

# **LAMPIRAN**

### **Lampiran 1. Gambar Alat**



**Tampak Depan**

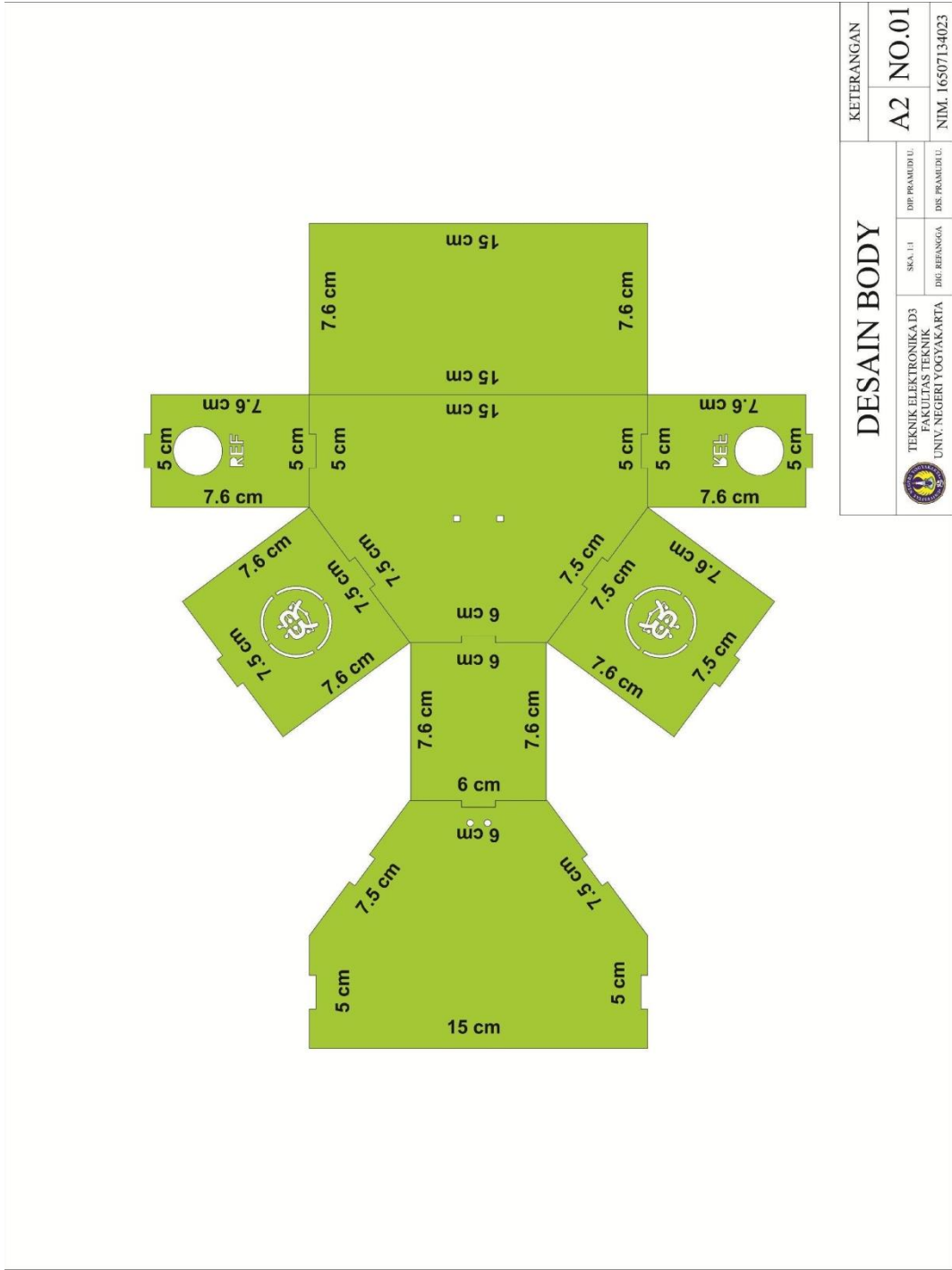


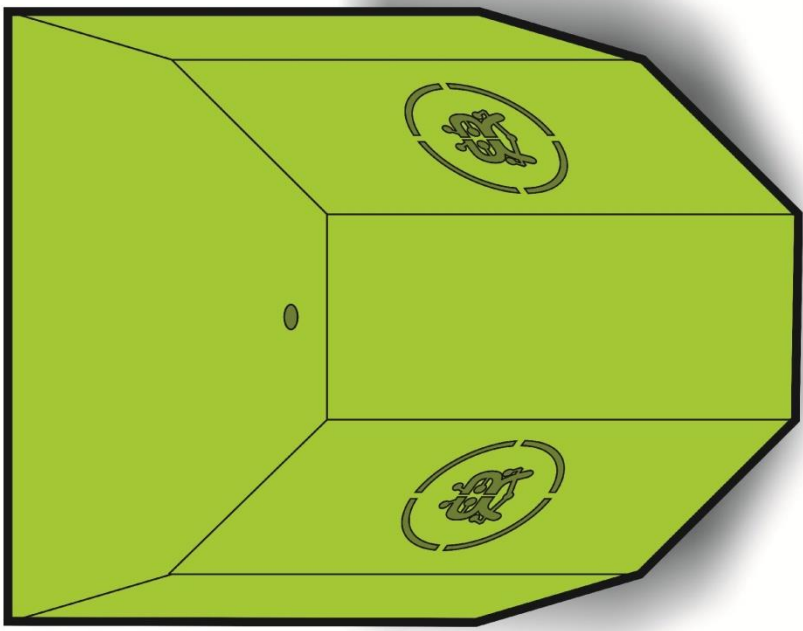
**Tampak Samping**



**Tampak Atas**

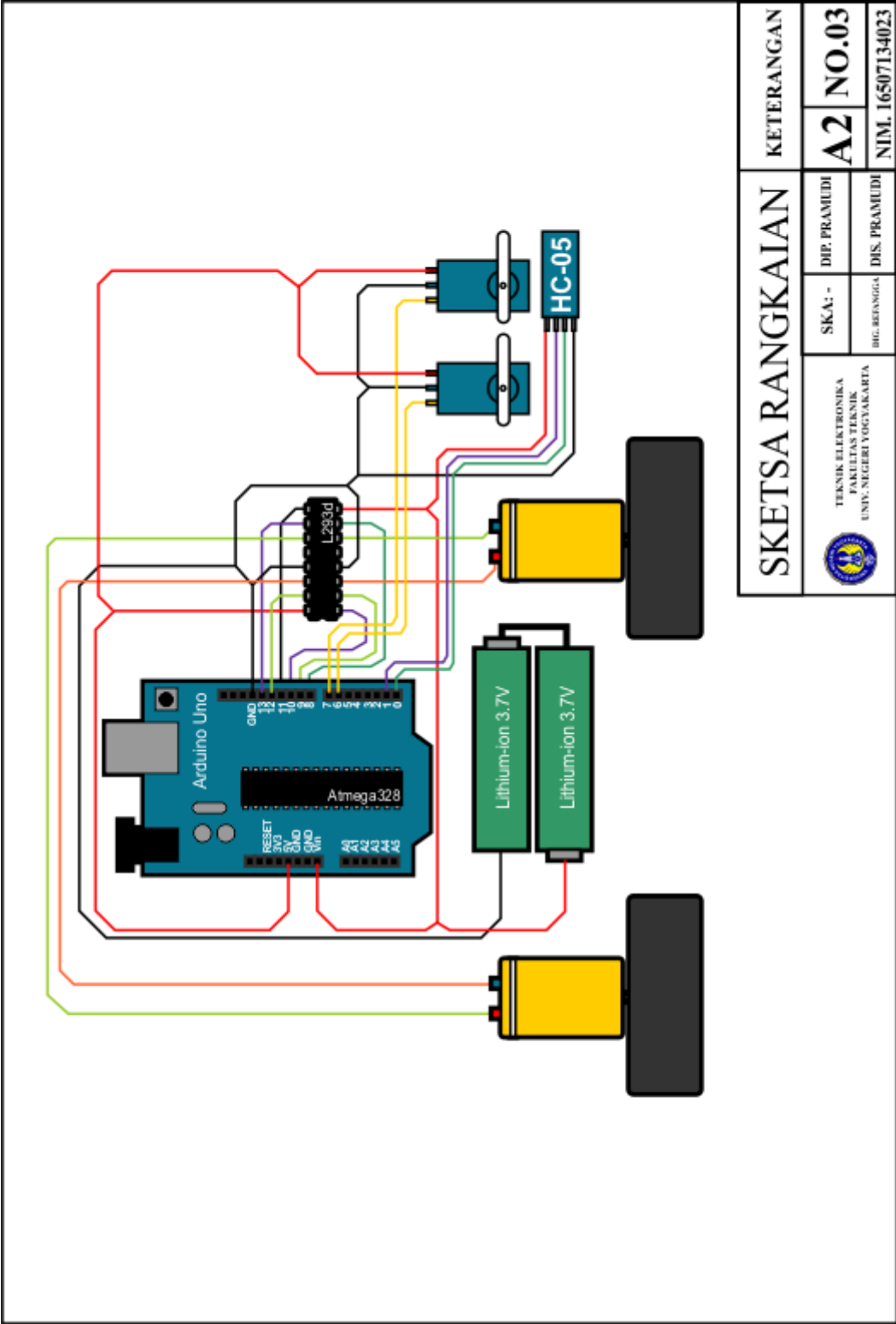
Lampiran 2. Desain Body





|                                                                                                                                                            |               |                  |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|------------------|
| DESAIN BODY                                                                                                                                                |               | KETERANGAN       |                  |
| <br>TEKNIK ELEKTRONIKA D3<br>FAKULTAS TEKNIK<br>UNIV. NEGERI YOGYAKARTA | SKALA 1:1     | DIS. PRANATEE U. | A2 NO.02         |
|                                                                                                                                                            | DIS. ZEPANGGA | DIS. PRANATEE U. | NIM. 16507134023 |

Lampiran 3. Rangkaian Alat



| SKETSA RANGKAIAN                                                                                                                                         |        | KETERANGAN   |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------|------------------|
| <br>TEKNIK ELEKTRONIKA<br>FAKULTAS TEKNIK<br>UNIV. NEGERI YOGYAKARTA | SKA: - | DIP. PRAMUDI | A2 NO.03         |
|                                                                                                                                                          |        | DIG. REANUGA | NIM. 16507134023 |

#### Lampiran 4. Program Arduino

```
#include <AFMotor.h>
#include <Servo.h>
AF_DCMotor motor1(1, MOTOR12_64KHZ);
AF_DCMotor motor2(2, MOTOR12_64KHZ);

Servo servo1; // servo grip
Servo servo2; // servo katrol

int servo1Pin = 9;
int servo2Pin = 10;
int pos = 0;
int servo_Spd = 12;
int mtr_Spd = 255;

String str;
int blueToothVal;

void setup() {
  Serial.begin(9600);
  servo1.attach (servo1Pin);
  servo2.attach (servo2Pin);}

void loop(){
  bluetooth(); }

void bluetooth(){
  while (Serial.available()) { {
    str = Serial.readStringUntil('\n'); }

    blueToothVal = (str.toInt());
    Serial.print("BlueTooth Value ");
    Serial.println(blueToothVal);

    switch (blueToothVal) {
      case 1:
        Serial.println("Forward");
        Forward();
        break;
      case 2:
        Serial.println("Reverse");
        Reverse();
        break;
      case 3:
        Serial.println("Right");
        RightTurn();
        break;
      case 4:
        Serial.println("Left");
        LeftTurn();
        break;
      case 5:
        Serial.println("Stop");
        Stop();
        break;
      case 6:
        Serial.println("Angkat");
        Angkat();
        break;
      case 7:
        Serial.println("Turunkan");
        Turunkan();
        break; } }

    if (Serial.available() < 0) {
      Serial.println("No Bluetooth Data "); } }

void Forward() {
  Serial.println("Forward");
  motor1.setSpeed(mtr_Spd);
  motor2.setSpeed(mtr_Spd);
  motor1.run(FORWARD);
  motor2.run(FORWARD); }

void Reverse() {
  Serial.println("Reverse");
  motor1.setSpeed(mtr_Spd);
  motor2.setSpeed(mtr_Spd);
  motor1.run(BACKWARD);
  motor2.run(BACKWARD);}

void LeftTurn() {
  Serial.println("Left");
  motor1.setSpeed(mtr_Spd);
  motor2.setSpeed(mtr_Spd);
  motor1.run(BACKWARD);
  motor2.run(FORWARD); }

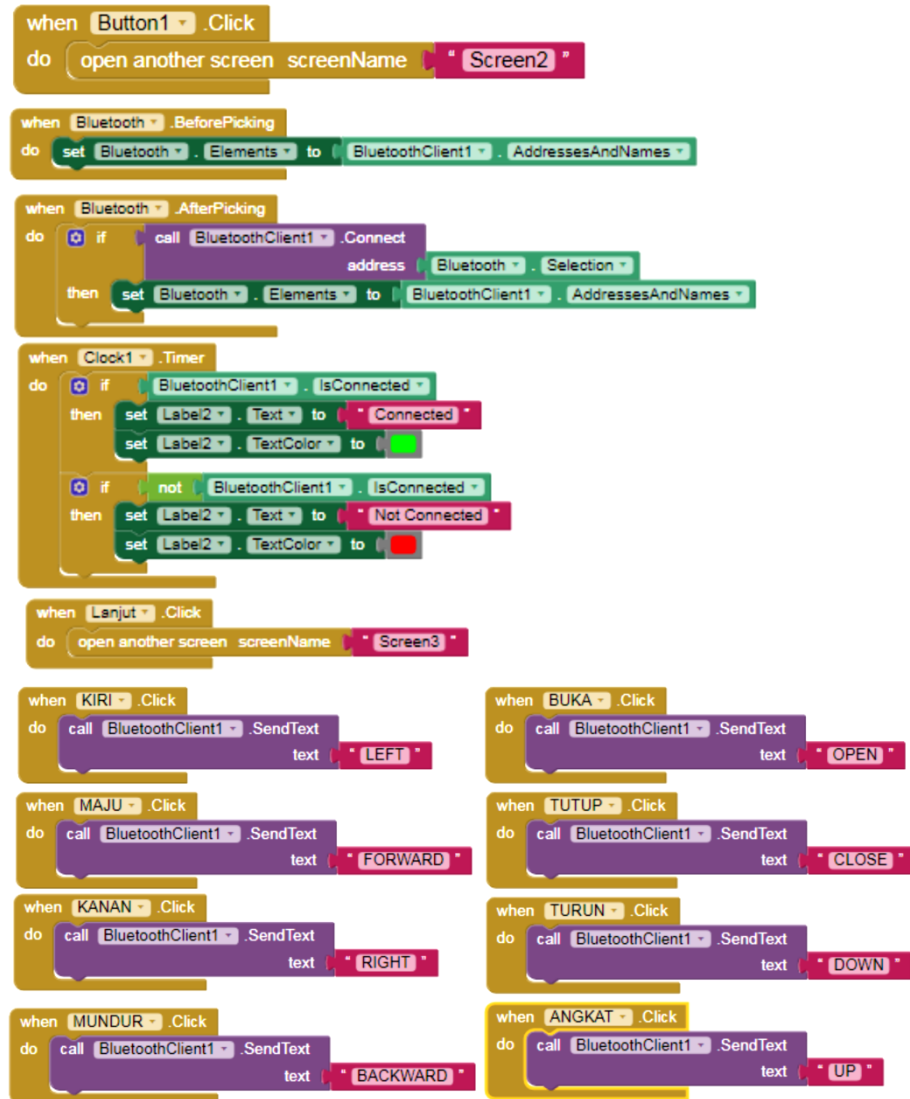
void RightTurn() {
  Serial.println("Right");
  motor1.setSpeed(mtr_Spd);
  motor2.setSpeed(mtr_Spd);
  motor1.run(FORWARD);
  motor2.run(BACKWARD); }

void Stop() {
  motor1.run(RELEASE);
  motor2.run(RELEASE);}

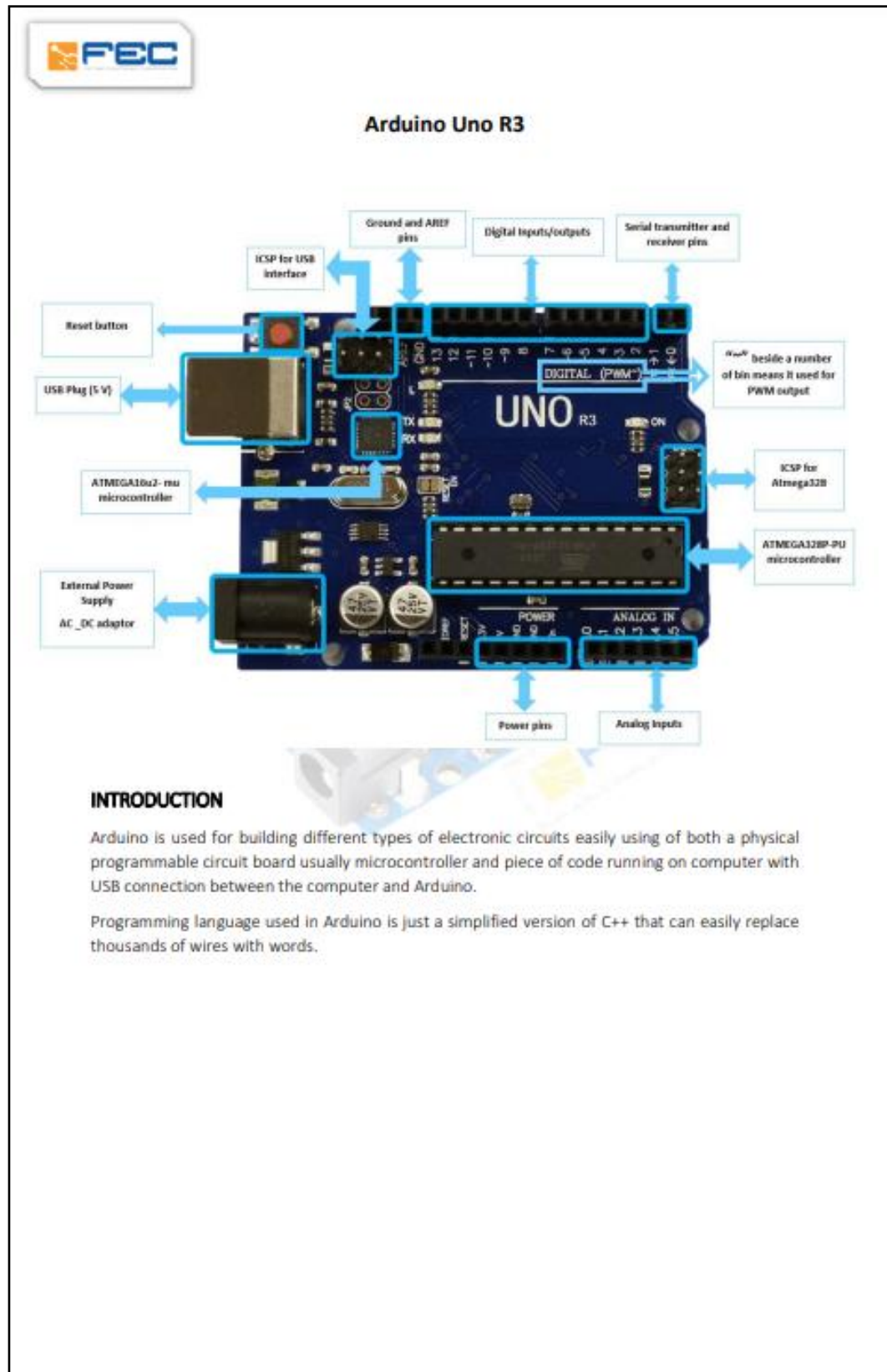
void Angkat () {
  servo1.write(0);
  delay (1500);
  servo2.write(140);
  delay(servo_Spd); }

void Turunkan (){{
  servo2.write(0);
  delay (1500);
  servo1.write(90);
  delay(servo_Spd); }}
```

## Lampiran 5. Program Blok Prototipe



## Lampiran 6. Datasheet Arduino Uno



## ARDUINO UNO-R3 PHYSICAL COMPONENTS

### ATMEGA328P-PU microcontroller

The most important element in Arduino Uno R3 is ATMEGA328P-PU is an 8-bit Microcontroller with flash memory reach to 32k bytes. It's features as follow:

- **High Performance, Low Power AVR**

- **Advanced RISC Architecture**

- 131 Powerful Instructions – Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers
- Up to 20 MIPS Throughput at 20 MHz
- On-chip 2-cycle Multiplier

- **High Endurance Non-volatile Memory Segments**

- 4/8/16/32K Bytes of In-System Self-Programmable Flash program memory
- 256/512/512/1K Bytes EEPROM
- 512/1K/1K/2K Bytes Internal SRAM
- Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Data retention: 20 years at 85°C/100 years at 25°C
- Optional Boot Code Section with Independent Lock Bits
- In-System Programming by On-chip Boot Program
- True Read-While-Write Operation
- Programming Lock for Software Security

- **Peripheral Features**

- Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- Real Time Counter with Separate Oscillator
- Six PWM Channels
- 8-channel 10-bit ADC in TQFP and QFN/MLF package
- Temperature Measurement
- 6-channel 10-bit ADC in PDIP Package
- Temperature Measurement
- Programmable Serial USART



## Lampiran 7. HC-05

# HC-05

## -Bluetooth to Serial Port Module

### Overview



HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

### Specifications

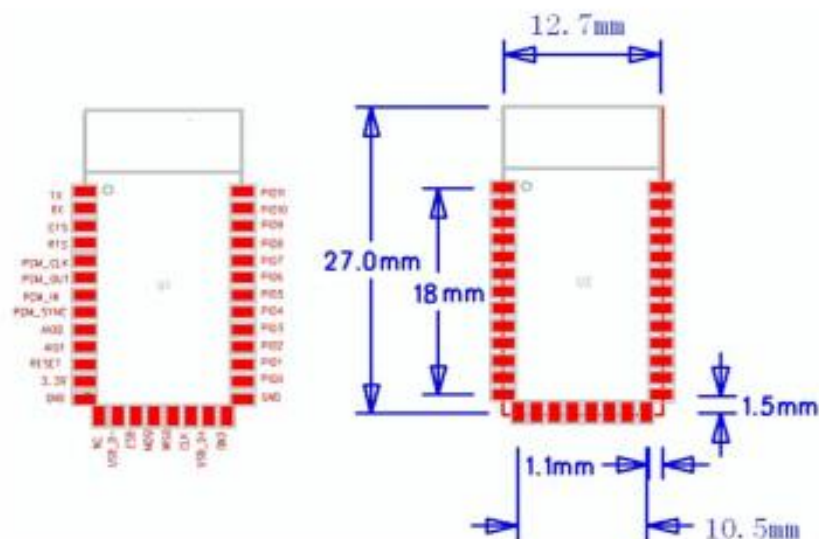
#### Hardware features

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With integrated antenna
- With edge connector

## Software features

- Default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control: has. Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected;
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led blinks 2times/s.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:"0000" as default
- Auto-reconnect in 30 min when disconnected as a result of beyond the range of connection.

## Hardware



## Lampiran 8. Datasheet IC L293D



**L293D**  
**L293DD**

### PUSH-PULL FOUR CHANNEL DRIVER WITH DIODES

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL
- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES

#### DESCRIPTION

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.

To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz.



SO(12+4+4)



Powerdip (12+2+2)

#### ORDERING NUMBERS:

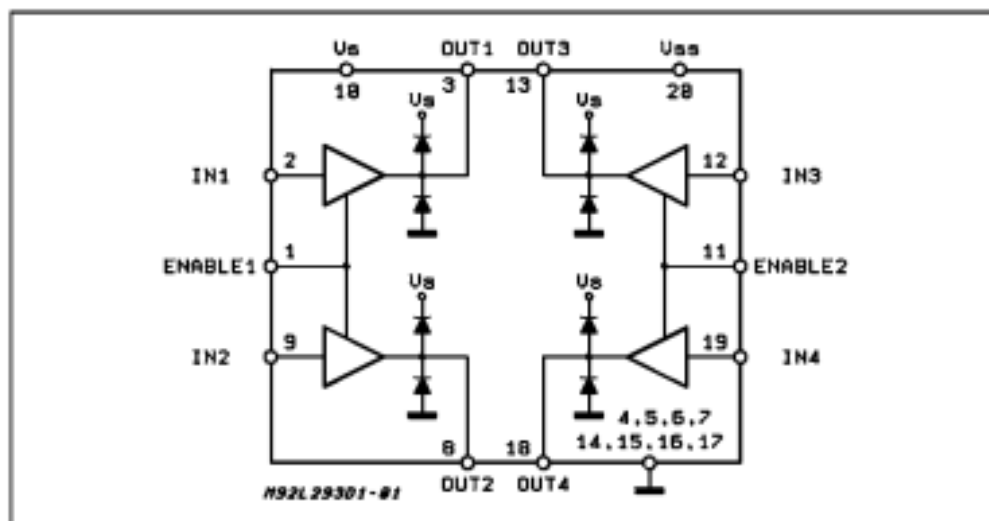
L293DD

L293D

The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heatsinking

The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heatsinking.

#### BLOCK DIAGRAM

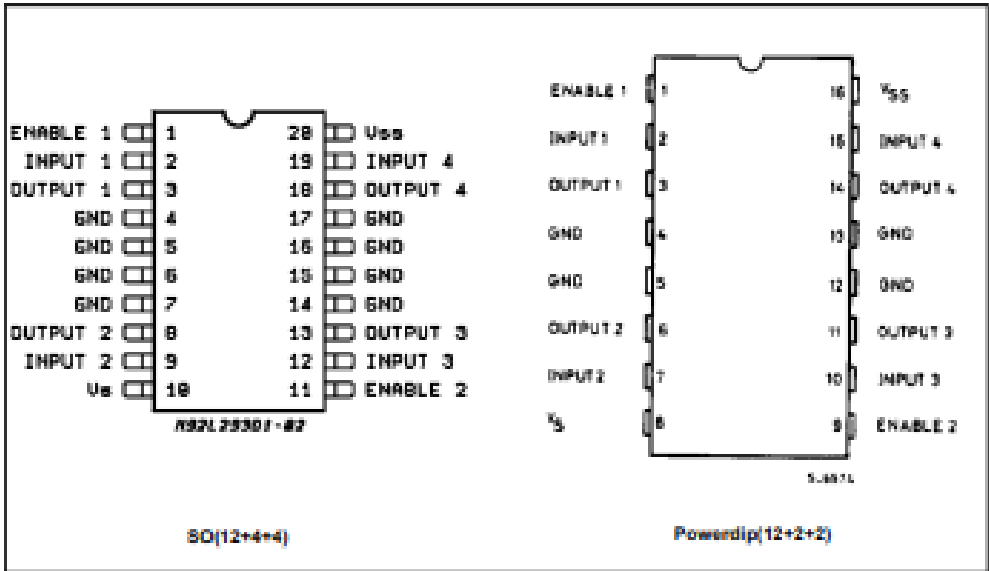


L293D - L293DD

ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                                         | Value       | Unit               |
|----------------|-------------------------------------------------------------------|-------------|--------------------|
| $V_S$          | Supply Voltage                                                    | 36          | V                  |
| $V_{SS}$       | Logic Supply Voltage                                              | 36          | V                  |
| $V_I$          | Input Voltage                                                     | 7           | V                  |
| $V_{en}$       | Enable Voltage                                                    | 7           | V                  |
| $I_o$          | Peak Output Current (100 $\mu$ s non repetitive)                  | 1.2         | A                  |
| $P_{tot}$      | Total Power Dissipation at $T_{amb} = 50\text{ }^{\circ}\text{C}$ | 4           | W                  |
| $T_{stg}, T_j$ | Storage and Junction Temperature                                  | - 40 to 150 | $^{\circ}\text{C}$ |

PIN CONNECTIONS (Top view)



THERMAL DATA

| Symbol           | Description                         | DIP  | SO | Unit                                           |
|------------------|-------------------------------------|------|----|------------------------------------------------|
| $R_{th(j-pin)}$  | Thermal Resistance Junction-pins    | max. | 14 | $^{\circ}\text{C/W}$                           |
| $R_{th(j-amb)}$  | Thermal Resistance junction-ambient | max. | 80 | $50\text{ }(^{\circ})$<br>$^{\circ}\text{C/W}$ |
| $R_{th(j-case)}$ | Thermal Resistance Junction-case    | max. | 14 | -                                              |

(\*) With 8sq. cm on board heatsink.

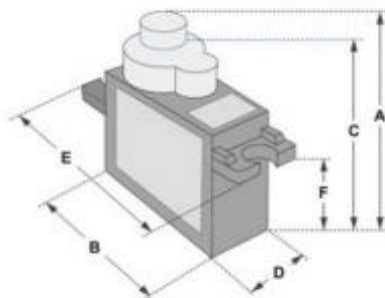
## Lampiran 9. Datasheet Motor Servo

### SERVO MOTOR SG90

### DATA SHEET



Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.



Position "0" (1.5 ms 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.

#### Dimensions & Specifications

A (mm) : 32

B (mm) : 23

C (mm) : 28.5

D (mm) : 12

E (mm) : 32

F (mm) : 19.5

Speed (sec) : 0.1

Torque (kg-cm) : 2.5

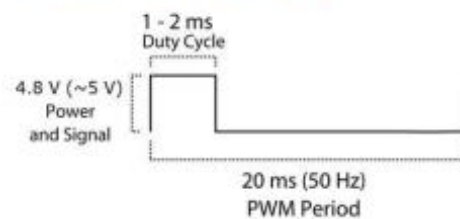
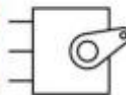
Weight (g) : 14.7

Voltage : 4.8 - 6

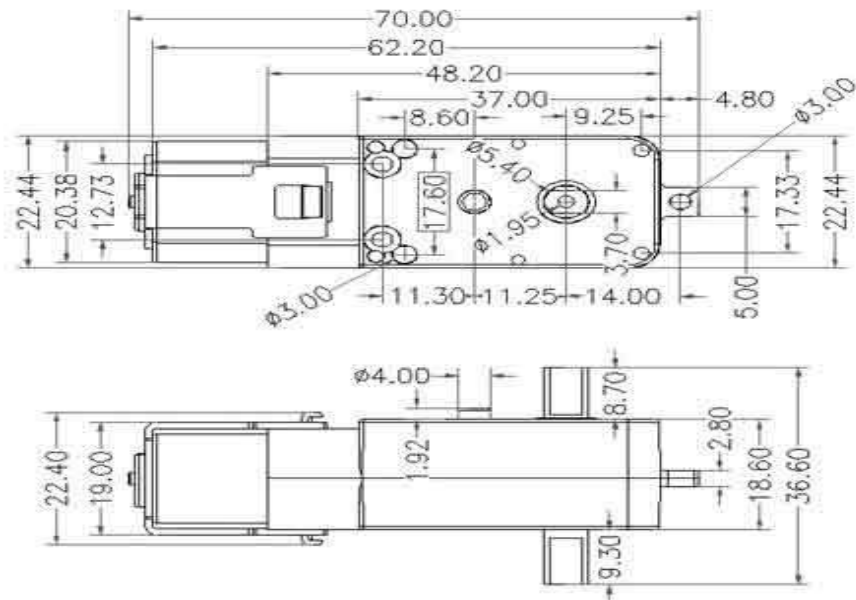
PWM=Orange (⏏)

Vcc = Red ( + )

Ground=Brown ( - )



## Lampiran 10. Datasheet Motor DC



### Spesifikasi :

Rated Voltage: 3~6V  
Continuous No-Load Current: 150mA +/- 10%  
Min. Operating Speed (3V): 90+/- 10% RPM  
Min. Operating Speed (6V): 200+/- 10% RPM  
Torque: 0.15Nm ~0.60Nm  
Stall Torque (6V): 0.8kg.cm  
Gear Ratio: 1:48  
Body Dimensions: 70 x 22 x 18mm  
Wires Length: 200mm & 28 AWG  
Weight: 30.6g

## Lampiran 11. Datasheet Baterai Lithium Ion



| Document Name             | Document No.      | Date      | Page |
|---------------------------|-------------------|-----------|------|
| LIR18650<br>Specification | ZJQM-RD-SPC-H0452 | 2019-4-20 | 3/11 |

### 1. Scope 适用范围

This product specification defines the requirements of the rechargeable Lithium-ion Battery supplied to the customer by EEMB Co., Ltd.

本产品规格书适用于 EEMB 提供的锂离子电池。

### 2. Battery Cell Basic Characteristics 电芯产品基本特性

| No. | Item 项目                    |                                     | Characteristics 性能指标 |     | Remark 备注                    |
|-----|----------------------------|-------------------------------------|----------------------|-----|------------------------------|
| 2.1 | Model 型号                   |                                     | LIR18650             |     |                              |
| 2.2 | Capacity 容量                | Nominal 标称容量                        | 3000                 | mAh | 0.2C <sub>5</sub> A          |
|     |                            | Minimum 最小容量                        | 2900                 | mAh | 0.2C <sub>5</sub> A          |
| 2.3 | Nominal Voltage 额定电压       |                                     | 3.7                  | V   |                              |
| 2.4 | Weight 重量                  |                                     | Approx. 46.50        | g   |                              |
| 2.5 | Internal Impedance 内阻      |                                     | ≤ 60                 | mΩ  | AC 1KHz(50% charge) with PTC |
| 2.6 | Charge 充电                  | Maximum Current 最大充电电流              | 1500                 | mA  | 0.5C <sub>5</sub> A (CC&CV)  |
|     |                            | Limited Voltage 充电上限电压              | 4.35±0.005           | V   |                              |
|     |                            | End-of Current 充电截至电流               | 30                   | mA  |                              |
| 2.7 | Discharge 放电               | Maximum Current 最大放电电流              | 1500                 | mA  | 0.5C <sub>5</sub> A          |
|     |                            | Max. Continuous Current 最大持续放电电流    | 4500                 | mA  | 5~50℃, 1.5C                  |
|     |                            | Max. Instantaneous Current 最大瞬间放电电流 | 6000                 | mA  | 2.0C                         |
| 2.8 | Operation Temperature 工作温度 | Charge 充电温度                         | 0 ~ 45               | ℃   |                              |
|     |                            | Discharge 放电温度                      | -10 ~ +50            | ℃   |                              |
| 2.9 | Storage Temperature 贮存温度   | 1 month 1 个月 (贮存期)                  | -20 ~ +50            | ℃   |                              |
|     |                            | 3 months 3 个月 (贮存期)                 | -20 ~ +45            | ℃   |                              |
|     |                            | 12 months 12 个月 (贮存期)               | -20 ~ +20            | ℃   |                              |