



No. CHD40011-008-01

参考資料
Reference data

TECHNICAL DATA

MODEL: SWK150P-48

SANKEN ELECTRIC CO.,LTD.

CHD40011-008-01
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| | | |
|-----------------------|------|------|
| 入力電圧 Input Voltage | MIN | 85V |
| | NOM | 100V |
| | | 240V |
| MAX | 265V | |

| | | | | | |
|----------------------|------|------|--|--|--|
| 出力 Output Circuit | | 48V | | | |
| 負荷電流 Load Current | MIN | 0A | | | |
| | NOM | 3.2A | | | |
| | MAX | - | | | |
| | PEAK | 6.4A | | | |

1.入力特性 Input Characteristics

Ta=25°C

| 試験項目 Test Item | 条件 Condition | | 試験結果 Test Results | | | 仕様 SPEC | 備考 Remarks |
|---|-----------------|------------|----------------------|----------|------------------|--|---------------|
| | 入力 Vin | 負荷 Load | Vin=100V | Vin=240V | | | |
| | | | | | | | |
| 入力電流 Input Current | NOM | NOM | 1.7A | 0.7A | | 1.7A/0.7A _{typ} | 図1 Fig.1 |
| 入力電力 Input Power | NOM | NOM | 171.6W | 164.3W | | --- | |
| 力率 Power Factor | NOM | NOM | 1.00 | 0.92 | | 0.99/0.90 _{typ} | 図2 Fig.2 |
| 効率 Efficiency | NOM | NOM | 89.7 % | 93.8% | | 90/94% _{typ} | 図3 Fig.3 |
| 突入電流 Inrush Current | 100V 200V | NOM | 15.5A | - | 32.0A (Vin=200V) | 100V:15A _{typ} 200V:30A _{typ} | 図4 Fig.4 |
| 漏洩電流 Leakage Current | NOM | NOM | 0.067mA | 0.169mA | | 0.150/0.250mA or less 60Hz | 図5 Fig.5 |
| 起動停止電圧 Startup Voltage & Stop Voltage | ---- | MIN | | | ON37V・OFF12V | ---- | ---- |
| | ---- | NOM | | | ON54V・OFF48V | ---- | ---- |
| 入力瞬断時間 Hold up time | 100V | NOM | 35ms | | | 20ms or more | 図12 Fig.12 |

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 Test Item | | 条件 Condition | | 試験結果 Test Results | | | | 備考 Remarks |
|----------------------------------|---|------------------------|------------|---|--|--|--|---------------|
| | | 入力 Vin | 負荷 Load | | | | | |
| | | | | +48V | | | | |
| 1 | 出力偏差 Output Standard Voltage | NOM | NOM | 48.07V | | | | |
| 2 | 入出力相互変動 Voltage Change Fluctuation | MIN | MIN | 48.049V | | | | 図6 Fig.6 |
| | | MAX | MAX | 48.106V | | | | |
| 3 | 温度ドリフト Temperature Drift | NOM | NOM | -0.167V 0.295V | | | | 図6 Fig.6 |
| 4 | 経時ドリフト Warm-Up Drift | NOM | NOM | -0.006V 0.024V | | | | 図7 Fig.7 |
| 総合安定度 Total Regulation | | | | 47.876V ~ 48.425V | | | | |
| 仕様 SPEC | | | | 46.560V ~ 49.440V | | | | |
| 5 | リップル電圧 Ripple Voltage | NOM | NOM | 45mVp-p | | | | 図8 Fig.8 |
| | | 室温 Room Temperature | | Ta=25°C | | | | |
| 仕様 SPEC | | | | 300(Ta=-10~0°C) 150(Ta=0~60°C) | | | | |
| | リップルノイズ電圧 Ripple Noise Voltage | NOM | NOM | 50mVp-p | | | | |
| | | 室温 Room Temperature | | Ta=25°C | | | | |
| 仕様 SPEC | | | | 300(Ta=-10~0°C) 250(Ta=0~60°C) | | | | |
| 6 | 出力電圧可変範囲 Output Voltage Variable Range | MIN | MIN | 41.270V | | | | |
| | | MAX | MAX | 56.260V | | | | |
| 仕様 SPEC | | | | 43.200V ~ 52.800V | | | | |
| コメント Comment | | | | | | | | |
| 使用プローブ=リップル電圧1:1 リップルノイズ電圧1:1 | | | | Used Probe = Ripple Voltage 1:1 Ripple Noise Voltage 1:1 | | | | |

Model: SWK150P-48

3.保護特性 Protection Characteristics

| 試験項目 Test Item | 条件 Condition | | 試験結果 Test Results | | | 仕様 SPEC | 備考 Remarks |
|-----------------------------------|-----------------|------------|----------------------|---------|---------|------------------|---------------|
| | 入力 Vin | 負荷 Load | | | | | |
| 過電流検出値 Over Current Protection | | | Ta=-10°C | Ta=25°C | Ta=60°C | | |
| +48V | MIN | MAX | 7.33A | 7.65A | 7.96A | 6.5A以上(or more) | 図9 Fig.9 |
| 過電圧検出値 Over Voltage Protection | | | Ta=-10°C | Ta=25°C | Ta=60°C | | |
| +48V | MAX | MIN | 59.2V | 60.9V | 62.3V | 55.2V以上(or more) | 図10 Fig.10 |
| リセット時間 Reset Time | MAX | MIN | 16s (Ta=25°C) | | | --- | --- |

4.環境試験 Environment Test

Ta=25°C

| 試験項目 Test Item | 条件 Condition | | 試験結果 Test Results | | | 仕様 SPEC | 備考 Remarks |
|--|-----------------|------------|---|--|--|--|---------------|
| | 入力 Vin | 負荷 Load | | | | | |
| 振動試験(非動作時) Vibration (Non-Operating) | --- | --- | 周波数10Hz~55Hz,周期3分,加速度2G X・Y・Z方向に各60分,にて試験後外観・特性に問題なし Frequency 10~55Hz, Sweep cycle 3min., Acceleration 19.6m/s ² , Direction X/Y/Z 60 minutes par each axis. There is no problem in appearance and characteristics | | | 正常に起動 Normal Operation | |
| 高温スタート Power on at high temp | NOM | MAX | POWER OFFにて80°Cに1時間放置後POWER ON Left the power supply at 80°C for one hour and turned on. | | | 正常に起動 Normal Operation | |
| 低温スタート Power on at low temp | NOM | MAX | POWER OFFにて-15°Cに1時間放置後POWER ON Left the power supply at -15°C for one hour and turned on. | | | 正常に起動 Normal Operation | |
| 耐衝撃 Shock | --- | --- | 床面から50mmの高さより各辺3回自然落下後 外観・特性に問題なし Lift one side of surface of the unit 50mm and drop it on the board. Drop 3 times for each side. There is no problem in appearance and characteristics | | | 196m/s ² 正常に起動 Normal Operation | --- |

5.耐ノイズ特性 Noise Tolerance Characteristics

Ta=25°C

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

6. その他の特性 Other Characteristics

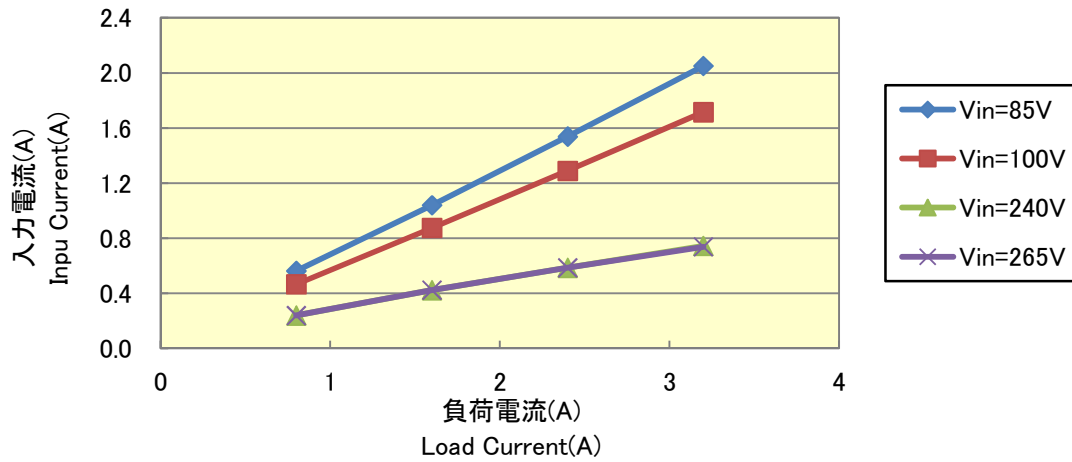
Ta=25°C

| 試験項目 Test Item | 条件 Condition | | 試験結果 Test Results | | | 仕様 SPEC | 備考 Remarks |
|-------------------------------|-----------------|------------|---|---|---|--|---------------|
| | 入力 Vin | 負荷 Load | | | | | |
| 絶縁耐圧 Withstand Voltage | --- | --- | P-S 3.0/3.6kV (漏電流) Leakage Current 1.39/1.49mA | P-E 2.0/2.4kV (漏電流) Leakage Current 1.26/1.35mA | S-E 0.5/0.6kV (漏電流) Leakage Current 1.40/1.54mA | P-S:3.0kV1m,3.6kV 1s P-E:2.0kV1m,2.4kV 1s S-E:0.5kV1m,0.6kV 1s (漏電流10mA以下) Leakage Current 10mA or less | --- |
| 絶縁抵抗 Insulation Resistance | --- | --- | P-S1000MΩ 以上 (or more) | P-E1000MΩ 以上 (or more) | S-E1000MΩ 以上 (or more) | P-S100MΩ以上 (DC500Vカテ-) P-S100MΩ or more (DC500VMegger) | --- |

7. ダイナミック時の負荷特性 Dynamic Load Characteristics 参考データ Reference data

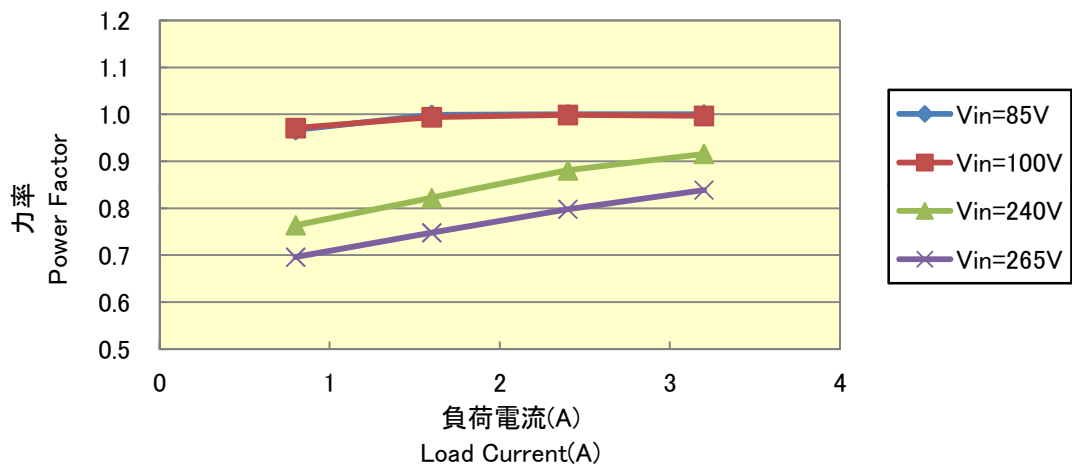
| 試験条件 Test Condition | | 試験結果 Test Results | | | | | 備考 Remarks |
|------------------------|-----------------|------------------------|-----------------------------------|-------|--|--|---------------|
| | | +48V | | | | | |
| 出力電圧 Output Voltage | 条件 Condition | Ta=25°C | | 47.9V | | | 図13 |
| | | | | 48.1V | | | |
| | 条件 Condition | 入力電圧 Vin | NOM | | | | Fig.13 |
| | | 出力電流 Output Current | 0A (1ms) ~ 3.2A (1ms) | | | | |

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



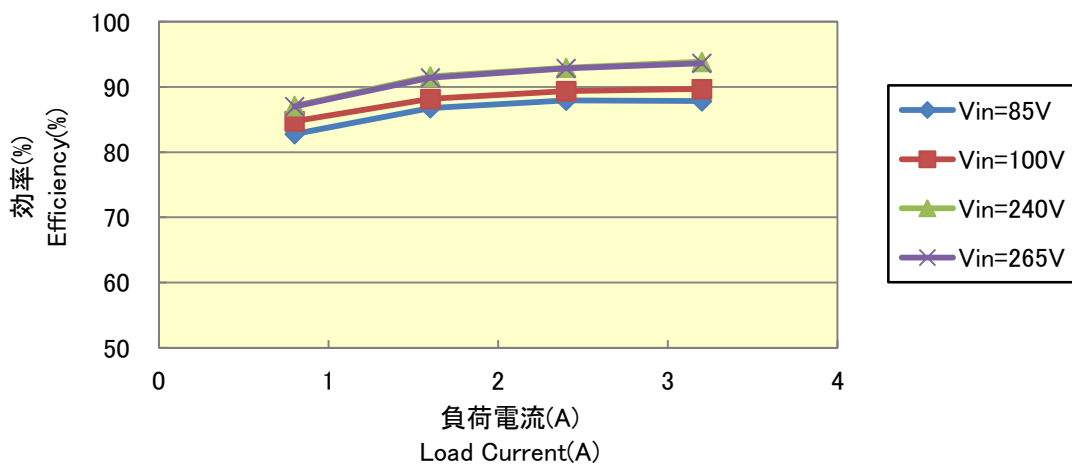
| | |
|----------------|--------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC85V~265V |
| 出力:Output | 48V 25%~100% |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

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



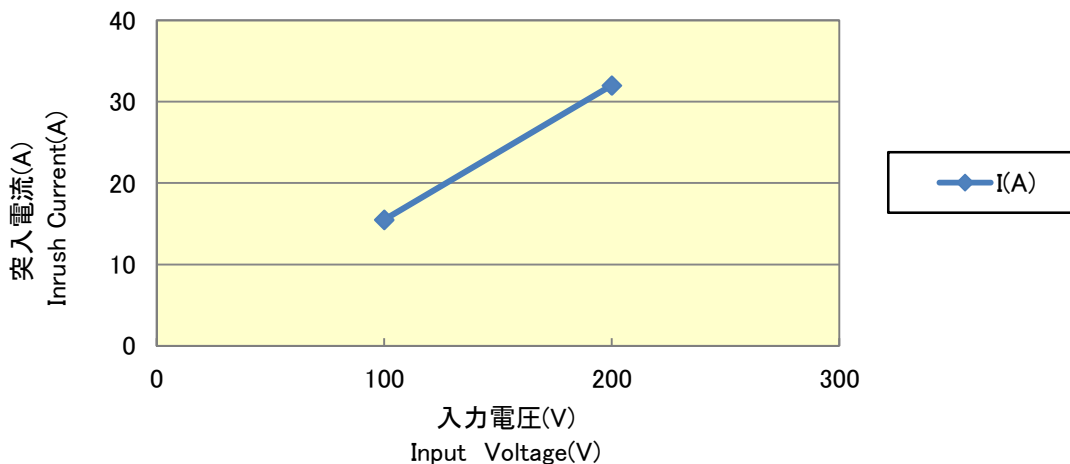
| | |
|----------------|--------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC85V~265V |
| 出力:Output | 48V 25%~100% |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

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



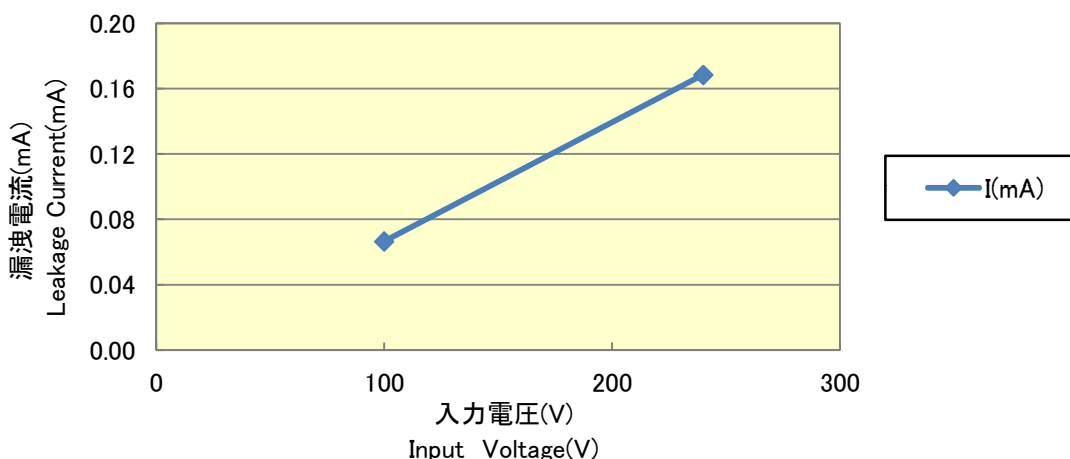
| | |
|----------------|--------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC85V~265V |
| 出力:Output | 48V 25%~100% |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

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



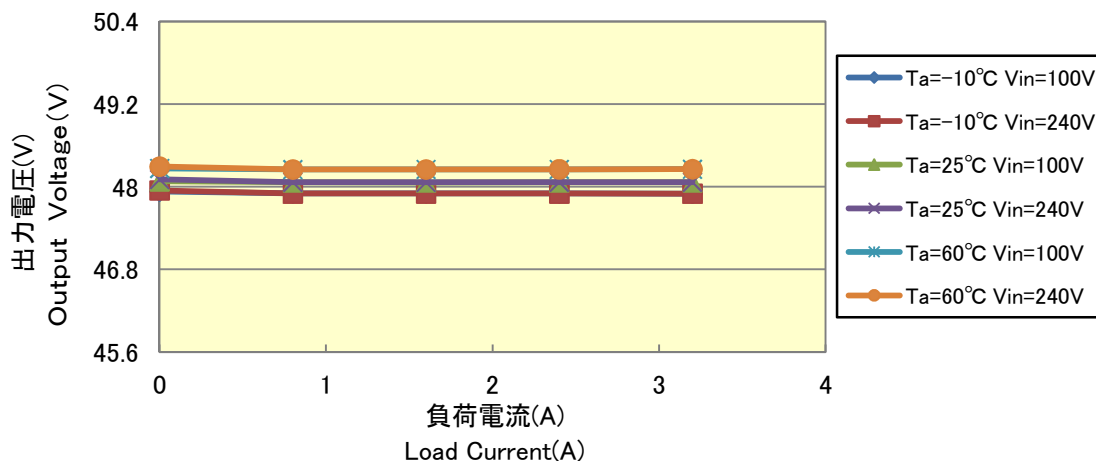
| | |
|----------------|-------------------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100~200V |
| 出力:Output | 48V 3.2A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | コールドスタート時 Cold Start |

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



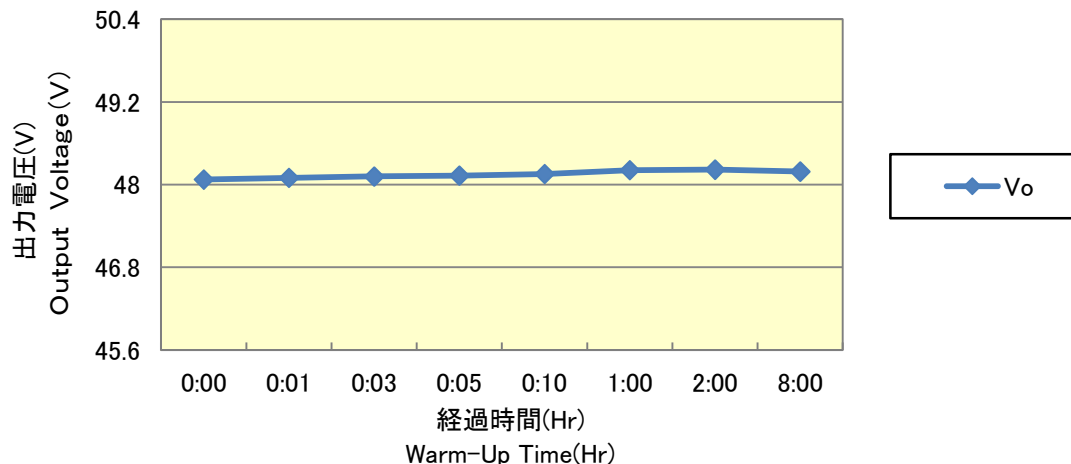
| | |
|----------------|-----------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100~240V 60Hz |
| 出力:Output | 48V 3.2A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

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)



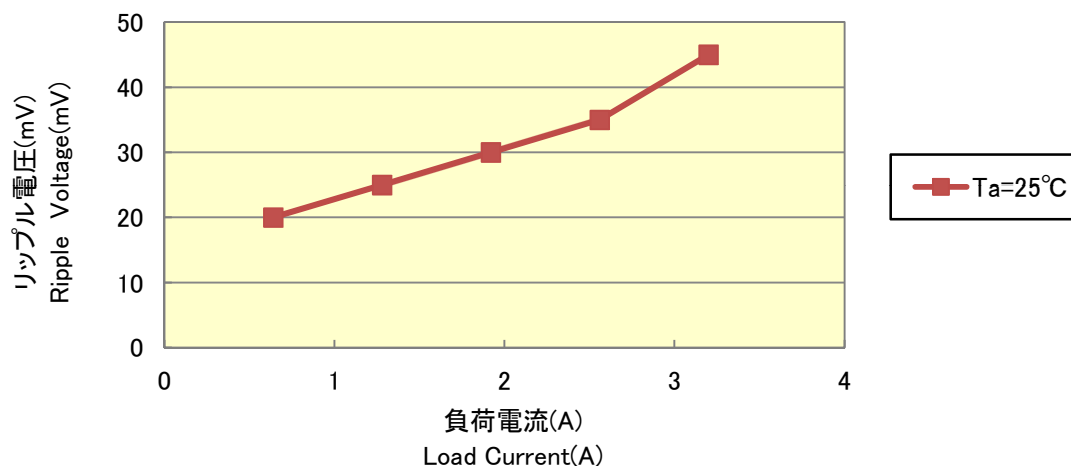
| | |
|----------------|---------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100~240V |
| 出力:Output | 48V 0%~100% |
| 温度:Temperature | Ta=-10°C~60°C |
| 備考:Remarks | |

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



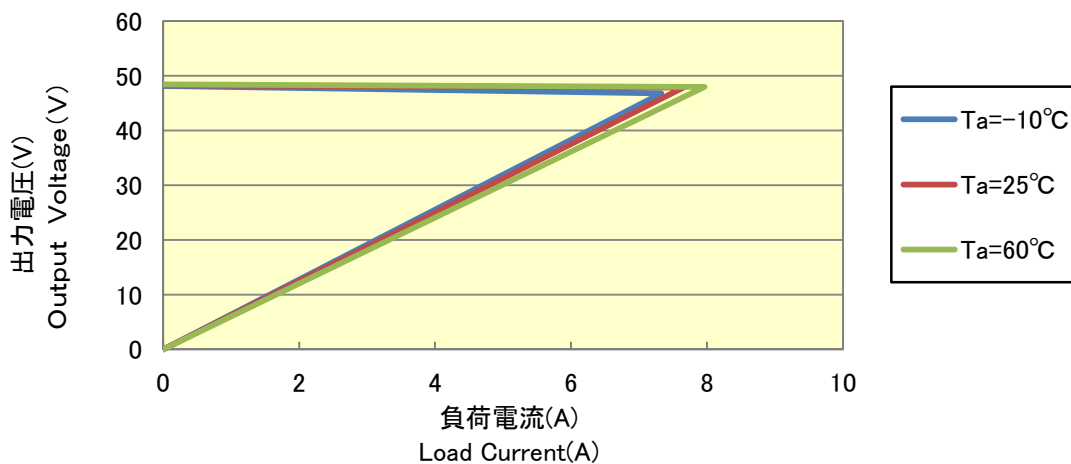
| | |
|----------------|------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | 48V 3.2A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

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)



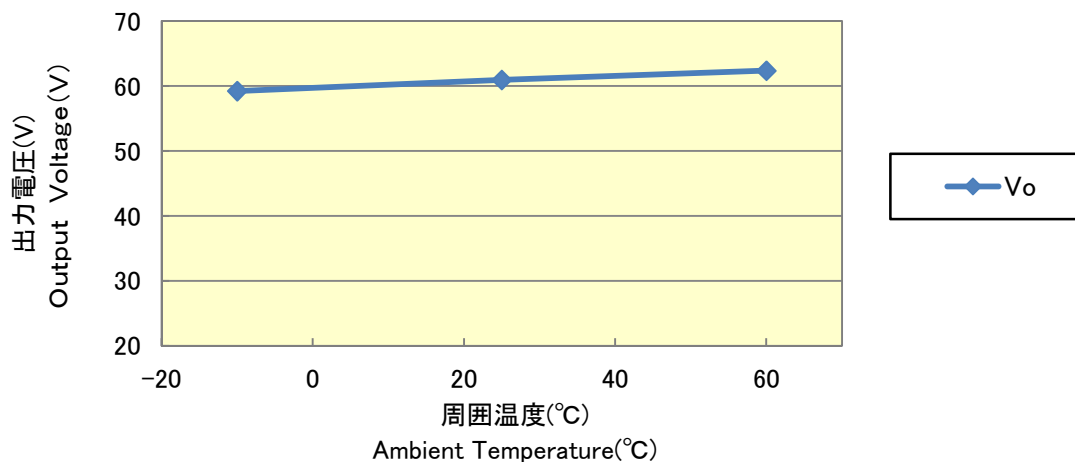
| | |
|----------------|--------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | 48V 20%~100% |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

図9 過電流特性(負荷電流に対して)
Fig.9 Over Current Protection Characteristics (vs Load Current)



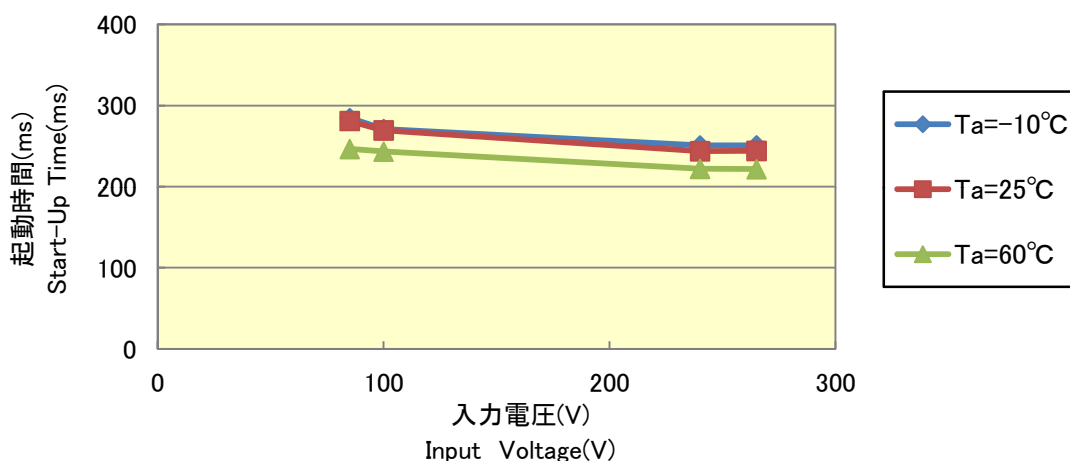
| | |
|----------------|---------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC85V |
| 出力:Output | 48V |
| 温度:Temperature | Ta=-10°C~60°C |
| 備考:Remarks | |

図10 過電圧特性(温度に対して)
Fig.10 Over Voltage Protection Characteristics (vs Temperature)



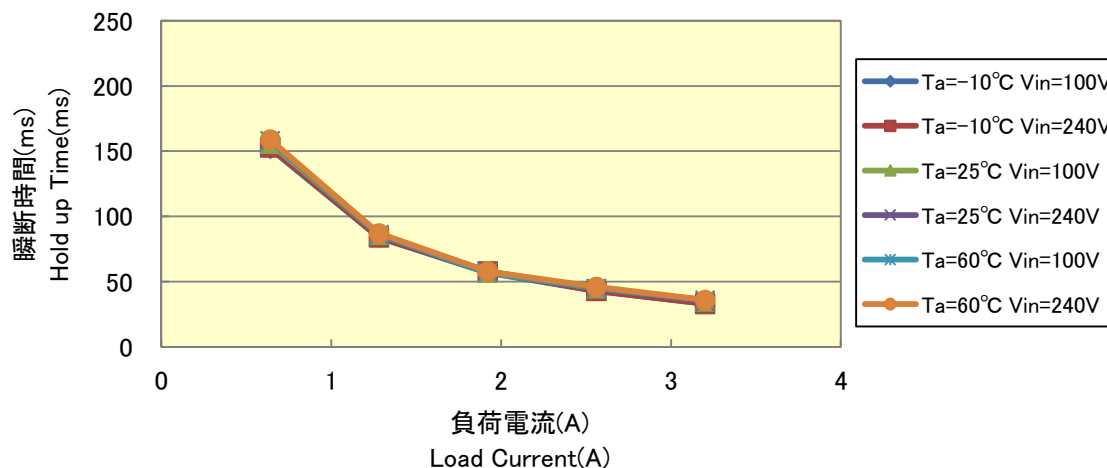
| | |
|----------------|---------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC265V |
| 出力:Output | Io=0A |
| 温度:Temperature | Ta=-10°C~60°C |
| 備考:Remarks | |

図11 起動時間特性(入力電圧に対して)
Fig.11 Start-Up Time Characteristics (vs Input Voltage)



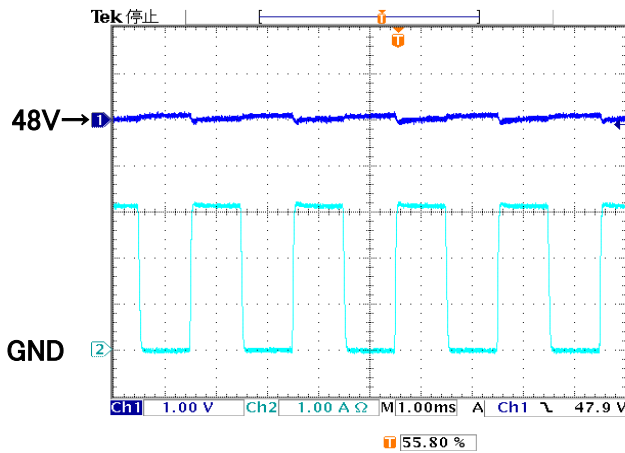
| | |
|----------------|---------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC85V~265V |
| 出力:Output | Io=3.2A |
| 温度:Temperature | Ta=-10°C~60°C |
| 備考:Remarks | |

図12 入力瞬断時間(負荷電流に対して)
Fig.12 Hold up time Characteristics (vs Load Current)



| | |
|----------------|---------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V~240V |
| 出力:Output | 48V 20%~100% |
| 温度:Temperature | Ta=-10°C~60°C |
| 備考:Remarks | |

図13 タイミング時の負荷波形
Fig.13 Dynamic Load Waveform

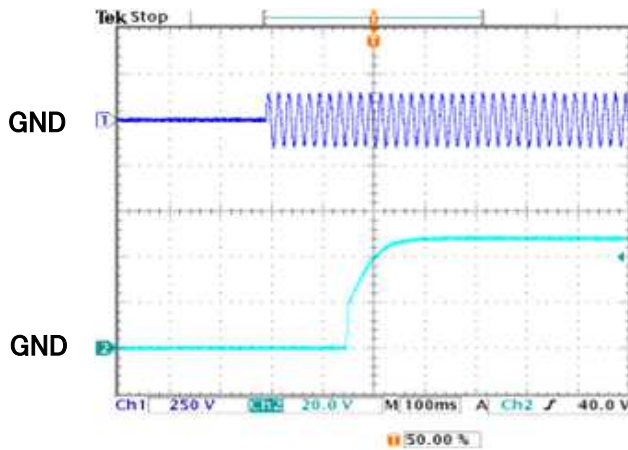


出力電圧
Output Voltage

出力電流
Output Current

| | |
|----------------|---|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | $I_o=0A \leftrightarrow 3.2A$ |
| 温度:Temperature | $T_a=25^\circ C$ |
| 備考:Remarks | 出力電圧 OutputVoltageVertical: 1V/div 出力電流 OutputCurrentVertical: 1A/div 時間 TimeHorizontal: 1ms/div |

図14 出力電圧立上り波形
Fig.14 Output Voltage Rising Waveform

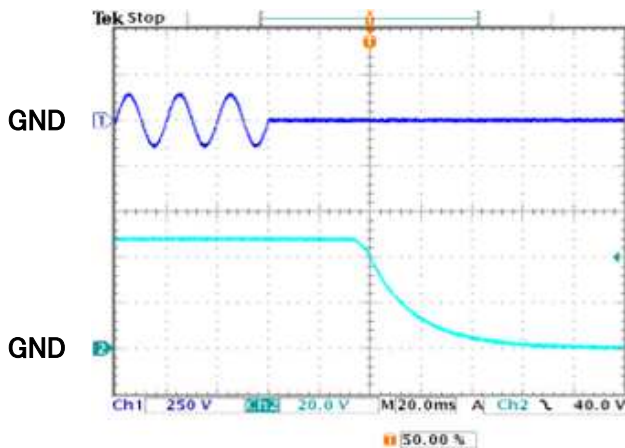


入力電圧
Input Voltage

出力電圧
Output Voltage

| | |
|----------------|---|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | $I_o=3.2A$ |
| 温度:Temperature | $T_a=25^\circ C$ |
| 備考:Remarks | 入力電圧 InputVoltageVertical: 250V/div 出力電圧 OutputVoltageVertical: 20V/div 時間 TimeHorizontal: 100ms/div |

図15 出力電圧立下り波形
Fig.15 Output Voltage Falling Waveform

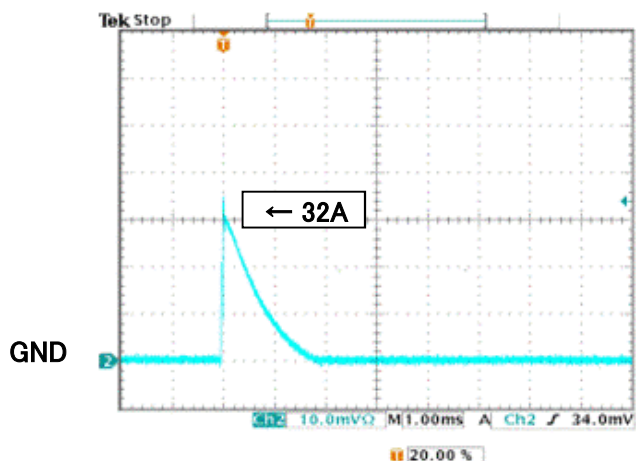


入力電圧
Input Voltage

出力電圧
Output Voltage

| | |
|----------------|--|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | $I_o=3.2A$ |
| 温度:Temperature | $T_a=25^\circ C$ |
| 備考:Remarks | 入力電圧 InputVoltageVertical: 250V/div 出力電圧 OutputVoltageVertical: 20V/div 時間 TimeHorizontal: 20ms/div |

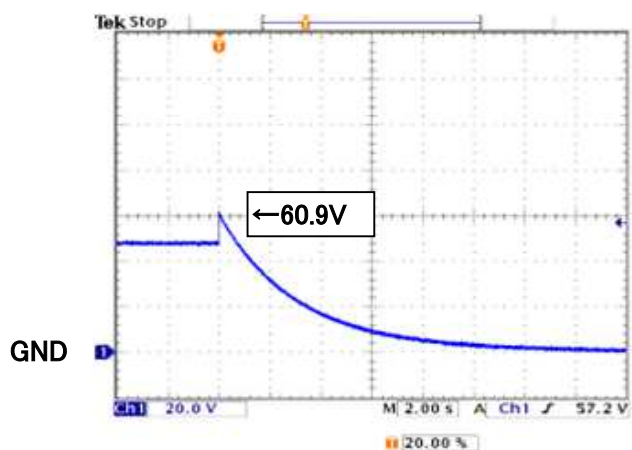
図16 突入電流波形
Fig.16 Inrush Current Waveform



突入電流
Inrush Current

| | |
|----------------|--|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC200V |
| 出力:Output | Io=3.2A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | 入力電流 InrushCurrentVertical: 10A/div 時間 TimeHorizontal: 1ms/div ノイズフィルタへの突入電流は除く Excluding inrush current to noise |

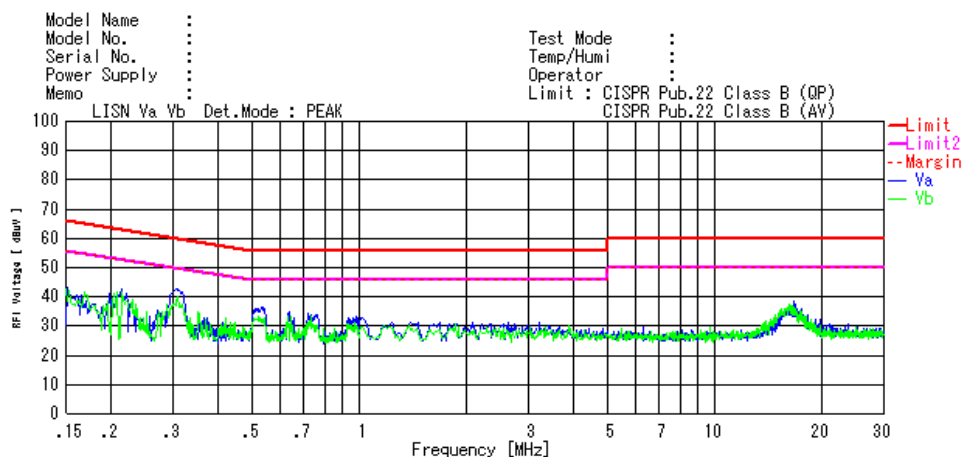
図17 過電圧波形
Fig.17 Over Voltage Waveform



出力電圧
Output Voltage

| | |
|----------------|--|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | Io=0A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | 出力電圧 OutputVoltageVertical: 20V/div 時間 TimeHorizontal: 2s/div |

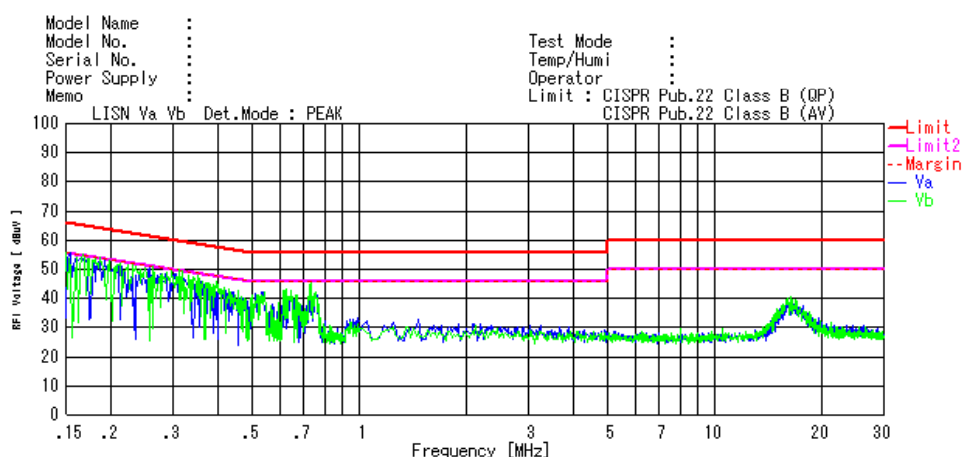
図18 雑音端子電圧波形 参考データ
Fig.18 Conduction Noise Waveform Reference data



| LinePhase | Frequency [MHz] | Results | | Limit | | Margin | |
|-----------|-----------------|----------|-----------|----------|-----------|----------|-----------|
| | | QP[dBuV] | AVE[dBuV] | QP[dBuV] | AVE[dBuV] | QP[dBuV] | AVE[dBuV] |
| A | 0.323 | 48.1 | 39.0 | 59.6 | 49.6 | 11.5 | 10.6 |
| B | 0.323 | 47.2 | 38.2 | 59.6 | 49.6 | 12.4 | 11.4 |

| | |
|----------------|------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC100V |
| 出力:Output | Io=3.2A |
| 温度:Temperature | Ta=25°C |
| 備考:Remarks | |

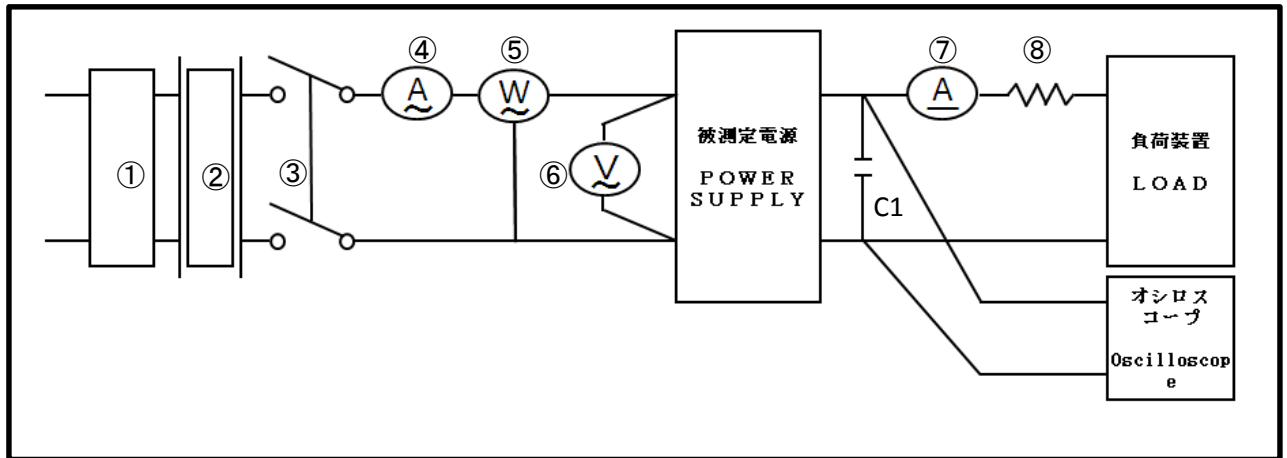
図19 雑音端子電圧波形 参考データ
Fig.19 Conduction Noise Waveform Reference data



| LinePhase | Frequency [MHz] | Results | | Limit | | Margin | |
|-----------|-----------------|----------|-----------|----------|-----------|----------|-----------|
| | | QP[dBuV] | AVE[dBuV] | QP[dBuV] | AVE[dBuV] | QP[dBuV] | AVE[dBuV] |
| A | 0.746 | 44.5 | 24.2 | 56.0 | 46.0 | 11.5 | 21.8 |
| B | 0.746 | 44.5 | 21.0 | 56.0 | 46.0 | 11.5 | 25.0 |

| | |
|----------------|------------|
| 型名:Model | SWK150P-48 |
| 入力:Input | AC230V |
| 出力:Output | Io=3.2A |
| 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

C1: Electrolytic Capacitor 100 μ F
Film Capacitor 0.1 μ F