150 kVA 3-phase SiC Power Stack Evaluation Kit

SOLUTIONS FOR POWER MANAGEMENT

STACK REFERENCE DATASHEET

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

POWERED BY:

CONTROLLED BY:









PART NUMBER: SIC-EVAL-KIT-150

Mersen SiC Power Stack Evaluation Kits 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 applications.

Part Number: SiC-Eval-Kit-150

FEATURES

- 16 kW/L power density
- Up to 130°C Tj
- Peak efficiency 98%
- SiC MOSFET power modules:
 - Microchip® MSCSM120AM042CD3AG
- AgileSwitch® 2ASC-12A1HP Gate Driver core
- 700 VDC / 200 A_{PMS}
- · 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

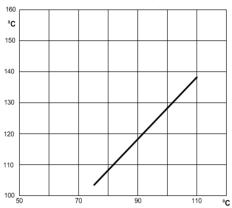
- E-Mobility
- · DC smart grid
- Industrial
- Renewable energies

TECHNICAL SPECIFICATIONS

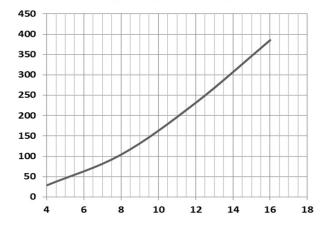
| Three Phase Output Voltage, VDC > 700V | Electrical | | Min | Тур. | Max | Unit |
|---|--------------------------------|--|-----------------|-----------|---------|------------------|
| Flow: 4 Irmin, Loolant: 5 UK Water/SUK Bilgrol, Tocolant: 7 DC, YDE 7 DC, YSW = 7 DC, YS | Modules | 3x SiC MOSFET half-bridge modules (Microchip®) | | 1200 | | V |
| Flow: 4 Irmin, Loolant: 5 UK Water/SUK Bilgrol, Tocolant: 7 DC, YDE 7 DC, YSW = 7 DC, YS | Vo | Three Phase Output Voltage, VDC > 700V | | 480 | | V _{RMS} |
| DC Bus Voltage/ DC Supply Voltage 700 800 V | lo. | | | 200 | | 1 |
| Switching frequency, PWM type | | | | | | |
| Cdc DC Link Capacitor, 760uf, 1100V 0.65 0.7 0.75 mF Cdd* EMC decoupling capacitors 0.68 µF µF Viso Power Terminals to chassis, DC, 1 min 3000 4000 V Cooling and Environment Min Typ. Max Unit Isto Storage Temperature. See Note 1 -40 65 °C Tair* Ambient air temperature. See Note 1 -40 65 °C Toolant Coolant inlet temperature, derate > 70°C -40 105 °C IPO Enclosure Ingress Protection IPO0 IPO0 IPO0 IPO0 dp Pressure Drop, nominal flow 4 ltr/min 29 mbar mbar P Power dissipated to liquid coolant 2400 3000 W Altitude VDC = 800V Min Typ. Max Unit tdis No active discharge to VDC < 50V | VDC | | | | | V |
| Cdd* EMC decoupling capacitors 0.68 µF 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 IPO Enclosure Ingress Protection IPO0 .40 .105 °C IPO Pressure Drop, nominal flow 4 ltr/min .29 | fsw | Switching frequency, PWM type | 10 | 15 | 20 | kHz |
| Visio Power Terminals to chassis, DC, 1 min 3000 4000 V Cooling and Environment Min Typ. Max Unit Tisto Storage Temperature -40 85 °C Tair* Ambient air temperature, See Note 1 -40 -40 105 °C T coolant Coolant inlet temperature, derate > 70°C -40 -40 105 °C IPD Enclosure Ingress Protection IPP00 | Cdc | | 0.65 | 0.7 | 0.75 | mF |
| Cooling and Environment Min Typ. Max Unit Tisto 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 IP00 </td <td>Cdd*</td> <td>EMC decoupling capacitors</td> <td></td> <td>0.68</td> <td></td> <td>μF</td> | Cdd* | EMC decoupling capacitors | | 0.68 | | μF |
| Storage Temperature | Viso | Power Terminals to chassis, DC, 1 min | | 3000 | 4000 | V |
| 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 | Cooling and Environment | | Min | Тур. | Max | Unit |
| Tocolant Coolant inlet temperature, derate > 70°C | Tsto | Storage Temperature | -40 | | 85 | °C |
| P | Tair* | Ambient air temperature. See Note 1 | -40 | | 65 | °C |
| Pressure Drop, nominal flow 4 ltr/min 29 | T coolant | Coolant inlet temperature, derate > 70°C | -40 | | 105 | °C |
| Power dissipated to liquid coolant 2400 3000 W | IP | Enclosure Ingress Protection | | IP00 | | |
| Altitude | dp | Pressure Drop, nominal flow 4 ltr/min | | 29 | | mbar |
| 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 131 mm Length 272 mm mw Weight Average value 18 kg Tt Fastener torque for power terminals 18 Kg Torque for TBD TBD Nm Vibration According to IEC60721 50 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | P | Power dissipated to liquid coolant | | 2400 | 3000 | W |
| Discharge of DC Bus (Optional) No active discharge to VDC < 50V tadis No active discharge to VDC < 50V Solve Tontrol Interface Gate Driver AgileSwitch 2ASC-12A1HP — 1200V Dual-Channel Augmented High Performance Sic Core Mechanical Height Length Wind With active discharge to VDC < 50V AgileSwitch 2ASC-12A1HP — 1200V Dual-Channel Augmented High Performance Sic Core Mechanical Min Typ. Max Unit Height Length Width 272 mmm Width Weight Average value Tength Fastener torque for power terminals The Fastener torque for power terminals Torque for TBD Nom Vibration According to IEC60721 Solve Tontrol According to IEC60721 Min Typ. Max Unit Typ. Max Unit | Altitude | VDC = 800V | | | 4000 | m |
| tdis No active discharge to VDC < 50V 5 5 S Control Interface Gate Driver AgileSwitch 2ASC-12A1HP – 1200V Dual-Channel Augmented High Performance SiC Core Mechanical 131 mm Length 272 mm Width 404 Average value 18 Average value 18 Average value 18 Fastener torque for power terminals 18 Mm Torque for TBD Nm Vibration According to IEC60721 50V | Humidity | No condensation, Pollution Degree 2 | 5 | | 85 | % |
| tadis With active discharge to VDC < 50V 5 Control Interface Gate Driver AgileSwitch 2ASC-12A1HP – 1200V Dual-Channel Augmented High Performance SiC Core Mechanical Nin Typ. Max Unit Height 131 mm Length 272 mm Width 259 mm Weight Average value 18 kg Tt Fastener torque for power terminals 18 Nm T1 Torque for TBD Nm Vibration According to IEC60721 5 m/s² | Discharge of DC Bus (Optional) | | Min | Тур. | Max | Unit |
| 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 180 mm T1 Torque for TBD Nm Vibration According to IEC60721 5 m/s² | tdis | No active discharge to VDC < 50V | | | 30 | min |
| AgileSwitch 2ASC-12A1HP – 1200V Dual-Channel Augmented High Performance SiC Core Mechanical Min Typ. Max Unit | tadis | With active discharge to VDC < 50V | | | 5 | S |
| 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/s² | Control Interface | | | | | |
| 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/s² | Gate Driver | AgileSwitch 2ASC-12A1HP – 1200V Dual-Channel Augme | ented High Perf | ormance S | iC Core | |
| 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/s² | Mechanical | | Min | Тур. | Max | Unit |
| 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/s² | Height | | | 131 | | 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/s² | Length | | | 272 | | mm |
| Tt Fastener torque for power terminals TBD Nm T1 Torque for TBD TBD Nm Vibration According to IEC60721 5 m/s² | Width | | | 259 | | mm |
| Tt Fastener torque for power terminals TBD Nm T1 Torque for TBD TBD Nm Vibration According to IEC60721 5 m/s² | Weight | Average value | | 18 | | kg |
| T1 Torque for TBD TBD Nm Vibration According to IEC60721 5 m/s² | Tt . | Fastener torque for power terminals | | TBD | | |
| Vibration According to IEC60721 5 m/s² | T1 | | | TBD | | Nm |
| | Vibration | · | | | 5 | m/s ² |
| | Shock | - | | | | m/s ² |

COOLING PERFORMANCE

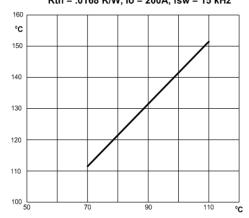
FET Tj vs Coolant inlet Temperature. Rth = .012 K/W, Io = 200A, fsw = 15 kHz



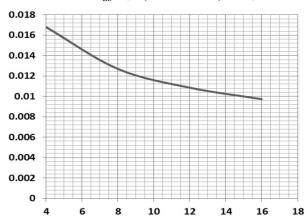
Pressure Drop, mBar, vs Flow Rate, liters/min



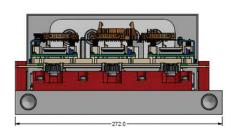
FET Tj vs Coolant inlet Temperature. Rth = .0168 K/W, Io = 200A, fsw = 15 kHz

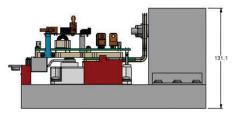


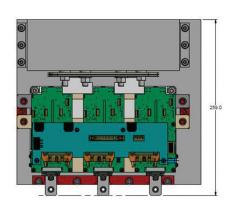
Cold Plate R_{th}, °C/W, vs Flow Rate, liters/min



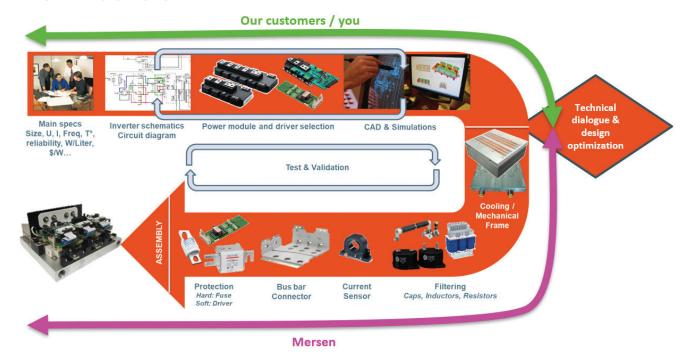
DIMENSIONS







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)

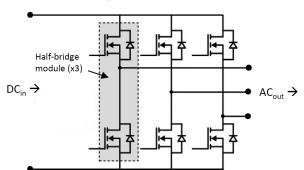
- · Overall dimensions and form-factor of the mechanical frame
- Bracket and hardware for integration
- SiC MOSFET module model and type
- 1700V SiC module
- Air-cooling (instead or liquid-cooled)
- Increase of F_{sw} , I_{nom} or Vdc
- Integration of output filter inductors
- Test and qualification
- 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



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