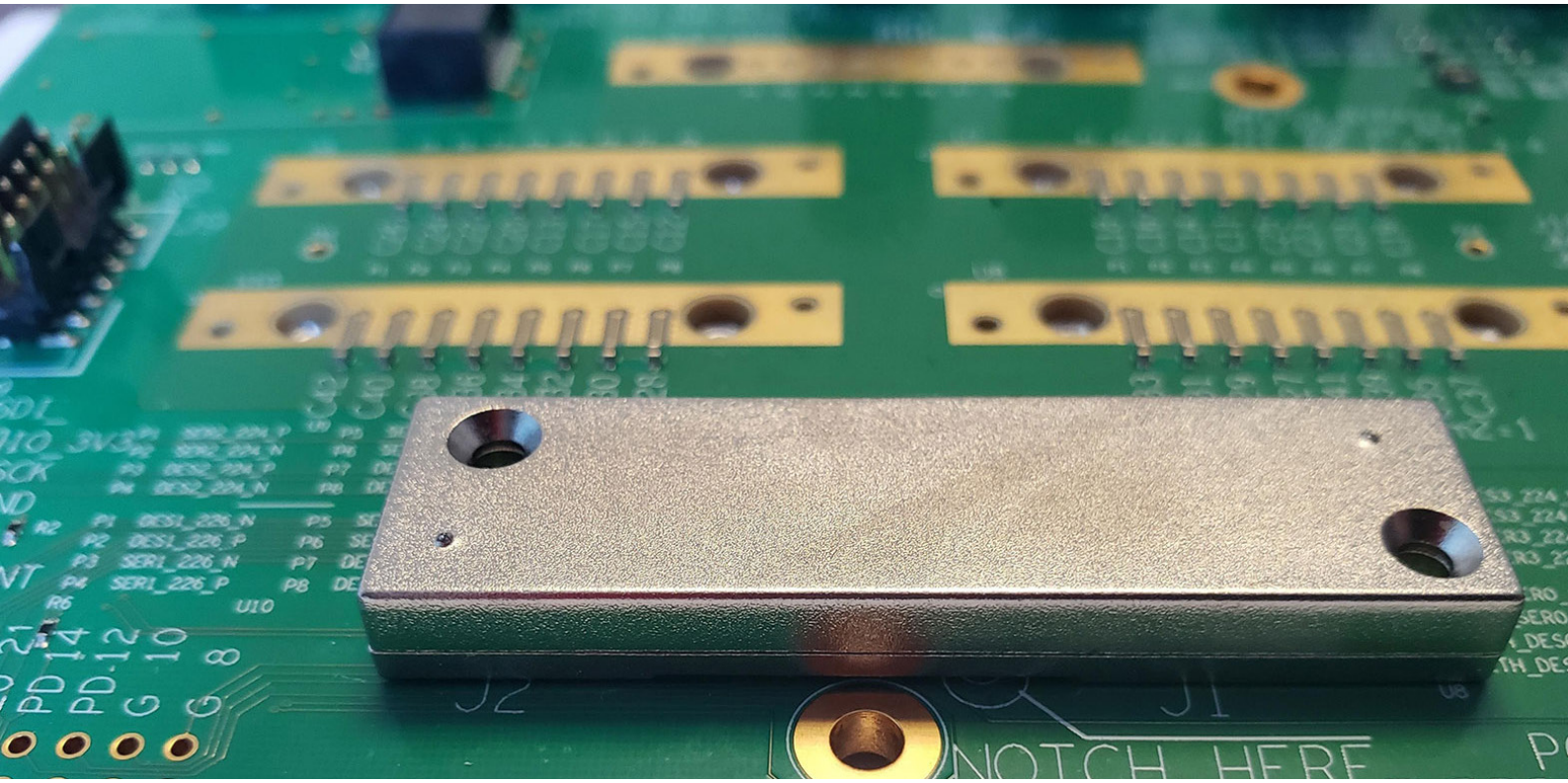
Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix



As broadcast and live production migrates to SMPTE ST 2110 based workflows, there is increased demand for equipment manufacturers to add IP capabilities to their products.

Adding ST 2110 presents many challenges if the manufacturer does not have the expertise or resources to do this work in-house. Not only is the initial development expensive and time consuming, the requirements for qualifying the interfaces to ensure compatibility with other vendor's equipment is resource intensive. Plus, additional investments are required whenever there are changes in industry specifications or updates to the control protocols.

Embrionix specializes in developing interface modules, which are sold exclusively to video equipment manufacturers on an OEM basis. To meet the needs of manufacturers that plan to add ST 2110 interfaces to their products, the Embrionix EB82SOC1 "System on Chip" (SOC) was developed. The SOC performs multi-channel AV processing between IP and SDI, in a compact and ruggedized form factor that easily integrates into almost any broadcast equipment manufacturers' product. This ability allows the manufacturer to focus on the design of their core product and still have a world-class, feature-rich, high-performance ST 2110 implementation.

Figure 1: Embrionix EB82SOC1 "System on Chip"

Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix

A wide array of devices can take advantage of the EB82SOC1. These devices include cameras, base stations, audio/video monitors, projectors, routers, graphics systems, teleprompters, playout servers, encoders, and terminal devices. The applications are wide reaching.

Overview

The EB82SOC1 is a 'Software Defined Platform" that utilizes a hardware processing engine in conjunction with a gateway application which defines the function to be performed. Up to three applications can be loaded into the chip, and the user can switch between them at any time to select which application is active.

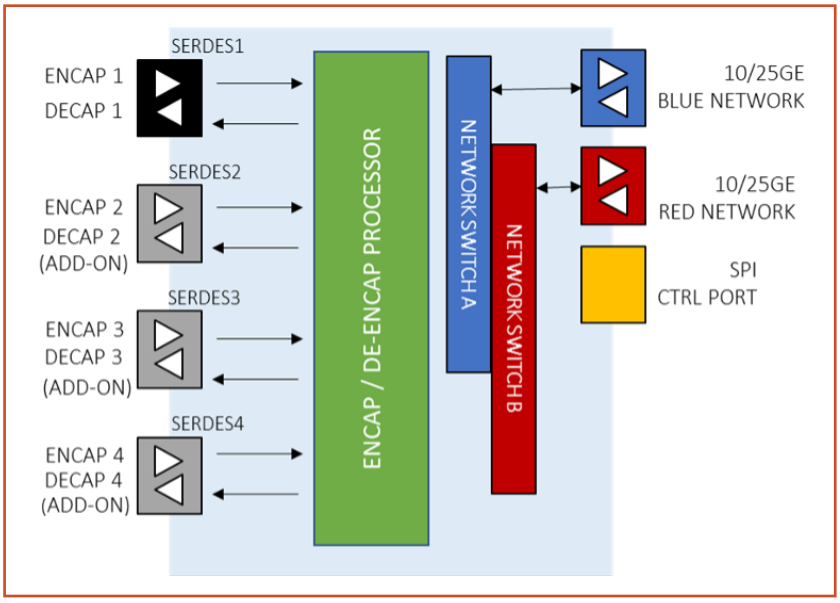


Figure 2: EB82SOC1 Internal block diagram.

There are eight SDI lanes (or signals) that can be configured as inputs or outputs, which allow the device to mix and match any combination of 1.5G, 3G, and (optionally) 12G video, up to the maximum device throughput. The ST2110 - SDI gateway application performs encapsulation (SDI to ST2110) and de-encapsulation (ST2110 to SDI) on the first two SDI lanes, which can be configured as dual SDI input, dual SDI output, or bi-directional. The remaining six SDI lanes are licensed in pairs. The fully loaded configuration provides up to 4in/4out, 6in/2out, or 2in/6out (4in/4out example shown in Figure 2).

Dual NIC's provide full ST2022-7 "hitless redundancy" supporting red/blue network topologies on the IP side.

ST2110 - SDI Gateway Application Features

In addition to the core function of video encapsulation and de-encapsulation, the gateway application also provides a feature rich platform that is standards compliant and versatile.

Each SDI video stream can have associated audio streams (up to four channels), plus one channel of ancillary data. There are various functions for synchronization, traffic shaping, and device control via NMOS, EMBER+, SPI, and Restful API protocols per the list below:

Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix

List of Standards Compliancy and Control Options

Video (ST 2110-20)	**Audio** (ST 2110-30 "PCM", ST 2110-31 "AES3 Compressed")	**Ancillary** (ST 2110-40)
• Encapsulator (ST 2110-20) • De-Encapsulator (ST 2110-20) • CDIS De-Encapsulator (ST 2110-23)	• 4x Encapsulators (per SDI Channel) • 4x De-Encapsulators (per SDI Channel	• Encapsulator • De-Encapsulator
Synchronization	**Traffic Shaping** (ST 2110-21)	**Control**
• PTP Support: ST 2110-10 (AES-R16-2016)	• Senders: Narrow Gapped • Receivers: Narrow Gapped, Narrow Linear or Wide	• NMOS - IS-04 v1.2 (Discovery) - IS-05 v1.0 (Routing) - IS-08 v1.0 (Audio Mapping) - IS-09 (System) - BCP-002-01 (Essence Grouping) - TR-1001 (System Environment and Device Behaviors) • Ember+ / Ember+ Bess

Latency, Frame Sync, And Clean Switching

Latency is always a concern, and the EB82SOC1 boasts the industry's best performance **with less than 1 line of delay** on the encapsulation side and **less than 2 lines of delay** on de-encapsulation side.

ST2110 requires video to be synched to PTP (Precision Time Protocol). The EB82SOC1 provides a built-in frame synchronizer as a standard feature, which can be used to lock incoming video to the PTP master. Use of the frame synchronizer, however, will naturally introduce one frame of delay.

On the de-encapsulation side, an optional "Clean Switch" feature is available which provides various modes for 'make before break' and 'break before make' to ensure glitch-free switching (using the Clean Switch frame buffer mode can add one or two frames of delay, versus less than 2 lines latency for normal de-encapsulation.)

Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix

List of Management Features

Management	Transport	ST2110 ENCAP Direction	ST2110 ENCAP Direction
• EIPv4 In-Band via Media Ports (or via SPI) • DHCP Support (RFC-2131) • LLDP Support (IEEE-802.1 AB) • IGMP v2 and IGMP v3 (RFC-2236 and RFC-3376) • Field Upgradable (via SPI or REST)	• Multicast streams (RTP - RFC-5771)	• Frame Synchronizer • Reed Solomon FEC (25GbE) • Flexible Audio Mapping (16 Audio Channels)	• Frame Buffer Mode vs. Minimum Delay Mode • AV Delay Control • IP Jitter Tolerance • Vertical Offset (Buffer) Adjustment • Flexible Audio Mapping (16 Audio Channels) • Clean Switching

Blackburst Generator

With the ST 2110 Gateway APP Version 4.40 and higher, the SOC can generate a 270 Mbit blackburst signal on SDI output 4. This optional feature can be used to produce a local reference, ensuring that the host product itself is precisely genlocked to the PTP grandmaster. This blackburst SDI signal can also be routed to an external BNC connector and used to synchronize other studio equipment whose video is feeding into the host product.

Integrating The EB82SOC1

The EB82SOC1 is integrated as a component on the PC board of the host product. Internal SDI signals (inputs and outputs) can be fed to the SOC for processing. The IP output from the SOC is routed to standard 10GbE/25GbE SFP data modules, such as the Embrionix EBC0LCRT-LR-P13D or the Embrionix EBC1LCRT-LR-P13D (for connection to the network switch).

If a mix of SDI and IP is desired, the SDI signals can continue to be routed to a BNC connector for traditional IO, or to a video SFP for greater format flexibility (as shown in Figure 3).

To facilitate integration, Embrionix provides example schematics and Gerber files. This dramatically reduces time to market and eliminates costly board spins throughout the prototyping phase of development.

The Embrionix engineering team is available as a resource, providing up to four hours of design review for new OEM customers, to ensure that the System on Chip (SOC) integration is successful.

Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix

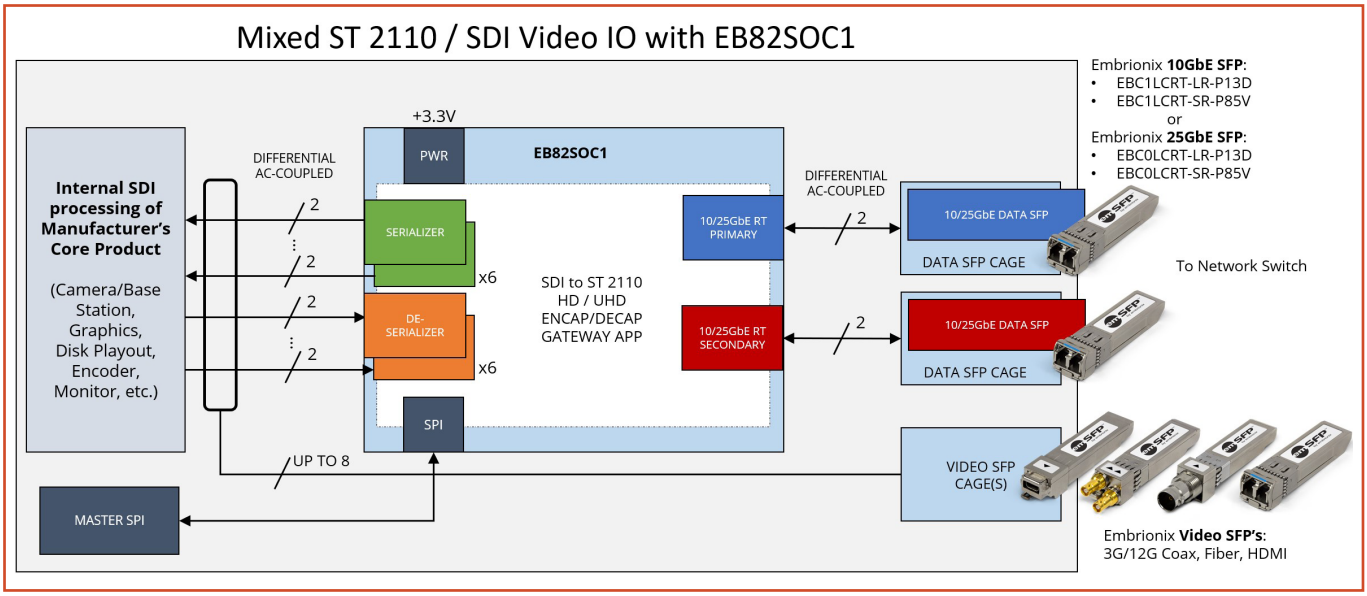


Figure 3: High level integration.

EB82SOC1 Evaluation Board

To allow the equipment manufacturer to test all the software interfaces in parallel to the PC board design process, the EB82SOC1-EVB "Evaluation Board" is available, which includes:

- The EB82SOC1 module itself (plus heatsink)
- Two SFP cages for the network data
- Differential pair SMA connectors for the video IO
- Low-level code to read and write to the SOC
- Higher-level tools to connect to the IP network
- All user guides (hardware and software, Restful API, and SPI)

An external power supply and an SPI interface (which is easily obtained from a USB converter as shown in Figure 4) are required.

Also available is a companion SMA adapter board, so that standard video SFP modules can be used for the video signal.

Overcoming ST 2110 Product Design Challenges With The Embrionix EB82SOC1

by David Workman, Global OEM Sales Manager, Embrionix

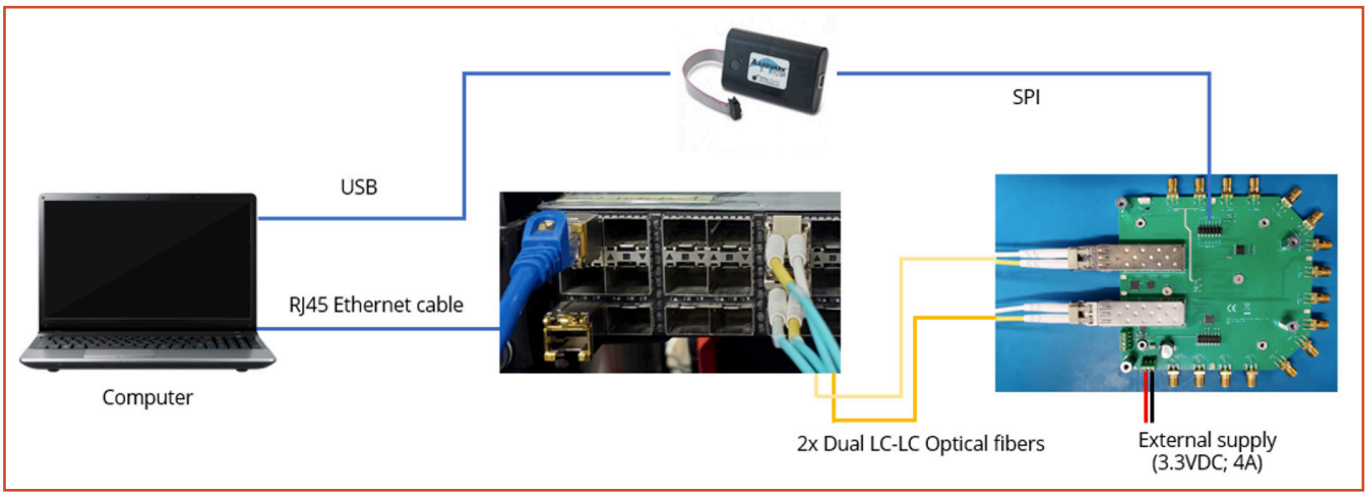


Figure 4: Evaluation Board configuration.

Conclusion

The EB82SOC1 from Embrionix is a feature rich and robust solution for easily integrating ST2110 into broadcast video products. Embrionix actively participates in ST2110 and NMOS interop events and has taken a leadership role in ensuring that standards are implemented consistently throughout the industry, and that APIs are clearly written to eliminate ambiguity.

As the EB82SOC1 (and the companion SFP module, the EB22LC2B-SN) are used in a wide range of other manufacturer's products around the world, Embrionix has a proven track record of interoperability, reliability, and keeping up on new revisions of the standards as they are released.

By using the EB82SOC1, video equipment manufacturers can concentrate on their core product development, enjoy quicker time to market, save on development costs, and invest in a future-proof platform.

More vendor content

- Multiformat I/O: Advantages Of Using SFP Modules In Broadcast Video Equipment

Full listing on Embrionix page