



User Manual – NSE5310 – AB – 1.0

NSE5310

12-bit Linear Incremental Position Sensor with I²C and PWM output



Table of Contents

1	General Description	3
2	The NSE5310 adapter board	3
2.1	Board description	3
2.2	Mounting the NSE5310 Adapterboard	4
3	NSE5310 adapter board and pinout	5
4	Operation cases	6
4.1	Standalone PWM output mode	6
5	NSE5310 adapter board hardware	8
5.1	NSE5310 – AB – 1.0 schematics	8
5.2	NSE5310 – AB – 1.0 - PCB layout.....	8
6	Copyright	9
7	Disclaimer	9
8	Contact Information	9

Revision History

Revision	Date	Owner	Description
1.0			Initial revision
1.1	10.07.2013	azen	Updated to new template & minor corrections

1 General Description

The NSE-5310 is an incremental position sensor with onchip encoding for direct digital output. A Hall element array on the chip is used to derive the incremental position of an external magnetic strip placed above the IC at a distance of 0.3 mm (typ). This sensor array detects the ends of the magnetic strip to provide a zero reference point.

The integration of Hall-effect position sensors, analog front end and digital signal processing on a single IC chip provides an ingeniously small position sensor, without the need for external pulse counters. Direct digital output is accessible over the serial interface using I²C protocol.

The NSE-5310 provides absolute position information over the length of a magnet pole pair (2 mm). A user can count pole pairs and achieve absolute position information over the entire length of the magnet (essentially unlimited). With better than 0.5 μm resolution, the NSE5310 is a robust, cost-effective alternative to miniature optical encoders. It can be used as a linear or off-axis rotary encoder.

2 The NSE5310 adapter board

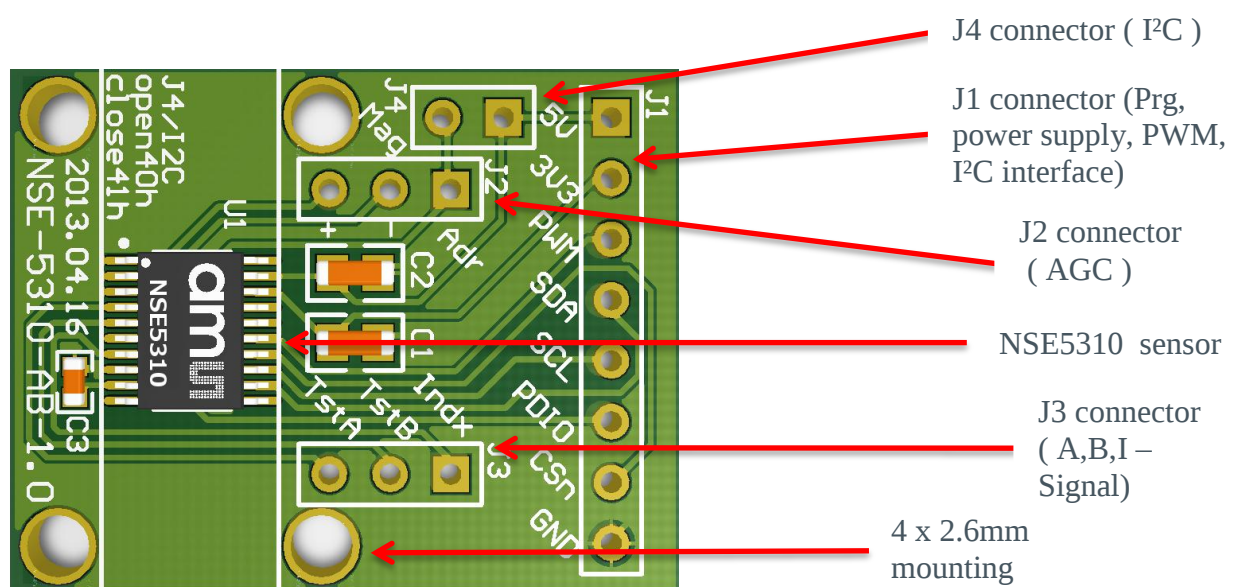
2.1 Board description

The NSE5310 adapter board is a simple circuit allowing test and evaluation of the NSE5310 High Resolution Magnetic Linear Encoder quickly without building a test fixture or PCB.

The PCB can be used as standalone unit or attached to a microcontroller. The standalone operation requires a 5V power supply only; the magnet's angle can be read on the PWM-, I²C- or Incremental Outputs.

Figure 1:

NSE5310 Adapterboard



2.2 Mounting the NSE5310 Adapterboard

The NSE5310 accepts magnetic multipole strip or ring magnets with a pole length of 1.0mm.

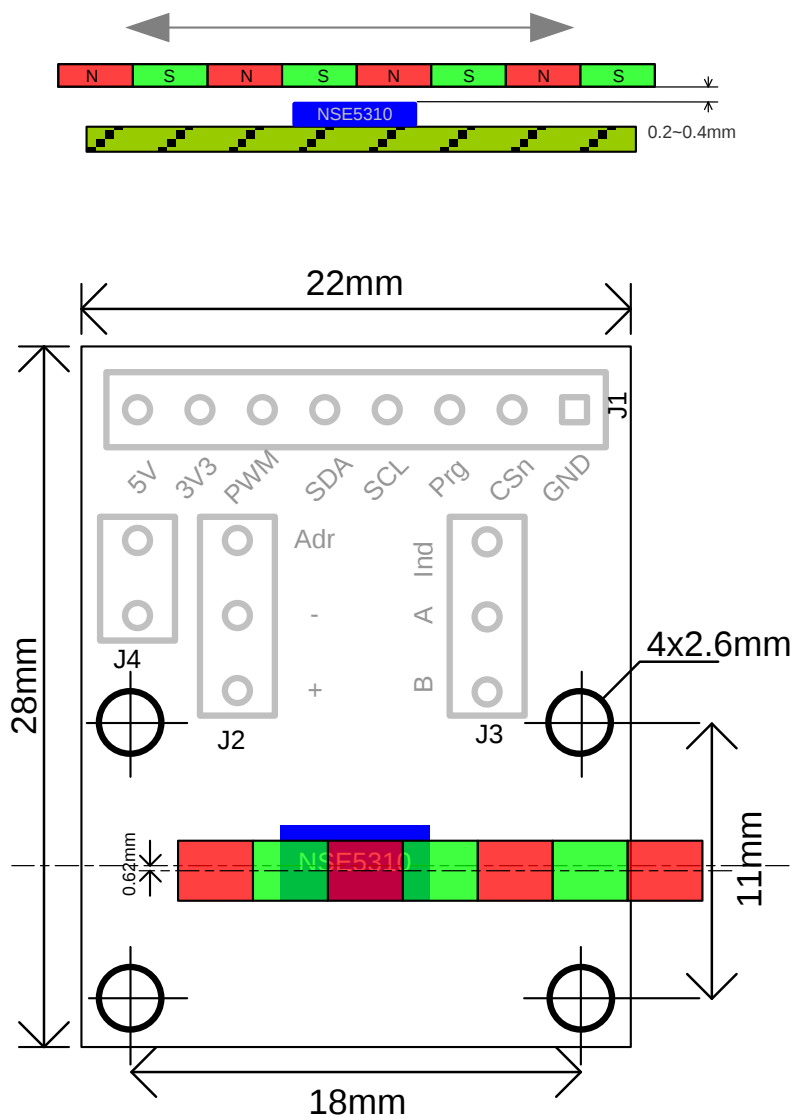
The airgap between the magnet and the NSE5310 casing should be maintained in the range 0.2mm~0.4mm.

The magnet holder must not be ferromagnetic.

Materials as brass, copper, aluminum, stainless steel are the best choices to make this part.

Figure 2:

NSE5310 adapter board mounting and dimension



3 NSE5310 adapter board and pinout

Figure 3:

NSE5310 adapter board connectors and encoder pinout

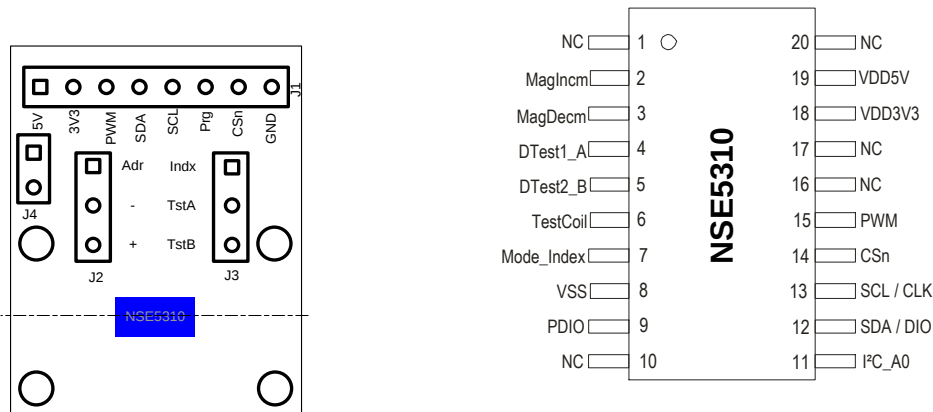


Table 1:

Pin description

Pin # Board	Pin # NSE5310	Symbol	Type	Description
J1-1	19	5V	S	Positive Supply Voltage (VDD5V)
J1-2	18	3V3	S	3V-Regulator output; internally regulated from VDD5V. Connect to VDD5V for 3V supply voltage. Do not load externally.
J1-3	15	PWM	D_O	Pulse Width Modulation of approx.; ~200Hz
J1-4	12	SDA	D_I/O	DATA Input/Output for I ² C Mode
J1-5	13	SCL	D_I	Serial Interface Unit CLK
J1-6	9	Prg	D_I/O	OTP P rogramming Input for factory programming. Connect to VSS
J1-7	14	CSn	D_I	Chip S elect, active low
J1-8	8	GND	S	Negative Supply Voltage (VSS)
J2-1	11	Adr	D_I	Digital input to choose I ² C address by input pin
J2-2	3	-	D_O	Indicates increasing or decreasing of magnitude by the AGC
J2-3	2	+	D_O	
J3-1	7	Indx	D_I/O	Incremental Output Index
J3-2	4	TstA	D_O	Incremental Output A
J3-3	5	TstB	D_O	Incremental Output B
J4-1	19	5V	S	Positive Supply Voltage (VDD5V)
J4-2	11	Adr	D_I	Digital input to choose I ² C address by input pin

4 Operation cases

4.1 Standalone PWM output mode

The absolute serial output counts from 0....4095 within one pole pair a repeats with each subsequent pole pair.

The PWM output starts with a pulse width of $1\mu\text{s}$, increases the pulse width with every step of $0.488\mu\text{s}$ and reaches a maximum pulse width of $4097\mu\text{s}$ at the end of each pole pair. See NSE5310 datasheet for more details on the PWM output.

The PWM frequency is internally trimmed to an accuracy of $\pm 5\%$ ($\pm 10\%$ over full temperature range).

Figure 4:

Using the PWM output with the adapter board

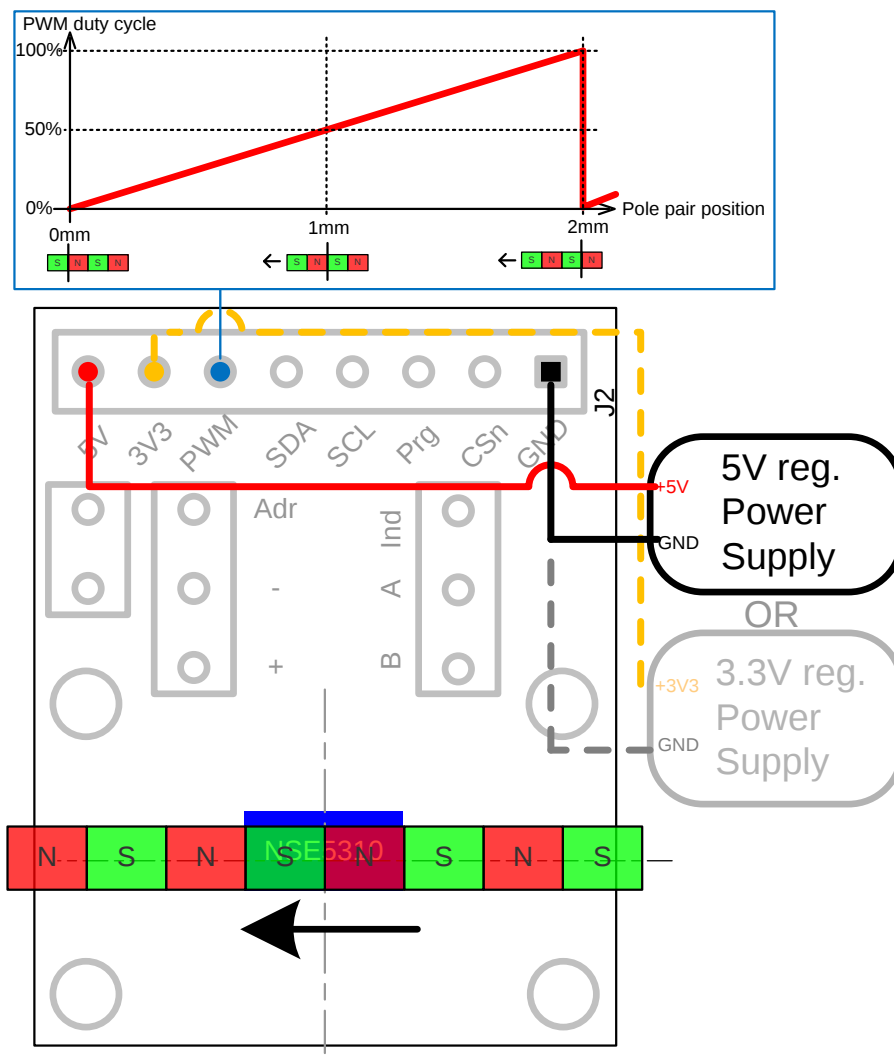
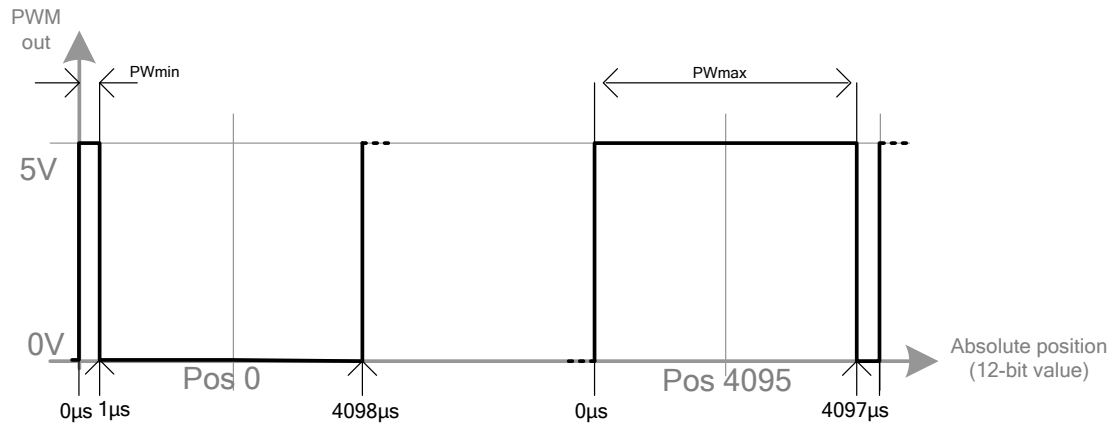


Figure 5:

PWM duty cycle depending on magnet position



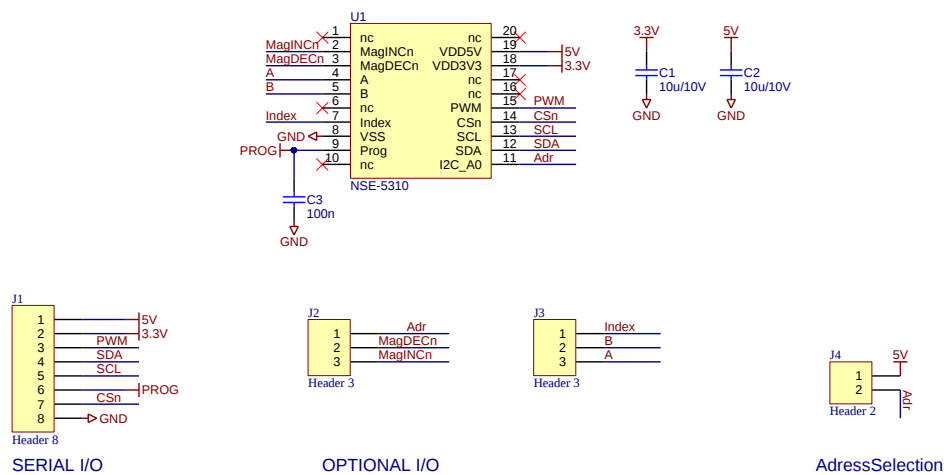
5 NSE5310 adapter board hardware

Below you can find the NSE5310-AB schematics and pcb.

5.1 NSE5310 – AB – 1.0 schematics

Figure 6:

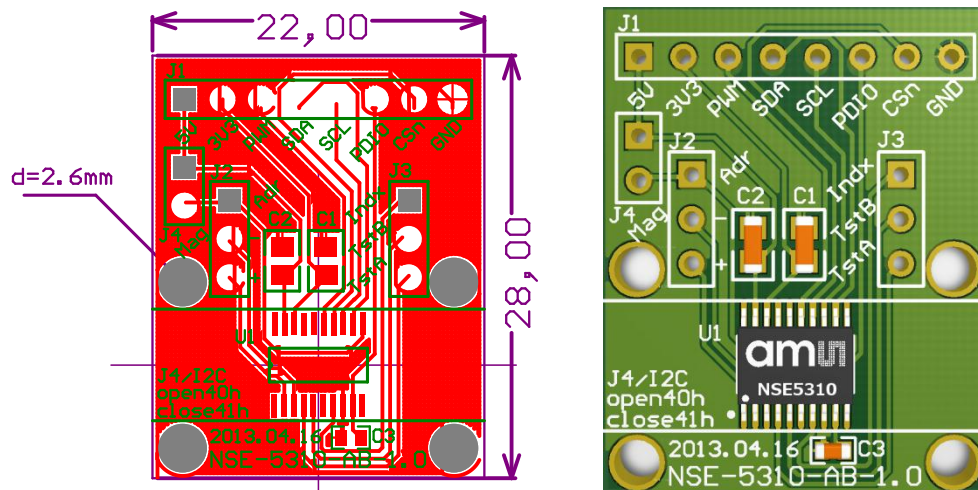
AS5040-AB-2.1 schematics



5.2 NSE5310 – AB – 1.0 - PCB layout

Figure 7:

NSE5310 – AB – 1.0 PCB



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