Test Data
For PMP9351
01/24/2014

Overview

PMP9351 is a compact power and serializer solution for automotive backup camera module using OmniVision image sensor OV10635. The reference board provides two 3.3V and one 1.5V outputs to power the OV10635 eval board bypassing the on-board LDOs. The system input voltage is 9V nominal from an ECU, and the input range is from 5.5V to 20V. The reference board includes the DS90UB913Q serializer and supports power-over-coax configuration allowing input power and FPD-Link III signals transferring over a single coax cable. The system block diagram can be seen in Figure 1.

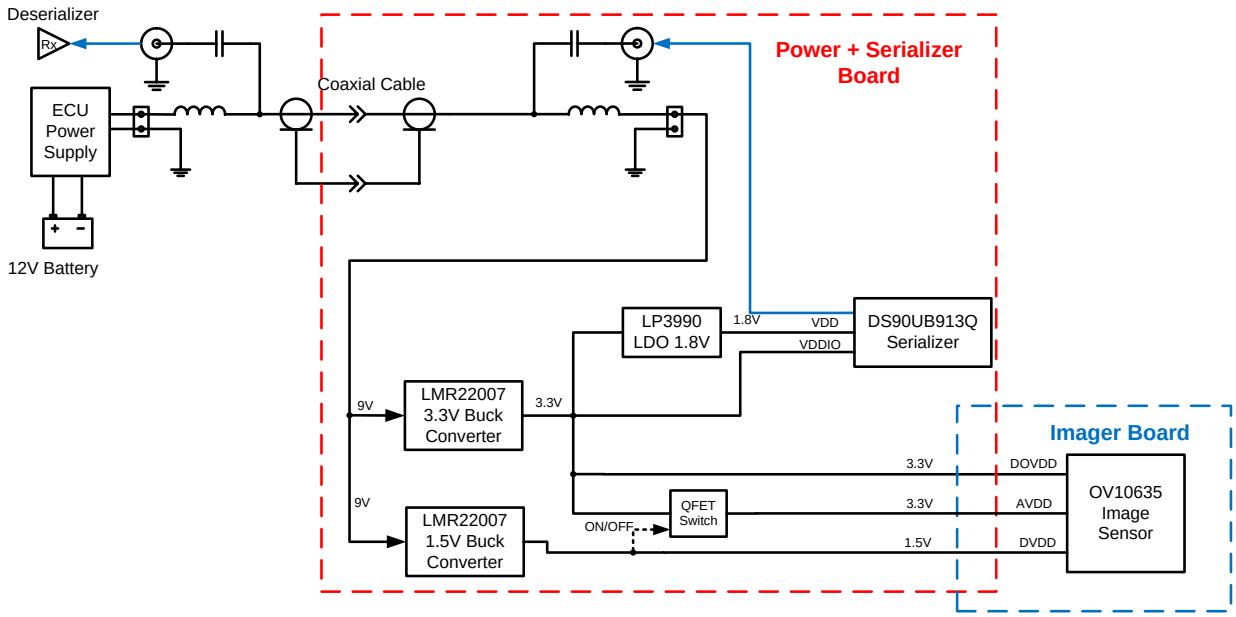

Figure 1

Power Specification

Vin range: 5.5V – 20V

Nominal Vin = 9V

Outputs to Imager Board: DOVDD 3.3V, AVDD 3.3V, 200mA total; DVDD, 1.5V, 240mA

Board Photo

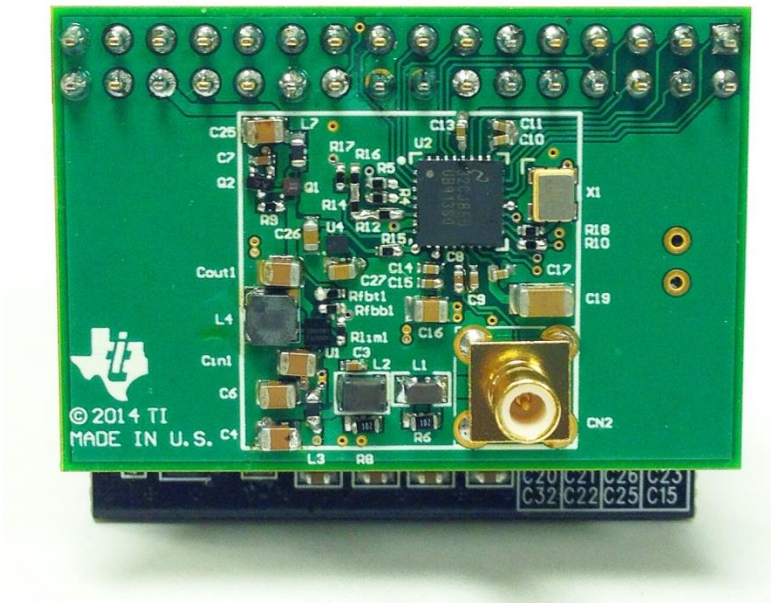

Figure 2 Top View

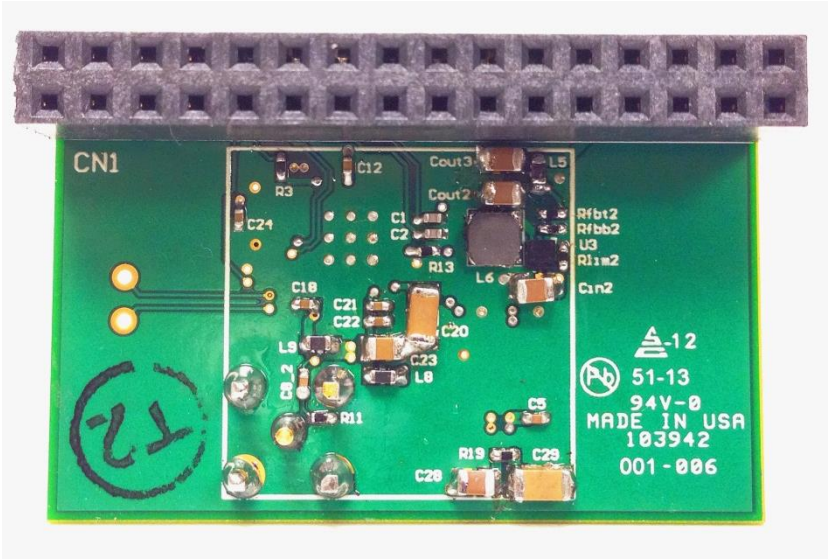

Figure 3 Bottom View

Effective board area (marked as the white square): 20x20mm

Figure 4 Connected with the Camera Board

Test Setup

The reference board is designed with compatible connector to OmniVision OV10635 EVM, and it provides the DOVDD, DVDD and AVDD supply voltage required by the image sensor. On the OV10635 EVM, three LDOs are used to generate these voltage rails, which has limited input voltage level of 5V and have low power efficiency. The reference board utilizes the NC (no connect) pins of the connector to output these voltages, and some modifications to the imager board are required to bypass the on-board LDOs. Follow the below steps to modify the OV10635 EVM:

1. Remove the three LDOs, U2, U3 and U4;
2. Use wire to tie the NC pins of connector J2 to the corresponding output capacitors of each voltage rail: J2 pin 28 to C32 for AVDD 3.3V, J2 pin 30 to C35 for DOVDD 3.3V, and J2 pin 26 to C37 for DVDD 1.5V;

After the modification, the reference board can be plugged in to the OV10635 EVM, which forms a complete camera module. The coaxial cable with the input power, FPD-Link III camera data and control signal should be connected to the SMB/FAKRA connector CN2 on the reference board.

To test the functionality of the camera, we use the Deserializer EVM (DS90UB913Q), the Vision 28 CPU & Applications board, and a LCD daughter board as a demo platform to receive, process and display the camera video. The test setup with two camera modules connected is shown in Figure 5.

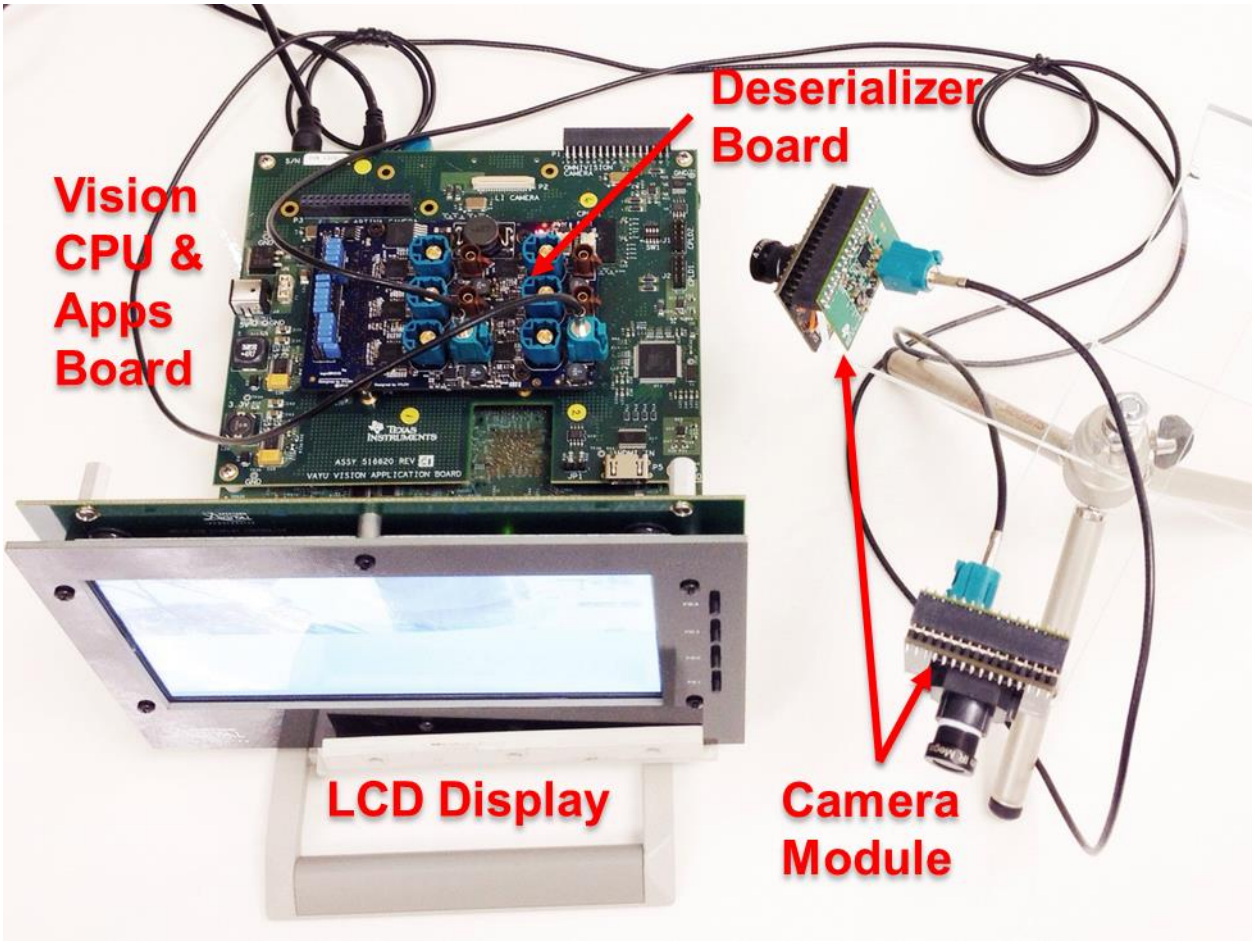

Figure 5

Camera Function and Signal Integrity

The signal transmission between the DS90UB913Q/914Q is monitored by reading the CRC (cyclic redundancy check)/parity error registers. For serializer, they're registers 0x0A~0x0B for back channel errors. For deseralizer, they're registers 0x1A~0x1B for the forward channel errors. The reading is zero during the test indicating no data/bits errors.

The camera module test with the test platform in Figure 5 shows the module operates properly with clear image displayed on the screen.

Input Power and Regulation

The reference board is tested with the image board plugged-in under different Vin condition. The input power and output voltages is shown in

Vin	Iin	Pin	DOVDD	DVDD	AVDD
8.94V	63.92mA	571mW	3.313V	1.498V	3.294V
19.84V	35.23mA	699mW	3.314V	1.500V	3.296V
5.42V	98.87mA	536mW	3.310V	1.498V	3.292V

The camera module consumes about 571mW power at 9Vin, and all three outputs to the image sensor are stable and well regulated from 5.5Vin to 20Vin.

Switching Waveforms

The switching waveforms of the LMR22007 for 3.3V DOVDD and AVDD are captured with the image board plugged-in, while for the 1.5V DVDD it is tested with 240mA electronic load as the buck regulator is on the bottom of the reference board and inaccessible when plugged-in. The 240mA represents the max load condition for DVDD.

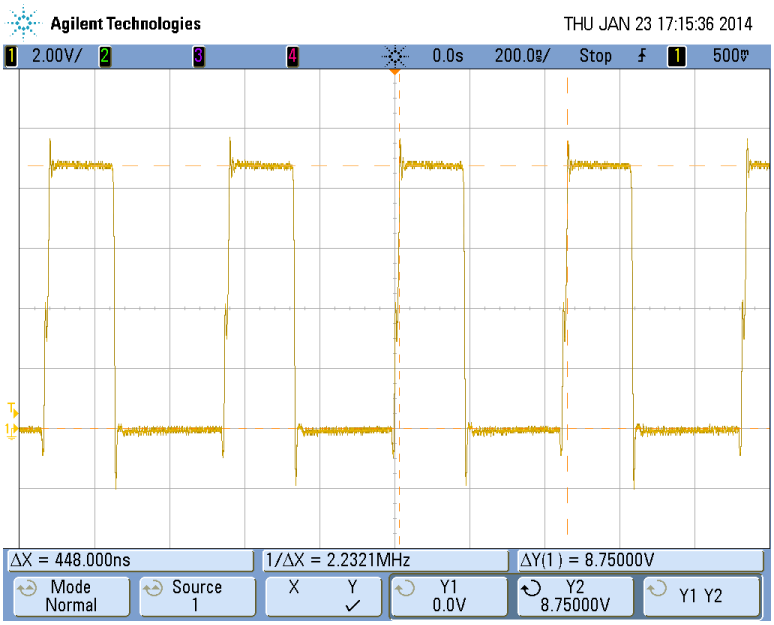

Figure 6 3.3V LMR22007 Buck Regulator Switching Waveform at 9V input

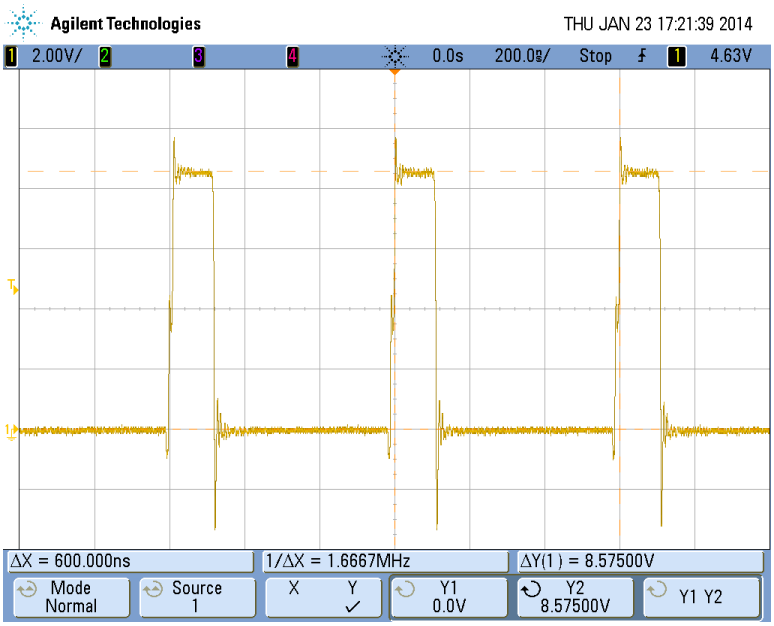

Figure 7 1.5V LMR22007 Buck Regulator Switching Waveform at 9V input

Output Voltage Ripples

The output ripples are measured at the output capacitor closest to the output pin of the connector CN2 on the reference board. The Test condition: The DOVDD and AVDD ripples are tested with the image board, and the DVDD is tested separately with 240mA electronic load.

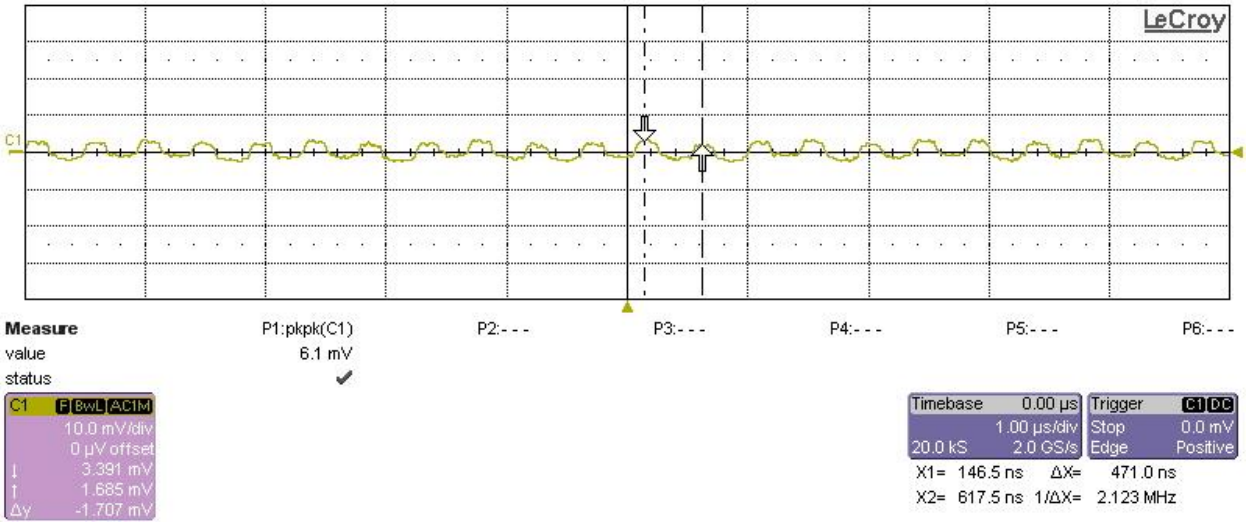

Figure 8 DOVDD (3.3V) Output Ripple

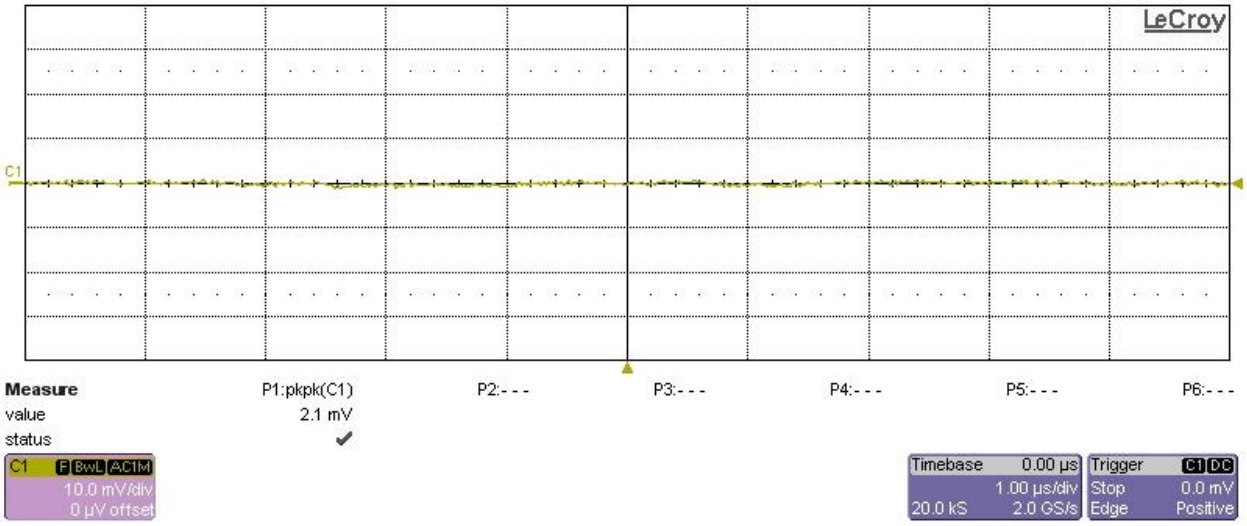

Figure 9 AVDD (3.3V) Output Ripple

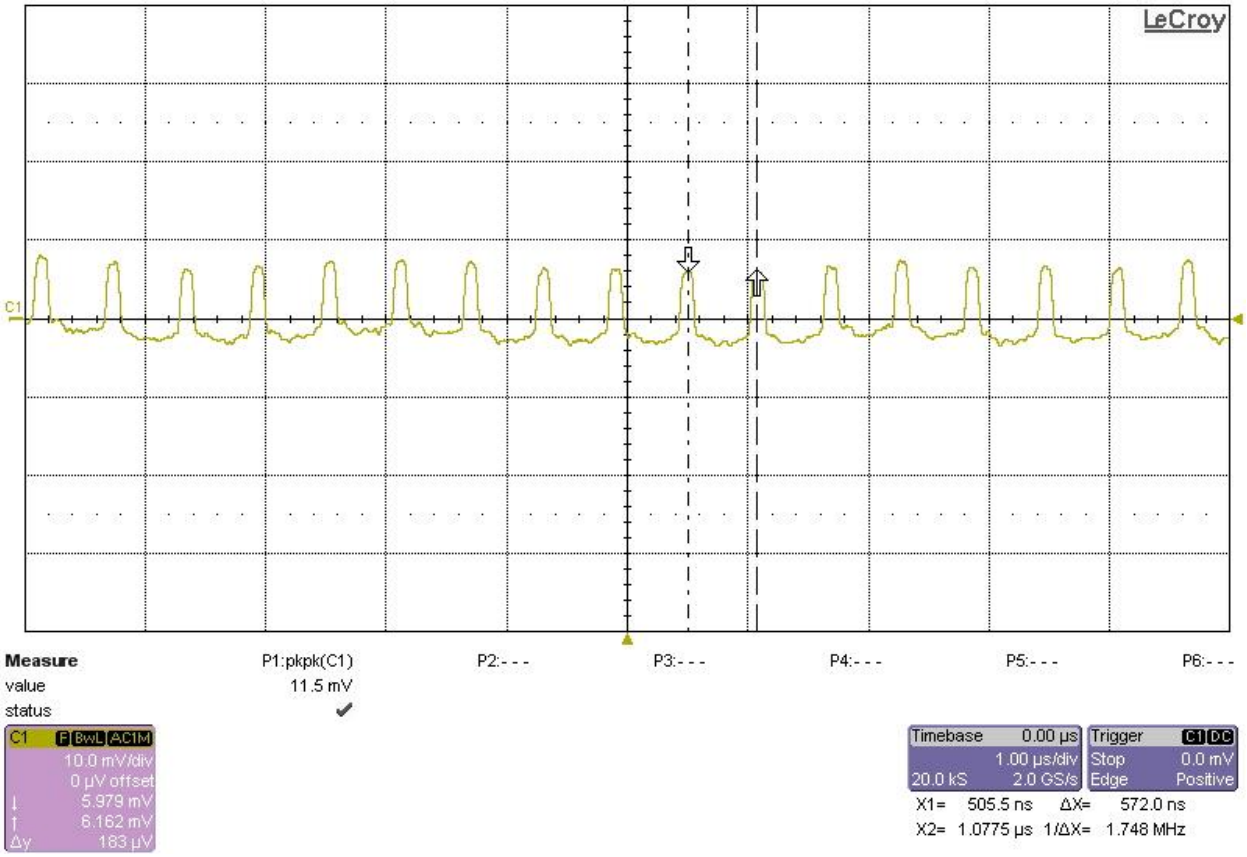

Figure 10 DVDD (1.5V) Output Ripple

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