Vhodno izhodne naprave

Laboratorijska vaja 12

LV5: Tipala in signali – praktični izzivi

Laboratorijska vaja 12
LV5: Tipala in signali – praktični izzivi

- UZ tipalo razdalje (SR04)
- Zvočno tipalo – mikrofon
- Ostala tipala (IR razdalja, PIR, Hall, …)
- Meritve deformacij UTP kabla
- Meritev karakteristične upornosti linije z multimetrom (R0)

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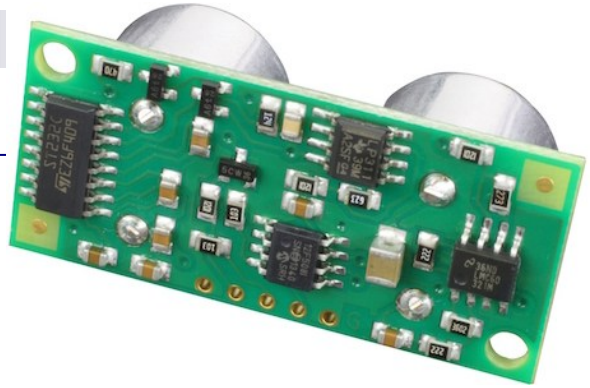
SRF04 - Ultra-Sonic Ranger

Z naslova < https://www.robot-electronics.co.uk/htm/srf04tech.htm >

SRF04 - Ultrasonic Range Finder.

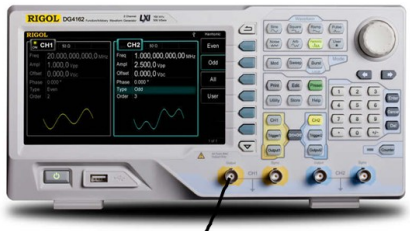
Voltage	-	5v only required
Current	-	30mA Typ. 50mA Max.
Frequency	-	40KHz
Max Range	-	3 m
Min Range	-	3 cm
Sensitivity	-	Detect 3cm diameter broom handle at > 2 m
Input Trigger	-	10uS Min. TTL level pulse
Echo Pulse	-	Positive TTL level signal, width proportional to ra
Small Size	-	43mm x 20mm x 17mm height

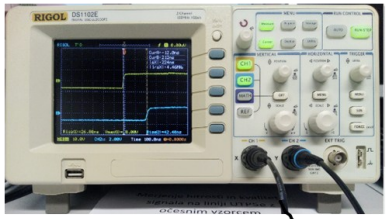


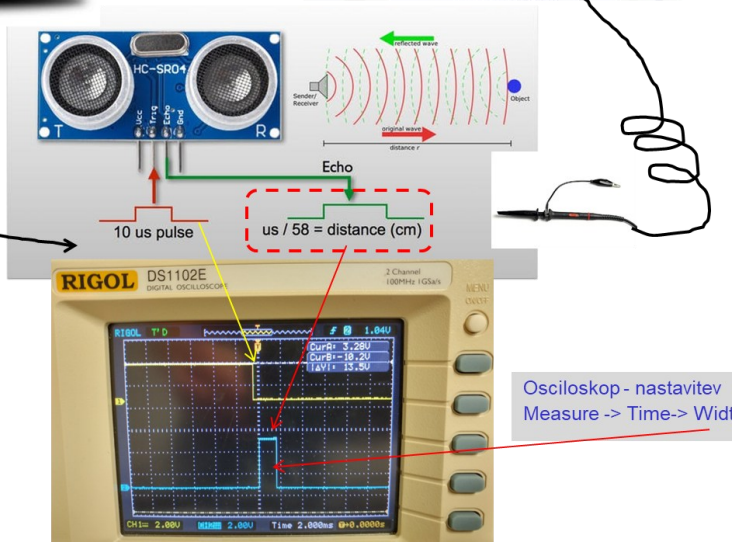
HC-SR04

Ultrasonic Distance Sensor, 5V, 15mA, 40kHz, Range 4m

Z naslova <https://si.farnell.com/multicomp-pro/hc-sr04/ultrasonic-sensor-40khz-4-5m/dp/4162009>

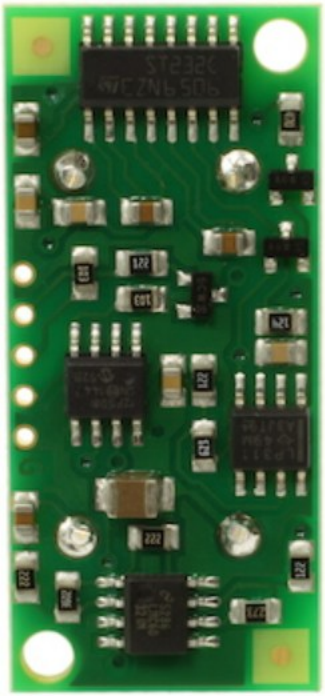






Osciloskop - nastavitev
Measure -> Time-> Width

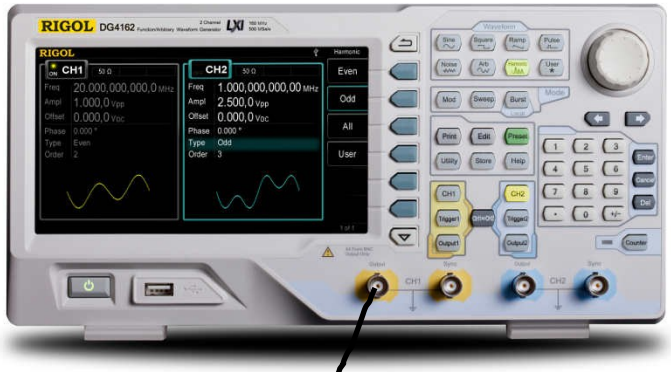
+5v
Echo output
Trigger input
Do not connect
GND

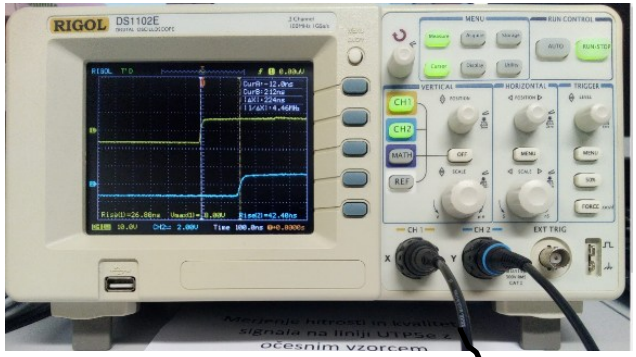


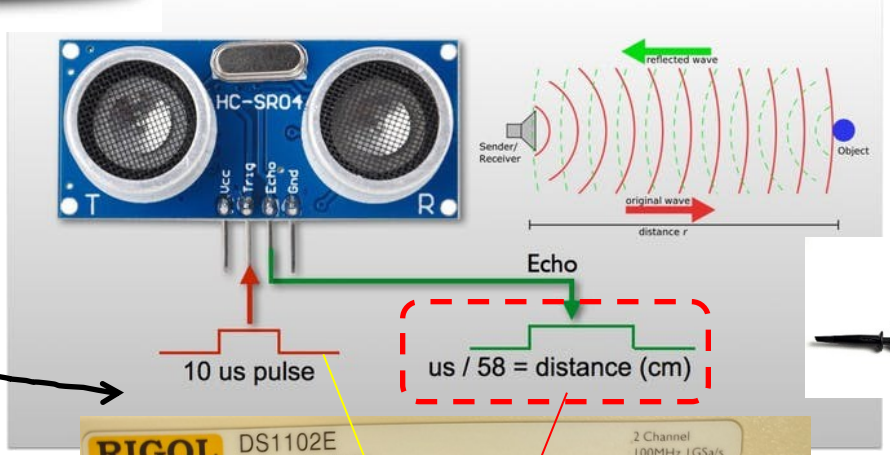
Priklop :
- Napajanje
  - 5V
  - GND
- Vhod:
  - Trigger
- Izhod:
  - PWM

8

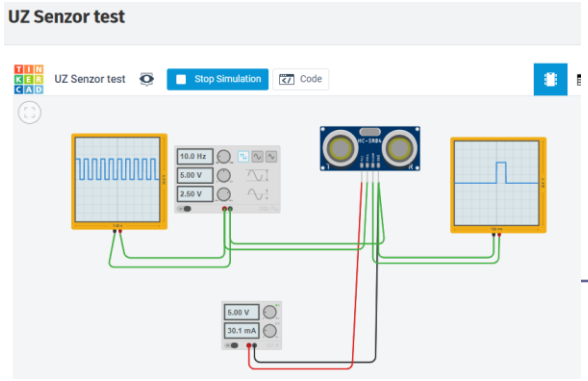
Praktična izvedba (meritev delovanja tipala)

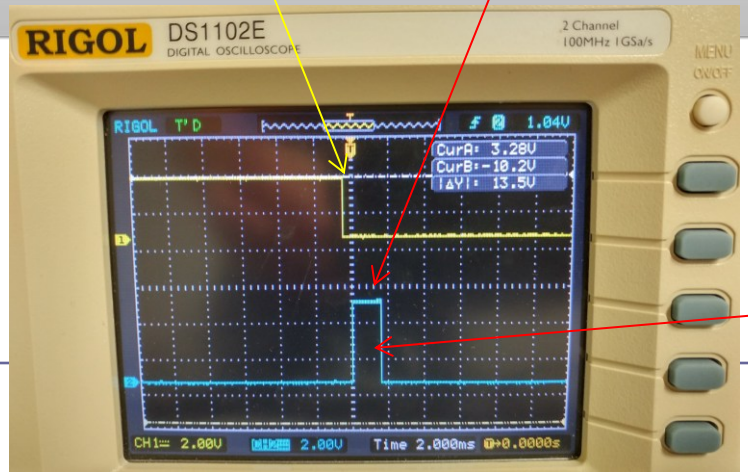






Simulacija:

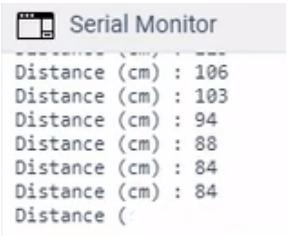




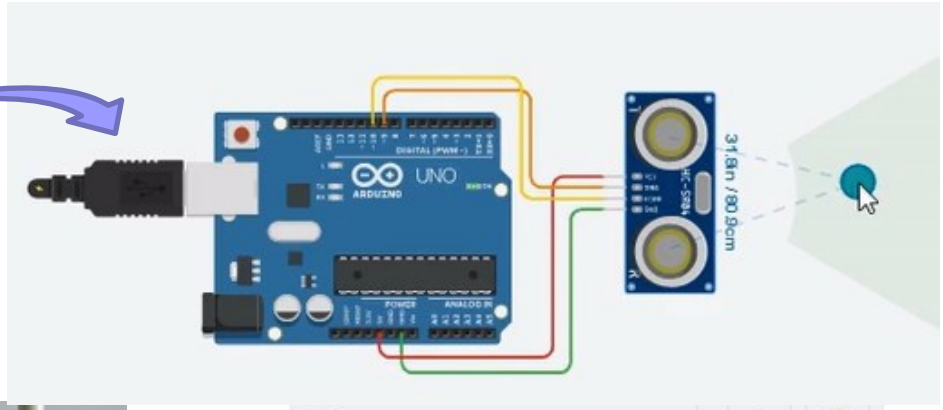
Osciloskop - nastavitev
Measure -> Time-> Width

Priključitev na mikrokrmilnik

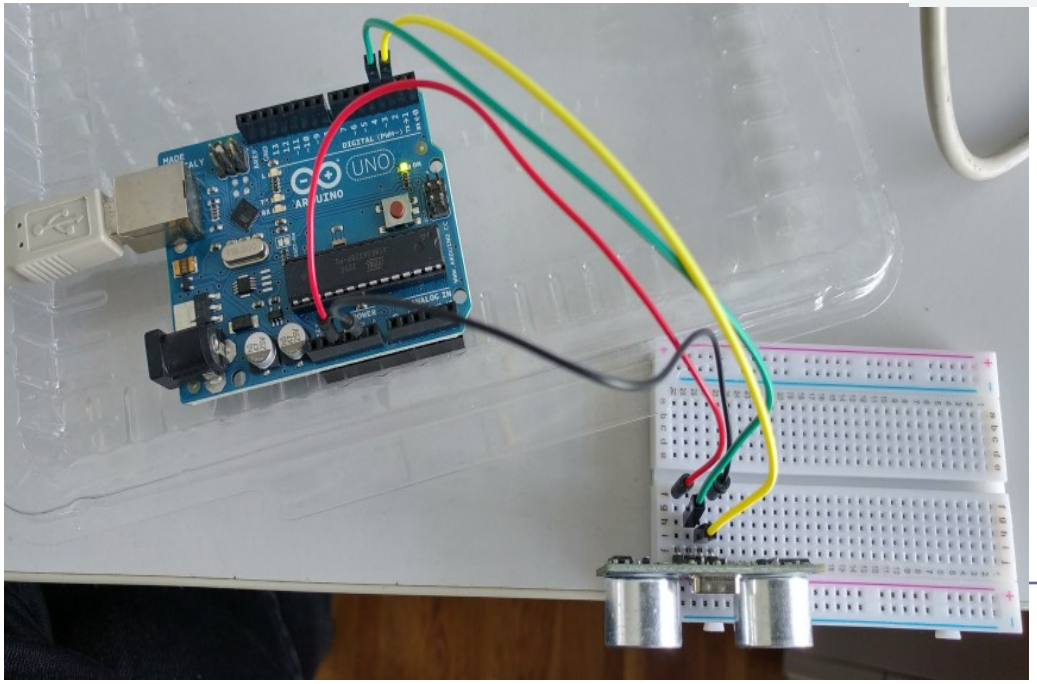
Simulacija: TinkerCad



https://www.tinkercad.com/



Izvedba:

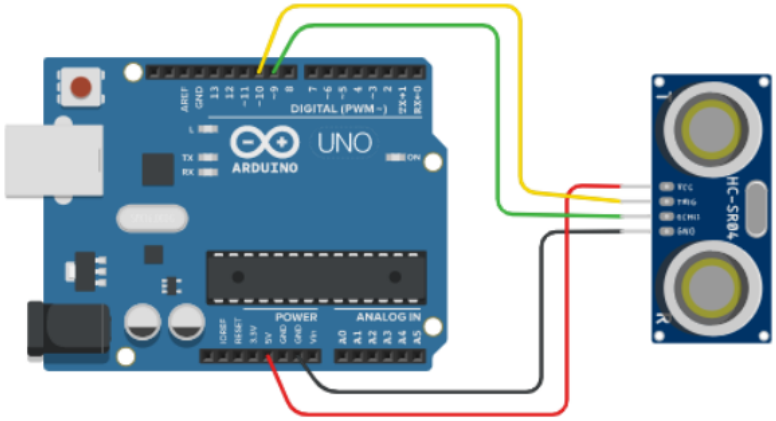


```
Text

12
13  void loop() {
14    digitalWrite(trigger_Pin, LOW);   /
15    delay(1);
16    digitalWrite(trigger_Pin, HIGH);
17    delayMicroseconds(10);          //Mak
18    digitalWrite(trigger_Pin, LOW);
19
20    duration = pulseIn(echo_Pin, HIGH);
21    distance = duration * 0.017; //((34
22  /* Speed of the sound in Air = 340 m/
23   * multiply it by 100 to get the data
24   * divide by 1,000,000 as duration is
25   * divide by 2 as ultrasound signal t
26   */
27    Serial.print("Distance (cm) : ");
28    Serial.println(distance);
29    delay(100);
30  }
```

UZ tipalo razdalje (SR04)

- # Preprosto vezje z UZ tipalom – Časovnik (Timer)



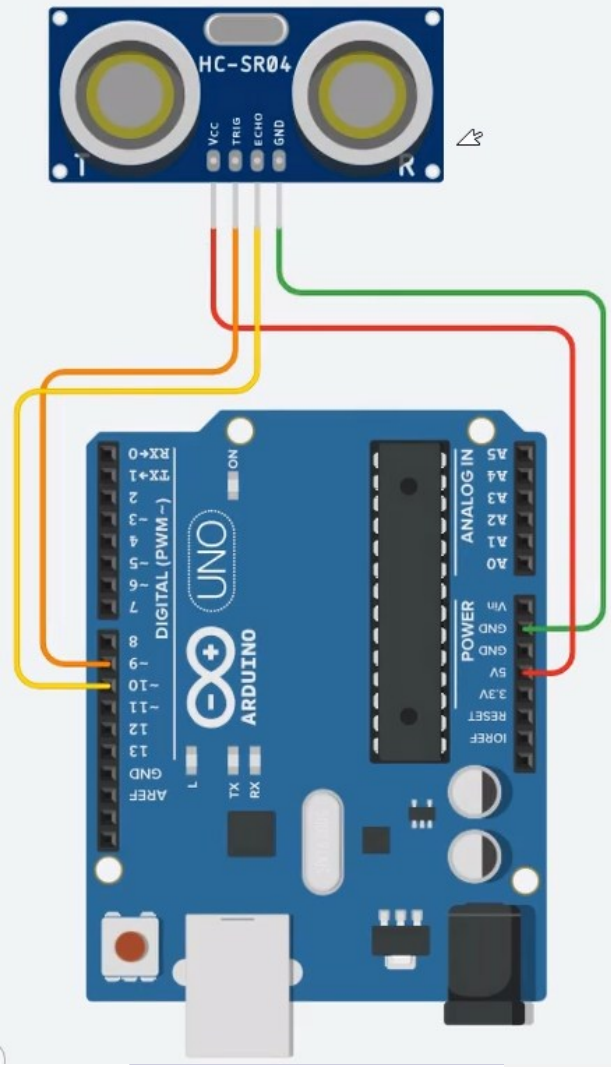
Text

1 (Arduino Uno R3)

```
6  void setup() {
7    Serial.begin(9600);   //Initialize Serial communication
8    pinMode(echo_Pin, INPUT);      //Echo pin as Input
9    pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
10 }
11
12 void loop() {
13   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
14   delay(1);
15   digitalWrite(trigger_Pin, HIGH);
16   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to st
17   digitalWrite(trigger_Pin, LOW);
18   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ul
19 //  distance = duration * 0.017; //((340*100)/10e6)/2
20   distance = duration / 58; //((340*100)/10e6)/2
21 /* Speed of the sound in Air = 340 m/S
22  * multiply it by 100 to get the data in cm
23  * divide by 1,000,000 as duration is measured in microseconds
24  * divide by 2 as ultrasound signal travels to object and comes b
25  */
26   Serial.print("Distance (cm) : ");
27   Serial.println(distance);
```

https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04

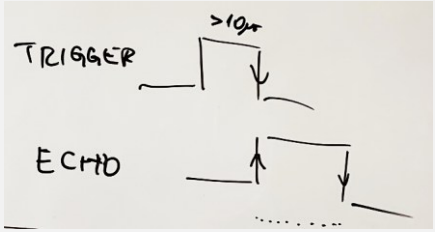


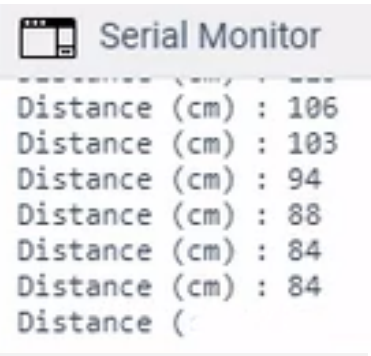

```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
   Serial.begin(9600);   //Initialize Serial communication
   pinMode(echo_Pin, INPUT);      //Echo pin as Input
   pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
   delay(1);
   digitalWrite(trigger_Pin, HIGH);
   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
   digitalWrite(trigger_Pin, LOW);

  duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
  distance = duration * 0.017; //((340*100)/10e6)/2
 /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
  * divide by 1,000,000 as duration is measured in microseconds
  * divide by 2 as ultrasound signal travels to object and comes back
 */
  Serial.print("Distance (cm) : ");
  Serial.println(distance);
  delay(100);
}
```





https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04 - program

```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
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   pinMode(echo_Pin, INPUT);     //Echo pin as Input
   pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

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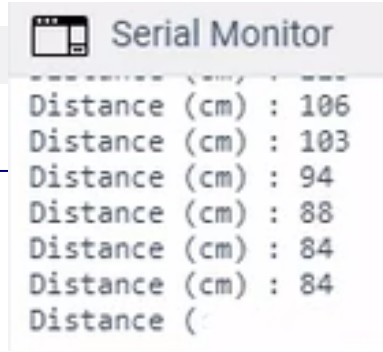
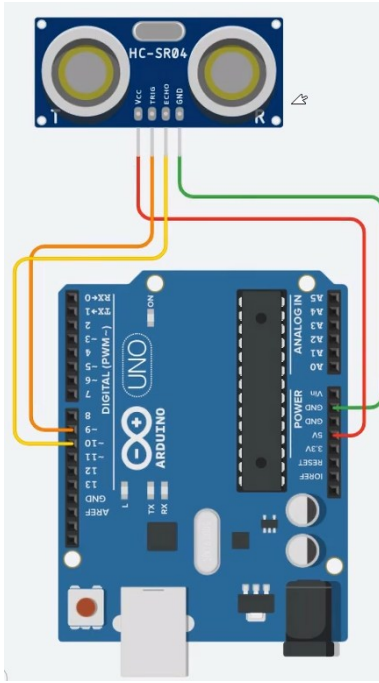
   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
   delay(1);
   digitalWrite(trigger_Pin, HIGH);
   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
   digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
   * divide by 1,000,000 as duration is measured in microseconds
   * divide by 2 as ultrasound signal travels to object and comes back
  */
   Serial.print("Distance (cm) : ");
   Serial.println(distance);
   delay(100);
}
```





https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

UZ tipalo razdalje (SR04)

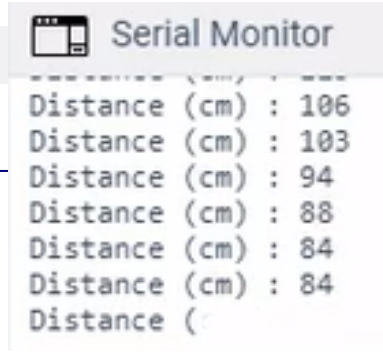
Vezje z ultrazvočnim senzorjem SR04 - program

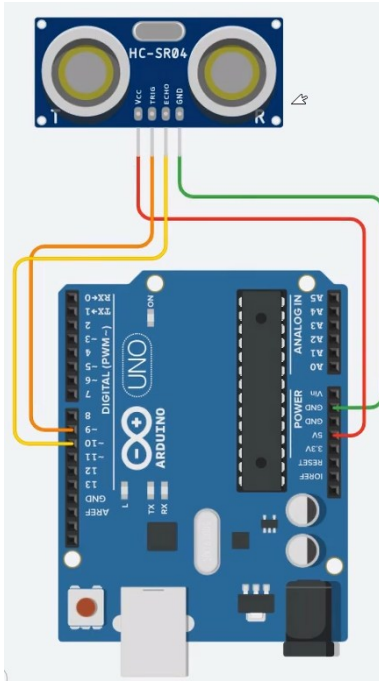
```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
    Serial.begin(9600);   //Initialize Serial communication
    pinMode(echo_Pin, INPUT);      //Echo pin as Input
    pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
    digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
   * divide by 1,000,000 as duration is measured in microseconds
   * divide by 2 as ultrasound signal travels to object and comes back
  */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```





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UZ tipalo razdalje (SR04)

Vezje z ultrazvočnim senzorjem SR04 - program

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const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
    Serial.begin(9600);   //Initialize Serial communication
    pinMode(echo_Pin, INPUT);      //Echo pin as Input
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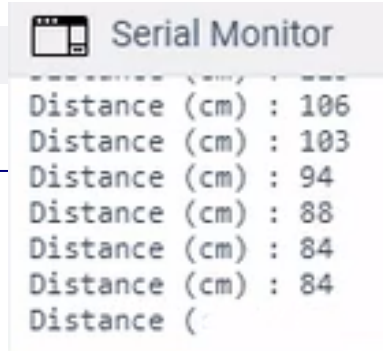
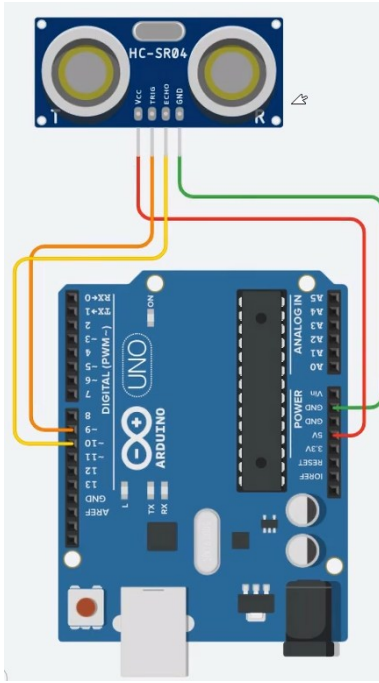
void loop() {
    digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
    * divide by 1,000,000 as duration is measured in microseconds
    * divide by 2 as ultrasound signal travels to object and comes back
   */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```





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UZ tipalo razdalje (SR04)

Vezje z ultrazvočnim senzorjem SR04 - program

```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
   Serial.begin(9600);   //Initialize Serial communication
   pinMode(echo_Pin, INPUT);     //Echo pin as Input
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}

void loop() {
   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
   delay(1);
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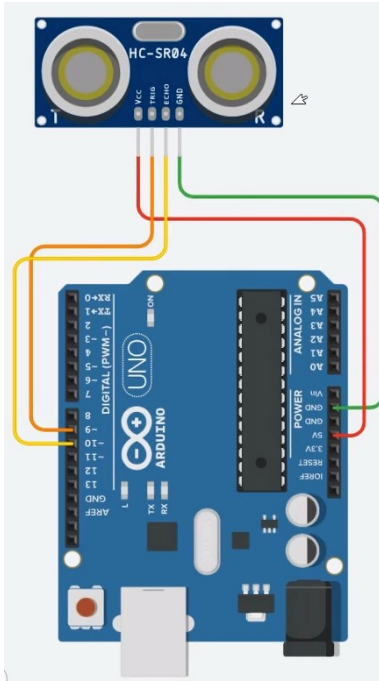
   digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2   or    duration/58
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
   * divide by 1,000,000 as duration is measured in microseconds
   * divide by 2 as ultrasound signal travels to object and comes back
   */
   Serial.print("Distance (cm) : ");
   Serial.println(distance);
   delay(100);
}
```

Serial Monitor

```
Distance (cm) : 106
Distance (cm) : 103
Distance (cm) : 94
Distance (cm) : 88
Distance (cm) : 84
Distance (cm) : 84
Distance (
```



Distance (cm) = Measured Echo Time (in µsec)/58
Distance (inch) = Measured Echo Time (in µsec)/148

https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

UZ tipalo razdalje (SR04)

Vezje z ultrazvočnim senzorjem SR04 - program

```
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const byte echo_Pin = 10;
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unsigned int distance;  //To save the distance

void setup() {
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   pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
   delay(1);
   digitalWrite(trigger_Pin, HIGH);
   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
   digitalWrite(trigger_Pin, LOW);

  duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
  distance = duration * 0.017; //((340*100)/10e6)/2
 /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
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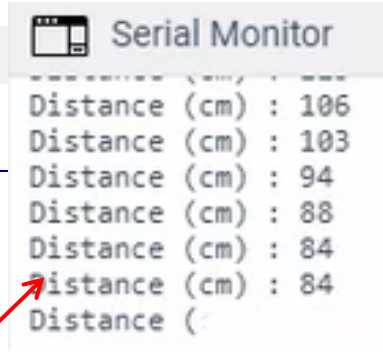
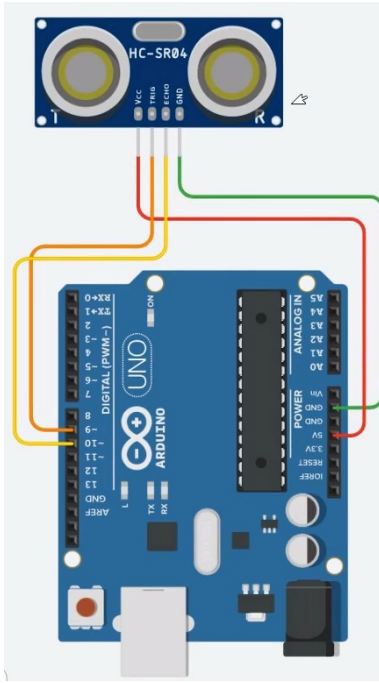
   * divide by 2 as ultrasound signal travels to object and comes back
  */
   Serial.print("Distance (cm) : ");
   Serial.println(distance);
   delay(100);
}
```





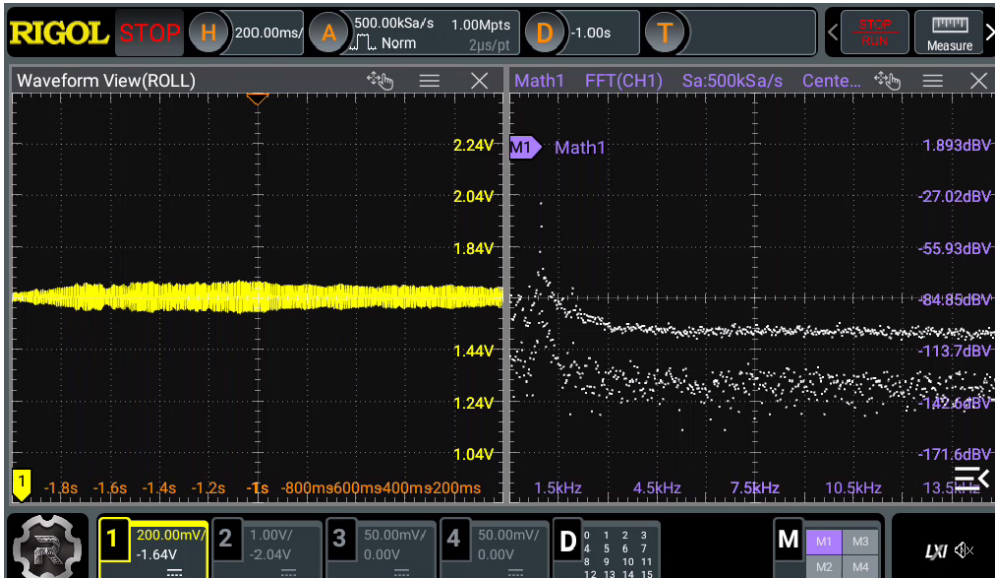
https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Laboratorijska vaja 12
LV5: Tipala in signali – praktični izzivi

- UZ tipalo razdalje (SR04)
- Zvočno tipalo – mikrofon
- Ostala tipala (IR razdalja, PIR, Hall, …)
- Meritve deformacij UTP kabla
- Meritev karakteristične upornosti linije z multimetrom (R0)

Mikrofon

- **Meritev z osciloskopom**
- **Zunanji priklop na ADC pretvornik na STM32H7**



GY-MAX4466 Electret Microphone Amplifier Module MAX4466 Adjustable Gain For Arduino

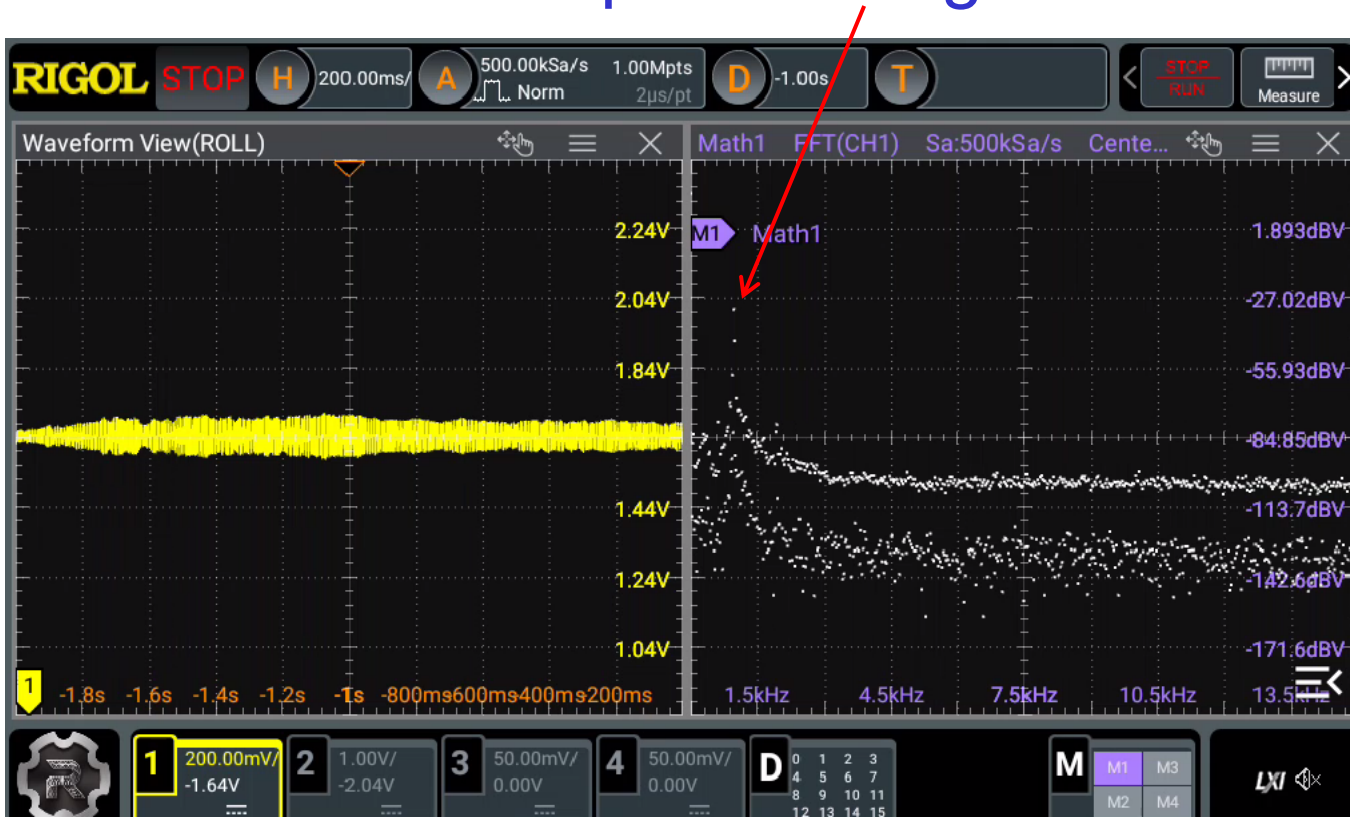
Z naslova
<https://www.aliexpress.com/item/1005007203959876.html>

Electret Microphone Amplifier - MAX4466 with Adjustable Gain

Z naslova <https://www.adafruit.com/product/1063>

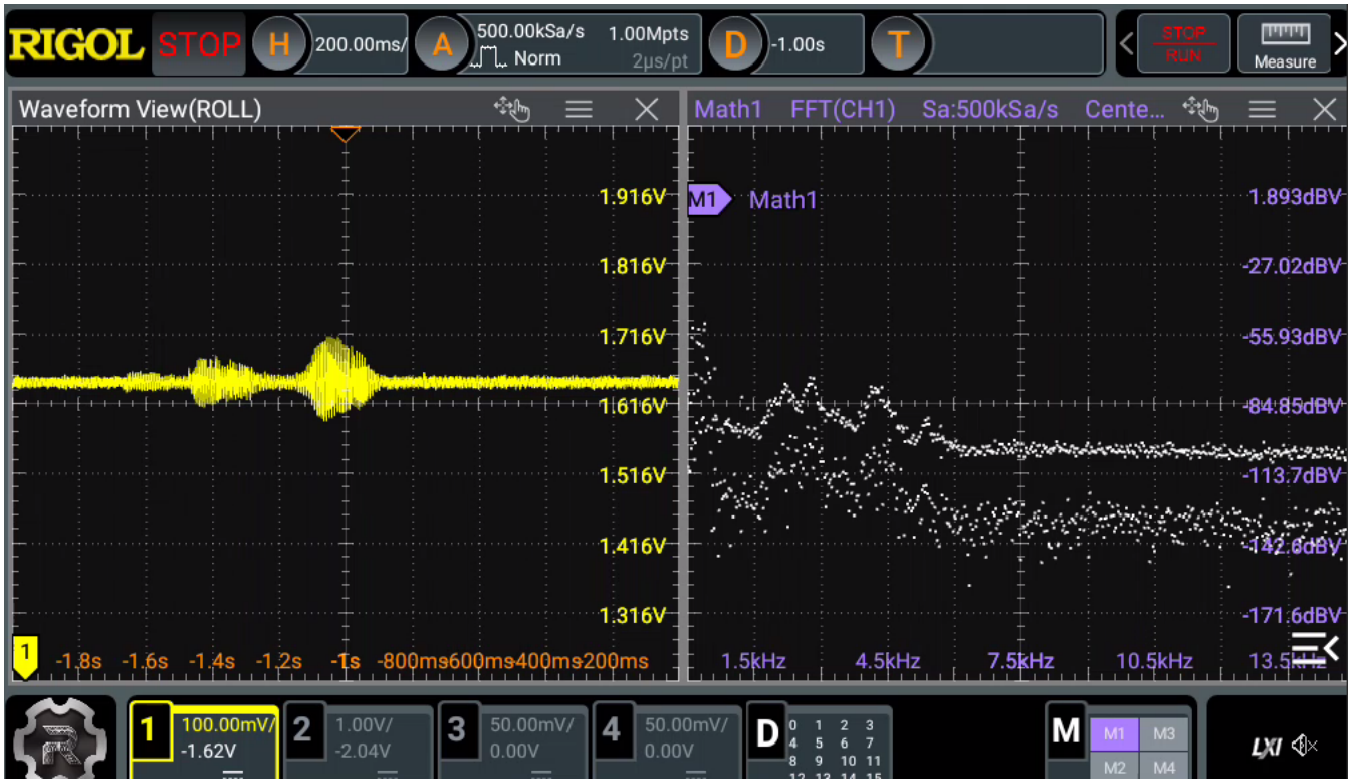
Mikrofon

- Meritev z osciloskopom - žvižg



Mikrofon

- Meritev z osciloskopom - govor

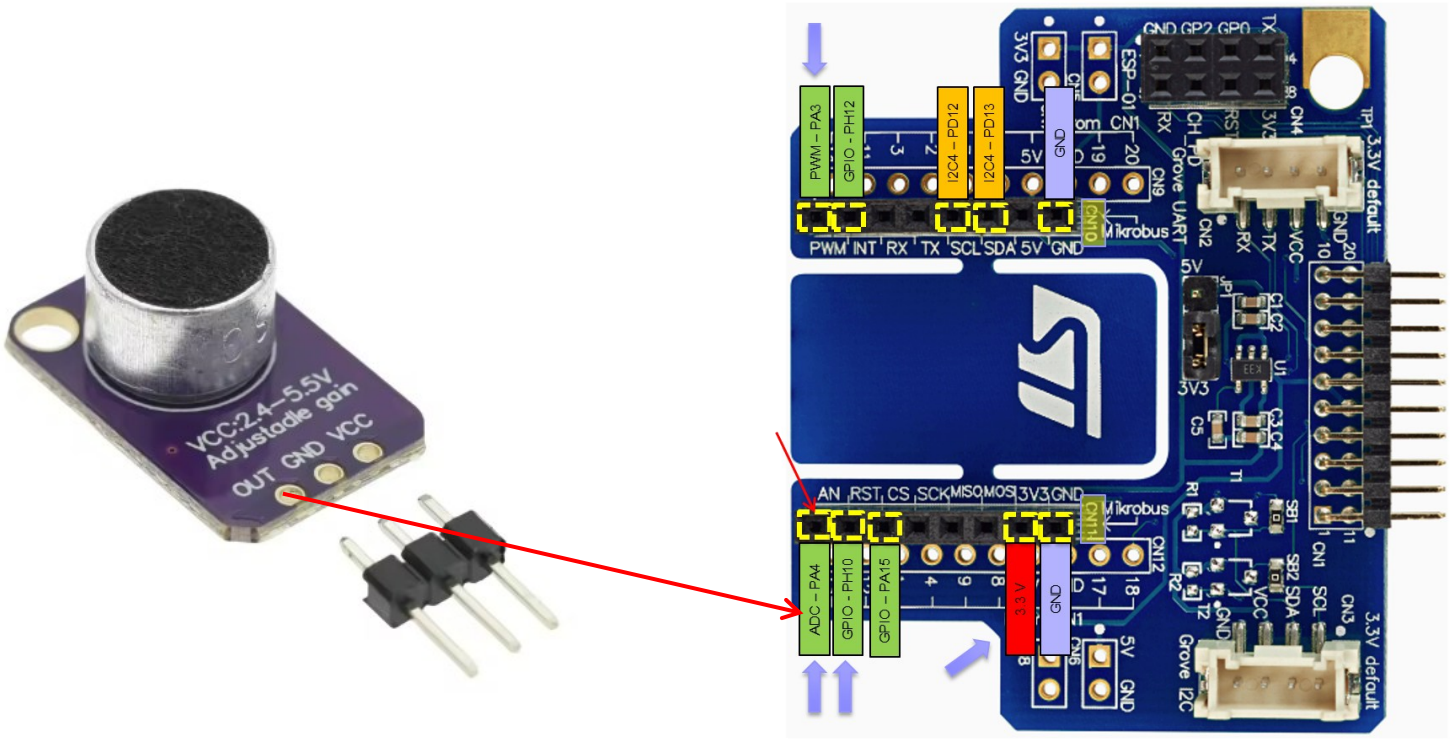


Mikrofon: priključitev na ADC (STM32H7)

- Programski del

```
HAL_ADC_Start(&hadc1); // start the adc
HAL_ADC_PollForConversion(&hadc1, 100);
// poll for conversion
adc_val = HAL_ADC_GetValue(&hadc1); //
get the adc value
HAL_ADC_Stop(&hadc1); // stop adc
```

- Vezava na ADC (PA4)

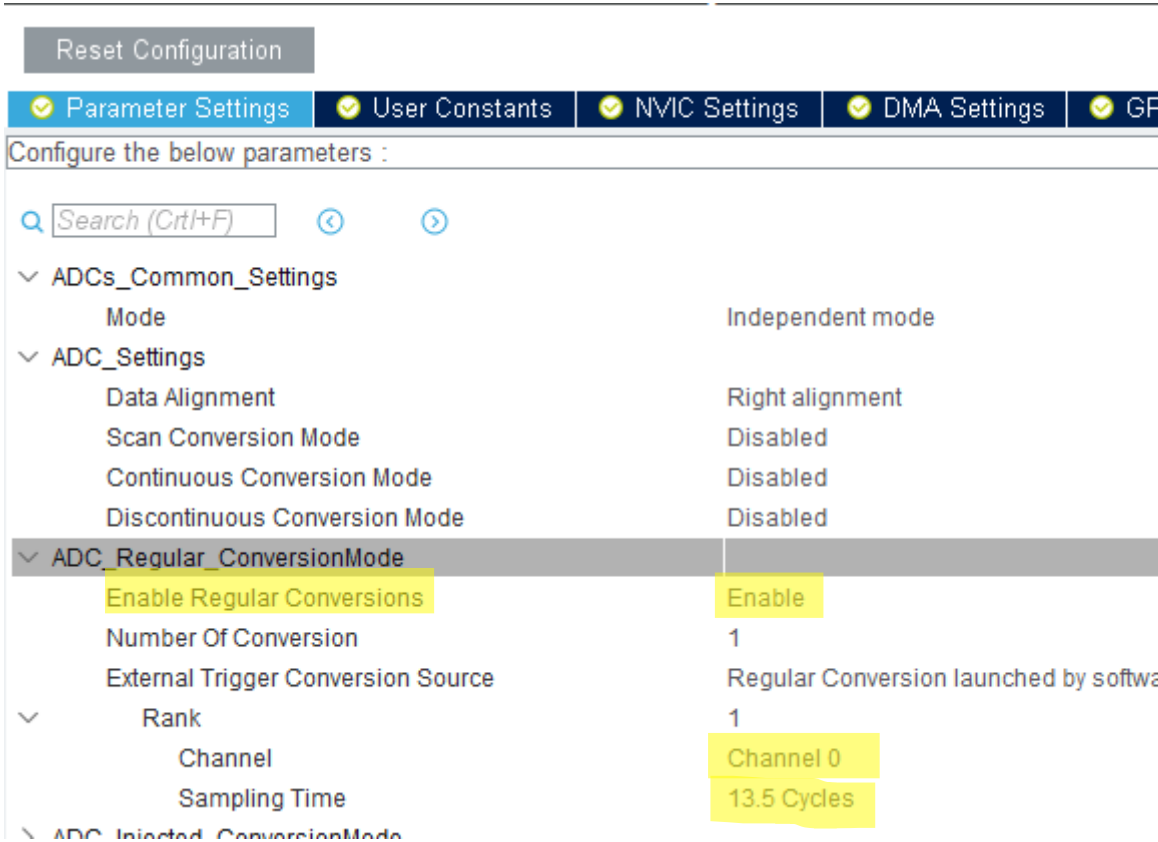


Primer 3: STM32 – ADC na 3 načine

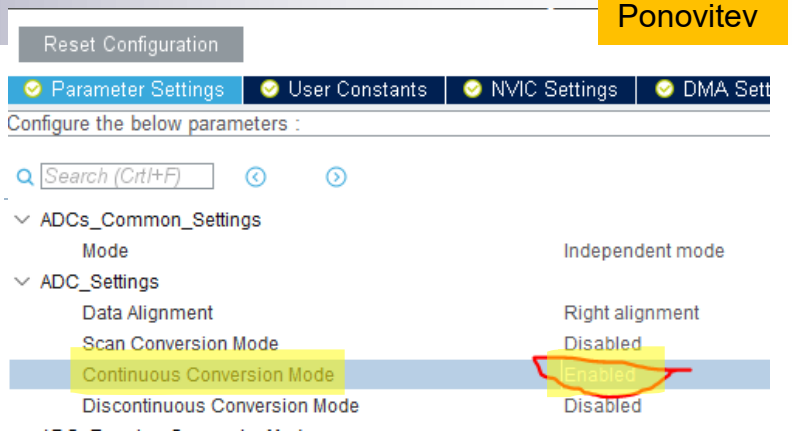
- Programsko spraševanje (angl. Software Polling)

```
HAL_ADC_Start(&hadc1); // start the adc
    HAL_ADC_PollForConversion(&hadc1, 100); // poll for conversion
    adc_val = HAL_ADC_GetValue(&hadc1); // get the adc value
HAL_ADC_Stop(&hadc1); // stop adc

HAL_Delay (500); // wait for 500ms
```



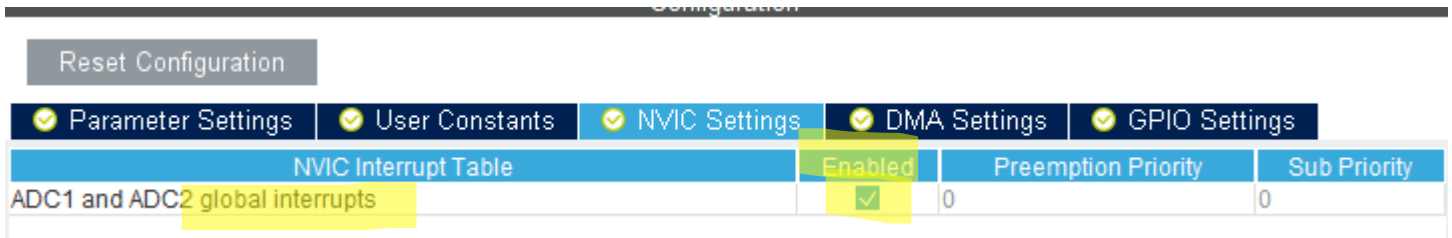
Primer 3: STM32 – ADC na 3 načine



- Prekinitve (angl. Interrupts)

```
HAL_ADC_Start_IT (&hadc1);

void HAL_ADC_ConvCpltCallback(ADC_HandleTypeDef* hadc)  {
  adc_val = HAL_ADC_GetValue(&hadc1);
  /*If continuous conversion mode is DISABLED uncomment below*/
  //HAL_ADC_Start_IT (&hadc1);
}
```

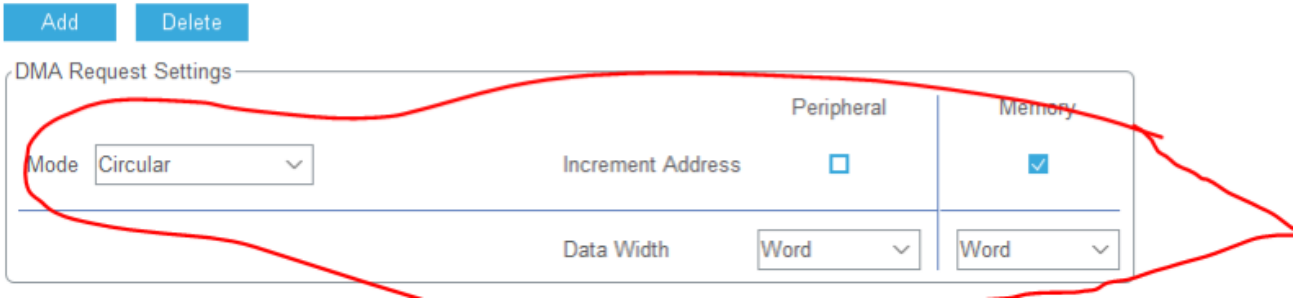


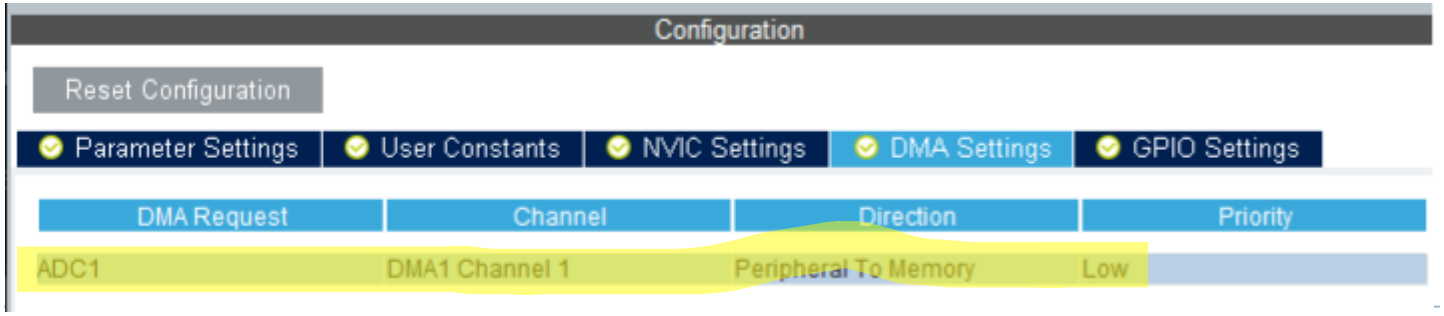
Primer 3: STM32 – ADC na 3 načine

- DMA (angl. Direct Memory Access)

```
HAL_ADC_Start_DMA (&hadc1, &buffer, 1);

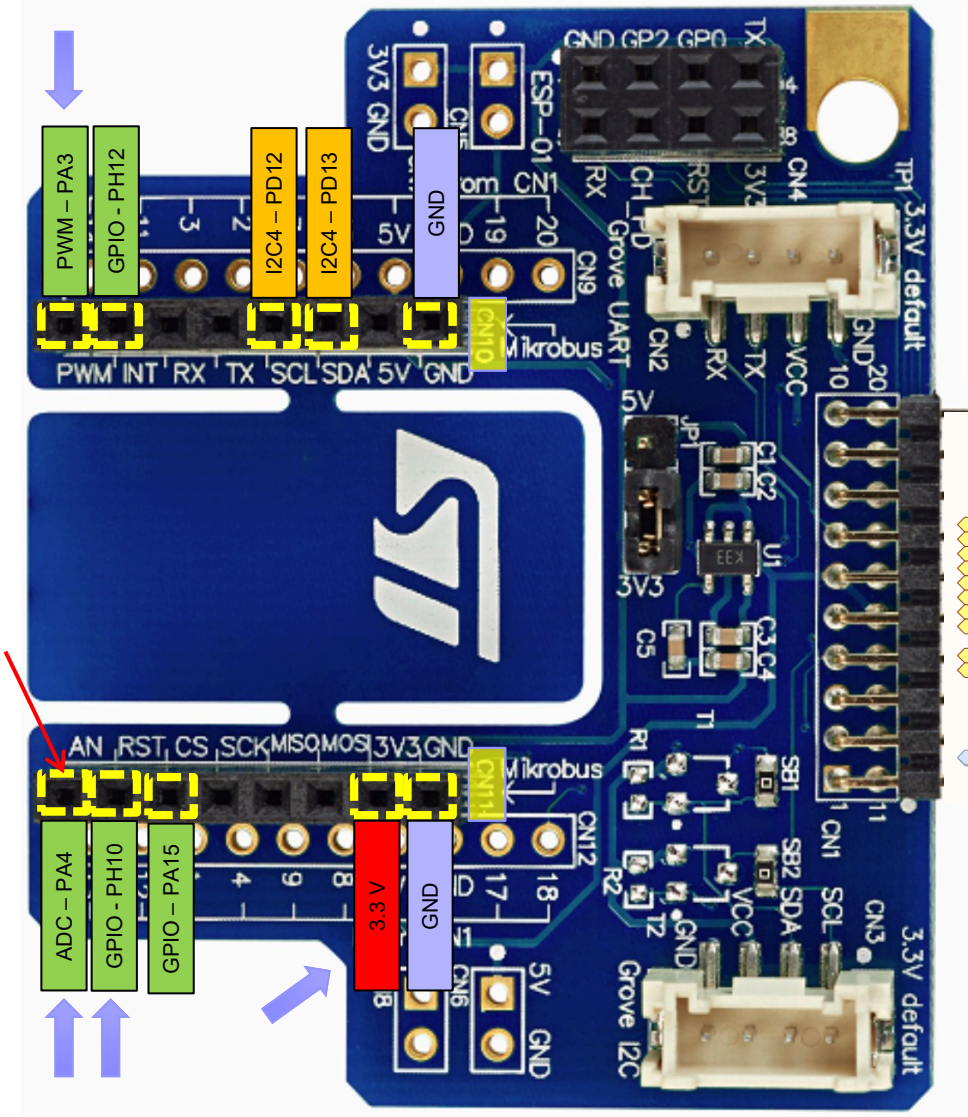
void HAL_ADC_ConvCpltCallback(ADC_HandleTypeDef* hadc) {
   adc_val = buffer;
}
```

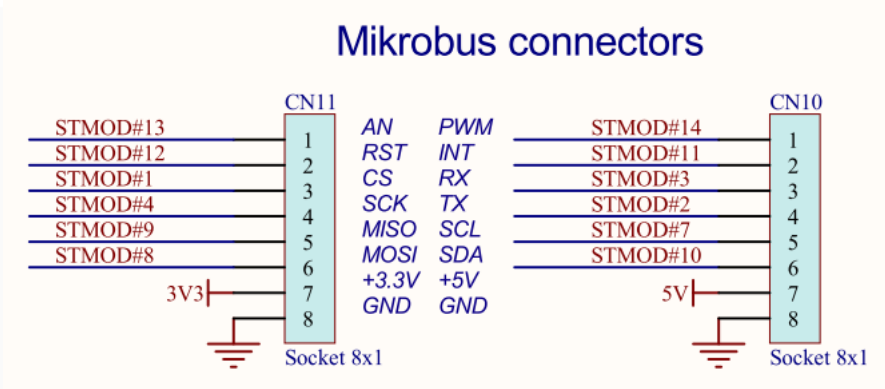


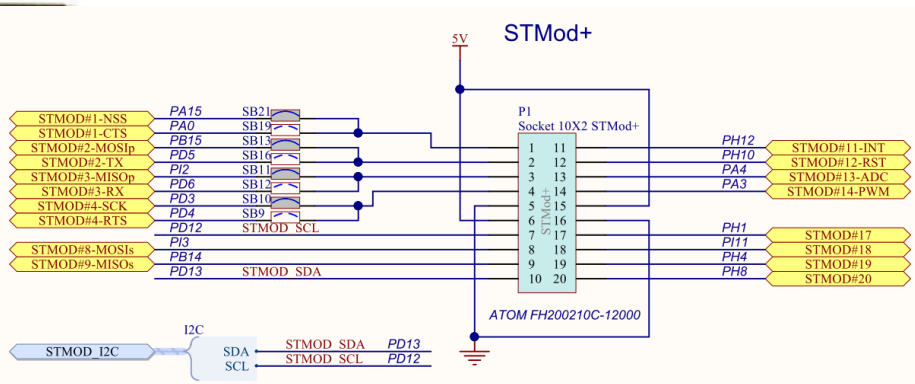


3.3V !!!

STM32H750B – Breadboard vezave







Testno vezje (primer) - STM32H7 :

GPIO	Vrsta	Povezava
PC13	User tipka	Modra tipka
PA4	Analogni vhod	Rumena žička
PH10	Dig. Vhod	Zelena žička
PA3	Dig. Izhod - LED	Oranžna žička
PJ2,Pi13	Dig. Izhodi	vgr. LED diode

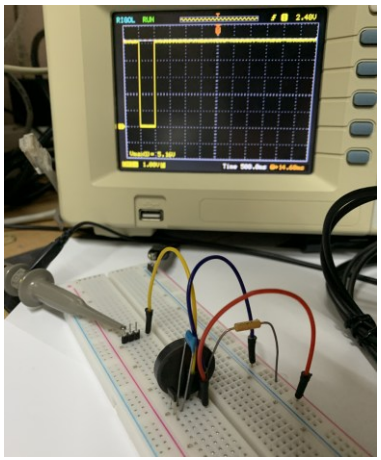
Laboratorijska vaja 12
LV5: Tipala in signali – praktični izzivi

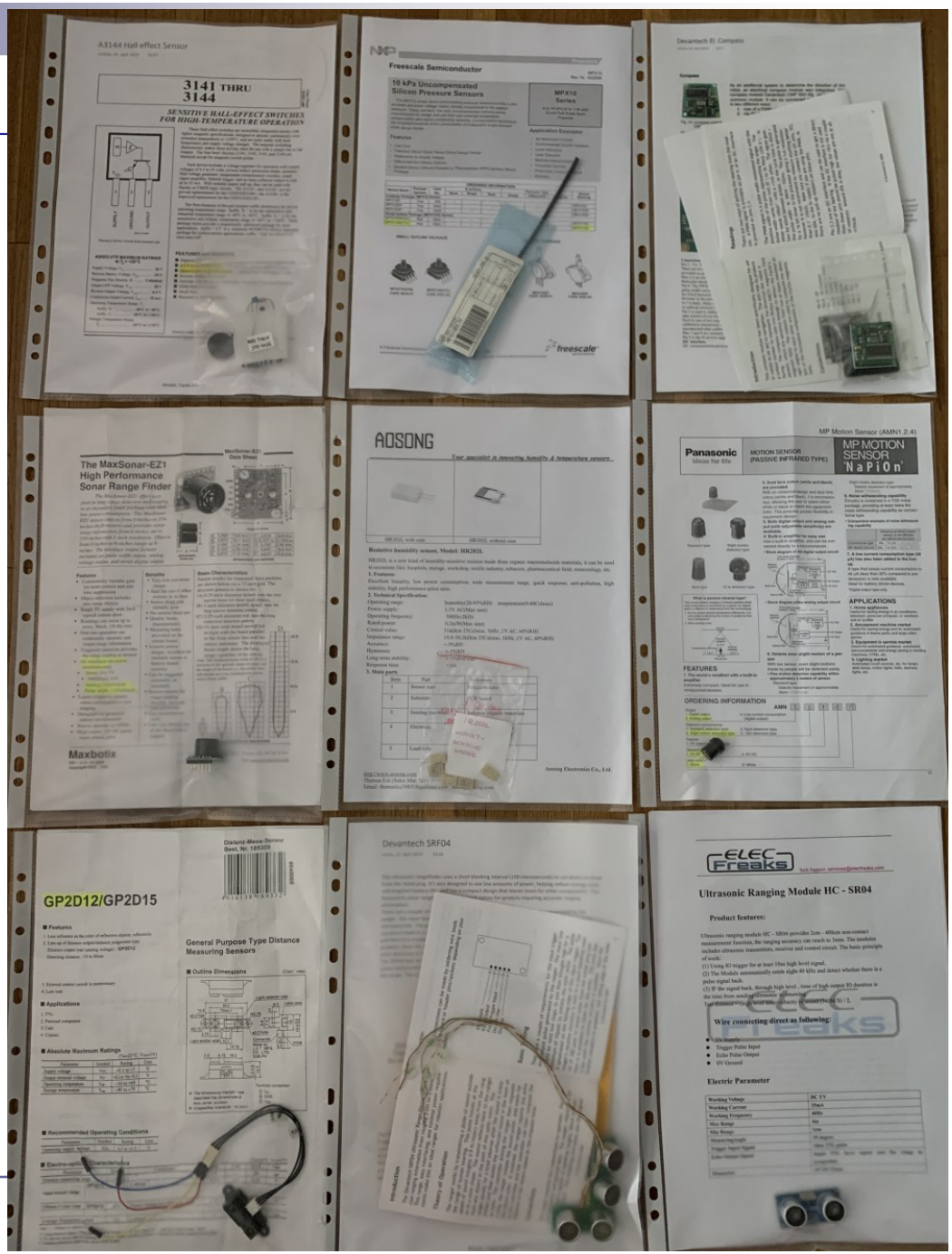
- UZ tipalo razdalje (SR04)
- Zvočno tipalo – mikrofon
- Ostala tipala (IR razdalja, PIR, Hall, …)
- Meritve deformacij UTP kabla
- Meritev karakteristične upornosti linije z multimetrom (R0)

Preizkusi različnih tipal

Tipala: IR,UZ razdalja, PIR, Hall, …)

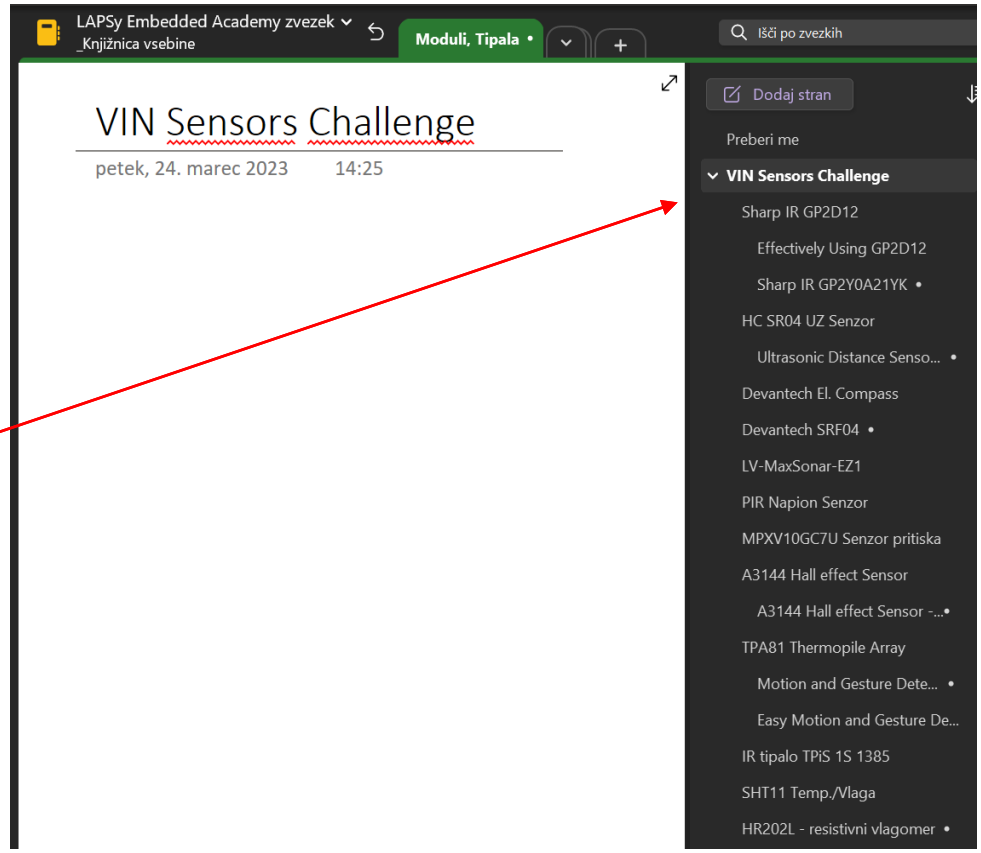
Izziv: z ustreznimi orodji (osciloskop, generator, …) preizkusite in opišite delovanje različnih vrst tipal po lastni izbiri.

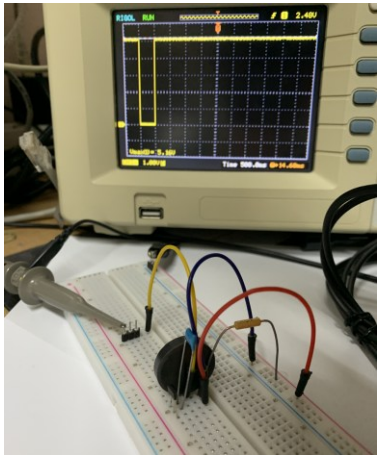




Tipala: IR,UZ razdalja, PIR, Hall, …)

Izziv: z ustreznimi orodji (osciloskop, generator, …) preizkusite in opišite delovanje različnih vrst tipal po lastni izbiri.





MB1010 LV-MaxSonar-EZ1

MB1010 Datasheet

Ranges from 6 inches to 254 inches with a 20Hz read rate. Wide detection field. Excellent for people detection.

Z naslova <https://maxbotix.com/products/mb1010>

LV-MaxSonar® - EZ™ Series

LV-MaxSonar®-EZ™ Series

High Performance Sonar Range Finder

MB1000, MB1010, MB1020, MB1030, MB1040[2]

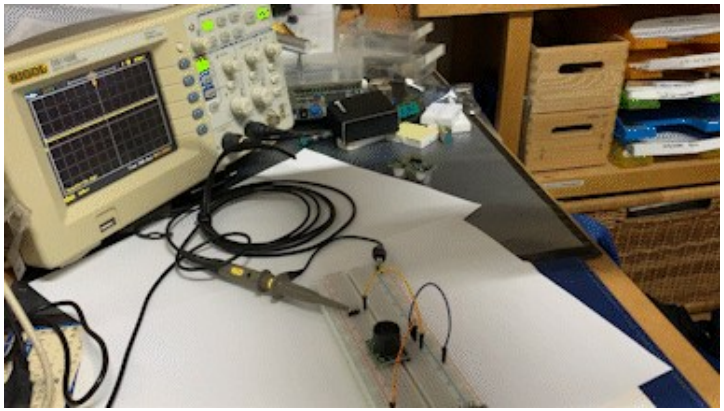
With 2.5V - 5.5V power the LV-MaxSonar-EZ provides very short to long-range detection and ranging in a very small package. The LV-MaxSonar-EZ detects objects from 0-inches to 254-inches (6.45-meters) and provides sonar range information from 6-inches out to 254-inches with 1-inch resolution. Objects from 0-inches to 6-inches typically range as 6-inches[1]. The interface output formats included are pulse width output, analog voltage output, and RS232 serial output. Factory calibration and testing is completed with a flat object. [1]***See Close Range Operation***

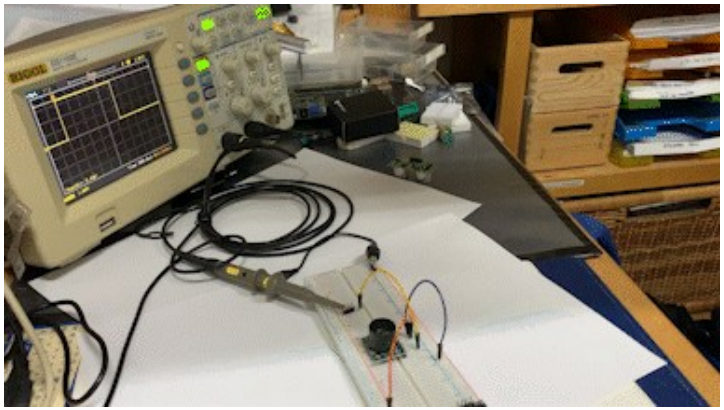
Features

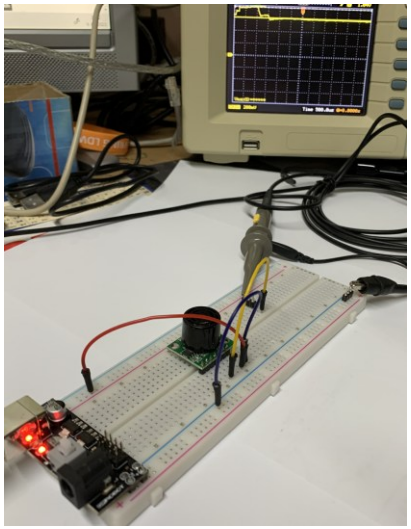
- Continuously variable gain for control and side lobe suppression
- Object detection to zero range objects
- 2.5V to 5.5V supply with 2mA typical current draw
- Readings can occur up to every 50mS, (20-Hz rate)
- Free run operation can continually measure and output range information
- Triggered operation provides the range reading as desired
- Interfaces are active simultaneously
- Serial, 0 to Vcc, 9600 Baud, 8N1
- Analog, (Vcc/512) / inch
- Pulse width, (147uS/inch)

Priklop :

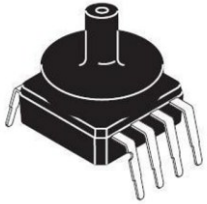
- Napajanje
  - 2.5-5.5V
  - GND
- Izhoda:
  - Analogni
  - PWM







Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)



MPXV10GC7U

Z naslova <https://eu.mouser.com/ProductDetail/NXP-Semiconductors/MPXV10GC7U?qs=N2XN0KY4UWWYdp78g4P8QQ%3D%3D>

6 Pin Information

6.1 MPXV10GC6U

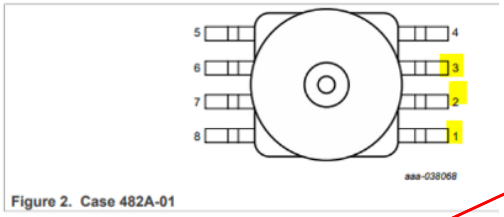


Figure 2. Case 482A-01

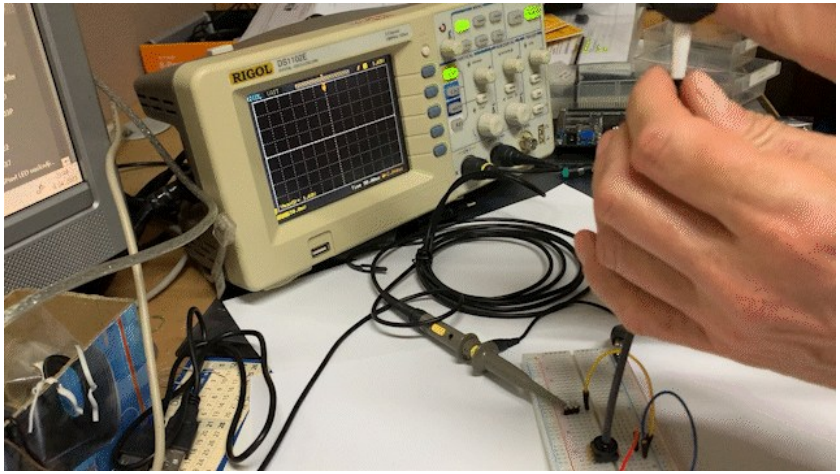
Table 2. Pin definitions - MPXV10GC6U

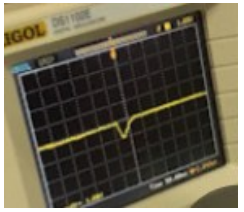
Symbol	Pin	Description
GND	1	Ground
$+V_{OUT}$	2	+Voltage output
V_S	3	Power supply

8 Operating Characteristics

Table 7. Operating Characteristics (V_S = 3.0 Vdc, T_A = 25 °C unless otherwise noted, P1 > P2)

Characteristic		Symbol	Min	Typ	Max	Unit
Operating Pressure Range	[1]	P_{OP}	0	—	10	kPa
Supply Voltage	[2]	V_S	—	3.0	6.0	V_{DC}
Supply Current		I_o	—	6.0	—	mAdc
Full Scale Span	[3]	V_{FSS}	20	35	50	mV
Offset	[4]	V_{off}	0	20	35	mV
Sensitivity		ΔV/ΔP	—	3.5	—	mV/kPa



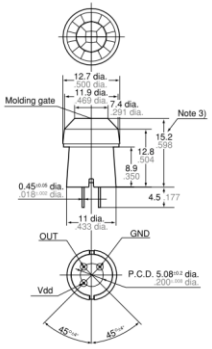


Priklop :

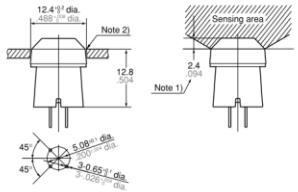
- Napajanje
  - Do 6V
  - GND
- Izhod:
  - Analogni

Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

2. Slight motion detection type



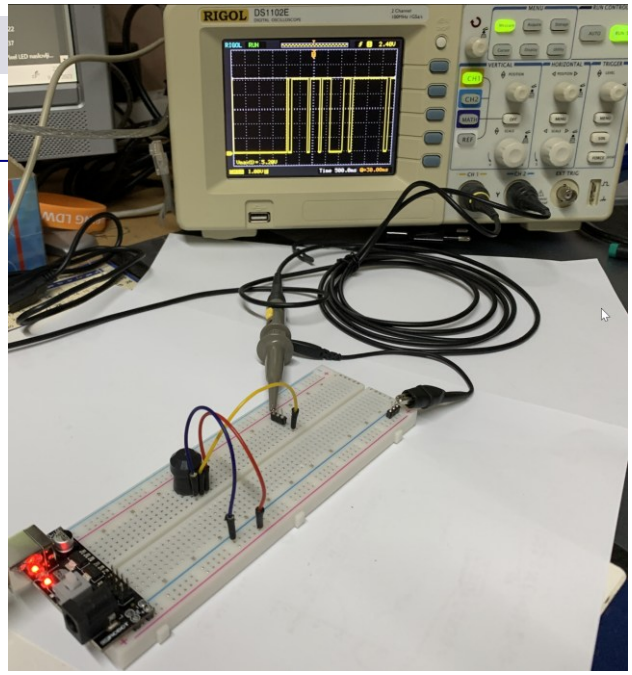
Recommended PC board pattern (BOTTOM VIEW)



Notes: 1. In order to ensure proper detection, install it with the lens exposed at least 2.4mm .094inch.
2. As for panel mounting hole, tapering or making a large size hole should be done.
3. The height dimension does not include the remaining molding gate.

Priklop :

- Napajanje
  - 3-6V
  - GND
- Izhod:
  - Digitalni (H/L)



3. Electrical characteristics (Measuring condition: ambient temp. = 25°C 77°F; operating voltage = 5V) (Common to All types)

1) Digital output

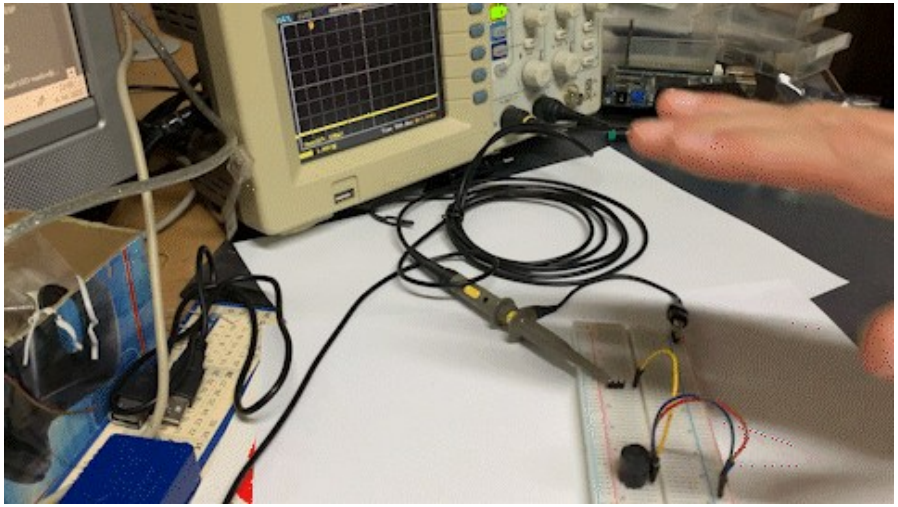
Items			Symbol	Specified value		Measured conditions
				Standard type	Low current consumption type	
Reted operating voltage		Minimum Typical Maximum	Vdd	3.0 V DC — 6.0 V DC	2.2 V DC — 3.0 V DC	
Reted consumption current (Standby) *Remark		Typical Maximum	Iw	170 µA 300 µA	46 µA 60 µA	Iout = 0
Output (when detecting)	Current	Maximum	Iout	100 µA	100 µA	Vout ≧ Vdd–0.5
	Voltage	Minimum Maximum	Vout	Vdd –0.5 —	Vdd –0.5 —	Open when not detecting
Circuit stability time		Typical Maximum	Twu	7 s 30 s	7 s 30 s	

Remark: The current which is consumed during detection consists of the standby consumed current plus the output current.

2) Analog output

Items		Symbol	Specified value	Measured conditions
Reted operating voltage	Minimum Maximum	Vdd	4.5 V DC 5.5 V DC	
Reted consumption current	Typical Maximum	Iw	0.17 mA 0.3 mA	Iout = 0
Output current	Maximum	Iout	50 µA	
Output voltage	Minimum Typical Maximum	Vout	0 V 2.5 V Vdd	
Output offset average voltage	Minimum Typical Maximum	Voff	2.3 V 2.5 V 2.7 V	Steady-state output voltage when not detecting
Steady-state noise	Typical Maximum	Vn	130 m Vp-p 300 m Vp-p	
Circuit stability time	Maximum	Twu	45 s	

Note: To set to the same detection performance as the digital type, set the output voltage to the offset voltage (2.5V) ±0.45V (i.e. 2.95V or more and 2.05V or less).



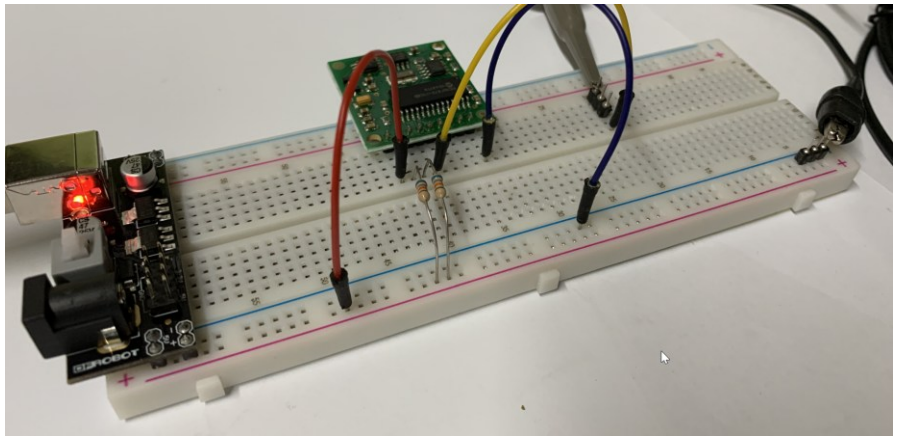
Z naslova <https://eu.mouser.com/ProductDetail/Panasonic-Industrial-Devices/AMN22111?qs=mTeSeKeuVA4zSZ1O6%2F0inQ%3D%3D>

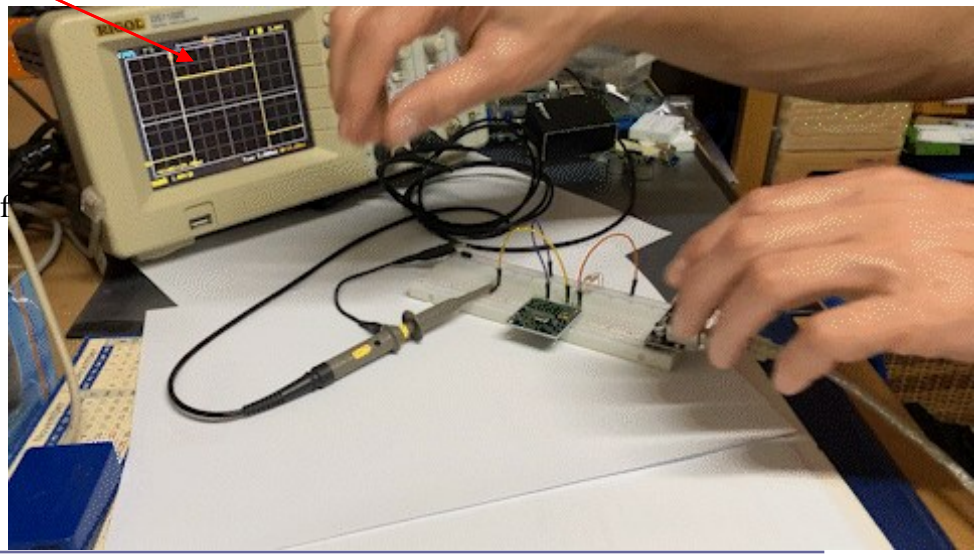
https://eu.mouser.com/datasheet/2/315/panasonic_amn1_2_4-1196943.pdf

Priklop :
- Napajanje
  - 5V Pin1
  - GND Pin9
- Izhod - PWM: Pin4
  - 0-360° (1-37ms)

CMPS03 - Compass Module

For documentation on CMPS03 revisions prior to Rev14, click here
Earlier versions can be identified by the presence of the silver 8MHz ceramic resonator in the middle of the PCB, this has been removed on new modules.
Rev14 was released March 2007
Z naslova <http://www.robot-electronics.co.uk/htm/cmps3tech.htm>





Connections
Pins 2,3 are the I2C interface and can be used to get a direct readout of the bearing. If the I2C interface is not used then these pins should be pulled high (to +5v) via a couple of resistors. Around 47k is ok, the values are not at all critical.
Pin 4. The PWM signal is a pulse width modulated signal with the positive width of the pulse representing the angle. The pulse width varies from 1mS (0°) to 36.99mS (359.9°) – in other words 100uS/° with a +1mS offset.

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Measuring Distance Range	ΔL		10	-	80	cm
Output Voltage	V_O	L = 80 cm	0.25	0.4	0.55	V
Output Voltage Difference	ΔV_O	Output change at L change (80 cm - 10 cm)	1.75	2.0	2.25	V

Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

SHARP

GP2D12

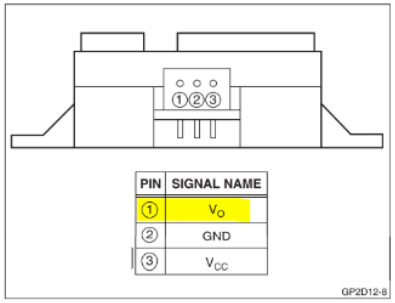
Optoelectronic Device

FEATURES

- Analog output
- Effective Range: 10 to 80 cm
- LED pulse cycle duration: 32 ms
- Typical response time: 39 ms
- Typical start up delay: 44 ms
- Average current consumption: 33 mA
- Detection area diameter @ 80 cm: 6 cm

DESCRIPTION

The GP2D12 is a distance measuring sensor with integrated signal processing and analog voltage output.



PIN	SIGNAL NAME
①	V_O
②	GND
③	V_{CC}

Figure 1. Pinout

SHARP GP2

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Ta = 25°C, V_{CC} = 5 VDC

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	-0.3 to +7.0	V
Output Terminal Voltage	V_O	-0.3 to (V_{CC} + 0.3)	V
Operating Temperature	Topr	-10 to +60	°C
Storage Temperature	Tstg	-40 to +70	°C

Operating Supply Voltage

PARAMETER	SYMBOL	RATING	UNIT
Operating Supply Voltage	V_{CC}	4.5 to 5.5	V

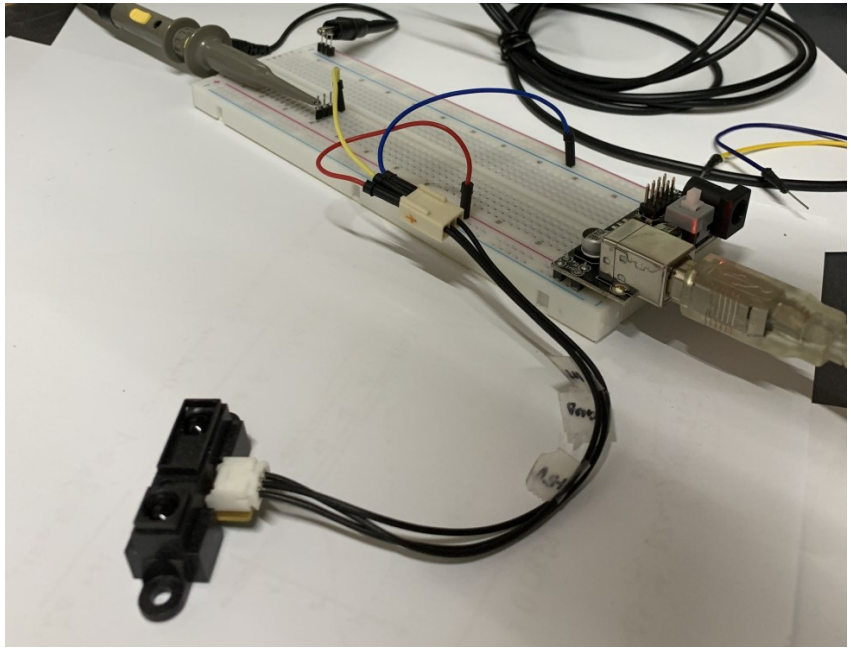
Electro-optical Characteristics

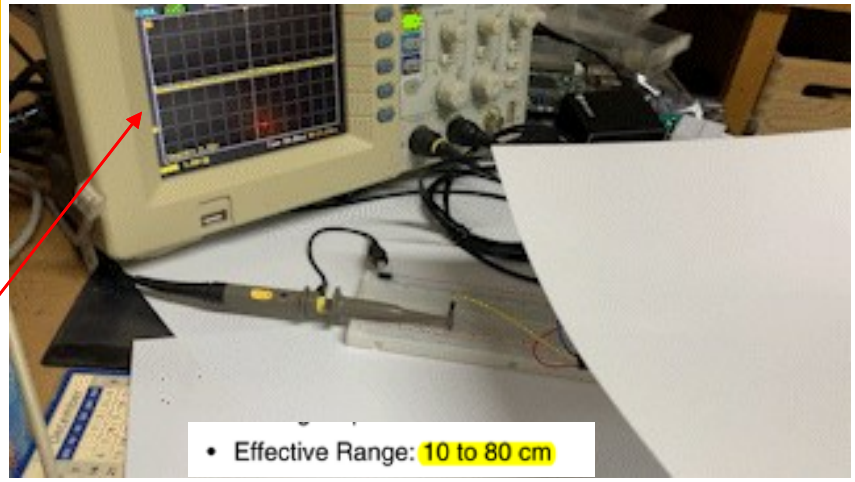
Ta = 25°C, V_{CC} = 5 VDC

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTES
Measuring Distance Range	ΔL		10	-	80	cm	1, 2
Output Voltage	V_O	L = 80 cm	0.25	0.4	0.55	V	1, 2
Output Voltage Difference	ΔV_O	Output change at L change (80 cm - 10 cm)	1.75	2.0	2.25	V	1, 2
Average Supply Current	I_{CC}	L = 80 cm	-	33	50	mA	1, 2

NOTES:
1. Measurements made with Kodak R-27 Gray Card, using the white side, (90% reflectivity).
2. L = Distance to reflective object.

Priklop :
- Napajanje
  - Do 7V
  - GND
- Izhod:
  - Analogni





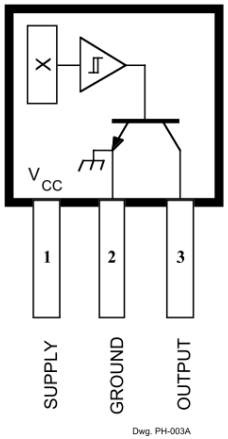
Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

Priklop :
- Napajanje
  - 4.5-24V
  - GND
- Izhod OC – „Open Collector“:
  - Digitalni (OC)
    (10k Pull-up upor)

3141 THRU 3144

Data Sheet 27621.6B*

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMPERATURE OPERATION



Pinning is shown viewed from branded side.

ABSOLUTE MAXIMUM RATINGS at T_A = +25°C

Supply Voltage, V_{CC}	28 V
Reverse Battery Voltage, V_{RCC}	-35 V
Magnetic Flux Density, B	Unlimited
Output OFF Voltage, V_{OUT}	28 V
Reverse Output Voltage, V_{OUT}	-0.5 V
Continuous Output Current, I_{OUT}	25 mA
Operating Temperature Range, T_A	
Suffix ‘E–’	-40°C to +85°C
Suffix ‘L–’	-40°C to +150°C
Storage Temperature Range, T_S	-65°C to +170°C

These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to +150°C, and are more stable with both temperature and supply voltage changes. The unipolar switching characteristic makes these devices ideal for use with a simple bar or rod magnet. The four basic devices (3141, 3142, 3143, and 3144) are identical except for magnetic switch points.

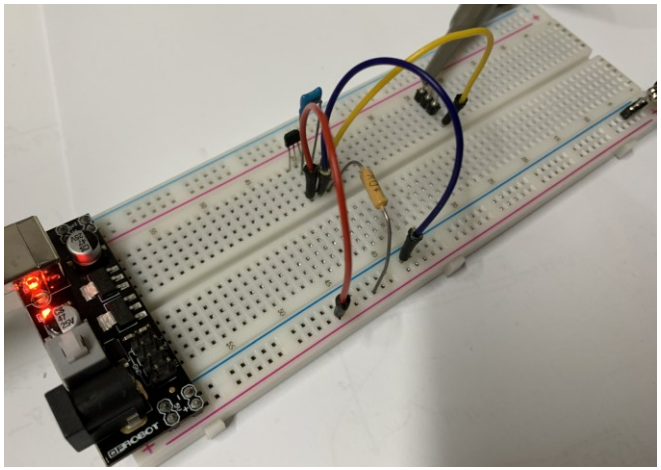
Each device includes a voltage regulator for operation with supply voltages of 4.5 to 24 volts, reverse battery protection diode, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 25 mA. With suitable output pull up, they can be used with bipolar or CMOS logic circuits. The A3141– and A3142– are improved replacements for the UGN/UGS3140–; the A3144– is the improved replacement for the UGN/UGS3120–.

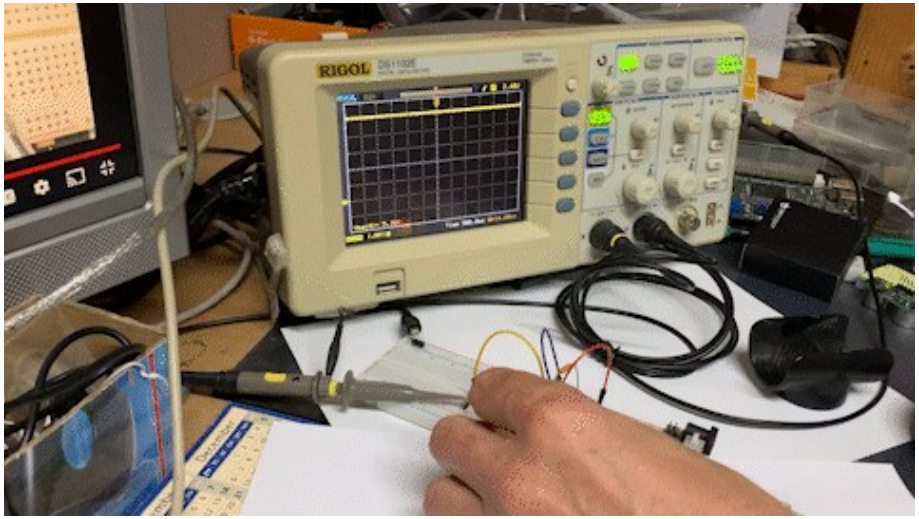
The first character of the part number suffix determines the device operating temperature range. Suffix ‘E–’ is for the automotive and industrial temperature range of -40°C to +85°C. Suffix ‘L–’ is for the automotive and military temperature range of -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix ‘–LT’ is a miniature SOT89/TO-243AA transistor package for surface-mount applications; suffix ‘–UA’ is a three-lead ultra-mini-SIP.

FEATURES and BENEFITS

- Superior Temp. Stability for Automotive or Industrial Applications
- 4.5 V to 24 V Operation … Needs Only An Unregulated Supply
- Open-Collector 25 mA Output … Compatible with Digital Logic
- Reverse Battery Protection
- Activate with Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

Always order by complete part number, e.g., **A3141ELT** .

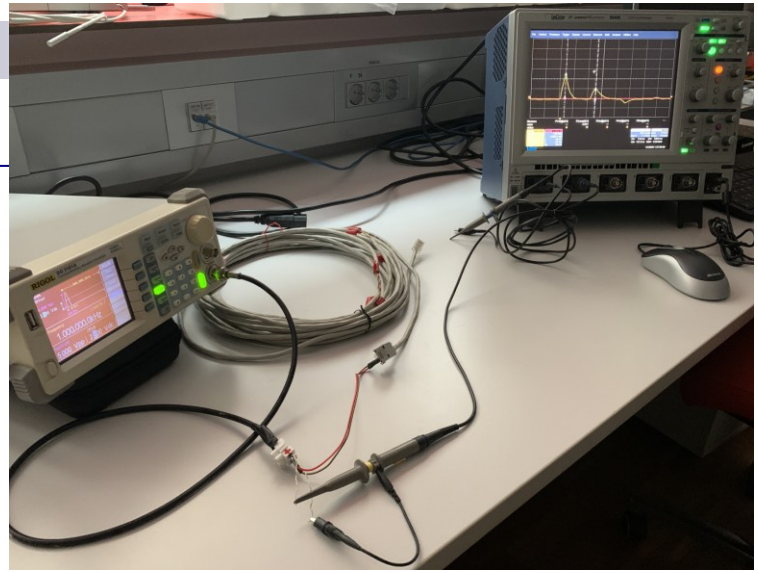




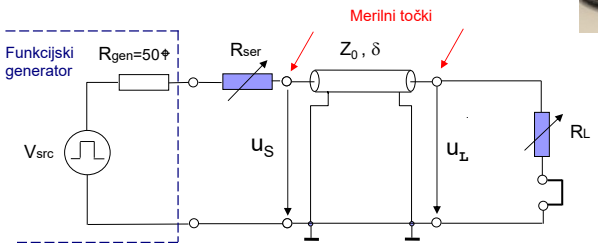
Laboratorijska vaja 12
LV5: Tipala in signali – praktični izzivi

- UZ tipalo razdalje (SR04)
- Zvočno tipalo – mikrofon
- Ostala tipala (IR razdalja, PIR, Hall, …)
- Meritve deformacij UTP kabla
- Meritev karakteristične upornosti linije z multimetrom (R0)

LV 2*: Meritve deformacij UTP kabla



Izziv: z ustreznimi orodji (osciloskop, generator, …) določite deformacije (vrsta, razdalja od točke A) na vseh paricah v UTP kablu.

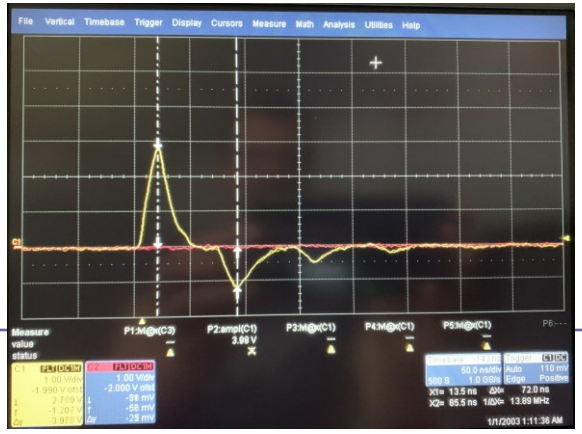


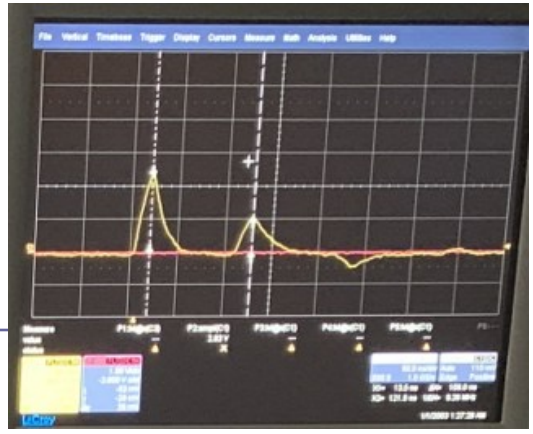
Meritev s pravokotnim signalom, kot pri R_0:
trajanje stopničk = 2 τ

Meritev s kratkim impulzom:
zakasnitev odboja impulza = 2 τ

odboj v - … kratki stik

odboj v + … prekinitev





Laboratorijska vaja 12
LV5: Tipala in signali – praktični izzivi

- UZ tipalo razdalje (SR04)
- Zvočno tipalo – mikrofon
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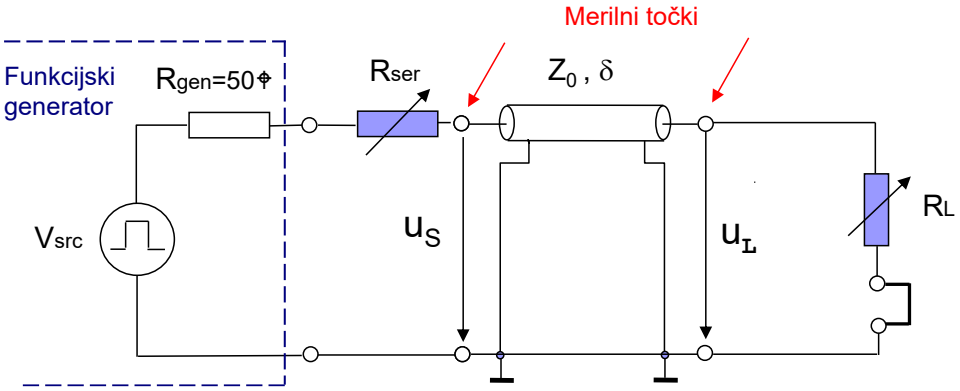
LV1*: Meritev karakteristične upornosti prenosne linije

Izziv: ali bi lahko z multimetrom in dano opremo lahko določili karakteristično upornost linije ?



Podan je komplet kablov in opreme z multimetrom. Razmislite ali je mogoče s tem kompletom določiti karakteristično upornost linije in če je mogoče, opišite vse podrobnosti. Sicer utemeljite nasprotni odgovor.

Tipala in signali – praktični izzivi – DN2-LV5*

- **Spada v sklop poročila z LAB vaj**
- **Opišite reševanje izzivov po lastni izbiri**
- **Objavite v OneNote delovnem zvezku**
  - **_Prostor za sodelovanje, razdelek DN2-LV5 Izzivi**