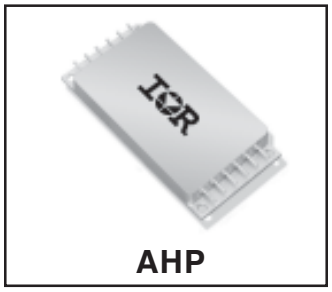
International
IOR Rectifier

PD-97181C

AHP270XXS SERIES

270V Input, Single Output

HYBRID - HIGH RELIABILITY DC/DC CONVERTER



AHP

Description

The AHP Series of DC/DC converters feature high power density without derating over the full military temperature range. This series is offered as lower cost alternatives to the legendary AFL series with improved performance for new design applications. The AHPs are form, fit and functional replacement to the AFL series. The new AHP series offers a full compliment of single and dual output voltages operating from nominal +28V or +270V inputs with output power ranging from 66W to 120W. For applications requiring higher output power, multiple converters can be operated in parallel. The internal current sharing circuits assure equal current distribution among the paralleled converters. Same as the AFL, the AHP series incorporates International Rectifier's proprietary magnetic pulse feedback technology providing optimum dynamic line and load regulation response. This feedback system samples the output voltage at the pulse width modulator fixed clock frequency, nominally 550KHz. Multiple converters can be synchronized to a system clock in the 500KHz to 700KHz range or to the synchronization output of one converter. Undervoltage lockout, primary and secondary referenced inhibit, soft-start and load fault protection are provided on all models. Also included is input over-voltage protection, a new protection feature unique to the AHP.

These converters are hermetically packaged in two enclosure variations, utilizing copper core pins to minimize resistive DC losses. Three lead styles are available, each fabricated with International Rectifier's rugged ceramic lead-to-package seal assuring long term hermeticity in the most harsh environments.

Manufactured in a facility fully qualified to MIL-PRF-38534, these converters are fabricated utilizing DSCC qualified processes. For available screening options, refer to device screening table in the data sheet. Variations in electrical, mechanical and screening can be accommodated. Contact IR Santa Clara for special requirements.

Features

- 160V To 400V Input Range
- 3.3V, 5V, 6V, 9V, 12V, 15V, 25V and 28V Outputs Available
- High Power Density - up to 84W/in^3
- Up To 120W Output Power
- Parallel Operation with Stress and Current Sharing
- Low Profile (0.380") Seam Welded Package
- Ceramic Feed thru Copper Core Pins
- High Efficiency - to 87%
- Full Military Temperature Range
- Continuous Short Circuit and Overload Protection
- Remote Sensing Terminals
- Primary and Secondary Referenced Inhibit Functions
- Line Rejection > 60dB - DC to 50KHz
- External Synchronization Port
- Fault Tolerant Design
- Dual Output Versions Available
- Standard Microcircuit Drawing Available

Specifications

International
IOR Rectifier

Absolute Maximum Ratings	
Input voltage	-0.5V to +500V
Soldering temperature	300°C for 10 seconds
Operating case temperature	-55°C to +125°C
Storage case temperature	-65°C to +135°C

Static Characteristics

-55°C ≤ T_{CASE} ≤ +125°C, 160 ≤ V_{IN} ≤ 400 unless otherwise specified.

Parameter	Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
INPUT VOLTAGE		Note 6	160	270	400	V
OUTPUT VOLTAGE		V_{IN} = 270 Volts, 100% Load				
AHP27003R3S	1		3.27	3.30	3.33	
AHP27005S	1		4.95	5.00	5.05	
AHP27006S	1		5.94	6.00	6.06	
AHP27009S	1		8.91	9.00	9.09	
AHP27012S	1		11.88	12.00	12.12	
AHP27015S	1		14.85	15.00	15.15	
AHP27025S	1		24.75	25.00	25.25	V
AHP27028S	1		27.72	28.00	28.28	
AHP27003R3S	2, 3		3.24		3.36	
AHP27005S	2, 3		4.90		5.10	
AHP27006S	2, 3		5.88		6.12	
AHP27009S	2, 3		8.82		9.18	
AHP27012S	2, 3		11.76		12.24	
AHP27015S	2, 3		14.70		15.30	
AHP27025S	2, 3		24.50		25.50	
AHP27028S	2, 3		27.44		28.56	
OUTPUT CURRENT		V_{IN} = 160, 270, 400 Volts - Note 6				
AHP27003R3S					20	
AHP27005S					16	
AHP27006S					13.5	
AHP27009S					10.0	A
AHP27012S					9.0	
AHP27015S					8.0	
AHP27025S					4.0	
AHP27028S					4.0	
OUTPUT POWER		Note 6				
AHP27003R3S					66	
AHP27005S					80	
AHP27006S					81	
AHP27009S					90	
AHP27012S					108	W
AHP27015S					120	
AHP27025S					100	
AHP27028S					112	
MAXIMUM CAPACITIVE LOAD		Note 1	10,000			µF
OUTPUT VOLTAGE TEMPERATURE COEFFICIENT		V_{IN} = 270 Volts, 100% Load–Notes1, 6	-0.015		+0.015	%/°C
OUTPUT VOLTAGE REGULATION						
AHP27025S/ AHP27028S Line	1, 2, 3	No Load, 50% Load, 100% Load	-100		+100	mV
All Others Line	1, 2, 3	V_{IN} = 160, 270, 400 Volts – Note10	-10		+10	mV
Load	1, 2, 3		-1.0		+1.0	%

For Notes to Specifications, refer to page 4

Static Characteristics (Continued)

Parameter	Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
OUTPUT RIPPLE VOLTAGE		V_{IN} = 160, 270, 400 Volts, 100% Load,				
AHP27003R3S	1, 2, 3	BW = 10MHz			30	
AHP27005S	1, 2, 3				30	
AHP27006S	1, 2, 3				35	
AHP27009S	1, 2, 3				40	mV_{pp}
AHP27012S	1, 2, 3				45	
AHP27015S	1, 2, 3				50	
AHP27025S/ AHP27028S	1, 2, 3				100	
INPUT CURRENT		V_{IN} = 270 Volts				
No Load	1	I_{OUT} = 0			13	
	2, 3				15	
Inhibit 1	1, 2, 3	Pin 4 Shorted to Pin 2			3.0	mA
Inhibit 2	1, 2, 3	Pin 12 Shorted to Pin 8			5.0	
INPUT RIPPLE CURRENT		V_{IN} = 270 Volts, 100% Load				
AHP27003R3S	1, 2, 3	B.W. = 10MHz			60	
AHP27005S	1, 2, 3				60	
AHP27006S	1, 2, 3				60	
AHP27009S	1, 2, 3				70	mA_{pp}
AHP27012S	1, 2, 3				70	
AHP27015S	1, 2, 3				80	
AHP27025S/ AHP27028S	1, 2, 3				80	
CURRENT LIMIT POINT		V_{OUT} = 90% V_{NOM} - Note 5				
Expressed as a Percentage	1		115		125	
of Full Rated Load	2, 3		105		125	%
LOAD FAULT POWER DISSIPATION		V_{IN} = 270 Volts				
Overload or Short Circuit	1, 2, 3				33	W
EFFICIENCY		V_{IN} = 270 Volts, 100% Load				
AHP27003R3S	1, 2, 3		72	76		
AHP27005S	1, 2, 3		78	82		
AHP27006S	1, 2, 3		79	83		
AHP27009S	1, 2, 3		80	84		%
AHP27012S	1, 2, 3		82	85		
AHP27015S	1, 2, 3		83	87		
AHP27025S/ AHP27028S	1, 2, 3		82	85		
ENABLE INPUTS (Inhibit Function)						
Converter Off	1, 2, 3	Logical Low, Pin 4 or Pin 12	-0.5		0.8	V
Sink Current		Note 1			100	µA
Converter On	1, 2, 3	Logical High, Pin 4 and Pin 12 - Note 9	2.0		50	V
Sink Current		Note 1			100	µA
SWITCHING FREQUENCY	1, 2, 3		500	550	600	KHz
SYNCHRONIZATION INPUT						
Frequency Range	1, 2, 3		500		700	KHz
Pulse Amplitude, Hi	1, 2, 3		2.0		10	V
Pulse Amplitude, Lo	1, 2, 3		-0.5		0.8	V
Pulse Rise Time		Note 1			100	ns
Pulse Duty Cycle		Note 1	20		80	%
ISOLATION	1	Input to Output or Any Pin to Case (except Pin 3). Test @ 500VDC	100			MΩ
DEVICE WEIGHT		Slight Variations with Case Style		85		g
MTBF		MIL-HDBK-217F2, AIF @ T_C = 40°C	300			KHrs

For Notes to Specifications, refer to page 4

Dynamic Characteristics

-55°C ≤ T_{CASE} ≤ +125°C, V_{IN} = 270 Volts unless otherwise specified.

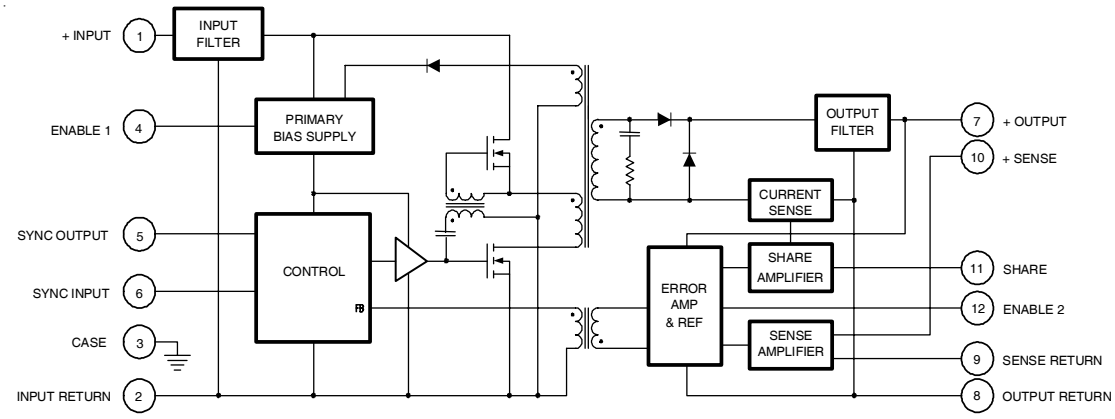
Parameter		Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
LOAD TRANSIENT RESPONSE			Notes 2, 8				
AHP27003R3S / AHP27005S							
	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-450		450	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-450		450	mV
	Recovery	4, 5, 6				400	µs
AHP27006S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-450		450	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-450		450	mV
	Recovery	4, 5, 6				400	µs
AHP27009S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-600		600	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-600		600	mV
	Recovery	4, 5, 6				400	µs
AHP27012S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-750		750	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-750		750	mV
	Recovery	4, 5, 6				400	µs
AHP27015S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-900		900	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-900		900	mV
	Recovery	4, 5, 6				400	µs
AHP27025S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-1200		1200	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-1200		1200	mV
	Recovery	4, 5, 6				400	µs
AHP27028S	Amplitude	4, 5, 6	Load Step 50% ⇔ 100%	-1200		1200	mV
	Recovery	4, 5, 6				200	µs
	Amplitude	4, 5, 6	Load Step 10% ⇔ 50%	-1200		1200	mV
	Recovery	4, 5, 6				400	µs
LINE TRANSIENT RESPONSE			Notes 1, 2, 3				
	Amplitude		V_{IN} Step = 160 ⇔ 400 Volts	-500		500	mV
	Recovery					500	µs
TURN-ON CHARACTERISTICS			Note 4				
	Overshoot	4, 5, 6	Enable 1, 2 on. (Pins 4, 12 high or		5.0	10	%
	Delay	4, 5, 6	open)	50	75	120	ms
LOAD FAULT RECOVERY			Same as Turn On Characteristics.				
LINE REJECTION			MIL-STD-461, CS101, 30Hz to 50KHz Note 1	60	70		dB

Notes to Specifications:

1. Parameters not 100% tested but are guaranteed to the limits specified in the table.
2. Recovery time is measured from the initiation of the transient to where VOUT has returned to within ±1.0 % of VOUT at 50% load.
3. Line transient transition time ≥100µs.
4. Turn-on delay is measured with an input voltage rise time of between 100V and 500V per ms.
5. Current limit point is that condition of excess load causing output voltage to drop to 90% of nominal.
6. Parameter verified as part of another test.
7. All electrical tests are performed with the remote sense leads connected to the output leads at the load.
8. Load transient transition time ≥10µs.
9. Enable inputs internally pulled high. Nominal open circuit voltage ≈ 4.0VDC.
10. All tests at no-load are performed after start-up of the converter.
    The converter may fail to start when the output load is less than 1.0W. Under these circumstances, the converter's start-up circuitry will continue to cycle until an adequate load is present.

Circuit Description

Figure I. Single Output Block Diagram



Circuit Operation and Application Information

The AHP series of converters employ a forward switched mode converter topology. (refer to Figure I.) Operation of the device is initiated when a DC voltage whose magnitude is within the specified input limits is applied between pins 1 and 2. If pin 4 is enabled (at a logical 1 or open) the primary bias supply will begin generating a regulated housekeeping voltage bringing the circuitry on the primary side of the converter to life. Two power MOSFETs used to chop the DC input voltage into a high frequency square wave, apply this chopped voltage to the power transformer. As this switching is initiated, a voltage is impressed on a second winding of the power transformer which is then rectified and applied to the primary bias supply. When this occurs, the input voltage is shut out and the primary bias voltage becomes exclusively internally generated.

The switched voltage impressed on the secondary output transformer winding is rectified and filtered to provide the converter output voltage. An error amplifier on the secondary side compares the output voltage to a precision reference and generates an error signal proportional to the difference. This error signal is magnetically coupled through the feedback transformer into the controller section of the converter varying the pulse width of the square wave signal driving the MOSFETs, narrowing the width if the output voltage is too high and widening it if it is too low.

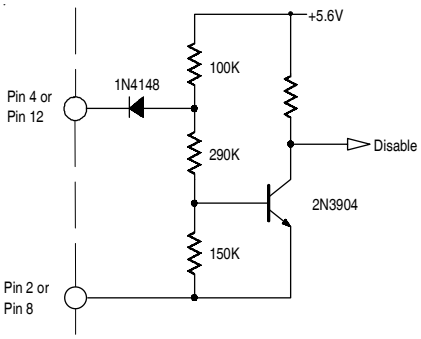
Remote Sensing

Connection of the **+** and **-** sense leads at a remotely located load permits compensation for resistive voltage drop between the converter output and the load when they are physically separated by a significant distance. This connection allows regulation to the placard voltage at the point of application. When the remote sensing feature is not used, the sense leads should be connected to their respective output terminals at the converter. Figure III. illustrates a typical application.

Inhibiting Converter Output

As an alternative to application and removal of the DC voltage to the input, the user can control the converter output by providing TTL compatible, positive logic signals to either of two enable pins (pin 4 or 12). The distinction between these two signal ports is that enable 1 (pin 4) is referenced to the input return (pin 2) while enable 2 (pin 12) is referenced to the output return (pin 8). Thus, the user has access to an inhibit function on either side of the isolation barrier. Each port is internally pulled “high” so that when not used, an open connection on both enable pins permits normal converter operation. When their use is desired, a logical “low” on either port will shut the converter down.

Figure II. Enable Input Equivalent Circuit



Internally, these ports differ slightly in their function. In use, a low on Enable 1 completely shuts down all circuits in the converter while a low on Enable 2 shuts down the secondary side while altering the controller duty cycle to near zero. Externally, the use of either port is transparent save for minor differences in idle current. (See specification table).

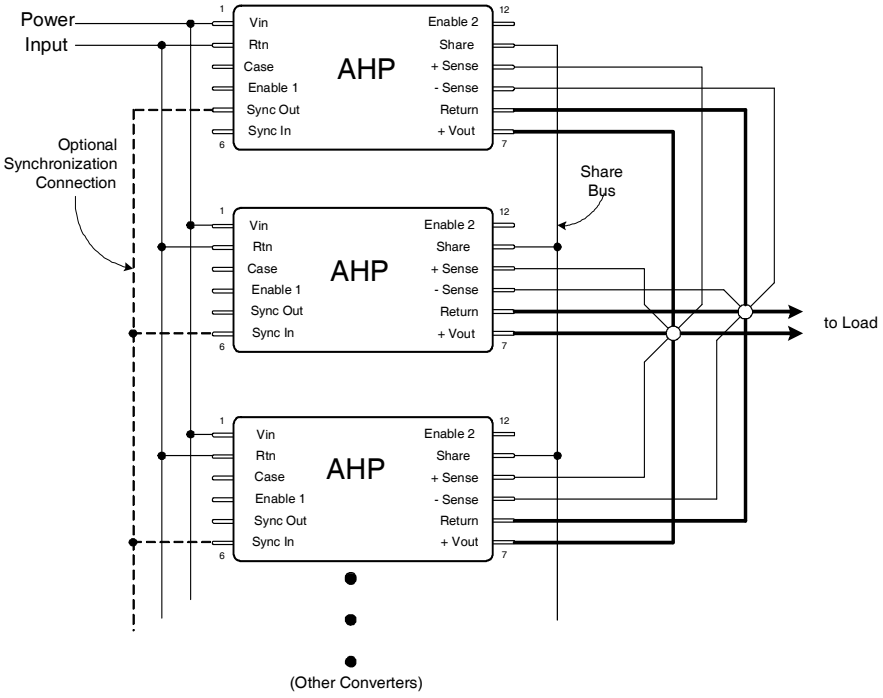
Synchronization of Multiple Converters

When operating multiple converters, system requirements often dictate operation of the converters at a common frequency. To accommodate this requirement, the AHP series converters provide both a synchronization input and output.

The sync input port permits synchronization of an AHP converter to any compatible external frequency source operating between 500KHz and 700KHz. This input signal should be referenced to the input return and have a 10% to 90% duty cycle. Compatibility requires transition times less than 100ns, maximum low level of +0.8V and a minimum high level of +2.0V. The sync output of another converter which has been designated as the master oscillator provides a convenient frequency source for this mode of operation. When external synchronization is not required, the sync in pin should be left unconnected thereby permitting the converter to operate at its own internally set frequency.

The sync output signal is a continuous pulse train set at 550 ± 50KHz, with a duty cycle of 15 ± 5%. This signal is referenced to the input return and has been tailored to be compatible with the AFL sync input port. Transition times are less than 100ns and the low level output impedance is less than 50Ω. This signal is active when the DC input voltage is within the specified operating range and the converter is not inhibited. This output has adequate drive reserve to synchronize at least five additional converters. A typical synchronization connection option is illustrated in Figure III.

Figure III. Preferred Connection for Parallel Operation



Parallel Operation-Current and Stress Sharing

Figure III. illustrates the preferred connection scheme for operation of a set of AHP converters with outputs operating in parallel. Use of this connection permits equal sharing of a load current exceeding the capacity of an individual AHP among the members of the set. An important feature of the AHP series operating in the parallel mode is that in addition to sharing the current, the stress induced by temperature will also be shared. Thus if one member of a paralleled set is operating at a higher case temperture, the current it provides to the load will be reduced as compensation for the temperature induced stress on that device.

When operating in the shared mode, it is important that symmetry of connection be maintained as an assurance of optimum load sharing performance. Thus, converter outputs should be connected to the load with equal lengths of wire of the same gauge and sense leads from each converter should be connected to a common physical point, preferably at the load along with the converter output and return leads. All converters in a paralleled set must have their share pins connected together. This arrangement is diagrammatically illustrated in Figure III. showing the outputs and sense pins connected at a star point which is located as close as possible to the load.

As a consequence of the topology utilized in the current sharing circuit, the share pin may be used for other functions. In applications requiring a single converter, the voltage appearing on the share pin may be used as a "current monitor". The share pin open circuit voltage is nominally +1.00V at no load and increases linearly with increasing output current to +2.20V at full load. The share pin voltage is referenced to the output return pin.

Thermal Considerations

Because of the incorporation of many innovative technological concepts, the AHP series of converters is capable of providing very high output power from a package of very small volume. These magnitudes of power density can only be obtained by combining high circuit efficiency with effective methods of heat removal from the die junctions. This requirement has been effectively addressed inside the device; but when operating at maximum loads, a significant amount of heat will be generated and this heat must be conducted away from the case. To maintain the case temperature at or below the specified maximum of 125°C, this heat must be transferred by conduction to an appropriate heat dissipater held in intimate contact with the converter base-plate.

Because effectiveness of this heat transfer is dependent on the intimacy of the baseplate/heatsink interface, it is strongly recommended that a high thermal conductivity heat transferance medium is inserted between the baseplate and heatsink. The material most frequently utilized at the factory during all testing and burn-in processes is sold under the trade name of Sil-Pad® 400[1] . This particular pro duct is an insulator but electrically conductive versions are also available. Use of these materials assures maximum surface contact with the heat dissipator thereby compensating for minor variations of either surface. While other available types of heat conductive materials and compounds may provide similar performance, these alternatives are often less convinient and are frequently messy to use.

A conservative aid to estimating the total heat sink surface area ($A_{HEAT\ SINK}$) required to set the maximum case temperature rise (ΔT) above ambient temperature is given by the following expression:

$$A_{HEAT\ SINK} \approx \left\{\frac{\Delta T}{80P^{0.85}}\right\}^{-1.43} - 3.0$$

where

$\Delta T =$ Case temperature rise above ambient

$P =$ Device dissipation in Watts $= P_{OUT}\left\{\frac{1}{Eff} - 1\right\}$

As an example, it is desired to maintain the case temperature of an AHP27015S at ≤ +85°C in an area where the ambient temperature is held at a constant +25°C; then

$$\Delta T = 85 - 25 = 60°C$$

From the Specification Table, the worst case full load efficiency for this device is 83%; therefore the power dissipation at full load is given by

$$P = 120 \bullet \left\{\frac{1}{.83} - 1\right\} = 120 \bullet (0.205) = 24.6W$$

and the required heat sink area is

$$A_{HEAT\ SINK} = \left\{\frac{60}{80 \bullet 24.6^{0.85}}\right\}^{-1.43} - 3.0 = 71\ in^2$$

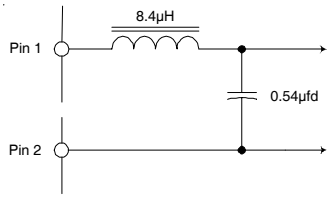
Thus, a total heat sink surface area (including fins, if any) of 71 in^2 in this example, would limit case rise to 60°C above ambient. A flat aluminum plate, 0.25" thick and of approximate dimension 4" by 9" (36 in^2 per side) would suffice for this application in a still air environment. Note that to meet the criteria in this example, both sides of the plate require unrestricted exposure to the ambient air.

[1] Sil-Pad is a registered Trade Mark of Bergquist, Minneapolis, MN

Input Filter

The AHP270XXS series converters incorporate a single stage LC input filter whose elements dominate the input load impedance characteristic during the turn-on sequence. The input circuit is as shown in Figure IV.

Figure IV. Input Filter Circuit



Input Overvoltage Protection

One additional protection feature is incorporated into the AHP input circuit is input over-voltage protection. The converter will shutdown at approximately 110% of the maximum rated input voltage and restart once the input voltage drops back below this threshold.

Undervoltage Lockout

A minimum voltage is required at the input of the converter to initiate operation. This voltage is set to 150V ± 5V. To preclude the possibility of noise or other variations at the input falsely initiating and halting converter operation, a hysteresis of approximately 10V is incorporated in this circuit. Thus if the input voltage droops to 140V ± 5V, the converter will shut down and remain inoperative until the input voltage returns to ≈ 150V.

Output Voltage Adjust

In addition to permitting close voltage regulation of remotely located loads, it is possible to utilize the converter sense pins to incrementally increase the output voltage over a limited range. The adjustments made possible by this method are intended as a means to "trim" the output to a voltage setting for some particular application, but are not intended to create an adjustable output converter. These output voltage setting variations are obtained by connecting an appropriate resistor value in the locations as shown in Figure V or Figure VI depending on the desired output voltage. The range of adjustment and corresponding range of resistance values can be determined by use of the equations presented below.

For (V_{NOM} + 0.25V) < V_{OUT} < (V_{NOM} + 0.5V), a resistor is connected between the +Sense and –Sense pins with the –Sense connected to the output return as shown in Figure V. The resistor value (R_{ADJ}) is calculated as follows:

$$R_{ADJ} = 1000 \cdot \left[\frac{V_{NOM}}{V_{OUT} - V_{NOM} - 0.25} \right]$$

For V_{NOM} < V_{OUT} < (V_{NOM} + 0.25V), a resistor is connected between the +Sense and +Output pins with the –Sense connected to the output return as shown in Figure VI. The resistor value (R_{ADJ}) is calculated as follows:

$$R_{ADJ} = \frac{1000}{\left(\frac{0.25}{V_{OUT} - V_{NOM}} - 1 \right)}$$

V_{NOM} = device nominal output voltage

V_{OUT} = desired output voltage

R_{ADJ} = value of the external resistor required to achieve the desired Vout

Finding a resistor value for a particular output voltage, is simply a matter of substituting the desired output voltage and the nominal device voltage into the equation and solving for the corresponding resistor value.

Figure V. Connection for V_{OUT} > V_{NOM}+ 0.25V

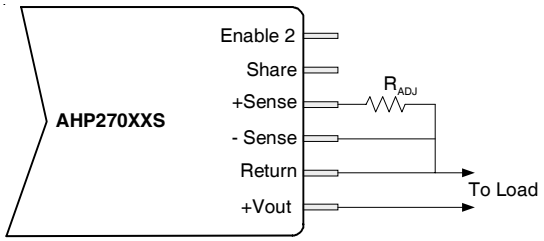
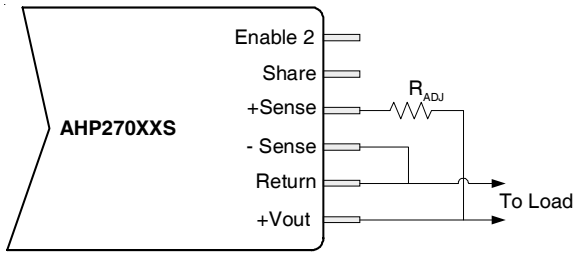


Figure VI. Connection for $V_{NOM} < V_{OUT} < (V_{NOM} + 0.25V)$



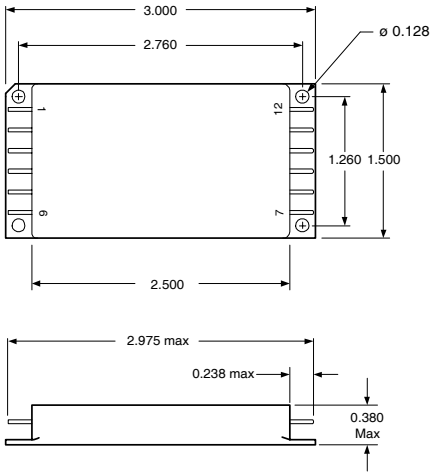
Attempts to adjust the output voltage to a value greater than 120% of nominal should be avoided because of the potential of exceeding internal component stress ratings and subsequent operation to failure. Under no circumstance should the external setting resistor be made less than 500Ω. By remaining within this specified range of values, completely safe operation fully within normal component derating is assured.

Examination of the equation relating output voltage and resistor value reveals a special benefit of the circuit topology utilized for remote sensing of output voltage in the AHP270XXS series of converters. It is apparent that as the resistance increases, the output voltage approaches the nominal set value of the device. In fact the calculated limiting value of output voltage as the adjusting resistor becomes very large is ≅ 250mV above nominal device voltage.

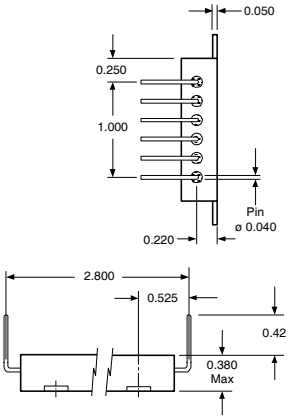
The consequence is that if the +sense connection is unintentionally broken, an AHP270XXS has a fail-safe output voltage of Vout + 250mV, where the 250mV is independent of the nominal output voltage. It can be further demonstrated that in the event of both the + and - sense connections being broken, the output will be limited to Vout + 500mV. This 500mV is also essentially constant independent of the nominal output voltage. While operation in this condition is not damaging to the device, not all performance parameters will be met.

Mechanical Outlines

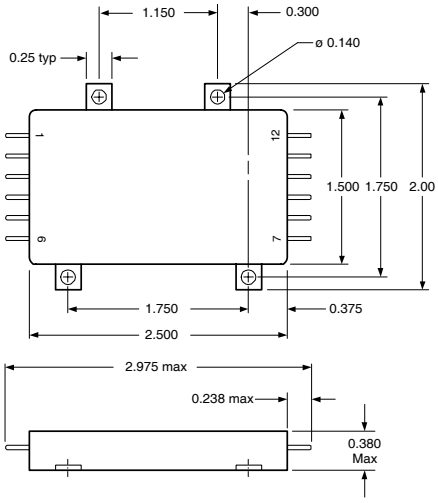
Case X



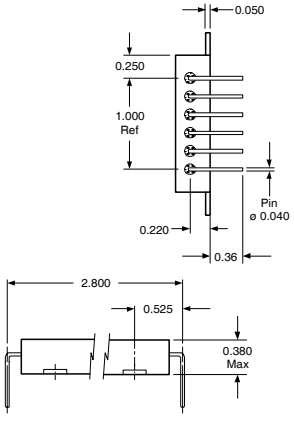
Case W
Pin Variation of Case Y



Case Y



Case Z
Pin Variation of Case Y



Tolerances, unless otherwise specified: .XX = ±0.010
.XXX = ±0.005

BERYLLIA WARNING: These converters are hermetically sealed; however they contain BeO substrates and should not be ground or subjected to any other operations including exposure to acids, which may produce Beryllium dust or fumes containing Beryllium

Pin Designation

Pin #	Designation
1	+ Input
2	Input Return
3	Case
4	Enable 1
5	Sync Output
6	Sync Input
7	+ Output
8	Output Return
9	Sense Return
10	+ Sense
11	Share
12	Enable 2

Standard Microcircuit Drawing Equivalence Table

Standardized Military Drawing Pin	Vendor Cage Code	Vendor Similar Pin
5962-0623101	52467	AHP27025S

Device Screening

Requirement	MIL-STD-883 Method	No Suffix	ES ②	HB	CH
Temperature Range	—	-20°C to +85°C	-55°C to +125°C ③	-55°C to +125°C	-55°C to +125°C
Element Evaluation	MIL-PRF-38534	N/A	N/A	N/A	Class H
Non-Destructive Bond Pull	2023	N/A	N/A	N/A	N/A
Internal Visual	2017	①	Yes	Yes	Yes
Temperature Cycle	1010	N/A	Cond B	Cond C	Cond C
Constant Acceleration	2001, Y1 Axis	N/A	500 Gs	3000 Gs	3000 Gs
PIND	2020	N/A	N/A	N/A	N/A
Burn-In	1015	N/A	48 hrs@hi temp	160 hrs@125°C	160 hrs@125°C
Final Electrical (Group A)	MIL-PRF-38534 & Specification	25°C	25°C ②	-55°C, +25°C, +125°C	-55°C, +25°C, +125°C
PDA	MIL-PRF-38534	N/A	N/A	N/A	10%
Seal, Fine and Gross	1014	Cond A	Cond A, C	Cond A, C	Cond A, C
Radiographic	2012	N/A	N/A	N/A	N/A
External Visual	2009	①	Yes	Yes	Yes

Notes:
① Best commercial practice
② Sample tests at low and high temperatures
③ -55°C to +105°C for AHE, ATO, ATW

Part Numbering

AHP 270 05 S X ES

Model

Input Voltage
28 = 28V
270 = 270V

Output Voltage
3R3 = 3.3V, 05 = 5V
06 = 6V, 09 = 9V
12 = 12V, 15 = 15V
25 = 25V, 28 = 28V

Output
S = Single

Case Style
W, X, Y, Z

Screening Level
(Please refer to Screening Table)
No Suffix, ES, HB, CH

International
IOR Rectifier

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Data and specifications subject to change without notice. 01/2007