

150 kVA 3-phase SiC Power Stack Reference Designs

SOLUTIONS FOR POWER MANAGEMENT

STACK REFERENCE CUT SHEET

COOLED, CONNECTED,
PROTECTED, FILTERED
AND ASSEMBLED BY:

MERSEN

POWERED BY:



or



or

SEMIKRON

CONTROLLED BY:



Mersen SiC Power Stack reference designs help inverter designers save time and confusion in selecting individual components and can greatly benefit from a solution that is optimally pre-designed for their specific application.

FEATURES*

- 16 kW/L power density
- Up to 130°C Tj
- Peak efficiency 98%
- SiC MOSFET power modules:
 - Microchip® MSCSM120AM042CD3AG
 - or Wolfspeed® CAS300M12BM2
 - or Semikron® SKM350MB120SCH17
- AgileSwitch® 2ASC-12A1HP Gate Driver core
- 700 V_{DC} / 200 A_{RMS}
- Compact water cooled
- Up to 20 kHz switching Frequency

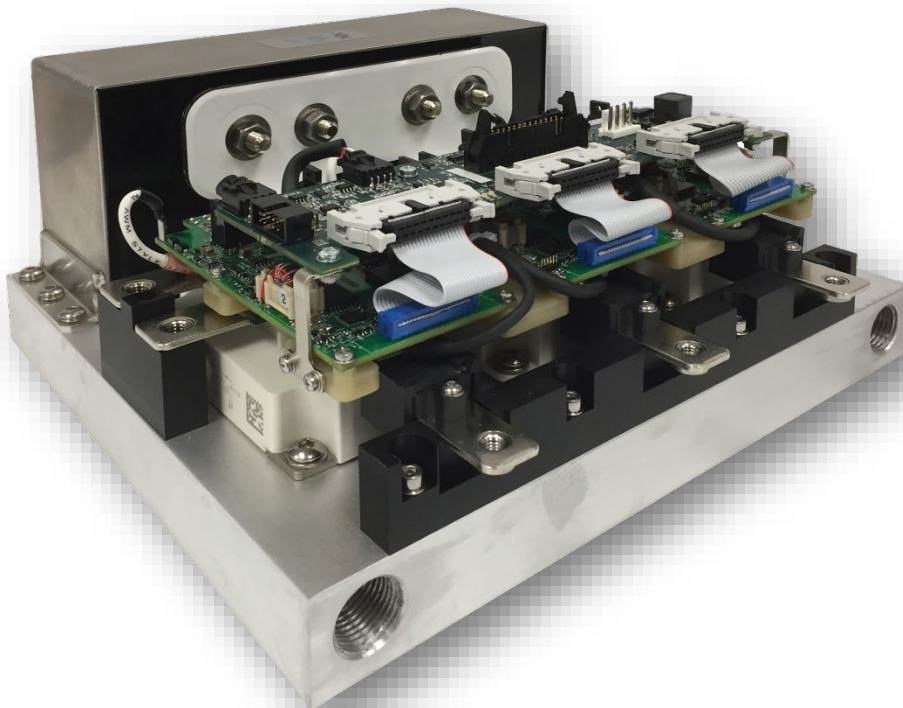
BENEFITS

- Power modules, Bus bar, Cooling, Gate drivers and Capacitors can now be optimally designed together in one step to answer electrical, mechanical and thermal challenges of the system.

APPLICATIONS

- E-Mobility
- DC smart grid
- Industrial
- Renewable energies

*: Customization or derating can be studied on request



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TECHNICAL SPECIFICATIONS

Electrical		Min	Typ.	Max	Unit
Modules	3x SiC MOSFET half-bridge modules (Microchip®, Wolfspeed® or Semikron®)		1200		V
Vo	Three Phase Output Voltage, Vdc > 700V		480		V _{RMS}
Io	Flow: 4 l/min, Coolant: 50% Water/50% Glycol, Tcoolant = 70 C, Vdc = 700V, fsw = 15kHz		200		A _{RMS}
Vdc	DC Bus Voltage/ DC Supply Voltage		700	800	V
fsw	Switching frequency, PWM type	10	15	20	kHz
Cdc	DC Link Capacitor, 760uF, 1100V	0.65	0.7	0.75	mF
Cdd*	EMC decoupling capacitors		0.68		μF
Viso	Power Terminals to chassis, DC, 1 min		3000	4000	V

Cooling and Environment		Min	Typ.	Max	Unit
Tsto	Storage Temperature	-40		85	°C
Tair*	Ambient air temperature. See Note 1	-40		65	°C
T coolant	Coolant inlet temperature, derate > 70 °C	-40		105	°C
IP	Inclosure Ingress Protection		IP00		
dp	Pressure Drop, nominal flow 4 ltr/min		29		mbar
P	Power dissipated to liquid coolant		2400	3000	W
Altitude	Vdc = 800V			4000	m
Humidity	No condensation, Pollution Degree 2	5		85	%

Discharge of DC Bus (Optional)		Min	Typ.	Max	Unit
t _{dis}	No active discharge to Vdc < 50V			30	min
t _{adis}	With active discharge to Vdc < 50V			5	S

Control Interface	
Gate Driver	AgileSwitch 2ASC-12A1HP - 1200V Dual-Channel Augmented High Performance SiC Core

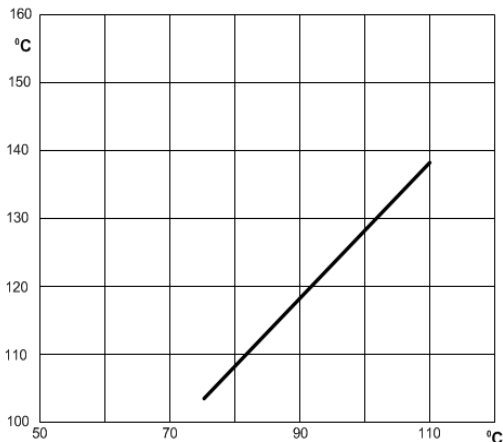
Mechanical		Min	Typ.	Max	Unit
Height			131		mm
Length			272		mm
Width			259		mm
Weight	Average value		18		kg
T _t	Fastener torque for power terminals		TBD		Nm
T ₁	Torque for TBD		TBD		Nm
Vibration	According to IEC60721			5	m/s ²
Shock	According to IEC60721			40	m/s ²

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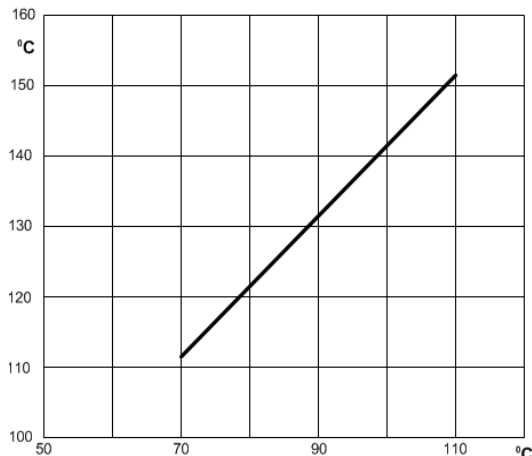
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COOLING PERFORMANCE

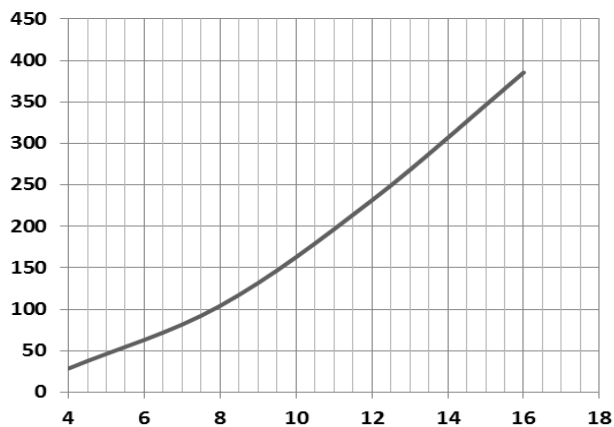
FET Tj vs Coolant inlet Temperature.
Rth = .012 K/W, Io = 200A, fsw = 15 kHz



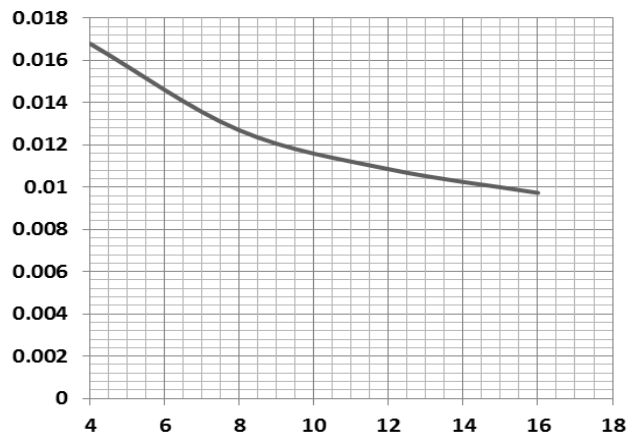
FET Tj vs Coolant inlet Temperature.
Rth = .0168 K/W, Io = 200A, fsw = 15 kHz



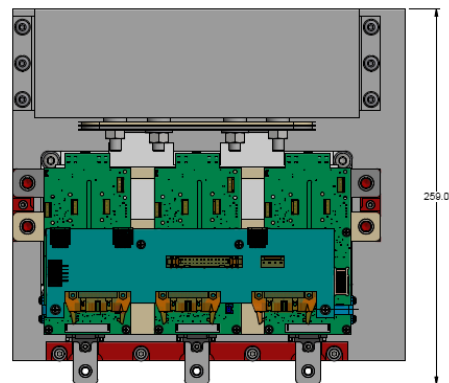
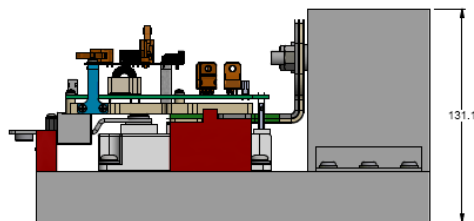
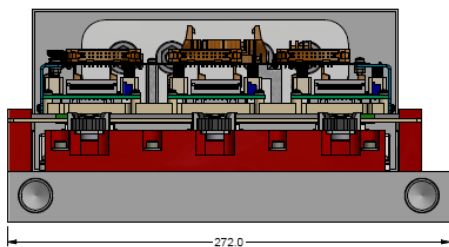
Pressure Drop, mBar, vs Flow Rate, liters/min



Cold Plate Rth, °C/W, vs Flow Rate, liters/min

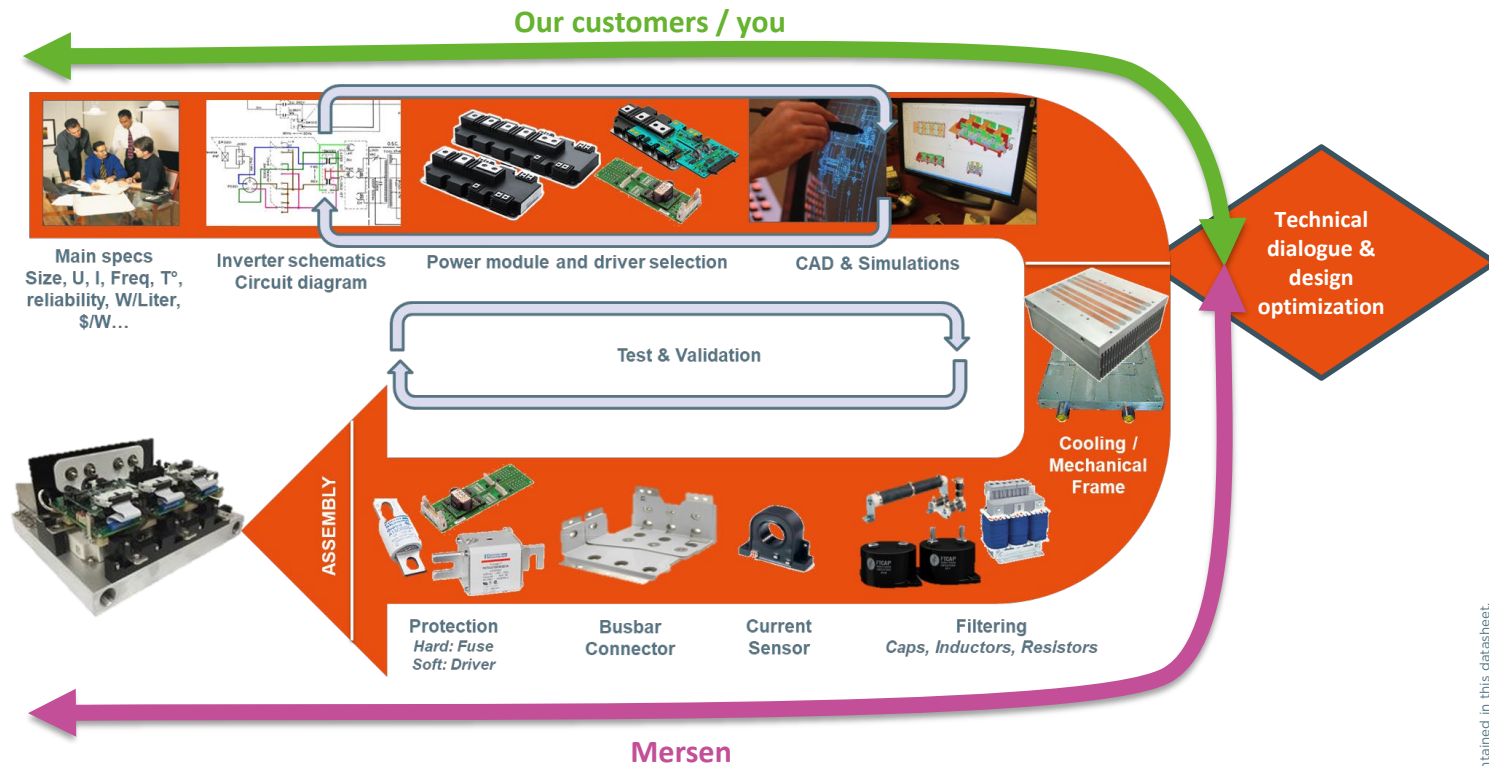


DIMENSIONS



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TYPICAL DESIGN CYCLE



TARGETED CUSTOMERS

- Inverter / Stack design-house and R&D lab with limited or no production capability.
- OEM / stack and inverter manufacturers: specialists and generalists
- System Integrators

POSSIBLE CUSTOMIZATION AND ADAPTATION (upon request)

- Overall dimensions and form-factor of the mechanical frame
- Bracket and hardware for integration
- SiC MOSFET module model and type
- 1700V SiC module
- Air-cooling (instead or liquid-cooled)
- Increase of F_{sw} , I_{nom} or V_{dc}
- Integration of output filter inductors
- Test and qualification
- Purchase of individual stand-alone components only (no assembly service)

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More information at: [inverterstack-design-optimization-assembly](https://www.mersen.com/inverterstack-design-optimization-assembly)

