

# FasTrak™

## Vicor 2nd Generation DC-DC Converters



**This document describes recent design and manufacturing improvements to Vicor's 2nd Generation DC-DC converters and associated quality and reliability testing.**

Vicor Corporation designs, manufactures, and markets modular power components and complete power systems used in the communications, data processing, industrial controls, test equipment, medical, and defense electronic markets.

Engineers use the advantages of Vicor components to create compact, highly functional, cost-effective products with streamlined development cycles that minimize time to market.



# FasTrak

## Qualification Testing

- ➔ **Acceleration** *To determine the ability of parts to withstand constant acceleration. As an indicator of the mechanical strength limits.*  
**Standard:** MIL-STD-810F Method 513.5, Procedure II • **Environment:** Acceleration step from 2 to 7 g, 6 direction.
- ➔ **Altitude** *To observe low air pressure effects on either operational or non-operational design parameters.*  
**Standard:** MIL-STD-810F, Method 500.2, Procedure I & II • **Environment:** 40,000 ft. and 70,000 ft. operational
- ➔ **Explosive Atmosphere** *To determine the ability of equipment to operate in the presence of an explosive atmosphere.*  
**Standard:** MIL-STD-810F, Method 511.4, Procedure I, operational • **Environment:** Fuel-Air Explosive Atmospheres
- ➔ **HALT** *Demonstrates product design margin and robustness.*  
**Standard:** Vicor internal reference EIAJESD22-A110-B  
**Environment:** Operational limits verified/Destruct limits determined
- ➔ **High Temperature Operational Life** *An operational test used to detect thermally activated failure mechanisms.*  
**Standard:** Vicor internal reference EIAJESD22-A110-B  
**Environment:** Nominal line, 75% Load, temperature within 5°C max operational
- ➔ **Humidity** *A humidity test simulates the moisture-laden air found in tropical regions.*  
**Standard:** MIL-STD-810F, Method 507.4 Procedure I, Cycle I • **Environment:** 240 hours, 95% RH
- ➔ **Mechanical Shock** *To determine the ability to withstand mechanical shocks from suddenly applied forces or an abrupt change in motion produced by handling, transportation or field operation.*  
**Standard:** MIL-STD-810F Method 514.3, category C.  
**Environment:** 75 g 11 ms saw tooth shock, 3± shock/axis, 3 axis, 18 total.
- ➔ **Random Mechanical Vibration** *To evaluate the construction, materials and mounting of the device for ruggedness.*  
**Standard:** MIL-STD-810F Method 514.5 and MIL-HDBK-344A  
**Environment:** Vibration step from 21 – 41 g.
- ➔ **Resistance to Solvents** *Determines the resistance to external force on the terminals.*  
**Standard:** MIL-STD-130L, UL 1950, EN 61010-1 • **Environment:** Ambient temperature, ambient humidity
- ➔ **Temperature Humidity Bias** *An operational test that evaluates the reliability of the device package in humid environments.*  
**Standard:** MIL-STD-810F, Method 507.3 • **Environment:** 85°C, 85% RH, high line input voltage
- ➔ **Thermal Shock** *To determine the resistance of the part to sudden changes in temperature.*  
**Standard:** MIL-STD-202G Method 107G Cond. B1 and MIL-HDBK-344A • **Environment:** -65°C to 125°C, 1,000 cycles
- ➔ **Temperature Cycle** *Conducted to determine the ability of devices to withstand mechanical stresses induced by alternating high and low temperature extremes.*  
**Standard:** JESD22-A104-B • **Environment:** -40°C to 125°C, 1,000 cycles

## Characterization Process

- ➔ **Electro Static Discharge** *Classifies the device according to its susceptibility to damage or degradation by exposure to electrostatic discharge.*  
**Standard:** MIL-STD-883C, Method 3015 • **Environment:** Ambient temperature, ambient humidity
- ➔ **Fungus** *To determine if a material (or materials) will support the growth of specific fungi.*  
**Standard:** MIL-STD-810F, Method 508.4 Section II • **Environment:** Severe climate conditions
- ➔ **Salt Fog** *To determine the resistance of the equipment to the effects of a salt atmosphere, primarily corrosion.*  
**Standard:** MIL-STD-810F, Method 509.1 Procedure • **Environment:** Salt fog harsh environment
- ➔ **Solderability** *To evaluate the solderability of terminations that are normally joined by a soldering operation.*  
**Standard:** MIL-STD-202G, Method 208H  
**Environment:** Continuous solder coating for a minimum of 95% surface area.
- ➔ **Terminal Strength** *Determines the resistance to external force on the terminals.*  
**Standard:** MIL-STD-202G, Method 211A Test Condition A • **Environment:** Ambient temperature, ambient humidity
- ➔ **AMCOM Testing** *Developed in partnership with the U.S. Army Aviation and Missile Command to demonstrate the ability to withstand sequential harsh environments, which simulate storage, field use and a 10 year service life in a ground mobile environment.*  
**Standard:** US Army Aviation and Missile Command  
**Environment:** High temp/high humidity, temp cycle, power cycle

## What Is FasTrak?

In keeping with the spirit of continuous improvement, Vicor has made significant design and manufacturing improvements to 2nd Generation DC-DC converters. Vicor refers to these changes as FasTrak. All models have undergone a thorough design and qualification process to ensure all form, fit and functional attributes remain unchanged with previous versions. The major changes to the modules are:

- Complete use of surface mount components and standard reflow processes
- Change from the use of bare die integrated power semiconductors to standard MLP packaged devices
- Molded terminal blocks for highly accurate pin positioning
- Greatly improved thermal management that reduces junction temperatures and improves reliability
- RoHS compliant with gold pins

*All three package sizes have been converted to FasTrak and benefit from the same design and manufacturing improvements. Please view the attached CD for a complete overview of all three families of modules and associated quality tests.*



## Reliability Testing

To ensure FasTrak DC-DC converters meet or exceed the reliability and performance of our 2nd Generation DC-DC converters, Vicor has performed a variety of reliability, environmental and life tests. Results from these tests indicate the FasTrak platform is a highly reliable and robust design that will stand up to demanding environments and applications.

A complete listing of the tests performed are outlined on the outside flap of this brochure. Detailed test reports are available on the enclosed CD.



**FasTrak Mini**  
(Half-brick)



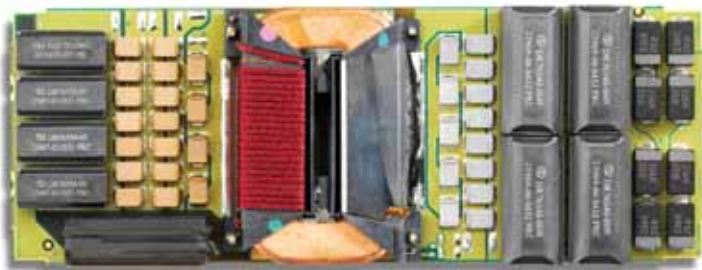
**FasTrak Micro**  
(Quarter-brick)

# FasTrak Maxi (Full-brick)



Bottom View

- Standard MLP power devices
- Efficient pick-and-place assembly



Top View

- Surface mount components for greater manufacturing efficiency
- Standard reflow process



Baseplate

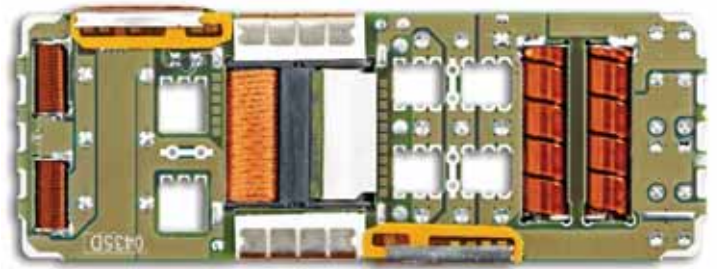
- Simplified baseplate construction



Complete Assembly

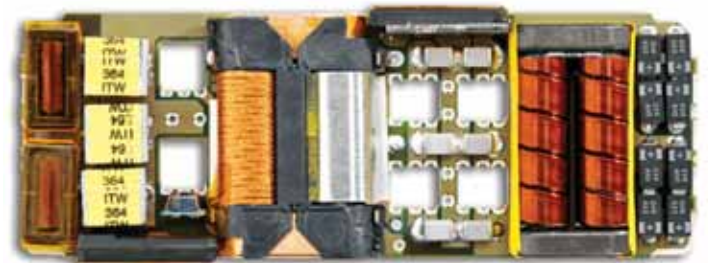
- Insert molded terminal block for more accurate pin positioning
- One piece cover with label
- New encapsulant - superior thermal performance

# 2nd Generation Maxi (Full-brick)



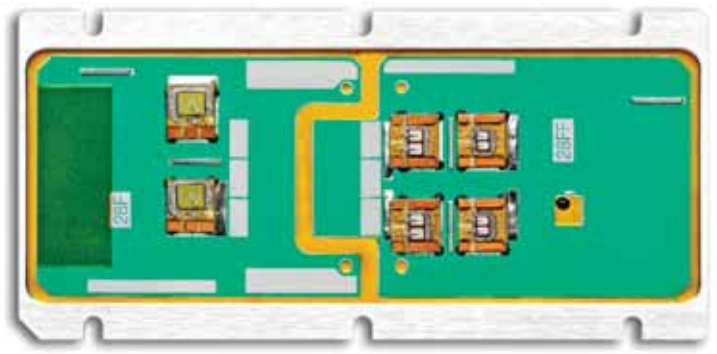
Bottom View

- Thru-hole and surface mount capacitors
- Blind reflow process
- Variable focused wave soldering process



Top View

- Thru-hole and surface mount capacitors
- Blind reflow process
- Variable focused wave soldering process



Baseplate

- Integrated power devices mounted to baseplate with thermal and insulating layers



Complete Assembly

- Two piece cover with label



**VICOR**

25 Frontage Road  
Andover, MA 01810  
**vicorpower.com**

