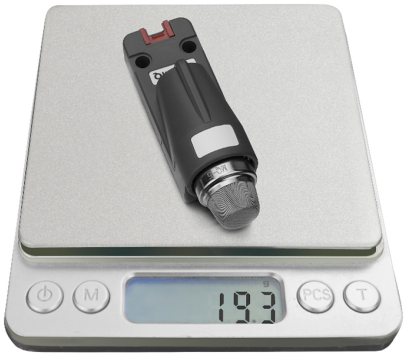
Unit MQ

SKU:U199



Description

Unit MQ is a combustible gas detection unit based on the semiconductor gas sensor (MQ-5), integrated with an MCU (STM32G030F6P6). It is mainly used for detecting combustible gases (such as propane, methane, etc.) in the environment. This unit communicates with various host devices via the I2C interface and can obtain internal reference voltage, sensor voltage, 12-bit and 8-bit ADC raw values, firmware version, thermistor temperature, and other information. It supports two heating modes to bring the sensor to the optimal operating temperature: continuous heating mode and intermittent heating mode. In continuous heating mode, the sensor heats up faster and responds with data more quickly. In intermittent heating mode, the heating cycle can be flexibly configured to optimize device power consumption. This product is suitable for various safety and monitoring applications such as smart homes, air quality detection, and industrial safety.

Features

- Built-in STM32 core controller
- I2C communication interface
- Supports detection of various combustible gases (such as LPG, methane, etc.)
- Supports two modes: continuous heating and intermittent heating with customizable periods
- Integrated thermistor for device temperature monitoring
- Readable internal reference voltage and sensor voltage
- Standard MQ sensor interface, compatible with multiple sensors (such as MQ-2, MQ-3, MQ-7, MQ-135, etc.)
- Development Platform:
  - Arduino
  - UiFlow2

Includes

- 1 x Unit MQ
- 1 x HY2.0-4P Grove Cable (20cm)

Applications

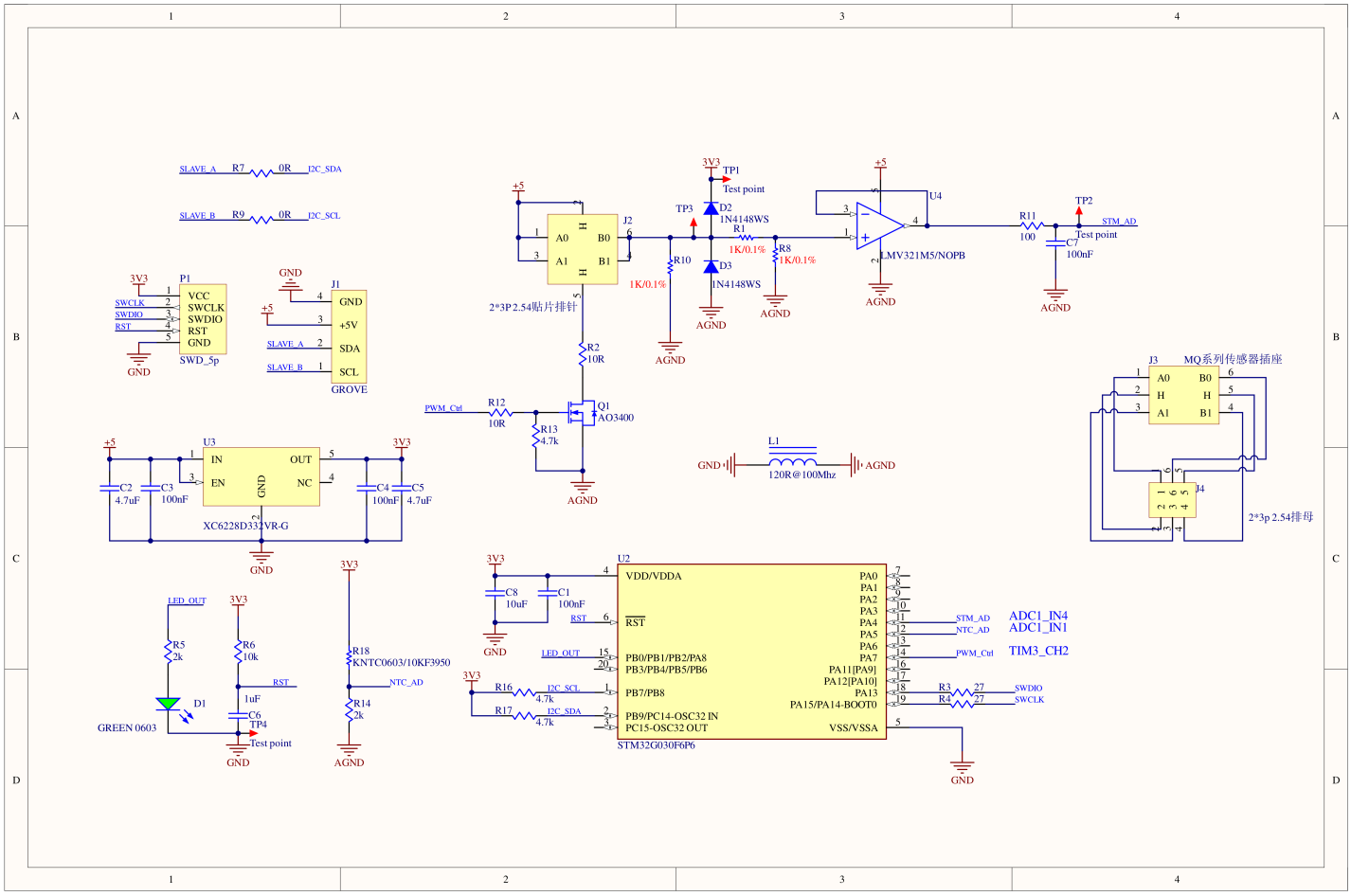
- Smart home
- Air quality detection
- Industrial safety

Specifications

Specification	Parameter
MCU	STM32G030F6P6@32-bit ARM Cortex-M0+ processor
Sensor	MQ-5 combustible gas sensor
Communication Interface	I2C @0x11, address configurable
Operating Current	Off mode: DC 5.02V@6.88mA Continuous heating mode: DC 5.05V@188.89mA
Detected Gases	LPG, methane
Detection Range	300 ~ 10000ppm (methane, propane)
Recommended Preheat Time in Continuous Heating Mode	20s
Product Size	64.0 x 24.0 x 25.0mm
Product Weight	19.3g
Package Size	138.0 x 93.0 x 25.0mm
Gross Weight	24.7g

Schematics

- Unit MQ Schematics PDF

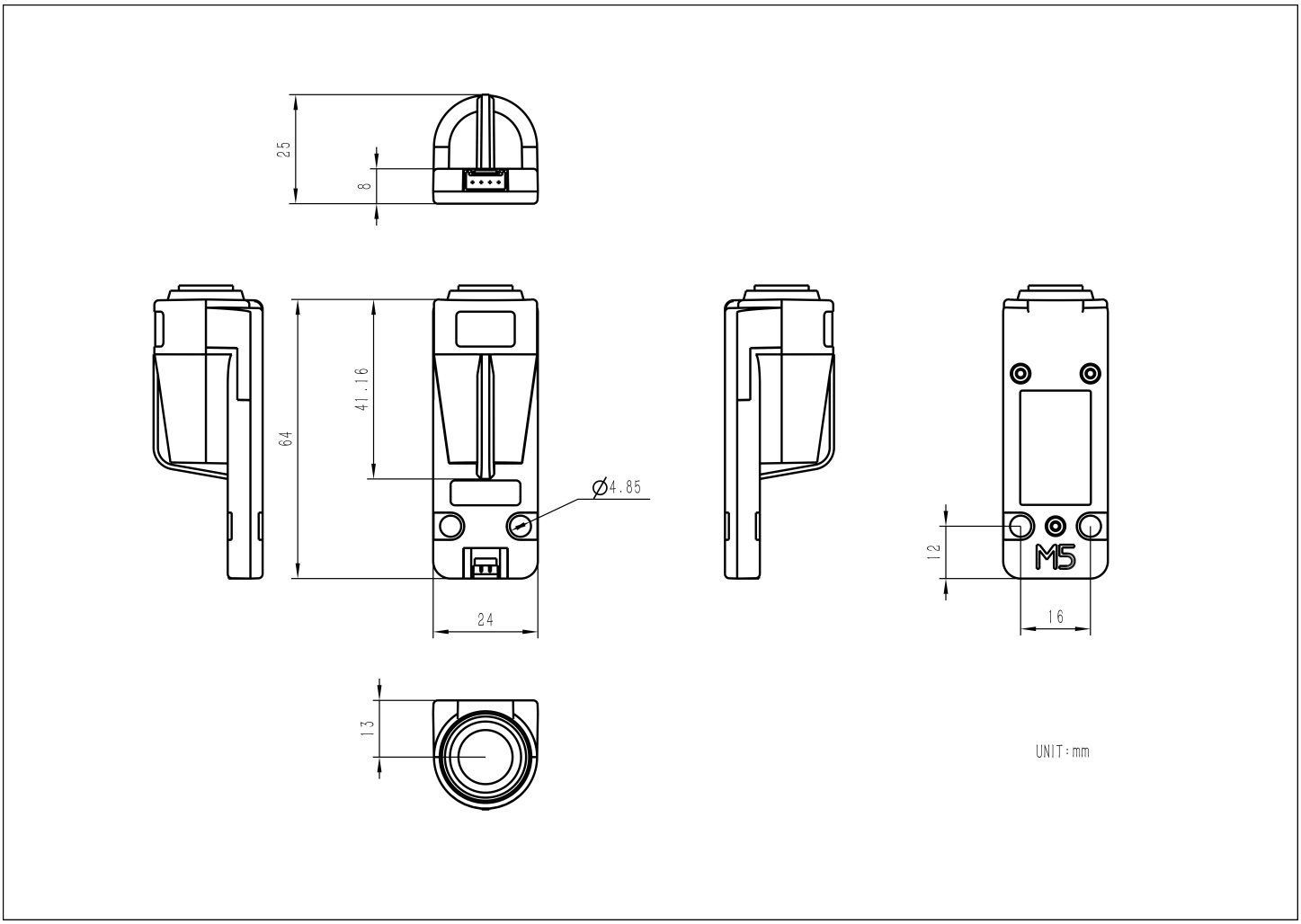


PinMap

HY2.0-4P	Black	Red	Yellow	White
PORT.A	GND	5V	SDA	SCL

Model Size

- Unit MQ Model Size PDF



Datasheets

- MQ-5 Datasheet

Softwares

Arduino

- Unit MQ Arduino Tutorial
- Unit MQ Arduino Driver Library

Internal Firmware

- Unit MQ Internal Firmware

Protocol

- Unit MQ I2C Protocol PDF

M5Stack Unit MQ I2C Protocol																		V1 (FW Version) 2025/5/8
REG MAP（Addr：0x11）		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	note
Config status	0x00 R/W	MQ Status	LED Status															MQ Status: MQ Working Status 0: OFF mode 1: Continuous heating mode 2: Pin-level switch mode default: 0 LED Status: LED Working Status 0: LED OFF 1: LED ON default: 0
MQ heating pin high and low time config	0x10 R/W	High level Time	Low level Time															High Level Time: High-level duration (30–255 s) default: 30 s Low Level Time: Low-level duration (5–255 s) default: 5 s
MQ ADC 8bits	0x20 R	ADC Value																ADC Value：0~255
MQ ADC 12bits	0x30 R	ADC Value-L	ADC Value-H															ADC Value：0~4095 ADC Value = (ADC Value-H << 8) | ADC Value-L)
MQ ADC valid tags	0x40 R	Valid Tags																Valid Tags: Whether the MQ ADC value is valid 0: Valid 1: Invalid
Internal NTC ADC 8bits	0x50 R	ADC Value																ADC Value：0~255
Internal NTC ADC 12bits	0x60 R	ADC Value-L	ADC Value-H															ADC Value：0~4095 ADC Value = (ADC Value-H << 8) | ADC Value-L)
NTC resistance value	0x70 R	NTC Resistance Value_L	NTC Resistance Value_H															NTC Resistance: Reflects real-time temperature variations. NTC Resistance = (NTC Resistance Value_H << 8) | NTC Resistance Value_L (unit: Ω)
ADC channel voltage value	0x80 R	Internal Reference Voltage_L	Internal Reference Voltage_H	MQ Voltage_L	MQ Voltage_H	NTC Voltage_L	NTC Voltage_H											Internal Reference Voltage = (Internal Reference Voltage_H << 8) | (Internal Reference Voltage_L) (unit: mV) MQ Voltage = (MQ Voltage_H << 8) | (MQ Voltage_L) (unit: mV) NTC Voltage = (NTC Voltage_H << 8) | (NTC Voltage_L) (unit: mV)
Firmware Version	0xF0 R															Version		Version：Software Version Number
I2C Address	0xF0 R/W																Address	Address：I2C device address value：0x08~0x77 default：0x11

Config status : Working Status Configuration
1. MQ work status
OFF mode: The heating pin remains LOW; the MQ sensor is not heated and does not operate, and Valid tags is always 0. (Example Fig. 1)
Continuous heating mode: The heating pin remains HIGH; the MQ sensor is continuously heated and stabilizes at about 55 °C (this refers to the temperature of the MQ sensor’s metal shell, not the internal device temperature). During the first 20 s after heating starts, data readings are unstable, so Valid tags is 0 and the data is invalid. After 20 s, the data becomes valid. (Example Fig. 2)
Pin-level switch mode: Requires configuring the HIGH-level time (0x10) and LOW-level time (0x11) (ensure the configuration is valid). In this mode the MQ sensor is intermittently heated by alternating the pin’s HIGH and LOW levels. During the HIGH-level period, data is unstable for the first 20 s; valid data is available only after those 20 s, meaning Valid tags becomes 1 only after 20 s. (Example Fig. 3, Fig. 4)
2. LED work status
LED OFF: The LED is disabled.
LED ON: The LED lights up when Valid tags indicates valid detection and turns off when invalid. While lit, the LED brightness is proportional to the detected ADC value—the higher the ADC value, the brighter the LED.

MQ heating pin high and low time config: This configuration applies only to the pin-level switch mode and must be set before enabling that mode; otherwise, it will not take effect.
High level time: Must be ≥ 30 s; shorter settings are invalid.
Low level time: Must be ≥ 5 s; shorter settings are invalid.

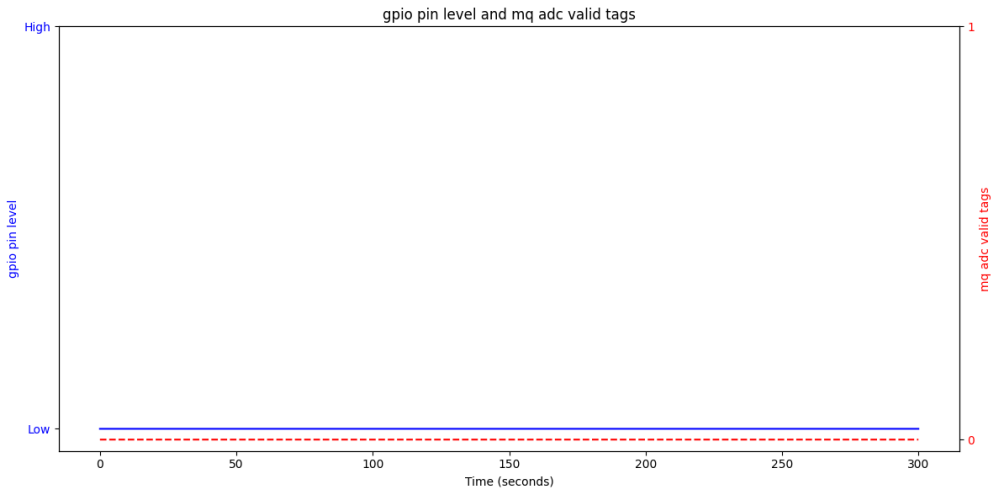
NTC resistance value: Returns the resistance of the NTC (unit: Ω).

ADC channel voltage value: Voltage of the ADC channels.
Internal Reference Voltage: The STM32 chip’s reference voltage is not always a stable 3.3 V. This value is the internally calibrated reference voltage; ADC conversions should be based on it to ensure measurement accuracy.
MQ Voltage: Voltage value calibrated with the internal reference voltage, indicating the actual MQ sensor voltage.
NTC Voltage: Voltage value calibrated with the internal reference voltage, indicating the actual NTC voltage.

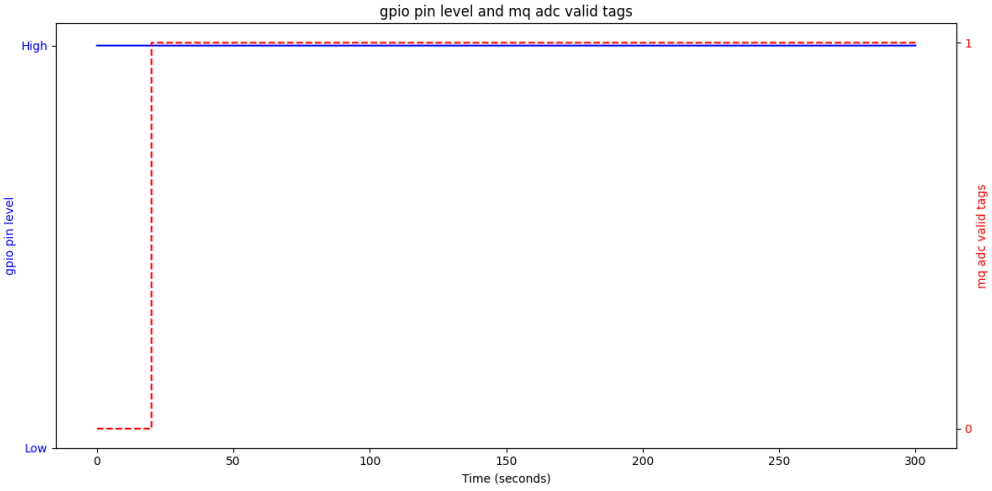
I2C Address: After a successful change the new address takes effect immediately, is stored in internal flash, and is retained after power-off (this operation is time-consuming and erases flash; avoid frequent changes. Allow a 20 ms delay after use).

Data Valid Flag and Control Pin Level States in Different Modes

- **Off Mode**:



- **Continuous Heating Mode**:



- **Intermittent Heating Mode** (In the following Figure 1 and Figure 2, the high/low level time of the control pin is different, but the data valid flag becomes effective after 20s of continuous high level, and becomes invalid immediately after switching to low level):

Figure 1:

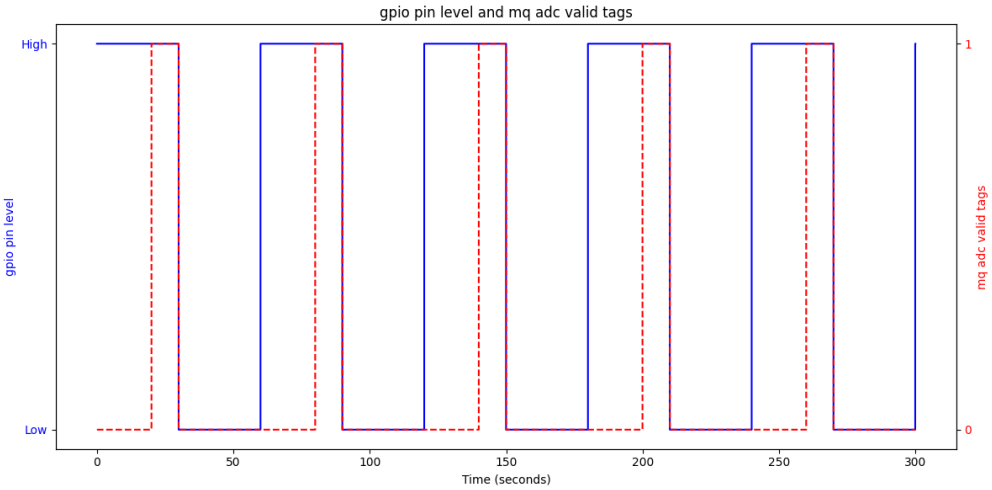
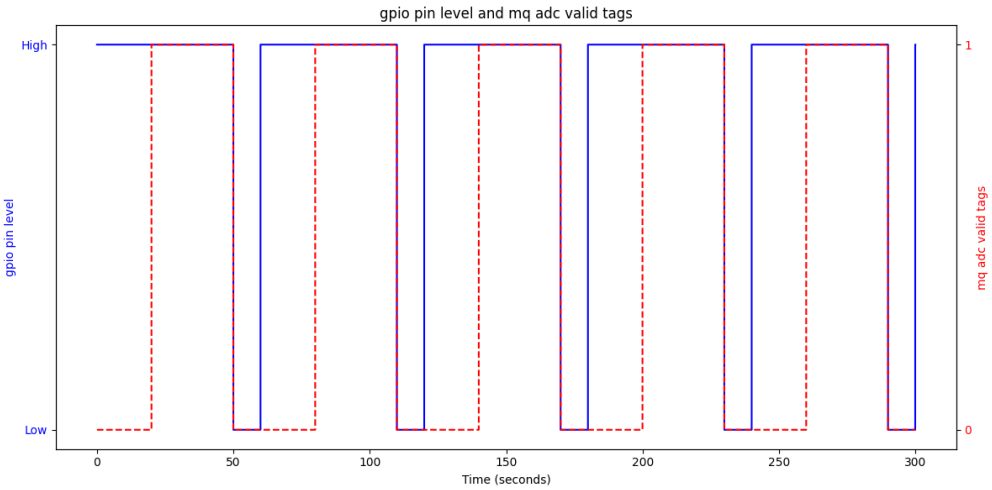


Figure 2:



Video

- Unit MQ Function Introduction

U199_Unit_MQ_video_en.mp4