

## SOC with integrated USB-A fast charging output protocol

### Product Features

#### Synchronous switching buck converter

- Built in power MOS
- Operating voltage range of 4.5V~30V
- CC/CV control
- 100% maximum duty cycle
- Conversion efficiency up to 96%
- 130KHz switching frequency
- Built in soft start
- Output voltage range: 3V~14V, automatically adjusted according to fast charging protocol

#### Output fast charging

- Supports BC1.2 DCP/Apple 2.4A, etc
- Supports QC2.0/QC3.0
- Supports AFC/FCP/SCP
- Supports high current direct charging
- Supports other protocols and can be customized

#### Multiple protection

- Short circuit protection
- Undervoltage protection
- Overcurrent protection
- Overvoltage protection
- Overheating protection

### Application field

- Car charger
- Travel Charge
- Other USB Type-A power output devices

V1.1(202505)

### Product Overview

FS9112K integrated synchronous switch step-down converter, chip selectively compatible with mainstream charging protocols. The chip can intelligently recognize the type of inserted phone and select the most suitable protocol to meet the needs of the phone.

FS9112K integrates an 80m  $\Omega$  upper tube and a 40m  $\Omega$  lower tube internally, which can continuously output 3A current. When outputting 3A current, the system conversion efficiency can reach 93% and supports a maximum duty cycle of 100%. The input voltage range is 4.5V to 30V, and the output voltage range is 3V to 14V.

FS9112K does not require external compensation and can rely on its built-in stable loop to achieve constant current and constant voltage control, while also having cable voltage drop compensation function.

FS9112K integrates fast charging protocol, which automatically identifies the fast charging protocol supported by the output terminal connected device through DP/DM, and then automatically adjusts the transmission voltage and current.

FS9112K provides ESOP8 packaging, making it convenient for users to arrange solutions reasonably.

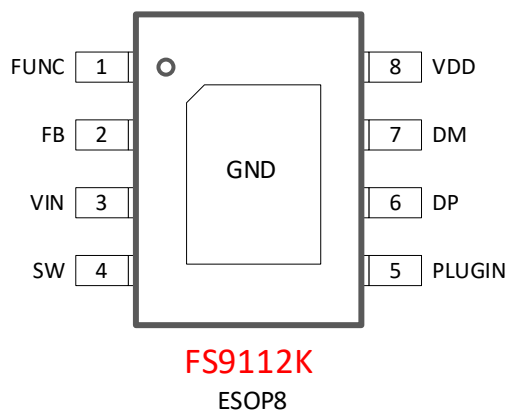
### Order information

Part No	Package	Pcs/Reel
FS9112K	ESOP8	4000

Note: Product model, please refer to the "Device Selection" section for details



## Chip packaging and pin definition



Pic 1. Pin definition

Table 1. FS9112K Pin function description

FS9112K	Name of the pin	Description
1	FUNC	Fast charging enable, connected to VDD or suspended: enable fast charging; Connect to GND: fast charging function is prohibited; Connect an external 200K $\Omega$ resistor to ground: Adjust the maximum voltage of high-voltage fast charging from 12V to 9V
2	FB	Feedback control, connected to two voltage divider circuits
3	VIN	Power input port, it is recommended to place a capacitor close to this pin during application
4	SW	DCDC switch node, connected to inductor
5	PLUGIN	Insert instructions
6	DP	USB D+, D- connected to USB Type-A D-
7	DM	USB D-, D- connected to USB Type-A D+
8	VDD	Chip power supply



## Extreme operating range

Table 2. Maximum operating range

Parameter	Symbol	Value taking	Company
Input voltage range	$V_{VIN}$	-0.3~40	V
FB voltage range	$V_{FB}$	-0.3~6	V
FUNC voltage range	$V_{FUNC}$	-0.3~6	V
SW voltage range	$V_{SW}$	-0.3~40	V
PLUGIN voltage range	$V_{PLUGIN}$	-0.3~40	V
DP/DM voltage range	$V_{DP/DM}$	-0.3~13	V
VDD voltage range	$V_{VDD}$	-0.3~6.5	V
Working temperature range	$T_{OP}$	-25~105	°C
Working node temperature	$T_J$	-40~150	°C
Storage temperature range	$T_{STG}$	-60~160	°C

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	Symbol	Minimum value	Maximum value	Company
VIN	$V_{VIN}$	4.5	32	V
VDD	$V_{VDD}$	3	5.6	V
FUNC, FB	$V_{FUNC}$ , $V_{FB}$	0	3.3	V
DP/DM	$V_{DP/DM}$	0	3.3	V
working temperature	$T_{OP}$	-25	105	°C



## Electrical characteristics

Special note:  $T_A=25^{\circ}\text{C}$ ,  $V_{\text{IN}}=24\text{V}$ ,  $V_{\text{OUT}}=5.1\text{V}$ , unless otherwise stated.

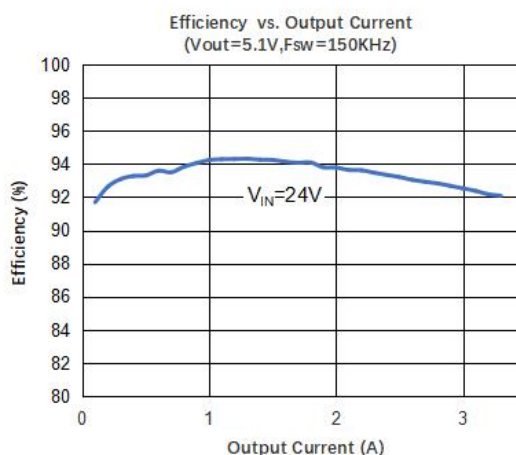
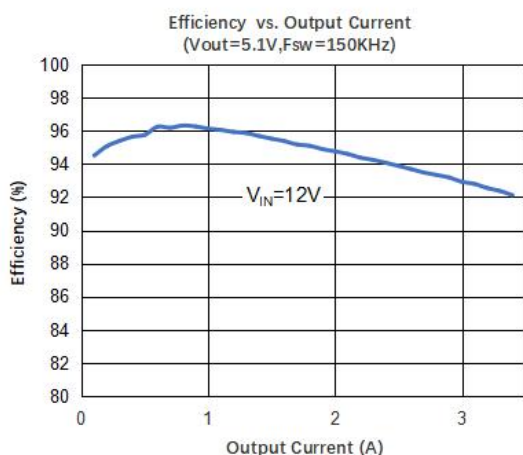
Parameter	Symbol	Test conditions	Minimum value	Typical value	Maximum value	Company
Input system						
Input voltage	$V_{\text{IN}}$		4.5	14	32	V
Input undervoltage locking voltage	$V_{\text{UVLO}}$	$V_{\text{INfalling}}$		4		V
Input undervoltage lock recovery voltage delay	$V_{\text{UVLO\_HYST}}$	$V_{\text{INrising}}$		50		mV
Input overvoltage protection voltage	$V_{\text{OVP}}$	$V_{\text{INrising}}$	30	31	32	V
Input overvoltage protection recovery voltage delay	$V_{\text{OVP\_HYST}}$	$V_{\text{INfalling}}$		1.5		V
Standby current	$I_{\text{Q}}$	$V_{\text{out}}=5.1\text{V}$		0.6		mA
Feedback voltage	$V_{\text{FB}}$		0.904	0.923	0.942	V
Hiccup restart time	$t_{\text{hiccup}}$			1300		mS
Power switch system						
Upper tube conduction resistance	$R_{\text{DS(ON)T}}$	By design		80		m $\Omega$
Lower tube conduction resistance	$R_{\text{DS(ON)B}}$	By design		40		m $\Omega$
Switching frequency	$F_{\text{SW}}$		120	130	140	KHz
Output system						
Output voltage	$V_{\text{out}}$		3	5	14	V
Soft start time	$T_{\text{SS}}$			500		us
Maximum duty cycle	$D_{\text{MAX}}$				100	%



## Function Description

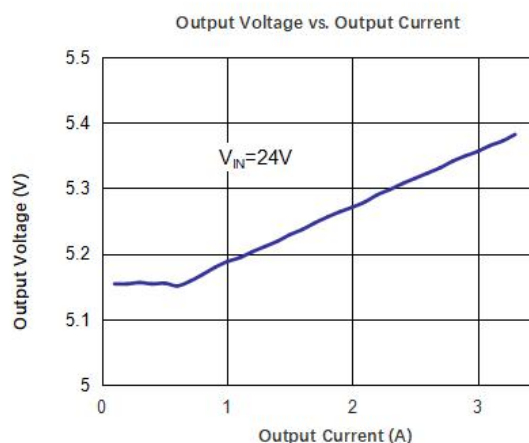
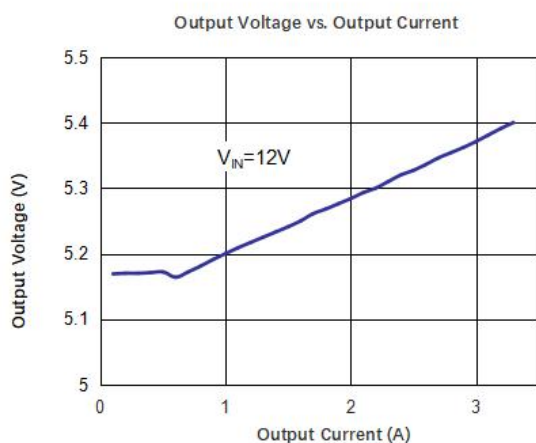
### Synchronous switching buck converter

FS9112K integrates a synchronous switching buck converter, with an input voltage range of 4.5V~30V and an output voltage range of 3V~14V. It has a built-in power switching transistor and operates at a switching frequency of 130KHz. At  $V_{IN}=12V$  and  $V_{OUT}=5V/3A$ , the conversion efficiency can reach 93%. FS9112K has a soft start function. FS9112K has a maximum duty cycle of 100% and supports application environments where  $V_{OUT}=V_{IN}$ .



### Output voltage line compensation function

The output voltage of FS9112K has a wired compensation function: when the output current is 3A, the output voltage will increase by about 200mV.



### PLUGIN function

FS9112K provides a PLUGIN pin as an insertion indicator.



### **Protection function**

FS9112K has input overvoltage protection function. When the input voltage exceeds 30V, the chip enters shutdown mode and can withstand input voltages exceeding 40V.

FS9112K has an output short circuit protection function. When the output is short circuited, the chip will hiccup and restart until the fault is resolved and normal output is restored; The restart interval is 1300mS. FS9112K also offers a short-circuit protection version in turn off mode, where the chip is locked in the event of a short circuit and can be restored after the load is released.

FS9112K's unique thermal protection function: When the chip temperature rises to 150 °C, it enters constant temperature mode, automatically reduces output power, reduces heat generation, and maintains a working junction temperature of 150 °C. If the temperature cannot be controlled and continues to rise to 160 °C, the output is turned off. When the temperature drops to 130 °C, the chip resumes operation.

FS9112K has input undervoltage protection function.

FS9112K also has output overcurrent protection and output overvoltage protection, with extremely high reliability.

FS9112K has anti-static capability (ESD) exceeding 4KV (HBM mode).

### **Output fast charging protocol**

FS9112K supports multiple output fast charging protocols

Support BC1.2 DCP/Apple 2.4A, etc

Support QC2.0/QC3.0

Support AFC/FCP/SCP

Support high current direct charging

Support other protocols, customizable

## Application example

The typical application of FS9112K is shown in the figure. The peripheral only requires capacitors, resistors, and inductors to achieve a fully functional car charging solution.

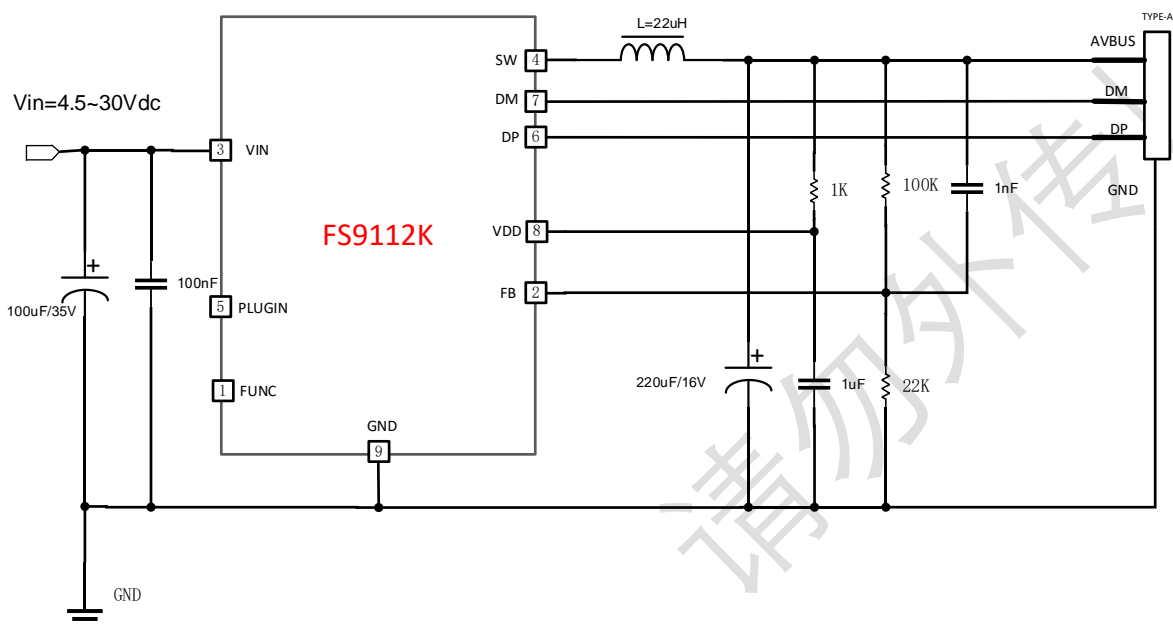
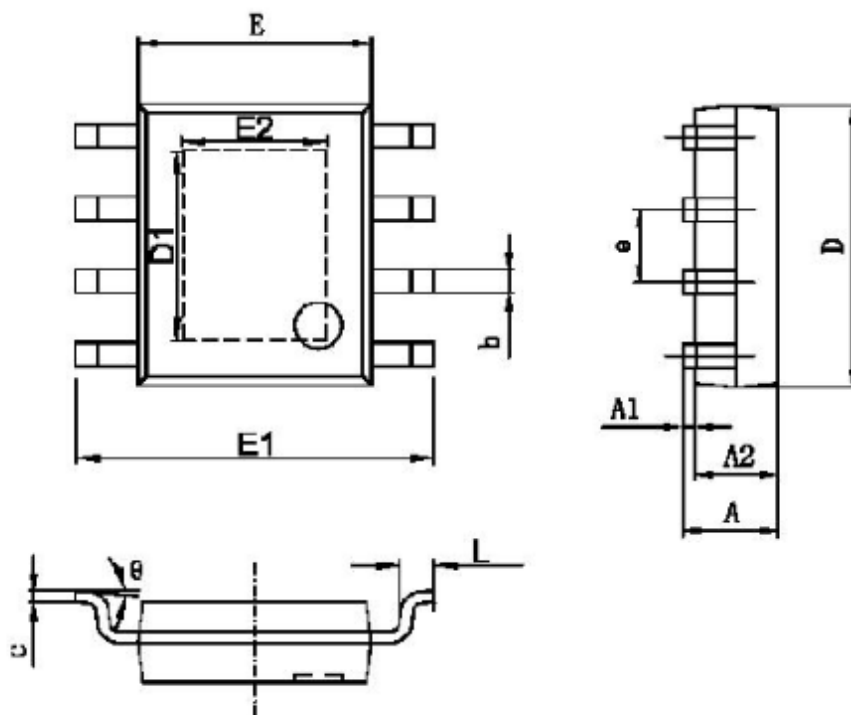


Figure 2. Application diagram

## Package outline drawing

### ESOP8



字符	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°





## Company information and statement

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