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# Motor Development Kit (MDK)

Solutions Engineering Center (SEC)

Public Information



# Motor Development Kit (MDK)

## Motor Development Kit Family (MDK)

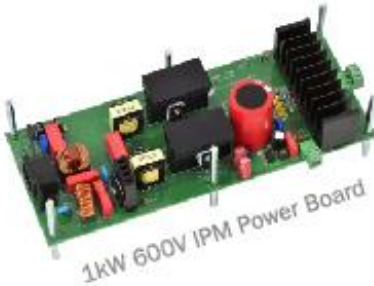
Universal Controller Board  
(UCB)



Power Boards



Motor Development Kit  
(UCB + Power Board)



More Power Boards from ON Semiconductor to be added to the MDK Family



# Motor Development Kit (MDK)

## Universal Controller Board (UCB)

MCU  
Zynq 7000 series SoC - Xilinx  
667 MHz CPU Cortex A9  
NCD9801  
10 Channel Differential ADC



## Power Boards



NFAQ1060L33  
Compact Intelligent Power Module  
NCP1632  
Interleaved PFC Controller  
NCP1063  
DC-DC Regulator  
GBU6K  
Bridge Rectifier  
NCS2250  
Fast Comparator  
NCS213  
Precision Current Sense Amplifier



NFAM5065L4B  
SPM31  
NCP1063A  
HV Switcher  
FAN8303  
DC-DC Regulator  
NCP718B  
LDO Regulator  
NCS2166  
Precision Op-Amp  
NCS2250SN2  
Comparator

## Motor Development Kits



# Universal Controller Board

## ➤ MCU

- Zynq 7000 series SoC - Xilinx
- 2x 667 MHz CPU Cortex A9

## ➤ Peripherals

- 10 channel differential ADC (ON Semiconductor NCD9801)
- 12 complementary PWM channels
- Freely configurable digital peripherals
- USB to JTAG/UART interface for configuration/debug
- On-board: ETH PHY and USB OTG
- Off-board: CAN (external transceiver required), USB OTG connector and ETH connector

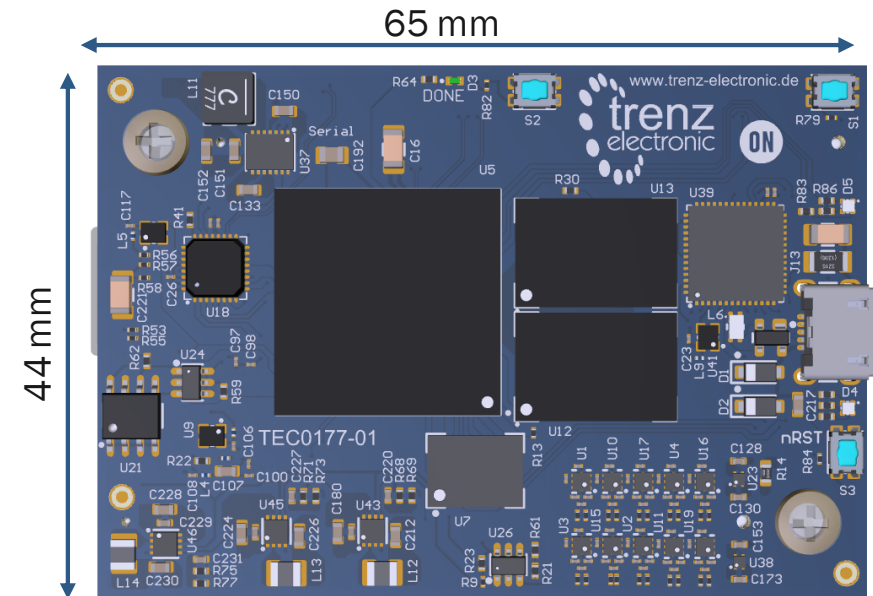
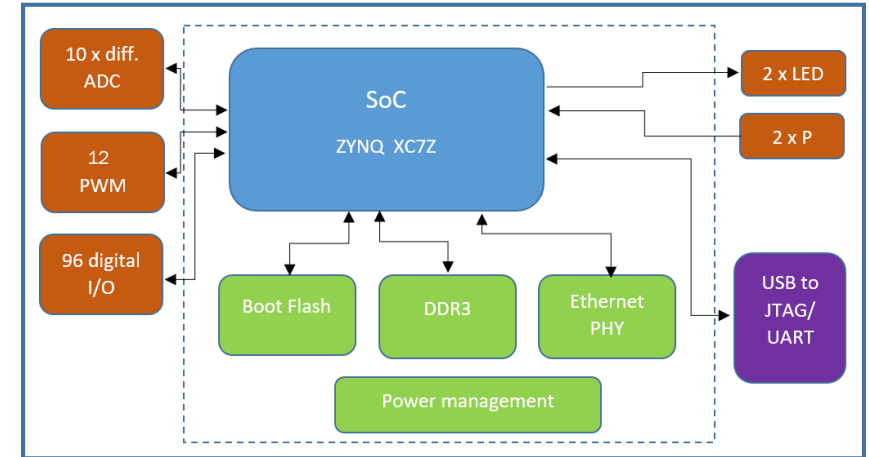
## ➤ Memory

- 512MB RAM
- 512kB EEPROM (ON Semiconductor CAT24C512)
- Micro SD card

## ➤ User interface

- Bootloader capability for user upgradability via UART
- Strata compatibility planned
- LEDs/buttons

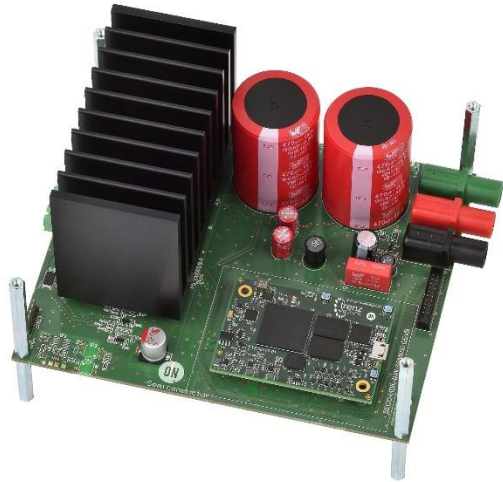
## Complete ON Semiconductor solution around Xilinx Zynq SoC



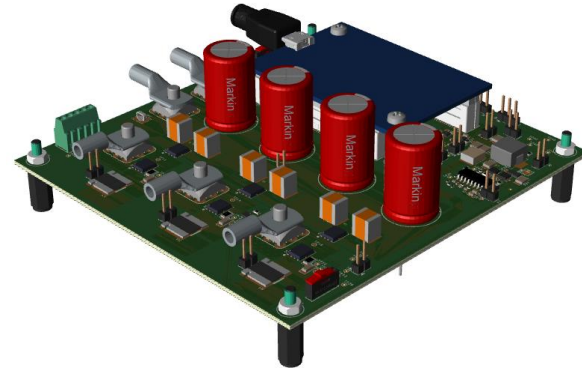
# MDK Target Applications



1kW motor inverter with PFC



4kW motor inverter board



48V MOSFET motor inverter (coming soon)

## Targeted Motor Technology

- BLDC
- BLAC
- Switched reluctance
- PMSM
- Induction
- ...

## Applications

- Industrial Motor Drive
- White Goods
- HVAC
- Pumps
- Fans

## High-end Applications

- 3-phase motor control
- 3-phase PFC
- 3-phase PFC + 3-phase motor
- 3-phase PFC + LLC
- 3-phase / 3 level inverter
- 1-3 Phase Vienna rectifier
- New/experimental topologies

# Additional Opportunities for the MDK

Industrial Power and Motion



Cloud power



Energy Infrastructure



Advanced control strategies

Diagnostics and predictive maintenance

IoT gateways and protocols

AI, Machine Learning, Deep Learning, ...

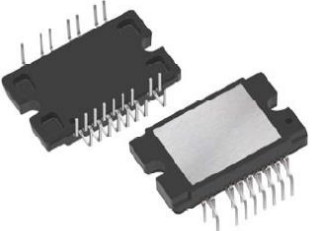
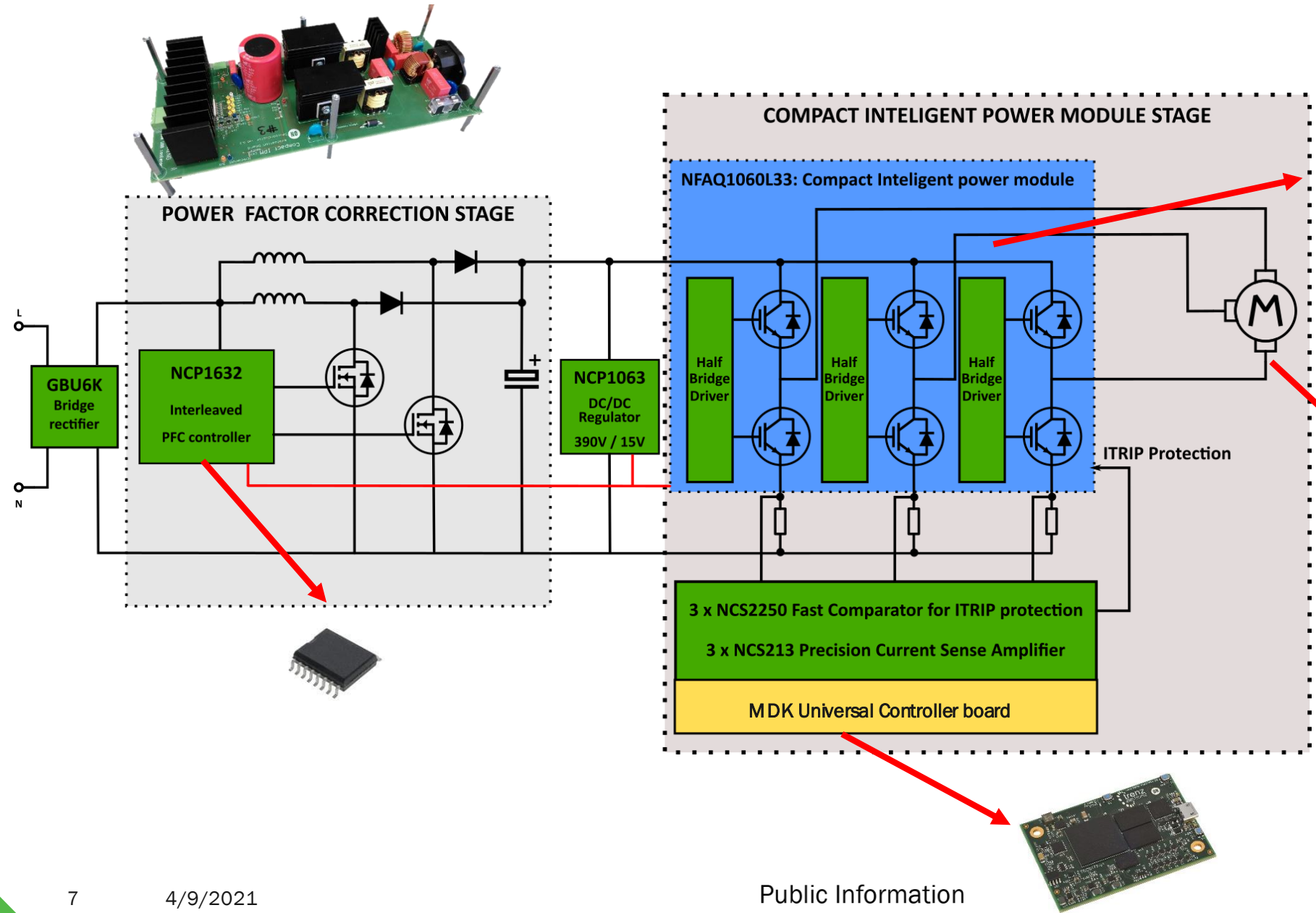
Machine vision

...

# Block Diagram - 1 kW Compact IPM Power Board

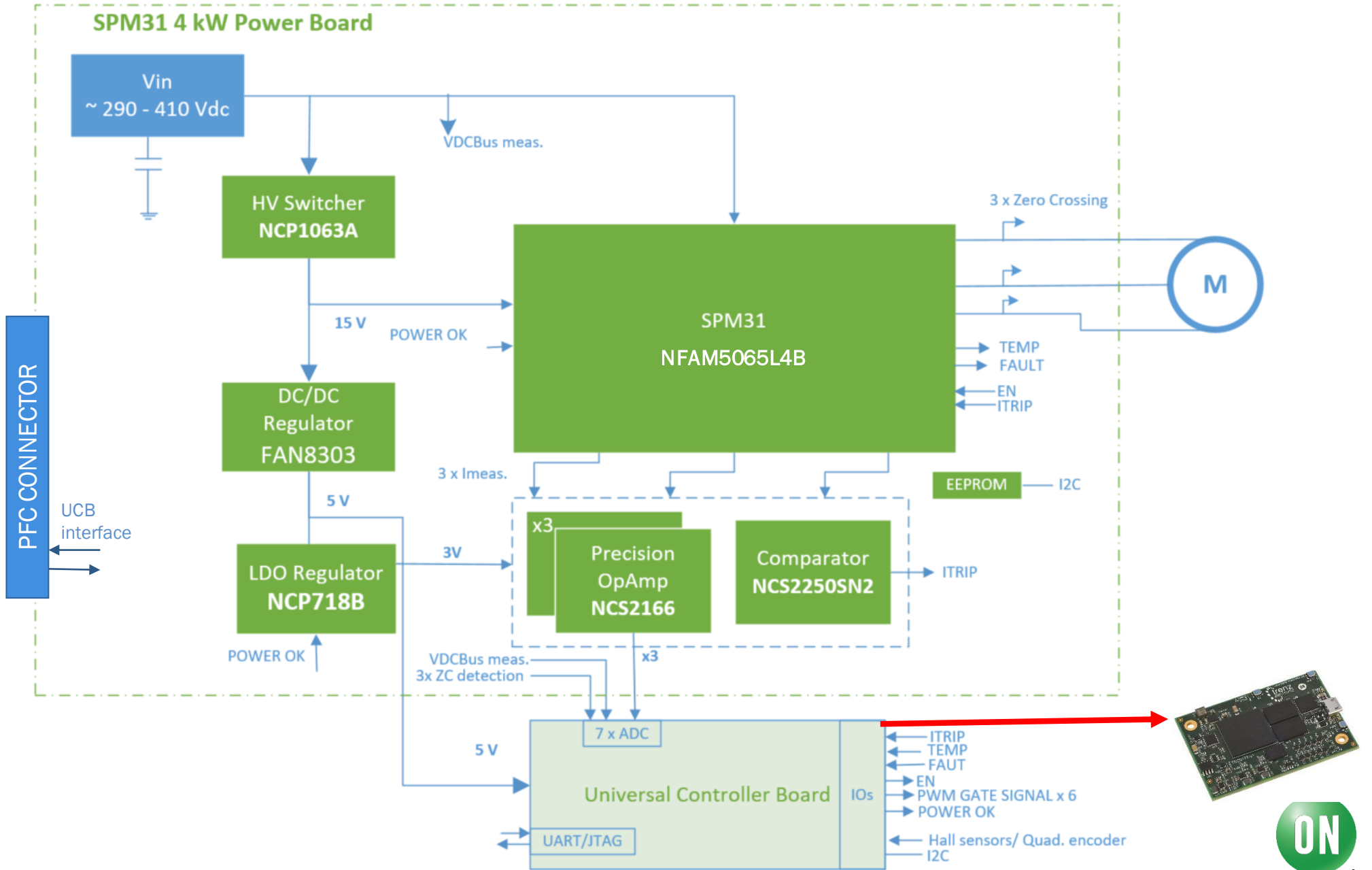
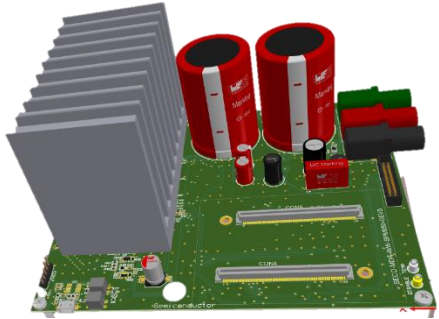
**SECO-1KW-MCTRL-GEVB**

\* With ArduinoDUE adaptor  
SECO-MDK-DUE-GEVB



# Block Diagram - 4 kW Compact IPM Power Board

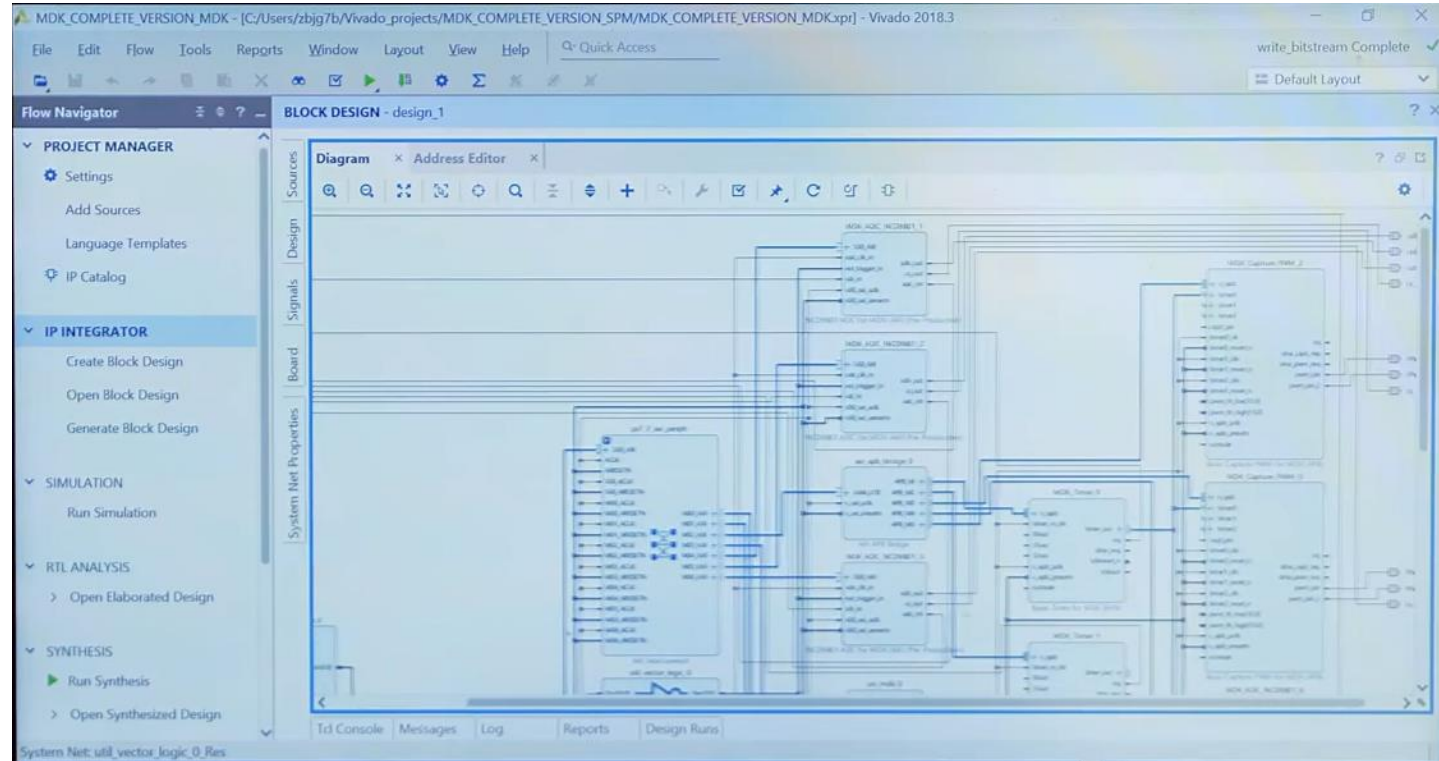
SECO-MDK-4KW-65SMP31-GEVB





## ➤ Xilinx Tool Key Features:

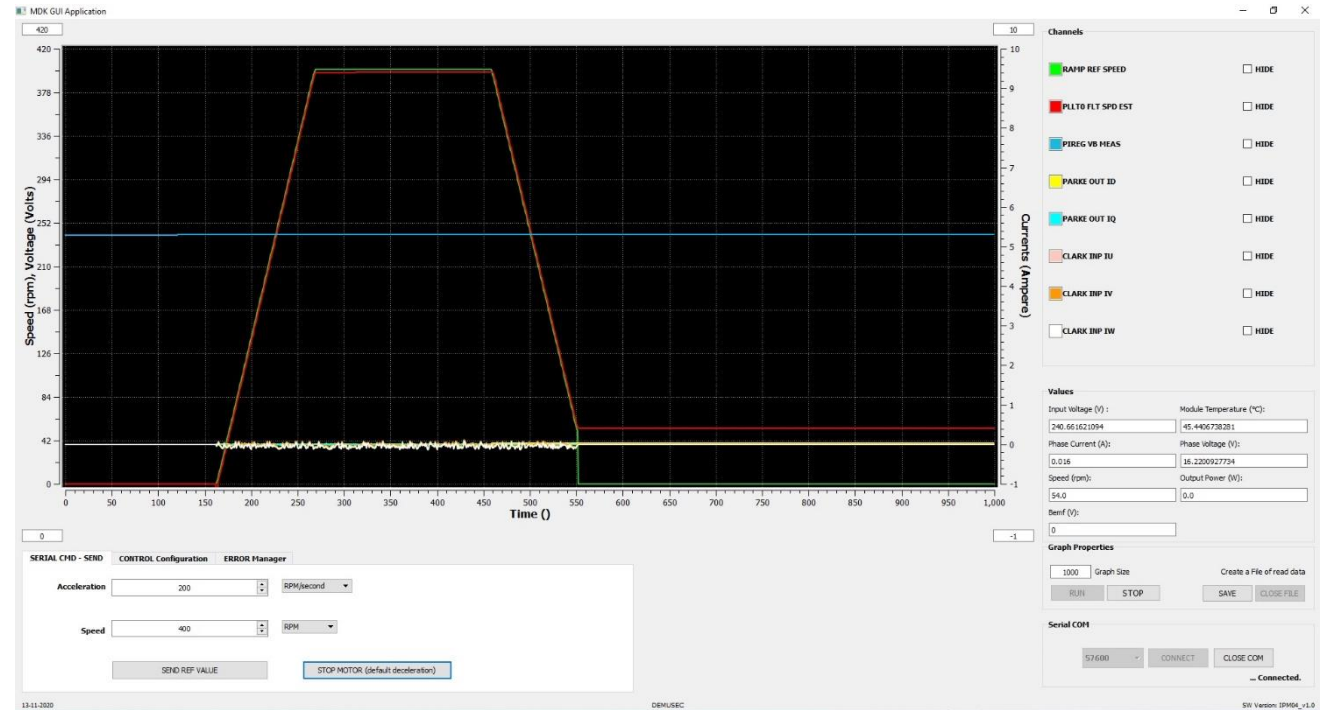
- Program FPGA (UCB)
    - View & edit block design
  - Set Softcore of FPGA in different view mode
- 
- ❑ User Guide describing the steps to integrate VHLS Xilinx IP blocks in the MDK is available.
  - ❑ Use case for each MDK board preflashed to run the motor through a GUI out of the box.
  - ❑ Other Xilinx software tools compatible with UCB (Zynq 7000).



# ON Semiconductor Graphical User Interface



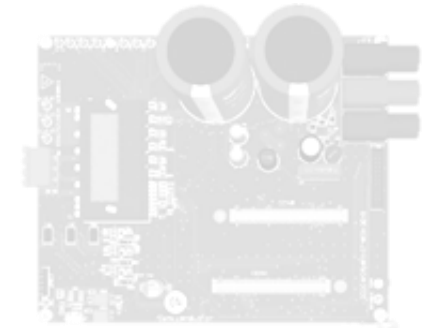
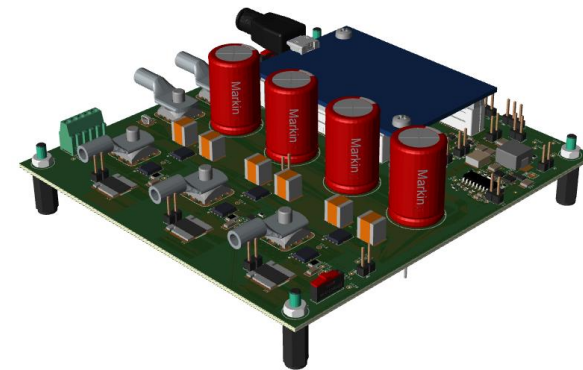
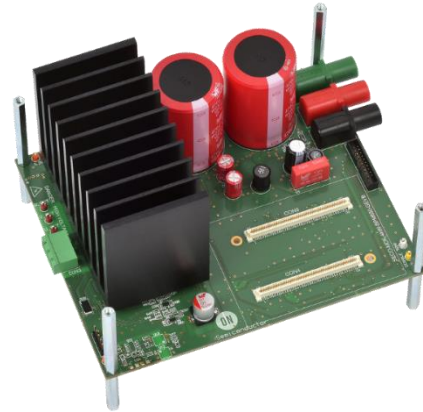
- Easy to use ON Semiconductor GUI for rapid evaluation
  - ❑ Control over speed,  $B_{emf}$ , output power, and many more to measure and evaluate the motor at different speeds.
  - ❑ Controllable RPM
  - ❑ Measure telemetry like Input voltage, module temperature and motor current



# What's Next for the Motor Development Kit Family?



Efficient and reliable electric motor drives are complex systems to develop, but with Motor Development Kit (MDK), ON Semiconductor makes it easy. ON Semiconductor is planning on developing various additional power boards like MV MOSFET BLDC Motor Driver, 8 kW TMPIM and many more to address a wide variety of industrial motor control applications, cover a broad power range and provides state-of-the-art computational capabilities with the Universal Controller Board, which allow for the development of low and high-end motor control applications.



# Additional Resources

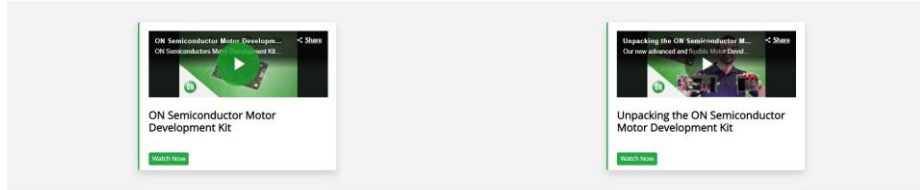
## Motor Development Kits (MDK)

Landing Page [click here](#)

### Motor Development Kits (MDK)

#### Industrial Motor Control System Solutions At Your Fingertips

Efficient and reliable electric motor drives are complex systems to develop, but with the Motor Development Kit (MDK) ON Semiconductor makes it easy. The comprehensive prototyping platform consists of the Universal Controller Board (UCB) which connects to an expanding variety of Power Boards to create quick-start platforms to run your motor, allowing you to rapidly test, evaluate and optimize your system before designing any hardware. Sporting the powerful Zynq®-7000 PPGX010 SoC, the UCB is suited for high-end control and AI-based applications. The Power Boards feature ON Semiconductor's leading power devices and modules together with all other necessary components and devices from our broad portfolio to develop complete motor driver solutions.



### Motor Development Kit Family (MDK)



## Webpages

### ➤ Control + Power Kit

- [SECO-1KW-MDK-GEVK](#): 1kW 600V Industrial Motor Development Kit (MDK) with Compact Intelligent Power Module (IPM) board and Universal Controller Board (UCB)
- [SECO-MDK-4KW-65SPM31-GEVK](#): 4kW 650V Industrial Motor Control Development Kit with Intelligent Power Module (IPM) and Universal Controller Board (UCB)

### ➤ Power Boards

- [SECO-1KW-MCTRL-GEVB](#): 1kW 600V Industrial Motor Control Power Board with Compact Intelligent Power Module (IPM)
- [SECO-MDK-4KW-65SPM31-GEVB](#): 4kW 650V Industrial Motor Control Power Board with Compact Intelligent Power Module (IPM)

### ➤ Universal Controller Board

- Universal Controller Board (UCB) with Zynq®-7000 SoC FPGA and ARM®-based processor



# Thank you