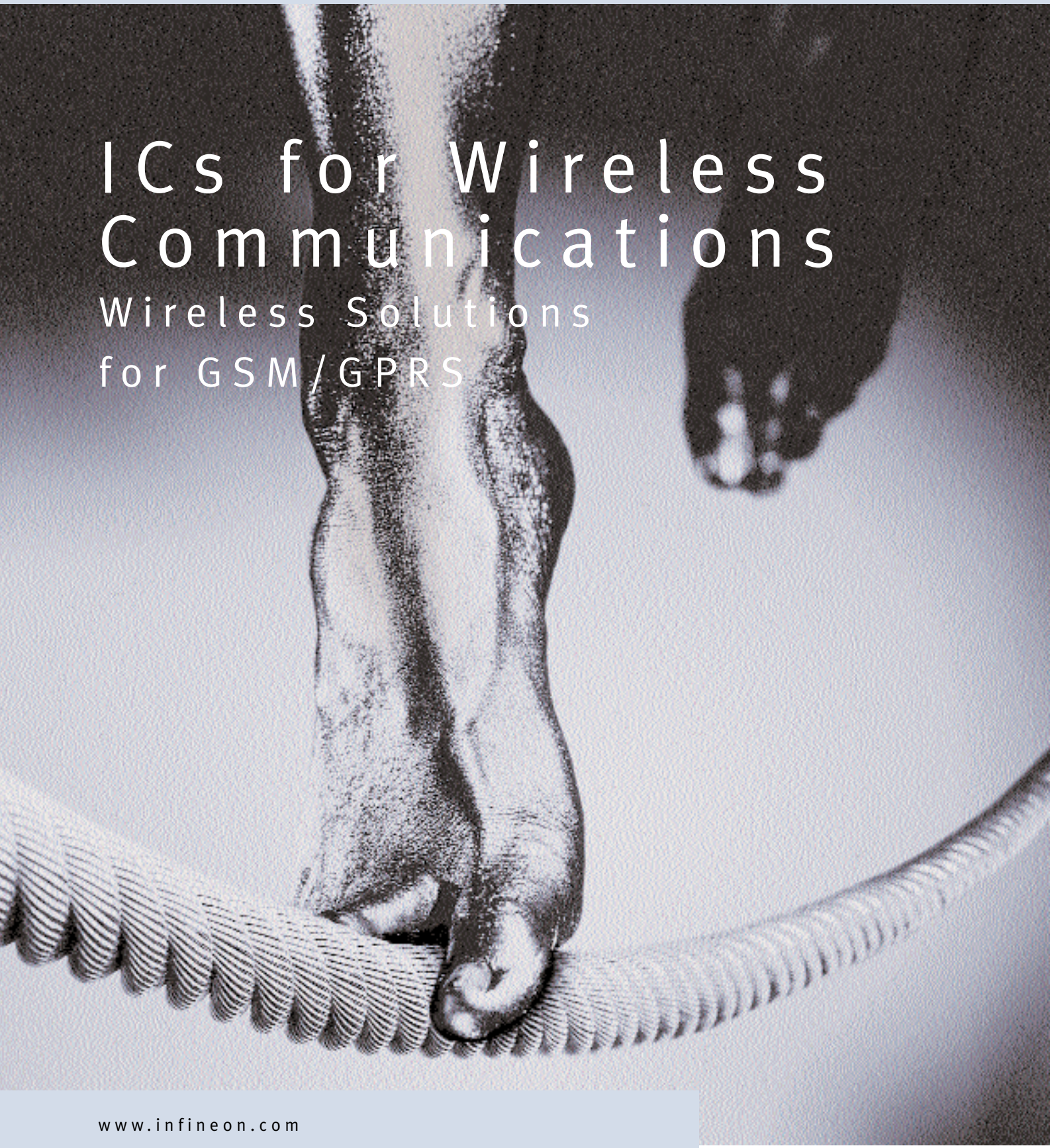


ICs for Wireless Communications

Wireless Solutions for GSM/GPRS

www.infineon.com

Infineon technologies

Never stop thinking.

CONTENTS

1. INTRODUCTION

1.1 E-GOLD+ V2 AND E-GOLD+ V3, THE NEW STARS WITHIN THE E-GOLD STANDARD

Infineon Technologies, the leading supplier of standard GSM, EDGE, and 3G/UMTS solutions, is setting another benchmark with its new E-GOLD+ V2 and E-GOLD+ V3 ICs, the newest members of the very successful and proven GOLD product family.

DUE TO RAPIDLY growing demand within the GSM mobile market and increasing competition, the handset manufacturer is forced to look for increasingly aggressive solutions regarding board space, power consumption, new features, bill of materials and overall development costs.

THE E-GOLD+ family is made up of 0.13 µm (effective) single chip mixed signal baseband ICs. Family members provide ideal solutions for multifaceted market demands. Their high level of integration reduces system complexity, component count and board space. In response to the increasing demand for multi-slot operations, the E-GOLD+ products implement High-Speed Circuit-Switched Data (HSCSD) and General Packet Radio Service (GPRS) up to class 12. They support FR, HR, EFR and AMR speech and channel coding without the need for external hardware. In combination with the Infineon SMARTi+ or SMARTi DC RF solution, a complete 2-chip GSM system solution is achieved. Due to their very flexible interfaces, E-GOLD+ products can be set up easily to control a wide variety of RF architectures.

1.2 HIGHLIGHTS OF THE E-GOLD+ V2 (V3)

- 0.13 µm (effective), 0.18 µm (drawn), 1.8 volt technology
- C166 MCU processor core, operating up to 52 MHz at 1.8 V
- OAK+ DSP operating up to 78 MHz at 1.8 V
- Up-to 2 Mbit on-chip MCU SRAM flexibly configurable as program or data RAM
- Feature-rich DSP firmware including AMR vocoder, noise reduction, echo cancellation, and voice memo support
- Mulit-slot data: HSCSD and GPRS up to class 12 (4 Rx + 4 Tx)
- Power saving by careful design and power management features
- System approach with flexible interfaces and support for multiband RF
- Extensive development environment and layer 1 drivers
- Complete GSM/GPRS protocol stacks are available from the Infineon subsidiary Comneon
- Temperature range –30° to +85°C
- Small LFBGA packaging

1.3 BENEFITS OF E-GOLD+ FAMILY

- High level of integration and low interface costs
- Reduced system complexity, component count and board space
- Ultra-low stand-by power consumption of 0.6 MW
- Superior data capabilities
- Short-time-to-market with low risk by using verified hardware and firmware macros
- Together with SMARTi+ or SMARTi DC RF complete 2-chip GSM system solution

2. SYSTEM INTEGRATION

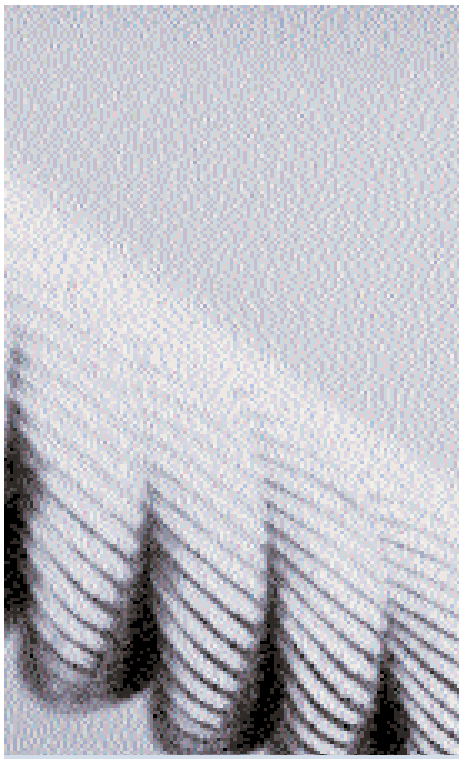
2.1 THE INFINEON APPROACH IN BRIEF

The signal received from the antenna follows one of two parallel paths, depending on whether the system is operating in the GSM 900 MHz or the GSM 1800 MHz band. In either case, the antenna signal is band-filtered and applied to the appropriate input of the SMARTi+ receiver chain, where it is amplified by a gain-programmable Low Noise Amplifier (LNA). The double-balanced RF signal is downconverted to an intermediate frequency (IF) by an image reject mixer, eliminating the need for an external surface-acoustic wave (SAW) filter. The IF signal is passed through an external SAW filter, which performs a rough channel selection. The signal is then fed again into the receiver circuit to pass a digitally programmable gain-controlled amplifier (PGC). Finally, the amplified IF signal is demodulated to baseband by a second mixer. The differential offset introduced by the second mixer is compensated by a sample-and-hold circuit. Incorporating the Infineon SMARTi DC direct conversion receiver eliminates the need for external IF-SAW filter, which subsequently reduces the component count.

THE RESULTING differential I and Q baseband signals are converted independently from analog to digital, forming two 6.5 Mbit/s data streams. The signal reconstruction and filtering are performed on the digital baseband filter, which is a part of the digital signal processing (DSP) unit of E-GOLD+. A complex equalizer with soft output recovers the original data stream.

THE E-GOLD+ family supports Full-Rate, Half-Rate, Enhanced Full-Rate and Adaptive Multi-Rate soft decision channel decoding and speech decoding. Data processing is done on the DSP section supported by a Viterbi hardware accelerator. The decoded voice samples are converted to analog signals using a highly linear 1-bit SD-modulator DAC. The output signal can be directly connected to a handset earpiece.

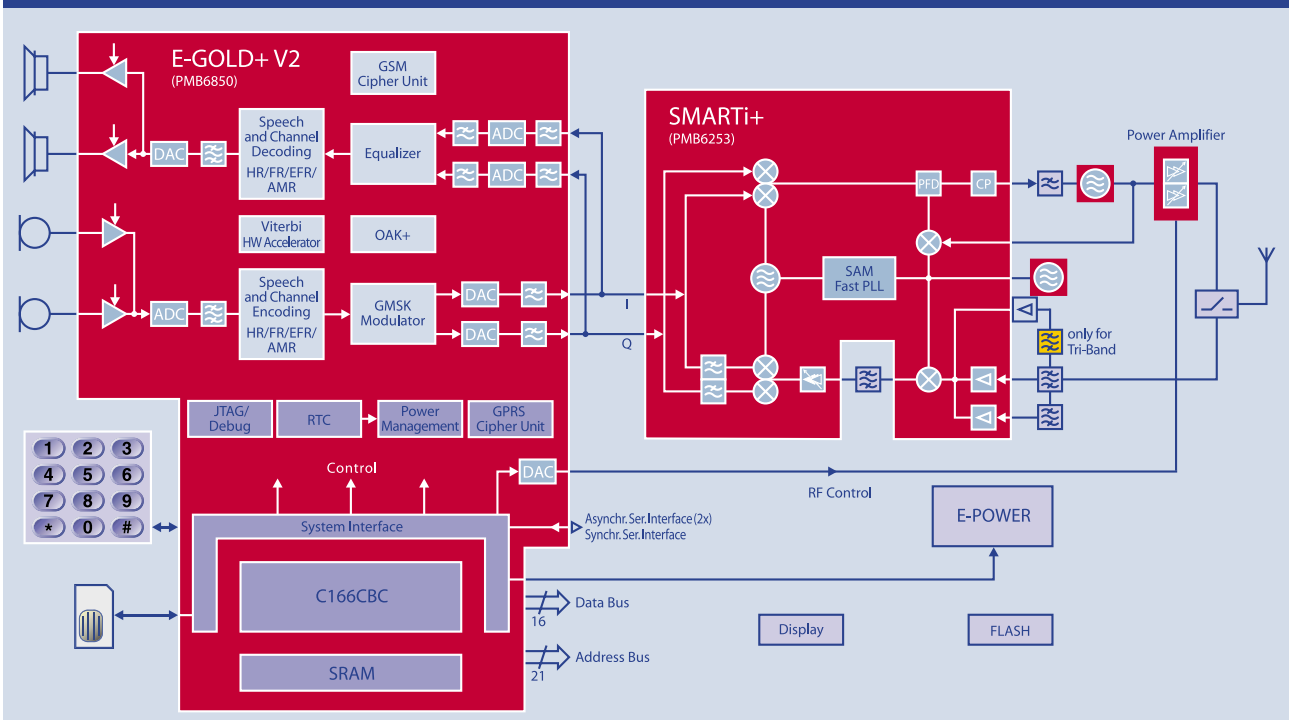
THE SIGNAL transmission starting from the microphone is first amplified by a programmable Low Noise Amplifier and then converted to a digital PCM data stream as input for the OAK+ DSP, once again using an SD-analog-to-digital converter.



FULL-RATE, Half-Rate, Enhanced Full-Rate and Adaptive Multi-Rate speech and channel encoding (including voice activity detection, VAD, and discontinuous transmission, DTX) as well as digital GMSK modulation are performed on E-GOLD+ family products.

THE RESULTING digital I and Q baseband components are converted in parallel from digital to analog. The resulting differential analog baseband signals are fed to the input of a quadrature modulator. The IF frequency input signal is split into two precise orthogonal carriers, which are multiplied by the baseband modulation signals. The modulated output signal passes through an integrated low pass filter. It is used as a reference signal for the up-conversion loop, pulling the power VCO (one for each band) to generate the desired radio frequency modulation in the 900 MHz or 1.8 GHz band.

Figure 1: Heterodyne System Overview



THE RF SIGNAL coming from the transceiver will than be amplified to the required output level for GSM 900 or GSM 1800 by a power amplifier, which completes the transmit chain. Ramping of the power amplifier is performed via software controlled by 11-bit control values, which are serially delivered by E-GOLD+, according to predefined ramping curves. After digital-to-analog conversion, the corresponding control voltage required for the power module is generated.

TO COMPLETE the system, a PMU (Power Management Unit) is necessary. Infineon's E-Power is a highly integrated power and battery management IC specially designed for use with the E-GOLD+ V2 and E-GOLD+ V3. It provides all power supply functions (except for RF PA) for a complete dual-band GSM handset. By using a step-down regulator for supplying the digital baseband part, power consumption is minimized. For the RF section, low-noise, low-dropout, linear regulators are used, minimizing interference to RF functions. The battery charge control section along with an external p-channel FET provides all required charging and supervisory functions. Operation of E-Power can be controlled completely by a set of control registers.

A COMPLETE GSM 900/1800/1900 triple-band system solution may consist of the following devices:

- PMB6850 V2 Single Chip Baseband Processor (E-GOLD+ V2)
- PMB6253 RF Multiband Transceiver (SMARTi+)
- PMB6810 Power Management Unit (E-Power)

3. FEATURES OF THE SYSTEM COMPONENTS

3.1 OVERVIEW OF THE E-GOLD+ FAMILY FEATURES

E-GOLD+ family products are single chip mixed signal baseband ICs, containing all the analog and digital functionality of a cellular radio. A mobile terminal built on the E-GOLD+ platform will meet all performance requirements set down in the GSM recommendations and is targeted to address the increasing demands of the GSM cellular subscriber market such as multi-slot operation, High-Speed Circuit-Switched Data (HSCSD) and General Packet Radio Service (GPRS). It supports Full-Rate (FR), Half-Rate (HR), Enhanced Full-Rate (EFR) and Adaptive Multi-Rate (AMR) speech and channel coding without the need for external hardware, and
includes full-duplex handsfree voice dialing and voice memo as well. The E-GOLD+ analog interface has functions that cover all the A-to-D and D-to-A conversion required within a mobile radio. Its high level of integration reduces system complexity, component count and board space. In combination with the Infineon SMARTi RF solution, a complete 2-chip GSM system solution is achieved, which results in extremely compact implementation, very low power consumption and cost-effective system performance. Due to its very flexible interfaces, E-GOLD+ can be set up easily to control a wide variety of RF architectures.

E-GOLD+ is powered by an Infineon 80C166 µC and an OAK+ DSP processor core. By integrating these high-performance processor cores with on-chip memory into TDMA timer modules and GSM specific peripherals a compelling single chip cellular baseband processor is possible.

AMR

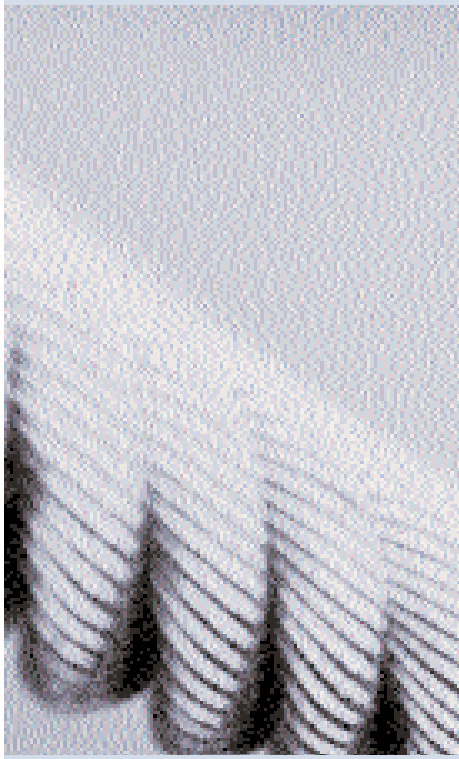
AMR is the abbreviation for Adaptive Multi Rate, the latest speech and channel coding standard from the European Telecommunications Standards Institute (ETSI).

UNLIKE PREVIOUS GSM speech and channel codecs (FR, HR, and EFR), which operated at a fixed rate with a fixed level of error protection, the AMR codec adapts to local radio channel and traffic conditions.

THE AMR CODEC selects the best channel (Half or Full Rate) and the best codec mode (speech and channel bit rate) to deliver the best possible combination of speech quality and network capacity. The AMR speech codec is based on the same technology as the previously standardized Enhanced-Full-Rate (EFR) speech codec, which is said to provide today's best speech quality.

3.2 E-GOLD+ V2 KEY FEATURES

- C166 MCU processor core
- OAK+ DSP core
- 1 Mbit on-chip SRAM
- On-chip MCU SRAM flexibly configurable as program or data RAM
- On-chip MCU Program ROM
- On-chip DSP ROM & RAM
- AD/DA converter
- Digital and analog voiceband and base-band filters including digital-to-analog and analog-to-digital converters
- GPRS cipher unit GEA1
- I^2C bus interface (eg. PMB6810)
- Ringer support for PWM output to earpiece
- Comprehensive static and dynamic power management
- 2 IrDA compatible UARTs
- Autobaud detection on ASC
- Serial-synchronous SPI compatible interface
- GSM timer module that off-loads the MCU from radio channel timing
- IEEE 1149.1 compliant boundary scan JTAG port
- OCDS level-1 debug support
- Programmable PLL for system clock generation
- Pulse carry modulation output for Automatic Frequency Correction (AFC)
- Serial RF control interface
- ISO 7816 compatible SIM card interface
- RF power ramping functions
- Measurement of battery voltage, battery and environment temperature and battery technology
- GMSK modulator
- Viterbi hardware accelerator
- A51/A52 cipher unit
- DAI interface according to GSM 11.10
- Keypad interface
- General-purpose IOs
- External memory interface to 1.8 V and 3 V devices
- 3.3 V tolerant inputs
- Operating temperature range of –30 to +85°C
- P-LFBGA package (13x13mm^2)



3.3 SMARTi+ KEY FEATURES

RECEIVER

- Dual-band image reject mixer front-end with 2 integrated LNAs with 50 Ω matched inputs
- Programmable IF/baseband amplifier
- Quadrature IF demodulator
- Programmable DC output level
- Automatic DC offset compensation

TRANSMITTER

- IF quadrature modulator
- Integrated IF filters and down conversion mixer
- Digital phase frequency detector
- Programmable charge pump current and phase detector polarity

RF-SYNTHESIZER

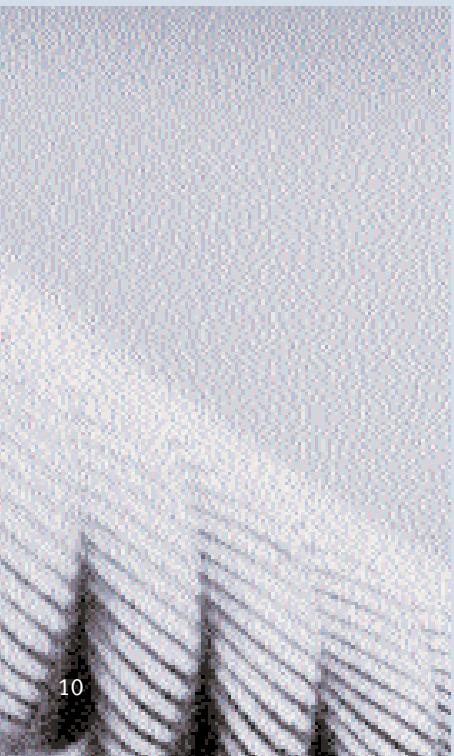
- SAM fast lock PLL supports GPRS class 12
- Programmable phase detector polarity

IF SYNTHESIZER

- Fixed divider ratios
- 2 fully integrated IF VCOs, no external tuning

SYSTEM

- Full triple-band capability GSM 900/1800/1900
- Multiplexed differential I/Q in- and outputs
- Active part of 13 MHz VCXO integrated
- 13/26 MHz can be applied externally
- VQFN 48 package (7x7 mm^2)



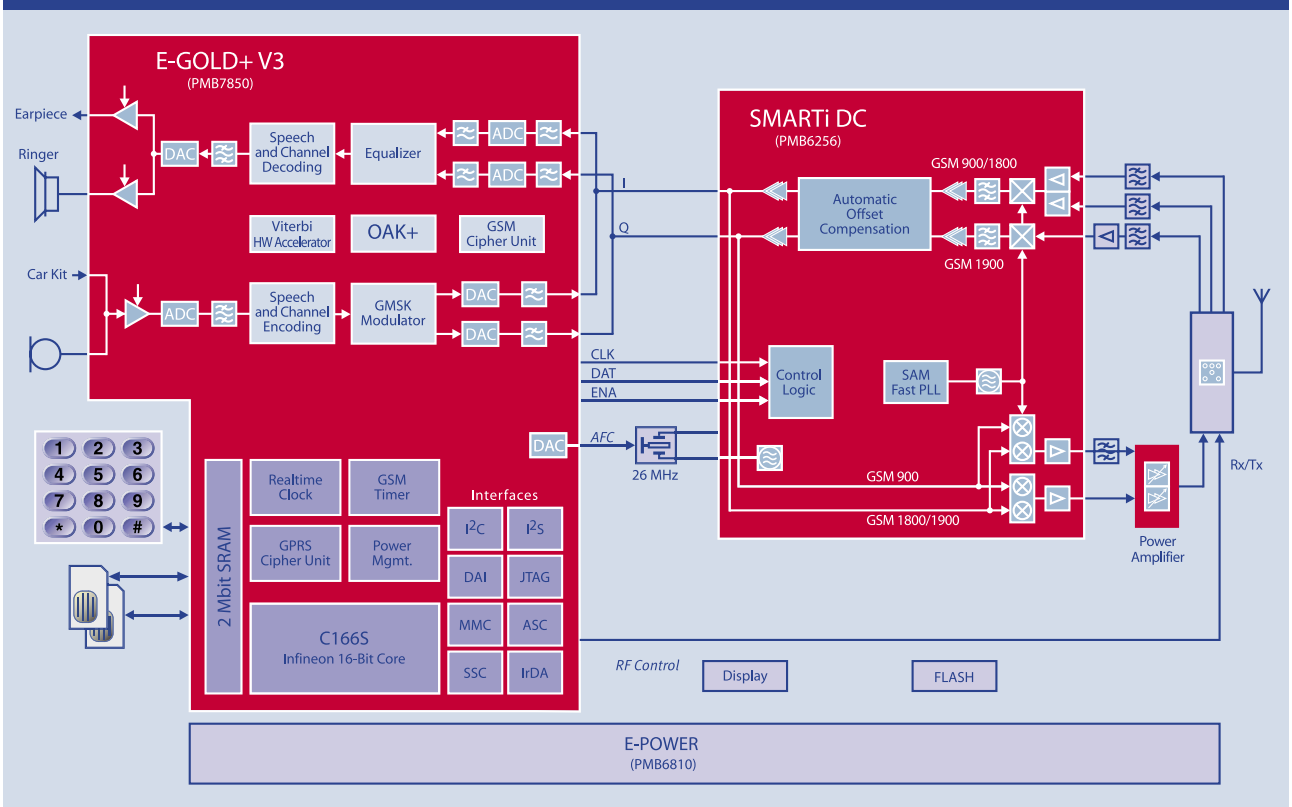
3.4 E-GOLD+ V3 KEY FEATURES

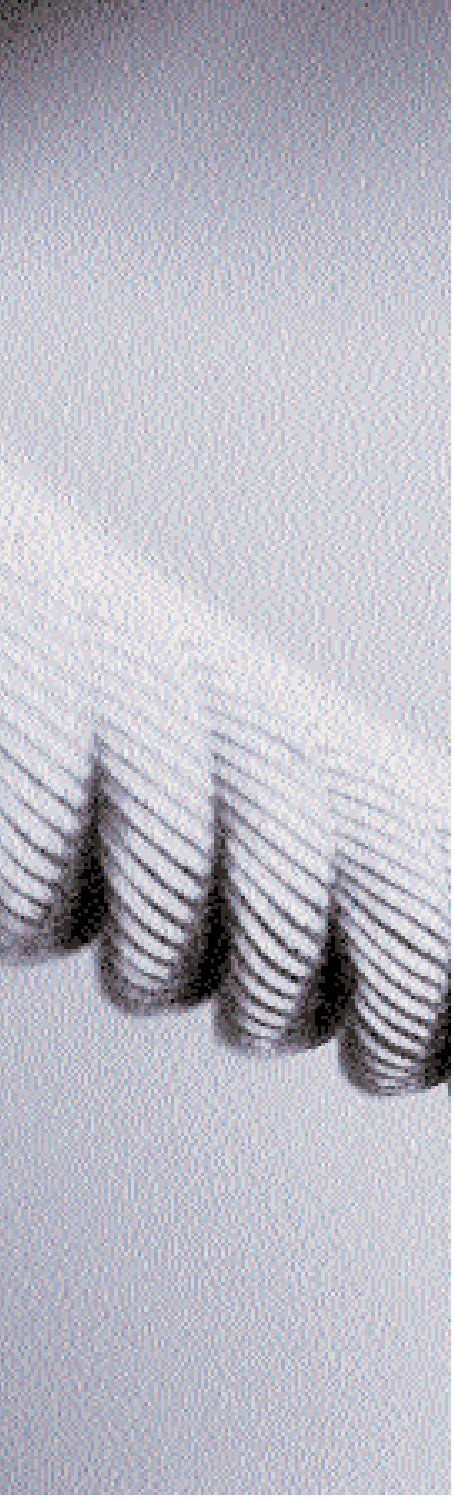
Figure 2 shows a block diagram of a complete GSM 900/1800/1900 triple-band system based on E-GOLD+ V3 and a SMARTi DC.

- C166 MCU processor core
- OAK+ DSP core
- 2 Mbit on-chip SRAM
- On-chip MCU SRAM flexibly configurable as program or data RAM
- On-chip MCU Program ROM
- On-chip DSP ROM & RAM

- AD/DA converter
- Digital and analog voiceband and base-band filters including digital-to-analog and analog-to-digital converters
- GPRS cipher unit GEA1 & 2
- I²C bus interface (eg. PMB6810)
- I²S PCM digital audio HiFi Interface
- Multimedia card interface
- Ringer support for PWM output to earpiece
- Comprehensive static and dynamic power management
- 2 IrDA compatible UARTs
- Autobaud detection on ASC
- Serial-synchronous SPI compatible interface
- Interface to Bluetooth™ module
- Logic port signal arranger
- GSM timer module that off-loads the MCU from radio channel timing
- JTAG IEEE 1149.1 boundary scan and debug interface
- OCDS level-1 debug support
- Programmable PLL for system clock generation
- Pulse carry modulation output for Automatic Frequency Correction (AFC)
- Serial RF control interface
- ISO 7816 compatible SIM card interface
- RF power ramping functions
- Measurement of battery voltage, battery and environment temperature and battery technology
- GMSK modulator
- Viterbi hardware accelerator
- A51/A52 cipher unit
- DAI interface according to GSM 11.10
- Keypad interface
- General-purpose IOs
- External-memory interface to 1.8 V and 3 V devices
- Page Mode Flash Interface
- 3.3 V tolerant inputs
- Operating temperature range of –30 to +85°C
- P-LFBGA package (12x12mm² body size)

Figure 2: Homodyne System Overview





3.5 SMARTi DC KEY FEATURES

RECEIVER

- Direct conversion receiver with integrated channel filtering
- Programmable baseband amplifier chain
- Highly-linear triple-band RF quadrature demodulator
- Automatic DC offset compensation
- Programmable DC output level
- Automatic filter adjustment
- Automatic phase control loop

TRANSMITTER

- Low noise direct modulator for GSM triple-band
- Integrated baseband filter
- Excellent sideband suppression

SYSTEM

- Full triple-band capability GSM 900/1800/1900
- Fully integrated RF VCO
- Multiplexed differential I/Q in- and outputs
- SAM fast lock PLL supports GPRS class 12
- 26 MHz VCXO integrated
- VQFN 48 package (7x7 mm^2)

4. E-POWER

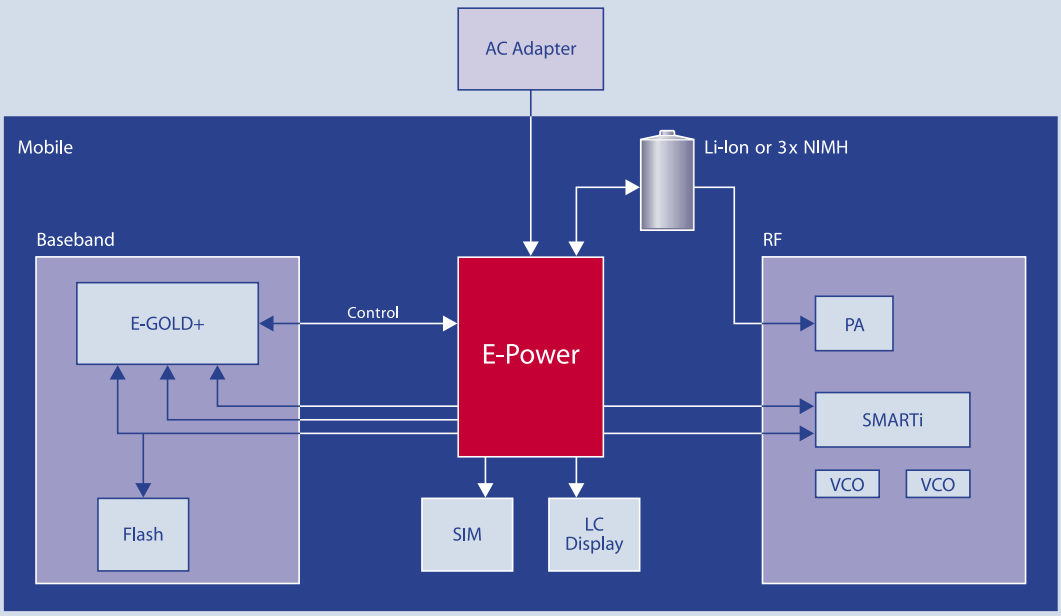
4.1 E-POWER – INTELLIGENT POWER MANAGEMENT UNIT

E-Power is a highly integrated power and battery management IC specially designed for use with the E-GOLD+ V2 and E-GOLD+ V3. It provides all power supply functions for both baseband and radio frequency sections, except for RF power amplifier (PA) for the entire dual-band GSM handset. It also minimizes the external device count. By using a step-down regulator for supplying the digital baseband part, handset power consumption has been significantly reduced, allowing longer stand-by and talk times. Low-noise, low-dropout, linear regulators are used to minimize interference with the RF section. The battery charge control section, combined with an external p-channel FET, provides all required charging and supervisory functions for a single-cell Li-Ion or a three-cell NiMH battery pack.

4.2 E-POWER IC AT A GLANCE

- Battery capacity can be reduced by 25 % (for similar stand-by time) due to the efficiency of the LDOs
- Charge control for Li-Ion and NiMH cells
- Optimized for ultra-small capacitors and inductors
- High-efficiency step-down converter for digital baseband
- Low-voltage lock-out, over-temperature protection, power-on reset circuitry integration

E-Power – Intelligent Power Management Unit



5. APPLICATION SUPPORT

5.1 E-GOLD+ FAMILY EVALUATION SUPPORT

A comprehensive set of data sheets and application notes supports the application of the E-GOLD+ chipset. In addition, a number of development tools are available which contribute significantly to the reduction of development time and effort.

THE E-GOLD+ EVALUATION board offers the designer a head start in developing a GSM handheld based on the E-GOLD+ chipset. It provides a complete reference hardware environment and debugging platform for the GSM baseband and software.

E-GOLD+V3 EVALUATION BOARD

FEATURES OF THE E-GOLD+ V2/V3 EVALUATION BOARD

- Includes E-GOLD+ V2/V3
- Single 5 V supply voltages
- 2 MByte FLASH, 70 ns
- 512 kByte SRAM, supporting 8 and 16-bit operations
- 32 kByte SPI-programmable EEPROM
- 2 x RS232 transceivers with optional level-shifting
- IrDA on-board transceiver
- Keypad
- Display
- RF interface connector (prepared for Infineon RF solution)
- Earpiece and microphone connectors
- On-board ringer
- 2 x 8 LED state monitor
- SMA connector
- JTAG test mode initialization via internal/external pattern generator
- 32-768 kHz oscillator
- 13 MHz oscillator (optional external input)
- Low-pass filter for RF control signals

SOFTWARE AND FIRMWARE SUPPORT

Software development is supported by various standard development tools for the C166 controller and OAK DSP.

- Microcontroller Tools
  - C, C++ compiler
  - Assembler, linker, libraries
  - OCDS HW debugger
  - Instruction set simulators
  - RTOS (all C16x)
  - Documentation
- DSP Tools
  - C compiler
  - Assembler, linker, libraries
  - OCEM HW debugger
  - Cycle accurate simulator
  - OAK+ C model
  - Firmware
  - Documentation
- On-chip multi-core HW-debug support
- E-GOLD+ V2/V3 user manual
- RF Workbench
- Layer-1 bit error rate software

TO ALLOW a very fast project setup, the application group offers a software startup package. This package consists of the RF Workbench, a Layer-1 driver package for BER measurements and a variety of small and useful tools, e.g. a flash loader or bootstrap loader tool.

THE RF WORKBENCH is a very useful tool for RF tests. It consists of target software and a Windows control application. With this Windows control tool the user can remote control the target software and make measurements of all signal paths of E-GOLD+.

THE LAYER-1-bit error rate software allows the user to go in traffic with his own PCB and to do the needed measurements for the verification of the PCBs. On request, it is possible to port the software to a customer's PCB, so that all resources can be focused on ongoing software projects. In addition with this driver package, the user can get examples of how he can use different E-GOLD+ V2/V3 peripherals and templates to setup his own concepts.

ADDITIONALLY, a bundle of small tools are provided to allow the customer to set up his own work environment easily and to start up his own project immediately, without worrying about necessary tools such as flash-loaders or low-level drivers for an I^2C interface, for example.

Further information on the E-GOLD+ V2/V3 application board and development tools is available from your local Infineon Technologies office.

EMULATORS/OCDS

Type	Name	Company
In Circuit Emulator for E-GOLD+	Trace 32	Lauterbach
In Circuit Emulator for E-GOLD+	DprobeC166CBC	Hitex
In Circuit Emulator for E-GOLD+	Fast-view66/EG-JT	pls

For further information please contact: **www.lauterbach.com · www.hitex.de · www.pls-mc.com**

GSM TEST EQUIPMENT

GSM CHIPSET DEVELOPMENT TOOLS

Type	Name	Company
GSM Tester	CMD 55	Rohde & Schwarz
GSM Tester	HP 8922M	Hewlett Packard

6. SYSTEM PLATFORM SOLUTIONS

During the last decade of mobile telephony, the market has changed dramatically. System solutions are becoming increasingly important for the mobile device market.

VARIETY OF PRODUCT PORTFOLIO AT ESTABLISHED MOBILE PHONE MANUFACTURERS

In the early days of mobile telephony, manufacturers (OEM) based their mobile phone design on analog chips (RF chips), digital chips (baseband chips), integrated power amplifiers and other active as well as passive components. The OEMs would introduce about one new model per year. Then came a variety of products, as OEMs responded to the needs of increasingly diverse user segments. The OEM's need for both expanded product portfolios and reduction of design cycles leads to a shortage of development resources. To counter this trend, OEMs increasingly outsource a broad range of activities, including R&D and production of low-end and mid-range products. Infineon is offering complete system solutions to help.

MARKET ENTRY OF MANUFACTURERS WITH OWN BRAND NAME

Several newcomers to the mobile device scene are manufacturers whose brand names are well known. To gain market entry quickly, these newcomers are requesting complete system solutions that incorporate many parts of the value chain.

FOR THE past few years, Infineon has been offering complete chipset solutions consisting of radio frequency and baseband ICs, including power management ICs, VCOs and active discrete components which work together in harmony. As a trendsetter and to serve best the needs of customers, Infineon offers complete system solutions, including not only the aforementioned chipsets but also protocol stacks, hardware designs, system integration, applications and services.

INFINEON ACQUIRED Comneon in 1999. Comneon, a 100% subsidiary of Infineon, with locations in Nuremberg and Munich, Germany, and Linz, Austria, employs more than 100 engineers. Comneon is responsible for all software-related issues.

DWD, DANISH Wireless Design, a 100% subsidiary of Infineon, was founded in 1999. DWD, located in Aalborg, Denmark, employs more than 40 engineers. DWD is responsible for all hardware-related issues and system integration.

INFINEON HAS also established a fast growing partner network, allowing us to offer services in the wireless arena.

P2002 SYSTEM PLATFORM FAMILY – COST-OPTIMIZED SOLUTIONS FOR THE MOBILE APPLICATION WORLD

With our new P2002 system platform, Infineon offers a very modular platform concept, giving customers the opportunity to choose between different Infineon baseband processors, RF transceivers and protocol stacks so that they can create cellular products that meet the requirements for specific target segments and different market regions. Using the same platform, it is possible to cover a broader range of product segments, including GSM and GPRS products. The new direct-conversion RF concept, based on our highly integrated RF transceiver family SMARTi DC, led to an extremely reduced component count of around 150, resulting in less PCB area usage and a very competitive bill of materials.

COST-OPTIMIZED PLATFORM P2002

The P2002 system platform is a cost-optimized solution for the low and mid-tier markets. P2002 is based on Infineon's chipset family baseband processing E-GOLD+ V2, power management E-Power and RF transceiver SMARTi DC. The platform's small size gives it the high flexibility necessary to create different phone designs or to integrate the complete hardware in small data cards. An application portfolio, which addresses the end-user's requirements in the target market, comes with this offering.

FEATURES:

- Dual-band GSM 900/1800 MHz or
- Dual-band GSM 850/1900 MHz or
- Triple-band GSM 900/1800/1900 MHz
- GPRS class 8 as option
- FR/HR/EFR vocoder
- Small component count of around 150 (without customer specific parts)
- PCB area usage less than 20cm^2
- Different memory options
- Basic-user interface
- PIM (Personal Information Manager)
- Extended phonebook and directories
- Predictive text input
- WAP 2.0 multi-mode browser
- EMS (Enhanced Short Message Service)

SMART PLATFORM P2002+

The Smart Platform P2002+ is equipped with the more powerful baseband processor E-GOLD+ V3, which provides the higher processing performance needed for enhanced product requirements in a competitive cost position.

THERE WILL also be an option to integrate the Infineon Bluetooth chipset BlueMoonSingle into the P2002+ platform. In addition to the P2002 features, the Smart Platform 2002+ provides features that address the mid-tier and high-tier markets.

FEATURES:

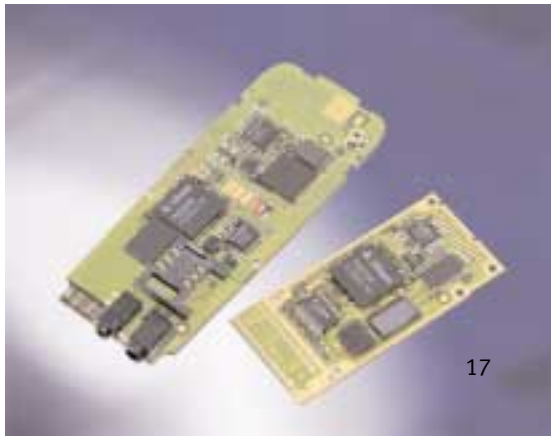
- GPRS class 10 to 12
- AMR vocoder
- Bluetooth™ functionality (optional) with different profiles
- MP3
- MultiMediaCard™ support
- USB interface
- Polyphone ringer
- Speech recognition
- SyncML
- E-OTD
- MMS (Multi Media Messaging)
- Java
- Integrated camera, e.g. for imaging
- GPS (optional)

FUTURE SYSTEM PLATFORMS

As GSM evolves, Infineon will continue to offer our customers complete system solutions for upcoming standards like EDGE and UMTS. Future platforms will be equipped with a complete application processing platform, providing software and hardware support for open operating systems and new multimedia features. With APOXI technology, there is a well-defined migration path between the different system platforms.

FEATURES:

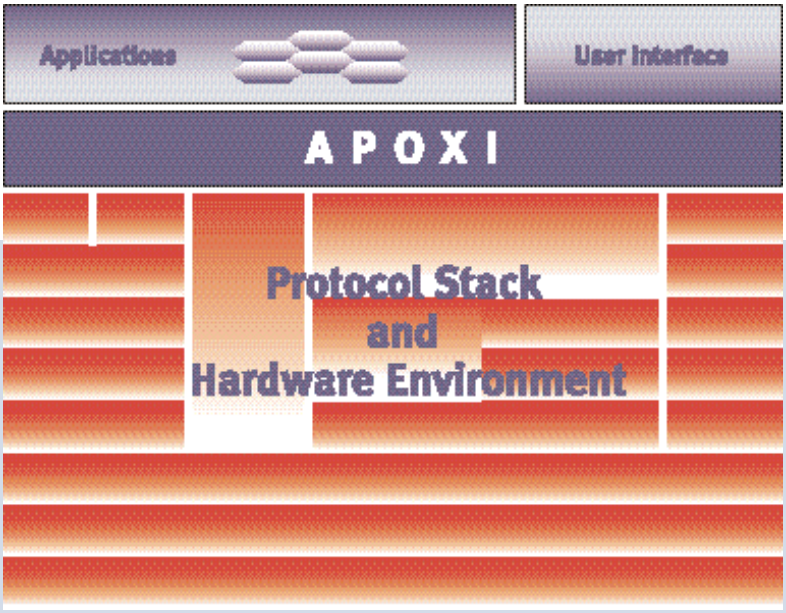
- Quad-band GSM 850/900/1800/1900 MHz
- EDGE (E-GPRS) class 12
- Dual-mode W-CDMA/EDGE
- Support for all major industry standard operating systems
- MExE
- Multi-mode browser
- Instant messaging



APPLICATIONS

Besides having an innovative and price competitive hardware and protocol stack platform, gaining market success increasingly depends on providing a good user experience and having a complete application portfolio.

IN A TYPICAL handset development project, the ever increasing demand for new applications is the limiting factor for the market launch of a product. As time-to-market is one of the most critical factors for commercial success, Infineon offers a unique development environment to speed up this part dramatically.



APOXI

Application **P**rogramming **O**bject-oriented e**X**tendable **I**nterface

APOXI is an object-oriented framework for rapid development of mobile applications for 2.5/3G terminals. It allows you to encapsulate the applications from the underlying hardware environment and protocol stack. This gives you the opportunity to reuse your applications when you upgrade your system platform. APOXI offers a lot of standard features from traditional GUI development:

- Event-based communication
- Hardware-independent graphical device interface
- Integrated window-system
- Complete set of controls: radio buttons, checkbox, lists, editors e.g. with predictive text input...
- Dynamically changeable look and feel
- Build-in multi-language support
- Full Unicode support, including simplified and traditional Chinese characters

To ease market entry even more, Infineon offers a lot of standard applications fully integrated and tested with our system platforms:

- Basic-user interface as a starting point for implementing your look and feel
- PIM (Personal Information Manager)
- Extended phonebook and directories
- WAP 2.0 multi-mode browser
- EMS (Enhanced Short Message Service)
- MMS (Multi-media Messaging)
- MultiMediaCard™ support
- Different Bluetooth™ profiles, like headset, dial-up networking, synchronization and file transfer
- Location-based services with either E-OTD or GPS
- SyncML
- Polyphone ringer
- E-mail client

SERVICES

In addition to our state-of-the-art system platforms and applications, we offer a wide range of services that allow you to bring a complete product to the market.

THESE SERVICES are provided either directly through our 100% subsidiaries DWD and Comneon or via our partner network.

The services we offer include among others:

PROFESSIONAL PROJECT MANAGEMENT

EXTENSIVE TRAINING FOR

- Hardware
- Hardware drivers
- Protocol stack
- Application development
- Production test

HARDWARE CUSTOMIZATION

- Display
- Batteries
- Keypad
- Acoustical components
- Customized form factor
- Add-ons like cameras or touch screens

SOFTWARE CUSTOMIZATION

- Customized user interface
- Hardware driver development
- Application integration

COMPLETE SYSTEM INTEGRATION

CONSULTING

- Acoustic design optimization and measurements
- EMV and ESD consulting and measurements
- Antenna design, integrated and external
- SAR consulting and measurements
- Design for manufacturability
- Yield optimization in your production line

PRODUCTION

- Production line design
- Production test software
- Calibration software

APPROVAL AND TEST SUPPORT

- Type approval
- IOT (Inter Operability Testing)
- Field trials in all major networks

TOOLS

- Trace tool for target debugging
- Emulator
- PC-based host development environment for user interface
- Software development and measurement hardware platform (GLOBE)
- Phone tool for lab calibration and hardware debugging
- Security tools for production and operators (SIM lock)

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