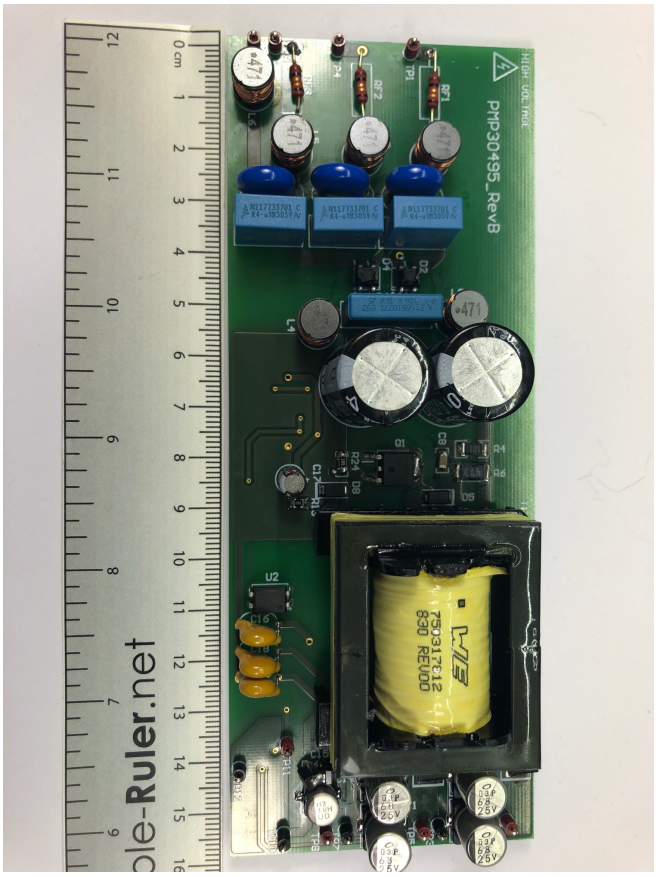
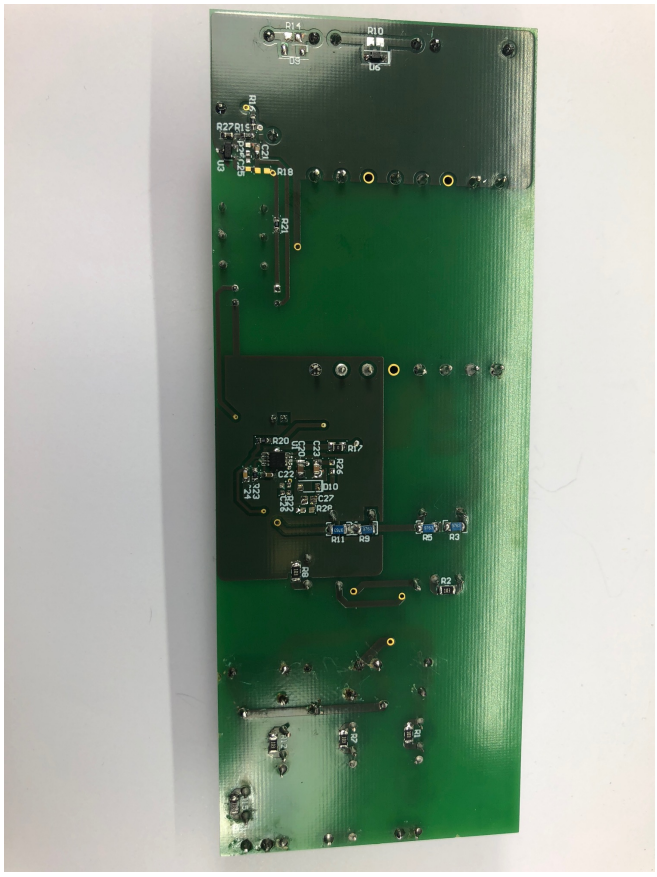
Test Report: PMP30495
58-VAC - 255-VAC 3-Phase Input Multiple Output Flyback Reference Design

Description

The PMP30495 is a power supply reference design with a 3-phase input (58VAC-255VAC [Line-to-Neutral]; 100VAC-440VAC [Line-to-Line]) and multiple isolated outputs (12V@705mA; 12V@733mA; 35V@25mA). The continuous maximum output power is 12.8W. The controller LM5021 operates at a fixed switching frequency of 100kHz. An optional skip cycle mode reduces input power and increases efficiency at light load conditions.





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1 Test Prerequisites

1.1 Voltage and Current Requirements

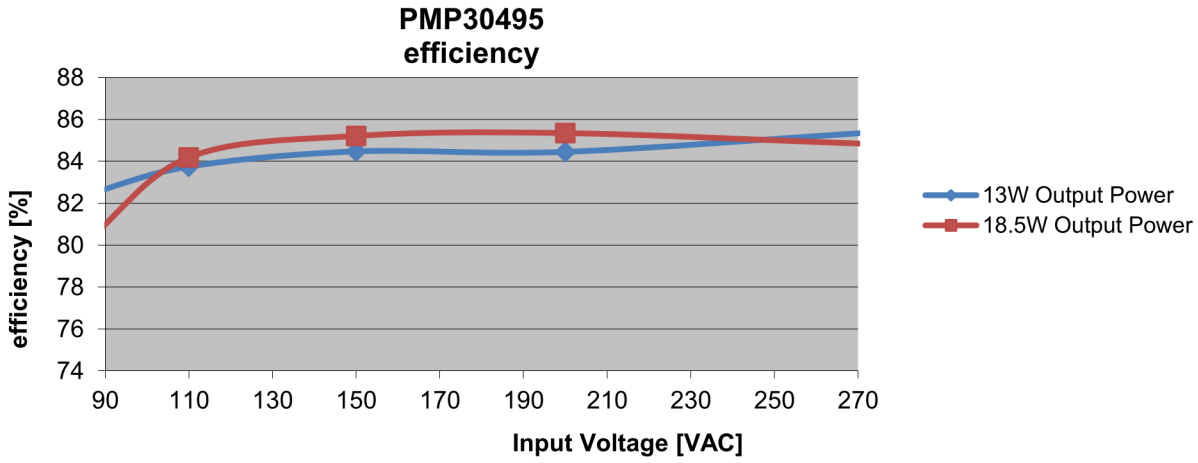
Table 1. Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
V_{IN}	3Phase: 58VAC-255VAC Line-Neutral
V_{OUT}	12V@705VA; 12V@733mA; 35V@25mA
Nominal switching frequency	100kHz

2 Testing and Results

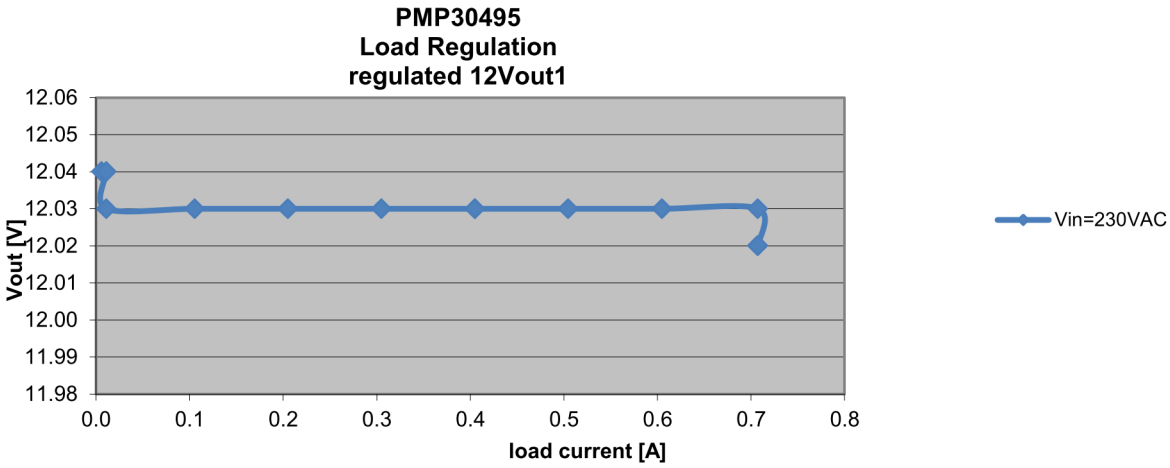
2.1 Efficiency Graphs

Figure 1. Efficiency vs. Input Voltage



2.2 Load Regulation

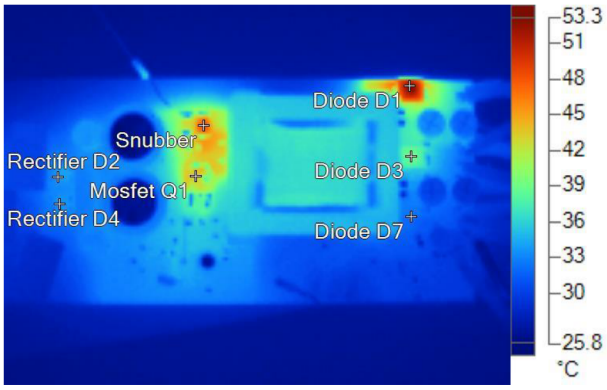
Figure 2. Load Regulation regulated output 12Vout1



2.3 Thermal Images

The images below show the infrared images taken from the FlexCam after 15min at 13W load output power.

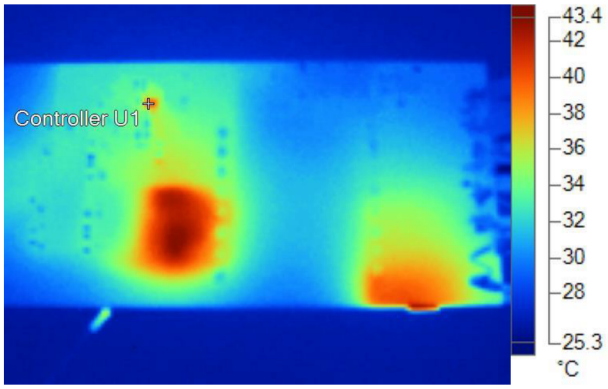
Figure 3. Thermal Image Top View



1360_Vin=230VAC 12V@0.71A 12V@0.24A 35V@25mA Top.is2

Name	Temperature	
Snubber	48.2°C	
Diode D1	53.3°C	
Diode D3	39.4°C	
Diode D7	32.3°C	
Mosfet Q1	43.8°C	
Rectifier D2	33.8°C	
Rectifier D4	33.5°C	

Figure 4. Thermal Image Bottom View



1361_Vin=230VAC 12V@0.71A 12V@0.24A 35V@25mA Bottom.is2

Name	Temperature	
Controller U1	39.8°C	

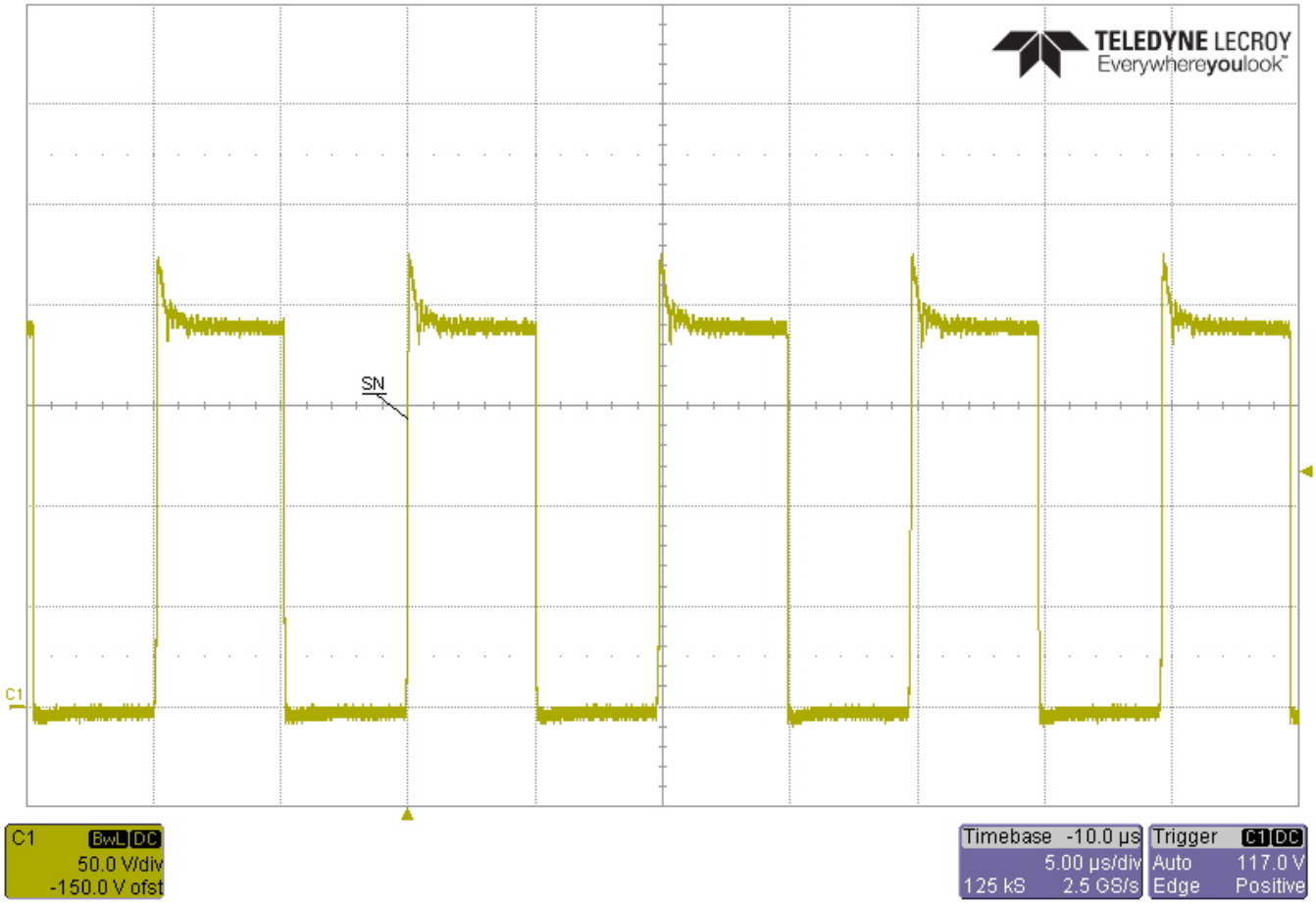
2.4 Dimensions

158mm x 61mm

3 Waveforms

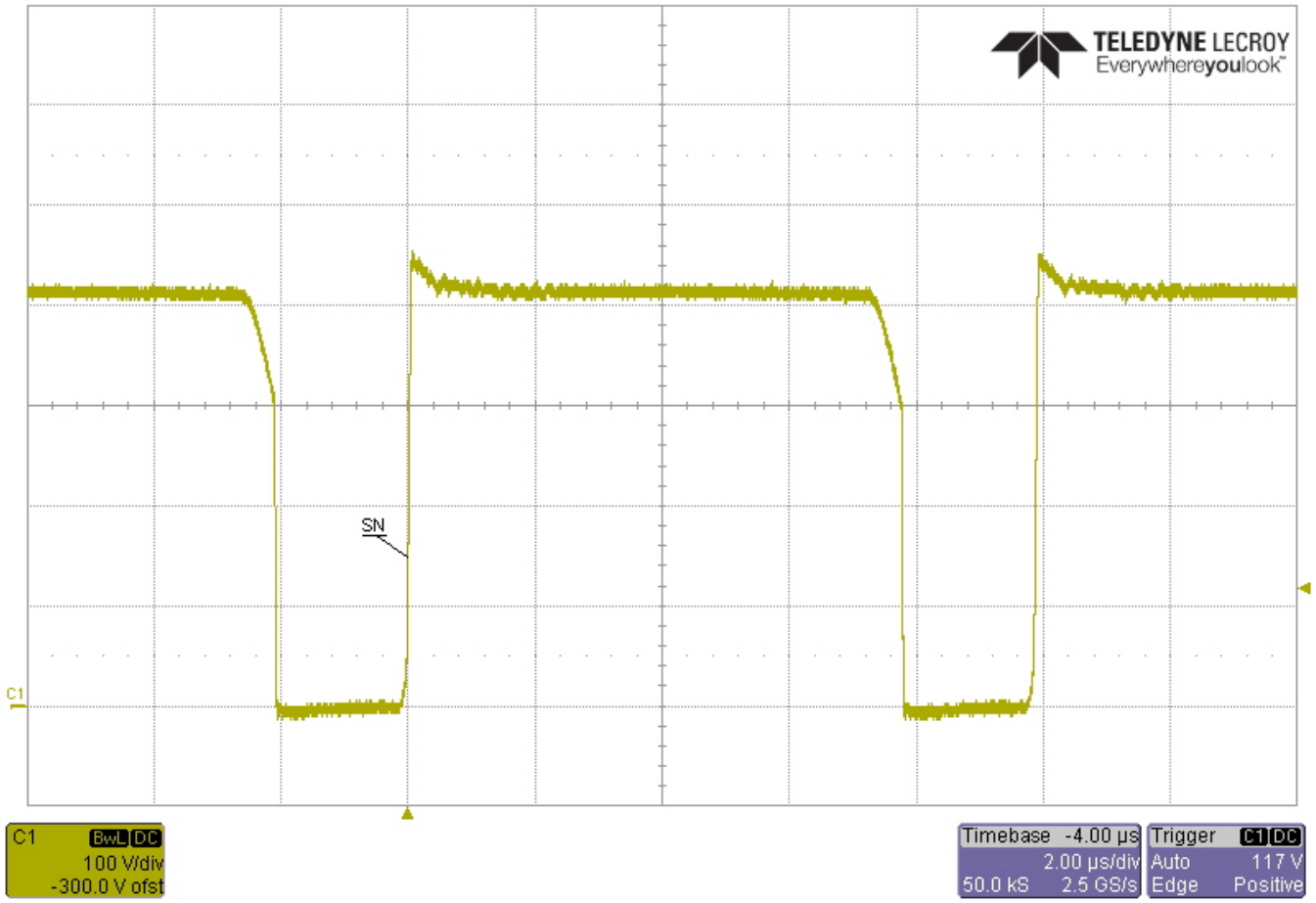
3.1 Switching

Figure 5. Switchnode



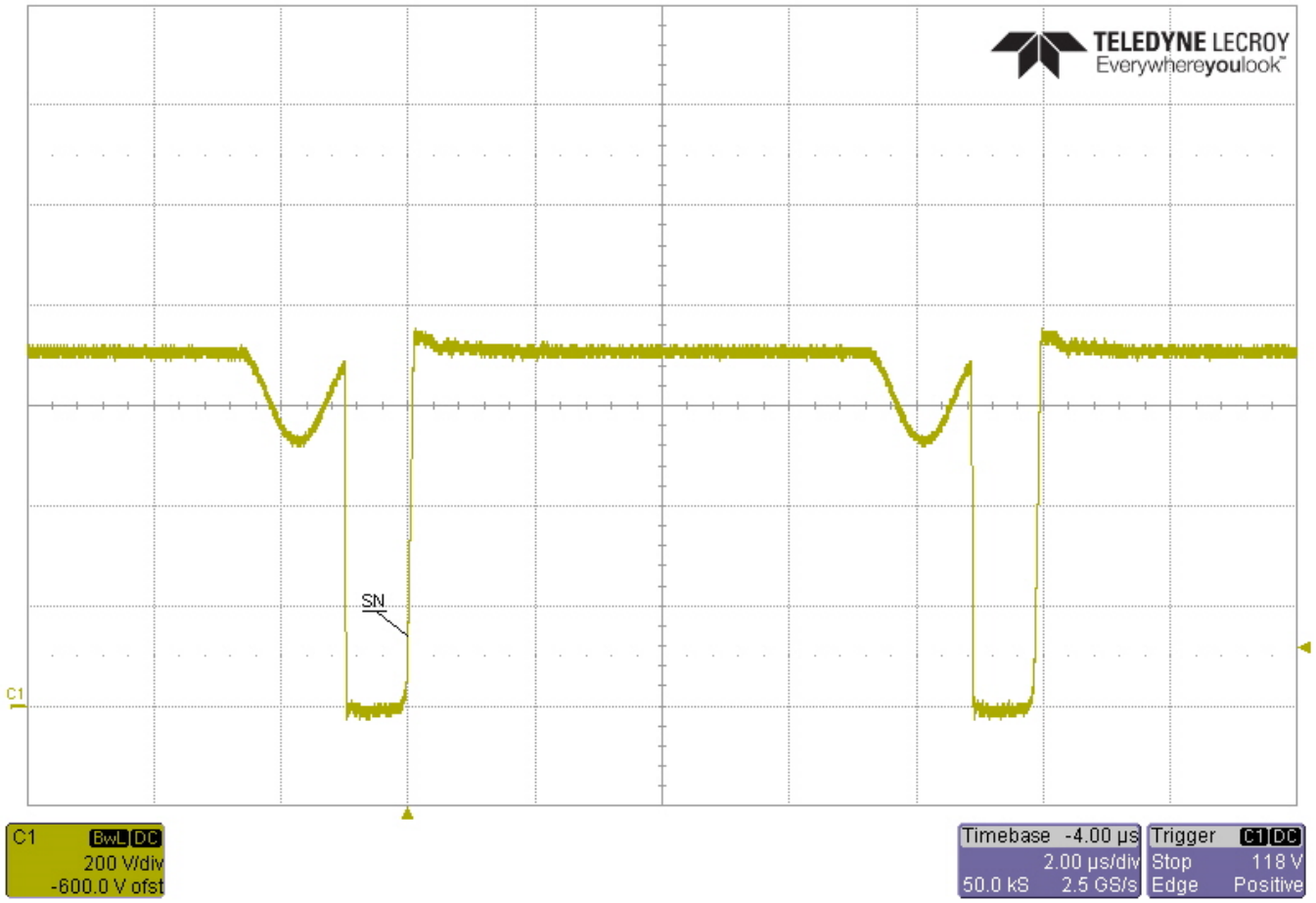
- Input Voltage = 100VDC
- Output Power = 12.8W

Figure 6. Switchnode



- Input Voltage = 325VDC
- Output Power = 12.8W

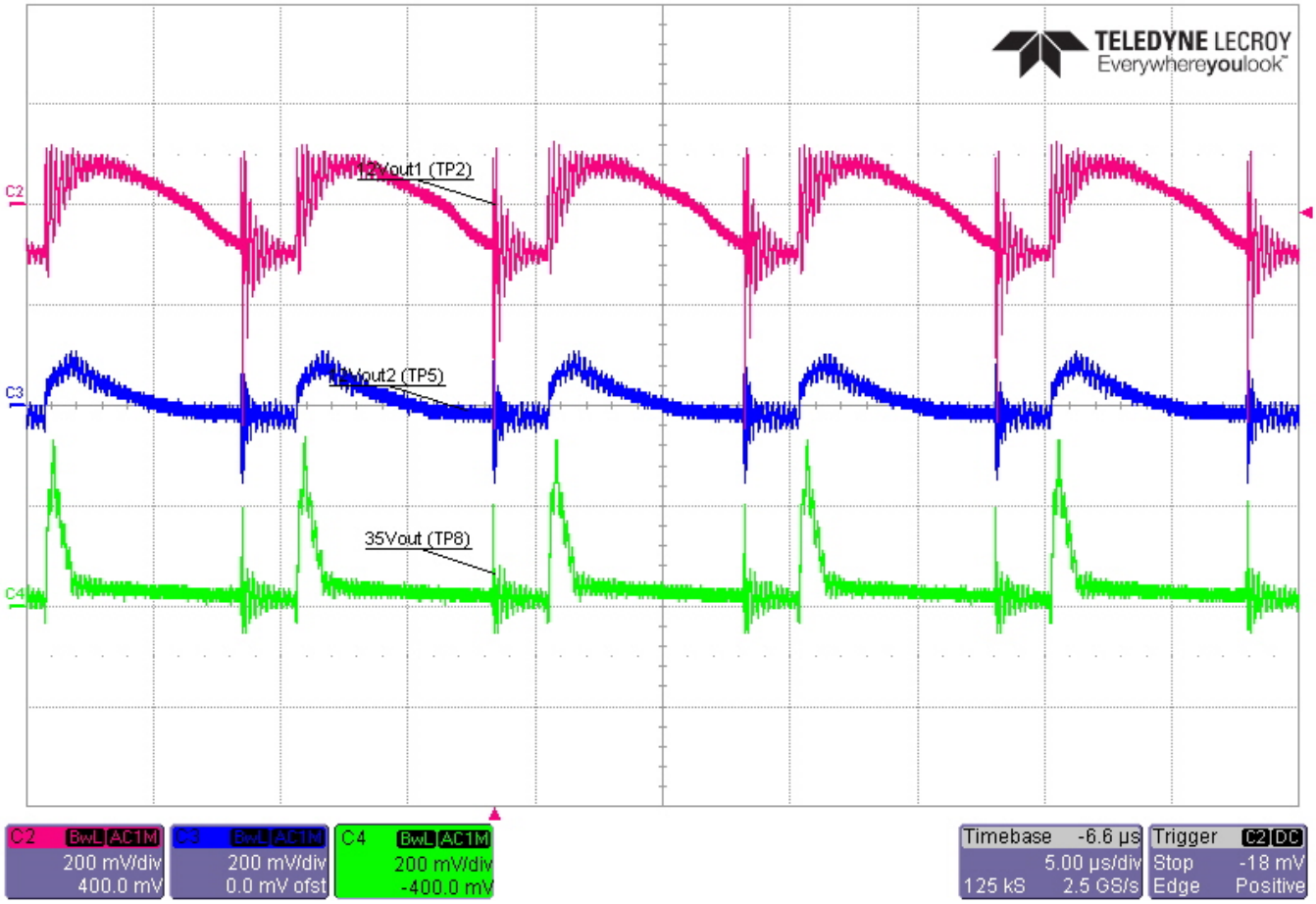
Figure 7. Switchnode



- Input Voltage = 623VDC
- Output Power = 12.8W

3.2 Output Voltage Ripple

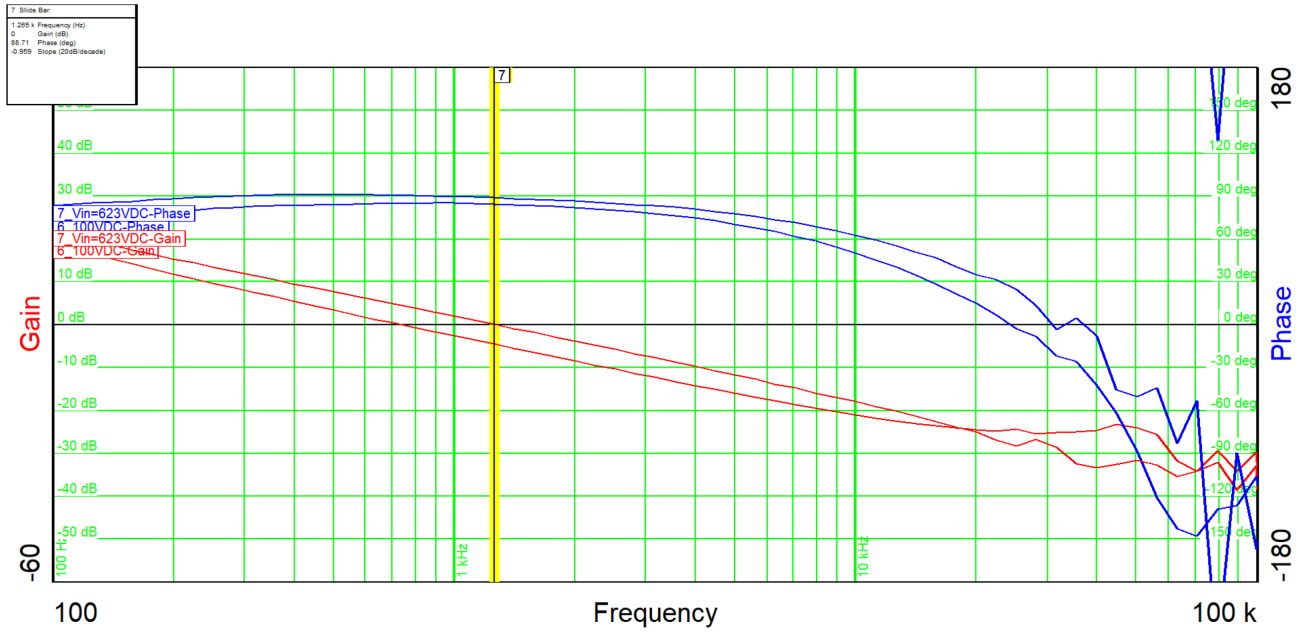
Figure 8. Output Ripple



- Input Voltage = 230VAC
- Load Current 12Vout1= 705mA
- Load Current 12Vout2 = 235mA
- Load Current 35Vout = 25mA

3.3 Bode Plot

Figure 9. Total Open Loop



Input Voltage = 100VDC:

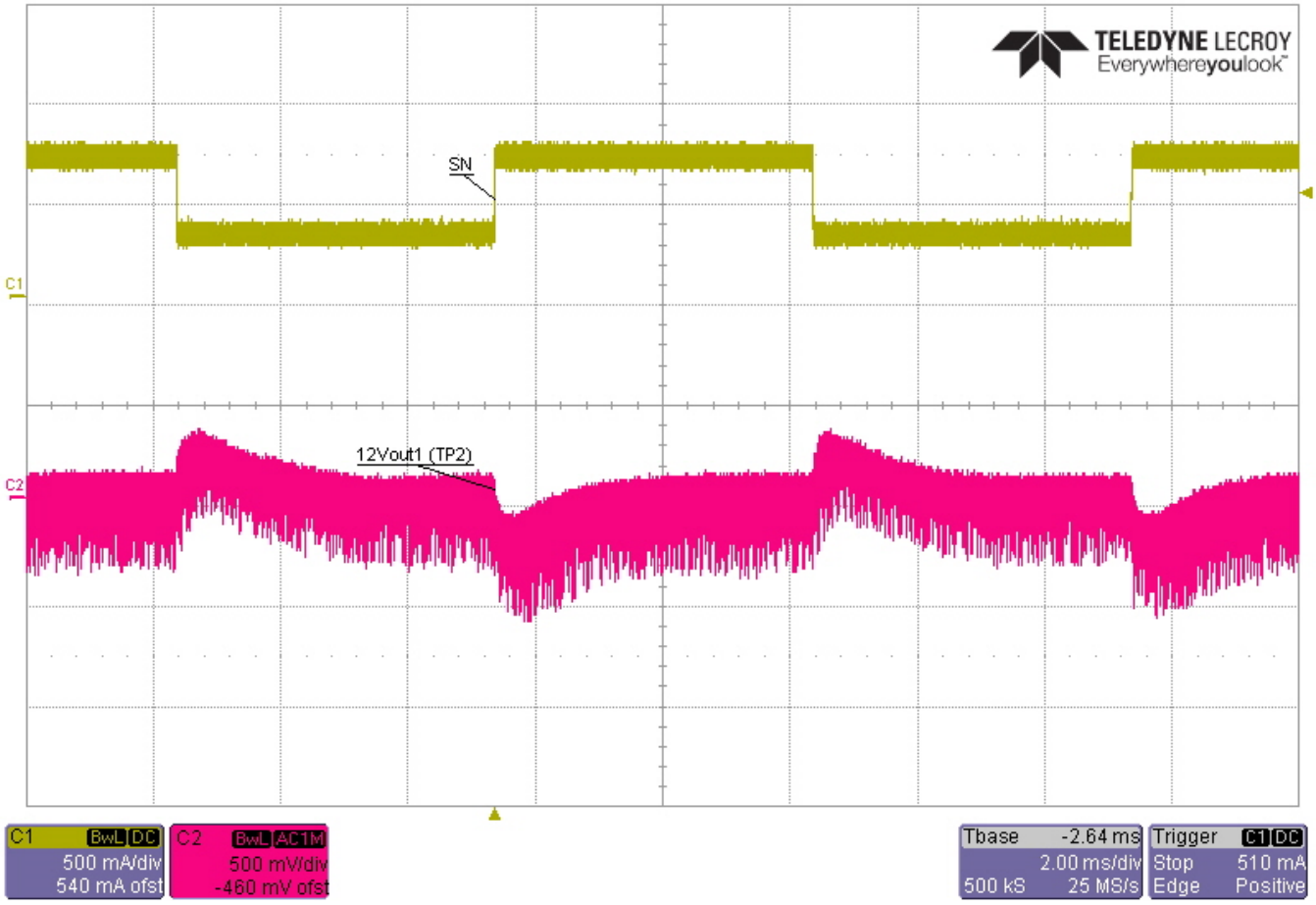
- Output Power = 18W
- Bandwidth = 0.7kHz
- Phasemargin = 85°
- Gain Margin > 20dB

Input Voltage = 623VDC:

- Output Power = 18W
- Bandwidth = 1.3kHz
- Phasemargin = 89°
- Gain Margin > 20dB

3.4 Load Transients

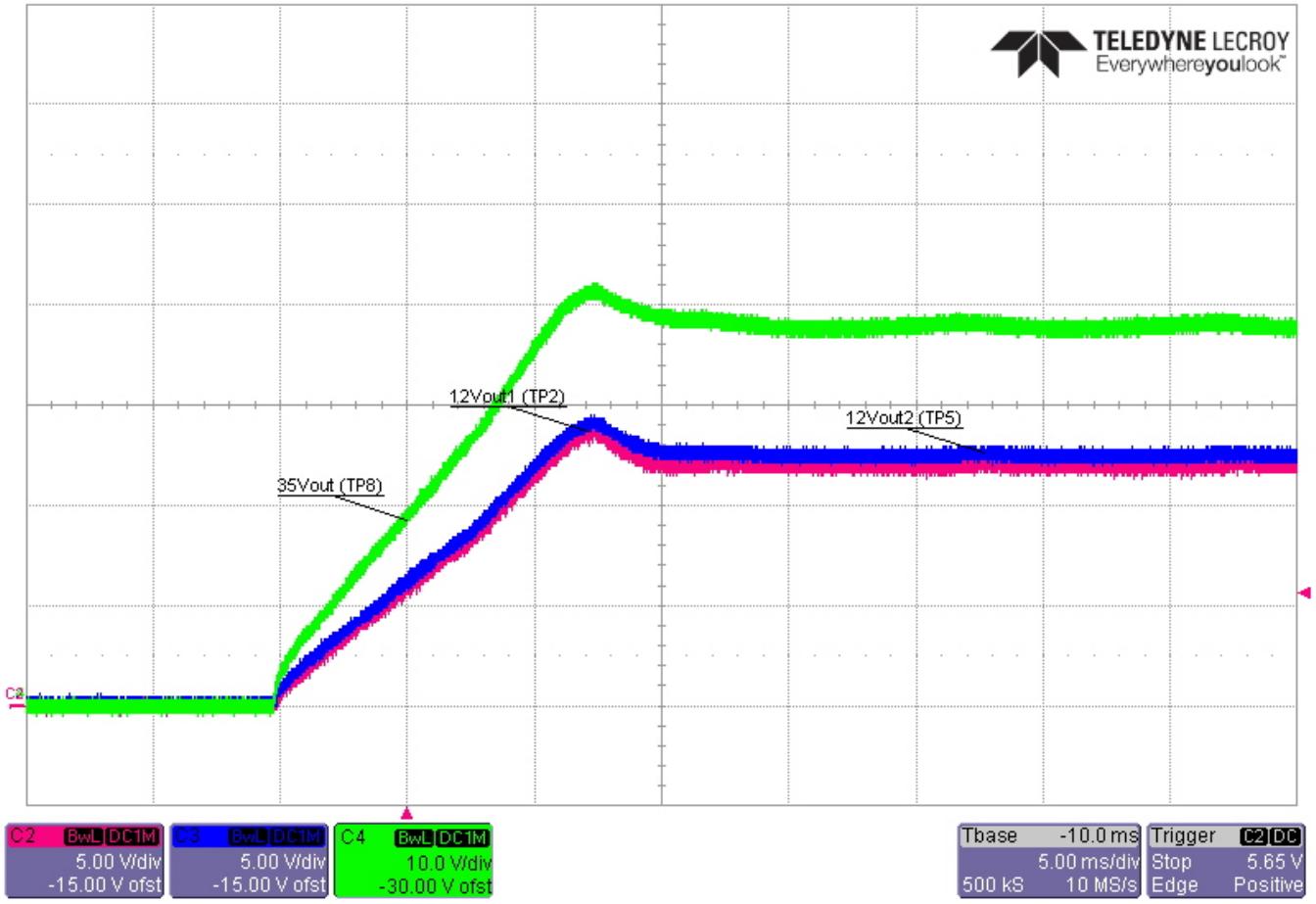
Figure 10. Load Step Response Regulated Output 12Vout1



- Input Voltage 230VAC
- Load Current 12Vout1= 300mA - 700mA

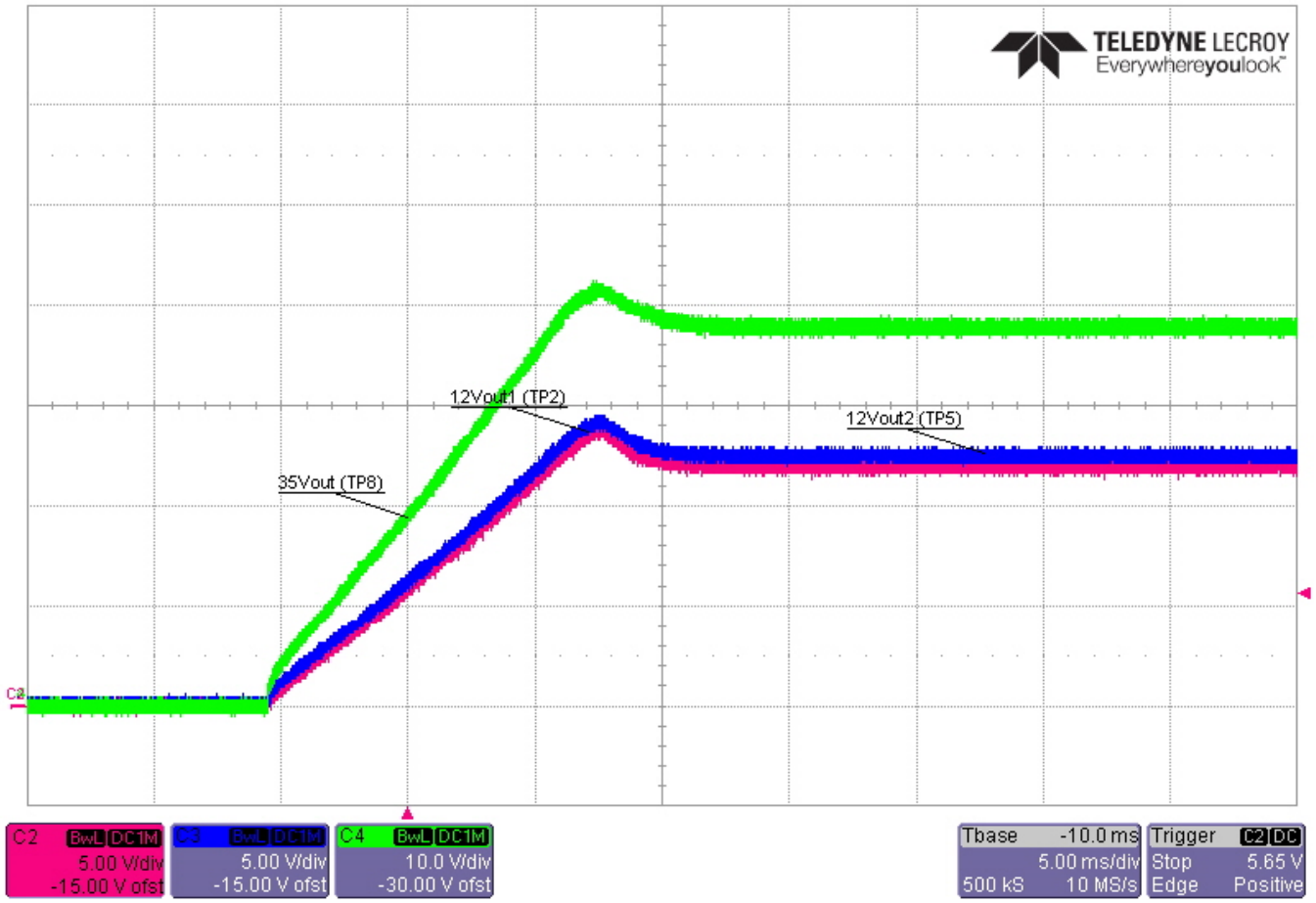
3.5 Start-up Sequence

Figure 11. Startup



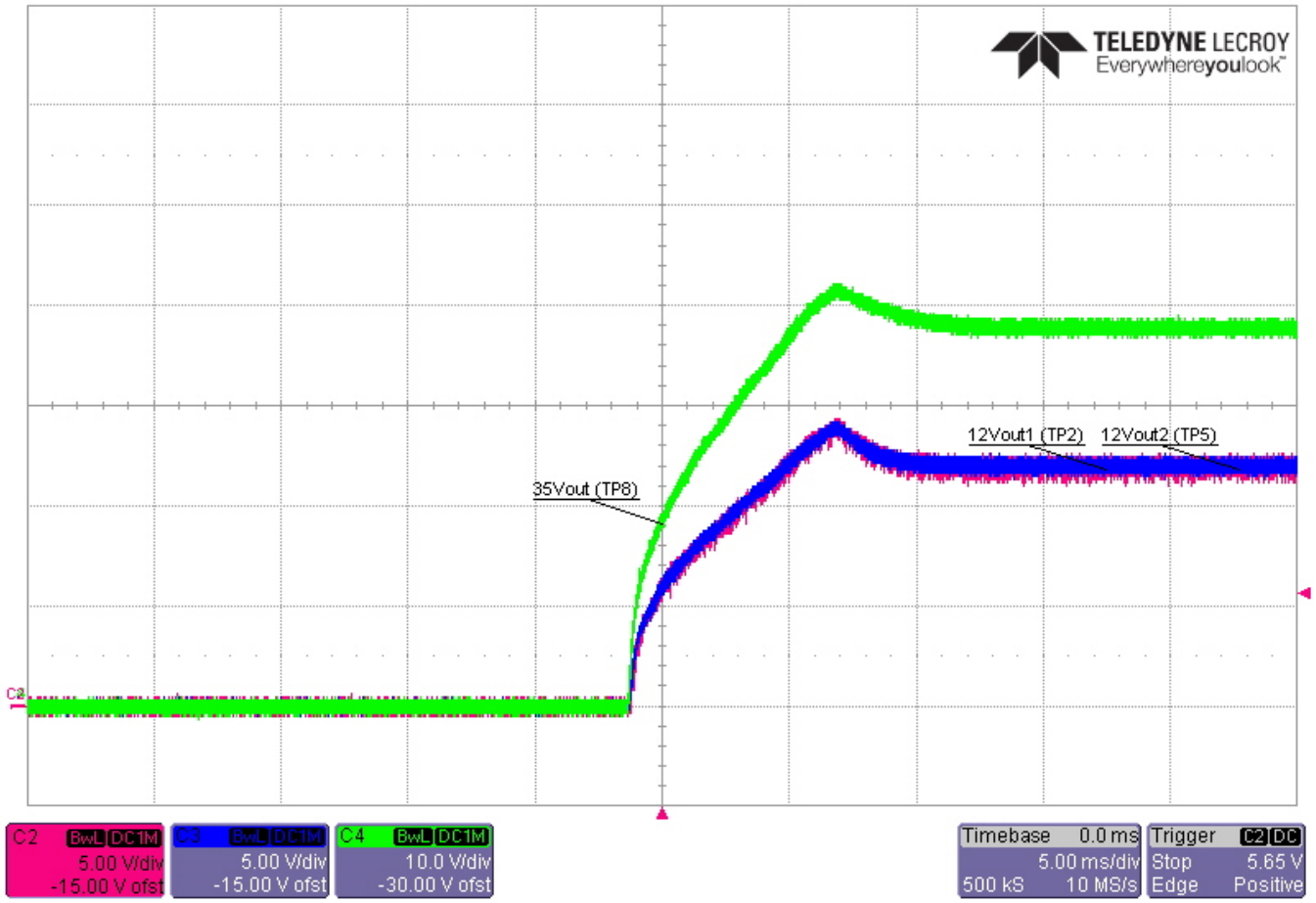
- Input Voltage = 85VAC
- Output Power = 12.8W

Figure 12. Startup



- Input Voltage = 100VDC
- Output Power = 12.8W

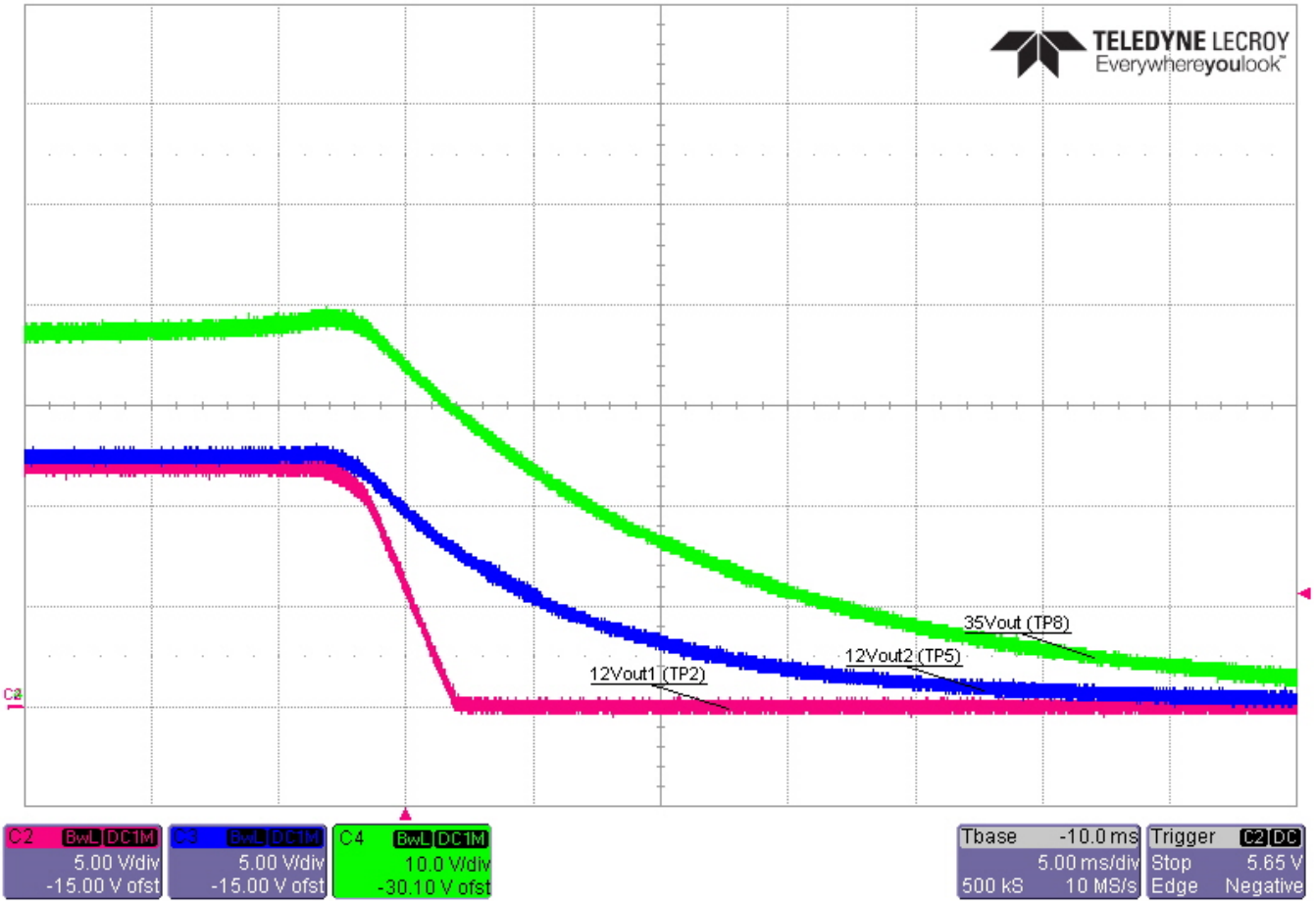
Figure 13. Startup



- Input Voltage = 623VDC
- Output Power = 12.8W

3.6 Shutdown

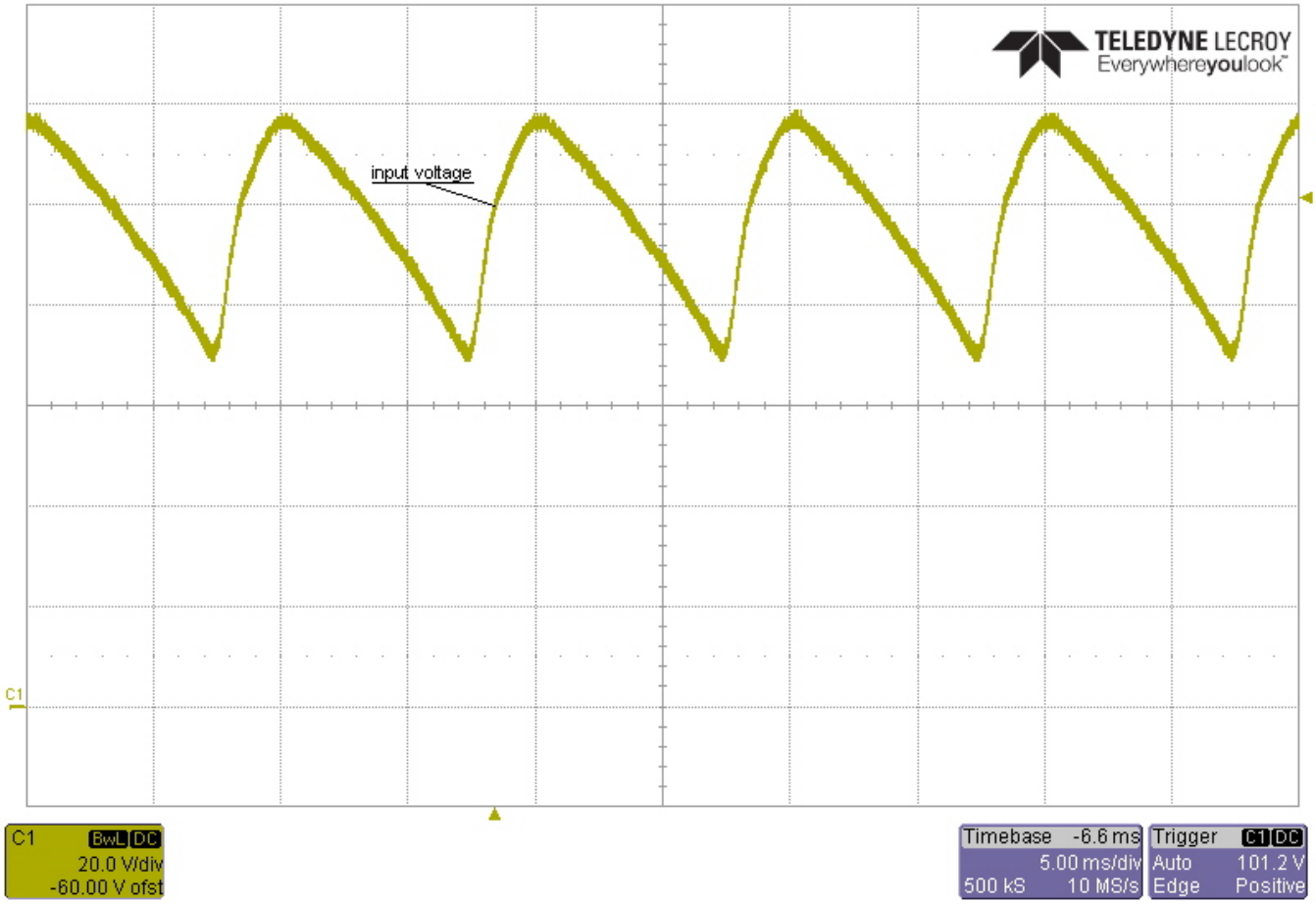
Figure 14. Shutdown



- Input Voltage = 230VAC
- Output Power = 12.8W

3.7 Input Ripple Voltage

Figure 15. Bulk Voltage



- Input Voltage = 85VAC
- Output Power = 12.8W

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