

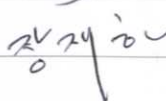


귀중

Evaluation Data

품 목	SMPS
품 명	JSF50-S
Rev. No.	A

2012년 9 월 14 일

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1-1. JSF50-3R3 Input Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (10A)	$I_{rush} = 18.7 [A]$		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (10A)	$I_{rush} = 34.4 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.034	0.034	0.036	0.043	0.051	0.058
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 5A	Input Current (A)	0.462	0.371	0.328	0.269	0.243	0.226
	Efficiency (%)	76.2	76.2	76.6	75.9	75.2	73.9
Load (100%) 10A	Input Current (A)	0.889	0.735	0.639	0.512	0.444	0.397
	Efficiency (%)	70.2	73.1	74.4	75.6	75.6	75.3
Leakage Current Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.21	0.25	0.43	0.45	-	-
Line N (mA)		0.21	0.24	0.44	0.46	-	-

1-2. JSF50-3R3 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE – PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT – AP015 Current probe (BANDWIDTH: 200MHz)

◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

Line & Load Regulation Characteristics							Condition Ta : 25 °C	
I_o \ V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
Load (0A)	3.364	3.364	3.364	3.363	3.363	3.363	1	
Load (50%)	3.358	3.357	3.357	3.357	3.357	3.357	1	
Load (100%)	3.351	3.351	3.351	3.351	3.350	3.350	1	
Load Regulation (mV)	13	13	13	12	13	13		

입력	출력	측정값	파형	비고
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Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 100uS	+VPK = 111mV (3.3%) -VPK = 147mV (4.4%)		CH1(전압) 100mV/div 5ms/div CH3(전류) 5A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 100uS	+VPK = 124mV (3.8%) -VPK = 126mV (3.8%)		CH1(전압) 100mV/div 500us/div CH3(전류) 5A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 10A	Ripple 6.0mV Ripple & Noise 30.0mV _{P-P}		CH4(전압) 10mV/div 10us/div
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1-2. JSF50-3R3 Output characteristics

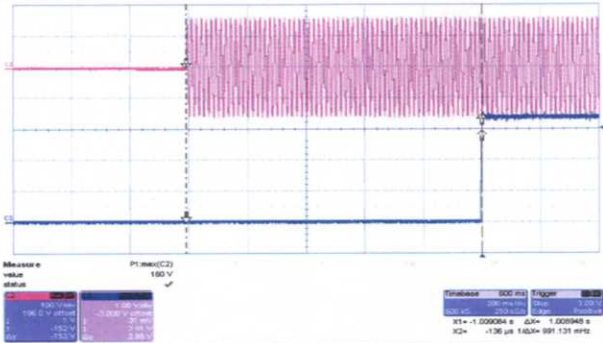
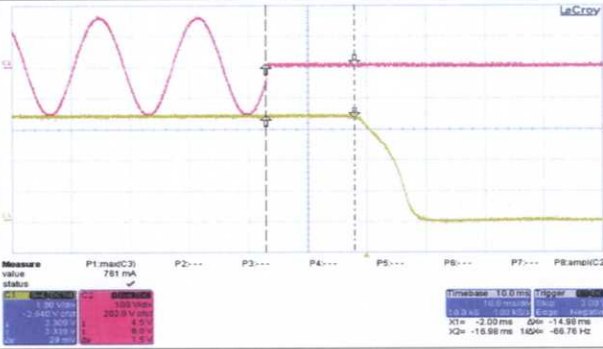
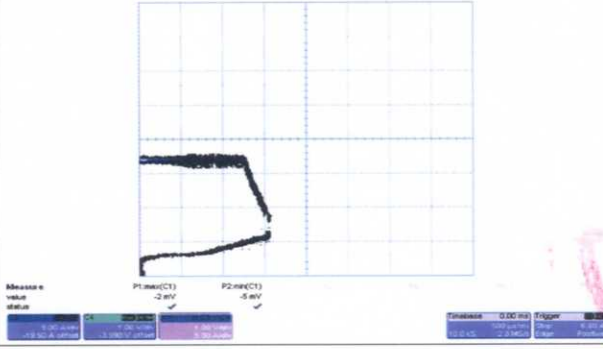
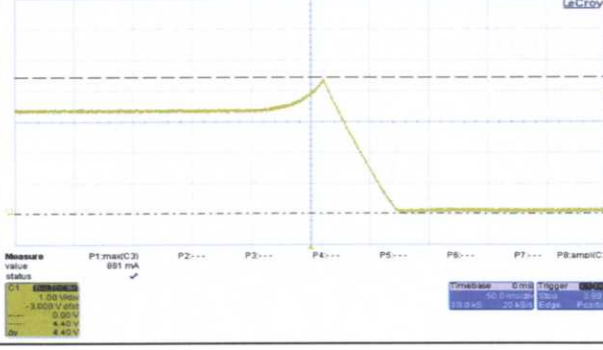
< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{on} = 1008\text{ms}$		CH3: 1.00V/div CH2: 100V/div 200ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{off} = 14.9\text{ms}$		CH1: 1.00V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o=0\text{A}\sim\text{가변}$	OCP= 12.8A (128%)		CH3(전압) 1.00V/div 500us/div CH4(전류) 5.00A/div 500us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 1.0A	OVP = 4.4V (133%)		CH1(전압) 1.00V/div 50.0ms/div

2-1. JSF50-05 Input Characteristics

< 계측기 >

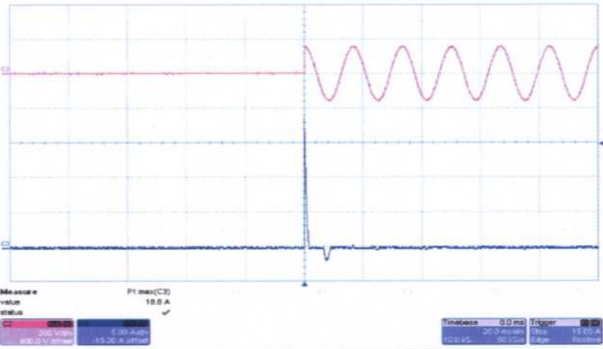
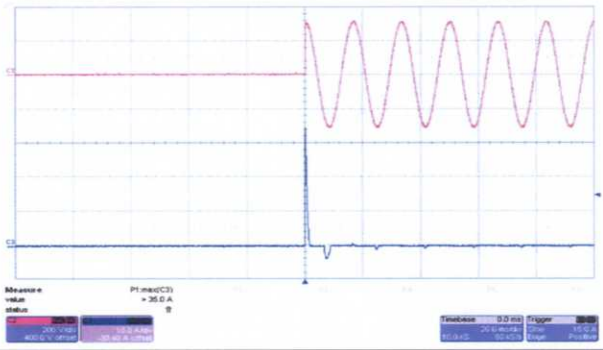
(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (10A)	$I_{rush} = 18.8 [A]$		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (10A)	$I_{rush} = 35.0 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition Ta : 25°C							
I_o \ V_{in}		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.031	0.033	0.037	0.045	0.053	0.062
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 5A	Input Current (A)	0.607	0.510	0.441	0.353	0.310	0.276
	Efficiency (%)	79.3	79.8	79.8	79.8	78.8	77.8
Load (100%) 10A	Input Current (A)	1.196	0.998	0.873	0.706	0.617	0.553
	Efficiency (%)	76.3	78.5	79.5	80.2	80.0	79.6
Leakage Current Characteristics Condition Ta : 25°C							
I_o \ V_{in}		88V	110V	220V	264V	-	-
Line L (mA)		0.22	0.26	0.44	0.46	-	-
Line N (mA)		0.22	0.25	0.44	0.47	-	-

2-2. JSF50-05 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

Line & Load Regulation Characteristics							Condition Ta : 25 °C	
V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
I_o								
Load (0A)	5.049	5.049	5.049	5.049	5.049	5.049	0	
Load (50%)	5.044	5.044	5.044	5.044	5.044	5.044	0	
Load (100%)	5.037	5.037	5.037	5.037	5.037	5.037	0	
Load Regulation (mV)	12	12	12	12	12	12		

입력	출력	측정값	파형	비고
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Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 200uS	+VPK = 180mV (3.6%) -VPK = 220mV (4.4%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 5A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 200uS	+VPK = 170mV (3.4%) -VPK = 130mV (2.6%)		CH1(전압) 200mV/div 500us/div CH3(전류) 5A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 10A	Ripple 7.0mV Ripple & Noise 38.0mV _{P-P}		CH4(전압) 10mV/div 10us/div
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2-2. JSF50-05 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{on} = 947ms$		CH3: 2.00V/div CH2: 100V/div 200ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{off} = 15.2ms$		CH1: 2.00V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o=$ 0A~가변	OCP= 12.7A (127%)		CH3(전압) 1.00V/div 2ms/div CH4(전류) 5.00A/div 2ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 1.0A	OVP = 6.5V (130%)		CH1(전압) 1.00V/div 50.0ms/div

3-1. JSF50-09 Input Characteristics

< 측정기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (5.6A)	$I_{rush} = 17.0$ [A]		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (5.6A)	$I_{rush} = 36.8$ [A]		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition Ta : 25°C							
$I_o \backslash V_{in}$		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.051	0.049	0.050	0.055	0.062	0.069
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 2.8A	Input Current (A)	0.631	0.535	0.468	0.381	0.328	0.305
	Efficiency (%)	81.7	82.2	81.7	81.5	79.4	77.9
Load (100%) 5.6A	Input Current (A)	1.153	0.959	0.823	0.666	0.572	0.516
	Efficiency (%)	80.6	81.9	82.1	82.5	81.9	81.5
Leakage Current Characteristics Condition Ta : 25°C							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.22	0.24	0.44	0.46	-	-
Line N (mA)		0.21	0.23	0.43	0.46	-	-

3-2. JSF50-09 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE – PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT – AP015 Current probe (BANDWIDTH: 200MHz)

◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

Line & Load Regulation Characteristics							Condition Ta : 25°C	
I_o \ V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
Load (0A)	9.058	9.058	9.058	9.058	9.058	9.058	0	
Load (50%)	9.054	9.055	9.054	9.054	9.054	9.054	0	
Load (100%)	9.050	9.050	9.049	9.049	9.050	9.050	1	
Load Regulation (mV)	8	8	9	9	8	8		

입력	출력	측정값	파형	비고
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Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	$+V_{PK} = 97\text{mV}$ (1.0%) $-V_{PK} = 48\text{mV}$ (0.5%)		CH1(전압) 50mV/div 5ms/div CH3(전류) 5A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 50uS	$+V_{PK} = 104\text{mV}$ (1.1%) $-V_{PK} = 71\text{mV}$ (0.8%)		CH1(전압) 50mV/div 500us/div CH3(전류) 5A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 5.6A	Ripple 8.0mV Ripple & Noise 44.0mV _{P-P}		CH4(전압) 20mV/div 10us/div
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3-2. JSF50-09 Output characteristics

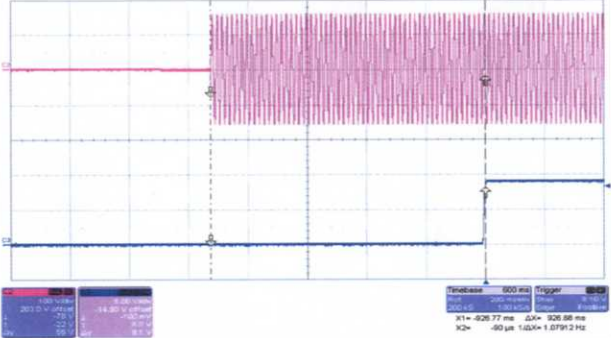
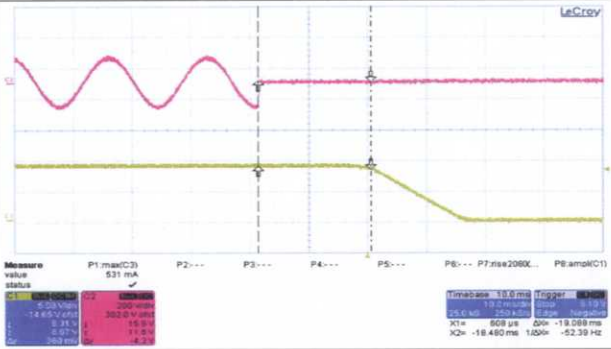
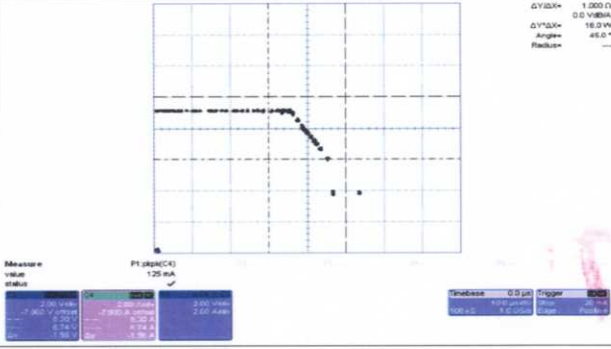
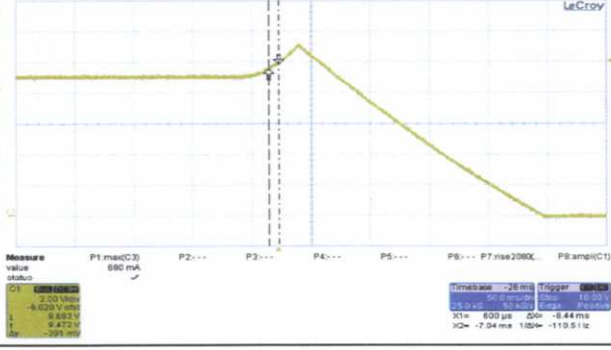
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(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 5.6A	$T_{on} = 926ms$		CH3: 5.00V/div CH2: 100V/div 200ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 5.6A	$T_{off} = 19.1ms$		CH1: 5.00V/div CH2: 200V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o = 0A \sim$ 가변	OCP = 7.4A (132%)		CH3(전압) 2.00V/div 10us/div CH4(전류) 2.00A/div 10us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 0.56A	OVP = 11.5V (127%)		CH1(전압) 2.00V/div 50.0ms/div

4-1. JSF50-12 Input Characteristics

< 측정기 >

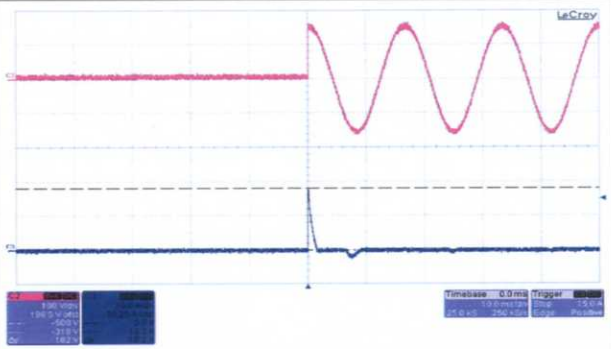
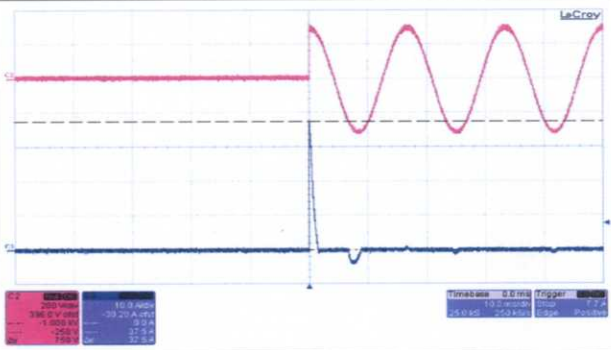
(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (4.2A)	$I_{rush} = 18.2 [A]$		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (4.2A)	$I_{rush} = 37.5 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.041	0.042	0.044	0.051	0.058	0.066
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 2.1A	Input Current (A)	0.612	0.523	0.462	0.375	0.331	0.030
	Efficiency (%)	83.8	84.3	84.0	83.8	81.9	81.6
Load (100%) 4.2A	Input Current (A)	1.12	0.936	0.815	0.653	0.572	0.517
	Efficiency (%)	83.2	84.6	85.3	85.3	84.7	84.0
Leakage Current Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.22	0.24	0.43	0.45	-	-
Line N (mA)		0.21	0.24	0.43	0.46	-	-

4-2. JSF50-12 Output Characteristics

< 계측기 >

(2) Oscilloscope: WAVESSSSSSSSSSSURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE – PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT – AP015 Current probe (BANDWIDTH: 200MHz)

◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

Line & Load Regulation Characteristics							Condition Ta : 25°C	
I_o \ V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
Load (0A)	12.058	12.062	12.062	12.064	12.065	12.065	7	
Load (50%)	12.053	12.058	12.057	12.059	12.058	12.059	6	
Load (100%)	12.047	12.049	12.051	12.051	12.051	12.051	4	
Load Regulation (mV)	9	13	11	13	14	14		

입력	출력	측정값	파형	비고
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Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	$+VPK = 80\text{mV}$ (0.7%) $-VPK = 103\text{mV}$ (0.9%)		CH1(전압) 100mV/div 5ms/div CH3(전류) 2A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 50uS	$+VPK = 59\text{mV}$ (0.5%) $-VPK = 71\text{mV}$ (0.6%)		CH1(전압) 100mV/div 500us /div CH3(전류) 2A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 4.2A	Ripple 7.0mV Ripple & Noise 44.0mV _{P-P}		CH4(전압) 10mV/div 10us/div
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4-2. JSF50-12 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 4.2A	$T_{on} = 686ms$		CH3: 5.00V/div CH2: 100V/div 100ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 4.2A	$T_{off} = 15.4ms$		CH1: 5.00V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o =$ 0A~가변	OCP = 5.3A (126%)		CH3(전압) 2.00V/div 5us/div CH4(전류) 1.00A/div 5us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 0.42A	OVP = 15.3V (128%)		CH1(전압) 5.00V/div 50ms/div

5-1. JSF50-15 Input Characteristics

< 측정기 >

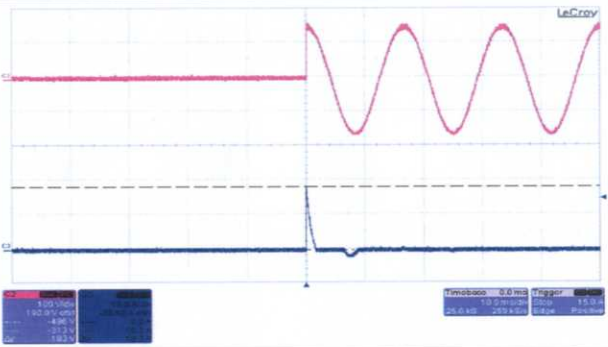
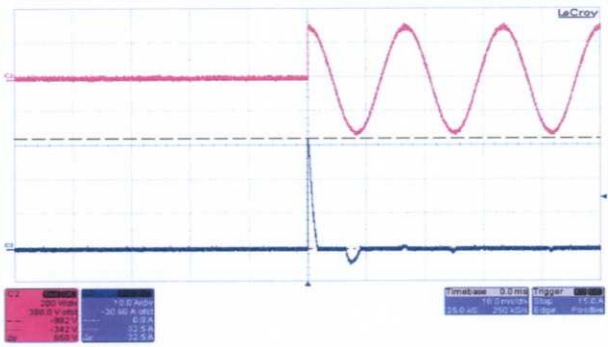
(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (3.4A)	$I_{rush} = 18.3 [A]$		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (3.4A)	$I_{rush} = 32.5 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.043	0.043	0.045	0.051	0.058	0.066
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 1.7A	Input Current (A)	0.605	0.515	0.452	0.367	0.322	0.294
	Efficiency (%)	87.6	88.2	87.6	87.0	85.3	83.1
Load (100%) 3.4A	Input Current (A)	1.098	0.909	0.793	0.632	0.551	0.493
	Efficiency (%)	85.5	86.9	87.4	87.4	86.9	86.1
Leakage Current Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.21	0.24	0.43	0.45	-	-
Line N (mA)		0.20	0.23	0.42	0.44	-	-

5-2. JSF50-15 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

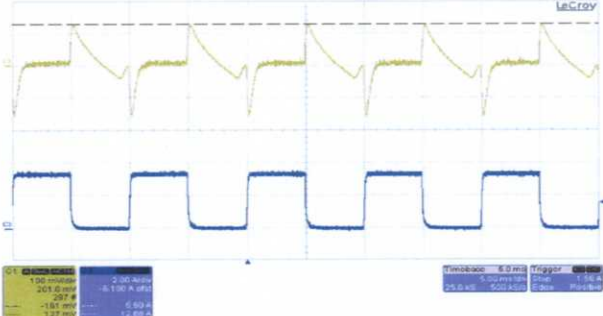
◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

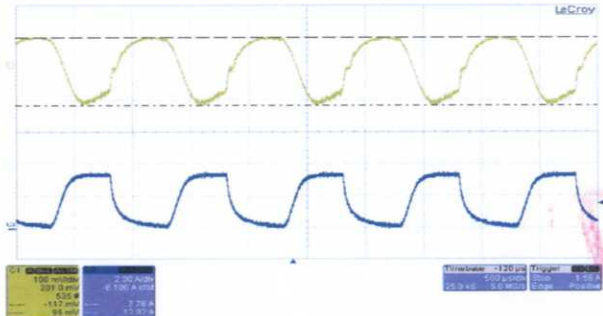
Line & Load Regulation Characteristics							Condition	Ta : 25°C
I_o \ V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
Load (0A)	15.052	15.053	15.053	15.054	15.054	15.056	4	
Load (50%)	15.048	15.049	15.049	15.050	15.050	15.052	4	
Load (100%)	15.043	15.044	15.044	15.045	15.045	15.047	4	
Load Regulation (mV)	9	9	9	9	9	9		

입력	출력	측정값	파형	비고
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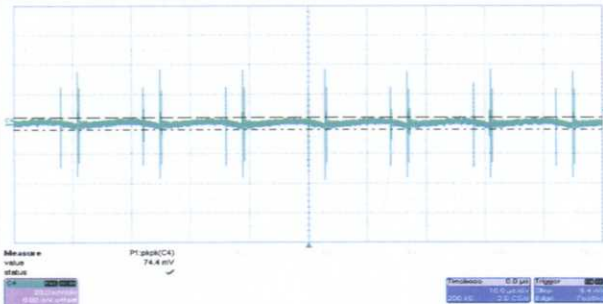
Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ fs=100Hz Duty=50% Slew rate 50uS	+VPK = 161mV (1.1%) -VPK = 127mV (0.9%)		CH1(전압) 100mV/div 5ms/div CH3(전류) 2A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ fs=1Kz Duty=50% Slew rate 50uS	+VPK = 117mV (0.8%) -VPK = 95mV (0.6%)		CH1(전압) 100mV/div 500us/div CH3(전류) 2A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 3.4A	Ripple 8.0mV Ripple & Noise 75.0mV _{P-P}		CH4(전압) 20mV/div 10us/div
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5-2. JSF50-15 Output characteristics

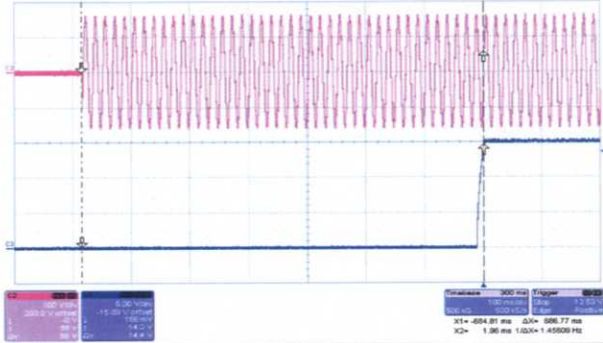
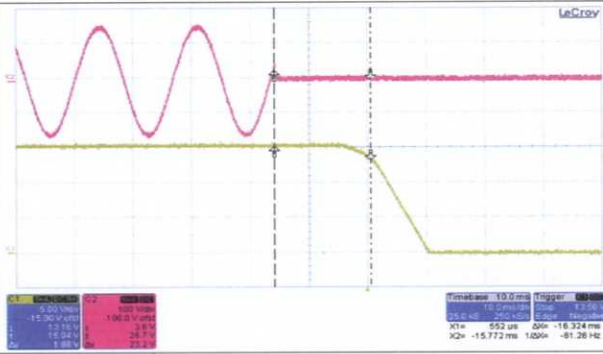
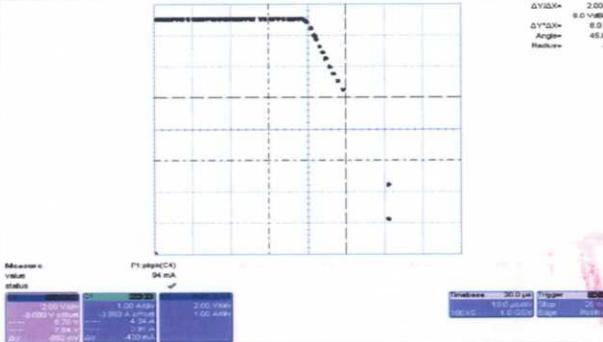
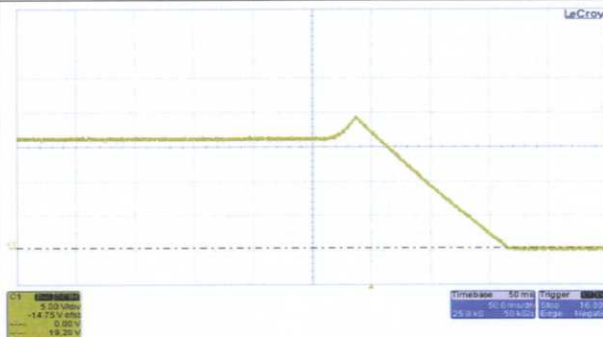
< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 3.4A	$T_{on} = 686ms$		CH3: 5.00V/div CH2: 100V/div 100ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 3.4A	$T_{off} = 16.3ms$		CH1: 5.00V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o =$ 0A~가변	OCP = 4.1A (125%)		CH3(전압) 5.00V/div 10us/div CH4(전류) 1.00A/div 10us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 0.34A	OVP = 19.2V (128%)		CH1(전압) 5.00V/div 50.0ms/div

6-1. JSF50-24 Input Characteristics

< 측정기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고				
Inrush Current Characteristics (110V)								
AC110V	$I_o=100\%$ (2.2A)	$I_{rush} = 17.0$ [A]		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div				
Inrush Current Characteristics (220V)								
AC220V	$I_o=100\%$ (2.2A)	$I_{rush} = 35.8$ [A]		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div				
Input Current & Efficiency Characteristics							Condition Ta : 25℃	
I_o \ V_{in}		88V	110V	132V	170V	220V	264V	
Load (min) 0A	Input Current (A)	0.050	0.049	0.050	0.057	0.063	0.070	
	Efficiency (%)	-	-	-	-	-	-	
Load (50%) 1.1A	Input Current (A)	0.620	0.540	0.476	0.391	0.346	0.312	
	Efficiency (%)	78.2	78.5	78.8	77.5	76.5	75.3	
Load (100%) 2.2A	Input Current (A)	1.125	0.957	0.836	0.677	0.595	0.508	
	Efficiency (%)	84.9	86.0	86.6	86.9	86.4	85.4	
Leakage Current Characteristics							Condition Ta : 25℃	
I_o \ V_{in}		88V	110V	220V	264V	-	-	
Line L (mA)		0.22	0.24	0.43	0.45	-	-	
Line N (mA)		0.21	0.23	0.43	0.45	-	-	

6-2. JSF50-24 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

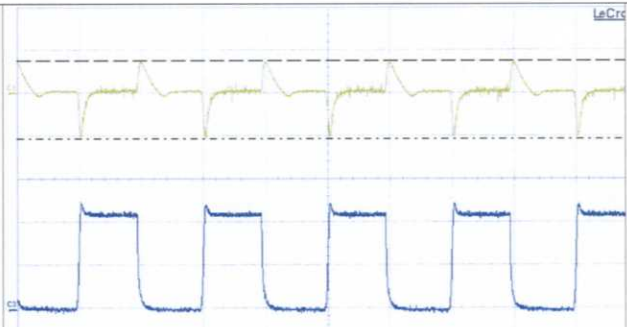
◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

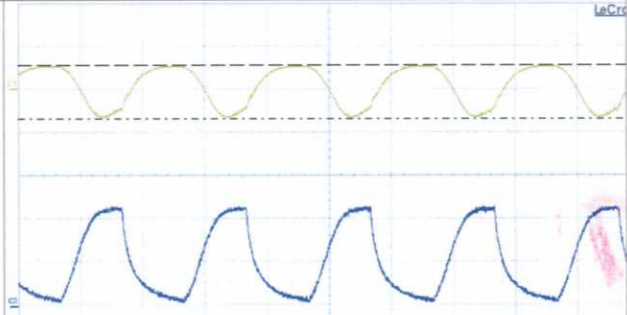
Line & Load Regulation Characteristics							Condition Ta : 25°C	
V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
I_o								
Load (0A)	24.029	24.029	24.029	24.030	24.029	24.029	1	
Load (50%)	24.024	24.025	24.026	24.026	24.024	24.024	2	
Load (100%)	24.018	24.026	24.019	24.020	24.019	24.026	2	
Load Regulation (mV)	11	10	10	10	10	9		

입력	출력	측정값	파형	비고
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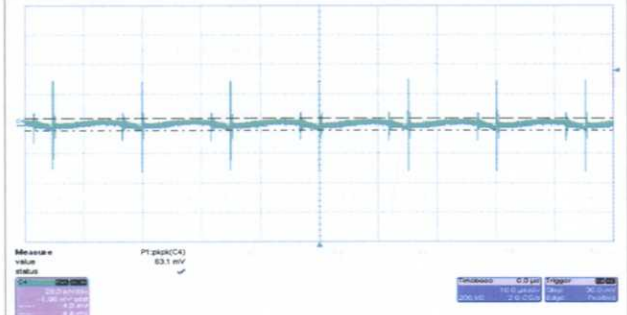
Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50 μs	+VPK = 152mV (0.6%) -VPK = 212mV (0.9%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 1A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 50 μs	+VPK = 110mV (0.5%) -VPK = 138mV (0.4%)		CH1(전압) 200mV/div 500us/div CH3(전류) 1A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 2.2A	Ripple 9.0mV Ripple & Noise 63.0mV _{P-P}		CH4(전압) 20mV/div 10us/div
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6-2. JSF50-24 Output characteristics

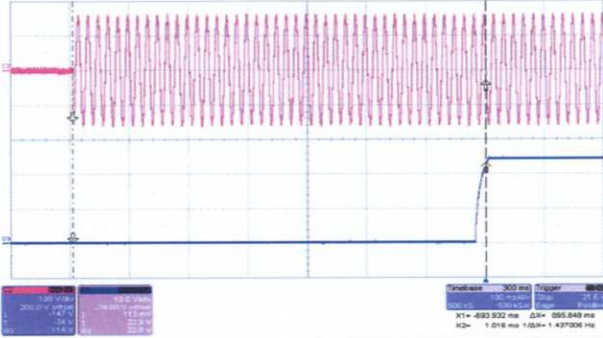
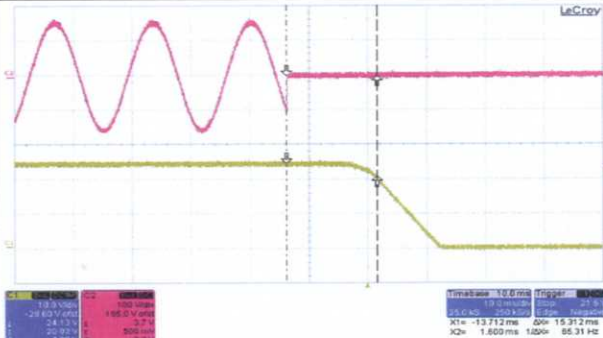
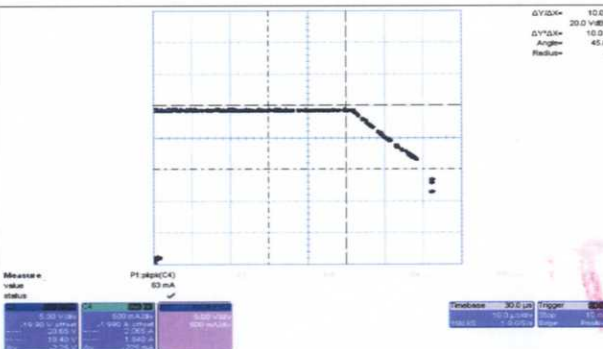
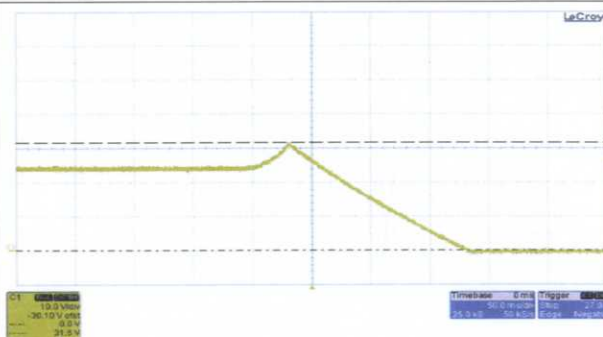
< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 2.2A	$T_{on} = 695ms$		CH3: 10.0V/div CH2: 100V/div 100ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 2.2A	$T_{off} = 15.3ms$		CH1: 10.0V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o=$ 0A~가변	OCP= 2.7A (127%)		CH3(전압) 5.00V/div 10us/div CH4(전류) 500mA/div 10us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 0.22A	OVP = 31.5V (131%)		CH1(전압) 10.0V/div 50.0ms/div

7-1. JSF50-48 Input Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3 : INPUT CURRENT - AP015 Current probe (BANDWIDTH: 200MHz)

(2) Power Analyzer: 3332 (HIOKI)

(3) Leakage Current Tester: 3226 (YOKOGAWA)

입력	출력	측정값	파형	비고			
Inrush Current Characteristics (110V)							
AC110V	$I_o=100\%$ (1.1A)	$I_{rush} = 19.4 [A]$		CH2(전압) 100V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (1.1A)	$I_{rush} = 35.7 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Input Current & Efficiency Characteristics Condition Ta : 25°C							
I_o \ V_{in}		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.045	0.045	0.046	0.053	0.059	0.066
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 0.55A	Input Current (A)	0.609	0.532	0.457	0.370	0.324	0.291
	Efficiency (%)	85.0	85.8	85.5	85.0	83.6	82.8
Load (100%) 1.1A	Input Current (A)	1.117	0.947	0.818	0.643	0.554	0.490
	Efficiency (%)	84.5	85.9	86.3	86.3	86.1	85.2
Leakage Current Characteristics Condition Ta : 25°C							
I_o \ V_{in}		88V	110V	220V	264V	-	-
Line L (mA)		0.22	0.25	0.43	0.45	-	-
Line N (mA)		0.22	0.25	0.44	0.46	-	-

7-2. JSF50-48 Output Characteristics

< 계측기 >

(1) Oscilloscope: WAVESURFER 454 (LeCroy)

◇ CH1 : OUTPUT VOLTAGE – PP005-WS Passive Voltage probe (BANDWIDTH: 200MHz)

◇ CH3 : OUTPUT CURRENT – AP015 Current probe (BANDWIDTH: 200MHz)

◇ CH4 : BNC Cable 1.5m, 50Ω (BANDWIDTH: 200MHz)

(2) Digital Multi Meter: 2000 (KEITHLEY)

Line & Load Regulation Characteristics

Condition Ta : 25 °C

I_o \ V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)
Load (0A)	48.083	48.082	48.083	48.085	48.086	48.085	2
Load (50%)	48.076	48.077	48.078	48.080	48.081	48.080	4
Load (100%)	48.057	48.067	48.071	48.076	48.072	48.071	14
Load Regulation (mV)	26	15	12	9	14	14	

입력

출력

측정값

파형

비고

Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 280mV (0.6%) -VPK = 350mV (0.7%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 0.5A/div 5ms/div
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Dynamic Load Response Characteristics (1KHz)

AC220V	$I_o=0 \leftrightarrow 100\%$ $f_s=1\text{Kz}$ Duty=50% Slew rate 50uS	+VPK = 162mV (0.3%) -VPK = 170mV (0.4%)		CH1(전압) 200mV/div 500us/div CH3(전류) 0.5A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 1.1A	Ripple 9.0mV Ripple & Noise 61.0mV _{P-P}		CH1(전압) 20mV/div 10us/div
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7-2. JSF50-48 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

◇ CH1(3) : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)

◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)

◇ CH3(4) : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 1.1A	$T_{on} = 670ms$		CH3: 20.0V/div CH2: 100V/div 100ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 1.1A	$T_{off} = 17.4ms$		CH1: 20.0V/div CH2: 100V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o = 0A \sim$ 가변	OCP = 1.46A (132%)		CH3(전압) 10.0V/div 50ms/div CH4(전류) 500mA/div 50ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$ 0.11A	OVP = 62.0V (129%)		CH1(전압) 10.0V/div 50.0ms/div