



We are the link
between the real and
the digital world.

Infineon's offerings for wireless charging for consumer and industrial applications

Infineon's virtual show 2020



It is not just about charging phones – wireless charging will become an essential part for charging various devices in the future

RX shipments – 2019: 516M 2023: 1.333M (CAGR of 27%)
TX shipments – 2019: 230M 2023: 671M (CAGR 31%)

Smartphones & wearables
are largest segments
(commodity,
integrated Rx)

WPC Qi standard is expanding to
**higher power levels enabling
new apps (>45W)**

Increasing wireless charging installations
(home, **public infrastructure**, restaurants)

Out-of-band communication
based on bluetooth introduced
in higher power wireless
charging

Authentication will become
mandatory in
WPC Qi 1.3 Spec

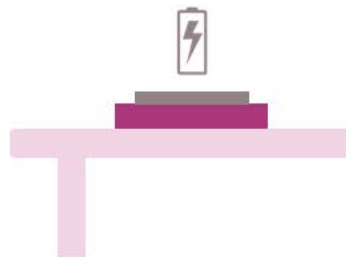
Inductive is the dominating standard – resonant is expected
to be used in selected niche markets but will just take a smaller
portion of the market

Main standards in the market

Tightly coupled

Inductive

Low frequency
110 - 205 kHz

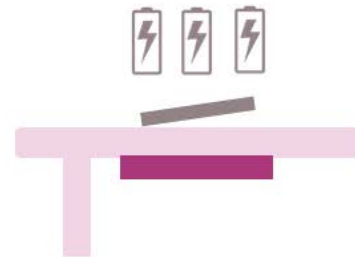


WIRELESS POWER
CONSORTIUM

Loosely coupled

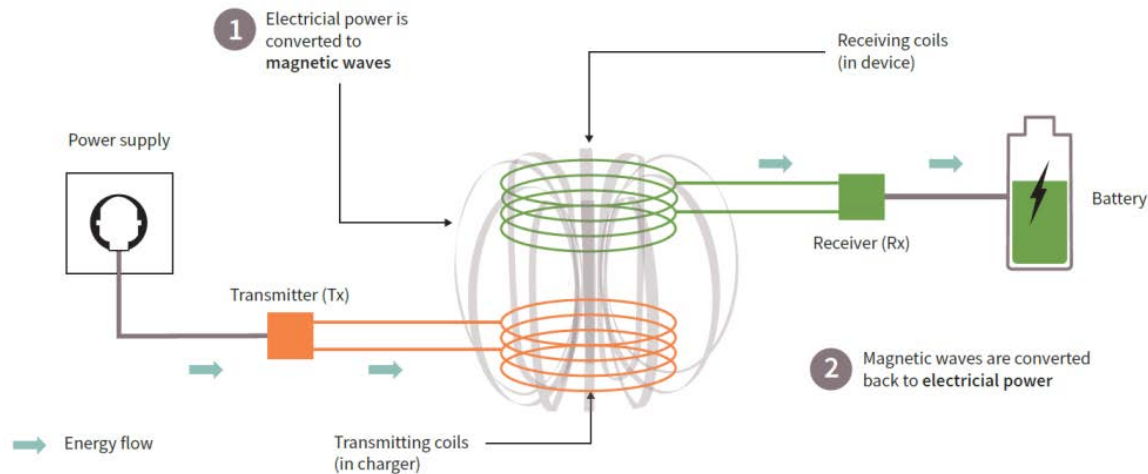
Resonant

High frequency
6.78 MHz



AirFuel™ Alliance

Wireless charging is not a trivial endeavor: Safety and user experience are key



Safe and efficient wireless charging

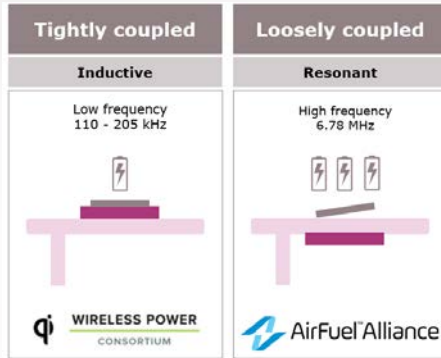
- › Requires a deep level of system knowledge and expertise
- › Must understand antennas and interaction with surrounding structures
- › Success requires precise control of power delivery

If done incorrectly, it can impact the user experience

- › Compatibility issues
- › Safety issues
- › Thermal issues during charging
- › Reduced efficiency and increased charging time
- › Device and battery damage

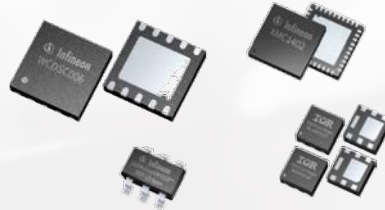
Key benefits why to choose Infineon for consumer & industrial wireless charging designs

Addressing the leading standards – inductive & resonant

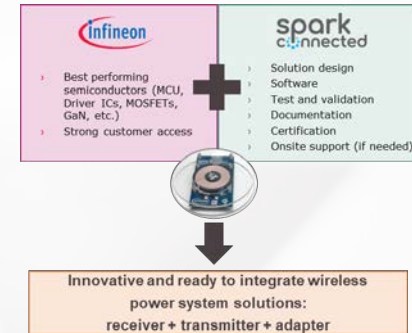


Offering the **right components** for efficient wireless charging experience

MOSFETs, driver ICs, Small Signal, MCU, voltage regulators, GaN, LDOs, authentication, USB Type-C port controller or a BLE module



Providing innovative, smart and high performance **system solutions together with our partner**

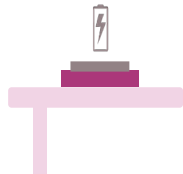


Leading wireless charging technologies – inductive Qi is the key standard in the market

Tightly coupled

Inductive > Magnetic Induction (MI)

Low frequency
110 - 205 kHz



- › In-band communication
- › Exact positioning of device
- › Single device charging
- › Efficiency >80% → approaching wired charging

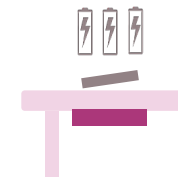


- › Established Standard (>9000 registered products)
- › **>600** members from network providers to IC developers
- › Leading OEMs participating e.g. Apple, Samsung, Google, LG, Dell
- › Latest specification 1.2.3 → 1.2.4
 - Baseline Power Profile 5W
 - Extended Power Profile 15W
 - Authentication → 1.3
- › **Qi standard expanding to higher power**
 - Medium Power standard 30 - 200W
 - Ki Cordless Kitchen Standard up to 2200 watts

Loosely coupled

Resonant

High frequency
6.78 MHz



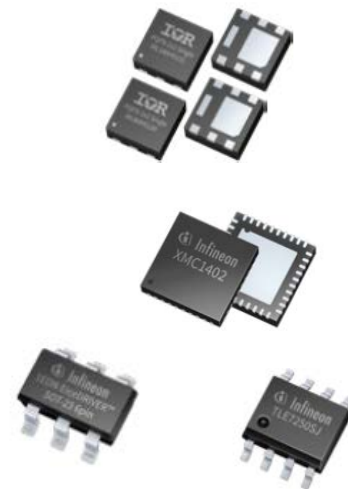
- › **Presently, no MR infrastructure**
- › No major industry rollouts
- › Only niche markets will adopt technology
- › Bluetooth out-of-band or in-band communication
- › Free positioning
- › Single & multiple device charging
- › Efficiency ~70%
- › Perfectly for unique form factors



Key enabling products for consumer & industrial wireless charging

Key enabling products

- › Low and medium voltage **power MOSFETs** – OptiMOS™ and StrongIRFET™
- › **Gate driver ICs** – EiceDRIVER™
- › **32-bit microcontrollers** – XMC™
- › P-channel and N-channel small signal power MOSFETs
- › **High-voltage power MOSFETs** – CoolMOS™ Superjunction MOSFETs
- › **PWM/flyback controllers and integrated power stage ICs** – CoolSET™
- › **Gallium nitride (GaN)** – CoolGaN™ e-mode HEMTs
- › Voltage and buck regulators for component and bridge supply
- › **Authentication** – OPTIGA™ Trust Charge
- › **Reverse conducting IGBTs** – 650V TRENCHSTOP™ 5
- › **New products from Legacy Cypress:** USB Type-C Port Controller or a BLE Module



Spark Connected – Official partner for Infineon to address system- and software requirements for your application



spark
c:nnected



Spark Connected has been selected as partner for Infineon to develop innovative and competitive reference designs for dedicated wireless charging applications

Infineon collaborates with wireless charging experts to offer wireless charging system solutions

Partnership with SPARK to offer what customers need



spark
c:nnected

- › Solution design
- › Software
- › Test and validation
- › Documentation
- › Certification
- › Onsite support (if needed)



Innovative and ready to integrate wireless power system solutions:
receiver + transmitter + adapter

Spark Connected



Ken Moore
Chief Executive Officer



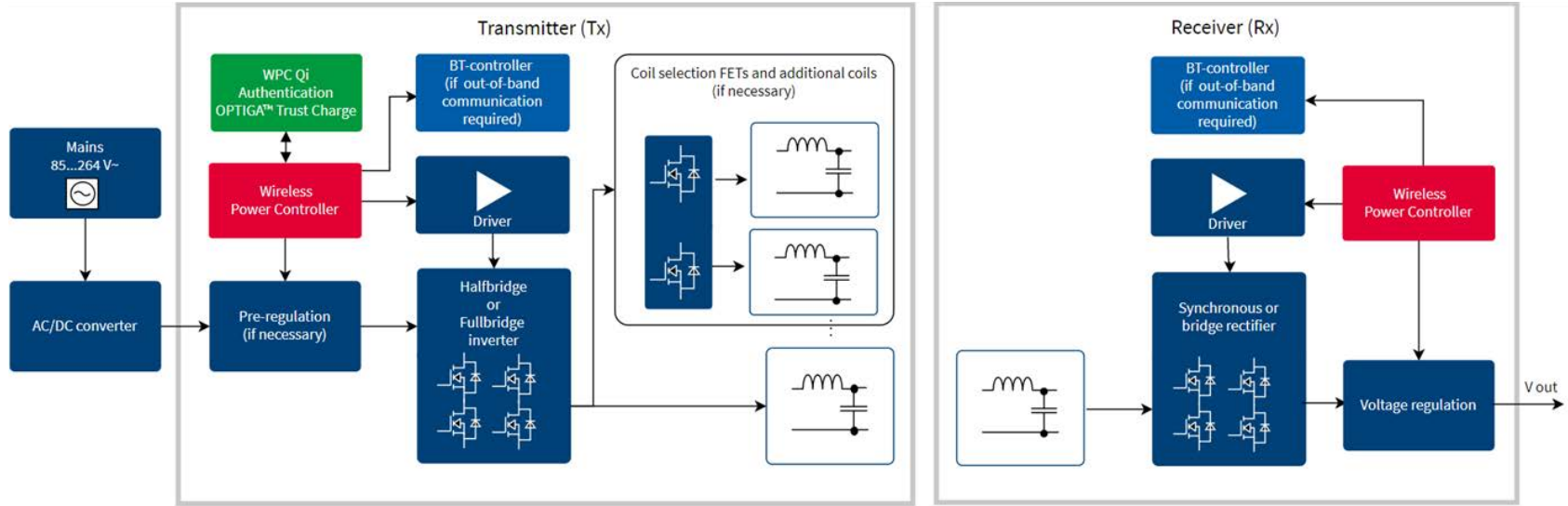
Ruwanga Dassanayake
Chief Operating Officer



Emanuel Stingu
Chief Technology Officer

- › Established in 2017 and headquartered in Dallas, Texas
- › **Over two decades** experience in wireless power implementation
- › **Early pioneers in creating safe products in the market, passing regulatory approval**
- › Spark has been selected to **multiple co-chair positions in the WPC consortium and shapes the market**
- › Company size: 11-50 employees

Infinion a one-stop-shop with excellent devices to ensure safe and efficient wireless power transfer – example inductive TX and RX



Key enabling products

MOSFETs

GaN

Driver ICs

Microcontroller

Small signal & LDOs

USB-C Controller

BT connectivity

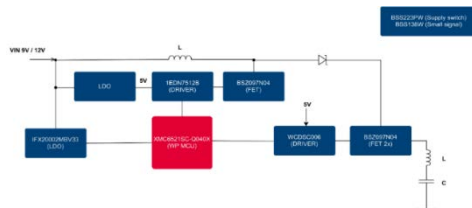
Authentication

Valkyrie 15 W Qi TX and WCDSC006 – now launched!

Board name: REF_10WTX_QI_4102 – SP# SP005344204



**spark
connected**



The Qi transmitter and the software IP is developed by our partner Spark Connected. For any customized solutions please get in contact with your regional interfaces. Learn more about our partner: www.sparkconnected.com

NEWS: Valkyrie 2.0 including OPTIGA™ Trust Charge in development!



WCDSC006

An EiceDRIVER™ half-bridge driver

Optimized solution for inductive wireless power

Motivation

› Optimized product for inductive (Qi, KHz) wireless power solutions (transmitter & receiver)

Product description

› The used EiceDRIVER™ technology combined with the PG-WSO-10 package offers an optimized solution for wireless charging

Where does the solution fit?

Get your smartphone charged:

- › Wireless charger unit
- › Wireless charger integrated into a lamp
- › Wireless charger integrated into desktop stand
- › Wireless charger integrated into furniture
- › Wireless charger integrated into busses or trains
- › Wireless charger integrated into public infrastructure
- › Wireless charger integrated into restaurants, hotels, offices

Which other applications can be charged?

- › Smart home devices
- › Small portable devices
- › Smart speaker
- › Electrical toys
- › Medical devices
- › Others

Customized RX solutions are available on demand for non smartphone applications! Please contact Verena.Lackner@infineon.com

G2M material

Interactive 3D Model	Explore more
Solution brief	Download here
Quick starter guide	Download here
Easy-to-use 15 W wireless charging video	Watch now
Unboxing video	Watch now
WCDSC006 – Datasheet	Download here
WCDSC006 – Product brief	Download here
XMC-SC Datasheet	Download here

Products	Voltage class	Package	Part number	$R_{DS(on)}$ max @ $V_{GS} = 4.5$ V [mQ]	Recommendation
MOSFETs	20 V	PQFN 2 x 2	IRLHS6242	11.7 (= 2.5 V drive capable)	Right fit
	25 V		IRFHS8242	21	Right fit
	30 V	Super SO8	BSC0996NS	11.8	Right fit
			BSC0993ND	7	Best performance
		PQFN 3.3 x 3.3	BSZ0589NS	4.4	Best performance
			BSZ0994NS	8.6	Right fit
			BSZ0909NS	15	Right fit
		PQFN 3.3 x 3.3 dual	BSZ0909ND	25	Best performance
			BSZ0910ND	13	Best performance
		PQFN 2 x 2	IRFHS8342	25	Right fit
			IRLHS6342	15.5 (= 2.5 V drive capable)	Best performance
	40 V	PQFN 3.3 x 3.3	BSZ097N04LS	14.2	Right fit
		SuperSO8	BSC035N04LSG	5.3	Right fit
	80 V	PQFN 2 x 2	IRL80HS120	32	
	100 V	PQFN 2 x 2	IRL100HS121	42	
Driver ICs	WCDSC006, PX3519, IRS2301S, 1EDN7512B, 2EDN7524G, IRS2007M, 2ED2182S06F				
Microcontroller or wireless power controller	XMC™ MCU and wireless power controller XMC™ -SC (including software IP)				
Voltage regulators	IR3841M, IFX20002, IFX91041EJV50, IFX90121ELV50, IFX81481ELV				
Small signal MOSFETs	BSS209PWH6327, BSS138WH6433 – Please check online				
Authentication	SLS32AIA020Ux – OPTIGA™ Trust Charge (USON10 3 x 3 package)				
Reverse Conducting IGBTs - 650V	Package PG-TO247-3 - IHW30N65R5 (30A), IHW40N65R5 (40A), IHW50N65R5 (50A)				

MOSFETs, Driver IC, μ Cs are on the website: www.infineon.com/wirelesscharging

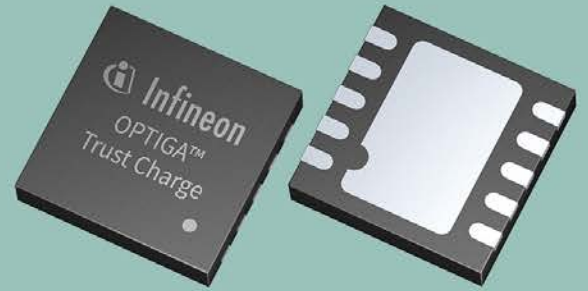
Components for resonant & high switching frequency solutions

Products	Voltage class	Package	Part number	$R_{DS(on)}$ max @ $V_{GS}=4.5$ [mQ]	Q_G typical [nC]	C_{oss} typical [pF]	Topology
MOSFETs	30 V	PQFN 2 x 2 dual	IRLHS6376PBF	48	2.8	32	Class D
		PQFN 3.3 x 3.3 dual	BSZ0909ND	25	1.8	120	Class D
			BSZ0910ND	13	5.6	230	Class D
		SOT-23	IRLML0030PBF	33	2.75	84	Class D
	40 V	SOT-23	IRLML0040	62	2.8	49	Class D
	60 V	SOT-23	IRLML0060	98	2.6	37	Class D
	80 V	PQFN 2 x 2	IRL80HS120	32	3.5	68	Class D/E
	100 V	PQFN 2 x 2	IRL100HS121	42	2.7	62	Class D/E
	150 V	PQFN 3.3 x 3.3	BSZ900N15NS3	75**	4.1**	46	Class E
			BSZ520N15NS3	42**	7.2**	80	Class E
	200 V		BSZ900N20NS3	78**	7.2**	52	Class E
			BSZ22DN20NS3	200**	3.5**	24	Class E
			BSZ12DN20NS3	111**	5.4**	39	Class E
	250 V		BSZ42DN25NS3	375**	3.6**	21	Class E
Driver ICs		EiceDRIVER™ 2EDL71*, 1EDN7512, 2EDN7524, 2ED2182S06F, 2ED24427N01F, 1EDI60N12AF					
		GaN EiceDRIVER™ ICs 1EDS5663H, 1EDF5673F, 1EDF5673K					
GaN e-mode HEMT		CoolGaN™ 600 V e-mode GaN HEMT IGT60R190D1S (HSOF-8-3)					
Microcontroller or wireless power controller		XMC™ MCU and wireless power controller XMC™-SC (including software IP)					
Voltage regulators		IR3841M, IFX20002, IFX91041EJV50, IFX90121ELV50, IFX81481ELV					
Small signal MOSFETs		Please check online ¹⁾					

MOSFETs, Driver IC, μ Cs are on the website: www.infineon.com/wirelesscharging

* Coming soon

OPTIGA™ Trust Charge
Making authentication for
wireless charging easy



OPTIGA™ Trust Charge is the authentication solution supporting Qi 1.3 wireless charging – for consumer and industry products



OPTIGA™ Trust Charge

Easy integration

- › Full turnkey solution for authentication for wireless charging (Qi 1.3)
- › Full system integration support
- › Customer specific certificate provided (provisioning)
- › Host code and **application notes** available

Security features

- › Based on CC EAL 6+ (high) certified security controller
- › X.509 / WPC certificate format supported
- › Authentication based on ECDSA NIST-P256
- › Cryptography support: ECC256, SHA-2

Key features

- › I2C serial communication
- › USON10-2 package (only 3x3mm)
- › Extended temperature range available

Deliverables

- › **Full turnkey solution = hardware / software / drivers / host library / certificate(s) & key material injection**

How does wireless charging work?



Schedule

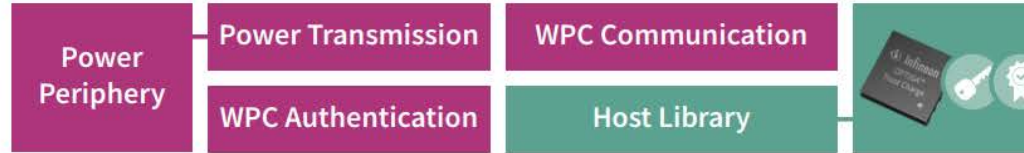
- | | |
|-------------------------|------------------------------|
| › Engineering samples | available |
| › Qualification samples | October 2020 |
| › Mass production | after release of Qi 1.3 spec |

OPTIGA™ Trust Charge

Authentication for Qi 1.3 compliant wireless charging



Receiver



Transmitter

Customer

Infineon



Learn more about wireless charging

Support material



Visit us on our website:

www.infineon.com/wirelesscharging

- › [Wireless charging selection tool](#)
- › [Application guide](#)
- › [Application brochure](#)
- › [Whitepapers](#)
- › [Power and Sensing Selection Guide](#)
- › [Reference Kit – Valkyrie 15W Qi transmitter](#)

Highlight products

[Wireless power controller – XMC™-SC](#)

[Half-bridge gate driver EiceDRIVER™ WCDSC006](#)

[OptiMOS™ & StrongIRFET™ low and medium voltage power MOSFETs](#)



Summary

- › **Infineon the right partner to choose** to solve your inductive and resonant wireless charging requirements
- › **Innovative and cost-effective reference designs** supported by **our board portfolio**
 - **MOSFETs, Driver ICs, Wireless Power Controller, Authentication, ...**

A close-up photograph of a silver smartphone resting on a blue circular wireless charging pad. The phone's screen is dark and reflects the ambient light. In the background, a portion of a red tablet is visible, resting on a light-colored wooden surface.

Visit us on our website:
www.infineon.com/wirelesscharging



Part of your life. Part of tomorrow.