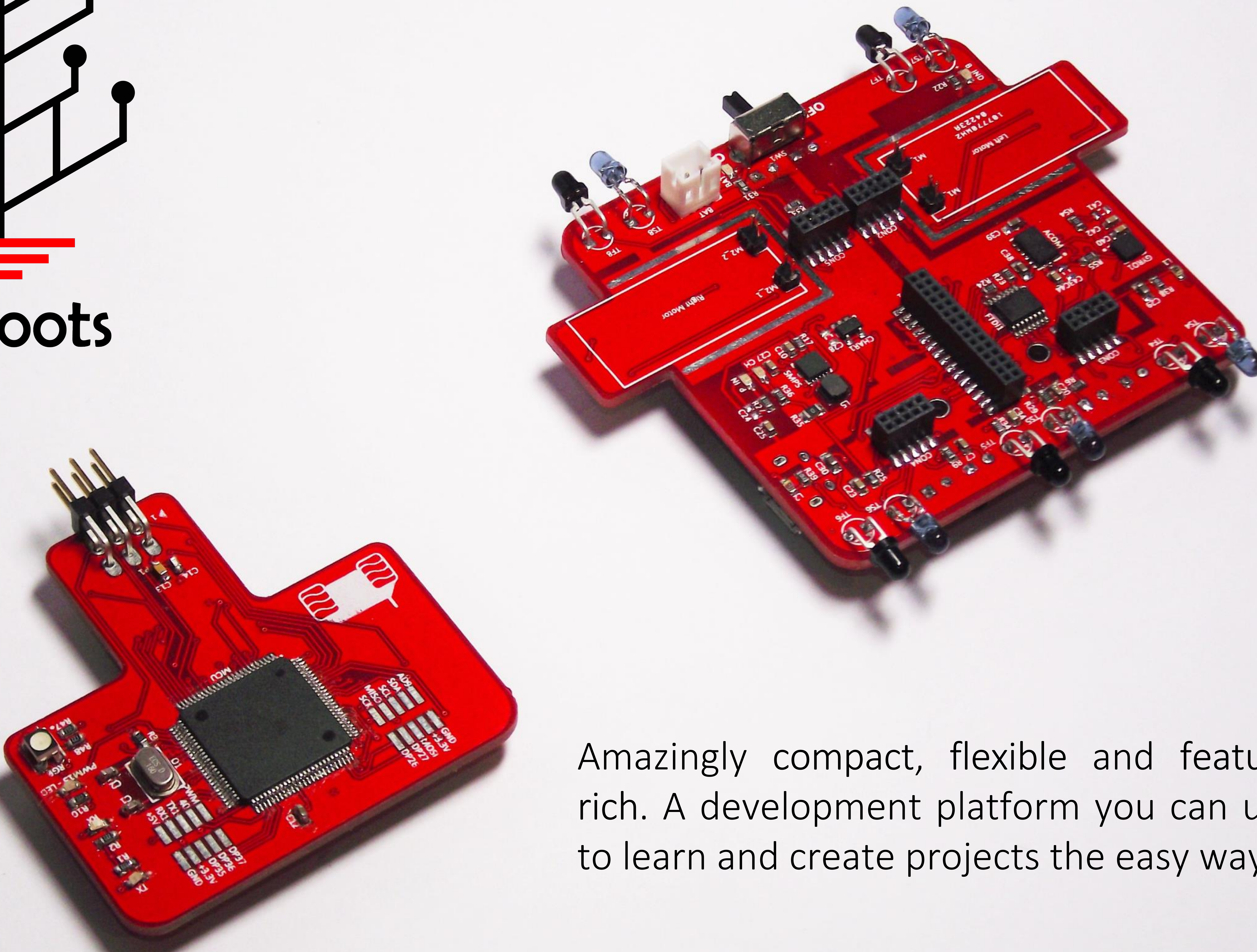
eeRoots



Amazingly compact, flexible and feature rich. A development platform you can use to learn and create projects the easy way.

Website

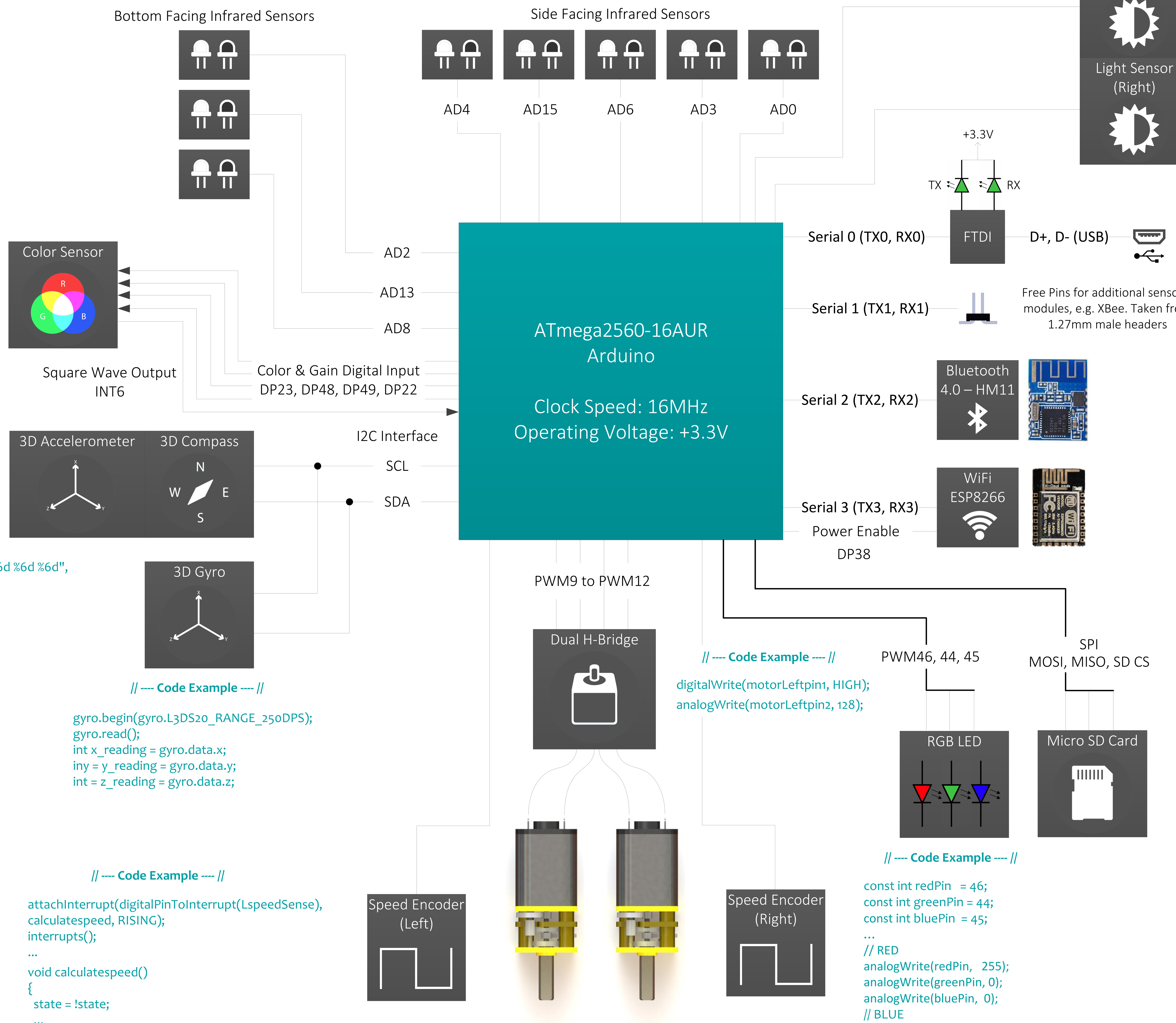
eeRoots

eeMod

Non-Technical System Layout

0 to 1023 as seen through analogRead(...)

```
// ---- Code Example ---- //
int frontIR = analogRead(15);
```




```
// ---- Code Example ---- //

...
attachInterrupt(6, getRGBvalue, CHANGE);
digitalWrite(13, LOW);
interrupts();
initRGB();

void getRGBvalue()
{
  TCCR4B &= ~(_BV(CS40) | _BV(CS41) | _BV(CS42));
  clock selects bits
  count = TCNT4;
  TCNT4 = 0;
  TCCR4B |= clockSelectBits;
}
```

```
// ---- Code Example ---- //

Wire.begin();
compass.init();
compass.enableDefault();
compass.read();

snprintf(report, sizeof(report),
"Accelerometer Data: %6d %6d %6d    Compass Data: %6d %6d %6d",
compass.a.x, compass.a.y, compass.a.z,
compass.m.x, compass.m.y, compass.m.z);

float heading = compass.heading();
```

```
// ---- Code Example ---- //

gyro.begin(gyro.L3DS20_RANGE_250DPS);
gyro.read();
int x_reading = gyro.data.x;
iny = y_reading = gyro.data.y;
int = z_reading = gyro.data.z;
```

```
// ---- Code Example ---- //

attachInterrupt(digitalPinToInterrupt(LspeedSense),
calculatespeed, RISING);
interrupts();
...
void calculatespeed()
{
  state = !state;
  ...
```

```
// ---- Code Example ---- //
digitalWrite(motorLeftpin1, HIGH);
analogWrite(motorLeftpin2, 128);
```

```
// ---- Code Example ---- //

const int redPin   = 46;
const int greenPin = 44;
const int bluePin  = 45;
...
// RED
analogWrite(redPin,   255);
analogWrite(greenPin, 0);
analogWrite(bluePin,  0);
// BLUE
analogWrite(redPin,   0);
analogWrite(greenPin, 0);
analogWrite(bluePin,  255);
...
```

```
// ---- Code Example ---- //

#define L1 5
#define L2 7
...
int leftLightSensor = analogRead(L1);
int rightLightSensor = analogRead(L2);
If (leftLightSensor <300) LEDON();
else LEDOFF();
```

```
// ---- Code Example ---- //

Serial.print("Hi there :) Welcome to eeMod!");
Serial.print(Serial.read());
```

```
// ---- Code Example ---- //

Serial1.print("We're glad you're here!");
Serial1.print(Serial1.read());
```

```
// ---- Code Example ---- //

Serial2.print("It means you're up to something!");
Serial2.print(Serial2.read());
```

```
// ---- Code Example ---- //

char *wifirequest = "GET / HTTP/1.1\r\nHost:
www.google.com\r\nConnection: close\r\n\r\n";

wifi.send((const uint8_t*)wifirequest , strlen(wifirequest ));
```

```
// ---- Code Example ---- //

...
SD.begin(4);
if (!SD.begin(4)) {
  return;
}
Serial.println("SD Initialized");

if (SD.exists("eeMod.txt")) {
  Serial.println("Hi there :)");
}
else {
  Serial.println("Try again.");
}
```

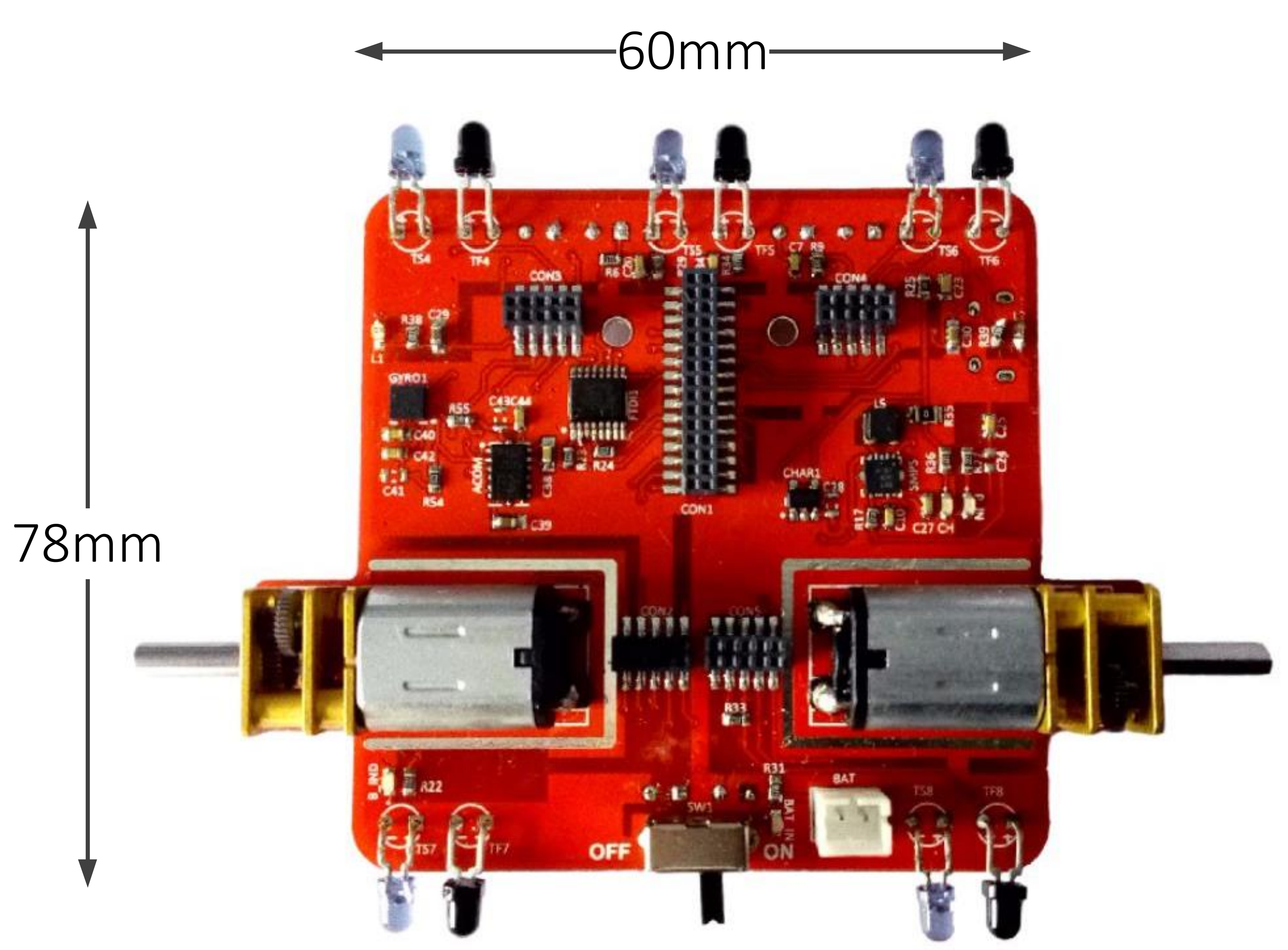
Specifications

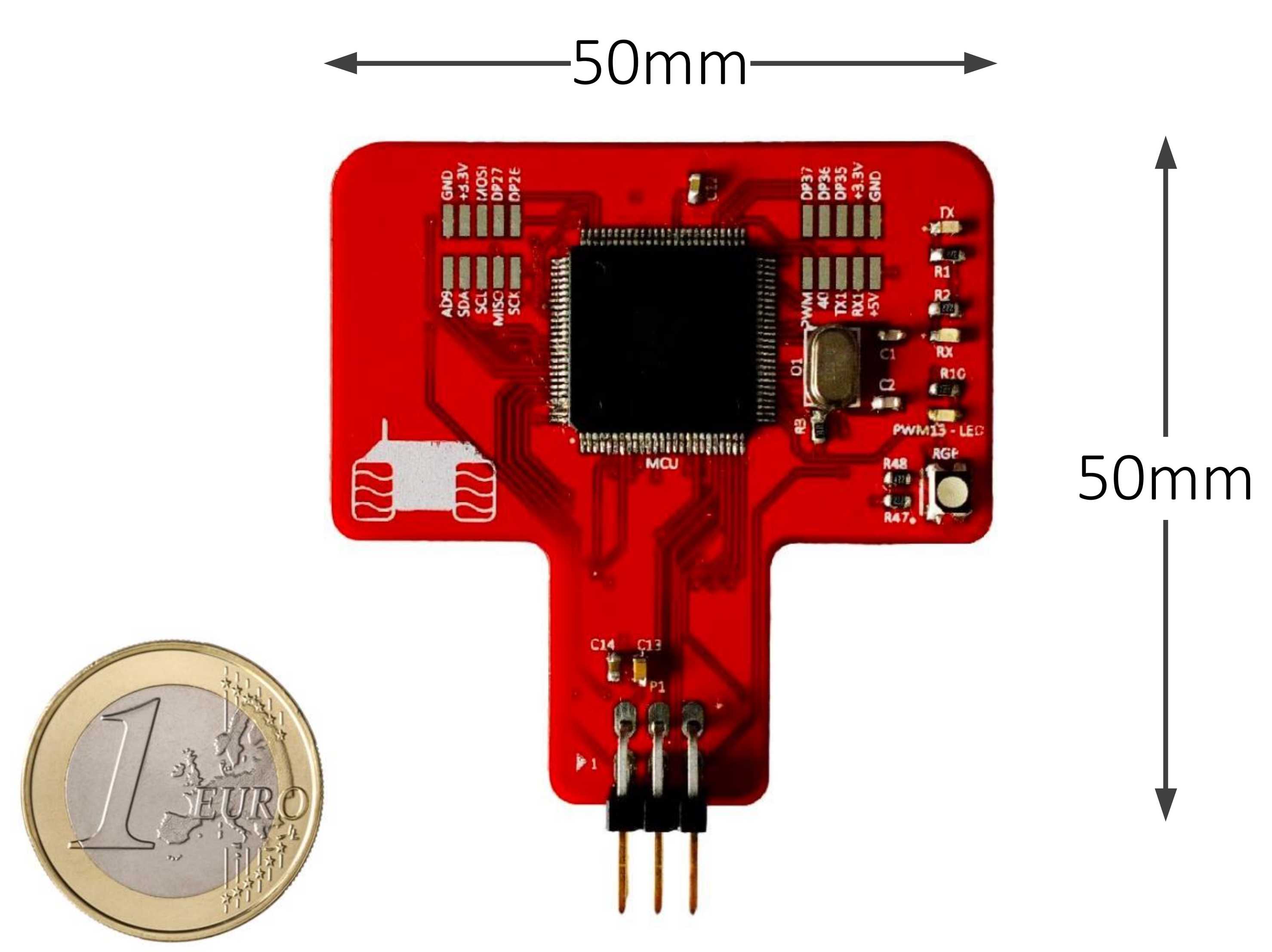
Sensors/Components		
Component		**Spec**
RGB Led	-	8-bit PWM Input
5 x Proximity Sensing Infrared Sensors	-	0-30cm sensitivity range
3 x Edge/Line Detection Infrared Sensors	-	0-10cm sensitivity range
Color Sensor	-	Frequency output sensed with interrupts and timer
3D Accelerometer	-	16-bit, ±2g/±4g/±8g/±16g linear acceleration, I2C Interface
3D Compass	-	16-bit, I2C Interface
3D Gyro	-	16-bit, I2C Interface
Li-Po Charger	-	USB compatible, 4.2V, 100/500mA charging current
2 x Motor Driver	-	Stepper/DC motor driver, 400mA max
2 x Motors	-	DC Motors, Full-Metal Gear Motors 420rpm, 30mA at 3.3V unloaded
2 x Speed Sensing	-	Filtered, interrupt based with timer
2 x Light Sensors	-	Analog, resolution is ADC dependent
Bluetooth HM-11	-	Version 4.0, UART Communication (FCC Certified)
Wi-Fi ESP8266-12E	-	802.11 b/g/n, UART communication (CE, FCC Certified)
SD Card Connector	-	Micro SD Card
Micro USB Connector	-	Connect to PC, ~50-100mA current draw on standby - sensor dependent
Ball Caster	-	1/2 inch diameter, plastic
Wheels	-	4.2cm diameter, plastic, knotches for speed sensing
Robot Casing	-	ABS/PLA material, 2mm wall thickness (75-200microns if 3D printed)

Power		
Component		**Max Current Supply**
Li-Po/USB Power Sharing	-	1.2A
Micro USB Connector	-	100mA
+3.3V Voltage Regulation (Switch Mode)	-	1.2A

Controller		
ATmega2560-16AUR		
Operational Voltage	-	+3.3V
Operational Frequency	-	16MHz
EEPROM	-	4Kbytes
SRAM	-	8Kbytes
Arduino Compatible - Shipped Programmed		
Note:		This Controller can be changed as desired. eeMod was designed to make the controller replacable - no need to change the entire board when you want an upgrade!

Size





Signal Pinout

Index	Signal Name	Input / Output / Power	Analog / Digital	Arduino Pin Name	Pin on ATMEGA2560
1	+3.3V	Power	-	-	VCC
2	+5.0V	Power	-	-	-
3	GND	Power	-	-	GND
4	Right Back Infrared Sensor - IR5	Input	Analog	AD0	PF0
5	Battery Monitor	Input	Analog	AD1	PF1
6	Bottom Front Left Infrared Sensor - BIR1	Input	Analog	AD13	PK5
7	Front Middle Infrared Sensor - IR2	Input	Analog	AD15	PK7
8	Bottom Back Infrared Sensor - BIR3	Input	Analog	AD2	PF2
9	Left Back Infrared Sensor - IR4	Input	Analog	AD3	PF3
10	Left Front Infrared Sensor - IR1	Input	Analog	AD4	PF4
11	Left Light Sensor - L1	Input	Analog	AD5	PF5
12	Front Right Infrared Sensor - IR3	Input	Analog	AD6	PF6
13	Right Light Sensor - L2	Input	Analog	AD7	PF7
14	Bottom Front Right Infrared Sensor - BIR2	Input	Analog	AD8	PK0
15	Free Pin	Input	Analog	AD9	PK1
16	Colour S3	Output	Digital	DP22	PA0
17	Colour S0	Output	Digital	DP23	PA1
18	SD Detect	Input	Digital	DP24	PA2
19	SD Chip Select (CS)	Output	Digital	DP25	PA3
20	Free Pin	Input / Output	Digital	DP26	PA4
21	Free Pin	Input / Output	Digital	DP27	PA5
22	Free Pin	Input / Output	Digital	DP35	PC2
23	Free Pin	Input / Output	Digital	DP36	PC1
24	Free Pin	Input / Output	Digital	DP37	PC0
25	Wi-Fi Power Enable / Sleep	Output	Digital	DP38	PD7
26	Free Pin	Input / Output	Digital	DP40	PG1
27	Colour S1	Output	Digital	DP48	PL1
28	Colour S2	Output	Digital	DP49	PL0
29	Right Speed Interrupts	Input	Digital	INT4	PE4
30	Left Speed Interrupts	Input	Digital	INT5	PE5
31	Colour Output	Output	Digital	INT6	PE6
32	MISO	Input	Digital Communication	MISO	PB3
33	MOSI	Output	Digital Communication	MOSI	PB2
34	Left Motor In 2	Output	Digital	PWM10	PB4
35	Right Motor In 1	Output	Digital	PWM11	PB5
36	Right Motor In 2	Output	Digital	PWM12	PB6
37	LED Indicator	Output	Digital	PWM13	PB7
38	RGB - Red	Output	Digital	PWM44	PL5
39	RGB - Green	Output	Digital	PWM45	PL4
40	RGB - Blue	Output	Digital	PWM46	PL3
41	Right Speed Sensing Power	Output	Digital	PWM5	PE3
42	Colour Enable - White Light	Output	Digital	PWM7	PH4
43	Left Speed Sensing Power	Output	Digital	PWM8	PH5
44	Left Motor In 1	Output	Digital	PWM9	PH6
45	RESET	Input	Digital	RESET	RESET
46	FTDI RX - Receive	Input	Digital Communication	RX0	PE0
47	RX1 - Free Pin	Input / Output	Digital	RX1	PD2
48	BLE RX - Receive	Input	Digital Communication	RX2	PH0
49	Wi-Fi RX - Receive	Input	Digital Communication	RX3	PJ0
50	SCK	Output	Digital Communication	SCK	PB1
51	SCL	Output	Digital Communication	D21	PD0
52	SDA	Input / Output	Digital Communication	D21	PD1
53	FTDI TX - Send	Output	Digital Communication	TX0	PE1
54	TX1 - Free Pin	Input / Output	Digital	TX1	PD3
55	BLE TX - Send	Output	Digital Communication	TX2	PH1
56	Wi-Fi TX - Send	Output	Digital Communication	TX3	PJ1

Note: This pinout will be kept updated. There will be minimal changes, if any.

Pin Labeling

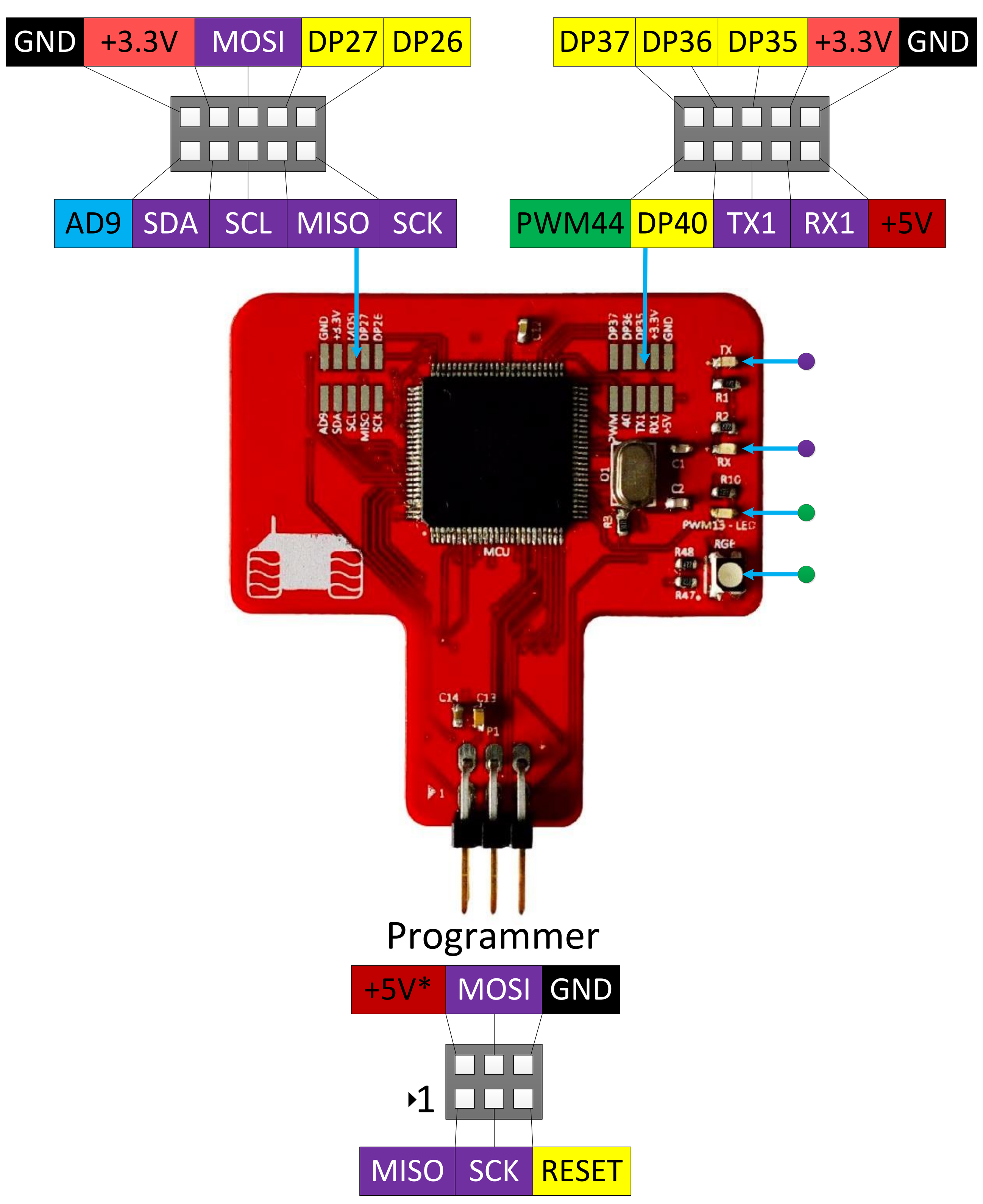
LEGEND

- GND
- +5V
- +3.3V
- DIGITAL PIN
- PWM PIN
- ANALOG PIN
- COMMUNICATIONS PIN

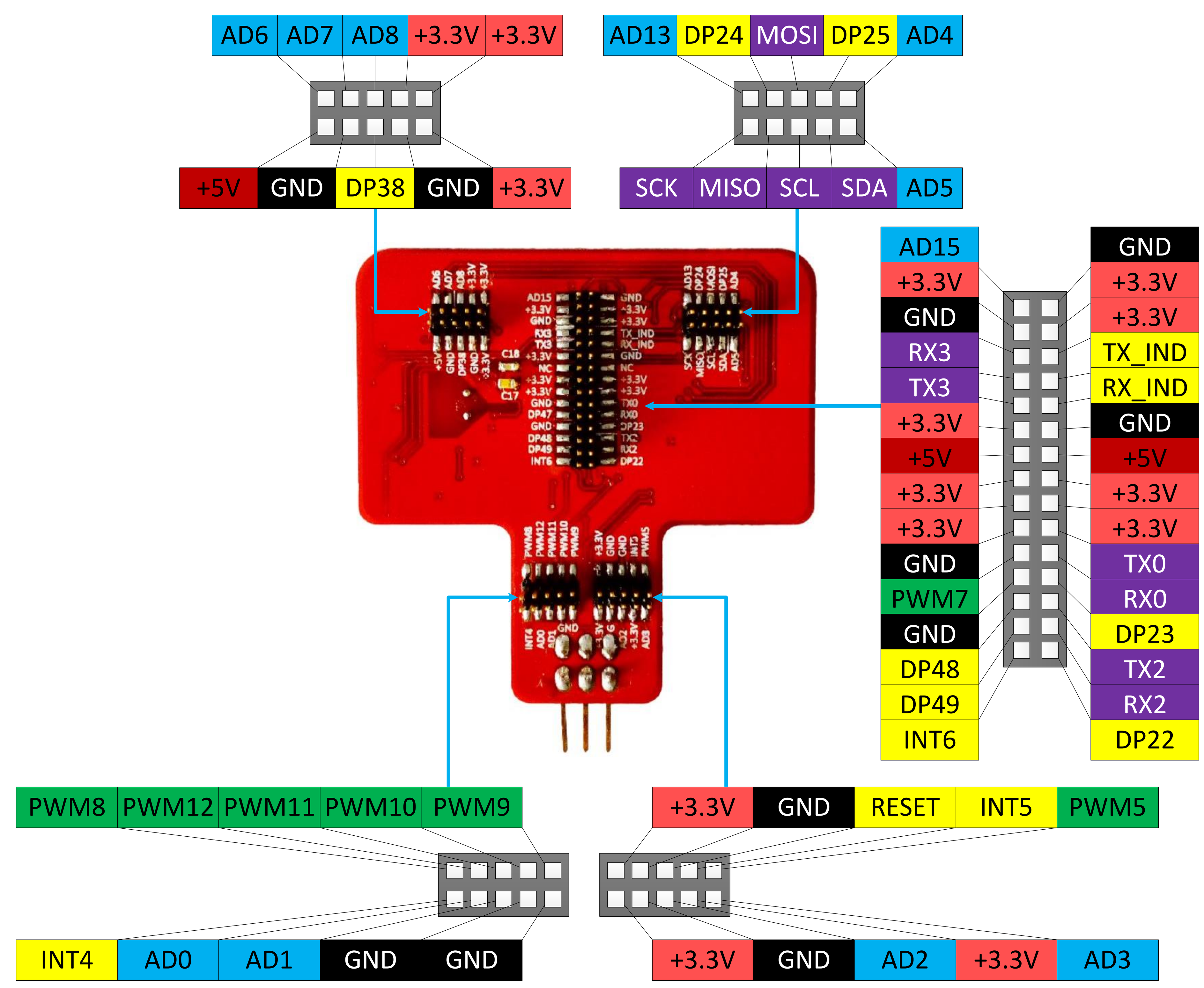
- ● COMMUNICATIONS INDICATION LED
- ● PWM CONTROLLED LED/RGB

The labels listed hereunder are the Arduino pin names. eeMod comes pre-programmed and installed with the ATmega2560 – located on the Top Board. This board can be easily replaced with a different board housing a different microcontroller and sensors. This means that eeMod is modular and gives you the possibility to design your own and expand whilst having all the sensors and features of the Bottom Board.

Top Board



*+5V supplied by the Programmer is disconnected by default, but may be connected. +5V is supplied via USB.



Bottom Board