

Test Report: PMP30502

18-VDC - 30-VDC Input Multiple Output Flybuck Reference Design



TEXAS INSTRUMENTS

Description

The LM3150 synchronous buck controller is used in a flybuck topology to generate one non-isolated (3.3V@5A) and two isolated outputs (5V@0.1A, 5V@0.1A) from an input voltage between 18V and 30V. Two additional linear regulator LP2922A improve the regulation of the secondary outputs.

Figure 1. Top View

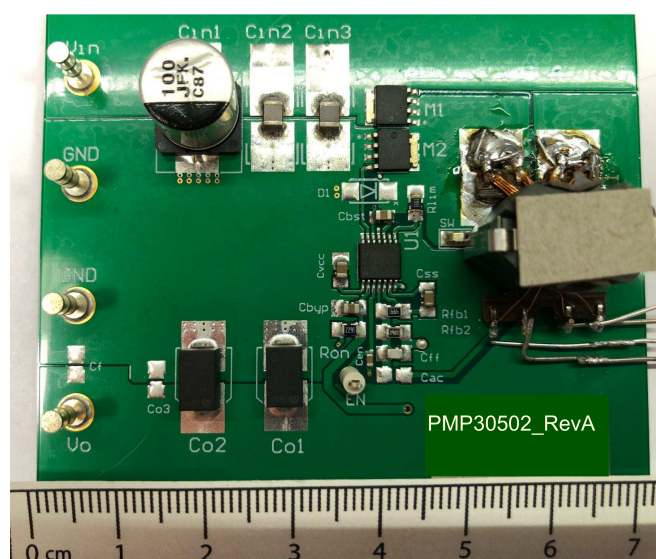
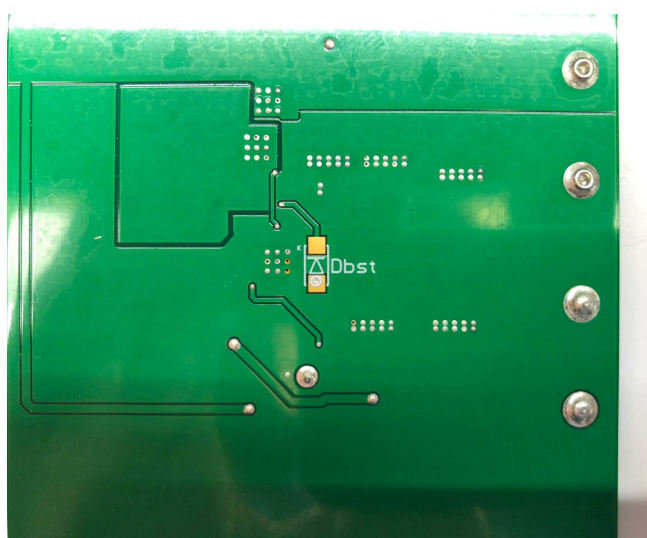


Figure 2. Bottom View



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1 Test Prerequisites

1.1 Voltage and Current Requirements

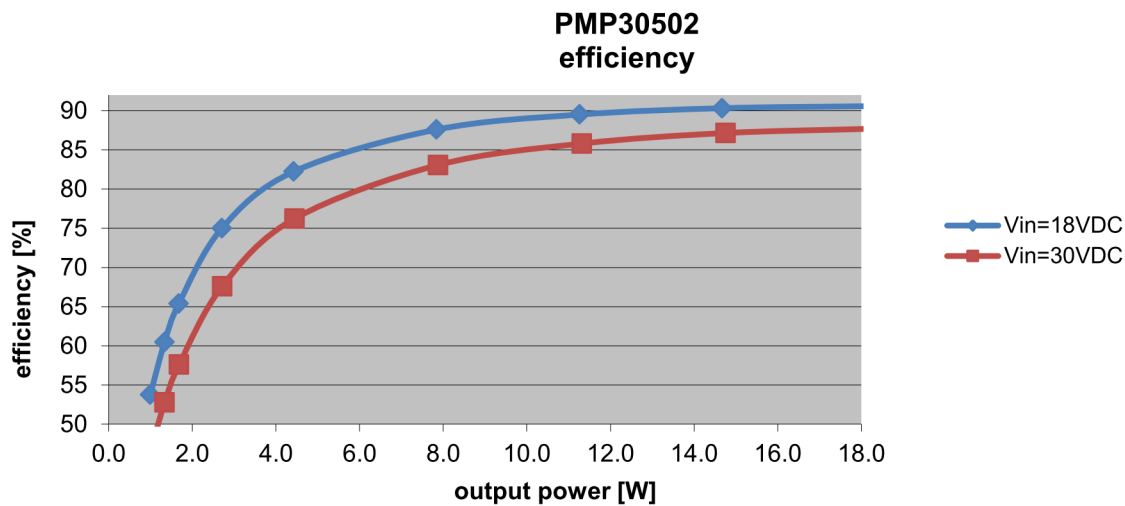
Table 1. Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
V_{IN}	18V-30V
V_{OUT}	3.3V@5.0A; 5.0V@0.1A; 5.0V@0.1A
Nominal switching frequency	170kHz

2 Testing and Results

2.1 Efficiency Graphs

Figure 3.



2.2 Load Regulation*

Figure 4. Load regulation isolated outputs

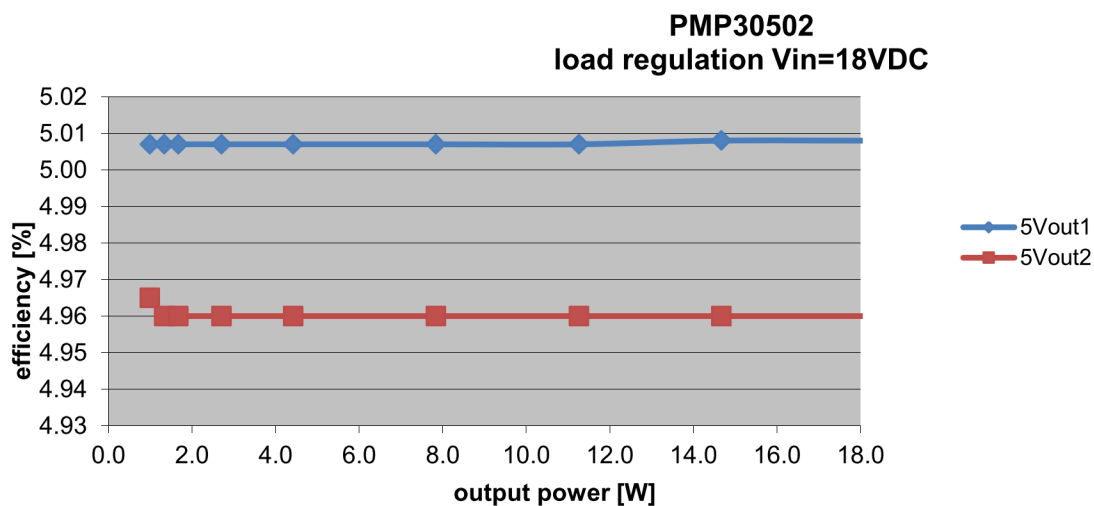


Figure 5. Load Regulation

input voltage [VDC] lin [A]		3.3Vout voltage current [V] [A]		5Vout (51ohm load) voltage current [V] [A]		5Vout2 (51ohm load) voltage current [V] [A]		Output Power [W]
18.0	0.103	3.440	0.006	5.007	0.098	4.965	0.097	0.994
18.0	0.123	3.439	0.105	5.007	0.098	4.960	0.097	1.336
18.1	0.142	3.437	0.205	5.007	0.098	4.960	0.097	1.679
18.0	0.200	3.434	0.505	5.007	0.098	4.960	0.097	2.707
18.0	0.299	3.430	1.007	5.007	0.098	4.960	0.097	4.428
18.0	0.496	3.425	2.004	5.007	0.098	4.960	0.097	7.838
18.0	0.699	3.423	3.005	5.007	0.098	4.960	0.097	11.260
18.0	0.901	3.422	4.002	5.008	0.098	4.960	0.097	14.669
18.0	1.108	3.422	5.001	5.008	0.098	4.960	0.097	18.088
30.1	0.071	3.460	0.005	5.008	0.098	4.960	0.097	0.992
30.1	0.084	3.459	0.105	5.008	0.098	4.960	0.097	1.338
30.0	0.097	3.458	0.205	5.008	0.098	4.960	0.097	1.683
30.1	0.134	3.456	0.505	5.007	0.098	4.960	0.097	2.718
30.1	0.194	3.452	1.007	5.008	0.098	4.960	0.097	4.450
30.1	0.315	3.447	2.003	5.008	0.098	4.960	0.097	7.878
30.1	0.439	3.444	3.003	5.009	0.098	4.960	0.097	11.317
30.0	0.564	3.443	4.002	5.009	0.098	4.960	0.097	14.753
30.0	0.691	3.442	5.000	5.009	0.098	4.960	0.097	18.184

2.3 Thermal Images

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

Figure 6. Input Voltage = 18V

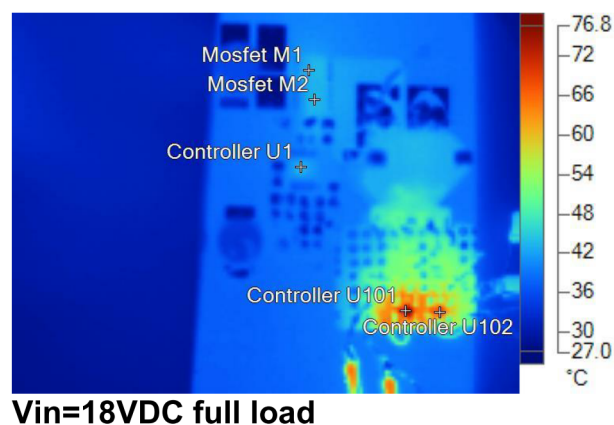
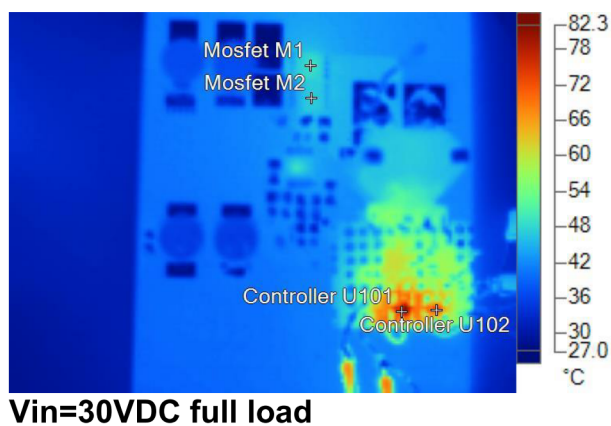


Figure 7. Input voltage = 30V



2.4 Dimensions

74mm x 74mm

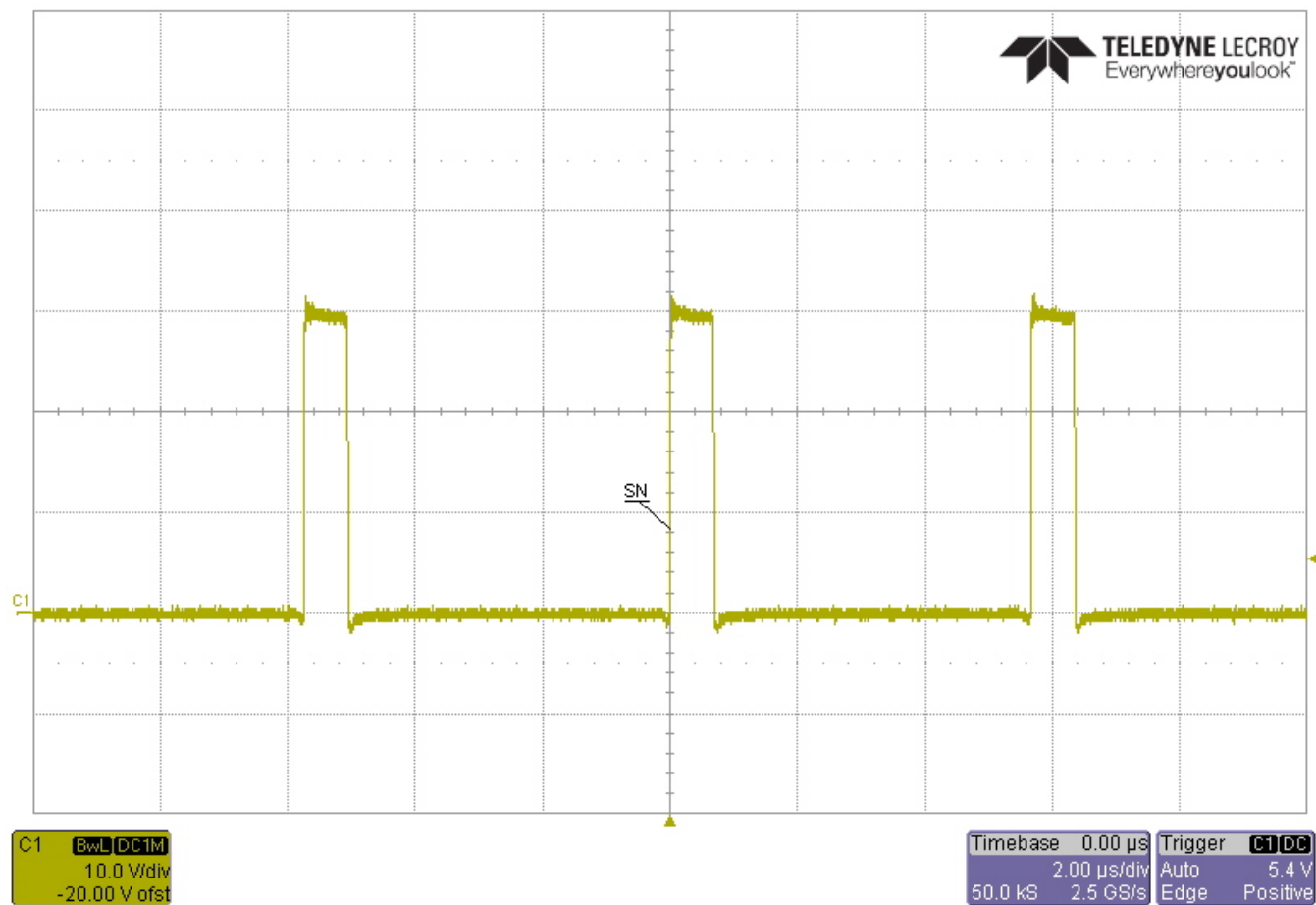
3 Waveforms

3.1 Switching*

Figure 8. Switchnode: $V_{in} = 18\text{VDC}$; output power = 17.5W (full load)



Figure 9. Switchnode: $V_{in} = 30\text{VDC}$; output power = 17.5W (full load)



3.2 Output Voltage Ripple*

Figure 10. Output ripple: Vin=18VDC; output power = 17.5W (full load)

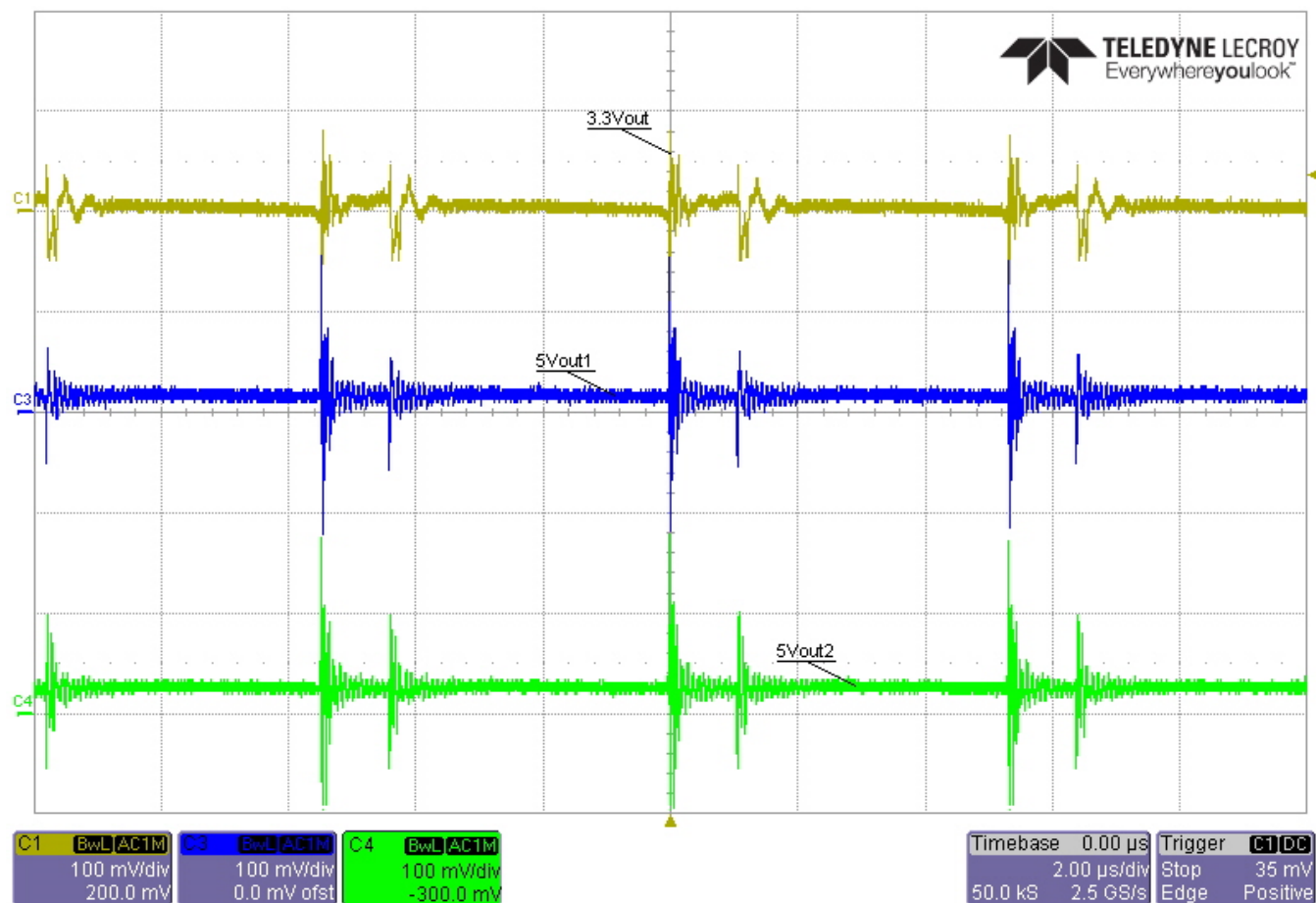
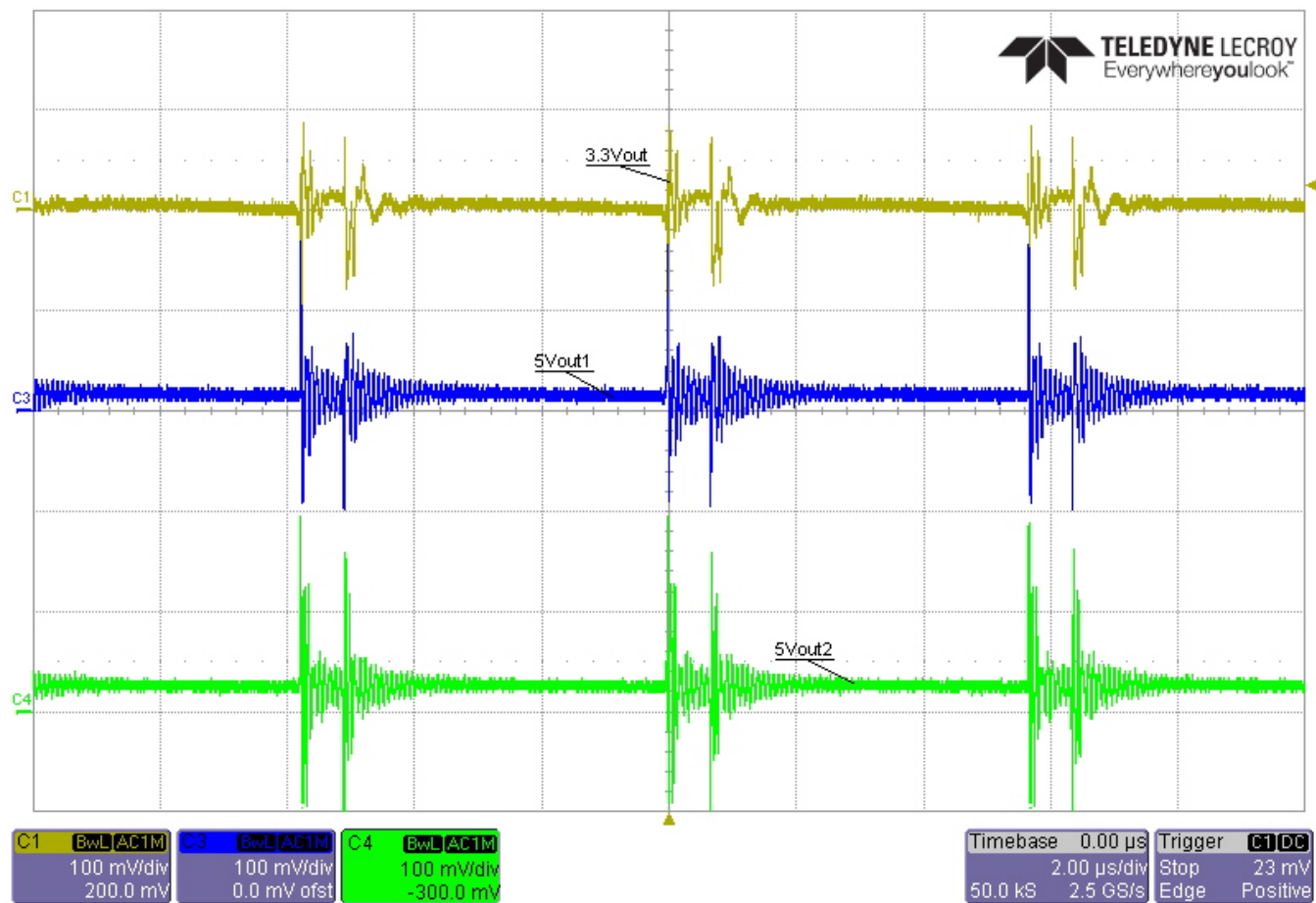


Figure 11. Output ripple: $V_{in}=30VDC$; output power = 17.5W (full load)



3.3 Load Transients*

Figure 12. Load step 3.3Vout: Vin=18VDC; I_{3.3Vout} = 0 to 5A

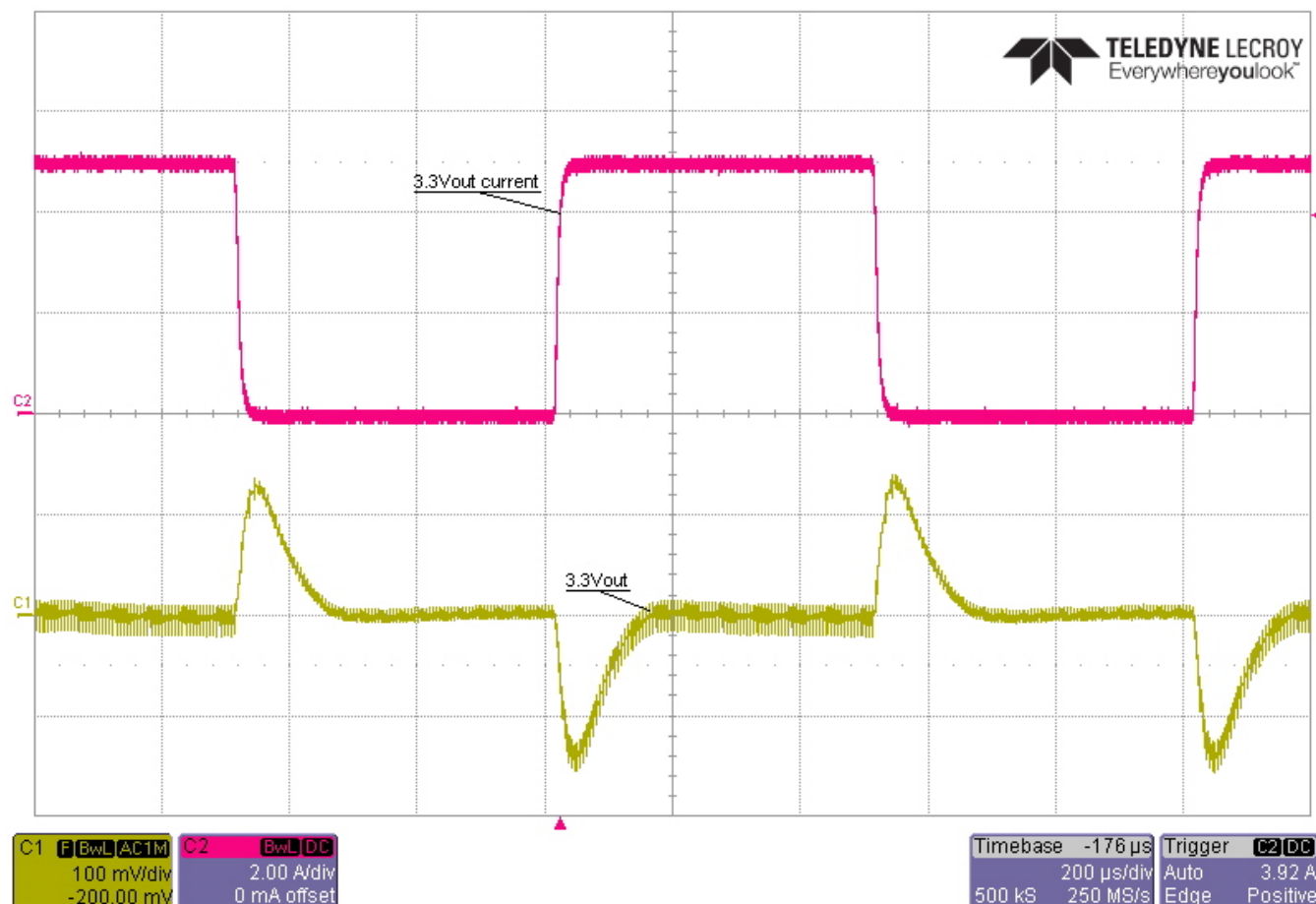


Figure 13. Load step 3.3Vout: Vin=30VDC; I_3.3Vout = 0 to 5A

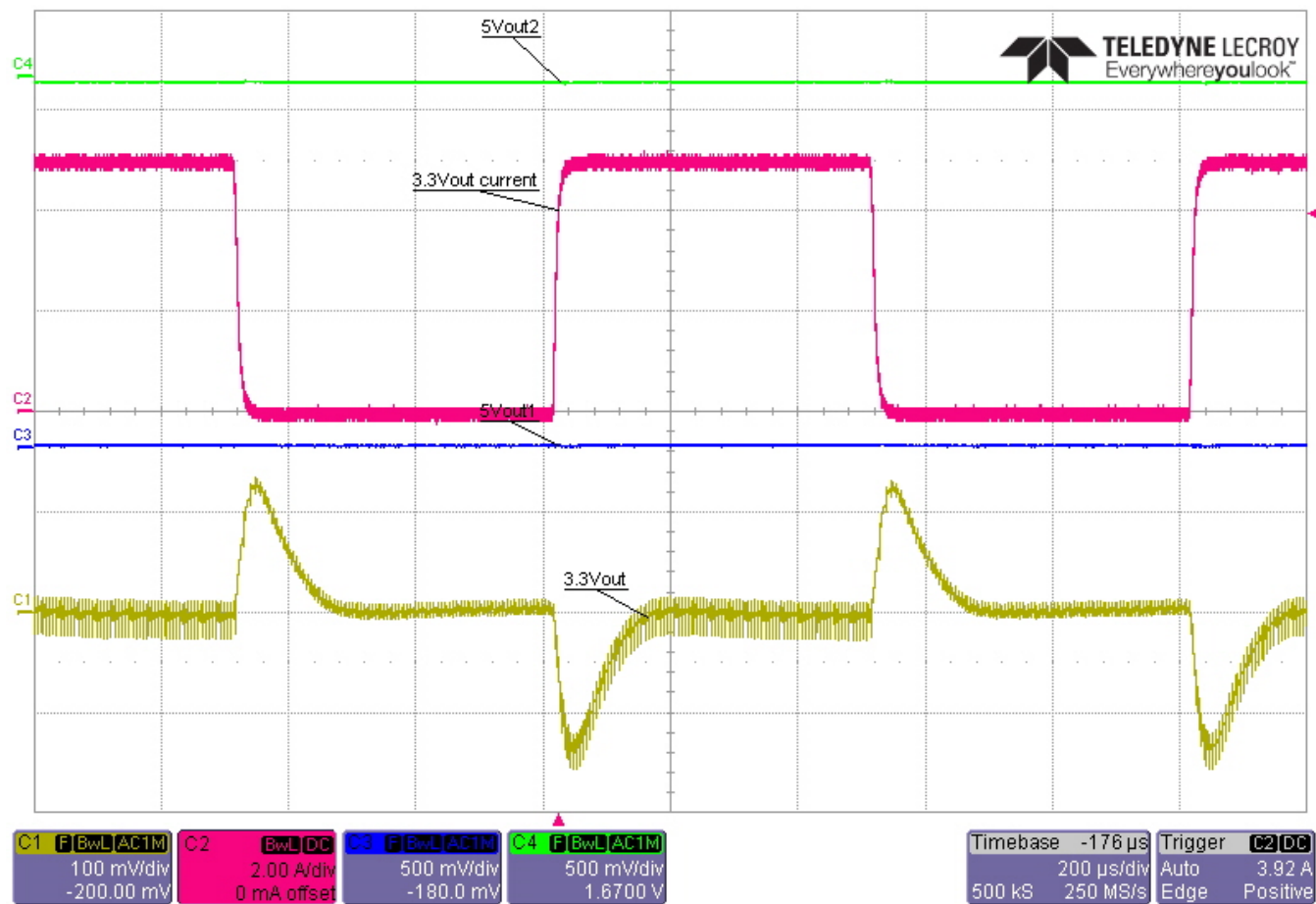


Figure 14. Load step 3.3Vout: Vin=18VDC; I_3.3Vout = 2.0A to 5A

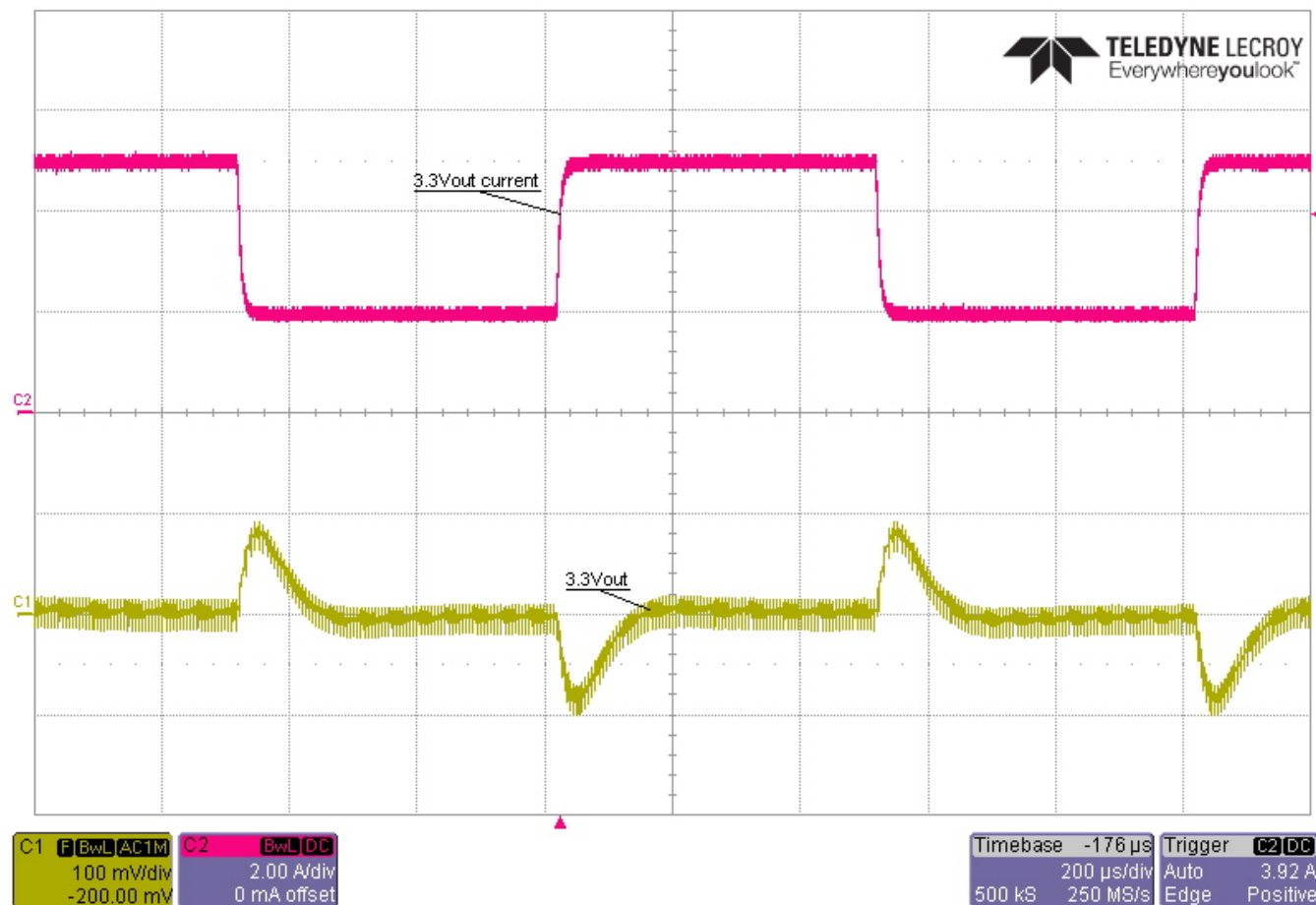
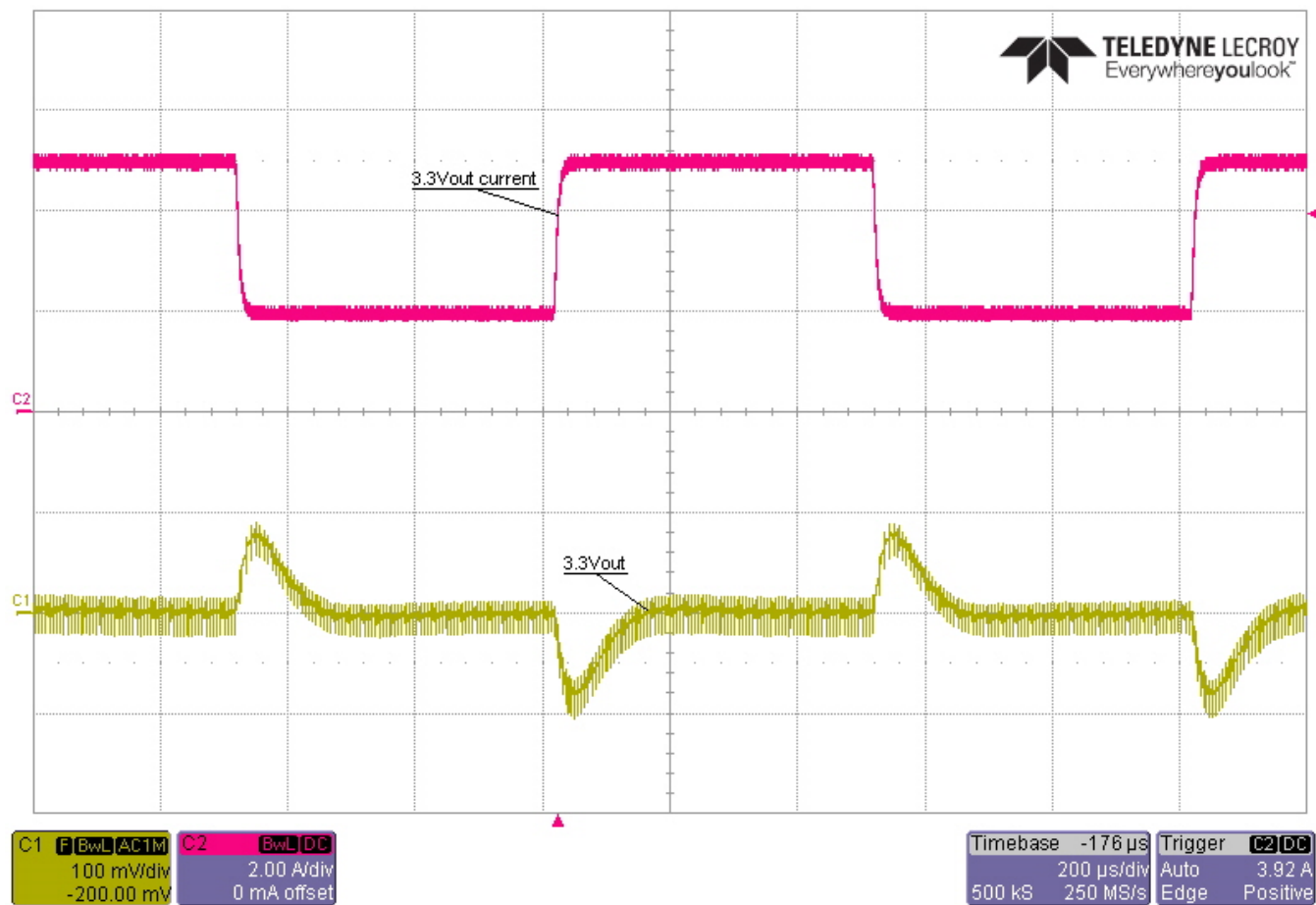


Figure 15. Load step 3.3Vout: Vin=30VDC; I_3.3Vout = 2.0A to 5A



3.4 Start-up Sequence

Figure 16. Startup: Vin=18VDC; output power = 17.5W (full load)

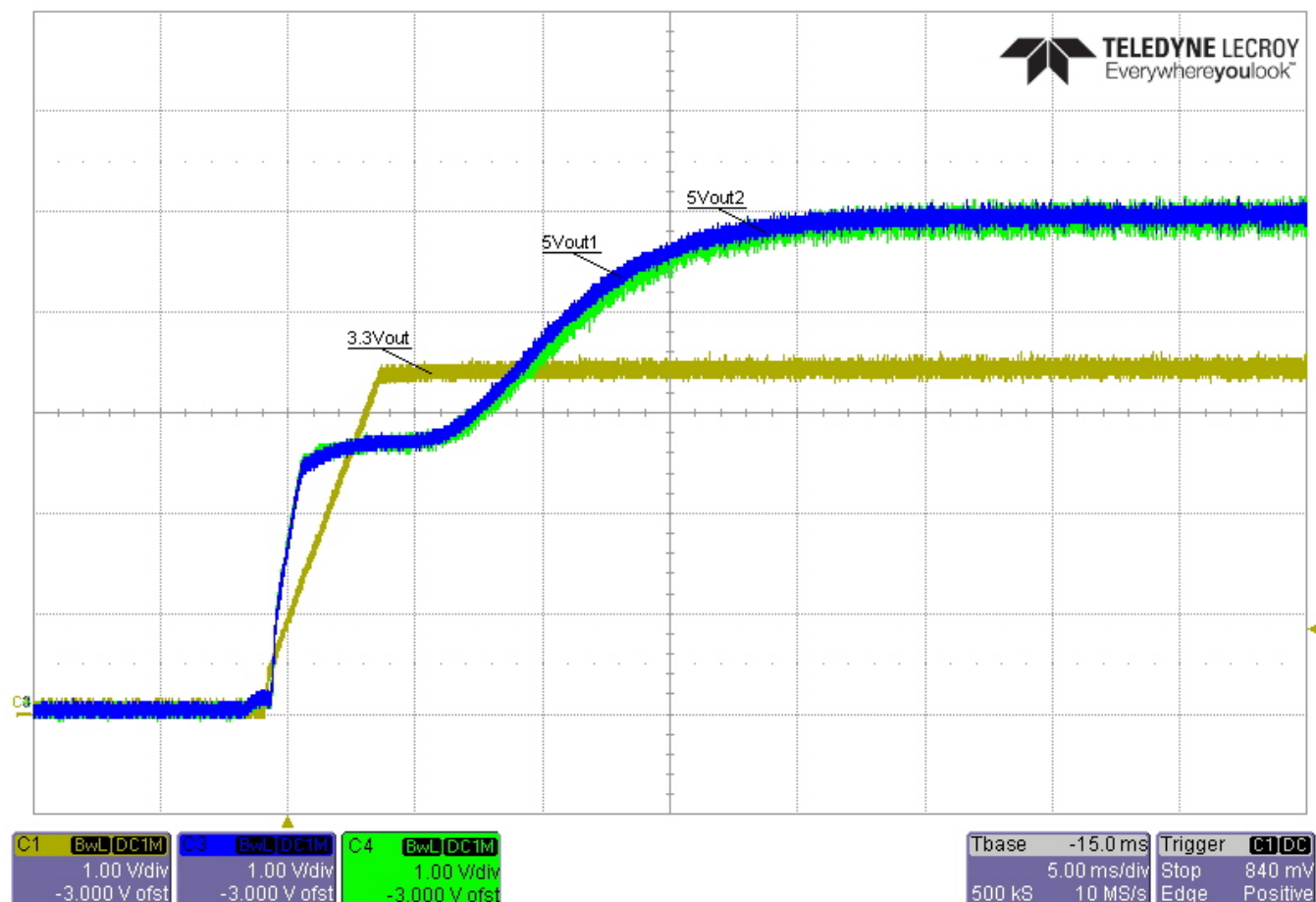
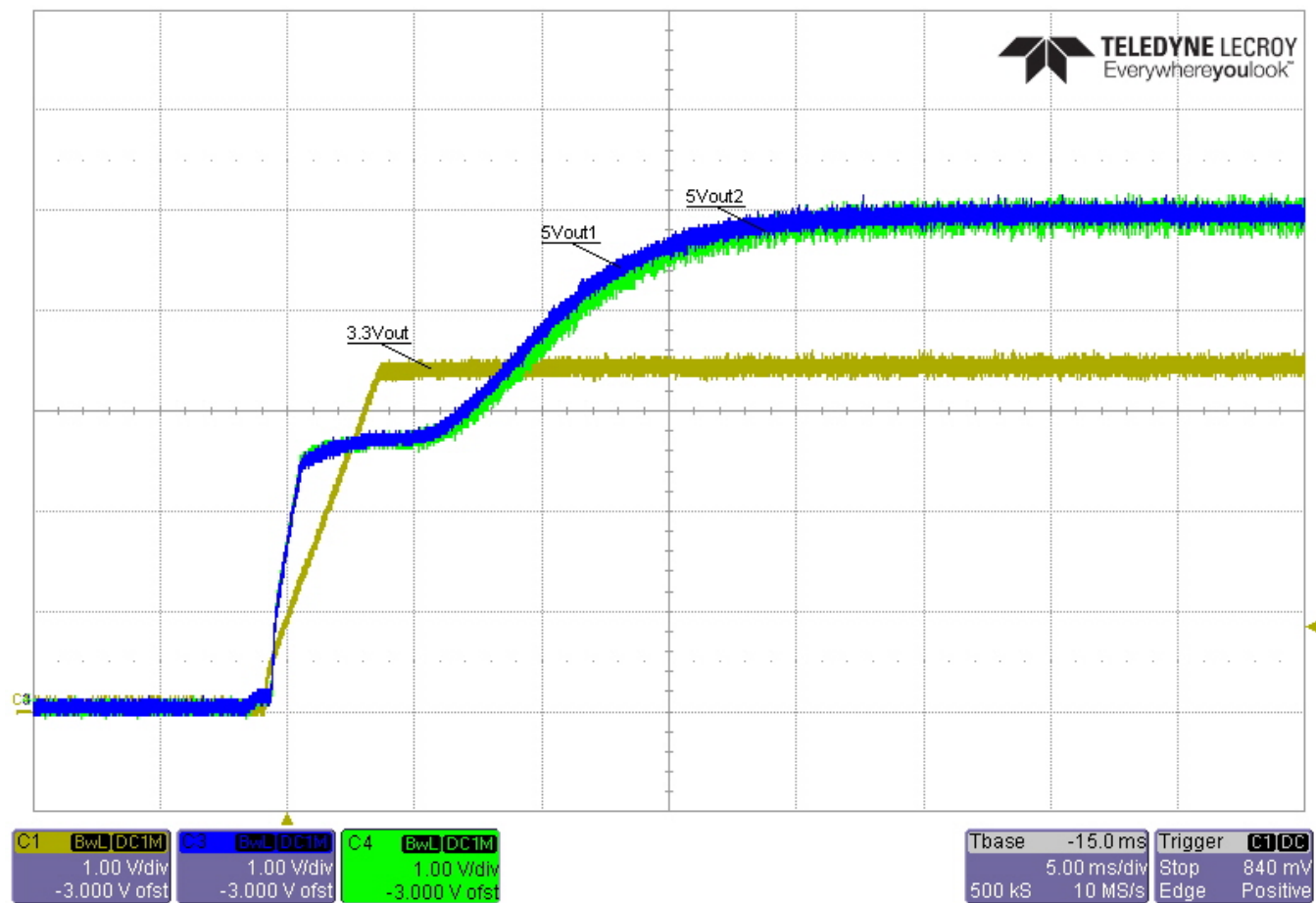


Figure 17. Startup: Vin=30VDC; output power = 17.5W (full load)



3.5 Shutdown Sequence*

Figure 18. Shutdown: Vin=18VDC; output power = 17.5W (full load)

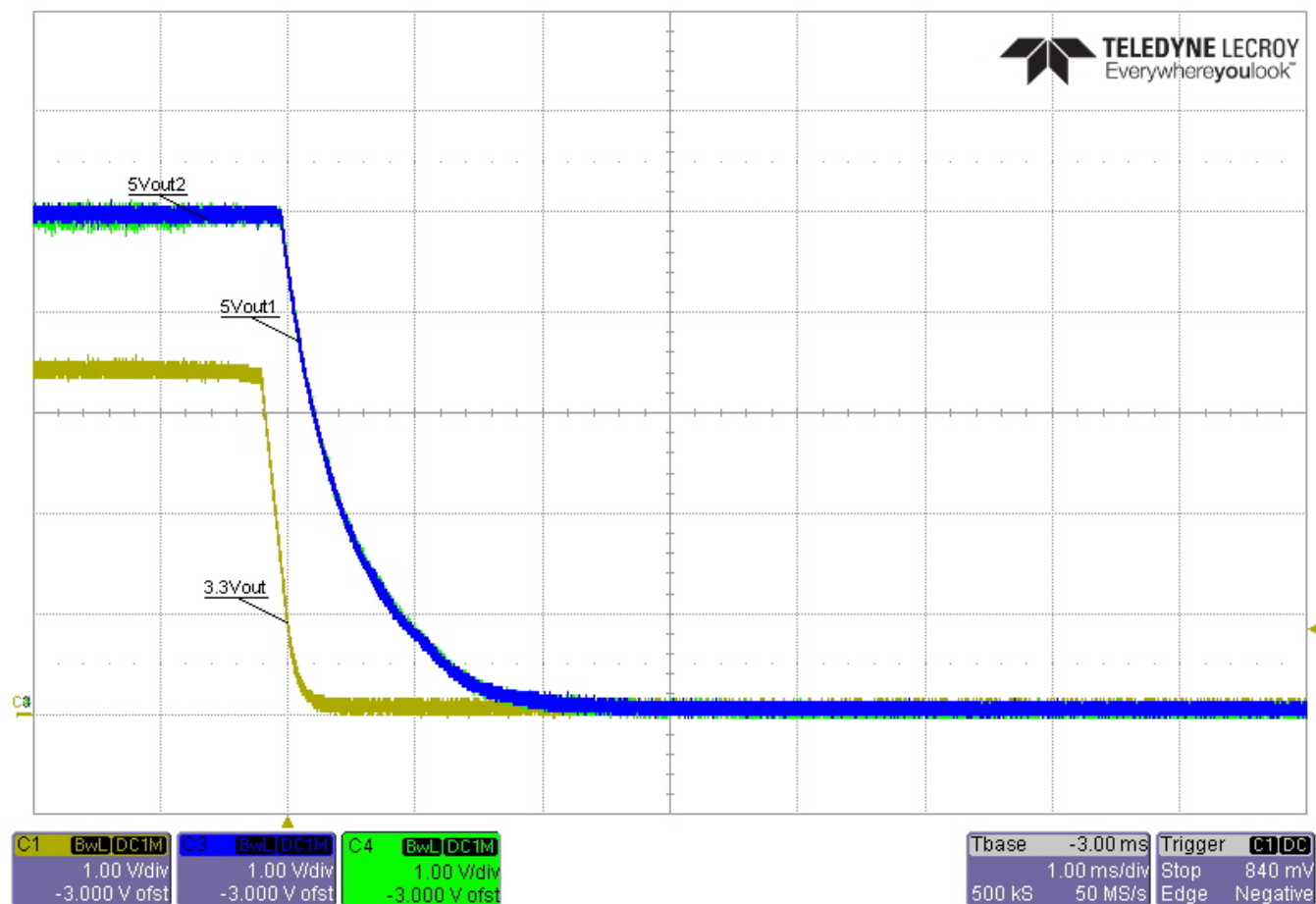
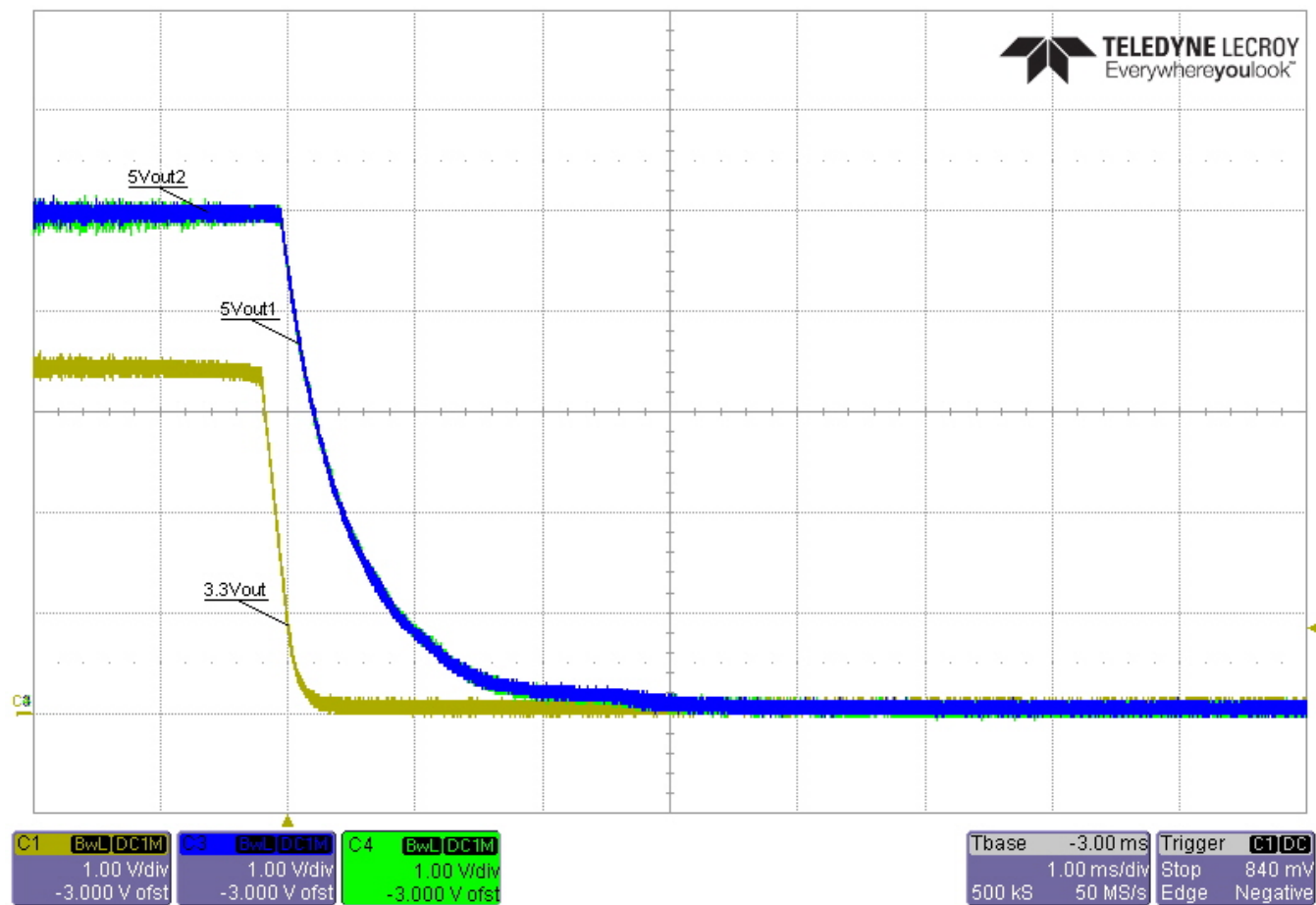


Figure 19. Shutdown: $V_{in}=30VDC$; output power = 17.5W (full load)



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