LASER-14P
14 CHANNEL LASER DIODE DRIVER BOARD FOR PRINTING APPLICATIONS

HARDWARE USER GUIDE

30.11.2016

Version 1.0

Table of Contents

1 Overview

LASER-14P is a 14 channel UV laser diode driver board which is used mainly in printing applications like screen exposure or film plotters. It connects to the AEWA Print Manager Board (APMB) over optical fiber interface.

Performance

- Optical fiber interface: 600 Mbits/sec.
- Maximum Printing Speed, 2 MHz pixel clock frequency.

Features

- 14x 0-1A Laser Diode drivers, independent control.
- Adjustable current output for each channel.
- 0-7V Laser Diode forward voltage.
- Optical fiber connectivity to APMB over SFP.
- PCB Temperature monitor.
- Customizable firmware which is stored in an SD-Card.
- SHA-1 Encryption for firmware copy protection.
- Heat spreader for passive cooling.
- Single 12V input voltage with reverse polarity, over voltage, over current and surge current protection.
- Small footprint, 115 x 90 mm.
- Easy software integration with APMB SDK which supports native C++ and .NET programming languages such as C# or Visual Basic.
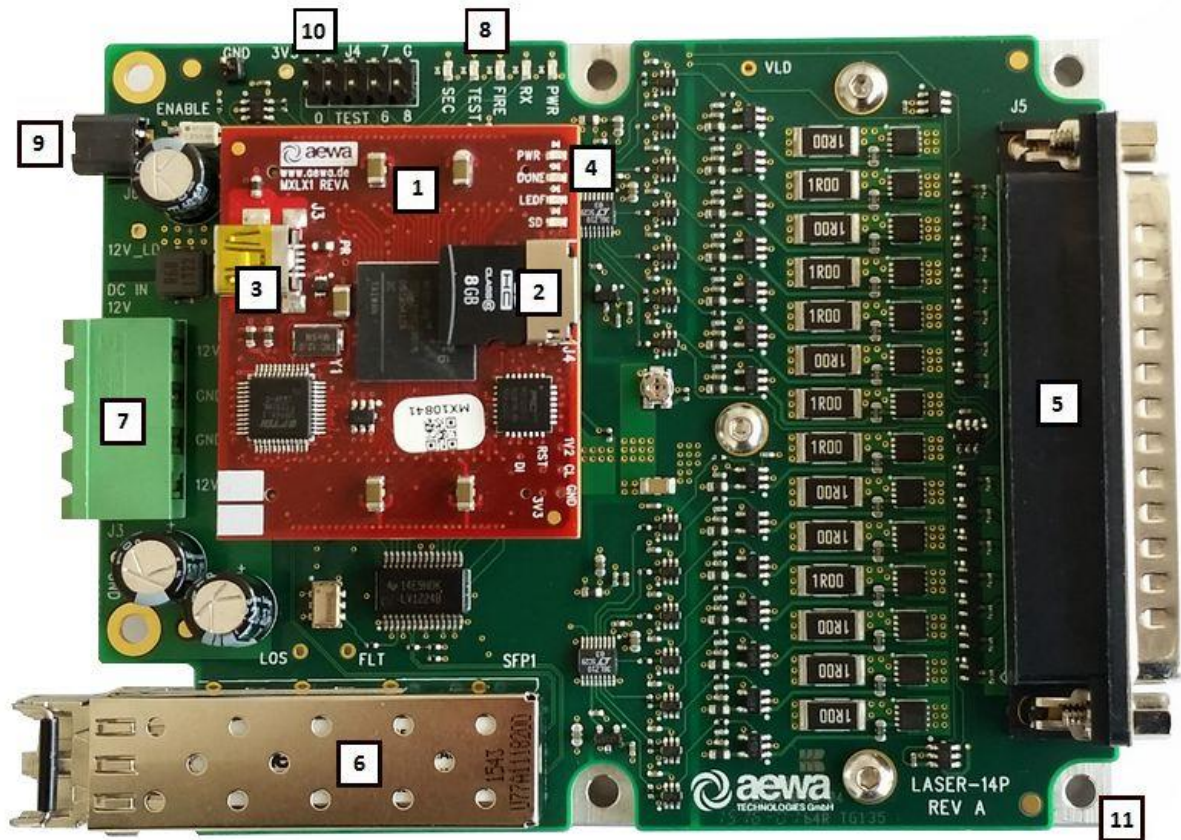
2 Board Components

IMAGE 1 – LASER-14P BOARD COMPONENTS

2.1 MXLX1 FPGA Board

LASER-14P is stacked with MXLX1 FPGA Board which provides all the digital functionality. It combines a powerful Xilinx FPGA with USB and a micro SD-Card which stores the firmware.

2.2 MXLX1 Micro SD-Card Connector

MXLX1 firmware (embedded software) for LASER-14P board is stored in a micro SD-Card which is delivered with the board. This enables easy firmware upgrade without a programming cable. There must be a single firmware file with .BIN extension inside the card.

2.3 MXLX1 USB Connector

All USB functionality of MXLX1 board is disabled with LASER-14P board. Optical fiber interface is used instead.

2.4 MXLX1 Board LEDs

There are 4 diagnostics LEDs on the MXLX1 PCB.

PWR LED is connected to the 3.3V voltage rail. It is ON when board power is OK.

DONE LED is ON when FPGA firmware is loaded correctly, otherwise none of the features of LASER-14P board is available.

LEDF pulses with 1 second frequency indicating that the board is functioning correctly. Otherwise it is OFF.

SD LED is ON after Power-On when firmware is loaded from the SD-Card into the FPGA. It switches OFF when firmware is loaded correctly.

2.5 Laser Diode Connector (J5)

LASER-14P connects to 14 Laser Diodes through a 37-pin male D-Sub connector. Following image shows the pin mapping of this connector:
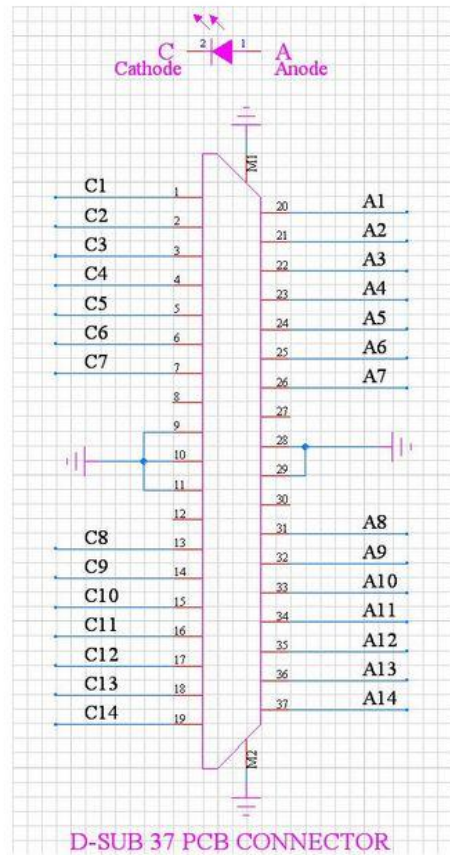
IMAGE 2 - J5 PIN MAPPING

2.6 Optical Interface (SFP1)

LASER-14P connects to AEWA Print Manager Board over optical fiber cable. Fiber cable is connected to an SFP (small form factor pluggable) transceiver module and plugged into the SFP connector.

LASER-14P is delivered with SFP transceiver module, but the optical cable is not included since the distance from the LASER-14P to APMB differs from system to system.

Following table shows the fiber cables supported.

Fiber Cable Type	Distance between LASER-14P and APMB board
OM2, 62.5µm/125µm, Multimode fiber, with LC connectors	0.5-300m

OM3, 50µm/125µm, Multimode fiber, with LC connectors	0.5-500m
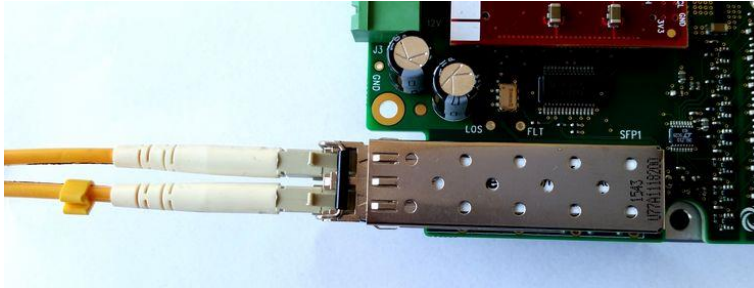
2.7 Power Input Connector (J3)

J3 is a 4-port terminal block connector for power input. Switching mode or analog AC/DC power converters can be used. Converters with PFC feature is recommended. Following table can be used to estimate the total current usage.

Parameter	Value
Input Voltage	12V (11 – 14V)
Max. Current consumption, all laser diodes are ON with 100% duty cycle and each with 700 mA output current. (Full black printing with maximum laser power).	7.5A @12V
Max. current consumption, all Laser diodes are OFF	0.3A @12V

2.8 LASER-14P Board LEDs

There are 5 diagnostics LEDs on the LASER-14P PCB.

PWR LED is connected to the 3.3V voltage rail. It is ON when board power is OK.

RX LED is ON when AEWA Print Manager Board is sending printing data to LASER-14P board, otherwise it is OFF.

FIRE LED is ON when laser diodes are active and printing. It switches OFF when printing is stopped.

SEC LED is OFF when SHA-1 Encryption keys programmed into the device is correct. If this LED is ON, complete functions of the LASER-14P board are disabled.

TEST LED is error indicator LED. Following table shows errors reported by TEST LED.

TEST LED Behavior	Meaning
OFF	No error. Image data stream is counting data.
ON	No error. Image data stream is not counting data.
Blink once, than OFF for 1 second	Checksum Error. Incoming data packages from Print Manager Board have CRC checksum errors.
Blink 2 times, than OFF for 1 second	Data packaging error. Incoming data packages from Print Manager Board have wrong number of bytes.
Blink 6 times, than OFF for 1 second	One or more voltages are switched off due to a PCB over temperature or voltage error condition.
Blink 7 times, than OFF for 1 second	Voltage error. At least one of the DC/DC converters has errors.

TABLE 3 –TEST LED FUNCTION

Same errors can also be read by APMB software. More error types might be added in the future with firmware updates.

2.9 Enable Input (J6)

J6 is the connector for the Enable input which enables or disables Laser Diodes' output drivers. If the enable switch is open, none of the Laser diodes will be active. For normal operation this switch must be closed.

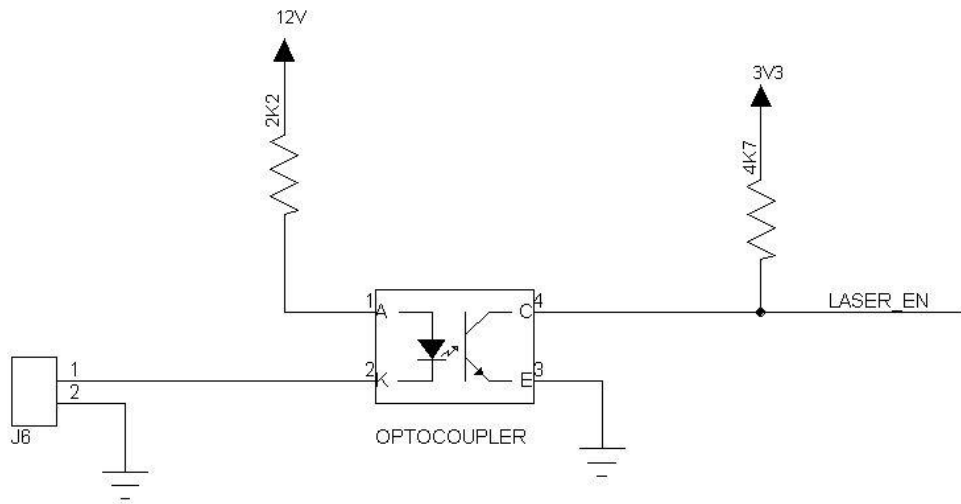Following image shows the simplified schematics of the Enable input:

IMAGE 4 - ENABLE INPUT SCHEMATICS

2.10 Test Connector (J4)

J4 is the test header for internal use by AEWA.

2.11 Heat spreader

An aluminum heat spreader with 1cm thickness is attached on the bottom side of the LASER-14P board. It removes the heat generated by DC/DC converters and laser diode driver circuit from the PCB away. Attach the head spreader with 4 screws to a metal surface on the printing machine. Apply thermal joint compound or pad between the heat spreader and the surface.
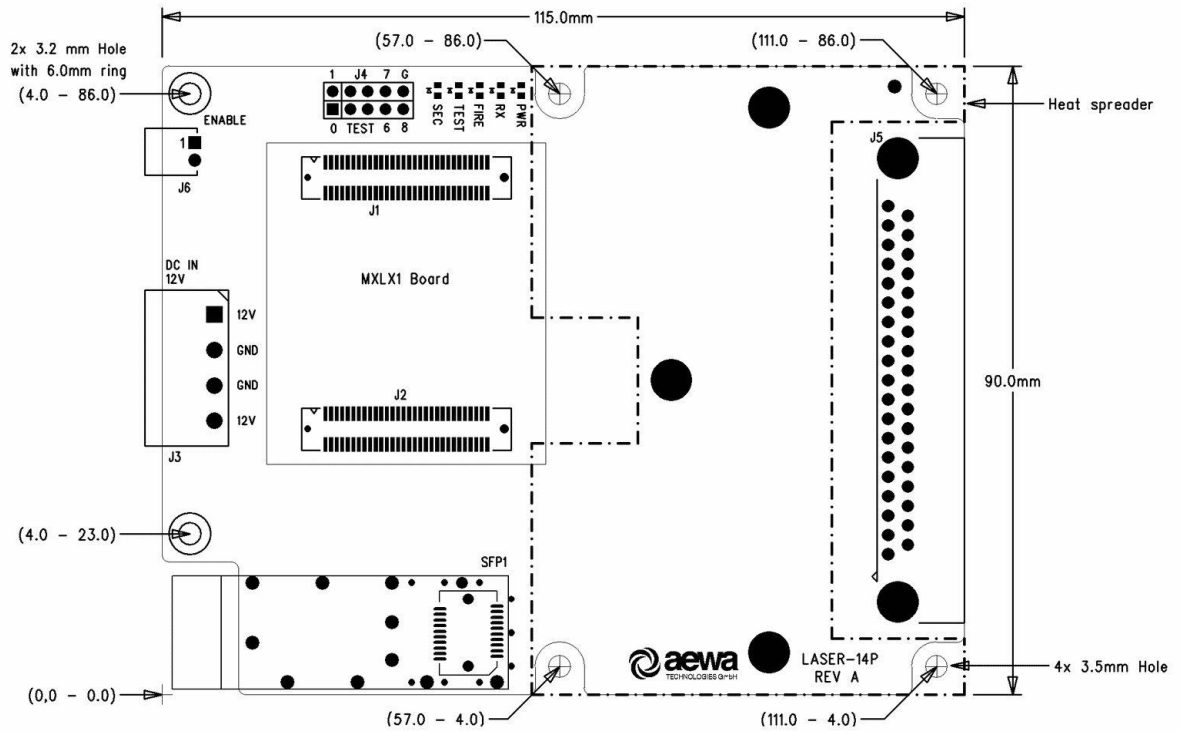
3 Mechanical Dimensions

IMAGE 5 – LASER-14P MECHANICAL DIMENSIONS

4 Connectors and Cables

LASER-14P is assembled with very high quality industrial terminal blocks and connectors for power in and input/output. Following table lists the PCB connectors and their mating cable connectors.

Description	PCB Side	Mating Side
J5, Laser Diode Connector	D-SUB PCB Connector, male, 37 pins. Manufacturer: ASSMANN Part Number: A-DS 37 A/KG-T2S	D-SUB receptacle, female, 37 pins. Manufacturer: ASSMANN Part Number: A-DFF 37LPIII/Z-UNC or compatible
J3, Power input connector	PCB header, 5.08 mm raster, 4 poles, MSTBA 2,5/ 4-G-5,08 Manufacturer: Phoenix Contact Order No: 1757268	Plug, 5.08 mm raster, 4 poles, MSTB 2,5/ 4-ST-5,08 Manufacturer: Phoenix Contact Order No: 1757035 or compatible
J6, Enable input connector	Terminal Block Header, 2.5 mm raster, 2 poles, 90° Manufacturer: Phoenix Contact Order No: 1778625	Terminal Block Plug, 2.5 mm raster, 2 poles Manufacturer: Phoenix Contact Order No: 1778832 or compatible

TABLE 4 – CONNECTORS AND CABLES

5 Ordering Information

Order No	Item
LASER-14P	LASER-14P Board
LASER-14P-CC	LASER-14P Board with conformal coating for harsh environments.

TABLE 5 – ORDERING INFORMATION