



S6SAP412A

# 2ch Buck + 1ch Buck/Boost DC/DC Evaluation Board Operation Guide

Doc. No. 002-08676 Rev. \*A

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# Preface



This manual explains how to use the evaluation board. Be sure to read this manual before using the product. For this product, please consult with sales representatives or support representatives.

## **Handling and Use**

Handling and use of this product and notes regarding its safe use are described in the manuals.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.

## **Notice on this Document**

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.


Please confirm the latest relevant information with the sales representatives.

# Cautions




## Caution of the Products Described in this Document

The following precautions apply to the product described in this manual.

 <b>WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.
--	---

<b>Electric shock, Damage</b>	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
<b>Electric shock, Damage</b>	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

 <b>CAUTION</b>	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.
--	--

<b>Cuts, Damage</b>	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
<b>Cuts</b>	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
<b>Damage</b>	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
<b>Damage</b>	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
<b>Damage</b>	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
<b>Damage</b>	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
<b>Damage</b>	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
<b>Damage</b>	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

# Contents



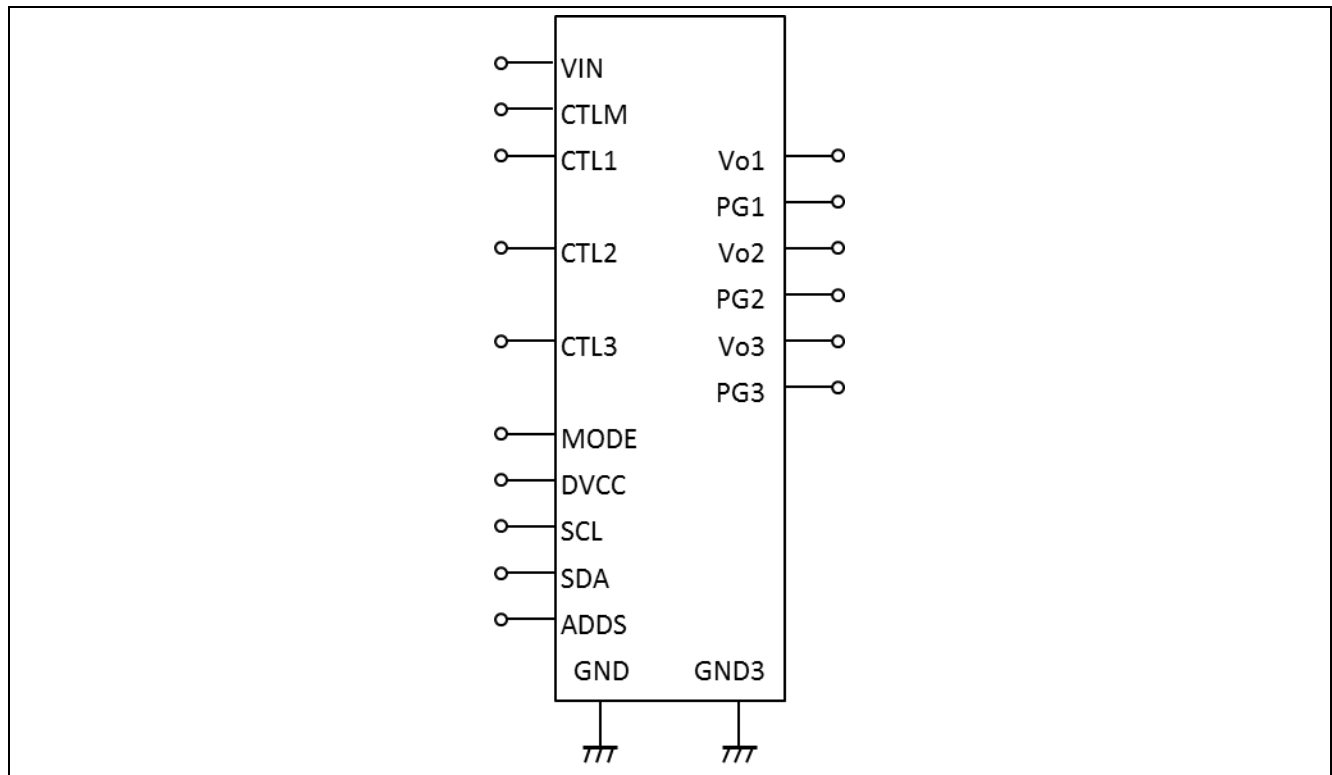
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# 1. Description



The S6SAP412A is the evaluation board for 2ch Buck + 1ch Buck/Boost DC/DC, S6AP412A. This board implements S6AP412A : Option-code 78, and output preset voltage DD1:1.0V, DD2:1.8V, DD2:3.3V. Also, this board implements the I<sup>2</sup>C interface. The separated communication tool is sold, and it can select the output voltage, soft-start time, ON/OFF sequence, PFM/PWM mode easily with I<sup>2</sup>C communication using windows PC and prepared software.

Figure 1-1. Board outline



## 2. Evaluation Board Specification



Table 2-1. Evaluation board specification

Item	Symbol	Min	Typ	Max	Unit
Input voltage	VIN	2.5	3.3	5.5	V
Output voltage	Vo1	0.988	1.00	1.012	V
Output current	Io1	-	-	4000	mA
Output voltage	Vo2	1.778	1.80	1.822	V
Output current	Io2	-	-	1200	mA
Output voltage	Vo3	3.23	3.30	3.37	V
Output current	Io3	-	-	600	mA

Board size:28mm x 28mm

## 3. PIN descriptions



### 3.1 Input/output pin descriptions

Table 3-1. Input/output pin descriptions

Block	Pin symbol	I/O	Function description
DD1	Vo1	O	DD1 output terminal
	PG1	O	DD1 POWERGOOD output monitor terminal
DD2	Vo2	O	DD2 output terminal
	PG2	O	DD2 POWERGOOD output monitor terminal
DD3	Vo3	O	DD3 output terminal
	PG3	O	DD3 POWERGOOD output monitor terminal
CTL	CTL1	I	DD1 control terminal
	CTL2	I	DD2 control terminal
	CTL3	I	DD3 control terminal
	CTLM	I	Control terminal for common block and logic block
MODE	MODE	I	MODE signal output terminal
I <sup>2</sup> C	DVCC	I	Power supply terminal for I <sup>2</sup> C.
	SCL	I	I <sup>2</sup> C clock terminal
	SDA	I/O	I <sup>2</sup> C data I/O terminal
	ADDS	I	Select terminal for slave address
COMMON	VIN	I	Control circuit block power supply terminal
	GND	-	Control circuit block ground terminal
	GND3	-	Control circuit block ground terminal

### 3.2 Jumper, Switch descriptions

Table 3-2. Jumper, Switch Descriptions

Jumper, Switch	Description	Initial Setting
JP1	Short VIN terminal and VBUS pin (2 pin)	Open
CN1	1,8,12,14,17 : GND pin 2 : VIN pin 4 : DVCC pin 5 : SCL pin 6 : SDA pin 3,7,9,10,11,13,15,16,18,19,20 : open	-

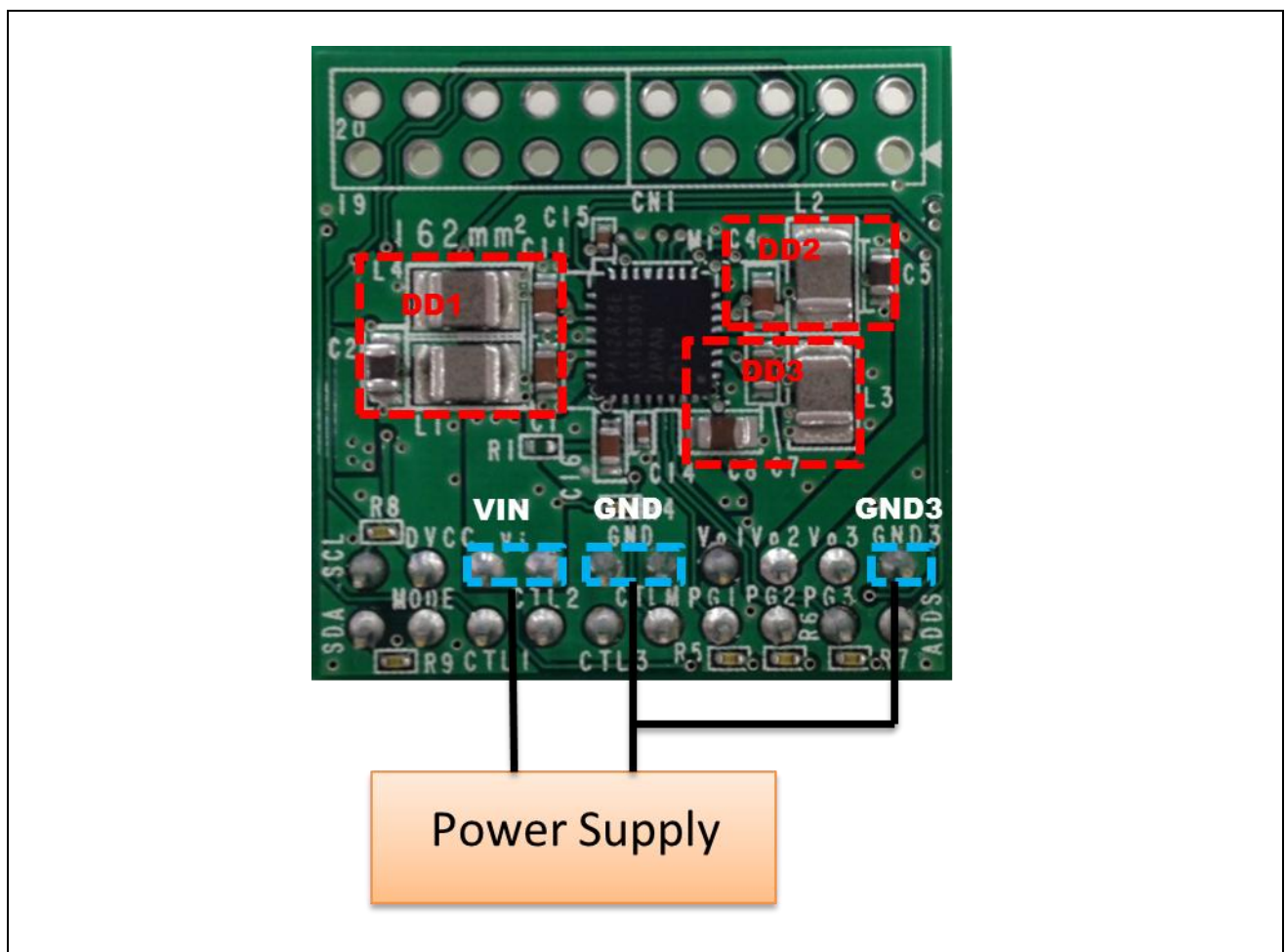


## 4. Setup and Verification

S6AP412A preset value can be evaluated with stabilized power supply.

1. 3.3V is applied to VIN terminal.
2. CTLM, CTL1, CTL2, CTL3 switch are turn on
3. Vo1:1.0V, Vo2:1.8V, Vo3:3.3V is output.

Figure 4-1. For Control switch evaluation



# 5. Component and Wiring Layout



## 5.1 Component layout

Figure 5-1. Component layout (layer 1)

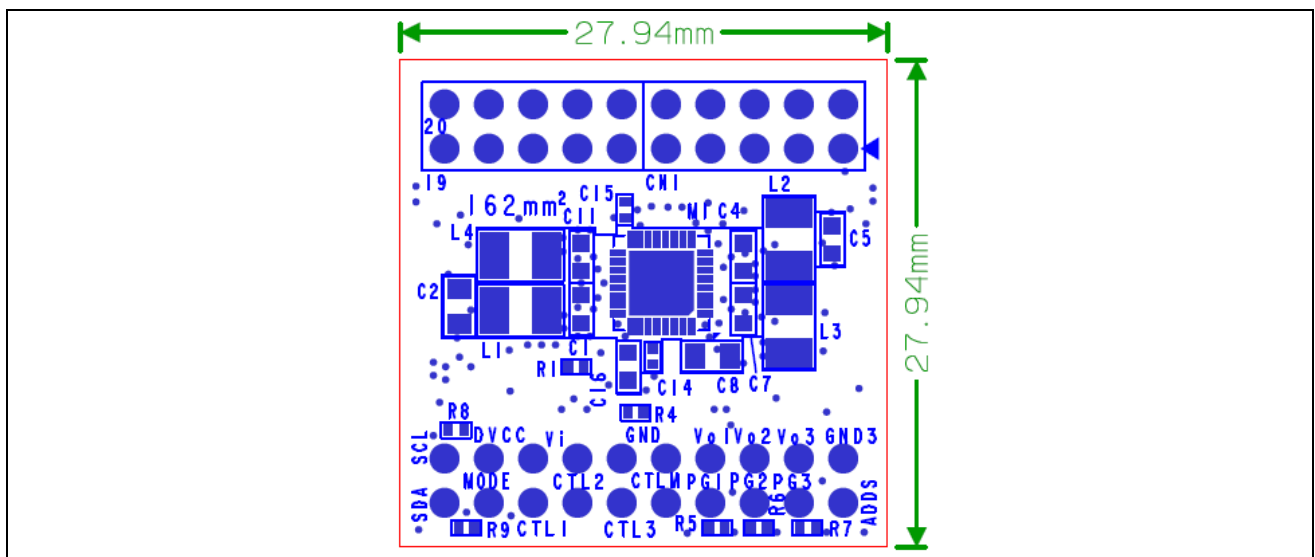
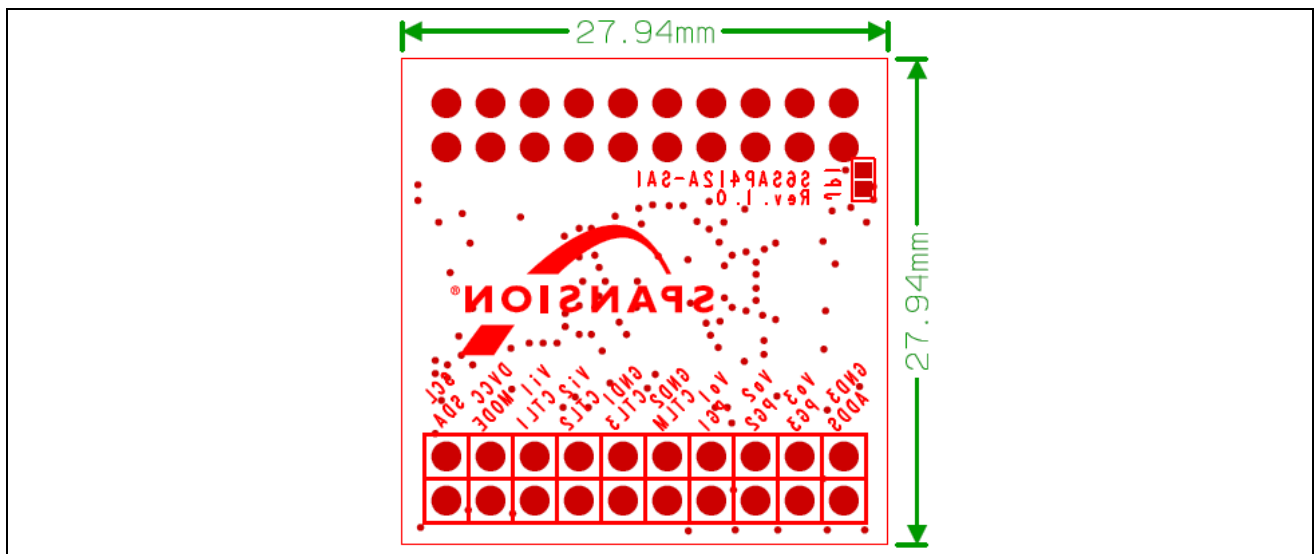


Figure 5-2. Component layout (layer 4)



## 5.2 Wiring layout

Figure 5-3. Wiring layout (layer 1)

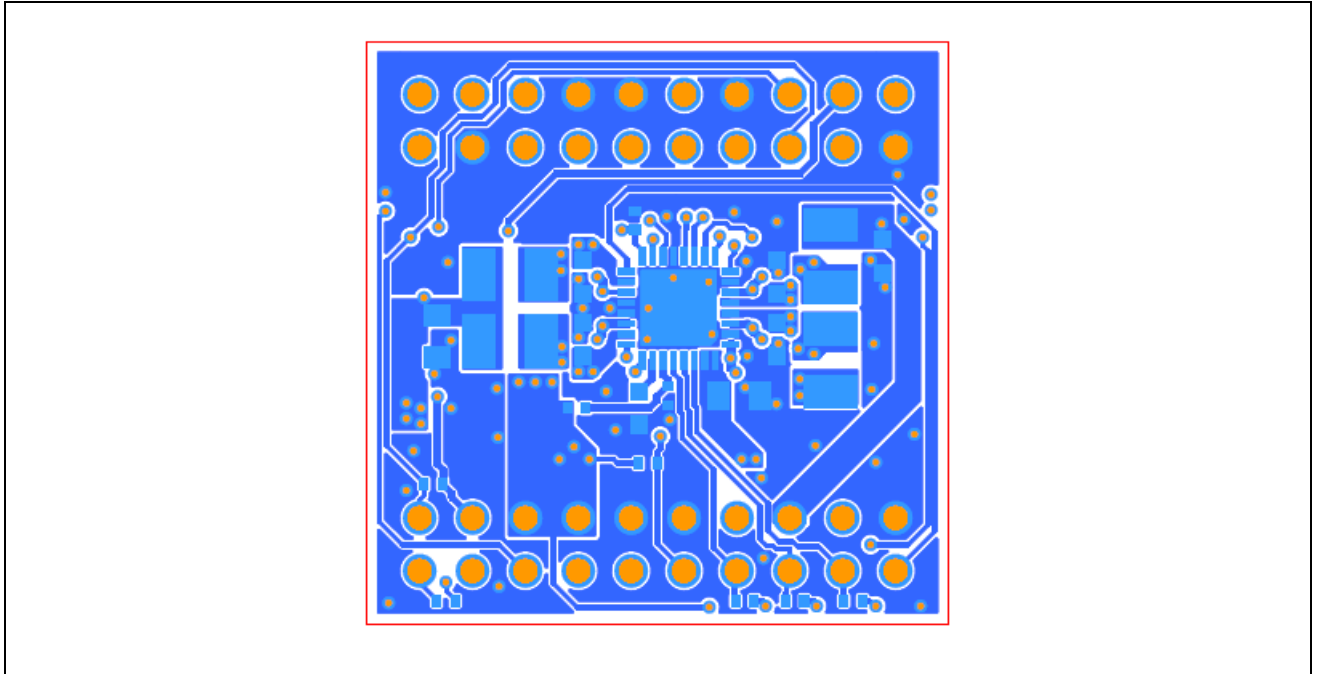


Figure 5-4. Wiring layout (layer 2)

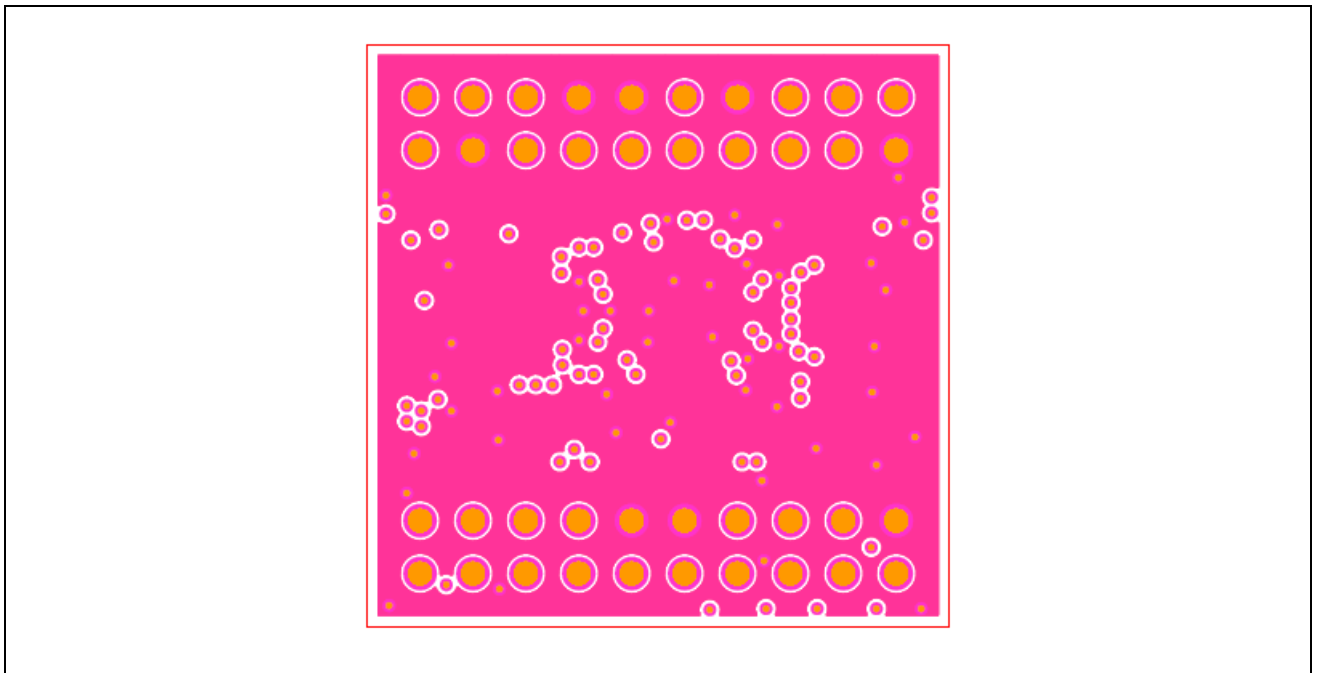


Figure 5-5. Wiring layout (layer 3)

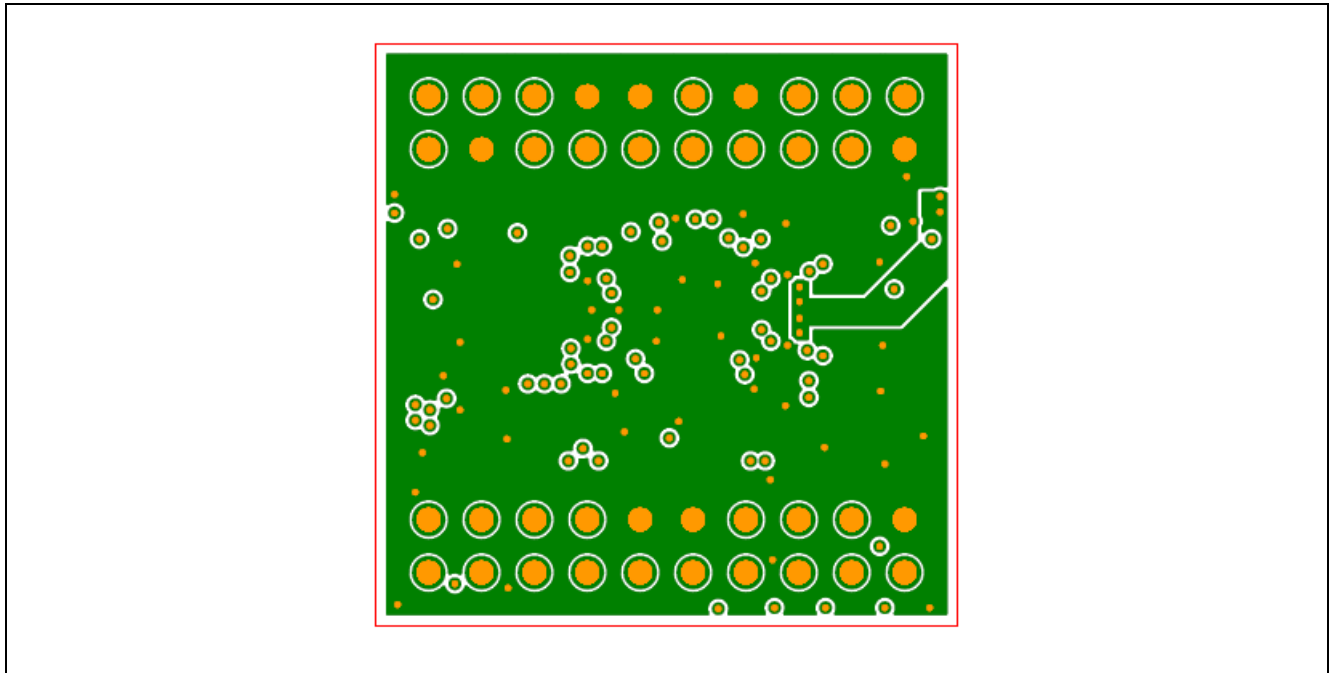
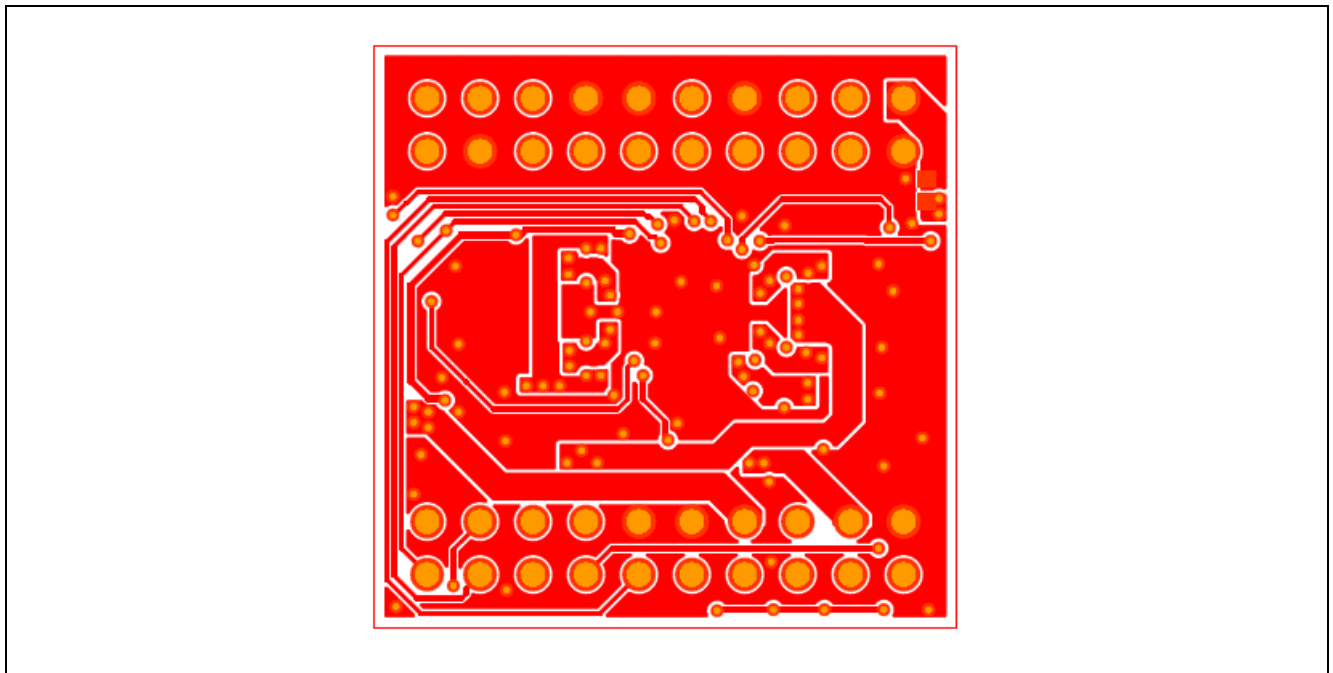


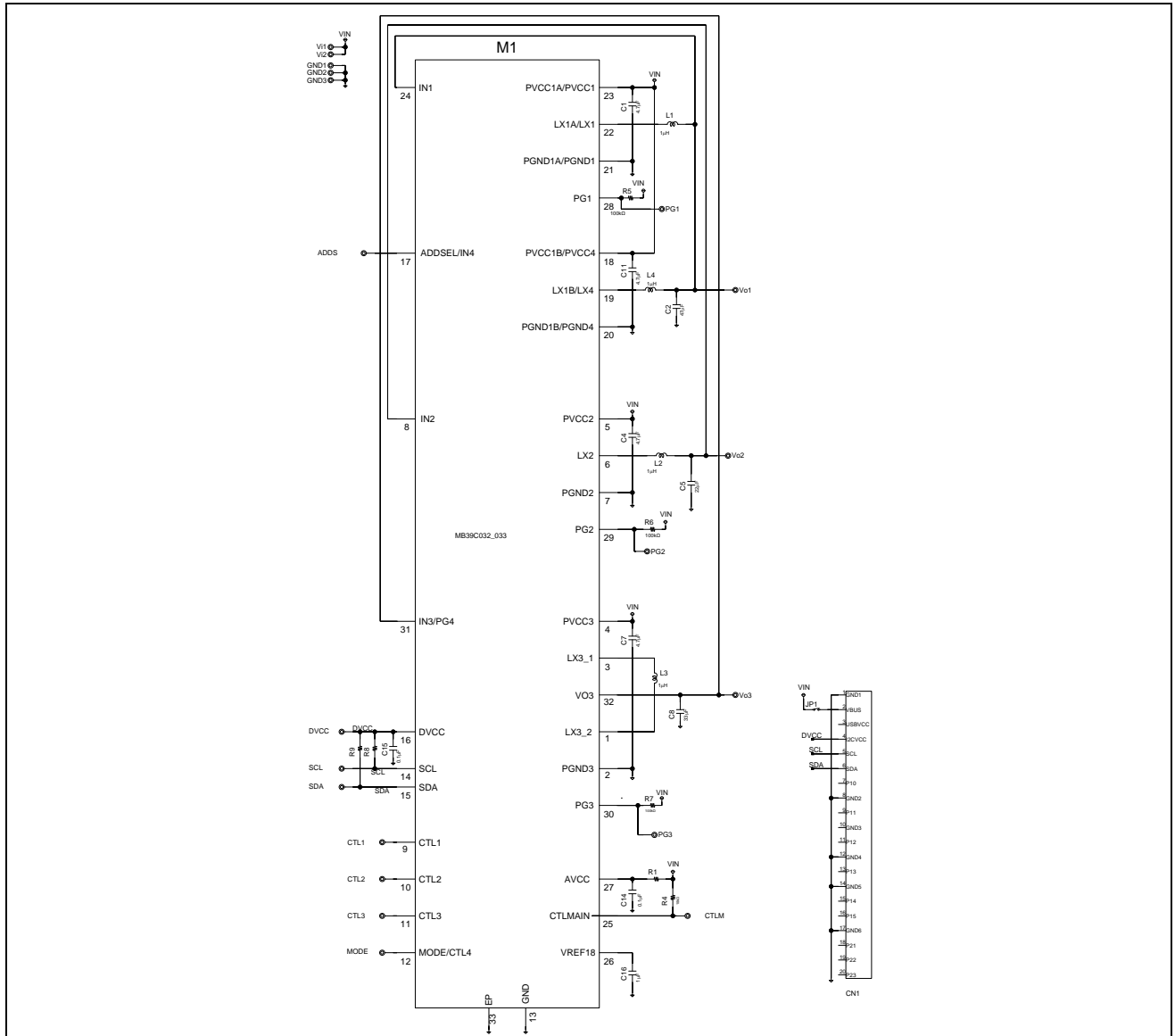
Figure 5-6. Wiring layout (layer 4)



# 6. Circuit Schematic



Figure 6-1. Circuit schematic for power block



# 7. Component List



Table 7-1. Component list

No.	Component	Item	Parts number	Vendor	Value	Remarks
1	M1	PMIC	S6AP412A-78	Cypress	-	-
2	L1	Inductor	1276AS-H-1R0M	TOKO	1.0μH	-
3	L2	Inductor	1276AS-H-1R0M	TOKO	1.0μH	-
4	L3	Inductor	1276AS-H-1R0M	TOKO	1.0μH	-
5	L4	Inductor	1276AS-H-1R0M	TOKO	1.0μH	-
6	C14	Ceramic Capacitor	C1005JB1H104K050BB	TDK	0.1μF	50V
7	C15	Ceramic Capacitor	C1005JB1H104K050BB	TDK	0.1μF	50V
8	C16	Ceramic Capacitor	C1608X5R1H105K080AB	TDK	1μF	50V
9	C1	Ceramic Capacitor	C1608X5R1V475K080AC	TDK	4.7μF	35V
10	C4	Ceramic Capacitor	C1608X5R1V475K080AC	TDK	4.7μF	35V
11	C7	Ceramic Capacitor	C1608X5R1V475K080AC	TDK	4.7μF	35V
12	C11	Ceramic Capacitor	C1608X5R1V475K080AC	TDK	4.7μF	35V
13	C5	Ceramic Capacitor	C2012X5R1A226K125AB	TDK	22μF	10V
14	C8	Ceramic Capacitor	C2012X5R1A336M125A C	TDK	33μF	10V
15	C2	Ceramic Capacitor	C2012X5R1A476M125A C	TDK	47μF	10V
16	R1	Chip Resistor	RK73Z1E	KOA	0Ω	Under 50mV
17	R4	Chip Resistor	RR0816P103D	SUSUMU	10kΩ	±0.5%, ±25ppm/°C
18	R5	Chip Resistor	RR0510P-104-D	SUSUMU	100kΩ	±0.5%, ±25ppm/°C
19	R6	Chip Resistor	RR0510P-104-D	SUSUMU	100kΩ	±0.5%, ±25ppm/°C
20	R7	Chip Resistor	RR0510P-104-D	SUSUMU	100kΩ	±0.5%, ±25ppm/°C
21	R8	Chip Resistor	RR0510P-222-D	SUSUMU	2.2kΩ	±0.5%, ±25ppm/°C
22	R9	Chip Resistor	RR0510P-222-D	SUSUMU	2.2kΩ	±0.5%, ±25ppm/°C
23	CN1	Connector	2214R-20SG-85-F1	Neltron Industrial Co., Ltd.	-	1x20pin header (2.54pitch) Unmounted
24	Vi1/Vi2	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
25	GND1/GND 2	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
26	GND3	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
27	DVCC	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-

No.	Component	Item	Parts number	Vendor	Value	Remarks
28	SCL	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
29	SDA	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
30	ADDS	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
31	CTLM	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
32	CTL1	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
33	CTL2	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
34	CTL3	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
35	MODE	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
36	Vo1	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
37	PG1	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
38	Vo2	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
39	PG2	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
40	Vo3	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
41	PG3	Terminal	HIF3H-20PB-2.54DSA	HIROSE	-	-
42	JP1	Solder jumper	Solder jumper	-	-	Unmounted

These components are compliant with RoHS, and please ask each vendor for details if necessary.

# 8. Evaluation Board Picture



Figure 8-1. Picture (top)

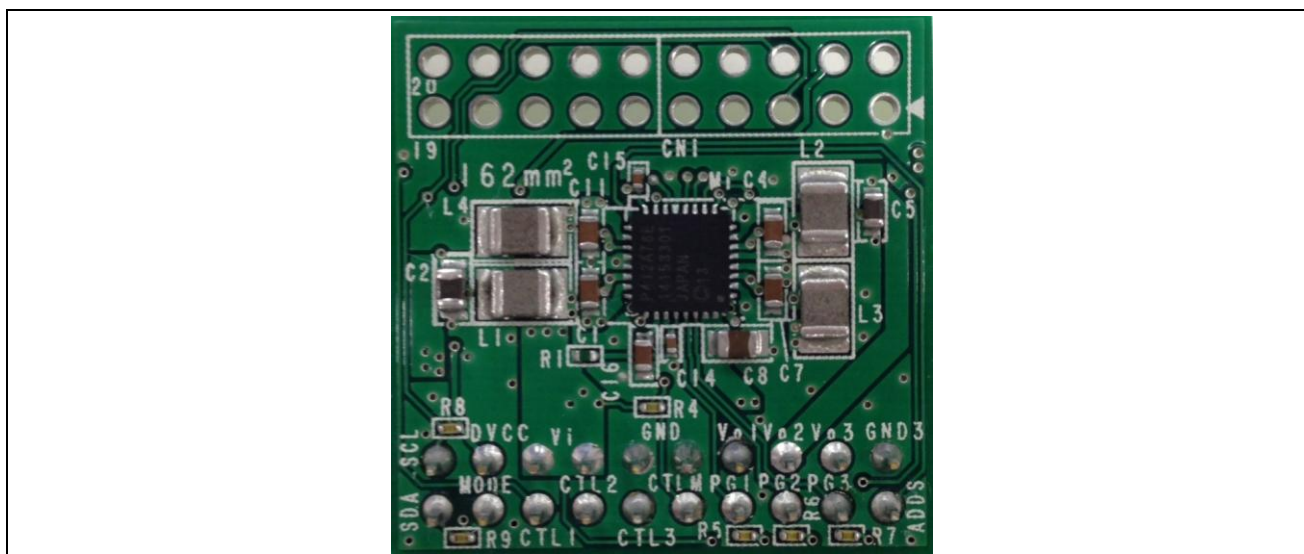
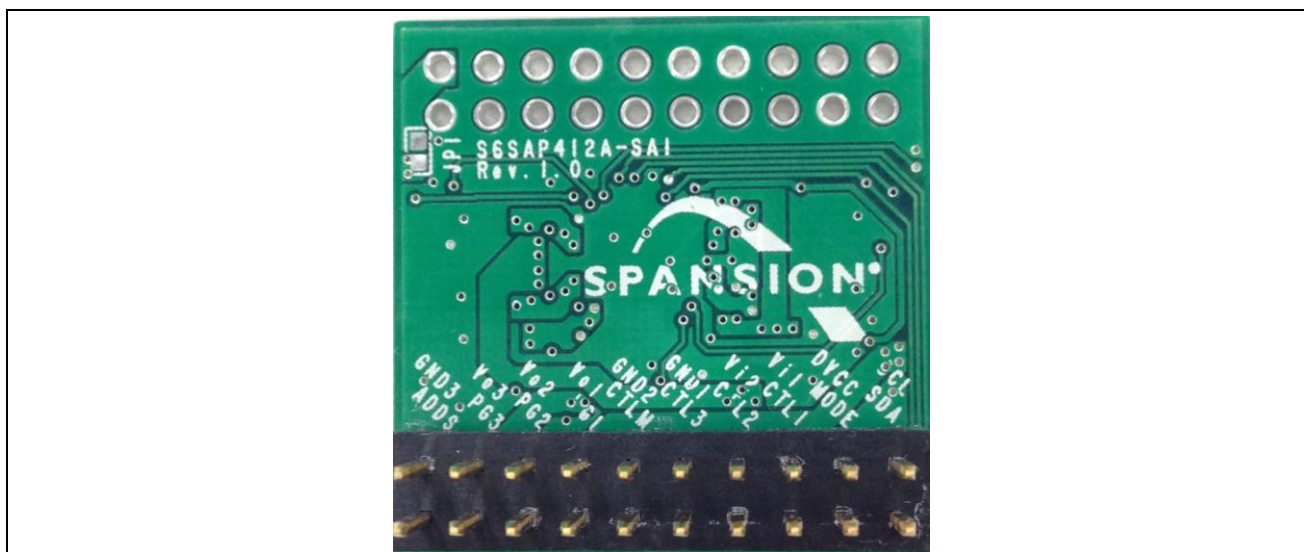


Figure 8-2. Picture (back)





# 9. Ordering Information



Table 9-1. Ordering Information

Part number	EVB revision	Note
S6SAP412A78SA1001	Rev 1.0	---

# Revision History



## Document Revision History

Document Title: S6SAP412A 2ch Buck + 1ch Buck/Boost DC/DC Evaluation Board Operation Guide			
Document Number: 002-08676			
Revision	Issue Date	Origin of Change	Description of Change
**	07/22/2014	TAOA	Initial release
*A	04/29/2016	TAOA	Migrated Spansion Guide from S6SAP412A_SS901-00025-2v0-E to Cypress format

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