QCI-S2-IGH

SilverSterling S2-IGH

The SilverSterling™ is an OEM servo controller/driver for QuickSilver's line of NEMA 11, 17, 23, high torque, direct drive hybrid servomotors, but is also capable of driving third party DC brush and voice coil motors, 3 phase brushless motors, open loop step motors, and the new Mosolver**™** hybrid servo with internal resolver functionality. The QCI-S2-IGH SilverSterling controller/driver is designed to be mounted in a rack/cage to minimize space and wiring.

The SilverSterling features a 15 pin interface connector including 4 IO, CAN , RS-485, and system power input. Four IO lines are brought out to the 15 pin connector. IO2, 3, 4 can optionally be used as Hall sensors for 3 phase motors. A motor memory signal is provided, which can access up to 3 external devices: a motor memory, a motor temperature sensor, and a auxiliary memory that may be used to identify slots, store communication parameters, and store slot specific motor configuration information (allowing the controllers to be swapped without losing project configuration data, if the auxiliary memory is mounted on the backplane.

The electronics are the same as the S2-IG controller, but the heatsink has been configured to allow the controller to be installed as modules in a common card-cage for easy access and to provide high density packaging of the controllers.

NOTE: Heatsink may slightly change when going from machined parts to extruded parts.

The QCI-S2-IGH fits into configurable backplanes (separately available) having a range of slots. These provide fusing, power, communications, and motor/feedback connections in a compact format. Each slot in the backplane has an auxiliary memory associated with it to hold slot ID information as well as axis specific information, allowing for easy swapping of controllers. The S2-IGH is designed to operate inside of a metal chassis for both EMI/EMC compliance and for fire safety. It is the user's responsibility to provide such appropriate housing.

Example card cage/housing, User Provided. See DS038 for more details on wiring 3 phase motors with backplane.

The QCI-S3-IGH has been tested to UL 61800-5-1
Listing # E114858

System Overview

Point-to-Point Moves
- Relative or Absolute
- Velocity or Time Based
- S-Curve

Advanced Motion Profile Moves
- Profile Move Commands
- Register Based
  - Position/Accel/Decel/Vel
  - Modify On-the-Fly

Multi-Axis Linear Interpolation
- XYZ Coords Contained in Text File
- CANopen® used for local bus
- 1000+ Points Stored In NV Memory

Built-In Voltage Clamp
- Regenerative Braking Resistor

Program and Data Storage
- 32K Non-Volatile Memory:
- 2000-3000 Program Lines
- User Data Examples
  - CAM Tables
  - Motion Profiles
  - Lookup Tables

Electronic Slip Clutch/Brake
- Variable Torque
- Wind/Unwind Applications

Anti-Hunt™
- Optionally use Open Loop While Holding
- No Servo Dither While At Rest

The QCI-S2-IGH is also compatible with:
- DC brush and Voice Coil Motors
- 3 Phase brushless motors,
- Stepper motors
- Hybrid Servo Motors

Communications
- RS-485 @ up to 230K Baud
- ASCII,Binary,Modbus®,DMX512
- Host Control While Servo in Motion
- CANopen® (Rev 03 SW and higher)

Programming Language
- Easy, Menu Driven Interface
- Command Parameter Prompts
- No Syntax Errors
- User Namable I/O and Registers

Advance PVIA™ Servo Loop
- 100:1 Inertial Mismatch
- Direct Drive Oversized Inertial Loads
  - Flywheels/Belt Drives
  - Typically Without Gearheads
- More Stable Than PID

Digital 4 Quadrant Vector Drive
- DSP Driven for Reduced Noise

Multi-Task/Multi-Thread

Compatible with QCI Motor/Encoders
- NEMA 11 Frame
  - 4000 Counts/Rev Encoder
  - Up To 9 oz-in (continuous)
- NEMA 17 Frame
  - 8000 Counts/Rev Encoder
  - Up To 43 oz-in (continuous)
  - IP50 or IP65
- NEMA 23 Frame
  - 8000 Counts/Rev Encoder
  - Up To 300 oz-in (continuous)
- NEMA 17 Frame Mosolver
  - 32000 counts per revolution
  - Includes commutation info
- NEMA 23 Frame Mosolver
  - 32000 Counts per revolution
  - Includes commutation info

Electrical Specifications

Configurations

The QCI-S2-IGH consists of a QCI-S2-IG-01 mounted in a heatsink configured to allow operation with a backplane. Motor connections, RS-485, CANopen, power and IO are all connected via the backplane. Status LED's are viewable from the outside of the backplane as well as from the wiring side of the backplane.

Input Power

Voltage

+12 VDC to +48 VDC, regulated. Device must be initialized for the actual operating voltage.

Reverse Polarity Protection

Reverse polarity protection is available on the SilverSterling. (Note, however, if power supply is not floating, connecting the V+ input to Ground will cause this potential to be present at the common connection to communications and I/O lines, which may damage these lines or that to which they are connected.

Input Current

4.5 Amps maximum for any input voltage, +12 VDC to +48 VDC per controller. Externally fuse with no larger than 8A slow blow.

Output Power

Output/Driver Current

5 Amp peak, 3.5A RMS x 2 phases; 6 A maximum for DC motors (using both phases in parallel) per controller (restricted to 4.5 A input current - such as driving a lower voltage motor from a higher voltage supply).

* With Adequate Airflow. (4.0A RMS x 2 phases typical 45C rise from 22C, ambient, 3.5A RMS x 2 typical 36C rise from 22C. Measurement on outside of heatsink, adjacent to driver.)

Hot Surface – Risk of Burn. Heatsink may exceed 60C at full current if operated at higher ambient temperatures and/or with insufficient airflow.

Maximum Output Power

200 Watts continuous power with adequate heat dissipation, 48V operation. Power may be derated in higher ambient temperatures.

Encoder Interface

Designed to work with differential encoders. The optional card-cage backplane has the ability to bias the unused lines to allow single ended encoders. These same encoder inputs are also used to interface to the Mosolver sense lines using the Encoder A, A-, B, B- inputs.

Inputs & Outputs

Digital Inputs
0 to +3.3 VDC. LVTTL level compatible.
On externally connected IO: Effective internal ~200K ohm pull-up impedance to +3.3 V. Inputs have a series 220 ohm / 3.3v protector to ground / Series 220 ohm ESD protection network. Do not exceed 5v on the inputs to prevent damage to the controller. NOTE: the optional backplane has pullups on the hall sensors as well as the encoder lines to allow non-driven single ended encoders to work properly without additional line drivers.

Digital Output Voltage
0 / +3.3 VDC.

Digital Output Current
Sinking or Sourcing
2mA; (externally connected IO include a 440 series impedance).

Analog Inputs
0 to +3.3 VDC input signal range.
12 bit ADC resolution (single).
Analog signal is read every servo cycle (120 µsec.) and the converted analog data is processed through a 5 ms filter to reduce noise & transients.

Analog channel #1 corresponds to physical I/O #4.

Clamp Resistor
The QCI-S2-IGH comes with a built in regenerative voltage clamping circuit to prevent damage to the driver from regenerated power associated with stopping a load.

Communications

Serial Interface
RS-485 multi-drop, Reduced unit load accommodates up to 255 nodes.
Protected up to +/- 70v not operating, +/-30V operating.

Note: RS-485 requires a nominal 120 ohm ½ W termination resistor at each end of the network. This termination is not provided onboard and must be provided by the user. Note: Short runs may work adequately with a higher impedance termination. The S2-IGH does not require a biased termination, but other attached devices may require a bias for proper operation.
Note: the optional backplane provides a header for connecting the RS-485 termination.

Protocols
8-bit ASCII, 9-bit binary, Modbus®, and DMX512

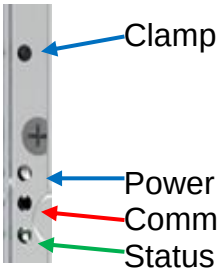
Hardware Configuration Settings
Available Baud Rates: 2400, 4800, 9600, 19.2k, 28.8k, 57.6k, 115.2k or 230.4k
(250k only for DMX512)
Data Bits: 8 (9 bits for binary)
Stop Bits: 1.5 or 2
Parity Bit: None (Modbus supports None, Even, Odd)

CAN interface
The CAN bus connection is NOT isolated, but does include transceivers which have an extended +/- 80v fault protection range. The CANopen® communications protocol allows the unit to function as a master, slave, or peer on a CANopen network. See the SilverLode CANopen User Manual for details on the CANopen protocol. This protocol operates simultaneously and independently from the standard serial protocols.

Note that a 120 ohm ½ W termination resistor is required at each end of the CAN network (only two per system). This termination is not provided onboard the controller and must be provided by the user. For the CAN bus, this termination is not optional.
Note: the optional backplane provides a header for connecting the bus terminations.

CANopen® and CiA® are registered community trade marks of CAN in Automation e.V.

STATUS LIGHTS



Four status lights are provided on the front side of the heatsink. The Blue Power light indicates power is connected to the unit. The Red COMM LED indicates the unit is ready (no program running) by a dim level, it is off between communications if a program is running. It blinks brightly during each incoming communications frame. The Green Status light varies in intensity with the motor torque (negative torque dimmer, positive torque brighter); if Done Bit is configured the LED lights to indicate Done (See Set Done Bit command), is also used to blink error codes if a fault is detected (and the Done bit is not configured). A second blue Led (separated from the other three) flashes when the Clamp is active

Environmental Specifications

Operational Temperature
-10 C to +70 C Hot Surface – Risk of Burn. Heatsink may exceed 60C at full current if operated at higher ambient temperatures and/or with insufficient airflow.

Storage Temperature
- 40 C to +85 C

Humidity
Continuous specification is 95% RH non-condensing.

Shock

Limitation is approximately 50g/11ms.

Specifications subject to change without notice. See www.QuickSilverControls.com for current information.

Mounting the QCI-S2-IGH

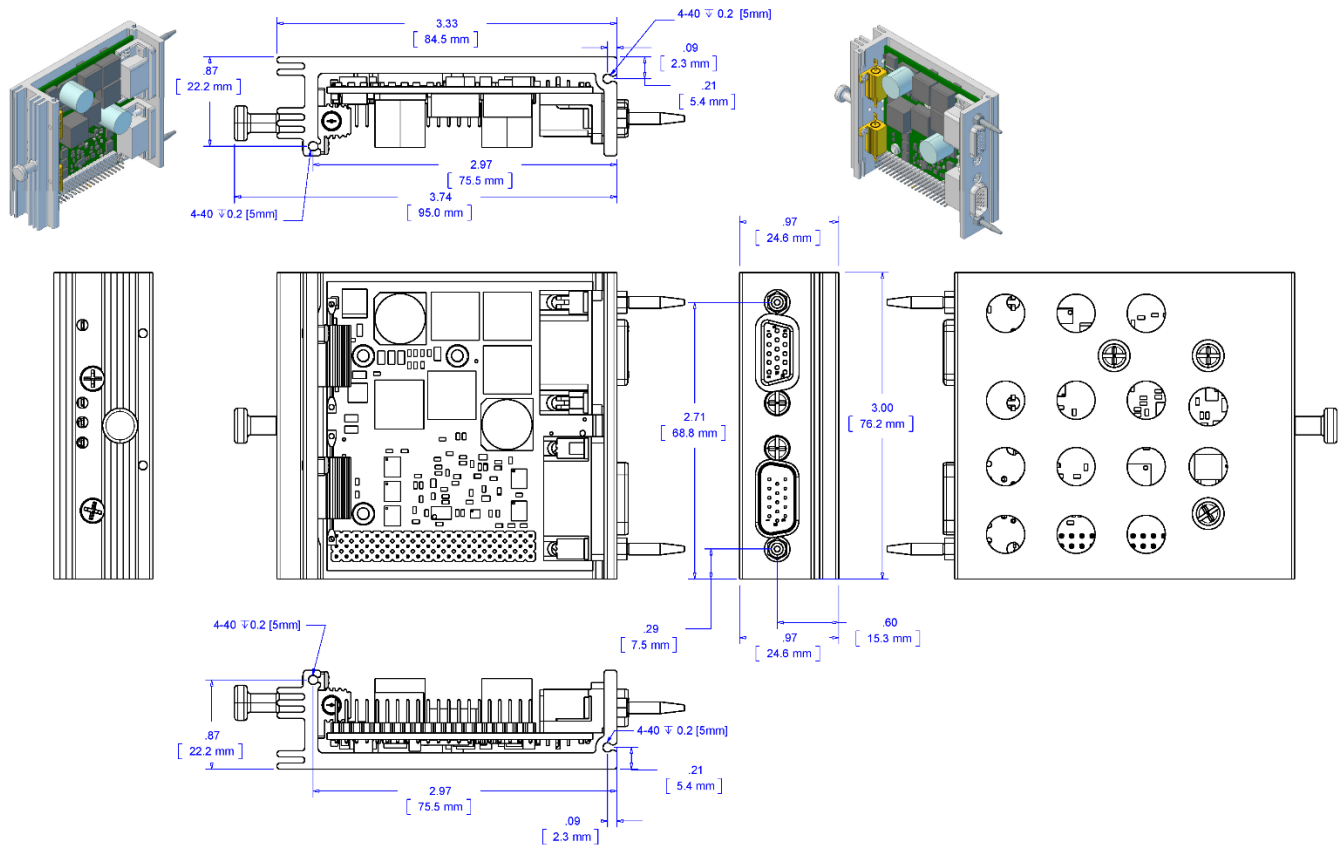
The Controller Driver is designed to be mounted into a card-cage using the optional backplane. The connector plane of the motor and SIP connectors is the reference for alignment. The outer two pins of the D-sub connectors are provided with guide pins to easy “blind” plugging of these connectors; the card-cage PCB has matching holes for the pins to extend through the mating connector. Custom card-cages require this feature as well.
Proper ESD handling techniques including grounding straps should be used while handling the QCI-S2-IGH as the board is exposed when not in the card-cage.

It is advised that the edges of the heatsink be conductively affixed to the card-cage guides to minimize EMI and to reduce ESD sensitivity by providing a direct path to chassis ground.

Note: The mechanical model shows the optional 60 pin header (available by special order). This connector is normally populated with a 10 pin header used internally.

Mechnical Dimensions

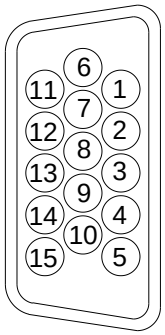
QCI-S2-IGH



Connector Data

SilverSterling Interface Port (SIP)

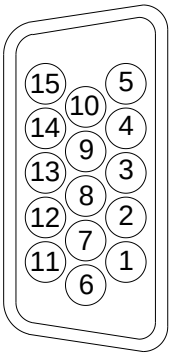
This port provides Power, RS-485 serial communications, CAN communications, and four IO. The IO is nominally 0-3.3v and should be limited to no more than 5v to avoid damage. The CAN and RS485 have extended input voltage range to improve robustness. Power ground and logic ground are internally connected.



1	V+ (12-48 VDC)
2	RS-485A
3	+5V OUTPUT 100mA
4	I/O #3
5	CAN_H
6	POWER GROUND
7	V+ (12-48 VDC)
8	LOGIC GROUND
9	I/O #2
10	LOGIC GND (CAN GND)
11	POWER GROUND
12	RS-485B
13	I/O #1
14	I/O #4
15	CAN_L

Motor Interface

This connector normally interfaces to the Backplane of the Card-cage. The signals are then routed to the motor via a dedicated connector. See Backplane board for more details.



1	Motor B+
2	Chassis Ground
3	+ 5V Encoder Power
4	Encoder A -
5	Encoder B -
6	Motor A +
7	Motor B -
8	Encoder Z +
9	Encoder A +
10	Encoder Z -
11	Motor A -
12	Chassis Ground
13	Encoder B+
14	Encoder Ground
15	Motor Memory Access

The motor temperature can be monitored and limited by using a DS1822 digital thermometer, with ground connected to Encoder Ground, Power to +5v encoder power, and IO connected to Motor Memory Access. The motor temperature can be measured in 1/16 C increments in the lower half of register 241, and the over- temperature threshold can be configured via ther upper half of register 241 (also in degrees C * 16).

Part Numbers

SilverSterling™ IG Controller/Drivers		
Driver	**Controller**	**Options**

QCI-S2-IGH: 4 A RMS Per Phase
• Best paired with
  • I-Grade Motor / Encoders
  • 3 Phase brushless motors
  • Voice Coils
  • DC brush motors
  • Step motors
  • Mosolvers
• 3.5A RMS per phase
• 5A peak per phase
• 4.5A @ 12v-48v
• Included Clamp circuit and resistor.
	IGH – SilverSterling S2 IG
	• 4 TTL Inputs or Outputs
	• 1 Analog input (IO#4)
	• 1 PWM output (IO#2)
	  ○ Use QCI-BO-S1A for analog output
	• ASCII, 9 bit Binary, Modbus®, DMX-512®
	• CANopen® (with Rev 03 sw)
	• DB15HD (pin): SIP Connector
	• DB15HD (socket): Motor I/F
		Blank – in Heat Sink Enclosure
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Contact Information

QuickSilver Controls, Inc.
990 N Amelia Ave
San Dimas, CA 91773
909-599-6291 or (888) 660-3801
909-599-6289 FAX
www.QuickSilverControls.com