



Product specification

DOC NO: NVT-MPP TX Module
REV.: A03

Product specification

Customer:

Product model: Nu223X

Part number: TNU223XMGMDL

Type: Qi2 wireless charger

Version: A03

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REVISED HISTORY

NO.	REV.	REVISED CONTENT	REVISDE REASON	DATE
1	01	Initially released		2023/9/15
2	02	Add temperature and output power adjust, Add IIC, Add FW upgrade.		2023/11/16
3	03	Add magnetic force definition		2023/12/6
4				

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1. Product description

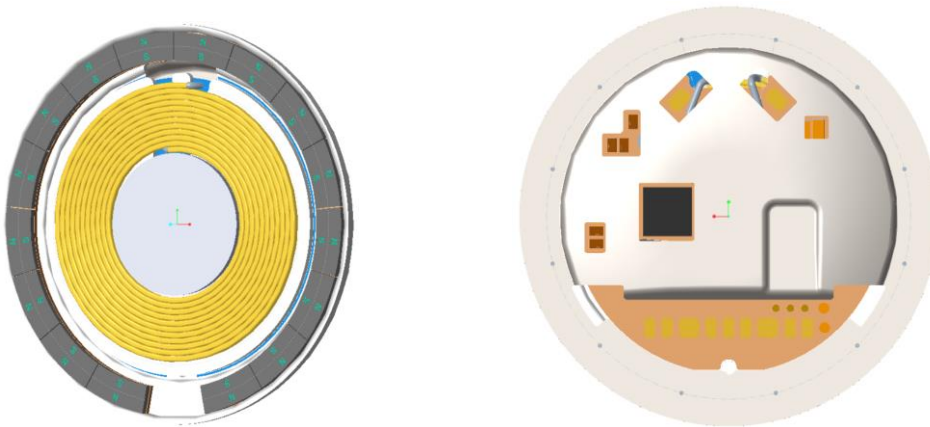
Nuvolta MPP TX module support Qi 2.0 MPP/ BPP protocols. It can support both DC power and QC/PD inputs, and is compatible with input voltage of 5V and 9V. The maximum power is 15W(14V-1.07A), it can support 15W charging power for MPP RX device, and 7.5W fast charging power for Apple non-MPP phones, and 5W charging for BPP RX device.

Nuvolta MPP TX module supports LED indicate application. User can connect LED to the module, develop LED indicate product.

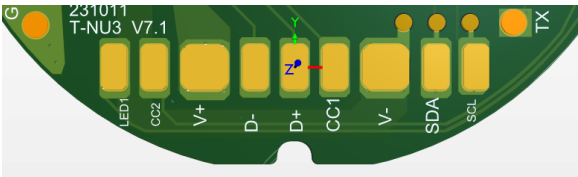
Nuvolta MPP TX module supports power allocation via IIC for the application such as single pad, X-in-1, MPP Powerbank etc. Other function module can get MPP TX module operate status and control MPP TX module with IIC communication.

Nuvolta MPP TX module is the same size as Apple Magsafe Charger Module, it can replace Apple Magsafe charger module.

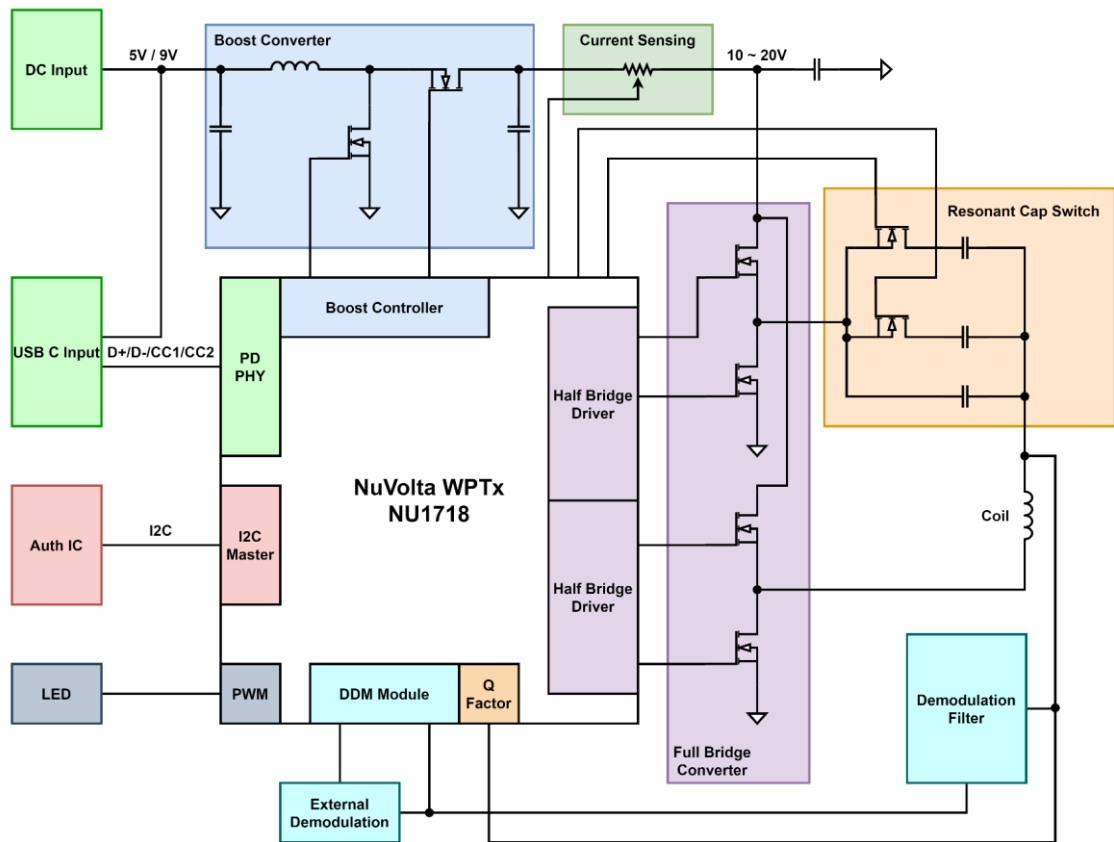
Nuvolta MPP TX module (Nu223) with 1100gf magnetic force, which can replace Apple C223 charger module. Nu223X without top cover.



2. Product specification

Descriptions	SPEC	
Input Power	USB-C mode	9V--2.22A / 5V-3A
	DC mode	9V($\geq 2.22A$)/5V($\geq 2.4A$)
Output Power		15W Max
Standby Power		< 350mW
System Efficiency	Max efficiency	$\geq 80\%$
Coil Type		8.4uH @360kHz
Frequency	BPP mode	128 kHz
	MPP mode	360 kHz
Protection		OVP /UVP /OCP /OTP
Input OVP	9V input	Trigger:10V/ recover:9.5V
	5V input	Trigger:5.6V/ recover:5.4V
Input UVP	9V input	Trigger:7.5V/ recover:8.5V
	5V input	Trigger:4.2V/ recover:4.5V
OTP		Trigger:72°C/ recover:55°C
FOD		Q test(pre-power transfer)/Power Transfer FOD
Protocol	Input	BC1.2/ QC/PD protocol function
	Output	MPP-15W/ BPP-5W/7.5W apple fast charge
Main Chips	SOC	NU1718 (NuVolta)
	Authentication chip	FM1230(Fudan)
Certification		Qi2.0 MPP
Interface	Power pins: V+,V-,D+,D-,CC1,CC2 Debug pins: G,SDA,SCL,TX LED pins: LED1	

3. Block diagram



4. Environment characteristics

Operate Temperature and Humidity

Item	Requirements			
	MIN	TYP	MAX	Units
Operate Temperature	-10	-	+40	°C
Operate Humidity	10	-	90	%RH

Storage Temperature and Humidity

Item	Requirements			
	MIN	TYP	MAX	Units
Storage Temperature	-20	-	+70	°C
Storage Humidity	5%	-	95	%RH

5. Power allocation

NuVolta MPP TX module can adjust the maximum output power according to the capability of the PSU as below

PSU Type	Output power
DC $\geq$ 20W (9V/2.22A)	BPP5W/AFC7.5W/MPP15W
DC $\geq$ 12W (5V/2.4A)	BPP5W/AFC7.5W/MPP7.5W
QC 18W (9V/2A)	BPP5W/AFC7.5W/MPP10W
QC 15W (9V/1.67A)	BPP5W/AFC7.5W/MPP10W
PD $\geq$ 20W (9V/2.22A)	BPP5W/AFC7.5W/MPP15W
PD 18W (9V/2A)	BPP5W/AFC7.5W/MPP12W
PD 15W (5V/3A)	BPP5W/AFC7.5W/MPP7.5W
BC1.2 12W	BPP5W/AFC7.5W/MPP7.5W

6. Pads definition

Pin	USB-C cable mode	USB-C Receptacle mode	DC 9V mode
LED1	NC	NC	NC
CC2	NC	USB CC2	NC
V+	VBUS	VBUS	VBUS
D-	USB D-	USB D-	NC
D+	USB D+	USB D+	NC
CC1	USB CC1	USB CC1	NC
V-	GND	GND	GND
SDA	NC	NC	NC
SCL	NC	NC	NC

* V+ and V- pads support up to 20AWG wires, the other pads support up to 26AWG wires.

7. LED definition

User can connect a LED anode to the LED1 pad. There is a 1K Ω resistor connect LED1 pad to Nu1718 in TX module, and the high Voltage of this pad is 5V, and the low Voltage of this pad is 0V. The LED indicate as below.

States	Operation
Start-up(Power on)	on then off
Standby	off
Charging	on
Fully charged	on
Error	Blink-1Hz

8. Temperature and output power

There is a NTC resistor inside the module to provide OTP for the module. The module can adjust output power according to the different temperature. It starts to decrease output power when the temperature exceeds 55°C, the output power decreases 1W for every 1°C increases. The module stops running when the temperature exceeds 72°C. It resumes operate when the temperature drops below 55°C.

PCB NTC Temperature (°C)	RX Prect(W)
≤55	15
56	14
57	13
58	12
59	11
60	10
61	9
62	8
63	7
64	6
65	5
66	4
67	3
68	2
69	1or Cloak
70	
71	
72	TX stop

9. IIC interface

User can get the Module status or send Power supply capacity of the adapter to the module through I2C.

The Module is configured to be a slave, and the maximum communication frequency is up to 400KHz. The pull-up voltage can use 3.3V or 5V.

SCL, SDA

V _{IH}	GPIO Logic input high threshold		1.3			V
V _{IL}	GPIO Logic input low threshold				0.6	V
I _{LKG}	Leakage Current		-1		1	uA
F _{SCL}	Clock Frequency		100		400	kHz



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I2C information as below

Slave Device Addr: 0x71(7bit)												
Read Addr: 0xE3												
Write Addr: 0xE2												
Info Addr (HEX)	Info Name	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Default Value (HEX)	Descriptions
00	TX_FW_VERSION	R	FW_VERSION								XX	Firmware version of TX, 0x14 means v1.4
01	TX_CHIP_ID	R	CHIP_ID								XX	Hardware version of TX, 0x50 means v5.0
02	TX_STATUS	R	TX_ERR	OTP	OVP	FOD	RESERVED		STATUS		00	STATUS=1, device present; *STATUS=0*, no device; TX_ERR=1, an error occurred at Tx side, such as FOD, OTP, ...; TX_ERR=0, no error;
03	RESERVED_0	R	RESERVED									
04	TX_REQUIRED_VOLT_L	R	REQUIRED_VOLT[7:0]								88	unit: mV
05	TX_REQUIRED_VOLT_H	R	REQUIRED_VOLT[15:8]								13	The master should set the voltage to 9V/5V directly.
06	TX_WORKING_VOLT_L	R	WORKING_VOLT[7:0]								88	unit: mV
07	TX_WORKING_VOLT_H	R	WORKING_VOLT[15:8]								13	
08	TX_WORKING_CURRENT_L	R	WORKING_CURRENT[7:0]								00	unit: mA
09	TX_WORKING_CURRENT_H	R	WORKING_CURRENT[15:8]								00	
0A	TX_NTC_TEMPERATURE	R	NTC_TEMPERATURE[7:0]								15	unit: °C
0B	TX_NTC_TEMPERATURE	R	NTC_TEMPERATURE[15:8]								00	
0C	MASTER_MSG	R/W	READY	RESERVED				ADP_TYPE			00	*READY=1*, master ready; *READY=0*, master not ready; *ADP_TPVE=0b000*, DCP; *ADP_TPVE=0b001*, QC2.0(can support 5V/9V output adapter, but the current capacity is not clear); *ADP_TPVE=0b010*, PD2.0(can support 5V/9V output adapter, and the current capacity is clear); *ADP_TPVE=0b011*, QC3.0_12V/QC3.0_20V; *ADP_TPVE=others*, DCP;
0D	TX_Q_VALUE	R	Q_VALUE								00	TX QDT value
0E	TX_F_VALUE_L	R	F_VALUE[7:0]								00	
0F	TX_F_VALUE_H	R	F_VALUE[15:8]								00	unit: 0.1KHz
10	MASTER_SEL_ADAP_VOLT_L	R/W	MASTER_SEL_ADAP_VOLT[7:0]								00	unit: mV
11	MASTER_SEL_ADAP_VOLT_H	R/W	MASTER_SEL_ADAP_VOLT[15:8]								00	*MASTER_SEL_ADAP_VOLT* is the selected voltage value of adapter. The master should send this value before setting the "READY" to 1.
12	MASTER_SEL_ADAP_CURRENT_L	R/W	MASTER_SEL_ADAP_CURRENT[7:0]								00	unit: mA
13	MASTER_SEL_ADAP_CURRENT_H	R/W	MASTER_SEL_ADAP_CURRENT[15:8]								00	*MASTER_SEL_ADAP_CURRENT* is the selected current value of adapter. The master should send this value before setting the "READY" to 1.

10. Firmware upgrade

The module support update Firmware through IIC communication. There are two ways to connect.

1. Connect IIC tool(Oneasy) to IIC port(SDA,SCL).
2. Connect IIC tool to the D+ and D- signals on the USB port.

11. Magnet force

Test set up: The distance from magnet surface to product surface is 0.85mm, Test with golden RX magnet from Magsound.

Module	Magnet force	Remark
Nu223X	11N min	

12. 2D drawing

Nu223X

