FASTSOC

FS8623B

USB Type-C PD3.0 Dual-port Fast charging protocol intelligent management chip

Product Features

- Be compatible with various of USB Type-A port Fast charge protocol, can intelligently identify the protocol of mobile phone, including: (BC1.2), (Apple2.4A), (QC2.0 Class A), (QC3.0 Class A/B), (FCP), (SCP), (AFC), (low voltage direct charge), etc.

- Be compatible with various USB Type-C protocols, including Type-C protocol, Type-C PD2.0, Type-C PD3.0, Type-C PD3.0 PPS, QC4.0 protocol.

- Support A+C dual port operation, the voltage automatically reverts to 5V When dual port connecting at the same time

- The maximum output current is optional

- D± BV is 15V

- CC BV is 27V

- Constant voltage and constant current function (optional)

- Adjustable voltage accuracy 20mV/step

- VBUS voltage range 3~20V

- Working voltage 3~21V

- Supports current compensation, 1A/100mV

- Pin setting refer to Type-C PD PDO

- Customization refer to Type-C PD PDO

- Integrate over temperature/over current/over voltage/undervoltage/discharge functions

- Package：SSOP16

Application field

- Charger
- USB panel
- USB HUB
- Car charger
- Other USB Type-A/C power output devices

V0.5 (2023. 07**)**

Product Overview

FS8623B belongs to FASTSOC FSFC series，the chip selectively compatible with the mainstream charging protocols. The chip intelligently identifies the type of Mobile and selects the most appropriate protocol for the mobile needs.

The chip has constant voltage and constant current functions.

The D± and CC Break down voltage of the chip are higher than 15V and 27V, with high reliability. At the same time, FS8623B have over temperature, over current, over voltage, under voltage, discharge and other protection functions.

FS8623B has a minimum power supply of 3V and a maximum power supply of 21V, which can adapt to the output voltage of various fast charging protocols.

FS8623B gives the user the choice of common Type-C PDO Settings. Users can select different system Settings by configuring the external resistor of the FUNC pin according to the application needs.

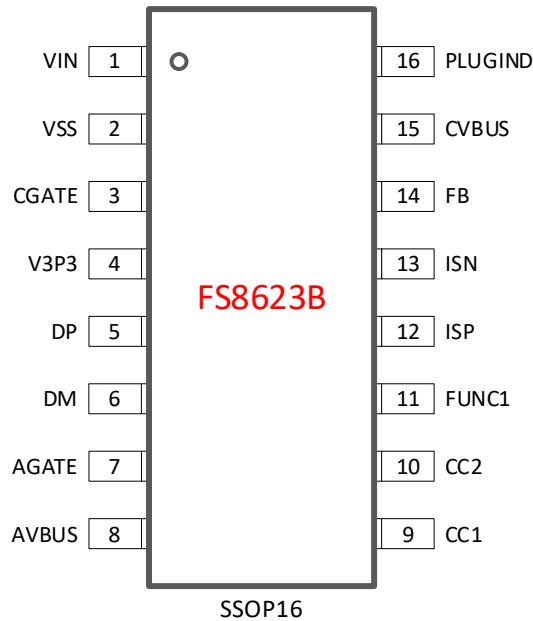FS8623B provides a rich PDO configuration for users.

FS8623B provides SSOP-16 package type，very convenient for you to arrange reasonable scheme.

Order information

Part No	Package	Pcs/Reel
FS8623B-XYZ	SSOP16	4000

comment：XYZ is selected according to specific function, refer to "device selection

Chip packaging and pin definition

```
         VIN  ┌ 1 │  ○        16 ┐  PLUGIND
         VSS  ┌ 2 │           15 ┐  CVBUS
       CGATE  ┌ 3 │           14 ┐  FB
        V3P3  ┌ 4 │  FS8623B  13 ┐  ISN
          DP  ┌ 5 │           12 ┐  ISP
          DM  ┌ 6 │           11 ┐  FUNC1
       AGATE  ┌ 7 │           10 ┐  CC2
       AVBUS  ┌ 8 │            9 ┐  CC1

                  SSOP16
```

Pic 1. Pin definition

Table 1. FS8623B-XYZ Pin function description

QFN	Name of the pin	Description
1	VIN	Power Input, connected to the output of a power supply system
2	VSS	Chip ground, connected to the system ground
3	CGATE	Control the Voltage of CVBUS in Type-C port，Control PMOSFET
4	V3P3	Internal LDO, connect external 1uF capacitor
5	DP	Connect the USB type-A DP pin
6	DM	Connect the USB Type-A DM pin
7	AGATE	Control the Voltage of AVBUS in Type-A port，Control PMOSFET
8	AVBUS	Connect to the VBUS pin of Type-A port
9	CC1	Connect the USB Type-C CC1 pin
10	CC2	Connect the USB Type-C CC2 pin
11	FUNC	Connect an external resistor, set the PDO of Type -C
12	ISP	Current sampling positive pole
13	ISN	Current sampling negative pole
14	FB	Voltage regulation feedback pin
15	CVBUS	Connect to the VBUS pin of Type-C
16	PLUGIND	Insert instruction

Extreme operating range

Table 2. Maximum working range

Parameter	value
VDD，CVBUS，CGATE，OPTO	-0.3v~27v
CC1, CC2	-0.3v~27v
DP, DM	-0.3v~15v
FB, ISP, ISN	-0.3v~5.5v
ESD（HBM）	±2KV

The maximum operating range listed in the table above, if the limit is exceeded, the chip may be permanently damaged. Users should try to avoid it.

Normal operating range

Table 3. Normal operating range

Parameter	value
VIN	3v~21v
D± CC1 CC2	0v~3.3v
FUNC, FB	0v~3.3v
Operating temperature range	-40°~85°
Working current	<1mA

Device Configuration

FSFC series IC have plenty of configuration options that include several broad categories: protocol type, declared power and voltage, and system current capability. List as following.

Protocol type

The FSFC series is compatible with various protocols of port A and port C. FASTSOC will provide commonly used chip types for users to choose, but users can still customize the type of agreement, please contact the sales for details.

Table 4. List of compatible protocol types

Port A protocol								Port C protocol				
Apple 2.4A	BC1.2	QC2.0	QC3.0	FCP	AFC	SCP	Low voltage charging	Type-C	PD2	PD3	PPS	QC4

Declared power and voltage

The IC offers a variety of power and voltage options for customers.

The first type related to C port protocol，such as QC4.0 and PD etc，divided into power and maximum Voltage.

PD power supports to 18W、24W、60W、87W etc；

PD maximum voltage supports to 9v、12v、14.5v、15v、20V etc；

In addition, FSFC series provides a special FUNC Pin, the user can set part of the PDO by external resistor to the ground, improve the application flexibility of the chip. The ettings made by the FUNC Pin always have the highest priority.

For the CC threshold, Fixed PDO is set to 115% of the broadcast current and PPS PDO is set to 105% of the request current.

Protection function

If OCP protection is enabled, the OCP threshold is 120% of the maximum current capacity.

The OVP guard point is 125% of the set voltage.

For Fixed PDO, the UVP is set to 60% of the set voltage, and for PPS PDO, the UVP is set to Fixed 3.1V.

OTP is set to 140 ° C to 100 ° C for hysteresis.

Feedback mode

The chip supports FB feedback.

Device selection

According to the PDO setting corresponding to FUNC Pin position, FS8623B is divided into three series, which are:

- Low power mode : FS8623BL
- High power mode : FS8623BH
- Power reduction mode : FS8623BP

The identification mode of the FS8623B series is FS8623BL/H/P-XYZ. For example, the official name: FS8623BL-20W12V-C, the choice of X depends on the declared voltage and power type. It is not listed completely in the data sheet.

For example, 20W9V indicates that the PDO is 20W and the maximum voltage is 9V, including 5V/3A and 9V/2.22A

Y is usually used for type C chip protocols

Z is for other model.

Pin definition and instructions

VCC

The VCC supplies power to the chip, supporting a minimum of 3V and a maximum of 21V.

The VCC can be directly connected to the output of the power system.

V3P3

Connect external 1uF capacitor

FUNC

You can choose different PDOs and system features, as shown in the following table. If the external resistance is 100 KΩ, the resistance with 1% accuracy is recommended.

For FS8623BL, the FUNC function is set as follows：

Table 10. FUNC Pin function

FUNC	PDO0	PDO1	PDO2	PDO3	PDO4	Remark
No Connection	OTP setting					
Resistor	5V3A	9V2.77A	3.3~5.9V3A	3.3~11V2.25A		25W
Ground	5V3A	9V3A	12V2.25A	3.3~5.9V3A	3.3~11V2.45A	27W

FS8623BH, the FUNC function is set as follows：

Table 11. FUNC Pin function

FUNC	PDO0	PDO1	PDO2	PDO3	PDO4	PDO5	PDO6	Remark
No Connection			OTP setting					
Resistor	5V3A	9V3A	15V2A	20V2.25A	3.3-10V4A	3.3-11V3.5A		45W
Ground	5V3A	9V3A	12V2.5A	15V2A	20V1.5A			30W

DP and DM

DP and DM breaking down voltage(BV) is greater than 15V, which improves the stability of system insertion and removal.

DP/DM Connects to the Type-A port.

CC1 and CC2

CC1 and CC2 Connect to CC1 and CC2 in the Type-C port. CC1 and CC2 BV is above 27V, which improves the stability of system insertion and removal.

ISP and ISN

ISP and ISN are used for current sampling and are connected to 5 mΩ sampling resistors.

A sampling network is usually used in conjunction with the sampling resistance, refer to the application example for the network structure.

The GND on the type-C port needs to be connected to the ISP, but cannot be connected to the system Ground directly.

ISP and ISN in PCB design will affect the accuracy of current sampling value, should be connected to the sampling network, ISN connected to the sampling resistor end, cannot be directly connected to the system ground.

FB

As a FB application, the FB is connected to the power supply system and used to control the VBUS voltage of the USB. After the mobile phone and FSFC negotiate the protocol through D±/CC and the required voltage, FSFC initiates voltage regulation through FB. The Voltage regulating accuracy of FB is 20mV, and the voltage regulating speed is 200mV / 500us.

The FB is connected with an external resistor R1 to VBUS and an external resistor R2 to ground. The usual calculation formula is as follows,

$$R_2 = \frac{R_1 V_{FB}}{V_{VBUS} - V_{FB}}$$

For instance,

V_{VBUS} take 5 v

V_{FB} can be found in the manual of the power IC, for example, take 0.8V

The typical value of R_1 is 100 KΩ. The precision must meet system requirements, for example, 1%

So we can figure out R2.

AGATE

Connect external PMOS to control the channel switch between VIN and AVBUS.

CGATE

Connect external PMOS to control the channel switch between VIN and CVBUS.

AVBUS

AVBUS connects to the VBUS pin of port Type-A.

CVBUS

CVBUS connects to the VBUS pin of port Type-C.

CVBUS has built-in discharge circuit loop.

PLUGIND

Insert indication, OD output.

Can be used in power reduction applications.

Application example

A typical application of FS8623B is shown in the figure. The chip power supply is taken from AC/DC output.

FS8623BL application

FUNC connect external resistor for functional setting.
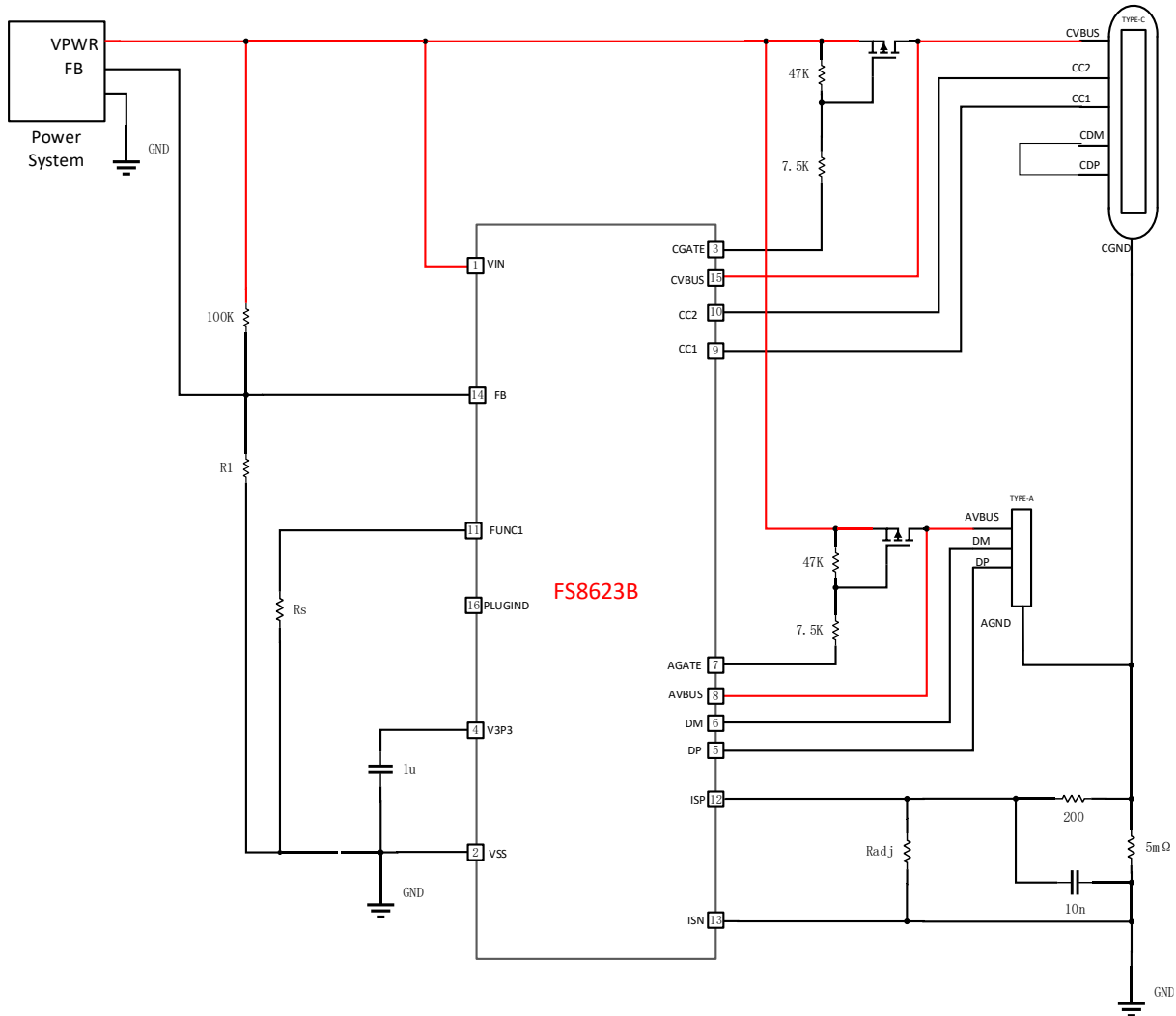
FB connects to the FB of DC/DC or 431/432.

Figure 3. Application diagram of FS8623BL

For FS8623BH or FS8623BP, if the PDO or port A voltage contains Settings greater than 12V, customers are advised to add protection circuits for AVBUS and AGATE as follows.
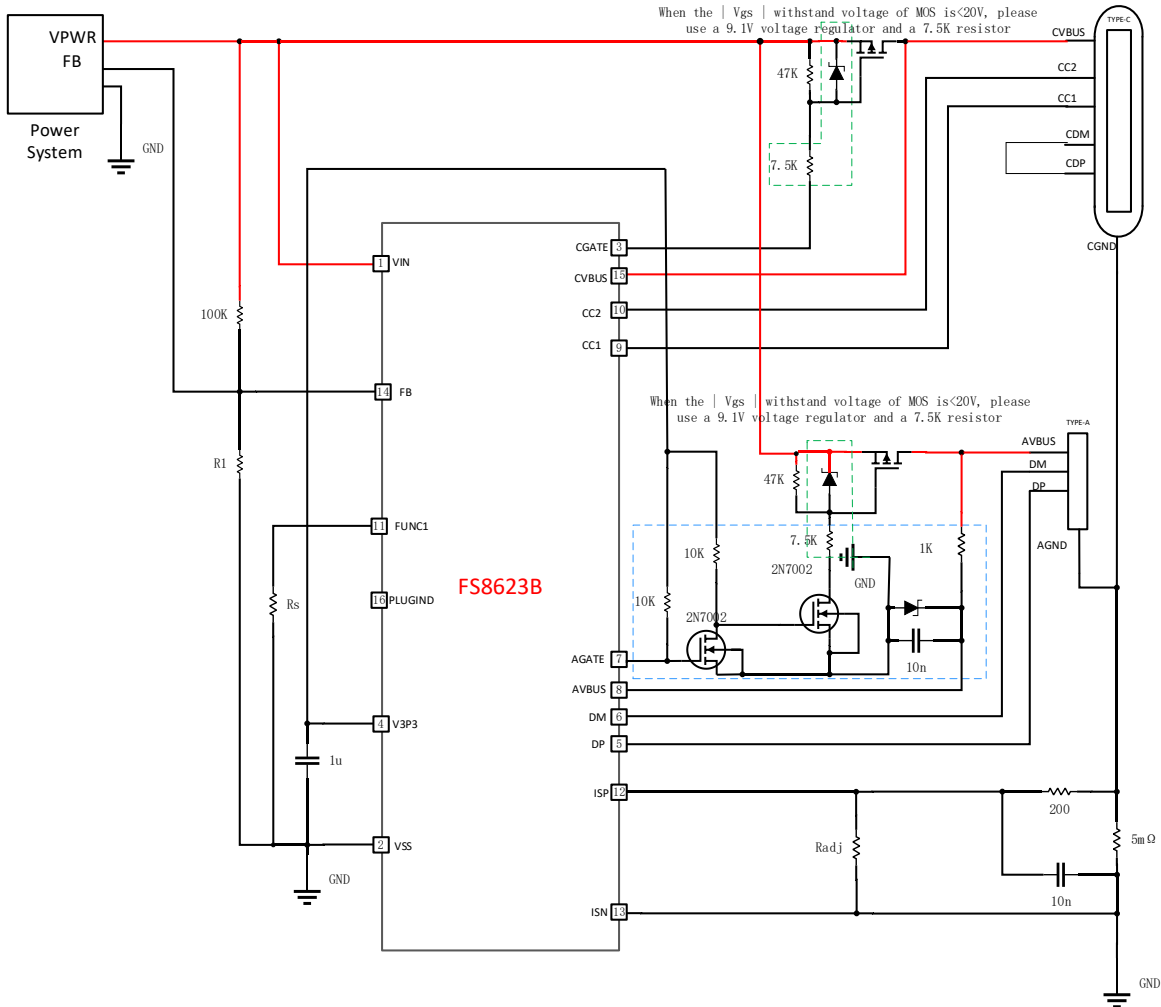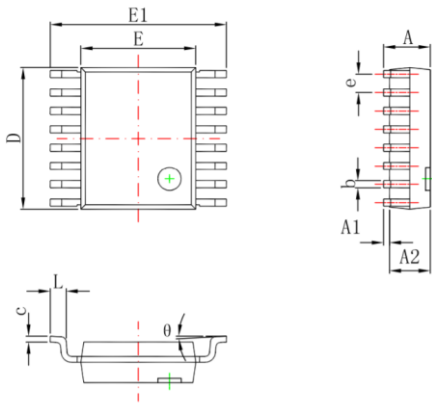
9.1V is recommended for the voltage regulator.

Figure 4. Application diagram of FS8623BH

Package outline drawing

SSOP16

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.200	0.300	0.008	0.012
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	0.635(BSC)		0.025(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Company information and statement

HQ

Room A409-3, Building 530, Science park, Sensor Network University, Xinwu District, WuXi City

Website：www.fastsoc.com

Wechat public Account.：fastsoc

Shanghai R&D Center

Room 210, Building 2, No. 1690 Cailun Road, Zhangjiang High-tech Park, Shanghai

Sales and technical support

Contact：Mr. Gu

Mobilephone：1800-185-3071

Wechat：asicasic

E-mail：gpp@fastsoc.com

Statement

Wuxi FASTSOC Microelectronics co., Ltd. reserves the right to modify the product and the product data manual at any time. All information in this document, including product functions, performance, and company information, may be modified without informing users. The functional and performance indicators described in this article were tested in a laboratory environment and there is no guarantee that the same data will be available on customer products. The information herein does not imply, indicate, support, prove or imply in any form that the Product can be used for any application that infringes the intellectual property rights of any third party. The information herein is only for guidance in the use of the chip and does not authorize users to use the intellectual property rights of our company or any other company.

Our products are not designed for extreme conditions and life support systems. If the user chooses to use it on these occasions, it is at the user's own risk without our confirmation and permission.

Wuxi FASTSOC Microelectronics Co., Ltd. and its registered and used trademarks, logos, all kinds of intellectual property rights belong to Wuxi FASTSOC Microelectronics Co., Ltd. All other trademarks, logos, designs, and material numbers used herein are the property of their respective owners.