QCI-S3-IGH

SilverSterling S3-IGH

The SilverSterling™ is an OEM servo controller/driver for QuickSilver's line of NEMA 34, high torque, direct drive hybrid servomotors, but is also capable of driving third party DC brush and voice coil motors, 3 phase brushless motors, and open loop step motors. The QCI-S3-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 an 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 S3-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.

The QCI-S3-IGH fits into configurable backplanes (separately available) having a range of slots. These provide communications (CAN and RS-485), and motor feedback connections in a compact format. The input power and motor driver connections are brought out using TE Power Lock connectors. Each slot in the backplane also has an auxiliary memory associated with it to hold slot ID information as well as axis specific information, allowing for easy swapping of controllers.

Note: The controller is designed to be enclosed in a conductive metal enclosure housing the card cage for both EMI / EMC and for fire protection.

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

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 34 Frame
  - 16000 Counts/Rev Encoder
  - Up To 3200 oz-in (continuous)

Compatible with 3rd party motors:
- DC brush and Voice Coil Motors
- 3 Phase brushless motors,
- Stepper motors
- Hybrid Servo Motors

Electrical Specifications

Configurations

The QCI-S3-IGH consists of a QCI-S3-IG-01 mounted in a heatsink configured to allow operation with a backplane. Motor feedback connections, RS-485, CANopen, and IO are all connected via the backplane. Input power, and Motor Driver signals are available on separate connectors brought to the same edge as the other connectors, accessed from the card cage side of the board. 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. An external fuse not exceeding 25A is required. 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

20 Amps maximum for any input voltage, +12 VDC to +48 VDC per controller. Externally fuse with no larger than 25A slow blow.

Output Power

Output/Driver Current

20 Amp peak, 10A RMS x 2 phases *.

* With Adequate Airflow. User to determine adequate air flow for their loads, motors, and duty cycles. Currents are derated at higher ambient temperatures. Hot Surface – Risk of Burn. Heatsink may exceed 60C at full current if operated at higher ambient temperatures and/or with insufficient airflow.

Encoder Interface

Designed to work with differential encoders. The optional card-cage backplane has pull up resistors and a voltage refernce to bias the unused lines, which enables the use of single ended encoders.

Hall sensors connections have two options: using IO2,3,4 or using the hall sensor inputs through the motor interface DB-15 connector.

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. The hall sensors through the Motor DB-15 connector also have pull-ups allowing open drain hall sensors to directly connect.

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 sac.) 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-S3-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 S3-IGH does not require a biased termination, but other attached devices may require a bias for proper operation.
Note: the optional backplane provides space in the header for adding RS-485 terminations.

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 space in the header for adding CAN bus terminations.

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

STATUS LIGHTS
Five status lights are provided on the outside edge of the box, four on the inside edge.. Two sets of status lights are provided to make it easier to see them with the box mounted in different orientations. 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). The outside edge also has a Green drive enable LED, and a blue clamping active led, while the backplane edge has the Green drive enable LED.

Environmental Specifications
Operational Temperature
-10 C to +65 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-S3-IGH

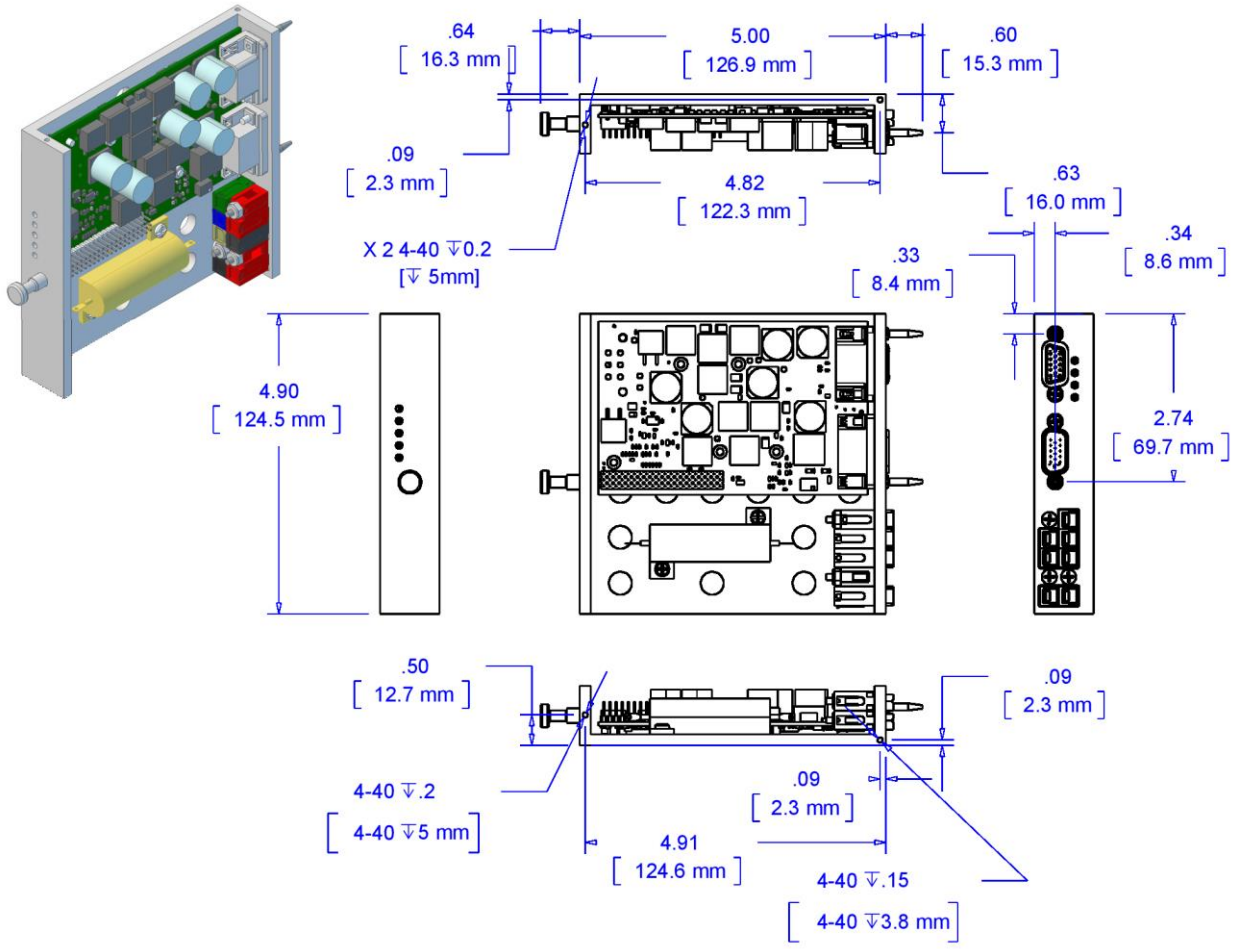
The Controller Driver is designed to be mounted into a card-cage using the optional backplane. The connector plane of the motor and SIP connectors is the reference for alignment. The outer two pins of the D-sub connectors are provided with guide pins to easy “blind” plugging of these connectors; the 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-S3-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.

The mechanical drawing shows an optional 60 pin header (available by special order). The units normally are stuffed with just 10 pins for internal programming of the unit with the four IO strapped to their standard configuration.

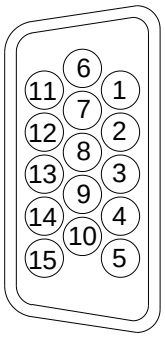
Mechanical Dimensions

QCI-S3-IGH



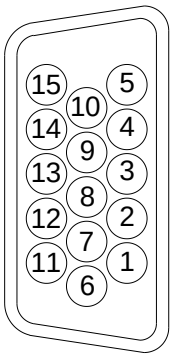
Connector Data

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.



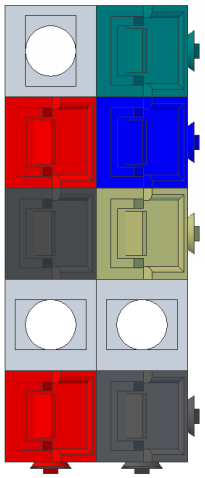
1	DR_ENA+
2	RS-485A
3	+5V OUTPUT 100mA
4	I/O #3
5	CAN_H
6	DR ENA -
7	DR ENA SOURCE
8	LOGIC GROUND
9	I/O #2
10	LOGIC GND (CAN GND)
11	POWER GROUND
12	RS-485B
13	I/O #1
14	I/O #4
15	CAN_L

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 Card Cage board for more details.
Note: 3 phase hall sensors can be routed through IO2,3,4 of the SIP port, or through Hall U*, Hall V* and Hall W*. The 3 phase initialization needs to select which source is being used for the hall sensors. See command reference manual SMD 26 (option 1 or 2 are for different motor wiring). SMD 26 2 sets the S3-IGH to use hall sensors wired to IO 2, 3, and 4, and phase U, V, W of the motor wired to RED, WHITE, and BLACK. SMD 26-1 command is available on Revision 37 and later. See DS038 for more details on wiring 3 phase motors with backplane.
Note: 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).



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

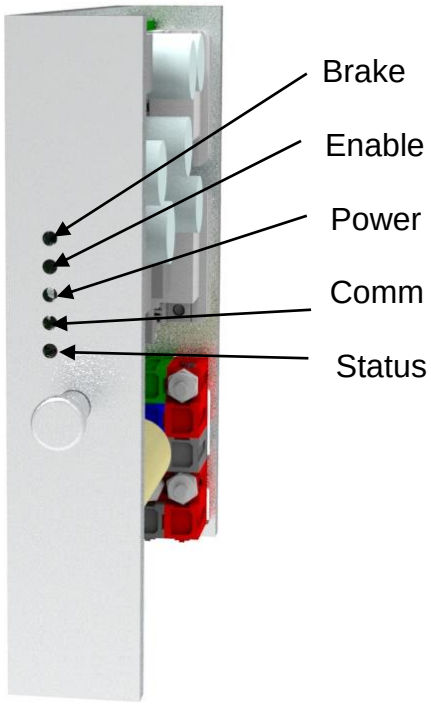
The motor windings are brought out using Power Lock Series 1 connectors [53894-x (x selects color)]
Pins are 54329-1 (solder – single), 53892-4 (Crimp - single), 53892-2(crimp strip)
The Chassis Ground should be connected to the cable shield at driver and to motor case to minimize EMI from chopping actions of the driver. A ferrite bead should go over the motor driver cable (shield and all) near the driver board to minimize EMI.

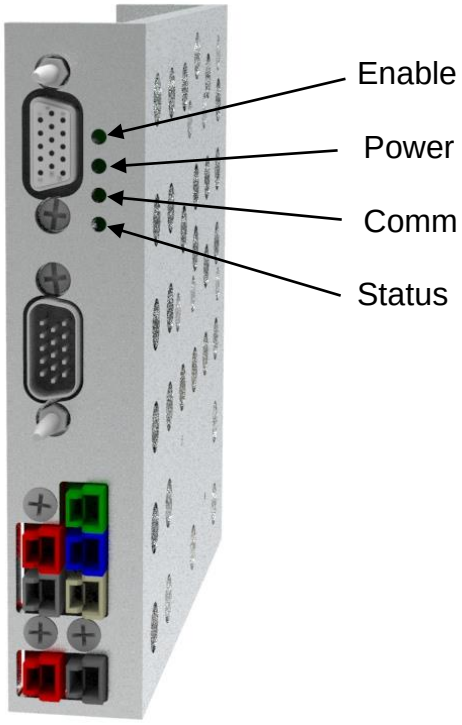


Screw	Chassis Gnd
Motor A+	Motor B-
Motor A-	Motor B+
Screw	Screw
Power V+	Power Ground

The power must be externally fused. 25A maximum slow blow fuse is suggested.

Status Lights





Part Numbers

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

QCI-S3-IGH: 10 A RMS Per Phase, 20A peak
• Best paired with
  • I-Grade Motor / Encoders
  • 3 Phase brushless motors
  • Voice Coils
  • DC brush motors
  • Step motors
• 10A RMS per phase
• 20A peak per phase
• 20A @ 12v-48v
• Includes Clamp circuit and resistor.
	IGH – SilverSterling S3 IGH
	• 4 TTL Inputs or Outputs
	• 1 Analog input (IO#4)
	• 1 PWM output (IO#2)
	• ASCII, 9 bit Binary, Modbus®, DMX-512®
	• CANopen®
	• DB15HD (pin): SIP Connector
	• DB15HD (socket): Motor I/F
	• 2 pin Power Lock Series 1 power connector
	• 5 pin Power Lock Series 1 motor connector

Contact Information

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