

귀중

Evaluation Data

품 목	SMPS
품 명	CSF50-DE/DW
Rev. No.	A

2009 년 01 월 13 일

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Evaluation data

1. CSF50-BDW

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7. CSF50-EEW

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1-1. CSF50-BDW Input characteristics

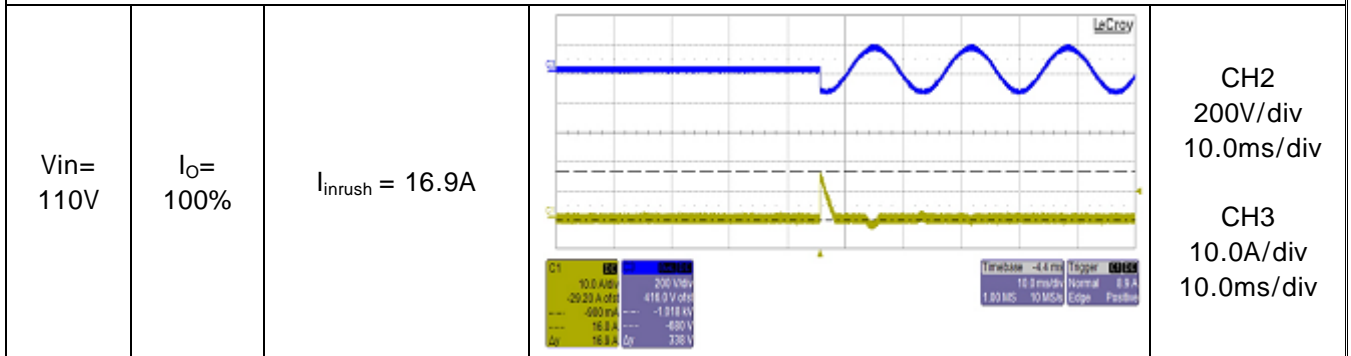
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

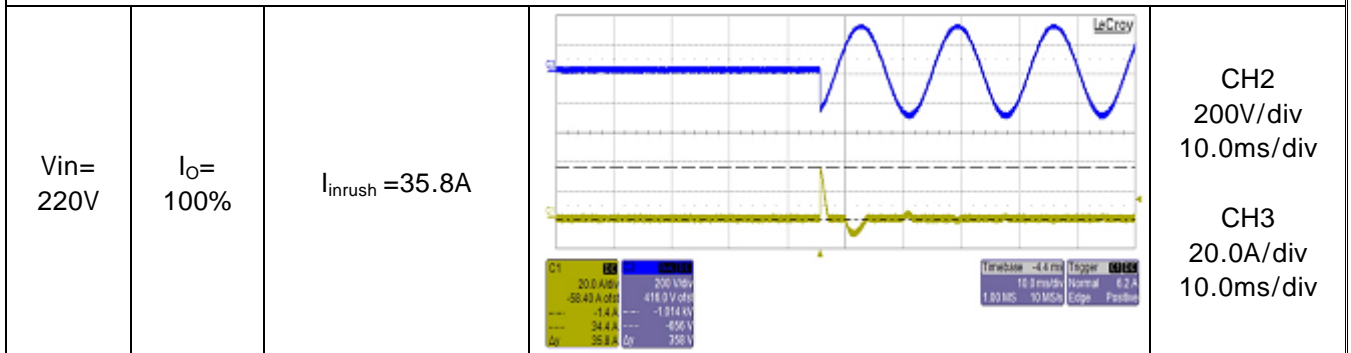
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current & Efficiency Characteristics

Condition Ta : 25

Vin		85V	110V	132V	170V	220V	264V
I _o							
Load (min)	Input Current	0.122	0.106	0.097	0.089	0.86	0.82
Load (min)	Efficiency	42.7	39.7	37.9	34.7	30.5	23.3
Load (50%)	Input Current	0.576	0.46	0.40	0.34	0.298	0.26
Load (50%)	Efficiency	33.7	33.5	33.6	34	35.2	36.5
Load (100%)	Input Current	1.09	0.872	0.74	0.61	0.53	0.44
Load (100%)	Efficiency	74.1	75.6	76,5	76.6	77.0	74.1

1-2. CSF50-BDW Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(5V/5A) Line & Load Regulation Characteristics

Condition Ta : 25

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.05	5.05	5.05	5.05	5.05	5.05	0
Load (50%)	5.03	5.03	5.03	5.03	5.03	5.03	0
Load (100%)	5.01	5.01	5.01	5.01	5.02	5.02	0.01
Load Regulation	0.04	0.04	0.04	0.04	0.04	0.03	

(2) CH2(12V/2A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.06	12.05	12.05	12.05	12.05	12.05	0.01
Load (50%)	12.02	12.02	12.02	12.02	12.02	12.02	0
Load (100%)	12.07	12.07	12.07	12.07	12.07	12.07	0
Load Regulation	0.05	0.05	0.05	0.05	0.05	0.05	

(3) Cross Regulation Characteristics

I_o \ V_{in}	CH1	CH2	CH1	CH2
Load (min)	5.05	12.06	5.02	12.06
Load (50%)	5.03	12.06	5.02	12.02
Load (100%)	5.02	12.07	5.02	12.06
Load Regulation	0.03	0.01	0	0.04

1-3. CSF50-BDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 100Hz	$V_{over} = 177mV$ (3.54%) $V_{under} = 217mV$ (4.34%)		CH3 500mV/div CH2 2.00A/div Timebase 10.00ms/div
(2) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 100Hz	$V_{over} = 174mV$ (3.48%) $V_{under} = 209mV$ (4.18%)		CH3 500mV/div CH2 2.00A/div Timebase 10.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 1KHz	$V_{over} = 150mV$ (3%) $V_{under} = 128mV$ (2.56%)		CH3 500mV/div CH2 2.00A/div Timebase 1.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 1KHz	$V_{over} = 141mV$ (2.82%) $V_{under} = 126mV$ (2.52%)		CH3 500mV/div CH2 2.00A/div Timebase 1.00ms/div

1-4. CSF50-BDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 12V/2A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 71.2mV$ (0.59%) $V_{under} = 99.5mV$ (0.82%)		CH2 100mV/div CH1 1A/div Timebase 10.00ms/div
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(2) 12V/2A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 71.4mV$ (0.59%) $V_{under} = 100.2mV$ (0.83%)		CH2 100mV/div CH1 1A/div Timebase 10.00ms/div
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(3) 12V/2A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 28.8 mV$ (0.24%) $V_{under} = 31.7mV$ (0.26%)		CH2 100mV/div CH1 1A/div Timebase 1.00ms/div
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(4) 12V/2A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 32.8mV$ (0.27%) $V_{under} = 36.1mV$ (0.3%)		CH2 100mV/div CH1 1A/div Timebase 1.00ms/div
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1-5. CSF50-BDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)
 CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)
 CH4 : Output voltage - BNC Probe(200MHz)
 CASE

(1) 5V/5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

Vin= 220V	Io= 100%	RIPPLE _{p-p} = 5.0[mV] RIPPLE&NOISE _{p-p} = 45.0[mV]		Ch3 50mV/div Timebase 2us/div
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(2) 12V/2A(CH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

Vin= 220V	Io= 100%	RIPPLE _{p-p} = 20.0[mV] RIPPLE&NOISE _{p-p} = 77.0[mV]		Ch3 50mV/div Timebase 2us/div
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(3) 5V/5A(CH1) Turn on Time Characteristics

Vin= 85V	Io= 100%	Turn on Time =686ms		CH2 200v/div CH3 2v/div Timebase 200ms/div
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(4) 12V/2A(CH2) Turn on Time Characteristics

Vin= 85V	Io= 100%	Turn on Time =700ms		CH2 200v/div CH3 5v/div Timebase 200ms/div
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1-6. CSF50-BDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

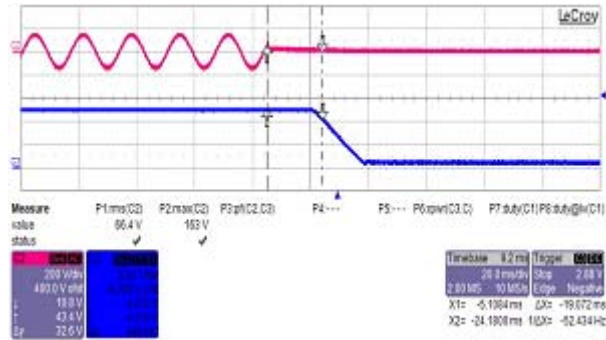
CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

(1) 5V/5A(CH1) Hold up Time Characteristics .

V_{in}=
100V

I_o=
100%

Hold up Time
=19ms



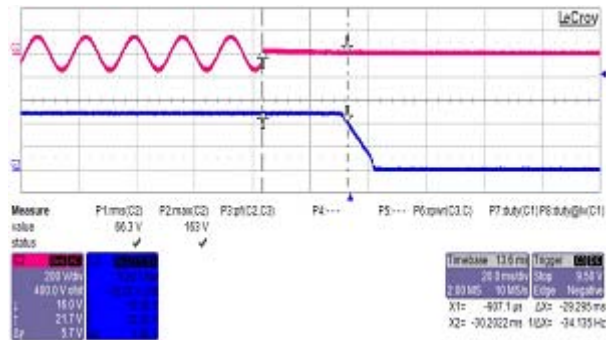
CH2
200v/div
CH1
2v/div
Timebase
20ms/div

(2) 12V/2A(CH2) Hold up Time Characteristics .

V_{in}=
100V

I_o=
100%

Hold up Time
=29ms



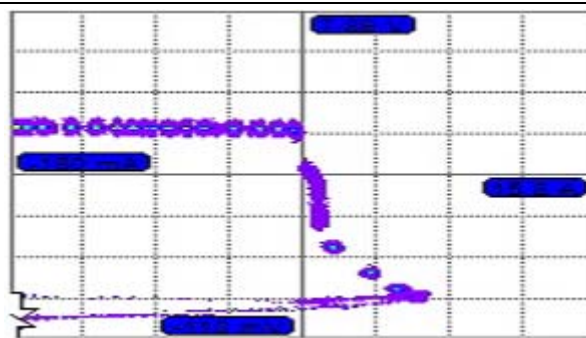
CH2
200v/div
CH1
2v/div
Timebase
100ms/div

(3) 5V/5A(CH1) Over Current Protection Characteristics

V_{in}=
110V

I_o=
100%

OCP:8.2A



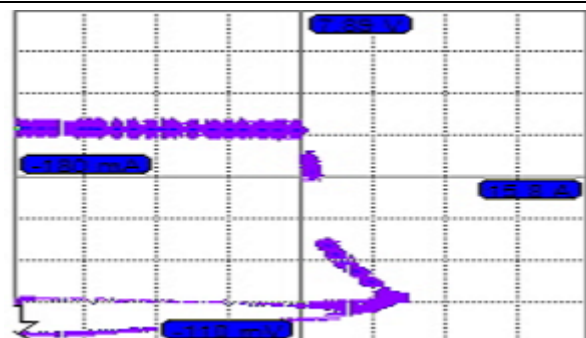
X: 2.0A/div
Y: 1.0V/div
5.0us/div

(4) 5V/5A(CH1) Over Current Protection Characteristics

V_{in}=
220V

I_o=
100%

OCP:8.2A



X: 2.0A/div
Y: 1.0V/div
5.0us/div

1-7. CSF50-BDW Output characteristics

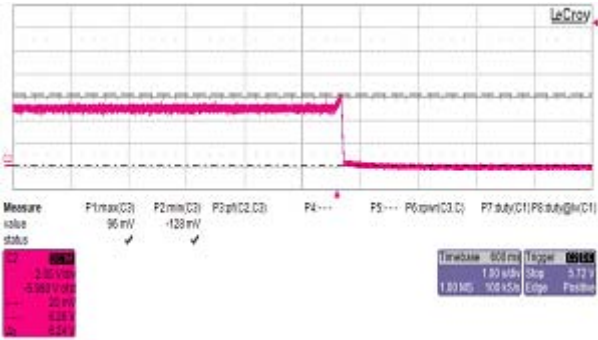
Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 EMC Analyzer : Agilent E7402A
 LISN : KNW-403D

(1) 5V/5.0A (CH1) Over Voltage Protection Characteristics

Vin=
220V

Io=
10%

OVP:6.24V



CH2
2v/div
Timebase
1s/div

2-1. CSF50-BEW Input characteristics

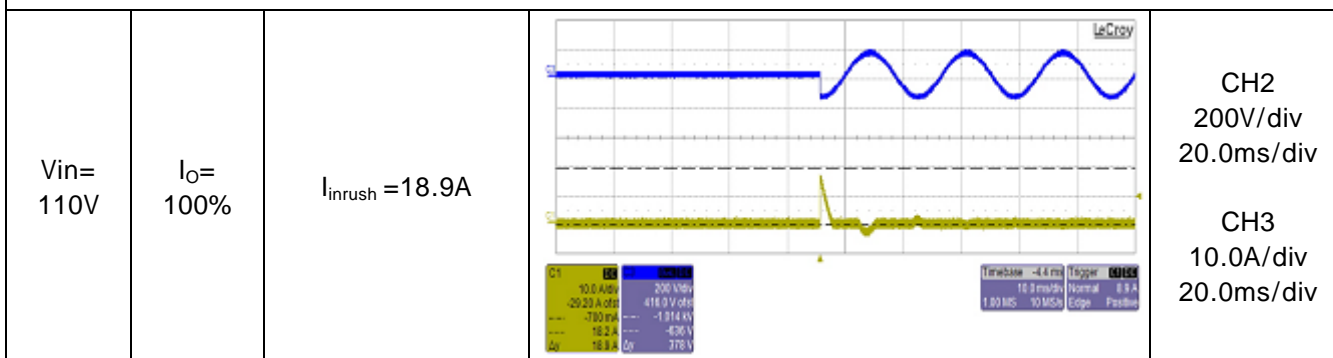
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

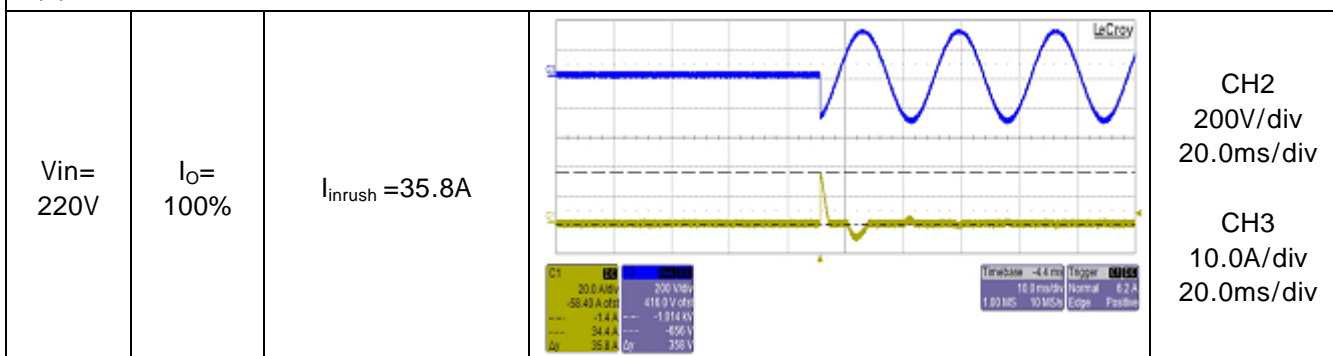
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25$

V_{in}		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.125	0.106	0.096	0.087	0.084	0.08
	Efficiency	41.5	39.9	38.4	35.7	31.3	26.8
Load (50%)	Input Current	0.535	0.424	0.381	0.324	0.293	0.247
	Efficiency	80.1	80.4	80.1	78.7	76.5	74.1
Load (100%)	Input Current	1.07	0.85	0.723	0.6	0.52	0.44
	Efficiency	75.5	77.6	78.4	78.4	77.3	75.8

2-2. CSF50-BEW Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(5V/5A) Line & Load Regulation Characteristics

Condition Ta : 25

V_{in} / I_o	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.04	5.04	5.04	5.04	5.04	5.04	0
Load (50%)	5.03	5.03	5.03	5.03	5.03	5.03	0
Load (100%)	5.01	5.01	5.01	5.01	5.01	5.01	0
Load Regulation	0.03	0.03	0.03	0.03	0.03	0.03	

(2) CH2(15V/1.7A) Line & Load Regulation Characteristics

V_{in} / I_o	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	14.96	14.96	14.96	14.96	14.96	14.96	0
Load (50%)	14.91	14.91	14.91	14.91	14.91	14.91	0
Load (100%)	14.86	14.86	14.86	14.86	14.86	14.86	0
Load Regulation	0.1	0.1	0.1	0.1	0.1	0.1	

(3) Cross Regulation Characteristics

V_{in} / I_o	CH1	CH2	CH1	CH2
Load (min)	5.04	14.87	5.01	14.96
Load (50%)	5.02	14.86	5.01	14.91
Load (100%)	5.01	14.86	5.01	14.86
Load Regulation	0.03	0.01	0	0.1

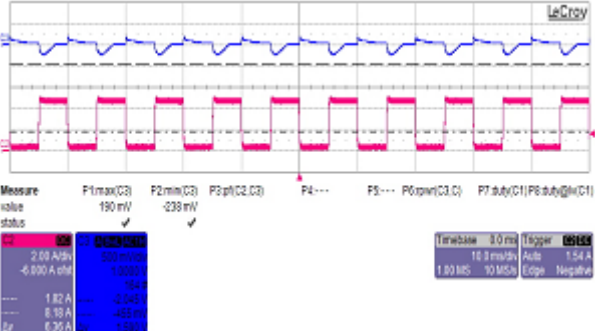
2-3. CSF50-BEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

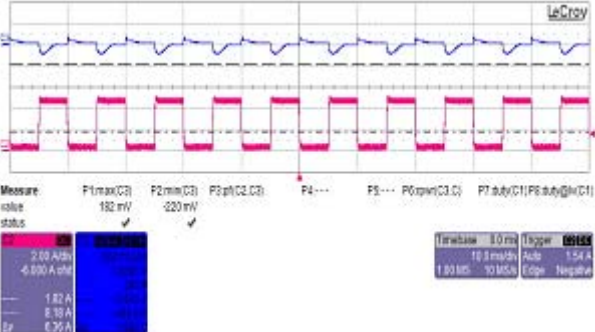
CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

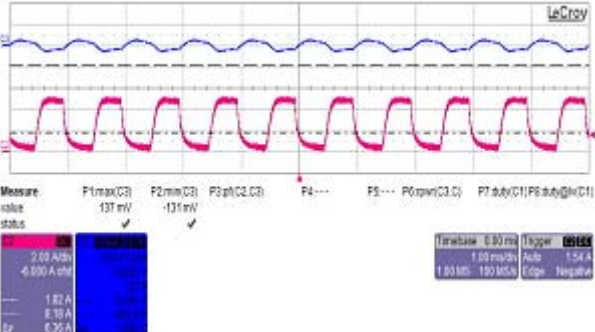
(1) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)

$V_{in} = 110V$	$I_o = \min(0.5A)$ $\sim 100\%$ $100Hz$	$V_{over} = 109mV (3.8\%)$ $V_{under} = 238mV (4.78\%)$		$CH2$ $500mV/div$ $CH1$ $2.00A/div$ $Timebase$ $10.00ms/div$
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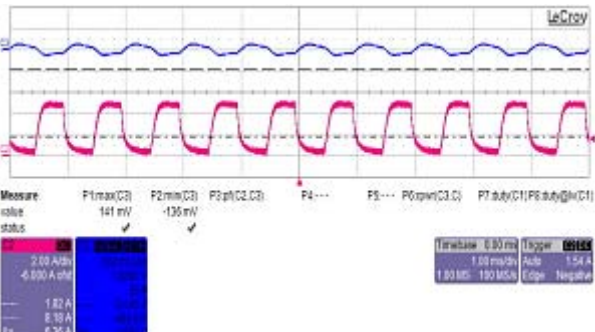
(2) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)

$V_{in} = 220V$	$I_o = \min(0.5A)$ $\sim 100\%$ $100Hz$	$V_{over} = 182mV (3.64\%)$ $V_{under} = 220mV (4.4\%)$		$CH2$ $500mV/div$ $CH1$ $2.00A/div$ $Timebase$ $10.00ms/div$
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(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)

$V_{in} = 110V$	$I_o = \min(0.5A)$ $\sim 100\%$ $1KHz$	$V_{over} = 137mV (2.74\%)$ $V_{under} = 131mV (2.62\%)$		$CH2$ $500mV/div$ $CH1$ $2.00A/div$ $Timebase$ $1.00ms/div$
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(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)

$V_{in} = 220V$	$I_o = \min(0.5A)$ $\sim 100\%$ $1KHz$	$V_{over} = 141mV (2.82\%)$ $V_{under} = 136mV (2.72\%)$		$CH2$ $500mV/div$ $CH1$ $2.00A/div$ $Timebase$ $1.00ms/div$
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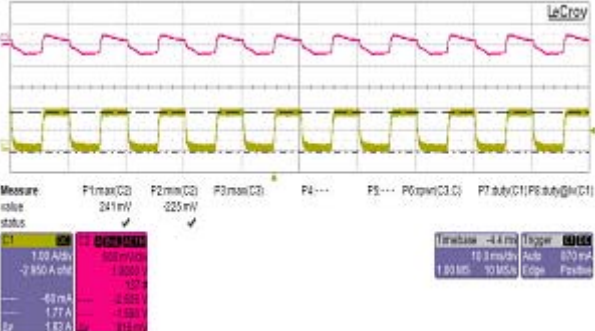
2-4. CSF50-BEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

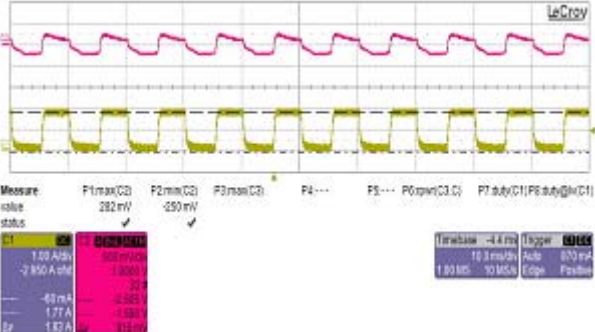
CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

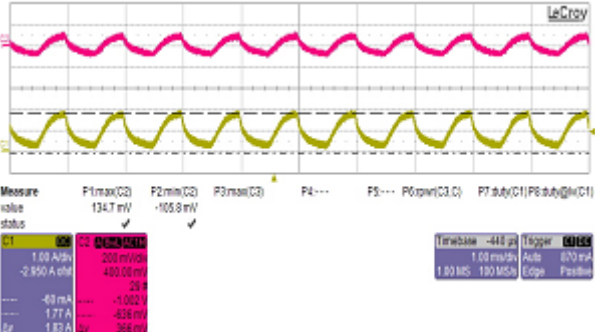
(1) 15V/1.7A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 241mV$ (1.6%) $V_{under} = 225mV$ (1.5%)		CH2 50mV/div CH1 1A/div Timebase 5.00ms/div
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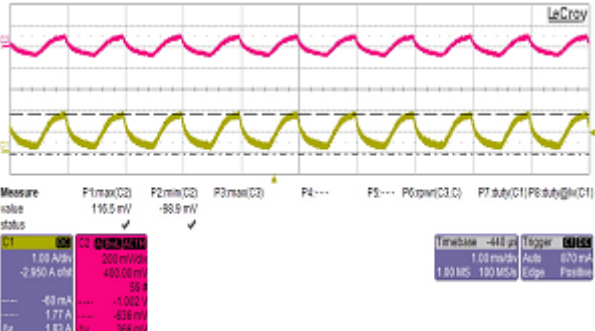
(2) 15V/1.7A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 282mV$ (1.88%) $V_{under} = 250mV$ (1.66%)		CH2 50mV/div CH1 1A/div Timebase 5.00ms/div
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(3) 15V/1.7A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 134mV$ (0.89%) $V_{under} = 105mV$ (0.89%)		CH2 50mV/div CH1 1A/div Timebase 1.00ms/div
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(4) 15V/1.7A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 116mV$ (0.77%) $V_{under} = 98.9mV$ (0.65%)		CH2 50mV/div CH1 1A/div Timebase 1.00ms/div
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2-5. CSF50-BEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

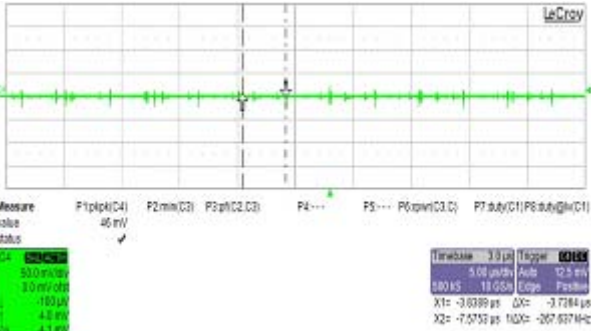
CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

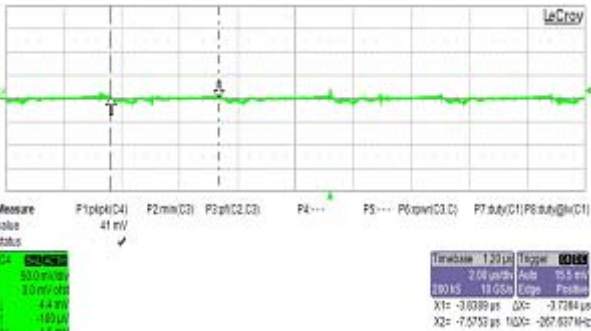
CH3 : Output voltage - BNC Probe(200MHz)

CASE

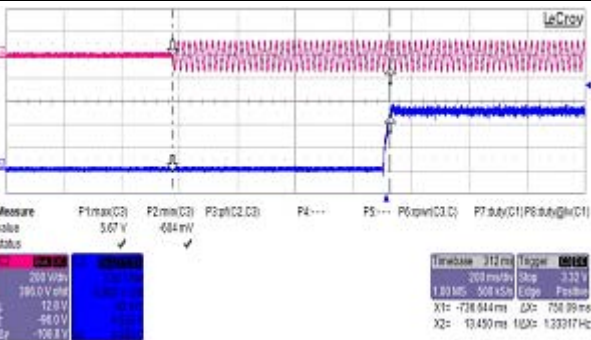
(1) 5V/5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 5.0[mV] RIPPLE&NOISE_{p-p} = 46.0[mV]</p>		<p>Ch4 20mV/div Timebase 2us/div</p>
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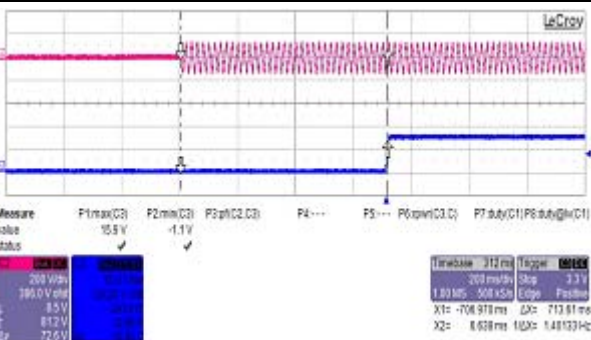
(2) 15V/1.7A(CH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 10.0[mV] RIPPLE&NOISE_{p-p} = 41.0[mV]</p>		<p>Ch4 50mV/div Timebase 2us/div</p>
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(3) 5V/5A(CH1) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =750ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>
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(4) 15V/1.7A(CH2) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =713ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>
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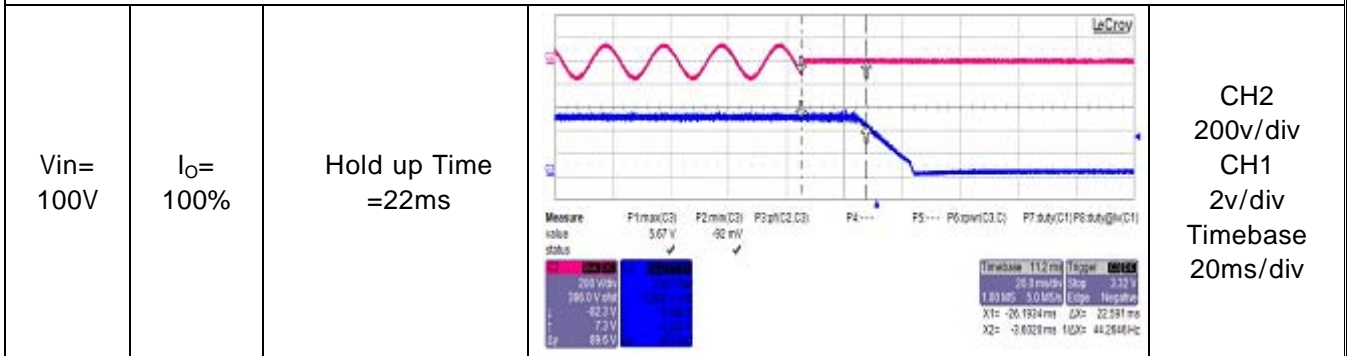
2-6. CSF50-BEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

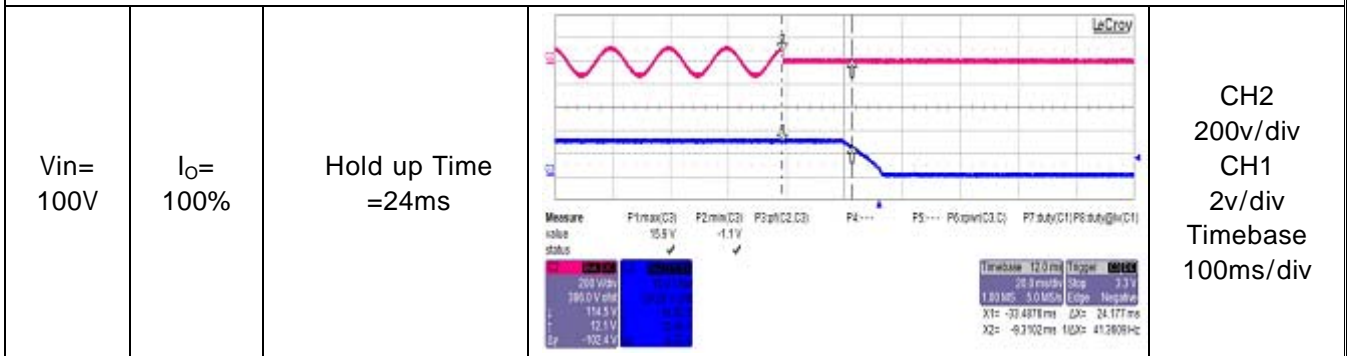
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

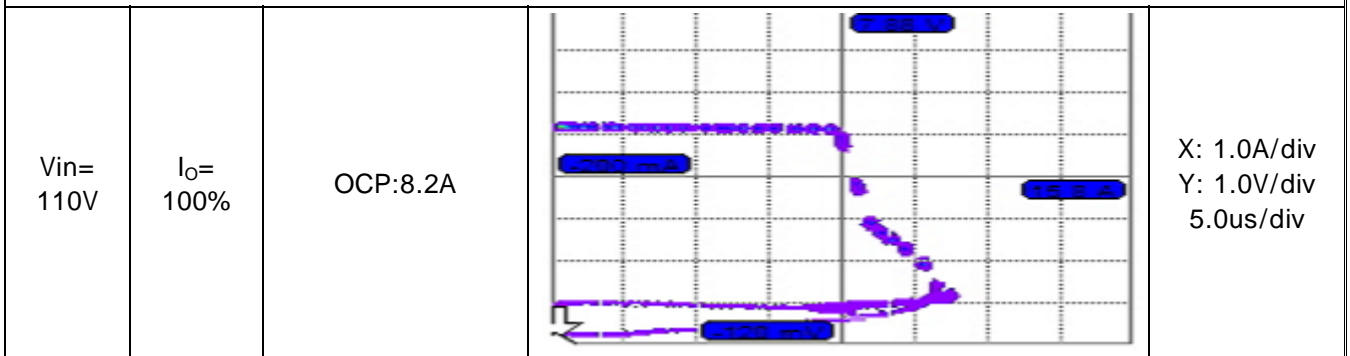
(1) 5V/5A(CH1) Hold up Time Characteristics .



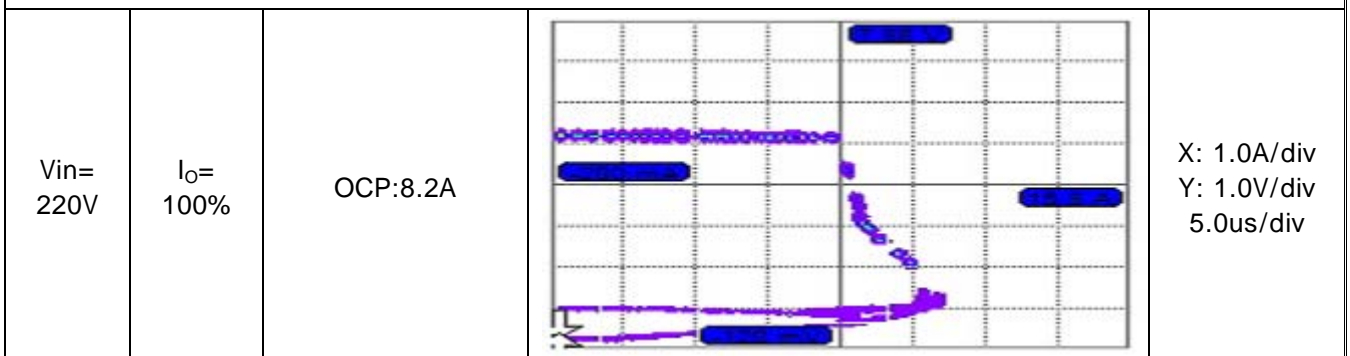
(2) 15V/1.7A(CH2) Hold up Time Characteristics .



(3) 5V/5A(CH1) Over Current Protection Characteristics



(4) 5V/5A(CH1) Over Current Protection Characteristics



2-7. CSF50-BEW Output characteristics

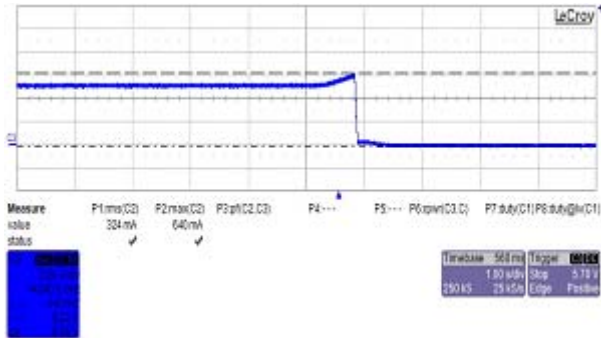
Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 EMC Analyzer : Agilent E7402A
 LISN : KNW - 403D

(1) 5V/5.0A (CH1) Over Voltage Protection Characteristics

V_{in} =
220V

I_o =
10%

OVP:6.36V



CH2
2v/div
Timebase
1s/div

3-1. CSF50-BHW Input characteristics

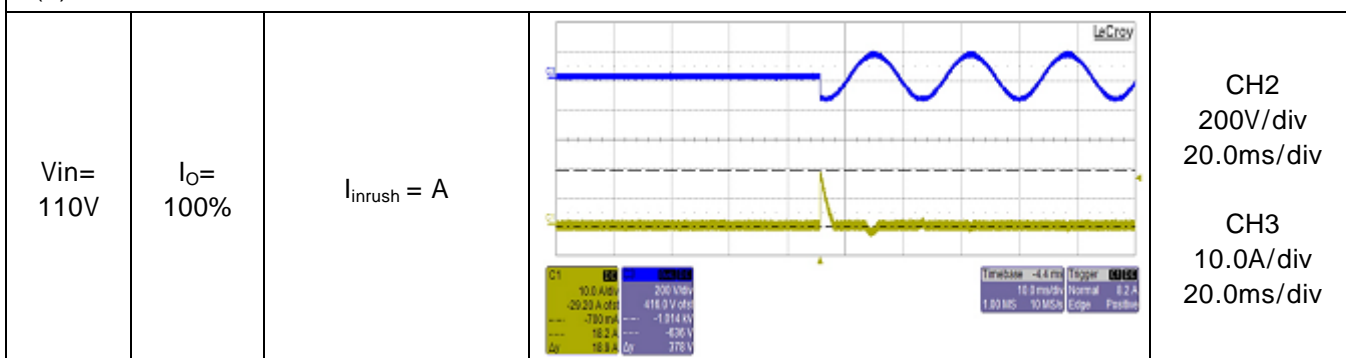
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

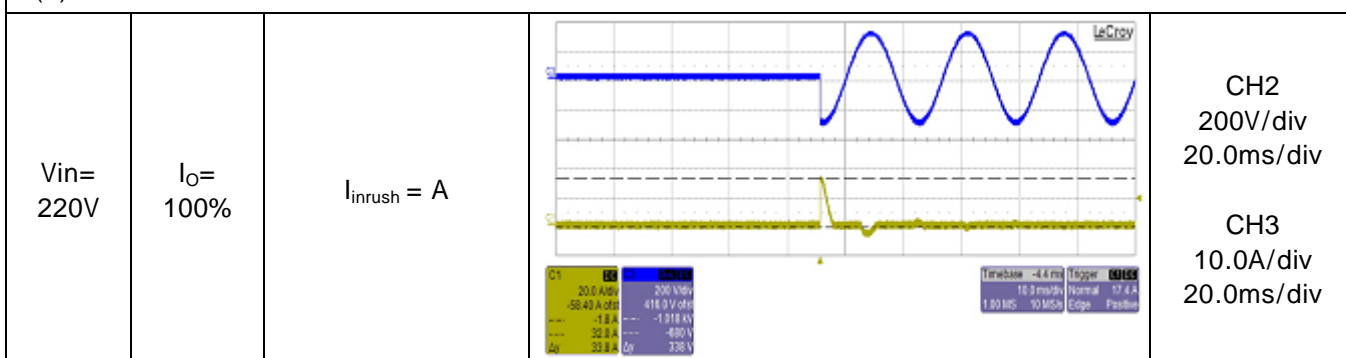
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25$

I_o \ V_{in}		85V	110V	132V	170V	220V	264V	
		Load (min)	Input Current	0.132	0.116	0.105	0.097	0.093
Load (50%)	Efficiency	38.5	36	35	31	28	23	
	Input Current	0.548	0.448	0.392	0.333	0.293	0.258	
Load (100%)	Efficiency	77	77.6	77.4	76	74	71	
	Input Current	1.075	0.834	0.726	0.608	0.522	0.435	
		Efficiency	76.7	78.9	79.6	79.6	78.4	76.9

3-2. CSF50-BHW Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(5V/5A) Line & Load Regulation Characteristics

Condition Ta : 25

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.03	5.03	5.03	5.03	5.03	5.03	0
Load (50%)	5.02	5.02	5.02	5.02	5.02	5.02	0
Load (100%)	5.01	5.01	5.01	5.01	5.01	5.01	0
Load Regulation	0.03	0.03	0.03	0.03	0.03	0.03	

(2) CH2(24V/1A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	24.01	24.01	24.01	24.01	24.01	24.01	0
Load (50%)	23.94	23.94	23.94	23.94	23.94	23.94	0
Load (100%)	23.89	23.89	23.89	23.89	23.89	23.89	0
Load Regulation	0.12	0.12	0.12	0.12	0.12	0.12	

(3) Cross Regulation Characteristics

I_o \ V_{in}	CH1	CH2	CH1	CH2
Load (min)	5.03	23.89	5.01	24.01
Load (50%)	5.02	23.89	5.01	23.94
Load (100%)	5.01	23.89	5.01	23.89
Load Regulation	0.02	0	0	0.12

3-3. CSF50-BHW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A) \sim 100\%$ 100Hz	$V_{over} = 216mV$ (4.32%) $V_{under} = 242mV$ (4.84%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(2) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A) \sim 100\%$ 100Hz	$V_{over} = 193mV$ 3.86 (%) $V_{under} = 224mV$ 4.48(%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A) \sim 100\%$ 1KHz	$V_{over} = 138mV$ 2.76(%) $V_{under} = 127mV$ 2.54 (%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A) \sim 100\%$ 1KHz	$V_{over} = 141mV$ (2.82%) $V_{under} = 127mV$ (2.54%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div

3-4. CSF50-BHW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 CH1 : Output current - AP015 current probe (BW:20MHz)
 CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 24V/1A((CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 300mV$ (1.25%) $V_{under} = 256mV$ (1.06%)		CH2 500mV/div CH1 0.5A/div Timebase 5.00ms/div
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(2) 24V/1A((CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 219mV$ (0.91%) $V_{under} = 218mV$ (0.9%)		CH2 500mV/div CH1 0.5A/div Timebase 5.00ms/div
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(3) 24V/1A((CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 54.4mV$ (0.26%) $V_{under} = 52.4mV$ (0.21%)		CH2 100mV/div CH1 0.5A/div Timebase 1.00ms/div
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(4) 24V/1A((CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 47.9mV$ (0.2%) $V_{under} = 48.3mV$ (0.2%)		CH2 100mV/div CH1 0.5A/div Timebase 1.00ms/div
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3-5. CSF50-BHW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

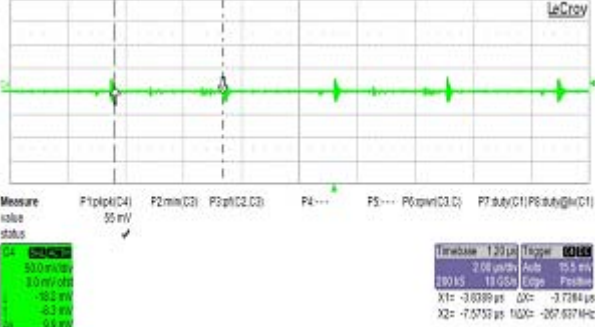
CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)


CH3 : Output voltage - BNC Probe(200MHz)

CASE

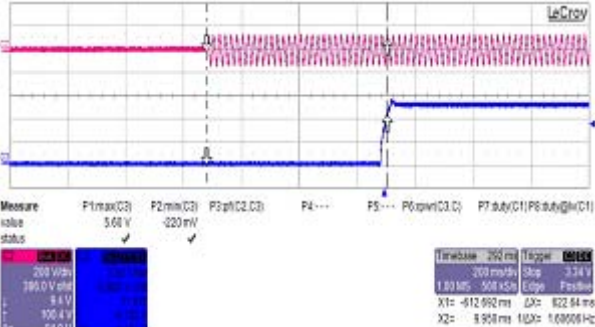
(1) 5V/5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 5.0[mV] RIPPLE&NOISE_{p-p} = 55.0[mV]</p>		<p>Ch3 20mV/div Timebase 2us/div</p>
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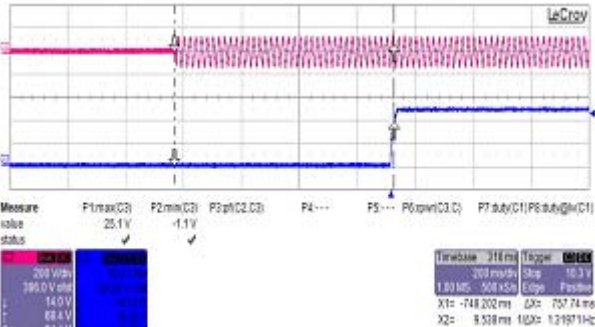
(2) 24V/1A((CH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 10.0[mV] RIPPLE&NOISE_{p-p} = 44.0[mV]</p>		<p>Ch3 20mV/div Timebase 2us/div</p>
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(3) 5V/5A(CH1) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =622ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>
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(4) 24V/1A((CH2) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =757ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>
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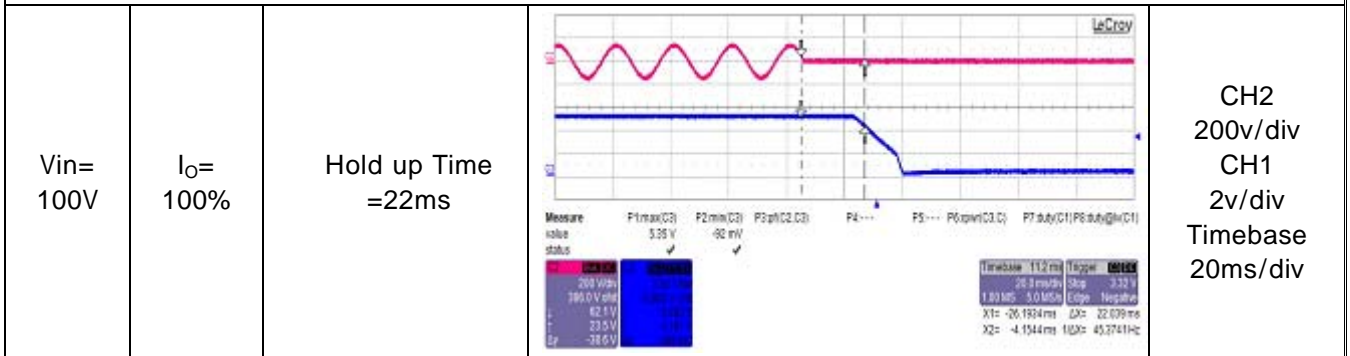
3-6. CSF50-BHW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

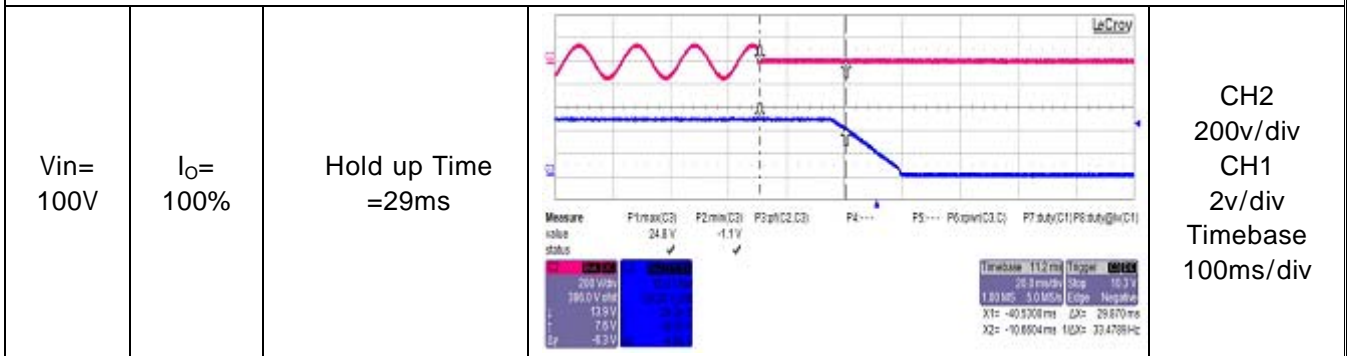
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

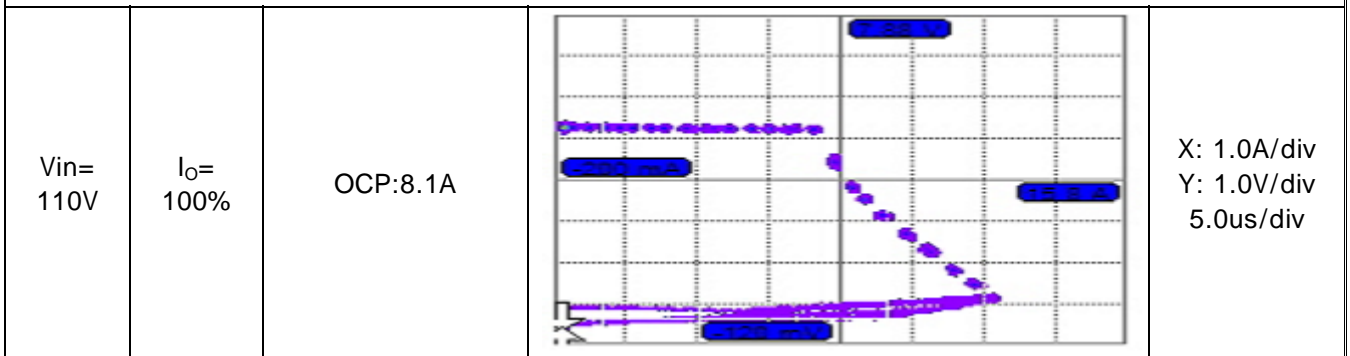
(1) 5V/5A(CH1) Hold up Time Characteristics .



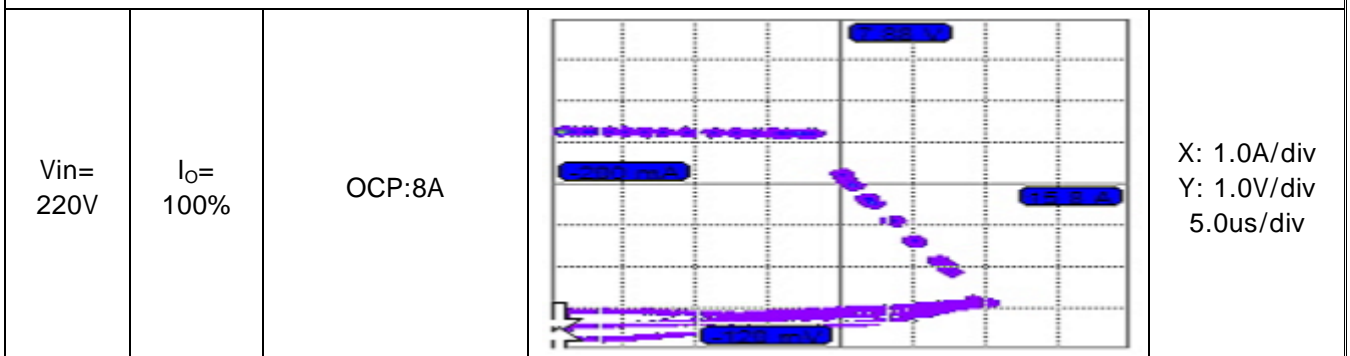
(2) 24V/1A((CH2) Hold up Time Characteristics .



(3) 5V/5A(CH1) Over Current Protection Characteristics



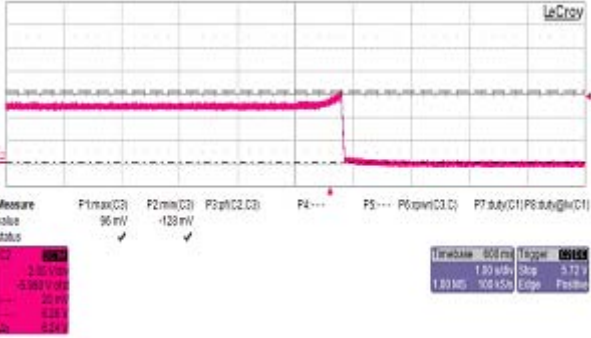
(4) 5V/5A(CH1) Over Current Protection Characteristics



3-7. CSF50-BHW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 EMC Analyzer : Agilent E7402A
 LISN : KNW - 403D

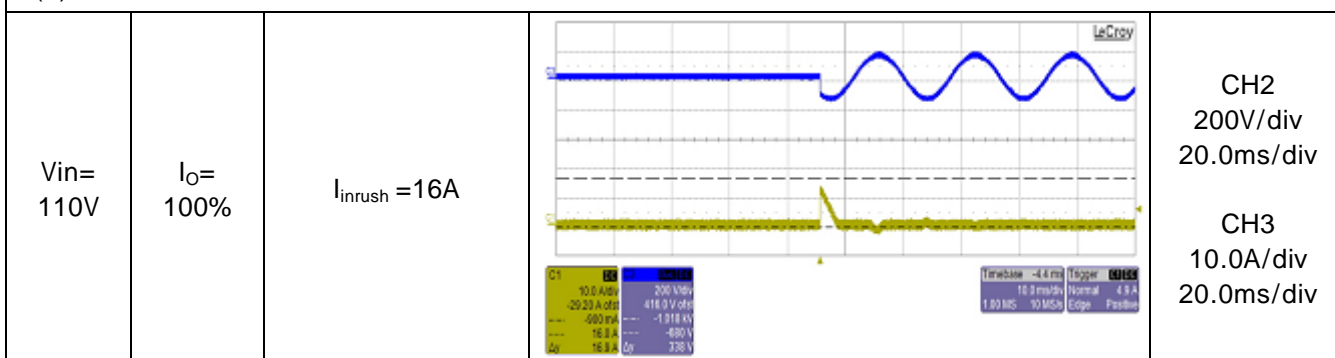
(1) 5V/5.0A (CH1) Over Voltage Protection Characteristics

<p>V_{in} = 220V</p>	<p>I_o = 10%</p>	<p>OVP:6.24V</p>	 <p>CH2 2v/div Timebase 1s/div</p>
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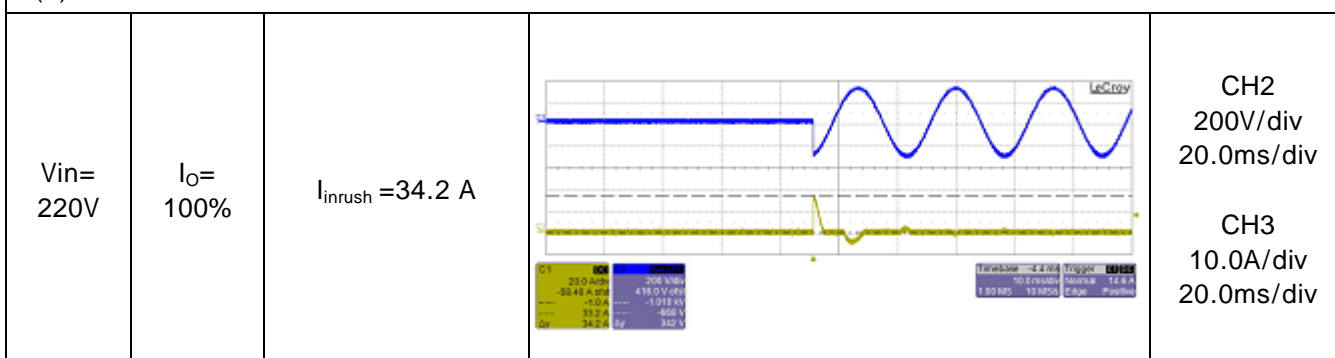
4-1. CSF50-DD Input characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)
 CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
 CH3 : Input current - CP500 current probe (BW:20MHz)
 Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25$

V_{in}		85V	110V	132V	170V	220V	264V
I_o							
Load (min)	Input Current	0.12	0.13	0.097	0.086	0.082	0.085
Load (min)	Efficiency	41	39	37.3	34.7	30.5	25
Load (50%)	Input Current	0.56	0.45	0.39	0.33	0.29	0.25
Load (50%)	Efficiency	75	75.6	75	75	71.4	68.5
Load (100%)	Input Current	1.1	0.86	0.746	0.62	0.52	0.44
Load (100%)	Efficiency	74	76.3	77.1	77.2	76.2	75.2

4-2. CSF50-DD Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(5V/5A) Line & Load Regulation Characteristics

Condition Ta : 25

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.00	5.00	5.00	5.00	5.00	5.00	0
Load (50%)	4.99	4.99	4.99	4.99	4.99	4.99	0
Load (100%)	4.98	4.98	4.97	4.97	4.97	4.97	0.01
Load Regulation	0.02	0.02	0.03	0.03	0.03	0.03	

(2) CH2(12V/1.8A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	11.98	11.98	11.98	11.98	11.98	11.98	0
Load (50%)	11.93	11.93	11.93	11.93	11.93	11.93	0
Load (100%)	11.89	11.89	11.89	11.89	11.89	11.89	0
Load Regulation	0.09	0.09	0.09	0.09	0.09	0.09	

(2) CH3(12V/0.3A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.03	12.03	12.03	12.03	12.03	12.03	0
Load (50%)	12.02	12.02	12.02	12.02	12.02	12.02	0
Load (100%)	12.02	12.02	12.02	12.02	12.02	12.02	0
Load Regulation	0.01	0.01	0.01	0.01	0.01	0.01	

(3) Cross Regulation Characteristics

I_o \ V_{in}	CH1	CH2	CH3	CH1	CH2	CH3	CH1	CH2	CH3
Load (min)	5.00	11.89	12.01	4.97	11.99	12.02	4.97	11.89	12.03
Load (50%)	4.99	11.89	12.02	4.97	11.93	12.02	4.97	11.89	12.02
Load (100%)	4.98	11.89	12.02	4.97	11.88	12.02	4.97	11.89	12.02
Load Regulation	0.02	0	0.01	0	0.11	0	0	0	0.01

4-3. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 100Hz	$V_{over} = 237mV$ (4.74%) $V_{under} = 209mV$ (4.18%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(2) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 100Hz	$V_{over} = 231mV$ (4.62%) $V_{under} = 200mV$ (4.0%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 110V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 1KHz	$V_{over} = 176mV$ (3.52%) $V_{under} = 75mV$ (1.5%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 220V$	$I_o = \text{min}(0.5A)$ $\sim 100\%$ 1KHz	$V_{over} = 177mV$ (3.54%) $V_{under} = 73mV$ (1.46%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div

4-4. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 CH1 : Output current - AP015 current probe (BW:20MHz)
 CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 12V/1.8A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 237mV$ (1.96%) $V_{under} = 246mV$ (2.0%)		CH2 50mV/div CH1 0.5A/div Timebase 5.00ms/div
(2) 12V/1.8A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 233mV$ (1.94%) $V_{under} = 210mV$ (1.76%)		CH2 50mV/div CH1 0.5A/div Timebase 5.00ms/div
(3) 12V/1.8A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 77mV$ (0.64%) $V_{under} = 102mV$ (0.84%)		CH2 50mV/div CH1 0.5A/div Timebase 1.00ms/div
(4) 12V/1.8A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 73.9mV$ (0.62%) $V_{under} = 98.3mV$ (0.82%)		CH2 50mV/div CH1 0.5A/div Timebase 1.00ms/div

4-5. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) - 12V/0.3A(CH3) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ $100Hz$	$V_{over} = 16.6mV$ (0.13%) $V_{under} = 22.2mV$ (0.185%)		$CH2$ $50mV/div$ $CH1$ $0.2A/div$ Timebase $10.00ms/div$
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(2) - 12V/0.3A(CH3) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ $100Hz$	$V_{over} = 17.7 mV$ (0.15%) $V_{under} = 23.6mV$ (0.19%)		$CH2$ $50mV/div$ $CH1$ $0.2A/div$ Timebase $10.00ms/div$
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(3) - 12V/0.3A(CH3) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ $1000Hz$	$V_{over} = 19.8 mV$ (0.17%) $V_{under} = 23.3mV$ (0.19%)		$CH2$ $50mV/div$ $CH1$ $0.2A/div$ Timebase $1.00ms/div$
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(4) - 12V/0.3A(CH3) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ $1000Hz$	$V_{over} = 24.2mV$ (0.2%) $V_{under} = 52mV$ (0.43%)		$CH2$ $50mV/div$ $CH1$ $0.2A/div$ Timebase $1.00ms/div$
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4-6. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH3 : Output voltage - BNC Probe(200MHz)
CASE

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(1) 5V/5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

$V_{in} = 220V$	$I_{O} = 100\%$	$RIPPLE_{p-p} = 5.0[mV]$ $RIPPLE\&NOISE_{p-p} = 40.0[mV]$		Ch3 20mV/div Timebase 2us/div
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(2) 12V/1.7ACH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

$V_{in} = 220V$	$I_{O} = 100\%$	$RIPPLE_{p-p} = 20.0[mV]$ $RIPPLE\&NOISE_{p-p} = 79.0[mV]$		Ch3 50mV/div Timebase 2us/div
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(3) -12V/0.3ACH3) Ripple&Noise Characteristics (Terminal Block Solder Pin).

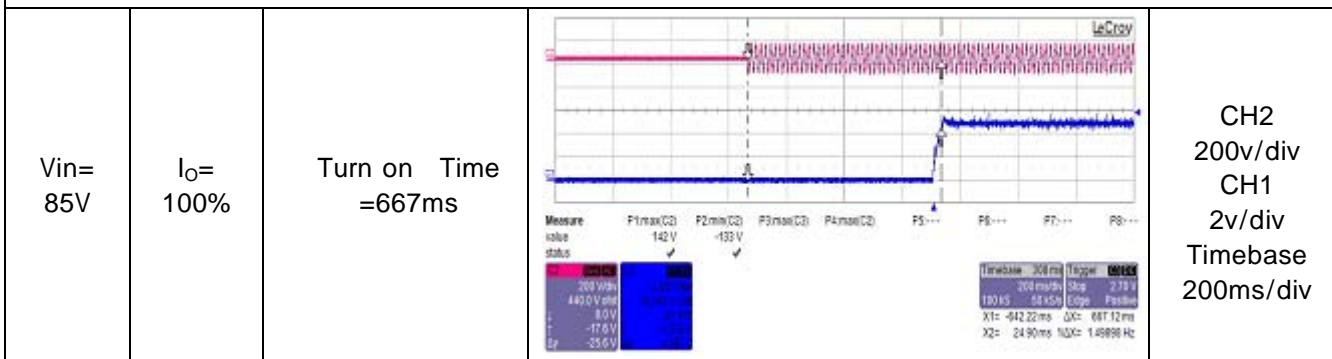
$V_{in} = 220V$	$I_{O} = 100\%$	$RIPPLE_{p-p} = 2.0[mV]$ $RIPPLE\&NOISE_{p-p} = 108.0[mV]$		Ch3 20mV/div Timebase 2us/div
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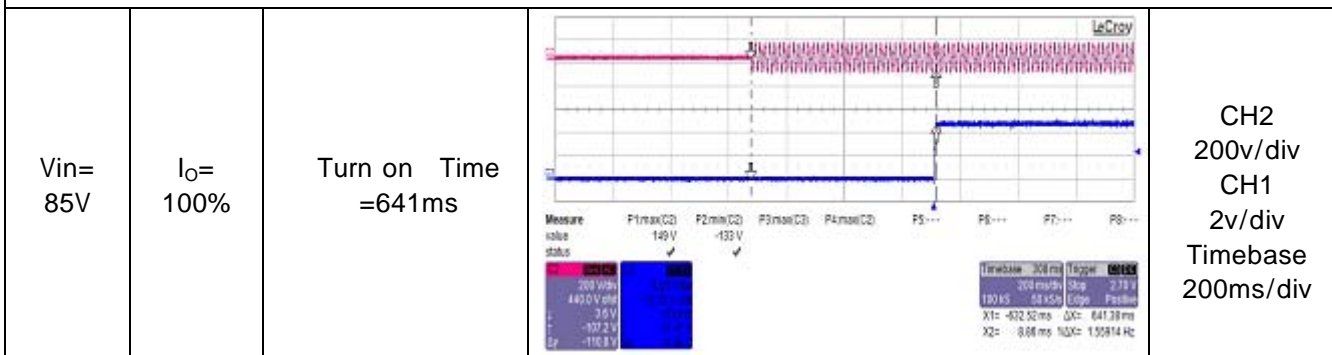
4-7. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)
 CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

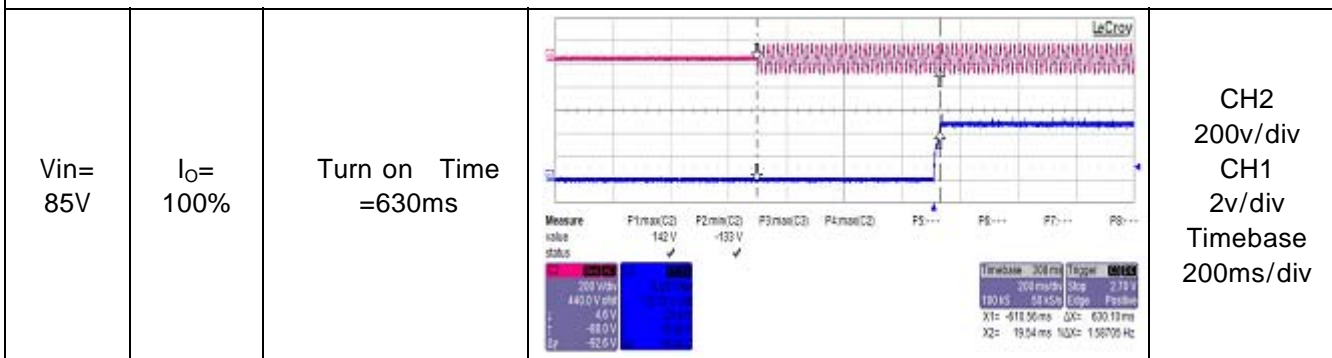
(1) 5V/5A(CH1) Turn on Time Characteristics



(2) 12V/1.8A(CH2) Turn on Time Characteristics



(3) -12V/0.3A(CH3) Turn on Time Characteristics



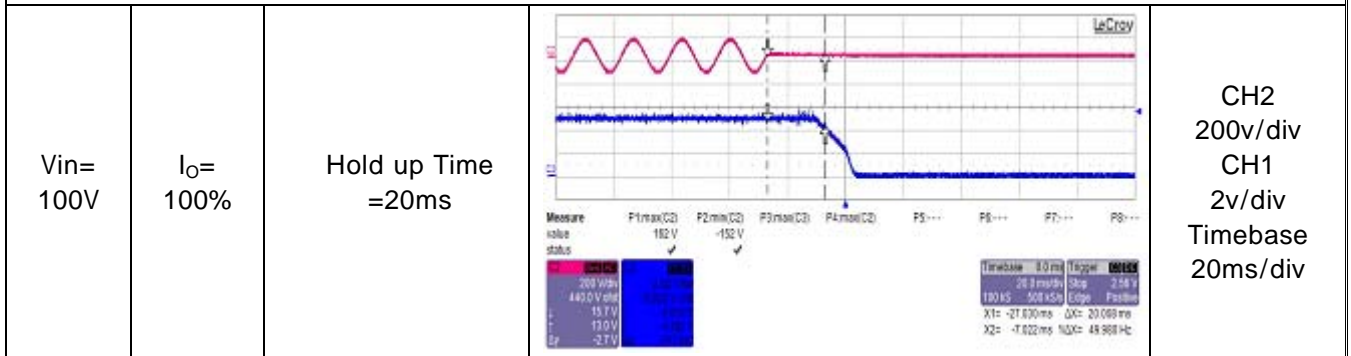
4-8. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

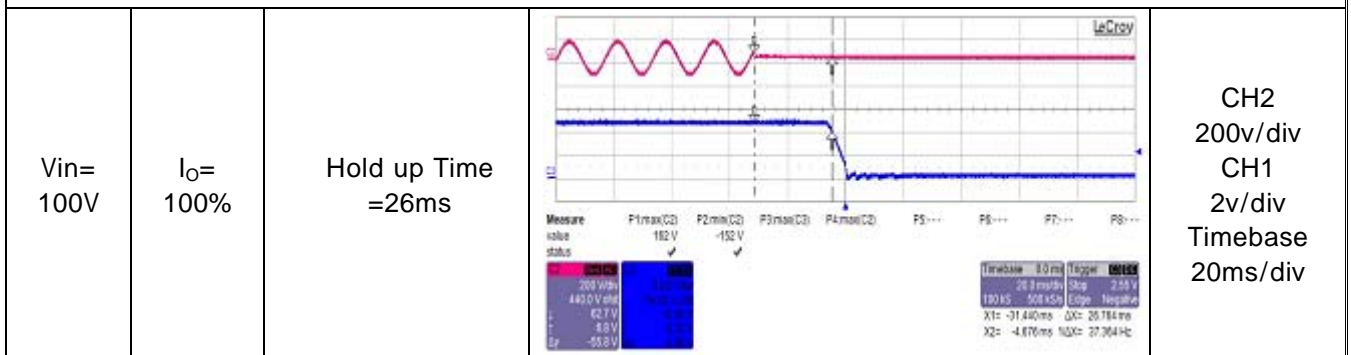
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

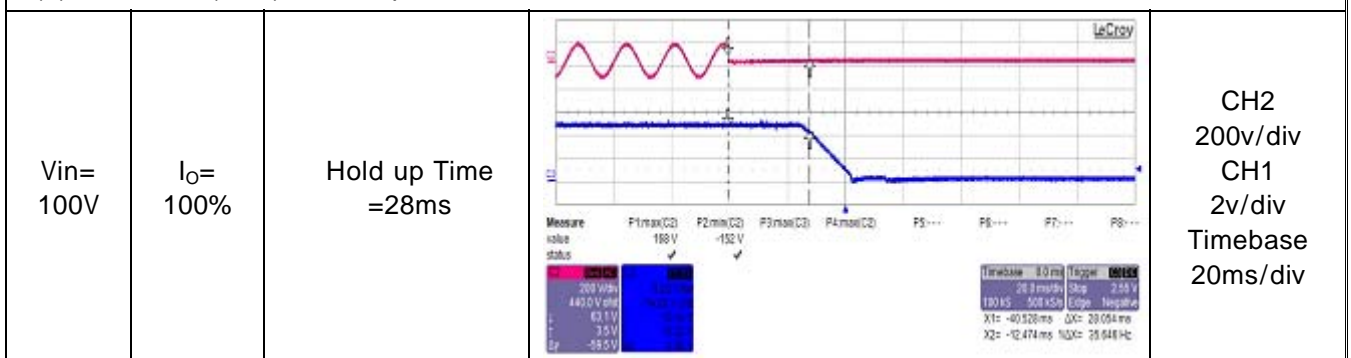
(1) 5V/5A(CH1) Hold up Time Characteristics .



(2) 12V/1.8A(CH2) Hold up Time Characteristics .



(3) -12V/0.3A(CH3) Hold up Time Characteristics .



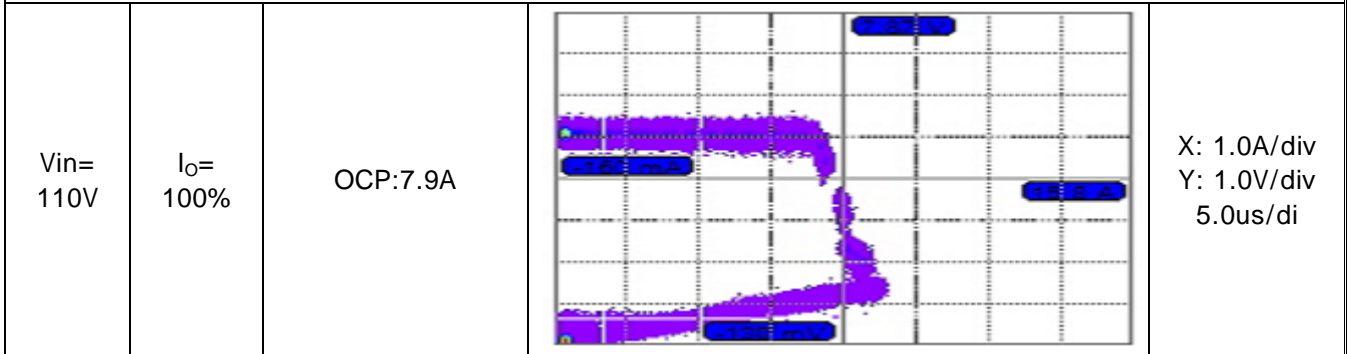
4-9. CSF50-DD Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

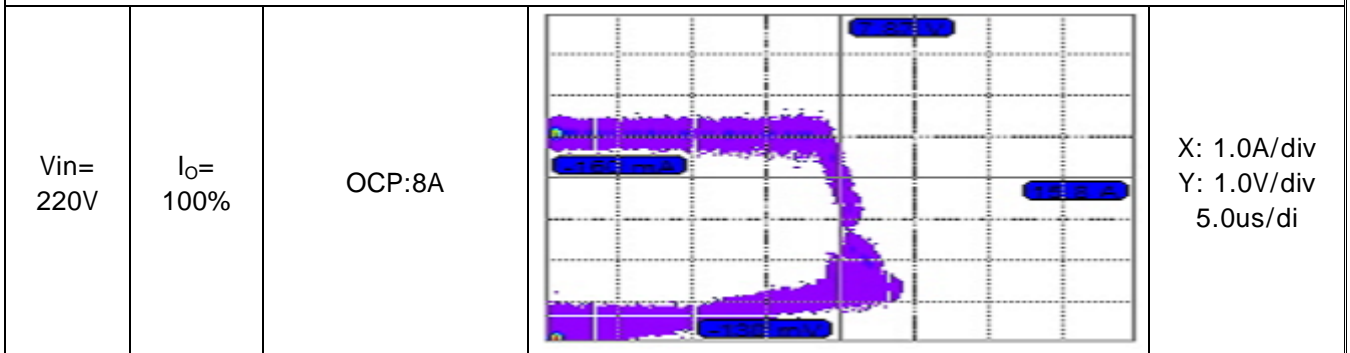
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

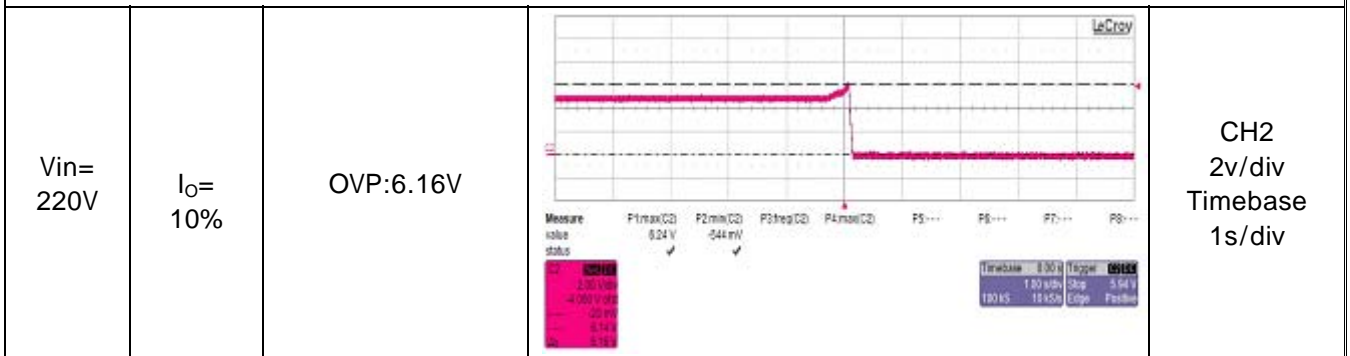
(3) 5V/5A(CH1) Over Current Protection Characteristics



(3) 5V/5A(CH1) Over Current Protection Characteristics



(1) 5V/5.0A (CH1) Over Voltage Protection Characteristics



5-1. CSF50-EE Input characteristics

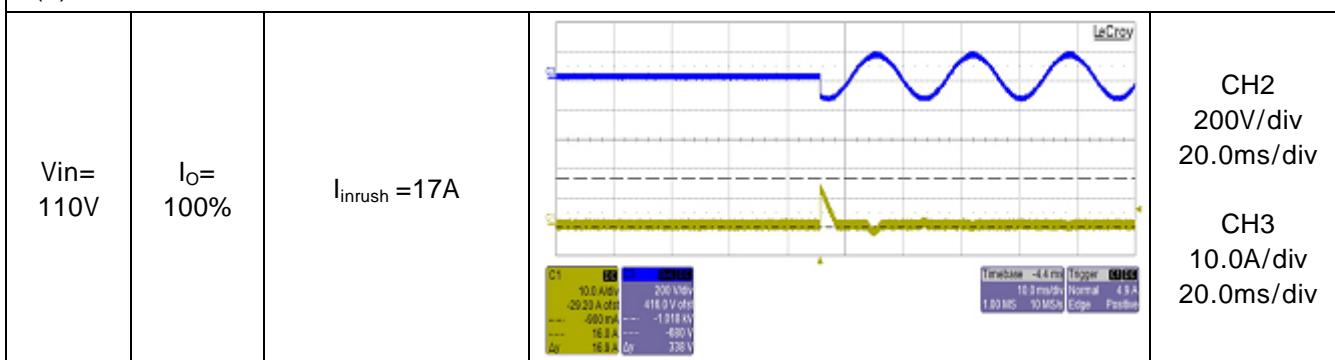
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

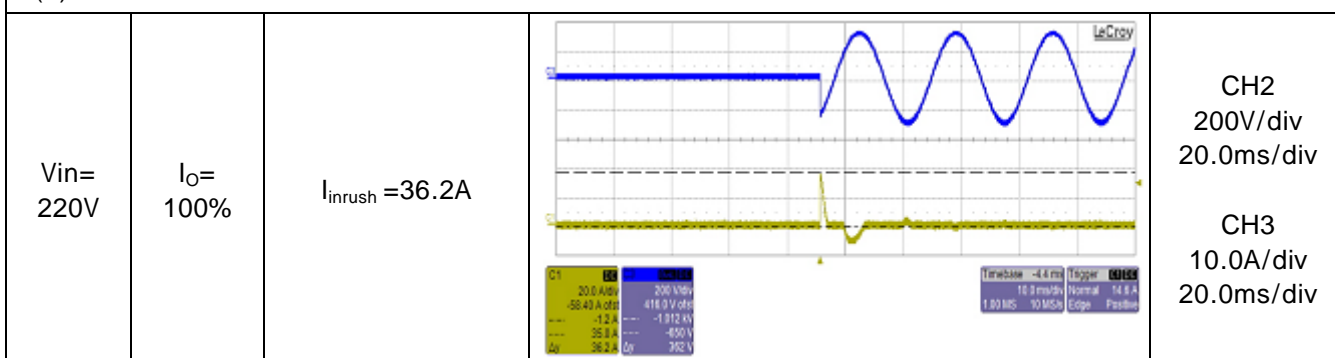
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current &Efficiency Characteristics

Condition Ta : 25

Vin		85V	110V	132V	170V	220V	264V
I _o							
Load (min)	Input Current	0.133	0.116	0.107	0.099	0.095	0.092
Load (min)	Efficiency	39	37.3	33.8	30	26.9	25
Load (50%)	Input Current	0.058	0.467	0.411	0.349	0.307	0.266
Load (50%)	Efficiency	74	74.6	74.4	73.1	70	67.6
Load (100%)	Input Current	1.1	0.87	0.75	0.623	0.547	0.455
Load (100%)	Efficiency	74	76	76.6	76.2	75.4	74

5-2. CSF50-EE Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(5V/5A) Line & Load Regulation Characteristics

Condition Ta : 25

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.03	5.03	5.03	5.03	5.03	5.03	0
Load (50%)	5.01	5.01	5.01	5.01	5.01	5.01	0
Load (100%)	5.00	5.00	5.00	5.00	5.00	5.00	0
Load Regulation	0.03	0.03	0.03	0.03	0.03	0.03	

(2) CH2(12V/2A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	15.22	15.22	15.22	15.22	15.22	15.22	0
Load (50%)	15.15	15.15	15.15	15.15	15.15	15.15	0
Load (100%)	15.11	15.11	15.11	15.11	15.11	15.11	0
Load Regulation	0.11	0.11	0.11	0.11	0.11	0.11	

(3) Cross Regulation Characteristics

I_o \ V_{in}	CH1	CH2	CH3	CH1	CH2	CH3	CH1	CH2	CH3
Load (min)	5.03	15.12	15.09	5.00	15.23	15.07	5.00	15.11	15.09
Load (50%)	5.02	15.12	15.09	5.00	15.16	15.07	5.00	15.11	15.09
Load (100%)	4.99	15.12	15.08	5.00	15.14	15.07	5.00	15.11	15.09
Load Regulation	0.04	0	0.01	0	0.09	0	0	0	0

5-3. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
<p>$V_{in} = 110V$</p>	<p>$I_o = \text{min}(0.5A) \sim 100\%$ 100Hz</p>	<p>$V_{over} = 242mV$ (4.8%) $V_{under} = 231mV$ (4.62%)</p>		<p>CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div</p>
(2) 5V/5A(CH1) Dynamic Load Response Characteristics (100Hz)				
<p>$V_{in} = 220V$</p>	<p>$I_o = \text{min}(0.5A) \sim 100\%$ 100Hz</p>	<p>$V_{over} = 233mV$ (4.66%) $V_{under} = 216mV$ (4.32%)</p>		<p>CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div</p>
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
<p>$V_{in} = 110V$</p>	<p>$I_o = \text{min}(0.5A) \sim 100\%$ 1KHz</p>	<p>$V_{over} = 165mV$ (3.3%) $V_{under} = 78mV$ (1.56%)</p>		<p>CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div</p>
(3) 5V/5A(CH1) Dynamic Load Response Characteristics (1KHz)				
<p>$V_{in} = 220V$</p>	<p>$I_o = \text{min}(0.5A) \sim 100\%$ 1KHz</p>	<p>$V_{over} = 174mV$ (3.48%) $V_{under} = 92mV$ (1.88%)</p>		<p>CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div</p>

5-4. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 15V/1.4A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 116mV$ (0.77%) $V_{under} = 105mV$ (0.7%)		CH2 100mV/div CH1 0.5A/div Timebase 10.00ms/div
(2) 15V/1.4A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 121mV$ (0.8%) $V_{under} = 116mV$ (0.77%)		CH2 100mV/div CH1 0.5A/div Timebase 10.00ms/div
(3) 15V/1.4A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 44.9mV$ (0.23%) $V_{under} = 46.5mV$ (0.31%)		CH2 100mV/div CH1 0.5A/div Timebase 1.00ms/div
(4) 15V/1.4A(CH2) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 44.4mV$ (0.296%) $V_{under} = 51.2mV$ (0.341%)		CH2 100mV/div CH1 0.5A/div Timebase 1.00ms/div

5-5. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

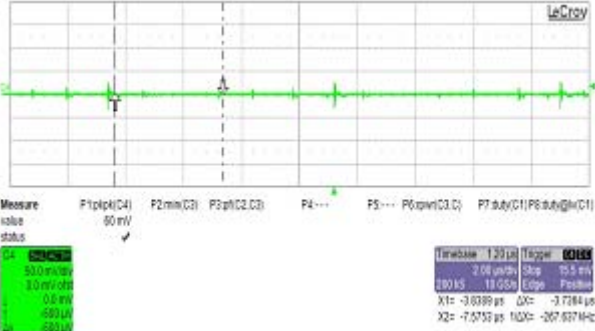
(1) - 15V/0.3A(CH3) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 17.8mV$ (0.12%) $V_{under} = 20.6mV$ (0.13%)		CH2 50mV/div CH1 0.2A/div Timebase 10.00ms/div
(2) - 15V/0.3A(CH3) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 20.2mV$ (0.13%) $V_{under} = 19.1mV$ (0.27%)		CH2 50mV/div CH1 0.2A/div Timebase 10.00ms/div
(3) - 15V/0.3A(CH3) Dynamic Load Response Characteristics				
$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 24mV$ (0.16%) $V_{under} = 25.1mV$ (0.17%)		CH2 50mV/div CH1 0.2A/div Timebase 1.00ms/div
(4) - 15V/0.3A(CH3) Dynamic Load Response Characteristics				
$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 23.1mV$ (0.15%) $V_{under} = 26.7mV$ (0.18%)		CH2 50mV/div CH1 0.2A/div Timebase 1.00ms/div

5-6. CSF50-EE Output characteristics


Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH3 : Output voltage - BNC Probe(200MHz)
CASE

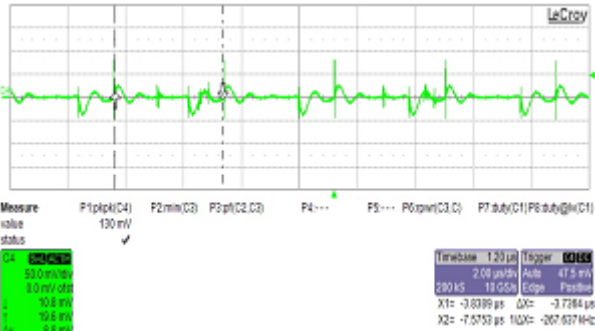
(1) 5V/5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>$V_{in} = 220V$</p>	<p>$I_{O} = 100\%$</p>	<p>$RIPPLE_{p-p} = 5.0[mV]$ $RIPPLE\&NOISE_{p-p} = 60.0[mV]$</p>		<p>Ch4 50mV/div Timebase 2us/div</p>
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(2) 15V/1.4ACH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>$V_{in} = 220V$</p>	<p>$I_{O} = 100\%$</p>	<p>$RIPPLE_{p-p} = 30.0[mV]$ $RIPPLE\&NOISE_{p-p} = 86.0[mV]$</p>		<p>Ch4 50mV/div Timebase 2us/div</p>
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(3) -15V/0.3ACH3) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>$V_{in} = 220V$</p>	<p>$I_{O} = 100\%$</p>	<p>$RIPPLE_{p-p} = 100.0[mV]$ $RIPPLE\&NOISE_{p-p} = 130.0[mV]$</p>		<p>Ch4 50mV/div Timebase 2us/div</p>
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5-7. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

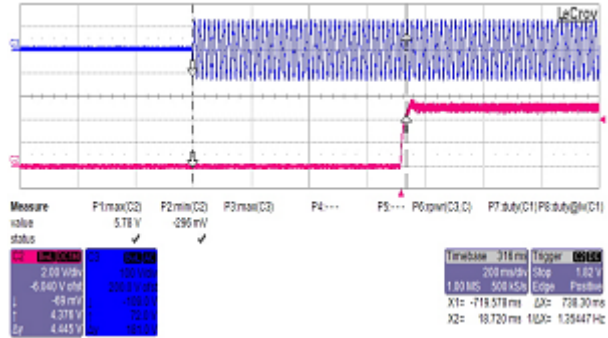
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

(1) 5V/5A(CH1) Turn on Time Characteristics

Vin=
85V

I_o=
100%

Turn on Time
=738ms



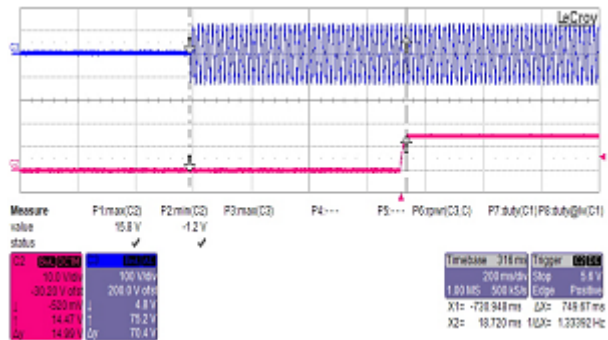
CH2
200v/div
CH1
2v/div
Timebase
200ms/div

(2) 15V/1.4A(CH2) Turn on Time Characteristics

Vin=
100V

I_o=
100%

Turn on Time
=749ms



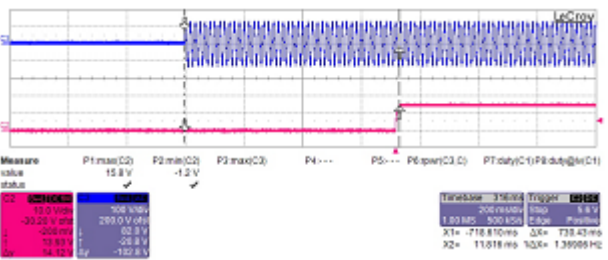
CH2
200v/div
CH1
2v/div
Timebase
200ms/div

(3) -15V/0.3A(CH3) Turn on Time Characteristics

Vin=
100V

I_o=
100%

Turn on Time
=730ms



CH2
200v/div
CH1
2v/div
Timebase
200ms/div

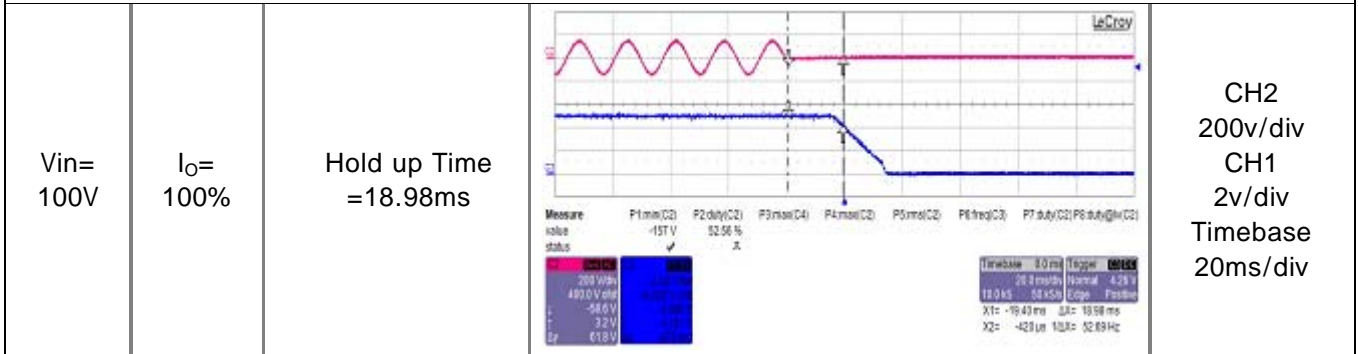
5-8. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

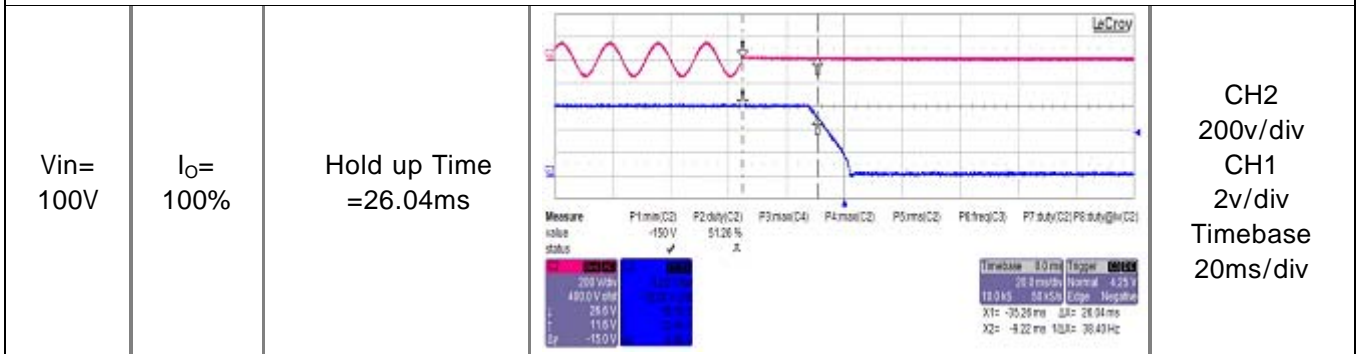
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

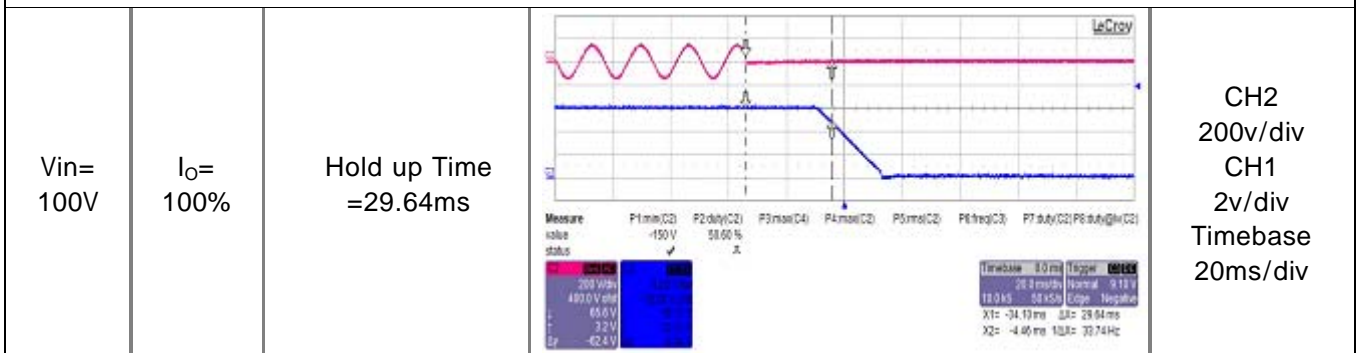
(1) 5V/5A(CH1) Hold up Time Characteristics .



(2) 12V/1.8A(CH2) Hold up Time Characteristics .



(3) -12V/0.3A(CH3) Hold up Time Characteristics .



5-9. CSF50-EE Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

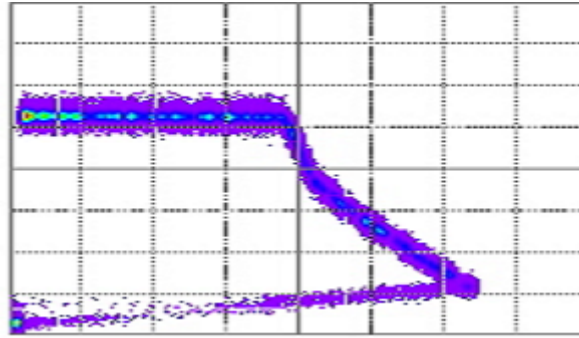
CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

(3) 5V/5A(CH1) Over Current Protection Characteristics

Vin=
110V

Io=
100%

OCP:8.1A



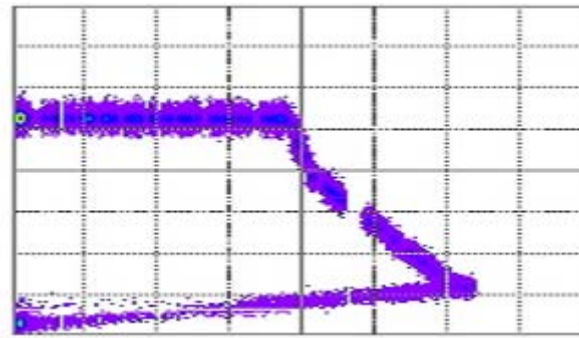
X: 1.0A/div
Y: 1.0V/div
5.0us/di

(3) 5V/5A(CH1) Over Current Protection Characteristics

Vin=
220V

Io=
100%

OCP:8.1A



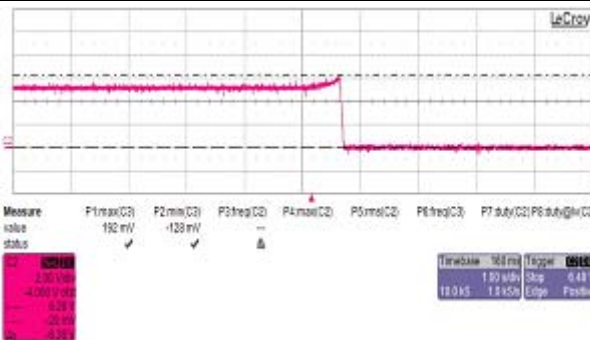
X: 1.0A/div
Y: 1.0V/div
5.0us/di

(1) 5V/5.0A (CH1) Over Voltage Protection Characteristics

Vin=
220V

Io=
10%

OVP:6.3V



CH2
2v/div
Timebase
1s/div

6-1. CSF50-DDW Input characteristics

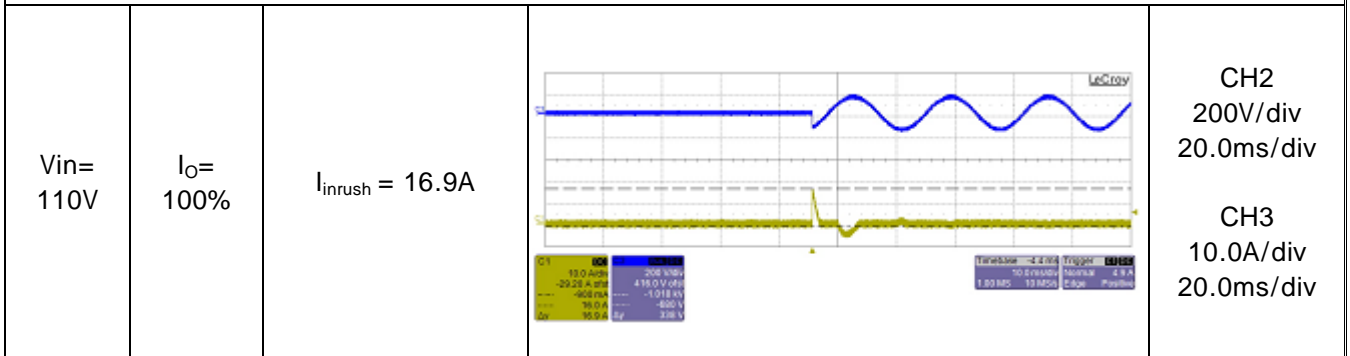
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

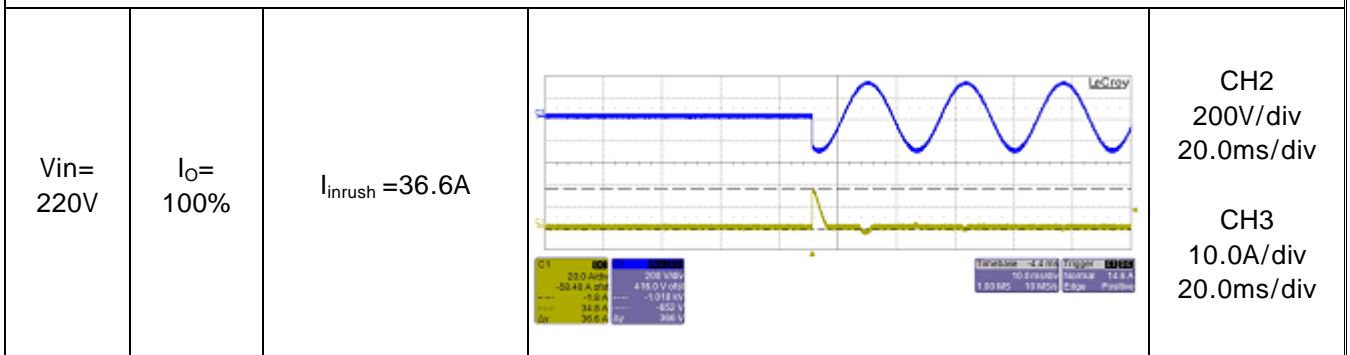
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics



(2) Inrush Current Characteristics



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25$

V_{in}		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.076	0.064	0.062	0.061	0.062	0.06
	Efficiency	35.5	34.3	30.8	25.5	21.9	18.5
Load (50%)	Input Current	0.53	0.428	0.37	0.32	0.282	0.242
	Efficiency	82.8	83	82.2	80.6	78.1	74.9
Load (100%)	Input Current	1.00	0.81	0.68	0.56	0.482	0.42
	Efficiency	81.9	83.6	84.2	83.6	82.5	80.6

6-2. CSF50-DDW Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(12V/2.5A) Line & Load Regulation Characteristics

Condition Ta : 25

V_{in} / I_o	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.07	12.07	12.07	12.07	12.07	12.07	0
Load (50%)	12.06	12.06	12.06	12.06	12.06	12.06	0
Load (100%)	12.05	12.04	12.04	12.04	12.04	12.04	0.01
Load Regulation	0.02	0.03	0.03	0.03	0.03	0.03	

(2) CH2(12V/2A) Line & Load Regulation Characteristics

V_{in} / I_o	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.22	12.22	12.22	12.22	12.22	12.22	0
Load (50%)	12.17	12.17	12.17	12.17	12.17	12.17	0
Load (100%)	12.13	12.13	12.13	12.13	12.13	12.13	0
Load Regulation	0.09	0.09	0.09	0.09	0.09	0.09	

(3) Cross Regulation Characteristics

V_{in} / I_o	CH1	CH2	CH1	CH2
Load (min)	12.07	12.13	12.05	12.22
Load (50%)	12.06	12.13	12.05	12.16
Load (100%)	12.04	12.13	12.05	12.13
Load Regulation	0.03	0	0	0.09

6-3. CSF50-DDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 12V/2.5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 110V$	$I_o = \text{min}(0.1A) \sim 100\%$ 100Hz	$V_{over} = 420mV$ (3.5%) $V_{under} = 235mV$ (1.95%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(2) 12V/2.5A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 220V$	$I_o = \text{min}(0.1A) \sim 100\%$ 100Hz	$V_{over} = 448mV$ (3.73%) $V_{under} = 230mV$ (1.91%)		CH2 200mV/div CH1 2.00A/div Timebase 10.00ms/div
(3) 12V/2.5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 110V$	$I_o = \text{min}(0.1A) \sim 100\%$ 1KHz	$V_{over} = 254mV$ (2.11%) $V_{under} = 229mV$ (1.9%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div
(3) 12V/2.5A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 220V$	$I_o = \text{min}(0.1A) \sim 100\%$ 1KHz	$V_{over} = 230mV$ (19%) $V_{under} = 245mV$ (2.04%)		CH2 200mV/div CH1 2.00A/div Timebase 1.00ms/div

6-4. CSF50-DDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 12V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 159mV$ (1.3%) $V_{under} = 158mV$ (1.3%)		CH2 100mV/div CH1 1A/div Timebase 10.00ms/div
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(2) 12V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 100Hz	$V_{over} = 152mV$ (1.26%) $V_{under} = 145mV$ (1.2%)		CH2 100mV/div CH1 1A/div Timebase 10.00ms/div
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(3) 12V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 69.3mV$ (0.57%) $V_{under} = 50.4mV$ (0.42%)		CH2 100mV/div CH1 1A/div Timebase 1.00ms/div
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(4) 12V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ 1000Hz	$V_{over} = 65.5mV$ (0.54%) $V_{under} = 48.8mV$ (0.4%)		CH2 100mV/div CH1 1A/div Timebase 1.00ms/div
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6-5. CSF50-DDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH3 : Output voltage - BNC Probe(200MHz)

CASE

(1) 12V/2.5A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin)				
<p>$V_{in}=220V$</p>	<p>$I_{O}=100\%$</p>	<p>$RIPPLE_{p-p} = 5.0[mV]$ $RIPPLE\&NOISE_{p-p} = 81.0[mV]$</p>		<p>Ch3 20mV/div Timebase 2us/div</p>
(2) 12V/1.5A(CH2) Ripple&Noise Characteristics (Terminal Block Solder Pin)				
<p>$V_{in}=220V$</p>	<p>$I_{O}=100\%$</p>	<p>$RIPPLE_{p-p} = 20.0[mV]$ $RIPPLE\&NOISE_{p-p} = 102.0[mV]$</p>		<p>Ch3 20mV/div Timebase 2us/div</p>
(3) 12V/2.5A(CH1) Turn on Time Characteristics				
<p>$V_{in}=85V$</p>	<p>$I_{O}=100\%$</p>	<p>Turn on Time =754ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>
(4) 12V/1.5A(CH2) Turn on Time Characteristics				
<p>$V_{in}=85V$</p>	<p>$I_{O}=100\%$</p>	<p>Turn on Time =738ms</p>		<p>CH2 200v/div CH1 2v/div Timebase 200ms/div</p>

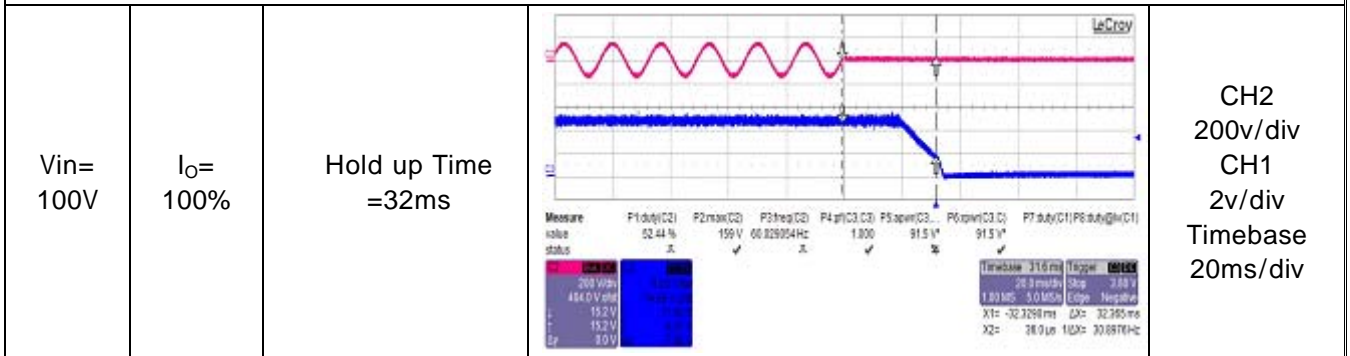
6-6. CSF50-DDW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

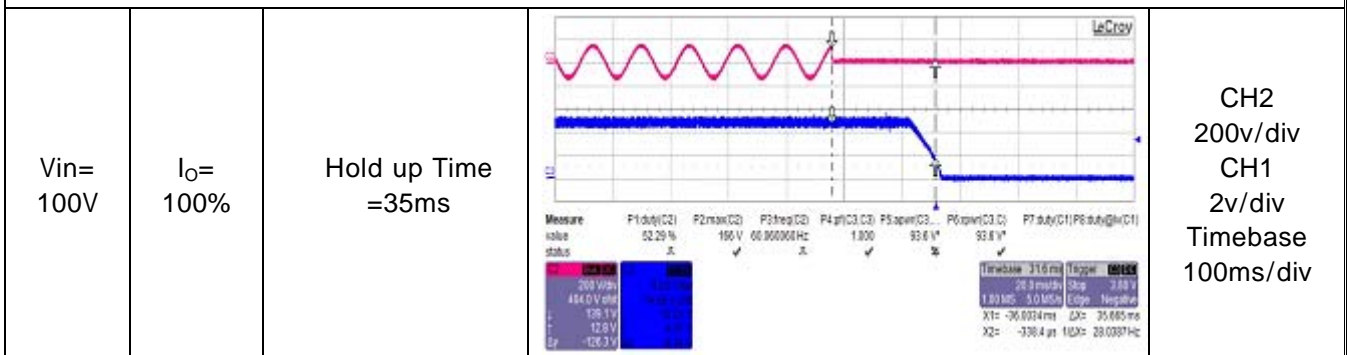
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

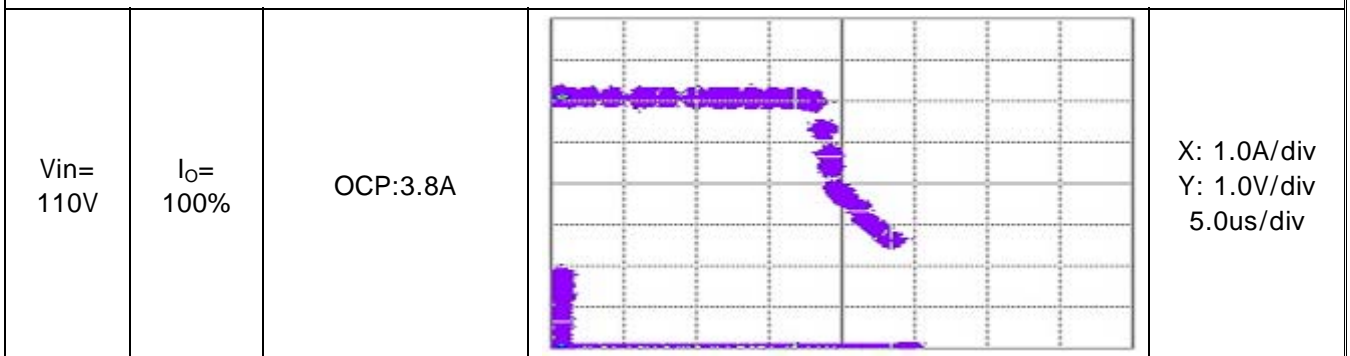
(1) 12V/2.5A(CH1) Hold up Time Characteristics .



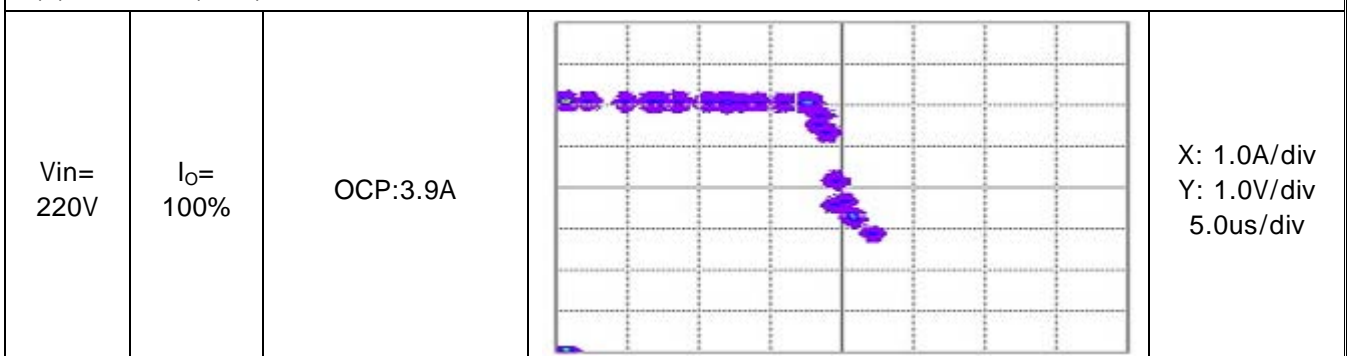
(2) 12V/1.5A(CH2) Hold up Time Characteristics .



(3) 12V/2.5A(CH1) Over Current Protection Characteristics



(4) 12V/2.5A(CH1) Over Current Protection Characteristics



6-7. CSF50-DDW Output characteristics

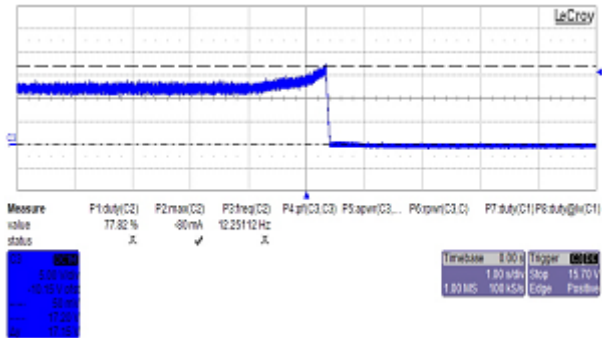
Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 EMC Analyzer : Agilent E7402A
 LISN : KNW-403D

(1) 12V/2.5A (CH1) Over Voltage Protection Characteristics

V_{in} =
220V

I_o =
10%

OVP:17.15V



CH2
2v/div
Timebase
1s/div

7-1. CSF50-EEW Input characteristics

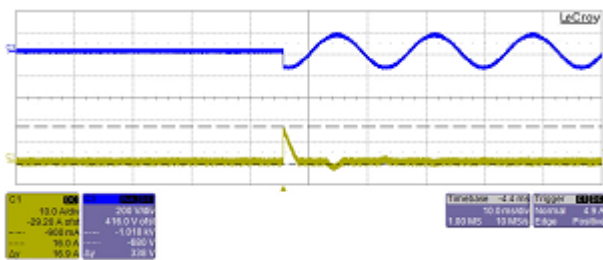
Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)

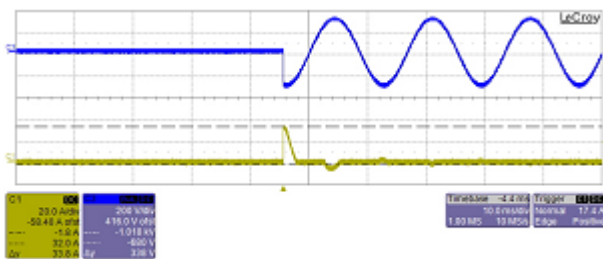
CH3 : Input current - CP500 current probe (BW:20MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) Inrush Current Characteristics

Vin= 110V	I _o = 100%	I _{inrush} =16.9A		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(2) Inrush Current Characteristics

Vin= 220V	I _o = 100%	I _{inrush} =33.8A		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(3) Input Current &Efficiency Characteristics

Condition Ta : 25

Vin		85V	110V	132V	170V	220V	264V
I _o							
Load (min)	Input Current	0.082	0.075	0.072	0.071	0.075	0.069
Load (min)	Efficiency	40	35	31	27	21	20
Load (50%)	Input Current	0.57	0.472	0.394	0.347	0.302	0.256
Load (50%)	Efficiency	76	76.2	75.7	74.6	73.5	71.8
Load (100%)	Input Current	1.09	0.845	0.726	0.614	0.53	0.44
Load (100%)	Efficiency	76.6	78.3	78.8	78.4	77.2	75.7

7-2. CSF50-EEW Output characteristics

Oscilloscope : WAVE PRO 7000(LeCroy)

CH2 : Output current - AP015 current probe (BW:20MHz)

CH3 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

Digital Multimeter : FLUKE189 (FLUKE)

(1) CH1(15V/2A) Line & Load Regulation Characteristics

Condition Ta : 25

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	15.11	15.11	15.11	15.11	15.11	15.12	0.01
Load (50%)	15.06	15.06	15.06	15.06	15.06	15.06	0
Load (100%)	15.09	15.09	15.09	15.09	15.09	15.09	0
Load Regulation	0.02	0.02	0.02	0.02	0.02	0.03	

(2) CH2(15V/1.5A) Line & Load Regulation Characteristics

I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	15.24	15.24	15.24	15.24	15.24	15.24	0
Load (50%)	15.18	15.18	15.18	15.18	15.18	15.18	0
Load (100%)	15.13	15.13	15.13	15.13	15.13	15.13	0
Load Regulation	0.11	0.11	0.11	0.11	0.11	0.11	

(3) Cross Regulation Characteristics

I_o \ V_{in}	CH1	CH2	CH1	CH2
Load (min)	15.16	15.14	15.09	15.24
Load (50%)	15.1	15.13	15.09	15.17
Load (100%)	15.09	15.13	15.09	15.13
Load Regulation	0.07	0.01	0	0.11

7-3. CSF50-EEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

(1) 15V/2A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 110V$	$I_o = \text{min}(0.1A) \sim 100\%$ 100Hz	$V_{over} = 155mV$ (1.03%) $V_{under} = 379mV$ (2.56%)		CH2 500mV/div CH1 1.00A/div Timebase 10.00ms/div
(2) 15V/2A(CH1) Dynamic Load Response Characteristics (100Hz)				
$V_{in} = 220V$	$I_o = \text{min}(0.1A) \sim 100\%$ 100Hz	$V_{over} = 158mV$ (1.05%) $V_{under} = 406mV$ (2.7%)		CH2 500mV/div CH1 1.00A/div Timebase 10.00ms/div
(3) 15V/2A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 110V$	$I_o = \text{min}(0.1A) \sim 100\%$ 1KHz	$V_{over} = 123mV$ (0.82%) $V_{under} = 78mV$ (0.52%)		CH2 500mV/div CH1 1.00A/div Timebase 1.00ms/div
(3) 15V/2A(CH1) Dynamic Load Response Characteristics (1KHz)				
$V_{in} = 220V$	$I_o = \text{min}(0.1A) \sim 100\%$ 1KHz	$V_{over} = 122mV$ (0.81%) $V_{under} = 77mV$ (0.51%)		CH2 500mV/div CH1 1.00A/div Timebase 1.00ms/div

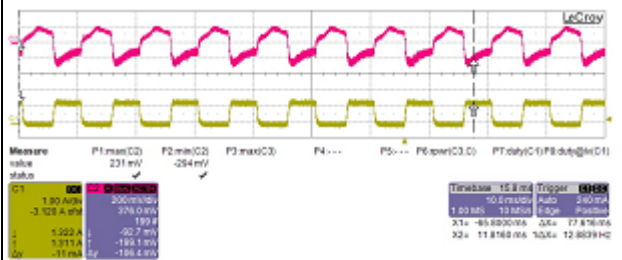
7-4. CSF50-EEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

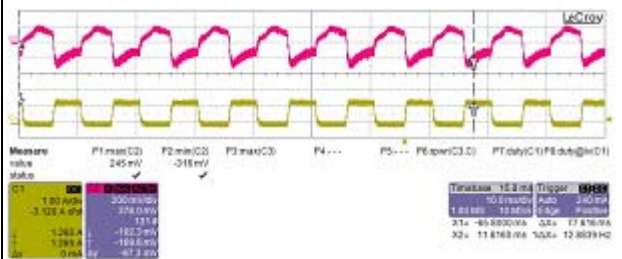
CH1 : Output current - AP015 current probe (BW:20MHz)

CH2 : Output voltage - PP007-WS(wavesurfer 400 series) Probe

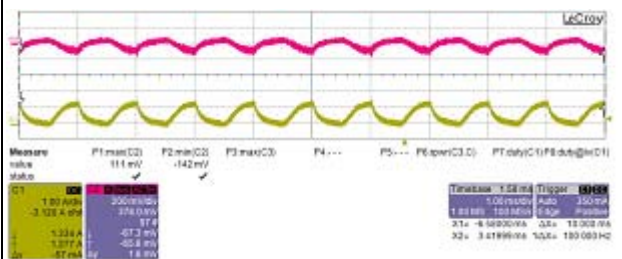
(1) 15V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ $100Hz$	$V_{over} = 231mV$ (1.54%) $V_{under} = 294mV$ (1.91%)		$CH3$ $200mV/div$ $CH2$ $1A/div$ Timebase $10.00ms/div$
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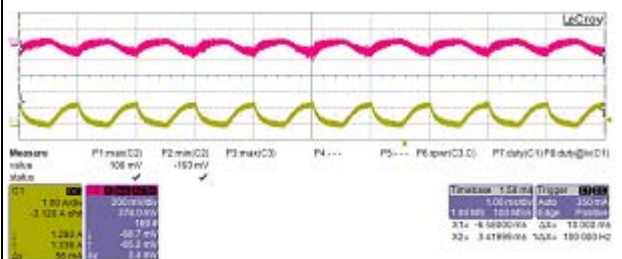
(2) 15V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ $100Hz$	$V_{over} = 245mV$ (1.61%) $V_{under} = 316mV$ (2.1%)		$CH3$ $200mV/div$ $CH2$ $1A/div$ Timebase $10.00ms/div$
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(3) 15V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 110V$	$I_o = 0 \sim 100\%$ $1000Hz$	$V_{over} = 111mV$ (0.74%) $V_{under} = 142mV$ (0.94%)		$CH3$ $200mV/div$ $CH2$ $0.5A/div$ Timebase $1.00ms/div$
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(4) 15V/1.5A(CH2) Dynamic Load Response Characteristics

$V_{in} = 220V$	$I_o = 0 \sim 100\%$ $1000Hz$	$V_{over} = 108mV$ (0.72%) $V_{under} = 193mV$ (1.21%)		$CH3$ $200mV/div$ $CH2$ $1A/div$ Timebase $1.00ms/div$
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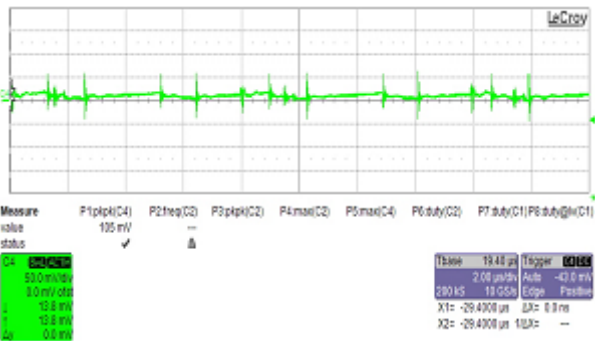
7-5. CSF50-EEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)
 CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)
 CH3 : Output voltage - BNC Probe(200MHz)
 CASE

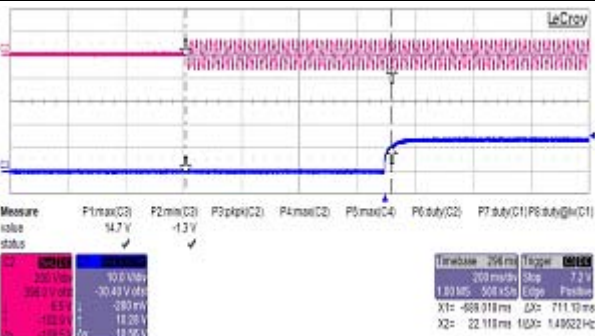
(1) 15V/2A(CH1) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 10.0[mV] RIPPLE&NOISE_{p-p} = 72.0[mV]</p>		<p>Ch3 50mV/div Timebase 2us/div</p>
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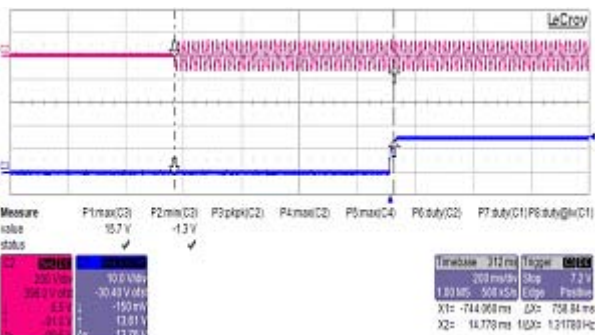
(2) 15V/1.5A(CH2) Ripple&Noise Characteristics (Terminal Block Solder Pin).

<p>Vin= 220V</p>	<p>I_O= 100%</p>	<p>RIPPLE_{p-p} = 20.0[mV] RIPPLE&NOISE_{p-p} = 105.0[mV]</p>		<p>Ch3 50mV/div Timebase 2us/div</p>
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(3) 15V/2A(CH1) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =711ms</p>		<p>CH2 200v/div CH1 10v/div Timebase 200ms/div</p>
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(4) 15V/1.5A(CH2) Turn on Time Characteristics

<p>Vin= 85V</p>	<p>I_O= 100%</p>	<p>Turn on Time =758ms</p>		<p>CH2 200v/div CH1 10v/div Timebase 200ms/div</p>
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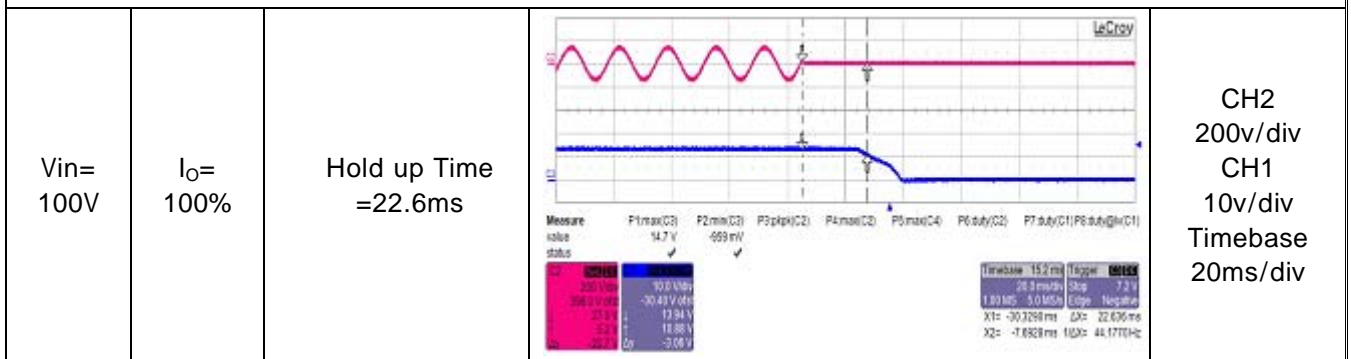
7-6. CSF50-EEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)

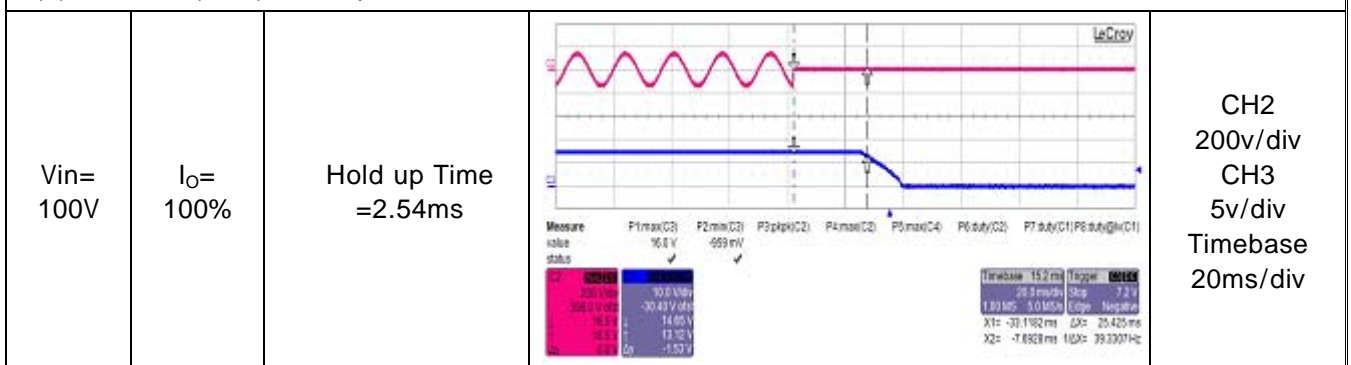
CH2 : Input voltage - ADP300 High voltage differential probe(BW:200MHz)

CH1 : Output voltage - ADP305 High voltage differential probe(BW:200MHz)

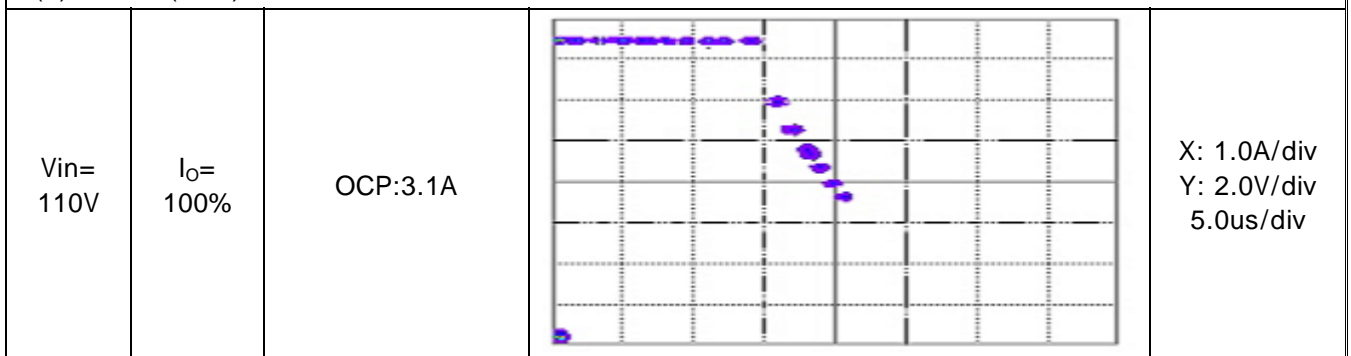
(1) 15V/2A(CH1) Hold up Time Characteristics .



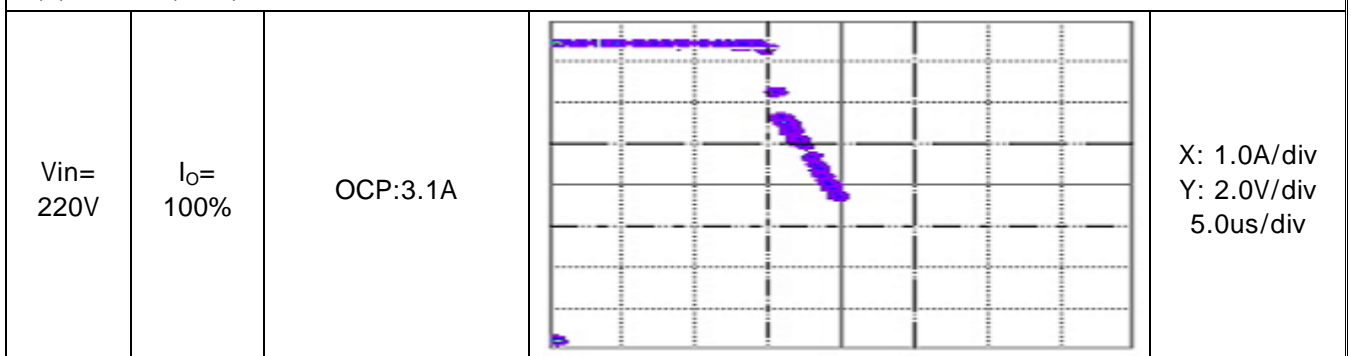
(2) 15V/1.5A(CH2) Hold up Time Characteristics .



(3) 15V/2A(CH1) Over Current Protection Characteristics



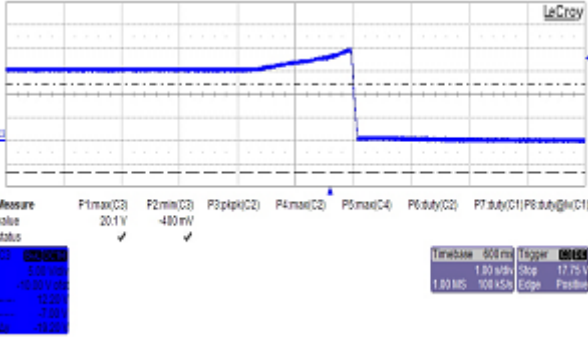
(4) 15V/2A(CH1) Over Current Protection Characteristics



7-7. CSF50-EEW Output characteristics

Oscilloscope : WAVE RUNNER 104MXI(LeCroy)
 EMC Analyzer : Agilent E7402A
 LISN : KNW-403D

(1) 15V/2A (CH1) Over Voltage Protection Characteristics

<p>V_{in} = 220V</p>	<p>I_o = 10%</p>	<p>OVP:19.2V</p>	 <p>CH3 5v/div Timebase 1s/div</p>
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<p>Empty table area for additional data or notes.</p>			
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