

Evaluation Data

품 목	SMPS
품 명	CSF15-S
Rev. No.	A

2007 년 4 월 13 일

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Evaluation data

1. CSF15-05

1. Input characteristics
 - . Inrush Current Characteristics
 - . Input Current & Efficiency Characteristics
2. Output characteristics
 - . Line & Load Regulation Characteristics
 - . Dynamic Load Response Characteristics
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 - . Turn on Time Characteristics
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1. Input characteristics
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1. Input characteristics
2. Output characteristics

4. CSF15-15

1. Input characteristics
2. Output characteristics

5. CSF15-24

1. Input characteristics
2. Output characteristics

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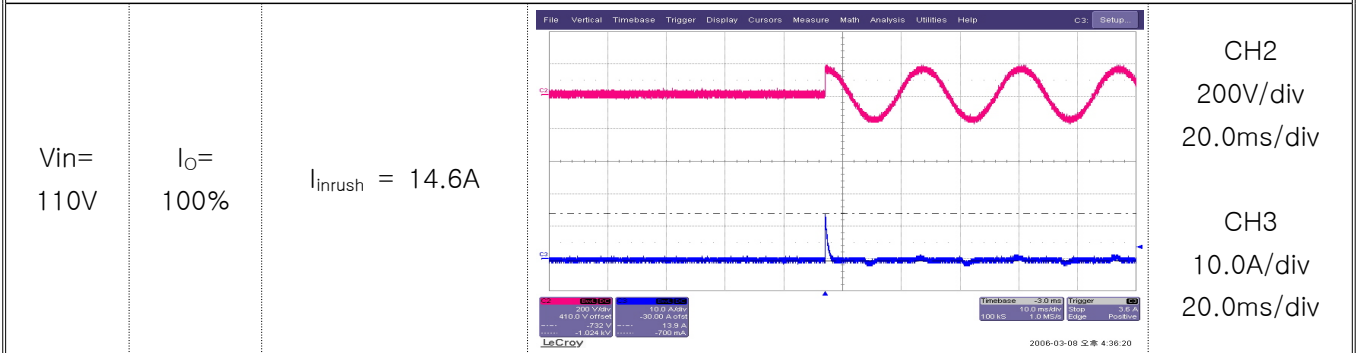
1. Input characteristics
2. Output characteristics

1-1. CSF15-05 Input characteristics

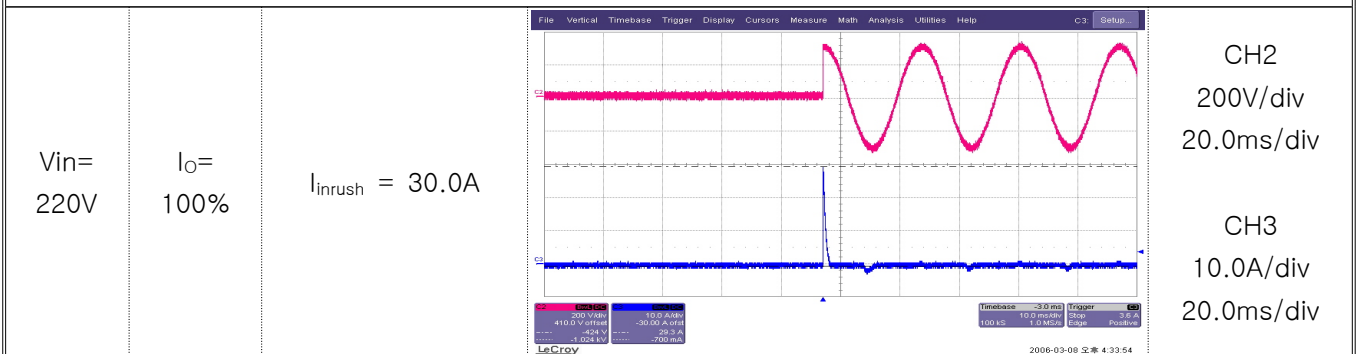
- ◆ (1) Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)



(2) Inrush Current Characteristics (220V)



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^\circ C$

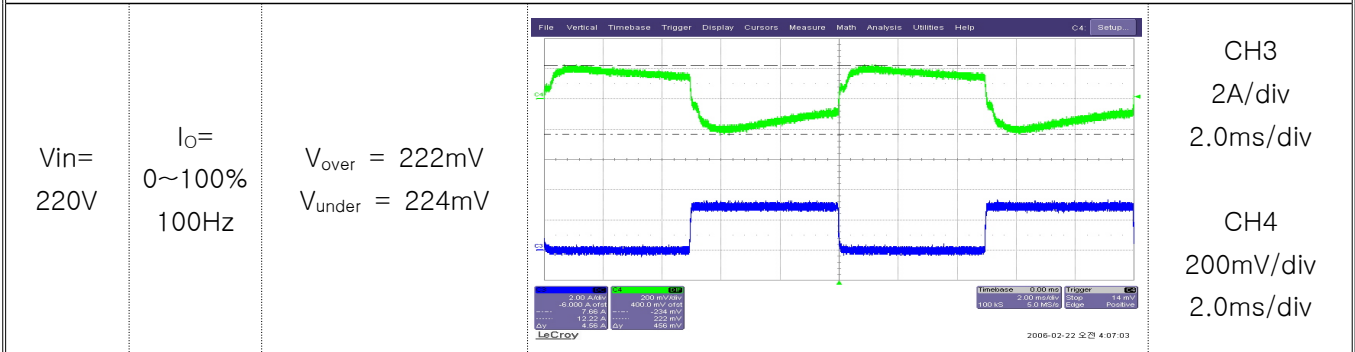
V_{in}		85V	110V	132V	170V	220V	264V
		I_o					
Load (min)	Input Current	0.02A	0.02A	0.02A	0.02A	0.02A	0.02A
	Efficiency	-	-	-	-	-	-
Load (50%)	Input Current	0.17A	0.13A	0.11A	0.09A	0.08A	0.08A
	Efficiency	75.0%	75.5%	75.0%	73.5%	68.8%	65.0%
Load (100%)	Input Current	0.37A	0.27A	0.22A	0.17A	0.15A	0.14A
	Efficiency	71.3%	74.5%	75.6%	75.9%	75.7%	73.3%

1-2. CSF15-05 Output characteristics

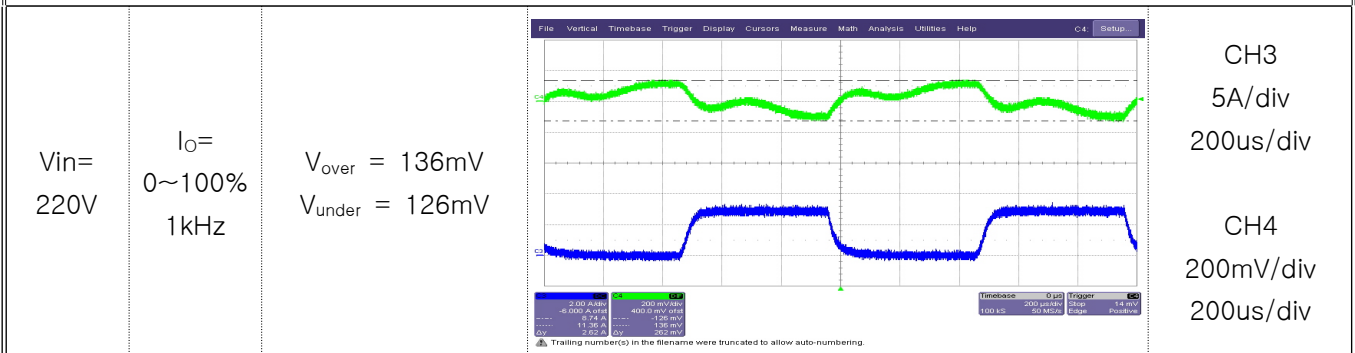
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
 - ◇ CH4 : Output voltage – DA1855 differential probe(BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	5.009V	5.008V	5.007V	5.007V	5.006V	5.006V	3mV
Load (50%)	5.004V	5.003V	5.003V	5.003V	5.004V	5.004V	1mV
Load (100%)	4.991V	4.991V	4.990V	4.988V	4.987V	4.987V	4mV
Load Regulation	18mV	17mV	17mV	19mV	19mV	19mV	

(3) Dynamic Load Response Characteristics (100Hz)



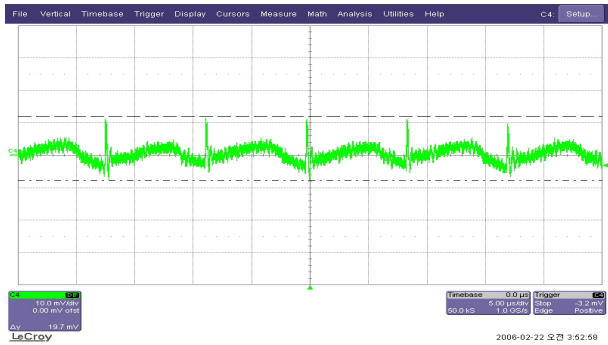
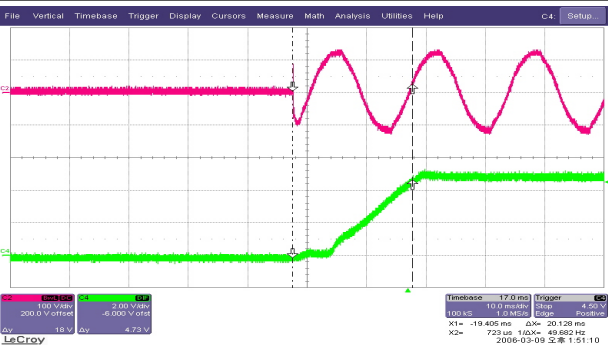
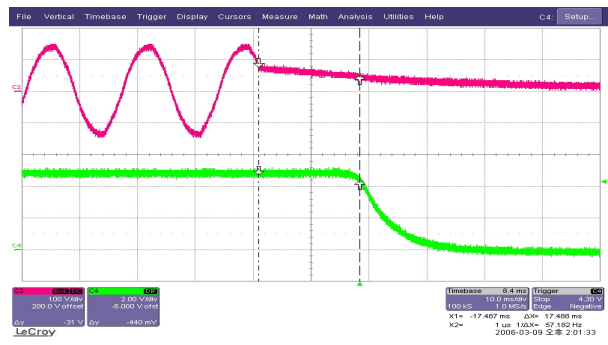
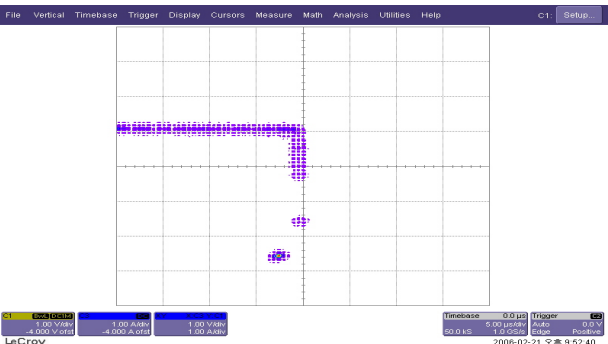
(4) Dynamic Load Response Characteristics (1kHz)



1-3. CSF15-05 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

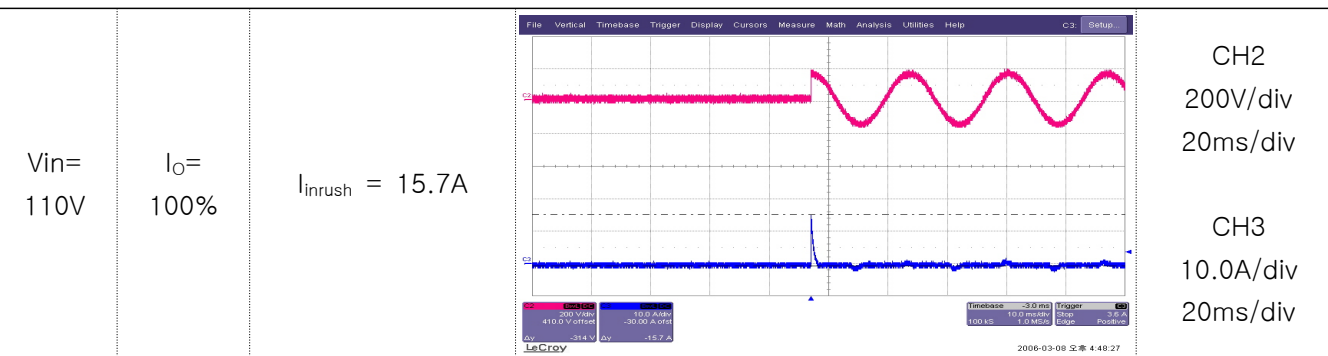
입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 10mV V _{Noise} = 19.7mV		CH4: 10.0mV/div 5.0us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 20.13ms		CH2 100V/div 10.0ms/div CH4 2.0V/div 10.0ms/div
(3) Hold up characteristics				
Vin= 100V	I _O = 100%	t _{hold up} = 17.48ms		CH2 100V/div 10.0ms/div CH4 2.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 3.8A		X 1.00A/div 5us/div Y 1.00V/div 5us/div

2-1. CSF15-09 Input characteristics

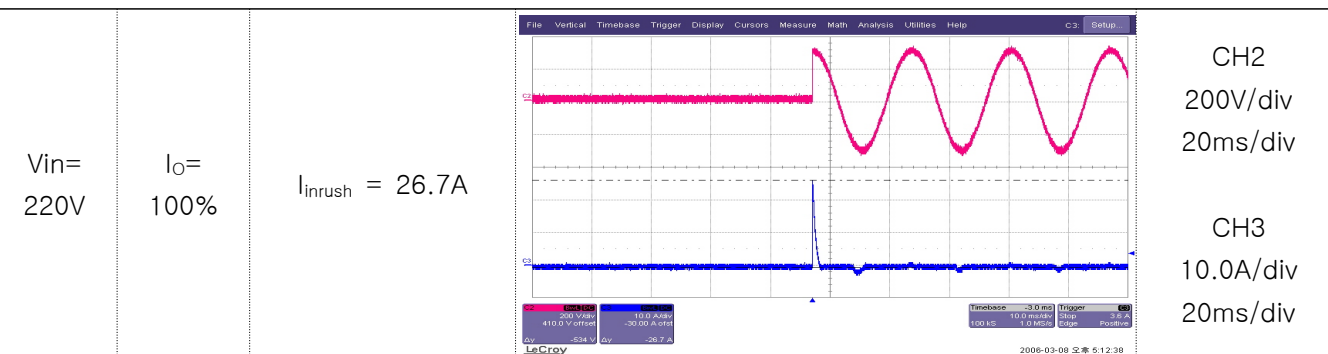
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)



(2) Inrush Current Characteristics (220V)



(3) Input Current & Efficiency Characteristics

Condition Ta : 25°C

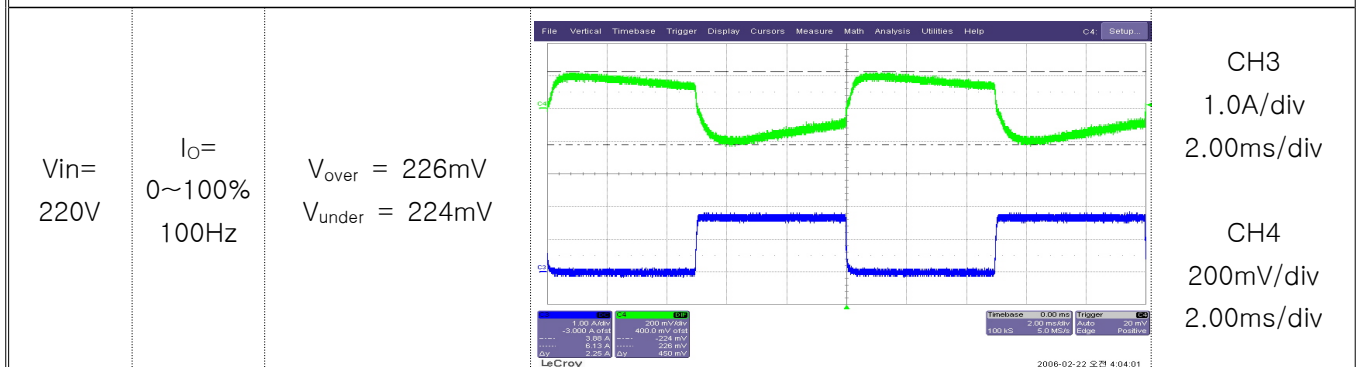
Io \ Vin		85V	110V	132V	170V	220V	264V
		Input Current	0.02A	0.02A	0.02A	0.02A	0.02A
Load (min)	Efficiency	-	-	-	-	-	-
	Input Current	0.17A	0.13A	0.11A	0.10A	0.09A	0.08A
Load (50%)	Efficiency	74.3%	75.8%	75.0%	72.9%	68.9%	64.3%
	Input Current	0.35A	0.26A	0.22A	0.17A	0.14A	0.14A
Load (100%)	Efficiency	73.9%	76.6%	77.6%	78.0%	77.8%	76.4%

2-2. CSF15-09 Output characteristics

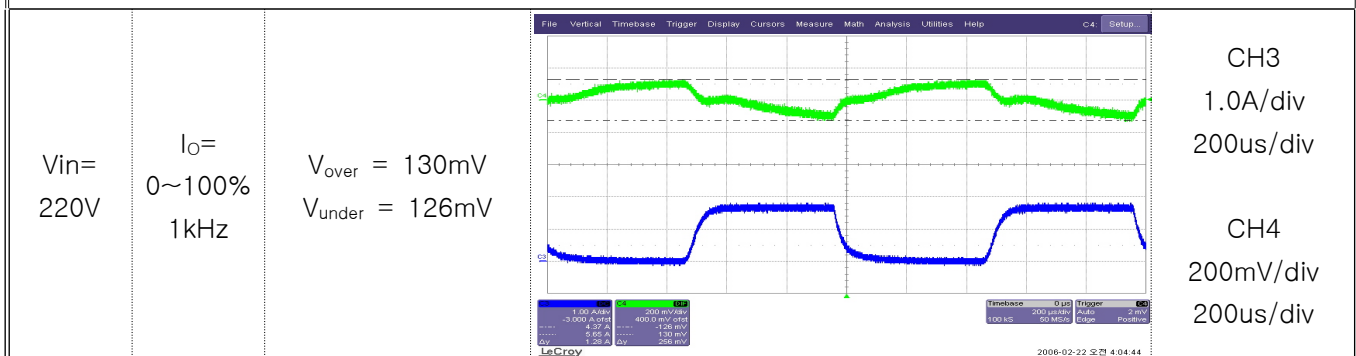
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
 - ◇ CH4 : Output voltage – DA1855 differential probe(BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
I_o							
Load (min)	9.023V	9.023V	9.023V	9.023V	9.022V	9.022V	1mV
Load (50%)	9.014V	9.012V	9.010V	9.009V	9.010V	9.011V	5mV
Load (100%)	9.002V	9.001V	8.998V	8.998V	8.996V	8.995V	7mV
Load Regulation	21mV	22mV	25mV	25mV	26mV	27mV	

(3) Dynamic Load Response Characteristics (100Hz)



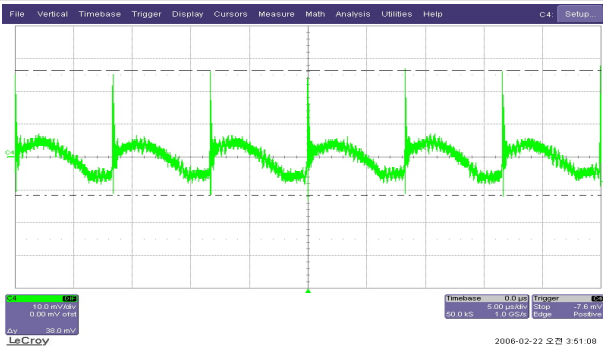
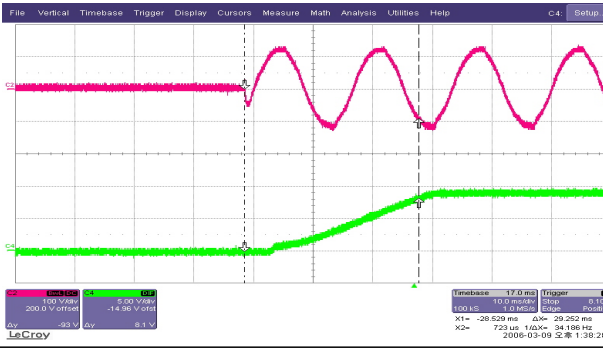
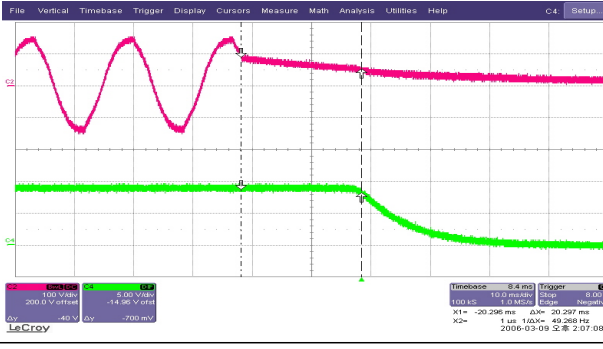
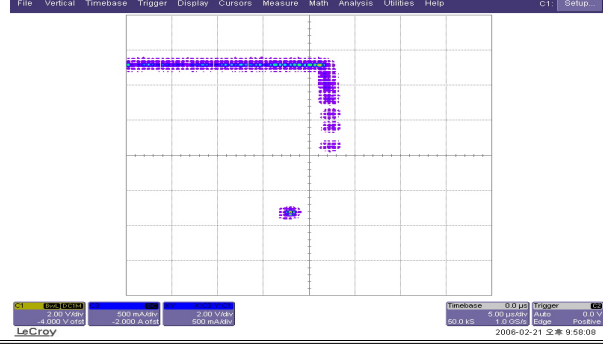
(4) Dynamic Load Response Characteristics (1kHz)



2-3. CSF15-09 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH3 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 14mV V _{Noise} = 38mV		CH4: 10.0mV/div 5.00us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 29.25ms		CH2 100V/div 10.0ms/div CH4 2.0V/div 10.0ms/div
(3) Hold up characteristics				
Vin= 100V	I _O = 100%	t _{hold up} = 20.29ms		CH2 100V/div 10.0ms/div CH4 5.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 2.2A		X 0.5A/div 5us/div Y 2.0V/div 5us/div

3-1. CSF15-12 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input line voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input line current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)

$V_{in} = 110V$	$I_o = 100\%$	$I_{inrush} = 12.9A$		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(2) Inrush Current Characteristics (220V)

$V_{in} = 220V$	$I_o = 100\%$	$I_{inrush} = 25.9A$		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(3) Input Current & Efficiency Characteristics

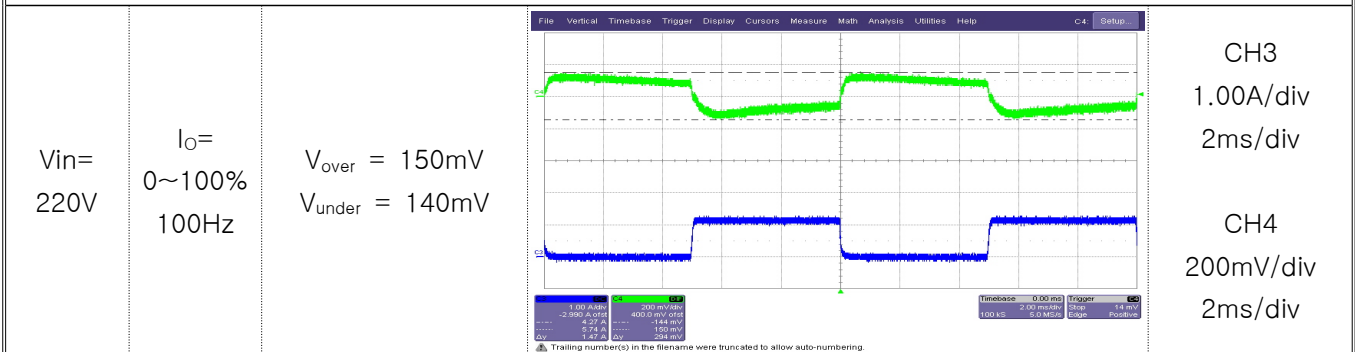
V_{in} / I_o		Condition $T_a : 25^\circ C$					
		85V	110V	132V	170V	220V	264V
Load (min)	Input Current	0.01A	0.01A	0.02A	0.02A	0.02A	0.02A
	Efficiency	-	-	-	-	-	-
Load (50%)	Input Current	0.17A	0.13A	0.11A	0.10A	0.09A	0.08A
	Efficiency	78.3%	79.9%	79.1%	76.8%	72.5%	67.5%
Load (100%)	Input Current	0.35A	0.26A	0.22A	0.18A	0.15A	0.14A
	Efficiency	77.5%	78.0%	81.5%	81.4%	80.2%	78.2%

3-2. CSF15-12 Output characteristics

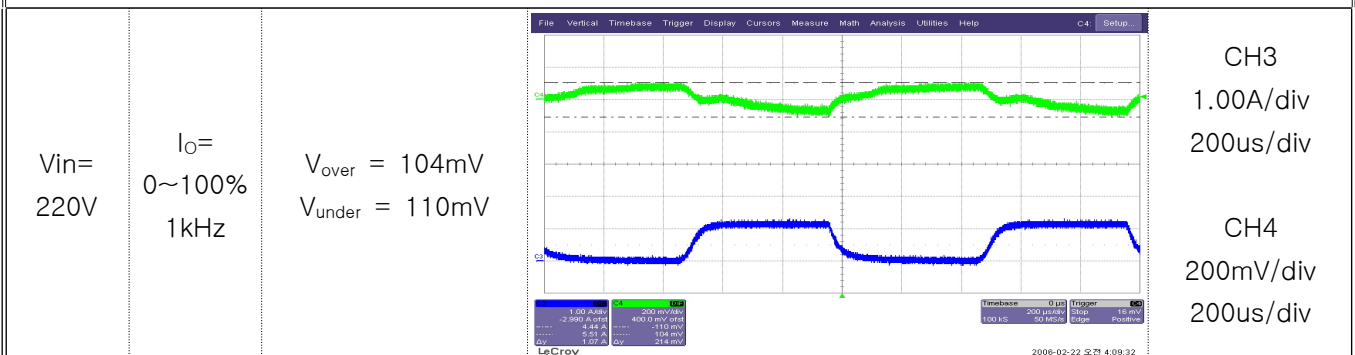
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH3 : Output line current – AP015 current probe (BW:20MHz)
 - ◇ CH4 : Output line voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	12.07V	12.07V	12.07V	12.07V	12.06V	12.06V	10mV
Load (50%)	12.05V	12.05V	12.05V	12.05V	12.05V	12.05V	0mV
Load (100%)	12.05V	12.04V	12.03V	12.03V	12.03V	12.03V	20mV
Load Regulation	20mV	30mV	40mV	40mV	30mV	30mV	

(3) Dynamic Load Response Characteristics (100Hz)



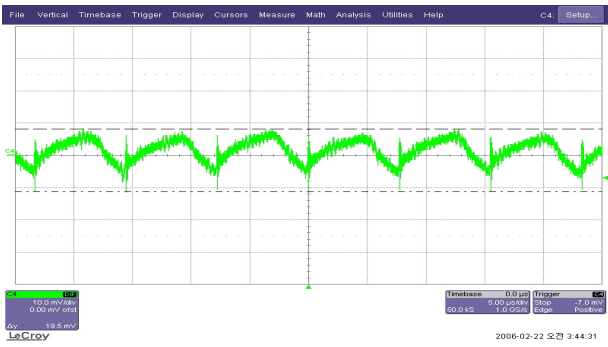
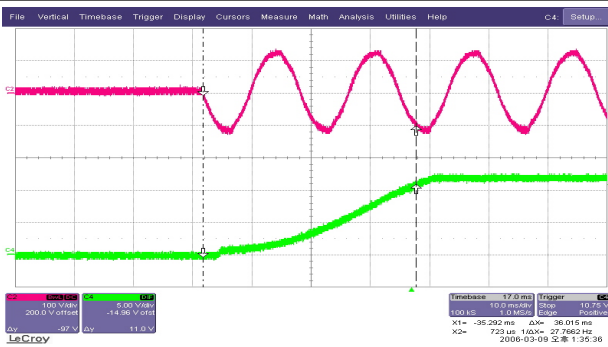
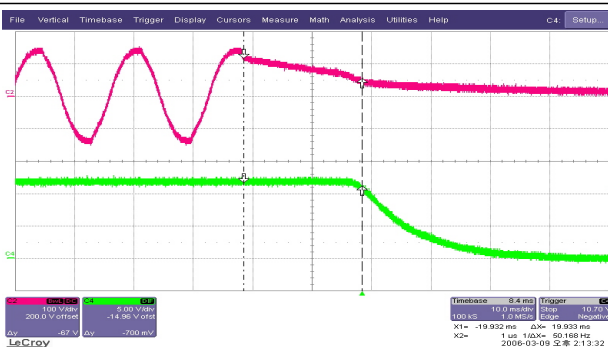
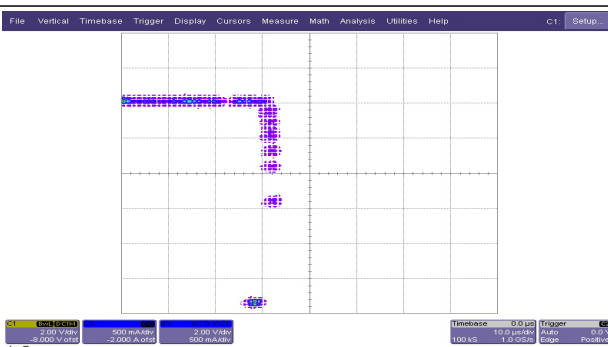
(4) Dynamic Load Response Characteristics (1kHz)



3-3. CSF15-12 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH3 : Input line voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 15mV V _{Noise} = 20mV		CH4: 10.0mV/div 5.00us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 36.01ms		CH2 100V/div 10.0ms/div CH4 2.0V/div 10.0ms/div
(3) Hold up characteristics				
Vin= 100V	I _O = 100%	t _{hold up} = 19.93ms		CH2 100V/div 10.0ms/div CH4 5.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 1.6A		X 0.5A/div 10us/div Y 2.0V/div 10us/div

4-1. CSF15-15 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)

$V_{in} = 110V$	$I_o = 100\%$	$I_{inrush} = 12.2A$		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(2) Inrush Current Characteristics (220V)

$V_{in} = 220V$	$I_o = 100\%$	$I_{inrush} = 25.4A$		CH2 200V/div 20.0ms/div CH3 10.0A/div 20.0ms/div
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(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^\circ C$							
V_{in}		85V	110V	132V	170V	220V	264V
I_o	Load (min)	Input Current	0.02A	0.02A	0.02A	0.02A	0.02A
	Efficiency	-	-	-	-	-	-
(50%)	Load	Input Current	0.16A	0.12A	0.10A	0.09A	0.08A
	Efficiency	79.1%	80.8%	80.0%	76.7%	72.3%	67.1%
(100%)	Load	Input Current	0.33A	0.24A	0.20A	0.16A	0.13A
	Efficiency	79.1%	79.2%	82.1%	82.0%	81.3%	78.2%

4-2. CSF15-15 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

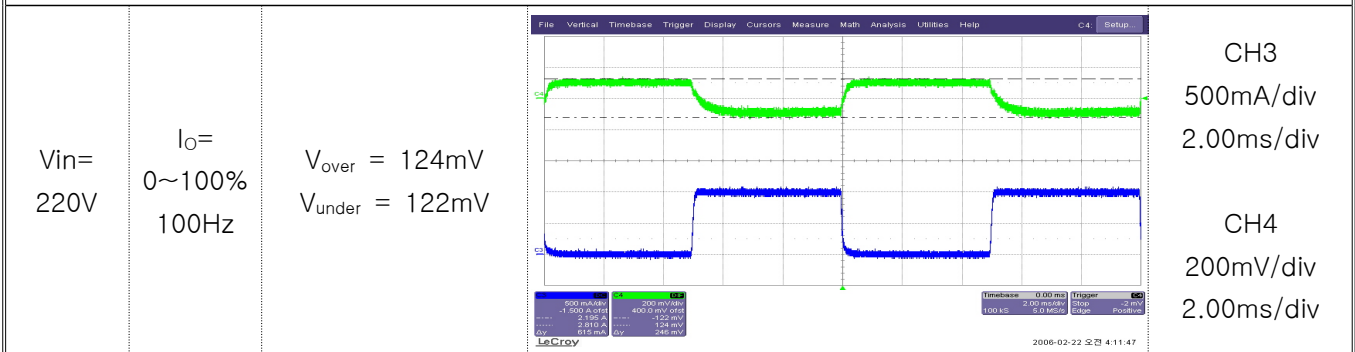
◇ CH3 : Input current – AP015 current probe (BW:20MHz)

◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

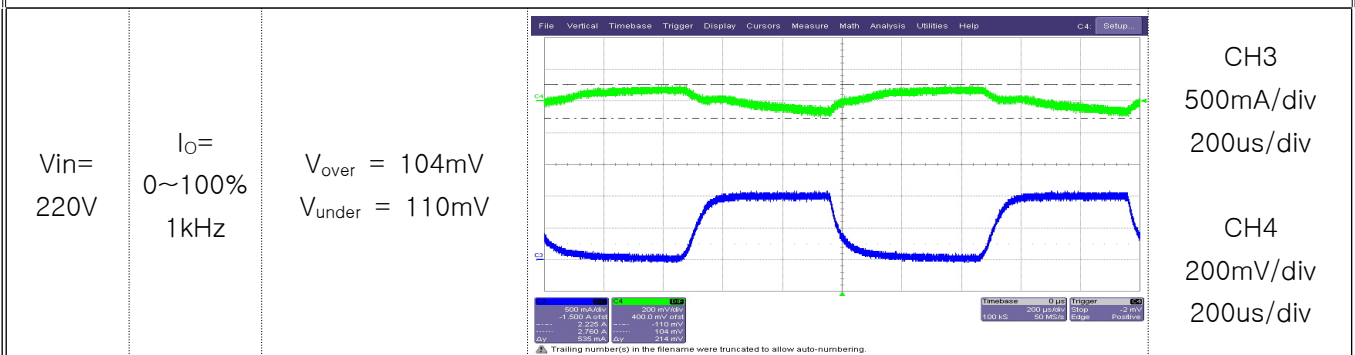
◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	15.06V	15.06V	15.06V	15.06V	15.06V	15.06V	0mV
Load (50%)	15.04V	15.04V	15.04V	15.04V	15.04V	15.04V	0mV
Load (100%)	15.04V	15.03V	15.03V	15.02V	15.02V	15.02V	20mV
Load Regulation	20mV	30mV	30mV	40mV	40mV	40mV	

(3) Dynamic Load Response Characteristics (100Hz)



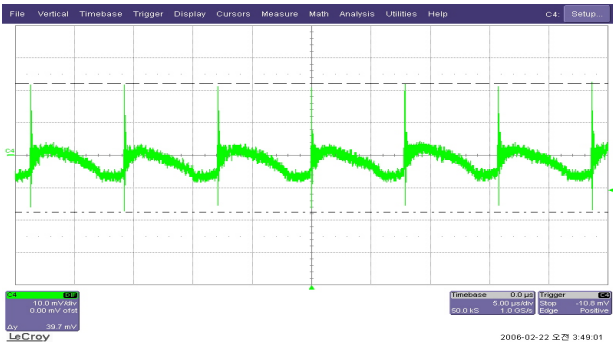
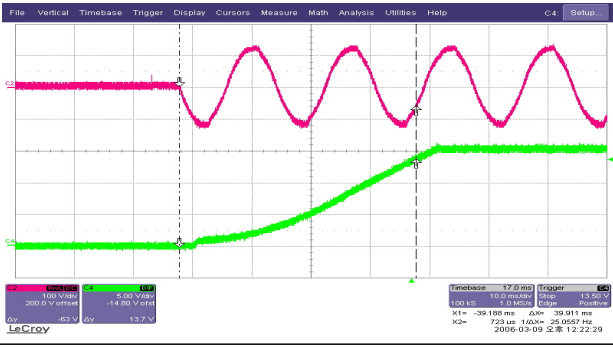
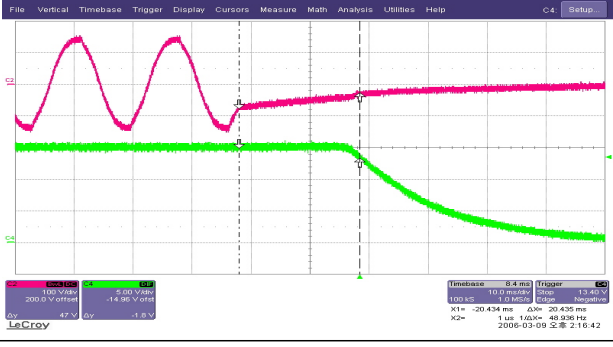
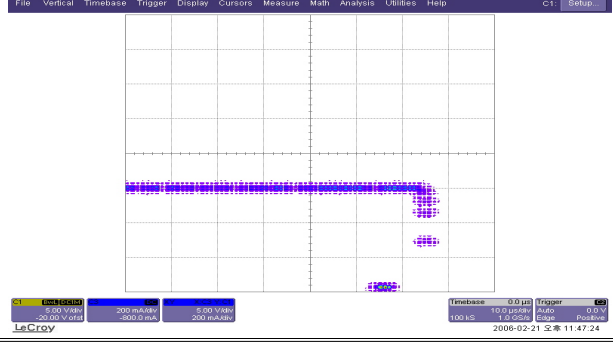
(4) Dynamic Load Response Characteristics (1kHz)



4-3. CSF15-15 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

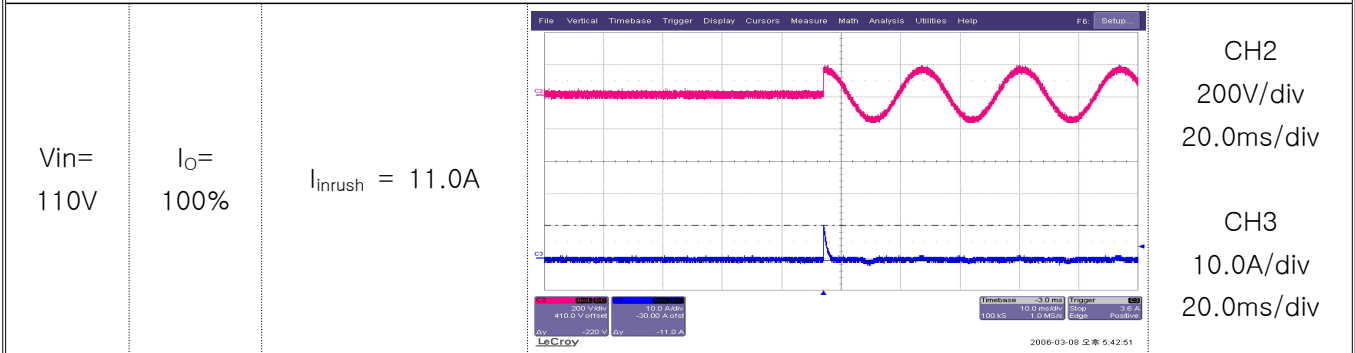
입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 12mV V _{Noise} = 39.7mV		CH4: 10.0mV/div 5.00us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 39.91ms		CH2 100V/div 10.0ms/div CH4 2.0V/div 10.0ms/div
(3) Hold up characteristics				
Vin= 100V	I _O = 100%	t _{hold up} = 20.43ms		CH2 100V/div 10.0ms/div CH4 5.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 1.3A		X 0.2A/div 10us/div Y 5.0V/div 10us/div

5-1. CSF15-24 Input characteristics

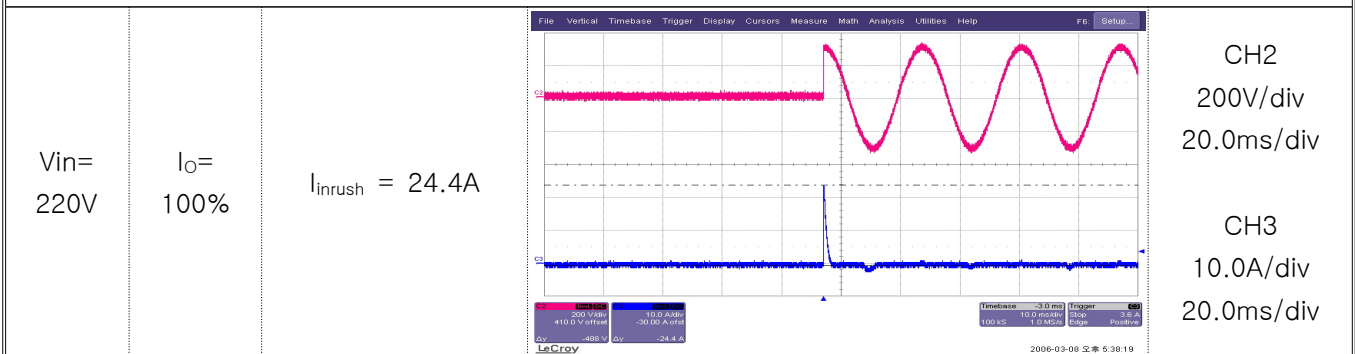
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)



(2) Inrush Current Characteristics (220V)



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^\circ C$

I_o \ V_{in}		85V	110V	132V	170V	220V	264V
		Load (min)	Input Current: 0.02A	0.02A	0.02A	0.02A	0.02A
	Efficiency	-	-	-	-	-	-
Load (50%)	Input Current	0.17A	0.13A	0.11A	0.10A	0.09A	0.08A
	Efficiency	80.8%	82.3%	82.3%	80.0%	75.7%	71.2%
Load (100%)	Input Current	0.36A	0.27A	0.23A	0.18A	0.15A	0.14A
	Efficiency	79.2%	80.1%	83.1%	83.5%	82.3%	80.3%

5-2. CSF15-24 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

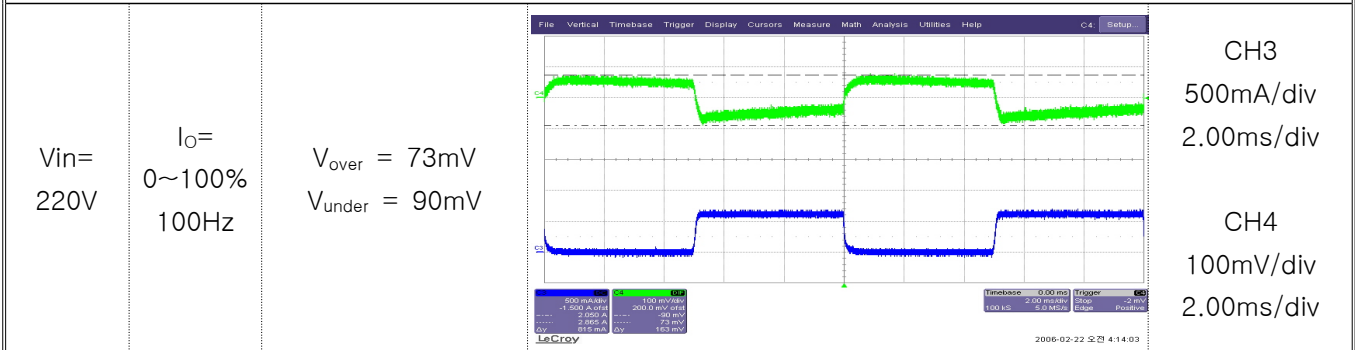
◇ CH3 : Input current – AP015 current probe (BW:20MHz)

◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

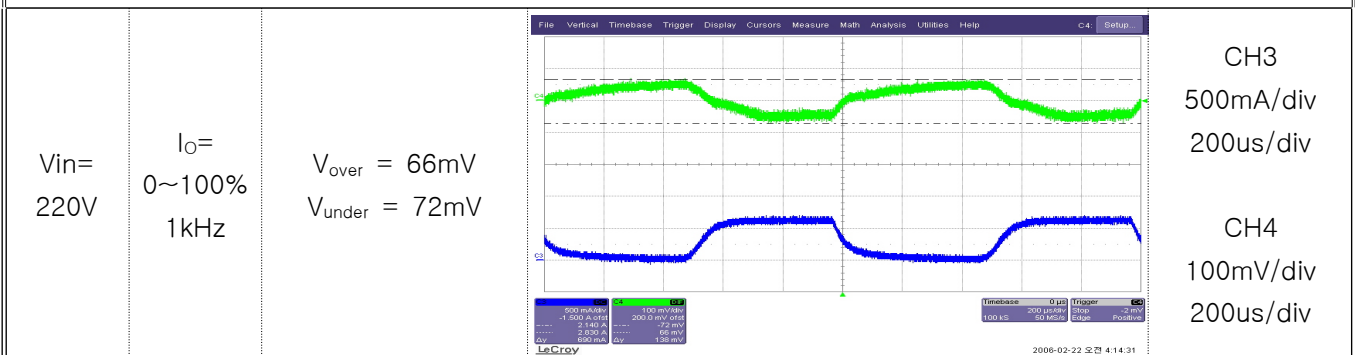
◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	24.04V	24.03V	24.03V	24.03V	24.03V	24.03V	10mV
Load (50%)	24.02V	24.01V	24.01V	24.01V	24.01V	24.02V	10mV
Load (100%)	24.01V	24.00V	24.00V	24.00V	23.99V	23.99V	20mV
Load Regulation	30mV	30mV	30mV	30mV	40mV	40mV	

(3) Dynamic Load Response Characteristics (100Hz)



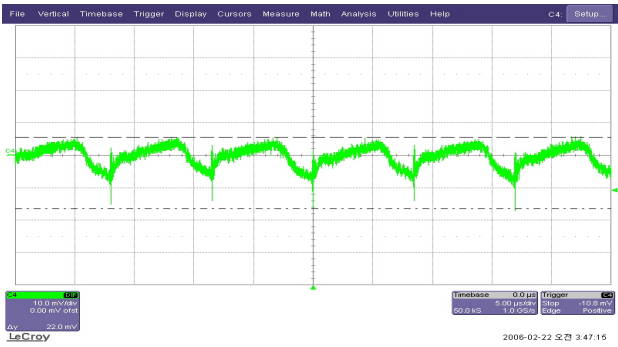
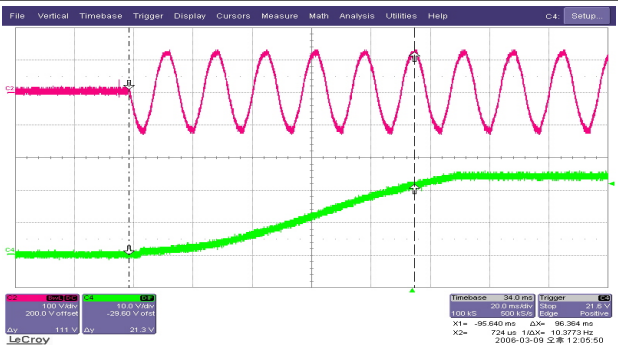
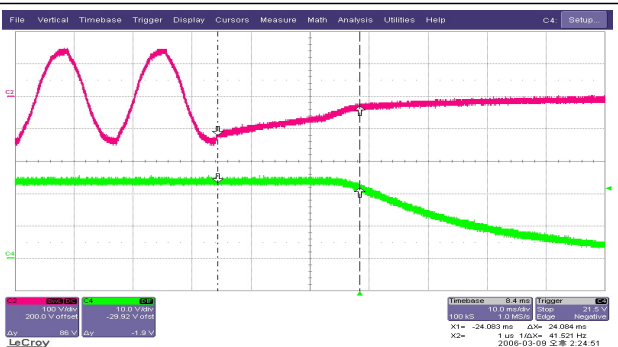
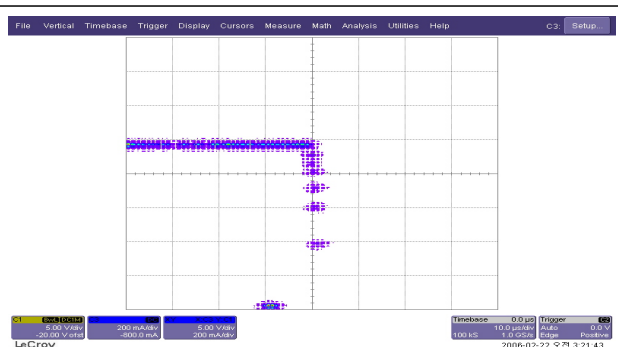
(4) Dynamic Load Response Characteristics (1kHz)



5-3. CSF15-24 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

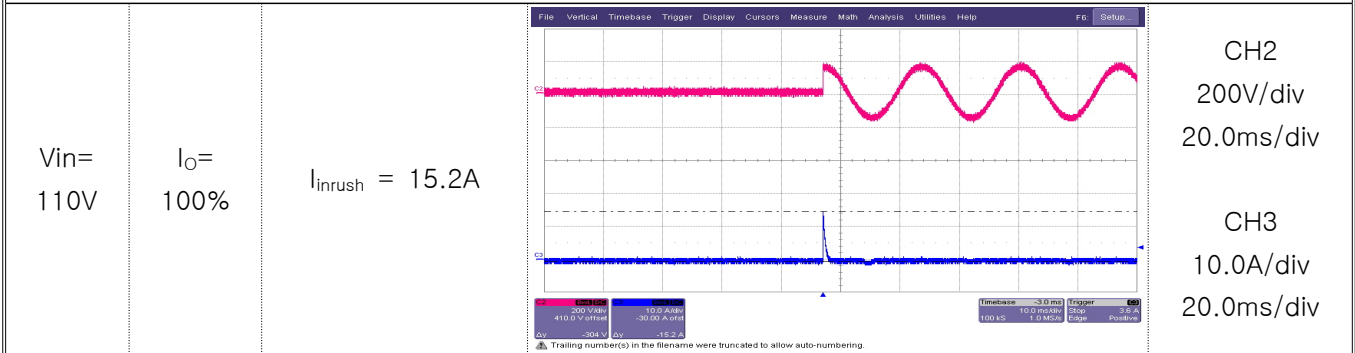
입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 13mV V _{Noise} = 22mV		CH4: 10.0mV/div 5.00us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 96.36ms		CH2 100V/div 20.0ms/div CH4 2.0V/div 20.0ms/div
(3) Hold up characteristics				
Vin= 100V	I _O = 100%	t _{hold up} = 24.08ms		CH2 100V/div 10.0ms/div CH4 10.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 0.8A		X 0.2A/div 5us/div Y 5V/div 5us/div

6-1. CSF15-48 Input characteristics

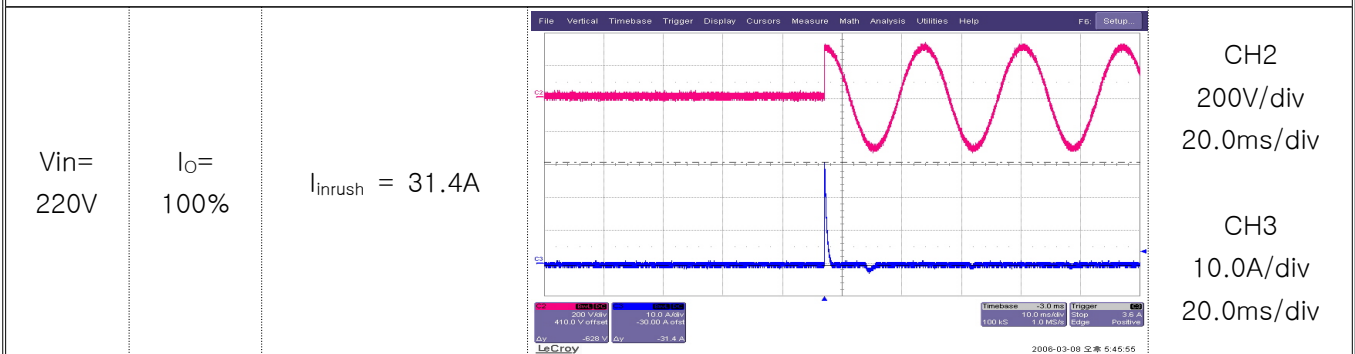
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH2 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH3 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형	비고
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(1) Inrush Current Characteristics (110V)



(2) Inrush Current Characteristics (220V)



(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^\circ C$

I_o \ V_{in}		85V	110V	132V	170V	220V	264V
		Load (min)	Input Current: 0.02A	0.02A	0.02A	0.02A	0.02A
	Efficiency	-	-	-	-	-	-
Load (50%)	Input Current	0.16A	0.13A	0.11A	0.10A	0.09A	0.08A
	Efficiency	81.7%	82.5%	82.5%	80.1%	75.6%	70.4%
Load (100%)	Input Current	0.37A	0.26A	0.22A	0.17A	0.15A	0.14A
	Efficiency	80.1%	80.9%	84.1%	84.1%	82.6%	80.8%

6-2. CSF15-48 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

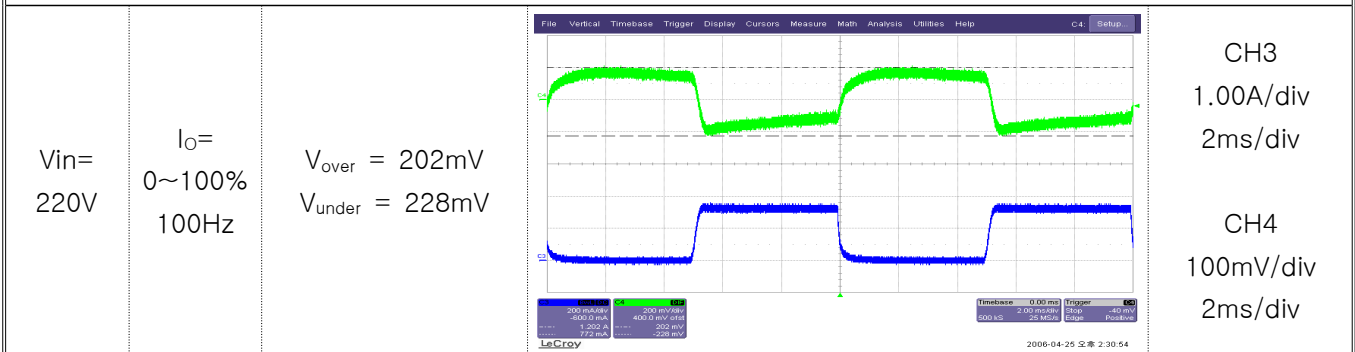
◇ CH3 : Input current – AP015 current probe (BW:20MHz)

◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

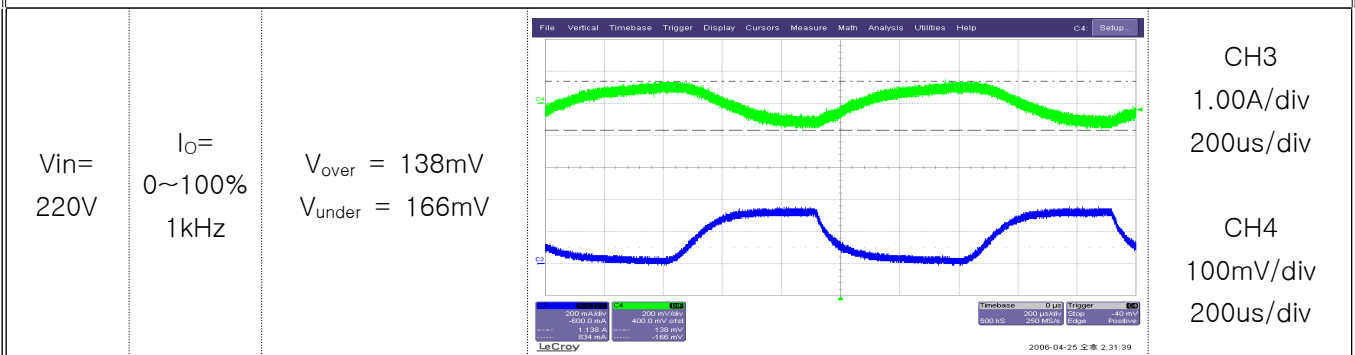
◆ Digital Multimeter : FLUKE189 (FLUKE)

입력	출력	측정값	파형				비고
(1) Line & Load Regulation Characteristics							
Condition Ta : 25°C							
I_o \ V_{in}	85V	110V	132V	170V	220V	264V	Line Regulation
Load (min)	48.07V	48.07V	48.08V	48.08V	48.08V	48.08V	10mV
Load (50%)	48.07V	48.07V	48.07V	48.07V	48.07V	48.07V	0mV
Load (100%)	48.07V	48.07V	48.07V	48.06V	48.06V	48.06V	10mV
Load Regulation	0V	0V	10mV	20mV	20mV	20mV	

(3) Dynamic Load Response Characteristics (100Hz)



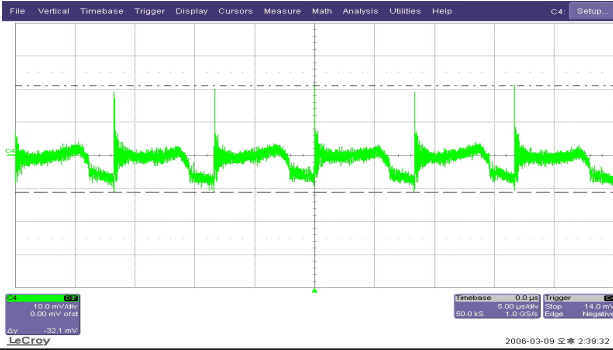
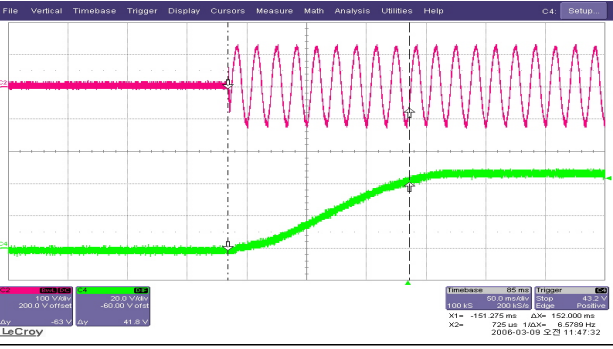
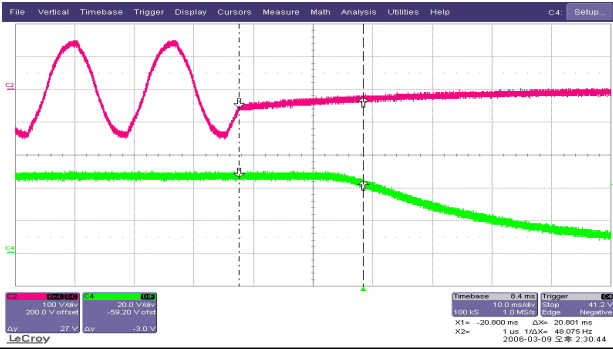
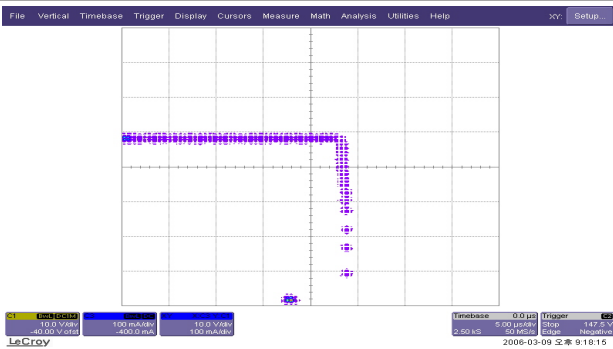
(4) Dynamic Load Response Characteristics (1kHz)



6-3. CSF15-48 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH4 : Output voltage - PP005A passive probe (BW:20MHz)
- ◇ CH2 : Input voltage - ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH4 : Output voltage - DA1855 Differential Probe

입력	출력	측정값	파형	비고
(1) Ripple & Noise characteristics.				
Vin= 220V	I _O = 100%	V _{Ripple} = 15mV V _{Noise} = 32.1mV		CH4 10mV/div 5us/div
(2) Turn on time characteristics				
Vin= 85V	I _O = 100%	t _{turn on} = 152ms		CH2 100V/div 50ms/div CH4 2.0V/div 50ms/div
(3) Hold up characteristics				
Vin= 100	I _O = 100%	t _{hold up} = 20.08ms		CH2 100V/div 10.0ms/div CH4 20.0V/div 10.0ms/div
(4) Over Current protection characteristics				
Vin= 220V	I _O = 110~145%	O.C.P = 0.47A		X 0.1A/div 5us/div Y 5.0V/div 5us/div