

Description:

This kit contains the required components to build yourself a petroleum gas detector. This module is based on a LM393 I.C. and a MQ5 sensor.

While being a simple soldering project for beginners, this kit can be used in a variety of small personal, educational or enterprise applications such as:

Liquid Petroleum Gas Detector for 5v Microcontrollers (Analog/Digital)

Natural Gas Detector for 5v Microcontrollers (Analog/Digital)

This is a D.I.Y. kit that requires soldering through-hole components on the main single-sided printed circuit board (PCB). Users with minimal soldering tools and intermediate skills can easily assemble this module. The assembly process should take anywhere between 10 to 20 minutes.

Specification:

Module

- Required Input Voltage: 5VDC
- Current: $\approx 150\text{mA}$
- PCB Dimensions: 69 x 34 x 2mm (2.71"x 1.33" x 0.07")

Sensor MQ5

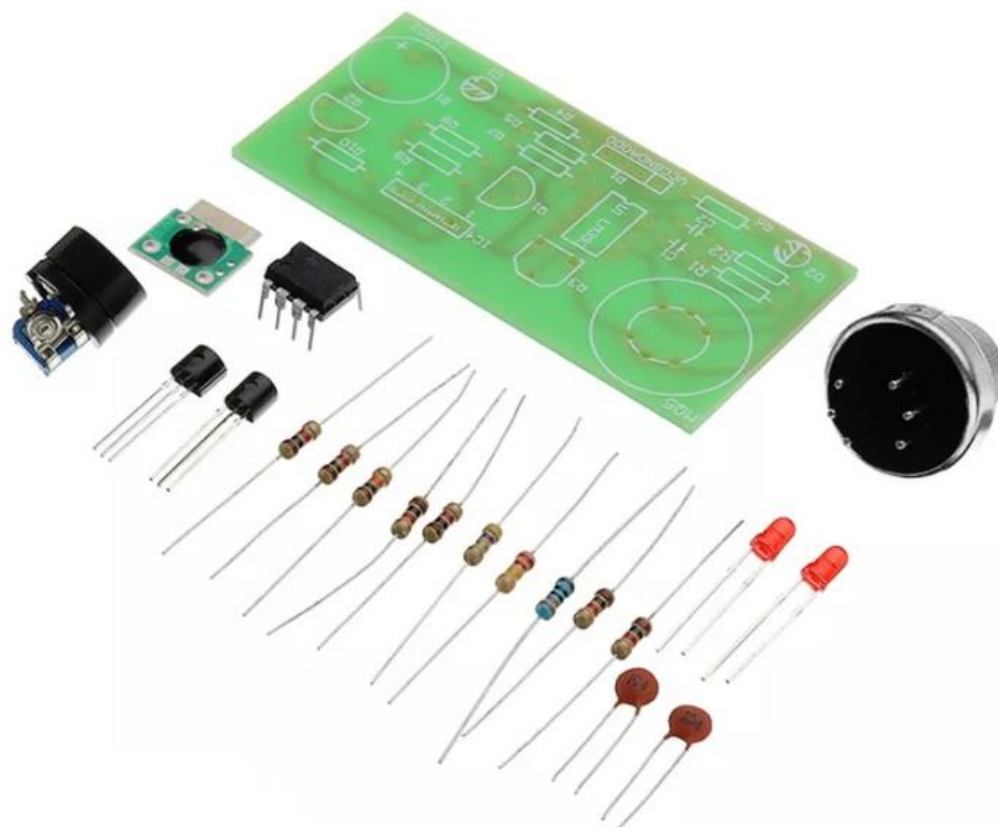
- Environment Condition: $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$
- Sensing Parameter: 5000ppm methane
- Concentration slope rate: ≤ 0.6



Bill of Materials:

This package includes **23** pieces which are listed below along with their labels and quantity.

Component	Label	Value / Type / Label	Quantity
Resistors	R1	47 Ω / (Yellow, Violet, Gold, Gold)	1
	R2, R5, R6, R7, R9, R10	1K Ω / (Brown Black, Red, Gold)	6
	R3	10K Ω / 103 potentiometer	1
	R4	10k Ω / (Brown, Black, Orange, Gold)	1
	R8	330 Ω / (Orange, Orange, Brown, Gold)	1
	—	220k Ω / (Red, Red, Yellow, Gold)	1
Light Emitting Diode	D1, D2	3mm Red LED	2
Ceramic Capacitor	C1, C2	104 (100nF)	2
Transistors	Q1	S9012 Epitaxial Silicon PNP	1
	Q2	S9013 Epitaxial Silicon NPN	1
IC Chips and Sockets	U1	LM393 Dual Op Amplifier	1
PCB	—	Gas Sensor PCB (Green)	1
	—	Sound IC PCB (Green)	1
Modules	MQ5	MQ5 Gas Sensor	1
	B1	Buzzer	1
Connector and Header	P1	Four pin breakable header pins	1



Assembly:

- 1) In order to assemble the module, you need the following tools:

Must Have

Temperature Adjustable Soldering Iron
A variety of soldering tips
Brass wool
Wet sponge



60/40 or 63/37, Tin-Lead Solder



Flush Cutters



Needle Nose Plier or Tweezers



Wire Stripper



Lint Free Cloth



***It is recommended to have some isopropyl alcohol and a fine soldering brush handy to clean off the excess flux on the circuit board when the soldering is done.**

Recommended

Isopropyl Alcohol



Soldering Brush



Rosin Flux Pen or Paste



***ATTENTION* DO NOT USE RUBBING ALCOHOL, IT WILL DAMAGE THE COMPONENTS.**

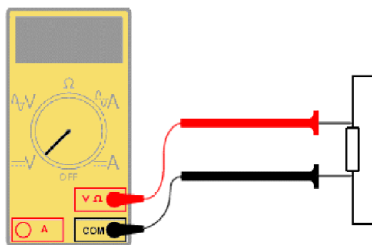
- 2) Open the package and verify the components. (refer to section 4. Bill of Materials on page 3)
- 3) Lay down all the components on your workbench and proceed to the next step.
- 4) Prepare your soldering tools.
 - a) Use an appropriate tip for the application. Also, make sure the soldering tip is clean. Gently use a brass wool or a brush to clean the tip when needed. Another way of cleaning the soldering tip is to use a wet sponge.



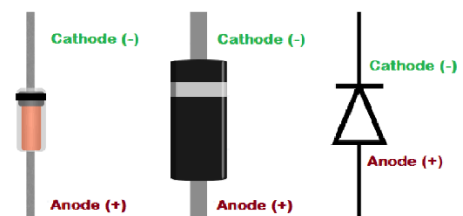
- b) The soldering iron temperature depends on the type of solder used. If you are using a typical **60/40 lead solder**, depending on the thickness the temperature should be set anywhere between **370 to 500 °F (187 to 260 °C)**. If you are using a lead-free solder, increase above temperatures by **40 to 70 °F (5 to 20 °C)**.
- *ATTENTION* HIGHER TEMPERATURES WILL DAMAGE THE COMPONENTS ALONG WITH THE CIRCUIT BOARD.**
- *ATTENTION* DO NOT TOUCH THE SOLDERING IRON WHEN IT IS HOT.**
- c) It is recommended that you clean the board with a fine brush, isopropyl alcohol and lint-free cloth to get rid of any pre-existing residue, glue or dirt. This way the solder will create a better joint with the copper surface.
- d) Have your flush cutter, needle nose plier or tweezers handy.
- e) Having a roll of paper tape helps you to keep the components in place when soldering on the bottom side of the board.
- f) Have a rosin flux pen or paste handy. Adding flux to the pads before soldering the components makes the wetting process easier by letting the melted solder to flow better on the pad and create a better joint.
- *ATTENTION* SOLDERING SHOULD BE DONE IN A VENTILATED AREA. BREATHING SOLDER FUMES WILL HARM YOU.**
- g) Always cut the excess leads with a flush cutter once a component is soldered on the PCB. At least 1mm of the lead should stick out from the solder joints.

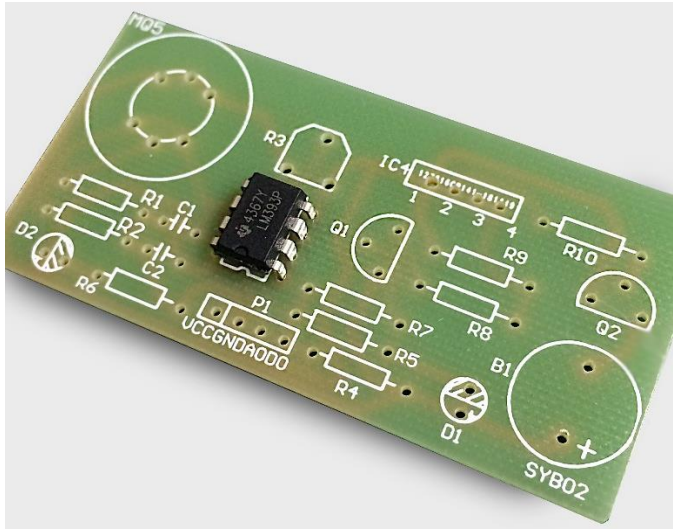


Optional
Use a digital multimeter to measure the resistor values



Pay attention to the polarity of the diodes.





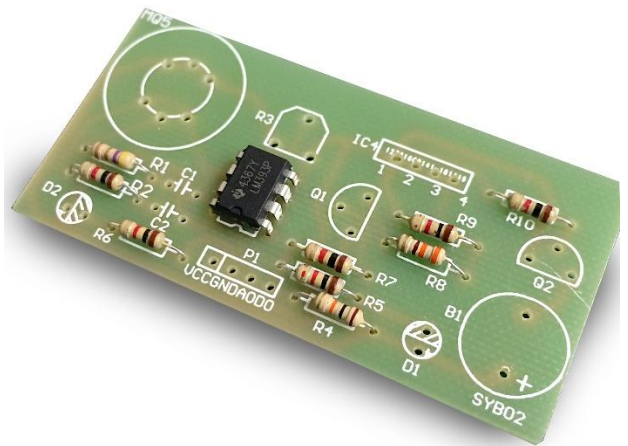
To begin the assembly process, insert the LM393 as shown in the photo.

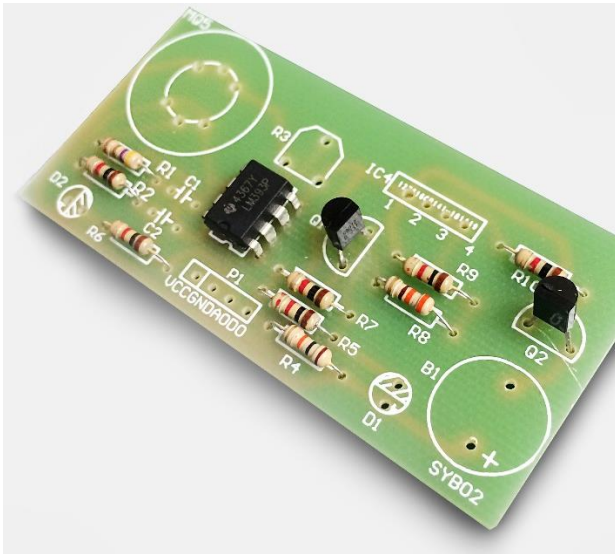
Ensure the notch of the Integrated Circuit aligns with the markings on the board, also known as the silkscreen.

All soldering will be done on the backside of the board.

You may proceed to solder the resistors in place by following the numbering on the board and placing the correct color resistor indicated in the “Bill of Materials” section on page 3.

It is recommended to solder and cut off the excess lead with a flush cutter, one resistor at a time.



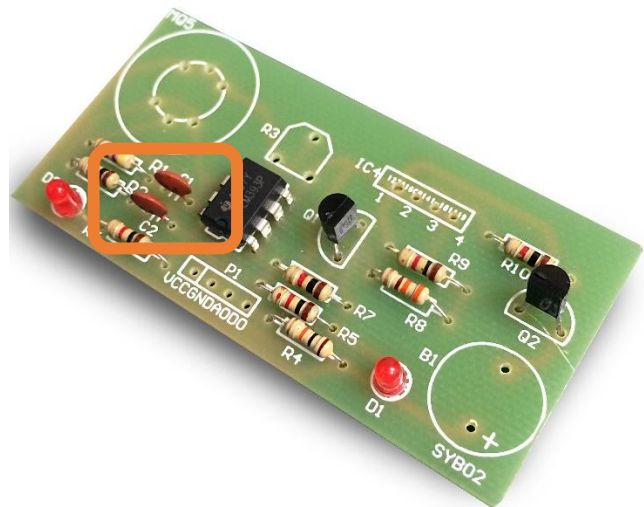


Insert the transistor as shown in the picture. Ensure the transistor matches the outline of the silkscreen.

Please pay attention to the IC number of the transistors as they both have different functions and must go in the correct place for this circuit to work!

Insert the 3mm LED as shown in the image. Ensure that the orientation of the LED is correct.

You can either check for the large plate inside the LED for the cathode, the body for the side that is cut or the shortest lead. The cathode must be inserted into the shaded part.



Save the excess leads from the LED that you have cut-off.

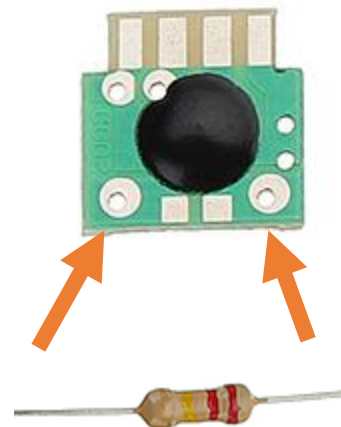
You may also solder the ceramic capacitors label 104, indicated in the orange box.



You may proceed to solder the blue potentiometer, then proceed to solder the black buzzer and the four-pin header.

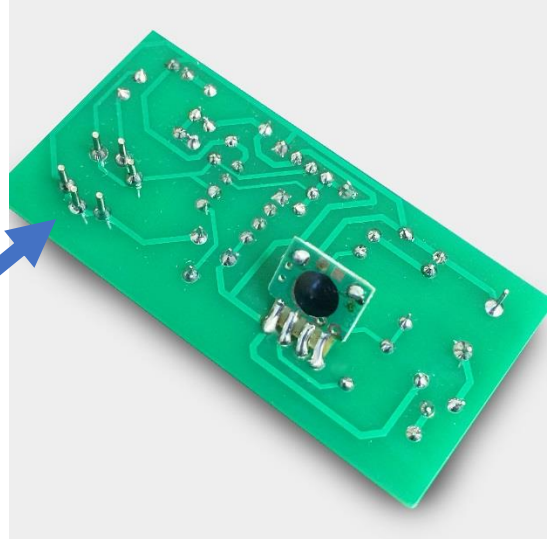
For the MQ5 element, it is recommended to solder the element with the label facing inwards towards the resistors.

On the provided daughter card, solder the remaining resistor in the kit with the color band sequence: Red, Red, Yellow Gold on the two through-hole pads as shown.



This secondary PCB is designed with the audio chip integrated. You have two options to solder this component.

Option 1: As shown in the photo, solder the daughter board on the backside of the board. To install in the correct orientation, use the MQ5 solder point for reference.



Option 2: As shown in the photo, solder the daughter board on the front side using the leads you placed aside from the LEDs. You will require a vice to help keep the components in place.

Implementation:

You have three methods you can use this module. The first method is to use this device as a standalone module where, when gas is detected in the MQ5 the buzzer will make a noise and D1 will light up to inform you that LPG or NG has been detected. You may use the potentiometer R3 to adjust the sensitivity of the detector. We used a firelighter to test this device.

Note: Do not expose the sensor to open flame!

The second method to use this module is to connect the third pin to Arduino analog pin and use analog read sketch to read the values from this module.

This example code can be found in the Arduino IDE under File>Examples>Basics>AnalogReadSerial.

The third method to use this module is to connect the fourth pin to Arduino digital pin and use digital read sketch to read when the sensor is active high or active low.

This example code can be found in the Arduino IDE under File>Examples>Basics>DigitalReadSerial.



Related D.I.Y Kits:



AK-30 D.I.Y MINI Speaker Educational Kit

Acrylic Frame that requires assembly and a controller board that requires some soldering work to get up and running.

The provided audio boards come with LED Vu Meter to see the sound level.

PI-ZEROWH-KIT Raspberry Pi Zero W Basic Kit

A low-cost method of getting into Linux environment and providing some pinouts to interface with some sensors.

Excellent to learn programming using scratch, OpenCV projects using python script language or running a 3D printer server using Octo-print.



EK-1 Theremin Player Kit

A soldering based kit that works as a Theremin when completed. The sounds coming out of the speaker will vary depending on the closeness of the fingers to the photocell sensor.

- Check out more awesome projects at www.abra-electronics.com -

