Lecture 9

Reference Design Inverter Schematics: Power Electronics & Sensing Circuits

Objectives:

- Study the schematics and circuits of a previously designed 250W three-phase power inverter system.
- Discuss the considerations for power supply design and components.
- Discuss isolation and its potential need in sensing circuits, power supplies, and gate driver circuits.
- Discuss different voltage sensing methods and when to consider isolation of the signal and resistor power ratings.
- Discuss different current sensing methods, with pros and cons for each.

Keywords:

Bypass capacitor
Galvanic isolation
Optical isolation
Under Voltage Lock Out (UVLO)
Optocoupler or Optoisolator
Hall Effect
Shunt resistor
Gate driver IC
Gate drive power
Miller Capacitance
Miller Effect
Differential amplifier

Overview of Power Inverter Schematics

Discuss the different sections of the schematic

Key Points of the Infineon BTN8980 IC

The Need for Isolation

Discuss different ground references resulting from the switching nodes

Upper switch needs a floating supply.

Difficulty to measure current through a shunt on a switching node

Gate Drivers and the Miller Effect

Discuss the need for level-shifting and current amplification of PWM signals

Voltage Sensing Methods

Voltage sensing of LV DC and HV DC

Sensing of AC voltages

Power ratings for resistors & safety / redundancy

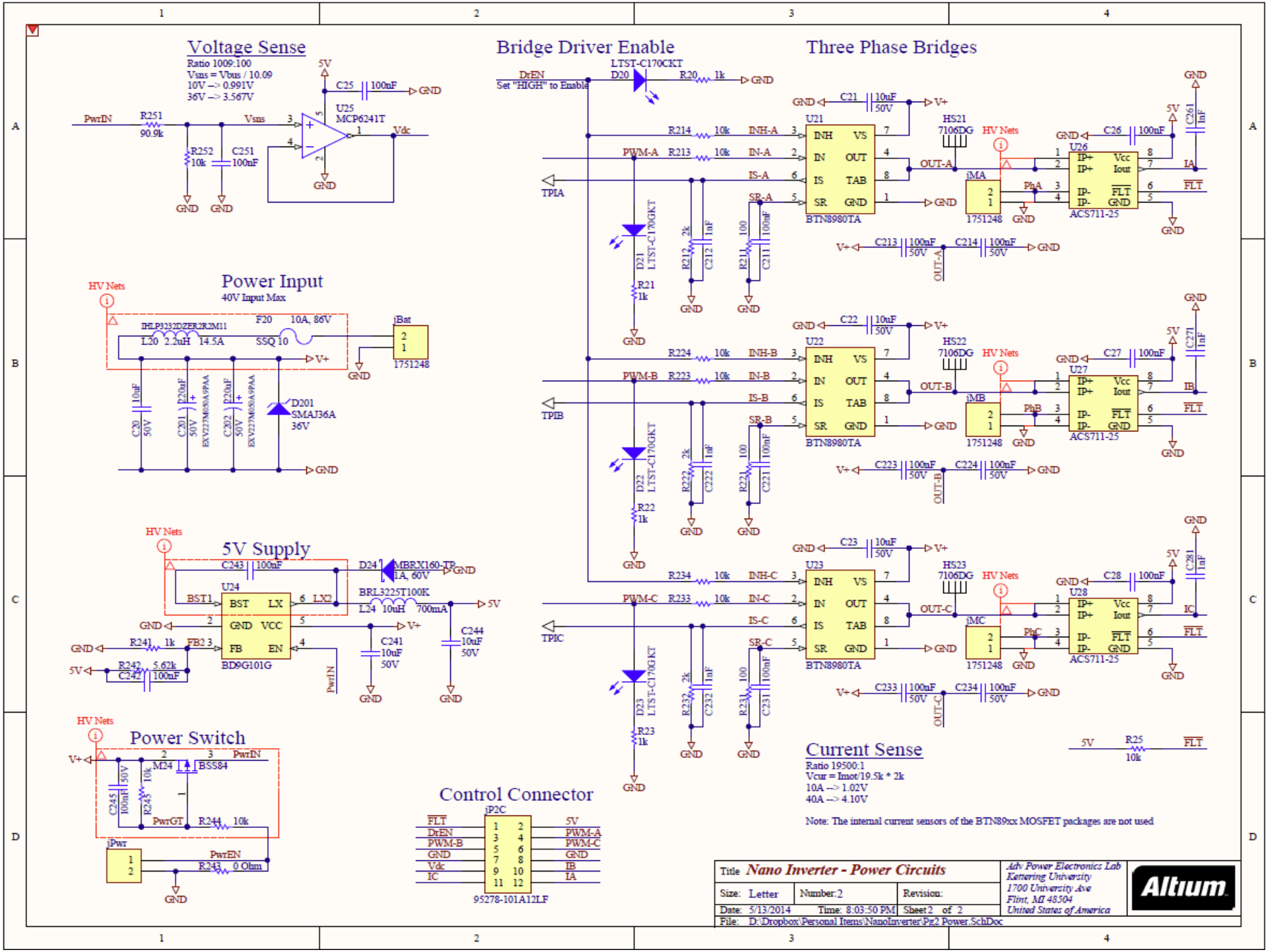
Current Sensing Methods

Discuss Hall Effect vs. shunt resistor

Discuss the level-shifting (common-mode voltage) issues with shunts

Discuss the power rating issues with shunts

Discuss the bandwidth limitations with Hall Effect sensors


Voltage Sense
Ratio 1009:100
Vsns = Vbus / 10.09
10V --> 0.991V
36V --> 3.567V
Power Input
40V Input Max
5V Supply
Power Switch
Bridge Driver Enable
Set "HIGH" to Enable
Three Phase Bridges
Control Connector
Current Sense
Ratio 19500:1
Vcur = Imot/19.5k * 2k
10A --> 1.02V
40A --> 4.10V
Note: The internal current sensors of the BTN89xx MOSFET packages are not used
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