



Infineon's UPS system solutions

Introducing high efficiency and cost-optimized UPS solutions

www.infineon.com/ups



System solution for uninterruptable power supply (UPS) applications

Higher awareness and commitment towards reducing carbon emissions have become a worldwide trend. Accordingly, the UPS units are becoming smaller while providing the equal level of protection. UPS systems need an increasing reliability as well as zero downtime, this is why manufacturers are designing more robust components for them. UPS systems have three indispensable requirements: modularity, scalability and energy efficiency.

Key features



Modularity

Infineon offers a complete portfolio according to the latest market trends, including modularization of UPS brick units for scalable UPS systems and multilevel topologies that achieve higher efficiency and performance.



Scalability

A full lineup of discrete up to highly integrated module packages enable freedom to choose the desired level of system integration across various UPS platforms to upgrade system power levels on demand.



Energy efficiency

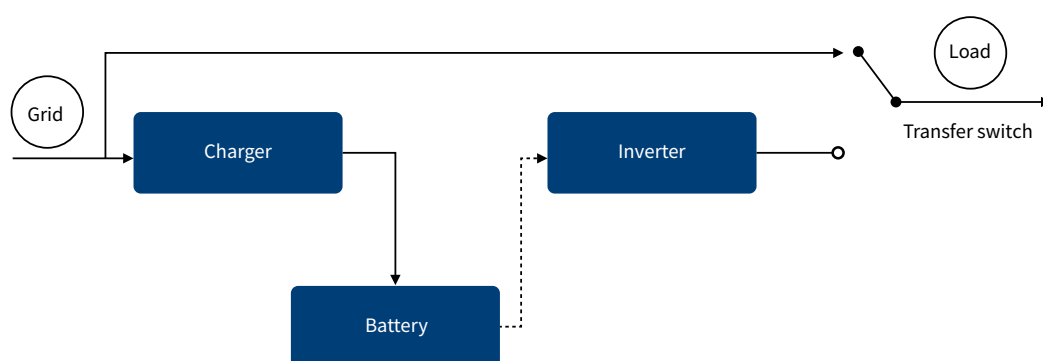
With our complete application knowledge, we offer the best product combination to achieve power density and best-in-class efficiency. This all-embracing portfolio includes best-in-class MOSFETs, IGBTs, and modules, highly integrated gate driver packages and microcontrollers.

Product portfolio

Infineon's products are suitable for offline and online uninterruptible power supplies in telecom, data center, server or industrial automation environments, such as:

Product family	Offline UPS	Online UPS
MOSFETs	OptiMOS™ and StrongIRFET™ 20-300 V	OptiMOS™ and StrongIRFET™ 20-300 V
	CoolMOS™ SJ MOSFETs 500-950 V	CoolMOS™ SJ MOSFETs 500-950 V
SiC diodes	-	CoolSic™ Schottky diode
IGBTs	TRENCHSTOP™ IGBT6 TRENCHSTOP™ 5 H5	TRENCHSTOP™ IGBT6 TRENCHSTOP™ 5 H5
Power module and stack	-	EasyPACK™
Driver ICs	EiceDRIVER™ 1EDN EiceDRIVER™ 2EDN	EiceDRIVER™ 1ED Compact
Auxiliary power supply	-	CoolSET™ 650-800 V
Microcontrollers	XMC1300 series	XMC4000 series

Offline (standby) UPS is used for small office and home office (SOHO), and it is usually from 0 to 10 kVA. This solution covers, above all, power discrete solutions and it is divided into low frequency and high frequency transformer-based systems.



Online (industrial) UPS, from 10 to 50 kVA or higher than 50 kVA, is the perfect fit for applications like data centers, servers, workstations, control systems, communication or telecom systems. The solution covers primarily power discrete or power modules solutions, which depends on the customer.





UPS power rating

0-10 kVA	10-50 kVa	>50 kVa
<ul style="list-style-type: none"> > Mainly simple offline single-phase UPS systems > Cost-driven and commoditized market segment > Solution covered by power discrete 	<ul style="list-style-type: none"> > Three-phase online UPS systems > Very much driven by modularization (e.g. 20/25/50 kVA bricks) > Grey area where solutions covered by power discrete or power modules 	<ul style="list-style-type: none"> > Project-based UPS business > High reliability, footprint and high efficiency > Mostly power module solutions

Offline UPS

Offline UPS, between 0 to 10 kVA, is used for small office and home office (SOHO). This solution covers power discrete solutions and is usually divided into low frequency and high frequency transformer based systems. The load is normally connected to the grid. When the grid fails, UPS switches the load to the battery DC/AC inverter source.

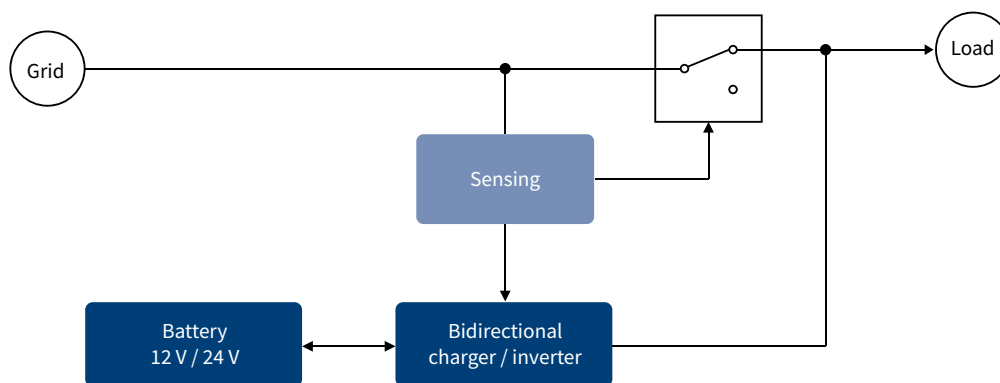
Typical topologies for 0 – 10 kVA UPS

DC/AC AC/DC		Bi-directional push-pull	OptiMOS™ or StrongIRFET™ 60 to 150 V	
DC/AC (output stage)		Bi-directional full-bridge	OptiMOS™ or StrongIRFET™ 30 to 60 V	
DC/DC (boost stage)		Unidirectional full-bridge (output stage)	CoolMOS™ P7/C7 in 600/800 V	
DC/DC (boost stage)		Push-pull	OptiMOS™ or StrongIRFET™ 60 to 150 V	
AC/DC (charger)		Flyback	CoolMOS™ P7/C7 in 600/800 V	
Every switch needs a driver EiceDRIVER™ 1EDN, EiceDRIVER™ 1EDN-TDI, EiceDRIVER™ 2EDN				

Low frequency transformer

- > 50/60 Hz iron core transformers, which are large and heavy
- > Sine or square wave output voltage
- > Full-bridge or push-pull inverter/charger (full-bridge is generally preferred)
- > Robust against AC line surges

Bi-directional UPS power stage





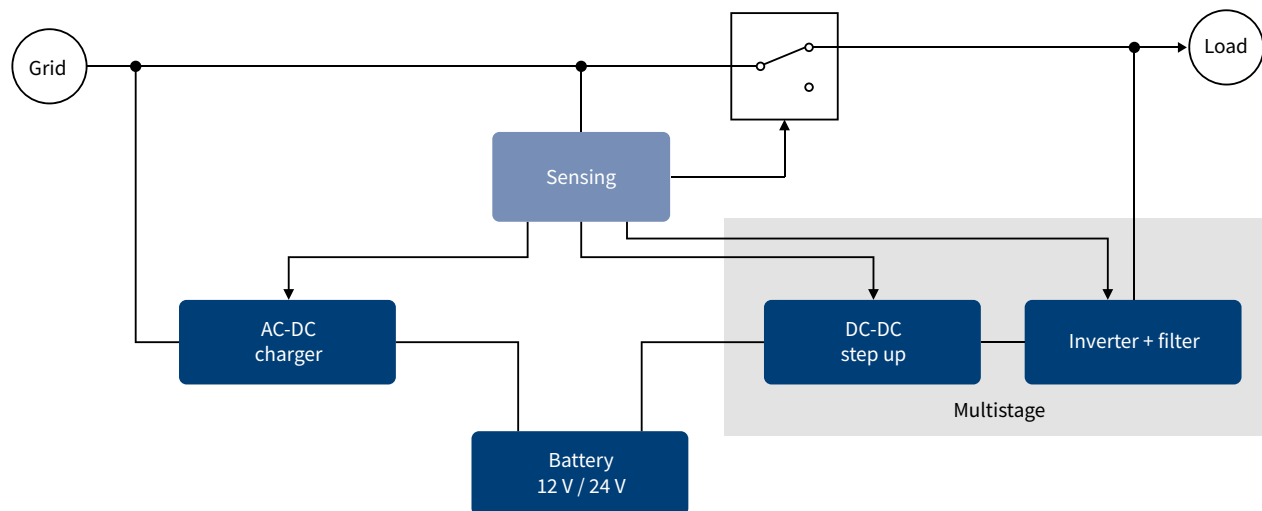
Product portfolio

Product family	Topology	Voltage class [V _{DS} max]	Package	Part number	R _{DS(on)}
Inverter/charger MOSFETs	Push-pull	60 V	TO-220	IRFB7530	2.0 mΩ
			TO-247	IRFP3006	2.5 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7530	2.0 mΩ
		75 V	TO-220	IRFB3077	3.3 mΩ
			TO-247	IRFP7718	1.8 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7730	2.6 mΩ
		100 V	D ² PAK and D ² PAK 7pin	IRF3610S	11.6 mΩ
		150 V	TO-220	IRFB4115	11.0 mΩ
			TO-247	IRFP4568	5.9 mΩ
			D ² PAK and D ² PAK 7pin	IRFS4321	15.0 mΩ
		200 V	TO-220	IPP110N20N3	11.0 mΩ
			TO-247	IRF200P222	6.6 mΩ
			D ² PAK and D ² PAK 7pin	IPB110N20N3LF	11.0 mΩ
	Full-bridge	30 V	TO-220	IRLB3813	1.95 mΩ
		40 V	TO-220	IRFB7430	1.3 mΩ
			TO-247	IRFP7430	1.3 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7430	1.2 mΩ
		60 V	TO-220	IRFB7545	5.9 mΩ
		100 V	TO-220	IPP030N10N	3.0 mΩ
			TO-247	IRFP4468	2.6 mΩ
			D ² PAK and D ² PAK 7pin	IRF3710S	23.0 mΩ
		150 V	TO-220	IRFB4321	15.0 mΩ
			TO-247	IRFP4568	5.9 mΩ
			D ² PAK and D ² PAK 7pin	IRFS4321	15.0 mΩ
		200 V	TO-220	IPP110N20N3	11.0 mΩ
			TO-247	IRF200P222	6.6 mΩ
			D ² PAK and D ² PAK 7pin	IPB110N20N3LF	11.0 mΩ
Gate driver	EiceDRIVER™ 1EDN, EiceDRIVER™ 2 EDN				
Microcontroller	XMC1300 series				

High frequency transformer

- › 20-50 kHz switching, ferrite core transformers which are small and light and can be mounted on the PCB
- › Sine wave output voltage
- › Two stage topology; push-pull DC-DC plus full-bridge AC-AC, separate flyback converter for battery charging
- › Suitable for good power quality AC power grids

Unidirectional UPS power stage



Product portfolio

Product family	Topology	Voltage class [V _{DS} max]	Package	Part number	R _{DS(on)}
Unidirectional charger	Flyback	650 V	PG-DIP-7	ICE3RBR1765JZ	1.7 mΩ
		800 V	TO-247	IPP80R750P7	750.0 mΩ
Unidirectional DC-DC stage	Push-pull	40 V	TO-220	IRFB7430	1.3 mΩ
			TO-247	IRFP7718	1.8 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7430	1.2 mΩ
		60 V	TO-220	IRFB7540	5.1 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7530-7P	1.4 mΩ
		75 V	TO-220	IRFB3077	3.3 mΩ
			TO-247	IRFP7718	1.8 mΩ
			D ² PAK and D ² PAK 7pin	IRFS7730	2.6 mΩ
			TO-247	IRF100P218	1.28 mΩ
			D ² PAK and D ² PAK 7pin	IRFS4010	4.7 mΩ
		150 V	TO-220	IRFB4115	11.0 mΩ
			TO-247	IRF150P220	2.7 mΩ
D ² PAK and D ² PAK 7pin	IRFS4321		15.0 mΩ		
Unidirectional inverter stage	Full-bridge inverter 120 V _{AC}	300 V	TO-220	IPP410N30N	41.0 mΩ
			TO-247	IRF300P226	19.0 mΩ
		500 V	TO-220	IPP50R280CE	280.0 mΩ
			TO-247	IPW50R190CE	190.0 mΩ
Gate driver	EiceDRIVER™ 1EDN, EiceDRIVER™ 2EDN, EiceDRIVER™ 1EDN-TDI				
Microcontroller	XMC1300 series				



DEMO_850VA_12V_230VAC_UPS demonstration board

The demonstration board is a cost-competitive offline UPS solution designed for operation with a low frequency iron lamination core transformer. It includes a bi-directional inverter/charger system.

Parameter	Specification
Input voltage	220-240 V _{rms} (50-60 Hz)
Battery voltage	12 V
Maximum load	850 VA
Topology	Offline bi-directional full-bridge
Transformer	Iron core, low frequency
MOSFETs	IRFS7440 x 12 (40 V, 2.5 mΩ) StrongIRFET™
Gate drivers	2EDL8114 (100 V, +/-4 A peak)
Controller	XMC1301-T016x0032

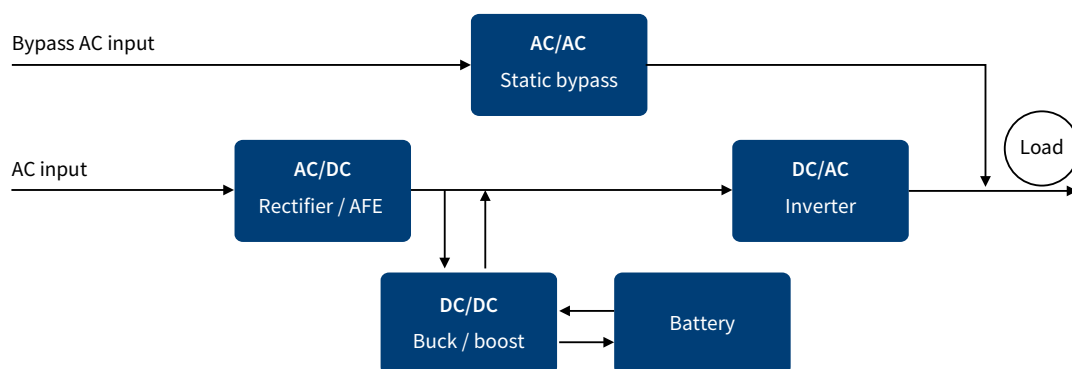


Online UPS

Applications like server, data center and industry automation demand double conversion UPS topology. UPS system delivers power to connected equipment in a two-stage process. First incoming AC power is converted to DC, then DC power is converted to a conditioned pure sine wave output. During an outage, the UPS system converts stored DC battery power into AC power. In addition, internal components are automatically bypassed and the power is directly delivered to connected equipment in the case of an internal fault or overload condition.

It is common to build UPS system using 10 kVA to 50 kVA sub power modules, then stack them to create a 500 kVA UPS solution.

UPS double conversion block diagram





Product portfolio for online UPS from 5 kVA to 25 kVA

Sub power modules design from 5 up to 25 kVA

You can achieve the best price/performance ratio by using Infineon discrete products.

Power block	Topology	Voltage class [V _{CE} or V _{DRM} , V _{RRM}]	Current class package [IC or I _{FAVM} or I _{TAVM}]	Package	Part number
AC / DC or DC / AC or DC / DC	3-level NPC1	650 V	30 A	TO-247 3pin (10 ... 30kHz)	IKW30N65ES5
			40 A		IKW40N65ES5
			50 A		IKW50N65ES5
			75 A		IKW75N65ES5
			30 A	TO-247 3pin (30 ... 50kHz)	IKW30N65H5
			40 A		IKW40N65H5
			50 A		IKW50N65EH5
			75 A		IKW75N65EH5
	3-level NPC2 or Vienna Rectifier	1200 V (for 650 V please refer first row)	15 A	TO-247 3pin	IKW15N120BH6
			40 A		1KW40N120CS6
			75 A	TO-247PLUS 3pin	IKQ75N120CS6
			40 A	TO-247PLUS 4pin	IKY40N120CS6
			75 A	TO-247PLUS 4pin	IKY75N120CS6
	2-level full-bridge and buck-boost	1200 V (for 650 V please refer first row)	15 A	TO-247 3pin	IKW15N120BH6
			40 A		1KW40N120CS6
			75 A	TO-247PLUS 3pin	IKQ75N120CS6
			40 A	TO-247PLUS 4pin	IKY40N120CS6
			75 A	TO-247PLUS 4pin	IKY75N120CS6
	Gate driver	EiceDRIVER™ SOI / EiceDRIVER™ 1ED Compact			
Microcontroller	XMC1000 / XMC4000				
Current sensor	TLI4970 / TLI4971				

Product portfolio for online UPS from 25 kVA up to 50 kVA

Sub power modules design from 25 kVA to 50 kVA

You can achieve the best-in-class power density and ease of manufacturing by using Infineon module products.

Power Block	Topology	Voltage class [V_{CE} or V_{DRM} , V_{RRM}]	Current class [I_C or I_{FAVM} or I_{TAVM}] Package	Package	Part number
AC / DC or DC / AC or DC / DC	3-level NPC1	650 V	30 A 50 A	Easy 2B	FS3L30R07W2H3F_B11 FS3L50R07W2H3F_B11
	3-level NPC2 or Vienna Rectifier	1200 V / 650 V	75 A 15 A 100 A 150 A	Easy 1B	F3L75R12W1H3_B11
				Easy 2B	F3L15MR12W2M1_B69
					F3L100R12W2H3_B11
					F3L150R12W2H3_B11
	2-level full-bridge and buck-boost	1200 V	50 A 75 A 100 A 150 A 200 A	EconoPACK™ 2	FS50R12KT4_B11 FS75R12KT4_B11
					FS100R12N2T4
				EconoPACK™ 3	FS150R12KT4_B11 FS200R12KT4_B11
		1200 V	100 A 150 A 200 A	EconoPACK™ 4	FS100R12PT4 FS150R12PT4 FS200R12PT4
					TT60N16SOF
					TT120N16SOF
					TT190N18SOF
Rectifier or bypass	Full-bridge & bi-directional	1600 V	60 A 120 A	Eco Block 20 mm	TT60N16SOF
		1800 V	190 A	Eco Block 34 mm	TT190N18SOF
Gate driver	EiceDRIVER™ 1ED Compact / EiceDRIVER™ Enhanced 1ED-F2 and 2ED-F2				
Microcontroller	XMC1000 / XMC4000				
Current sensor	TLI4970 / TLI4971				

Product portfolio for online UPS higher than 50 kVA

Power Block	Topology	Voltage class [V_{CE} or V_{DRM} , V_{RRM}]	Current class [I_C or I_{FAVM} or I_{TAVM}] Package	Package	Part number	
AC / DC or DC / AC or DC / DC	3-level NPC1	650 V	200 A	EconoPACK™ 4	F3L200R07PE4	
			300 A		F3L300R07PE4	
			300 A (TIM)		F3L300R07PE4P	
			225 A (TIM)	Easy 2B	F3L225R07W2H3P_B63	
	3-level NPC2	1200 V / 650 V	200 A	Easy 2B	F3L200R12W2H3_B11	
			300 A	EconoPACK™ 4	F3L300R12PT4_B26	
		1200 V / 650 V	300 A (TIM)		F3L400R12PT4P_B26	
			400 A		F3L400R12PT4_B26	
		1200 V	300 A	62 mm	FF300R12KE4/_E	
			450 A		FF450R12KE4/_E	
			600 A		FF600R12KE4/_E	
		2-level full-bridge and buck-boost	1200 V	300 A	EconoDUAL™ 3	FF300R12ME4_B11
				450 A		FF450R12ME4_B11
				600 A		FF600R12ME4_B11
				900 A		FF900R12ME7_B11
	1200 V		200 A	EconoPACK™ 4	FD200R12PT4_B6	
			200 A		DF200R12PT4_B6	
	1200 V		300 A	62 mm	FF300R12KE4	
			450 A		FF450R12KE4	
			600 A		FF600R12KE4	
	Rectifier or bypass		Full-bridge and bi-directional	1800 V	190 A	Eco Block 34 mm
		250 A			Power Block 50 mm	TT250N18KOF
		320 A			Eco Block 50 mm	TT320N18SOF
		425 A			Eco Block 60 mm	TT425N18KOF
		500 A				TT500N18KOF
Gate driver	EiceDRIVER™ 1ED Compact / EiceDRIVER™ Enhanced 1ED-F2 and 2ED-F2					
Microcontroller	XMC1000 / XMC4000					
Current sensor	TLI4970 / TLI4971					

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in semiconductor solutions



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We are the link between the
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We partner
We innovate
We perform

Our mission

We make life
easier, safer
and greener.

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