

81357-X-MP1

PFC BOOST CONVERTER MODULE (400Hz)



The **81357-X-MP1** PFC boost converter module contains all the necessary circuitry for complete power line compliance with aeronautics specification RTCA/DO-160D and Boeing's D6-36440(C). Housed in an all aluminum enclosure, with silicon-based encapsulant, the **81357-X-MP1** module is compact and rugged. Providing line rectification, minimized input current harmonic distortion, active inrush current limiting and near unity power factor; the **81357-X-MP1** is ideal for avionics applications where power demands are in the 40W-120W range.

The **81357-X-MP1** provides a standard 330Vdc 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. Reliable, compliant power supplies can be configured in weeks, not months, without the need for specialized Power Supply Engineers.



81357-H-MP1 MODULE SHOWN

FEATURES

	EXCEEDS BOEING'S D6-36440 (Rev C) FOR INPUT CURRENT HARMONIC DISTORTION LEVELS @ 400Hz +/- 10%
	EFFICIENCY: 90% TYPICAL AT FULL 120W LOAD
	WIDE INPUT RANGE: 97 - 134Vrms, 47 - 440Hz
	STANDARD 330Vdc OUTPUT COMPATIBLE WITH BROAD RANGE OF <i>OFF-THE-SHELF</i> DC/DC CONVERTER MODULES
	COMPLIES WITH RTCA/DO-160D, SECTION 21, CATEGORY M FOR EMISSIONS & SUSCEPTIBILITY
	VL94V-0 FLAMMABILITY CLASSIFICATION
	RUGGEDIZED SILICON-BASED ENCAPSULATED CONSTRUCTION WITH INTEGRAL HEATSINK OR FLAT TOP
	SIZE: FINNED VERSION: 4.0" x 2.3" x 1.25", WEIGHT = 15oz, FLAT-TOP VERSION: 4.0" x 2.3" x 0.99", WEIGHT = 14oz
	ACTIVE INRUSH CURRENT LIMITING
	MTBF (RIAC 217Plus, Aic, 50°C OPERATING TEMPERATURE, 65% DC, 2190 Cycles/ yr.) 1.39 MILLION HOURS

NOT RECOMMENDED FOR NEW DESIGN
SUGGESTED ALTERNATIVE: 81357-X-MPM

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OVERVIEW

PARAMETER	81357-X-MP1
OUTPUT POWER RANGE (1,2)	40-120W
OUTPUT VOLTAGE (3)	330Vdc
EFFICIENCY (4)	90%
SWITCHING FREQUENCY	100kHz
MINIMUM OUTPUT CAPACITANCE (5)	100uF
INPUT LINE TO NEUTRAL CAPACITANCE (6)	0.15uF
TOTAL LINE/NEUTRAL TO CHASSIS CAPACITANCE (6)	8600pF

NOTES:

1. Output power range in which module complies with D6-36440 rev C for harmonic distortion.
2. Module is power limited at upper output limit, (Pmax).
3. DC output voltage $\pm 3\%$ when operating within 20-120W output power range. The DC output voltage tolerance is $\pm 5\%$ when operating at no load through 20W output power.
4. Minimum efficiency at Pmax.
5. Minimum output capacitance for proper boost module operation. Typical values will be larger to meet hold-up time requirements. Use polarized aluminum electrolytic type.
6. Capacitance tolerances are $\pm 20\%$.

TEMPERATURE CHARACTERISTICS

*AIRFLOW (LFM)	THERMAL IMPEDANCE (θ_{s-a}) ($^{\circ}\text{C}/\text{W}$)	
	INTEGRAL FINS	FLAT TOP (W/O FINS)
Air velocity through cross-sectional area of fins or across flat top		
0 LFM	3.27	4.34
250 LFM	1.06	2.28
500 LFM	0.59	1.59
750 LFM	0.35	1.07

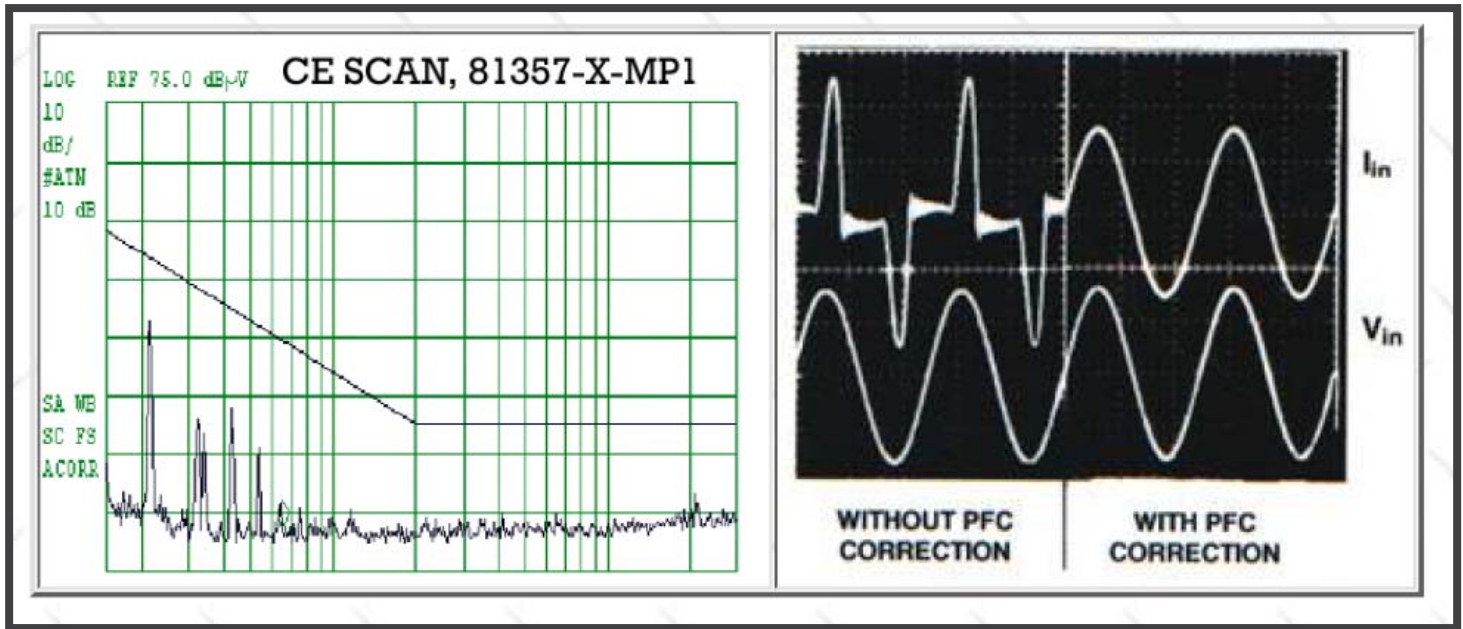
* Air velocity measured using a digital anemometer positioned within an airflow duct 1" X 2.3" above top of module

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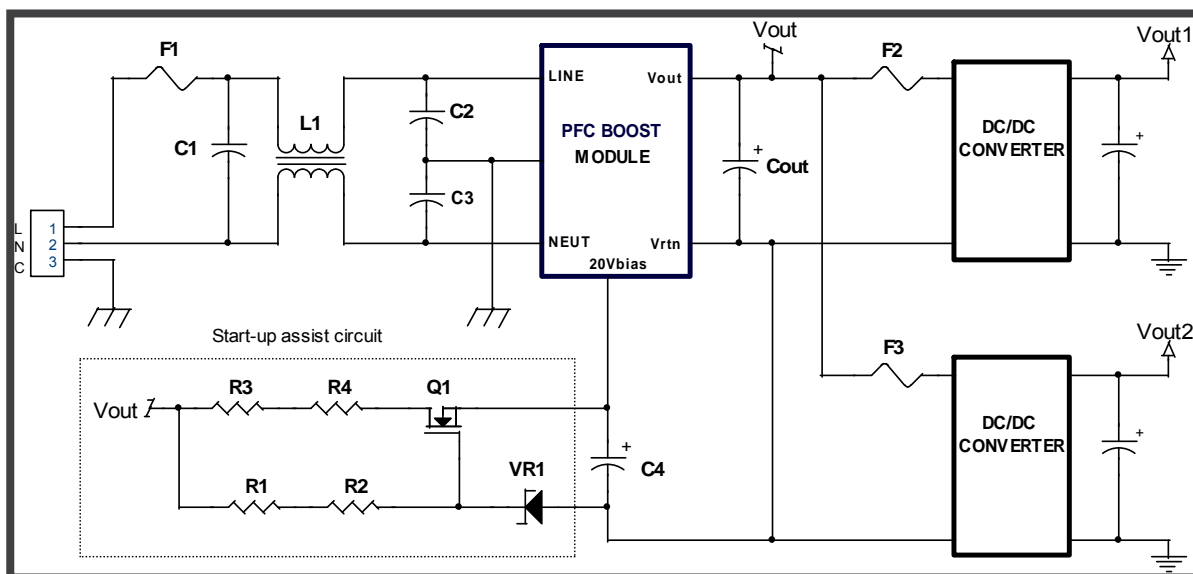
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TYPICAL PERFORMANCE CURVES



TYPICAL APPLICATION CIRCUIT

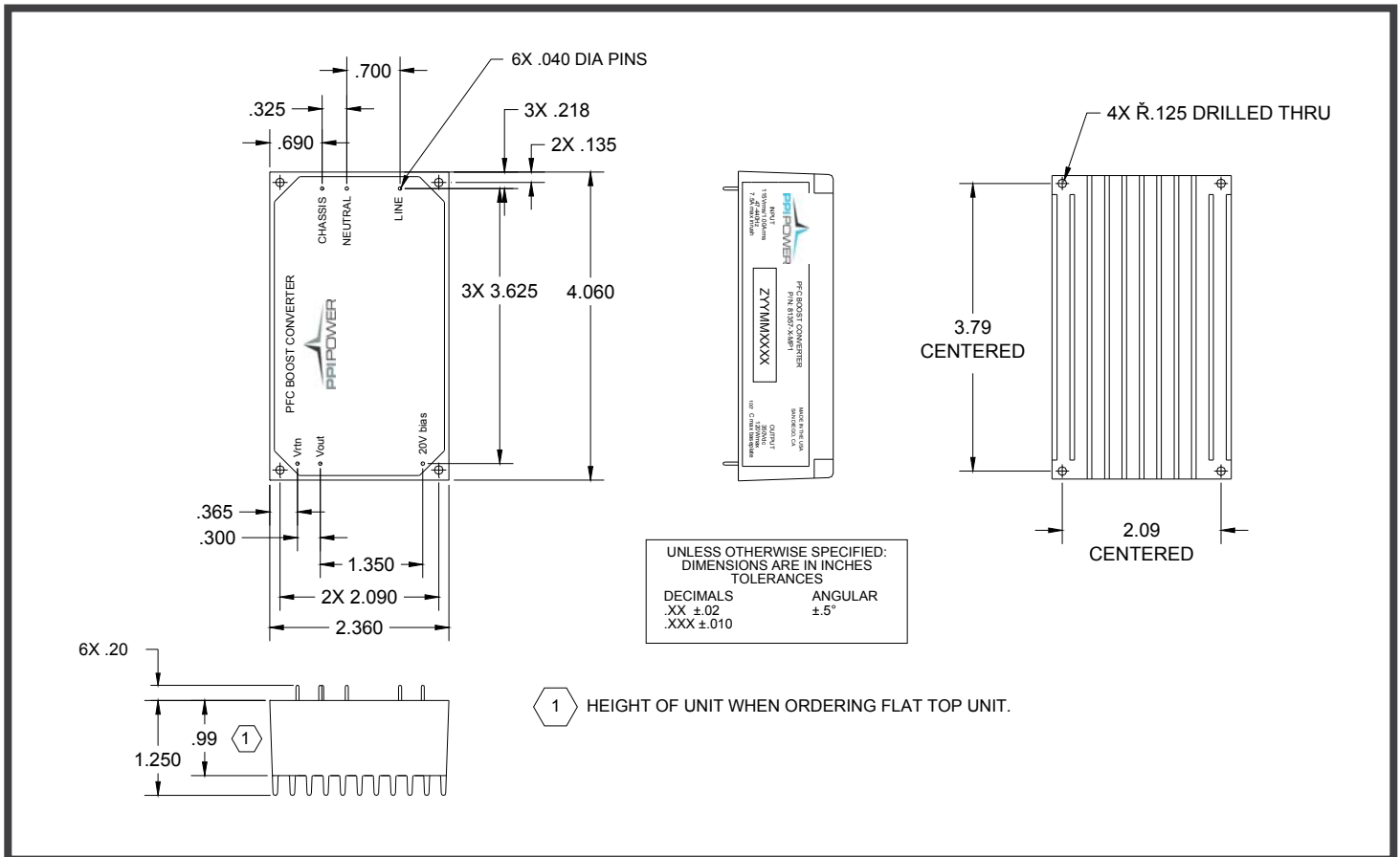


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MECHANICAL DIAGRAM



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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 220 μf CAPACITOR. $V_{IN}=115\text{Vrms}$, 400Hz, < 1% THD SINUSOID.

INPUT CHARACTERISTICS

PARAMETER	81357-X-MP1	REMARKS	NOTES
INPUT VOLTAGE RANGE	97 - 134Vrms	COMPLIES WITH NORMAL/ ABNORMAL INPUT VOLTAGES PER RTCA/DO-160D, SECTION 16	2
INPUT FREQUENCY RANGE	47 - 440Hz	OPERATES OVER THE RANGE OF 47 - 360Hz WITH REDUCED INPUT CURRENT HARMONIC DISTORTION PERFORMANCE	2
CONTINUOUS OUTPUT POWER	120W	OBSERVE MAXIMUM BASEPLATE TEMPERATURE	2
LEAKAGE CURRENT	< 3mArms	AC LINE/NEUTRAL TO CHASSIS, V_{in} @ 115Vrms, 400Hz	1
INRUSH CURRENT	< 7.5Apk	COLD START; INITIAL $V_{out} = 0\text{Vdc}$	2
TOTAL HARMONIC DISTORTION (INPUT CURRENT)	< 3.5%	$V_{in} = 115\text{Vrms}$, 400Hz $P_{out} > 40\text{W}$	2
INDIVIDUAL HARMONICS - AC CLEAN	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	$V_{in} = 115\text{Vrms}$, 360 - 440Hz $V_{thd} \leq 1\%$ $n = \text{ORDER OF HARMONIC, 1 THRU 42}$ $I_f = \text{FUNDAMENTAL CURRENT}$ FOR $P_{out} \geq 40\text{W}$ and INDIVIDUAL HARMONICS > 5mArms	1
INDIVIDUAL HARMONICS - DISTORTED INPUT	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% $I_f / n + V_n$	$V_{in} = 115\text{Vrms}$, 360 - 440Hz $V_{thd} \geq 5\%$, $V_n = \text{CORRESPONDING INPUT VOLTAGE HARMONIC}$ $n = \text{ORDER OF HARMONIC, 1 THRU 42}$ $I_f = \text{FUNDAMENTAL CURRENT}$ FOR $P_{out} \geq 40\text{W}$ and INDIVIDUAL HARMONICS > 5mArms	1
POWER FACTOR	0.90 min	$V_{in} = 115\text{Vrms}$, 360 - 440Hz, $P_{out} > 20\text{W}$	2
CREST FACTOR (CURRENT)	1.314 - 1.514	RATIO OF PEAK/RMS	1
START-UP TIME	< 1000mSec	$V_{out} > 200\text{Vdc}$	2
CONDUCTED EMISSIONS	RTCA/DO-160D	CATEGORY M	1
OPERATING TEMP RANGE	-40°C TO 100°C	BASEPLATE	1
STORAGE TEMP RANGE	-55°C TO 100°C	NON-OPERATING	1
OVERTEMPERATURE PROTECTION	BASEPLATE 100°C \pm 5°C (TYPICAL)	BOOST INHIBITED WHEN OVERTEMPERATURE FAULT IS DETECTED. DURING INHIBIT, MODULE OUTPUT OPERATES AT $\sqrt{2} * V_{in}(\text{rms})$. AUTO RESET WITH $\sim 15^{\circ}\text{C}$ HYSTERESIS	1

Notes:

1. Ensured by design, not 100% tested in production.
2. 100% tested for specification compliance in production.

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OUTPUT CHARACTERISTICS

PARAMETER	81357-X-MP1	REMARKS	NOTES
RATED OUTPUT VOLTAGE	330Vdc \pm 3%, Pout \geq 20W 330Vdc \pm 5%, Pout < 20W		2
MINIMUM OUTPUT CURRENT	0A _{dc}	TYPICAL QUIESCENT POWER IS 3.5W	2
MAXIMUM BASEPLATE TEMPERATURE	100°C		1
TEMPERATURE STABILITY COEF.	0.03% / °C	OUTPUT VOLTAGE	1
OUTPUT RIPPLE + NOISE (pk - pk)	< 0.5%	20MHz BANDWIDTH, Cout = 220uF	1
LINE REGULATION	< 1%	OUTPUT DEVIATION FOR \pm 20%, STEP CHANGE IN LINE VOLTAGE	1
HOLD-UP TIME	0mSec	REQUIRES EXTERNAL HOLD-UP CAPACITOR, SEE APPLICATION NOTES FOR DETAILS	1
MINIMUM OUTPUT CAPACITANCE	100uF	OBSERVE RIPPLE CURRENT REQUIREMENTS @ 800Hz & 100kHz FOR EXTERNAL OUTPUT CAPACITORS	1
MAXIMUM OUTPUT CAPACITANCE	1000uF	SPECIFIED IN ORDER NOT TO OVERSTRESS THE INTERNAL ACTIVE INRUSH CURRENT LIMITING CIRCUIT	1
OVERVOLTAGE PROTECTION	OVP SET-POINT: 406V \pm 5%	OUTPUT VOLTAGE LIMITED, AUTO RECOVERY	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	1500Vrms, 60Hz	NO ARCING OR DAMAGE FOR 60 SECOND DURATION, 7mA _{rms} MAXIMUM LEAKAGE CURRENT	2
SHORT-CIRCUIT PROTECTION	NONE	FUSE INPUT WITH 3A FAST BLOW FUSE	1
20V _{bias} OUTPUT	17.8Vdc +1.2Vdc, -2.0Vdc	REFERENCED TO Vrtn, MAXIMUM SOURCE CURRENT IS 5mA AT MODULE START-UP AND 12mA THEREAFTER UNLESS INCORPORATING START-UP ASSIST CIRCUIT (SEE APP NOTES). VOLTAGE MAY DROP BELOW 16.6V WHEN BOOST MODULE IS DISABLED OR LIGHTLY LOADED ON THE OUTPUT. 20V _{bias} OUTPUT IS INTERNALLY OVER-CURRENT PROTECTED.	2

Notes:

1. Ensured by design, not 100% tested in production.
2. 100% tested for specification compliance in production.

* OPTIONAL CROSS HATCH HEATSINK AVAILABLE FOR "F" VERSION

ORDERING INFORMATION

PPI PART NUMBER: 81357 -  - MP1

"H"	"F"
INTEGRAL FIN	FLAT TOP