ESI MOTION™
2250-A Union Place, Simi Valley, CA 93065
Tel: 800.823.3235 – sales@esimotion.com
Product of USA

SCORPION SERVO DRIVE MODULE DATASHEET

ESI Motion's Scorpion is an extreme high-power density servo drive module.

This exceptionally lightweight efficient controller is one of the smallest high-power drives on the market today. At 24kW the Scorpion is capable of performing in demanding applications and incorporates our rugged controller and power drive modules, offers multiple feedback options and is packaged in a potted plastic case.

Specifications & Features:

- Bus Voltage (DC) 24V to 610V
- Peak Current 80A
- Output Power 24kW
- Operating Temperature - 40°C to 71°C
  - Extended -55°C to 100°C (optional)
- Maximum Electrical Speed 75,000 RPM
- Weight 1 lb./453g
- Size: 2.6"L x 4.0"W x 1.8"H
- Single axis configuration
- Operational vibration +/- 20g
- Light weight and efficient
- Torque, velocity or position control
- Configurable, user friendly GUI with integrated oscilloscope feature

Configurations:

- Motor Types: DC brushless, brushed and induction
- Feedback: sensorless, encoder, resolver, hall, BiSS-C and EnDAT
- Cooling Options: Chassis
- Packaging: Potted plastic case

Scorpion Servo Drive

Overview

The following describes both the electrical and physical interfaces for the Scorpion Servo Drive. Included in this document is information necessary to integrate the Scorpion Servo Drive with other system components.

In order to design a multi-use capability, networking has been emphasized in the Scorpion Servo Drive. This drive can be connected to the following two types of networks:

- RS-422
- Controller Area Network (CAN)

Both networks are ideal for real-time embedded networking. They have been proven to be stable and robust as well as flexible. The Scorpion Servo Drive can be easily modified through software to accept commands and report feedback without hardware modification.

This document discusses the system interconnect by functional group. The four groups are as follows:

- Motor Power & Phases
- Motor Feedback
- Communication
- Services Interfaces

Motor Power & Phases

Dedicated motor power pins are provided for the motor. The motor power and phase pins are designed to be soldered to a carrier printed circuit board. The motor power consists of two voltage DC in (VDC_IN) and two voltage DC Return pins. The six motor phase pins (two each for phase A, B and C) are located along the middle of the Scorpion module.

The Scorpion module has an integrated heat sink along the bottom. CARE MUST BE TAKEN when using the Scorpion for high-power applications. Motor currents greater than 5A will require an external heat sink. Proper heat sinking practices should be followed.

Electrical Interfaces

Feedback

The Scorpion has several types of motor position feedback that can be used: Sensorless, Digital Encoder, Re- solver, Hall, BiSS-C and EnDAT. Feedback is provided for flexibility in high performance systems. The feedback A is located on J2 and the feedback B is located on J1. The feedback is selected and configured via the Host Interface for the Drives' Servo (HiDS) software. The Sensorless, Digital Encoder, Resolver, Hall, BiSS-C and EnDAT interfaces are 5V tolerant. External feedback sensors should be powered from the same +5V supply used to power the Scorpion Controller. The following pages show the pin out configuration for J1 and J2.

Communication Interfaces

The Scorpion includes a RS422 physical interface compliant to the TAI/EIA-B specification. The Scorpion is capable of a 1 Mbps data rate. The RS422 pins are short circuit protected from -7 V to +12V.

The Scorpion includes a CAN physical interface compliant to the ISO 11898-2 specification. The maximum data rate is 1Mbps for bus length of 40 meters. The Scorpion CAN interface meets the extended common mode range of -7V to +12V. No internal bus termination is provided. The HiDS functions may be accessed via the CAN interface.

The High-Speed Serial Bus (HSSB) and Serial Communication Interface (SCI) is reserved for customer specific applications.

Services Interfaces

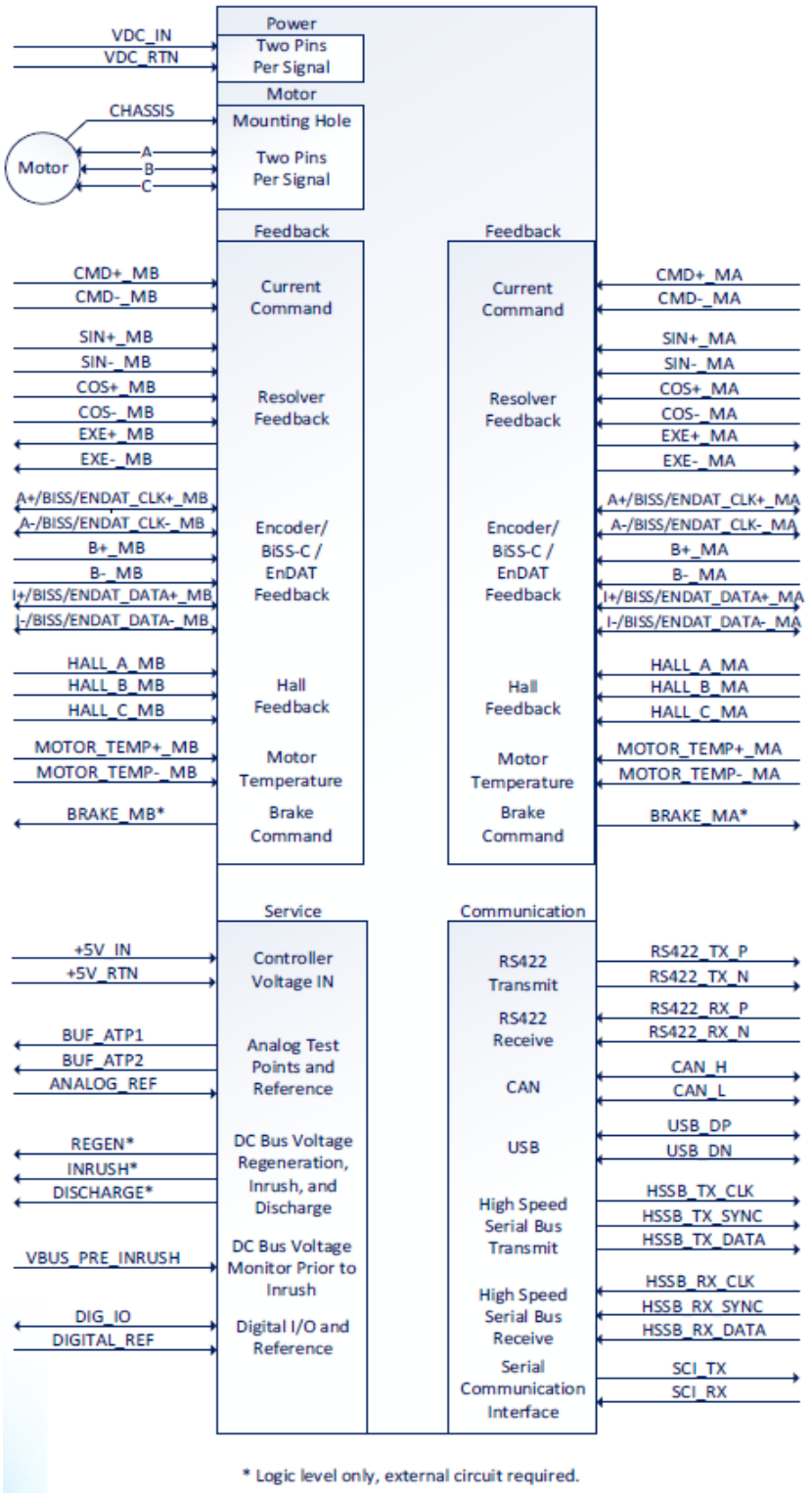
The analog test points may be configured through HiDS. The voltage range on the analog test points is +/- 3.0V. The analog test points are buffered with a 50 Ohm series resistor.

The DC Bus Voltage Regeneration, Inrush and Discharge are TTL level control signals that are to be used in conjunction with external hardware designed to specifically perform DC Bus Voltage Regeneration, Inrush or Discharge.

The DC Bus Voltage Monitor prior to Inrush is an analog voltage input for the DC Bus Voltage measured prior to the Inrush hardware. The analog input needs to be scaled between 0 to 5V.

The Digital I/O is a TTL level input or output discrete that can be configured via the HiDS software.

System Diagram



* Logic level only, external circuit required.

Electrical Interfaces – J1 2x20 Header

J1, 2 x 20 Header, 0.05 in Pitch, 0.016 in Square Pin*			
PIN	**NAME**	**DESCRIPTION**	**TYPE**
1	CMD+_MB	Current Command Positive B	Analog Input
2	CMD-_MB	Current Command Negative B	Analog Input
3	SIN+_MB	Resolver Sin Positive B	Analog Input
4	SIN-_MB	Resolver Sin Negative B	Analog Input
5	COS+_MB	Resolver Cos Positive B	Analog Input
6	COS-_MB	Resolver Cos Negative B	Analog Input
7	EXE+_MB	Resolver Excitation Positive B	Analog Output
8	EXE-_MB	Resolver Excitation Negative B	Analog Output
9	A+/BISS/ENDAT_CLK+_MB	Digital Encoder A Positive / BiSS-C / EnDAT Clock Positive B	Digital In / Out
10	A-/BISS/ENDAT_CLK-_MB	Digital Encoder A Negative / BiSS-C / EnDAT Clock Negative B	Digital In / Out
11	B+_MB	Digital Encoder B Positive B	Digital In
12	B-_MB	Digital Encoder B Negative B	Digital In
13	I+/BISS/ENDAT_DATA+_MB	Digital Encoder I Positive / BiSS-C / EnDAT Data Positive B	Digital In / Out
14	I-/BISS/ENDAT_DATA-_MB	Digital Encoder I Negative / BiSS-C / EnDAT Data Negative B	Digital In / Out
15	HALL_A_MB	Hall A B	Digital In
16	HALL_B_MB	Hall B B	Digital In
17	HALL_C_MB	Hall C B	Digital In
18	DIGITAL_REF	Digital Reference	Digital
19	MOTOR_TEMP+_MB	Temperature Positive B	Analog
20	MOTOR_TEMP-_MB	Temperature Negative B	Analog
21	+5V_IN	+5V Input	Digital Power
22	+5V_RTN	+5V Return	Digital Power
23	Reserved	Reserved	No Connect
24	Reserved	Reserved	No Connect
25	Reserved	Reserved	No Connect
26	Reserved	Reserved	No Connect
27	Reserved	Reserved	No Connect
28	Reserved	Reserved	No Connect
29	Reserved	Reserved	No Connect
30	Reserved	Reserved	No Connect
31	BRAKE_MA	Brake Command A	Digital Out
32	BRAKE_MB	Brake Command B	Digital Out
33	REGEN	DC Bus Voltage Regeneration Command	Digital Out
34	INRUSH	DC Bus Voltage Inrush (Precharge) Command	Digital Out
35	DISCHARGE	DC Bus Voltage Discharge Command	Digital Out
36	VBUS_PRE_INRUSH	DC Bus Voltage Monitor Prior to Inrush	Analog In
37	SCI_TX	Serial Communication Interface (SCI) Transmit	Digital Out
38	SCI_RX	Serial Communication Interface (SCI) Receive	Digital In
39	Reserved	Reserved	Digital In
40	Reserved	Reserved	Digital In

* Mating connector Samtec P/N CLP-120-02-F-D-TR

Electrical Interfaces – J2 2x20 Header

J2, 2 x 20 Header, 0.05 in Pitch, 0.016 in Square Pin*			
PIN	**NAME**	**DESCRIPTION**	**TYPE**
1	CMD+_MA	Current Command Positive A	Analog Input
2	CMD-_MA	Current Command Negative A	Analog Input
3	SIN+_MA	Resolver Sin Positive A	Analog Input
4	SIN-_MA	Resolver Sin Negative A	Analog Input
5	COS+_MA	Resolver Cos Positive A	Analog Input
6	COS-_MA	Resolver Cos Negative A	Analog Input
7	EXE+_MA	Resolver Excitation Positive A	Analog Output
8	EXE-_MA	Resolver Excitation Negative A	Analog Output
9	A+/BISS/ENDAT_CLK+_MA	Digital Encoder A Positive / BiSS-C / EnDAT Clock Positive A	Digital In / Out
10	A-/BISS/ENDAT_CLK-_MA	Digital Encoder A Negative / BiSS-C / EnDAT Clock Negative A	Digital In / Out
11	B+_MA	Digital Encoder B Positive A	Digital In
12	B-_MA	Digital Encoder B Negative A	Digital In
13	I+/BISS/ENDAT_DATA+_MA	Digital Encoder I Positive / BiSS-C / EnDAT Data Positive A	Digital In / Out
14	I-/BISS/ENDAT_DATA-_MA	Digital Encoder I Negative / BiSS-C / EnDAT Data Negative A	Digital In / Out
15	HALL_A_MA	Hall A A	Digital In
16	HALL_B_MA	Hall B A	Digital In
17	HALL_C_MA	Hall C A	Digital In
18	DIGITAL_REF	Digital Reference	Digital
19	MOTOR_TEMP+_MA	Temperature Positive A	Analog
20	MOTOR_TEMP-_MA	Temperature Negative A	Analog
21	+5V_IN	+5V Input	Digital Power
22	+5V_RTN	+5V Return	Digital Power
23	RS422_TX_P	RS422 Transmit Positive	Digital Out
24	RS422_TX_N	RS422 Transmit Negative	Digital Out
25	RS422_RX_P	RS422 Receive Positive	Digital In
26	RS422_RX_N	RS422 Receive Negative	Digital In
27	CAN_H	CAN High	Digital
28	CAN_L	CAN Low	Digital
29	USB_DP	Reserved for USB Data Positive (Not Implemented)	Digital
30	USB_DN	Reserved for USB Data Negative (Not Implemented)	Digital
31	ANALOG_REF	Analog Reference	Analog
32	DIG_IO	Digital Input / Output	Digital In / Out
33	HSSB_TX_CLK	High Speed Serial Bus Transmit Clock	Digital Out
34	HSSB_RX_CLK	High Speed Serial Bus Receive Clock	Digital In
35	HSSB_TX_SYNC	High Speed Serial Bus Transmit Sync	Digital Out
36	HSSB_RX_SYNC	High Speed Serial Bus Receive Sync	Digital In
37	HSSB_TX_DATA	High Speed Serial Bus Transmit Data	Digital Out
38	HSSB_RX_DATA	High Speed Serial Bus Receive Data	Digital In
39	BUF_ATP1	Analog Test Point 1	Analog Out
40	BUF_ATP2	Analog Test Point 2	Analog Out

* Mating connector Samtec P/N CLP-120-02-F-D-TR

Electrical Characteristics

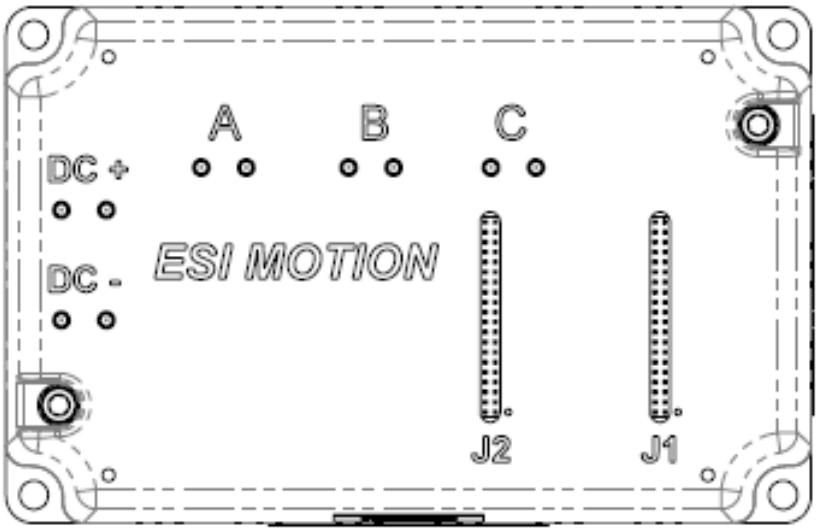
SIGNAL	MINIMUM	MAXIMUM	UNITS
VDC In	100	865	V
Peak Phase Current	-	2 x Rated Current (6) (7)	A
Current Command	-10	10	V
Current Command	-	20	K Ohm
Resolver Excitation	4.0 (5)	-	V rms
Resolver Sin, Cos	2 (5)	4.2	V rms
Resolver Sin, Cos	0	5K (5)	Hz
Resolver Sin, Cos	-	20	K Ohm
Encoder, BiSS-C, EnDAT Data	0	5	V
Encoder, BiSS-C, EnDAT Data	-	120	Ohm
BiSS-C, EnDAT Clock	3.5	-	V
BiSS-C, EnDAT Clock	-20	20	mA
Hall	0	5	V
Temperature (4)	-	2	K Ohm
5 VDC In	-	450	mA
Brake Command	0	3.3	V
Regeneration Command	0	3.3	V
Inrush Command	0	3.3	V
Discharge Command	0	3.3	V
Vbus Monitor Pre Inrush	0	5	V
RS422 (1) (2)	-	1000	K bps
CAN (2) (3)	-	1000	K bps
USB 2.0 (Future Upgrade)	-	12	M bps
Digital I/O	0	3.3	V
High Speed Serial Bus	0	3.3	V
SCI	0	3.3	V
Analog Test Point Out	-5	5	V
Analog Test Point Out	-	50	Ohm

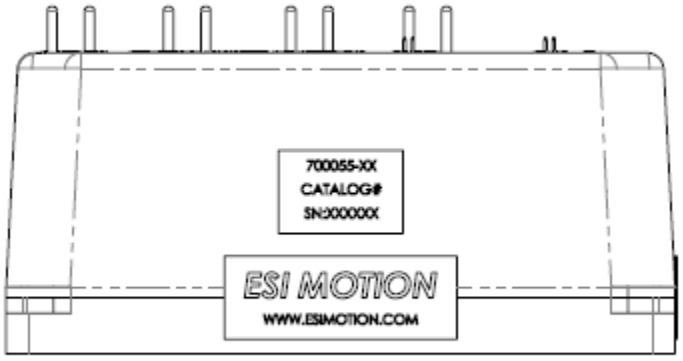
(1) Physical Interface compliant to the TIA/EIA-422-B.
(2) Short circuit protection from –7 V to 12 V protection.
(3) Compliant to ISO 11898-2 specification.
(4) Recommended NTC 5k, Epcos part # B57540G502F.
(5) Nominal value
(6) Peak Sine Wave
(7) Up to a Maximum of 80 A

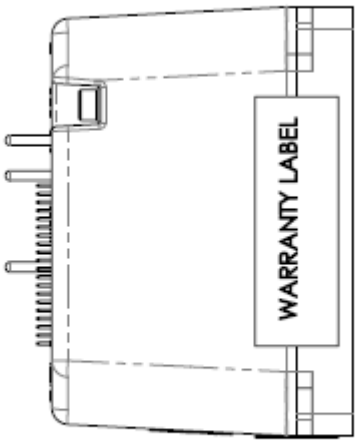
Mechanical – Scorpion Dual Axis

WEIGHT: 1 LB. MAX

FINISH: ELECTROLESS NICKEL PLATE PER ASTM B733-04, TYPE IV, SC2, CLASS 4.
NOT APPLICABLE FOR COVER, CONNECTORS AND HARDWARE.







UNLESS OTHERWISE SPECIFIED:

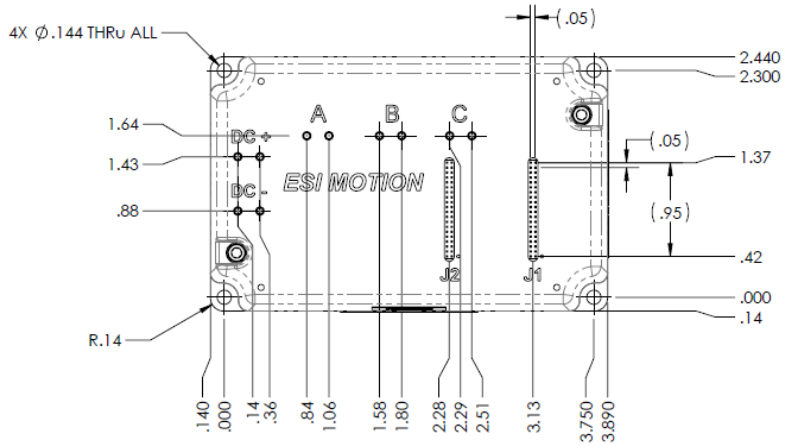
INTERPRET GEOMETRIC
TOLERANCING PER: ASME Y14.100-2004

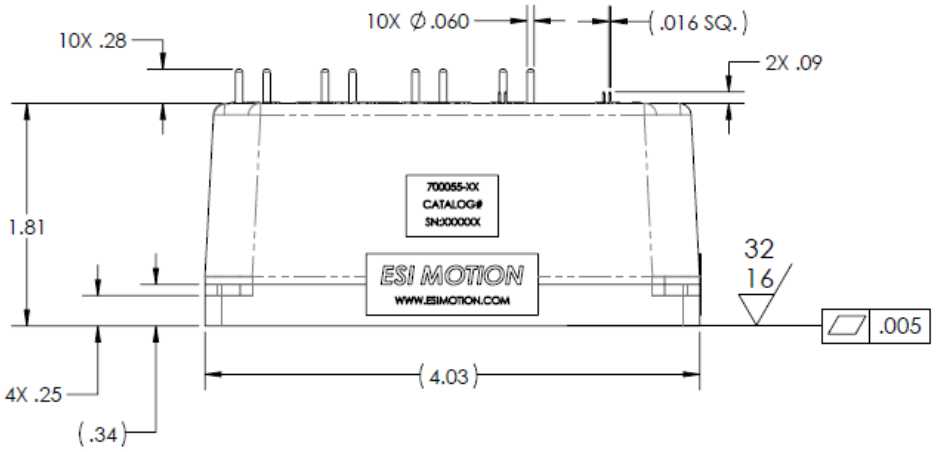
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/64
ANGULAR: MACH ± .5° BEND ± 1
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005

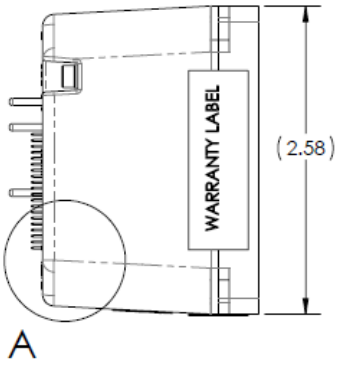
SCALE: 1:1

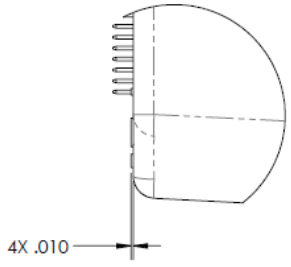
Mechanical – Scorpion Dual Axis

SCORPION MODULE ONLY



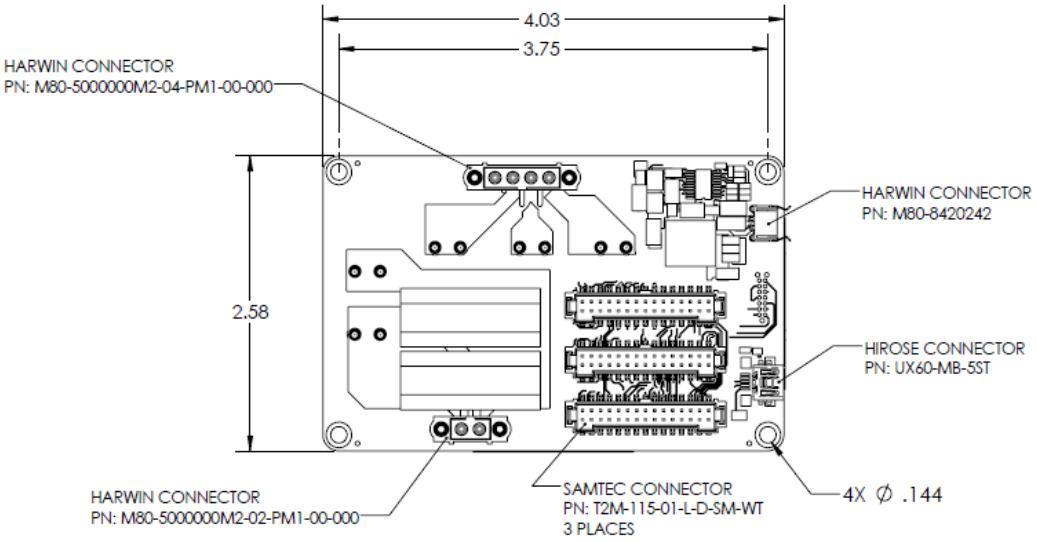


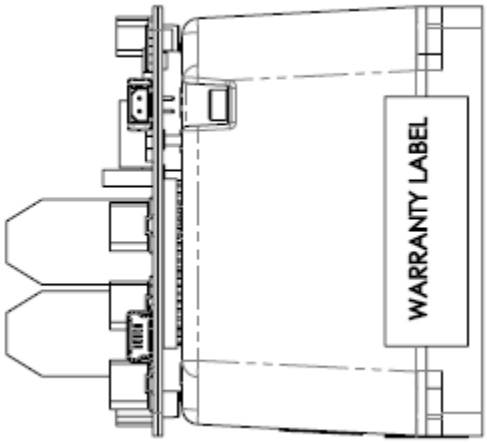


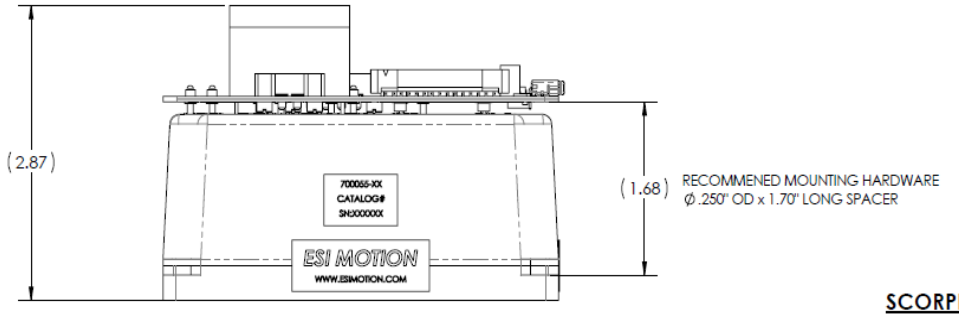


DETAIL A
SCALE 2 : 1

Mechanical – Scorpion Dual Axis







SCORPION MODULE WITH I/O PCBA

Mechanical – Scorpion Dual Axis

RECOMMENDED MATING CONNECTORS FOR THE I/O PCBA

J1
HARWIN PN: M80-4000000F1-04-PF5-00-000

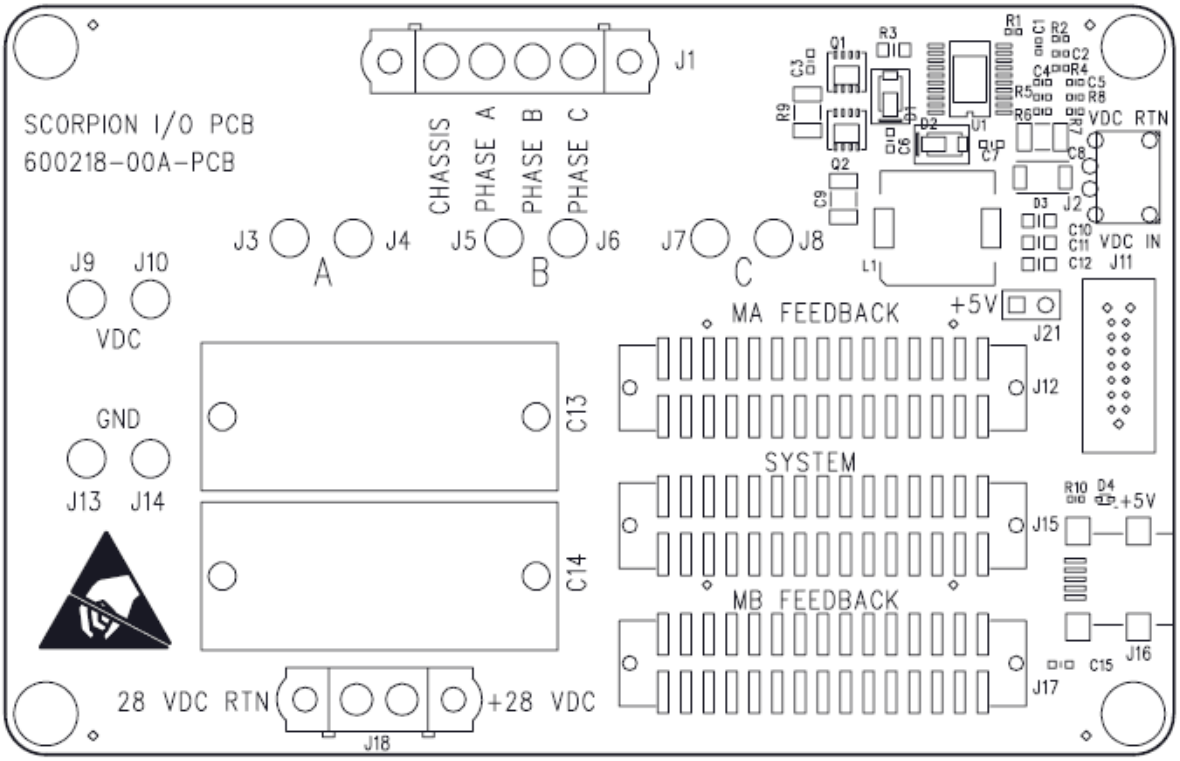
J2
HARWIN PN: M80-8980205

J18
HARWIN PN: M80-4000000F1-02-PF5-00-000

J12, J15, J17:
SAMTEC PN: S2SDT-15-24-L-12.00-SR, CABLE ASSEMBLY

J16:
ANY MINI-USB MATING CONNECTOR

SCORPION I/O PCBA



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Ordering Information

S XXA YYYV P D -I

Servo Drive	Continuous Motor Current*	Voltage	Case	Configuration	Options
S-Scorpion	05 –5A 10 – 10A 20 – 20A 40 – 40A 60 – 60A	300 – 300V 600 – 600V	P-Potted Plastic	S – Single Axis	- I Include I/O PCBA

* Peak of sine wave

Example:
Part Number: S40A600VPS-I
Servo Drive: Scorpion
Continuous Current: 40A
Nominal Voltage: 600V
Case: Potted Plastic

Configuration: Single Axis
Options:
-Include I/O PCBA

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Important Information:

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