AcBel Product Specification

Acbel Part No.	DC9010-000G
Model Name	A2DM500W-28V
Description	AC-DC Converter 85~265Vac Input, 28Vdc Output, 500W Output Power,
Revision	Rev 3.5
Date Issued	18/07/2012

High Output Power, High Efficiency AC-DC Converter,

DC9010-000G A2DM500W-28V

Module: 85Vac to 265Vac Input,

28Vdc Output, Maximum Output Power 500W.

World's Most Advanced Ultra High Power Density AC-DC Converters.

DESCRIPTION:

AC to DC Converter A2DM500W-28V modules are high power density and high efficiency AC-DC converters designed for uses in telecom and other centralized modular and distributed power applications. All use metal baseplate, planar transformers, and surface mount construction to produce up to 500W maximum.

FEATURES:

- Miniature Size: 116.8mmx61mmx12.7mm (4.59in. x 2.40in. x 0.50in.)
- High Power Density: Up to 90.78W/in.^3
- High Efficiency: 86.5% at 110Vac, 88.5% at 230Vac
- Low Output Noise
- Industry-Standard Size
- Metal Baseplate
- Thermal Protection
- Over Voltage Protection
- Current Limit/Short Circuit Protection
- Adjustable Output Voltage: 60% to 120% of Vo,set
- Remote Sense
- Power On Signal (ENA) Open Collector (10mA sink current). Low (ON) when output is present.

Safety Approval:

- Meets safety standards UL60950-1 2nd edition and IEC/EN 60950-1
- Approved by UL and TUV
- CE mark meets 2006/95/EC directives

SPECIFICATIONS:

ABSOLUTE MAXIMUM RATINGS

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Input Voltage AC(L) to AC(N)	85		265	Vac	
Input Power With No Damage			312	Vac	
Power Factor Correction	0.95				Vin=85~265Vac@ Full Load
Storage Temperature	-55		+125	°C	
Storage Humidity	10		95	%	
Operating Temperature	-40		+100	°C	Temperature measure shall be taken from the baseplate (Tb). Refer to Fig.2 for location defini-tion
Operating Humidity	20		95	%	

INPUT SPECIFICATIONS:

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Operation Input Voltage (Vi)	85		265	Vac	
Input Frequency	47		63	Hz	
Maximum Input Current (Ii,max)			6.2	A	Vi=100Vac, Io =Io,max
Inrush Current			40	A	Vi=265Vac Turn On, External components are needed for opera-tion. Refer to Fig.3 for appli-cation circuit.

OUTPUT SPECIFICATIONS:

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Output Voltage Accuracy (28V)	27.44	28.0	28.56	V	Io,max
Output Voltage Adjustment Range	16.8	28.0	33.6	V	Vo>=28V, Po=504W. Vo<=28V, Output current should be <=18A.
Line Regulation		56		mV	Vi= Vi,min to Vi,max.
Load Regulation		56		mV	Io= Io,min to Io,max.
Output Ripple and Noise Voltage Peak to Peak			280	mVp-p	Bandwidth 5Hz to 20MHz and with filter 4.7 nF MLCC series 50 ohm Min. Output Capacitor: 470uF *2, Tb>= -20℃ 470uF *4, Tb<= -20℃
Output Current (Io,max)			18	A	At Vo<=28V, if Vo>28V Output Power (Po) should be <=504W
Output Current limit	105		140	%Io,max	Current limit inception point Vo=90% of Vo,set @Tb=25°C; Automatic recovery method.
Output Over Voltage Protection	125		145	%Vo,set	Io=0.5A; Converter out-put clamp method.

OUTPUT SPECIFICATIONS (CONTINUED):

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Efficiency		86.5 88.5		% %	Vi=110Vac, Vi=230Vac, Vo=28V, Io= 100%Io,max @Tb=25°C
Dynamic Response: Peak Deviation Settling Time		3	300	%Vo,set us	25% - 50% -75% load, 0.1A/us; With Cap. 940uF/35V Tb=25 °C, Vi=200Vac

CONTROL SPECIFICATIONS:

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Turn-On Time			3	Sec	Io= Io,max, Vo with 90% Vo,set
Output Voltage Adjustment Output Voltage Trim Range	60		120	%Vo,set	With Cap. 940uF/35V, @Tb=25 °C
Over Temperature Protection Shutdown Recovery	90	110		°C °C	Auto. Recovery

ISOLATION SPECIFICATIONS:

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
Input to Output		3000		Vac	60 seconds
Input to Case		2500		Vac	60 seconds
Output to Case		1500		Vdc	60 seconds
Input to Output Capacitance		2000		pF	
Isolation Resistance	100			Mohm	at Tb=25°C and 70%RH, Output to Baseplate - 500VDC

(Input refer to pin AC(L), AC(N), R, +BC, -BC. Output refer to pin +OUT, -OUT, +S, -S, TRIM, ENA)

STRUCTURAL DYNAMICS:

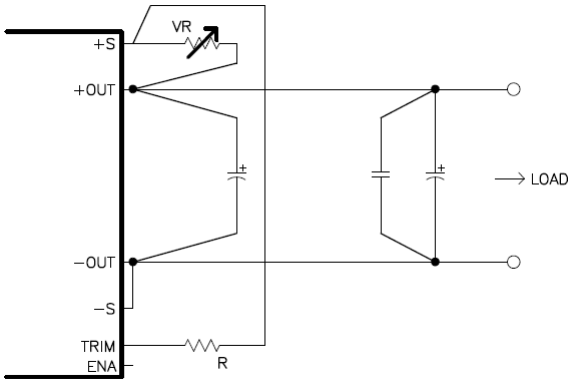
PARAMETER	CONDITIONS
Vibration	Sine Wave, 10-55Hz (Sweep for 1 min.), Amplitude 0.825mm Constant (Maximum 0.5g) X,Y,Z 1 Hour each, At No Operating,
Shock	196.1m/S^2

GENERAL SPECIFICATIONS:

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
MTBF		1.47		Mhrs	Tb=40 °C, Io=80% Io,max, Vi=230V
Weight		200		g	
Size (WxHxD)		116.8x12.7x61		mm	

TRIM CIRCUIT:

Output Voltage Adjusted by using external resistor and/or variable resistor:



Assign R=35.7Kohm,

$$VR = 2.709\left(\frac{Vo_{trim}}{2.469} - 1\right) - 15.692 \quad (UNIT: K\Omega)$$

Fig1 The schematic of output voltage adjusted by using external resistor and/or variable resistor.

BASEPLATE MEASURE POINT:

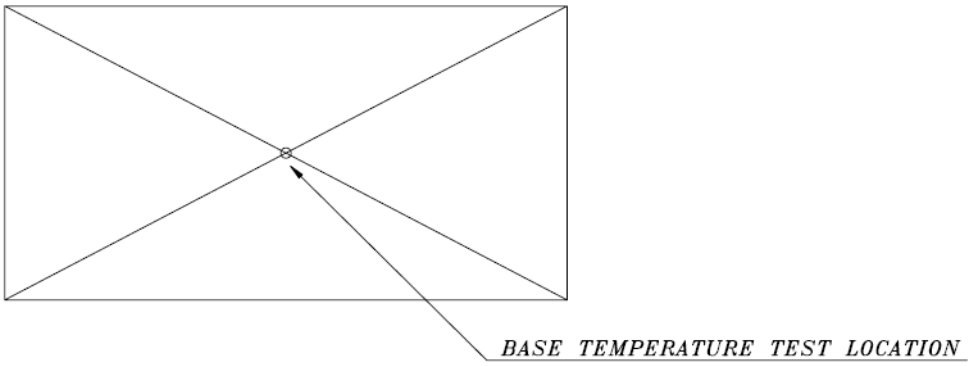


Fig2 Baseplate Temperature Measure Point.

APPLICATION CIRCUIT AND COMPONENT SELECTION:

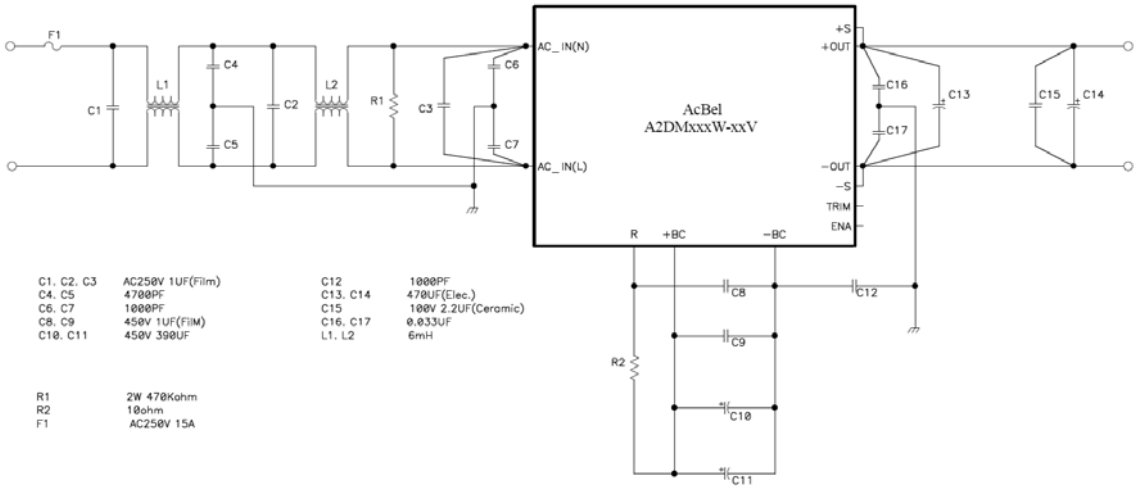


Fig. 3 Application Circuit.

F1: Use external fuse to meet safety standard and improve safety. Current rating of fuse must higher than application with margin. Also check the I^2t rating during inrush, transient and surge.

L1 L2: CM choke. Part of EMI filter

C1~C3: Part of EMI filter. Choose safety approved X-cap.

C4~C7: Part of EMI filter. Choose safety approved Y-cap. Check leakage current requirement for application.

R1: Bleeding resistor for safety requirement. Voltage rating and power rating should higher than application.

C8 C9: Filter cap. Check current rating and the rating should higher than application.

C10 C11: Bulk cap. The ripple current rating should higher than application. The figure below shows minimum required current ripple rating for bulk cap vs. output load. Make sure the selected bulk cap ripple current rating higher than the requirement. Suggest to choose at least 390uF*2.

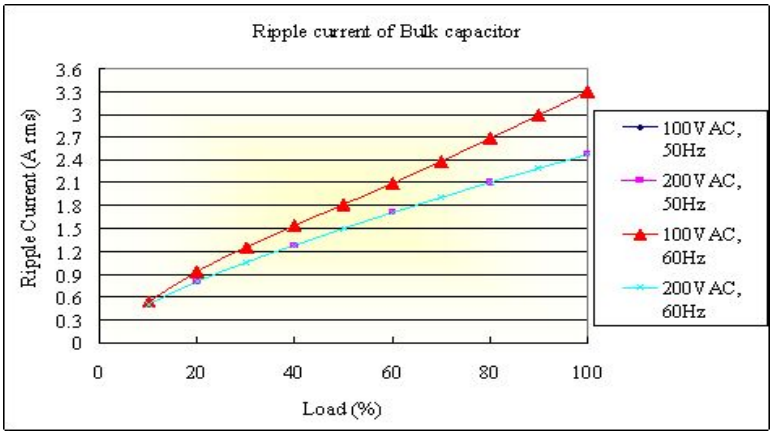


Fig. 4 Bulk cap ripple current requirement vs. Output load

R2: Inrush current limit. Resistance can be calculated by formula below. Suggest to choose resistance >10ohm.

$$R = \frac{Vin_{rms} * \sqrt{2}}{Ir, pk}$$.

Vin$_{rms}$: Input voltage

Ir,pk: Inrush current peak value.

Sufficient inrush energy withstand capacity is required. Required energy capacity can be calculated below and suggest having some design margin.

$$\frac{1}{2} C_{bulk} * (\sqrt{2} Vin_{rms})^2$$

Cbulk: Bulk capacitance (C10&C11)

Vin$_{rms}$: Input voltage.

Inrush current limit resistor and bulk capacitor time constant must smaller than 20mS. See formula below:

$$R < \frac{300mS}{20 * C_{bulk}}$$

Cbulk: Bulk capacitance (C10&C11)

C12: Part of EMI filter. Choose safety approved Y-cap.

C13 C14: E-cap to reduce output ripple and ensure stability. Choose low ESR part and check the ripple current rating higher than application. Suggest at least 470uF*2 if Tb>-20℃ and 470uF*4 if -40℃<Tb<-20℃.

C15: Connect ceramic capacitor near output terminal to reduce output noise.

C16 C17: Ceramic or film capacitor for EMI filtering. High voltage rating is required for isolation requirement.

EFFICIENCY CURVE:

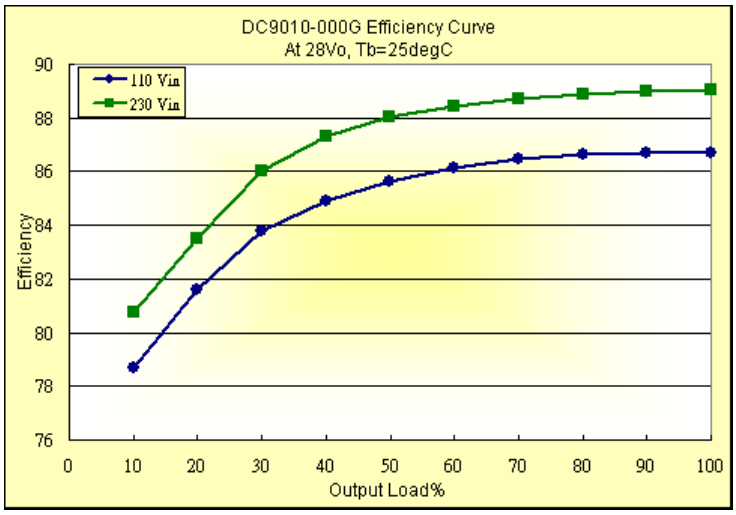


Fig. 5 Efficiency curve.

OUTLINE DRAWING:

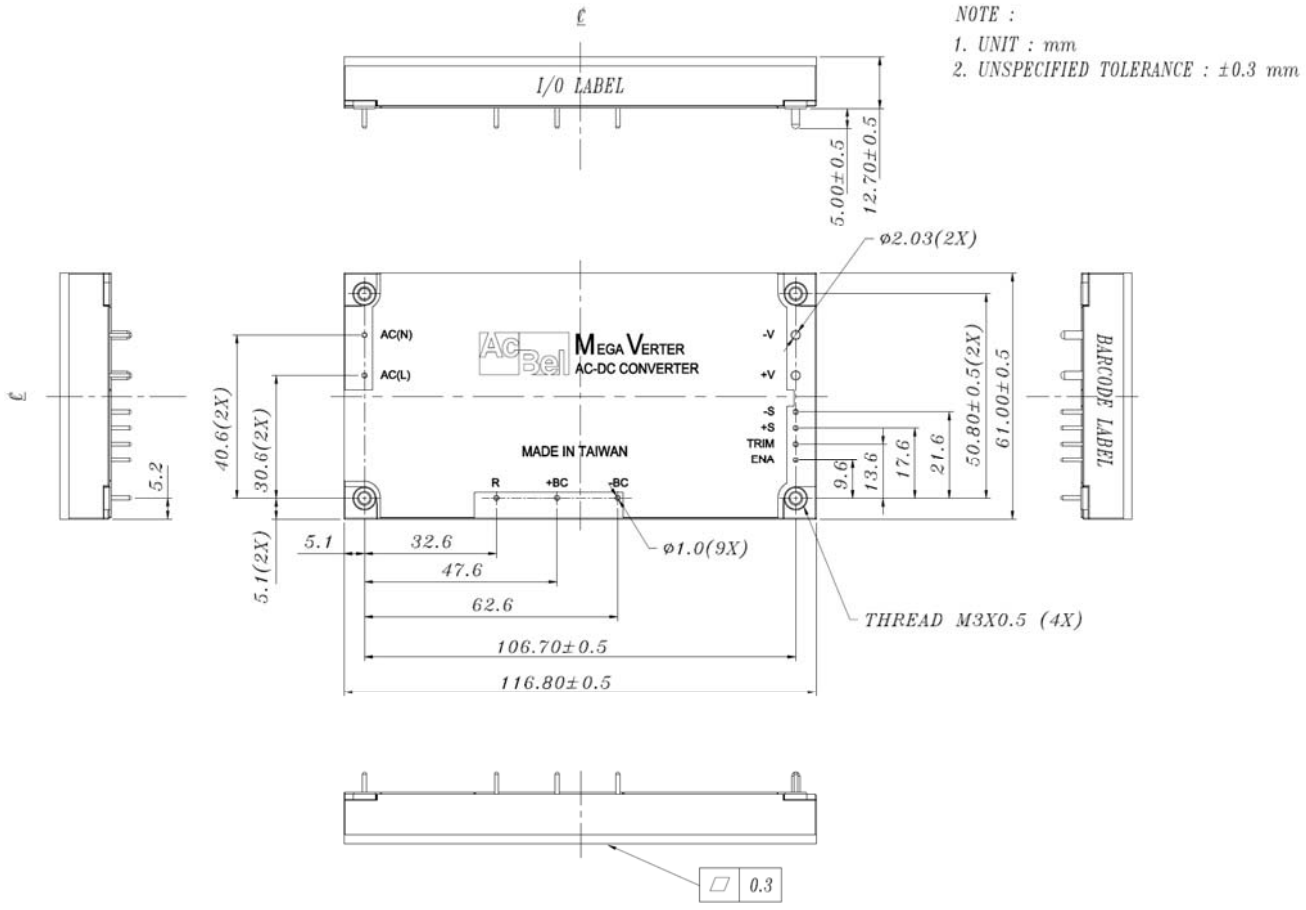


Fig. 6 Outline drawing.