3.8V-40V Vin, 3.5A High Efficiency Synchronous Step-down DCDC Converter Evaluation Board

FEATURES

- Wide Input Range: 3.8V-40V
- Up to 3.5A Continuous Output Current
- 0.8V ±1%Feedback Reference Voltage
- Integrated 80mΩ High-Side Rdson and 50mΩ Low-Side Rdson Power MOSFETs
- 25uA Low Quiescent Current with Pulse Skipping Mode PSM at Light Load
- Low Dropout Mode Operation
- Derivable Inverting Voltage Regulator
- EMI Reduction with Frequency Spread Spectrum FSS
- Over-voltage and Over Temperature Protection
- Available in an ESOP-8 Package

APPLICATIONS

- Industrial Distributed Power Supplies
- Battery Pack Powered System - Cordless Power Tools, Cordless Home Appliance, Drone etc.
- Cigarette Lighter Adapters, USB Chargers
- USB Type-C Power Delivery
- Optical Communication and Networking System
- Automotive System

DESCRIPTION

The EV2433-B-01A Evaluation Board is designed to demonstrate the capabilities of SCT2433, high efficiency fully integrated synchronous step-down DCDC converter supporting up to 3.5A continuous output current from an input source from 3.8V to 40V. The SCT2433 features 2ms internal soft-start with fixed 570KHz switching frequency. Both devices are available in an easy-soldering 8-pin eSOP package.

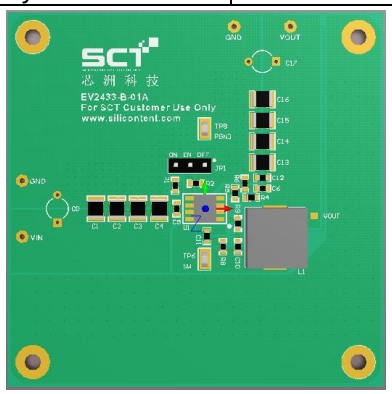
This user's guide describes the characteristics, operation and the use of the EV2433-B-01A Evaluation Module including EVM specifications, recommended test setup, test result, schematic diagram, bill of materials, and the board layout.

Board Number	IC Number
EV2433-B-01A	SCT2433

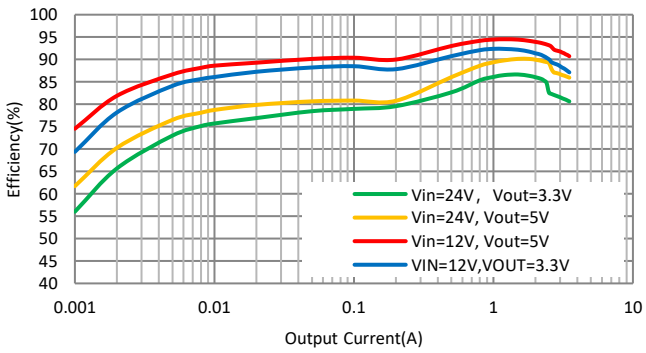
PERFORMANCE SUMMARY

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

Parameter	Condition	Value
Input Voltage	DC up to 40V	3.8V-40V
Output Voltage	Iout=0A~3.5A	3.3V ± 1%
Output Current	Continuous DC current	3.5A
Frequency	Default R3=200KΩ	570KHz



EV2430-B-01A Evaluation Board Top View



SCT2433 Efficiency, Freq.=500KHz

QUICK START PROCESURE

Evaluation board EV2433-B-01A is easy to set up to evaluate the performance of SCT2433, synchronous step-down DCDC converter. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions:
   - VIN, GND: Connect the power supply to the input of converter.
   - VOUT,GND: Connect the load to the output of converter.
   - JP1: Enable. ON Connect EN pin to V_{in} through a 100KΩ resistor to enable IC. OFF Disable IC
2. With power off, connect the input power supply to J1 V_{IN} connector and J1 GND connector. Make sure that the input voltage does not exceed 40V, and supports sufficient current limit. Turn on the power at the input.
3. Check the output voltage at VOUT. The output voltage should be 3.3V 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 JP1

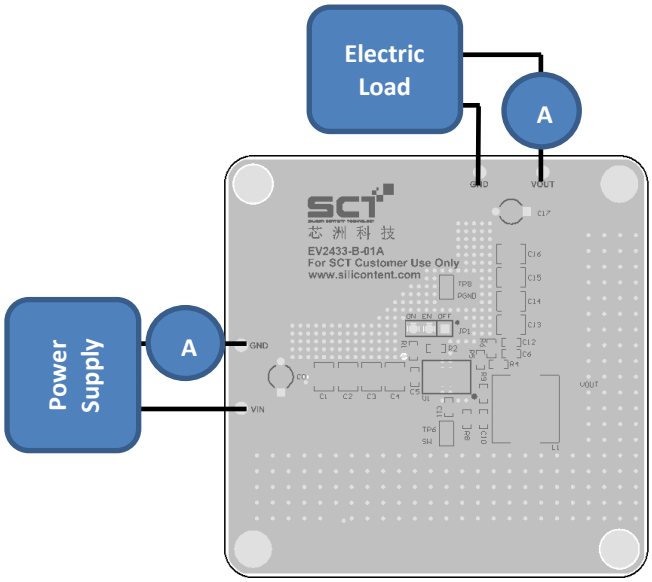


Figure 1. Power Supply, Load and Measurement Equipment Setup

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

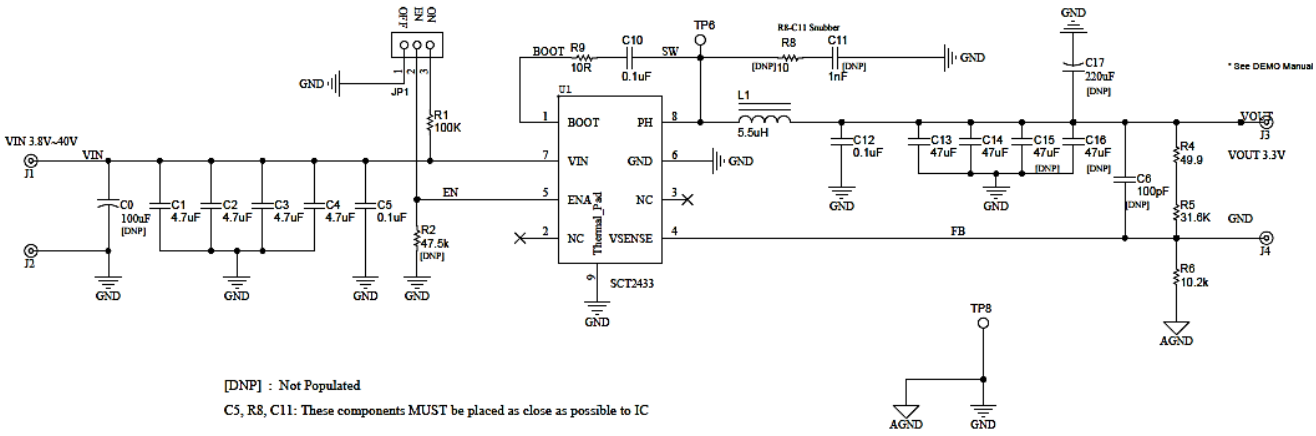


Figure 3. Evaluation Board Schematic

BILL OF MATERIALS

Table 2. Bills of Materials

Manufacture	Comment	Designator	Description	Quantity
Silicon Content Technology	SCT2433	U1	SCT2433, 3.8V-36V Vin, 3.5A, Low Quiescent Current Synchronous Step-down Converter ESOP-8, 4.0mmX5.0mm with thermal pad	1
Wurth Elektronix	613 003 111 21	JP1	Header, 100mil, 3x1, Tin, TH	1
QJCJ Factory	Terminal 1.1	J1, J2, J3, J4	Terminal 1.1	4
Wurth Elektronix	860 040 775 006	C0	WCAP-ATUL Aluminum Electrolytic Capacitors 100uF, 63V, Dimension 10x12.5	Not Installed
Wurth Elektronix	860 040 575 007	C17	WCAP-ATUL Aluminum Electrolytic Capacitors 220uF, 35V, Dimension 10x12.5	Not Installed
Wurth Elektronix	885 012 209 048	C1, C2, C3, C4	CAP, CERM, 4.7uF, 50V, +/-10%, X7R, 1210	4
Wurth Elektronix	885 012 206 095	C5	CAP, CERM, 100nF, 50V, +/-10%, X7R, 0603	1
Wurth Elektronix	885 012 206 071	C10,C12	CAP, CERM, 100nF, 25 V, +/- 10%, X7R, 0603	2
Wurth Elektronix	885 012 109 011	C13, C14	CAP, CERM, 47uF, 50 V, +/- 10%, X5R, 1210	2
Wurth Elektronix	885 012 109 011	C15, C16	CAP, CERM, 47uF, 50 V, +/- 10%, X5R, 1210	Not Installed
Wurth Elektronix	885 012 206 077	C6	CAP, CERM, 100pF, 50V, +/- 10%, X7R, 0603	Not Installed
Wurth Elektronix	885 012 206 059	C11	CAP, CERM, 1000pF, 25 V, +/- 10%, X7R, 0603	Not Installed
Wurth Elektronix	744325550	L1	Inductor, Shielded Drum Core, WE-HCI SMD Flat Wire High Current, 5.5 uH, Rate current IR 10A, Saturation Current ISAT 12A, DCR 0.0123 ohm,	1
Yageo	RC0603JR-07100KL	R1	RES 100k OHM 5% 1/10W 0603	1
Vishay	CRCW060347K5FKEA	R2	RES, 47.5k, 1%, 0.1 W, 0603	Not Installed
Vishay	CRCW060349R9FKEA	R4	RES, 49.9, 1%, 0.1 W, 0603	1
Bourns	CR0603-FX-3162ELF	R5	RES, 31.6k, 1%, 0.1 W, 0603	1
Vishay	CRCW060310K2FKEA	R6	RES, 10.2k, 1%, 0.1 W, 0603	1
Bourns	CR0603-FX-10R0ELF	R8	RES, 10, 1%, 0.1 W, 0603	Not Installed
Bourns	CR0603-FX-10R0ELF	R9	RES, 10, 1%, 0.1 W, 0603	1
Keystone	5015	TP6	Test Point, Miniature, SMT	1

PRINTED CIRCUIT BOARD LAYOUT

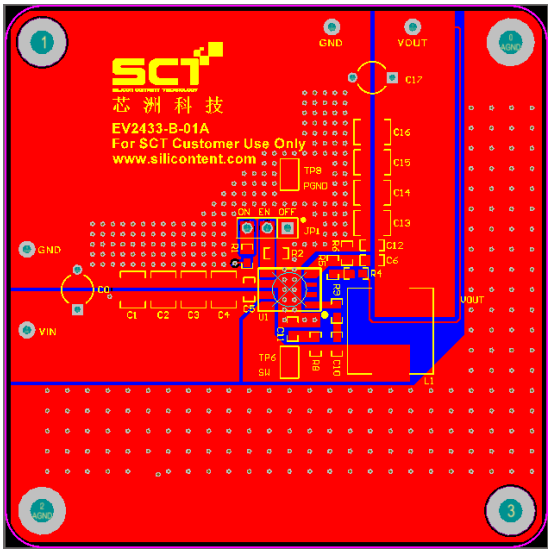


Figure 4. Top Layer

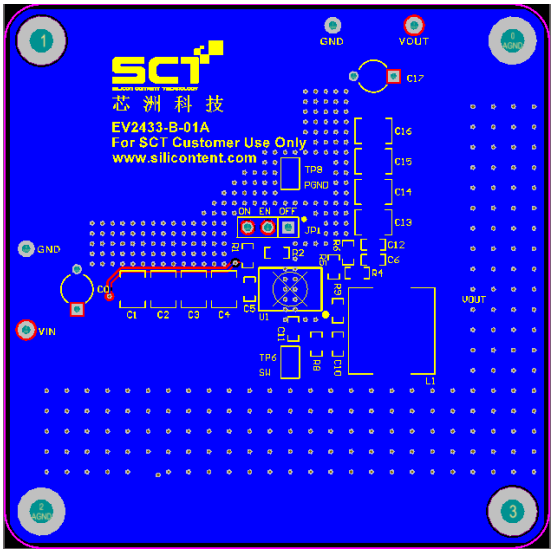


Figure **5**. Bottom Layer

EVB TEST RESULTS

Vin=24V, Vout=3.3V, unless otherwise noted

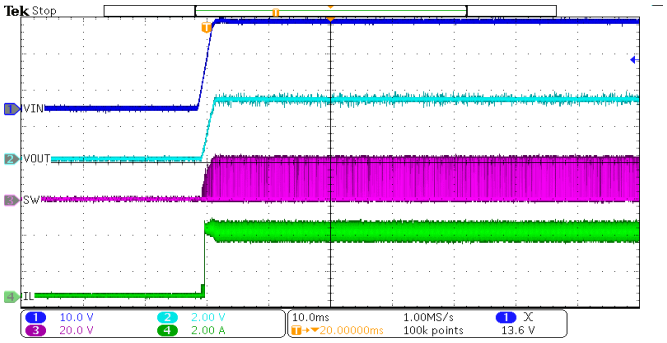


Figure 9. Power Up
(CH-1: Vin, CH-2: Vout, CH-3: SW, CH-IL)

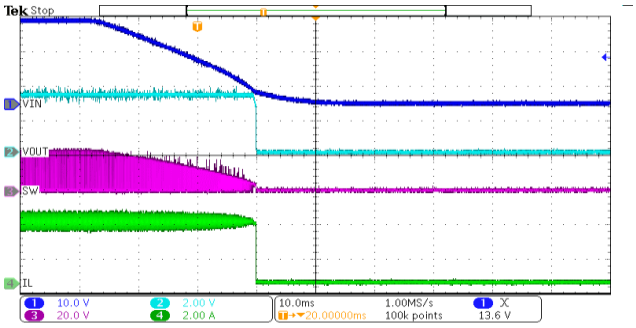


Figure 10. Power Down
(CH-1: Vin, CH-2: Vout, CH-3: SW, CH-IL)

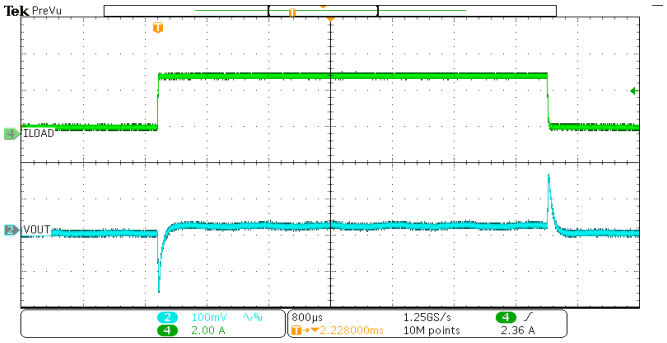


Figure 13. Load Transient
(0.35A-3.15A, SR=250mA/us, CH-1: Iout, CH-2: Vout)

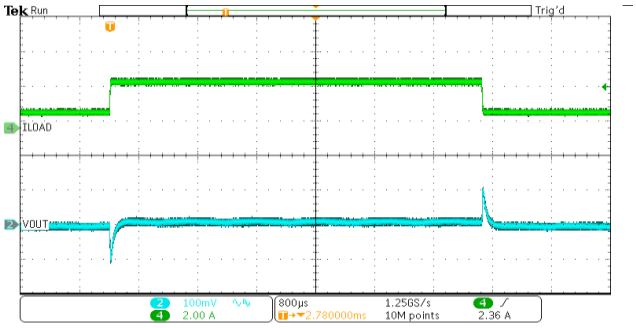


Figure 14. Load Transient
(0.87A-2.7A, SR=250mA/us, CH-1: Iout, CH-2: Vout)

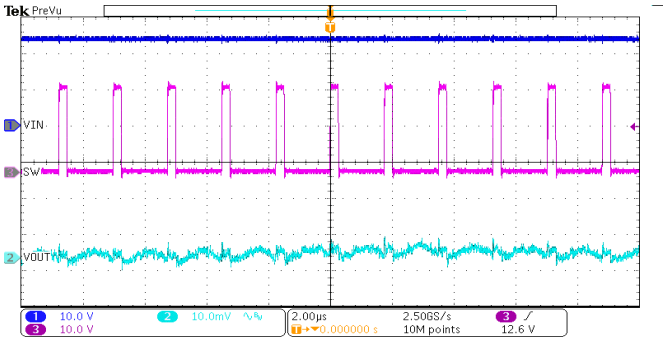


Figure 15. Output Ripple, PWM, Iout=3.5A
(CH-1: Vin, CH-2: Vout, CH-3: SW, CH-4: IL)

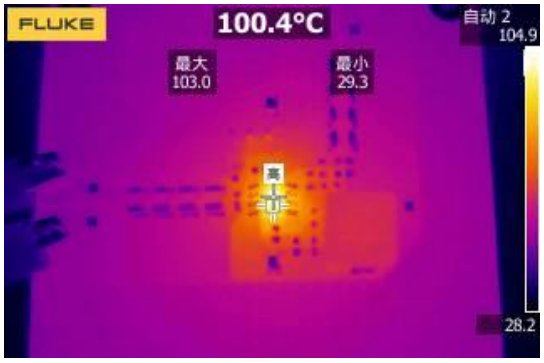


Figure 16. Thermal, 3.3Vout/3.5A
(CH-1: Vin, CH-2: Vout, CH-3: SW, CH-4: IL)

OPTIONAL MODIFICATION

Under Voltage Lockout Threshold

The SCT2433 are enabled when the VIN pin voltage rises about 3.5V and the EN pin voltage exceeds the enable threshold of 1.18V. The device is disabled when the VIN pin voltage falls below 3.1V or when the EN pin voltage is below 1.1V. An internal1.5uA pull up current source to EN pin allows the device enable when EN pin is floating.

If an application requires a higher system under voltage lockout threshold, two external resistors divider (R1 and R2) in Figure 3 can be used to achieve an expected system UVLO. The UVLO rising and falling threshold can be calculated by Equation 4 and Equation 5 respectively.

$$V_{rise} = 1.18 * \left(1 + \frac{R1}{R2}\right) - 1.5uA * R1 \quad (3)$$

$$V_{fall} = 1.1 * \left(1 + \frac{R1}{R2}\right) - 5.5uA * R1 \quad (4)$$

where:

- V_{rise} is the rising threshold of Vin UVLO.
- V_{fall} is the falling threshold of Vin UVLO

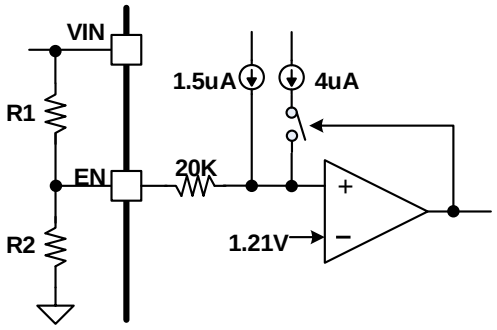


Figure 15. VIN UVLO Programmable by EN Dividers

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