Marvell Avastar 88W8764 Integrated 4x4 MAC/Baseband/RF MIMO SoC

Supports High Throughput Data Rates for Next Generation WLAN Products

PRODUCT OVERVIEW

The Marvell® Avastar™ 88W8764 is a highly integrated 4x4 wireless local area network (WLAN) system-on-chip (SoC), specifically designed to support high throughput data rates for next generation WLAN products and is part of the Marvell Avastar family of wireless devices. The device is designed to support IEEE 802.11n/a/g/b payload data rates.

The Marvell Avastar 88W8764 provides the combined functions of Direct Sequence Spread Spectrum (DSSS), Orthogonal Frequency Division Multiplexing (OFDM), and Multiple Input, Multiple Output (MIMO) baseband modulation, Medium Access Controller (MAC), on-chip CPU, memory, host interfaces, and direct-conversion WLAN RF radio on a single integrated chip.

The device supports 802.11n Beamformer and Beamformee functionality, enabling a simplified, integrated solution. When combined with other Marvell solutions, significant range and throughput performance can be achieved.

For security, the 88W8764 supports 802.11i security standards through implementation of the Advanced Encryption Standard (AES)/Counter Mode CBC-MAC Protocol (CCMP), Wired Equivalent Privacy (WEP) with Temporal Key Integrity Protocol (TKIP), Advanced Encryption Standard (AES)/Cipher-Based Message Authentication Code (CMAC), and WLAN Authentication and Privacy Infrastructure (WAPI) security mechanisms.

For video, voice, and multimedia applications, 802.11e Quality of Service (QoS) is supported. Also supported are 802.11h Dynamic Frequency Selection (DFS) for detecting radar pulses when operating in the 5 GHz band.

The device is also equipped with a coexistence interface for external, co-located 2.4 GHz radios.

The 88W8764 supports a PCI Express v1.1 interface and is available in a 231-pin (12x12) TFBGA package option.

BLOCK DIAGRAM

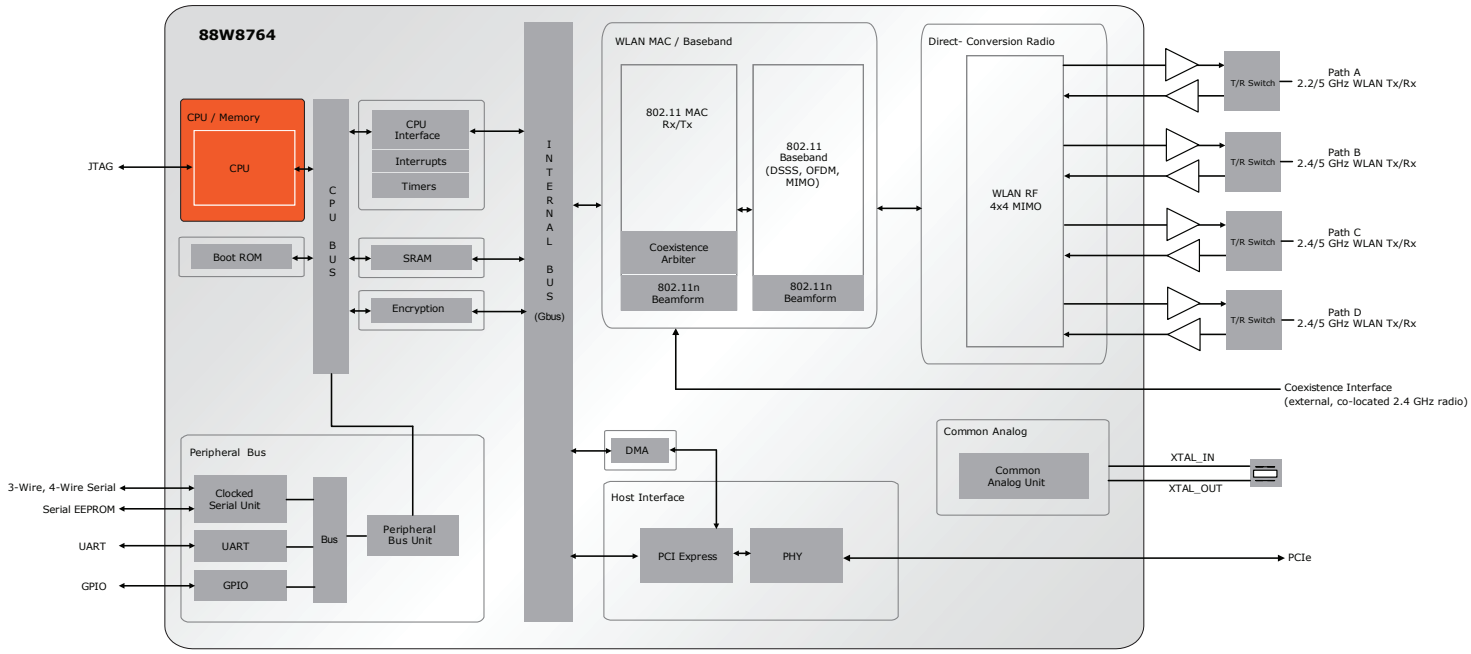

Fig 1. Avastar 88W8764 SoC Block Diagram

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SPECIFICATIONS

APPLICATIONS

- Personal computer systems
- Wireless gateways, routers, and access points
- Wireless client cards and bridges
- Wireless home audio and video entertainment systems including TV, set-top boxes, media servers, and gaming platforms

GENERAL FEATURES

- Single-chip integration of 802.11n/a/g/b wireless baseband, MAC, radio, CPU, memory, and host interface
- 4x4 MIMO operation
- Low power dissipation
- 40 MHz crystal clock support

IEEE 802.11/STANDARDS

- 802.11 data rates of 1 and 2 Mbps
- 802.11b data rates of 5.5 and 11 Mbps
- 802.11a/g data rates 6, 9, 12, 18, 24, 36, 48, and 54 Mbps for multimedia content transmission
- 802.11n compliant
- 802.11d operation in additional regulatory domains
- 802.11e QoS block acknowledgement (with support for 802.11n extension)
- 802.11h transmit power control
- 802.11h DFS radar pulse detection
- 802.11i enhanced security
- 802.11k radio resource management
- 802.11r fast hand-off for AP roaming
- 802.11v TIM broadcast
- 802.11w protected management frames
- 802.11z tunneled direct link setup
- Fully supports clients (stations) implementing IEEE Power Save mode

PACKAGING

- 12 x 12 mm, 231-pin TFBGA

PROCESSOR

- CPU
  - Integrated ARM9E-S™ CPU with integrated memories and cache controller for Access Point applications
- DMA
  - Independent 4-Channel Direct Memory Access (DMA)

MEMORY

- Internal Memory
  - Internal SRAM for Tx frame queues and Rx data buffers
  - Internal boot ROM

WLAN MAC

- Ad-Hoc and Infrastructure Modes
- RTS/CTS for operation under DCF
- Hardware filtering of 64 multicast addresses and duplicate frame detection for up to 96 unicast addresses
- On-chip Tx and Rx FIFO for maximum throughput
- Open System and Shared Key Authentication services
- A-MPDU Rx (de-aggregation) and Tx (aggregation)
- 20/40 MHz channel coexistence
- Reduced Inter-Frame Spacing (RIFS) receive
- Management information base counters
- Radio resource measurement counters
- Block acknowledgement with 802.11 extension
- Dynamic frequency selection
- Beamforming
  - 802.11n Explicit Beamformer, supports NDP and Stagger sounding
  - 802.11n Explicit Beamformee, supports immediate feedback generation using uncompress and compress steering matrix or delayed feedback of all feedback types
- 802.11v TIM frame transmission
- Multiple-BSSID/Station operation
- Transmit rate adaptation
- Transmit power control
- Long and short preamble generation on a frame-by-frame basis for 802.11b frames

WLAN BASEBAND

- 802.11n 4x4 MIMO (on-chip Marvell MIMO RF radio)
- Backward compatibility with legacy 802.11a/g/b technology
- PHY data rates up to 450 Mbps
- 20 MHz bandwidth/channel, 40 MHz bandwidth/channel, upper/lower 20 MHz bandwidth and duplicate legacy packet in 40 MHz channel mode operation
- Modulation and Coding Scheme (MCS)—0~23 and 32 (duplicate 6 Mbps)
- Enhanced radar detection for long and short pulse radar
- Enhanced AGC scheme for DFS channels
- Japan DFS requirements for W53 and W56
- Radio resource measurement
- Optional 802.11n MIMO features:
  - 20/40 MHz coexistence
  - 1-stream STBC transmission and reception
  - Short guard interval
  - RIFS on receive path
  - Explicit beamformee and beamformer
  - Greenfield Tx/Rx
- Enhanced receiver performance by channel smoothing
- Power save features

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SPECIFICATIONS

WLAN RADIO

- Integrated direct-conversion radio
- 20 and 40 MHz channel bandwidths
- WLAN Rx Path
  - Direct-conversion architecture eliminates need for external SAW filter
  - On-chip gain selectable LNAs with optimized noise figure and power consumption
  - High dynamic range AGC function in receive mode
- WLAN Tx Path
  - Closed/open loop power control (0.5 dB increments)
  - Optimized Tx gain distribution for linearity and noise performance
- WLAN Local Oscillator
  - Fractional-N for multiple reference clock support

WLAN ENCRYPTION

- WEP 64- and 128-bit encryption with hardware TKIP processing (WPA)
- AES-CCMP hardware implementation as part of 802.11i security standard (WPA2)
- Enhanced AES engine performance
- AES-Cipher-Based Message Authentication Code (CMAC) as part of the 802.11w security standard
- WLAN Authentication and Privacy Infrastructure (WAPI)
- Dual AES-CCMP and WAPI engines, which support simultaneous operation

COEXISTENCE

- Coexistence interface for external, co-located 2.4 GHz radio
  - Marvell 3/4-wire interface
  - WL_ACTIVE 3/4-wire interface
  - WL_ACTIVE 2-wire interface

HOST INTERFACES

- PCI Express specification v1.1

PERIPHERAL BUS INTERFACES

- Clocked Serial Unit (CSU)
  - 3-Wire, 4-Wire Serial Interface
  - SPI Serial EEPROM
- 16550 Universal Asynchronous Receiver/Transmitter (UART)
- General Purpose Input Output (GPIO)

TEST

- On-chip diagnostic information

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MARVELL®

Marvell Semiconductor, Inc.

5488 Marvell Lane
Santa Clara, CA 95054

Phone 408.222.2500
www.marvell.com

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