

# Efficiency Optimization In Data Center - From Packaging to Solution

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# Contents

- **Data Center Power Trend and Architecture**
- **High Efficiency Power Packaging & Integration**
- **Application Case: 48V Solution for Server**

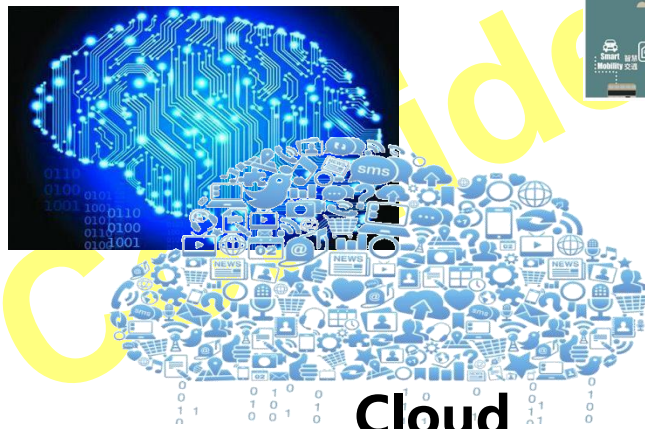
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# AI is Changing the World



NLP

AI



Cloud



Smart City



Image Recognition

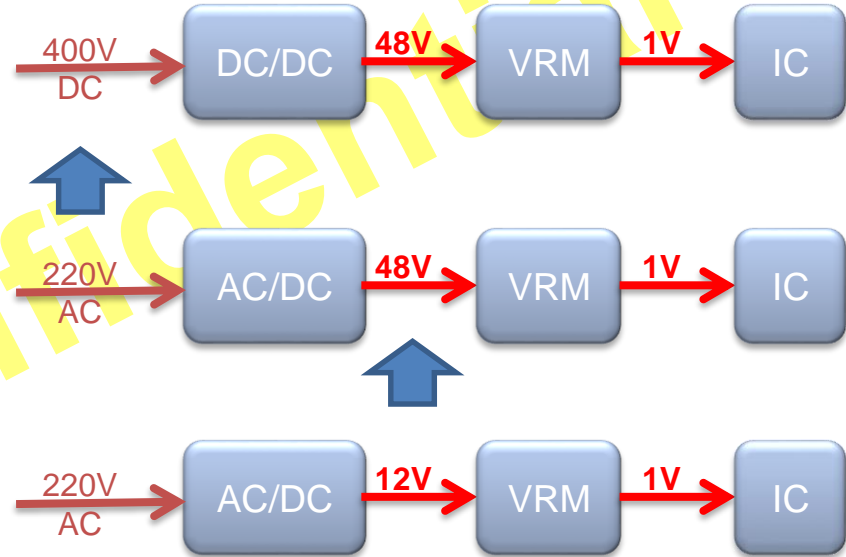
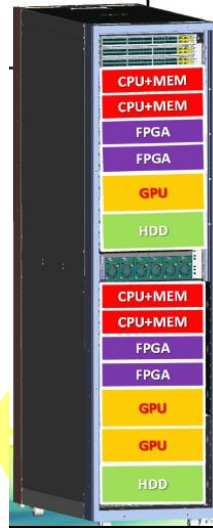
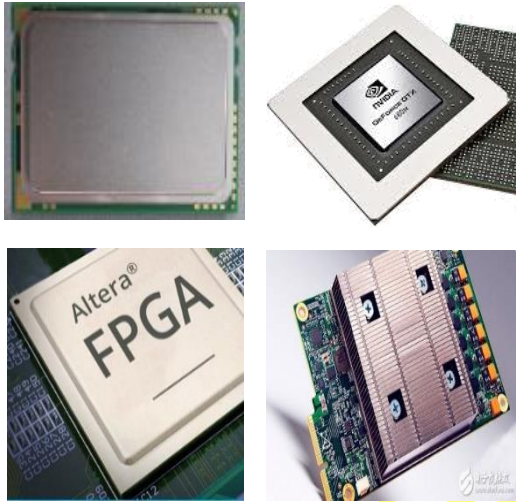


Unmanned Vehicle



Industry 4.0

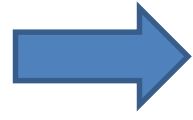
# Data Center Power Architecture Evolution



More heterogeneous computing;  
More high performance processors



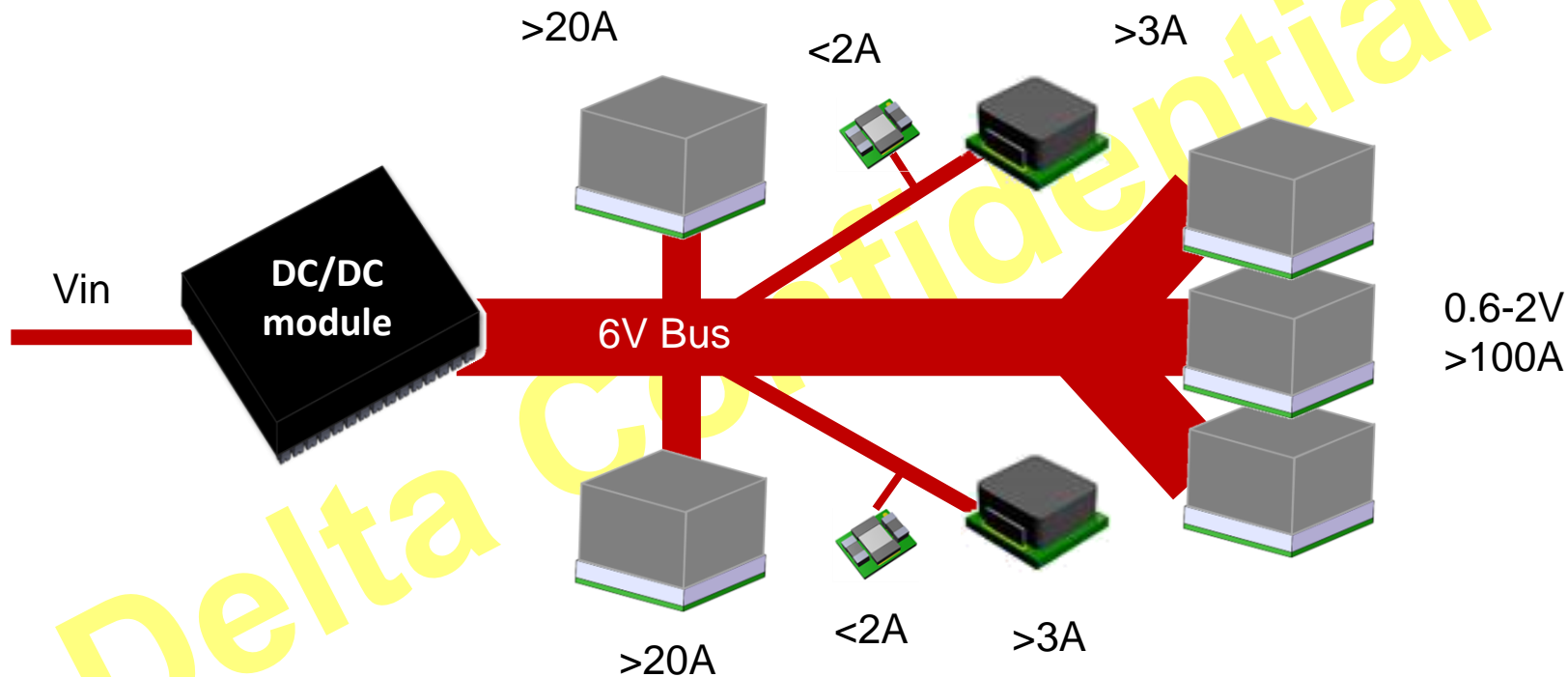
Higher integration;  
Higher power density



Evolving and diversified power architecture

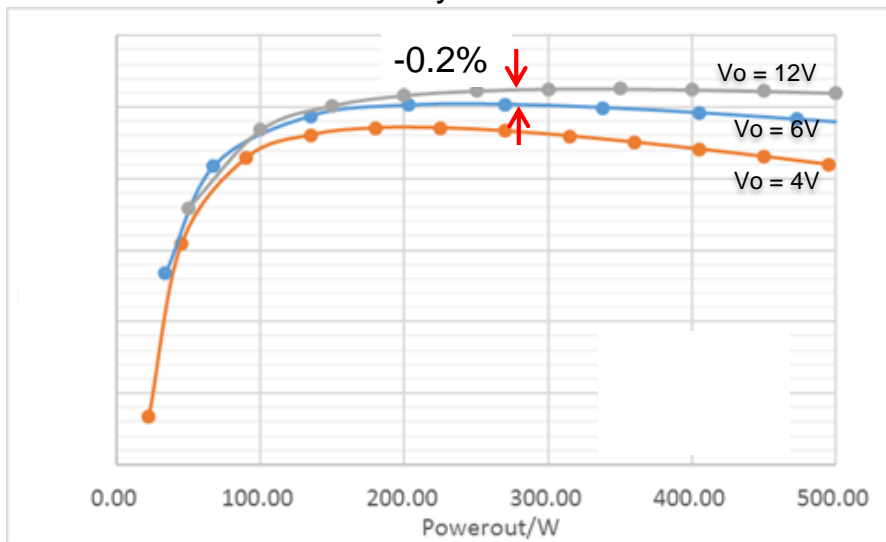
## ➤ The Challenges: Performance, Scalability, Diversity

# 2-Stage Power Architecture for AI Processor

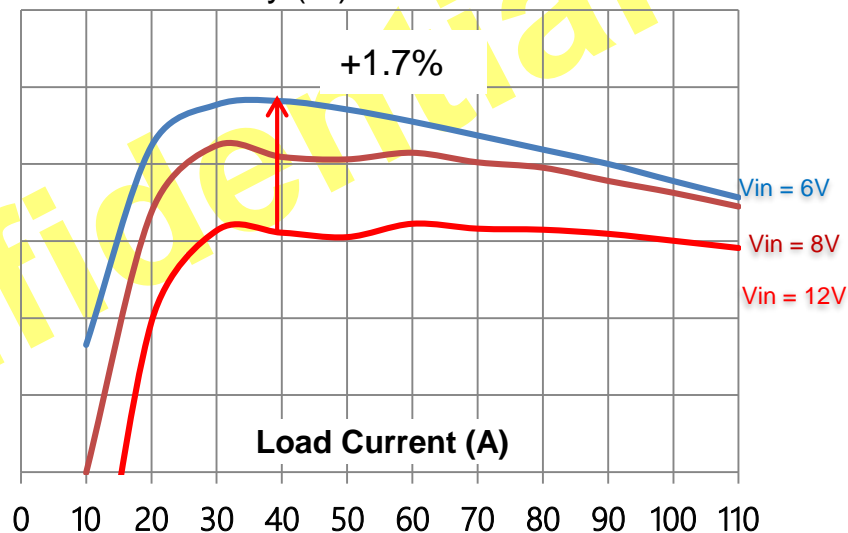


➤ **Very flexible architecture**

DCDC module Efficiency @ 48Vin



Buck Efficiency (%) @ 1.8Vo



- DCDC module efficiency slightly drop from 12Vo to 6Vo
- Buck efficiency significantly increase from 12Vin to 6Vin

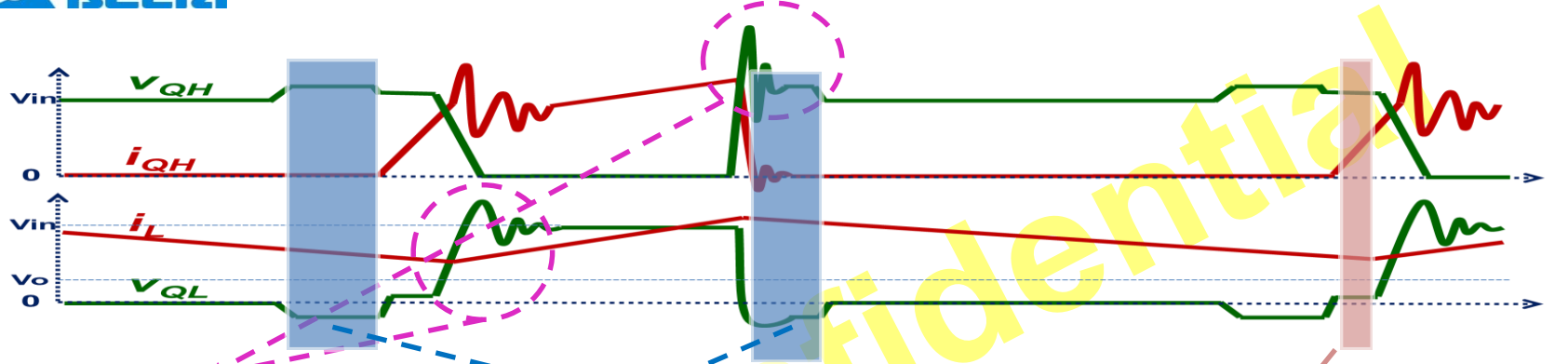
➤ **System Efficiency optimization by low voltage bus**

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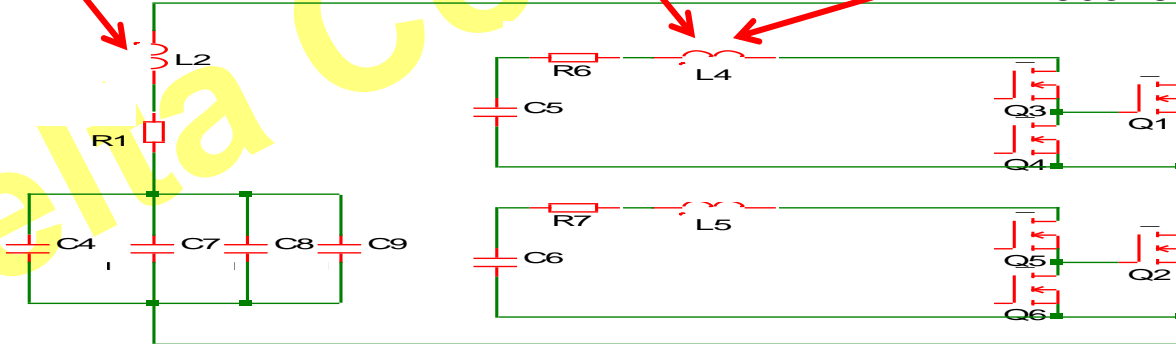
# Buck Losses and Key Parameters



Switch ringing loss

Body diode conduction loss

Body diode reverse recovery loss

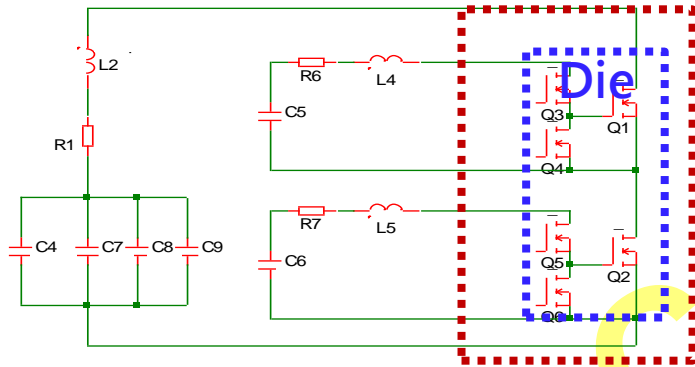


**Loop inductance is the key parameter for buck efficiency**

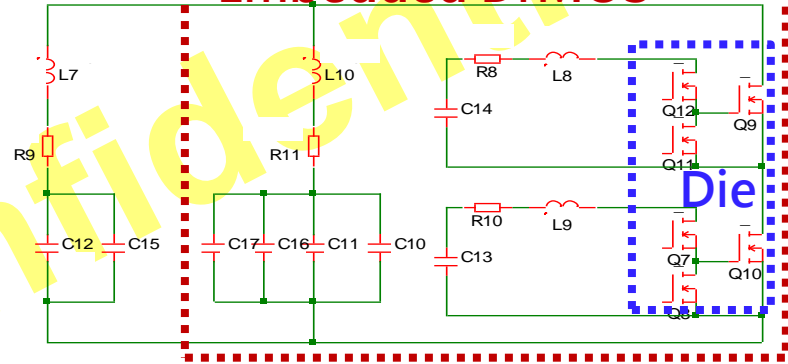


# Embedded DrMOS

## DrMOS



## Embedded DrMOS



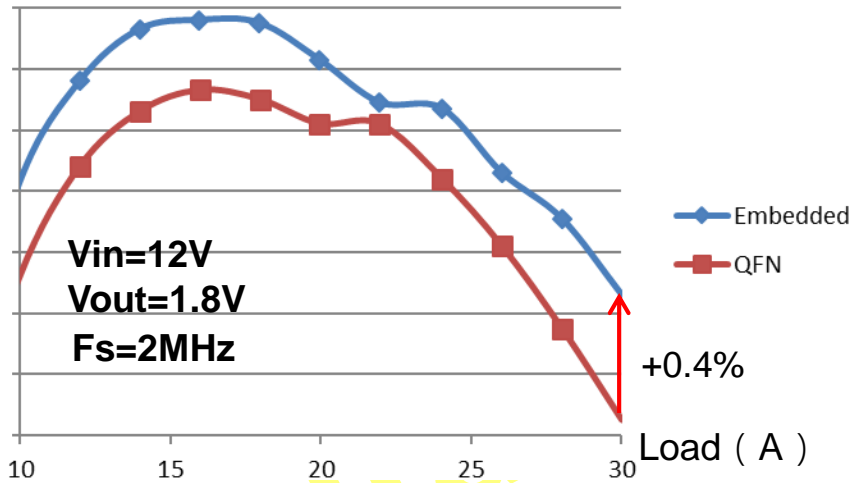
- Switching loop inductance: 50% decreasing
- Driver loop inductance: 50% decreasing



**Smaller loop inductance, lower switching loss**

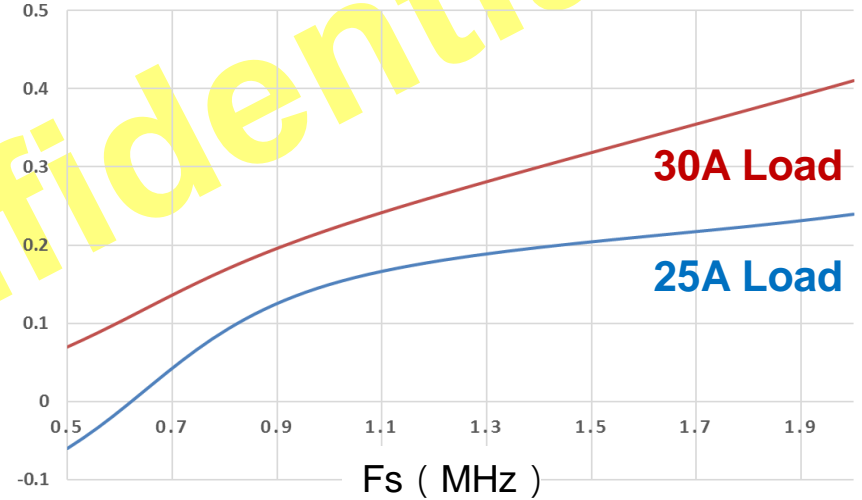
# Efficiency Improvement

Efficiency (%)



Efficiency curve w/ different package

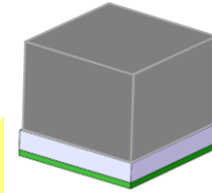
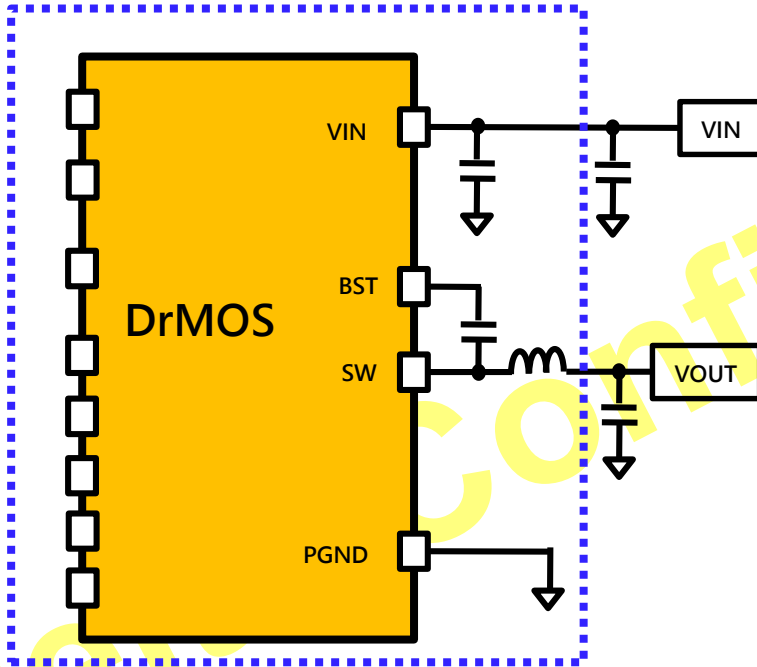
Efficiency Improvement (%)



Efficiency improved at different frequency

➤ **The higher fs or load current, the more improved**

# VRM Integration



2-Phase Buck Module	
Vin	5 - 7.5V
Vo	0.8 - 1.8V
TDC	60A
Footprint	10*10mm
Height	10 mm

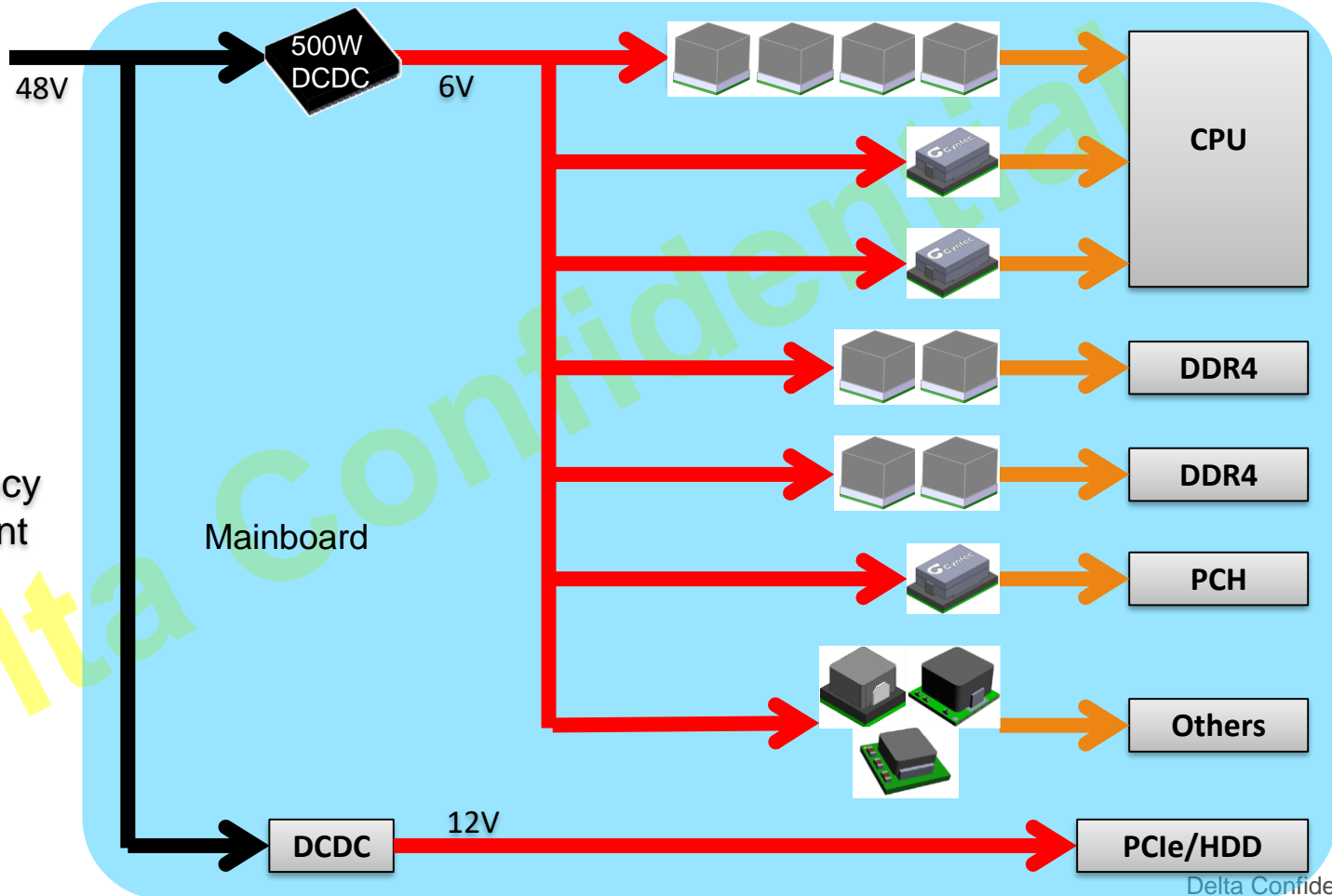
**High density integration of high performance device, packaging and magnetics**

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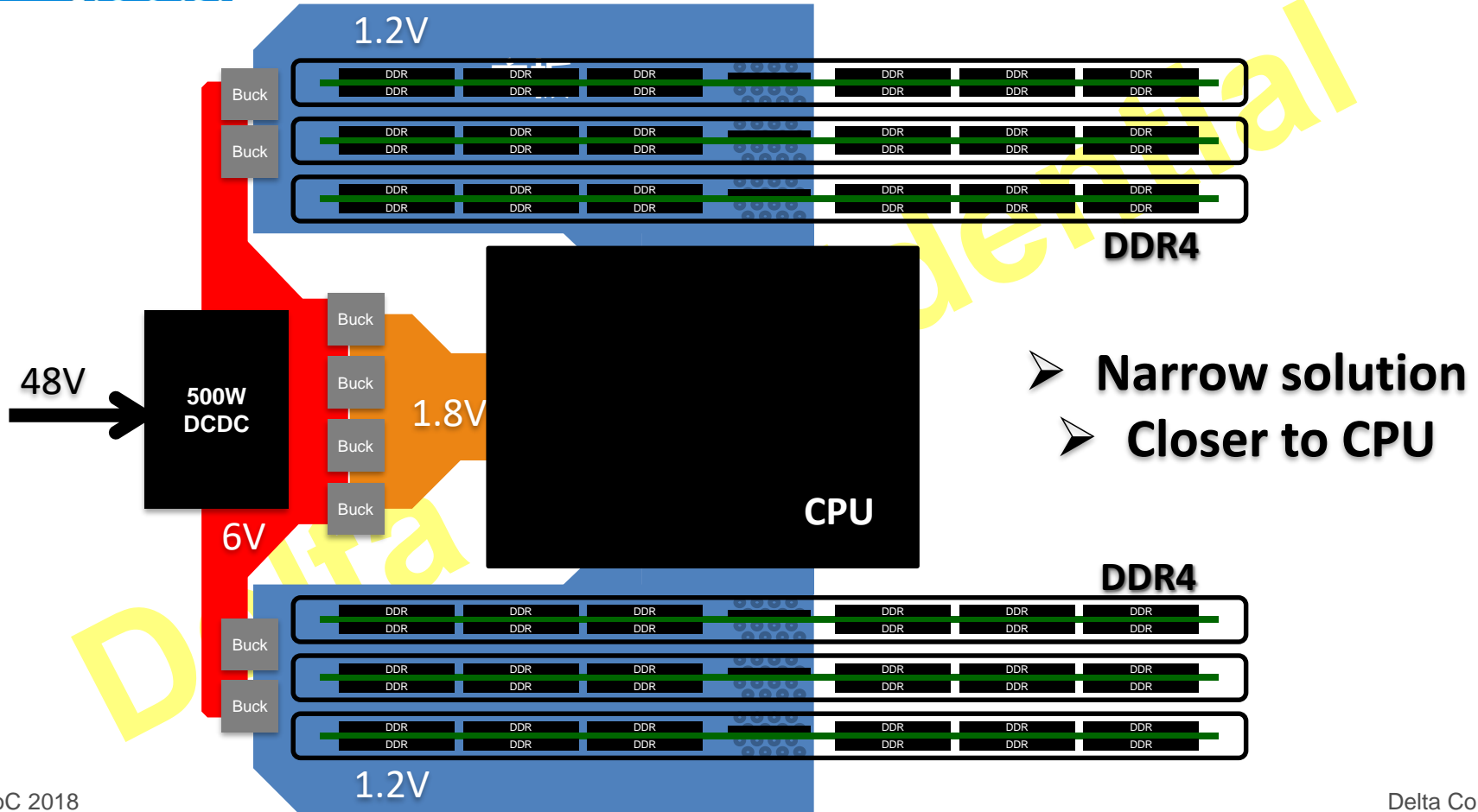
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# 2-Stage Solution for 48V Server

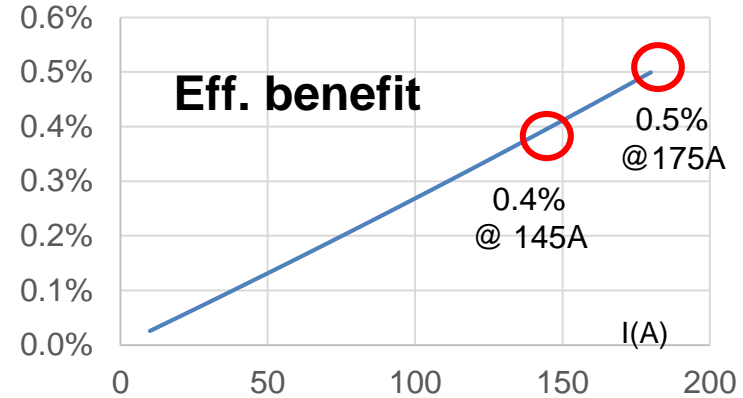
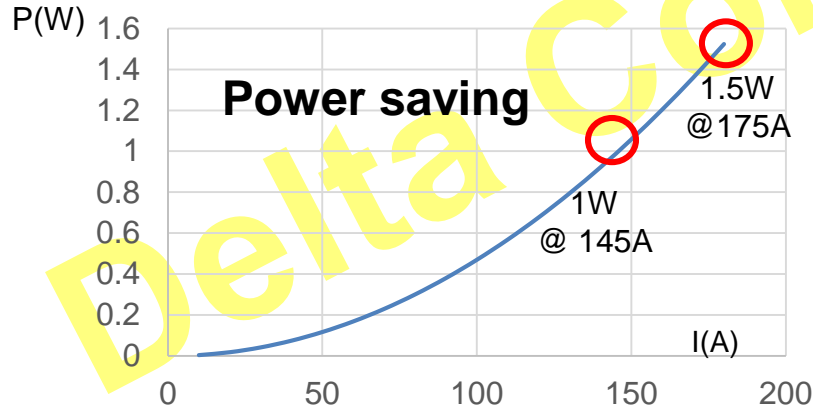
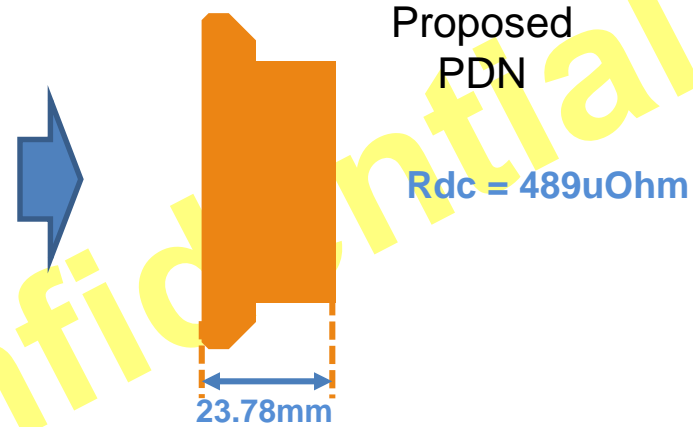
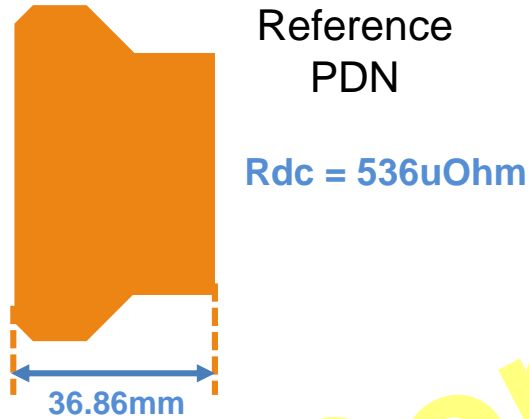


- **High density VRM/PoL**
- ✓ Good efficiency
- ✓ Good transient response
- ✓ Compact footprint

# Proposal Placement

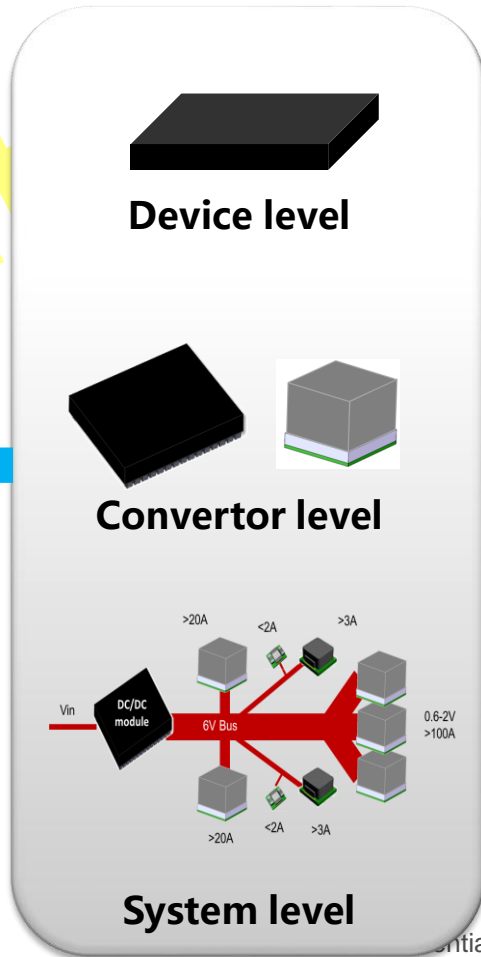
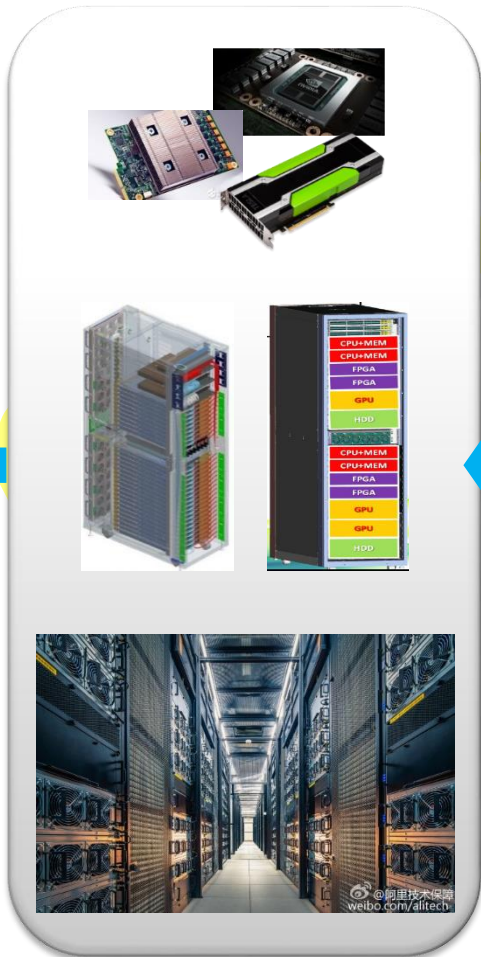
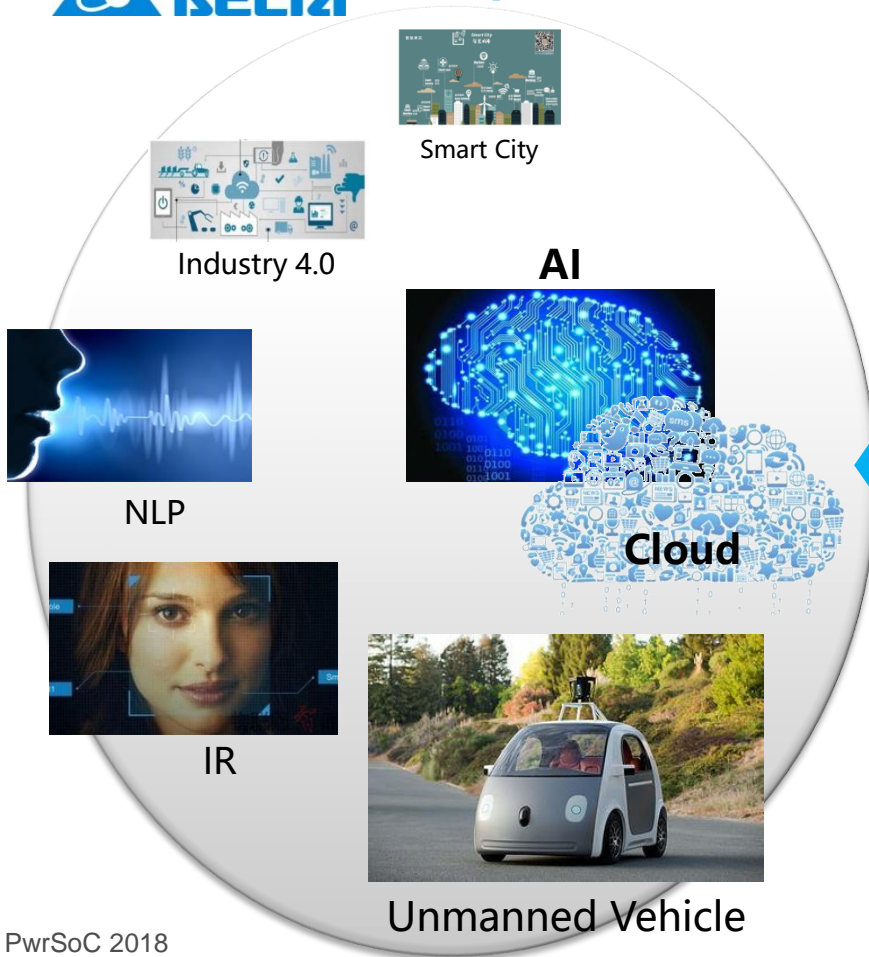


# PDN Modeling and Calculation



**Minimum PDN losses, efficiency improvement**

# Optimize AI Infra with Power Solution





Smarter. Greener.  
Together.

*Your questions?*

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