

VEHICLE CONTROL MODULES

SAGE



SIMPLE INTEGRATION, PROGRESSIVE SOLUTIONS.

SAGE, ASI's intelligent Vehicle Control Module (VCM) empowers OEMs to engineer uncommonly unique power equipment capable of operating in diverse and harsh environments. SAGE's smart algorithms spawn dynamic performance correction, speed & stability control, vehicle run time maximization and advanced safety protocols protecting both user and equipment health.

Benchmark Features

Dynamic performance correction

Manage both Traction and Auxiliary Drives

Integrated Advanced Safety States

SAGE, as the "brain" of ASI's smart power equipment eco-system, is designed to integrate seamlessly, in a plug & play fashion with ASI High Power controllers.

ASI, one supplier for all your Power Equipment products.

- Zero-turn lawn mower with multiple deck motors
- Ride-on mower with multiple deck motors
- 4WD & 2WD golf-carts
- Sprayers & spreaders
- Skid steer
- Low-speed multi-drive vehicles with PTO or electric implements



Engineered in Canada

SIMPLE INTEGRATION, PROGRESSIVE SOLUTIONS.

SAGE



ADAPTABLE

Effortlessly adapt to a myriad of machine architectures, empowering OEMs to develop their unique vehicle feel & customer experience



ROBUST

Enables your customers to work in diverse temperatures and harsh industrial environments



SAFE

Incorporates purposeful pre-configured safety state machines to safeguard both the operator & the equipment



SMART

Intelligent control for multiple electric drive technology applications

<p>Smart collection of vehicle state information regulates drive operation remotely using CAN communication</p>	<p>Reliable, safe real-time control of the vehicle delivering improved performance, run-time & cost savings for end-users.</p>	<p>Compatibility with numerous traction drive configurations</p>	<p>Single Hub with Foot Throttle Dual Hub with Foot Throttle Dual Hub with Steering Sensor Dual Hub with Independent Throttles Quad Hub with Foot Throttle</p>
<p>Pre-charger</p>	<p>Minimizes component stress during power-up and avoids overcurrent trips of the BMS due to large in-rush currents to downstream high capacitance devices.</p>	<p>Coordination of Traction, Auxiliary drives, and Inputs</p>	<p>Automatically slowing down traction drives through heavy grass. Idle deck speeds when mower has stopped for 5 seconds. Slow down and speed up deck based on traction speed to improve battery efficiency. Perform safety functions such as seatbelt and parking brake interlock, automatic brake applications, disable PTO etc. Enable drive mode selection features such as push to pass, speed limiting, throttle management.</p>
<p>Smart Faults disable only necessary systems</p>	<p>An auxiliary drive fault will still allow the operator to drive the vehicle.</p>		

SAGE SPECIFICATIONS

HARDWARE #10-000855

Nominal input voltage	36 V to 48 V
Recommended lower voltage limit	30 V
Absolute maximum operating voltage	54.6 V
Current consumption	Off = 0 A Idle ≈ 0.01 A Max = 4 A (based on Vbatt-1 & Vbatt-2 input limits)
Operating temperature range	-30 °C to 50 °C
Storage temperature range	-20 °C to 80 °C
Ingress protection	IP66 with fully populated connectors
Communication protocols & quantity	2x ASI CANopen, 1x TTL-232, 1x Bluetooth

INPUT SPECIFICATIONS

TYPE	QUANTITY	LOGIC			ELECTRICAL LIMITS	
		TYPE	Vin.min	Vin.max	CURRENT	TRANSIENT VOLTAGE
Digital 5V, pulled-up, active low	6	Vin.low	n/a	0.37 V	n/a	57 V
		Vin.high	1.79 V	n/a		
Digital 5V, pulled-down, active high	2	Vin.low	n/a	1.65 V	n/a	57 V
		Vin.high	4.25 V	n/a		
Digital VBat+, pulled-down, active high	2	Vin.low	n/a	11.5 V	n/a	57 V
		Vin.high	29.6 V	n/a		
0-5V analogue	6	Vin.high	n/a	5.5 V	n/a	57 V
0-12V analogue	1	Vin.high	n/a	12.6 V	n/a	57 V
0-60V analogue	1	Vin.high	n/a	69.1 V	n/a	70 V
Key-in	1	VBat+	30 V	54.6 V	2 A	57 V
CAN-H, CAN-L	1	5V	n/a	n/a	n/a	±58 V
TTL-Tx	1	5V	n/a	n/a	n/a	57 V
TTL-Rx	1	5V	n/a	n/a	n/a	57 V
Battery	2	Battery Positive, VBat+	30 V	54.6 V	2 A each	57 V
	3	Ground	n/a	n/a	Not limited	n/a

OUTPUT SPECIFICATIONS

TYPE	QUANTITY	NOMINAL OUTPUT	ELECTRICAL LIMITS	
			CURRENT	TRANSIENT VOLTAGE
Pre-charger	1	VBat+	1.1 A	57 V
Switched B+ output	2	VBat+	1 A Each	57 V
12V output	1	12 V	5 A	5 A Shared
12V Switched (PWM) output	1	12 V	1 A	
5V output	2	5 V	0.5 A Shared	
Inductive Low-side PWM switches	2	0 V	2 A Each	Contact ASI
Resistive Low-side PWM switches	3	0 V	2 A Each	Contact ASI
Resistive Low-side PWM switches (requires key-in)	1	0 V	2 A	Contact ASI
Key-out	1	VBat+	2 A	57 V

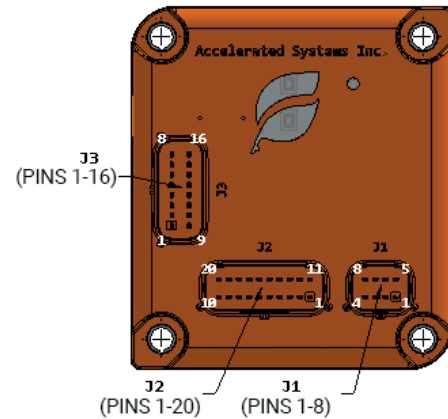
• All specifications are for an ambient temperature of +25°C, unless otherwise specified and are subject to change without notice.

SAGE SPECIFICATIONS

PIN-OUT

J1 - PRIMARY - MX150 8 PIN DUAL ROW –MATING CONNECTOR:
 MX150 8 PIN DUAL ROW FEMALE CONNECTOR, MOLEX P/N 33472-4806

PIN	FUNCTION	ELECTRICAL LIMITS		SPECIFICATIONS
		CURRENT	TRANSIENT VOLTAGE	
1	Key-In	2 A	57 V	From key, for ON/OFF state measurement only
2	Key-Out	2 A	57 V	Diode from Key-In, for pack ignition
3	VBat+ Input 1	2 A	57 V	VCM battery power input (36 V to 48 V nominal)
4	VBat+ Input 2	2 A	57 V	VCM battery power input (36 V to 48 V nominal)
5	Pre-Charge Out	1.1 A	57 V	PWM bus cap pre-charge output, 2 A capable
6	CAN-L	n/a	±58 V	
7	CAN-H	n/a	±58 V	5 V supply
8	VBat-	Not limited	n/a	Battery ground



J2 - INPUTS - MX150 20 PIN DUAL ROW – MATING CONNECTOR:
 MX150 20 PIN DUAL ROW FEMALE CONNECTOR, MOLEX P/N 33472-2001

PIN	FUNCTION	ELECTRICAL LIMITS		SPECIFICATIONS
		CURRENT	TRANSIENT VOLTAGE	
1	5V output	0.5 A	n/a	0.5 A Shared with all 5V output
2	Analog 1A	n/a	57 V	0-5 V, can be redundant pair with 1B
3	Analog 2A	n/a	57 V	0-5 V, can be redundant pair with 2B
4	Analog 3A	n/a	57 V	0-5 V, can be redundant pair with 3B
5	Analog 1B	n/a	57 V	0-5 V, can be redundant pair with 1A
6	Analog 2B	n/a	57 V	0-5 V, can be redundant pair with 2A
7	Analog 3B	n/a	57 V	0-5 V, can be redundant pair with 3A
8	Analog 4	n/a	57 V	0-12 V
9	Analog 5	n/a	70 V	0-60 V
10	Input Ground	Not limited	n/a	
11	Digital 1A	n/a	57 V	Active low, pulled high, can be redundant pair with 1B
12	Digital 2A	n/a	57 V	Active low, pulled high, can be redundant pair with 2B
13	Digital 3A	n/a	57 V	Active low, pulled high, can be redundant pair with 3B
14	Digital 4A	n/a	57 V	Active high (5 V), pulled low, can be redundant pair with 4B
15	Digital 5A	n/a	57 V	Active high (VBat+), pulled low, can be redundant pair with 5B
16	Digital 1B	n/a	57 V	Active low, pulled high, can be redundant pair with 1A
17	Digital 2B	n/a	57 V	Active low, pulled high, can be redundant pair with 2A
18	Digital 3B	n/a	57 V	Active low, pulled high, can be redundant pair with 3A
19	Digital 4B	n/a	57 V	Active high (5 V), pulled low, can be redundant pair with 4A
20	Digital 5B	n/a	57 V	Active high (VBat+), pulled low, can be redundant pair with 5A

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SAGE SPECIFICATIONS

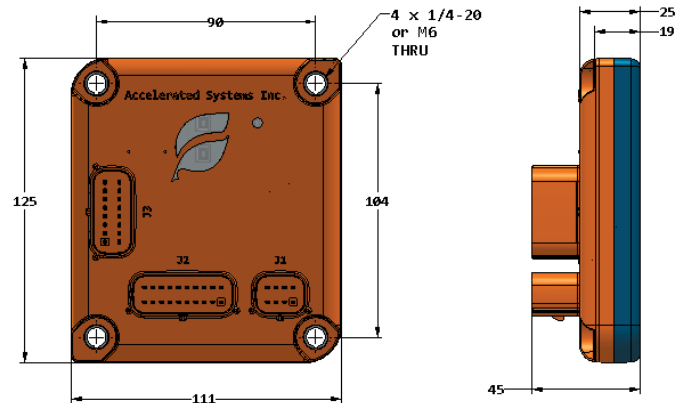
PIN-OUT CONTINUED

J3 - AUXILIARY - MX150 16 PIN DUAL ROW – MATING CONNECTOR:
 MX150 16 PIN DUAL ROW FEMALE CONNECTOR, MOLEX P/N 33472-1601

PIN	FUNCTION	ELECTRICAL LIMITS		SPECIFICATIONS
		CURRENT	TRANSIENT VOLTAGE	
1	12V Out	5 A	n/a	5 A Shared with all 12 V outputs.
2	Switched 12V	1 A	n/a	Switched on/off, or PWM. 5 A Shared with all 12 V outputs
3	5V Out	0.5 A	n/a	0.5 A Shared with all 5 V outputs
4	TTL-Tx	n/a	57 V	5 V TTL
5	TTL-Rx	n/a	57 V	5 V TTL
6	CAN-L	n/a	±58 V	
7	CAN-H	n/a	±58 V	5 V supply
8	Auxiliary Ground	Not limited	n/a	
9	Low-side 1	2 A	Contact ASI	Hardware disabled when Key = OFF. 8 A shared between all Low-side outputs. PWM capable. Resistive
10	Low-side 2	2 A	Contact ASI	8 A shared between all Low-side outputs. PWM capable. Resistive.
11	Low-side 3	2 A	Contact ASI	8 A shared between all Low-side outputs. PWM capable. Resistive
12	Low-side 4	2 A	Contact ASI	8 A shared between all Low-side outputs. PWM capable. Resistive.
13	Low-side 5	2 A	Contact ASI	8 A shared between all Low-side outputs. PWM capable. Inductive.
14	Low-side 6	2 A	Contact ASI	8 A shared between all Low-side outputs. PWM capable. Inductive.
15	Switched VBat+ Output 1	1 A	57 V	
16	Switched VBat+ Output 2	1 A	57 V	

DIMENSIONS AND WEIGHT

Dimensions (LxWxH)	125 mm x 111 mm x 45 mm
Weight	275 g ± 5%
Mounting pattern	4 through holes, 104 mm x 90 mm
Maximum recommended bolt diameter	¼" or M6
Maximum recommended torque	Up to 100 in-Lbf, based on ¼"-20 Grade 5, dry torque spec Up to 10.4 N-m, based on M6x1 Class 8.8, dry torque spec



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