

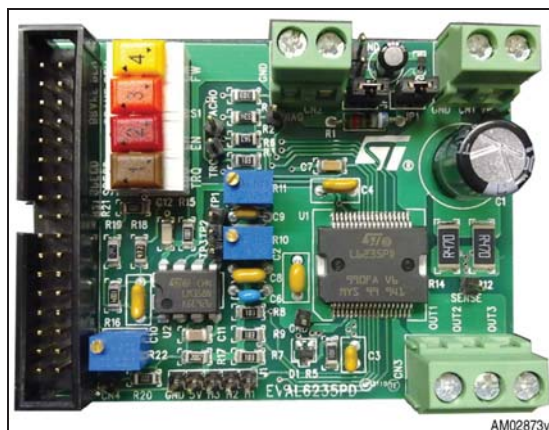


## L6235 three-phase brushless DC motor driver demonstration board

Data brief

### Features

- Operating supply voltage from 8 V to 52 V
- 5.6 A output peak current (2.8 A<sub>RMS</sub>)
- Operating frequency up to 100 kHz
- Non-dissipative overcurrent protection
- Constant off-time PWM current controller
- 60° and 120° Hall effect decoding logic
- Brake function
- TACHO output for speed loop
- Suitable for EVALPRACTISPIN control
- Capable of running in stand-alone mode



### Description

The EVAL6235PD demonstration board is a fully integrated DMOS three-phase brushless DC motor driver.

Used in conjunction with the EVALPRACTISPIN interface board and practiSPIN software, the board provides an evaluation platform to test the features of the L6235 device. In particular, the board provides a means to evaluate the power dissipation performance of the IC in the PowerSO package.

An example of speed loop is implemented. The speed information is obtained by analog integration of the TACHO output. Fine tuning of external components is needed to fit application requirements.

The board is designed with a large GND area to minimize noise and optimize power dissipation.

# 1 Board description

The EVAL6235PD provides external connectors for the supply voltage, an external 5 V reference for the logic inputs, three outputs for the motor and a 34-pin connector to control the main functions of the board through the external interface board EVALPRACTISPIN.

Figure 1. EVAL6235PD demonstration board

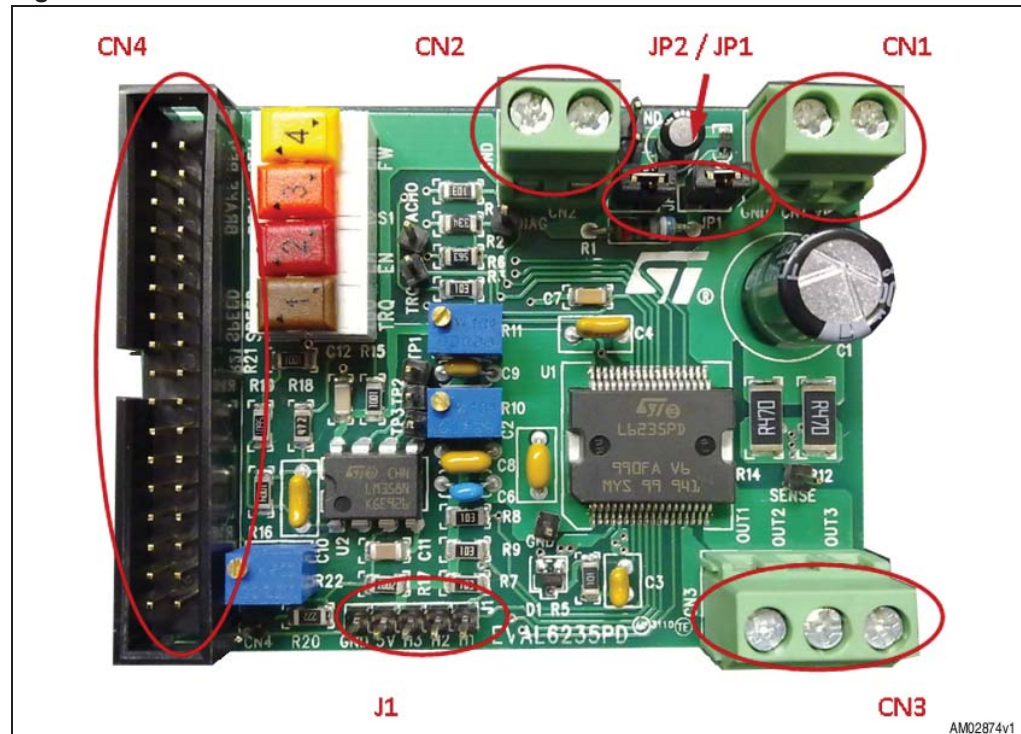


Table 1. EVAL6235PD: connector and jumper description

Name	Type	Function
CN1	Power supply	Board power supply (VS)
CN2	Power supply	Logic power supply (5V)
CN3	Power outputs	Half-bridge power outputs
CN4	Signal connector	Communication with interface board
JP1, JP2	Jumper	On-board 5V supply generation (closed)
J1	Strip connector	Hall effect sensors signals and power supply
S1	DIP switches	Allows enabling of the IC, to select to run in torque or speed mode, to set the motor direction and motor braking <sup>(1)</sup>

1. Function available if board is running in stand-alone mode.

**Table 2. EVAL6235PD: 34-pin signal connector pinout**

Pin number	Description
1	Board pull-up (5V)
2	L6235PD DIAG pin (diagnostic output)
4	Hall effect sensor 1 (H1)
11	Board pull-up (5V)
14	L6235PD EN pin (device enable)
20	Hall effect sensor 1 (H1)
22	L6235PD BRAKE pin (braking function)
23	Ground
25	Hall effect sensor 1 (H1)
26	Hall effect sensor 3 (H3)
28	L6235PD FWD/REV pin (motor direction)
31	L6235PD VREF pin (reference voltage)
32	Hall effect sensor 2 (H2)
others	Not connected

**Table 3. EVAL6235PD: electrical specification (recommended values)**

Parameter	Value
Supply voltage range ( $V_S$ )	8 to 52 V
Output current rating	Up to 5.6 A <sub>peak</sub> (2.8 A <sub>RMS</sub> )
Logic input voltage range	0 to +5V
Operating temperature range	-25 °C to +125 °C
L6235PD thermal resistance junction-to-ambient	15 °C/W

Figure 2. EVAL6235PD schematic diagram

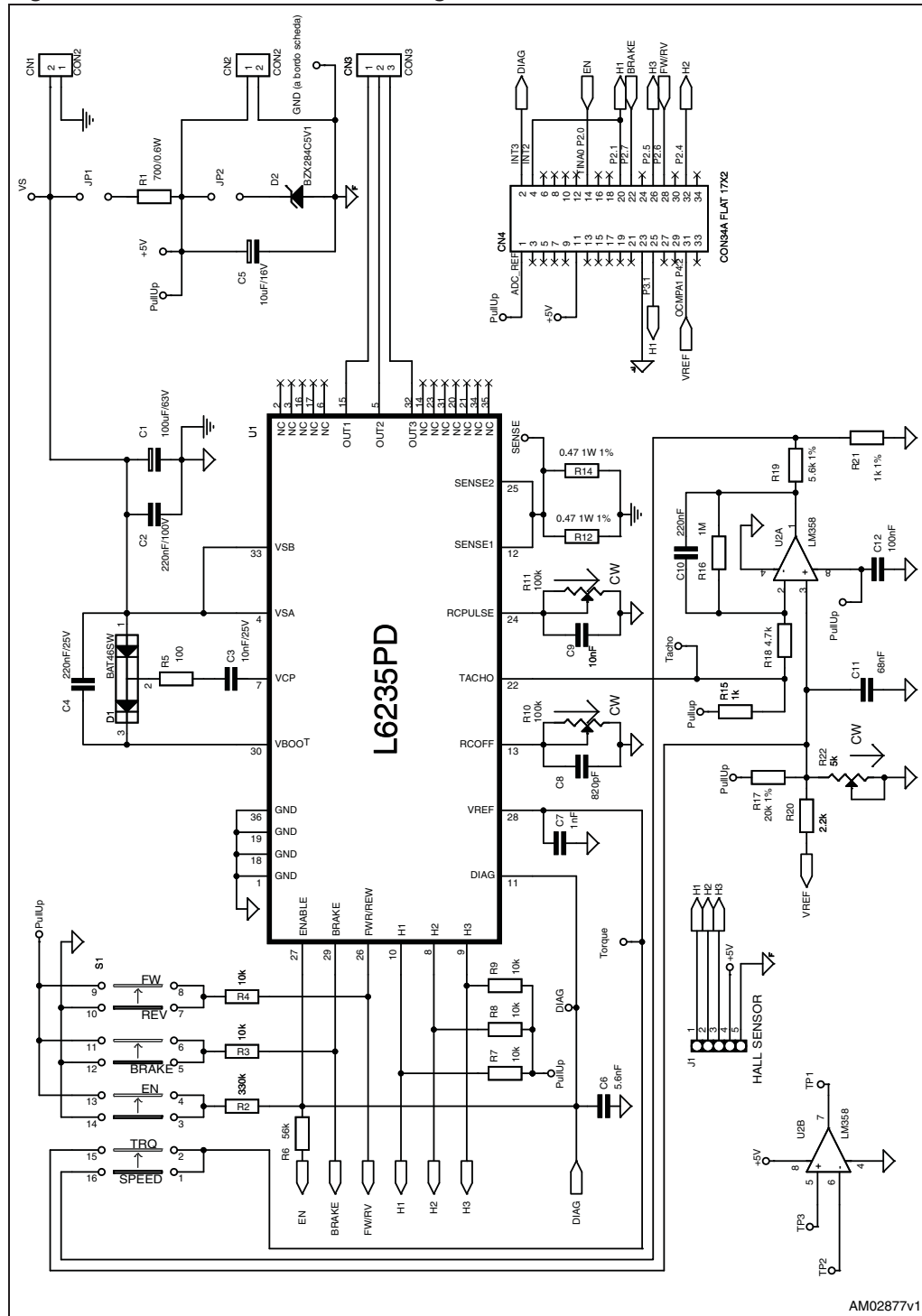


Table 4. EVAL6235PD component list

Part reference	Part value	Part description
C1	100 $\mu$ F – 63V	Electrolytic capacitor
C2	220nF – 100V	Ceramic capacitor
C3	10nF – 25V	Ceramic capacitor
C4, C10	220nF – 50V	Ceramic capacitor
C5	10 $\mu$ F – 16V	Electrolytic capacitor
C6	5.6nF – 50V	Ceramic capacitor
C7	1nF – 50V	Ceramic capacitor
C8	820pF – 50V	Ceramic capacitor
C9	10nF – 50V	Ceramic capacitor
C11	68nF – 50V	Ceramic capacitor
C12	100nF – 50V	Ceramic capacitor
D1	BAT46SW <sup>(1)</sup>	Low drop diode couple
D2	BZX384C5V1	Zener diode
R1	700W - 0.6 $\Omega$ – 1%	Resistor
R2	330k $\Omega$ - 1/4W	Resistor
R3, R4, R7÷R9	10k $\Omega$ - 1/4W – 5%	Resistor
R5	100 $\Omega$ - 1/4W	Resistor
R6	56k $\Omega$ - 1/4W	Resistor
R10, R11	100k $\Omega$ - 74W	Trimmer
R12, R14	470m $\Omega$ - 1W	Resistor
R16	1M $\Omega$	Resistor
R17	20k $\Omega$ - 1/4W – 1%	Resistor
R18	4.7k $\Omega$ - 1/4W	Resistor
R19	5.6k $\Omega$ - 1/4W – 1%	Resistor
R20	2.2k $\Omega$ - 1/4W	Resistor
R21, R15	1 k $\Omega$ - 1/4W	Resistor
R22	5k $\Omega$ - 74W	Trimmer
U1	L6235PD	3-phase BLDC DMOS motor driver
U2	LM358	Low power dual operational amplifier

1. Alternative part number BAV99

Figure 3. EVAL6235PD component placement

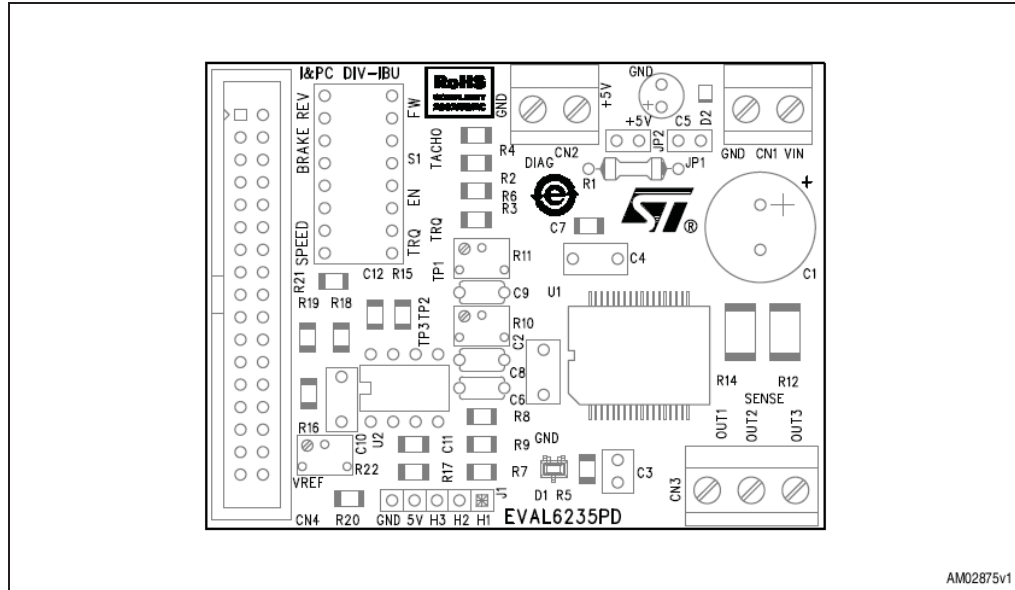


Figure 4. EVAL6235PD top side layout

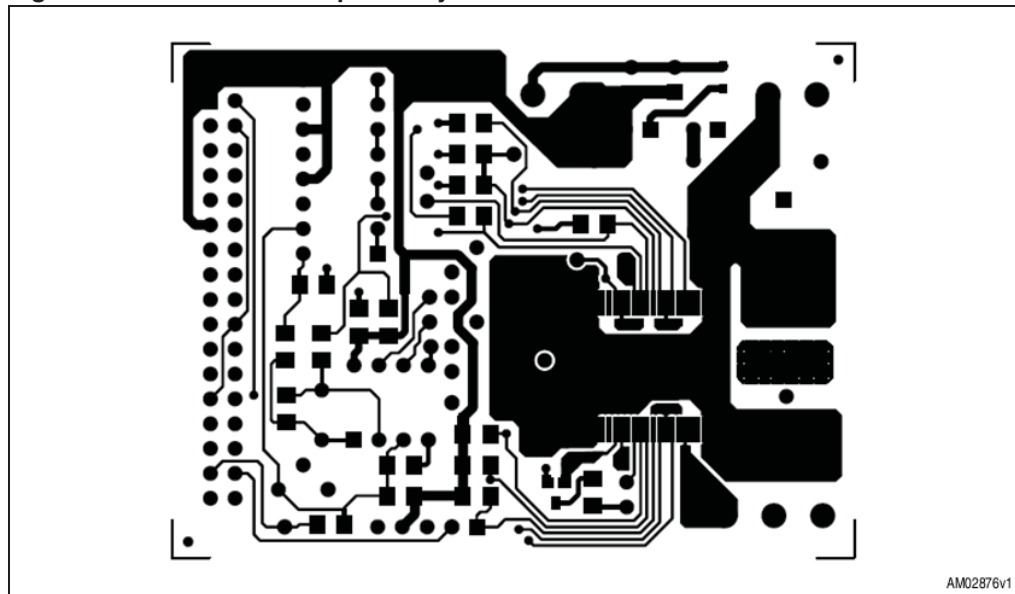
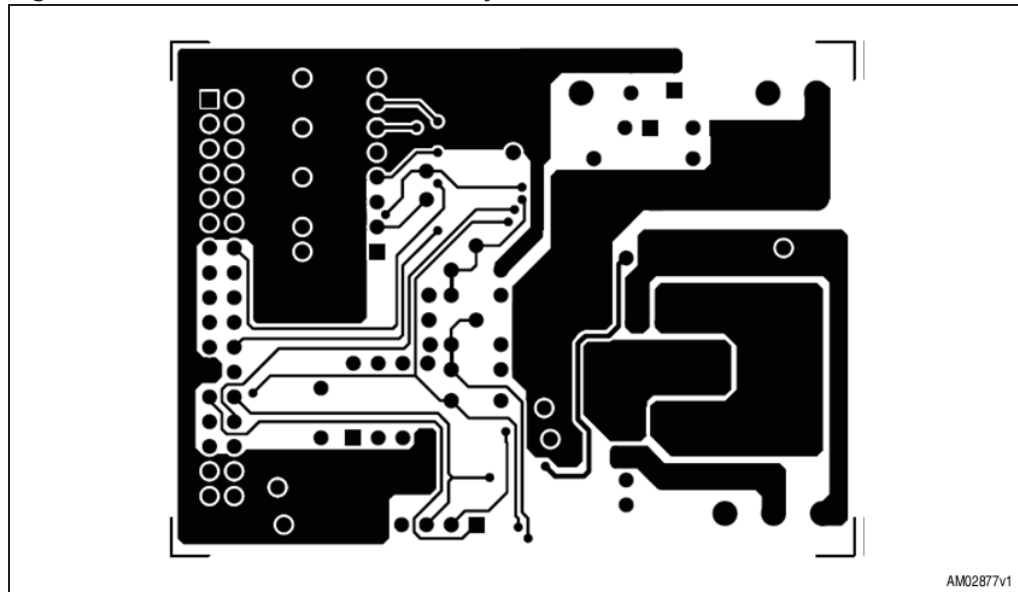


Figure 5. EVAL6235PD bottom side layout



## 2 Using the EVAL6235PD

The EVAL6235PD demonstration board can be used in combination with the EVALPRACTISPIN interface board and practiSPIN software, or it can run in stand-alone mode.

The 5 V for logic inputs and reference voltage is obtained from R1 and D2. For supply voltages higher than 20 V, R1 must be replaced with a higher value resistor. The jumpers JP1 and JP2 allow disconnecting the internal Zener diode network, in case the 5 V is provided through pin 11 of CN4 (for example, an external microcontroller board can provide 5 V to the demonstration board).

The CN2 connector can also be used to provide an external 5 V voltage to the board, and CN2, or pin 1 of CN4, can be used to provide a 5 V voltage to external circuits. In this case, only a small current can be drawn from the board, depending on the supply voltage and R1 value.

### 2.1 Connection to the EVALPRACTISPIN interface board

The EVAL6235PD board connects to the EVALPRACTISPIN board through the 34-pole CN4 connector.

Device evaluation can be performed by running the dedicated practiSPIN software. For more details, please refer to application note AN1794 “PractiSPIN evaluation system configuration and set up guide”, available at [www.st.com](http://www.st.com).

### 2.2 Running the EVAL6235PD in stand-alone mode

When running the demonstration board in stand-alone mode, the four switches (S1) allow the user to perform the following:

- enable the device
- set the motor direction
- brake the motor
- choose to run in torque or speed mode

R17 and R22 set the reference voltage provided to the VREF pin of the L6235 (in torque mode) or to the error amplifier, U2 (in speed mode). R20 and C11 make up a low-pass filter to provide an external reference voltage by a PWM output of a microcontroller. R10 and C8 are used to set the off-time, and R11 and C9 set the duration of the TACHO output pulses.

For more details on the L6235PD IC, refer to the L6235 datasheet and application note AN1625, both available on [www.st.com](http://www.st.com).



### 3 Revision history

Table 5. Document revision history

Date	Revision	Changes
25-Aug-2011	1	Initial release.

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