Test Report: PMP21557
Compact low-loss isolated four-output flyback reference design

TEXAS INSTRUMENTS

Description

PMP21557 is a four-output flyback that uses the LM25017 converter. The four 3.3V outputs are isolated for 1250 VAC. Each output stage has a TLV75533 Linear Regulator to create a more accurate output voltage.
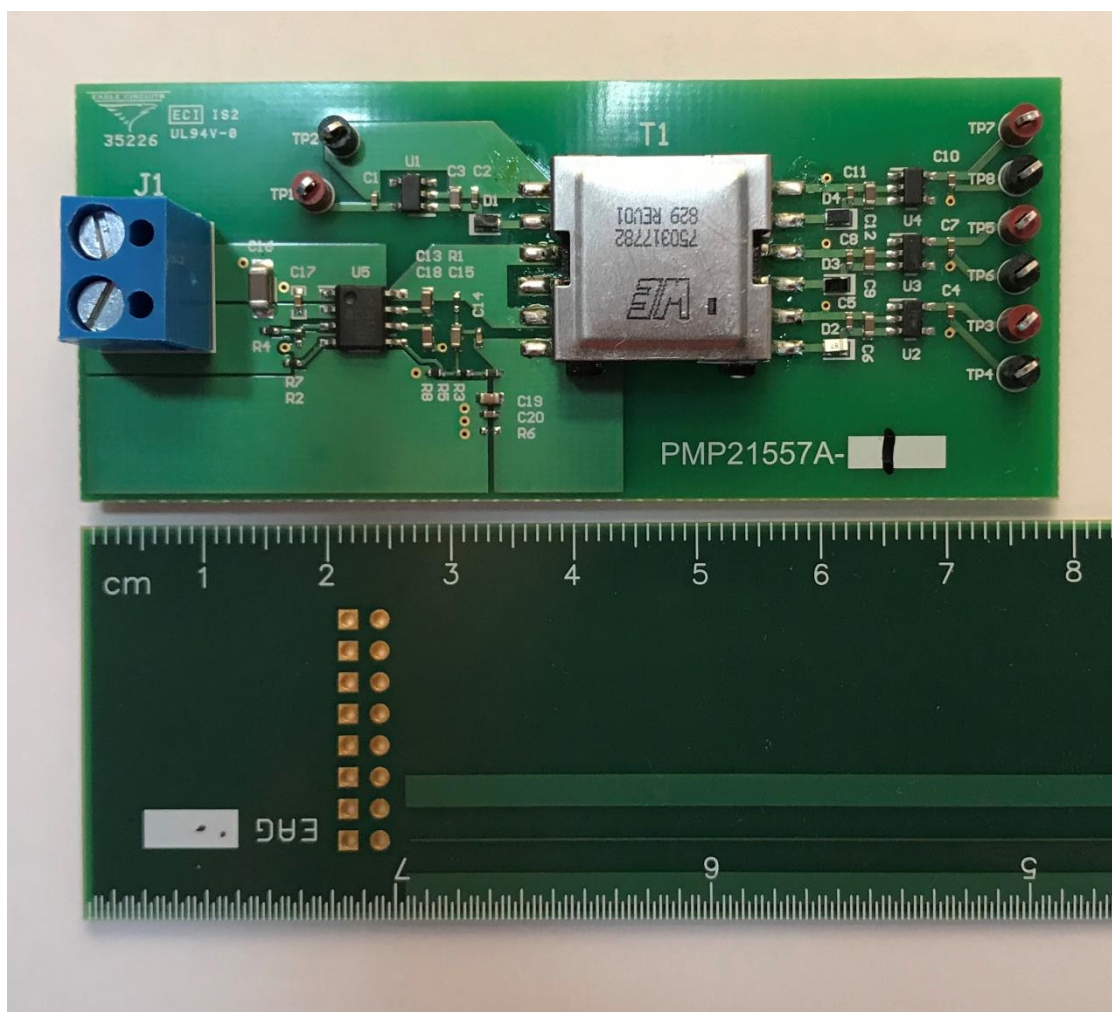
1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1.   Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
Input Voltage Range	19V-29V, 24V nominal
Output Voltage	3.3V +/- 1%
Output Current Per Rail	25mA nominal, 80mA max
Switching Frequency	500kHz

2 Testing and Results

2.1 Efficiency Data

The table below shows the efficiency data for PMP21557. The top row was tested with all outputs on full load. The other two rows were tested with two outputs full load and the other two with no load. In those rows the *Italicized* numbers denote the non-loaded outputs.

Input			Output 1			Output 2		
Vin [V]	Iin [A]	Pin [W]	Vout [V]	Iout[A]	Pout [W]	Vout [V]	Iout[A]	Pout [W]
23.686	0.0574	1.360	3.289	0.079	0.261	3.295	0.080	0.262
23.832	0.030867	0.736	3.296	*5.00E-06*	*0.000*	3.302	*5.00E-06*	*0.000*
23.834	0.03056	0.728	3.289	0.079	0.260575	3.295	0.080	0.262253

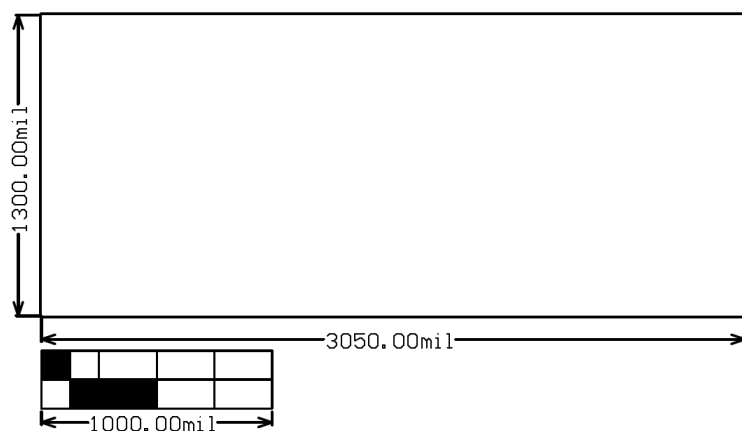| Output 3			Output 4			Total	Calculations	
Vout [V]	Iout[A]	Pout [W]	Vout [V]	Iout[A]	Pout [W]	Pout [W]	EFF [%]	LOSS [W]
3.296	0.080	0.262	3.291	0.079	0.261	1.047	**77.00%**	0.313
3.296	0.080	2.62E-01	3.291	0.079	2.61E-01	0.524	**71.23%**	0.212
3.303	*5.00E-06*	*0.000*	3.297	*5.00E-06*	*0.000*	0.523	**71.79%**	0.206

2.2 Dimensions

Figure 1. Board dimensions of PMP21557.

3   Waveforms

3.1   Switching

The switch node was measured with 24V input Voltage and all outputs at full load. Measured switching frequency = 434.8kHz, global maxima = 26.9V, global minima = -2.6V
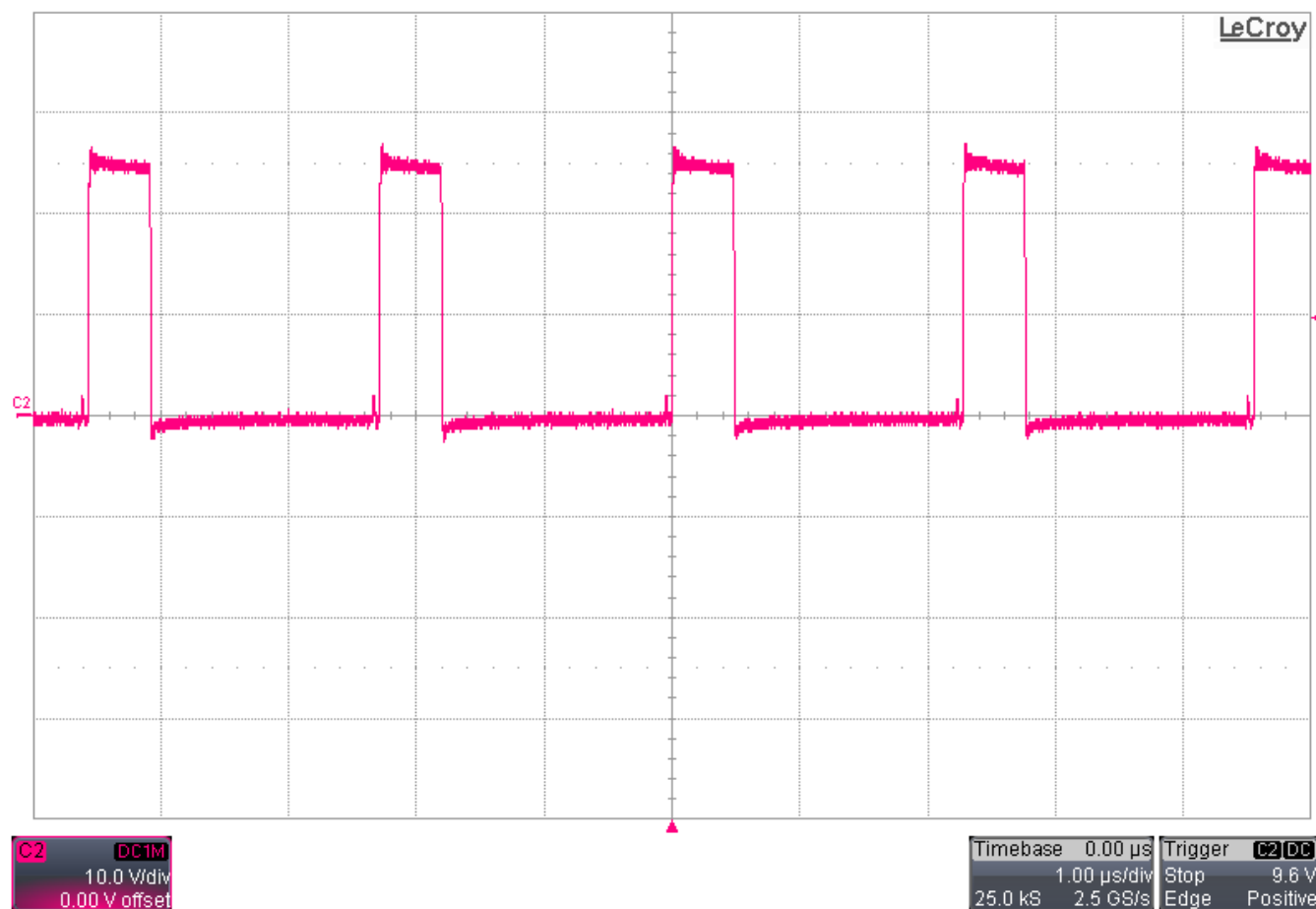

Figure 2. Primary Switching Node Waveform

3.2 Output Voltage Ripple

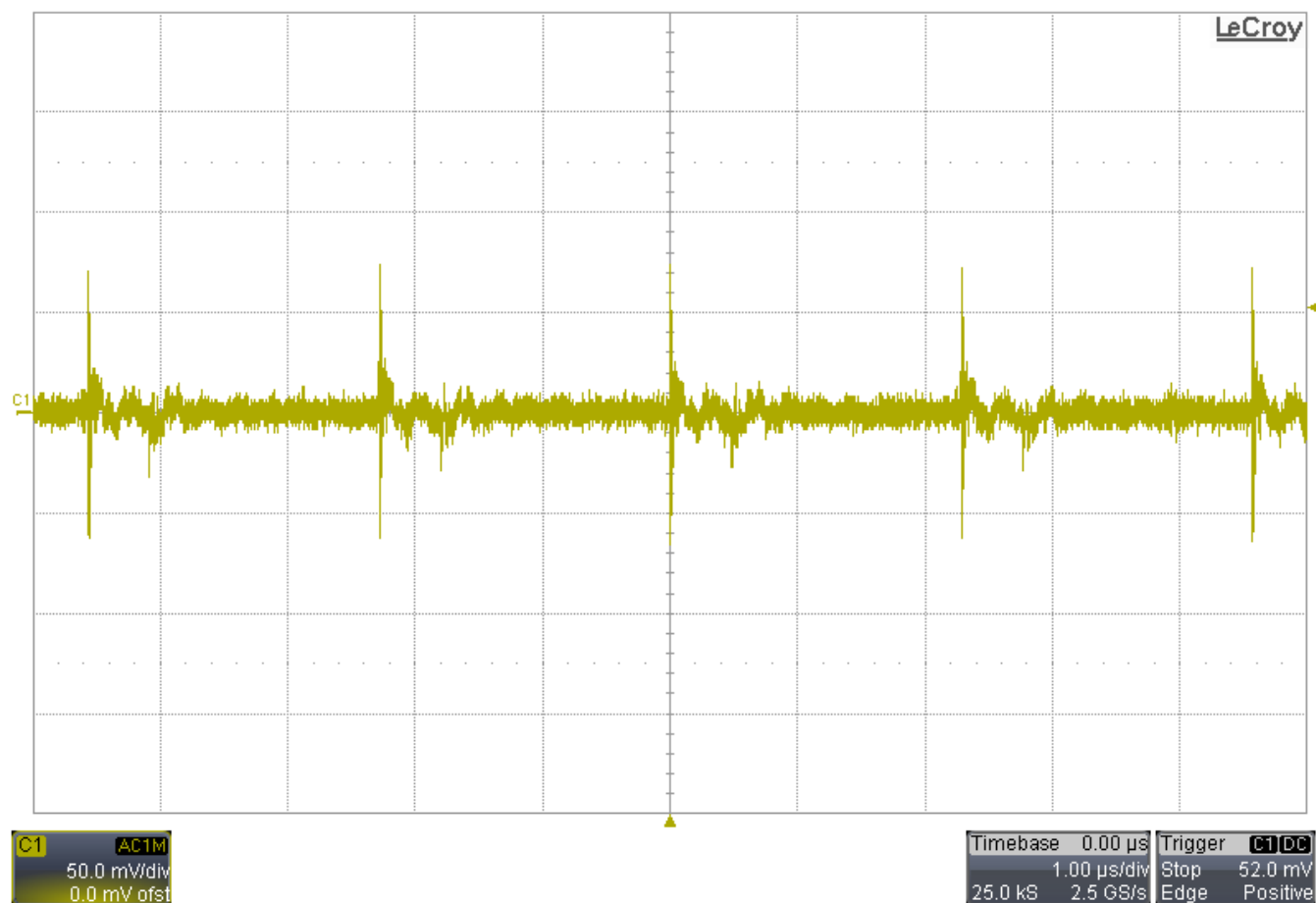Measurements were taken using the tip and barrel method across the output caps of the rail.
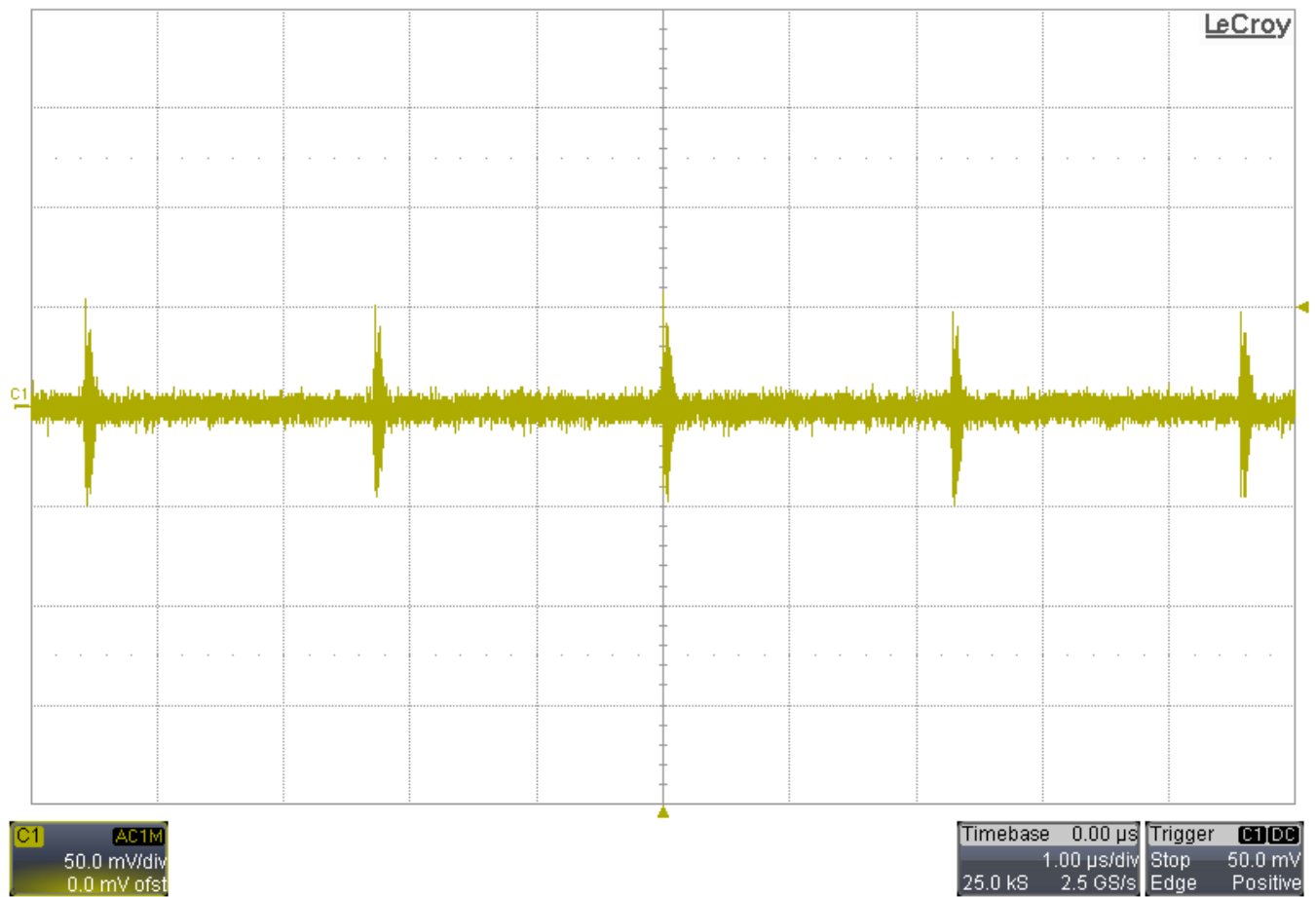

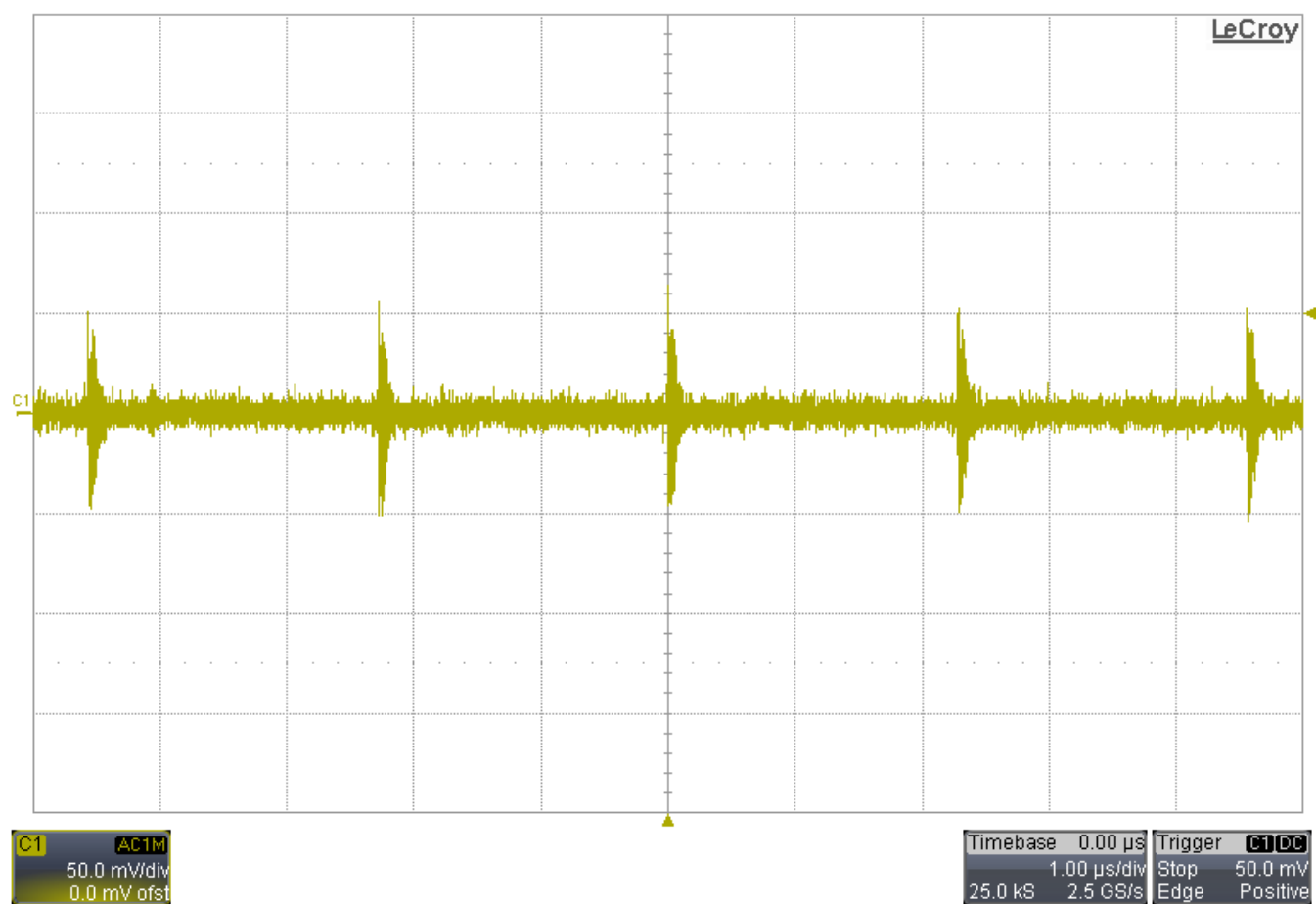**Figure 3.** Output 1 Voltage Ripple (C1)

Figure 4. Output 2 Voltage Ripple (C4)

Figure 5. Output 3 Voltage Ripple (C7)
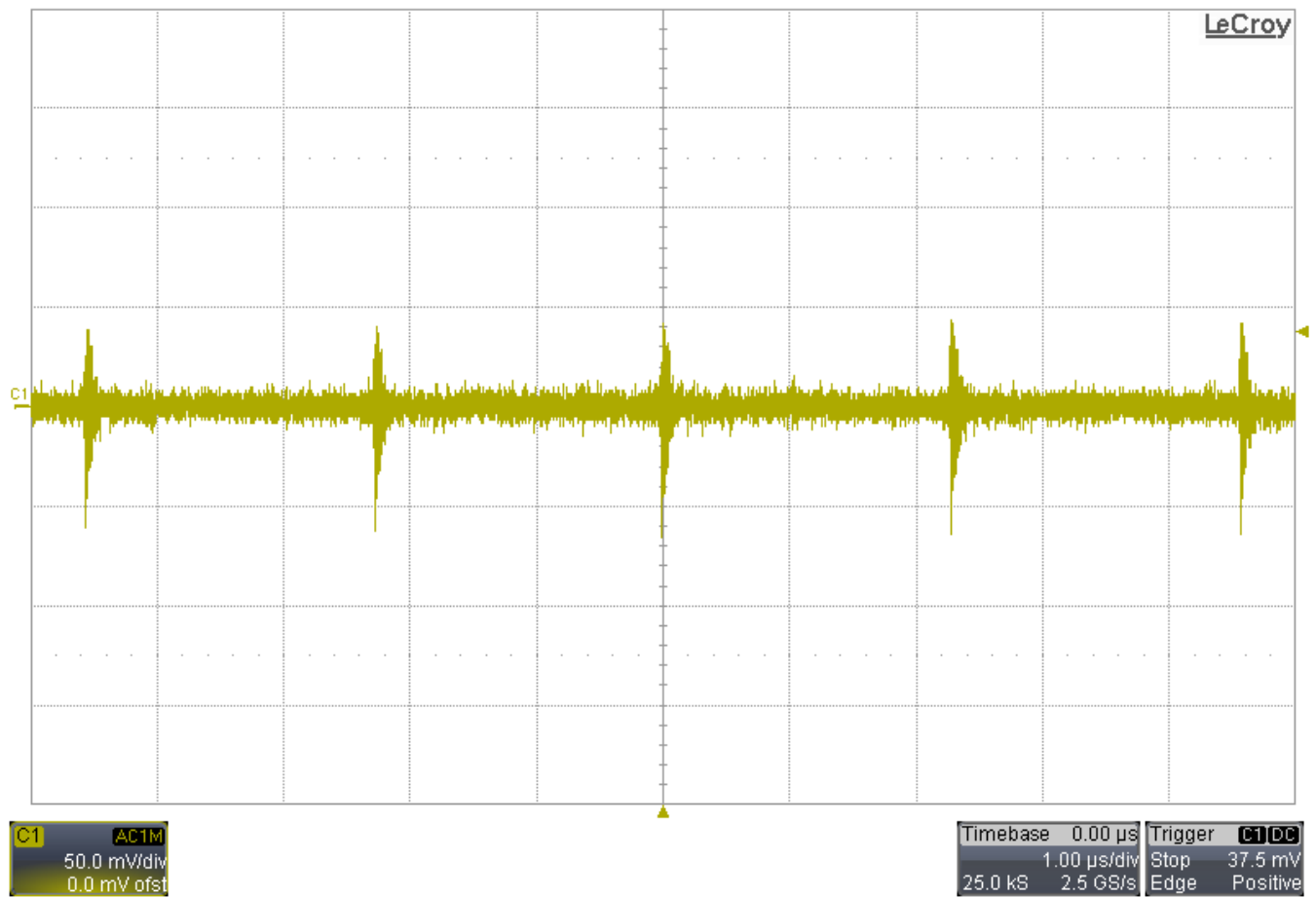
Figure 6. Output 4 Voltage Ripple (C10)

3.3 Load Transients

For the transient testing, V1 and V3 were full loaded. V2 and V4 were loaded with a load step between 10mA for 10ms and 80mA for 20ms. Slew rate was set to 80mA/µs. The output voltage measurements were taken at the output test points. The plots show the high accuracy of the linear regulators during transients.
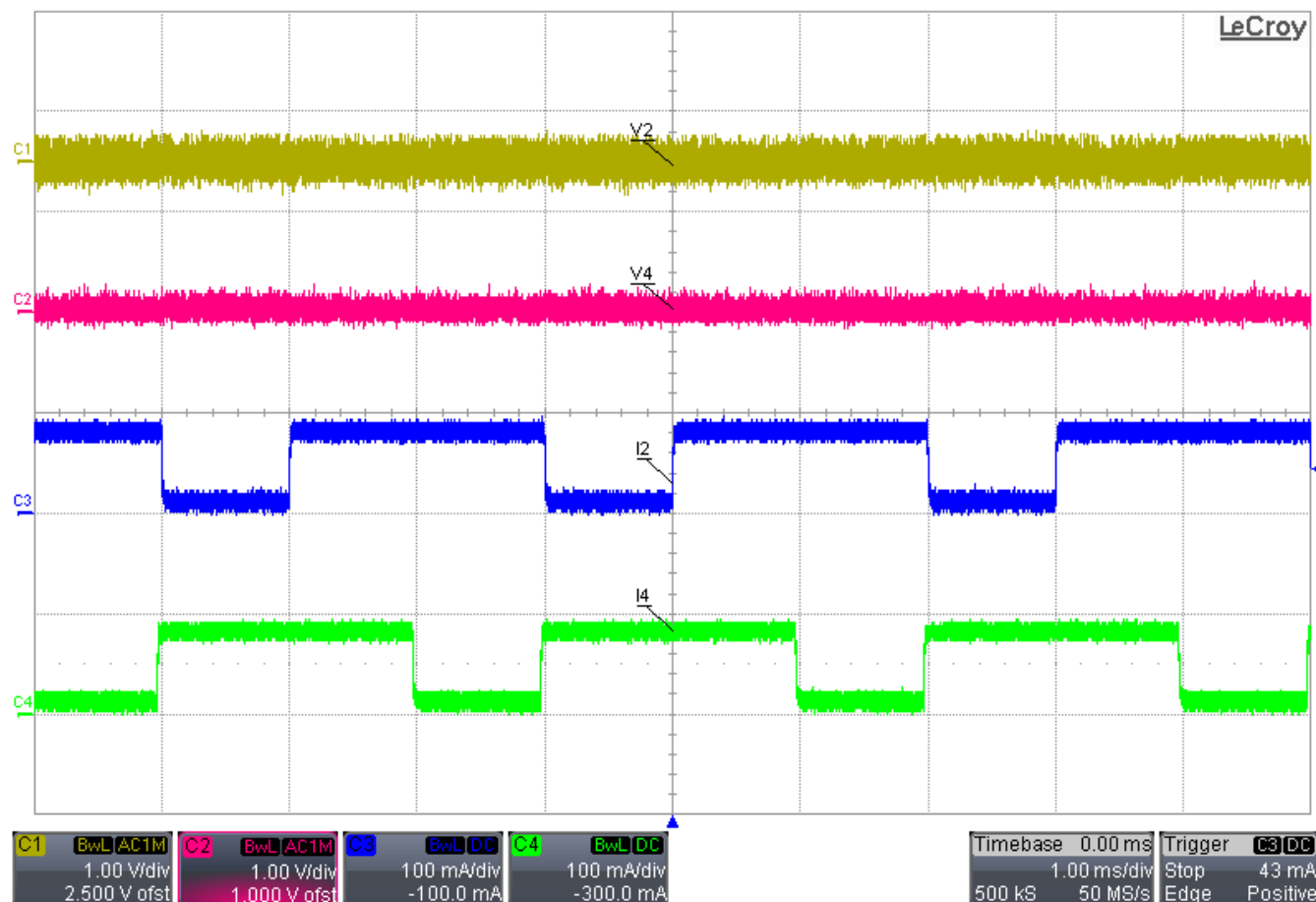
Figure 7. Load Transient on Outputs 2 and 4. Output Voltages 2 and 4 are shown.
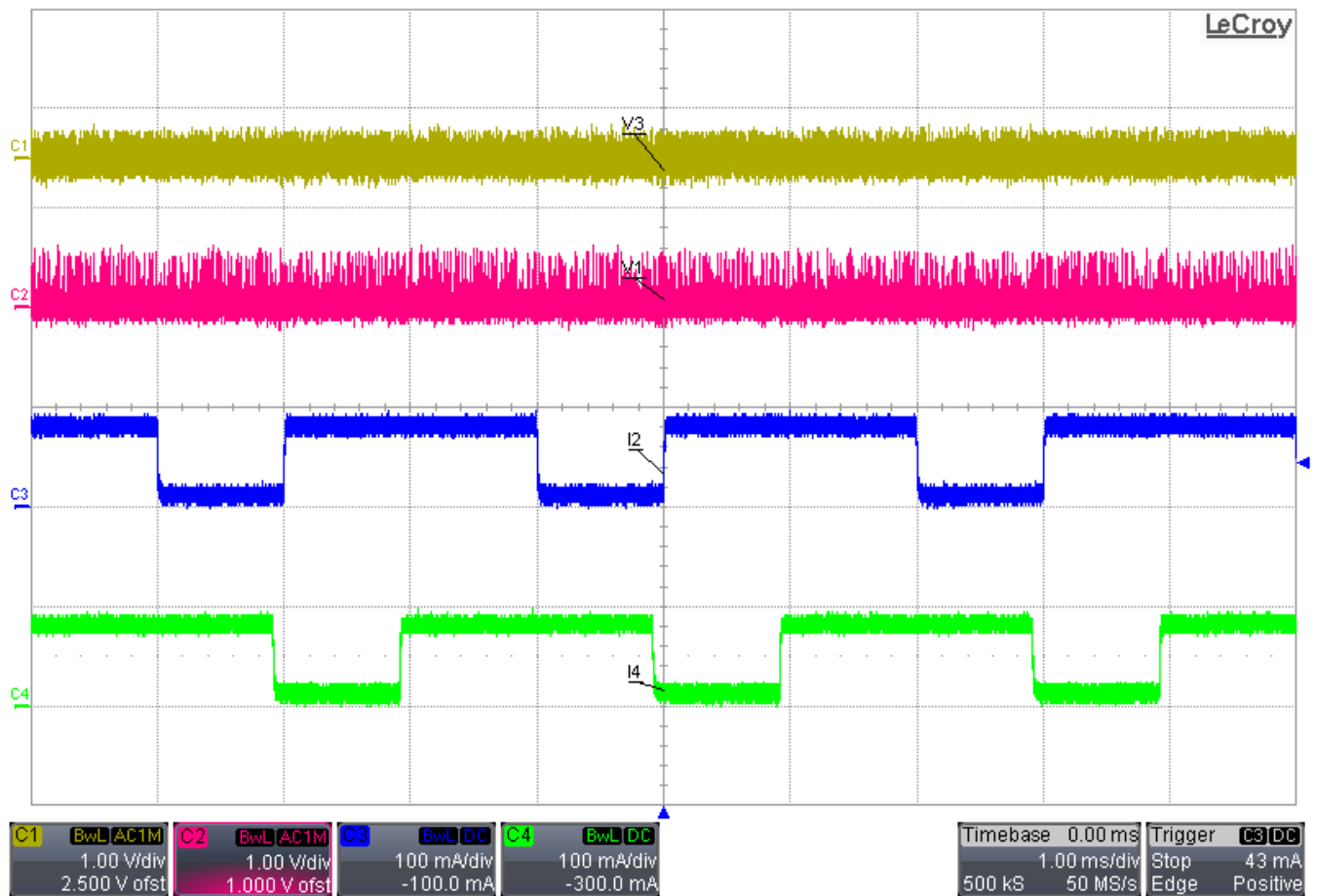
Figure 8. Load Transient on Outputs 2 and 4. Output Voltages 1 and 3 are shown.

3.4 Start Up Sequence

Start up sequencing was measured by applying a 24VDC source to the input.

Figure 9. Start up voltages of the input and outputs 1 and 2.

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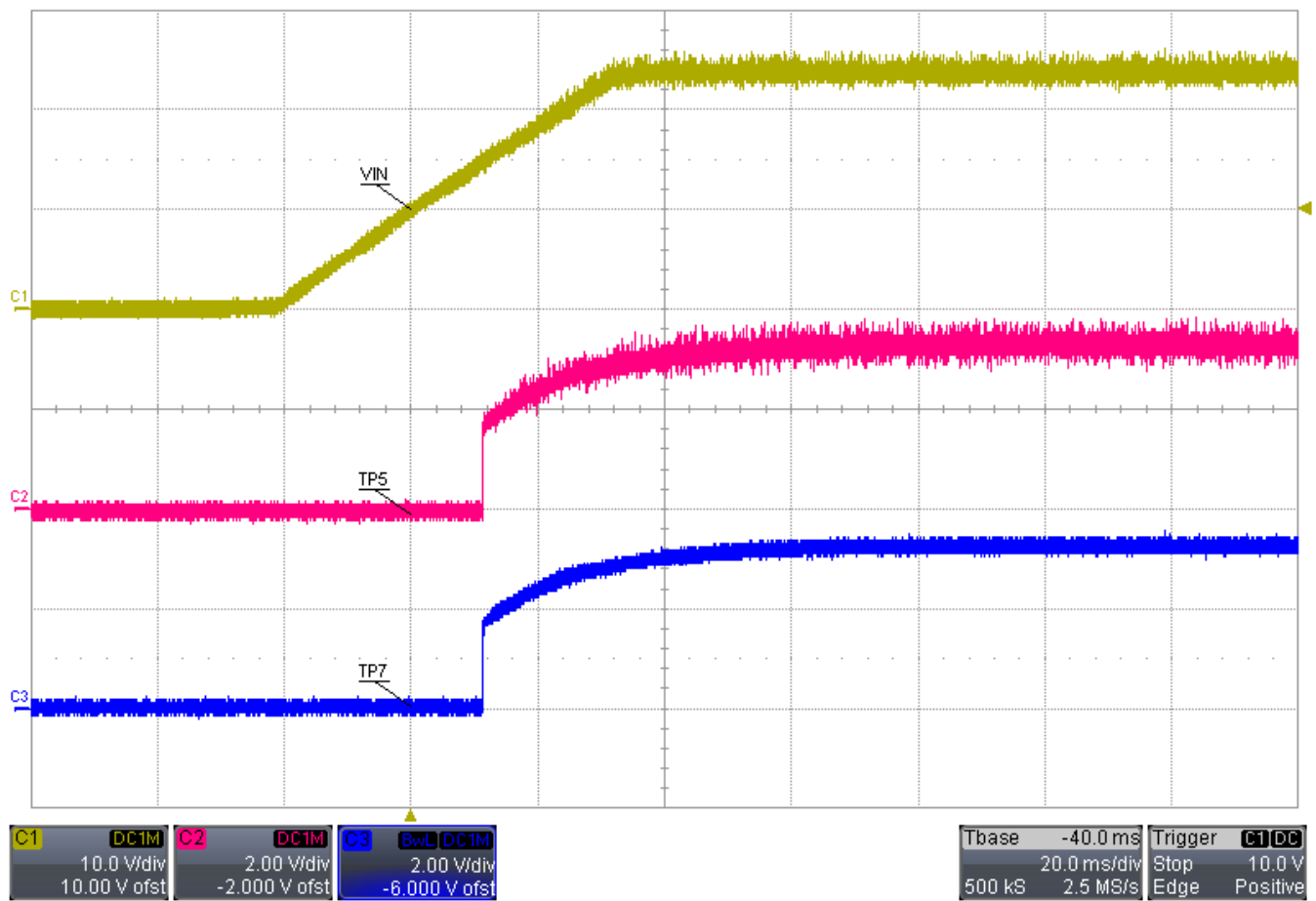
Figure 10. Start up voltages of the input and outputs 3 and 4.

3.5 Power Down Sequence

Power down sequencing was measured by removing a 24VDC source from the input. All of the outputs were set to max load (80mA).
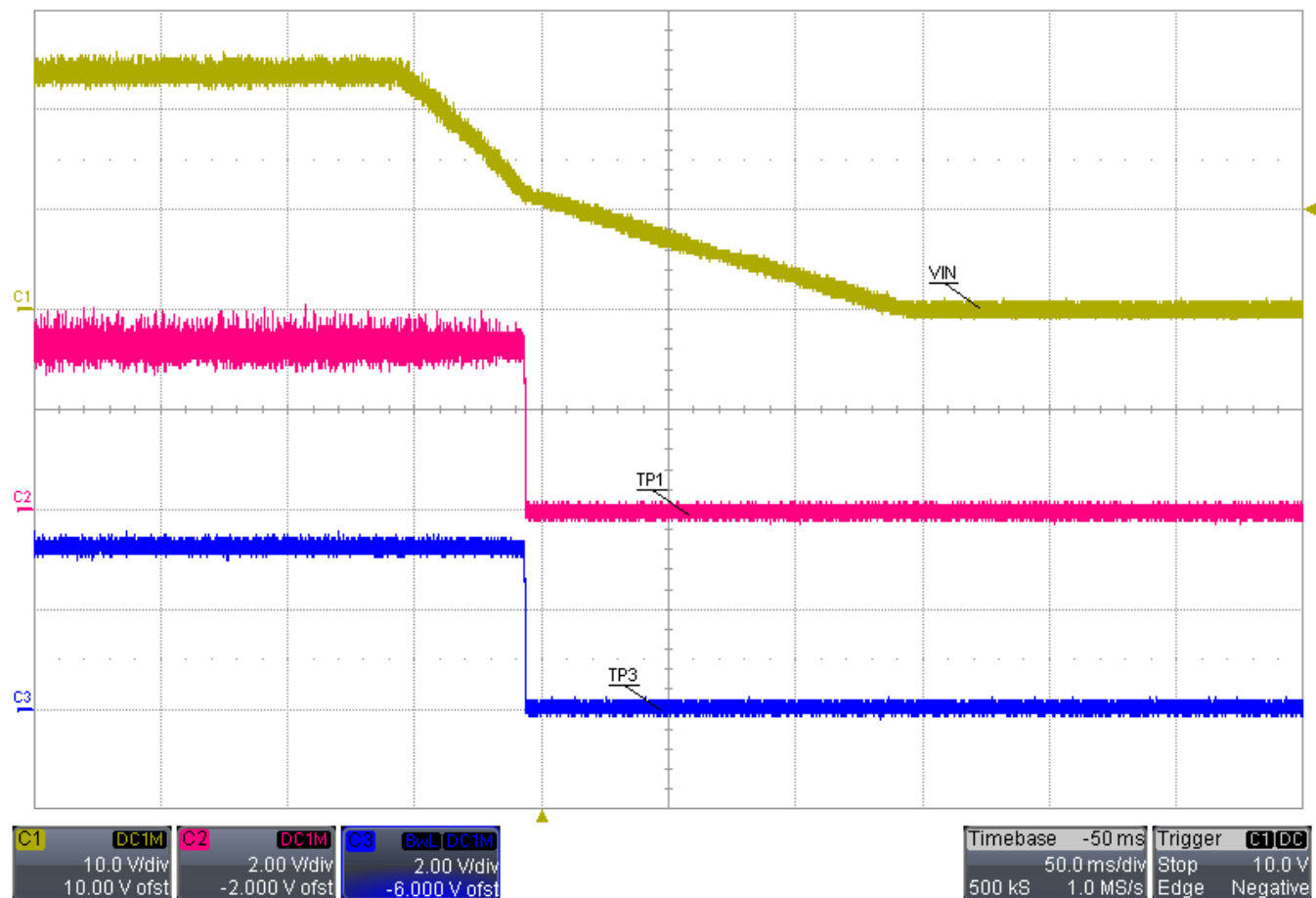
Figure 11. Power down voltages of the input and outputs 1 and 2.
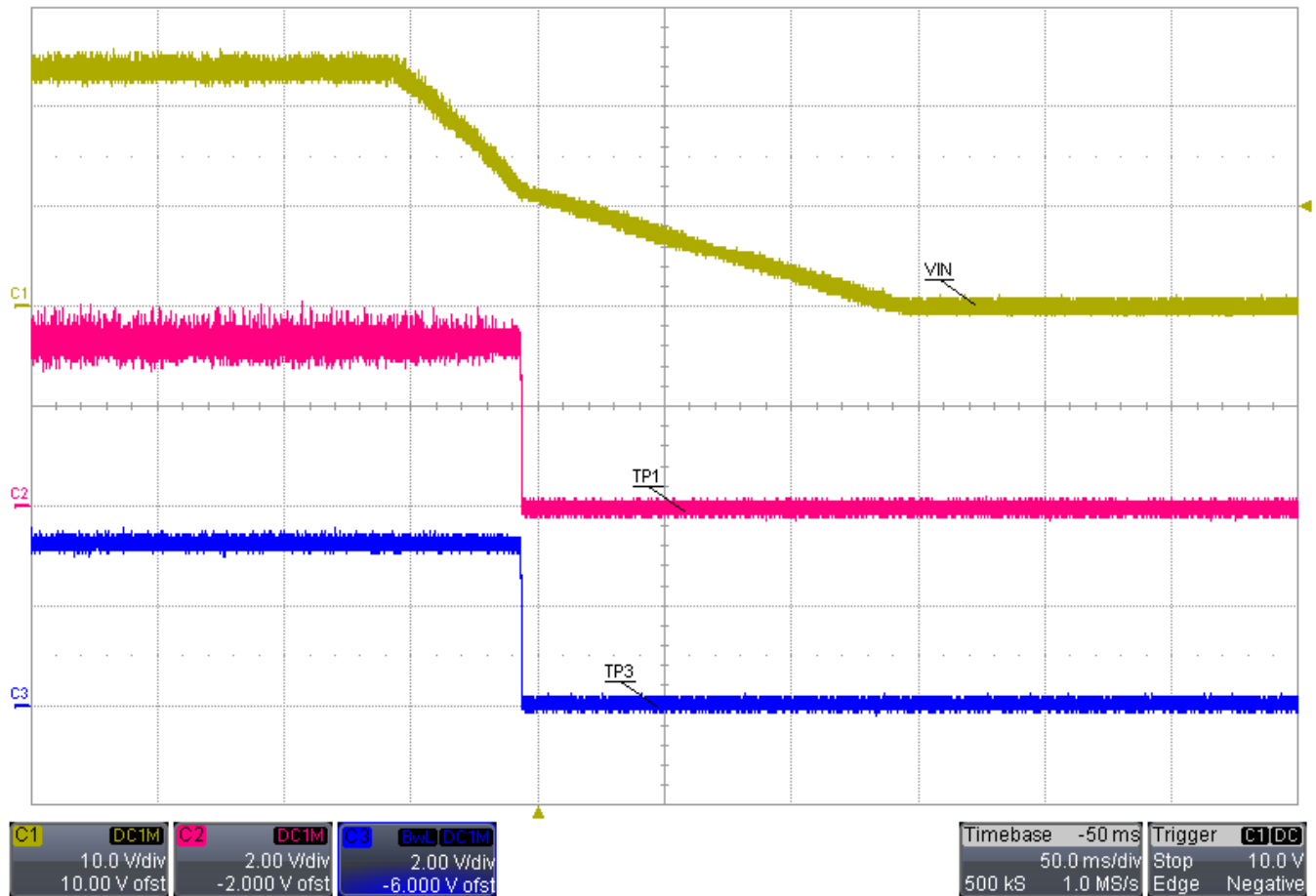
Figure 12. Power down voltages of the input and outputs 3 and 4.

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