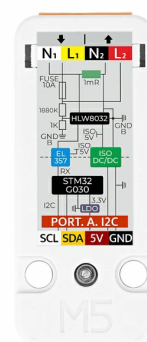# Unit AC Measure

SKU:U164

Description

Unit AC Measure is an isolated single-phase AC measurement unit based on an **STM32 + HLW8032** solution, capable of real-time high-accuracy monitoring of current, voltage and power data. It integrates the AC isolation converter B0505ST16-W5 and communicates with the STM32 via the EL357 optocoupler. Users can obtain measurement data through the I2C interface. This product is ideal for power information collection, remote smart appliances and similar applications.

Note

> **Input Voltage**
>
> Operating measurement range: must be AC 100 ~ 240V@10A, otherwise the device will not work properly.

Features

- STM32G030 @ Cortex-M0+ 32-bit MCU, 64 KB Flash, 8 KB RAM
- Single-phase AC 100 ~ 240V / 10A measurement
- I2C communication (0x42)
- Development Platform: UIFlow, Arduino

Includes

- 1 x Unit AC Measure
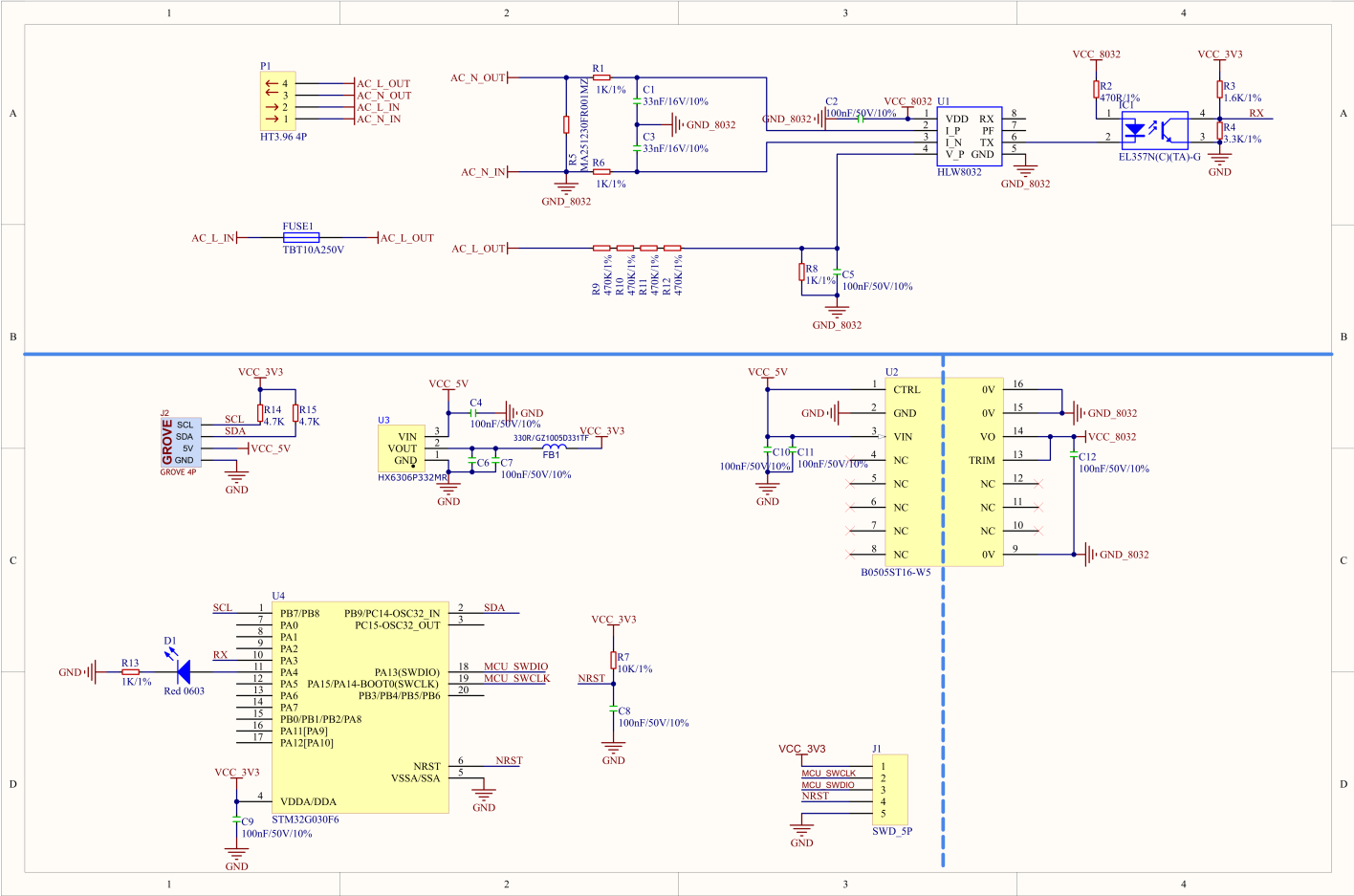- 1 x HY2.0-4P Grove Cable (20cm)
- 1 x HT3.96-4P Terminal

Applications

- Smart home appliances
- Metered socket
- Smart Wi-Fi socket
- EV charging pile
- Streetlight control system

Specifications

Specification	Parameter
MCU	STM32G030F6P6
AC Acquisition Chip	HLW8032
Isolation Chip	B0505ST16-W5
Optocoupler Communication Chip	EL357NB
Communication Interface	I2C @0x42
Measured Voltage/Current	AC 100 ~ 240V@10A
Product Size	56.0 x 24.0 x 10.3mm
Product Weight	8.4g
Package Size	138.0 x 93.0 x 11.3mm
Gross Weight	16.9g

Schematics

- Unit AC Measure Schematics PDF

Schematic

P1 HT3.96 4P
- 4 AC_L_OUT
- 3 AC_N_OUT
- 2 AC_L_IN
- 1 AC_N_IN

AC_N_OUT R1 1K/1% C1 33nF/16V/10% C2 100nF/50V/10% VCC_8032
AC_N_IN R6 1K/1% C3 33nF/16V/10% GND_8032
R5 MA25123OFR001MZ GND_8032

U1 HLW8032
- 1 VDD / RX 8
- 2 I_P / PF 7
- 3 I_N / TX 6
- 4 V_P / GND 5

VCC_8032 R2 470R/1% VCC_3V3 R3 1.6K/1%
IC1 EL357N(C)(TA)-G R4 3.3K/1% RX GND

AC_L_IN FUSE1 TBT10A250V AC_L_OUT AC_L_OUT
R9 470K/1% R10 470K/1% R11 470K/1% R12 470K/1%
R8 1K/1% C5 100nF/50V/10% GND_8032

VCC_3V3 R14 4.7K R15 4.7K
J2 GROVE 4P
- SCL
- SDA
- 5V
- GND
VCC_5V GND

VCC_5V C4 100nF/50V/10% GND
U3 HX6306P332MR
- 3 VIN
- VOUT
- 1 GND
FB1 330R/GZ1005D331TF VCC_3V3
C6 C7 100nF/50V/10% GND

VCC_5V U2 B0505ST16-W5
- 1 CTRL / 0V 16
- 2 GND / 0V 15 GND_8032
- 3 VIN / VO 14 VCC_8032
- 4 NC / TRIM 13
- 5 NC / NC 12
- 6 NC / NC 11
- 7 NC / NC 10
- 8 NC / 0V 9 GND_8032
GND C10 100nF/50V/10% C11 100nF/50V/10% C12 100nF/50V/10%

U4 STM32G030F6
- 1 PB7/PB8
- 7 PA0
- 8 PA1
- 9 PA2
- 10 PA3
- 11 PA4
- 12 PA5
- 13 PA6
- 14 PA7
- 15 PB0/PB1/PB2/PA8
- 16 PA11[PA9]
- 17 PA12[PA10]
- PB9/PC14-OSC32_IN 2 SDA
- PC15-OSC32_OUT 3
- PA13(SWDIO) 18 MCU_SWDIO
- PA15/PA14-BOOT0(SWCLK) 19 MCU_SWCLK
- PB3/PB4/PB5/PB6 20
- NRST 6 NRST
- VSSA/SSA 5
- 4 VDDA/DDA

SCL RX GND R13 1K/1% D1 Red 0603
VCC_3V3 R7 10K/1% NRST C8 100nF/50V/10% GND
VCC_3V3 C9 100nF/50V/10% GND

VCC_3V3 J1 SWD_5P
- 1 MCU_SWCLK
- 2 MCU_SWDIO
- 3 NRST
- 4
- 5
GND

PinMap

Unit AC Measure

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

Model Size

UNIT:mm
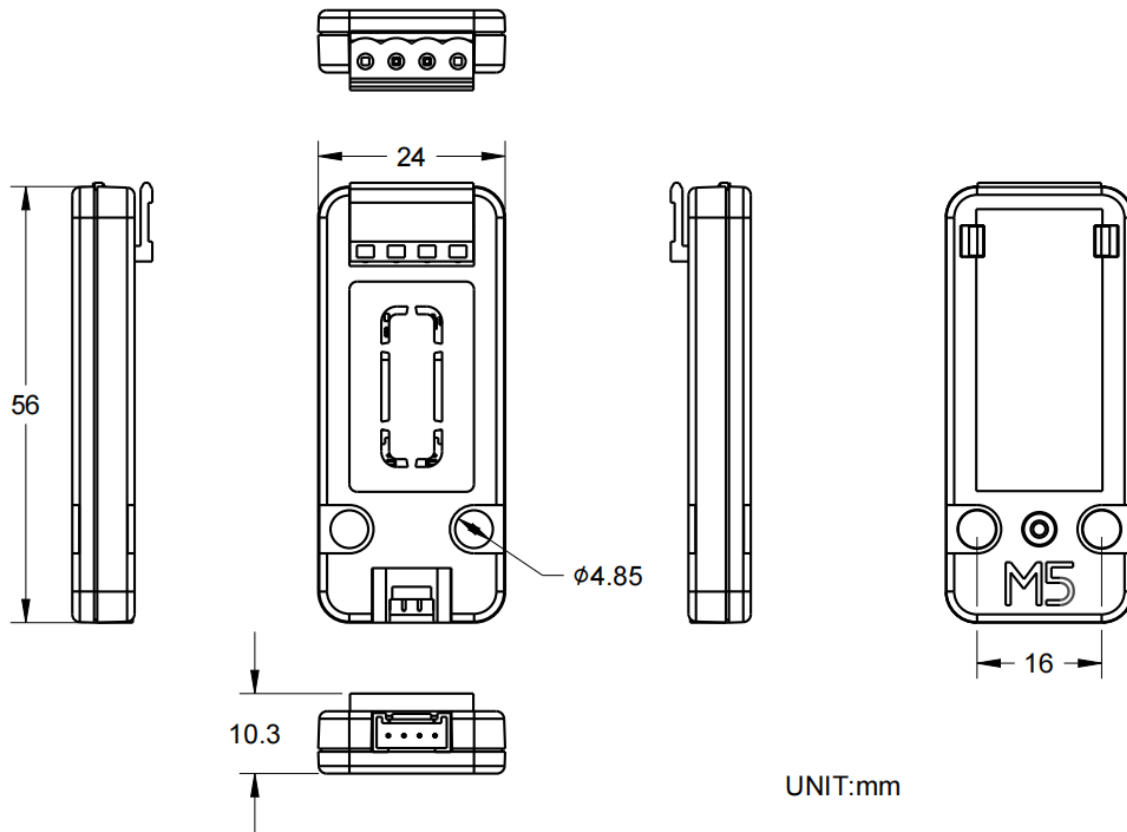
Datasheets

- B0505ST16-W5
- EL357NB
- HLW8032
- STM32G030
- I2C Protocol

Softwares

Arduino

- Unit AC Measure Driver Library

UiFlow1

- Unit AC Measure UiFlow1 Docs
- Unit AC Measure UiFlow1 Demo

UiFlow2

- Unit AC Measure UiFlow2 Docs

Internal Firmware

- Unit AC Measure Internal Firmware

Protocol

- Unit AC Measure I2C Protocol

M5Stack Unit AC Measure I2C Protocol

																			V1 (FW Version) 2023/3/24
REG MAP (Addr:0x42)			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	note
String	Voltage(V)	0x00 R	thousand's digit	hundred's digit	ten's digit	unit's digit	.	tenths	hundredths										
	Current(A)	0x10 R	thousand's digit	hundred's digit	ten's digit	unit's digit	.	tenths	hundredths										
	Active Power(W)	0x20 R	thousand's digit	hundred's digit	ten's digit	unit's digit	.	tenths	hundredths										
	Apparent Power(VA)	0x30 R	thousand's digit	hundred's digit	ten's digit	unit's digit	.	tenths	hundredths										
	Power Factor	0x40 R	unit's digit	.	tenths	hundredths													
	kW.h	0x50 R	ten millions	millions	hundred thousand's digit	ten thousand's digit	thousand's digit	hundred's digit	ten's digit	unit's digit	.	tenths	hundredths						
Value	Voltage(V)	0x60 R	voltage-L	voltage-H															Voltage: Voltage = (voltage-L + voltage-H * 256) / 100 [1]
	Current(A)	0x70 R	current-L	current-H															Current: Current = (Current-L + Current-H * 256) / 100
	Active Power(W)	0x80 R	active power-byte0	active power-byte1	active power--byte2	active power--byte3													Active Power: ActivePower = (ActivePower-L + ActivePower-H * 256) / 100
	Apparent Power(VA)	0x90 R	apparent power-byte0	apparent power-byte1	apparent power-byte2	apparent power-byte3													Apparent Power: ApparentPower = (ApparentPower-L + ApparentPower-H * 256) / 100
	Power Factor	0xA0 R	power factor																Power Factor: power factor / 100
	kW.h	0xB0 R	kW.h-byte0	kW.h-byte1	kW.h-byte2	kW.h-byte3													kW.h: kW.h = (kW.h-byte0 + kW.h-byte1 * 256 + kW.h-byte2 * 65536 + kW.h-byte3 * 16777216) / 100
	Voltage Coefficient	0xC0 R/W	voltage coefficient																Voltage Coefficient: voltage coefficient / 100
	Current Coefficient	0xD0 R/W	current coefficient																Current Coefficient: current coefficient / 100
	Save Coefficient	0xE0 W	save																Save: set a value > 1, will save voltage and current coefficient
	Data Ready	0xF0 R											Data Ready						Data Ready: Data Ready=1, data ready; Data Ready = 0, data not ready
	Firmware Version	0xF0 R															Version		Version: firmware version number
	I2C Address	0xF0 R/W																Address	Address: I2C Address

[1] For example, the actual voltage is 100.55V, and the obtained data is 100.55*100=10055，Temperature-L = 0x47, Temperature-H = 0x27

Easyloader

Easyloader	Download	Note
Unit AC Measure Easyloader	download	/