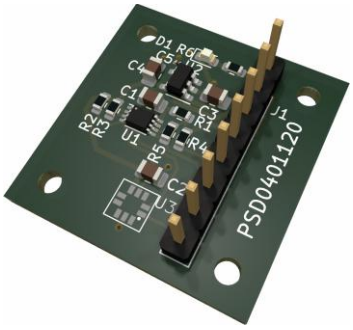


Data Sheet PSD0401120-EB Demonstration Board

PUI Audio's PSD0401120-EB pressure sensor demonstration board features the PUI Audio PSD0401120-EB digital output pressure sensor. The PSD0401120-EB features a 30kPa to 120kPa input pressure range.

The PSD0401120-EB features an I²C interface. The PSD0401120-EB combines high-linearity pressure sensor with an ultra-low-power 24-bit delta-sigma analog-to-digital converter (ΔΣADC). The pressure sensor is factory calibrated. The calibration coefficients are stored internally and used by the ΔΣADC as it processes the sensor's analog output. The PSD0401120-EB also includes a temperature sensor with a nominal resolution of 0.1°C

The board features a small size of 23.5966mm x24.2522mm, 1.8V to 5.0V power supply voltage range, and header pins for easy design prototype development.

Features

- Pressure range: 30kPa to 120kPa
- Temperature resolution: 0.1°k/LSB
- 24-bit ΔΣADC
- I²C serial interface
- 3.3V_{DC} nominal power supply voltage
- 3.55mm x 3.55mm x 1.40mm surface-mount 10-pin LGA package
- Water resistant to 100m

Electrical Characteristics

Absolute Maximum Ratings (T_A = 25°C, specificized voltages are referenced to ground (GND), unless otherwise specified.) Note 1

Parameter	Conditions	Minimum	Typical	Maximum	Unit
V_{DD}				4.0	V
V_{DDIO}				4.0	V
IO Pin		-0.3		V_{DD}+0.3	V
$\lvert V_{DD} - V_{DDIO} \rvert$				0.3	V
Pressure				1000	kPa
ESD Class	Human Body Model (JESD22-A114)	-2000		2000	V
Storage Temperature		-40		125	°C

Performance Characteristics (V_{DD} = VDDIO = 1.8V, T_A = 25°C, unless otherwise specified.) Note 1

Parameters	Conditions		Minimum	Typical	Maximum	Unit
V_{DD}			1.8		3.6	V
V_{DDIO}			1.8		3.6	V
Peak Current				0.3		mA
Standby Current				50	250	nA
ΔΣADC Conversion I_{DD}	1Hz conversion rate	Low Precision		3		µA
		Standard Precision		11		
		High Precision		40		
ΔΣADC Conversion I_{DD}	OSR = 128			80		µA
	OSR = 64			42		
	OSR = 32			23		
	OSR = 16			13		
	OSR = 8			8		
	OSR = 4			6		
	OSR = 2			4		
Single Conversion Time	Temperature OSR = 1024x	OSR = 128		203		ms
		OSR = 64		105		
		OSR = 32		56		
		OSR = 16		31		
		OSR = 8		19		
		OSR = 4		13		
		OSR = 2		10		
ΔΣADC Conversion Frequency	2x ≤ Over-sampling-rate ≤ 128x		20		1350	Hz
Single Conversion Frequency	Temperature OSR = 1024x	OSR = 128		4.9		Hz
		OSR = 64		9.5		
		OSR = 32		17.9		
		OSR = 16		32.3		
		OSR = 8		52.6		
		OSR = 4		76.9		
		OSR = 2		100		
Start Time	t_{ST1} V_{DD} rising edge to communication start				1	ms
	t_{ST2} V_{DD} rising edge to measurement start				2.5	

Wake Time	T_{wu1} Sleep state to communication start			0.5	ms
	T_{wu2} Sleep state to measurement start			2	
On-Device Oscillator Frequency		3.6	4	4.4	MHz
ADC Resolution	Pressure Sensor	20	21		Bits
	Temperature Sensor	16	20		
Input Signal Center	Set input signal center based on applied bridge to match ADC	1/16		8/16	____
Integral Non-Linearity Error		-4		4	LSB
Differential Non-Linearity Error		-1		1	LSB
Power Supply Rejection	f = 217Hz squarewave, V_{MAG} = 100mV_{p-p} Measurement BW = 20Hz ≤ f ≤ 20kHz	0.063			Pa_{RMS}
Measurement Frequency	Digital compensation included	5		100	Hz
Overall Non-Linearity				0.01	%FS
Operating Temperature		-20		85	°C
Storage Temperature		-40		125	°C
Overall System Non-Linearity				0.01	%FS
Pressure Sensor Performance					
Pressure Range		30		120	kPa
Pressure Resolution				0.06	Pa_{RMS}
Absolute Pressure Accuracy	30kPa ≤ Pressure ≤ 120kPa 0°C ≤ T_A ≤ 65°C		100		Pa
Relative Pressure Accuracy	Relative to absolute pressure accuracy		10		Pa
Pressure Precision	Low power		5.0		Pa_{RMS}
	Standard power		1.2		
	High precision		0.6		
Temperature Measurement Rate		1		128	Hz
Pressure Measurement Time	Low power		5		ms
	Standard power		28		
	High precision		105		
Overload Pressure				300	kPa
Pressure Compensation Temperature Range		-40		85	°C
Pressure Temperature Drift Coefficient	Pressure = 100kPa 25°C ≤ T_A ≤ 40°C		0.5		Pa/°K
Temperature Sensor Performance					
Temperature Resolution			0.003		K/LSB
Temperature Data Resolution				0.1	°C
Temperature Accuracy	-40°C ≤ T_A ≤ 50°C		±1.0		°C
Temperature Measurement Rate		1		128	Hz

Temperature Measurement Range		-40		125	°C

Note 1: *Absolute Maximum Ratings* indicate limits beyond which damage to the device may occur. *Performance Characteristics* indicate conditions for which the device is functional, but do not ensure specific performance limits. *Performance Characteristics* state DC and AC electrical specifications under specific test conditions that ensure specific performance limits, and this assumes that the device is within the *Performance Characteristics*. Specifications are not ensured for parameters where no limit is given. The typical value, however, is a good indication of device performance.

I²C Interface Characteristics (T_A = 25°C, unless otherwise specified.)

Symbol	Parameters	Conditions	Minimum	Typical	Maximum	Unit
f_{SCL}	Serial Bus Frequency	Standard Mode	0		100	kHz
$t_{r(SDA)}$	Data Rise Time				300	ns
$t_{f(SDA)}$	Data Fall TIme				300	ns
$t_{su(SDA)}$	SDA Setup Time		250			ns
$t_{h(SDA)}$	SDA Hold Time		0.09		3.45	µs
$t_{w(SCLL)}$	Clock-Low Time		4.7			µs
$t_{w(SCLH)}$	Clock-High Time		4.0			µs
$t_{r(SCL)}$	Clock Rise Time				1000	ns
$t_{f(SCK)}$	Clock Fall Time				1000	ns
$T_{h(ST)}$	Hold Time (Note2)		4.0			µs
$t_{su(STA)}$	Repeated START Set-Up TIme		4.7			µs
$t_{su(STOP)}$	STOP Set-up Time		4.0			µs
t_{BUF}	Bus Free Time Between Stop and Start Conditions		4.7			µs
Symbol	**Parameters**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Unit**
f_{SCL}	Serial Bus Frequency	Fast Mode	0		400	kHz
$t_{r(SDA)}$	Data Rise Time		20		300	ns
$t_{f(SDA)}$	Data Fall TIme		20*(V_{DD}/5.5)		300	ns
$t_{su(SDA)}$	SDA Setup Time		100			ns
$t_{h(SDA)}$	SDA Hold Time		0.02		0.9	µs
$t_{w(SCLL)}$	Clock-Low Time		1.3			µs
$t_{w(SCLH)}$	Clock-High Time		0.6			µs
$t_{r(SCL)}$	Clock Rise Time		20		300	ns
$t_{f(SCK)}$	Clock Fall Time		20*(V_{DD}/5.5)		300	ns
$T_{h(ST)}$	Hold Time (Note2)		0.6			µs
$t_{su(STA)}$	Repeated START Set-Up TIme		0.6			µs
$t_{su(STOP)}$	STOP Set-up Time		0.6			µs
t_{BUF}	Bus Free Time Between Stop and Start Conditions		1.3			µs
Symbol	**Parameters**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Unit**
f_{SCL}	Serial Bus Frequency	Fast Mode+	0		1000	kHz
$t_{r(SDA)}$	Data Rise Time				120	ns
$t_{f(SDA)}$	Data Fall TIme		20*(V_{DD}/5.5)		120	ns

$t_{su(SDA)}$	SDA Setup Time		50			ns
$t_{h(SDA)}$	SDA Hold Time		0.02		0.9	µs
$t_{w(SCLL)}$	Clock-Low Time		0.5			µs
$t_{w(SCLH)}$	Clock-High Time		0.26			µs
$t_{r(SCL)}$	Clock Rise Time				120	ns
$t_{f(SCK)}$	Clock Fall Time		20*(V_{DD}/5.5)		120	ns
$T_{h(ST)}$	Hold Time (Note2)		0.26			µs
$t_{su(STA)}$	Repeated START Set-Up TIme		0.26			µs
$t_{su(STOP)}$	STOP Set-up Time		0.26			µs
t_{BUF}	Bus Free Time Between Stop and Start Conditions		0.5			µs

Functional Description

The PSD0401120-EB demonstration board and its PSD0401120-EB pressure sensor uses a MEMS piezoresistive absolute pressure sensor as a pressure detecting element. The digital output is a serial data bit stream, containing data that is proportional to the local ambient atmospheric pressure. The pressure sensor's analog output is buffered before driving ΔΣADC's input capacitance with the necessary current and slew rate to ensure accurate analog to digital conversion. The 24-bit delta-sigma analog to digital converter (ΔΣADC) performs the conversion from the sensor's analog signal to a corresponding digital value and simultaneously applies temperature and linearity compensation. The PSD0401120-EB's block diagram is shown in Figure 1.

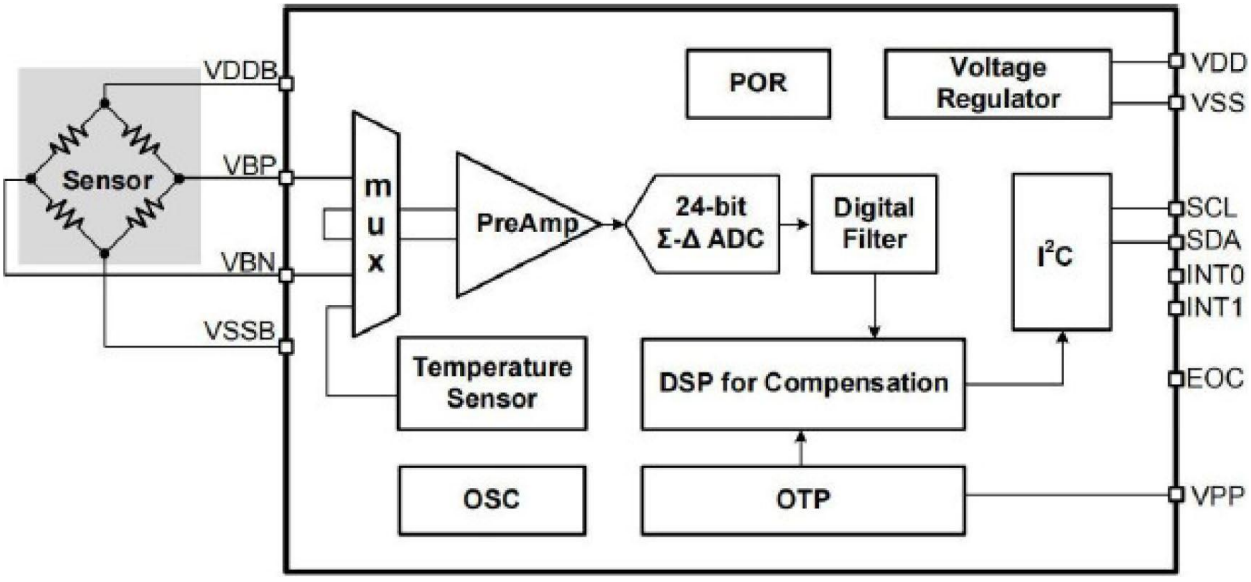


Figure 1. PSD0401120-EB block diagram.

Circuit Description

Referring to Figure 2, the PSD0401120-EB is designed for a nominal supply 5V power supply voltage, applied through connector J1's pin 1. This voltage is converted to 3.3V by U2 to power the PSD0401120-EB. That voltage is also available on connector J1's pin 2. The board features a level shifter (U1, PCA9306DC1) that allows the sensor to operate on its nominal 3.3V supply while the system to which it is connected can operate on a higher voltage, such as 5V.

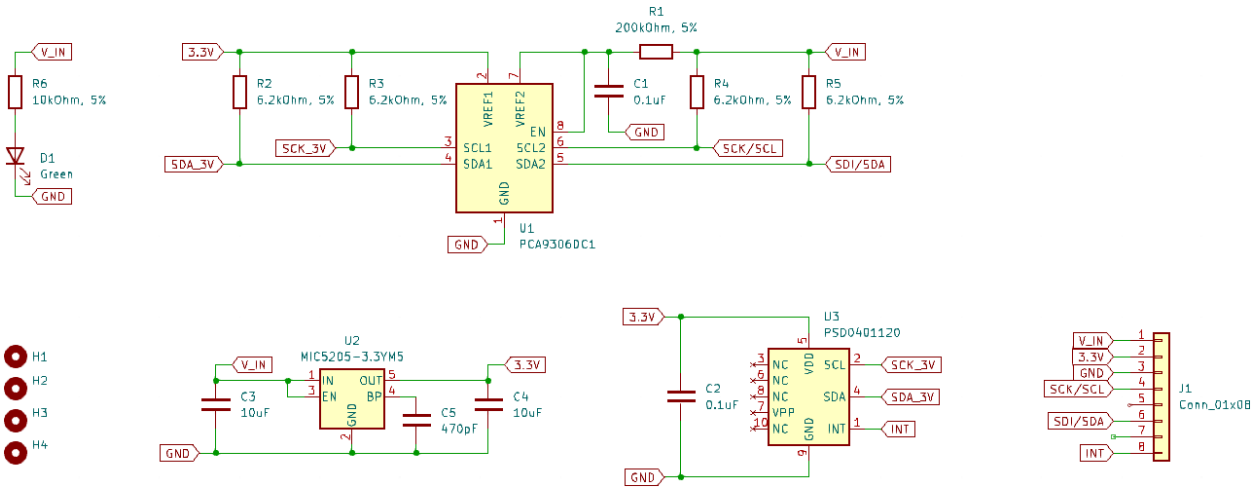


Figure 2. PSD0401120-EB schematic.

Code Sample

The sample code shown in Listing 1 is a simple program that enables an Arduino to read the PSD0401120-EB's digital output values that represent the currently measured pressure and display the results in the Arduino IDE's output console. Figure 3 details the connections between the PSD0401120-EB-EB demonstration board and an Arduino Uno board.

```
#include <Wire.h>

void setup() {
  Wire.begin();
  Serial.begin(9600);
}

char readbit;
char read5bytes[5];
long pressure_value[3];
long temp_value[2];
long pressure;
float pressure_float;
long temperature;
float temperature_float;
```

```
void loop() {
  Wire.beginTransmission(0x78);
  Wire.write(0xac);
  Wire.endTransmission();

  Wire.requestFrom(0x78, 1);
  readbit = Wire.read();
  delay(10);

  while(readbit == 0x60){
    Wire.requestFrom(0x78, 1);
    readbit = Wire.read();
    delay(10);
  }

  Wire.requestFrom(0x78, 6);
  int count = 0;
  while(Wire.available()){
    readbit = Wire.read();
    if(count > 0){read5bytes[count-1] = readbit;}
    count++;
  }

  pressure_value[0] = long(read5bytes[0]);
  pressure_value[1] = long(read5bytes[1]);
  pressure_value[2] = long(read5bytes[2]);
  temp_value[0] = long(read5bytes[3]);
  temp_value[1] = long(read5bytes[4]);

  pressure = (pressure_value[0] * 65536) + (pressure_value[1] * 256) +
(pressure_value[2]);
  temperature = (pressure_value[0] * 256) + (pressure_value[1]);

  if(pressure > 8388608){pressure = (pressure-16777216);}
  pressure_float = float((float(pressure)/-8388608.0));
  pressure_float = ((14.51/0.8)*(pressure_float-0.1))+4.35;

  if(temperature > 32768){temperature = (temperature - 65536);}
  temperature_float = float(float(temperature)/-256);
  Serial.println("--------------");
  Serial.print("Pressure Val: ");
  Serial.println(pressure_float);
  Serial.print("Temperature Val: ");
  Serial.println(temperature_float);
  delay(500);
}
```

Listing 1. Simple Arduino sketch that reads the PSD0401120-EB's digital output values that represent the currently measured pressure.

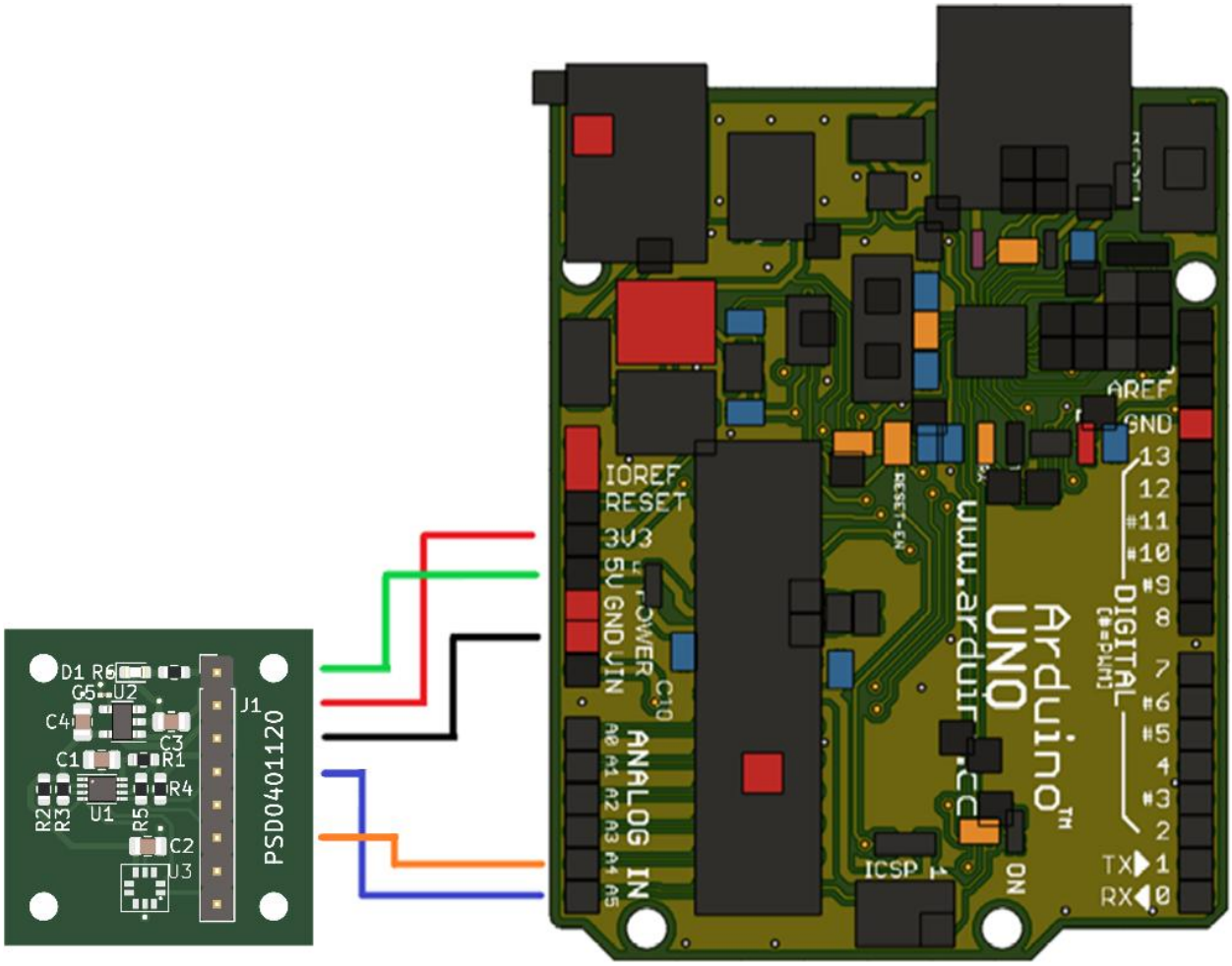
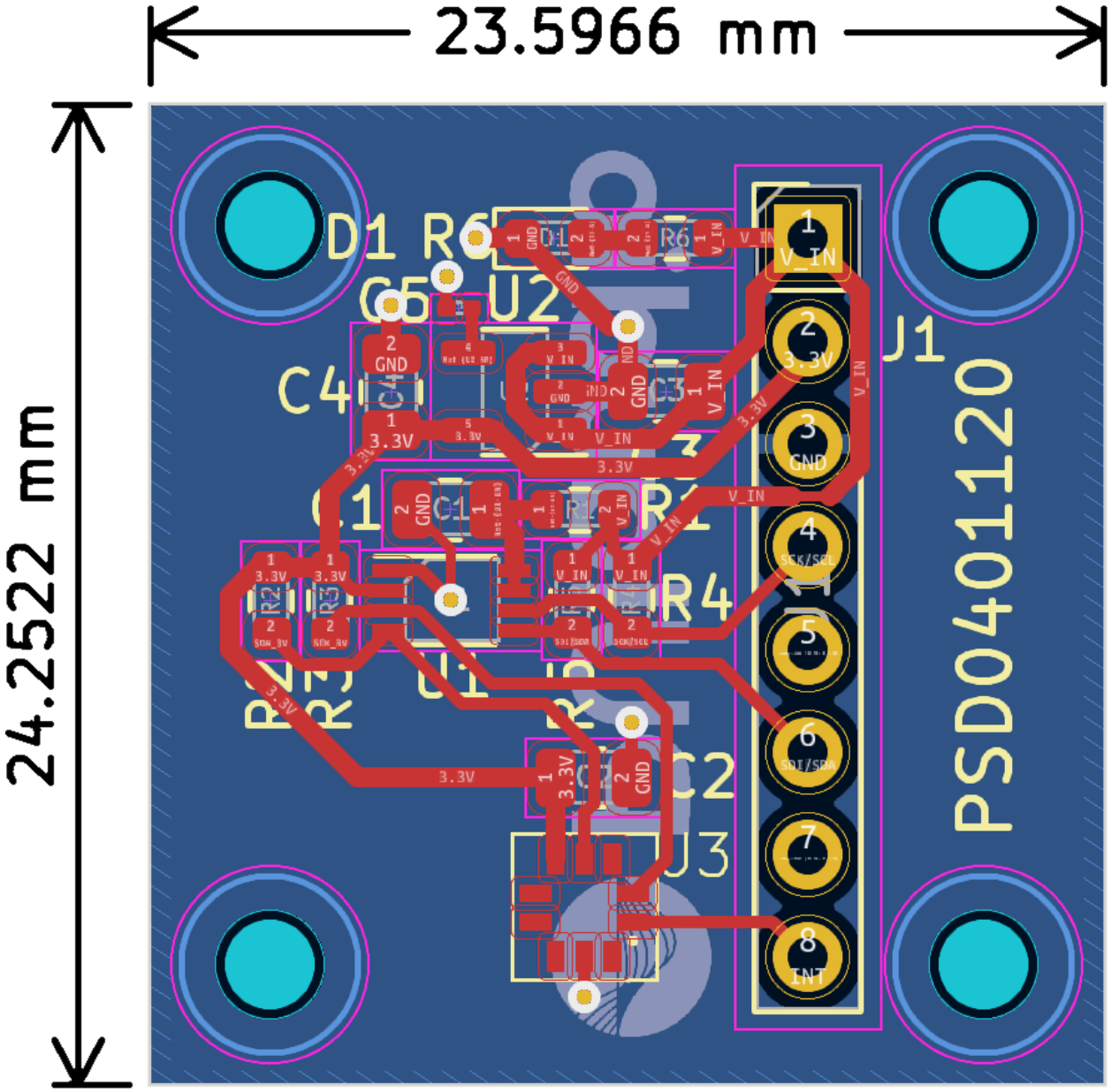


Figure 3. Suggested connections between the PSD0401120-EB demonstration board and an Arduino Uno.

Dimensions



Packaging

1 tray = 42 pieces
23 trays = 966 pieces
1 partial tray = 34 pieces
1000 total pieces

Specifications Revisions

Revision	Description	Date	Approved
A	Datasheet released from Engineering	08/18/2025	KH
B	Updated Arduino sketch	08/19/2025	KH
C	Updated Packaging information	08/20/2025	KH
D	Revised Packaging description	08/27/2025	KH

Note:

1. Unless otherwise specified:
   A. All dimensions are in millimeters.
   B. Default tolerances are ±0.5mm and angles are ±3°, unless otherwise specified.
2. Specifications subject to change or withdrawal without notice.