

# 150 kVA 3-phase SiC Power Stack Reference Designs

SOLUTIONS FOR POWER MANAGEMENT

STACK REFERENCE CUT SHEET

COOLED, CONNECTED,  
PROTECTED, FILTERED,  
AND ASSEMBLED BY:



POWERED BY:



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

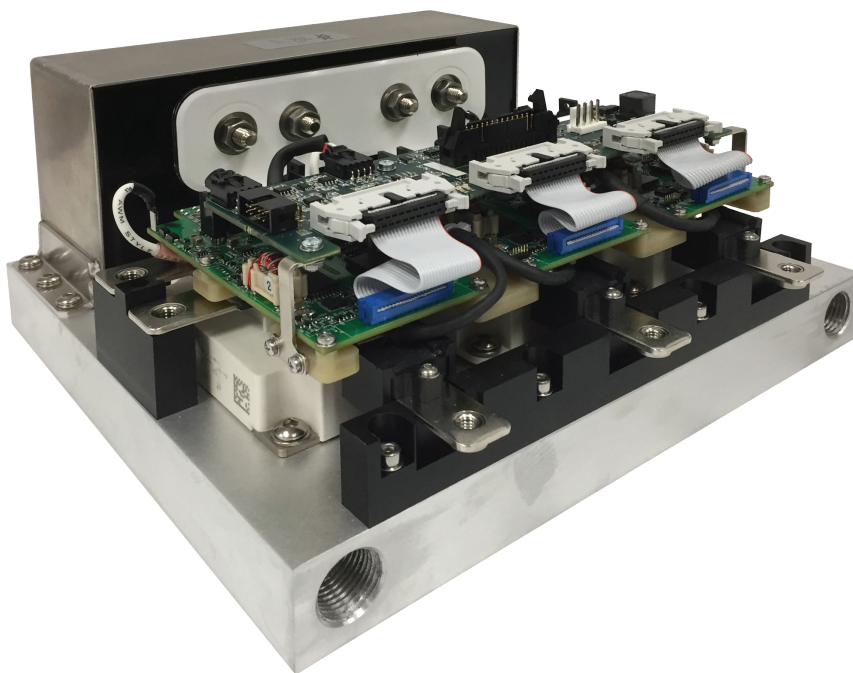
- 16 kW/L power density
- Up to 130°C T<sub>j</sub>
- Peak efficiency 98%
- SiC MOSFET power modules:
  - Microchip® MSCSM120AM042CD3AG
- AgileSwitch® 2ASC-12A1HP Gate Driver core
- 700 VDC / 200 A<sub>RMS</sub>
- Compact water cooled
- Up to 20 kHz switching frequency

## 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

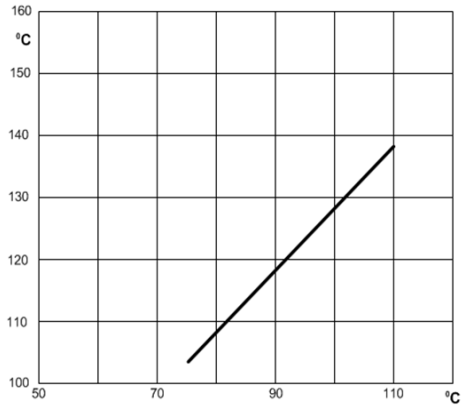


## TECHNICAL SPECIFICATIONS

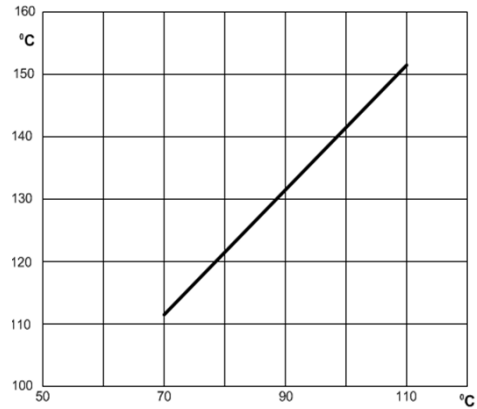
Electrical		Min	Typ.	Max	Unit
Modules	3x SiC MOSFET half-bridge modules (Microchip®)		1200		V
Vo	Three Phase Output Voltage, VDC > 700V		480		V <sub>RMS</sub>
Io	Flow: 4 l/min, Coolant: 50% Water/50% Glycol, Tcoolant = 70 C, VDC = 700V, fsw = 15kHz		200		A <sub>RMS</sub>
VDC	DC Bus Voltage/ DC Supply 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	Enclosure 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
tdis	No active discharge to VDC < 50V			30	min
tadis	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
Tt	Fastener torque for power terminals		TBD		Nm
T1	Torque for TBD		TBD		Nm
Vibration	According to IEC60721			5	m/s <sup>2</sup>
Shock	According to IEC60721			40	m/s <sup>2</sup>

## COOLING PERFORMANCE

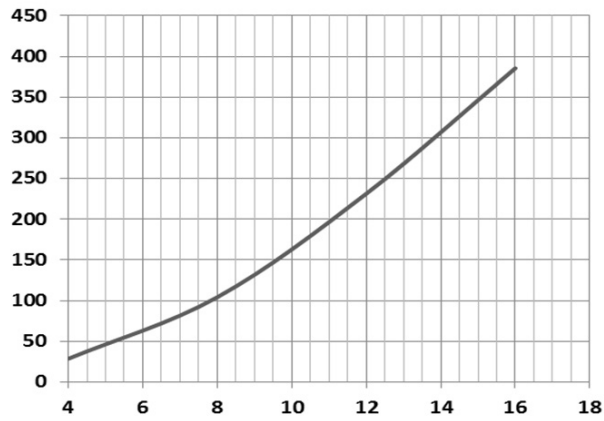
FET T<sub>j</sub> vs Coolant inlet Temperature.  
R<sub>th</sub> = .012 K/W, I<sub>o</sub> = 200A, f<sub>sw</sub> = 15 kHz



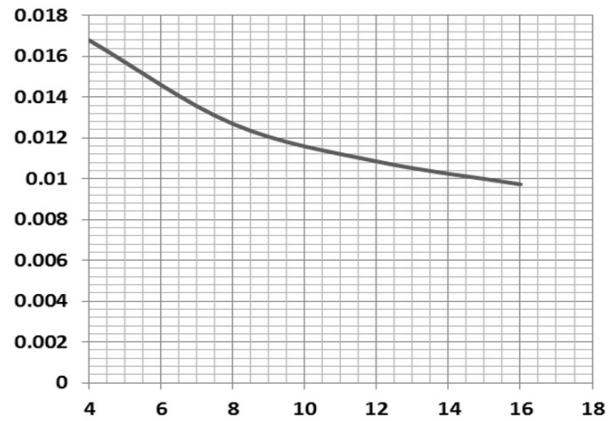
FET T<sub>j</sub> vs Coolant inlet Temperature.  
R<sub>th</sub> = .0168 K/W, I<sub>o</sub> = 200A, f<sub>sw</sub> = 15 kHz



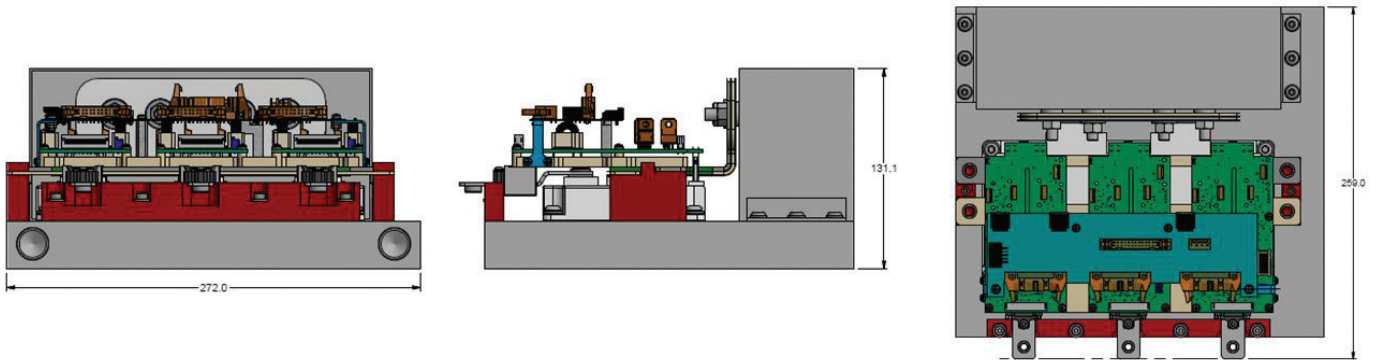
Pressure Drop, mBar, vs Flow Rate, liters/min



Cold Plate R<sub>th</sub>, °C/W, vs Flow Rate, liters/min

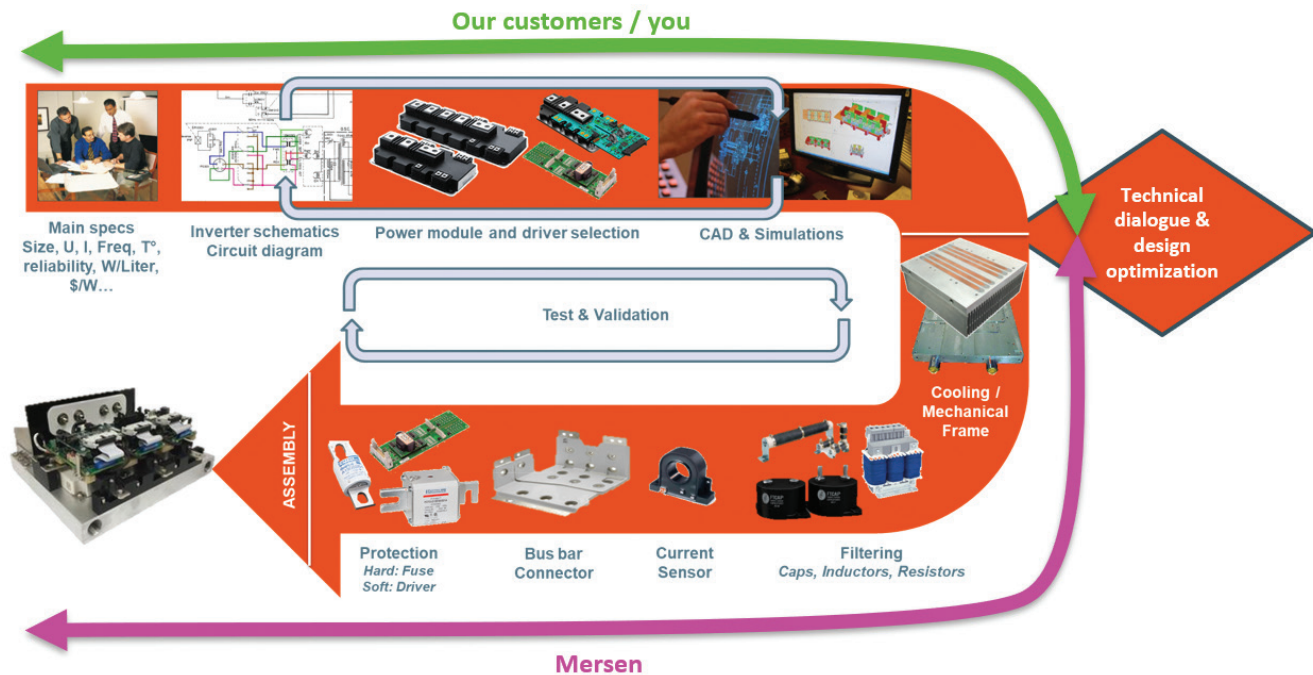


## DIMENSIONS



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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)

## CONTACT

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More information at:

<https://ep-us.mersen.com/products/engineering/inverterstack-design-optimization-assembly>

