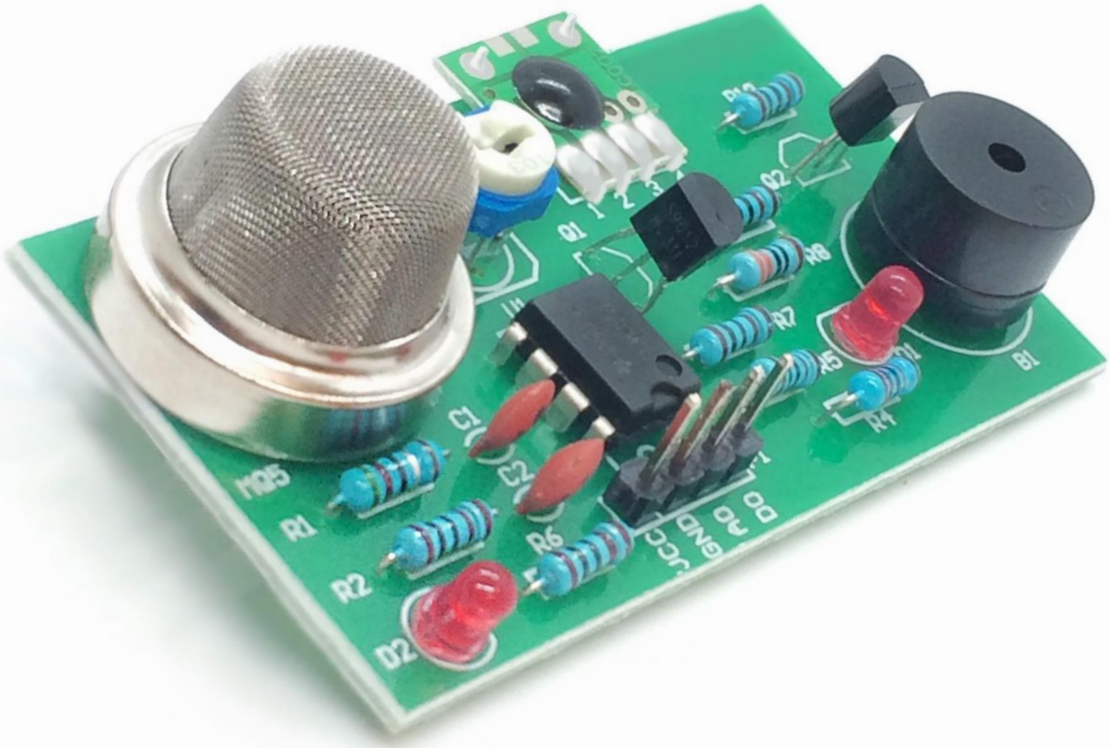
Methane, Butane and LPG Detector D.I.Y Kit

“ for detecting methane (CH_4), butane (C_4H_{10}) and LPG in household or workplace environment using the MQ2 ”

Part Number: AK-325

Level: Intermediate



ABRA

www.abra-electronics.com

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 MQ2 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:

Methane, Butane and LPG Detector for Microcontrollers (Analog/Digital)

Methane, Butane and LPG Detector for Arduino (Analog/Digital)

Methane, Butane and LPG Detector for Raspberry Pi (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: ≈ 150mA
- PCB Dimensions: 61 x 32 x 1.6mm (2.71”x 1.33" x 0.07”)

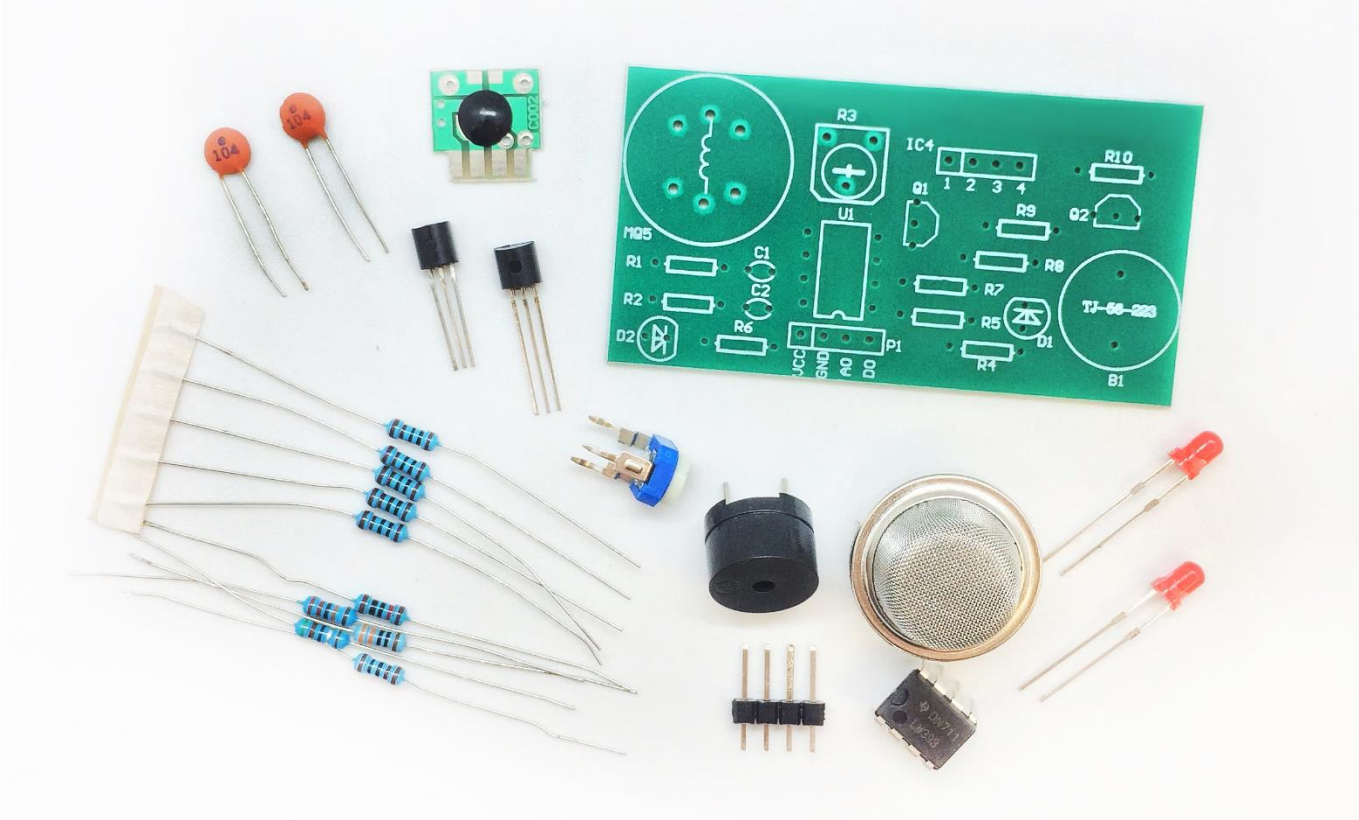
Sensor MQ2

- Environment Condition: -10°C~50°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 and Potentiometer	R1	5.1Ω / (Green, Brown, Black, Silver)	1
	R2, R5, R6, R7, R9, R10	1KΩ / (Brown, Black, Black, Brown)	6
	R3	10KΩ / 103 potentiometer	1
	R4	10kΩ / (Brown, Black, Black, Red)	1
	R8	330Ω / (Orange, Orange, Black, Black)	1
	R11	220kΩ / (Red, Red, Black, Orange)	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 Chip	U1	LM393 Dual Op Amplifier	1
PCB	—	Main PCB (Green)	1
	—	Sound IC PCB (Green)	1
Modules	MQ5	MQ Sensor	1
	B1	Buzzer	1
Headers	P1	4-pin Breakable Male Header	1

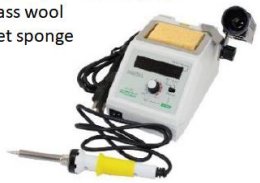


Assembly:

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).**

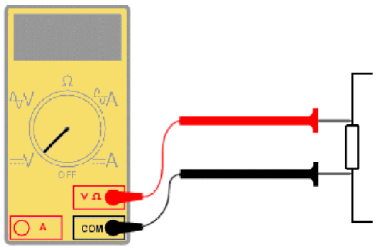
ATTENTION HIGHER TEMPERATURES WILL DAMAGE THE COMPONENTS ALONG WITH THE CIRCUIT BOARD.
*ATTENTION*DO NOT TOUCH THE SOLDERING IRON WHEN IT IS HOT.

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.

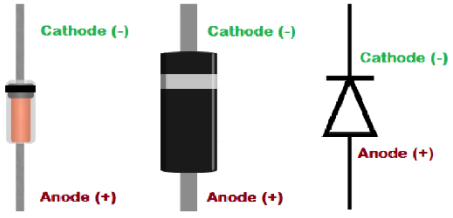
ATTENTION SOLDERING SHOULD BE DONE IN A VENTILATED AREA. BREATHING SOLDER FUMES WILL HARM YOU.

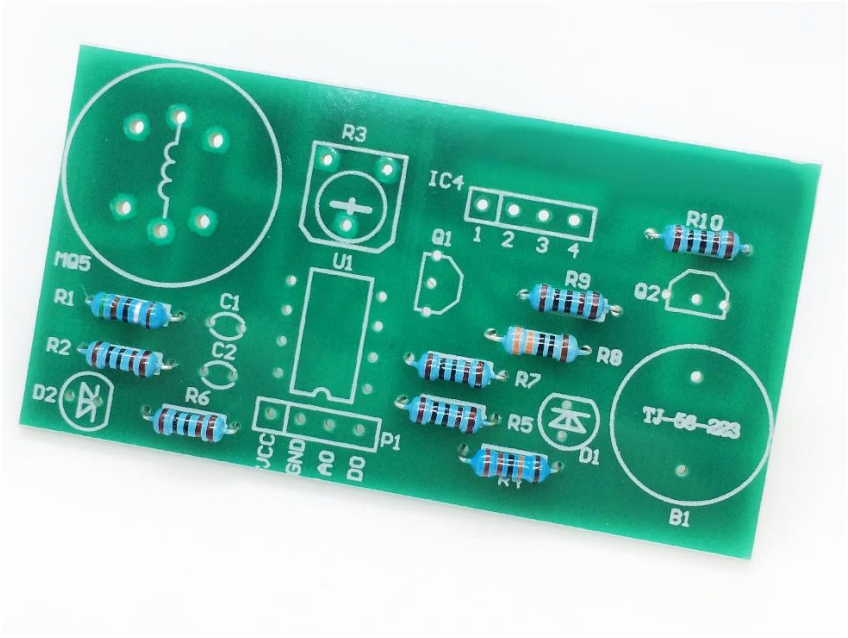
g) Always cut the excess leads with a flush cutter once a component is soldered on the PCB. At least 1mm of the lead should stick out from the solder joints.

Optional
Use a digital multimeter to measure the resistor values



Pay attention to the polarity of the diodes.





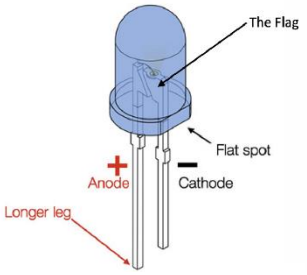
To begin the assembly process, insert the resistors as shown in the photo.

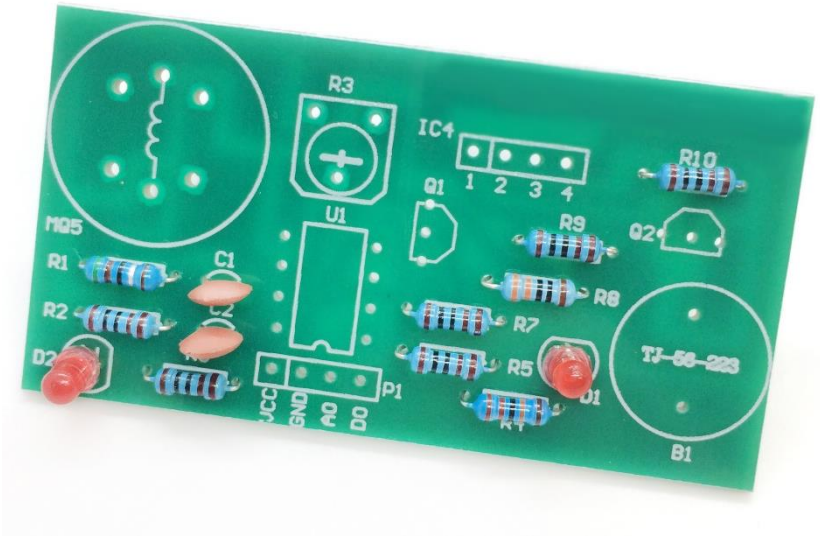
Pay attention to the color coding of the resistors as indicated in the “Bill of Materials” section on page 3.

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

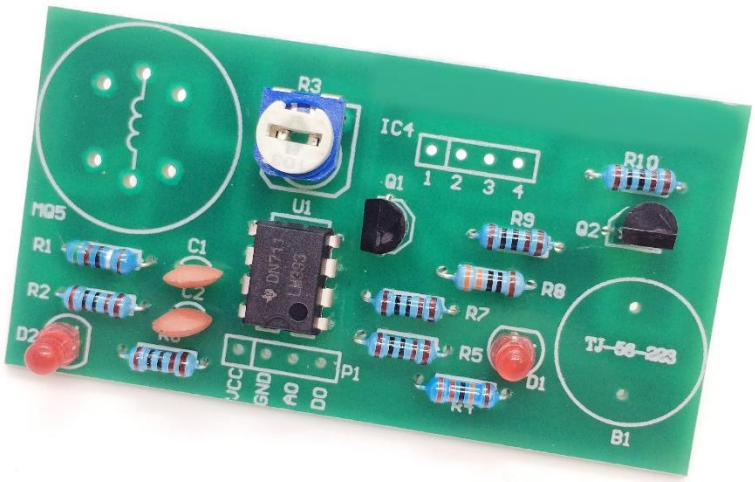
You may proceed to solder the ceramic capacitors and the LEDs in place by following the labelling on the board.

Pay attention to the LED polarity.





It is recommended to solder and cut of the excess leads with a flush cutter, one component at a time. Save the excess leads from the LED that you have cut-off, you will need them.

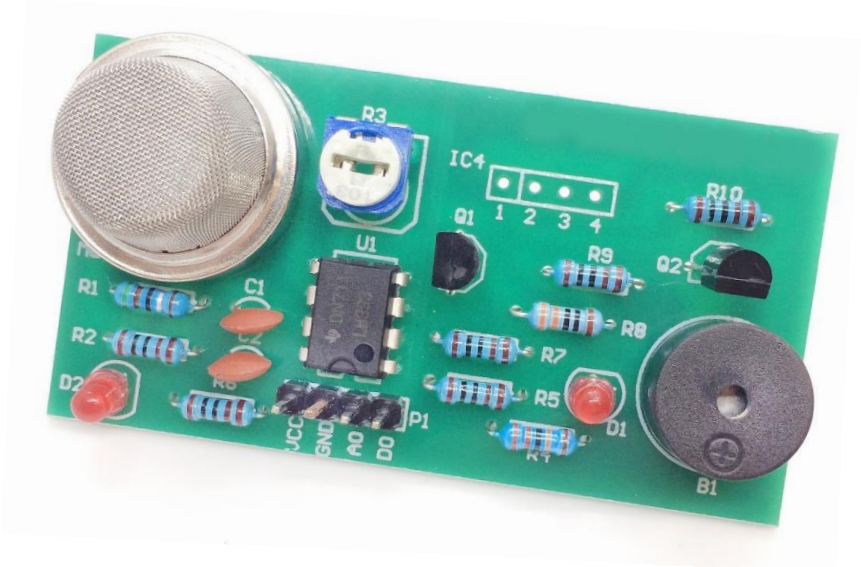


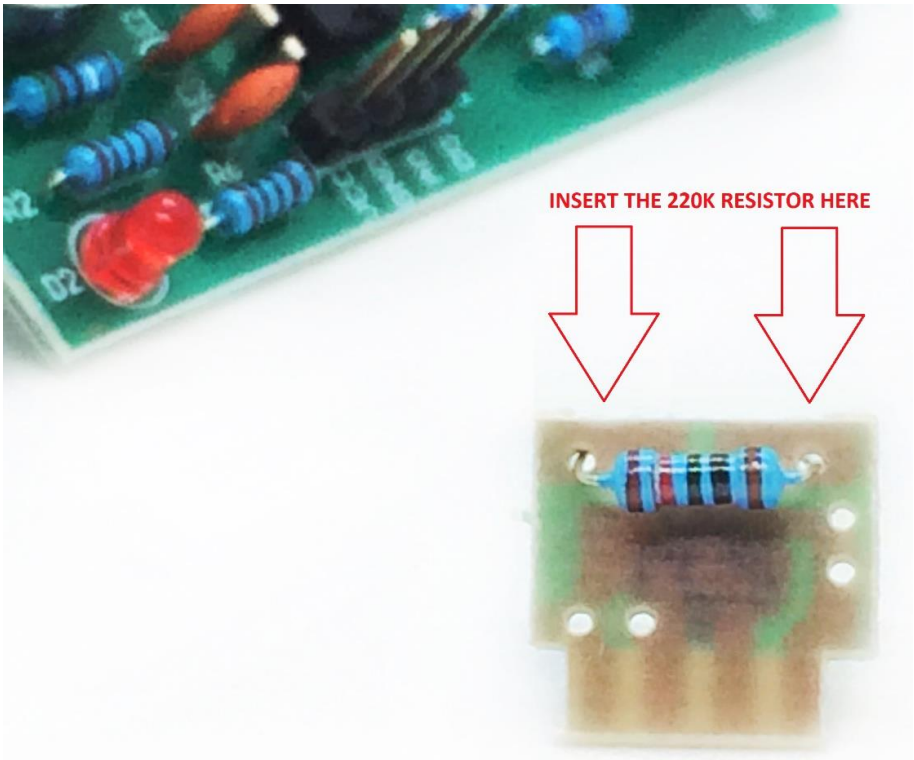
Insert the transistor, the potentiometer and the IC as shown in the picture. Ensure the transistor's flat side matches the outline of the silkscreen. Ensure the notch of the IC aligns with the markings on the board, also known as the silkscreen.

Please pay attention to the labelling of the transistors as one is an SS9012 and the other is SS9013. They both have different functions and must go in the correct place for this circuit to work!

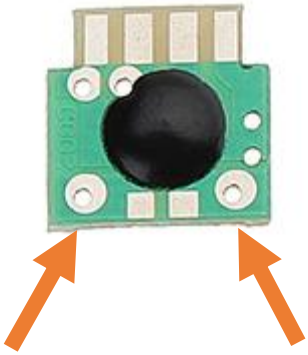
Insert the 4-pin header, the piezo buzzer and the MQ sensor onto the board and solder them as shown in the image. Ensure that the buzzer's positive lead (+) is facing down.

It is recommended to solder the MQ2 element with the label facing inwards towards the resistors.

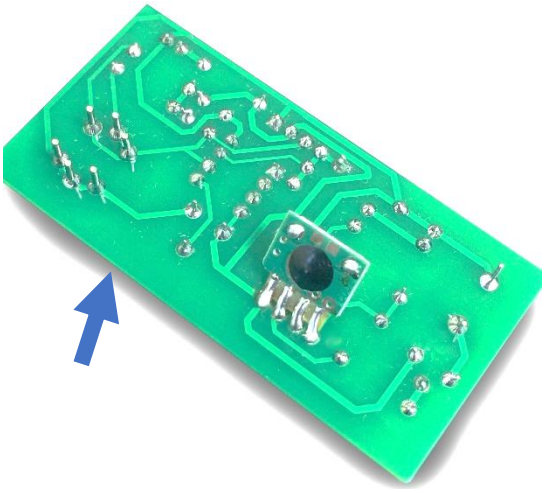




On the provided sound chip card, solder the remaining resistor (R11) in the kit on the two through-hole pads as shown.



This secondary PCB has an integrated sound chip that controls the buzzer when it goes off. You have two options to solder this component.



Option 1: As shown in the photo, solder the secondary board on the backside of the board. To install in the correct orientation, use the MQ2 solder point as reference.

Option 2: As shown in the photo, solder the secondary board on the top side using the left over LED or resistor leads that you set aside from the previous steps. You will require a vice to help keep the components in place while soldering.

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 MQ2 the buzzer will make a noise and D1 will light up to inform you that Methane, Butane or LPG has been detected. You may use the potentiometer R3 to adjust the sensitivity of the detector.

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.