

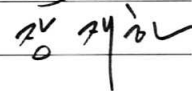


Evaluation Data

품 목	SMPS
품 명	JSF150-S
Rev. No.	A

2012 년 6 월 15 일

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1-1. JSF150-3R3 Input Characteristics

< 계측기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (30A)	$I_{rush} = 51.7 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (30A)	$I_{rush} = 49.8 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/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)	0.06	0.06	0.07	0.05	0.07	0.07
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 15A	Input Current (A)	1.08	0.91	0.82	0.67	0.63	0.50
	Efficiency (%)	78.5	79.5	78	79	79.2	77.8
Load (100%) 30A	Input Current (A)	2.40	1.74	1.53	1.30	1.19	0.95
	Efficiency (%)	75.6	76.6	76.3	76.1	76.7	76.5
Leakage Current Characteristics				Condition $T_a : 25^\circ C$			
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.34	0.39	0.65	0.7	-	-
Line N (mA)		0.34	0.38	0.66	0.7	-	-

1-2. JSF150-3R3 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)	3.309	3.309	3.307	3.307	3.304	3.306	5
Load (50%)	3.310	3.309	3.307	3.308	3.305	3.305	5
Load (100%)	3.311	3.310	3.307	3.309	3.306	3.306	5
Load Regulation (mV)	2	1	0	2	2	1	

입력

출력

측정값

파형

비고

Dynamic Load Response Characteristics (100Hz)

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 131mV (2.62%)* -VPK = 285mV (5.70%)* * 출력 5V 기준 적용		CH1(전압) 200mV/div 5ms/div CH3(전류) 10A/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 = 214mV (4.28%)* -VPK = 310mV (6.20%)* * 출력 5V 기준 적용		CH1(전압) 200mV/div 500us/div CH3(전류) 10A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 30A	Ripple 29.8mV Ripple & Noise 35.8mV _{P-P}		CH4(전압) 20mV/div 20us/div
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1-2. JSF150-3R3 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

- ◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)
- ◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)
- ◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 30A	$T_{on} = 720ms$		CH1: 2.00V/div CH2: 200/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 30A	$T_{off} = 42.3ms$		CH1: 2.00V/div CH2: 200V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 36A (120%)		CH1(전압) 1.00V/div 500us/div CH3(전류) 10.0A/div 500us/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 4.1[V] (139%)		CH1(전압) 2.00V/div 50.0ms/div

2-1. JSF150-05 Input Characteristics

< 계측기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (26A)	$I_{rush} = 49.1 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (26A)	$I_{rush} = 48.5 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Input Current & Efficiency Characteristics				Condition $T_a : 25^\circ C$			
$I_o \backslash Vin$		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.08	0.08	0.08	0.06	0.07	0.08
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 13A	Input Current (A)	1.35	1.13	1.01	0.85	0.76	0.62
	Efficiency (%)	81.2	82	80.9	82.6	81.5	81.2
Load (100%) 26A	Input Current (A)	2.64	2.14	1.89	1.60	1.44	1.17
	Efficiency (%)	78.5	79.9	79.2	78.7	79.2	79.5
Leakage Current Characteristics				Condition $T_a : 25^\circ C$			
$I_o \backslash Vin$		88V	110V	220V	264V	-	-
Line L (mA)		0.32	0.39	0.62	0.7	-	-
Line N (mA)		0.32	0.39	0.61	0.71	-	-

2-2. JSF150-05 Output Characteristics

< 측정기 >

(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)	5.000	5.001	5.001	5.002	5.005	5.003	5	
Load (50%)	5.002	5.003	5.003	5.004	5.006	5.004	4	
Load (100%)	5.003	5.004	5.005	5.005	5.007	5.006	4	
Load Regulation (mV)	3	3	4	3	2	3		

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50 μs	+VPK = 8.6mV (1.72%) -VPK = 18.2mV (3.64%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 20A/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 = 15.7mV (3.14%) -VPK = 22.7mV (4.54%)		CH1(전압) 200mV/div 500us/div CH3(전류) 20A/div 500us/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 26A	Ripple 44.5mV Ripple & Noise 59mV_{P-P}		CH4(전압) 50mV/div 10us/div
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2-2. JSF150-05 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

- ◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)
- ◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)
- ◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 26A	$T_{on} = 783.8ms$		CH1: 2.00V/div CH2: 200/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 26A	$T_{off} = 32.1ms$		CH1: 2.00V/div CH2: 200V/div 10.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 32.5A (125%)		CH1(전압) 1.00V/div 2.00ms/div CH3(전류) 5.00A/div 2.00ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 6.94[V] (138%)		CH1(전압) 2.00V/div 50.0ms/div

3-1. JSF150-09 Input Characteristics

< 계측기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (16.5A)	$I_{rush} = 45.5 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (16.5A)	$I_{rush} = 49 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/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)	0.05	0.06	0.06	0.05	0.05	0.06
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 8.25A	Input Current (A)	1.50	1.23	1.10	0.92	0.84	0.67
	Efficiency (%)	84.3	84.3	83.4	84.4	84.3	83.4
Load (100%) 16.5A	Input Current (A)	2.89	2.32	2.03	1.71	1.57	1.24
	Efficiency (%)	81.9	83.2	83	83.1	83.4	83.3
Leakage Current Characteristics Condition $T_a : 25^\circ C$							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.35	0.4	0.62	0.69	-	-
Line N (mA)		0.33	0.36	0.62	0.69	-	-

3-2. JSF150-09 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	
V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
I_o								
Load (0A)	9.021	9.020	9.019	9.017	9.011	9.013	10	
Load (50%)	9.017	9.015	9.015	9.013	9.008	9.009	9	
Load (100%)	9.015	9.015	9.015	9.012	9.008	9.009	7	
Load Regulation (mV)	6	5	4	5	3	4		

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 200mV (2.22%) -VPK = 296mV (3.29%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 20A/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 = 316mV (3.5%) -VPK = 312mV (3.4%)		CH1(전압) 200mV/div 1ms/div CH3(전류) 20A/div 1ms/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 16.5A	Ripple 66.5mV Ripple & Noise 69mV _{P-P}		CH4(전압) 50mV/div 10us/div
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3-2. JSF150-09 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454.(LeCroy)

- ◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)
- ◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)
- ◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 16.5A	$T_{on} = 675.6\text{ms}$		CH1: 5.00V/div CH2: 200/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 16.5A	$T_{off} = 26.8\text{ms}$		CH1: 5.00V/div CH2: 200V/div 20.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 19.8A (120%)		CH1(전압) 2.00V/div 2.00ms/div CH3(전류) 5.00A/div 2.00ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 12.0[V] (133%)		CH1(전압) 5.00V/div 500ms/div

4-1. JSF150-12 Input Characteristics

< 계측기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (12.5A)	$I_{rush} = 50.4 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 10A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (12.5A)	$I_{rush} = 49.1 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Input Current & Efficiency Characteristics Condition Ta : 25°C							
I_o \ Vin		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.06	0.06	0.06	0.05	0.06	0.06
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 6.25A	Input Current (A)	1.49	1.22	1.10	0.91	0.85	0.67
	Efficiency (%)	85.2	86.2	84.2	86	85.3	84.2
Load (100%) 12.5A	Input Current (A)	2.81	2.28	2.02	1.69	1.58	1.23
	Efficiency (%)	84	84.9	84.6	84.9	85.1	85
Leakage Current Characteristics Condition Ta : 25°C							
I_o \ Vin		88V	110V	220V	264V	-	-
Line L (mA)		0.3	0.35	0.6	0.69	-	-
Line N (mA)		0.3	0.35	0.58	0.7	-	-

4-2. JSF150-12 Output Characteristics

< 측정기 >

(2) 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)	12.158	12.158	12.159	12.158	12.159	12.158	1	
Load (50%)	12.146	12.146	12.147	12.146	12.148	12.146	2	
Load (100%)	12.134	12.135	12.135	12.134	12.134	12.136	2	
Load Regulation (mV)	24	23	24	24	25	22		

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50 μs	+VPK = 125mV (1.04%) -VPK = 272mV (2.26%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 10A/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 = 221mV (1.84%) -VPK = 278mV (2.31%)		CH1(전압) 200mV/div 1ms/div CH3(전류) 10A/div 1ms/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 12.5A	Ripple 44mV Ripple & Noise 61mV _{P-P}		CH4(전압) 50mV/div 10us/div
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4-2. JSF150-12 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

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

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

◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 12.5A	$T_{on} = 880ms$		CH1: 5.00V/div CH2: 200V/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 12.5A	$T_{off} = 29.6ms$		CH1: 5.00V/div CH2: 200V/div 20.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 15.2A (121%)		CH1(전압) 2.00V/div 2.00ms/div CH3(전류) 5.00A/div 2.00ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 16.0[V] (133%)		CH1(전압) 5.00V/div 50.0ms/div

5-1. JSF150-15 Input Characteristics

< 측정기 >

(1) Oscilloscope: WavePro 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)	$I_{rush} = 49.1$ [A]		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (10A)	$I_{rush} = 49.1$ [A]		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Input Current & Efficiency Characteristics Condition $T_a : 25^\circ\text{C}$							
I_o \ V_{in}		88V	110V	132V	170V	220V	264V
Load (min) 0A	Input Current (A)	0.06	0.06	0.06	0.05	0.06	0.07
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 5A	Input Current (A)	1.62	1.22	1.09	0.93	0.82	0.68
	Efficiency (%)	85.7	86.6	85.2	88.2	86.2	85.2
Load (100%) 10A	Input Current (A)	3.20	2.26	2.00	1.70	1.52	1.24
	Efficiency (%)	83.7	85.8	85.9	86.4	86	86.1
Leakage Current Characteristics Condition $T_a : 25^\circ\text{C}$							
I_o \ V_{in}		88V	110V	220V	264V	-	-
Line L (mA)		0.3	0.37	0.6	0.7	-	-
Line N (mA)		0.31	0.36	0.63	0.7	-	-

5-2. JSF150-15 Output Characteristics

< 측정기 >

(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)	15.041	15.035	15.035	15.032	15.033	15.033	19	
Load (50%)	15.030	15.026	15.024	15.021	15.021	15.023	9	
Load (100%)	15.021	15.021	15.018	15.012	15.015	15.009	12	
Load Regulation (mV)	20	14	17	20	18	24		

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 189mV (1.26%) -VPK = 234mV (1.56%)		CH1(전압) 200mV/div 5ms/div CH3(전류) 10A/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 = 227mV (1.5%) -VPK = 291mV (1.9%)		CH1(전압) 200mV/div 1ms/div CH3(전류) 10A/div 1ms/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 10A	Ripple 64.5mV Ripple & Noise 72mV _{P-P}		CH4(전압) 50mV/div 10us/div
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5-2. JSF150-15 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

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

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

◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{on} = 871ms$		CH1: 5.00V/div CH2: 200V/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 10A	$T_{off} = 29.9ms$		CH1: 5.00V/div CH2: 200V/div 20.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 12.4A (124%)		CH1(전압) 5.00V/div 2.00ms/div CH3(전류) 2.00A/div 2.00ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 18.7[V] (125%)		CH1(전압) 5.00V/div 50.0ms/div

6-1. JSF150-24 Input Characteristics

< 측정기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (6.5A)	$I_{rush} = 51.7 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (6.5A)	$I_{rush} = 49.8 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/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)	0.08	0.08	0.08	0.06	0.07	0.07
	Efficiency (%)	-	-	-	-	-	-
Load (50%) 3.25A	Input Current (A)	1.53	1.25	1.12	0.93	0.87	0.68
	Efficiency (%)	86	86.6	85.7	87.6	86.6	85
Load (100%) 6.5A	Input Current (A)	2.91	2.32	2.05	1.73	1.58	1.24
	Efficiency (%)	85.5	86.6	86.4	86.6	87	86.8
Leakage Current Characteristics Condition Ta : 25°C							
$I_o \backslash V_{in}$		88V	110V	220V	264V	-	-
Line L (mA)		0.32	0.39	0.6	0.7	-	-
Line N (mA)		0.32	0.36	0.66	0.7	-	-

6-2. JSF150-24 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	
I_o	V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)
Load (0A)		24.062	24.063	24.061	24.062	24.061	24.060	3
Load (50%)		24.061	24.060	24.059	24.060	24.057	24.058	4
Load (100%)		24.063	24.062	24.065	24.061	24.063	24.064	4
Load Regulation (mV)		2	3	6	2	6	6	

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 252mV (1.0%) -VPK = 436mV (1.8%)		CH1(전압) 500mV/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	+VPK = 462mV (1.9%) -VPK = 558mV (2.3%)		CH1(전압) 500mV/div 1ms/div CH3(전류) 5A/div 1ms/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 6.5A	Ripple 42.5mV Ripple & Noise 54mV_{P-P}		CH4(전압) 50mV/div 10us/div
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6-2. JSF150-24 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

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

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

◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 6.5A	$T_{on} = 928ms$		CH1: 10.0V/div CH2: 200/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 6.5A	$T_{off} = 30ms$		CH1: 10.0V/div CH2: 200V/div 20.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 7.9A (121%)		CH1(전압) 5.00V/div 2.00ms/div CH3(전류) 2.00A/div 2.00ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 30.0[V] (125%)		CH1(전압) 10.0V/div 50.0ms/div

7-1. JSF150-48 Input Characteristics

< 측정기 >

(1) Oscilloscope: WavePro 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	$I_o=100\%$ (3.3A)	$I_{rush} = 51.7 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Inrush Current Characteristics (220V)							
AC220V	$I_o=100\%$ (3.3A)	$I_{rush} = 49.1 [A]$		CH2(전압) 200V/div 10ms/div CH3(전류) 20A/div 10ms/div			
Input Current & Efficiency Characteristics Condition $T_a : 25^\circ C$							
V_{in}		88V	110V	132V	170V	220V	264V
I_o	Load (min)	0.08	0.09	0.09	0.06	0.08	0.08
	0A	Efficiency (%)	-	-	-	-	-
1.65	Load (50%)	1.54	1.27	1.13	0.93	0.87	0.7
	Efficiency (%)	86.6	86.9	85.6	87.5	86.8	85.3
3.3A	Load (100%)	2.95	2.36	2.07	1.75	1.60	1.28
	Efficiency (%)	85.6	86.8	86.7	87	87.3	87
Leakage Current Characteristics Condition $T_a : 25^\circ C$							
V_{in}		88V	110V	220V	264V	-	-
I_o	Line L (mA)	0.33	0.38	0.61	0.71	-	-
	Line N (mA)	0.33	0.35	0.65	0.71	-	-

7-2. JSF150-48 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	
V_{in}	88V	110V	132V	170V	220V	264V	Line Regulation (mV)	
I_o								
Load (0A)	48.054	48.056	48.056	48.061	48.052	48.067	13	
Load (50%)	48.053	48.067	48.064	48.061	48.059	48.046	21	
Load (100%)	48.075	48.070	48.070	48.082	48.066	48.012	70	
Load Regulation (mV)	22	14	14	21	14	55		

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

AC220V	$I_o=10 \leftrightarrow 100\%$ $f_s=100\text{Hz}$ Duty=50% Slew rate 50uS	+VPK = 280mV (0.6%) -VPK = 504mV (1.0%)		CH1(전압) 500mV/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 = 456mV (0.9%) -VPK = 552mV (1.1%)		CH1(전압) 500mV/div 1ms/div CH3(전류) 2A/div 1ms/div
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Ripple & Noise Characteristics

AC220V	$I_o=100\%$ 3.3A	Ripple 12.6mV Ripple & Noise 26.9mV_{P-P}		CH1(전압) 20mV/div 20us/div
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7-2. JSF150-48 Output characteristics

< 계측기 >

(3) Oscilloscope : WAVESURFER 454 (LeCroy)

- ◇ CH1 : OUTPUT VOLTAGE - PP005-WS Passive probe (BANDWIDTH: 200MHz)
- ◇ CH2 : INPUT VOLTAGE - ADP305 High voltage differential probe (BANDWIDTH: 200MHz)
- ◇ CH3 : OUTPUT CURRENT - AP015 Current probe

입력	출력	측정값	파형	비고
Turn on Time Characteristics				
AC110V	$I_o=100\%$ 3.3A	$T_{on} = 993\text{ms}$		CH1: 20.0V/div CH2: 200/div 600ms/div
Hold up Time Characteristics				
AC110V	$I_o=100\%$ 3.3A	$T_{off} = 33.3\text{ms}$		CH1: 20.0V/div CH2: 200V/div 20.0ms/div
Over Current protection characteristics				
220VAC	$I_o=100\%$	OCP= 4.1A (124%)		CH1(전압) 10.0V/div 20.0ms/div CH3(전류) 1.00A/div 20.0ms/div
Over Voltage protection characteristics				
AC220V	$I_o=10\%$	OVP = 56.2[V] (117%)		CH1(전압) 20.0V/div 50.0ms/div