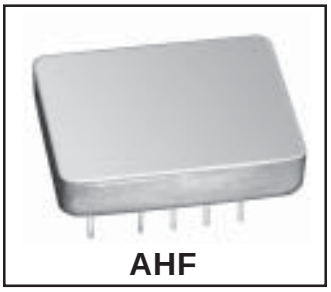
International
IOR Rectifier

PD - 94542

ADVANCED ANALOG HIGH RELIABILITY DC/DC CONVERTERS

AHF2815T SERIES

28V Input, Triple Output



AHF

Description

The AHF2815T Series of DC/DC converters provide 8 watts of power and an extended temperature range for use in military and industrial applications. Designed to the nominal input requirements of MIL-STD-704, these devices have nominal 28VDC inputs with +5V and ±15V triple outputs to satisfy a wide range of requirements. 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.

Manufactured in a facility qualified to MIL-PRF-38534, these converters are available in four screening grades to satisfy a wide range of requirements. The CH grade is fully compliant to the requirements of MIL-PRF-38534 for class H. The HB grade is processed and screened to the class H requirement, but may not necessarily meet all of the other MIL-PRF-38534 requirements, e.g., element evaluation and Periodic Inspection (P.I.) not required. Both grades are tested to meet the complete group “A” test specification over the full military temperature range without output power deration. Two grades with more limited screening are also available for use in less demanding applications. Variations in electrical, mechanical and screening can be accommodated. Contact Advanced Analog for special requirements.

Features

- 16 to 40 VDC Input Range (28 VDC Nominal)
- 5V, ±15 Volt Output
- Infinite Short Circuit and Overload Protection
- 8 Watts Output Power
- Fast Loop Response for Superior Transient Characteristics
- Operating Temperature Range from -55°C to +125°C Available
- Popular Industry Standard Pin-Out
- Resistance Seam Welded Case for Superior Long Term Hermeticity
- Efficiency Up to 75%
- Shutdown from External Signal
- 400,000 Hour MTBF at 85%
- Constant Switching Frequency (550KHz Nominal)

International
IOR Rectifier

Specifications

T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5% unless otherwise specified [7]

TYPICAL CHARACTERISTICS	
Temperature Range[7]	Operating -55°C to +125°C case Storage -65°C to +135°C
Isolation	100 megaohms at 500 volts DC
Weight	35 grams
Conversion frequency	550 kHz

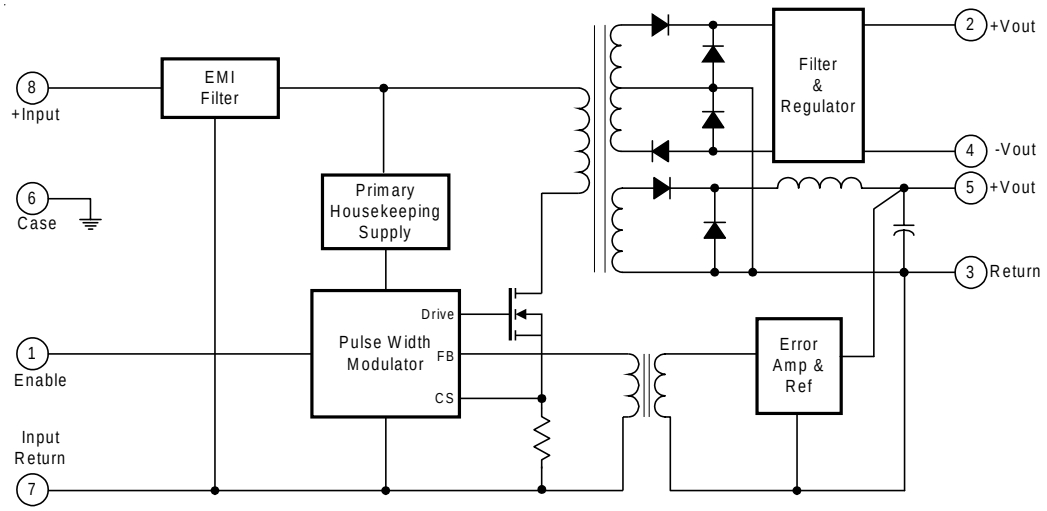
Test	Symbol	Conditions -55°C ≤ Tc ≤ +125°C Vin = 28 Vdc ±5%, C_L = 0 unless otherwise specified[7]		AHF2815T Limits		Unit
				Min	Max	
STATIC CHARACTERISTICS						
Output voltage[1]	V_{OUT}	I_{OUT} = 0 (main)	TC = 25°C	4.95	5.05	V
			Over Temp	4.90	5.10	V
		I_{OUT} = 0 (dual)[1]	TC = 25°C	±14.50	±15.50	V
			Over Temp	±14.35	±15.65	V
Current[1,2,3]	I_{OUT}	V_{IN} = 16, 28, and 40 Vdc (main)		120	1200	mA
		V_{IN} = 16, 28, and 40 Vdc (dual)		0.0	±66.7	mA
Ripple Voltage[1,4]	V_{RIP}	V_{IN} = 16, 28, and 40 Vdc BW = DC to 2 MHz (main)			60	mV p-p
		V_{IN} = 16, 28, and 40 VDC BW = DC to 2 MHz (dual)			80	mV p-p
Power[1,2,3]	P_{OUT}	V_{IN} = 16, 28, and 40 Vdc (main)		5		W
		(+dual)		1.5		W
		(-dual)		1.5		W
		(total)		8		W
REGULATION						
Line[1,3]	VR_{LINE}	V_{IN} = 16, 28, and 40 VDC				
		I_{OUT} = 120, 600,1200 mA (main)			25	mV
		I_{OUT} = 0, ±33.4, ±66.7 mA (dual)	T_C = 25°C		±35	mV
			Over Temp		±75	mV
Load[1,3]	VR_{LOAD}	V_{IN} = 16, 28, and 40 VDC				
		I_{OUT} = 120, 600, 1200mA (main)			50	mV
		I_{OUT} = 0, ±33.4, ±66.7 mA (dual)			±75	mV
Input current	I_{IN}	I_{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)			15	mA
		I_{OUT} = 0, inhibit (pin 1) = open			50	mA
Ripple current[4]	I_{RIP}	I_{OUT} = 1200mA (main)			50	mA p-p
		I_{OUT} = ±66.7 mA (dual) BW = DC to 2MHz				
Efficiency	E_{FF}	P_{OUT} = Full load	T_C = ±25°C	68		%
			T_C = ±25°C			
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc Tc = +25°C	T_C = ±25°C	100		MΩ
Load fault power dissipation[3]	P_D	Overload, T_C = ±25°C[5]	T_C = ±25°C		8	W
		Short Circuit, T_C = ±25°C			6	W
Switching frequency	F_S			500	600	kHz
Inhibit Open Circuit Voltage	V_{OI}			9	13	V

For Notes to Specifications, refer to page 3

Notes to Specifications

1. Tested at each output.
2. Parameter guaranteed by line and load regulation tests.
3. At least 20 percent of the total output power should be taken from the (+5 volt) main output.
4. Bandwidth guaranteed by design. Tested for 20 KHz to 2 MHz.
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. Above 125°C case temperature, derate output power linearly to 0 at 135°C case.
7. T_{CASE} = -55°C to 85°C for non screened grade.

AHF2815T Block Diagram



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 µA of current. The open circuit voltage of the inhibit input is 11.5 ±1 VDC.

Thermal Management

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

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

where A = the effective surface area in square inhes(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 75% is assumed, then the case temperature rise can be calculated as follows:

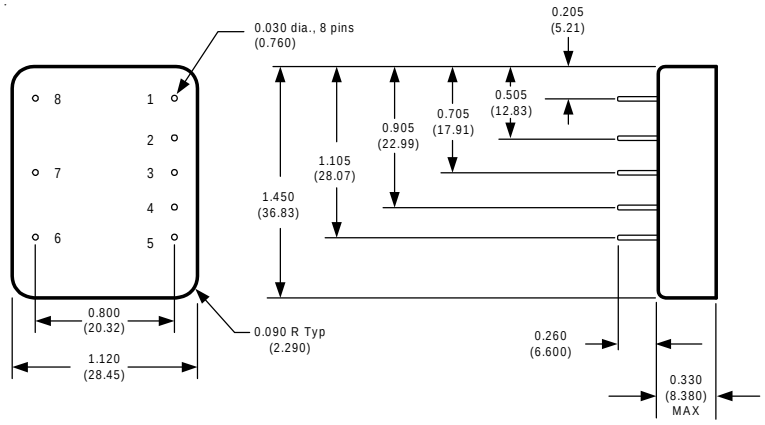
$$P = P_{OUT}\left[\frac{1}{Eff} - 1\right] = 8\left[\frac{1}{.78} - 1\right] = 2.66W$$

$$\Delta T = 80\ (4.9)^{-0.7}\ (2.66)^{0.85} = 60.4°C$$

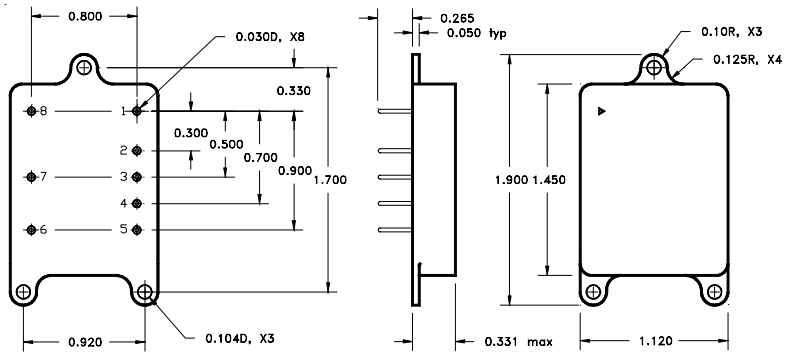
Hence, if $T_{AMBIENT}$ = +25°C, the DC/DC converter case temperature will be approximately 85°C if no heat sink or air flow is provided.

AHF2815T Case Outlines

Standard



Flanged



AHF2815T Pin Designation

Pin No.	Designation
1	Enable Input
2	+Dual Output
3	Output Return
4	-Dual Output
5	+5V Output
6	Case Ground
7	Input Return
8	Positive Input

Part Numbering

AHF 28 15 T F / CH

- Model
- Input Voltage: 28 = 28V Nominal
- Output Voltage: 15 = 5V,±15V
- Outputs: T = Triple
- Package Options: F = Flange; Omit for Standard
- Screening: -, ES, HB, CH

Available Screening Levels and Process Variations for AHF2815T 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 Specification	25°C	25°C	-55, +25, +125°C	-55, +25, +125°C
Seal, Fine & Gross	1014	Cond A	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
5962-9462301	52467	AHF2815T

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
ADVANCED ANALOG: 2270 Martin Av., Santa Clara, California 95050, Tel: (408) 727-0500
Visit us at www.irf.com for sales contact information.