C45 / M50 / MT50

Level 2.5e

Repair Documentation

V 1.0

Table of Contents:

1 List of available level 2,5e parts C45, M50 + MT50

ID-No	Type	Name, Location	Part-No.
D100	IC	Egold+	L36810-G6132-D670
D361	IC	ASIC	L36145-J4682-Y29
D800	IC	Transceiver IC	L36820-L6081-D670
D920	IC	PA_Comperator	L36820-L6084-D670
N386	IC	Volt.Regulator_ZUB	L36820-C6161-D670
N840	IC	Volt.Regulator_RF	L36810-C6065-D670
R959	Resistor	Temp_Resistor	L36120-F4223-H
L366	Diode	Diode_AF	L36840-D3084-D670
V342	Transistor	Tran._Charge	L36830-C1104-D670
V344	Diode	Diode_Charge	L36840-D5061-D670
V442	Transistor	Tran._SW_Vibra	L36830-C1097-D670
V850	Transistor	Tran._VCO_Switch	L36820-C6047-D670
V880	Transistor	Tran._Sw_Diplexer	L36820-C6047-D670
V881	Transistor	Tran._Sw_Diplexer	L36820-C6047-D670
V920	Diode	Feedback_Diode	L36840-D5049-D670
V922	Transistor	Tran._PA_Control	L36840-C4009-D670
V950	Transistor	Tran._26MHz_Ampl.	L36840-C4049-D670
V951	Diode	Capa_Diode	L36840-D61-D670
Z100	Quartz	Quarz/Egold	L36145-F102-Y8
Z850	VCO	1LO_VCO	L36145-G100-Y93
Z851	Filter	Filter_BALUN	L36145-K260-Y31
Z880	IC	Ant_Switch_Diplexer	L36145-K280-Y181
Z890	VCO	Transmitter_VCO	L36145-G100-Y92
Z900	IC	Power_Amplifier	L36851-Z2002-A45
Z950	Quartz	Oszillator_26MHz	L36145-F260-Y16

2 Required Equipment for Level 2,5e

- GSM-Tester (CMU200 or 4400S incl. Options)
- PC-incl. Monitor, Keyboard and Mouse
- Bootadapter 2000/2002 (L36880-N9241-A200)
- Troubleshooting Frame C45 (F30032-P135-A1)
- Power Supply
- Spectrum Analyser
- Active RF-Probe incl. Power Supply
- Oscilloscope incl. Probe
- RF-Connector (N<>SMA(f))
- Power Supply Cables
- Dongle (F30032-P28-A1)
- BGA Soldering equipment

Reference: Equipment recommendation V1.0 (downloadable from the technical support page)

3 Required Software for Level 2,5e C45, M50 AND MT50

- Windows NT Version4
- Winsui version1.22 or higher
- Windows software for GSM-Tester (Cats(Acterna) or CMU-GO(Rohde&Schwarz))
- Software for reference oscillator adjustment
- Internet unblocking solution

4 Radio Part

The radio part of the C45, M50 AND MT50 consists of a Hitachi RF chip-set.

The radio part is designed for Dual Band operation, covering EGSM900 as well as GSM 1800 frequencies, and can be divided into 4 Blocks.

- Power supply for RF-Part
- Transmitter
- Receiver
- Synthesizer,

The RF-Part has it´s own power supply realised by a voltage regulator which is directly connected to the battery. The voltages for the logic part are generated by the Power-Supply ASIC

The transmitter part converts the I/Q base band signals supplied by the logic (EGOLD+) into RF-signals with characteristics as defined in the GSM recommendation (www.etsi.org) After amplification by a power Amplifier the signal is radiated via the internal or external antenna.

The receiver part converts the received GMSK signal supplied by the antenna into IQ base band signals which can then be further processed by the logic (EGOLD+).

The synthesizer generates the required frequencies for the transmitter and Receiver. A 26MHz oscillator is acting as a reference frequency.

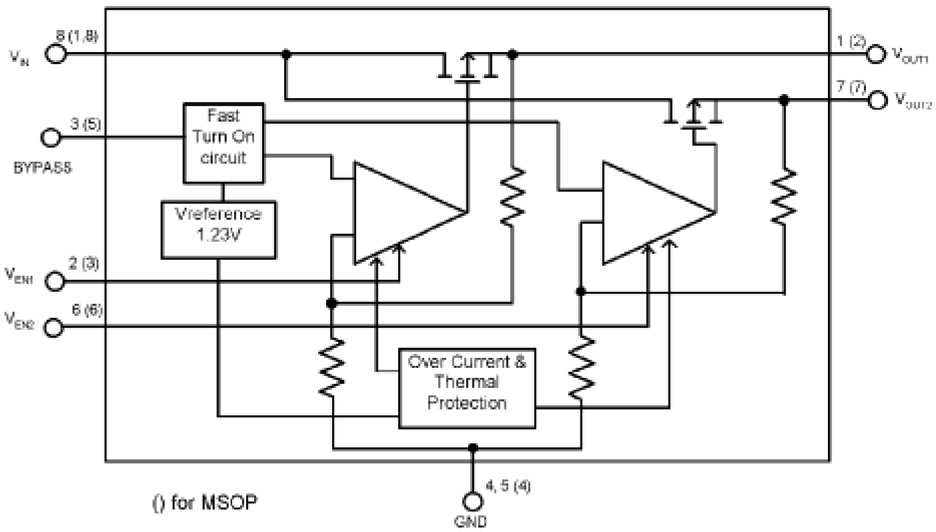
Restrictions:

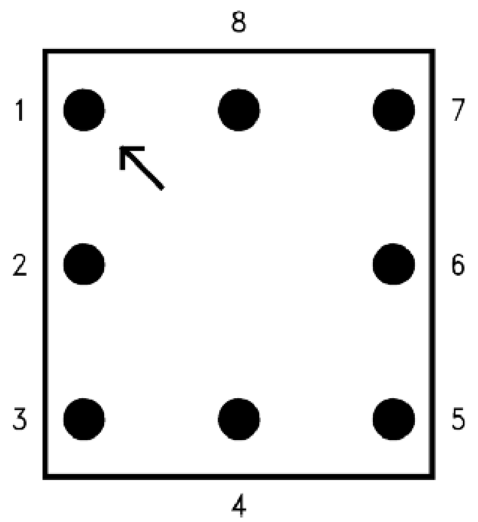
- The mobile phone can never transmit and receive in both bands simultaneously.
- Only the monitor time slot can be selected independently of the frequency band.
- Transmitter and receiver can of course never operated simultaneously.

4.1 Power Supply RF-Part

A directly to Batt+ connected voltage regulator, with a nominal output voltage of 2.8V is used, to perform the required “RF-Voltages” named VCC2_8 and VCC_SYN.
The voltage regulator is activated as well as deactivated via SLEEPQ and VCXOEN provided by the EGOLD+
The temporary deactivation is used to extend the stand by time.

Blockdiagram

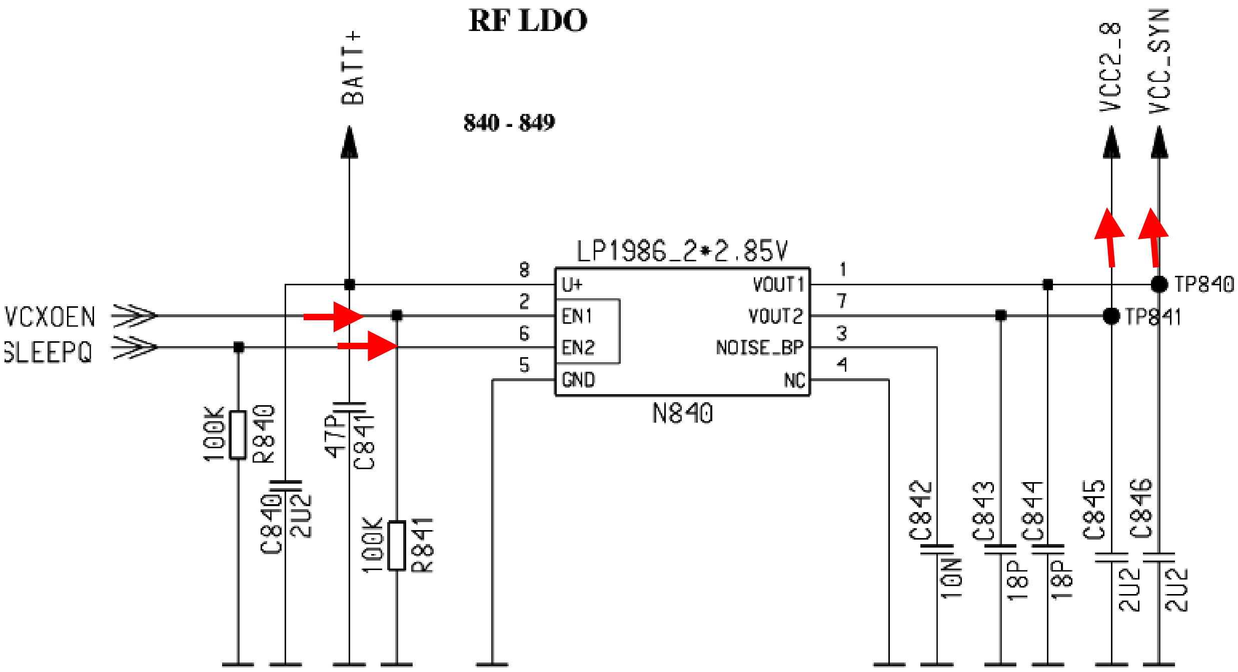




PIN-OUT DS200034-4

Top View

Circuit diagram



Type	Part No.	Signal	Source	Output
Hitachi	N840	Pin 6 SleepQ	EGOLD+ L11	Pin 7 VCC2_8
		Pin 2 VCXOEN	EGOLD+ P7	Pin 1 VCC_SYN

4.2 Frequency generation

4.2.1 Synthesizer: The discrete VCXO (26MHz)

M46 mobile is using a reference frequency of 26MHz for the Hitachi chip set.
The generation of the 26MHz signal is done via a discrete "Colpitts" VCXO .
This oscillator consists mainly of:

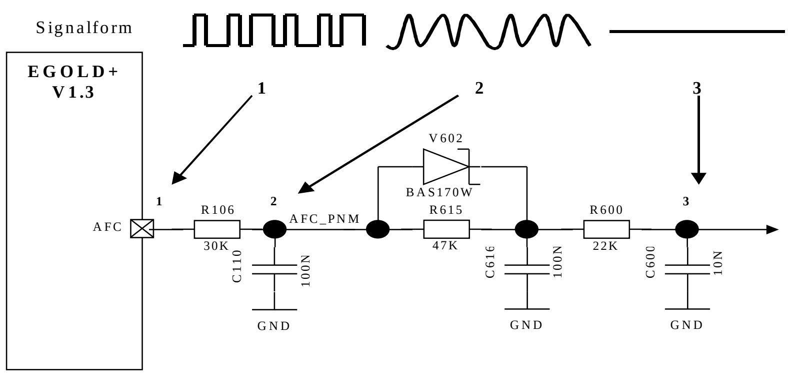
A 26MHz crystal	Z950
An oscillator switch	V950
A capacity diode	V951

TP 951 after dividing by two

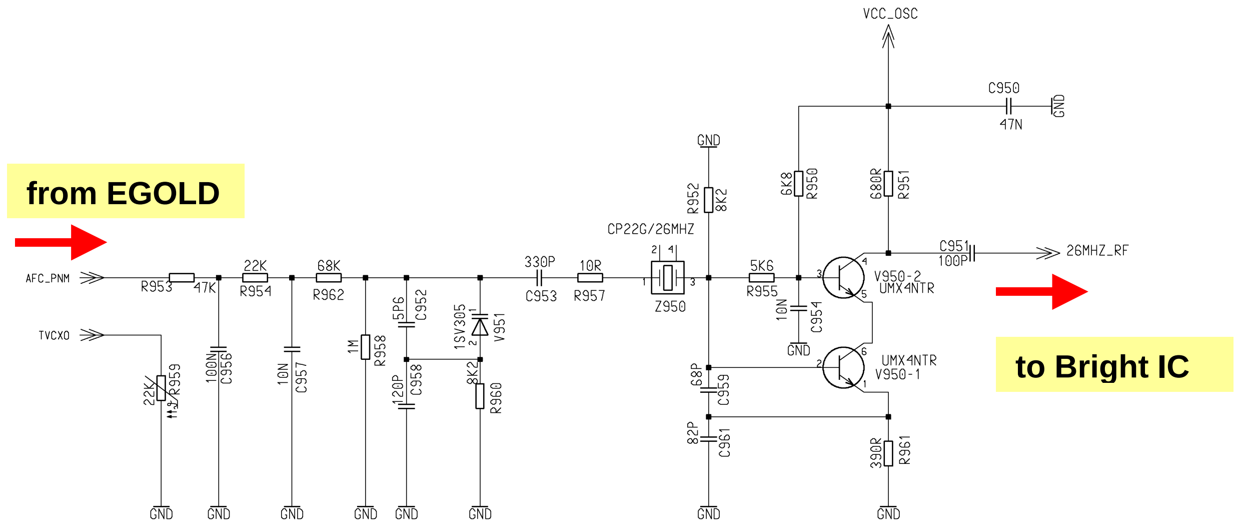
The oscillator output signal is directly connected to the BRIGHT IC (pin 38) to be used as reference frequency inside the Bright and to be divided by 2.
This so gained signal SIN13MHZ_BB is used from the EGOLD+(functional M14).
To compensate frequency drifts (e.g. caused by temperature) the oscillator frequency is controlled by the (AFC_PNM) signal, generated through the internal EGOLD+ (D100 (functional R3)) PLL via the capacity diode V951.
Reference is the base station frequency.
To compensate a temperature caused frequency drift, the temperature-depending resistor R959 is placed near the VCXO to measure the temperature. The measurement result TVCXO is reported to the EGOLD+(baseband L4) via R136 as the signal TENV.

The required voltage VCC_OSC is provided by the N840 (VCC_SYN) through R863 and R861

Waveform of the AFC_PNM signal from EGOLD+ to Oscillator



Circuit diagram



4.2.2 Synthesizer: LO1

The first local oscillator is needed to generate frequencies which enable the transceiver IC to mix an “IF” and to perform the channel selection in the TX part.
To do so, a control voltage for the LO1 is used. Gained by a comparator (located inside the Transceiver -IC).
This control voltage is a result of the comparison of the divided LO1 and a reference Signal. The division ratio of the dividers is programmed by the EGOLD+, according to the network channel requirements.

The first local oscillator (LO1) is part of the PLL which consists of the comparator inside the Bright (D800), a loop filter and the VCO (Z850) module.
This LO1 circuit generates frequencies from:

3610-3760 MHz for GSM900
3700-3840 MHz for GSM1800
(The VCO can be switched via the signal VSW (Pin 3) to generate frequencies for GSM900 and GSM1800)

RX IF = no IF required

TX IF-GSM900 = 45…46MHz
TX IF-GSM1800 = 90…92MHz

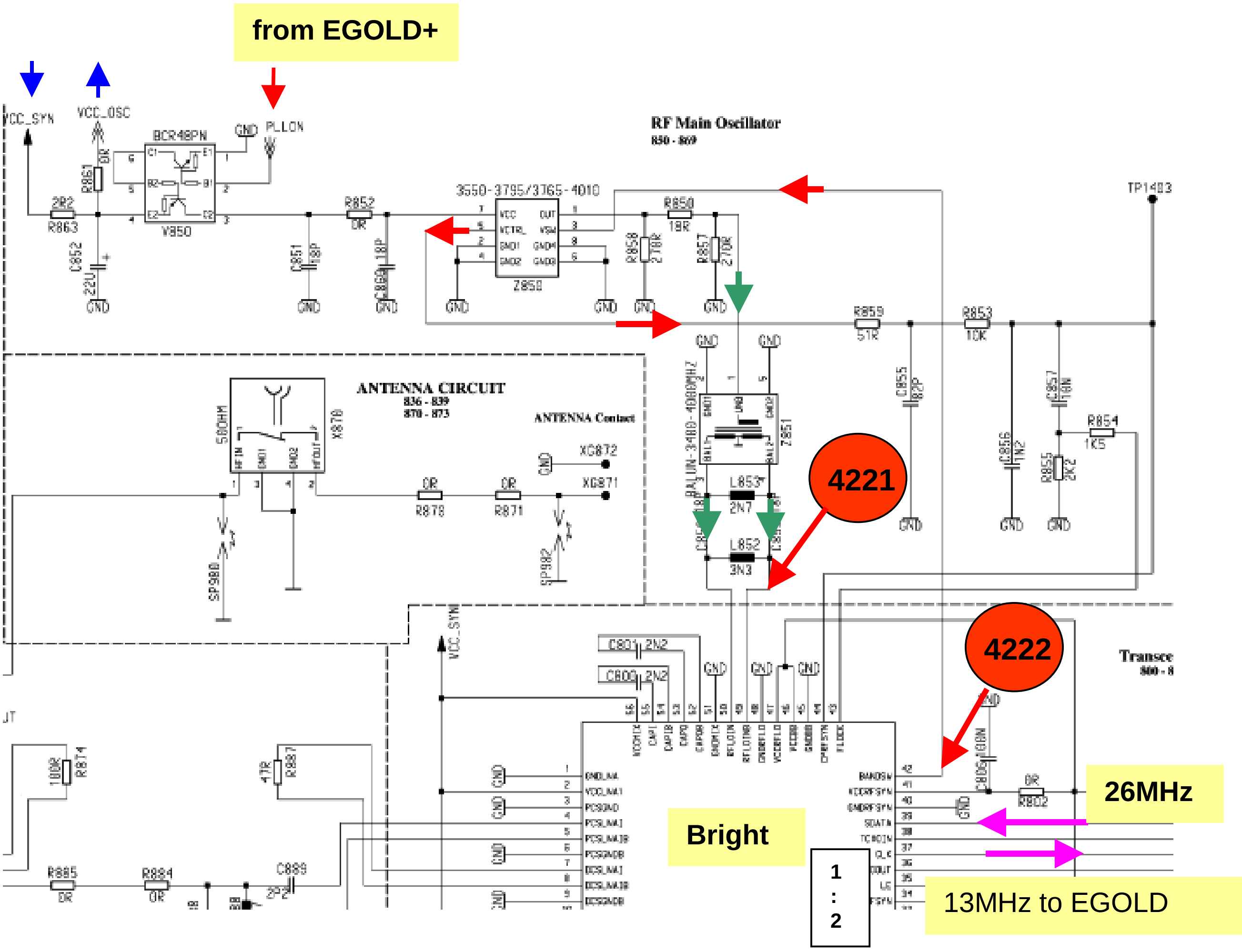
Formula to calculate the frequencies:

1st LO freq. RX EGSM = Ch. * 4
PCN = Ch. * 2

The VCO (Z850) is switched on by the EGOLD+ signal PLLON (TDMA-Timer J12) via V850 and therefore supplied with VCC_SYN. The VCO guarantees by using the control voltage at pin5 a coverage of the GSM900 and GSM1800 band.
The channel programming of the PLL happens via the EGOLD+ signals SYGCCL, SYGCDT, SYNSTR (RF Control K14, K15, M15).

The required voltage VCC_SYN is provided by the N840

Circuit diagram



4.2.3 Synthesizer: LO2

The second local oscillator (LO2) consists of a PLL and a VCO which are integrated in Bright IV and a second order loopfilter which is realized external. Due to the direct conversion receiver architecture, the LO2 is only used for transmit-operation. To avoid inband-spurious in the transmit-signal, the LO2-frequency assignment is not fixed for the whole band.

Before the LO2-signal gets to the modulator it is divided by 8 for GSM900 and by 4 for GSM1800. So the resulting

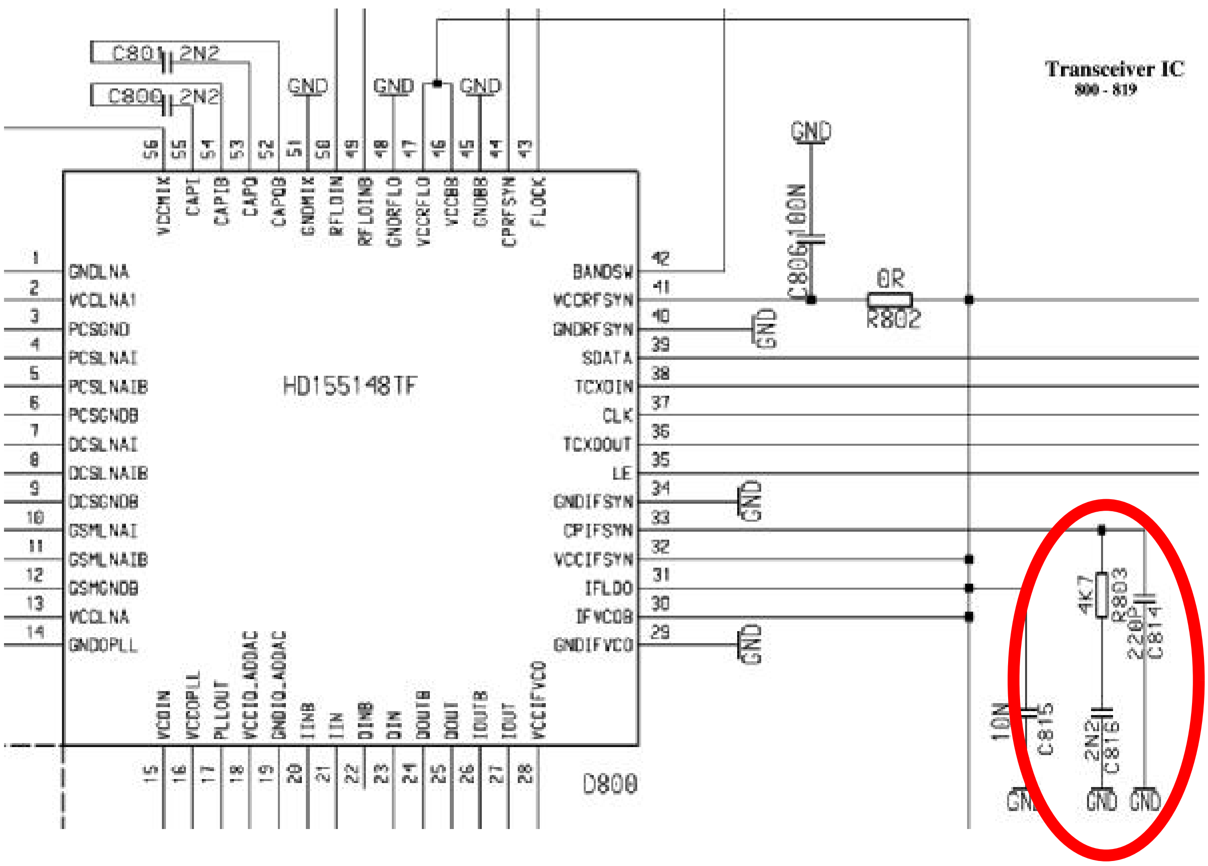
TX-IF frequencies are 45…46 MHz. GSM900
TX-IF frequencies are 90…92 MHz. GSM1800

2nd LO freq. = 360…368 MHz divided by 8 = 45…46 MHz,
divided by 4 = 90…92 MHz

The LO2 PLL and power-up of the VCO is controlled via the tree-wire-bus of Bright IV+.(EGOLD+ signals SYGCCL, SYGCDT, SYNSTR (RF Control K14, K15, M15))

The required voltage VCC_SYN is provided by the N840

Circuit diagram

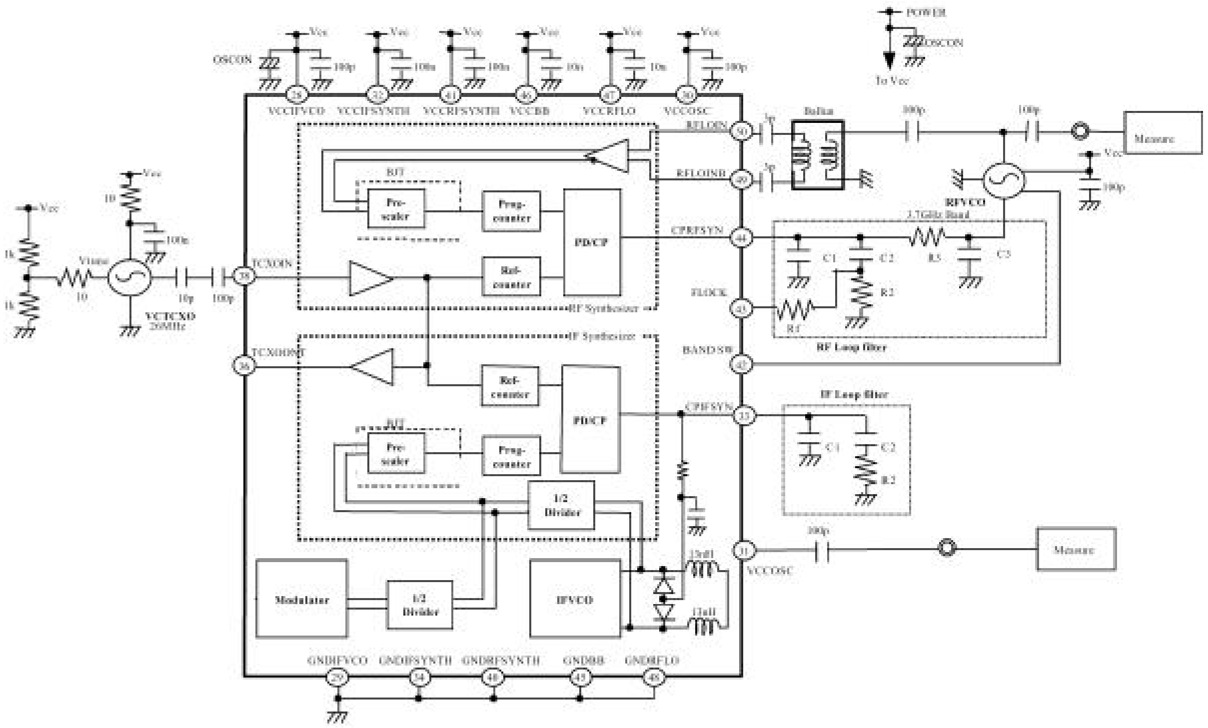


Loop-filter LO2

4.2.4 Synthesizer: PLL

PLL as a part of the BRIGHT IC

Blockdiagram

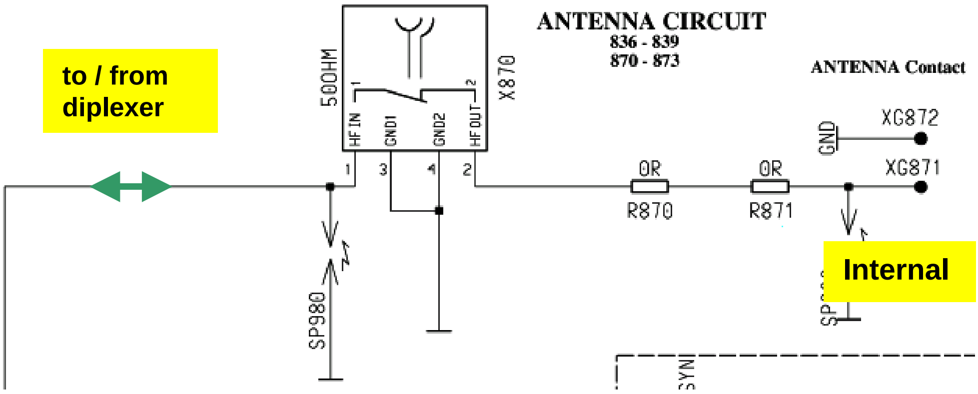


4.3 Antenna switch (electrical/mechanical)

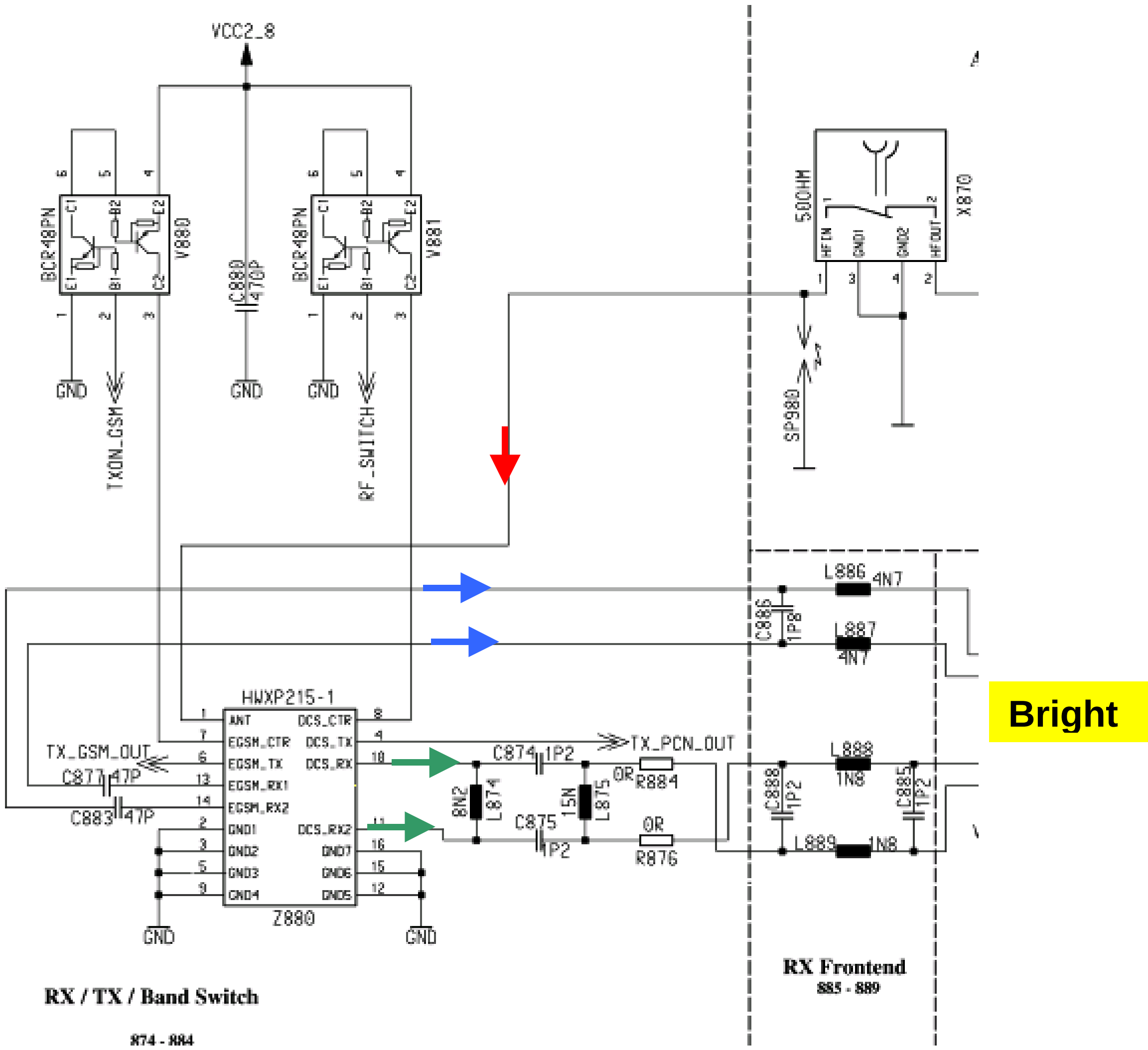
Internal/External <> GSM1900/PCS <> Receiver/Transmitter

The M46 mobile has two antenna switches.

a) The mechanical antenna switch for the differentiation between the internal and external antenna



b) The electrical antenna switch, for the differentiation between the receiving and transmitting signals.
To activate the correct settings of this diplexer, some logical switches and switching signals are required. (V880, V881)



4.4 Receivers

4.4.1 Receiver: GSM900/1800 –Filter to Demodulator

From the antenna switch, up to the demodulator the received signal passes the following blocks to get the demodulated baseband signals for the EGOLD+:

Filter >>>>>>>>	LNA >>>>>>>>	Demodulator>>>>>>>>	PGC
Z880	Bright	Bright	Bright

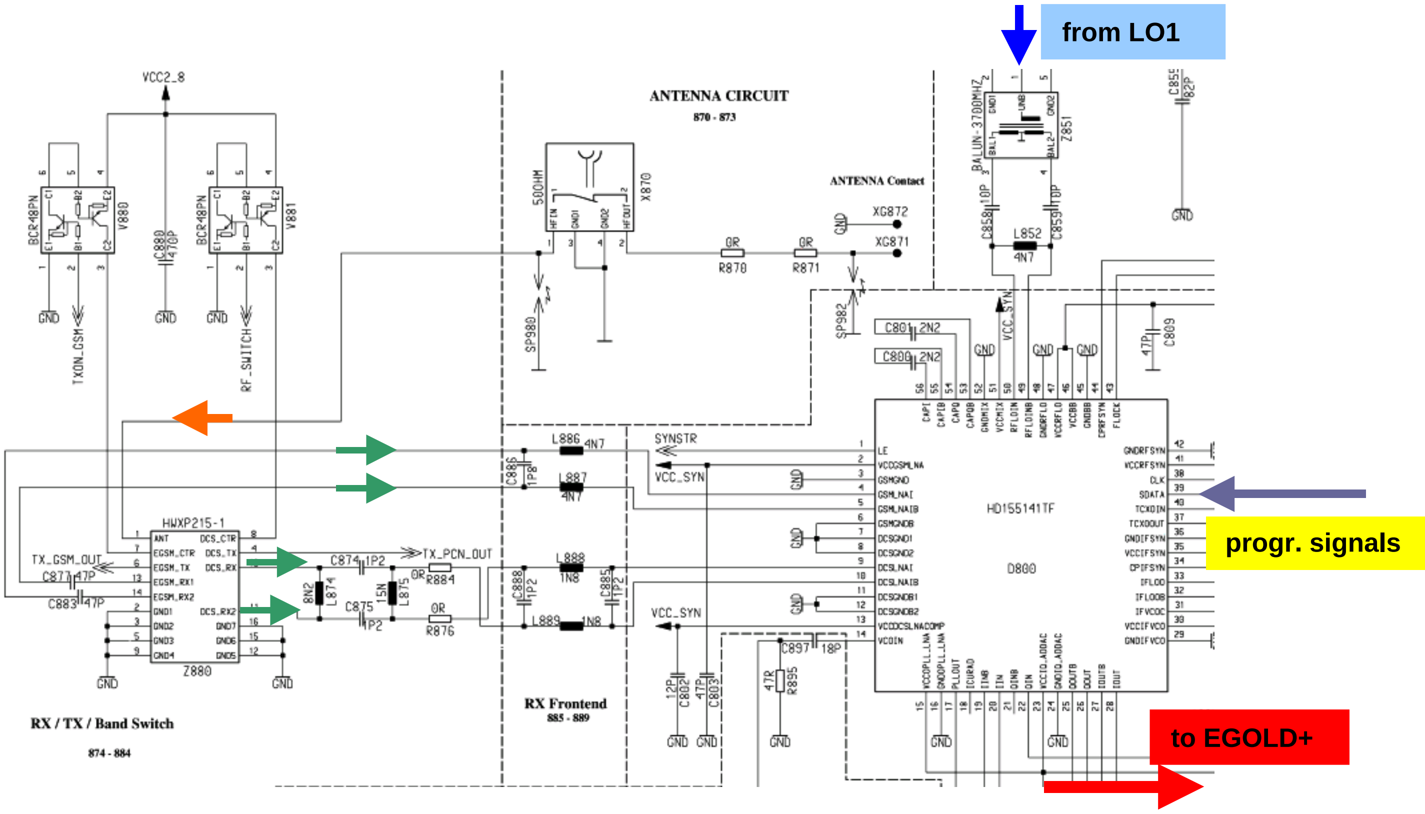
Filter: The GSM900 and GSM 1800 filters are located inside the frontend module. The Filter are centered to a frequency of 942,5MHz for GSM900 and 1847,5MHz for GSM1800. The symmetrical filter output is matched via LC-Combinations to the LNA input of the BRIGHT (D800)

LNA: The LNA´s is located inside the BRIGHT and is able to perform an amplification/attenuation from ~ 20dB. The LNA is can be switched in HIGH and LOW mode and is controlled by the Bright.

Demodulator: The Bright IC performs a direct demodulation of the received GSM1900 Signals. To do so the LO1 is required.
The channel depending frequencies for 1900MHz band are divided by´2 for internally.

PGC: After demodulation the "I" and "Q" signals are amplified by the internal PGC-Amplifier whereby the "I" and the "Q" path are amplified independently From each other. The performance of this PGC is 80dB (-22 up to 58dB), switchable in steps of 2dB. The control is realised through the EGOLD+ signals (SYGCCL, SYGCDT, SYNSTR).
After passing an internal switch, the signals are ready for further processing through EGOLD+

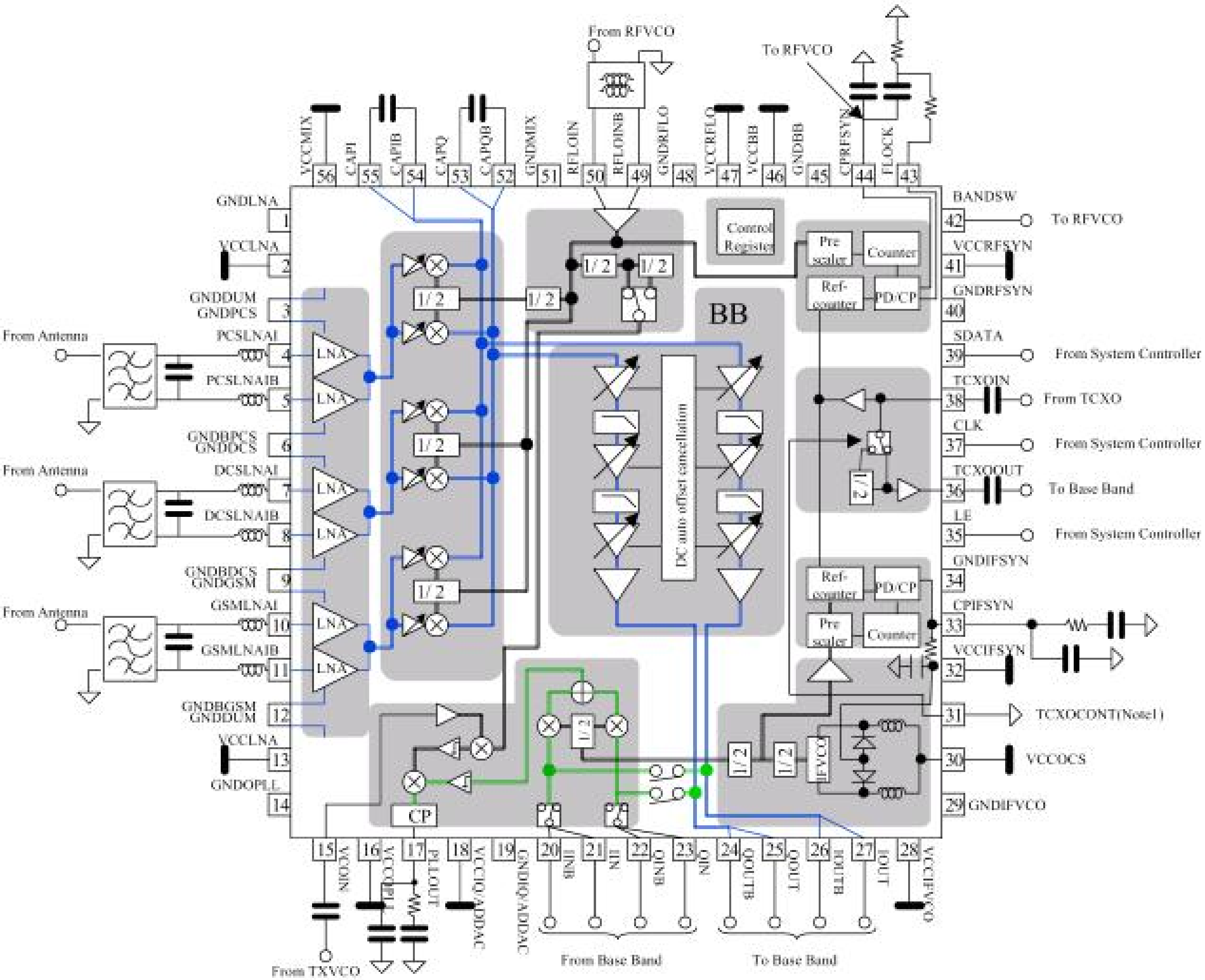
The required voltage VCC_SYN is provided by the N840


from LO1
progr. signals
to EGOLD+
ANTENNA CIRCUIT
870 - 873
ANTENNA Contact
RX Frontend
885 - 889
RX / TX / Band Switch
874 - 884
HD155141TF
D800
HWXP215-1
Z880
BALUN-3700MHZ
Z851
X870
VCC2_8
V880
V881
BCR48PN
TXON_GSM
RF_SWITCH
TX_GSM_OUT
TX_PCN_OUT
SYNSTR
VCC_SYN
XG871
XG872
SP980
SP982
GND

4.4.2 IC Overview

IC Overview

BRIGHT IV

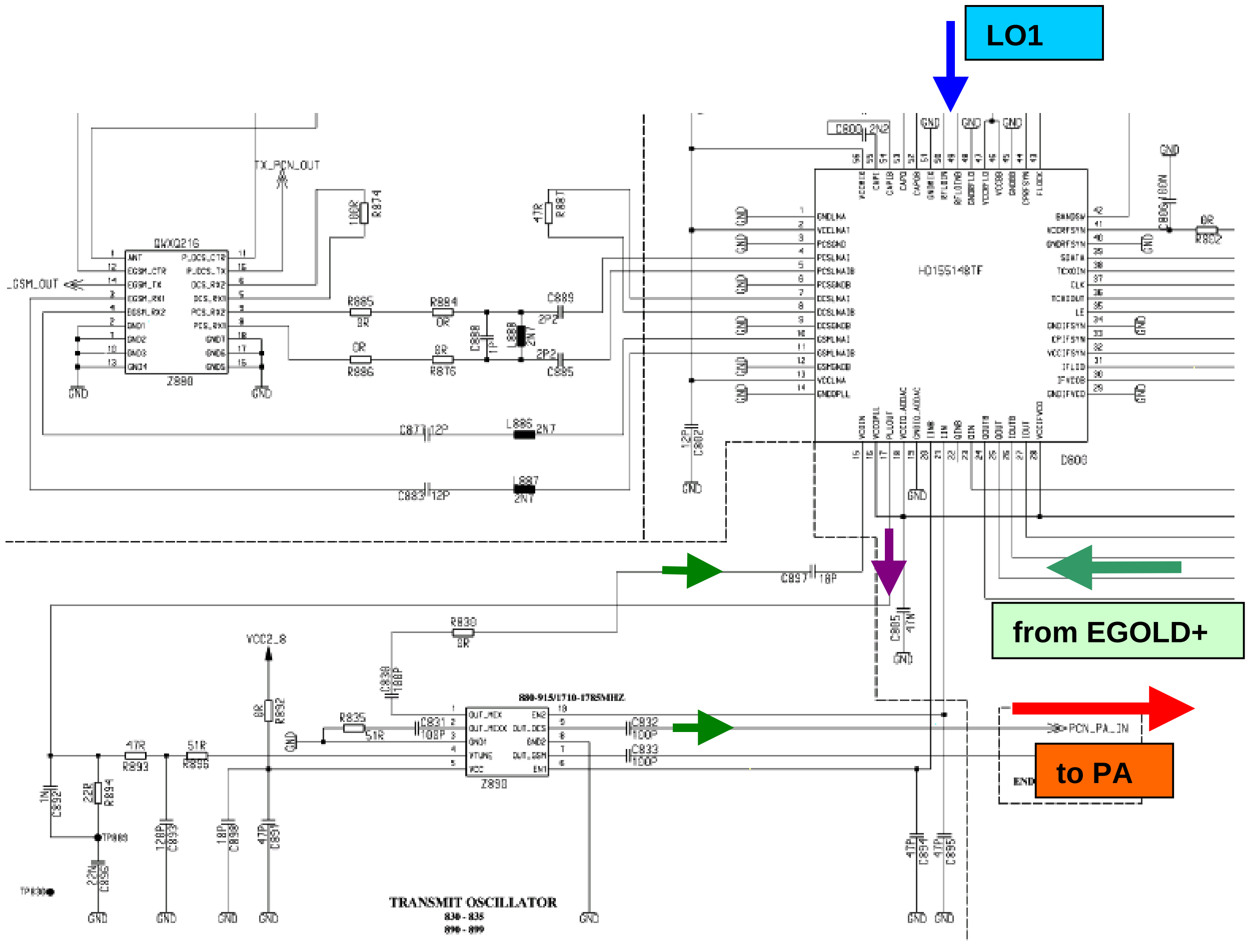


4.5 Transmitter

4.5.1 Transmitter: Modulator and Up-conversion Loop

The modulation is also based on the principle of the
“up-conversion modulation phase locked loop” and is accomplished via the BRIGHT IC(D800). The internal TX IF-LO provides the quadratic modulator with the TX IF frequencies (79…81 MHz) by generating 632…648 MHz frequencies, which are divided by 8.
This so generated IF GMSK RF signal is compared in a phase detector with the down mixed GMSK RF output from the TX-VCO (Z890).
To get the comparison signal PCN_PA_IN signal appearing at Pin 10 of the (Z890) is mixed with the LO1 signal (divided by 2).
The output (PLLOUT) signal of the phase detector passes a discrete loop filter realised by capacitors and resistors to set the TXVCO to required frequency.
The large loop band width (~1,5MHz) guarantees that the regulating process is considerably quicker than the changes in the modulation signal.

The required voltage VCC_SYN and VCC2_8 is provided by the N840

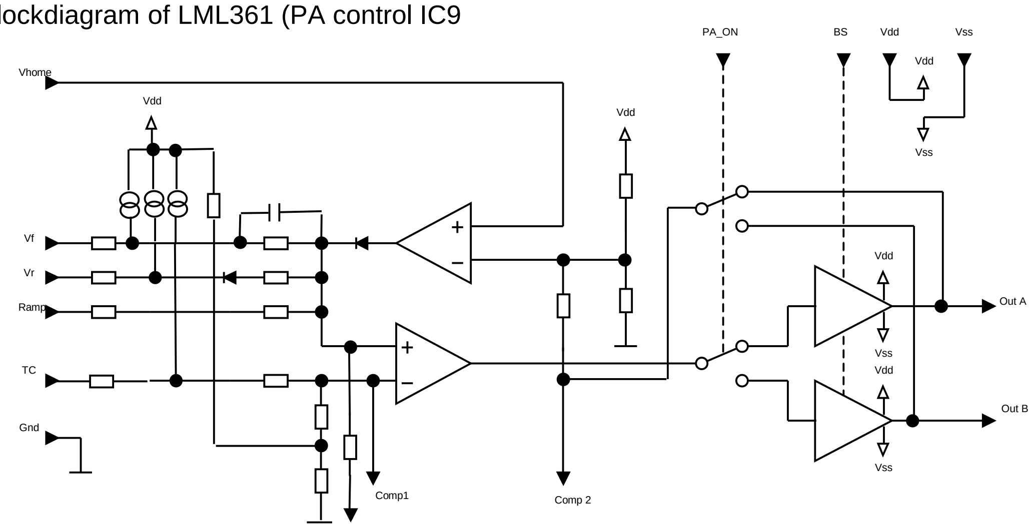


4.5.2 Transmitter: Power Amplifier

The output signal (PCN_PA_IN) from the TX-VCO are led to the power amplifier (Z900) passing a matching circuit. The PA is a "two in one" PA (GSM part not used) and, is connected directly to Batt+.
After amplification, a part of the output signal (TX_PCN_OUT) is decoupled via a directional coupler. The other part runs through the antenna switch (Z880) and the antenna connector (X870) to the Antenna. The decoupled part is equalised by the detector diode (V920) and used from the (N920) to get a PA control voltage by comparing this voltage with the PA_RAMP signal provided from the EGOLD+ (GAIM/BASEBAND H2).
The (N920) is activated through the signal TXONPA and TXON1.

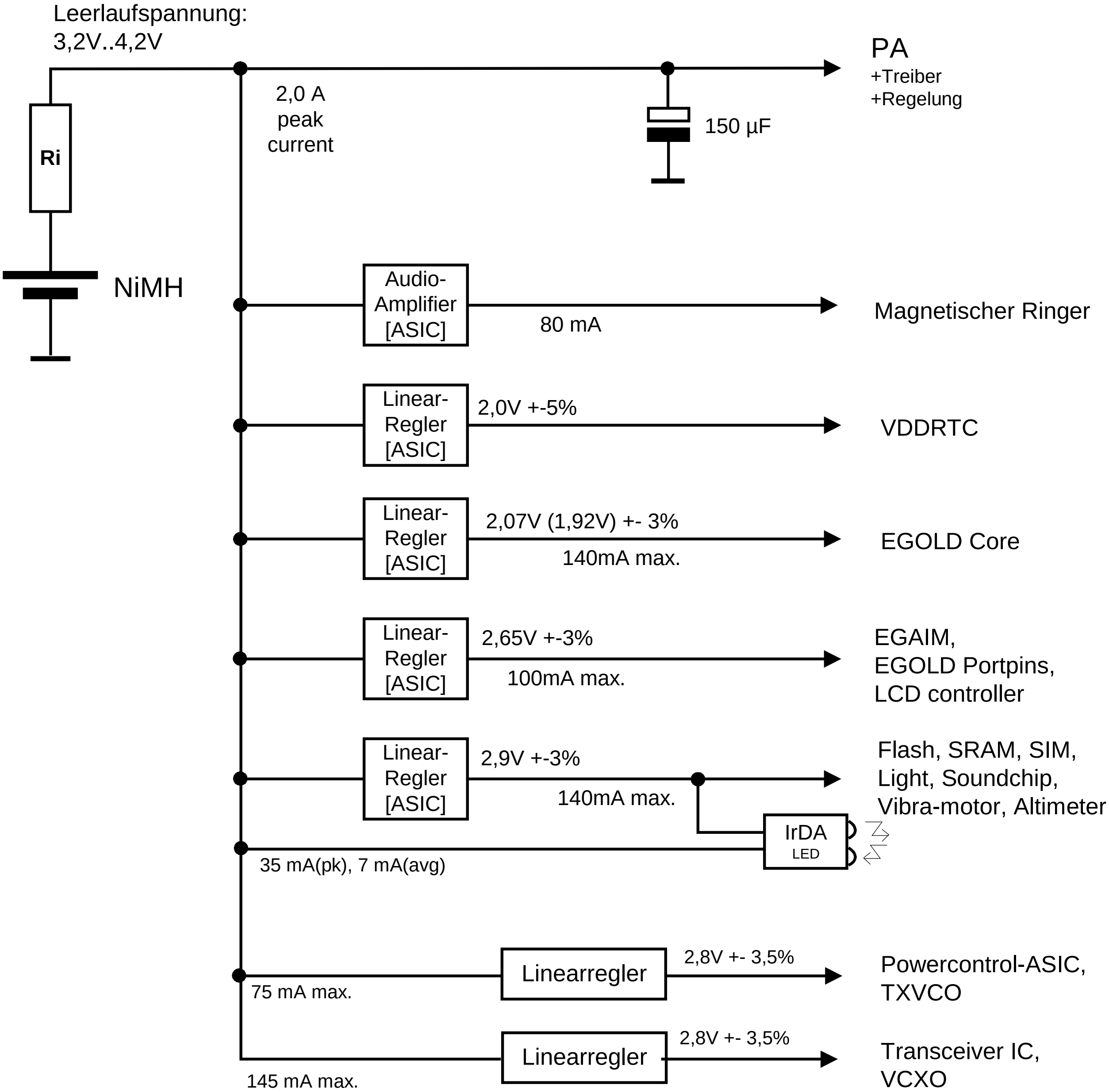
The required voltage BATT+ is provided by the battery.
The required voltage VCC2_8 is provided by N840.

Blockdiagram of LML361 (PA control IC9



5 Power Supply

5.1 Overview and Voltages



Overview of HW Structure

All power supply functions of the mobile phone, except the RF-Part, are carried out by the power supply ASIC (D361)

General:
The pin POWER of the I/O-Connector is used for charging the battery.
For accessories, which provide a variable charging current, the current will be set via a pin SB (current byte) (e.g. S25 chargers corresponding to Car Kits etc.).

- The S45/ME45 power supply is unregulated and cannot be controlled by the SB signal.
- The SB signal is used to distinguish between various chargers.

The following restrictions must be considered:

- The phone cannot be operated without battery.
- The phone will be damaged if the battery is inserted the wrong way
- In the charging branch a fuse element is inserted against over current.

5.2 Power Supply ASIC

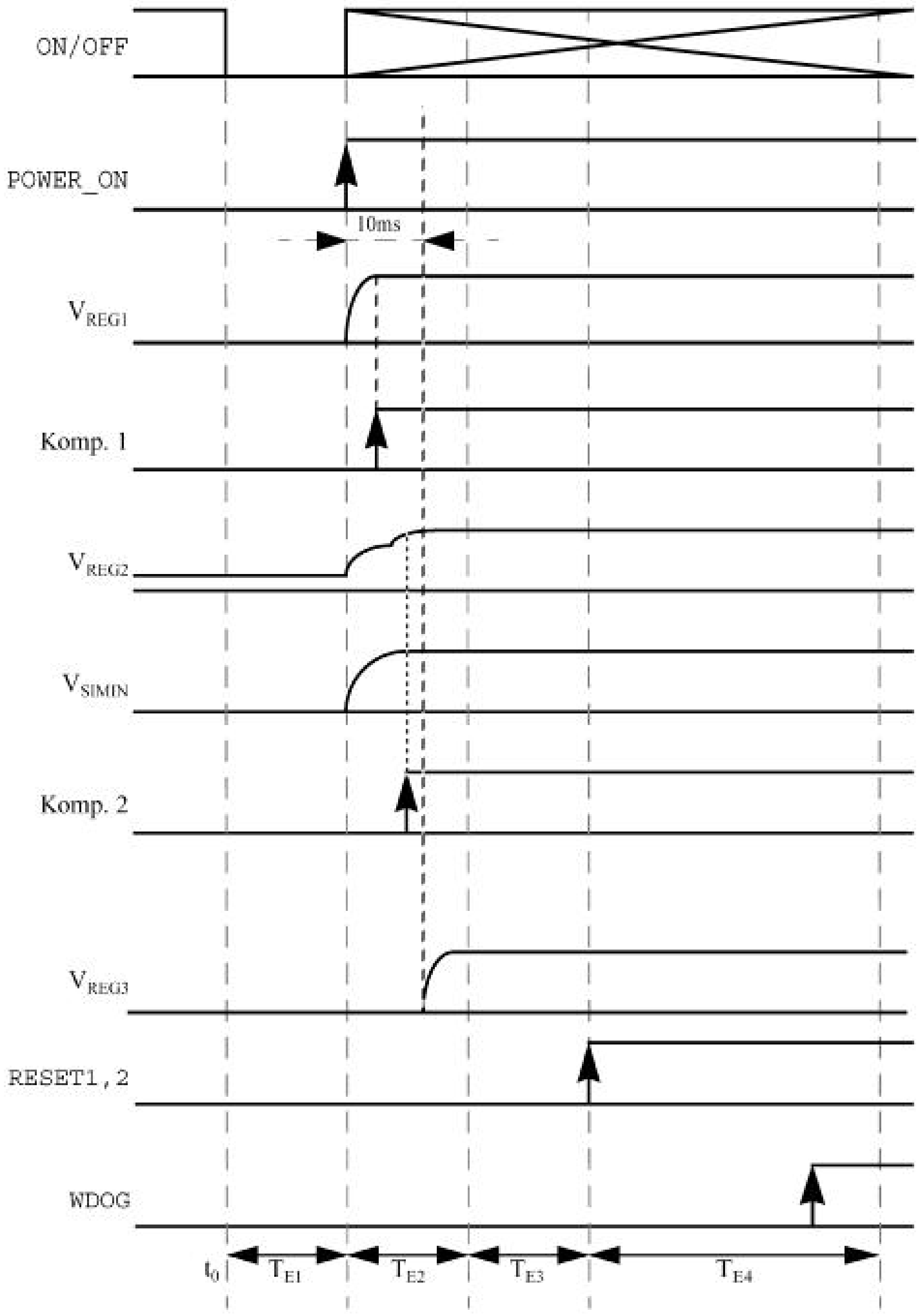
The power supply ASIC (D361) contains the following functions:

- Control of “Switch On” of the mobile phone via the ON/OFF switch.
- Recognition of external chargers connected on POWER.
- Control of “Switch On” of the mobile phone via the ON/OFF1 (RTC)
- Watchdog monitoring
- Control of mobile phone “SWITCH OFF” via WATCHDOG_µP connection.
- “Switch off “of mobile phone in the case of overvoltage at battery connection.
- Generation of RESET signal for EGOLD+ and Flash
- Voltage generation via “Linear regulator 2.90 V “
- Voltage generation via “Linear regulator 2.65 V “
- Voltage generation via “Linear regulator 2.07 V “
- Battery charge support: interrupted if there is an over-temperature
- Software-controlled switching of voltage supply for the accessories
- Light switching
- Voltage generation for “SIM-CARD”
- VIBRA switching
- Ringer tone switching
- Audio switching

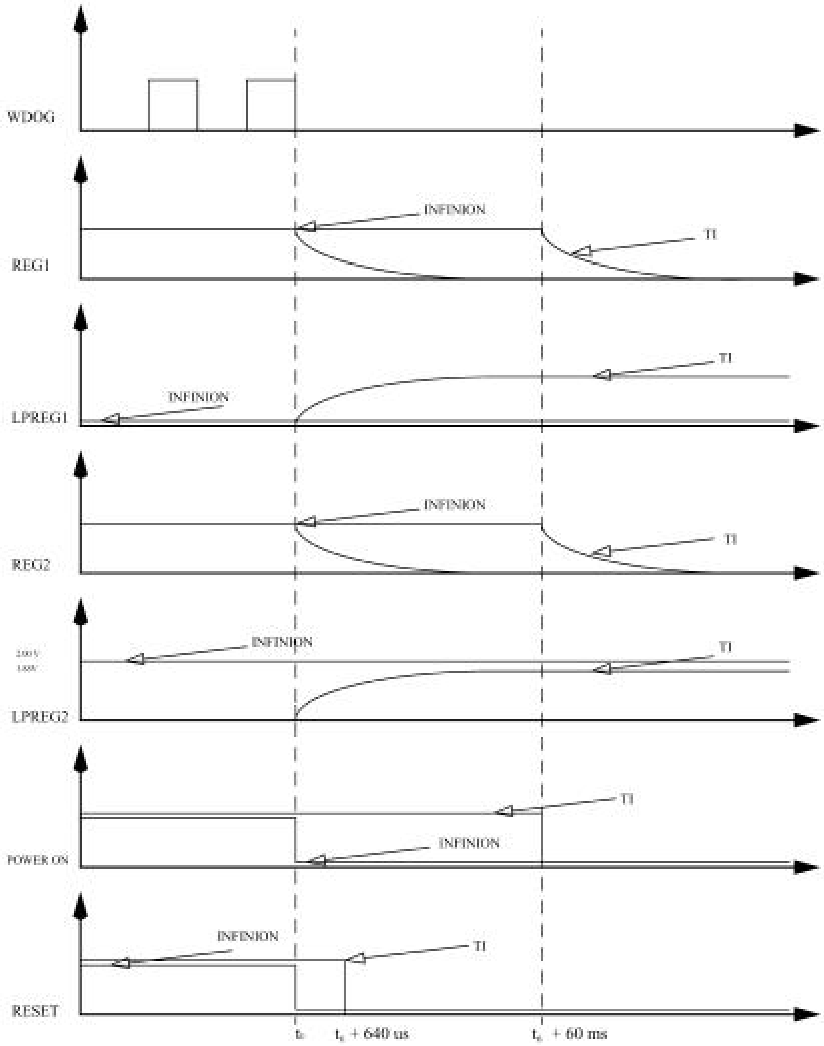
Switch “ON” sequence

- Falling edge recognition KB7, or RTC_INT
- Generation of the “2,07; 2,65; 2,9” voltages
- Generation of the “RESET_2,0V and RESET_2,65V”
- 32,768 KHz oscillator
- Generation of the “Watch Dog” signal through the EGOLD+ after “POWER_ON”
- 26MHz oscillator

"Switch-On" timing



“Switch-Off” timing



“PIN-OUT” ASIC D361

8	7	6	5	4	3	2	1	
vlpreg2	light_ disable	vbatlp	mref	vdd_ charge	charge	lightout (double bond)	vddref (double bond)	A
avdd	sense_in	vspgsout	ref_osc	vbat	vibraout (double bond)	power_o n	vss_sw (double bond)	B
vsimout	sleepn	vsimctrl	avss	avss	avss	vrefdex	vreg1	C
vreg2	audi_a1	ringin	avss	avss	avss	avss	vbat1	D
vbat2	audi_b1	avss	avss	avss	avss	audi_a2	vbat3 (double bond)	E
audi_c1	chargeup	avss	on_off2	on_off	resetn2	audi_b2	vreg3 (double bond)	F
resetn	fuse	i2c_clk	i2c_data	i2c_int	outport	watch-dogup	audi_c2	G
gndaudi o1	audio1	vddaudi o1	vddau-dio	vddaudi o2	audio2	gndaudi o2	cxen2	H

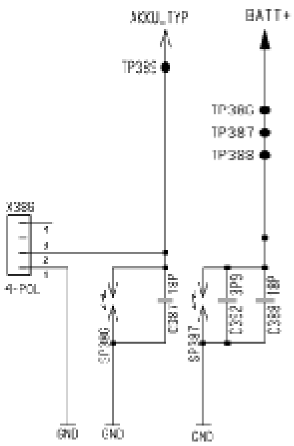
bottom view

5.3 Battery and Charging

5.3.1 Battery

A Li-Ion battery with a nominal capacity of 840mAh is used for the S/ME45 series and a NiMH battery with a nominal capacity of 550mAh for the C45. M50 and MT50 are delivered out with a Li-Ion battery of 650 mAh. A temperature sensor (22kΩ at 25°C) is integrated to monitor the battery temperature.

Battery connector:



5.3.2 Charging Concept

The battery is charged in the unit itself. The hardware and software is designed for Li-Ion or NiMH with 4.2V technology.
The battery will be charged as long as the GAIM part of the EGOLD+ measures changes in the values of the battery voltages during the charging process.
There are two ways to charge the battery:
Normal charging also called “fast charging”
Trickle charging

Normal Charging
As soon as the phone is connected to an external charger, charging starts. The customer can see this via the “Charge” symbol in the display
Charging is enabled via a FET-Switch (V342) in the phone. This FET-Switch activates the circuit form the external charger to the battery. The EGOLD+ takes over the steering of this switch depending on the charge level of the battery, whereby a disable function in the ASIC (D361) hardware can override/interrupt the charging in the case of overvoltage of the battery (only in case of NEC batteries).
The charging software is able to charge the battery with an input current within the range of 350-600mA. If the FET-Switch is switched off, no charging current will flow into the battery (exception is trickle charging, see below).
For controlling the charging process it is necessary to measure the ambient (phone) temperature and the battery voltage.

For temperature detection, a NTC resistor (22kΩ at 25°) is assembled in the battery pack. Via the pin 2 of the battery connector connected to the EGOLD+ (GAIM L3) is carrying out the measurement.

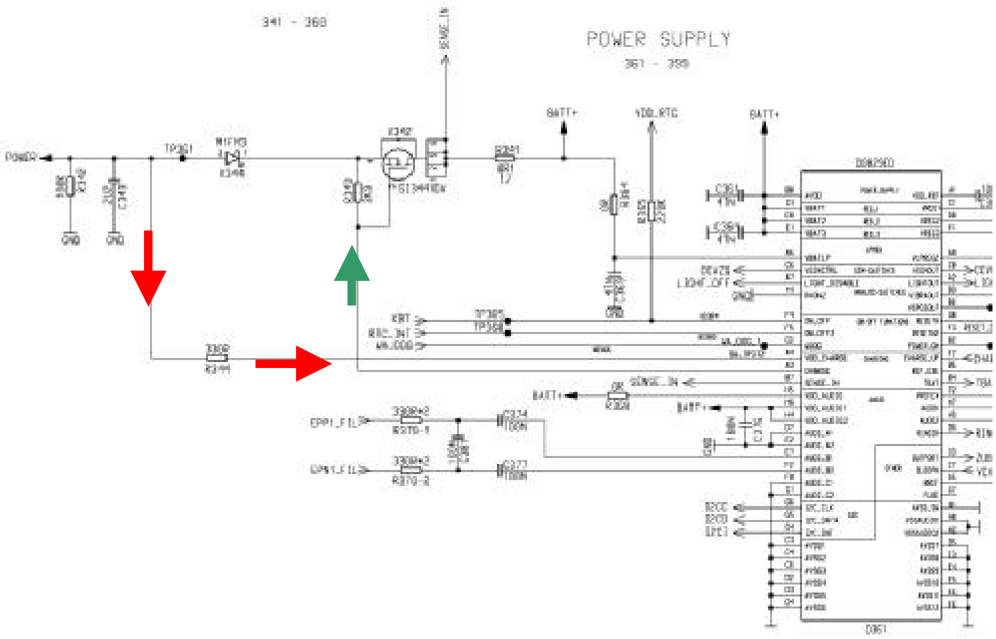
The voltage is measured from the GAIM-part of the EGOLD+ (see description In chapter 7)

Trickle charge

If the phone has not been used for a longish time (longer than approx. 1 month), the battery could be totally self-discharged. (battery voltage less then 3,2V), so that it is not possible to charge the battery via the normal charging circuit. In this case only trickle charge is possible.
The STV-ASIC (D361) controls the charging circuit himself.

- Battery voltage below 2,8 Volt charging current 20mA.
- Battery voltage below 3,2 Volt charging current 50mA.
- Battery voltage over 3,2 Volt “Normal charging”.

Power supply for the ASIC (D361) in this mode is the external charger. (VDD_CHARGE)
The switch into normal charging mode, is done automatically if the required voltage is reached.



→ Trickle Charging Power Supply

→ “Normal/Trickle” charging activation

!! Attention!!

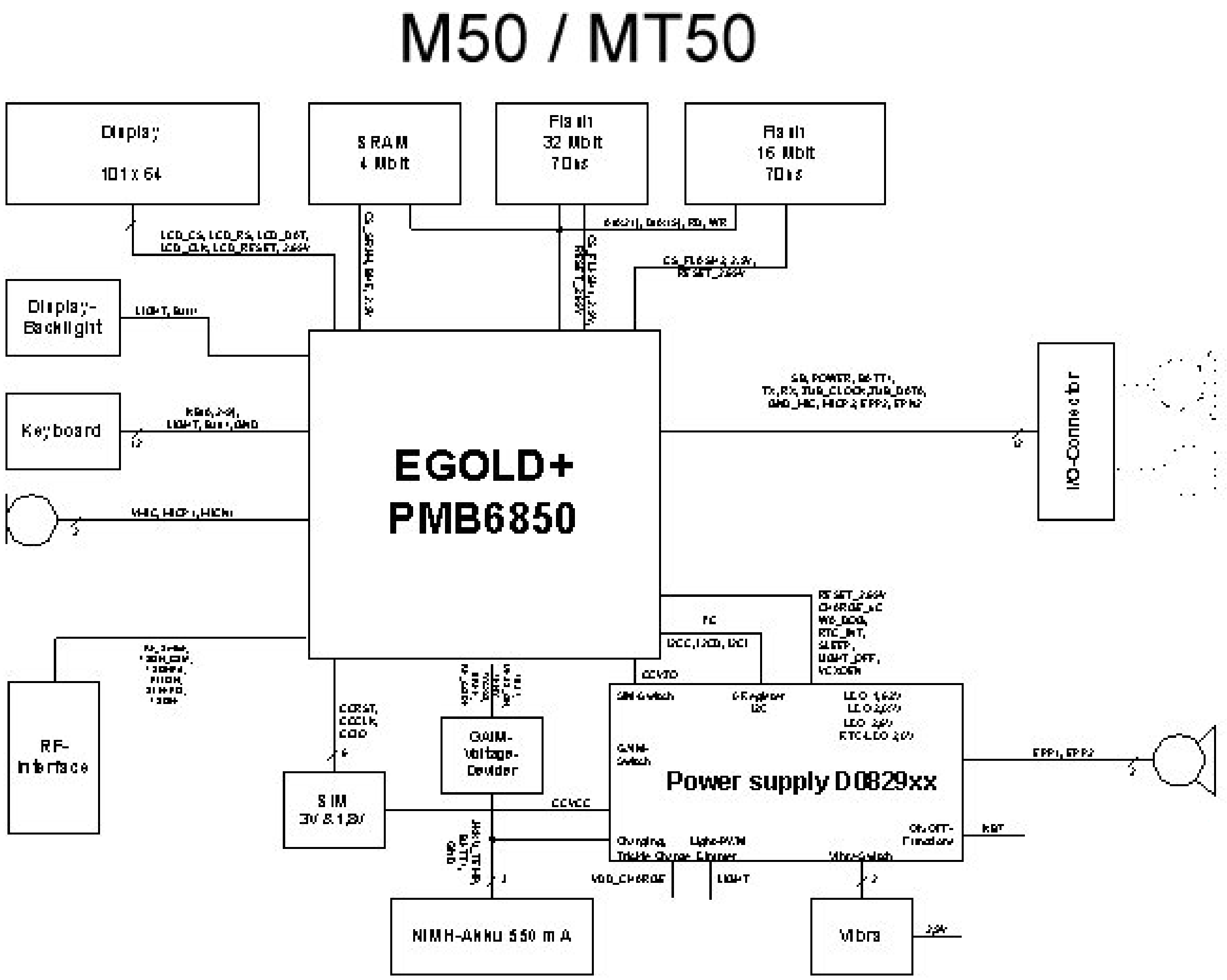
- a charger voltage >15V can destroy resistors or capacitors in the charging path
- a charger voltage >20V can destroy the MOS-FET switch transistor in the charging path.

6 Logic Part

6.1 Overview Logic/control

Overview to the HW structure

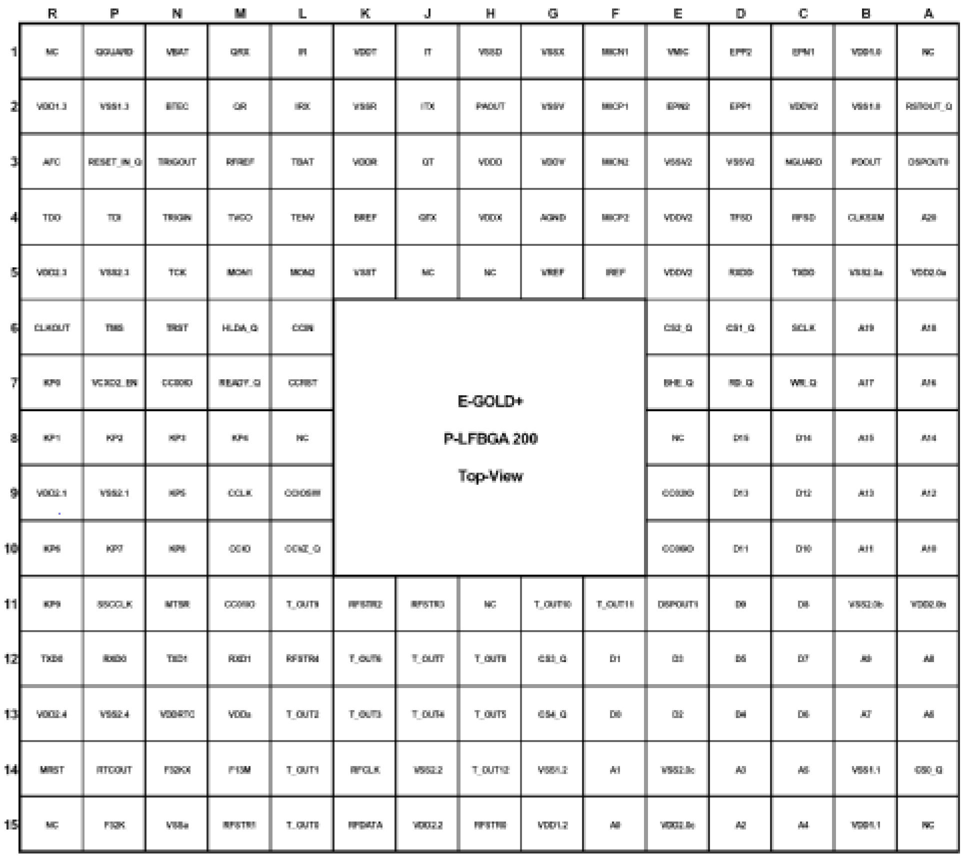
The hardware in the M50 / MT50 can be split up into two function groups:
At first there is the baseband chipset with its periphery comprising the EGOLD+, Flash and power supply ASIC. This function group is basis for all equipment variants.



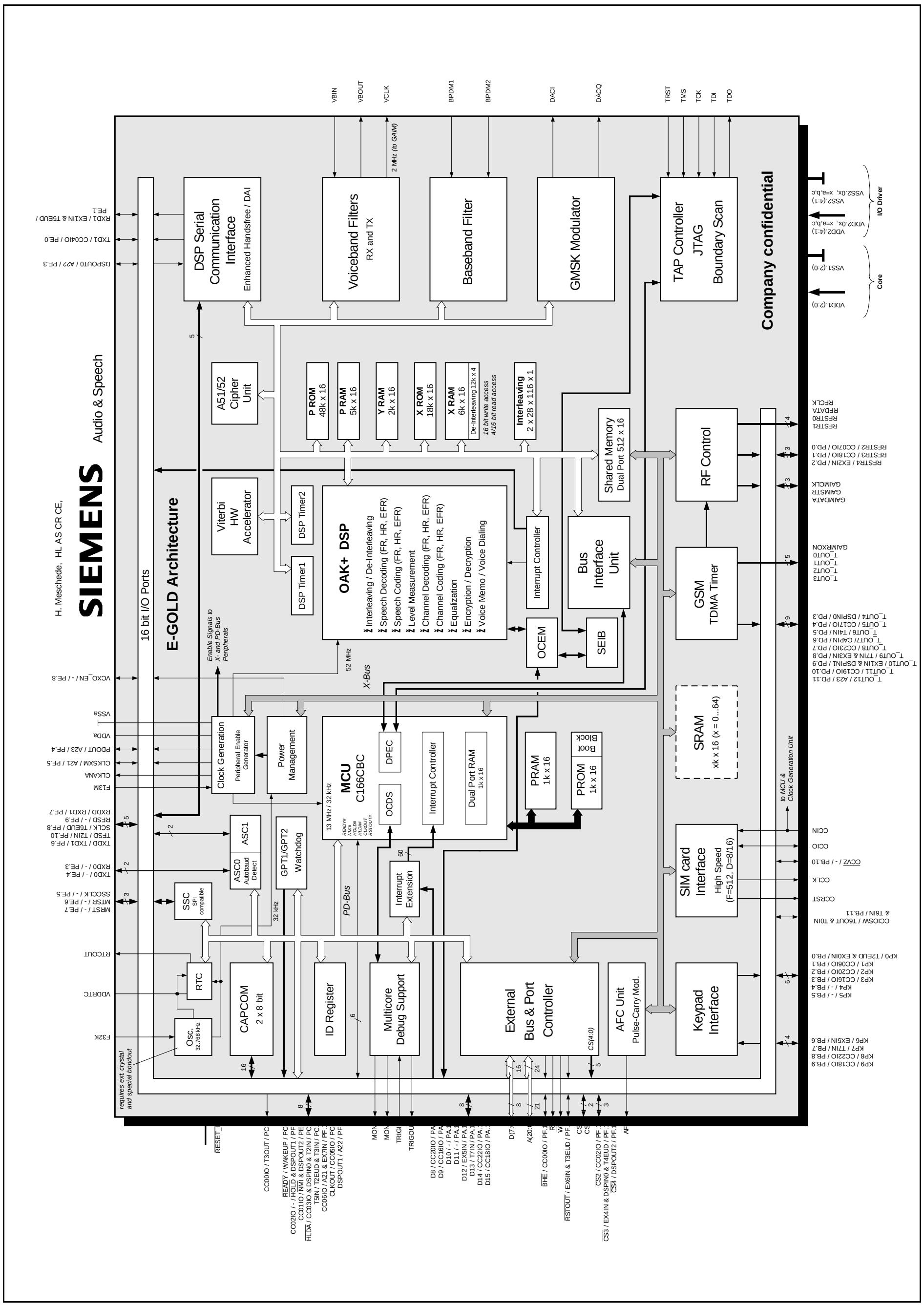
The logic part of the M50 consists of:

The EGOLD+

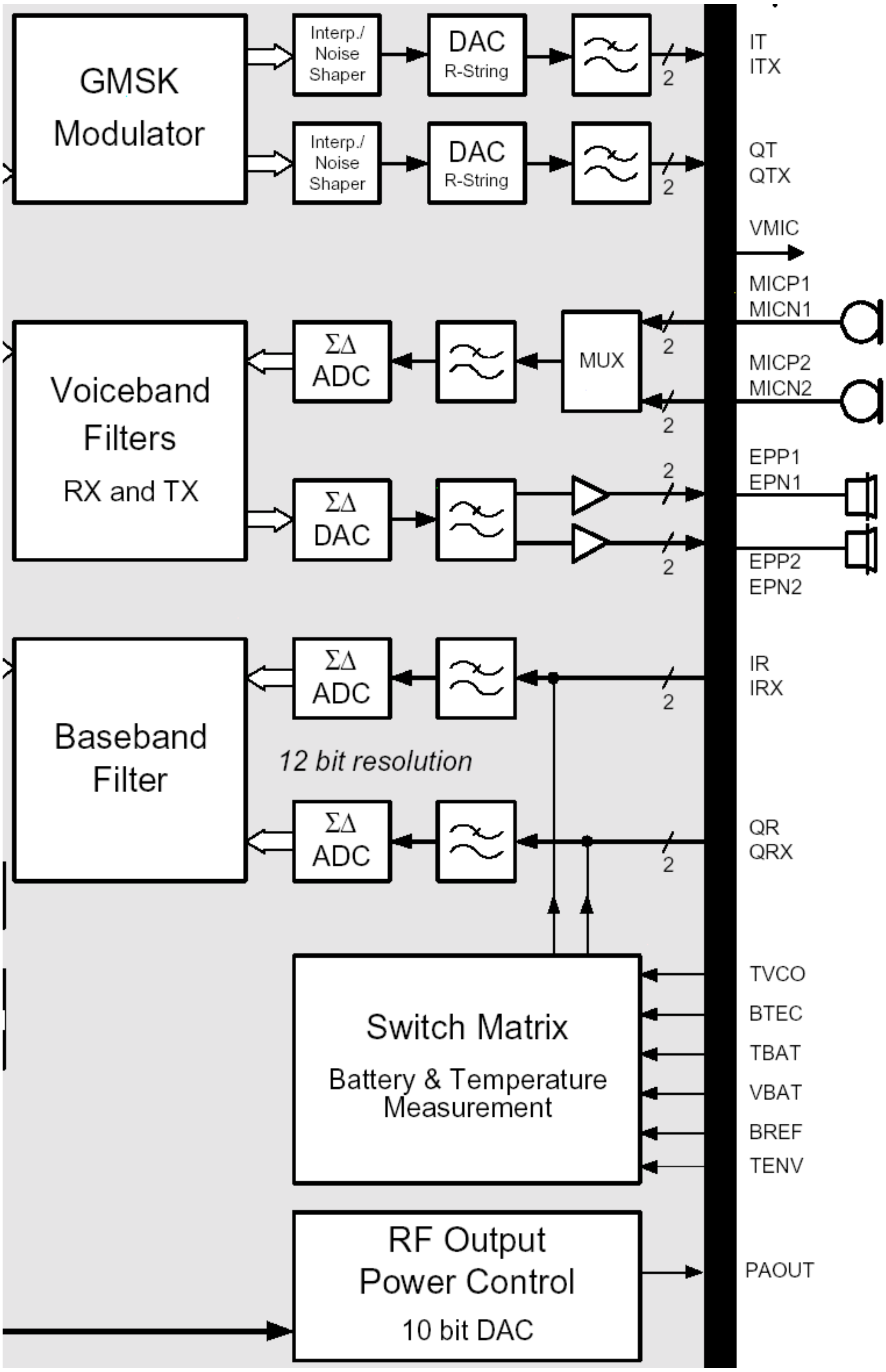
Hardware µC-part
Software µC-part
Software SP (Signal Processor) part Equaliser
EGAIM inside the EGOLD+
RTC (Real Time Clock)



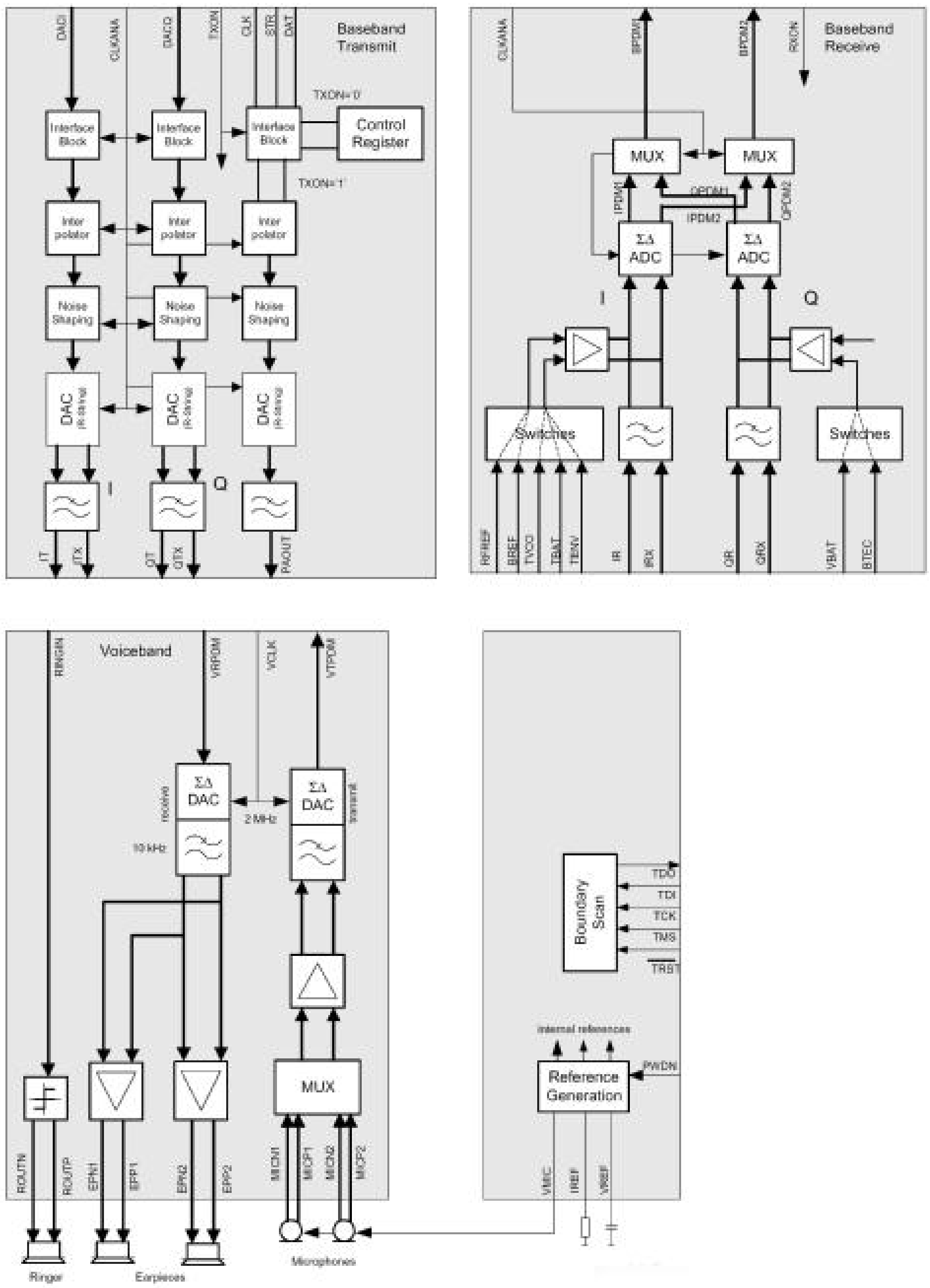
6.2 EGOLD (PMB6850) V2.x



6.3 EGAIM inside the EGOLD+



EGAIM inside the EGOLD+

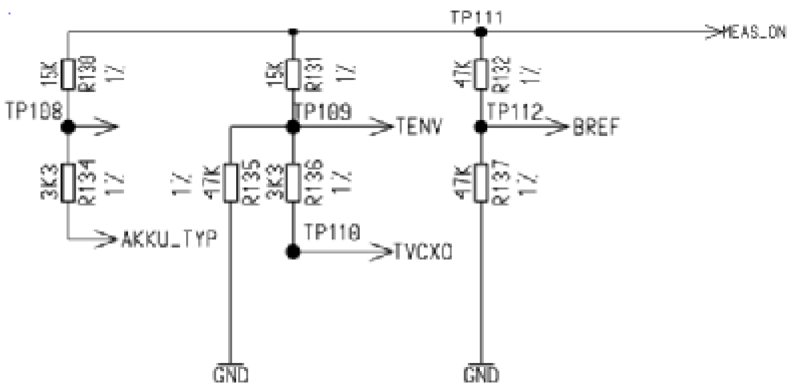


6.3.1 Tasks of the EGAIM inside the EGOLD+

- Measurement of Battery and Ambient temperature
- Measurement of Battery Voltage
- A/D conversion of MIC-Path signals incl. coding
- D/A conversion of EP-Path signals incl. decoding
- Generating of the PA-Control Signal “PA_Ramp”

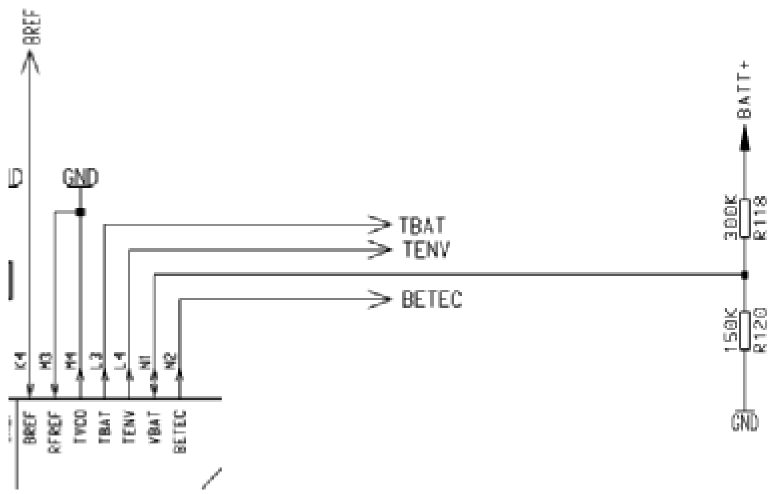
Measurement of Battery and Ambient Temperature

The temperature is measured as a voltage equivalent of the temperature on the voltage dividers R131,R136,R135 for the ambient temperature by the EGAIM. The battery temperature is measured directly at (I3) of the EGOLD+. For this, the integrated ΣΔ converter of the EGAIM of the RX-I base band branch is used. This ΣΔ converter compares the voltage of TBAT and TENV internally with a reference voltage BREF.
Via an analog multiplexer, either the RX-I base band signal, or the TBAT signal and the TENV signal can be switched to the input of the converter.
The signal MEAS_ON from the EGOLD+(GSM TDMA-TIMER G11) activates the measurement and is used to generate to BREF by the help of R137,R132



Measurement of the Battery Voltage

The measurement of the battery voltage is done in the Q-branch of the EGAIM. for this BATT+ is connected via a voltage divider R118, R120 to the EGOLD+ (GAIM N2) (Input limitation 1.33V to 5.91V) .An analog multiplexer does the switching between the baseband signal processing and the voltage measurement.



A/D conversion of MIC-Path signals incl. coding

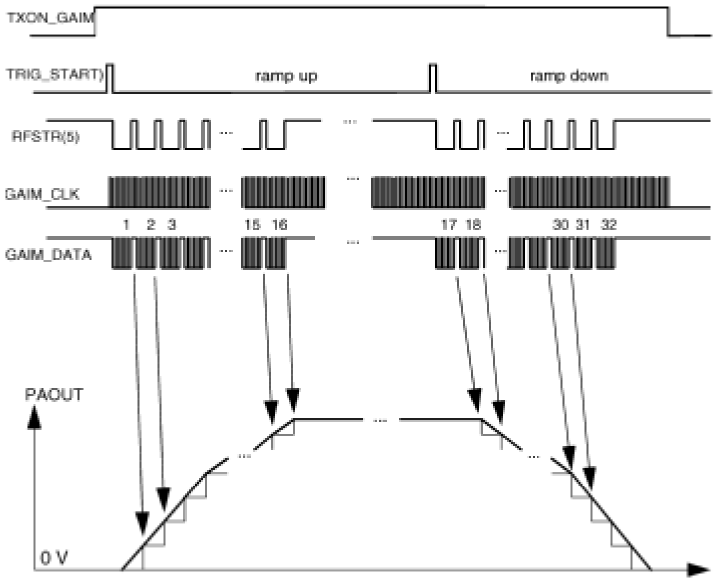
The Microphone signals (MICN2, MIpN2, MICP1, MICN1) arrive at the voiceband part of the EGAIM. For further operations the signals will be converted into digital information, filtered, coded and finally formed into the GMSK-Signal by the internal GMSK-Modulator.
This so generated signals (MOD_A, MOD_AX, MOD_B, MOD_BX) are given to the SMARI IC / Bright IC in the transmitter path.

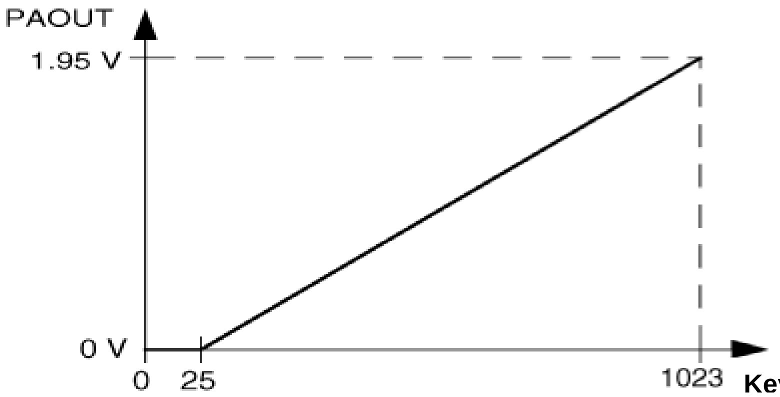
D/A conversion of EP-Path signals incl. decoding

Arriving at the Baseband-Part the demodulated signals (MOD_A, MOD_AX, MOD_B, MOD_BX) will be filtered and A/D converted. In the voiceband part after decoding (with help of the uC part) and filtering the signals will be D/A converted amplified and given as (EPP1, EPN1, EPP2, EPN2) to the internal earpiece or the external loudspeaker.

Generation of the PA Control Signal (PA_RAMP)

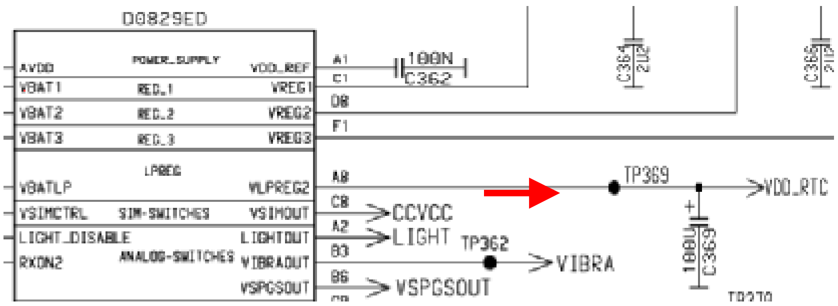
The RF output power amplifier needs an analog ramp up/down control voltage. For this the system interface on EGOLD+ generates 10 bit digital values which have to be transferred serially to the power ramping path. After loading into an 10 bit latch the control value will be converted into the corresponding analog voltage with a maximum of ~2V

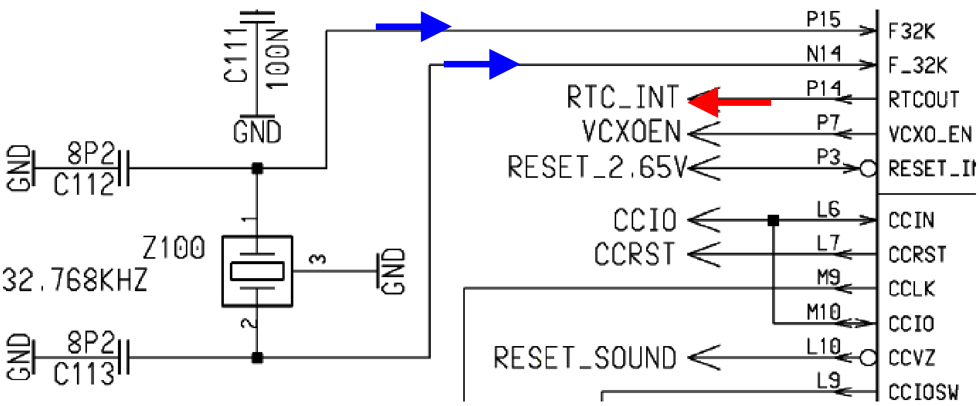




6.4 Real Time Clock (integrated in the EGOLD+)

The real time clock is powered via its own voltage regulator inside the ASIC (D361) directly from the battery. The so gained voltage VDD_RTC is buffered by a capacitor (C369) to keep the data (e.g. clock) in the internal RAM during a battery change for at least 30 seconds.
An alarm function is also integrated which allows to switch the phone on and off. via RTC_INT
The reference oscillator for the RTC is (Z100)

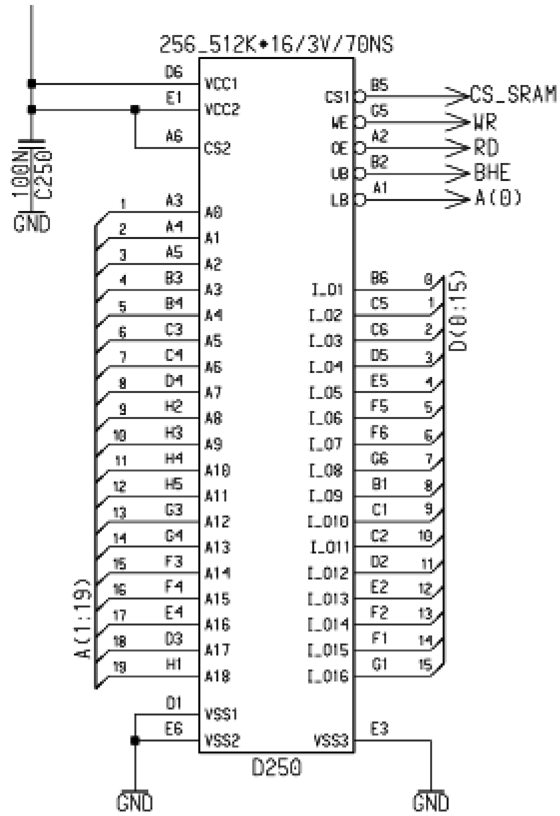




6.5 SRAM

Memory for volatile data.
Memory Size: 4Mbit
Data Bus: 16Bit
Access Time: 70ns

The SRAM (D250) is provided with 2.07V from the ASIC (D361) . It is used from the EGOLD+ to store temporally data.
The communication is controlled and activated from the EGOLD+.

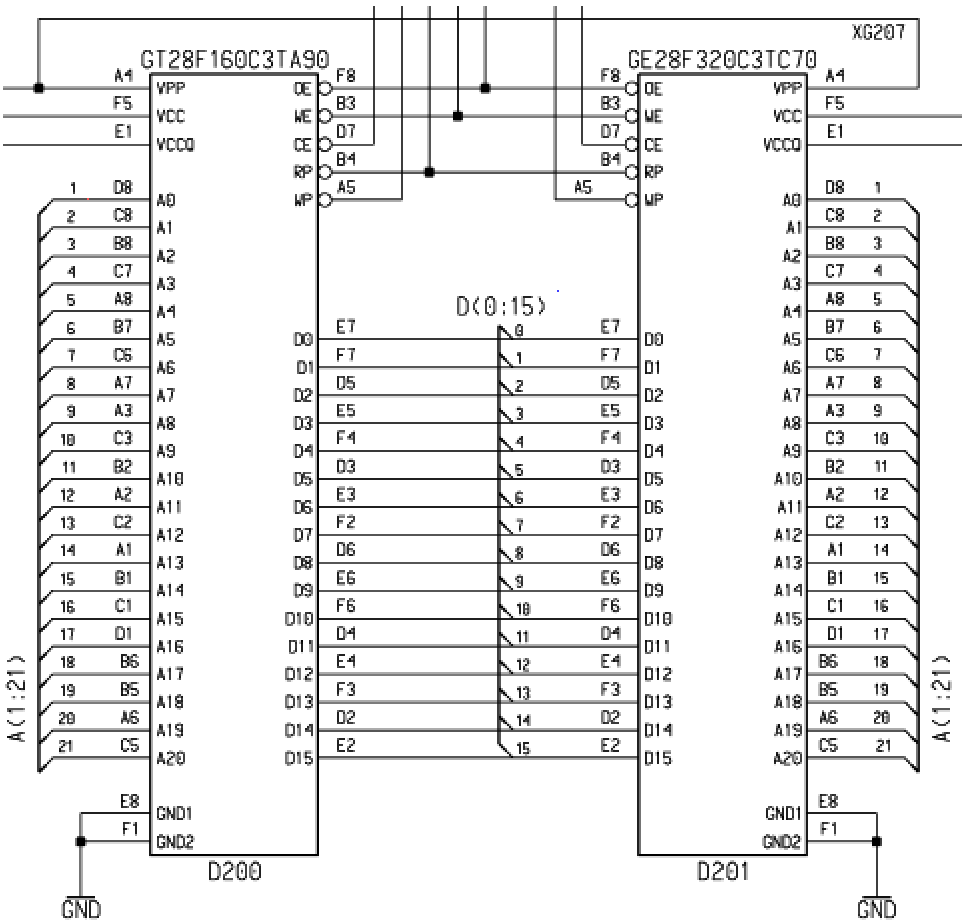


6.6 FLASH

Non-volatile but erasable and re-programmable (software update) program memory (Flash) for the EGOLD and for saving user data (menu settings), linguistic data (voice memo) and mobile phone matching data.
There is a serial number on the flash which cannot be forged.

Memory Size: 48 Mbit (32 Mbit + 16 Mbit)

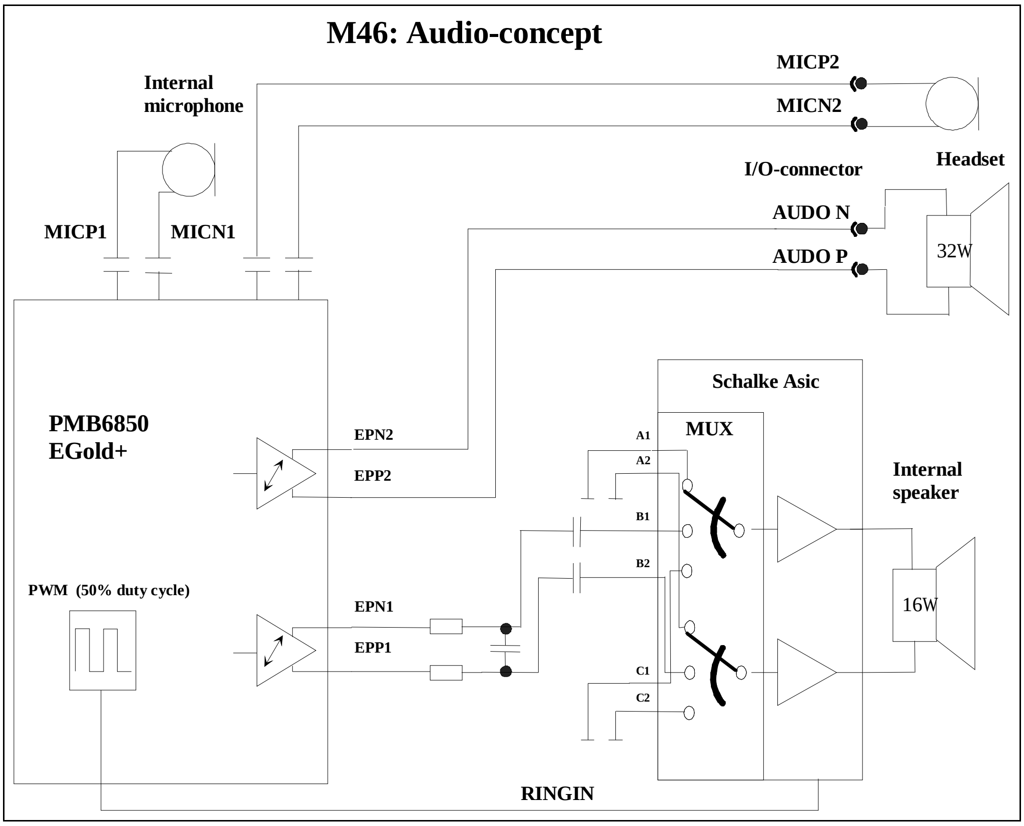
Data Bus: 16 Bit
Access Time: 70ns (32 Mbit)
90ns (16Mbit)
Boot Block: Top



7 Acoustics

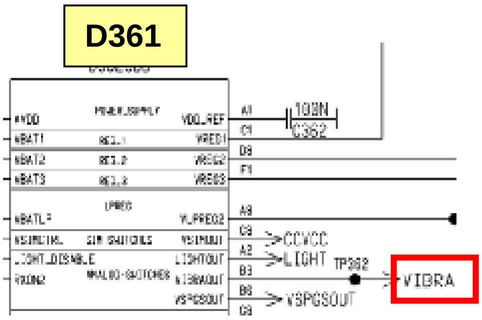
7.1 General

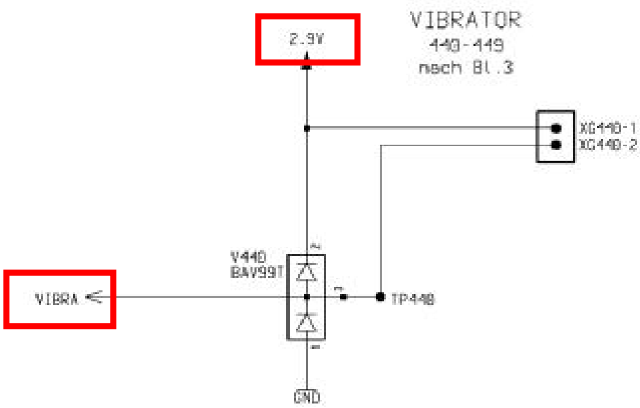
The Electro-Acoustic components are:
a) The Vibra
b) The Microphone
c) The Loudspeaker/Ringer

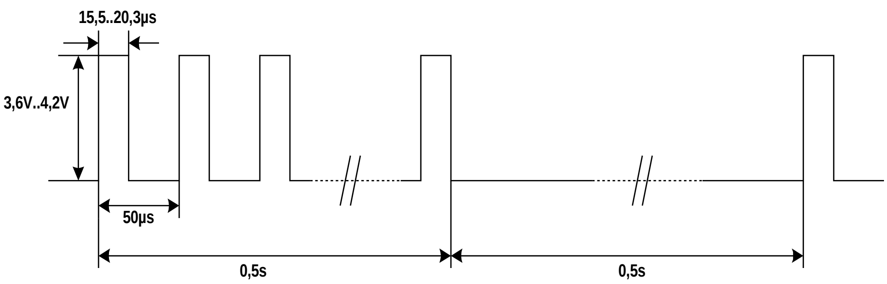


7.2 Vibra

The vibrator is assembled in the lower case shell. The electrical connection is carried out via spring contacts The Vibra is driven and controlled from the power supply ASIC (pin B3)via the signal VIBRA
The vibrator is directly connected to the ASIC´s 2,9V. The diode V440 is used to protect the circuit against over voltage and switching spikes.





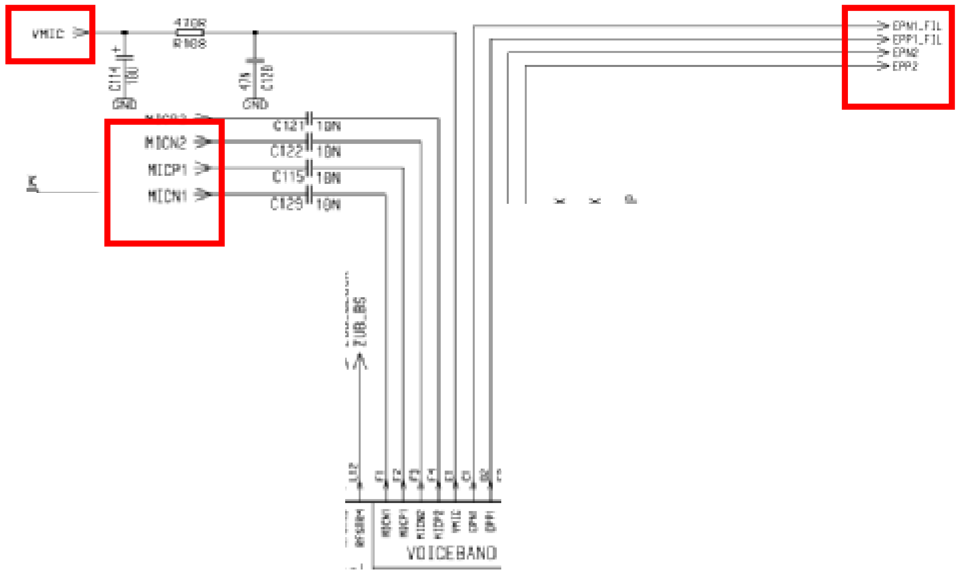


Vibra-Timing

7.3 Microphone and Loudspeaker (Ringer)

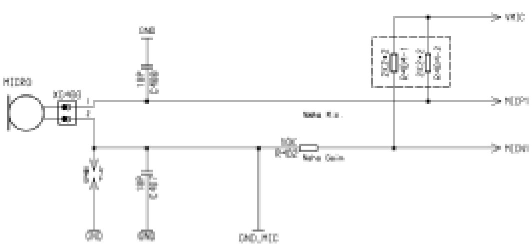
7.3.1 Loudspeaker

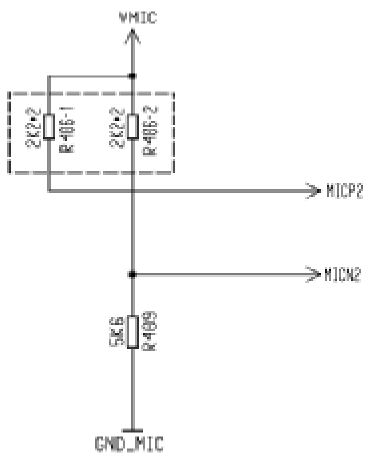
Loudspeaker (EPP1_FIL, EPN1_FIL, EPP2, EPN2) and Microphone (MIC2, MICN2-MICP1, MICN1) are connected directly to the Voiceband-Part of EGOLD+



7.3.2 Microphone

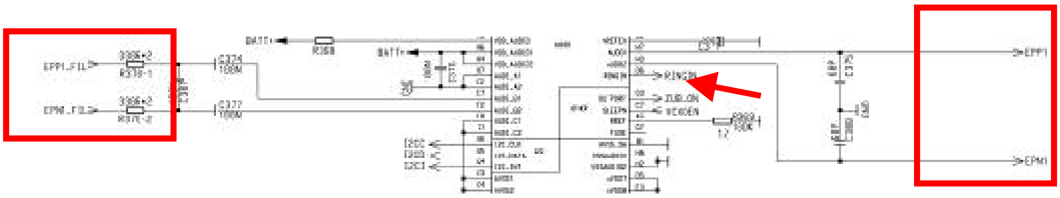
Both Microphones are directly connected to the EGOLD+.(Voiceband F1-F4) via the signals MICN1, MICP1 (Internal Microphone)and MICN2, MICP2 (External Microphone/Headset). Power supply for the Microphone is VMIC (Voiceband E1)

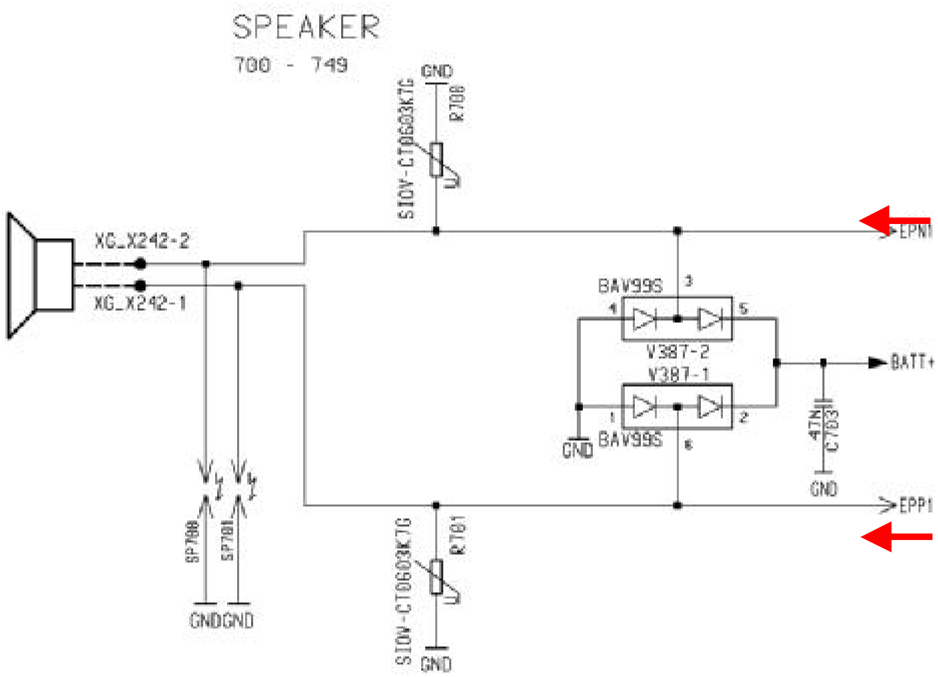




7.3.3 Loudspeaker/Ringer

The internal Loudspeaker (Earpiece) is connected to the voiceband part of the EGOLD+ (VOICEBAND D1,E2) via the mono audio amplifier inside the ASIC (D361).
Input EPN1_FIL - EPP1_FIL Output to earpiece EPN1 - EPP1
The ringing tones are generated with the loudspeaker too. To activate the ringer, the signal RINGIN from the EGOLD+ (Miscellaneous,E9) is used

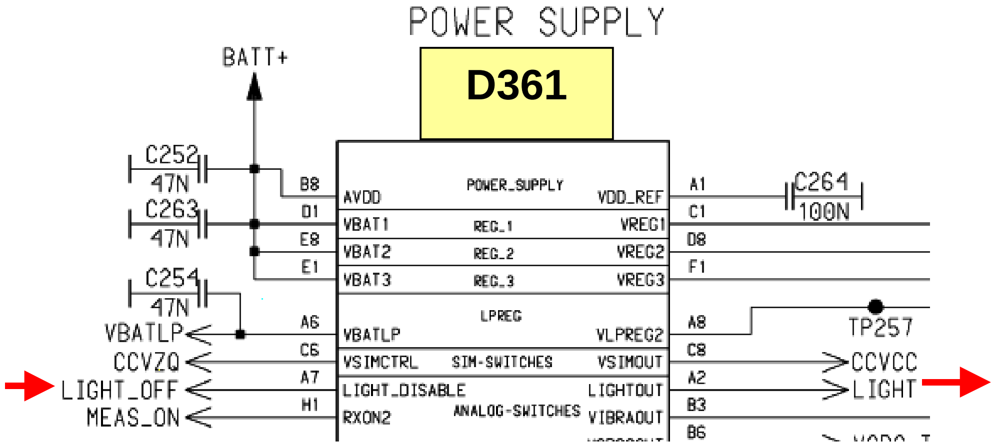


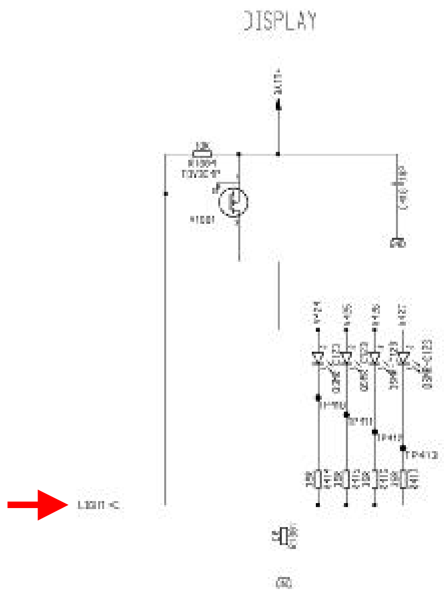


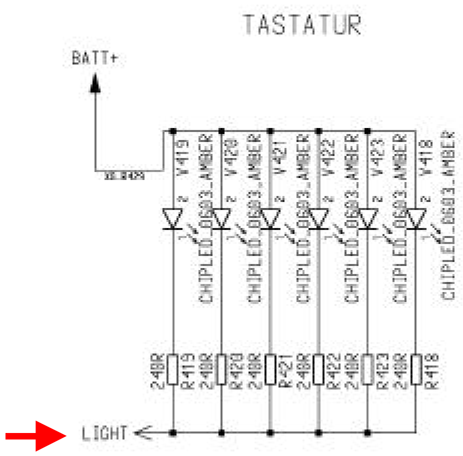
8 Illumination:

8.1 Illumination

The Light is switched via an analogue switch inside the ASIC (D361). It is controlled from the EGOLD+ (TDMA-TIMER,L15) with the signal LIGHT_OFF. Output is the signal LIGHT, which is connected via the MMI connector X550 to the keypad LED´s. and directly to display backlight section



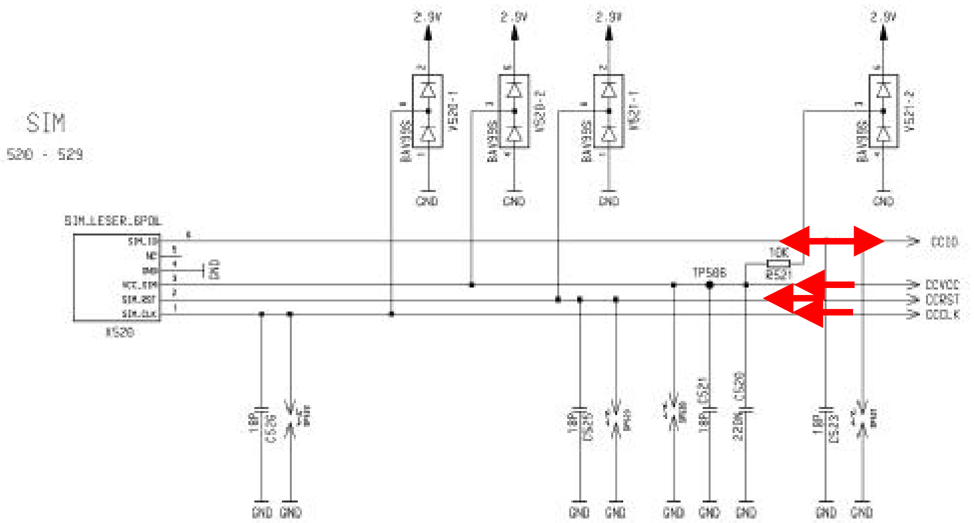




9 SIM-CARD and Connectors

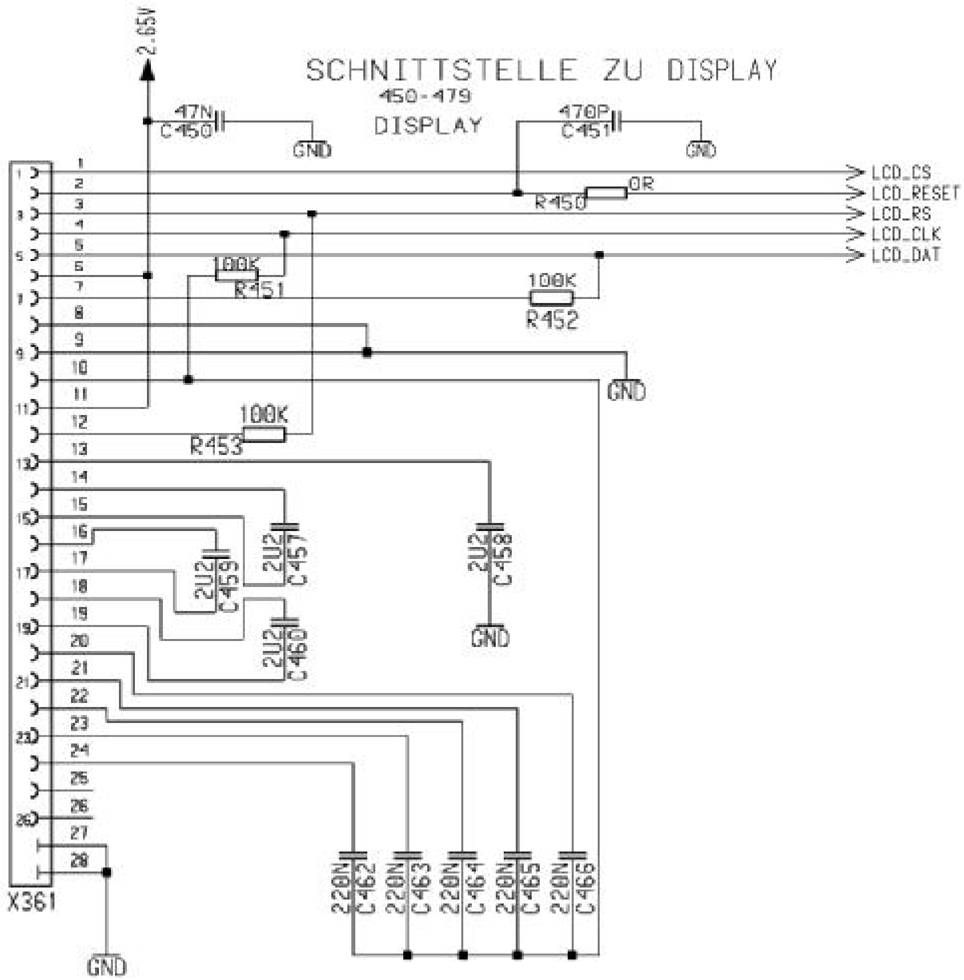
9.1 SIM-Card

The SIM-CARD is supplied via X520 at pin3 with CCVCC (2,9V) The CCVCC is a ASIC (D361) switched 2,9V voltage, activated by CCVZQ from the EGOLD+(Address-Data G13)
If no SIM-CARD is connected, or if there is no response (CCIO) from the SIM-CARD, the EGOLD+ tries 3 times to connect the SIM-CARD. After this time the EGOLD+ stops trying. That means, if the EGOLD+ is losing the connection while normal operation of the mobile phone, the mobile must be switched off and on again.
The communication between the EGOLD+ and the SIM-CARD is done via the CCIO X520 pin6 by using CCCLK as a clock signal.
The diodes V520/521 are used to protect signal lines versus switching peaks.



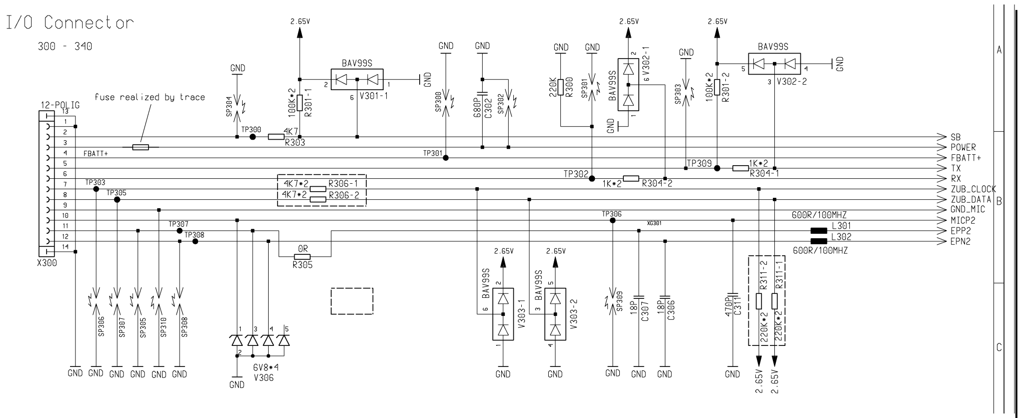
9.2 Display connector

The display is provided with 2,65V from the ASIC (D361). The communication with the EGOLD+ by the LCD-Signals, directly connected to the EGOLD+



LCD_CS	SIM L9
LCD_RESET	Miscellaneous N7
LCD_RS	Serial-Interface R14
LCD_CLK	Serial-Interface P11
LCD_DAT	Serial-Interface N11

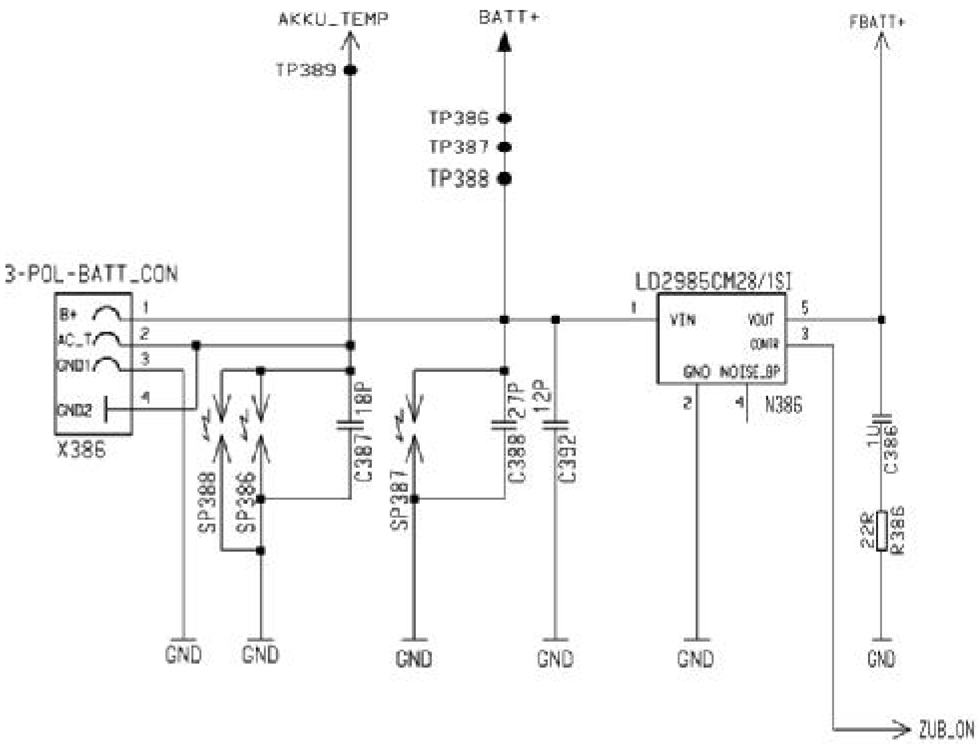
9.3 I/O-Connector



Pin	Name	IN/OUT	Notes
1	GND		
2	SB	O	Control line for external power supply
3	POWER	I	Power input from external power supply
4	FBatt+	O	Voltage for external accessories.
5	TX	O	Serial interface
6	RX	I	Serial interface
7	ZUB_CLK	I/O	Clock line for accessory bus Use as DTC In data operation
8	ZUB_DATA	I/O	Data line for accessory bus. Use as CTS in data operation
9	GND_MIC		For external microphone
10	MICP2	I	External microphone
11	EPP2	O	For external loudspeaker
12	EPN2	O	For external loudspeaker

9.4 Battery Connector

The battery is connected via the battery connector (X386) to the battery contacts on the RF-Board.
Directly connected to battery, there is a voltage regulator (N386). This regulator Is used to provide the external accessories with the required voltage.
To extend STAND-BY time, the regulator is switched on with the signal ZUB_On only if accessories are recognised.
Responsible for the ZUB_ON signal is the ASIC (D361).



Pin	Name	IN/OUT	Notes
1	Batt+	I/O	Battery voltage
2	Akku_Temp	O	Temperature control of the battery pack.
3	GND		