

82500-PBF

(250W, 47– 800Hz)

Low Profile

PFC Boost Converter Module



The **82500-PBF** module contains all of the necessary circuitry for complete power line compliance with aeronautics specification RTCA/DO-160G and Boeing's D6-36440(C)*. It is a pin-for-pin and form-fit compatible drop-in replacement for the popular 80751E PFC boost module. Constructed using thermal circuit board technology and planar magnetics, these low profile (0.5" height) modules are compact and rugged. Providing line rectification, minimized input current harmonic distortion, active inrush current limiting and near unity power factor; the **82500-PBF** is ideal for avionics' applications where power demands are in the 150W-250W range.

The **82500-PBF** provides a standard 360Vdc output, compatible with a broad range of off-the-shelf DC/DC converter modules. Utilizing a modular approach, system power supplies are easily configured with a few individual components required. Tedious design and development cycles normally associated with custom power solutions are no longer necessary with this approach.

*Requires external power line filter and hold-up capacitors; see application circuit for details



FEATURES

| | |
|--|---|
| | EXCEEDS BOEING'S RTCA/DO-160G, CATEGORY A(WF) FOR INPUT CURRENT HARMONIC DISTORTION LEVELS @ 360-800Hz |
| | EFFICIENCY: 90% TYPICAL |
| | WIDE INPUT RANGE: 96 - 134Vrms, 47 - 800Hz |
| | STANDARD 360Vdc OUTPUT COMPATIBLE WITH BROAD RANGE OF OFF-THE-SHELF DC/DC CONVERTER MODULES |
| | COMPLIES WITH RTCA/DO-160G EMI & SUSCEPTIBILITY (WITH EXTERNAL FILTER) |
| | VL94V-0 FLAMMABILITY CLASSIFICATION |
| | RUGGEDIZED SILICON-BASED ENCAPSULATED CONSTRUCTION WITH THERMAL CLAD TECHNOLOGY |
| | SIZE: 3.5" x 2.5" x 0.5", WEIGHT: 6oz. |
| | ACTIVE INRUSH CURRENT LIMITING |
| | OVERVOLTAGE AND THERMAL PROTECTION |

TEMPERATURE CHARACTERISTICS

| *AIRFLOW (LFM) | THERMAL IMPEDANCE (0s-a) (°C/W) |
|----------------|---------------------------------|
| 0 LFM | 5.50 |
| 250 LFM | 1.50 |
| 500 LFM | 0.90 |

* Air velocity measured using a digital anemometer positioned within an airflow duct 4" X 3" above top of module

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PERFORMANCE SUMMARY

| PARAMETER | SPECIFICATIONS |
|---|-----------------|
| OUTPUT POWER RANGE (1) | 150 - 250W |
| OUTPUT VOLTAGE (2) | 360Vdc |
| MINIMUM EFFICIENCY (3) | 88% |
| SWITCHING FREQUENCY | 100kHz |
| MINIMUM OUTPUT CAPACITANCE (4) | 100uF |
| INPUT LINE TO NEUTRAL CAPACITANCE (5) | 0.39uF |
| TOTAL LINE/NEUTRAL TO CHASSIS CAPACITANCE (6) | 4000pF |
| ISOLATION VOLTAGE, INPUT/ OUTPUT TO CHASSIS (7) | 1500Vac |
| MTBF: Per RIAC 217Plus, Aic, 50°C operating temperature, 65% DC, 2190 Cycles/ yr. | 2,440,000 Hours |

NOTES:

1. Output power range in which module complies with RTCA/DO-160G, Category A(WF), with external filter.
2. DC output voltage $\pm 3\%$ when operating from no load through 250Wout (Pmax). Output may overshoot at initial start-up to 388Vpk.
3. Minimum efficiency at Pmax. Efficiency is 90% typical.
4. Minimum output capacitance for proper boost module operation. Typical values will be larger to meet hold-up time requirements. Use polarized aluminum electrolytic type.
5. Capacitance tolerances are $\pm 20\%$.
6. 1500Vac, 60Hz for 60 seconds without arc or damage; 4mArms maximum leakage current (internal line-to-earth capacitors installed).

SPECIFICATIONS

| | |
|--|--|
| | RTCA/DO-160G, Section 4, Temperature, category A1 equipment, -15°C to 70°C operating (requires proper heatsinking) |
| | RTCA/DO-160G, Section 4, Category A1 equipment, Altitude: 15,000 feet, Decompression: 55,000 feet, Overpressure: 170kPa |
| | RTCA/DO-160G, Section 5, Temperature variation, category C (requires proper heatsinking) |
| | RTCA/DO-160G, Section 6, Humidity, category A |
| | RTCA/DO-160G, Section 7, Shock (operating) category B |
| | RTCA/DO-160G, Section 8, Vibration (operating) category S, curve B |
| | RTCA/DO-160G, Section 16, Power input requirements for category A(WF) equipment (requires external hold-up capacitors) |
| | RTCA/DO-160G, Section 17, Voltage spike, category A |
| | RTCA/DO-160G, Section 18, Audio frequency conducted susceptibility, category R(WF) equipment |
| | RTCA/DO-160G, Section 19, Induced signal susceptibility, category ZW |
| | RTCA/DO-160G, Section 20, Conducted and radiated susceptibility, category T, R |
| | RTCA/DO-160G, Section 21, Conducted and radiated emissions, category M (requires external filtering per application notes) |

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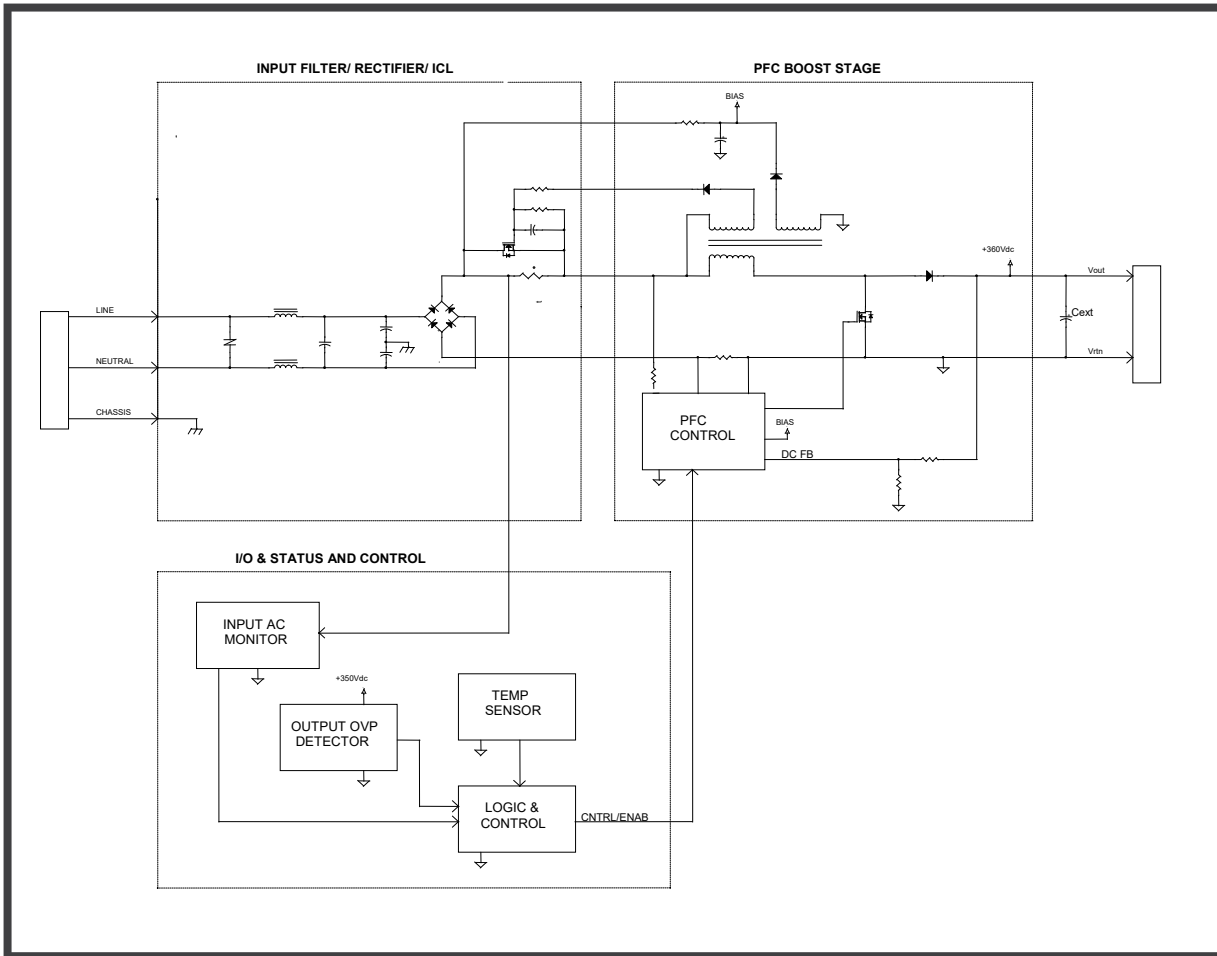
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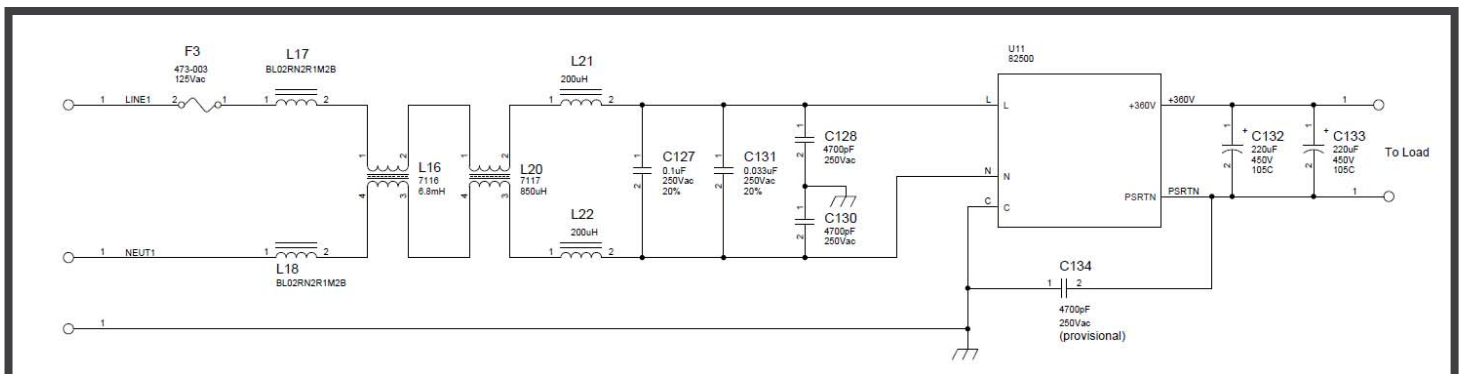
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BLOCK DIAGRAM



TYPICAL APPLICATION CIRCUIT



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ELECTRICAL SPECIFICATIONS

UNLESS OTHERWISE SPECIFIED THE FOLLOWING TEST CONDITIONS APPLY: $T_A=25^{\circ}\text{C}$. CONSTANT ACTIVE LOAD APPLIED TO OUTPUT IN PARALLEL WITH 470uF CAPACITOR. $V_{IN}=115\text{V}_{\text{rms}}$, 400Hz, < 1% THD SINUSOID.

INPUT CHARACTERISTICS

| PARAMETER | 82500-PBF | REMARKS | NOTES |
|---|--|--|-------|
| INPUT VOLTAGE RANGE | 96 - 134Vrms | COMPLIES WITH NORMAL/ABNORMAL INPUT VOLTAGES PER RTCA/DO-160G, SECTION 16. DERATE OUTPUT POWER TO 80% of Pmax (200Wout) FROM 96Vac to 104Vac. | 2, 3 |
| INPUT FREQUENCY RANGE | 47 - 800Hz | COMPLIES WITH DO-160G, SECTION 16, FOR A(WF) EQUIPMENT. OPERATES AT 47 - 360Hz WITH REDUCED DISTORTION PERFORMANCE | 2 |
| CONTINUOUS OUTPUT POWER | 250W | OBSERVE 100°C MAXIMUM BASEPLATE TEMPERATURE | 2, 3 |
| LEAKAGE CURRENT | < 5mArms | AC LINE/NEUTRAL TO CHASSIS, V_{in} @ 115Vrms, 400Hz | 1 |
| INRUSH CURRENT | < 7Apk | COLD START, $V_{out} = 0\text{Vdc}$ | 2 |
| TOTAL HARMONIC DISTORTION (INPUT CURRENT) | < 5.5% | $P_{out} \geq 150\text{W}$ | 2 |
| INDIVIDUAL HARMONICS - AC CLEAN (with app note filter) | EVEN: < 1% I_f / n , ($n < 10$) EVEN: < 0.1% I_f , ($n \geq 10$) ODD: < 30% I_f / n ODD TRIPLENS: < 15% I_f / n | $V_{in} = 115\text{V}_{\text{rms}}$, 360 - 800Hz $V_{thd} \leq 1\%$ $n = \text{ORDER OF HARMONIC, 1 THRU 40}$; $I_f = \text{FUND CURRENT}$ $P_{out} \geq 150\text{W}$ and INDIVIDUAL HARMONICS > 10mArms | 1 |
| INDIVIDUAL HARMONICS - DISTORTED INPUT (with app note filter) | EVEN: < 1% $I_f / n + V_n$ ($n < 10$) EVEN: < 0.1% $I_f + V_n$ ($n \geq 10$) ODD: < 30% $I_f / n + V_n$ ODD TRIPLENS: < 15% $I_f / n + V_n$ | $V_{in} = 115\text{V}_{\text{rms}}$, 360 - 800Hz $V_{thd} \geq 10\%$, $V_n = \text{CORRESPONDING INPUT VOLTAGE HARMONIC}$ $n = \text{ORDER OF HARMONIC, 1 THRU 40}$; $I_f = \text{FUND CURRENT}$ $P_{out} \geq 150\text{W}$ and INDIVIDUAL HARMONICS > 10mArms | 1 |
| POWER FACTOR | 0.98 min | $P_{out} \geq 150\text{W}$ at 400Hz $P_{out} \geq 170\text{W}$ at 800Hz | 2 |
| CREST FACTOR (CURRENT) | 1.314 - 1.514 | RATIO OF PEAK/RMS | 1 |
| START-UP TIME | < 1Sec | $V_{out} > 200\text{Vdc}$ | 2 |
| CONDUCTED EMISSIONS | RTCA/DO-160G CATEGORY M | REQUIRES EXTERNAL FILTER, SEE APPLICATION NOTES | 1 |
| AUDIO FREQUENCY CONDUCTED EMISSIONS | D6-16050-4 INDUCTIVE COUPLING PER SECTION 8.3.2 | INPUT POWER LINES (with app note filter installed) | 1 |
| OPERATING TEMPERATURE RANGE | -25°C TO 100°C | BASEPLATE | 1 |
| STORAGE TEMPERATURE RANGE | -55°C TO 100°C | NON-OPERATIONAL | 1 |
| OVERTEMPERATURE PROTECTION | 100°C +10, -5°C | BOOST INHIBITED WHEN OVERTEMPERATURE FAULT IS DETECTED. DURING INHIBIT, MODULE OUTPUT OPERATES AT $\sqrt{2} * V_{in}$ (rms). AUTO RESET WITH ~ 15°C HYSTERESIS | 1 |

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OUTPUT CHARACTERISTICS

| PARAMETER | 82500-PBF | REMARKS | NOTES |
|--|--------------------------|--|-------|
| RATED OUTPUT VOLTAGE | 360Vdc+/-3% | $0W \leq P_{out} \leq 250W$ | 2, 4 |
| MINIMUM OUTPUT CURRENT | 0A _{dc} | | 2 |
| MAXIMUM BASEPLATE TEMPERATURE | 100°C | | 1 |
| TEMPERATURE STABILITY COEF. | 0.02% / °C | OUTPUT VOLTAGE | 1 |
| OUTPUT RIPPLE + NOISE (pk - pk) | < 0.5% | 20MHz BANDWIDTH, C _{out} = 470uF | 1 |
| LINE REGULATION | < 1% | OUTPUT DEVIATION FOR ± 20%, STEP CHANGE IN LINE VOLTAGE | 1 |
| HOLD-UP TIME | 0mSec | REQUIRES EXTERNAL HOLD-UP CAPACITOR, SEE APPLICATION NOTES | 1 |
| MINIMUM OUTPUT CAPACITANCE | 100uF | OBSERVE RIPPLE CURRENT REQUIREMENTS @ 800Hz & 100kHz FOR EXTERNAL HOLD-UP CAPACITORS | 1 |
| MAXIMUM OUTPUT CAPACITANCE | 1,200uF | SPECIFIED IN ORDER NOT TO OVERSTRESS THE INTERNAL ACTIVE INRUSH CURRENT LIMITING CIRCUIT | 1 |
| ISOLATION VOLTAGE: INPUT TO OUTPUT | NONE | NON-ISOLATED DEVICE, ISOLATION VOLTAGE IS ACHIEVED IN DC/DC CONVERTERS | 1 |
| ISOLATION VOLTAGE: INPUT/OUTPUT TO CHASSIS | 1500Vac / 60Hz | NO ARCING OR DAMAGE FOR 60 SECOND DURATION 4mArms MAX LEAKAGE CURRENT | 2 |
| SHORT-CIRCUIT PROTECTION | NONE | FUSE INPUT WITH 3A OR 4A SLOW-BLOW FUSE | 1 |
| OVERVOLTAGE PROTECTION | OVP SET-POINT: 405V ± 2% | OUTPUT VOLTAGE LIMITED, AUTO RECOVERY | 1 |

Notes:

1. Ensured by design, not 100% tested in production.
2. 100% tested for specification compliance in production.
3. Output power is derated from 250W to 200W maximum when starting at low line (96Vac to 104Vac).
4. Output may overshoot at start-up to 360V + 8% (389Vpk).