Test Data
For PMP10653
08/06/2015

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1. Design Specifications

Vin Minimum	**4.5V**
Vin Maximum	**36V**
Vin Nominal	**12V (Automotive Lead Acid Battery)**
Vout1	**3.3V**
Iout 1	**1A**
Switching Frequency(SMPS)	**2.2MHz**
Vout2	**1.8V (Need High PSRR- for Serializer+ Image Sensor)**
Iout2	**250mA**
Vout3	**1.5V (Need High PSRR- for Image Sensor)**
Iout3	**250mA**
Seriailizer	**12 bit FPD-Link III**
Fpclk	**50MHz**
Line rate	**1.4Gbps**
Image Sensor	**Seperated 12 bit RAW**

2. Circuit Description

PMP10653 is an Optimized Automotive Camera Module Design for Uncompressed Digital Video over Coax. The design is broadly divided into four Blocks

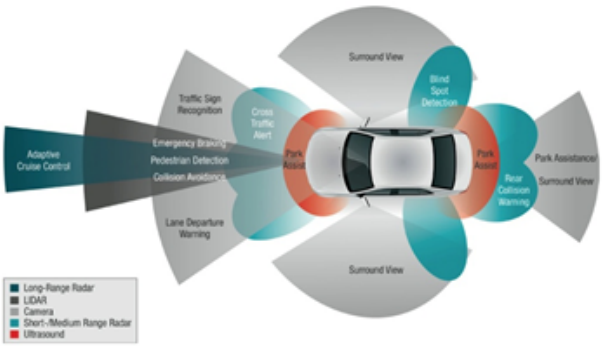
1. Power Block: This design support Wide Vin ie 4.5V-36V. LM53601 is used for first stage DC/DC conversion, which can deliver 1A at 3.3V output. This device is synchronous, fully integrated and 2.1MHz switching which results in highly integrated design. Two ultra-low noise LDOs (LP5907) are used to power noise susceptible image sensor as well as serializes.

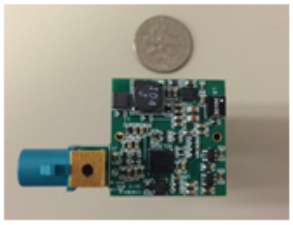
2. Serializers: 12 bit Serializer DS90UB913A is used which offers a FPD-Link III interface with a high-speed forward channel and a bidirectional control channel for data transmission over a single coaxial cable or differential pair

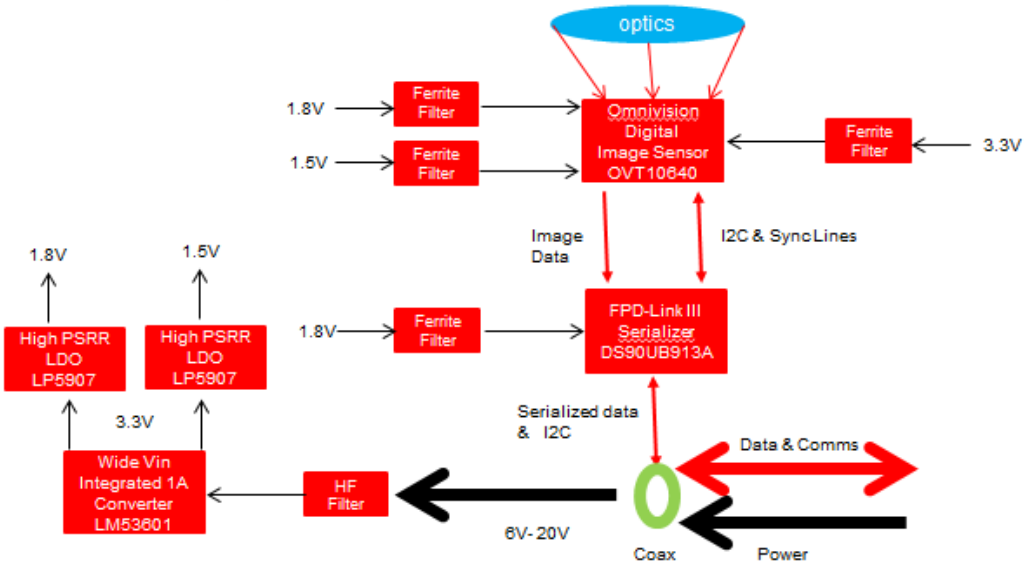
3. Digital image Sensor: Omnivision's OV10640 image sensor is used which utilizes backside illumination technology, enabling industry leading sensitivity.

4. Power Supply filter : One of the most critical portions of a design which uses Power over Coax is the filter circuitry. The goal is twofold: 1) deliver a clean DC supply to the input of the switching regulators, and 2) protect the FPDLink communication channels from noise coupled backwards from the rest of the system.

3. PMP10653 Block diagram



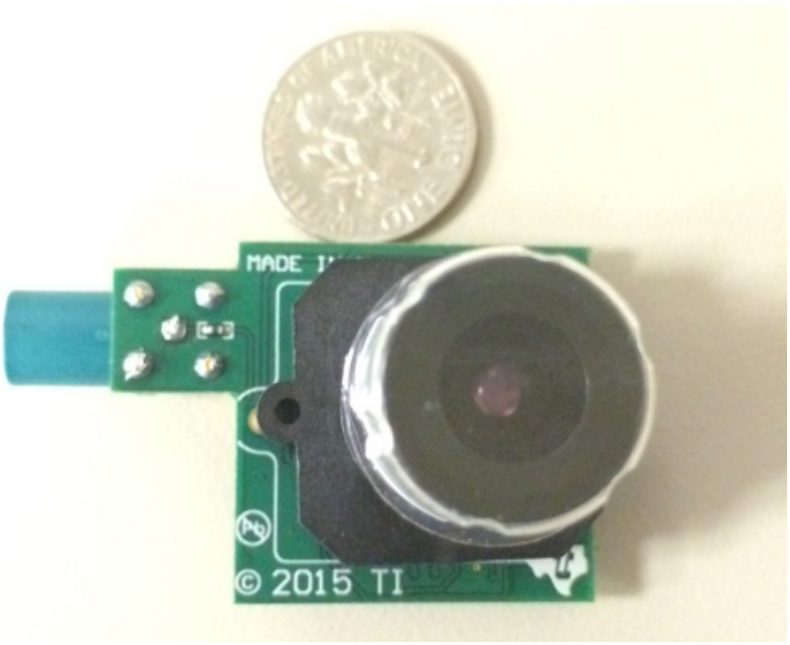




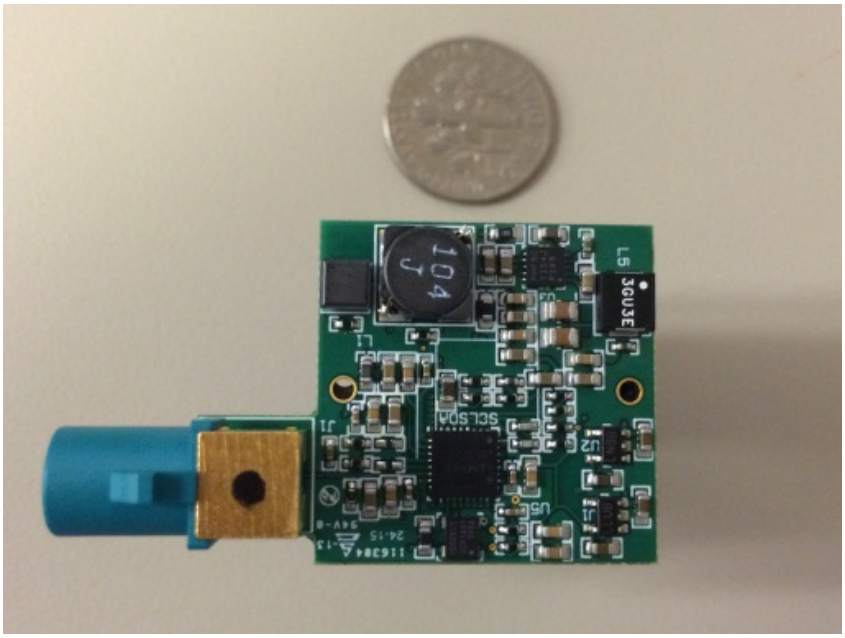
The digital image sensor OV10640 generates 12 bit data which is serialized by DS90UB913A serializer and transmitted over single Coax cable .

4. PMP10653 Board Photos

Board's Dimension :26mm*26mm

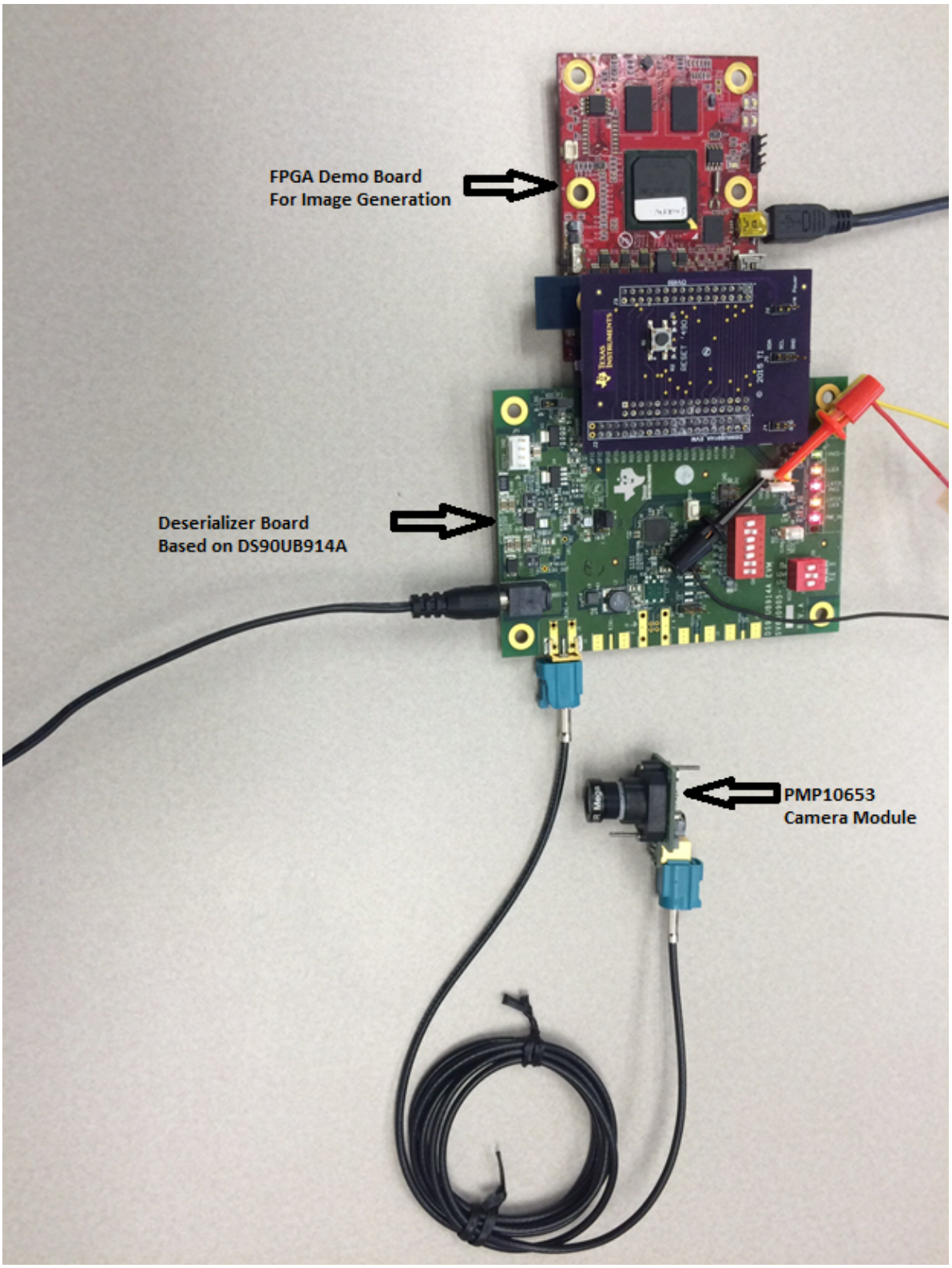


Board Photo (Top)

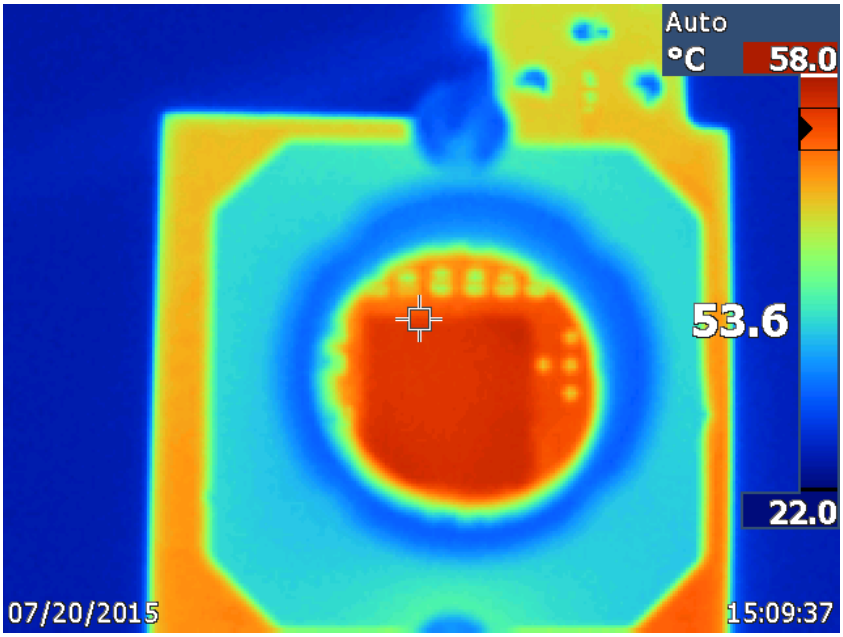


Board Photo (Bottom)

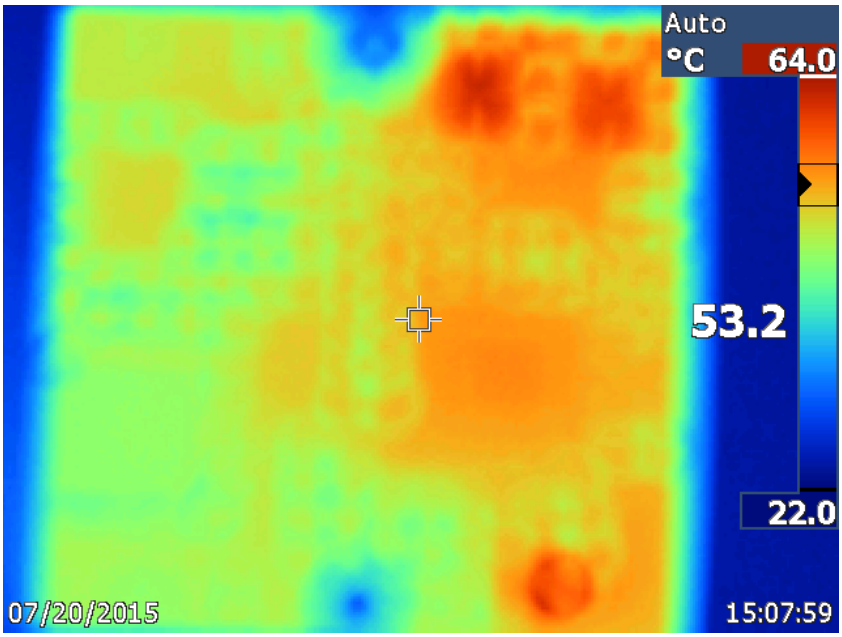
5. PMP10653 Test Set Up



6. Camera module's thermal data



IR thermal image taken at steady state(Top Side) with 12 Vin and Image sensor operating at max gain



IR thermal image taken at steady state(Bottom Side) with 12 Vin and Image sensor operating at max gain

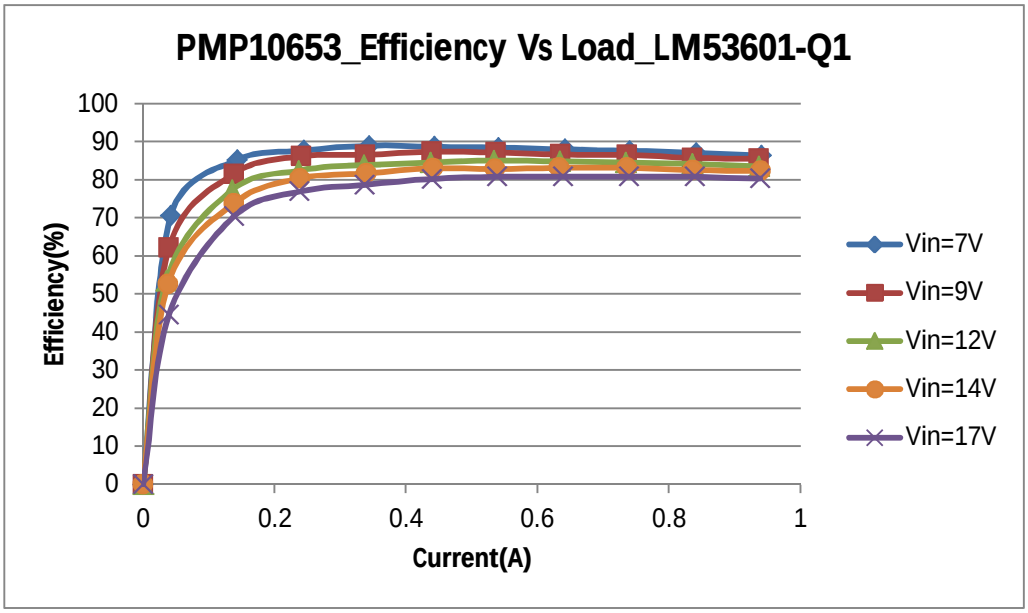
7. Actual Images and link to video shot

The above image is the screen shot of the video taken by camera module .The link to the test video shot is mentioned below.

https://www.youtube.com/watch?v=ED1VNj_oSZY

8. Efficiency – Front End Buck LM53601

8.1 Efficiency Chart



8.2 Efficiency Data

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
7.006	0.008	3.301	0	0
7.006	0.028	3.302	0.042	70.697
7.006	0.079	3.301	0.143	85.287
7.006	0.131	3.301	0.244	87.759
7.006	0.182	3.3	0.344	89.029
7.006	0.235	3.298	0.443	88.739
7.006	0.287	3.297	0.54	88.544
7.005	0.343	3.296	0.642	88.068
7.005	0.397	3.295	0.74	87.678
7.005	0.454	3.294	0.841	87.108
7.005	0.511	3.293	0.94	86.475

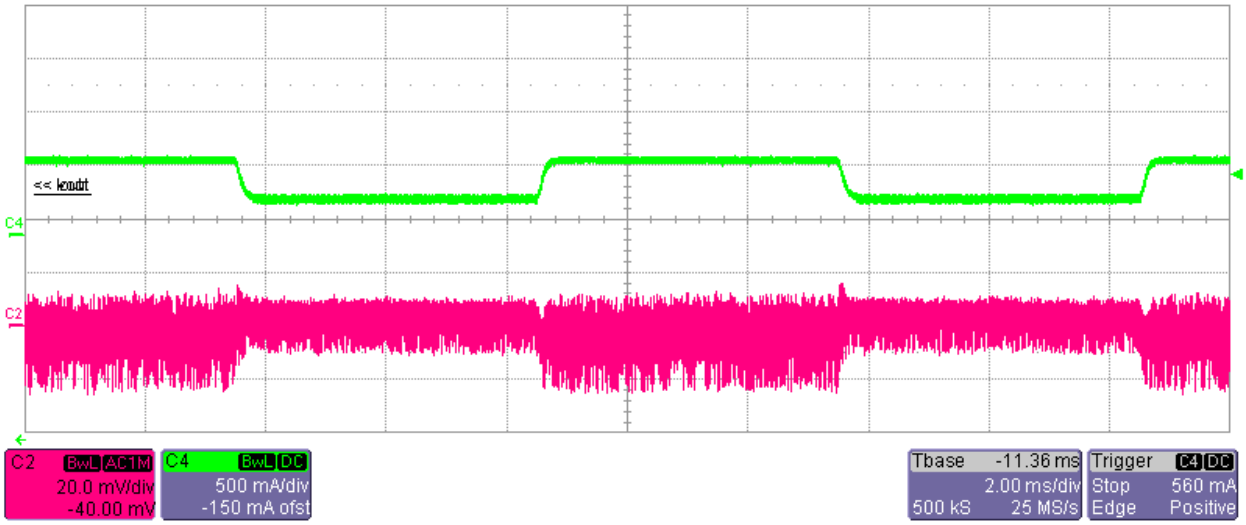
Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
9.004	0.008	3.302	0	0
9.004	0.023	3.302	0.039	62.184
9.004	0.062	3.302	0.138	81.626
9.004	0.102	3.301	0.24	86.262
9.004	0.143	3.3	0.338	86.628
9.004	0.184	3.299	0.439	87.417
9.003	0.225	3.298	0.536	87.266
9.003	0.268	3.296	0.635	86.744
9.003	0.311	3.295	0.736	86.614
9.003	0.356	3.294	0.835	85.817
9.003	0.4	3.293	0.936	85.589

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
12.004	0.008	3.301	0	0
12.004	0.018	3.302	0.035	53.487
12.004	0.048	3.301	0.135	77.341
12.004	0.079	3.301	0.237	82.498
12.004	0.11	3.3	0.336	83.972
12.004	0.142	3.299	0.437	84.576
12.004	0.172	3.298	0.533	85.138
12.003	0.205	3.297	0.634	84.95
12.004	0.238	3.296	0.734	84.68
12.004	0.272	3.294	0.835	84.239
12.003	0.307	3.293	0.936	83.645

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
14.007	0.008	3.301	0	0
14.007	0.017	3.302	0.038	52.695
14.007	0.044	3.301	0.138	73.914
14.007	0.07	3.301	0.239	80.464
14.007	0.098	3.3	0.34	81.738
14.007	0.125	3.299	0.441	83.093
14.007	0.152	3.298	0.535	82.874
14.007	0.179	3.297	0.633	83.239
14.007	0.208	3.296	0.736	83.264
14.007	0.238	3.295	0.836	82.63
14.007	0.268	3.293	0.939	82.372

9. Waveforms-Front End Buck

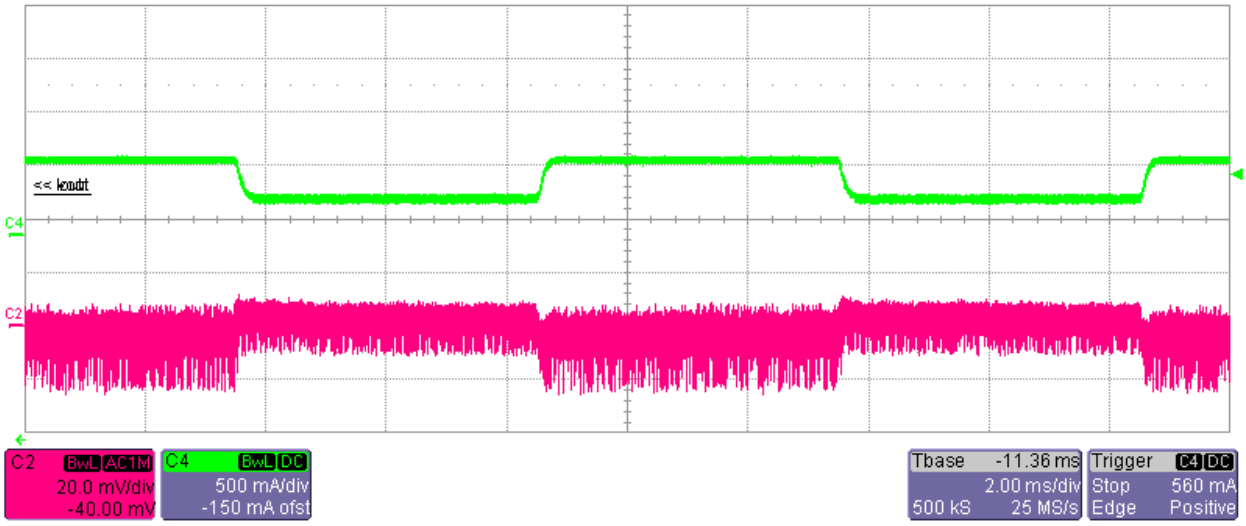
9.1 Load Transient Response



Load Transient Response at 7 Vin and 30%-to-70% Load Step

C4- Iout

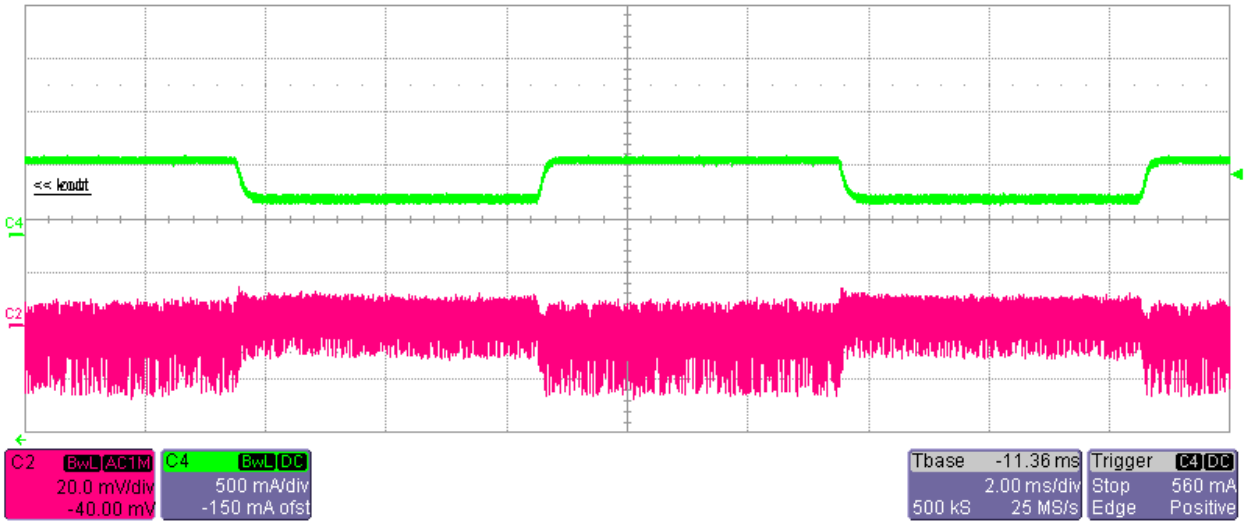
C2- Vout(AC coupled)



Load Transient Response at 12 Vin and 30%-to-70% Load Step

C4- Iout

C2- Vout(AC coupled)

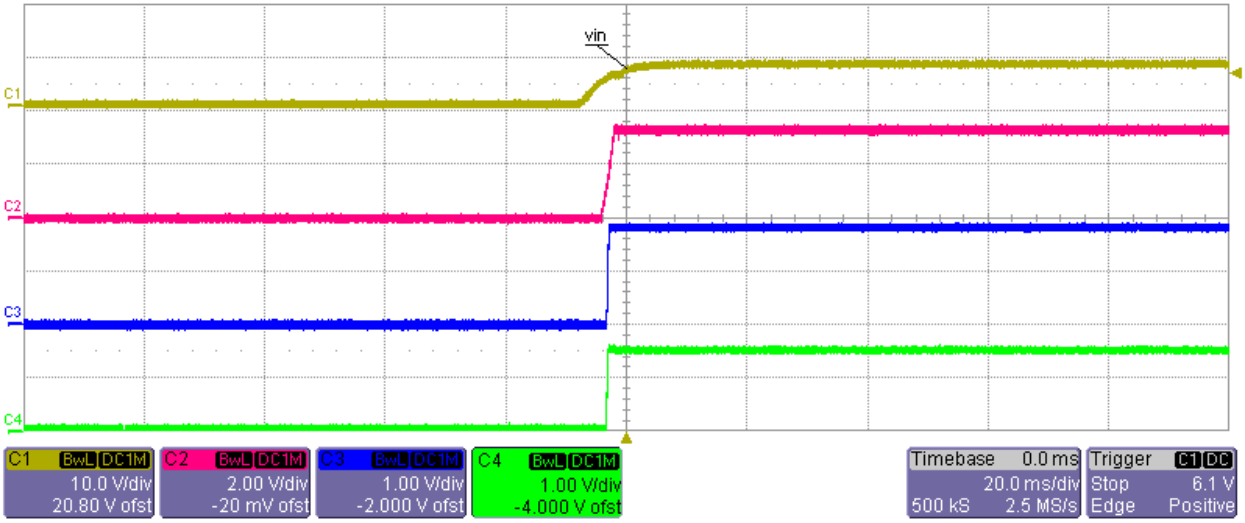


Load Transient Response at 20 Vin and 30%-to-70% Load Step

C4- Iout

C2- Vout(AC coupled)

9.2 Startup



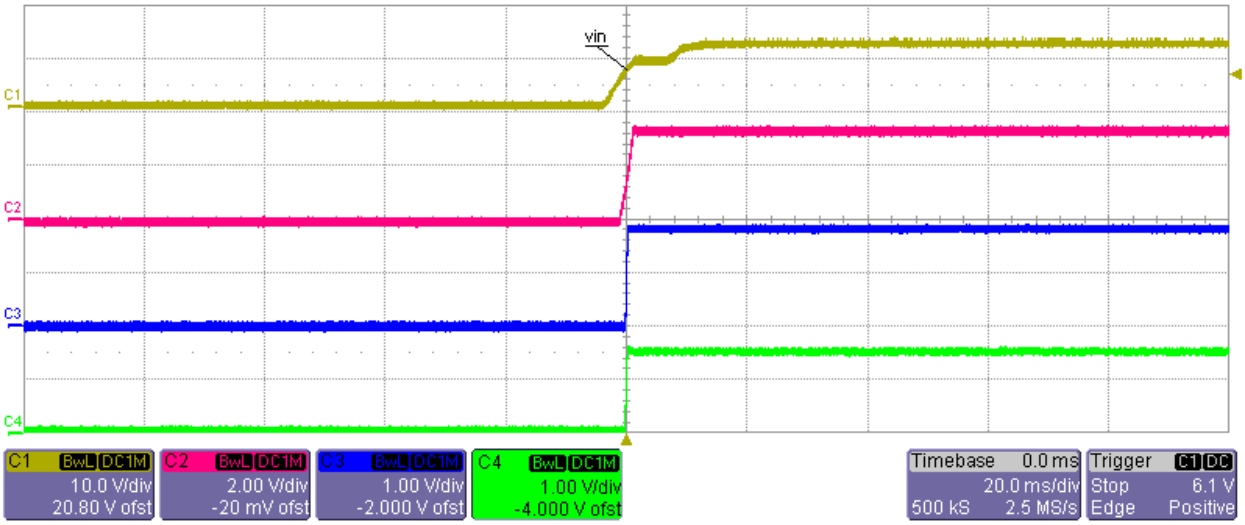
Startup into Full Load at 8 Vin

C1- Vin

C2-Vout 1

C3-Vout 2

C4- Vout 3



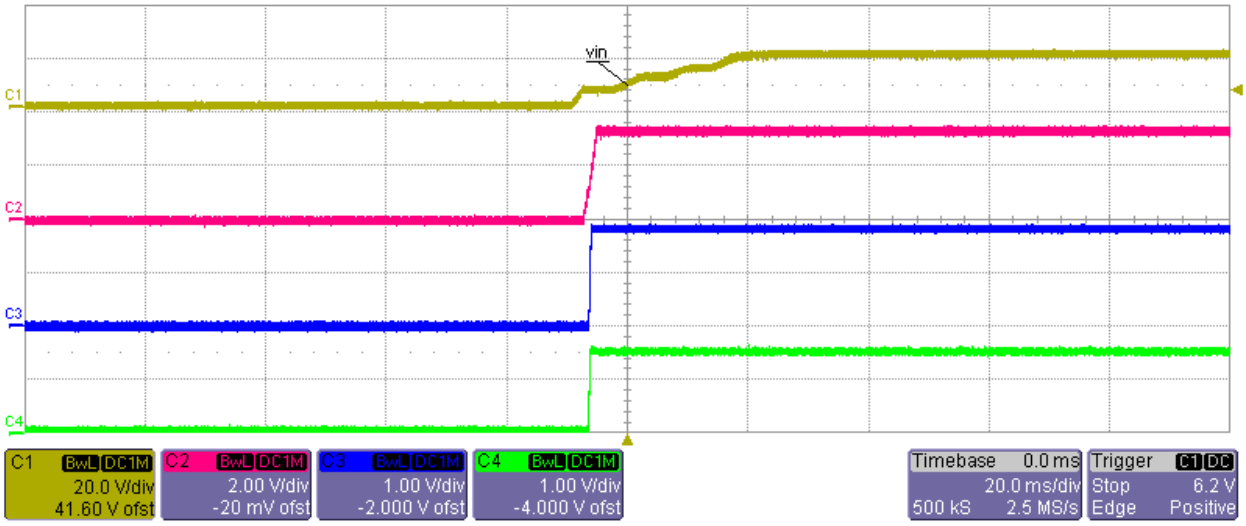
Startup into Full Load at 12 Vin

C1- Vin

C2-Vout 1

C3-Vout 2

C4- Vout 3



Startup into Full Load at 20 Vin

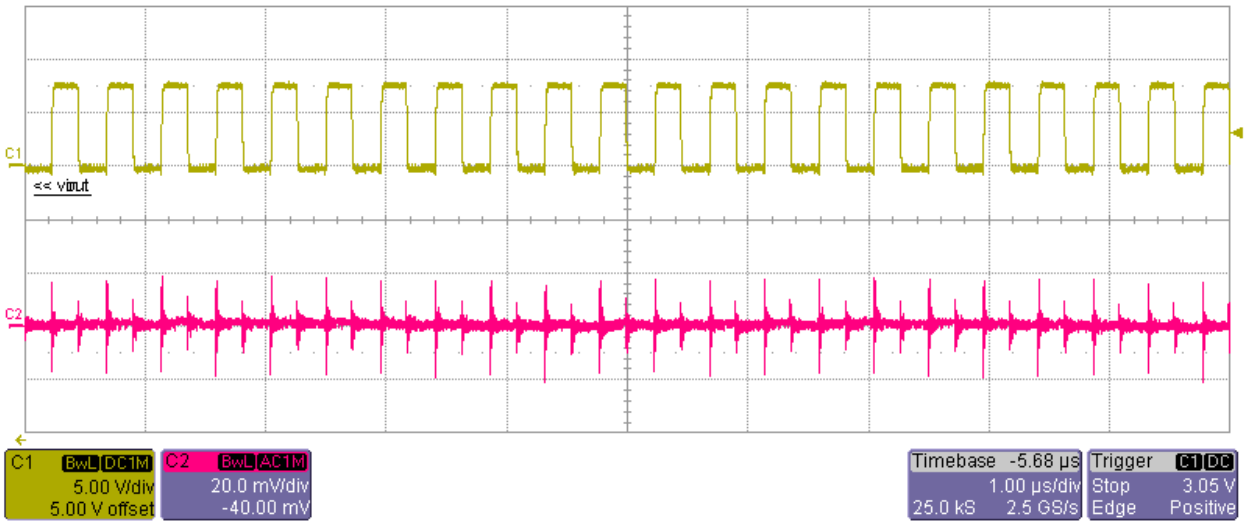
C1- Vin

C2-Vout 1

C3-Vout 2

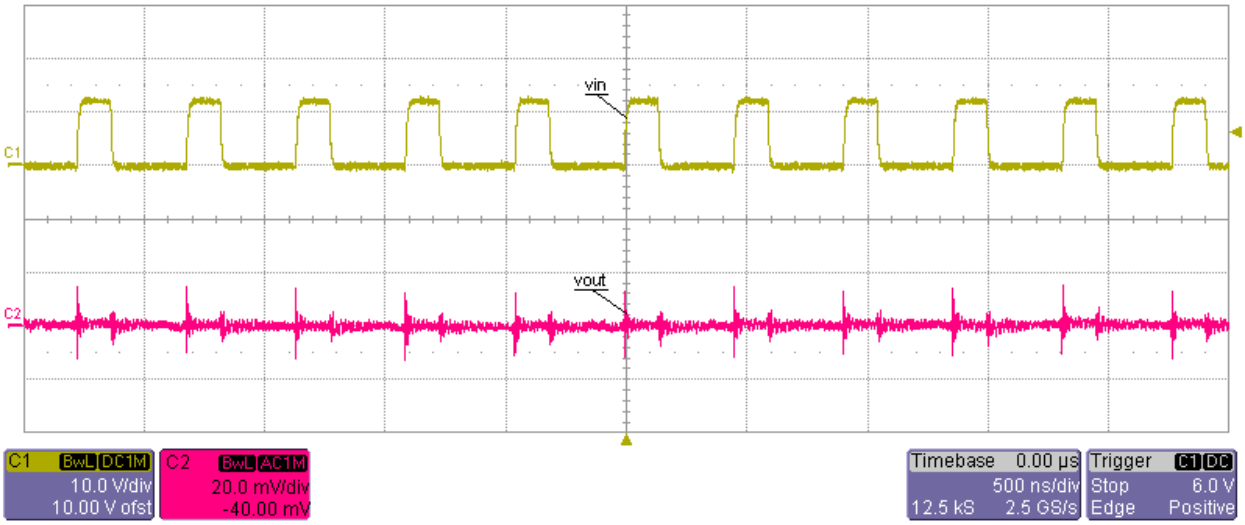
C4- Vout 3

9.3 Output Voltage Ripple and Switch Node Voltage



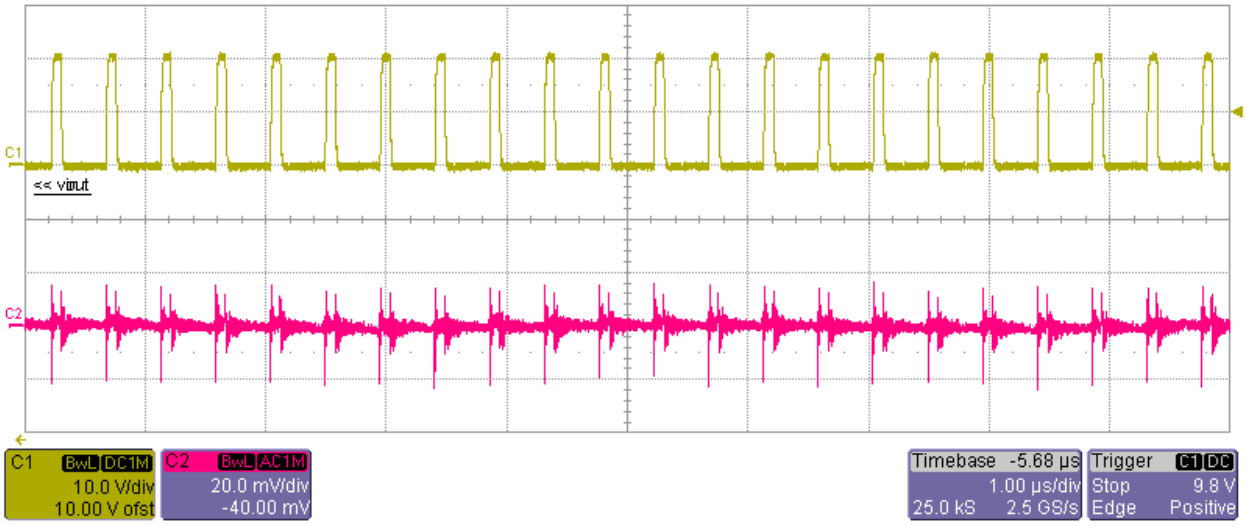
Ch1 - Switch Node Voltage

Ch2-Output Voltage Ripple at 7 Vin and Full load on Vout1



Ch1 - Switch Node Voltage

Ch2-Output Voltage Ripple at 12 Vin and Full load on Vout1



Ch1 - Switch Node Voltage

Ch2-Output Voltage Ripple at 20 Vin and Full load on Vout1

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