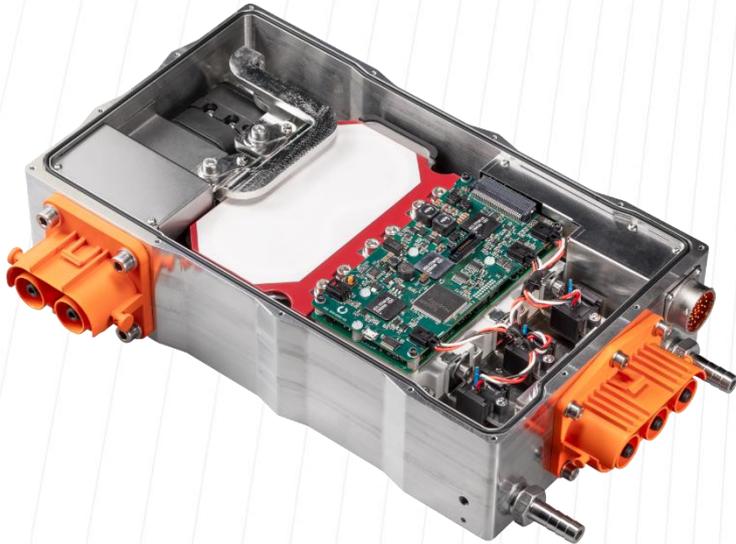


On-Board SiC INVERTER REFERENCE DESIGN



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: up to 463kW_{PEAK}
- Bus voltage: up to 900V_{PEAK}
- High power density: up to 69kW/litre

KEY FEATURES

- 3-phase 1200V SiC power module
- Ultra-fast ACU T222 based control board
- Customizable AC APP T222 Inverter software
- DC and phase current sensors
- DC link capacitor & EMI filter
- Liquid cooling



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POWER SEMICONDUCTORS

INVERTER SOFTWARE

- FIELD ORIENTED CONTROL (FOC)
- HIGH CONTROL LOOP AND SWITCHING FREQUENCIES (UP TO 50kHz)
- ADVANCED MODULATIONS (SVPWM, DPWM, OPP)
- FLUX WEAKENING FOR EXTENDED SPEED
- OPTIMIZED DEAD TIME COMPENSATION
- IMPROVED TOTAL HARMONICS DISTORTION (THD)
- REDUCED HVDC LINK VOLTAGE RIPPLE

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 (PT100/PT1000/KTY84/NTC)
- 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

FUNCTIONAL SAFETY

- ACU T222 PROCESSOR & SOFTWARE:
ISO 26262 ASIL-D CERTIFIED
- INVERTER CONTROL MODULE:
ISO 26262 ASIL-C READY CERTIFIED



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On-board SiC INVERTER REFERENCE DESIGN

EVK-PLA1060 characteristics	Values	Units
DC Bus Voltage (operating)	50 to 850	V _{DC}
Maximum DC Bus Voltage (incl ripple)	900	V _{DC}
Maximum Phase Current - Steady State (Amphenol HVSL-1000 3phase connector)	250 ⁽¹⁾	A _{RMS}
Maximum Phase Current - Peak (60s)	670 ⁽²⁾	A _{PEAK}
Maximum Output Power – Steady State (Amphenol HVSL-1000 3phase connector)	245 ⁽¹⁾	kW
Maximum Output Power – Peak (60s)	463 ⁽²⁾	kW
Output Frequency	100 to 2000	Hz
Inverter PWM frequency	up to 50 ³	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)	69	kW/litre
Inverter Peak Power Efficiency @ 199kW, 700V, 275ARMS, 10kHz @ 50kW, 700V, 100ARMS, 10kHz	> 99 99.1 99.6	%

1. Current limit imposed by connector
2. Limited by current sensing
3. Output power derating versus PWM frequency