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## Features

- Bluetooth® v4.0 specification compliant
- 80MHz RISC MCU and 80MIPS Kalimba DSP
- High-performance mono codec with 1 microphone input
- Internal ROM, serial flash memory and EEPROM interfaces
- Radio includes integrated balun with RF performance of 8dBm transmit power and -89dBm receiver sensitivity
- AVRCP v1.4
- 5-band fully configurable EQ
- Wideband speech supported by HFP v1.6 and mSBC codec
- CSR's latest CVC technology for narrowband and wideband voice connections including wind noise reduction
- Multipoint support for A2DP connection to 2 A2DP sources for music playback
- Secure simple pairing, CSR's proximity pairing and CSR's proximity connections
- Stereo line-in
- Serial interfaces: USB 2.0, UART, I<sup>2</sup>C and SPI
- SBC, MP3 and AAC decoder support
- Wired audio support
- Integrated dual switch-mode regulators, linear regulators and battery charger
- External crystal load capacitors not required for typical crystals
- 3 LED outputs (RGB)
- 68-lead QFN 8 x 8 x 0.9mm 0.4mm pitch
- Green (RoHS compliant and no antimony or halogenated flame retardants)

## General Description

CSR's BlueCore® CSR8615 QFN is a single-chip CSR8615 mono ROM solution for rapid evaluation and development of Bluetooth audio applications.

BlueCore® CSR8615 QFN consumer audio platform for wired and wireless applications using the QFN package integrates an ultra-low power DSP and application processor with embedded flash memory, a high-performance mono codec, a power management subsystem and LED drivers.

The CSR configuration tools and the development kit provide a flexible and powerful development platform to design advanced and high-quality audio products using BlueCore® CSR8615 QFN single-chip Bluetooth audio solution.

## BlueCore® CSR8615 QFN

### CSR8615 Mono ROM Solution

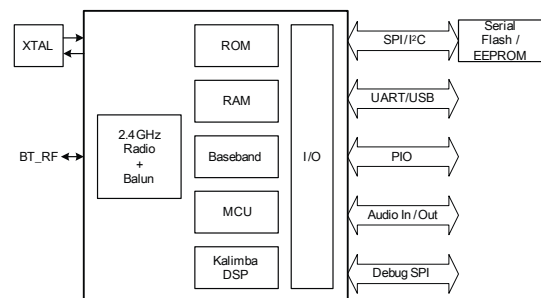
### 1-mic CVC Audio Enhancement

### Fully Qualified Single-chip Bluetooth® v4.0 System

#### Production Information

CSR8615A04

Issue 2



## Applications

- Bluetooth mono speakers
- Speakerphones
- 1-mic CVC headset or headphones
- Handsfree car kits

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

The integrated audio codec supports stereo line input with 1-mic CVC input and mono output, as well as a variety of audio standards.

See *CSR Glossary* at [www.csrsupport.com](http://www.csrsupport.com).

## Device Details

### Bluetooth low energy

- Dual-mode Bluetooth low energy radio
- Support for Bluetooth basic rate / EDR and low energy connections
- 3 Bluetooth low energy connections at the same time as basic rate A2DP

### Bluetooth Radio

- On-chip balun (50Ω impedance)
- No production trimming of external components
- Bluetooth v4.0 specification compliant

### Bluetooth Transmitter

- 8dBm (typ) RF transmit power with level control
- Class 1, Class 2 and Class 3 support, no external PA or TX/RX switch required

### Bluetooth Receiver

- -91dBm (typ)  $\pi/4$  DQPSK receiver sensitivity and -81dBm (typ) 8DPSK receiver sensitivity
- 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 16MHz to 32MHz

### 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
- 6K x 32-bit program RAM including 1K instruction cache for executing out of internal ROM
- 16K x 24-bit + 16K x 24-bit 2-bank data RAM

### Audio Interfaces

- Stereo line input audio ADC with 1-mic CVC
- Mono audio DAC
- Supported sample rates of 8, 11.025, 16, 22.05, 32, 44.1, 48 and 96kHz (DAC only)

### Auxiliary Features

- Crystal oscillator with built-in digital trimming

### Package Option

- 68-lead QFN 8 x 8 x 0.9mm 0.4mm pitch

### Physical Interfaces

- UART interface for debug
- USB 2.0 (full-speed) interface, including charger enumeration
- 1-bit SPI flash memory interface
- SPI interface for debug and programming
- I<sup>2</sup>C interface for EEPROM
- Up to 20 general purpose PIOs with 3 extra open-drain PIOs available when LED not used
- PCM and I<sup>2</sup>S (only in HCI mode) interfaces
- 3 LED drivers (includes RGB) with PWM flasher independent of MCU

### Integrated Power Control and Regulation

- Automatic power switching to charger when present
- 2 high-efficiency switch-mode regulators with 1.8V and 1.35V outputs direct from battery supply
- 3.3V linear regulator for USB supply
- Low-voltage linear regulator for internal digital circuits
- Low-voltage linear regulator for internal analogue circuits
- Power-on-reset detects low supply voltage
- Power management includes digital shutdown and wake-up commands for ultra-low power modes

### Battery Charger

- Lithium ion / Lithium polymer battery charger
- Instant-on function automatically selects the power supply between battery and USB, which enables operation even if the battery is fully discharged
- Fast charging support up to 200mA with no external components. Higher charge currents using external pass device.
- Supports USB charger detection
- Support for thermistor protection of battery pack
- Support to enable end product design to PSE law:
  - Design to JIS-C 8712/8714 (batteries)
  - Testing based on IEEE 1725

### Baseband and Software

- Internal ROM
- Memory protection unit supporting accelerated VM
- 56KB internal RAM, enables full-speed data transfer, 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

## CSR8615 Mono ROM Solution Details

### Bluetooth Profiles

- Bluetooth v4.0 specification support
- A2DP v1.2
- AVRCP v1.4
- HFP v1.6
- HSP v1.2
- DI v1.3

### Music Enhancements

- Configurable 5-band EQ for music playback (rock, pop, classical, jazz, dance etc)
- SBC, MP3, AAC and Faststream decoder
- Volume Boost

### Additional Functionality

- Support for multi-language programmable audio prompts
- CSR's proximity pairing and CSR's proximity connection
- Multipoint support for A2DP connection to 2 A2DP sources for music playback
- Talk-time extension

### CSR8600 ROM Series Configuration Tool

Configures the CSR8615 mono ROM solution software features:

- Bluetooth v4.0 specification features
- Reconnection policies, e.g. reconnect on power-on
- Audio features, including default volumes
- Button events: configuring button presses and durations for certain events, e.g. double press on PIO for last number redial
- LED indications for states, e.g. device connected, and events, e.g. power on
- Indication tones for events and ringtones
- Battery divider ratios and thresholds, e.g. thresholds for battery low indication, full battery etc.
- Advanced Multipoint settings

### CSR8615 Mono ROM Solution Development Kit

- Example CSR8615 QFN module design
- Carrier board
- Output stage: headphone amplifier
- Interface adapters and cables
- Works in conjunction with the CSR8600 ROM Series Configuration Tool and other supporting utilities

## 1 Ordering Information

Device	Package			Order Number
	Type	Size	Shipment Method	
CSR8615 Mono ROM Solution	QFN-68-lead (Pb free)	8 x 8 x 0.9mm 0.4mm pitch	Tape and reel	CSR8615A04-IQQF-R

**Note:**

CSR8615 QFN is a ROM-based device where the product code has the form CSR8615Axx. Axx is the specific ROM-variant, A04 is the ROM-variant for CSR8615 Mono ROM Solution.

Minimum order quantity is 2kpcs taped and reeled.

**Supply chain:** CSR's manufacturing policy is to multisource volume products. For further details, contact your local sales account manager or representative.

### 1.1 Contacts

General information	<a href="http://www.csr.com">www.csr.com</a>
Information on this product	<a href="mailto:sales@csr.com">sales@csr.com</a>
Customer support for this product	<a href="http://www.csrsupport.com">www.csrsupport.com</a>
Details of compliance and standards	<a href="mailto:product.compliance@csr.com">product.compliance@csr.com</a>
Help with this document	<a href="mailto:comments@csr.com">comments@csr.com</a>

### 1.2 CSR8615 Mono ROM Solution Development Kit Ordering Information

Description	Order Number
CSR8615 Mono ROM Solution Audio Development Kit	DK-8615-10161-1A

## Document History

Revision	Date	Change Reason
1	02 AUG 13	Original publication of this document.
2	08 OCT 13	Production Information added.

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