High Performance 3D Integrated Synchronous Buck Buck Converters

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Market demands

- Power density (Higher power in smaller space)
- Less time-to-design / greater ease of use
- Greater integration with more outputs and fewer components
- Dynamic control & faster transient response switchers
- Greater precision / accuracy
- Lower energy (more efficient) solutions

Power packaging and integration plays an increasingly important role.
Value proposition for 3D integration

Advantages:
- 3D stacking enables miniaturization and drives power density
- Integration enables ease of use with reduced PCB layout complexity and ease of SMT
- Integration enables improved efficiency, faster switching and reduced ripple / EMI

Challenges:
- Thermal management – understanding the system
- Package complexity / reliability – manufacturing excellence and innovative design
- Cost – innovative assembly flows and package structures
Power density: PowerStack™

Reduction of package parasitics
– Stacked NexFET™, ~ 2X greater power density
– Low resistance Cu clips, ~ 30% lower power loss
– Ability to optimize and deliver higher efficiency
Power density: PowerStack™

Improved thermal management and PCB layout
- Single grounded DAP

Reduced Inductance Package

Std Side By Side Package

Larger Ground Pad Enable More Vias in Low Noise Location

76°C

109°C

Up to 30°C Lower with a Optimized Solution
Power density: PowerStack™

Improved thermal management and PCB layout
- Simple PCB layout for optimized performance

Package impact can be equivalent to 2 generations on silicon improvement!
Improved performance with 3D integration

**DualCool™: Key improvements**
- Enables top side Cooling
- 30% higher power dissipation
- Higher current capability

**Top view**

**Bottom view**
Improved performance with 3D integration

Integrated passives: Key improvements

- Integrated Vin capacitors
- Ringing reduced by 40%
Ease of Use – SIMPLE SWITCHER® Power Modules

Industry’s first TO-263 style integrated module
Ease of Use – SIMPLE SWITCHER® Power Modules

Industry’s first TO-263 style integrated module with dual leadframe
SIMPLE SWITCHER® Power Module – value advantage

Ease-of Use Packaging
- Single exposed pad with IC leads
- Easy prototyping and manufacturing

Heat Dissipation
- Best-in-class thermal performance
- No airflow required

Low EMI with Shielded Inductor
- Ideal for noise-sensitive applications

SIMPLE SWITCHER®

Competitors

LMZ22010 Radiated Emissions
Conclusions

- 3D integration in Power Packaging is a critical element to creating a strong value proposition
  - Reduced parasitics and noise
  - Improved power density and thermals
  - Significant ease of use
  - Superior solution reliability and cost

- Future integration
  - High voltage
  - Isolation
  - High accuracy current sensing
  - Integrated magnetics