APPLICATION BROCHURE

USB-C adapters and chargers

The semicondutor offering for high-performing, highly reliable and cost-effective solutions.

Introduction

Over the last few years, the number of rechargeable battery-powered portable devices has increased substantially. The lack of unification and standardization in the charger and adapter equipment domain led to a situation that each device required its own bulky charger and cable, inconvenient for end-users.
To solve this, the USB-C power delivery (USB-PD) technology, standard for fast-charging and data transfer, gained significant importance. With the primary ambition of simplifying the end-user experience, USB-C PD chargers promise a compact-sized charging solution with higher power, making charging faster and more efficient. However, this convenience comes at the cost of higher engineering efforts.

From the technology point-of-view, the unification headway poses many new challenges to the engineers while laying the foundations of a highly competitive environment. The latest technology and market trends in chargers and adapters are pushing the envelope of form-factor, charging power, battery capacity, and charging time. These needs are translated into more stringent performance requirements, i.e. a significant increase in power density and efficiency. Engineering teams must fulfill these requirements and at the same time, provide a comprehensive, customer-friendly, and high-quality solution at competitive cost. Ideally, all of these ahead of the competition to harvest the market by gaining more significant market share through a shorter time-to-market.

Why Infineon

Ease-of-use	High-efficiency designs	Differentiation and short time-to-market	Secured supply chain
Ready-to-use reference designs – Different power ranges (18 W - 240 W) – Various form factor levels – Single- and multi-port solutions **Complexity reduction** A comprehensive offering of power and protocol controllers, Si- and GaN-based high- and low-voltage switches, highly integrated solutions and TVS diodes allow customers to source all components from one supplier	**Addressing a multitude of topologies** – Quasi-resonant (QR) flyback – Zero voltage switching (ZVS) flyback – Active-clamp flyback (ACF) – Hybrid flyback **Highly efficient power switches** – Low $R_{DS(on)}$ – Low parasitic capacitances **High-performance packaging (Kelvin-source engaged Thin-PAK and PQFN)** – Minimizing power losses – Reducing PCB space – Improving thermal dissipation capabilities	**Programmable USB-C Power Delivery port controllers** – Highest flexibility – Shortest time to market – Supporting custom protocol additions, legacy protocols and protocol updates **Configurability and upgradeability** – XDP™ and EZ-PD™ power controllers – Possibility to fix issues or upgrade firmware via flash or OTP during development	**Capacity and security of supply** Infineon has the largest installed in-house power semiconductor capacity with 12” wafer production for discretes to ensure maximum security of supply **Flexibility** Infineon offers dedicated supply chain programs to secure capacity and enable flexibility to demand fluctuations

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Reference designs and evaluation boards

Infineon offers a broad variety of USB-C adapter and charger reference boards for different power density requirements and power levels ranging from 60 W to 120 W, addressing single- and multi-port solutions.

USB-C charger and adapter board selection guide

Multi-port solutions

Power rating [W]	120
Name	REF_CCG7DC_120W_2C
Topology	Boost PFC + Hybrid flyback + buck converters
Primary start-up controller	XDP™ XDPS2221
Synchronous rectification controller	3rd party
Protocol controller	EZ-PD™ CCG7DC
High-voltage PWM switch	CoolGaN™
Medium-voltage SR switch	OptiMOS™
V_{bus} switch (load switch)	OptiMOS™
Buck switch (dual-port only)	OptiMOS™
Uncased size [mm x mm x mm]	180.16 x 44.71 x 25
Uncased power density [W/in^3]	11.39
Single port full-load efficiency (%) @ 115 V_{AC}/230 V_{AC}	(20 V/5 A = 100 W) 93.38%/94.84%
Dual-port full-load efficiency (%) @ 115 V_{AC}/230 V_{AC}	(20 V/2 A + 20 V/2 A+20 V/2 A = 120 W) 92.00%/93.15%
CoC tier 2 and DoE level VI compliance	✓

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

USB-C charger and adapter board selection guide

Single-port solutions

Power rating [W]	65	65
Name	DEMO_XDPS2201_65W1	REF_65W_HFACF_PAG2
Topology	Hybrid flyback	ACF flyback
Primary start-up controller	XDP™ XDPS2201	EZ-PD™ PAG2P
Synchronous rectification controller	3rd party	EZ-PD™ PAG2S
High-voltage PWM switch	CoolMOS™	CoolGaN™
Medium-voltage SR switch	OptiMOS™	OptiMOS™
V_{bus} switch (load switch)	OptiMOS™	OptiMOS™
Uncased size in [mm x mm x mm]	37 x 43 x 19	35 x 31.5 x 31.5
Uncased power density [W/in^3]	31	31
Full-load efficiency (%) @ 115 V_{AC}/230 V_{AC}	20 V/3.25 A 93.5%/93.8%	20 V/3.25 A 93.5%/94.5%
CoC tier 2 and DoE level VI compliance	✓	✓
Standby power @ 230 V_{AC} [mW]	60	29
Feedback loop	Opto coupler	Pulse edge transformer
Programmable USB-PD protocol functionality	✓	✓
USB-PD PPS feature	✓	✓

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

USB-C charger and adapter board selection guide

Single-port solutions

Power rating [W]	140	240	240
Name	REF_140W_HFB_PAG2S	EVAL_XDPS2222_240W1	REF_XDPS2222_240W1
Topology	Hybrid flyback combo	Hybrid flyback	Hybrid flyback
Primary start-up controller	XDP™ XDPS2221	XDP™ XDPS2222	XDP™ XDPS2222
Synchronous rectification controller	EZ-PD™ PAG2S-PS	3rd party	3rd party
Protocol controller		EZ-PD™ CCG3PA	EZ-PD™ CCG3PA
High-voltage PWM switch	CoolGaN™	CoolGaN™	CoolGaN™
Medium-voltage SR switch	OptiMOS™	OptiMOS™	OptiMOS™
V_{bus} switch (load switch)	OptiMOS™	OptiMOS™	OptiMOS™
Uncased size in [mm x mm x mm]	117.5 x 38.5 x 24	200 x 65 x 24	75 x 70 x 30
Uncased power density [W/in^3]	21.13	12.7	25
Full-load efficiency (%) @ 115 V_{AC}/230 V_{AC}	28 V/5 A, 93.51%/94.92%	48 V/5 A = 240 W, 93.01%/94.92%	(48 V/5 A = 240 W), 94.82% (@115 V_{AC})/95.91% (@230 V_{AC})
CoC tier 2 and DoE level VI compliance	✓	✓	✓
Standby power @ 230 V_{AC} [mW]	72	79	190
Feedback loop	Opto coupler	Opto coupler	Opto coupler
Programmable USB-PD protocol functionality	✓	✓	✓

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

USB-C AC-DC and DC-DC charging solutions

The one-stop shop for charger and adapter designs

Infineon offers a one-stop shop for a wide variety of USB PD AC-DC and DC-DC conversion solutions for charger adapters from 18 to 140 W. The portfolio includes a scalable PD controller architecture to support both single-port and multi-port charger configurations. Our reference designs allow the quick and easy development of prototypes, meaning customers can benefit from new, fast-charging adapter technology while reducing development costs and time-to-market. Moreover, the high degree of programmability and the ability to support custom protocols and updates enables a high degree of flexibility for customers. With decades of experience in the electronics industry, Infineon drives the trend of adapter miniaturization without compromising product efficiency and performance.

As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C adapters and chargers.

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPAP211A1-14SXI	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP211A1-14SXIT	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXI	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXIT	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPET121	Pulse edge transformer	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	N/A
CYPAS212A1-32LQXQ	USB-PD + SR + PWM controller	PAG2S-AC	*	64	8	10	0	1	-40 to 105
CYPAS212A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-AC	*	64	8	10	0	1	-40 to 105
CYPAS213A1-24SXQ	USB-PD + SR controller	PAG2S-PS	*	64	8	4	0	1	-40 to 105
CYPAS213A1-24SXQT	USB-PD + SR controller	PAG2S-PS	*	64	8	4	0	1	-40 to 105
CYPAS213A1-32LQXQ	USB-PD + SR controller	PAG2S-PS	*	64	8	10	0	1	-40 to 105
CYPAS213A1-32LQXQT	USB-PD + SR controller	PAG2S-PS	*	64	8	10	0	1	-40 to 105
CYPAS211A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-QZ	*	64	8	10	0	1	-40 to 105

* Arm® Cortex®- M0

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPAS211A1-32LQXQT	USB-PD + SR + PWM controller	PAG2S-QZ	*	64	8	10	0	1	-40 to 105
CYPAS2174A1-32LQXQ	USB-C PD controller	PAG2-PD	*	64	8	10	0	1	-40 to 105
CYPAS2174A1-32LQXQT	USB-C PD controller	PAG2-PD	*	64	8	10	0	1	-40 to 105
CYPD3135-32LQXQ	USB-PD controller	CCG3	*	128	8	14	4	1	-40 to 105
CYPD3135-32LQXQT	USB-PD controller	CCG3	*	128	8	14	4	1	-40 to 105
CYPD3135-40LQXI	USB-PD controller	CCG3	*	128	8	20	4	1	-40 to 105
CYPD3135-40LQXIT	USB-PD controller	CCG3	*	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQ	USB-PD controller	CCG3	*	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQT	USB-PD controller	CCG3	*	128	8	20	4	1	-40 to 105
CYPD3171-24LQXQ	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD3171-24LQXQT	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD3172-24LQXQ	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3172-24LQXQT	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQ	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQT	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQ	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQT	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQ	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQT	USB-PD controller	CCG3PA-NFET	*	64	4	6	0	1	-40 to 105
CYPD3174-16SXQT	USB-PD controller	CCG3PA	*	64	8	6	1	1	-40 to 105
CYPD3174-24LQXQ	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD3174-24LQXQT	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQ	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQT	USB-PD controller	CCG3PA	*	64	8	12	2	1	-40 to 105
CYPD7271-68LQXQ	USB-PD + DCDC controller	CCG7DC	*	128	16	19	4	2	-40 to 105

* Arm® Cortex®- M0

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPD7271-68LQXQT	USB-PD + DCDC controller	CCG7DC	*	128	16	19	4	2	-40 to 105
CYPD7272-68LQXQ	USB-PD + DCDC controller	CCG7DC	*	128	16	19	4	2	-40 to 125
CYPD7272-68LQXQT	USB-PD + DCDC controller	CCG7DC	*	128	16	19	4	2	-40 to 125
CYPD7171-40LQXQ	USB-PD + DCDC controller	CCG7SC	*	128	16	13	3	1	-40 to 125
CYPD7171-40LQXQT	USB-PD + DCDC controller	CCG7SC	*	128	16	13	3	1	-40 to 125

* Arm® Cortex®- M0

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

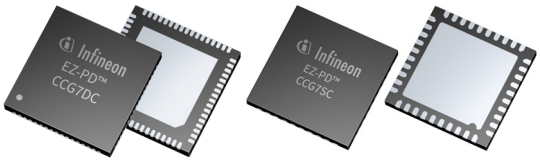
EZ-PD™ CCG7SC and CCG7DC

Single- and dual-port USB-C PD and DC-DC controller

Infineon's EZ-PD™ CCG7SC and CCG7DC are highly integrated single- and dual-port USB Type-C power delivery (PD) solutions with built-in buck-boost controllers; they are designed for multi-port consumer charging applications and comply with the most recent USB Type-C and PD specifications. With an on-chip 32-bit Arm® Cortex®-M0 processor, 128 kB flash, 16 kB RAM, and 32 kB ROM, EZ-PD™ CCG7xC is the most programmable USB-PD solution for DC-DC applications, leaving the flash available for user application's use. Custom system management features, like dynamic load sharing and temperature monitoring, are part of the feature set thanks to the inclusion of this fully programmable MCU with analog and digital peripherals. EZ-PD™ CCG7xC also integrates gate drivers for V_{bus} NFET on the provider path and hardware-controlled protection features on the V_{bus}. The high degree of integration lowers the system BOM and provides a footprint-optimized solution to support higher power density designs.

Features and benefits

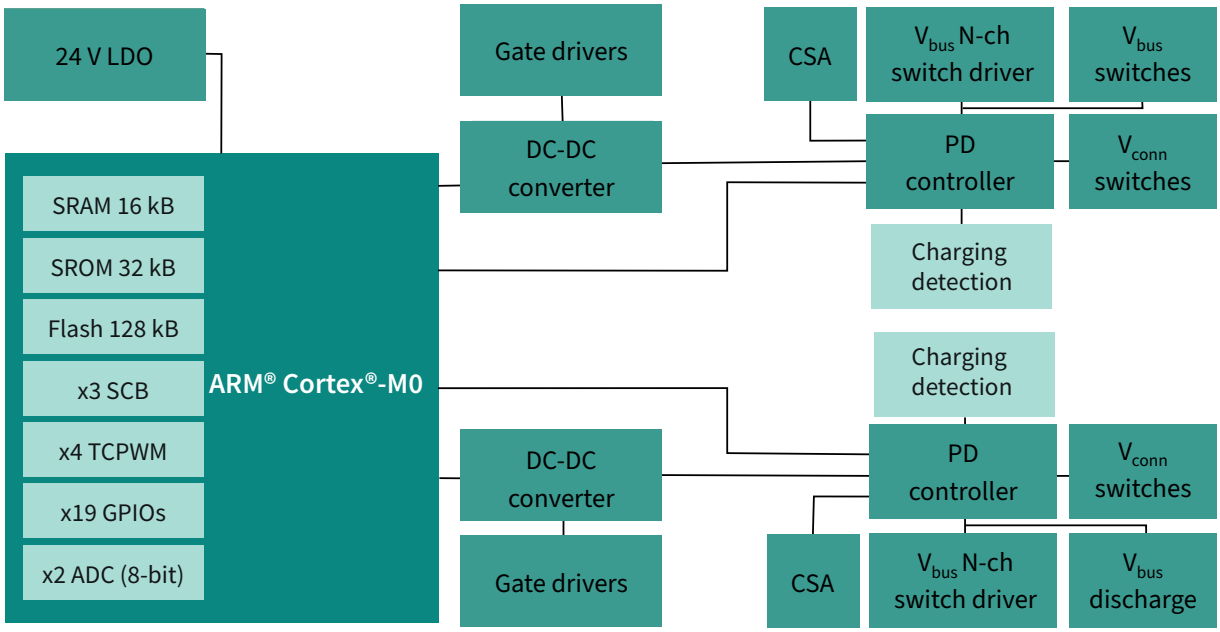
Key features	Key benefits
– One/two USB-C PD controllers + DC-DC controllers	– Enables high power density designs
– Supports latest USB-C PD 3.1 with PPS, QC4+, Samsung AFC, Apple 2.4 A, BCv1.2	– Dynamic load sharing enables intelligent redistribution of power among ports
– Arm® Cortex®-M0 with flash for custom features implementation	– Capable of support 2-port, 3-ports, 4-port, or more configuration
– Integrated V_{bus} NFET gate drivers, buck-boost NFET gate drivers, V_{conn} FETs and high-side current sense amplifier (HSCSA)	– Does not require additional MCU externally for system peripheral
– DC-DC controller: configurable switching frequency of 150 – 600 kHZ, PSM/FCCM mode of operation, wide input voltage range of 4 – 24 V (40 V tolerant), and programmable spread spectrum frequency for low EMI	
– Protection features: OVP, UVP, SCP, OCP, OTP, and V_{bus}-CC short	
– Advanced features: dynamic load sharing, power throttling, field firmware upgrade, optimized-efficiency control methods for flyback converter, and buck-bypass	



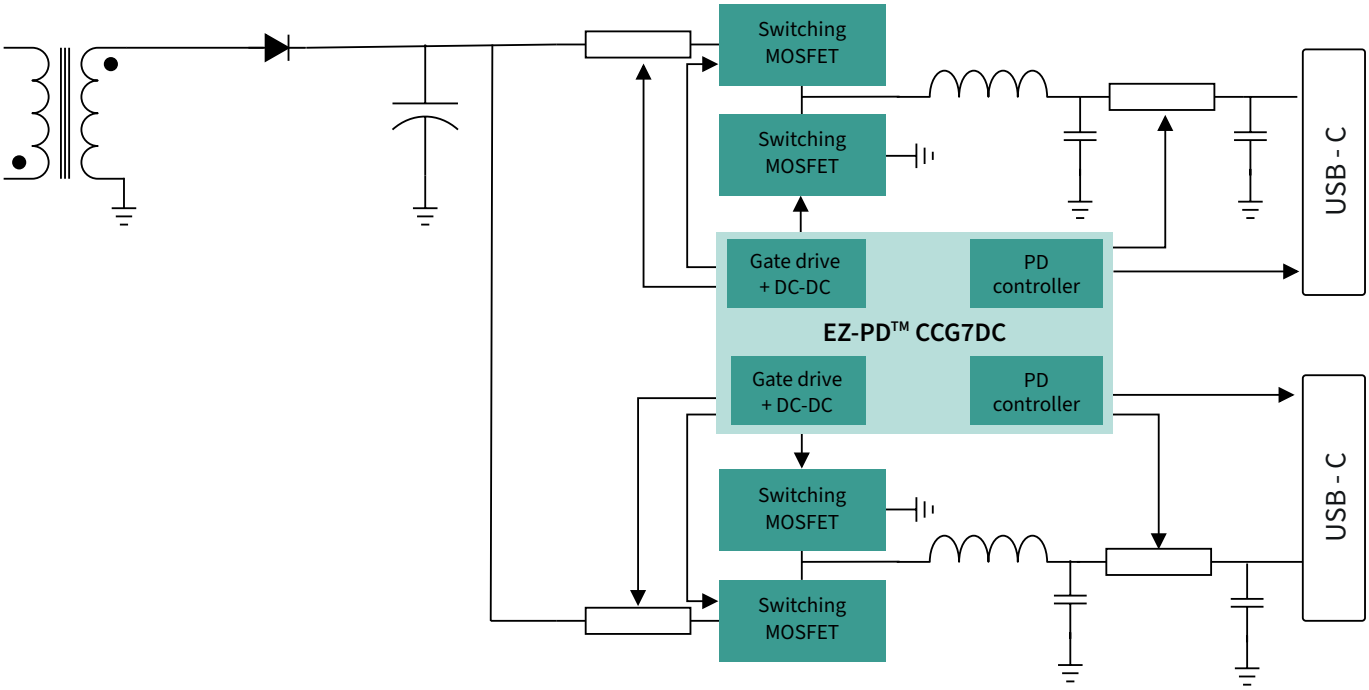
Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Block diagram



Application example



Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

EZ-PD™ PAG2 - USB-C PD and DC-DC controller

ZVS flyback converter chipset with integrated USB PD, synchronous rectification (SR), and PWM

EZ-PD™ PAG2 is a complete AC-DC charger and adapter solution with integrated USB PD. It is a 2-chip secondary-side controlled flyback converter chipset (EZ-PD™ PAG2P and EZ-PD™ PAG2S) with integrated USB PD, synchronous rectifier (SR), and PWM controllers. EZ-PD™ PAG2 supports quasi-resonance flyback with zero voltage switching (QR-ZVS) and active clamp flyback (ACF). Its design supports PD 3.1 SPR and 28 V EPR. EZ-PD™ PAG2S standalone can pair with PWM controllers through an optocoupler by acting as USB PD and SR.

EZ-PD™ PAG2P

EZ-PD™ PAG2P is a primary start-up controller designed to receive PWM signals from EZ-PD™ PAG2S, which performs the PWM regulation. It provides HV start-up, PET receiver via CYPET121, boosts V_{CC}, low-side NFET gate driver, and high-side logical driver. EZ-PD™ PAG2P supports both X-cap discharge and non-X-cap discharge mode. It pairs with EZ-PD™ PAG2S-AC to support ACF converters and EZ-PD™ PAG2S-QZ to support QR-ZVS flyback converters.

Key features
– Integrated high-voltage start-up
– Integrated low-side gate driver
– Integrated high-side logical driver
– Integrated V_{CC} boost switch
– Support x-cap discharge mode
– Brown-in/out and line OVP/UVP
– Support OCP and SCP
– Startup secondary V_{bus} OVP
– Programmable soft-start
– Integrated PET receiver

Notebook Communication Charger

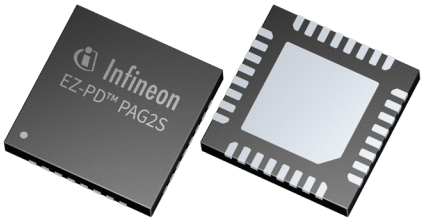
Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

EZ-PD™ PAG2S

EZ-PD™ PAG2S supports secondary-side controlled flyback converters by pairing with EZ-PD™ PAG2P. PAG2S-AC is a secondary-side ACF controller enabling leakage energy recycling and ZVS operation. PAG2S-QZ is a secondary-side QR-ZVS controller achieving ZVS using an SR control scheme. EZ-PD™ PAG2S-PS standalone acts as a USB PD and SR-integrated secondary-side controller by pairing with third-party primary-side PWM controllers via an optocoupler.

Key features
– Support PD 3.1 SPR and 28 V EPR
– 20-300 kHz switching frequency
– Support DCM, CCM, and CrCM
– Support PSR and SSR PWM regulation
– BC1.2, QC5, Apple 2.4 A, and AFC
– Support V_{bus} fault protection
– Support current limit
– Supports V_{bus}-CC short
– Short SR turn-on and off delay
– Support non-logical level MOSFETs

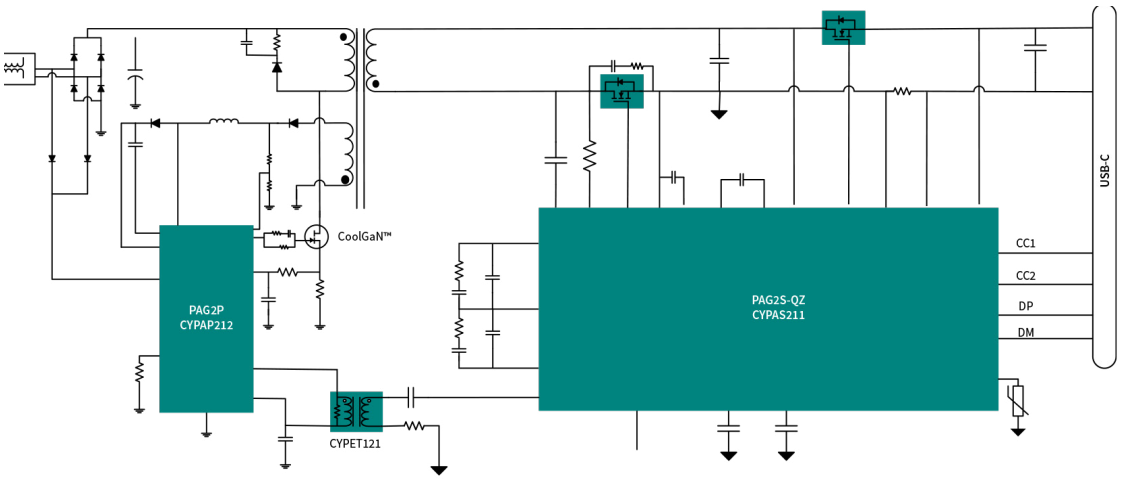


Notebook Communication Charger

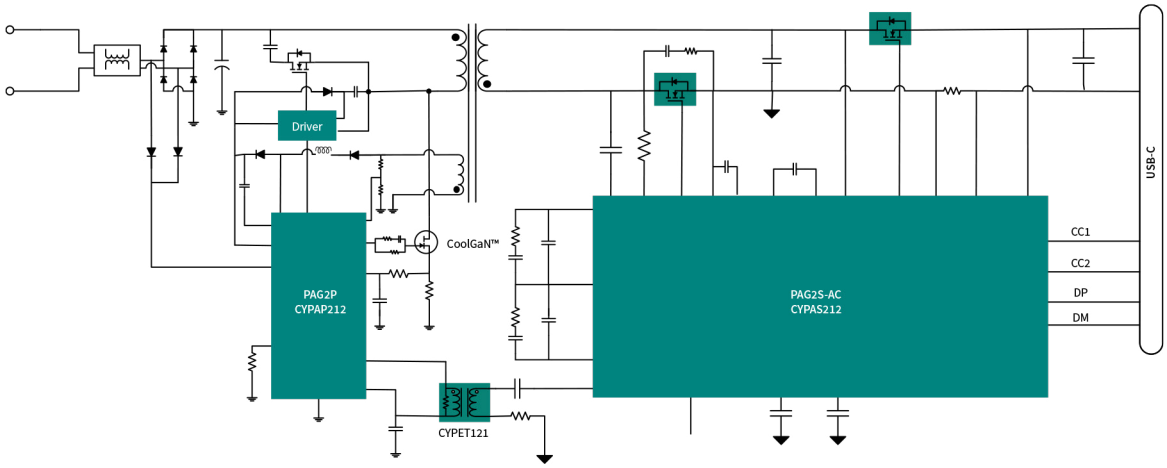
Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

EZ-PD™ PAG2-QZ chipset: secondary-side controlled QR-ZVS



EZ-PD™ PAG2-AC chipset: secondary-side controlled ACF



Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

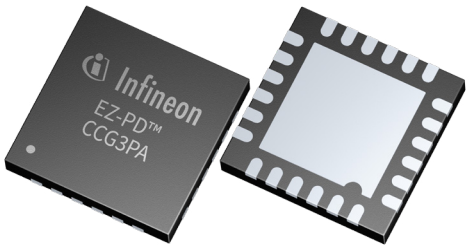
USB Type-C power delivery controller EZ-PD™ CCG3PA

The EZ-PD™ CCG3PA is a single-chip USB Type-C power delivery (PD) controller and ideal for applications such as power adapters, mobile chargers, power banks and car chargers. It integrates USB-C transceiver along with the termination resistors, an integrated feedback control circuitry for voltage (V_{bus} regulation), a 30 V-tolerant regulator, V_{bus} to CC short protection, a high-voltage PFET gate driver and system level ESD protection. The CCG3PA is a fully programmable solution, that supports Power Delivery 3.0 Programmable Power Supply and Quick Charge 4.0 standards.

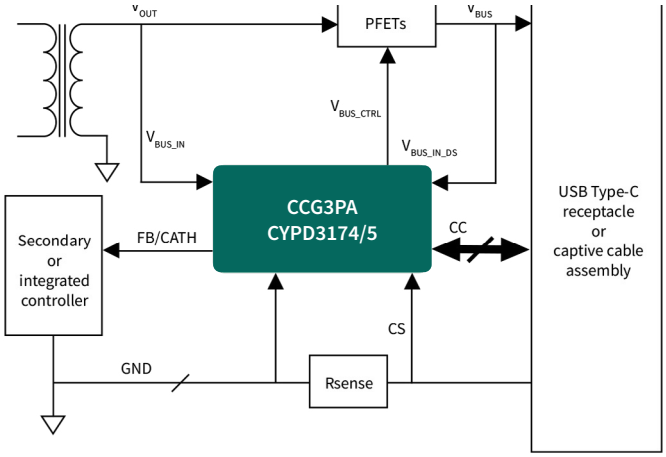
Features and benefits

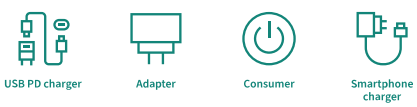
Key features
– Supports one USB type-C port and one type-A port
– Supports USB Power Delivery 3.0 PPS
– Supports the legacy protocols including Qualcomm QC 4.0, Apple charging 2.4 A, AFC, BC 1.2 at no additional BOM cost
– Integrates voltage regulation and current sense amplifier
– Integrates 30 V-tolerant regulator
– On-chip OVP, OCP, UVP, SCP and V_{bus} to CC short protection
– Integrates a PFET V_{bus} gate driver
– Integrated system level ESD on V_{bus}, CC and DP/DM
– Available in 24-pin QFN and 16-pin SOIC packages

Key benefits
– Integrates 30 V-tolerant regulator, including V_{bus} PFET gate drivers, OVP and OCP circuitry
– Integrates voltage regulation and low-side current sense to support PD3.0 PPS and QC4.0
– Supports PWM/I2C/GPIO interface to control V_{bus}
– Integrates V_{bus} to CC short protection and ESD protection



Application schematic

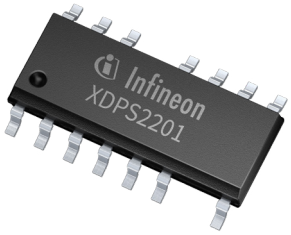




Click here to learn more:

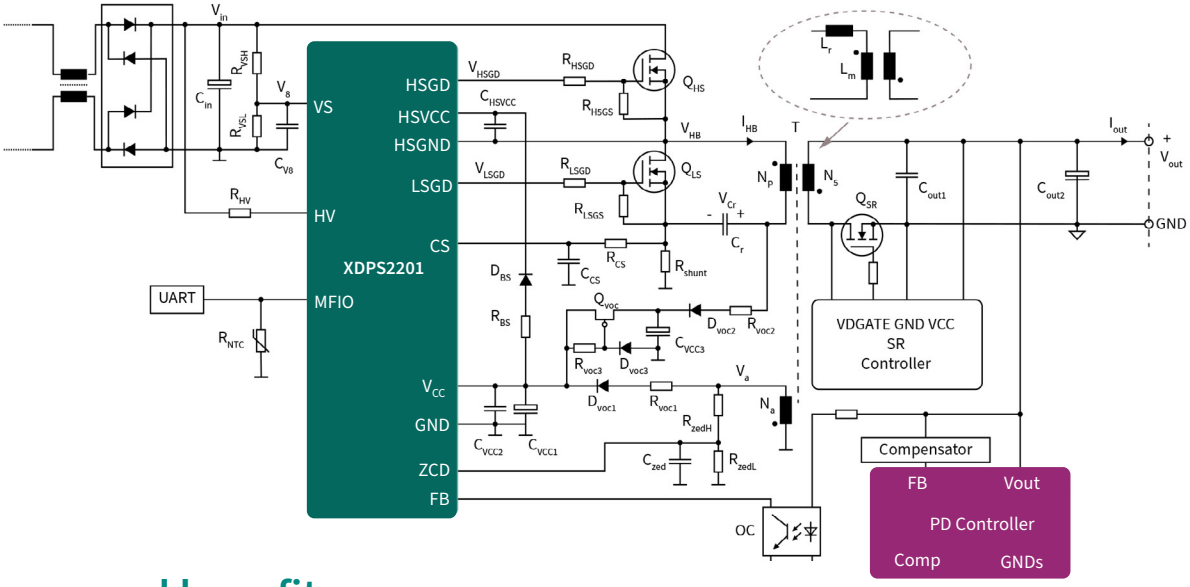
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Digital hybrid flyback PWM controller XDP™ XDPS2201



The XDP™ digital power XDPS2201 is a digital multi-mode hybrid flyback controller that combines the simplicity of a traditional flyback topology with the performance of a resonant converter. By utilizing two high-voltage MOSFETs, such as CoolMOS™, the controller can drive both high and low-side MOSFETs in an asymmetric half-bridge flyback topology. Both zero voltage and current switching are achieved through means of regulating the polarity of the magnetizing current to increase efficiency. In addition, transformer leakage energy is recycled and thereby further increases efficiency.

Typical application schematic



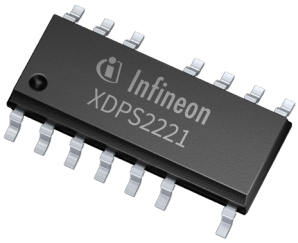
Features and benefits

Key features	Key benefits
– Zero voltage and current switching across all line, and load conditions	– Reduce switching loss and achieve high efficiency
– Multi-mode operation (active burst mode, DCM, ZV-RVS and CRM	– Optimize efficiency across various line/load condition
– Integrated high-side driver and 600 V start-up cell	– Save BOM count and cost
– Single auxiliary transformer winding and resonant cap to supply power to IC	– Simplified transformer design to support wide output voltage range
– Comprehensive suite of protection feature sets	– Robust and safe design
– Digital platform with configurable parameters	– Optimize and/or scale system performance and behavior to the requirement

Click here to learn more:

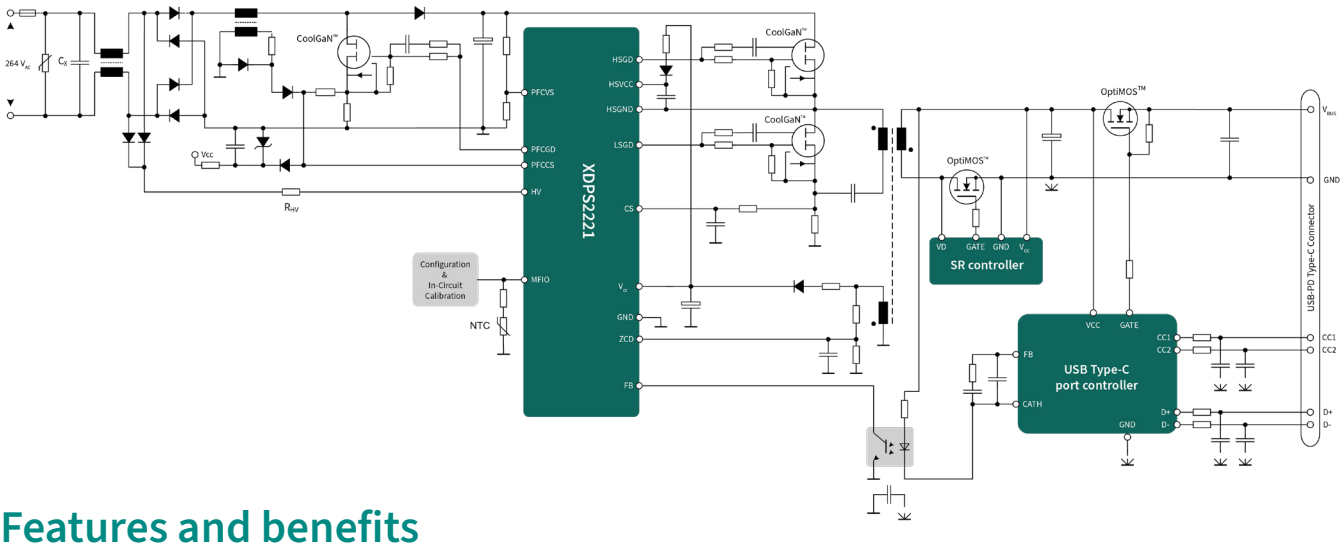
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Digital PFC + hybrid flyback combo IC XDP™ digital power XDPS2221



The XDP™ digital power XDPS2221 is a digital PFC + hybrid flyback (HFB) combo IC and a highly integrated device combining a multimode AC-DC PFC controller and a multimode DC-DC hybrid flyback controller. The integration of PFC and HFB into a single package enables the reduction of external bill material components and optimizes the system performance by combined operation of the two stages.

Typical application schematic



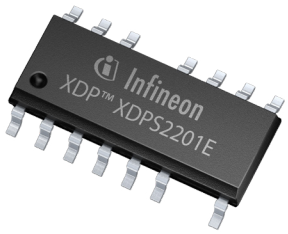
Features and benefits

Key features	Key benefits
– PFC and hybrid flyback functionality in DSO-14 (150 mil) package	– Reduced switching losses
– Novel ZVS hybrid flyback topology	– Achieving ultra-high system efficiency
– Integrated 600 V start-up cell	– Fast V_{CC} charging
– Active X-capacitor discharge	– Lowest no-load stand-by power
– Burst mode operation controller	– Optimized efficiency across various line/load condition
– Adaptive PFC bus voltage and PFC enable/disable control	– Save BOM count and cost
– Digital platform with wide range of configurable parameters	– Optimize and/or scale system performance
– Pb-free lead plating, halogen-free (according to IEC61249-2-21), RoHS compliant	– Robust and safe design

Click here to learn more:

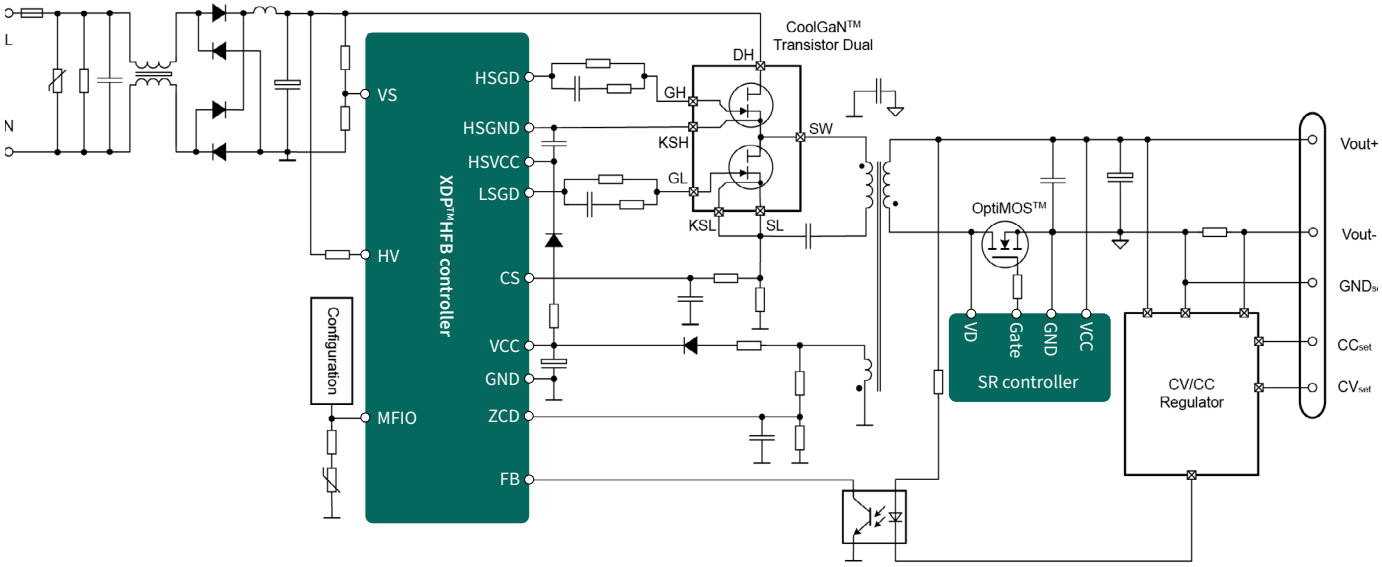
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

XDP™ XDPS2201E hybrid-flyback controller



The XDP™ XDPS2201E PWM controller is a highly integrated, multimode DC-DC hybrid-flyback (HFB) controller. The controller enables reduction of external parts and optimizes performance. It serves applications with fixed output voltage and offers even more benefits for applications with wide output voltage range. The system efficiency can further be increased using Infineon CoolMOS™, CoolGaN™ Transistor, CoolGaN™ Transistor Dual and OptiMOS™ transistors.

Typical application schematic



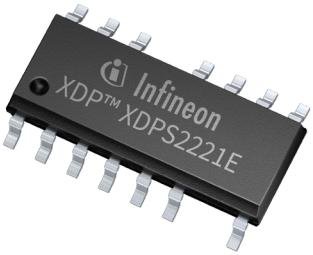
Features and benefits

Key features	Key benefits
– High voltage start-up cell	– Efficiency of >95% and low standby power
– Integrated gate drivers for Si/GaN FETs	– Complies with DoE-7 and CoC-2 standards
– Supports wide AC input voltage range	– Ultra-high power for compact designs
– Lowest standby power via burst mode	– Flexibility to support an external PFC
– ZVS operation at high/low side switch	– High stability and low audible noise
– HFB peak current for robust control	– Simplified design with tools and guide

Click here to learn more:

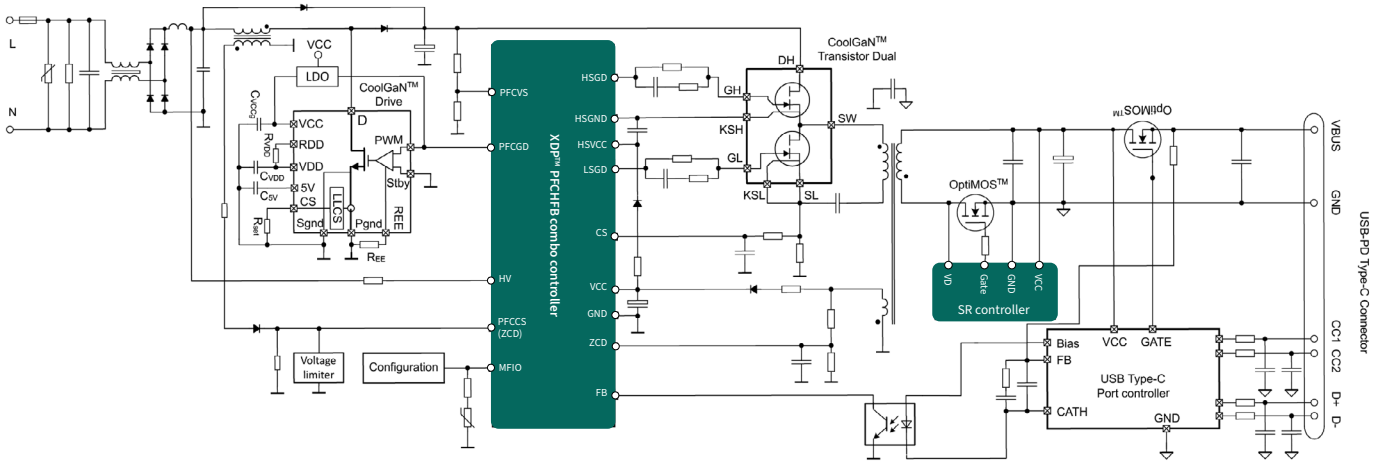
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

XDP™ XDPS2221E PFC + hybrid-flyback combo controller



XDP™ XDPS2221E is a digital combo controller with configurable parameters for protection modes and maximized system performance. The novel ZVS hybrid-flyback (HFB, known also as asymmetrical half-bridge) topology enables ultra-high system efficiency. The integration of PFC and hybrid-flyback into a single package optimizes the system performance by harmonized operation of the two stages and reduces the external bill of material components.

Typical application schematic



Features and benefits

Key features	Key benefits
– High-voltage start-up cell	– Efficiency of >95% and low standby power
– Integrated gate drivers for Si/GaN FETs	– Complies with DoE-7 and CoC-2 standards
– Supports wide AC input voltage range	– Ultra-high power for compact designs
– Harmonized control of PFC and HFB (AHB)	– Bulk capacitance reduction
– PFC QRM multimode operation	– Improved load transient response
– Enhanced OFC dynamics	– High stability and low audible noise
– Lowest standby power via burst mode	– Simplified design with tools and guide
– ZVS operation at high/low side switch	

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

CoolGaN™ power semiconductors – discrete and integrated solutions

Gallium nitride (GaN) offers fundamental advantages over silicon. In particular, the higher critical electrical field makes it very attractive for power semiconductor devices with outstanding specific dynamic on-state resistance and smaller capacitances compared to silicon MOSFETs, which makes GaN devices great for high speed switching. Not only because of the resulting power savings and total system cost reduction, it also allows a higher operating frequency, improves the power density as well as the overall system efficiency.

Savings potential with CoolGaN™

3x	>30	20%	50%	2x
Switching frequency	Energy savings	Lower system cost	Higuer power density	Less size and weight

CoolGaN™ product recommendations

Product family	Part number	V_{DS}	$R_{DS(on)\ typ.}$	Package	Topology	Power range
CoolGaN™ Transistor 650 V G5	IGLR65R270D2	650 V	0.27 Ω	DFN 5x6	QR	25 W – 45 W
CoolGaN™ Transistor 650 V G5	IGLR65R200D2	650 V	0.2 Ω	DFN 5x6	PFC and QR	65 W – 100 W
CoolGaN™ Transistor 650 V G5	IGLR65R140D2	650 V	0.14 Ω	DFN 5x6	PFC and QR and HFB	100 W – 140 W
CoolGaN™ Transistor 650 V G5	IGLD65R140D2	650 V	0.14 Ω	DFN 8x8	PFC and QR and HFB	100 W – 140 W
CoolGaN™ Transistor 650 V G5	IGLD65R110D2	650 V	0.11 Ω	DFN 8x8	PFC and QR and HFB	>140 W
CoolGaN™ Transistor Dual 650 V G5	IGI65D1414A3M	650 V	0.14 Ω	DFN 6x8	HFB and LLC	>140 W
CoolGaN™ Drive 700 V G5*	IGI70N500A2PS	700 V	0.5 Ω	PQFN 5x6	QR	<25 W

* Coming soon

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Product family	Part number	V_{DS}	$R_{DS(on)\ typ.}$	Package	Topology	Power range
CoolGaN™ Drive 700 V G5*	IGI70N270A2PS	700 V	0.27 Ω	PQFN 5x6	QR	25 W – 45 W
CoolGaN™ Drive 700 V G5*	IGI70N200A2PS	700 V	0.2 Ω	PQFN 5x6	PFC and QR	65 W – 100 W
CoolGaN™ Drive 700 V G5*	IGI70N140A2PS	700 V	0.14 Ω	PQFN 5x6	PFC and QR	100 W – 140 W
CoolGaN™ Drive 700 V G5*	IGI70N500A2MS	700 V	0.5 Ω	PQFN 5x6	QR	<25 W
CoolGaN™ Drive 700 V G5*	IGI70N270A2MS	700 V	0.27 Ω	PQFN 5x6	QR	25 W – 45 W
CoolGaN™ Drive 700 V G5*	IGI70N200A2MS	700 V	0.2 Ω	PQFN 5x6	PFC and QR	65 W – 100 W
CoolGaN™ Drive 700 V G5*	IGI70N140A2MS	700 V	0.14 Ω	PQFN 5x6	PFC and QR	100 W – 140 W
CoolGaN™ Drive 700 V G5*	IGI70N100A2MS	700 V	0.1 Ω	PQFN 5x6	PFC and QR	>140 W
CoolGaN™ Drive HB 600 V G5	IGI60L1414B1M	600 V	0.14 Ω	LGA 6x8	HFB	100 W – 140 W
CoolGaN™ Transistor 700 V G5	IGD70R500D2S	700 V	0.5 Ω	DPAK	QR	<25 W
CoolGaN™ Transistor 700 V G5	IGD70R270D2S	700 V	0.27 Ω	DPAK	QR	25 W – 45 W
CoolGaN™ Transistor 700 V G5	IGD70R200D2S	700 V	0.2 Ω	DPAK	PFC and QR	65 W – 100 W
CoolGaN™ Transistor 700 V G5	IGD70R140D2S	700 V	0.14 Ω	DPAK	PFC and QR	100 W – 140 W

* Coming soon

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Si-based primary-side switches – CoolMOS™ SJ MOSFETs

Manufacturers of slimmer and lighter chargers require cost-effective MOSFETs in small packages that feature good electromagnetic interference (EMI) and excellent thermal performance, enabling high efficiency and low standby power. Infineon offers a wide range of high-voltage superjunction MOSFETs. For example, the CoolMOS™ P7 family, which combines high efficiency and optimized cost with ease of use. Soft-switching techniques enable devices to operate in ZVS, which means that the MOSFET is turned on only after its drain-source voltage reaches 0 V (or a value close to 0 V). This strategy eliminates the turn-on loss of the device, which is typically the major contributor to the overall switching loss.

600 V CoolMOS™ P7	700 V/800 V CoolMOST™ P7	600 V CoolMOS™ PDF7
– Most balanced technology of all CoolMOS™ families	– Price competitiveness compared to similar competitor technologies	– Minimizing switching and hysteresis losses
– Integrated Zener diode	– Supports increased switching frequency to reduce magnetics	– BOM cost reduction and easy manufacturing
– Highest efficiency	– Integrated Zener diode	– Robustness and reliability – Integrated Zener Diode – Up to 2 kV ESD protection
– Excellent ease of use and commutation ruggedness	– Best fit for target applications in terms of – Thermals and efficiency – Ease of use level	
– Competitive price		

600 V/650 V CoolMOS™ C7
– High switching performance enabling highest efficiency
– Ease of use level high
– Optimized devices for highest efficiency switched mode power supplies

Unfortunately, all high-voltage SJ MOSFETs suffer from another type of loss due to their "non-lossless" behavior of the output capacitance. This means that when the MOSFET output capacitance (C_{oss}) is charged and subsequently discharged, some energy will be lost. Therefore, even when operating under ZVS conditions, all the energy stored in the output capacitance (E_{oss}) will not be recovered. This phenomenon is related to the hysteretic behavior of the C_{oss}, as shown below, which can be observed performing a C_{oss} charge/discharge cycle with a large signal measurement. This is why these losses are commonly known as C_{oss} hysteresis losses (E_{oss},hys). CoolMOS™ C7 series well reduce switching loss and hysteresis losses to maximize efficiency.

Click here to learn more:

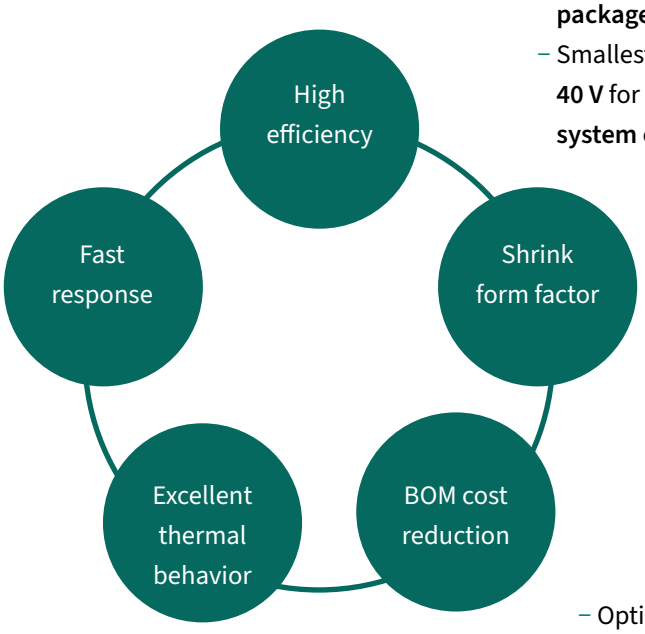
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Si-based secondary-side switches – CoolMOS™ SJ MOSFETs

Infineon's OptiMOS™ PD low-voltage MOSFET portfolio represents the best fit for USB power delivery and fast charger designs. OptiMOS™ PD power MOSFETs in PQFN 2x2, PQFN 3.3x3.3, and SuperSO8 packages are optimized for synchronous rectification in charger and adapter SMPS applications. The small package sizes translate into shrinking form factors.

- OptiMOS™ PD **meets efficiency standards** even in a 3x3 package
- OptiMOS™ PD enables **high power density designs**

- …with OptiMOS™ PD in **5x6 and 3x3 packages**
- Smallest **2x2 PQFN package with up to 40 V** for **maximium power density** and **system cost reduction**



- Quick quote response
- Short lead times

- OptiMOS™ PD achieves **lower temperature** in a 3x3 package compared to the next best alternative in 5x6

- OptiMOS™ provides **lower charges** for:
  - Less switching losses
  - Excellent price/performance ratio

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Si power switch recommendation for ≤ 65 W

Part number	V_{DS}	$R_{DS(on)}$ typ.	Package	Power
IPN70R1K4P7S	700 V	1.4 Ω	SOT-223	18 W
IPN70R900P7S	700 V	0.9 Ω	SOT-223	33 W
IPN70R600P7S	700 V	0.6 Ω	SOT-223	45 W
IPAN70R600P7S	700 V	0.6 Ω	TO-220F	45 W
IPL60R365P7	600 V	0.365 Ω	ThinPAK 8x8	45 W/65 W
IPN70R360P7S	700 V	0.36 Ω	SOT-223	65 W
IPD70R600P7S	700 V	0.6 Ω	TO-252	65 W
IPAN70R360P7S	700 V	0.36 Ω	TO-220F narrow lead	65 W
IPL60R185C7	600 V	0.185 Ω	ThinPAK 8x8	65 W
IPL60R185P7	600 V	0.185 Ω	ThinPAK 8x8	65 W

Part number	V_{DS}	$R_{DS(on)}$ typ.	Package	Power
ISC0702NLS	60 V	2.8 mΩ	PQFN 5x6	27 W/33 W
ISC0703NLS	60 V	6.9 mΩ	PQFN 5x6	27 W
ISZ0702NLS	60 V	4.5 mΩ	PQFN 3.3x3.3	27 W
ISZ0703NLS	60 V	7.3 mΩ	PQFN 3.3x3.3	27 W
BSZ0704LS	60 V	9.9 mΩ	PQFN 3.3x3.3	27 W
ISC0602NLS	80 V	7.3 mΩ	PQFN 5x6	45 W/65 W
ISC0603NLS	80 V	8.9 mΩ	PQFN 5x6	45 W/65 W
ISZ0602NLS	80 V	7.8 mΩ	PQFN 3.3x3.3	27 W
ISC0805NLS	100 V	7.8 mΩ	PQFN 5x6	45 W/65 W
ISC0804NLS	100 V	10.9 mΩ	PQFN 5x6	45 W/65 W
ISC0803NLS	100 V	16.9 mΩ	PQFN 5x6	27 W
ISZ0804NLS	100 V	11.5 mΩ	PQFN 3.3x3.3	45 W/65 W

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

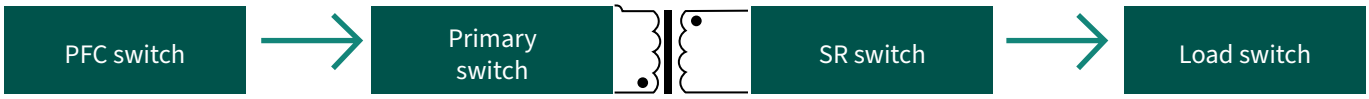
Part number	V_{DS}	$R_{DS(on)}$ max	Package	Power
ISZ0803NLS	100 V	16.9 mΩ	PQFN 3.3x3.3	27 W
BSC0302LS	120 V	8 mΩ	PQFN 5x6	45 W/65 W
BSC0303LS	120 V	12 mΩ	PQFN 5x6	45 W/65 W
BSZ0905PNS	-30 V	8.6 mΩ	PQFN 3.3x3.3	27 W
ISZ0901NLS	25 V	6 mΩ	PQFN 3.3x3.3	27 W/45 W/65 W
BSZ0910LS	30 V	4.5 mΩ	PQFN 3.3x3.3	45 W/65 W
BSZ0911LS	30 V	7 mΩ	PQFN 3.3x3.3	27 W/45 W

Part number	V_{DS}	$R_{DS(on)}$ max	Package	Power
ISK024NE2LM5	25 V	2.4 mΩ	PQFN 2*2	27 W/45 W/65 W
ISK036N03LM5	30 V	3.6 mΩ		27 W/45 W/65 W
ISK05XN04LM6	40 V	~5.9 mΩ		45 W/65 W

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Si power switch recommendation for > 75 W



Power MOSFET recommendation for > 75 W

PFC switch

Product family	PFC switch	V_{DS}	$R_{DS(on)\ typ.}$	Package	Topology
600 V CoolMOS™ P7	IPD60R180P7S	600 V	0.18 Ω	TO-252	PFC
600 V CoolMOS™ P7	IPAN60R280P7S	600 V	0.28 Ω	TO-220F	PFC
600 V CoolMOS™ P7	IPAN60R180P7S	600 V	0.18 Ω	TO-220F	PFC
600 V CoolMOS™ C7	IPL60R185C7	600 V	0.185 Ω	ThinPAK 8x8	PFC
600 V CoolMOS™ C7	IPL60R125C7	600 V	0.125 Ω	ThinPAK 8x8	PFC

Primary switch

Product family	Primary switch	V_{DS}	$R_{DS(on)\ typ.}$	Package	Topology
600 V CoolMOS™ P7	IPD60R360P7S	600 V	0.36 Ω	TO-252	ACF, LLC , ZVS and Hybrid mode Flyback
600 V CoolMOS™ P7	IPAN60R600P7S	600 V	0.60 Ω	TO-220F	ACF, LLC , ZVS and Hybrid mode Flyback
600 V CoolMOS™ P7	IPAN60R360P7S	600 V	0.36 Ω	TO-220F	ACF, LLC , ZVS and Hybrid mode Flyback
600 V CoolMOS™ P7	IPL60R365P7	600 V	0.365 Ω	ThinPAK 8x8	ACF, LLC , ZVS and Hybrid mode Flyback
600 V CoolMOS™ PFD7	IPLK60R360PFD7	600 V	0.36 Ω	ThinPAK 5x6	ACF, LLC , ZVS and Hybrid mode Flyback
700 V CoolMOS™ P7	IPAN70R360P7S	700 V	0.36 Ω	TO-220F	Flyback
600 V CoolMOS™ C7	IPA65R225C7	650 V	0.225 Ω	TO-220F	Flyback
600 V CoolMOS™ C7	IPL65R230C7	650 V	0.23 Ω	ThinPAK 8x8	Flyback
600 V CoolMOS™ C7	IPL65R195C7	650 V	0.195 Ω	ThinPAK 8x8	Flyback
600 V CoolMOS™ C7	IPD65R190C7	650 V	0.19 Ω	TO-252	Flyback

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

SR switch

Product family	SR switch	V_{DS}	$R_{DS(on)\ typ.}$	Package
OptiMOS™ PD	ISC0702NLS	60 V	2.8 mΩ	PQFN 5x6
OptiMOS™ PD	ISC0703NLS	60 V	6.9 mΩ	PQFN 5x6
OptiMOS™ PD	ISC0802NLS	100 V	3.6 mΩ	PQFN 5x6
OptiMOS™ PD	ISC0806NLS	100 V	5.4 mΩ	PQFN 5x6

Load switch

Product family	Load switch	V_{DS}	$R_{DS(on)\ typ.}$	Package
OptiMOS™ PD	ISZ0501NLS	25 V	3.1 mΩ	PQFN 3.3x3.3
OptiMOS™ PD	BSZ0909LS	30 V	3.0 mΩ	PQFN 3x3
OptiMOS™ PD	BSZ0910LS	30 V	5.7 mΩ	PQFN 3x3

40 V load switch for EPR

Product family	Part number	V_{DS}	$R_{DS(on)\ typ.}$	Package
OptiMOS™ 6 40 V power MOSFET	BSZ007N04LS6	40 V	0.07 mΩ	PQFN 3.3x3.3
OptiMOS™ 6 40 V power MOSFET	BSZ018N04LS6	40 V	1.8 mΩ	PQFN 3.3x3.3
OptiMOS™ 6 40 V power MOSFET	BSZ021N04LS6	40 V	2.1 mΩ	PQFN 3.3x3.3
OptiMOS™ 6 40 V power MOSFET	BSZ024N04LS6	40 V	2.4 mΩ	PQFN 3.3x3.3

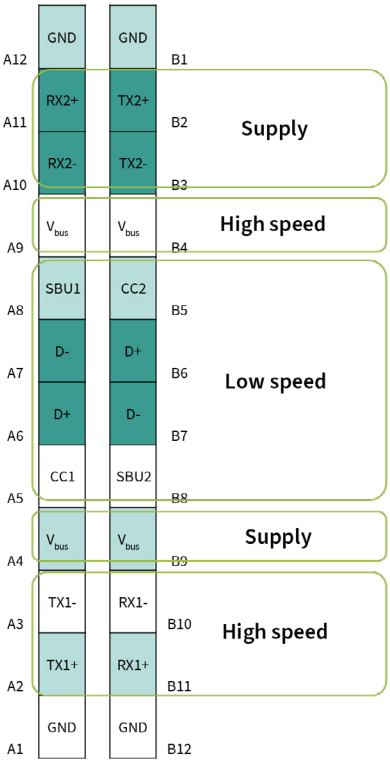
Click here to learn more:

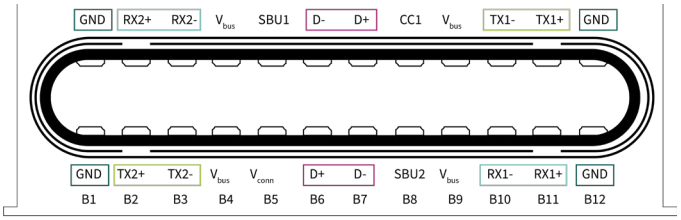
www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

ESD protection devices

Infineon offers ESD protection devices specifically designed for USB Type-C applications, both for data and power transfer. These devices come with excellent clamping performance and are highly reliable.

ESD solutions for USB-C PD





	Signaling	TVS requirements
Supply (V_{bus})	9-21 V for USB-PD5 V typical	– High operating voltage for PDHigh surge robustness – Capacitance unimportant
Low speed (D+, D-, CC, SBU)	USB 2.0: 480 Mbps, 5 V	– High robustness (increasingly: surge) – Capacitance less important
High speed (Rx, Tx)	USB 4: 20 Gbps, 1 V max USB 3.2 Gen2: 10 Gbps, 2.8 V max	– Lowest capacitance – Lowest clamping

TVS: selected highlight products serving as ESD Protection Solution in chargers and adapters

USB type-C line	Product name	V_{RWM} [V]	Cap [pF]	V_{ESD} [kV]	R_{dyn} [Ohm]	V_{cl} @16A [V]	I_R, max [nA]	Package
Rx/Tx/USB3.2	ESD134	±2.1 V	0.25 pF	±20 kV	0.28 Ω	7.7 V	20 nA	0201
Rx/Tx USB3.2/USB4	ESD150	±3.3 V	0.15 pF	±12 kV	0.15 Ω	5.3 V	10 nA	0201
D+/D-	ESD131/ ESD133	±5.5 V	0.23 pF	±20 kV	0.66/0.56 Ω	13.0 V	100 nA	0201/01005
D+/D-	ESD108	±5.5 V	0.28 pF	±12 kV	0.78 Ω	20.0 V	20 nA	0201
SBU/CC, D+/D- V_{bus} 5 V	ESD245/ ESD246	±5.5 V	5.8/5.5 pF	±15 kV	0.1 Ω	7.5 V	30 nA	0201/01005

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

USB type-C line	Product name	V_{RWM} [V]	Cap [pF]	V_{ESD} [kV]	R_{dyn} [Ohm]	V_{cl} @16A [V]	I_R, max [nA]	Package
V_{bus} 9-15 V	ESD249/ ESD259	±18 V	4.2 pF	±16 kV	0.27 Ω	23.5 V	100 nA	0201
V_{bus} 20 V	ESD239/ ESD240	±22 V	3.2/3.0 pF	±16 kV	0.27/0.3 Ω	27.0 V	100 nA	0201/01005
V_{bus} 20 V	ESD253	±24 V	2.8 pF	±15 kV	0.3 Ω	31.0 V	100 nA	0201

Summary of recommended products

Functional block	Product category	Topology	Product family	Benefits
Flyback converter	High-voltage power devices (Si MOSFETs and GaN transistors)	Quasi-resonant flyback (QR)	600 V/700 V/800 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light-load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			600 V/650 V CoolMOS™ C7	– High switching performance enabling highest efficiency – Ease of use level high – Optimized devices for highest efficiency switched-mode power supplies
		Active-clamp flyback (ACF) Hybrid flyback (HFB)	600 V CoolMOS™ PFD7	– Robustness and reliability with integrated robust fast body diode and up to 2 kV ESD protection – Reduced gate charge for enhanced light-load efficiency – Lower hysteresis loss
		Flyback (QR, ZVS, ACF, HFB)	CoolGaN™ Transistor 650 V/700 V	– Highest efficiency – Highest power density
	Controller	Hybrid flyback controller	XDPS2201	– Asymmetrical half-bridge ZVS control to maximize efficiency – Supports a wide range of configurable parameters – Supports ultrahigh power density (20 W/in³) design
		QR flyback controller	EZ-PD™ PAG2P/S	– Secondary-side-controlled flyback solution – Dual-chip flyback solution with integrated SR+PD controller supports 28 V EPR and SPR – ACF topology supported – Leakage energy recycling and ZVS switching
	Gate driver IC	Active-clamp flyback (ACF)	IRS25752L	– High-side gate driver enables active clamp mode of operation – Cost-effective, 600 V, single-channel driver in SOT23 package
			IRS21271S	– High-side gate driver enables active clamp mode of operation – 600 V, single-channel driver with over-current protection (OCP)

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Functional block	Product category	Topology	Product family	Benefits
PFC DC-DC	High-voltage power devices (Si MOSFETs and GaN HEMTs)	DCM PFC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
		DCM/CCM PFC	CoolGaN™ Transistors 650 V/700 V	– Highest efficiency contribution via less parasitic parameter – Space saving with SMD smaller package
	Boost diode	DCM/PFC	650 V Rapid 1 diodes	– Low conduction losses
	Controller	PFC/LLC combo	IDP2308	– Digital multimode PFC and LLC combined controller with a floating – High-side driver and a start-up cell – Comprehensive and configurable protection features – Wide set of configurable parameters
		PFC/HFB combo	XDPS2221	– Digital multimode PFC and HFB combined controller – High-side driver and a 600 V startup cell – Integrated gate drivers supporting GaN switches – Configurability for protections and system performance
			XDPS2222	– Digital multimode PFC and HFB combined controller – High-side driver and a 600 V startup cell– Integrated gate drivers supporting GaN switches– Configurability for protections and system performance – Supports extra wide output voltage range with MFIO switching depending on output voltage
	High-voltage power devices (Si MOSFETs and GaN HEMTs)	HB LLC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			CoolGaN™ integrated power stages	– Highest efficiency and highest power density – Isolated gate driver integrated
	Gate driver IC	HB LLC	EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	– Isolated gate driver, up to 14 A, 100 ns propagation delay
Synchronous rectifier	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ PD 60-150 V	– Low conduction losses, reduced overshoot – Adapter-oriented synchronous rectification MOSFETs
	Control ICs	Synchronous rectification	EZ-PD™ PAG2S	– Integration of synchronous rectification and PD3.1 controller – Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc.

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Functional block	Product category	Topology	Product family	Benefits
Protocol controller	USB-C ICs	Protocol controller	EZ-PD™ PAG2S	– Supports PD3.1 28 V EPR and SPR
		PD controller	EZ-PD™ CCG3PA-NFET	– Supports USB PD 3.1 with Programmable Power Supply (PPS) – Independent constant current (CC) and constant voltage (CV) modes – Configurable OVP, OCP, and OTP – Integrates NFET gate driver to drive the load switch 64 kB flash memory
			EZ-PD™ CCG3PA	– Supports USB PD 3.1 with PPS, QC4, Apple 2.4 A charging, AFC, – BC1.2 etc. – Supports 1C and 1A port – 64 kB flash memory
		Multi-port controller	EZ-PD™ CCG7DC	– Integrates 2 USB-C PD controllers + 2 DC-DC controllers in one single chip – Supports latest USB-C PD v3.0 with PPS, QC4+, QC4.0, Samsung AFC, Apple 2.4A, Cv1.2 – Configurable switching frequency of 150 kHz - 600 kHz – Arm® Cortex®-M0 with flash allows users to implement custom features
Connector	ESD	ESD protection	Multi-purpose diodes for ESD protection	– Small packaging to support minimum board space consumption – High linearity - reducing harmonic generation/enabling suppression EMC problems – Exceptional quality and reliability

Click here to learn more:

www.infineon.com/usb-pd
www.infineon.com/ccg3
www.infineon.com/ccg3pa
www.infineon.com/gan
www.infineon.com/pag2

Published by
Infineon Technologies AG
Am Campeon 1-15, 85579 Neubiberg
Germany

Public

Version: V1.1_EN
Date: 10/2025

Stay connected!

Scan QR code and explore offering
www.infineon.com

Please note!
This Document is for information purposes only and any information given herein shall in no event be regarded as a warranty, guarantee or description of any functionality, conditions and/or quality of our products or any suitability for a particular purpose. With regard to the technical specifications of our products, we kindly ask you to refer to the relevant product data sheets provided by us. Our customers and their technical departments are required to evaluate the suitability of our products for the intended application.
We reserve the right to change this document and/or the information given herein at any time.

Additional information
For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office (www.infineon.com).

Warnings
Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.
Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.