

PFE1500FB-48-xxx-R

Evaluation Report



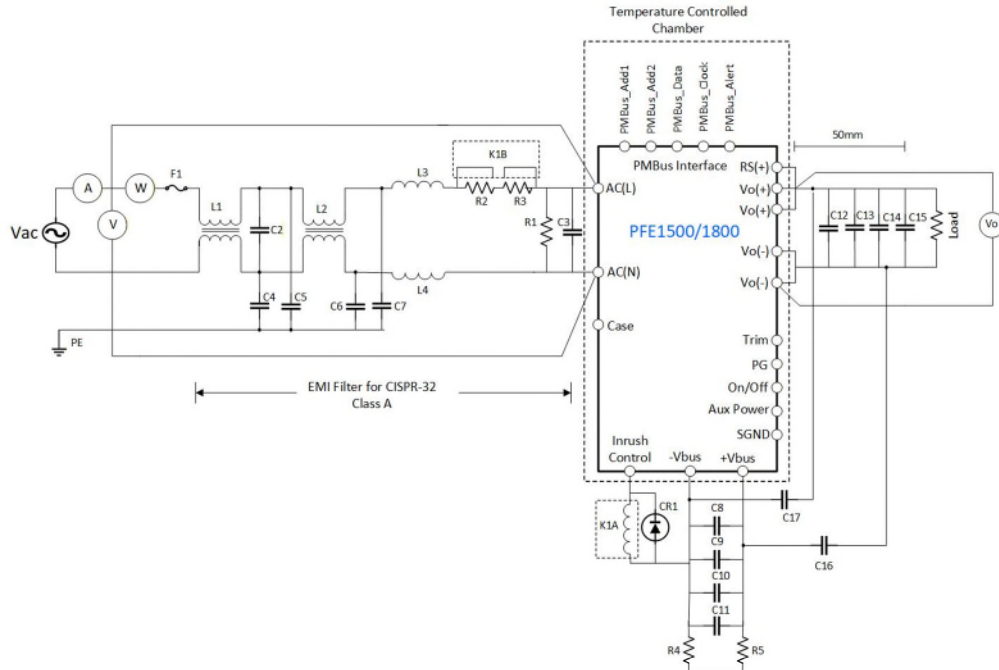
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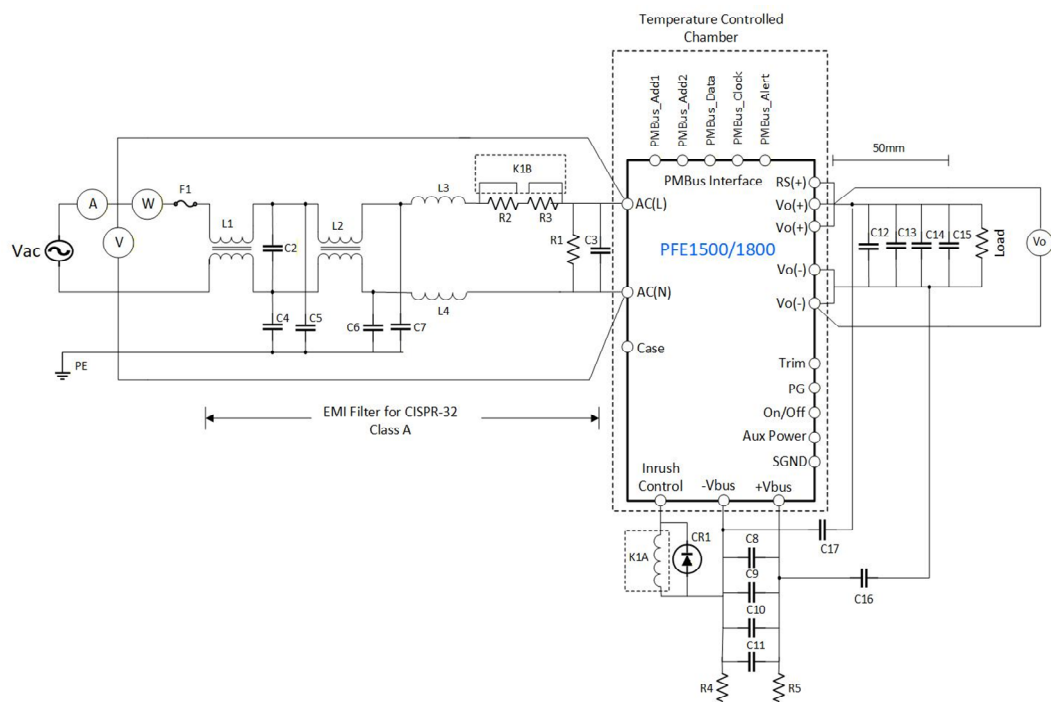
1. EVALUATION METHOD

1.1. Test / Measurement Circuits

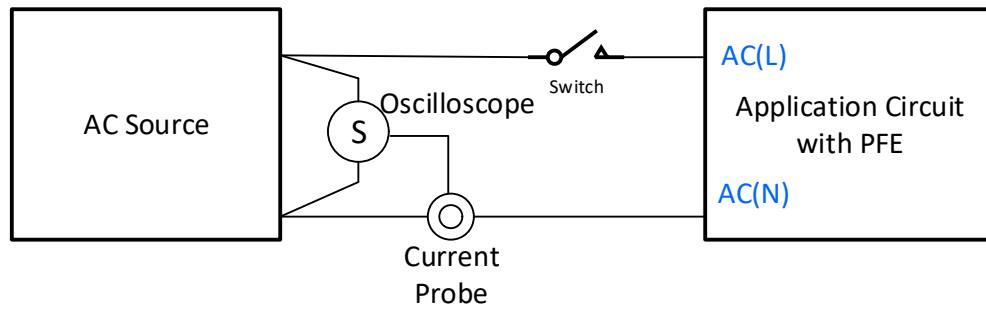
1.1.1. Steady State Test Measurement Circuit



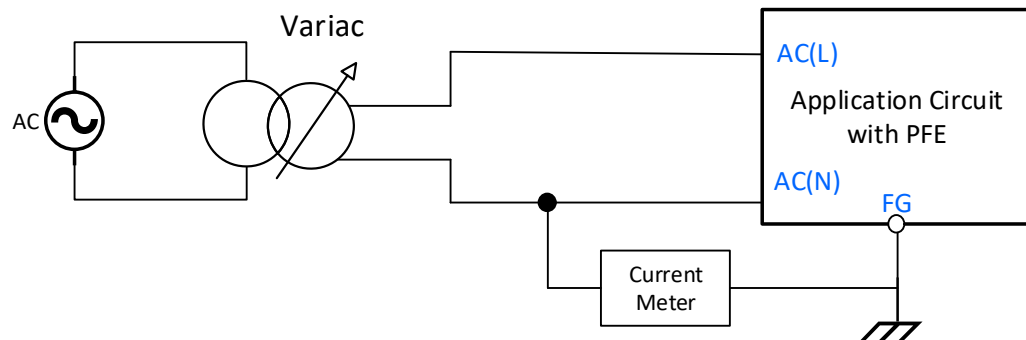
1.1.2. Dynamic, Protection and Output Ripple and Noise Measurement Circuit



1.1.3. Inrush Current Measurement Circuit

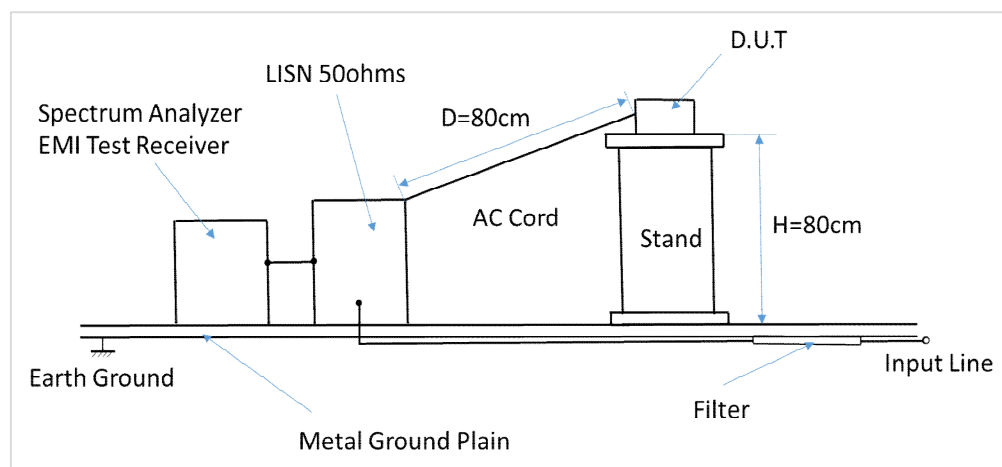


1.1.4. Leakage Current Measurement Circuit

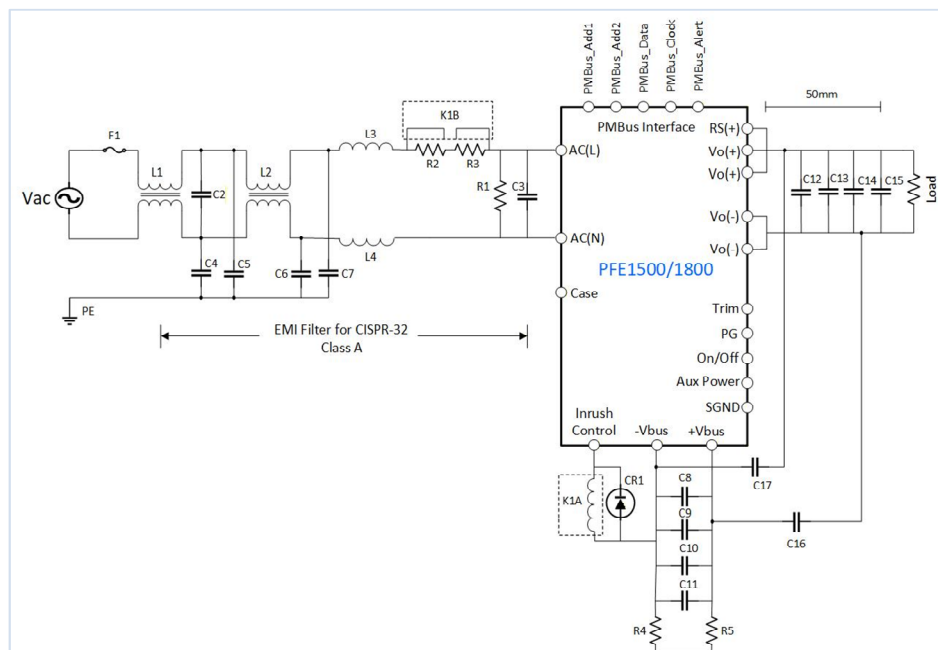
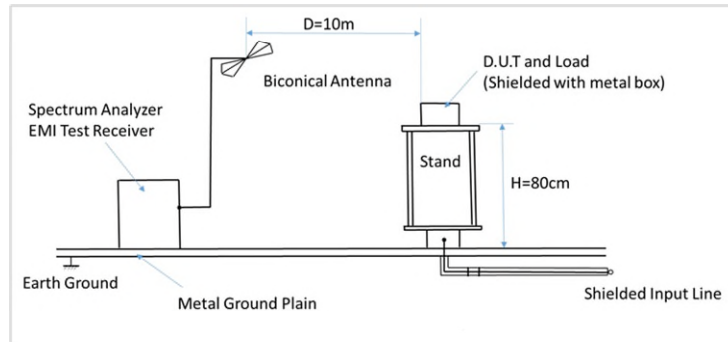


1.1.5. Electromagnetic Interference Test Setup

1.1.5.1. Conducted EMI



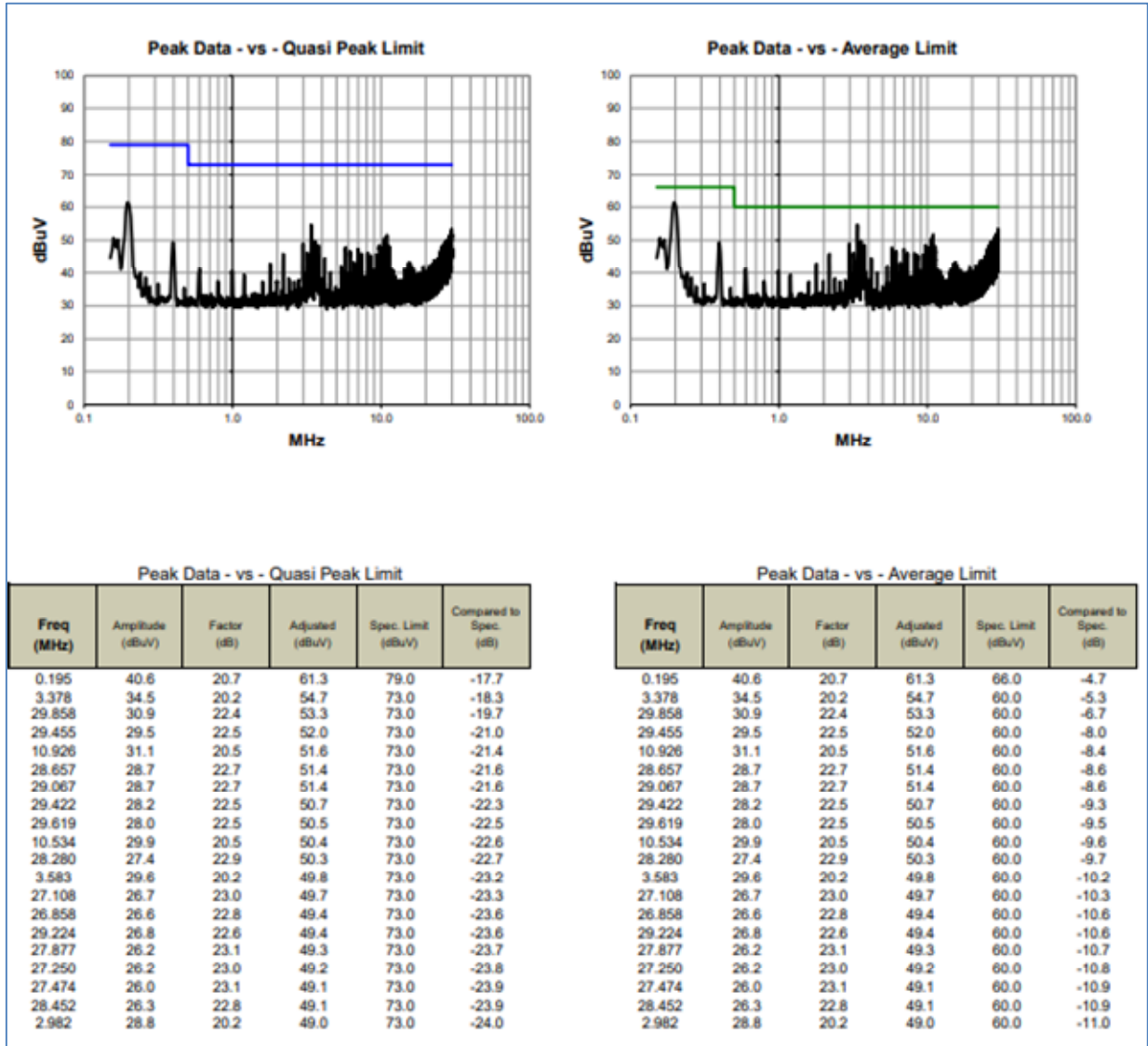
1.1.5.2. Radiated EMI



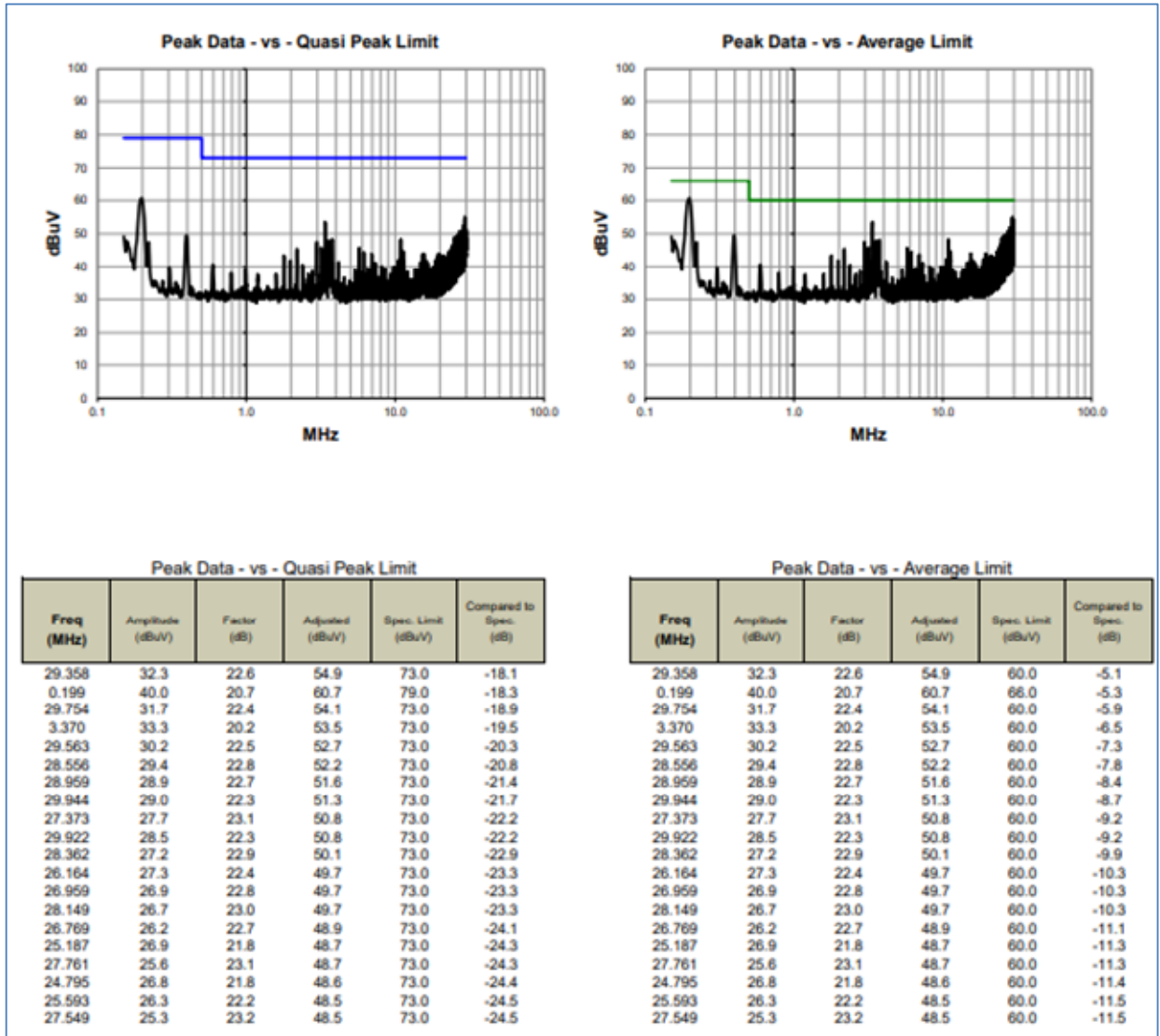
Reference Designator	Description	Reference Designator	Description
C2	0.47 μ F Film Capacitor	C3	2x2.2 μ F Film Capacitor
C4, C5, C6, C7	4700pF Ceramic Capacitor	C15	0.1 μ F ceramic capacitor
C16, C17	7500pF ceramic capacitor	CR1	CRH01, 200V, 1A Diode
L1	1mH	R2, R3	10 Ω 5W
L2	1.3mH	C12, C13	560 μ F electrolytic capacitor
L3, L4	27 μ H	C14	8x4.7 μ F Ceramic Capacitor
R1, R4, R5	470 k Ω , 2 W	C8, C9, C10, C11	470 μ F Electrolytic Capacitor
K1	1 Form A relay with 16A, 277VAC, power rating: 12VDC, 16.7mA, 200mW, High Sensitivity	F1	20A, 280V, Fast Blow

1.1.5.3. Conducted EMI Results

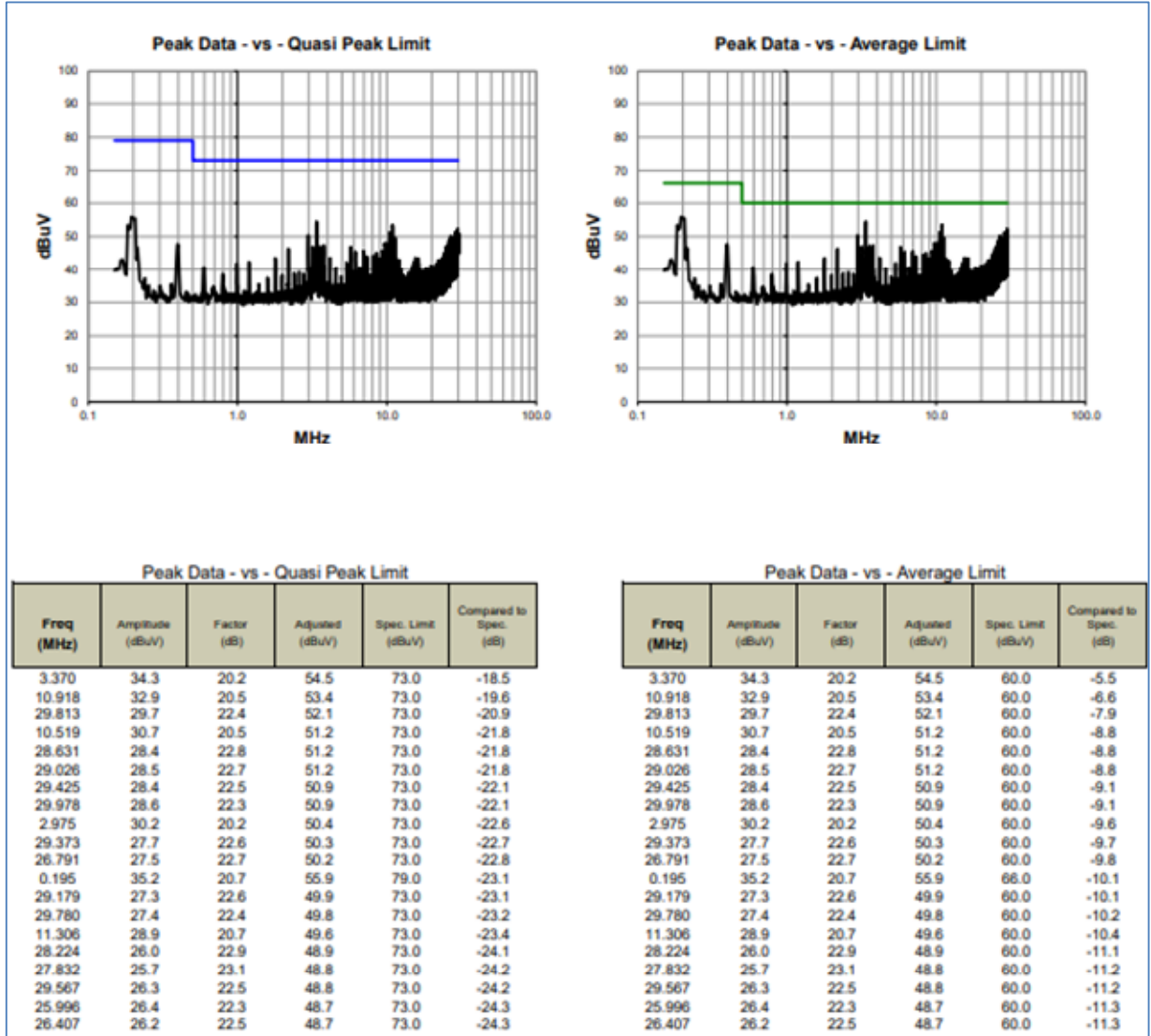
Line. 120Vac, Iout = 24A, 60 Hz



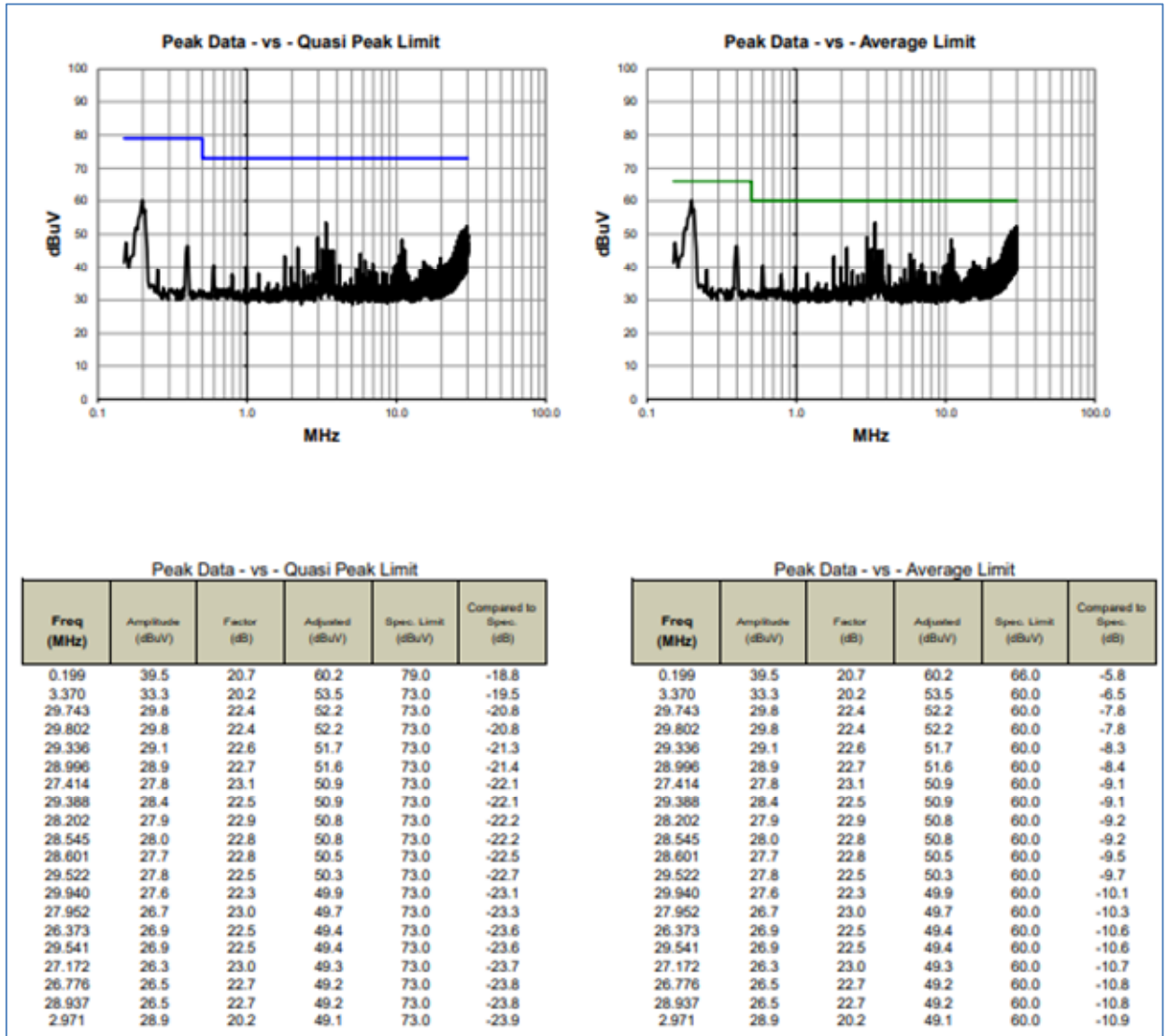
Neutral. 120Vac, Iout = 24A, 60 Hz



Line. 230Vac, Iout = 24A, 50 Hz

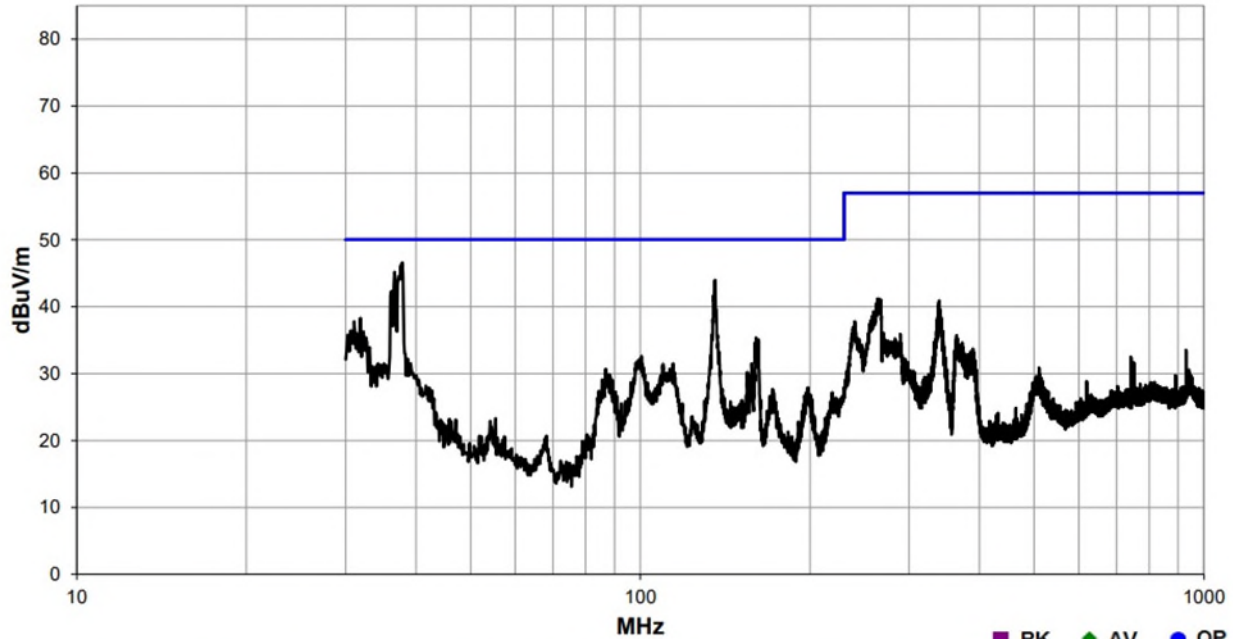


Neutral, 230Vac, Iout = 24A, 50 Hz



1.1.5.4. Radiated EMI Results

230Vac, Iout = 28A, 50 Hz



Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Antenna Height (meters)	Transducer (dB/m)	Cable (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
37.816	69.0	38.1	2.8	14.7	1.0	0.0	Vert	PK	0.0	46.6	50.0	-3.4
36.632	67.0	38.1	2.8	15.3	1.0	0.0	Vert	PK	0.0	45.2	50.0	-4.8
135.751	68.4	38.0	1.0	12.0	1.6	0.0	Vert	PK	0.0	44.0	50.0	-6.0
36.158	63.8	38.1	2.8	15.5	1.1	0.0	Vert	PK	0.0	42.3	50.0	-7.7
135.751	63.3	38.0	3.8	12.0	1.6	0.0	Horz	PK	0.0	38.9	50.0	-11.1
31.895	56.8	38.1	1.0	17.6	2.0	0.0	Vert	PK	0.0	38.3	50.0	-11.7
31.066	55.7	38.1	1.0	18.1	2.1	0.0	Vert	PK	0.0	37.8	50.0	-12.2
32.250	55.0	38.1	1.0	17.5	1.9	0.0	Vert	PK	0.0	36.3	50.0	-13.7
160.383	57.5	38.1	1.5	14.2	1.8	0.0	Horz	PK	0.0	35.4	50.0	-14.6
162.041	57.6	38.1	1.0	13.8	1.8	0.0	Horz	PK	0.0	35.1	50.0	-14.9
160.028	56.7	38.1	2.0	14.3	1.8	0.0	Horz	PK	0.0	34.7	50.0	-15.3
264.003	59.6	38.2	1.5	17.5	2.3	0.0	Vert	PK	0.0	41.2	57.0	-15.8
267.319	59.5	38.3	2.0	17.5	2.3	0.0	Horz	PK	0.0	41.0	57.0	-16.0
339.202	58.5	38.3	1.0	18.2	2.5	0.0	Horz	PK	0.0	40.9	57.0	-16.1
33.079	53.3	38.1	1.0	17.0	1.7	0.0	Vert	PK	0.0	33.9	50.0	-16.1
100.462	57.4	38.0	2.8	11.7	1.5	0.0	Horz	PK	0.0	32.6	50.0	-17.4
114.317	56.1	38.0	2.0	11.9	1.5	0.0	Horz	PK	0.0	31.5	50.0	-18.5
157.660	53.3	38.1	2.8	14.6	1.7	0.0	Horz	PK	0.0	31.5	50.0	-18.5
109.580	55.6	38.0	1.0	12.2	1.5	0.0	Vert	PK	0.0	31.3	50.0	-18.7
109.462	55.4	38.0	2.8	12.2	1.5	0.0	Horz	PK	0.0	31.1	50.0	-18.9

List of Equipment

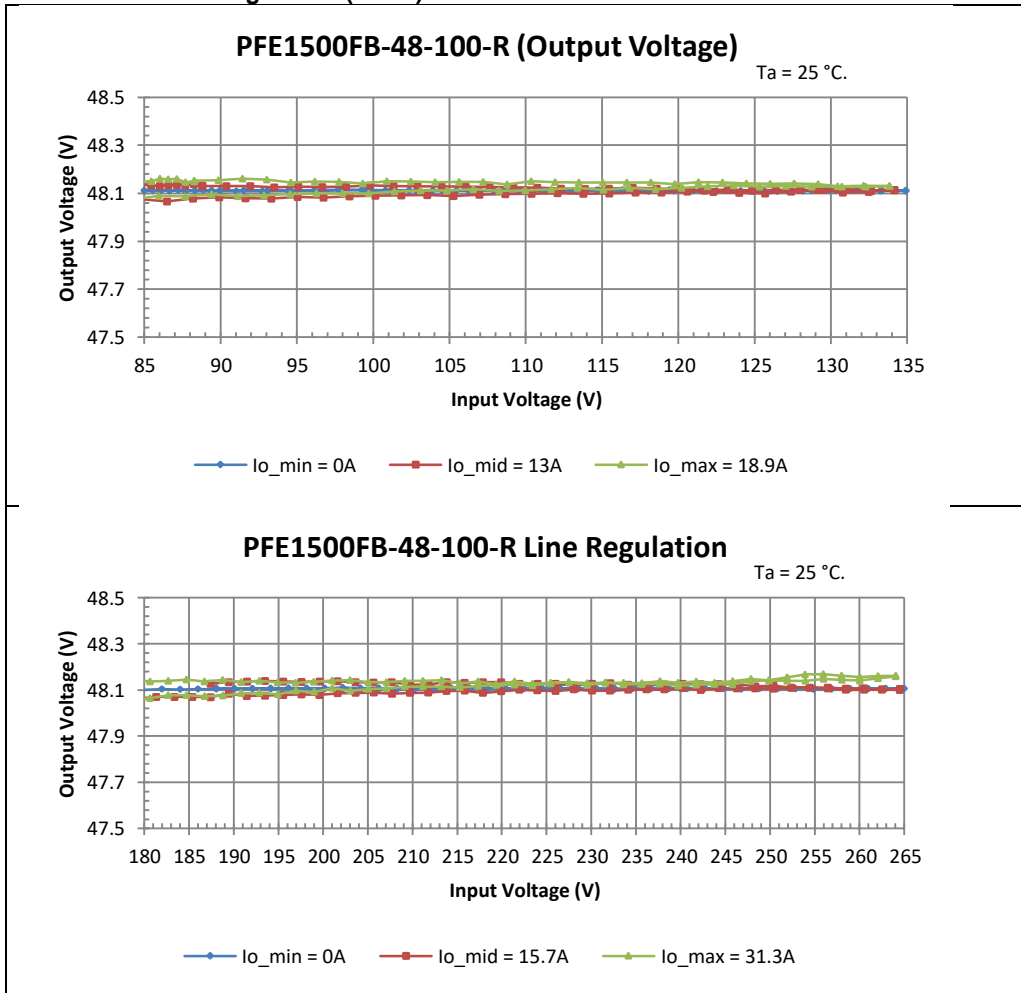
	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	OSCILLOSCOPE	LECROY	HDO 4054
2	OSCILLOSCOPE	LECROY	HDO 4054
3	DIGITAL MULTIMETER	KEITHLEY	2110
4	DIGITAL MULTIMETER	KEITHLEY	2110
5	DIFFERENTIAL AMPLIFIER	LECROY	DA1855A
6	DIFFERENTIAL AMPLIFIER	LECROY	DA1855A
7	SHUNT RESISTOR	EMPRO SHUNT	HA20-100
8	TEMP CHAMBER	TENNEY JUNIOR ENVIRONMENTAL	TJR
9	DIFFERENTIAL PROBE	LECROY	A101
10	DIFFERENTIAL PROBE	LECROY	DXG100A
11	DIGITAL POWER METER	YOKOGAWA	WT310
12	SURGE TESTER	TESEQ	NSG 3060A-ANSI
13	DC ELECTRONIC LOAD	CHROMA	63201
14	FREQUENCY ANALYZER	AP INSTRUMENT	300
15	AC POWER SOURCE	CHROMA	6530
16	INJECTION ISOLATOR	RIDLEY ENGINEERING	0.1Hz TO 30MHz
17	WAVEFORM GENERATOR	AGILENT	33120A
18	DC ELECTRONIC LOAD	CHROMA	6334
19	AC CONTROL	SORENSEN	DCS150-20
20	THERMOSTREAM	TEMPTRONIC CORPORATION	ATS-810-M-4
21	CURRENT PROBE	LECROY	AP015
22	CURRENT PROBE	LECROY	CP150

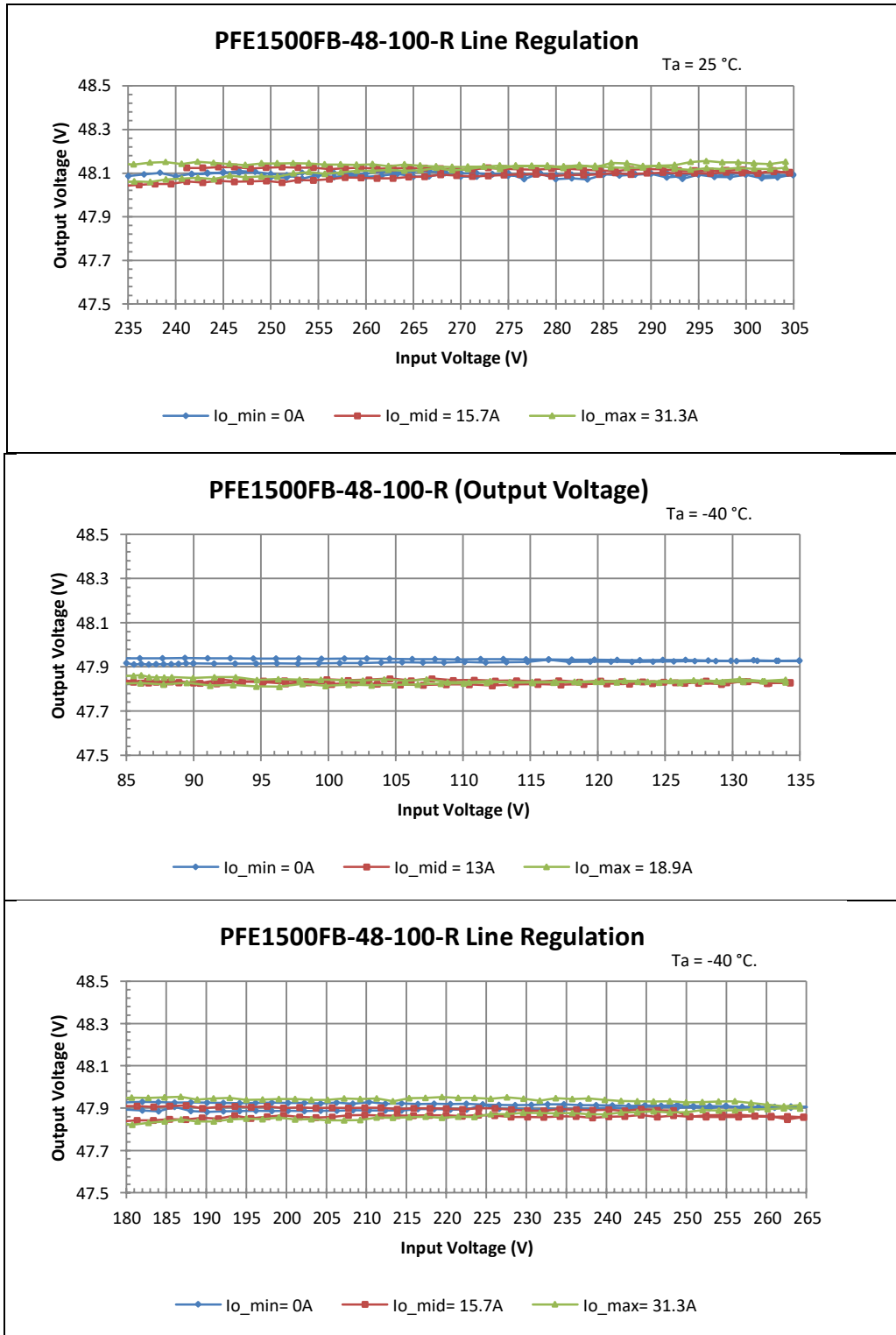
2. CHARACTERISTICS

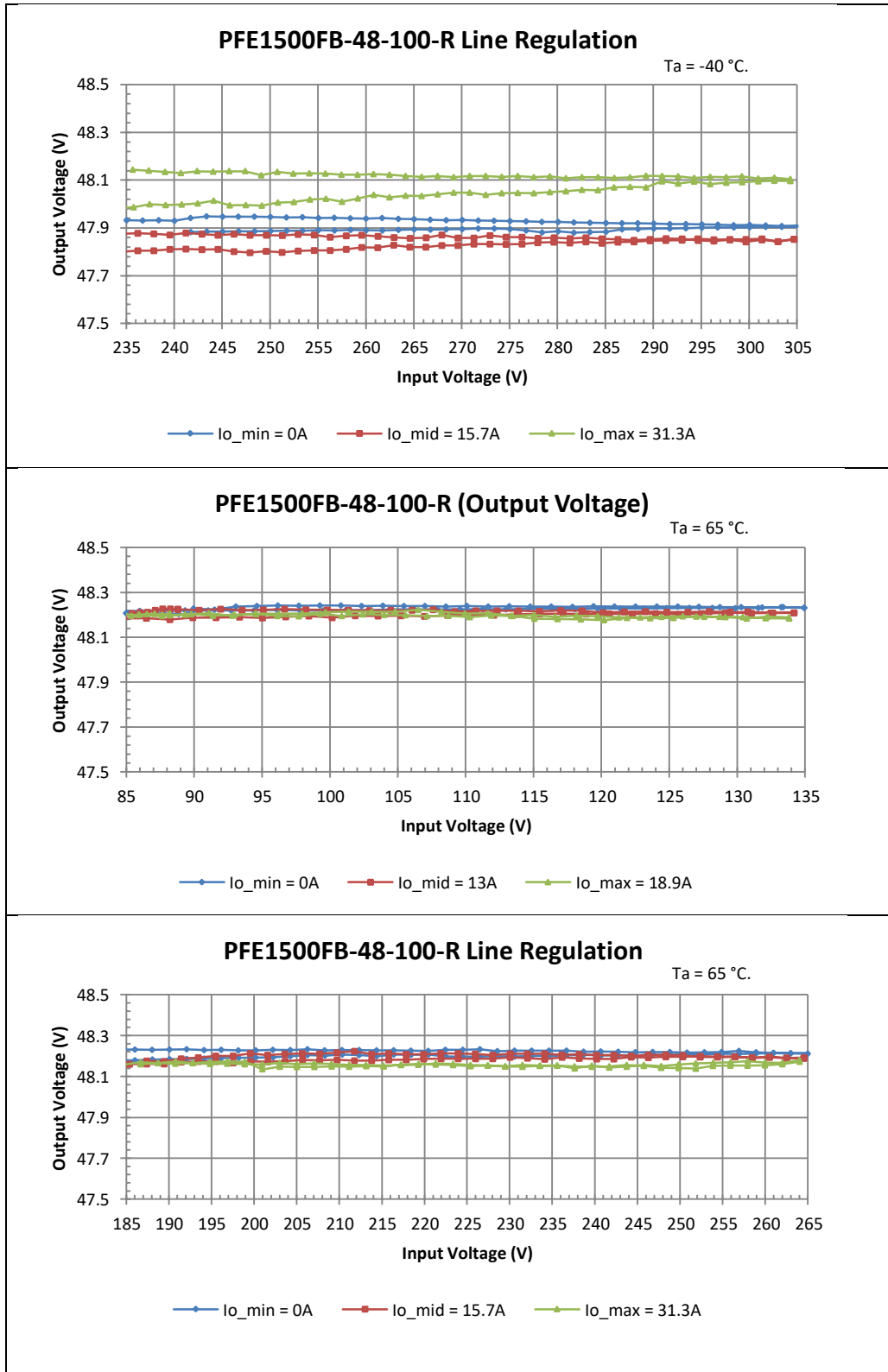
2.1 Steady State Data (Refer to Section 1.1.1 For Test Setup)

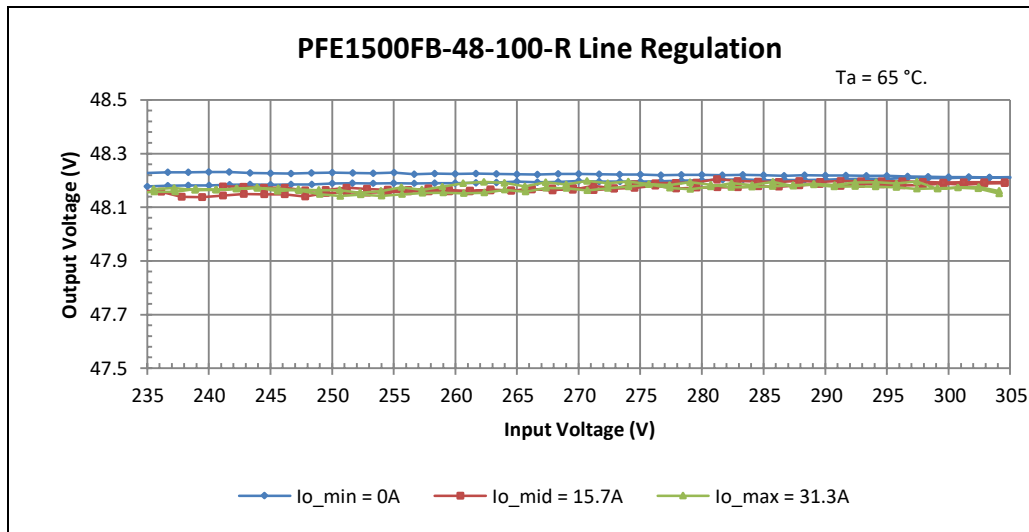
2.1.1 Regulation – Line, Load

a. Line Regulation (60 Hz)





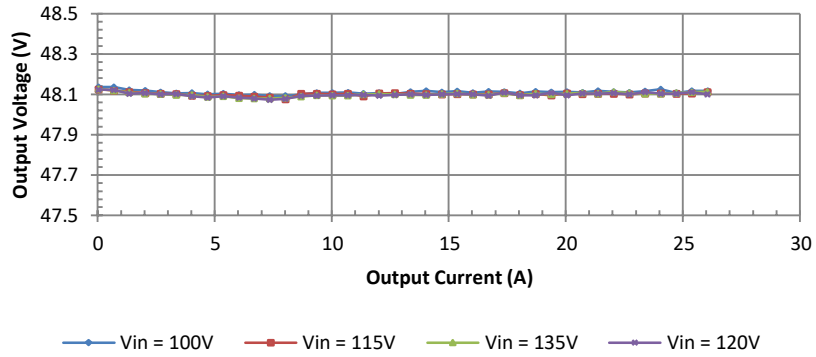




b. Load Regulation (60 Hz)

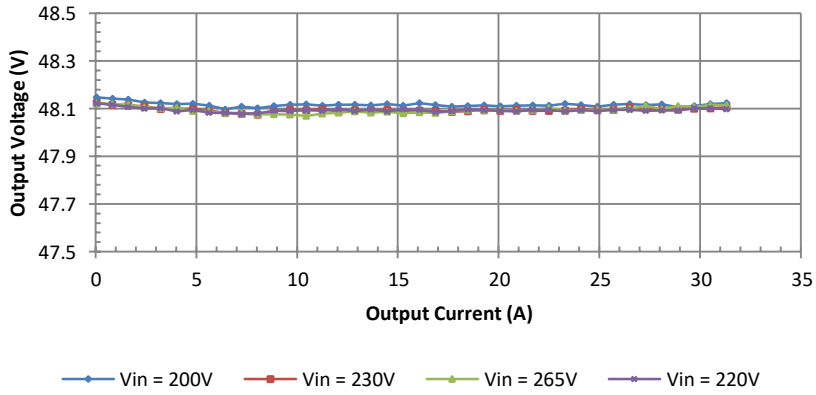
PFE1500FB-48-100-R Load Regulation

Ta = 25 °C.



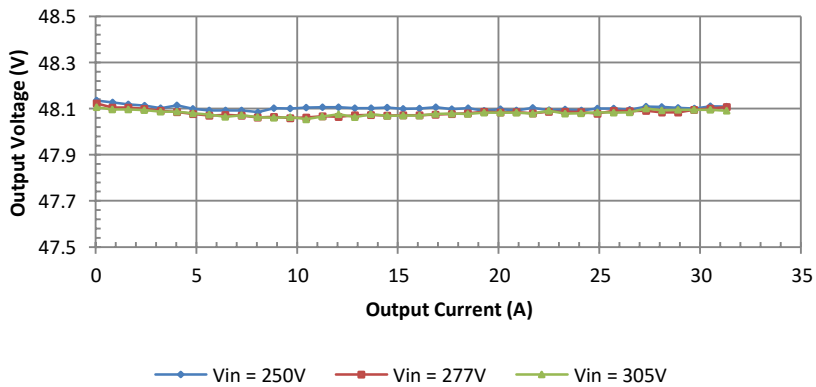
PFE1500FB-48-100-R Load Regulation

Ta = 25 °C.



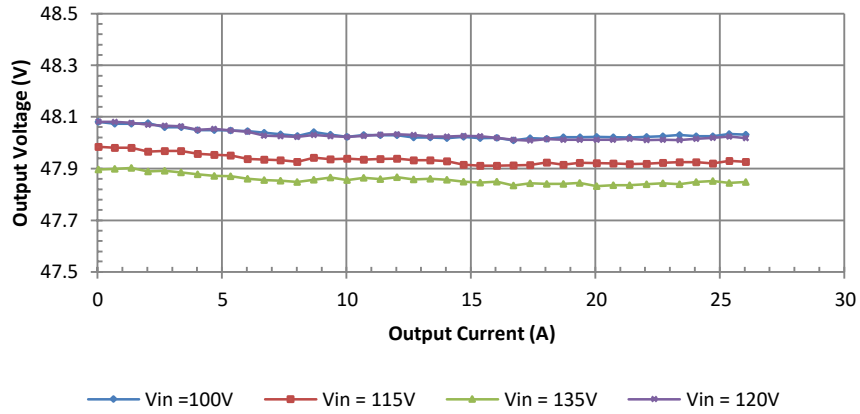
PFE1500FB-48-100-R Load Regulation

Ta = 25 °C.



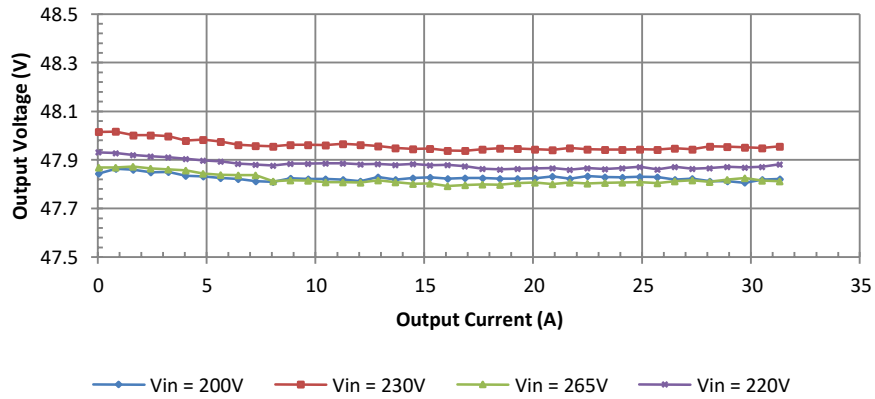
PFE1500FB-48-100-R Load Regulation

Ta = -40 °C.



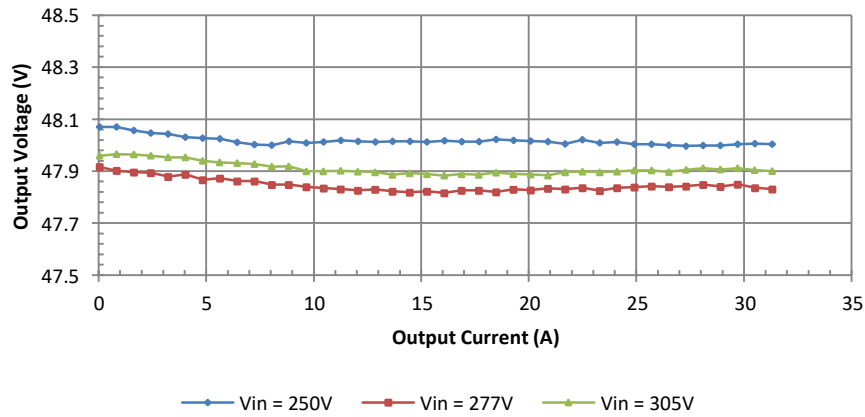
PFE1500FB-48-100-R Load Regulation

Ta = -40 °C.



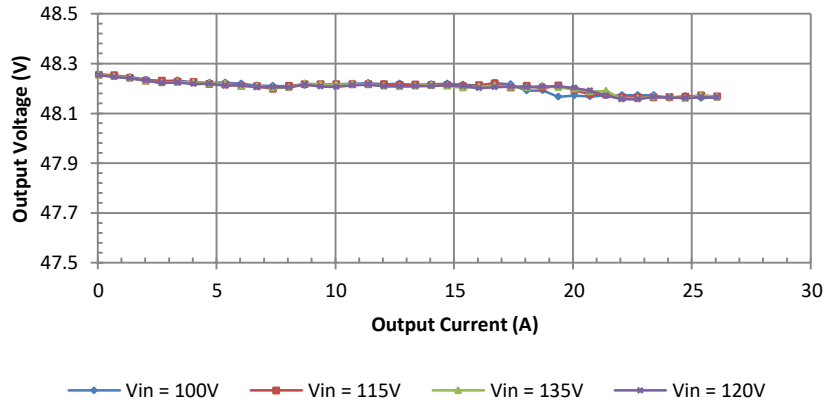
PFE1500FB-48-100-R Load Regulation

Ta = -40 °C.



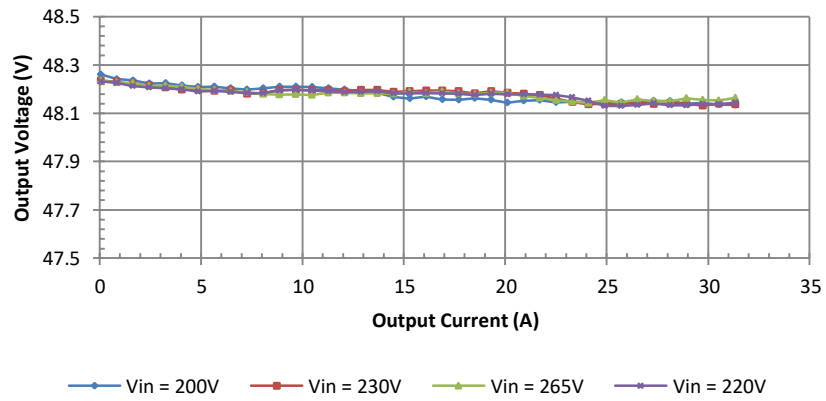
PFE1500FB-48-100-R Load Regulation

Ta = 65 °C.



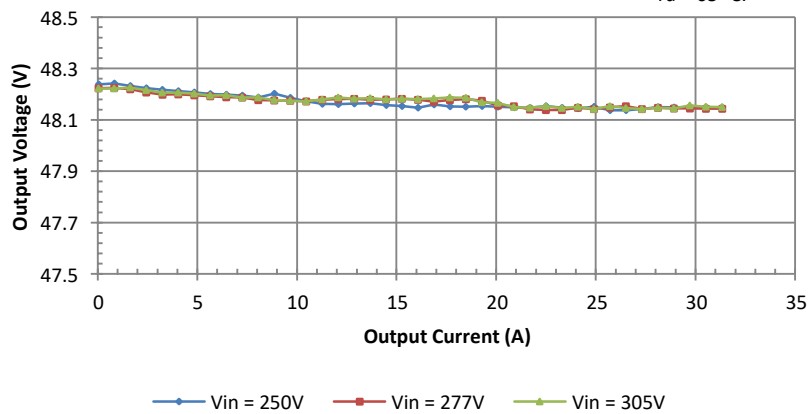
PFE1500FB-48-100-R Load Regulation

Ta = 65 °C.

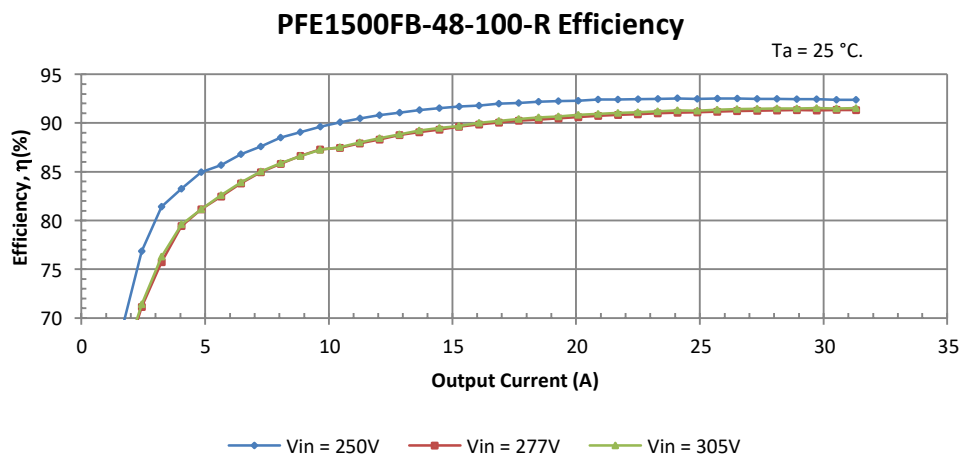
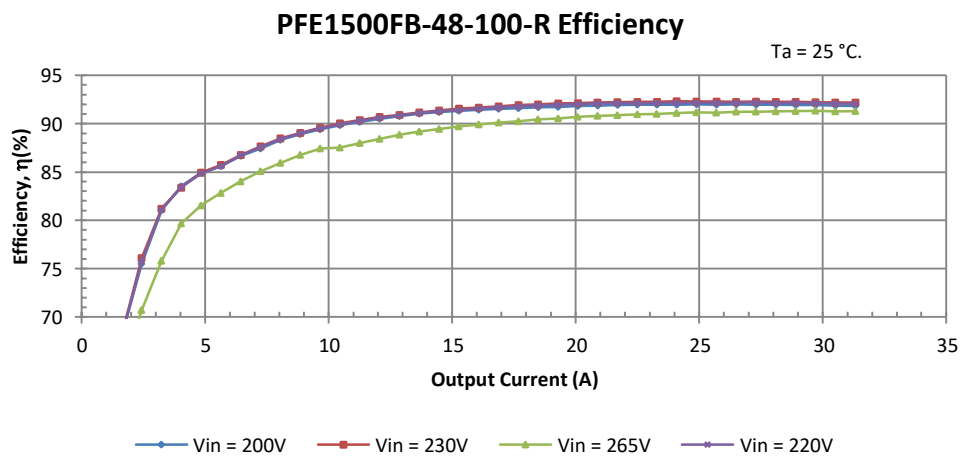
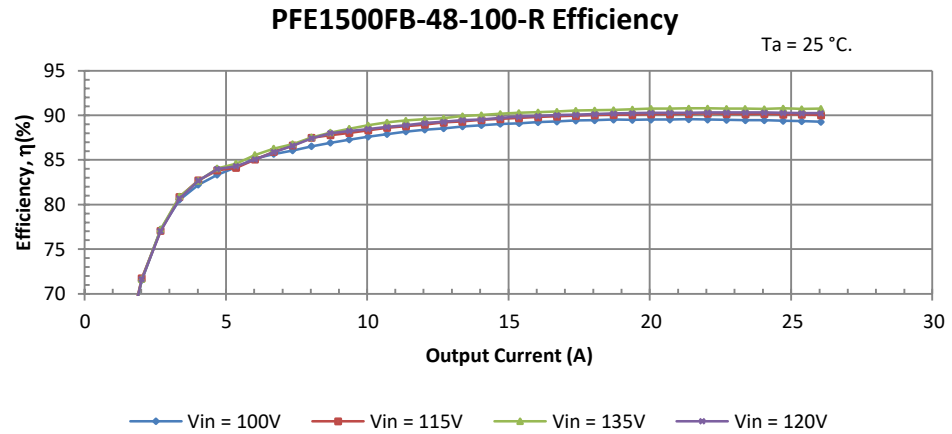


PFE1500FB-48-100-R Load Regulation

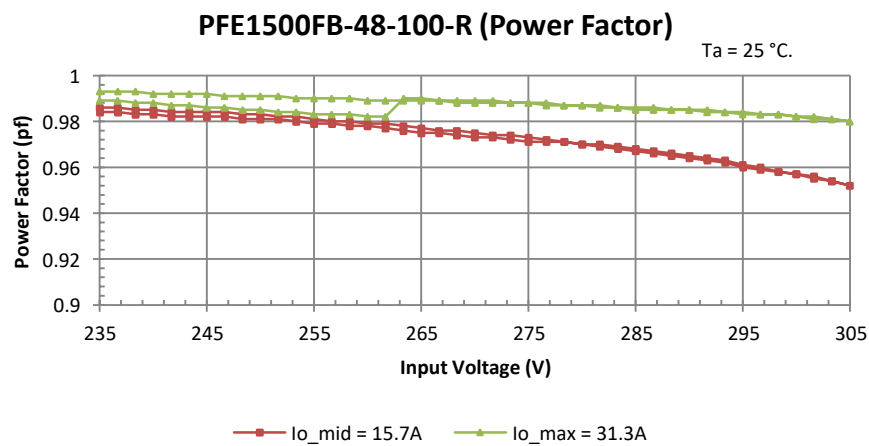
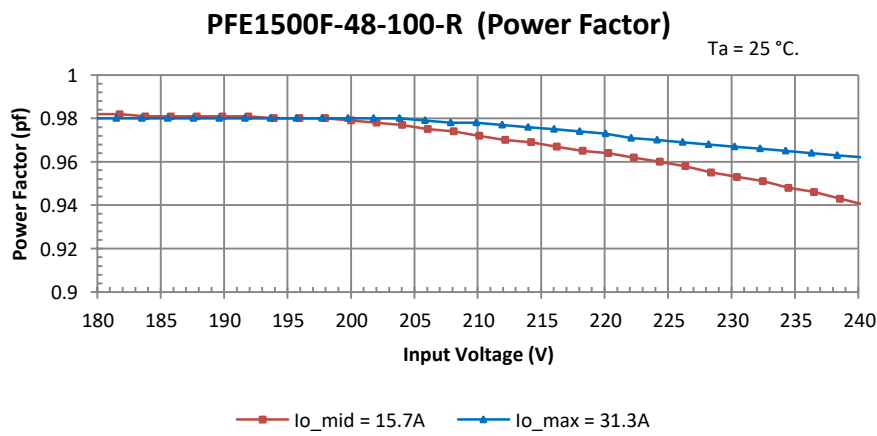
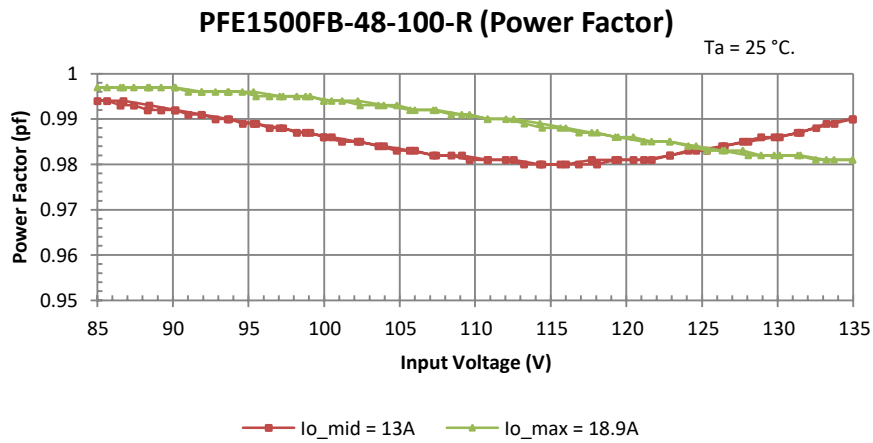
Ta = 65 °C.



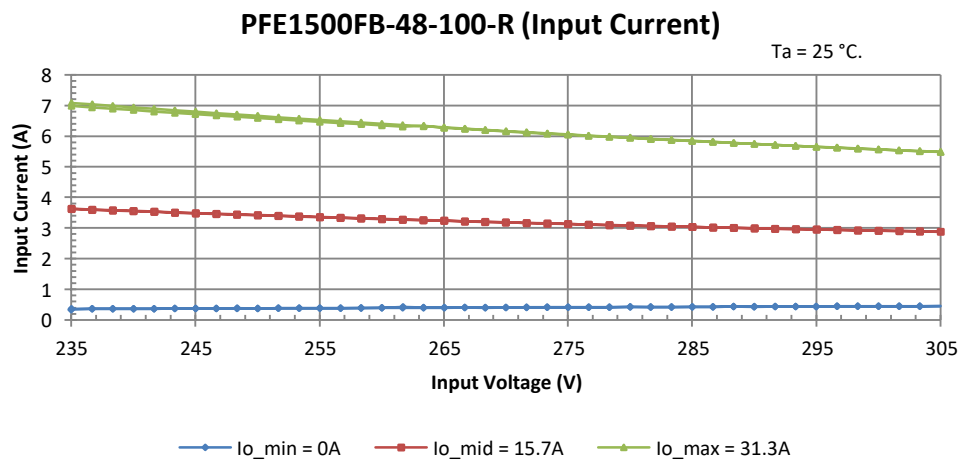
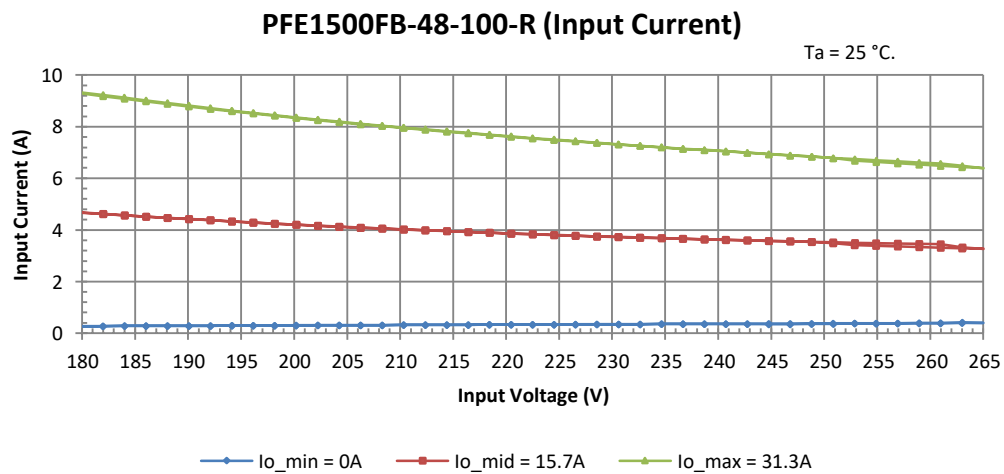
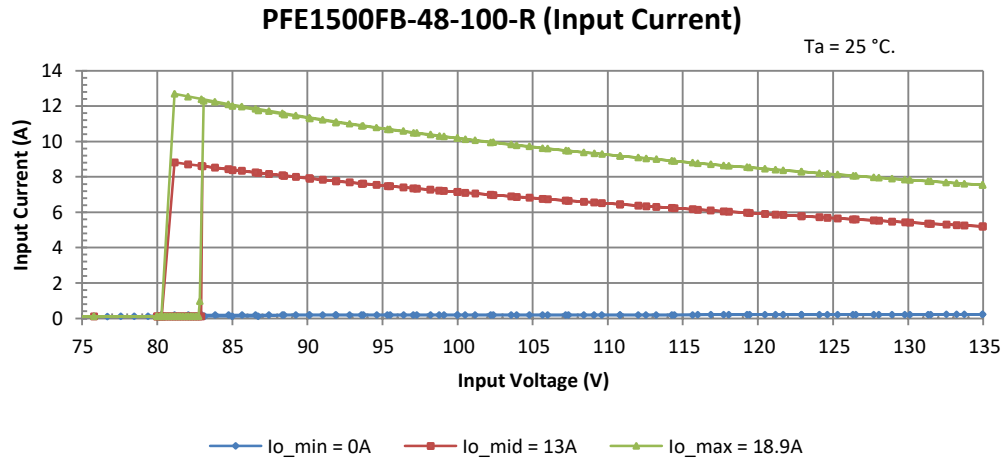
2.1.2 Efficiency vs. Output Current (60 Hz)



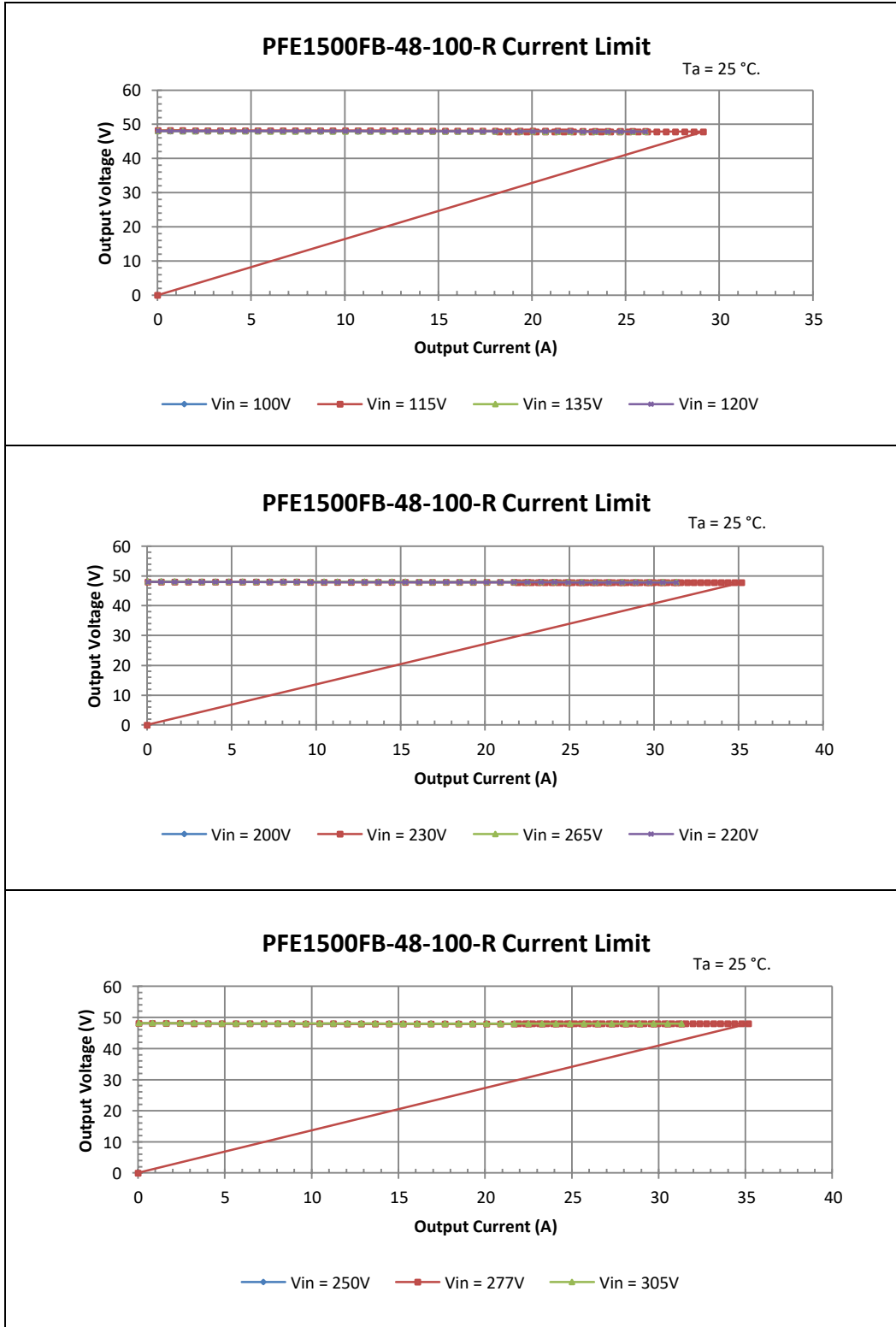
2.1.3 Power Factor (PF) vs. Input Voltage (60 Hz)

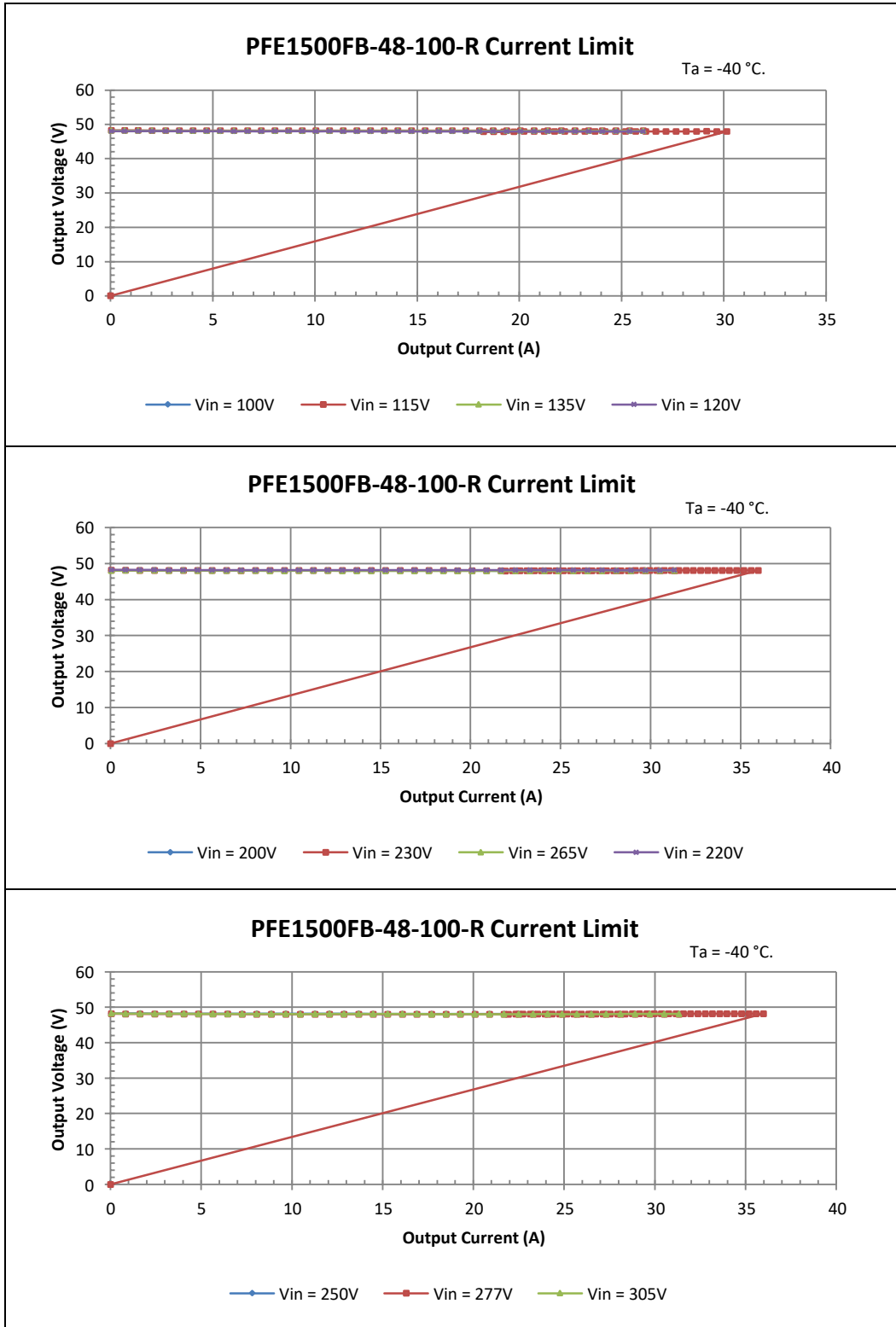


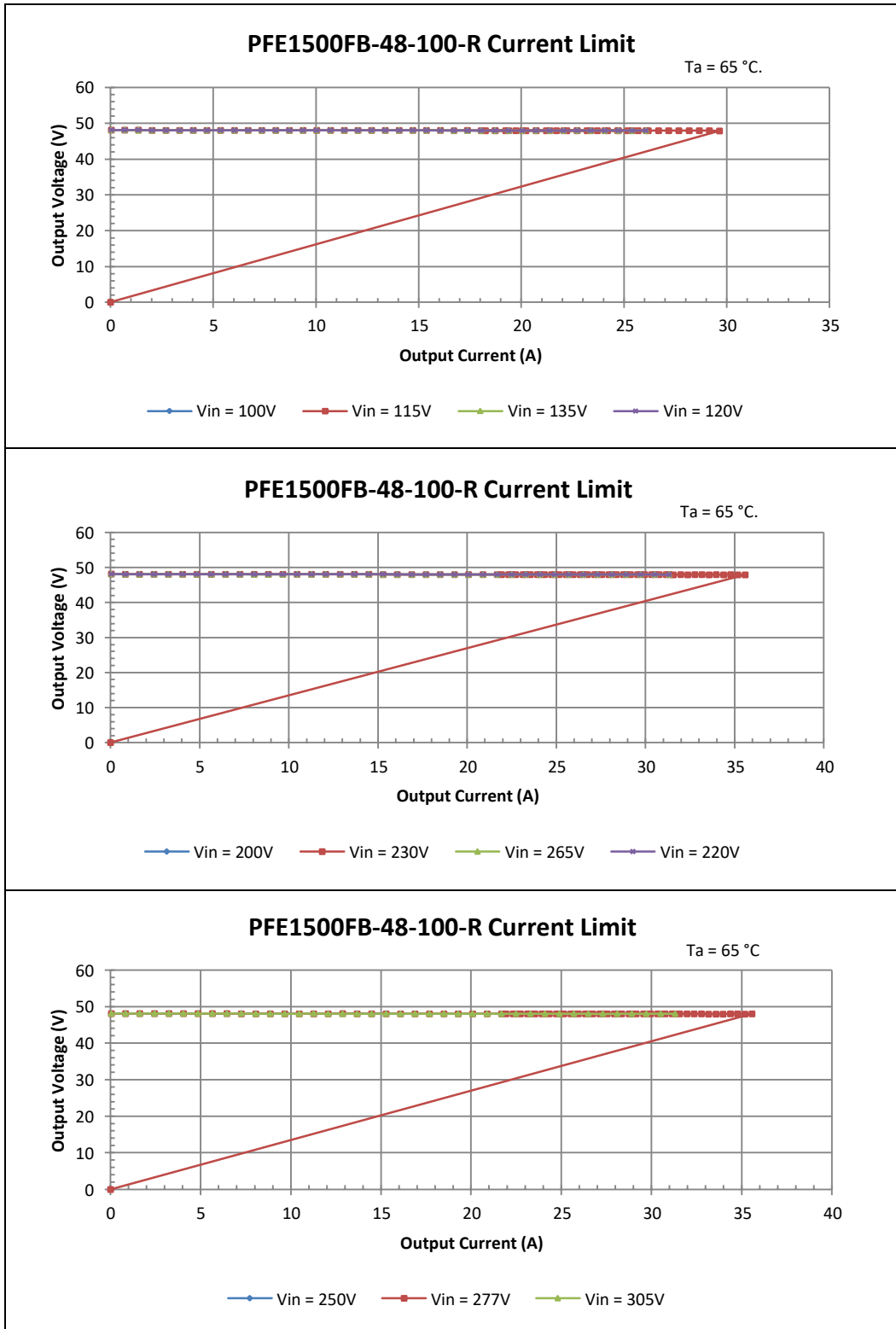
2.1.4 Output behavior with input line sweep (60 Hz)

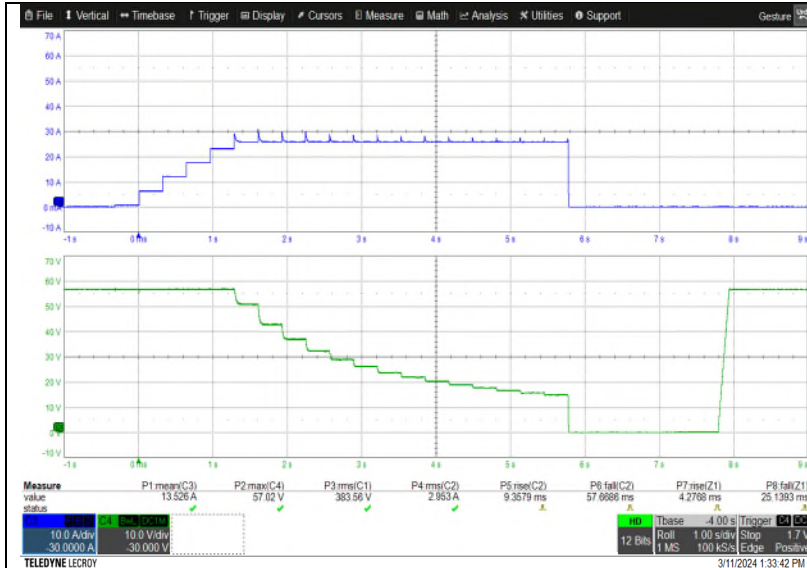


Over Current Protection (OCP) Characteristics (Refer to section 1.1.2 for Test Setup) (60 Hz)







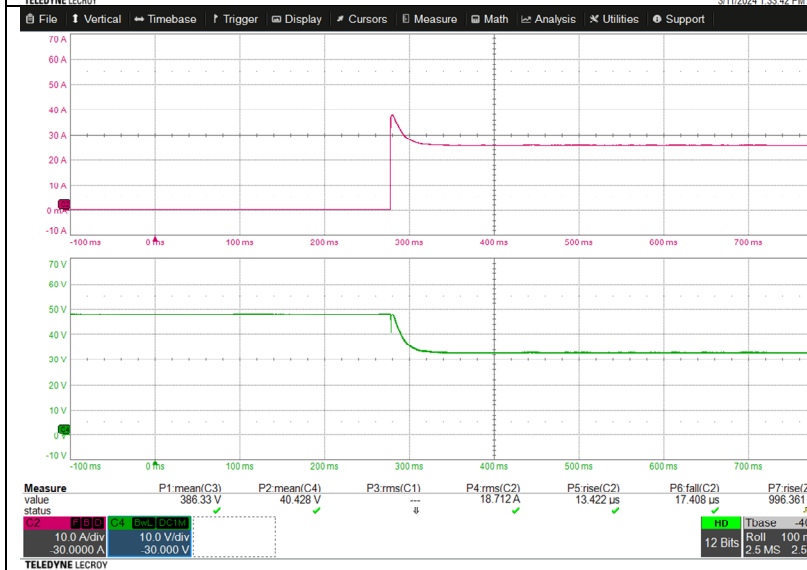


Voltage Foldback

Current Limit is 26A.

Load is increased step by step until Output hits UVP hiccup.

Output recovers after 2 secs after the load is removed.



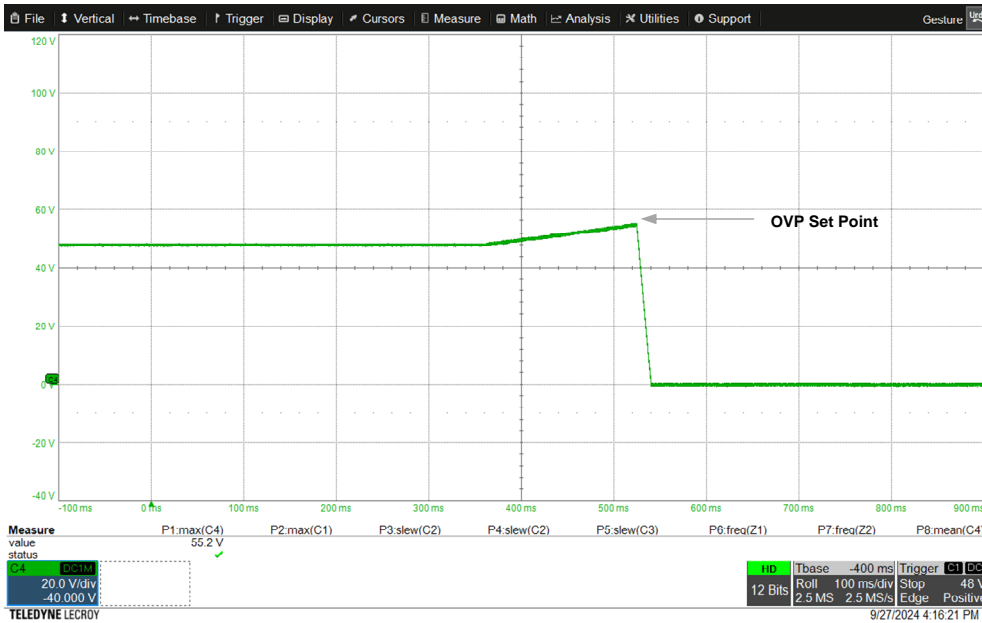
Voltage Foldback

Load is stepped from 0→38.4A.

Output folds back to 32.5V and recovers after overload is removed.

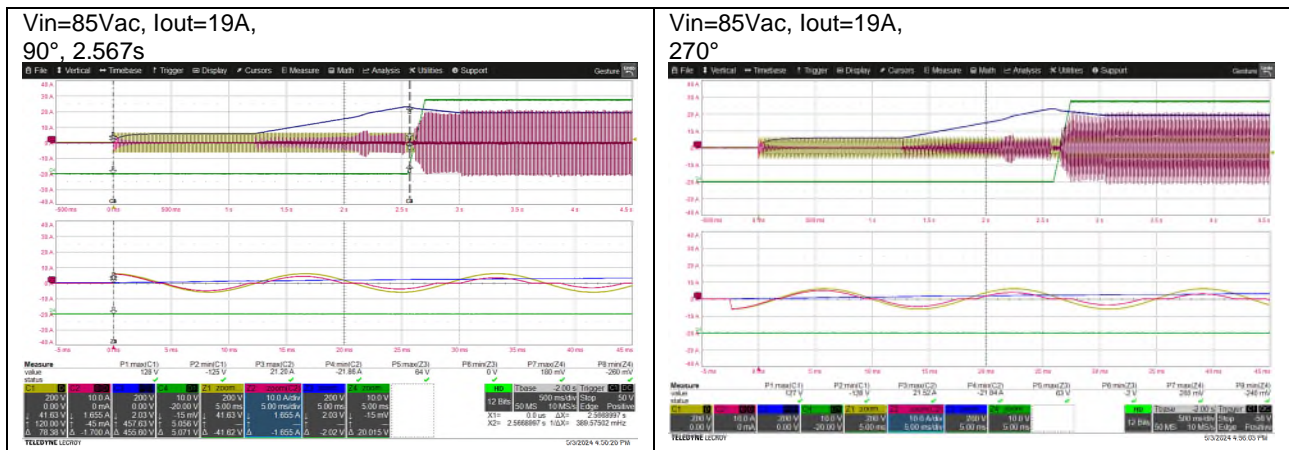
2.2 Over Voltage Protection (OVP) Characteristics (Refer to Section 1.1.2 for Test Setup)

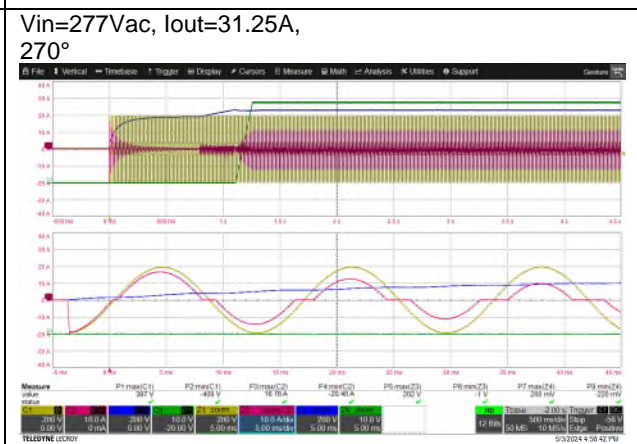
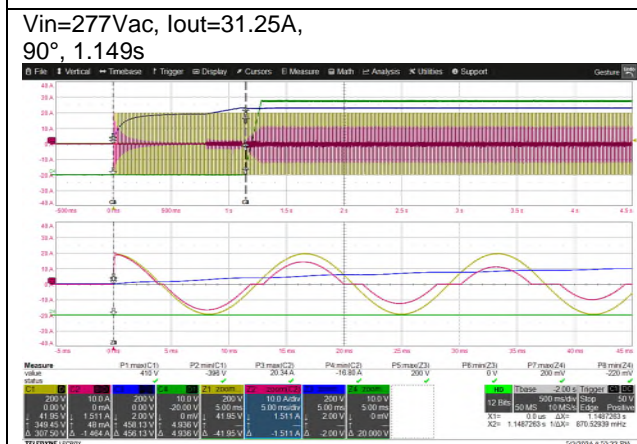
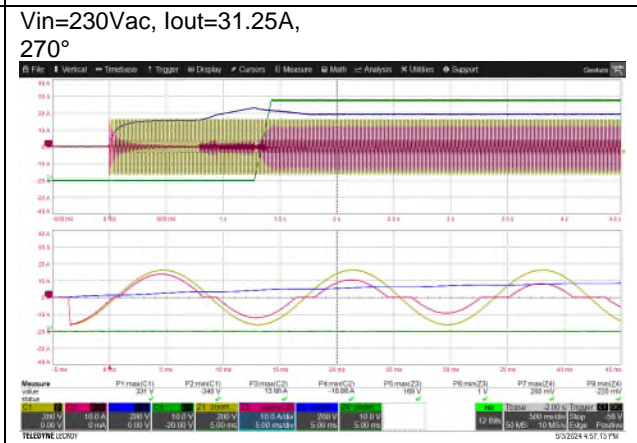
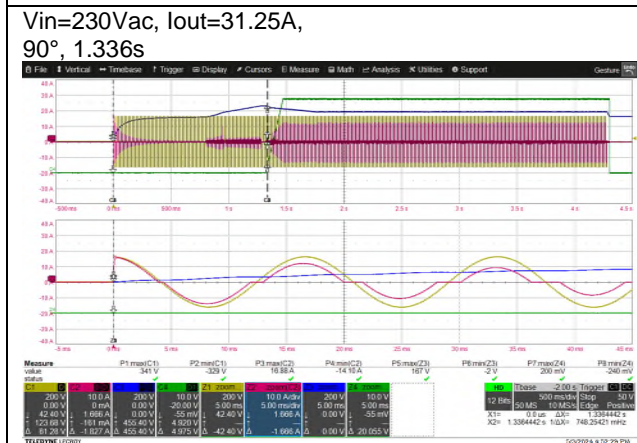
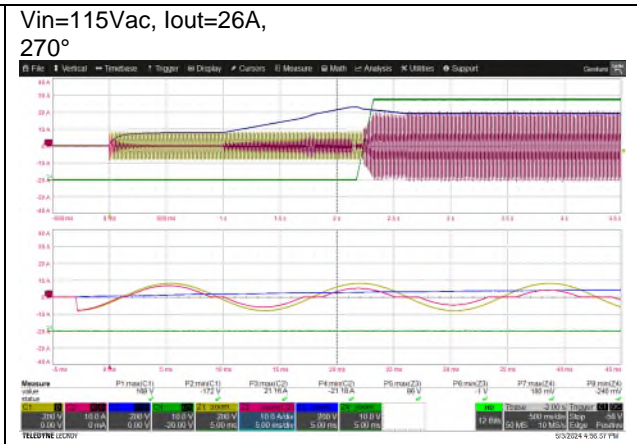
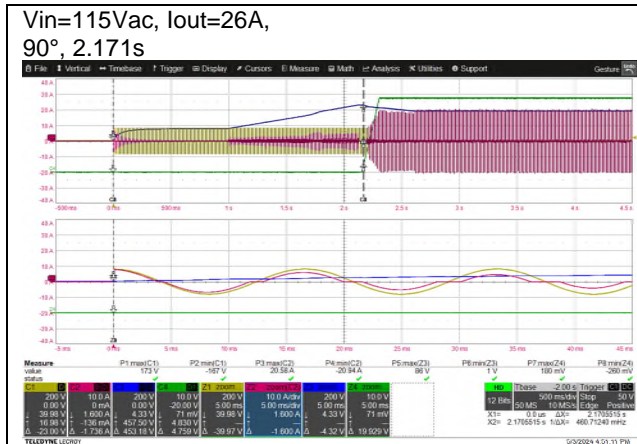
Conditions: Set Point = 55V	$I_{out} = 4A$
	$T_a = 25\text{ }^\circ\text{C}$
	$V_{IN} = 115\text{ Vac}$

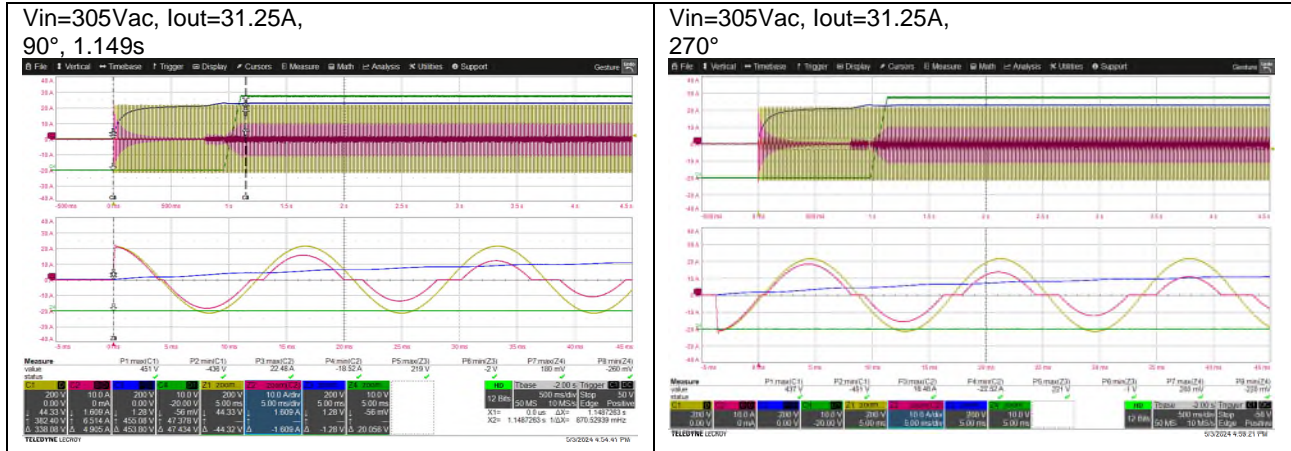


2.3 Output Rise and Fall Characteristics with AC Turn On

CH1: AC line at fixture input, CH2: AC input current, CH3: Vbus, CH4: Vout

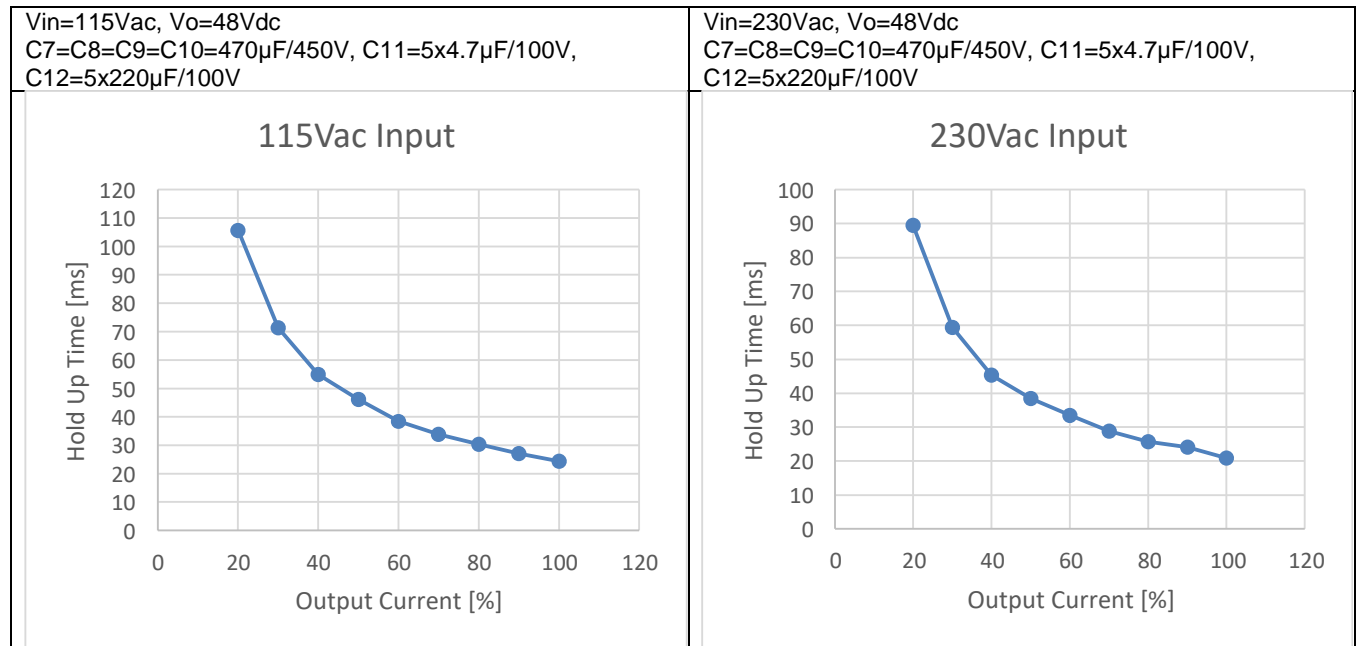
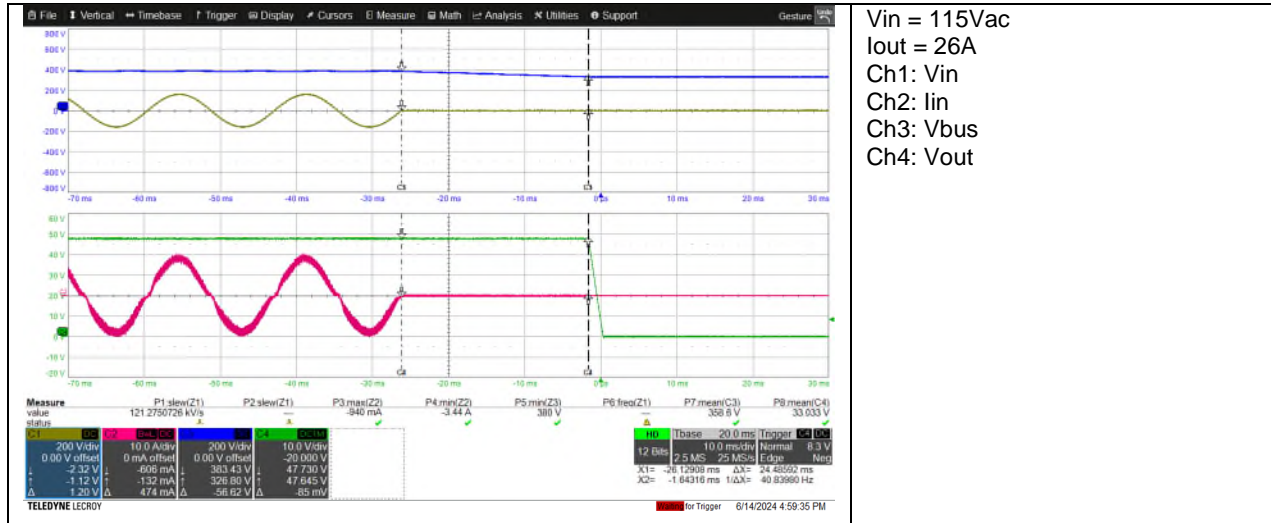






2.4 Hold Up Time Characteristic

CH1: AC line at fixture input, CH2: AC input current, CH3: Vbus, CH4: Vout

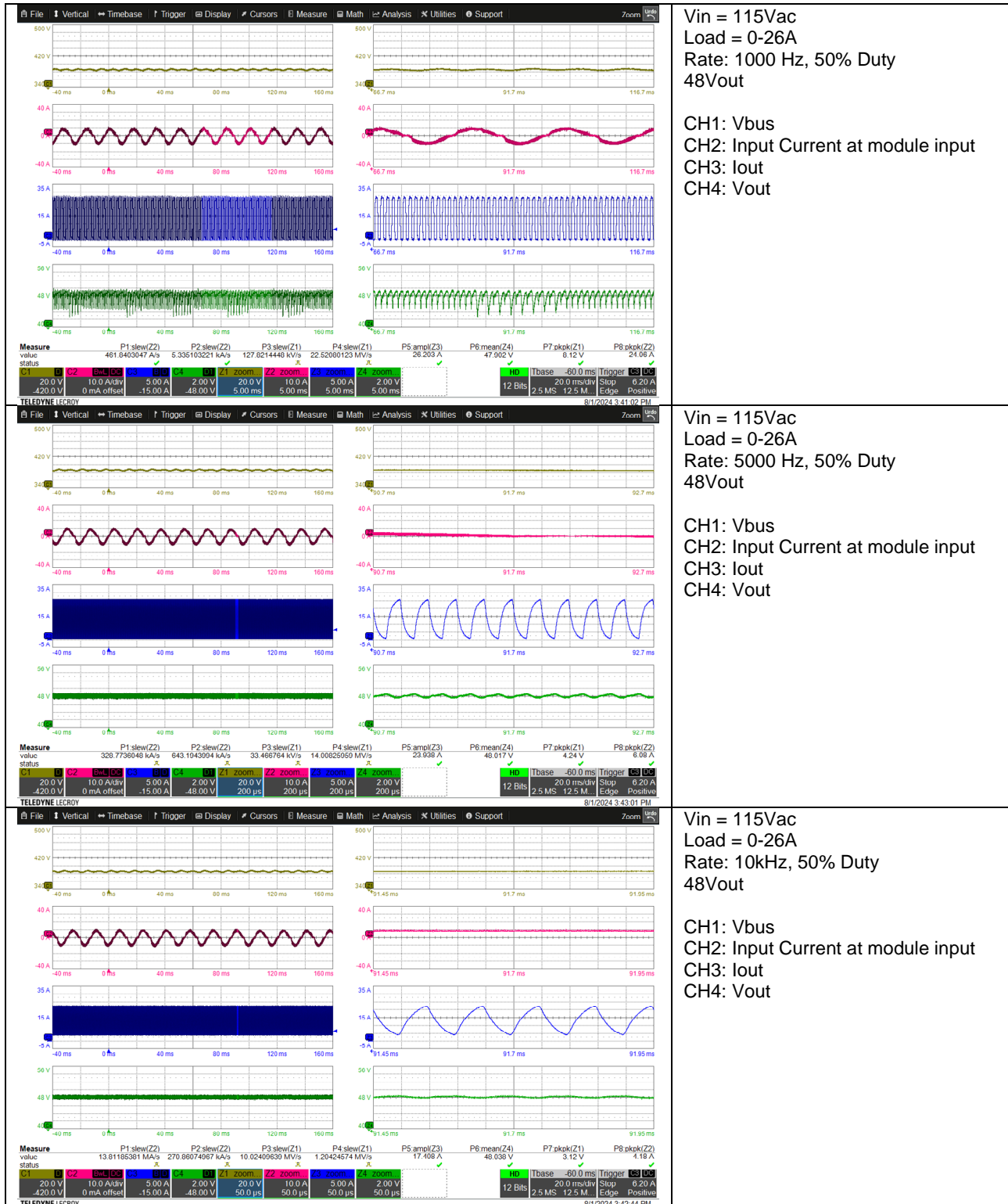


2.5 Dynamic Line Response (60 Hz)

CH1: AC line at fixture input, CH2: AC input current, CH3: Vbus, CH4: Vout

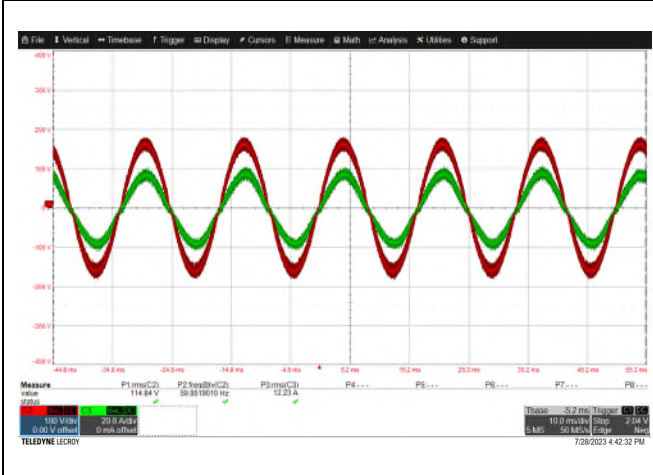


2.6 Dynamic Load Response



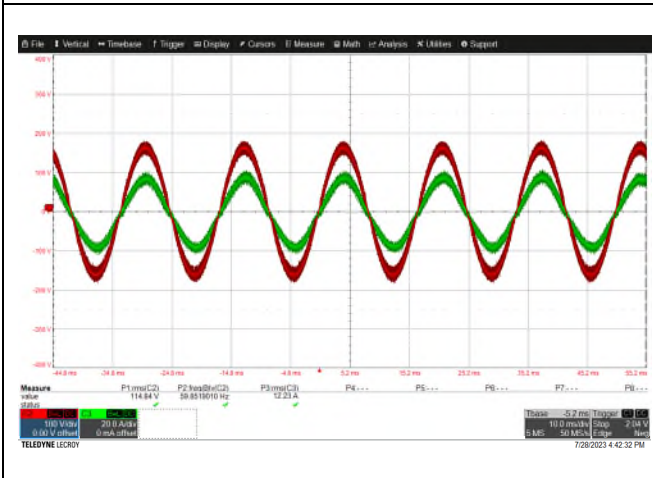
2.7 Input Current Waveform

$V_{IN} = 115 \text{ Vac } 60 \text{ Hz}; I_{out} = 26\text{A}$
CH2: V_{IN} ; CH3: I_{IN}



Current (THD = 3.81%) (PF = 0.998)

$V_{IN} = 230 \text{ Vac } 60 \text{ Hz}; I_{out} = 31.25\text{A}$
CH2: V_{IN} ; CH3: I_{IN}

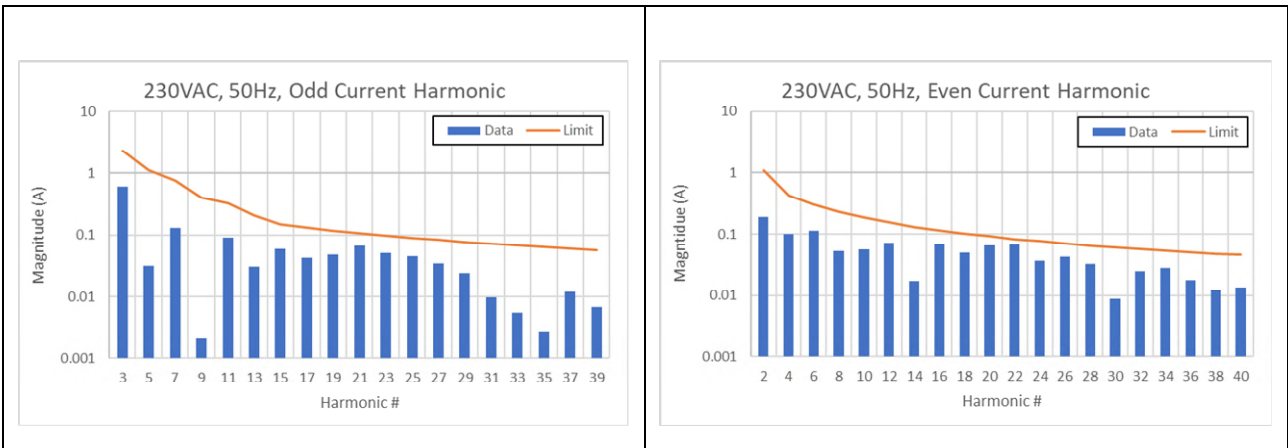


Current (THD = 6.065%) (PF = 0.967)

2.8 Input Current Harmonics

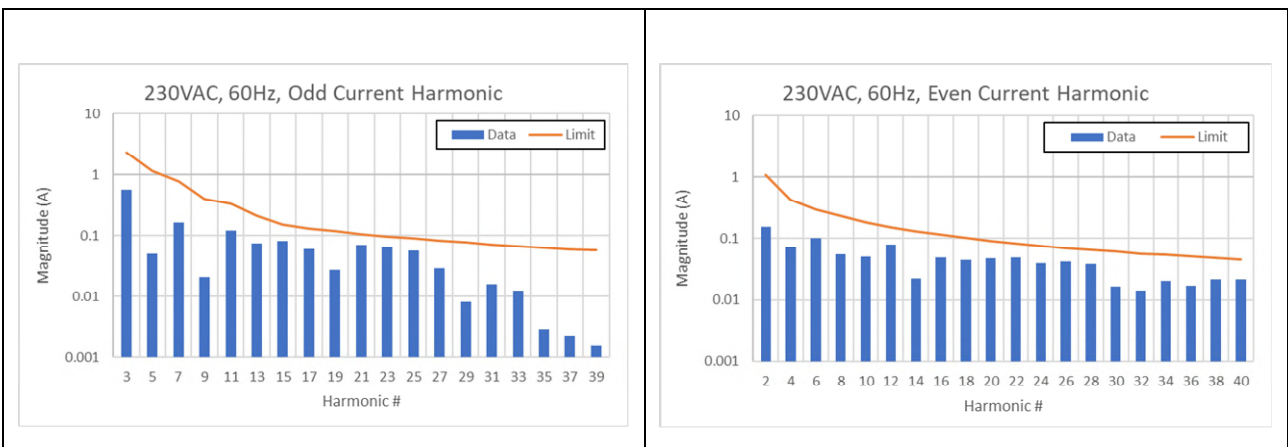
230 Vac, 50 Hz, 31.25A

V	I	W	PF	FREQ	THDI
229.181V	7.16596A	1.62580kW	0.9899	49.9998Hz	9.6018%

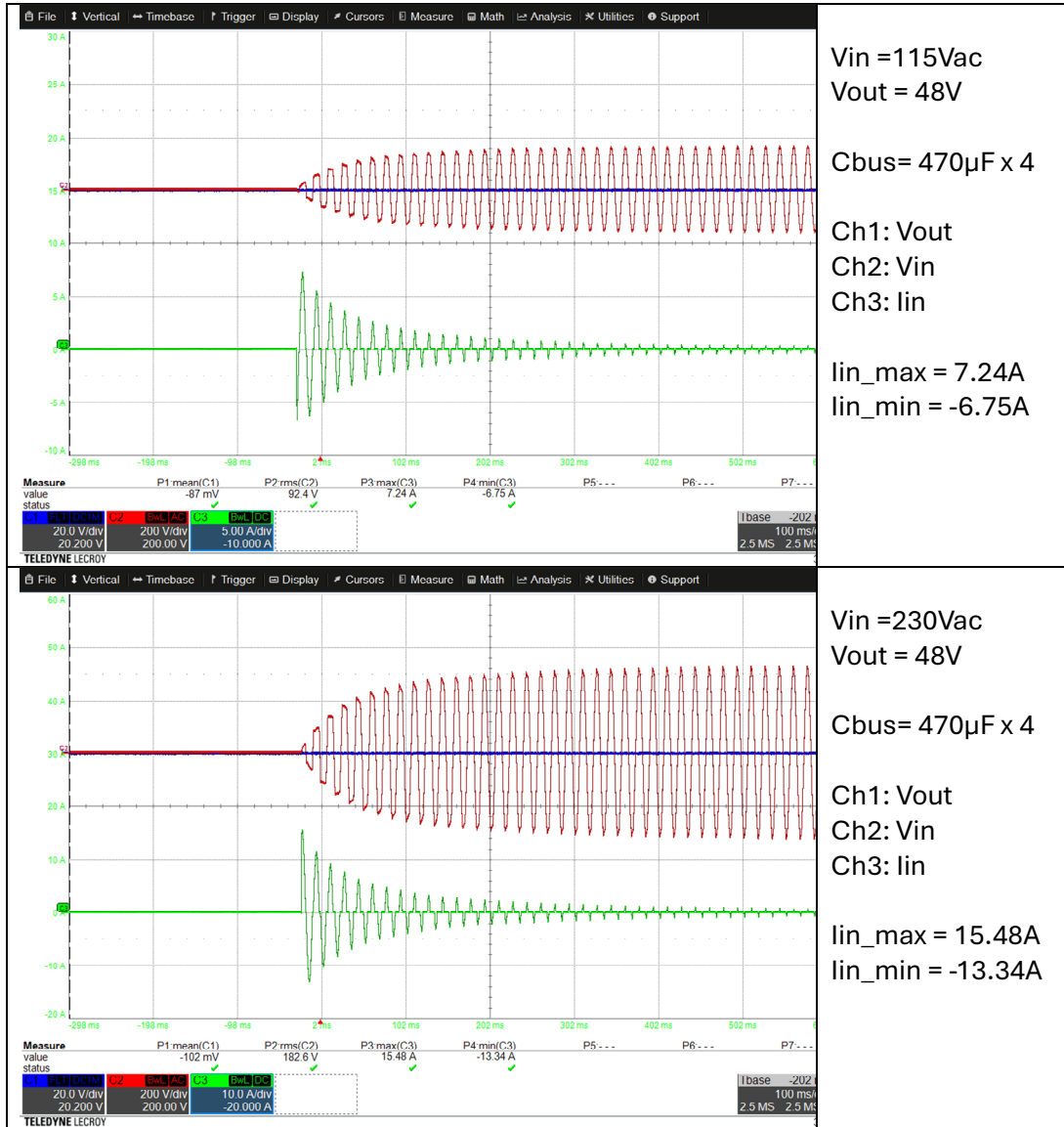


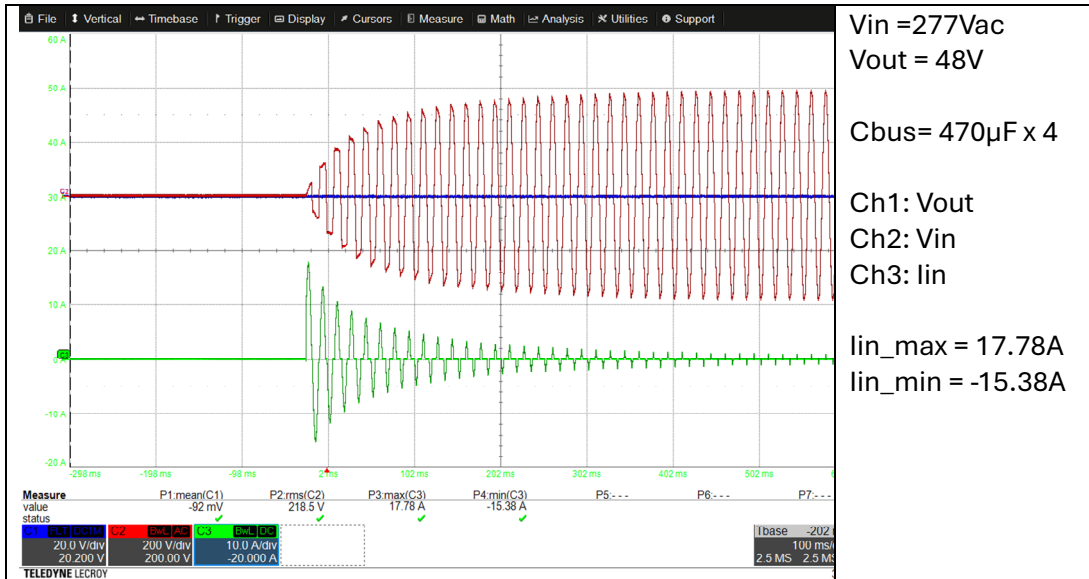
230 Vac, 60 Hz, 31.25A

V	I	W	PF	FREQ	THDI
229.173V	7.18244A	1.62731kW	0.9886	59.9998Hz	9.5382%



2.9 Input Inrush Current





2.10 Brownout Data

Vout = 48V

Hardware: Open-frame, Vbus 4*470μF (electrolytic cap), Output 5*220μF (electrolytic cap) 8*4.7μF ceramic cap.

Results table

A = criteria A - DUT operates within specification limits during and after test.

B = criteria B - DUT exhibits a change in performance when operating then self-recovered.

A/B = some are criteria A or criteria B based on start angle

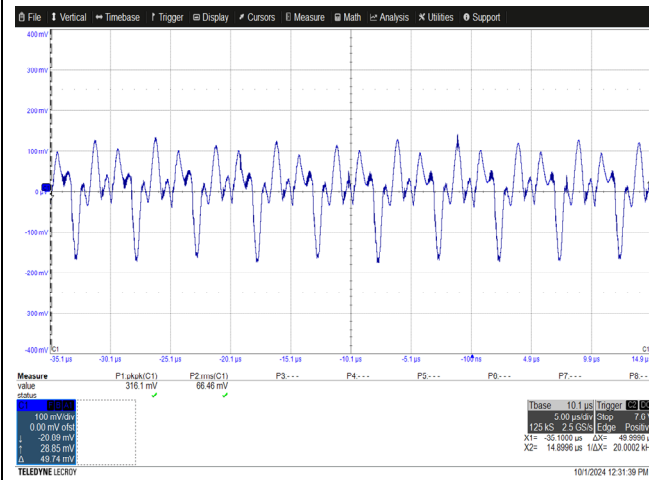
A* = criteria A, but due to derate at low Vrms, either resistive load or foldback must be used. Otherwise, criteria B.

	50 Hz			60 Hz		
	115Vac	230Vac	277Vac	115Vac	230Vac	277Vac
70% VAC, 0.5 cycle	A	A	A	A	A	A
40% VAC, 25 cycle	B	B	B	B	B	B
0% VAC, 250/300 cycles	B	B	B	B	B	B
0% VAC, 0.5 cycle	A	A/B	A	A	A	A
0% VAC, 1 cycle	B	B	A/B	B	B	A
40% VAC, 10 cycles	B	B	B	B	B	B
70% VAC, 25 cycles	B	A	A	B	A	A
80% VAC, 250 cycles	A*	A	A	A*	A	A
0% VAC, 250 cycles	B	B	B	B	B	B

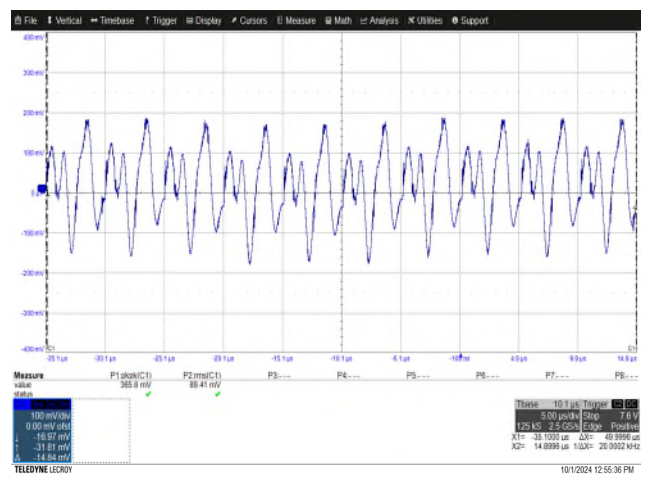
2.11 Output Ripple and Noise

$T_a = 25\text{ }^\circ\text{C}$

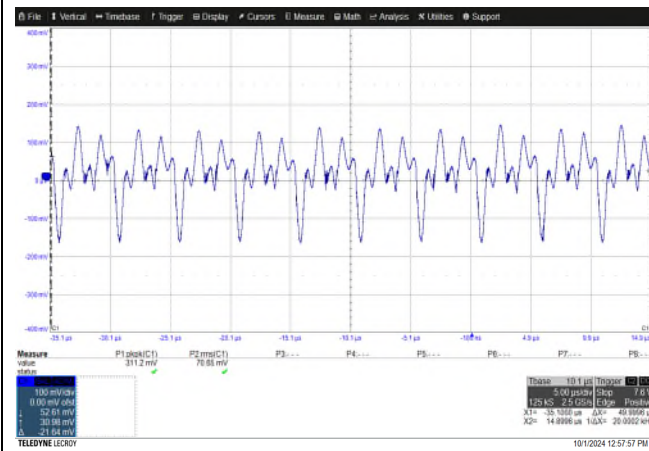
$V_{IN} = 115\text{ Vac } 60\text{ Hz}; I_{out} = 3\text{ A}; V_O = 48\text{ Vdc}$



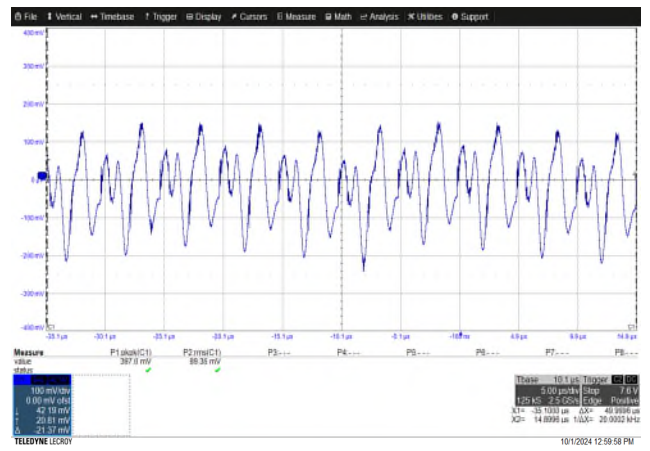
$V_{IN} = 115\text{ Vac } 60\text{ Hz}; I_{out} = 26\text{ A}; V_O = 48\text{ Vdc}$



$V_{IN} = 230\text{ Vac } 60\text{ Hz}; I_{out} = 3\text{ A}; V_O = 48\text{ Vdc}$



$V_{IN} = 230\text{ Vac } 60\text{ Hz}; I_{out} = 31.25\text{ A}; V_O = 48\text{ Vdc}$



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