

# Pre-Switch CleanWave200 DC to AC Power Block

## OVERVIEW

Using United SiC cascode FETs, the Pre-Switch CleanWave200 was able to achieve system efficiencies of 99.3% @ 100kHz Fsw with three devices in parallel per switching location

## SOLUTIONS

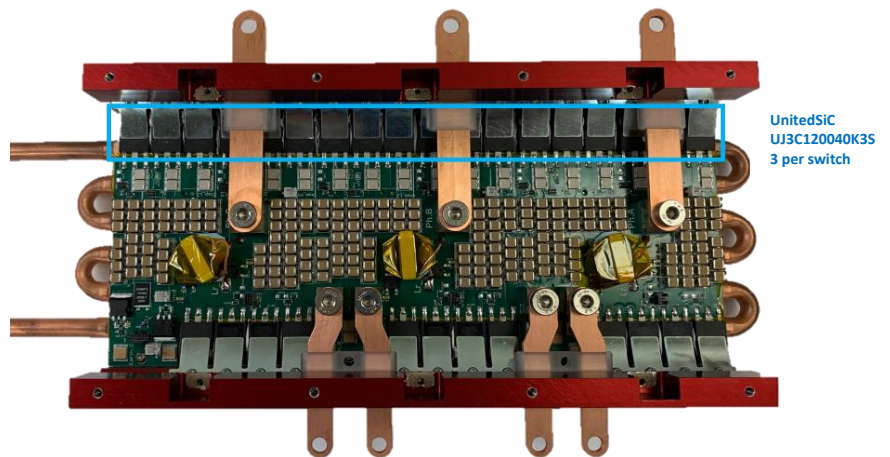
[UJ3C120040K3S](#)  
(1200V, 40mΩ)

## BENEFITS

- Avoided need for gate drive circuitry
- Significantly reduced dead time loss
- Less drive power required
- Allowed for additional focus on Pre-switch core technology

►To learn more, go to:  
<https://unitedsic.com/group/sic-fets/>

Utilizing the high-efficiency of UnitedSiC cascode SiC FET technology to demonstrate the effectiveness of Pre-Switch solutions in high-frequency EV switching.



[Pre-Switch](#) is a Silicon Valley start-up focused on improving EV drivetrain efficiency and reducing cost by enabling higher switching frequency, reducing dV/dT, and improving current sharing in high voltage (500-900V) discrete devices. The company uses AI to control a forced resonant tank ensuring soft switching in systems even under dynamic changes in input voltage, device degradation, device temperature, and load.

## SOLUTIONS

The newly developed Pre-Switch CleanWave200 is a 200kW, 3-phase, DC to AC power block for evaluating Pre-Switch's soft-switching technology. Using forced-resonant ARCP circuitry with advanced AI control, the system virtually eliminates switching losses. The technology also allows switching frequencies in the range of 50kHz to 100kHz which provides customers with cleaner sine waves, improved motor efficiencies, reduced EMI, and smaller

DC-link capacitance. Pre-Switch designed the new CleanWave200 around the UJ3C120040K3S 35mΩ SiC cascode-configured FET after UnitedSiC provided test samples to aid in its early development process.



**Andre Willis**  
 CTO, Pre-Switch

**“UnitedSiC was the perfect match for our output stage architecture.”**

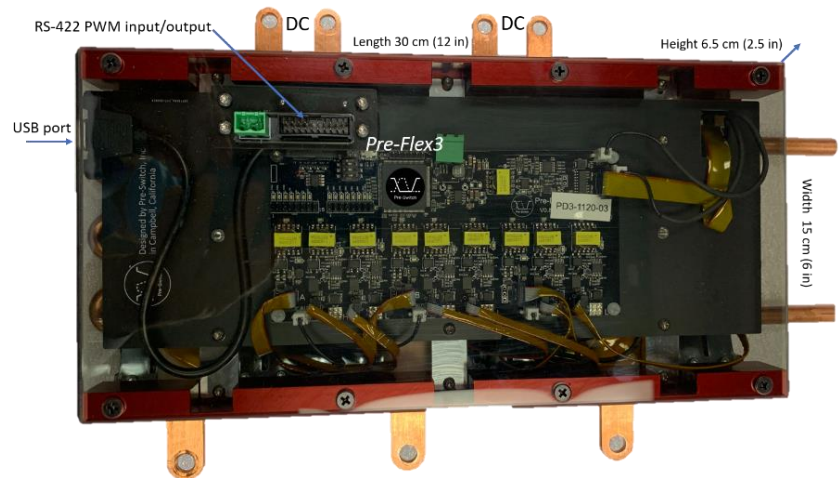


Figure 1. Pre-Flex 3 Design

## BENEFITS

UnitedSiC’s cascode FET devices have a “better bang for the buck” compared to other competitive SiC MOSFETs. Combined with Pre-Switch’s technology and UnitedSiC’s price/performance benefits, the end system delivered a lower cost solution to Pre-Switch customers and pioneered the usage of UnitedSiC devices in an AC/DC inverter application for automotive evaluation systems.

### Less Worry, More Focus

UnitedSiC’s devices have a wide V(GS) input range and high V(GS, th) compared to other competitive SiC MOSFETs. This allowed Pre-Switch to focus on core technology and system benefits rather than worry about designing gate drive circuitry.

### Lower Power

The low Q(g) of UnitedSiC devices meant less power was required to drive them, especially at 100kHz.

### Reduced Dead Time Loss

During the self-resonant edge transition, there may be some dead time loss due to the diode conduction. This was estimated to be ~3x higher with the competitor's typical SiC MOSFET body diode, measured at  $V(f) = 3-4V$ , while the UJ3C120040K3S is specified at much lower  $V(f) = 1.5V$ .

## PERFORMANCE DATA

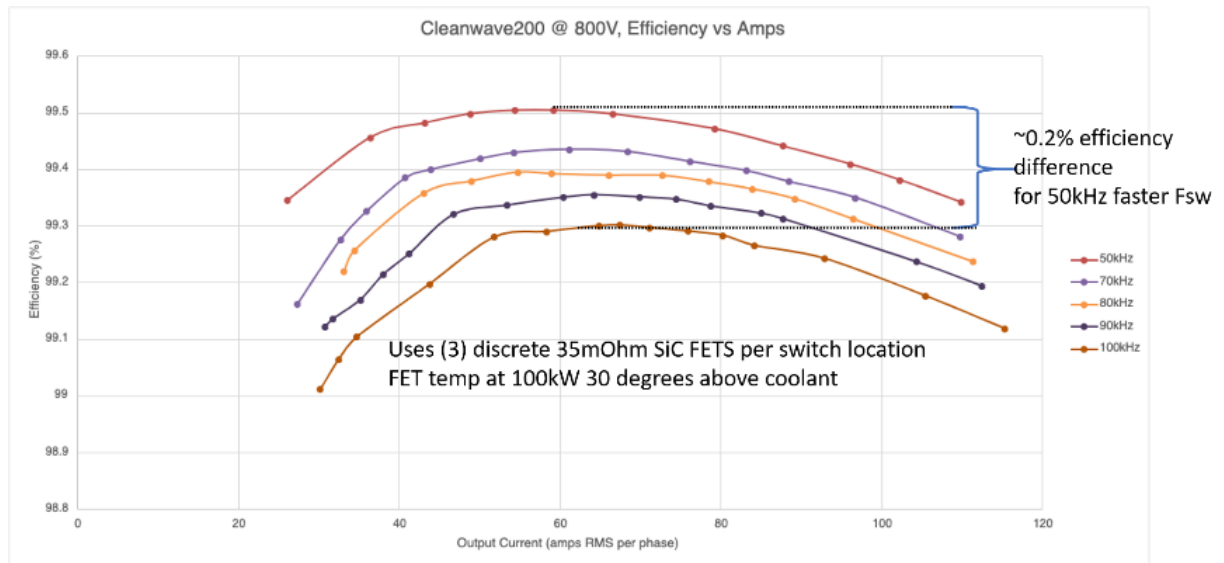


Figure 2. Efficiency vs. Amps

For more information about the Pre-Switch CleanWave200 product, contact them at [info@pre-switch.com](mailto:info@pre-switch.com).