



No. CHD40005-001-03

参考資料  
Reference data

# TECHNICAL DATA

MODEL: SWF050P-24

SANKEN ELECTRIC CO.,LTD.

CHD40005-001-03  
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|                          |      |      |
|--------------------------|------|------|
| 入力電圧<br>Input<br>Voltage | MIN  | 85V  |
|                          | NOM  | 100V |
|                          |      | 240V |
| MAX                      | 264V |      |

|                      |     |      |  |  |  |
|----------------------|-----|------|--|--|--|
| 出力<br>Output Circuit |     | 24V  |  |  |  |
| 負荷電流<br>Load Current | MIN | 0A   |  |  |  |
|                      | NOM | 2.1A |  |  |  |
|                      | MAX | 4.2A |  |  |  |
|                      |     |      |  |  |  |

1.入力特性 Input Characteristics

Ta=25°C

| 試験項目<br>Test Item                           | 条件<br>Condition |            | 試験結果<br>Test Results  |               |                  | 仕様<br>SPEC         | 備考<br>Remarks |
|---|-----------------|------------|-----------------------|---------------|------------------|--------------------|---------------|
|   | 入力<br>Vin       | 負荷<br>Load | Vin=100V              | Vin=240V      |                  |                    |               |
|   |                 |            | 入力電流<br>Input Current | NOM           | NOM              | 0.86A              | 0.42A         |
| 入力電力<br>Input Power                         | NOM             | NOM        | 60.16W                | 59.33W        |                  | ---                |               |
| 力率<br>Power Factor                          | NOM             | NOM        | 0.698                 | 0.589         |                  | 0.5以上<br>(or more) | 図2<br>Fig.2   |
| 効率<br>Efficiency                            | NOM             | NOM        | 83.64%                | 84.77%        |                  | 84%typ / 85%typ    | 図3<br>Fig.3   |
| 突入電流<br>Inrush Current                      | NOM             | NOM        | 8.2A                  | 20.0A         |                  | 15/30A(typ)        | 図4<br>Fig.4   |
| 漏洩電流<br>Leakage Current                     | NOM             | NOM        | 0.039mA(60Hz)         | 0.070mA(60Hz) | R=1.5kΩ・C=0.15μF | 0.75mA             | 図5<br>Fig.5   |
| 起動停止電圧<br>Startup Voltage &<br>Stop Voltage | ---             | MIN        |                       |               | ON46.4V・OFF7V    | ---                |               |
|   | ---             | NOM        |                       |               | ON50V・OFF33V     | ---                |               |
| 入力瞬断時間<br>Hold up time                      | ---             | NOM        |                       |               | 25ms(Ta=25°C)    | 20ms               | 図13<br>Fig.13 |

2.出力特性 Output Characteristics

\*総合安定度:②+③+④ Output Regulation:②+③+④

Ta=25°C

| 試験項目<br>Test Item                           | 条件<br>Condition        |            | 試験結果<br>Test Results            |   |  |  | 備考<br>Remarks |
|---|------------------------|------------|---------------------------------|---|--|--|---------------|
|   | 入力<br>Vin              | 負荷<br>Load | 24V                             |   |  |  |               |
| 1 出力偏差<br>Output Standard Voltage           | NOM                    | NOM        | -                               |   |  |  |               |
| 2 入出力相互変動<br>Voltage Change Fluctuation     | MIN                    | MIN        | 23.95V                          |   |  |  | 図6<br>Fig.6   |
|   | MAX                    | MAX        | 24.1V                           |   |  |  |               |
| 3 温度ドリフト<br>Temperature Drift               | NOM                    | NOM        | +49mV<br>-48mV                  |   |  |  | 図6<br>Fig.6   |
| 4 経時ドリフト<br>Warm-Up Drift                   | NOM                    | NOM        | -4mV                            |   |  |  | 図7<br>Fig.7   |
| 総合安定度<br>Total Regulation                   |                        |            | 23.898V<br>~<br>24.149V         |   |  |  |               |
| 仕様<br>SPEC                                  |                        |            | 23.38V<br>~<br>24.72V           |   |  |  |               |
| 5 リップル電圧<br>Ripple Voltage                  | NOM                    | NOM        | 46mV                            |   |  |  | 図8<br>Fig.8   |
|   | 室温<br>Room Temperature |            | Ta=25°C                         |   |  |  |               |
| 仕様<br>SPEC                                  |                        |            | 320mV(-10~0°C)<br>240mV(0~60°C) |   |  |  |               |
| リップルノイズ電圧<br>Ripple Noise Voltage           | NOM                    | NOM        | 187mV                           |   |  |  | 図9<br>Fig.9   |
|   | 室温<br>Room Temperature |            | Ta=25°C                         |   |  |  |               |
| 仕様<br>SPEC                                  |                        |            | 360mV(-10~0°C)<br>300mV(0~60°C) |   |  |  |               |
| 6 出力電圧可変範囲<br>Output Voltage Variable Range | MIN                    | MIN        | 18.43V                          |   |  |  |               |
|   | MAX                    | MAX        | 27.35V                          |   |  |  |               |
| 仕様<br>SPEC                                  |                        |            | 21.6V<br>~<br>26.4V             |   |  |  |               |
| コメント Comment                                |                        |            |                                 |   |  |  |               |
| 使用プローブ=リップル電圧1:1<br>リップルノイズ電圧1:1            |                        |            |                                 | Used Probe = Ripple Voltage 1:1<br>Ripple Noise Voltage 1:1 |  |  |               |

3.保護特性 Protection Characteristics

| 試験項目<br>Test Item                 | 条件<br>Condition |            | 試験結果<br>Test Results |         |         | 仕様<br>SPEC       | 備考<br>Remarks |
|-----------------------------------|-----------------|------------|----------------------|---------|---------|------------------|---------------|
|                                   | 入力<br>Vin       | 負荷<br>Load |                      |         |         |                  |               |
| 過電流検出値<br>Over Current Protection |                 |            | Ta=-10°C             | Ta=25°C | Ta=60°C |                  |               |
|                                   | MIN             | MAX        | 5.57A                | 5.29A   | 4.94A   | 4.24A以上(or more) | 図10<br>Fig.10 |
|                                   | MIN             | MAX        |                      |         |         |                  |               |
| 過電圧検出値<br>Over Voltage Protection |                 |            | Ta=-10°C             | Ta=25°C | Ta=60°C |                  |               |
|                                   | NOM             | MIN        | 30.6V                | 31.2V   | 32.8V   | 27.6V以上(or more) | 図11<br>Fig.11 |
|                                   | NOM             | MIN        |                      |         |         |                  |               |
| リセット時間<br>Reset Time              | MAX             | MIN        | 58.0s Ta=25°C        |         |         | -----            | --            |

4.環境試験 Environment Test

Ta=25°C

| 試験項目<br>Test Item                          | 条件<br>Condition |            | 試験結果<br>Test Results   |  |  | 仕様<br>SPEC                                      | 備考<br>Remarks |
|--|-----------------|------------|--|--|--|---|---------------|
|  | 入力<br>Vin       | 負荷<br>Load |  |  |  |   |               |
| 振動試験(非動作時)<br>Vibration<br>(Non-Operating) | ---             | ---        | 周波数10Hz~55Hz,周期3分,加速度2G<br>X・Y・Z方向に各60分,にて試験後外観・特性に問題なし<br>Frequency 10~55Hz, Sweep cycle 3min.,<br>Acceleration 19.6m/s <sup>2</sup> , Direction X/Y/Z 60<br>minutes par each axis  |  |  | 正常に起動<br>Normal Operation                       | --            |
| 高温スタート<br>Power on at high temp            | NOM             | MAX        | POWOFFにて65°Cに1時間放置後POWERON<br>Left the power supply at 65°Cfor one hour and turned on.   |  |  | 正常に起動<br>Normal Operation                       | --            |
| 低温スタート<br>Power on at low temp             | NOM             | MAX        | POWOFFにて-15°Cに1時間放置後POWERON<br>Left the power supply at -15°Cfor one hour and turned on.   |  |  | 正常に起動<br>Normal Operation                       | --            |
| 耐衝撃<br>Shock                               | ---             | ---        | 床面から50mmの高さより各辺3回自然落下後<br>外観・特性に問題なし<br>98m/s <sup>2</sup> . Conduct this test on an oak board with a<br>flat surface and a thickness of 10mm or more. Lift<br>one side of surface of the unit 50mm and drop it<br>on the board. Drop 3 times for each side. |  |  | 98m/s <sup>2</sup><br>正常に起動<br>Normal Operation | --            |

5.耐ノイズ特性 Noise Tolerance Characteristics

Ta=25°C

| 試験項目<br>Test Item                      | 条件<br>Condition |                 | 試験結果<br>Test Results  |      |                     | 仕様<br>SPEC  | 備考<br>Remarks |
|--|-----------------|-----------------|---|------|---------------------|---|---------------|
|  | 入力<br>Vin       | 負荷<br>Load      |   |      |                     |   |               |
| 注入ノイズ耐量<br>ACLInoise<br>(50ns~1000ns)  | MIN<br>~<br>MAX | MIN<br>~<br>MAX | L-N   | ±2.4 | kV No Err,No Damage | L-N, L-FG, N-FG<br>±2.0kV   | ---           |
|  |                 |                 | L-FG  | ±2.4 | kV No Err,No Damage |   |               |
|  |                 |                 | N-FG  | ±2.4 | kV No Err,No Damage |   |               |
| 雷サージ耐量<br>LightningSurge<br>(1.2×50μs) | NOM             | NOM             | L-N   | ±2.4 | kV No Err,No Damage | L-N, L-FG, N-FG<br>±2.0kV 3 times                                 | ---           |
|  |                 |                 | L-FG  | ±2.4 | kV No Err,No Damage |   |               |
|  |                 |                 | N-FG  | ±2.4 | kV No Err,No Damage |   |               |
| 静電気耐量ESD                               | MIN<br>~<br>MAX | MIN<br>~<br>MAX | Contact discharge ±8.4 kV No Err,No Damage<br>Aerial discharge ±11.2 kV No Err,No Damage<br>C: 150pF, R: 330Ω |      |                     | 接触放電 6.0kV<br>Contact discharge<br>気中放電 8.0kV<br>Aerial discharge | ---           |

6. その他の特性 Other Characteristics

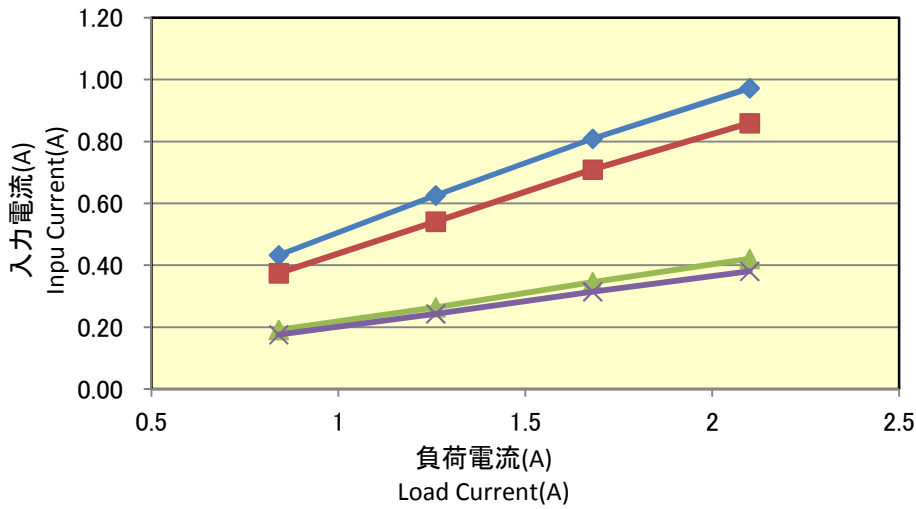
Ta=25°C

| 試験項目<br>Test Item             | 条件<br>Condition |            | 試験結果<br>Test Results  |   |   | 仕様<br>SPEC   | 備考<br>Remarks |
|-------------------------------|-----------------|------------|---|---|---|--|---------------|
|                               | 入力<br>Vin       | 負荷<br>Load | P-S   | P-E   | S-E   |  |               |
| 絶縁耐圧<br>Withstand Voltage     | ---             | ---        | P-S<br>3.0/3.6kV<br>(漏電流)<br>Leakage Current<br>1.95/2.18mA | P-E<br>2.0/2.4kV<br>(漏電流)<br>Leakage Current<br>1.21/1.36mA | S-E<br>0.5/0.6kV<br>(漏電流)<br>Leakage Current<br>0.97/1.50mA | P-S:3.0kV1m,3.6kV1s<br>P-E:2.0kV1m,2.4kV1s<br>S-E:500V1m,600V1s<br>(漏電流15mA以下)<br>Leakage Current 15mA or less | ---           |
| 絶縁抵抗<br>Insulation Resistance | ---             | ---        | P-S1000MΩ以上<br>(or more)                                    | P-E1000MΩ以上<br>(or more)                                    | S-E1000MΩ以上<br>(or more)                                    | P-S50MΩ以上(DC500V効 <sup>+</sup> )<br>P-S50MΩ or more (DC500VMegger)   | ---           |

7. ダイミット時の負荷特性 Dynamic Load Characteristics 参考データ Reference data

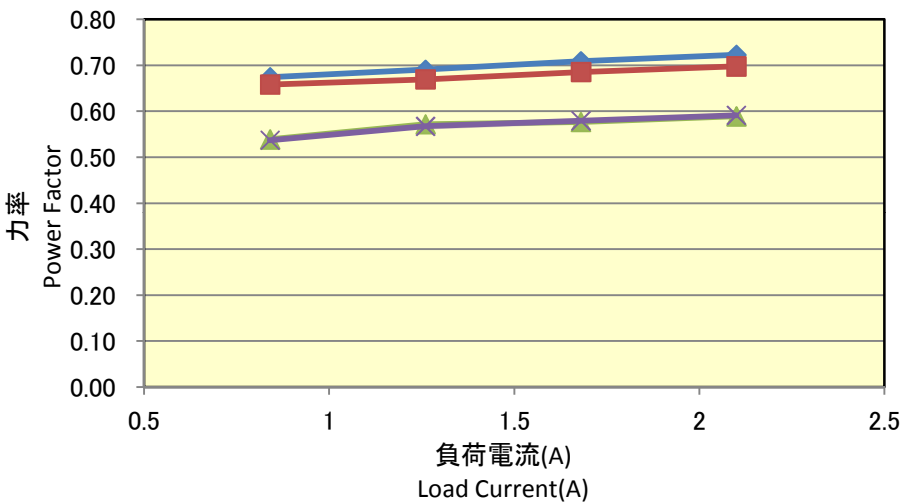
| 試験条件<br>Test Condition |                 | 試験結果 Test Results      |                                     |  |  |  | 備考<br>Remarks     |  |
|------------------------|-----------------|------------------------|-------------------------------------|--|--|--|-------------------|--|
|                        |                 | 24V                    |                                     |  |  |  |                   |  |
| 出力電圧<br>Output Voltage | Ta=-10°C        | 23.60V                 |                                     |  |  |  | 図14<br><br>Fig.14 |  |
|                        |                 | 24.50V                 |                                     |  |  |  |                   |  |
|                        | Ta=60°C         | 22.70V                 |                                     |  |  |  |                   |  |
|                        |                 | 24.40V                 |                                     |  |  |  |                   |  |
|                        | 条件<br>Condition | 入力電圧<br>Vin            | MIN                                 |  |  |  |                   |  |
|                        |                 | 出力電流<br>Output Current | 0A<br>(10ms)<br>~<br>4.2A<br>(10ms) |  |  |  |                   |  |
| 仕様<br>SPEC             |                 | ---<br>~<br>---        |                                     |  |  |  |                   |  |

図1 入力電流特性(負荷電流に対して)  
Fig.1 Input Current Characteristics (vs Load Current)



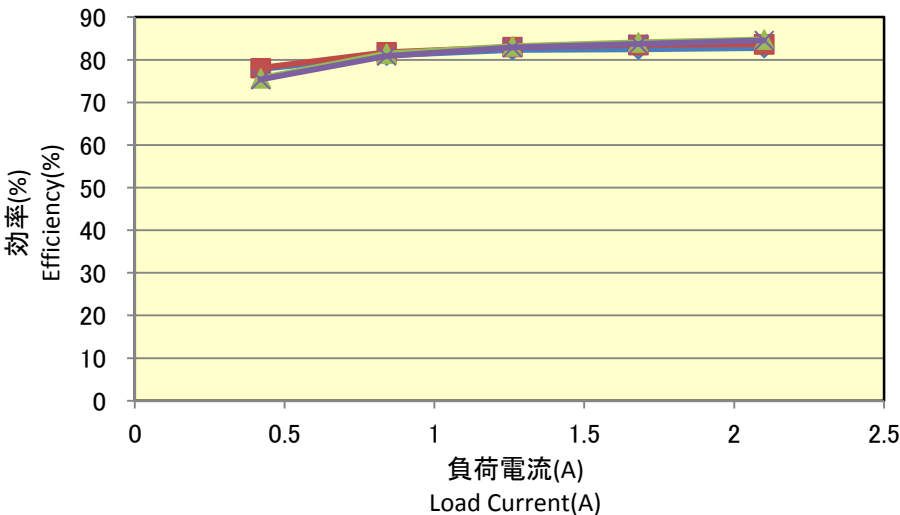
|                |              |
|----------------|--------------|
| 型名:Model       | SWF050P-24   |
| 入力:Input       | AC85~264V    |
| 出力:Output      | 24V、40%~100% |
| 温度:Temperature | Ta=25°C      |
| 備考:Remarks     |              |

図2 力率特性(負荷電流に対して)  
Fig.2 Power Factor Characteristics (vs Load Current)



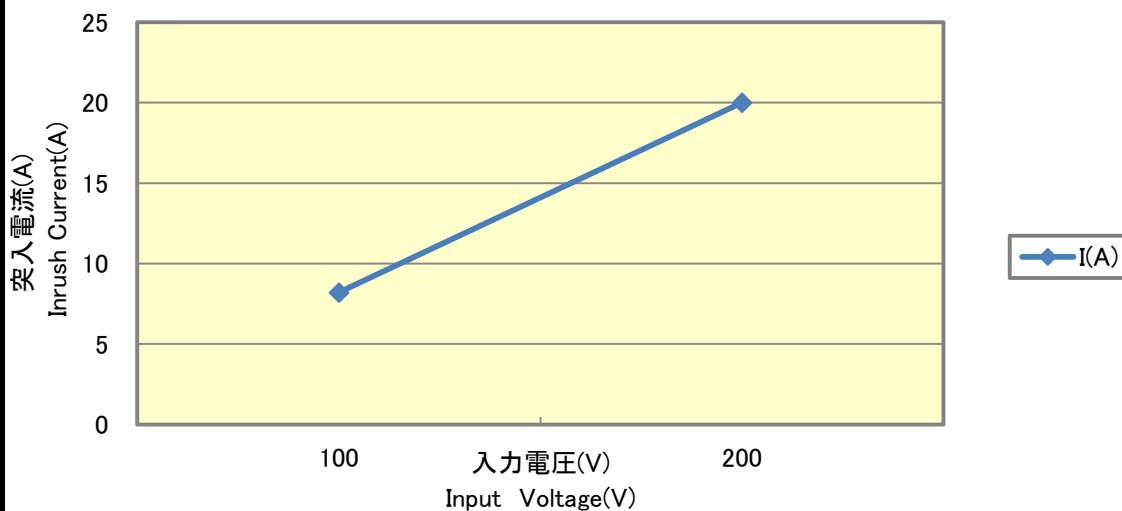
|                |              |
|----------------|--------------|
| 型名:Model       | SWF050P-24   |
| 入力:Input       | AC85~264V    |
| 出力:Output      | 24V、40%~100% |
| 温度:Temperature | Ta=25°C      |
| 備考:Remarks     |              |

図3 効率特性(負荷電流に対して)  
Fig.3 Efficiency Characteristics (vs Load Current)



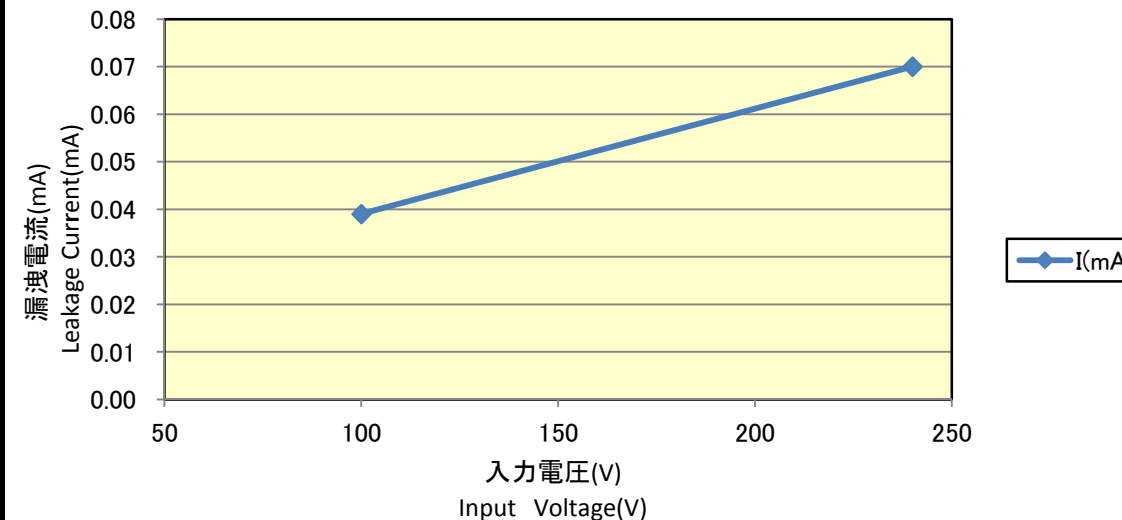
|                |              |
|----------------|--------------|
| 型名:Model       | SWF050P-24   |
| 入力:Input       | AC85~264V    |
| 出力:Output      | 24V、20%~100% |
| 温度:Temperature | Ta=25°C      |
| 備考:Remarks     |              |

図4 突入電流特性(入力電圧に対して)  
Fig.4 Inrush Current Characteristics (vs Input Voltage)



|                |                         |
|----------------|-------------------------|
| 型名:Model       | SWF050P-24              |
| 入力:Input       | AC100~200V              |
| 出力:Output      | 24V2.1A                 |
| 温度:Temperature | 25°C                    |
| 備考:Remarks     | コールドスタート時<br>Cold Start |

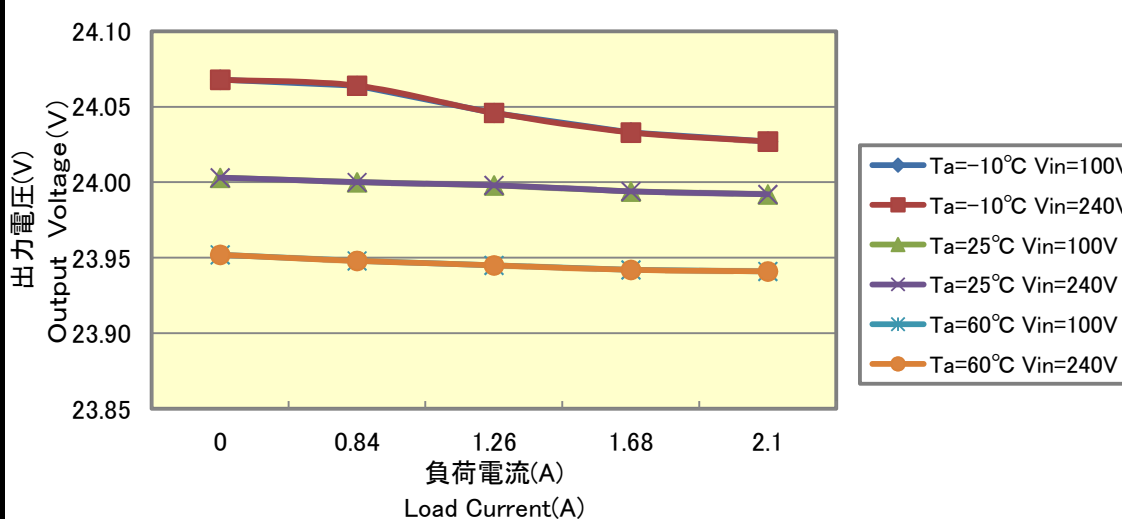
図5 漏洩電流特性(入力電圧に対して)  
Fig.5 Leakage Current Characteristics (vs Load Current)



|                |            |
|----------------|------------|
| 型名:Model       | SWF050P-24 |
| 入力:Input       | AC100~240V |
| 出力:Output      | Io=2.1A    |
| 温度:Temperature | Ta=25°C    |
| 備考:Remarks     |            |

R=1.5kΩ C=0.15μF

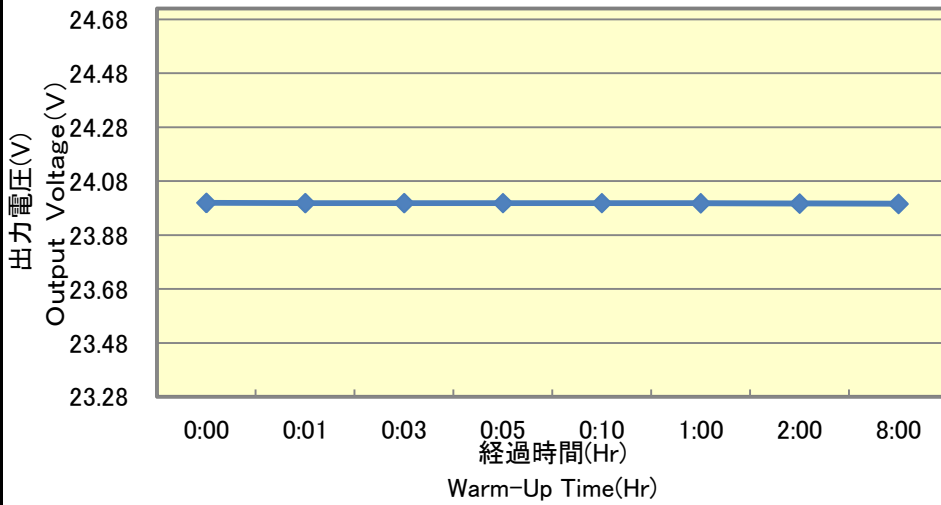
図6 出力電圧精度特性(負荷電流に対して)  
Fig.6 Output Voltage Accuracy Characteristics (vs Load Current)



|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100~240V       |
| 出力:Output      | 24V, 0%~100%     |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

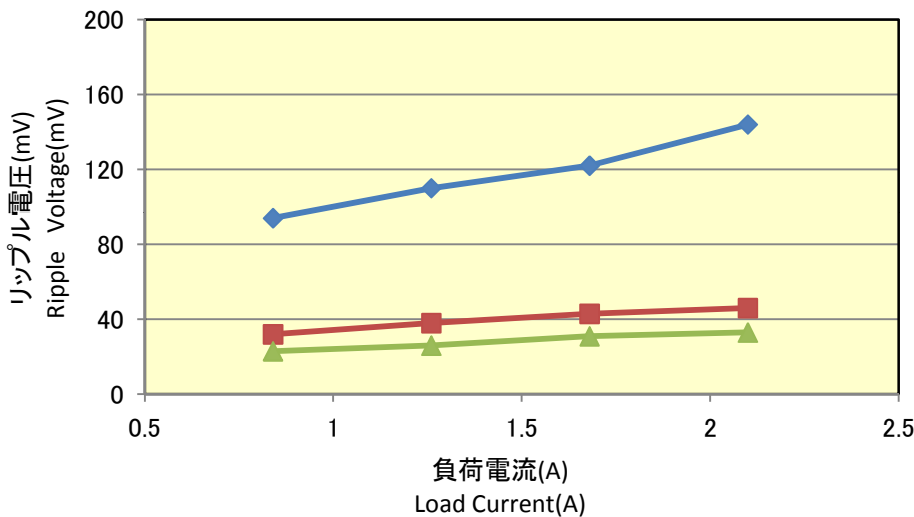


図7 経時ドリフト特性  
Fig.7 Warm-Up Drift Characteristics



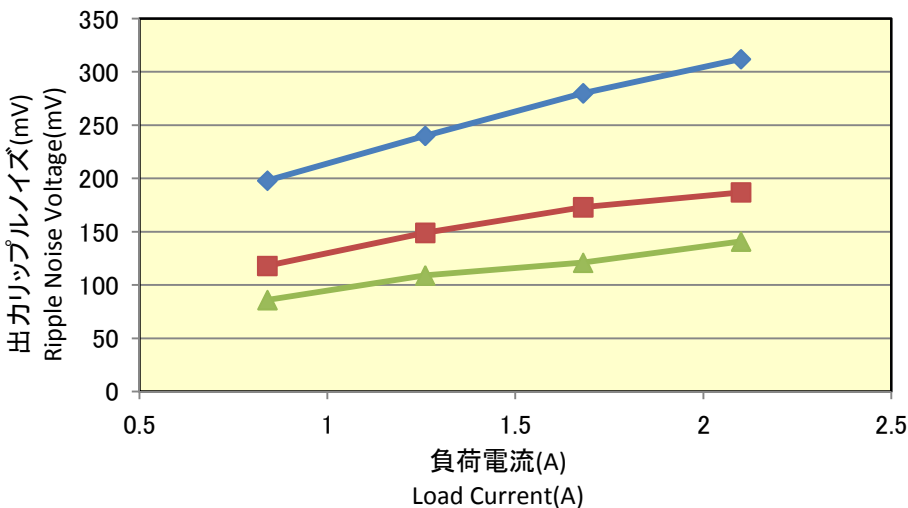
|                |            |
|----------------|------------|
| 型名:Model       | SWF050P-24 |
| 入力:Input       | AC100V     |
| 出力:Output      | 24V, 2.1A  |
| 温度:Temperature | Ta=25°C    |
| 備考:Remarks     |            |

図8 リプル電圧特性(負荷電流に対して)  
Fig.8 Ripple Voltage Characteristics (vs Load Current)



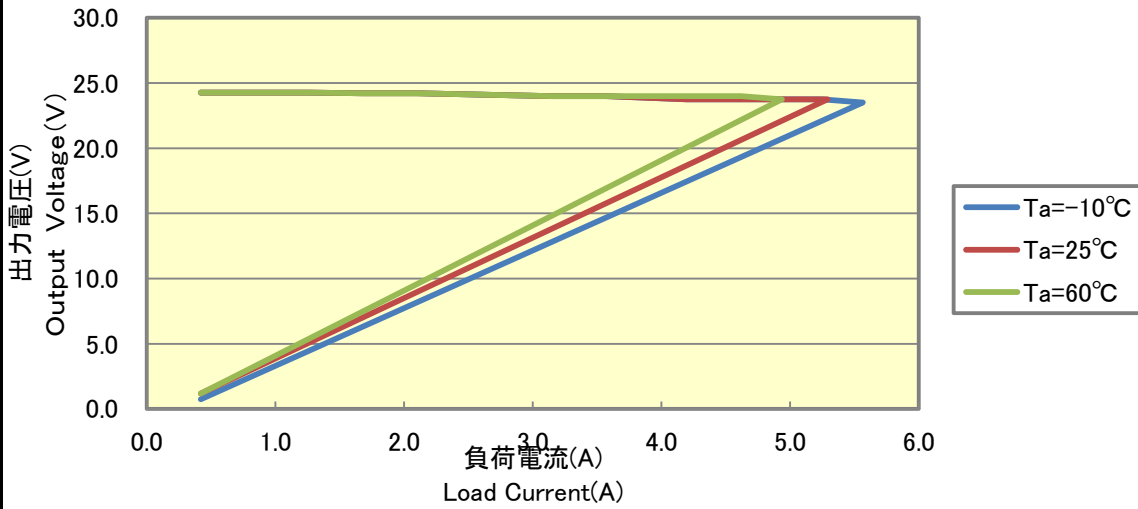
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100V           |
| 出力:Output      | 24V, 40%~100%    |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図9 リプルノイズ電圧特性(負荷電流に対して)  
Fig.9 Ripple Noise Voltage Characteristics (vs Load Current)



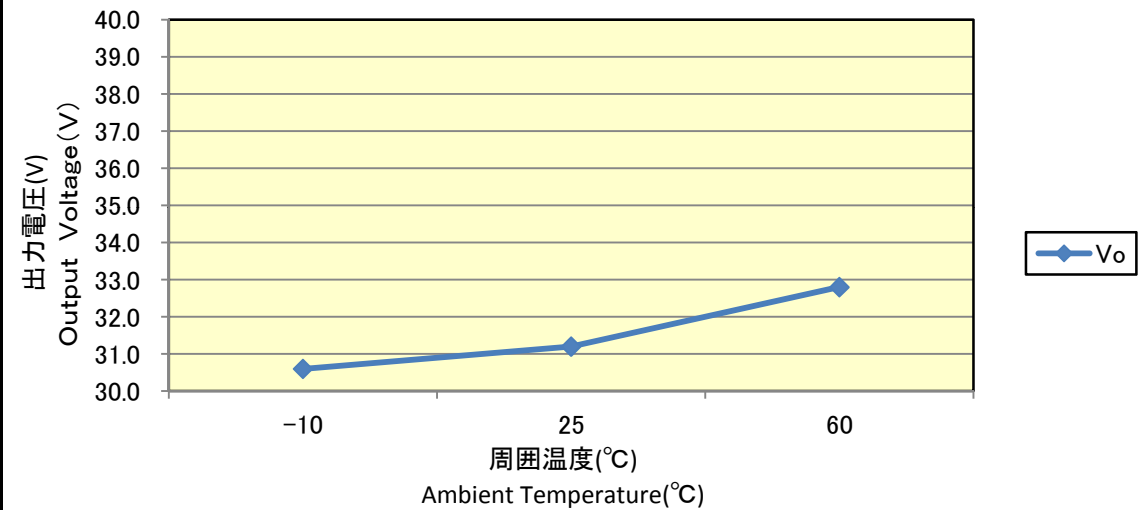
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100V           |
| 出力:Output      | 24V, 40%~100%    |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図10 過電流特性(負荷電流に対して)  
Fig.10 Over Current Protection Characteristics (vs Load Current)



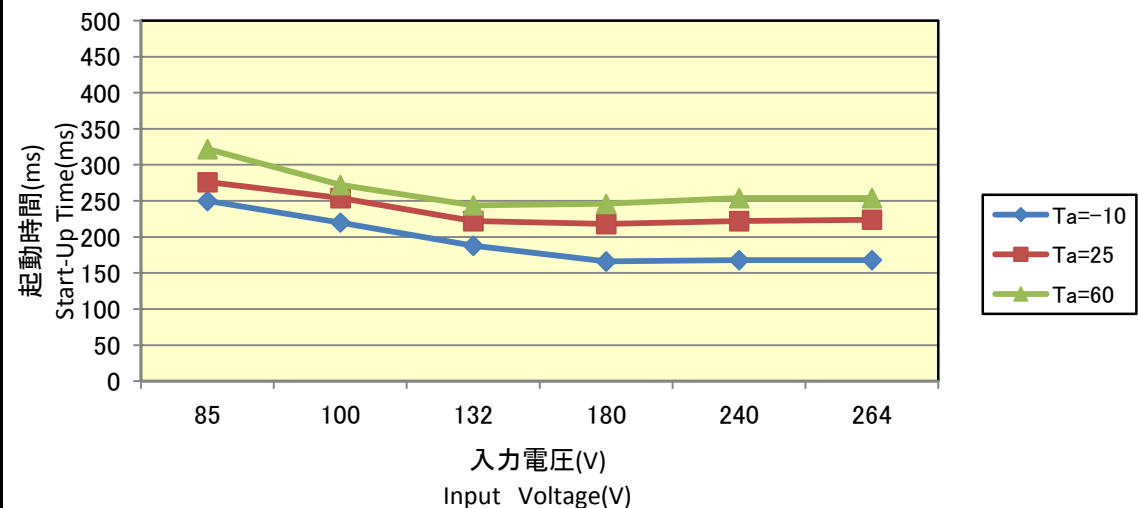
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100V           |
| 出力:Output      | 24V              |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図11 過電圧特性(温度に対して)  
Fig.11 Over Voltage Protection Characteristics (vs Temperature)



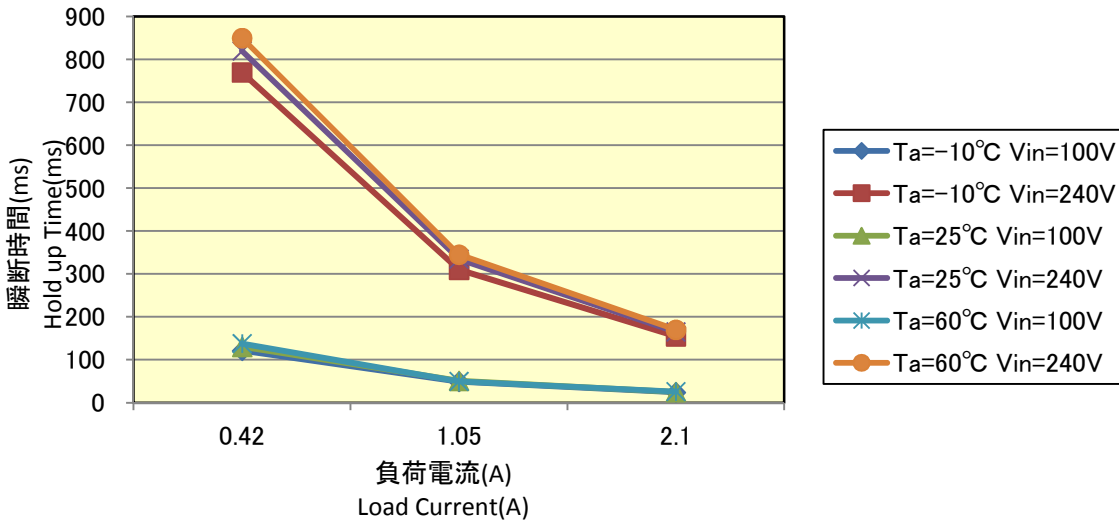
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100V           |
| 出力:Output      | Io=0A            |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図12 起動時間特性(入力電圧に対して)  
Fig.12 Start-Up Time Characteristics (vs Input Voltage)



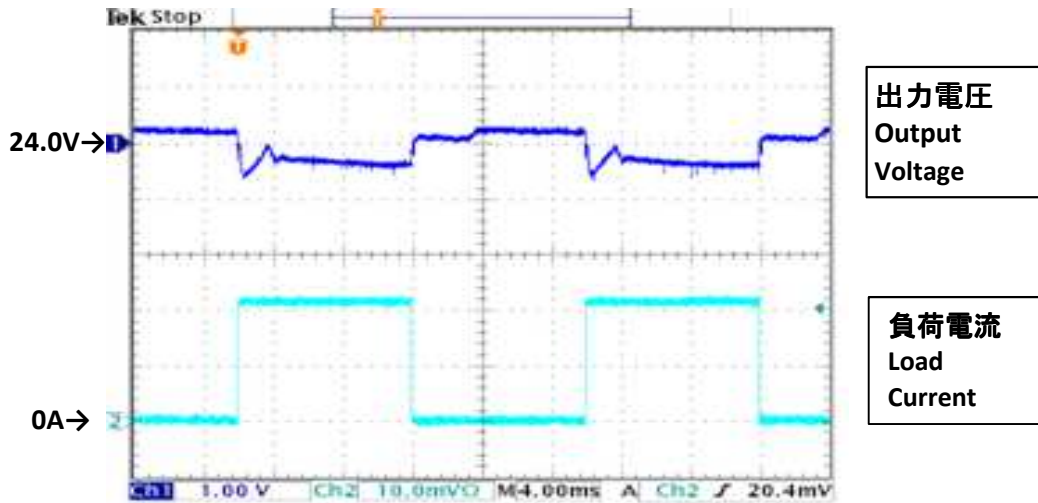
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC85~264V        |
| 出力:Output      | Io=2.1A          |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図13 入力瞬断時間(負荷電流に対して)  
Fig.13 Hold up time Characteristics (vs Load Current)



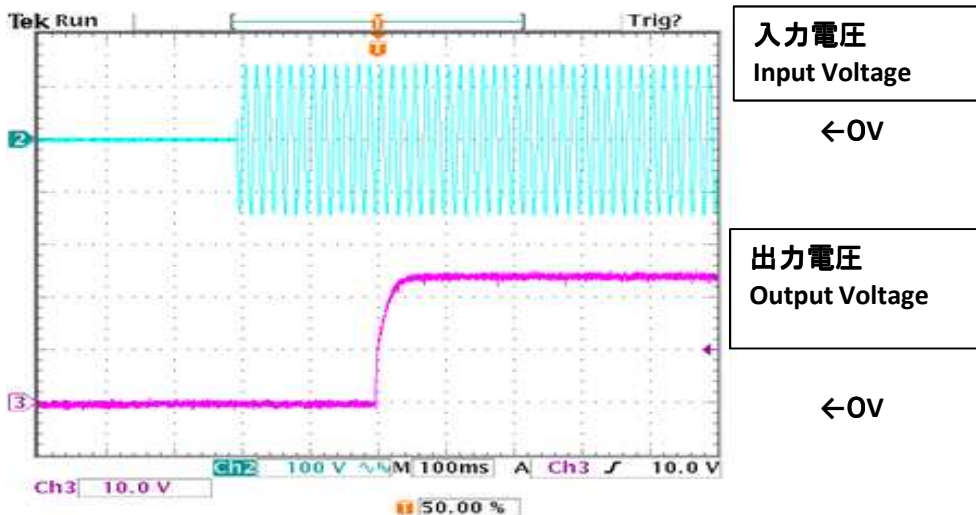
|                |                  |
|----------------|------------------|
| 型名:Model       | SWF050P-24       |
| 入力:Input       | AC100~240V       |
| 出力:Output      | 24V, 20%~100%    |
| 温度:Temperature | Ta=-10°C~Ta=60°C |
| 備考:Remarks     |                  |

図14 ダイナミック時の負荷波形  
Fig.14 Dynamic Load Waveform



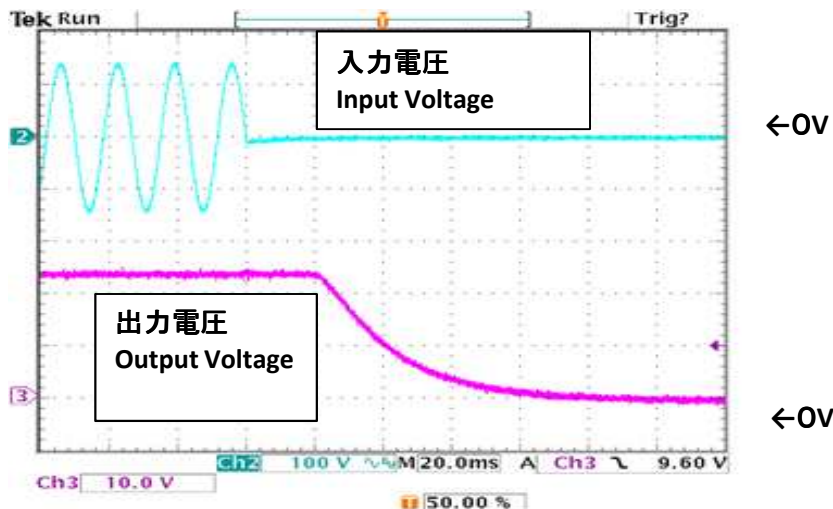
|                |   |
|----------------|---|
| 型名:Model       | SWF050P-24  |
| 入力:Input       | Vin=85V   |
| 出力:Output      | Io=0A⇄4.2A  |
| 温度:Temperature | Ta=25°C   |
| 備考:Remarks     | 出力電圧<br>OutputVoltageVertical: 1V/div<br>負荷電流<br>LoadCurrentVertical: 2A/div<br>時間<br>TimeHorizontal: 4mS/div |

図15 出力電圧立上り波形  
Fig.15 Output Voltage Rising Waveform



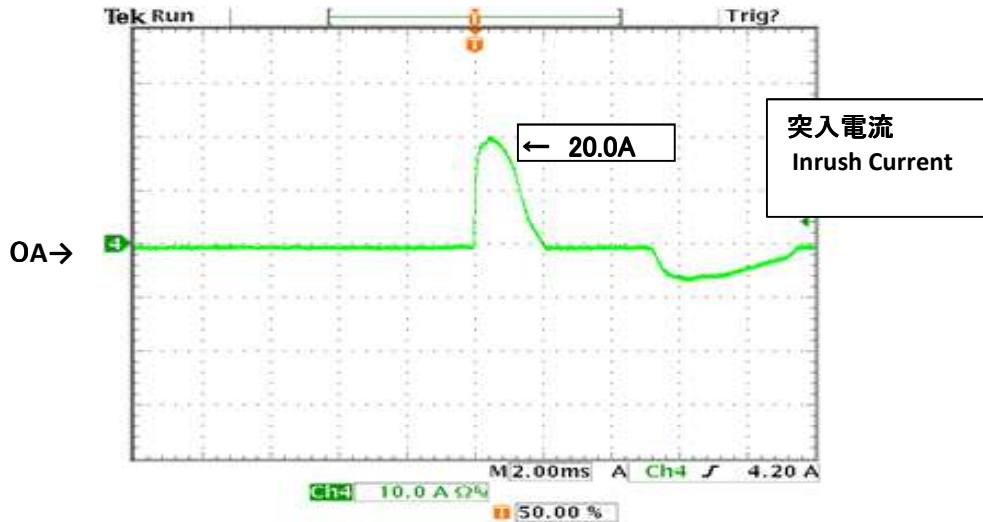
|                |   |
|----------------|---|
| 型名:Model       | SWF050P-24  |
| 入力:Input       | Vin=100V  |
| 出力:Output      | Io=2.1A   |
| 温度:Temperature | Ta=25°C   |
| 備考:Remarks     | 入力電圧<br>InputVoltageVertical: 100V/div<br>出力電圧<br>OutputVoltageVertical: 10V/div<br>時間<br>TimeHorizontal: 100mS/div |

図16 出力電圧立下り波形  
Fig.16 Output Voltage Falling Waveform



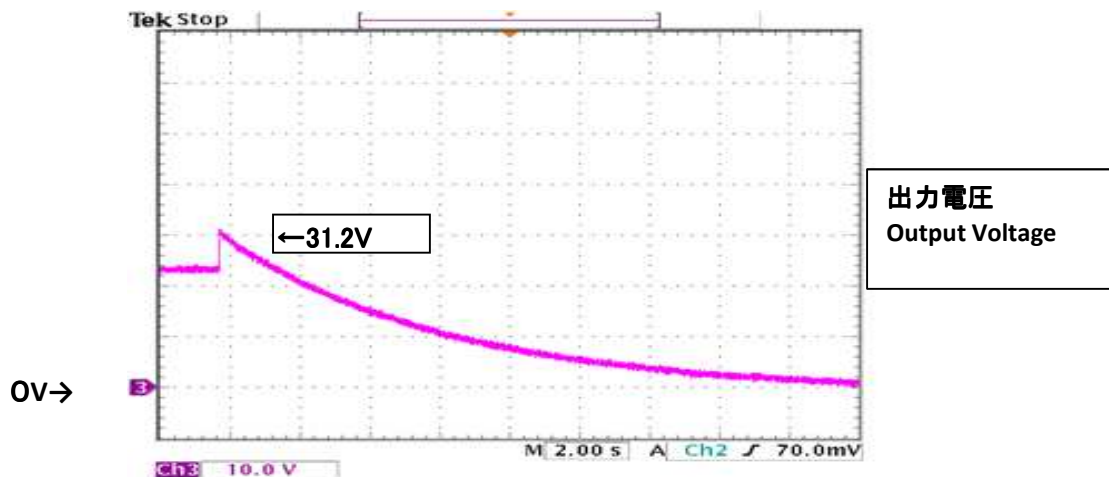
|                |  |
|----------------|--|
| 型名:Model       | SWF050P-24   |
| 入力:Input       | $V_{in}=100\text{ V}$  |
| 出力:Output      | $I_o=2.1\text{ A}$   |
| 温度:Temperature | $T_a=25^\circ\text{ C}$  |
| 備考:Remarks     | 入力電圧<br>InputVoltageVertical: 100V/div<br>出力電圧<br>OutputVoltageVertical: 10V/div<br>時間<br>TimeHorizontal: 20mS/div |

図17 突入電流波形  
Fig.17 Inrush Current Waveform



|                |   |
|----------------|---|
| 型名:Model       | SWF050P-24  |
| 入力:Input       | $V_{in}=200\text{ V}$   |
| 出力:Output      | $I_o=2.1\text{ A}$  |
| 温度:Temperature | $T_a=25^\circ\text{ C}$   |
| 備考:Remarks     | 出力電圧<br>InrushCurrentVertical: 10A/div<br>時間<br>TimeHorizontal: 2mS/div |

図18 過電圧波形  
Fig.18 Over Voltage Waveform



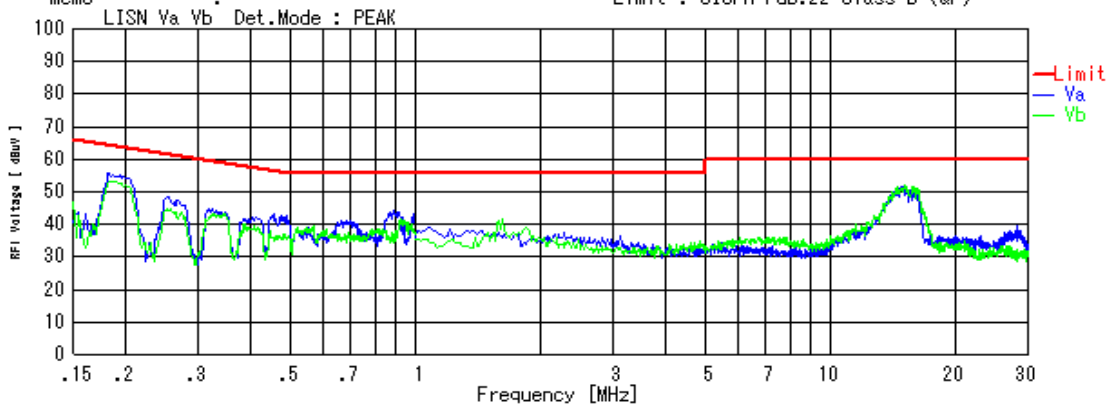
|                |  |
|----------------|--|
| 型名:Model       | SWF050P-24   |
| 入力:Input       | $V_{in}=100\text{ V}$  |
| 出力:Output      | $I_o=0\text{ A}$   |
| 温度:Temperature | $T_a=25^\circ\text{ C}$  |
| 備考:Remarks     | 出力電圧<br>OutputVoltageVertical: 10V/div<br>時間<br>TimeHorizontal: 2S/div |

図19 雑音端子電圧波形

Fig.19 Conduction Noise Waveform

Model Name : SWF050P-24  
 Model No. :  
 Serial No. :  
 Power Supply : AC100V/230V  
 Memo :

Test Mode : 24V/2.1A  
 Temp/Humi :  
 Operator :  
 Limit : CISPR Pub.22 Class B (QP)



型名:Model  
SWF050P-24

入力:Input  
Vin=100V

出力:Output  
Io=2.1A

温度:Temperature  
Ta=25°C

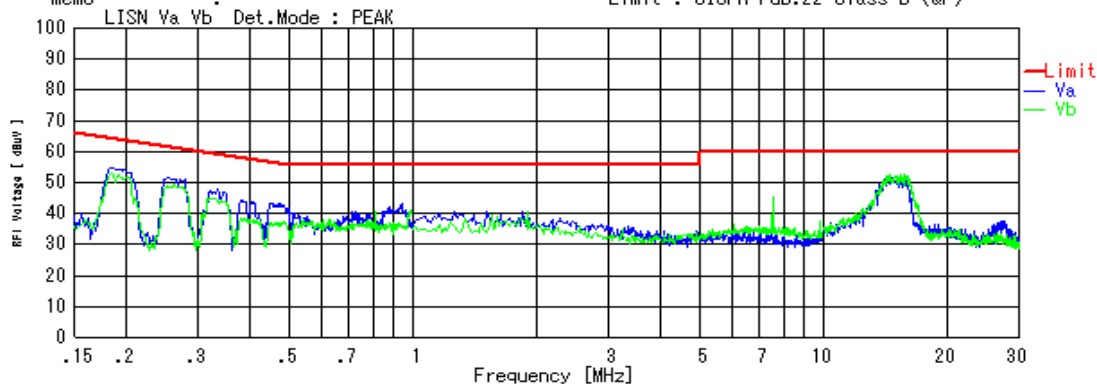
備考:Remarks

図20 雑音端子電圧

Fig.20 Conduction Noise Waveform

Model Name : SWF050P-24  
 Model No. :  
 Serial No. :  
 Power Supply : AC100V/230V  
 Memo :

Test Mode : 24V/2.1A  
 Temp/Humi :  
 Operator :  
 Limit : CISPR Pub.22 Class B (QP)



型名:Model  
SWF050P-24

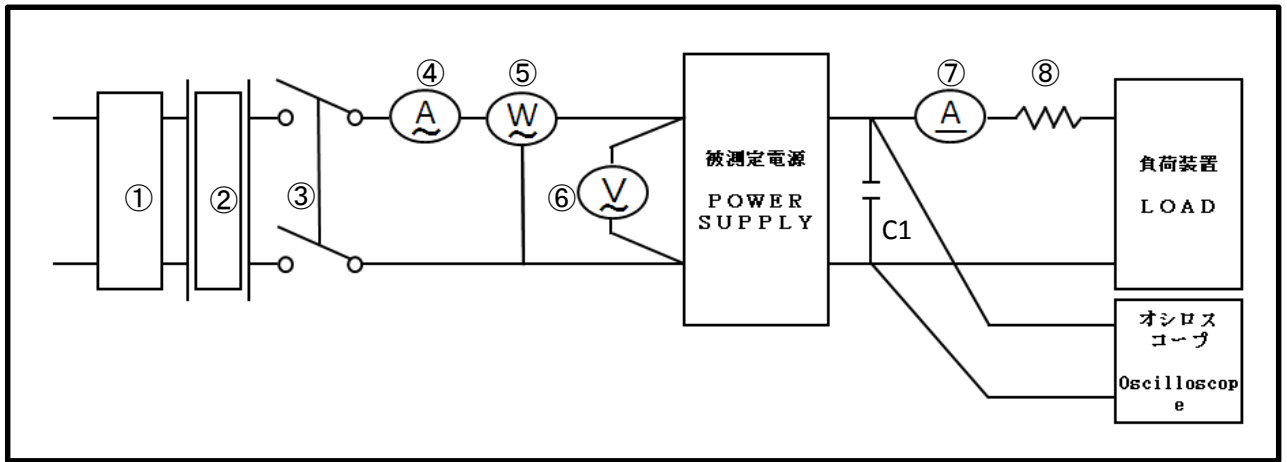
入力:Input  
Vin=230V

出力:Output  
Io=2.1A

温度:Temperature  
Ta=25°C

備考:Remarks

試験回路図 Test Circuit



使用計測機器

- ①スライダック
- ②絶縁トランス
- ③ブレーカー
- ④電流計
- ⑤電力計
- ⑥電圧計
- ⑦電流計
- ⑧シャント抵抗

- Measuring instruments
- Variable autotransformer
  - Isolation transformer
  - A circuit breaker
  - Ammeter
  - Wattmeter
  - Voltmeter
  - Ammeter
  - Shunt resistor

2次側出力電圧はDMMで測定  
Output voltage is measured with DMM

負荷コンデンサ Load capacitor  
24V Circuit C1: Electrolytic Capacitor 100  $\mu$ F  
Film Capacitor 0.1  $\mu$ F