48 V, 72V 15 kW

For Light Electric Vehicle

Automotive Inverter

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Product Overview

SAYKAL Inverter is an innovative solution designed by SAYKAL Electronics to meet the energy efficiency demands of various vehicle applications. This compact and integration-friendly inverter is engineered to optimize electric vehicle battery utilization, seamlessly fitting into the architecture of passenger cars, buses, and light electric vehicles (LEVs). With advanced control features, it ensures peak performance and smart energy management, ultimately enhancing your vehicle's efficiency.

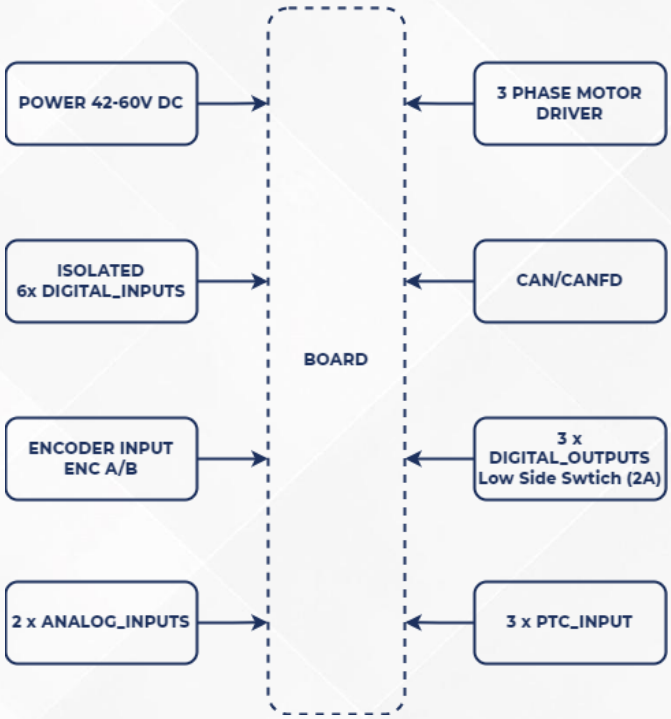
Applications

- Electric Vehicles - EVs
- Hybrid Electric Vehicles - HEVs
- Industrial Drive
- Battery powered vehicles
- Mobile elevating platforms

Hardware Features

- 42V – 100V DC Input Voltage
- Max Phase Current 600A (60 seconds)
- Max Input Current 350A
- Rated Power 15kW
- Efficiency > **0,97 η**
- Reverse Connection Protection AUTOMOTIVE
- CAN / FDCAN
- Temperature Sensing
- ECE R10 compliant
- ASIL-B Functional Safety Level
- IP67 Class Protection

Functional Block Diagram



Software Features

- Firmware Update with CAN Bus
- Control over CANBus
- Monitor over CANBus
- Regenerative braking
- Speed mode
- Torque mode
- Hill start assist.
- Sleep mode
- Sensored and Sensorless drive mode
- Reverse Protection Control
- Over Current/Voltage/Temperature Control
- Under Voltage Control
- Phase & Balance Error Control
- Open Phase Control

Cyber Security & Functional Safety Features

C2000 Real-Time Microcontrollers Family

Security:

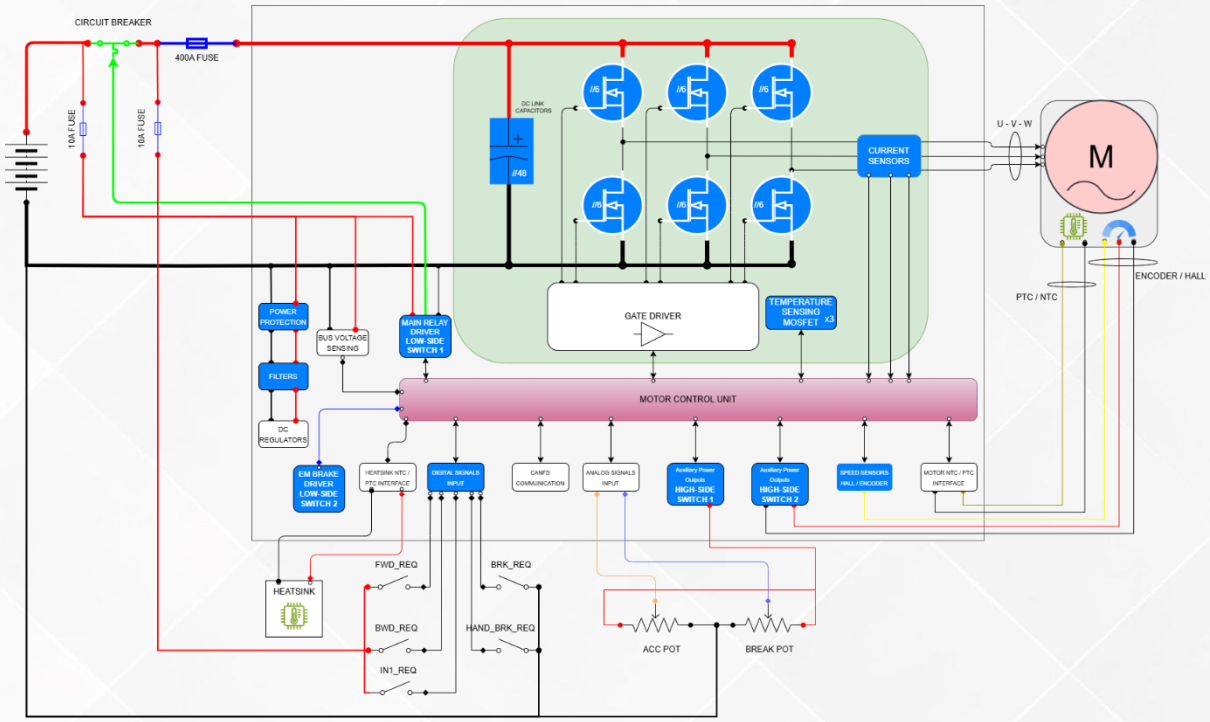
- JTAGLOCK
- Zero-pin boot
- Dual-zone security

Functional Safety-Compliant

- Developed for functional safety applications
- Documentation available to aid ISO 26262 and IEC 61508 system design
- Systematic capability up to ASIL-D and SIL 3
- Hardware capability up to ASIL-B and SIL 2

Technical Details

Block Diagram



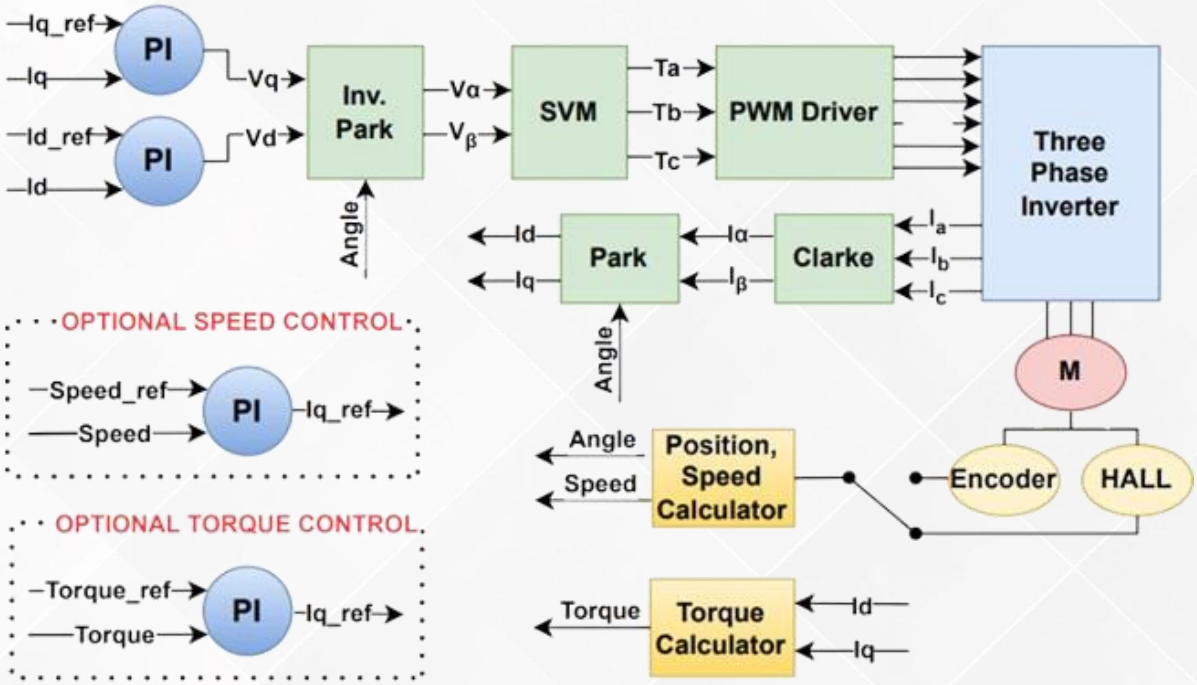
Topologies

The motor driver is configured in a 3-phase full-bridge inverter topology.

CANBUS Communication

The detailed DBC file, which defines the CANBUS communication structure, message formats, and signal mappings, is available and in our possession.

Motor Control Diagram

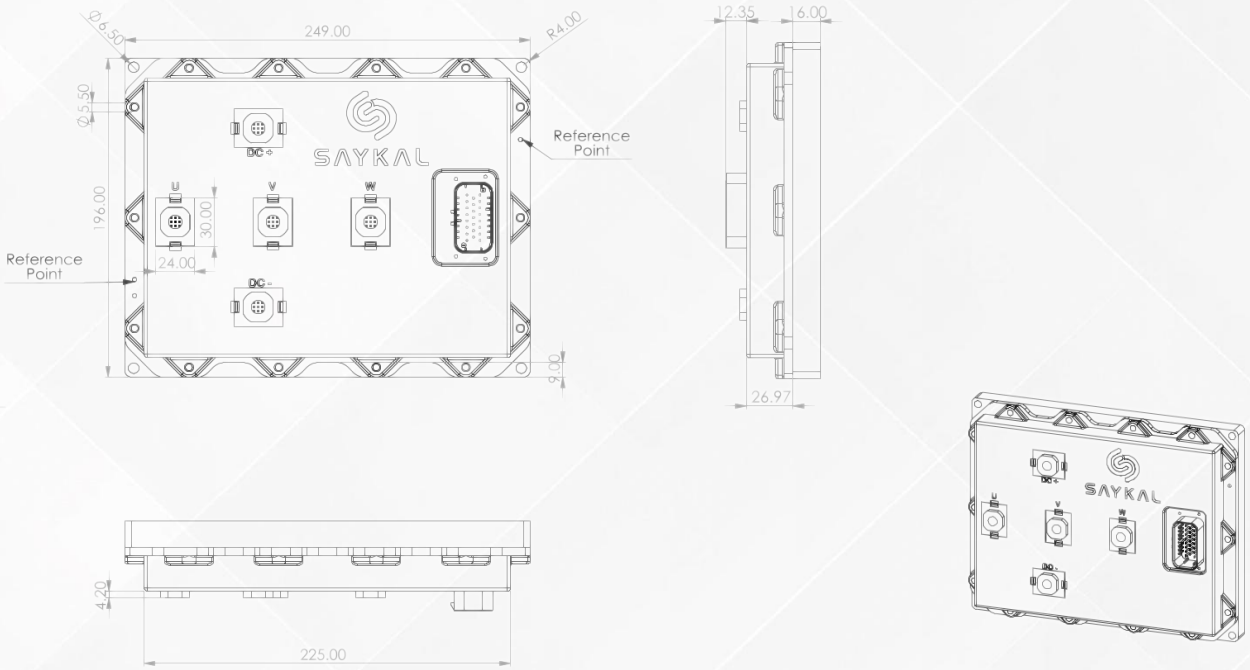


Weights And Dimensions

Weights

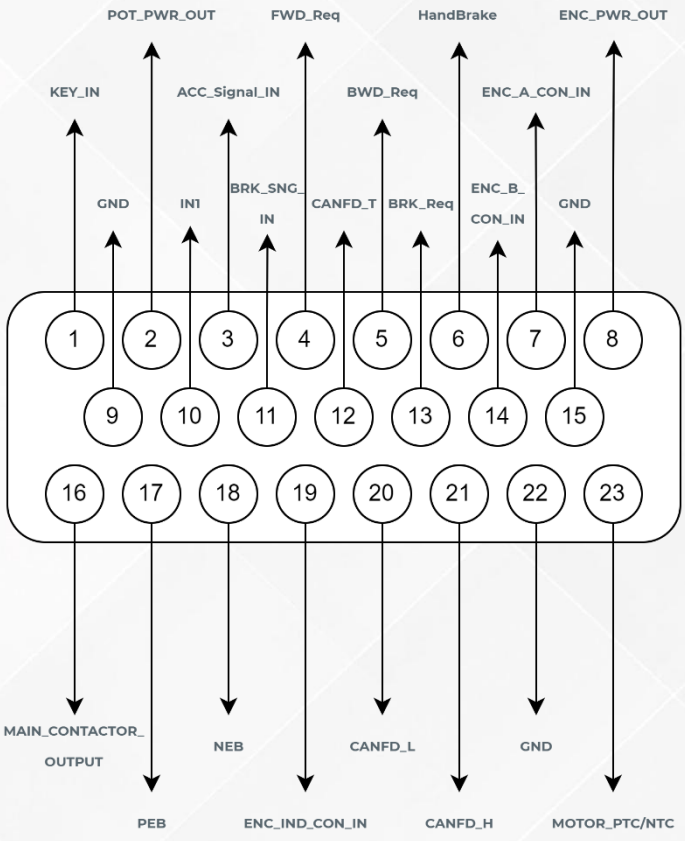
Item	Weight
Board	650
Heat Sink	1950
Case	370
Total Weights	**2970**

Dimensions



Pin Out / Pin Names and Descriptions

PIN	NAME	DESCRIPTION
1	KEY_IN	Key Input - Low Current Power Side Power In
2	POT_PWR_OUT	Potentiometer Power Output
3	ACC_Signal_IN	Accelerator Signal Input
4	FWD_Req	Forward Request
5	BWD_Req	Backward Request
6	HandBrake (Seat)	Handbrake Signal (Seat Interlock), Hall U
7	ENC_A_CON_IN	Encoder Channel A Connection Input
8	ENC_PWR_OUT	Encoder Power Output
9	GND	Ground
10	IN1	Input 1
11	BRK_SNG_IN	Brake Signal Input
12	CANFD_T	CAN FD Termination
13	BRK_Req	Brake Request
14	ENC_B_CON_IN	Encoder Channel B Connection Input, Hall V
15	GND	Ground
16	MAIN_CONTACTOR_OUTPUT	Main Contactor Output
17	PEB	Positive Electric Brake
18	NEB	Negative Electric Brake
19	ENC_IND_CON_IN	Negative Voltage Protection, Encoder Index, Hall W
20	CANFD_L	CAN FD Low
21	CANFD_H	CAN FD High
22	GND	Ground
23	MOTOR_PTC/NTC	Motor PTC/NTC Sensor



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Test and Result

Test

Test Target: Temperature performance test under rated current operation.

Test Condition: The test was performed using a passive load.

Parameter	Value	Comment
Vdc	48 V, 72V	DC bus voltage
Fs	50 Hz	Phase output frequency
Iph	260 A	RMS phase current
Vgd	10 V	Gate drive supply voltage
Tam	25 °C	Actual ambient temperature before the test

Result

As a result of the test, no excessive temperature or hotspot was observed in the MOSFETs and other components. The test was successful.

Absolute Maximum Ratings

ABSOLUTE MAXIMUM RATINGS (Tamb = 25 °C, unless otherwise noted)

ELECTRICAL PARAMETER	LIMITS	UNIT
Maximum Input Voltage	100	V
Maximum Current	600	A RMS
Maximum Digital Input Voltage	60	V
Maximum Analog Input Voltage	36	V
Maximum Low Side Output	2.8	A
Maximum High Side Output	0.5	A

ELECTRICAL CHARACTERISTICS (Tamb = 25 °C, unless otherwise noted)

PARAMETER	MIN	TYP	MAX	UNIT
Input Voltage (48V Version)	42	48	58	V
Input Voltage (72V Version)	60	72	90	V
Rated Current		350		A
Digital Input Voltage	5	12	24	V
Analog Input Voltage		12	24	
Low Side Output		0.2	2	A

SAFETY AND INSULATION RATINGS

PARAMETER	TEST CONDITION	VALUE	UNIT
Insulation Resistance	@500 V	20	MOhm
Dielectric Strength	@60 sec	1.2	kV

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