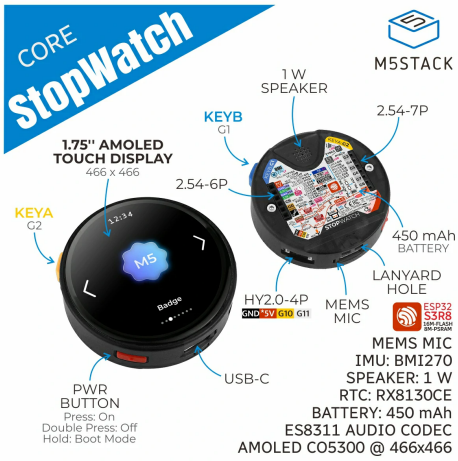
StopWatch

SKU:C152



Description

StopWatch is a round AMOLED touch development board designed for portable and interactive scenarios. It features an ESP32-S3R8 main controller with 16MB Flash and 8MB PSRAM, supporting 2.4GHz Wi-Fi wireless communication. The device integrates a 1.75" AMOLED touch round screen, programmable buttons, and vibration feedback for an intuitive human-machine interaction experience. It also features audio input/output, IMU attitude sensing, RTC timekeeping, and multiple expansion interfaces. Combined with the M5PM1 multi-level power management system and a 450mAh battery, it meets diverse development needs including portable smart control, wearable human-machine interaction, and lightweight IoT terminals.

Tutorial

UiFlow2

This tutorial introduces how to control the StopWatch device through the UiFlow2 graphical programming platform.

Arduino IDE

This tutorial explains how to program and control the StopWatch device using Arduino IDE.

Xiaozhi Voice Assistant

This tutorial covers flashing the Xiaozhi Voice Assistant firmware onto StopWatch via M5Burner to build a personal voice assistant application.

Factory Firmware Usage Tutorial

This tutorial covers the factory firmware usage for StopWatch, including button operations and feature descriptions.

Features

- ESP32-S3R8 Core Controller:
  - 16MB Flash + 8MB PSRAM
  - 2.4GHz Wi-Fi
- Interactive Experience:
  - 1.75" AMOLED Touch Round Screen
  - 2 x Programmable Buttons, 1 x Power Button
  - Built-in Vibration Motor
  - 6-axis IMU BMI270
- Audio System:
  - ES8311 Audio Codec
  - MEMS MIC
  - AW8737A Speaker Amplifier + 1W @ 8Ω Speaker
- RTC Clock Chip RX8130CE
- Expansion Capability:
  - HY2.0-4P Expansion Interface
  - Rear Expansion Bus (2.54-7P, 2.54-6P)
  - Lanyard Hole Design
  - Rear Magnetic Attachment Design
- Power System:
  - M5PM1 Multi-level Power Management System
  - Built-in 450mAh Battery
  - Balanced Battery Life and Low Power Operation

Includes

- 1 x StopWatch

Applications

- Portable Smart Devices
- Electronic Badges
- Lightweight IoT Terminals

Specification

Specification	Parameter
SoC	ESP32-S3R8 Dual-core Xtensa LX7, up to 240MHz
Flash	16MB
PSRAM	8MB
Wireless Connectivity	2.4GHz Wi-Fi
Display	1.75" AMOLED Touch Round Screen 466x466 Resolution, CO5300 Driver Chip QSPI Interface
Touch	CST820B Driver Chip
Buttons	2 x Programmable Buttons + 1 x Power Button
Vibration Feedback	Built-in Vibration Motor
Audio Codec	ES8311
Microphone	MEMS MIC
Speaker	AW8737A Amplifier, 8Ω@1W 1318 Cavity Speaker
IMU	BMI270
RTC	RX8130CE
Expansion Interface	HY2.0-4P
Rear Expansion Bus	2.54-7P, 2.54-6P
Body Structure	Lanyard Hole
Power Management	M5PM1 Multi-level Power Management
Battery Capacity	450mAh
Input Power	USB Type-C DC 5V
Product Size	52.0 x 52.0 x 15.5mm
Product Weight	39.0g
Package Size	70.0 x 70.0 x 23.6mm
Gross Weight	49.5g

Learn

Power On/Off

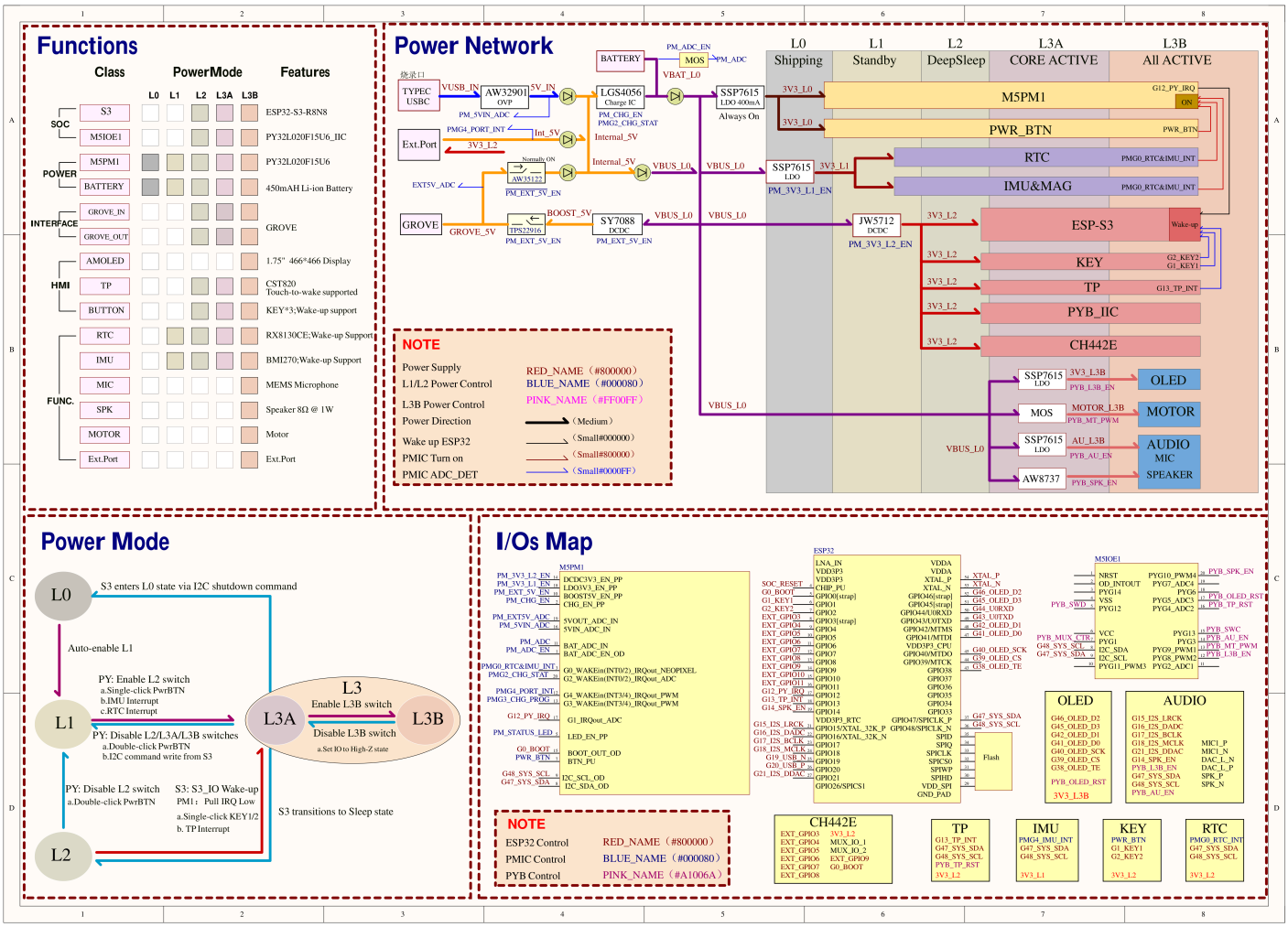
- Power On / Reset: Short press the power button once
- Power Off: Press the power button twice quickly

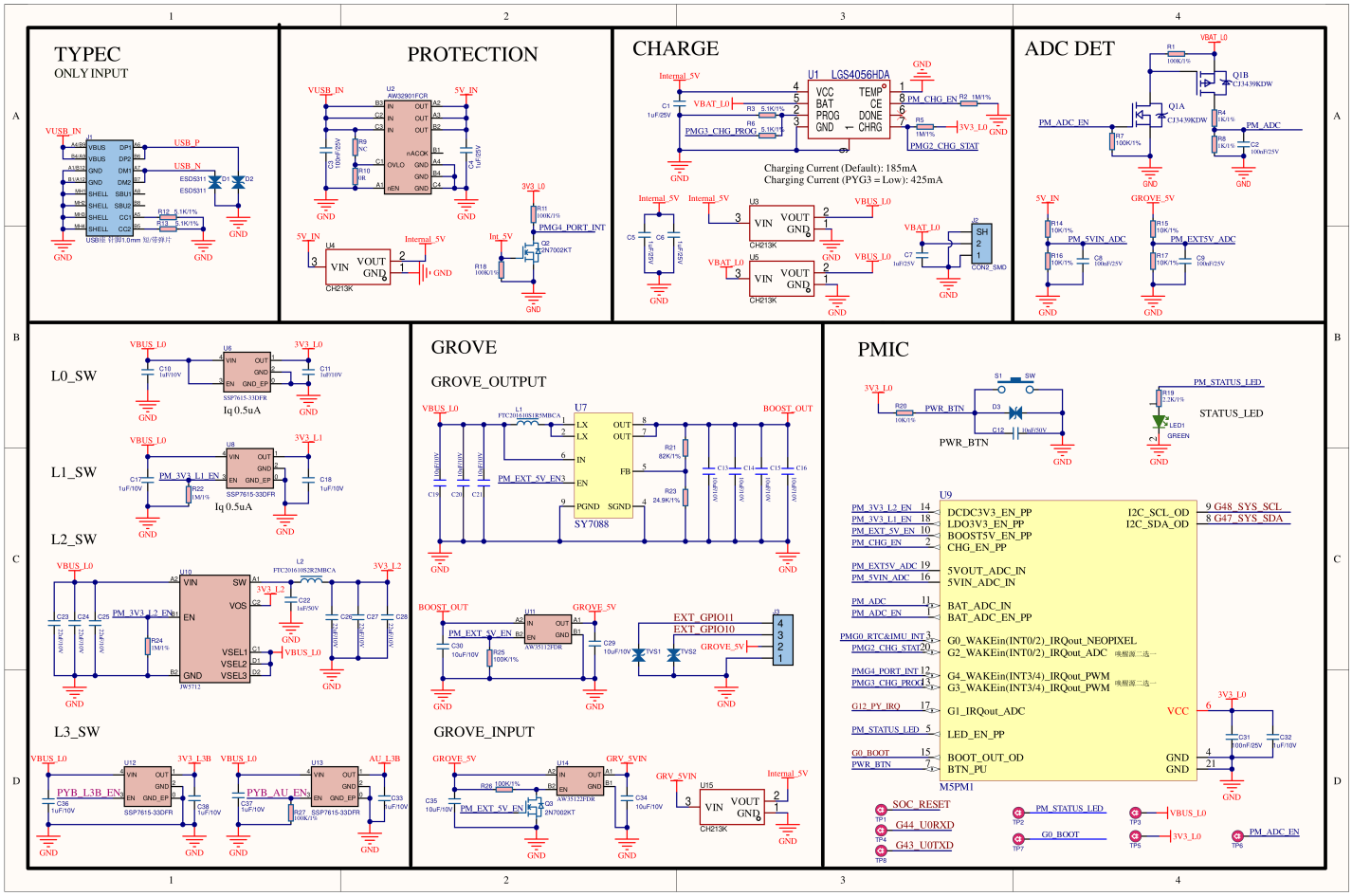
Enter Download Mode

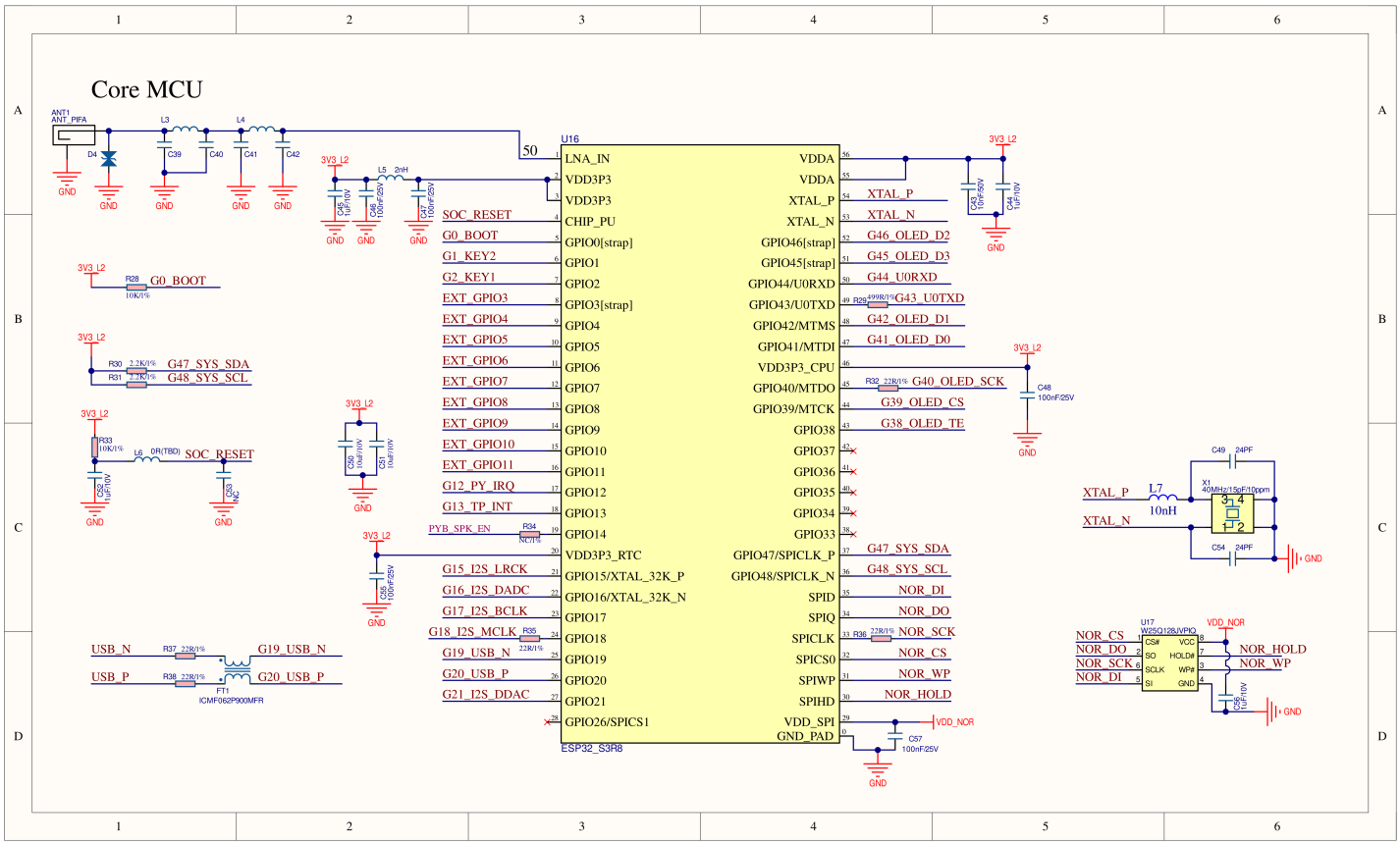
- Connect the device to your computer via a USB Type-C cable, press and hold the power button (about 2 seconds) until the green LED lights up, then release. The device is now in download mode, ready for flashing.

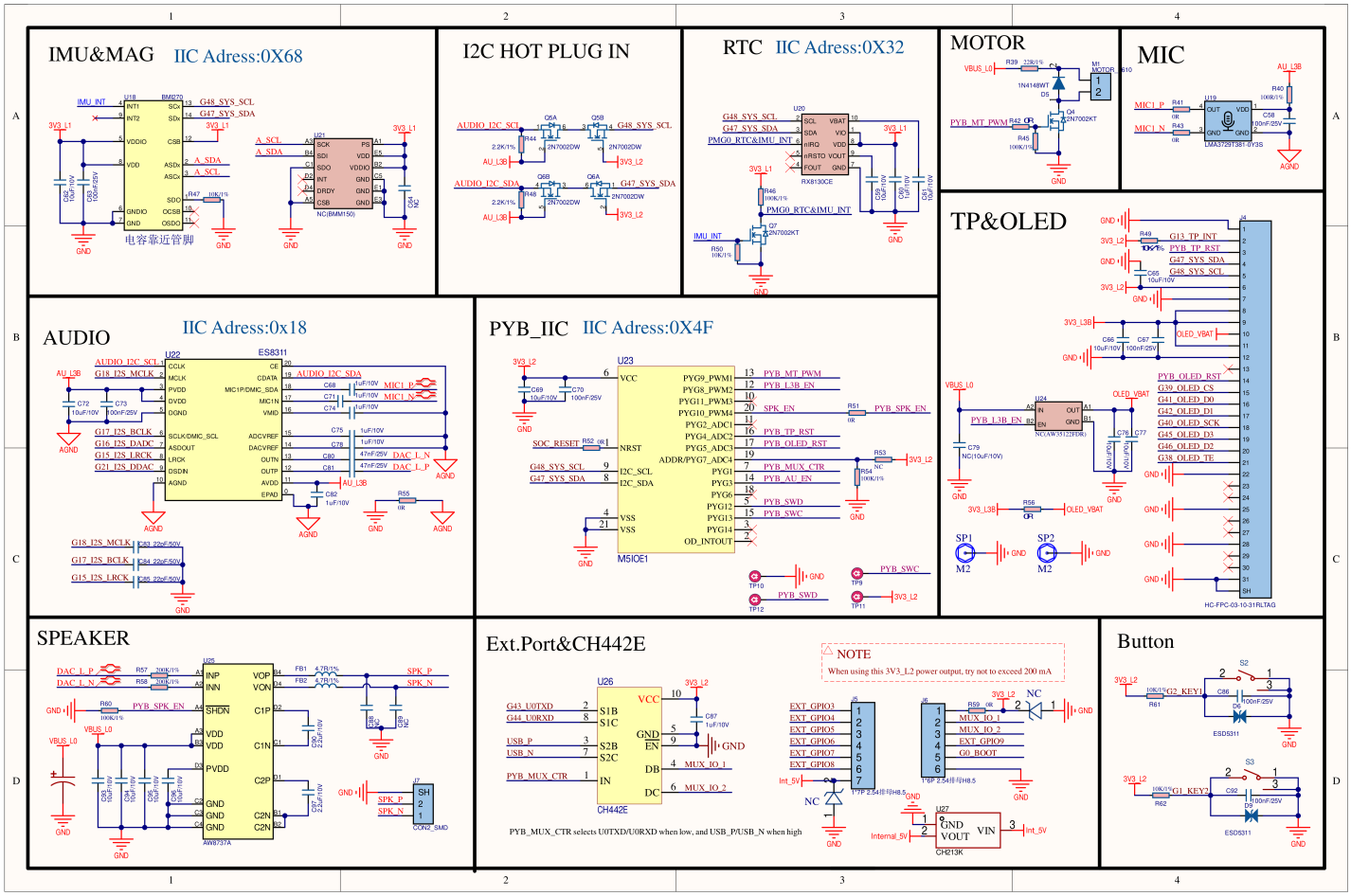
Schematics

- StopWatch Schematics PDF


Functions
Class
PowerMode
Features
L0 L1 L2 L3A L3B
SOC
S3
ESP32-S3-R8N8
M5IOE1
PY32L020F15U6_IIC
POWER
M5PM1
PY32L020F15U6
BATTERY
450mAH Li-ion Battery
INTERFACE
GROVE_IN
GROVE_OUT
GROVE
HMI
AMOLED
1.75" 466*466 Display
TP
CST820
Touch-to-wake supported
BUTTON
KEY*3;Wake-up support
FUNC.
RTC
RX8130CE;Wake-up Support
IMU
BMI270;Wake-up Support
MIC
MEMS Microphone
SPK
Speaker 8Ω @ 1W
MOTOR
Motor
Ext.Port
Ext.Port
Power Network
L0
L1
L2
L3A
L3B
Shipping
Standby
DeepSleep
CORE ACTIVE
All ACTIVE
BATTERY
TYPEC USBC
AW32901 OVP
LGS4056 Charge IC
SSP7615 LDO 400mA
Always On
Ext.Port
AW35122
GROVE
TPS22916
SY7088 DCDC
SSP7615 LDO
JW5712 DCDC
M5PM1
PWR_BTN
RTC
IMU&MAG
ESP-S3
KEY
TP
PYB_IIC
CH442E
SSP7615 LDO
MOS
SSP7615 LDO
AW8737
OLED
MOTOR
AUDIO
MIC
SPEAKER
NOTE
Power Supply
L1/L2 Power Control
L3B Power Control
Power Direction
Wake up ESP32
PMIC Turn on
PMIC ADC_DET
RED_NAME（#800000）
BLUE_NAME（#000080）
PINK_NAME（#FF00FF）
（Medium）
（Small#000000）
（Small#800000）
（Small#0000FF）
Power Mode
L0
S3 enters L0 state via I2C shutdown command
Auto-enable L1
L1
PY: Enable L2 switch
a.Single-click PwrBTN
b.IMU Interrupt
c.RTC Interrupt
PY: Disable L2/L3A/L3B switches
a.Double-click PwrBTN
b.I2C command write from S3
L3A
L3
Enable L3B switch
Disable L3B switch
a.Set IO to High-Z state
L3B
L2
PY: Disable L2 switch
a.Double-click PwrBTN
S3: S3_IO Wake-up
PM1： Pull IRQ Low
a.Single-click KEY1/2
b. TP Interrupt
S3 transitions to Sleep state
I/Os Map
M5PM1
ESP32
M5IOE1
OLED
AUDIO
CH442E
TP
IMU
KEY
RTC
Flash
NOTE
ESP32 Control
PMIC Control
PYB Control
RED_NAME（#800000）
BLUE_NAME（#000080）
PINK_NAME（#A1006A）


TYPEC
ONLY INPUT
PROTECTION
CHARGE
ADC DET
L0_SW
L1_SW
L2_SW
L3_SW
GROVE
GROVE_OUTPUT
GROVE_INPUT
PMIC
SY7088
M5PM1


Core MCU
U16
ESP32_S3R8
LNA_IN
VDD3P3
VDD3P3
CHIP_PU
GPIO0[strap]
GPIO1
GPIO2
GPIO3[strap]
GPIO4
GPIO5
GPIO6
GPIO7
GPIO8
GPIO9
GPIO10
GPIO11
GPIO12
GPIO13
GPIO14
VDD3P3_RTC
GPIO15/XTAL_32K_P
GPIO16/XTAL_32K_N
GPIO17
GPIO18
GPIO19
GPIO20
GPIO21
GPIO26/SPICS1
VDDA
VDDA
XTAL_P
XTAL_N
GPIO46[strap]
GPIO45[strap]
GPIO44/U0RXD
GPIO43/U0TXD
GPIO42/MTMS
GPIO41/MTDI
VDD3P3_CPU
GPIO40/MTDO
GPIO39/MTCK
GPIO38
GPIO37
GPIO36
GPIO35
GPIO34
GPIO33
GPIO47/SPICLK_P
GPIO48/SPICLK_N
SPID
SPIQ
SPICLK
SPICS0
SPIWP
SPIHD
VDD_SPI
GND_PAD
SOC_RESET
G0_BOOT
G1_KEY2
EXT_GPIO3
EXT_GPIO4
EXT_GPIO5
EXT_GPIO6
EXT_GPIO7
EXT_GPIO8
EXT_GPIO9
EXT_GPIO10
EXT_GPIO11
G12_PY_IRQ
G13_TP_INT
PYB_SPK_EN
G15_I2S_LRCK
G16_I2S_DADC
G17_I2S_BCLK
G18_I2S_MCLK
G19_USB_N
G20_USB_P
G21_I2S_DDAC
G46_OLED_D2
G45_OLED_D3
G44_U0RXD
G43_U0TXD
G42_OLED_D1
G41_OLED_D0
G40_OLED_SCK
G39_OLED_CS
G38_OLED_TE
G47_SYS_SDA
G48_SYS_SCL
NOR_DI
NOR_DO
NOR_SCK
NOR_CS
NOR_WP
NOR_HOLD
ANT1
ANT_PIFA
L3
L4
L5 2nH
L6 0R(TBD)
L7 10nH
D4
C39
C40
C41
C42
C45 10pF/10V
C46 100nF/25V
C47 100nF/25V
C48 100nF/25V
C49 24PF
C54 24PF
C55 10uF/10V
C56 10uF/10V
C57 100nF/25V
C58 100nF/25V
C59 10uF/10V
C60 10uF/10V
C61 10uF/10V
C62 10uF/10V
C63 NC
R28 10K/1%
R29 499R/1%
R30 2.2K/1%
R31 2.2K/1%
R32 22R/1%
R33 10K/1%
R34 NC/1%
R35 22R/1%
R36 22R/1%
R37 22R/1%
R38 22R/1%
FT1
ICMF0602P900MFR
X1 40MHz/15pF/10ppm
U17 W25Q128JVPIQ
CS# SO SCLK SI VCC HOLD# WP# GND
3V3_L2
VDD_NOR
GND
USB_N
USB_P
XTAL_P
XTAL_N
50



PinMap

AMOLED

ESP32S3R8	G39	G40	G38	G41	G42	G46	G45
CO5300	OLED_CS	OLED_SCK	OLED_TE	OLED_D0	OLED_D1	OLED_D2	OLED_D3

The display reset is controlled via `PYG5 (PYB_OLED_RST)` of the `M5IOE1` expansion chip.

Touch

ESP32S3R8	G47	G48	G13
CST820B	SYS_SDA	SYS_SCL	TP_INT

The touch reset is controlled via `PYG4 (PYB_TP_RST)` of the `M5IOE1` expansion chip.

Audio

ESP32S3R8	G48	G47
ES8311(0x18)	AUDIO_I2C_SCL	AUDIO_I2C_SDA

ESP32S3R8	G18	G17	G16	G15	G21
ES8311	I2S_MCLK	I2S_BCLK	I2S_ASDOUT	I2S_LRCK	I2S_DSDIN

The speaker amplifier (AW8737A) enable is controlled via `PYG10(PYB_SPK_EN)` of the `M5IOE1` expansion chip, and the Audio L3B level power supply for audio peripherals is controlled via `PYG3(PYB_AU_EN)`.

KEY

ESP32S3R8	G2	G1
KEY	KEYA (YELLOW)	KEYB (BLUE)

IMU & RTC

ESP32S3R8	G48	G47
BMI270(0x68)	SYS_SCL	SYS_SDA
RX8130CE(0x32)	SYS_SCL	SYS_SDA

HY2.0-4P

HY2.0-4P	Black	Red	Yellow	White
PORT.A	GND	5V	G10	G11

EXT 2.54 Bus

FUNC	PIN	LEFT	RIGHT	PIN	FUNC
	3V3_L2	1	2	G3	
G43(UART0_TX) / G20(USB_DP)	MUX_IO_1	3	4	G4	
G44(UART0_RX) / G19(USB_DM)	MUX_IO_2	5	6	G5	
	G9	7	8	G6	
BOOT	G0	9	10	G7	
	GND	11	12	G8	
	/	13	14	BAT	

The `MUX_IO_1, MUX_IO_2` pin switching between `USB / UART` functions is controlled via `PYG1(PYB_MUX_CTR)` of the `M5IOE1` expansion chip. The default function is `UART`.

PYG1_HAT_SW	EXT MUX_IO_1/2 FUNC
LOW	G43_U0TXD / G44_U0RXD
HIGH	USB_P / USB_N

M5PM1

ESP32S3R8	G48	G47
M5PM1	SYS_SCL	SYS_SDA

M5PM1	DCDC3V3_EN_PP	LDO3V3_EN_PP	BOOST5V_EN_PP
3V3_L2	PM_3V3_L2_EN		
3V3_L1		PM_3V3_L1_EN	
Grove			PM_EXT_5V_EN

M5PM1	PYG0	PYG2	PYG4	PYG3	PYG1
RTC & IMU	RTC_INT & IMU_INT				
CHARGE		CHG_STAT		CHG_PROG	
EXT 5VIN			PORT_INT		
ESP32S3R8					G12_PY_IRQ

- PYG0(RTC_INT & IMU_INT): Interrupt wake-up signal
- PYG2(CHG_STAT): Charging status
- PMG4(PORT_INT): External power wake-up signal
- PYG1(G12_PY_IRQ): Interrupt signal connected to ESP32-S3
- PMG3_CHG_PROG: Charging current control

PMG3_CHG_PROG	CHARGE CURRENT
LOW	425mA
HIGH	185mA (Default)

M5IOE1

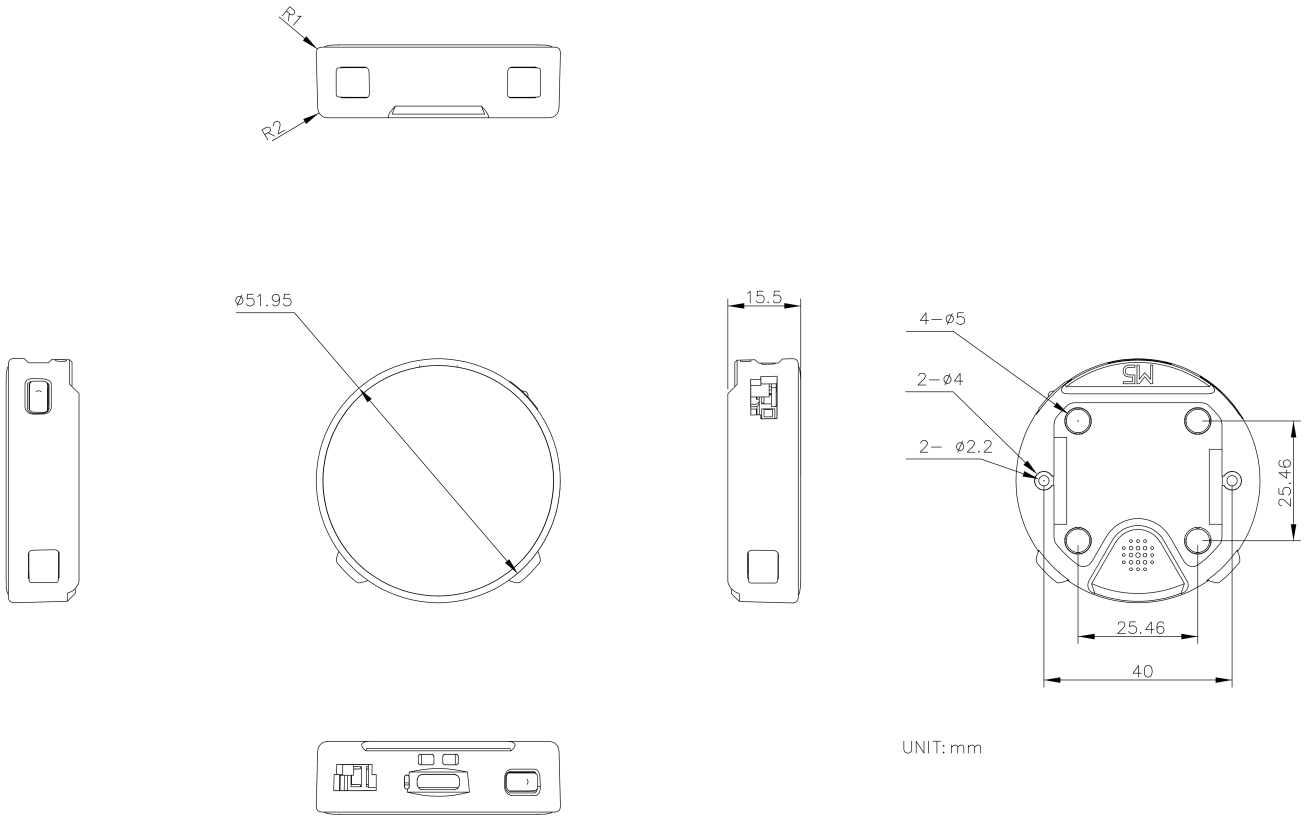
ESP32S3R8	G48	G47
M5IOE1(0x4F)	SYS_SCL	SYS_SDA

M5IOE1	PYG1	PYG3	PYG9	PYG8	PYG10	PYG4	PYG5
Ext.Port Select	PYB_MUX_CTR						
Audio L3B		PYB_AU_EN					
Vibration Motor			PYB_MT_PWM				
3V3_L3B				PYB_L3B_EN			
Speaker AMP AW8737A					PYB_SPK_EN		
Touch						PYB_TP_RST	
AMOLED							PYB_OLED_RST

- PYG1(PYB_MUX_CTR): Rear expansion interface MUX_IO_1/2 switching between `USB` / `UART` functions
- PYG3(PYB_AU_EN): ES8311 power supply + MIC power supply
- PYG9(PYB_MT_PWM): Vibration motor PWM signal
- PYG8(PYB_L3B_EN): AMOLED screen power supply
- PYG10(PYB_SPK_EN): AW8737A speaker amplifier enable
- PYG4(PYB_TP_RST): Touch screen reset
- PYG5(PYB_OLED_RST): Display screen reset

Model Size

- StopWatch Model Size PDF



Structure

- StopWatch Structure Files

Datasheets

- ESP32-S3
- ES8311
- RX8130CE Datasheet

Softwares

Quick Start

- StopWatch Xiaozhi Voice Assistant

Arduino

- StopWatch Arduino Quick Start
- StopWatch M5PM1 Power Management
- M5PM1 Arduino Library
- M5IOE1 Arduino Library

- StopWatch Arduino M5Unified Driver Library
- StopWatch Arduino M5GFX Driver Library

UiFlow2

- StopWatch UiFlow2 Quick Start

Protocol

- M5PM1 Power Management Chip
- M5IOE1 IO Expansion Management Chip

ESP-IDF

- StopWatch Factory Firmware

PlatformIO

```
[env:m5stack-stopwatch]
platform = espressif32 @ 6.12.0
board = esp32s3box
framework = arduino
board_build.partitions = default_16MB.csv
board_upload.flash_size = 16MB
board_upload.maximum_size = 16777216
board_build.arduino.memory_type = qio_opi
monitor_speed = 115200
build_flags =
    -DESP32S3
    -DBOARD_HAS_PSRAM
    -DCORE_DEBUG_LEVEL=5
    -DARDUINO_USB_CDC_ON_BOOT=1
    -DARDUINO_USB_MODE=1
lib_deps =
    M5Unified = https://github.com/m5stack/M5Unified
    M5GFX = https://github.com/m5stack/M5GFX
    M5PM1 = https://github.com/m5stack/M5PM1
    M5IOE1 = https://github.com/m5stack/M5IOE1
```

Easyloader

Easyloader	Download	Note
StopWatch User Demo	download	/

Other

- StopWatch Factory Firmware Usage Tutorial
- StopWatch Factory Firmware Flashing Tutorial

Video

- StopWatch Product Introduction and Feature Demo

C152-StopWatch-video-EN.mp4