TI Designs
Mobile Point of Sale (mPOS) Power Reference Design

TEXAS INSTRUMENTS

Design Overview

The TIDA-00818 is a *Mobile Point of Sale (mPOS) Power Reference Design* that features a 1S1P Li-Ion battery architecture to reduce the system size and cost. Integrated load switches are used to reduce the standby power consumption and maximize battery life to enable the single-cell architecture. The design also features a USB type-C charging port to support higher power delivery and minimize charging time.

Design Resources

|	
TIDA-00818	Design Folder
TPS22918	Product Folder
TCA8418	Product Folder
BQ24295	Product Folder
TUSB320	Product Folder
TCA5013	Product Folder

Design Features

- 1S1P Low-Voltage Battery Architecture Enabled by Including Low Voltage (5 V) Printer Rail Driven by DRV8833
- USB Type C Charging Port Through TUSB320 and BQ25890 Updates Current USB Implementations to New Standard
- TPS22918 Disconnects Inactive Sub-Systems to Extend Battery Life in Small SOT-23 Package (≈500-nA Leakage)
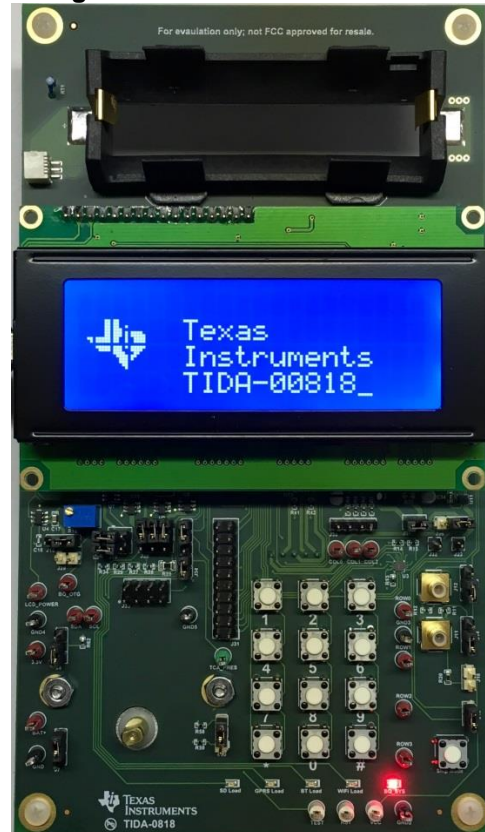- TCA8414 Integrates Keypad Scanner and GPIO Expander into Single Package, Simplifying Design and Reducing BOM Count

Featured Applications

- Mobile Point of Sale (mPOS)

Block Diagram
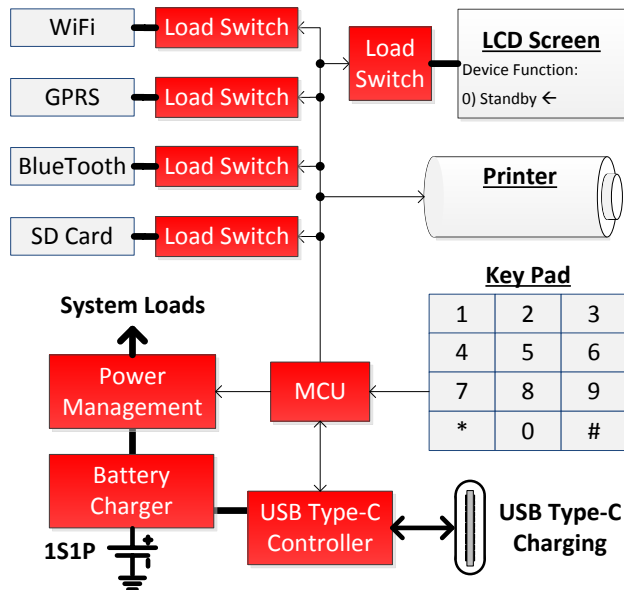
Board Image

1 Key System Specifications

The table below summarizes the key specifications for this design.

Parameter	Specification (Design Goals)
Battery Size	1S1P Li-Ion 2000mAh
Transactions per Charge	200
Maximum Size (mm)	300 x 100
Charging Interface	USB Type-C Charging Port (up to 15W)

Table 1: Mobile Point-of-Sale Key System Specifications

2   System Description

TIDA-00818 is a Mobile Point of Sale (mPOS) Power Reference Design featuring a 1S1P Li-Ion Battery Architecture to reduce system size and cost. Integrated Load Switches are used to reduce standby power consumption and maximize battery life to enable the single cell architecture. A USB Type-C Charging Port is also featured to support higher power delivery and minimize charging time.

2.1   TPS22918 5.5-V, 2-A, 52-mΩ On-Resistance Load Switch

The TPS22918 is a single-channel load switch with configurable rise time and configurable quick output discharge. The device contains an N-channel MOSFET that can operate over an input voltage range of 1 V to 5.5 V and can support a maximum continuous current of 2 A. The switch is controlled by an on and off input, which is capable of interfacing directly with low-voltage control signals.

The configurable rise time of the device greatly reduces inrush current caused by large bulk load capacitances, thereby reducing or eliminating power supply droop. The TPS22918 features a configurable quick output discharge (QOD) pin, which controls the fall time of the device to allow design flexibility for power down and sequencing.

In this Design, The TPS22918 Load Switch is used to turn off sub-systems not in use to reduce standby power consumption and maximize battery lifetime.
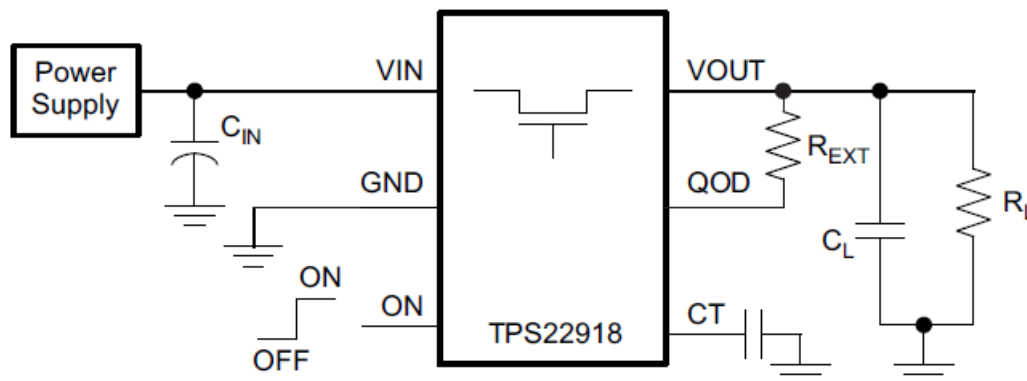

Figure 2 TPS22918 Simplified Schematic

2.2   TCA8418 I2C Controlled Keypad Scan IC With Integrated ESD Protection

The TCA8418 Keypad Scanner is used for User Input via the provided push buttons. This device is also used an I^{2}C to GPIO expander for enabling and disabling subsystems.
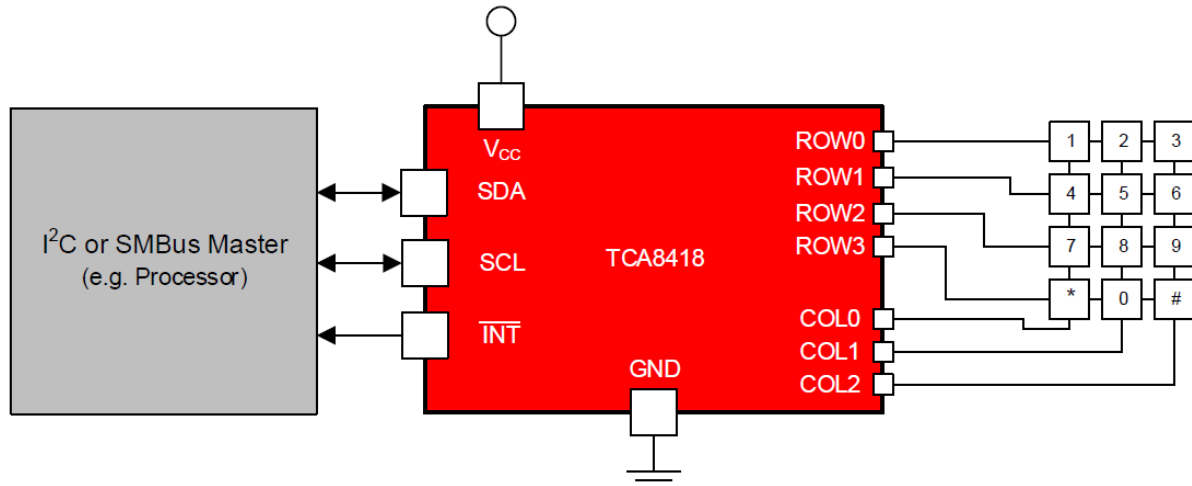

Figure 3 TCA8418 Simplified Schematic

2.3   BQ25890 I^{2}C Controlled Single Cell 5-A Fast Charger with MaxCharge^{TM} Technology for High Input Voltage and Adjustable Voltage USB On-the-Go Boost Mode

The bq25890, bq25892 are highly-integrated 5-A switch-mode battery charge management and system power path management device for single cell Li-Ion and Li-polymer battery. The devices support high input voltage fast charging. The low impedance power path optimizes switch-mode operation efficiency, reduces battery charging time and extends battery life during discharging phase. The I2C Serial interface with charging and system settings makes the device a truly flexible solution.
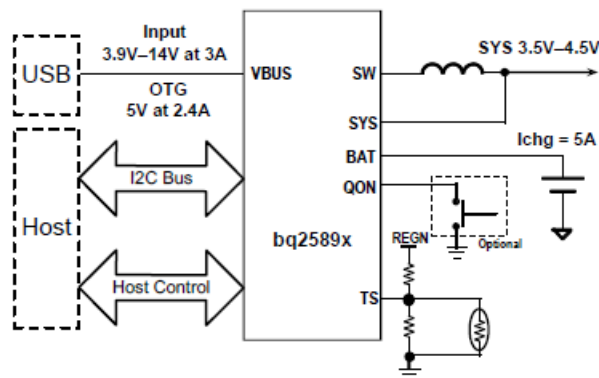

Figure 4 BQ25890 Simplified Schematic

2.4   TUSB320 USB Type-C™ Configuration Channel Logic and Port Control

The TUSB320 device enables USB Type-C ports with the configuration channel (CC) logic needed for Type-C ecosystems. The TUSB320 device uses the CC pins to determine port attach and detach, cable orientation, role detection, and port control for Type-C current mode.
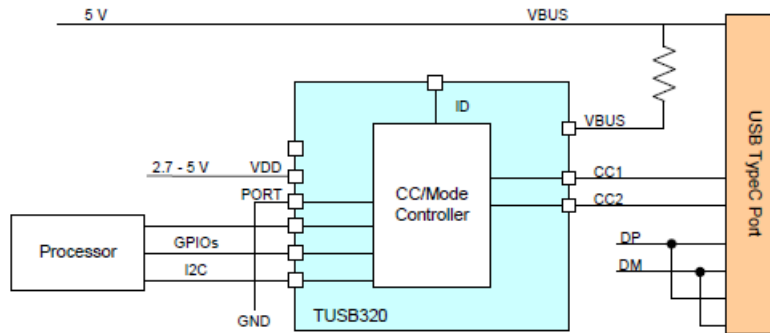

Figure 5 TUSB320 Simplified Schematic

2.5   TCA5013 Feature Rich Smartcard Interface IC with 1 User Card and 3 SAM Card Support

TCA5013 is a smartcard interface IC that is targeted for use in Point of Sale (POS) terminals. The device enables POS terminals to interface with EMV4.3, ISO7816-3 and ISO7816-10 compliant cards. It supports up to 3 Secure Access Module (SAM) cards in addition to 1 user card. It operates from a single supply and generates all the card voltages. The device is controlled by a standard I2C interface and is capable of card activation and deactivation per EMV4.3 and ISO7816-3 standards. In addition it also supports ISO7816-10 synchronous cards. It has a 4- byte FIFO that stores the ATR (Answer to Reset) sequence in ISO7816-10 type 1 cards. Synchronous cards (ISO7816-10 type 1 and type 2) can be set up for automatic activation or manual activation. The device has multiple power saving modes and also supports power saving in the smartcard itself by "clock stop" or lowering clock frequency to lowest allowable levels per the ISO7816 - 3 standard.
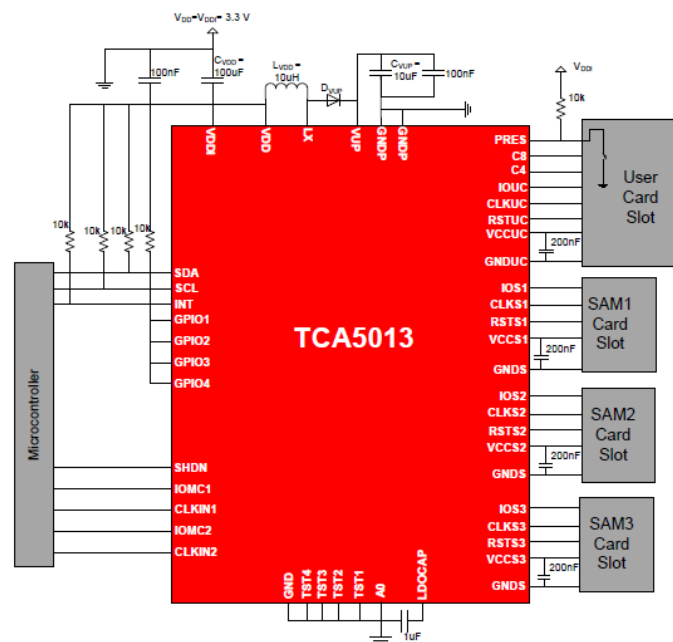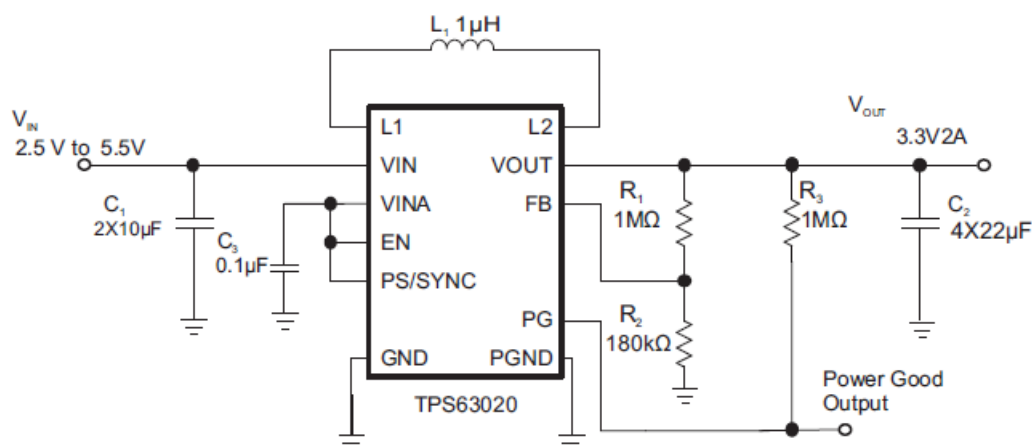

Figure 6 TCA5013 Simplified Schematic

2.6 TPS63020 High Efficiency Single Inductor Buck-Boost Converter With 4-A Switches

The TPS6302x devices provide a power supply solution for products powered by either a two-cell or three-cell alkaline, NiCd or NiMH battery, or a one- cell Li-ion or Li-polymer battery. Output currents can go as high as 3 A while using a single-cell Li-ion or Li-polymer battery, and discharge it down to 2.5 V or lower. The buck-boost converter is based on a fixed frequency, pulse width modulation (PWM) controller using synchronous rectification to obtain maximum efficiency. At low load currents, the converter enters power save mode to maintain high efficiency over a wide load current range. The power save mode can be disabled, forcing the converter to operate at a fixed switching frequency. The maximum average current in the switches is limited to a typical value of 4 A. The output voltage is programmable using an external resistor divider, or is fixed internally on the chip. The converter can be disabled to minimize battery drain. During shutdown, the load is disconnected from the battery.
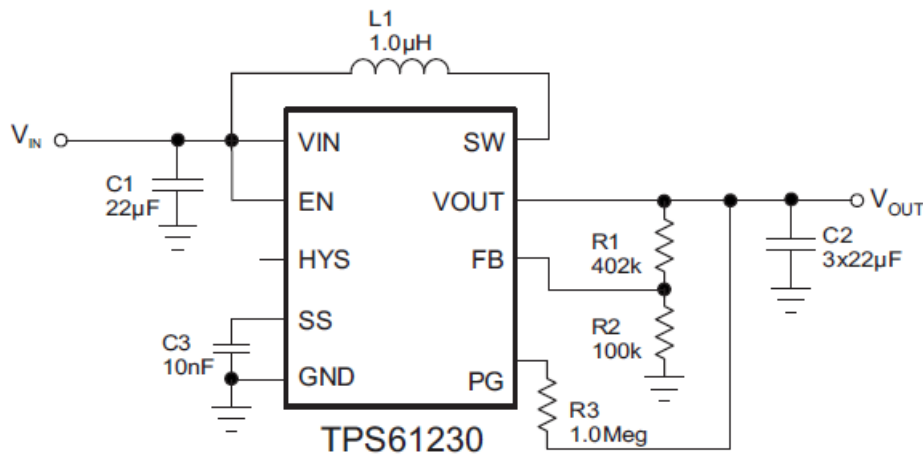

Figure 7 TPS63020 Simplified Schematic

2.7 TPS61230 High Efficiency Synchronous Step Up Converter with 5-A Switches

The TPS6123x device family is a high efficiency synchronous step up converter with compact solution size. It is optimized for products powered by a one-cell Li-Ion battery, or a regulated power rail of 3.3 V. The IC integrates a 5-A switch and is capable of delivering output currents up to 2.1 A at a 5-V output with a 3.3-V input supply. The device is based on a quasi-constant on-time valley current mode control scheme. The typical operating frequency is 2 MHz, which allows the use of small inductors and capacitors to achieve a small solution size. The TPS61230 and TPS61231 provide an adjustable output voltage via an external resistor divider, and the TPS61232 provides a fixed output voltage of 5 V.

During light loads, the TPS6123x automatically enters power save mode for maximum efficiency at lowest quiescent currents. In shutdown, the load is completely disconnected from the input, and the input current consumption is reduced to 1.5 µA typical. The device integrates a precise low power EN comparator. The EN threshold as well as the hysteresis of the enable comparator are adjustable with external resistors and support application specific system power up and down requirements. Other

features like output over voltage protection, thermal shutdown protection, and a power good output are built-in.

Figure 8 TPS61230 Simplified Schematic

2.8   TPS22965 5.7-V, 6-A, 16-mΩ On-Resistance Load Switch

The TPS22965x is a single channel load switch that provides configurable rise time to minimize inrush current. The device contains an N-channel MOSFET that can operate over an input voltage range of 0.8 V to 5.7 V and can support a maximum continuous current of 6 A. The switch is controlled by an on/off input (ON), which is capable of interfacing directly with low-voltage control signals. In the TPS22965, a 225-Ω on-chip load resistor is added for quick output discharge when switch is turned off.
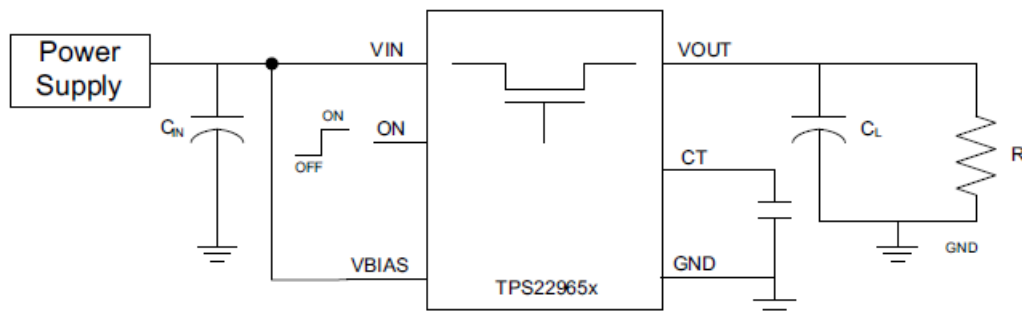
Figure 9 TPS22965 Simplified Schematic

2.9 DRV8833 Dual H-Bridge Motor Driver

The DRV8833 device provides a dual bridge motor driver solution for toys, printers, and other mechatronic applications. The device has two H-bridge drivers, and can drive two DC brush motors, a bipolar stepper motor, solenoids, or other inductive loads. The output driver block of each H-bridge consists of N-channel power MOSFETs configured as an H-bridge to drive the motor windings. Each H-bridge includes circuitry to regulate or limit the winding current. Internal shutdown functions with a fault output pin are provided for overcurrent protection, short-circuit protection, undervoltage lockout, and overtemperature. A low-power sleep mode is also provided.
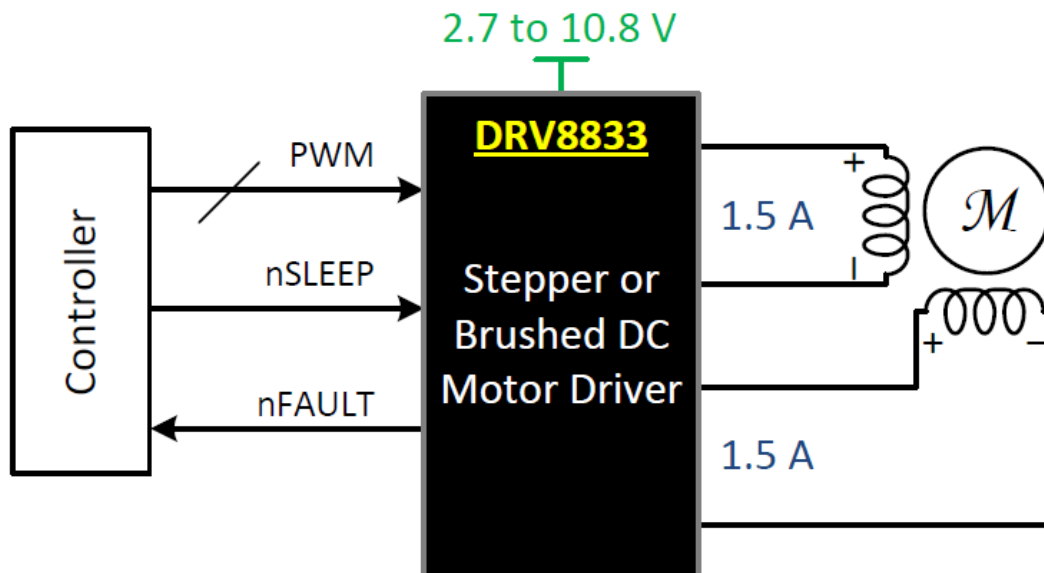

Figure 10 DRV8833 Simplified Schematic

2.10 INA219 Zerø-Drift, Bidirectional Current/Power Monitor With I2C Interface

The INA219 is a current shunt and power monitor with an I2C- or SMBUS-compatible interface. The device monitors both shunt voltage drop and bus supply voltage, with programmable conversion times and filtering. A programmable calibration value, combined with an internal multiplier, enables direct readouts of current in amperes. An additional multiplying register calculates power in watts. The I^{2}C- or SMBUS-compatible interface features 16 programmable addresses.
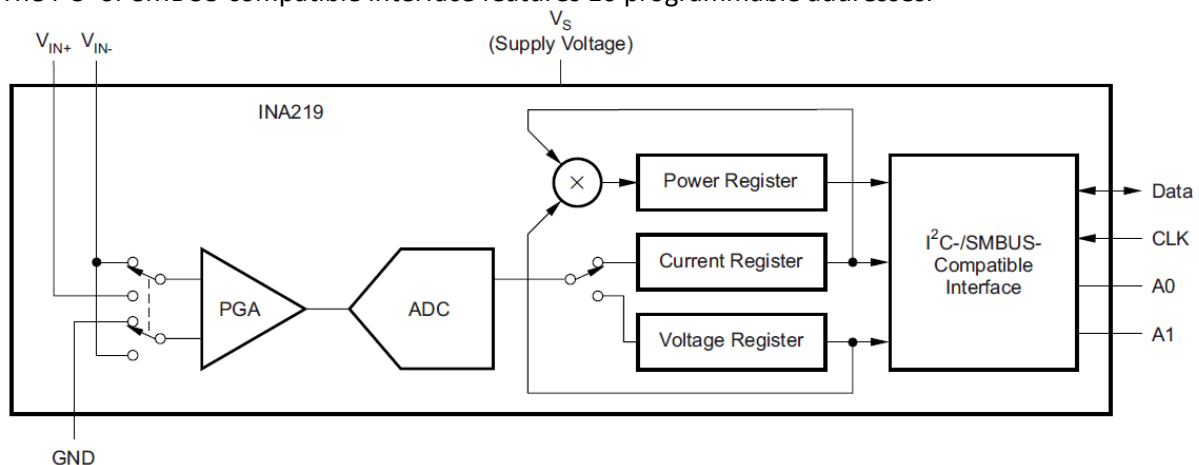

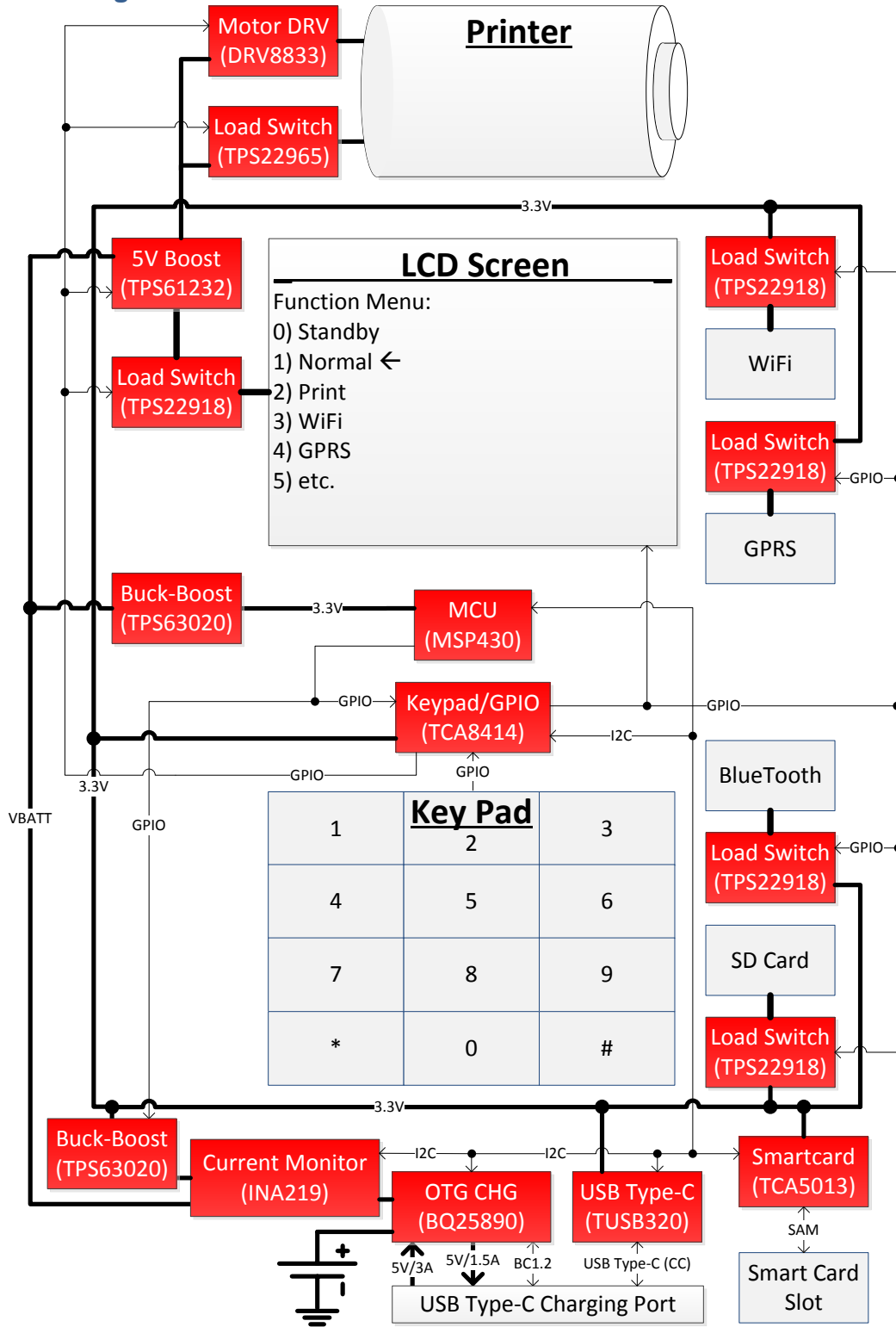**Figure 11 INA219 Simplified Schematic**

3 Block Diagram

Figure 12 Mobile Point-of-Sale Power Block Diagram

3.1 Highlighted Products

This section highlights the key features for each device used in this design.

3.1.1 TPS22918 5.5-V, 2-A, 52-mΩ On-Resistance Load Switch

• Integrated Single Channel Load Switch
• Ambient Operating Temperature: –40°C to +105°C
• Input Voltage Range: 1 V to 5.5 V
• On-Resistance (R_{ON})
    – R_{ON} = 52 mΩ (typical) at V_{IN} = 5 V
    – R_{ON} = 53 mΩ (typical) at V_{IN} = 3.3 V
• 2-A Maximum Continuous Switch Current
• Low Quiescent Current
    – 8.3 µA (typical) at V_{IN} = 3.3 V
• Low-Control Input-Threshold Enables Use of 1 V or Higher GPIO
• Adjustable Quick-Output Discharge (QOD)
• Configurable Rise Time With CT Pin
• Small SOT23-6 Package (DBV)
    – 2.90 mm × 2.80 mm, 0.95 mm Pitch, 1.45 mm Height (with leads)
• ESD Performance Tested per JESD 22
    – ±2-kV HBM and ±1-kV CDM

3.1.2 TCA8418 I2C Controlled Keypad Scan IC With Integrated ESD Protection

• Operating Power-Supply Voltage Range of 1.65-V to 3.6-V
• Supports 80 Buttons With Use of 18 GPIOs
• Supports QWERTY Keypad Operation Plus GPIO Expansion
• Low Standby (Idle) Current Consumption: 3 μA
• Supports 1-MHz Fast Mode Plus I2C Bus
• 10 Byte FIFO to Store 10 Key Presses and Releases
• Open-Drain Active-Low Interrupt Output
• Integrated Debounce Time of 50 μs
• Schmitt-Trigger Action Allows Slow Input Transition and Better Switching Noise Immunity at the SCL and SDA Inputs: Typical V_{hys} at 1.8 V is 0.18 V
• Latch-Up Performance Exceeds 200 mA Per JESD 78, Class II
• ESD Protection Exceeds JESD 22 on all 18 GPIO Pins and non GPIO pins
    – 2000-V Human Body Model (A114-A)
    – 1000-V Charged Device Model (C101)

3.1.3 BQ25890 I²C Controlled Single Cell 5-A Fast Charger with MaxCharge™ Technology for High Input Voltage and Adjustable Voltage USB On-the-Go Boost Mode

• High Efficiency 5-A, 1.5-MHz Switch Mode Buck Charge
    – 93% Charge Efficiency at 2 A and 91% Charge Efficiency at 3-A Charge Current
    – Optimize for High Voltage Input (9 V to 12 V)
    – Low Power PFM mode for Light-Load Operations
• USB On-the-Go (OTG) with Adjustable Output from 4.5 V to 5.5 V
    – Selectable 500-kHz and 1.5-MHz Boost Converter with up-to 2.4-A Output
    – 93% Boost Efficiency at 5 V at 1-A Output
    – Accurate Hiccup Mode Overcurent Protection
• Single Input to Support USB Input and Adjustable High Voltage Adapters
    – Support 3.9-V to 14-V Input Voltage Range
    – Input Current Limit (100 mA to 3.25 A with 50-mA resolution) to Support USB2.0, USB3.0
Standard and High Voltage Adapters

– Maximum Power Tracking by Input Voltage Limit up-to 14 V for Wide Range of Adapters
– Auto Detect USB SDP, CDP, DCP, and Non-Standard Adapters (bq25890)
• Input Current Optimizer (ICO) to Maximize Input Power without Overloading Adapters
• Resistance Compensation (IRCOMP) from Charger Output to Cell Terminal
• Highest Battery Discharge Efficiency with 11-mΩ Battery Discharge MOSFET up to 9 A
• Integrated ADC for System Monitor (Voltage, Temperature, Charge Current)
• Narrow VDC (NVDC) Power Path Management
– Instant-On Works with No Battery or Deeply Discharged Battery
– Ideal Diode Operation in Battery Supplement Mode
• BATFET Control to Support Ship Mode, Wake Up, and Full System Reset
• Flexible Autonomous and I2C Mode for Optimal System Performance
• High Integration includes all MOSFETs, Current Sensing and Loop Compensation
• 12-µA Low Battery Leakage Current to Support Ship Mode
• High Accuracy
– ±0.5% Charge Voltage Regulation
– ±5% Charge Current Regulation
– ±7.5% Input Current Regulation
• Safety
– Battery Temperature Sensing for Charge and Boost Mode
– Thermal Regulation and Thermal Shutdown

3.1.4   TUSB320 USB Type-C™ Configuration Channel Logic and Port Control

• USB Type-C™ Specification 1.1
• Backward Compatible with USB Type-C Specification 1.0
• Supports Up to 3 A of Current Advertisement and Detection
• Mode Configuration
– Host Only – DFP (Source)
– Device Only – UFP (Sink)
– Dual Role Port – DRP
• Channel Configuration (CC)
– Attach of USB Port Detection
– Cable Orientation Detection
– Role Detection
– Type-C Current Mode (Default, Medium, High)
• V$_{BUS}$ Detection
• I2C or GPIO Control
• Role Configuration Control through I2C
• Supply Voltage: 2.7 V to 5 V
• Low Current Consumption
• Industrial Temperature Range of –40 to 85°C

3.1.5   TCA5013 Feature Rich Smartcard Interface IC with 1 User Card and 3 SAM Card Support

• Operating Supply Voltage Range of 2.7 V to 5.5 V
• Supports EMV 4.3, ISO7816-3 and ISO7816-10 Standards
• Supports 1 User Card and 3 Secure Access Module Cards
• IEC61000-4-2 8-kV Contact Discharge ESD Protection on All Smartcard Interface Pins
• Low Power Mode for Power Saving when Inactive (Shutdown Mode)
• Automatic Card Deactivation in the Event of Short Circuit, Card Pull Out, Over Temperature or Power Supply Fault
• Integrated DC-DC Boost to Generate V$_{CC}$ for 5 V and 3 V on All Card Interfaces
• Automatic Card Clock Generation for Synchronous Card Activation
• 4-byte FIFO for Storing ATR from ISO7816-10 Type 1 Cards
• Programmable Rise/Fall Time Control for IO and Clock Lines of All Smartcards

• Input Clock Frequency up to 26 MHz
• Tamper proof package design

3.1.6 TPS63020 High Efficiency Single Inductor Buck-Boost Converter With 4-A Switches

• Input Voltage Range: 1.8 V to 5.5 V
• Fixed and Adjustable Output Voltage Options from 1.2 V to 5.5 V
• Up to 96% Efficiency
• 3-A Output Current at 3.3 V in Step Down Mode (V_{IN} = 3.6 V to 5.5 V)
• More than 2-A Output Current at 3.3 V in Boost Mode (V_{IN} > 2.5 V)
• Automatic Transition Between Step Down and Boost Mode
• Dynamic Input Current Limit
• Device Quiescent Current less than 50 μ A
• Power Save Mode for Improved Efficiency at Low Output Power
• Forced Fixed Frequency Operation at 2.4 MHz and Synchronization Possible
• Smart Power Good Output
• Load Disconnect During Shutdown
• Overtemperature Protection
• Overvoltage Protection
• Available in a 3mm × 4mm 14-Pin VSON Package (DSJ)

3.1.7 TPS61230 High Efficiency Synchronous Step Up Converter with 5-A Switches

• Input Voltage Range: 2.3 V to 5.5 V
• Output Voltage Range: 2.5 V to 5.5 V
• Up to 96% Efficiency Synchronous Boost Converter
• 3.3-V to 5-V Power Conversion with 2.1-A Output Current
• Input Supply Voltage Supervisor with Adjustable Threshold/Hysteresis
• Power Save Mode for Light Load Efficiency
• Load Disconnect During Shutdown
• Output Over Voltage Protection
• Programmable Soft Start
• Power Good Output
• 2-MHz Switching Frequency
• Output Capacitor Discharge (TPS61231)
• 3 mm x 3 mm x 0.9 mm VSON Package

3.1.8 TPS22965 5.7-V, 6-A, 16-mΩ On-Resistance Load Switch

• Integrated Single Channel Load Switch
• Input Voltage Range: 0.8 V to 5.7 V
• Ultra-Low On Resistance (R_{ON})
    – R_{ON} = 16 m Ω at VIN = 5 V (VBIAS = 5 V)
    – R_{ON} = 16 m Ω at VIN = 3.6 V (VBIAS = 5 V)
    – R_{ON} = 16 m Ω at VIN = 1.8 V (VBIAS = 5 V)
• 6-A Maximum Continuous Switch Current
• Low Quiescent Current (50 µA)
• Low Control Input Threshold Enables Use of 1.2-, 1.8-, 2.5-, and 3.3-V Logic
• Configurable Rise Time
• Quick Output Discharge (QOD) (Optional)
• SON 8-pin Package With Thermal Pad
• ESD Performance Tested per JESD 22

– 2000-V HBM and 1000-V CDM

3.1.9   DRV8833 Dual H-Bridge Motor Driver

• Dual-H-Bridge Current-Control Motor Driver
  – Can Drive Two DC Motors or One Stepper Motor
  – Low MOSFET ON-Resistance: HS + LS 360 mΩ
• Output Current (at V_M = 5 V, 25°C)
  – 1.5-A RMS, 2-A Peak per H-Bridge in PWP Hand RTY Package Options
  – 500-mA RMS, 2-A Peak per H-Bridge in PW Package Option
• Outputs can be in Parallel for
  – 3-A RMS, 4-A Peak (PWP and RTY)
  – 1-A RMS, 4-A Peak (PW)
• Wide Power Supply Voltage Range: 2.7 to 10.8 V
• PWM Winding Current Regulation and Current Limiting
• Thermally Enhanced Surface-Mount Packages

3.1.10   INA219 Zerø-Drift, Bidirectional Current/Power Monitor With I2C Interface

• Senses Bus Voltages from 0 to 26 V
• Reports Current, Voltage, and Power
• 16 Programmable Addresses
• High Accuracy: 0.5% (Maximum) Over Temperature (INA219B)
• Filtering Options
• Calibration Registers
• SOT23-8 and SOIC-8 Packages

4   System Design Theory

In order to enable operating from a single cell battery, both standby and active power must be carefully managed to maximum battery life. This reference design uses several methods including load switches to shutdown modules when not in use.

4.1   Reducing Power Consumption

The following Table Summarizes the Typical Average Power Consumption for the modules that consume a majority of the power:

Module	Average Power Consumption (mW)
MCU	150 mW
LCD Screen	300 mW
WiFi	200 mW
GPRS	1300 mW
BlueTooth	100 mW
Printer	2500 mW
Total:	4550 mW
Battery Life:	1.6 Hours

If all modules were left on continuously, this would result in a battery life of about 1.6 hours for 2000mAh battery. By adding a load switch to disconnect each module, the average power consumption can be reduced to lengthen the battery life.

Some module may feature shutdown operation, but often this can be further reduced with the addition of a load switch. The following table compares the shutdown power consumption for each module with and without the addition of a load switch.

Module	Typical Shutdown Power Consumption without Load Switch (mW)	Shutdown Power Consumption with Load Switch
MCU	40 mW	N/A (40mW)
LCD Screen	10 mW	0.00165 mW
WiFi	0.015 mW	0.00165 mW
GPRS	0.330 mW	0.00165 mW
BlueTooth	65 mW	0.00165 mW
Printer	55 mW	0.005 mW
Total:	170.345 mW	40.012 mW
Battery Life:	50 Hours	210 Hours

By Introducing Load Switches into the design, the standby power consumption is reduced by ~76% percent increasing the battery lifetime during shutdown operation.

4.2 Managing Power Consumption

In order to maximize battery life, the power consumption must also be carefully managed. Before it was found that if all modules were left enabled, this would result in a very short battery life.   By enabling only the needed modules the active power consumption can be drastically reduced. The following table shows a typical Mobile Point-of-Sale Transaction and the percent of time each module is active during the transaction.

| Module	Active Time (%)	Active Time (Sec)	Activity
MCU	100%	60 Sec	All
LCD Screen	100%	60 Sec	All
WiFi	50%	30 Sec.	Data Transmission
GPRS	50%	30 Sec	Data Transmission
BlueTooth	50%	30 Sec	Data Transmission
Printer	25%	15 Sec	Printing

5   Getting Started Hardware

The reference design includes the following Hardware Components:

1)   TIDA-00818 reference board
2)   HD44780-Compatible 20x4 LCD
3)   28BYJ-48 Stepper Motor
4)   (4) Nylon standoffs and (4)

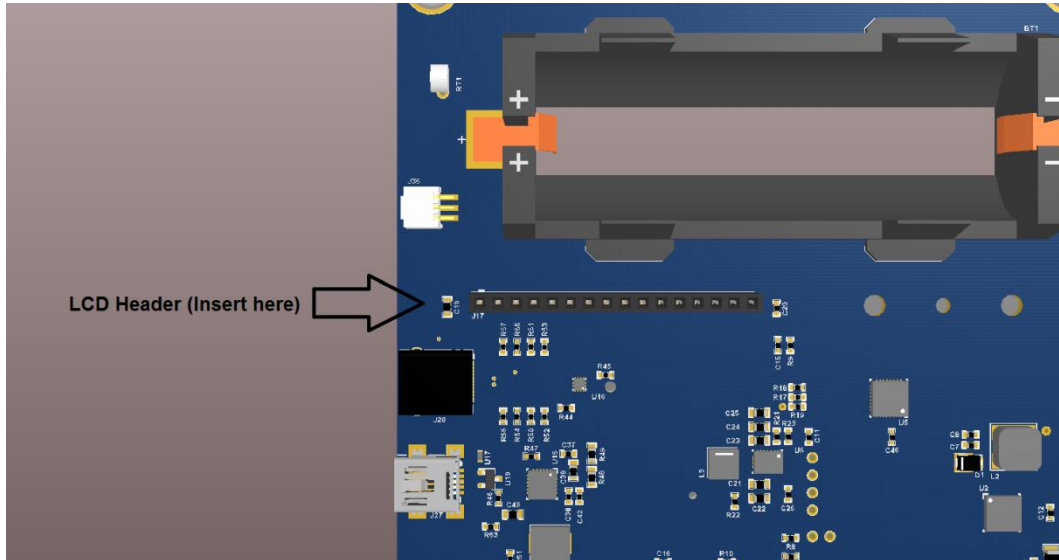## 5.1   Location of Subsystems

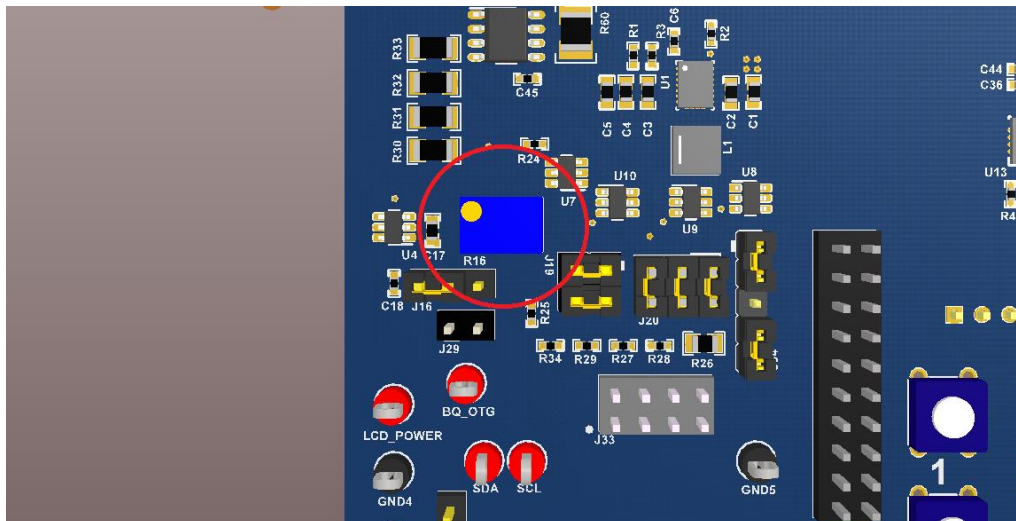The Figure below shows the location of key hardware components:
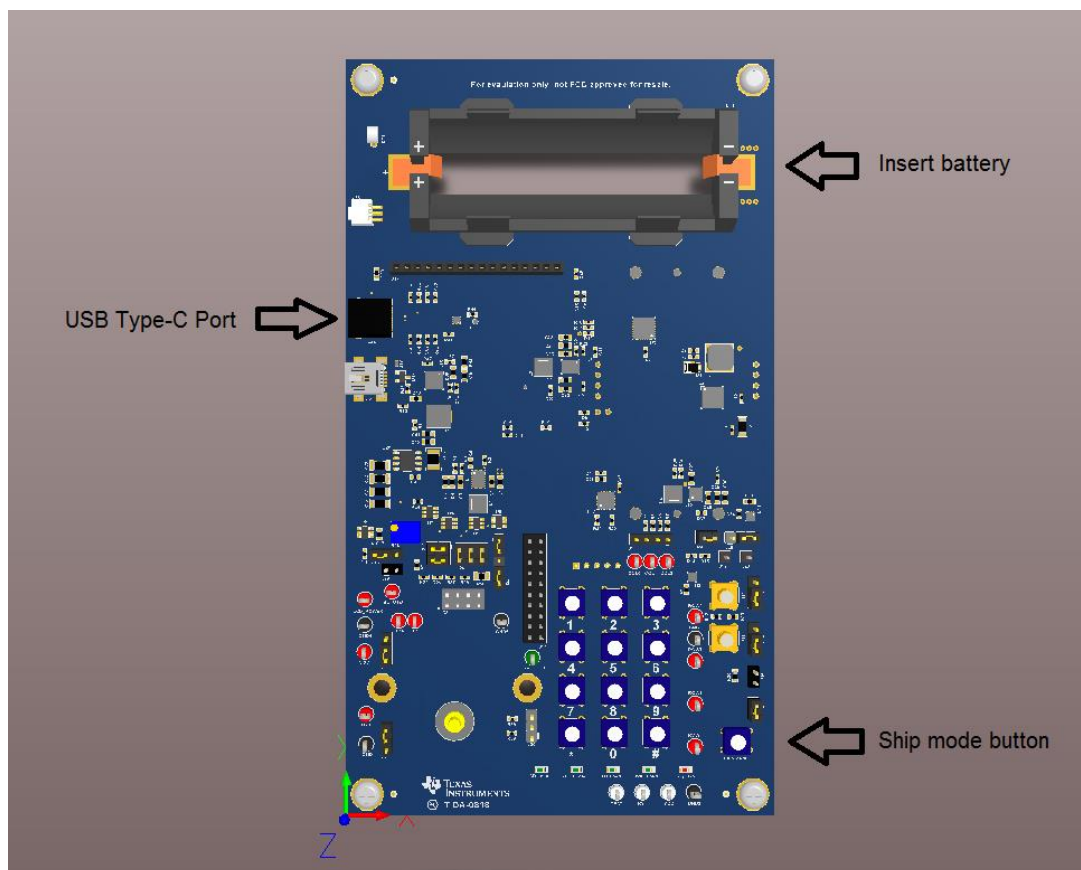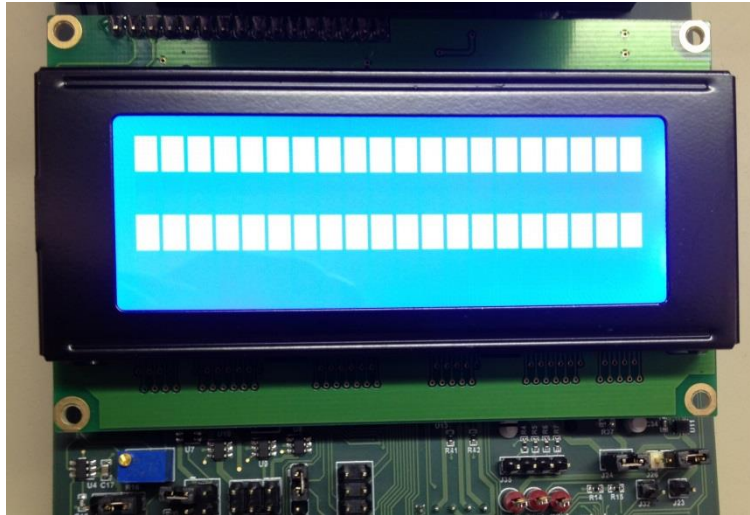
5.2   Setting the LCD Brightness

An LCD is included in the reference design. Mount the LCD male headers to corresponding female headers on the top of the board.

A trim pot (R16) is located on the left middle of the board for adjusting the LCD's contrast.

Upon power up of the board, turn the trim pot (R16) clockwise until two solid white bars can be seen.

At this point, the reference design assembly is complete. The reference design will need to be flashed with code as described in a later section.

## 5.3   Test Points

Listed are test points included in the design.

Test Point	Type	Purpose
BQ_OTG	DO	BQ charge OTG enable pin
LCD_POWER	AO	LCD power output
SDA	DIO	I2C data line
SCL	DIO	I2C clock line
3.3V	P	3.3V buck-boost output
BAT+	P	Battery output after shunt monitor
COL0	AO	Output for keypad column 0
COL1	AO	Output for keypad column 1
COL2	AO	Output for keypad column 2
ROW0	AO	Output for keypad row 0
ROW1	AO	Output for keypad row 1
ROW2	AO	Output for keypad row 2
ROW3	AO	Output for keypad row 3
TEST	DIO	MSP430 test pin breakout
RST	DIO	MSP430 reset pin breakout
VCC	P	MSP430 VCC pin breakout
GND	P	Ground
GND2	P	Ground
GND3	P	Ground
GND4	P	Ground
GND5	P	Ground

6 Getting Started Firmware

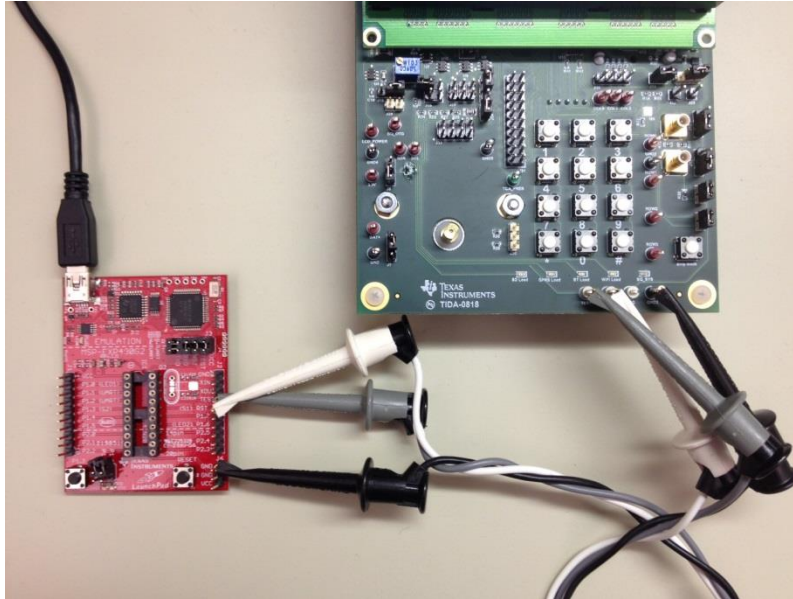This section described the firmware operation of this design.

6.1 Hierarchy Chart

The board is designed to be operated with the following power state hierarchy to measure the active power consumption for each module.

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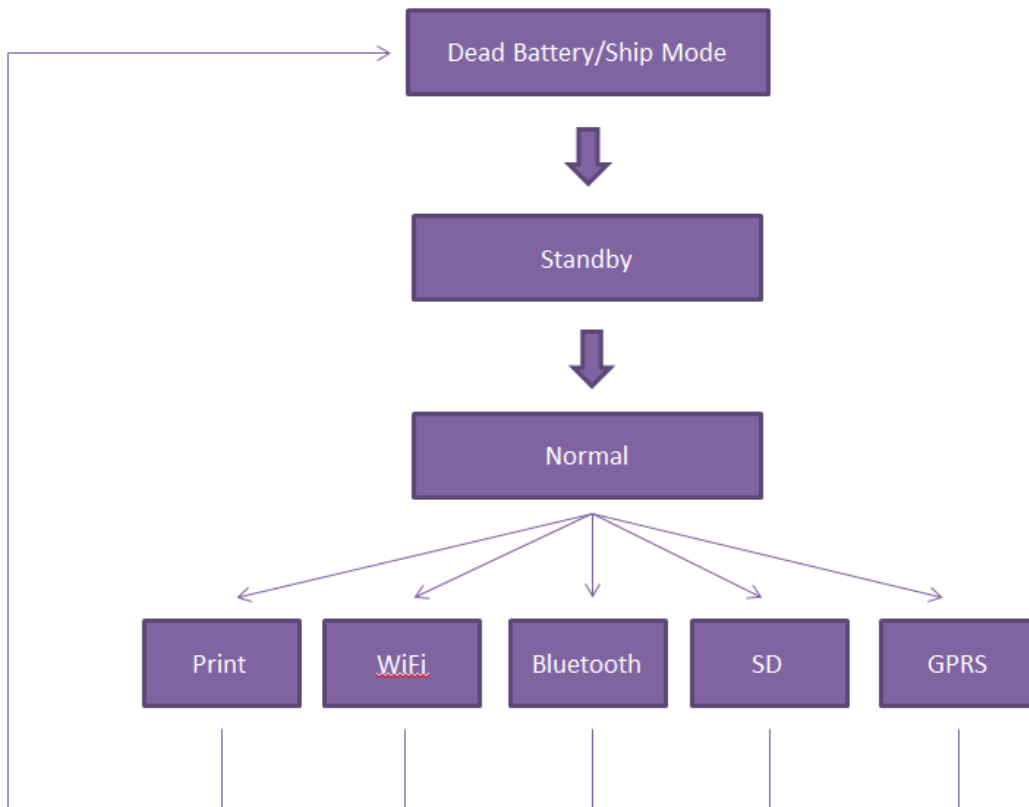
6.2 Communicating with Device

The board's microcontroller is designed to be flashed via SPI-By-Wire through the RST and TST pins of the MSP430. These pins are broken out at the bottom of the board; reference the table in the section below for more information. The tests points are wired to an empty MSP430-Launchpad for flashing:

The reference design device blocks are initialized in this general order:

Enable BQ BATFET

↓

Enable 3.3V Rail

↓

Ping I2C Devices

↓

Initialize I2C Devices

↓

Initialize LCD
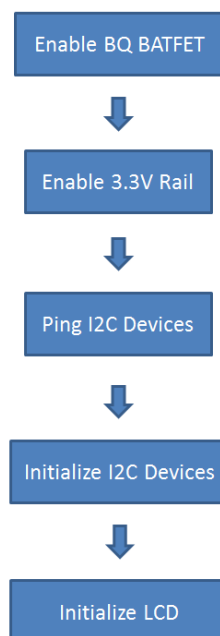
This reference design is designed to be primarily interrupt or timer driven. All interrupts are tied to interrupt-capable pins on the microcontroller. Current shunt monitoring can also be done on a timer instead of continuous polling, the latter of which is shown in the pseudocode:
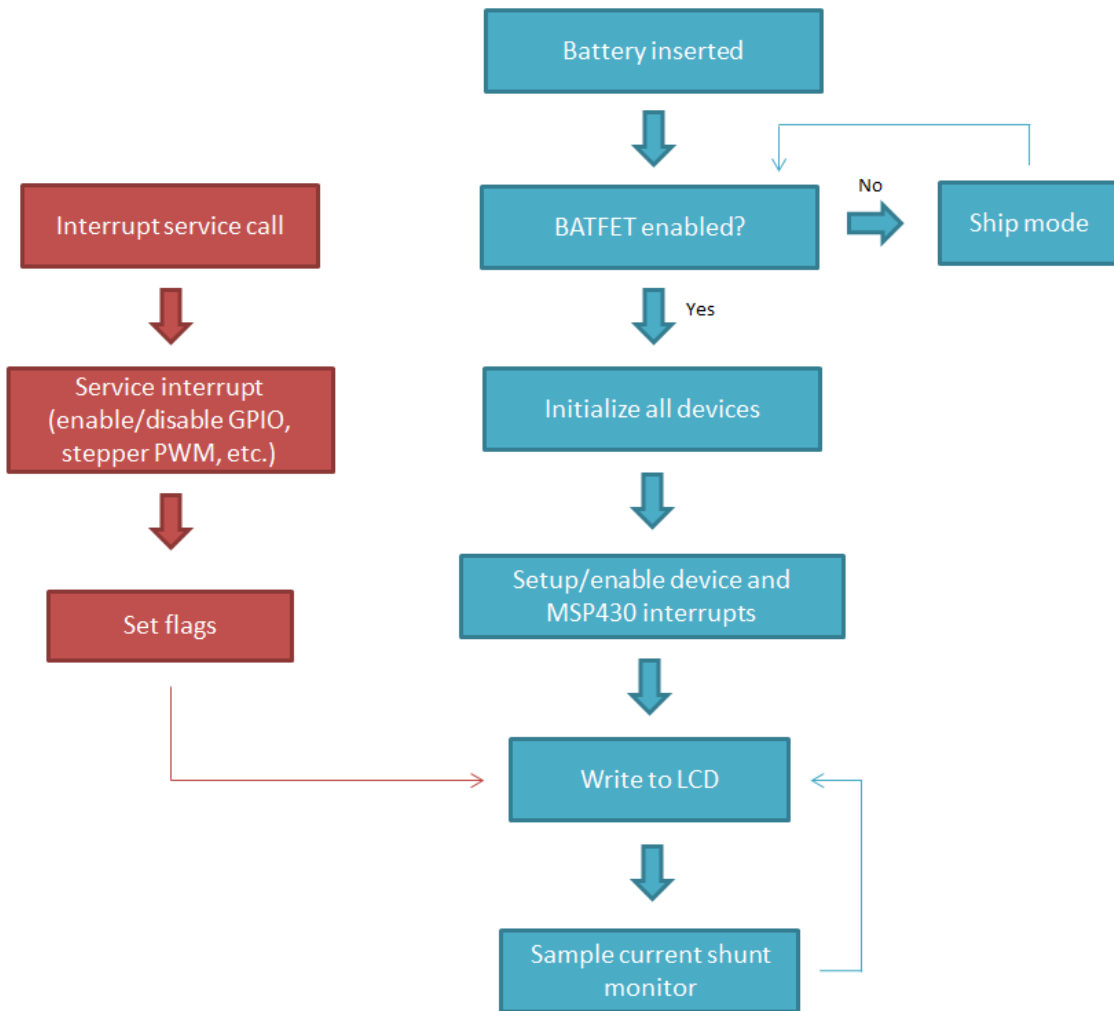
6.3 Devices Addresses

| Device	Function	I2C Address
TCA5013ZAHR	Card Reader	0x39
TCA8418EYFPR	Keypad Scanner/IO Expander	0x34
BQ25890RTWR	Battery Charger	0x6A
TUSB320LIRWBR	Type-C Controller	0x60
INA219BIDR	Current Shunt Monitor	0x40

7   Test Setup

This section described the test setup for the measurements presenting in the following section.
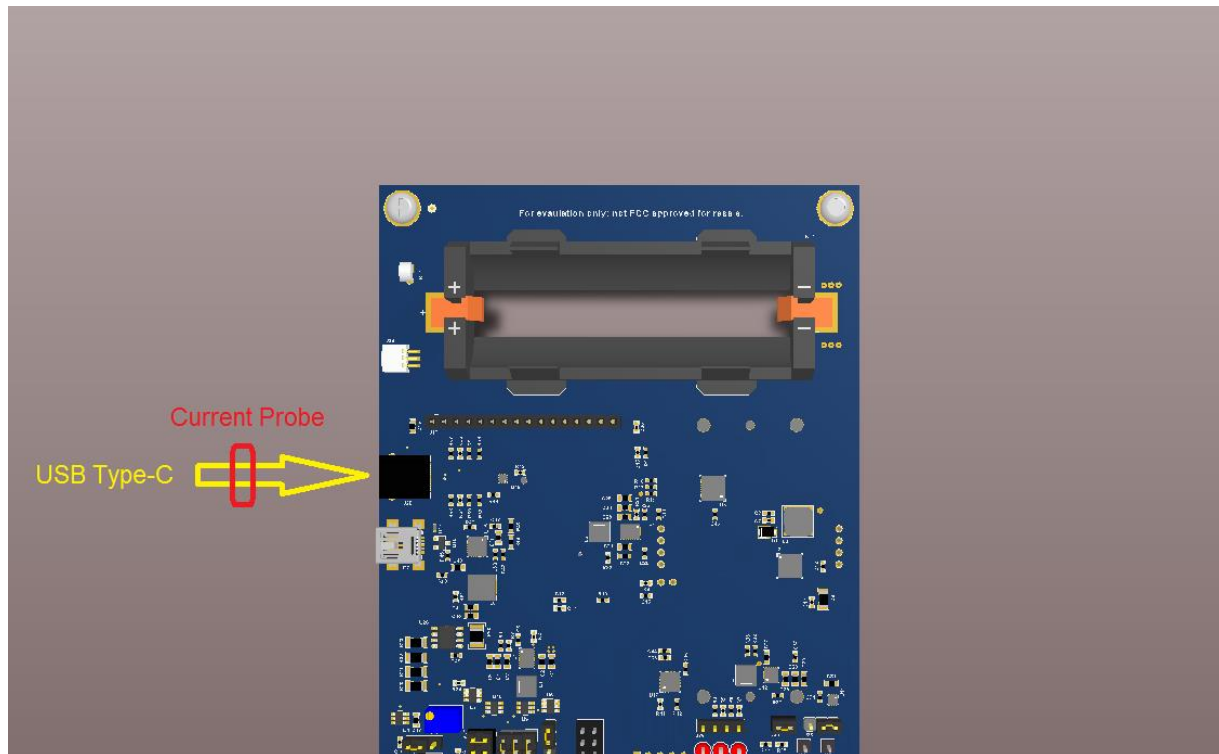
7.1   Transaction Power Consumption

In order to measure the average power consumption for each load, the on board shut monitor was used to measure the current being consumed from the battery. The current measurements were verified using an external voltmeter from Test Point 1 to Test Point 2 across the current sense resistor (R60) from as shown below:
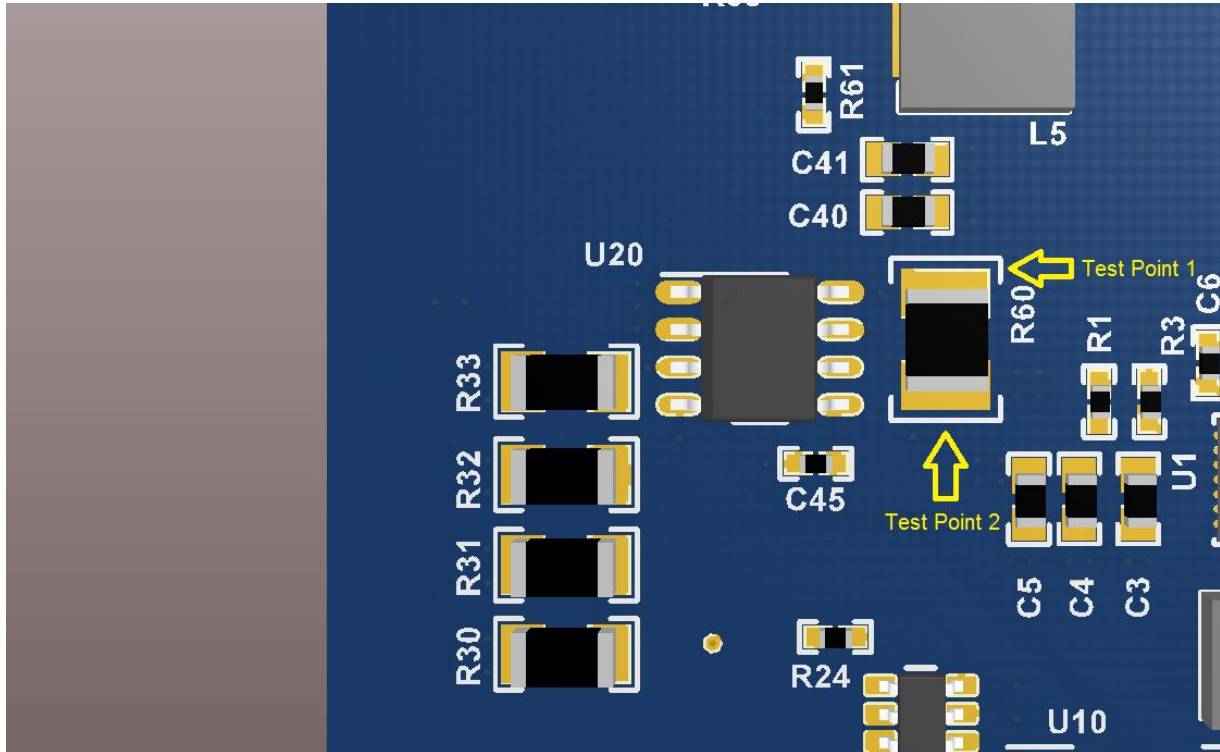
7.2 Charging over USB Type-C

In order to measure the USB Type-C Charging Current, a current probe was used while the system negotiates for higher power.

8   Test Data

This section summarizes the measured performance of the design

8.1 Transaction Power Consumption

The following table summarizes the measured average power consumption for each module as well as the total estimated power consumed for a single transaction.

Module	Average Power Consumption	Active Time During Transaction	Power Consumed per Transaction
MCU	128 mW	60 Sec	2.13 mWh
LCD Screen	330 mW	60 Sec	5.50 mWh
WiFi	225 mW	30 Sec.	1.88 mWh
GPRS	1299 mW	30 Sec	10.8 mWh
BlueTooth	128 mW	30 Sec	1.06 mWh
Printer	2530 mW	15 Sec	10.5 mWh
Power:	-	-	31.9 mWh
Transactions:	-	-	232 Transactions

8.2 Charging over USB Type-C

This design features USB Type-C Charge which increases the charging capabilities over previous USB capabilities up to 15W. This increase in available power allows for a reduced charging time. The following waveform shows the system increasing the charging current from the default 500mA to the full 3A capability of USB Type-C.
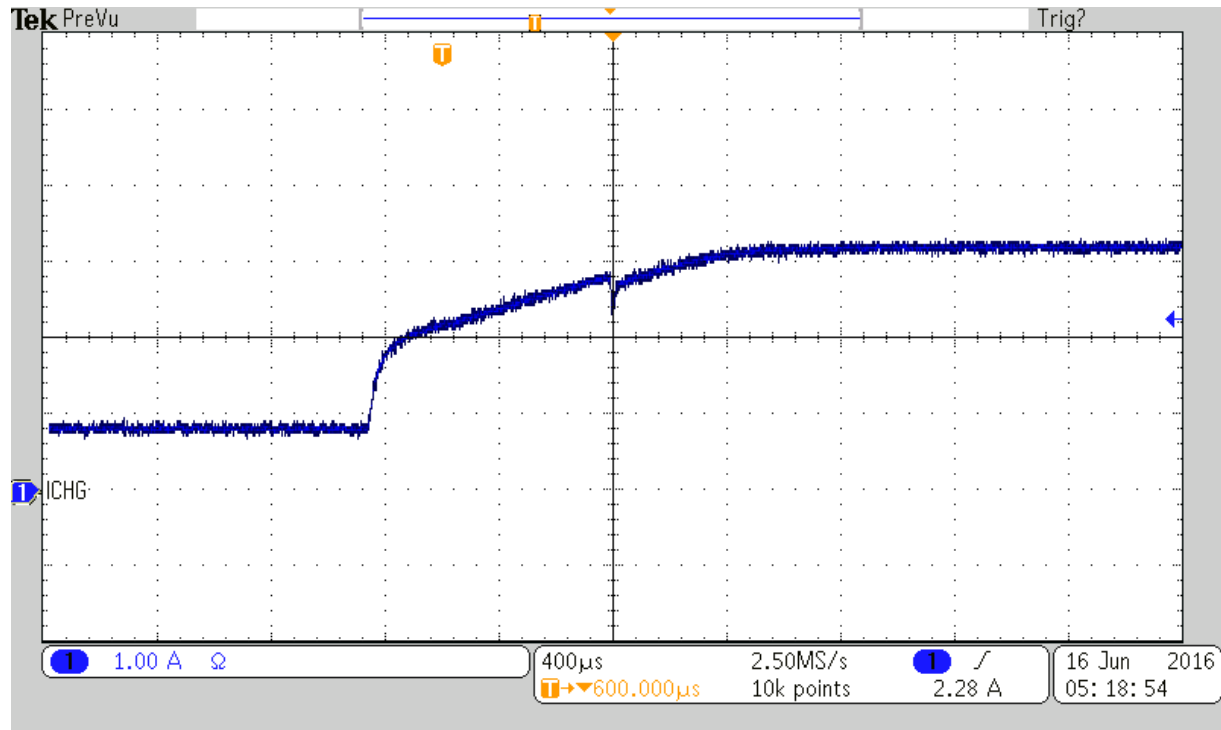
9 Design Files

9.1 Schematics

To download the Schematics for each board, see the design files at http://www.ti.com/tool/ TIDA-00818

9.2 Bill of Materials

To download the Bill of Materials for each board, see the design files at http://www.ti.com/tool/TIDA-00818

9.3 Layout Prints

To download the Layout Prints for each board, see the design files at http://www.ti.com/tool/ TIDA-00818

9.4 Altium Project

To download the Altium project files for each board, see the design files at http://www.ti.com/tool/ TIDA-00818

9.5 Gerber files

To download the Gerber files for each board, see the design files at http://www.ti.com/tool/ TIDA-00818

9.6 Assembly Drawings

To download the Assembly Drawings for each board, see the design files at http://www.ti.com/tool/ TIDA-00818

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