AN2965
Application note

STEVAL-SPMD250Vx: demonstration boards for the SPMD250STP 2.5 A bipolar stepper motor drive module

Introduction

The SPMD250STP is part of the EASY POWER™ series of fully integrated modules designed to drive bipolar permanent-magnet stepper motors.

All EASY POWER™ modules offer an easy-to-use, fully-protected solution to implement precise position control with high torque at rest, without the need for external components.

The module operates over a wide 12 V to 40 V input voltage range and supports an output maximum current of 2.5 A.

The SPMD250STP implements full/half-step drive capability, working at a fixed chopper frequency of 17 kHz. It is possible to select between fast and slow decay current. Home position indication is available, as well as synchronization for multi-motor applications.

The module internally generates the phase sequence, significantly reducing the burden on the controller.

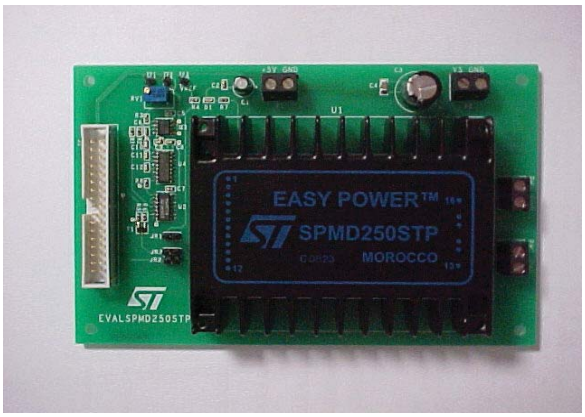
Integration of a power MOSFET stage significantly reduces both commutation and conduction losses.

The SPMD250STP offers complete output protection against all types of short conditions. The metal package acts as an integrated heat-sink, with no ventilation or additional components required. The metal case also isolates the inner circuitry from external agents, making the module suitable for operation in harsh environments.

The purpose of this application note is to provide information on the operation, use and characteristics of the STEVAL-SPMD250V1 and STEVAL-SPMD250V2 demonstration boards, which is designed to provide platform for evaluating the performance and the features of the SPMD250STP module.

The board works in conjunction with the PractiSPIN™ HW and the PractiSPIN™.spmd SW which allow the user to operate with SPMD250STP module.

Figure 1. STEVAL-SPMD250V1 / STEVAL-SPMD250V2 demonstration board



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1 System overview

To illustrate the operation of the complete system comprised of the demonstration boards STEVAL-SPMD250V1 and STEVAL-SPMD250V2, the control board PractiSPIN™ and SW PractiSPIN™.spmd, please refer to the PractiSPIN™ and the PractiSPIN™.spmd application notes.

This document provides the features, electrical characteristics, circuit schematic and the bill of material for the STEVAL-SPMD250V1 demonstration board.

The boards support the following measurements and demonstrations:

- Full/half, CW/CCW, control behavior
- Motor current waveforms and measurements
- Movement sequences

Note: For a detailed description of the SPMD250STP module with user notes and application suggestions, please refer to the SPMD250STP datasheet.

2 STEVAL-SPMD250V1, STEVAL-SPMD250V2 main features

- Ready-to-use board for SPMD250STP demonstration
- Easy interfacing with the PractiSPIN™ software
- Simulates:
  - Normal / half-step sequence
  - Fast / slow decay
  - Forward / reverse
  - Enable
- Phase current selectable for acceleration / deceleration ramp, running and stop mode
- Possibility to program moving and waiting time sequences

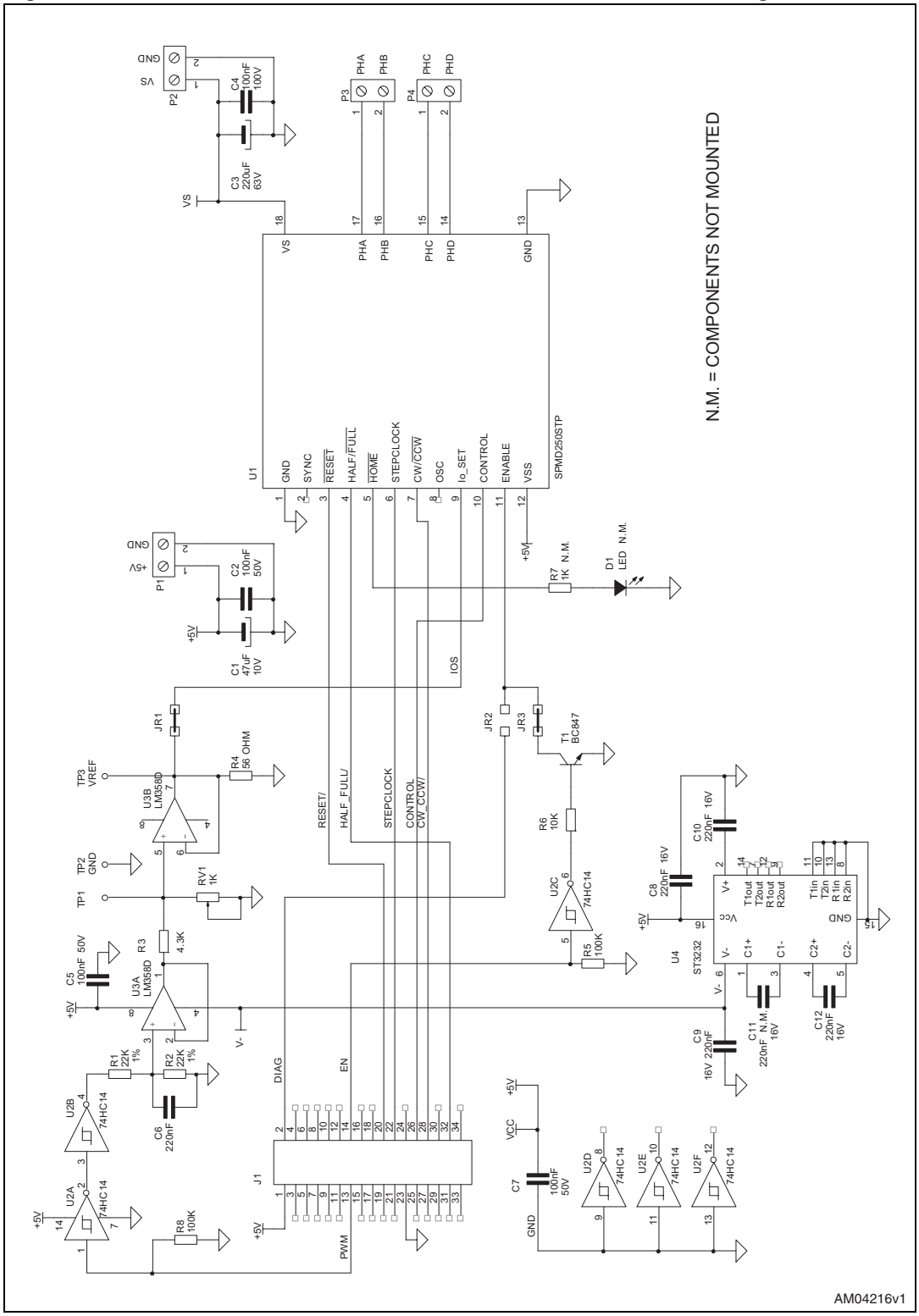
2.1 Operating ranges

Table 1. Main electrical parameters

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vs	Motor supply voltage		12	24	40	V
Vlog	Logic supply voltage		4.75	5	5.25	V
Iop	Operation current	Vs = 24 V		2	2.5	A
fc	Chopper frequency			17		kHz
Tcop	Case operating temperature		-40		+ 85	°C

3 Demonstration board schematic

Figure 2. STEVAL-SPMD250V1 / STEVAL-SPDM250V2 schematic diagram



4 Component list

Table 2. Boards component list

Name	Description
C1	Electr.cap. 47 µF 10 V 105 °C
C3	Electr.cap. 220 µF 63 V 105 °C
C2-C5-C7	Chip capacitor 100 nF 50 V X7R
C4	Chip capacitor 100 nF 100 V X7R
C6-C8-C9-C10-C12	Chip capacitor 220 nF 16 V X7R
R1-R2	Chip resistor 22 kΩ ±5%
R3	Chip resistor 4.3 kΩ ±5%
R4	Chip resistor 56 Ω ±5%
R5-R8	Chip resistor 100 kΩ ±5%
R6	Chip resistor 10 kΩ ±5%
RV1	Trimmer M.T. 1 kΩ ±10% p/n RS 154-2022
T1	Transistor BC847B
U1	Motor driver module SPMD250STP (STM)
U2	I.C. M74HC14 (STM)
U3	I.C. LM358D (STM)
U4	I.C. ST3232BDR (STM)
J1	34 poles male connector p/n RS 6257347
JR1-JR2-JR3	Pins strip 2 poles
TP1-TP2-TP3	Pins strip 1 poles
P1-P2-P3-P4	2 poles connector p5.08 p/n RS 425-8720

5 Demonstration board layout

Both demonstration boards are a two-layer FR4 PCB (printed circuit board), with dimensions of 140 x 90 mm. The layout of the components and the layer structure of the board are shown in *Figure 3* and *4*.

Figure 3. Demonstration board layout - top layer, component side

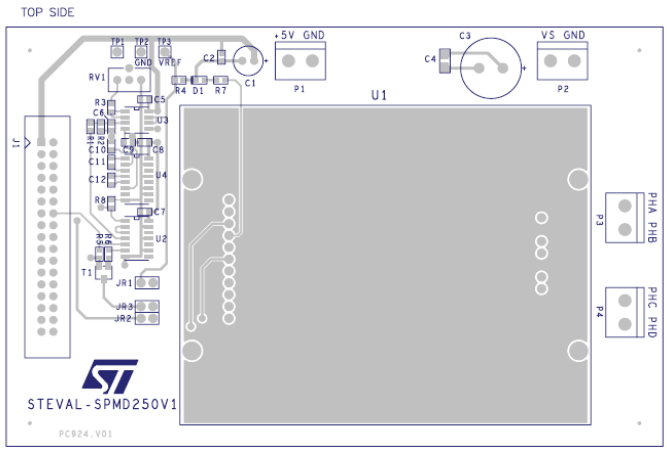
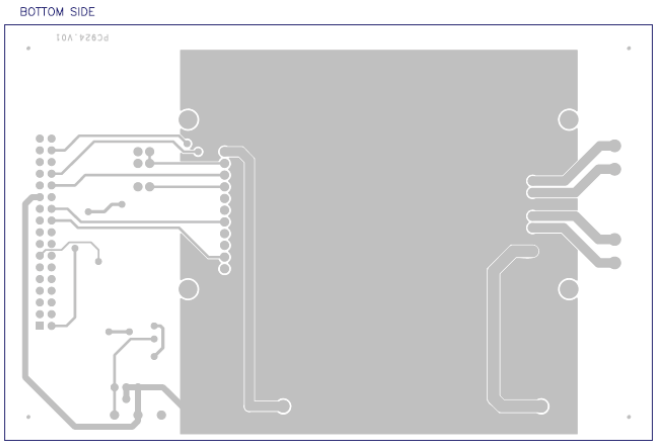


Figure 4. Demonstration board layout - bottom layer



6 Pin connection

The STEVAL-SPMD250V1 and STEVAL-SPMD250V2 connect with the PractiSPIN™ control board through connector J1.

The P1 and P2 connectors are used to supply the board with logic voltage (P1) and motor voltage (P2); connectors P3 and P4 are used for motor connection.

7 Pin description / jumpers

Table 3. Pin description

N°	Name	Description
J1-1	+5 V	Supply voltage for the PractiSPIN™ control board
J1-2	DIAG	DIAG signal (enable status from SPMD250STP)
J1-13	PWM	PWM signal (current level) from PractiSPIN™
J1-14	EN	ENABLE signal from PractiSPIN™
J1-20	RESET	RESET signal from PractiSPIN™ (active low)
J1-22	STEPCLOCK	STEPCLOCK signal from PractiSPIN™
J1-23	GND	GROUND
J1-26	Control	CONTROL signal from PractiSPIN™ (fast/slow decay)
J1-28	CW/CCW	CW/CCW signal from PractiSPIN™ (direction control)
J1-32	Half/full	HALF/FULL step signal from PractiSPIN™
P1-1	+5 V	+5 V for SPMD250STP logic part
P1-2	GND	+5 V ground
P2-1	+Vm	Motor voltage supply
P2-2	GND	+Vm ground
P3-1	PHA	Stepper motor phase A
P3-2	PHB	Stepper motor phase B
P4-1	PHC	Stepper motor phase C
P4-2	PHD	Stepper motor phase D
JR1	Jumper JR1	Connection between PractiSPIN™ current control and module Io_SET
JR2	Jumper JR2	Enable feedback to PractiSPIN™
JR3	Jumper JR3	Enable signal from PractiSPIN™

8 Special notes

8.1 Standalone configuration

The STEVAL-SPMD250V1and STEVAL-SPMD250V2 can operate in standalone mode, without the PractiSPIN™ control board. In this case user must provide the proper signals to the board, through the 34-pole input connector.

For the definitions of the I/O pins, please refer to *Table 3*. For the voltage levels of the signals to be applied, please refer to the SPMD250STP datasheet.

9 Revision history

Table 4. Document revision history

Date	Revision	Changes
04-Jun-2009	1	Initial release.
19-Oct-2009	2	Inserted new board part number