Prepaid Energy System

Group 21

Group Members

- Sahin Okur – Electrical Engineering
- Youssef Ojeil – Electrical Engineering
- Michael Cuervo – Electrical Engineering
- MD.S. Rahaman – Electrical Engineering
- Dr. Chung-Yong Chan – Supervisor

Sponsorship

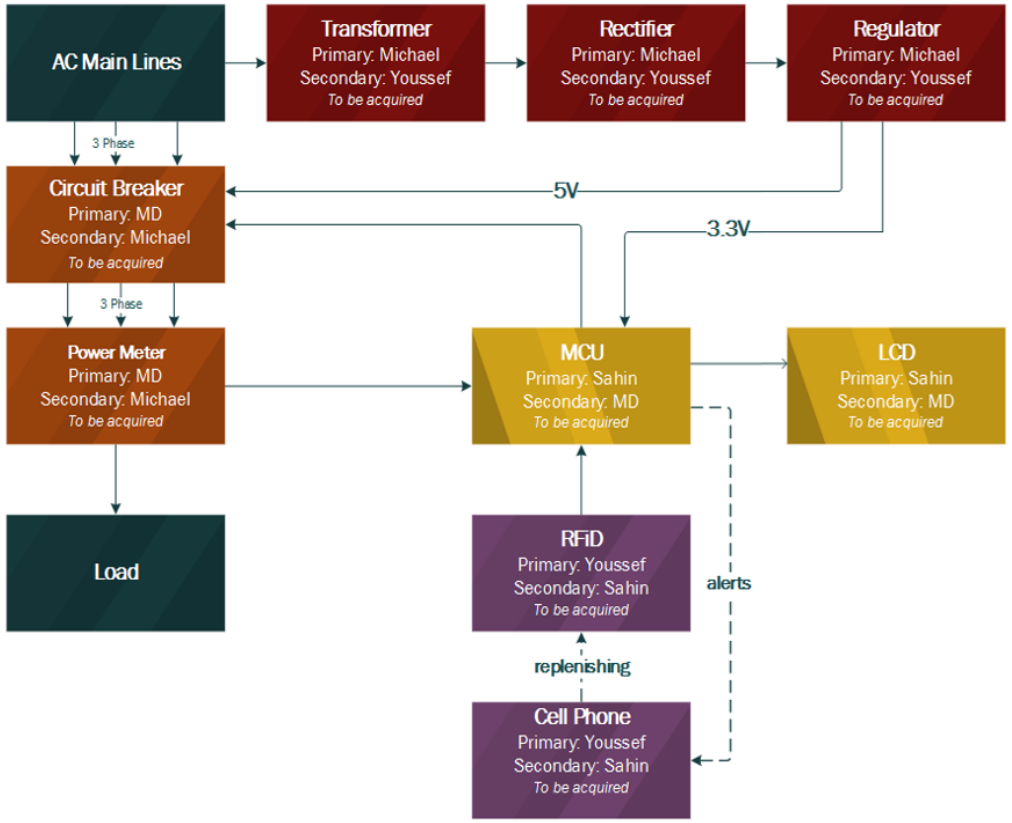
Objective

- Alternative to conventional Utility Billing
- Simple User friendly Interface
- Monitoring and Regulating Energy usage
- Benefit for both the consumer and provider

System Specifications

- Validate user via RFID
- Accept payment greater than 0 US dollars via RFID
- Replenish credit once payment is complete
- Display balance with 1 second of activation
- Send different types of data through Wi-Fi
- Desired dimensions 15x11 sq. inches
- System should operate in temperatures from 100 degrees to -40 Celsius

Project Overview



Legend

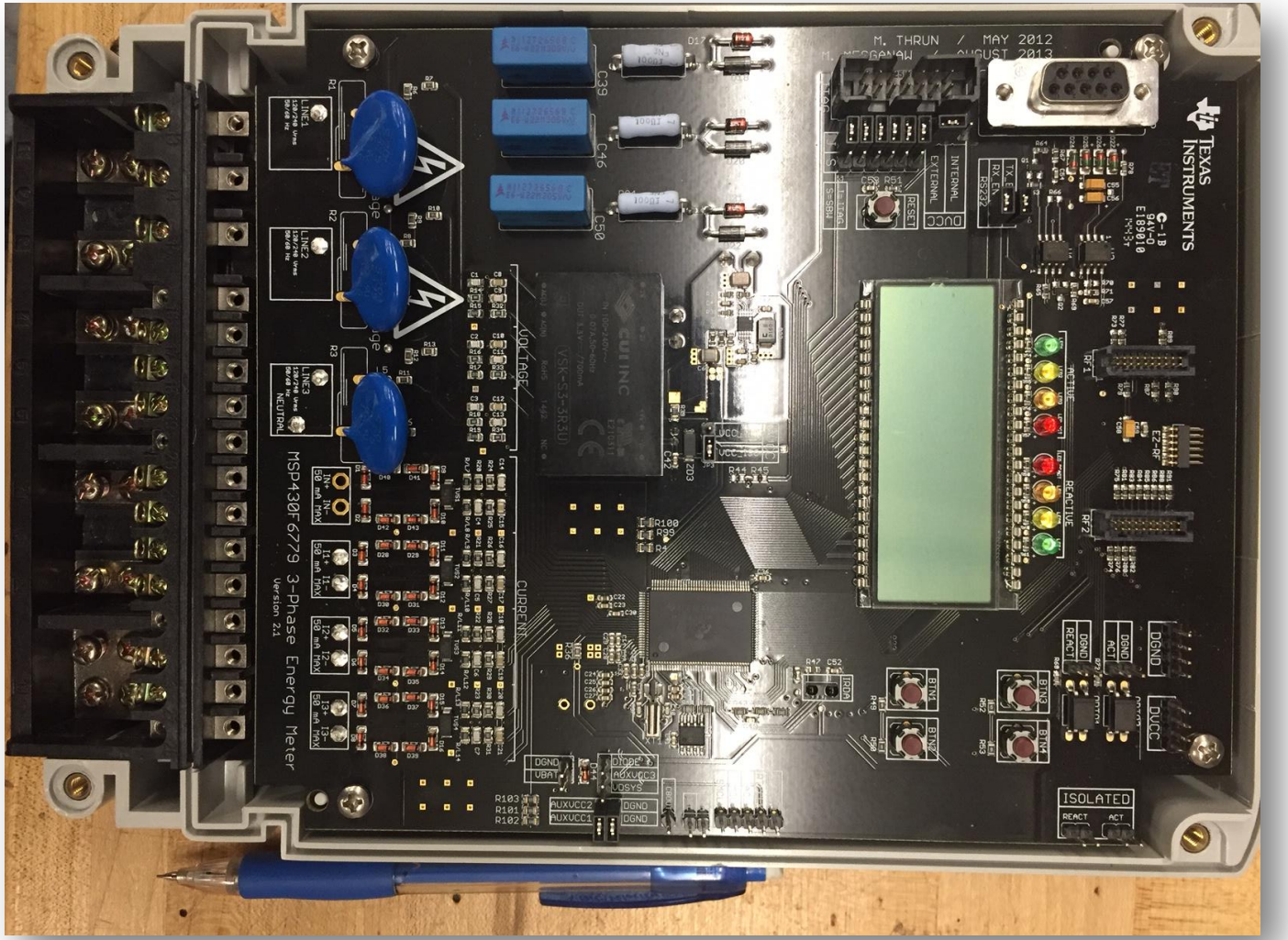
- Michael
- Youssef
- MD
- Sahin

Circuit Breaker: Power switch.
Power Meter: Measures power consumption.
MCU (Microcontroller Unit): The "brain" of the system. Computations, communications, and control.
Transformer: Steps down voltage.
Rectifier: AC to DC voltage converter.
Regulator: Steps down voltage.
RFiD (Radio Frequency Identification): Wireless communication.
Cell Phone: Communicates with MCU through RFiD.

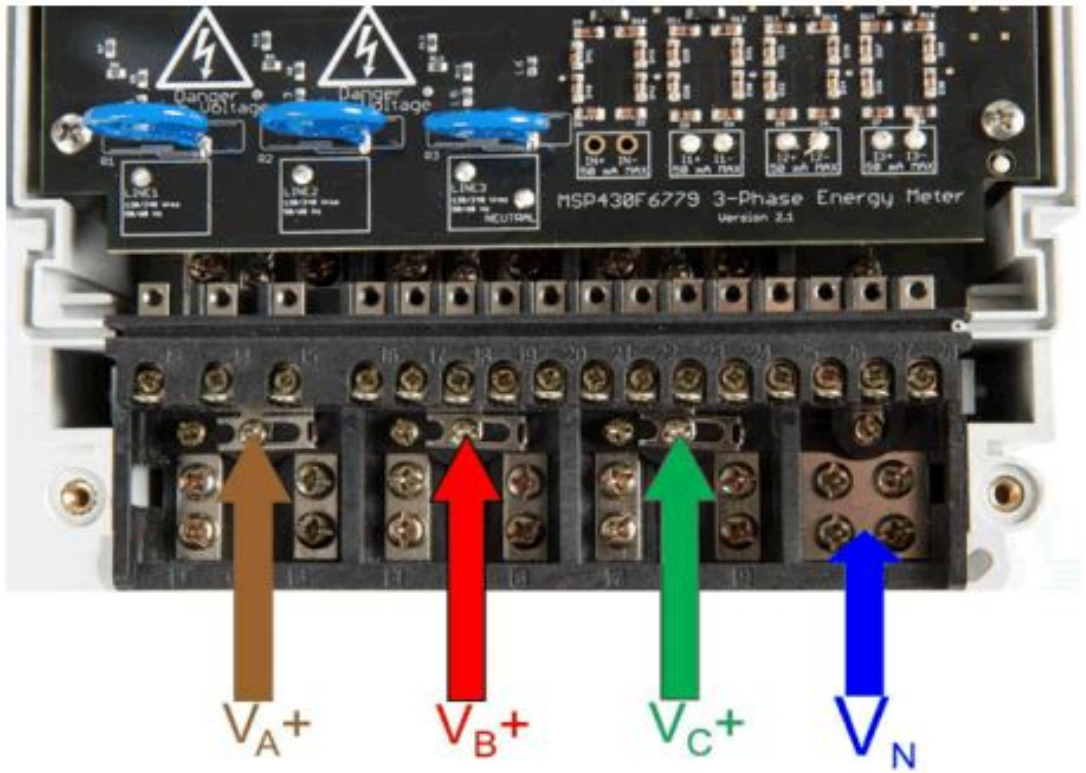
EVM430-F6779 - 3 Phase Electronic Power Meter

- Run real-time electricity metering applications
- Metrology software provided
- Connects to any test system or AC voltage
- Capacitive and isolated power supplies present
- Easy viewing of results and calibration via RS-232
- 160 segment LCD display
- RF connectors for AMR/AMI support
- 32kHz RTC support (header available for RTC calibration)
- Headers for powering MSP430 or RTC-only via auxiliary power sources

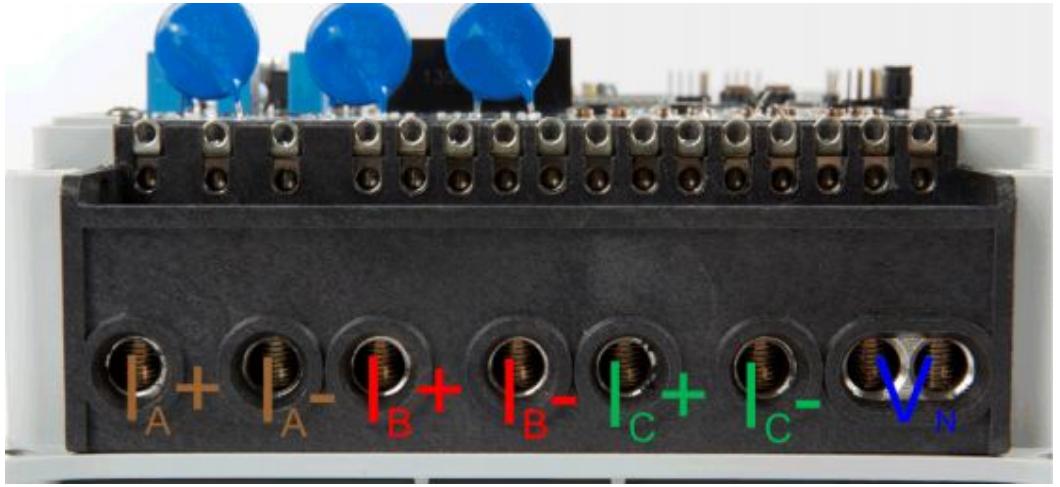
EVM430-F6779 - 3 Phase Electronic Power Meter



Input

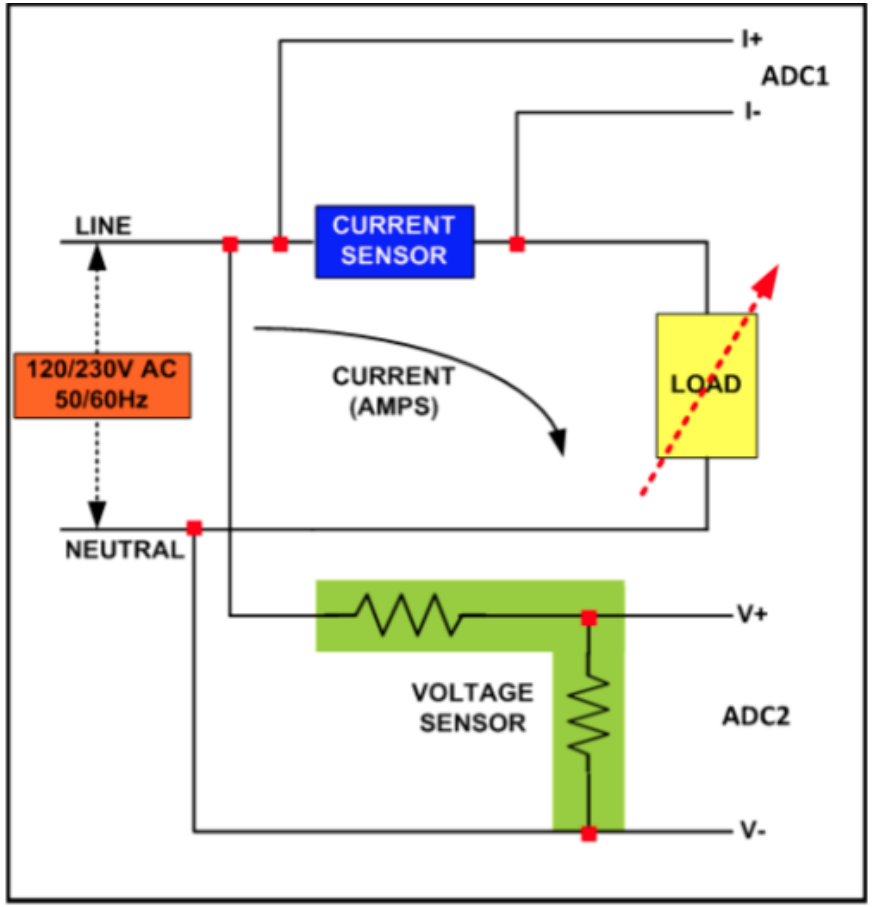


Input voltages and neutral



Input currents

Single Phase Connection



Solid Staee Relay

- Load current 75 A

Input:

- Input DC control 3-32 V
- Trigger current 7.5mA/12 V

Output:

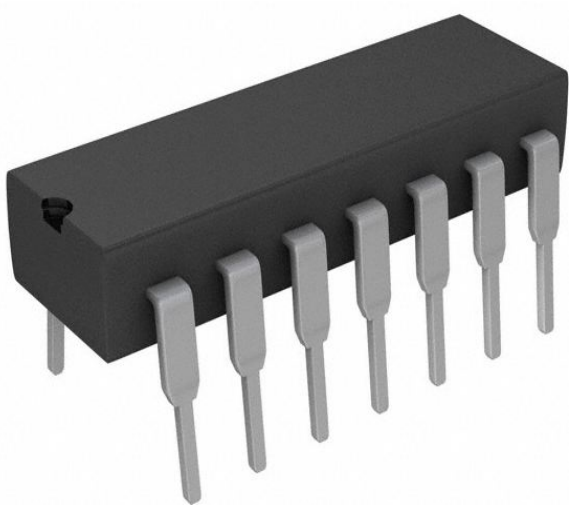
- Operating voltage 90-480V

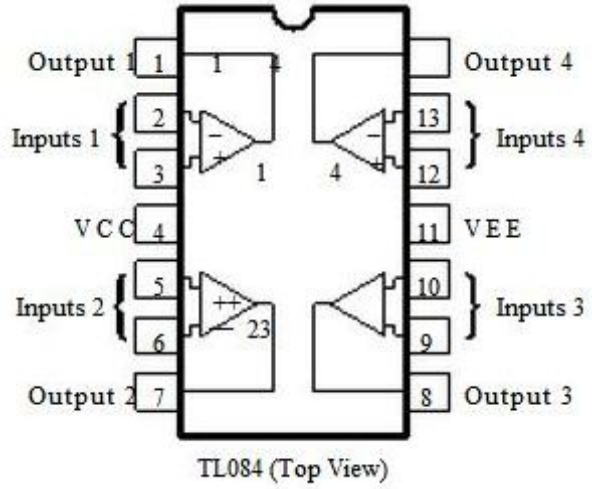
Weight:

125g

Comparator
TL084

- MCU Output voltage 3.3
- Rise the voltage to 12 V.
- Using as a logic circuit either 0 to 12 volt output.

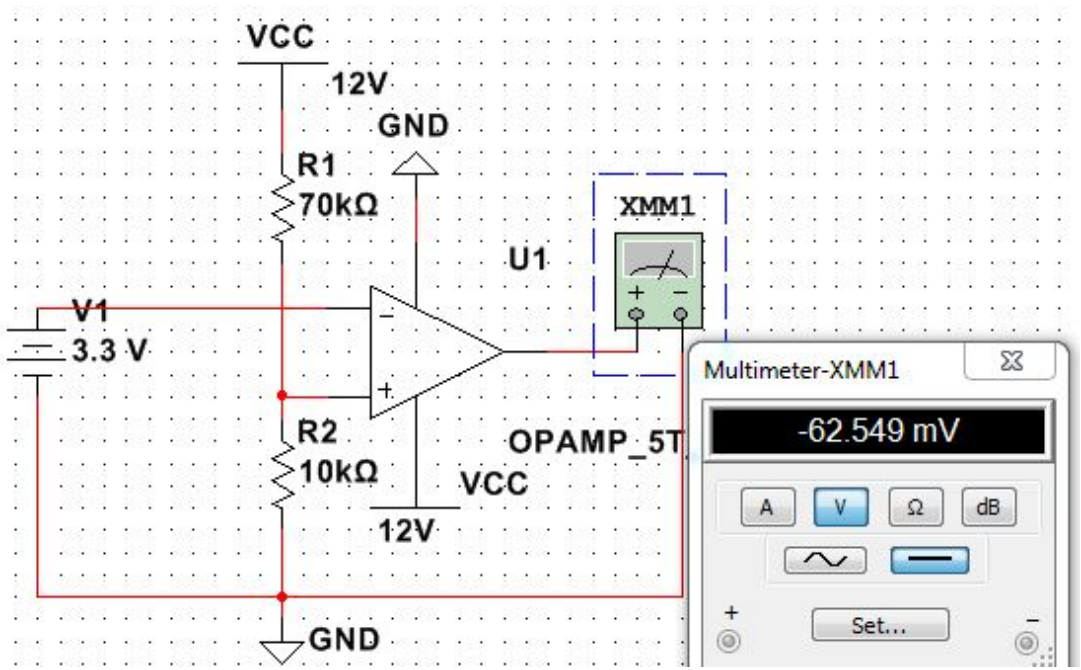




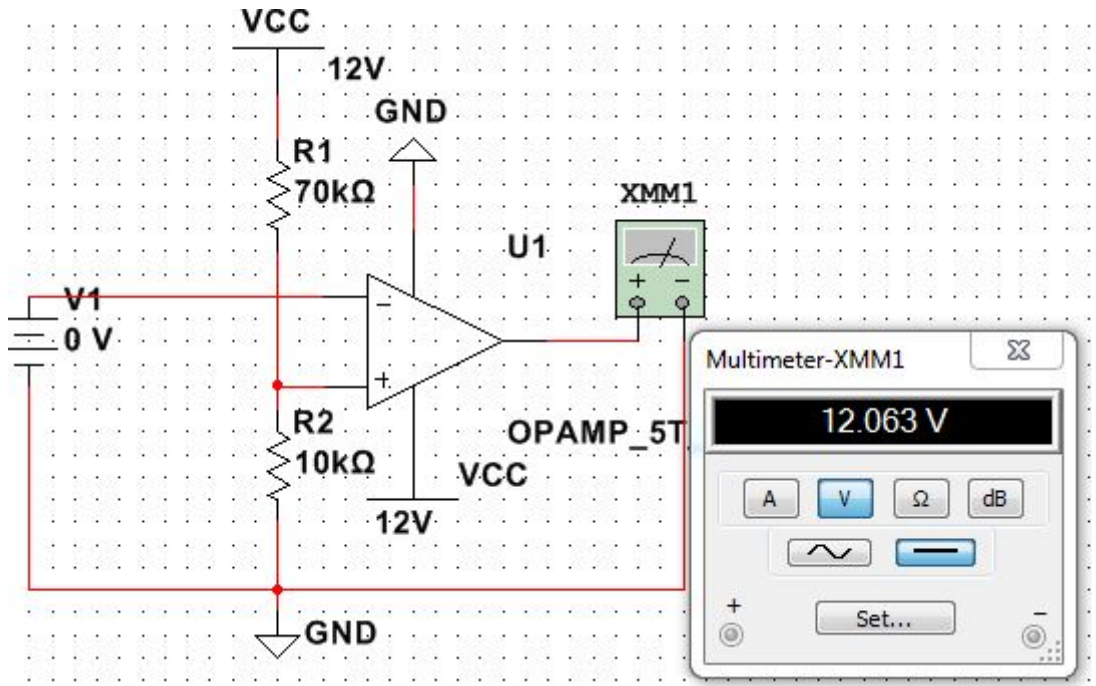
TL084 (Top View)

Comparator Logic circuit

@3.3V input output less than 0



@0V input output 12 V



Continue

Input	**Output**
3.3	0
0	12

Energy Calculation

- Every 6400 pluses equivalent to 1KWH

RFID

- Chose NFC since near field is more secure.
- Operates at 13.56 MHz
- Contains two separate parts the Host and the Tag

NFC reader Selection

	TRF7970A	TRF7964A
Standard	ISO 14443A ISO 14443B JIS X 6319-4 ISO 15693 ISO 18000-3	ISO 14443A ISO 14443B JIS X 6319-4 ISO 15693 ISO 18000-3
FIFO (bytes)	12	127
Supply Voltage (V)	2.7 -5.5	2.7 - 5.5
Power Down(uA)	0.5	0.5
Stand By (mA)	2	2
Cost $		

TRF7970A Chip Features

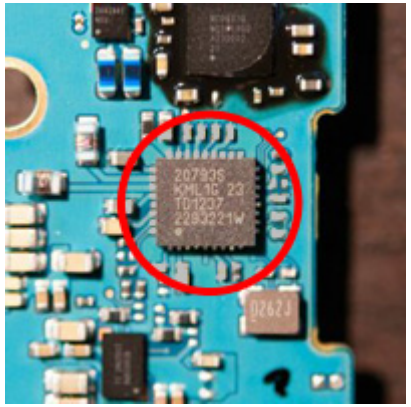
- Completely Integrated Protocol Handling for ISO15693, ISO18000-3, ISO14443A, ISO14443B, NFC Forum Device Types 1 to 4, and FeliCa
- Input Voltage Range: 2.7 VDC to 5.5 VDC
- Programmable Output Power: +20 dBm (100 mW) or +23 dBm (200 mW)
- Programmable I/O Voltage Levels: 1.8 VDC to 5.5 VDC

TRF7960A Multi-Protocol Fully Integrated 13.56-MHz RFID Reader/Writer IC

NFC & MCU Block Diagram

Phone Selection

- Nexus S & Nexus 4
- Nexus S was initially used because it was cheap
- Nexus 4 used because of Android 4.4
- Broadcom NFC chip
- Android 4.4 was minimum for Host card emulation method



NFC tag

- Different tags

NFC modes

- Card em
- P2P
- reader/writer

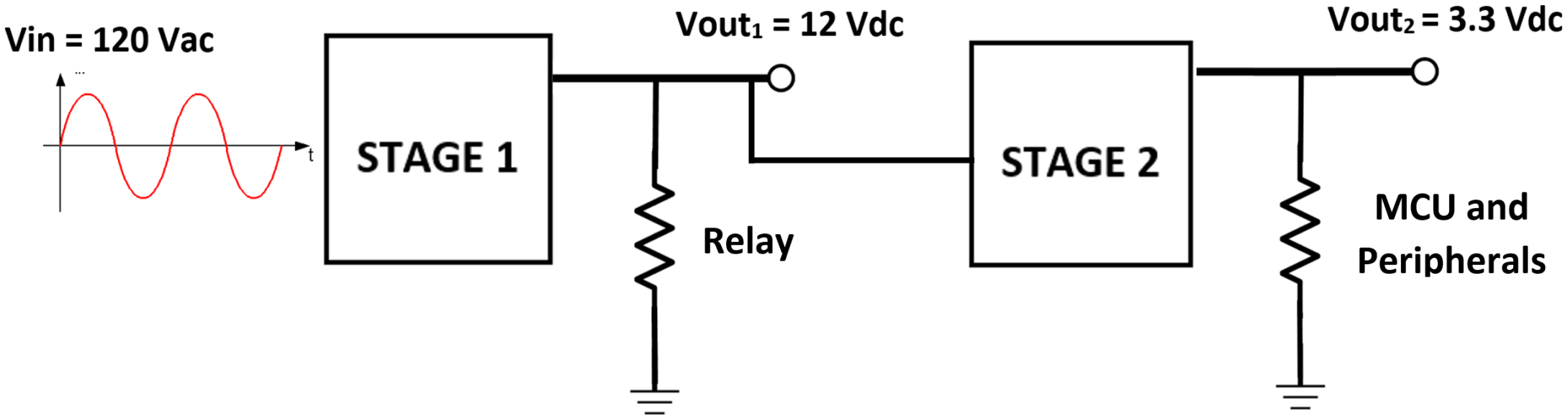
Android Application

- Login
- User Interface
- Mobile app will have alert system
- Emulating a transponder tag using HCE
- Retrieve Data through Wi-Fi

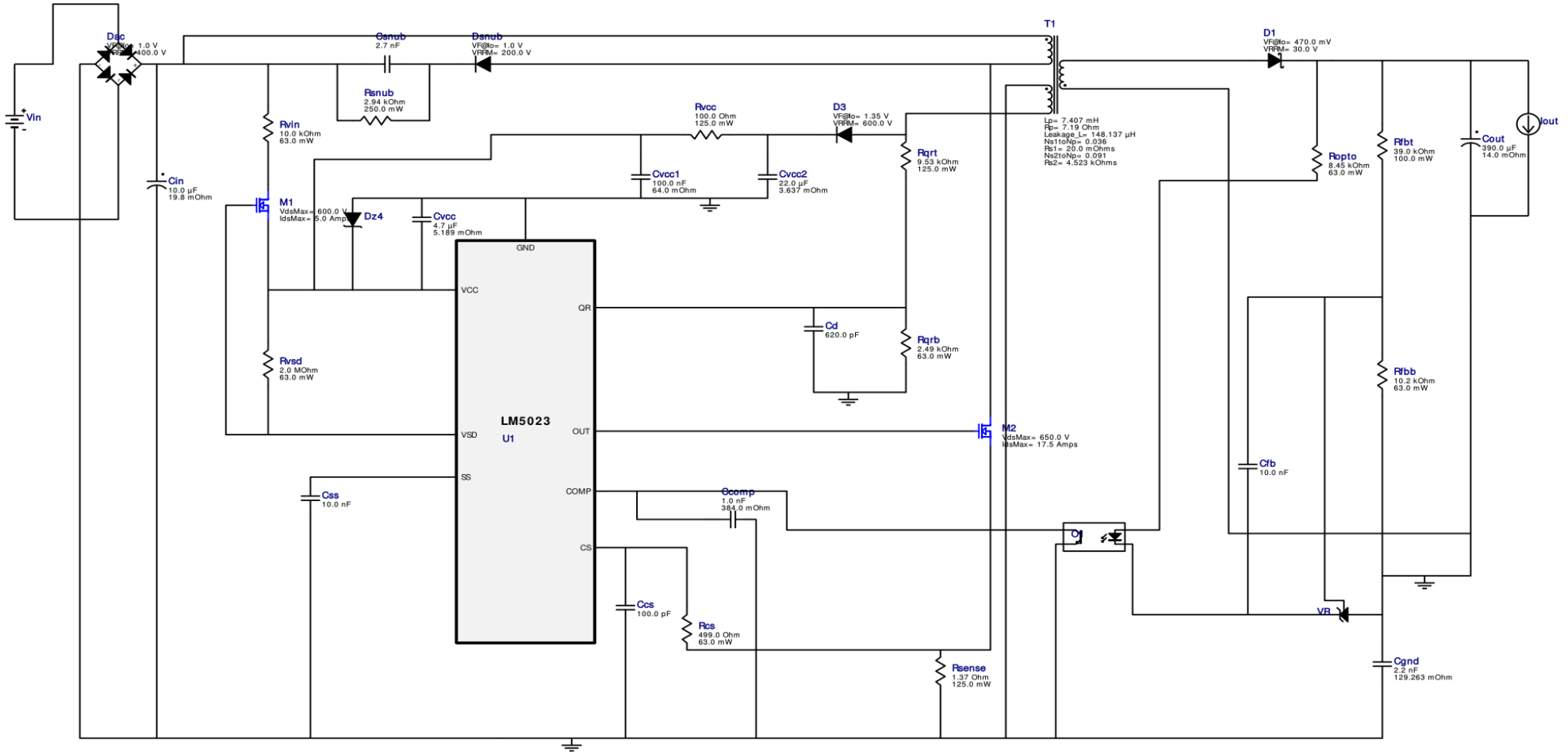
Power Supply Design

- 120 Volt AC input
- 3.3 Volt DC output
- 2 Rails
    a. Relay 12 Volts DC
    b. Microcontroller and Peripherals 3.3 Volts DC

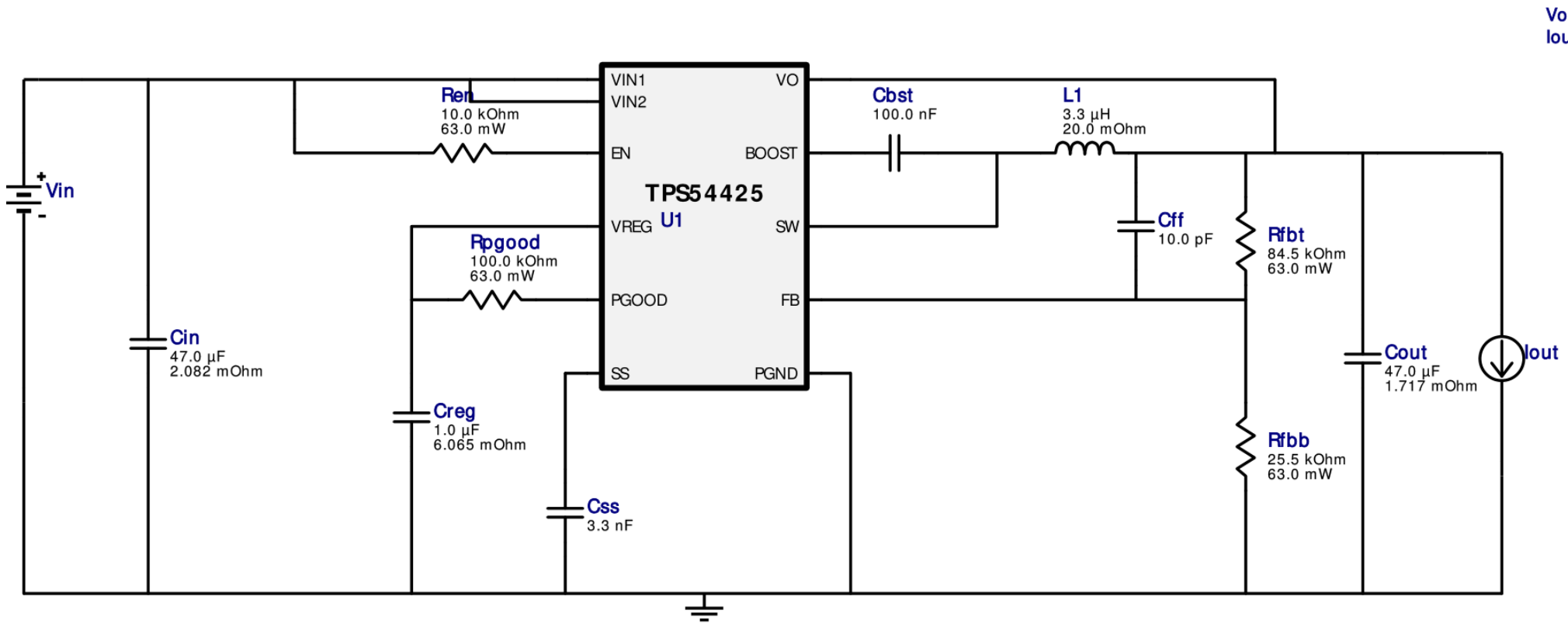
Power Supply Design



120Vac to 12Vdc (Stage 1)



12Vdc to 3.3Vdc (Stage 2)



Administrative

	Youssef Ojeil	Michael Cuervo	Sahin Okur	MD. Rahaman
Primary	Android Application	Power Supply	Microcontroller	Power Meter
	RFiD	PCB Design	Wi-Fi Communication	Relay
		Administrative Content		
Secondary				


QUESTIONS?