International Power Sources, Inc.

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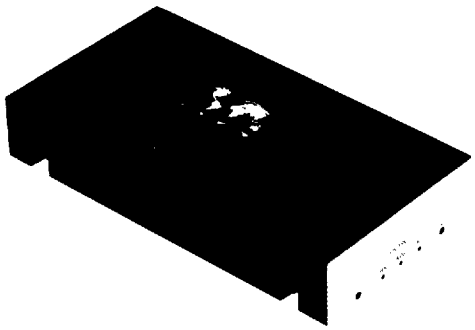
DC/DC Converters



HD Series: 50-240 Watt

FEATURES

- High Density DC/DC Converters
- Single/Triple Outputs to 240W
- Fixed Frequency Operation
- 70-90% Efficiency
- Thermal Protection
- Input Voltages From 10-400VDC
- Output Voltages 3.3-48VDC
- Industry Standard Footprint
- N+1 or Parallel Operation
- Fully Adjustable

DESCRIPTION

The HD series of high density, fixed-frequency, DC/DC Converters provides single and triple output modules up to 240 Watts, with Industry Standard (2.4" x 4.6") packaging. HD modules can be operated in parallel to increase total output power or in N+1 redundant configurations. The HD series is ideal for distributed power applications in Telecommunications, Process Control and Mass Storage systems.

RATINGS CHART

Input	Single Output Modules							Triple Output Modules		
	3.3V	5V	6V	12V	15V	24V	48V	5V/12V*/12V*	5V/15V*/15V*	Pout Max.
12V (10-20V)	15A	12A	10A	5A	4A	2.5A	1.5A	10A/3A/3A	10A/2.5A/2.5A	60W
24V (20-36V)	25A	25A	20A	11A	9A	5.5A	3A	15A/3A/3A	15A/2.5A/2.5A	125W
48V (40-65V)	30A	30A	25A	14A	11A	7A	3.5A	20A/4A/4A	20A/3.5A/3.5A	150W
155V (115-180V)	35A	35A	30A	18A	15A	9A	4.5A	25A/4A/4A	25A/3.5A/3.5A	175W
300V (225-400V)	40A	40A	35A	20A	16A	10A	5A	25A/4A/4A	25A/3.5A/3.5A	200W

* 8A surge for 5 seconds not to exceed maximum power rating. Minimum load of 3A required on 5VDC output. All other single output models require a 10% minimum load.

ORDERING GUIDE: SERIES/INPUT VOLTS – OUTPUT VOLTS

EXAMPLE: HD48-5/15/15 = 48V input, 5V/20A, 15V/3.5A, 15V/3.5A output.

NOTE: Other input/output configurations available upon request. See pages 42 and 43 for AC Front End.

ELECTRICAL SPECIFICATIONS

All specifications typical at nominal line, full load and 25°C

OUTPUT CHARACTERISTICS

Voltage Accuracy	Single Output	±2%
	Triple Output CH1	±2%
	CH2/3	±8%
Voltage Adjustment (CH1 only)		±5% min.
Remote Sense		±0.25V
Efficiency		70%-90%
Ripple and Noise (20 MHz BW)		3% max.
Transient Response		400µS max. (50% Step Load Change)
Current Limit		105%-130% max.
Short Circuit Protection		
	Single Output	Continuous
	Triple Output CH1	Continuous
	CH2/3	Short Term
Overvoltage Protection		115%-140% Vnom.
Line Regulation		0.5% max.
Load Regulation (10-100%)		
	Single Output	0.5% max.
	Triple Output CH1	0.5% max.
	CH2/3	6.0% max.

CH2/3 = Channel 2/3

INPUT CHARACTERISTICS

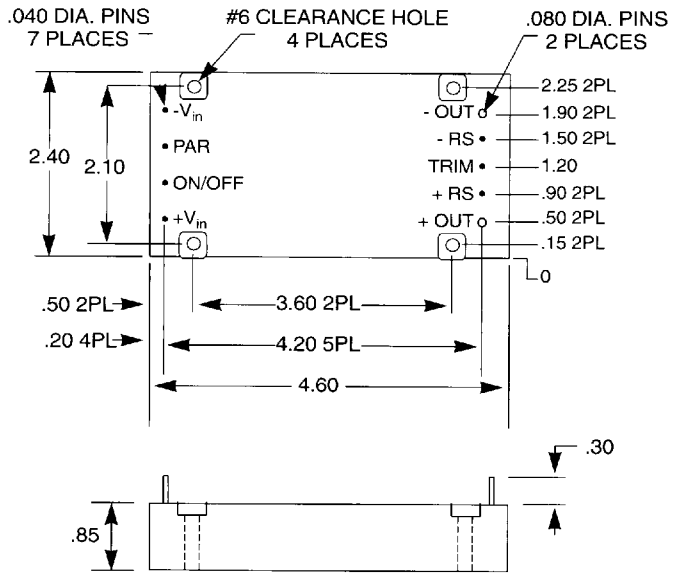
Input Voltage Range	See Table
Turn-On Time	1 sec. max.

GENERAL CHARACTERISTICS

Operating Temperature		0°C to 85°C Baseplate
Storage Temperature		-40°C to 85°C
Thermal Protection		+85°C to 100°C Auto Restart
Isolation	Input-Output Single Output	1500VDC
	Triple Output	1500VDC
	Input-Case (All)	1500VDC
Switching Frequency		200kHz
Dimensions	Single Output	2.40" x 4.60" x 0.85"
	Triple Output	2.40" x 4.60" x 1.00"
Designed to Meet		UL/CSA/TUV

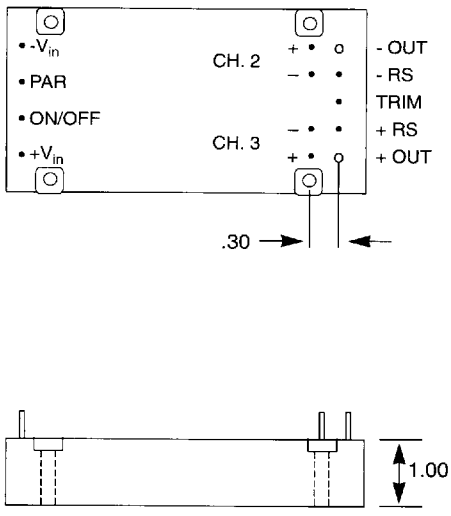
MECHANICAL SPECIFICATIONS

SINGLE OUTPUT PACKAGE



TRIPLE OUTPUT PACKAGE

(DIMENSIONS ARE THE SAME AS SINGLE OUTPUT PACKAGE EXCEPT WHERE SHOWN)



NOTE: Dimensions in inches.

APPLICATION INFORMATION

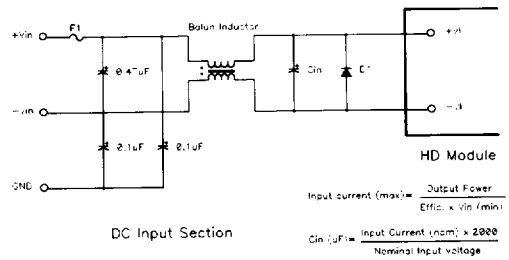
INPUT SECTION

DC Input For systems with remote DC sources, precautions must be taken to filter the input bus and protect the HD module.

In Figure 1, the rating of the input fuse is determined by calculating the maximum input current and adding a margin of 30 to 50% to prevent fuse failure due to thermal fatigue or input transients. The input capacitor should be a low "ESR" type (30 milliohms or less), possess a high ripple current rating, and be placed as close to the input terminals as possible.

NOTE: Efficiency is shown for a 5V nominal output. For other output voltages, please contact the factory.

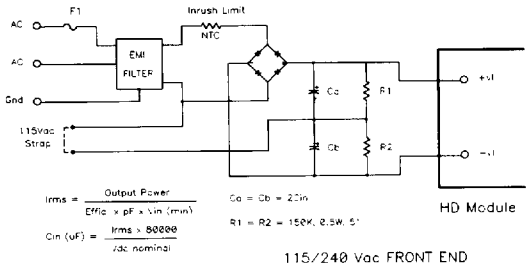
Input Voltage	12V	24V	48V	155V	300V
Efficiency	65%	72%	75%	78%	80%



DC Input Section

Figure 1

Optionally, common mode EMI filtering may be added to limit conducted noise in the system. These filters are available commercially from vendors as Corcom, or may be custom made. Reverse polarity protection is achieved using diode D1 and the input fuse, such that F1 opens when D1 conducts.



115/240 Vac FRONT END

Figure 2

AC Input The HD Series can also be used in AC line power systems. Figure 2 shows an AC/DC rectification circuit suitable for the HD300 series. The AC "front end" should include an EMI filter to comply with FCC and VDE conducted emission requirements which are commercially available. Alternately, a low profile 600W AC front-end module is available. Please contact the factory for complete details.

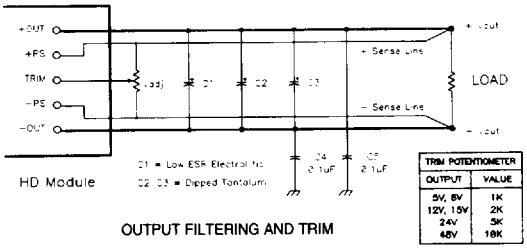
The rating of fuse F1 is found by calculating the maximum RMS input current and adding a 20% margin to comply with UL ratings and provide protection against premature failure. This calculation is also used to select the appropriate EMI filter and input rectifier. To determine the value of capacitors Ca and Cb, a total input capacitance is found initially, which is then doubled to determine the individual values.

Inrush current limiting is achieved by thermistor TH1, NTC type. A suitable product may be chosen from the "Surge-Gard" line available from Amatek's Rodan division.

OUTPUT SECTION

Remote Sense For systems with long load conductors, and/or significant load current variations, remote sensing is provided. The maximum compensation per load conductor is 0.25V, or 0.50V total. Connections should be made from the +RS and –RS pins to the +OUT and –OUT points at the load. See Figure 3. If the user does not require remote sensing, then the +RS and –RS pins should be connected to the +OUT and –OUT pins at the power supply.

If the remote sensing is used on Channel 1 of the triple output units, the magnitude of Channels 2 and 3 may increase in proportion to the compensation of Channel 1.



OUTPUT FILTERING AND TRIM

ADD 200 uF PER AMP OF OUTPUT CURRENT.

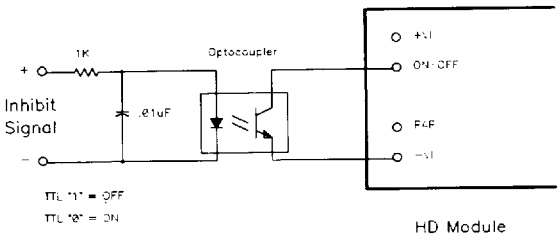
Figure 3

Output Trim All single output modules, as well as Channel 1 on the triple output units, can be trimmed ±5% minimum using an external potentiometer. Refer to Figure 3 and Table 1 for details.

Output Filtering Figure 3 also shows a suggested differential mode (C1, C2 & C3) and common mode (C4 & C5) filtering scheme to reduce the output ripple and noise for any output. If the output is not floating with respect to the system chassis ground, then capacitors C4 & C5 are irrelevant, and additional high frequency decoupling capacitors (C2, C3) may be required.

REMOTE OUTPUT INHIBIT

The output(s) of the HD series modules may be disabled by pulling the ON/OFF (INHIB) pin below 1V with respect to the negative input terminal. See Figure 4. In some cases, the –VI pin may not be an acceptable common point for the control signal. Therefore, an optocoupler is used allowing an alternate common to be used. If this is not the case, then the optocoupler should be replaced with a bipolar signal transistor, 2N2222 type or similar, able to sink 2mA minimum.



REMOTE ON/OFF CIRCUIT

Figure 4

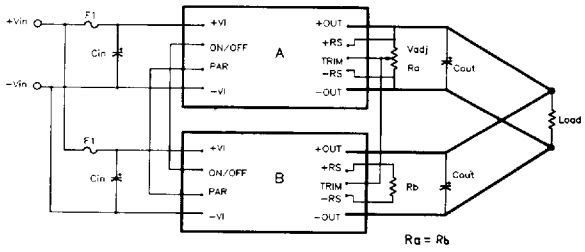
APPLICATION INFORMATION

PARALLEL OPERATION

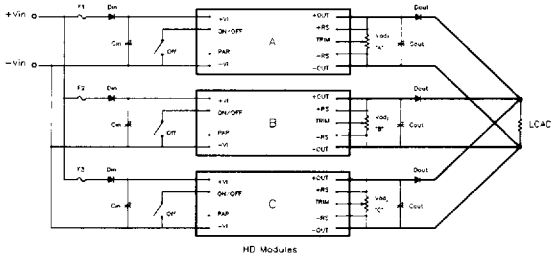
Current Sharing In applications where higher output currents are required, up to four HD modules can be paralleled. See Figure 5. For automatic current sharing, the output voltage setting of each module should be within 1% of each other, and the PAR and ON/OFF pins of each module should all be connected. The remote sense feature should not be used in this configuration. If remote sense is required, please contact the factory.

N+1 Redundancy The HD series modules may also be configured for true N+1 redundant operation, where system power integrity is crucial. Figure 6 shows such a system.

The "ORing" diodes, Din & Dout, should be Schottky type, with a blocking voltage rating 50% higher than the nominal output voltage of the module, and a current capacity rating 25% greater than the maximum output current of the module. The fuse rating can be determined using the formula found in Figure 1 of the "DC Input" section.



PARALLEL OPERATION WITH CURRENT SHARE **Figure 5**

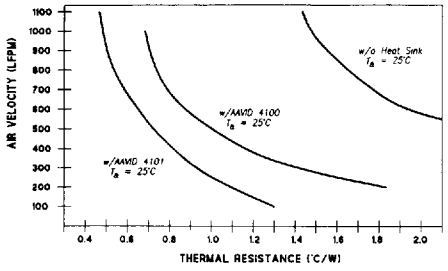


TYPICAL N+1 REDUNDANT SYSTEM **Figure 6**

THERMAL CONSIDERATIONS

The maximum baseplate temperature for the HD series in 85°C, at rated output power. Baseplate temperatures above 85°C will activate the thermal protection circuit disabling the module. The module will recover automatically when the baseplate temperature drops below 85°C.

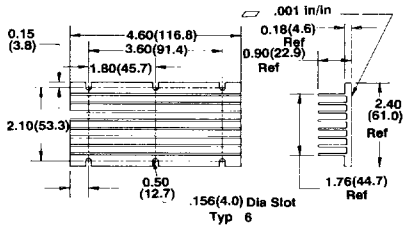
Thermal Resistance The HD modules may be cooled by convection, conduction, forced air, or any combination thereof. In free air for example, the baseplate-to-air thermal resistance is approximately 5°C/watt. 1000 linear feet per minute (LFM) of forced air will reduce this to an estimated 1.5°C/watt.



THERMAL RESISTANCE FOR VARIOUS COOLING CONFIGURATIONS **Figure 7**

Heatsinks may be utilized to increase the total surface area of the baseplate, making the heat dissipation process more efficient. Aavid Engineering manufactures standard heatsinks, series 4100 and 4101, suitable for the HD modules. Figure 7 compares the amount of moving air required for HD modules alone and with these heatsinks.

For more details on thermal considerations, please contact the factory.



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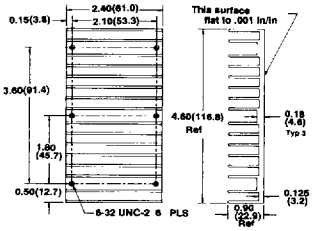

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