

## VN9D30Q100F evaluation board



### Features

| Channel | V <sub>CC</sub> | R <sub>DS(on)</sub> (typ.) | I <sub>LIMH</sub> (typ.) |
|---------|-----------------|----------------------------|--------------------------|
| 0-5     | from 4 to 28 V  | 33 mΩ                      | 31.5 A                   |
| 1-4     |                 | 90 mΩ                      | 14 A                     |

- Simple single IC application board dedicated to VN9D30Q100F
- Provides electrical connectivity and thermal heat-sinking for easy prototyping
- General device features
  - Extreme low voltage operation for deep cold cranking applications (compliant with LV124, revision 2013)
  - 24-bit ST-SPI for full diagnostic and digital current sense feedback
  - Integrated 10 bit ADC for digital current sense
  - Integrated PWM engine with independent phase shift and frequency generation (for each channel)
  - Programmable Bulb/LED mode for all channels
  - Advanced limp home functions for robust fail-safe system
  - Very low standby current
  - Optimized electromagnetic emissions
  - Very low electromagnetic susceptibility
  - Control through direct inputs and / or SPI
  - Compliant with European directive 2002/95/EC
- Diagnostic functions
  - Digital proportional load current sense
  - Synchronous diagnostic of over load and short to GND, output shorted to V<sub>CC</sub> and OFF-state open-load
  - Programmable case overtemperature warning
- Protections
  - Two levels load current limitation
  - Self limiting of fast thermal transients
  - Undervoltage shutdown
  - Overvoltage clamp
  - Latch-off or programmable time limited auto restart (power limitation and overtemperature shutdown)
  - Load dump protected
  - Protection against loss of ground

#### Product status link

[EV-VN9D30Q100F](#)

### Application

- Automotive resistive, inductive and capacitive loads

### Description

The [EV-VN9D30Q100F](#) board provides an easy way to connect ST VIPower M0-9SPI technology into existing system.

## 1 Overview

It comes pre-assembled with VN9D30Q100F high-side driver. On board minimum set of electrical components (as for device datasheet recommendation) enables the user to directly connect the load, the power supply and the microcontroller without any additional effort in external component design and connection.

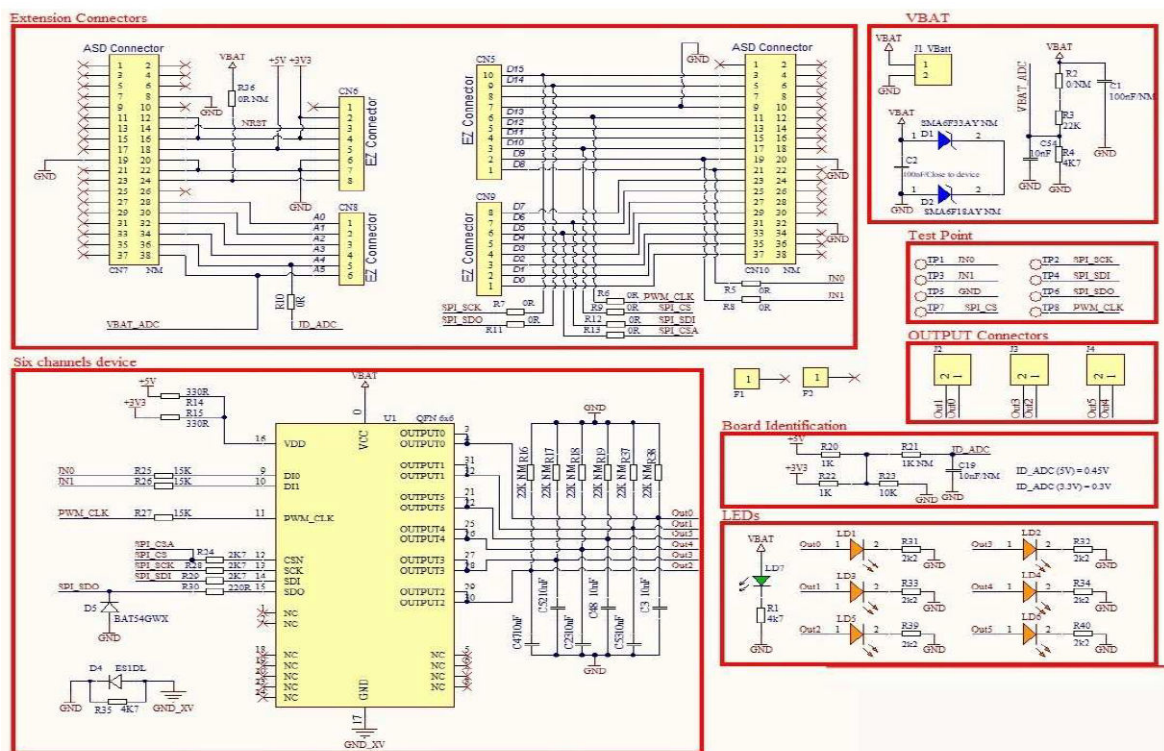
The VN9D30Q100F is a device made using STMicroelectronics VIPower technology. It is intended for driving resistive or inductive loads directly connected to ground. The device is protected against voltage transient on  $V_{CC}$  pin. Programming, control and diagnostics are implemented via the SPI bus.

A digital current sense feedback for each channel is provided through an integrated 10-bit ADC with 0.1% of FSR. Dedicated trimming bits allow to adjust the ADC reference current. The device is equipped with 6 outputs controllable via SPI or with the 2-OTP assignable direct inputs.

The device detects open-load in OFF-state conditions. Real time diagnostic is available through the SPI bus (open-load, output short to  $V_{CC}$ , overtemperature, communication error, power limitation or latch off). Output current limitation protects the device in an overload condition. The device can limit the dissipated power to a safe level up to thermal shutdown intervention. Thermal shutdown can be configured as latched off or programmable time limited auto restart.

The device enters a limp home mode in case of loss of digital supply ( $V_{DD}$ ), reset of digital memory or watchdog monitoring time-out event. In limp home mode each output is set according to the programmed register: to be always OFF, or according to the 2x direct inputs pins.

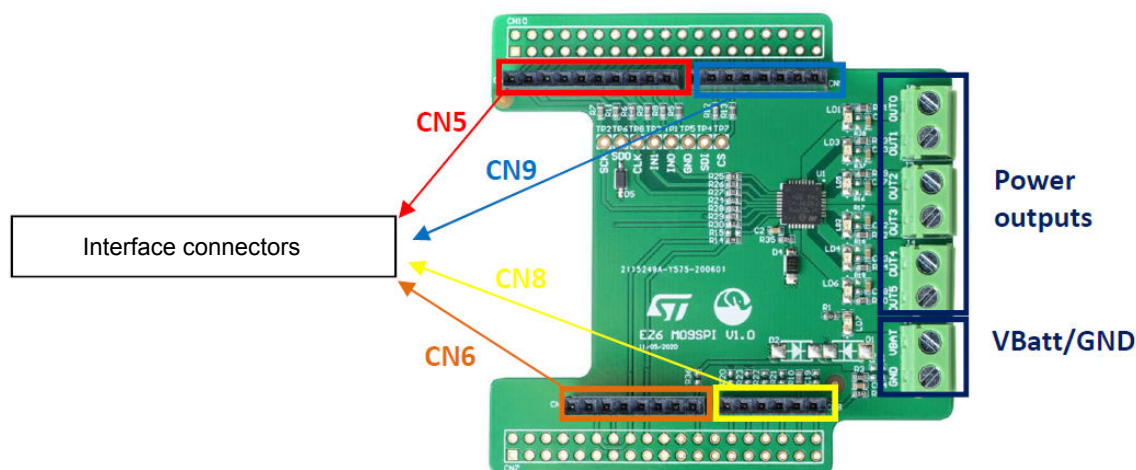
**Figure 1. Board schematics**



## 2 Board connections

The Figure 2 shows the placement of the connectors to be used for supplying the evaluation board, connecting the load, and controlling the functionality and diagnostic of the device.

**Figure 2. Evaluation board connections**



**Table 1. CN connectors: pin functions**

| Pin number | Connector | Pin function |
|------------|-----------|--------------|
| 1          | CN5       | IN0          |
| 2          | CN5       | IN1          |
| 3          | CN5       | SPI_CS       |
| 4          | CN5       |              |
| 5          | CN5       |              |
| 6          | CN5       | PWM_CLK      |
| 7          | CN5       | GND          |
| 8          | CN5       |              |
| 9          | CN5       | SPI_SD0      |
| 10         | CN5       | SPI_SCK      |
| 2          | CN6       |              |
| 3          | CN6       |              |
| 4          | CN6       | 3.3v         |
| 5          | CN6       | 5V           |
| 6          | CN6       | GND          |
| 7          | CN6       | GND          |
| 8          | CN6       |              |
| 1          | CN8       |              |
| 2          | CN8       |              |
| 3          | CN8       |              |

| Pin number | Connector | Pin function |
|------------|-----------|--------------|
| 4          | CN8       |              |
| 5          | CN8       | ID_ADC       |
| 6          | CN8       | VBATT_ADC    |
| 1          | CN9       |              |
| 2          | CN9       |              |
| 3          | CN9       |              |
| 4          | CN9       |              |
| 5          | CN9       |              |
| 6          | CN9       | SPI_CSA      |
| 7          | CN9       | SPI_SDI      |
| 8          | CN9       |              |

### 3 Thermal data

**Table 2. VN9D30Q100F thermal data**

| Symbol     | Parameter                                      | Max | Unit |
|------------|--|-----|------|
| $R_{thJA}$ | Thermal resistance, junction-to-ambient (max.) | 55  | °C/W |

**Table 3. PCB specifications**

| Parameter              | Value            |
|------------------------|------------------|
| Board dimensions       | 70 mm x 70 mm    |
| Number of Cu layer     | 2                |
| Layer Cu thickness     | 35 $\mu$ m       |
| Board finish thickness | 1.6 mm $\pm$ 10% |
| Board material         | FR4              |
| Thermal vias diameter  | 0.3 mm           |

## Revision history

**Table 4. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 05-May-2021 | 1        | Initial release.   |
| 10-May-2023 | 2        | Updated <a href="#">Figure 2. Evaluation board connections</a> . |

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