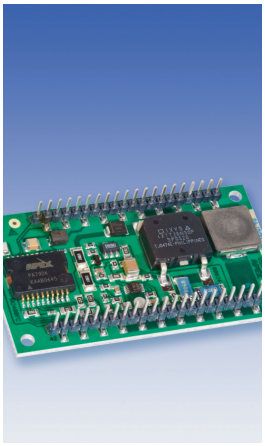
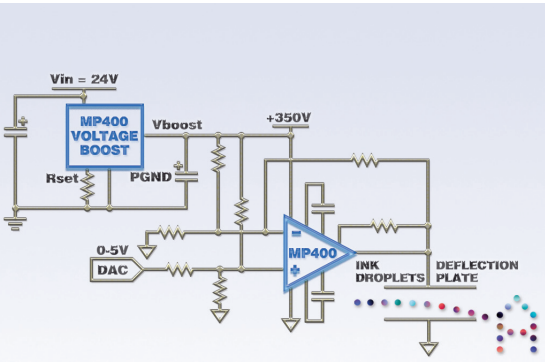
MP400

Open Frame Product Technology
65.1mm X 42.5mm
actual footprint





Drive Both Piezo Actuation and Deflection Off a Single Low Supply

MP400 Applications

- Piezoelectric positioning and actuation
- Electrostatic deflection
- Deformable mirror actuators
- Chemical, biological stimulators

MP400 Features

- Low, single supply voltage
  - » 10V to 50V
- Wide output voltage supply
  - » 50V to 350V
- High slew rate
  - » 350V/µs
- Power bandwidth
  - » 200kHz
- Output current
  - » 150mA continuous
- Power dissipation rating
  - » TBD
- Stability
  - » User defined current limit on the output stage
  - » Externally compensated

Evaluation Kit – EK65

The EK65 is available to help with rapid prototyping of the MP400. The kit includes an eval board, heatsink, connectors and all necessary hardware to allow evaluation of the MP400. Small quantities of the MP400 are sold separately.

High Voltage, High Speed Power Operational Amplifier Features *Onboard* Switch Mode Power Supply

MP400

The MP400 is a "board-level module" power op amp that integrates the performance of a high speed op amp with a switch mode power supply. The result is a high voltage driver that delivers adjustable output voltages from 50V-350V off of low, standard buss supplies of 12V, 24V and 48V. With the ability to internally generate high levels of output voltage, the MP400 allows designers to bypass having to design or purchase an external high voltage power supply. Both the high voltage output of the MP400, and the application's drive circuitry – typically a piezo element – can operate of the same standard system supply. The result is a reduction in board space, as well as potential savings on operating costs.

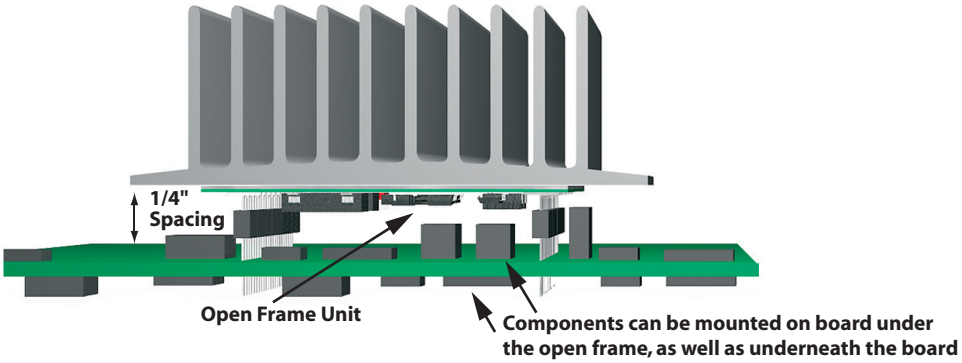
The MP400's ability to adjust the voltage output level is made possible through use of a single, external 1/4 watt resistor from the set pin (R_{SET}) to ground. The only input required by the boost supply are the V_{IN} source, the input/output filter capacitor and the V_{BOOST} set resistor (RSET). The voltage boost adjustment is independent of V_{IN}.

The MP400 offers additional flexibility with external phase compensation that allows the designer to select gain, slew rate and bandwidth to suit their specific application. Slew rate performance is extremely high at 350V/µs. In pulse applications, the MP400 can swing rapidly from rail to rail without generating an over abundance of standby current, or quiescent current.

The product design topology of the MP400 utilizes Apex's own integrated thermally conductive module design, or "open frame" packaging. With the open frame approach, thermal management actually begins with the individually packaged components which feature their own heat management properties. The open frame product design delivers the power and thermal performance of a hybrid, but at a cost that is significantly less.

Apex Precision Power has a long tenure of customer design wins in the piezo drive market. Most piezo drives require high voltage with the piezo driver typically the only high voltage component in the system. The industrial and medical sectors are becoming rapid adaptors of piezoelectronic positioning and actuation technology for its ability to provide very fine movement in applications such as ultrasound, mass spectrometers and deformable mirrors.

MP400



Save Space: Open Frame Heat Sinking and Board Mounting
A heatsink can be flush mounted to the open frame module above the board to free up board space. Components can even be mounted on the board under the open frame, as well as underneath the board.

Apex Precision Power has been an industry leader in the design and manufacturing of high power, precision analog products for more than two decades. Many Apex products have traditionally been designed as hybrids in order to achieve voltage levels up to 1200V and 50A of output current. Hybrids are known to be very reliable, but also costly. To address this cost issue, Apex re-engineered how a power component is designed and manufactured. The Apex "open frame" product technology utilizes low cost surface mount technology (SMT) to reduce per unit costs by up to 75%.

Traditional hybrid packages achieve exceptional thermal management by soldering unpackaged power transistor die to a BeO (beryllia oxide) substrate which in turn is soldered to a metal base package. In researching lower cost alternatives, Apex design engineers discovered how to create a package with a similarly low thermal resistance at a significant cost savings by soldering surface mount packaged power transistors to an insulated metal substrate (IMS). An IMS substrate consists of an aluminum metal substrate, a thin insulating layer and a copper conductive layer. Overall the substrate is similar to a standard printed circuit board but with far lower thermal resistance.

The use of SMT construction techniques generate significant cost efficiencies because they eliminate a number of costly, time consuming manufacturing steps typically found in the process intensive, labor intensive assembly of hybrid components. Here is a comparison:

Hybrid Construction	Open Frame Construction
Substrate printing • Thick film conductive layers • Resistor layers	Solder screening of IMS substrate
Solder reflow substrate to package header	Component placement
Die epoxy attach Die epoxy cure	Reflow
Wire bonding	
First yield testing, possible rework	
Package welding	
Second yield testing	Test

The most noticeable physical element of the "open frame" design is the absence of an enclosure. In the traditional sense, that is. Granted, these devices are not sealed inside a package so they do not meet traditional hermetic requirements. But look closely at the individual components on the PCB substrate. Each and every component is enclosed in its own individual package. This attribute provides a level of protection suited to all but the most stringent operating environments. Customers can also create their own hermetic enclosure for these devices. Simply place the component on a board with other circuit-type components and install them in a protective cabinet that is hermetically sealed.

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