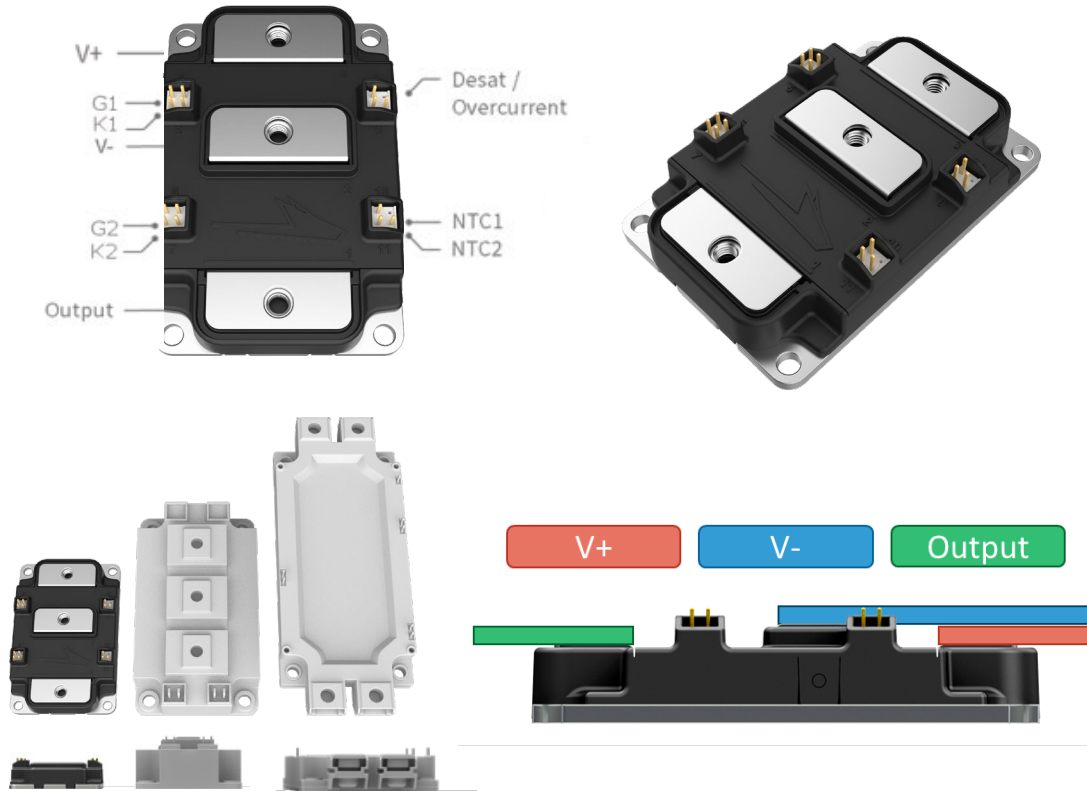


# WOLFSPEED POWER MODULES



# XM3 MODULE PLATFORM ENABLES CLASS LEADING POWER DENSITY



Supports 1200 – 1700 V C3M™ Silicon Carbide MOSFETs

Capable of more than 500 A

6.7 nH stray inductance

60% less volume and 55% less area than equivalent modules

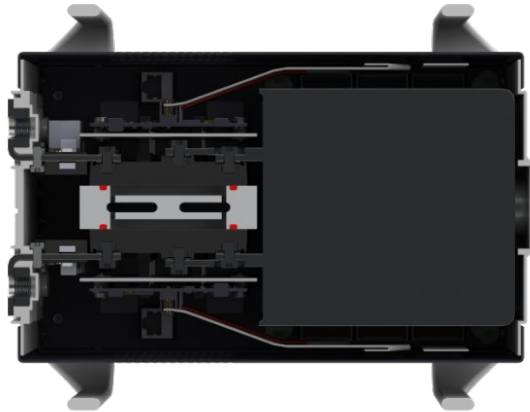
Built-in temperature sensor

# INVERTER REFERENCE DEMONSTRATES >70 KW/L POWER DENSITY

- 625 kW peak output power
- 900 V+ DC bus and 360 A<sub>RMS</sub> phase current (Single)  
720 A<sub>RMS</sub> phase current max (Parallel)
- Compact and lightweight at only 8.6 L and 9.7 kg
- Power density of **72.5 kW/L**, 3.6x traditional Si inverter
- >99% efficiency
- High-performance liquid cooled cold plate
- Low-inductance DC Link capacitor with integrated laminated bus bar

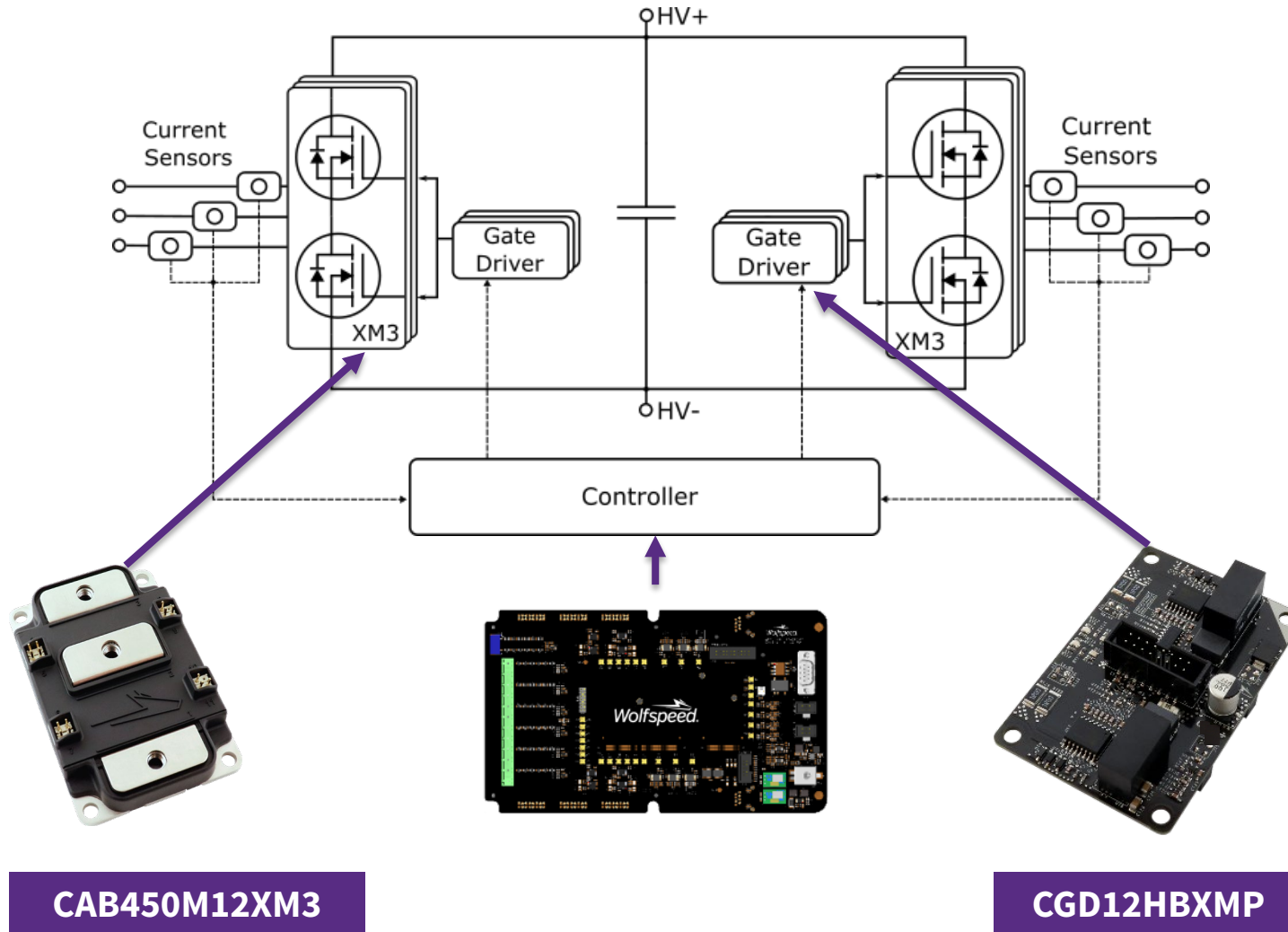


# XM3 DUAL INVERTER SYSTEM ENABLES SIMPLIFIED MANUFACTURING



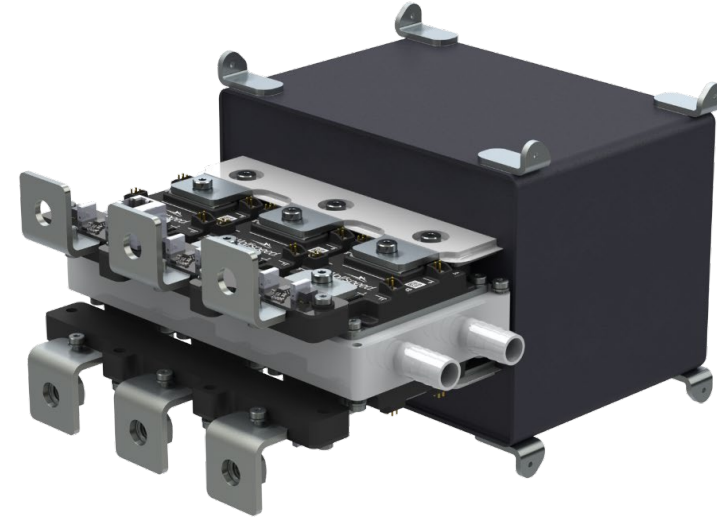
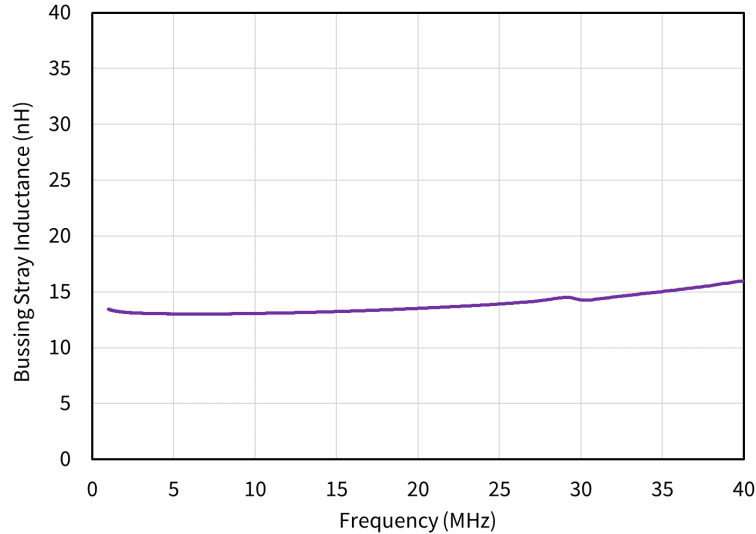
- Modular sheet metal construction allows access to components for evaluation in application
- Compact metal enclosure only **8.6 L** and 9.7 kg
- Dimensions: 204 x 267.5 x 157.5 mm
- Handles and feet included for portability

# SYSTEM INCLUDES ALL KEY COMPONENTS TO GET UP AND RUNNING QUICKLY



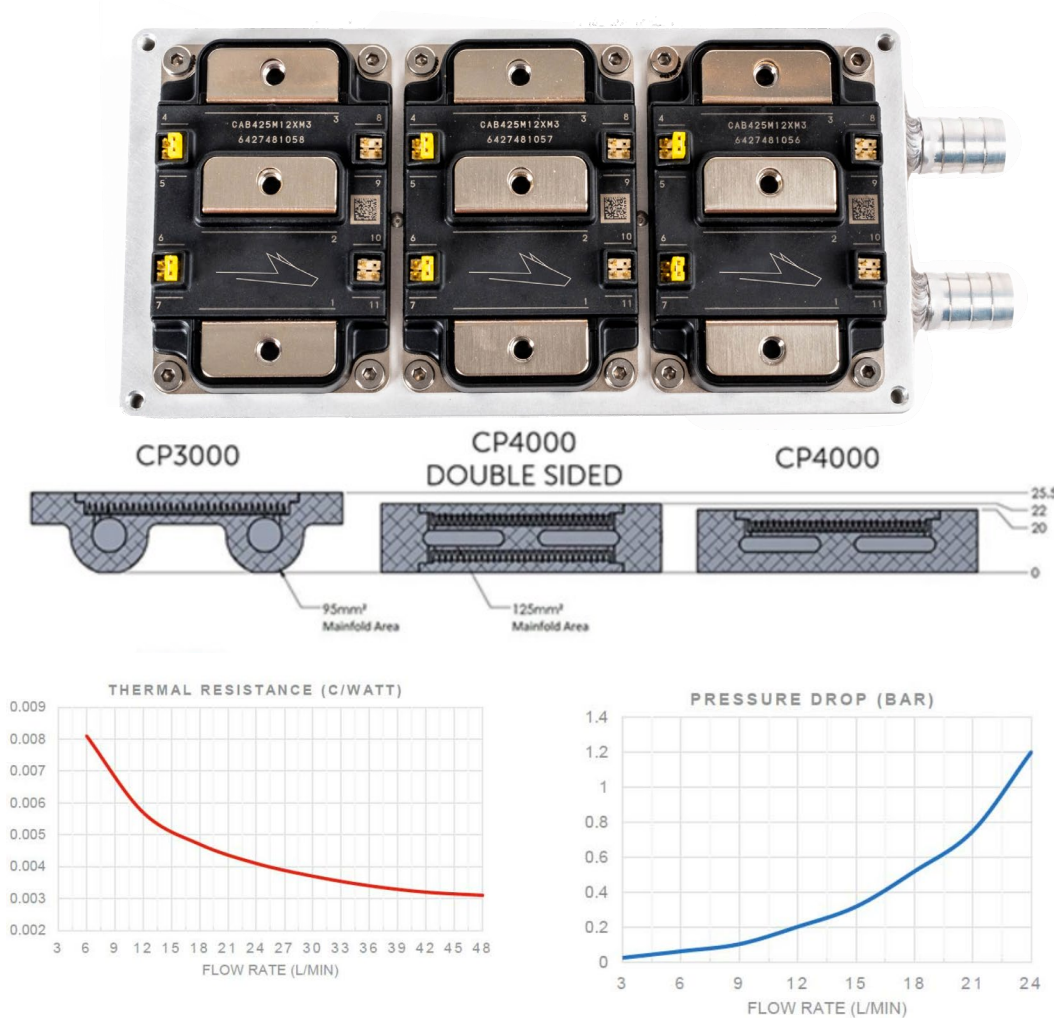
- Complete solution for dual motor drive application
- 6 current sensors
- Dual motor position sensor support
- Isolated CAN interface
- Dual-core, 200 MHz, 32-bit DSP
- Pathway to automotive grade gate drive available
- Various compatible partners gate drive available

# XM3 DUAL INVERTER POWER LOOP MINIMIZES STRAY INDUCTANCE FOR FAST, CLEAN SWITCHING



- Custom DC Link capacitor with integrated laminated bussing for both banks of power modules, 900 V+, 600  $\mu$ F
- Dedicated DC input terminals
- Low power loop inductance of 13 nH for bussing and capacitor
- Less than 20 nH total stray inductance
- >98% efficiency
- Compact, high bandwidth hall-effect current sensors on each output busbar to support single or dual motor configurations

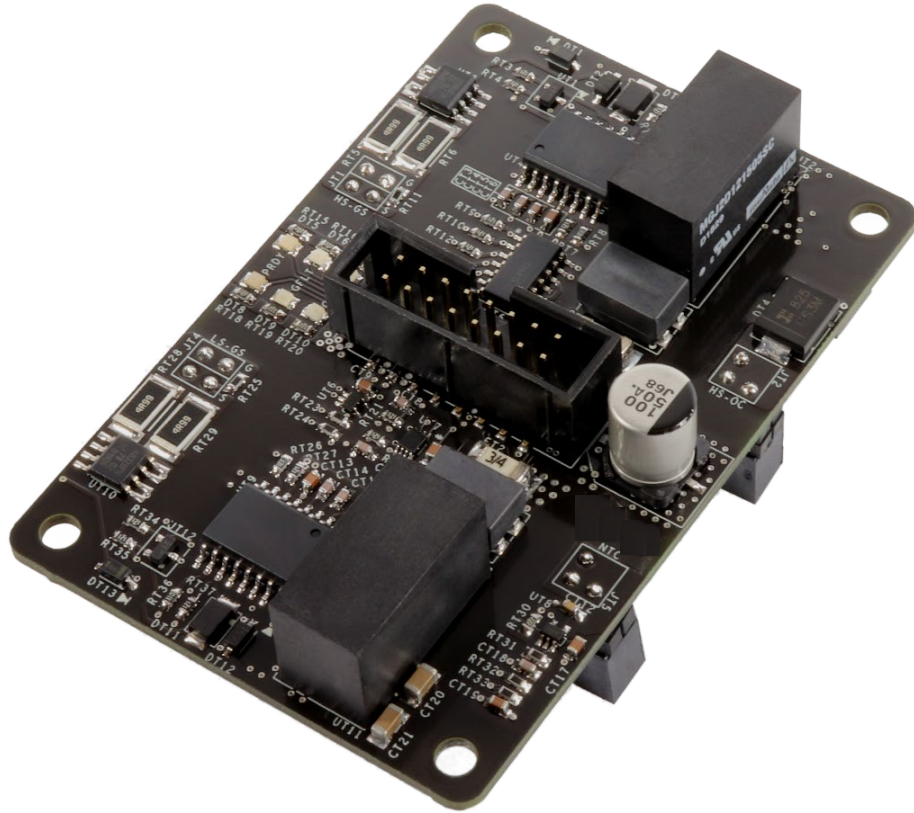
# HIGH EFFICIENCY DOUBLE SIDED COLD PLATE ENABLES HIGH PERFORMANCE IN A COMPACT FORM FACTOR



- Double sided Wieland Microcool CP4012D-XP is **13%** thinner and previous generation CP3012 while featuring the same MDT pins for low thermal resistance
- The profile of the cold plate has been optimized to match the XM3 module footprint and is 10% narrower and 15 mm shorter
- Balanced coolant flow across all 6 module positions
- 0.008 C/W thermal resistance per position at 12 LPM flow rate
- **750 W** power dissipation per switch with 1200 V 450 A XM3 modules



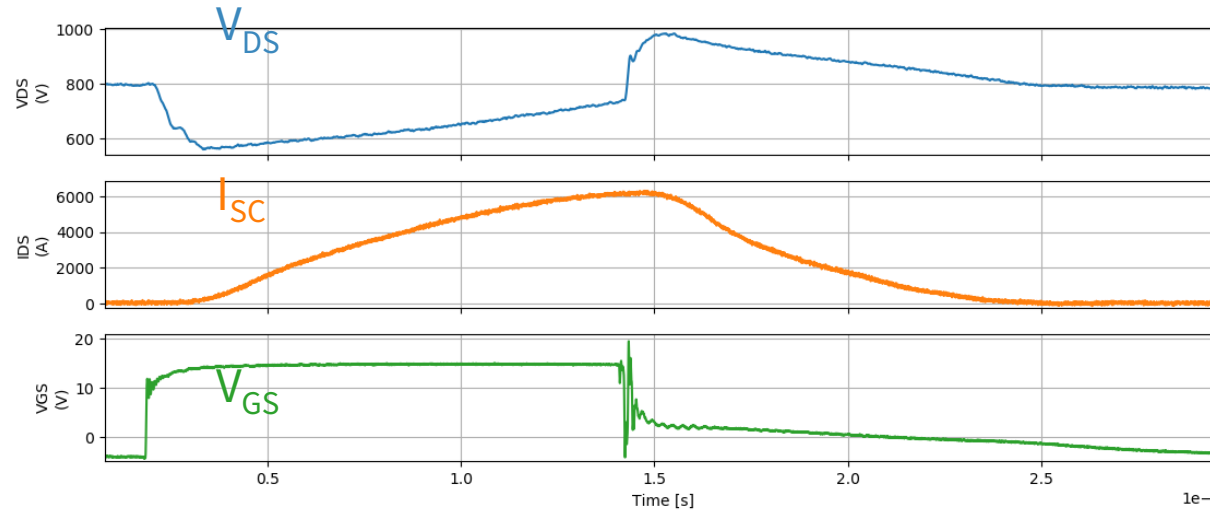
## INCLUDES CGD15HBXMP XM3 GATE DRIVER TO ACCELERATE DESIGN CYCLES



- Over-current protection quickly and safely responds to short circuit events
- +15/-4 V output compatible across whole C3M portfolio
- RS-422 differential inputs for improved noise immunity
- 2 W isolated power supply per channel
- Isolated temperature sensor feedback
- Low propagation delay and jitter
- Up to 80 kHz switching frequency



# INCLUDED GATE DRIVER KEEPS DEVICES SAFE UNDER FOR SHORT-CIRCUIT OPERATION

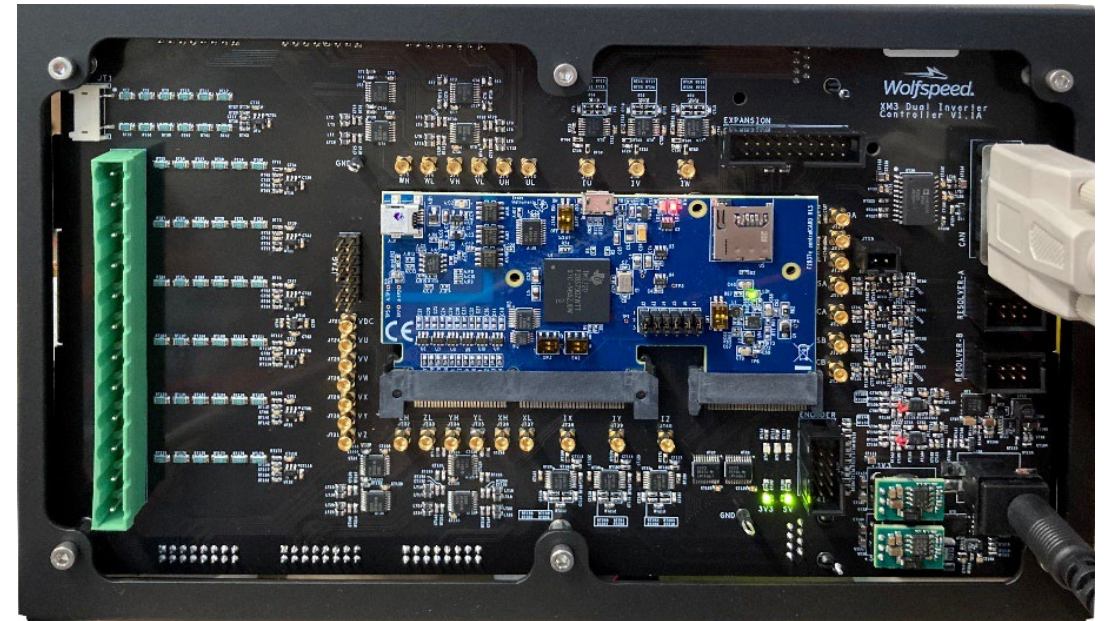


- Wolfspeed's CGD15HBXMP gate driver is optimized to safely detect and respond to a short circuit event
- Soft-shutdown and low stray inductance limits VDS peak overshoot
- Short circuit test with DC bus of 800 V produced a peak current 6.2 kA and peak voltage 985 V
- Blanking time and soft-shutdown tuned to safely limit short-circuit duration to  $< 2 \mu$ s without nuisance trips

Wolfspeed partner gate drives can limit short circuit duration time less than  $1 \mu$ s

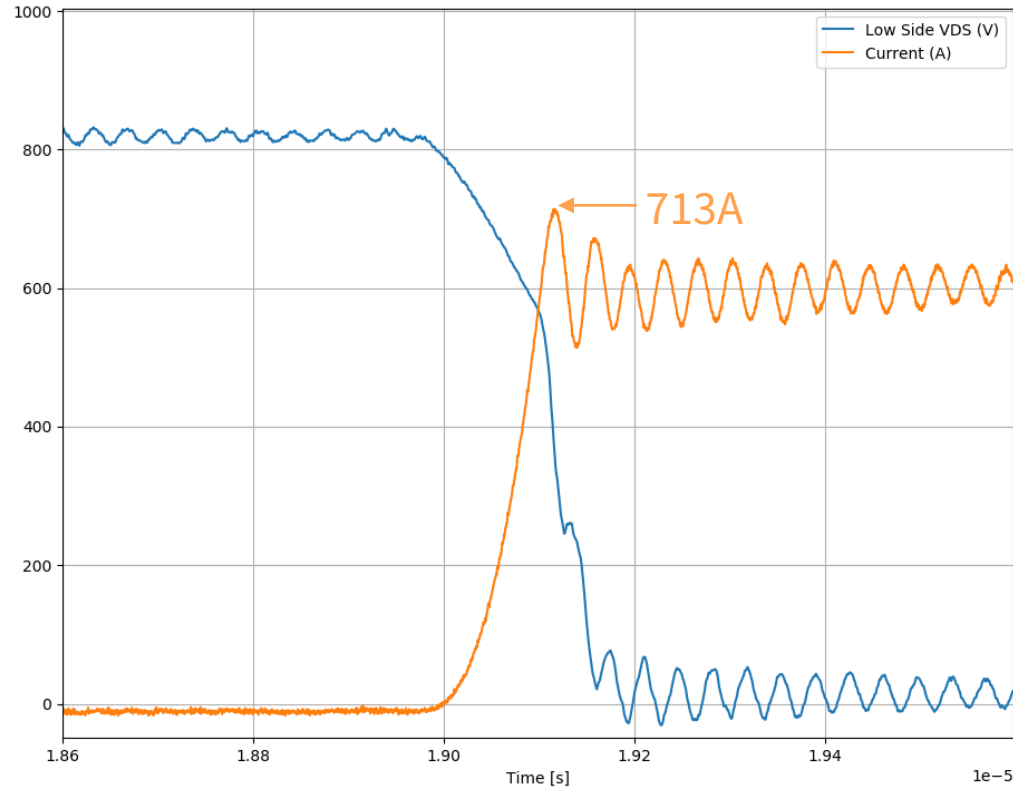
# INCLUDED CONTROLLER REDUCES DEVELOPMENT TIME

- Controller selected to ensure enough processing “horsepower” is available to sample all inputs and make control decisions
- High ADC count enables all required system states can be measured for appropriate control and monitoring
- **Controller has fast hardware interrupts to respond to faults**
- Included CAN communication critical to ensure robust operation



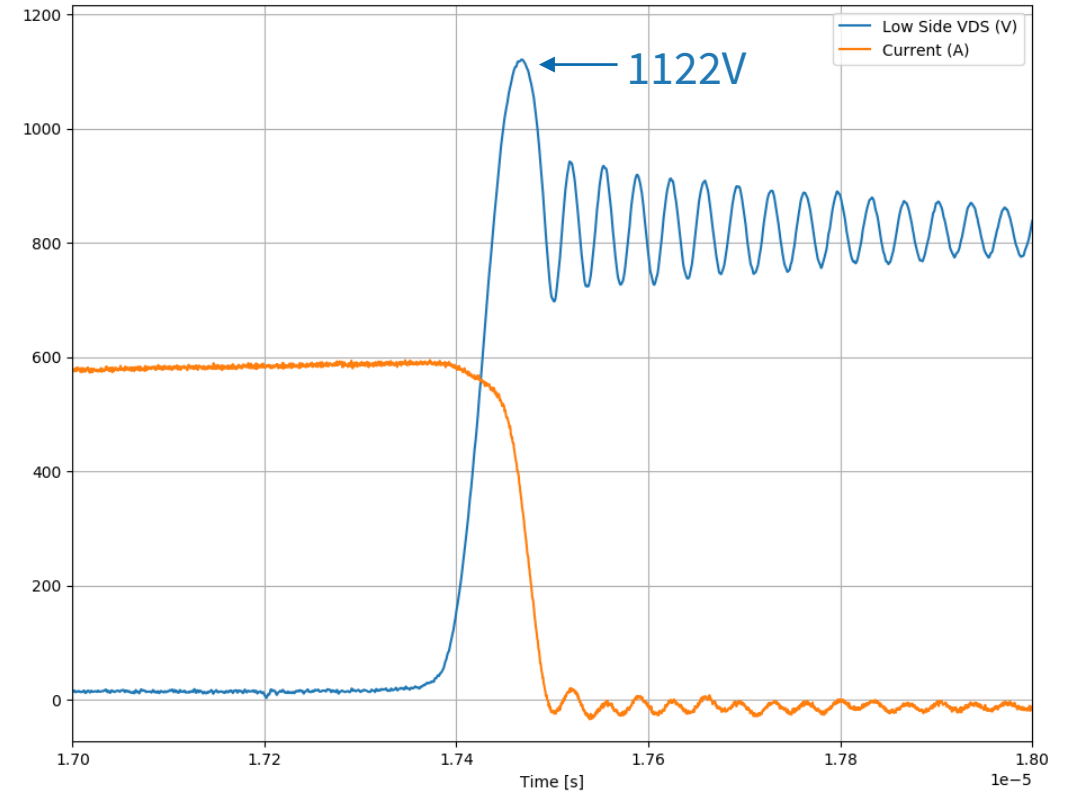
# REFERENCE POWER LOOP DESIGN OPERATES CLEANLY UNDER AGGRESSIVE SWITCHING

Turn-On



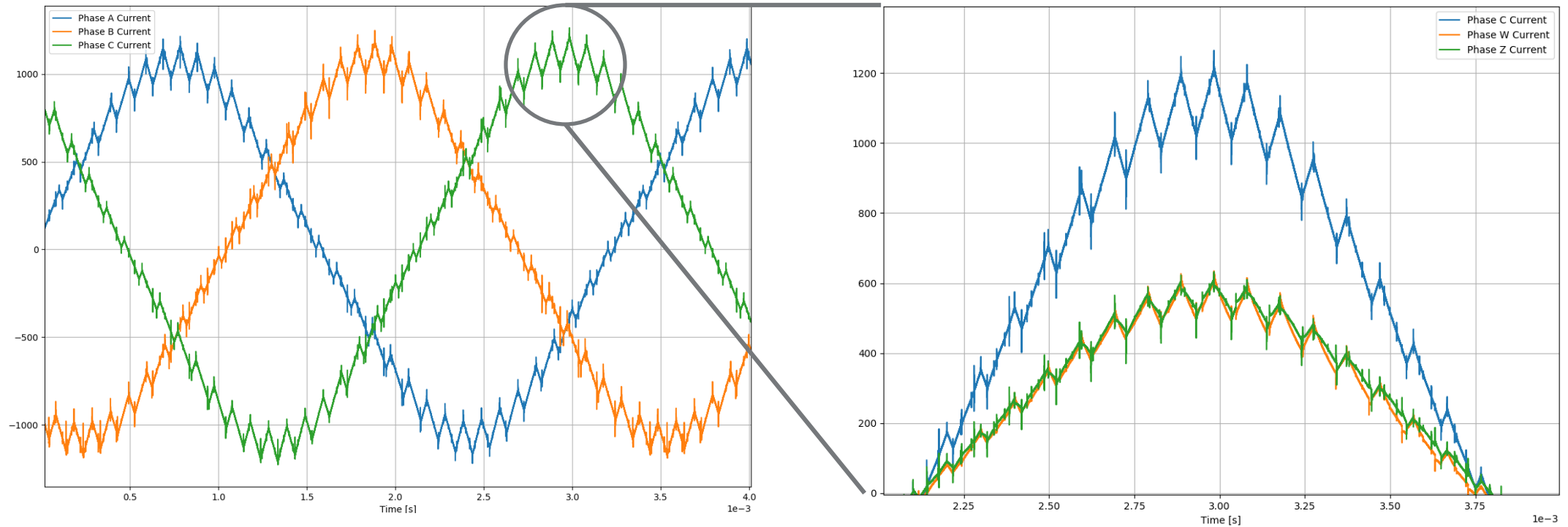
30.1mJ – 113 A of peak current overshoot

Turn-Off



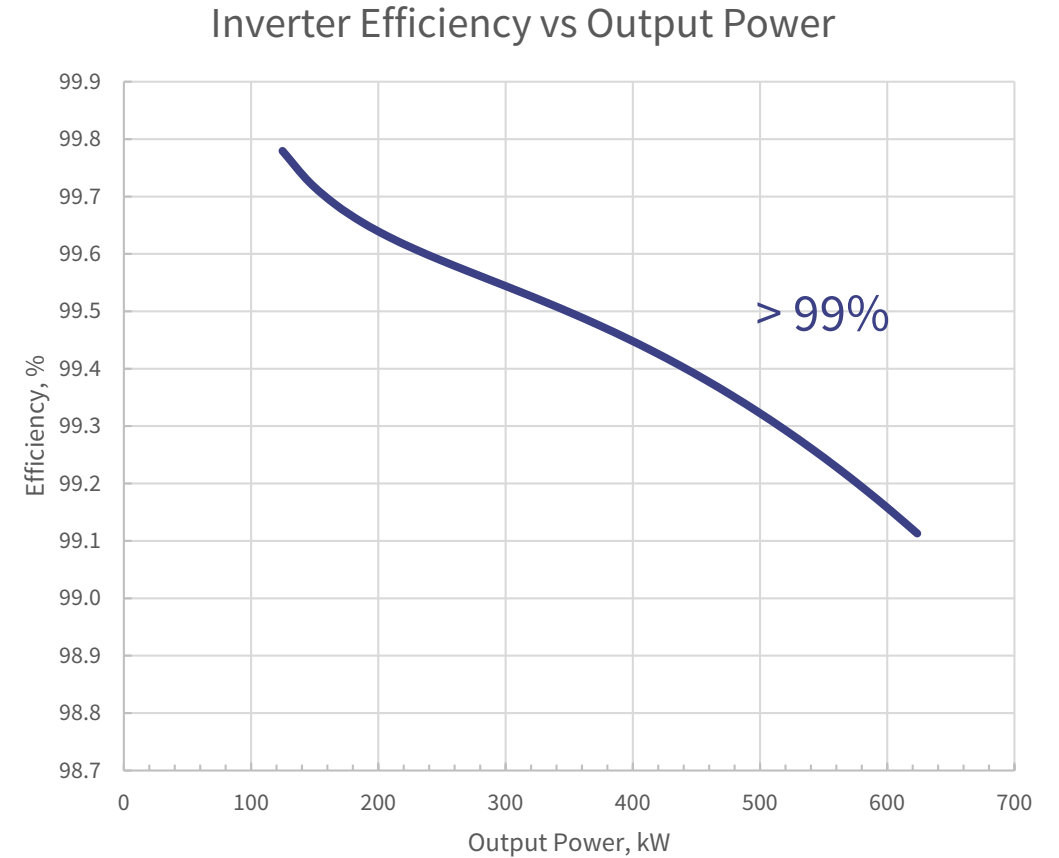
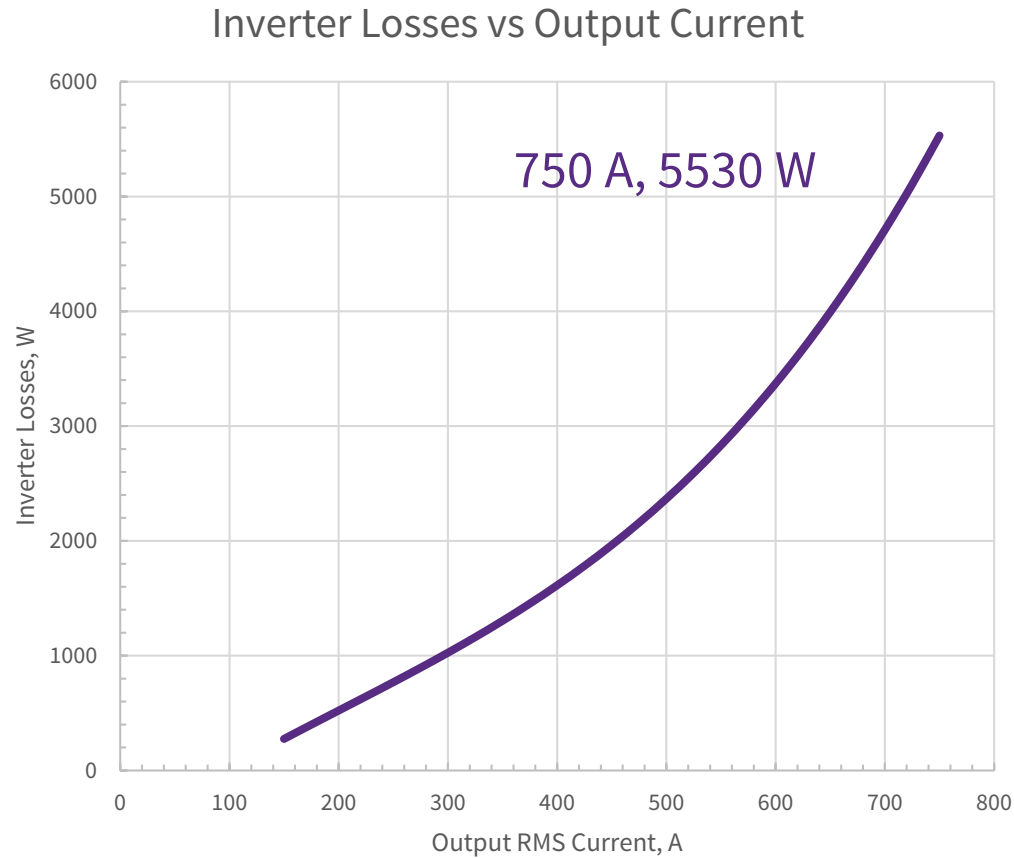
23.1mJ – 80 V of margin at 2 x overload

# PROVEN XM3 PARALLELED OUTPUT CURRENTS TO 720 A<sub>RMS</sub> PER PHASE



Module Layout Enables Equalized Current Sharing

# INVERTER POWER LOSSES @ 800 V, 10KHZ, 25°C COOLANT



Low losses enable extremely high system efficiency

# NXP GD3160 - AUTOMOTIVE GRADE WOLFSPEED XM3 HALF-BRIDGE KIT

- Evaluation kit is designed to connect to an **Wolfspeed XM3 Silicon Carbide MOSFET** module for half-bridge evaluations and applications development.
- Half-bridge evaluation kit populated with two **MC33GD3160** single channel Silicon Carbide MOSFET gate drivers.
- Freedom KL25Z microcontroller hardware PC interface to SPI GUI



**Part Number:** [FRDMGD3160XM3EVM](#)

## Evaluation Kit Contains

- Half-Bridge evaluation kit featuring GD3160 gate drive devices for IGBT/Silicon Carbide MOSFET
- KITGD3160TREVB translator with KL25Z MCU
- Micro USB cable
- Quick start guide
- Automotive grade components







**THANK YOU**