AN2759
Application note

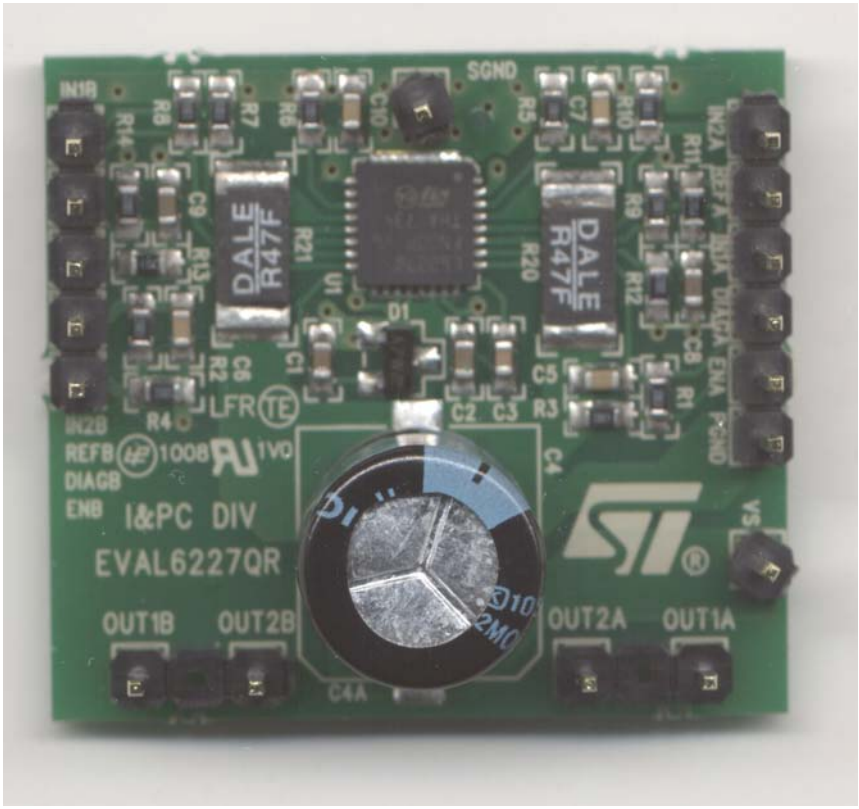
EVAL6227QR demonstration board using a dual full-bridge L6227Q for motor control applications

Introduction

This application note describes the demonstration board of the DMOS dual full-bridge L6227Q designed for motor control applications. The board implements a typical application that can be used as a reference design to drive two-phase bipolar stepper motors with currents up to 1A DC, multiple DC motors and a wide range of inductive loads.

Thanks to the small footprint of the L6227Q (QFN 5 x 5 mm, 32-lead) the PCB is very compact (27 x 32 mm).

Figure 1. EVAL6227QR demonstration board

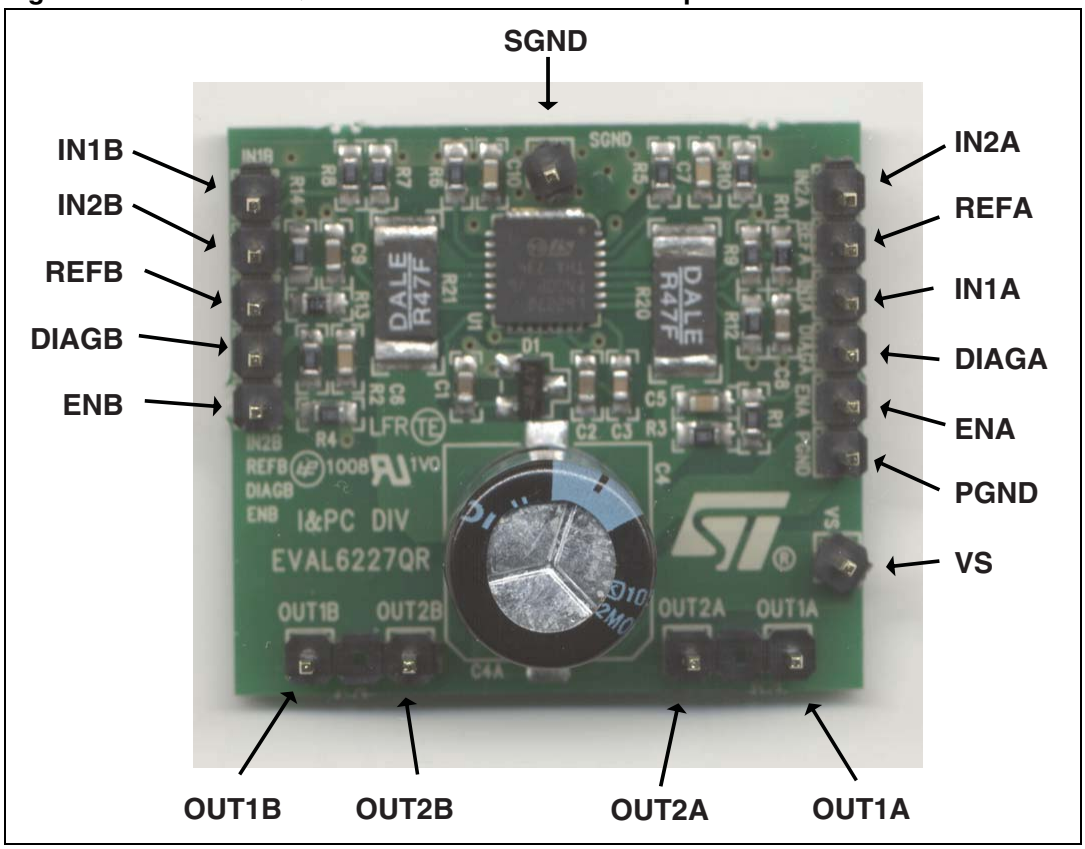


1 Demonstration board description

Table 1. EVAL6227QR pin connections

Name	Type	Function
VS	Power supply	Bridge A and bridge B power supply
PGND	Ground	Power ground terminal
IN1A	Logic input	Bridge A logic input 1
IN2A	Logic input	Bridge A logic input 2
ENA	Logic input	Bridge A enable (active high). When low, the power DMOSs of bridge A are switched OFF.
IN1B	Logic input	Bridge B logic input 1
IN2B	Logic input	Bridge B logic input 2
ENB	Logic input	Bridge B enable (active high). When low, the power DMOSs of bridge B are switched OFF.
DIAGA	Open drain output	Bridge A diagnostic pin. When low, an overcurrent or overtemperature event of bridge A is signaled.
DIAGB	Open drain output	Bridge B diagnostic pin. When low, an overcurrent or overtemperature event of bridge B is signaled.
SGND	Ground	Signal ground terminal
REFA	Analog input	Bridge A current controller reference voltage
REFB	Analog input	Bridge B current controller reference voltage
OUT1A	Power output	Bridge A output 1
OUT2A	Power output	Bridge A output 2
OUT1B	Power output	Bridge B output 1
OUT2B	Power output	Bridge B output 2

Figure 2. EVAL6227QR demonstration board description



The INx input pins drive the corresponding half-bridge. When low logic level is applied, the low side MOS is switched on, whereas a high logic level turns on the high side MOS.

To perform the PWM current control an analog reference voltage should be provided to each channel of the driver. A fixed reference voltage can be easily obtained through a resistive divider from an external voltage rail and GND (can be the one supplying the microcontroller or the rest of the application).

Otherwise a very simple way to obtain a variable voltage without using a DAC is to low-pass filter a PWM output of a microcontroller.

Table 2 summarizes the electrical specification of the application and *Figure 3* shows the electrical schematic.

Table 2. EVAL6227QR electrical specification (recommended value)

Parameter	Value
Supply voltage range (VS)	8 to 52 Vdc
RMS output current rating (OUTx)	up to 1.4 A
Switching frequency	up to 100 kHz
Input and enable voltage range	0 to + 5 V
Voltage reference range (REFA, REFB)	0 to + 5 V
Operating temperature range	-25 to +125°C
L6227Q thermal resistance junction to ambient	42°C/W

Figure 3. EVAL6227QR demonstration board schematic

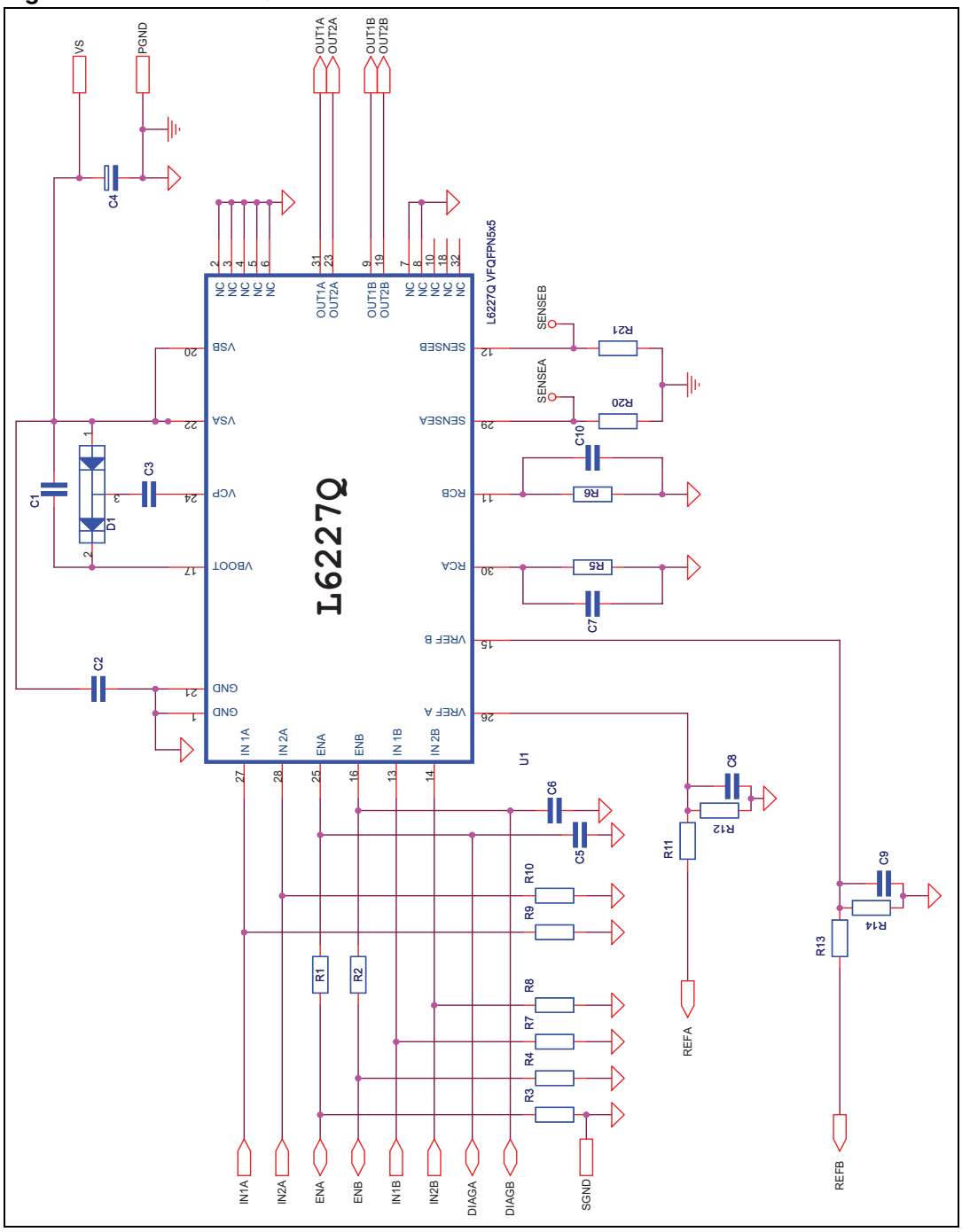


Table 3. EVAL6227QR part list

Part reference	Part value	Part description
C1	220 nF/25 V	Capacitor
C2	220 nF/63 V	Capacitor
C3	10 nF/25 V	Capacitor
C4	100 µF/63 V	Capacitor
C5, C6	5.6 nF	Capacitor
C7, C10	820 pF	Capacitor
C8, C9	220 nF	Capacitor
D1	BAT46SW	Diode
R1, R2, R3, R4, R7, R8, R9, R10	100 kΩ, 5%, 0.25 W	Resistor
R5, R6	100 kΩ, 1%, 0.25 W	Resistor
R11, R13	20 kΩ, 5 %, 0.25 W	Resistor
R12, R14	2 kΩ, 5 %, 0.25 W	Resistor
R20, R21	0.4 Ω, 1 W	Resistor
U1	L6227Q	Dual full-bridge in VFQFPN5x5

D1, C1 and C3 constitute a charge pump circuit, which generates the supply voltage for the high-side integrated MOSFETs. Due to voltage and current switching at relatively high frequency, these components are connected through short paths in order to minimize induced noise on other circuitries.

R1, R2 and C5, C6 are used by the overcurrent protection integrated circuitry (disable time $t_{DISABLE}$ is about 200 µs and delay time t_{DELAY} about 1 µs using the values in *Table 3*).

R5, C7 and R6, C10 are used to set the off-time t_{OFF} of the two PWM channels at about 50 µs. The off-time should be adjusted according to the motor electrical characteristics and supply voltage by changing R5, C7 and R6, C10 values.

R11, R12, C8 and R13, R14, C9 are low-pass filters which provide an external reference voltage through a PWM output of a microcontroller.

Figure 4, *Figure 5* and *Figure 6* show the placement of the components and the layout of the two layers of the EVAL6227QR demonstration board. A GND area has been used to improve the IC power dissipation.

Figure 4. Component placement

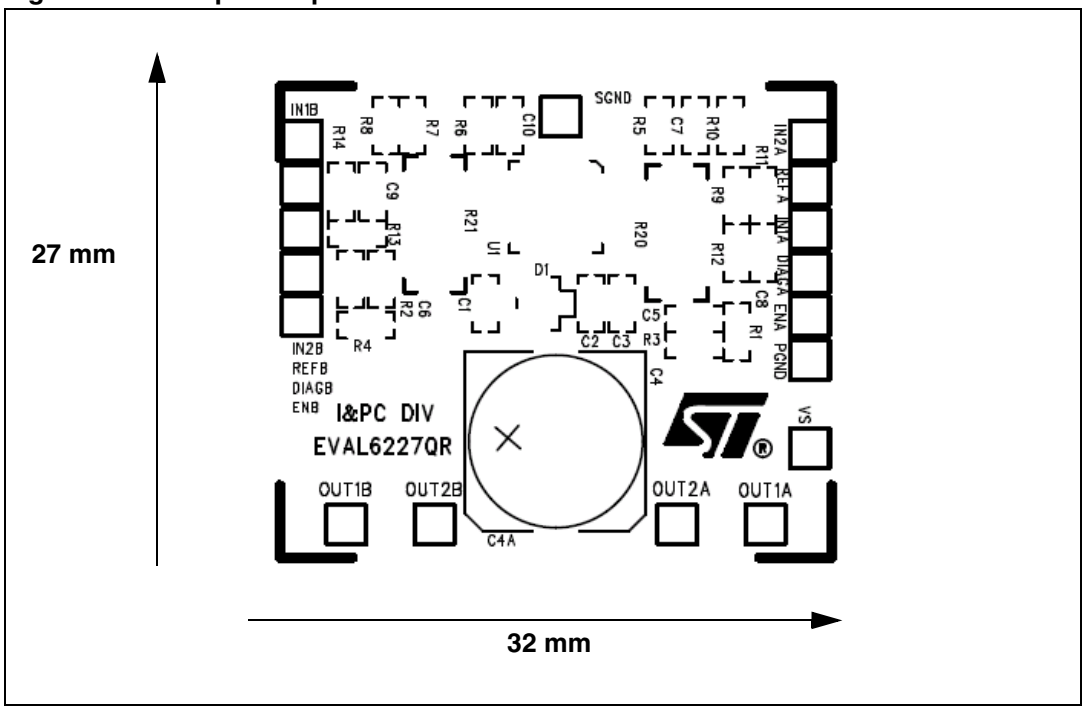


Figure 5. Top layer layout

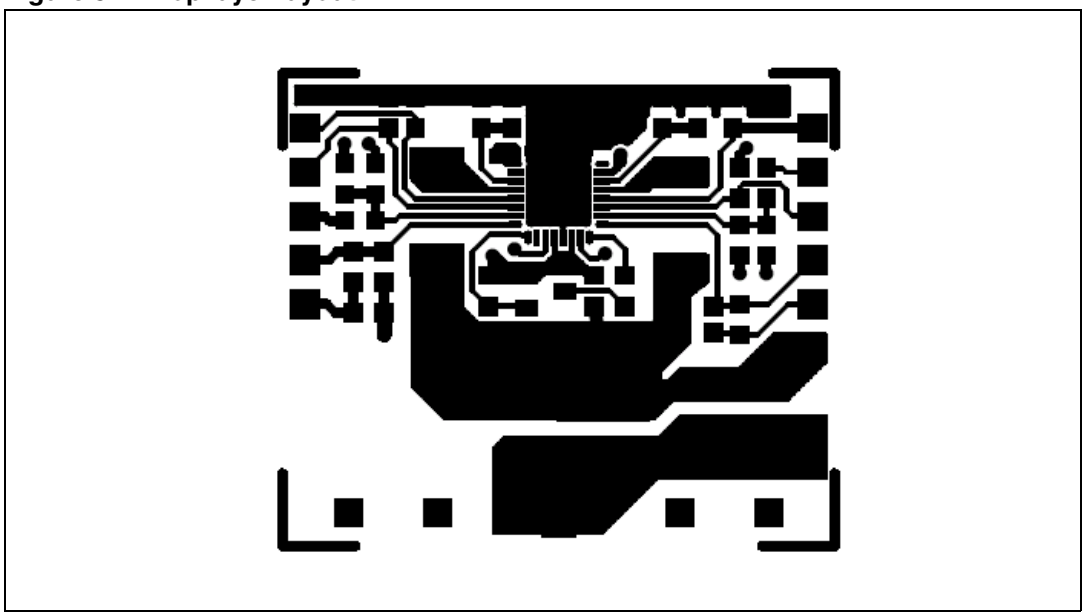
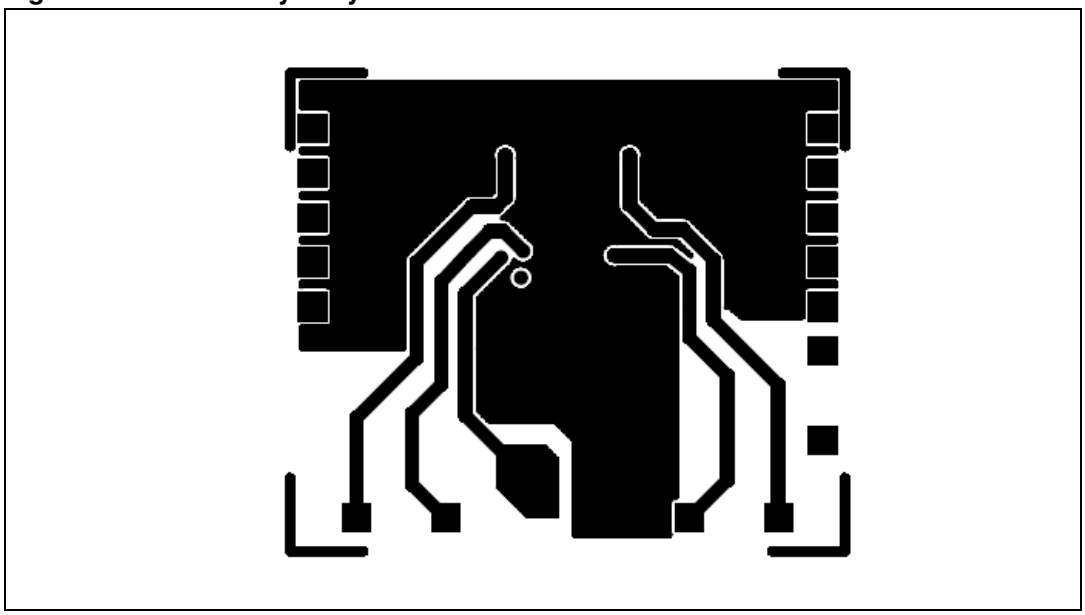


Figure 6. Bottom layer layout



2 Revision history

Table 4. Document revision history

Date	Revision	Changes
06-Oct-2008	1	Initial release
28-Jan-2009	2	Updated value in *Table 2: EVAL6227QR electrical specification (recommended value) on page 3*