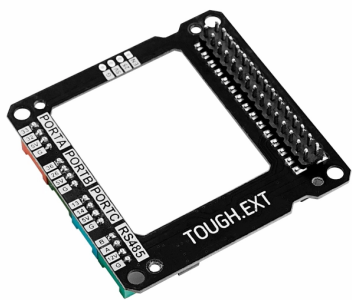


Tough

SKU:K034

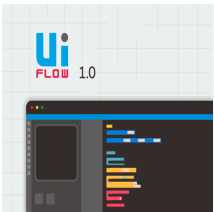




Description

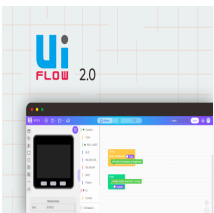
Tough is an industrial-grade programmable embedded controller. It is equipped with the Espressif ESP32 main control chip, which integrates Wi-Fi and features a dual-core low-power **Xtensa® 32-bit LX6** microprocessor with a main frequency of up to **240MHz**. The board includes **8M PSRAM + 16M Flash** memory, a 2.0-inch 320x240 full-color IPS display, a high-sensitivity capacitive touch panel, and a variety of peripheral and expansion interfaces. The fully enclosed casing offers dustproof and waterproof protection, ensuring stable circuit operation even in complex industrial environments. This controller is suitable for scenarios such as industrial field control, smart buildings, and outdoor data acquisition nodes.

Tutorial



UiFlow1

This tutorial introduces how to control the Tough device using the UiFlow1 graphical programming platform.



UiFlow2

This tutorial introduces how to control the Tough device using the UiFlow2 graphical programming platform.



Arduino IDE

This tutorial introduces how to program and control the Tough device using the Arduino IDE.

Note

Do not immerse the casing in water. This product is not designed for immersion protection.



Features

- Developed based on ESP32, supports Wi-Fi
- 16MB Flash + 8MB PSRAM
- Onboard TFCard slot
- Built-in speaker, I2S power amplifier
- IPS display, capacitive touch
- AXP192 power management chip
- BM8563-RTC clock, supports RTC timer wake-up
- Integrated DC 6 ~ 24V to 5V DC-DC step-down circuit
- Dustproof and waterproof design, UV-resistant plastic
- Supports FreeRTOS
- Development Platform
 - UiFlow1
 - UiFlow2
 - Arduino IDE
 - ESP-IDF
 - PlatformIO

Includes

- 1 x Tough
- 1 x USB Type-C cable (1m)
- 1 x 2.5mm hex wrench
- 1 x 1.5mm hex wrench
- 1 x 1.25-2P single-ended terminal wire
- 1 x 1.25-4P single-ended terminal wire
- 1 x Waterproof O-ring
- 1 x HY2.0-4P connector

Applications

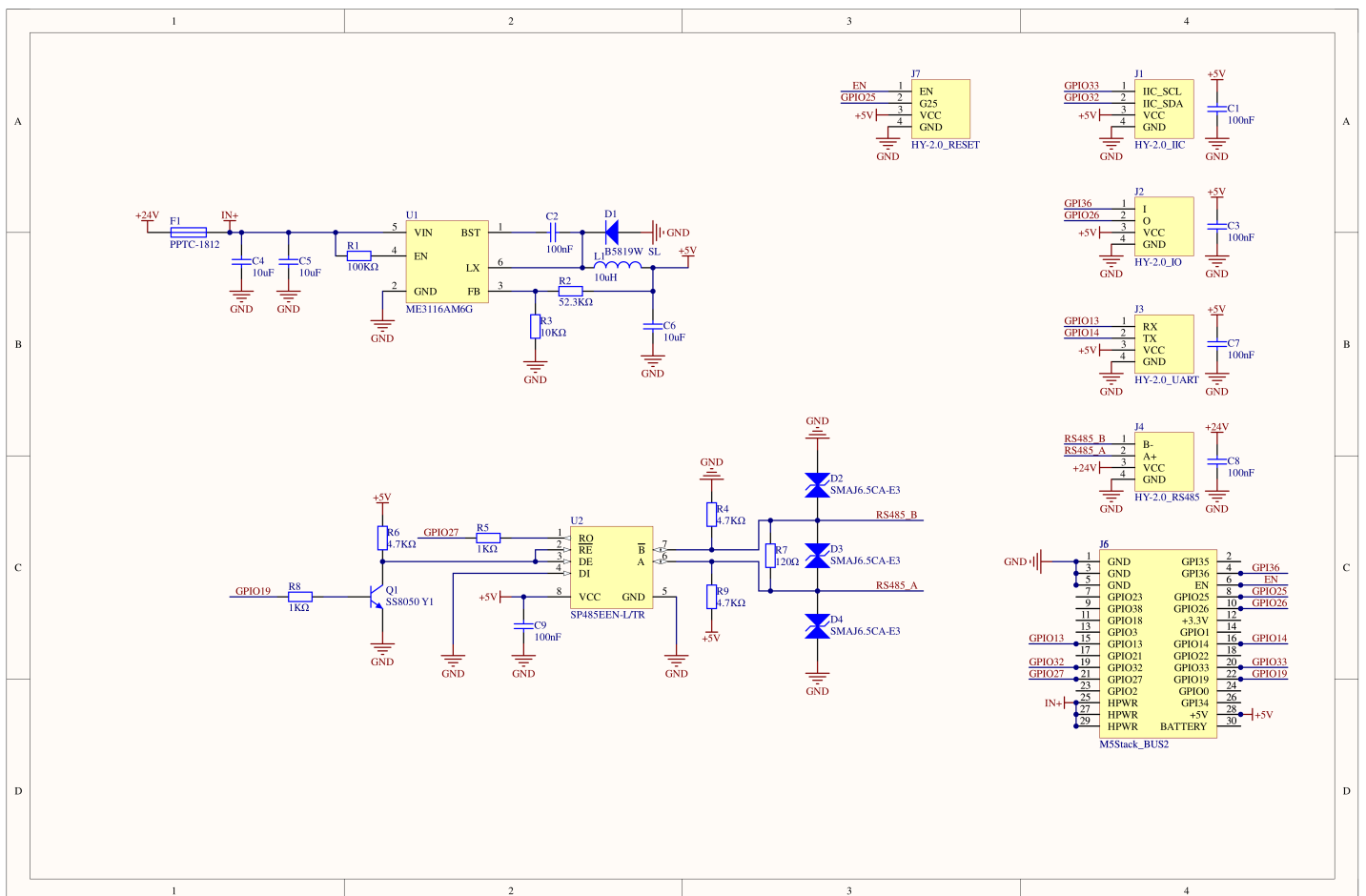
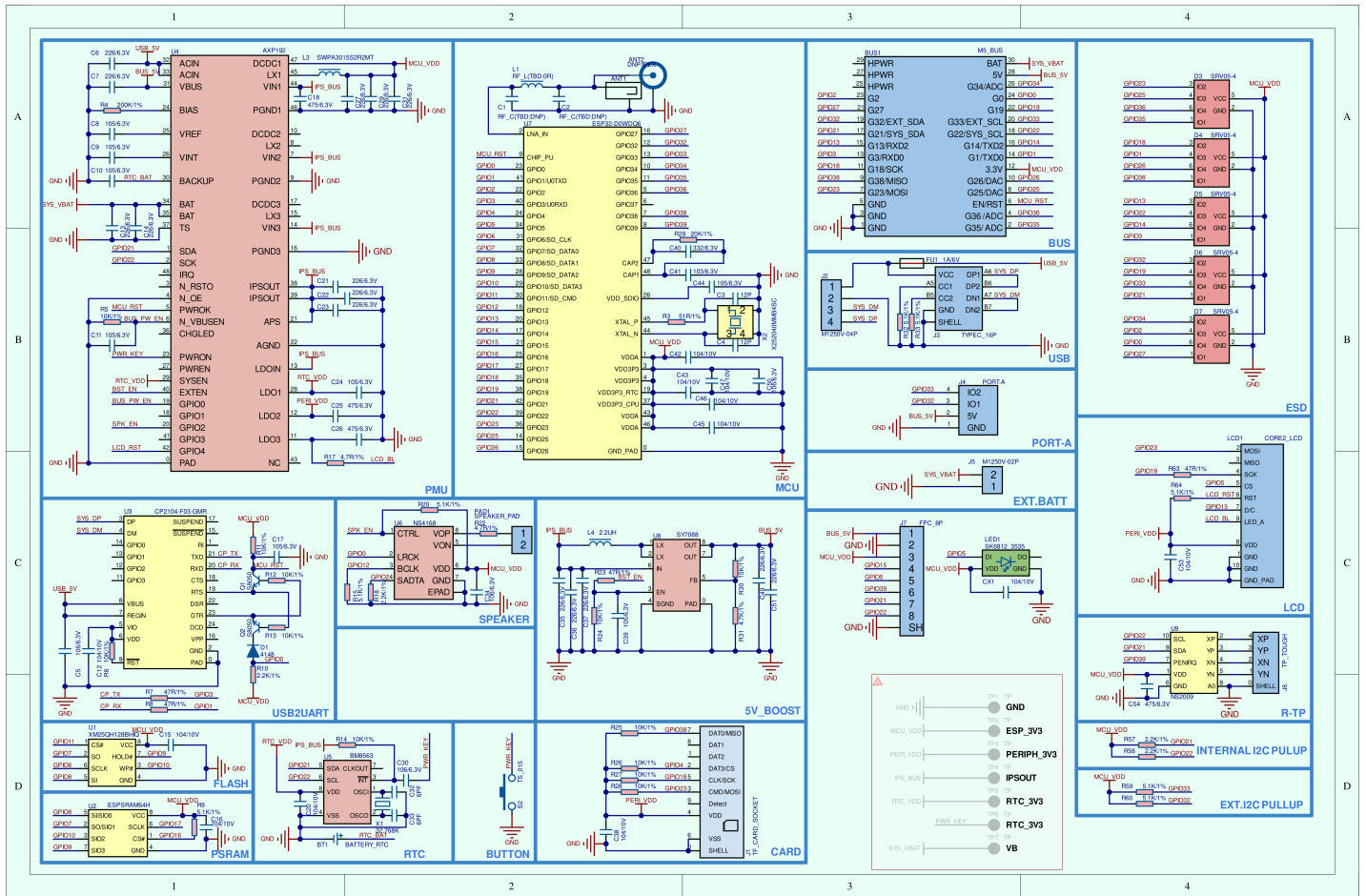
- IoT Controller
- Data Acquisition

Specifications

Specification	Parameter
SoC	ESP32-D0WDQ6-V3, 240MHz dual core, 520KB SRAM, Wi-Fi
Flash	16MB
PSRAM	8MB
Input Voltage	USB (5V @ 500mA) / RS485 interface power input (6 ~ 24V @ 1A)
Interfaces	Type-C x 1, Grove x 4 (RS485 / I2C / GPIO / UART interfaces)
IPS LCD	2.0" 320 x 240 ILI9342C full-color display, max brightness 853 nits
Touch Controller	CHSC6540
Speaker Setup	NS4168 16-bit I2S amplifier + 1W speaker
RTC Clock Chip	BM8563
PMU	AXP192
USB Chip	CH9102 USB-TTL serial/programming interface
TF Card Slot	Supports memory cards up to 16GB
Antenna	3D Wi-Fi antenna
Casing Material	UV-resistant plastic
Product Size	76.0 x 58.0 x 41.6 mm
Product Weight	117.5 g
Package Size	101.0 x 83.0 x 46.0mm
Gross Weight	151.0 g

Schematics

- [Tough Schematics PDF](#)
- [Tough Ext Board Schematics PDF](#)



PinMap

LCD Screen & TF Card

ESP32-D0WDQ6-V3	GPIO38	GPIO23	GPIO18	GPIO5	GPIO15
ILI9342C	MISO	MOSI	SCK	CS	DC

AXP192	AXP_IO4	AXP_DC3	AXP_LDO2
ILI9342C	RST	BL	PWR

ESP32-D0WDQ6-V3	GPIO38	GPIO23	GPIO18	GPIO4	\
TFCard	MISO	MOSI	SCK	CS	

Cap.Touch

ESP32-D0WDQ6-V3	GPIO21	GPIO22	GPIO39
FT6336U	SDA	SCL	INT

AXP192	AXP_IO4
FT6336U	RST

Mic & NS4168 Amplifier

ESP32-D0WDQ6-V3	GPIO12	GPIO0	GPIO2	GPIO34
NS4168	BCLK	LRCK	DATA	
Mic		CLK		DATA

AXP192	AXP_IO2
NS4168	SPK_EN

RTC-BM8563

ESP32-D0WDQ6-V3	GPIO21	GPIO22
BM8563	SDA	SCL

AXP192	AXP_PWR
BM8563	INT

RS485

M5-Bus	GPIO27	GPIO19	(DC-DC 6 ~ 24V->5V)	GND
RS485	RX	TX	6 ~ 24V	GND

HY2.0_RESET

M5-Bus	EN	GPIO25	VCC	GND
RESET	EN	GPIO25	5V	GND

ESP32 ADC/DAC Mappable Pins

ADC1	ADC2	DAC1	DAC2
8 channel	10 channel	2 channel	2 channel
G32-39	G0/2/4/12-15/25-27	G25	G26

For more information on pin assignments and pin remapping, please refer to the [ESP32 datasheet](#).

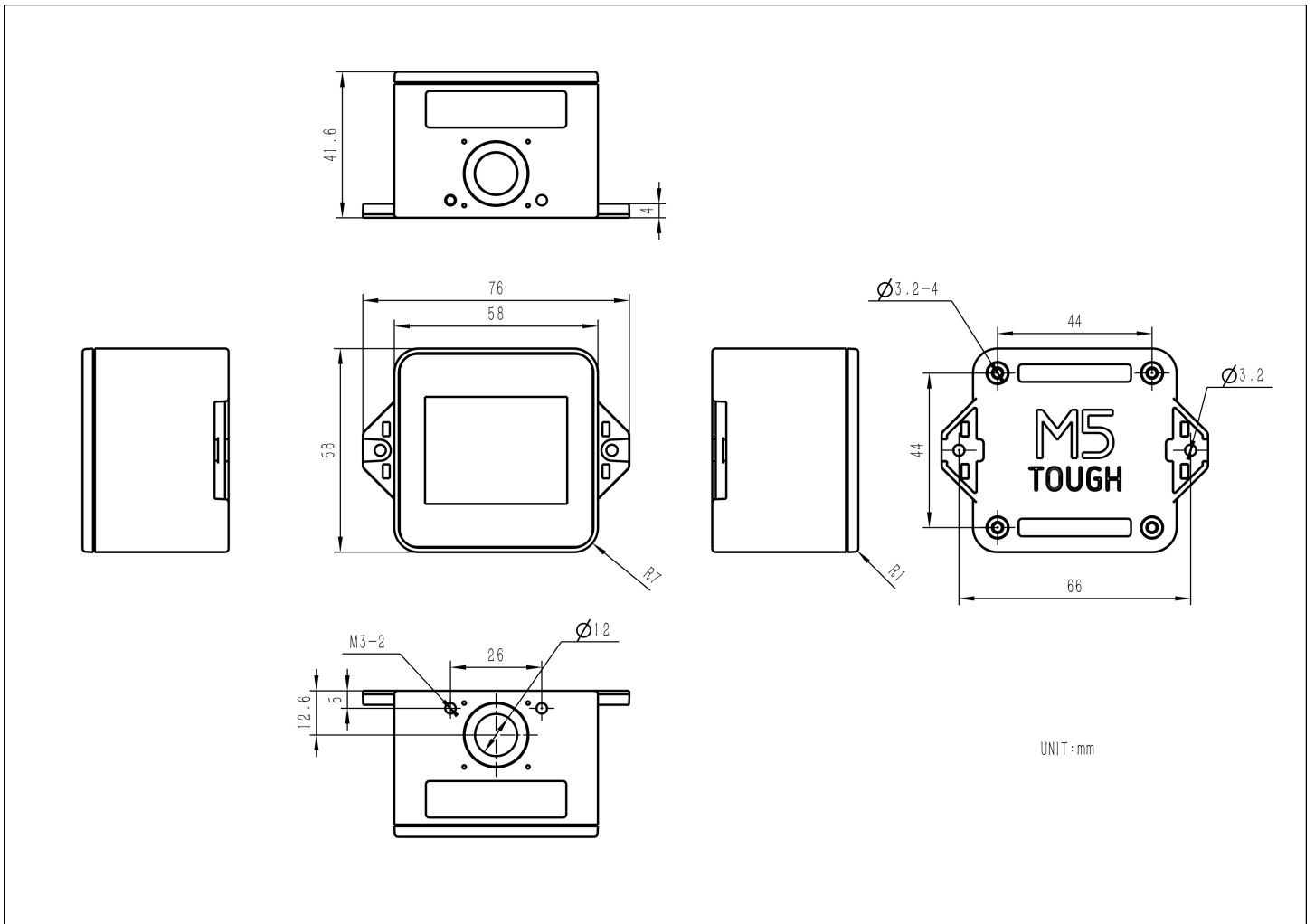
HY2.0-4P

HY2.0-4P	Black	Red	Yellow	White
PORT.A	GND	5V	G32	G33
PORT.B	GND	5V	G26	G36
PORT.C	GND	5V	G14	G13

M5-Bus

FUNC	PIN	LEFT	RIGHT	PIN	FUNC
	GND	1	2	G35	ADC
	GND	3	4	G36	ADC
	GND	5	6	RST	EN
MOSI	G23	7	8	G25	DAC
MISO	G38	9	10	G26	DAC
SCK	G18	11	12	3V3	
RXD0	G3	13	14	G1	TXD0
RXD2	G13	15	16	G14	TXD2
SYS_SDA	G21	17	18	G22	SYS_SCL
EXT_SDA	G32	19	20	G33	EXT_SCL
GPIO	G27	21	22	G19	GPIO
GPIO	G2	23	24	G0	GPIO
	NC	25	26	G34	ADC
	NC	27	28	5V	
	NC	29	30	BAT	

| Model Size



Datasheets

- [ESP32](#)
- [NS4168](#)
- [ILI9342C](#)
- [HYM8563](#)
- [BM8563](#)
- [SY7088](#)
- [AXP192 datasheet](#)
- [AXP192 register](#)

Softwares

Arduino

- [Tough Arduino Quick Start](#)
- [Tough Arduino Library](#)
- [Tough Tools](#)

UiFlow1

- [Tough UiFlow1 Quick Start](#)

UiFlow2

- [Tough UiFlow2 Quick Start](#)

USB Driver

USB Driver

Click the link below to download and install the driver for your operating system. If you encounter issues such as failed program downloads (e.g., timeout or "Failed to write to target RAM"), try reinstalling the device driver.

Driver Name	Supported Chip	Download Link
CH9102_VCP_SER_Windows	CH9102	Download
CH9102_VCP_CDC_Windows	CH9102	Download
CH9102_VCP_MacOS_v1.7	CH9102	Download

Note

CH9102_VCP_MacOS_v1.7 may display system error messages during installation, but the installation is actually complete and can be ignored.

After installing the driver on macOS, you may see two available ports. Please select the port named **wchmodem** when using the device.

Videos

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[M5Stack:](#)

[K034](#)