SWF Series SWF050P-24
50 W, High Surge Tolerant, Low Noise Power Supply

General Description

The SWF series are compact, wide ranging power supplies, providing peak power capability that supports twice the rated output, making them ideal for motorized applications. They offer low noise and high efficiency by current resonant circuitry.

Features and Benefits

- Supports peak loading, two times the rated current (maximum of 10 seconds)
- World wide input (85 to 264 VAC)
- Provides high efficiency and low noise via current switching technology
- Acquired CE marking for Low Voltage Differential
- Conductive emission class B (VCCI class B, FCC class B, EN55022 class B)
- Safety standards: UL60950-1, C-UL (CSA60950-1), SEMKO (EN60950-1)
- Optional remote on/off control, and L type chassis, cover

Sample Test Conditions

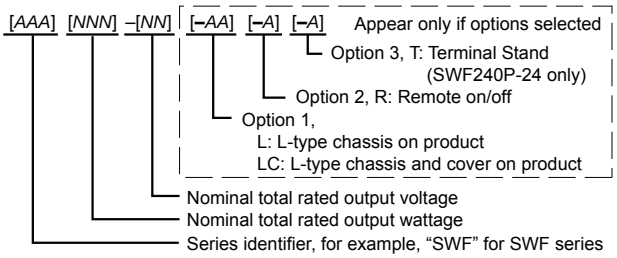
Input Voltage, V_{IN}

Min. (V)	Nom. (V)		Max. (V)
85	100	240	264

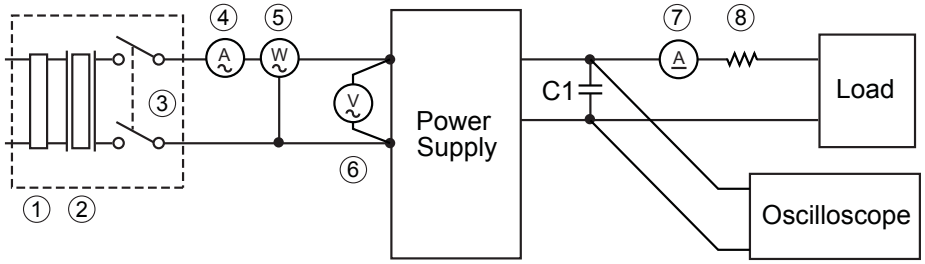
Load Current, I_{LOAD}

Output Voltage (V)	Min. (A)	Nom. (A)	Max. (A)
24	0	2.1	4.2

Model Number Key Table



Sample Test Circuit Diagram



Key	Description	Remarks
–	Measuring instrument	Output voltage is measured with a digital multimeter
1	Variable autotransformer	–
2	Isolation transformer	–
3	Circuit breaker	–
4, 7	Ammeter	–
5	Watt meter	–
6	Volt meter	–
8	Shunt resistor	–
C1	24 V Load capacitor	Electrolytic capacitor: 100 µF Film capacitor: 0.1 µF

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Table 1. Input Characteristics
(At T_A = 25°C)

Test Item	Conditions		Test Results			Specifi-cation	Remarks
	V_{IN}	I_{LOAD}	V_{IN} = 100 V	V_{IN} = 240 V			
Input Current	Nom	Nom	0.86 A	0.42 A	–	1 A/0.4 A	Figure 1
Input Power	Nom	Nom	60.16 W	59.33 W	–	–	–
Power Factor	Nom	Nom	0.698	0.589	–	≥ 0.5	Figure 2
Efficiency	Nom	Nom	83.64%	84.77%	–	84% (typ) / 85% (typ)	Figure 3
Inrush Current	Nom	Nom	8.2 A	20.0 A	–	15 A/ 30 A	Figure 4
Leakage Current	Nom	Nom	0.039 mA at 60 Hz	0.070 mA at 60 Hz	R = 1.5 kΩ, C = 0.15 µF	0.75 mA	Figure 5
Minimum Input Voltage for Voltage Output	–	Min	–	–	On = 46.4 V, Off = 7 V	–	–
	–	Nom	–	–	On = 50 V, Off = 33 V	–	–
Hold-Up Time	–	Nom	–	–	25 ms at T_A = 25°C	20 ms	Figure 11

Figure 1. Input Current
(By Load Current)

Input Voltage	Output	Temperature	Remarks
85 to 264 VAC	24 V, 40% to 100%	T_A = 25°C	–

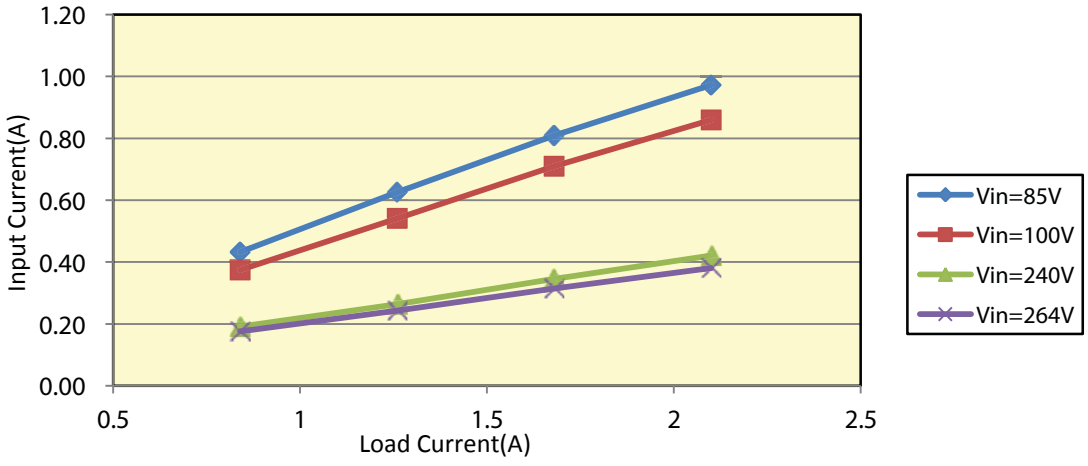


Figure 2. Power Factor (By Load Current)

Input Voltage	Output	Temperature	Remarks
85 to 264 VAC	24 V, 40% to 100%	T_A = 25°C	–

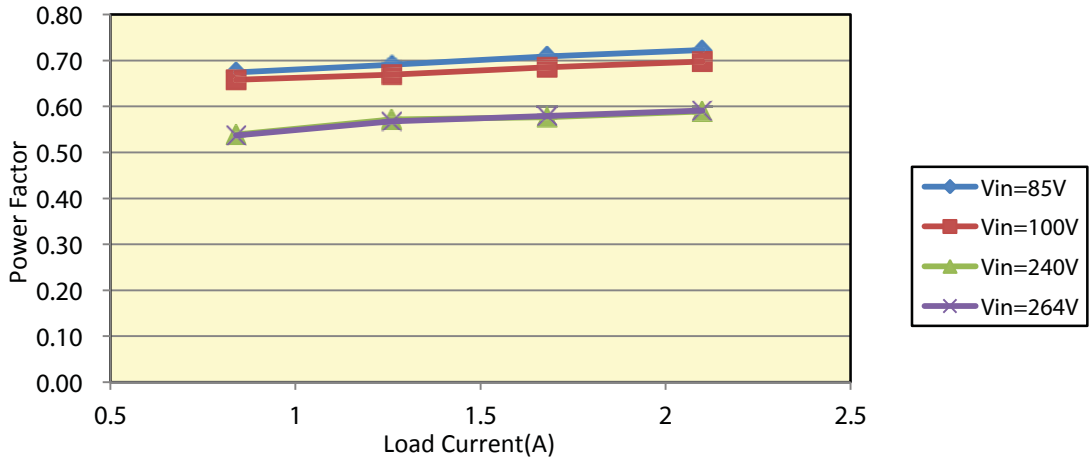


Figure 3. Efficiency (By Load Current)

Input Voltage	Output	Temperature	Remarks
85 to 264 VAC	24 V, 20% to 100%	T_A = 25°C	–

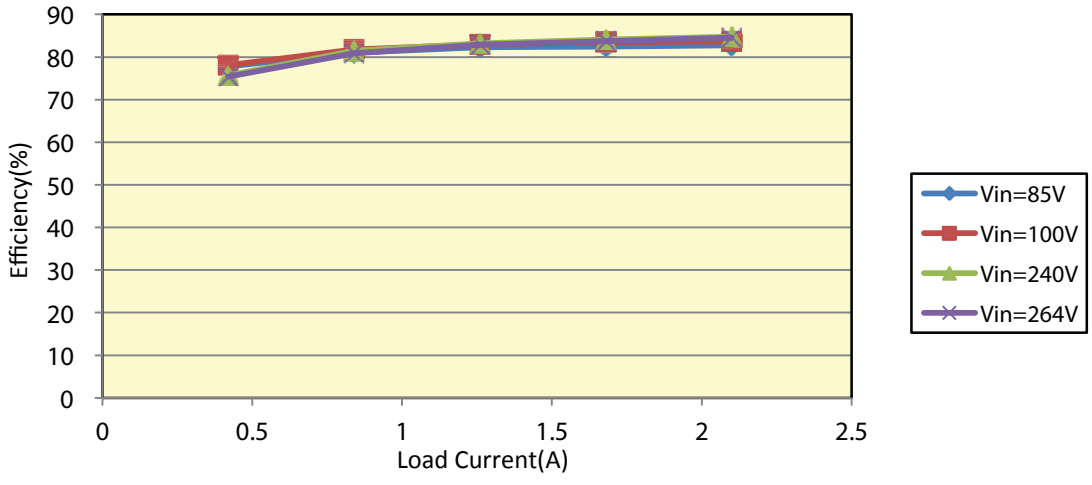


Figure 4. Inrush Current (By Input Voltage)

Input Voltage	Output	Temperature	Remarks
100 to 200 VAC	24 V, 2.1 A	T_A = 25°C	Cold start

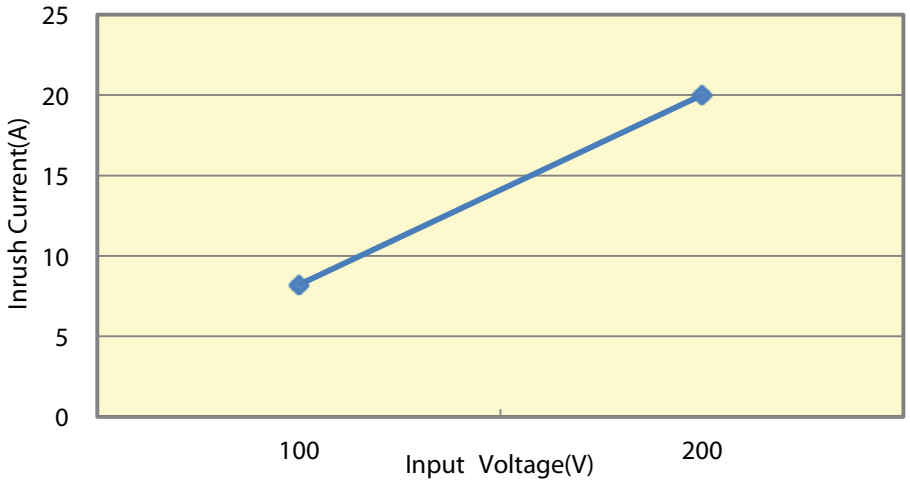


Figure 5. Inrush Current Operation

Input Voltage	Output	Temperature	Remarks
V_{IN} =200 V	I_{OUT} = 2.1 A	T_A = 25°C	Inrush Current: 10 A /div., time = 2 ms /div.

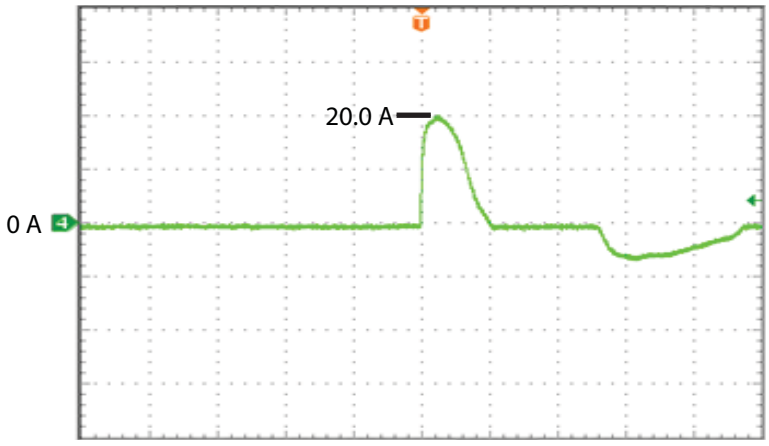


Figure 6. Leakage Current (By Load Current)

Input Voltage	Output	Temperature	Remarks
100 to 240 VAC	I_{OUT} = 2.1 A	T_A = 25°C	R = 1.5 kΩ, C = 0.15 µF

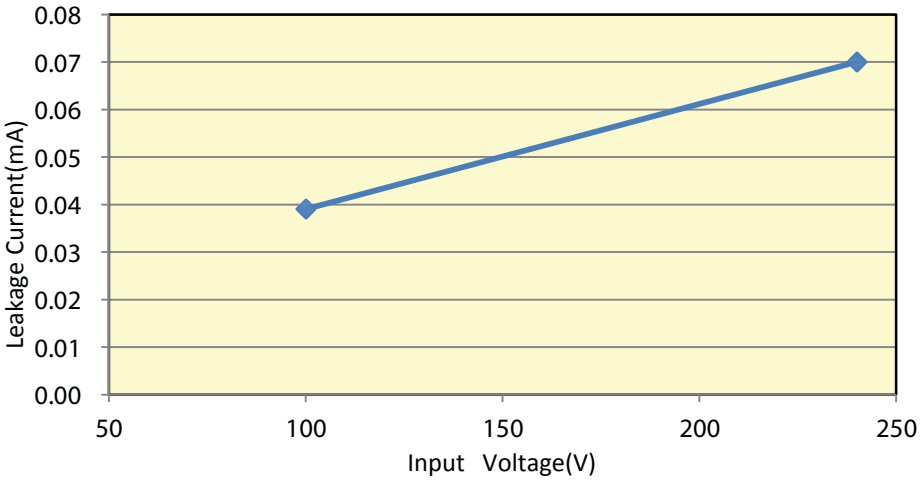


Figure 7. Hold-Up Time (By Load Current)

Input Voltage	Output	Temperature	Remarks
100 to 240 VAC	24 V, 20% to 100%	T_A = –10°C to 60°C	–

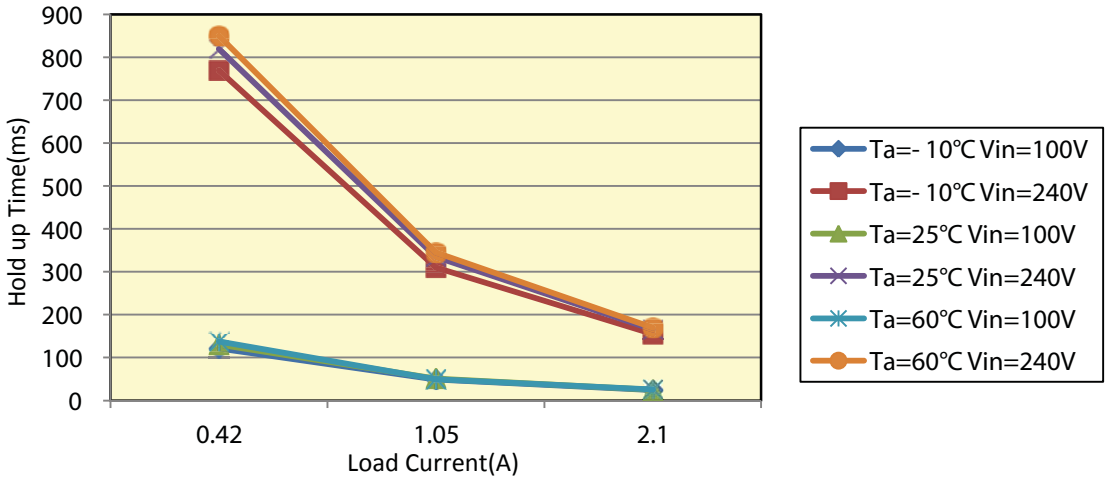


Table 2. Output Characteristics
(At T_A = 25°C)

Test Item	Conditions		Test Results			Specification	Remarks
	V_{IN}	I_{LOAD}	24 V				
Output Setting Voltage	Nom	Nom	–			–	–
Input/Output Voltage Change Fluctuation	Min	Min	23.95 V			–	Note 1, Figure 8
	Max	Max	24.1 V			–	
Temperature Drift	Nom	Nom	–48 mV and +49 mV			–	Note 1, Figure 8
Warm-Up Drift	Nom	Nom	–4 mV			–	Note 1, Figure 9
Total Regulation	–	–	23.898 V			23.38 V	Note 1
	–	–	24.149 V			24.72 V	
Ripple Voltage	Nom	Nom	46 mV at T_A = 25°C			320 mV at T_A = –10°C to 0°C 240 mV at T_A = 0°C to 60°C	Note 2, Figure 10
Ripple Noise Voltage	Nom	Nom	187 mV at T_A = 25°C			360 mV at T_A = –10°C to 0°C 300 mV at T_A = 0°C to 60°C	Note 3, Figure 11
Output Voltage Variable Range	Min	Min	18.43 V			21.6 V	–
	Max	Max	27.35 V			26.4 V	–

1. Total Regulation (output regulation) is the sum of: Input/Output Voltage Change Fluctuation, Temperature Drift, and Warm-Up Drift.
2. Used probe = Ripple Voltage 1:1.
3. Used probe = Ripple Noise Voltage 1:1.

Figure 8. Output Voltage Accuracy
(By Load Current)

Input Voltage	Output	Temperature	Remarks
100 to 240 VAC	24 V, 0% to 100%	T_A = –10°C to 60°C	–

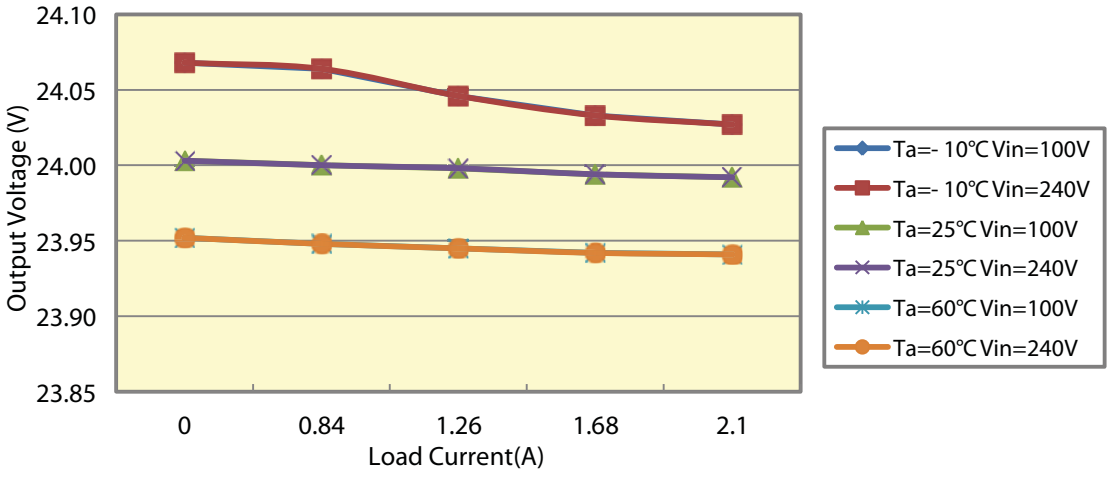


Figure 9. Warm-Up Drift

Input Voltage	Output	Temperature	Remarks
100 VAC	24 V, 2.1 A	T_A = 25°C	–

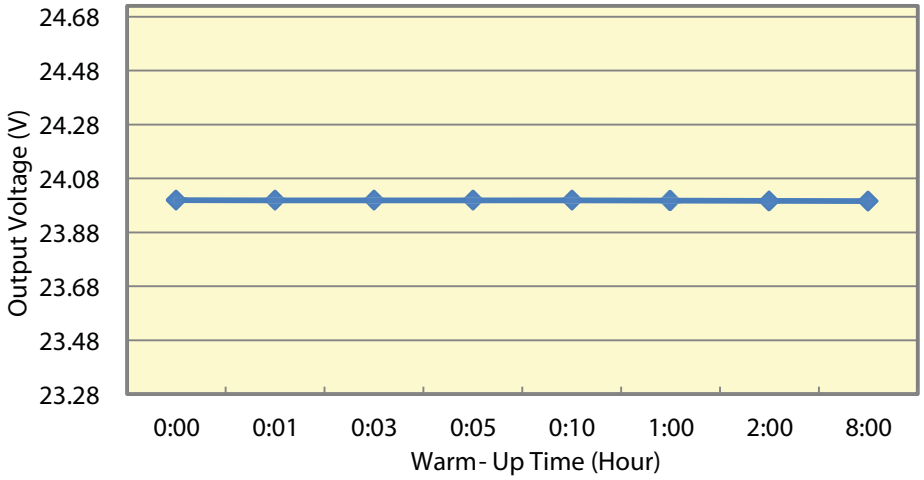


Figure 10. Ripple Voltage (By Load Current)

Input Voltage	Output	Temperature	Remarks
100 VAC	24 V, 40% to 100%	T_A = –10°C to 60°C	–

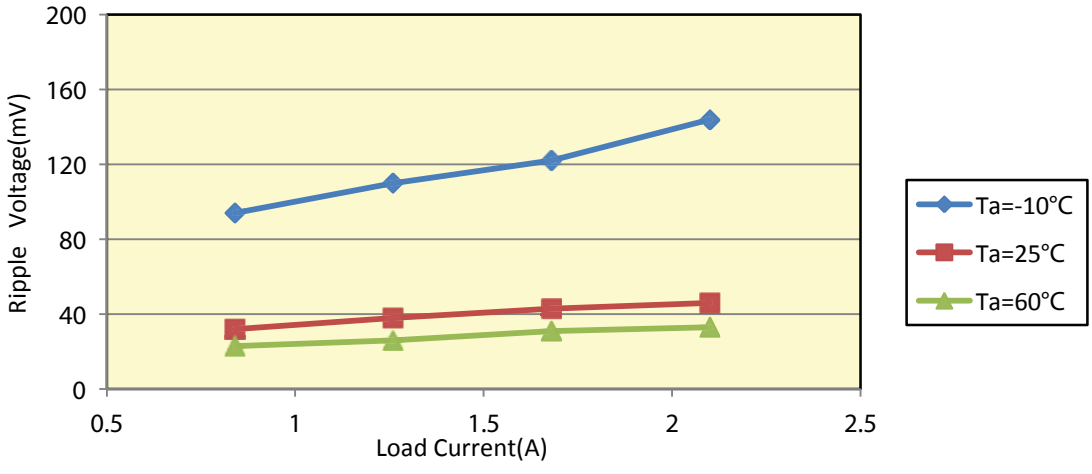


Figure 11. Ripple Noise Voltage (By Load Current)

Input Voltage	Output	Temperature	Remarks
100 VAC	24 V, 40% to 100%	T_A = –10°C to 60°C	–

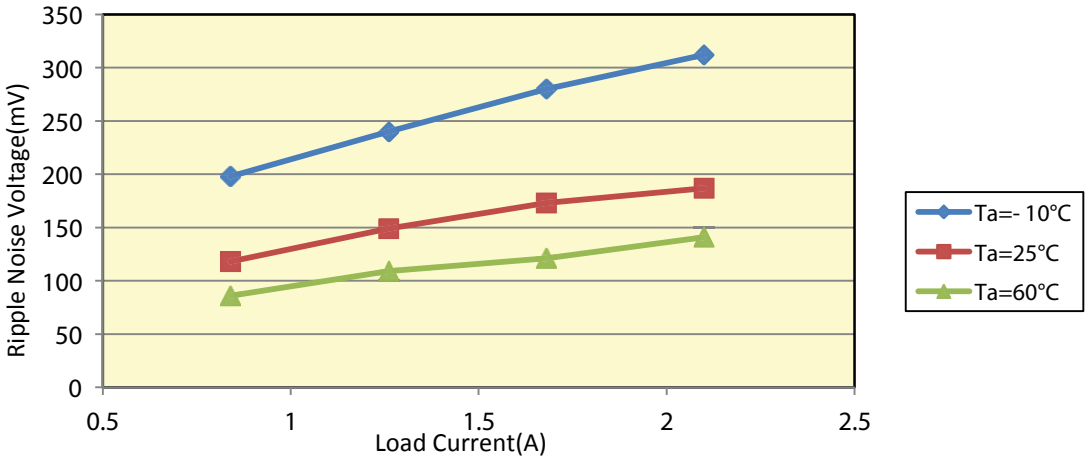


Figure 12. Output Voltage Rising

Input Voltage	Output	Temperature	Remarks
V_{IN} =100 V	I_{OUT} = 2.1 A	T_A = 25°C	Input Voltage: 100 V /div., Output Voltage: 10 V /div., time = 100 ms /div.

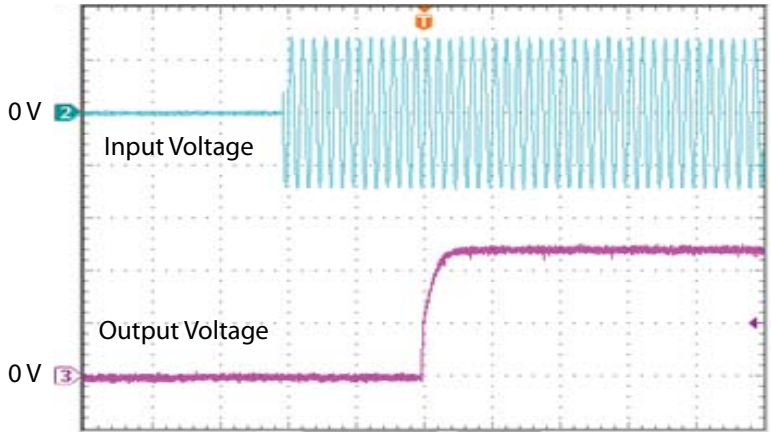


Figure 13. Output Voltage Falling

Input Voltage	Output	Temperature	Remarks
V_{IN} =100 V	I_{OUT} = 2.1 A	T_A = 25°C	Input Voltage: 100 V /div., Output Voltage: 10 V /div., time = 20 ms /div.

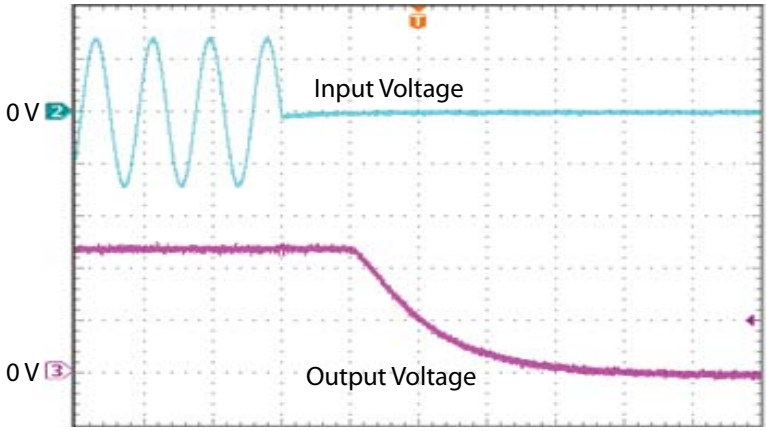


Table 3. Protection Characteristics

Test Item	Conditions		Test Results			Specification	Remarks
	V_{IN}	I_{LOAD}	T_A = –10°C	T_A = 25°C	T_A = 60°C		
Overcurrent Protection	Min	Max	5.57 A	5.29 A	4.49 A	≥ 4.24 A	Figure 14
Overvoltage Protection	Nom	Min	30.6 V	31.2 V	32.8 V	≥ 27.6 V	Figure 15
Reset Time	Max	Min	58.0 s at T_A = 25°C			–	–

Figure 14. Overcurrent Protection (By Load Current)

Input Voltage	Output	Temperature	Remarks
100 VAC	24 V	T_A = –10°C to 60°C	–

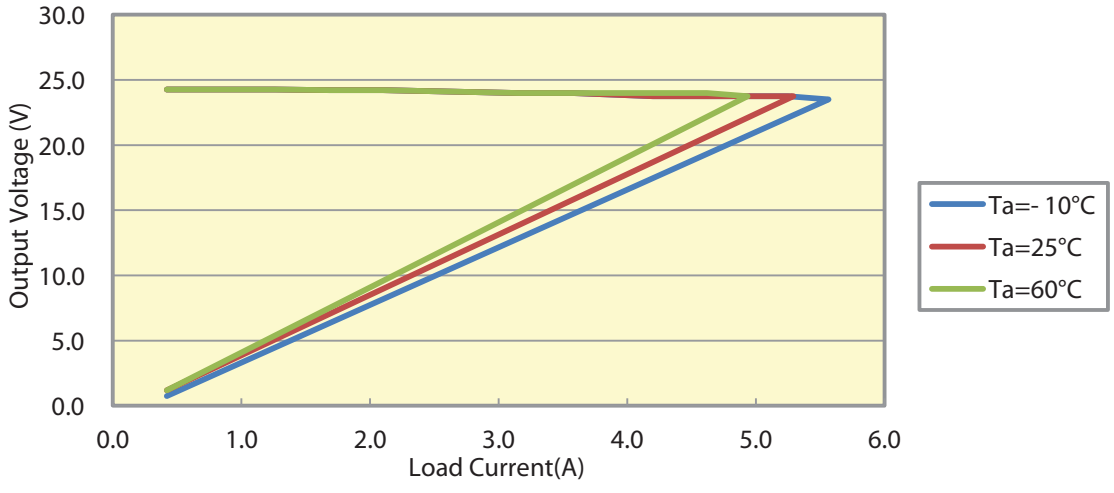


Figure 15. Overvoltage Protection (By Temperature)

Input Voltage	Output	Temperature	Remarks
100 VAC	I_{OUT} = 0 A	T_A = –10°C to 60°C	–

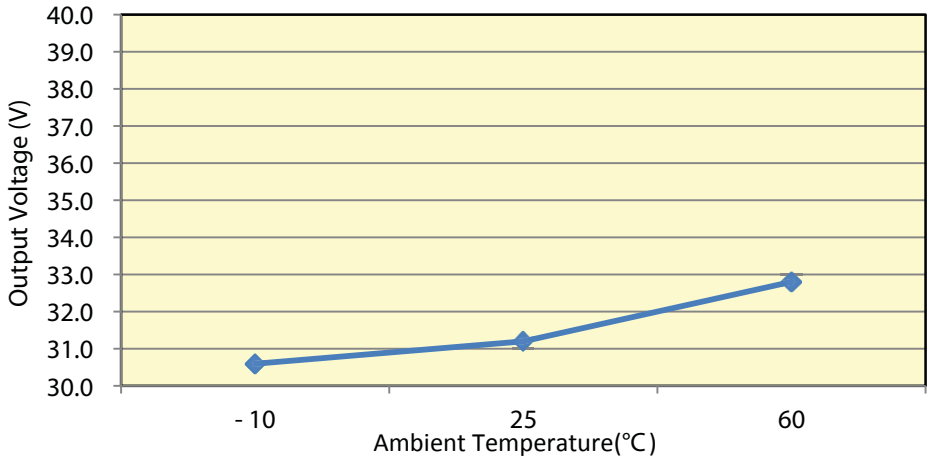


Figure 16. Overvoltage Protection Operation

Input Voltage	Output	Temperature	Remarks
V_{IN} =100 V	I_{OUT} = 0 A	T_A = 25°C	Output Voltage: 10 V /div., time = 2 s /div.

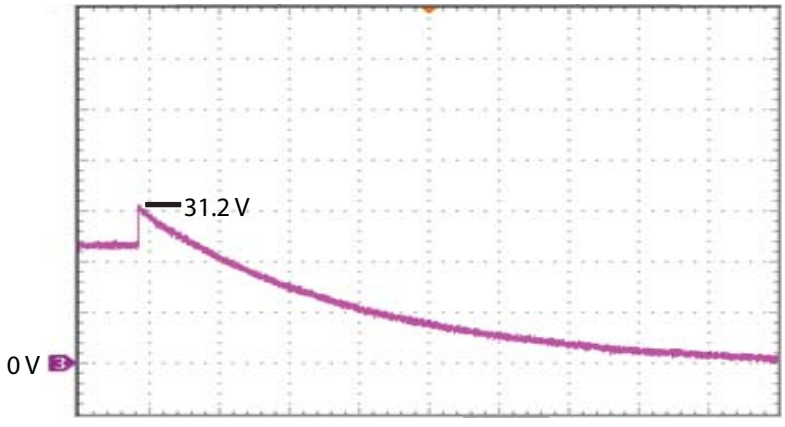


Figure 17. Start-Up Time (By Input Voltage)

Input Voltage	Output	Temperature	Remarks
85 to 264 VAC	I_{OUT} = 2.1 A	T_A = –10°C to 60°C	–

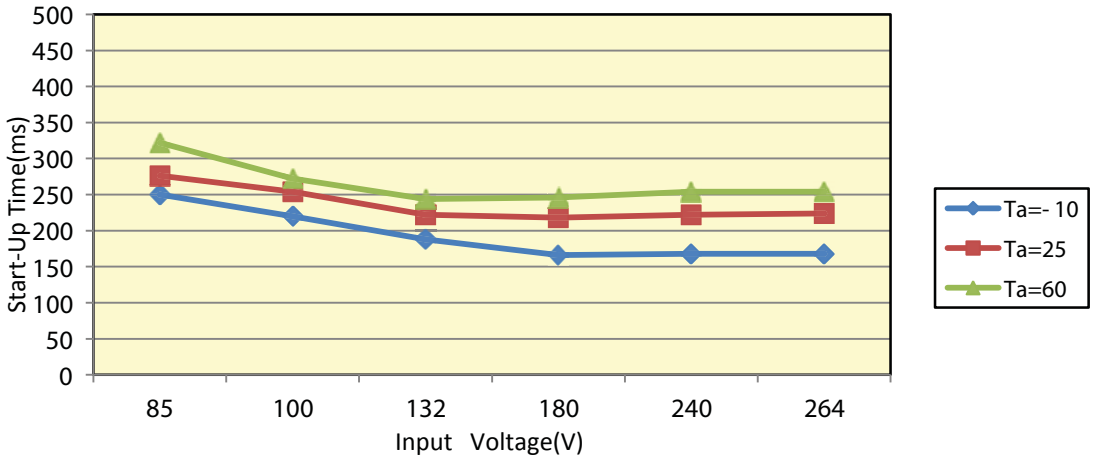


Table 4. Environment Tests
(At T_A = 25° C)

Test Item	Conditions		Test Results	Specification	Remarks
	V_{IN}	I_{LOAD}			
Vibration (Non-Operating)	–	–	Frequency = 10 to 55 Hz, Sweep Cycle = 3 minutes, Acceleration = 19.6 m/s^2, Direction = x,y, and z axes at 60 minutes per axis	Normal operation	–
Power-On at High Temperature	Nom	Max	Power-off for 1 hour at 65°C, then power-on	Normal operation	–
Power-On at Low Temperature	Nom	Max	Power-off for 1 hour at –15°C, then power-on	Normal operation	–
Shock	–	–	Product is dropped from a height of 50 mm (98 m/s$^{2)}$ onto a flat surface of wood (10 mm or thicker); the test is performed three times on each edge of the bottom side of the product	Normal operation	–

Table 5. Noise Tolerance Characteristics
(At T_A = 25° C)

Test Item	Conditions		Test Results	Specifi-cation	Remarks
	V_{IN}	I_{LOAD}			
AC Line Noise (50 to 1000 ns)	Min to Max	Min to Max	Line to Line ±2.4 kV OK	±2 kV	–
	Min to Max	Min to Max	Line to Frame Ground ±2.4 kV OK	±2 kV	–
	Min to Max	Min to Max	Neutral to Frame Ground ±2.4 kV OK	±2 kV	
Lightning Surge (1.2 × 50 µs)	Nom	Nom	Line to Neutral ±2.4 kV OK	±2.0 kV, 3 times	–
	Nom	Nom	Line to Frame Ground ±2.4 kV OK	±2.0 kV, 3 times	
	Nom	Nom	Neutral to Frame Ground ±2.4 kV OK	±2.0 kV, 3 times	
Electrostatic Discharge	Min to Max	Min to Max	Contact discharge ±8.4 kV OK at R = 330 Ω, C = 150 pF	6 kV	–
	Min to Max	Min to Max	Aerial discharge ±11.2 kV OK at R = 330 Ω, C = 150 pF	8 kV	

Figure 18. Conduction Noise 100 V

Input Voltage	Output	Temperature	Remarks
V_{IN} =100 V	I_{OUT} = 2.1 A	T_A = 25°C	–

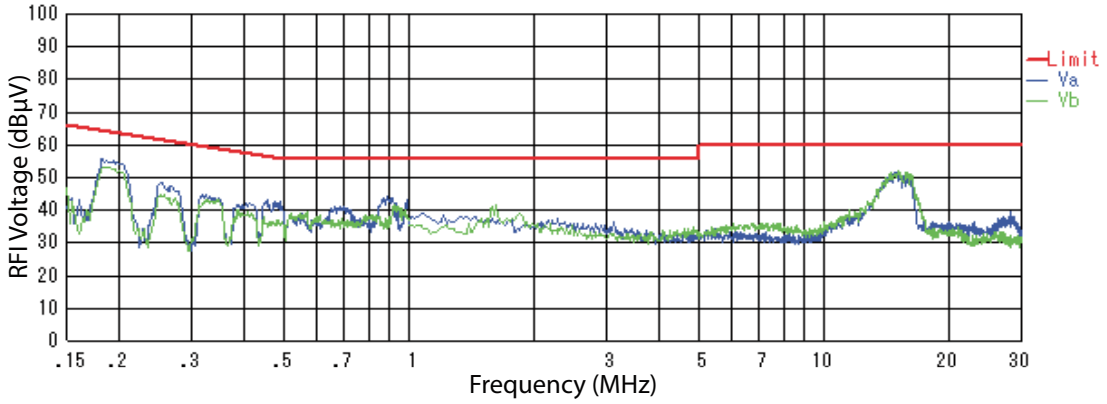


Figure 19. Conduction Noise 230 V

Input Voltage	Output	Temperature	Remarks
V_{IN} =230 V	I_{OUT} = 2.1 A	T_A = 25°C	–

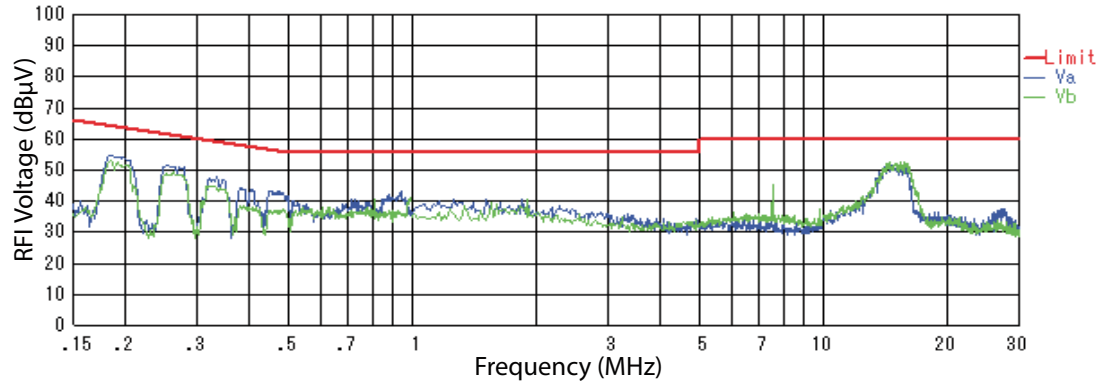


Table 6. Other Characteristics
(At T_A = 25° C)

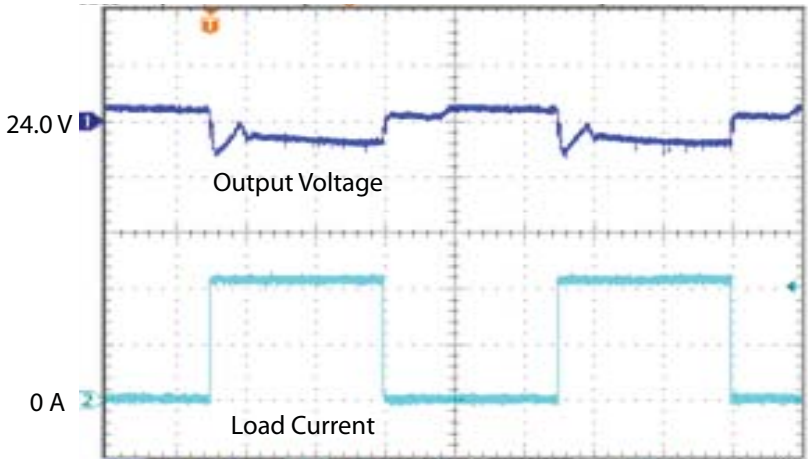
Test Item	Conditions		Test Results			Specification	Remarks
	V_{IN}	I_{LOAD}	P–S	P–E	S–E		
Withstand Voltage	–	–	3.0 kV / 3.6 kV	1.5 kV / 1.8 kV	0.5 kV / 0.6 kV	P–S: 3 kV for 1 minute 3.6 kV for 1 second P–E: 1.5 kV for 1 minute 1.8 kV for 1 second S–E: 500 V for 1 minute 600 V for 1 second	–
Leakage Current at Withstand Voltage	–	–	1.95 mA /2.18 mA	1.21 mA /1.36 mA	0.97 mA /1.50 mA	≤15 mA	–
Insulation Resistance	–	–	≥1000 MΩ	≥1000 MΩ	≥1000 MΩ	≥100 MΩ at 500 VDC Megger	–

Table 7. Output under Dynamic Load

Test Item	Conditions		Test Results			Specification	Remarks
	V_{IN}	I_{LOAD}	24 V				
Output Voltage at T_A = –10°C	Min	0 A to 4.2 A for 10 ms	23.60 V / 24.50 V			–	Figure 20
Output Voltage at T_A = 60°C	Min	0 A to 4.2 A for 10 ms	22.70 V / 24.40 V			–	Figure 20

Figure 20. Dynamic Load

Input Voltage	Output	Temperature	Remarks
V_{IN} =85 V	I_{OUT} = 0 to 4.2 A	T_A = 25°C	Output Voltage: 1 V /div., Load Current: 2 A /div., time = 4 ms /div.



Important Information

- The products described in this document are built-in type DC stabilized power supplies with special structures and are designed for installation in equipment. Be sure to use the products only for installation in equipment.
- The products should be handled only by persons who have competent electrical knowledge.
- Be sure to read through all safety precaution and operation manuals before installation, operation, or maintenance and to use the products only for the intended use and in accordance with all applicable safety standards and regulations in the location of use.

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