# SL45
# Level 2.5e

# Repair Documentation




V 1.0

# Table of Contents:

# 1. List of available level 2,5e parts SL45

| ID-No | Type | Name(function)/Location | Rep-Code | Order No. |
|---|---|---|---|---|
| D100 | IC | EGOLD+ | 4EGO | L36810-G6103-D670 |
| D250 | IC | SCHALKE_ASIC/Pow.Supply | 4PSA | L36145-J4682-Y29 |
| D400 | IC | MP3 (LARA) 1 | 4LA1 | L36820-C6118-D670 |
| D401 | IC | MP3 (LARA) 2 | 4LA2 | L36820-U6068-D670 |
| D470 | IC | MMG_SCHALKE_ASIC | 4MMG | L36145-J4681-Y54 |
| D490 | IC | Volt.Reg/RF | 4REG | L36820-C6148-D670 |
| D500 | IC | SMARTI | 4SMA | |
| D550 | IC | LNA/RF | 4LNA | L36820-L6047-D670 |
| N600 | IC | Op.Amp/RF | 4OPA | L36810-C6046-D670 |
| N630 | IC | Volt.Reg/RF | 4REG | L36820-C6070-D670 |
| N631 | IC | Volt.Reg/RF | 4REG | L36820-C6147-D670 |
| V251 | Transistor | Charge/Logic | 4CHT | L36830-C1064-D670 |
| V530 | Transistor | VCO_SW/RF | 4SWT | L36820-C6047-D670 |
| V601 | Transistor | PA_Cont./RF | 4SWT | L36840-C4014-D670 |
| V651 | Transistor | PA_Cont./RF | 4SWT | L36840-C4009-D670 |
| V653 | Transistor | PA_Cont./RF | 4SWT | L36840-C2074-D670 |
| V810 | Transistor | 13_AMP/RF | 4SWT | L36840-C4039-D670 |
| Z100 | Quarz | EGOLD+/Logic | 4OSC | L36145-F102-Y14 |
| Z400 | Quarz | Quarz/MP3 (LARA) | 4OSL | L36145-F260-Y13 |
| Z500 | Filter | IF_360/RF | 4IFF | L36145-K280-Y127 |
| Z530 | VCO | 1LO/RF | 4VC1 | L36145-G100-Y32 |
| Z555 | Filter | RX-PCN/RF | 4FI1 | L36145-K280-Y167 |
| Z556 | Filter | RX-GSM/RF | 4FI3 | L36145-K280-Y160 |
| Z570 | VCO | TX/RF | 4VCT | L36145-G100-Y32 |
| Z650 | IC | Power_Amplifier | 4PAM | L36851-Z2002-A45 |
| Z800 | Quarz | 13MHz/RF | 4VCX | L36145-F220-Y4 |

# 2. Required Equipment for Level 2,5e SL45

- GSM-Tester (CMU200 or 4400S incl. Options)
- PC-incl. Monitor, Keyboard and Mouse
- Bootadapter 2000 (L36880-N9241-A200)
- Troubleshooting Frame P35 (F30032-A82-A1)
- Power Supply
- Spectrum Analyser (Advantest 3162)
- RF-Probe incl. Power Supply (e.g. from Agilent)
- Oscilloscope incl. Probe
- RF-Connector (N<>SMA(f))
- Power Supply Cables
- Dongle (F30032-P28-A1)
- BGA Soldering equipment

***Reference:*** Equipment recommendation Level 2,5e

# 3. Required Software for Level 2,5e SL45

- Windows NT Version4
- Winsui version1.22 or higher
- Winswup
- Windows software for GSM-Tester ( Cats or CMU-GO)
- Software for 13MHz adjustment
- Internet unblocking solution

# 4. Radio Part

**Notes**

The radio part converts the I/Q base band signals supplied by the logic (EGOLD+) into RF-signals with characteristics as per the GSM recommendation (transmission) which are radiated by the antenna.
Or the radio 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 radio part is designed for Dual Band operation and can therefore serve the frequency bands EGSM900 and GSM1800. The radio part can never transmit and receive in both bands simultaneously. However, the monitor time slot can be selected independently of the frequency band. Transmitter and receiver are of course never operated simultaneously.

**The radio part consists of the following blocks:**

- Power supply (RF-Voltage regulators)
- Synthesizer (partly located in SMARTI)
- Receiver (partly located in SMARTI)
- Transmitter (Up conversion loop partly located in SMARTI)
- Transmitter (Power amplifier)
- Antenna Switch

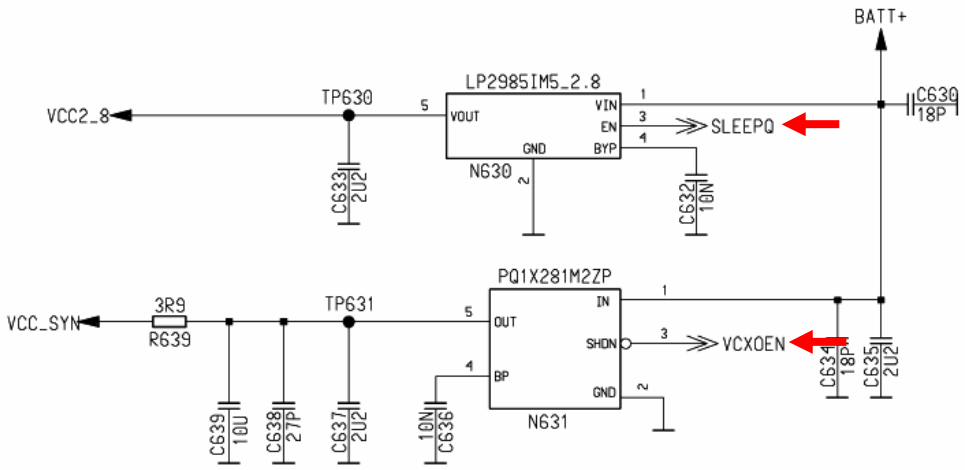


## 4.1. Power Supply RF-Part

Two voltage regulators (N630/631) with a nominal output voltage of 2.8V are used, to perform the required “RF-Voltages”.
The voltage regulator N630 is activated via SLEEPQ provided by the EGOLD+ (**TDMA-Timer H13**).
The voltage regulator N631 is activated via VCXOEN provided by the EGOLD+ (**Functional P7**).

The name of the voltages are: a) **VCC_SYN** activated by VCXOEN
and b) **VCC2_8** activated by SLEEPQ

For both voltages **BATT+** is required.



## 4.2. Frequency generation

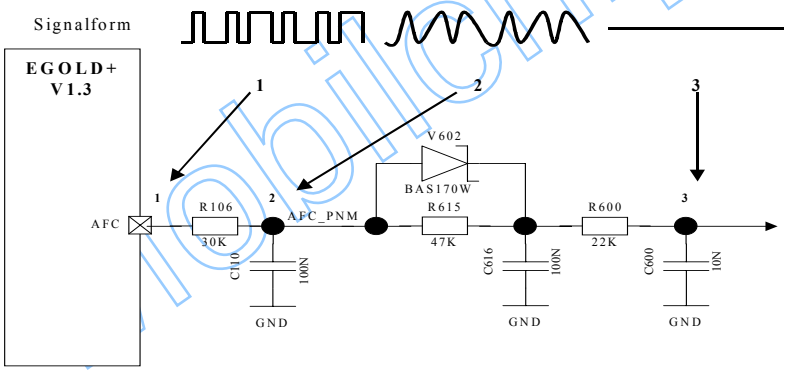
### 4.2.1. Synthesizer: The discrete VCXO (13MHz)

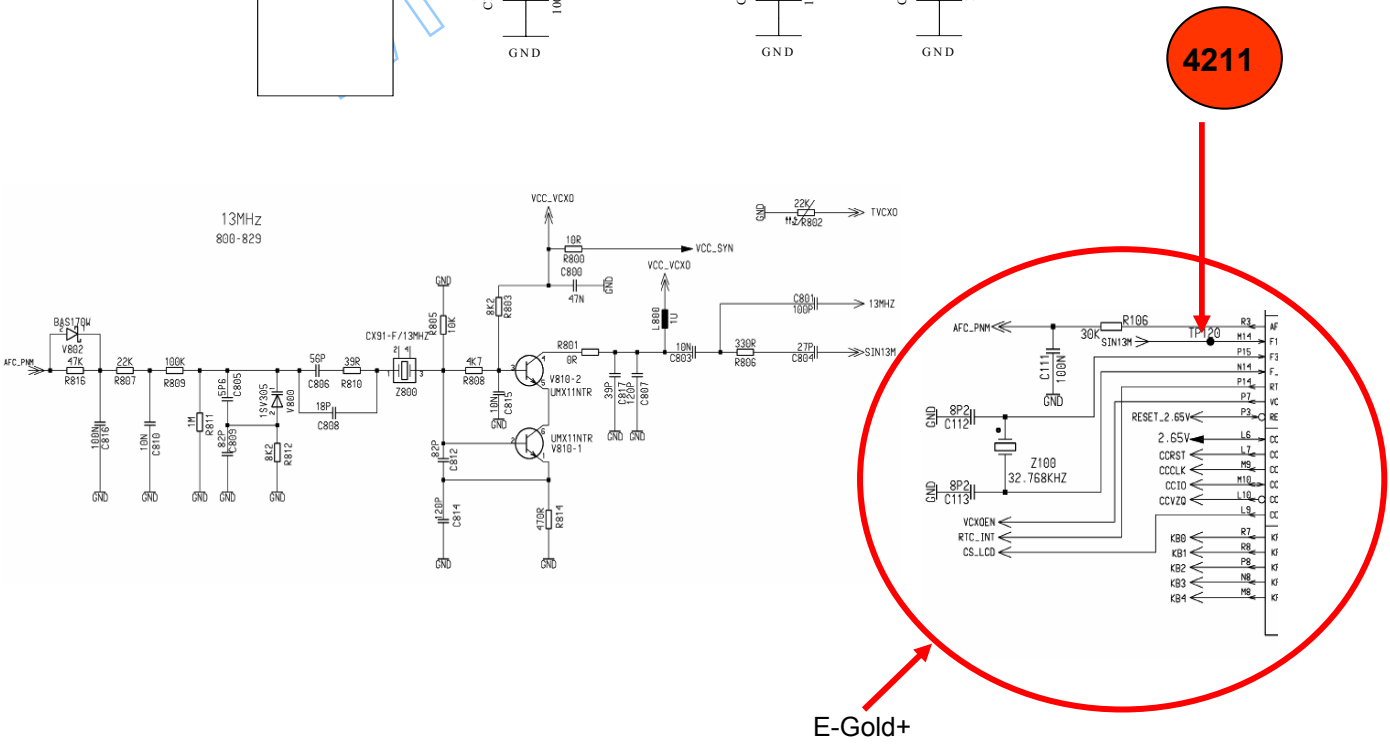
The generation of the 13MHz signal is done in the SL45 via a discrete VCXO.
A Colpitts oscillator with a crystal Z800 and a post-switched buffer stage is used as oscillator switch.
The subsequent oscillating circuit (C807,C817, L800) and the resistor R806 create a de-coupling of the synthesiser from interference signals coming from the logic (SIN13M **(functional M14)**).
The oscillator frequency is controlled by the (AFC_PNM) signal which is generated from the EGOLD+ (D100 **(functional R3)**) and the capacity diode V800.
To reduce the charging time of the low pass (R816, C816) the resistor R816 is bridged by the diode V802
For the temperature control a temperature-dependent resistance R802 is placed near the VCXO.

The required voltage VCC_SYN is provided by the N631

The picture **4211** shows the SIN 13M measured at TP120.

**Notes**



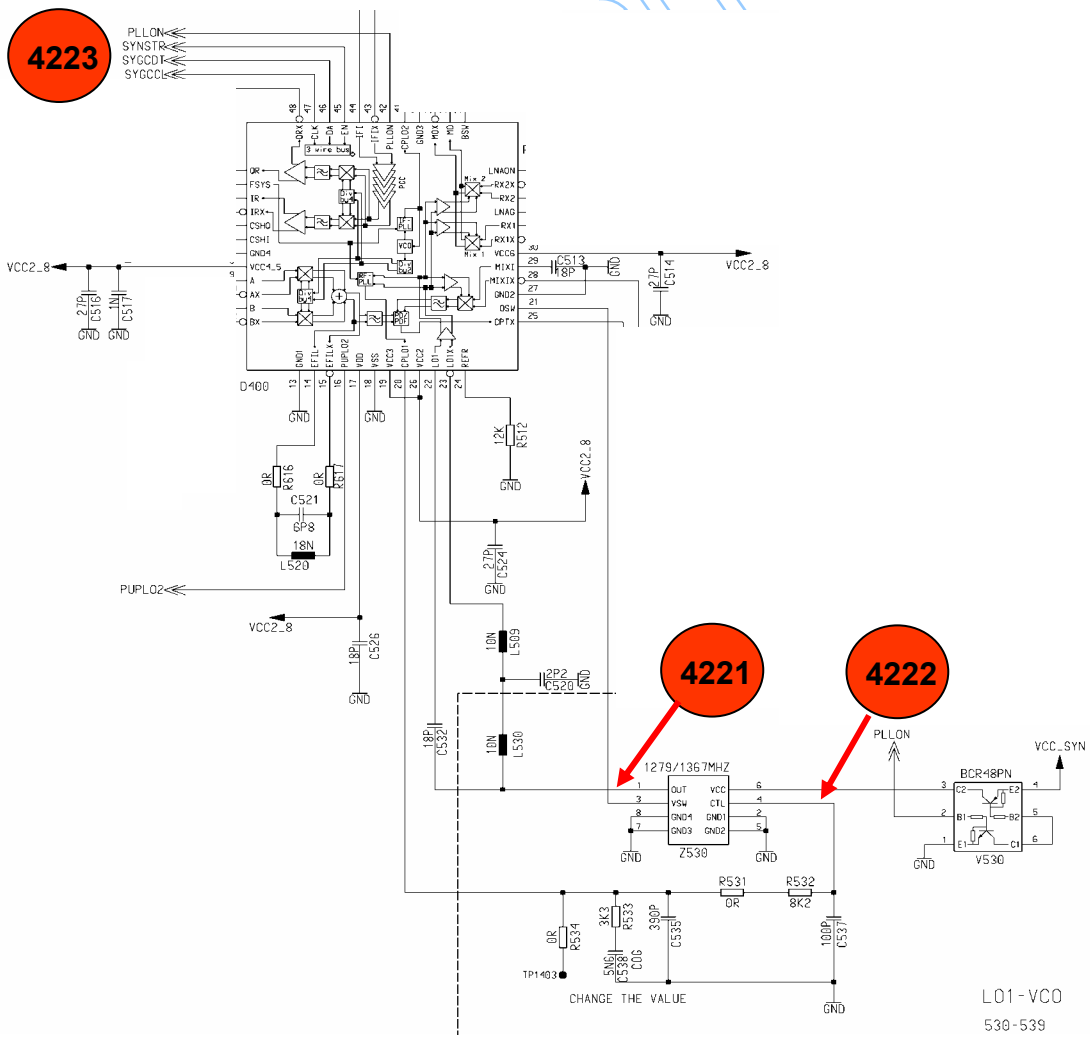
### 4.2.2. Synthesizer: LO1

**Notes**

The first local oscillator (LO1) consists of the PLL part of the Smarti (**D500**), a loop filter
and a VCO (**Z530**) module. This LO1 circuit generates frequencies from 1445MHz to 1520MHz for GSM 1800 RX-operation and from 1285MHz to 1361MHz for the other operations. It is switched to select the channels in stages of 200kHz.
The VCO module is switched on by the EGOLD+ signal PLLON **(TDMA-Timer J12)** via (V530). The switching between GSM900 and GSM1800 is done via the signal OSW signal from the Smarti (D400 **pin 21**),
The channel programming of the PLL part of the Smarti happens via the EGOLD+ signals SYGCCL, SYGCDT, SYNSTR **(RF Control K14, K15, M15)**.
The VCO output signal enables the Smarti IC to mix the IF-Frequency (360 MHz)
The VCO output is also guided to the Smarti PLL part (D400) to ensure frequency stability (output Smarti D500 **pin 20**). To do so the 13MHz frequency is used as the reference signal for the PLL circuit.

The required voltage are: VCC2_8 for D400 is provided by N630.
VCC_SYN for the VCO is provided by N631

The picture **4221** shows the VCO output signal
The picture **4222** shows Control voltage
The picture **4223** shows the programming signals for the PLL



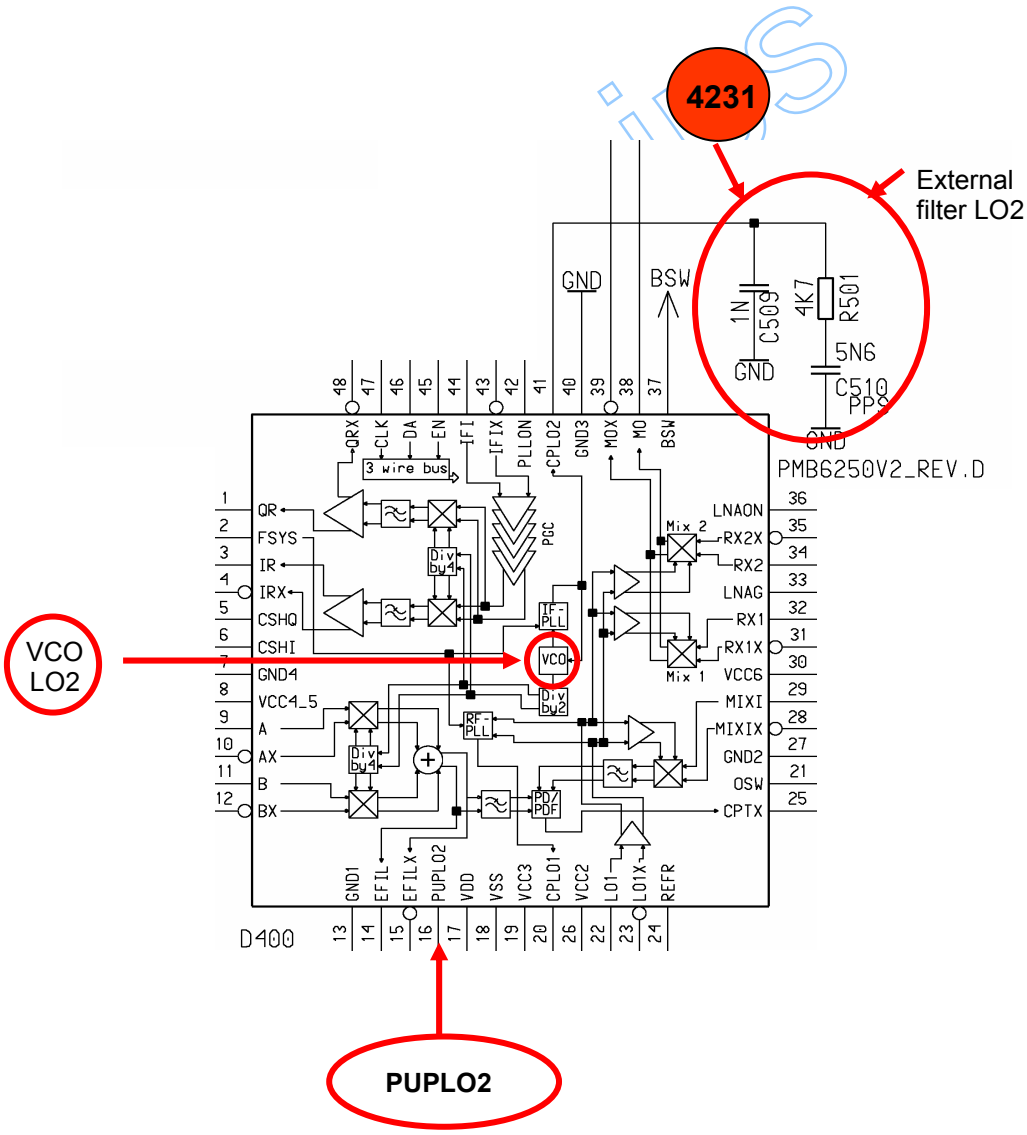
### 4.2.3. Synthesizer: LO2

The second local oscillator (LO2) consists of the PLL part of the Smarti (D400), 2 internal VCO´s (1440 MHz for RX-Mode and 1696 MHz for TX-Mode) and an external filter (C509,C510,R501),
Both frequencies are divided by 4 to get the 360MHz demodulator IF frequency and the 424MHz modulator frequency.
The RX/TX switching is done internally and is initiated by the EGOLD+ through the SYGCCL, SYGCDT,SYNSTR **(RF Control K14, K15, M15)** signals.
Responsible for switching "On/Off" the second local oscillator in the EGOLD+ signal PUPLO2 **(TDMA-Timer L11)** at SMARTI **pin 16**.

The required voltage VCC2_8 for D400 is provided by N630

The picture **4231** shows the VCO output signal

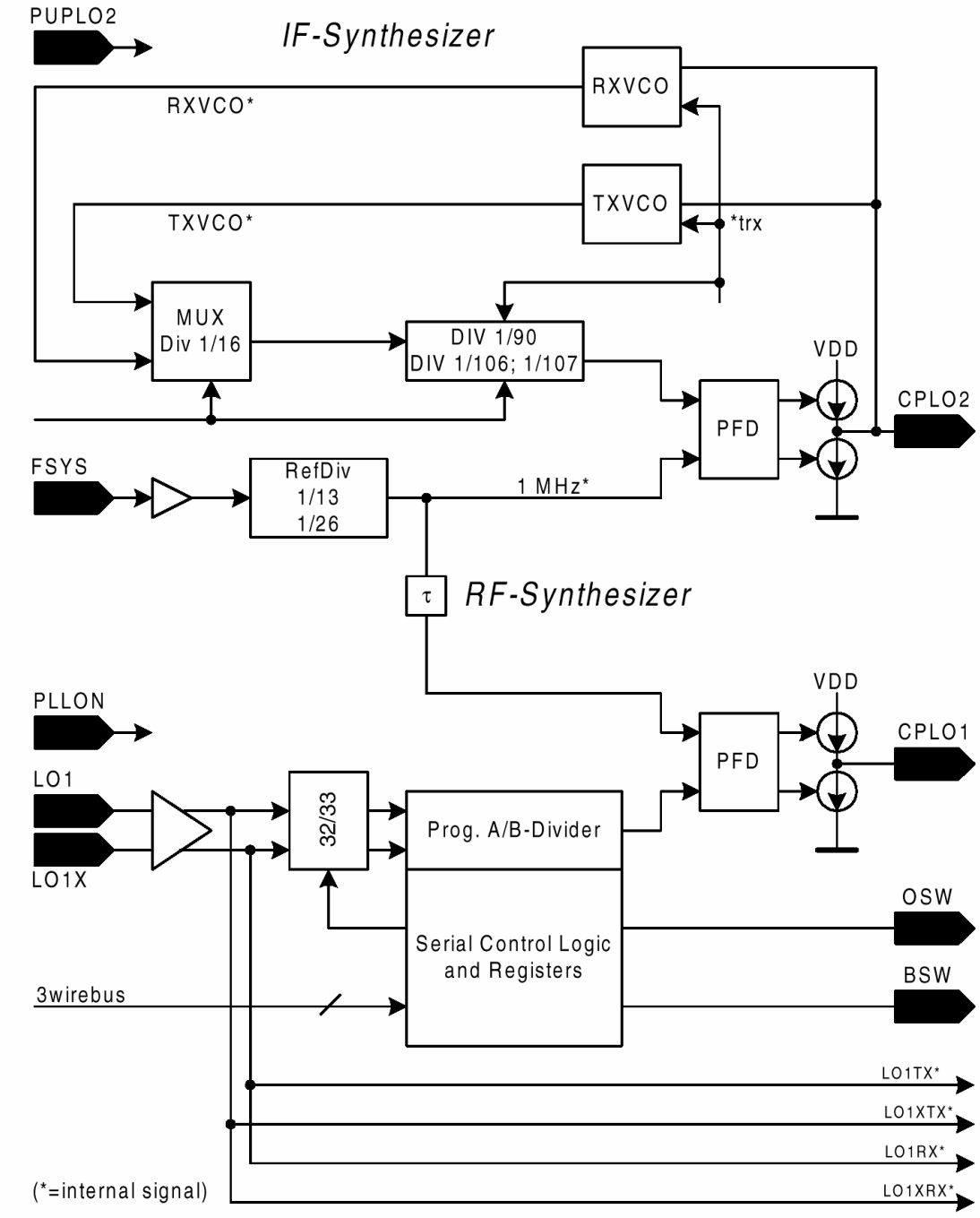
**Notes**



### 4.2.4. Synthesizer: PLL

**PLL as a part of the PMB6250 (Smarti) IC**

**Blockdiagramm**



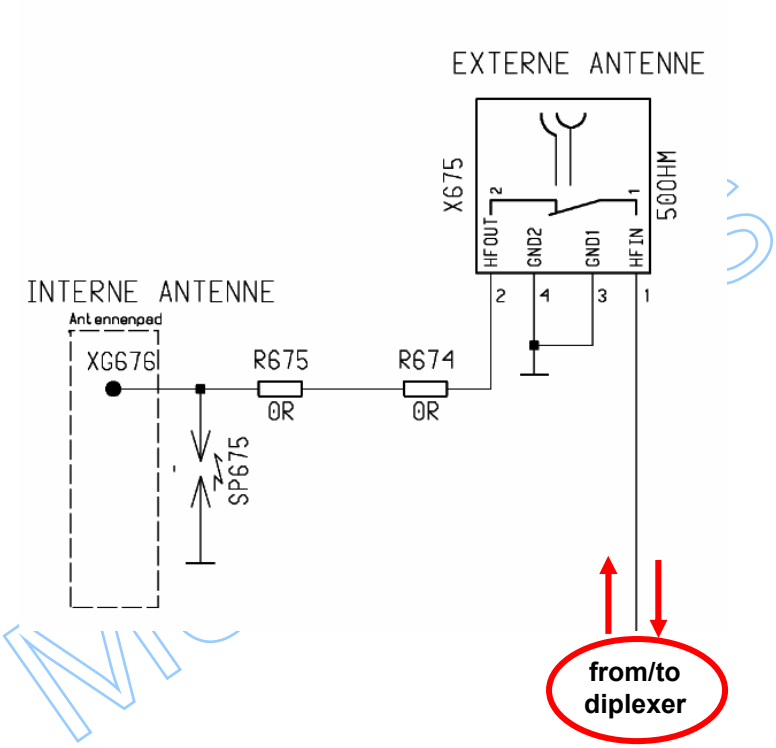
## 4.3. Antenna switch (electrical/mechenical)

**Internal/External <> GSM900/1800 <> Receiver/Transmitter**

**Notes**

The SL45 mobile consists of two antenna switches.

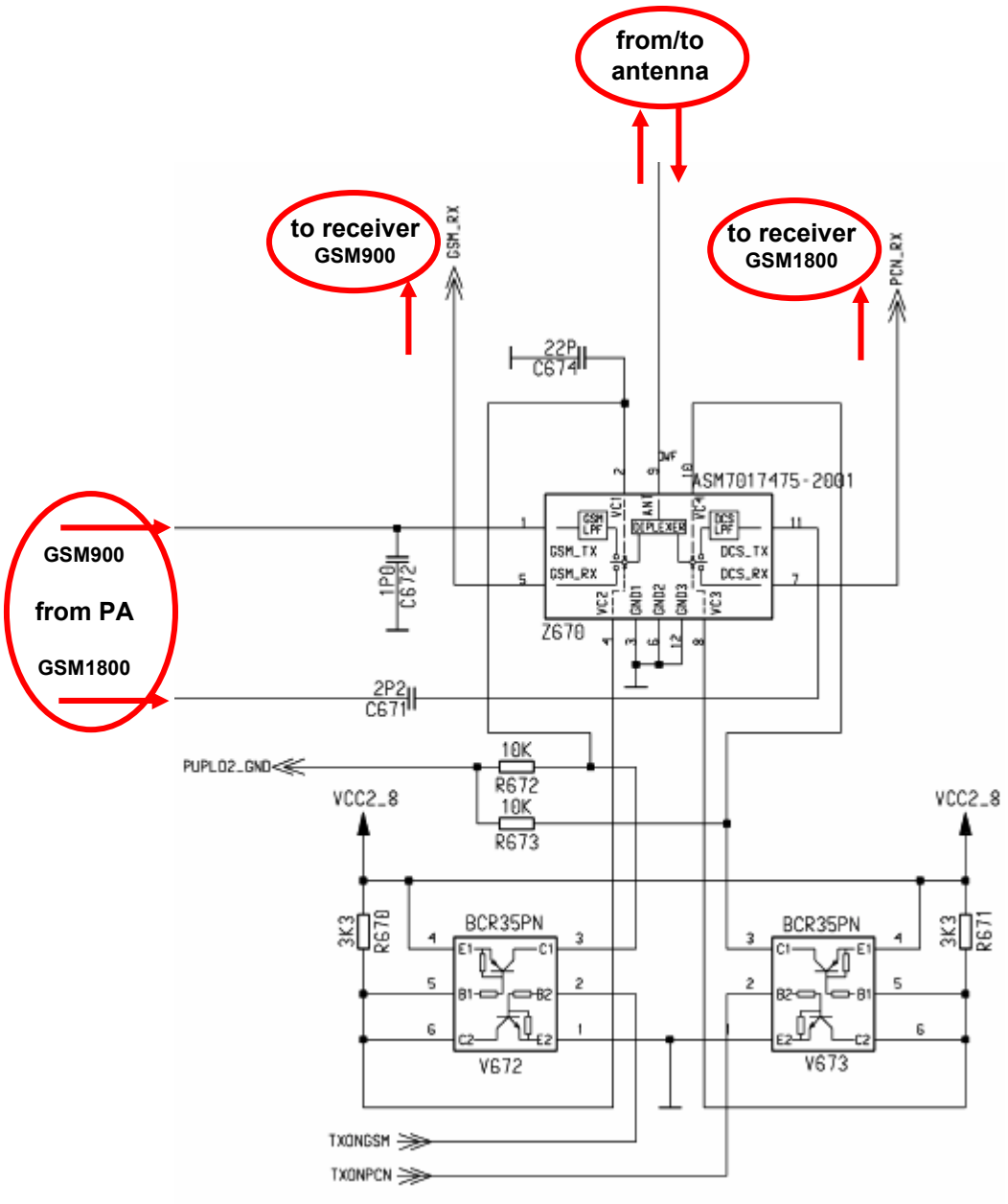
a: The mechanical antenna switch (connector X675) for the differentiation between the internal and external antenna




b: The electrical antenna switch (Diplexer Z670) for the differentiation between the receiving and transmitting signals, just like the differentiation between GSM900 and GSM1800.
To do so the Transistors V672,V673 are used to switch the diplexer input signals VC1–VC4 as required.

The required voltage VCC2_8 for D400 is provided by N630

**Notes**




The matrix below shows the different conditions at the Diplexer and the accompanying signals.

| | VC1 | VC2 | VC3 | VC4 |
|---|---|---|---|---|
| GSM Rx | 0 | 1 | 1 | 0 |
| Tx | 1 | 0 | 1 | 0 |
| PCN Rx | 0 | 1 | 1 | 0 |
| Tx | 0 | 1 | 0 | 1 |

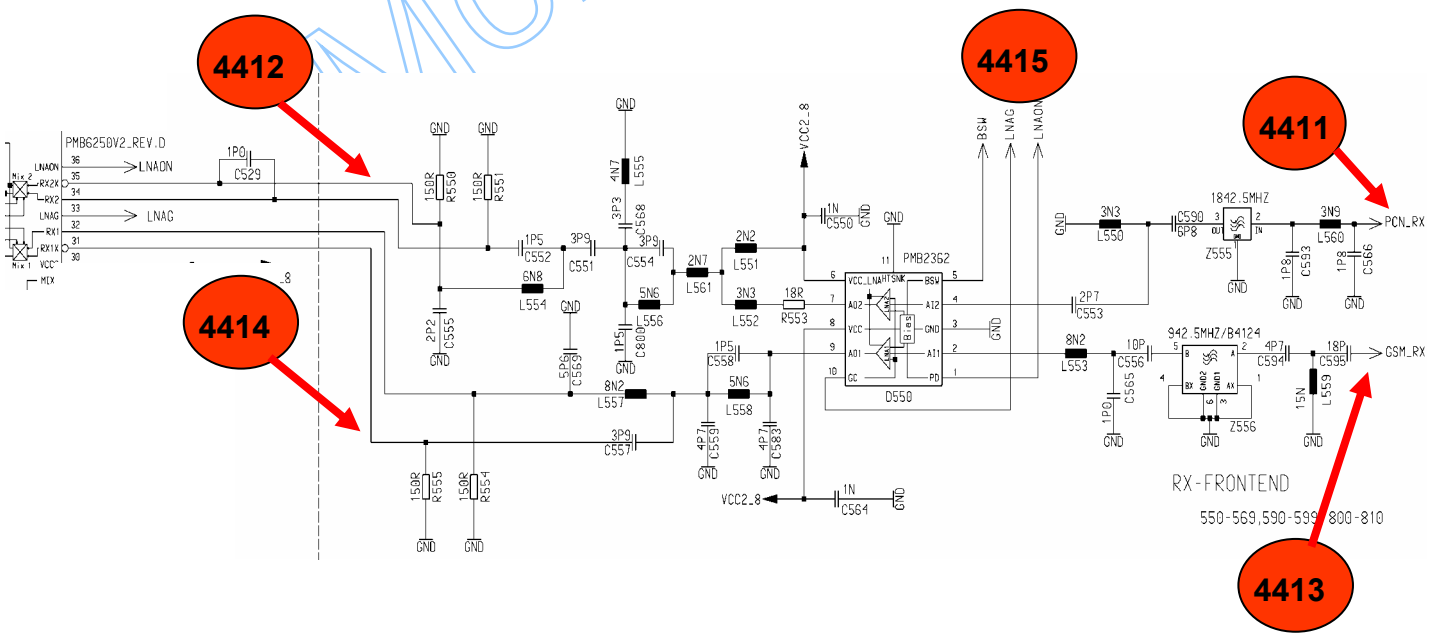
## 4.4. Receivers

### 4.4.1. Receiver: GSM900/1800 –Filter and LNA

From the antenna switch, up to the IF-Mixer the GSM1800 receiver circuit consists of a ceramic front end filter (**Z555**),a LNA (**L**ow **N**oise **A**mplifier **D550**) and a discrete distortion LC-high-pass-filter after LNA amplification.
For GSM900 the signal flow is as follows: From the antenna switch via a SAW filter (**Z556**) through the LNA (**D550**) and a discrete distortion LC-low-pass-filter to the IF-Mixer.
The amplification of both LNA´s is approx. 18dB with a matched 50 ohm output. To switch on the LNA, the signal LNAON (Smarti **pin 36**) is used.
LNAG (Smarti **pin 33**) is in use if the received signal level is too high. With the high signal LNAG the LNA reduces the incoming signal in one step by 20dB
For activating the GSM1800 or the GSM900 LNA part a signal BSW is generated from the (Smarti **pin 37**)
The non-symmetrical output of the LNA (**D550**) is connected to the IF mixer via a discrete balancing and adaptation circuit This circuit converts the asymmetrical input signal into a symmetrical signal.

**Notes**

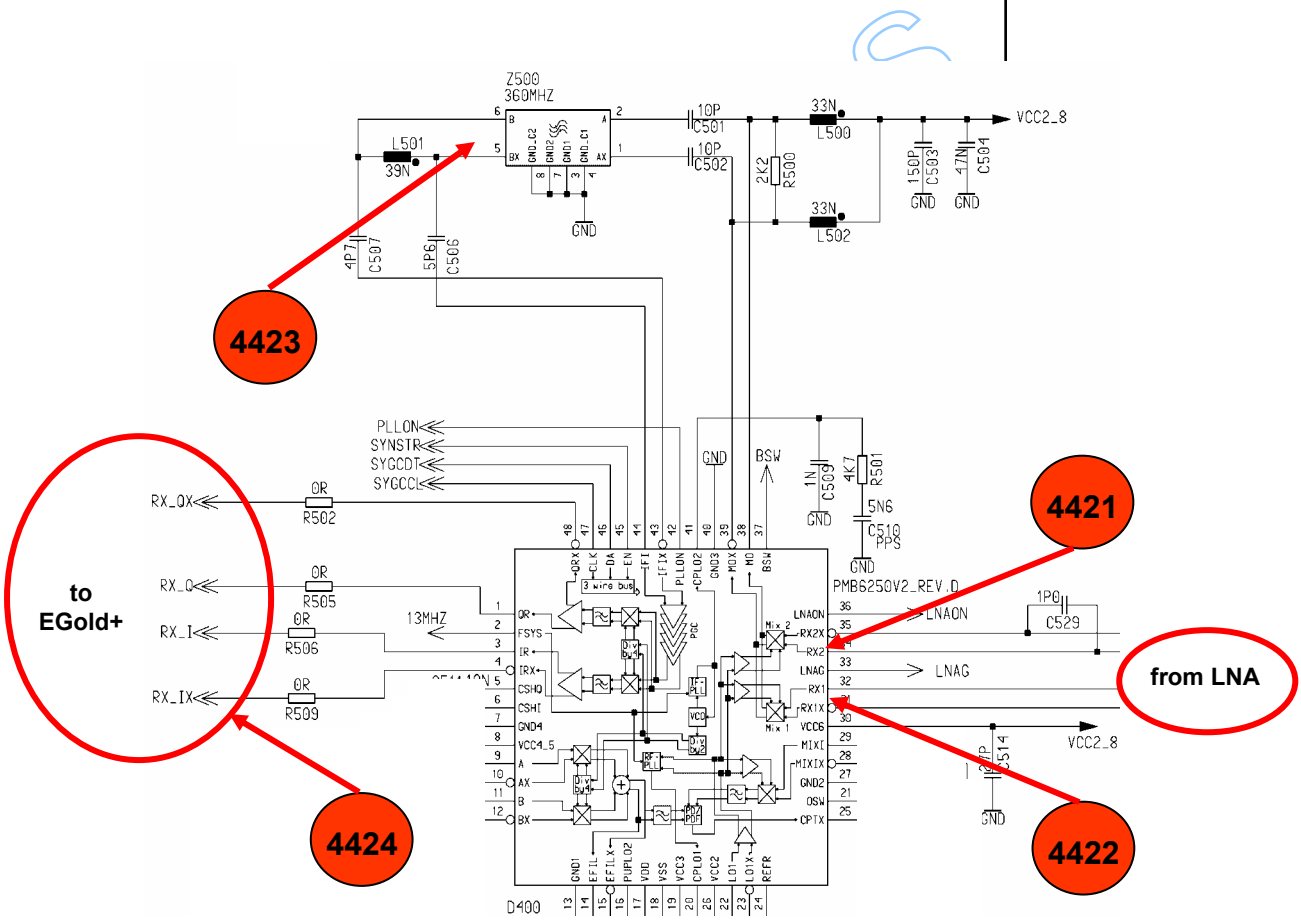
The required voltage VCC2_8 is provided by the N630



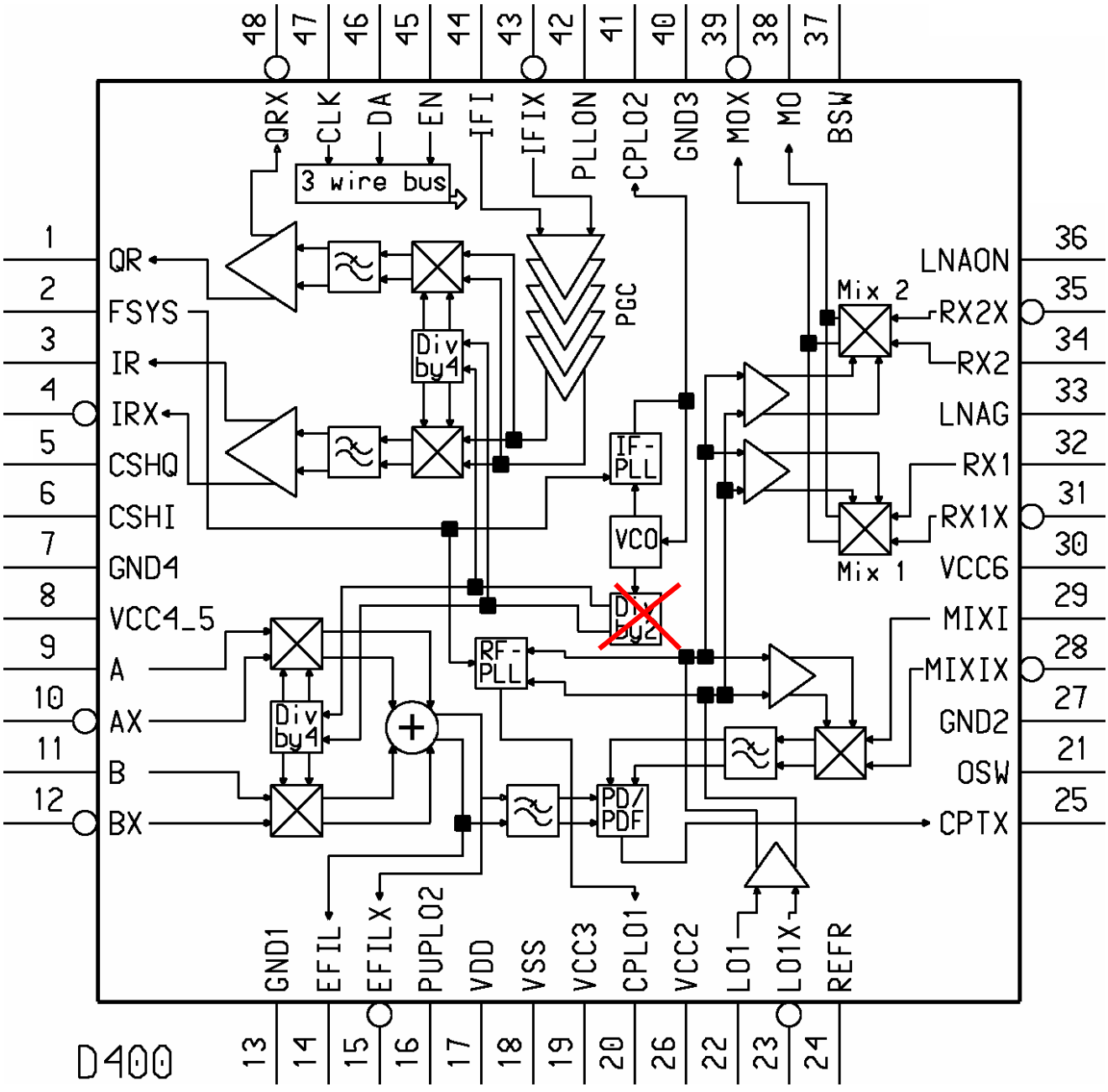
### 4.4.2. Receiver : Mixer, IF Amplifier and Demodulator

The Smarti IC (D400) has two separate input mixers one for EGSM900 and one for GSM1800.
The mixing result for both mixers is an intermediate frequency from 360 MHz.
The GSM900 mixer works in inverted sideband mode (LO1 above RX frequency), the GSM1800 mixer in step mode (LO1 below RX frequency).
The outputs of both mixer are connected to the same IF Filter.
After passing an external IF Filter (Z500) the signal arrives at the programmable IF amplifier in the Smarti. This amplifier has a dynamic of 80dB (-20dB to 60dB) and can be set (PGCSTR;SYGCDT;SYGCCL) in 2dB steps.
Finally the signal is mixed down by the IQ demodulator to differential I and Q (RX_I,RX_IX-RX_Q,RX_QX) signals off 50mV$_{pp}$.
This signals are guided to the EGold+ A/D converters in the base band path.

**Notes**



### 4.4.3. Smarti IC Overview




✗ **Not active**

## 4.5. Transmitter

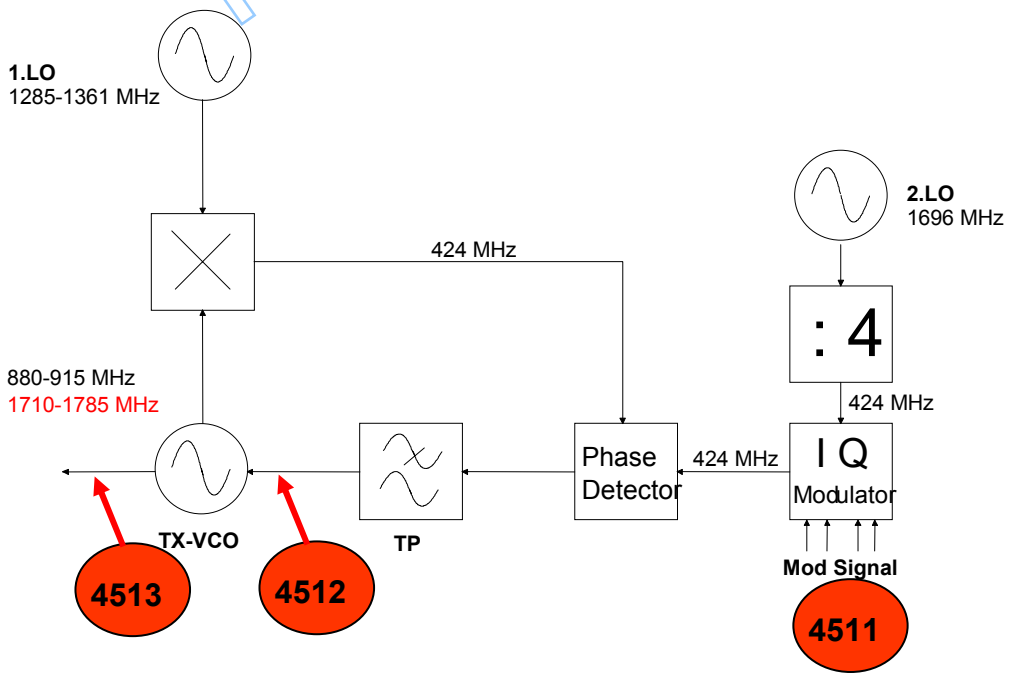
### 4.5.1. Transmitter: Modulator and Up-conversion Loop

**Notes**

The SL45 modulation is based on the principle of the up-conversion modulation phase locked loop and is accomplished via the Smarti IC(D400).
The Smarti IC provides the quadratic modulator working with the TX IF frequencies GSM/PCN 424 MHz. Whereby these frequencies are supplied from the second local oscillator signals (1694MHz/4).
This so generated GMSK RF signal is compared in a phase detector with the down mixed GMSK RF output.
To get the comparison signal the TXVCO_OUT signal is mixed with LO1 signal.
With the help of the 1.LO the GMSK-RF signal appearing at
the output of the TXVCO (Z570) is mixed to a TX IF below the TX signal and is led on to the phase detector. The I-Q modulated signal in the IF position is also led to the phase detector.
The output signal of the phase detector passes a discrete loop filter realized by capacitors and resistors and force the TXVCO to work on the right frequency.
This large loop band width guarantees that the regulating process is considerably quicker than the changes in the modulation signal.
The TXVCO is a so-called two-in-one VCO, this means the VCO module contains the GSM900-VCO and the GSM1800-VCO in one housing.
The TXVCO is switched from GSM to PCN by using the signals GSM_TX_VCOENQ and PCN_TX_VCOENQ from the EGold+ (**TDMA Timer J13, K12**)

The required voltage VCC2_8 is provided by N630
The required voltage VCC_SYN is provided by N631





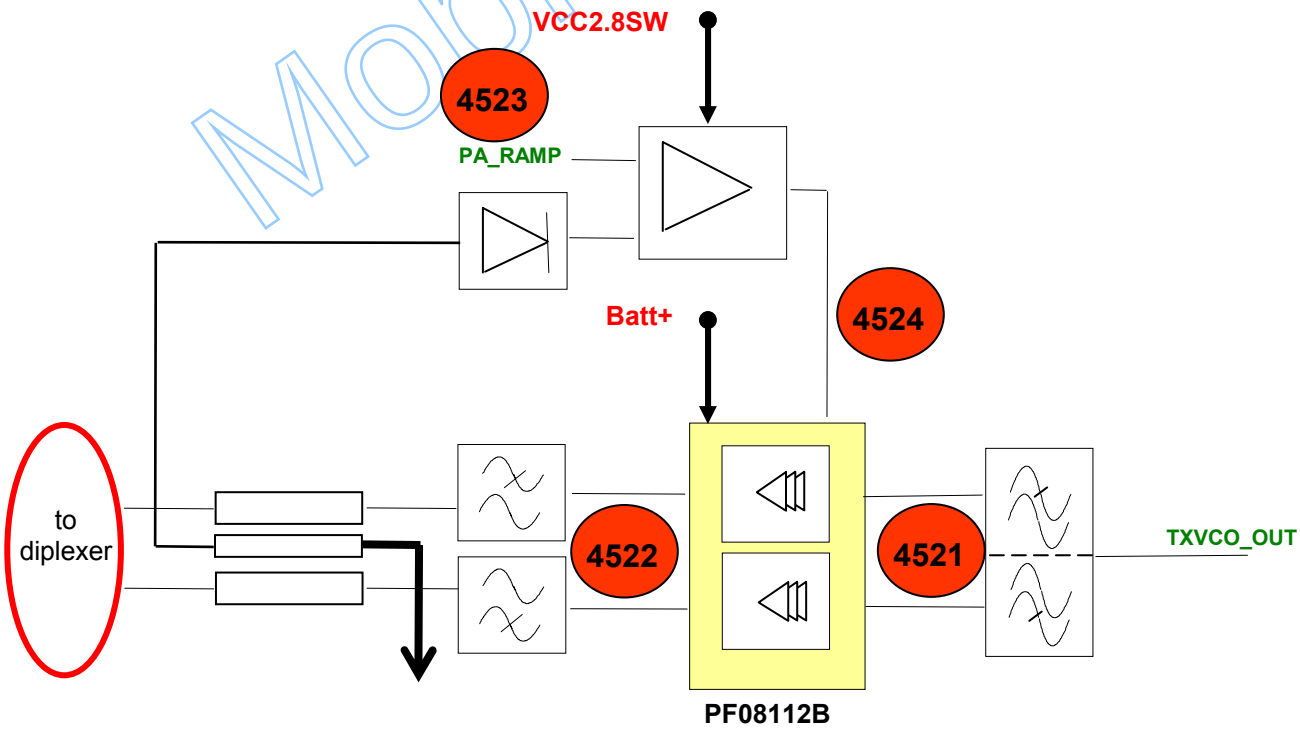
### 4.5.2. Transmitter: Power Amplifier and Antenna Switch

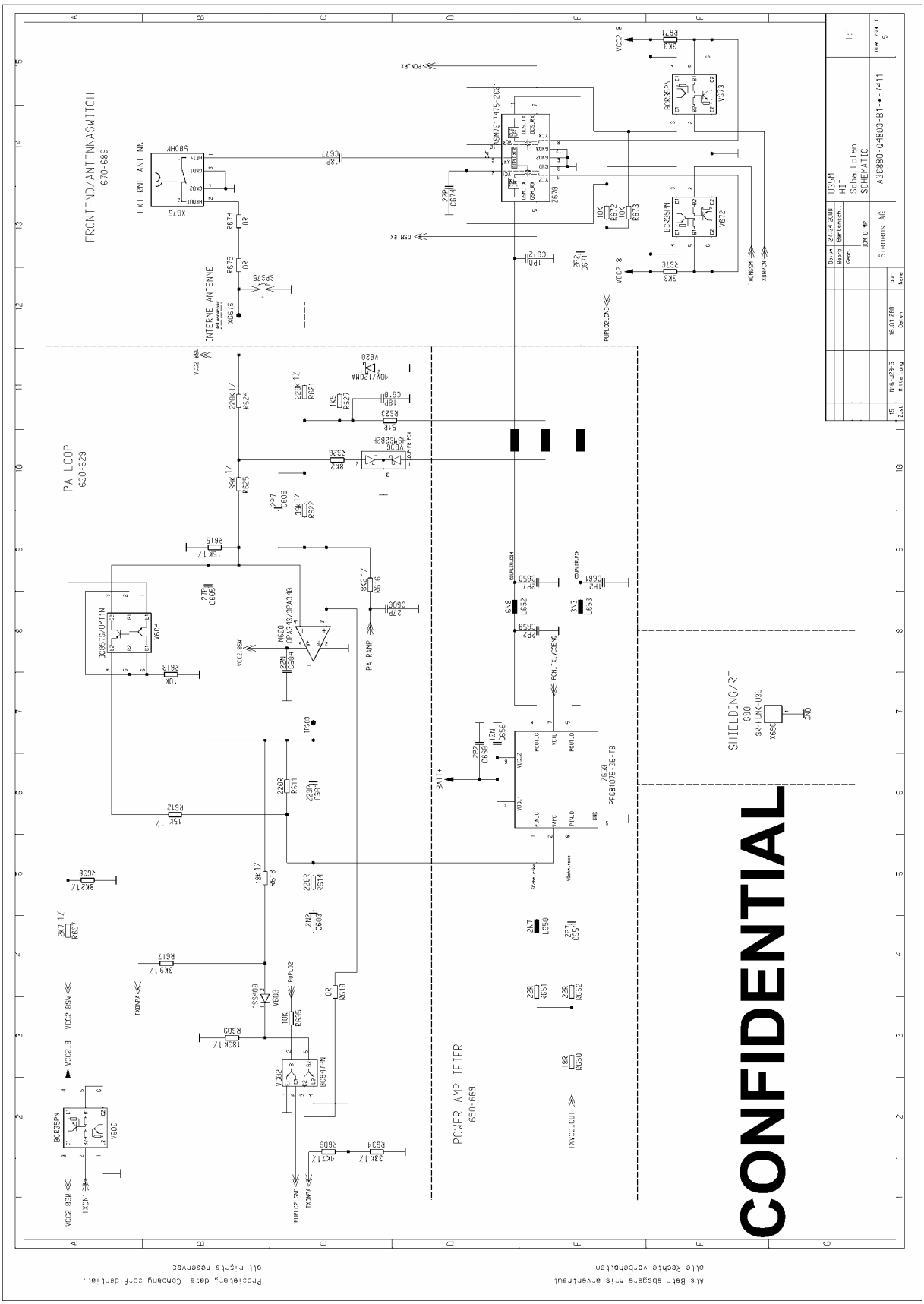
**Notes**

Splited by a discrete circuit into GSM900 (low pass R651/L650) and GSM1800 (high pass R652/C651) the TXVCO output signal arrives at the power amplifier.
The dual band power amplifier module (Z650) is assembled on a ceramic substrate in one housing. The module amplifies the output signal of the TXVCO to the required PCL. Controlled by the feedback circuit according to settings from the logic.
A part of the TX output signal is decoupled via a directional coupler (realised by conductive tracks) and is equalised at a detector diode (V620).
This so gained voltage is compared by an operation amplifier (N600) with the PA_RAMP signal provided by the EGold+ (**GAIM/BASEBAND H2**), to ensure that the PA is working within the required PCL´s.
The different amplifiers are selected on by the PCN_TX_VXCOENQ signal from the EGold+ (**TDMA Timer K12**). The power amplifier is feeded directly from the battery (BATT+).
After amplification the signal passes on the way to the antenna the diplexer (Z670) and antenna connector (X675).

The required voltage BATT+ is provided by the battery.
The required voltage VCC2_8SW is provided by transistor V600.



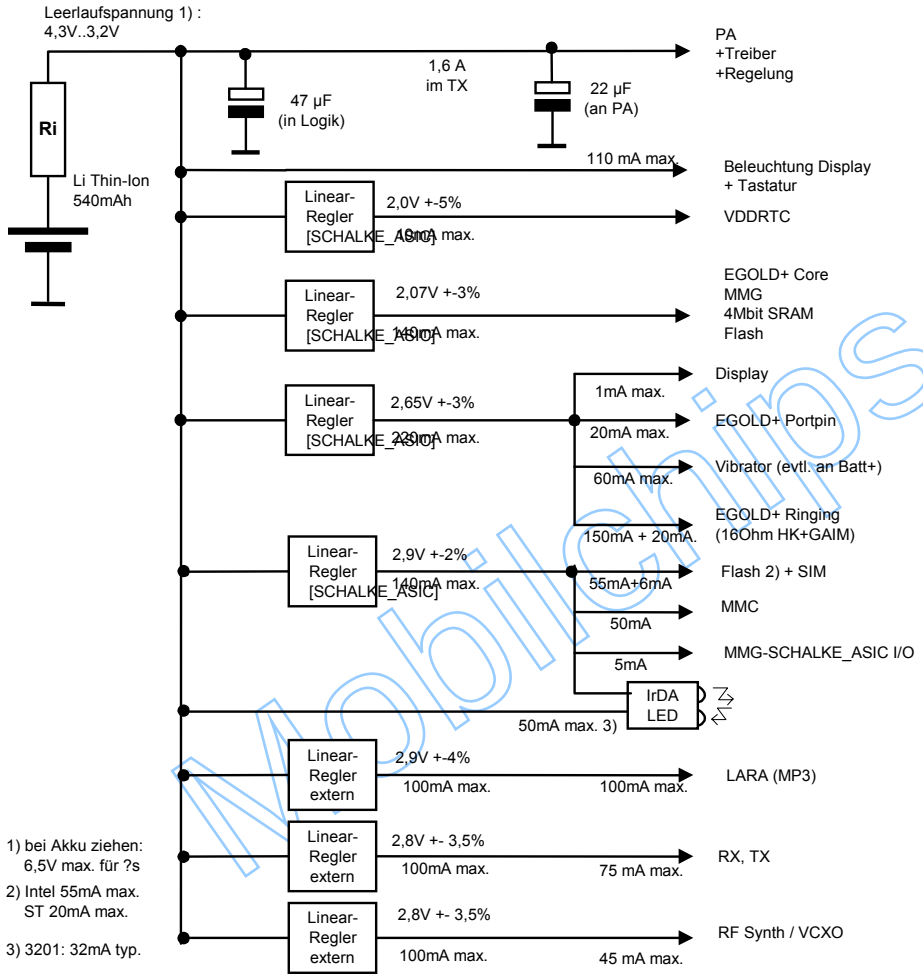



FRONTEND/ANTENNASWITCH
670-683
EXTERNE ANTENNE
INTERNE ANTENNE
PA LOOP
630-623
PA RAMP
POWER AMPLIFIER
650-669
SHIELDING/RF
CONFIDENTIAL
U35M
HI
Schaltplan
SCHEMATIC
Siemens AG

# 5. Power Supply

## 5.1. Overview and Voltages

**Notes**




The following restrictions must be observed:

- The phone cannot be operated without battery.
- The phone will be damaged if the battery is inserted the wrong way round (the mechanics of the phone prevent the battery from being put in the wrong way round). The electric system assumes that the battery as been inserted correct.

## 5.2. STV-Schalke-ASIC

**Notes**

The power supply Schalke-ASIC contains the following functions:

- Control of "**switching on**" the mobile phone via

  1.The ON/OFF Key. (Schalke-ASIC F4)
  2.The bottom connector with the signal VDD_CHARGE (Schalke-ASIC A4)
  3.The **R**eal **T**ime **C**lock RTC_Int (Schalke-ASIC F5)

- Watchdog monitoring

  1.Control of "**switching off**" the mobile phone via WATCHDOG_µP.
  2. Watchdog observation

- Switch off of mobile phone in the case of overvoltage at battery connection.
- Generation of RESET signal for EGOLD+, Flash, MMG_ASIC and Display
- Generation of 2.90 V via linear controller (REG_1)
- Generation of 2.00 V via linear controller (REG_2)
- Generation of 2.65 V via linear controller (REG_3)
- Generation of 2.00 V via linear controller (LPREG)

- Analog switches

  7. SIM Switch
  7. LIGHT Switch
  7. IRDA Switch
  7. VSPG_Teiler Switch

- Battery charge support:
  1. Normal charging
  2. Trickle charging, if the battery voltage is below 3,2 V.

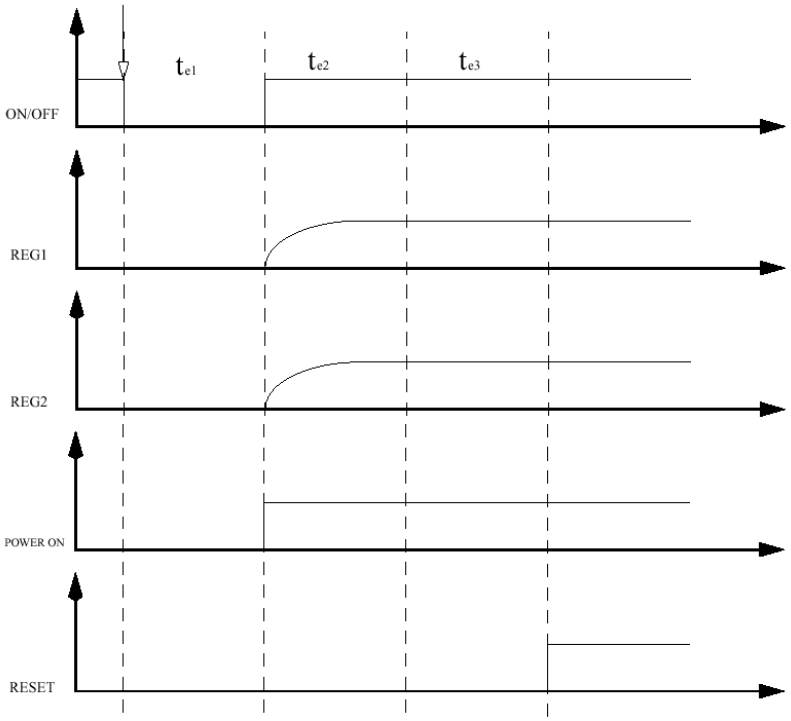
- Timer generation
  All internal timers and pulses are derived from a 900 kHz ± 10% internal oscillator. Responsible for the frequency stability is an external resistor (R257) (1%) at the RREF pin.

- Audio

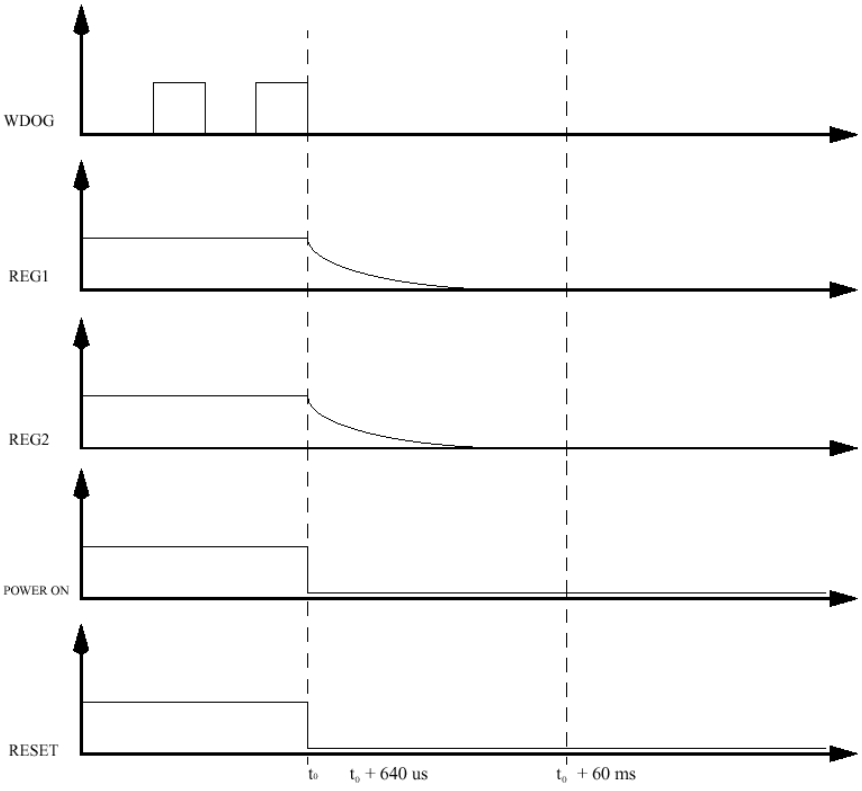
  1. Audio amplifier
  2. Mono audio driver for internal loudspeaker
  3. Driver to generate ringer tones
  4. Key-click generator

- $I^2C$ bus for communication between EGOLD+ and Schalke-ASIC

## Switch on timing overview




## Switch off timing overview



## Battery

A Li-Ion battery with a nominal capacity of 540mAh is used for SL45.
A temperature sensor (NTC) is integrated to monitor the battery temperature.

**Notes**.

## Charging Concept

### General

To control the charging process a charging control unit consists of a Fast Charge Controller and a Trickle Charger is implemented. Existing of a internal current source, a temperature monitoring, a external charge-FET, a charge detector ( voltage level and/or charge current of an external charger supplied trickle charge circuit) and a detection of the charge current in 5 steps.
The charging control unit communication with the EGOLD+ is done via the $I^2C$ bus.

- CHARGE_µC: charge request input of the EGOLD+
- CHARGE: Open Drain, -300...-600µA
- TBAT: comparator input for temperature sensor of the battery
- REF_EXE: Reference voltage for temperature sensor
- VDD_CHARGE: Charger typ detector input, power supply for trickle charge
- SENSE_IN: Voltage input of external current sensor (with reference to AVDD)

With rising slope on CHARGE_µC the current source is switched on via a LOW active CHARGE signal and the Charge-FET is conductive.
Condition:

- CHARGE_µC is HIGH for min. 20µs
- temperature sensor detects no overhead
- No overvoltage on VDD.

With falling slope on CHARGE_µC the current source is switched off and the Charge-FET is locked.
Temperature sensor works by T>60°C.

### Fast charging

After connecting a charger and a battery voltage higher then 3,2 V the controller switches via a HIGH level of CHARGE_µC the charge-FET conductive, if the level of TBAT is > then the level of REF_EXE.
The charging current (and battery voltage) is controlled with the pulse duty factor of CHARGE_µC. The current flow can detected with the signal SENCE_IN, controlled via the $I^2C$ bus from the EGOLD+.

### 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 Schalke-ASIC controlles 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 Schalke-ASIC in this mode is the external charger. (VDD_CHARGE) This charging mode is not visible for the customer. IF the battery voltage reaches the 3,2V level the Schalke-ASIC switch into normal charge.

### Measurement of Battery and Ambient Temperature

The voltage equivalent of the temperature on the voltage divider is measured as the difference against a reference voltage of the EGOLD+. For this, the integrated ΣΔ converter of the EGOLD+ of the RX-I base band branch is used. Via an analog multiplexer, either the RX-I base band signal,(the battery temperature Voltage) or the ambient temperature voltage can be switched to the input of the converter. The 1-Bit current of the converter will be subjected to a data reduction via the DSP circuit so that the measured voltage (for battery and ambient temperature) will be available at the end as a 10-bit data word.

### Measurement of the Battery Voltage

Analog to the I-branch either the RX-Q base band signal or the battery voltage can be measured in the Q-branch. The processing in the DSP circuit is done similar to the I-branch. The EGOLD+ is specified for voltages measurements at the input pin N1 (VBAT) from 3V...5.5V.

### Timing of the Battery Voltage Measurement

Unless the battery is going to be charged, the measurements are made in the TX time slot. While charging the measurement is done after the TX time slot. At the same time, either the battery temperature (in the I-branch) and the battery voltage (in the Q-branch) or the ambient temperature in the I-branch can be measured
Other combinations are not possible. For the time of the measurement the multiplexer in the EGOLD+ must be programmed to the corresponding measurement.

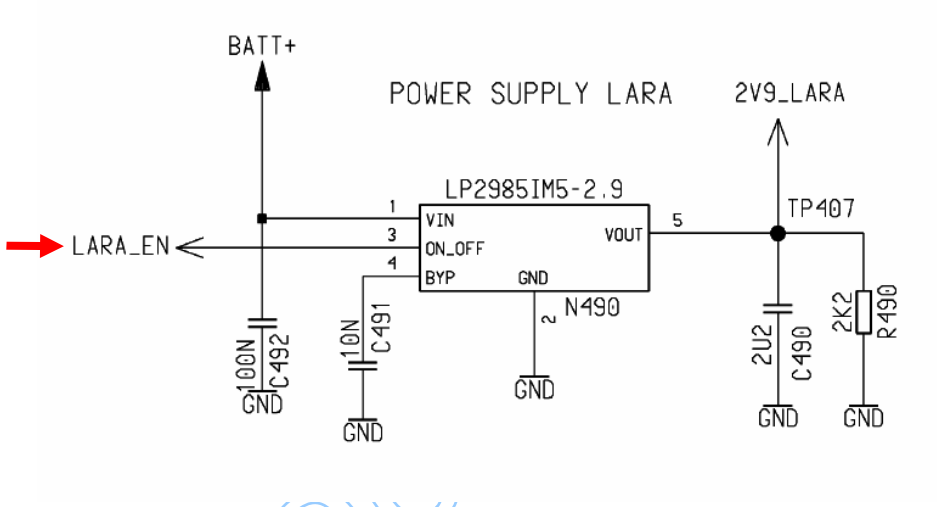
**Notes**

## 5.3. Power Supply MP3 (LARA)

A voltage regulator (N490) with a nominal output voltage of 2.9V is used, to perform the required MP3 (LARA) voltage.
The voltage regulator N490 is activated via MP3 (LARA) _EN provided by the EGOLD+ (**RF-Control L12**).

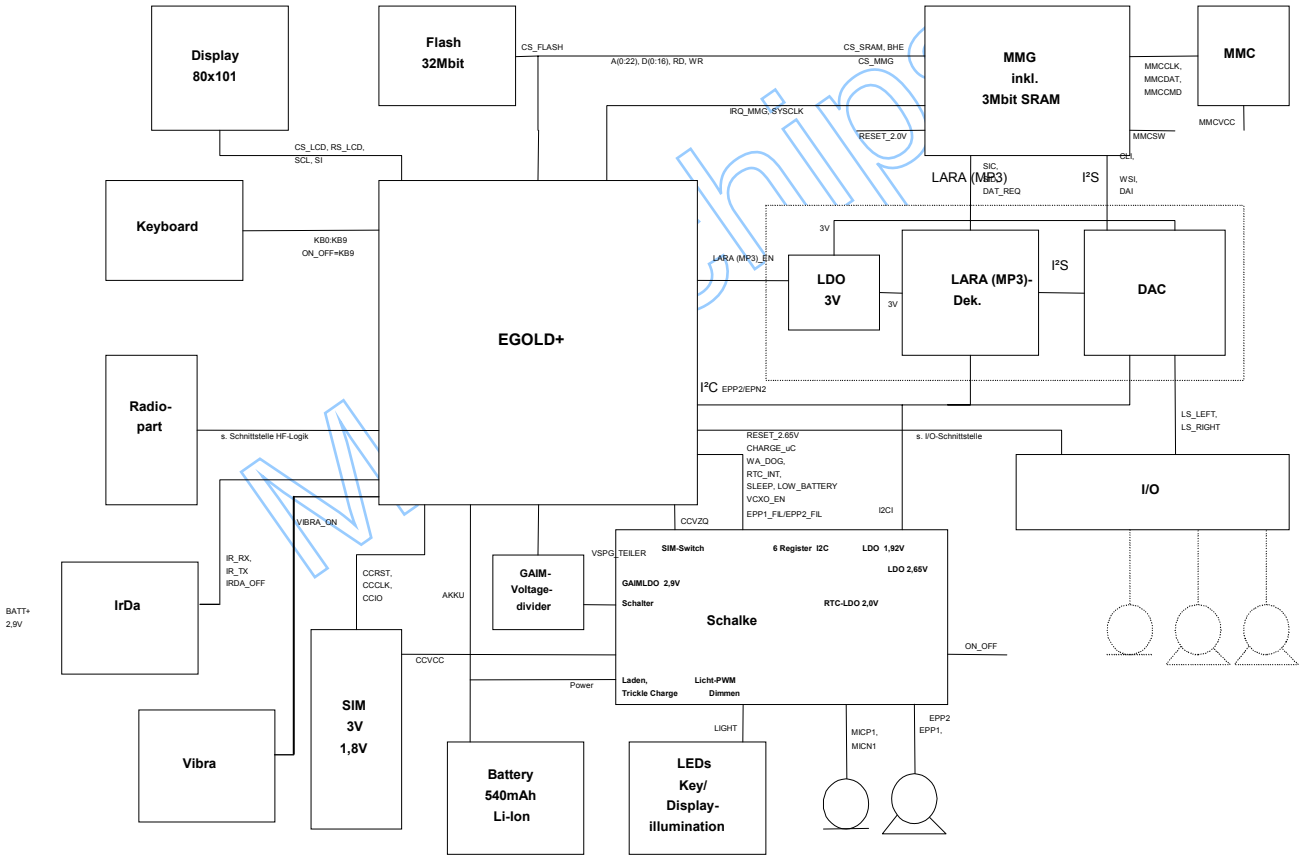
The name of the voltages is **2V9_MP3 (LARA)** activated by MP3 (LARA) _EN

For the voltage **BATT+** is required.

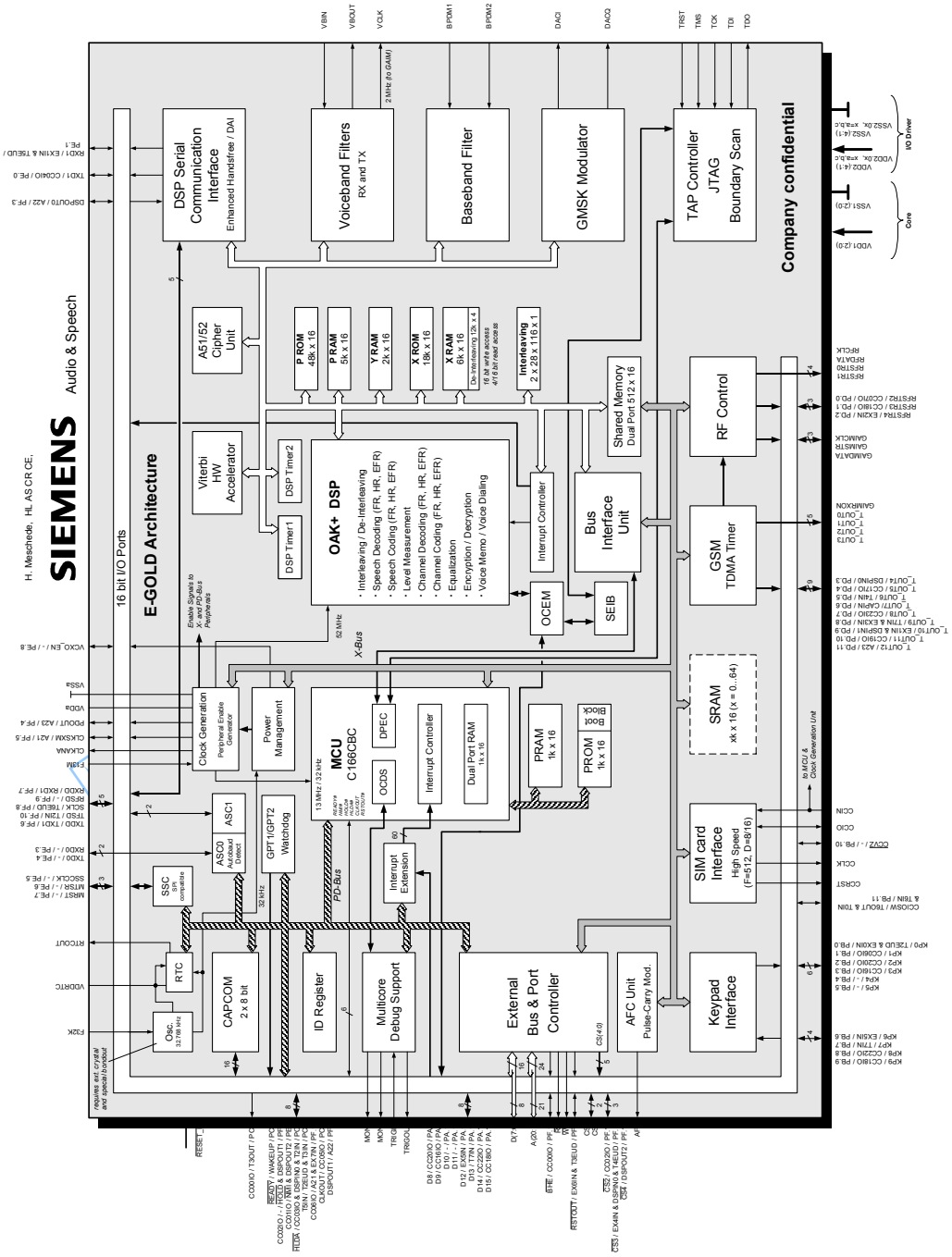


# 6.Logic Part

## 6.1. Overview Logic



## 6.2. Overview EGOLD+



The µC-part components

- Mikrocontroller
- Systeminterfaces for internal and external peripherals
- Onchip peripherals and memory chips

The Controller-Firmware:

- Controlling of the Man Machine Interface (Keypad, LCD, Illumination, ... )
- GSM Layer 1-3
- Controlling Radio part (Synthesizer, AGC, AFC, ...),
- Controlling of the Baseband part (EGAIM)

The SP-Part components

- DSP Signalprozessor

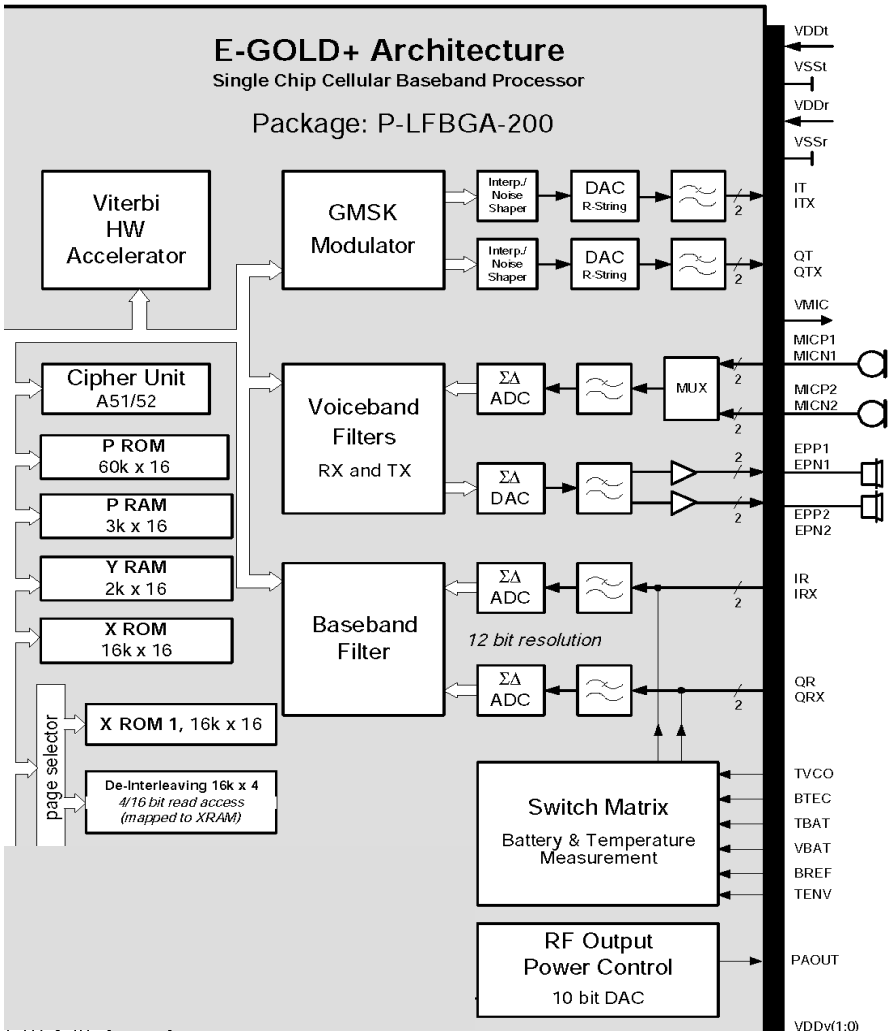
Die DSP-Firmware

- Equaliser
- Channel Coder
- Channel Decoder,
- Voice Encoder
- Voice Decoder

**Notes**

## 6.3. Overview EGAIM

**Notes**



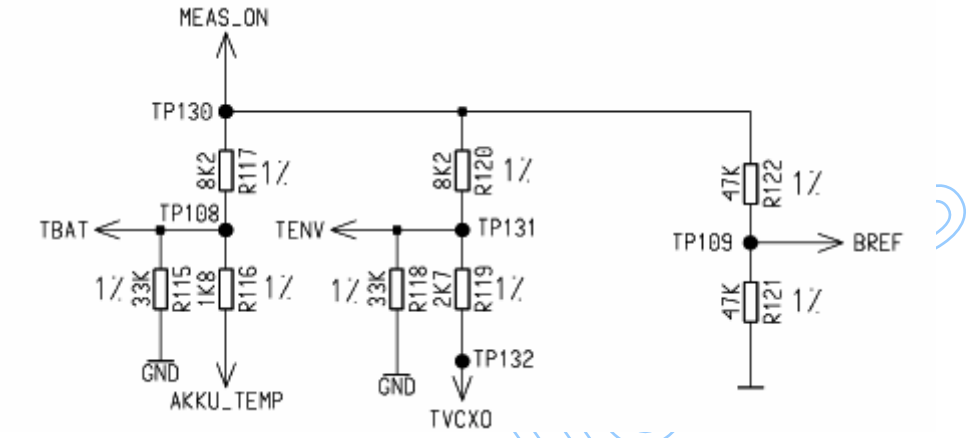

EGAIM inside the EGOLD+

This IC is the interface between digital and analogue signals.
EGAIM components

- 2 Sigma Delta A/D-converter for RX/Battery
- 2 D/A- converter for GMSK TX Inphase- und Quadratursignals,
- 1 D/A- converter for the Power Ramping signal,
- 1 Sigma Delta A/D- und D/A-converter for the voiceband part

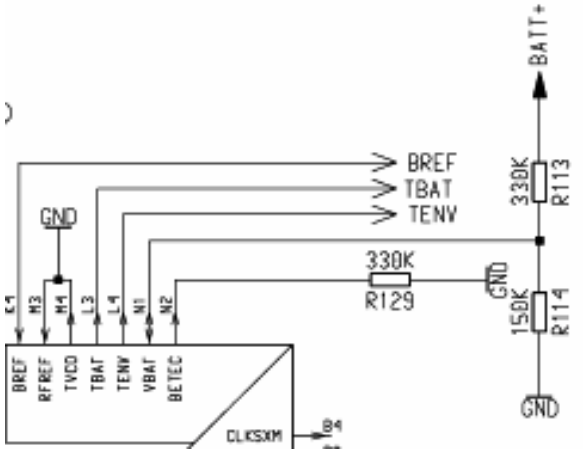
## a) Measurement of Battery and Ambient Temperature

The temperature is measured as a voltage equivalent of the temperature on the voltage dividers R115,R116,R117 for the battery temperature and R118,R119, R120 for the ambient temperature from the EGAIM.
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 R121,R122




## b) 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 R113, R114 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.




**Notes**

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

The Microphone signals (HF_MICRO, MICN2, MICP, MICN) 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 (IT, ITX, QT, QTX) are given to the SMARI IC (pins 9-12) in the transmitter path.

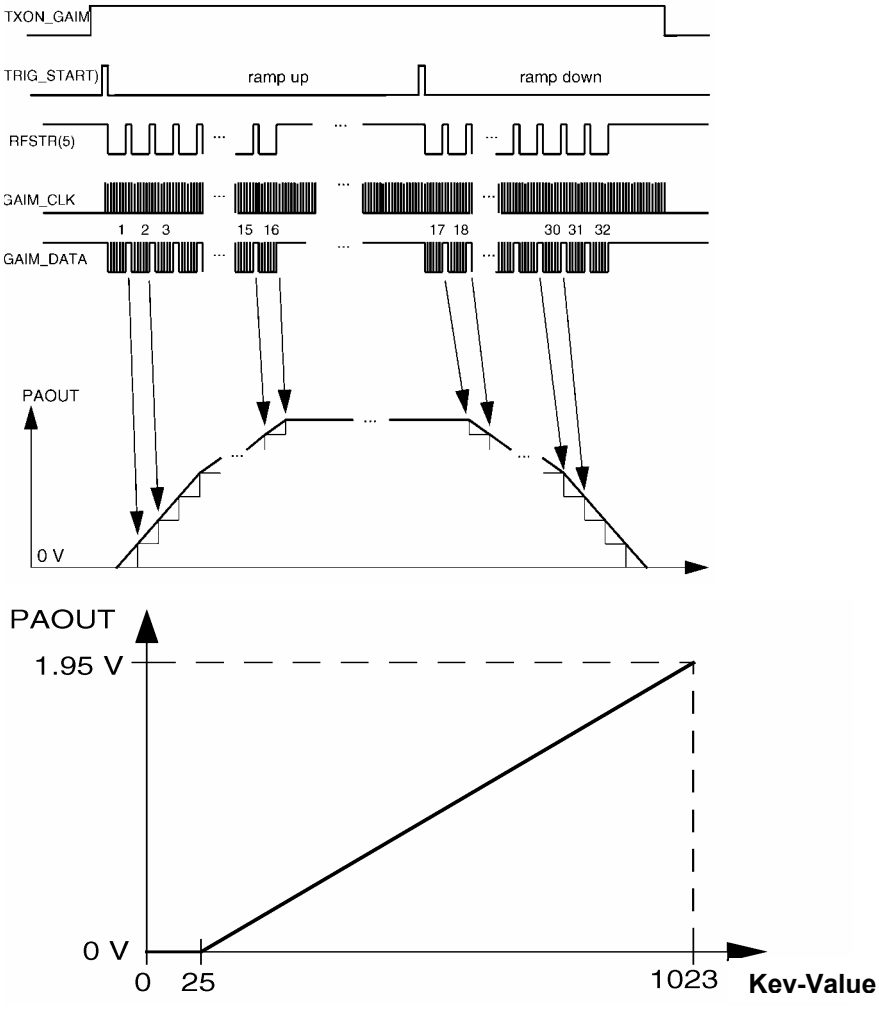
**Notes**

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

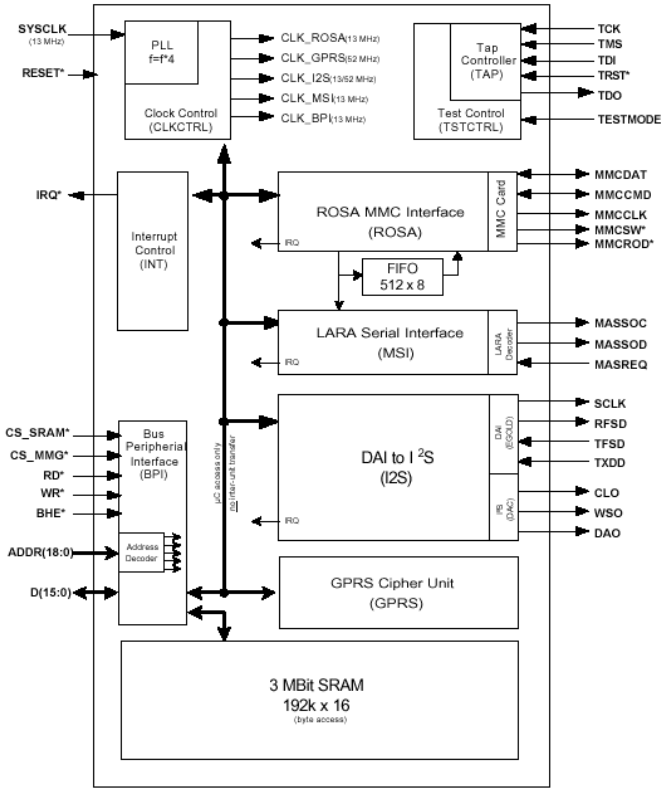
Arriving at the Baseband-Part the demodulated signals (RX_I, RX_IX, RX_Q, RX_QX) will be filtered and A/D converted. In the voiceband part after decoding (with help of the uC part) and filtering the signals will be D/A converted amplified and given as (EPP1, EPN1, EPP2, EPN2) to the internal earpiece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

### c) 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. Overview MMG ASIC




MMG-ASIC components

- Frequency generation
  The PLL generates a 52MHz signal based on the 13MHz-(output CLKSXM EGOLD+). The signal is the reference of all Clock and Timing signals of the ASIC.

- I²S-Interface:
  The interface modulate the data of the DAI-Interfaces (EGOLD+) into a $I^2S$-data format, used for the input of the stereo-D/A-converter in the DAC3550.

- MP3 (LARA) - Interface*:*
  Generate a MP3 (LARA) -data current. Conversation of parallel-/serial data of the 16bit-parallelbus

- MMC-Interface*:*
  Access to the MMC via serial HW-Interface. Control commands and data transmission from and to the EGOLD+.

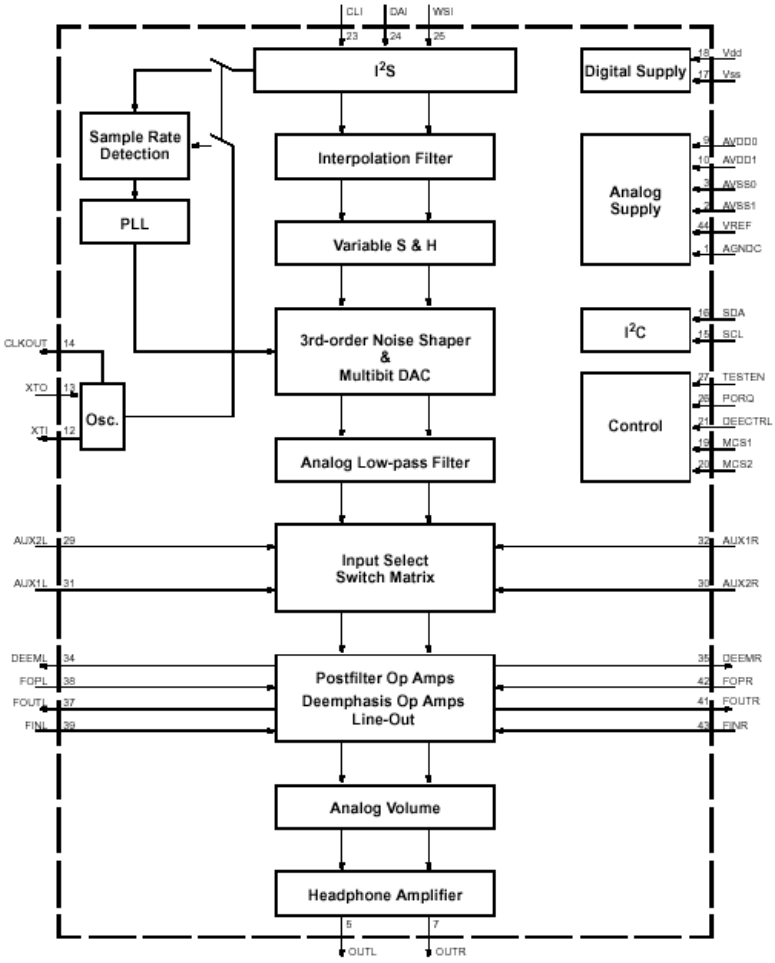
- 3MBit SRAM*:*
  SRAM implemented for write and read access.

**Notes**

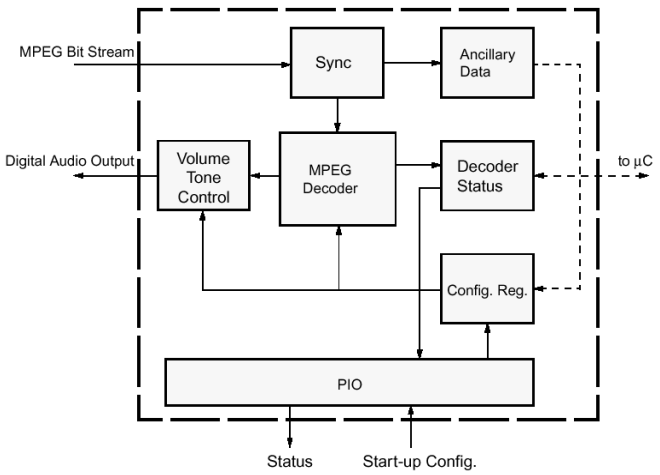
## 6.5. MP3 (LARA) HW components

- DAC3550

  Stereo-D/A-converter analogue - multiplexer are inside, for speech and MP3 (LARA) output. (not simultaneously). Loudness level adjusted via I²C.




- MAS3507
  Decoding off MP3 (LARA) data

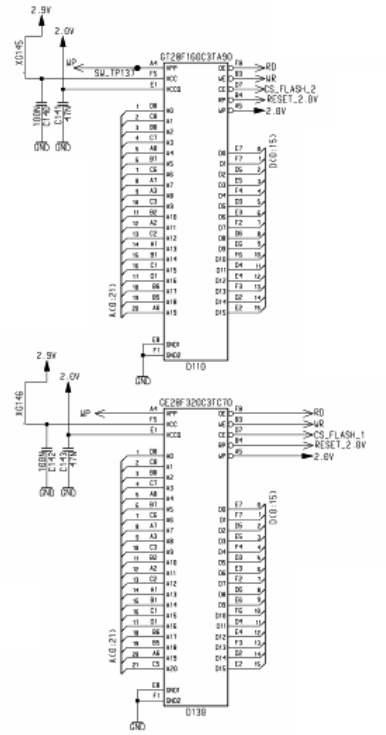



**Notes**

## 6.6. FLASH memory

Non volatile, but erasable and re-programmable (Software-Update) memory chip of the EGOLD+, also to save user data (menu settings), Voice Memo, adjustment values

**Notes**



## 6.7. Real time clock inside the EGOLD+

Real time clock, supplied from a voltage regulator inside the Schalke-ASIC. Also active when mobile phone is switched off. During battery change a capacitor (C258) as power supply is used for minimum 30 sec to save the stored data.

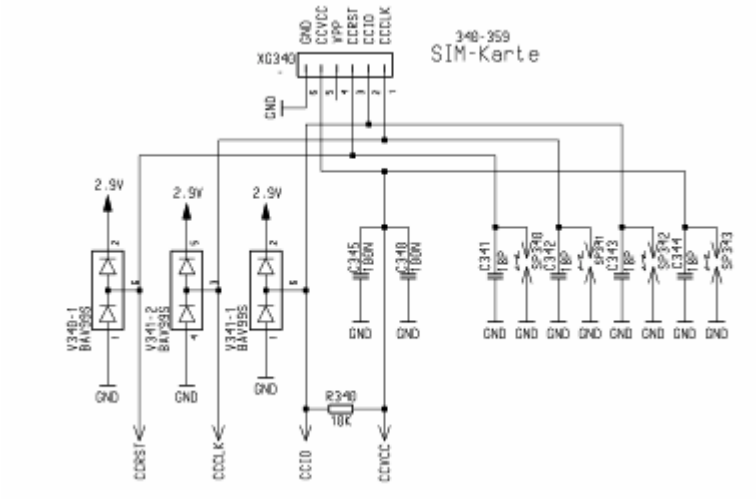
## 6.8. IrDA

Infrared diode for data transfer to standard IrDa devices.

## 6.9. SIM

SIM cards support of 1.8V and 3V cards.

**Notes**



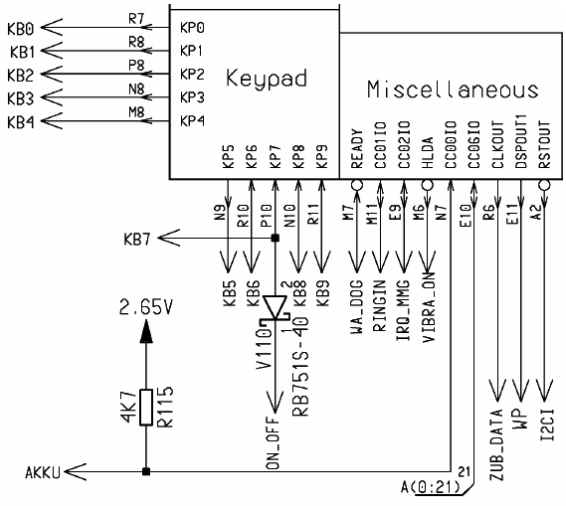

# 7. Acoustics

## 7.1. General

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

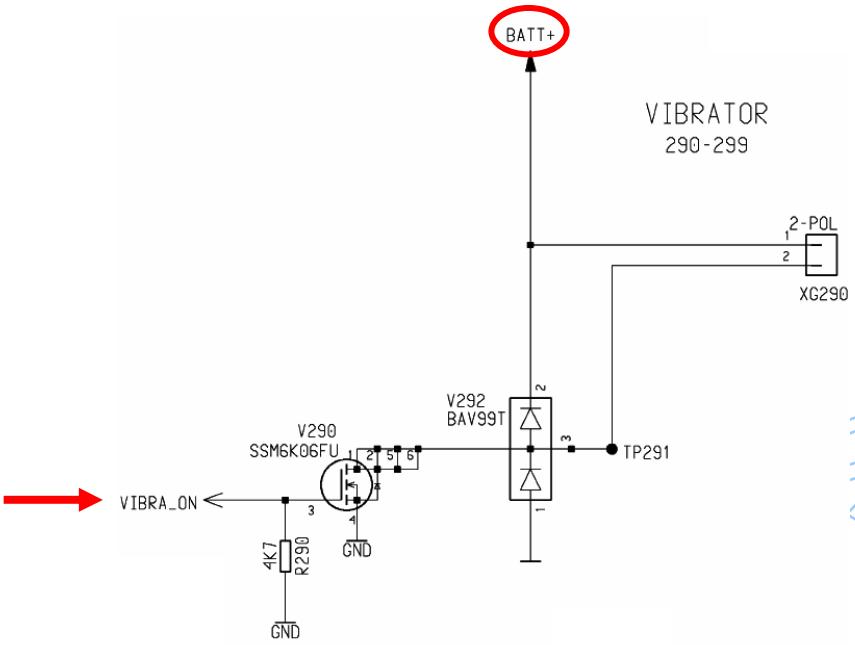
## 7.2. Vibra

The Vibra is driven and controlled from the EGOLD+ (**Miscellaneous M6**)via the signal Vibra_ON.



The vibrator is activated by the transistor V290 via the Signal Vibra_on from EGOLD+. Batt+ is required to provide the VIBRA. The diode V292 is used to protect the circuit against over voltage and switching spikes.

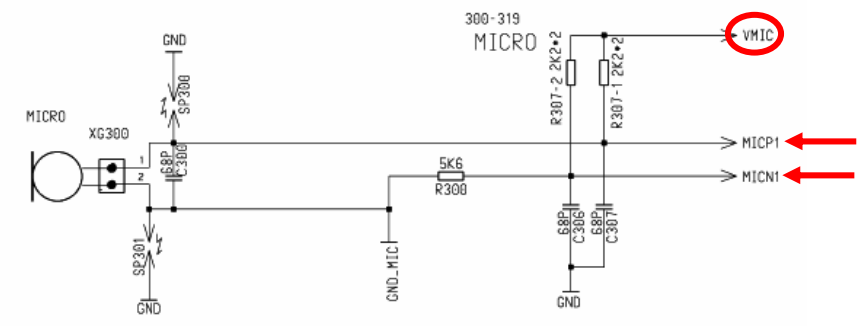
**Notes**




## 7.3. Microphone

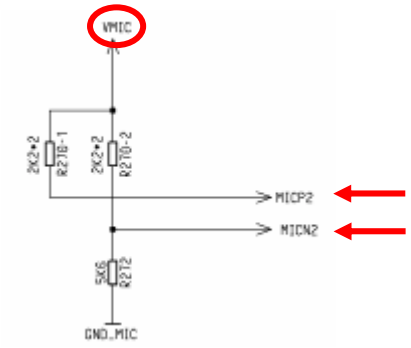
Both Microphones are direct connected to the EGOLD+.(**Voiceband F1-F4**) via the signals MICN1, MICP1 (Internal Microphone )and MICN2, MICP2 (External Microphone/Headset). Power supply for the Microphone is VMIC (**Voiceband E1**)

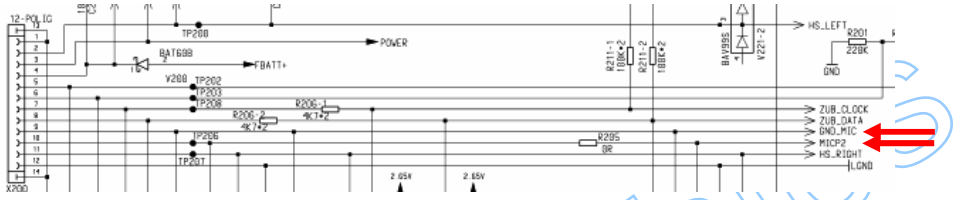
Internal Microphone



External Microphone

**Notes**

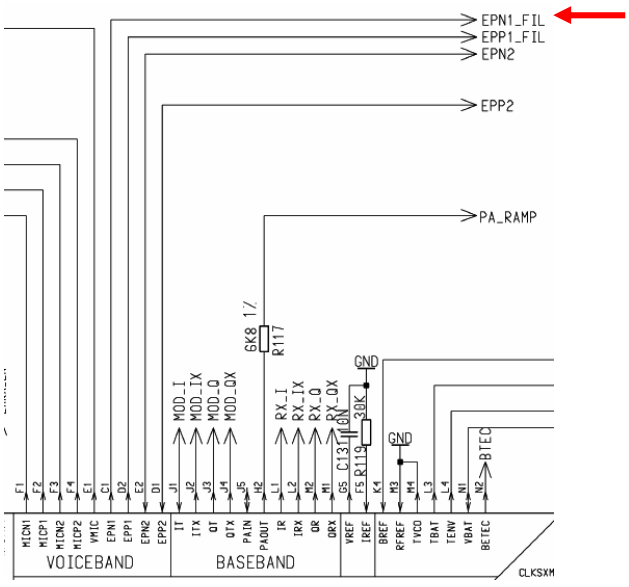



## 7.4. Loudspeaker

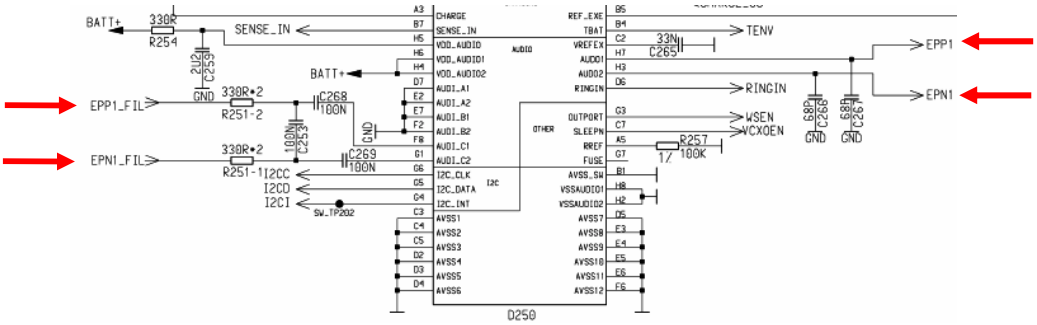
The internal Loudspeaker (Earpiece) is connected to the voiceband part of the EGOLD+ (**VOICEBAND C1,D2**) via the mono audio amplifier inside the Schalke-ASIC. Also the ringing tones are generated with the loudspeaker.

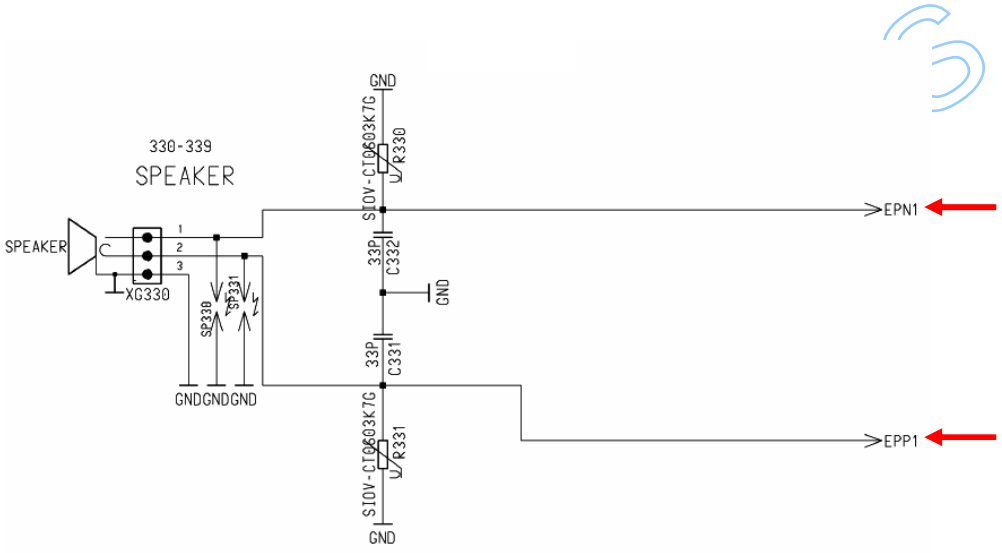
Signal names: EGOLD+ - Schalke-ASIC EPN1_FIL - EPP1_FIL



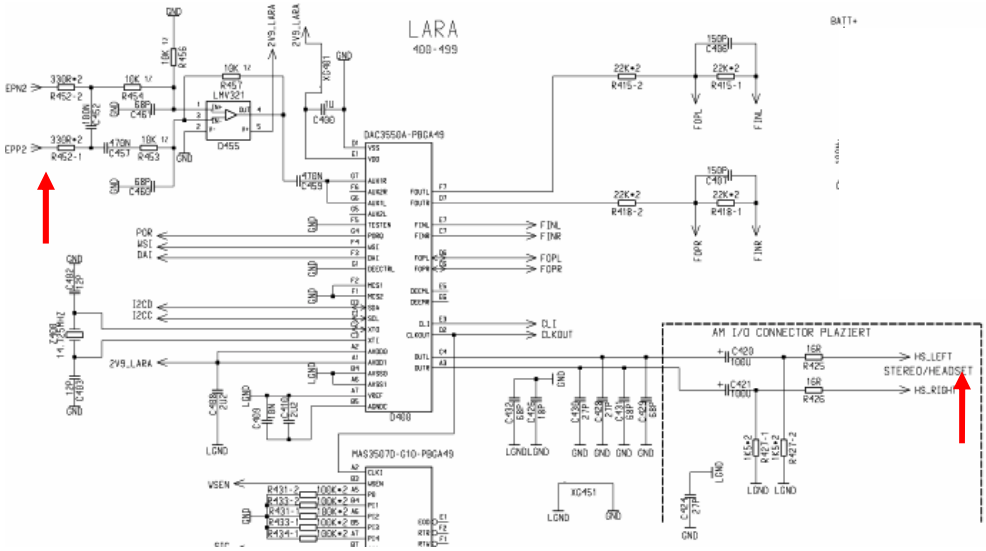
Signal names: Schalke-ASIC - Speaker EPP1 - EPN2

**Notes**



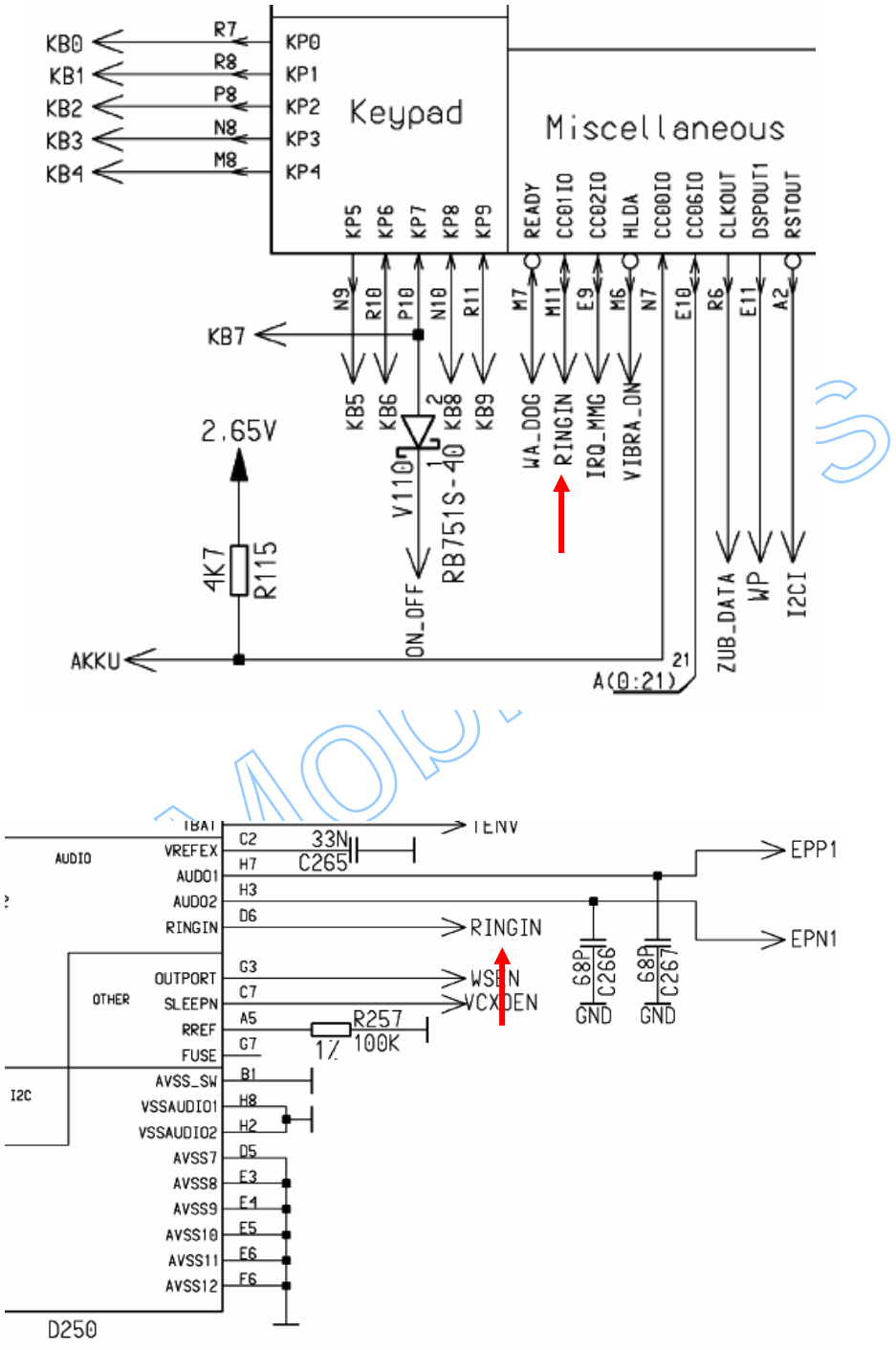




The external Loudspeaker (Headset) is connected to the voiceband part of the EGOLD+ (**VOICEBAND D1,E2**) (EPN/EPP2)via the Stereo-D/A-converter analogue - multiplexer inside the DAC3550.(HS_LEFT/HD_RIGHT)



The SL45 has no ringer component. Responsible for the audio output of the ringer tones is the loudspeaker. The ringer tones are generated by a signal RINGIN from the EGOLD+ (**Miscellaneous M11**). This signal goes to the mono audio amplifier inside the Schalke-ASIC.

**Notes**

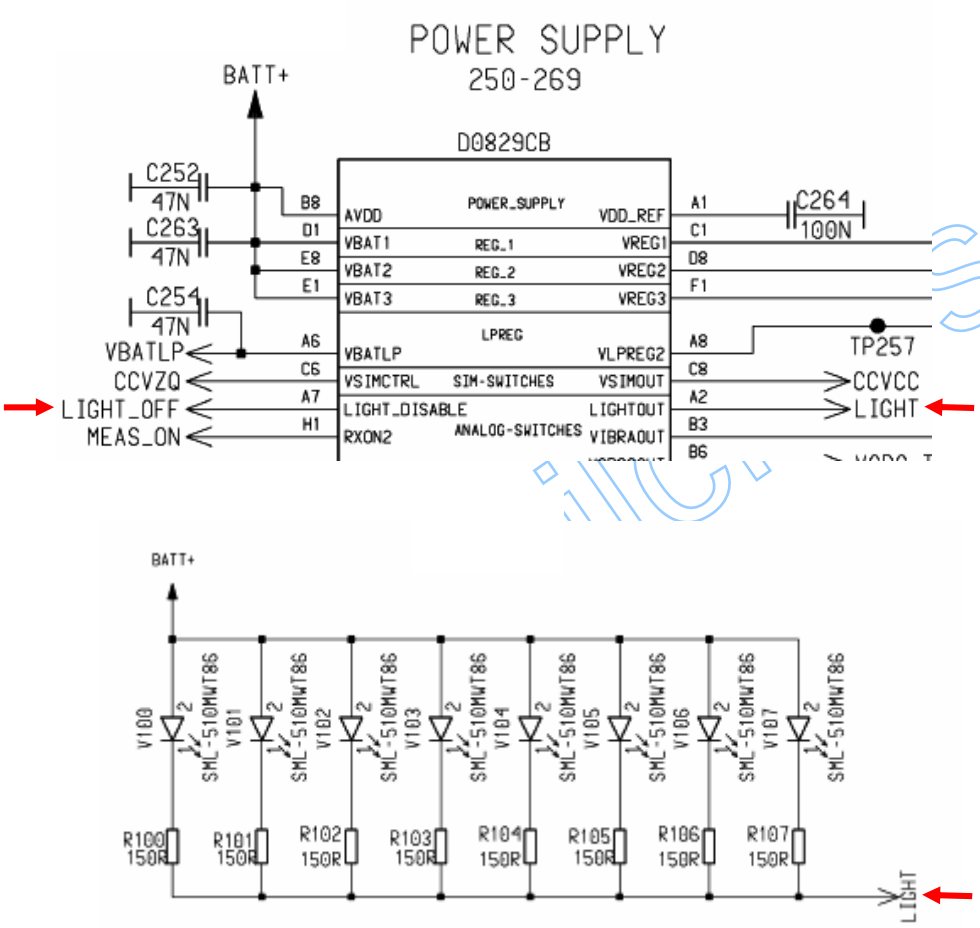


# 8.Illumination and keyboard:

## 8.1. Illumination

The Light is switched via an analogue switch inside the Schalke-ASIC. It is controlled from the EGOLD+ with the signal LIGHT_OFF. Output is the signal LIGHT which is connected via the MMI connector the LEDs.

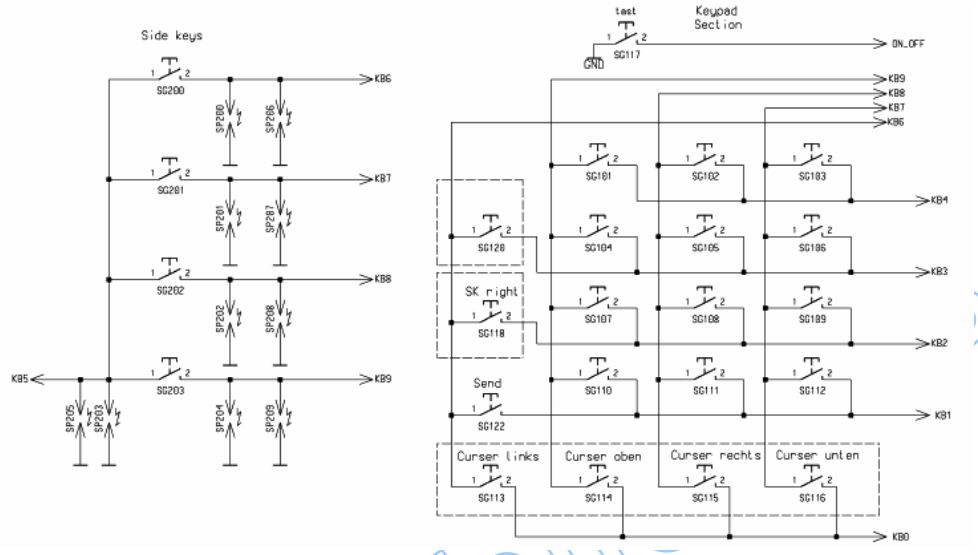
**Notes**



## 8.2. Keyboard

The keyboard lines are via MMI connector linked to the EGOLD+ (**Keybad R7/R8/P8/N8/M8/N9/R10/P10/N10/R11**). KB (keyboard line ) 0 to 5 are outputs, KB 6 to 9 inputs. To make a short cut from an output to an input line with the keypad the EGOLD+ registered with key is pressed.

**Notes**



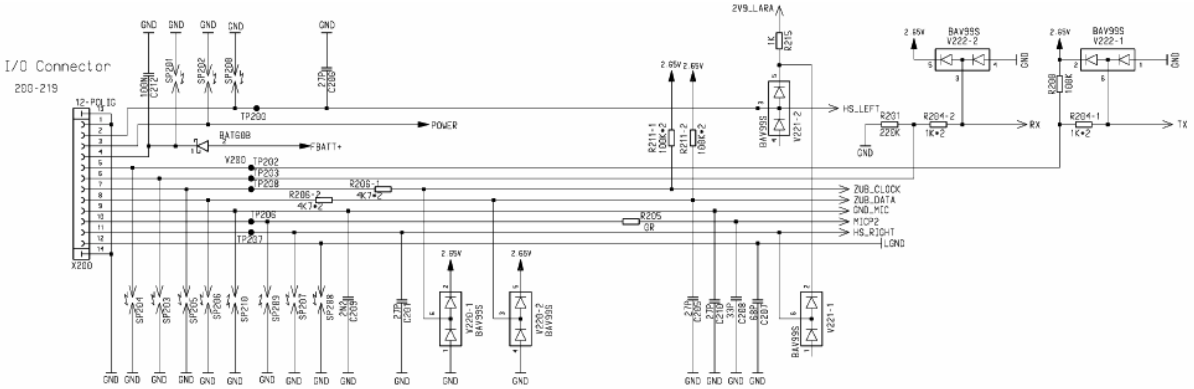
# 9. Connectors

## 9.1 I/O connector

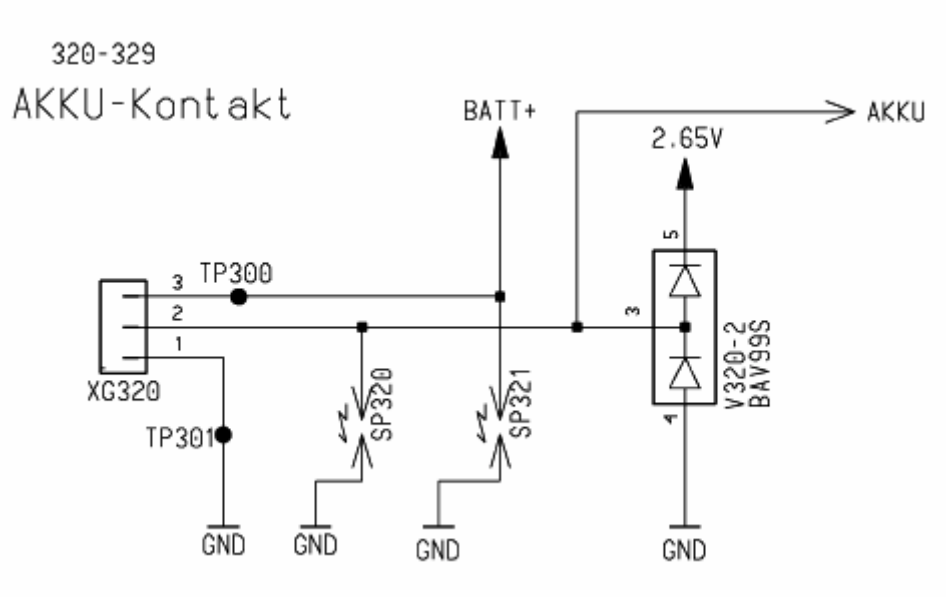
**Notes**

| Pin | Name | IN/OUT | Notes |
|---|---|---|---|
| 1 | GND | | |
| 2 | HS_LEFT | I/O | Output left channel for stereo-headset. |
| 3 | POWER | I | Charging Current |
| 4 | FBatt+ | O | Power supply for the accessories. |
| 5 | TX | O | Serial interface |
| 6 | RX | I | Serial interface |
| 7 | ZUB_CLK | I/O | Clock line for accessory bus<br>Use as DTC In data operation |
| 8 | ZUB_DATA | I/O | Data line for accessory bus.<br>Use as CTS in data operation |
| 9 | GND_MIC | | For external microphone |
| 10 | MICP2 | I | External microphone |
| 11 | HS_RIGHT | O | Output right channel for stereo-headset |
| 12 | LGND | | For external loudspeaker |



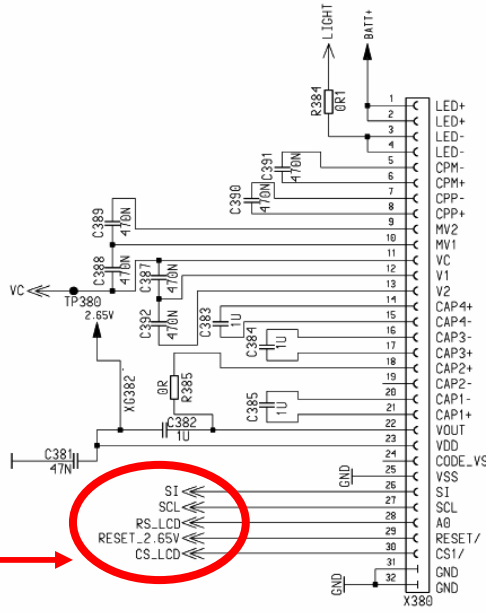


## 9.2 Battery connector



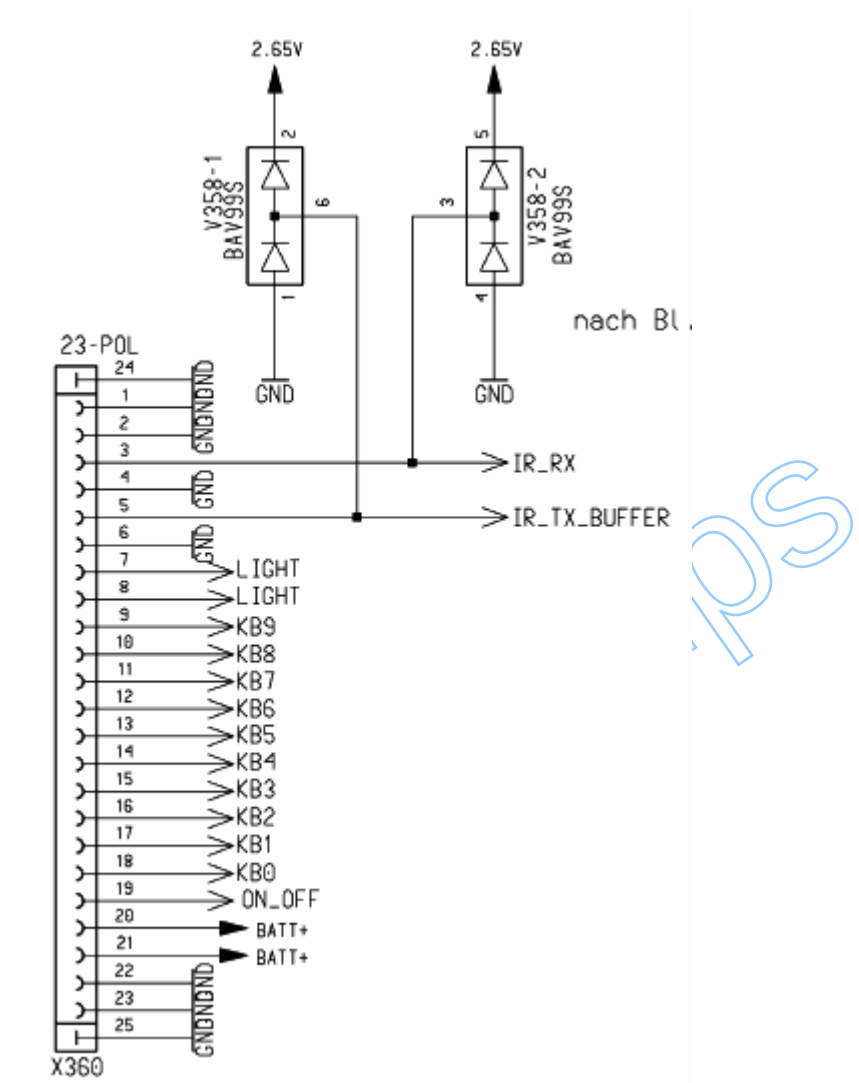

| Pin | Name | IN/OUT | Notes |
|---|---|---|---|
| 1 | GND | | |
| 2 | Akku_Temp | O | Temperature control of the battery pack. |
| 3 | POWER + | I/O | Battery voltage |

## 9.3 Display connector



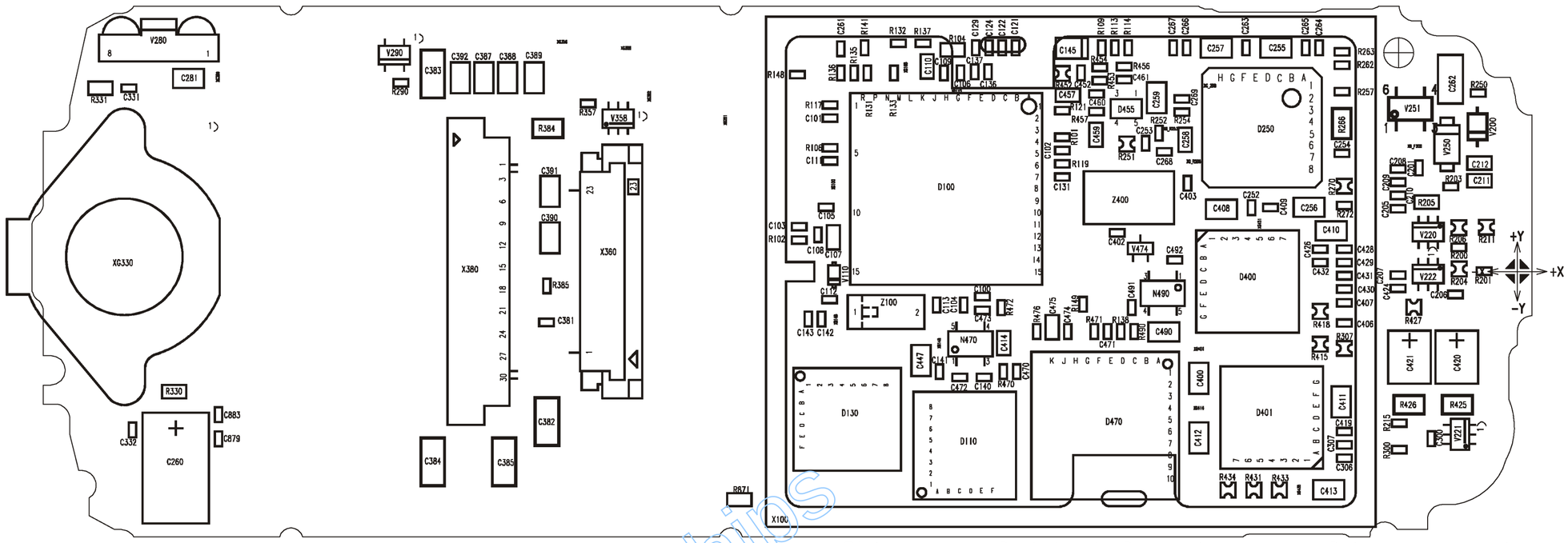

Connection Egold+ to Display-Controller

## 9.4 MMI connector




| Function | Names |
|---|---|
| ILLUMINATION | Light |
| KEYBOARD | KB0 – KB9 / ON_OFF |
| IrDA INTERACE | IR_RX / IR/TX_BUFFER |
| BATTERY VOLTAGE | BATT+ |

Einbaulage des Schirmrahmen beachten !




1) ABC Einbaulage der Bauteile im Bauschaltplan durch Balken gekennzeichnet.
am Bauteil durch Text gekennzeichnet.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C100 | 7B | C206 | 9B | C307 | 9B | C421 | 9B | D250 | 9A | R201 | 9B | R426 | 9B | X360 | 5B |
| C101 | 6A | C207 | 9B | C331 | 2A | C424 | 9B | D400 | 8B | R203 | 9A | R427 | 9B | X380 | 4A |
| C102 | 7A | C208 | 9A | C332 | 2B | C426 | 9B | D401 | 9B | R204 | 9B | R431 | 8C | Z100 | 6B |
| C103 | 6B | C209 | 9A | C381 | 5B | C428 | 9B | D455 | 8A | R205 | 9A | R433 | 8C | Z400 | 7A |
| C104 | 7B | C210 | 9A | C382 | 5B | C429 | 9B | D470 | 8B | R206 | 9B | R434 | 8C | | |
| C105 | 6A | C211 | 10A | C383 | 4A | C430 | 9B | N470 | 7B | R211 | 10B | R452 | 7A | | |
| C106 | 7A | C212 | 9A | C384 | 4B | C431 | 9B | N490 | 8B | R215 | 9B | R453 | 7A | | |
| C107 | 6B | C252 | 8B | C385 | 4B | C432 | 9B | R101 | 7A | R250 | 9A | R454 | 7A | | |
| C108 | 6B | C253 | 8A | C387 | 4A | C447 | 7B | R102 | 6B | R251 | 8A | R456 | 8A | | |
| C109 | 7A | C254 | 9A | C388 | 4A | C452 | 7A | R104 | 7A | R252 | 8A | R457 | 7A | | |
| C110 | 7A | C255 | 8A | C389 | 4A | C457 | 7A | R106 | 6A | R254 | 8A | R470 | 7B | | |
| C111 | 6A | C256 | 9A | C390 | 5B | C459 | 7A | R109 | 7A | R257 | 9A | R471 | 7B | | |
| C112 | 6B | C257 | 8A | C391 | 5A | C460 | 7A | R113 | 8A | R262 | 9A | R472 | 7B | | |
| C113 | 7B | C258 | 8A | C392 | 4A | C461 | 8A | R114 | 8A | R263 | 9A | R476 | 7B | | |
| C121 | 7A | C259 | 8A | C400 | 8B | C470 | 7B | R117 | 6A | R266 | 9A | R490 | 8B | | |
| C122 | 7A | C260 | 3B | C402 | 8B | C471 | 8B | R119 | 7A | R270 | 9A | R871 | 6C | | |
| C124 | 7A | C261 | 6A | C403 | 8A | C472 | 7B | R121 | 7A | R272 | 9A | V110 | 6B | | |
| C129 | 7A | C262 | 9A | C406 | 9B | C473 | 7B | R131 | 6A | R290 | 4A | V200 | 9A | | |
| C131 | 7A | C263 | 8A | C407 | 9B | C474 | 7B | R132 | 6A | R300 | 9B | V220 | 9B | | |
| C136 | 7A | C264 | 9A | C408 | 8A | C475 | 7B | R133 | 6A | R307 | 9B | V221 | 9B | | |
| C137 | 7A | C265 | 9A | C409 | 8A | C490 | 8B | R135 | 6A | R330 | 3B | V222 | 9B | | |
| C140 | 7B | C266 | 8A | C410 | 9B | C491 | 8B | R136 | 6A | R331 | 2A | V250 | 9A | | |
| C141 | 7B | C267 | 8A | C411 | 9B | C492 | 8B | R137 | 7A | R357 | 5A | V251 | 9A | | |
| C142 | 6B | C268 | 8A | C412 | 8B | C879 | 3B | R138 | 8B | R384 | 5A | V280 | 3A | | |
| C143 | 6B | C269 | 8A | C413 | 9C | C883 | 3B | R141 | 6A | R385 | 5B | V290 | 4A | | |
| C145 | 7A | C281 | 3A | C414 | 7B | D100 | 7A | R148 | 6A | R415 | 9B | V358 | 5A | | |
| C201 | 9A | C300 | 9B | C419 | 9B | D110 | 7B | R149 | 7B | R418 | 9B | V474 | 8B | | |
| C205 | 9A | C306 | 9B | C420 | 9B | D130 | 6B | R200 | 9B | R425 | 9B | X100 | 6C | | |





Achtung : Hoehenprofil C24___-___-___-__-42 (gilt nur fuer Entwicklung)
Liefervarianten siehe : V24851-Z2000-A1-*-35

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Datum | 31.01.2001 | U35M<br>HIT/neues Display<br>Bauschaltplan (Loetseite 1)<br>WIRING DIAGRAMM (SOLDER SIDE 1) | 3:1 |
| | | | | Bearb | Bartenschl. | | |
| | | | | Gepr. | | | |
| | | | | Norm | | | |
| | | | | D MP RD MC73 | | | |
| 3 | N220-J29-3 | 08.08.01 | bar | Siemens AG | | T30880-Q4800-C1-*-7402 | Blatt 1+ |
| 2 | N141-J29-4 | 21.05.2001 | bar | | | | |
| 1 | N31-J29-3 | 31.01.2001 | bar | | | | |
| Zust. | Mitteilung | Datum | Name | | | | |

PMB6850V1.3M37

GSM TDMA-Timer | RF-Control | VOICEBAND | BASEBAND | GAIM

Digital VDD | Analog VDD | Debug & JTAG | Functional | SIM | Keypad | Miscellaneous | Adress- & Data-Bus | Digital VSS | Analog VSS | Serial-Interface SXm- | Adress- & Data-Bus

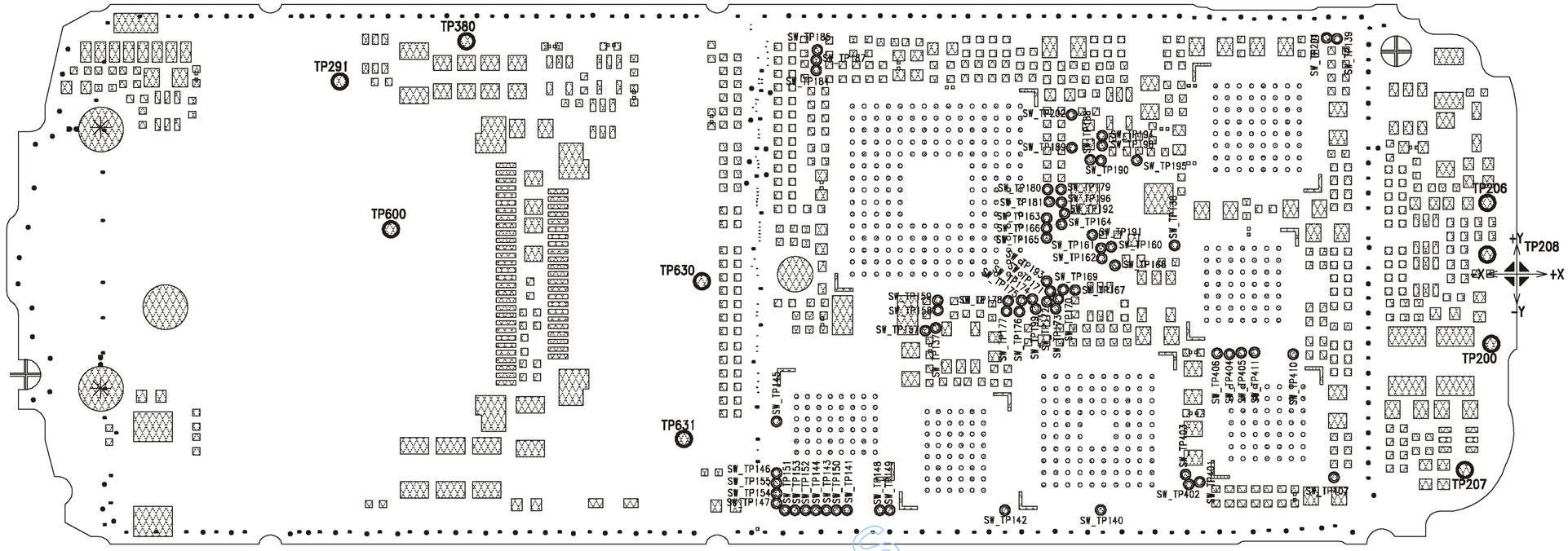
GT28F160C3TA90 | GE28F320C3TC70

SHIELDING/LOGIC

SUPPORT PIN/DISPLAY



| | | | | | |
|---|---|---|---|---|---|
| | | | | Datum 31.01.2001 | U35M HIT/neues Display Schaltplan SCHEMATIC | 1:1 |
| | | | | Bearb Bartenschl. | | |
| | | | | Gepr. | | |
| | | | | D MP RD MC73 | | |
| 3 | N220-J29-3 | 08.08.01 | bar | Siemens AG | A30880-Q4800-C1-*-7411 | Blatt/SHEET 1+ |
| 2 | N141-J29-4 | 21.05.2001 | bar | | | |
| 1 | N31-J29-3 | 31.01.2001 | bar | | | |
| Zust | Mitteilung | Datum | Name | | | |




| | |
|---|---|
| TP200 | 9B |
| TP206 | 9A |
| TP207 | 9B |
| TP208 | 9A |
| TP291 | 3A |
| TP380 | 4A |
| TP600 | 3A |
| TP630 | 5B |
| TP631 | 5B |



# Confidential





| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Datum | 27.04.2000 | U35M<br>B2/HIT<br>Testpunktplan (Loetseite 1)<br>TEST POINT DIAGRAMM (SIDE 1) | 3:1 |
| | | | | Bearb | Bartenschl. | | |
| | | | | Gepr. | | | |
| | | | | Norm | | | |
| 4 | M220-J29-6 | 12.08.00 | bar | CD GSM MP RD M | | | |
| 3 | M203-J29-1 | 21.07.00 | bar | Siemens AG | | A30880-Q4800-B1-*-7471 | Blatt 1+ |
| 2 | M166-J29-1 | 21.06.00 | bar | | | | |
| 1 | M105-J29-1 | 27.04.2000 | END | | | | |
| Zust. | Mitteilung | Datum | Name | | | | |