DAFTAR LAMPIRAN

1. Kode Program

```
#include <ThingerESP8266.h>
#include "Arduino.h"
#include "SoftwareSerial.h"
#include <SoftwareSerial.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h> //Library I2C LCD
#include <Servo.h>
#include "HX711.h"

Servo servo1,servo2;
#define USERNAME "PemilahAyam"
#define DEVICE_ID "Pemilah_Ayam"
#define DEVICE_CREDENTIAL "FN9n9AIJ3VFYjGA5"

//#define ON_Board_LED 2 //--> Defining an On Board LED, used for
indicators when the process of connecting to a wifi router. GPIO2 = D4.

ThingerESP8266 thing(USERNAME, DEVICE_ID, DEVICE_CREDENTIAL);
//--> Initialize Thinger IO (ThingerESP8266)

// ---------------------------------------- SSID and Password of your WiFi
Router/Hotspot.
const char* ssid = "GALAXY"; //--> Your wifi name or SSID.
const char* password = "imum1745"; //--> Your wifi password.

#define DOUT  14
#define CLK  12
// initialize the library with the numbers of the interface pins
LiquidCrystal_I2C lcd(0x27,20,4); //alamat I2C

HX711 scale;
float calibration_factor = -449.80; //Hasil Kalibrasi
int units;
const int irSend1=D7;//program untuk IR modul
const int irSend2=D0;
const int pompa1 =D3;

int irPin1=HIGH;
int irPin2=HIGH;

unsigned int Jkecil=0;
unsigned int Jbesar=0;
unsigned int tot=0;
```

```
boolean kecil=false;
boolean besar=false;

void setup(){
  Serial.begin(9600);         // Inisialisasi Serial
  scale.begin(DOUT,  CLK);
  scale.set_scale();
  scale.tare();  //Reset the scale to 0

  long zero_factor = scale.read_average(); //Get a baseline reading
Serial.print("Zero factor: "); //This can be used to remove the need to tare the
scale. Useful in permanent scale projects.
  Serial.println(zero_factor);

  lcd.begin(20,4);
lcd.init();
  // Nyalakan backlight
lcd.backlight();
lcd.setCursor(0,0);
  lcd.print("SISTEM PEMILAH");
  lcd.setCursor(7,1);
 lcd.print("AYAM");
 lcd.clear();
  //inisialisasi pin modul IR
  pinMode(irSend1,INPUT);
  pinMode(irSend2,INPUT);
  pinMode(pompa1,OUTPUT);
  digitalWrite(pompa1,LOW);

  //inisialisasi pin servo dan posisi awal servo
  servo1.attach(D4); //pin servo 1 berada pada pin A1 Arduino
  servo1.write(75);
  delay(500); // tunda 500 milidetik
  WiFi.begin(ssid, password); //--> Connect to your WiFi router

  //........................................................Wait for connection
  while (WiFi.status() != WL_CONNECTED) {
    // ----------------------------------------Make the On Board Flashing LED on the
process of connecting to the wifi router.
    delay(250);
    //..........................................................
  }
  //..........................................................

  // digitalWrite(ON_Board_LED, HIGH); //--> Turn off the On Board LED
when it is connected to the wifi router.

  thing.add_wifi(ssid, password); //--> Initialize wifi
```

```
  //-------------------------------------Sends DHT11 Sensor data (Temperature and
Humidity) to Thinger IO
  // Symbol or operator ">>" means to transmit data
thing["HASIL"] >> [](pson & out) {
out["BERAT"] =units ;
   out["BESAR"] =Jbesar ;
   out["KECIL"] =Jkecil ;
   out["TOTAL"] =tot ;
  };
}

/*
 * Program Utama
 */
void loop() {
  thing.handle();
  scale.set_scale(calibration_factor); //Adjust to this calibration factor
  Serial.print("Berat: ");
  Serial.print(units);
  Serial.print(" Gram");
  Serial.println();
  Serial.print("Reading: ");
  units = scale.get_units(), 1;
  if (units < 0)
  {
    units = 0.00;
  }
   delay(100);
  if ( units >50 && units <400 ){
    Serial.println("Kecil"); // Tampilkan pesan ke Serial Monitor
    digitalWrite(pompa1,HIGH);
    lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("BERAT: ");
  lcd.setCursor(7,0);
  lcd.print(units);
  lcd.setCursor(3,3);
  lcd.print("Ayam Kecil");
  Serial.println("SERVO 1 GERAK");
   servo1.write(0); //servo3 berganti posisi ke 75 derajat
   delay(3000);
   servo1.write(75);
 kecil=true;
 digitalWrite(pompa1,LOW);
  }
 else if ( units >400 ){
```

```
   Serial.println("Ayam BESAR"); // Tampilkan pesan ke Serial Monitor
   digitalWrite(pompa1,HIGH);
  besar=true;
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("BERAT: ");
 lcd.setCursor(7,0);
 lcd.print(units);
 lcd.setCursor(3,3);
   lcd.print("Ayam Besar");
   servo1.write(150); //servo3 berganti posisi ke 75 derajat
   delay(3000);
   servo1.write(75);
   digitalWrite(pompa1,LOW);

 }
if(irPin1==LOW && kecil==true){
   delay(10);
   Jkecil++;
   Serial.println("SERVO 1 GERAK");
   kecil=false;
 }
 else if(irPin2==LOW && besar==true){
   delay(10);
   Jbesar++;
   besar=false;
 }


 tot=Jbesar+Jkecil;
lcd.clear();
lcd.setCursor(0,0);
lcd.print("BERAT: ");
lcd.setCursor(7,0);
lcd.print(units);
lcd.setCursor(12,0);
lcd.print("gram");
lcd.setCursor(0,1);
lcd.print("K=");
lcd.setCursor(2,1);
lcd.print(Jkecil);
lcd.setCursor(6,1);
lcd.print("B=");
lcd.setCursor(8,1);
lcd.print(Jbesar);
lcd.setCursor(12,1);
lcd.setCursor(0,2);
lcd.print("TOTAL=");
```

```
  lcd.print(tot);
 bacaIR();
}

void bacaIR(){
  irPin1 = digitalRead(irSend1);
  irPin2 = digitalRead(irSend2);
  delay(100);
}
```

2.

ESPRESSIF SMART CONNECTIVITY PLATFORM: ESP8266

Table of Contents

1 Introduction

Espressif Systems' Smart Connectivity Platform (ESCP) of high performance wireless SOCs, for mobile platform designers, provides unsurpassed ability to embed Wi-Fi capabilities within other systems, at the lowest cost with the greatest functionality.

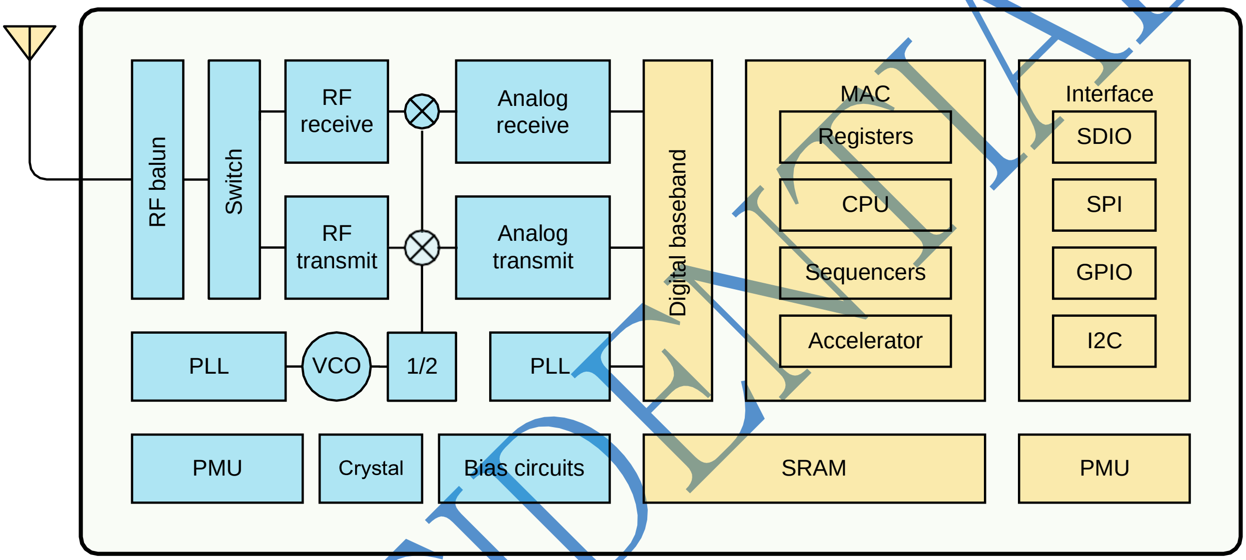


Figure 1: ESP8266 Block Diagram

2 Technology Overview

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to eitherhost the application or to offload all Wi-Fi networking functions from another application processor.

When ESP8266 hosts the application, and when it is the only application processor in the device,it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements.

Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface or the CPUAHB bridge interface.

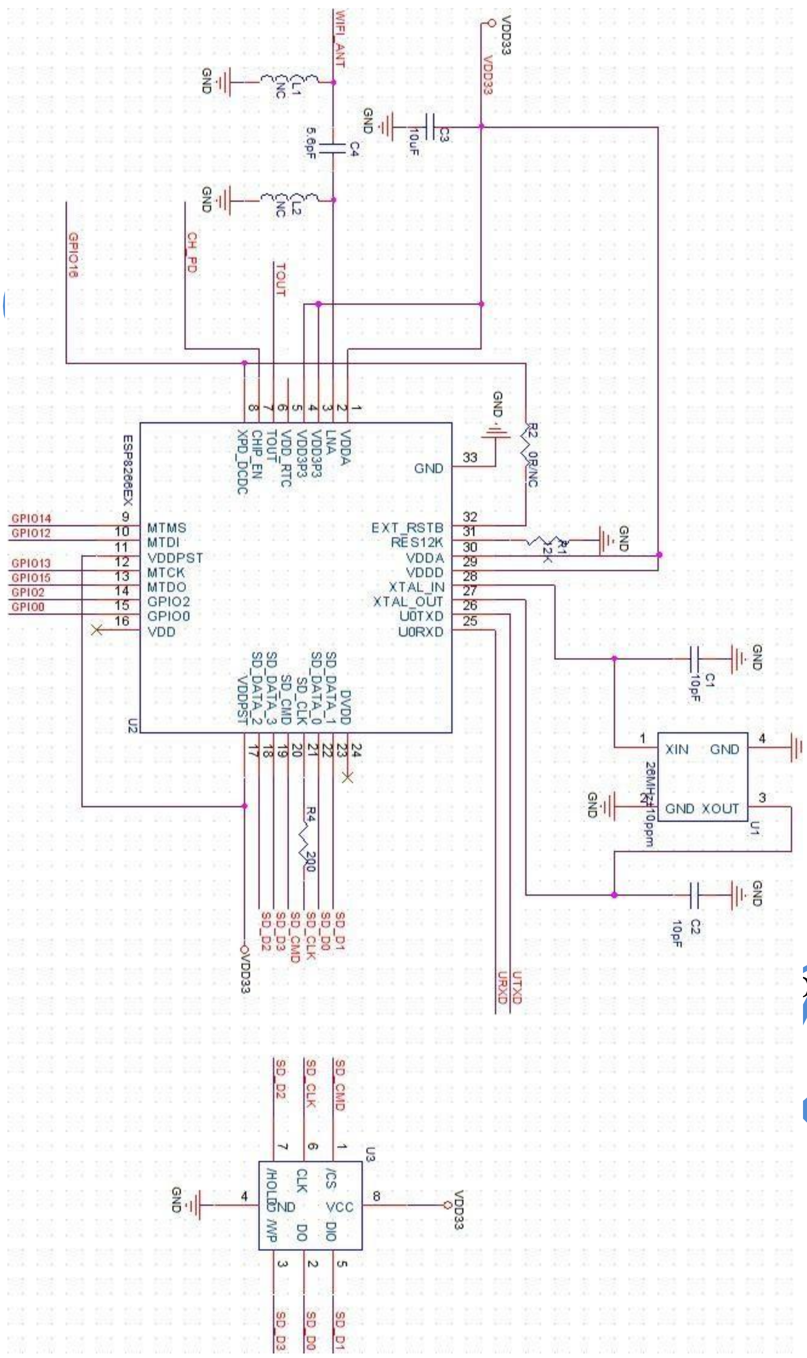
ESP8266 on-board processing and storage capabilities allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front andminimal loading during runtime. With its high degree of on-chip integration, which includes the antenna switch balun, power management converters, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

Sophisticated system-level features include fast sleep/wake context switching for energy-efficient VoIP, adaptive radio biasing for low-power operation, advance signal processing, and spur cancellation and radio co-existence features for common cellular, Bluetooth, DDR, LVDS,LCD interference mitigation.

3 Features

- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- +19.5dBm output power in 802.11b mode
- Integrated temperature sensor
- Supports antenna diversity
- Power down leakage current of < 10uA
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4μs guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

4 Application Diagram



5 Ultra Low Power Technology

ESP8266 has been designed for mobile, wearable electronics and Internet of Things applicationswith the aim of achieving the lowest power consumption with a combination of several proprietary techniques. The power saving architecture operates in 3 modes: active mode, sleep mode and deep sleep mode.

By using advance power management techniques and logic to power-down functions not required and to control switching between sleep and active modes, ESP8266 consumes less than12uA in sleep mode and less than 1.0mW (DTIM=3) or less than 0.5mW (DTIM=10) to stay connected to the access point.

When in sleep mode, only the calibrated real-time clock and watchdog remains active. The real-time clock can be programmed to wake up the ESP8266 at any required interval.

The ESP8266 can be programmed to wake up when a specified condition is detected. This minimal wake-up time feature of the ESP8266 can be utilized by mobile device SOCs, allowingthem to remain in the low-power standby mode until Wi-Fi is needed.

In order to satisfy the power demand of mobile and wearable electronics, ESP8266 can be programmed to reduce the output power of the PA to fit various application profiles, by tradingoff range for power consumption.

5.1 Highest Level of Integration

By integrating the costliest components such as power management unit, TR switch, RF balun, high power PA capable of delivering +25dBm (peak), ESP8266 ensures that the BOM cost is thelowest possible, and ease of integration into any system.

With ESP8266, the only external BOM are resistors, capacitors, and crystal.

6 ESP8266 Applications

- Smart power plugs

- Home automation
- Mesh network
- Industrial wireless control
- Baby monitors
- IP Cameras
- Sensor networks
- Wearable electronics
- Wi-Fi location-aware devices
- Security ID tags
- Wi-Fi position system beacons

7 Specifications

7.1 Current Consumption

The following current consumption is based on 3.3V supply, and 25°C ambient, using internalregulators. Measurements are done at antenna port without SAW filter. All the transmitter's measurements are based on 90% duty cycle, continuous transmit mode.

Mode	Min	Typ	Max	Unit
Transmit 802.11b, CCK 1Mbps, P_{OUT}=+19.5dBm		215		mA
Transmit 802.11b, CCK 11Mbps, P_{OUT}=+18.5dBm		197		mA
Transmit 802.11g, OFDM 54Mbps, P_{OUT} =+16dBm		145		mA
Transmit 802.11n, MCS7, P_{OUT}=+14dBm		135		mA
Receive 802.11b, packet length=1024 byte, -80dBm		60		mA
Receive 802.11g, packet length=1024 byte, -70dBm		60		mA
Receive 802.11n, packet length=1024 byte, -65dBm		62		mA
Standby		0.9		mA
Deep sleep		10		uA
Power save mode DTIM 1		1.2		mA
Power save mode DTIM 3		0.86		mA
Total shutdown		0.5		uA

7.2 RF Performance

The following are measured under room temperature conditions with 3.3V and 1.1V powersupplies.

Description	Min	Typical	Max	Unit
Input frequency	2412		2484	MHz
Input impedance		50		Ω
Input reflection			-10	dB
Output power of PA for 72.2Mbps	14	15	16	dBm
Output power of PA for 11b mode	17.5	18.5	19.5	dBm
Sensitivity				
CCK, 1Mbps		-98		dBm
CCK, 11Mbps		-91		dBm
6Mbps (1/2 BPSK)		-93		dBm
54Mbps (3/4 64-QAM)		-75		dBm
HT20, MCS7 (65Mbps, 72.2Mbps)		-71		dBm
Adjacent Channel Rejection				
OFDM, 6Mbps		37		dB
OFDM, 54Mbps		21		dB
HT20, MCS0		37		dB
HT20, MCS7		20		dB

8 CPU, Memory and Interfaces

8.1 CPU

This chip embeds an ultra low power Micro 32-bit CPU, with 16-bit thumb mode. This CPU canbe interfaced using:

- code RAM/ROM interface (iBus) that goes to the memory controller, that can also beused to access external flash memory,
- data RAM interface (dBus), that also goes to the memory controller
- AHB interface, for register access, and
- JTAG interface for debugging

8.2 Memory Controller

The memory controller contains ROM, and SRAM. It is accessed by the CPU using the iBus, dBus and AHB interface. Any of these interfaces can request access to the ROM or RAM modules, and the memory controller arbiters serve these 3 interfaces on a first-come-first-servebasis.

8.3 AHB and AHB Blocks

The AHB blocks performs the function of an arbiter, controls the AHB interfaces from the MAC,SDIO (host) and CPU. Depending on the address, the AHB data requests can go into one of the two slaves:

- APB block, or
- flash controller (usually for standalone applications).

Data requests to the memory controller are usually high speed requests, and requests to the APBblock are usually register access.

The APB block acts as a decoder. It is meant only for access to programmable registers within ESP8266's main blocks. Depending on the address, the APB request can go to the radio, SI/SPI,SDIO (host), GPIO, UART, real-time clock (RTC), MAC or digital baseband.

8.4 Interfaces

The ESP8266 contains several analog and digital interfaces described in the following sections.

8.4.1 Master SI / SPI Control (Optional)

The master serial interface (SI) can operate in two, three or four-wire bus configurations tocontrol the EEPROM or other I2C/SPI devices. Multiple I2C devices with different deviceaddresses are supported by sharing the 2-wire bus.

Multiple SPI devices are supported by sharing the clock and data signals, using separate softwarecontrolled GPIO pins as chip selects.

The SPI can be used for controlling external devices such as serial flash memories, audio CODECs, or other slave devices. It is set up as a standard master SPI device with 3 differentenable pins:

- SPI_EN0,
- SPI_EN1,
- SPI_EN2.

Both SPI master and SPI slave are supported with the latter being used as a host interface.

SPI_EN0 is used as an enable signal to an external serial flash memory for downloading patch code and/or MIB-data to the baseband in an embedded application. In a host based application,patch code and MIB-data can alternatively be downloaded via the host interface. This pin is active low and should be left open if not used.

SPI_EN1 is usually used for a user application, e.g. to control an external audio codec or sensorADC, in an embedded application. This pin is active low and should be left open if not used.

9 Firmware & Software Development Kit

The application and firmware is executed in on-chip ROM and SRAM, which loads theinstructions during wake-up, through the SDIO interface, from the external flash.

The firmware implements TCP/IP, the full 802.11 b/g/n/e/i WLAN MAC protocol and Wi-Fi Direct specification. It supports not only basic service set (BSS) operations under the distributedcontrol function (DCF) but also P2P group operation compliant with the latest Wi-Fi P2P protocol. Low level protocol functions are handled automatically by ESP8266:

- RTS/CTS,
- acknowledgement,
- fragmentation and defragmentation,
- aggregation,
- frame encapsulation (802.11h/RFC 1042),
- automatic beacon monitoring / scanning, and
- P2P Wi-Fi direct,

Passive or active scanning, as well as P2P discovery procedure is performed autonomously onceinitiated by the appropriate command. Power management is handled with minimum host interaction to minimize active duty period.

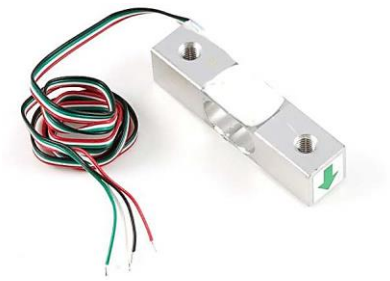
9.1 Features

The SDK includes the following library functions:

- 802.11 b/g/n/d/e/i/k/r support;
- Wi-Fi Direct (P2P) support:
- P2P Discovery, P2P Group Owner mode, P2P Power Management
- Infrastructure BSS Station mode / P2P mode / softAP mode support;
- Hardware accelerators for CCMP (CBC-MAC, counter mode), TKIP (MIC, RC4), WAPI(SMS4), WEP (RC4), CRC;

Datasheet

3133 - Micro Load Cell (0-5kg) - CZL635



Contents

What do you have to know?

A load cell is a force sensing module - a carefully designed metal structure, with small elements called strain gauges mounted in precise locations on the structure. Load cells are designed to measure a specific force, and ignore other forces being applied. The electrical signal output by the load cell is very small and requires specialized amplification. Fortunately, **the 1046 PhidgetBridge will perform all the amplification and measurement of the electricaloutput.**

Load cells are designed to measure force in one direction. They will often measure force in other directions, but the sensor sensitivity will be different, since parts of the load cell operating under compression are now in tension, and vice versa.

How does it work - For curious people

Strain-gauge load cells convert the load acting on them into electrical signals. The measuring is done with very smallresistor patterns called strain gauges - effectively small, flexible circuit boards. The gauges are bonded onto a beamor structural member that deforms when weight is applied, in turn deforming the strain-gauge. As the strain gauge is deformed, it's electrical resistance changes in proportion to the load.

The changes to the circuit caused by force is much smaller than the changes caused by variation in temperature.Higher quality load cells cancel out the effects of temperature using two techniques. By matching the expansionrate of the strain gauge to the expansion rate of the metal it's mounted on, undue strain on the gauges can be avoided as the load cell warms up and cools down. The most important method of temperature compensation involves using multiple strain gauges, which all respond to the change in temperature with the same change
in resistance. Some load cell designs use gauges which are never subjected to any force, but only serve to counterbalance the temperature effects on the gauges that measuring force. Most designs use 4 strain gauges,some in compression, some under tension, which maximizes the sensitivity of the load cell, and automatically cancels the effect of temperature.

Installation

This Single Point Load Cell is used in small jewelry scales and kitchen scales. It's mounted by bolting down the end of the load cell where the wires are attached, andapplying force on the other end **in the direction of the arrow.** Where the force isapplied is not critical, as this load cell measures a shearing effect on the beam, not the bending of the beam. If you mount a small platform on the load cell, as would be done in a small scale, this load cell provides accurate readings regardless of the position of the load on the platform.

Calibration

You can use this simple formula to convert the measured mv/V output from the load cell to the measured force:

Expected Force/Weight = K * (Measured mV/V - Offset)

Where K is gain value that will change depending on what unit of force or weight you want to measure. Since the offset varies between individual load cells, it's necessary to measure it for each sensor. Record the output of the load cell at rest on a flat surface with no force on it. The mv/V output measured by the PhidgetBridge is the offset.

Once you've found the offset, measure something with a known weight and solve the equation for K. You can also calibrate the load cell at multiple known weights and use these points to model a linear function.

Product Specifications	
Mechanical	
Housing Material	Aluminum Alloy
Load Cell Type	Strain Gauge
Capacity	5kg
Dimensions	55.25x12.7x12.7mm
Mounting Holes	M5 (Screw Size)
Cable Length	550mm
Cable Size	30 AWG (0.2mm)
Cable - no. of leads	4
Electrical	
Precision	0.05%
Rated Output	1.0±0.15 mv/V
Non-Linearity	0.05% FS
Hysteresis	0.05% FS
Non-Repeatability	0.05% FS
Creep (per 30 minutes)	0.1% FS
Temperature Effect on Zero (per 10°C)	0.05% FS
Temperature Effect on Span (per 10°C)	0.05% FS
Zero Balance	±1.5% FS
Input Impedance	1130±10 Ohm
Output Impedance	1000±10 Ohm
Insulation Resistance (Under 50VDC)	≥5000 MOhm
Excitation Voltage	5 VDC
Compensated Temperature Range	-10 to ~+40°C
Operating Temperature Range	-20 to ~+55°C
Safe Overload	120% Capacity
Ultimate Overload	150% Capacity

Glossary

Capacity
The maximum load the load cell is designed to measure within its specifications.

Creep
The change in sensor output occurring over 30 minutes, while under load at or near capacity and with all environmentalconditions and other variables remaining constant.

FULL SCALE or FS
Used to qualify error - FULL SCALE is the change in output when the sensor is fully loaded. If a particular error (for example, Non-Linearity) is expressed as 0.1% F.S., and the output is 1.0mV/V, the maximum non-linearity that will be seen over the operating range of the sensor will be 0.001 mV/V. An important distinction is that this error doesn'thave to only occur at the maximum load. If you are operating the sensor at a maximum of 10% of capacity, for thisexample, the non-linearity would still be 0.001mV/V, or 1% of the operating range that you are actually using.

Hysteresis
If a force equal to 50% of capacity is applied to a load cell which has been at no load, a given output will be measured. The same load cell is at full capacity, and some of the force is removed, resulting in the load cell operating at 50% capacity. The difference in output between the two test scenarios is called hysteresis.

Excitation Voltage
Specifies the voltage that can be applied to the power/ground terminals on the load cell. In practice, if you are using the load cell with the PhidgetBridge, you don't have to worry about this spec.

Input Impedance
Determines the power that will be consumed by the load cell. The lower this number is, the more current willbe required, and the more heating will occur when the load cell is powered. In very noisy environments, a lower input impedance will reduce the effect of Electromagnetic interference on long wires between the load cell and PhidgetBridge.

Insulation Resistance
The electrical resistance measured between the metal structure of the load cell, and the wiring. The practical result of this is the metal structure of the load cells should not be energized with a voltage, particularly higher voltages, asit can arc into the PhidgetBridge. Commonly the load cell and the metal framework it is part of will be grounded to earth or to your system ground.

Maximum Overload
The maximum load which can be applied without producing a structural failure.

Non-Linearity
Ideally, the output of the sensor will be perfectly linear, and a simple 2-point calibration will exactly describe the behaviour of the sensor at other loads. In practice, the sensor is not perfect, and Non-linearity describes the maximumdeviation from the linear curve. Theoretically, if a more complex calibration is used, some of the non-linearity can becalibrated out, but this will require a very high accuracy calibration with multiple points.

Non-Repeatability
The maximum difference the sensor will report when exactly the same weight is applied, at the same temperature,
over multiple test runs.

Operating Temperature
The extremes of ambient temperature within which the load cell will operate without permanent adverse change to
any of its performance characteristics.

Output Impedance
Roughly corresponds to the input impedance. If the Output Impedance is very high, measuring the bridge will distortthe results. The PhidgetBridge carefully buffers the signals coming from the load cell, so in practice this is not a concern.

Rated Output
Is the difference in the output of the sensor between when it is fully loaded to its rated capacity, and when it's unloaded. Effectively, it's how sensitive the sensor is, and corresponds to the gain calculated when calibrating the sensor. More expensive sensors have an exact rated output based on an individual calibration done at the factory.

Safe Overload
The maximum axial load which can be applied without producing a permanent shift in performance characteristicsbeyond those specified.

Compensated Temperature
The range of temperature over which the load cell is compensated to maintain output and zero balance within specified
limits.

Temperature Effect on Span
Span is also called rated output. This value is the change in output due to a change in ambient temperature. It ismeasured over 10 degree C temperature interval.

Temperature Effect on Zero
The change in zero balance due to a change in ambient temperature. This value is measured over 10 degree Ctemperature interval.

Zero Balance
Zero Balance defines the maximum difference between the +/- output wires when no load is applied. Realistically, each sensor will be individually calibrated, at least for the output when no load is applied. Zero Balance is more of aconcern if the load cell is being interfaced to an amplification circuit - the PhidgetBridge can easily handle enormous differences between +/-. If the difference is very large, the PhidgetBridge will not be able to use the higher Gain settings.

24-Bit Analog-to-Digital Converter (ADC) for Weigh Scales

DESCRIPTION

Based on Avia Semiconductor's patented technology, HX711 is a precision 24-bit analog-to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor.

The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full-scale differential input voltage of ±20mV or ±40mV respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32. On-chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on-chip oscillator that does not require any external component. On-chip power-on-reset circuitry simplifies digital interface initialization.

There is no programming needed for the internal registers. All controls to the HX711 are through the pins.

FEATURES

- **Two selectable differential input channels**
- **On-chip active low noise PGA with selectable gain of 32, 64 and 128**
- **On-chip power supply regulator for load-cell and ADC analog power supply**
- **On-chip oscillator requiring no external component with optional external crystal**
- **On-chip power-on-reset**
- **Simple digital control and serial interface: pin-driven controls, no programming needed**
- **Selectable 10SPS or 80SPS output data rate**
- **Simultaneous 50 and 60Hz supply rejection**
- **Current consumption including on-chip analog power supply regulator:**
  normal operation < 1.5mA, power down < 1uA
- **Operation supply voltage range: 2.6 ~ 5.5V**
- **Operation temperature range: -40 ~ +85℃**
- **16 pin SOP-16 package**

APPLICATIONS

- **Weigh Scales**
- **Industrial Process Control**

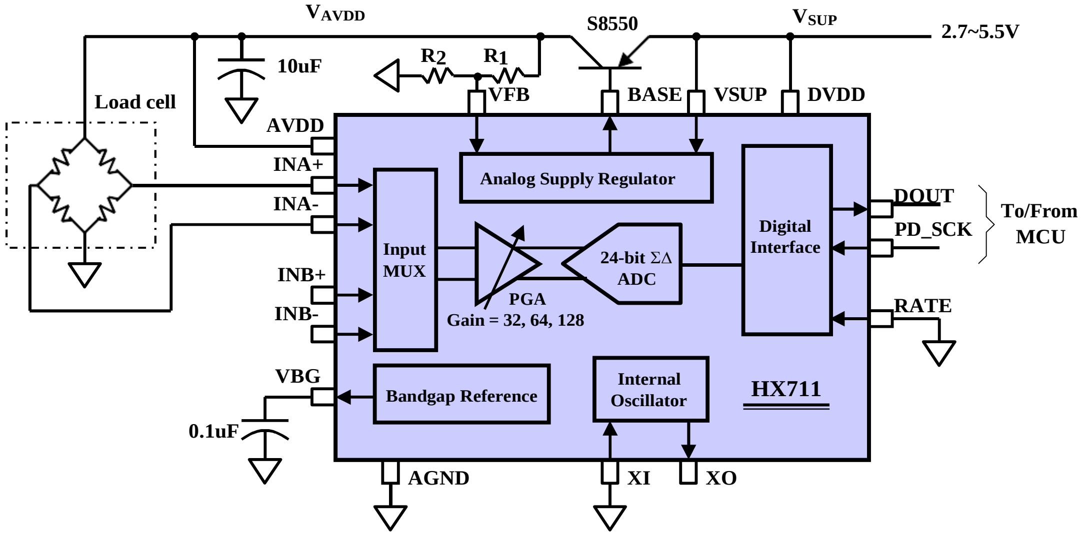
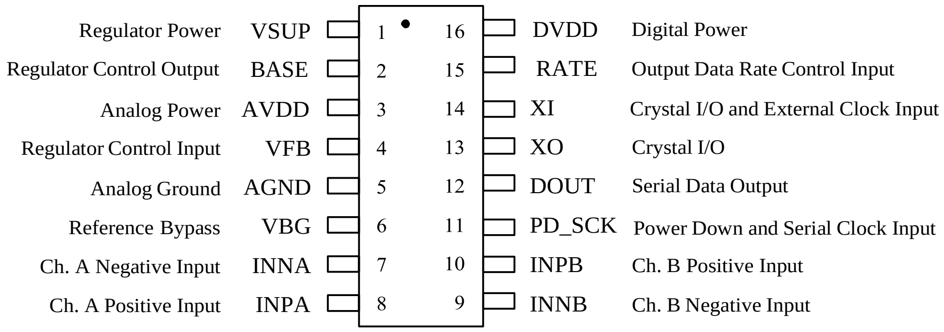


Fig. 1 Typical weigh scale application block diagram

Pin Description



SOP-16L Package

Pin #	Name	Function	Description
1	VSUP	Power	Regulator supply: 2.7 ~ 5.5V
2	BASE	Analog Output	Regulator control output（NC when not used）
3	AVDD	Power	Analog supply: 2.6 ~ 5.5V
4	VFB	Analog Input	Regulator control input（connect to AGND when not used）
5	AGND	Ground	Analog Ground
6	VBG	Analog Output	Reference bypass output
7	INA-	Analog Input	Channel A negative input
8	INA+	Analog Input	Channel A positive input
9	INB-	Analog Input	Channel B negative input
10	INB+	Analog Input	Channel B positive input
11	PD_SCK	Digital Input	Power down control (high active) and serial clock input
12	DOUT	Digital Output	Serial data output
13	XO	Digital I/O	Crystal I/O (NC when not used）
14	XI	Digital Input	Crystal I/O or external clock input, 0: use on-chip oscillator
15	RATE	Digital Input	Output data rate control, 0: 10Hz; 1: 80Hz
16	DVDD	Power	Digital supply: 2.6 ~ 5.5V

Table 1 Pin Description

KEY ELECTRICAL CHARACTERISTICS

Parameter	Notes	MIN	TYP	MAX	UNIT
Full scale differential input range	V(inp)-V(inn)		±0.5(AVDD/GAIN)		V
Common mode input		AGND+1.2		AVDD-1.3	V
Output data rate	Internal Oscillator, RATE = 0		10		Hz
	Internal Oscillator, RATE = DVDD		80		
	Crystal or external clock, RATE = 0		f_{clk}/1,105,920		
	Crystal or external clock, RATE = DVDD		f_{clk}/138,240		
Output data coding	2's complement	800000		7FFFFF	HEX
Output settling time (1)	RATE = 0		400		ms
	RATE = DVDD		50		
Input offset drift	Gain = 128		0.2		mV
	Gain = 64		0.4		
Input noise	Gain = 128， RATE = 0		50		nV(rms)
	Gain = 128， RATE = DVDD		90		
Temperature drift	Input offset（Gain = 128）		±6		nV/℃
	Gain（Gain = 128）		±5		ppm/℃
Input common mode rejection	Gain = 128， RATE = 0		100		dB
Power supply rejection	Gain = 128， RATE = 0		100		dB
Reference bypass （V_{BG}）			1.25		V
Crystal or external clock frequency		1	11.0592	20	MHz
Power supply voltage	DVDD	2.6		5.5	V
	AVDD，VSUP	2.6		5.5	
Analog supply current (including regulator)	Normal		1400		µA
	Power down		0.3		
Digital supply current	Normal		100		µA
	Power down		0.2		

（1）Settling time refers to the time from power up, reset, input channel change and gain change to valid stable output data.

Table 2 Key Electrical Characteristics

Analog Inputs

Channel A differential input is designed to interface directly with a bridge sensor's differential output. It can be programmed with a gain of 128 or 64. The large gains are needed to accommodate the small output signal from the sensor. When 5V supply is used at the AVDD pin, these gains correspond to a full-scale differential input voltage of ±20mV or ±40mV respectively.

Channel B differential input has a fixed gain of 32. The full-scale input voltage range is ±80mV, when 5V supply is used at the AVDD pin.

Power Supply Options

Digital power supply (DVDD) should be the same power supply as the MCU power supply.

When using internal analog supply regulator, the dropout voltage of the regulator depends on the external transistor used. The output voltage is equal to $V_{AVDD}=V_{BG}*(R1+R2)/R1$ (Fig. 1). This voltage should be designed with a minimum of 100mV below VSUP voltage.

If the on-chip analog supply regulator is not used, the VSUP pin should be connected to either AVDD or DVDD, depending on which voltage is higher. Pin VFB should be connected to Ground and pin BASE becomes NC. The external 0.1uF bypass capacitor shown on Fig. 1 at the VBG output pin is then not needed.

Clock Source Options

By connecting pin XI to Ground, the on-chip oscillator is activated. The nominal output data rate when using the internal oscillator is 10 (RATE=0) or 80SPS (RATE=1).

If accurate output data rate is needed, crystal or external reference clock can be used. A crystal can be directly connected across XI and XO pins. An external clock can be connected to XI pin, through a 20pF ac coupled capacitor. This external clock is not required to be a square wave. It can come directly from the crystal output pin of the MCU chip, with amplitude as low as 150 mV.

When using a crystal or an external clock, the internal oscillator is automatically powered down.

Output Data Rate and Format

When using the on-chip oscillator, output data rate is typically 10 (RATE=0) or 80SPS (RATE=1).

When using external clock or crystal, output data rate is directly proportional to the clock or crystal frequency. Using 11.0592MHz clock or crystal results in an accurate 10 (RTE=0) or 80SPS (RATE=1) output data rate.

The output 24 bits of data is in 2's complement format. When input differential signal goes out of the 24 bit range, the output data will be saturated at 800000h (MIN) or 7FFFFFh (MAX), until the input signal comes back to the input range.

Serial Interface

Pin PD_SCK and DOUT are used for data retrieval, input selection, gain selection and power down controls.

When output data is not ready for retrieval, digital output pin DOUT is high. Serial clock input PD_SCK should be low. When DOUT goes to low, it indicates data is ready for retrieval. By applying 25~27 positive clock pulses at the PD_SCK pin, data is shifted out from the DOUT output pin. Each PD_SCK pulse shifts out one bit, starting with the MSB bit first, until all 24 bits are shifted out. The 25th pulse at PD_SCK input will pull DOUT pin back to high (Fig.2).

Input and gain selection is controlled by the number of the input PD_SCK pulses (Table 3). PD_SCK clock pulses should not be less than 25 or more than 27 within one conversion period, to avoid causing serial communication error.

PD_SCK Pulses	Input channel	Gain
25	A	128
26	B	32
27	A	64

Table 3 Input Channel and Gain Selection

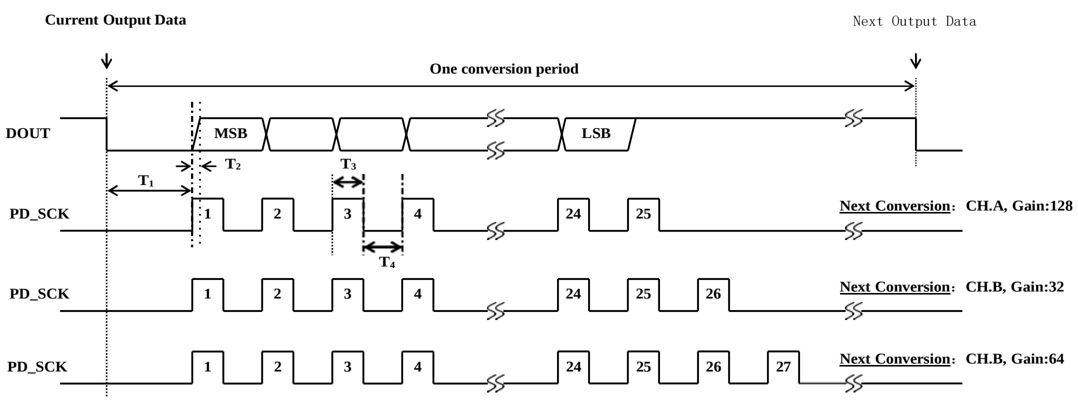


Fig.2 Data output, input and gain selection timing and control

Symbol	Note	MIN	TYP	MAX	Unit
T_1	DOUT falling edge to PD_SCK rising edge	0.1			µs
T_2	PD_SCK rising edge to DOUT data ready			0.1	µs
T_3	PD_SCK high time	0.2	1	50	µs
T_4	PD_SCK low time	0.2	1		µs

Reset and Power-Down

When chip is powered up, on-chip power on rest circuitry will reset the chip.

Pin PD_SCK input is used to power down the HX711. When PD_SCK Input is low, chip is in normal working mode.

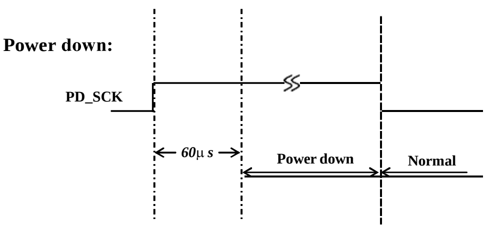


Fig.3 Power down control

When PD_SCK pin changes from low to high and stays at high for longer than 60µs, HX711 enters power down mode (Fig.3). When internal regulator is used for HX711 and the external transducer, both HX711 and the transducer will be powered down. When PD_SCK returns to low, chip will reset and enter normal operation mode.

After a reset or power-down event, input selection is default to Channel A with a gain of 128.

Application Example

Fig.1 is a typical weigh scale application using HX711. It uses on-chip oscillator (XI=0), 10Hz output data rate (RATE=0). A Single power supply （2.7～5.5V） comes directly from MCU power supply. Channel B can be used for battery level detection. The related circuitry is not shown on Fig. 1.

Reference PCB Board (Single Layer)

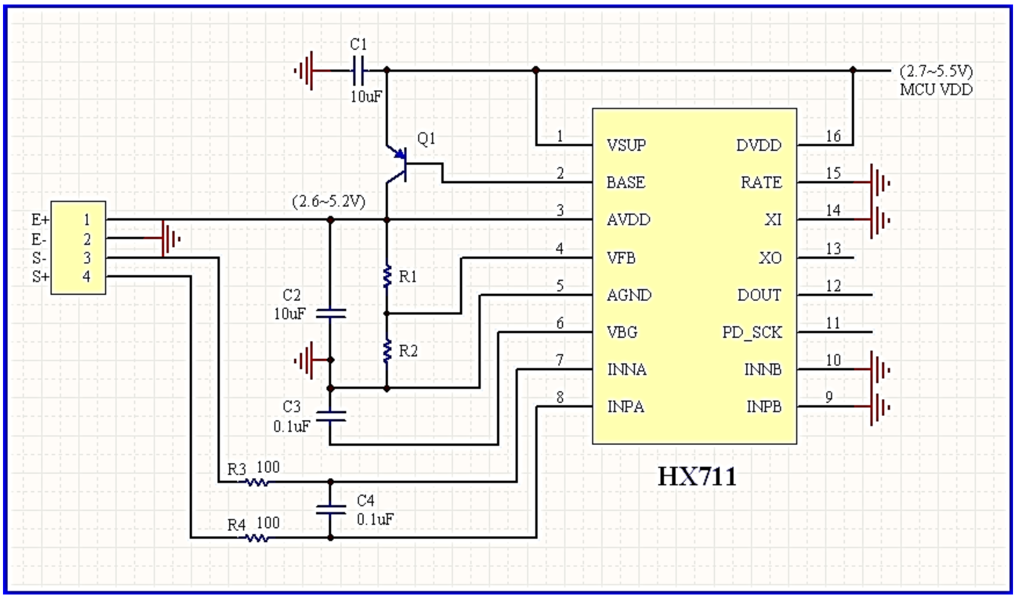


Fig.4 Reference PCB board schematic

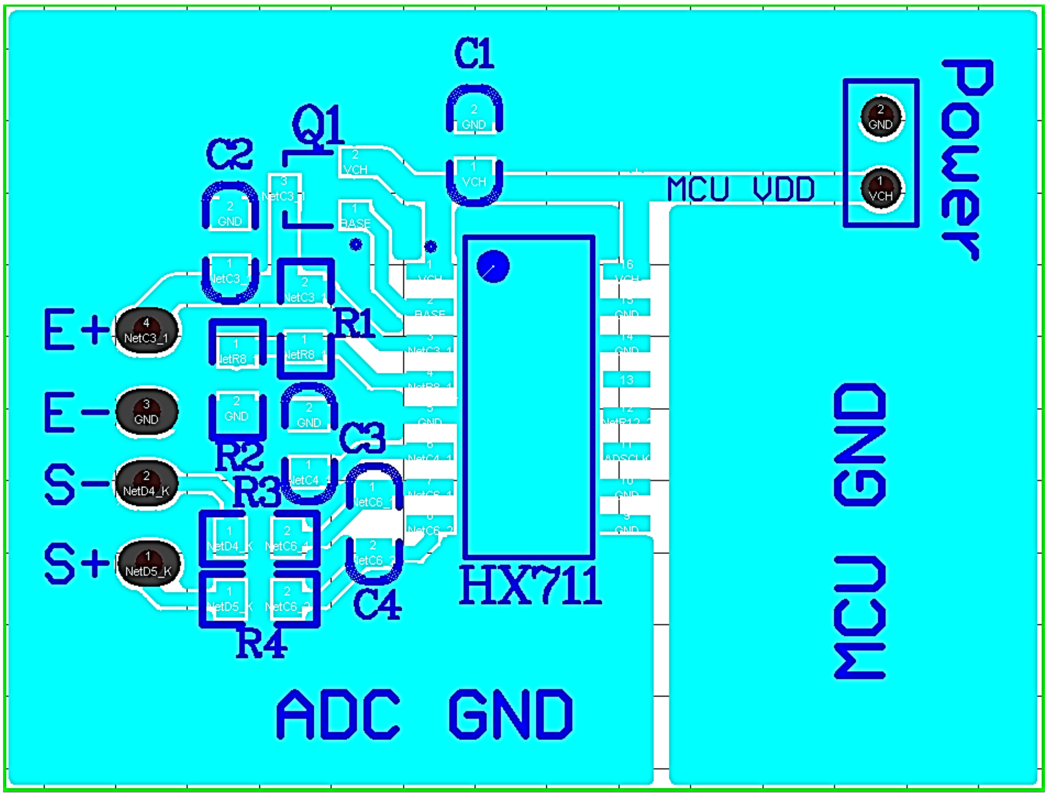


Fig.5 Reference PCB board layout

Reference Driver (Assembly)

```
/*-------------------------------------------------------------------------------------------------------
Call from ASM:      LCALL   ReaAD
Call from C:    extern unsigned long ReadAD(void);
                   .
                   .
                  unsigned long data;
                  data=ReadAD();
                   .
                   .
--------------------------------------------------------------------------------------------------------*/
PUBLIC         ReadAD
HX711ROM       segment  code
rseg           HX711ROM

sbit           ADDO = P1.5;
sbit           ADSK = P0.0;
/*------------------------------------------------------------------------------------
 OUT:   R4, R5, R6, R7   R7=>LSB
------------------------------------------------------------------------------------*/
ReadAD:
    CLR     ADSK              //AD Enable (PD_SCK set low)
    SETB    ADDO              //Enable 51CPU I/0
    JB      ADDO,$            //AD conversion completed?
    MOV     R4,#24
ShiftOut:
    SETB    ADSK              //PD_SCK set high (positive pulse)
    NOP
    CLR     ADSK              //PD_SCK set low
    MOV     C,ADDO            //read on bit
```

Reference Driver（C）

```
    XCH     A,R7              //move data
    RLC     A
    XCH     A,R7
    XCH     A,R6
    RLC     A
    XCH     A,R6
    XCH     A,R5
    RLC     A
    XCH     A,R5
    DJNZ    R4,ShiftOut         //moved 24BIT?
    SETB    ADSK
    NOP
    CLR     ADSK
    RET
    END
```

MG996R All Metal Gear Servo Motor

MG996R All Metal Gear Servo Motor.

This High-Torque MG996R Digital Servo features metal gearing resulting in extra high 10kg stalling torque in a tiny package. It features upgraded shock-proofing and a redesigned PCB and IC control system that make it much more accurate than its predecessor MG995. The gearing and motor have also been upgraded to improve dead bandwidth and centering. This high-torque standard servo can rotate approximately 120º (60º in each direction). The MG996R Metal Gear Servo also comes with a selection of arms and hardware to get you set up nice and fast servo control projects!

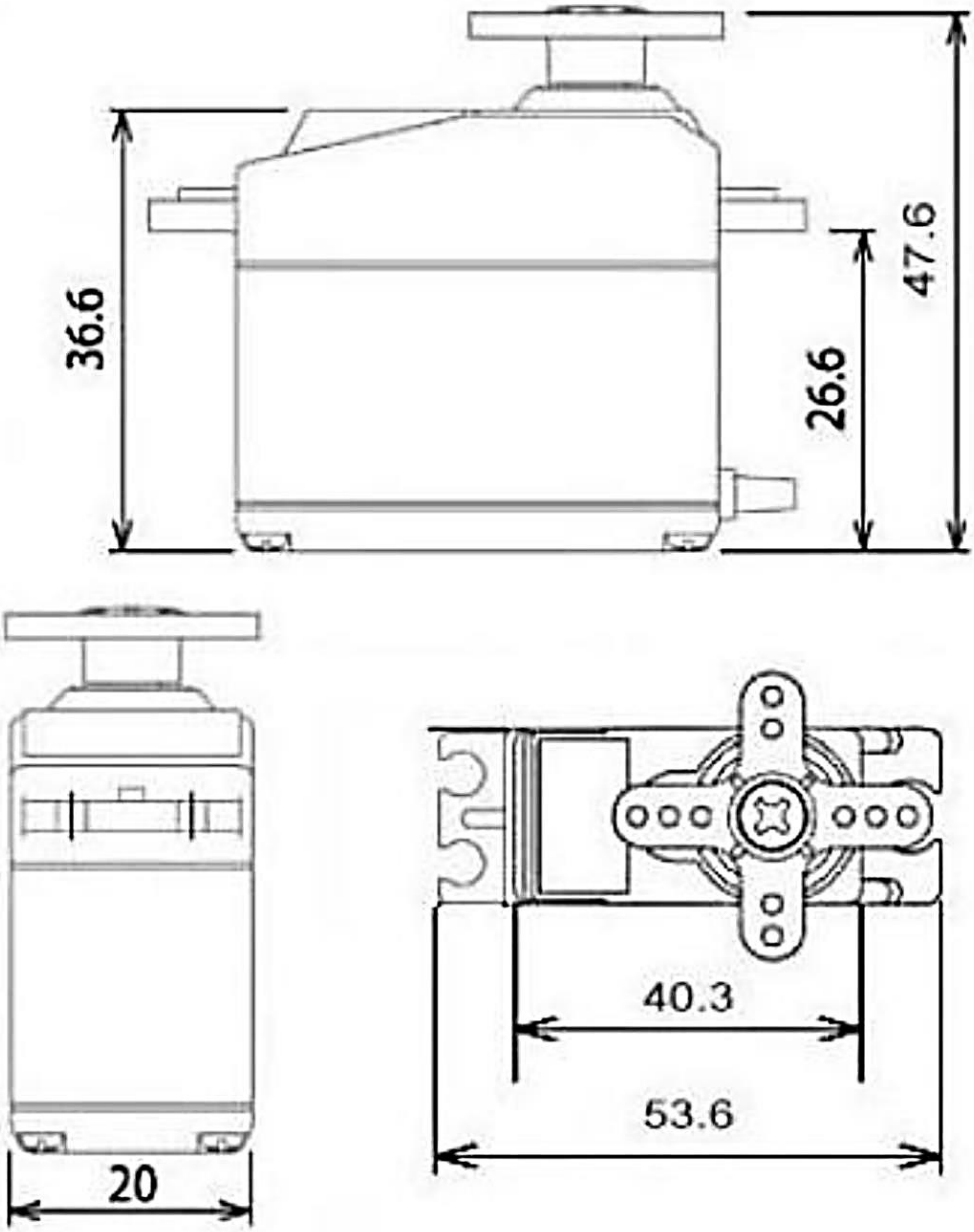
Pack of 1-piece/lot.

General Specification:

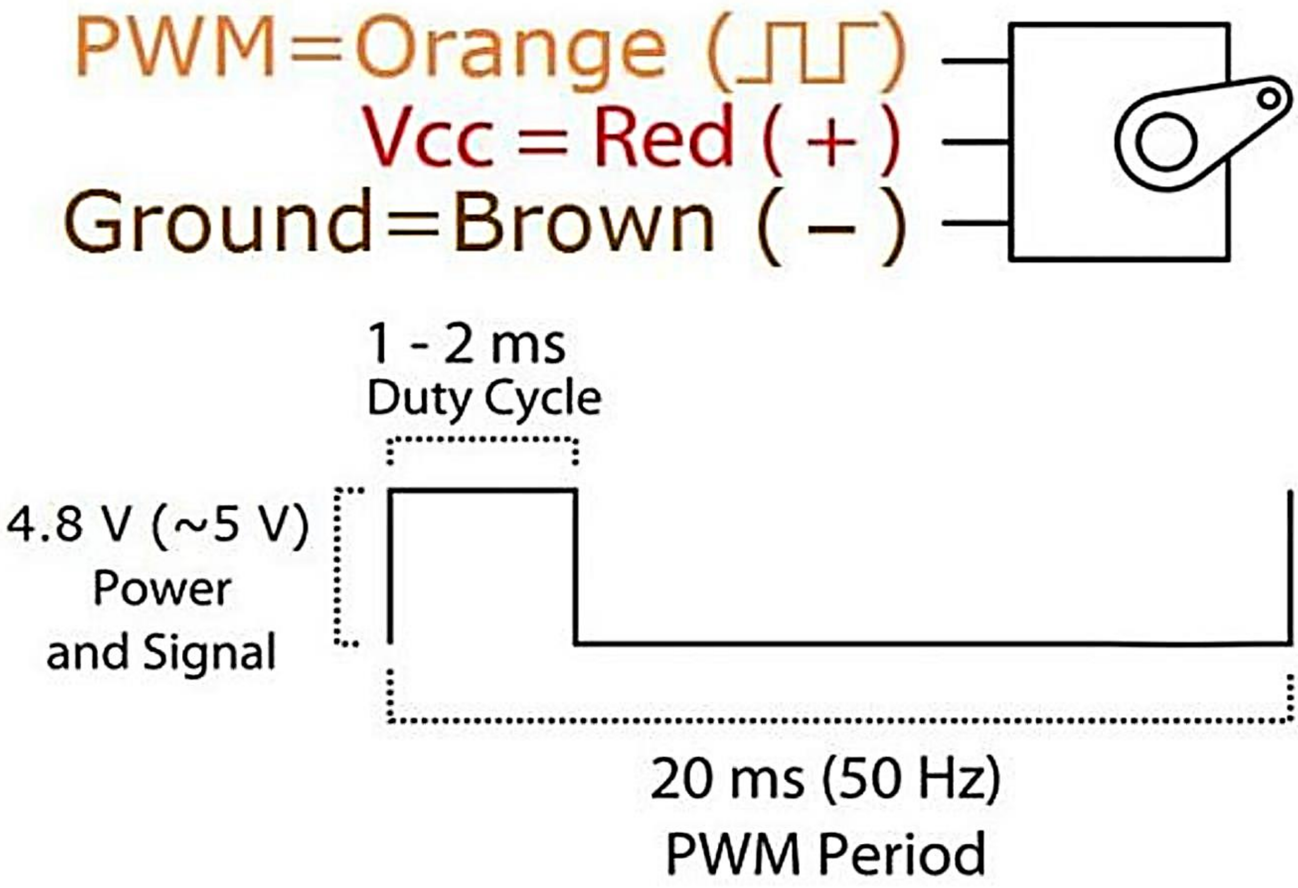
- Model : MG996R Tower Pro.
- Weight: 55g.
- Dimension: 40.7 x 19.7 x 42.9 mm approx.
- Stall torque: 9.4 kgf·cm (4.8V), 11 kgf·cm (6 V)
- Operating speed: 0.17 s/60º (4.8 V), 0.14 s/60º (6 V)
- Operating voltage: 4.8V a 7.2V
- Running Current: 500mA.
- Stall Current: 2.5A (6V).
- Dead band width: 5µs
- Stable and shock proof double ball bearing design.
- Temperature range: 0ºC ~ 55ºC.

<u>Detail Specification:</u>

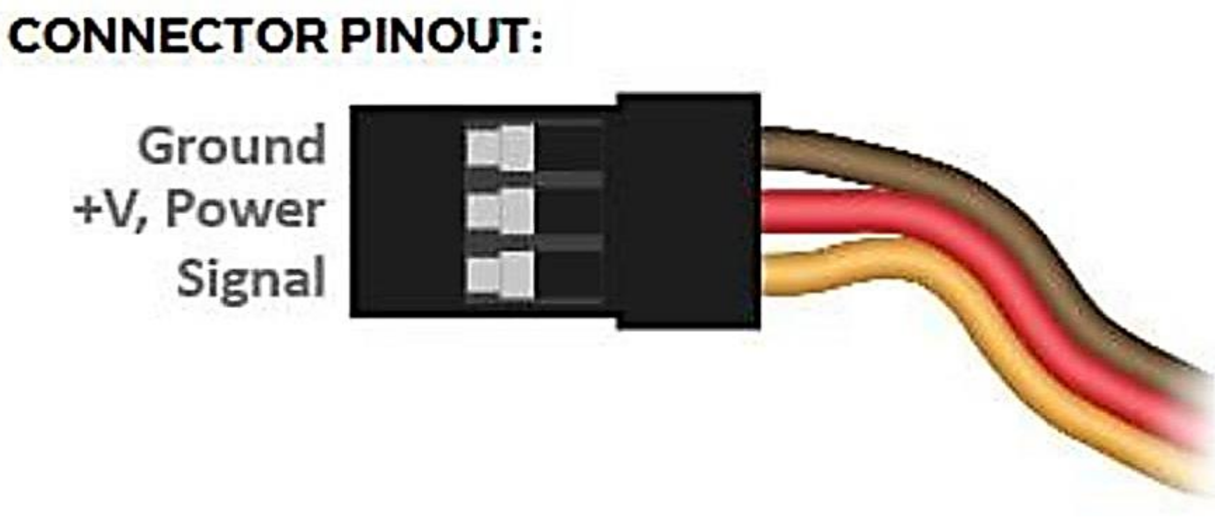
Unit: mm



Electrical Control Signal:



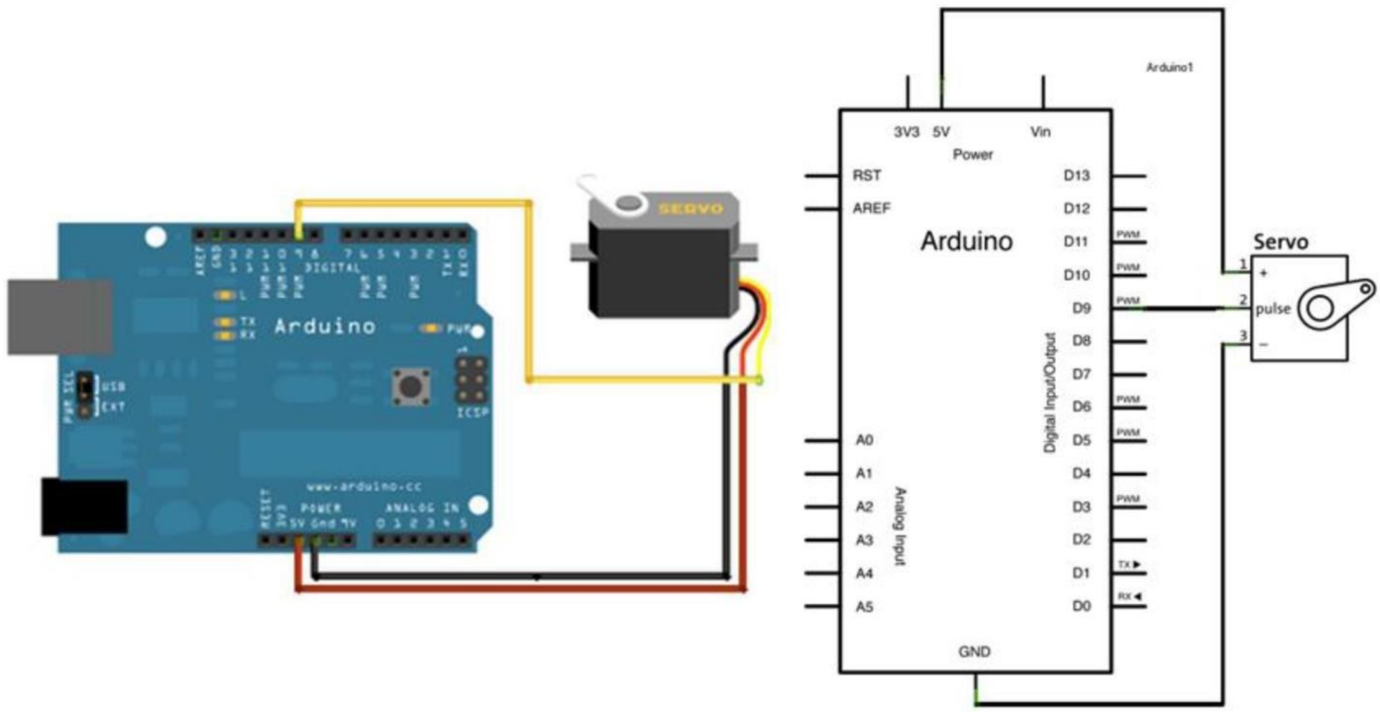
Position "0" (1.5ms pulse) is middle, "90" (~2ms pulse) is middle, is all the way to the right, "-90" (~1ms pulse) is all the way to the left.



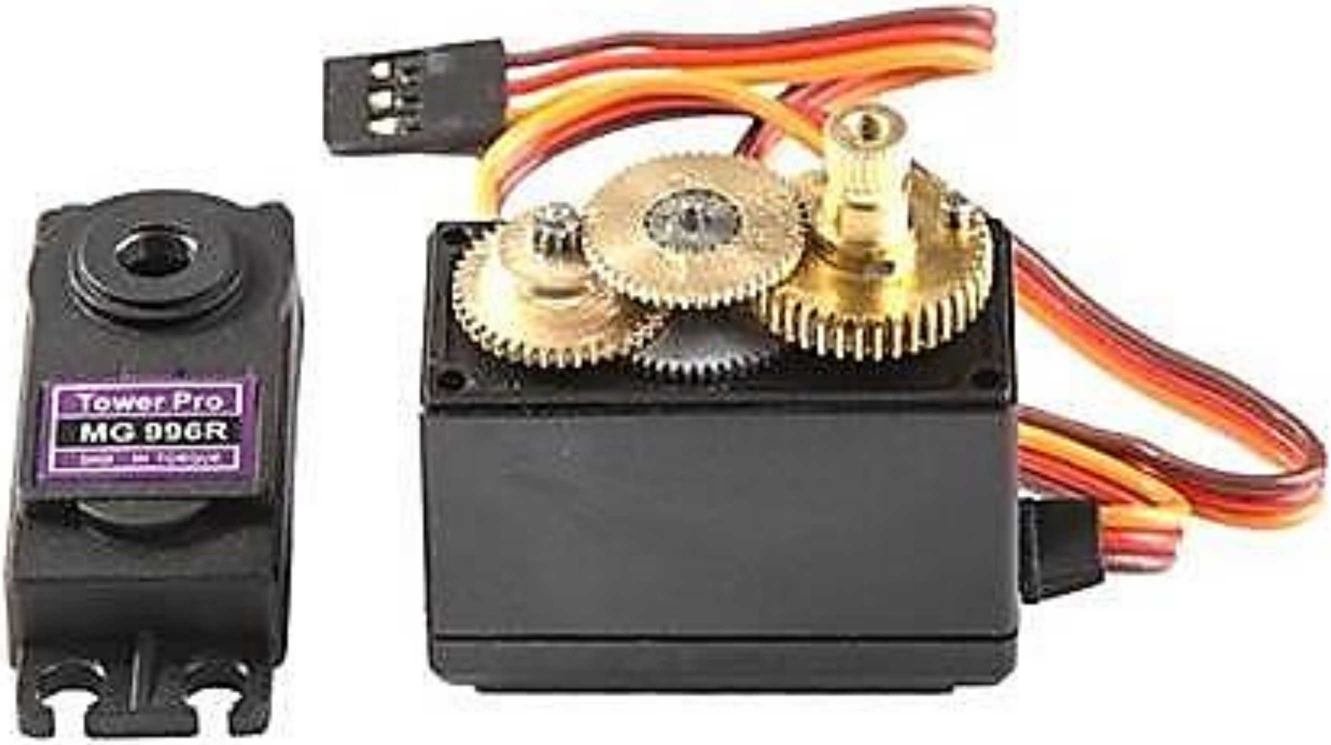
Application With Arduino:

Circuit:

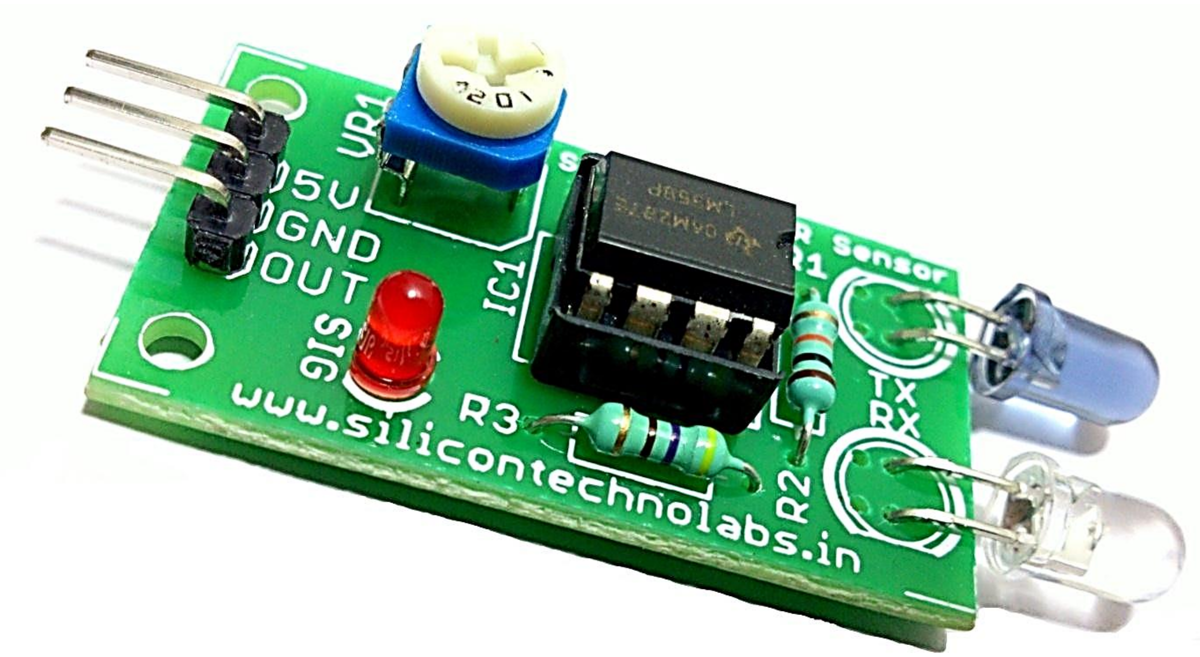
Servo motors have three wires: power, ground, and signal. The power wire is typically red, and should be connected to the 5V pin on the Arduino board. The ground wire is typically black or brown and should be connected to a ground pin on the board. The signal pin is typically yellow, orange or white and should be connected to pin 9 on the board.



Open Arduino IDE, go to
“File” > “Examples” > “Servo” > “Sweep”. Open the “Sweep” sketch and upload to your Arduino board. Attach an arm to the servo motor, you should see the arm sweeping at 180° to and fro.


Tower Pro
MG 996R


MG 996R



IR Proximity Sensor

1. Descriptions

The Multipurpose Infrared Sensor is an add-on for your line follower robot and obstacle avoiding robot that gives your robot the ability to detect lines or nearby objects. The sensor works by detecting reflected light coming from its own infrared LED. By measuring the amount of reflected infrared light, it can detect light or dark (lines) or even objects directly in front of it. An onboard RED LED is used to indicate the presence of an object or detect line. Sensing range is adjustable with inbuilt variable resistor.

The sensor has a 3-pin header which connects to the microcontroller board or Arduino board via female to female or female to male jumper wires. A mounting hole for easily connect one or more sensor to the front or back of your robot chassis.

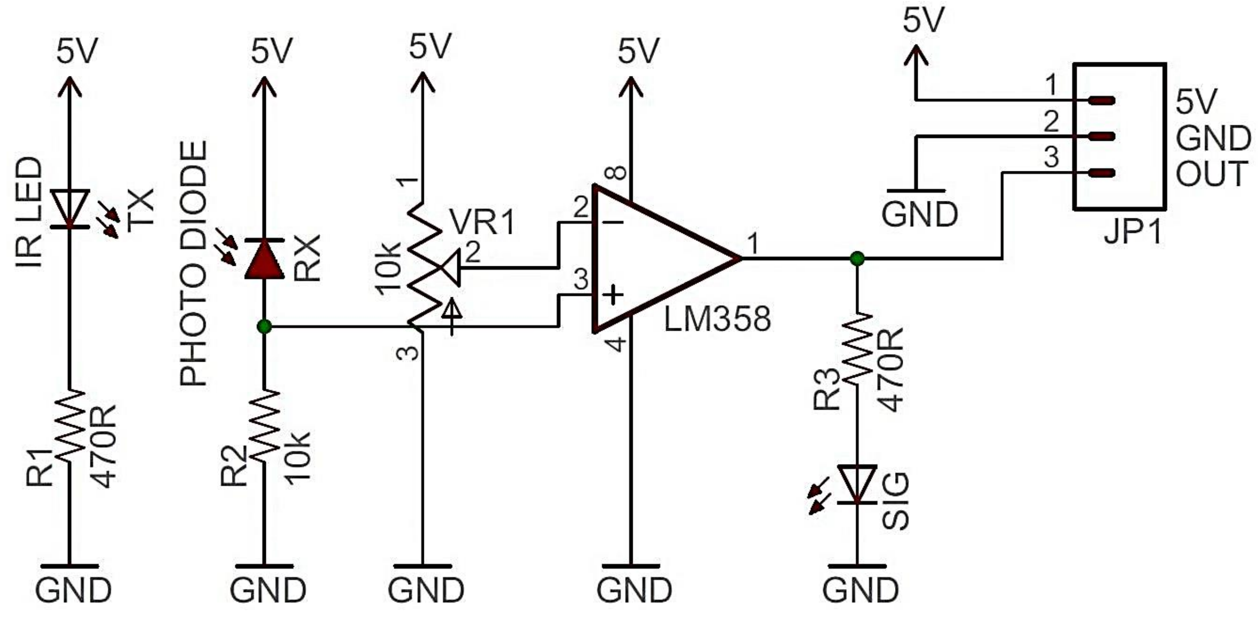
2. Features

- 5VDC operating voltage.
- I/O pins are 5V and 3.3V compliant.
- Range: Up to 20cm.
- Adjustable Sensing range.
- Built-in Ambient Light Sensor.
- 20mA supply current.
- Mounting hole.

3. Specifications

- Size: 50 x 20 x 10 mm (L x B x H)
- Hole size: ϕ2.5mm

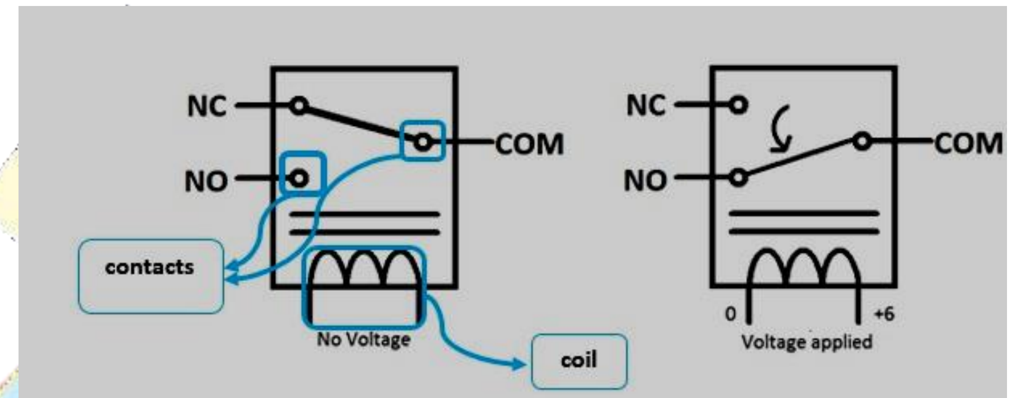
4. Schematics



RELAY MODULES

RELAY WORKING IDEA

Relays consist of three pins normaly open pin , normaly closed pin, common pin and coil. When coil powerd on magntic field is generated the contacts connected to each other.



Relay modules 1-channel features

- Contact current 10A and 250V AC or 30V DC.
- Each channel has indication LED.
- Coil voltage 12V per channel.
- Kit operating voltage 5-12 V
- Input signal 3-5 V for each channel.
- Three pins for normally open and closed for each channel.

How to connect relay module with Arduino

As shown in relay working idea it depends on magnetic field generated from the coil so there is power isolation between the coil and the switching pins so coils can be easily powered from Arduino by connecting VCC and GND bins from Arduino kit to the relay module kit after that we choose Arduino output pins depending on the number of relays needed in project designed and set these pins to output and make it out high (5 V) to control the coil that allow controlling of switching process.

User Guide

I2C Serial Interface 1602 LCD Module

This is I2C interface 16x2 LCD display module, a high-quality 2 line 16 character LCD module with on-board contrast control adjustment, backlight and I2C communication interface. For Arduino beginners, no more cumbersome and complex LCD driver circuit connection. The real significance advantages of this I2C Serial LCD module will simplify the circuit connection, save some I/O pins on Arduino board, simplified firmware development with widely available Arduino library.

SKU: DSP-1182

Brief Data:

- Compatible with Arduino Board or other controller board with I2C bus.
- Display Type: Negative white on Blue backlight.
- I2C Address:0x38-0x3F (0x3F default)
- Supply voltage: 5V
- Interface: I2C to 4bits LCD data and control lines.
- Contrast Adjustment: built-in Potentiometer.
- Backlight Control: Firmware or jumper wire.
- Board Size: 80x36 mm.

Setting Up:

Hitachi's HD44780 based character LCD are very cheap and widely available, and is an essential part for any project that displays information. Using the LCD piggy-back board, desired data can be displayed on the LCD through the I2C bus. In principle, such backpacks are built around PCF8574 (from NXP) which is a general purpose bidirectional 8 bit I/O port expander that uses the I2C protocol. The PCF8574 is a silicon CMOS circuit provides general purpose remote I/O expansion (an 8-bit quasi-bidirectional) for most microcontroller families via the two-line bidirectional bus (I2C-bus). Note that most piggy-back modules are centered around PCF8574T (SO16 package of PCF8574 in DIP16 package) with a default slave address of 0x27. If your piggy-back board holds a PCF8574AT chip, then the default slave address will change to 0x3F. In short, if the piggy-back board is based on PCF8574T and the address connections (A0-A1-A2) are not bridged with solder it will have the slave address 0x27.

Address selection pads in the I2C-to-LCD piggy-back board.

Table 5. PCF8574A address map

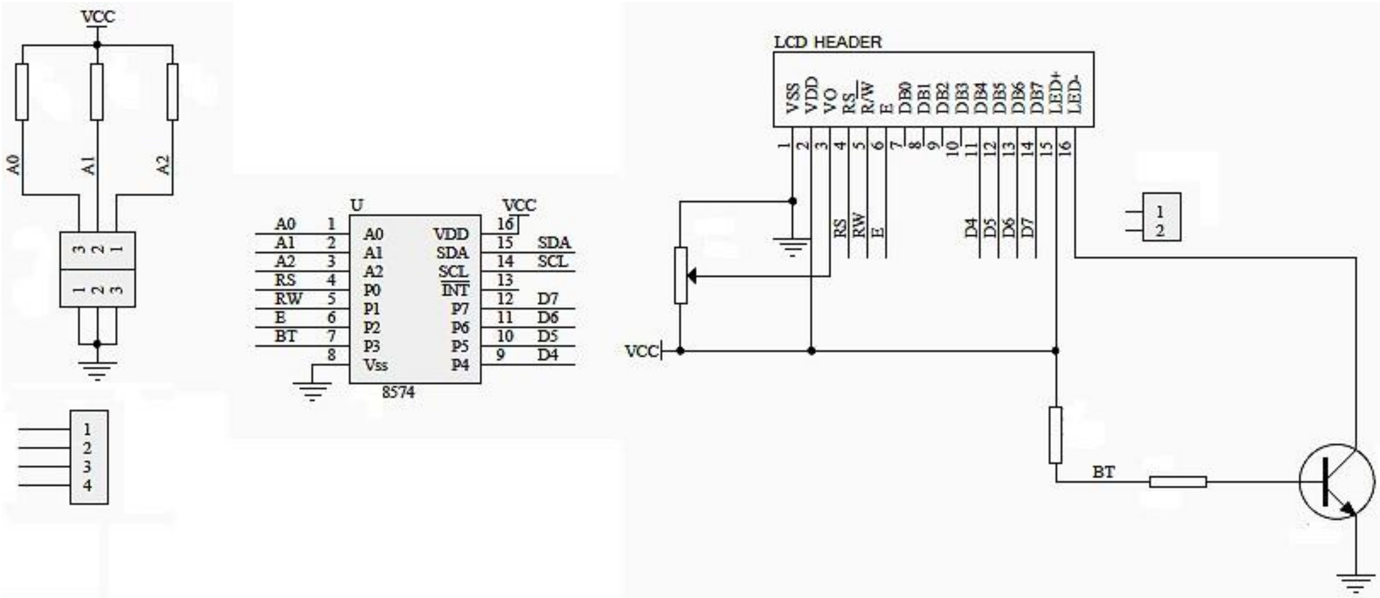
Pin connectivity			Address of PCF8574A								Address byte value		7-bit hexadecimal address without R/$\overline{W}$
A2	A1	A0	A6	A5	A4	A3	A2	A1	A0	R/$\overline{W}$	Write	Read	
V_{SS}	V_{SS}	V_{SS}	0	1	1	1	0	0	0	-	70h	71h	38h
V_{SS}	V_{SS}	V_{DD}	0	1	1	1	0	0	1	-	72h	73h	39h
V_{SS}	V_{DD}	V_{SS}	0	1	1	1	0	1	0	-	74h	75h	3Ah
V_{SS}	V_{DD}	V_{DD}	0	1	1	1	0	1	1	-	76h	77h	3Bh
V_{DD}	V_{SS}	V_{SS}	0	1	1	1	1	0	0	-	78h	79h	3Ch
V_{DD}	V_{SS}	V_{DD}	0	1	1	1	1	0	1	-	7Ah	7Bh	3Dh
V_{DD}	V_{DD}	V_{SS}	0	1	1	1	1	1	0	-	7Ch	7Dh	3Eh
V_{DD}	V_{DD}	V_{DD}	0	1	1	1	1	1	1	-	7Eh	7Fh	3Fh

Address Setting of PCD8574A (extract from PCF8574A data specs).

Note: When the pad A0~A2 is open, the pin is pull up to VDD. When the pin is solder shorted, it is pull down to VSS.

The default setting of this module is A0~A2 all open, so is pull up to VDD. The address is 3Fh in this case.

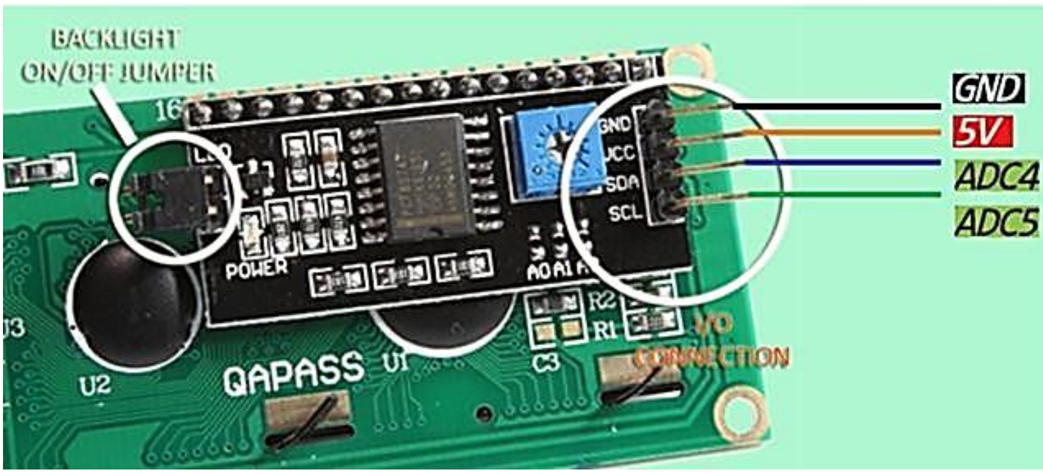
Reference circuit diagram of an Arduino-compatible LCD backpack is shown below. What follows next is information on how to use one of these inexpensive backpacks to interface with a microcontroller in ways it was exactly intended.



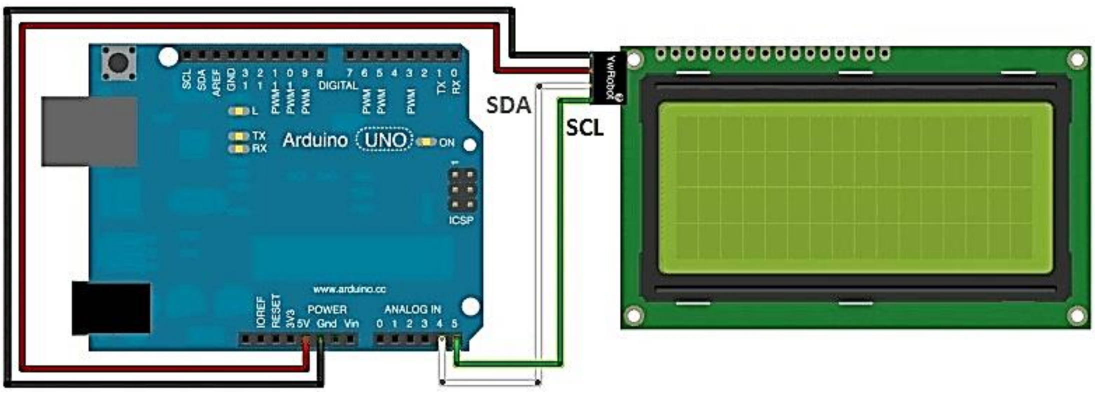
Reference circuit diagram of the I2C-to-LCD piggy-back board.

I2C LCD Display.

At first you need to solder the I2C-to-LCD piggy-back board to the 16-pins LCD module. Ensure that the I2C-to-LCD piggy-back board pins are straight and fit in the LCD module, then solder in the first pin while keeping the I2C-to-LCD piggy-back board in the same plane with the LCD module. Once you have finished the soldering work, get four jumper wires and connect the LCD module to your Arduino as per the instruction given below.



LCD display to Arduino wiring.



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ARDUINO

Arduino Board & Shield

Tools & Accessory

Typical application: Drill Air Compressor Electric screwdriver

Pitching toys Wireless TOOLS Pruning Machine

Mower Vacuum Cleaner ELECTRIC Locks makita

MODEL	VOLTAGE		NO LOAD		AT MAXIMUM EFFICIENCY					STALL	
	OPERATING RANGE	NOMINAL	SPEED	CURRENT	SPEED	CURRENT	TORQUE	OUTPUT	EFF	TORQUE	CURRENT
			RPM	A	RPM	A	G-CM	W	%	G-CM	A
ADRS-550SA-5001	6.0-18.0V	12.0V	7300	0.26	6400	1.7	185	12.1	59.3	1530	12.5
ADRS-550SA-5002	20.0-36.0V	24.0V	3100	0.08	2750	0.27	150	4.2	64.8	800	5.6
ADRS-550PH-5003	6.0-18.0V	14.4V	20500	1.5	17500	7.8	430	77.7	69.2	2900	53
ADRS-550SH-5004	6.0-15.0V	12.0V	16300	1.0	14300	6.0	350	51.3	71.3	2850	52