Introduction

High current density dc/dc converters are becoming popular in the telecommunication and industrial power systems because of low cost, consistent performance and high reliability. These converters provide a modularity to the design of power supply systems. By using dc/dc converters, complex multiple outputs and custom power supplies can be designed and manufactured in a short time to meet demanding market datelines.

However, high-density brick-type dc/dc converters are considered as building blocks only. These converters should be viewed as components, not as complete power supply units. Additional circuitry such as input filters, output filters, EMI /EMC suppressions, and the use of common mode and differential mode chokes are required to build a complete power system.

Thermal management is also an important part of the system design. Proper cooling and transfer of heat by the module is important for maintaining lower operating temperature. The amount of air-flow and the thermal conductivity of the heat sink will determine the thermal performance of these dc/dc converters. The maximum base-plate temperature rating of the converter can be used to estimate the amount of cooling required. The maximum rating of the output power specified by the manufacturer assumes that proper thermal management is enforced to ensure that the maximum base-plate temperature is not exceeded. Therefore,it is important to maintain the base-plate operating temperature as low as possible in a typical application to have some safety margins.

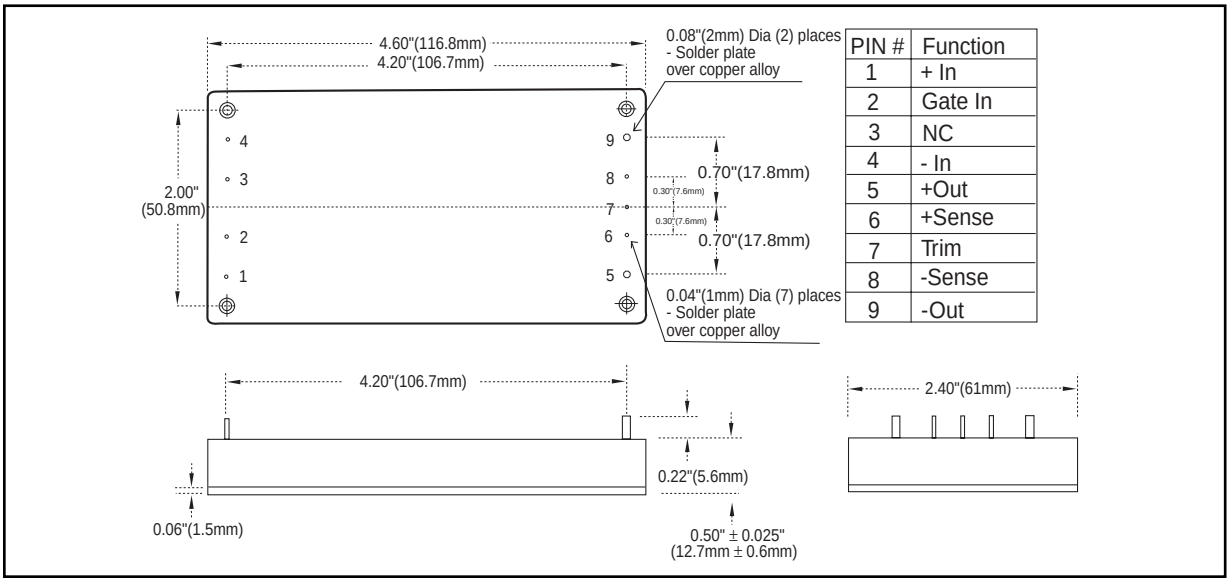
BTCPower's dc/dc converters are available with many built-in features which the end users can configure to achieve the desired functions such as remote digital on/off, remote sensing, and output trimming. The IMT series converters do not have built-in current sharing,however, the current sharing is implemented by the use of external circuits.

The IMT series is also built with protection circuits to ensure that these converters do not blowout when they are misused. These protection circuits consist of over-temperature latched shut down, output over voltage latched shut down, and auto recovery type short circuit and over-current protection. To reset the converter during a latched shutdown, the user needs to re-cycle the input power.

This application note will explain how to use all the features of the IMT series of dc/dc converters, the proper layout and configuration, filtering requirements, and correct methods of measuring the output ripple and noise levels.

Technology

The basic technology used in the IMT series dc/dc converters is a unique flat transformer with a simple push-pull topology. The flat transformer is an ideal technology for products where high output currents is required. Conventional transformer uses a single core with many turns, whereas a flat transformer uses multiple cores with one or minimum number of turns.



PIN #	Function
1	+ In
2	Gate In
3	NC
4	- In
5	+Out
6	+Sense
7	Trim
8	-Sense
9	-Out

Figure 1. IMT-200 mechanical drawing

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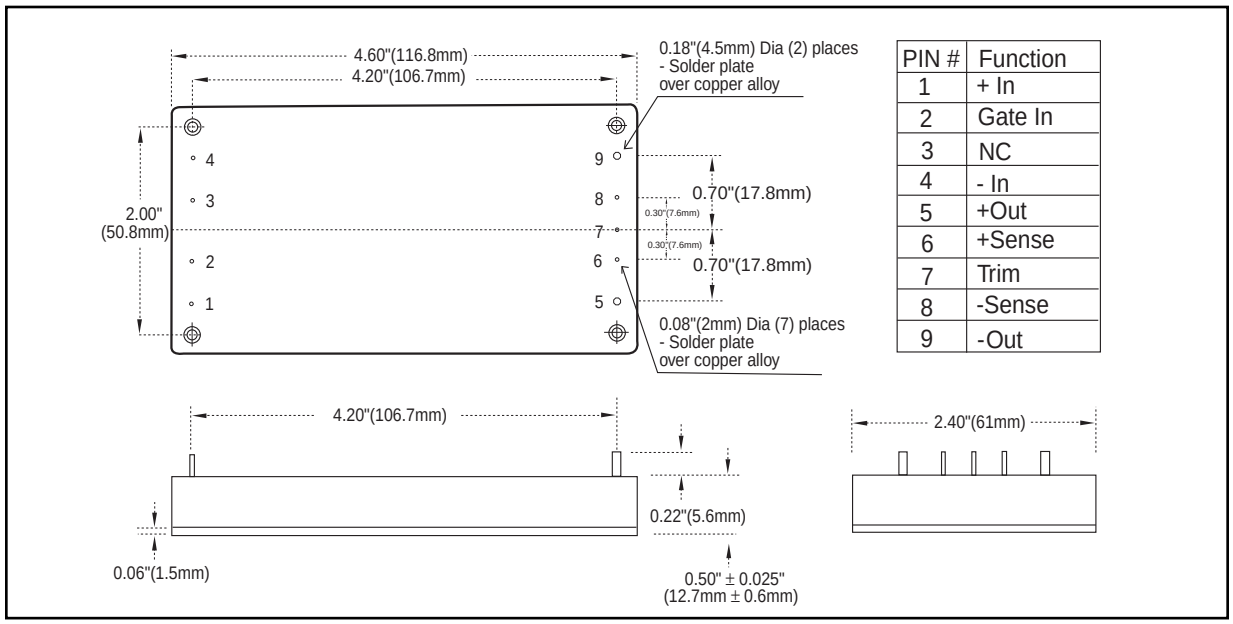

PIN #	Function
1	+ In
2	Gate In
3	NC
4	- In
5	+Out
6	+Sense
7	Trim
8	-Sense
9	-Out

Figure 2. IMT-400 mechanical drawing

The use of multiple cores forces equal current sharing through the multiple rectifiers, providing current and heat distributions.

The basic material used for the manufacture of the base-plate consists of Insulated Metal Substrate (IMS). The use of IMS as base-plate material, coupled with the use of parallel equal current sharing rectifiers and multiple transformer cores allows extremely good thermal management of the IMT converters. Under proper thermal management, the maximum internal temperature rise is below 10 °C.

IMS is also used by other dc/dc converter vendors such as Lucent, Astec, etc, however, the use of IMS can cause common mode noise to be coupled to the outputs. Therefore, proper use of by-pass capacitors is necessary for a clean output.

Figure 3. Photograph of IMT-200

Figure 4. Photograph of IMT-400

IMT dc/dc Converters

The IMT series of dc/dc converters consists of the full brick 400 watts (IMT400), half brick 200 watts (IMT200), and quarter brick 100 watts (IMT100). The mechanical drawings of IMT200 and IMT400 are shown in Figures 1 and 2. The pin assignments and functions are shown in the mechanical drawings. Photographs of IMT 200 and IMT 400 are shown in Figures 3 and 4.

General Considerations

Handling

IMT series dc/dc converters are mounted with a UL approved soft epoxy to reduce stress on the internal components that provide a good mechanical integrity and thermal properties. The outer shell is made of fiber glass reinforced ABS material. The outer shell can withstand high temperature variations. The base plate is completely isolated electrically and is made up of aluminum with dielectric layer. This type of base plate is typically called insulated metal substrate (IMS). The IMT converter is therefore very rugged and sturdy.

Nevertheless, the IMT converter should not be mis-handled physically because the aluminum base plate and the input and output pins may be damaged.

Mounting

The typical way of installing the IMT converter is to solder mount it on a PC board (PCB). The mounting holes on the PCB for the converter must be located and aligned with the converter pins to fit properly. After carefully mounting the converter onto the PCB, the pins should be soldered on. When removing the converter from the PCB, care must be taken to ensure that the pins come off easily.

Heat sinks should be assembled onto the dc/dc converter before mounting the converter onto the PCB. If a large heat sink is used to connect to more than one dc/dc converters, make sure that the pins on the converters are aligned accurately.

PCB Layout

A solid copper land pattern should be laid out on both sides of the PCB. See Figure 5. This land pattern will help minimize noise from the converter coupled to other circuits on the PCB. Typically, input and output filter capacitors and chokes are also laid out together at the same time.

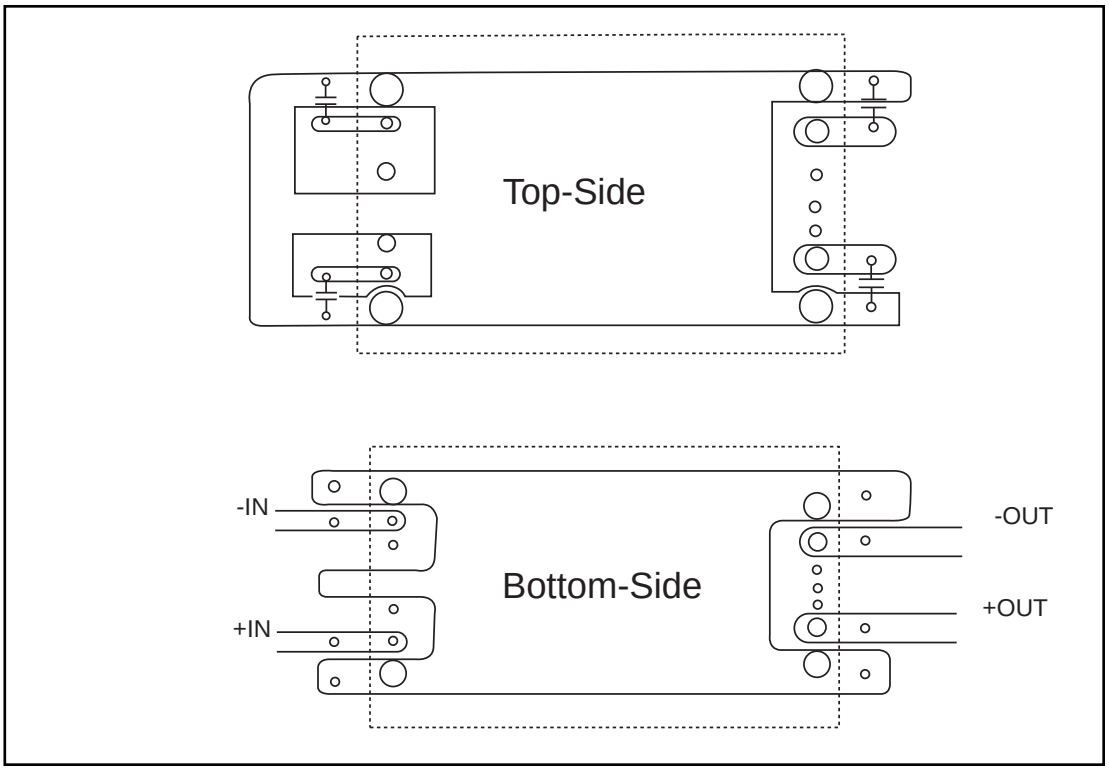

Figure 5. PCB Layout

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