C166 MCU and TEAKlite DSP debug tools (JTAG)
- 3-color RGB LEDs and keyboard LEDs
- on-ground connector

On **Page 4** the full RF transceiver is implemented, including RF part of E-GOLDradio, power amplifier, antenna switch with SAW filters front-end module, matching components for all the RX paths, 26MHz XTAL, RF 50ohm SMA antenna connector and printed antenna matching circuit.

The schematic **Page 5** shows the full application of the FM radio receiver and auxiliary audio parts, i.e. the stereo audio DAC with headphone amplifier and hands-free stereo connector(s).

On **Page 6** the following function/interfaces are implemented:
- voltage translators/buffers for Power Trace from Lautherbach
- connector for Power Trace
- connector for external memory daughterboard
- connector for multimedia expansion

On **Page 7** all the memories external to phone design are implemented, including: Infineon 32Mbits CellularRAM, Intel 32Mbits Wireless Flash, M-Systems 256Mbits DiskOnChip, Samsung 1GBits NAND Flash, Samsung 4GBits NAND Flash.
On the same **Page 7** also the following function/interfaces are implemented:

- discrete regulator (3V)
- microSD memory card connector (inside phone design)
- microSD memory card connector (outside phone design)
- connector for BlueMoon UniCellular Compact Flash Card

On **Page 8** schematic shows the Bluetooth subsystem, including Infineon BlueMoon UniCellular, 2.45GHz balanced filter and printed antenna matching circuit.
On the same **Page 8** schematic also shows the A-GPS subsystem, including Infineon Hammerhead, discrete regulator (2V85), GPS LNA, SAW filters, GPS antenna chip and SMA connector for external GPS antenna.

8. Quick Startup

This section briefly recalls few key points in the procedure to setup the board in case of its standard use.

8.1. Suggested Procedure

Please refer to the following picture for identifying key items for quick startup
The suggested procedure is:

1. Set jumpers and switches (please refer to following sections for default configuration)

A jumper on J201 feeds the VBAT input point for the overall board. If this jumper is missing, is not possible to power on the board, even if the +5V are correctly supplied.

2. Connect the power supply using an AC/DC adapter connected to J203 plug connector, or using a different +5V DC supply connected on J204 (positive +5V) and J202 (ground), or using the Battery to the connector J207 (please refer to following section for additional information)

Warning:	**Careful attention to battery voltage must be paid when using this connector J207, since no HW protection is provided!**

3. Connect the GSM antenna on J400 (or use a 50ohm RF termination) if it is expected that the board goes to transmission

Warning:	**Operating the GSM/GPRS transmitter without a proper antenna connection or RF termination (e.g. by the Phonetool non-signalling mode) may result in permanent damages!**

4. Insert the SIM, if required by the wanted use (e.g. AT normal call)

5. Connect the serial cables, if the case (Standard port for AT commands and for SW download is Serial Port 0 - ASC0- , please refer to SW usage documents for detailed description)

6. Push one of the “ON” sources (e.g. PB100 or KB313)

In case the user needs to reset the board, an External Reset button PB101 is provided to this scope.

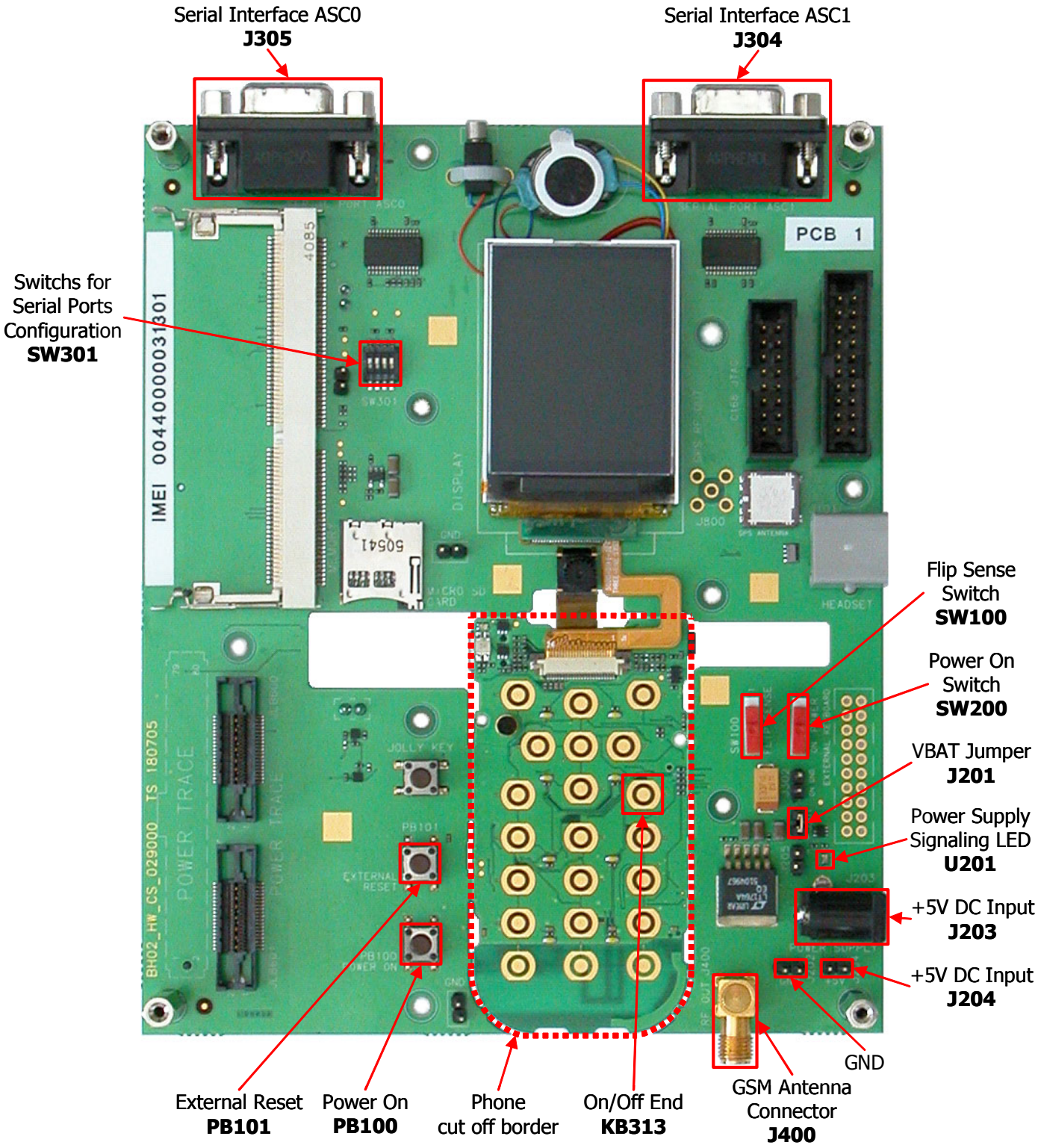
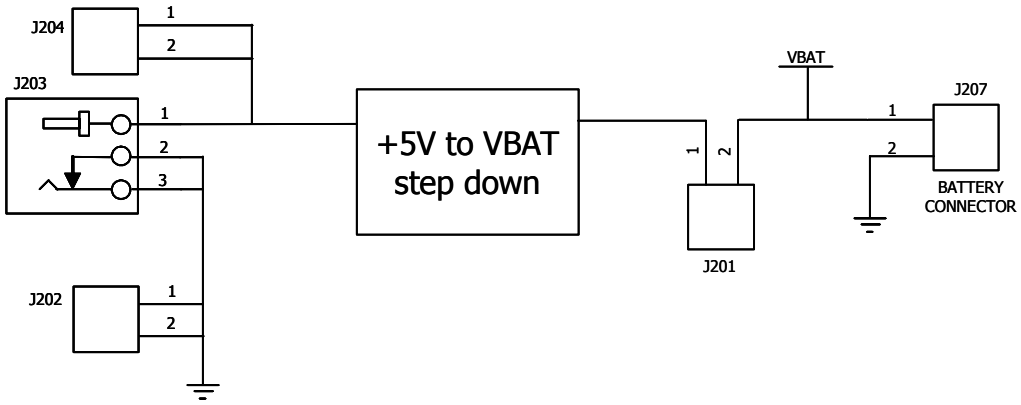


Figure 8-1: Quick startup key items

8.2. Board Supply

The following picture shows the Board Supply subsystem



The default configuration for board supply is based on +5V DC input, that could be fed either by:
- connecting the AC/DC adapter on the plug power connector J203
- using a different +5V DC supply, connected on J204 (positive +5V) and J202 (ground)

The regulated 3.8V typ. is available at pin 1 of J201.

A jumper on J201 feeds the VBAT input point for the overall board. If this jumper is missing, is not possible to power on the board, even if the +5V are correctly supplied.

Alternatively, by not setting any jumper on J201, the user is allowed to connect directly a battery or a dedicated DC supply to J207 (pin 1 → +3.8V typ, pin 2 → GND).

Warning:	**Careful attention to battery voltage must be paid when using this connector J207, since no HW protection is provided!**

8.3. Switches Settings

SW100: Flip Sense switch

Flip Sense switch provides the capabilities to simulate the clam-shell closure. Flip-sense signal is parallel with the output of the hall sensor.

SW100: Power On switch

Power On switch provides the capabilities to disable the VBAT feeding from a +5V DC supply, with the shutdown of the discrete linear step-down regulator. If a +5V DC supply is used, the switch must be set to the position ON. If a battery is used, the switch should be set to the position ON or to the other.

SW301: Serial Interface ASC0 Conflicts

SW301 is used to prevent conflicts on serial ASC0
The Default setting are shown shaded in the following table.

SW301: Serial Interface ASC0 Conflicts			
Switch	**Meaning**	**Position ON**	**Position OFF**
1	Pulldown ENn ASC1	RX ASC1 ACTIVE	RX ASC1 INACTIVE
2	RI control ASC0	RING ASC0 = 0	RING ASC0 = 1
3	IRDA shutdown control	RX ASC0 ACTIVE	IRDA ACTIVE
4	SHDNn active pull-up	TX ASC0 ASC1 ACTIVE	TX ASC0 ASC1 INACTIVE

8.4. Power on

To power on the board, the user might use 3 different procedures:
- The button PB100
- The keypad push-button marked with ON (KB313)
- Short the connector J302.

The board is usually switched on under control of E-POWERlite. When it receives a logical High on its “ON” pin, it starts a power-on sequence, which includes the settings of supply voltages, reset signal generation, etc.

The button PB100 and KB313 connect the “ON” pin of E-POWERlite to VBAT, J302 achieve the same result by setting to ground the base of a PNP-BJT which emitter is connected to VBAT and collector to the “ON” pin of E-POWERlite.

8.5. Reset

Several causes of reset are possible
- Reset generated by E-POWERlite
- Manual reset by user through push the External Reset button PB101
- Debugger (JTAG connector)
- E-GOLDradio reset (please refer to Infineon datasheet for explanation of this occurrence)

In case the user needs to reset the board, the External Reset button PB101 is recommended.
Last resource is disconnection from the power supply and subsequent power-on.

The reset generated by E-POWERlite is named PMRSTn and is connected to the logical AND of PMRSTn with the EXTRSTn signal, coming from the button PB101 or the JTAG connectors: therefore by using the External Reset button PB101 to generate a logical low (connection to ground) of signal EXTRSTn, a proper reset signal is distributed to E-GOLDradio and memories.

9. References

Title	Doc ID
HW Schematics	BH02.HW.HS.029000

10. Document change report

	Change Reference		Record of changes made to previous released version	
Rev	**Date**	**CR**	**Section**	**Comment**
1.0	16/09/2005	N.A.	Document Created	
1.1	23/09/2005	BH02.PO.CR.000001	See CR	

11. Approval

Revision	Approver(s)	Date	Source/signature
1.0	Massimo Vlacci	16/09/2005	Document Stored on Server
1.1	Massimo Vlacci	23/09/2005	Document Stored on Server