

Overview

The BridgeCo DM850 Media Networking Processor is a highly flexible interface processor optimised for secure, real-time encoding/decoding and processing of multi-channel media content. It features an on-chip Ethernet MAC, USB OTG Controller and PHY, and a direct, glueless interface to 802.11 PHY/MAC chipsets.

The DM850 supports standard networking and I/O protocols, and incorporates the interface and processing blocks described in Figure 1.

The DM850 IC and the available software packages form a turnkey solution, enabling rapid product development by OEMs and ODMs. The software packages feature an intuitive Application Programming Interface (API) which allows easy customisation, resulting in fast time to market. Reference designs are available for the example applications below.



Features

Secure high-performance audio/video media networking processor:

- Audio and video ports: I²S, I⁸S, SPDIF, CCIR 656, DVB-SPI
- Network I/O interfaces and controller: Ethernet, USB 2.0 OTG
- PCMCIA16/Compact Flash interface to connect IEEE 802.11, Bluetooth, etc. chipsets
- Control Ports: Two UARTs, SPI, GPIO
- Real-time media processor
- Industry-standard ARM9E embedded RISC controller

Comprehensive Media Network System Software:

- Real-time operating system and kernel
- Audio encoding/decoding and processing such as MP3, WMA, AC3, etc.
- Digital Rights Management and User Interface support
- Device discovery, configuration and device control: UPnP, USB Device Classes
- Functional libraries with configuration management, accessed through intuitive API Framework

Example Applications

Digital Media Player (DMP)

Wired or wireless audio DMP. Picture DMPs that receive and process high-quality digital media content from the Internet or networked PCs.

Consumer Electronic Products

Integrated wired or wireless network capability for consumer electronics and set-top devices.

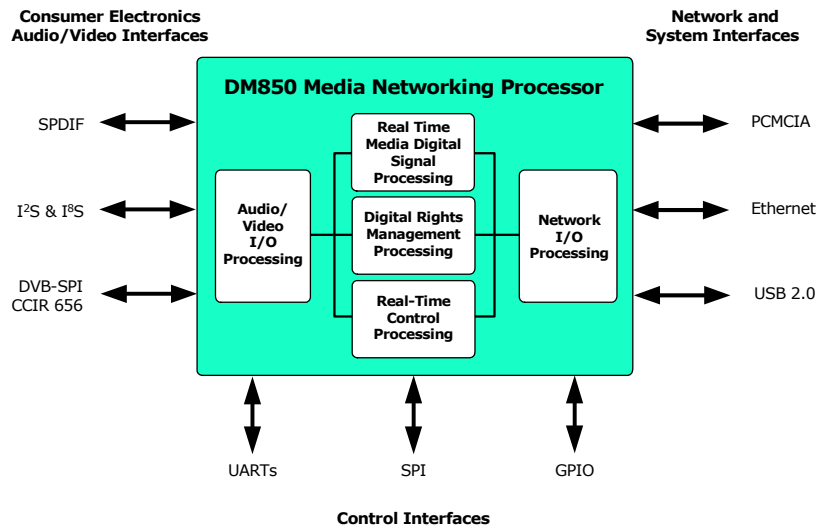


Figure 1
The DM850 enables networked media applications.

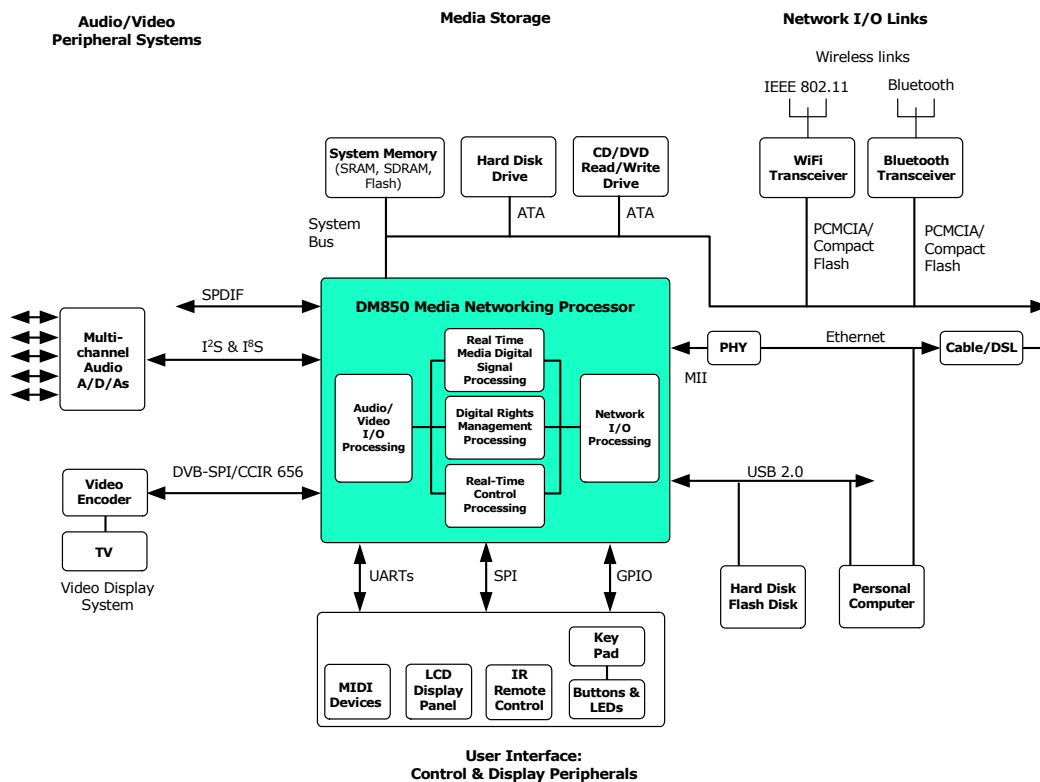


Figure 2
Composite view of network and consumer electronics devices that can be linked to DM850 applications

Digital Media Adapter (DMA)

The term DMA is used to describe a wide range of devices that stream and process media content.

Figure 2 is a composite representation of the diversity of connection and configuration options that can occur in a DMA, and how

these configurations are supported by the DM850. The diagram also shows that the DM850 supports the five functional processing areas essential to the implementation of a DMA. Table 1 gives an overview of the associated software functionality.

Network I/O Processing

As the division between the computer domain and the consumer domain narrows, there is an increasing need for devices to support a wider range of interfaces. USB is the dominant approach for interfacing PC peripherals. Ethernet is the de facto standard for data networking, but the wireless standard 802.11 is becoming increasingly important to all classes of products.

Real-Time Media Digital Signal Processing

As most of the media stream’s timing, formatting and de/multiplexing is performed by the I/O hardware and its software drivers, the remaining media processing falls into the broad categories of compression/expansion (encode/decode), or the conversion of some functions on data blocks or frames. In the DM850, these processes are shared between the embedded RISC microcontroller and the real-time media processor, where array and DSP-intensive multiply-accumulate operations dominate.

Digital Rights Management Processing

It is becoming increasingly common to stream media content digitally between devices, so it is important to consider the protection of the property rights of the content providers through appropriate Digital Rights Management (DRM) schemes. The different algorithms used often need computationally intensive encryption and authentication routines. The powerful processing engine of the real-time media processor in the DM850 is designed to support these algorithms, many of which are already available in the associated software platform.

Audio/Video I/O Processing

Digital audio applications require a range of interfaces, including SPDIF, I²S and I⁸S. All these interfaces are supported in the DM850 hardware. The combination of the media processor and supporting software facilitates operations such as switching and mixing. Support for video is provided in the form of CCIR 656, MPEG, or DV through a digital DVB-SPI interface.

Real-Time Control Processing

In addition to its core media streaming functions, a DMA must support a range of interfaces such as LCDs, LEDs, push buttons, rotary encoders and remote controls. There is also a need to provide the general control program requirements with support for advanced services, such as Web-based browsers and UART-based MIDI controls. In order to minimize overall system costs, it is important that this range of functions can be supported without additional components.

The software support provided with the DM850 leverages the processing power of the ARM 926EJ controller. This allows general purpose control functions to be elegantly implemented alongside media processing algorithms. This avoids the need for ancillary control processors. General purpose outputs, coupled with industry standard SPI and UART ports, complete this support in hardware. An extensive library of software also exists for these functions.

Table 1

Functional Process	Functional Software Stack
Network Input/Output	A/V Streaming & Clock Regeneration
	Reference Time Distribution
	Packet Synchronisation
	TCP/IP Stack
	USB Communication Stack
Audio Support	Audio Decoding (MP3, WMA, DTS, Dolby 5.1 etc.)
	Graphics Overlay for video UI
	Sample Rate Conversions
	Audio mixing, equalisation, limiting, fading, etc.
	MINI interface
Video Support	JPEG image decoding
	Video 656 framing
	Video transport (eg. MPEG, DV, etc.)
Digital Rights Management Processing	Encryption/Decryption including DES, 3DES, AES, IDEA & DTCP (5C)
	Authentication including RSA, Diffie/Helman & Elliptic Curves
	Support for Proprietary Content schemes
Control Protocols	UPnP Stack
User Interface	IR Remote Control support
	Graphical LCD support

Hardware Description

The DM850 major functional blocks are shown below.

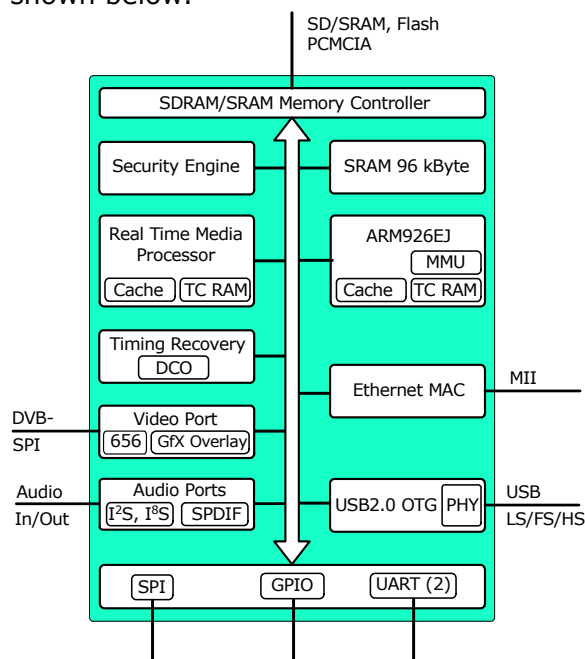


Figure 3
DM850 Hardware Block Diagram

Network Input/Output

Network I/O is provided by four distinct interfaces.

- The on-chip Ethernet MAC supports 10/100 Mbps half or full duplex modes with IEEE 802.1d/q VLAN, and priority. It connects to an external PHY through the MII interface. A dedicated output provides a 25 MHz clock to the PHY, making an additional crystal unnecessary.
- The integrated USB 2.0 On-The-Go (OTG) Controller (Dual-Role) supports Full Speed (12 Mbps), High Speed (480 Mbps) and Low Speed (1.5 Mbps) rates. A total of 12 endpoints providing INT, BULK and ISOCH transaction capabilities are supported.
- IEEE 802.11 a/b/g WiFi is supported through an external chipset with the PCMCIA16 or Compact Flash interface.

Audio/Video Input/Output

There are up to four Audio I/O ports, each with four I²S/I⁸S interfaces operating at up to 192 kHz in both I²S and I⁸S modes. There are up to eight SPDIF interfaces operating at up to 192 kHz.

Video I/O is an 8 bit input or output, compliant with EN50083-9 (DVB-SPI). It provides a glueless connection to MPEG, DV, and PAL/NTSC video encoders/decoders. Low-jitter digital clock recovery, using an on-chip DCO, eliminates the need for an external VCO.

Control & System Input/Output

Two UARTs provide data rates up to 1.5 Mbps and MIDI capability. Auxiliary interfaces include SPI (master and slave) and GPIOs supporting IR receivers and transceivers, LCD displays, etc.

ARM Microcontroller

The ARM926EJ RISC CPU operates at up to 150 MHz, and supports Linux, Windows[®] CE and real-time operating systems. It has a 4 kByte instruction and a 4 kByte data cache. Tightly coupled RAM is provided on-chip, with 16 kByte for instructions and 8 kByte for data.

The ARM926EJ offers additional performance by incorporating DSP enhancements, a multichannel DMA controller and a Java Virtual Machine.

Real-Time Media Processor

Running at 150 MHz, this provides:

- Secure processing capabilities to prevent spoofing of data and code
- Signal processing including audio decode, sample rate conversions and still image decoding
- CCIR656 video generation from still images
- Graphical user interface overlays on CCIR656 video streams
- Support for Copy Protection and Digital Rights Management schemes.

Memory Controller

An SDRAM/SRAM memory controller, with a 16 bit data path, provides connectivity

- to SDRAM at up to 150 MHz
- to SRAM and Flash
- to PCMCIA, Compact Flash, or ATA compliant devices.

It features four Chip-Select signals, each with 32 MB address ranges; the address range for SDRAM is 256 MB. It provides an IOREADY signal to prolong access cycles as well as 96 kByte internal general-purpose SRAM.

Software

A comprehensive set of software modules and complete reference applications for an audio DMP is available for the DM850. The application software is based on BridgeCo's Kernel & OS (KnOS), a highly efficient real-time multi-threaded processing kernel, optimised for data streaming and data handling.

The KnOS API provides abstracted access to all functions of the DM850. In addition to standard operating system functions, such as thread and memory management, KnOS integrates a complete driver stack for Ethernet. KnOS supports FLASH-based persistent storage, clock management and an interactive terminal shell.

On top of KnOS, a comprehensive set of object-oriented software libraries is offered. This software framework supports typical interface functions, e.g. buttons, switches, rotaries, LEDs, LCD drivers, and control and transport protocols (including UPnP, TCP/IP and HTTP).

DSP functions include MP3 and WMA decoders, Dolby Digital (AC3), Dolby ProLogic II and Dolby Virtual Surround, bass management, equalizers, audio mixers and

volume control for audio. Additional DSP functions offered are picture decoding and OSD.

For a complete list of software modules and supported applications, please visit www.bridgeco.com.

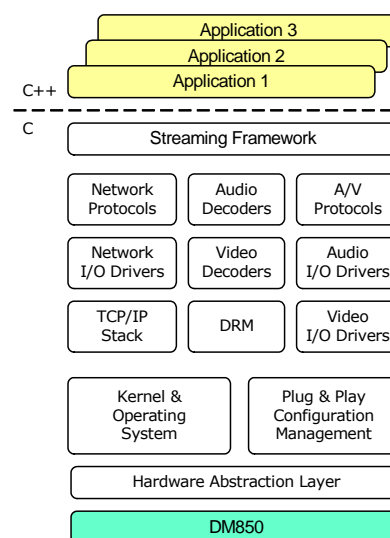


Figure 4
DM850 Software Stack

Product Development and Reference Designs

Given the increasing complexities of the target products and the competitive nature of the market, system designers must consider three important criteria when choosing an application platform solution:

1. Does it meet the functionality and performance criteria?
2. Does it lower product risk?
3. Will it reduce time to market?

BridgeCo meets all of these needs with the DM850. The DM850 Evaluation Board provides a working physical design that can be used for familiarisation with the software. BridgeCo also supplies complete turnkey application software which operates on companion reference boards:

- CE Family: AVR and DVD networking
- Wireless Audio DMP

Please see the relevant Product Information brochures for more details. The most up to date information can be found at www.bridgeco.com. This list is being constantly extended.

Software Development Kit

The DM850 Software Development Kit (SDK) includes a development license, together with software, documentation and a reference design evaluation board.

The DM850 software consists of the KnOS Operating System, together with the application framework for the specific application (Breakout Box, DMA, etc). Tools and function libraries are provided to enable the generation of custom application software.

Simple APIs make the kit easy to use and the documentation is straightforward and easy to understand.

The SDK comes with sample applications that run on BridgeCo Evaluation Boards or Reference Boards, and can serve as models for final product designs.

The BridgeCo SDK reduces development risk and enables rapid progress from prototype design to a shipping product.

Ordering Information

The following ordering codes should be used to specify DM850 products when ordering from BridgeCo:

Product Description	Ordering Code
DM850 Media Networking Processor IC	IC BCOIC-DM850-CQL
Package	eLQFP208 (lead free package)
Temperature Range	Commercial
Evaluation Kit including reference board	Contact BridgeCo Sales – www.bridgeco.com
Development Kit including reference board	Contact BridgeCo Sales – www.bridgeco.com
Application software packages and software modules	Contact BridgeCo Sales – www.bridgeco.com

For information on additional software modules, integrated software application packages, or pricing and order enquiries, please contact BridgeCo directly:

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