ACBEL POLYTECH INC.

# Engineering Specification

Model No : DC9001-000G Customer: Andrew

Part No: SPEC-DC9001-000G

Revision: 4

Engineer: Ian Yeh

表格編號：DF-405-39_A

# AcBel Product Specification

| | |
|---|---|
| Acbel Part No. | DC9001-000G |
| Model Name | SV48-28-350-B |
| Description | DC-DC Converter<br>48Vdc Input,<br>28Vdc Output,<br>350W Output Power,<br>Negative ON/OFF control |
| Revision | Rev.4 |
| Date Issued | 01/26/2010 |

Rev.4 Jan/26/2010

# High Output Power, High Efficiency Half Brick, SV48-28-350-B

## Module: 36Vdc to 75Vdc Input, 28Vdc Output, Output Power Up to 350W.

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


## DESCRIPTION:

The SUPERVERTER™ module is a high density DC-DC converter designed for use in distributed power architectures, workstation, EDP equipment, and telecommunication applications. The surface-mount construction uses a metal baseplate and planar transformer to produce up to 350W in a half brick package. The SUPERVERTER™ module is a suitable replacement for all industry.

## OPTIONS

- Remote On/Off Logic Configuration
- Heat Sink Available for Extended Operation

## FEATURES:

- Industry Standard Half Brick: 61.0mm x 57.9mm x 12.7mm (2.40in. x 2.28in. x 0.50in.) (Typical)
- High Power Density: Up to 128W/in.^3
- High Efficiency: 93.6% Typical
- Low Output Noise
- Metal Baseplate
- Thermal Protection
- Input Under Voltage Protection
- Output Over Voltage Protection
- Current Limit Protection: Step down mode
- Short Circuit Protection
- Adjustable Output Voltage: 16.8V to 33.6V
- Remote Sense
- Remote ON/OFF Control : Negative Logic
- RoHS Compliant

# SPECIFICATIONS:

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Input Voltage (+In to –In) | -0.3 | | 100 | V | <100ms |
| | -0.3 | | 75 | V | Continuous |
| Logic ON/OFF Voltage ( ON/OFF to –In ) | -0.3 | | 5 | V | |
| Storage Temperature | -40 | | 125 | ℃ | |
| Storage Humidity | 10 | | 95 | % | |
| Operating Temperature | -40 | | 100 | ℃ | Temperature measure shall be taken from the baseplate (Tb). |
| Operating Humidity | 30 | | 95 | % | |

## INPUT SPECIFICATIONS:

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Operation Input Voltage (Vi) | 36 | 48 | 75 | V | |
| Maximum Input Current (Ii,max) | | | 10.5 | A | Vi=36V, Io =Io,max, Tb=25°C |
| Inrush Transient | | | 2 | A^2s | |
| Input Reflected-Ripple Current: Peak-Peak | | 40 | 60 | mAp-p | 5HZ to 20MHZ, Vin=48V, Io= Io,max, 12uH source Imped-ance, Cin=690uF, Tb=25 °C |
| Input Ripple Rejection | | 60 | | dB | 120Hz |
| Input Under Voltage Protection:<br>Turn-on Threshold<br>Turn-off Threshold<br>Hysteresis | <br>30<br>25<br>2 | <br>31<br>26<br>5 | <br>32<br>27 | V<br>V<br>V<br>V | Vo=28V, Io =Io,max. |

## OUTPUT SPECIFICATIONS:

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Output Set Point (Vo,set) | 27.75 | 28 | 28.25 | V | Initial Adjusted Tb=25℃,Vi=48V, Io=Io,max |
| Output Voltage Tolerance Band | -3 | | +3 | % | All Operating Condition |
| Line Regulation | | | 0.2 | % | Vi=36V to 75V |
| Load Regulation | | | 0.2 | % | Io= Io,min to Io,max. |
| Temperature Drift | | | 0.02 | %/ ℃ | Tb= -40 to 100℃ |
| Output Ripple and Noise Voltage Peak to Peak | | | 200 | mVp-p | Bandwidth 5Hz to 20MHz and with 0.1uF MLCC. Output Ca-pacitor: 880uF, Tb=25℃ |
| Output Current (Io,max) | 0 | | 12.5 | A | At Vo<=28V, if Vo>28V, Output Power (Po) should be less than its rating power. |
| Output Current Limit | 105 | | 165 | %Io,max | Current limit inception point Vo=90% of Vo,set, |
| Output Short Circuit Current | | | 12.5 | Arms | Hiccup Mode |
| Output Over Voltage Protection | 112 | | 150 | %Vo,set | Io=0.5A |
| External Capacitance | | 880 | 5000 | uF | |
| Output Power | | | 350 | W | |

## OUTPUT SPECIFICATIONS (CONTINUED):

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Efficiency | | 93.6 | | % | Vi=48V, Vo=28V,<br>Io=70% of Io,max<br>Tb=25℃. |
| Dynamic Response:<br><br>Peak Deviation<br>Settling Time | | 3 | 500 | %Vo,set<br>us | Vi=48V, Tb=25°C<br>25% - 50% -75% load,<br>Δ Io/Δ t=0.1A/us; with<br>Output Capacitor 880uF,<br>Duration outside of<br>Vo,set +/- 1.0% error<br>band |

## CONTROL SPECIFICATIONS:

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Logic ON/OFF Remote:<br>Positive:<br>Off-State Voltage<br>On-State Voltage<br><br>Negative:<br>Off-State Voltage<br>On-State Voltage | <br><br><br>2.0<br><br><br>2.0 | | <br><br>0.8<br><br><br><br>0.8 | <br><br>V<br>V<br><br><br>V<br>V | |
| Turn-On Time | | | 30 | ms | Vo=90% of Vo,set |
| Output Voltage Trim Range | 16.8 | | 33.6 | V | Refer to Trim Circuit. |
| Over Temperature Protection<br>Shutdown<br>Recovery | 100 | 105<br>90 | 110 | °C<br>°C | Refer to Fig.3 for loca-<br>tion definition<br>Auto. Recovery |

## ISOLATION SPECIFICATIONS:

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| Input to Output | | 1500 | | Vdc | 60 seconds |
| Input to Case | | 1500 | | Vdc | 60 seconds |
| Output to Case | | 500 | | Vdc | 60 seconds |
| Input to Output Capacitance | | 2000 | | pF | |
| Isolation Resistance | 100 | | | Mohm | At Tb=25℃, 70%RH,<br>Output to Baseplate<br>500VDC |

## STRUCTURAL DYNAMICS:

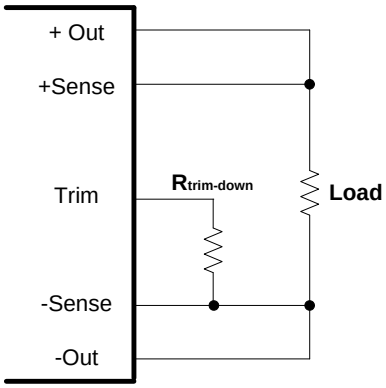
| PARAMETER | CONDITIONS |
|---|---|
| Vibration | Sine Wave, 10-55Hz (Sweep for 1 min.), Amplitude 0.825mm Constant (Maximum 5g) X,Y,Z 1 Hour each, At No Operating, |
| Shock | 20g, 166 in/sec, Square Wave |

## GENERAL SPECIFICATIONS:

| PARAMETER | MIN | TYP | MAX | UNITS | CONDITIONS |
|---|---|---|---|---|---|
| MTBF | | 1.3 | | Mhrs | Tb=40℃,Vin=48V,<br>Io=80% of Io,max |
| Weight | | 108 | | g | |
| Size (WxHxD) | | 2.40x2.28x0.5 | | in.^3 | |

## TRIM CIRCUIT:

A. Trim down: The resistor for output voltage trim-down function could be calculated with the following formula:

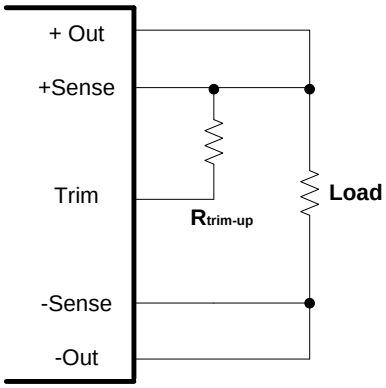



$$R_{trim-down} = \left(\frac{100\%}{\Delta\%} - 2\right)(k\Omega)$$

$\Delta\%$: Output voltage change rate against nominal output voltage.

Fig. 1 The schematic for output voltage trim down

B. Trim up: The resistor for output voltage trim-up function could be calculated with the following formula




$$R_{trim-up} = \left[\frac{Vo(100\% + \Delta\%)}{1.225\Delta\%} - \frac{(100\% + 2\Delta\%)}{\Delta\%}\right](k\Omega)$$

Vo: The nominal output voltage.

$\Delta\%$: Output voltage change rate against nominal output voltage.

Fig. 2 The schematic for output voltage trim up

## BASEPLATE MEASURE POINT:

**UNIT: mm**

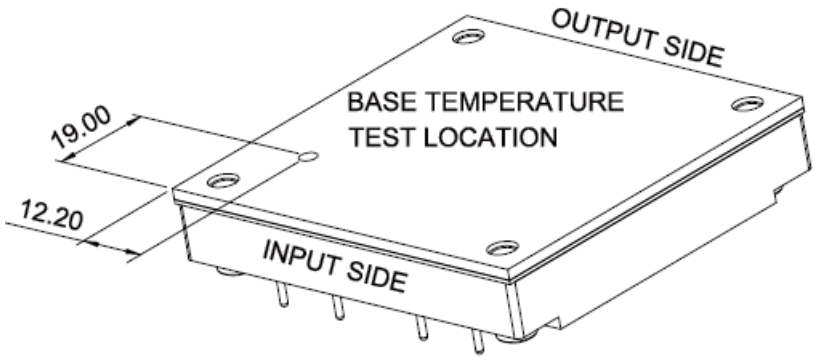



Fig. 3 Baseplate Temperature Measure Point

## EFFICIENCY CURVE :

**Vout = 28 V**

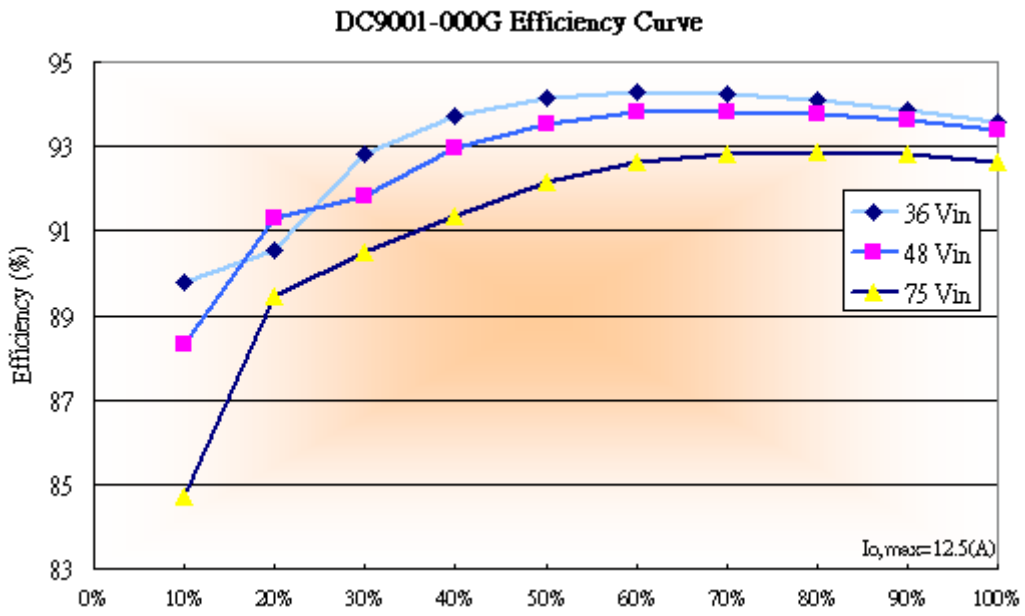



Fig. 4 Typical efficiency vs. output load at room temperature

## DERATING CURVE :

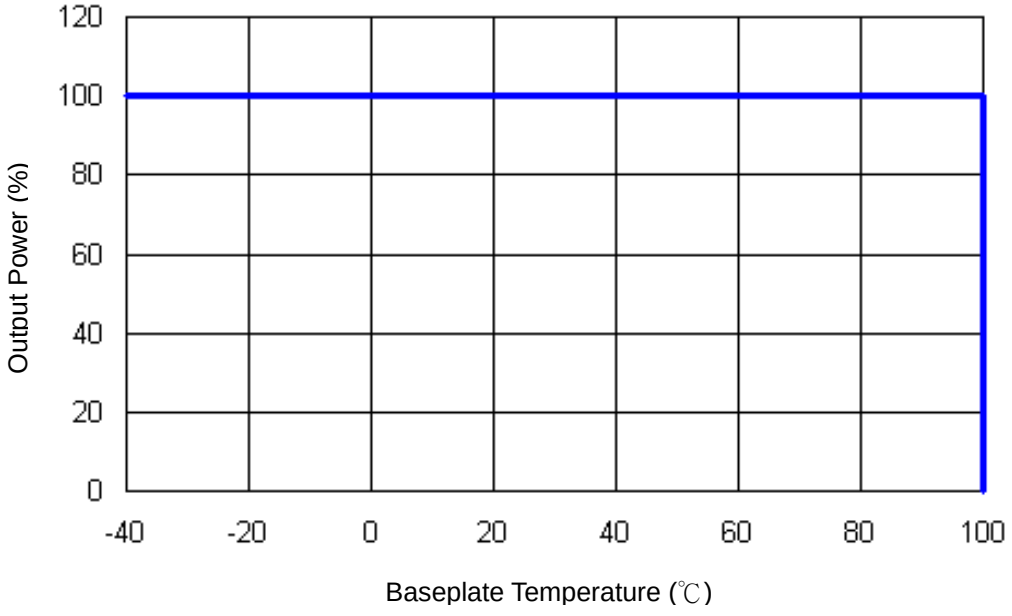



Fig. 5 Maximum output load vs. baseplate temperature

## OUTLINE DRAWING :

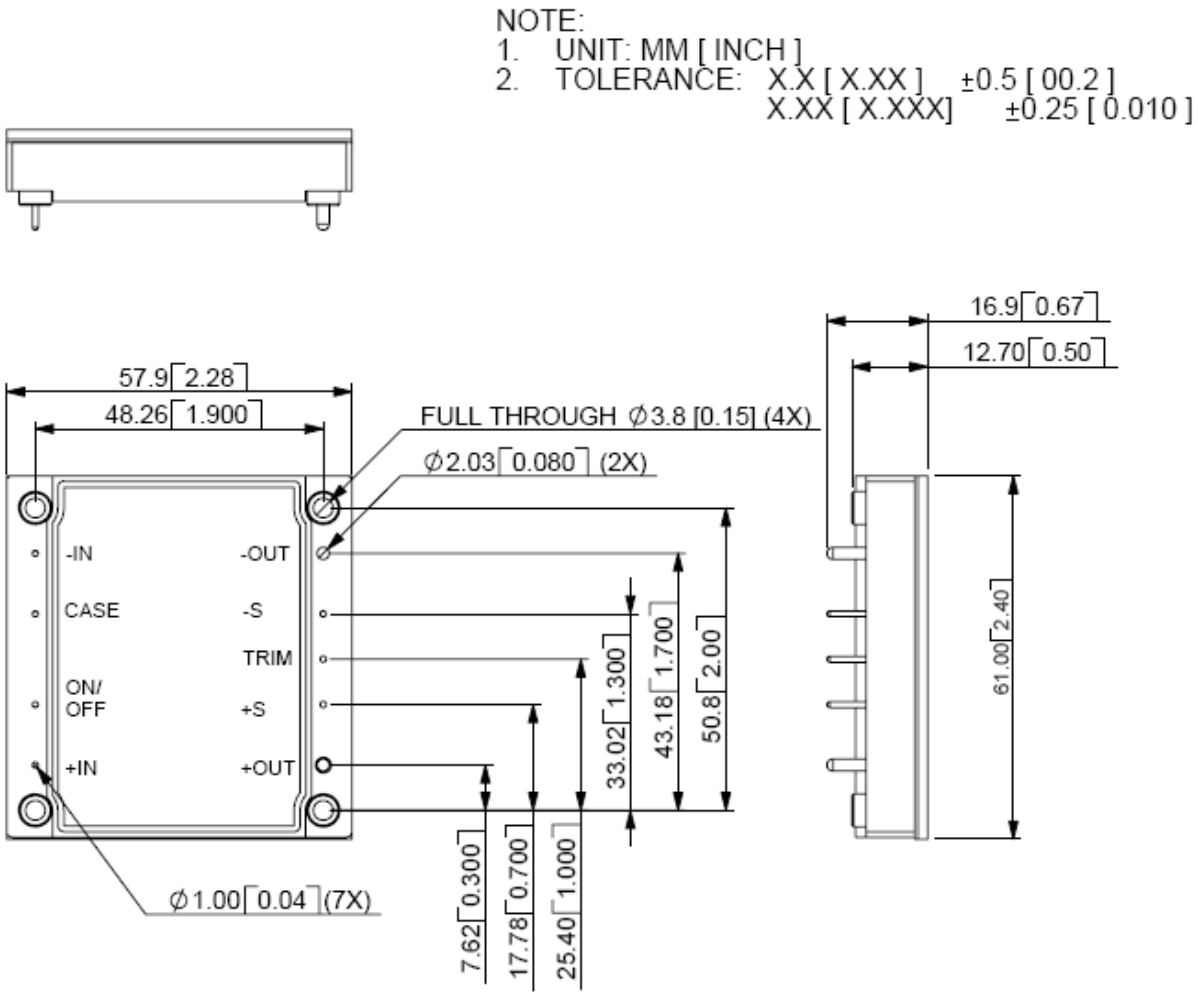



Fig. 6 Outline Drawing