NCV760040 Evaluation Kit User's Manual

EVBUM2930/D

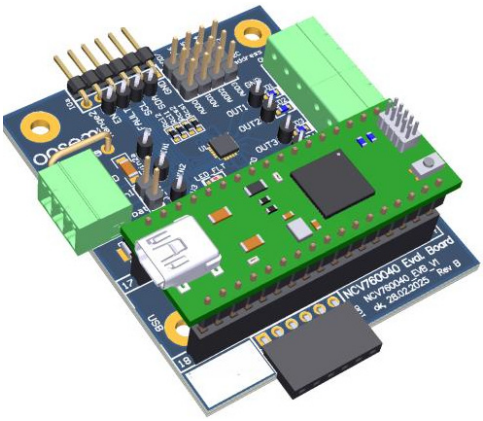

Figure 1. Board Picture

Features

This document describes NCV760040 evaluation kit for the NCV760040 Quad High-side driver. The kit consists of the NCV760040 evaluation board, ONMCU3V3R2GEVB control board and an USB-C cable. The evaluation board contains all the application components allowing evaluation of NCV760040 functionality and its major parameters.

Evaluation Board Features

- On-board 3.3 V LDO
- Two Supply Inputs
- Device I^2C Address Selection
- Two Current Limit and Current Sense Configurability
- LEDs For Output Status Indication and FAULT Diagnostics
- Good Thermal Connection of NCV760040 Allowing High Current Capability
- Oscilloscope Test-Points on All Important Signals
- Compatible with ONMCU3V3R2GEVB, ONMCU3V3R1GEVB (3.3 V) or ONMCU5V0R2GEVB, ONMCU5V0R1GEVB (5.0 V) MCU Module with USB Interface for PC Control
- Easy-to-Use GUI
- Header Providing Stacking of the Evaluation Boards and Connection of the Board Into a More Complex Application Setup

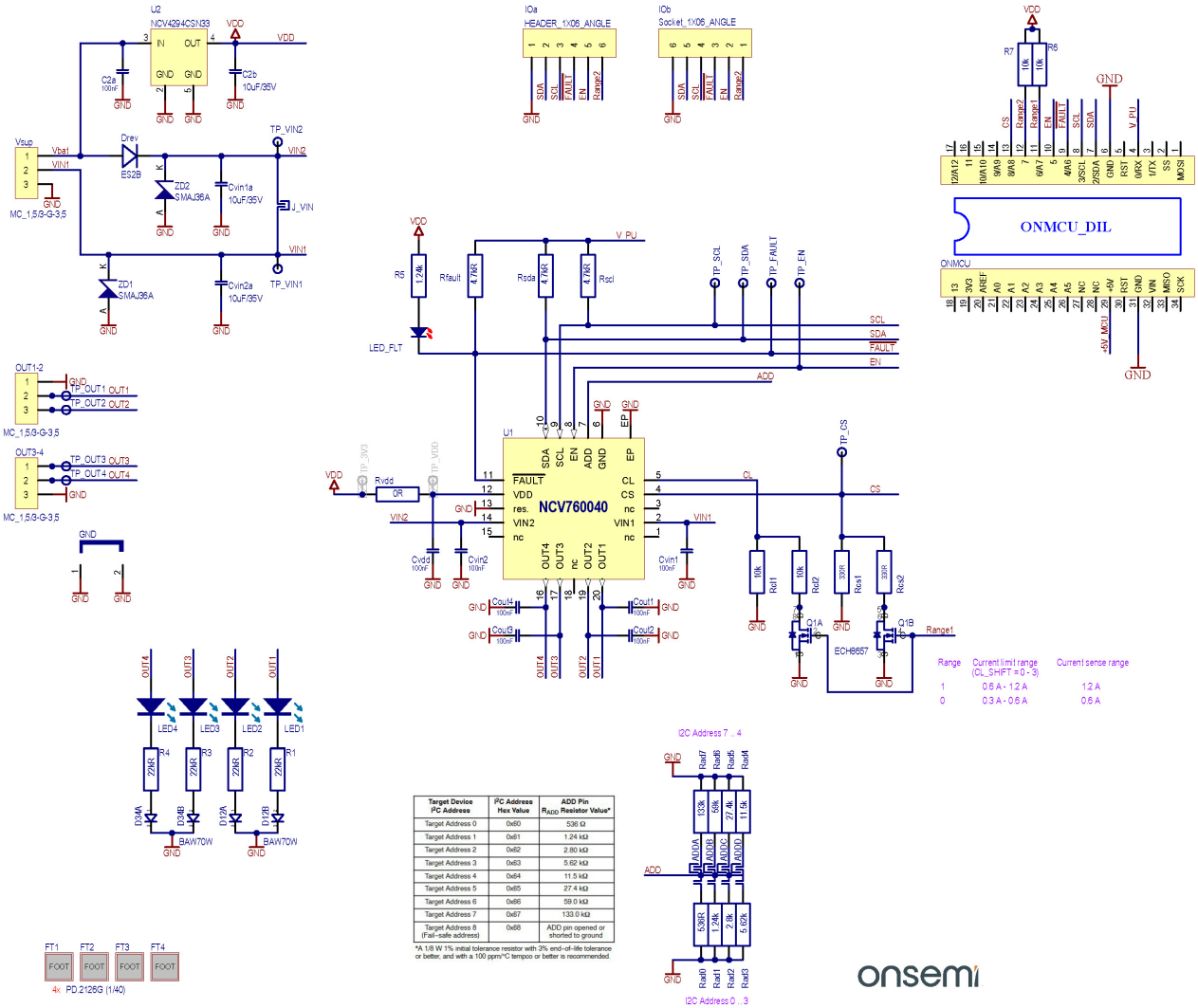

Figure 2. NCV760040 Evaluation Board Schematic

ABSOLUTE MAXIMUM RATINGS

Rating	External Pin	Min	Max	Unit
Power Supply voltage 1	Vbat	−40	40	V
Power Supply voltage 2	VIN1	−0.3	40	V
Outputs voltage	OUT1, OUT2, OUT3, OUT4	−0.3	40	V
Outputs current	OUT1, OUT2, OUT3, OUT4	0	Internally limited	A
Digital inputs / outputs voltage	EN, SCL, SDA, FAULT, Range2	−0.3	5.5	V
SDA output current	SDA	−10	20	mA
NCV760040 junction temperature	–	−40	+150	°C
Board temperature	–	−40	+125	°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.

RECOMMENDED OPERATING RANGES

Rating	External Pin	Min	Max	Unit
Power Supply voltage 1	Vbat	4.5	28	V
Power Supply voltage 2	VIN1	4.5	28	V
Digital inputs / outputs voltage	EN, SCL, SDA, FAULT, Range2	0	3.3	V
Outputs current	OUT1, OUT2, OUT3, OUT4 – Single Channel On, T_J < 150°C – All Channels On, T_A < 125°C – All Channels On, T_A < 105°C – All Channels On, T_A < 85°C	 – – – –	 1.2 529 710 854	A
I^2C frequency	SCL, SDA	–	1.0	MHz
NCV760040 junction temperature	–	−40	+150	°C
Board temperature	–	−40	+105	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

FUNCTIONAL DESCRIPTION

The NCV760040 is an I^2C-enabled target device featuring four independent high-side outputs constructed using two back-to-back NMOS power transistors for true reverse current blocking capability. Each output is protected against short to battery, short to ground, and overtemperature faults. An off-state open load diagnostic supports system-level fault detection.

Supply strategy

The supply is divided into three main paths:

- Main (battery) supply – this path supplies VIN2 of NCV760040 as well as on-board 3.3 V LDO for VDD logic supply of NCV760040. This path is protected against reverse polarity voltage.
- VIN1 supply – this path is directly connected to VIN1 pin of NCV760040 and therefore cannot withstand reverse polarity. It may be connected to VIN2 through a jumper J_VIN.
- The MCU is supplied from USB to maintain USB connection with the MCU as well as to allow quiescent current measurement of NCV760040.

As the ONMCU board is supplied from the USB connector, allowing quiescent current measurement of NCV760040. To measure the VDD consumption of NCV760040 only, 0R resistor Rvdd has to be replaced by 10-100R resistor.

Getting Started

The board supports a full access to NCV760040 control and diagnostics using a PC connected to the board via USB and ONMCU daughterboard.

The GUI software is part of the installation package, which can be downloaded from the EVK product page: onsemi EVK Product Page.

On top of that, an external I^2C master might control NCV760040 through IO connector with the ONMCU daughterboard present (but not communicating) or removed.

Device I^2C Address

To allow I^2C communication, a valid address has to be selected through the ADD header array, connecting appropriate resistors to the ADD pin. The device is able to detect invalid address (no jumper or jumper inappropriately placed). The same address has to be selected in the software.

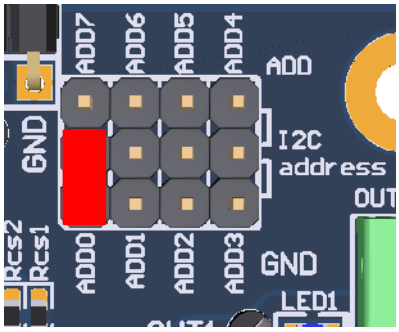

Figure 3. EVB Address Setting (Target Address 0)

Current Limit

The device contains a current limit for the outputs. It is defined by Rcl1/2 resistors. By default, a limit of 0.6 A is selected. It might be changed to 0.3 A by pulling Range1 signal low. On top of that, the device allows increasing the limit through the I^2C control up to the double.

Current Sensing

The device provides possibility to sense the selected output current. The current sense range is defined by Rcs1/2 resistors. By default, the range of 1.2 A is selected to cover the highest possible current limit range. The range selection is bound with the current limit selection, controlled by the Range1 signal. The software is able to display the internal ADC readback value as well as its current representation and voltage over Rcs measured directly by the MCU. The maximum sensed current is limited to 600 mA due to 3.3 V VDD supply.

Functions of LEDs

The board contains LEDs indicating status of the outputs. LED1-4 indicate active output, including diagnostic current. Dur to a higher voltage drop they do not affect the open load diagnostic feature.

LED_FLT indicate a fault if enabled in the Fault Pin Configuration register (0x81).

Table 1. Functions of LEDs

LED	Function	Color
LED1	OUT1 Status	Blue
LED2	OUT2 Status	Blue
LED3	OUT3 Status	Blue
LED4	OUT4 Status	Blue
LED_FLT	FLT pin Fault indication	Red

Stacking the Boards

More “slave” evaluation boards without ONMCU may be stacked using IOa and IOb connectors. Each board must have unique I^2C address (ADD jumpers) and VIN1/2 supply connected.

To control the current limit and current sense range of the “slave” boards from the software, pins 11 and 12 on the ONMCU socket have to be bridged on the “slave” boards.

Control Software

The software provides full access to all the device I^2C registers, EN and FAULT pins and allows changing the current sense and limit ranges.

The connection is done through a “Connect” button in the main framework, as shown in Figure 3. If the board is not detected automatically (COM port appears), click the Refresh button. After successful connection, the I^2C interface is configured automatically and EN pin set high. Disconnection of the board is detected automatically. The “mockup” is a software standalone mode without the board connected. All the returned values are random, nothing is sent to a virtual COM port.

The software provides calculation of the ADC readout to the current in line with the Range (Rcs1/2 resistors) selection. In addition, the voltage over the Rcs1/2 resistors is sampled by the MCU ADC converter with the accuracy of 10%.

Firmware Updates

The ONMCU board and PC software supports firmware updates through the USB. The update procedure is described in a separate document. The update is normally not necessary, the boards are delivered with programmed MCU.

Figure 4. NCV760040 Controller Framework

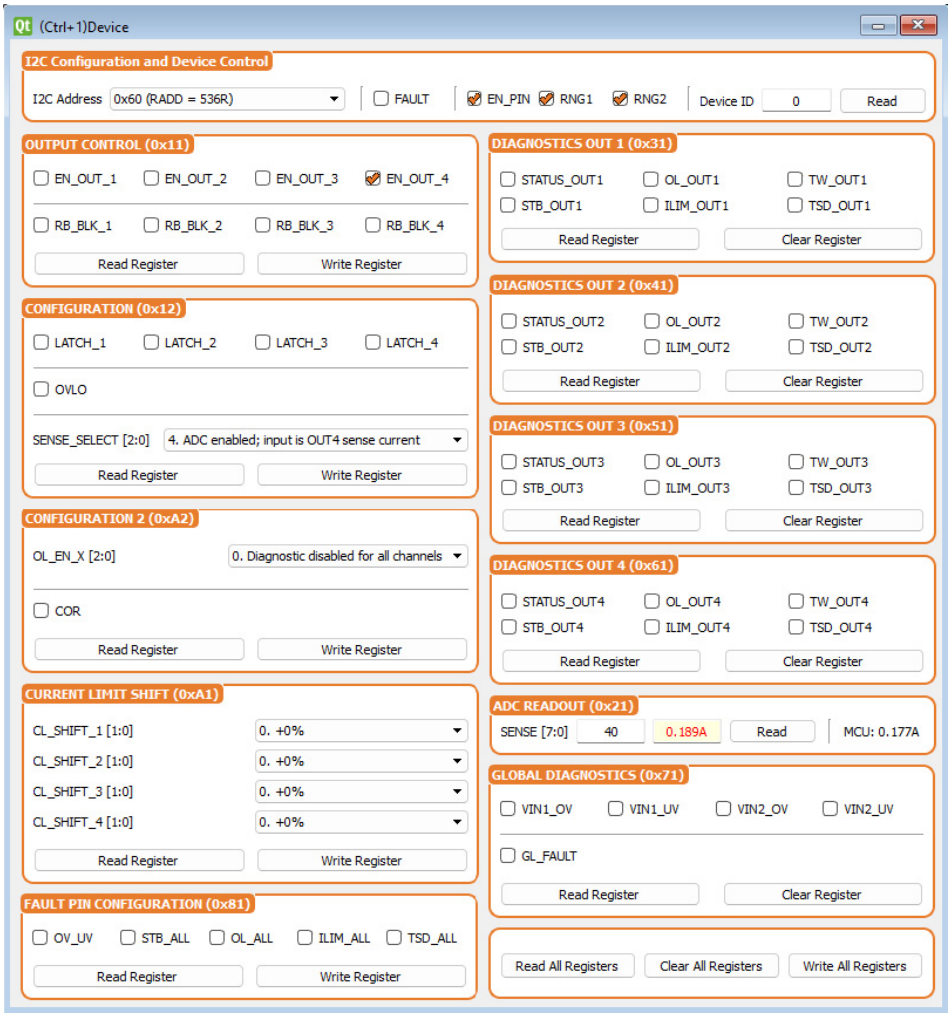

Figure 5. NCV760040 Control Window

PCB DRAWINGS

Assebmly Drawings

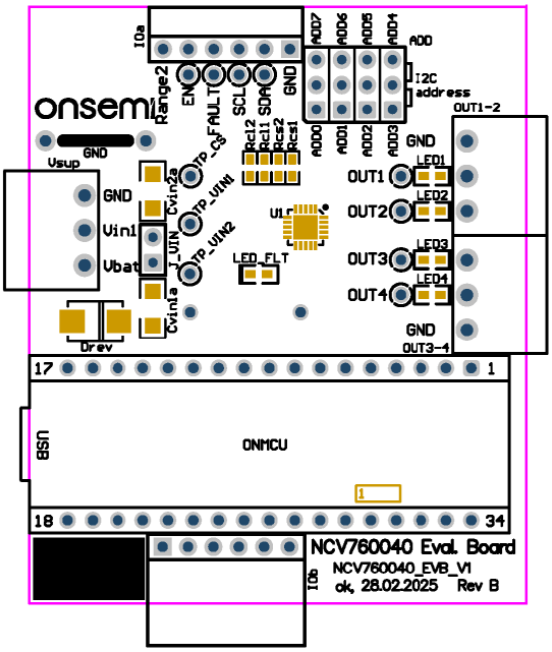

Figure 6. NCV760040 EVB PCB Top Assembly Drawing

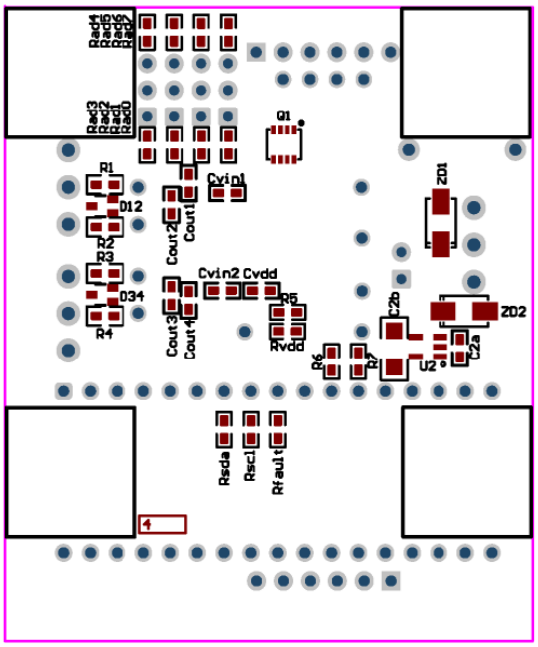

Figure 7. NCV760040 EVB PCB Bottom Assembly Drawing (Bottom View)

Composite Drawings

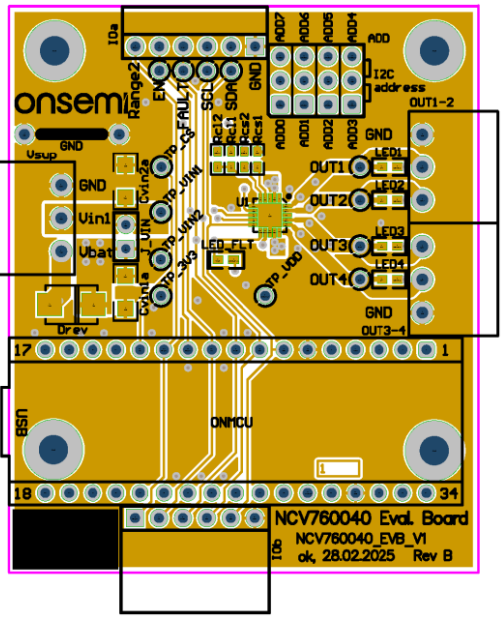

Figure 8. NCV760040 EVB PCB Top Composite Drawing

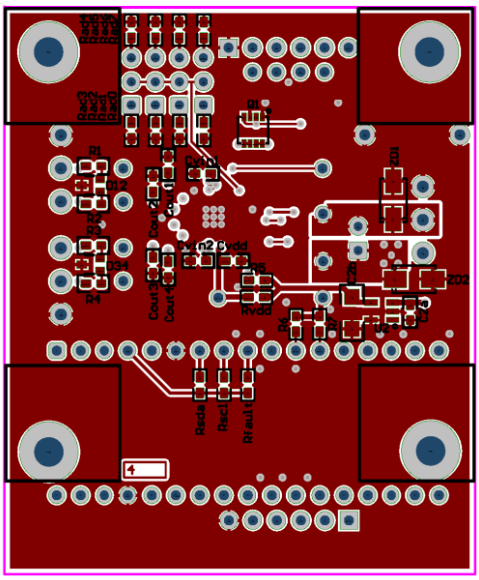

Figure 9. NCV760040 EVB PCB Bottom Composite Drawing (Bottom View)

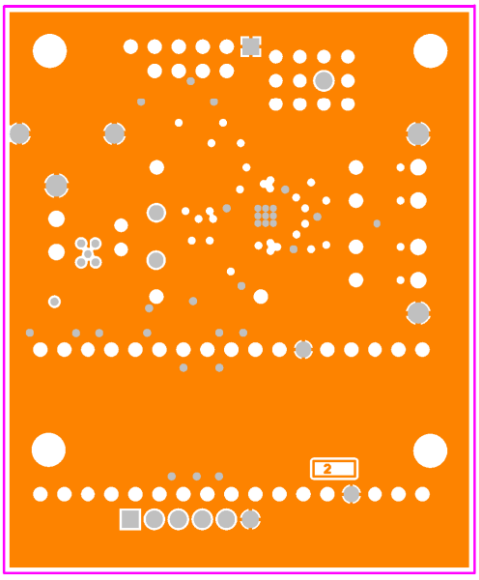

Figure 10. NCV760040 EVB PCB Internal Plane 1 Drawing

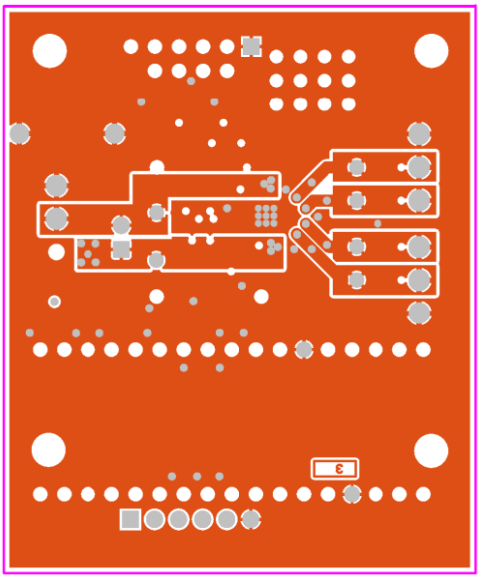

Figure 11. NCV760040 EVB PCB Internal Plane 2 Drawing

REVISION HISTORY

Revision	Description of Changes	Date
0	Eval Board User's Manual creation.	6/20/2025

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales