User's Manual

EMMA2SL/P DVB-S Reference Board

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Chapter 1 Introduction

1.1 Document Scope

The EMMA2SL/P DVB-S Reference board is a hardware tool that allows the features and functionality of the EMMA2SL/P MPEG2 decoder device to be tested.

This document provides details of the hardware features and interfaces that are available on the reference board.

1.2 Acronyms

EMMA	Enhanced Multi Media Architecture
MPEG	Motion Picture Experts Group
DVB-S	Digital Video Broadcasting Satellite
LNB	Low Noise Block
VCR	Video Cassette Recorder
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs
TV	Television
CVBS	Composite Video and Blanking Signal
Y/C	Luminance/Chrominance (S-Video format)
Red Green Blue	Red Green Blue
SP/DIF	Sony Philips Digital Interface
DC	Direct Current
GND	Ground
UART	Universal Asynchronous Receiver Transmitter
FUART	Fast Universal Asynchronous Receiver Transmitter
RX	Receiver
TX	Transmitter
IR	Infra-Red
IC	Integrated Circuit
ISO	International Standards Organisation
AC	Alternating Current
EJTAG	Enhanced Joint Test Action Group interface
JTAG	Joint Test Action Group interface
PC	Personal Computer
DAC	Digital to Analogue Converter
I²C	Philips serial bus 2 wire protocol

1.3 References

Latest reference board schematics: nec_stb_v2.2_20070111.pdf.

1.4 Numeric Convention

Hexadecimal   0xXXXXXXXX
Binary   'XX'
Decimal   XXXX
Mega Byte   XXMB
Mega Bit   XXMb

Chapter 2 Mechanical

2.1 Dimensions

The EMMA2SL/P DVB-S Reference board is the size of a typical set top box. Static electricity handling precautions should be followed when handling the board. Figure 1 shows the layout of the board.

2.2 Connectors

2.2.1 Rear of the board

F Type Dish Input

The satellite dish input is provided via a standard 'F Type' connector. The board can provide full LNB power switching for polarity and band.

Modem

An RJ11 connector is provided for telephone line connection to the modem.

VCR SCART

A 21-pin VCR SCART is provided that supports CVBS & Y/C video output from EMMA2SL/P and RGB video switching.

TV SCART

A 21-pin TV SCART is provided that supports RGB video output from EMMA2SL/P.

Coaxial SP/DIF

SP/DIF output from EMMA2SL/P is supported via a phono connector.

Power

The power jack on the rear of the board must be supplied with 12V DC. Note that the centre pin is +12V and the outer core is GND.

2.2.2 Front of the board

Debug UARTs

There are 2 debug UART headers provided on the board. J3000 provides a full UART pin out and J3001 provides an RX/TX only UART. Note that external RS-232 level converters are required for the UARTs as this is not provided by the board.

Push buttons

There are 4 push buttons provided; S301, S302, S303, S304, their functions are plus, minus, standby and enter respectively.

IR receiver

An IR receiver IC is provided and is connected to the IR input on EMMA2SL/P.

Smart Card connector

A smart card connector is provided for ISO compliant smart cards. The smart card connector is connected to Smart Card Interface 0 on EMMA2SL/P.
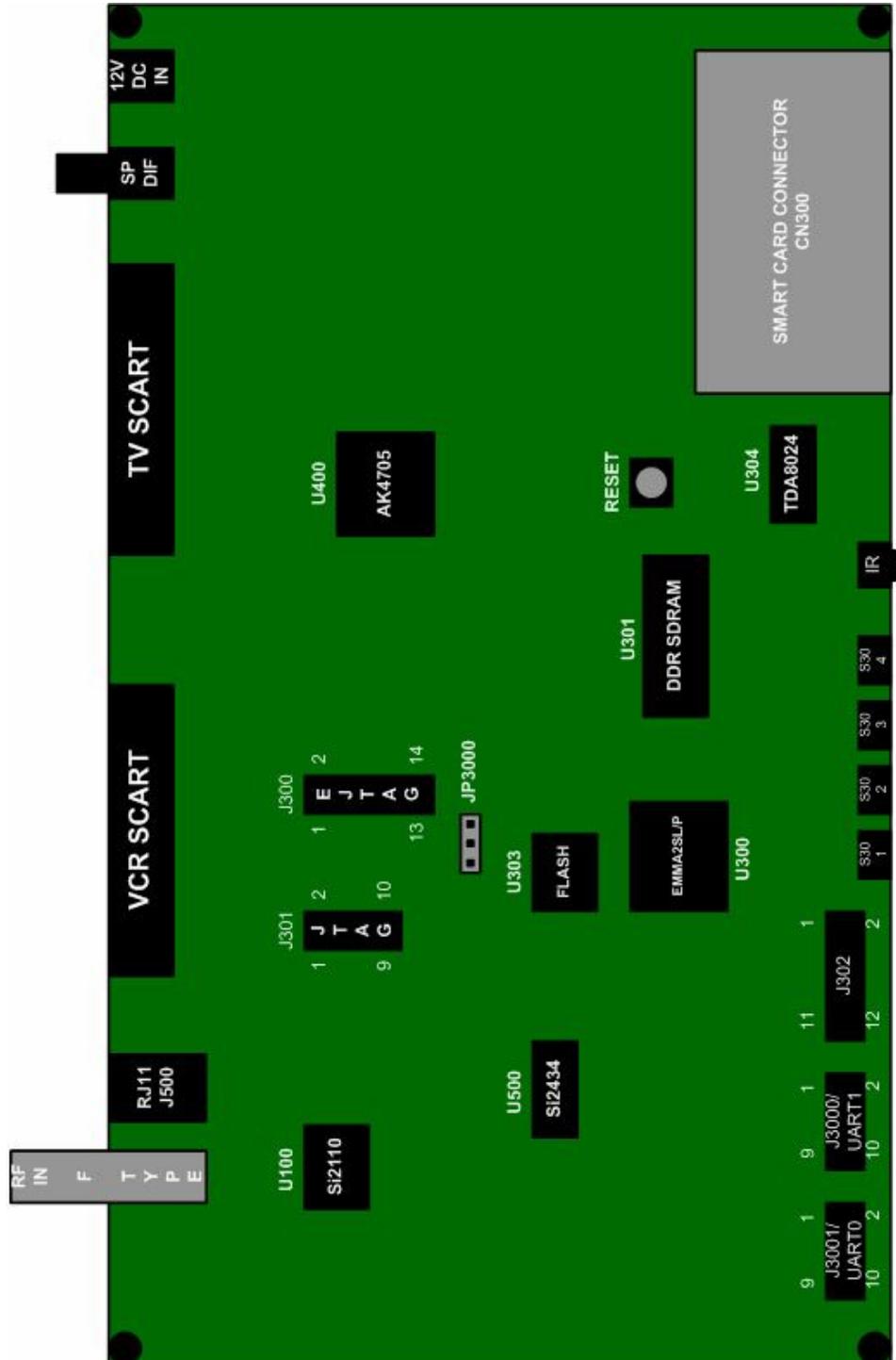

Figure 2-1   Reference board layout

Chapter 3 Electrical

3.1 Operating and storage temperature range

The ambient operating temperature range of the reference board is 0 to 50°C.

3.2 Power supply

The reference board is powered using the provided external AC-DC power supply which is 12V DC output.

3.3 Si2110 DVB-S Satellite Receiver Front End

The DVB-S input is provided by a Silicon Laboratories Si2110 device with full LNB control (schematic reference Si2110 U100). The transport stream output from the Si2110 device is directly connected to the parallel transport stream input on the EMMA2SL/P device.

3.4 EJTAG and JTAG debug interfaces

Connector J300 is an EJTAG-compliant debug interface with the following pin out:

Pin	Description	Pin	Description
1	TARGET RESET	2	GROUND (0V)
3	TARGET DATA IN	4	GROUND (0V)
5	TARGET DATA OUT	6	GROUND (0V)
7	TARGET MODE SELECT	8	GROUND (0V)
9	TARGET CLOCK	10	GROUND (0V)
11	SYSTEM RESET	12	Not used
13	DEVICE INTERRUPT	14	3.3 V

Connector J301 is a JTAG debug interface with the following pin out:

Pin	Description	Pin	Description
1	JTAG CLOCK	2	GROUND (0V)
3	JTAG DATA OUT	4	V_{CC} (+ 3.3 V)
5	JTAG MODE SELECT	6	Not used
7	JTAG RESET	8	Not used
9	JTAG DATA IN	10	GROUND (0V)

Jumper JP3000 is used to set the EMMA2SL/P RDATA13 strap pin, which selects EJTAG or JTAG mode. When JP3000 is in the left position, JTAG mode is selected. When JP3000 is in the right position, EJTAG mode is selected.

3.5 UART interfaces

J3000 is wired as a full FUART and is connected to EMMA2SL/P FUART1B (Alternate Mode 15). The pin out of J3000 is compatible with a standard PC serial port adaptor (9 way D male 1:1 wiring). J3000 has the following pin out:

Pin	Description	Pin	Description
1	DCD	2	RXD
3	TXD	4	DTR
5	GROUND (0V)	6	DSR
7	RTS	8	CTS
9	RI	10	Not used

Note In order to use FUART1B via J3000, resistors R5000-R5005 must be removed from the board.

J3001 is wired as a RX/TX only FUART and is connected to EMMA2SL/P FUART0 (Alternate Mode 13). The pin out of J3001 is compatible with a standard PC serial port adaptor. J3001 has the following pin out:

Pin	Description	Pin	Description
1	Not used	2	RXD
3	TXD	4	Not used
5	GROUND (0V)	6	Not used
7	Not used	8	Not used
9	Not used	10	Not used

Note For both UARTs no level translation is provided on the reference board. External RS-232 level converters are required. 1 external RS-232 level converter and 1 serial port adaptor cable are supplied with the reference board.

3.6 Smart Card interface

The Smart Card interface is provided by a Philips TDA8024 device (schematic reference U304). The clock to the TDA8024 device can be isolated via tri-state buffer U3000. EMMA2SL/P PPORT32 (SM0_CCTR) controls the enabling and disabling of the tri-state buffer. When PPORT32 is LOW the clock is gated from the TDA8024 device and when HIGH the clock is supplied to the TDA8024 device. The TDA8024 device is interfaced with EMMA2SL/P Smart Card Interface 0 (Alternate Mode 7). The clock frequency selection pins on the TDA8024 device (pins 1 & 2) may be controlled via EMMA2SL/P PPORT30 & PPORT31 respectively (CLK_DIV1, CLK_DIV2). By default CLK_DIV1 and CLK_DIV2 are set to '10'.

3.7 SCART Switch interface

The SCART Switch interface is provided by a AKM AK4705 device (schematic reference U400). This device provides the video switching and audio DAC conversion. The interrupt signal from the AK4705 device is connected to EMMA2SL/P PPORT18 (AV_INT). The power down control to the AK4705 device is controlled by EMMA2SL/P PPORT19 (AV_ONOFF), and is disabled (LOW) by default.

3.8 Modem interface

The Modem interface is provided by a Silicon Laboratories Si2434 device (U500), which can operate in V.90, V.34, V.32BIS, V.22BIS modes. The interrupt signal from the Si2434 device is connected to EMMA2SL/P PPORT21 (MODEM_INT). The Escape pin (online/offline) on the Si2434 device is controlled by EMMA2SL/P PPORT20 (MODEM_ONOFF).

3.9 Front Panel interface

4 switches and a front panel header are implemented on the reference board, which are controlled via spare EMMA2SL/P PPORT signals. The following table lists the PPORTs and their functions:

PPORT	Signal	Function
PPORT24	LED_RED	Red LED control
PPORT25	LED_GREEN	Green LED control
PPORT26	STANDBY_SW	Standby switch
PPORT27	ENTER_SW	Enter switch
PPORT28	PLUS_SW	Plus switch
PPORT29	MINUS_SW	Minus switch

The following table shows the pin out of the front panel connector J302:

Pin	Description	Pin	Description
1	IR_IN	2	STANDBY_SW
3	SCK	4	ENTER_SW
5	SDOUT	6	PLUS_SW
7	Not used	8	MINUS_SW
9	Not used	10	LED_RED
11	Not used	12	LED_GREEN

Chapter 4 Memory implementation

4.1 DDR SDRAM

An Elpida EDD1216AATA-6B-E device provides 128 Mbit (16 MBytes) of DDR SDRAM memory operated in 16-bit mode.

4.2 Flash

A Spansion GL032A90FF device provides 32 Mbit (4 MBytes) of flash memory operated in 16-bit mode.

Chapter 5 I²C bus addresses

5.1 I²C Channel 0

The following table lists the I²C devices and their corresponding I²C address for EMMA2SL/P I²C Channel 0:

Device	I²C address
X24128 16K x 8 E2PROM (U306)	0xA0
AK4705 SCART switch (U400)	0x22

5.2 I²C Channel 1

The following table lists the I²C devices and their corresponding I²C address for EMMA2SL/P I²C Channel 1:

Device	I²C address
Si2110 DVB-S Satellite Receiver	0xD0