귀중

Evaluation Data

품 목	S.M.P.S
품 명	CSF300-S
Rev. No.	A

2008 년 11 월 19 일

작 성 :	연 구 원	윤 성 원	
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FINE SUNTRONIX

1-1. CSF300-3R3 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
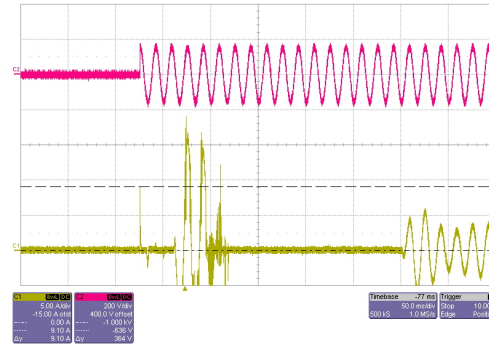   CH1 : INPUT CURRENT - AP015 Current probe
      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

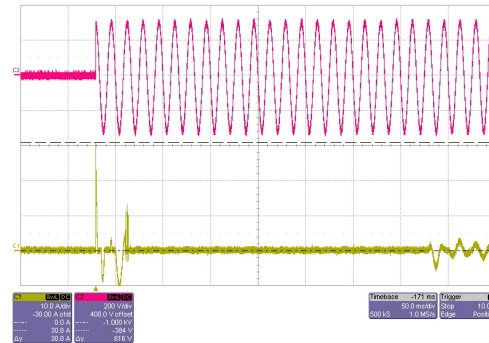| Vin= 110V	I_O= 100%	I_{inrush} = 9.1A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I_O= 100%	I_{inrush} = 30.8A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div

(3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I_O= 100%	V_{RMS} = 112.1V I_{RMS} = 2.335A PWR_{IN} = 260W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
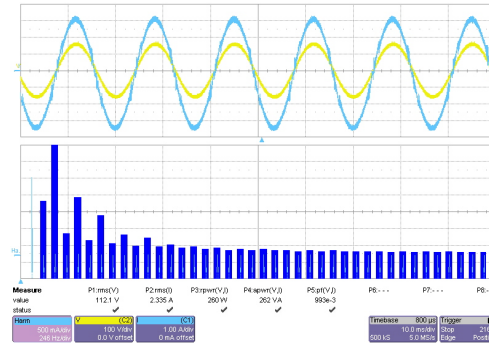
(4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I_O= 100%	V_{RMS} = 220V I_{RMS} = 0.562A PWR_{IN} = 246W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
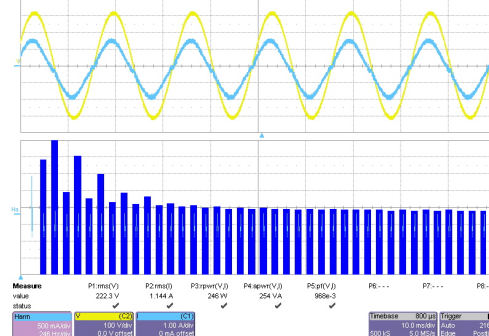
1-2. CSF300-3R3 Input characteristics

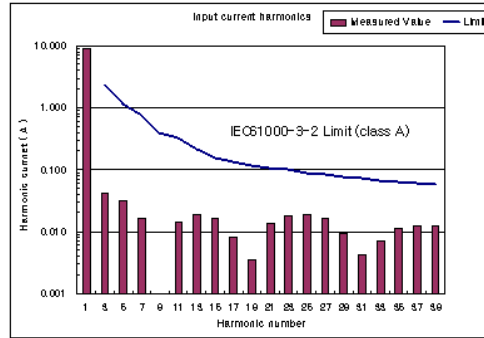Oscilloscope : WaveRunner 104MXi (LeCroy)

    CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe

    CH3 : INPUT CURRENT - AP015 Current probe

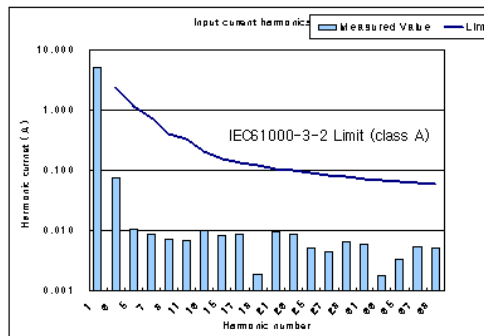Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)

Vin= 110V	I$_O$= 100%	P.F = 0.993		

(2) Input Line Harmonics Chart (220V)

Vin= 220V	I$_O$= 100%	P.F = 0.968		

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I$_O$ \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.096A	0.080A	0.076A	0.079A	0.092A	0.100A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	2.54A	1.88A	1.53A	1.20A	0.93A	1.10A
	Efficiency	66.7%	68.6%	69.6%	70.9%	72.0%	72.7%
Load (100%)	Input Current	3.13A	2.50A	1.99A	1.55A	1.18A	1.43A
	Efficiency	66.6%	66.2%	67.7%	68.8%	70.4%	70.6%

1-3. CSF300-3R3 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)

      CH1 : OUTPUT VOLTAGE - PP005A passive probe

      CH2 : OUTPUT CURRENT - CP500 Current Probe

Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	3.309V	3.309V	3.309V	3.309V	3.309V	3.309V	0mV
Load (80%)	3.275V	3.275V	3.275V	3.275V	3.275V	3.275V	0mV
Load (100%)	3.265V	3.265V	3.265V	3.265V	3.265V	3.265V	0mV
Load Regulation	44mV	44mV	44mV	44mV	44mV	44mV	

(3) Dynamic Load Response Characteristics (100Hz)

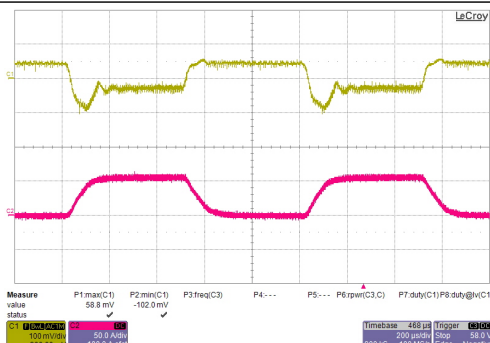| Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 61.4mV V_{under} = 117.1mV		CH1 100mV/div 2.0ms/div CH2 50.0A/div 2.0ms/div
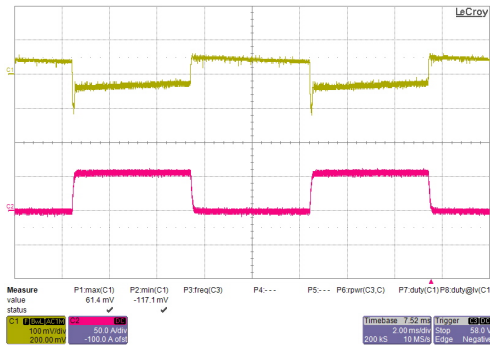
(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 58.8mV V_{under} = 102.0mV		CH1 100mV/div 200us/div CH2 50.0A/div 200us/div

1-4. CSF300-3R3 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

      CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

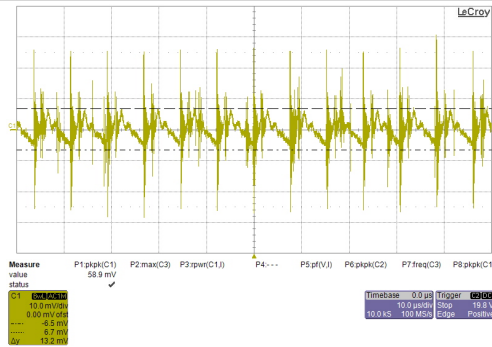   CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

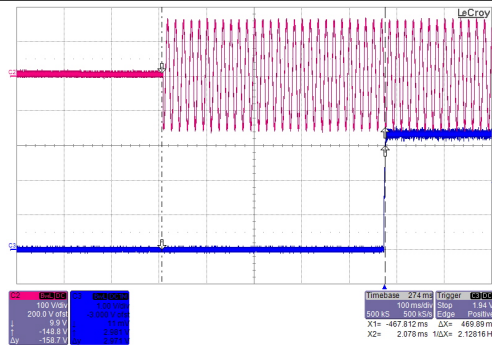| Vin= 220V | I_O=100% | V_{Ripple} = 13.2mV
V_{Noise} = 58.9mV | | CH1
10mV/div
10us/div |

(2) Turn on time characteristics

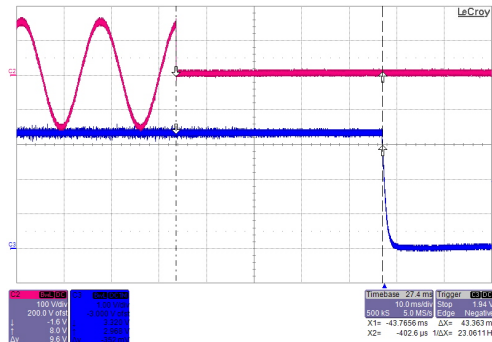| Vin= 110V | I_O=100% | $t_{turn\ on}$ = 469ms | | CH2
100V/div
100ms/div

CH3
1.0V/div
100ms/div |

(3) Hold up characteristics

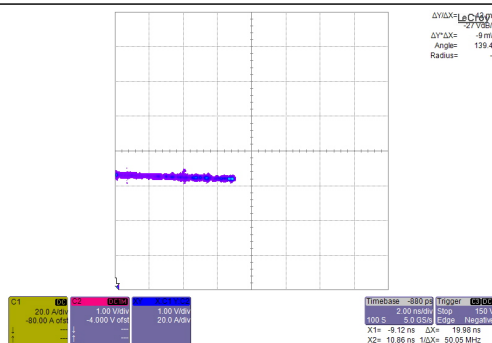| Vin= 110V | I_O=100% | $t_{hold\ up}$ = 43ms | | CH2
100V/div
10.0ms/div

CH3
1.0V/div
10.0ms/div |

(4) Over Current protection characteristics

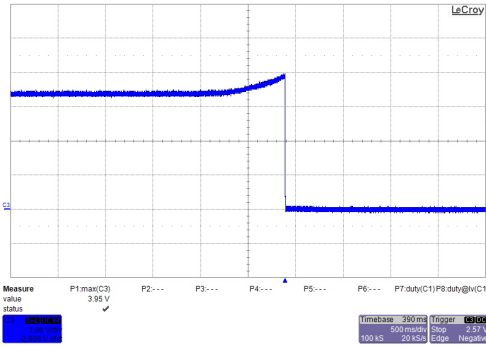| Vin= 220V | I_O= 110~145% | O.C.P = 70A | | X
20.0A/div
2.0ns/div

Y
1.0V/div
2.0ns/div |

1-5. CSF300-3R3 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)

      CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics				
Vin= 220V	I_O= 10%	O.V.P = 3.95V		CH3 1.00V/div 1.00s/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

2-1. CSF300-05 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
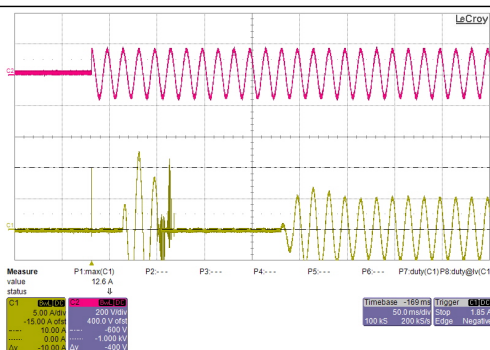   CH1 : INPUT CURRENT - AP015 Current probe
      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

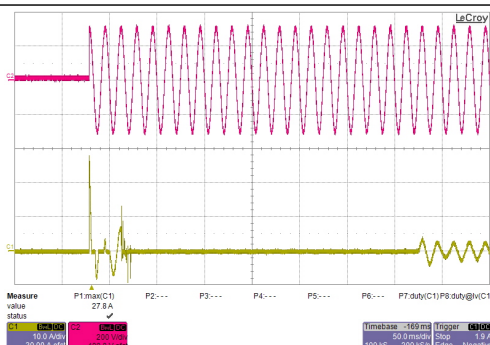| Vin=
110V | I_O=
100% | I_{inrush} = 10.0A | | CH1
5.0A/div
50ms/div

CH2
200V/div
50ms/div |

(2) Inrush Current Characteristics (220V)

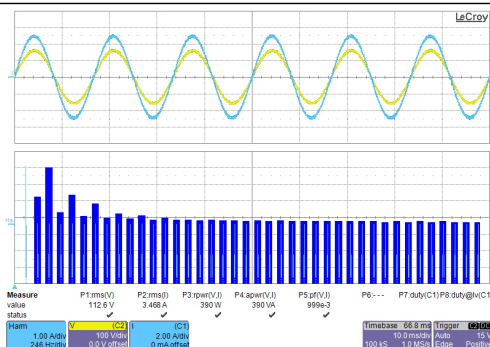| Vin=
220V | I_O=
100% | I_{inrush} = 30.0A | | CH1
10A/div
50ms/div

CH2
200V/div
50ms/div |

(3) Input Voltage & Current Characteristics (110V)

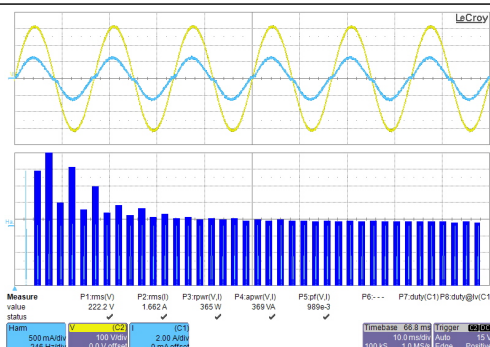| Vin=
110V | I_O=
100% | V_{RMS} = 112.6V
I_{RMS} = 3.468A
PWR_{IN} = 390W | | CH1
1.0A/div
10ms/div

CH2
100V/div
10ms/div |

(4) Input Voltage & Current Characteristics (220V)

| Vin=
220V | I_O=
100% | V_{RMS} = 222.2V
I_{RMS} = 1.662A
PWR_{IN} = 365W | | CH1
2.0A/div
10ms/div

CH2
100V/div
10ms/div |

2-2. CSF300-05 Input characteristics

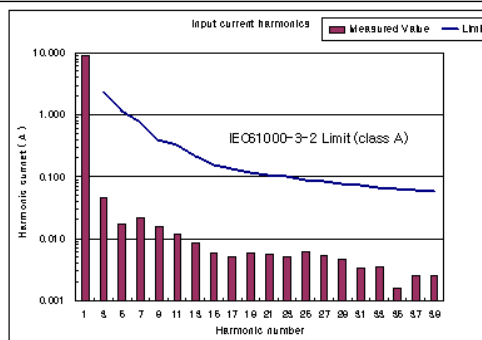Oscilloscope : WaveRunner 104MXi (LeCroy)

      CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe

      CH3 : INPUT CURRENT - AP015 Current probe

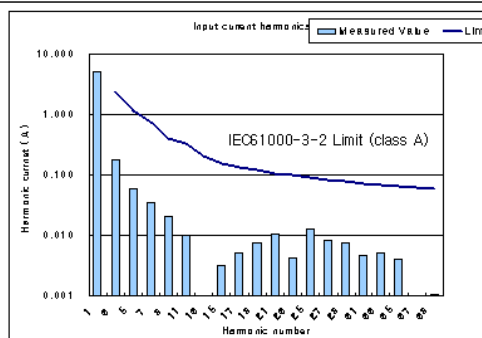Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)

| Vin=
110V | I_O=
100% | P.F = 0.999 | | |

(2) Input Line Harmonics Chart (220V)

| Vin=
220V | I_O=
100% | P.F = 0.989 | | |

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I_O \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.11A	0.08A	0.08A	0.08A	0.09A	0.10A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	3.63A	2.70A	2.19A	1.69A	1.30A	1.10A
	Efficiency	71.1%	74.0%	75.2%	76.6%	77.9%	79.1%
Load (100%)	Input Current	-	3.40A	2.8A	2.1A	1.61A	1.37A
	Efficiency	-	73.0%	74.6%	76.2%	77.8%	78.7%

2-3. CSF300-05 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
      CH1 : OUTPUT VOLTAGE - PP005A passive probe
      CH2 : OUTPUT CURRENT - CP500 Current Probe
Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.00V	5.00V	5.00V	5.00V	5.00V	5.00V	0mV
Load (80%)	4.98V	4.98V	4.98V	4.98V	4.98V	4.98V	0mV
Load (100%)	-	4.98V	4.98V	4.98V	4.98V	4.98V	0mV
Load Regulation	20mV	20mV	20mV	20mV	20mV	20mV	

(3) Dynamic Load Response Characteristics (100Hz)

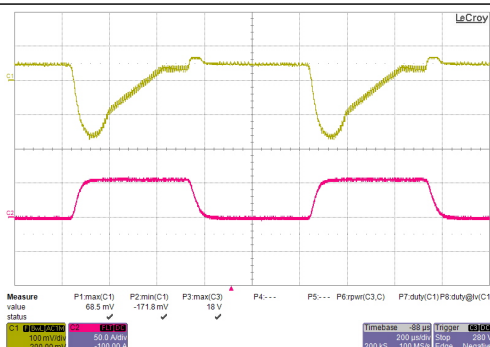| Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 39.3mV V_{under} = 197.7mV		CH1 100mV/div 2.0ms/div CH2 50.0A/div 2.0ms/div
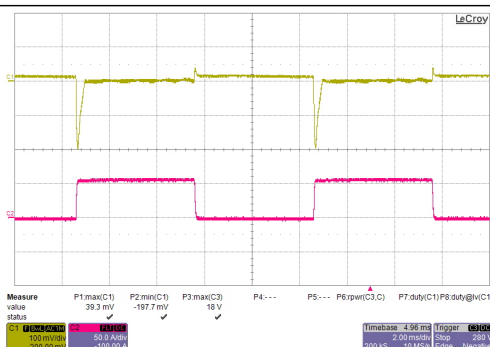
(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 68.5mV V_{under} = 171.8mV		CH1 100mV/div 200us/div CH2 50.0A/div 200us/div

2-4. CSF300-05 Output characteristics

   (1) Oscilloscope : WaveRunner MXi104 (LeCroy)

       CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

       CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

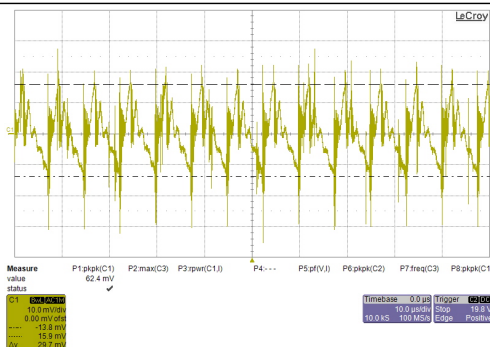   CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

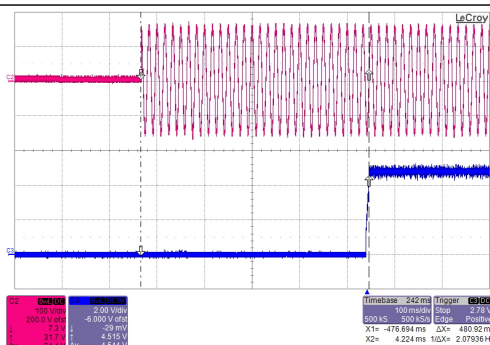| Vin= 220V | I_O=100% | V_{Ripple} = 29.7mV
 V_{Noise} = 62.4mV | | CH1
 10mV/div
 10us/div |

(2) Turn on time characteristics

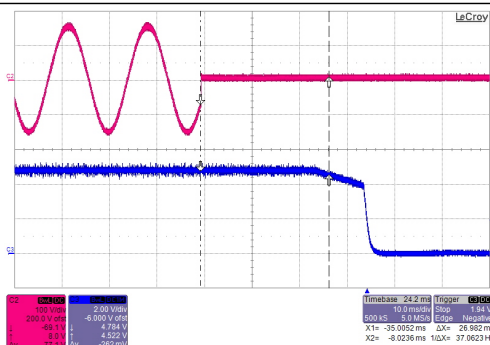| Vin= 110V | I_O=100% | $t_{turn\ on}$ = 480ms | | CH2
 100V/div
 100ms/div

 CH3
 2.0V/div
 100ms/div |

(3) Hold up characteristics

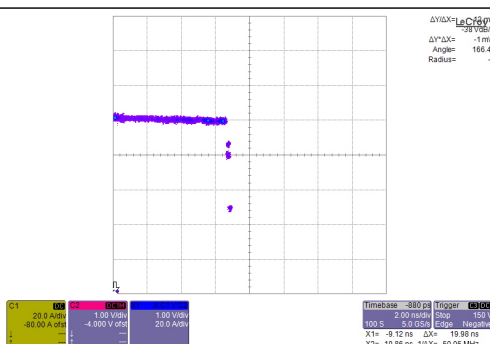| Vin= 110V | I_O=100% | $t_{hold\ up}$ = 26ms | | CH2
 100V/div
 10.0ms/div

 CH3
 2.0V/div
 10.0ms/div |

(4) Over Current protection characteristics

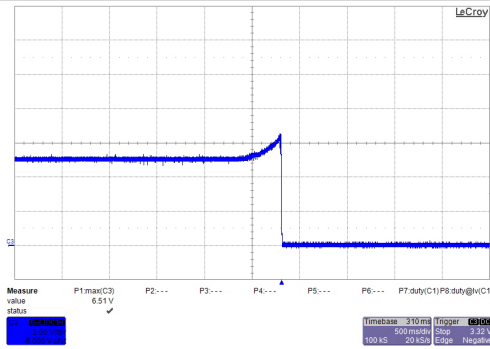| Vin= 220V | I_O= 110~145% | O.C.P = 67A | | X
 20.0A/div
 2.0ns/div

 Y
 1.0V/div
 2.0ns/div |

2-5. CSF300-05 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
    CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

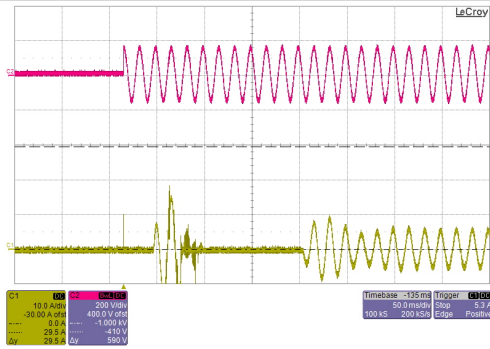| Vin= 220V	I$_O$= 10%	O.V.P = 6.51V		CH3 2.00V/div 500ms/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

3-1. CSF300-09 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
  CH1 : INPUT CURRENT - AP015 Current probe
  CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)
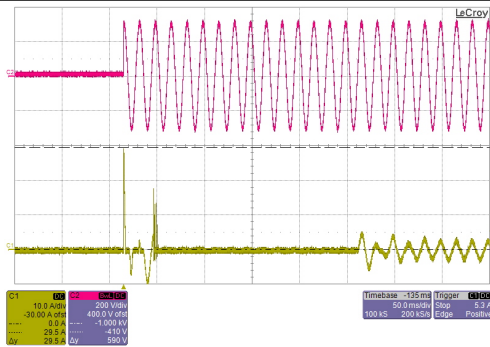
Vin= 110V	I$_O$= 100%	I$_{inrush}$ = 10.0A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I$_O$= 100%	I$_{inrush}$ = 29.5A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div

(3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I$_O$= 100%	V$_{RMS}$ = 112.9V I$_{RMS}$ = 3.772A PWR$_{IN}$ = 425W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
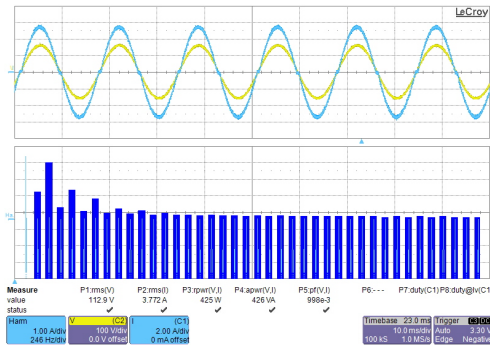
(4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I$_O$= 100%	V$_{RMS}$ = 222.8V I$_{RMS}$ = 1.789A PWR$_{IN}$ = 394W		CH1 2.0A/div 10ms/div CH2 100V/div 10ms/div
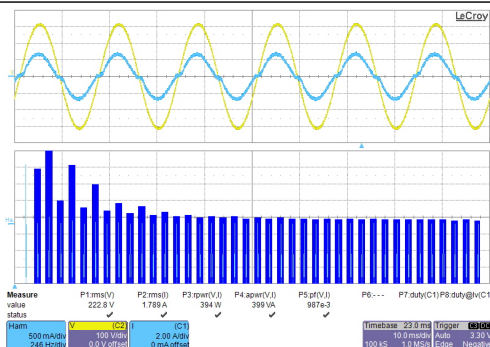
3-2. CSF300-09 Input characteristics

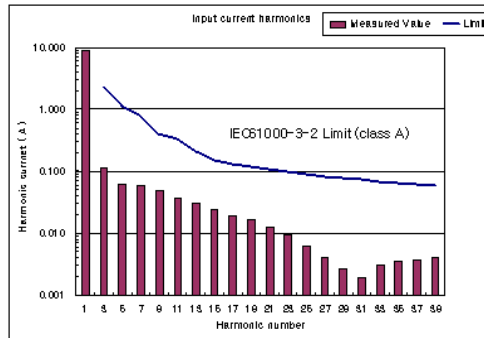Oscilloscope : WaveRunner 104MXi (LeCroy)
      CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe
      CH3 : INPUT CURRENT - AP015 Current probe
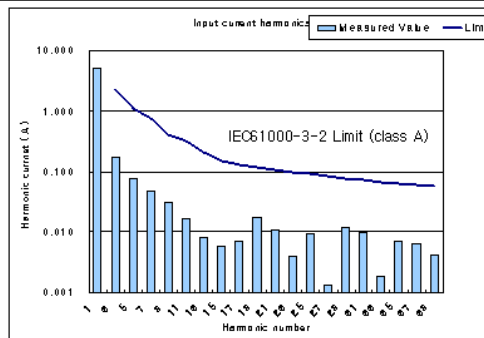Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)

Vin= 110V	I_O= 100%	P.F = 0.998

(2) Input Line Harmonics Chart (220V)

Vin= 220V	I_O= 100%	P.F = 0.983

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I_O \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.14A	0.12A	0.10A	0.09A	0.10A	0.10A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	4.02A	2.91A	2.39A	1.81A	1.37A	1.15A
	Efficiency	71.0%	75.0%	76.7%	78.2%	80.0%	81.1%
Load (100%)	Input Current	-	3.70A	2.98A	2.28A	1.72A	1.41A
	Efficiency	-	74.0%	76.3%	78.3%	79.9%	81.2%

3-3. CSF300-09 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)

      CH1 : OUTPUT VOLTAGE - PP005A passive probe

      CH2 : OUTPUT CURRENT - CP500 Current Probe

Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \\ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	9.030V	9.030V	9.030V	9.030V	9.030V	9.030V	0mV
Load (80%)	9.031V	9.031V	9.031V	9.031V	9.031V	9.030V	1mV
Load (100%)	-	9.030V	9.030V	9.030V	9.030V	9.030V	0mV
Load Regulation	1mV	1mV	1mV	1mV	1mV	0mV	

(3) Dynamic Load Response Characteristics (100Hz)

Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 71.6mV V_{under} = 193.3mV
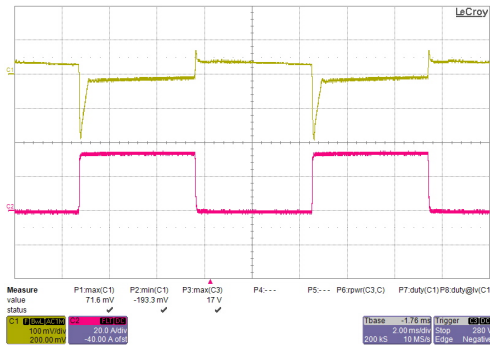
CH1
100mV/div
2.0ms/div

CH2
20.0A/div
2.0ms/div

(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 102.3mV V_{under} = 175.8mV

CH1
100mV/div
200us/div
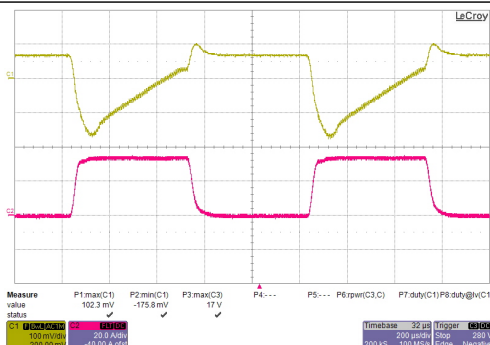
CH2
20.0A/div
200us/div

3-4. CSF300-09 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

    CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

    CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe
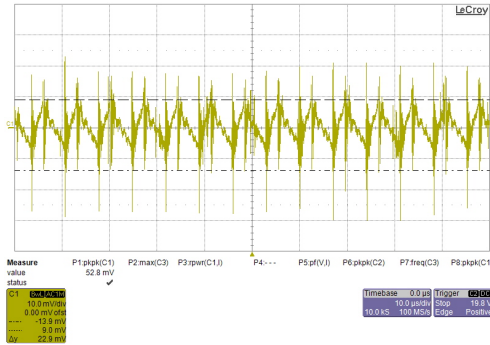
    CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

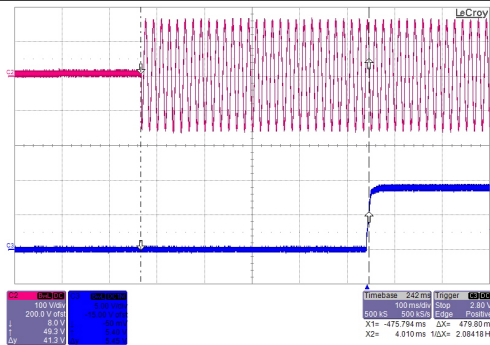| Vin= 220V	I_O=100%	V_{Ripple} = 22.9mV V_{Noise} = 52.8mV		CH1 10mV/div 10us/div

(2) Turn on time characteristics

Vin= 110V	I_O=100%	$t_{turn\ on}$ = 479ms		CH2 100V/div 100ms/div CH3 5.0V/div 100ms/div

(3) Hold up characteristics

Vin= 110V	I_O=100%	$t_{hold\ up}$ = 27ms		CH2 100V/div 10.0ms/div CH3 5.0V/div 10.0ms/div
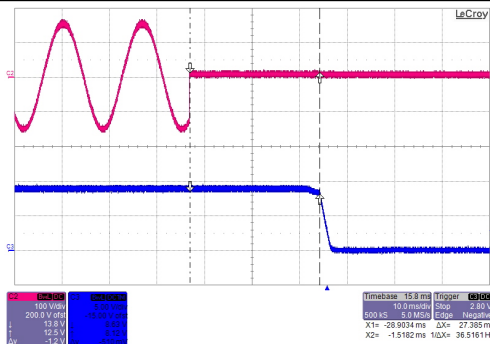
(4) Over Current protection characteristics

Vin= 220V	I_O= 110~145%	O.C.P = 41A		X 10.0A/div 2.0ns/div Y 2.0V/div 2.0ns/div
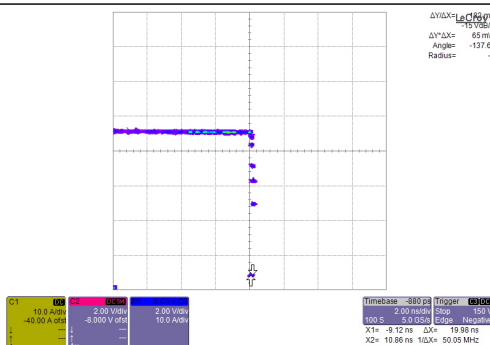
3-5. CSF300-09 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

Vin= 220V	I_O= 10%	O.V.P = 10.9V		CH3 2.00V/div 500ms/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
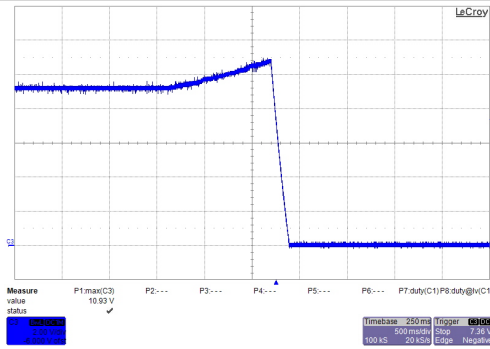
4-1. CSF300-12 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
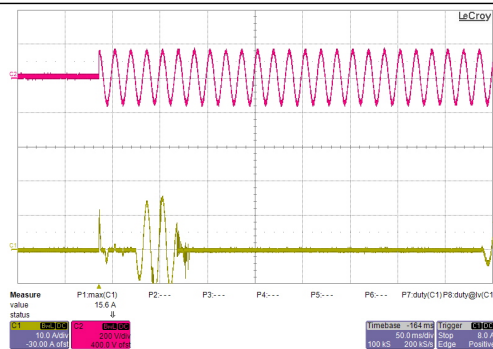   CH1 : INPUT CURRENT - AP015 Current probe
      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

Vin= 110V	I_O= 100%	I_{inrush} = 12.0A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I_O= 100%	I_{inrush} = 31.9A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div
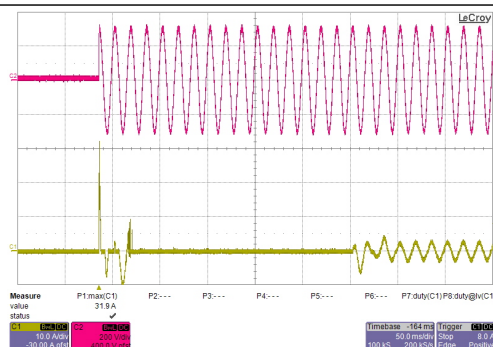
(3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I_O= 100%	V_{RMS} = 112.7V I_{RMS} = 3.842A PWR_{IN} = 432W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
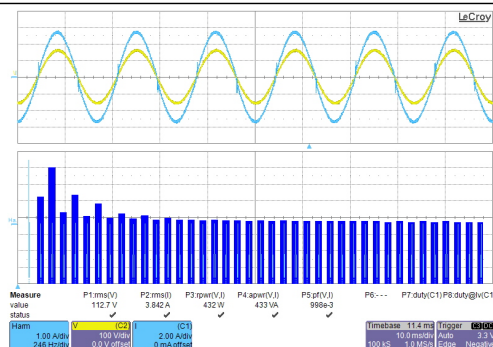
(4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I_O= 100%	V_{RMS} = 222.5V I_{RMS} = 1.831A PWR_{IN} = 400W		CH1 2.0A/div 10ms/div CH2 100V/div 10ms/div
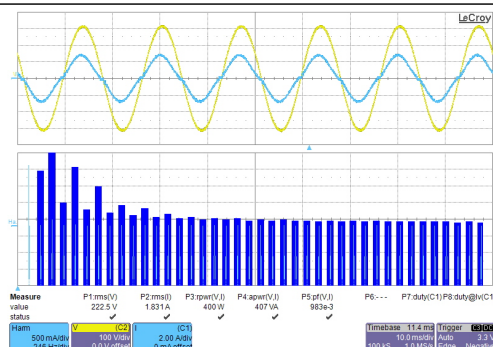
4-2. CSF300-12 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
    CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe
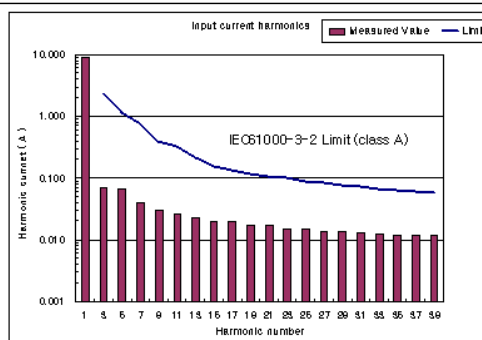   CH3 : INPUT CURRENT - AP015 Current probe
Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)
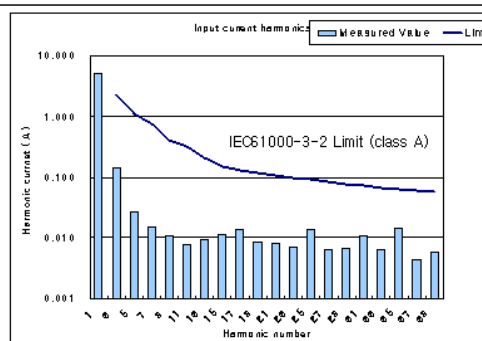
Vin= 110V	I_O= 100%	P.F = 0.998		

$Vin = 110V$, $I_O = 100\%$, P.F = 0.998

(2) Input Line Harmonics Chart (220V)

$Vin = 220V$, $I_O = 100\%$, P.F = 0.983

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I_O \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.16A	0.13A	0.11A	0.11A	0.11A	0.11A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	4.04A	2.97A	2.47A	1.89A	1.44A	1.22A
	Efficiency	71.4%	75.5%	76.9%	78.3%	80.1%	80.6%
Load (100%)	Input Current	-	3.70A	3.05A	2.26A	1.76A	1.51A
	Efficiency	-	75.2%	77.2%	79.4%	81.1%	82.1%

4-3. CSF300-12 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)

　　　CH1 : OUTPUT VOLTAGE - PP005A passive probe

　　　CH2 : OUTPUT CURRENT - CP500 Current Probe

Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition　Ta : 25

I_O　　　　Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.02V	12.02V	12.02V	12.02V	12.02V	12.02V	0mV
Load (80%)	12.02V	12.02V	12.02V	12.02V	12.02V	12.02V	0mV
Load (100%)	-	12.01V	12.01V	12.01V	12.01V	12.01V	0mV
Load Regulation	0mV	10mV	10mV	10mV	10mV	10mV	

(3) Dynamic Load Response Characteristics (100Hz)

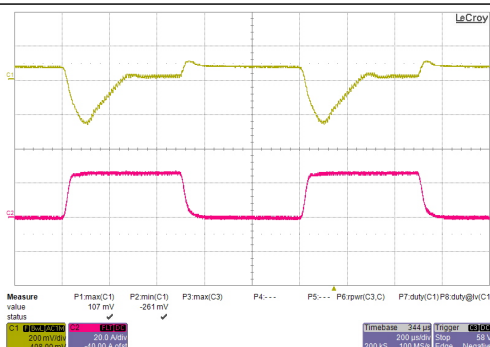| Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 100mV V_{under} = 309mV		CH1 200mV/div 2.0ms/div CH2 20.0A/div 2.0ms/div
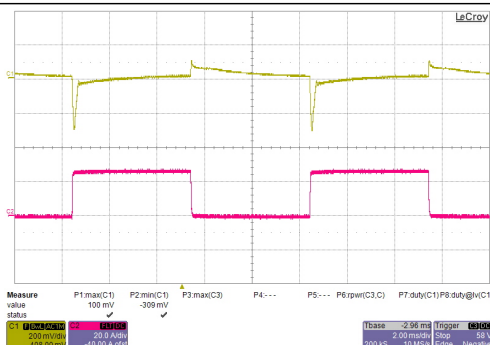
(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 107mV V_{under} = 261mV		CH1 200mV/div 200us/div CH2 20.0A/div 200us/div

4-4. CSF300-12 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

       CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

       CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

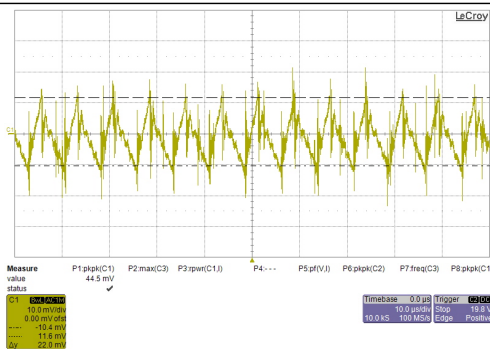   CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

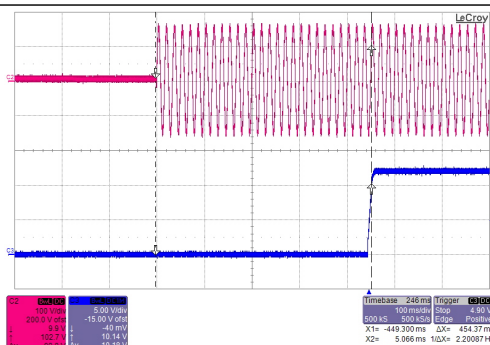| Vin= 220V | I_O=100% | V_{Ripple} = 22.0mV
V_{Noise} = 44.5mV | | CH1
10mV/div
10us/div |

(2) Turn on time characteristics

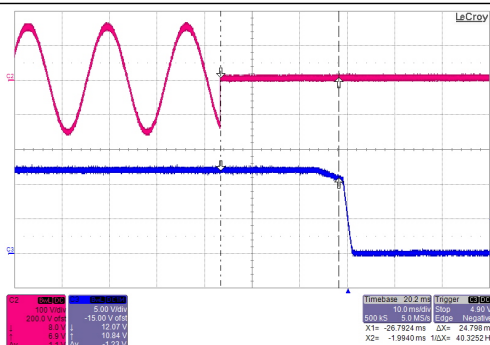| Vin= 110V | I_O=100% | $t_{turn\ on}$ = 454ms | | CH2
100V/div
100ms/div

CH3
5.0V/div
100ms/div |

(3) Hold up characteristics

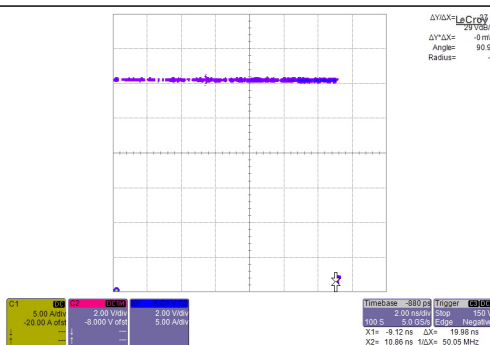| Vin= 110V | I_O=100% | $t_{hold\ up}$ = 24ms | | CH2
100V/div
10.0ms/div

CH3
5.0V/div
10.0ms/div |

(4) Over Current protection characteristics

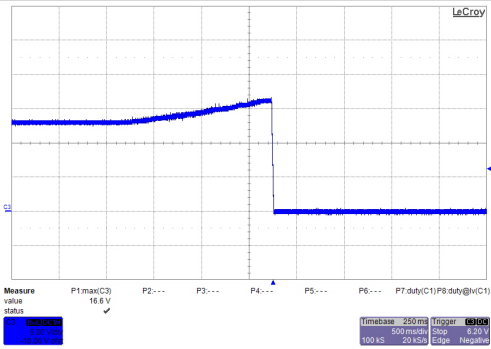| Vin= 220V | I_O= 110~145% | O.C.P = 31A | | X
5.0A/div
2.0ns/div

Y
2.0V/div
2.0ns/div |

4-5. CSF300-12 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
      CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

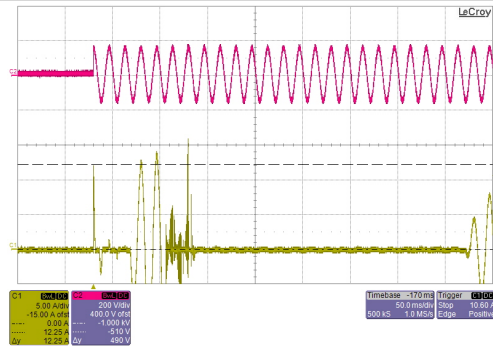|				
Vin= 220V	I$_O$= 10%	O.V.P = 16.6V		CH3 5.00V/div 500ms/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

5-1. CSF300-15 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
    CH1 : INPUT CURRENT - AP015 Current probe
    CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

Vin= 110V	I$_O$= 100%	I$_{inrush}$ = 12.2A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I$_O$= 100%	I$_{inrush}$ = 33.7A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div
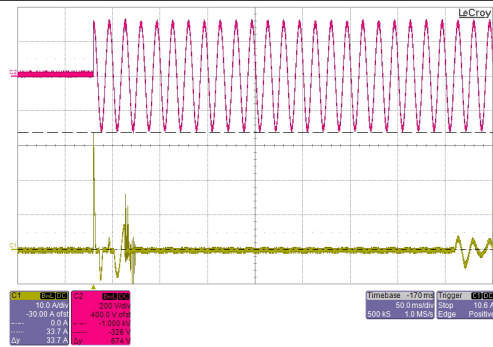
(3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I$_O$= 100%	V$_{RMS}$ = 111.8V I$_{RMS}$ = 3.668A PWR$_{IN}$ = 409W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
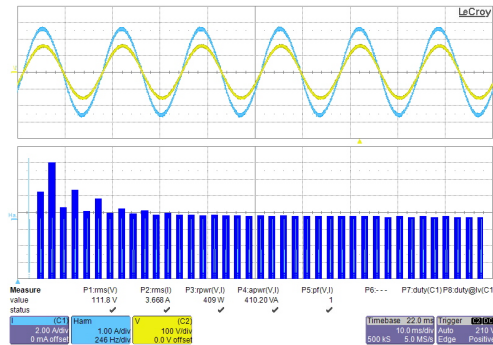
(4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I$_O$= 100%	V$_{RMS}$ = 220.6V I$_{RMS}$ = 1.758A PWR$_{IN}$ = 381.0W		CH1 2.0A/div 10ms/div CH2 100V/div 10ms/div
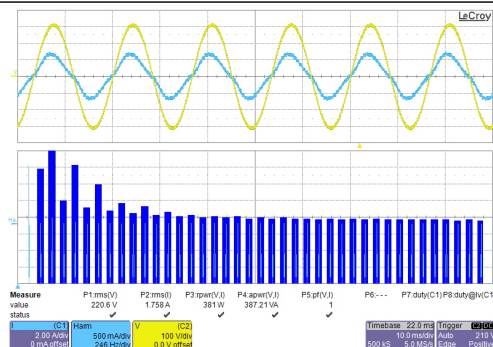
5-2. CSF300-15 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
      CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe
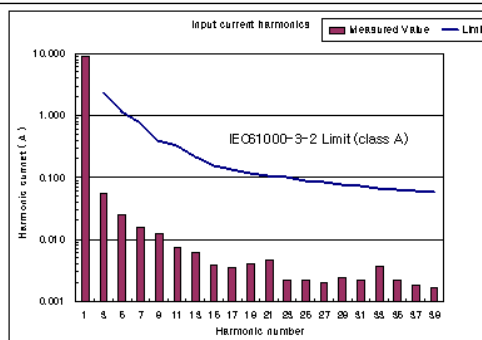   CH3 : INPUT CURRENT - AP015 Current probe
Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)
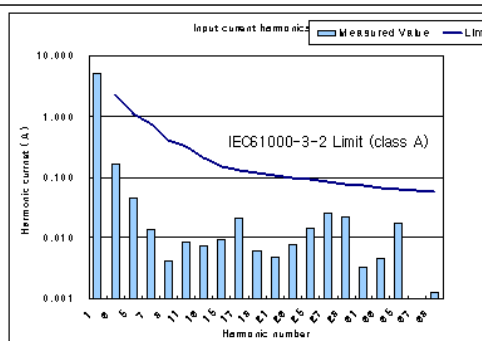
Vin= 110V	I$_O$= 100%	P.F = 0.999	

(2) Input Line Harmonics Chart (220V)

Vin= 220V	I$_O$= 100%	P.F = 0.999	

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I$_O$ \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.12A	0.09A	0.08A	0.08A	0.09A	0.10A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	3.95A	2.89A	2.38A	1.78A	1.40A	1.18A
	Efficiency	75.5%	79.1%	80.6%	82.1%	83.5%	84.9%
Load (100%)	Input Current	-	3.63A	2.94A	2.21A	1.75A	1.46A
	Efficiency	-	78.0%	80.2%	82.1%	83.6%	84.7%

5-3. CSF300-15 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)

  CH1 : OUTPUT VOLTAGE - PP005A passive probe

  CH2 : OUTPUT CURRENT - CP500 Current Probe

Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	15.02V	15.02V	15.02V	15.02V	15.02V	15.02V	0mV
Load (80%)	15.02V	15.02V	15.02V	15.02V	15.02V	15.02V	0mV
Load (100%)	15.02V	15.02V	15.02V	15.02V	15.02V	15.02V	0mV
Load Regulation	0mV	0mV	0mV	0mV	0mV	0mV	

(3) Dynamic Load Response Characteristics (100Hz)

Vin= 220V

I_O= 0~100% 100Hz

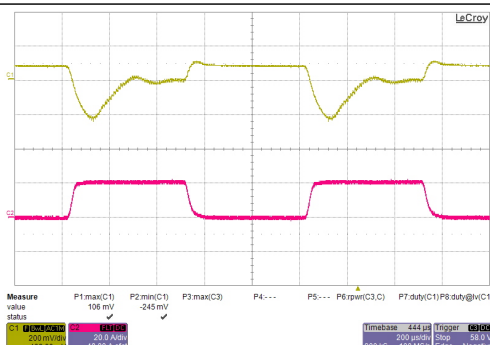V_{over} = 120mV

V_{under} = 302mV
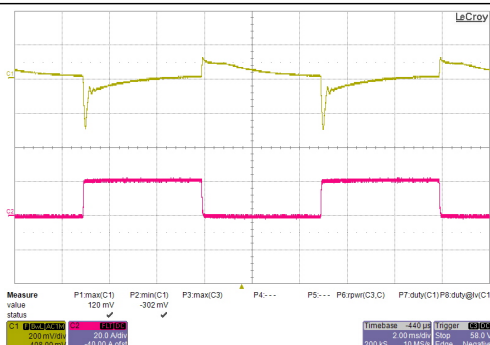
CH1
200mV/div
2.0ms/div

CH2
20.0A/div
2.0ms/div

(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V

I_O= 0~100% 1kHz

V_{over} = 106mV

V_{under} = 245mV

CH1
200mV/div
200us/div

CH2
20.0A/div
200us/div

5- 4. CSF300-15 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

      CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

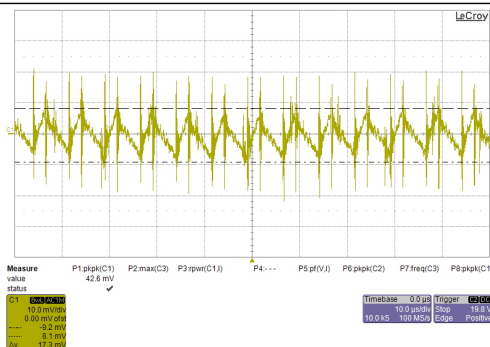   CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

Vin= 220V	I_O=100%	V_{Ripple} = 17.3mV V_{Noise} = 42.6mV		CH1 10mV/div 10us/div

(2) Turn on time characteristics

Vin= 110V	I_O=100%	$t_{turn\ on}$ = 453ms		CH2 100V/div 100ms/div CH3 5.0V/div 100ms/div
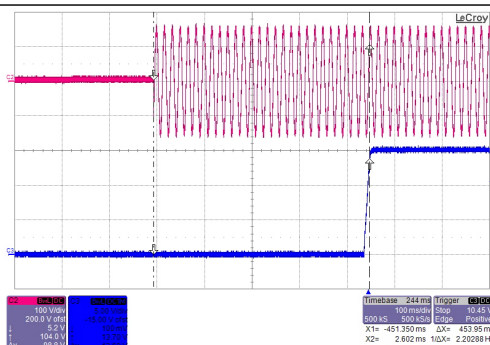
(3) Hold up characteristics

Vin= 110V	I_O=100%	$t_{hold\ up}$ = 26ms		CH2 100V/div 10.0ms/div CH3 5.0V/div 10.0ms/div
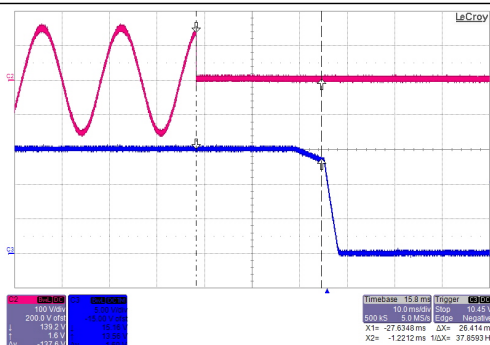
(4) Over Current protection characteristics

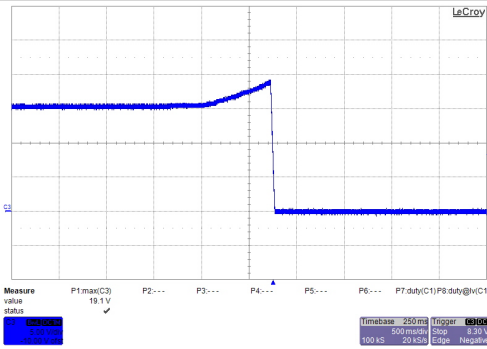|				
Vin= 220V	I_O= 110~145%	O.C.P = 26A		X 5.0A/div 2.0ns/div Y 5.0V/div 2.0ns/div
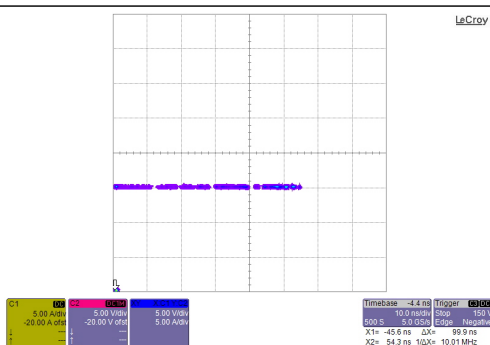
5-5. CSF300-15 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
      CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

Vin= 220V	I$_O$= 10%	O.V.P = 19.1V		CH3 2.00V/div 1.00s/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

6-1. CSF300-24 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
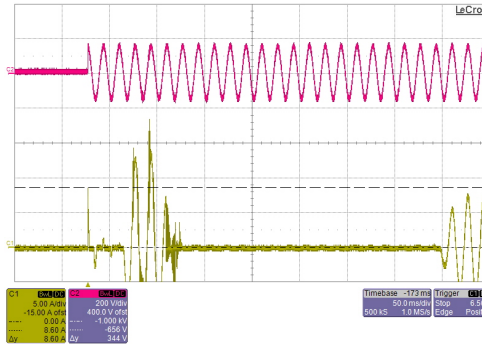   CH1 : INPUT CURRENT - AP015 Current probe
      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

Vin= 110V	I_O= 100%	I_{inrush} = 8.6A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I_O= 100%	I_{inrush} = 32.0A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div
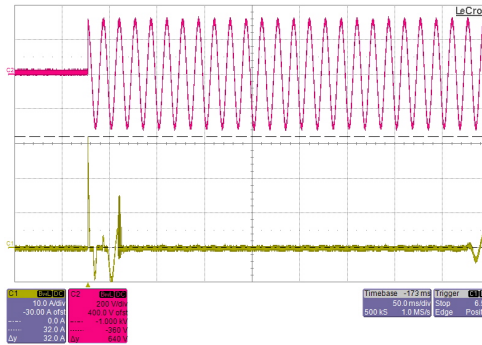
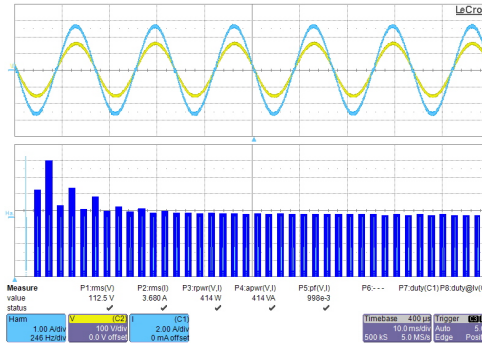### (3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I_O= 100%	V_{RMS} = 112.5V I_{RMS} = 3.680A PWR_{IN} = 414W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div

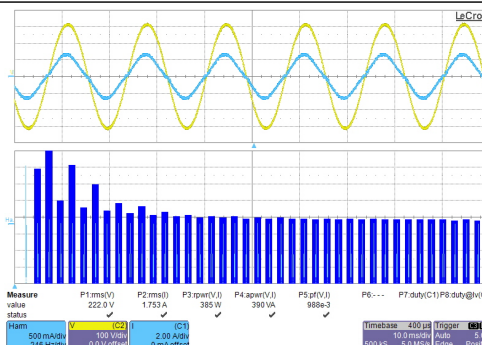### (4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I_O= 100%	V_{RMS} = 222.0V I_{RMS} = 1.753A PWR_{IN} = 385W		CH1 2.0A/div 10ms/div CH2 100V/div 10ms/div

6-2. CSF300-24 Input characteristics

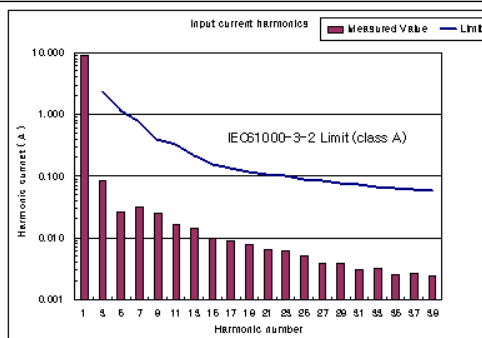Oscilloscope : WaveRunner 104MXi (LeCroy)

    CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe

    CH3 : INPUT CURRENT - AP015 Current probe

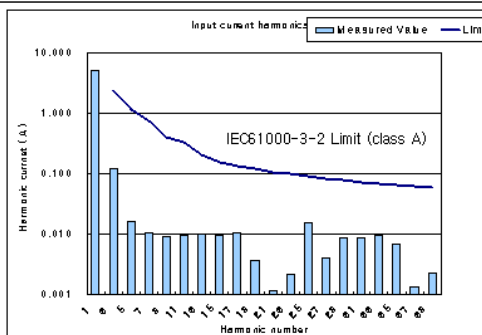Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)

Vin= 110V	I$_O$= 100%	P.F = 0.998	

(2) Input Line Harmonics Chart (220V)

Vin= 220V	I$_O$= 100%	P.F = 0.988	

(3) Input Current &Efficiency Characteristics

Condition   Ta : 25

I$_O$ \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.14A	0.11A	0.10A	0.10A	0.10A	0.11A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	3.84A	2.78A	2.35A	1.80A	1.38A	1.15A
	Efficiency	75.3%	79.4%	80.7%	82.0%	83.9%	85.4%
Load (100%)	Input Current	-	3.57A	2.97A	2.21A	1.69A	1.42A
	Efficiency	-	78.7%	80.8%	82.5%	84.3%	85.4%

6-3. CSF300-24 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)

      CH1 : OUTPUT VOLTAGE - PP005A passive probe

      CH2 : OUTPUT CURRENT - CP500 Current Probe

Digital Multimeter : 34401A (Agilent)

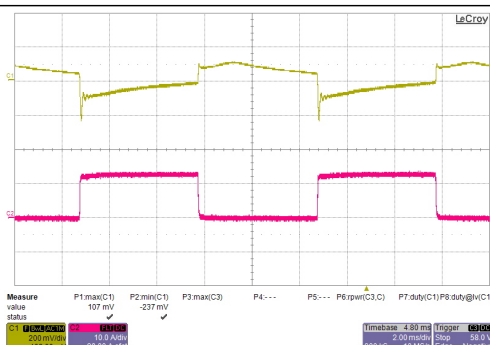### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	24.05V	24.05V	24.05V	24.05V	24.05V	24.05V	0mV
Load (80%)	24.06V	24.06V	24.06V	24.06V	24.06V	24.06V	0mV
Load (100%)	-	24.06V	24.06V	24.06V	24.06V	24.06V	0mV
Load Regulation	10mV	10mV	10mV	10mV	10mV	10mV	

(3) Dynamic Load Response Characteristics (100Hz)

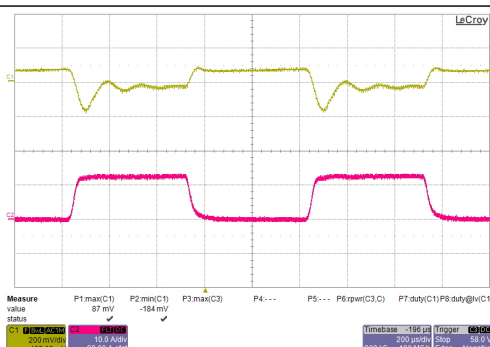| Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 107mV V_{under} = 237mV		CH1 200mV/div 2.0ms/div CH2 10.0A/div 2.0ms/div

(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 87mV V_{under} = 184mV		CH1 200mV/div 200us/div CH2 10.0A/div 200us/div

6-4. CSF300-24 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

      CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

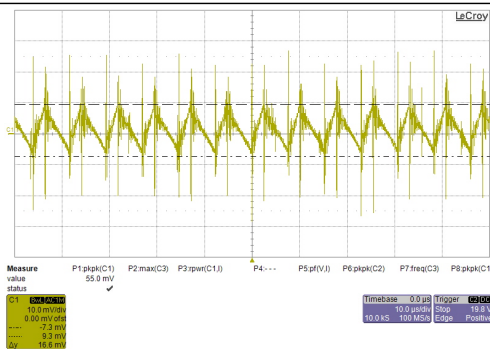   CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

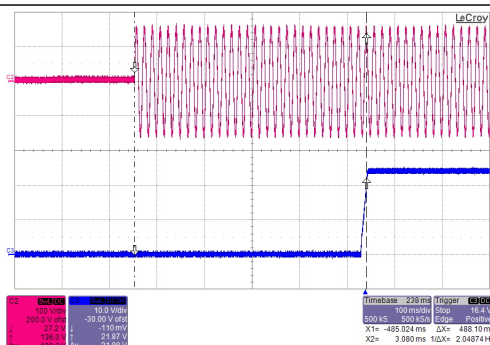| Vin= 220V | I_O=100% | V_{Ripple} = 16.6mV
V_{Noise} = 55.0mV | | CH1
10mV/div
10us/div |

(2) Turn on time characteristics

| Vin= 110V | I_O=100% | $t_{turn\ on}$ = 488ms | | CH2
100V/div
100ms/div

CH3
10V/div
100ms/div |

(3) Hold up characteristics

| Vin= 110V | I_O=100% | $t_{hold\ up}$ = 28ms | | CH2
100V/div
10.0ms/div

CH3
10V/div
10.0ms/div |

(4) Over Current protection characteristics

| Vin= 220V | I_O= 110~145% | O.C.P = 16.5A | | X
5.0A/div
2.0ns/div

Y
5.0V/div
2.0ns/div |
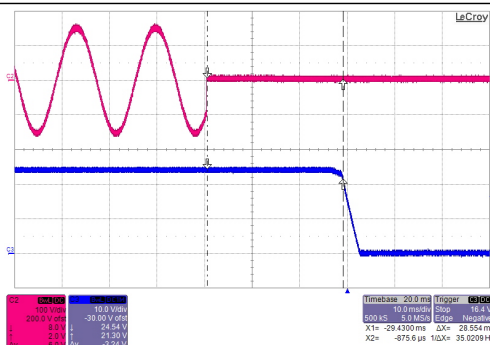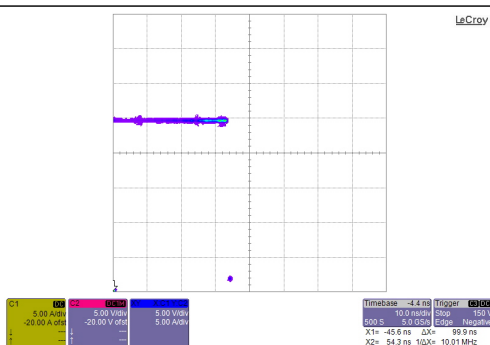
6-5. CSF300-24 Output characteristics
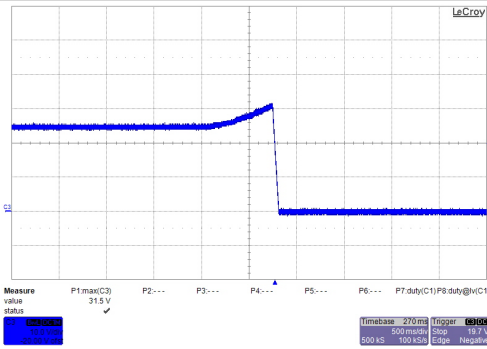
(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

Vin= 220V	I_o= 10%	O.V.P = 31.5V		CH3 10.0V/div 500ms/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

7-1. CSF300-48 Input characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
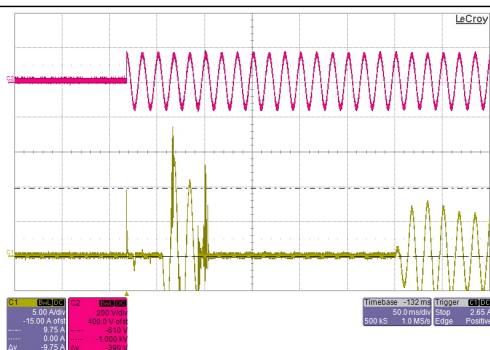
      CH1 : INPUT CURRENT - AP015 Current probe

      CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe

(1) Inrush Current Characteristics (110V)

Vin= 110V	I_O= 100%	I_{inrush} = 9.75A		CH1 5.0A/div 50ms/div CH2 200V/div 50ms/div

(2) Inrush Current Characteristics (220V)

Vin= 220V	I_O= 100%	I_{inrush} = 29.6A		CH1 10A/div 50ms/div CH2 200V/div 50ms/div
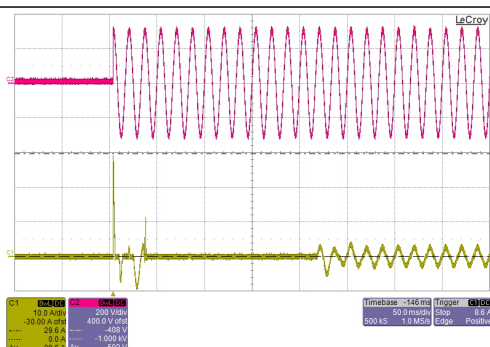
(3) Input Voltage & Current Characteristics (110V)

Vin= 110V	I_O= 100%	V_{RMS} = 112.1V I_{RMS} = 3.747A PWR_{IN} = 418W		CH1 1.0A/div 10ms/div CH2 100V/div 10ms/div
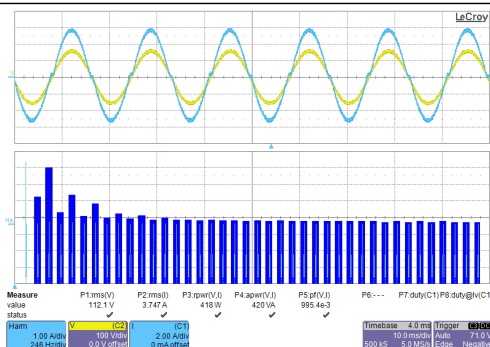
(4) Input Voltage & Current Characteristics (220V)

Vin= 220V	I_O= 100%	V_{RMS} = 221.4V I_{RMS} = 1.792A PWR_{IN} = 387W		CH1 2.0A/div 10ms/div CH2 100V/div 10ms/div
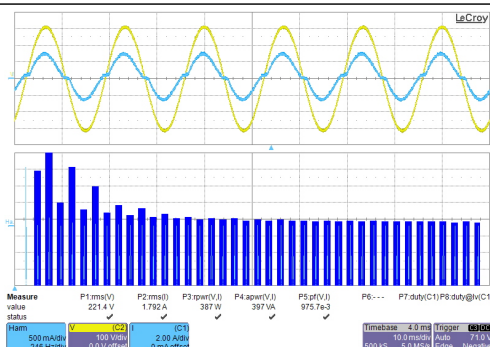
7-2. CSF300-48 Input characteristics

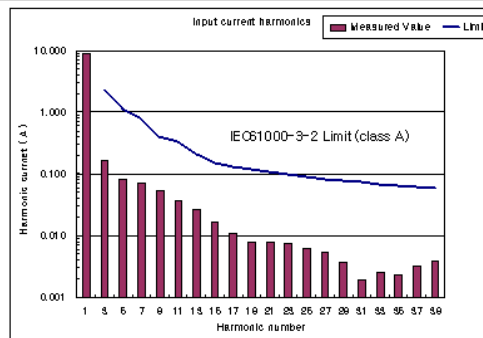Oscilloscope : WaveRunner 104MXi (LeCroy)
      CH1 : INPUT VOLTAGE - ADP305 High voltage differential probe
      CH3 : INPUT CURRENT - AP015 Current probe
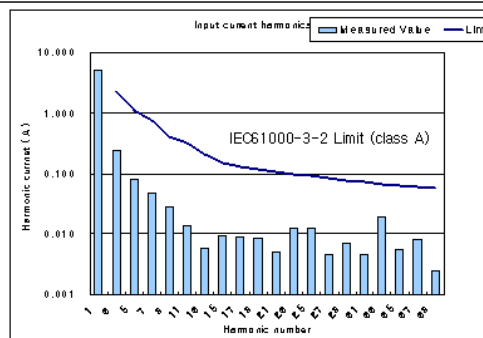Digital Multimeter : 34401A (Agilent)

(1) Input Line Harmonics Chart (110V)

Vin= 110V	I_O= 100%	P.F = 0.995	

(2) Input Line Harmonics Chart (220V)

Vin= 220V	I_O= 100%	P.F = 0.975	

(3) Input Current &Efficiency Characteristics

Condition Ta : 25

I_O \ Vin		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.14A	0.11A	0.10A	0.09A	0.09A	0.10A
	Efficiency	-	-	-	-	-	-
Load (80%)	Input Current	4.01A	2.93A	2.43A	1.83A	1.41A	1.18A
	Efficiency	75.3%	79.5%	81.0%	82.8%	84.7%	85.5%
Load (100%)	Input Current	-	3.72A	3.00A	2.30A	1.75A	1.47A
	Efficiency	-	78.5%	80.9%	82.7%	84.7%	85.8%

7-3. CSF300-48 Output characteristics

Oscilloscope : WaveRunner 104MXi (LeCroy)
      CH1 : OUTPUT VOLTAGE - PP005A passive probe
      CH2 : OUTPUT CURRENT - CP500 Current Probe
Digital Multimeter : 34401A (Agilent)

### (1) Line & Load Regulation Characteristics

Condition Ta : 25

I_O \\ Vin	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	48.06V	48.06V	48.06V	48.06V	48.06V	48.06V	0mV
Load (80%)	48.06V	48.06V	48.06V	48.06V	48.06V	48.06V	0mV
Load (100%)	48.06V	48.06V	48.06V	48.06V	48.06V	48.06V	0mV
Load Regulation	0mV	0mV	0mV	0mV	0mV	0mV	

(3) Dynamic Load Response Characteristics (100Hz)

Vin= 220V	I_O= 0~100% 100Hz	V_{over} = 153mV V_{under} = 337mV	
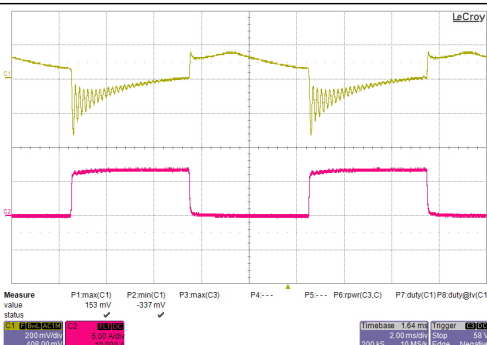
CH1
200mV/div
2.0ms/div

CH2
5.0A/div
2.0ms/div

(4) Dynamic Load Response Characteristics (1KHz)

Vin= 220V	I_O= 0~100% 1kHz	V_{over} = 154mV V_{under} = 247mV	
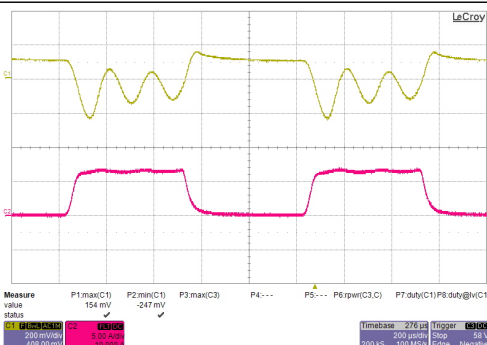
CH1
200mV/div
200us/div

CH2
5.0A/div
200us/div

7-4. CSF300-48 Output characteristics

(1) Oscilloscope : WaveRunner MXi104 (LeCroy)

CH1 : OUTPUT VOLTAGE RIPPLE & NOISE - BNC CABLE (BW:200MHz)

CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe
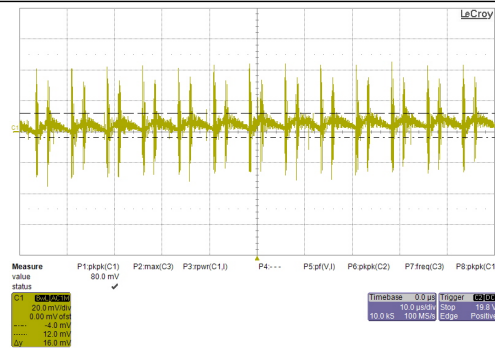
CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Ripple & Noise characteristics.

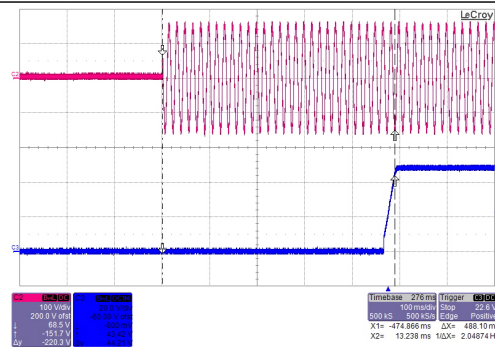| Vin= 220V | I_O=100% | V_{Ripple} = 16.0mV
V_{Noise} = 80mV | | CH1
20mV/div
10us/div |

(2) Turn on time characteristics

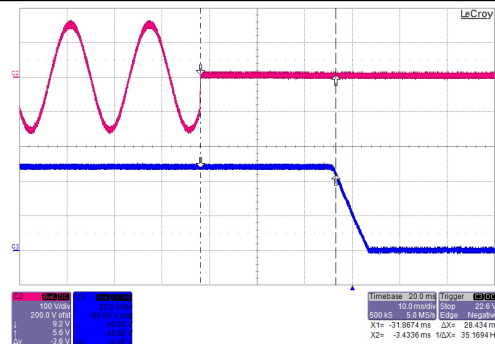| Vin= 110V | I_O=100% | $t_{turn\ on}$ = 488ms | | CH2
100V/div
100ms/div

CH3
20V/div
100ms/div |

(3) Hold up characteristics

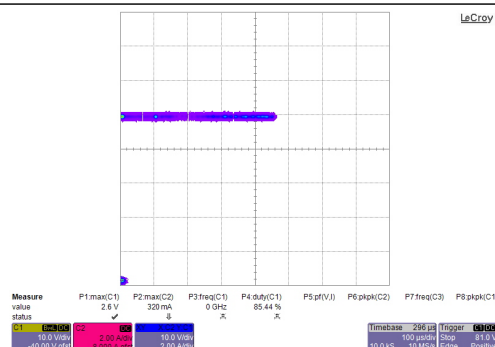| Vin= 110V | I_O=100% | $t_{hold\ up}$ = 28ms | | CH2
100V/div
10.0ms/div

CH3
20V/div
10.0ms/div |

(4) Over Current protection characteristics

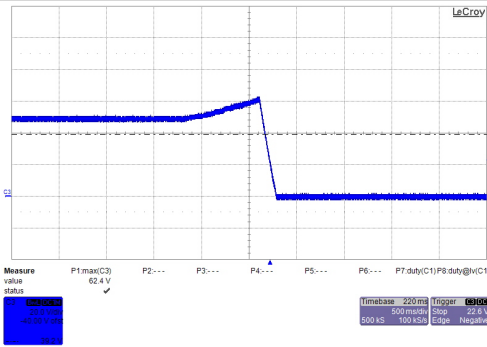| Vin= 220V | I_O= 110~145% | O.C.P = 8.8A | | X
5.0A/div
2.0ns/div

Y
10.0V/div
2.0ns/div |

7-5. CSF300-48 Output characteristics

(1) Oscilloscope :WaveRunner MXi104 (LeCroy)
    CH3 : OUTPUT VOLTAGE - PP005A Probe

(1) Over-voltage protection characteristics

Vin= 220V	Io= 10%	O.V.P = 62.4V		CH3 20.00V/div 500ms/div
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-