VN9D5D20F evaluation board
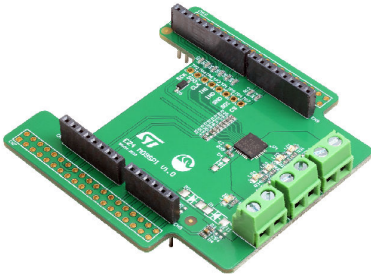
Product status link
EV-VN9D5D20F

Features

Channel	V_{CC}	$R_{DS(on)}$ (typ.)	I_{LIMH} (typ.)
0-1	from 4 to 28 V	6.7 mΩ	72 A
2-3		20 mΩ	34.5 A

- Simple single IC application board dedicated to EV-VN9D5D20F
- 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
  – 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_{CC} 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
  – Reverse battery through self turn-on

Application

- Automotive resistive, inductive and capacitive loads

Description

The EV-VN9D5D20F board provides an easy way to connect ST VIPower M0-9SPI technology into existing system.

1   Overview

It comes pre-assembled with EV-VN9D5D20F high-side driver. On board minimum set of electrical components (as for device datasheet recommendation) is enabling the user to directly connect the load, the power supply and the microcontroller without any additional effort in external component design and connection.

The device is 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 VCC ,overtemperature, communication error, power limitation or latch off). Output current limitation protects the device in an over load 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
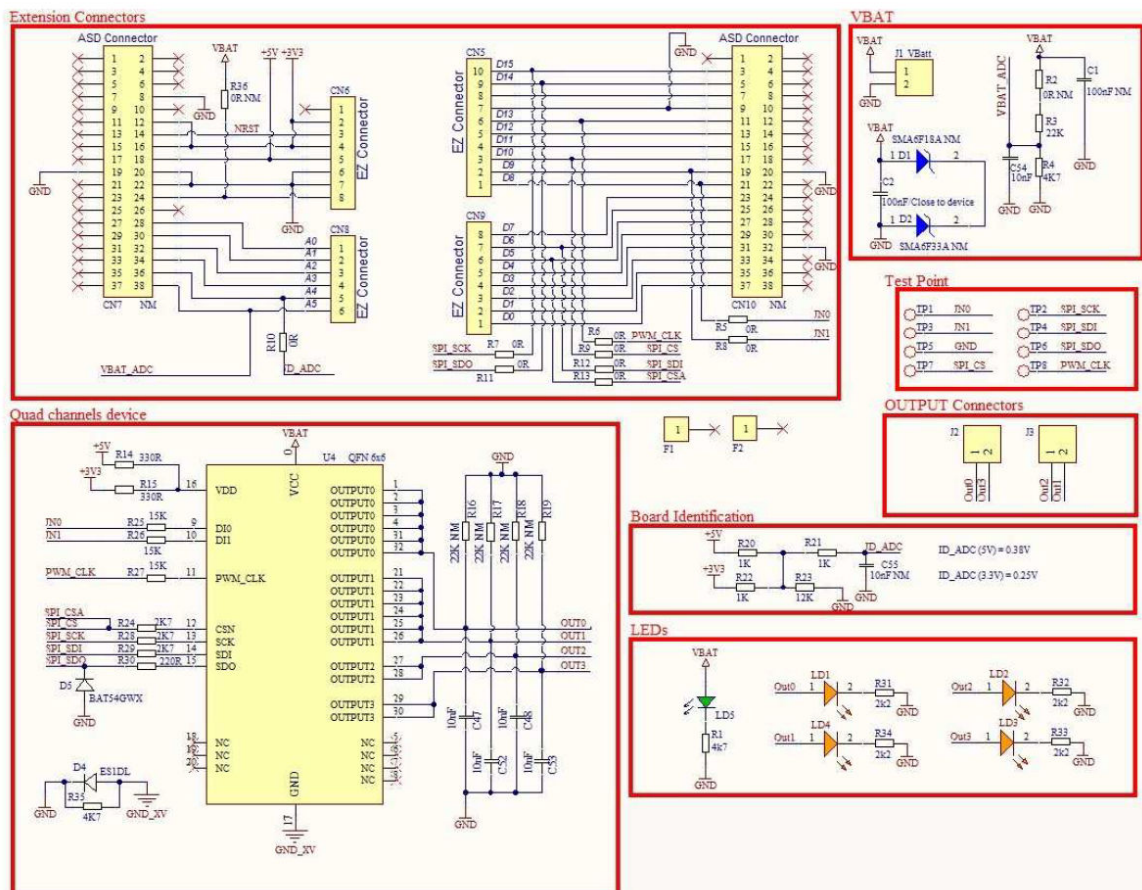
2   Board connections

Figure 2. Evaluation board connections 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.
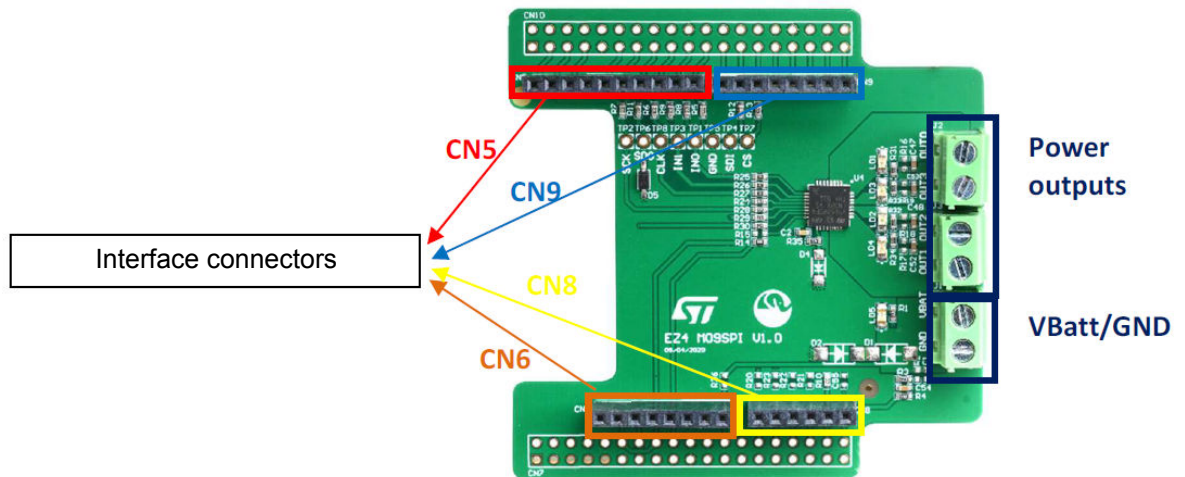
Figure 2. Evaluation board connections

Table 1. CN connectors: pin functions

Connector	Pin number	Pin function
CN5	1	IN0
CN5	2	IN1
CN5	3	SPI_CS
CN5	4	
CN5	5	
CN5	6	PWM_CLK
CN5	7	GND
CN5	8	
CN5	9	SPI_SD0
CN5	10	SPI_SCK
CN6	2	
CN6	3	
CN6	4	3V3
CN6	5	5V
CN6	6	GND
CN6	7	GND
CN6	8	
CN8	1	
CN8	2	
CN8	3	
CN8	4	

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

3 Thermal data

Table 2. Thermal data

Symbol	Parameter	Max	Unit
$R_{thj-amb}$	Thermal resistance junction-ambient (max.)	47.7	°C/W

Table 3. PCB specifications

Parameter	Value
Board dimensions	70 mm x 70 mm
Number of Cu layer	2
Layer Cu thickness	35 μm
Board finish thickness	1.6 mm +/- 10%
Board material	FR4
Thermal vias diameter	0.3 mm

Revision history

Table 4. Document revision history

Date	Revision	Changes
23-Feb-2022	1	Initial release.
14-Oct-2024	2	Updated Section Features.

Contents

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