NCV890430

NCV890430 Evaluation Board User's Manual

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EVAL BOARD USER'S MANUAL

Description

The NCV890430 is a fixed−frequency Synchronous Buck regulator intended for Automotive, battery−connected applications that operate with up to a 45 V input supply. It is suitable for automotive systems requiring low noise and low shutdown currents that also need to operate at low input voltage close to the output voltage. A reset pin (with adjustable delay) simplifies interfacing with a microcontroller. This part also features an enable input that can either be connected to a low voltage (such as a micro−controller output) or high voltage (such as the battery input), and a synchronization input. The NCV890430 also provides several protection features expected in automotive power supply systems such as current limit, short circuit protection, and thermal shutdown. In addition, the high switching frequency produces low output voltage ripple even when using small inductor values and all−ceramic input and output filter capacitors – forming a space−efficient switching regulator solution.

Top Side

Bottom Side

Figure 1. Evaluation Board Photo

Features and Benefits

- Internal 550 mΩ P Channel and 300 mΩ N−Channel Power Switches
- Capable of 100% Duty Cycle Operation
- V_{IN} Operating Range 3.5 V to 37 V, Withstands Load Dump to 45 V
- 2 MHz Free−running Switching Frequency
- Shutdown Current Less than 10 μA
- High Voltage Enable Pin
- Synchronization Input Pin
- Maximum DC Output Current of at Least 0.6 A
- Fixed Output Voltages of 2.5 V, 3.3 V or 5.0 V with ±2% Accuracy

Typical Applications

- Automotive Infotainment and Instrumentation
- Automotive Body Applications
- Linear Regulator Replacement
- Rear View Camera

BLOCK DIAGRAM

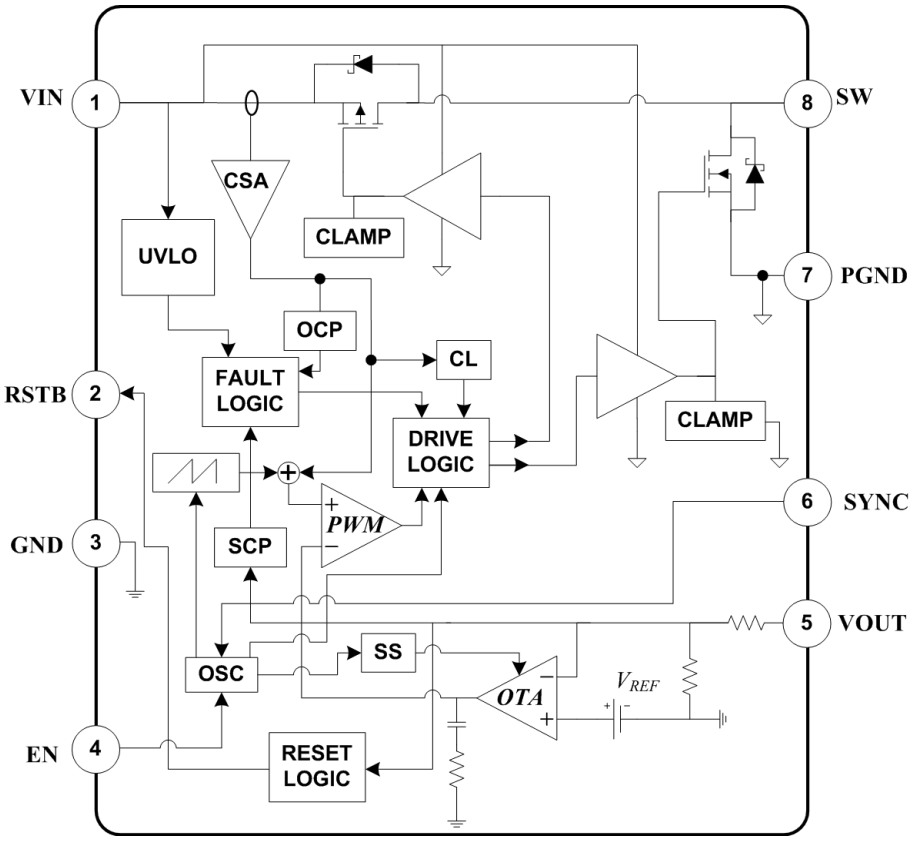


Figure 2. NCV890430 Simplified Block Diagram

TYPICAL APPLICATION

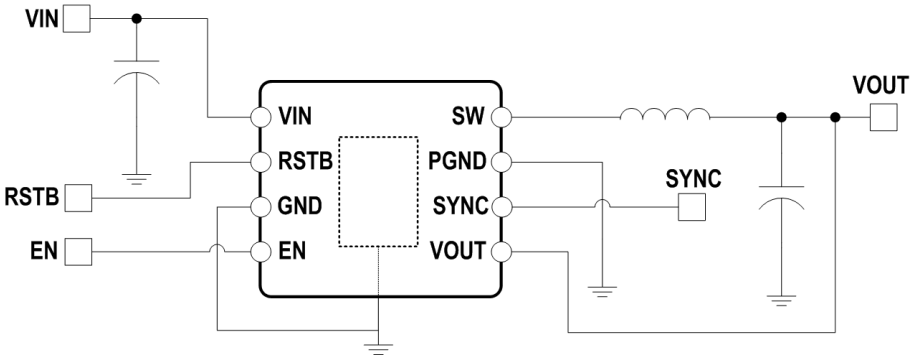


Figure 3. NCV890430 Typical Application Diagram

Table 1. EVALUATION BOARD TERMINALS

Pin Number	Pin Name	Function
1	VIN	Input voltage from battery. Place an input filter capacitor in close proximity to this pin.
2	RSTB	Reset reporting flag. Open drain output, pulling down to ground when the output voltage is out of regulation. The value of the external pull−up resistor determines the delay time that the Reset is held low.
3	GND	Analog ground reference − should be connected directly to the output capacitor ground and the exposed pad.
4	EN	Enable input. Connecting a “high” voltage (TTL compatible, battery voltage tolerant) to this pin turns on the regulator. A low voltage forces the part into a very low Iq shutdown mode.
5	VOUT	Output voltage sensing for regulation.
6	SYNC	Synchronization input. Connecting an external clock to this pin synchronizes switching to the rising edge of the SYNC signal.

Table 2. ABSOLUTE MAXIMUM RATINGS

(Voltages are with respect to GND)

Rating	Value	Units
DC supply voltage (VIN)	−0.3 to 45	V
DC supply voltage (EN)	−0.3 to 40	V
DC supply voltage (VOUT)	−0.3 to 18	V
DC supply voltage (SYNC and RSTB)	−0.3 to 6	V
Storage Temperature Range	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 3. ELECTRICAL CHARACTERISTICS

Characteristics	Conditions	Typical Value	Units
Regulation			
Output Voltage (NCV890430MW25GEVB)		2.5	V
Output Voltage (NCV890430MW33GEVB)		3.3	V
Output Voltage (NCV890430MW50GEVB)		5.0	V
Switching			
Switching Frequency		2.0	MHz
Soft−start Time		1.4	ms
Synchronization Frequency Range	2.5 V version 3.3 V and 5.0 V version	1.8 to 2.2 1.8 to 2.5	MHz
Current Limit			
Peak Current Limit		1.9	A
Protections			
Input Undervoltage Lockout (UVLO)	V_{IN} decreasing	3.2	V
Input Overvoltage Protection	V_{IN} increasing	37	V
Thermal Shutdown	T_J rising	170	°C

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Quick−Start Guide

The following steps will get you familiar with the setup of inputs and outputs of the NCV890430.

Required Equipment

1 DC Source – ≥ 40 V, ≥ 2 A capable	VIN
1 Oscilloscope – 2 Channel minimum	VOUT and SW
1 Multi−meter	VOUT
1 DC Electronic Load – 1 A capable	ILOAD

1. Disconnect the EN jumper.
2. Connect DC source set to 13.2 V DC between the VIN and GND terminals in the center left of the evaluation board.
3. Connect a multi−meter or oscilloscope probe between the VOUT and GND terminals located in the center right of the evaluation board.
4. Connect the EN jumper between VIN to the EN input.
   Verify that VOUT is:
   a.) 2.5 V ±2% for NCV890430MW25GEVB
   b.) 3.3 V ±2% for NCV890430MW33GEVB
   c.) 5.0 V ±2% for NCV890430MW50GEVB
5. Apply a 600 mA load to VOUT.
   a.) Verify that VOUT is at the necessary regulated voltage.
   b.) Place a scope probe tip on the SW side of L1. It should show a stable 2 MHz pulsed waveform with amplitude approximately between VIN and GND.
6. While at load, increase VIN to 21 V.
   Verify that the SW signal now shows a stable 1 MHz pulsed waveform with amplitude approximately between VIN and GND.
7. Increase VIN to 39 V.
   Verify the switching regulator turns off and there is 0 V at VOUT.
8. Reduce VIN to 13.2 V.
   Verify that VOUT is restored to the necessary regulated voltage and that the SW signal returns to a 2 MHz pulsed waveform with amplitude approximately between VIN and GND.
9. Remove the jumper between VIN the EN input.
   Verify the switching regulator turns off and there is 0 V at VOUT.
10. Disconnect all external connections from the board and restore the EN jumper.

Soft Start

The NCV890430 contains a battery−connectable EN pin for the regulator. A common setup includes the following connections:

EN → VIN

When the EN connection on the board is as shown above, the following startup profile can be seen on an oscilloscope:

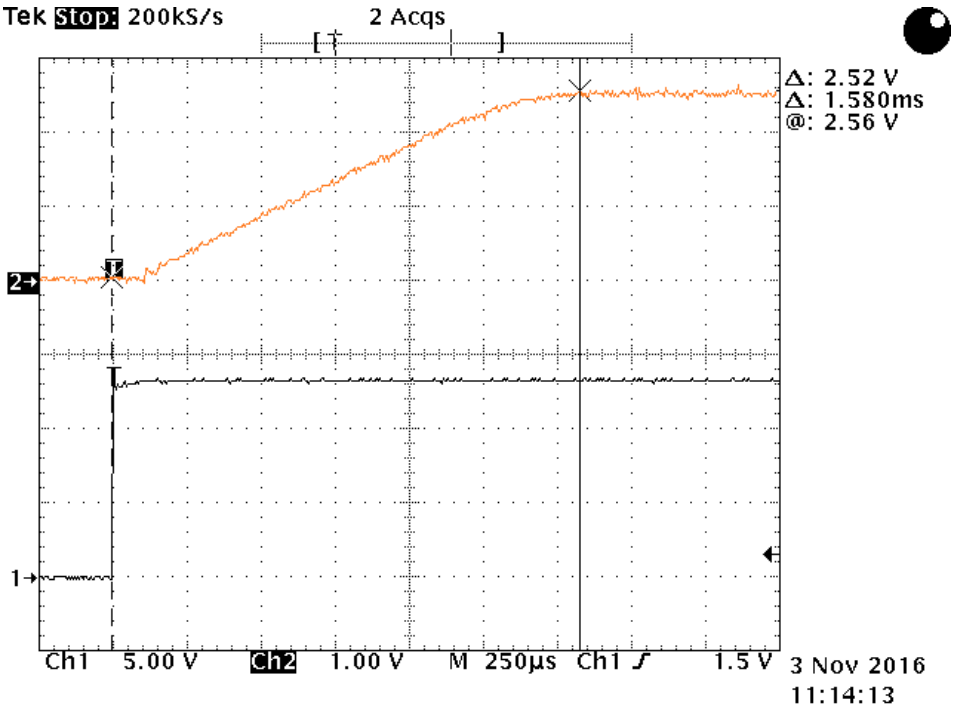


Figure 4. Typical NCV890430 Startup Profile

EMI Filter

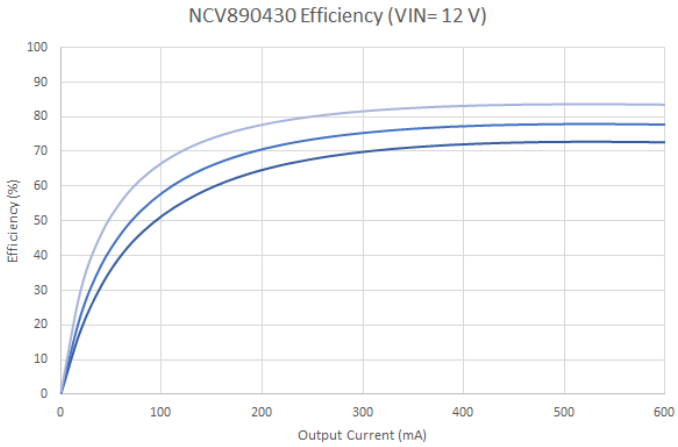
In a typical application, an LC filter is used on the input line of a buck regulator to filter EMI from the device. On this demo board, an LC filter is pre−populated to allow you to perform EMI testing directly with this demo board.

Figure 5. LC Filter on VIN Line

LF1: 1.0 μH
CF1: 0.1 μF

An input filter can drastically reduce the emissions from a switching regulator.

Efficiency



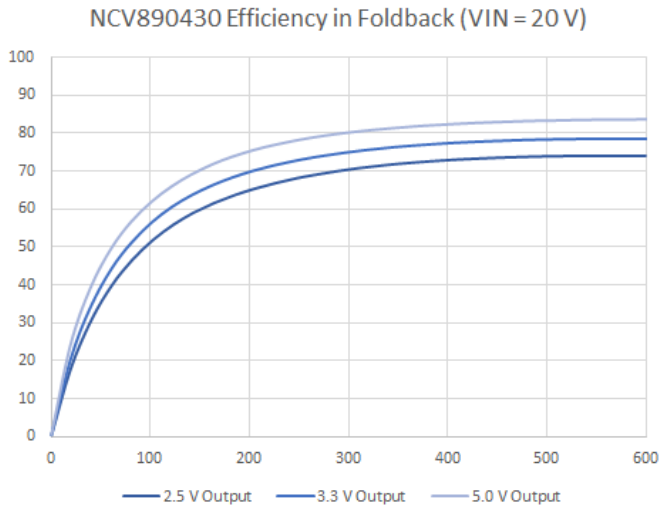


Figure 6. NCV890430 Efficiency Curves

SCHEMATIC

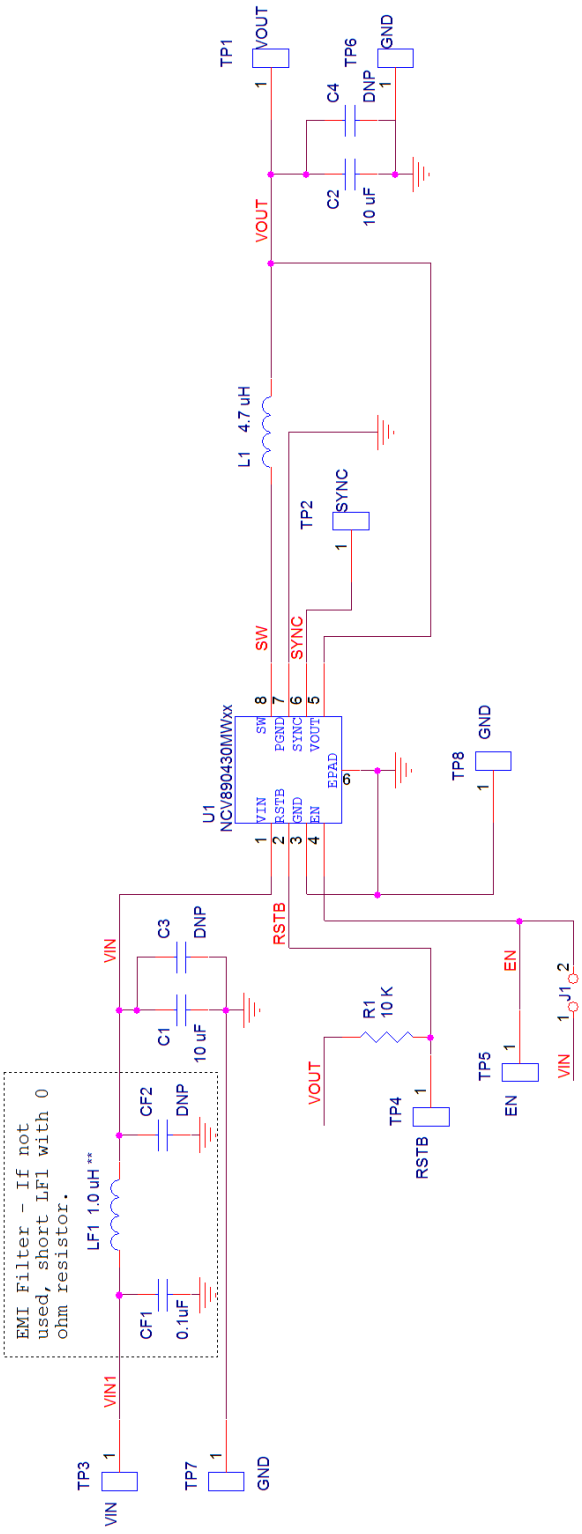


Figure 7. NCV890430MWxxGEVB Evaluation Board Schematic − Rev.1

PCB LAYOUT

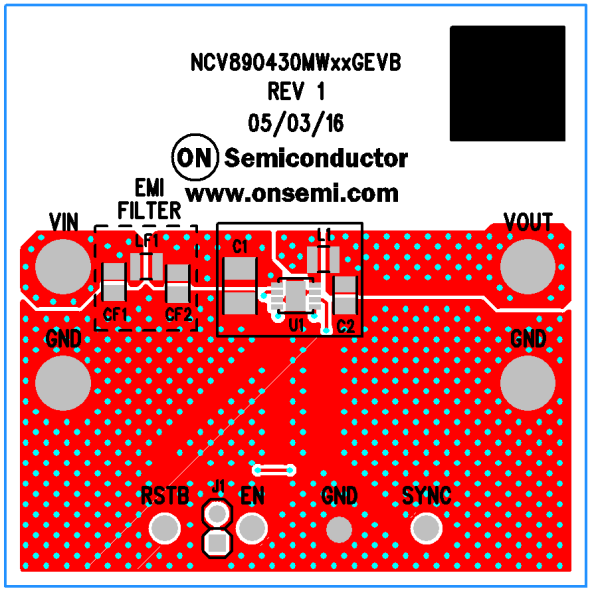


Figure 8. NCV890430MWxxGEVB PCB Layout – Top

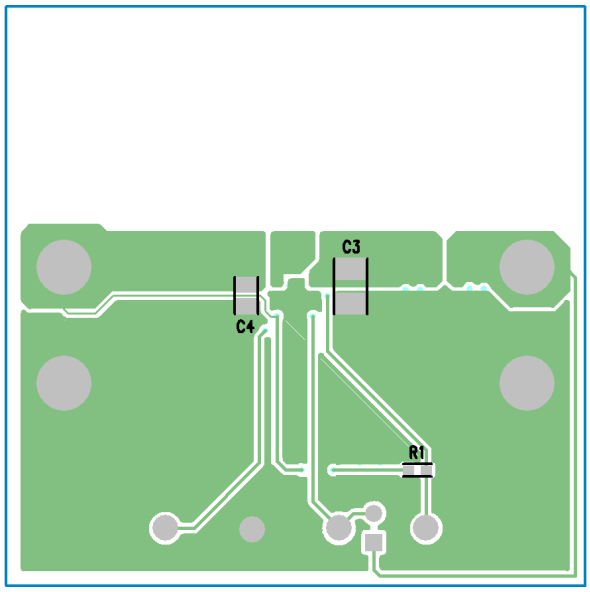


Figure 9. NCV890430MWxxGEVB PCB Layout – Bottom (mirrored)

All evaluation board PCB layouts are identical with the exception of TOP Silkscreen and device mounted upon them.

BILL OF MATERIALS

Table 4. BILL OF MATERIALS

Reference Designator(s)	Qty	Description	Value	Toler-ance	Footprint	Manufacturer	Manufacturer's Part Number
C1	1	CAP CER 10UF 50V 10% X7R 1210	10 μF	10%	1210	Taiyo Yuden	UMK325AB7106KM−T
C3	1	CAP CER 10UF 50V 10% X7R 1210	10 μF	10%	DNP	Taiyo Yuden	UMK325AB7106KM−T
C2	1	CAP CER 10UF 10V 10% X7R 0805	10 μF	10%	805	Murata Electronics North America	GRM21BR71A106KE51L
C4	1	CAP CER 10UF 10V 10% X7R 0805	10 μF	10%	DNP	Murata Electronics North America	GRM21BR71A106KE51L
CF1	1	CAP CER 0.1UF 50V 10% X7R 0805	0.1 μF	10%	805	Murata Electronics North America	GCM21BR71H104KA37K
CF2	1	CAP CER 0.1UF 50V 10% X7R 0805	0.1 μF	10%	DNP	Murata Electronics North America	GCM21BR71H104KA37K
L0	1	FIXED IND 1UH 2.5A 75 MOHM SMD	1.0 μH	30%	WURTHSMA LLSMDL	Wurth Electronics Inc	78438323010
L1	1	FIXED IND 4.7UH 940MA 388 MOHM	4.7 μH	30%	WURTHSMA LLSMDL	Wurth Electronics Inc	78438323047
R1	1	RES 10.0K OHM 1/10W 1% 0603 SMD	10.0 K	1%	603	Vishay/Dale	CRCW060310K0FKEA
GND1, GND2, VIN1, VOUT	4	TERM SOLDER TURRET .219" .109"L	N/A	N/A	TURRET	Mill−Max Manufacturing Corp.	2501−2−00−44−00−00−07−0
J1	1	DIODE SCHOTTKY 4.0A 40V SMB	N/A	N/A	JMP	Molex Connector Corporation	22−28−4023
	1	DIODE SWITCH 200MA 100V SOD323	N/A	N/A		Sullins Connector Solutions	SSC02SYAN
EN, GND3, RSTB, SYNC	4	High Current Shielded Inductor 1.0uH, 8.7A SAT	N/A	N/A	TP	Vector Electronics	K24C/M
U1	1	High Current Shielded Inductor 2.2uH, 5.6A SAT	N/A	N/A	8PINDFNP 65	ON Semiconductor	NCV890430MWxxTXG

*The Bills of Materials for all three evaluation boards covered in this user's manual are identical with the exception of the mounted device. This can be either NCV890430MW25TXG, NCV890430MW33TXG, or NCV890430MW50TXG.

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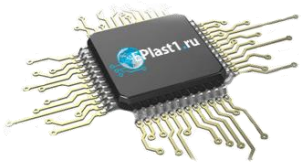

Как с нами связаться

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