Lampiran 1 : Listing program Arduino

/* This code works with ESP8266 12E or Arduino and ZMPT101B AC voltage sensor up to 250 VAC 50/60Hz

 * It permits the measure of True RMS value of any AC signal, not only sinewave

 * The code uses the Sigma "Standard deviation" method and displays the value every "printPeriod"

 * check www.SurtrTech.com for more details

 */


```
#include <Filters.h>                    //Library to use

#include <LiquidCrystal_I2C.h>

#include <Wire.h>

#include <ACS712.h>

#include <ZMPT101B.h>
```

```
LiquidCrystal_I2C lcd(0x27,20,4);  // set the LCD address to 0x27 for a 16 chars
and 2 line display
```

```
ACS712 currentSensor(ACS712_30A, A0);

ACS712 currentSensorDC(ACS712_30A, A1);

float testFrequency = 60;               // test signal frequency (Hz)

float windowLength = 40.0/testFrequency;      // how long to average the signal,
for statistist, changing this can have drastic effect
```

// Test as you need

```
int SensorAC = 2;//A2 Sensor Tegangan AC

int SensorDC = 3; //A3 Sensor Tegangan DC


float intercept = 0;  // to be adjusted based on calibration testin

float slope = 0.140; // to be adjusted based on calibration testin

float volts; //voltage


// Voltage Sensor DC

float Vmodul = 0.0;

float hasil = 0.0;

float R1 = 30000.0; //30k

float R2 = 7500.0; //7500 ohm resistor,

int value = 0;



/* How to get the intercept and slope? First keep them like above, intercept=0 and
slope=1,

 * also below keep displaying Calibrated and non calibrated values to help you in
this process.

 * Put the AC input as 0 Volts, upload the code and check the serial monitor,
normally you should have 0

 * if you see another value and it is stable then the intercept will be the opposite of
that value
```

* Example you upload first time and then you see a stable 1.65V so the intercept will be -1.65

* To set the slope now you need to put the voltage at something higher than 0, and measure that using your reference TRMS multimeter

* upload the new code with the new intercept and check the value displayed as calibrated values

* Slope = (Measured values by multimeter)/(Measured values by the code)

* Place your new slope and reupload the code, if you have problems with calibration try to adjust them both

* or add a new line to calibrate further

* Slope and intercept have nothing to do with the TRMS calculation, it's just an adjustement of the line of solutions

*/

```
unsigned long Periodo = 1000; //Measuring frequency, every 1s, can be changed

unsigned long tiempoAnterior = 0;


RunningStatistics inputStats; //This class collects the value so we can apply some functions


void setup() {

  lcd.init();                // initialize the lcd

  // Print a message to the LCD.
```

```
lcd.backlight();

Serial.begin(9600);    // start the serial port

Serial.println("Serial started");

delay(100);

lcd.setCursor(8,0);

lcd.print("SKRIPSI");

lcd.setCursor(4,1);

lcd.print("RANCANG BANGUN");

 lcd.setCursor(3,2);

lcd.print("SISTEM PEMBANGKIT");

lcd.setCursor(2,3);

lcd.print("LISTRIK TENAGA AIR");

delay(1000);

lcd.clear();

lcd.setCursor(2,0);

lcd.print("UNTUK MEMANFAATKAN");

lcd.setCursor(1,1);

lcd.print("ENERGI ALIRAN POMPA");

lcd.setCursor(3,2);

lcd.print("AIR DI KOLAM IKAN");

lcd.setCursor(0,3);

lcd.print("===================");
```

```
  delay(1000);

 lcd.clear();

}


void loop() {


    RunningStatistics inputStats;

    inputStats.setWindowSecs(windowLength);


    while(true){

     SensorAC = analogRead(2);

     inputStats.input(SensorAC);

     if((unsigned long)(millis() - tiempoAnterior) >= Periodo) {

       volts = intercept + slope * inputStats.sigma();

       volts = volts*(35.3231);

       Serial.print("V:");

       Serial.println(volts);

       lcd.setCursor(0,0);

       lcd.print("VAC=");

       lcd.setCursor(4,0);

       lcd.print(volts);
```

```
value = analogRead(SensorDC);

Vmodul = (value * 5.0) / 1024.0;

hasil = Vmodul / (R2/(R1+R2));

/*lcd.setCursor(0,0);

lcd.print("Vout modul= ");

lcd.print(Vmodul);

lcd.print(" V");*/

Serial.print("VDC=");

Serial.println(hasil,2);

lcd.setCursor(0,1);

lcd.print("VDC=");

lcd.print(hasil,2);


// tegangan PLN diasumsikan stabil pada 220v

  float I = currentSensor.getCurrentAC();

  float Idc = currentSensorDC.getCurrentAC();


// Untuk menghitung daya, kita perlu tegangan dikalikan dengan arus

  float P = volts * I;

  float P1 = hasil * Idc;
```

```
/*Serial.println(String("I = ") + I + " A");

Serial.println(String("P = ") + P + " Watts");*/

//Sensor Arus AC

//Tampilan Serial Monitor

Serial.print("IAC=");

Serial.println(I);

Serial.print("PAC=");

Serial.println(P);

//Tampilan LCD

lcd.setCursor(0,2);

lcd.print("IAC=");

lcd.setCursor(4,2);

lcd.print(I);

lcd.setCursor(0,3);

lcd.print("PAC=");

lcd.setCursor(4,3);

lcd.print(P);

//Sensor Arus DC

//Tampilan Serial Monitor

Serial.print("IDC=");

Serial.println(Idc);
```

```
Serial.print("PDC=");

Serial.println(P1);

//Tampilan LCD

lcd.setCursor(10,2);

lcd.print("IDC=");

lcd.setCursor(14,2);

lcd.print(Idc);

lcd.setCursor(10,3);

lcd.print("PDC=");

lcd.setCursor(14,3);

lcd.print(P1);

 delay(1000);

tiempoAnterior = millis();

    }

    }


}
```

Lampiran 2 : Data Sheet Komponen-komponen

Arduino UNO

Product Overview

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Index

RS radiospares RADIONICS

Technical Specification

Summary

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

the board
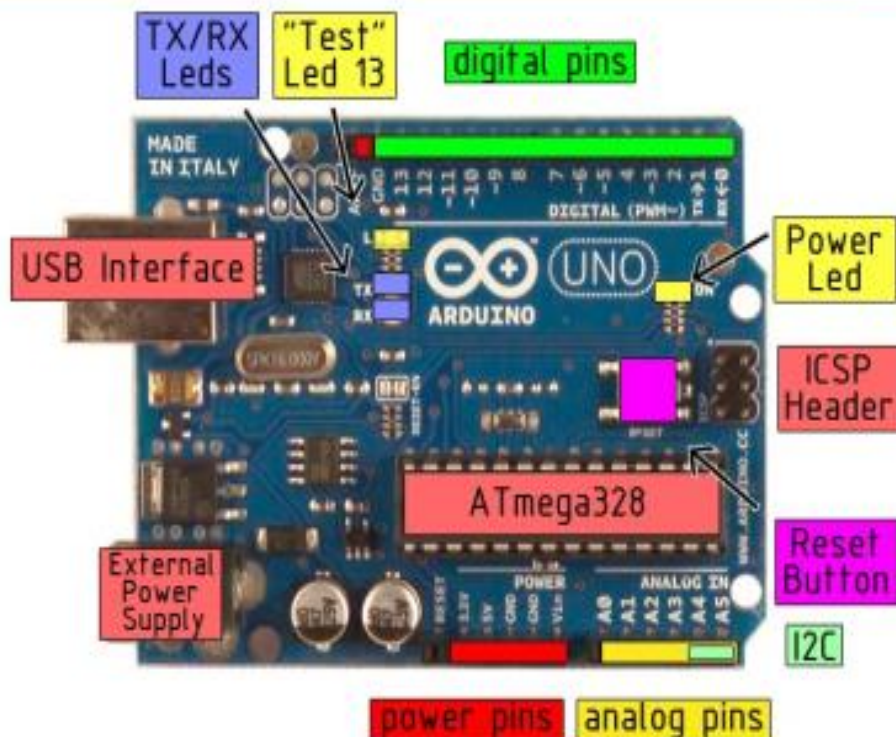
Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- **VIN**. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3V3**. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**. Ground pins.

Memory

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the bootloader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- **Serial: 0 (RX) and 1 (TX)**. Used to receive (RX) and transmit (TX) TTL serial data. TThese pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip .
- **External Interrupts: 2 and 3**. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- **PWM: 3, 5, 6, 9, 10, and 11**. Provide 8-bit PWM output with the analogWrite() function.
- **SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK)**. These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.

- **LED: 13**. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function. Additionally, some pins have specialized functionality:

- I²C: 4 (SDA) and 5 (SCL). Support I²C (TWI) communication using the Wire library.

There are a couple of other pins on the board:

- **AREF**. Reference voltage for the analog inputs. Used with analogReference().
- **Reset**. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

See also the mapping between Arduino pins and Atmega328 ports.

Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an *.inf file is required..

The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A SoftwareSerial library allows for serial communication on any of the Uno's digital pins.

The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. To use the SPI communication, please see the ATmega328 datasheet.

Programming

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno w/ ATmega328" from the **Tools > Board** menu (according to the microcontroller on your board). For details, see the reference and tutorials.

The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

The ATmega8U2 firmware source code is available . The ATmega8U2 is loaded with a DFU bootloader, which can be activated by connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader).

Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

USB Overcurrent Protection

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

I2C interface for LCD

Discription:

This LCD2004 is a great I2C interface for 2x16 and 4x20 LCD displays. With the limited pin resources, your project may be out of resources using normal LCD shield. With this I2C interface LCD module, you only need 2 lines (I2C) to display the information. If you already has I2C devices in your project, this LCD module actually cost no more resources at all. Fantastic for Arduino based projects.
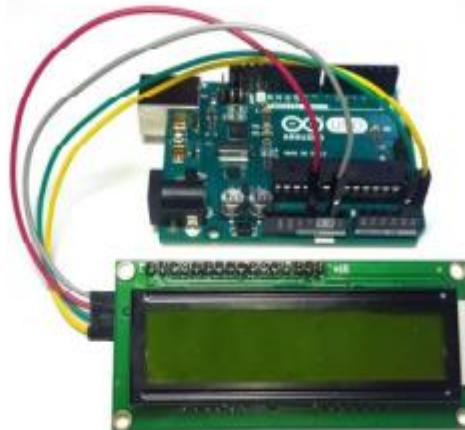
Specification:

Compatible with 16x2 and 20x4 LCD's
Default I2C Address = 0X27
Address selectable - Range 0x20 to 0x27

Board Layout:
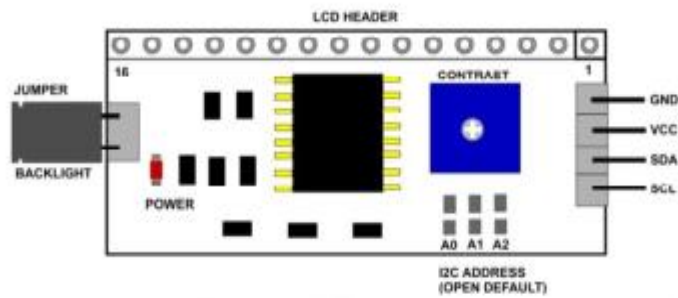
I2C Address Setup:

The LCD2004 board utilized the PCF8574 I/O expander. This nifty little chip provides eight bits of parallel I/O addressabl
by a I2C bus address – 0x00 to 0x27. SainSmart tied all address leads to Vcc, so the LCD2004 board's I2C address
is permanently fixed at hex 27. This is rather limiting since no additional LCD2004s can be added to the bus.
Anyway, you simply address the board and write an eight bit value which is then presented on the output pins of the
PCF8574, which, in this case, are connected to the HD44780 based LCD screen.

INPUTS			I2C SLAVE ADDRESS
A2	A1	A0	
L	L	L	0x20
L	L	H	0x21
L	H	L	0x22
L	H	H	0x23
H	L	L	0x24
H	L	H	0x25
H	H	L	0x26
H	H	H	0x27

H = Open Jumper   L = Close Jumper
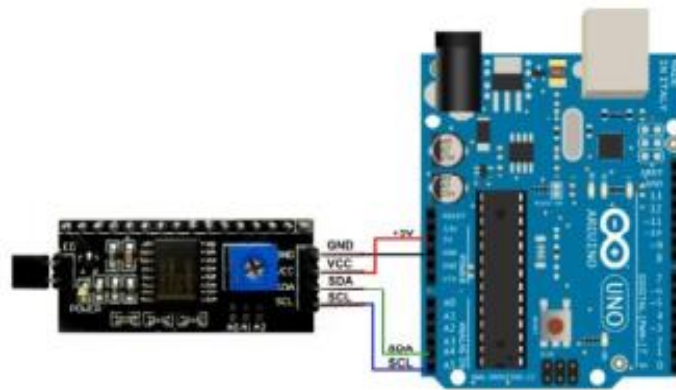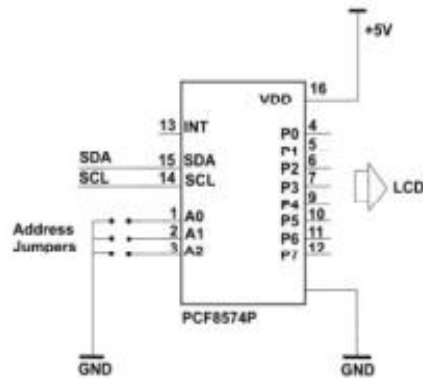
```
//Arduino Code
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27,2,1,0,4,5,6,7,3, POSITIVE); // Initialize LCD Display at address 0x27
                                                       // unmodified backpack
void setup() {
  // activate LCD module
  lcd.begin (16,2); // for 16 x 2 LCD module
  lcd.setBacklightPin(3,POSITIVE);
  lcd.setBacklight(HIGH);
}

void loop() {
  lcd.home (); // set cursor to 0,0
  lcd.print(" Hello, world!");
  lcd.setCursor (0,1);      // go to start of 2nd line
  lcd.print(millis());
  delay(1000);
  lcd.setBacklight(LOW);     // Backlight off
  delay(500);
  lcd.setBacklight(HIGH);    // Backlight on

  delay(1000);
}      // END
```

Check for more info at
https://arduino-info.wikispaces.com/LCD-Blue-I2C

500W Pure Sine Wave DC to AC Power Inverter   SR-500-S Series

■Features:

* Pure sine wave output (THD<3%)
* High surge power up to 1000W
* 1.5 times rated power for 10s, 2 times for 2s
* USB Port (5V,500mA) for charging USB devices
* Remote Control, control the inverter through cable
* Two multiple controlled DC fans: Temperature & Load.
* Protections:Bat.low alarm/Over voltage/Over shutdown/
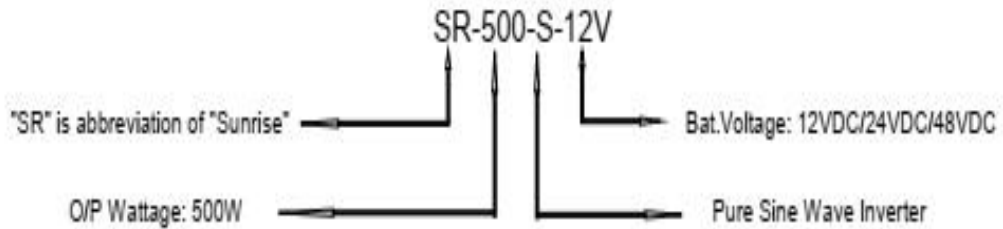 Output short/ Input reverse polarity/ Over load
* 1 year warranty

CE RoHS

SPECIFICATION

MODEL: SR-500-S		SR-500-S-12V	SR-500-S-24V	SR-500-S-48V
OUTPUT	Rated Power	500W		
	Maximum Output Power	1000W SURGE POWER; 750W for 10sec, 1000w for 2sec		
	AC Voltage	100~120VAC / 200~240VAC (Optional)		
	Frequency	50Hz±0.1% or 60Hz±0.1% (Optional)		
	Waveform	Pure sine wave output (THD<3%) at rated input voltage		
	Socket Types	USA/Australia/Universal/UK/France/Germany/South Africa		
	Led Indicator Light	Inverter and Fault		
INPUT	Bat.Voltage	12V	24V	48V
	Voltage Range	10.8V-15.5V	21.6V-31V	43.2V-62V
	DC Current	50A	25A	12.5A
	No Load Consumption	<0.4A	<0.2A	<0.1A
	Efficiency	90% (Full Loading) / 95% (1/3 Loading)		
	Battery Types	Open & sealed lead acid battery		
BATTERY INPUT PROTECTION	Fuses	35A*4	20A*4	10A*4
	Low Voltage Alarm	10.8V± 0.2V	21.6V±0.4V	43.2V±0.8V
	Low Voltage Shut down	10.2V± 0.2V	20.4V±0.4V	40.8V±0.8V
	Over Voltage Shut down	15.5V±0.2V	31V±0.4V	62V±0.8V
	Reverse Polarity	By fuse open		
OUTPUT PROTECTION	Over Temperature	Shut Off Output Automatically, Temperature >75℃		
	Output Short	Protection type: Shut down o/p voltage, re-power on to recover		
	Over Load	Protection type: Shut down o/p voltage, re-power on to recover		
BUZZER ALARM	Low Battery Alarm	Buzzer sound 2times and Red light blink 2times every 8sec		
	Low Battery Shutdown	Buzzer sound 3times and Red light blink 3times every 8sec		
	Over Voltage Shutdown	Buzzer sound 4times and Red light blink 4times every 8sec		
	Over temperature Shutdown	Buzzer sound 5times and Red light blink 5times every 8sec		
	Short Circuit/Overload Shutdown	Red light blink constantly		
ENVIRONMENT	Working Temp.	-10℃~+50℃		
	Working Humidity	20%~90% RH Non-Condensing		
	Storage Temp.	-30℃~+70℃		
SAFETY	CE EMC	Compliance to EN61000-3-2,3; EN55022; EN55024		
	CE LVD	Compliance to EN62040-1:2008		
	RoHS	Compliance to 2011/65/EU		
PACKING	Inner Box	315*195*135 mm, 2.5kg		
	Carton	420*340*460 mm, 15kg		
	Package	6pcs /Carton		
ACCESSORIES	Battery Cable	1x Positive & 1x Negative Battery Cables		
	User Manual	1x English Manual		
	Fuse	4x Replaceable fuses		

500W Pure Sine Wave DC to AC Power Inverter   SR-500-S Series

SR-500-S-12V

"SR" is abbreviation of "Sunrise" → Bat.Voltage: 12VDC/24VDC/48VDC

O/P Wattage: 500W → Pure Sine Wave Inverter

■ AC Output Receptacles (Optional)

A	B	C	D	E	F
USA	AUSTRALIA	UNIVERSAL	U.K	FRANCE	GERMANY

■ How Power Inverter Works

Solar Panels

DC Loads

Cooler   Cell Phone

Spotlight   Fan

Batteries

Solar Charge Controller

AC Loads

Sump Pump   Laptop

Fleurescent Lighting   Television

Power Inverter

ACS712

Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

Features and Benefits

- Low-noise analog signal path
- Device bandwidth is set via the new FILTER pin
- 5 μs output rise time in response to step input current
- 80 kHz bandwidth
- Total output error 1.5% at $T_A = 25°C$
- Small footprint, low-profile SOIC8 package
- 1.2 mΩ internal conductor resistance
- 2.1 kV_{RMS} minimum isolation voltage from pins 1–4 to pins 5–8
- 5.0 V, single supply operation
- 66 to 185 mV/A output sensitivity
- Output voltage proportional to AC or DC currents
- Factory-trimmed for accuracy
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis
- Ratiometric output from supply voltage

CE

TÜV America
Certificate Number:
U8V 06 05 54214 010

c UL us

## Package: 8 Lead SOIC (suffix LC)

Approximate Scale 1:1

Description

The Allegro® ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switched-mode power supplies, and overcurrent fault protection.

The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

The output of the device has a positive slope ($>V_{IOUT(Q)}$) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sensing. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power

Typical Application
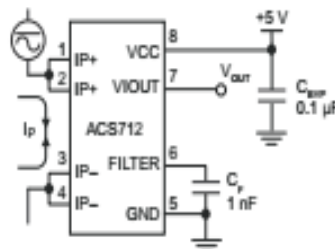
Application 1. The ACS712 outputs an analog signal, V_{OUT}, that varies linearly with the uni- or bi-directional AC or DC primary sensed current, I_P, within the range specified. C_F is recommended for noise management, with values that depend on the application.

Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

Description (continued)

loss. The thickness of the copper conductor allows survival of the device at up to 5× overcurrent conditions. The terminals of the conductive path are electrically isolated from the sensor leads (pins 5 through 8). This allows the ACS712 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques.

The ACS712 is provided in a small, surface mount SOIC8 package. The leadframe is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory.

Selection Guide

Part Number	Packing*	T_A (°C)	Optimized Range, I_p (A)	Sensitivity, Sens (Typ) (mV/A)
ACS712ELCTR-05B-T	Tape and reel, 3000 pieces/reel	−40 to 85	±5	185
ACS712ELCTR-20A-T	Tape and reel, 3000 pieces/reel	−40 to 85	±20	100
ACS712ELCTR-30A-T	Tape and reel, 3000 pieces/reel	−40 to 85	±30	66

*Contact Allegro for additional packing options.

Absolute Maximum Ratings

Characteristic	Symbol	Notes	Rating	Units
Supply Voltage	V_{CC}		8	V
Reverse Supply Voltage	V_{RCC}		−0.1	V
Output Voltage	V_{IOUT}		8	V
Reverse Output Voltage	V_{RIOUT}		−0.1	V
Reinforced Isolation Voltage	V_{ISO}	Pins 1-4 and 5-8; 60 Hz, 1 minute, T_A=25°C	2100	V
		Voltage applied to leadframe (Ip+ pins), based on IEC 60950	184	V_{peak}
Basic Isolation Voltage	$V_{ISO(bsc)}$	Pins 1-4 and 5-8; 60 Hz, 1 minute, T_A=25°C	1500	V
		Voltage applied to leadframe (Ip+ pins), based on IEC 60950	354	V_{peak}
Output Current Source	$I_{IOUT(Source)}$		3	mA
Output Current Sink	$I_{IOUT(Sink)}$		10	mA
Overcurrent Transient Tolerance	I_p	1 pulse, 100 ms	100	A
Nominal Operating Ambient Temperature	T_A	Range E	−40 to 85	°C
Maximum Junction Temperature	T_J(max)		165	°C
Storage Temperature	T_{stg}		−65 to 170	°C

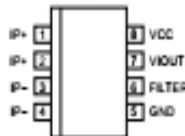| Parameter	Specification
Fire and Electric Shock	CAN/CSA-C22.2 No. 60950-1-03 UL 60950-1:2003 EN 60950-1:2001

ACS712

Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

Functional Block Diagram
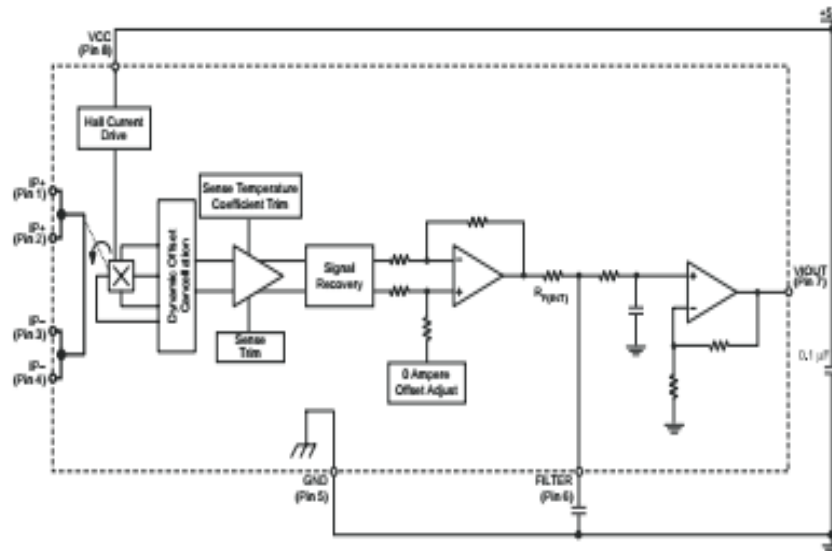
Pin-out Diagram

Terminal List Table

Number	Name	Description
1 and 2	IP+	Terminals for current being sensed; fused internally
3 and 4	IP–	Terminals for current being sensed; fused internally
5	GND	Signal ground terminal
6	FILTER	Terminal for external capacitor that sets bandwidth
7	VIOUT	Analog output signal
8	VCC	Device power supply terminal

ACS712

Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

COMMON OPERATING CHARACTERISTICS[1] over full range of T_A, C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
ELECTRICAL CHARACTERISTICS						
Supply Voltage	V_{CC}		4.5	5.0	5.5	V
Supply Current	I_{CC}	V_{CC} = 5.0 V, output open	–	10	13	mA
Output Capacitance Load	C_{LOAD}	VIOUT to GND	–	–	10	nF
Output Resistive Load	R_{LOAD}	VIOUT to GND	4.7	–	–	kΩ
Primary Conductor Resistance	$R_{PRIMARY}$	T_A = 25°C	–	1.2	–	mΩ
Rise Time	t_r	I_p = I_p(max), T_A = 25°C, C_{OUT} = open	–	5	–	µs
Frequency Bandwidth	f	–3 dB, T_A = 25°C; I_p is 10 A peak-to-peak	–	80	–	kHz
Nonlinearity	E_{LIN}	Over full range of I_p	–	1.5	–	%
Symmetry	E_{SYM}	Over full range of I_p	98	100	102	%
Zero Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_p = 0 A, T_A = 25°C	–	V_{CC} X 0.5	–	V
Power-On Time	t_{PO}	Output reaches 90% of steady-state level, T_J= 25°C, 20 A present on leadframe	–	35	–	µs
Magnetic Coupling[2]			–	12	–	G/A
Internal Filter Resistance[3]	$R_{F(INT)}$			1.7		kΩ

[1]Device may be operated at higher primary current levels, I_p, and ambient, T_A, and internal leadframe temperatures, T_A, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

[2]1G = 0.1 mT.

[3]$R_{F(INT)}$ forms an RC circuit via the FILTER pin.

COMMON THERMAL CHARACTERISTICS[1]

			Min.	Typ.	Max.	Units
Operating Internal Leadframe Temperature	T_A	E range	–40	–	85	°C
					Value	Units
Junction-to-Lead Thermal Resistance[2]	$R_{\theta JL}$	Mounted on the Allegro ASEK 712 evaluation board			5	°C/W
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	Mounted on the Allegro 85-0322 evaluation board, includes the power consumed by the board			23	°C/W

[1]Additional thermal information is available on the Allegro website.

[2]The Allegro evaluation board has 1500 mm^2 of 2 oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4, with thermal vias connecting the layers. Performance values include the power consumed by the PCB. Further details on the board are available from the Frequently Asked Questions document on our website. Further information about board design and thermal performance also can be found in the Applications Information section of this datasheet.

x05B PERFORMANCE CHARACTERISTICS T_A = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–5	–	5	A
Sensitivity	Sens	Over full range of I_P, T_A = 25°C	180	185	190	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A = 25°C, 185 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	21	–	mV
Zero Current Output Slope	$\Delta I_{OUT(Q)}$	T_A = –40°C to 25°C	–	–0.26	–	mV/°C
		T_A = 25°C to 150°C	–	–0.08	–	mV/°C
Sensitivity Slope	ΔSens	T_A = –40°C to 25°C	–	0.054	–	mV/A/°C
		T_A = 25°C to 150°C	–	–0.008	–	mV/A/°C
Total Output Error[2]	E_{TOT}	I_P = ±5 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_A, provided that the Maximum Junction Temperature, $T_{J(max)}$, is not exceeded.

[2]Percentage of I_P, with I_P = 5 A. Output filtered.

x20A PERFORMANCE CHARACTERISTICS T_A = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–20	–	20	A
Sensitivity	Sens	Over full range of I_P, T_A = 25°C	96	100	104	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A = 25°C, 100 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	11	–	mV
Zero Current Output Slope	$\Delta I_{OUT(Q)}$	T_A = –40°C to 25°C	–	–0.34	–	mV/°C
		T_A = 25°C to 150°C	–	–0.07	–	mV/°C
Sensitivity Slope	ΔSens	T_A = –40°C to 25°C	–	0.017	–	mV/A/°C
		T_A = 25°C to 150°C	–	–0.004	–	mV/A/°C
Total Output Error[2]	E_{TOT}	I_P = ±20 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_A, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

[2]Percentage of I_P, with I_P = 20 A. Output filtered.

x30A PERFORMANCE CHARACTERISTICS T_A = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–30	–	30	A
Sensitivity	Sens	Over full range of I_P, T_A = 25°C	64	66	68	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A = 25°C, 66 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	7	–	mV
Zero Current Output Slope	$\Delta I_{OUT(Q)}$	T_A = –40°C to 25°C	–	–0.35	–	mV/°C
		T_A = 25°C to 150°C	–	–0.08	–	mV/°C
Sensitivity Slope	ΔSens	T_A = –40°C to 25°C	–	0.007	–	mV/A/°C
		T_A = 25°C to 150°C	–	–0.002	–	mV/A/°C
Total Output Error[2]	E_{TOT}	I_P = ±30 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_A, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

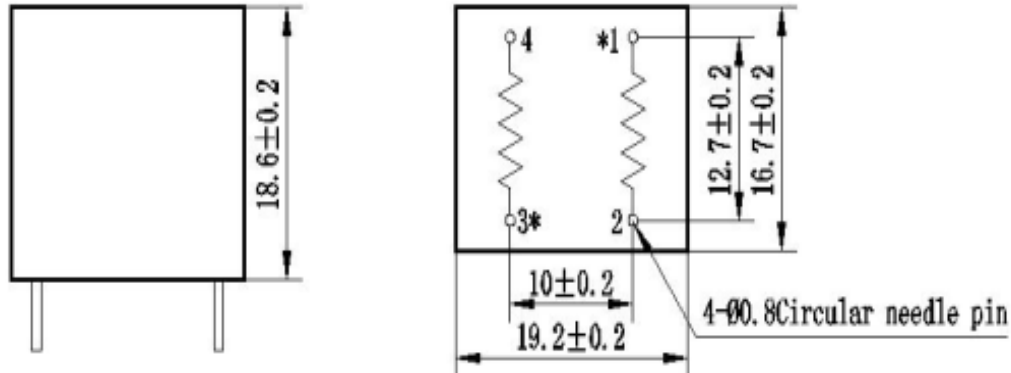[2]Percentage of I_P, with I_P = 30 A. Output filtered.

ZMPT101B
Current-type Voltage Transformer

Small size，high accuracy, good consistency, for voltage and power measurement

Structural parameters：

Front view   **Bottom view**

The main technical parameters：

Model	ZMPT101B
Rated input current	2mA
Rated output current	2mA
turns ratio	1000:1000
phase angle error	≤20′ （input 2mA，sampling resistor 100Ω）
operating range	0~1000V 0~10mA（sampling resistor 100Ω）
linearity	≤0.2%(20%dot~120%dot)
Permissible error	-0.3%≤ f ≤+0.2% （input 2mA，sampling resistor 100Ω）
isolation voltage	4000V
application	voltage and power measurement
Encapsulation	Epoxy
installation	PCB mounting （Pin Length>3mm）
Operating temperature	-40℃~+60℃
Case Material	**ABS (Note: ABS CASE is NOT available for wave-soldering)**

Direction for use:

$$U_2 = \frac{U_1}{R'} \cdot R$$

U₁: input voltage U₂: output voltage
R' : limiting resistor
R: sampling resistor
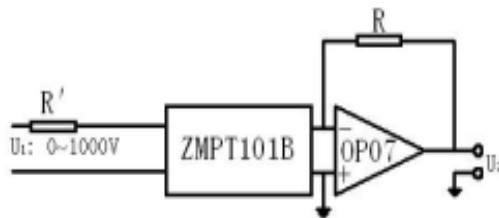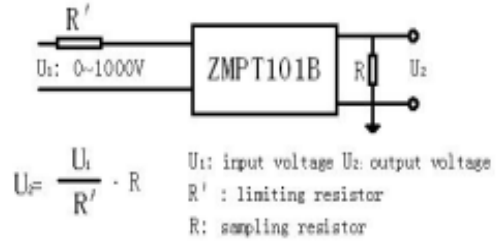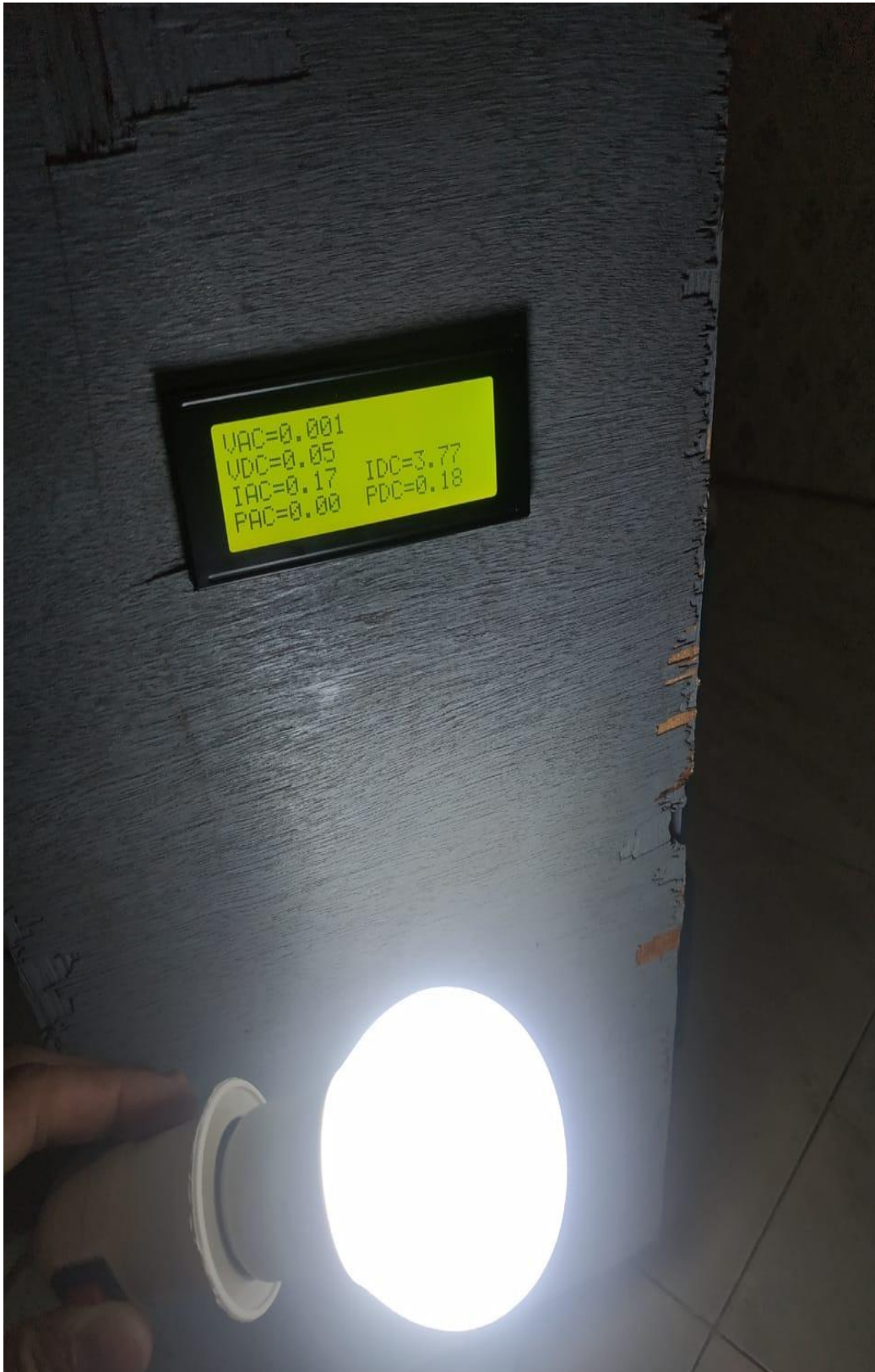
Figure Ⅰ   **Figure Ⅱ**

1. The typical usage of the product is for the active output (Figure Ⅰ). R' is a limiting resistor, R is a sampling resistor.

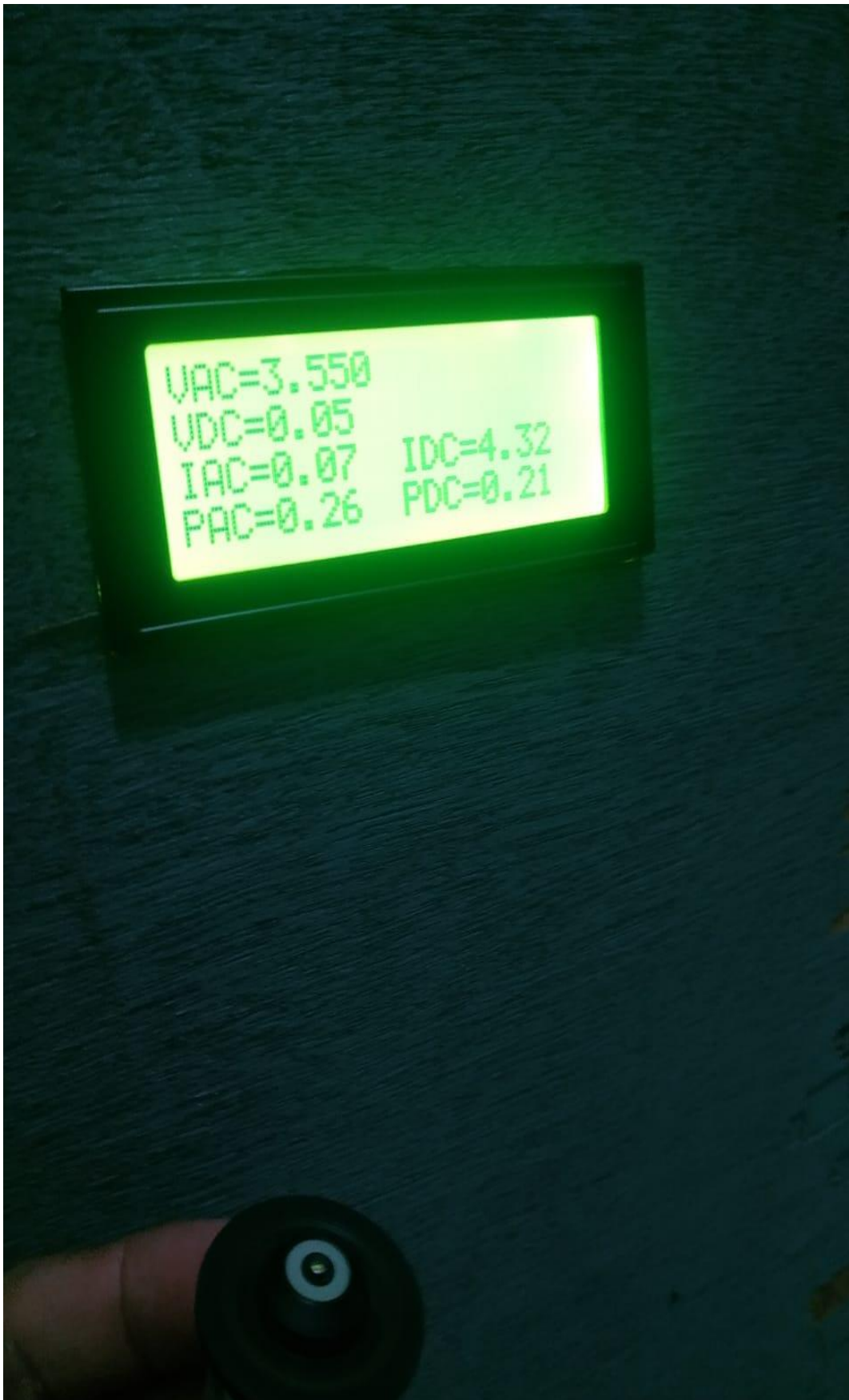2. The product can be directly through the resistance sampling , easy to use (Figure Ⅱ).

Lampiran 3 : Hasil Pengujian

DAFTAR RIWAYAT HIDUP

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   2. Tempat/ tanggal lahir   : Gresik, 27 05 1996

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