

Sonix SNPD1714HJG

Support Sink PPS



Reported
FAE Dept.





2.9.2 Programmable Power Supply (PPS) Charging Models

USB Power Delivery includes support for Programmable Power Supply (PPS) charging using a set of defined standard Voltage ranges. With current up to the limit of the Source's and cable's Advertised capacity. Additionally, when operating in SPR mode the current is also limited by the Operating Current in the *Request* message.

The standard Voltage ranges available in the Standard Power Range (SPR) for PPS are summarized in Table 2-2.

Table 2-2 PPS Voltage Power Ranges

Available Current	Prog	Min Voltage	Max Voltage	PDP Range
3A	5V Prog	3.3V	5.9V	15 – 60W
	9V Prog	3.3V	11V	
	15V Prog	3.3V	16V	
	20V Prog	3.3V	21V	
5A ¹	20V Prog	3.3V	21V	60 – 100W
¹ Requires 5A cable.				

6.4.1.2.5 Augmented Power Data Object (APDO)

These APDOs are used primarily for Sink Directed Charge of a Battery in the Sink. When applying a current to the Battery greater than the cable supports, a high efficiency fixed scaler **May** be used in the Sink to reduce the cable current.

The Voltage fields define the output Voltage range over which the power supply **shall** be adjustable in 20mV steps in SPR PPS Mode and 100mV steps in EPR AVS Mode. The Maximum Current field contains the current the Programmable Power Supply **shall** be capable of delivering over the Advertised Voltage range. See Section 7.1.3 for the electrical requirements of the power supply.

[USB PD 3.1 SPEC: USB_PD_R3_1 V1.6 2022-10.pdf](#)

APDO 指 PPS 模式底下，電壓可以在一定範圍區間內調整輸出
同樣以 36W 為例，若產品欲支援 PPS (Optional)，則需包含：

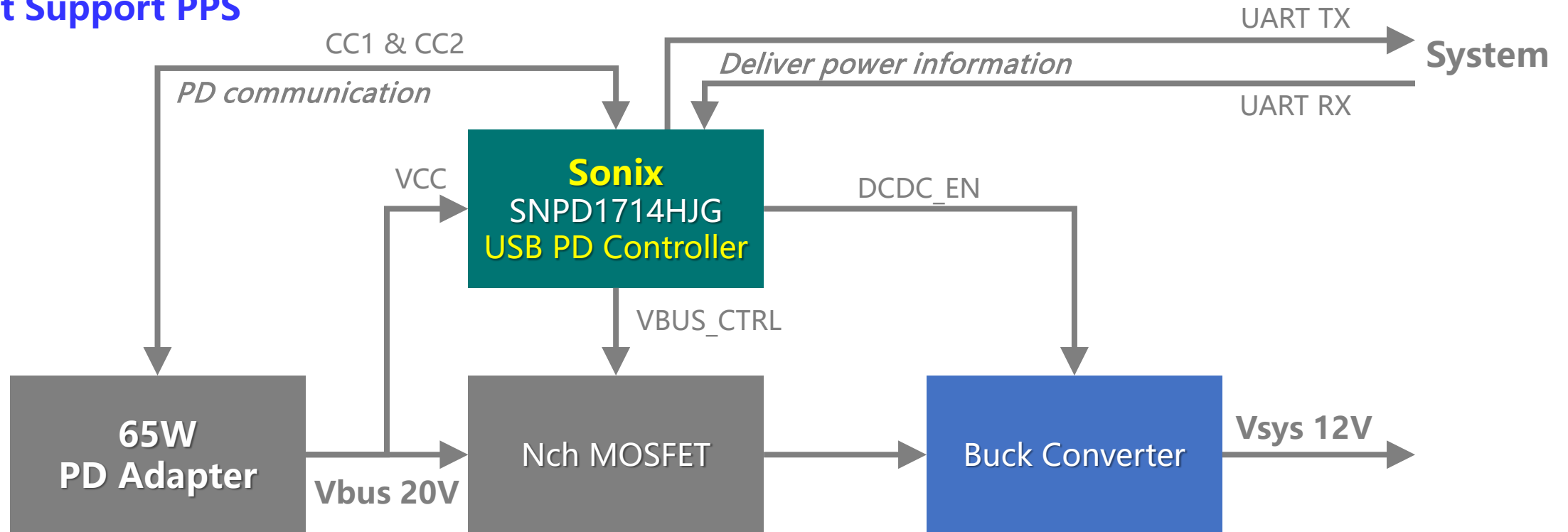
- (1) Fixed PDO: 5V@3A、9V@3A、15V@2.4A
- (2) APDO: 3.3V ~ 11V (9V Prog)@3A、3.3~16V (15V Prog)@2.4A



USB PD Solution (60W)

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Do Not Support PPS



Step1: CC pin Communication.

SNPD1714HJG get PD adapter profile table (Not support PPS).

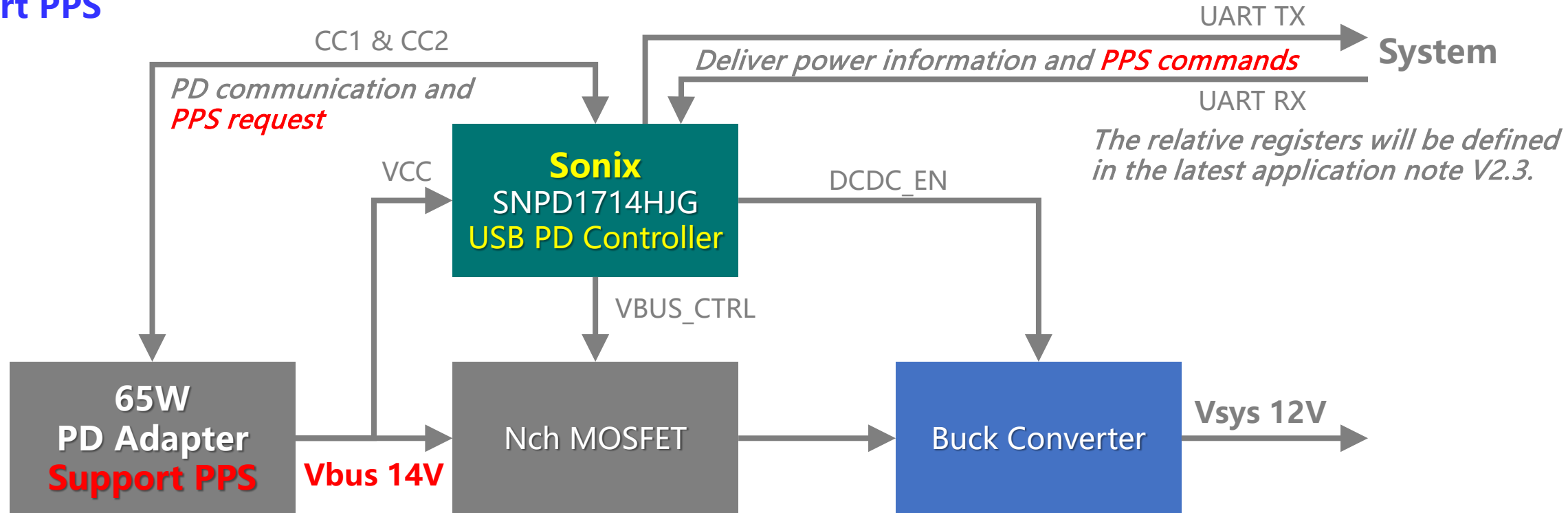
Step2: PD Adapter provides 20V (by SNPD1714HJG H/W setting).



USB PD Solution (60W)

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Support PPS



Step1: CC pin Communication.

SNPD1714HJG get PD adapter profile table (**Support PPS**).

Step2: PD Adapter provides 20V (by SNPD1714HJG H/W setting).

Step3: SNPD1714HJG get PPS requirement from system by UART I/F.

Step4: SNPD1714HJG requests PPS voltage to PD adapter by CC pins.

Step5: PD Adapter provides specific voltage (ex: 14V) to improve the power efficiency.



Flow Chart including PPS

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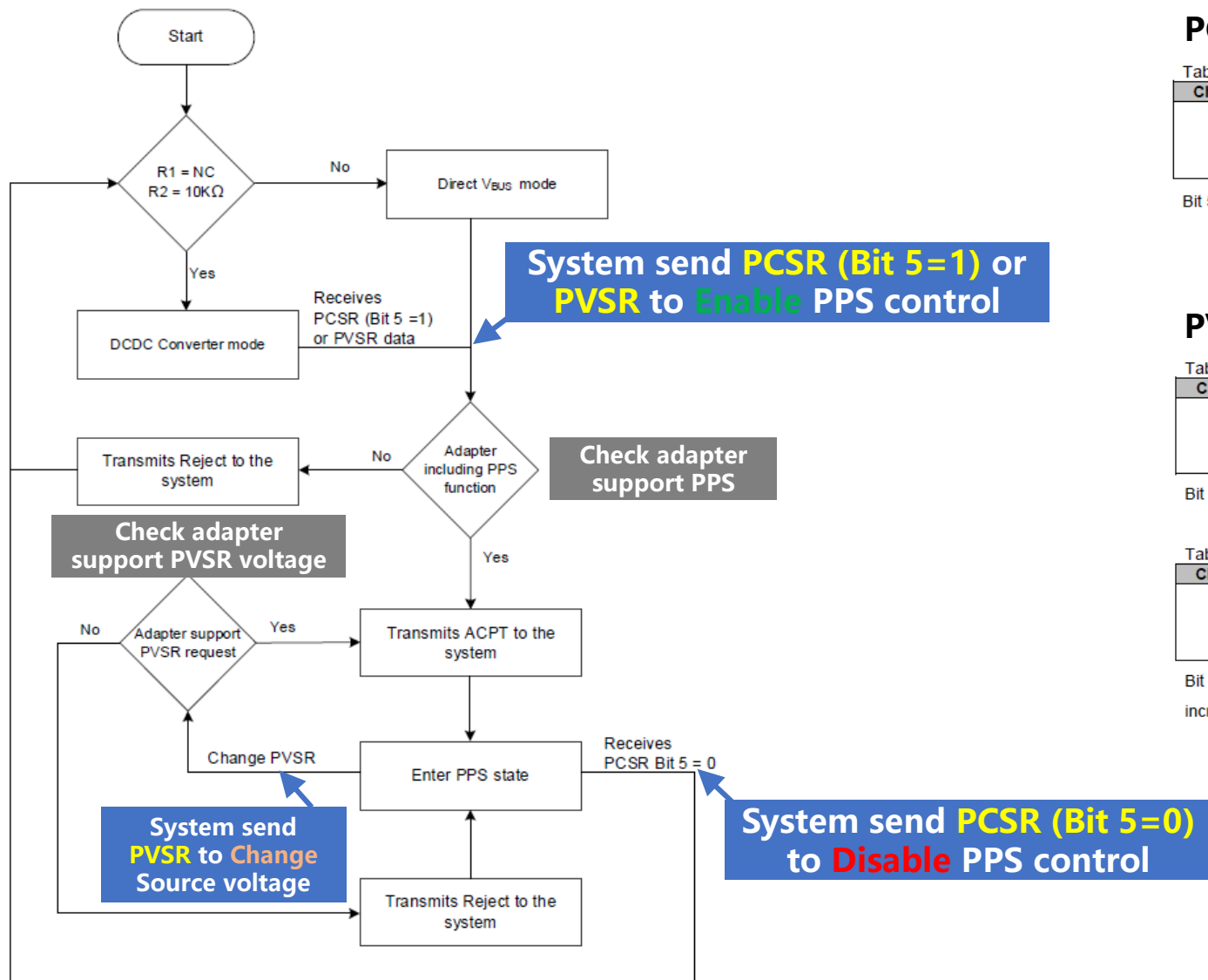


Figure 3-6 The Flow Chart of SNPD1714HJG Enter or Leave PPS State

PCSR (1Byte)

Table 4-18. PCSR Function table

Check pattern	06H	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0101b	PCSR	SPPS	PPSS	PPSEN	-	-	-	-	-
	R/W	R	R	R/W	-	-	-	-	-
	Default	0	0	0	-	-	-	-	-

Bit 5: PPSEN: Enter PPS control bit.

0 = Disable.

1 = Enable.

PVSR (2 Byte)

Table 4-16. PVSR1 Function table

Check pattern	04H	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0101b	PVSR1	-	-	-	-	-	VPPS10	VPPS9	VPPS8
	R/W	-	-	-	-	-	R/W	R/W	R/W
	Default	-	-	-	-	-	0	0	0

Bit [2:0] Set PPS voltage bit [10:8] in 11-bit resolution.

Table 4-17. PVSR0 Function table

Check pattern	05H	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0101b	PVSR0	VPPS7	VPPS6	VPPS5	VPPS4	VPPS3	VPPS2	VPPS1	VPPS0
	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
	Default	1	1	1	1	1	0	1	0

Bit [7:0]: Set PPS voltage bit [7:0] in 11-bit resolution. The range of voltage is between 3.3V to 21V. The voltage in 0.02V increments.

000 0000 0000b ~ 000 1010 0100b → NA

000 1010 0101b → V_{BUS} = 3.3V.

000 1010 0110b → V_{BUS} = 3.32V.

...

000 1111 1010b → V_{BUS} = 5V. (Default)

...

100 0001 1010b → V_{BUS} = 21V.

100 0001 1011b ~ 111 1111 1111b → NA



The diagram illustrates the timing and data flow for 10 UART frames. Each frame consists of an address byte and a data byte, with a maximum duration of 200us per frame. The frames are labeled RVR, RMCR, PCSR, RVHAR, RVLAR, and RMCAR. The bit sequences for each frame are as follows:

Frame	Address byte (Bit 0 to Bit 7)	Data byte (Bit 0 to Bit 7)
RVR	1 0 0 0 1 0 1	0 0 0 1 1 1 1
RMCR	0 1 0 0 1 0 1	0 1 1 1 1 0 0
PCSR	0 1 1 0 1 0 1	0 0 0 0 0 0 1
RVHAR	1 0 0 0 1 0 1	1 1 1 0 1 1 0
RVLAR	0 1 0 0 1 0 1	0 1 1 1 1 0 0
RMCAR	1 1 0 0 1 0 1	1 0 1 0 1 1 0

Below the timing diagram, the hex values for each frame are provided:

Frame	Address byte (Hex)	Data byte (Hex)
RVR	0xA1	0xC8
RMCR	0xA2	0x3C
PCSR	0x56	0x80
RVHAR	0x51	0x6E
RVLAR	0x52	0x1E
RMCAR	0x53	0x35

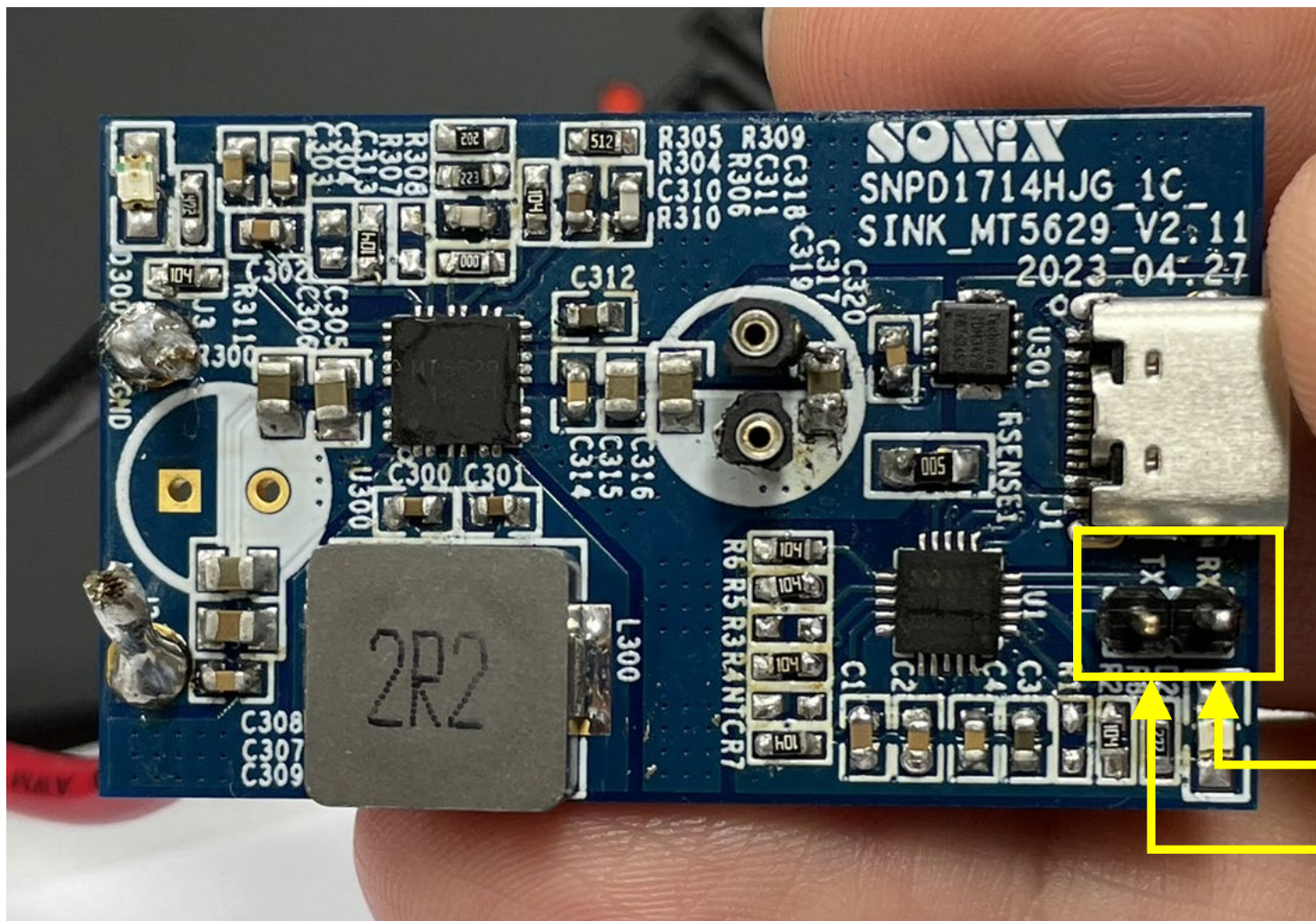
成功完成協議後，每次傳6筆資料給系統，每100ms傳一次，共傳10次

Parameter	Description	Note
RVR	Read voltage of PD's Power Data Object	PDO 的電壓
RMCR	Read maximum current of PD's Power Data Object	PDO 的最大電流
PCSR	PPS function control setting	PPS資訊 (PPS 開關, PD controller 狀態, adapter 是否支援PPS)
RVHAR	Read maximum voltage of Adjustable Power Data Object	APDO 的最大電壓
RVLAR	Read minimum voltage of Adjustable Power Data Object	APDO 的最小電壓
RMCAR	Read maximum current of Adjustable Power Data Object	APDO 的最大電流



SNPD1714HJG Sink PPS EVB

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UART RX

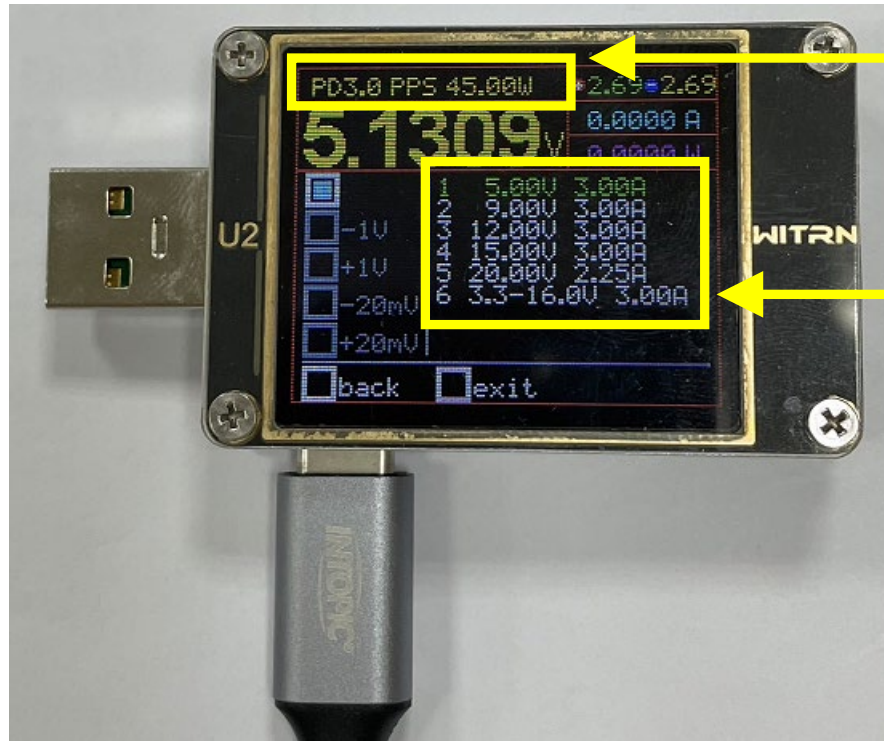
UART TX



SNPD1714HJG Sink PPS Function Test -1

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Check voltage power ranges of the PD adapter



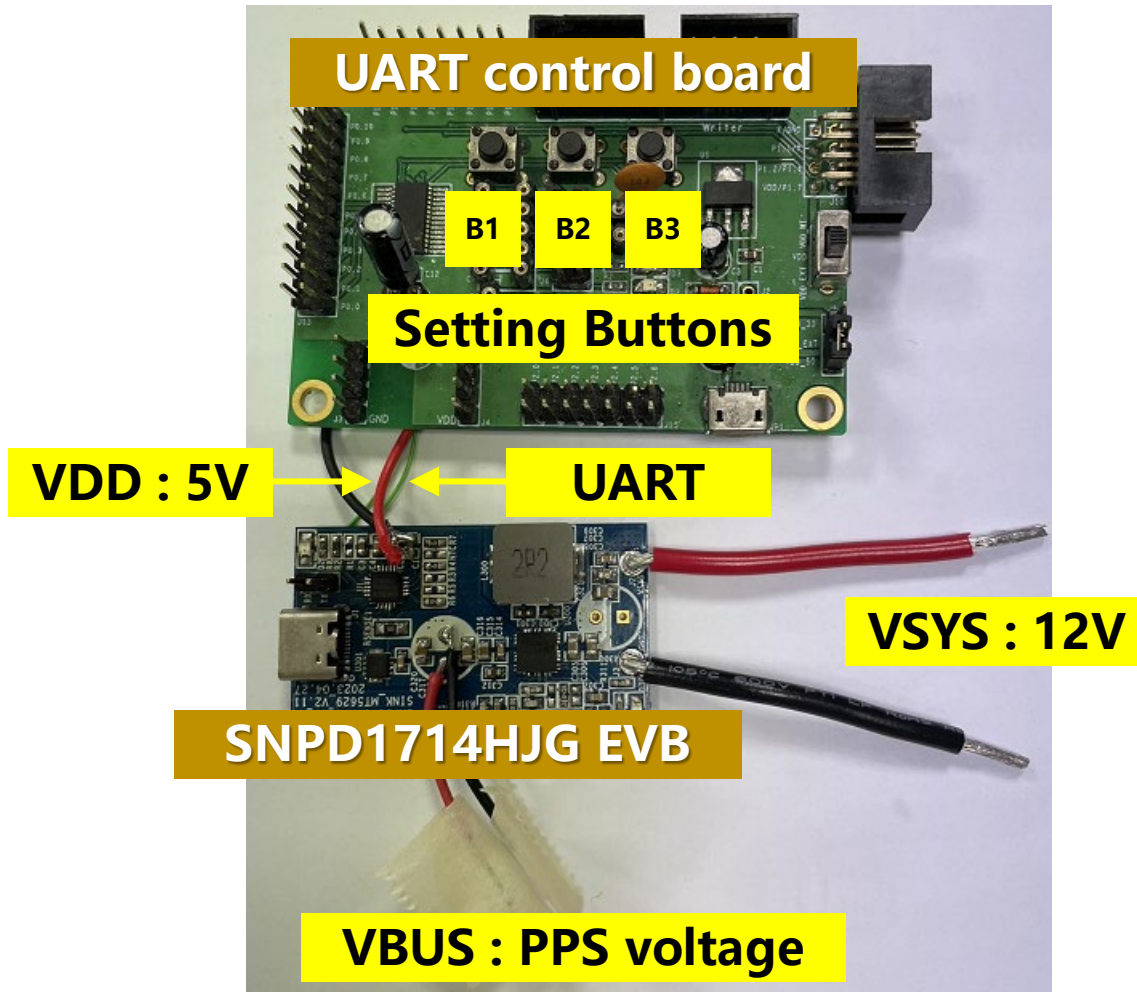
PD3.0 PPS 45W adapter

PPS voltage power range: 3.3 – 16.0V 3A



SNPD1714HJG Sink PPS Function Test -2

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Function of the setting buttons

- B1 : To decrease VBUS voltage (0.1V/step)
- B2 : To increase VBUS voltage (0.1V/step)
- B3 : To change VBUS voltage step by step (3.3V, 5V, 9V, 12V, 15V and 21V)

Q1. 為什麼需要做可調 (PPS) 或者不可調?

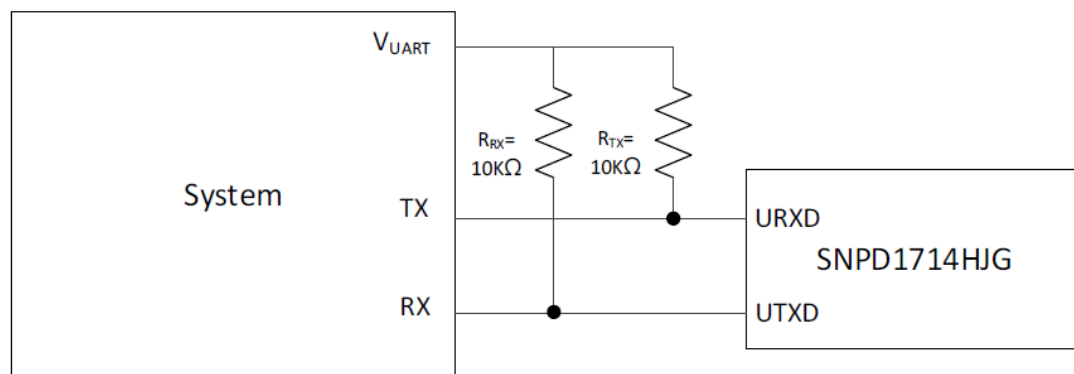
A1. 為了提供電壓轉換效率最好的 V_{in} 給後端 Buck converter。

Q2. 使用 USB-PD 供電會不會有相容性問題?

A2. 相容性問題需要 Source 和 Sink 裝置共同解決, USB 協會為此制定互通性測試 (Interoperability test)。

Q3. UART 電壓為多少?

A3. UART 電壓只需要Pull high到系統的UART電壓即可, 不需額外設定。



Q4. UART baud rate 是多少?

A4. 57600bps, application note P20 中有敘述。

Q5. 如支援 I²C, 是否和 UART 同 pin (QCD+, QCD-)?

A5. 不同pin。



USB Power Delivery 3.1 認證測試項目 & 使用儀器

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USB 協會所規定的協議測試機台

PD Merged Test Specification:

- GRL USB-PD-C2
- Ellisys Explorer 350
- MQP-PDT
- LeCroy Voyager M310P

Type-C Functional Test:

- Ellisys Explorer 350
- LeCroy Voyager M310P
- GRL USB-PD-C2

Interoperability Test:

- Google Pixel 4 Phone
- Samsung Galaxy S21
- Google Pixelbook Go
- MacBook Air M1
- ASUS 4K Monitor

Source Power Test:

- QuadraMAX

Battery Charging 1.2 Compliance Test:

- MQP-PET

PD 3.0 Test:

- GRL USB-PD-C2
- Ellisys Explorer 350
- MQP-PDT
- LeCroy Voyager M310P





Thank You!

