



# SI-MOD68xx

## Family of 16/32/64 Channel High Resolution Multifunction I/O Modules

### Key Features

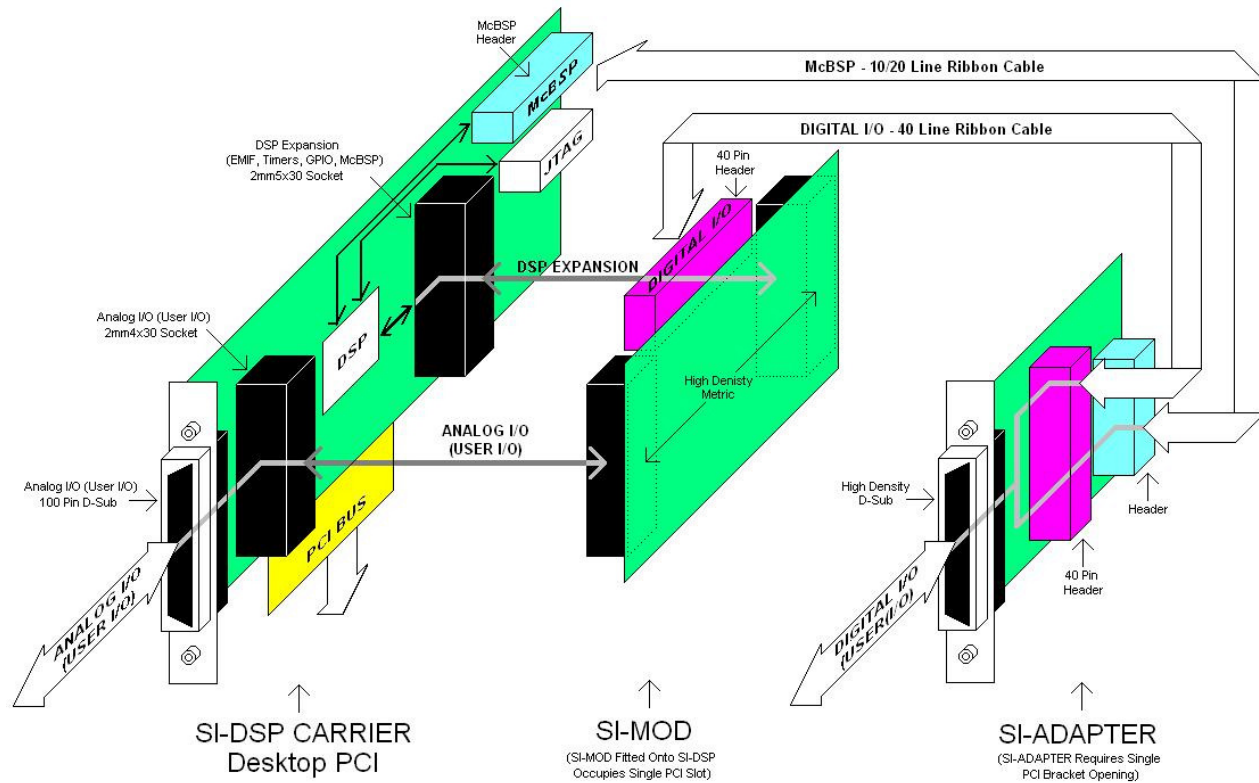
- Up to 64SE/32DE Analog Inputs, 100khz/250khz sampling, 16 bit resolution, 1-100 gains.
- Up to 16 Analog Outputs, 180khz update rates, 16 bit resolution.
- On board 32KByte EEPROM contains offset/gain errors, loaded to FPGA for real time digital calibration on all analog I/O.
- 32 digital I/O lines.
- 2 Quadrature Encoder inputs, CW/CCW 32 bit position counter, x1/x2/x4 modes, 37.5Mhz sampling.
- 2 Pulse inputs for accurately measuring frequency.
- 2 PWM outputs, up to 18.75Mhz/53ns resolution.
- Extremely flexible timing with 2 onboard DDSes, 4 Event Counters, and routing matrix allowing a myriad of clocking schemes.
- Small 3.7"x3.7" form factor.
- Software development tools from Sheldon Instruments includes **QuVIEW**, **QuBASE** and the **SI-DDKs**; as well compatibility with separately purchased TI and third party tools.
- Windows and Linux 32/64 bit drivers and sample application support.





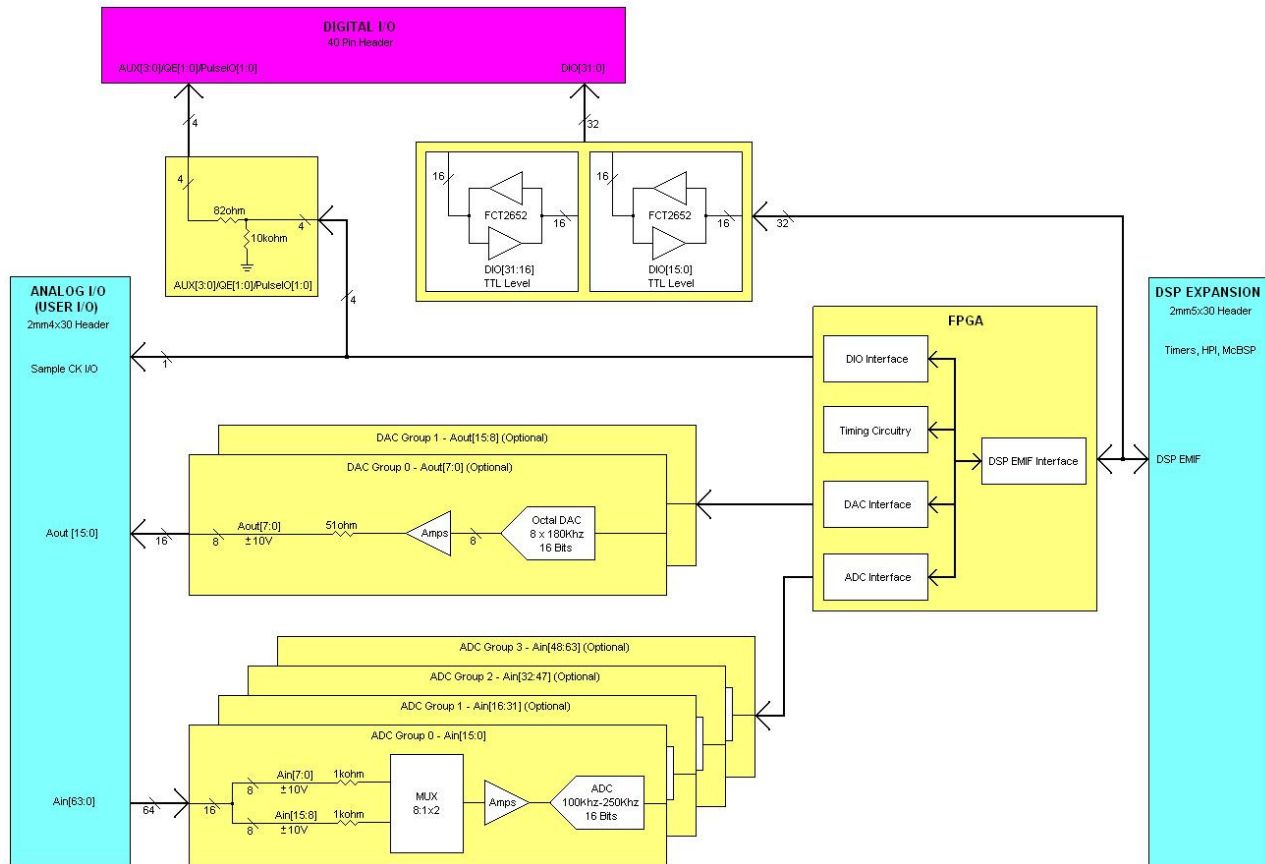
## Introduction

The SI-MOD68xx is a family of high resolution, multi function data acquisition and control modules that plug into any SI-DSP carrier processor card.





## Block Diagram



SI-MOD6x Block Diagram



## Hardware Features

Each card features either 8DE/16SE, 16DE/32SE or 32DE/64SE analog input channels. Every group of 8DE/16SE channels is comprised of its own multiplexer, programmable gain instrumentation amplifier and ADC circuitry. Up to four (4) distinct channels, one from each group, can be simultaneously sampled. The ADC resolution is 16 bits, each with sampling rates ranging from 0hz to 100khz/250khz, or an additive rate of 400khz/1Mhz respectively. The maximum input voltage level is between +/- 10Vp (or +/-9.5Vp for the "HG" or high gain option), with gains controlled by a precision differential instrumentation amplifier ranging from 1, 2, 5, 10, along with an optional 20, 50, and 100 for the "HG" option. The ADCs are based on a Successive Approximation architecture, which makes them ideal for control applications. Each input's termination can be individually programmed for differential or single ended operation, thereby not limiting you to an all-or-nothing configuration.

Additionally, up to sixteen (16) analog outputs can each update at rates up to 180khz, with 16 bits of resolution. These bipolar outputs have a maximum +/-10Vp range, along with a 1-pole smoothing filter.

An on board 32KByte EEPROM contains the offset and gain errors which are loaded into the FPGA and used to implement real time digital calibration on all analog I/O

The sample clock can be derived internally or externally. If derived internally from the onboard timing circuitry, either several traditional divide by N counters or a pair of onboard Direct Digital Synthesizers (DDSes) may be used. The DDSes provide programmable sampling rates with precision up to +/-1hz resolution. An externally sourced sample clock can also be used to accommodate a variety of sampling schemes. All ADC sample clocks are routed to an external connector in the case that multiple cards need to be synchronized to a common clock.

Thirty six (36) general purpose, highly flexible digital I/O lines are also available, four (4) of which can also double as a pair of Quadrature Encoder inputs, or as a set of four (4) individual PWM I/Os lines. These lines are in addition to any of the digital I/O lines native to the DSP carrier card, such as its own serial ports and timers.

## Software Support

All functions for the SI-MOD68xx are fully programmable with **QuVIEW** and **QuBASE**, which are a set of DSP-resident libraries for real time performance that greatly accelerate data acquisition, signal processing, and control applications. QuVIEW is a real time accelerator for LabVIEW, and QuVIEW a real time accelerator for Visual Basic. A full range of examples and tutors are provided to demonstrate their ease of use and breadth of functionality and capabilities. Complete driver support for Windows and Linux.



## Technical Specifications

### PC Interface:

- PCI initiated bus master transfer speeds through SI-DSP carrier cards:
  - Up to 132Mbyte/sec bursts with block sizes of eight (8) 32 bit words.
  - Up to 25Mbyte/sec sustained transfers of any block size, using the DSP carrier card's DMA.

### Analog Inputs:

- 16S/8D, 32S/16D, or 64S/32D analog inputs cascading multiple 4:1x2 MUX part # DG409:
  - SI-MOD6816-100, 16S/8D, 0hz to 100khz additive sampling for all channels.
  - SI-MOD6832-100, 32S/16D, 0hz to 200khz additive sampling for all channels.
  - SI-MOD6800-100, 64S/32D, 0hz to 400khz additive sampling for all channels.
  - SI-MOD6816-250, 16S/8D, 0hz to 250khz additive sampling for all channels.
  - SI-MOD6832-250, 32S/16D, 0hz to 500khz additive sampling for all channels.
  - SI-MOD6800-250, 64S/32D, 0hz to 1Mhz additive sampling for all channels.
- +/-10Vp maximum input voltage level, or +/-9.5Vp maximum for the "HG" option.
- High input impedance 1Mohm minimum.
- Precision differential instrumentation amplifiers with gains of 1, 2, 5, 10, part #AD8250 (Analog Devices).
- Each MUX-PGA-ADC group has 0hz to 100khz/250khz muxed time division sampling on 16 channels, for a maximum additive rate of 400khz/1Mhz on all channels, respectively.
- Up to 4 distinct inputs are simultaneously sampled, one from each MUX-PGA-ADC group.
- Successive Approximation ADCs with 16 bits of resolution:

- 100khz part ADS8320/25 (Burr Brown).
- 250khz part LTC1864 (Linear Technology).

- DC coupling.
- Each input's termination individually programmable for single ended or differential ended operation.
- Optional High Gain (-HG) amplification, adds a second amplifier with gains of 1, 2, 5, 10, part #ADS8250 (Analog Devices), extending gain ranges from 1 to 100.

### Timing:

- 2 internal DDSes, 27 bit resolution phase accumulators.
- 4 internal programmable Event Counters, based on divide-by-n 32 bit resolution counters.
- Flexible switching matrix allows timing signals to be routed from onboard resources as well external sources (Quadrature Encoders, Pulse I/Os).

### Digital I/O:

- 36 lines of general purpose digital lines:
  - 4 lines programmable as general purpose I/Os, or as a pair of Quadrature Encoder inputs, or as 4 bidirectional PWM lines. Nominal 3.3V CMOS logic levels, directly tied to Xilinx Spartan 2E FPGA.
  - Secondary bi-directional 32 bit port, with programmable directional control as two individual 16 bit ports. Nominal 4.3V CMOS/TTL logic levels, directly tied to 74FCT2652 class of bidirectional buffers.

### Optional Analog Outputs:

- "-8DAC" or a "-16DAC" option: Up to 8 or 16 DACs for analog output channels, part LTC6200 (Linear Technology).
- Each output has 0hz to 180khz update rates.
- 16 bits of resolution.
- +/-10Vp bipolar voltage range.



- Fixed 40kHz, 1-pole smoothing filter.

### General Features:

- Xilinx XC3S500E Spartan FPGA.
- Internal and external hardware triggers and sample clocks, software triggers.
- On board 32KByte EEPROM contains offset/gain errors, loaded to FPGA for real time digital calibration on all analog I/O.
- Fully programmable with QuVIEW, an accelerator library for LabVIEW.
- Fully programmable with QuBASE, an accelerator library for Visual Basic.
- Full suite of development tools from Sheldon Instruments and several third parties.
- Driver support for 32/64 bit Windows and Linux.

### Physical Dimensions, Electrical Requirements, & Temperature:

- 3.7"(L) x 3.7"(H), 0.18lbs or 85 grams.
- Supply Voltages: 3.3V for logic circuitry, 5V for 32 bit port buffers, and +/-12V for analog circuitry.
- 6.75 Watts typical with minimum configuration: +12Vdc@0.25A, -12Vdc@0.2A, 5Vdc@0.1A, 3.3Vdc@0.35A.
- 14 Watts typical with maximum configuration: +12Vdc@0.55A, -12Vdc@0.5A, 5Vdc@0.1A, [3.3Vdc@0.35A](#).
- Commercial grade 0-85C. Consult factory for availability of industrial and military temperature grades.

### Ordering Information:

- SI-MOD68xx-100 family (low gain):
  - SI-MOD6816-100 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6832-100 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6864-100 (blank or "-8DAC" or "-16DAC").
- SI-MOD68xx-HG-100 family (high and low gain):
  - SI-MOD6816-HG-100 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6832-HG-100 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6864-HG-100 (blank or "-8DAC" or "-16DAC").
- SI-MOD68xx-250 family (low gain):
  - SI-MOD6816-250 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6832-250 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6864-250 (blank or "-8DAC" or "-16DAC").
- SI-MOD68xx-HG-250 family (high and low gain):
  - SI-MOD6816-HG-250 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6832-HG-250 (blank or "-8DAC" or "-16DAC").
  - SI-MOD6864-HG-250 (blank or "-8DAC" or "-16DAC").

## Contact Information

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