

NCV890201GEVB

NCV890201 Automotive Grade High-Frequency Buck Regulator Evaluation Board User's Manual



ON Semiconductor®

<http://onsemi.com>

Description

The NCV890201 demonstration board provides a convenient way to evaluate a high-frequency buck converter design. No additional components are required, other than dc supplies for the input and enable voltages. An external clock can be used to synchronize the switching frequency; and the board also provides a synchronization output, enabling it to be used as a master. It is configured for a 3.3 V output with a 2 MHz switching frequency and a 2.0 A maximum output current, over the typical 4.5 V to 18 V automotive input voltage range. In addition, the board regulates up to 36 V thanks to switching frequency foldback.

Key Features

- 3.3 V Output Voltage
- 2 MHz Switching Frequency
- 2.0 A Current Limit
- Wide Input Voltage of 4.5 V to 36 V
- Regulates through Load Dump Conditions
- External Clock Synchronization up to 2.5 MHz
- Synchronization Output
- Automotive Grade

EVAL BOARD USER'S MANUAL



Figure 1. NCV890201GEVB Board Picture

Table 1. DEMONSTRATION BOARD TERMINALS

Terminal	Function
VIN	Positive dc input voltage
GND	Common dc return
VOOUT	Regulated dc output voltage
EN	Enable input
SYNCl	Input for external clock synchronization
SYNCO	Output for synchronizing other boards

Table 2. ABSOLUTE MAXIMUM RATINGS

(Voltages are with respect to GND)

Rating	Value	Units
Dc supply voltage (VIN, EN)	-0.3 to 36 V	V
Dc supply voltage (SYNCl)	-0.3 to 6 V	V
Junction Temperature (NCV890201)	-40 to 150	°C
Ambient temperature (Demo Board)	-40 to 85	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 3. ELECTRICAL CHARACTERISTICS

(T_A = 25°C, 4.5 V ≤ V_{IN} ≤ 40 V, V_{EN} = 2 V, V_{OUT} = 3.3 V, 0 ≤ I_{OUT} ≤ 2.0 A, unless otherwise specified)

Characteristics	Conditions	Typical Value	Units
Regulation			
Output Voltage		3.30	V
Voltage Accuracy		4	%
Line Regulation	I _{OUT} = 1.0 A	0.12	%
Load Regulation	V _{IN} = 13.2 V	0.03	%
Switching			
Switching Frequency		2.0	MHz
Soft-start Time		1.4	ms
SYNCl Frequency range		1.8 to 2.5	MHz
Current Limit			
Average Current Limit	V _{IN} = 6 to 18 V	1.8	A
Cycle-by-cycle Current Limit		2.45	A
Protections			
Input Undervoltage Lockout (UVLO)	V _{IN} decreasing	4.2	V
Thermal Shutdown	T _A increasing	170	°C

NCV890201GEVB

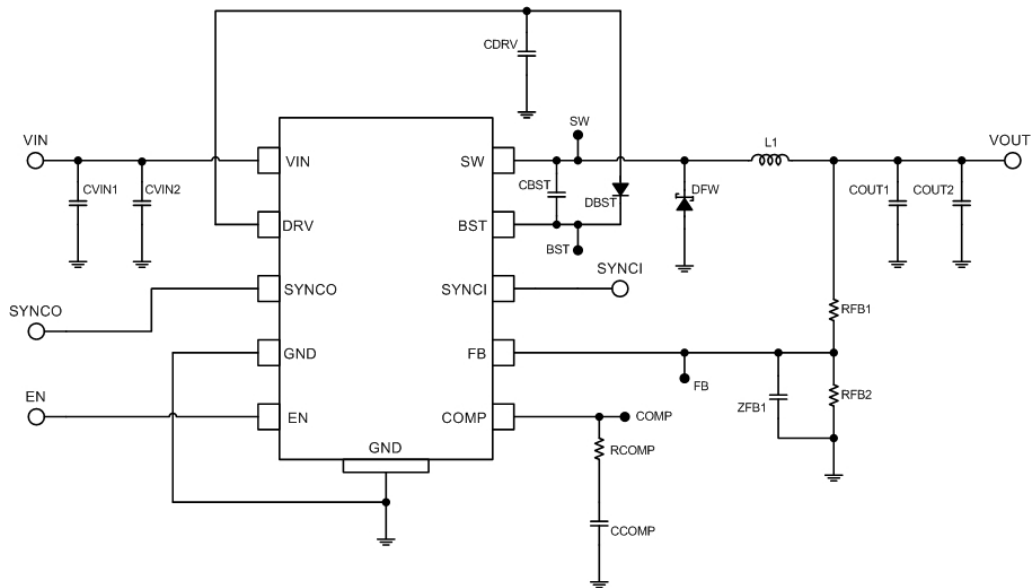


Figure 2. NCV890201GEVB Board Schematic

Operational Guidelines

1. Connect a dc input voltage, within the 4.5 V to 36 V range, between VIN and GND
2. Connect a load between VOUT and GND
3. Connect a dc enable voltage, within the 4.5 V to 36 V range, between EN and GND
4. Optionally, for external clock synchronization, connect a pulse source between SYNCI and GND. The high state level should be within the 2 to 6 V range, and the low state level within the -0.3 V to 0.8 V range, with a minimum pulse width of 40 ns and a frequency within the 1.8 to 2.5 MHz range.

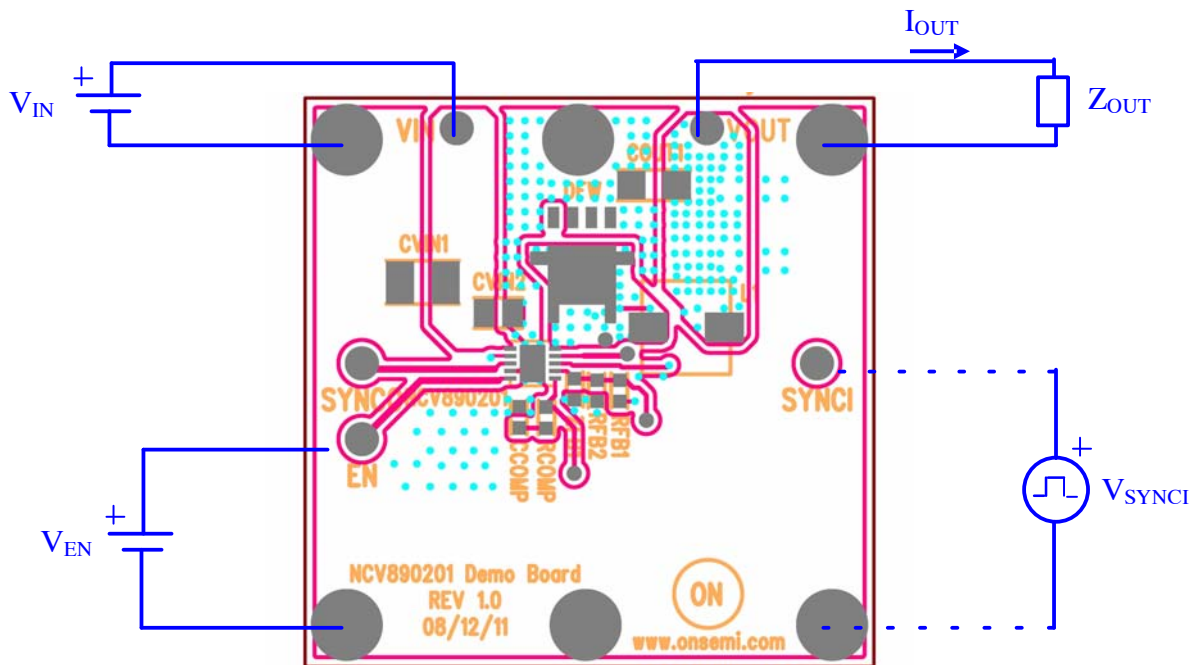


Figure 3. NCV890201GEVB Board Connections

TYPICAL PERFORMANCE

Efficiency

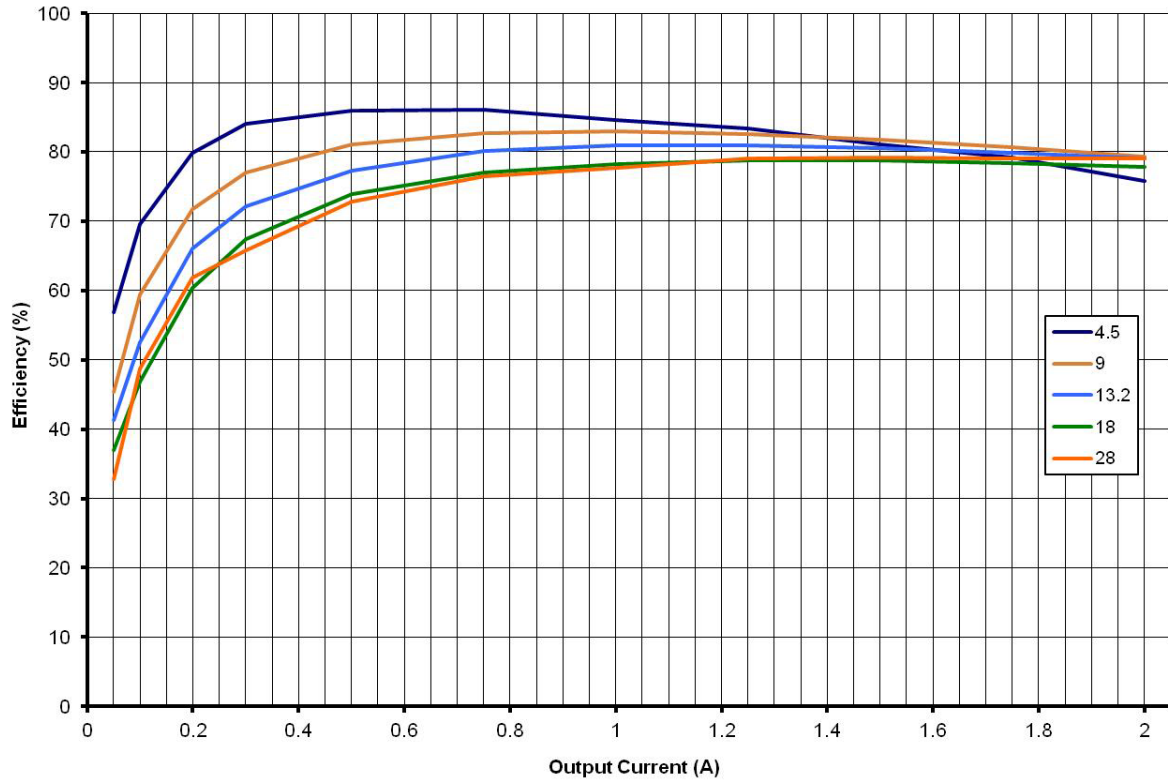


Figure 4. Efficiency at 2 MHz for a 3.3 V output

Start-up

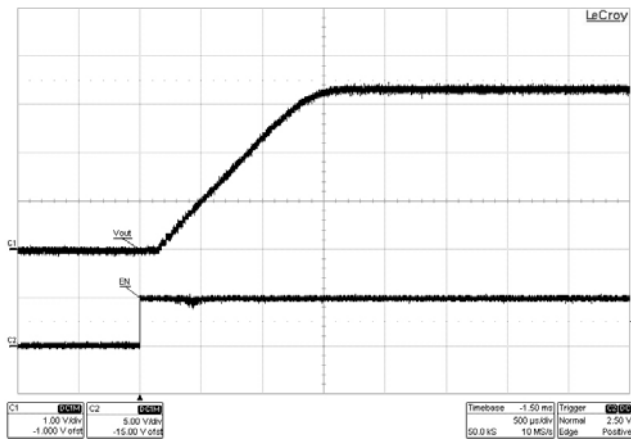


Figure 5. Typical start-up with $V_{IN} = 13.2$ V, $V_{OUT} = 3.3$ V and $I_{OUT} = 0.2$ A

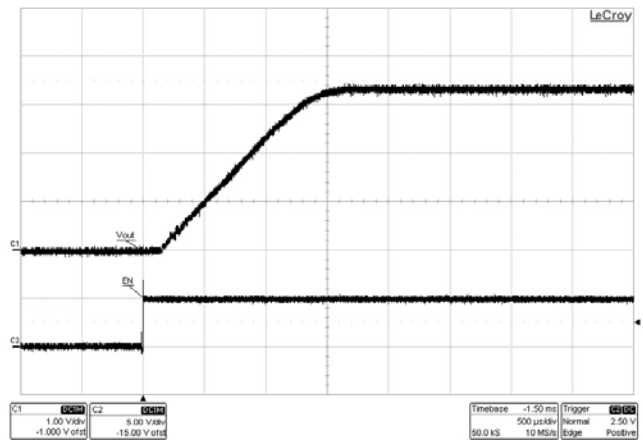


Figure 6. Typical start-up with $V_{IN} = 13.2$ V, $V_{OUT} = 3.3$ V and $I_{OUT} = 1.8$ A

Load Transients

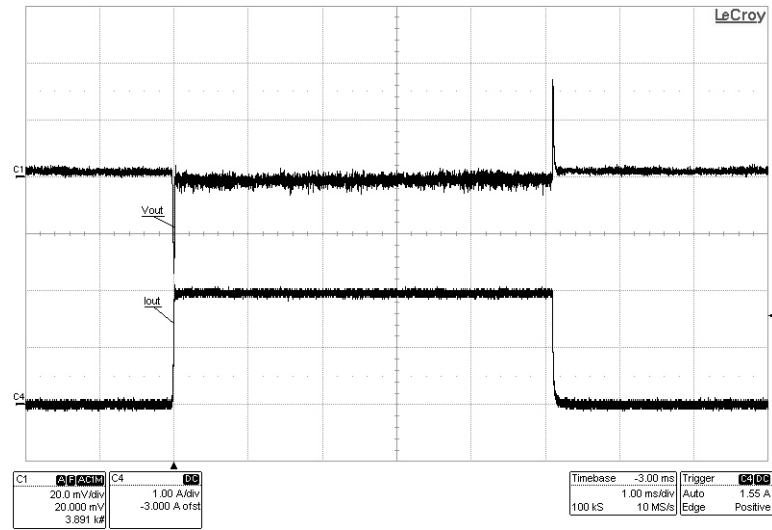


Figure 7. Load transient 0.1 A to 2.0 A, with $V_{OUT} = 3.3$ V and $V_{IN} = 13.2$ V

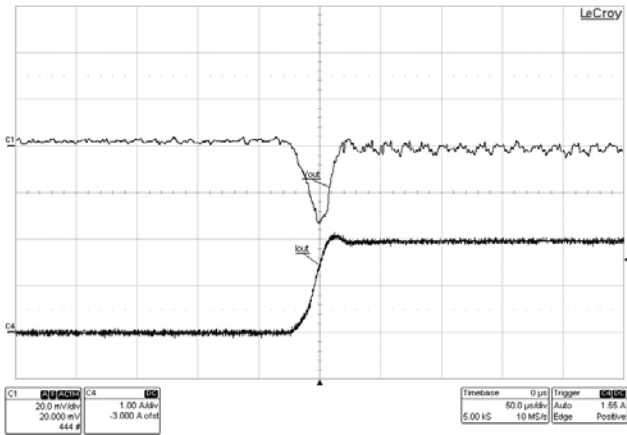


Figure 8. Load transient 0.2 A to 2.0 A, with $V_{OUT} = 3.3$ V and $V_{IN} = 13.2$ V

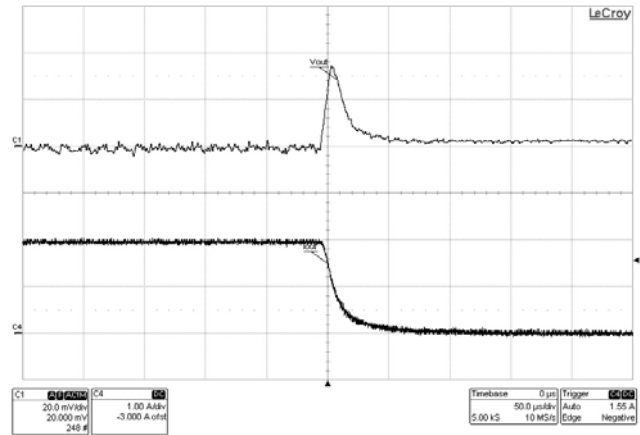


Figure 9. Load transient 2.0 A to 0.2 A, with $V_{OUT} = 3.3$ V and $V_{IN} = 13.2$ V

Synchronization

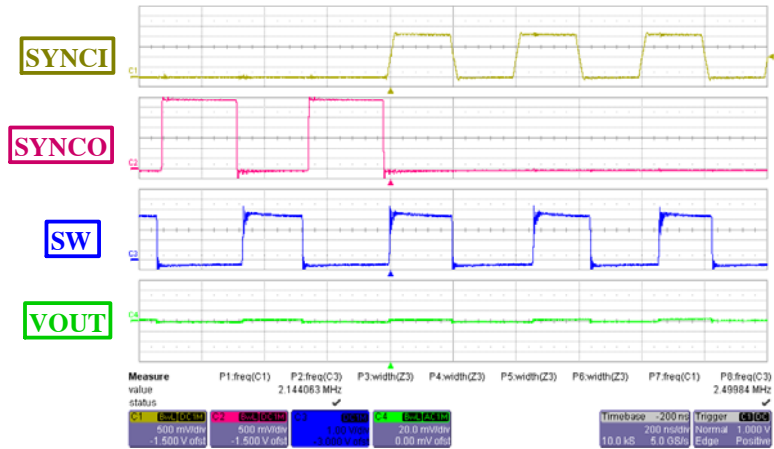


Figure 10. Starting synchronization at 2.5 MHz (from free-running)

Minimum on time

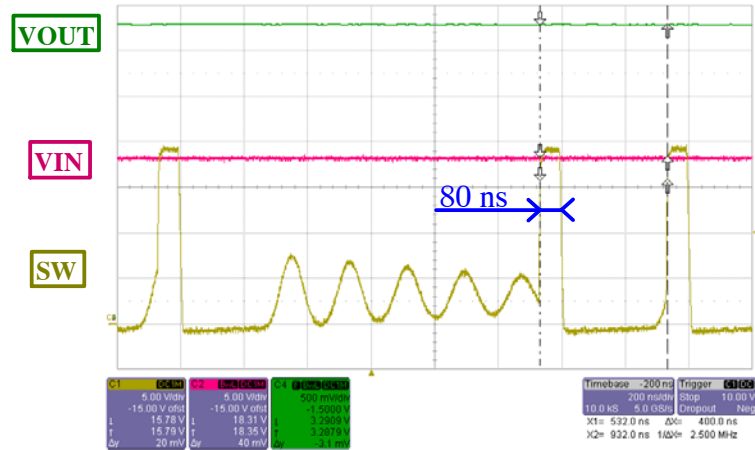
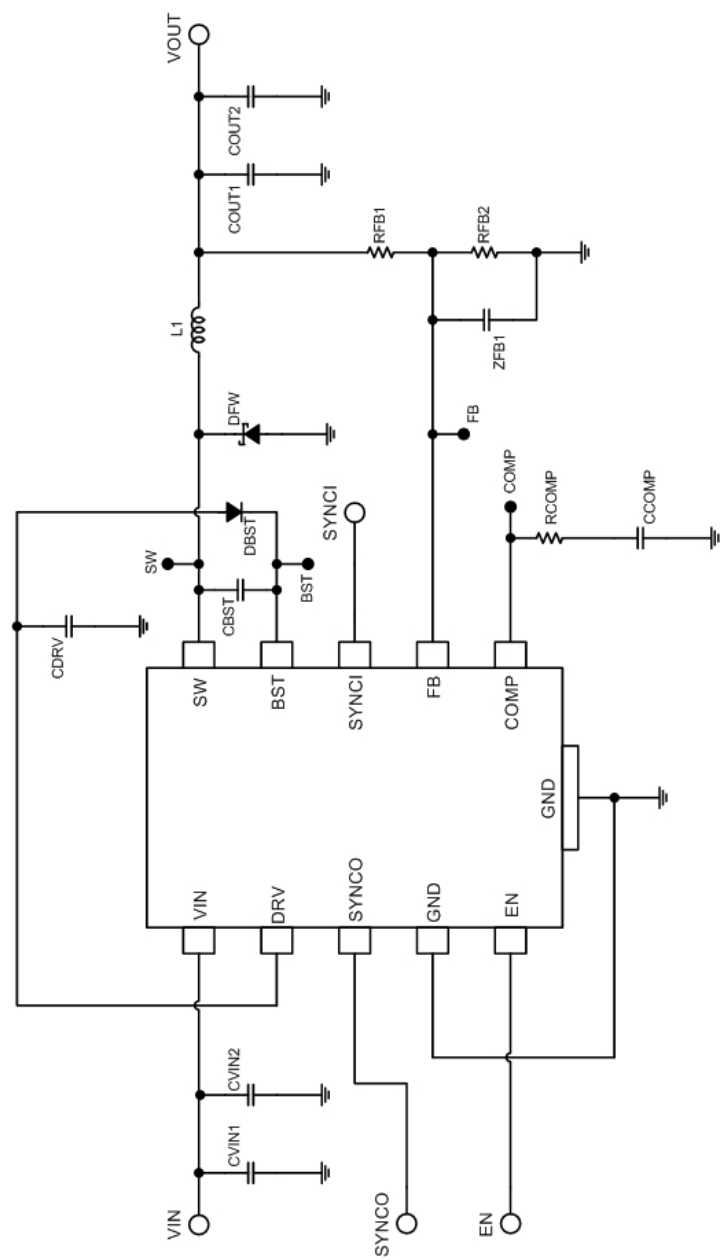


Figure 11. Minimum on time seen during a load transient

Schematic



NCV890201GEVB

PCB LAYOUT

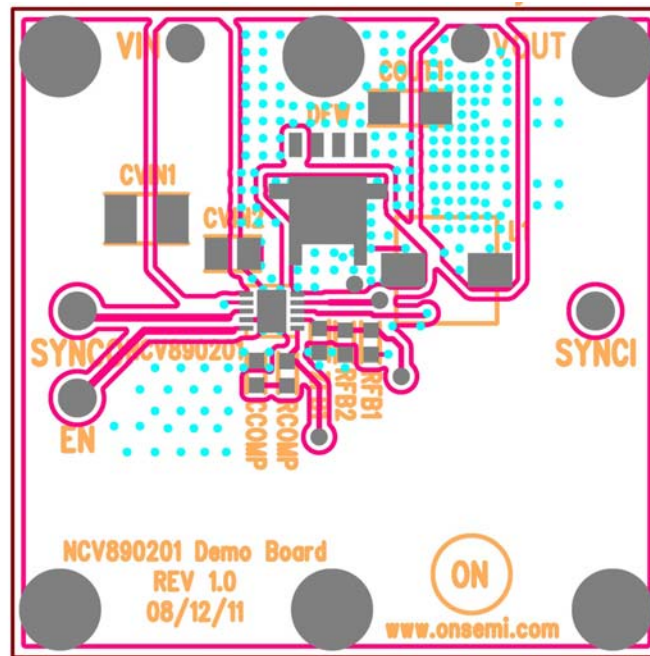


Figure 12. Top View

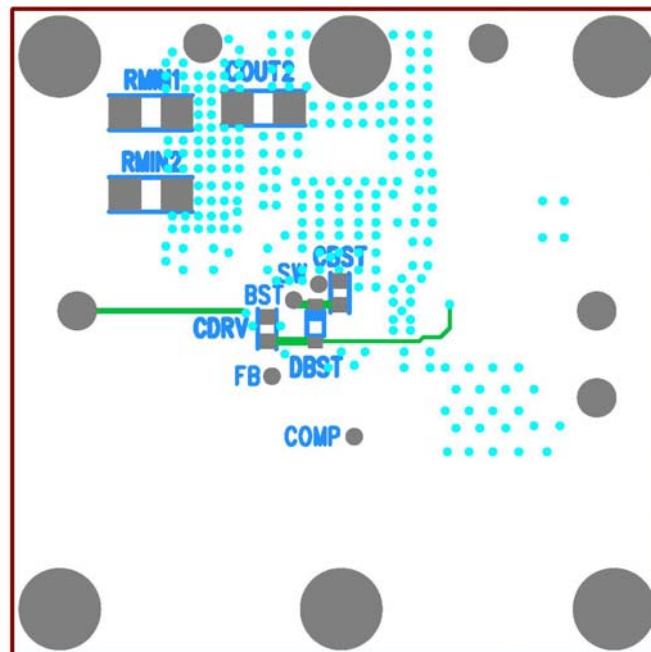


Figure 13. Bottom View

NCV890201GEVB

Table 4. BILL OF MATERIALS

Reference	Value	Part #	Manufacturer	Description	Package
U1		NCV890201	ON Semiconductor	Integrated circuit	3x3 DFN10
L1	4.7 μ H	7447786004	Würth	Inductor	WE-PD-XS
DFW		MBR340MFS	ON Semiconductor	Diode, Schottky, 1.5A, 40V	SMB
DBST		BAS16HT1	ON Semiconductor	Diode, Switching, 200mA, 75V	SOD-323
CVIN1	4.7 μ F		Murata	Capacitor, Ceramic, 50V, X7R	1210
CVIN2	1 μ F		Murata	Capacitor, Ceramic, 50V, X5R	0805
CDRV, CBST	0.1 μ F		Kemet	Capacitor, Ceramic, 10V, X7R	0603
ZFB1	4.7 nF		Murata	Capacitor, Ceramic, 50V, X7R	0603
COUT1, COUT2	10 μ F		Murata	Capacitor, Ceramic, 10V, X7R	1206
CCOMP	330 pF		Murata	Capacitor, Ceramic, 50V, C0G	0603
RCOMP	12.4 K Ω		Vishay	Resistor, 1%	0603
RFB1	100 Ω		Vishay	Resistor, 1%	0603
RFB2	31.6 Ω		Vishay	Resistor, 1%	0603

ON Semiconductor and **ON** are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9