



به نام خدا



دانشگاه تهران

پردیس دانشکده‌های فنی

دانشکده مهندسی برق و کامپیوتر

مینی پروژه 6

ابزار دقیق

نام و نام خانوادگی

فاطمه نائینیان 810198479

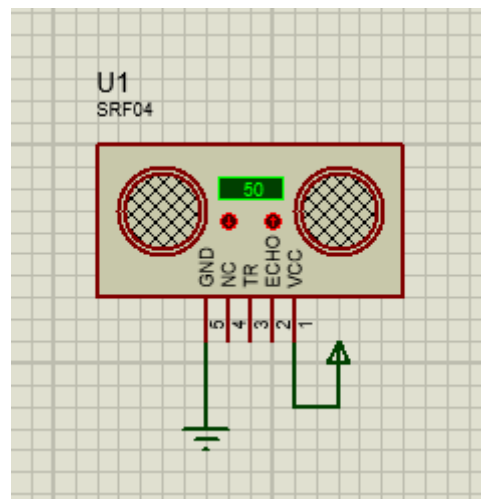
خرداد ماه 1401

فهرست

- 3..... راه اندازی حسگر اندازه گیری فاصله فراصوت
- 6..... راه اندازی موتور
- 7..... اندازه گیری سرعت
- 8..... اندازه گیری زاویه چرخش موتور
- 9..... راه اندازی حسگر اندازه گیری فشار

راه اندازی حسگر اندازه گیری فاصله فراصوت

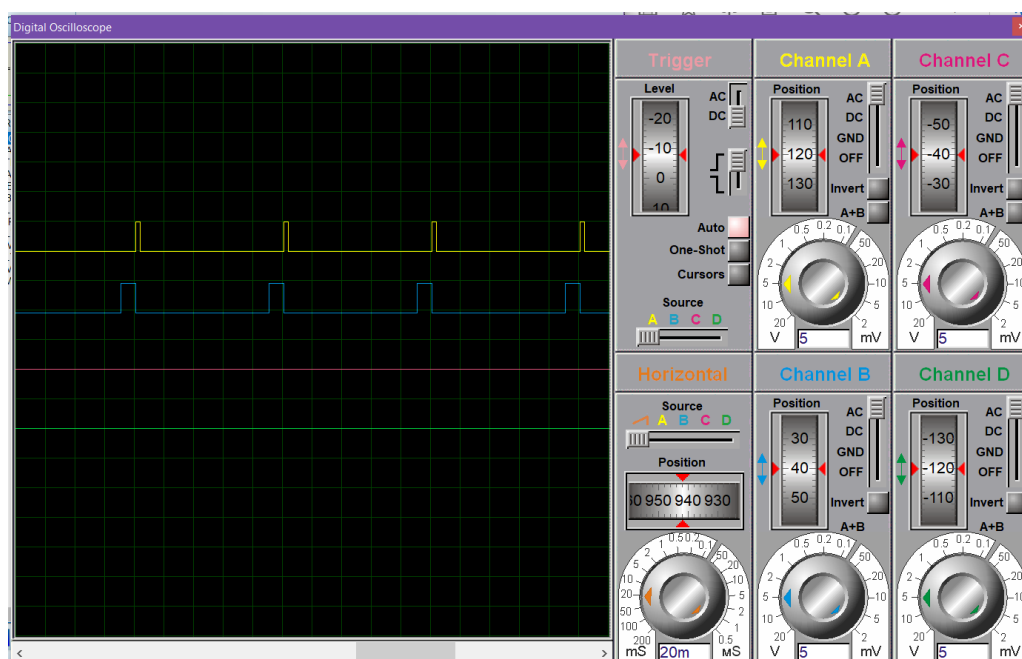
(1)



Features

- Voltage – 5 v
- Current – 30 mA Typ. 50mA Max.
- Frequency – 40 kHz
- Max Range - 3 m
- Min Range - 3 cm
- Sensitivity - Detect 3 cm diameter broom handle at > 2 m
- Input Trigger – 10 μ S Min. TTL level pulse
- Echo Pulse - Positive TTL level signal, width proportional to range.
- Small Size – (1.7 in x .8 in x .7 in height) 43 mm x 20 mm x 17 mm height

(2)



(4)

distance	time
3	87
10	290
20	580
40	1160
50	1450
60	1740
80	2321

(5)

Results

Linear model Poly1:

$$f(x) = p1 \cdot x + p2$$

Coefficients (with 95% confidence bounds):

p1 = 0.03447 (0.03446, 0.03449)

p2 = 0.006703 (-0.01147, 0.02487)

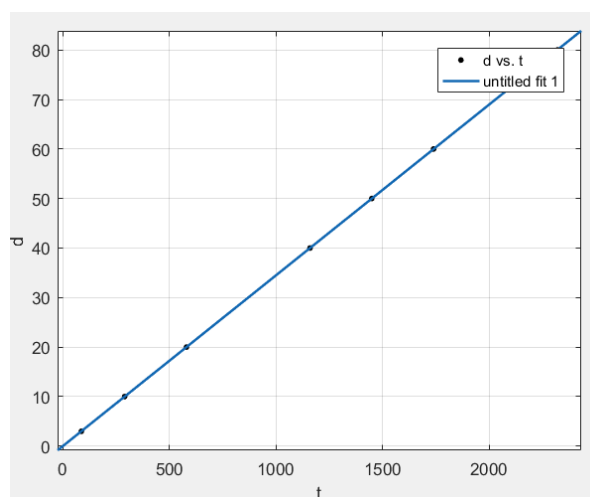
Goodness of fit:

SSE: 0.0005661

R-square: 1

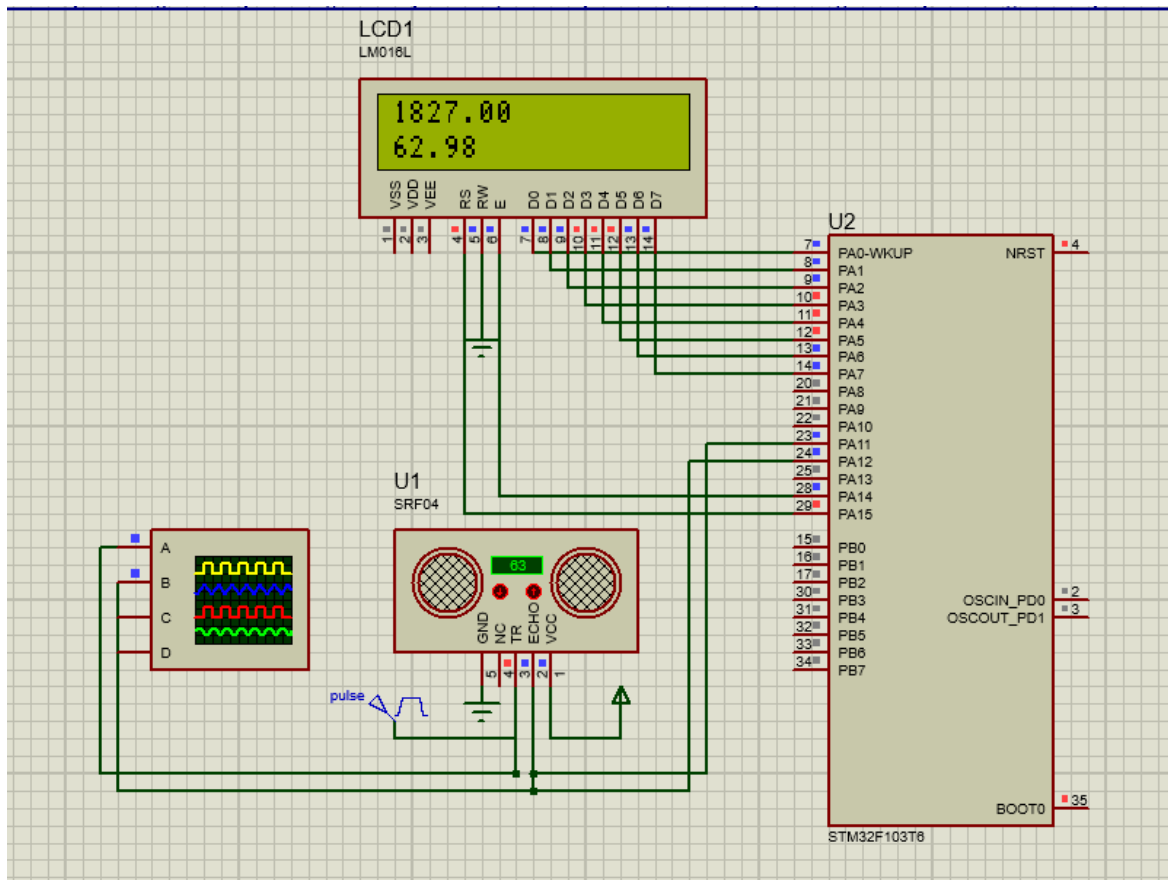
Adjusted R-square: 1

RMSE: 0.01064



سرعت صوت برابر 344.7 متر بر ثانیه است.

(6)



(7)

دقت حسگر

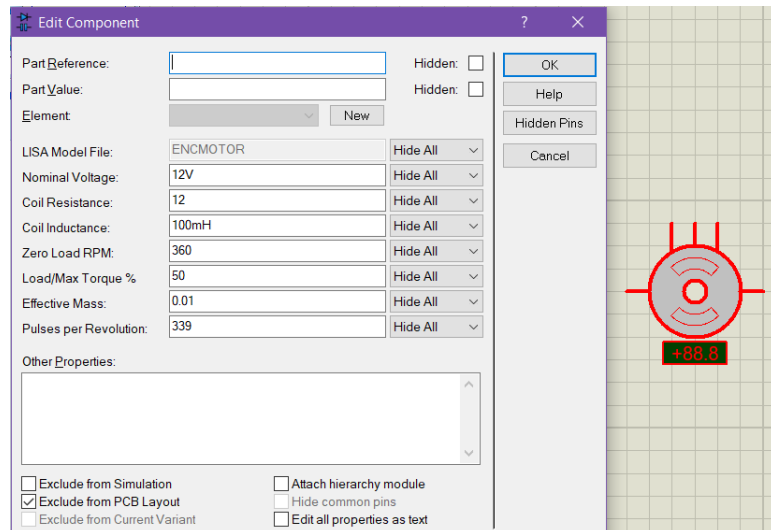
$$\text{Accuracy} = 6.667 * 344.7 * 10^{-8} = 3 * 10^{-5}$$

دقت میکروکنترلر

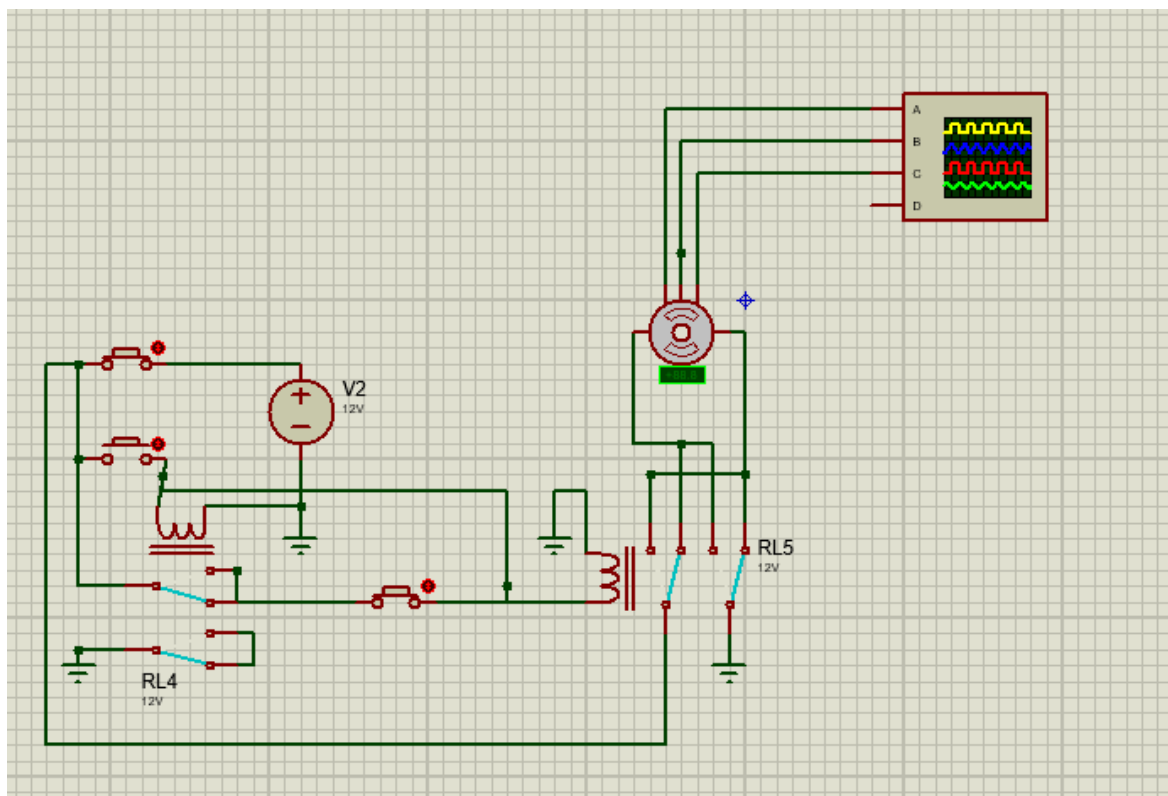
$$\frac{V_{ref}}{2^{12} - 1} = 0.0012$$

راه اندازی موتور

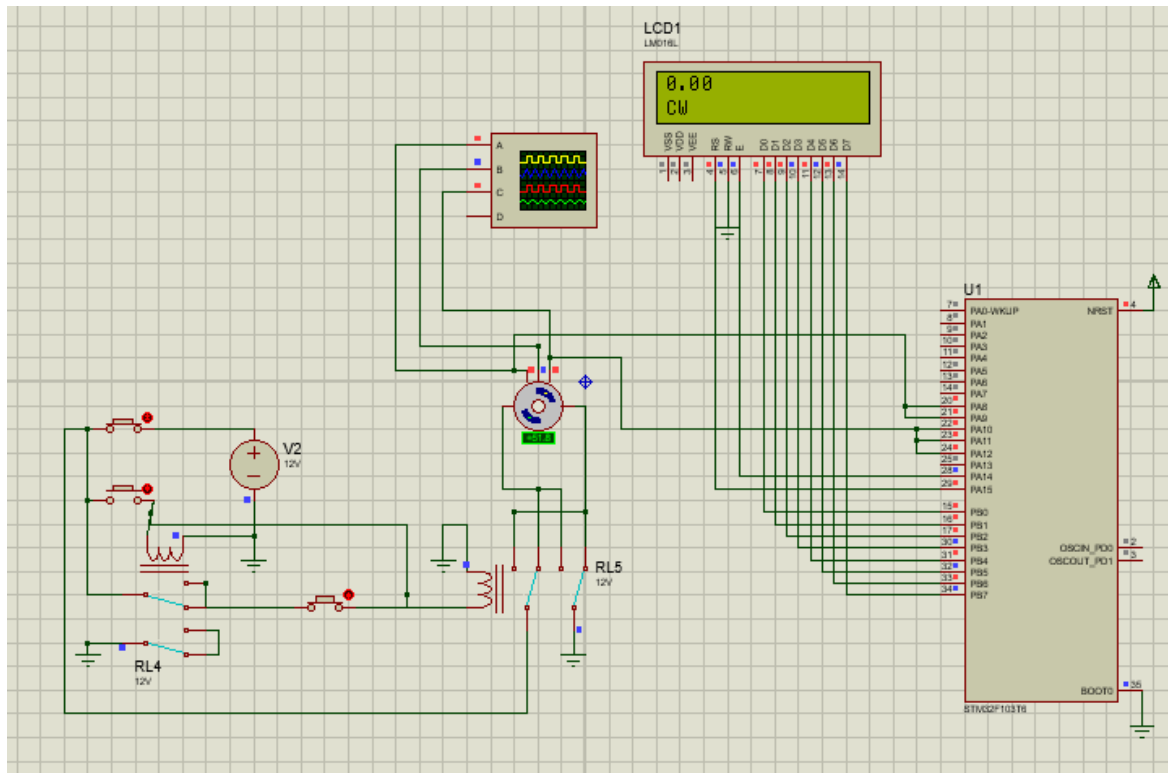
(1)



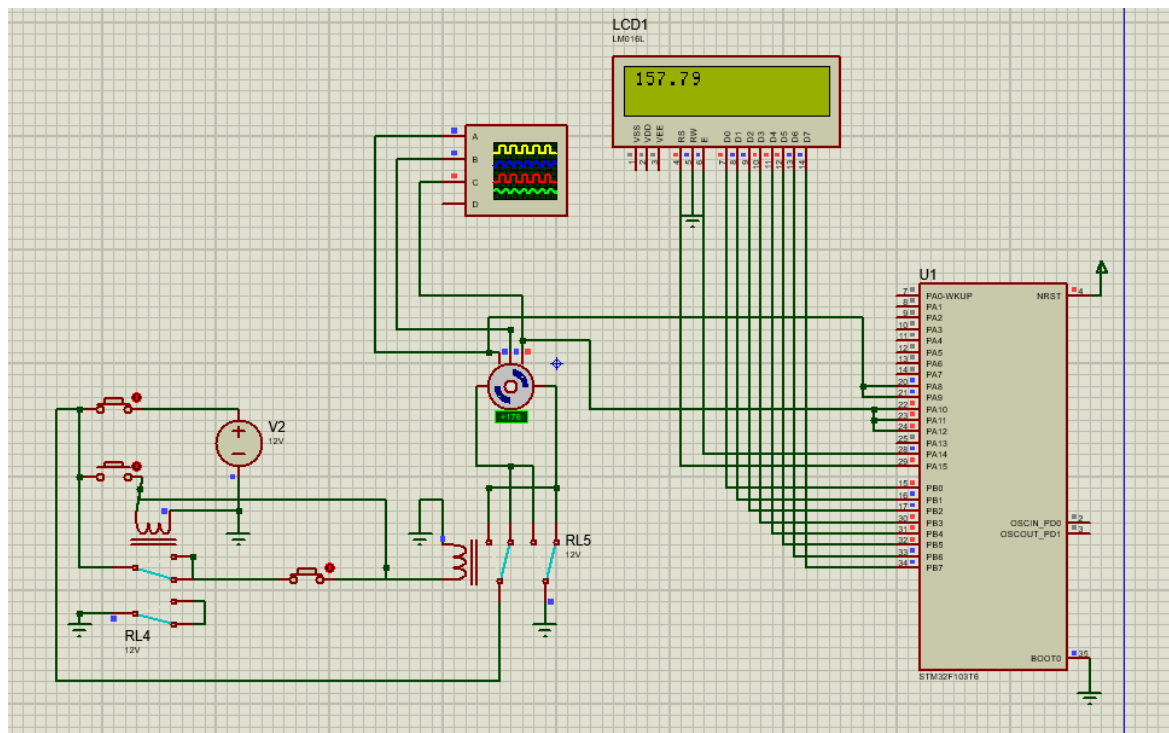
(2)



اندازه گیری سرعت



اندازه گیری زاویه چرخش موتور



(1

MPX4115

(2

Integrated Silicon Pressure Sensor Altimeter/Barometer Pressure Sensor On-Chip Signal Conditioned, Temperature Compensated and Calibrated

The MPX4115 series is designed to sense absolute air pressure in an altimeter or barometer (BAP) applications. Freescale's BAP sensor integrates on-chip, bipolar op amp circuitry and thin film resistor networks to provide a high level analog output signal and temperature compensation. The small form factor and high reliability of on-chip integration makes the Freescale BAP sensor a logical and economical choice for application designers.

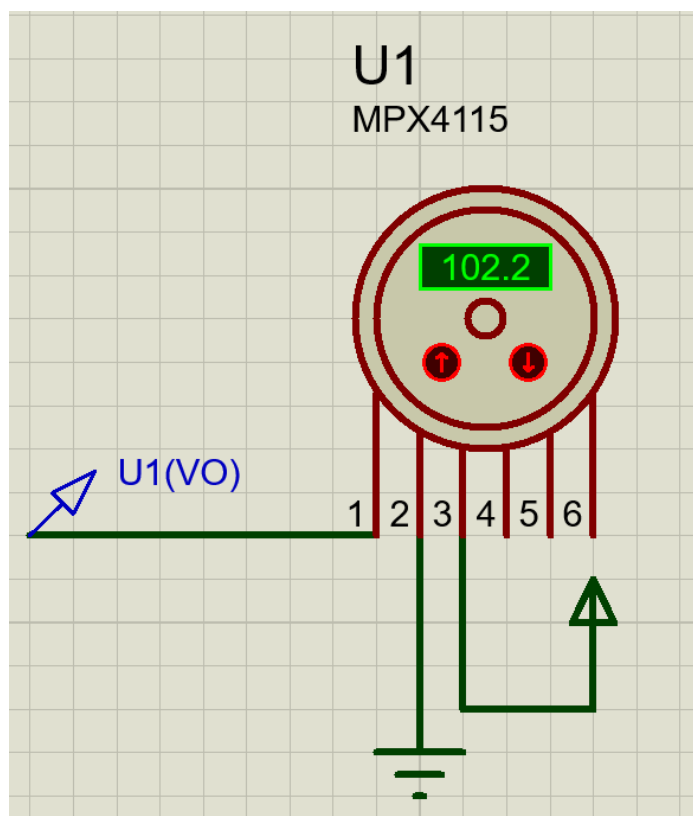
Features

- 1.5% Maximum Error over 0° to 85°
- Ideally suited for Microprocessor or Microcontroller-Based Systems
- Available in Absolute, Differential and Gauge Configurations
- Durable Epoxy Unibody Element
- Easy-to-Use Chip Carrier Option

Typical Applications

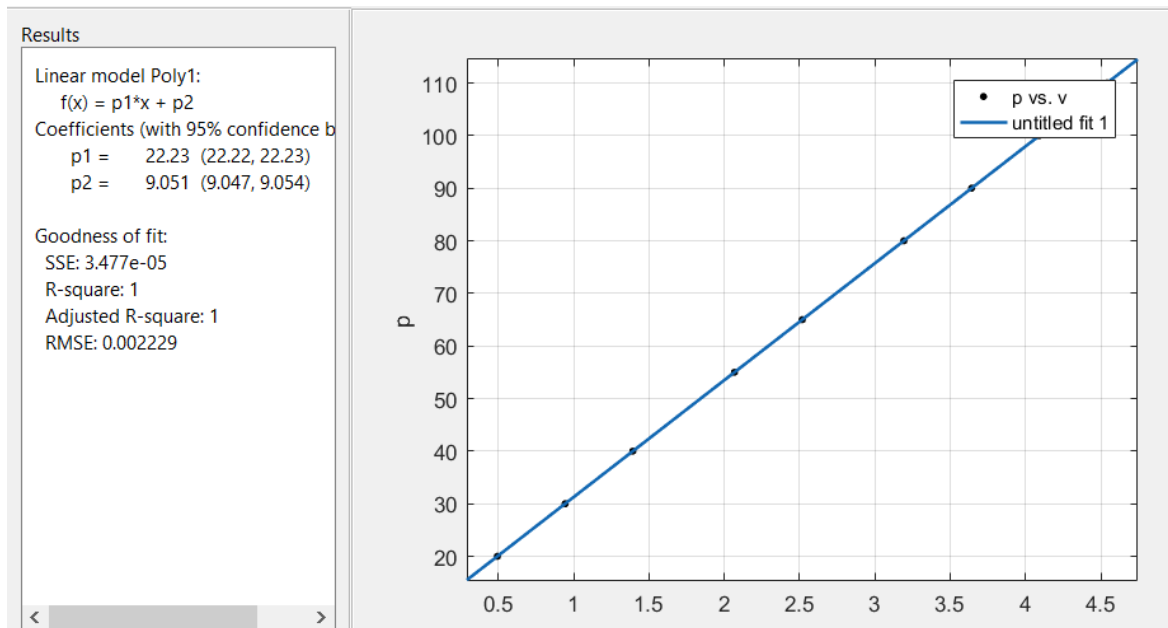
- Altimeter
- Baromete

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure Range ⁽¹⁾	P _{OP}	15	-	115	kPa
Supply Voltage ⁽²⁾	V _S	4.85	5.1	5.35	Vdc
Supply Current	I _O	—	7.0	10	mAdc
Minimum Pressure Offset ⁽³⁾ @ V _S = 5.1 Volts	V _{off}	0.135	0.204	0.273	Vdc
Full Scale Output ⁽⁴⁾ @ V _S = 5.1 Volts	V _{FSO}	4.725	4.794	4.863	Vdc
Full Scale Span ⁽⁵⁾ @ V _S = 5.1 Volts	V _{FSS}	—	4.59	—	Vdc
Accuracy ⁽⁶⁾ (0 to 85°C)	—	—	—	±1.5	%V _{FSS}
Sensitivity	V/P	—	46	—	mV/kPa
Response Time ⁽⁷⁾	t _R	—	1.0	—	ms
Output Source Current at Full Scale Output	I _{O+}	—	0.1	—	mAdc
Warm-Up Time ⁽⁸⁾	—	—	20	—	mSec
Offset Stability ⁽⁹⁾	—	—	±0.5	—	%V _{FSS}

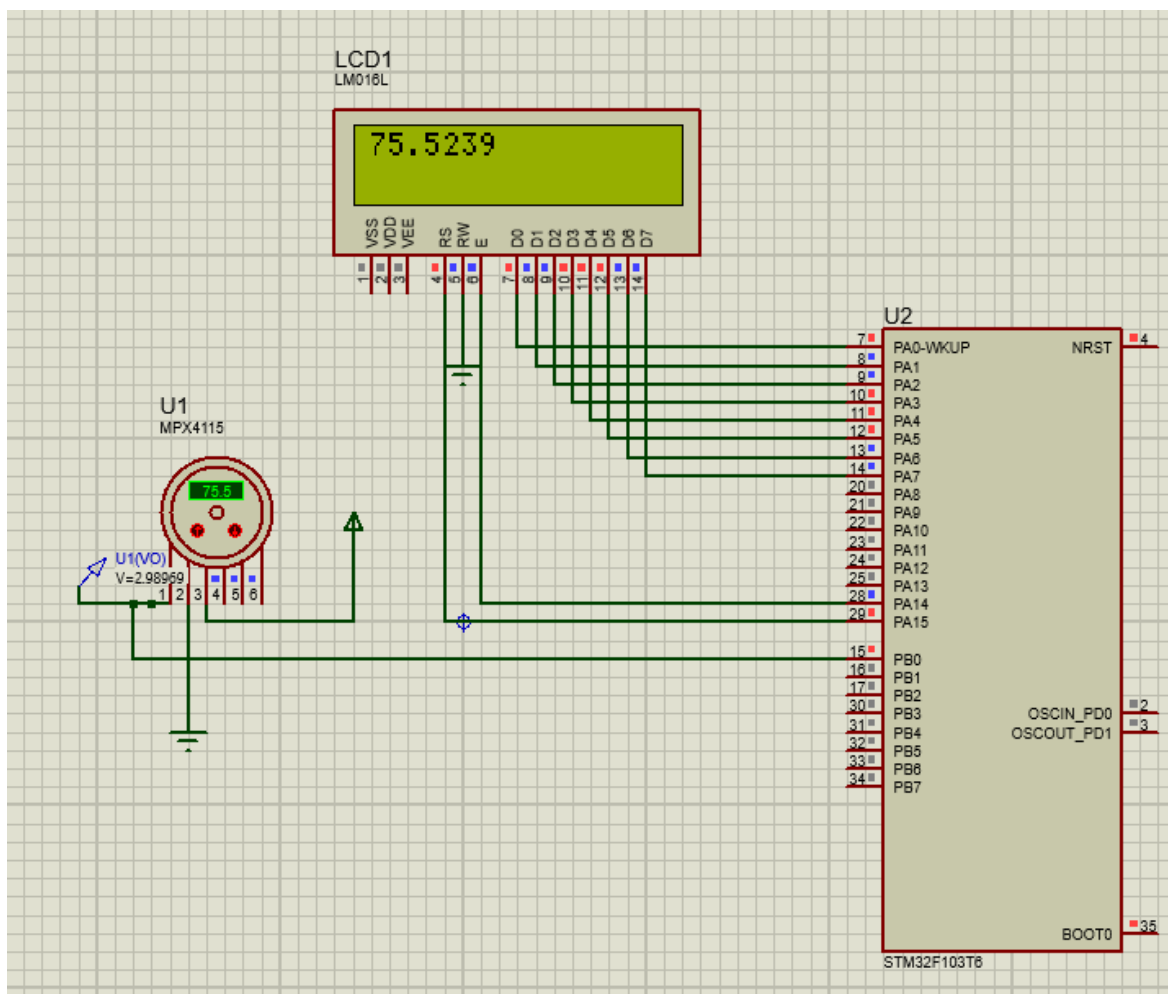


pressure	Vout
20	0.492544
30	0.94279
40	1.39242
55	2.06732
65	2.51725
80	3.19216
90	3.64209
100	4.09203
110	4.54197

(4)



(5)



(6)

دقت كنترلر

$$\frac{V_{ref}}{2^{12} - 1} = 0.0012$$

دقت حسگر با توجه به دیتاشیت ± 1.5