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1 Features

ÿ Synchronous switching buck converter

- Built-in power MOS
- Automatically identify input voltage and adjust output voltage
- Input operating voltage up to 31V
- Output voltage range: 3.3V to 21V, depending on fast charge Automatic adjustment of the protocol
- Maximum output power 65W
- Output voltage wired compensation function: 50mV/A, 100mV/Aÿ150mV/A
- Output has CV/CC characteristics
- Soft start function
- 3A start-up with load
- XP-LINK intelligent power reduction

ÿ Support USB Power Delivery (PD) 3.1 protocol - PD3.1 certified (TID: 7689)

- FPDO configurable: 5V, 9V, 12V, 15V, 20V
- APDO configurable: 5V Prog, 9V Prog, 15V Progÿ20V Prog
- APDO adjusts voltage in 20mV steps
- APDO current can support up to 5A

ÿ Output fast charge

- Support Quick Charge 2.0/3.0/3.0+ protocol - Support Xiaomi CHARGE TURBO 27W protocol
- Support Huawei FCP/SCP/HVSCP protocols
- Support Samsung AFC protocol
- Support VOOC 2.0/4.0 protocol
- Support MediaTek PE protocol
- Support USB BC1.2 DCP
- Support Apple 2.4A charging standard

ÿ Support online upgrade

ÿ Multiple protections, high reliability

- Input overvoltage and undervoltage protection
- Output short circuit, output overcurrent
- Over temperature protection

ÿ Full pin ESD 4KV

ÿ PackageÿQFN4x4-16L

2 Applications

ÿ USB car charger

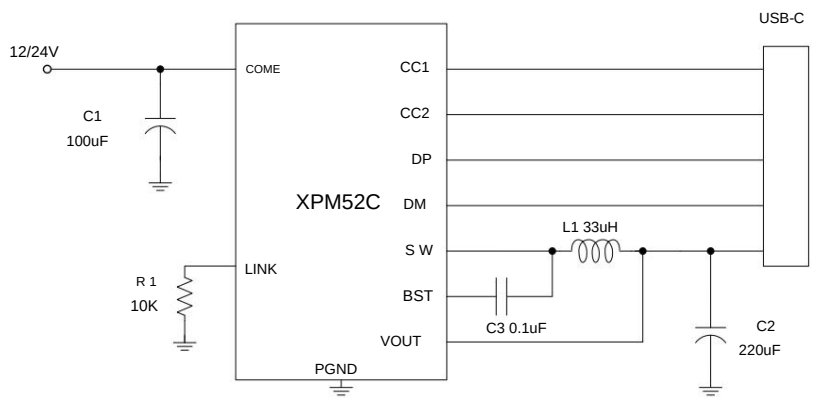
ÿ Portable charging equipment

ÿ Universal high voltage USB charger

ÿ General high voltage DC/DC conversion applications

ÿ Smart power strip

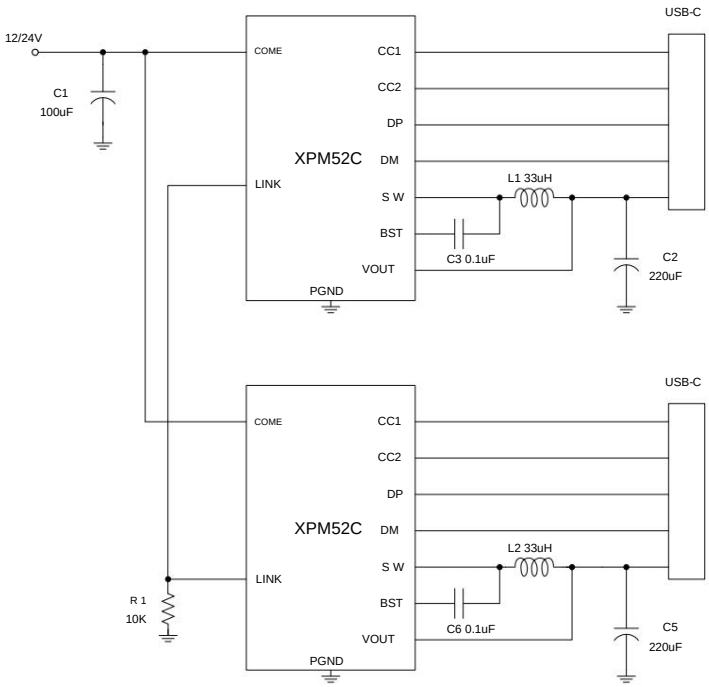
3 Application Circuit Diagram



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Application 1: Single C port operation



Application 2: Dual C port work

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4 Overview

XPM52C is a buck converter with integrated synchronous switch. It supports multiple output fast charging protocols, including USB Type-C and PD, Qualcomm QC2.0/3.0/3.0+, Huawei FCP/SCP/HVSCP, VOOC 2.0/4.0, MediaTek PE, Samsung AFC, USB BC1.2 DCP and Apple 2.4A charging specifications, providing a complete solution for car chargers, various fast charging adapters, smart power strips and other power supply devices.

XPM52C has the function of automatically identifying the VIN input voltage and adjusting the output voltage according to the input voltage.

XPM52C has a built-in power MOS, with an input operating voltage of up to 31V and an output voltage range of 3.3V to 21V. It can provide a maximum output power of 65W and can automatically adjust the output voltage and current according to the recognized fast charging protocol.

The output of XPM52C has CV/CC characteristics. When the output current is less than the set value, the output is in CV mode and the output voltage is constant. When the output current is greater than the set value, the output is in CC mode and the output voltage decreases.

The output voltage of XPM52C has a line compensation function. When the output current increases, the output voltage will increase accordingly to compensate for the voltage drop caused by the connection line impedance.

XPM52C specially integrates XPD-LINK™ patented interconnection communication technology. Through the XPD-LINK™ interconnection function, XPM52C can be simply and flexibly applied in charging solutions with multiple Type-C ports.

XPM52C supports secondary burning and can realize online upgrade.

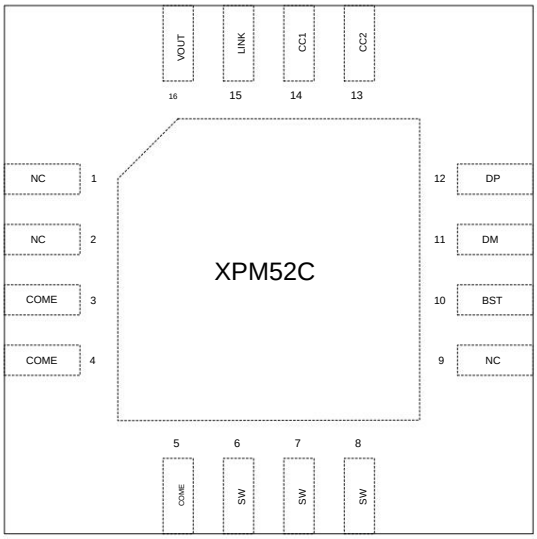
XPM52C has multiple protection functions, including input overvoltage, undervoltage protection, output short circuit, overcurrent protection, and overtemperature protection.

XPM52C is available in QFN4x4-16L package.

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5. Pin Definition



XPM52C Pinout (Top View)

QFN16	Name	Functional Description
1ÿ2ÿ9	NC	No connection.
3ÿ4ÿ5	COME	Input voltage pin, close to IC, needs to place filter capacitor, recommended 100uFÿ
6ÿ7ÿ8	SW	DCDC Switching node, connect the inductor.
10	BST	The bootstrap circuit pin is placed close to the chip BST pin and SW pin The bootstrap capacitor is 0.1uF, which provides voltage for the gate drive of the upper tube.
11	DM	USB fast charge identification signal DM.
12	DP	USB fast charge identification signal DP.
13	CC2	Type-C detection pin CC2.
14	CC1	Type-C detection pin CC1.
15	LINK	Intelligent power reduction output pin.
16	VOUT	Output voltage feedback pin.
17	PGND	Power ground and heat dissipation ground.

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6 Ordering Information

Part Number	**USB Type-C** port **PDO** and **APDO**	**QC** Configuration	Packaging
XPM52CD30A	configuration High power PDO: 5V/3A, 9V/3A, 12V/2.5A, 15V/2A, 20V/1.5A Low power	Class B	QFN16 5K/disk
XPM52CD30	PDO: 5V/3A High power PDO: 5V/3A, 9V/3A, 12V/2.5A, 15V/2A, 20V/ 1.5A Low power PDO: 5V/3A, 9V/	Class A	
XPM52CDP30	1.75A High power PDO: 5V/3A, 9V/3A, 12V/2.5A, 15V/2A, 20V/1.5A High power APDO1: 3.3-11V/3A High power APDO2: 3.3-16V/2A Low power PDO: 5V/3A, 9V/1.75A	Class A	
XPM52CD35	PDO : 5V/3A, 9V/3A, 12V/2.92A, 15V/2.33A, 20V/1.75A	Class B	
XPM52CD3515	High power PDO: 5V/3A, 9V/3A, 12V/2.92A, 15V/2.33A, 20V/ 1.75A Low power PDO: 5V/3A, 9V/1.67A High	Class A	
XPM52CD3518	power PDO: 5V/3A, 9V/3A, 12V/2.92A, 15V/2.33A, 20V/1.75A Low power PDO: 5V/3A, 9V/2A, 12V/1.5A High power	Class A	
XPM52CD3518 B	PDO: 5V/3A, 9V/3A, 15V/2.33A, 20V/1.75A Low power PDO: 5V/3A, 9V/2A High power PDO:	/	
XPM52CD3520	5V/3A, 9V/3A, 12V/2.92A, 15V/2.33A, 20V/1.75A Low power PDO : 5V/ 3A, 9V/2.22A, 12V/1.67A High power PDO : 5V/3A,	Class A	
XPM52CD45	9V/3A, 12V/3A, 15V/3A, 20V/2.25A Low power PDO : 5V/3A, 9V/ 2.5A, 12V/2A, 15V/1.5A High power PDO : 5V/3A, 9V/3A,	Class A	
XPM52CD65	12V/3A, 15V/3A, 20V/3.25A Low power PDO : 5V/3A, 9V/3A, 12V/ 2.5A, 15V/2A, 20V/1.5A High Power PDO: 5V/3A, 9V/3A, 12V/3A,	Class B	
XPM52CDP65	15V/3A, 20V/3.25A High Power APDO1: 3.3-16V/3.25A High Power APDO2: 3.3-21V/3A Low Power PDO: 5V/3A, 9V/3A, 12V/2.5A, 15V/2A, 20V/1.5A Low Power APDO1: 3.3-16V/2A Low Power APDO2: 3.3-21V/1.5A High Power PDO: 5V/3A, 9V/3A, 12V/3A, 15V/3A, 20V/	Class B	
XPM52CD6545	3.25A Low Power PDO: 5V/3A, 9V/3A, 12V/3A, 15V/3A, 20V/2.25A High power PDO: 5V/3A, 9V/3A, 12V/3A, 15V/3A, 20V/3.25A High	Class B	
XPM52CDP654 5	power APDO1: 3.3-16V/3.25A High power APDO2: 3.3-21V/3A	Class B	

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	Low power PDO: 5V/3A, 9V/3A, 12V/3A, 15V/3A, 20V/2.25A Low power APDO1: 3.3-16V/2.8A Low power APDO2: 3.3-21V/2.1A		
Customizable	Customizable		

Printing instructions:

The first line, XPM52C: chip model;

The second line, XXXXXX: Lot Number, X: reserved information.

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7 Specifications

7.1 Extreme operating parameters (1)

parameter		Minimum	Maximum	unit
Pressure resistance	COME	-0.3	38	In
	VSW	-0.3	COME	In
	VBST	VSW-0.3	VSW+6	In
	DM/DP/CC1/CC2	-0.3	6	In
Junction temperature	TJ	-40	150	ÿ
Storage temperature	TSTG	-65	150	ÿ

(1) Exceeding the operating limit range may cause permanent damage to the device. Long-term operation at the extreme ratings may affect the device. reliability.

7.2 ESD Performance

symbol		value	unit
VESDHBM	Parametric Human Body Model (HBM)	±4000	In

ESD testing is based on the Human Body Model (HBM).

7.3 Recommended operating conditions

parameter		Min Typ Max Unit			
COME			12/24		In
L			33		µH
BIN			100		µF
COUT			220		µF
FACING		-40		125	ÿ

7.4 Thermal resistance

symbol	Parameter	value	unit
RÿJA	Thermal resistance between junction temperature and ambient temperature (1)	25	ÿ/W

7.5 Electrical Characteristics

Unless otherwise specified, the following parameters are measured under the following conditions: VIN=12V, VOUT=5V, L=33uH, Ta=25ÿ

Parameters	**Symbol**	**Condition**	**Min**	**Type**	**Max Unit**	
Synchronous Switching Buck Converter						

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Parameters	Symbol	Condition	Min	Type	Max Unit	
VIN Undervoltage	LOVE	VIN=6V		400		a
Current Static Operating Current	INOSW	VIN=12VÿVOUT=5V		600		a
Input undervoltage lockout upper threshold	VUVLO_UP			7.3		In
Input undervoltage lockout lower threshold	VUVLO_DOWN			6.2		In
Input undervoltage lockout hysteresis	VUVLO_HYS	Input		1.1		In
overvoltage protection	VINOVP			30.5		In
Input overvoltage protection hysteresis	VINOVP_HYS			3		In
Upper tube on-resistance	RDSON_H			30		mÿ
Lower tube on-resistance	RDSON_L			20		mÿ
No-load output voltage	VOUT	VIN=12/24VÿVOUT=5V 5.00		5.05	5.10	In
		VIN=12/24VÿVOUT=9V 9.00		9.09	9.18	In
		VIN=12ÿVOUT=12V		11.7		In
		VIN=24VÿVOUT=12V	12.00	12.12	12.24	In
		VIN=24VÿVOUT=15V	15.00	15.15	15.30	In
		VIN=24VÿVOUT=20V	20.00	20.20	20.40	In
Operating frequency	DARK			120		kHz
Maximum duty cycle	DMAX			97		%
Minimum on-time	TON			200		ns
Constant current mode maximum output current	ICC	VIN=12V/24Vÿ 3.3VÿVOUTÿ8.8V		3		A
		VIN=12V/24Vÿ 9VÿVOUTÿ11.8V		3		A
		VIN=24Vÿ 12VÿVOUTÿ14.8V		3		A
		VIN=24Vÿ 15VÿVOUTÿ20V		2.25		A
Output line compensation	VCOMP			50		mV/A
voltage Over temperature	TSD			150		ÿ
shutdown temperature Over temperature shutdown hysteresis	TSD_HYS			15		ÿ

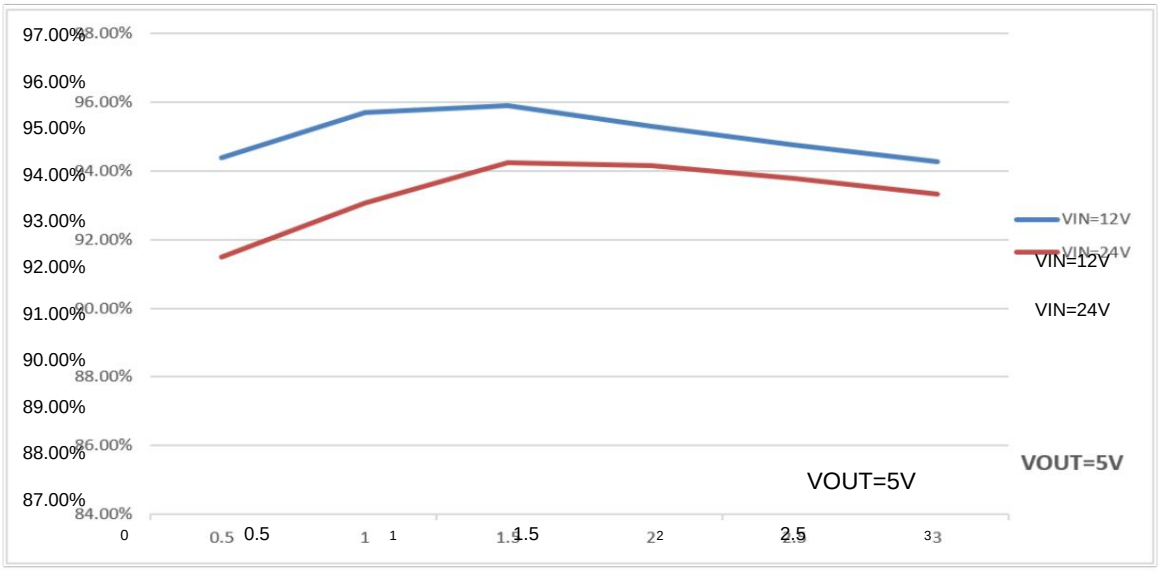
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8 Functional Description

8.1 Conversion Efficiency

XPM52C integrates dual low-impedance NMOS to provide higher conversion efficiency. The internal resistance of High-side NMOS is 72 mÿ, and the internal resistance of Low-side NMOS is 31 mÿ. Under the test conditions of input access to 100uF electrolytic capacitor, output access to 220uF electrolytic capacitor, and 33uH inductor, the conversion efficiency curve of XPM52C is shown in the figure below.



XPM52C conversion efficiency curve

If you need to further improve the conversion efficiency of XPM52C, you can take the following measures:

1. Replace the 100uF input electrolytic capacitor with 4 22uF chip ceramic capacitors; 2. Use low ESR inductors; 3. Use multi-layer PCB.

4. Improve the thermal conductivity of the product and speed up heat dissipation.

8.2 Layout Notes

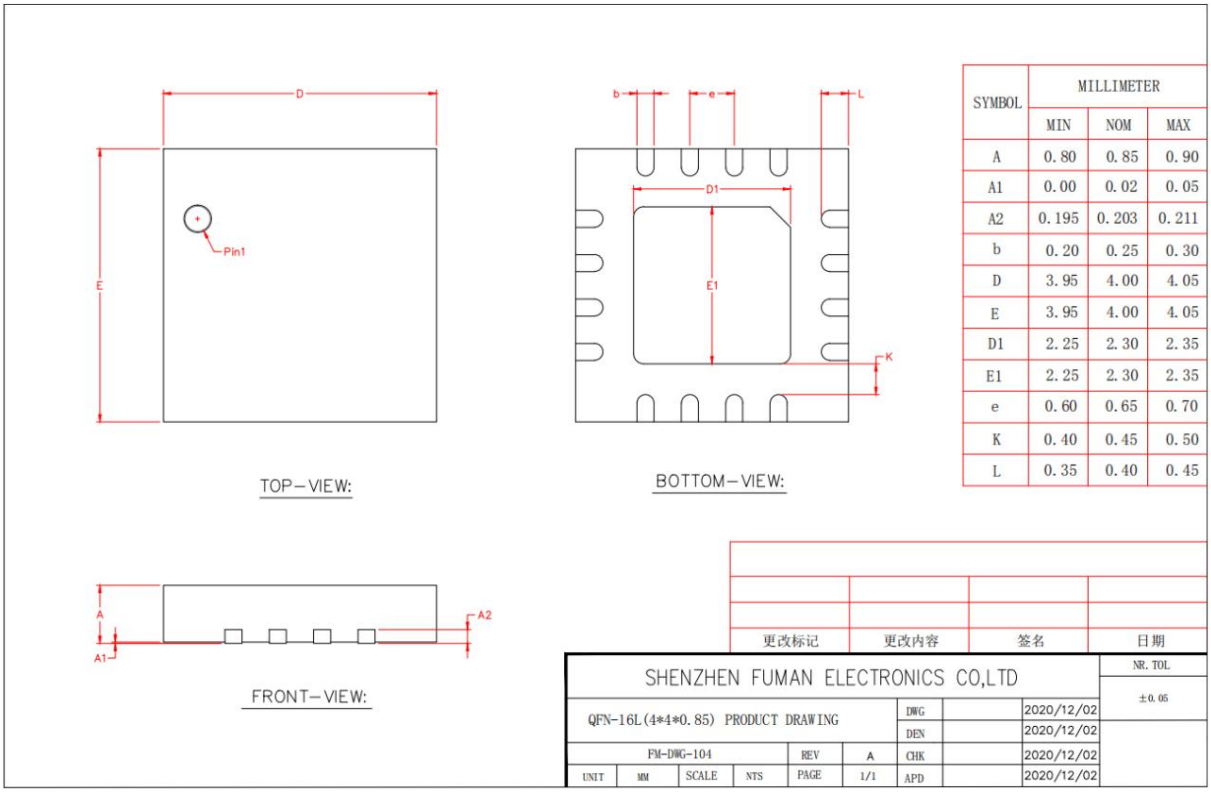
1. The input filter capacitor, especially the high-frequency decoupling capacitor, should be placed as close to the input pin VIN as possible to improve the filtering effect. 2. The inductor L should be placed close to the SW pin to reduce electromagnetic noise. 3. The output capacitor COUT should be placed close to the inductor L.

4. The ground connection of the input capacitor and the output capacitor should be connected to the system ground at one point as much as possible.

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9 Package size



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0.00	0.02	0.05
A2	0.195	0.203	0.211
b	0.20	0.25	0.30
D	3.95	4.00	4.05
E	3.95	4.00	4.05
D1	2.25	2.30	2.35
E1	2.25	2.30	2.35
e	0.60	0.65	0.70
K	0.40	0.45	0.50
L	0.35	0.40	0.45

更改标记	更改内容	签名	日期

SHENZHEN FUMAN ELECTRONICS CO,LTD						NR. TOL
QFN-16L(4*4*0.85) PRODUCT DRAWING				DWG	2020/12/02	±0.05
				DEN	2020/12/02	
FM-DWG-104			REV A	CHK	2020/12/02	
UNIT MM	SCALE NTS		PAGE 1/1	APD	2020/12/02	

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