FSP650M-K48 Series

FEATURES
- Compact size 4 x 8 x 2.58 inches
- Certified medical safety IEC 60601-1
- High altitude 5000 meters operation
- Power Fail Detect (PFD) signal
- Inhibit – TTL high to disable output
- BF Class insulation
- Meet EN55011 and FCC Class B
- Over voltage protection
- Over current protection
- Over temperature protection
- Compliant with RoHS requirement

DESCRIPTION
The FSP650M-K48 series is Class-I design in 4 x 8 inches, AC/DC switching power supplies are capable of delivering 600-650 watts of continuous output power at 30 CFM forced air cooling. The unit is constructed on a printed circuit board with U-bracket or enclosed form for mechanical support. All models meet EN55011 and FCC class B emission limits, and are designed for medical applications.

INPUT SPECIFICATIONS
- Input voltage: 90-264 VAC
- Input frequency: 47-63 Hz
- Input current: < 8.4 A (rms) for 115 VAC
- Earth leakage current: < 350 μA @ 264 VAC, 63 Hz
- Touch current: < 100 μA @ 264 VAC, 63 Hz

OUTPUT SPECIFICATIONS
- Output voltage/current: See rating chart
- Maximum output power: See rating chart
- Remote sense: Compensation for cable losses up to 0.5 V
- Protection:
  - Over voltage: Provided on output. Set at 115% to 140% of its nominal output voltage.
  - Over current: The power supply will shut down without damage and enter auto-recovery mode.
  - Over temperature: The power supply will enter into shut down while the abnormal thermal rise occurs.
- Temperature coefficient: All outputs ±0.04% /℃ maximum.
- Transient response: Maximum excursion of 4%, recovering to 1% of final value within 500µs after a 25% step load change.
- Fan power: 12 V at 500 mA maximum
- Standby power: 5 V at 200 mA maximum

ENVIRONMENTAL SPECIFICATIONS
- Operating temperature: -10°C to +70°C
- Storage temperature: -40°C to +85°C
- Operating humidity: 10% to 90% RH non-condensing
- Storage humidity: 5% to 95% RH non-condensing
- Temperature derating: Derate from 100% at +50°C linearly to 50% at +70°C, applicable to convection and forced-air cooling conditions

GENERAL SPECIFICATIONS
- Switching frequency: 85 KHz (typical)
- Power factor: 0.98 typical at 115 VAC
- Efficiency: See rating chart
- Hold-up time: 20 ms minimum at 110 VAC & 650 W
- Line regulation: ±0.5% maximum at full load
- Inrush current: 20 A @ 115 VAC, or 40 A @ 230 VAC, at 25°C cold start
- Operating altitude: 5000 meters
- Withstand voltage: 4000 VAC from input to output (2 MOPP)
- MTBF: 190,000 hours at full load at 25°C ambient, calculated per MIL-HDBK-217F

EMC Performance (IEC60601-1-2)
- EN55011: Class B conducted, class B radiated
- FCC: Class B conducted, class B radiated
- VCCI: Class B conducted, class B radiated
- EN61000-3-2: Harmonic distortion, Class A and D
- EN61000-3-3: Line flicker
- EN61000-4-2: ESD, ±15 KV air and ±8 KV contact
- EN61000-4-3: Radiated immunity, 10 V/m
- EN61000-4-4: Fast transient/burst, ±2 KV
- EN61000-4-5: Surge, ±1 KV diff., ±2 KV com.
- EN61000-4-6: Conducted immunity, 10 V/m
- EN61000-4-8: Magnetic field immunity, 30 A/m
- EN61000-4-11: Voltage dip immunity, 30% reduction for 500 ms, 60% reduction for 100 ms, and >95% reduction for 10 ms

SAFETY STANDARD APPROVAL
# OUTPUT VOLTAGE/CURRENT RATING CHART

<table>
<thead>
<tr>
<th>Model(1)</th>
<th>V1</th>
<th>Min. Current</th>
<th>Max. Current at 30 CFM</th>
<th>Peak Current</th>
<th>Tolerance</th>
<th>Ripple &amp; Noise(2)</th>
<th>Max. Power(3)</th>
<th>Average Active Efficiency (typical) @ 115 / 230 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSP600M-K48-12C</td>
<td>12 V</td>
<td>0 A</td>
<td>50.00 A</td>
<td>55.00 A</td>
<td>±2%</td>
<td>120 mV</td>
<td>600 W</td>
<td>88% / 90%</td>
</tr>
<tr>
<td>FSP600M-K48-15C</td>
<td>15 V</td>
<td>0 A</td>
<td>40.00 A</td>
<td>44.00 A</td>
<td>±2%</td>
<td>150 mV</td>
<td>600 W</td>
<td>88% / 90%</td>
</tr>
<tr>
<td>FSP650M-K48-18C</td>
<td>18 V</td>
<td>0 A</td>
<td>36.12 A</td>
<td>40.00 A</td>
<td>±2%</td>
<td>180 mV</td>
<td>650 W</td>
<td>88% / 90%</td>
</tr>
<tr>
<td>FSP650M-K48-24C</td>
<td>24 V</td>
<td>0 A</td>
<td>27.09 A</td>
<td>30.00 A</td>
<td>±2%</td>
<td>240 mV</td>
<td>650 W</td>
<td>88% / 90%</td>
</tr>
<tr>
<td>FSP650M-K48-28C</td>
<td>28 V</td>
<td>0 A</td>
<td>23.22 A</td>
<td>25.50 A</td>
<td>±2%</td>
<td>280 mV</td>
<td>650 W</td>
<td>89% / 91%</td>
</tr>
<tr>
<td>FSP650M-K48-36C</td>
<td>36 V</td>
<td>0 A</td>
<td>18.06 A</td>
<td>20.00 A</td>
<td>±2%</td>
<td>360 mV</td>
<td>650 W</td>
<td>89% / 91%</td>
</tr>
<tr>
<td>FSP650M-K48-48C</td>
<td>48 V</td>
<td>0 A</td>
<td>13.55 A</td>
<td>15.00 A</td>
<td>±2%</td>
<td>480 mV</td>
<td>650 W</td>
<td>89% / 91%</td>
</tr>
<tr>
<td>FSP650M-K48-57C</td>
<td>57 V</td>
<td>0 A</td>
<td>11.41 A</td>
<td>12.50 A</td>
<td>±2%</td>
<td>570 mV</td>
<td>650 W</td>
<td>89% / 91%</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Change suffix “C” for enclosed form with cover and fan assembly to “B” for U-bracket form, e.g. FSP600M-K48-12B.
2. Ripple and noise is maximum peak-to-peak voltage value measured at output within 20 MHz bandwidth, at rated line voltage and output load ranges, and with a 10 μF tantalum capacitor in parallel with a 0.1 μF ceramic capacitor across the output.
3. 600 W or 650 W for “C” version or with 30 CFM forced air provided by user for “B” version.

## INTERFACE SIGNALS

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFD</td>
<td>TTL logic high for normal operation and TTL logic low upon loss of input power. Turn-on delay time 100-750 ms, turn-off delay time 1 ms minimum.</td>
</tr>
<tr>
<td>Inhibit</td>
<td>TTL high level signal to inhibit output.</td>
</tr>
</tbody>
</table>

## OUTPUT POWER DERATING CURVE

[Graph showing output power derating curve over ambient temperature range from 0°C to 70°C]
NOTES:
1. Dimensions shown in inches [mm].
2. Tolerance 0.02 [0.5] maximum.
3. Input connector P1 is Dinkle terminal P/N DT-35-B01W-03, with nickel plated M3 screws.
4. Output connector P2 is Dinkle terminal P/N DT-4N-B01W-06, with nickel plated M3.5 screws.
5. Output connector P3 is JST header S10B-PHDSS or equivalent, mating with JST housing PHDR-10VS or equivalent.
6. Fan connector P4 is JST header S2B-ZR-3.4 or equivalent, mating with JST housing ZHR-2 or equivalent.
7. Maximum penetration depth of fixing screws is 4 mm from the outer surface of chassis.
8. Weight: 1.8 Kgs (3.97 lbs.) approx. for U-bracket form, 2.0 Kgs (4.41 lbs.) approx. for enclosed form.

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**PIN CHART**

<table>
<thead>
<tr>
<th>Connector</th>
<th>P1</th>
<th>P2</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin No.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Polarity</td>
<td>Ground</td>
<td>Live</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin No.</td>
<td>1</td>
</tr>
<tr>
<td>Polarity</td>
<td>+V1 Sense</td>
</tr>
</tbody>
</table>