AHF2815T Series

Triple Output, Hybrid - High Reliability
DC/DC Converter

DESCRIPTION

The AHF2800T 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, thse devices have nominal 28VDC inputs with +5V and ±12V or +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 550KHx. Input to output isolation is achieved through the use of transformers in the forward and feedback circuits.

The poprietary 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 fully 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 Lambda Advanced Analog for special requirements.

FEATURES

- **16 To 40 V_{DC} Input Range (28V_{DC} Nominal)**
- **5V, ± 15 Volt Output**
- **Indefinite 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**
- **Efficiencies Up to 75%**
- **Shutdown from External Signal**
- **400,000 Hour MTBF at 85%**
- **Constant Switching Frequency (550 KHz Nominal)**

SPECIFICATIONS

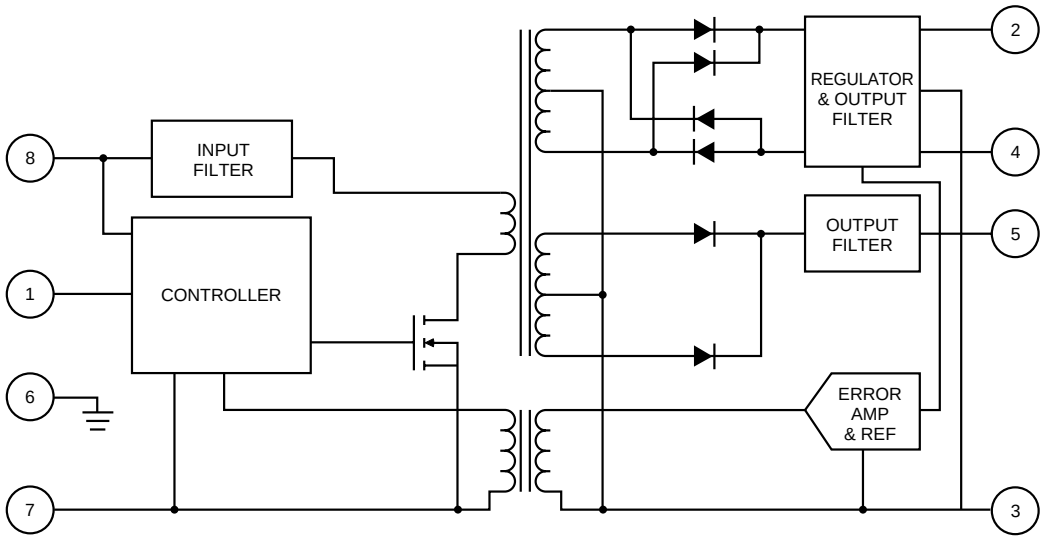
T_{CASE} = -55°C to +125°C, V_{IN} = +28 V ±5% unless otherwise specified[7]

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, V_{IN} = 28 V_{DC} ±5%, C_L=0, unless otherwise specified[7]		AHF2815T Limits Min	 Max	Units
STATIC CHARACTERISTICS						
OUTPUT						
Voltage[1]	V_{OUT}	I_{OUT} = 0 (main)	T_C = 25°C	4.95	5.05	V
			Over Temp	4.90	5.10	V
		I_{OUT} = 0 (dual)[1]	T_C = 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 V_{DC} (main)		120	1200	mA
		V_{IN} = 16, 28, and 40 V_{DC} (dual)[1]		0.0	±66.7	mA
Ripple Voltage[1,4]	V_{RIP}	V_{IN} = 16, 28, and 40 V_{DC} BW = DC to 2 MHz (main)			60	mV p-p
		V_{IN} = 16, 28, and 40 V_{DC} BW = DC to 2 MHz (dual)			80	mV p-p
Power[1,2,3]	P_{OUT}	V_{IN} = 16, 28, and 40 V_{DC} (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 V_{DC} I_{OUT} = 120, 600, 1200 mA (main)			25	mV
		V_{IN} = 16, 28, and 40 V_{DC} (dual)	T_C = 25°C		±35	mV
		I_{OUT} = 0, ±33.4, ±66.7 mA (dual)	Over Temp		±75	mV
Load[1,3]	VR_{LOAD}	V_{IN} = 16, 28, and 40 V_{DC} I_{OUT} = 120, 600, 1200 mA (main)			50	mV
		V_{IN} = 16, 28, and 40 V_{DC} 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} = 1200 mA (main) I_{OUT} = ±66.7 mA (dual) BW = DC to 2 MHz			50	mA p-p
EFFICIENCY	EFF	P_{OUT} = Full load	T_C = +25°C T_C = ±25°C	68		%
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]	PD	Over Load, T_C = +25°C[5] Short Circuit, T_C = +25°C	T_C = +25°C		8 6	W W
SWITCHING FREQUENCY	FS			500	600	KHz
INHIBIT OPEN CIRCUIT VOLTAGE	V_{OI}			9	13	V

Notes:
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.

BLOCK DIAGRAM

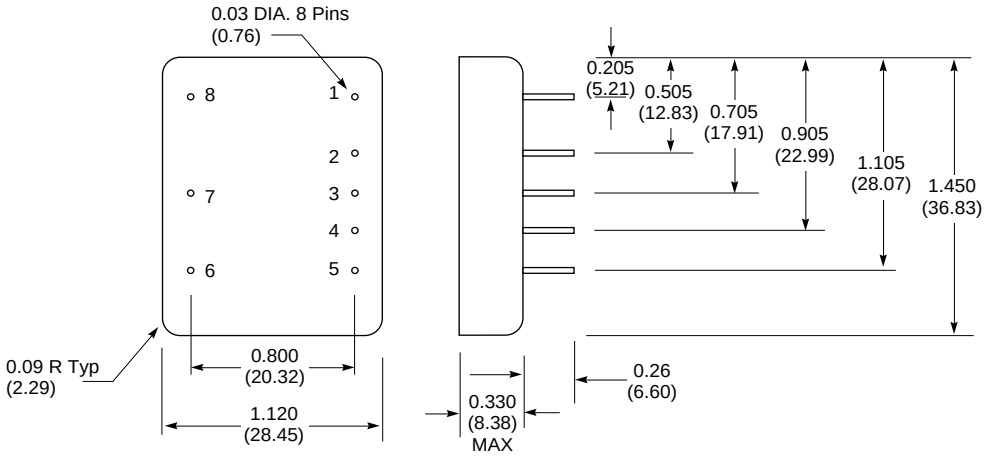


APPLICATION INFORMATION

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 400µA of current. The open circuit voltage of the inhibit input is 11.5 + 1 V_{DC}.

MECHANICAL OUTLINE

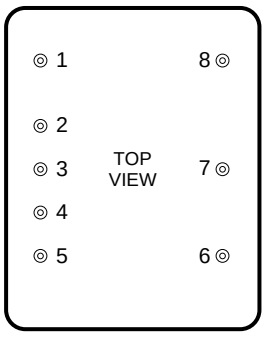


Tolerances: .xx = ±0.010, .xxx = ±0.005

PIN DESIGNATION

AHF2815T

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	+5V output	Pin 6	Case Ground



Thermal Management

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

$$ĐT \spadesuit 80\ A^{-0.7}\ p^{0.85}\ (\ °C)$$

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 75% is assumed, then the case temperature rise can be calculated as follows:

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

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

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.

PART NUMBER

AHF 28 xx T / x

- Model
- Input Voltage
- Output Voltage
  15—15 VDC
- Triple Output
- Screening
  No Suffix ,ES,
  HB, CH,
  (Class B compliant
  See table for standard
  military drawing 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		-25°C to +85°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°C
Element Evaluation					MIL-H-38534
Internal Visual	2017	◆	✔	✔	✔
Temperature Cycle	1010		Cond B	Cond C	Cond C
Constant Acceleration	2001		500g	Cond A	Cond A
Burn-in	1015		96hrs @125°C	160hrs @125°C	160hrs @125°C
Final Electrical (Group A)	MIL-H-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	◆	✔	✔	✔

◆ per Commercial Standards

LAMBDA ADVANCED ANALOG INC.

MIL-PRF-38534 Certified
ISO9001 Rgstrd

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