

Over Current Protection

Reference Design & Study



Project Overview

As portable devices advance, the need for current sensing within the device is increasing. Current sensing allows for power monitoring, which may aid in extending battery life, as well as over current protection, which extends the overall lifetime of the product. Texas Instruments (TI) has provided Design Team 5 with two separate current sensing applications: emergency shutdown of a tablet PC and current & power monitoring of a cell phone using TI current sensing components. In addition to this, TI requested various studies be completed to explore how poor PCB traces adversely affect the overall accuracy of ICs used.

Design Specifications

Tablet-PC Emergency Shutdown

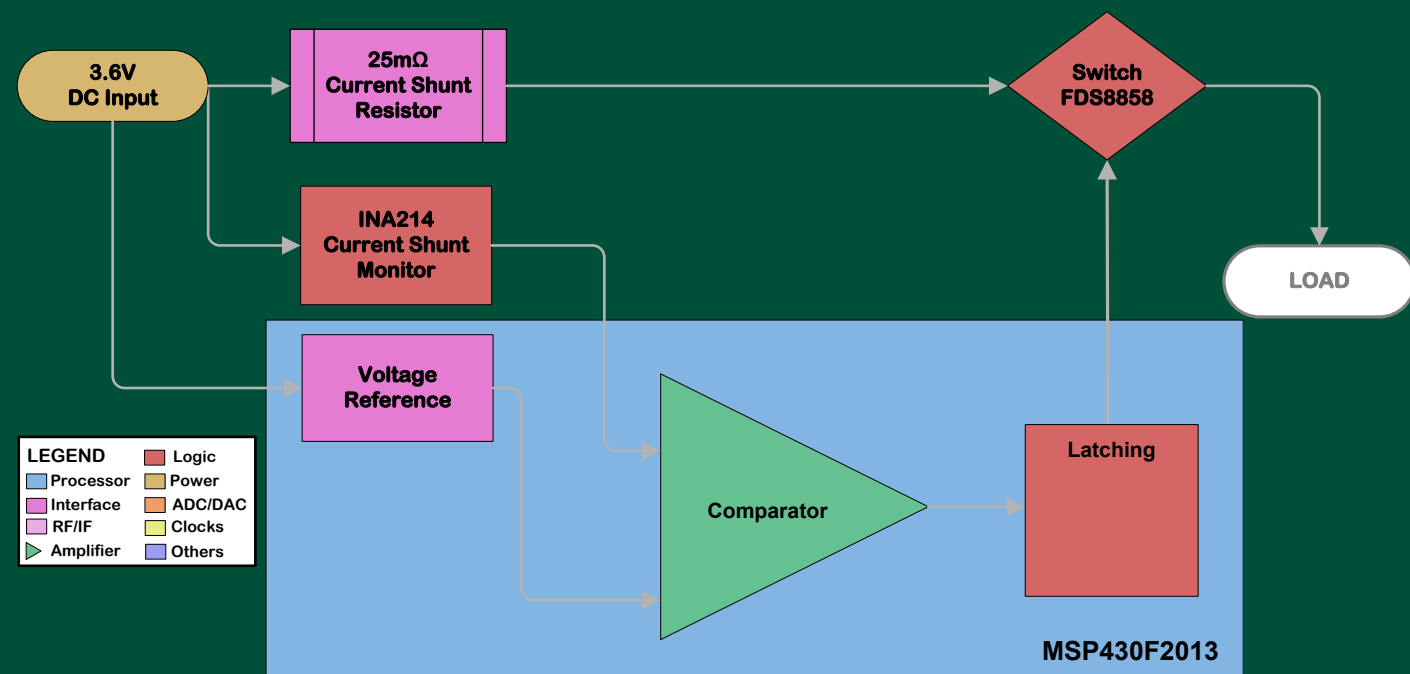
- Assume 3.6 V, 6.75 A-hr Li-Ion battery
- Shutdown power to load at 1 A
- Low cost
- Small size
- Low power consumption
- Fast speed of shutoff > Accuracy

Cell Phone Power Monitoring*

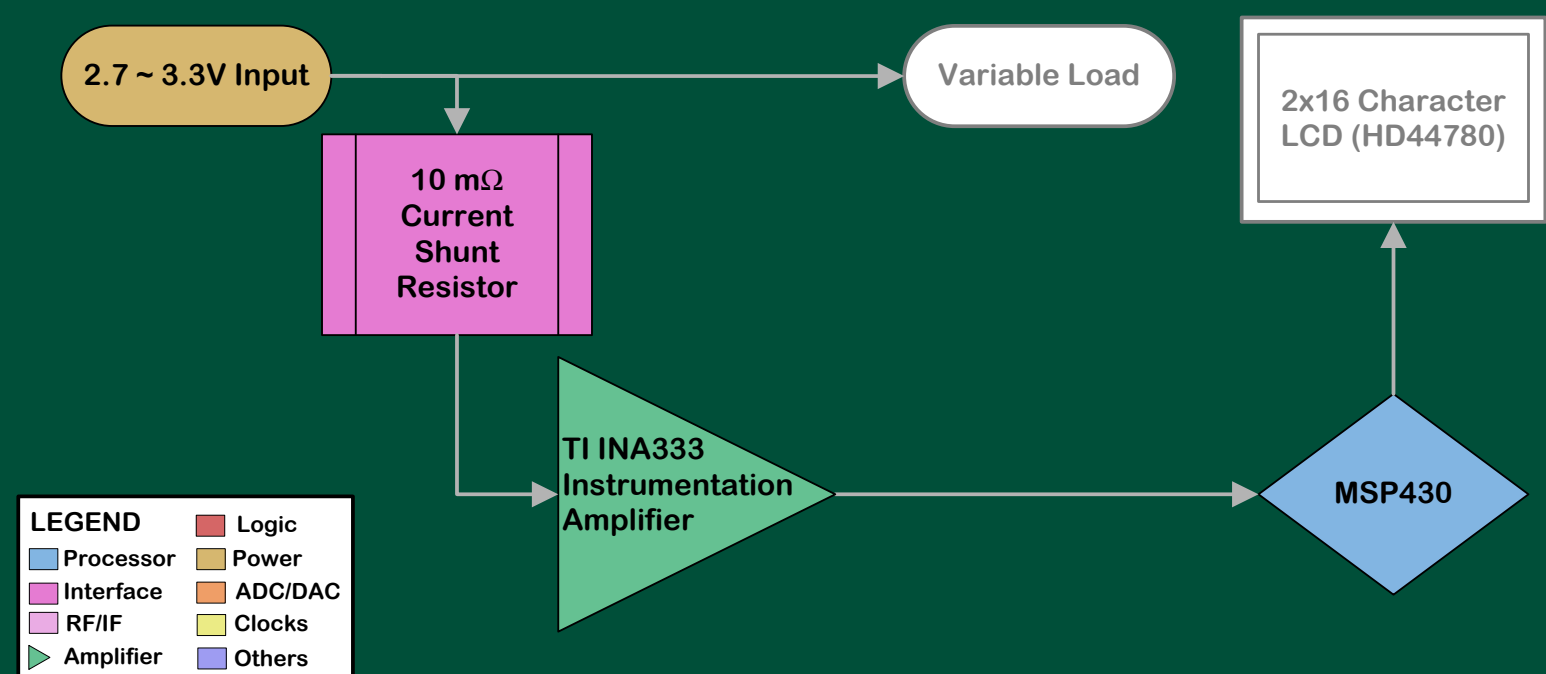
- Assume well-regulated 3 V supply
- Variable load (2.7-3.3 V)
- Accuracy within 7.0-192.5 mA
- Minimal system impact
- Low cost
- Small size

*Specifications based on Motorola Droid X

Design Concepts



Tablet PC emergency shutoff block diagram

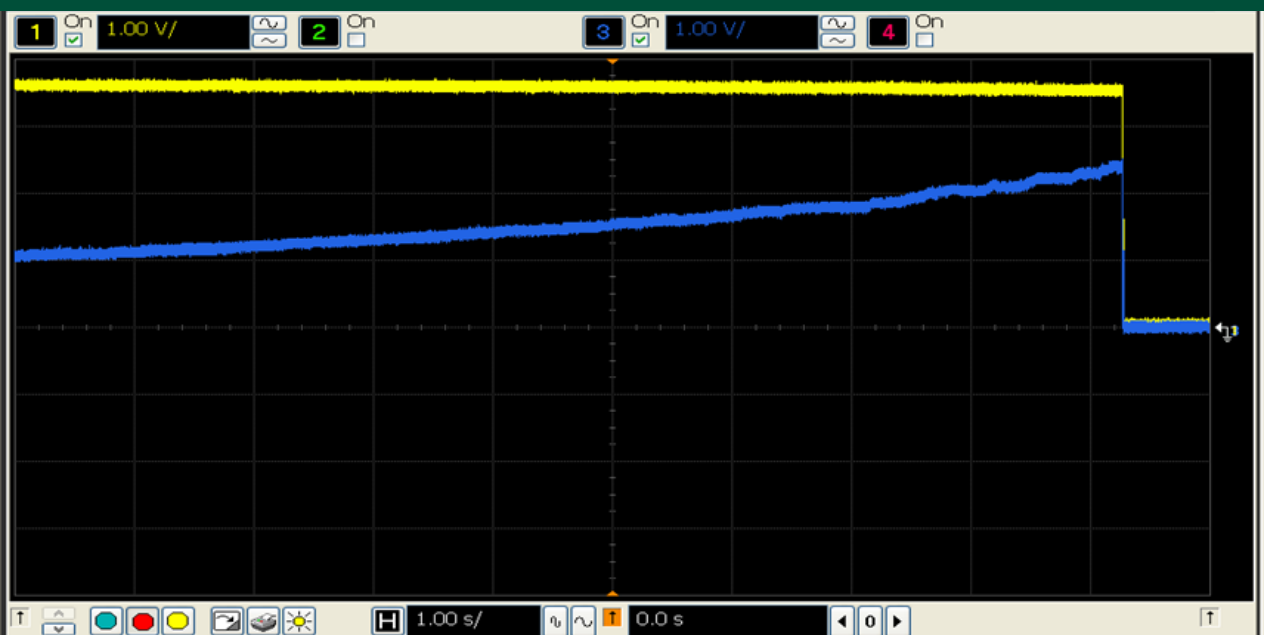


Cell phone current monitoring block diagram

Results

Tablet PC Shutdown

Speed: 125 μ s
Power: 288.72 μ W
Size: 0.97 in X 0.75 in



Cell Phone Power Monitoring

Power consumption is monitored with an MSP430 microcontroller and displayed on an LCD screen.

Accuracy : Within 100 μ V of actual signal

PCB Design Studies

4 cases completed:

- Ideal case
- Long traces
- Unsymmetrical traces
- Non-kelvin connections

Case	Current	Expected output	Output	%Error
Ideal	118.92mA	297.3mV	323.5mV	8.81%
Long	111.42mA	278.55mV	493.89mV	77.31%
Non-symmetrical	100.24mA	250.56mV	273.77mV	9.57%
Non-Kelvin	99.513mA	248.78mV	325.24mV	30.77%



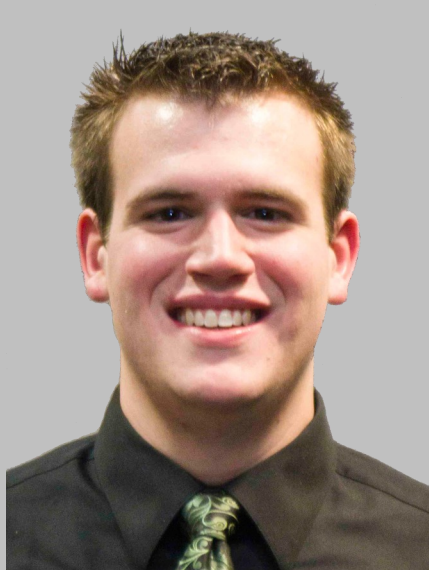
Facilitator:

Dr. Wen Li



Document Prep. :

Kenji Aono



Manager:

Stephen England



Presentation Prep. :

Ryan Laderach



Webmaster:

Joshua Myers



Sponsor:

Mr. Pete Semig

MICHIGAN STATE
UNIVERSITY

Design Team 5