

# Data Center and Cloud Computing



Challenges &  
Opportunities



Discover ST  
solutions in details





# Energy efficiency

## The challenges

Optimize the Power Usage Effectiveness (PUE)

Build power delivery systems minimizing energy consumption

## ST solutions

Advanced telemetry for PUE optimization

Providing power delivery topologies with the highest efficiency





# Data management

## The challenges

Massive volume of data to manage

Security for cyber threats and breaches

## ST solutions

Data storage leadership in HDD. Expanding presence in SSD

Secure PMBus implemented in CPU within the voltage regulation system





# Scalability

## The challenges

Scalable system and specialized hardware

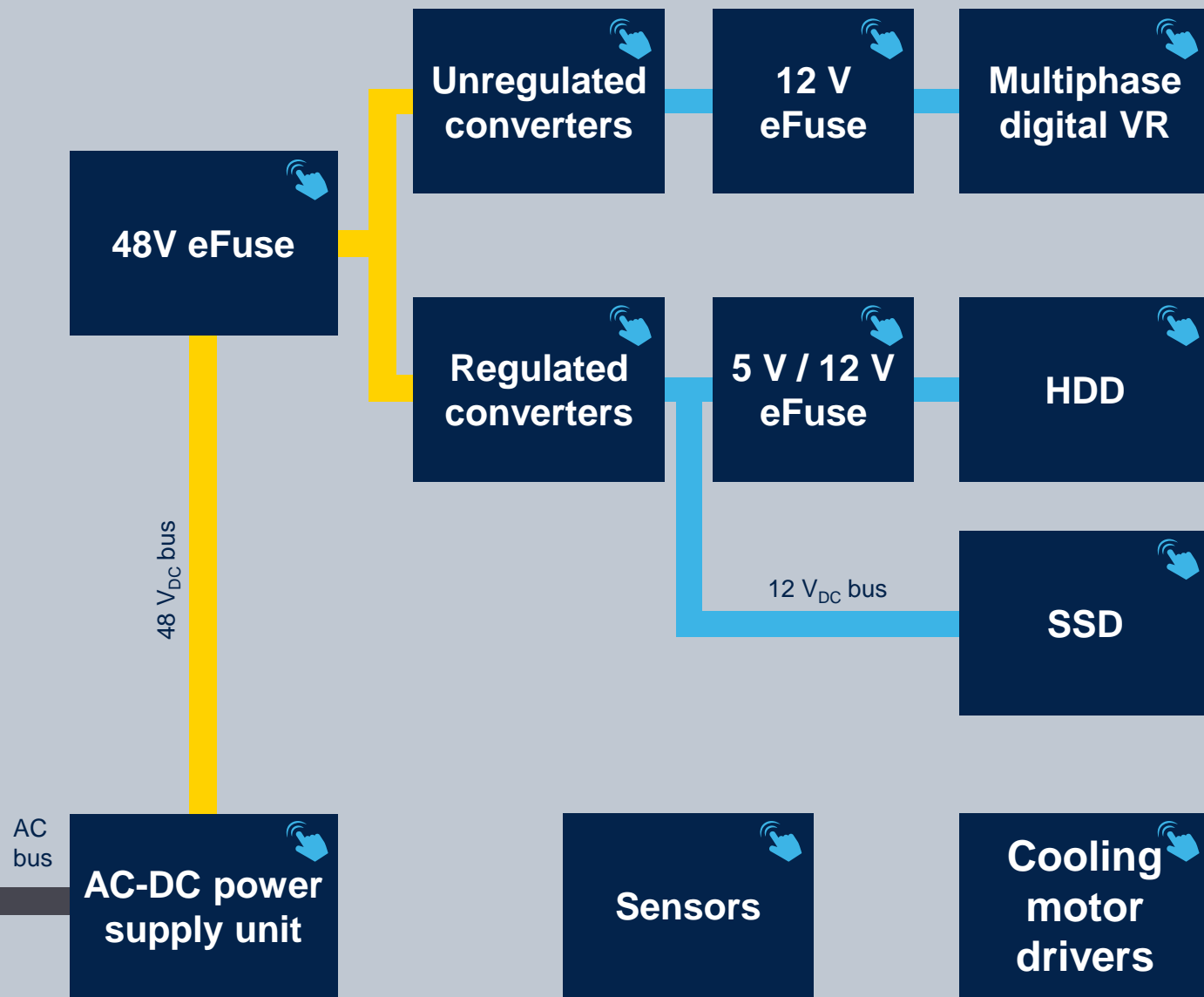
Cost management

## ST solutions

Broad portfolio of power delivery solutions enabling optimal system with enhanced scalability

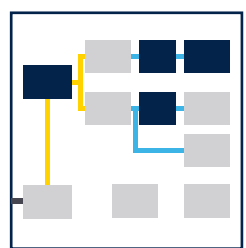
Complete coverage from AC to point of load (POL), allowing BOM optimization





Click to discover  
ST solutions  
for data center and  
cloud computing





# Digital multiphase VR and eFuse

## eFuse



- 12 V / 60 A, 48 V / 28 A integrated solution
- Integrated CS resistor
- Parallel operations



## Digital multiphase controllers





- 12 / 16 phase controllers
- Support Intel, AMD and ARM
- Fully configurable via SW
- Fastest loop for load transient
- Best control loop for TLVR
- Seamless  $T_{ON}$  overlapping

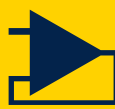
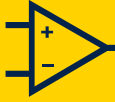
## Smart power Stages (SPS)


- 50 A, 60 A, 80 A SPS
- Common footprint

eFuse	
	12V and 48V high-current eFuse
	5V and 12V low-current eFuse

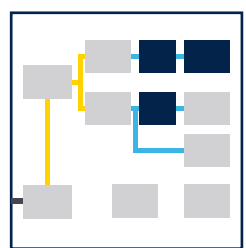
Power transistors	
	LV MOSFET
	Diodes

CPU VRs	
	12 phase digital controller
	8 phase digital controller
	16 phase digital controllers
	50A, 60A, 80A Smart Power Stages (SPS)

Signal conditioning	
	Operational amplifiers
	Comparators

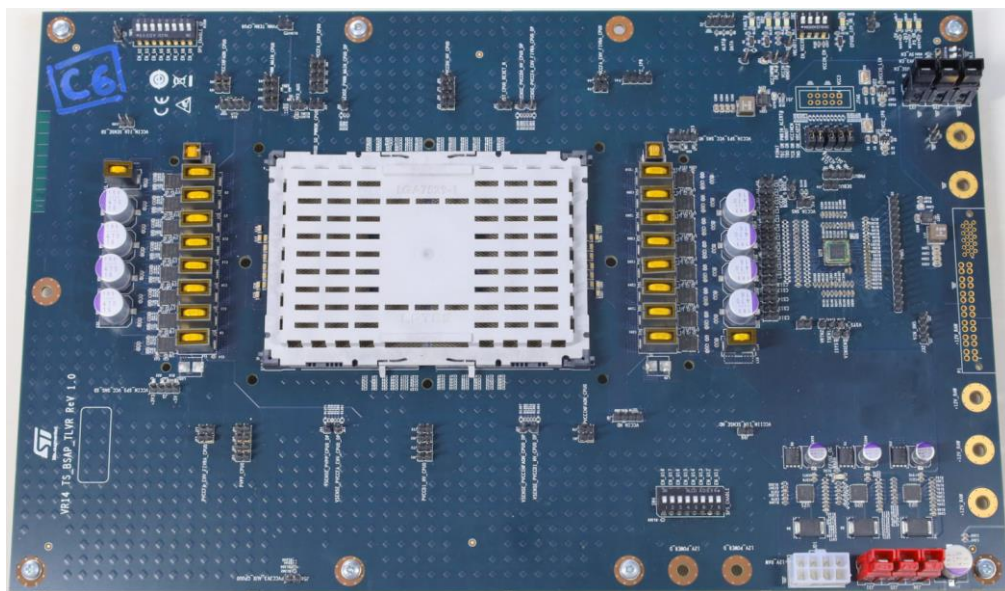
LDOs	
	Broad portfolio of LDOs





# Digital multiphase VR and eFuse

## Our reference design



### 12 V / 60 A integrated eFuse

- Integrated CS resistor
- Parallel operations

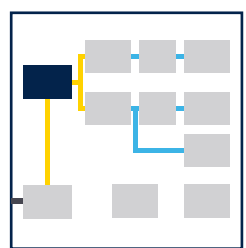
### 12 and 16 phase multiphase digital controller supporting Intel, AMD and AVS for ARM

- Fully configurable via SW
- Best control loop for TLVR

### 50 A, 60 A, 80 A SPS with common footprint

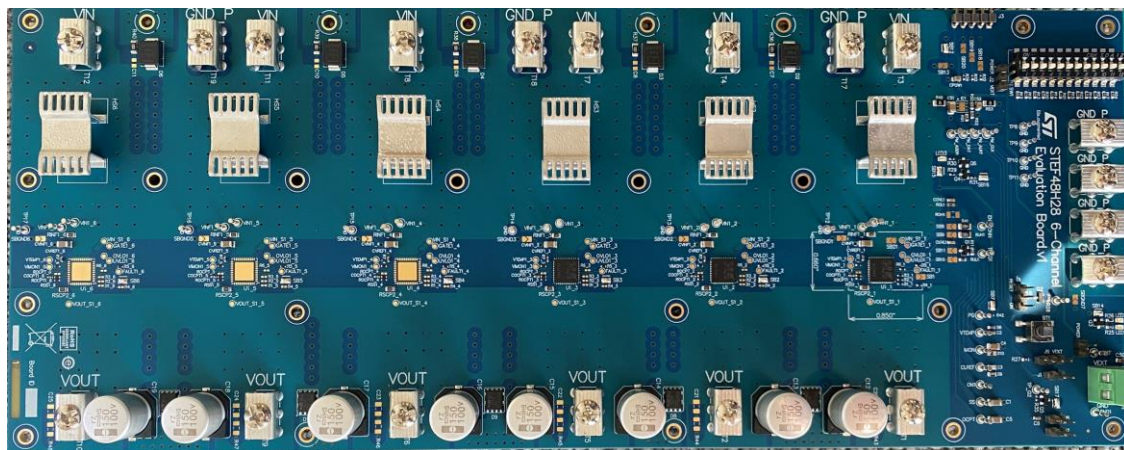
- QFN 4x6, 5x6, 4x5 packages





# 48 V eFuse

## Our reference design



Up to 6 paralleled eFuse

**48 V eFuse** with **28 A** current capability

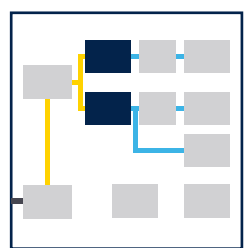
**Integrated solution** (MOSFET + Controller)

Integrated CS resistor

Parallel operations







# Regulated and unregulated converters

## Regulated:

### STB-CL (Stacked Buck with Coupled Inductors)

- High power density
- 1 kW TDP reference design
- 4 kW Interleaved topology

## Unregulated:

### STC (Switched Tank Converter)

- High density low profile
- 1 kW TDP reference design
- X7R capacitor with ZCD

### HSTC (Hybrid STC) 5:1, 10:1

- High density, 750 W TDP
- Flexible ratio, minimum BOM

## Digital controllers



8 phase digital controller



SMED controllers

## Smart drivers



Dual half bridge driver with ZCD

## Switching regulators



Monolithic regulators

## Signal conditioning



Operational amplifiers



Comparators



Digital I/V/T monitoring AFE

## Power transistors

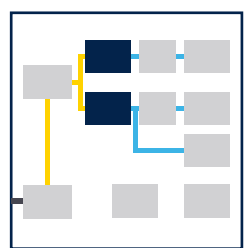


LV MOSFET



Diodes





# Regulated and unregulated converters

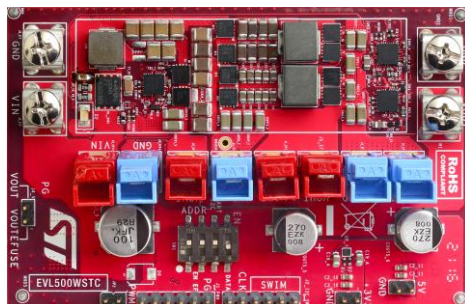
## Our reference designs



STB-CL



HSTC



STC

### Regulated

#### Stacked buck with coupled inductors (STB-CL)

- High density, 1kW TDP
- 4 kW Interleaved topology

### Unregulated

#### Switch Tank Converter (STC)

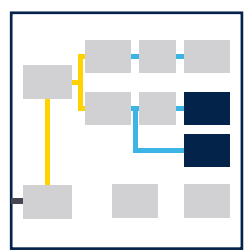
- High density, low profile
- 1 kW TDP reference design
- X7R capacitor with ZCD

#### Hybrid STC (HSTC) 5:1, 10:1

- High density, 750 W TDP
- Flexible ratio, minimum BOM







# HDD and SSD

**Power combo** market leader


**Preamplifier** ramp up

**PMIC** solutions for enterprise and consumer SSD

Monolithic **DC-DC** regulators

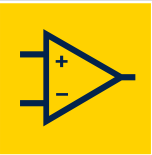
Single and dual **eFuse**

Power combo



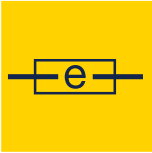
Power combo

Preamplifier

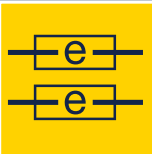


10 channel preamplifier (MAMR, HAMR)

eFuse



5 V and 12 V single eFuse

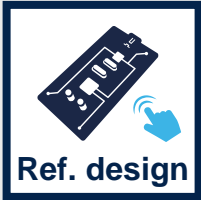


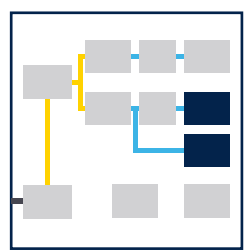
5 V and 12 V dual eFuse

PMIC



Monolithic regulators





# HDD and SSD

## Our reference design

Power Combo



PMICs



**Power Combo** market leader

**Preamplifier** ramp up

**PMIC** solutions for enterprise and consumer SSD

Monolithic **DC-DC** regulators

Single and dual **eFuse**



# Sensors

## Complete sensor offering:

- Accurate temperature
- Air pressure
- Motion sensors for anti tampering

### Environmental

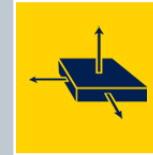


Temperature sensors

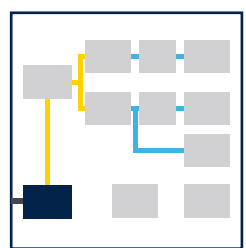


Pressure sensors

### Motion



Motion MEMS



# AC-DC PSU

## PSU complete solution:

- High efficiency AC-DC
- Full power management features with PMBus
- High power density
- Redundant operation

### Power transistors



Low power and high power MOSFET  
60V/1500V/1700 V



SiC MOSFET  
1200V/1500V

### Signal conditioning



Operational amplifiers and comparators

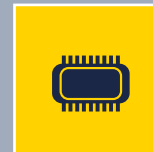
### Diodes



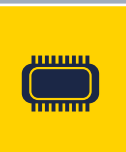
Ultrafast, Schottky and FER diodes

### Controllers

PWM

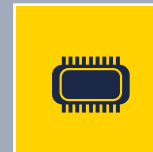


Multimode controller

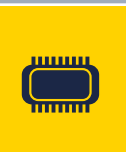


Quasi resonant controller

Voltage & current

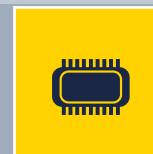


Adjustable voltage reference



CC/CV controller

Sync rect.



Sync rectification controller

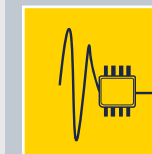


### Protections



TVS protections  
400W/ 600W/1500 W

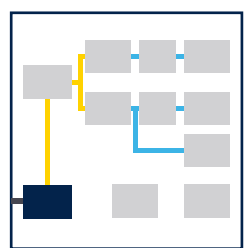
### LDOs



Broad portfolio of LDOs

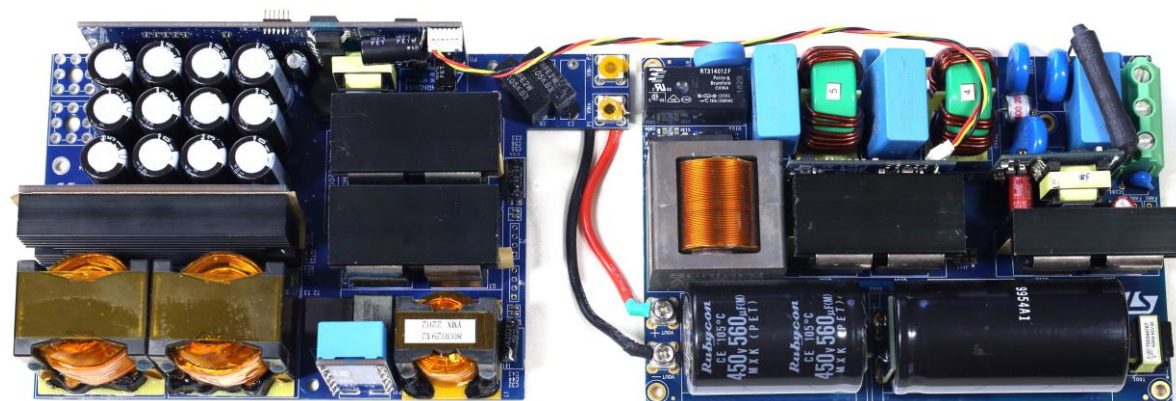






# AC-DC PSU

## Our reference design



AC-DC LLC

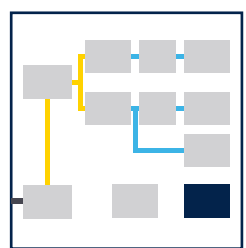
PFC Totem Pole

**3 kW** high efficiency AC-DC

Full power management features with PMBus

High power density

Redundant operation



# Motor control for liquid cooling systems

High **system integration** for board space saving

**Fully protected** for safety and robustness

**High flexibility** with embedded STM32

**High power density** in monolithic motor drivers

**Easy design** tools, full system application expertise

## Power transistors



LV MOSFET  
100V



HV MOSFET  
600V



HV IGBT  
600V

## Isolation I/F and ADC



STISO620/1, ISOSD61  
isolated digital interface &  
Delta-Sigma ADC

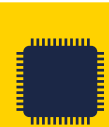
## STSPIN motor drivers

High  
Voltage  
SiP

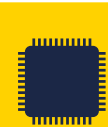


STSPIN32F0601/2  
600V, 3-phase BLDC  
drivers + STM32F0

Low  
Voltage  
SiP



STSPIN32F0  
45V, 3-phase BLDC  
drivers + STM32F0



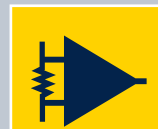
STSPIN32G0  
45V, 3-phase BLDC  
drivers + STM32G0

Low  
Voltage  
Monolithic



STSPIN948  
58V, 4.5 A dual or  
single full-bridge

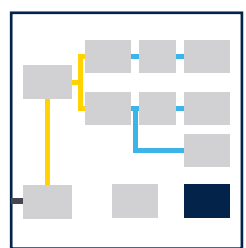
## Current sensing



Digital I/V/T  
Monitoring AFE

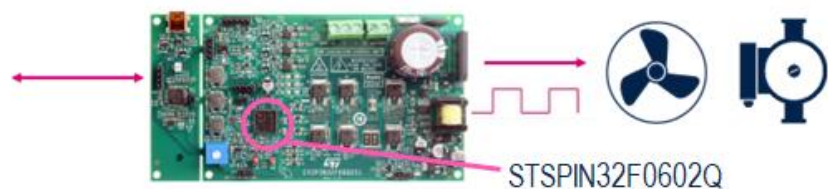




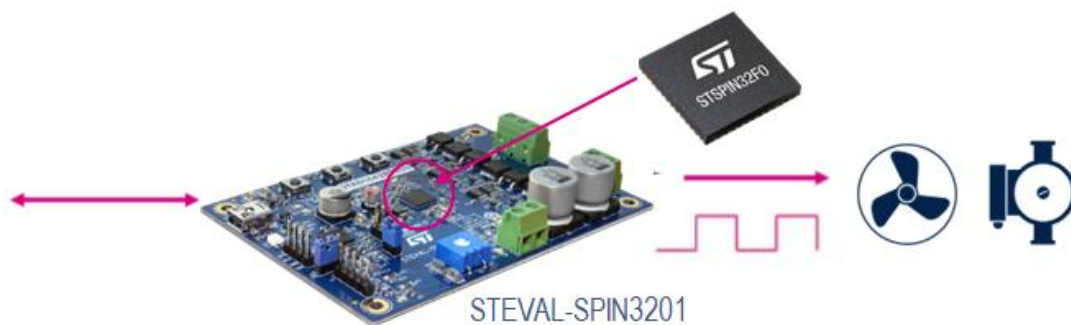


# Motor control for liquid cooling systems

## Our reference designs



STSPIN32F0602Q



STEVAL-SPIN3201

### Integration

- 8 ICs in 1 with 64% BOM area saving

### Flexibility and performance

- 7 control methods, 1/2/3 shunts

### Fully protected

- UVLO, Short-circuit, OCP, OTP

### Easy design

- 19 ready-to-use system solutions