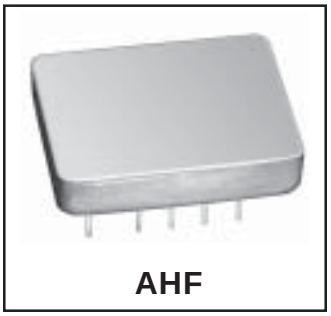
International
IOR Rectifier

PD - 94541

ADVANCED ANALOG HYBRID-HIGH RELIABILITY DC/DC CONVERTERS

AHF28XX SERIES

28V Input, Single and Dual Output



AHF

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 550KHz. 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 50KHz, 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 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 the full military temperature range without derating of output power. Industrial and commercial grades are also available. Variations are electrical, mechanical and screening can be accommodated.

Features

- 16 to 40 VDC Input Range (28 VDC Nominal)
- Single and Dual Outputs
- 12 Watts Output Power
- 22.8 W/in3 Power Density
- Low Input / Output Noise (50mA/60mVp-p max. respectively)
- Indefinite Short Circuit and Overload Protection
- Wideband Control Loop for Superior Transient Characterstics
- No Derating for -55°C to +125°C Opertation
- Constant Switching Frequency (550KHz Nominal)

Extensive computer simulation using complex modeling enables rapid design modification to be provided. Contact Advanced Analog with specific requirements.

Specifications

AHF2805S

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 I. Electrical Performance Characteristics

Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 Unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	01	4.95	5.05	V
			2,3		4.90	5.10	
Output current[1]	I_{OUT}	V_{IN} = 16, 28, and 40 V dc	1,2,3	01		2400	mA
Output ripple voltage[2]	V_{RIP}	V_{IN} = 16, 28, and 40 V dc, B.W. = 20 Hz to 2MHz	1,2,3	01		60	mV p-p
Line regulation	VR_{LINE}	V_{IN} = 16, 28, and 40 V dc, Iout = 0, 500, and 1000 mA	1,2,3	01		25	mV
Load regulation	VR_{LOAD}	V_{IN} = 16, 28, and 40 V dc, I_{OUT} = 0, 500, and 1000 mA	1,2,3	01		50	mV
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I_{OUT} = 0, inhibit (pin 1) = open				30	
Input ripple current[2]	I_{RIP}	I_{OUT} = 1000mA B.W. = 20 Hz to 2MHz	1,2,3	01		50	mA p-p
Efficiency	E_{FF}	I_{OUT} = 1000mA	1	01	76		%
			2,3		74		
Isolation	ISO	Input to output or any pin To case (except pin 6) at 500V dc Tc = +25°C	1	01	100		MΩ
Capacitive load[3,4]	C_L	No effect on dc performance, Tc = +25°C	4	01		500	µF
Power dissipation load fault	P_D	Overload [5]	1	01		6	W
		Short circuit	1,2,3	01		2	
Switching frequency	F_S	I_{OUT} = 1000mA	4,5,6	01	500	600	kHz

For Notes to Specifications, refer to page 3

Table I. Electrical Performance Characteristics - continued

AHF2805S

Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output response to step transient load changes[6]	VO_{TLOAD}	1200 mA to/from 2400mA	4,5,6	01	-300	+300	mV pk
		0 mA to/from 1200mA	4,5,6		-500	+500	mV pk
Recovery time step transient load changes[6.7]	TT_{LOAD}	1200 mA to/from 2400mA	4,5,6	01		70	µs
		0 mA to 1200 mA	4,5,6			1200	ms
		500 mA to 0 mA	4,5,6			8	ms
Output response to transient step line changes	VO_{TLINE}	Input step 16 V to/from 40 V dc, I_{OUT} = 2400mA [4, 8]	4,5,6	01		500	mV pk
Recovery time transient step line changes	TT_{LINE}	Input step 16 V to/from 40Vdc I_{OUT} = 2400mA [4, 7, 8]	4,5,6	01		800	µs
Turn on overshoot	$VTon_{OS}$	I_{OUT} = 0 and 2400mA	4,5,6	01		600	mV pk
Turn on delay	Ton_D	I_{OUT} = 0 and 2400mA [9]	4,5,6	01		20	ms
Load fault recovery[4,9]	Tr_{LF}		4,5,6	01		20	ms
Weight						35	grams

Notes to Specifications

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 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 I.
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_{OUT} has returned to within ±1 percent of V_{OUT} 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 ground signal from the inhibit pin (pin 1) while power is applied to the input is unlimited.

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 ≤Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 Unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	01	11.88	12.12	V
			2,3		11.76	12.24	
Output current[1]	I_{OUT}	V_{IN} = 16, 28, and 40 V dc	1,2,3	01		1000	mA
Output ripple voltage[2]	V_{RIP}	V_{IN} = 16, 28, and 40 V dc, B.W. = 20 Hz to 2MHz	1,2,3	01		60	mV p-p
Line regulation	VR_{LINE}	V_{IN} = 16, 28, and 40 V dc, Iout = 0, 500, and 1000 mA	1,2,3	01		50	mV
Load regulation	VR_{LOAD}	V_{IN} = 16, 28, and 40 V dc, I_{OUT} = 0, 500, and 1000 mA	1,2,3	01		50	mV
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I_{OUT} = 0, inhibit (pin 1) = open				50	
Input ripple current[2]	I_{RIP}	I_{OUT} = 1000mA B.W. = 20 Hz to 2MHz	1,2,3	01		50	mA p-p
Efficiency	E_{FF}	I_{OUT} = 1000mA	1	01	78		%
			2,3		75		
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500V dc Tc = +25°C	1	01	100		MΩ
Capacitive load[3,4]	C_L	No effect on dc performance, Tc = +25°C	4	01		500	µF
Power dissipation load fault	P_D	Overload [5]	1	01		6	W
		Short circuit	1,2,3	01		2	
Switching frequency	F_S	I_{OUT} = 1000mA	4,5,6	01	500	600	kHz

For Notes to Specifications, refer to page 5

Table II. Electrical Performance Characteristics - continued

AHF2812S

Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output response to step transient load changes[6]	VO_{TLOAD}	50 mA to/from 1000mA	4	01	-300	+300	mV pk
			5,6		-450	+450	
		0 mA to/from 500mA	4		-500	+500	
			5,6		-750	+750	
Recovery time step transient load changes[6,7]	TT_{LOAD}	50 mA to/from 1000mA	4,5,6	01		100	µs
		0 mA to 500 mA	4,5,6			1500	
		500 mA to 0 mA	4,5,6			10	ms
Output response to transient step line changes	VO_{TLINE}	Input step 16 V to/from 40 V dc, I_{OUT} =1000mA [4, 8]	4,5,6	01		1500	mV pk
Recovery time transient step line changes	TT_{LINE}	Input step 16 V to/from 40Vdc I_{OUT} =1000mA [4, 7, 8]	4,5,6	01		800	µs
Turn on overshoot	$VTon_{OS}$	I_{OUT} = 0 and 1000mA	4,5,6	01		600	mV pk
Turn on delay	Ton_D	I_{OUT} = 0 and 1000mA [9]	4,5,6	01		20	ms
Load fault recovery[4,9]	Tr_{LF}		4,5,6	01		20	ms
Weight						35	grams

Notes to Specifications

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 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_{OUT} has returned to within ±1 percent of V_{OUT} 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 ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	All	14.85	15.15	V
			2,3		14.70	15.30	
Output current[1]	I_{OUT}	V_{IN} = 18, 28, and 40 V dc	1,2,3	All		2000	mA
Output ripple voltage[2]	V_{RIP}	V_{IN} = 18, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	All		50	mV p-p
Line regulation	VR_{LINE}	V_{IN} = 18, 28, and 40 V dc, Iout = 0, 1000, and 2000 mA	1	All		±35	mV
			2,3			±75	
Load regulation	VR_{LOAD}	V_{IN} = 18, 28, and 40 V dc, I_{OUT} = 0, 1000, and 2000 mA	1,2,3	All		±150	mV
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 2) tied to input return (pin 10)	1,2,3	All		18	mA
		I_{OUT} = 0, inhibit (pin 2) = open				50	
Input ripple current[2]	I_{RIP}	I_{OUT} = 2000mA, B.W. = 20 Hz to 2 MHz	1,2,3	All		20	mA p-p
Efficiency	E_{FF}	I_{OUT} = 2000mA	1	All	80		%
			2,3		77		
Isolation	ISO	Input to output or any pin to case (except pin 7) at 500 V dc Tc = +25°C	1	All	100		MΩ
Capacitive load[3,4]	C_L	No effect on dc performance, Tc = +25°C	4	All		200	µF
Power dissipation load fault	P_D	Overload [5]	1	All		6	W
		Short circuit	1,2,3	All		2	
Switching frequency	F_S	I_{OUT} = 2000mA	4,5,6	01, 04	250	300	kHz
				02, 05	250	270	
				03, 06	275	300	

For Notes to Specifications, refer to page 7

Table III. Electrical Performance Characteristics - continued

AHF2815S

Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output response to step transient load Changes[6]	VO_{TLOAD}	1000 mA to/from 2000mA	4,5,6	All	-800	+800	mV pk
		0 mA to/from 1000mA	4,5,6		-1000	+750	
Recovery time step transient load Changes[6,7]	TT_{LOAD}	1000 mA to/from 2000mA	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_{TLINE}	Input step 18 V to/from 40 V dc, I_{OUT} = 2000mA [4, 8]	4,5,6	04	-1000	+1000	mV pk
				05			
				06			
Recovery time transient step line changes	TT_{LINE}	Input step 18 V to/from 40Vdc I_{OUT} = 2000mA [4, 7, 8]	4,5,6	04		500	µs
				05			
				06			
Turn on overshoot	$VTon_{OS}$	I_{OUT} = 0 and 2000mA	4,5,6	All		750	mV pk
Turn on delay	Ton_D	I_{OUT} = 0 and 2000mA [9]	4,5,6	All		12	ms
Load fault recovery[4,9]	Tr_{LF}		4,5,6	All		12	ms
Weight						38	grams

Notes to Specifications

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 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_{OUT} has returned to within ±1 percent of V_{OUT} 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 is unlimited.

Specifications

AHF2805D

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 IV. Electrical Performance Characteristics

Test	Symbol	Conditions -55°C ≤ Tc ≤+125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	01	±4.95	±5.05	V
			2,3		±4.90	±5.10	
Output current[1,2]	I_{OUT}	V_{IN} = 16, 28, and 40 V dc, each output	1,2,3	01	0.12	1.08	A
Output ripple voltage[3]	V_{RIP}	V_{IN} = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation[4]	VR_{LINE}	V_{IN} = 16, 28, and 40 V dc, Iout = 0, 1200, and 2400 mA	1,2,3	01		30	mV
Load regulation[4]	VR_{LOAD}	V_{IN} = 16, 28, and 40 V dc, I_{OUT} = 0, 1200, and 2400 mA	1,2,3	01		30	mV
Cross regulation[5]	VR_{cros}	10 percent to 90 percent load change	1,2,3	01		±10	%
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I_{OUT} =0, inhibit (pin 1) = open				60	
Input ripple current[3,4]	I_{RIP}	I_{OUT} = 2400mA B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency[4]	E_{FF}	I_{OUT} = 2400mA,	1,3		75		
		T_C =+25°C	2	01	72		%
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500V dc, T_C = +25°C	1	01	100		MΩ
Capacitive load[6,7]	C_L	No effect on dc performance, T_C = +25°C, total for both outputs	4	01		200	µF

For Notes to Specifications, refer to page 9

Table IV. Electrical Performance Characteristics - continued

AHF2805D

Test	Symbol	Conditions -55°C ≤ Tc ≤+125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Power dissipation load fault	P_D	Overload, T_C = +25°C [8]	1,2,3	01		6	W
		Short circuit, T_C = +25°C				2	
Switching frequency[4]	F_S	I_{OUT} = 2400mA	4,5,6	01	500	600	kHz
Output response to step transient load changes[4,9]	VO_{TLOAD}	1200 mA to/from 2400mA	4,5,6	01	-400	+400	mV pk
		0 mA to/from 1200 mA	4,5,6		-800	+800	
Recovery time step transient load changes[4,9,10]	TT_{LOAD}	1200 mA to/from 2400mA	4,5,6	01		70	µs
		0 mA to/from 1200 mA	4,5,6			100	
Output response transient step line changes[4,7,11]	VO_{TLINE}	Input step from/to 16 to 40 V dc, I_{OUT}=2400mA	4,5,6	01	-400	+400	mV pk
Recovery time transient step line changes[4,7,10,11]	TT_{LINE}	Input step from/to 16 to 40 V dc, I_{OUT}=2400mA	4,5,6	01		1200	µs
Turn on overshoot[4]	$VTon_{OS}$	I_{OUT}=0 and 2400mA	4,5,6	01		600	mV pk
Turn on delay[4,12]	Ton_D	I_{OUT} = 0 and 2400mA	4,5,6	01		25	ms
Load fault recovery[7]	Tr_{LF}		4,5,6	01		25	ms
Weight						38	grams

Notes to Specifications

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 12W.
3. Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
4. Load current split equally between $+V_{OUT}$ and $-V_{OUT}$.
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 IV.
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_{OUT} has returned to within ±1 percent of V_{OUT} 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

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 ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	01	±11.88	±12.12	V
			2,3		±11.76	±12.24	
Output current[1,2]	I_{OUT}	V_{IN} = 16, 28, and 40 V dc, each output	1,2,3	01	100	900	mA
Output ripple voltage[3]	V_{RIP}	V_{IN} = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation[4]	VR_{LINE}	V_{IN} = 16, 28, and 40 V dc, Iout = 0, 500, and 1000 mA	1,2,3	01		30	mV
Load regulation[4]	VR_{LOAD}	V_{IN} = 16, 28, and 40 V dc, I_{OUT} = 0, 500, and 1000 mA	1,2,3	01		30	mV
Cross regulation[5]	VR_{cros}	10 percent to 90 percent load change	1,2,3	01		3.0	%
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I_{OUT} =0, inhibit (pin 1) = open				60	
Input ripple current[3,4]	I_{RIP}	I_{OUT} = 1000mA B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency[4]	E_{FF}	I_{OUT} = 1000mA,	1,3		77		
		T_C=+25°C	2	01	74		%
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500V dc, T_C = +25°C	1	01	100		MΩ
Capacitive load[6,7]	C_L	No effect on dc performance, T_C = +25°C, total for both outputs	4	01		200	µF

For Notes to Specifications, refer to page 11

Table V. Electrical Performance Characteristics - continued

AHF2812D

Test	Symbol	Conditions -55°C ≤ Tc ≤+125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Power dissipation load fault	P_D	Overload, T_C = +25°C [8]	1,2,3	01		6	W
		Short circuit, T_C = +25°C				2	
Switching frequency[4]	F_S	I_{OUT} = 1000mA	4,5,6	01	500	600	kHz
Output response to step transient load changes[4,9]	VO_{TLOAD}	500 mA to/from 1000mA	4,5,6	01	-200	+200	mV pk
		0 mA to/from 500 mA	4,5,6		-800	+800	
Recovery time step transient load changes[4,9,10]	TT_{LOAD}	500 mA to/from 1000mA	4,5,6	01		70	µs
		0 mA to/from 500 mA	4,5,6			1000	
Output response transient step line changes[4,7,11]	VO_{TLINE}	Input step from/to 16 to 40 V dc, I_{OUT}=1000mA	4,5,6	01	-750	+750	mV pk
Recovery time transient step line changes[4,7,10,11]	TT_{LINE}	Input step from/to 16 to 40 V dc, I_{OUT}=1000mA	4,5,6	01		1200	µs
Turn on overshoot[4]	$VTon_{OS}$	I_{OUT}=0 and 1000mA	4,5,6	01		600	mV pk
Turn on delay[4,12]	Ton_D	I_{OUT} = 0 and 1000mA	4,5,6	01		25	ms
Load fault recovery[7]	Tr_{LF}		4,5,6	01		25	ms
Weight						38	grams

Notes to Specifications

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 12W.
3. Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
4. Load current split equally between $+V_{OUT}$ and $-V_{OUT}$.
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 oad 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_{OUT} has returned to within ±1 percent of V_{OUT} 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 ≤ Tc ≤+125°C Vin = 28 Vdc ±5%, C_L = 0 Unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 0	1	01	±14.85	±15.15	V
			2,3		±14.70	±15.30	
Output current[1,2]	I_{OUT}	V_{IN} = 16, 28, and 40 V dc, each output	1,2,3	01	80	720	mA
Output ripple voltage[3]	V_{RIP}	V_{IN} = 16, 28, and 40 V dc, B.W. = 20 Hz to 2 MHz	1,2,3	01		60	mV p-p
Line regulation[4]	VR_{LINE}	V_{IN} = 16, 28, and 40 V dc, Iout = 0, 400, and 800 mA	1,2,3	01		35	mV
Load regulation[4]	VR_{LOAD}	V_{IN} = 16, 28, and 40 V dc, I_{OUT} = 0, 400, and 800 mA	1,2,3	01		35	mV
Cross regulation[5]	VR_{cros}	10 percent to 90 percent load change each output	1,2,3	01		3.0	%
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)	1,2,3	01		12	mA
		I_{OUT} = 0, inhibit (pin 1) = open				55	
Input ripple current[3,4]	I_{RIP}	I_{OUT} = 800mA B.W. = 20 Hz to 2 MHz	1,2,3	01		50	mA p-p
Efficiency[4]	E_{FF}	I_{OUT} = 800mA	1,3	01	78		%
			2		75		
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc, T_C = +25°C	1	01	100		MΩ
Capacitive load[6,7]	C_L	No effect on dc performance, T_C = +25°C, total for both outputs	4	01		200	µF

For Notes to Specifications, refer to page 13

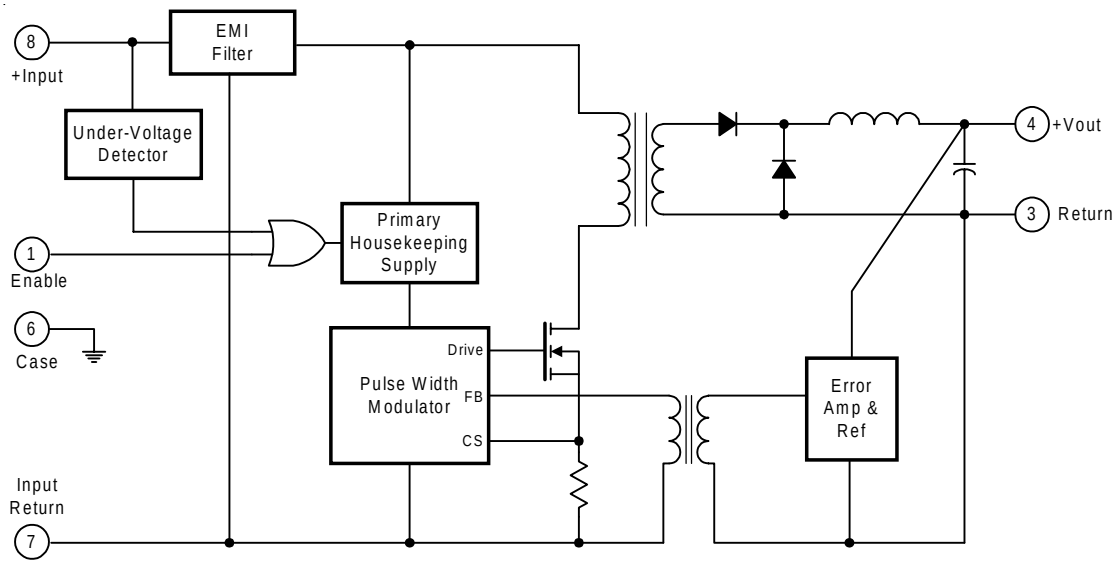
Table VI. Electrical Performance Characteristics - continued AHF2815D

Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 Unless otherwise specified	Group A Subgroups	Device Types	Limits		Unit
					Min	Max	
Power dissipation load fault	P_D	Overload [8]	1,2,3	01		6	W
		Short circuit				2	
Switching frequency[4]	F_S	I_{OUT} = 800 mA	4,5,6	01	500	600	kHz
Output response to step transient load changes[4,9]	VO_{TLOAD}	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	
Recovery time step transient load changes[4,9,10]	TT_{LOAD}	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[4,7,11]	VO_{TLINE}	Input step from/to 16 to 40 V dc, I_{OUT}=800mA	4,5,6	01	-750	+750	mV pk
Recovery time transient step line changes[4,7,10,11]	TT_{LINE}	Input step from/to 16 to 40Vdc, I_{OUT}=800mA	4,5,6	01		1200	µs
Turn on overshoot[4]	$VTon_{OS}$	I_{OUT}=0 and 800mA	4,5,6	01		750	mV pk
Turn on delay[4,12]	Ton_D	I_{OUT} = 0 and 800mA	4,5,6	01		25	ms
Load fault recovery[7]	Tr_{LF}		4,5,6	01		25	ms
Weight						38	grams

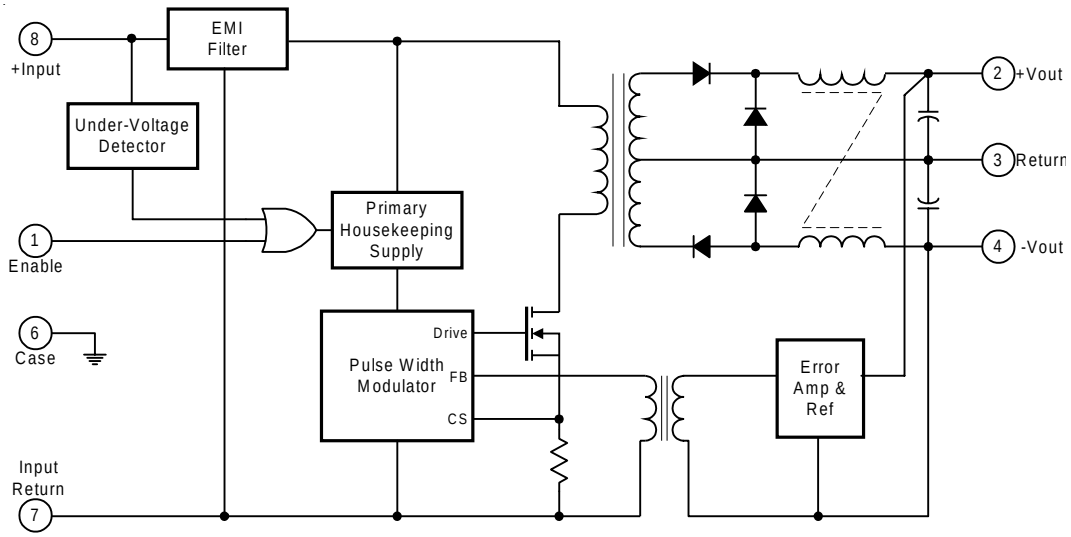
Notes to Specifications

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 12W.
3. Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
4. Load current split equally between $+V_{OUT}$ and $-V_{OUT}$.
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_{OUT} has returned to within ±1 percent of V_{OUT} 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.

AHF28XX (Single Output) Block Diagram



AHF28XX (Dual Output) Block Diagram



Application Information

Inhibit Function

Connecting the enable input (Pin 1) to input common (Pin 7) will cause the converter to shut down. It is recommended that the enable pin be driven by an open collector device capable of sinking at least 400 µA of current. The open circuit voltage of the enable input is 15 ±1 VDC. If the inhibit function is not used, this input can be left unconnected because it is internally pulled-up.

Thermal Management

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

$$\Delta T \approx 80\ A^{-0.7} p^{0.85}\ (°C)$$

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:

$$P = P_{OUT}\left[\frac{1}{Eff} - 1\right] = 12\left[\frac{1}{0.78} - 1\right] = 3.4W$$

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

Hence, if $T_{AMBIENT}$ = +25°C, the DC/DC converter case temperature will be approximately 100°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:

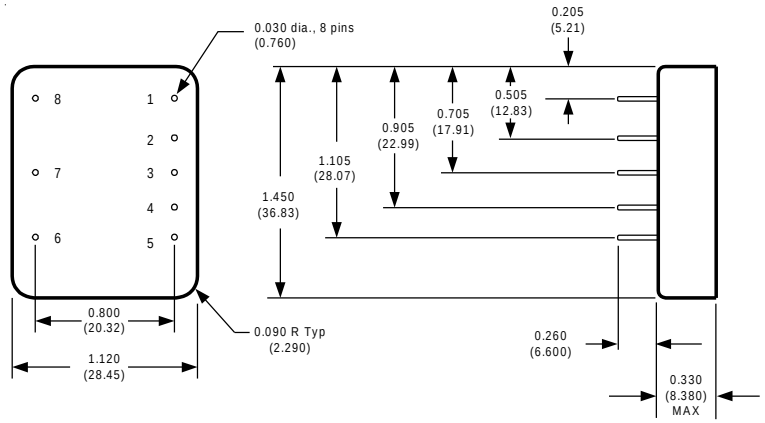
$$A_{HEAT\ SINK} = \left[\frac{\Delta T}{80P^{0.85}}\right]^{-1.43} - A_{PKG}$$

As an example, if a maximum case temperature rise of 50°C rise above ambient is desired, then the required effective heat sink area is:

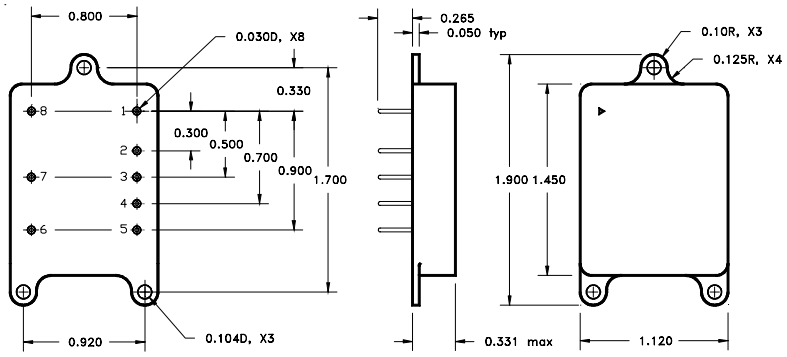
$$A_{HEATSINK} = \left[\frac{50}{80(3.4)^{0.85}}\right]^{-1.43} - 4.9 = 3.75 in.^2$$

AHF28XX Case Outlines

Non-Flanged



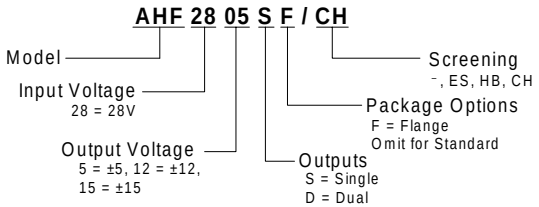
Flanged



Pin Designation

	AHF28XXS		AHF28XXD
Pin No.	Designation	Pin No.	Designation
1	Enable	1	Enable
2	N/C	2	+ Output
3	Output Return	3	Output Return
4	+ Output	4	- Output
5	N/C	5	N/C
6	Case	6	Case
7	Input Return	7	Input Return
8	+ Input	8	+ Input

Part Numbering



Available Screening Levels and Process Variations for AHF28XX Series

Requirement	MIL-STD-883 Method	No Suffix	ES Suffix	HB Suffix	CH Suffix
Temperature Range		-20 to +85°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°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	48hrs @ 85°C	48hrs @ 125°C	160hrs @ 125°C	160hrs @ 125°C
Final Electrical (Group A)	MIL-PRF-38534	25°C	25°C	-55, +25, +125°C	-55, +25, +125°C
Seal, Fine & Gross	1014	*	Cond A, C	Cond A, C	Cond A, C
External Visual	2009	*	Yes	Yes	Yes

* Per Commercial Standards

Available Standard Military Drawing (SMD) Cross Reference

Standardized Military Drawing Pin	Vendor CAGE Code	Vendor Similar Pin
5962-9160001	52467	AHF2805S/CH
5962-9456801	52467	AHF2812S/CH
5962-9456301	52467	AHF2815S/CH
5962-9211101	52467	AHF2812D/CH
5962-9235101	52467	AHF2815D/CH

International
IOR Rectifier

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