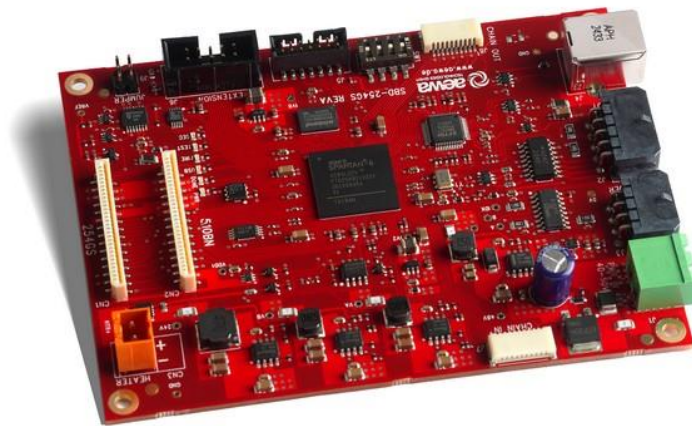




SBD-254GS
SINGLE BOARD PRINTHEAD DRIVER
FOR SEIKO 254GS and 510BN

HARDWARE USER GUIDE



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Version 1.0

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1 Overview

SBD-254GS is AEWA printhead driver board for SEIKO 254GS and 510BN printheads. It connects to the computer through USB and doesn't require a print manager board. Designed with latest technologies, SBD-254GS enables to control all digital, analog and power interfaces of the printhead.

Features

- Single board driver, requires no print manager board
- Supported printheads:
 - 254GS, 180 dpi, 254 nozzles
 - 510BN, 180 dpi, 510 nozzles (binary only)
- USB 2.0 Hi-Speed (480Mbit/s) interface.
- Generates accurate printhead driving voltages which are factory programmed. Printhead voltages can be further adjusted for special ink types.
- Printhead voltage control with respect to the temperature.
- Correct voltage sequencing during power ON and power OFF.
- Gray scale printing, up to 7 levels (only for 254GS).
- Printing waveform stored in the EEPROM.
- Tickling pulse generation logic to keep nozzles always active.
- Printhead temperature monitor, over temperature protection.
- Firmware update over optical interface.
- Single 48V input voltage with reverse polarity, over current and surge current protection.
- SHA Encryption for firmware copy protection.
- Small footprint, 90 mm x 120mm.
- Compatible with APMB Software Development Kit (SDK) for C++ and .NET. Supports Windows and Linux operating systems.
- ApmbWave analog waveform designer support with drop watcher interface.
- Compatible with APRINT RIP and Print software.



2 Board Components

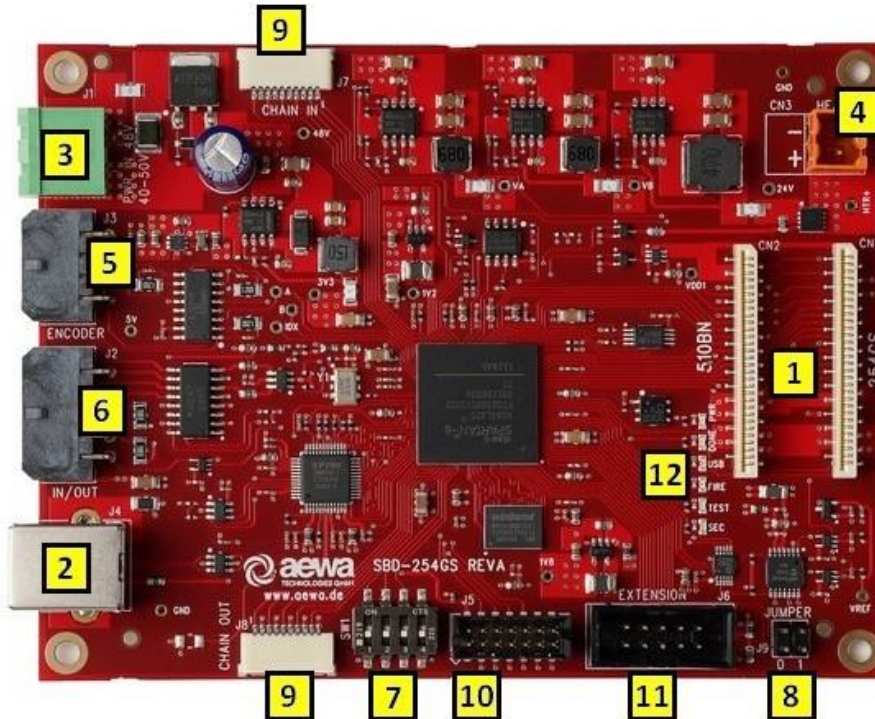


IMAGE 1 – SBD-254GS-REVC/D BOARD COMPONENTS

2.1 Printhead Connectors (CN1 and CN2)

SBD-254GS connects to 254GS printhead with CN1 and 510BN printhead with CN2 through a 30-pin 1 mm pitch FFC cable. Only one printhead can be connected at a time.

IMPORTANT: Don't connect or unconnect the printhead cable when the printhead board is powered on. This may damage the printhead and/or the printhead board.

2.2 USB Connector (J4)

SBD-254GS connects to the PC over USB. J4 is USB2.0 Type-B connector. Use good quality USB cable with ferrite attached at least to one side of the cable.



2.3 Power Input Connector (J1)

J1 is a 2-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	48V (40V-56V)
Max. current consumption, with 510BN printhead, without heater	0.45A@48V
Max. current consumption, with 510BN printhead, with external 8W heater	0.65A@48V
Max. current consumption, with 254GS printhead	0.35A@48V
Max. current consumption, not printing	0.1A @48V

TABLE 1 -INPUT POWER SPECIFICATIONS

Current consumption values are not exact and collected from printhead manuals. They may change with temperature, printhead voltage, drop settings and the waveform. Please contact SEIKO for more accurate values.

2.4 External Heater Connector for 510BN (CN3)

CN3 is a 2-port connector for an external heater connection. It is only for the 510BN printhead.

Heater specifications: 24V, maximum 1A/24W

2.5 Encoder Input (J3)

J3 is an 8 pin encoder input connector with A, B and Index signals. It can deliver 5V power to the encoder up to 0.5A current.

Inputs are RS422/485 compatible. If connected to a 3.3V or 5V TTL logic directly, resistors R7, R8 and R9 must be unsoldered. See the next image for encoder schematics.



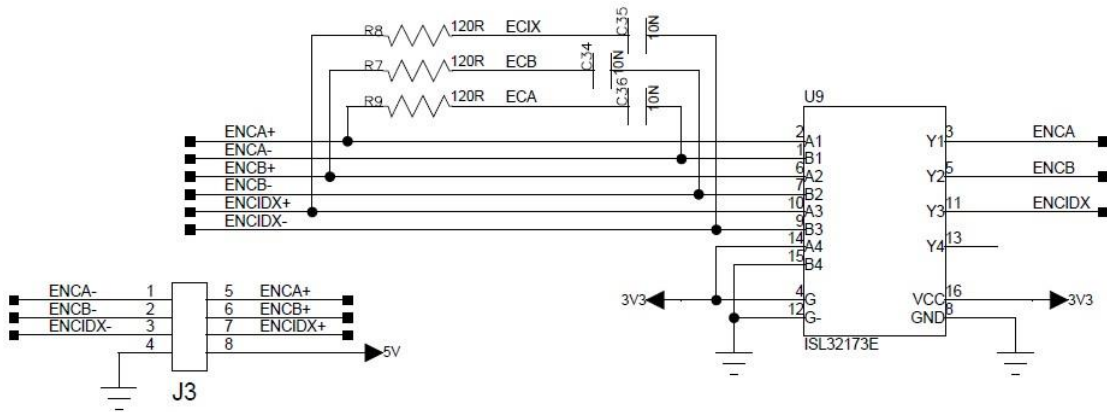


IMAGE 2 – ENCODER SCHEMATICS



IMAGE 3 – ENCODER CONNECTOR PINOUT

2.6 Input/output connector (J2)

J2 is a 10 pin connector for input outputs. Following table summarizes functions of its pins.

Input Number	Function
IN0	Start print input if single pass band or continuous mode is activated, otherwise general purpose input. A 3-Wire PNP or NPN sensor or photocell can be connected to this input.
IN1	General purpose input.



OUT_0+ OUT_0-	Curing lamp on/off signal if single pass or continuous mode is selected, otherwise general purpose output.
OUT_1+ OUT_1-	Second Curing lamp on/off signal if single pass or continuous mode is selected, otherwise general purpose output.
DWATCHER	Drop-watcher output. 5V TTL signal which is synchronous to the pixel clock. Its width is software programmable.

TABLE 2 – INPUT/OUTPUT FUNCTIONS

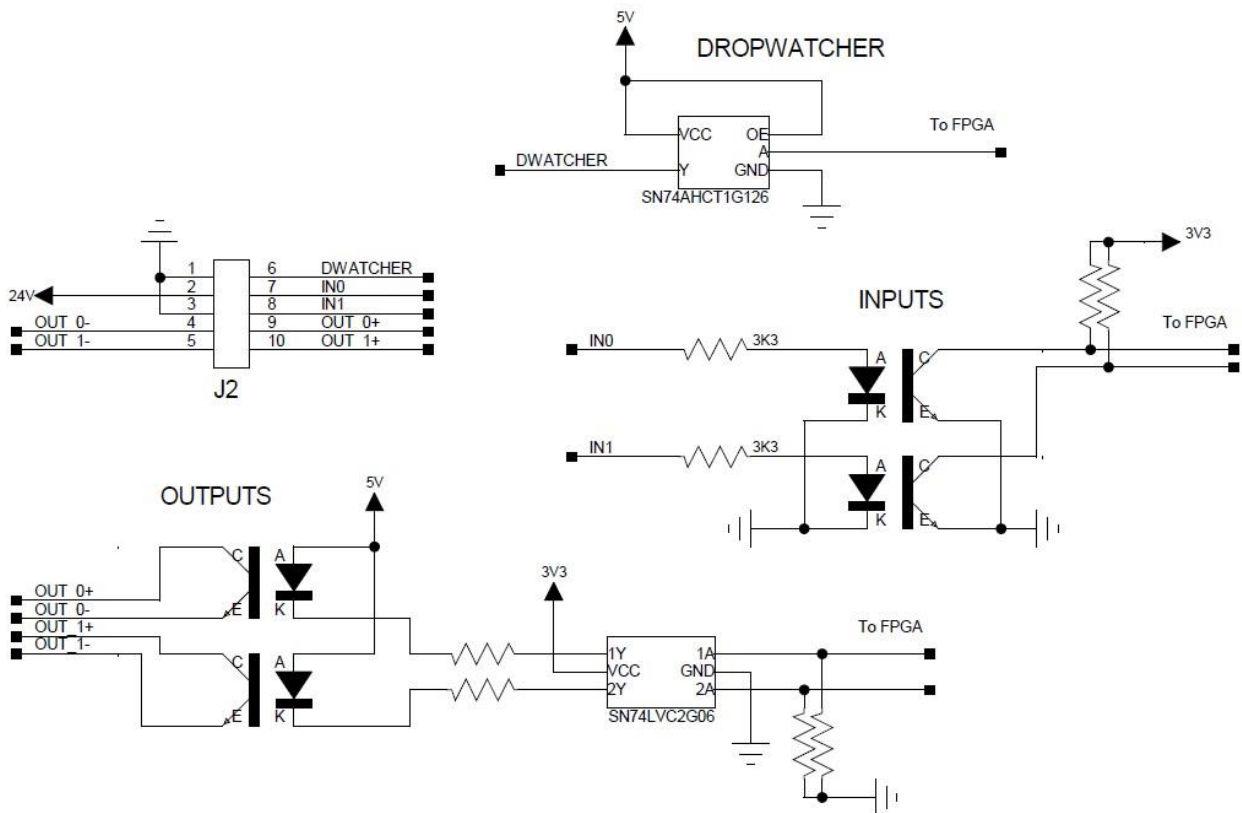


IMAGE 4 – INPUT/OUTPUT SCHEMATICS





IMAGE 5 – INPUT/OUTPUT CONNECTOR PINOUT

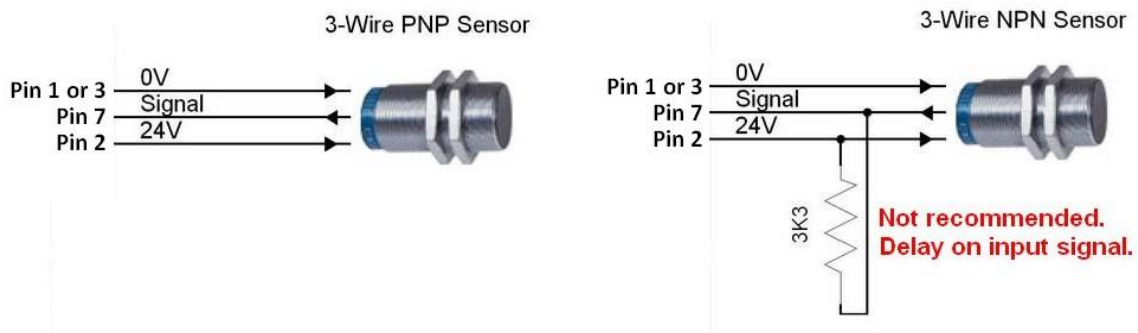


IMAGE 6 – J2, PNP AND NPN SENSOR CONNECTION

2.7 USB Device Address Switch (SW1)

SW1 selects a USB Device Address as shown in following table. This address identifies the board when multiple SBD-254GS boards are connected to the system. Position 4 is not used.

Position 3	Position 2	Position 1	USB Device Address
OFF	OFF	OFF	0
OFF	OFF	ON	1
OFF	ON	OFF	2
OFF	ON	ON	3



ON	OFF	OFF	4
ON	OFF	ON	5
ON	ON	OFF	6
ON	ON	ON	7

TABLE 3 – SW1 FUNCTION TABLE

2.8 Jumper (J9)

J9 is a 2-port jumper. It selects between different printhead types as shown in the following table:

Jumper 1	Jumper 0	Printhead Type
Open	Open	254GS
Open	Closed	510BN
Closed	Open	510BN old type
Closed	Closed	Not valid

TABLE 4 – JUMPER FUNCTION TABLE

2.9 Daisy chain input and output connectors (J7 and J8)

Used only if more than one SBD-254GS boards are connected to the printing system. Connect chain output connector (J8) to the chain input connector (J7) of the next board with a 10-pin 1mm pitch FPC cable.

2.10 JTAG Connector (J5)

This connector is for internal use by AEWA for testing, debugging and updating the firmware. SBD-254GS firmware can also be updated over optical interface using ApmbDiag or APRINT software.

2.11 Extension Connector (J6)

10 pin extension connector (8 signals) with 3.3V LVTTTL inputs and outputs.

Currently this extension connector has no dedicated inputs or outputs. It is programmed if customer has special input or output requirements.



2.12 LEDs

There are 6 diagnostics LEDs on the SBD-254GS 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 SBD-254GS is available.

USB LED is ON when USB device is functioning and connected with the host computer.

FIRE LED is ON when printhead nozzles are active and printing. It switches OFF when printing is stopped.

RX LED is ON when AEWA Print Manager Board is sending printing data to SBD-254GS board, otherwise it is OFF.

SEC LED is OFF when SHA Encryption keys programmed into the device is correct. If this LED is ON, printing functions of the SBD-254GS 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	Error on data control, RAM or encoder part of the firmware. More detailed error can be get through APMB SDK or APRINT.
Blink 2 times, than OFF for 1 second	Data packaging error. Incoming data packages from Print Manager Board have wrong number of bytes.
Blink 3 times, than OFF for 1 second	Speed error. Printing speed or row to row delay setting is too high.
Blink 4 times, than OFF for 1 second	Waveform error. Either no waveform is loaded or the loaded waveform has errors.
Blink 5 times, than OFF for 1 second	Input under voltage error.
Blink 6 times, than OFF for 1 second	Printhead voltages are switched off due to an over temperature, overcurrent or voltage error condition.

TABLE 5 –TEST LED FUNCTIONS

More detailed errors can be read from the PHB through APMB SDK or APRINT software.



4 Connectors and Cables

SBD-254GS is assembled with very high quality industrial terminal blocks and connectors for power and input/output. Following table lists the PCB connectors and their mating cable connectors.

Description	PCB Side	Mating Side
J1, Power input connector	PCB header, 5.08 mm raster, 2 poles, MSTBA 2,5/ 2-G-5,08 Manufacturer: Phoenix Contact Order No: 1757242	Plug, 5.08 mm raster, 2 poles, MSTB 2,5/ 2-ST-5,08 Manufacturer: Phoenix Contact Order No: 1757019 or equivalent
CN1 and CN2, Printhead connectors	FFC/FPC Connector, 1mm pitch, 30-positions Manufacturer: Molex Order No: 52808-3071	FPC cable, 1mm raster, 30-positions. Premo-Flex 15267 from Molex is recommended. For example: 0152670479 (20.32 cm) 0152670485 (30.48 cm)
J7 and J8, Daisy chain connectors	FFC/FPC Connector, 1mm pitch, 10-positions Manufacturer: TE Connectivity Order No: 1-84981-0	FPC cable, 1mm raster, 10-positions. Premo-Flex 15267 from Molex is recommended. For example: 0152670251 (10.16 cm) 0152670255 (15.24 cm)
J3, Encoder connector	PCB header, through hole, right angle, 8 positions Manufacturer: Molex Order No: 0430450800	Receptacle, 8 positions Manufacturer: Molex Order No: 0430250800 or 0430250808
J2, Input/output connector	PCB header, through hole, right angle, 10 positions Manufacturer: Molex Order No: 0430451000	Receptacle, 10 positions Manufacturer: Molex Order No: 0430251000 or 0430251008
Cable assembly for J3		Molex, Micro-Fit 3.0 214756 serie. 8-positions. For example: 2147562082 (30 cm) 2147562083 (60 cm)
Cable assembly for J2		Molex, Micro-Fit 3.0 214756 serie. 10-positions. For example: 2147562102 (30 cm) 2147562103 (60 cm)

TABLE 6 – CONNECTORS AND CABLES



5 Ordering Information

Order No	Item
SBD-254GS	SBD-254GS board

TABLE 7 – ORDERING INFORMATION

