Application brief

Infineon's full-spectrum power system solutions for battery formation

Everyday routine is being increasingly pervaded by a growing number of wireless and battery powered devices – electric vehicles (EVs) among them. This trend further drives a steadily rising demand for the production of batteries with different charging capacities. Consequently, battery manufacturers find themselves confronted with the challenge to increase efficiency throughout their production and meet the required volume.

The essential stage every battery needs to undergo in the manufacturing process is battery formation. In it, the newly assembled batteries are initially charged and discharged with high voltage and current accuracy with the aim to activate the battery material. Formation cycling has great impact on battery lifetime, quality and cost, but is currently the bottleneck in the production process as it is expensive and time-consuming.

With its comprehensive product portfolio of cost- and efficiency-optimized products Infineon offers full-spectrum power system solutions, and adequately addresses the application requirements of high accuracy, efficiency and power density.

Key features:

- High voltage and current accuracy (up to 0.01%) during charge and discharge cycles
- High power density
- High efficiency
- Optimal thermal management during operation
- High system reliability due to 24/7 operation cycles

Infineon's key enabling products:

- Low voltage power MOSFETs – OptiMOS™ and StrongIRFET™
- High voltage power MOSFETs – CoolMOS™
- Gate driver ICs - EiceDRIVER™
- Discrete IGBTs - TRENCHSTOP™
- Microcontroller - XMC™

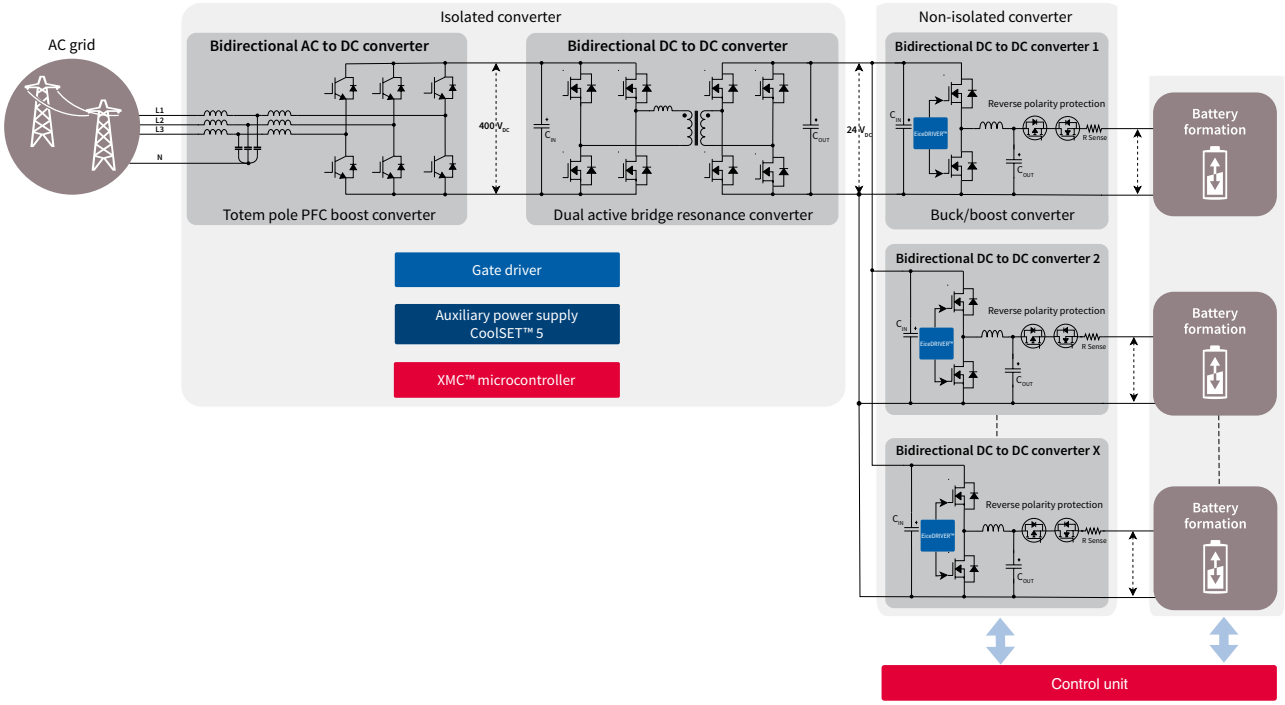
Key benefits

- Highly efficient, innovative and cost-attractive solutions leading to overall BOM savings
- High power density semiconductors enabling size reduction
- Fast time to market due to the complete ecosystem:
  - simulations
  - documentations
  - demonstration boards
- Increased lifetime and reliability due to Infineon's quality
- One-stop-shop portfolio

Further information

- www.infineon.com/batteryformation
- www.infineon.com/optimos
- www.infineon.com/coolmos
- www.infineon.com/eicedriver

System block diagram – Battery formation



AC-DC stage: bidirectional converter*			
Power	Stage	CoolMOS™ and IGBT	Eice DRIVER™
2 kW	PFC	IPW60R090CFD7 TRENCHSTOP™ H5	2EDFx 2EDSx 2EDNx 1EDIx
4 kW		IPW60R040CFD7 TRENCHSTOP™ H5	
2 kW	Isolated DC-DC primary side	IPW60R105CFD7	
4 kW		IPW60R090CFD7	
Auxiliary power supply		CoolSET™ 5 - ICE5QR4780AZ	
Microcontroller		XMC™ 4000 family	

Isolated DC-DC secondary side*					
V_{out}	MOSFET breakdown voltage	SMD packages OptiMOS™ 6 and OptiMOS™ 5			
		D²PAK	SSO8	TOLL	D²PAK-7
12 V	40 V	IPB015N04L G (1.5 mΩ)	BSC007N04LS6 (0.7 mΩ)	IRL40T209 (0.7 mΩ)**	IPB011N04L (1.1 mΩ)
24 V	60 V	IPB019N06L3 G (1.9 mΩ)	BSC012N06NS (1.2 mΩ)	IPT007N06N (0.75 mΩ)	IPB014N06N (1.4 mΩ)
48 V	100 V	IPB020N10N5 (2.0 mΩ)	BSC027N10NS5 (2.7 mΩ)	IPT015N10N5 (1.5 mΩ)	IPB017N10N5 (1.7 mΩ)
96 V	150 V	IPB048N15N5 (4.8 mΩ)	BSC093N15NS5 (9.3 mΩ)	IPT059N15N3 (5.9 mΩ)	IPB044N15N5 (4.4 mΩ)
	200 V	IPB107N20N3 (10.7 mΩ)	BSC220N20NSFD (22 mΩ)	IPT111N20NFD (11.1 mΩ)	
Drivers		1EDN7550B / 2EDF7275X			
Microcontroller		XMC™ 4000 family			

Non-isolated bidirectional DC-DC stage*							
V_{in}	MOSFET breakdown voltage	SMD packages OptiMOS™ 6 and OptiMOS™ 5				Through-hole packages OptiMOS™ and StrongIRFET™	
		D²PAK	SSO8	TOLL	D²PAK-7	TO-220	TO-247
12 V	30 V	IRLS3813PbF (1.95 mΩ)	BSC011N03LS (1.1 mΩ)	IPT004N03L (0.4 mΩ)	IPB009N03L (0.95 mΩ)	IRLB3813 (1.95 mΩ)	IRFP3703 (2.8 mΩ)
24 V	40 V	IPB015N04L G (1.5 mΩ)	BSC007N04LS6 (0.7 mΩ)	IRL40T209 (0.7 mΩ)**	IPB011N04L (1.1 mΩ)	IRLB3034 (2.0 mΩ)	IRFP7430PBF (1.3 mΩ)
	60 V	IPB019N06L3 G (1.9 mΩ)	BSC012N06NS (1.2 mΩ)	IPT007N06N (0.75 mΩ)	IPB014N06N (1.4 mΩ)	IPP020N06N (2.0 mΩ)	IRFP7530 (2.0 mΩ)
48 V	100 V	IPB020N10N5 (2.0 mΩ)	BSC027N10NS5 (2.7 mΩ) BSC093N15NS5 (150 V, 9.3 mΩ)	IPT015N10N5 (1.5 mΩ)	IPB017N10N5 (1.7 mΩ)	IPP023N10N5 (2.3 mΩ)	IRF100P219 (1.7 mΩ)
96 V	200 V	IPB107N20N3 (10.7 mΩ)	BSC220N20NSFD (22 mΩ)	IPT111N20NFD (11.1 mΩ)		IPP110N20N3 (11 mΩ)	IRF200P222 (6.6 mΩ)
Drivers		1EDN7550B / 2EDF7275X					

*Best-in-class products for given package **StrongIRFET™

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