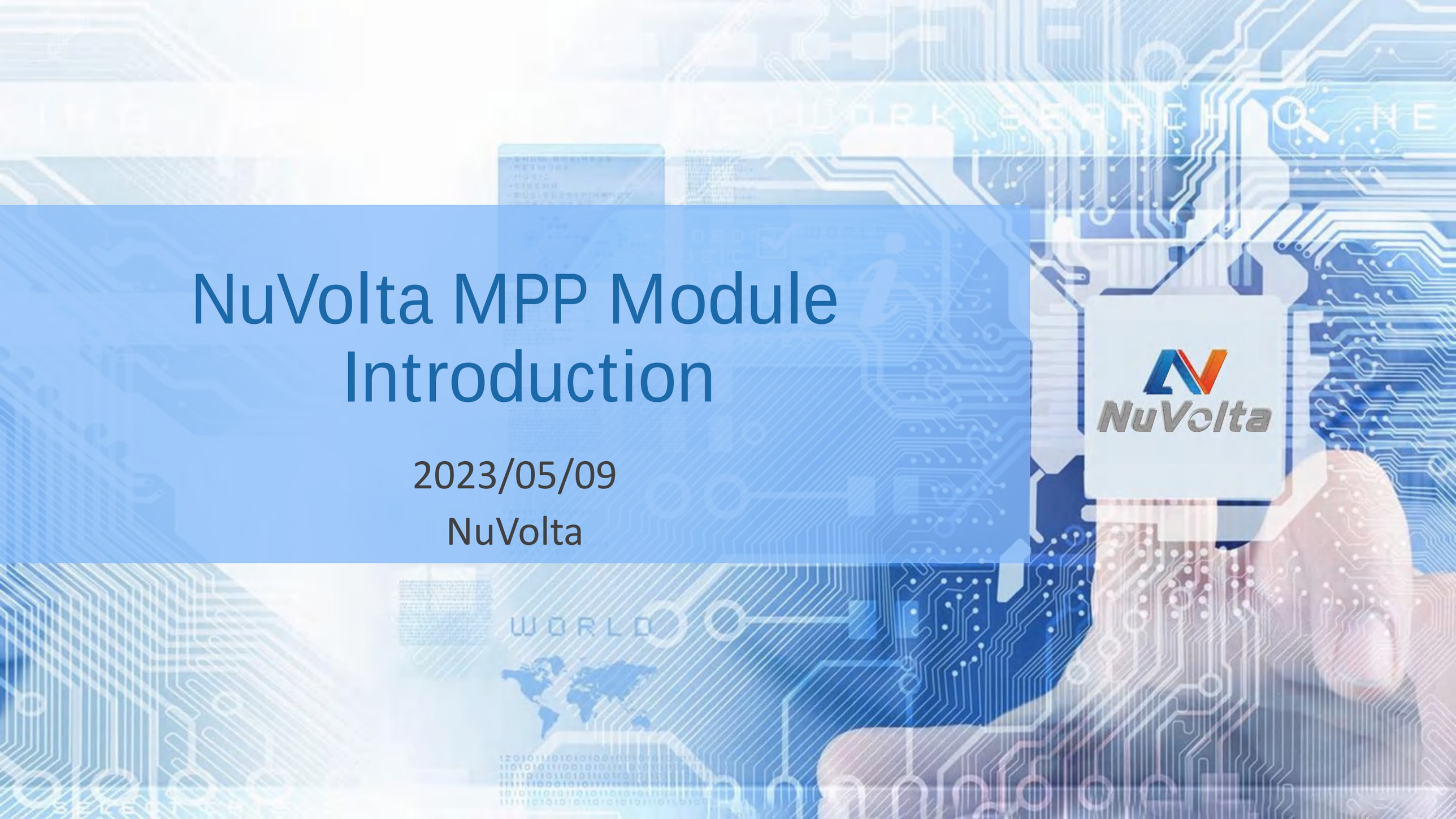
NuVolta MPP Module Introduction

2023/05/09

NuVolta



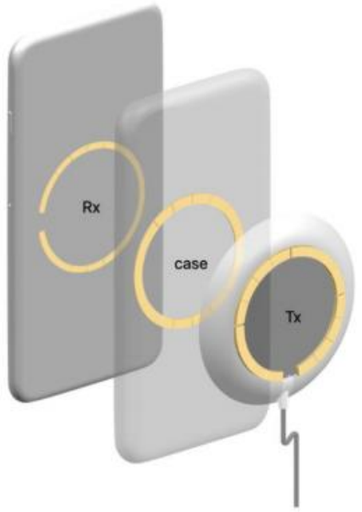
CONTENTS

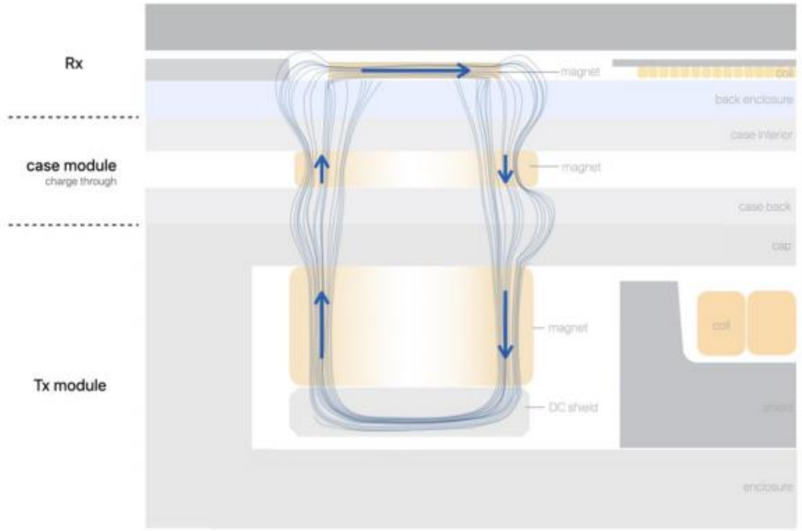
What is MPP?

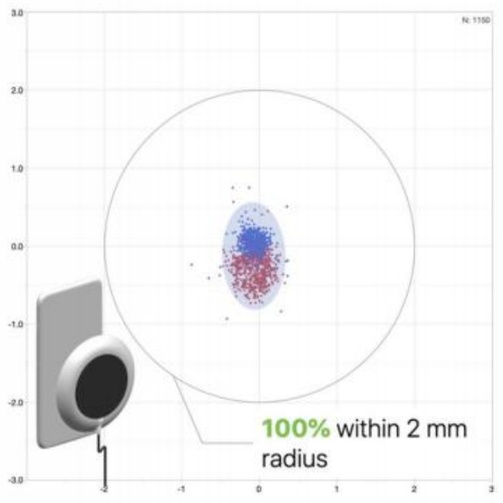
- MPP is an extension of the Baseline Power Profile (BPP), and utilizes some (but not all) features defined in the Extended Power Profile (EPP).
  - MPP uses ***the same authentication scheme as EPP***, but in order to speed up the authentication process, MPP uses fast FSK with ***128 cycles per bit***. (***Qi: 512 cycles per bit***)
  - ***Magsafe*** uses ***NFC*** to do authentication.
- MPP is an interface which allows for (***also see Apple's presentation for explanation***):
  - Never missing the sweet spot - ease of attach through ring of magnets
  - Ecosystem of powered and unpowered accessories
  - Conveniently using your device while charging
  - Delivering high power (15W) safely
  - Preventing interference with vehicle key fobs without regulatory issues
  - Maintaining near-parity compatibility with Qi BPP receivers and Qi BPP transmitters

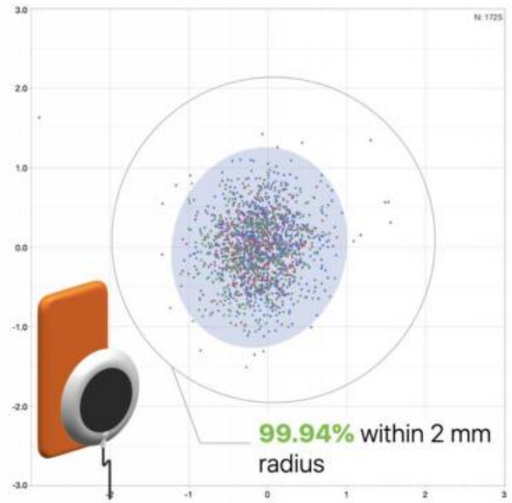
What is MPP?
- Never missing the sweet spot

- Multipole magnet design that tightly couples strong DC magnetic fields within the region of the magnet array.









What is MPP?
- Ecosystem of powered and unpowered accessories

- Powered accessories

MagSafe Battery Pack

$99.00

MagSafe Duo Charger

$129.00

MagSafe Charger

$39.00

- Unpowered accessories

iPhone 13 Pro Clear Case with MagSafe

$49.00

Now with Find My support

iPhone Leather Wallet with MagSafe - Golden Brown

$59.00

What is MPP?

- Conveniently using your device while charging

- Magsafe Tx

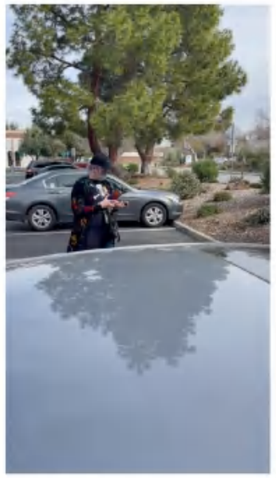
- Magsafe battery pack

What is MPP?
- Preventing interference with vehicle key fobs

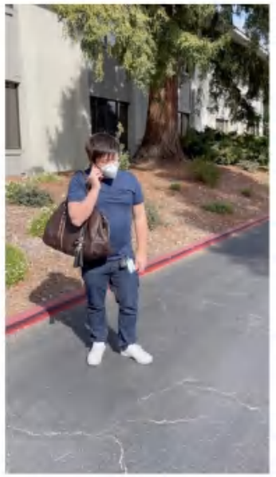
- Operating at 128kHz causes key fob interference.
- Moving to 360kHz prevents key fob interference for keyless entry, keyless start and trunk lockout.

Keyless Entry
Keyfob and phone/charge in different front pockets

Keyless Entry
Keyfob and phone/charge in bag (separate pockets)



Keyless Start



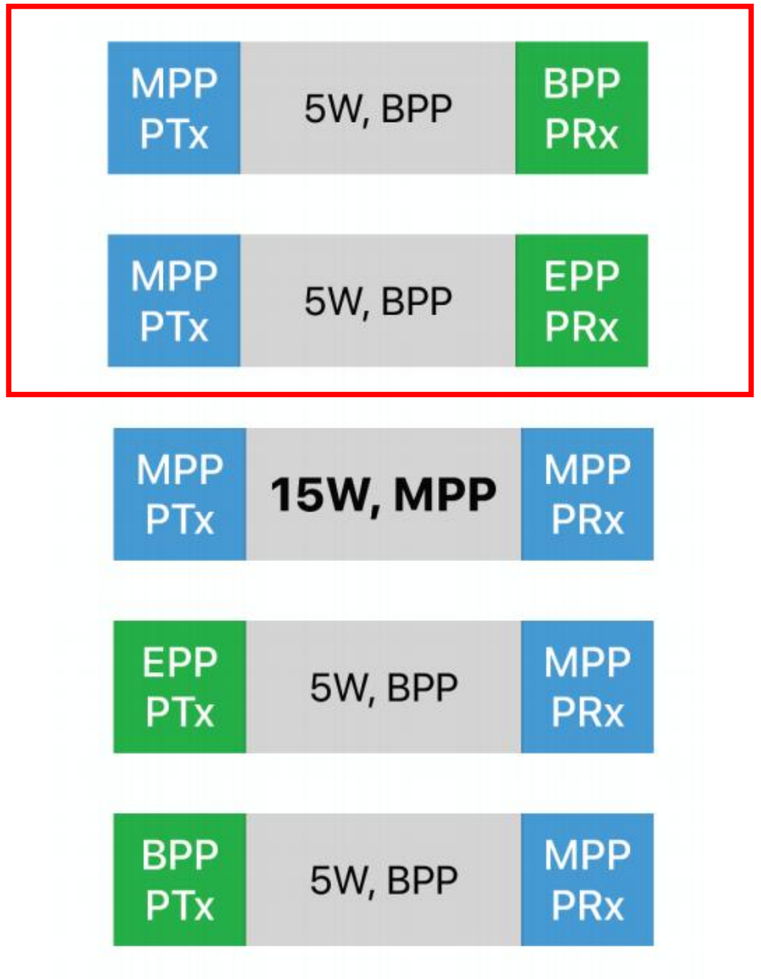
Trunk Lockout

PTx	Push-To-Start <3 CM	Door Lockout < 10cm	Trunk Lockout < 10cm
MagSafe	Pass	Pass	Pass
Wireless battery pack 1	Fail	Fail	Fail
Wireless battery pack 2	Fail	Fail	Fail
Wireless battery pack 3	Fail	Fail	Fail
Wireless battery pack 4	Fail	Fail	Fail
Wireless battery pack 5	Fail	Fail	Fail

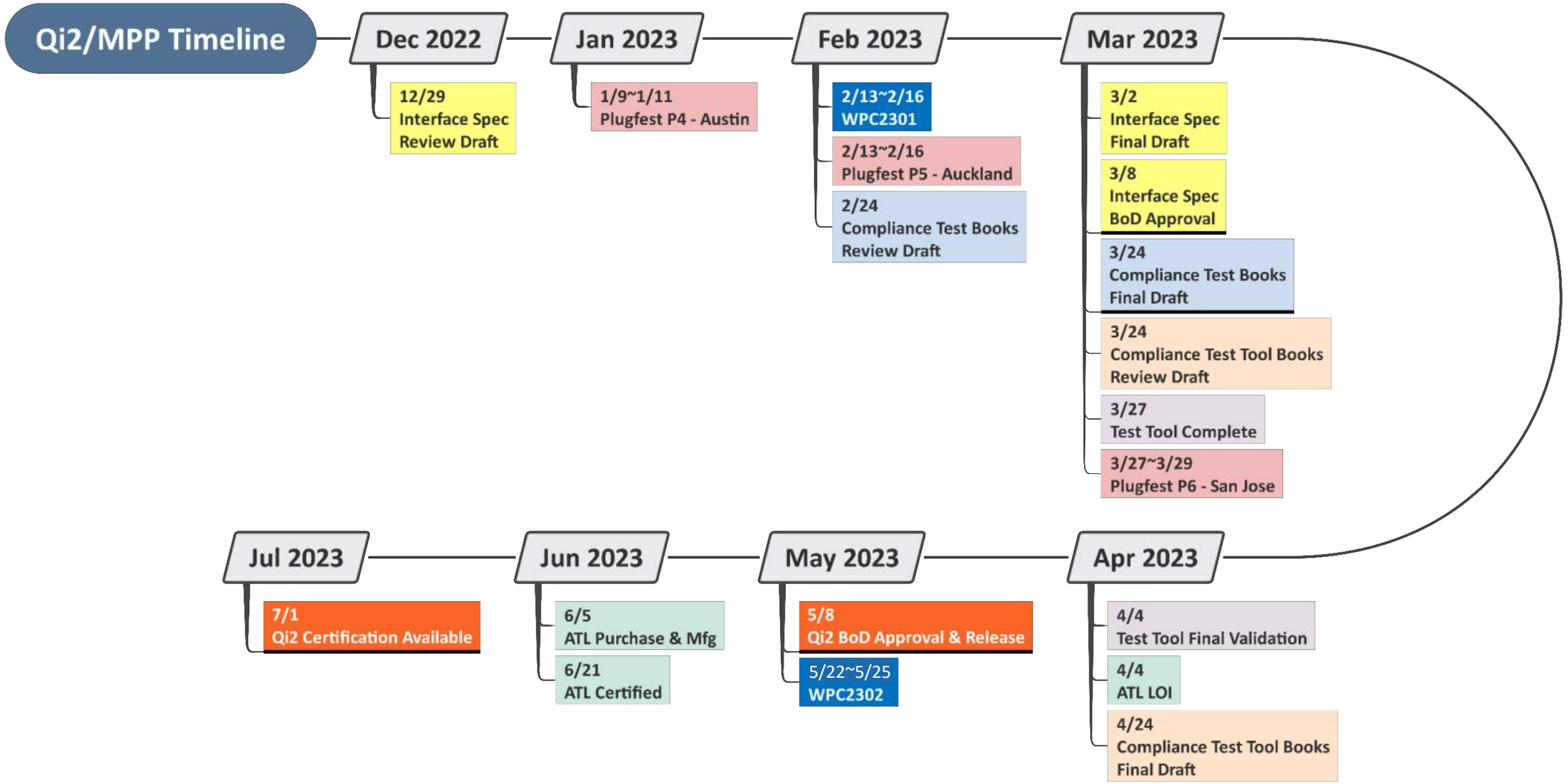
What is MPP?
- Near-parity compatibility with Qi BPP Tx and Rx

SHO (Sub-Harmonic Oscillation)

- There are some ferrite-based Qi receivers.
- DC magnets can cause saturation in receivers with thin ferrite
  - this saturation leads to nonlinear sub-harmonic oscillation;
  - causing ASK packet drops;
  - leading to disconnect.
- MagSafe shipped with temporary fix limiting inverter power
  - low power delivery for all Qi receivers;
  - reduced active area.



Qi2 / MPP Release Timeline



Qi2 / MPP latest update

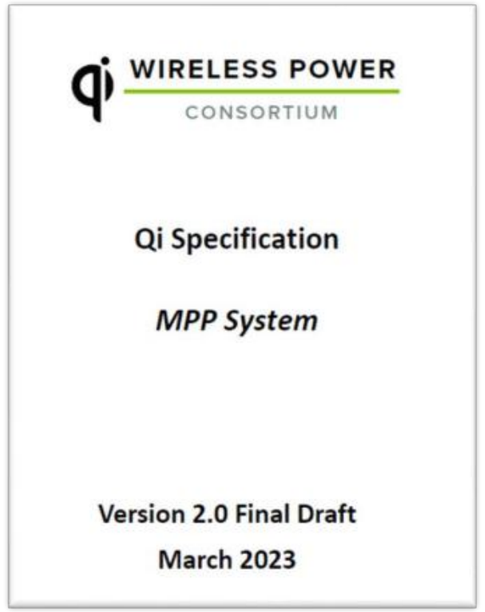
✓ The WPC Board of Directors has provided final approval of the Qi v2.0 Interface Standard by email on 5/10.

WPC Members,

The WPC Board of Directors has provided final approval of the Qi v2.0 Interface Standard.

This is a critical milestone in launching the Qi2.0 standard. Approval of the Qi v2.0 Test Standard, Verification of Qi 2.0 test tools, training of ATL, and the launch of Qi 2.0 certification will follow later this year.

Congratulations to all the members and staff that contributed to WPC Qi-SWG and MPP Task Force reaching this critical milestone



✓ WPC will hold WPC2302 meeting including plugfest P7 in Copenhagen on 5/22;

WPC 2302

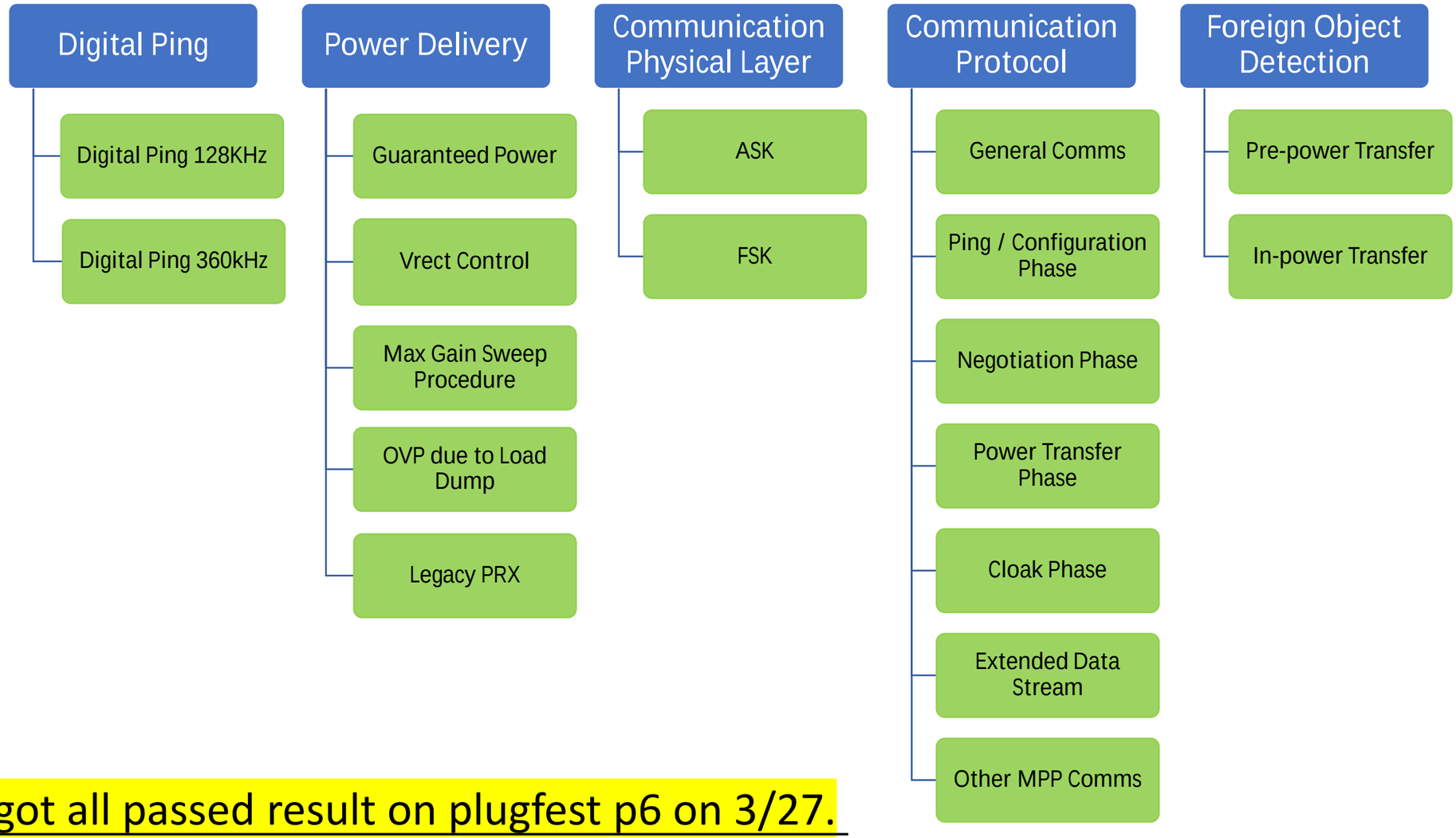
Monday 22 May 2023 - Thursday 25 May 2023. Location: Copenhagen, Denmark

May 22 - 25 in Copenhagen, Denmark

The meeting will be held at the Scandic Sluseholmen.

The meeting starts on Monday and ends on Thursday. Some task forces may organize pre-meetings before the official start on Monday.

MPP key feature



NuVolta got all passed result on plugfest p6 on 3/27.

MPP power delivery

✓ Different power delivery requirements in different positions is defined in MPP compliance test.

Position #	Radius to center (mm)	Distance between Rx and Tx Surface (mm)
1	0	0
2	2	2
3	3	3
4	3	4

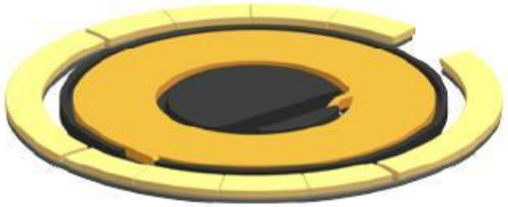
Test	Position#	Procedure/Note
P1	1	• $P_{rect} \geq 15W$ • $V_{rect\_TPR} \geq 13.7V$
P2	2	
P3	3	• $P_{rect} \geq 5W$ • $V_{rect\_TPR} \geq 11.7V$
P4	4	• $P_{rect} \geq 2.5W$ • $V_{rect\_TPR} \geq 11.7V$

Coil design

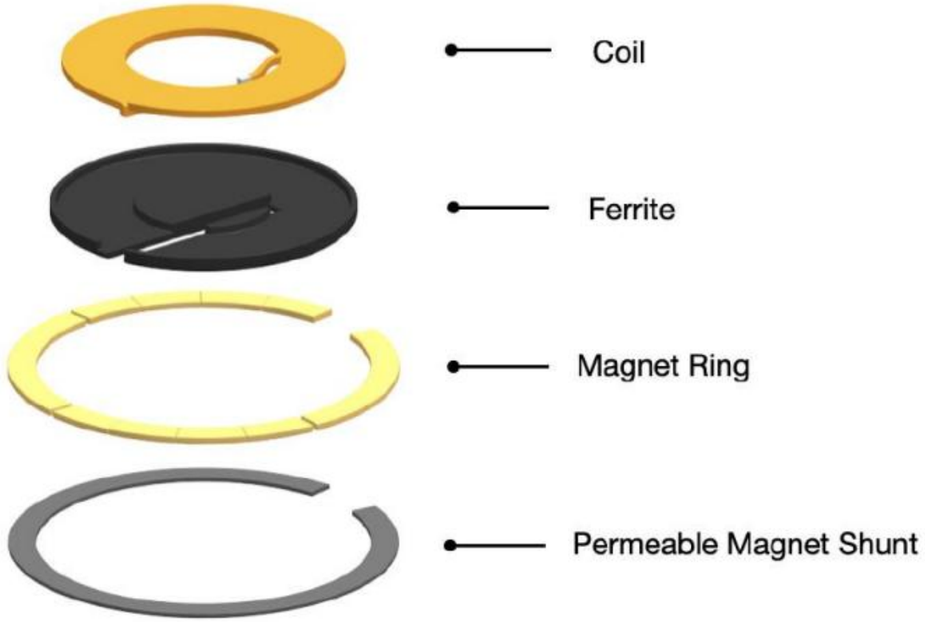
For MPP application, WPC will not recommend the coil model instead of opening the design and providing the spec requirement for MPP coil. The below photos is captured from MPP system.

> It is recommended that MPP PTx or PRx implementations follow these coil system models as closely as possible to minimize the differences with the TPT#MPP1-coil and TPR#MPP1-coil compliance test tools.

PTx coil



Transmitter Module



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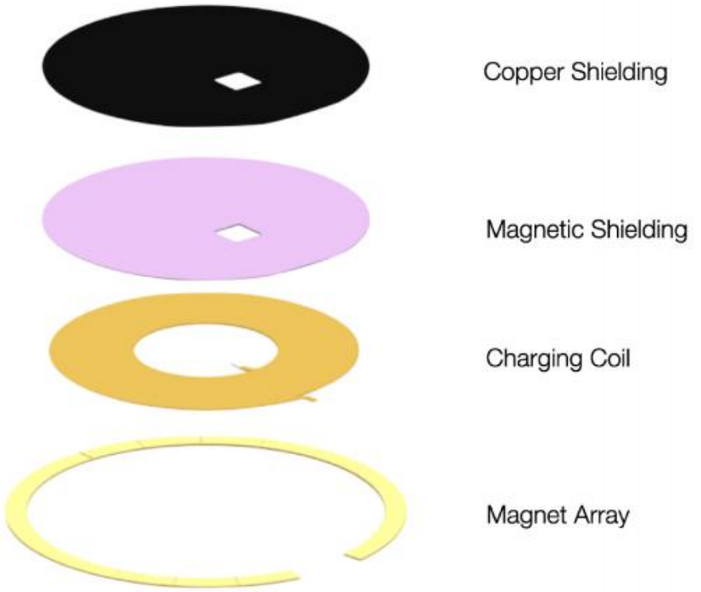
PRx coil

Coil Module



NuVolta MPP module

(Part Number: NU222)

Share the same dimensions with Apple C222 module

OD: 58.56mm.

Thickness: 7.9mm

No design modification for current products with C222. Just drop-in replacement with new MPP module

Installation is compatible with C222

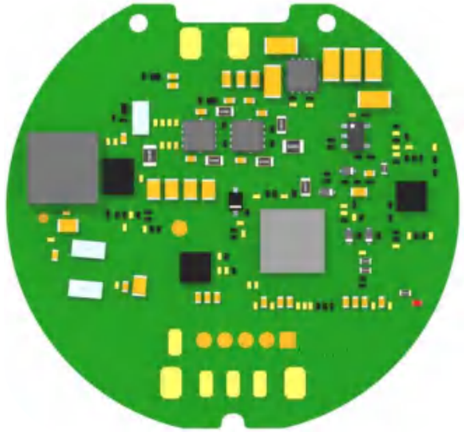
Power supply requirements are same with C222

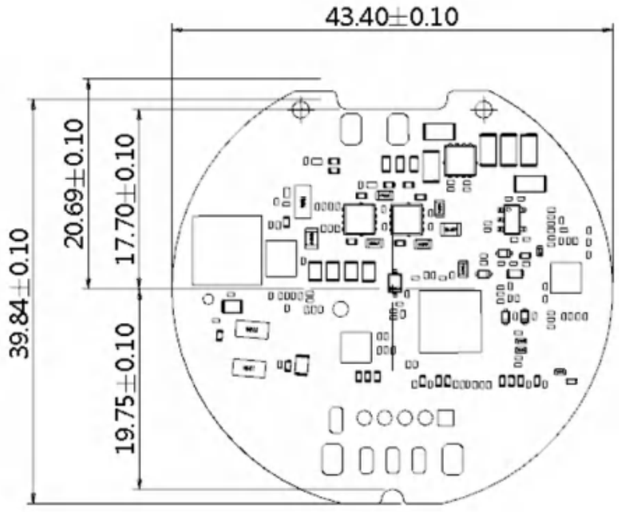
- USB PD 9V/2.22A 5V/3A
- DC 9V/2.22A

Expose one more CCx signal, compared with C222, to support more applications

Qi2 certificated as subsystem. Support MPP / EPP / BPP protocols

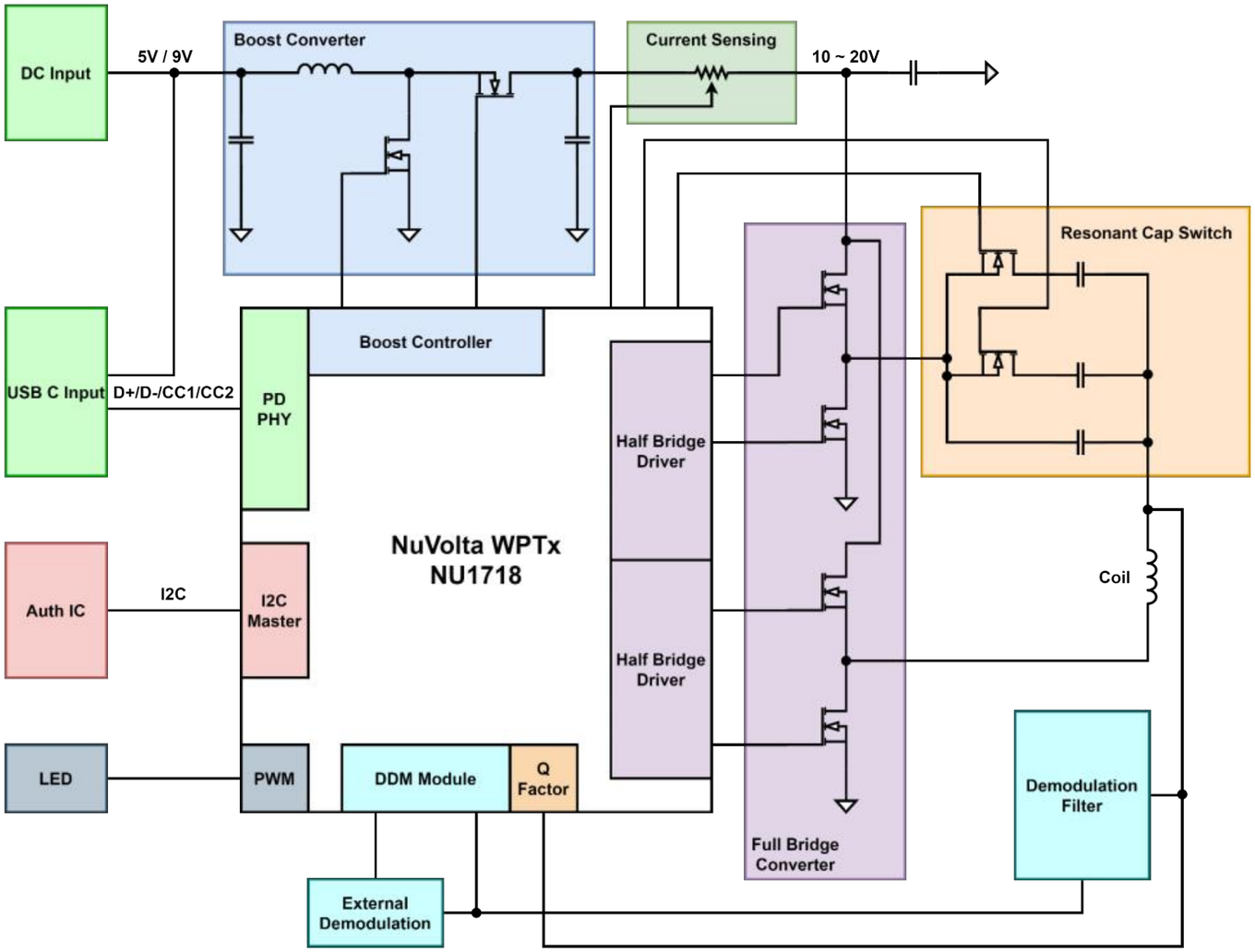
NU222 EE spec - specification





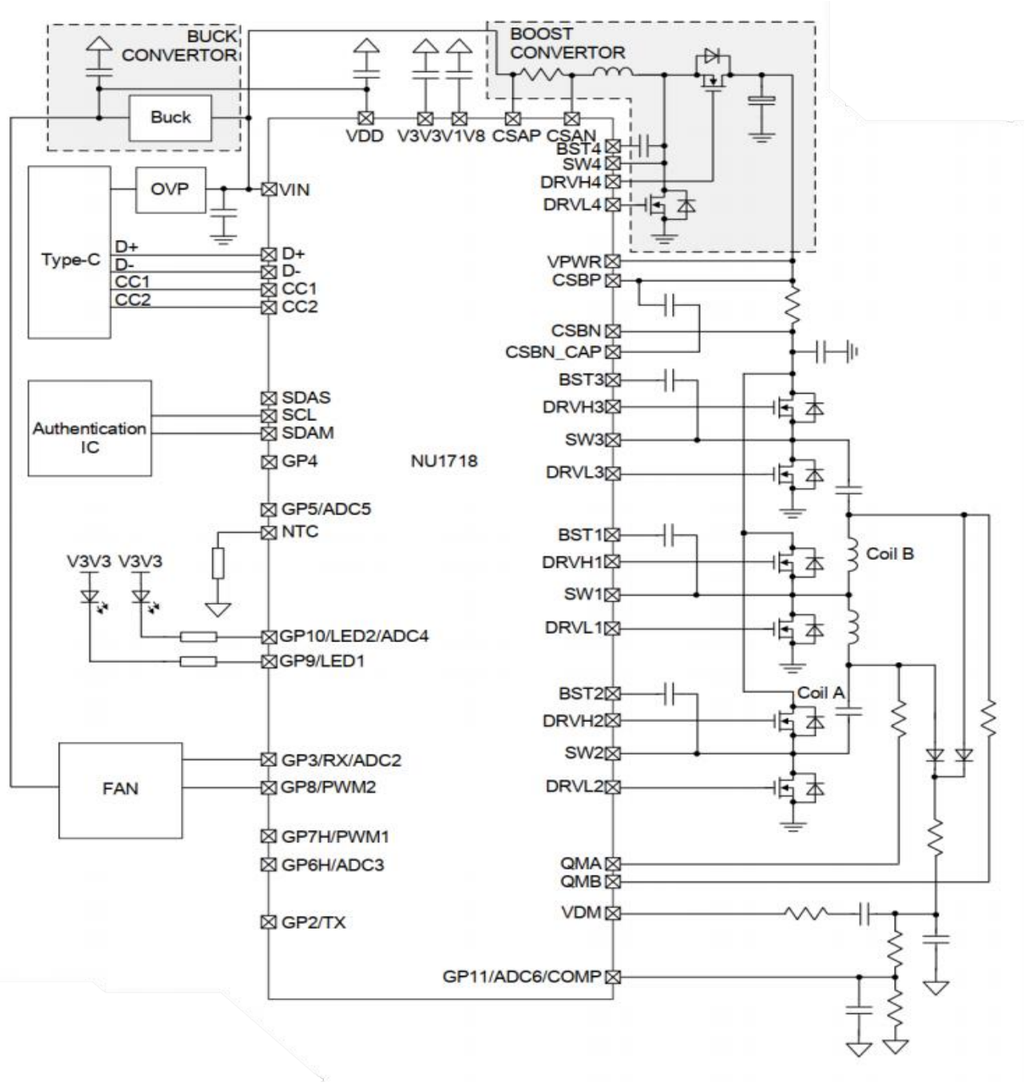
Item	Parameter
Input Power	USB PD 9V 2.22A / 5V 3A DC 9V 2.22A
Output Power	15W Max
Standby power	<500mW
System Efficiency	78% (Max)
Protocol	MPP (Qi 2.0) EPP / BPP (Qi 1.3.3)
Coil Type	MPP 7.42uH@360KHz
Protection	OVP / UVP / OCP / OTP / OSP
FOD	Q factor / Analog Ping / Power Transfer FOD based on power loss modeling
Dimension	150mm*60mm
Main Chips	NU1718 (NuVolta) / FM1203 (Fudan)
Interface	Programming: TX, GND, SDA, SCL, VDD,CC2 Power: V+, V-, D+,D-, CC1

NU222 EE spec - block diagram



NU1718 Brief Spec

- Wide Input Voltage: 4.5V to 30V
- Integrated Boost/Buck Controller, output voltage range is 5V to 45V with 25mV step
- Integrated 3 pair Half-Bridge Drivers with controllable dead-time and slew rate
- Integrated 5V, 3.3V and 1.8V LDO
- High-Accuracy Current Measurement for FOD and In-Band Communication
- Integrated high precision Q Factor and LC resonant Frequency Measurement
- Integrated Low-Error-Rate Digital Demodulation
- Robust OVP, UVP, OCP, OJP (Juggle Protection) and TSD Protectior
- I2C Master/Slave and UART Interfaces
- 13 channel, 14bit ADC
- Integrated 91.996MHz, 32Bit/64K MTP/4K SRAM MCU Core
- Integrated QC/PD3.0(PPS) protocol function
- Ultra-Low quiescent current in SLEEP mode <20uA



NU1705/8A: Wireless Power Transmitter

Features

- Wide Vin：4V 到20.5V（符合MPP输入要求）
- 集成MTP MCU 32K+Power Stage单芯片 Tx SoC
- 集成的高精度 Q 值测量
- 强大的 OVP、OCP、SCP、OJP 和 OTP 保护
- 11 通道，15 位 ADC
- 集成 92MHz晶振、32 位/32K MTP/2K SRAM MCU
- 集成QC/PD3.0(PPS)/SCP/AFC协议功能
- 休眠模式下的超低静态电流：<20uA

Applications

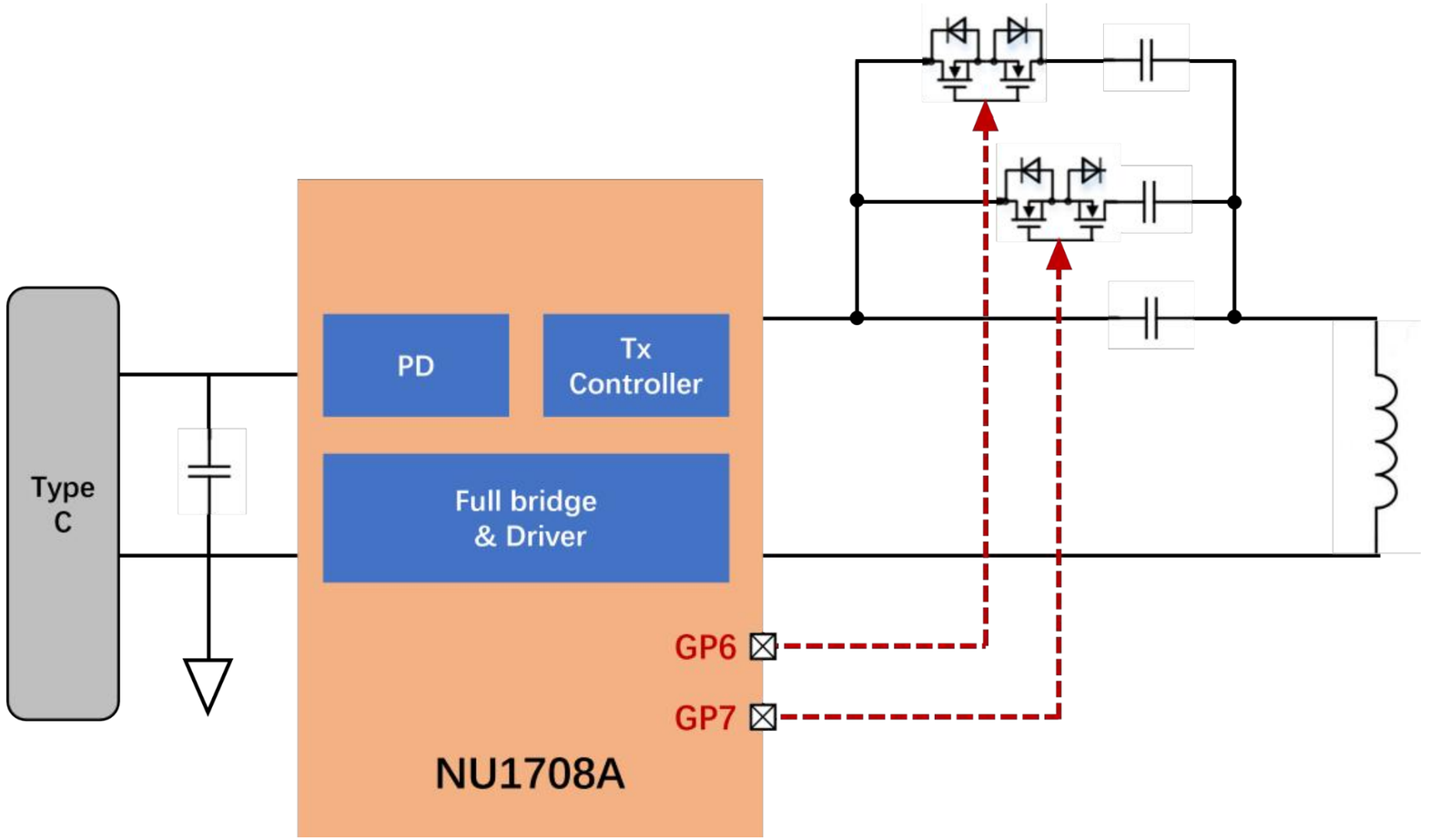
- 30W输出功率
- 应用于消费类，工业，汽车，以及医疗市场的无线充发射器

Benefits

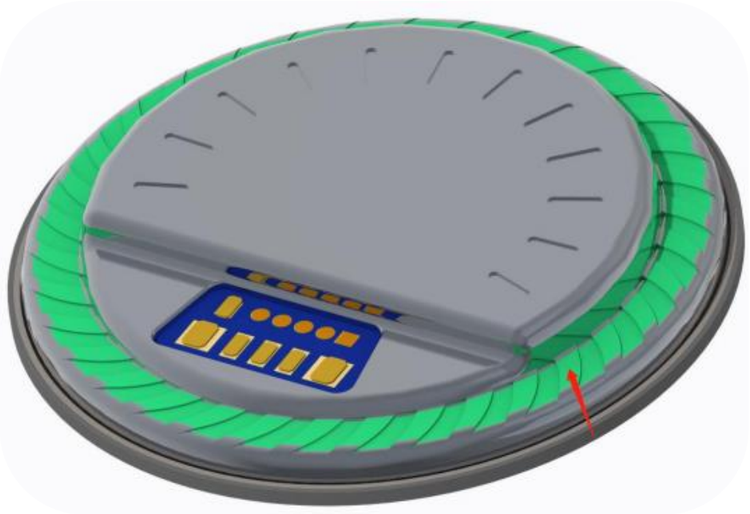
- **高集成度**
  - > QFN 4mm*4mm封装
  - > 集成Magsafe/MPP驱动，适合双线圈以及高频应用
  - > 方案外围少于20个元器件，可用单面板设计
- **高性能**
  - > 高精度Q值检测
  - > 支持一触即发功能
  - > 可配置的MOS驱动时间，优化的EMI性能，无需外置snubber

NU1705/8A: Wireless Power Transmitter

适合MPP磁吸应用：

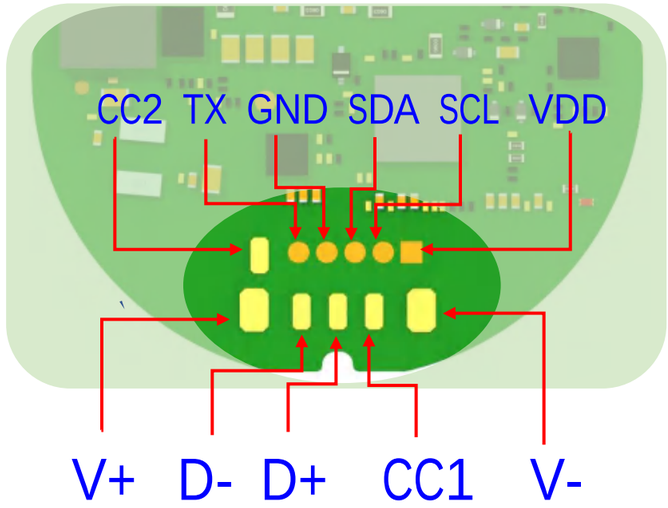


NuVolta MPP module assembly

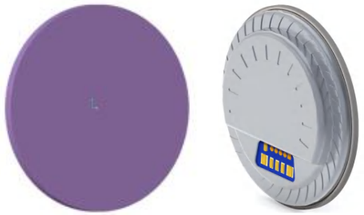
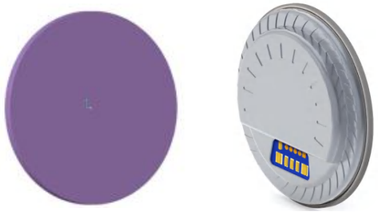


NU222

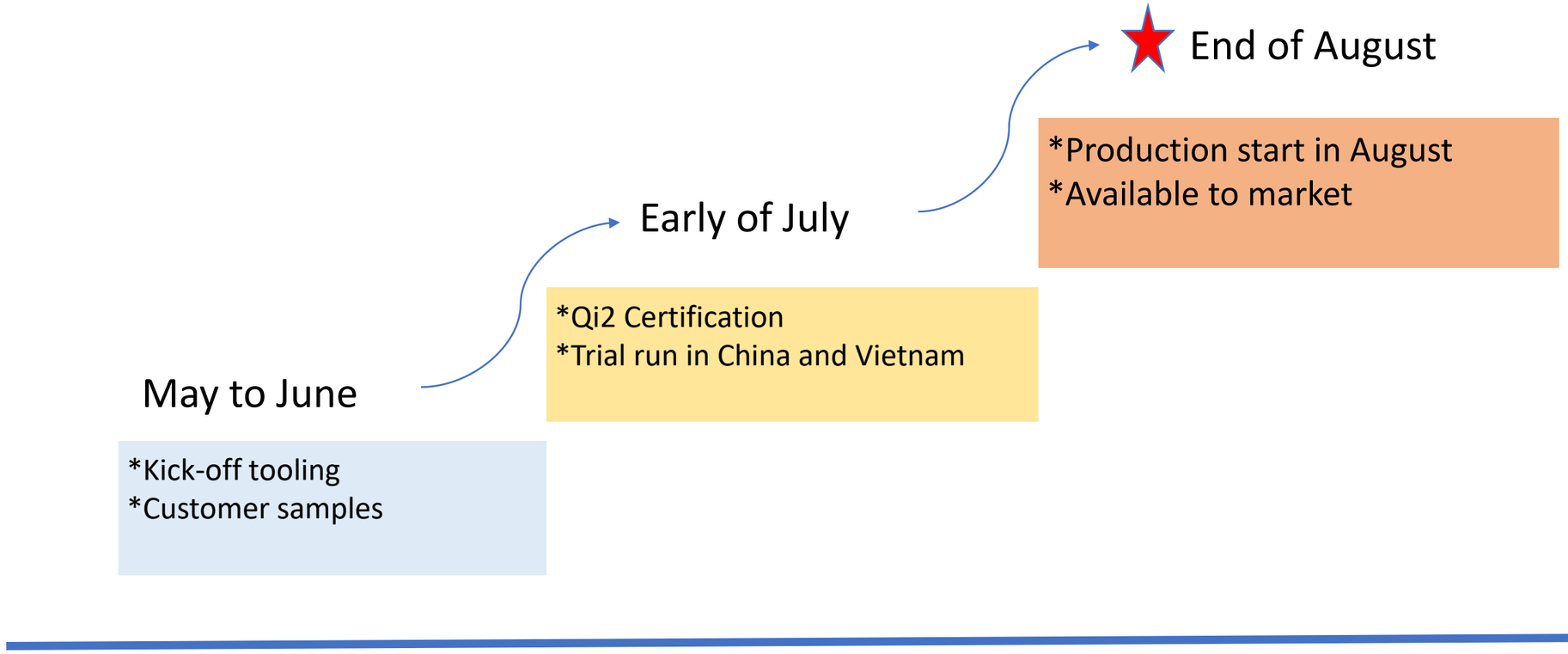
- ✓ Easy assemble to your product with applying glue in the green area which the same as C222
- ✓ Programming interface: TX, GND, SDA, SCL, VDD,CC2
- ✓ Power interface: V+, V-, D+,D-, CC1



NuVolta MPP module product center

Nuvolta MPP Module product center			
Module	NU222	NU222X	NU223
Picture			
Top cover	Y	N, Optional.	Y
Back cover	Y	N, Optional.	N
Magnet force	900gf	900gf	1500gf
OD	58.56mm	58.56mm	58.56mm
Thickness (Nominal)	7.9mm	6.4mm+0.85mm=7.2mm (NU222X + Top cover)	7.3mm
Protocol	BPP, EPP, MPP 15W	BPP, EPP, MPP 15W	BPP, EPP, MPP 15W
Input	USB PD 9V/2.22A 5V/3A DC 9V/2.22A	USB PD 9V/2.22A 5V/3A DC 9V/2.22A	USB PD 9V/2.22A 5V/3A DC 9V/2.22A

Production plan



NuVolta

Deliver Our Values
Enable Your Success

nuvoltatech.com