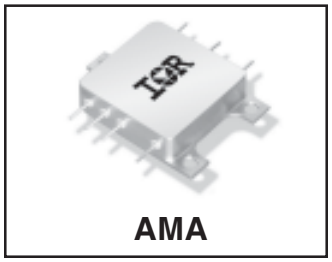
International
IOR Rectifier

PD-94692F

AMA28XXD SERIES
28V Input, Dual Output

HYBRID - HIGH RELIABILITY RADIATION TOLERANT DC-DC CONVERTER



AMA

Description

The AMA28XXD series of DC-DC converter modules has been specifically designed for operation in moderate radiation environments supplementing the higher radiation performance available in the International Rectifier ART2815T converter series. Environments presented to space vehicles operating in low earth orbits, launch boosters, orbiting space stations and similar applications requiring a low power, high performance converter with moderate radiation hardness performance will be optimally served by the AMA28XXD Series.

The physical configuration of the AMA28XXD series permits mounting directly to a heat conduction surface without the necessity of signal leads penetrating the heat sink surface. This package configuration permits greater independence in mounting and more mechanical security than traditional packages. International Rectifier's rugged ceramic seal pins are used exclusively in the package thereby assuring long term hermeticity.

The AMA28XXD has been designed for high density using chip and wire hybrid technology that complies with the class H requirements of MIL-PRF-38534. Manufactured in a facility fully qualified to MIL-PRF-38534, these converters are fabricated utilizing DLA qualified processes. For available screening options, refer to device screening table in the data sheet. Applicable generic lot qualification test data including radiation performance can be made available on request. Variations to the standard screening can be accomodated. Consult IR San Jose for special requirements.

Features

- 5.0 Watts Output Power
- Available in ± 5, ±12 and ±15 Volt Outputs
- 16- 40 VDC Input Range (28 VDC Nominal)
- Total Ionizing Dose > 25 kRads(Si)
- SEE Hardened to LET up to 60 MeV.cm^2/mg
- -55°C to +125°C Operating Range
- Indefinite Short Circuit Protection
- Flexible Mounting
- Fully Isolated - Input to Output and to Case
- Complimentary EMI Filter Available
- Electrical Performance Similar to ASA28XXD Series
- Standard Microcircuit Drawings Available

Specifications

Absolute Maximum Ratings		Recommended Operating Conditions	
Input Voltage range	-0.5V to +50VDC (Continuous), 80V (100ms)	Input Voltage range	+16V to +40VDC
		Output Power	Less than or equal to 5W
Soldering temperature	300°C for 10 seconds	Operating case temperature	-55°C to +125°C
Storage case temperature	-65°C to +135°C		

Static Characteristics

-55°C ≤ T_{CASE} ≤ +125°C, V_{IN} = 28V_{DC} ±5%, C_L= 0, unless otherwise specified.

Parameter	Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
Input Voltage			16	28	40	V
Output Voltage		Vin = 28 Volts, 20% load on both outputs				V
AMA2805D	1		±4.95	±5.00	±5.05	
AMA2812D	1		±11.88	±12.00	±12.12	
AMA2815D	1		±14.85	±15.00	±15.15	
AMA2805D	2, 3		±4.90		±5.10	
AMA2812D	2, 3		±11.76		±12.24	
AMA2815D	2, 3		±14.70		±15.30	
Output Current [1, 2]		Vin = 16, 28, 40 Volts				mA
AMA2805D	1, 2, 3	each output	200		800	
AMA2812D	1, 2, 3	each output	83		333	
AMA2815D	1, 2, 3	each output	67		267	
Output Power [1, 2]	1, 2, 3	Vin = 28 Volts, 100% load			5.0	W
Output Ripple Voltage [1, 3]		Vin = 16, 28, 40 Volts				mV_{PP}
AMA2805D	1, 2, 3	100% load			200	
AMA2812D	1, 2, 3	BW = 20 Hz to 2 MHz			200	
AMA2815D	1, 2, 3				290	
Output Voltage Regulation [3]		V_{in} = 16, 28, 40 Volts				mV
		Iout = 10, 50%, 100% load				
Line AMA2805D	1, 2, 3			±10	±25	
AMA2812D	1, 2, 3			±10	±50	
AMA2815D	1, 2, 3			±10	±50	
Load AMA2805D	1, 2, 3			±10	±50	
AMA2812D	1, 2, 3			±10	±50	
AMA2815D	1, 2, 3			±10	±50	

For Notes to Specifications, refer to page 4

Static Characteristics (Continued) -55°C ≤ T_{CASE} ≤ +125°C, V_{IN}= 28V_{DC} ±5%, C_L = 0, unless otherwise specified.

Parameter	Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
Cross Regulation [5]		Minimum 1.0 watt on both outputs 20%-80% load				
AMA2805D	1, 2, 3				15	%
AMA2812D	1, 2, 3				8.0	
AMA2815D	1, 2, 3				8.0	
Input Current		Vin=28V,				
No Load	1, 2, 3	Iout=0, Inhibit (pin 5)=open		35	60	mA
Inhibit	1, 2, 3	Inhibit (pin 5) shorted to input return (pin 7)			12	
Input Ripple Current [3]		Vin = 16, 28, 40 Volts, 100% load, BW = 20 Hz to 2 MHz				
AMA2805D	1, 2, 3				100	mA_{PP}
AMA2812D	1, 2, 3				100	
AMA2815D	1, 2, 3				100	
Efficiency [3]		100% load				
AMA2805D	1, 3		66			%
AMA2812D	1, 3		71			
AMA2815D	1, 3		71			
AMA2805D	2		60			
AMA2812D	2		68			
AMA2815D	2		68			
Isolation	1	Input to output or any pin to case (except pin 8) at 500Vdc	100			MΩ
Capacitive Load [5, 6]		No effect on dc performance, total for both outputs				
AMA2805D	4				500	µF
AMA2812D	4				200	
AMA2815D	4				200	
Short Circuit Power Dissipation	1, 2, 3				4.0	W
MTBF		MIL-HDBK-217F, SF @ 70ºC	750			Khrs
Weight					32	g

For Notes to Specifications, refer to page 4

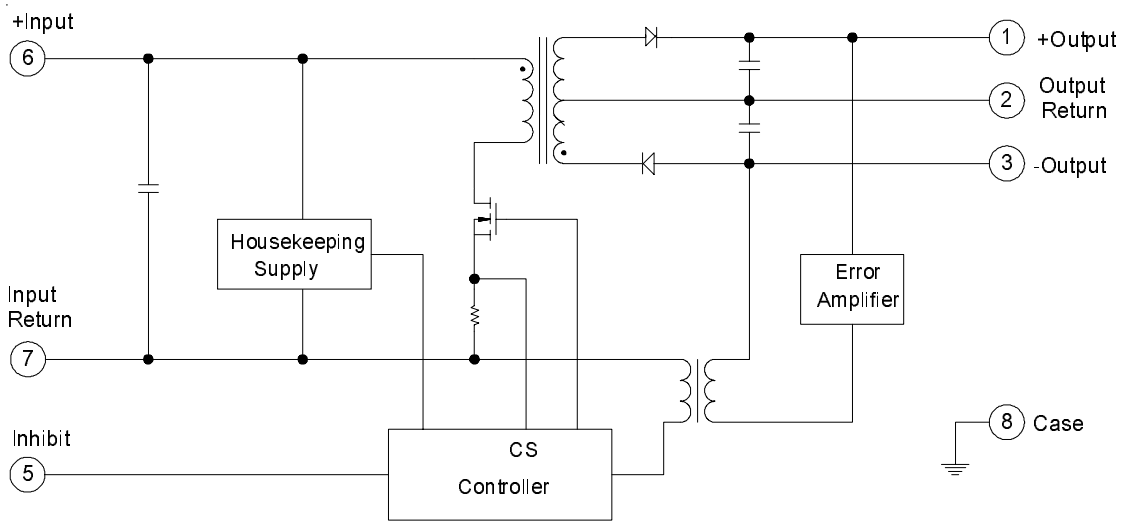
Dynamic Characteristics -55°C ≤ T_{CASE} ≤ +125°C, V_{IN} = 28V_{DC} ±5%, C_L = 0, unless otherwise specified.

Parameter	Group A Subgroups	Test Conditions	Min	Nom	Max	Unit
Short Circuit Recovery [6]	4, 5, 6	0% load to 100% load			25	ms
Switching Frequency [3]	4, 5, 6	100% load	500	550	600	KHz
Output Response To Step Transient Load Changes [3, 7]	4, 5, 6 4, 5, 6	Load step 50%⇔ 100% Load step 0% ⇔ 50%	-400 -800		+400 +800	mV pk
Recovery Time, Step Transient Load Changes [3, 7, 8]	4, 5, 6 4, 5, 6	Load step 50%⇔ 100% Load step 0% ⇔ 50%			100 2000	µs
Output Response Transient Step Line Changes [3, 6, 9] AMA2805D AMA2812D AMA2815D	 4, 5, 6 4, 5, 6 4, 5, 6	Input step 16 ⇔ 40Vdc, 100% load	 -550 -750 -750		 +550 +750 +750	mV pk
Recovery Time Transient Step Line Changes [3, 6, 9]	4, 5, 6	Input step 16 ⇔ 40Vdc, 100% load			1200	µs
Turn On Overshoot [3, 10]	4, 5, 6 4, 5, 6	0% load 100% load			600 400	mV pk
Turn On Delay [3, 10]	4, 5, 6	0% load to 100% load			25	ms

Notes to Specifications

1. Applicable to positive and negative outputs.
2. Maximum combined output is 5.0 watts. 4.0 watts (max.) is available from either output (80%).
3. Load current split equally between +VOUT and –VOUT.
4. 1.0 watt load on output under test, 1.0 watt to 4.0 watt load change on other output.
5. Capacitive value 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.
6. Parameter shall be tested as part of design characterization and after design or process changes. Thereafter, parameters shall be guaranteed to the limit specified.
7. Load step transition time between 2 and 10 microseconds.
8. Recovery time is measured from initiation of the transient to where VOUT has returned to within ±1% of VOUT at 50% load.
9. Input step transient time between 1 and 10 microseconds.
10. 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 while power is applied to the input.

Block Diagram



Application Information

Inhibit Function

Connecting the inhibit input (Pin 5) 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 inhibit input is 10 +1.0 VDC

EMI Filter

An optional EMI filter is available (ASF461 or AFH461) will reduce the input ripple current to levels below the limits imposed by MIL-STD-461 CE03.

Thermal Considerations

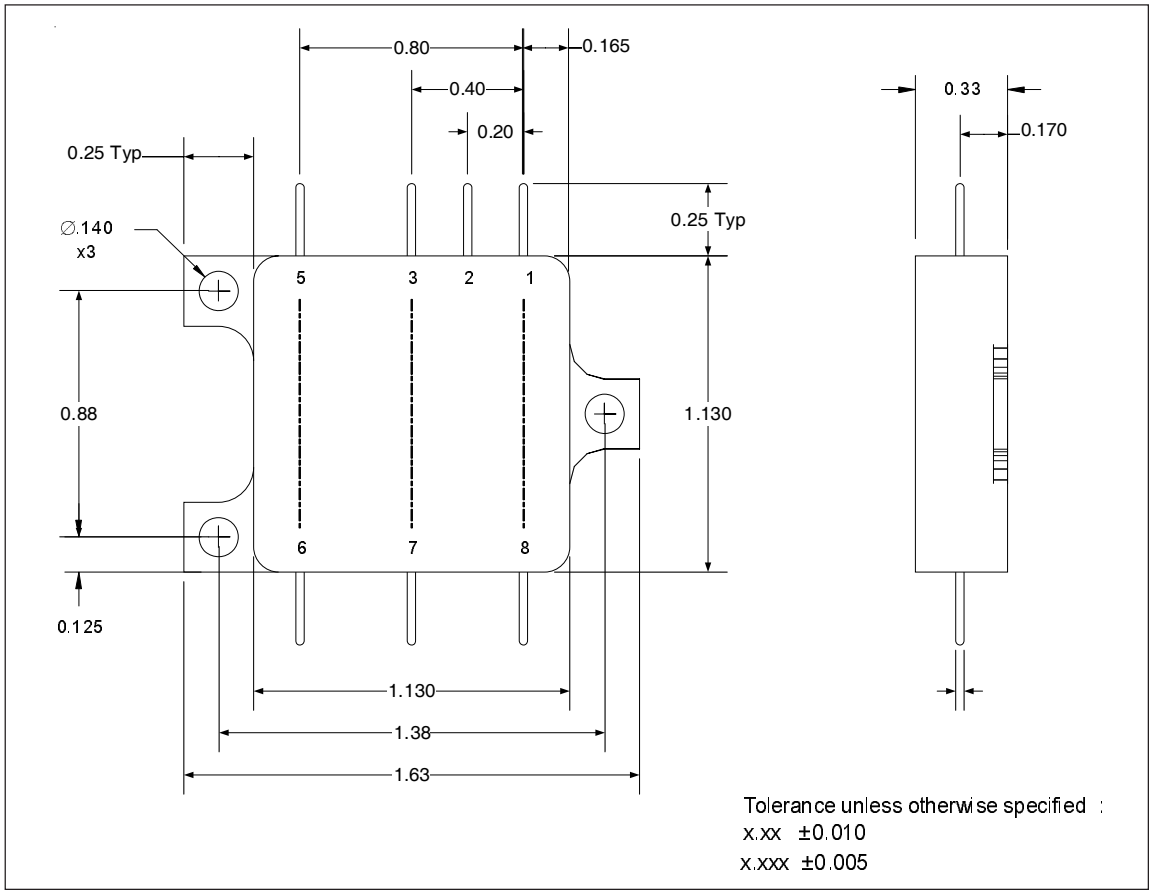
Irrespective of the fact that the AMA28XXD series of converters are relatively low power devices and are designed to provide efficient voltage conversion, there will be some heat generated during normal operation. To avoid a continuous thermal rise that may eventually exceed the maximum case temperature rating and to maintain a safe operating environment for the internal components, these converters should be attached to a heat conducting surface allowing a continuous flow of the heat away from the base plate. This becomes more important when operating in the near vacuum environment of space which provides no alternate heat radiating path.

Radiation Specification

Parameter	Condition	Min	Typ	Max	Unit
Total Ionizing Dose	MIL-STD-883, Method 1019.4 Operating bias applied during exposure	25	—	—	kRads (Si)
Heavy Ion (Single event effects)	BNL Dual Van de Graf Generator	60	—	—	MeV•cm^2 /mg

International Rectifier currently does not have a DLA certified Radiation Hardness Assurance Program.

Mechanical Outline



Pin Designation

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

Device Screening

Requirement	MIL-STD-883 Method	No Suffix ②	CH ②	EM
Temperature Range	—	-55°C to +125°C	-55°C to +125°C	-55°C to +85°C
Element Evaluation	MIL-PRF-38534	Class H	Class H	N/A
Non-Destructive Bond Pull	2023	N/A	N/A	N/A
Internal Visual	2017	Yes	Yes	①
Temperature Cycle	1010	Cond C	Cond C	Cond C
Constant Acceleration	2001, Y1 Axis	3000 Gs	3000 Gs	3000 Gs
PIND	2020	Cond A	Cond A	N/A
Burn-In	1015	320 hrs @ 125°C (2 x 160hrs)	320 hrs @ 125°C (2 x 160hrs)	48 hrs @ 125°C
Final Electrical (Group A)	MIL-PRF-38534 & Specification	-55°C, +25°C, +125°C	-55°C, +25°C, +125°C	-55°C, +25°C, +85°C
PDA	MIL-PRF-38534	2%	2%	N/A
Seal, Fine and Gross	1014	Cond A, C	Cond A, C	Cond A
Radiographic	2012	Yes	Yes	N/A
External Visual	2009	Yes	Yes	①

Notes:
① Best commercial practice.
② Device with '/CH' suffix is a DLA class H compliant without radiation performance. No suffix is a radiation rated device but not available as a DLA qualified SMD per MIL-PRF-38534.
International Rectifier currently does not have a DLA certified Radiation Hardness Assurance Program.

Standard Microcircuit Drawing Equivalence Table

Standard Microcircuit Drawing Number	IR Standard Part Number
5962-04250	AMA2812D
5962-04251	AMA2815D

Part Numbering

AMA 28 05 D /EM

- Model
- Input Voltage: 28 = 28V
- Output Voltage: 05 = ±5V, 12 = ±12V, 15 = ±15V
- Output: S = Single, D = Dual
- Screening Level (Please refer to Screening Table): No Suffix, CH, EM

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Data and specifications subject to change without notice. 12/2014