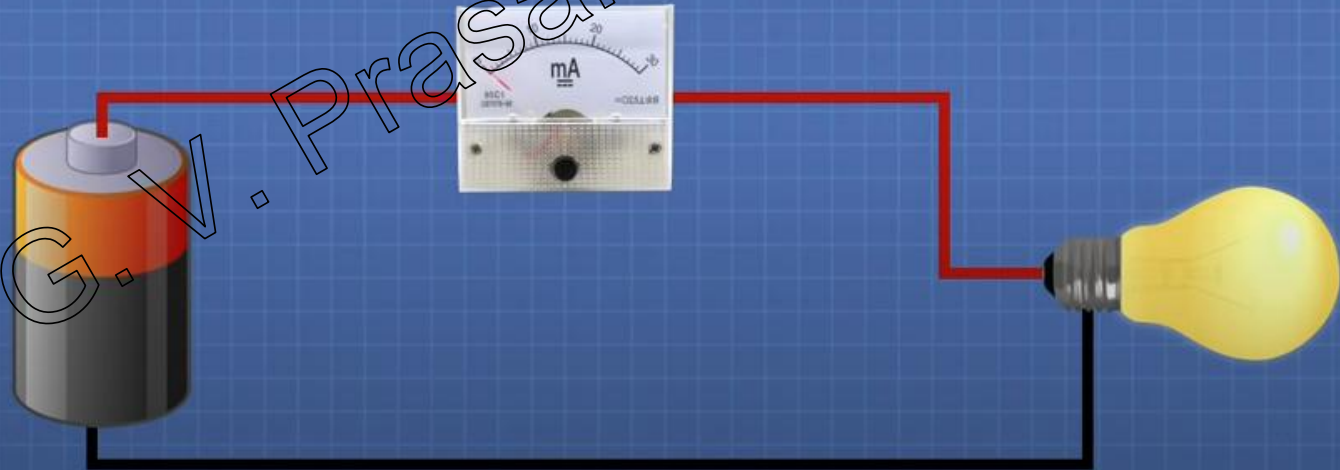


Current Measurement using ARDUINO

From
Dr.G.V.Prasanna Anjaneyulu

Measuring DC Current

- Current measured in amperes or milliamperes
- Measurement device inserted in series with load
- Current is turned into voltage, which is sampled by ADC
- Two types of measurements - Invasive



Invasive

- Uses low-value resistor
- Measures voltage drop
- Affects circuit voltage
- Requires direct connection
- Simple passive design



Non-Invasive

- Uses Hall-Effect sensor
- Measures magnetic field
- No effect on circuit voltage
- Indirect connection possible
- Complex active design



ACS712



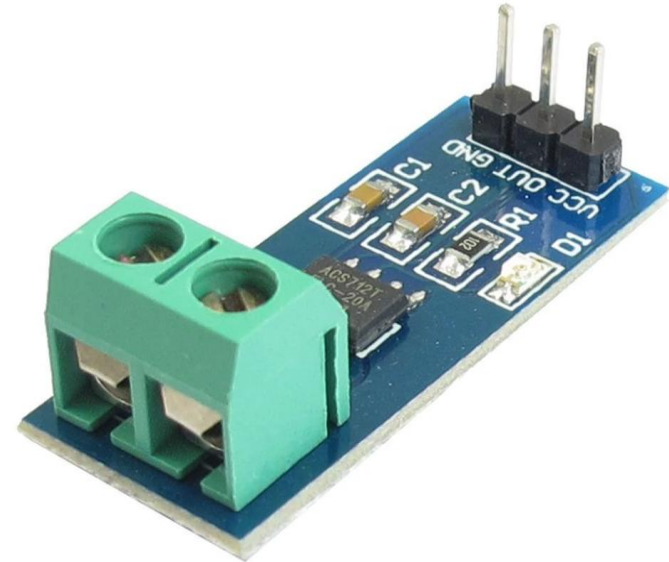
ACS712

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

Selection Guide

Part Number	T _A (°C)	Optimized Range, I _p (A)	Sensitivity, Sens (Typ) (mV/A)
ACS712ELCTR-05B-T	-40 to 85	±5	185
ACS712ELCTR-20A-T	-40 to 85	±20	100
ACS712ELCTR-30A-T	-40 to 85	±30	66

*Contact Allegro for additional packing options.



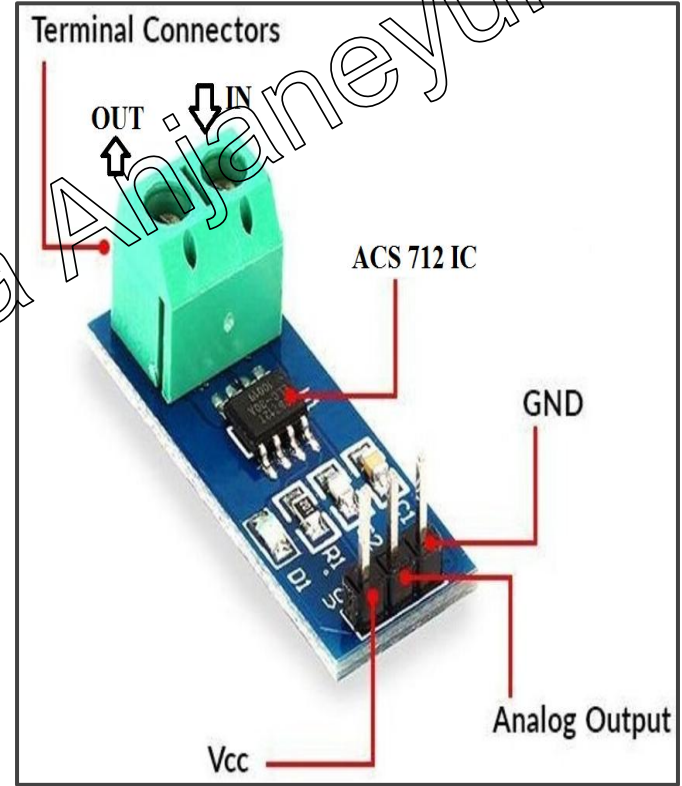
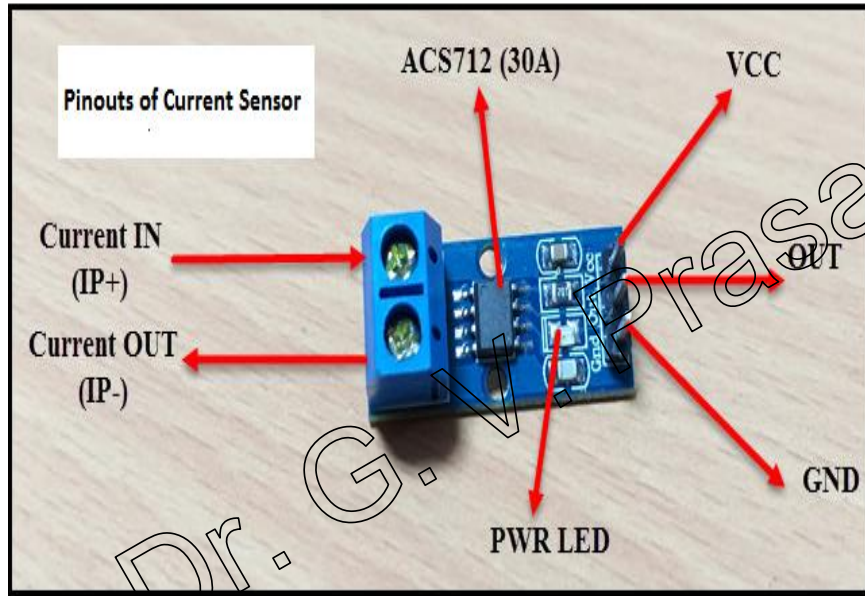
Features and Benefits



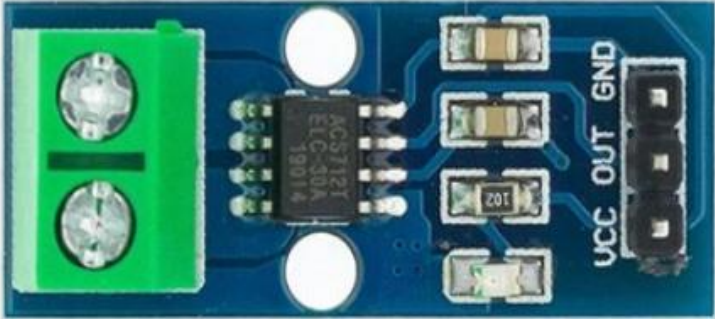
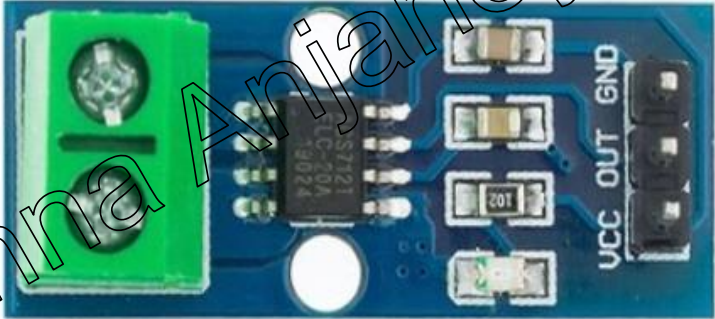
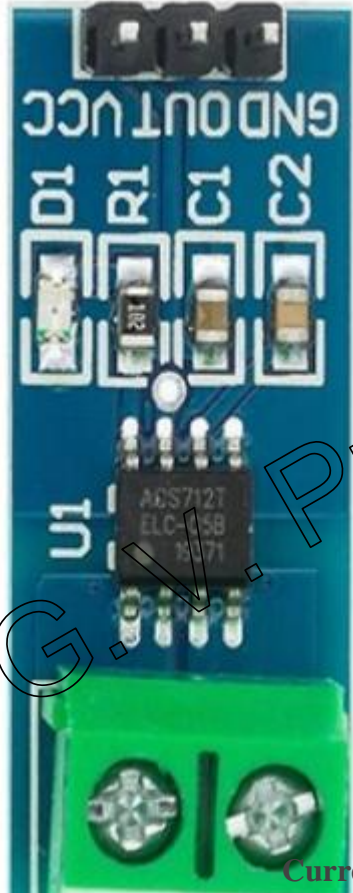
Low-noise analog signal path

- Device bandwidth is set via the new FILTER pin
- 5 μ s output rise time in response to step input current
- 80 kHz bandwidth
- Total output error 1.5% at TA = 25°C
- 1.2 m Ω internal conductor resistance
- 2.1 kVRMS 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
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis

Contd....

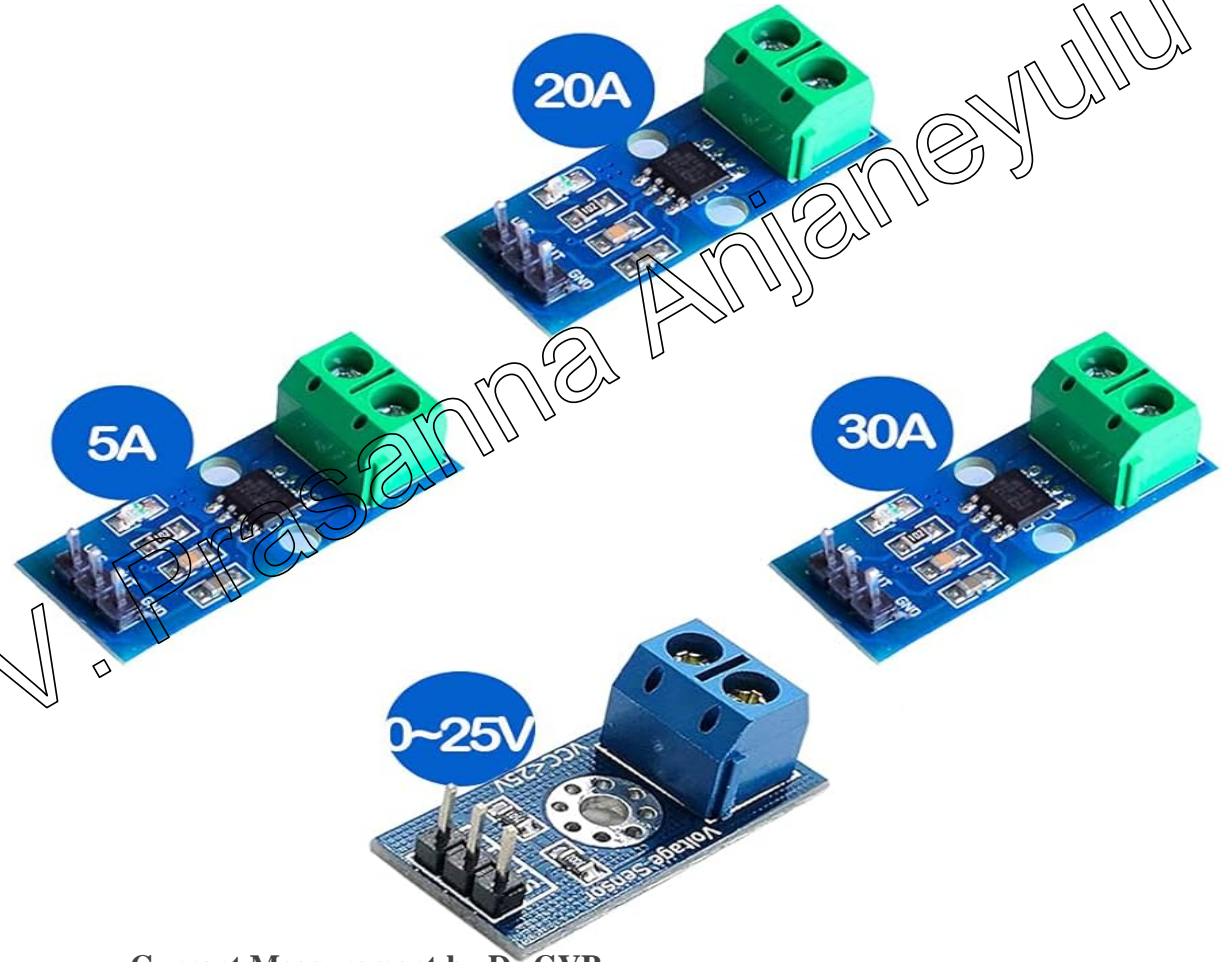


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Dr. G. V. Prasanna Anjaneyulu

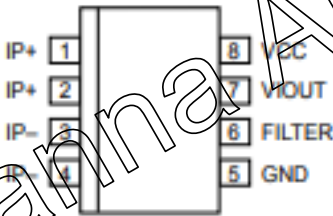
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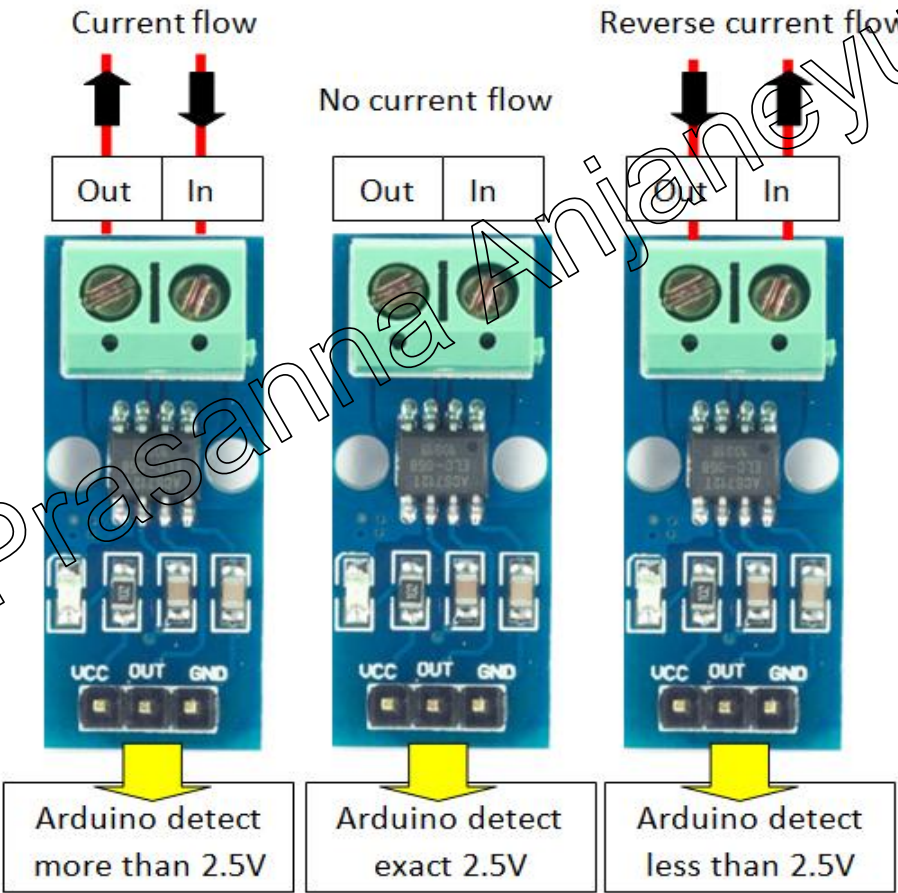
Pin-out Diagram



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

Contd...



Current Measurement by Dr.GVP

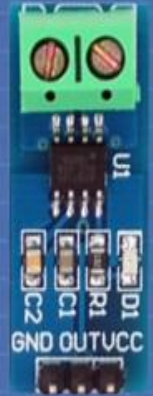
ACS712 Hall Effect Sensor

- Hall effect linear current sensor
- Low-resistance 1.2 milliohm current conductor
- Works with DC or AC current
- Powered by 5VDC
- Three Different models: 5A, 20A and 30A

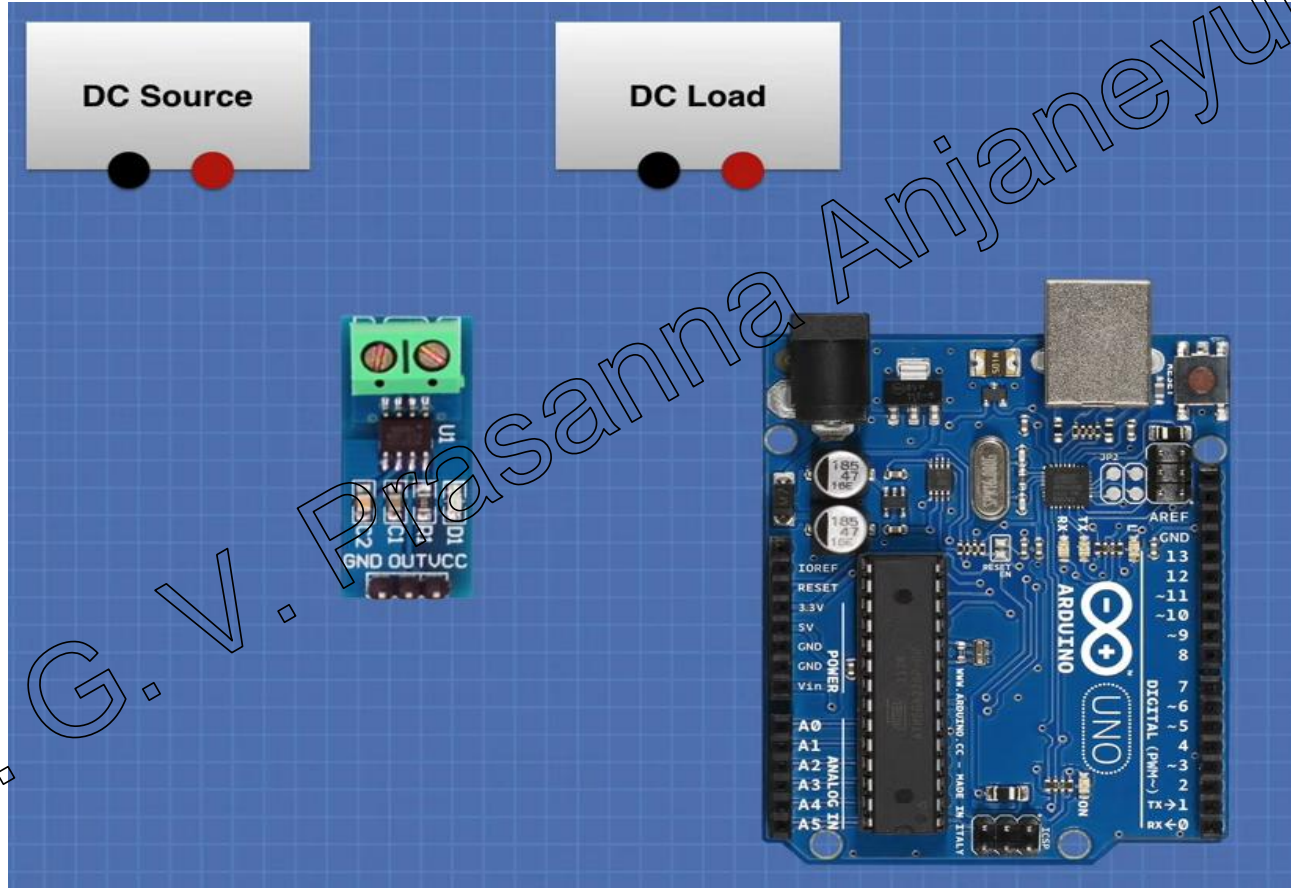


Scale Factor

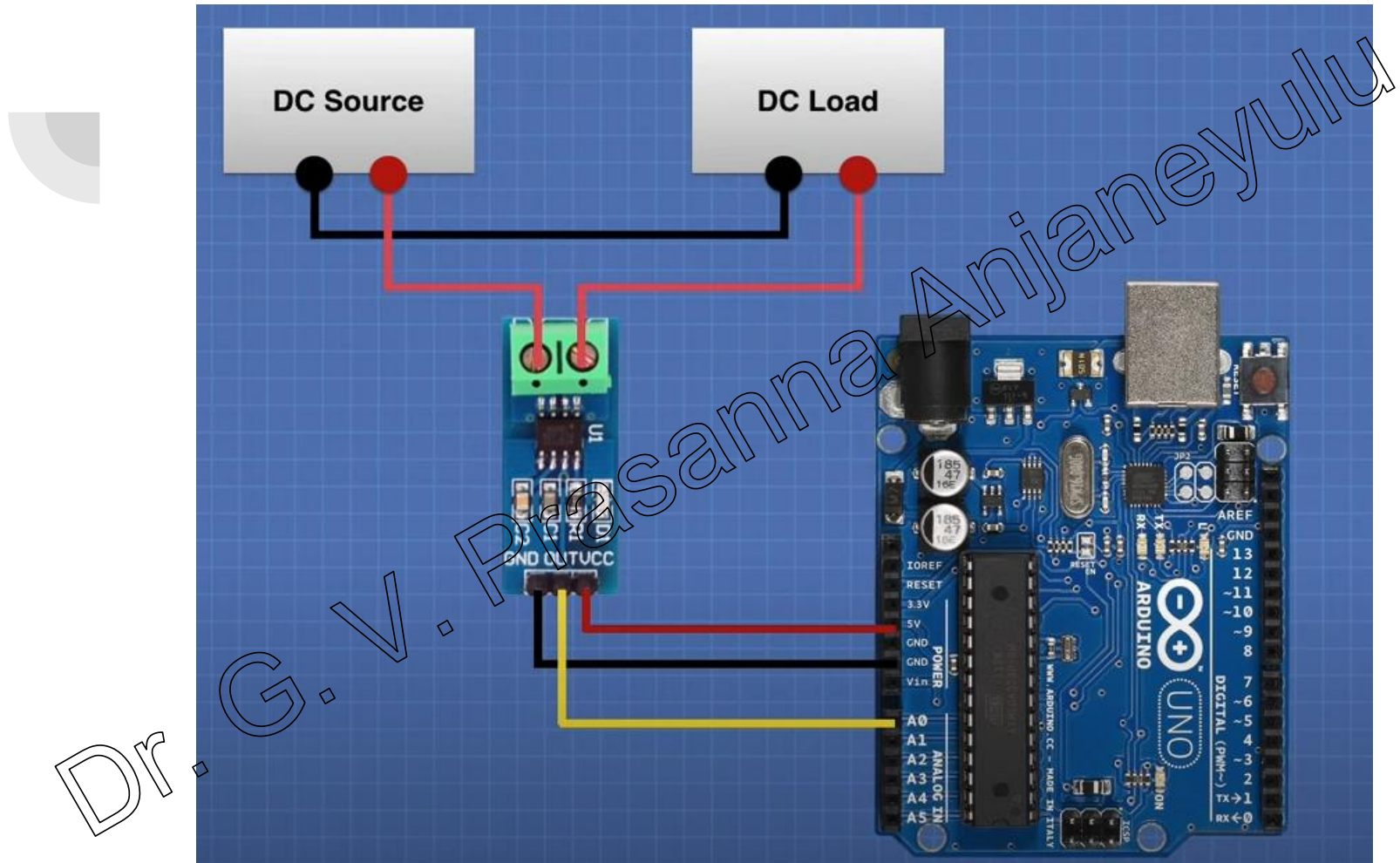
5A	20A	30A
185mV/Amp	100mv/Amp	66mv/Amp



$$\text{Current(Amps)} = (\text{Vout(mv)} - 2500) / \text{Scale Factor}$$

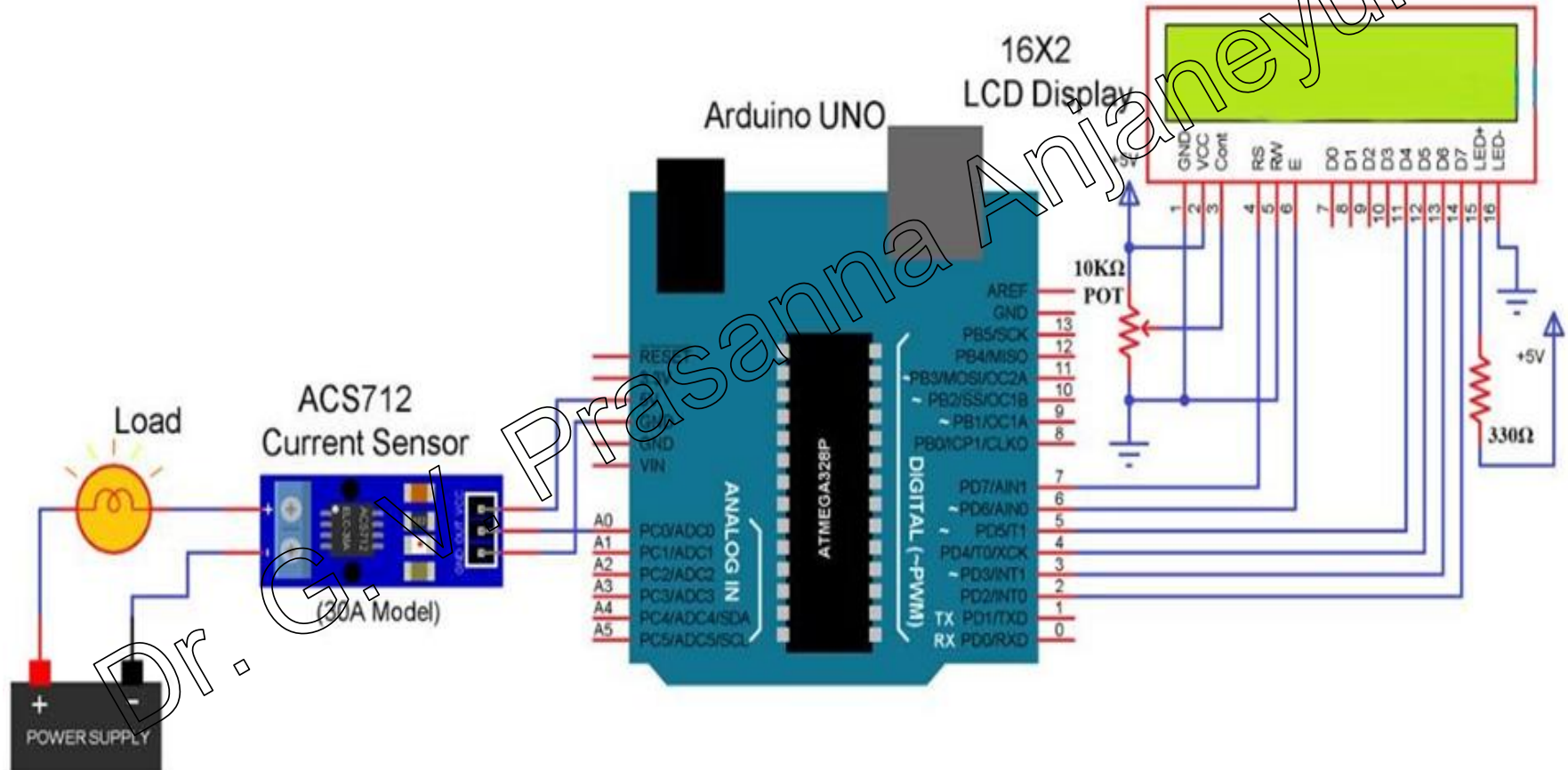


Current Measurement by Dr.GVP

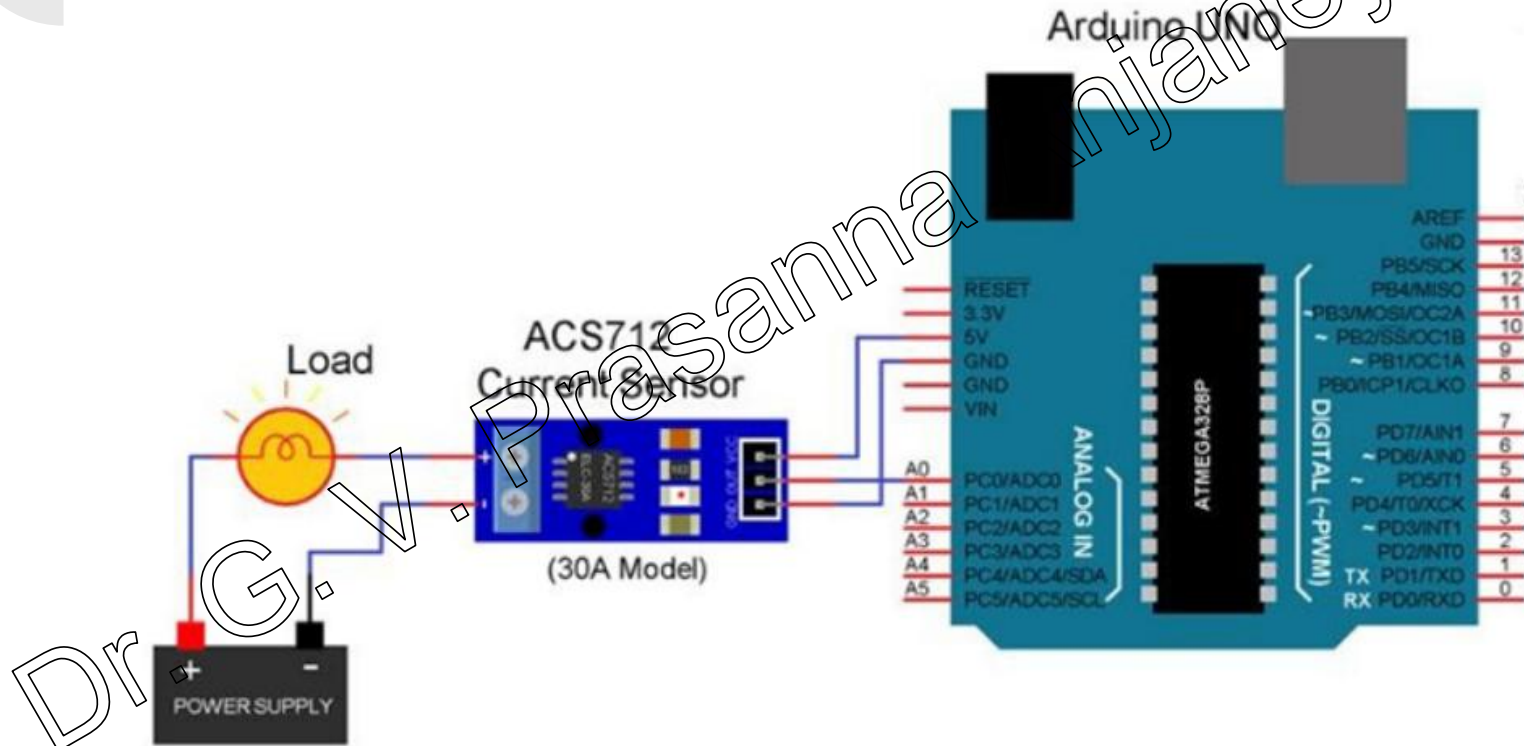


Current Measurement by Dr.GVP

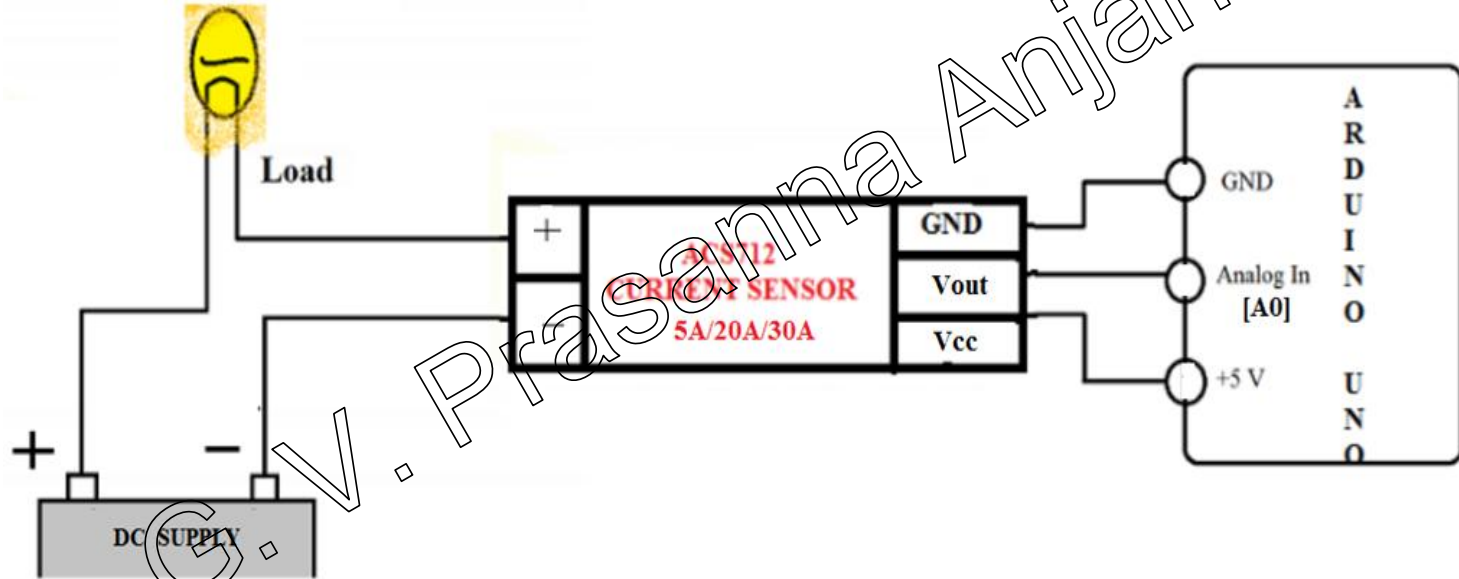
Circuit diagram with 16 x 2 LCD



Circuit diagram by without 16 x 2 LCD



Theoretical circuit



Program



//Measurement of current with ACS712-30A by ARDUINO

```
const int currentPin = A0;  
int sensitivity = 66; // it for 30A Sensor //for 5A Sensor sensitivity =185  
int adcValue= 0;  
int offsetVoltage = 2500;  
double adcVoltage = 0;  
double currentValue = 0;
```

void setup()

```
{  
  Serial.begin(9600);  
  delay(1000);  
}
```

void loop()

```
{  
  adcValue = analogRead(currentPin);  
  adcVoltage = (adcValue / 1024.0) * 5000;  
  currentValue = ((adcVoltage - offsetVoltage) / sensitivity);  
  Serial.print("Sensor Value = " );  
  Serial.print(adcValue);  
  delay(2000);  
  Serial.print("\t Voltage(mV) = ");  
  Serial.print(adcVoltage,3);  
  delay(1000);  
  Serial.print("\t Current = ");  
  Serial.println(currentValue,3);  
  delay(1000);  
}
```

Current Measurement by Dr.GVP

Results



Sensor Value = 514 Voltage (mV) = 2509.766 Current = 0.053
Sensor Value = 510 Voltage (mV) = 2490.234 Current = -0.053
Sensor Value = 512 Voltage (mV) = 2500.000 Current = 0.000
Sensor Value = 510 Voltage (mV) = 2490.234 Current = -0.053
Sensor Value = 511 Voltage (mV) = 2495.117 Current = -0.053
Sensor Value = 513 Voltage (mV) = 2504.883 Current = 0.028
Sensor Value = 513 Voltage (mV) = 2504.883 Current = 0.028
Sensor Value = 512 Voltage (mV) = 2500.000 Current = 0.000
Sensor Value = 515 Voltage (mV) = 2514.644 Current = 0.079
Sensor Value = 514 Voltage (mV) = 2509.766 Current = 0.053

Results at Serial Monitor

sl.no	Sensor value	Voltage [mV]	Current [A]
1			
2			
3			
4			



Thank
you!