BAB V
KESIMPULAN DAN SARAN

A. Kesimpulan

Dalam penelitian ini, telah berhasil dikembangkan prototipe sistem monitoring suhu dan kelembapan otomatis berbasis IoT yang diterapkan di Terminal 1 Bandara Internasional Juanda Surabaya. Sistem ini menggunakan mikrokontroler ESP32, sensor DHT22, sensor MQ-135, dan OLED LCD, terhubung dengan server cloud Blynk dan Google Spreadsheet. Hasilnya menunjukkan bahwa sistem mampu memonitor suhu secara real-time dan mencatat data suhu dengan akurasi yang baik berdasarkan hasil uji standar deviasi, serta memberikan notifikasi real-time saat suhu melebihi 25°C. Data yang terkumpul disimpan di server spreadsheet untuk analisis lebih lanjut, sehingga meningkatkan efisiensi operasional di terminal dan mendukung pengambilan keputusan berbasis data.

B. Saran

Adapun saran dari penelitian *Prototype* yang telah dibuat dan diuji guna keberlanjutan pengembangan dan penelitian lebih lanjut adalah sebagai berikut adalah sebagai berikut :

1. Meningkatkan fungsi alat monitoring, disarankan pengembangan dan penambahan perangkat *humidifier* HVAC yang terintegrasi dengan sistem monitoring control berbasis IoT.
2. Untuk meningkatkan efisiensi operasional dan kualitas layanan di Bandara Internasional Juanda Surabaya, kami menyarankan penerapan sistem otomatisasi berbasis IoT yang terintegrasi. Sistem ini akan memantau parameter lingkungan seperti suhu, kelembapan, dan kualitas udara di seluruh area terminal, memungkinkan respons cepat terhadap perubahan kondisi dan mengurangi kebutuhan intervensi manual.

3. Disarankan agar sistem ini diawasi dan dievaluasi secara teratur untuk memastikan data yang dihasilkannya akurat dan andal serta peningkatan dalam kualitas material yang dipakai seperti kabel, *case* dan peralatan elektronika lainnya demi menunjang umur dan daya tahan *Prototype* yang dibuat.
4. Untuk mengembangkan prototype ini sesuai dengan skala teknis dan konstruksi industri seperti yang dijelaskan di bab 4, tingkatkan akurasi dan stabilitas sensor, integrasikan dengan platform IoT untuk monitoring yang lebih baik, dan gunakan protokol komunikasi yang sesuai. Selain itu, tingkatkan software dan otomatisasi data untuk meningkatkan keamanan dan memudahkan penggunaan.

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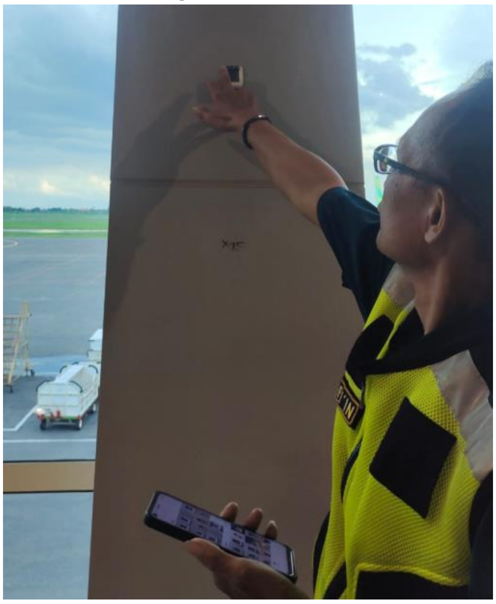
LAMPIRAN

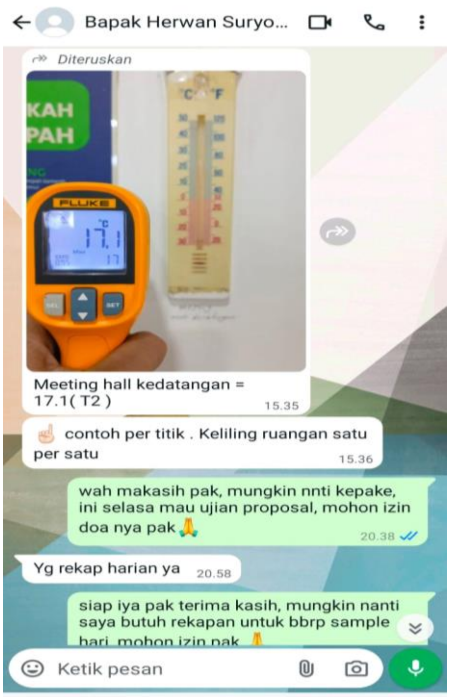
Lampiran 1. Dokumentasi Kegiatan Penulis di Bandar Udara Internasional Juanda Surabaya.

<table>
<tr><th>No</th><th>Kegiatan</th></tr>
<tr><td>1</td><td>Melakukan pengukuran temperatur pada diffuser HVAC
</td></tr>
<tr><td>2</td><td>Kegiatan Monitoring harian bersama Teknisi
</td></tr>
</table>

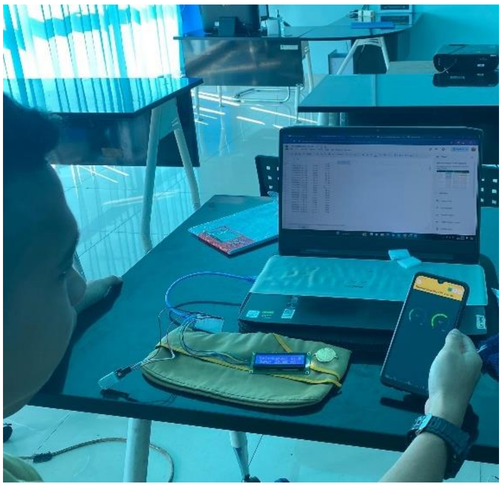
3	Perbaikan *ducting* AHU bahan seng BJLS dan bahan PU 
5	Perbaikan isolasi *Jacketing* pipa *chilled water* diatas plafon  Sesudah Kegiatan Revitalisasi

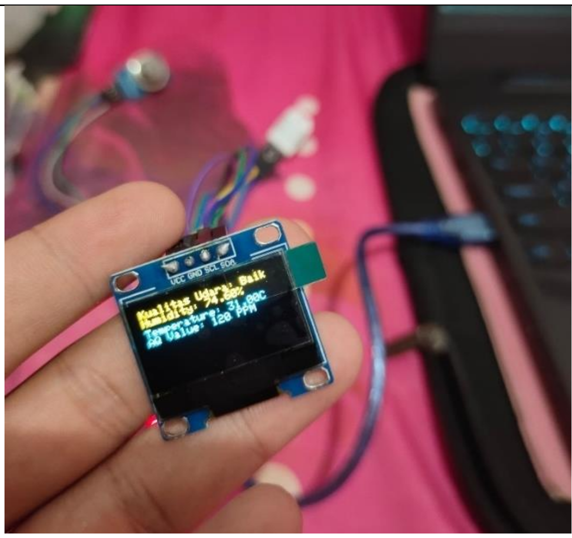
	

Lampiran 2. Dokumentasi Wawancara dan Bimbingan Penelitian Terkait

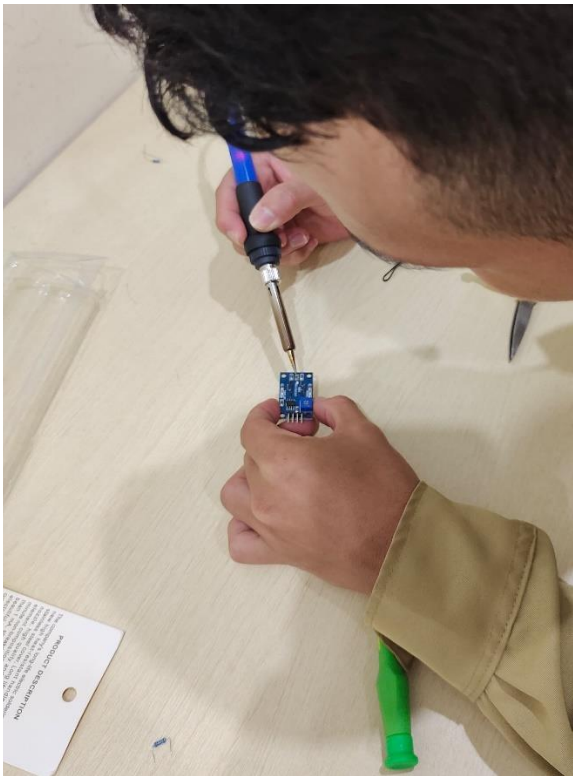
No	Kegiatan
1	Wawancara dan Tanya Tawab Akademis  
2	Chat dan Bimbingan mengenai judul terhadap pihak ahli bandara terkait 

Lampiran 3. Tahap Percobaan dan Perancangan *Prototype* Alat Monitoring.

No	Kegiatan
1	Integrasi *Blynk* dan Sensor DHT-22 
2	Integrasi *Server Blynk*, LCD dengan *Server Spreadsheet* 
3	Penambahan Fitur MQ-135 dan Pembaharuan LCD OLED a. Penggantian LCD menggunakan OLED IC2



b. Kalibrasi MQ-135



5	Integrasi Untuk 2 *Device Sensor* 
6	Pembuatan *Cover* dan *Body* Alat 

Lampiran 4. Tahap Pengujian *Prototype* Alat Monitoring.

No	Jenis Kegiatan
1	Kegiatan Pengukuran Suhu Sesuai Jam Acuan *Device* A  *Device* B 
2	kegiatan Pengukuran Keandalan sistem alat dengan alat acuan. A. Dokumentasi Pengukuran Alat

b. Dokumentasi Kegiatan Pencatatan Data Pengukuran

Lampiran 5. Kegiatan Bimbingan Tugas Akhir Selama Proses Penelitian.

a. Kegiatan Bimbingan Dosen Pembimbing 1

b. Kegiatan Bimbingan Dosen Pembimbing 2

Lampiran 6. Data*sheet* Komponen dan Peralatan *Prototype*

DHT22 *DATASHEET COMPONENT*

Aosong Electronics Co.,Ltd

Your specialist in innovating humidity & temperature sensors

1. Feature & Application:

* Full range temperature compensated * Relative humidity and temperature measurement
* Calibrated digital signal *Outstanding long-term stability *Extra components not needed
* Long transmission distance * Low power consumption *4 pins packaged and fully interchangeable

2. Description:

DHT22 output calibrated digital signal. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability.Its sensing elements is connected with 8-bit single-chip computer.

Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of programme in OTP memory, when the sensor is detecting, it will cite coefficient from memory.

Small size & low consumption & long transmission distance(20m) enable DHT22 to be suited in all kinds of harsh application occasions.

Single-row packaged with four pins, making the connection very convenient.

3. Technical Specification:

Model	DHT22
Power supply	3.3-6V DC
Output signal	digital signal via single-bus
Sensing element	Polymer capacitor
Operating range	humidity 0-100%RH; temperature -40~80Celsius
Accuracy	humidity +-2%RH(Max +-5%RH); temperature <+-0.5Celsius
Resolution or sensitivity	humidity 0.1%RH; temperature 0.1Celsius
Repeatability	humidity +-1%RH; temperature +-0.2Celsius
Humidity hysteresis	+-0.3%RH
Long-term Stability	+-0.5%RH/year
Sensing period	Average: 2s
Interchangeability	fully interchangeable
Dimensions	small size 14*18*5.5mm; big size 22*28*5mm

4. Dimensions: (unit----mm)

1) Small size dimensions: (unit----mm)

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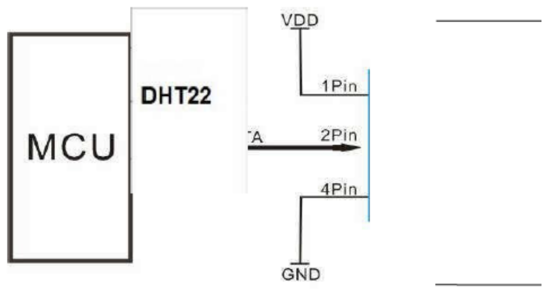
5. Electrical connection diagram:



3Pin---NC, AM2302 is another name for DHT22

6. Operating specifications:

(1) Power and Pins

Power's voltage should be 3.3-6V DC. When power is supplied to sensor, don't send any instruction to the sensor within one second to pass unstable status. One capacitor valued 100nF can be added between VDD and GND for wave filtering.

(2) Communication and signal

Single-bus data is used for communication between MCU and DHT22, it costs 5mS for single time communication.

Data is comprised of integral and decimal part, the following is the formula for data.

DHT22 send out higher data bit firstly!

DATA=8 bit integral RH data+8 bit decimal RH data+8 bit integral T data+8 bit decimal T data+8 bit check-sum If the data transmission is right, check-sum should be the last 8 bit of "8 bit integral RH data+8 bit decimal RH data+8 bit integral T data+8 bit decimal T data".

When MCU send start signal, DHT22 change from low-power-consumption-mode to running-mode. When MCU finishs sending the start signal, DHT22 will send response signal of 40-bit data that reflect the relative humidity

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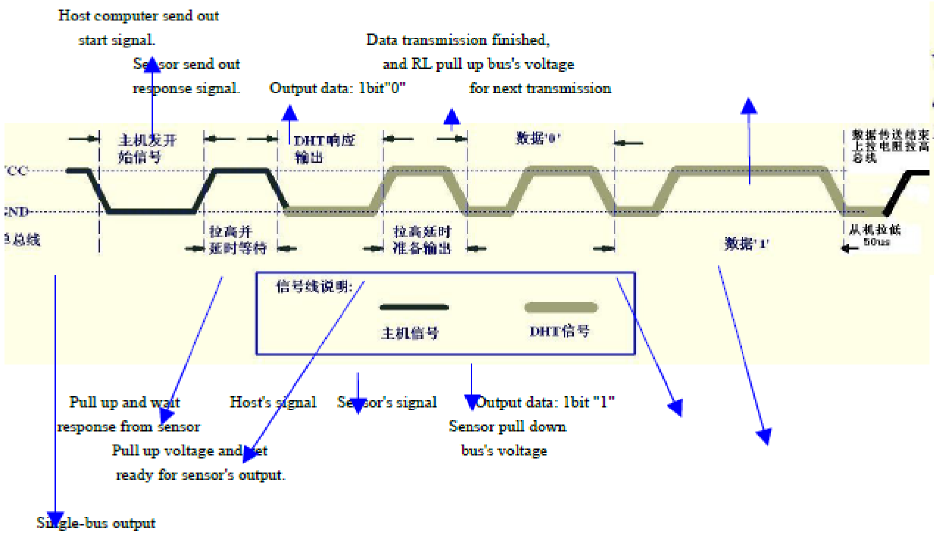
and temperature information to MCU. Without start signal from MCU, DHT22 will not give response signal to MCU. One start signal for one time's response data that reflect the relative humidity and temperature information from DHT22. DHT22 will change to low-power-consumption-mode when data collecting finish if it don't receive start signal from MCU again.

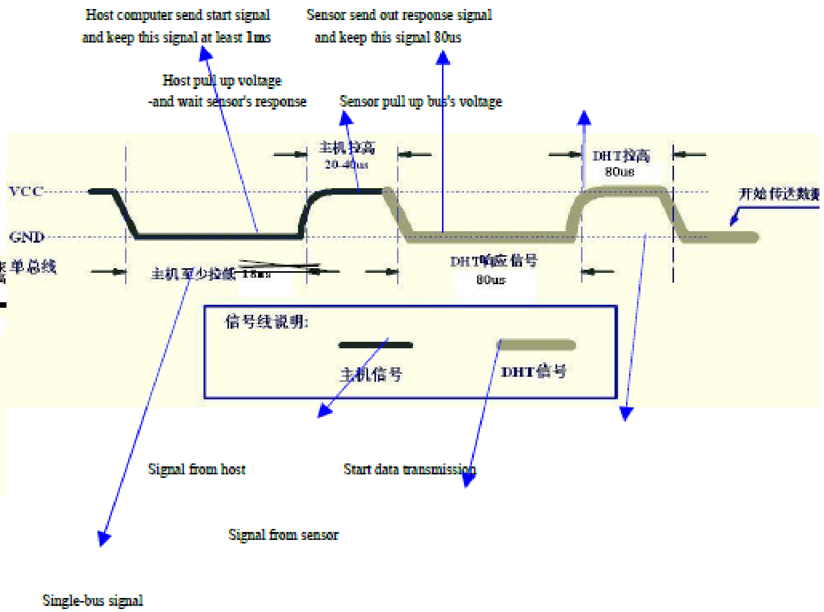
1) Check bellow picture for overall communication process:



2) Step 1: MCU send out start signal to DHT22

Data-bus's free status is high voltage level. When communication between MCU and DHT22 begin, program of MCU will transform data-bus's voltage level from high to low level and this process must beyond at least 1ms to ensure DHT22 could detect MCU's signal, then MCU will wait 20-40us for DHT22's response.

Check bellow picture for step 1:



Step 2: DHT22 send response signal to MCU

When DHT22 detect the start signal, DHT22 will send out low-voltage-level signal and this signal last 80us as response signal, then program of DHT22 transform data-bus's voltage level from low to high level and last 80us for DHT22's preparation to send data.

Check bellow picture for step 2:

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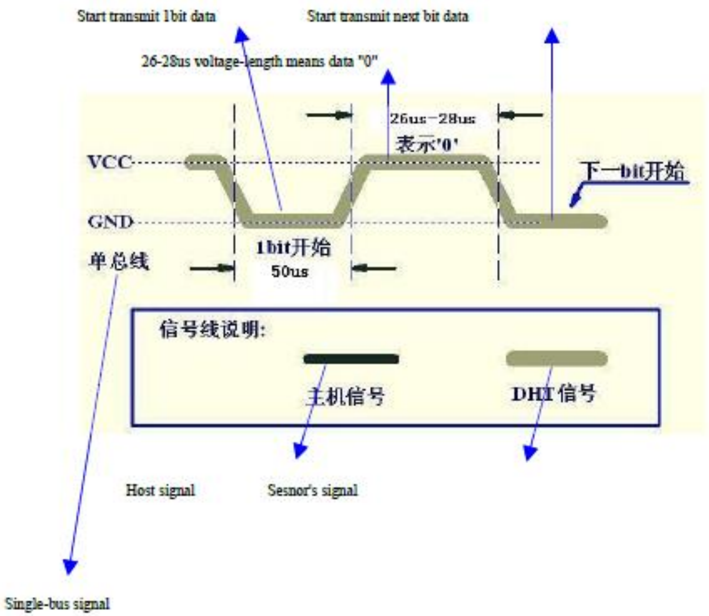

Step 3: DHT22 send data to MCU

When DHT22 is sending data to MCU, every bit's transmission begin with low-voltage-level that last 50us, the following high-voltage-level signal's length decide the bit is "1" or "0".

Check bellow picture for step 3:

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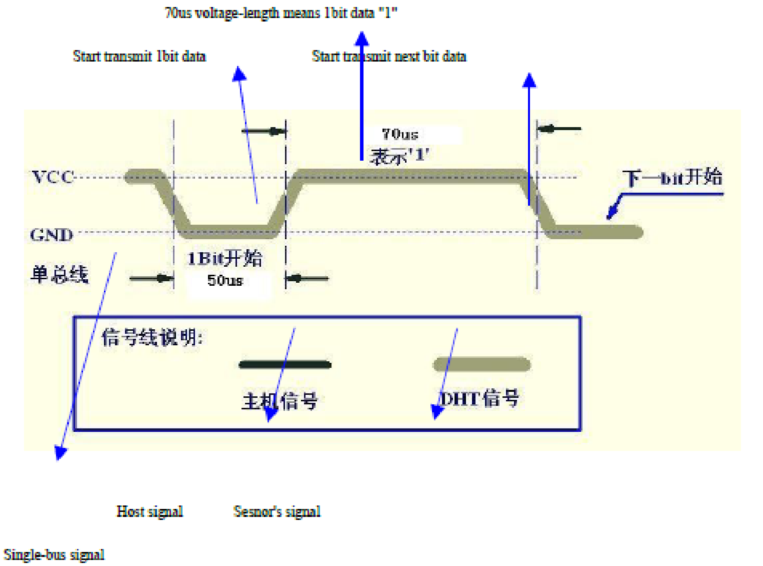

If signal from DHT22 is always high-voltage-level, it means DHT22 is not working properly, please check the electrical connection status.

7. Electrical Characteristics:

Item	Condition	Min	Typical	Max	Unit
Power supply	DC	3.3	5	6	V
Current supply	Measuring	1		1.5	mA
	Stand-by	40	Null	50	uA
Collecting period	Second		2		Second

*Collecting period should be : >2 second.

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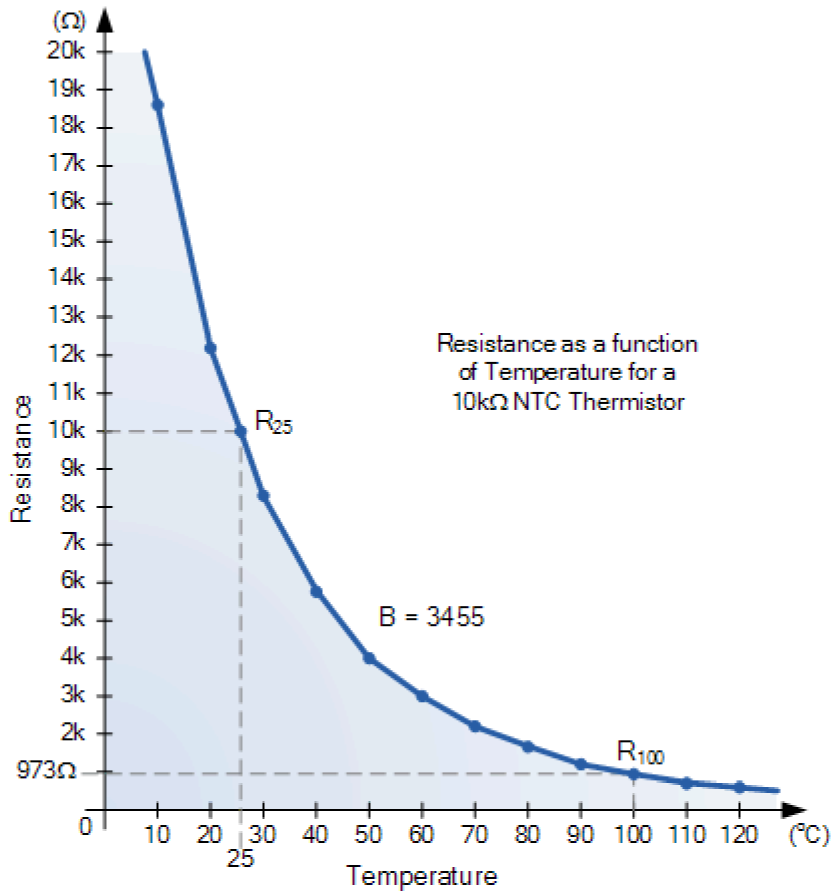
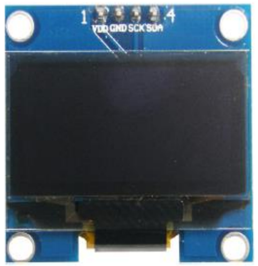
NTC Thermisthor Chart

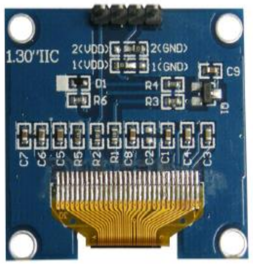


OLED LCD I2C *DATASHEET*

A guide of Module OLED Model. OLED 1.3 I2C

ETT





SPECIFICATIONS

- Use CHIP No.SH1106
- Use 3.3V-5V POWER SUPPLY
- Graphic LCD 1.3" in width with 128x64 Dot Resolution
- White Display is used for the model **OLED 1.3 I2C WHITE** and blue Display is used for the model **OLED 1.3 I2C BLUE**
- Use I2C Interface
- Directly connect signal to Microcontroller 3.3V and 5V without connecting through Voltage Regulator Circuit
- Total Current when running together is 8 mA
- PCB Size: 33.7 mm x 35.5 mm

Table shows name and function of Pin OLED

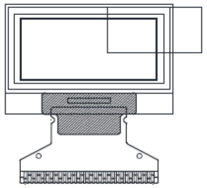
Pin No.	Pin Name	Description
1	VDD	Pin Power Supply for LCD, using 3.3V-5V
2	GND	Pin Ground
3	SCK	Pin SCL of I2C Interface
4	SDA	Pin SDA of I2C Interface

VISHAY. www.vishay.com

OLED-128O064D-BPP3N00000

Vishay

128 x 64 Graphic OLED



FEATURES

- Type: graphic
- Display format: 128 x 64 dots
- Built-in controller: SSD1306BZ
- Duty cycle: 1/64
- +3 V power supply
- Interface: 6800, 8080, serial, and I^2C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

MECHANICAL DATA

ITEM	STANDARD VALUE	UNIT
Module dimension	26.7 x 19.26 x 1.65	mm
Viewing area	23.938 x 12.058	
Active area	21.738 x 10.858	
Dot size	0.148 x 0.148	
Dot pitch	0.17 x 0.17	
Mounting hole	n/a	

ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	STANDARD VALUE		UNIT
		MIN.	MAX.	
Supply voltage for logic (1)(2)	V_{DD}	0	4	V
Supply voltage for display (1)(2)	V_{CC}	0	15	
Operating temperature	T_{OP}	-40	+80	°C
Storage temperature	T_{STG}	-40	+80	

Notes

(1) All the above voltages are on the basis of "V_{SS} = 0 V".

(2) When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to section 6 "Electrical Characteristics". If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply voltage for logic	V_{DD}	-	2.8	3.0	3.3	V
Supply voltage for display	V_{CC}	-	10	12	15	
Input high voltage	V_{IH}	-	0.8 V_{DD}	-	$V_{DDI/O}$	
Input low voltage	V_{IL}	-	0	-	0.2 V_{DD}	
Output high voltage	V_{OH}	-	0.9 V_{DD}	-	$V_{DDI/O}$	
Output low voltage	V_{OL}	-	0	-	0.1 V_{DD}	
50 % check board operating current	I_{CC}	V_{CC} = 12 V	9	10	12	mA

OPTIONS

EMITTING COLOR				
YELLOW	GREEN	RED	BLUE	WHITE
-	-	-	Yes	-

For technical questions, contact: displays@vishay.com

ESP32 *DATASHEET*

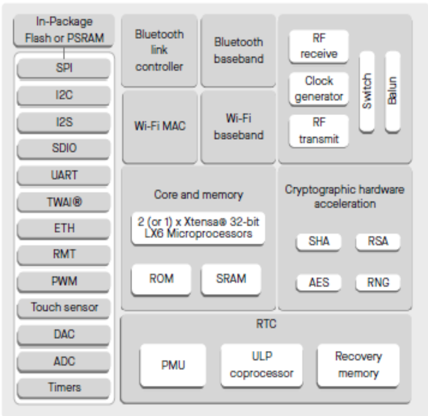
ESP32 is a single 2.4 GHz Wi-Fi-and-Bluetooth combo chip designed with the TSMC low-power 40 nm technology. It is designed to achieve the best power and RF performance, showing robustness, versatility and reliability in a wide variety of applications and power scenarios.

The ESP32 series of chips includes ESP32-D0WD-V3, ESP32-D0WDR2-V3, ESP32-U4WDH, ESP32-S0WD (NRND), ESP32-D0WDQ6-V3 (NRND), ESP32-D0WD (NRND), and ESP32-D0WDQ6 (NRND), among which,

- ESP32-S0WD (NRND), ESP32-D0WD (NRND), and ESP32-D0WDQ6 (NRND) are based on chip revision v1 or chip revision v1.1.
- ESP32-D0WD-V3, ESP32-D0WDR2-V3, ESP32-U4WDH, and ESP32-D0WDQ6-V3 (NRND) are based on chip revision v3.0 or chip revision v3.1.

For details on part numbers and ordering information, please refer to Section 1 ESP32 Series Comparison. For details on chip revisions, please refer to *ESP32 Chip Revision v3.0 User Guide* and *ESP32 Series SoC Errata*.

The functional block diagram of the SoC is shown below.



ESP32 Functional Block Diagram

Features

Wi-Fi

- 802.11b/g/n
- 802.11n (2.4 GHz), up to 150 Mbps
- WMM
- TX/RX A-MPDU, RX A-MSDU
- Immediate Block ACK
- Defragmentation
- Automatic Beacon monitoring (hardware TSF)
- Four virtual Wi-Fi interfaces
- Simultaneous support for Infrastructure Station, SoftAP, and Promiscuous modes
  Note that when ESP32 is in Station mode, performing a scan, the SoftAP channel will be changed.
- Antenna diversity

Bluetooth®

- Compliant with Bluetooth v4.2 BR/EDR and Bluetooth LE specifications
- Class-1, class-2 and class-3 transmitter without external power amplifier
- Enhanced Power Control
- +9 dBm transmitting power
- NZIF receiver with –94 dBm Bluetooth LE sensitivity
- Adaptive Frequency Hopping (AFH)
- Standard HCI based on SDIO/SPI/UART
- High-speed UART HCI, up to 4 Mbps
- Bluetooth 4.2 BR/EDR and Bluetooth LE dual mode controller
- Synchronous Connection-Oriented/Extended (SCO/eSCO)
- CVSD and SBC for audio codec
- Bluetooth Piconet and Scatternet
- Multi-connections in Classic Bluetooth and Bluetooth LE
- Simultaneous advertising and scanning

CPU and Memory

- Xtensa® single-/dual-core 32-bit LX6 microprocessor(s)
- CoreMark® score:
  - 1 core at 240 MHz: 504.85 CoreMark; 2.10 CoreMark/MHz

- 2 cores at 240 MHz: 994.26 CoreMark; 4.14 CoreMark/MHz

- 448 KB ROM
- 520 KB SRAM
- 16 KB SRAM in RTC
- QSPI supports multiple flash/SRAM chips

Clocks and Timers

- Internal 8 MHz oscillator with calibration
- Internal RC oscillator with calibration
- External 2 MHz ~ 60 MHz crystal oscillator (40 MHz only for Wi-Fi/Bluetooth functionality)
- External 32 kHz crystal oscillator for RTC with calibration
- Two timer groups, including 2 × 64-bit timers and 1 × main watchdog in each group
- One RTC timer
- RTC watchdog

Advanced Peripheral Interfaces

- 34 programmable GPIOs
  - Five strapping GPIOs
  - Six input-only GPIOs
  - Six GPIOs needed for in-package flash/PSRAM (ESP32-D0WDR2-V3, ESP32-U4WDH)
- 12-bit SAR ADC up to 18 channels
- Two 8-bit DAC
- 10 touch sensors
- Four SPI interfaces
- Two I2S interfaces
- Two I2C interfaces
- Three UART interfaces
- One host (SD/eMMC/SDIO)
- One slave (SDIO/SPI)
- Ethernet MAC interface with dedicated DMA and IEEE 1588 support
- TWAI®, compatible with ISO 11898-1 (CAN Specification 2.0)
- RMT (TX/RX)
- Motor PWM
- LED PWM up to 16 channels

Power Management

- Fine-resolution power control through a selection of clock frequency, duty cycle, Wi-Fi operating modes, and individual power control of internal components
- Five power modes designed for typical scenarios: Active, Modem-sleep, Light-sleep, Deep-sleep, Hibernation
- Power consumption in Deep-sleep mode is 10 μA
- Ultra-Low-Power (ULP) coprocessors
- RTC memory remains powered on in Deep-sleep mode

Security

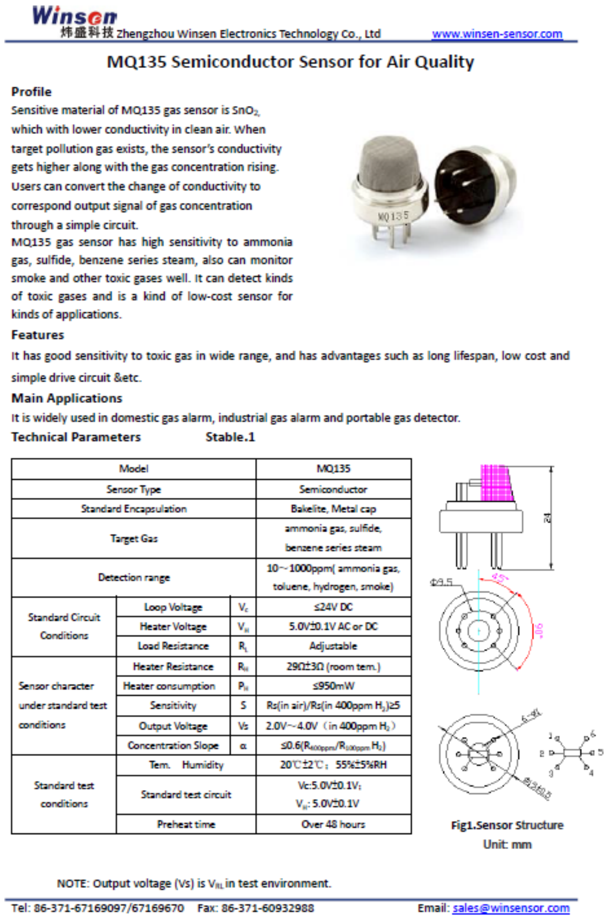
- Secure boot
- Flash encryption
- 1024-bit OTP, up to 768-bit for customers
- Cryptographic hardware acceleration:
  - AES
  - Hash (SHA-2)
  - RSA
  - ECC
  - Random Number Generator (RNG)

Applications

With low power consumption, ESP32 is an ideal choice for IoT devices in the following areas:

- Smart Home
- Industrial Automation
- Health Care
- Consumer Electronics
- Smart Agriculture
- POS machines
- Service robot
- Audio Devices
- Generic Low-power IoT Sensor Hubs
- Generic Low-power IoT Data Loggers
- Cameras for Video Streaming
- Speech Recognition
- Image Recognition
- SDIO Wi-Fi + Bluetooth Networking Card
- Touch and Proximity Sensing

MQ-135 *DATASHEET*



Winsen 炜盛科技 Zhengzhou Winsen Electronics Technology Co., Ltd www.winsen-sensor.com

MQ135 Semiconductor Sensor for Air Quality

Profile

Sensitive material of MQ135 gas sensor is SnO_2, which with lower conductivity in clean air. When target pollution gas exists, the sensor's conductivity gets higher along with the gas concentration rising. Users can convert the change of conductivity to correspond output signal of gas concentration through a simple circuit.

MQ135 gas sensor has high sensitivity to ammonia gas, sulfide, benzene series steam, also can monitor smoke and other toxic gases well. It can detect kinds of toxic gases and is a kind of low-cost sensor for kinds of applications.

Features

It has good sensitivity to toxic gas in wide range, and has advantages such as long lifespan, low cost and simple drive circuit &etc.

Main Applications

It is widely used in domestic gas alarm, industrial gas alarm and portable gas detector.

Technical Parameters **Stable.1**

Model			MQ135
Sensor Type			Semiconductor
Standard Encapsulation			Bakelite, Metal cap
Target Gas			ammonia gas, sulfide, benzene series steam
Detection range			10~1000ppm(ammonia gas, toluene, hydrogen, smoke)
Standard Circuit Conditions	Loop Voltage	V_c	≤24V DC
	Heater Voltage	V_H	5.0V±0.1V AC or DC
	Load Resistance	R_L	Adjustable
Sensor character under standard test conditions	Heater Resistance	R_H	29Ω±3Ω (room tem.)
	Heater consumption	P_H	≤950mW
	Sensitivity	S	Rs(in air)/Rs(in 400ppm H_2)≥5
	Output Voltage	Vs	2.0V~4.0V (in 400ppm H_2)
	Concentration Slope	α	≤0.6(R_{400ppm}/R_{100ppm} H_2)
Standard test conditions	Tem. Humidity		20℃±2℃; 55%±5%RH
	Standard test circuit		Vc:5.0V±0.1V; V_H: 5.0V±0.1V
	Preheat time		Over 48 hours

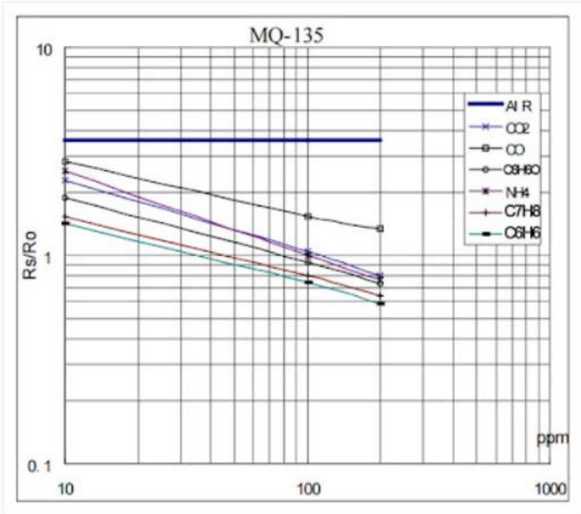
Fig1.Sensor Structure
Unit: mm

NOTE: Output voltage (Vs) is V_{RL} in test environment.

Tel: 86-371-67169097/67169670 Fax: 86-371-60932988 Email: sales@winsensor.com

Rs = Sensor resistance in fresh air at various temperatures/humidities Ro = Sensor resistance in fresh air at 20°C and 65% R.H. * Indoor air quality monitors. * Air cleaners.

As a reference, let's consider the MQ135 sensor (again).
We will look at the "*sensitivity characteristics of the MQ-135*" figure of the datasheet.



Notice that it's a log-log plot, this means that is has logarithmic scales on both axes.
Another thing to notice, is that the y-axis is for *Rs/Ro*, it will be much clearer if we impose *ppm* on the y-axis.
So as a first step, we will **flip the axis**.
As a reference, above we will see a flip axis example

Lampiran 7. Hasil Bimbingan Tugas Akhir.

a. Bimbingan Dosen Pembimbing 1

POLITEKNIK PENERBANGAN PALEMBANG
PROGRAM STUDI
TEKNOLOGI REKAYASA BANDAR UDARA
PROGRAM SARJANA TERAPAN

LEMBAR BIMBINGAN TUGAS AKHIR
TAHUN AKADEMIK 2023/2024

Nama Taruna : M. Fattar Habillah
NIT : 56192010014
Course : TR01 A
Judul TA : Merancang sistem Monitoring Temperature, Density dan Data Collection Otomatis Berbasis IoT Untuk Mengevaluasi Kapasitas Beban Pendinginan di Bandara Internasional Juanda Surabaya
Dosen Pembimbing : Bapak Sukahir S.Si.T., M.T

No	Tanggal	Uraian	Paraf Pembimbing
1	Jumat 17/5 2024	- Perbaikan latar belakang - Rumusan masalah lebih fokus	
2	Senin 27/5 2024	- Lanjutkan BAB II - Tujuan [illegible] lebih sederhana	
3	Kamis 20/6 2024	- Lanjut BAB III -	
4	Senin 24/6 2024	- Gunakan referensi [illegible] edisi - [illegible] kesimpulan	
5	Jumat 28/6 2024	- Lanjut BAB IV - pembahasan lebih detail	
6	Selasa 2/7 2024	- Lanjut BAB V	
7	Minggu 7/7 2024	- Perbaikan daftar isi - perbaiki kesimpulan.	
8	Jumat 19/7 2024	- Siap [illegible] seluruhnya	

Mengetahui,
Ketua Program Studi
Teknologi Rekayasa Bandar Udara

Ir. M. Indra Martadinata, S.ST., M.Si.
NIP. 19810306 200212 1 001

Dosen Pembimbing

Sukahir, S.Si.T., M.T.
NIP. 19740714 199803 1 001

b. Bimbingan Dosen Pembimbing 2

POLITEKNIK PENERBANGAN PALEMBANG
PROGRAM STUDI
TEKNOLOGI REKAYASA BANDAR UDARA
PROGRAM SARJANA TERAPAN

LEMBAR BIMBINGAN TUGAS AKHIR
TAHUN AKADEMIK 2023/2024

Nama Taruna : M. Fathar Habillah
NIT : 56192010019
Course : TRO1A
Judul TA : Merancang sistem Monitoring Temperature, Density dan Data Collection Otomatis Berbasis IoT Untuk Mengevaluasi Kapasitas Beban Pendinginan di Bandara Internasional Juanda Surabaya
Dosen Pembimbing : Bapak Surardi, S.T., M.Pd., M.T.

No	Tanggal	Uraian	Paraf Pembimbing
1	Jumat 31/5 24	latar belakang, rumusan masalah & batasan masalah (BAB I)	
2	Senin 3/5 24	- Penjelasan rangkaian (goal) yang akan dirancang - Perbaikan (BAB I)	
3	Senin 25/6 24	- Diskusikan pembahasan progress Bab IV	
4	Jumat 28/6 24	Metode & Progress Bab IV	
5	Selasa 9/7 24	Perbaikan & Pembahasan Bab IV	
6	Sabtu 13/7 24	Mekanisme Alat	
7	Selasa 16/7 24	Progress Mekanisme/Alur Kerja Alat	
8	Jumat 19/7 24	Pembahasan Bab V, Acc. TA. Pemeriksaan PPT	

Mengetahui,
Ketua Program Studi
Teknologi Rekayasa Bandar Udara

Ir. M. Indra Martadinata, S.ST., M.Si.
NIP. 19810306 200212 1 001

Dosen Pembimbing

Sunardi, S.T., M.Pd., M.T.
NIP. 19720217 199501 1 001

Lampiran 8. Hasil Validasi *Prototype* IoT untuk Monitoring Suhu, Kelembapan, dan Pengumpulan Data di Terminal Bandara Internasional Juanda Surabaya

a. Lembar Validator 1

LEMBAR VALIDASI AHLI ALAT

"RANCANGAN PROTOTYPE IOT UNTUK MONITORING SUHU, KELEMBAPAN, DAN PENGUMPULAN DATA DI TERMINAL BANDARA INTERNASIONAL JUANDA SURABAYA"

A. Identitas

Nama Validator : Sukahir, S.Si.T., M.T

Ahli Bidang : Teknik Navigasi Udara & Elektronika Pesawat

B. Tujuan

Lembar penilaian ini dimaksudkan untuk mendapatkan informasi mengenai kualitas Alat Prototype Iot Untuk Monitoring Suhu, Kelembapan, Dan Pengumpulan Data Di Terminal Bandara Internasional Juanda Surabaya.

C. Petunjuk Pengisian

1. Berilah tanda cek (√) pada kolom yang tersedia sesuai penilaian terhadap alat yang dikembangkan.
2. Kriteria penilaian terdiri dari
   5 = sangat baik
   4 = baik
   3 = cukup
   2 = kurang
   1 = sangat kurang

D. Tabel Penilaian

No	Kriteria Penilaian	Skor				
		1	2	3	4	5
1	Kesesuaian fitur dengan tujuan sistem *monitoring* dan integrasi server					√
2	Kemudahan penggunaan antarmuka (*user interface*) sistem			√		
3	Keakuratan data pengukuran suhu dan kelembapan yang terdeteksi				√	
4	Ketepatan penentuan peringatan dini kenaikan suhu					√
5	Kehandalan sistem Monitoring Kualitas Udara				√	
6	Kemampuan sistem Blynk dan Spreadsheet					√

7	Kemudahan *maintenance* dan *troubleshooting*					√
8	Potensi penerapan di Bandara Juanda Surabaya				√	
9	Kesesuaian pemilihan sensor suhu dan aksesoris pendukung					√
10	Kompatibilitas dengan sistem lain di bandara				√	

E. Komentar/Saran

....

....

....

....

....

F. Kesimpulan

Alat Prototype Iot Untuk Monitoring Suhu, Kelembapan, Dan Pengumpulan Data Di Terminal Bandara Internasional Juanda Surabaya ini dinyatakan:

1. Layak Digunakan
2. Layak digunakan dengan revisi sesuai saran
3. Tidak layak digunakan

Palembang, Juli 2024

Validator/Penilai

SUKAHIR, S.Si.T., M.T.

NIP. 19740714 199803 1 001

b. Lembar Validator 2

LEMBAR VALIDASI AHLI ALAT
"*RANCANGAN PROTOTYPE IOT UNTUK MONITORING SUHU, KELEMBAPAN, DAN PENGUMPULAN DATA DI TERMINAL BANDARA INTERNASIONAL JUANDA SURABAYA*"

A. Identitas

Nama Validator : Sunardi , S.T., M.Pd., M.T.
Ahli Bidang : Teknik Listrik Bandara & Elektronika Pesawat

B. Tujuan

Lembar penilaian ini dimaksudkan untuk mendapatkan informasi mengenai kualitas Alat Prototype Iot Untuk Monitoring Suhu, Kelembapan, Dan Pengumpulan Data Di Terminal Bandara Internasional Juanda Surabaya.

C. Petunjuk Pengisian

1. Berilah tanda cek (√) pada kolom yang tersedia sesuai penilaian terhadap alat yang dikembangkan.
2. Kriteria penilaian terdiri dari
   5 = sangat baik
   4 = baik
   3 = cukup
   2 = kurang
   1 = sangat kurang

D. Tabel Penilaian

No	Kriteria Penilaian	Skor				
		1	2	3	4	5
1	Kesesuaian fitur dengan tujuan sistem *monitoring* dan integrasi server				√	
2	Kemudahan penggunaan antarmuka (*user interface*) sistem				√	
3	Keakuratan data pengukuran suhu dan kelembapan yang terdeteksi				√	
4	Ketepatan penentuan peringatan dini kenaikan suhu					√
5	Kehandalan sistem Monitoring Kualitas Udara			√		
6	Kemampuan sistem Blynk dan Spreadsheet					√

7	Kemudahan *maintenance* dan *troubleshooting*					√
8	Potensi penerapan di Bandara Juanda Surabaya				√	
9	Kesesuaian pemilihan sensor suhu dan aksesoris pendukung				√	
10	Kompatibilitas dengan sistem lain di bandara				√	

E. Komentar/Saran

Untuk lebih sempurna perlu dilakukan perbaikan-perbaikan di bagian itu

F. Kesimpulan

Alat Prototype Iot Untuk Monitoring Suhu, Kelembapan, Dan Pengumpulan Data Di Terminal Bandara Internasional Juanda Surabaya ini dinyatakan:

1. Layak Digunakan
2. Layak digunakan dengan revisi sesuai saran (dilingkari)
3. Tidak layak digunakan

Palembang, Juli 2024

Validator/Penilai

SUNARDI, S.T., M.Pd., M.T

NIP. 19720217 199501 1001

$$\text{Nilai Rata-rata Keseluruhan} = \frac{(5+3+4+5+4+5+5+4+5+4)+(4+4+4+5+3+5+5+4+4+4)}{20}$$

$$\text{Nilai Rata-rata Keseluruhan} = \frac{(44)+(42)}{20}$$

$$\text{Nilai Rata-rata Keseluruhan} = \frac{86}{20}$$

Nilai Rata-rata Keseluruhan = 4,3 (Baik)

Lampiran 9. *SCAN* QR *MANUAL BOOK PROTOTYPE* ALAT

Lampiran 10. Hasil *Turnitin* Plagiasi Penelitian

PLAGIASI_TR01A_M. FATHAR HABILLAH_TUGAS AKHIR.pdf

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