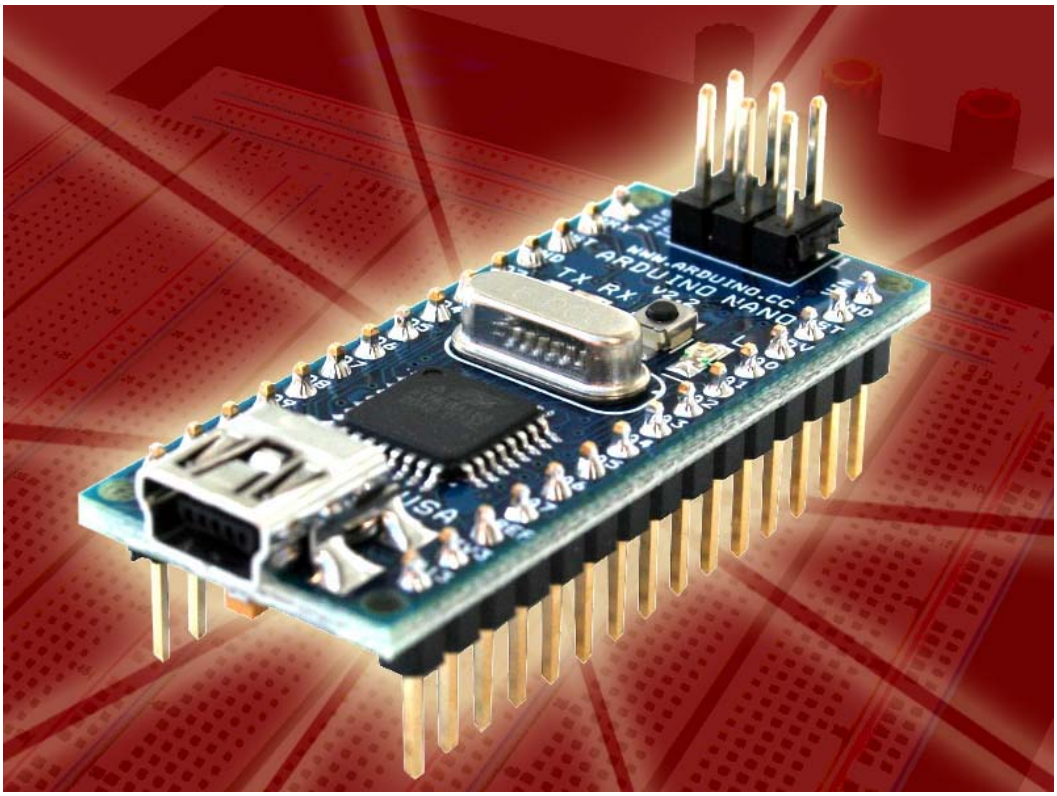
# Arduino Nano (V2.3)

## User Manual

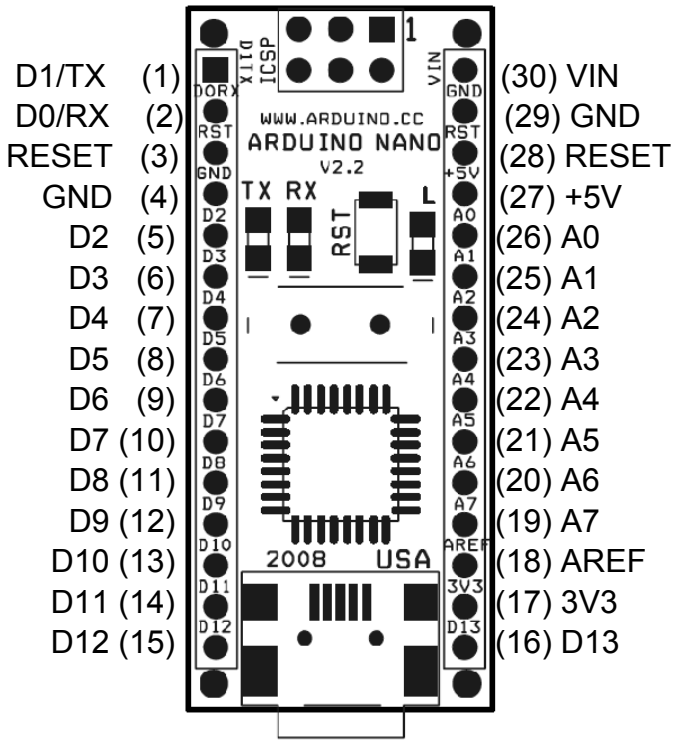





More information:

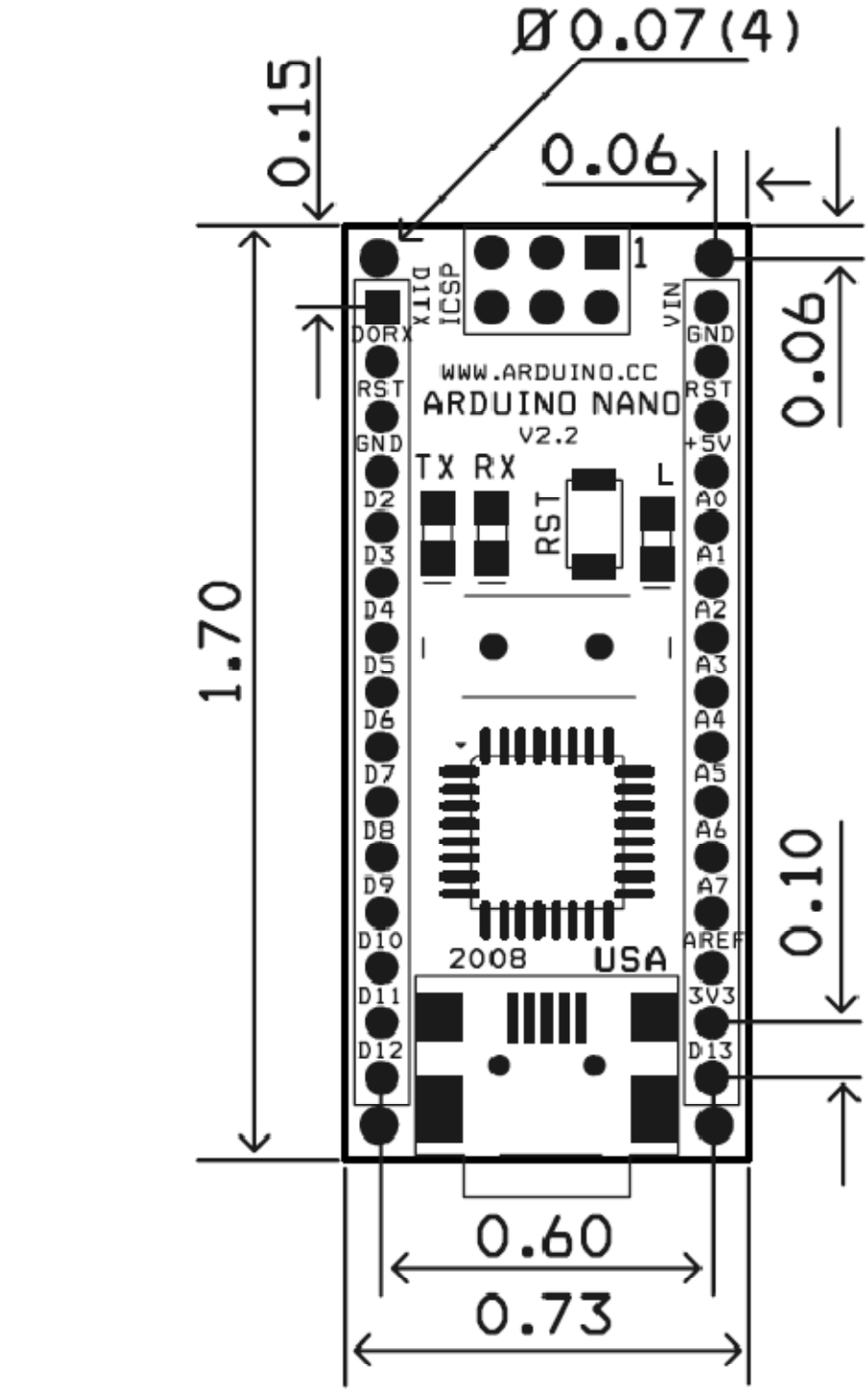
www.arduino.cc Rev. 2.3

# ***Arduino Nano Pin Layout***




| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1-2, 5-16 | D0-D13 | I/O | Digital input/output port 0 to 13 |
| 3, 28 | RESET | Input | Reset (active low) |
| 4, 29 | GND | PWR | Supply ground |
| 17 | 3V3 | Output | +3.3V output (from FTDI) |
| 18 | AREF | Input | ADC reference |
| 19-26 | A7-A0 | Input | Analog input channel 0 to 7 |
| 27 | +5V | Output or Input | +5V output (from on-board regulator) or +5V (input from external power supply) |
| 30 | VIN | PWR | Supply voltage |

# ***Arduino Nano Mechanical Drawing***

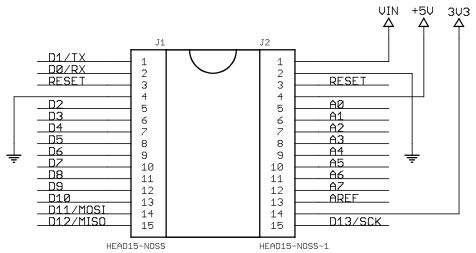



ALL DIMENTIONS ARE IN INCHES

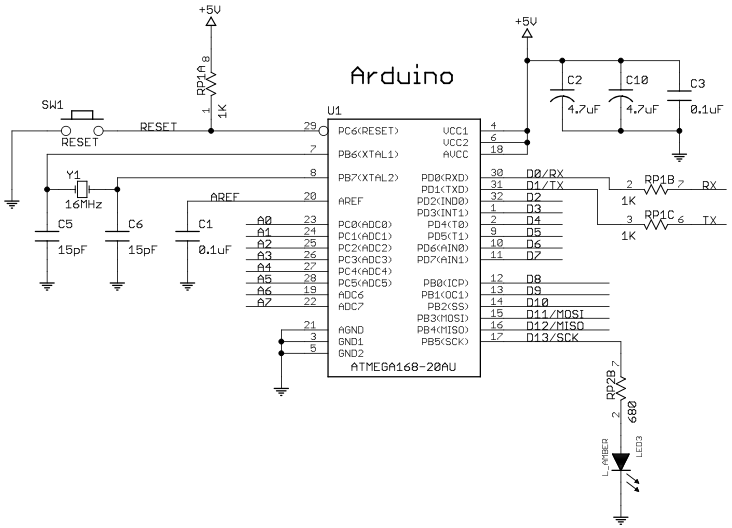
# ***Arduino Nano Bill of Material***

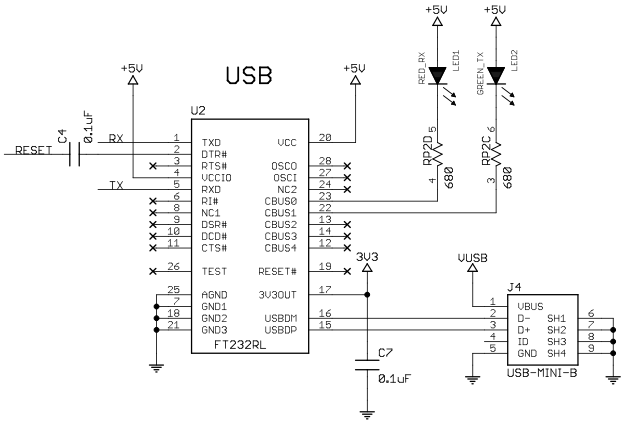
| Item Number | Qty. | Ref. Dest. | Description | Mfg. P/N | MFG | Vendor P/N | Vendor |
|---|---|---|---|---|---|---|---|
| 1 | 5 | C1,C3,C4,C7,C9 | Capacitor, 0.1uF 50V 10% Ceramic X7R 0805 | C0805C104K5RACTU | Kemet | 80-C0805C104K5R | Mouser |
| 2 | 3 | C2,C8,C10 | Capacitor, 4.7uF 10V 10% Tantalum Case A | T491A475K010AT | Kemet | 80-T491A475K010 | Mouser |
| 3 | 2 | C5,C6 | Capacitor, 18pF 50V 5% Ceramic NOP/COG 0805 | C0805C180J5GACTU | Kemet | 80-C0805C180J5G | Mouser |
| 4 | 1 | D1 | Diode, Schottky 0.5A 20V | MBR0520LT1G | ONSemi | 863-MBR0520LT1G | Mouser |
| 5 | 1 | J1,J2 | Headers, 36PS 1 Row | 68000-136HLF | FCI | 649-68000-136HLF | Mouser |
| 6 | 1 | J4 | Connector, Mini-B Recept Rt. Angle | 67503-1020 | Molex | 538-67503-1020 | Mouser |
| 7 | 1 | J5 | Headers, 72PS 2 Rows | 67996-272HLF | FCI | 649-67996-272HLF | Mouser |
| 8 | 1 | LD1 | LED, Super Bright RED 100mcd 640nm 120degree 0805 | APT2012SRCPRV | Kingbright | 604-APT2012SRCPRV | Mouser |
| 9 | 1 | LD2 | LED, Super Bright GREEN 50mcd 570nm 110degree 0805 | APHCM2012CGCK-F01 | Kingbright | 604-APHCM2012CGCK | Mouser |
| 10 | 1 | LD3 | LED, Super Bright ORANGE 160mcd 601nm 110degree 0805 | APHCM2012SECK-F01 | Kingbright | 04-APHCM2012SECK | Mouser |
| 11 | 1 | LD4 | LED, Super Bright BLUE 80mcd 470nm 110degree 0805 | LTST-C170TBKT | Lite-On Inc | 160-1579-1-ND | Digikey |
| 12 | 1 | R1 | Resistor Pack, 1K +/-5% 62.5mW 4RES SMD | YC164-JR-071KL | Yageo | YC164J-1.0KCT-ND | Digikey |
| 13 | 1 | R2 | Resistor Pack, 680 +/-5% 62.5mW 4RES SMD | YC164-JR-07680RL | Yageo | YC164J-680CT-ND | Digikey |
| 14 | 1 | SW1 | Switch, Momentary Tact SPST 150gf 3.0x2.5mm | B3U-1000P | Omron | SW1020CT-ND | Digikey |
| 15 | 1 | U1 | IC, Microcontroller RISC 16kB Flash, 0.5kB EEPROM, 23 I/O Pins | ATmega168-20AU | Atmel | 556-ATMEGA168-20AU | Mouser |
| 16 | 1 | U2 | IC, USB to SERIAL UART 28 Pins SSOP | FT232RL | FTDI | 895-FT232RL | Mouser |
| 17 | 1 | U3 | IC, Voltage regulator 5V, 500mA SOT-223 | UA78M05CDCYRG3 | TI | 595-UA78M05CDCYRG3 | Mouser |
| 18 | 1 | Y1 | Cystal, 16MHz +/-20ppm HC-49/US Low Profile | ABL-16.000MHZ-B2 | Abracon | 815-ABL-16-B2 | Mouser |

# Arduino Nano Schematic

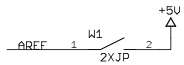




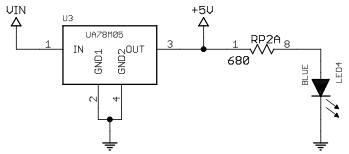



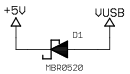

## +5V AREF OPTION



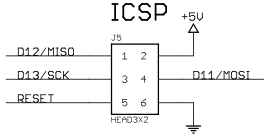

## +5V REG



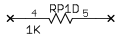

## +5V AUTO SELECTOR

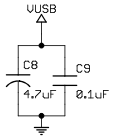



## ICSP




## NOT USED




| | |
|---|---|
| v2.3 - Modify FT232RL to use +5V | |
| TITLE: Arduino Nano | |
| Document Number: | REV: 2.3 |
| Date: 6/26/2008 8:35:54 PM | Sheet: 1/1 |

# Buzzer

pro-SIGNAL


## Features

- Black in colour
- With internal drive circuit
- Sealed structure
- Wave solderable and washable
- Housing material: Noryl

**RoHS Compliant**

## Applications

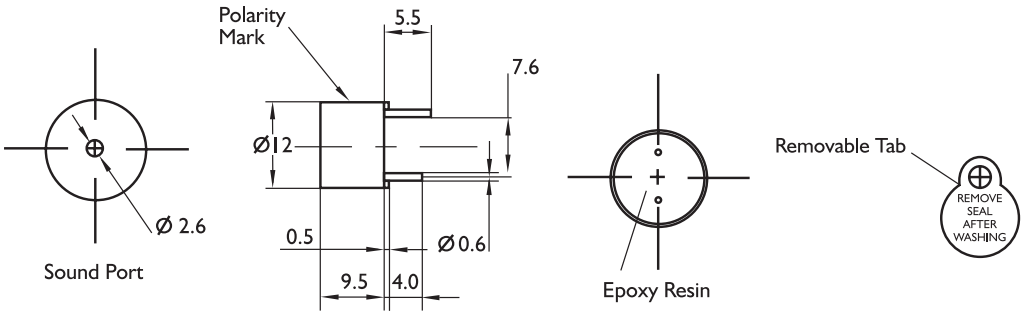
- Computer and peripherals
- Communications equipment
- Portable equipment
- Automobile electronics
- POS system
- Electronic cash register

## Specifications:

| | |
|---|---|
| Rated Voltage | : 6V DC |
| Operating Voltage | : 4 to 8V DC |
| Rated Current* | : ≤30mA |
| Sound Output at 10cm* | : ≥85dB |
| Resonant Frequency | : 2300 ±300Hz |
| Tone | : Continuous |
| Operating Temperature | : -25°C to +80°C |
| Storage Temperature | : -30°C to +85°C |
| Weight | : 2g |

*Value applying at rated voltage (DC)

## Diagram




Dimensions : Millimetres
Tolerance : ±0.5mm

## Part Number Table

| Description | Part Number |
|---|---|
| Buzzer, Electromech, 6V DC | ABI-009-RC |

# MQ-2 Semiconductor Sensor for Combustible Gas

Sensitive material of MQ-2 gas sensor is $SnO_2$, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration.

MQ-2 gas sensor has high sensitity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

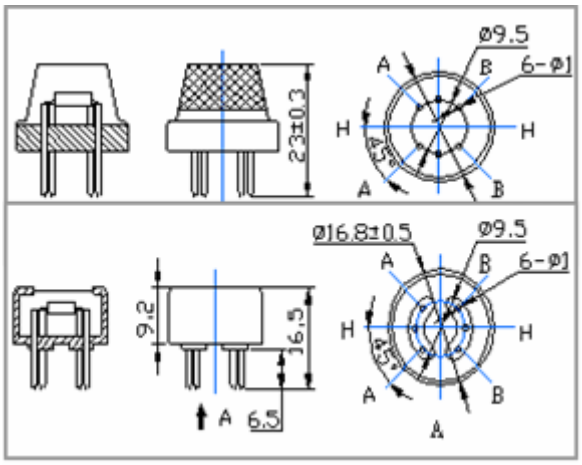
## Character

*Good sensitivity to Combustible gas in wide range
* High sensitivity to LPG, Propane and Hydrogen
* Long life and low cost
* Simple drive circuit

## Application

* Domestic gas leakage detector
* Industrial Combustible gas detector
* Portable gas detector

## Configuration

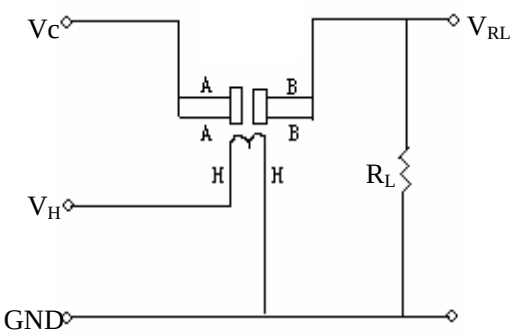



## Technical Data

| | | | |
|---|---|---|---|
| Model No. | | | MQ-2 |
| Sensor Type | | | Semiconductor |
| Standard Encapsulation | | | Bakelite (Black Bakelite) |
| Detection Gas | | | Combustible gas and smoke |
| Concentration | | | 300-10000ppm ( Combustible gas) |
| Circuit | Loop Voltage | $V_c$ | ≤24V DC |
| | Heater Voltage | $V_H$ | 5.0V±0.2V ACorDC |
| | Load Resistance | $R_L$ | Adjustable |
| Character | Heater Resistance | $R_H$ | 31Ω±3Ω（Room Tem.） |
| | Heater consumption | $P_H$ | ≤900mW |
| | Sensing Resistance | $R_s$ | 2KΩ-20KΩ(in 2000ppm $C_3H_8$ ) |
| | Sensitivity | S | Rs(in air)/Rs(1000ppm isobutane)≥5 |
| | Slope | α | ≤0.6($R_{5000ppm}/R_{3000ppm}$ $CH_4$) |
| Condition | Tem. Humidity | | 20℃±2℃；65%±5%RH |
| | Standard test circuit | | Vc:5.0V±0.1V； $V_H$: 5.0V±0.1V |
| | Preheat time | | Over 48 hours |

## Basic test loop

T




The above is basic test circuit of the sensor. The sensor need to be put 2 voltage, heater voltage（VH） and test voltage（VC）. VH used to supply certified working temperature to the sensor, while VC used to detect voltage (VRL) on load resistance （RL） whom is in series with sensor. The sensor has light polarity, Vc need DC power. VC and VH could use same power circuit with precondition to assure performance of sensor. In order to make the sensor with better performance, suitable RL value is needed:

Power of Sensitivity body(Ps):

$Ps=Vc^2\times Rs/(Rs+RL)^2$

Resistance of sensor(Rs): Rs=(Vc/VRL-1)×RL

## Sensitivity Characteristics

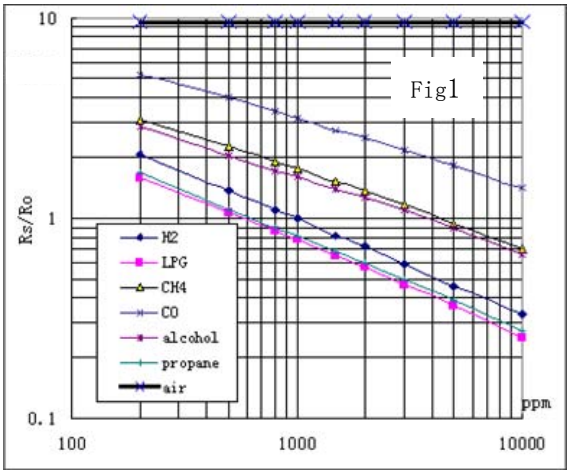



Fig.1 shows the typical sensitivity characteristics of the MQ-2, ordinate means resistance ratio of the sensor (Rs/Ro), abscissa is concentration of gases. Rs means resistance in different gases, Ro means resistance of sensor in 1000ppm Hyrogen. All test are under standard test conditions.

## Influence of Temperature/Humidity

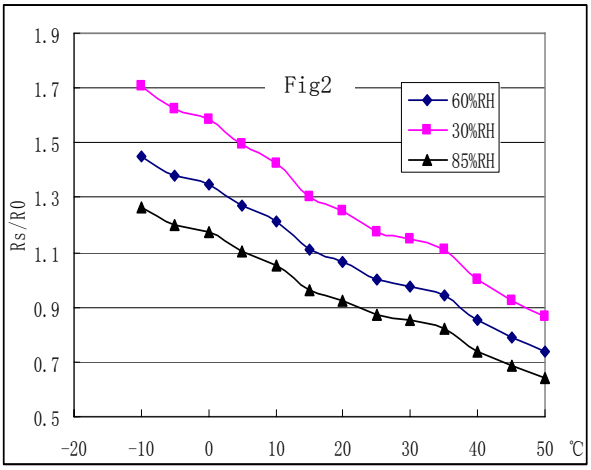



Fig.2 shows the typical temperature and humidity characteristics. Ordinate means resistance ratio of the sensor (Rs/Ro), Rs means resistance of sensor in 1000ppm Butane under different tem. and humidity. Ro means resistance of the sensor in environment of 1000ppm Methane, 20℃/65%RH

## Structure and configuration

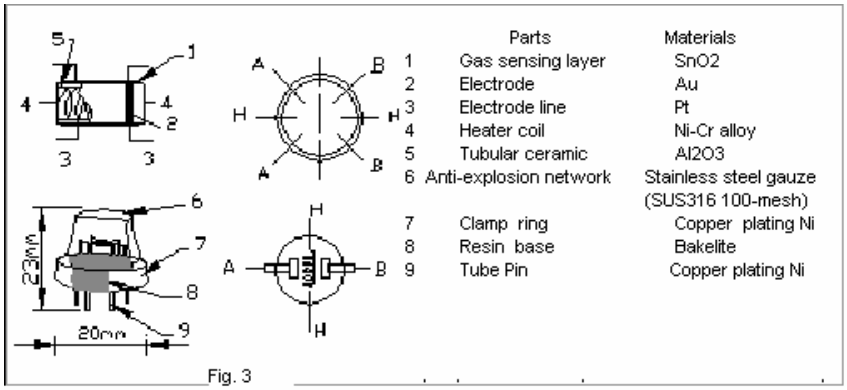



Fig. 3

Structure and configuration of MQ-2 gas sensor is shown as Fig. 3, sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-2 have 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

**Notification**

**1 Following conditions must be prohibited**

1.1 Exposed to organic silicon steam

Organic silicon steam cause sensors invalid, sensors must be avoid exposing to silicon bond, fixature, silicon latex, putty or plastic contain silicon environment

1.2 High Corrosive gas

If the sensors exposed to high concentration corrosive gas (such as $H_2Sz$, $SO_X$, $Cl_2$, HCl etc), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

1.3 Alkali, Alkali metals salt, halogen pollution

The sensors performance will be changed badly if sensors be sprayed polluted by alkali metals salt especially brine, or be exposed to halogen such as fluorin.

1.4 Touch water

Sensitivity of the sensors will be reduced when spattered or dipped in water.

1.5 Freezing

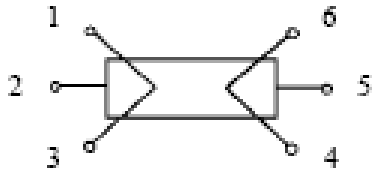
Do avoid icing on sensor'surface, otherwise sensor would lose sensitivity.

1.6 Applied voltage higher

Applied voltage on sensor should not be higher than stipulated value, otherwise it cause down-line or heater damaged, and bring on sensors' sensitivity characteristic changed badly.

1.7 Voltage on wrong pins

For 6 pins sensor, if apply voltage on 1、3 pins or 4、6 pins, it will make lead broken, and without signal when apply on 2、4 pins




**2 Following conditions must be avoided**

2.1 Water Condensation

Indoor conditions, slight water condensation will effect sensors performance lightly. However, if water condensation on sensors surface and keep a certain period, sensor' sensitivity will be decreased.

2.2 Used in high gas concentration

No matter the sensor is electrified or not, if long time placed in high gas concentration, if will affect sensors characteristic.

2.3 Long time storage

The sensors resistance produce reversible drift if it's stored for long time without electrify, this drift is related with storage conditions. Sensors should be stored in airproof without silicon gel bag with clean air. For the sensors with long time storage but no electrify, they need long aging time for stbility before using.

2.4 Long time exposed to adverse environment

No matter the sensors electrified or not, if exposed to adverse environment for long time, such as high humidity, high temperature, or high pollution etc, it will effect the sensors performance badly.

2.5 Vibration

Continual vibration will result in sensors down-lead response then repture. In transportation or assembling line, pneumatic screwdriver/ultrasonic welding machine can lead this vibration.

2.6 Concussion

If sensors meet strong concussion, it may lead its lead wire disconnected.

2.7 Usage

For sensor, handmade welding is optimal way. If use wave crest welding should meet the following conditions:

2.7.1 Soldering flux: Rosin soldering flux contains least chlorine

2.7.2 Speed: 1-2 Meter/ Minute

2.7.3 Warm-up temperature：100±20℃

2.7.4 Welding temperature：250±10℃

2.7.5 1 time pass wave crest welding machine

If disobey the above using terms, sensors sensitivity will be reduced.