

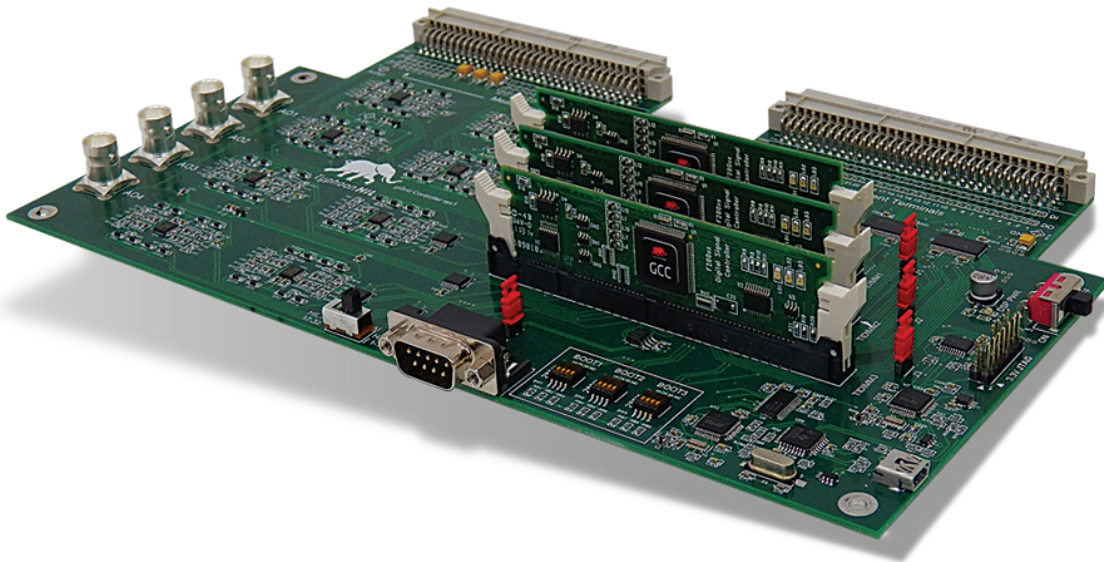
# Typhoon HIL micro-Grid DSP Interface

Rapidly develop, test, and deploy controllers for parallel converter systems and micro-grids.



# Typhoon HIL micro-Grid DSP Interface

Develop, test, and deploy parallel converters and micro-grids using our micro-grid DSP interface—with up to three DSP controllers—and our HIL emulators in cluster or individual configuration.



## Applications

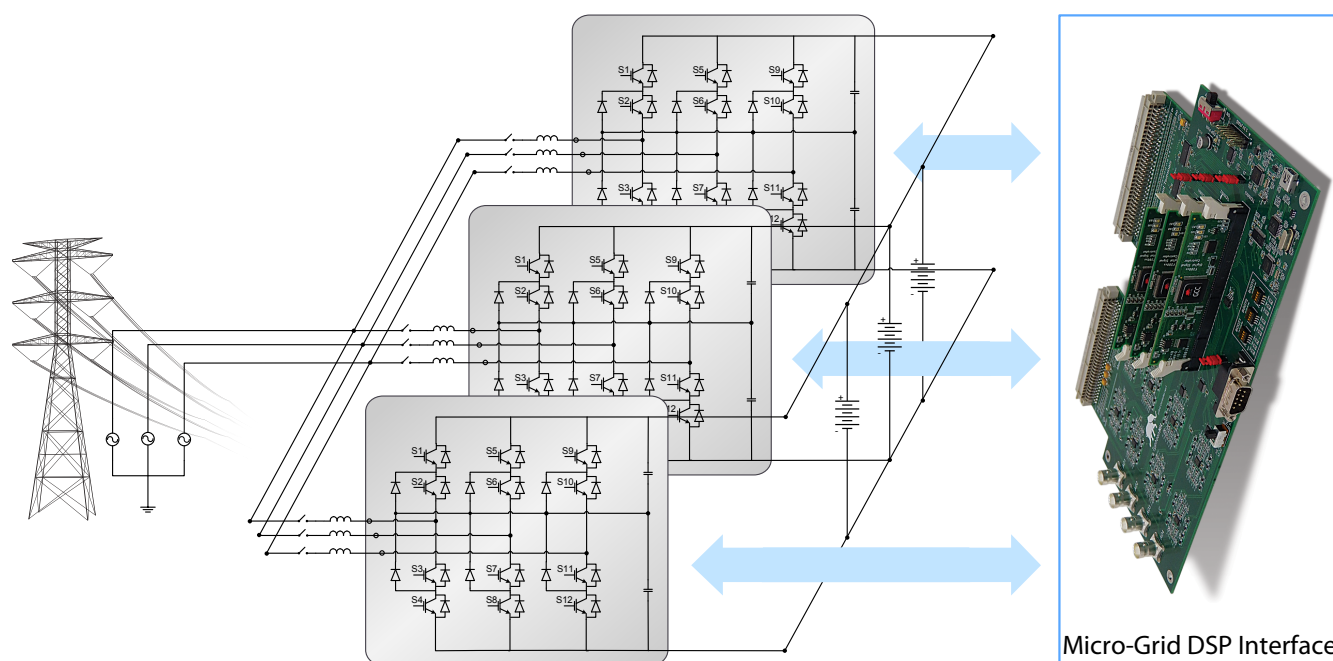
Design, test and verify parallel converter systems, or entire micro-grids using the micro-Grid DSP interface(s) with up to 3 TI DSP controllers, and Typhon HIL emulators in single or cluster configuration. *HIL micro-Grid DSP Interface* makes renewable energy R&D faster and more cost effective, cutting your time to market substantially. You'll be able to quickly prototype your energy storage systems, micro-grids as remote energy sources for i.e. oil rigs, district energy systems, military bases, mining etc.

## Features and Benefits.

- Simply plug in up to three TI DSP DIM100 cards into the *HIL micro-Grid DSP Interface* and prototype and test control for multi-converter applications, including parallel converters, micro-grids etc.
- Use any control environment for DSP programming, i.e. Matlab, Code Composer Studio etc.
- Use the built-in USB-accessible XDS100 emulator for DSP programming
- Plug and Play interface between *HIL micro-Grid DSP Interfaces* and HIL.
- Directly monitor and debug signals with on-board peripherals and emulator
- All HIL I/O pins are physically accessible

# Micro-Grid DSP Interface use case

Controller development for modular inverter battery storage system.



## Parallel inverter controller.

Design and verification of control code for parallel inverters, in grid connected configuration, is a daunting task. Here, a complete control software for three parallel grid-connected inverters for energy storage is developed, and tested with *micro-Grid DSP Interface* board and HIL602. All the fast controller functions—i.e. PWM modulation, inverter synchronization, current loops—as well as protection functions and high-level control functions (i.e. dynamic grid support) were tested and characterized using *micro-Grid DSP Interface* board and HIL602. One key advantage of the DSP board is its PnP HIL interface that enables quick deployment in HIL configuration. Hence, designer can immediately test parallel-inverter control code, even without performing off-line simulations first. Also, multiple *micro-Grid DSP boards* can be used with multiple HILs in a Cluster configuration.

## Testing and verification.

*Micro-Grid DSP Interface*, with three TI DSP controller boards enables rapid deployment and testing of paralleled converter control algorithms. Indeed, *Micro-Grid DSP Interface* is ideal choice for developing multi-inverter synchronization schemes and PWM optimization for minimization of circulating currents. Built in TI DSP JTAG emulator chip enables quick access and full control over all three DSP processors for efficient debugging via USB cable.

With automated test scripts, controlling both HIL602 and DSPs, test cases required for safe and robust grid connected operation can be verified. In addition, HIL fault injection provides comprehensive environment for test and verification of controller performance under grid faults, including sags, dips, frequency disturbances, over voltages, component failures, and battery faults.

# HIL uGrid DSP Interface technical details.

TI DSP C2000 Control card compatible	F2808	
	F28044	
	F28335 (Delfino)	
	F2803x (Piccolo)	
	F2806x (Piccolo)	
	F28M35xx (Concerto)	
Analog Inputs (AI), (DSP AI pins connected to HIL AO pins)	Channels	16 / 32 (User configurable)
	Voltage range	±5V (0-3V on DSP)
Digital Inputs (DI), (DSP DI pins connected to HIL DO pins)	Channels	32
	Voltage range	0-5V (0-3.3V on DSP)
Digital Output (DO) PWM & GPIO (DSP DO pins connected to HIL DI pins)	Channels	30 PWM + 2 GPIO
	Voltage range	0-5V (0-3.3V on DSP)
Host interface	on-board XDS100 emulator 3xUART	USB connector
	CAN	DB9 connector
	External emulator connector	JTAG, 14 pin header
Additional on-board peripherals	HIL AI monitoring	8 channels, ±5V
	HIL AO monitoring	4 BNC connectors



Typhoon HIL

[www.typhoon-hil.com](http://www.typhoon-hil.com)