EB22HDRT-LM-0515-03

ST2110 to SDI IP decapsulator emSFP+ gateway, Single Channel, MSA, HD-BNC - 10GbE host

DESCRIPTION

The EB22HDRT-LM-0515-03 is a single channel ST2110 to SDI IP decapsulator emSFP+ gateway, with MSA pinout, HD-BNC connector and an SFI host interface (10GbE) designed to transmit one SDI signal up to 3Gbps over 75ohms coax as defined in ST424, ST292, ST259. This IP-to-SDI module is carefully designed to support SDI pathological test patterns. The EB22HDRT-LM-0515-03 is compatible with 10GbE COTS switch port and implement the gateway by performing the ST2110 to SDI stream decapsulation.

The EB22HDRT-LM-0515-03 provides module identification information and diagnostic through a 2 wire serial interface and the module is controllable via the 10GbE interface (more details available in the API user guide). It is also hot pluggable/removable solution for in field system upgrade and maintenance resulting in a low MTTR. The EB22HDRT-LM-0515-03 is interchangeable with others MSA datacom pinout SFP+ improving product flexibility. The module is ST424, ST292, ST259, ST2110 compliant resulting in quick time-to-market and reduced development efforts and cost. The EB22HDRT-LM-0515-03 is Pb-free and RoHS compliant.

FEATURES

— ST2110, ST424, ST292, ST259, SFI (10GBE SFP+) compliant

— HD-BNC connectors

— Supports video pathological patterns for SD-SDI, HD-SDI and 3G-SDI

— Hot-pluggable

— Control & Monitoring via serial interface:
  o Alarm reports
  o Voltage & Temperature monitoring
  o Module Information

— Controllable via IP (RESTful API)

— Low Power Consumption - typical 1.5W @ 3.3V

— Pb-free and RoHS compliant

— Operating temperature range: -20C to 85C

— 58.5mm x 13.4mm x 8.6mm SFP Package

— Ganged Cages & Stacked Cages mounting supported

APPLICATIONS

— SDI to IP Gateway

— IP Audio/Video Signal Routing

— Signal Contribution

ORDERING INFORMATION

PART NUMBER	TYPE	PACKAGE	TEMPERATURE
EB22HDRT-LM-0515-03	RT	SFP/SFP+	-20C to 85C

PICTURE

Figure 1. EB22HDRT-LM-0515-03 emSFP+

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ST2110 to SDI IP decapsulator emSFP+ gateway, Single Channel, MSA, HD-BNC - 10GbE host
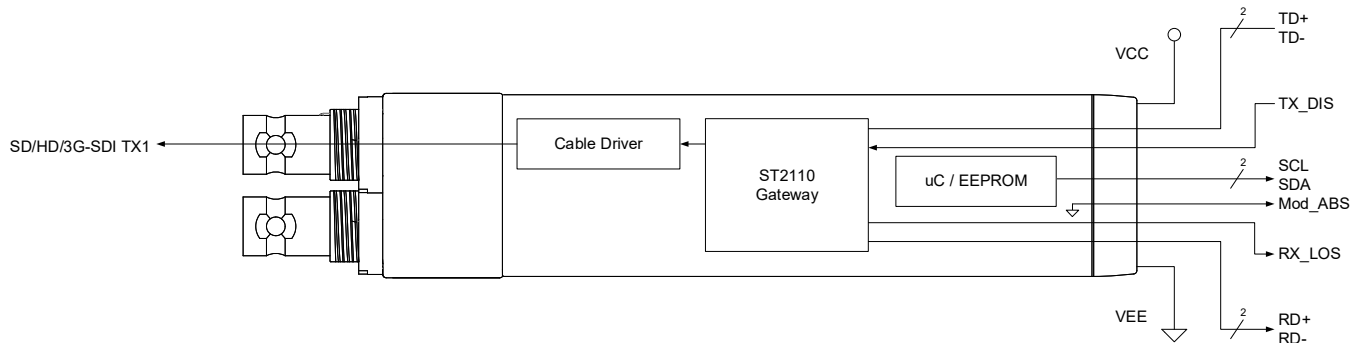
1. FUNCTIONAL BLOCK DIAGRAM

Figure 1-1. High level block diagram

2. PIN SPECIFICATION

2.1 HOST CONNECTOR PIN CONFIGURATION

The Figure 2-1 below shows the pin names and numbering for the connector block on the host board. The diagram is in the same relative orientation as the host board layout. The pin functions are described in Table 2-1 with accompanying notes. To minimize EMI emission, the signals to the 20-pin connector should be shut off when the module is removed.
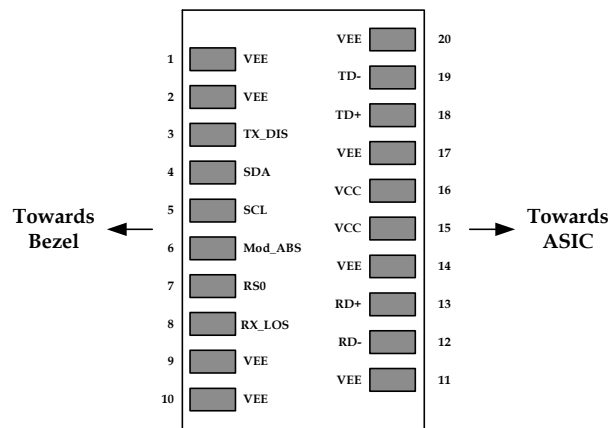

Figure 2-1. Host connector pin configuration

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2.2 EMSFP+ PIN DEFINITION

Table 2-1. Pin Description

PIN#	NAME	FUNCTION	NOTES
1	VEE	Ground	
2	VEE	Ground	TX_FAULT function not implemented.
3	TX_DIS	Transmitter disable	TX_DIS function is not implemented. It is internally pulled up with a 4.7k to 10k resistor. High/Open = Transmitter Disabled.
4	SDA	Serial Data	Must be pulled up to VCC (4.7k-10k) on the host board (open drain).
5	SCL	Serial Clock	Must be pulled up to VCC (4.7k-10k) on the host board (open drain).
6	Mod_ABS	Internally grounded	Module Absent.
7	RS0	Not Connected	RS0 function not implemented. Floating, Internally Not Connected
8	RX_LOS	Lost Of Signal	RX_LOS function is not implemented. RX_LOS is an active high open-drain output that returns the loss of a valid signal. High = signal not valid.
9	VEE	Ground	
10	VEE	Ground	
11	VEE	Ground	
12	RD-	Inv. RD Channel 1	RD± are the differential receiver outputs. The AC coupling is done inside the module and is thus not required on the host board.
13	RD+	RD Channel 1	The voltage swing on RD± will be between 300mV and 850mV differential (150mV to 425mV SE) when properly terminated.
14	VEE	Ground	
15	VCC	+3.3V Supply	Defined as 3.3V±5% at the SFP connector pin. Recommended host board power filtering is shown in figure section 6.
16	VCC	+3.3V Supply	
17	VEE	Ground	
18	TD+	Transmit Data In	TD± are the differential inputs of the transmitter. They are AC coupled differential lines with 100 ohms differential termination inside the module.
19	TD-	Inv. Transmit Data In	TD± will accept differential swing of 180mV to 700mV.
20	NC	Not Connected	Floating, Internally Not Connected.

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3. SPECIFICATIONS

3.1 ABSOLUTE MAXIMUM RATINGS

Exceeding any of these ratings may permanently damage the module. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 3-1. Absolute maximum ratings

	SYMBOL	MIN	MAX	UNIT	NOTES
Supply Voltage	V_{CC_MAX}	0	3.6	V	
Operating Case Temperature*	T_{C_MAX}	-20	+85	C	
Storage Temperature	T_S	-40	+85	C	
Operating Relative Humidity		5	95	%	Non-condensing
ESD Rating			1	kV	HBM

*Measured on the top side of the module in the center

3.2 RECOMMENDED OPERATING CONDITIONS

Unless otherwise specified, all specifications are valid under these conditions: VCC = 3.3±5%, TC=-20C to 85C. Specifications are guaranteed by design and characterization.

Table 3-2. Recommended operating conditions

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage	V_{CC}	3.13	3.3	3.465	V	
Operating Case Temperature*	T_C	-20		+85	C	
Serial Data Rate SD	BR_{SD}		270		Mbps	SMPTE 259M, C
Serial Data Rate HD	BR_{HD}		1483, 1485		Mbps	SMPTE 292M

*Measured on the top side of the module in the center

3.3 DC CHARACTERISTICS

Table 3-3. DC Characteristics

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Power Supply Current	I_{CC}		455		mA	Note 1
Total Power Consumption*	P_D		1500		mW	Note 1

Note 1) All power consumption characterized at 25C, V_{cc} = 3.3V

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3.4 DIGITAL IO CHARACTERISTICS

Table 3-4. Digital IO characteristics

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
SDA (Output)						
Output Voltage Low	V_{OL}			0.1	V	I_{OL}= 10µA
	V_{OL}			0.6	V	I_{OL}= 8.5mA
SCL & SDA (Input)						
Input Voltage Low	V_{iL}			0.8	V	Note 1
Input Voltage High	V_{IH}	2.0			V	Note 1

Notes:
1) SCL & SDA must be pulled up to VCC with a 4.7-10kΩ on the host board

Table 3-5. Digital Receiver IO characteristics

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
RD± (Output)						
Single-ended Voltage Swing	V_{OP-P}	150		425	mV_{P-P}	Note 1,2
Differential Voltage Swing	$V_{ODIFF\ P-P}$	300		850	mV_{P-P}	Note 1,2
Differential Impedance	Z_{ODIFF}	90	100	110	Ω	Note 1,2
Rise Time, Fall Time	t_r,t_f		45		ps	20%-80%, Note 1,2

Notes:
1) RD± outputs are AC-coupled inside the module
2) 100Ω Load condition, 25C

Table 3-6. Digital Transmitter IO characteristics

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
TD± (Input)						
Single-ended Voltage Swing	V_{IP-P}	90		350	mV_{P-P}	Note 1
Differential Voltage Swing	$V_{IDIFF\ P-P}$	180		700	mV_{P-P}	Note 1
Differential Impedance	Z_{ODIFF}	90	100	110	Ω	Note 1

Notes:
1) TD± outputs are AC-coupled inside the module

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3.5 TIMING SPECIFICATION

Table 3-7. Timing specifications

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
SCL (Input)						
Clock Rate				400	kHz	NOTE 1
Processing						
Time to Initialize				300	ms	

Note: 1) if host does not support clock stretching, SCL clock rate should be set to 100Khz maximum.

3.6 ELECTRICAL TX1 CHARACTERISTICS

Table 3-8. ELECTRICAL TX1 SIGNAL

	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
SDI TX1 SIGNAL (Electrical Output)						
Output Voltage Swing	V_{SDo}	720	800	950	mV_{p-p}	
Output Return Loss	$ORL_{0-1.5G}$	15	19		dB	Bandwidth 0-1.5Ghz
	$ORL_{1.5-3G}$	10	14		dB	Bandwidth 1.5-3Ghz
Rise/Fall Time (20%-80%)	t_r-SD, t_f-SD	400		800	ps	
	t_r-HD, t_f-HD			135	ps	
	t_r-3G, t_f-3G			135	ps	
SD Rise/Fall time Mismatch				125	ps	
HD/3G Rise/Fall time Mismatch				30	ps	
Overshoot				10	%	

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4. FUNCTIONAL DESCRIPTION

The EB22HDRT-LM-0515-03 ST2110 to SDI decapsulator emSFP+ gateway is an enhanced Small Form Factor Pluggable (SFP+) module with HD-BNC interface.

The EB22HDRT-LM-0515-03 provide through its HD-BNC connector a SDI output signal conforming to the ST424, ST292 or ST259 by performing the UDP/RTP decapsulation of the ST2110 stream.

The EB22HDRT-LM-0515-03 module has a serial interface through which an EEPROM containing the SERIAL IDENTIFICATION can be read. Through the same serial interface, diagnostic monitoring is provided via the SERIAL CONFIG INTERFACE giving the opportunity to read the temperature and the supply voltage.

This module comes with a MAC address configured at the factory which cannot be changed. It can have IP address configured on the fly either via the serial interface (I2C) or via RESTful API. Advanced diagnostic information is also available through vendor specific A2h pages and via the RESTful API.

For more information on the API user guide, please download it from EB22HDRT-LM-0515-03 page on our website www.embrionix.com/product/EB22HDRT-LM-0515-03.

4.1 MODULE INSTALLATION

The module is simply inserted, small end first, under manual pressure. Controlled hot plugging is ensured by design. The module housing makes initial contact with the host board EMI shield, mitigating potential damage due to Electrostatic Discharge (ESD).
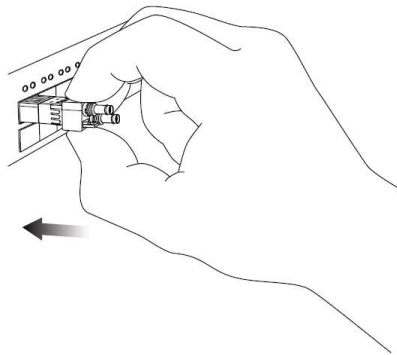
Figure 4-1. Module installation

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4.2 SERIAL IDENTIFICATION (EEPROM)

The emSFP+ 2-wire serial interface (SDA & SCL) provides access to the identification information describing SFP capabilities, interfaces, and associated information. The serial interface uses the 2-wire serial EEPROM protocol defined for the ATMEL AT24C02 family component. The memory is organized as a series of 8-bit data words that can be addressed individually or sequentially. The content of the SERIAL IDENTIFICATION (serial ID) device is write-protected. The 2-wire serial bus address 1010000X (A0h) is used for serial ID access.
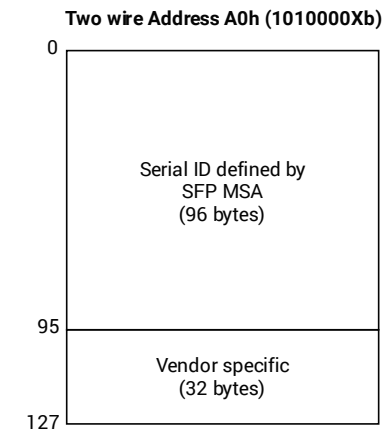
Two wire Address A0h (1010000Xb)

Figure 4-2. EEPROM Memory Mapping

For more information on the EEPROM memory mapping, please download it from EB22HDRT-LM-0515-03 page on our website www.embrionix.com/product/EB22HDRT-LM-0515-03.

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4.3 SERIAL CONFIG INTERFACE

The emSFP+ 2-wire serial interface (SDA & SCL) provides also digital diagnostic monitoring via the SERIAL CONFIG INTERFACE. The serial interface uses the 2-wire serial EEPROM protocol defined for the ATMEL AT24C02 family component. The memory is organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial bus address 1010001X (A2h) is used for SERIAL CONFIG INTERFACE access.
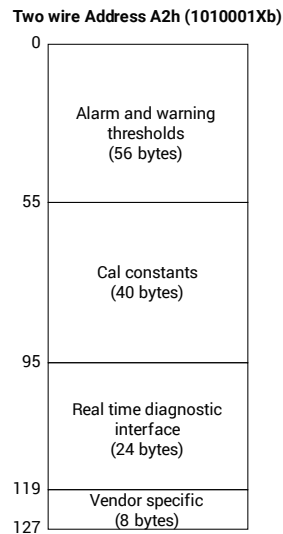
Two wire Address A2h (1010001Xb)

```
0
      Alarm and warning
         thresholds
         (56 bytes)
55
       Cal constants
        (40 bytes)
95
    Real time diagnostic
          interface
         (24 bytes)
119
      Vendor specific
        (8 bytes)
127
```

Figure 4-3. Serial Configuration Interface Memory Mapping

For more information on the configuration interface memory mapping, please download it from EB22HDRT-LM-0515-03 page on our website www.embrionix.com/product/EB22HDRT-LM-0515-03.

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5. RECOMMENDED CIRCUIT SCHEMATIC

5.1 HOST BOARD RECOMMENDED CIRCUIT SCHEMATIC

Next figure shows an example of a complete emSFP+ host board schematic with connections to SerDes/ASIC and protocol ICs.
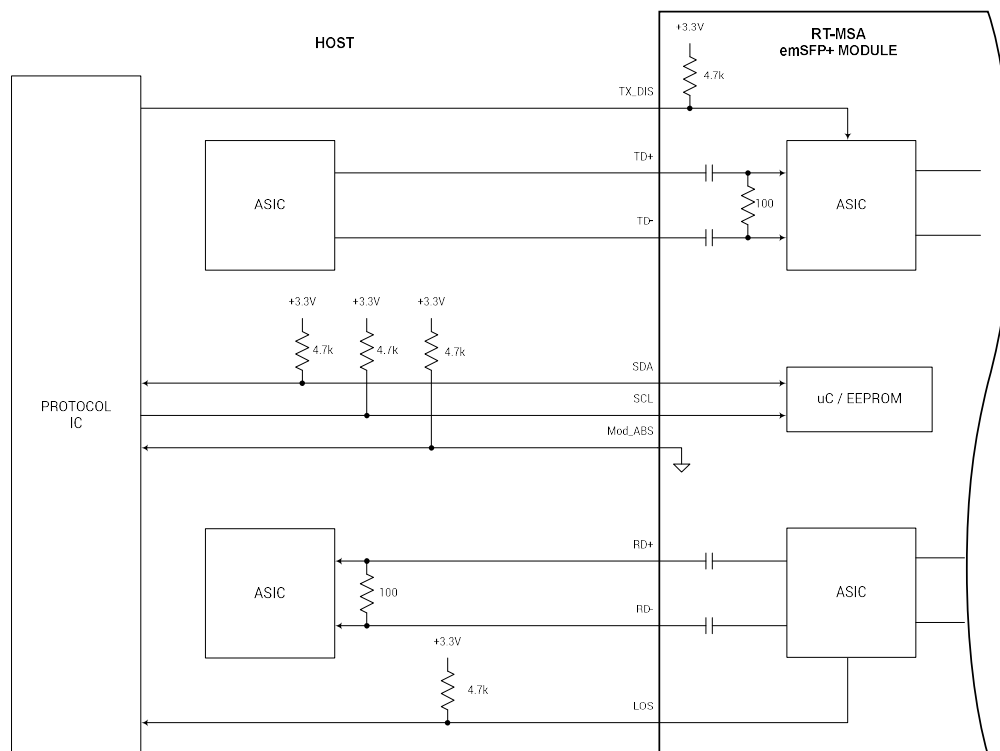

Figure 5-1. Recommended host schematic
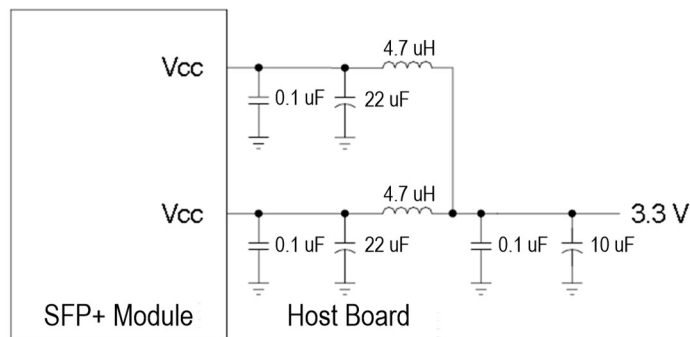
5.2 HOST BOARD RECOMMENDED POWER SUPPLY

Figure 5-2. Recommended Host Power Supply

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6. MECHANICAL SPECIFICATION

6.1 MECHANICAL FEATURES

This section provides a brief list of the EB22HDRT-LM-0515-03 mechanical features.

Table 6-1. Mechanical features

ITEM	DESCRIPTION
Connector Type	HD-BNC
Ganged Cages	Ganged cages mounting supported
Stacked Cages	Stacked cages mounting supported
Mechanical release	Simple pull up mechanical release system to disengage the module from his cage

6.2 PACKAGE OUTLINE DRAWINGS

To download the mechanical drawing, please download it from EB22HDRT-LM-0515-03 page on our website www.embrionix.com/product/EB22HDRT-LM-0515-03.

7. DOCUMENT REVISION HISTORY

Document revision history of the EB22HDRT-LM-0515-03 of ADVANCED SPECIFICATION

VERSION	DOC#	SUBJECT	RELEASE DATE
001	EB22HDRT-LM-0515-03-AS01-001	First Release	4/4/2017

8. NOTICE

The product and the ADVANCED SPECIFICATION are subject to change without notice. Embrionix reserves the right to remove the product at any time. Listing the product does not constitute an offer for sale.

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