AI1 Adaptive Frequency Hopping Declaration.

The Bluetooth radio IC is a CSR8670 that supports adaptive frequency hopping based on the Bluetooth v3.0 software and v4.0 compliant hardware. The minimum number of hopping channels is 20, see page 3.

Refer to the datasheet brief shown below:

Features

- Bluetooth® v3.0 specification fully qualified software
- Bluetooth v4.0 specification compliant hardware
- Radio includes integrated balun and RF performance of 10dBm transmit power and -90dBm receive sensitivity
- 80MHz RISC MCU and 80MIPS Kalimba DSP
- 16Mb internal flash memory (64-bit wide, 45ns); optional support for 64Mb of external SPI flash
- Stereo codec with 2 channels of ADC and up to 6 microphone inputs (includes bias generators and digital microphone support)
- Support for CSR's latest CVC technology for narrow-band and wideband voice connections including wind noise reduction
- Audio interfaces: I²S, PCM and SPDIF
- Serial interfaces: UART, USB 2.0 full-speed, master and slave bit-serialiser (I²C and SPI)
- Integrated dual switch-mode regulators, linear regulators and battery charger
- 3 hardware LED controllers (for RGB) and ability to drive LCD segment display directly
- Support for up to 6 capacitive touch sensor inputs
- 6.5 x 6.5 x 1mm, 0.5mm pitch 112-ball VFBGA
- Green (RoHS compliant and no antimony or halogenated flame retardants)

General Description

The BlueCore® CSR8670™ BGA consumer audio platform for wired and wireless applications integrates an ultra-low-power DSP and application processor with embedded flash memory, a high-performance stereo codec, a power management subsystem, LED and LCD drivers and capacitive touch sensor inputs in a SOC IC. The dual-core architecture with flash memory enables manufacturers to easily differentiate their products with new features without extending development cycles.

CSR's popular BlueCore5-Multimedia® platform is software-portable to the BlueCore® CSR8670™ BGA, with easy migration of a broad range of solutions from CSR's eXtension partners. This migration enables rapid time-to-market deployment of a broad range of consumer electronics products.

The enhanced Kalimba DSP coprocessor with 80MIPS supports enhanced audio and DSP applications.

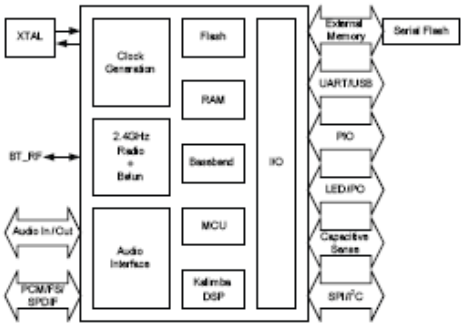
BlueCore® CSR8670™ BGA

Low-power Solution for DSP Intensive Audio Applications

Advance Information

CSR8670C

Issue 3



Applications

Home Entertainment Ecosystem

- TVs
- Smart remote controllers
- Wired or wireless soundbars
- Wired or wireless speakers and headphones

Tablets / PCs / Mobile Connectivity

- Wearable audio (on-the-go)
- Wearable audio with sensors (health and well-being applications)
- Wired or wireless stereo headphones for music/ gaming/multimedia content
- Wired or wireless speakers
- Wired or wireless speakerphones
- Mono headsets for voice

The audio codec supports 2 ADC channels, up to 6 microphone inputs, stereo output and a variety of audio standards.

See *CSR Glossary* at www.csrsupport.com.

CSR8670 BGA Technical Overview

1 Device Details

Bluetooth Radio

- On-chip balun (50Ω impedance in TX and RX modes)
- No external trimming is required in production
- Bluetooth v3.0 specification compliant

Bluetooth Transmitter

- 10dBm RF transmit power with level control from on-chip 6-bit DAC over a dynamic range >30dB
- Class 1, Class 2 and Class 3 support without the need for an external power amplifier or TX/RX switch

Bluetooth Receiver

- Receiver sensitivity of -90dBm
- Integrated channel filters
- Digital demodulator for improved sensitivity and co-channel rejection
- Real-time digitised RSSI available to application
- Fast AGC for enhanced dynamic range
- Channel classification for AFH

Bluetooth Synthesiser

- Fully integrated synthesiser requires no external VCO, varactor diode, resonator or loop filter
- Compatible with crystals 19.2MHz to 42MHz or an external clock 19.2MHz to 42MHz
- Accepts 19.2, 19.44, 19.68, 19.8 and 38.4MHz TCXO frequencies for GSM and CDMA devices with sinusoidal or logic level signals

Kalimba DSP

- Enhanced Kalimba DSP coprocessor, 80MIPS, 24-bit fixed point core
- 2 single-cycle MACs; 24 x 24-bit multiply and 56-bit accumulator
- 32-bit instruction word, dual 24-bit data memory
- 12K x 32-bit program RAM including 1K instruction cache for executing out of internal flash
- 32K x 24-bit + 32K x 24-bit 2-bank data RAM

Audio Interfaces

- Audio codec with 2 high-quality dedicated ADCs
- 2 microphone bias generators and up to 2 analogue microphone inputs
- Up to 6 digital microphone (MEMS) inputs
- G.722 compatible, includes improved digital FIR filter path for stop-band attenuation required for G.722 compliance
- Enhanced side-tone gain control
- Supported sample rates of 8, 11.025, 16, 22.05, 32, 44.1, 48 and 96kHz (DAC only)

Baseband and Software

- 16Mb internal flash
- Memory protection unit supporting accelerated VM
- 56KB internal RAM, enables full-speed data transfer, mixed voice/data and full piconet support
- Logic for forward error correction, header error control, access code correlation, CRC, demodulation, encryption bit stream generation, whitening and transmit pulse shaping
- Transcoders for A-law, μ-law and linear voice via PCM and A-law, μ-law and CVSD voice over air

Physical Interfaces

- UART interface
- USB 2.0 interface (full-speed)
- Master and slave bit-serialiser (I^2C and SPI)
- Up to 29 PIOs, i.e. 14 general purpose PIOs and unused digital interfaces are available as PIOs
- SPI debug and programming interface with read access disable locking
- PCM, I^2S and SPDIF interfaces
- Dual/quad external serial flash memory interface
- 3 LED drivers (includes RGB) with PWM flasher on sleep clock
- Support for up to 6 capacitive touch sensor inputs

Integrated Power Control and Regulation

- 2 high-efficiency switch-mode regulators with 1.8V and 1.35V outputs from battery supply
- 3.3V USB pad supply linear regulator
- Low-voltage linear regulator for internal digital supply with 0.80V to 1.25V output
- Low-voltage linear regulator for internal analogue supply with 1.35V output
- Power-on-reset detects low supply voltage
- Power management includes digital shutdown and wake-up commands with an integrated low-power oscillator for ultra-low power Park/Sniff/Hold mode

Battery Charger

- Lithium ion / Lithium polymer battery charger with instant-on
- Fast charging support up to 200mA with no external components
- Higher charge currents using external pass device
- Supports USB charge enumeration
- Charger pre-calibrated by CSR
- PSE compliance:
  - Design to JIS-C 8712/8714 (batteries)
  - Testing based on IEEE 1725

Auxiliary Features

- Customer application space available
- Crystal oscillator with built-in digital trimming
- Clock request output to control external clock
- Auxiliary ADC and DAC available to applications

Package Option

- 6.5 x 6.5 x 1mm, 0.5mm pitch 112-ball VFBGA

Adaptive frequency hopping was added with the v1.2 Bluetooth standard.

BLUETOOTH SPECIFICATION Version 4.0 [Vol 0] page 62 of 106

Appendix

Rev	Date	Comments
		New features added in v1.2: - Architectural overview - Faster connection - Adaptive frequency hopping - Extended SCO links

2.3 ADAPTED PICONET PHYSICAL CHANNEL

2.3.1 Hopping Characteristics

The adapted piconet physical channel shall use at least N_{min} RF channels (where N_{min} is 20).

The adapted piconet physical channel uses the adapted channel hopping sequence described in Section 2.6 on page 83.

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