

AHF2815T SERIES **28V Input, Triple Output**

HYBRID-HIGH RELIABILITY DC/DC CONVERTER

Description

The AHF2815T Series of DC/DC converters provide 8W 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 $\pm 15V$ 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 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

- 16V to 40VDC Input Range (28VDC Nominal)
- 5V, $\pm 15V$ Output
- Infinite Short Circuit and Overload Protection
- 8W Output Power
- Fast Loop Response for Superior Transient Characteristics
- Operating Temperature Range from -55°C to $+125^{\circ}\text{C}$ 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)
- Standard Microcircuit Drawing Available

AHF2815T Series

International
IRF Rectifier

Specifications

$T_{CASE} = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{IN} = +28\text{V} \pm 5\%$ unless otherwise specified ⁷

Typical Characteristics		
Conversion frequency	550KHz	
Temperature Range ¹	Recommended Operating temperature	-55°C to +125°C
	Storage case temperature	-65°C to +135°C

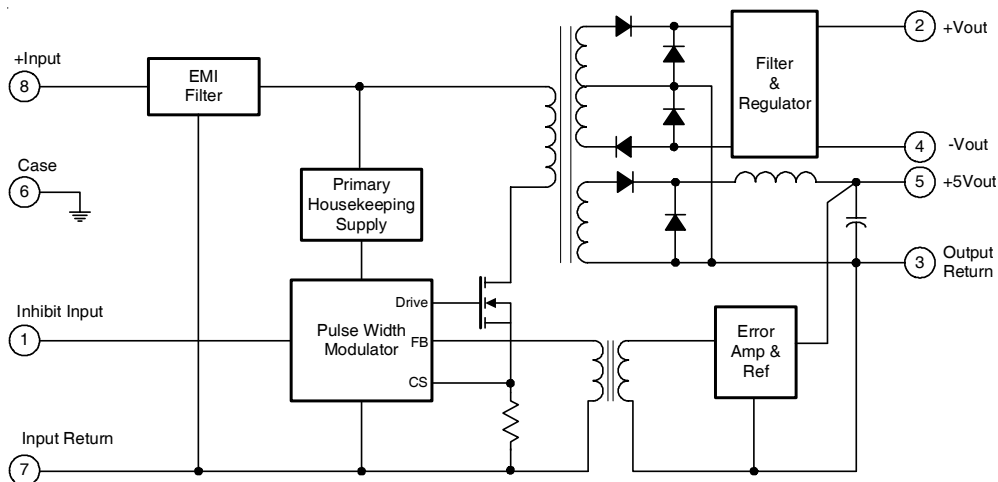
Test	Symbol	Conditions -55°C ≤ T _c ≤ +125°C V _{in} = 28 Vdc ±5%, C _L = 0, unless otherwise specified ⁷	AHF2815T Limits		Unit	
			Min	Max		
STATIC CHARACTERISTICS						
Output voltage ¹	V _{OUT}	I _{OUT} = 0 (main) I _{OUT} = 0 (dual) ¹	TC = 25°C Over Temp TC = 25°C Over Temp	4.95 4.90 ±14.50 ±14.35	5.05 5.10 ±15.50 ±15.65	V V V V
Current ^{1,2,3}	I _{OUT}	V _{IN} = 16, 28, and 40 Vdc (main) V _{IN} = 16, 28, and 40 Vdc (dual)		120 0.0	1200 ±66.7	mA mA
Ripple Voltage ^{1,4}	V _{RIP}	V _{IN} = 16, 28, and 40 Vdc BW = DC to 2 MHz (main) V _{IN} = 16, 28, and 40 VDC BW = DC to 2 MHz (dual)			60 80	mV p-p mV p-p
Power ^{1,2,3}	P _{OUT}	V _{IN} = 16, 28, and 40 Vdc (main) (+dual) (-dual) (total)		5.0 1.5 1.5 8.0		W W W W
REGULATION						
Line ^{1,3}	V _{RLINE}	V _{IN} = 16, 28, and 40 VDC I _{OUT} = 120, 600, 1200 mA (main) I _{OUT} = 0, ±33.4, ±66.7 mA (dual)	T _C = 25°C Over Temp		25 ±35 ±75	mV
Load ^{1,3}	V _{RLOAD}	V _{IN} = 16, 28, and 40 VDC I _{OUT} = 120, 600, 1200mA (main) I _{OUT} = 0, ±33.4, ±66.7 mA (dual)			50 ±75	
Input current	I _{IN}	I _{OUT} = 0, inhibit (pin 1) tied to input return (pin 7)			15	mA
Ripple current ⁴	I _{RIP}	I _{OUT} = 0, inhibit (pin 1) = open I _{OUT} = 1200mA (main) I _{OUT} = ±66.7 mA (dual) BW = DC to 2MHz			50 50	mA mA p-p
Efficiency	E _{FF}	P _{OUT} = Full load	T _C = ±25°C	68		%
Isolation	ISO	Input to output or any pin to case (except pin 6) at 500 V dc T _C = +25°C	T _C = ±25°C	100		MΩ
Load fault power dissipation ³	P _D	Overload, T _C = ±25°C ⁵ Short Circuit, T _C = ±25°C	T _C = ±25°C		8.0 6.0	W
Switching frequency	F _S			500	600	KHz
Inhibit Open Circuit Voltage	V _{OI}			9.0	13	V
Weight					35	g

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 20percent of the total output power should be taken from the (+5.0 volt) main output.
4. Bandwidth guaranteed by design. Tested for 20KHz to 2.0MHz.
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. $T_{CASE} = -55^{\circ}C$ to $85^{\circ}C$ 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 ± 1.0VDC.

Thermal Management

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

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

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 worst case full load efficiency of 75% is assumed, then the case temperature rise can be calculated as follows:

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

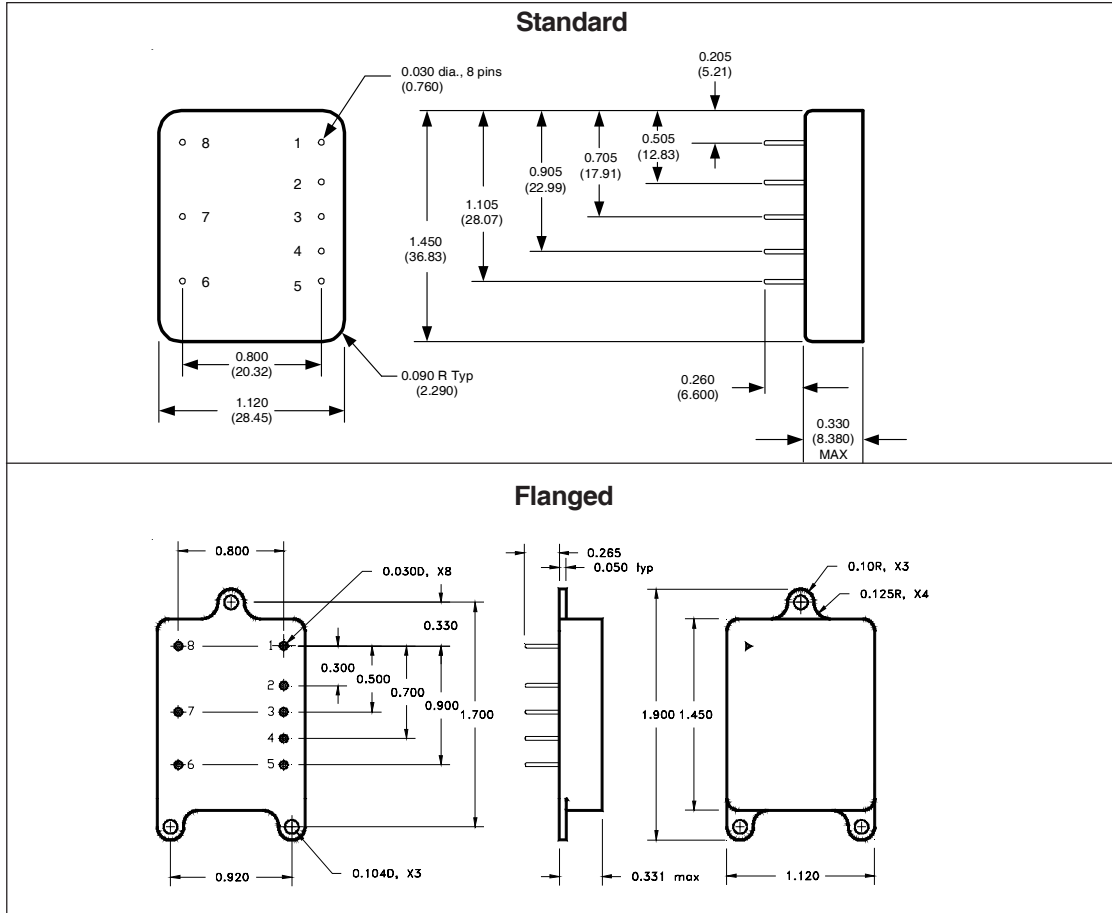
$$\Delta T = 80 (4.9)^{-0.7} (2.66)^{0.85} = 60.4^{\circ}C$$

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

Standard Microcircuit Drawing Equivalence Table

Standard Microcircuit Drawing Number	Vendor Cage Code	IR Standard Part Number
5962-94623	52467	AHF2815T

Mechanical Outlines



Pin Designation

Pin #	Designation
1	Inhibit Input
2	+ Dual Output
3	+5V Output Return
4	- Dual Output
5	+5V Output
6	Case Ground
7	Input Return
8	+Input

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

