

Evaluation data

1. CSF100-3R3

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1. Input characteristics
2. Output characteristics

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1. Input characteristics
2. Output characteristics

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1. Input characteristics
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1. Input characteristics
2. Output characteristics

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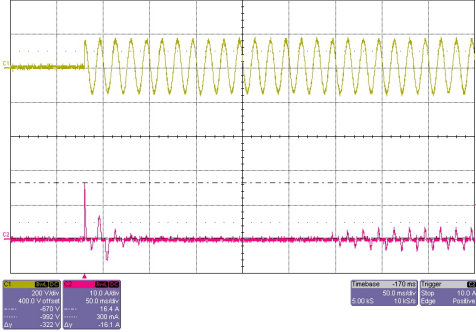
1. Input characteristics
2. Output characteristics

1-1. CSF100-3R3 Input characteristics

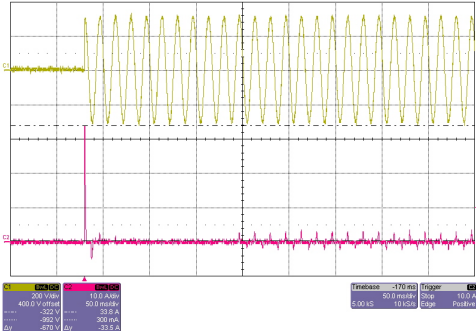
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|----|----|-----|----|----|
|----|----|-----|----|----|

(1) Inrush Current Characteristics (110V)

| | | | | |
|-----------------|---------------|----------------------|--|---|
| $V_{in} = 110V$ | $I_o = 100\%$ | $I_{inrush} = 16.1A$ |  | CH1 200V/div 50ms/div CH2 10.0A/div 50ms/div |
|-----------------|---------------|----------------------|--|---|

(2) Inrush Current Characteristics (220V)

| | | | | |
|-----------------|---------------|----------------------|---|---|
| $V_{in} = 220V$ | $I_o = 100\%$ | $I_{inrush} = 33.5A$ |  | CH1 200V/div 50ms/div CH2 10.0A/div 50ms/div |
|-----------------|---------------|----------------------|---|---|

(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^{\circ}C$

| V_{in} / I_o | | 85V | 110V | 132V | 170V | 220V | 264V |
|------------------|---------------|--------|--------|--------|--------|--------|--------|
| Load (min) | Input Current | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.546A | 0.421A | 0.346A | 0.265A | 0.205A | 0.168A |
| | Efficiency | 71% | 71% | 72% | 73% | 73% | 74% |
| Load (100%) | Input Current | 1.062A | 0.820A | 0.674A | 0.516A | 0.399A | 0.328A |
| | Efficiency | 73% | 73% | 74% | 75% | 75% | 76% |

1-2. CSF100-3R3 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)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 3.317V | 3.317V | 3.318V | 3.319V | 3.318V | 3.319V | 2mV |
| Load (50%) | 3.301V | 3.301V | 3.303V | 3.301V | 3.302V | 3.303V | 2mV |
| Load (100%) | 3.285V | 3.286V | 3.072V | 3.286V | 3.287V | 3.287V | 15mV |
| Load Regulation | 32mV | 31mV | 45mV | 33mV | 31mV | 32mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|--|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 66mV$ $V_{under} = 147mV$ | | CH3 100mV/div 2.00ms/div CH2 10.0A/div 2.00ms/div |
|-----------------|-------------------------------|--|--|--|

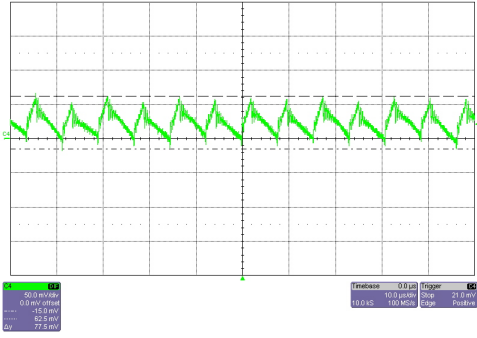
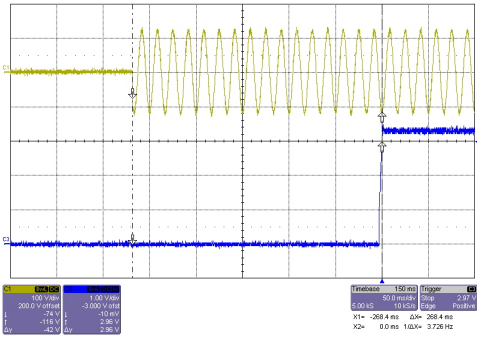
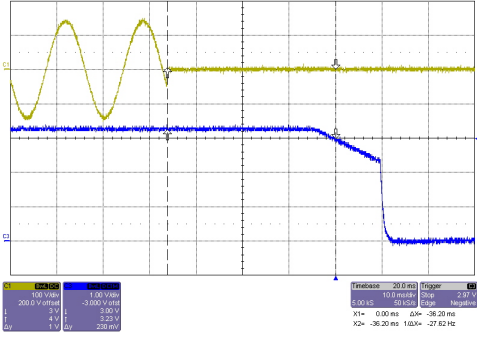
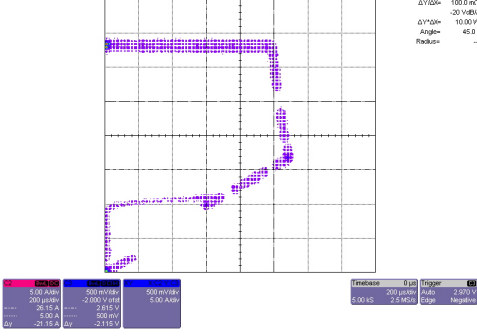
(4) Dynamic Load Response Characteristics (1KHz)

| | | | | |
|-----------------|------------------------------|--|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 60mV$ $V_{under} = 115mV$ | | CH3 100mV/div 200us/div CH2 10.0A/div 200us/div |
|-----------------|------------------------------|--|--|--|

1-3. CSF100-3R3 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

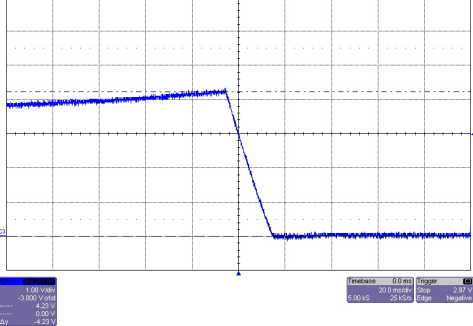
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-----------------|---|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | Io= 100% | V _{Ripple} = 57mV V _{Noise} = 78mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | Io= 100% | t _{turn on} = 268ms |  | CH1 100V/div 50.0ms/div CH4 1.00V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | Io= 100% | t _{hold up} = 36.2ms |  | CH1 100V/div 10.0ms/div CH4 1.00V/div 10.0ms/div |
| (4) Over Current protection characteristics | | | | |
| Vin= 220V | Io= 110~145% | O.C.P = 25.2A |  | X(CH3) 5.00A/div 200us/div Y(CH4) 0.50V/div 200us/div |

1-4. CSF100-3R3 Output characteristics

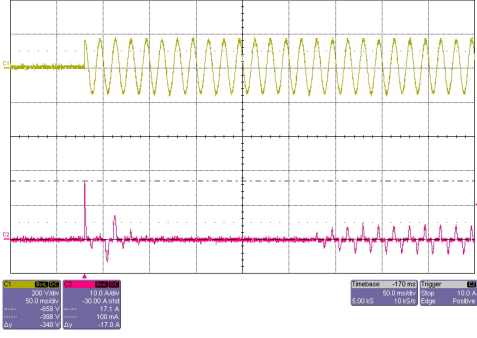
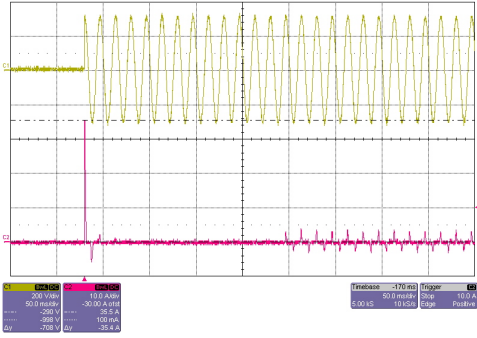
◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|----------------------|---------------|---|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 4.23V |  <p>The oscilloscope trace shows a steady-state output voltage of approximately 4.2V. A sharp spike occurs, reaching a peak of 4.23V, after which the voltage drops to 0V. The grid shows 1.00V/div and 20.0ms/div.</p> | CH3 1.00V/div 20.0ms/div |
| | | | | |
| | | | | |
| | | | | |

2-1. CSF100-05 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 | | | |
|---|---------------|----------------------|---|---|--------|--------|--------|
| (1) Inrush Current Characteristics (110V) | | | | | | | |
| Vin= 110V | Io= 100% | $I_{inrush} = 17.0A$ |  | CH1 200V/div 50ms/div CH2 10.0A/div 50ms/div | | | |
| (2) Inrush Current Characteristics (220V) | | | | | | | |
| Vin= 220V | Io= 100% | $I_{inrush} = 35.4A$ |  | CH1 200V/div 50ms/div CH2 10.0A/div 50ms/div | | | |
| (3) Input Current & Efficiency Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| Vin / Io | | 85V | 110V | 132V | 170V | 220V | 264V |
| Load (min) | Input Current | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.742A | 0.573A | 0.472A | 0.362A | 0.279A | 0.230A |
| | Efficiency | 79% | 79% | 80% | 81% | 81% | 82% |
| Load (100%) | Input Current | 1.447A | 1.118A | 0.920A | 0.706A | 0.545A | 0.449A |
| | Efficiency | 81% | 81% | 82% | 83% | 83% | 84% |

2-2. CSF100-05 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)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 5.011V | 5.010V | 5.009V | 5.012V | 5.013V | 5.013V | 4mV |
| Load (50%) | 4.994V | 4.995V | 4.992V | 4.996V | 4.997V | 4.997V | 5mV |
| Load (100%) | 4.978V | 4.979V | 4.975V | 4.981V | 4.981V | 4.981V | 6mV |
| Load Regulation | 33mV | 31mV | 34mV | 31mV | 32mV | 32mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|---|--|---|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 49mV$ $V_{under} = 47mV$ | | CH3 50mV/div 2.00ms/div CH2 10.0A/div 2.00ms/div |
|-----------------|-------------------------------|---|--|---|

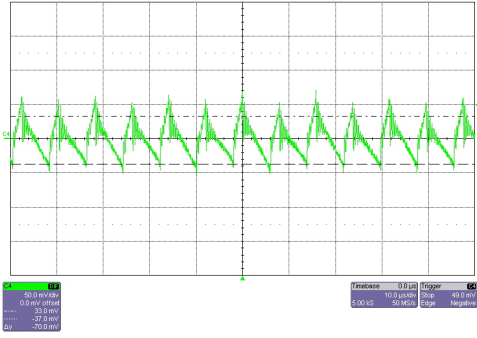
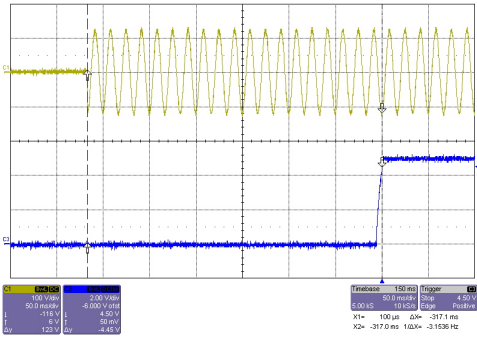
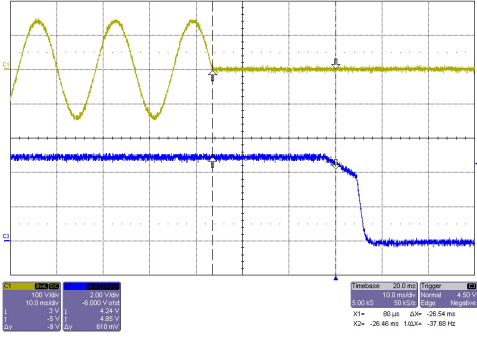
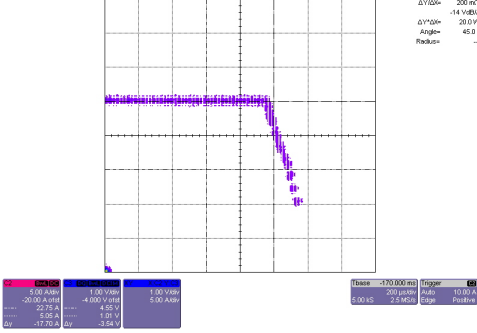
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|---|--|---|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 48mV$ $V_{under} = 45mV$ | | CH3 50mV/div 200us/div CH2 10.0A/div 200us/div |
|-----------------|------------------------------|---|--|---|

2-3. CSF100-05 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

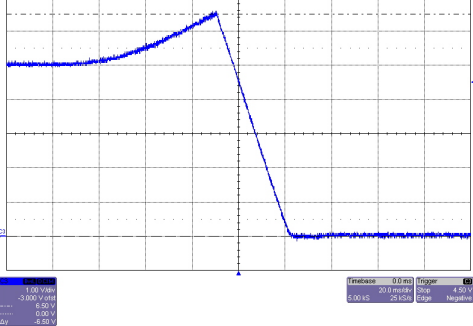
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-----------------|--|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | Io= 100% | V _{Ripple} = 70mV V _{Noise} = 102mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | Io= 100% | t _{turn on} = 317ms |  | CH1 100V/div 50.0ms/div CH4 2.00V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | Io= 100% | t _{hold up} = 26.4ms |  | CH1 100V/div 10.0ms/div CH4 2.00V/div 10.0ms/div |
| (4) Over Current protection characteristics | | | | |
| Vin= 220V | Io= 110~145% | O.C.P = 26.0A |  | X(CH3) 5.00A/div 200us/div Y(CH4) 1.00V/div 200us/div |

2-4. CSF100-05 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-------------------------|---------------|--|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 6.50V |  | CH3 1.00V/div 20.0ms/div |
| | | | | |
| | | | | |
| | | | | |

3-1. CSF100-09 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|----|----|-----|----|----|
|----|----|-----|----|----|

(1) Inrush Current Characteristics (110V)

| | | | | |
|-----------------|---------------|----------------------|--|---|
| $V_{in} = 110V$ | $I_o = 100\%$ | $I_{inrush} = 15.0A$ | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div |
|-----------------|---------------|----------------------|--|---|

(2) Inrush Current Characteristics (220V)

| | | | | |
|-----------------|---------------|----------------------|--|---|
| $V_{in} = 220V$ | $I_o = 100\%$ | $I_{inrush} = 32.8A$ | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div |
|-----------------|---------------|----------------------|--|---|

(3) Input Current & Efficiency Characteristics

Condition $T_a : 25^{\circ}C$

| Vin | | 85V | 110V | 132V | 170V | 220V | 264V |
|-------------|---------------|--------|--------|--------|--------|--------|--------|
| Load (min) | Input Current | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.741A | 0.573A | 0.471A | 0.361A | 0.279A | 0.230A |
| | Efficiency | 79% | 79% | 80% | 81% | 81% | 82% |
| Load (100%) | Input Current | 1.447A | 1.118A | 0.920A | 0.706A | 0.545A | 0.449A |
| | Efficiency | 81% | 81% | 82% | 83% | 83% | 84% |

3-2. CSF100-09 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)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 9.020V | 9.020V | 9.022V | 9.023V | 9.024V | 9.024V | 4mV |
| Load (50%) | 9.011V | 9.012V | 9.013V | 9.014V | 9.016V | 9.014V | 5mV |
| Load (100%) | 9.002V | 9.004V | 9.004V | 9.005V | 9.007V | 9.005V | 5mV |
| Load Regulation | 18mV | 16mV | 18mV | 18mV | 14mV | 19mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|---|--|---|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 44mV$ $V_{under} = 90mV$ | | CH3 50.0mV/div 2.00ms/div CH2 5.00A/div 2.00ms/div |
|-----------------|-------------------------------|---|--|---|

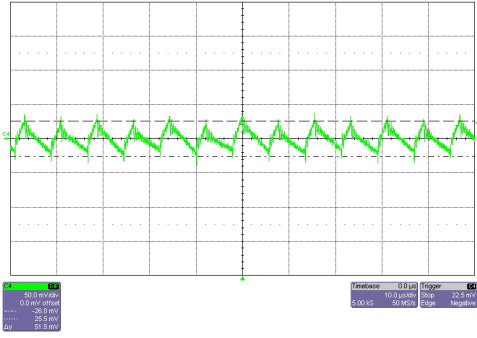
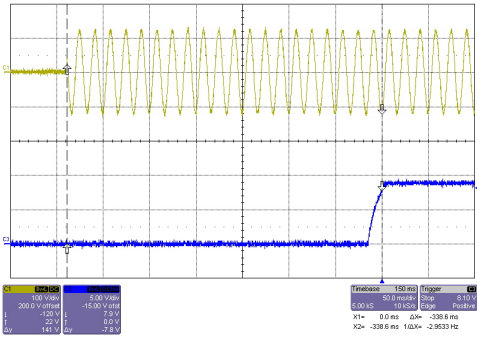
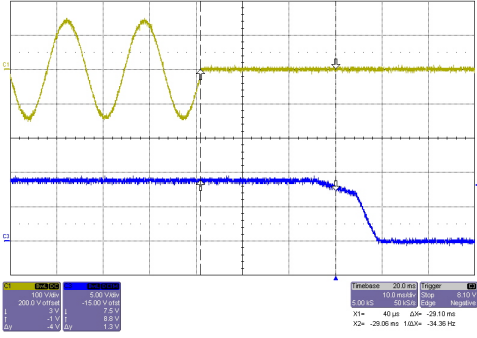
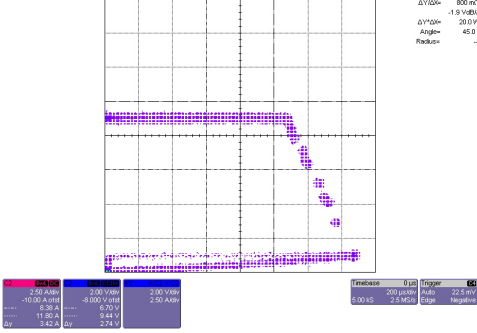
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|---|--|---|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 34mV$ $V_{under} = 40mV$ | | CH3 50.0mV/div 200us/div CH2 5.00A/div 200us/div |
|-----------------|------------------------------|---|--|---|

3-3. CSF100-09 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

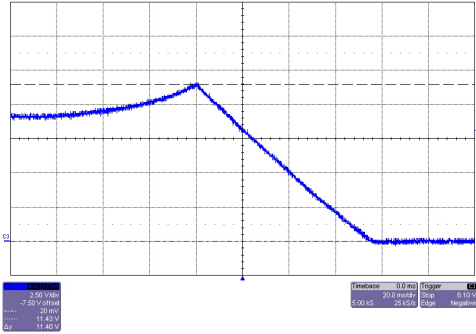
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|------------------------------|---|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | I _O = 100% | V _{Ripple} = 52mV V _{Noise} = 82mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | I _O = 100% | t _{turn on} = 338ms |  | CH1 100V/div 50.0ms/div CH4 5.00V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | I _O = 100% | t _{hold up} = 29.0ms |  | CH1 100V/div 10.0ms/div CH4 5.00V/div 10.0ms/div |
| (4) Over Current protection characteristics | | | | |
| Vin= 220V | I _O = 110~145% | O.C.P = 14.5A |  | X(CH3) 2.50A/div 200us/div Y(CH4) 2.00V/div 200us/div |

3-4. CSF100-09 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

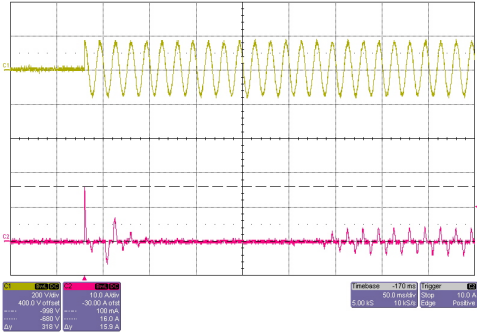
| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-------------------------|---------------|--|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 11.4V |  | CH3 2.50V/div 20.0ms/div |
| | | | | |
| | | | | |
| | | | | |

4-1. CSF100-12 Input characteristics

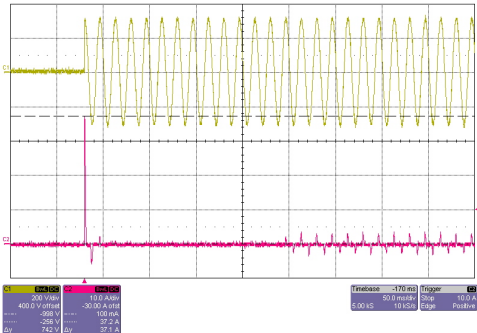
- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|----|----|-----|----|----|
|----|----|-----|----|----|

(1) Inrush Current Characteristics (110V)

| | | | | |
|-----------------|---------------|----------------------|--|---|
| $V_{in} = 110V$ | $I_o = 100\%$ | $I_{inrush} = 14.4A$ |  | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div |
|-----------------|---------------|----------------------|--|---|

(2) Inrush Current Characteristics (220V)

| | | | | |
|-----------------|---------------|----------------------|---|---|
| $V_{in} = 220V$ | $I_o = 100\%$ | $I_{inrush} = 31.9A$ |  | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div |
|-----------------|---------------|----------------------|---|---|

(3) Input Current & Efficiency Characteristics

| I_o \ V_{in} | | Condition $T_a : 25^\circ C$ | | | | | |
|------------------|---------------|------------------------------|--------|--------|--------|--------|--------|
| | | 85V | 110V | 132V | 170V | 220V | 264V |
| Load (min) | Input Current | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.722A | 0.551A | 0.459A | 0.356A | 0.272A | 0.227A |
| | Efficiency | 81% | 82% | 82% | 82% | 83% | 83% |
| Load (100%) | Input Current | 1.410A | 1.077A | 0.897A | 0.688A | 0.532A | 0.438A |
| | Efficiency | 83% | 84% | 84% | 85% | 85% | 86% |

4-2. CSF100-12 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

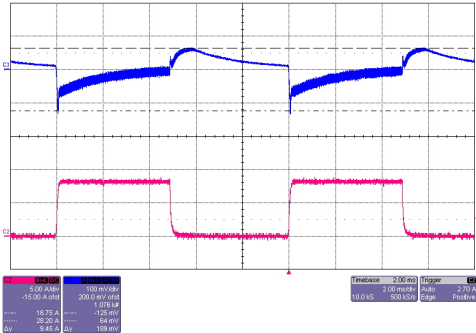
◇ CH2 : Output current – AP015 current probe (BW:20MHz)

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

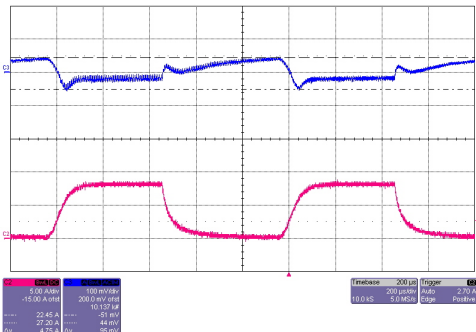
◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 12.04V | 12.04V | 12.04V | 12.03V | 12.03V | 12.03V | 10mV |
| Load (50%) | 12.03V | 12.03V | 12.03V | 12.03V | 12.02V | 12.03V | 10mV |
| Load (100%) | 12.02V | 12.02V | 12.02V | 12.02V | 12.02V | 12.02V | 0mV |
| Load Regulation | 20mV | 20mV | 20mV | 10mV | 10mV | 10mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|--|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 67mV$ $V_{under} = 124mV$ |  | CH3 100mV/div 2.00ms/div CH2 5.00A/div 2.00ms/div |
|-----------------|-------------------------------|--|--|--|

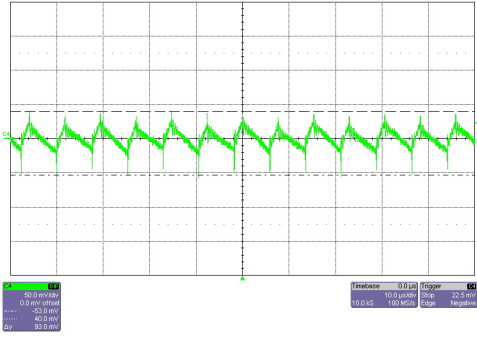
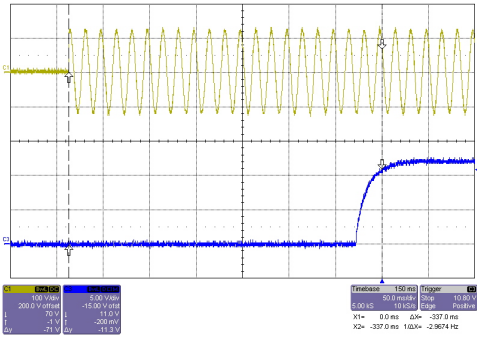
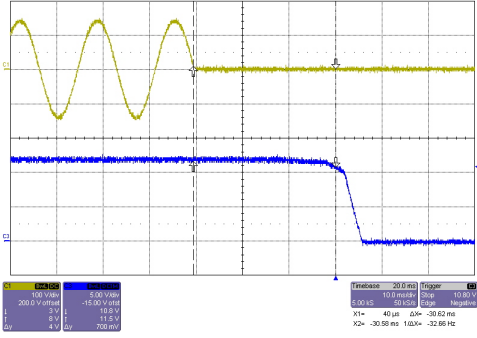
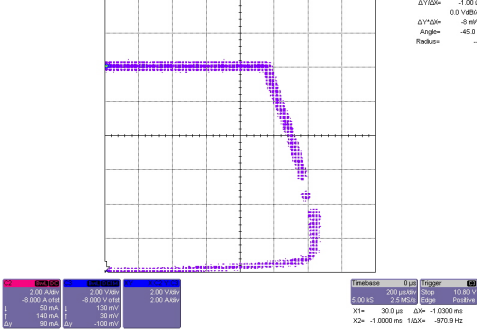
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|---|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 44mV$ $V_{under} = 51mV$ |  | CH3 100mV/div 200us/div CH2 5.00A/div 200us/div |
|-----------------|------------------------------|---|--|--|

4-3. CSF100-12 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

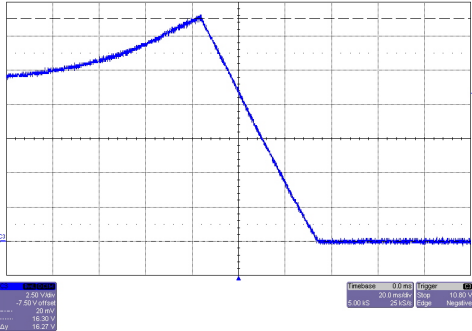
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|------------------------------|---|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | I _O = 100% | V _{Ripple} = 48mV V _{Noise} = 93mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | I _O = 100% | t _{turn on} = 337ms |  | CH1 100V/div 50.0ms/div CH4 5.00V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | I _O = 100% | t _{hold up} = 30.5ms |  | CH1 100V/div 10.0ms/div CH4 5.00V/div 10.0ms/div |
| (4) Over Current protection characteristics | | | | |
| Vin= 220V | I _O = 110~145% | O.C.P = 11.0A |  | X(CH3) 2.00A/div 200us/div Y(CH4) 2.00V/div 200us/div |

4-4. CSF100-12 Output characteristics

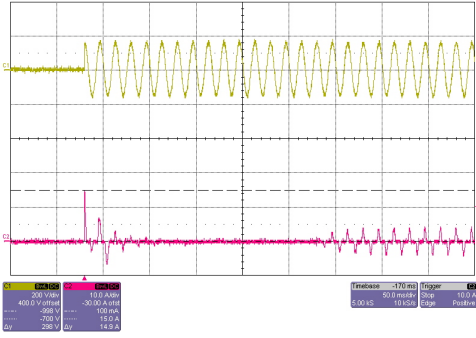
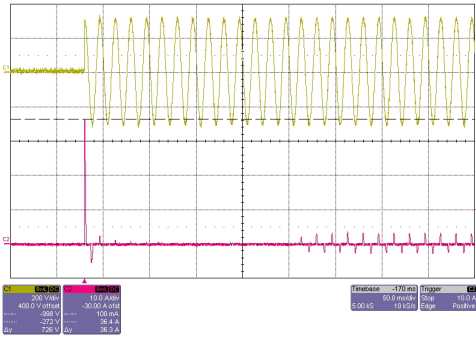
◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-------------------------|---------------|--|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 16.2V |  | CH3 2.50V/div 20.0ms/div |
| | | | | |
| | | | | |
| | | | | |

5-1. CSF100-15 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 | | | |
|---|---------------|----------------------|---|---|--------|--------|--------|
| (1) Inrush Current Characteristics (110V) | | | | | | | |
| Vin= 110V | Io= 100% | $I_{inrush} = 14.9A$ |  | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (2) Inrush Current Characteristics (220V) | | | | | | | |
| Vin= 220V | Io= 100% | $I_{inrush} = 36.3A$ |  | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (3) Input Current & Efficiency Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| Io \ Vin | | 85V | 110V | 132V | 170V | 220V | 264V |
| Load (min) | Input Current | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.721A | 0.550A | 0.459A | 0.352A | 0.272A | 0.224A |
| | Efficiency | 81% | 82% | 82% | 83% | 83% | 84% |
| Load (100%) | Input Current | 1.407A | 1.074A | 0.895A | 0.687A | 0.531A | 0.437A |
| | Efficiency | 83% | 84% | 84% | 85% | 85% | 86% |

5-2. CSF100-15 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)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 15.02V | 15.02V | 15.02V | 15.02V | 15.02V | 15.02V | 0mV |
| Load (50%) | 15.01V | 15.01V | 15.01V | 15.01V | 15.02V | 15.00V | 20mV |
| Load (100%) | 15.00V | 15.05V | 15.00V | 15.01V | 15.00V | 14.99V | 60mV |
| Load Regulation | 20mV | 40mV | 20mV | 10mV | 20mV | 30mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|--|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 63mV$ $V_{under} = 170mV$ | | CH3 100mV/div 2.00ms/div CH2 5.00A/div 2.00ms/div |
|-----------------|-------------------------------|--|--|--|

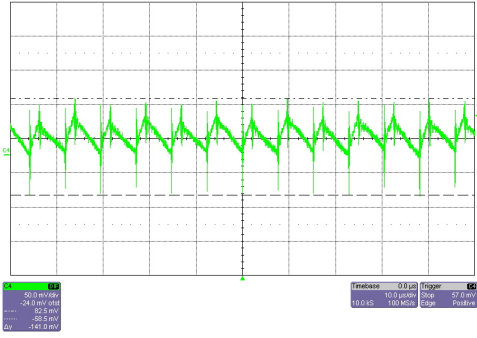
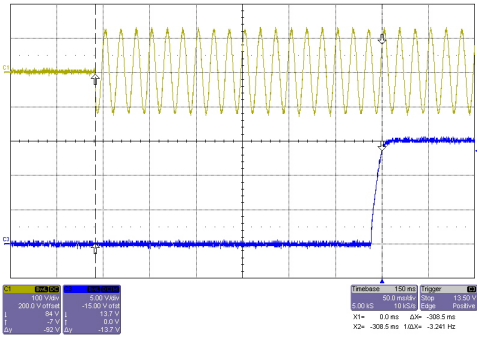
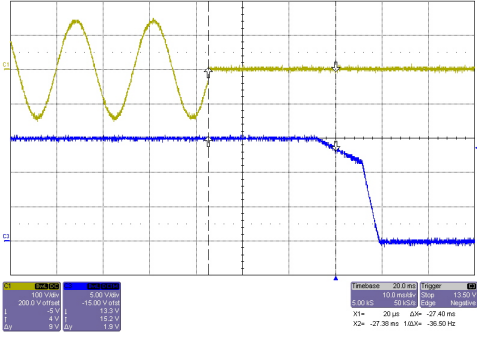
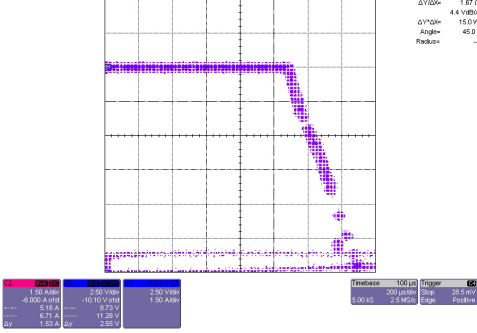
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|--|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 47mV$ $V_{under} = 100mV$ | | CH3 100mV/div 200us/div CH2 5.00A/div 200us/div |
|-----------------|------------------------------|--|--|--|

5-3. CSF100-15 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

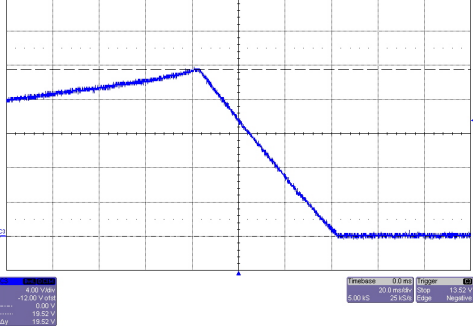
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|---------------------------|--|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | I _O = 100% | V _{Ripple} = 64mV V _{Noise} = 137mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | I _O = 100% | t _{turn on} = 308ms |  | CH1 100V/div 50.0ms/div CH4 5.00V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | I _O = 100% | t _{hold up} = 27.3ms |  | CH1 100V/div 10.0ms/div CH4 5.00V/div 10.0ms/div |
| (4) Over Current protection characteristics | | | | |
| Vin= 220V | I _O = 110~145% | O.C.P = 8.6A |  | X(CH3) 1.50A/div 200us/div Y(CH4) 2.50V/div 200us/div |

5-4. CSF100-15 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|----------------------|---------------|--|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 19.5V |  | CH3 4.00V/div 20.0ms/div |
| | | | | |
| | | | | |
| | | | | |

6-1. CSF100-24 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 | | | |
|--|-----------------------|-----------------------------|--------|---|--------|--------|--------|
| (1) Inrush Current Characteristics (110V) | | | | | | | |
| Vin= 110V | I _o = 100% | I _{inrush} = 15.9A | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (2) Inrush Current Characteristics (220V) | | | | | | | |
| Vin= 220V | I _o = 100% | I _{inrush} = 32.4A | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (3) Input Current & Efficiency Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| Vin | | 85V | 110V | 132V | 170V | 220V | 264V |
| I _o | Load (min) | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.720A | 0.550A | 0.458A | 0.347A | 0.268A | 0.223A |
| | Efficiency | 81% | 82% | 82% | 84% | 84% | 84% |
| Load (100%) | Input Current | 1.403A | 1.072A | 0.893A | 0.681A | 0.523A | 0.436A |
| | Efficiency | 83% | 84% | 84% | 86% | 86% | 86% |

6-2. CSF100-24 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

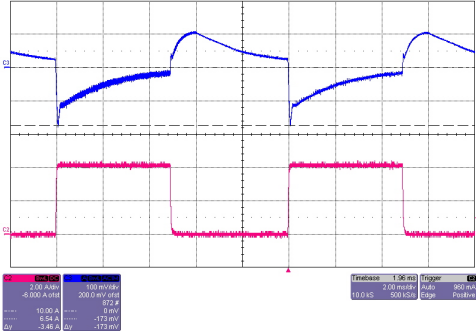
◇ CH2 : Output current – AP015 current probe (BW:20MHz)

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

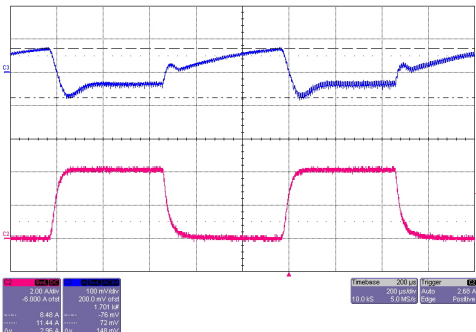
◆ Digital Multimeter : FLUKE189 (FLUKE)

| 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) | 24.04V | 24.04V | 24.04V | 24.04V | 24.04V | 24.04V | 0mV |
| Load (50%) | 24.03V | 24.02V | 24.00V | 24.03V | 24.02V | 24.00V | 30mV |
| Load (100%) | 24.02V | 24.01V | 23.99V | 24.02V | 24.01V | 23.99V | 30mV |
| Load Regulation | 20mV | 30mV | 50mV | 20mV | 30mV | 50mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|---|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 104mV$ $V_{under} = 178mV$ |  | CH3 100mV/div 2.00ms/div CH2 2.00A/div 2.00ms/div |
|-----------------|-------------------------------|---|--|--|

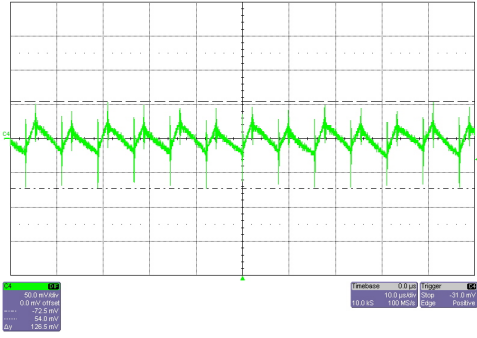
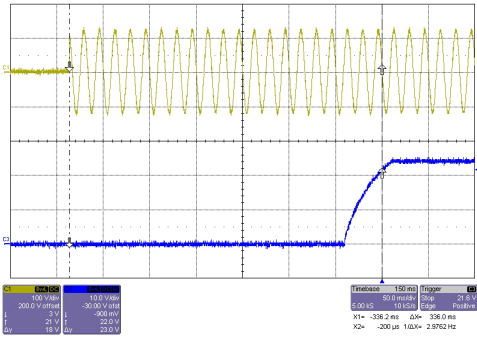
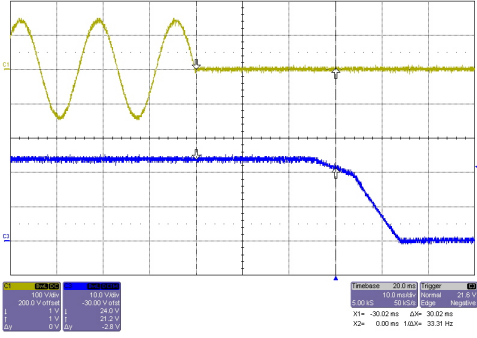
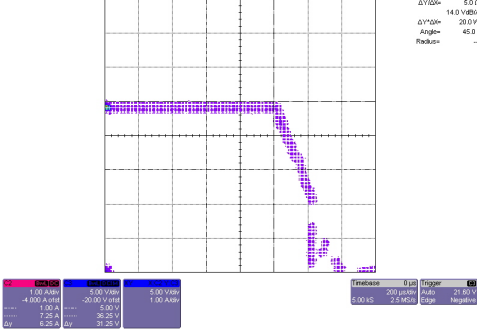
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|---|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 70mV$ $V_{under} = 71mV$ |  | CH3 100mV/div 200us/div CH2 2.00A/div 200us/div |
|-----------------|------------------------------|---|--|--|

6-3. CSF100-24 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|---------------------------|--|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | I _O = 100% | V _{Ripple} = 55mV V _{Noise} = 129mV |  | CH4 50.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | I _O = 100% | t _{turn on} = 336ms |  | CH1 100V/div 50.0ms/div CH4 10.0V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | I _O = 100% | t _{hold up} = 30.0ms |  | CH1 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 = 5.4A |  | X(CH3) 1.00A/div 200us/div Y(CH4) 5.00V/div 200us/div |

7-1. CSF100-48 Input characteristics

- ◆ Oscilloscope : WAVE PRO 7000(LeCroy)
 - ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
 - ◇ CH2 : Input current – AP015 current probe (BW:20MHz)
- ◆ Digital Multimeter : FLUKE189 (FLUKE)

| 입력 | 출력 | 측정값 | 파형 | 비고 | | | |
|--|-----------------------|-----------------------------|--------|---|--------|--------|--------|
| (1) Inrush Current Characteristics (110V) | | | | | | | |
| Vin= 110V | I _o = 100% | I _{inrush} = 16.1A | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (2) Inrush Current Characteristics (220V) | | | | | | | |
| Vin= 220V | I _o = 100% | I _{inrush} = 37.2A | | CH1 200V/div 50.0ms/div CH2 10.0A/div 50.0ms/div | | | |
| (3) Input Current & Efficiency Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| Vin | | 85V | 110V | 132V | 170V | 220V | 264V |
| I _o | Load (min) | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A | 0.00A |
| | Efficiency | - | - | - | - | - | - |
| Load (50%) | Input Current | 0.719A | 0.548A | 0.457A | 0.350A | 0.271A | 0.223A |
| | Efficiency | 81% | 82% | 82% | 83% | 83% | 84% |
| Load (100%) | Input Current | 1.417A | 1.082A | 0.901A | 0.692A | 0.528A | 0.440A |
| | Efficiency | 83% | 84% | 84% | 85% | 86% | 86% |

7-2. CSF100-48 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)

| 입력 | 출력 | 측정값 | 파형 | | | | 비고 |
|--|--------|--------|--------|--------|--------|--------|-----------------|
| (1) Line & Load Regulation Characteristics | | | | | | | |
| Condition Ta : 25°C | | | | | | | |
| V_{in} \ I_o | 85V | 110V | 132V | 170V | 220V | 264V | Line Regulation |
| Load (min) | 47.94V | 47.94V | 47.94V | 47.94V | 47.95V | 47.95V | 10mV |
| Load (50%) | 47.94V | 47.94V | 47.94V | 47.94V | 47.96V | 47.95V | 20mV |
| Load (100%) | 47.94V | 47.94V | 47.94V | 47.95V | 47.96V | 47.95V | 20mV |
| Load Regulation | 0mV | 0mV | 0mV | 10mV | 10mV | 0mV | |

(3) Dynamic Load Response Characteristics (100Hz)

| | | | | |
|-----------------|-------------------------------|---|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 100Hz | $V_{over} = 210mV$ $V_{under} = 495mV$ | | CH3 500mV/div 2.00ms/div CH2 1.00A/div 2.00ms/div |
|-----------------|-------------------------------|---|--|--|

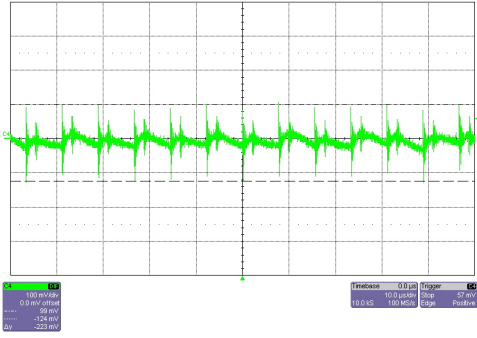
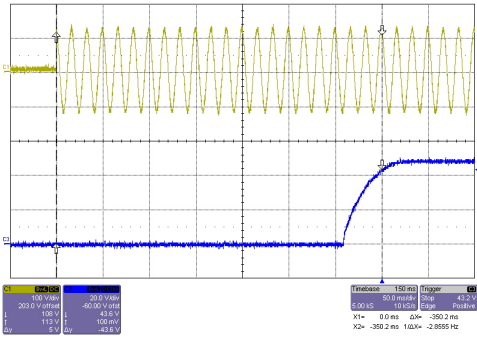
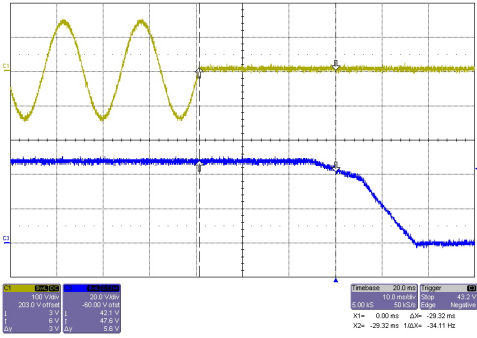
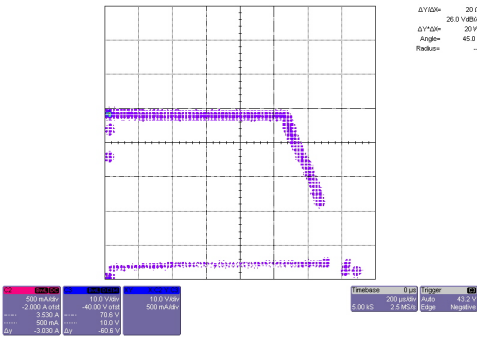
(4) Dynamic Load Response Characteristics (1kHz)

| | | | | |
|-----------------|------------------------------|---|--|--|
| $V_{in} = 220V$ | $I_o = 0 \sim 100\%$ 1kHz | $V_{over} = 140mV$ $V_{under} = 150mV$ | | CH3 500mV/div 200us/div CH2 1.00A/div 200us/div |
|-----------------|------------------------------|---|--|--|

7-3. CSF100-48 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

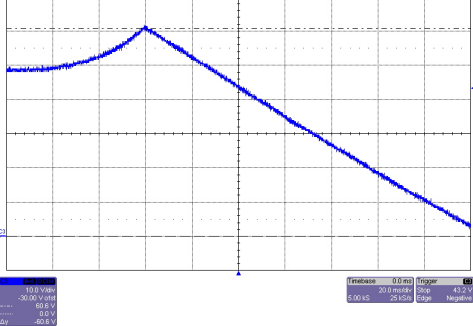
- ◇ CH1 : Input voltage – ADP305 High voltage differential probe(BW:200MHz)
- ◇ CH3 : Output current – AP015 current probe (BW:20MHz)
- ◇ CH4 : Output voltage – ADP305 High voltage differential probe(BW:200MHz)

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|---------------------------|--|--|--|
| (1) Ripple & Noise characteristics. | | | | |
| Vin= 220V | I _O = 100% | V _{Ripple} = 70mV V _{Noise} = 223mV |  | CH4 100.0mV/div 10.0us/div |
| (2) Turn on time characteristics | | | | |
| Vin= 85V | I _O = 100% | t _{turn on} = 350ms |  | CH1 100V/div 50.0ms/div CH4 20.0V/div 50.0ms/div |
| (3) Hold up characteristics | | | | |
| Vin= 100V | I _O = 100% | t _{hold up} = 29.3ms |  | CH1 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 = 2.7A |  | X(CH3) 0.50A/div 200us/div Y(CH4) 10.0V/div 200us/div |

7-4. CSF100-48 Output characteristics

◆ Oscilloscope : WAVE PRO 7000(LeCroy)

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

| 입력 | 출력 | 측정값 | 파형 | 비고 |
|---|-------------------------|---------------|--|--------------------------------|
| (1) Over-voltage protection characteristics | | | | |
| Vin= 220V | I _o = 10% | O.V.P = 60.6V |  | CH3 10.0V/div 20.0ms/div |
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