

## **AHF2800 Series Hybrid - High Reliability DC/DC Converters**

### **DESCRIPTION**

The AHF Series of DC/DC converters feature single or dual outputs over the full military temperature range. No derating in output power is required, making them suitable for use in rugged military applications. The low profile, small outline package is ideally suited to the tight board space requirements of many industrial and aerospace applications. Designed for nominal 28VDC inputs, this family of converters will meet the requirements of MIL-STD-704D. The basic circuit utilizes a pulse width modulated, feed-forward topology at a nominal switching frequency of 550 KHz. Input to output isolation is achieved through the use of transformers in the forward and feedback circuits.

The proprietary magnetic feedback circuit provides for an extremely wide bandwidth control loop with a high phase margin. The closed loop frequency response of this converter family extends to approximately 50 kHz, resulting in superior line and load transient characteristics. This feedback method is also inherently temperature and radiation insensitive. This gives the AHF Series an important advantage over converters that incorporate opto-couplers in their design.

These converters are manufactured in a facility certified to MIL-PRF-38534. All processes used to manufacture these converters have been qualified to enable Lambda Advanced Analog to deliver compliant devices. Four screening grades are available to satisfy a wide range of requirements. The CH grade converters are fully compliant to MIL-PRF-38534 class H. The HB grade converters are processed to full MIL-PRF-38534 screening but do not have class H element evaluation as required by MIL-PRF-38534. Two grades are fully tested and operate over the full military temperature range without derating of output power. Industrial and commercial grades are also available. Variations in electrical, mechanical and screening can be accommodated. Extensive computer simulation using complex modeling enables rapid design modification to be provided. Contact Lambda Advanced Analog with specific requirements.

### **FEATURES**

- 16 - 40 VDC input range  
(28 VDC nominal)
- Single and dual outputs
- 12 watts output power
- 22.8 W/in<sup>3</sup> power density
- Low input/output noise  
(50 mA/60 mV p-p max. respectively)
- Indefinite short circuit and overload protection
- Wideband control loop for superior transient characteristics
- No derating for -55°C to +125°C operation
- Constant switching frequency  
(550 kHz nominal)

# SPECIFICATIONS

AHF2812S

## ABSOLUTE MAXIMUM RATINGS

Input Voltage	-0.5V to 50V
Soldering Temperature	300°C for 10 seconds
Case Temperature	Operating -55°C to +125°C
	Storage -65°C to +135°C

**TABLE II. Electrical Performance Characteristics**

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Output voltage	V <sub>OUT</sub>	I <sub>OUT</sub> = 0	1	01	11.88	12.12	V
			2,3		11.76	12.24	
Output current <u>1/</u>	I <sub>OUT</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc,	1,2,3	01		1000	mA
Output ripple voltage <u>2/</u>	V <sub>RIP</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation	VR <sub>LINE</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0,500, and 1000 mA	1,2,3	01		50	mV
Load regulation	VR <sub>LOAD</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0, 500, and 1000 mA	1,2,3	01		50	mV
Input current	I <sub>IN</sub>	I <sub>OUT</sub> = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I <sub>OUT</sub> = 0, inhibit (pin 1) = open				50	
Input ripple current <u>2/</u>	I <sub>RIP</sub>	I <sub>OUT</sub> = 1000 mA, B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency	E <sub>EFF</sub>	I <sub>OUT</sub> = 1000 mA,	1	01	78		%
			2,3		75		
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc, T <sub>C</sub> = +25°C	1	01	100		MΩ
Capacitive load <u>3/</u> <u>4/</u>	C <sub>L</sub>	No effect on dc performance, T <sub>C</sub> = +25°C	4	01		200	μF
Power dissipation load fault	P <sub>D</sub>	Overload <u>5/</u>	1	01		6	W
		Short circuit	1,2,3	01		2	
Switching frequency	F <sub>S</sub>	I <sub>OUT</sub> = 1000 mA	4,5,6	01	500	600	kHz

See footnotes at end of table.

TABLE II. Electrical Performance Characteristics - Continued

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A Subgroups	Device types	Limits		Unit
					Min	Max	
Output response to step transient load changes <u>6/</u>	VO <sub>TLOAD</sub>	500 mA to/from 1000 mA	4	01	-300	+300	mV pk
			5,6		-450	+450	
		0 mA to/from 500 mA	4		-500	+500	
			5,6		-750	+750	
Recovery time, step transient load changes <u>6/</u> <u>7/</u>	TT <sub>LOAD</sub>	500 mA to/from 1000 mA	4,5,6	01		100	μs
		0 mA to 500 mA	4,5,6	01		1500	
		500 mA to 0 mA	4,5,6			10	ms
Output response to transient step line changes	VO <sub>TLINE</sub>	Input step 16 V to/from 40 V dc, I <sub>OUT</sub> = 1000 mA <u>4/</u> <u>8/</u>	4,5,6	01		1500	mV pk
Recovery time transient step line changes	TT <sub>LINE</sub>	Input step 16 V to/from 40 V dc I <sub>OUT</sub> = 1000 mA <u>4/</u> <u>7/</u> <u>8/</u>	4,5,6	01		800	μs
Turn on overshoot	V <sub>TonOS</sub>	I <sub>OUT</sub> = 0 and 1000 mA	4,5,6	01		600	mV pk
Turn on delay	T <sub>onD</sub>	I <sub>OUT</sub> = 0 and 1000 mA <u>9/</u>	4,5,6	01		20	ms
Load fault recovery <u>4/</u> <u>9/</u>	Tr <sub>LF</sub>		4,5,6	01		20	ms
Weight						35	grams

## Notes:

- 1/ Parameter guaranteed by line and load regulation tests.  
2/ Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.  
3/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance. A capacitive load in excess of the maximum limit will not disturb loop stability but may interfere with the operation of the load fault detection circuitry, appearing as a short circuit during turn-on.  
4/ Parameter shall be tested as part of design characterization and after design or process changes. Thereafter, parameters shall be guaranteed to the limits specified in Table II.  
5/ An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the short circuit protection and is the condition of maximum power dissipation.  
6/ Load step transition time between 2 and 10 microseconds.  
7/ Recovery time is measured from the initiation of the transient to where V<sub>OUT</sub> has returned to within ±1 percent of V<sub>OUT</sub> at 50 percent load.  
8/ Input step transition time between 2 and 10 microseconds.  
9/ Turn-on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 1) while power is applied to the input is unlimited.

# SPECIFICATIONS

AHF2815S

## ABSOLUTE MAXIMUM RATINGS

Input Voltage	-0.5V to 50V
Soldering Temperature	300°C for 10 seconds
Case Temperature	Operating -55°C to +125°C
	Storage -65°C to +135°C

**TABLE III. Electrical Performance Characteristics**

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Output voltage	V <sub>OUT</sub>	I <sub>OUT</sub> = 0	1	All	14.85	15.15	V
			2,3		14.70	15.30	
Output current 1/	I <sub>OUT</sub>	V <sub>IN</sub> = 18, 28, and 40 V dc,	1,2,3	All		2000	mA
Output ripple voltage 2/	V <sub>RIP</sub>	V <sub>IN</sub> = 18, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	All		50	mV p-p
Line regulation	V <sub>RLINE</sub>	V <sub>IN</sub> = 18, 28, and 40 V dc, I <sub>OUT</sub> = 0, 1000, and 2000 mA	1	All		±35	mV
			2,3			±75	
Load regulation	V <sub>RLOAD</sub>	V <sub>IN</sub> = 18, 28, and 40 V dc, I <sub>OUT</sub> = 0, 1000, and 2000 mA	1,2,3	All		±150	mV
Input current	I <sub>IN</sub>	I <sub>OUT</sub> = 0, inhibit (pin 2) tied to input return (pin 10)	1,2,3	All		18	mA
		I <sub>OUT</sub> = 0, inhibit (pin 2) = open				50	
Input ripple current 2/	I <sub>RIP</sub>	I <sub>OUT</sub> = 2000 mA, B.W. = 20 Hz to 2 MHz	1,2,3	All		20	mA p-p
Efficiency	E <sub>EFF</sub>	I <sub>OUT</sub> = 2000 mA,	1	All	80		%
			2,3		77		
Isolation	ISO	Input to output or any pin to case (except pin 7) at 500 V dc, T <sub>C</sub> = +25°C	1	All	100		MΩ
Capacitive load 3/ 4/	C <sub>L</sub>	No effect on dc performance, T <sub>C</sub> = +25°C	4	All		200	μF
Power dissipation load fault	P <sub>D</sub>	Overload 5/	1	All		12	W
		Short circuit	1,2,3	All		9	
Switching frequency	F <sub>S</sub>	I <sub>OUT</sub> = 2000 mA	4,5,6	01, 04	250	300	kHz
				02, 05	250	270	
				03, 06	275	300	

See footnotes at end of table.

TABLE III. Electrical Performance Characteristics - Continued

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A Subgroups	Device types	Limits		Unit
					Min	Max	
Output response to step transient load changes <u>6/</u>	VO <sub>TLOA</sub> D	1000 mA to/from 2000 mA	4,5,6	All	-800	+800	mV pk
		0 mA to/from 1000 mA	4,5,6		-1000	+750	
Recovery time, step transient load changes <u>6/ 7/</u>	TT <sub>LOAD</sub>	1000 mA to/from 2000 mA	4	All		100	μs
			5,6			200	
		0 mA to/from 1000 mA	4	All		5	ms
			5,6			10	
Output response to transient step line changes	VO <sub>TLINE</sub>	Input step 18 V to/from 40 V dc, I <sub>OUT</sub> = 2000 mA <u>4/ 8/</u>	4,5,6	04 05 06	-1000	+1000	mV pk
Recovery time transient step line changes	TT <sub>LINE</sub>	Input step 18 V to/from 40 V dc I <sub>OUT</sub> = 2000 mA <u>4/ 7/ 8/</u>	4,5,6	04 05 06		500	μs
Turn on overshoot	VTonOS	I <sub>OUT</sub> = 0 and 2000 mA	4,5,6	All		750	mV pk
Turn on delay	TonD	I <sub>OUT</sub> = 0 and 2000 mA <u>9/</u>	4,5,6	All		12	ms
Load fault recovery <u>4/ 9/</u>	TrLF		4,5,6	All		12	ms
Weight						38	grams

**Notes:**

1/ Parameter guaranteed by line and load regulation tests.

2/ Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.

3/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance. A capacitive load in excess of the maximum

limit will not disturb loop stability but may interfere with the operation of the load fault detection circuitry, appearing as a short circuit during turn-on.

4/ Parameter shall be tested as part of design characterization and after design or process changes. Thereafter, parameters shall be guaranteed to the limits specified in Table III.

5/ An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the short circuit protection and is the condition of maximum power dissipation.

6/ Load step transition time between 2 and 10 microseconds.

7/ Recovery time is measured from the initiation of the transient to where V<sub>OUT</sub> has returned to within ±1 percent of V<sub>OUT</sub> at 50 percent load.

8/ Input step transition time between 2 and 10 microseconds.

9/ Turn-on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 2) while power is applied to the input.

# SPECIFICATIONS

AHF2812D

## ABSOLUTE MAXIMUM RATINGS

Input Voltage	-0.5V to 50V
Soldering Temperature	300°C for 10 seconds
Case Temperature	Operating -55°C to +125°C
	Storage -65°C to +135°C

**TABLE V. Electrical Performance Characteristics.**

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Output voltage	V <sub>OUT</sub>	I <sub>OUT</sub> = 0	1	01	±11.88	±12.12	V
			2,3		±11.76	±12.24	
Output current <u>1/ 2/</u>	I <sub>OUT</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, each output	1,2,3	01	100	900	mA
Output ripple voltage <u>3/</u>	V <sub>RIP</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation <u>4/</u>	VR <sub>LINE</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0, 500, and 1000 mA	1,2,3	01		30	mV
Load regulation <u>4/</u>	VR <sub>LOAD</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0, 500, and 1000 mA	1,2,3	01		30	mV
Cross regulation <u>5/</u>	VR <sub>CROS</sub>	10 percent to 90 percent load change	1,2,3	01		3.0	%
Input current	I <sub>IN</sub>	I <sub>OUT</sub> = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I <sub>OUT</sub> = 0, inhibit (pin 1) = open				60	
Input ripple current <u>3/ 4/</u>	I <sub>RIP</sub>	I <sub>OUT</sub> = 1000 mA, B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency <u>4/</u>	E <sub>FF</sub>	I <sub>OUT</sub> = 1000 mA, T <sub>C</sub> = +25°C	1,3	01	77		%
			2		74		
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc, T <sub>C</sub> = +25°C	1	01	100		MΩ
Capacitive load <u>6/ 7/</u>	C <sub>L</sub>	No effect on dc performance, T <sub>C</sub> = +25°C, total for both outputs	4	01		200	μF
Power dissipation load fault	P <sub>D</sub>	Overload, T <sub>C</sub> = +25°C <u>8/</u>	1,2,3	01		6	W
		Short circuit, T <sub>C</sub> = +25°C				3	

See footnotes at end of table.

TABLE V. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A Subgroups	Device types	Limits		Unit
					Min	Max	
Switching frequency <u>4/</u>	F <sub>S</sub>	I <sub>OUT</sub> = 1000 mA	4,5,6	01	500	600	kHz
Output response to step transient load changes <u>4/ 9/</u>	V <sub>O_TLOAD</sub>	500 mA to/from 1000 mA	4,5,6	01	-200	+200	mV pk
		0 mA to/from 500 mA	4,5,6	01	-800	+800	
Recovery time, step transient load changes <u>4/ 9/ 10/</u>	T <sub>T_LOAD</sub>	500 mA to/from 1000 mA	4,5,6	01		70	μs
		0 mA to/from 500 mA	4,5,6	01		1000	
Output response transient step line changes <u>4/ 7/ 11/</u>	V <sub>O_TLINE</sub>	Input step from/to 16 to 40 V dc, I <sub>OUT</sub> = 1000 mA	4,5,6	01	-750	+750	mV pk
Recovery time transient step line changes <u>4/ 7/ 10/ 11/</u>	T <sub>T_LINE</sub>	Input step from/to 16 to 40 V dc, I <sub>OUT</sub> = 1000 mA	4,5,6	01		1200	μs
Turn on overshoot <u>4/</u>	V <sub>TonOS</sub>	I <sub>OUT</sub> = 0 and 1000 mA	4,5,6	01		600	mV pk
Turn on delay <u>4 12/</u>	T <sub>onD</sub>	I <sub>OUT</sub> = 0 and 1000 mA	4,5,6	01		25	ms
Load fault recovery <u>7/</u>	T <sub>RLF</sub>		4,5,6	01		25	ms
Weight						38	grams

**Notes:**

- 1/ Parameter guaranteed by line load, and cross regulation tests.
- 2/ Up to 90 percent of full power is available from either output provided the total output does not exceed 12 W.
- 3/ Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
- 4/ Load current split equally between +V<sub>OUT</sub> and -V<sub>OUT</sub>.
- 5/ 1.2 watt load on output under test, 1.2 watt to 10.8 watt load change on other output.
- 6/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance. A capacitive load in excess of the maximum limit will not disturb loop stability but may interfere with the operation of the load fault detection circuitry, appearing as a short circuit during turn on.
- 7/ Parameter shall be tested as part of design characterization and after design or process changes. Thereafter, parameters shall be guaranteed to the limits specified in Table V.
- 8/ An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the short circuit protection and is the condition of maximum power dissipation.
- 9/ Load step transition time between 2 and 10 microseconds.
- 10/ Recovery time is measured from the initiation of the transient to where V<sub>OUT</sub> has returned to within ±1 percent of V<sub>OUT</sub> at 50 percent load.
- 11/ Input step transition time between 2 and 10 microseconds.
- 12/ Turn-on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 1) while power is applied to the input.

# SPECIFICATIONS

AHF2815D

## ABSOLUTE MAXIMUM RATINGS

Input Voltage	-0.5V to 50V
Soldering Temperature	300°C for 10 seconds
Case Temperature	Operating -55°C to +125°C
	Storage -65°C to +135°C

**TABLE VI. Electrical Performance Characteristics**

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Output voltage	V <sub>OUT</sub>	I <sub>OUT</sub> = 0	1	01	±14.85	±15.15	V
			2,3		±14.70	±15.30	
Output current <u>1/ 2/</u>	I <sub>OUT</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, each output	1,2,3	01	80	720	mA
Output ripple <u>3/</u> voltage	V <sub>RIP</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation <u>4/</u>	VR <sub>LINE</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0, 400, and 800 mA	1,2,3	01		35	mV
Load regulation <u>4/</u>	VR <sub>LOAD</sub>	V <sub>IN</sub> = 16, 28, and 40 V dc, I <sub>OUT</sub> = 0, 400, and 800 mA	1,2,3	01		35	mV
Cross regulation <u>5/</u>	VR <sub>CROS</sub>	10 percent to 90 percent load change each output	1,2,3	01		3.0	%
Input current	I <sub>IN</sub>	I <sub>OUT</sub> = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I <sub>OUT</sub> = 0, inhibit (pin 1) = open				55	
Input ripple current <u>3/ 4/</u>	I <sub>RIP</sub>	I <sub>OUT</sub> = 800 mA, B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency <u>4/</u>	E <sub>FF</sub>	I <sub>OUT</sub> = 800 mA	1,3	01	78		%
			2		75		
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc, T <sub>C</sub> = +25°C	1	01	100		MΩ
Capacitive load <u>6/ 7/</u>	C <sub>L</sub>	No effect on dc performance, T <sub>C</sub> = +25°C, total for both outputs	4	01		200	μF
Power dissipation load fault	P <sub>D</sub>	Overload <u>8/</u>	1,2,3	01		6	W
		Short circuit				2.5	
Switching frequency <u>4/</u>	F <sub>S</sub>	I <sub>OUT</sub> = 800 mA	4,5,6	01	500	600	kHz
Output response to step transient load changes <u>4/</u> <u>2/</u>	VO <sub>TLOAD</sub>	400 mA to/from 800 mA	4,5,6	01	-200	+200	mV pk
		0 mA to/from 400 mA	4,5,6	01	-800	+800	

See footnotes at end of table.



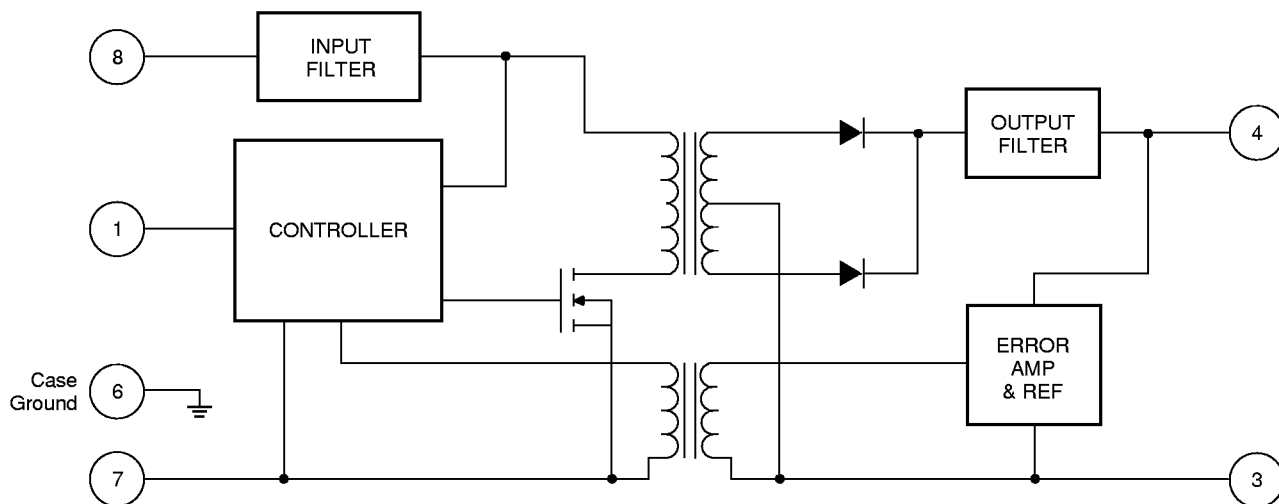
TABLE VI. Electrical Performance Characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>IN</sub> = 28 V dc ±5%, C <sub>L</sub> = 0 unless otherwise specified	Group A Subgroups	Device types	Limits		Unit
					Min	Max	
Recovery time, step transient load changes <u>4/</u> <u>9/ 10/</u>	TT <sub>LOAD</sub>	400 mA to/from 800 mA	4,5,6	01		70	μs
		0 mA to/from 400 mA	4,5,6	01		500	
Output response transient step line changes <u>4/ 7/</u> <u>11/</u>	VO <sub>TLINE</sub>	Input step from/to 16 to 40 V dc, I <sub>OUT</sub> = 800 mA	4,5,6	01	-750	+750	mV pk
Recovery time transient step line changes <u>4/ 7/</u> <u>10/ 11/</u>	TT <sub>LINE</sub>	Input step from/to 16 to 40 V dc, I <sub>OUT</sub> = 800 mA	4,5,6	01		1200	μs
Turn on overshoot <u>4/</u>	VT <sub>onOS</sub>	I <sub>OUT</sub> = 0 and 800 mA	4,5,6	01		750	mV pk
Turn on delay <u>4/ 12/</u>	Ton <sub>D</sub>	I <sub>OUT</sub> = 0 and 800 mA	4,5,6	01		25	ms
Load fault recovery <u>7/</u>	Tr <sub>LF</sub>		4,5,6	01		25	ms
Weight						38	grams

**Notes:**

- 1/ Parameter guaranteed by line load, and cross regulation tests.
- 2/ Up to 90 percent of full power is available from either output provided the total output does not exceed 12 W.
- 3/ Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
- 4/ Load current split equally between +V<sub>OUT</sub> and -V<sub>OUT</sub>.
- 5/ 1.2 watt load on output under test, 1.2 watt to 10.8 watt load change on other output.
- 6/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance. A capacitive load in excess of the maximum limit will not disturb loop stability but may interfere with the operation of the load fault detection circuitry, appearing as a short circuit during turn-on.
- 7/ Parameter shall be tested as part of design characterization and after design or process changes. Thereafter, parameters shall be guaranteed to the limits specified in Table VI.
- 8/ An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the short circuit protection and is the condition of maximum power dissipation.
- 9/ Load step transition time between 2 and 10 microseconds.
- 10/ Recovery time is measured from the initiation of the transient to where V<sub>OUT</sub> has returned to within ±1 percent of V<sub>OUT</sub> at 50 percent load.
- 11/ Input step transition time between 2 and 10 microseconds.
- 12/ Turn-on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 1) while power is applied to the input.

## BLOCK DIAGRAM (Single Output)



## APPLICATION INFORMATION

### Inhibit Function

Connecting the inhibit input (Pin 1) to input common (Pin 7) will cause the converter to shut down. It is recommended that the inhibit pin be driven by an open collector device capable of sinking at least 400  $\mu\text{A}$  of current. The open circuit voltage of the inhibit input is ~~15~~  $\pm 1$  VDC.

## Thermal Management

Assuming that there is no forced air flow, the package temperature rise above ambient ( $\Delta T$ ) may be calculated using the following expression:

$$\Delta T \approx 80 A^{-0.7} P^{0.85} \text{ (} ^\circ\text{C)}$$

where A = the effective surface area in square inches (including heat sink if used;) P = power dissipation in watts.

The total surface area of the AHF package is 4.9 square inches. If a worse case full load efficiency of 78% is assumed, then the case temperature rise can be calculated as follows:

$$P = P_{OUT} \left[ \frac{1}{E_{FF}} - 1 \right] = 12 \left[ \frac{1}{.78} - 1 \right] = 3.4 \text{ W}$$

$$\Delta T = 80 (4.9)^{-0.7} (3.4)^{0.85} = 74^\circ\text{C}$$

Hence, if  $T_{AMBIENT} = +25^\circ\text{C}$ , the DC/DC converter case temperature will be approximately  $100^\circ\text{C}$  if no heat sink or air flow is provided.

To calculate the heat sink area required to maintain a specific case temperature rise, the above equation may be manipulated as follows:

$$A_{HEAT\ SINK} = \left[ \frac{\Delta T}{80 P^{0.85}} \right]^{-1.43} - A_{PKG}$$

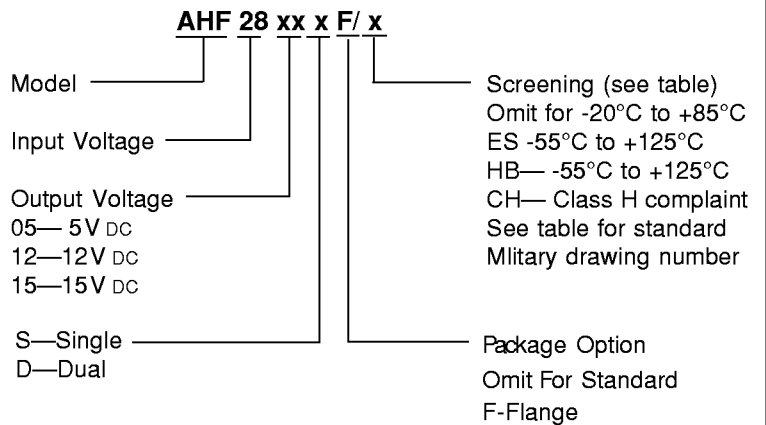
As an example, if a maximum case temperature rise of  $50^\circ\text{C}$  above ambient is desired, then the required effective heat sink area is:

$$A_{HEAT\ SINK} = \left[ \frac{50}{80 (3.4)^{0.85}} \right]^{-1.43} - 4.9 = 3.75 \text{ in.}^2$$

## STANDARDIZED MILITARY DRAWING CROSS REFERENCE

Model	Drawing Number
AHF2805S/CH	SMD #5962-91600
AHF2812S/CH	SMD #5962-94568
AHF2815S/CH	SMD #5962-94563
AHF2812D/CH	SMD #5962-92111
AHF2815D/CH	SMD #5962-92351

## PART NUMBER

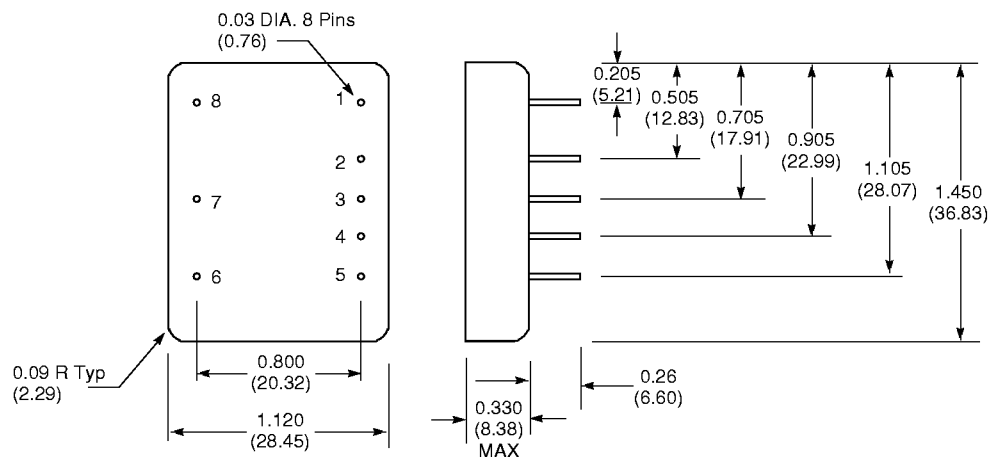


## Available Screening Levels and Process Variations for AHF Series

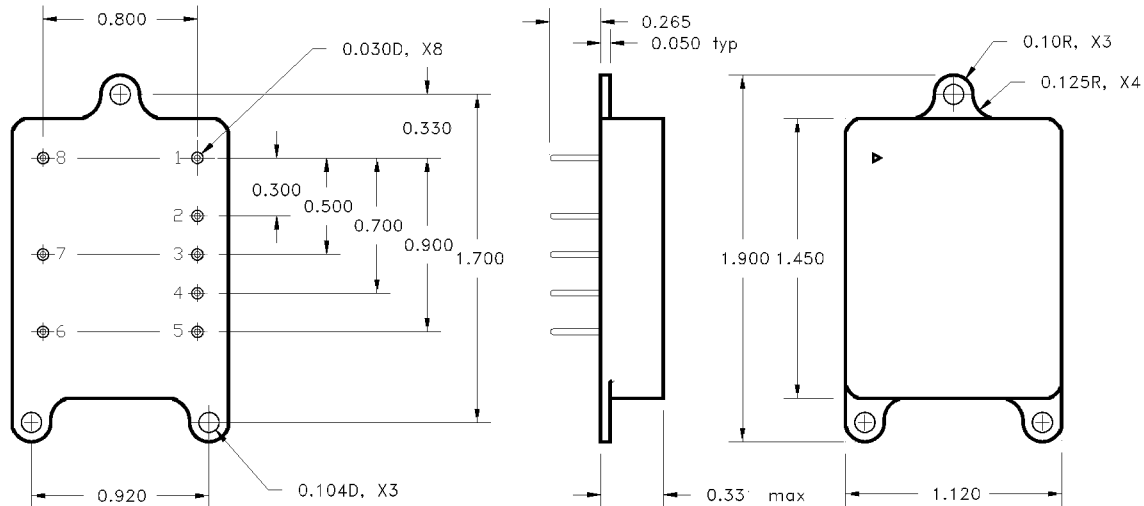
Requirement	MIL-STD-883 Method	No Suffix	ES Suffix	HB Suffix	CH Suffix
Temperature Range		$-20$ to $+85^\circ\text{C}$	$-55^\circ\text{C}$ to $+125^\circ\text{C}$	$-55^\circ\text{C}$ to $+125^\circ\text{C}$	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
Element Evaluation					MIL-PRF-38534
Internal Visual	2017	*	Yes	Yes	Yes
Temperature Cycle	1010		Cond B	Cond C	Cond C
Constant Acceleration	2001		500g	Cond A	Cond A
Burn-in	1015	96hrs @ $125^\circ\text{C}$	96hrs @ $125^\circ\text{C}$	160hrs @ $125^\circ\text{C}$	160hrs @ $125^\circ\text{C}$
Final Electrical (Group A)	MIL-PRF-38534	$25^\circ\text{C}$	$25^\circ\text{C}$	$-55$ , $+25$ , $+125^\circ\text{C}$	$-55$ , $+25$ , $+125^\circ\text{C}$
Seal, Fine & Gross	1014	*	Cond A, C	Cond A, C	Cond A, C
External Visual	2009	*	Yes	Yes	Yes

\* Per Commercial Standards

## MECHANICAL OUTLINE



Tolerances: .xx  $\pm 0.010$ , .xxx  $\pm 0.005$



## PIN DESIGNATION

AHF2805S

AHF2812S

AHF2815S

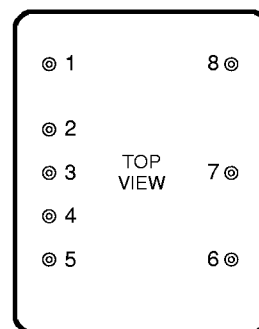
Pin 1 Inhibit input	Pin 8 Positive input
Pin 2 N/C	
Pin 3 Output common	Pin 7 Input common
Pin 4 Positive output	
Pin 5 N/C	Pin 6 Case ground

AHF2805D

AHF2812D

AHF2815D

Pin 1 Inhibit input	Pin 8 Positive input
Pin 2 Positive output	
Pin 3 Output common	Pin 7 Input common
Pin 4 Negative output	
Pin 5 N/C	Pin 6 Case Ground



## NOTES

## NOTES