

## Theory of operation

## Vocabulary

MS	= Mobile Station
E-GSM	= Enhanced Global System for Mobile communications
GSM	= Global System for Mobile communications
HW	= Hardware (drivers)
RAM	= Random-Access Memory
ROM	= Read-Only Memory
PWB	= Printed Wiring Board
SW	= Software
RF	= Radio Frequency
BB	= BaseBand

## Technical Summary

The NPM-8 is a dual band radio transceiver for GSM 850 and GSM1900 networks. The transceiver is a power class 4 unit providing 15 power levels with the highest power level 5 for GSM850 networks and is a power class1 unit providing 16 power levels with highest power level 0 for GSM1900 networks. The transceiver is a true 3 Volt transceiver. The transceiver has Full rate (FR) and Enhanced Full Rate (EFR) speech codecs.

The transceiver has one PWB structure which uses ground planes inside PWB as shielding between different modules.

The transceiver has full graphic display and soft key based user interface.

Transceiver uses internal integrated antenna. There is no external antenna connection.

The transceiver has leak tolerant earpiece and OMNI type microphone.

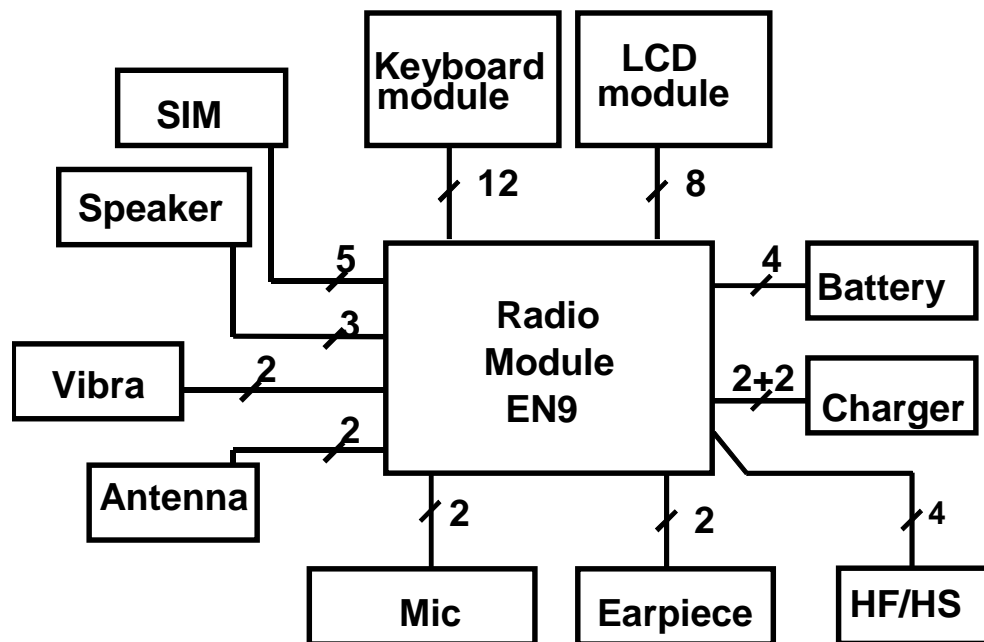
## **Circuit Description**

The EN-9 engine consists one PWB with BB/RF parts on the backside and UI parts on the front side of the PWB. Ground planes inside the PWB are used as shielding between UI and RF/BB module. Different modules are interconnected with PWB wiring. The phone can be connected to accessories via the charger connector and the headset connector at the bottom of the phone.

The RF submodule receives and demodulates radio frequency signals from the base station and transmits modulated RF signals to the base station. It consists of functional submodules Receiver, Frequency Synthesizer and Transmitter.

The Baseband module contains audio, control, signal processing and power supply functions.

Interconnection Diagram

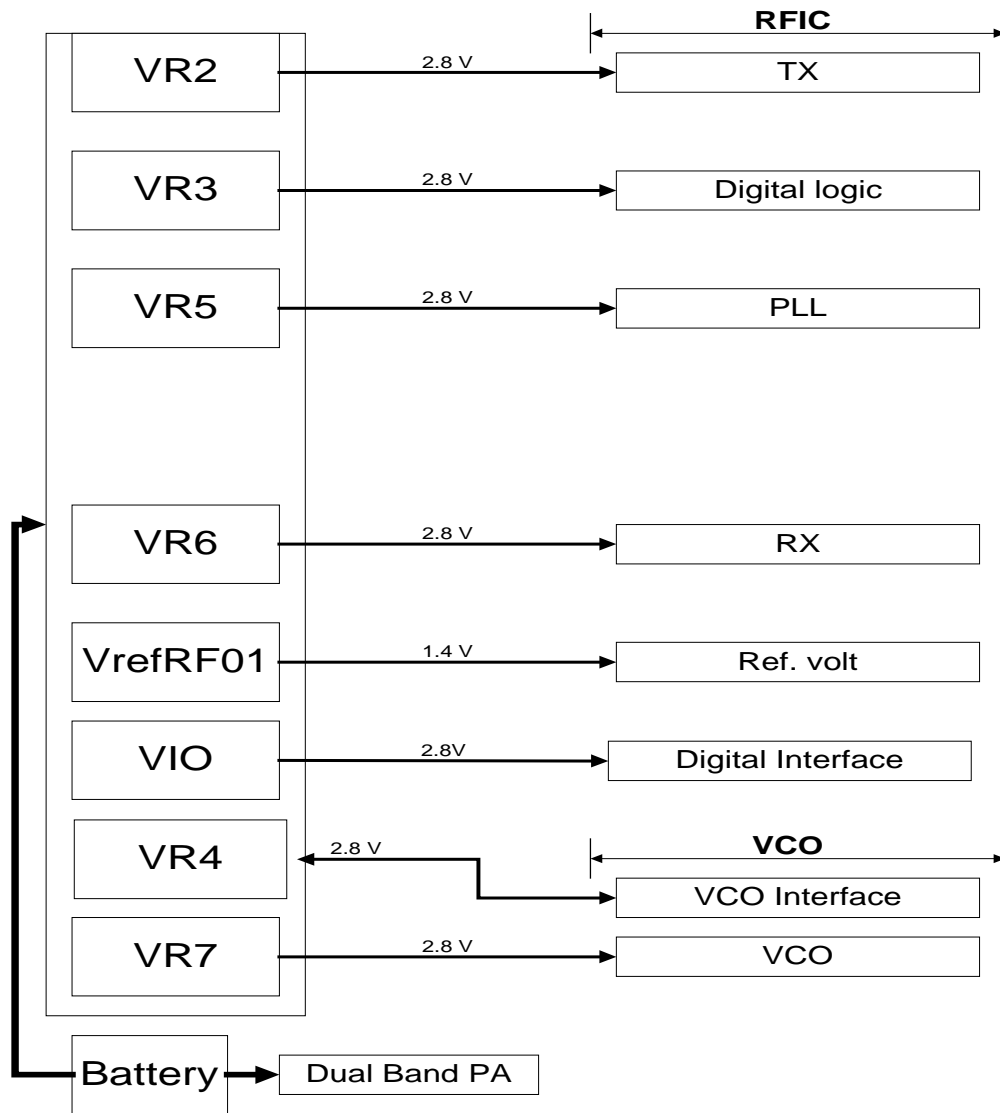


**Basic Specifications**

Table 1. Basic Specifications

<b>Parameter</b>	<b>GSM850</b>	<b>GSM1900</b>
Cellular system	GSM850	GSM1900
TX frequency band	824.2 ... 848.8 MHz	1850.2 ... 1909.8 MHz
RX frequency band	869.2 ... 893.8 MHz	1930.2 ... 1989.8 MHz
Duplex spacing	45 MHz	80 MHz
Number of RF channels	124	299
Channel spacing	200 kHz	200 kHz
Power class	4	1
Power levels	15	16
Method of frequency synthesis	Digital phase locked loop UHF 3300 ... 3580 MHz	Digital phase locked loop UHF 3700 ... 3980 MHz
Frequency control	26 MHz VCXO: AFC used	26 MHz VCXO: AFC used
Receiver type	Direct conversion	Direct conversion
Modulator type	GMSK	GMSK

### Power Distribution Diagram



## Technical Specifications

### Modes of Operation

NPM-8 operates in cellular mode and a local mode for service:

- Normal mode, the phone is controlled by Cellular System SW and partly by basestation
- Local mode, used by Production and After Sales.

#### Normal Mode

In Normal mode, the phone performs all the tasks to place and release calls. Also charging and communication between accessories and phone are done during this mode by Operating System SW. Signaling and handover functions are supported by basestation.

#### Power off

In the power-off mode only the regulator IC is active. Power-off mode can be left by ⓪pushing the -key, connecting charger to the phone, real time clock interrupt or intelligent battery interrupt.

#### Idle / standby

The phone is in SERV-state listening to the network and waiting for the page.

#### Call

The phone call is going on and during most of the time all RF- and BB-parts are on. Separate parts are turned off when they are not needed in order to save power.

#### Local Mode

Local mode is used for testing purposes by Product Development, Production and After Sales. The Cellular Software is stopped (no signalling to base station), and the phone is controlled by MBUS/FBUS messages by the controlling PC.