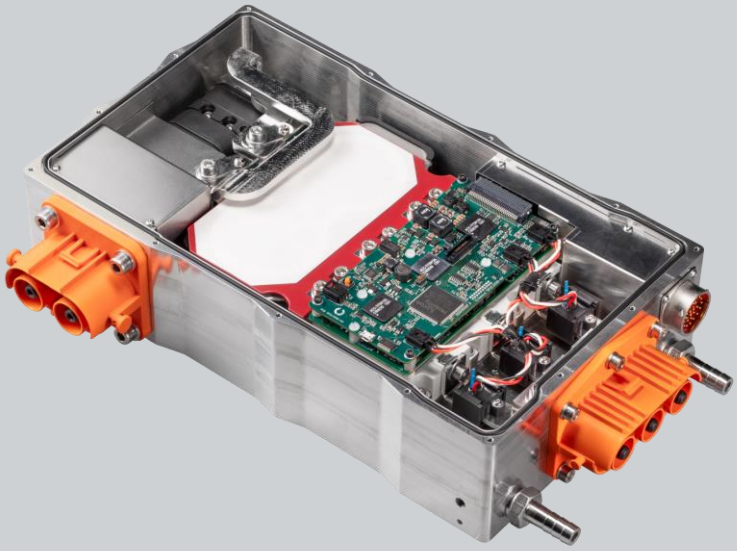
On-Board
SiC INVERTER
REFERENCE DESIGN

CISSOID
POWER SEMICONDUCTORS



The high power density, easily configurable On-Board SiC Inverter Reference Design, has been developed to be one step closer to production-ready. This reference design is targeted for in-vehicle and field testing, further accelerating time-to-market and reducing engineering required to achieve a functional electric drive train.

With a broad voltage and power range, based on the modular SiC inverter platform, it provides a very flexible solution for new electric drive trains that need to operate in harsh environments, like off-road and high performance automotive, avionics, marine and many other applications.

Key Specifications
- Output power: 100 up to 350kW$_{PEAK}$
- Bus voltage: 100 up to 850V$_{PEAK}$
- High power density: up to 50kW/litre

Key Features
- 3-phase 1200V SiC power module
- Ultra-fast OLEA® T222 FPCU control board
- Customizable OLEA® APP Inverter software
- DC and phase current sensors
- DC link capacitor & EMI filter
- Liquid cooling

INVERTER SOFTWARE
- Field Oriented Control (FoC)
- High control loop and switching frequencies (up to 50kHz)
- Advanced modulations (SVPWM, DPWM)
- Flux Weakening for extended speed
- Optimized Dead Time Compensation
- Improved Total Harmonics Distortion (THD)
- Reduced HVDC Link Voltage Ripple

FUNCTIONAL SAFETY
- OLEA® T222 processor & software: ISO26262 ASIL-D and AUTOSAR 4.3 certified
- Inverter Control Module: Designed for ISO-26262 ASIL-D (certification ongoing)

CALIBRATION AND DEBUG
- 1 x Programming and Configuration Connector (Lauterbach Trace interface)
- 1 x SWD debug interface

STANDARD INTERFACE
- 1 x CAN Flexible data rate interface up to 8 Mbit/s
- 1 x CAN High speed rate interface up to 1 Mbit/s
- 1 x Motor temperature measurement with signal conditioning circuitry for PT100/PT1000/KTY84 and NTC sensor.
- 1 x Resolver interface (EXC/SIN/COS)
- 1 x Battery input connection
- 1x HVIL input connection
- 2 x Digital input signals
- 1 x Digital output signal
- Spare: 1x Analog or Digital input signal

OPTIONAL INTERFACES
- 1 x USB connection
- 1 x Quadrature encoder interface (A/B/I)
- 3 x Digital Hall effect interface
- 5 x Analog input signals
- 6 x Digital input signals
- 6 x Digital output for relay interfaces
- 2 x Auxiliary 5V

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Inverter characteristics	Values	Units
DC Bus Voltage - operating	100 to 800	V_{DC}
Maximum DC Bus Voltage non-operating	850	V_{DC}
Maximum Phase Current - Steady State - Amphenol HVSL1 3phase connector - *TE HVP-HD1400 3phase connector*	 250 *320**	A_{RMS}
Maximum Phase Current - Peak (60s)	565	A_{PEAK}
Maximum Output Power – Steady State - Amphenol HVSL-1000 3phase connector - *TE HVP-HD1400 3phase connector*	 245 *300**	kW
Maximum Output Power – Peak (60s)	350	kW
Output Frequency	100 to 2000	Hz
Inverter PWM frequency	10 to 50**	kHz
DC link capacitor	135 - 500	µF
DC Bus Discharge Time (passive)	<60	s
Vehicle Battery Voltage Supply	6 to 36	V_{DC}
Operating Temperature Range (coolant)	-40 to +65	°C
Coolant Flow Rate	2 to 20	litre/min
3-phase connector (Amphenol HVSL1000023A1H8)	IP69K / 1kV / 250A HVIL	
Battery connector (Amphenol HVSL1400022A1D8S6)	IP67 - IP6K9K / 1kV / 430A HVIL	
Dimensions (outline)	381 x 220 x 90	mm
Dimension (volume)	6.73	litre
Power density (Steady State)	36	kW/litre
Power density (60s peak)	52	kW/litre
Inverter Peak Power Efficiency @ 210kW, 700V, 275ARMS, 10kHz @ 50kW, 700V, 100ARMS, 10kHz	> 99 99.1 99.6	%

* *Design modifications required*
** *Output power derating versus PWM frequency*

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