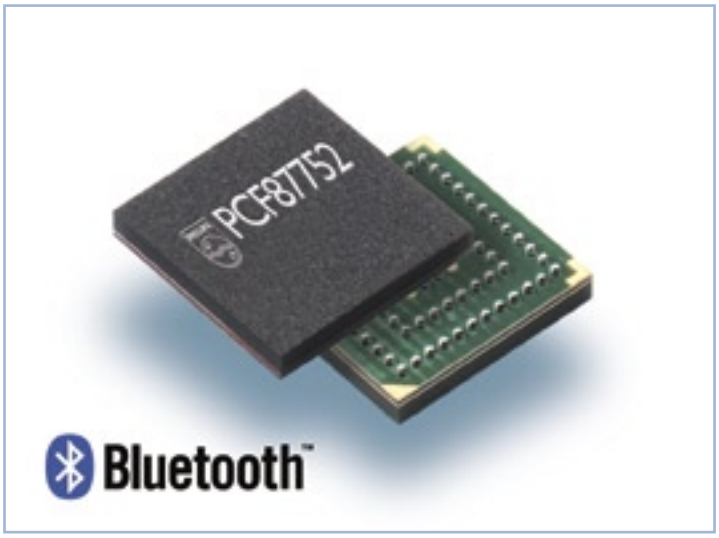
PCF87752
Blueberry™ DATA

2nd generation Bluetooth™ baseband controller optimized for hosted applications

The PCF87752 is the most highly-integrated single-chip baseband solution designed for *Bluetooth applications. Known as 'Blueberry* DATA,' it contains everything required to provide applications with complete baseband functionality for *Bluetooth* wireless technology. The IC is the optimal choice for *Bluetooth* integration in hosted and some embedded applications, such as mobile phones and computing devices.**



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Key benefits

- Complete, highly-integrated single-chip baseband solution, optimized for hosted applications (small footprint 7 x 7 mm LFBGA80 package)
- Can be connected to a wide range of discrete radio ICs and radio modules
- Proven core and software for maximum interoperability and fast time-to-market (*Bluetooth* 1.1 compliant)
- Shares resources with host application to minimize overall cost and power consumption
- On-chip Flash memory for fast, risk-free ramp-up and volume production.

Key features

- Proven Philips *Bluetooth* Core (PBC) operating as link controller
- Low-power embedded ARM7TDMI™ RISC core
- Low-power 32.768 kHz clock oscillator
- UART, PCM/IOM and I2C-bus microprocessor interfaces
- USB peripheral interface (version 1.1 compliant) with embedded transceiver
- 21 general purpose I/Os
- Highly flexible power-supply concept for use within a wide range of applications
- Firmware available: includes interface drivers and *Bluetooth* stack (up to HCI).

General information

Philips Semiconductors' Blueberry DATA IC is based upon the 2nd generation Blueberry platform. It features an enhanced version of the Ericsson *Bluetooth* Core (EBC) — the Philips *Bluetooth* Core (PBC). In Blueberry DATA, the PBC offers specially designed voice and data paths for low-power *Bluetooth* applications, and also performs ciphering, scrambling, CRC checking/generation, and FEC encoding/decoding. Use of the PBC and its associated software stack ensures stringent conformity to the *Bluetooth* 1.1 interoperability standard, minimizing the design-in risk.

Blueberry DATA can be connected to a wide choice of discrete radio ICs and Philips' TrueBlue radio modules for the most effective cost/ performance solution per *Bluetooth* application. The combination of the PCF87752 and BGB101, for example, requires only a few decoupling capacitors as external components.

Blueberry DATA is optimized to share resources already available in a host system such as oscillator circuitry, voice codecs and power control. On-chip Flash (224 kB) and SRAM (30 kB) memory are optimized for embedded firmware up to HCI. Blueberry DATA also comes with embedded and pre-qualified firmware, including the link controller, link manager and HCI.

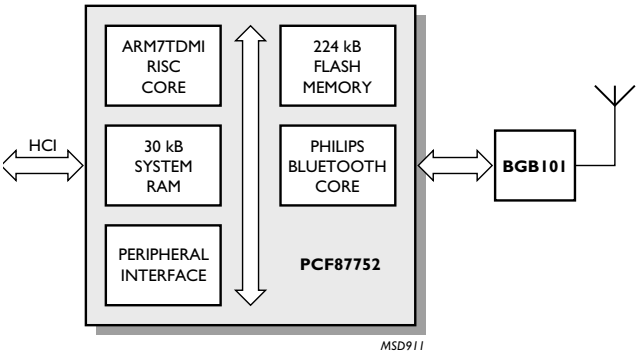

Fig.1 Block diagram of the PCF87752

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A closer look at what's on board

Bluetooth core

Today, the Ericsson *Bluetooth* Core (EBC) is considered to be the 'golden' core, resulting in a quasi industry standard. Philips Semiconductors uses an enhanced version of this in its Blueberry platform. The Blueberry DATA includes an optimized version of the PBC supporting 3 connections: 3 data (3 x ACL) or 2 data and one voice (2 x ACL and 1 x SCO). This reduces the power consumption and the silicon costs.

ARM/RISC processor

The central processor in Blueberry DATA is an embedded 32-bit ARM7TDMI RISC microcontroller, offering very low power consumption per MHz. The microcontroller connects to a 224 kB on-chip FLASH memory and 30 kB static RAM. A high performance bus connects the processor to the *Bluetooth* core as well as to peripheral hardware acting as a host interface.

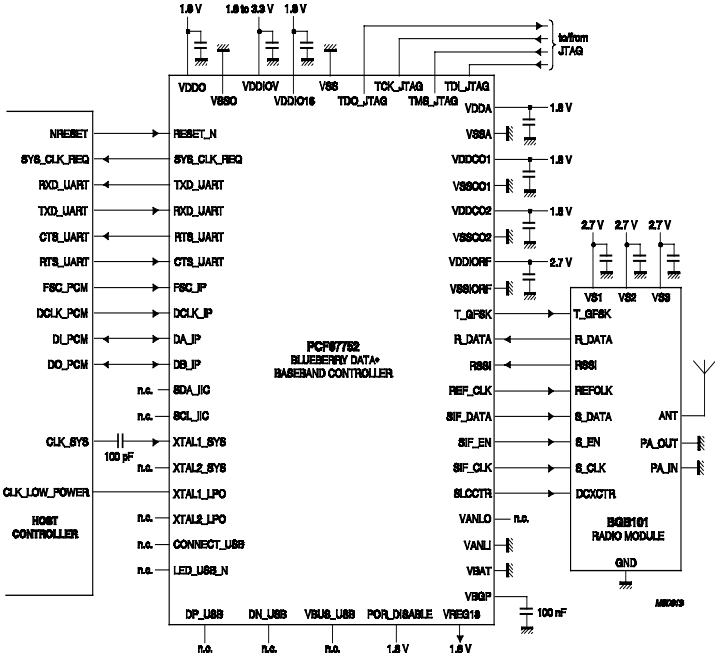

Fig.2 Blueberry DATA in hosted application based on a UART and PCM interface

I/O interfaces

Several industry-standard I/O interfaces are included, for example: USB, UART, I^2C-bus, PCM/IOM and 21 general-purpose I/Os. These enable the device to communicate with a wide range of devices or to carry out controller functions in the application.

Oscillators

The system clock and the sleep-mode clock are generated from two independent oscillator circuits. Where the host system can provide a reference clock, the system power consumption can be reduced by switching off the two on-chip oscillator circuits.

Power supply concept

A flexible power supply concept allows Blueberry DATA to be easily integrated into any application. An on-chip voltage regulator supplies the internal core and memories with 1.8 V, enabling low power consumption. Blueberry DATA peripheral functions extend the chip interface voltage level from 1.8 V anywhere up to 3.4 V.

Other features

Additional features of the IC include a system clock oscillator with programmable on-chip capacitors for frequency adjustment, an on-chip 8-bit A/D converter for RSSI measurement, a clock request signal for activation of an external clock source, and the availability of a bond-out version for source level debugging.

Technology with built-in flexibility

0.18 µm CMOS with embedded Flash

On-chip Flash memory allows applications to move rapidly from prototypes to volume production while keeping costs low. With embedded Flash, prototypes offer identical functionality to the final version and the same module size, so there's no need to redesign a PCB. Also, mature solutions in high-volume production can eventually migrate to ROM versions to reduce cost and power consumption.

Using chipsets with embedded memory brings big advantages in power consumption because data being fetched by the microcontroller does not need to be moved over long bond wires or PCB tracks with large capacitive loads. This makes Blueberry DATA especially suitable for battery-powered handheld devices with stringent power-consumption requirements.

Software concept

Philips Semiconductors offers software as part of a total solution. The software is based on a proven, pre-qualified *Bluetooth* stack covering all functions such as the hardware drivers, link controller and link manager. The link manager is *Bluetooth* 1.1 compliant.

The ARM processor offers a proven solution to add extra features adapted to the application. Specific host interface protocols, additional command controls, *Bluetooth* monitoring mechanisms, development support tracing mechanisms and dynamic consumption management are a just a few examples of what this flexible architecture can bring. This flexibility also enables customers to bring their own added value to differentiate from competing solutions. The ARM technology, Philips IP and third party *Bluetooth* software enable software modification to be managed easily. Our software is also developed as part of a system solution, having baseband and RF in mind.

Well-known software houses partnering with Philips Semiconductors offer a wide range of complementary *Bluetooth* stack and profile software.

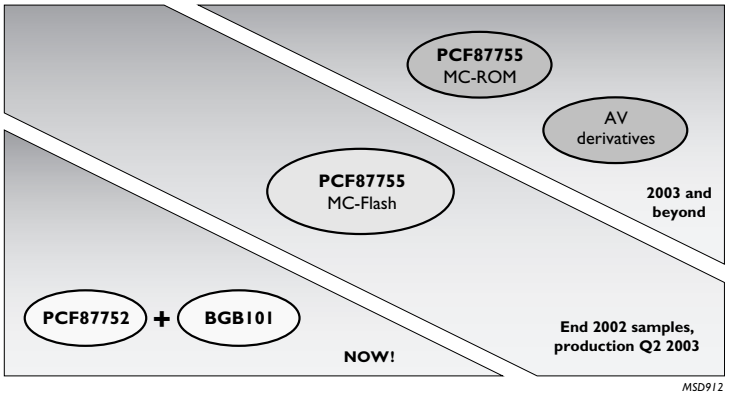

Fig.3 Blueberry roadmap

The best is yet to come

Blueberry DATA is one of an ever-growing family of highly-integrated *Bluetooth* solutions from Philips Semiconductors. The PCF87755 Flash will be the next development — a Blueberry-based Multi-Chip (MC) total *Bluetooth* solution. Inside the Blueberry MC multi chip package will be an advanced radio front-end and a Blueberry baseband. The radio die will use an advanced and highly integrated architecture functioning as analog front-end. All digital radio functionality like the modulator, de-modulator, and interfacing will be placed on the CMOS baseband die.

The MCP (Multi Chip Package) approach offers the benefit of rapidly-reducing cost cycles for CMOS technology without having to redesign the radio front-end. The advanced radio concept brings a better performance, lower power consumption, and needs only a very few external capacitors. Its receive sensitivity will be –90 dBm. This technology combination will ensure that the PCF87855, a ROM version of the PCF87755, will be the lowest cost *Bluetooth* solution available.

The PCF87755 will have identical baseband functionality to the PCF87752, including embedded flash memory, and UART and USB host controller interfaces. The IC will be available in a 7 x 7 mm package with a temperature range of –40 °C up to +85 °C. The total *Bluetooth* area will be around 70 mm². The Blueberry MC has an increased temperature range for industrial and automotive applications. Sampling is expected to start in Q4 2002, followed by mass production in Q2 2003. The PCF87855 ROM type will be available shortly afterwards with same footprint and functionality, and will be fabricated in the state-of-the-art 90 nm CMOS technology.

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More information

Leaflet title	Ordering code
BGB100 low power radio module	9397 750 09785
BGB101 2nd generation radio module	9397 750 09786
BGB101A 2nd generation radio module with integrated antenna	9397 750 09787
BGB121 2nd generation longe-range radio module	9397 750 09788
Bluetooth core	9397 750 08121
PCF87750 Blueberry baseband controller	9397 750 07688

Availability

Samples and development platforms for the PCF87752 Blueberry DATA can be ordered now via any local Philips Semiconductors sales office.
Mass production is expected in Q2 2003.

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