

2.7V~20V, 15A Fully Integrated Synchronous Boost Converter Evaluation Board

FEATURES

- Wide 2.7V-20V Input Voltage Range
- Wide 4.5V-21V Output Voltage Range
- 13mΩ/11mΩ R_{ds(on)} Internal Power MOSFETs
- Up to 15A Switch Current and Programmable Peak Current Limit
- Adjustable 200K-1.0MHz Switching Frequency:
- PFM Mode
- Programmable Soft Start
- Output and Feedback Overvoltage Protection
- Thermal Shutdown Protection at 150°C
- DFN-20 3.5mmx4.5mm Package

VSSOUDQH 7KH FRQVWDQW RIIWLPH SHDN FKUHQW
PRGHRSHUDWLRQSURYLGHVVDWWUDQVLHQWUHVSRQVHDQG
HDVHVORRSVWDELOLDWLRQ7KHGHYLFHIHDWKKHVLQFOKH
RYHUFKHUHQW SURWHFWLRQ RWSW RYHU YROWDII
SURWHFWLRQ DQG WKHUPDO VKWGRQ 7KH 6.5V
DYDLODEOH LQ D VSDFHVDYLQJ SLQ I
PPPPSDFNDII

7KL V KHUV KGH GHVFULEHV WKH FKDUDFWHULVWLEV
RSHUDWLRQ DQG WKH KH RI WKH %

Board Number	IC Number
EV12A2-B-01A	SCT12A2

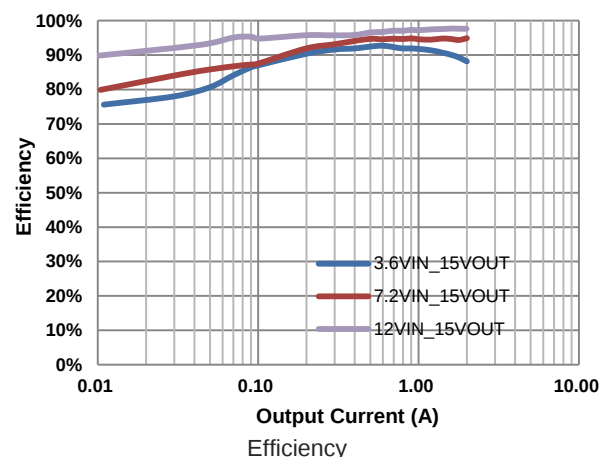
YDOWWLRQ URGH LQFOKLQJ VSHFLILFDWLRQV
PERFOMANCE SUMMARY
GLDDPELOORIPDWHULDOVDQGWKHERDUGODRW

Specifications are at TA = 25°C

Parameter	Condition	Value
Input Voltage	DC up to 20V	2.7V-20V
Output Voltage	JP3: ON PWM	15V ± 2.5%
Output Current	Continuous DC current	2A
Frequency	Default	400KHz



EV12A2-B-01A Evaluation Board Top View



QUICK START PROCEDURE

Evaluation board EV12A2-B-01A is easy to set up to evaluate the performance of the SCT12A2. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions:
 - JP3: ON Connect EN pin to V_{CC} to enable IC.
2. With power off, connect the input power supply to J1 V_{IN} connector and J2 GND connector. Turn on the power at the input. Make sure that the input voltage does not exceed 14V, and supports sufficient current limit.
3. Check the output voltage at J3. The output voltage should be 15V typical. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, output voltage ripple, efficiency and other parameters.
4. To use the enable function, apply a digital input to the EN pin of JP3.

NOTE.

When measuring the voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across relevant capacitor of V_{IN} or V_{OUT} . See Figure 2 for proper scope probe technique.

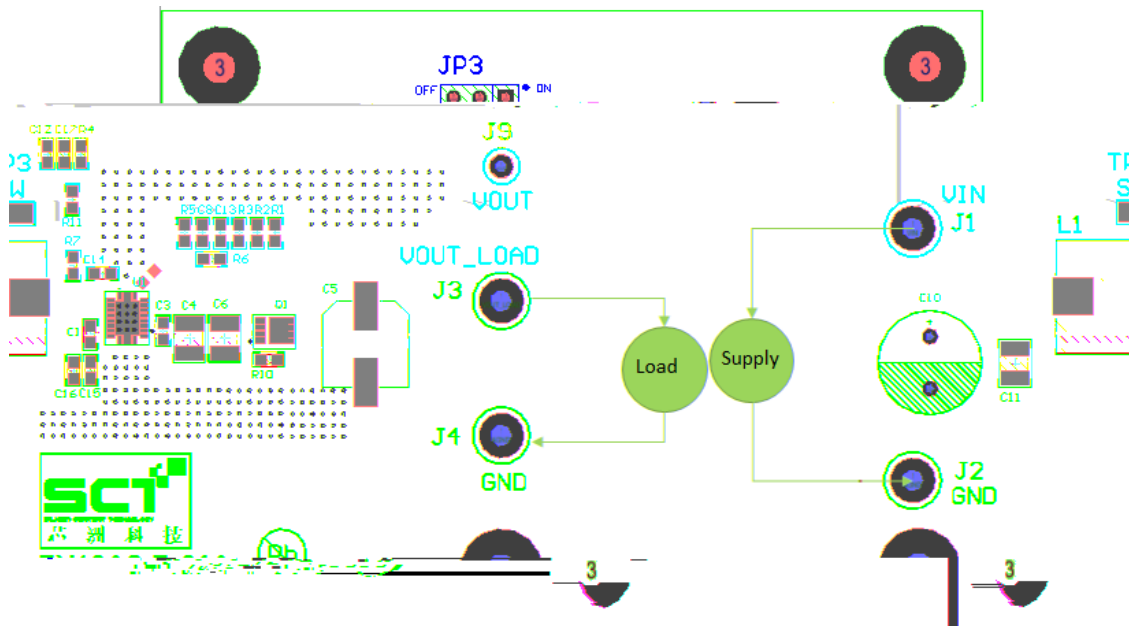


Figure 1. Proper Supply, Load and Measurement Equipment Setup



Figure 2. Measuring Voltage Ripple Across Terminals or Directly Across Ceramic Capacitor

SCHEMATIC DIAGRAM

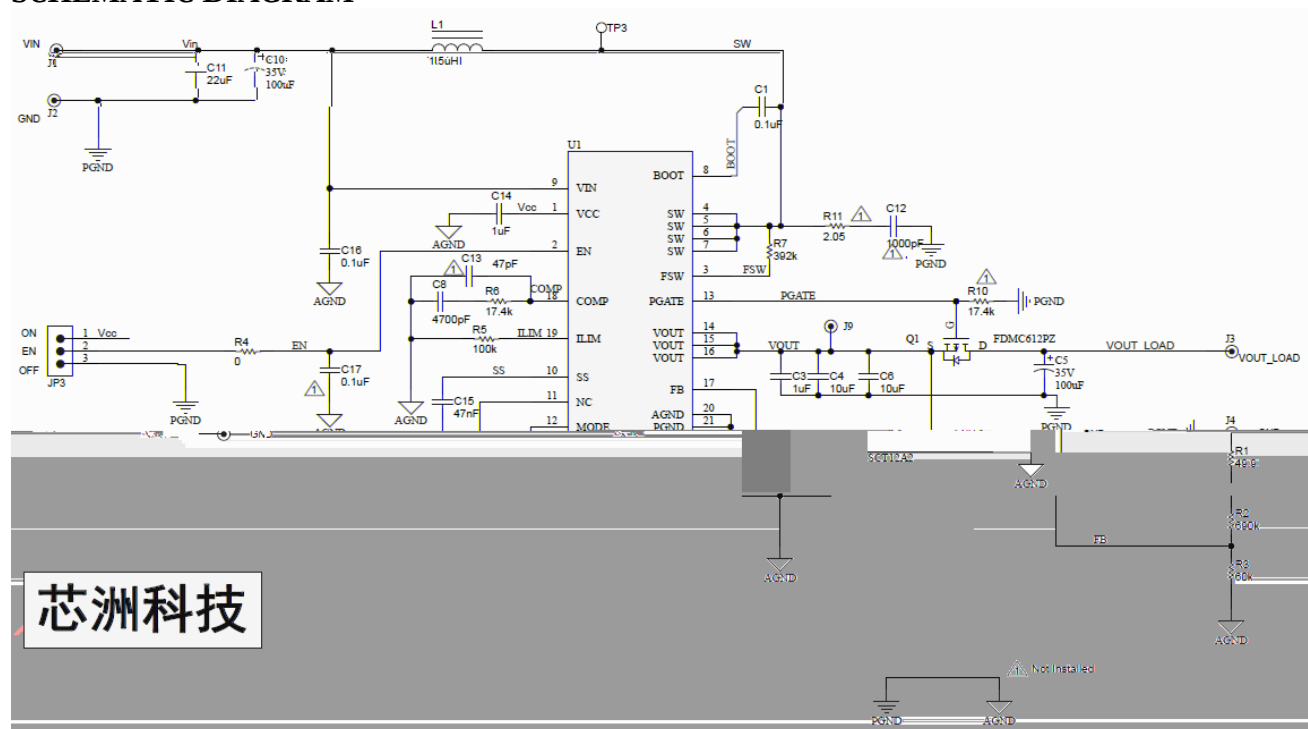


Figure 3. Evaluation Board Schematic

BILL OF MATERIALS

Table 2. Bills of Materials

Manufacture	Comment	Designator	Description	Quantity
Silicon Content Technology	SCT12A2	U1	SCT12A2, 21V/15A Synchronous Boost Converter DFN-20L 3.5mmX4.5mm with thermal pad	1
Würth Elektronik	61300211121	JP3	Header, 100mil, 2x1, Tin, TH	1
		J1, J2, J3, J4	Terminal Block, 2.2mm, 1-Pos, TH	4
Würth Elektronik	885 012 206 071	C1, C16, C17	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X5R, 0603	3
Würth Elektronik	885 012 206 063	C8	CAP, CERM, 4700 pF, 50 V, +/- 10%, X5R, 0603	1
Würth Elektronik	C0603C105K8PACTU	C14	CAP, CERM, 1uF, 10V, +/-10%, X5R, 0603	1
Würth Elektronik	885012109014	C11	CAP, CERM, 22 uF, 25 V, +/- 10%, X5R, 1210	1
Würth Elektronik	885012209028	C4, C6	CAP, CERM, 10 uF, 25 V, +/- 10%, X5R, 1210	2
Würth Elektronik	C0603C105K3PACTU	C3	CAP, CERM, 1 uF, 25 V, +/- 10%, X5R, 0603	1
Würth Elektronik	875115652007	C5	Aluminium Polymer Capacitors, 35V, 100uF, SMT	1
Würth Elektronik	870055675009	C10	Aluminium Polymer Capacitors, 35V, 100uF, TH	1
Murata	GRM1885C1H470JA01D	C13	CAP, CERM, 47 pF, 50 V, +/- 5%, C0G/NP0, 0603	Not Installed
Murata	GRM188R71H102KA01D	C12	CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0603	Not Installed
Murata	GRM188R71H473KA61D	C15	CAP, CERM, 0.047u, 50 V, +/- 10%, X7R, 0603	1
Würth Elektronik	7443552150	L1	Inductor, Shielded Drum Core, WE-Perm, 1.5 uH, Rate current 14 A, DCR 0.0051 ohm, SMD	1
Vishay	CRCW0603690KFKEA	R2	RES, 690 k, 1%, 0.1 W, 0603	1
Vishay	CRCW0603392KFKEA	R7	RES, 392 k, 1%, 0.1 W, 0603	1
Vishay	CRCW060359KFKEA	R3	RES, 59 k, 1%, 0.1 W, 0603	1
Vishay	CRCW0603100KFKEA	R5	RES, 100 k, 1%, 0.1 W, 0603	1
Vishay	CRCW060349R9FKEA	R1	RES, 49.9, 1%, 0.1 W, 0603	1
Vishay	CRCW060317K4FKEA	R6	RES, 17.4 k, 1%, 0.1 W, 0603	1
Vishay	CRCW06032R05FKEA	R11	RES, 2.05, 1%, 0.1 W, 0603	Not Installed
Vishay	CRCW06030000Z0EA	R4	RES, 0, 5%, 0.1 W, 0603	1
Vishay	CRCW060317K4FKEA	R10	RES, 17.4 k, 1%, 0.1 W, 0603	Not Installed
Keystone	5015	TP3	Test Point, Miniature, SMT	1
-Fairchild	FDMC612PZ	Q1	P-Channel MOSFET, -20V, -14A, 8.4mOhm	1

PRINTED CIRCUIT BOARD LAYOUT

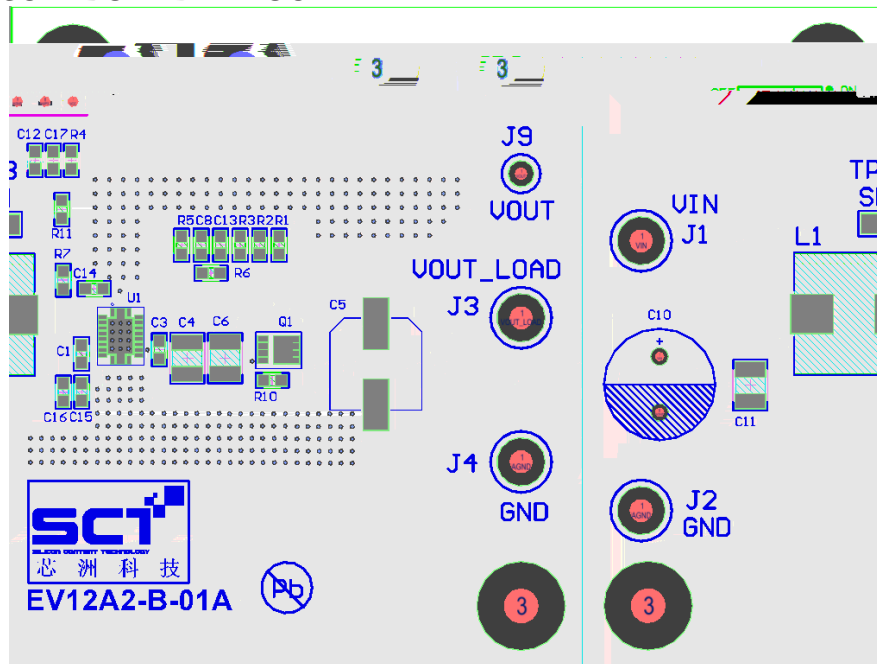


Figure 4. Top Silkscreen Layer

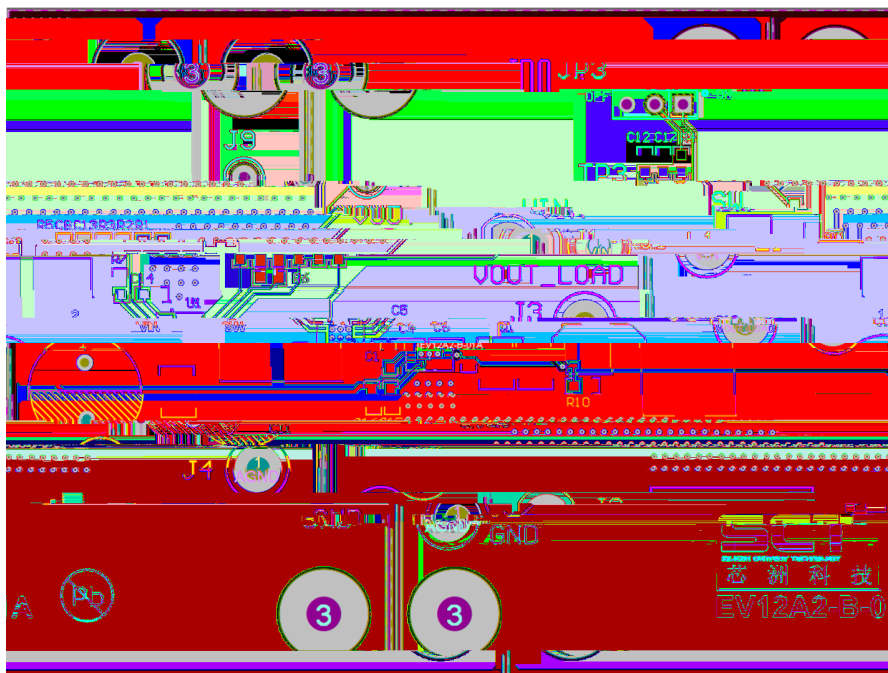


Figure 5. Composite Layer View

30W

EV12A2-B-01A User's Guide

OPTIONAL MODIFICATION

Switching Frequency

The resistor connected from FSW to SW R7 (Default 392KΩ) sets switching frequency of the converter. Use equation 1 to set a desired frequency.

$$R_{FSW} = \frac{1}{f_{SW} \cdot C_{FREQ}} \quad (1)$$

where:

- f_{SW} is the desired switching frequency
- $T_{DELAY} = 90 \text{ ns}$
- $C_{FREQ} = 34 \text{ pF}$
- V_{IN} is the input voltage
- V_{OUT} is the output voltage

Table 3. R_{FSW} Value for Common Switching Frequencies
($V_{IN}=3.6V$, $V_{OUT}=15V$, Room Temperature)

f_{SW}	R_{FSW}
230 KHz	698 KΩ
400 KHz	392 KΩ
575 KHz	255 KΩ
715 KHz	200 KΩ

Peak Current Limit

The resistor R5 at ILIM pin sets default peak input current limit at 15A typical. Use equation 2 to set inductor peak current limit

$$R_{LIM} = \frac{V_{IN}}{I_{LIM}} \quad (2)$$

where:

- I_{LIM} is the peak current limit
- R_{LIM} is the resistance of ILIM pin to ground

Table 4. R_{LIM} Value for Inductor Peak Current
($V_{IN}=3.6V$, $V_{OUT}=15V$, $L=1.5\mu H$, Room Temperature)

I_{LIM}	R_{LIM}
15 A	100 KΩ
10 A	151 KΩ
7.5A	200 KΩ

Output Voltage

The output voltage is set by an external resistor divider R2 and R3 in typical application schematic. The value of R2 can be calculated by equation 3. A minimum current of typical 20uA flowing through feedback resistor divider gives good accuracy and noise covering.

$$R_2 = \frac{V_{OUT} \cdot R_3}{V_{REF}} \quad (3)$$

where:

- V_{REF} is the feedback reference voltage, typical 1.2V

Table 5. Feedback Resistor R_3 R_4 Value for Output Voltage
(Room Temperature)

V_{OUT}	R_3	R_4
9 V	390 KΩ	59 KΩ
15 V	698 KΩ	59 KΩ

IMPORTANT NOTICE