RANCANGAN KONTROL DAN MONITORING *AIR QUALITY* MENGGUNAKAN MIKROKONTROLER VIA *IOT* DI RUANG TUNGGU BANDARA

TUGAS AKHIR

Oleh :

RIZA AGUNG FIRMANSYAH
NIT : 30118021

PROGRAM STUDI DIPLOMA III TEKNIK LISTRIK BANDAR UDARA
POLITEKNIK PENERBANGAN SURABAYA
2021

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Diajukan sebagai Syarat Menempuh Tugas Akhir
Pada Program Studi Diploma III Teknik Listrik Bandar Udara

Oleh :

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LEMBAR PERSETUJUAN

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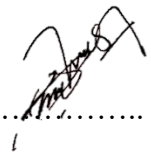

PROGRAM STUDI TEKNIK LISTRIK BANDAR UDARA
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2021

LEMBAR PENGESAHAN

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Oleh :
Riza Agung Firmansyah
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ABSTRAK

RANCANGAN KONTROL DAN *MONITORING AIR QUALITY* MENGGUNAKAN MIKROKONTROLER VIA *IOT* DI RUANG TUNGGU BANDARA

Oleh:
Riza Agung Firmansyah
30118021

Air Quality merupakan unsur alam yang perlu di jaga serta di pantau karena melalui udara bisa mengandung gas berbahaya maupun bakteri yang dapat mengganggu kesehatan. Untuk mempertahankan *Air Quality* ada beberapa sistem yaitu melakukan kontrol terhadap udara dengan cara sistem *Filtrasi* dan juga *Monitoring* sebagai sumber informasi. Rancangan ini di fungsikan untuk menjaga kualitas udara di ruang tunggu secara otomatis,serta melakukan pemantauan udara melalui *IoT.*

Rancangan ini menggunakan 2 buah sensor jika salah satu sensor mendeteksi debu atau gas maka sensor akan mengeluarkan tegangan. Nilai tegangan *output* dari sensor ini dihubungkan dengan mikrokontroler Arduino Nano. Pada saat mikrokontroler menerima input, mikrokontroler akan mengaktifkan pin output untuk mengaktifkan *Led* sebagai indikator adanya gas atau debu dalam udara, serta mengaktifkan fan sebagai sistem filtrasi udara.Fan tersebut bekerja secara otomatis. Sensor Debu sebagai sensor pembaca partikel debu di udara jika partikel terbaca lebih dari 150 μ/g, maka otomatisasi pada fan bekerja. Informasi tentang kondisi *on* atau *off Fan,* serta jumlah partikel debu yang dideteksi sensor Debu dapat diketahui *user* melalui *Blynk IoT.*

Sistem ini sangat berguna untuk mengetahui kualitas udara di ruang tunggu. Dan efektif dalam mendeteksi adanya gas maupun debu dalam udara. Serta sistem filtrasi udara dapat bekerja secara otomatis, apabila pembacaan debu di atas 150 μ/g yang terhadap dalam udara. Serta memantau kondisi *on* atau *off* Fan,,sensor Gas dan pembacaan presentase sensor Debu *via* internet dapat diakses dengan baik oleh *user* melalui *Smartphone.*

Kata Kunci: *Air Quality, Sensor Debu, sensor Gas, Smartphone* ,*Blynk IoT* dan Arduino Nano

ABSTRACT

DESIGN OF AIR QUALITY CONTROL AND MONITORING USING MICROCONTROLLER VIA IOT IN AIRPORT WAITING ROOMS

By:
Riza Agung Firmansyah
30118021

Air Quality is a natural element that needs to be maintained and monitored because through the air it can contain harmful gases and bacteria that can interfere with health. To maintain Air Quality, there are several systems, namely controlling the air by means of a Filtration system and also Monitoring as a source of information. This design is used to automatically maintain air quality in the waiting room, as well as carry out air monitoring via IoT.

This design uses 2 sensors, if one sensor detects dust or gas, the sensor will issue a voltage. The output voltage value of this sensor is connected to the Arduino Nano microcontroller. When the microcontroller receives input, the microcontroller will activate the output pin to activate the LED as an indicator of the presence of gas or dust in the air, and activate the fan as an air filtration system. The fan works automatically. Dust Sensor as a sensor for reading dust particles in the air if the particles read more than 150 µ/g, then the automation on the fan works. Information about the on or off condition of the Fan, as well as the number of dust particles detected by the Dust sensor can be known by the user through Blynk IoT.

This system is very useful for knowing the air quality in the waiting room. And effective in detecting the presence of gas and dust in the air. And the air filtration system can work automatically, if the dust reading is above 150 µ /g which is in the air. As well as monitoring on or off Fan conditions, Gas sensors and readings of Dust sensor percentages via the internet can be accessed properly by users via Smartphones.

Key Words: *Air Quality, Gas Sensor, Dust sensor , Smartphone ,Blynk IoT and Arduino Nano*

PERNYATAAN KEASLIAN DAN HAK CIPTA

Saya yang bertanda tangan di bawah ini :

Nama	: Riza Agung Firmansyah
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Program Studi	: D-III Teknik Listrik Bandar Udara
Judul Tugas Akhir	: *Rancangan Kontrol Dan Monitoring Air Quality Menggunakan Mikrokontroler Via Iot Di Ruang Tunggu Bandara*

dengan ini menyatakan bahwa :

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Surabaya, 1 Juli 2021
Yang membuat pernyataan

Riza Agung Firmansyah
30118021

MOTTO DAN PERSEMBAHAN

TERUSLAH
BERUSAHA
BERDOA DAN
BERSABAR

KATA PENGANTAR

Puji syukur kami panjatkan kepada Tuhan Yang Maha Esa, karena berkat limpahan rahmat dan hidayah Nya, Tugas Akhir yang berjudul "*RANCANGAN KONTROL DAN MONITORING AIR QUALITY MENGGUNAKAN MIKROKONTROLER VIA IOT DI RUANG TUNGGU BANDARA"* ini dapat diselesaikan dengan baik.

Penyusunan Tugas Akhir ini dimaksudkan sebagai salah satu syarat menyelesaikan pendidikan di Politeknik Penerbangan Surabaya dan memperoleh gelar Ahli Madya (A. Md).

Ucapan terima kasih kami sampaikan kepada segenap pihak yang telah membantu selama proses penyusunan Tugas Akhir ini, terutama kepada :

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6. Orang tua, serta adik-adik yang saya sayangi atas doa, semangat, dukungan moril dan material yang diberikan hingga terselesaikan Tugas Akhir ini.
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8. Teman–teman *course* Teknik Listrik Bandar Udara XIII, atas kebersamaan dan kerjasamanya di segala kondisi.
9. Teman-teman seangkatan dan adik-adik kelas, atas dukungan yang diberikan.

Penulis juga menyadari bahwa penulisan tugas akhir ini masih jauh dari sempurna. Oleh karena itu, penulis mengharapkan kritik dan saran membangun guna penyempuranaan rancangan ini kedepannya. Dengan segala kerendahan hati, penulis mempersembahkan Tugas Akhir ini, semoga bermanfaat bagi pembaca dan penulis untuk dunia penerbangan pada umumnya. Terima kasih.

Surabaya, 4 Agustus 2021

Penulis

DAFTAR ISI

DAFTAR GAMBAR

DAFTAR TABEL

DAFTAR PUSTAKA

[1] Baehaqi,P N.(2017).*Rancang Bangun Sistem Pemantau Kualitas Udara Menggunakan Sensor GP2Y1010AU0F dan MQ-7 Berbasis Web di Pelabuhan Tanjung Priok*.Jakarta,Indonesia:Universitas Negeri Jakarta

[2] Hutangalung,A.(2016). *Alat Ukur Kualitas Udara Berbasis Mikrokontroler Arduino Uno*.Medan,Indonesia :Universitas Sumatera Utara

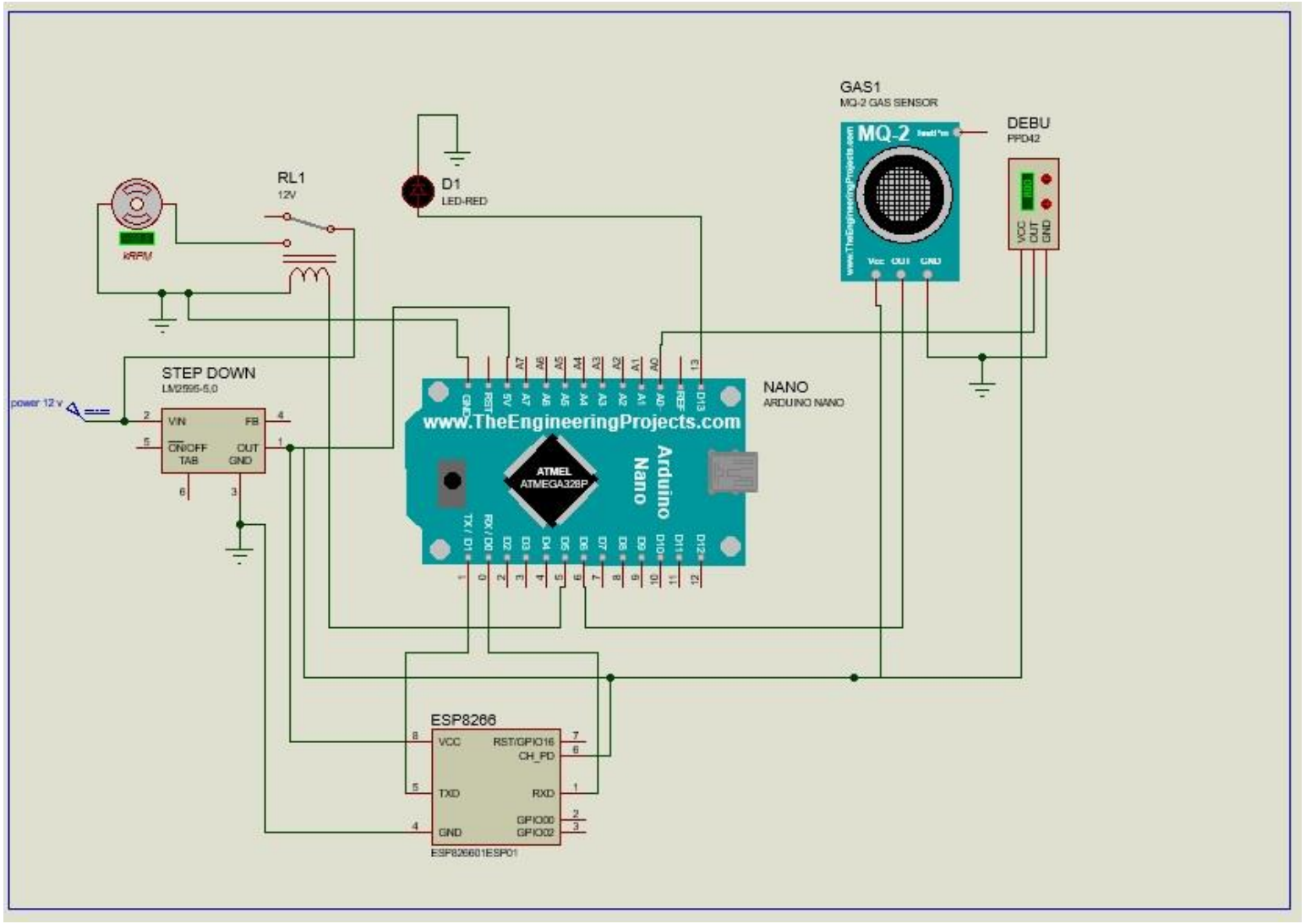
[3] Pavlenski,M.(2019).https://create.arduino.cc/projecthub/mircemk/diy-air-quality-monitor-with-sharp-gp2y1010au0f-sensor-7b0262

[4] Syafrial,Agus.(2019). *Prototype Smart Parking Stand Menggunakan Konsep Internet of Things Berbasis Mikrokontroler di apron bandar udara.*Surabaya:Politeknik Penerbangan Surabaya

[5] Zulias,J.(2011). bahasa-pemrograman-arduino.http://blog.famosastudio.com/2011/06/tutorial/tutorial-singkat-bahasa-pemrograman-arduino/82

[6] Junaidy,B.(2019). *Pendeteksi Dan Penetralisir Debu Dan Asap Pada Udara Menggunakan Sensor GP2Y1010U0F dan MQ-2 Berbasis Arduino Uno R3 Atmega 328p*.Medan,Indonesia:Universitas Medan

LAMPIRAN A. WIRING ALAT KESELURUHAN



LAMPIRAN B. KODING ARDUINO Nano

```
#include <ESP8266_Lib.h>
#include <BlynkSimpleShieldEsp8266.h>
#include <SoftwareSerial.h>

#define BLYNK_PRINT Serial

char auth[] = "MfuKmdiJsiCjlRtTd_zV-Kl-5vpizt2P";
char ssid[] = "AP";
char pass[] = "123456789";

#define EspSerial Serial
#define ESP8266_BAUD 115200
ESP8266 wifi(&Serial);

int pin_debu = A0;
int pin_gas = 6;
int ledPower_debu = 7;
int led = 13;
int fan = 5;

int gas_state;

int samplingTime = 280;
int deltaTime = 40;
int sleepTime = 9680;

float voMeasured = 0;
float calcVoltage = 0;
float dustDensity = 0;
```

```
void setup()
{
  Serial.begin(ESP8266_BAUD);
  pinMode(ledPower_debu,OUTPUT);
  pinMode(led,OUTPUT);
  pinMode(fan,OUTPUT);
  pinMode(pin_gas,INPUT);
  Blynk.begin(auth, wifi, ssid, pass);
}
void loop()
{
  Blynk.run();
  digitalWrite(ledPower_debu,LOW);
  delayMicroseconds(samplingTime);
  voMeasured = analogRead(pin_debu);
  delayMicroseconds(deltaTime);
  digitalWrite(ledPower_debu,HIGH);
  delayMicroseconds(sleepTime);
  calcVoltage = voMeasured * (5.0 / 1024.0);
  dustDensity = 170 * calcVoltage - 0.1;
  Blynk.virtualWrite(V0, dustDensity);
  gas_state = digitalRead(pin_gas);
  if(gas_state == 0)
  {
    Blynk.virtualWrite(V1, "Intensitas Gas Tinggi!");
  }
  if(gas_state == 1)
  {
    Blynk.virtualWrite(V1, "Intensitas Gas Aman");
```

```
 if(dustDensity >=150.00)
 {
  Blynk.virtualWrite(V2, "Intensitas Debu Tinggi!");
 }

 if(dustDensity < 150.00)
 {
  Blynk.virtualWrite(V2, "Intensitas Debu Aman");
 }

 if(gas_state == 0 || dustDensity >= 150.00)
 {
  digitalWrite(led,HIGH);
  digitalWrite(fan,HIGH);
 }
 else
 {
  digitalWrite(led,LOW);
  digitalWrite(fan,LOW);
 }
 delay(1000);
```

LAMPIRAN C. RANCANGAN ANGGARAN BIAYA

Rancangan Anggaran Biaya (RAB)
Alat Kontrol dan Monitoring Air Quality

No	Nama Komponen	Jumlah	Harga	Total
1	Arduino Nano	1	IDR 60,000.00	IDR 60,000.00
2	Adapter 12 Vdc	1	IDR 12,000.00	IDR 12,000.00
3	Fan DC	1	IDR 20,000.00	IDR 20,000.00
4	Filter udara	1	IDR 50,000.00	IDR 50,000.00
5	Sensor MQ2	1	IDR 18,000.00	IDR 18,000.00
6	Sensor GP2Y1010u0F	1	IDR 150,000.00	IDR 150,000.00
7	ESP8266	1	IDR 22,000.00	IDR 22,000.00
8	Voltage Regulator 12V to 5V	2	IDR 15,000.00	IDR 30,000.00
9	Led Merah	1	IDR 1,000.00	IDR 1,000.00
10	Relay 5V	1	IDR 9,000.00	IDR 9,000.00
11	Acrylic 2 mm	2.400 cm2	IDR 100,000.00	IDR 100,000.00
		Biaya Total		IDR 472,000.00

Standar Operasional Prosedur (SOP)

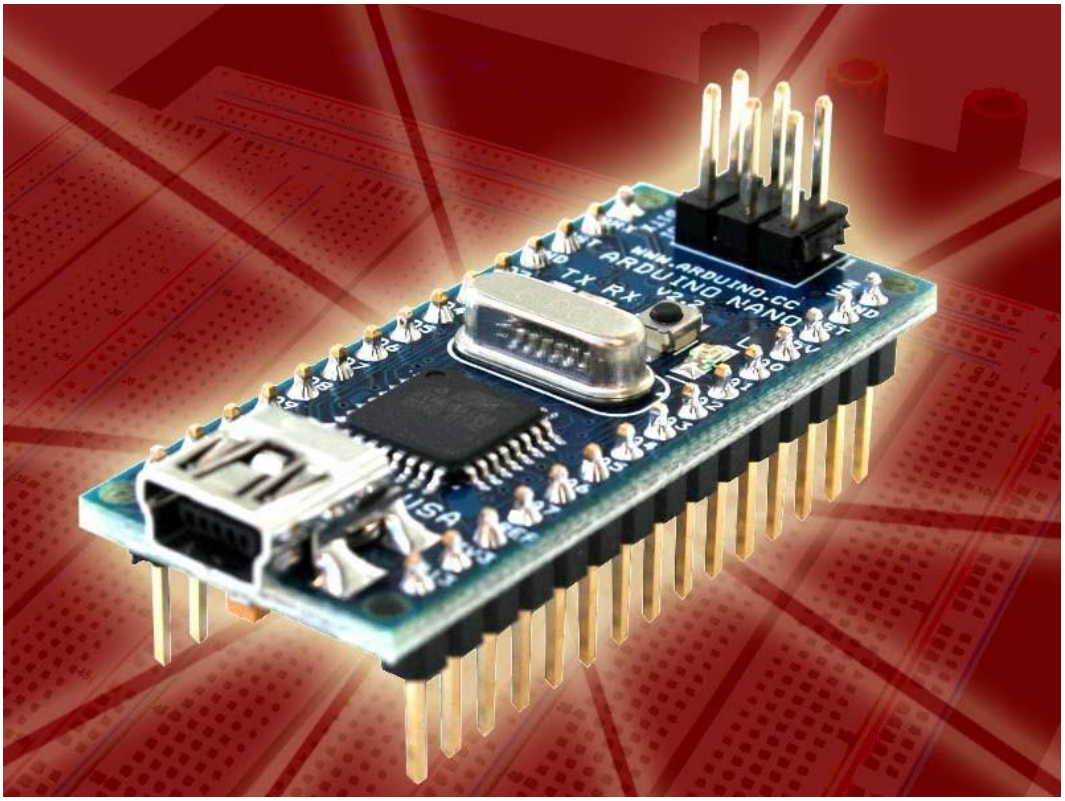
Tata Cara Penggunaan Alat:

1. **Colokkan power ke Alat,**Pasang Adaptor ke stopkontak kemudian pastikan output adaptor terkoneksi pada alat detektor.
2. **Hubungkan jaringan wifi dengan smartphone,**Nyalakan hotspot pada smartphone dan tunggu hingga aplikasi blynk terhubung.
3. **Letakkan alat detektor pada lokasi yang strategis,**Posisi dimana sering terdapat kerumunan.
4. **Pantau Alat detektor melaui Aplikasi,**Pada aplikasi akan muncul indikator gas dan Debu.
5. **Alat Bekerja Otomatis,**Alat akan bekerja apabila ada debu dan gas terdeteksi secara otomatis

Arduino Nano

(V2.3)

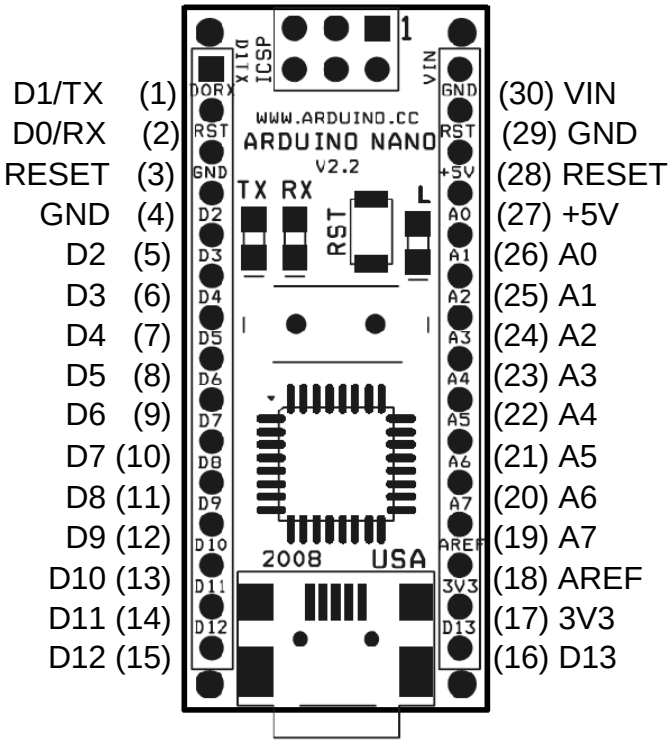
User Manual



More information:

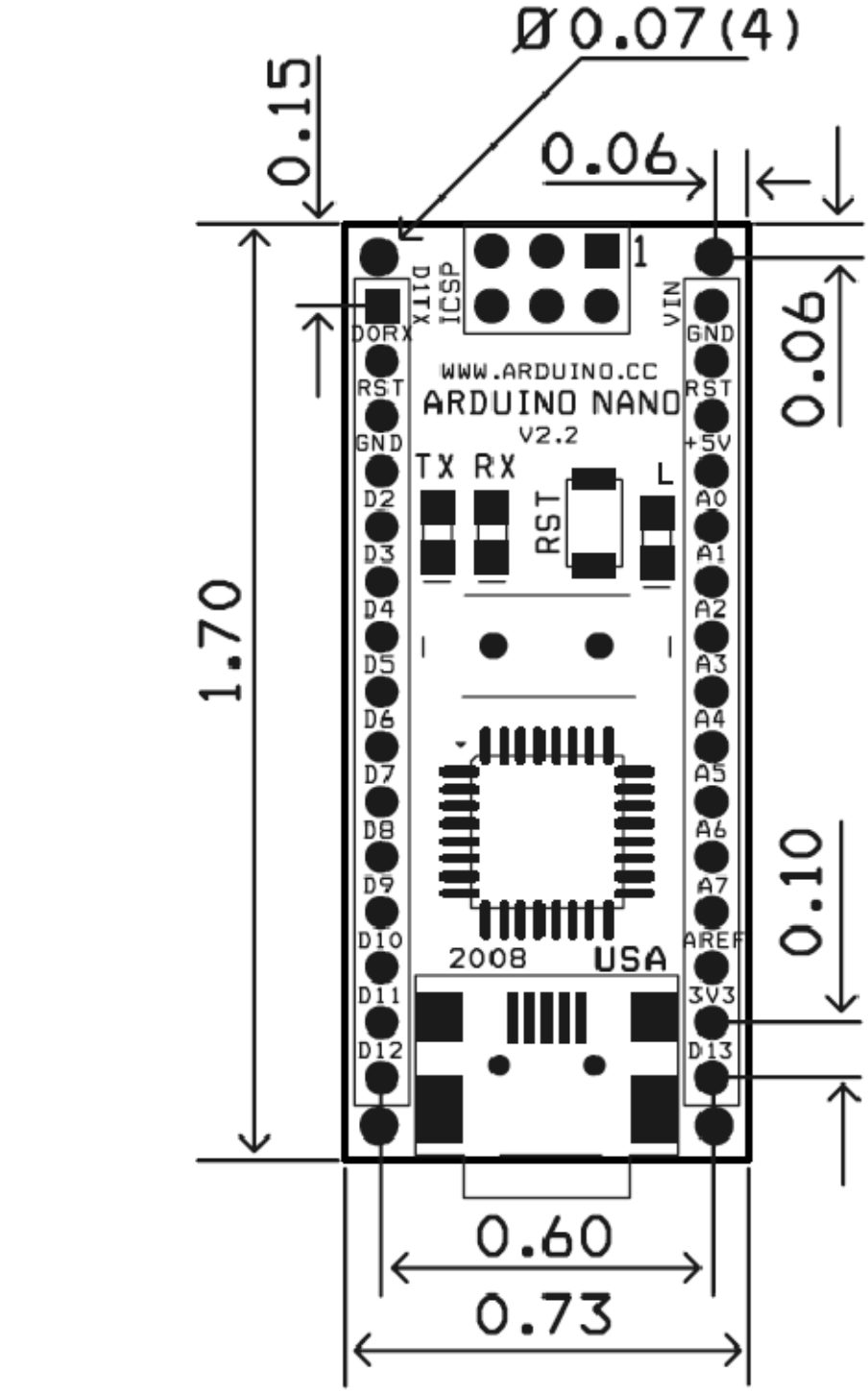
www.arduino.cc Rev. 2.3

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



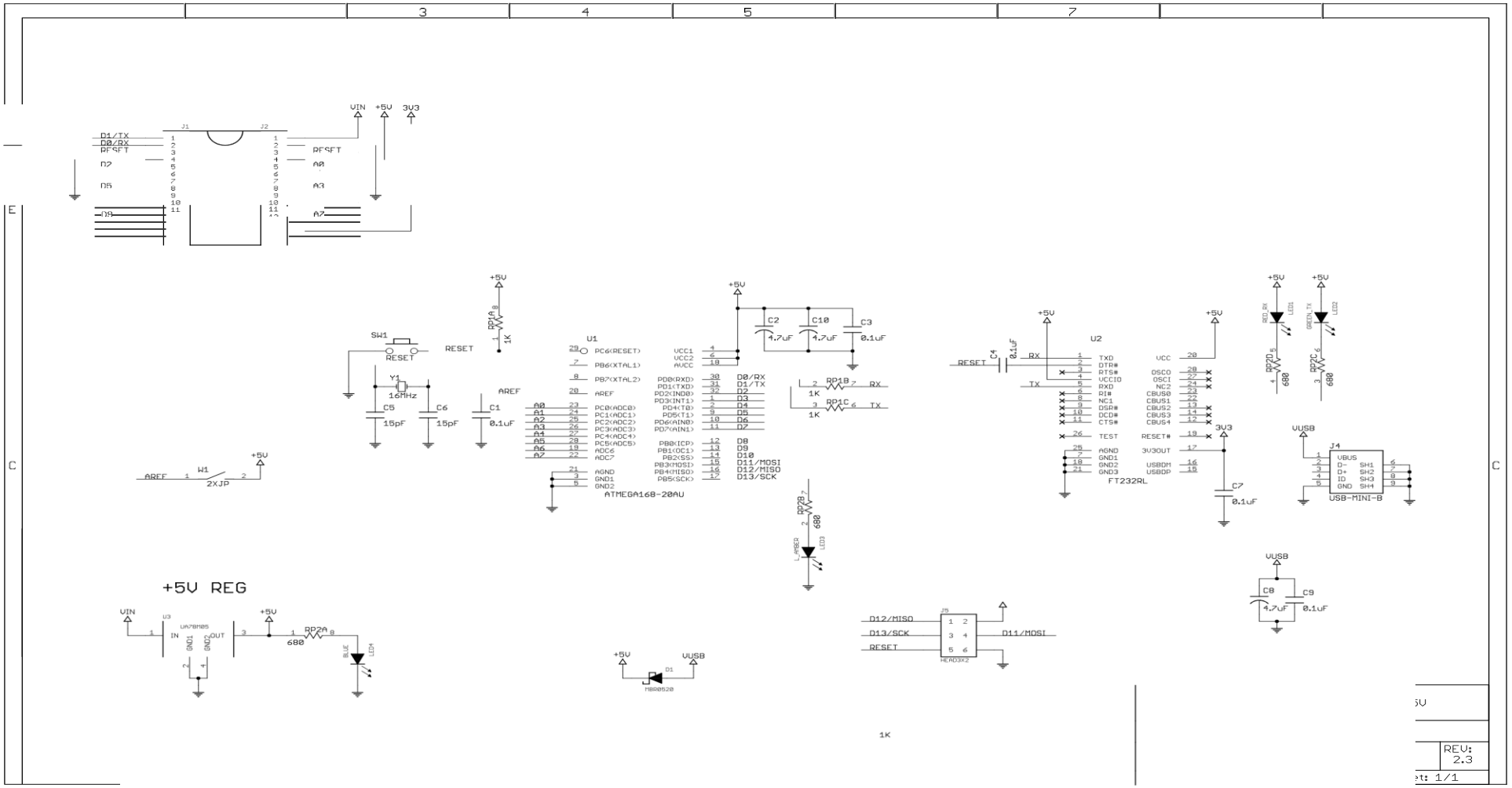
ALL DIMENTIONS ARE IN INCHES

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



GP2Y1010AU0F

Compact Optical Dust Sensor

Compliance

1. Compliant with RoHS directive (2002/85/EO)

Description

GP2Y1010AU0F is a dust sensor by optical sensing system.

An infrared emitting diode (IRED) and an phototransistor are diagonally arranged into this device.
It detects the reflected light of dust in air. Especially, it is effective to detect very fine particle like the cigarette smoke.
In addition it can distinguish smoke from house dust by pulse pattern of output voltage.

Applications

1. Detecting of dust in the air.
2. Example: Air purifier, Air conditioner, Air monitor

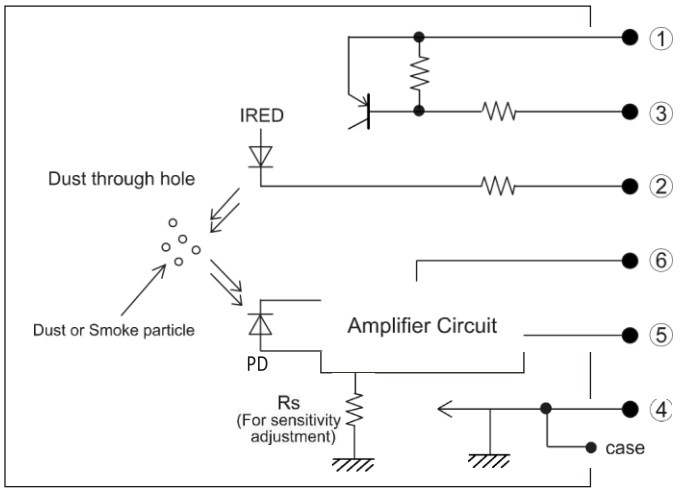
Features

1. Compact, thin package (46.0 x 30.0 x 17.6 mm)
2. Low consumption current (Icc: MAX. 20 mA)
3. The presence of dust can be detected bythe photometry of only one pulse
4. Enable to distinguish smoke from house dust
5. Lead-free and RoHS directive compliant

Sheet No.: E4-A01501 EN

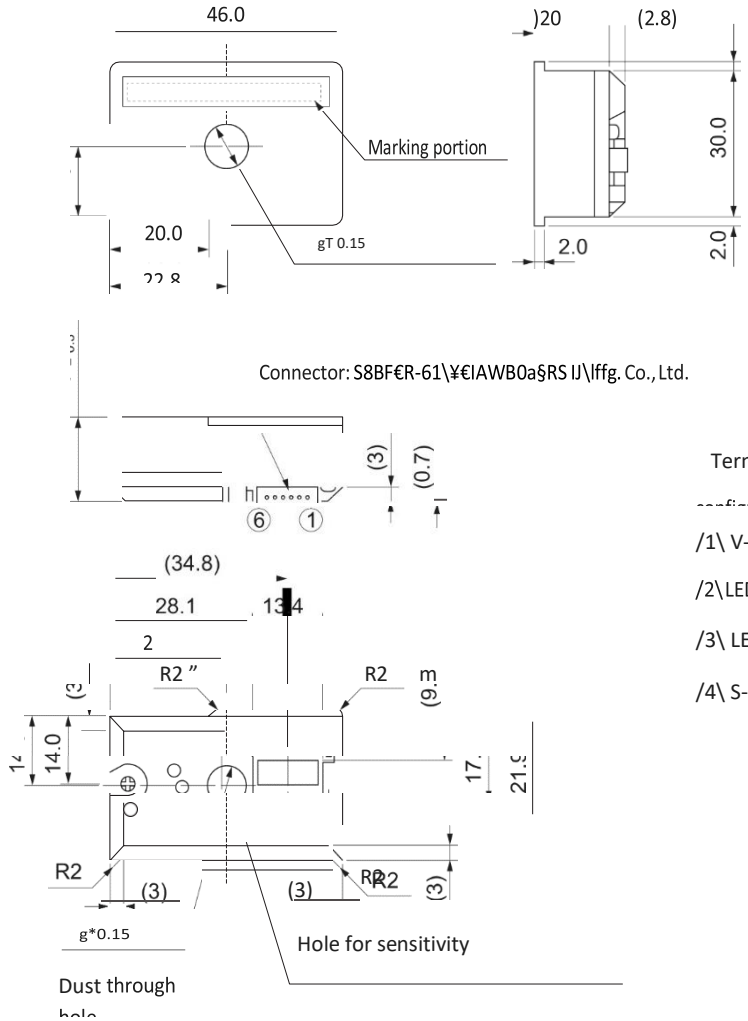
Date Dec. 1. 2006

nternal schematic



(Unit : mm)

■ Outline Dimensions



* Unspecified tolerance : + 0.3 mm.

Marking information

: Die stamp marking

: Ink stamp marking

Date code (2 digit)

1st digit		2nd digit	
Year of production		Month of production	
A.D.	Mark	Month	Mark
2010	0	1	1
2011	1	2	2
2012	2	3	3
2013	3	4	4
2014	4	5	5
2015	5	6	6
2016	6	7	7
2017	7	8	8
2018	8	9	9
2019	9	10	X
2020	0	11	Y
:	:	12	Z

repeats in a 10 year cycle

Country of origin

Philippines, China

■ Absolute Maximum Ratings

(T_a=25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	0.3 to 7	V
*1 Input terminal voltage	V_{LED}	0.3 to V_{CC}	V
Operating temperature	T_{opr}	10 to 65	C
Soldering temperature	T_{sol}	20 to 80	C

*1 Open drain drive input

■Electro-optical Characteristics

(T_a 25 C, V_{CC} 5V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Sensitivity	K	*1 *2 *3	0.35	0.5	0.65	V/(0.1mg/m^3)
Output voltage at no dust	V_{OC}	*2 *3	0	0.9	1.5	V
Output voltage range	V_{OH}	*2 *3 R_L 4.7k	3.4	–	–	V
LED terminal current	I_{LED}	*2 LED terminal voltage 0	–	10	20	mA
Consumption current	I_{CC}	*2 R_L=∞	–	11	20	mA

*1 Sensitivity is specified by the amount of output voltage change when dust density changes by 0.1 mg/m^3. And the dust density for detection is a value of the density of cigarette (MILD SEVEN®) smoke measured by the digital dust monitor (P-5L2: manufactured by SHIBATA SCIENTIFIC TECHNOLOGY LTD.).

*2 Input condition is shown in Fig. 1

*3 Output sampling timing is shown in Fig. 2

■Recommended input condition for LED input terminal

Parameter	Symbol	Value	Unit
Pulse Cycle	T	10 1	ms
Pulse Width	P_W	0.32 0.02	ms
Operating Supply voltage	V_{CC}	5 0.5	V

Fig. 1 Input Condition for LED Input Terminal

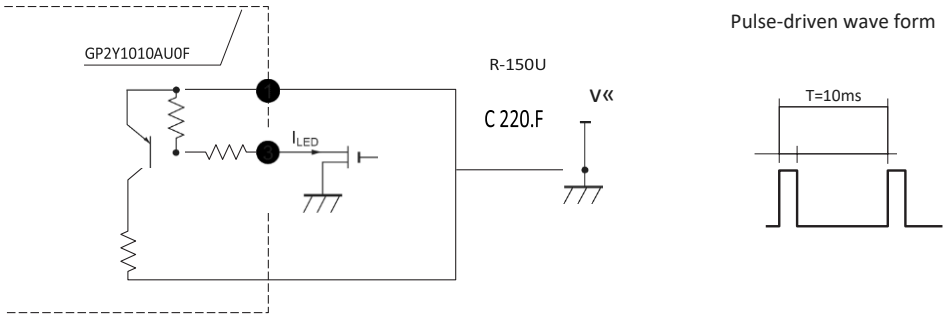


Fig. 2 Sampling Timing of Output Pulse

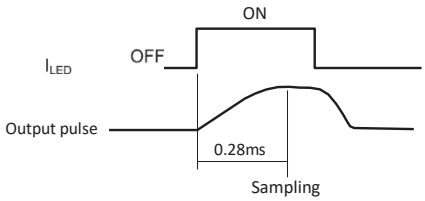
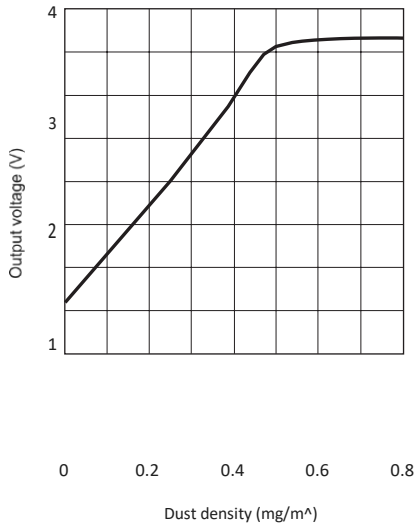


Fig. 3 Output Voltage vs. Dust Density



Remarks : Please be aware that all data in the graph are just for reference and are not for guarantee.

• Notes

1 Connection of case and GND
Case material use conductive resin as cover case (printed model No.) and metal (test terminal side) as bottom cover. The metal case connects with GND in sensor.

2 Cleaning
Please don't do cleaning, because there is a case that this device is not satisfied with its characteristics by cleaning.

3 Pulse input range
Please subject to recommendation as regard input condition for LED in order to keep reliability.

4 Dust adhesion
There is a case that this product does not detect the dust density correctly, since the dust adhered to the inside of the dust through hole may project into the detecting space which consist of emitter and detector light axis. Please take the structure and mechanism of the equipment into consideration to avoid the influence of adhered dust. And when the dust is adhered, please consider the maintenance such as vacuuming or blowing off the dust by air.
In addition, please pay attention to structure and placing location of the application to avoid any adhesive particle like oil, etc. to gets into the device. If it sticks to optical part, malfunction may occur.

5 Light output
In circuit designing, make allowance for the degradation of the light emitting diode output that results from long continuous operation. (50% degradation/5 years)

6 Sensitivity adjustment VR
VR for sensitivity adjustment is set up at shipping from sharp. Please do not touch the VR or Electro-optical characteristics specified on the specification will be invalid.

7 Resolution
Please do not disassemble the device such as removing tapping screw and so on. Even if the device is reassembled, it may not satisfy the specification.

8 Application to fire alarm
Please do not use this device for a fire alarm application. When using this device to application other than air purifying and equipment with air purifying function, please inform us before usage.

9 Noise influence
If the sensor is located close to noise generator (ex. Electric dust collector, etc.), the sensor output may be affected by leaded noise. On top of that noise from power supply line also may affect the sensor output. When desinging the system, please consider the effect from noise.

10 Vibration influence
The sensor may change its value under mechanical oscillation. Before usage, please make sure that the device works normally in the application.

11 Incident light influence
There is a case that the sensor output may be affected when outer-light comes through dust through hole on printed side. In order to avoid any influence from outer-light, please locate the printed side of sensor facing to inside of the application.

12 When inside of the sensor is moisturized, this product does not keep its proper function. Please design the application so that moisturization of the sensor does not happen.

- Presence of ODC etc.

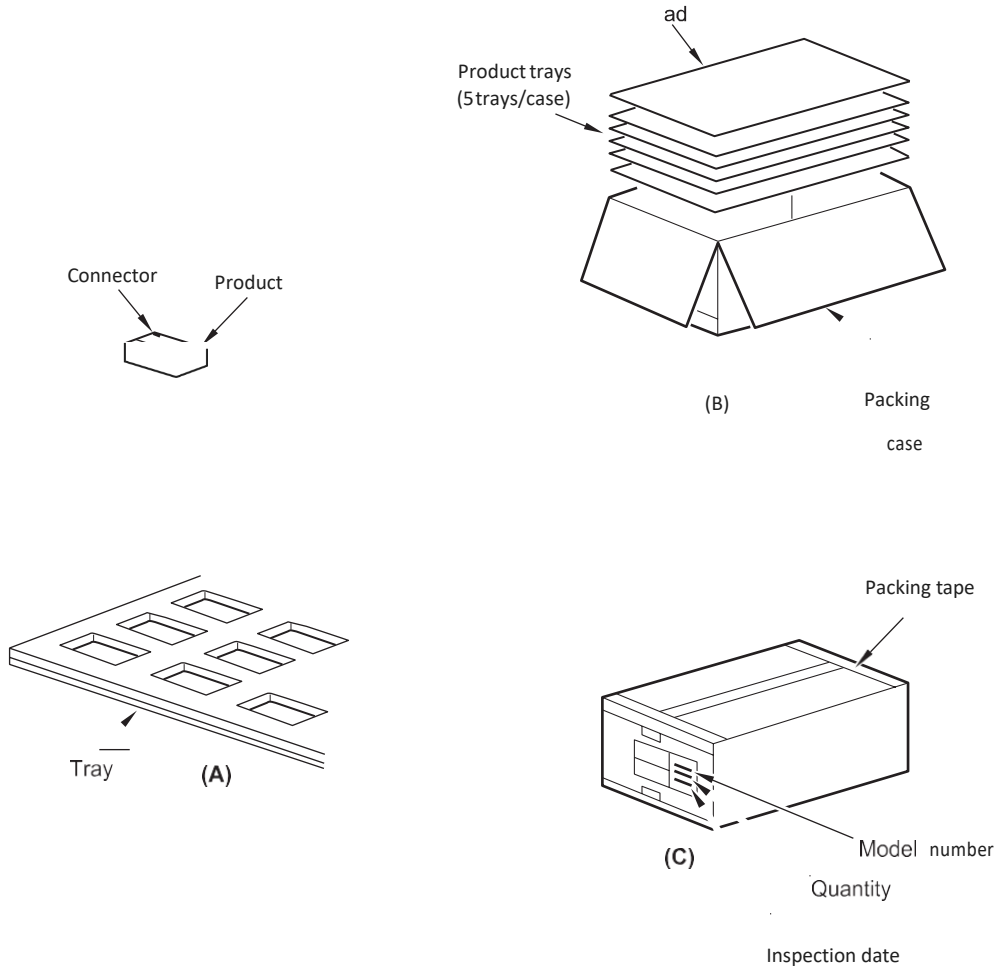
This product shall not contain the following materials.
And they are not used in the production process for this product.
Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform) Specific

brominated flame retardants such as the PBB and PBDE are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/65/EO).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls(PBB), Polybrominated diphenyl ethers (PBDE).

■ Packing Specification



PACKING METHOD

1. Each tray holds 50 pieces. Packing methods are shown in (A).
2. Each box holds 5 trays. Pads are added to top (B).
3. The box is sealed with packing tape. (C) shows the location of the Model number, Quantity, and Inspection date.
4. Weight is approximately 5.6 kg

■ Important Notices

The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the spec- ifications, characteristics, data, materials, structure, and other contents described herein at any time without no- tice in order to improve design or reliability. Manufactur- ing locations are also subject to change without notice.

Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(i) The devices in this publication are designed for use in general electronic equipment designs such as:

--- Personal computers
--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection

with equipment that requires higher reliability such as:

--- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connec- tion with equipment that requires an extremely high level of reliability and safety such as:

--- Space applications
--- Telecommunication equipment [trunk lines]
--- Nuclear power control equipment
--- Medical and other life support equipment (e.g., scuba).

If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

Contact and consult with a SHARP representative if there are any questions about the contents of this publi- cation.

TECHNICAL DATA MQ-2 GAS SENSOR

FEATURES

Wide detecting scope — Fast response and High sensitivity
Stable and long life — Simple drive circuit

APPLICATION

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, i-butane, propane, methane ,alcohol, Hydrogen, smoke.

SPECIFICATIONS

A. Standard work condition

Symbol	Parameter name	Technical condition	Remarks
Vc	Circuit voltage	5V±0.1	AC OR DC
V_H	Heating voltage	5V±0.1	ACOR DC
R_L	Load resistance	can adjust	
R_H	Heater resistance	33Ω±5%	Room Tem
P_H	Heating consumption	less than 800mw	

B. Environment condition

Symbol	Parameter name	Technical condition	Remarks
Tao	Using Tem	-20℃-50℃	
Tas	Storage Tem	-20℃-70℃	
R_H	Related humidity	less than 95%Rh	
O_2	Oxygen concentration	21%(standard condition)Oxygen concentration can affect sensitivity	minimum value is over 2%

C. Sensitivity characteristic

Symbol	Parameter name	Technical parameter	Remarks
Rs	Sensing Resistance	3KΩ-30KΩ (1000ppm iso-butane)	Detecting concentration scope : 200ppm-5000ppm LPG and propane 300ppm-5000ppm butane 5000ppm-20000ppm methane 300ppm-5000ppm H_2 100ppm-2000ppm Alcohol
α (3000/1000) isobutane	Concentration Slope rate	≤0.6	
Standard Detecting Condition	Temp: 20℃±2℃ Humidity: 65%±5%	Vc:5V±0.1 Vh: 5V±0.1	
Preheat time	Over 24 hour		

D. Structure and configuration, basic measuring circuit

	Parts	Materials
1	Gas sensing layer	SnO_2
2	Electrode	Au
3	Electrode line	Pt
4	Heater coil	Ni-Cr alloy
5	Tubular ceramic	Al_2O_3
6	Anti-explosion network	Stainless steel gauze (SUS316 100-mesh)
7	Clamp ring	Copper plating Ni
8	Resin base	Bakelite
9	Tube Pin	Copper plating Ni

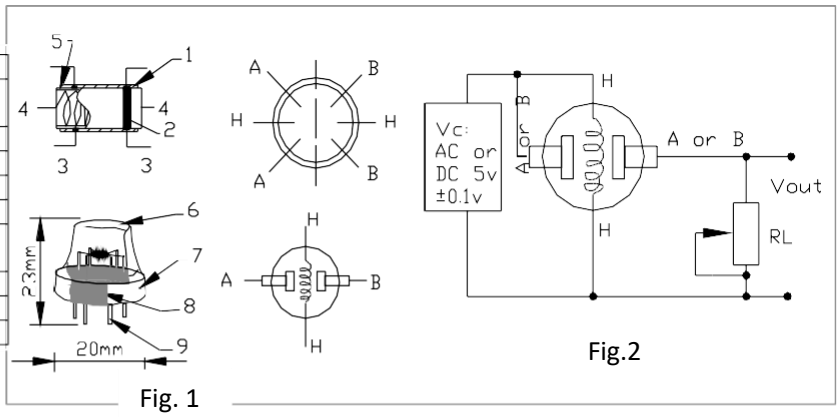
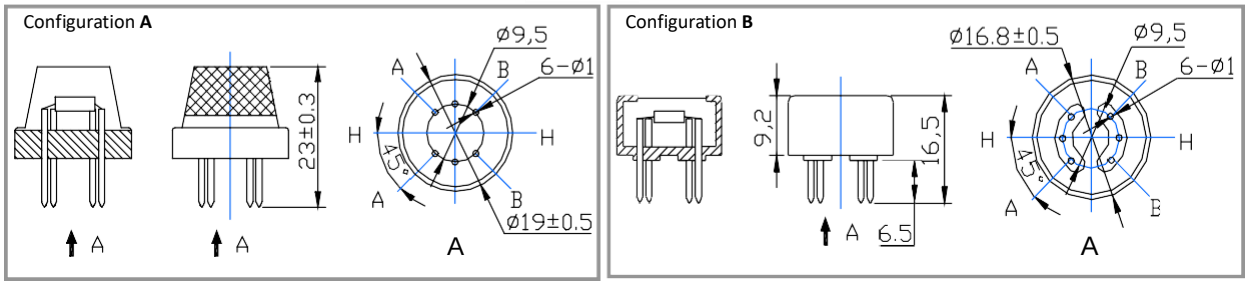


Fig. 1

Fig.2



Structure and configuration of MQ-2 gas sensor is shown as Fig. 1 (Configuration **A** or **B**), sensor composed by micro AL_2O_3 ceramic tube, Tin Dioxide (SnO_2) sensitive layer, measuring electrode and heater are fixed into

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.

Electric parameter measurement circuit is shown as Fig.2

A. Sensitivity characteristic curve

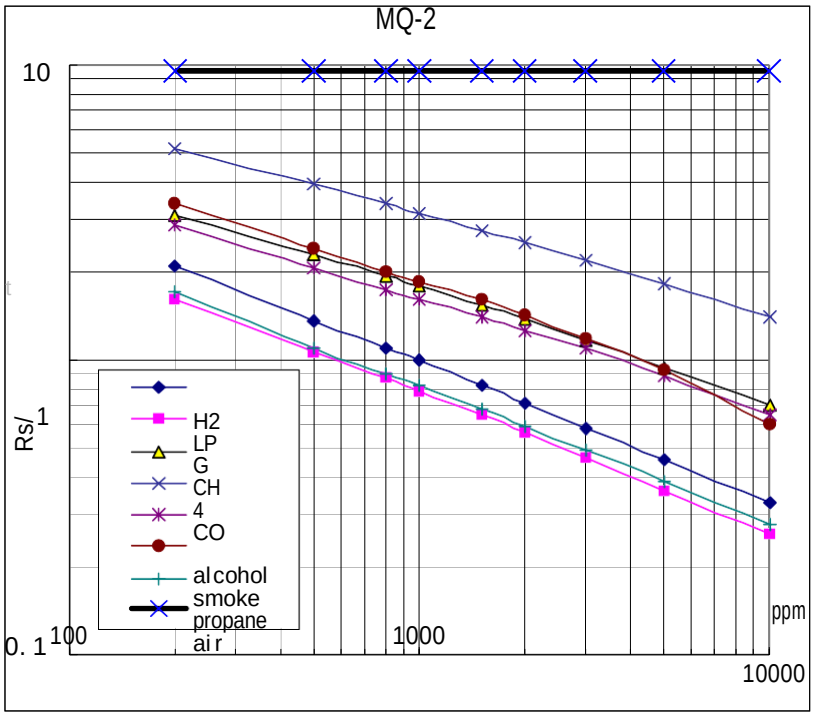


Fig.3 is shows the typical sensitivity characteristics of the MQ-2 for several gases.
in their: Temp: 20℃、
Humidity: 65%、

O_2 concentration 21%

RL=5kΩ

Ro: sensor resistance at 1000ppm of

H_2 in the clean air.

Rs:sensor resistance at various concentrations of gases.

Fig.2 sensitivity characteristics of the MQ-2

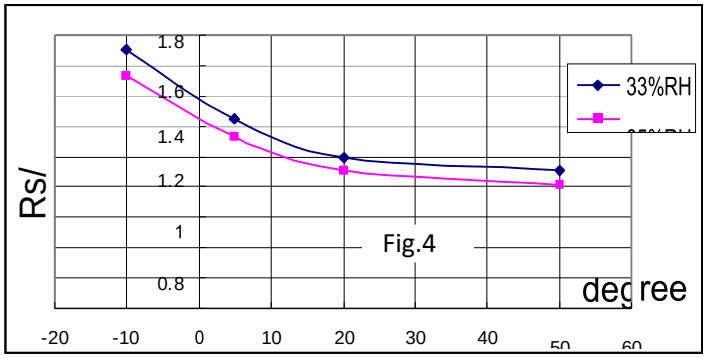


Fig.4 is shows the typical dependence of the MQ-2 on temperature and humidity.

Ro: sensor resistance at 1000ppm of H_2 in air at 33%RH and 20 degree.

Rs: sensor resistance at 1000ppm of H_2 at different temperatures and humidities.

SENSITVITY ADJUSTMENT

Resistance value of MQ-2 is difference to various kinds and various concentration gases. So,When using this components, sensitivity adjustment is very necessary. we recommend that you calibrate the detector for 1000ppm liquified petroleum gas<LPG>,or 1000ppm iso-butane<i-C_4H_{10}>concentration in air and use value of

Load resistance that(R_L) about 20 KΩ(5KΩ to 47 KΩ).

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

DAFTAR RIWAYAT HIDUP

Riza Agung Firmansyah, lahir di Mojokerto, Jawa Timur pada tanggal 10 Januari 2000, anak kedua dari tiga bersaudara, dari pasangan Kukuh dan Heri . Bertempat tinggal di Dusun Dungus Kec Puri Kab Mojokerto, Jawa Timur. Dengan pendidikan formal yang pernah diikuti sebagai berikut:

1. Sekolah Dasar di SD Negeri Ketemasdungus Kabupaten Mojokerto lulus pada tahun 2012.
2. Sekolah Menengah Pertama di SMP Negeri 1 Puri Kabupaten Mojokerto lulus pada tahun 2015.
3. Sekolah Menengah Atas di SMA Negeri 1 Kutorejo lulus pada tahun 2018.
4. Mengikuti pendidikan D III Teknik Listrik Bandar Udara di Perguruan Tinggi Kedinasan Politeknik Penerbangan Surabaya dari tahun 2018 sampai dengan saat ini