

CPFE1000Fi-12

EVALUATION DATA

Tested By: Miguel Valdez / <i>M. Valdez</i>	Date : 11/11/2015
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Name/Signature

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Name/Signature

INDEX

1. Test Set-ups

2. Characteristics

- 2.1 Line and Load regulation
- 2.2 Input turn ON/OFF voltage characteristics.
- 2.3 Efficiency and Power factor vs. Output power and Input Voltage, Standby Input Power
- 2.4 Over current protection (OCP) characteristics.
- 2.5 Over voltage protection (OVP) characteristics.
- 2.6 Output rise and fall characteristics
- 2.7 Output rise and fall characteristics with ON/OFF control.
- 2.8 Hold up time characteristics
- 2.9 Dynamic line response characteristics
- 2.10 Dynamic load response characteristics
- 2.11 Response to brownout characteristics
- 2.12 Inrush current characteristics
- 2.13 Input current waveforms
- 2.14 Input current harmonics
- 2.15 Leakage current characteristics
- 2.16 Output ripple and noise waveforms

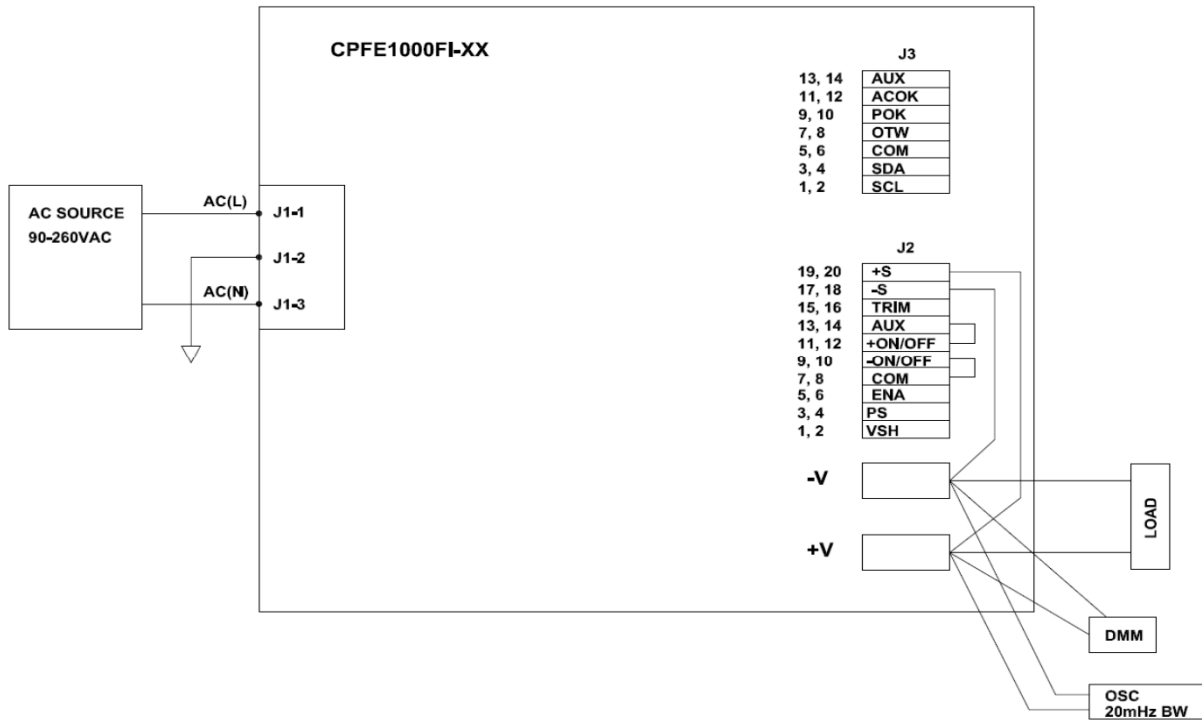
Test Equipment used:

Digital Multi-Meter (DMM) - Model: Fluke 45
Power Source - Model: Kikusui DCR4000L
Electronic Load - Model: Chroma 63201
Digital Power Meter - Model: Yokogawa WT2010
Digital Power Meter - Model: Chroma 66202
Oscilloscope - Model: Tektronix DPO2024
Leakage Tester - Associate Research Model no. 620L

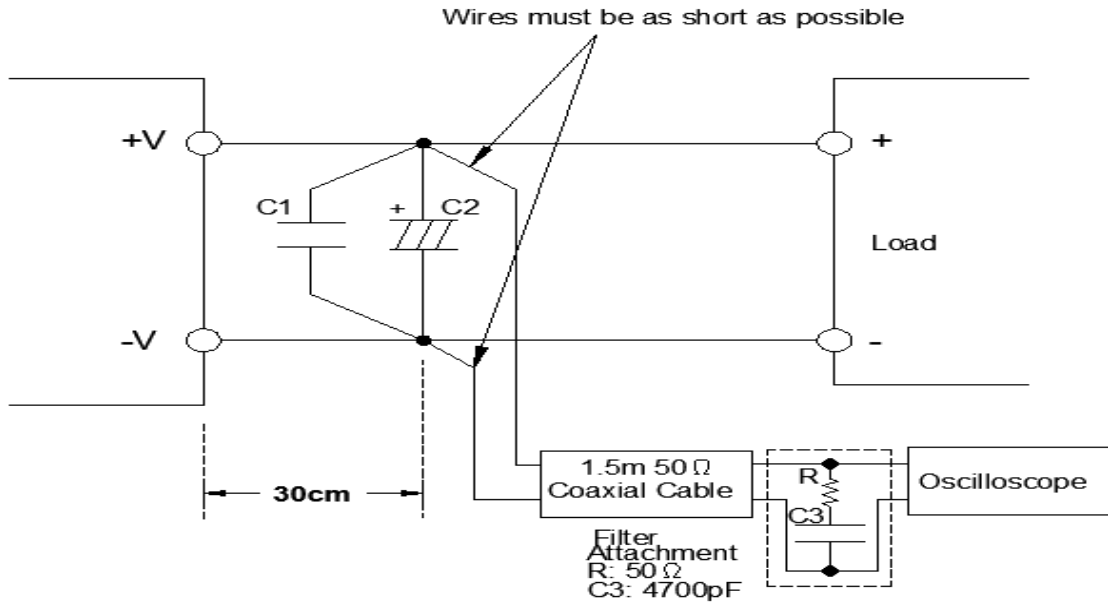
Terminology used

Vin	Input Voltage	Io.....	Output Current
Vout.....	Output Voltage	Tbp.....	Base Plate Temperature
On/Off.....	Control Voltage	Ta.....	Ambient Temperature
Iin.....	Input Current	f.....	Frequency
Pin.....	Input Power	Eff.....	Efficiency
Po.....	Ouptut Power	PF.....	Power factor

1. Test set-ups



General Test Setup



C1 - 0.1 μ F Ceramic Capacitor

C2 - 47 μ F Aluminum Electrolytic Capacitor

Setup for Ripple Measurement

2. Characteristics

2.1 Line and Load Regulation:

Condition Tbp = 25°C

Vout measured across output studs using local sense connections.

Io \ Vin	90 VAC	110 VAC	220 VAC	265 VAC	Line Regulation	
0% Load	12.0350	12.0360	12.0370	12.0380	0.003	0.006%
25% Load	12.0440	12.0430	12.0420	12.0410	0.003	0.006%
50% Load	12.0320	12.0340	12.0340	12.0350	0.003	0.006%
75% Load	12.0250	12.0240	12.0240	12.0240	0.001	0.002%
100% Load	12.0130	12.0130	12.0130	12.0130	0	0.000%
Load Regulation	0.031	0.03	0.029	0.028		
	0.065%	0.062%	0.060%	0.058%		

Vout measured across output studs using remote sense connections.

Io \ Vin	90 VAC	110 VAC	220 VAC	265 VAC	Line Regulation	
0% Load	11.974	11.972	11.97	11.968	0.006	0.013%
25% Load	12.027	12.028	12.028	12.03	0.003	0.006%
50% Load	12.083	12.083	12.083	12.082	0.001	0.002%
75% Load	12.141	12.14	12.14	12.14	0.001	0.002%
100% Load	12.199	12.2	12.202	12.203	0.004	0.008%
Load Regulation	0.225	0.228	0.232	0.235		
	0.469%	0.475%	0.483%	0.490%		

2.2 Input turn ON/OFF voltage characteristics.

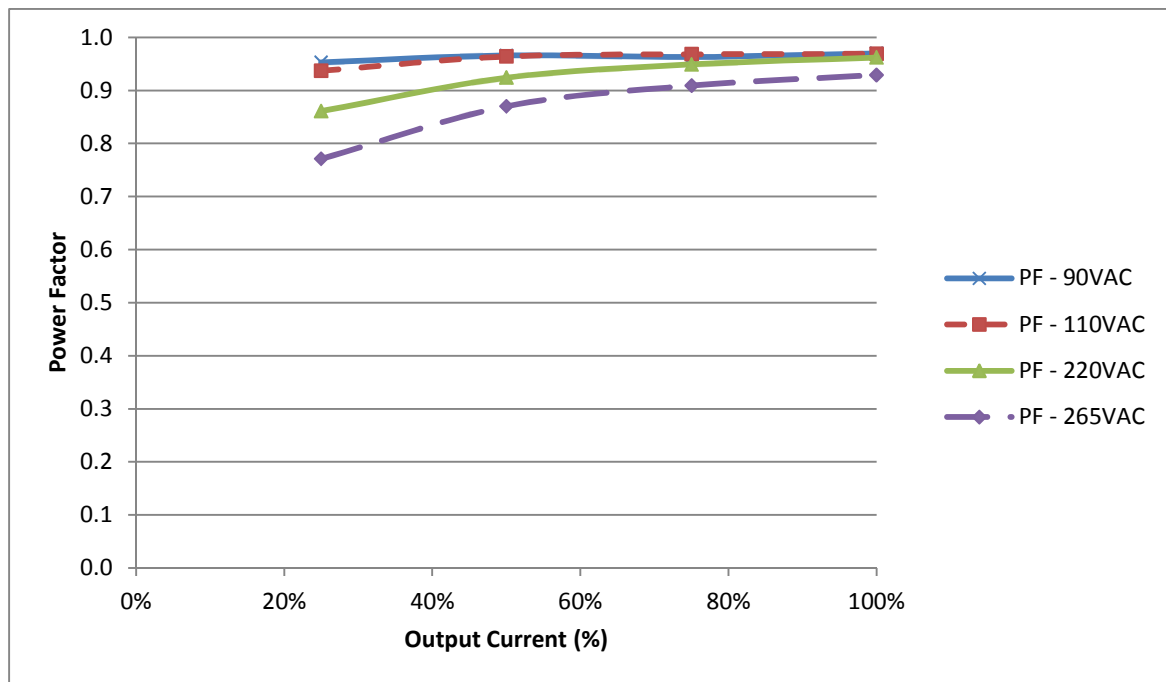
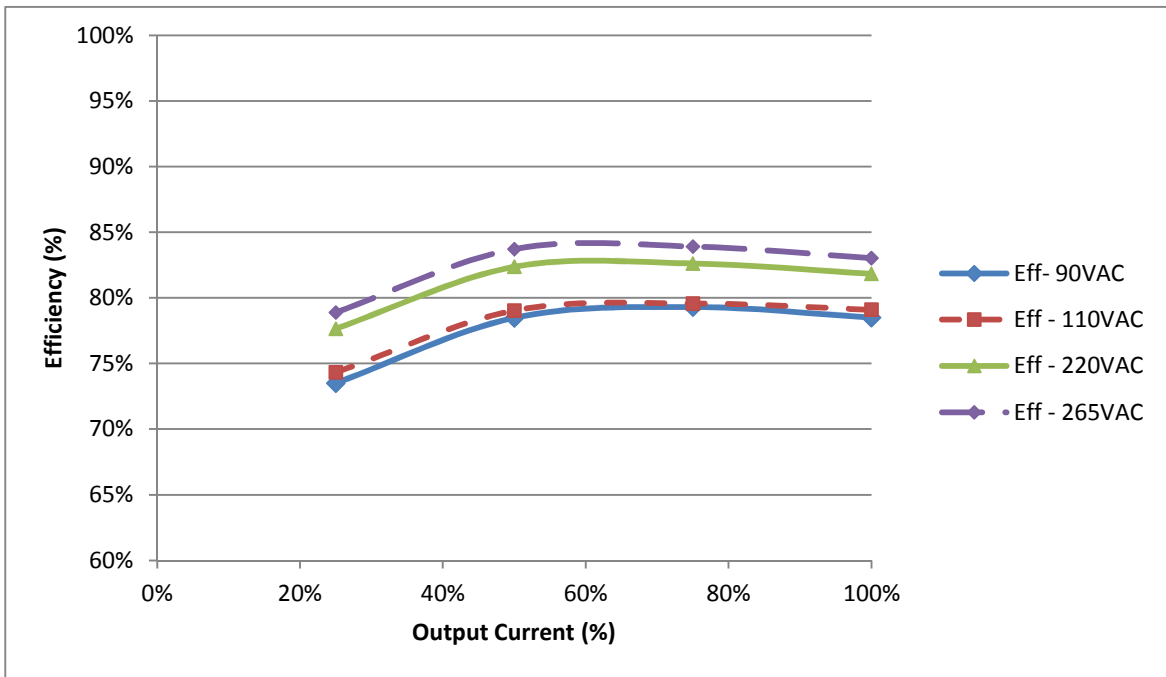
Condition Tbp = 25°C

	0% Load	100%Load
Turn ON Voltage	75	73
Turn OFF Voltage	68	70

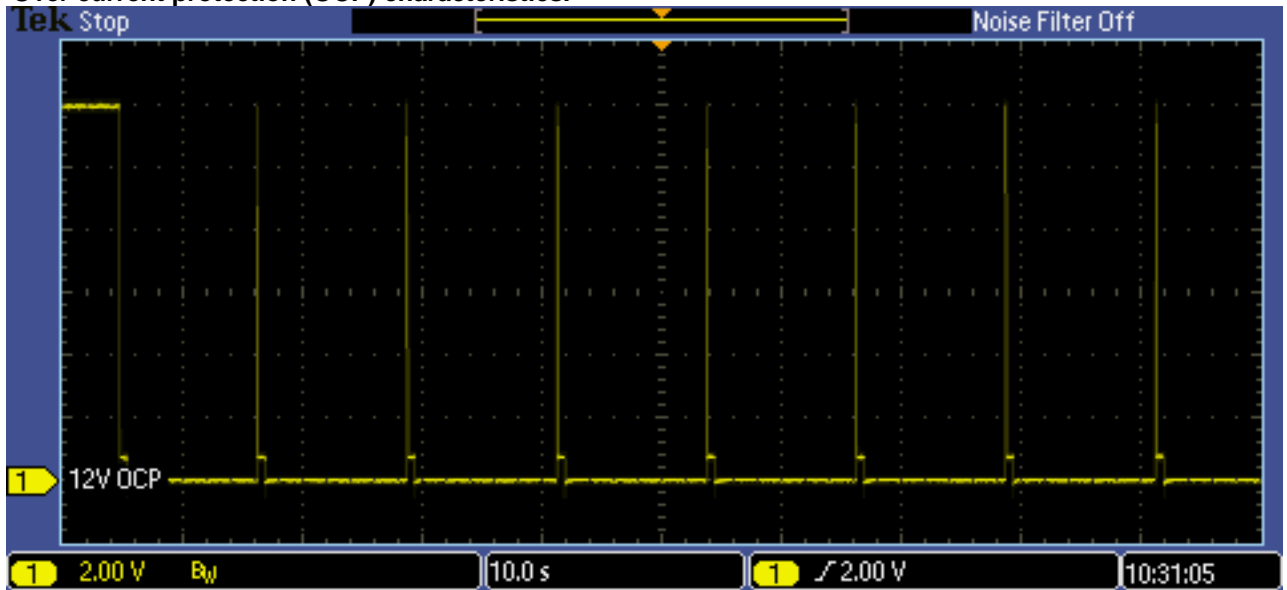
2.3 Efficiency and Power factor vs. Output power and Input Voltage, Standby Input Power

Condition Tbp = 25°C

Vin	Iin	Pin	PF	Vout	Io	Po	Eff	Load
90 VAC	0.65	51.6	0.863	12.035	0	0	N/A	0%
110 VAC	0.55	50.8	0.837	12.040	0	0	N/A	
220 VAC	0.50	48.6	0.439	12.032	0	0	N/A	
265 VAC	0.66	47.4	0.271	12.043	0	0	N/A	
90 VAC	2.81	245.5	0.953	12.030	15	180.45	73.50%	25%
110 VAC	2.34	243.1	0.937	12.045	15	180.675	74.32%	
220 VAC	1.22	232.4	0.861	12.031	15	180.465	77.65%	
265 VAC	1.13	229.1	0.771	12.049	15	180.735	78.89%	
90 VAC	5.20	459.4	0.966	12.017	30	360.51	78.47%	50%
110 VAC	4.28	456.8	0.964	12.034	30	361.02	79.03%	
220 VAC	2.15	437.9	0.924	12.022	30	360.66	82.36%	
265 VAC	1.87	431.4	0.870	12.038	30	361.14	83.71%	
90 VAC	7.76	681.4	0.963	12.007	45	540.315	79.29%	75%
110 VAC	6.36	679.9	0.968	12.022	45	540.99	79.57%	
220 VAC	3.13	654.3	0.949	12.011	45	540.495	82.61%	
265 VAC	2.67	645.1	0.909	12.029	45	541.305	83.91%	
90 VAC	10.40	917.2	0.970	11.999	60	719.94	78.49%	100%
110 VAC	8.53	910.9	0.969	12.008	60	720.48	79.10%	
220 VAC	4.15	879.9	0.962	12.001	60	720.06	81.83%	
265 VAC	3.49	868.6	0.929	12.018	60	721.08	83.02%	

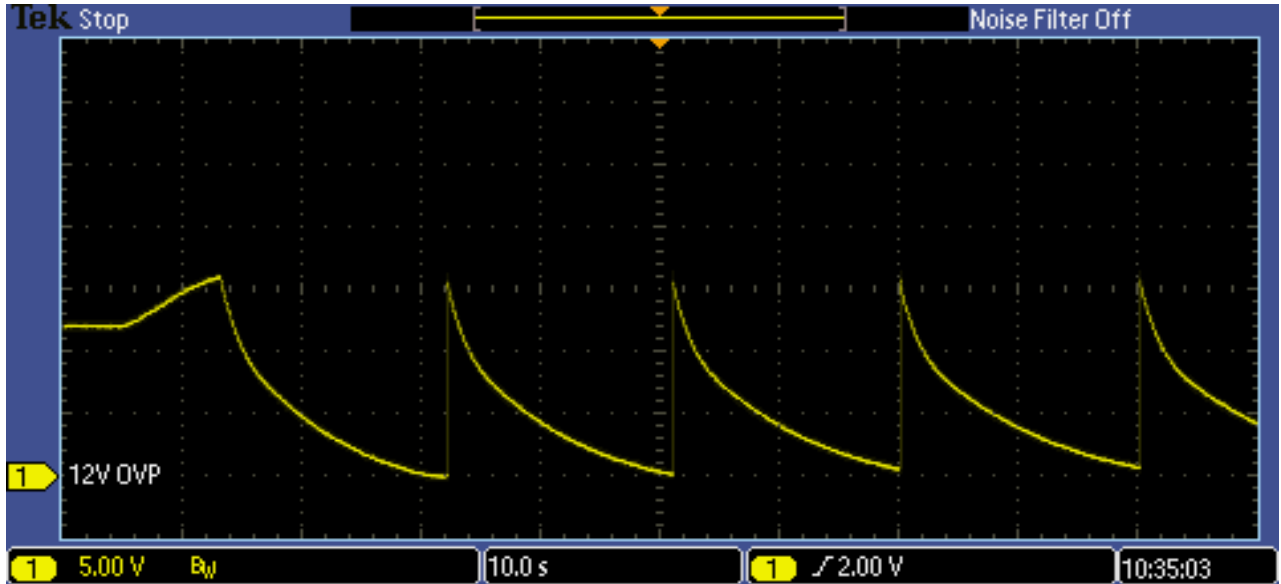


2.4 Over current protection (OCP) characteristics.

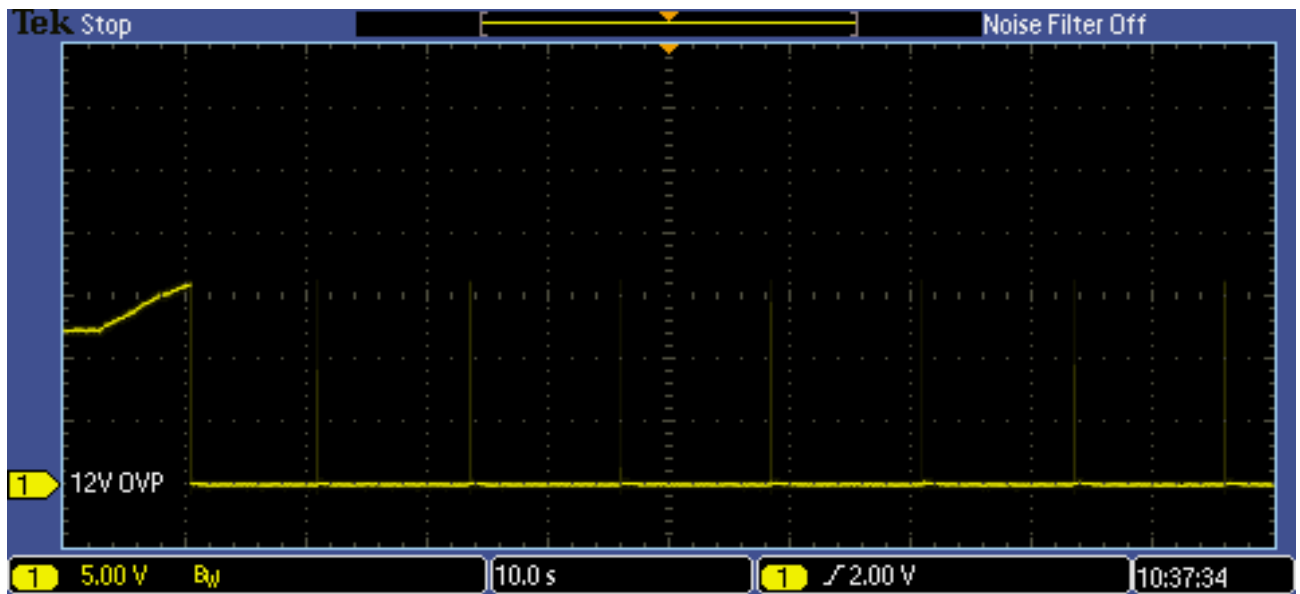


Vout: 2V/div 10s/div
Output Voltage during OCP mode.

2.5 Over voltage protection (OVP) characteristics.

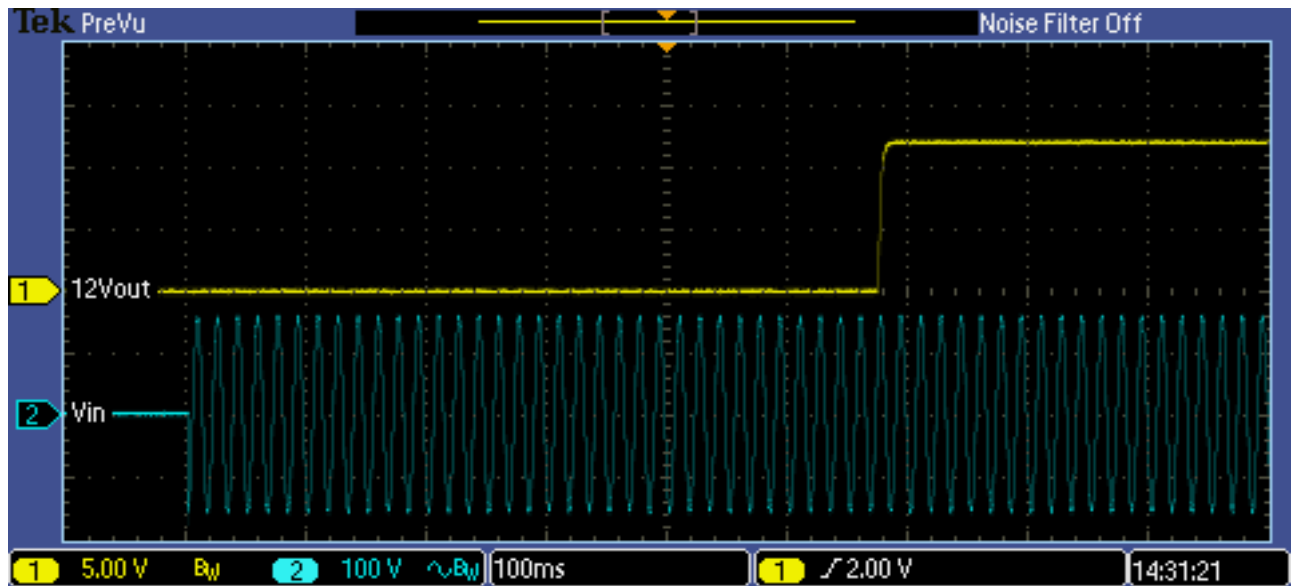


Output Voltage during OVP mode (0% Load)

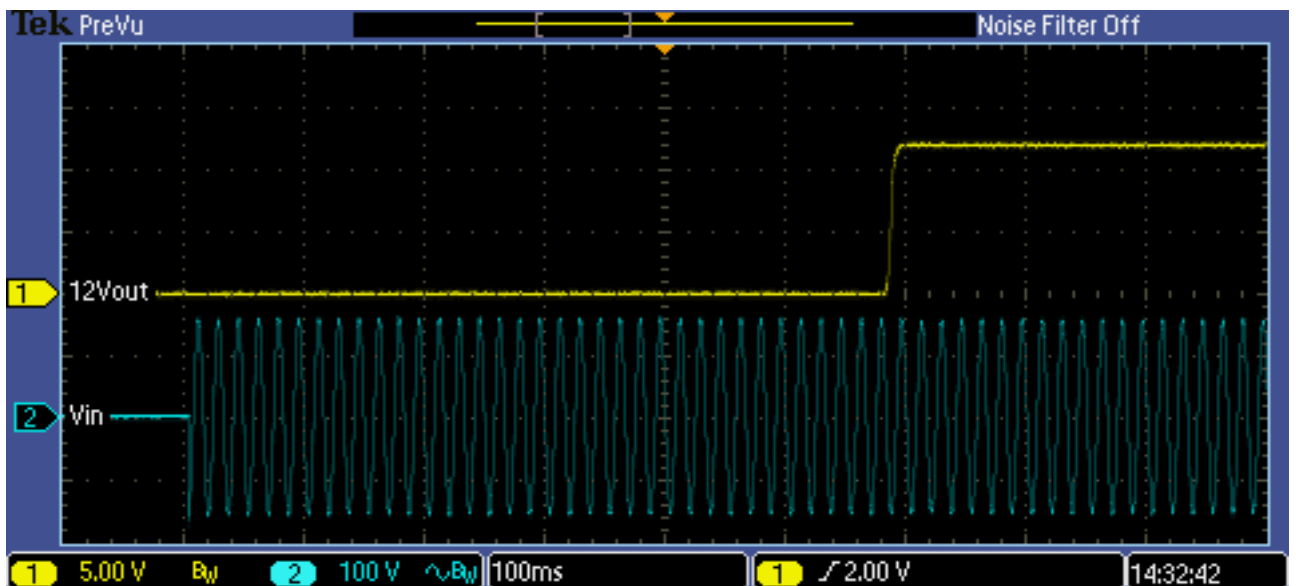


Output Voltage during OVP mode (100% Load)

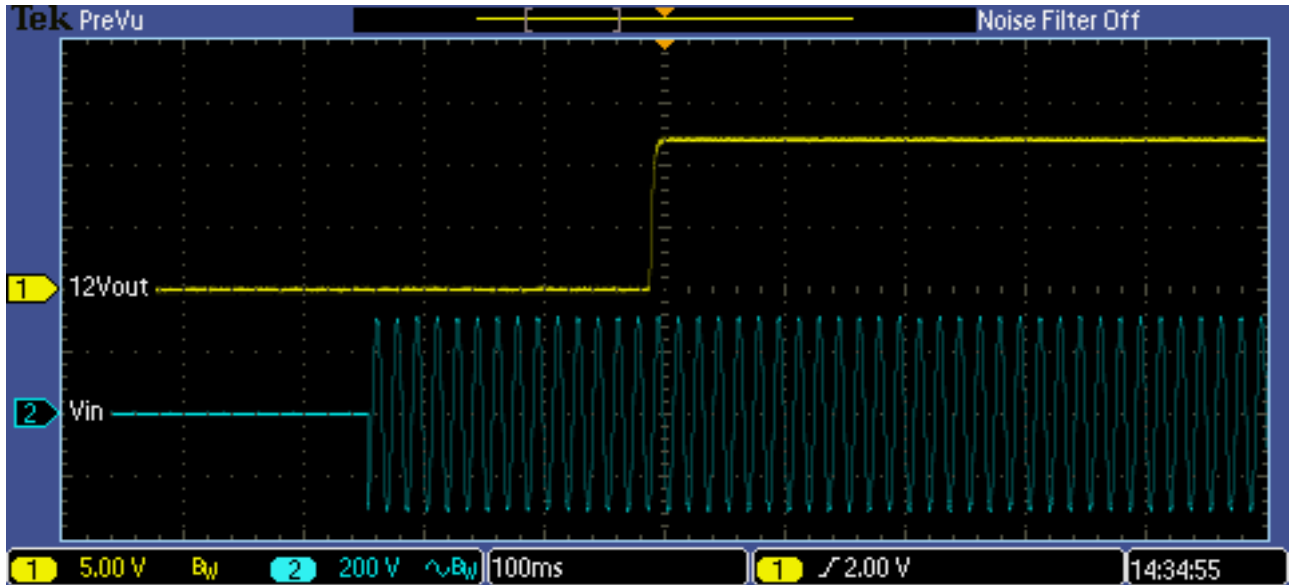
2.6 Output rise and fall characteristics



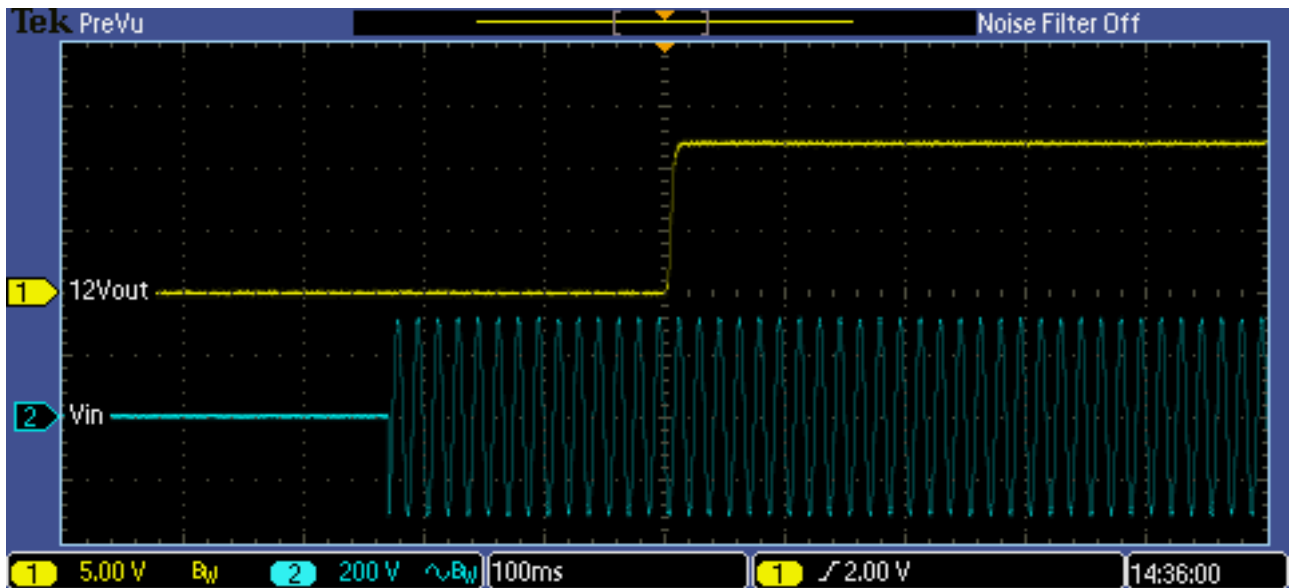
Vin: 100V/div Vout: 5V/div 100ms/div
Output rise (0% Load, 110Vac input)



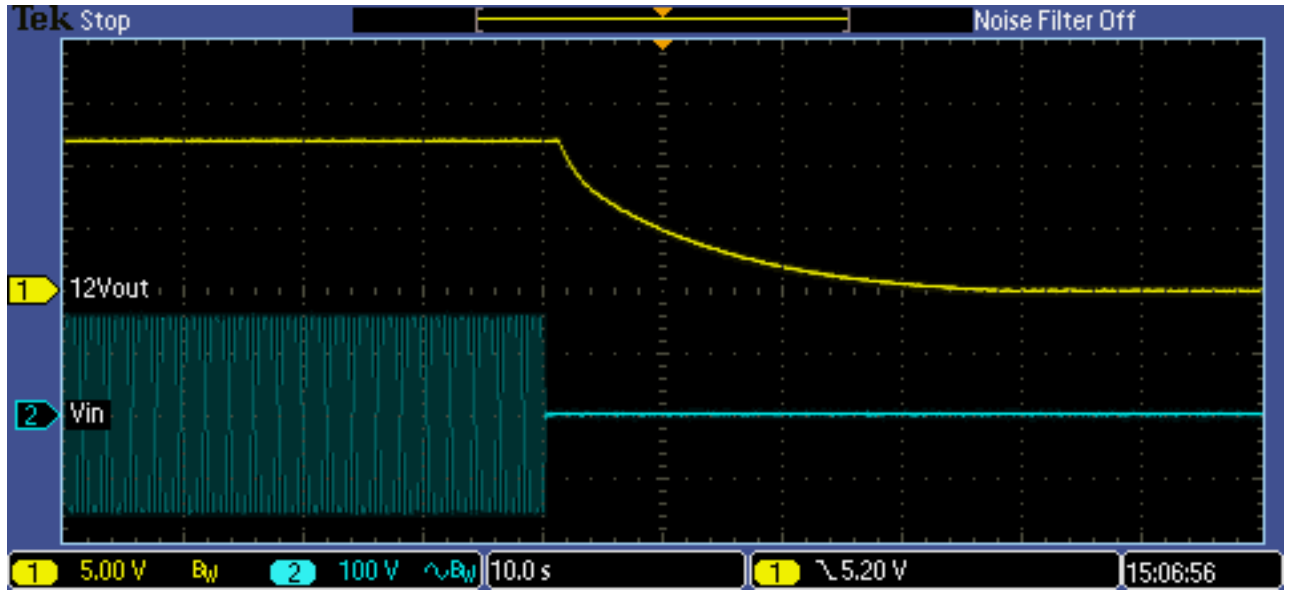
Vin: 100V/div Vout: 5V/div 100ms/div
Output rise (100% Load, 110Vac input)



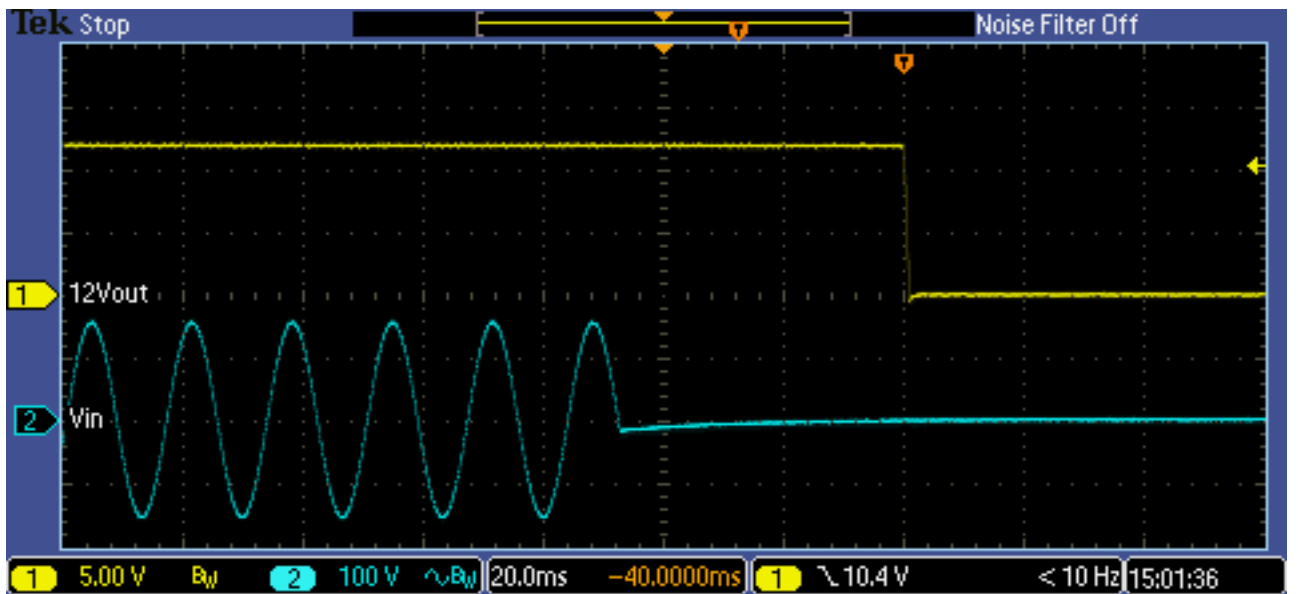
Vin: 200V/div Vout: 5V/div 100ms/div
Output rise (0% Load, 220Vac input)



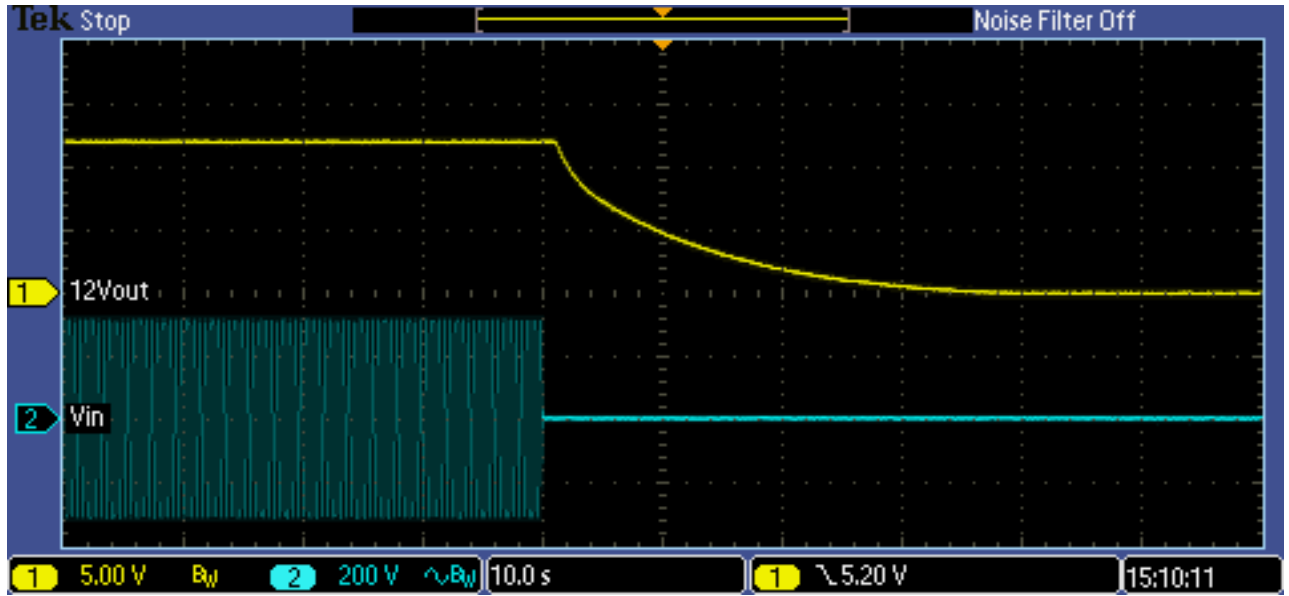
Vin: 200V/div Vout: 5V/div 100ms/div
Output rise (0% Load, 220Vac input)



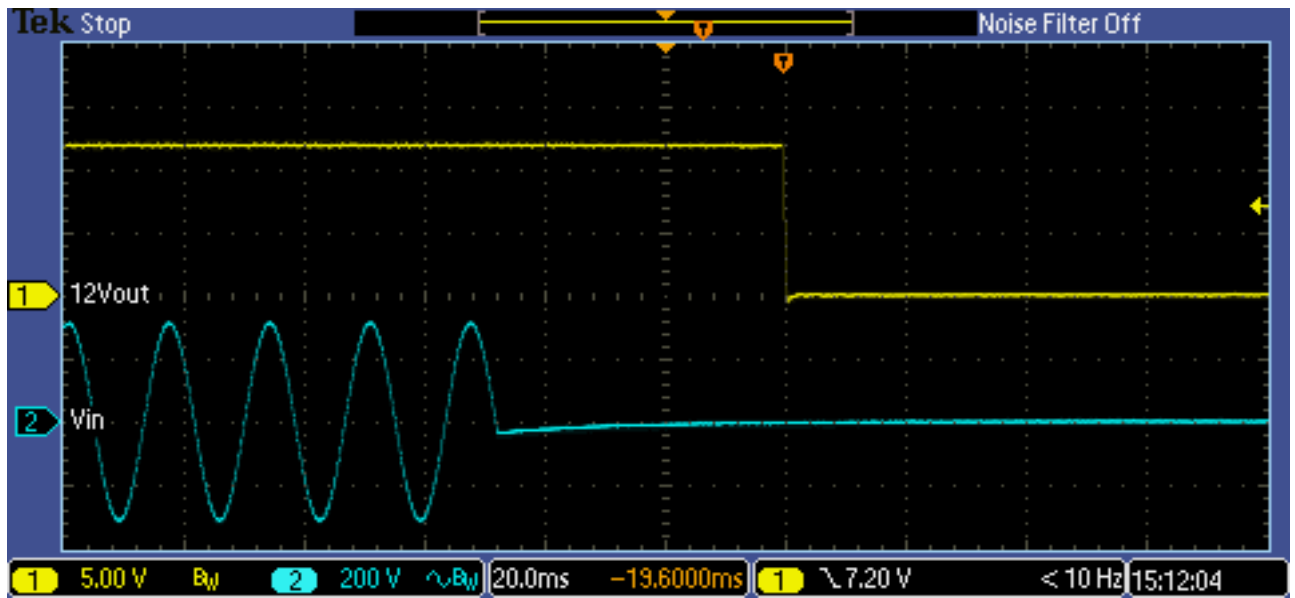
Vin: 100V/div Vout: 5V/div 10s/div
 Output fall (0% Load, 110Vac input)



Vin: 100V/div Vout: 5V/div 20ms/div
 Output fall (100% Load, 110Vac input)

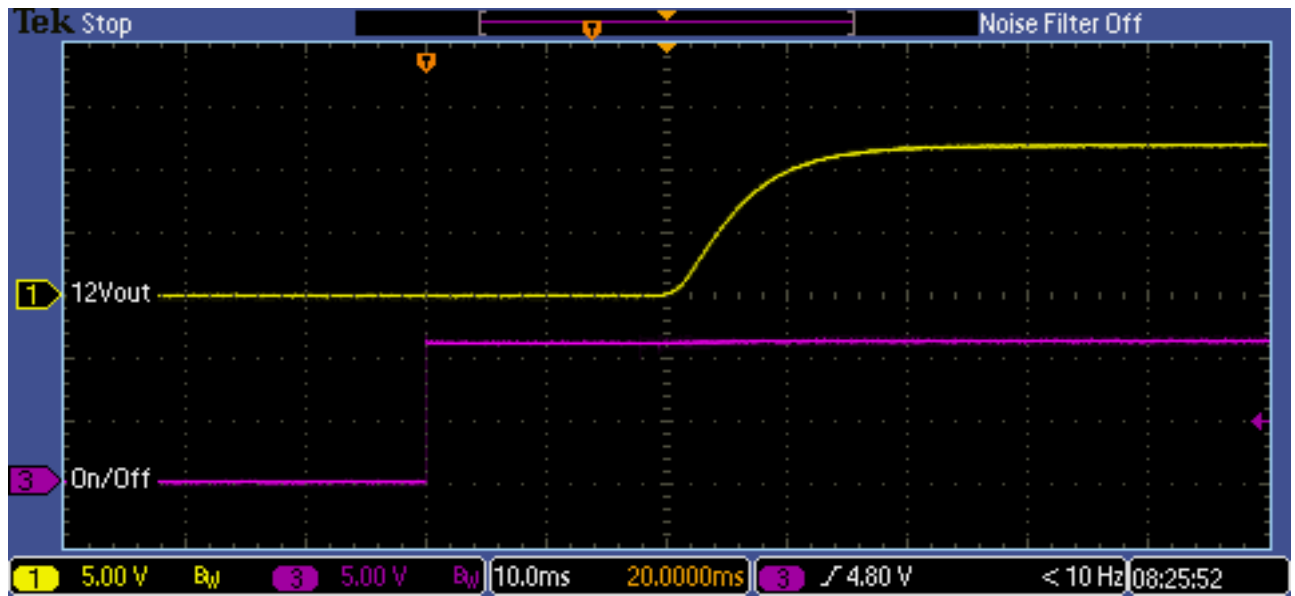


Vin: 200V/div Vout: 5V/div 10s/div
Output fall (0% Load, 220Vac input)

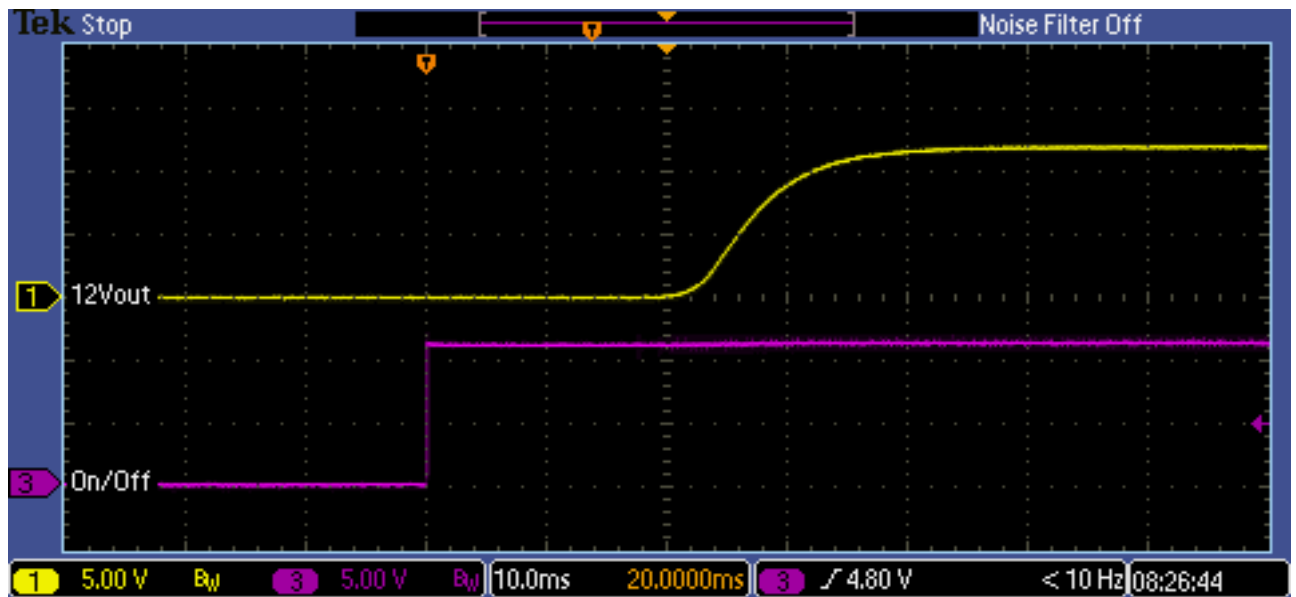


Vin: 200V/div Vout: 5V/div 20ms/div
Output fall (100% Load, 220Vac input)

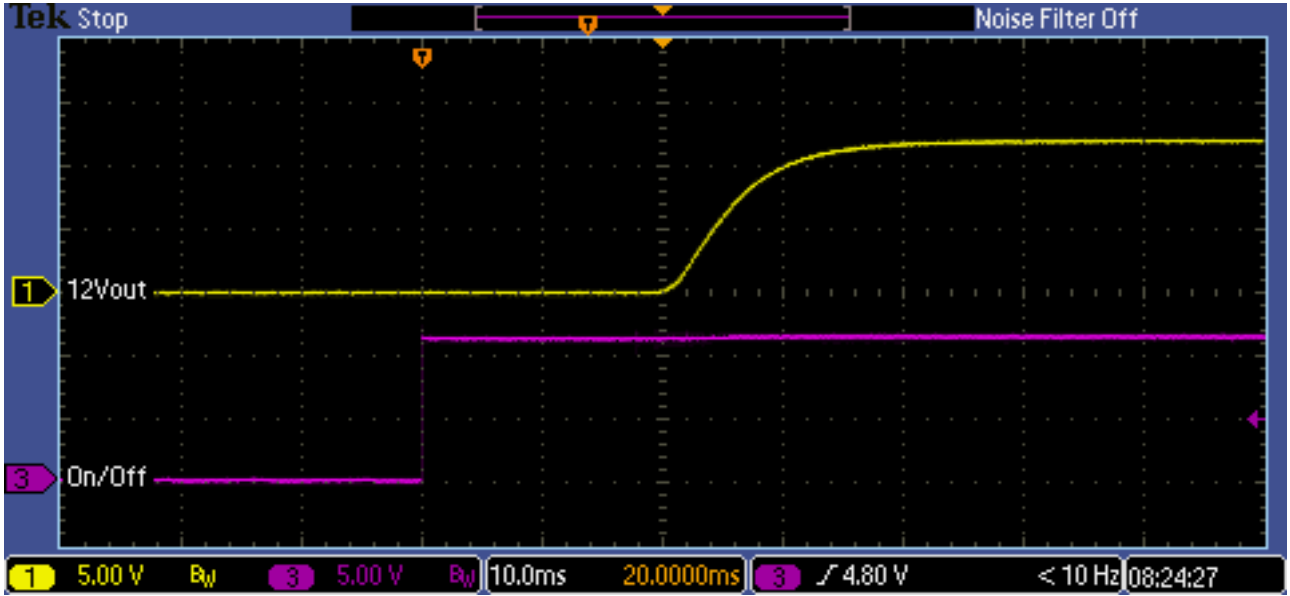
2.7 Output rise and fall characteristics with ON/OFF control.



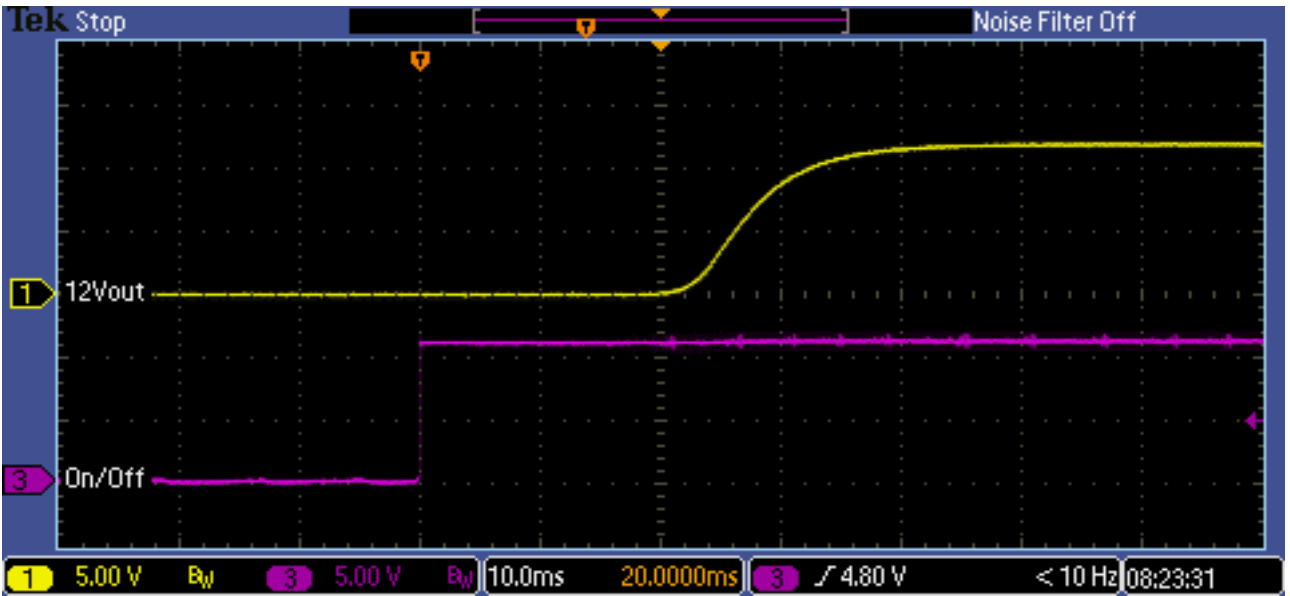
On/Off: 5V/div Vout: 5V/div 10ms/div
Output rise with ON/OFF control(0% Load, 110Vac input)



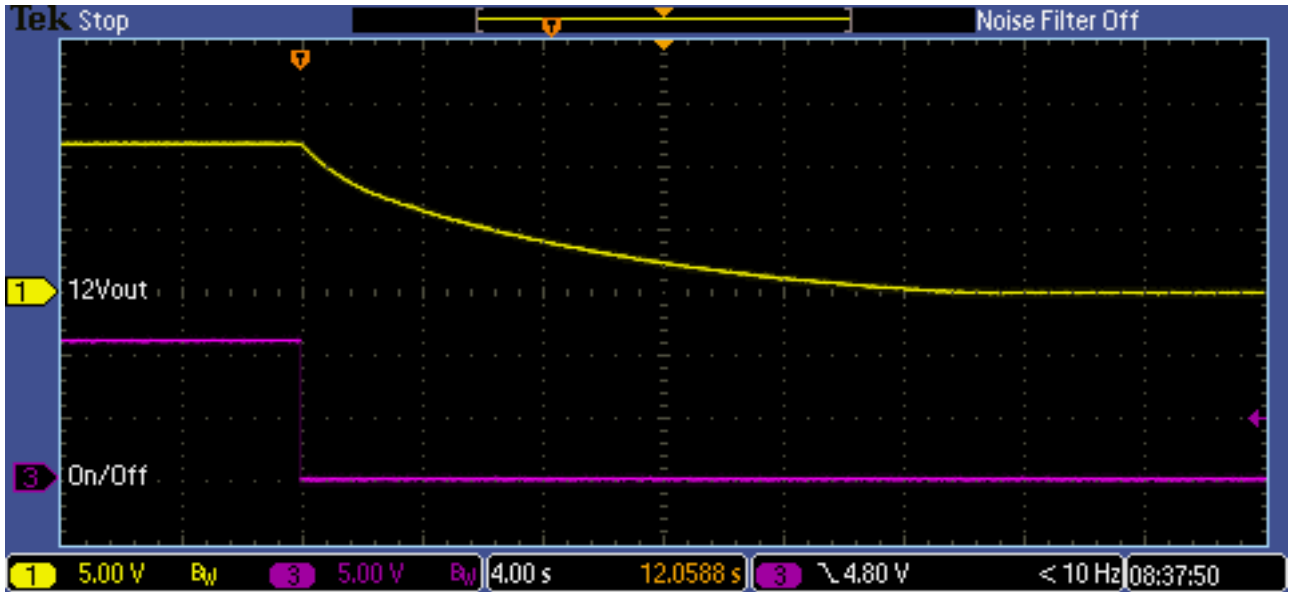
On/Off: 5V/div Vout: 5V/div 10ms/div
Output rise with ON/OFF control(100% Load, 110Vac input)



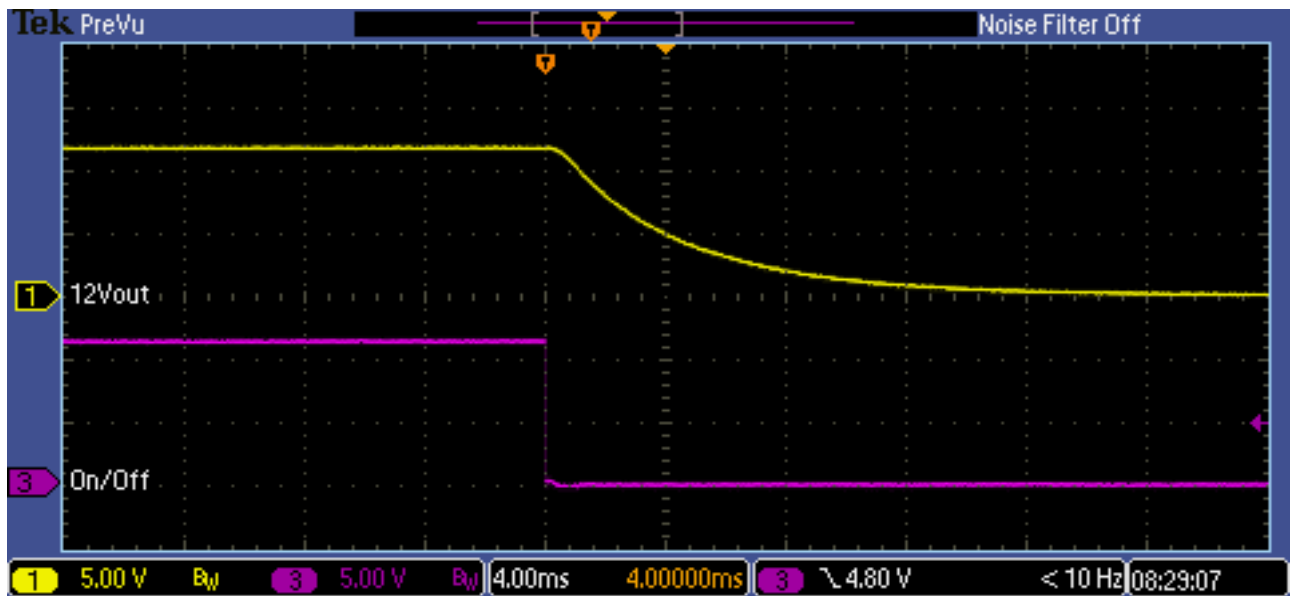
On/Off: 5V/div Vout: 5V/div 10ms/div
 Output rise with ON/OFF control(0% Load, 220Vac input)



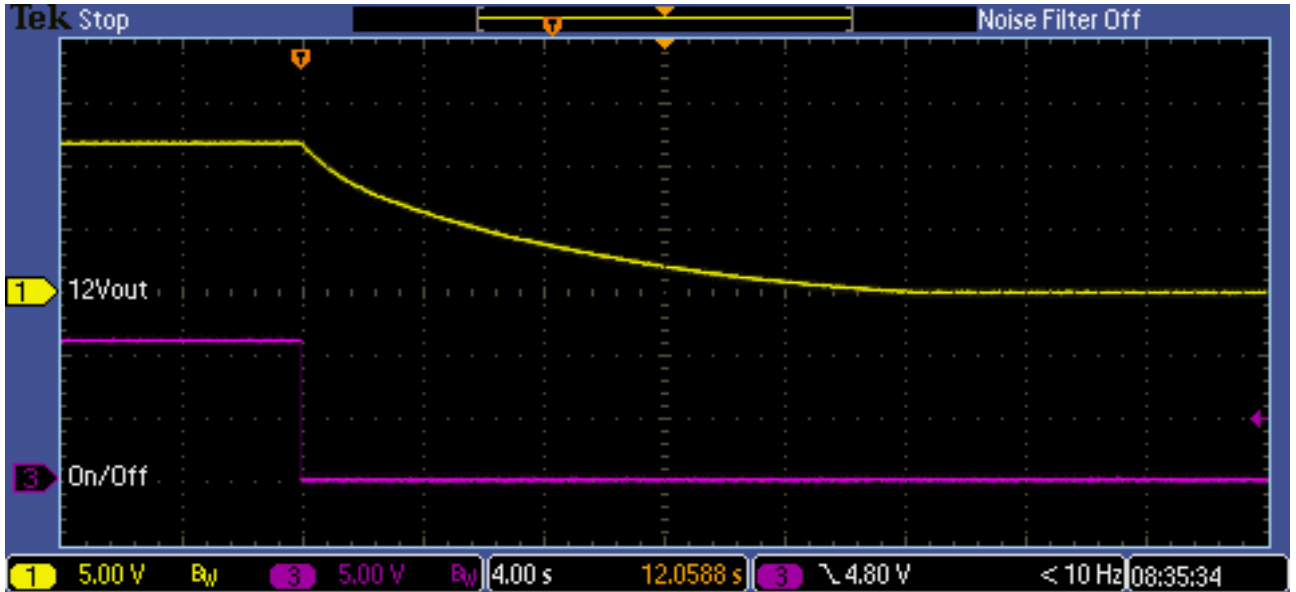
On/Off: 5V/div Vout: 5V/div 10ms/div
 Output rise with ON/OFF control(100% Load, 220Vac input)



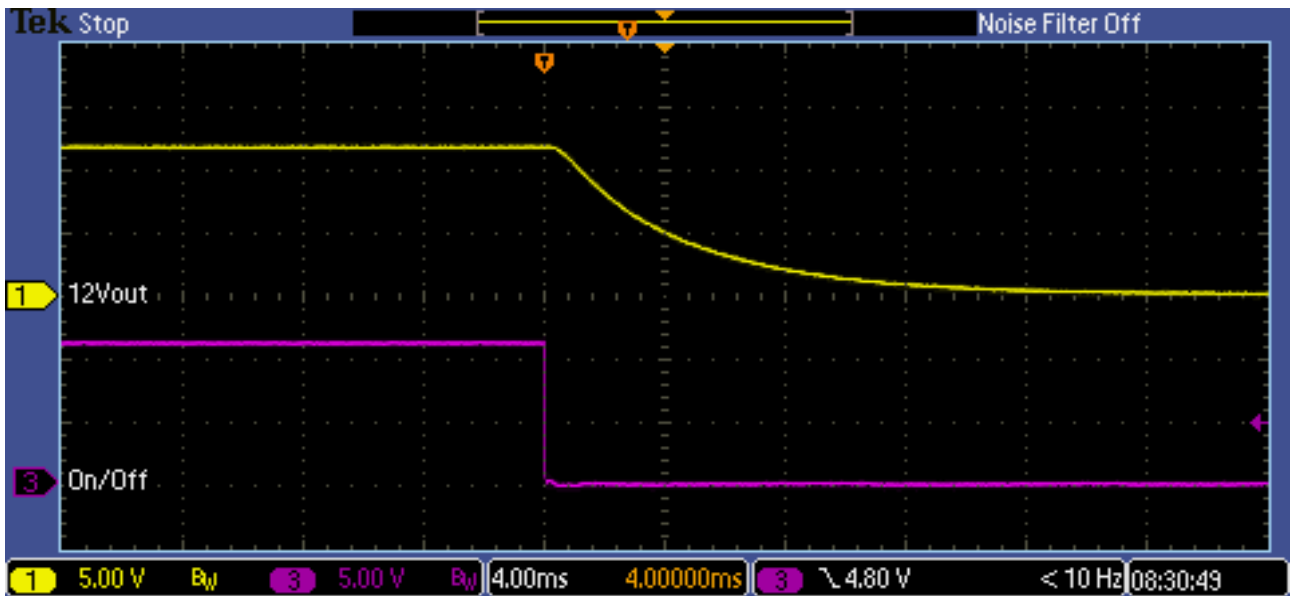
On/Off: 5V/div Vout: 5V/div 4s/div
 Output fall with ON/OFF control(0% Load, 110Vac input)



On/Off: 5V/div Vout: 5V/div 4ms/div
 Output fall with ON/OFF control(100% Load, 110Vac input)

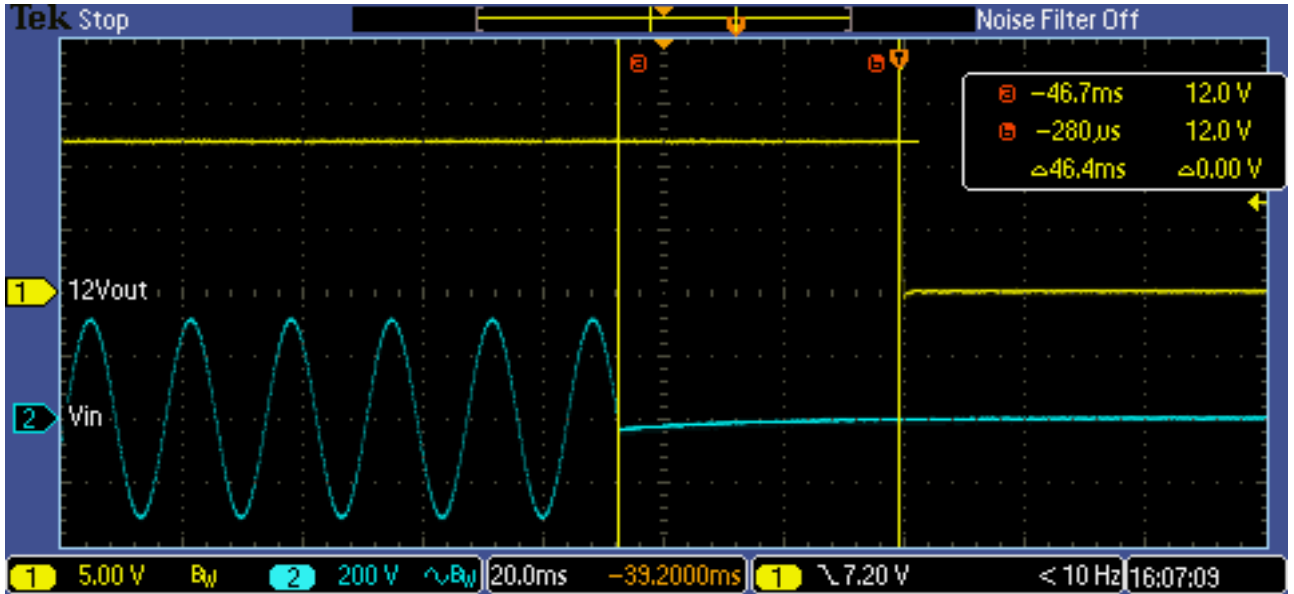


On/Off: 5V/div Vout: 5V/div 4s/div
 Output fall with ON/OFF control(0% Load, 220Vac input)



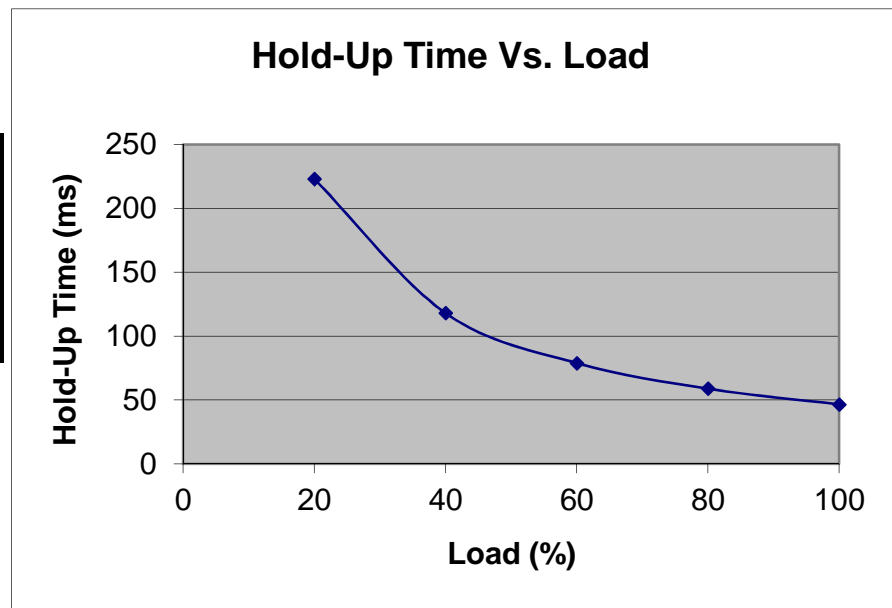
On/Off: 5V/div Vout: 5V/div 4ms/div
 Output fall with ON/OFF control(100% Load, 220Vac input)

2.8 Hold up time characteristics

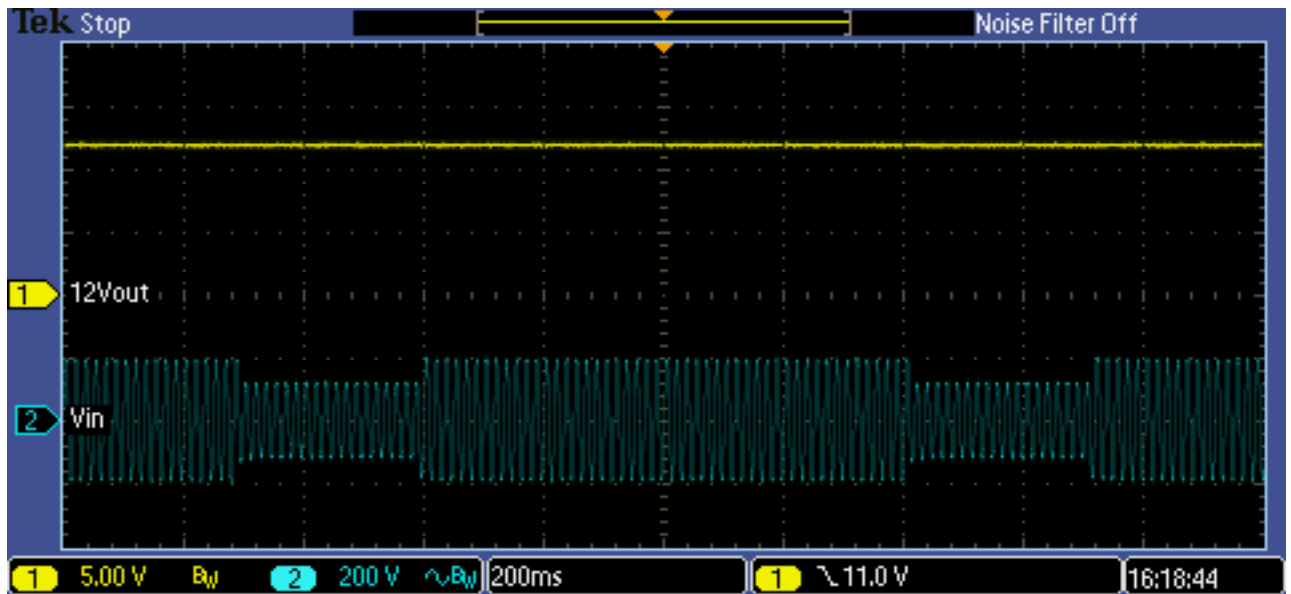


Vin: 200V/div Vout: 5V/div 20ms/div
Output fall with ON/OFF control(100% Load, 220Vac input)

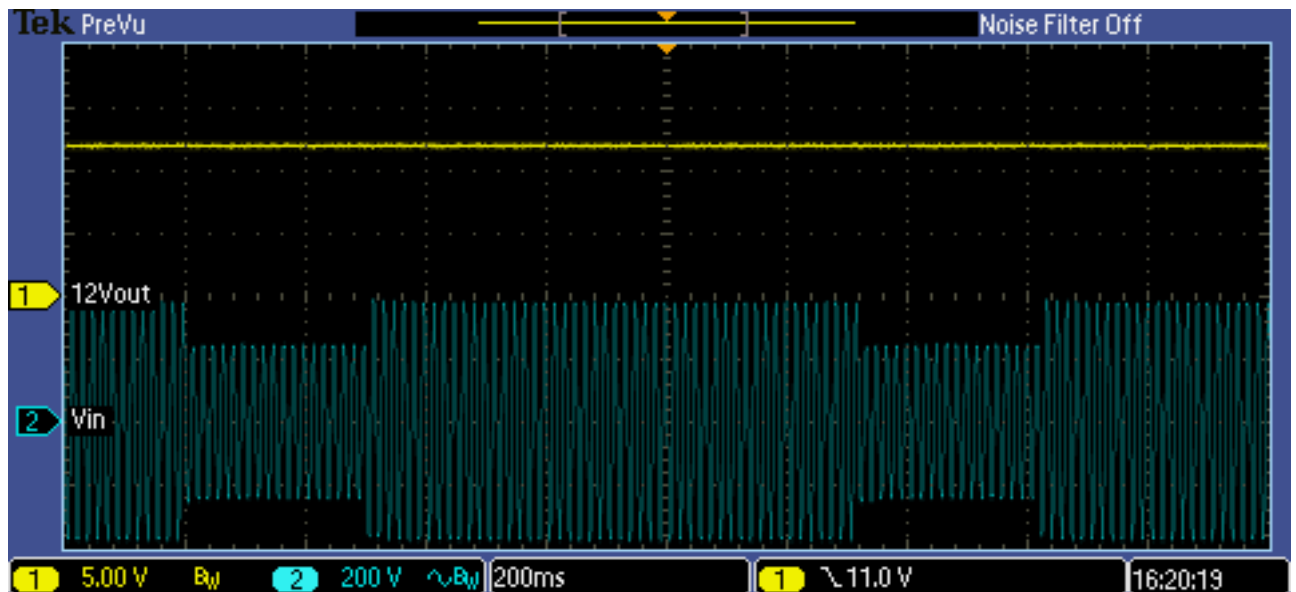
Load (%)	Hold up time (ms)
20	223
40	118
60	78.8
80	58.8
100	46.4



2.9 Dynamic line response characteristics

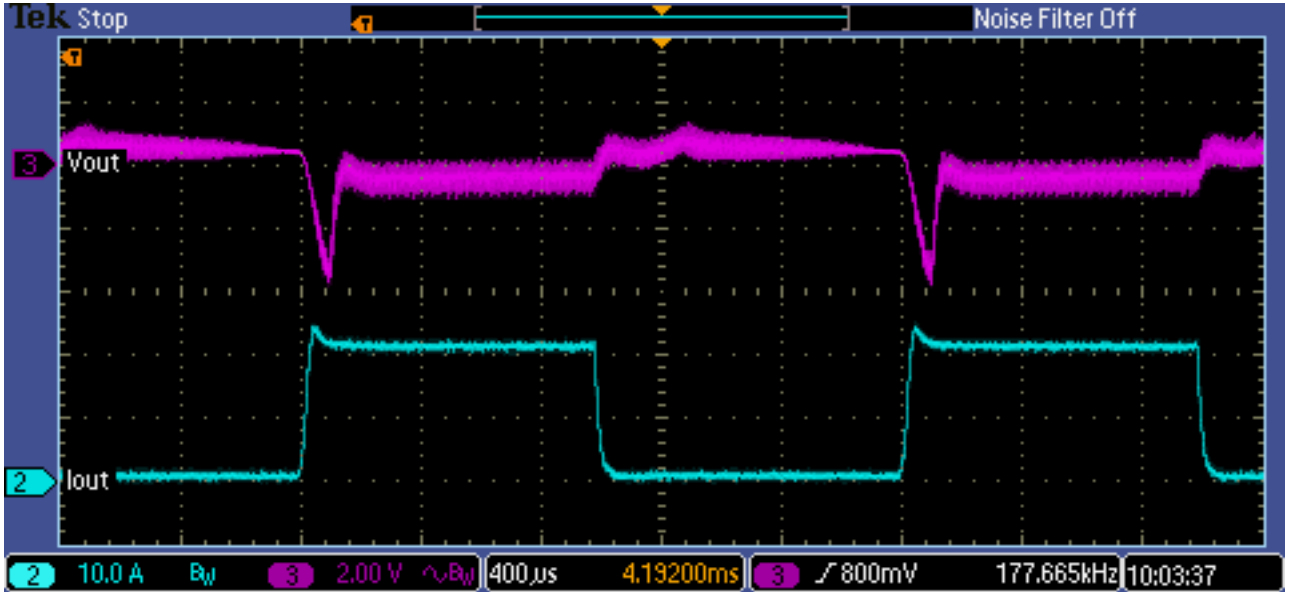


Vin: 200V/div Vout: 5V/div 200ms/div
Vin: 90VAC \iff 135VAC (100% Load)

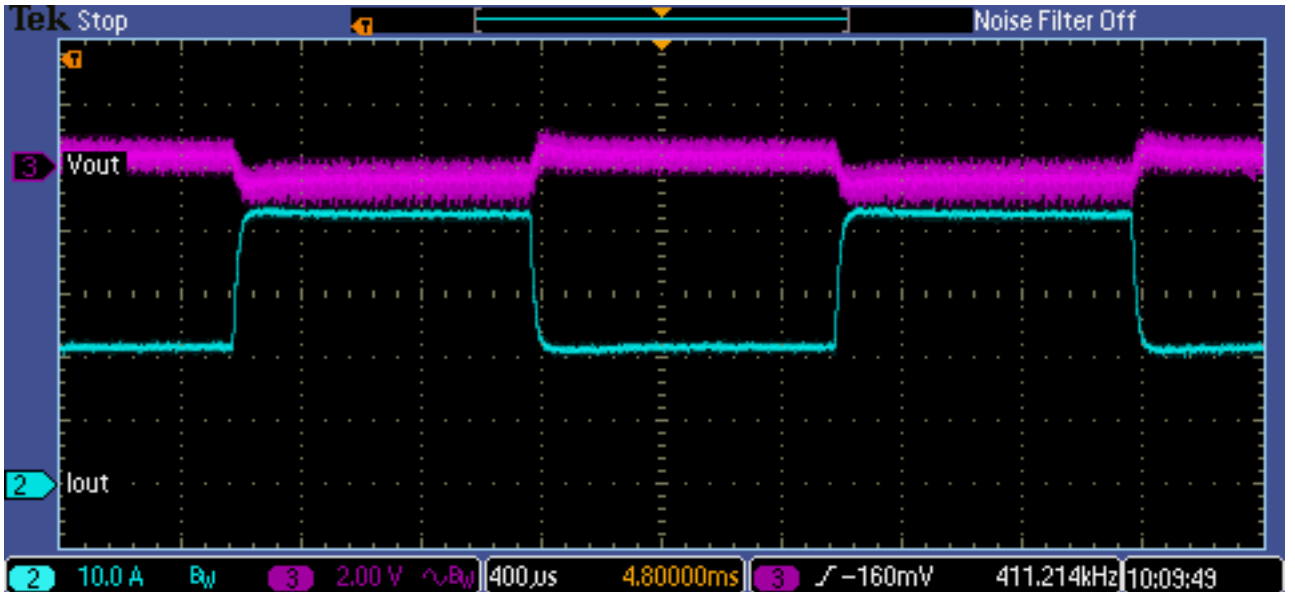


Vin: 200V/div Vout: 5V/div 200ms/div
Vin: 170VAC \iff 265VAC (100% Load)

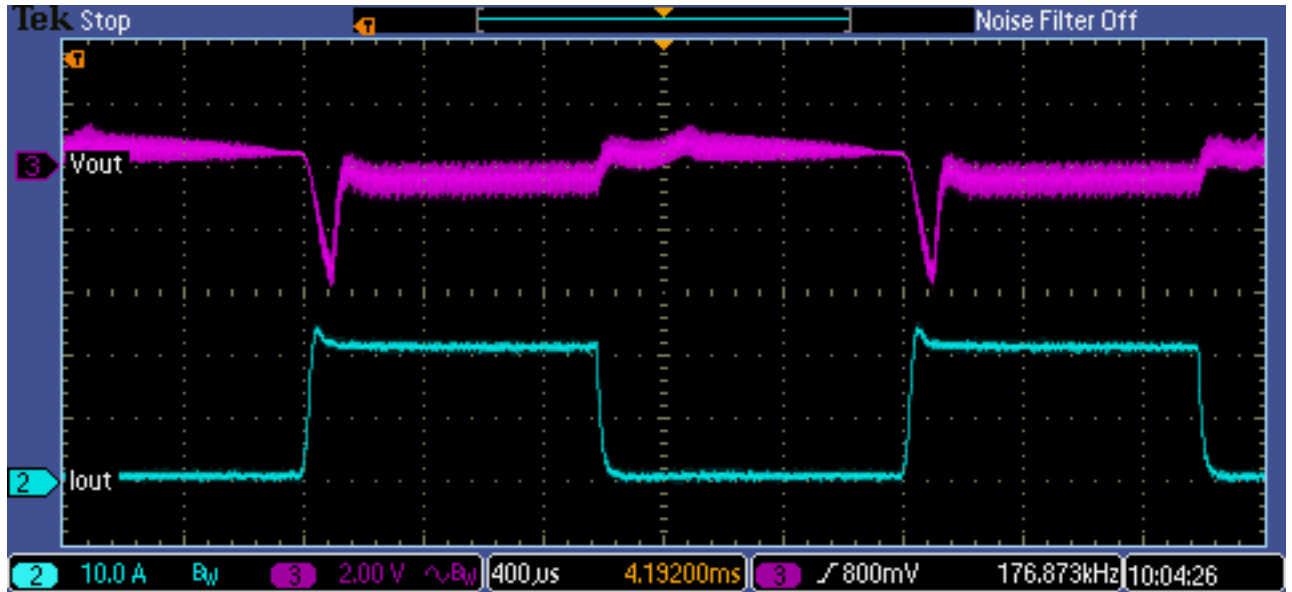
2.10 Dynamic load response characteristics



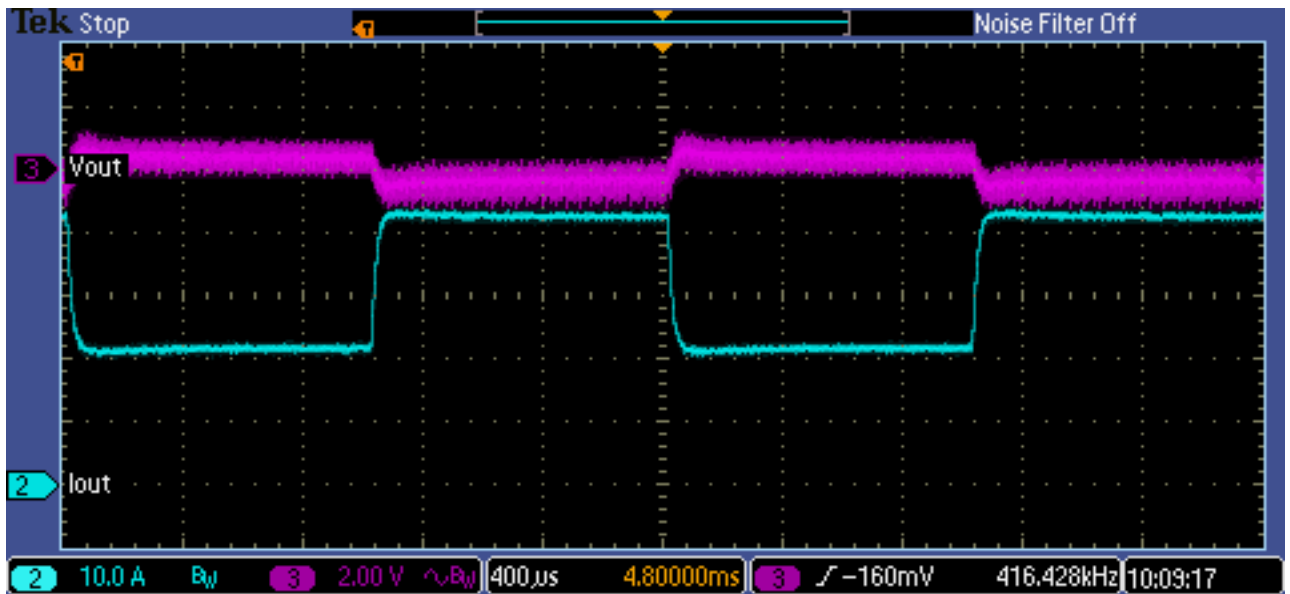
Iout: 10A/div Vout: 2V/div 400us/div
Dynamic Load Response (0% to 50% Load, 110Vac input)



Iout: 10A/div Vout: 2V/div 400us/div
Dynamic Load Response (50% to 100% Load, 110Vac input)

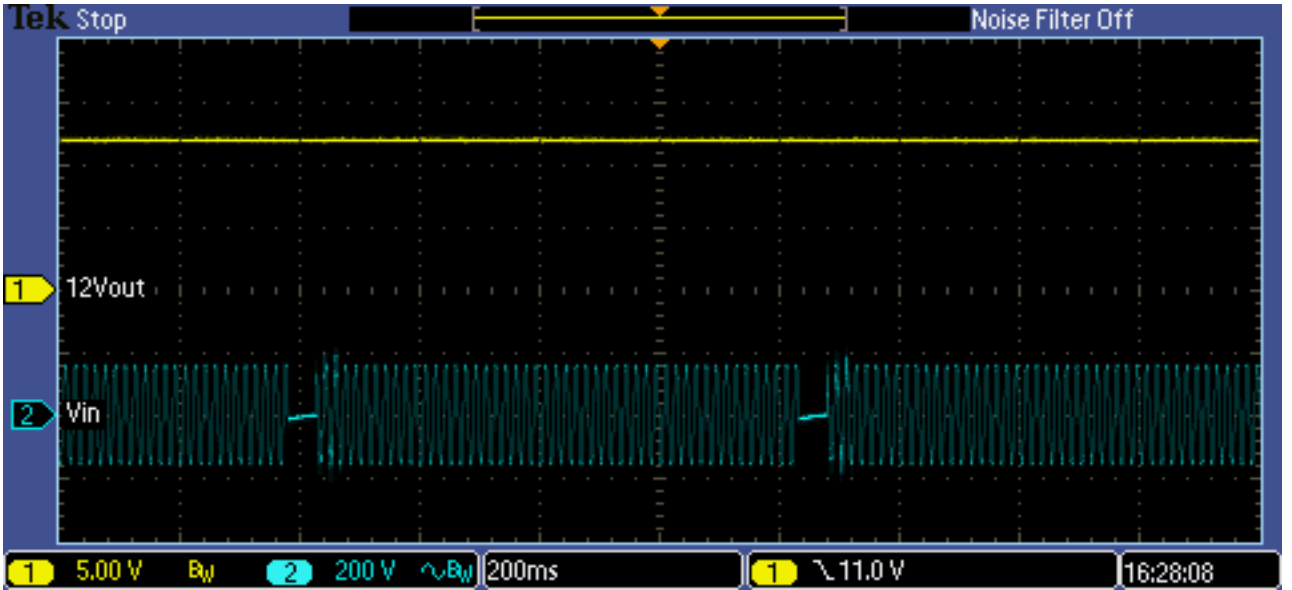


Iout: 10A/div Vout: 2V/div 400us/div
 Dynamic Load Response (0% to 50% Load, 220Vac input)

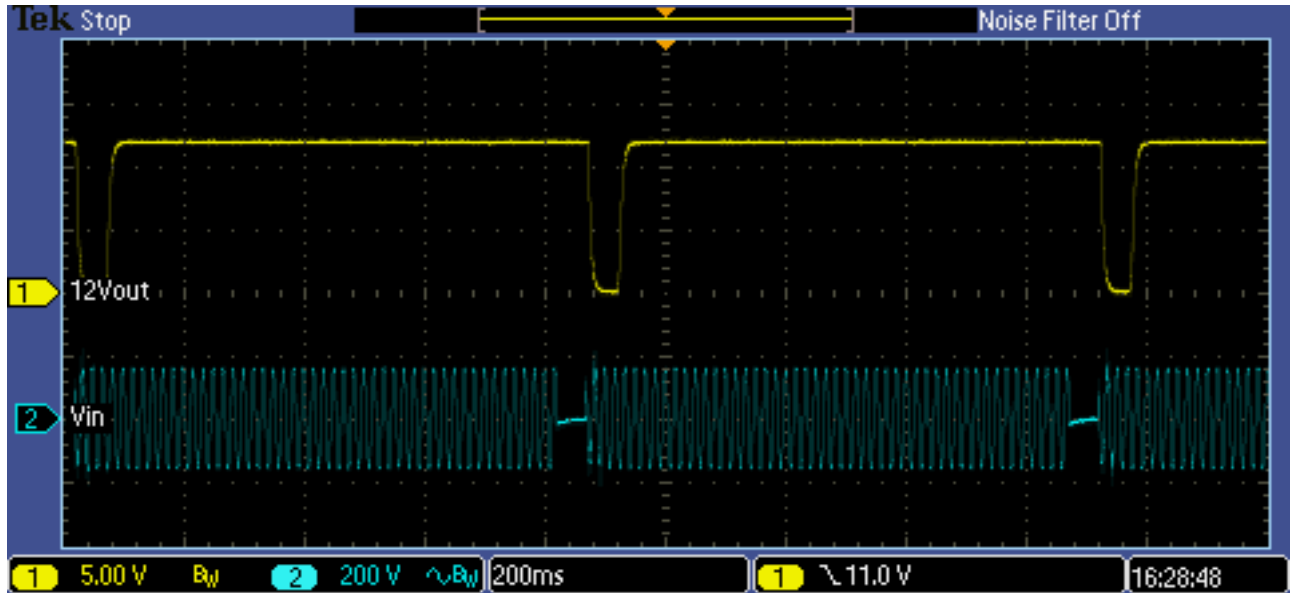


Iout: 10A/div Vout: 2V/div 400us/div
 Dynamic Load Response (50% to 100% Load, 220Vac input)

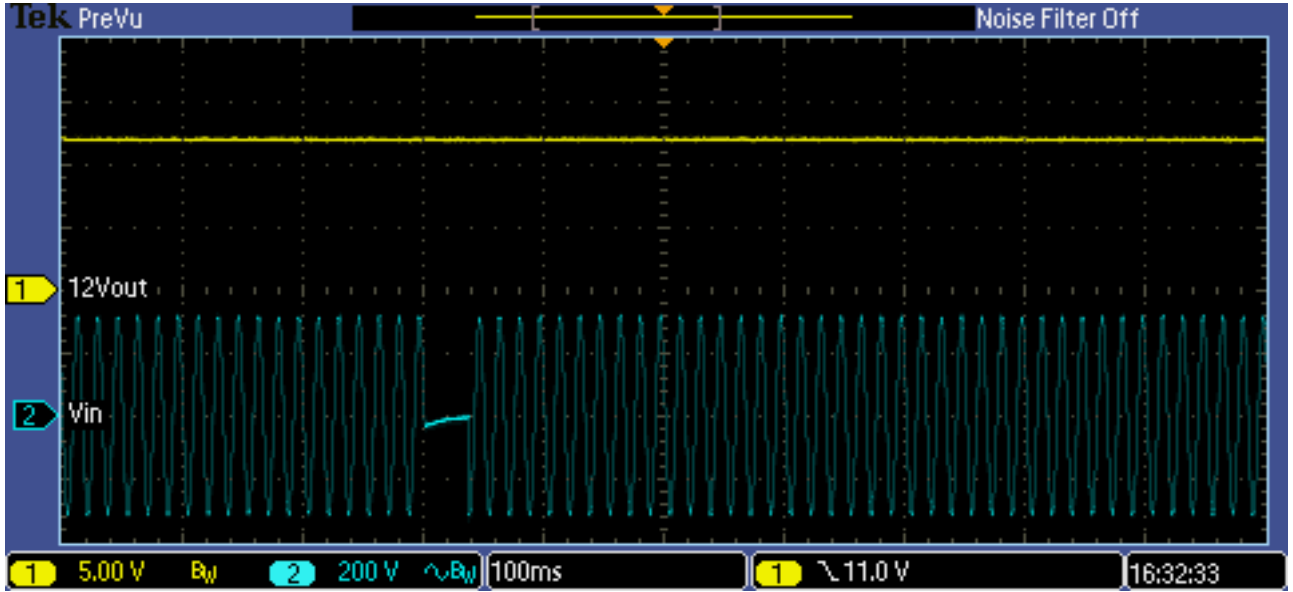
2.11 Response to brownout characteristics



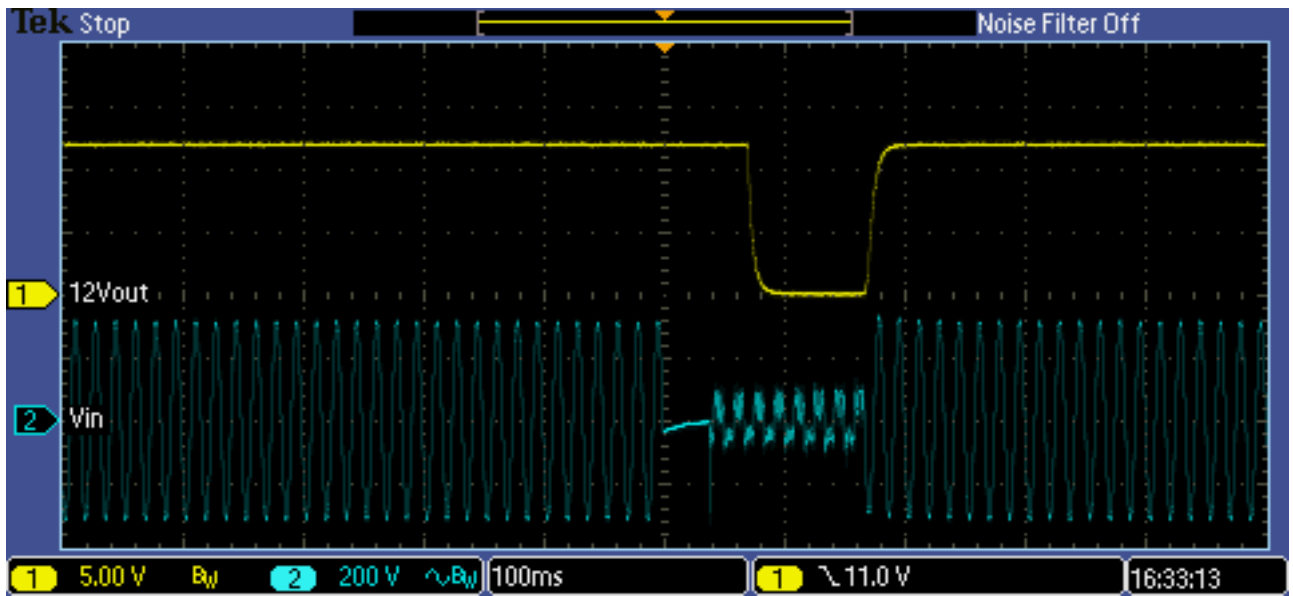
Vin: 200V/div Vout: 5V/div 200ms/div
Vin: 110VAC - 47mS Dropout (100% Load)



Vin: 200V/div Vout: 5V/div 200ms/div
Vin: 110VAC - 48mS Dropout (100% Load)

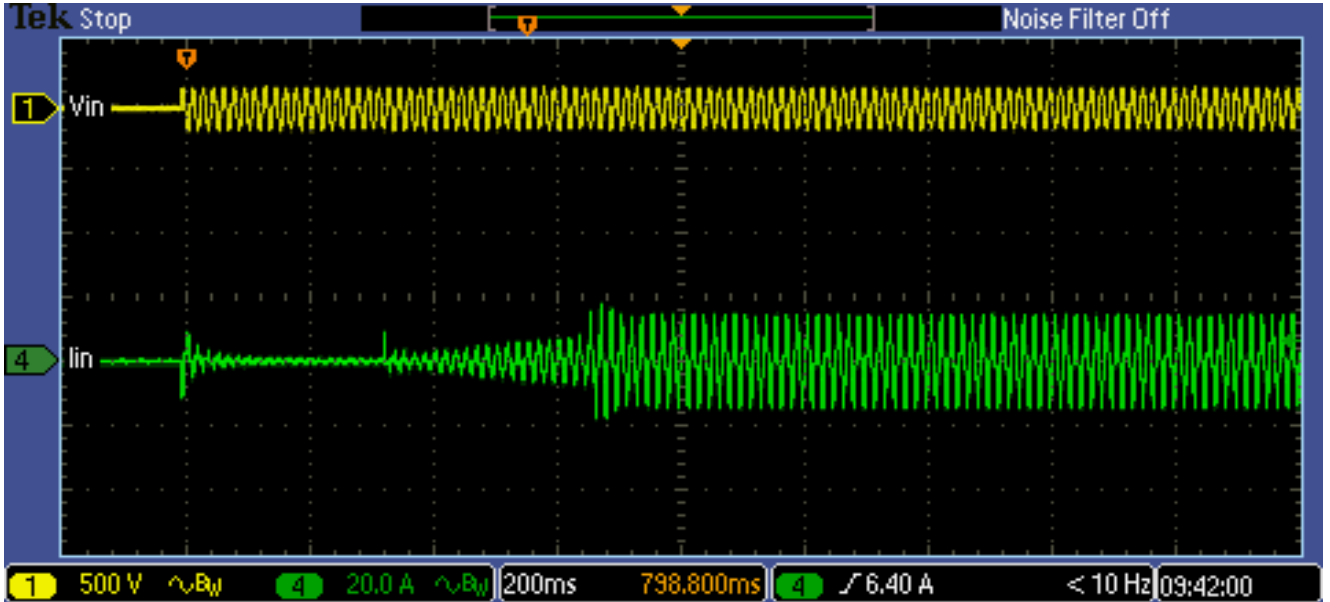


Vin: 200V/div Vout: 5V/div 100ms/div
 Vin: 220VAC - 37mS Dropout (100% Load)

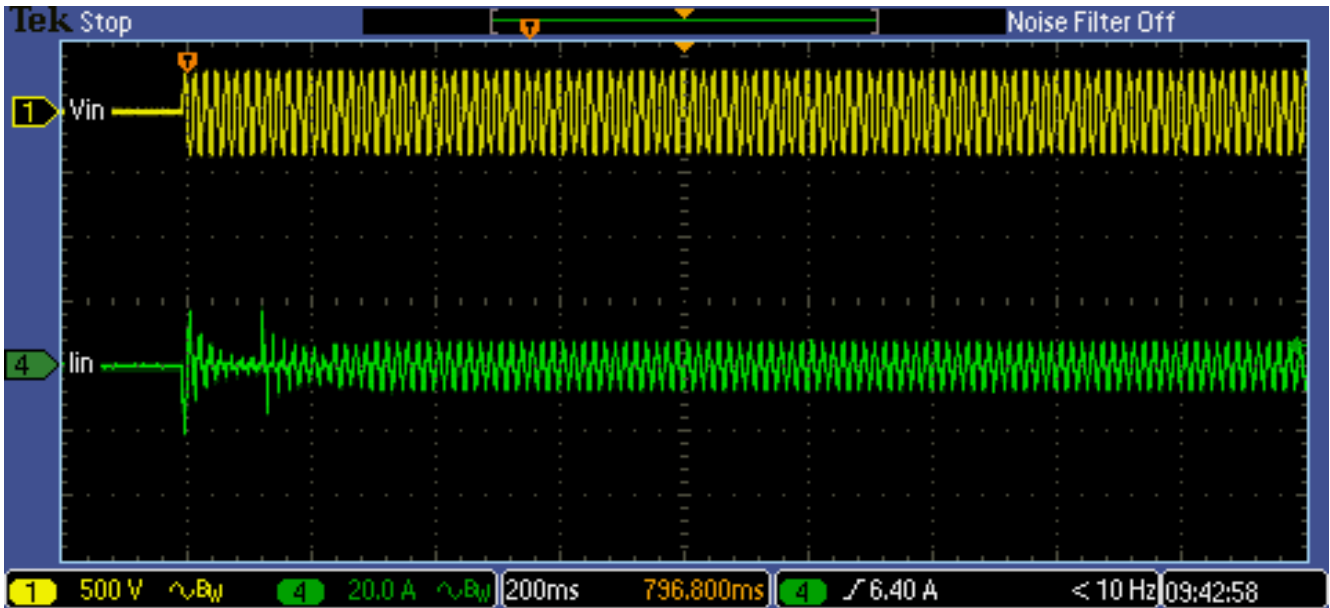


Vin: 200V/div Vout: 5V/div 100ms/div
 Vin: 220VAC - 38mS Dropout (100% Load)

2.12 Inrush current characteristics

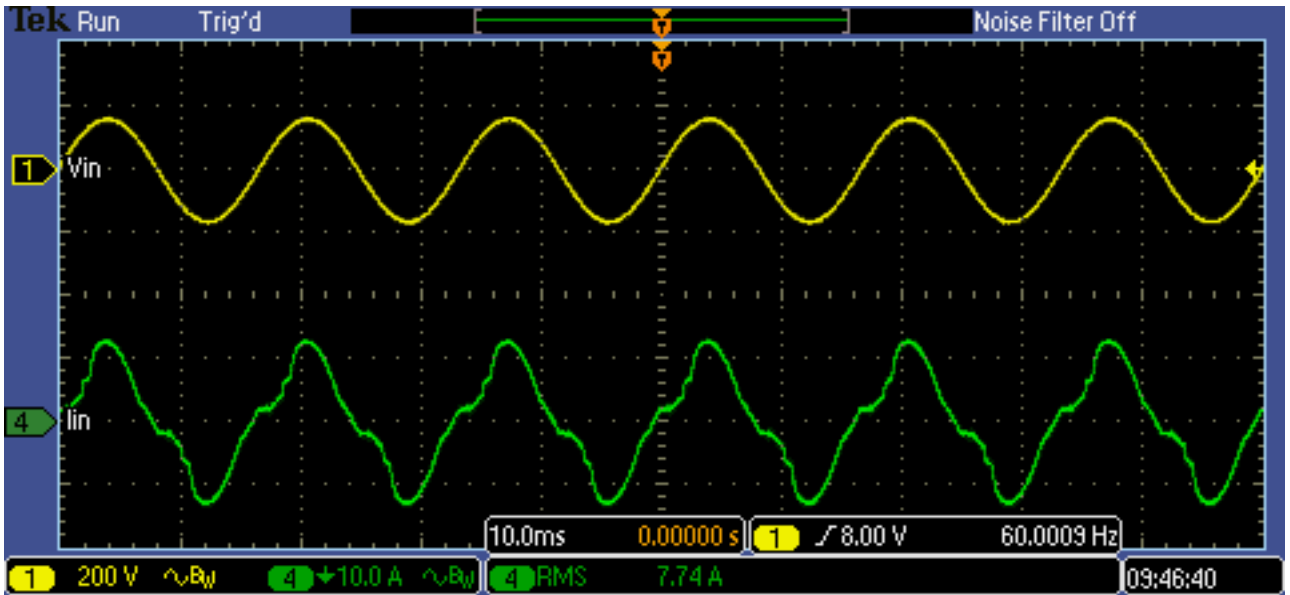


lin: 20A/div Vin: 500V/div 200ms/div
Inrush (100% Load, 110VAC input)

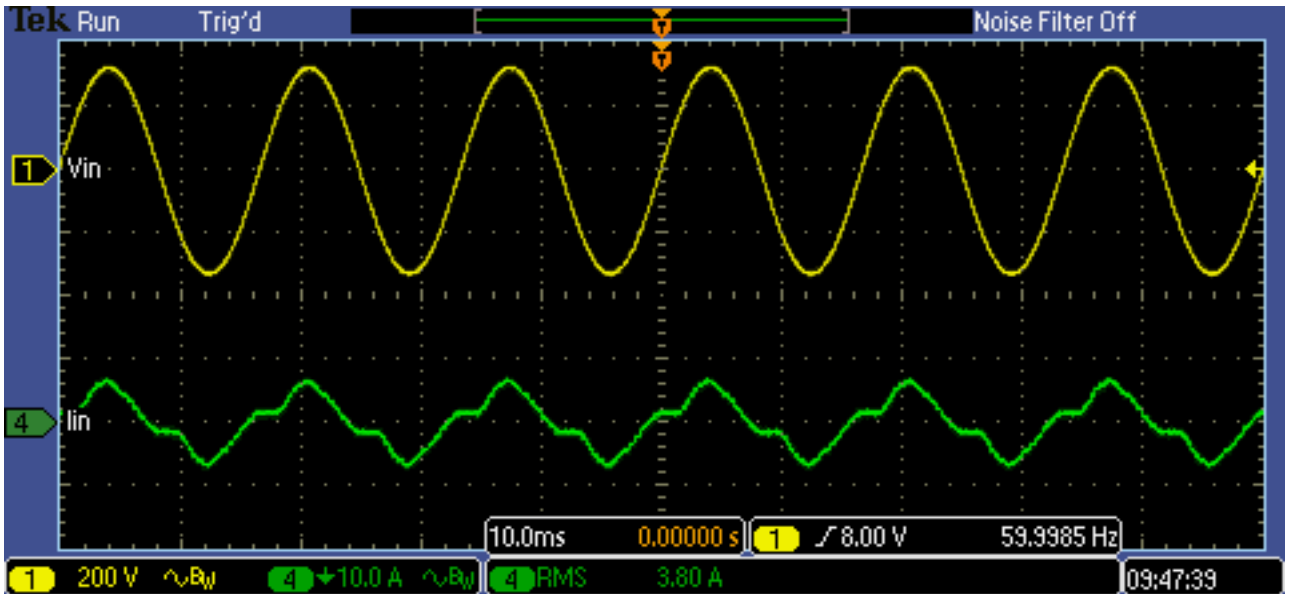


lin: 20A/div Vin: 500V/div 200ms/div
Inrush (100% Load, 220VAC input)

2.13 Input current waveforms



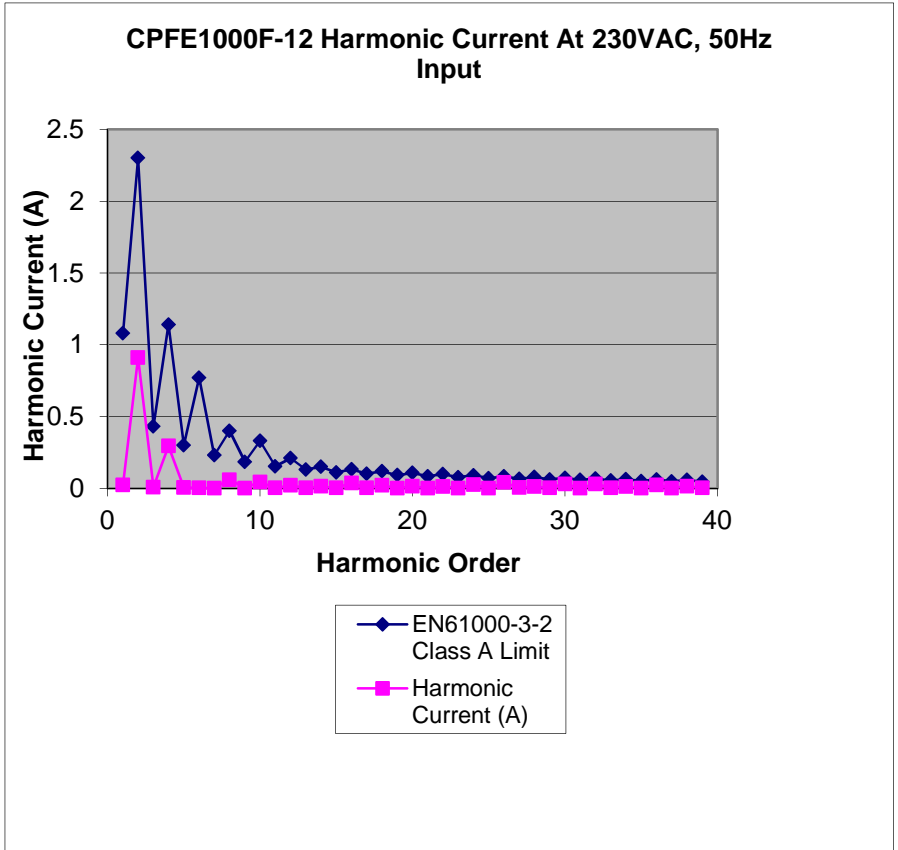
Iin: 10A/div Vin: 200V/div 10ms/div
Input Current (100% Load, 110VAC input)



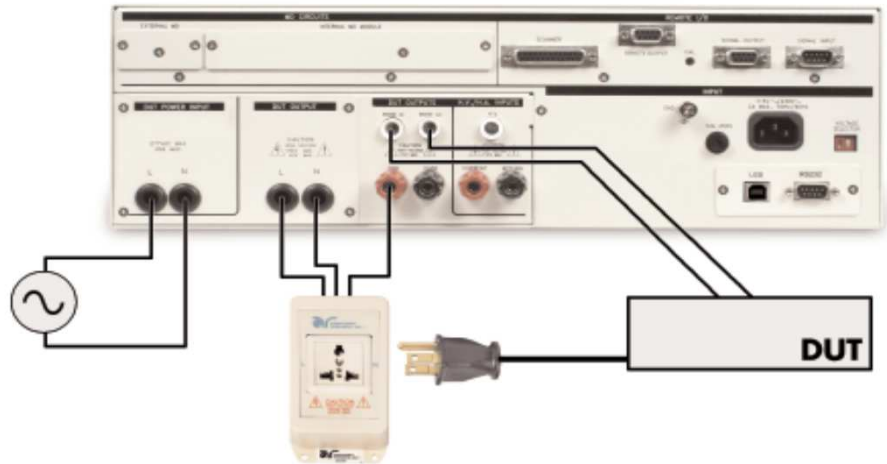
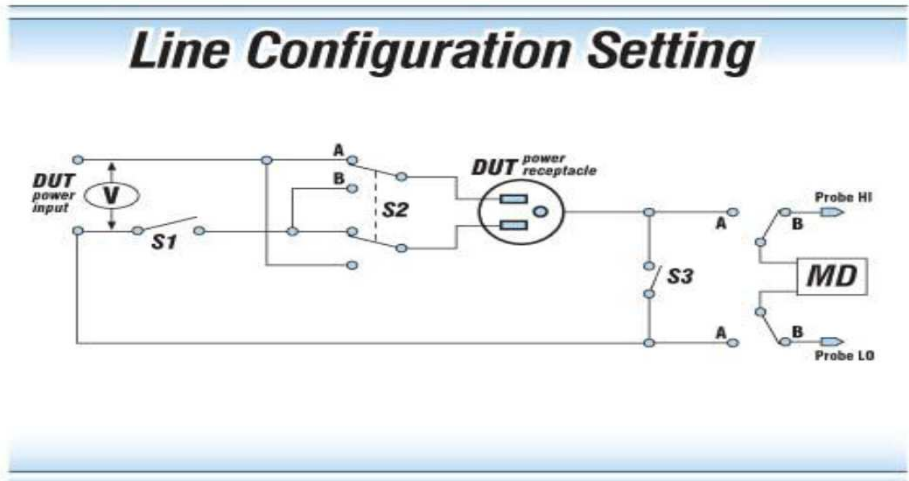
Iin: 10A/div Vin: 200V/div 10ms/div
Input Current (100% Load, 220VAC input)

2.14 Input current harmonics

CPFE1000F-12		
Vin	230 VAC	
Freq	50 HZ	
Io	60 ADC	
Vo	12VDC	
Iin	3.9763	
Harmonics	Limit (A)	A
2	1.08	0.0231
3	2.3	0.9092
4	0.43	0.0081
5	1.14	0.2944
6	0.3	0.0055
7	0.77	0.0027
8	0.23	0.0011
9	0.4	0.0597
10	0.184	0.0019
11	0.33	0.0438
12	0.153	0.0022
13	0.21	0.0201
14	0.131	0.0024
15	0.15	0.014
16	0.11	0.0023
17	0.132	0.0372
18	0.102	0.0024
19	0.118	0.0204
20	0.092	0.0018
21	0.107	0.0133
22	0.084	0.0019
23	0.098	0.0111
24	0.077	0.0015
25	0.09	0.0263
26	0.071	0.0012
27	0.083	0.0403
28	0.066	0.0043
29	0.078	0.0117
30	0.061	0.004
31	0.073	0.0298
32	0.058	0.002
33	0.068	0.0297
34	0.054	0.0038
35	0.064	0.0119
36	0.051	0.0017
37	0.061	0.0228
38	0.048	0.0015
39	0.058	0.0144
40	0.046	0.003



2.15 Leakage current characteristics



PS Vout	Time (s)	Freq (Hz)	Nom.1 110VAC	Nom.2 220VAC	Non.2HI 265VAC	Configuration		
						Neutral	S2	S3
12	10	60	<1.5mA	<1.5mA	<1.5mA	Closed	Normal	Open
	10	60	0.2580	0.5460	0.6670	Closed	Reverse	Open

2.16 Output ripple and noise waveforms



Vout: 20mV/div
2us/div
Output Ripple (100% Load, 110VAC input)



Vout: 20mV/div
2us/div
Output Ripple (100% Load, 220VAC input)