4.5V-100V Vin, 1.2A, High Efficiency Synchronous Step-down DCDC Converter with Programmable Frequency

FEATURES

- Wide Input Range: 4.5V-100V
- 1.2A Continuous Output Current
- Integrated 600mΩ High-Side and 300mΩ Low-Side Power MOSFETs
- 15uA Quiescent Current with VCC diode 150uA Quiescent Current without VCC diode
- Selectable PFM, USM and FPWM Operation Modes
- 1.2V ±1% Feedback Reference Voltage
- 3.6ms Internal Soft-start Time
- Fixed Switching Frequency at 300KHz
- COT Control Mode
- Support Iso-buck Topology at FPWM
- Precision Enable Threshold for Programmable Input Voltage Under-voltage Lock Out Protection (UVLO) Threshold and Hysteresis
- Cycle-by-Cycle Current Limit
- Available in an ESOP-8 Package

APPLICATIONS

- 48V Industry Power Bus System
- E-bike, Scooter
- BMS

DESCRIPTION

The SCT2A23 is 1.2A synchronous buck converters with wide input voltage, ranging from 4.5V to 100V, which integrates an 600mΩ high-side MOSFET and a 300mΩ low-side MOSFET. The SCT2A23, adopting the constant-on time (COT) mode control, supports the PFM mode with typical 150uA low quiescent current which assists the converter on achieving high efficiency at light load or standby condition.

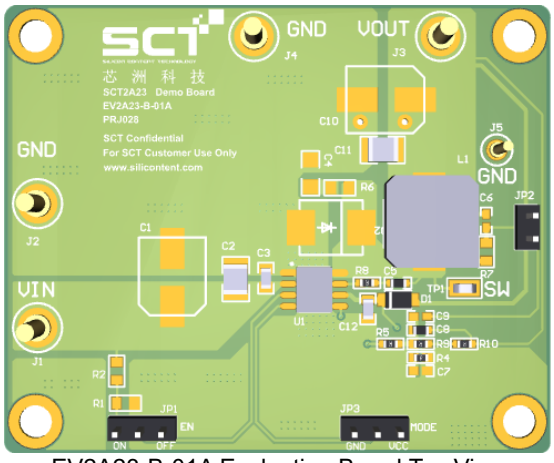
This user's guide describes the characteristics, operation and the use of the EV2A23-B-01A Evaluation Module including EVM specifications, recommended test setup, test result, schematic diagram, bill of materials, and the board layout.

Board Number	IC Number
EV2A23-B-01A	SCT2A23

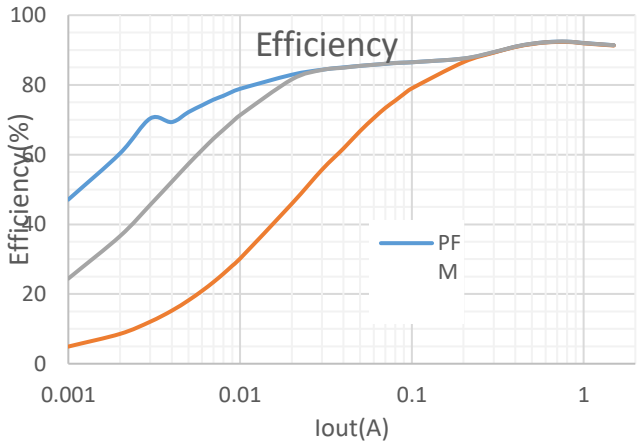
PERFORMANCE SUMMARY

Table 1. Performance — Specifications are at TA = 25°C

Parameter	Condition	Value
Input Voltage	DC up to 100V	4.5V-100V
Output Voltage		12V ± 1%
Output Current	Continuous DC current	1.2A
Frequency	Default	300KHz



EV2A23-B-01A Evaluation Board Top View



SCT2A23 Efficiency VIN=48V VOUT=12V

QUICK START PROCESURE

Evaluation board EV2A23-B-01A is easy to set up to evaluate the performance of the SCT2A23. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions:
   - J1, J2: Input terminal. Connect the power supply to the input of converter.
   - J3, J4: Output terminal. Connect the load to the output of converter.
   - JP1: Enable Jumper. Install ON shunt to connect EN pin to V_{in} through a 274KΩ resistor to enable IC. Install OFF shunt to disable 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 100V, and supports sufficient current limit.
3. Check the output voltage at J3, J4. The output voltage should be 12V 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.

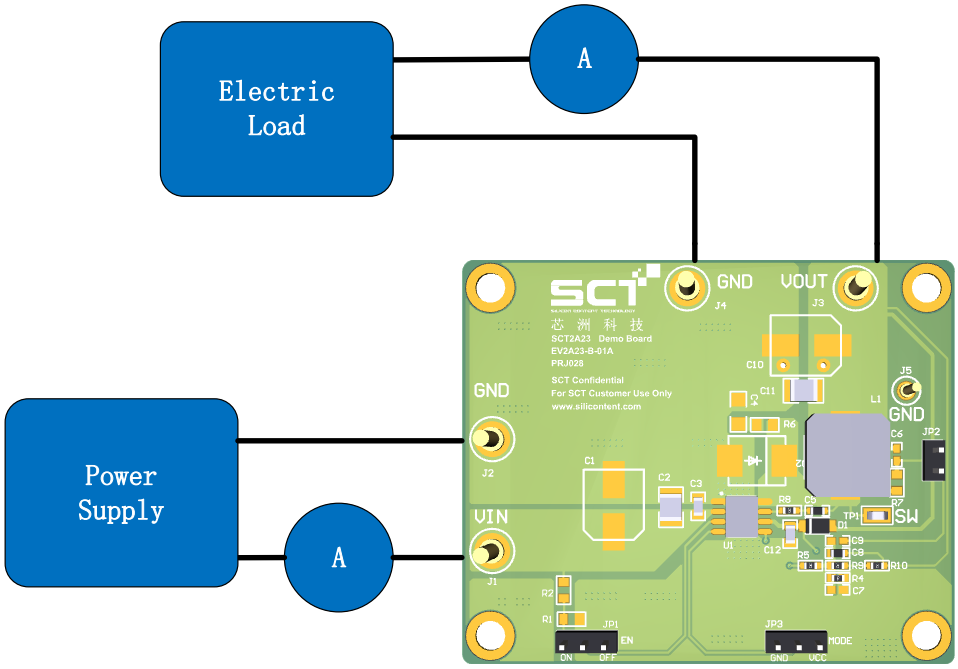


Figure 1. Proper Supply, Load and Measurement Equipment Setup

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 VIN or VOUT. See Figure 2 for proper scope probe technique.

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

SCHEMATIC DIAGRAM

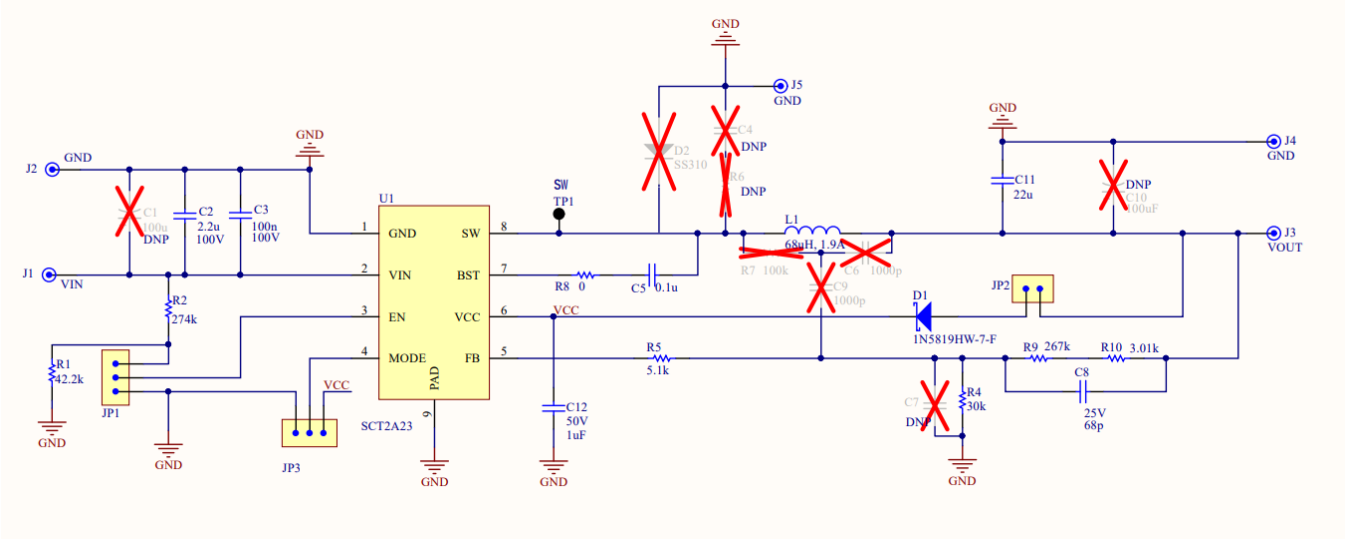


Figure 3. Evaluation Board Schematic

BILL OF MATERIALS

Table 2. Bills of Materials

Footprint	Comment	Part Number	Designator	Description	Quantity
SOP8	SCT2A23	SCT2A23	U1	100V, 1.2A High Efficiency Synchronous Step-down DCDC Converter	1
1210	CAPACITOR	885382209002	C2	CAP, CERM, 2.2uF, 100 V, +/- 10%, X7R, 1210	1
0805	CAPACITOR	885012207128	C3	CAP, CERM, 100nF, 100 V,+/- 10%, X7R, 0805	1
0603	CAPACITOR	885012206095	C5	CAP, CERM, 0.1 uF, 50V, +/- 10%, X7R, 0603	1
0603	CAPACITOR	885012206053	C8	CAP, CERM, 68pF, 25V, +/- 10%, X7R, 0603	1
1210	CAPACITOR	GRM32ER71E226KE15L	C11	CAP, CERM, 22uF, 25 V, +/- 10%, X7R, 1210	1
0603	CAPACITOR	DNP	C1	DNP	0
0603	CAPACITOR	DNP	C4	DNP	0
0603	CAPACITOR	DNP	C7	DNP	0
0603	CAPACITOR	DNP	C10	DNP	0
SOD123	Diode	1N5819HW-7-F	D1	Schottky Diode	1
0805	RESISTOR	AC0805FR-0742K2L	R1	RES, 42.2k, 1%, 0.1 W, 0603	1
0805	RESISTOR	AC0805FR-07274KL	R2	RES, 274k, 1%, 0.1 W, 0603	1

0603	RESISTOR	RC0603FR-0730KL	R4	RES, 30 k, 1%, 0.1 W, 0603	1
0603	RESISTOR	AC0603FR-075K1L	R5	RES, 5.1k, 1%, 0.1 W, 0603	1
0603	RESISTOR	RC0603FR-070RL	R8	RES, 0, 1%, 0.1 W, 0603	1
0603	RESISTOR	RC0603FR-07267KL	R9	RES, 267k, 1%, 0.1 W, 0603	1
0603	RESISTOR	RC0603FR-073K01L	R10	RES, 3.01k, 1%, 0.1W, 0603	1
	TERMINAL2.1	TERMINAL2.1	J1，J2，J3，J4	Terminal, 2mm Diameter, TH	4
	TERMINAL1.1	TERMINAL1.1	J5	Terminal, 1mm Diameter, TH	1
WE-HCI_1040	INDUCTOR	7447714820	L1	82uH, 1.85A Isat, 147mohms, 6033R	1
	JUMPER2		JP2	Header, 100mil, 2x1, Tin plated, TH	1
CONN_PEC03SAAN	JUMPER	613 003 111 21	JP1,JP3	Header, 100mil, 3x1, Tin plated, TH	2
	TEST POINT	5055	TP1	Test Point	1

PRINTED CIRCUIT BOARD LAYOUT

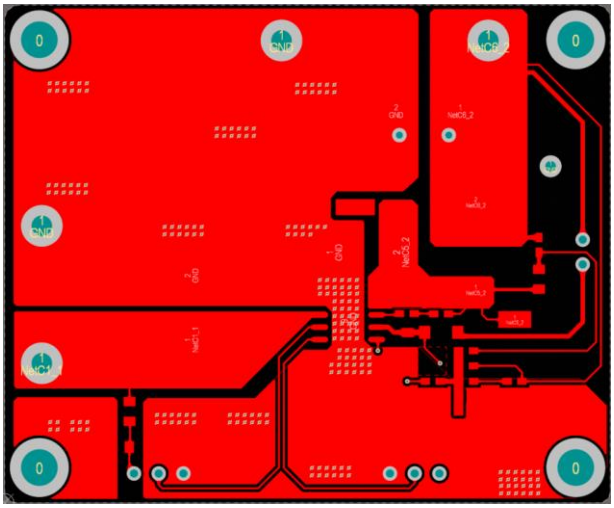


Figure 4.Top Layer

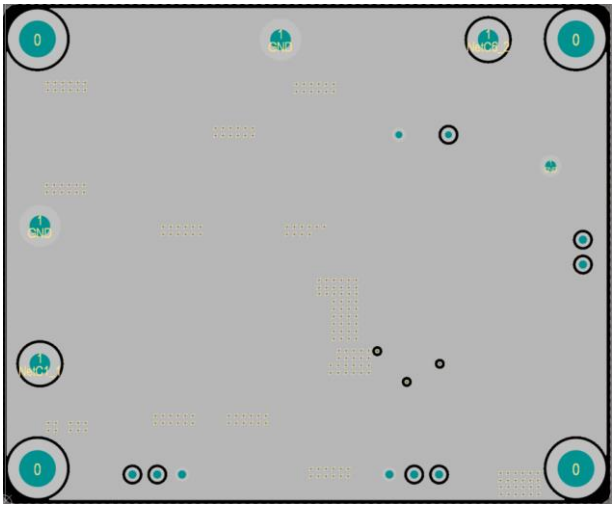


Figure 5. Inner Layer 1

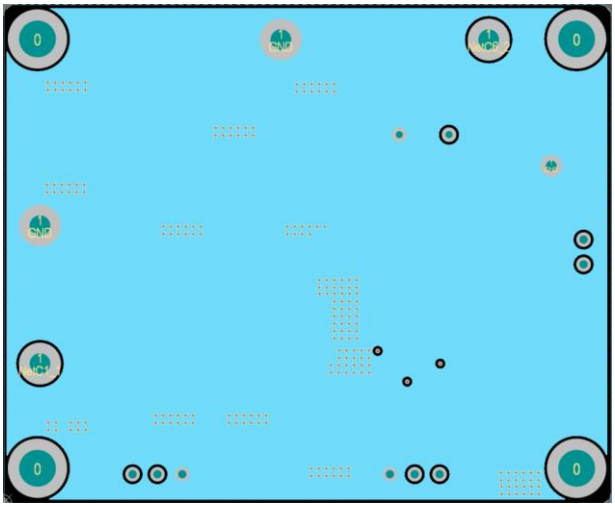


Figure 6. Inner Layer 2

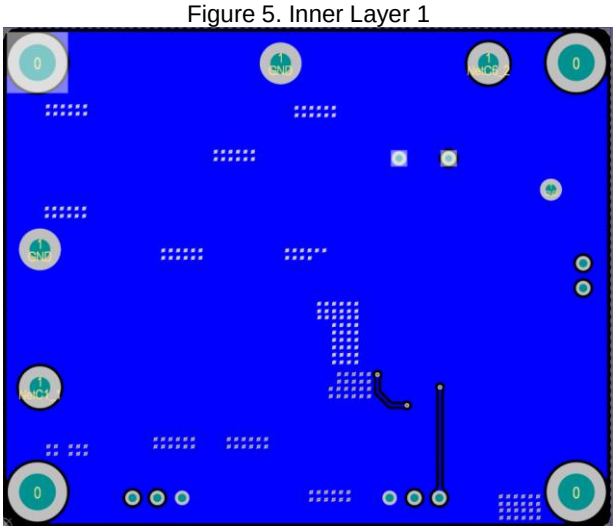


Figure 7. Bottom Layer

EVB TEST RESULTS

Vin=48V, Vout=12V, 1.2A loading, unless otherwise noted

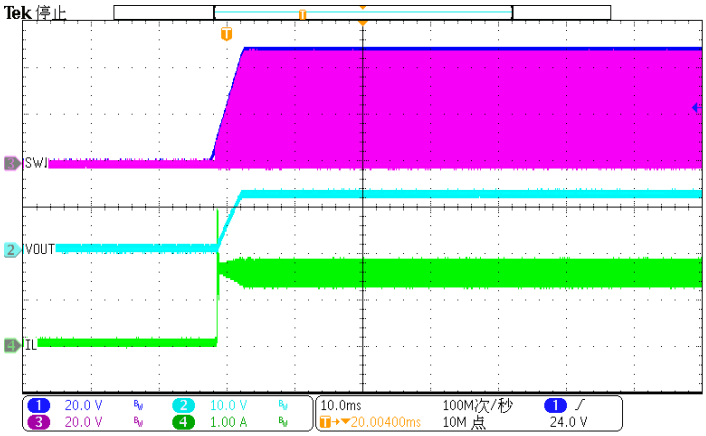


Figure 8. Power Up

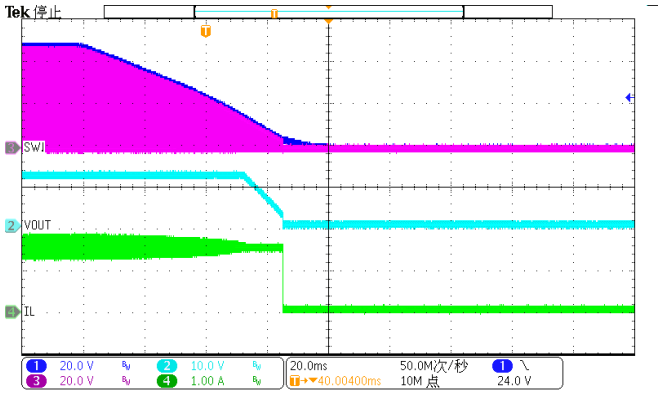


Figure 9. Power Down

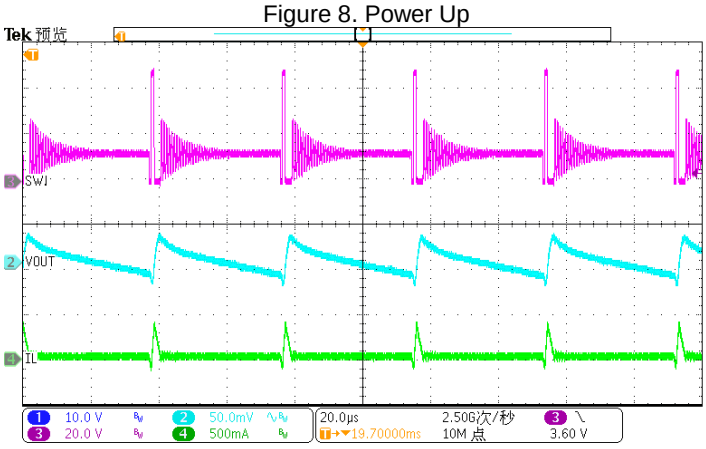


Figure 10. Steady State Ripple
Iout=10mA

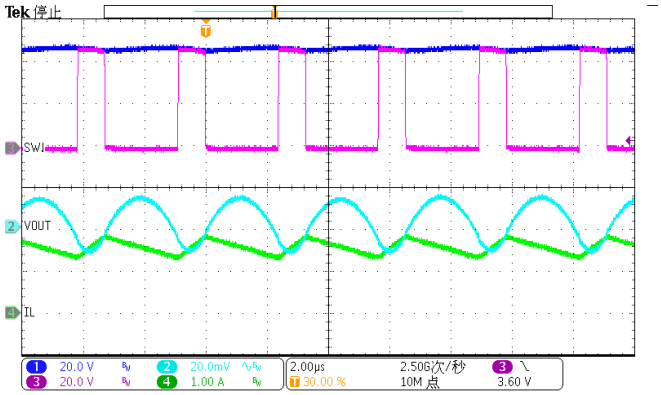


Figure 11. Steady State Ripple
Iout=1.2A

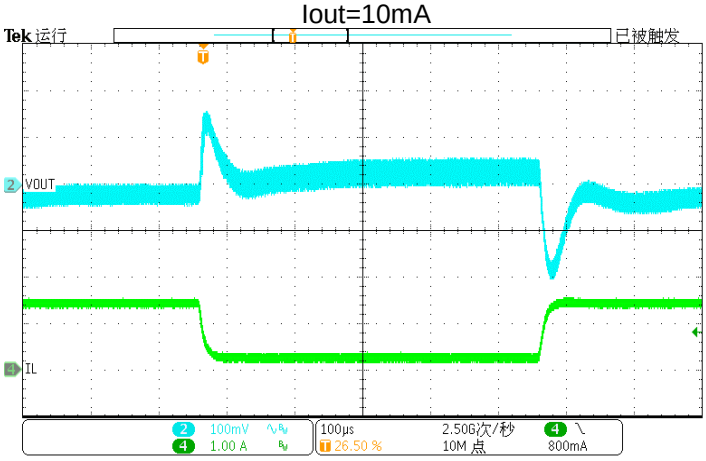


Figure 12. Load Transient
(0.375A-1.125A, SR=1600mA/us)

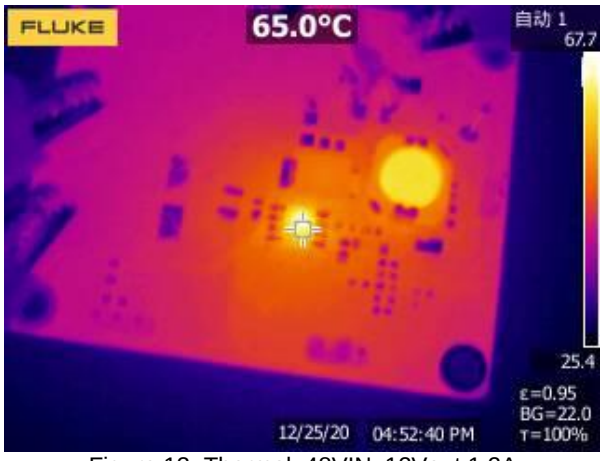


Figure 13. Thermal, 48VIN, 12Vout,1.2A

IMPORTANT NOTICE

This evaluation board kit being sold or provided by Silicon Content Technology is intended for use for ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY and is not provided by SCT for commercial use. As such, the evaluation board herein may not be complete in terms of required design, marketing, and/or manufacturing related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases SCT from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take all appropriate precautions regarding electrostatic discharge. Also, be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). No License is granted under any patent right or other intellectual property whatsoever. SCT assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind. Please read the Evaluation Board user's guide prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. Common sense is encouraged. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a SCT application engineer.
.

,