
Intelligent high side switch using EV-VNF1048F based on VNF1048F

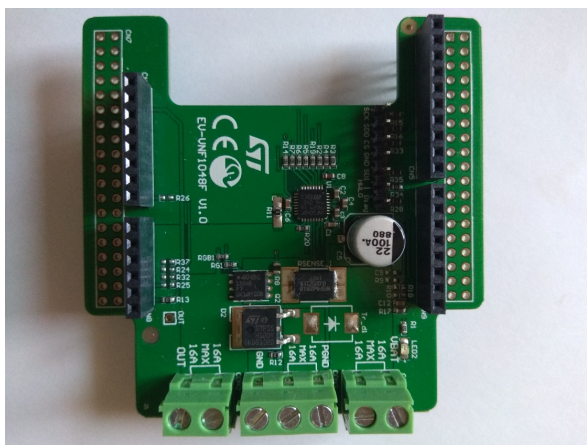
Introduction

This document describes the specifications for the [EV-VNF1048F](#) easy board that is able to work connected to EV-SPC582B to create an intelligent high side switch for 12 V, 24 V and 48 V automotive applications. The [VNF1048F](#) is an advanced controller for a power MOSFET in high side configuration and it is interfaced to a host microcontroller through a 3.3 V and 5 V CMOS-compatible SPI interface providing protection and diagnostics to the system.

1 Quick start

EV-VNF1048F is an easy to use board offered at budget price. Together with a dedicated GUI and firmware (STSW-VNF1048F) and in combination with EV-SPC582B board, it becomes a tool to evaluate VNF1048F drivers.

Figure 1. EV-VNF1048F board



1.1 Getting started

Follow the sequence below to configure the system and launch the application:

1. Check jumpers position of the EV-SPC582B board in the user manual (available on www.st.com)
2. Connect the EV-SPC582B board to a PC through USB cable 'type A to mini B'
3. Download firmware STSW-VNF1048F (available on www.st.com) and program the board as described on EV-SPC582B user manual (available on www.st.com)
4. Disconnect USB cable
5. Stack EV-VNF1048F on top of EV-SPC582B
6. Install the GUI as described on STSW-VNF1048 databrief (available on www.st.com)
7. Power supply
 - a. Supply MCU as described in the EV-SPC582B user manual
 - b. Apply $V_{cc} < V_{ccmax}$ between CON1 (VBAT) and CON1 (GND) in the EV-VNF1048F board
8. Connect using USB cable PC <-> EV-SPC582B
9. Run GUI (more info available on STSW-VNF1048F databrief)

2 Hardware, schematic and layout

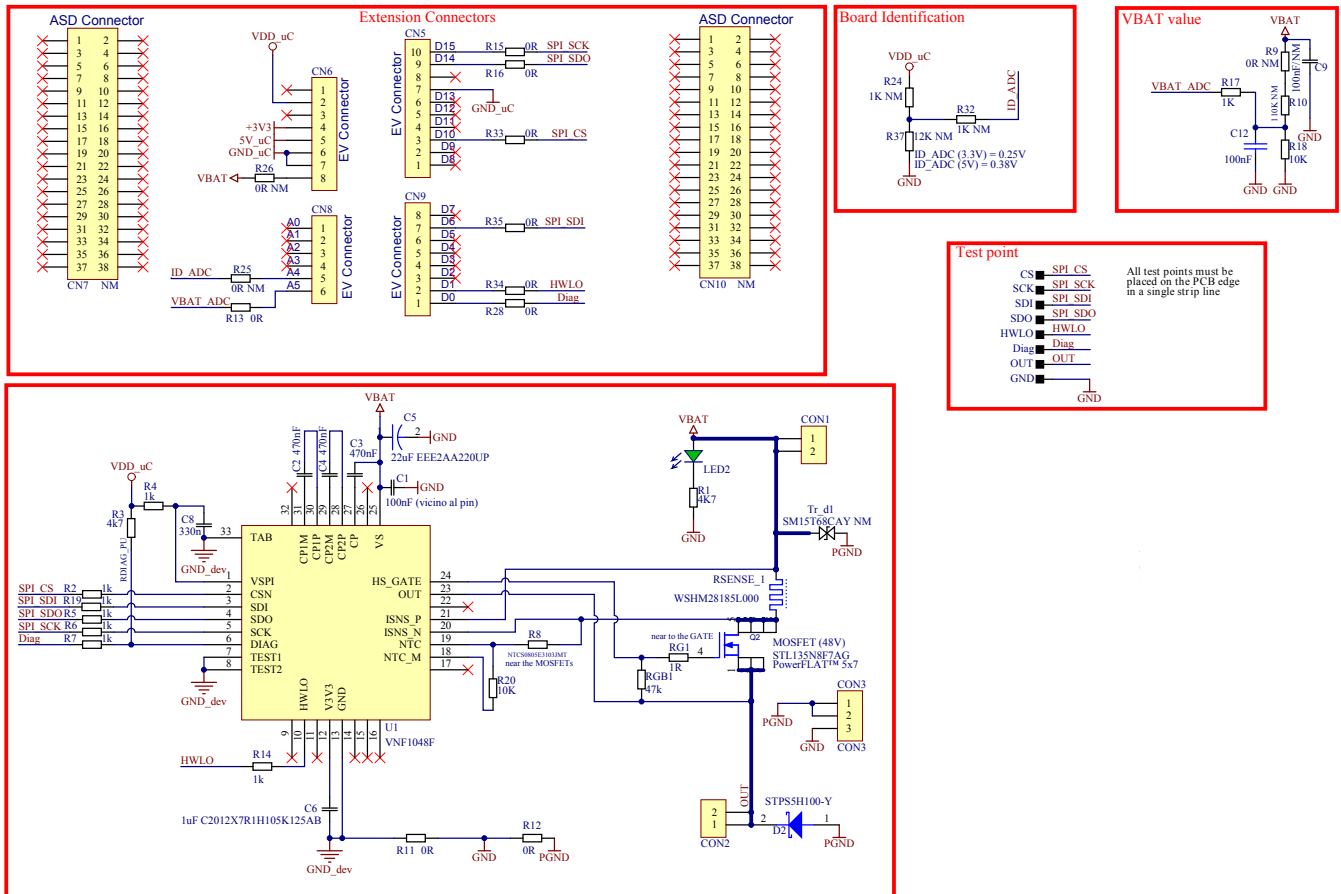
Figure 2. EV_VNF1048F schematic


Figure 3. EV-VNF1048F top layer

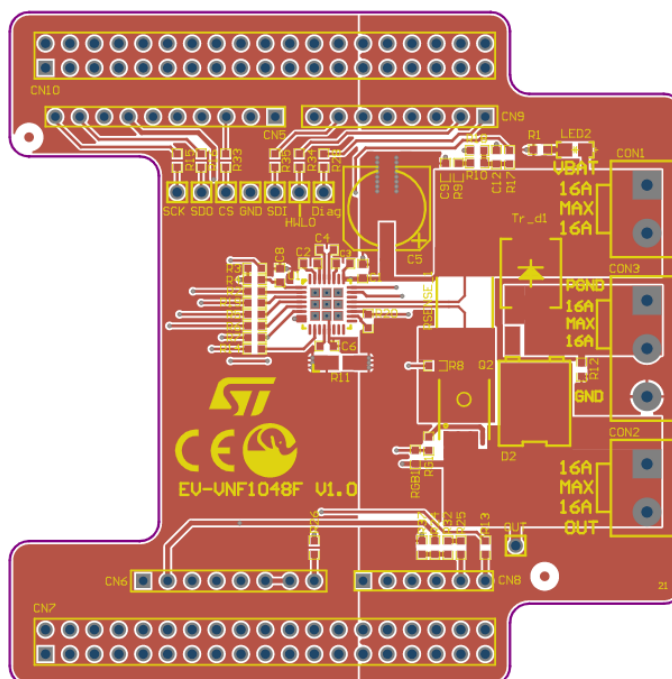
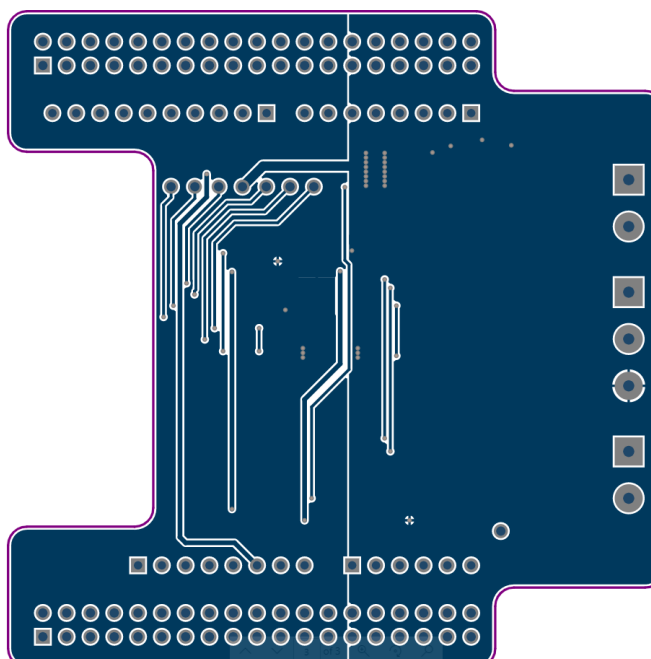


Figure 4. EV-VNF1048F bottom layer



2.1 VNF1048F device

The device is an advanced controller for a power MOSFET in high side configuration, designed for the implementation of an intelligent high side switch for 12 V, 24 V and 48 V automotive applications with intelligent fuse protection. The Control IC is interfaced to a host microcontroller through a 3.3 V and 5 V CMOS-compatible SPI interface and provides protection and diagnostics to the system. The device is intended for automotive power distribution applications and specifically as intelligent high current fuse replacement.

Here following a short description of the most important features of the VNF1048F device:

- General
 - High side switch Control IC with e-fuse protection for Automotive 12 V, 24 V and 48 V applications
 - SPI slave interface for host control
 - 32-bit ST-SPI interface compatible with 3.3 V and 5 V CMOS level
 - 2-stage charge pump
 - Gate drive for an external MOSFET in high side configuration
 - High precision uni-directional digital current sense via SPI through an external high side shunt resistor
 - Input for a NTC resistor to monitor the external MOSFET temperature
 - Very low standby current
 - Robust fail-safe functionality through internal and external controls
 - SPI register lock-out by a dedicate digital input pin
 - Integrated ADC for TJ, VNTC, VOUT and VDS conversion
- Protection
 - Battery under-voltage shut-down
 - External MOSFET desaturation shutdown configurable via SPI
 - Hard short-circuit latch-off configurable via SPI
 - Current vs Time latch-off configurable via SPI (fuse-emulation)
 - Device overtemperature shutdown
 - External MOSFET over-temperature shutdown

2.2 Power supply

The power supply is provided through CON1 connector (12 V, 24 V, 48 V battery voltage) CON3 (PGND) and must be enough to supply the current requested by the connected load.

2.3 Load connector

CON2

2.4 Easy board connectors (Arduino Uno V3)

The following figure shows the Arduino connectors pins of the EV-VNF1048F easy board and the correspondent pins used to manage them in the EV-SPC582B

Figure 5. Arduino connectors

		SPC582B-DIS																			
		ARDUINO Uno V3 / Easy bord connections																			
		Left Connector										Right Connector									
		CN6 Power					CN8 Analog					CN5 Digital					CN9 Digital				
		X	2	3	4	5	6	7	8			10	9	8	7	6	5	4	3	2	1
SPC582B60	MCU Pin	RESET										PB8	PB9	AREF	GND	PD11	PG12	PB11	PA10	PA11	PF3
			IOREF	NRST	3.3V (Input/Output)	5V (Output)	GND	GND	Vin	AD0/SPB3_CS0/eMIOS_CH16/CLKOUT	AD1/SPB3_MISO/eMIOS_CH14	I2C_SDA/LIN0_RX/SPB3_CS0/CAN1_RX/SPB2_MISO/eMIOS_CH17/ADC	I2C_SCL/SPB2_CLK/eMIOS_CH17/ADC			SPB0_CLK/eMIOS_CH19/ADC	SPB0_MISO/eMIOS_CH21/ADC	SPB0_MOSI/eMIOS_CH20/ADC	SPB2_CS2/eMIOS_CH14/SPB0_CS0	SPB3_CLK/eMIOS_CH15/LIN2_TX/LIN7_TX/CAN4_TX/CAN2_TX	SPB1_CS1/eMIOS_CH2/LIN2_TX/CAN6_TX
										AD2/SPB3_CLK/eMIOS_CH15	AD3/SPB3_MOSI/eMIOS_CH13										SPB2_CS3/SPB3_MISO/eMIOS_CH17/LIN0_RX/CAN5_TX
											ADC										SPB1_MISO/eMIOS_CH28/CAN4_TX
																					LIN1_TX/eMIOS_CH10/CAN2_TX
																					LIN1_RX/eMIOS_CH11/CAN2_RX
																					LIN2_TX/SPB3_CLK/eMIOS_CH6/CAN6_TX/ADC
																					LIN2_RX/SPB3_MISO/eMIOS_CH7/CAN6_RX
		EZ_VNF1048F																			
		VNF1048F																			
F	MCU Pin											SPB_SCK	SPB_SDO								SPB_SDI

2.5

Graphical User Interface

Read the STSW-VNF1048F databrief (available on www.st.com) for more info.

Revision history

Table 1. Document revision history

Date	Revision	Changes
02-Aug-2021	1	Initial release.

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