

## Fully integrated stepper motor driver mounting the L6470 in a high power PowerSo package

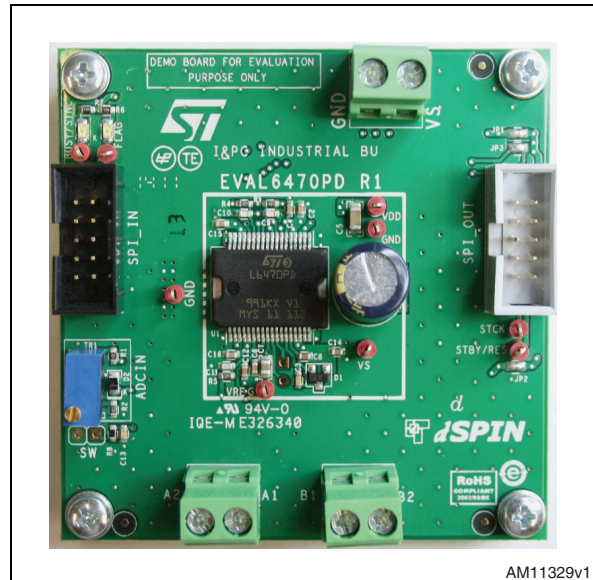
Data brief – preliminary data

### Features

- Voltage range from 8 V to 45 V
- Phase current up to 3 Ar.m.s.
- Dual SPI connector (daisy-chain configuration suitable)
- SW input
- FLAG and BUSY LED indicators
- Adjustable supply voltage compensation
- High thermal performance ( $R_{thj-a}$  12 °C/W typical)
- Suitable for use in combination with the STEVAL-PCC009V2

### Description

The EVAL6470PD demonstration board is a fully integrated microstepping motor driver. In combination with the STEVAL-PCC009V2 communication board and dSPIN evaluation software, the board allows the engineer to investigate all the features of the L6470 device. In particular, the board can be used to check the voltage mode driving and to regulate the L6470 parameters in order to fit the application requirements. The 4-layer layout and the PowerSO package allow the top thermal performance to be obtained. The EVAL6470PD supports the daisy-chain configuration making it suitable for the evaluation of the L6470 in multi-motor applications.



AM11329v1

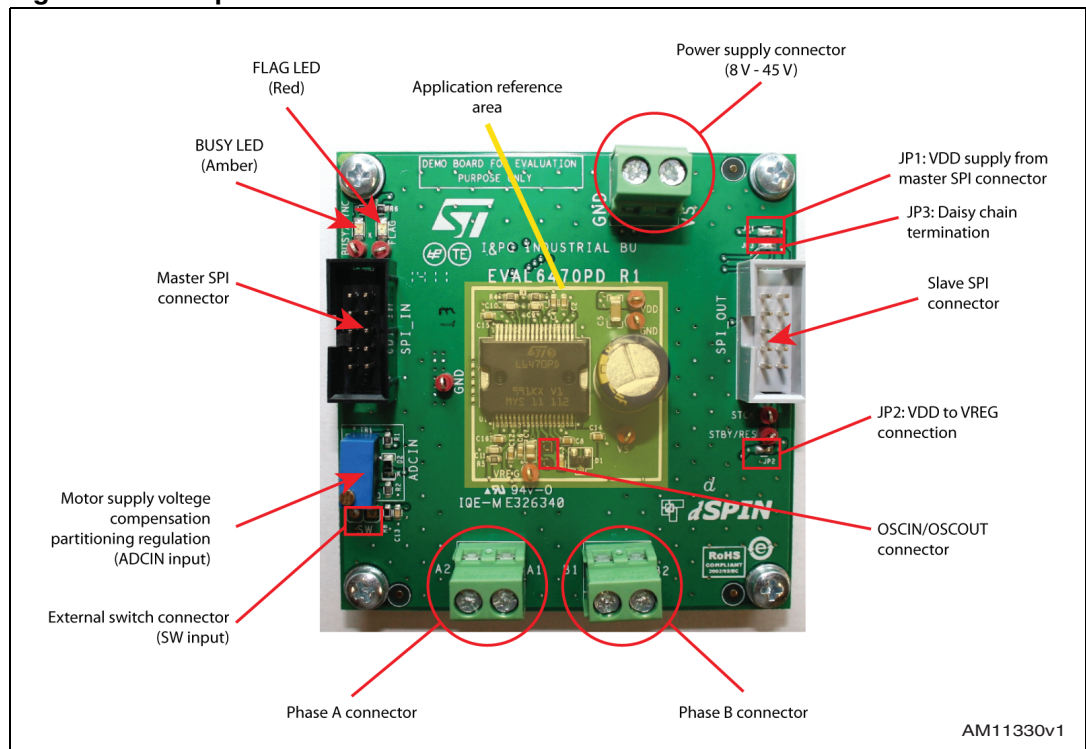
# 1 Board description

**Table 1. EVAL6470PD specifications**

Parameter	Value
Supply voltage (VS)	8 to 45 V
Maximum output current (each phase)	3 A <sub>r.m.s.</sub>
Logic supply voltage (VREG)	Externally supplied: 3.3 V internally supplied: 3 V typical
Logic interface voltage (VDD)	Externally supplied: 3.3 V or 5 V internally supplied: VREG
Low level logic input voltage	0V
High level logic input voltage	VDD <sup>(1)</sup>
Operating temperature	-25 to +125 °C
L6470PD thermal resistance junction-to-ambient	12 °C/W typical

1. All logic inputs are 5 V tolerant.

**Figure 1. Jumper and connector location**



**Table 2. Jumper and connector description**

Name	Type	Function
M1	Power supply	Motor supply voltage
M2	Power output	Bridge A outputs
M3	Power output	Bridge B outputs
CN1	SPI connector	Master SPI
CN2	SPI connector	Slave SPI
CN3	NM connector	OSCIN and OSCOUT pins
CN4	NM connector	External switch input
TP1 (VS)	Test point	Motor supply voltage test point
TP2 (VDD)	Test point	Logic interface supply voltage test point
TP3 (VREG)	Test point	Logic supply voltage/L6470 internal regulator test point
TP5 (GND)	Test point	Ground test point
TP6 (GND)	Test point	Ground test point
TP8 (STCK)	Test point	Step clock input test point
TP9 (STBY/RES)	Test point	Standby/reset input test point
TP10 (FLAG)	Test point	FLAG output test point
TP11 (BUSY/SYNC)	Test point	BUSY/SYNC output test point

**Table 3. Master SPI connector pinout (J10)**

Pin number	Type	Description
1	Open drain output	L6470 BUSY/SYNC output
2	Open drain output	L6470 FLAG output
3	Ground	Ground
4	Supply	EXT_VDD (can be used as external logic power supply)
5	Digital output	SPI master IN slave OUT signal (connected to the L6470 SDO output through the daisy-chain termination jumper JP2)
6	Digital input	SPI serial clock signal (connected to L6470 CK input)
7	Digital input	SPI master OUT slave IN signal (connected to L6470 SDI input)
8	Digital input	SPI slave select signal (connected to L6470 CS input)
9	Digital input	L6470 step-clock input
10	Digital input	L6470 STBY/RST input

**Table 4. Slave SPI connector pinout (J11)**

Pin number	Type	Description
1	Open drain output	L6470 BUSY/SYNC output
2	Open drain output	L6470 FLAG output
3	Ground	Ground
4	Supply	EXT_VDD (can be used as external logic power supply)
5	Digital output	SPI master IN slave OUT signal (connected to pin 5 of J10)
6	Digital input	SPI serial clock signal (connected to L6470 CK input)
7	Digital input	SPI master OUT slave IN signal (connected to L6470 SDO output)
8	Digital input	SPI slave select signal (connected to L6470 CS input)
9	Digital input	L6470 step-clock input
10	Digital input	L6470 STBY/RST input

Figure 2. EVAL6470PD - schematic

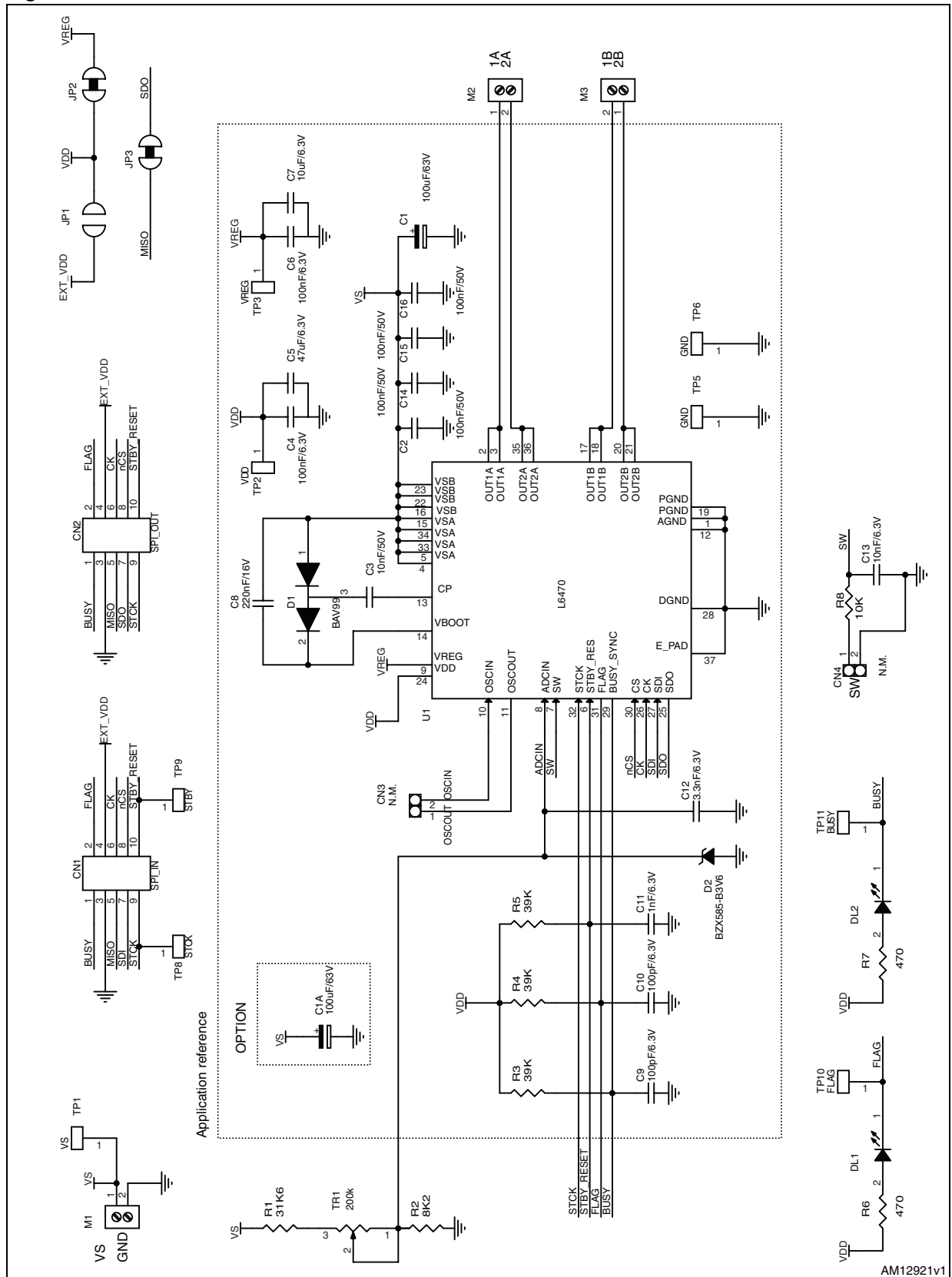
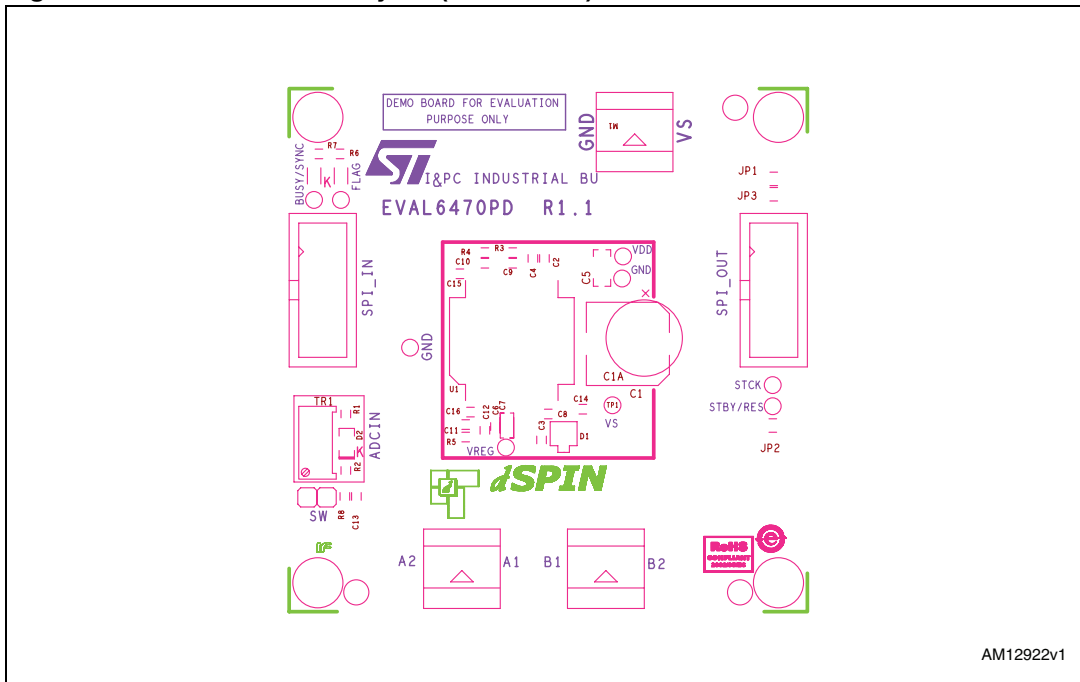


Table 5. EVAL6470PD - bill of material

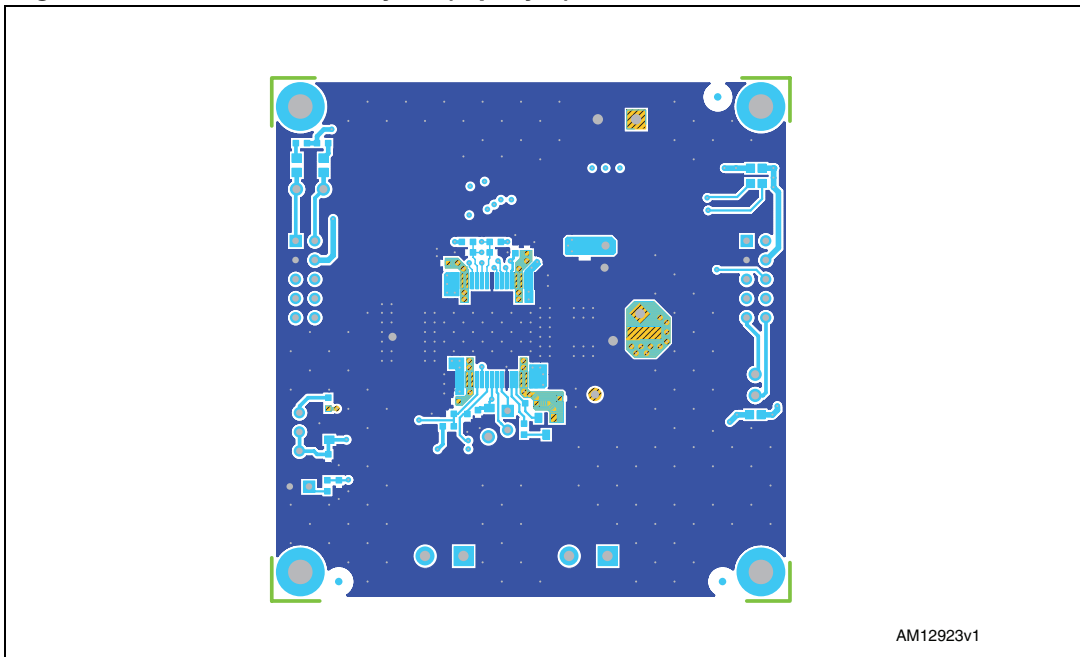
Index	Quantity	Reference	Value	Package
1	1	CN1	Pol. IDC male header vertical 10 poles (black)	CON-FLAT-5X2-180M
2	1	CN2	Pol. IDC male header vertical 10 poles (gray)	CON-FLAT-5X2-180M
3	2	CN3,CN4	N.M.	STRIP254P-M-2
4	1	C1A	100 $\mu$ F/63 V (option)	CAPE-R10HXX-P5
5	1	C1	100 $\mu$ F/63 V	CAPES-R10HXX
6	4	C2,C14,C15,C1	100 nF/50 V	CAPC-0603
7	1	C3	10 nF/50 V	CAPC-0603
8	2	C4,C6	100 nF/6.3 V	CAPC-0603
9	1	C5	47 $\mu$ F/6.3 V	CAPC-1206
10	1	C7	10 $\mu$ F/6.3 V	CAPC-0805
11	1	C8	220 nF/16 V	CAPC-0603
12	2	C9,C10	100 pF/6.3 V	CAPC-0603
13	1	C11	1 nF/6.3 V	CAPC-0603
14	1	C12	3.3 nF/6.3 V	CAPC-0603
15	1	C13	10 nF/6.3 V	CAPC-0603
16	1	DL1	LED red	LEDC-0805
17	1	DL2	LED amber	LEDC-0805
18	1	D1	BAV99	SOT23
19	1	D2	BZX585-B3V6	SOD523
20	1	JP1	Jumper OPEN	JP2SO
21	2	JP2,JP3	Jumper CLOSED	JP2SO
22	3	M1,M2,M3	Screw connector 2 poles	MORSV-508-2P
23	1	R1	31.6 k $\Omega$	RESC-0603
24	1	R2	8.2 k $\Omega$	RESC-0603
25	3	R3 R4 R5	39 k $\Omega$	RESC-0603
26	2	R6,R7	470 k $\Omega$	RESC-0603
27	1	R8	10 k $\Omega$	RESC-0603
28	9	TP1, TP2, TP3, TP5, TP6, TP8, TP9, TP10, TP11	TPTH-RING-1MM	TPTH-RING-1MM
29	1	TR1	200 k $\Omega$	TRIMM-100x50x110-64W
30	1	U1	L6470	PowerSO36

Figure 3. EVAL6470PD - Layout (silk screen)



AM12922v1

Figure 4. EVAL6470PD - Layout (top layer)



AM12923v1

Figure 5. EVAL6470PD - Layout (inner layer 2)

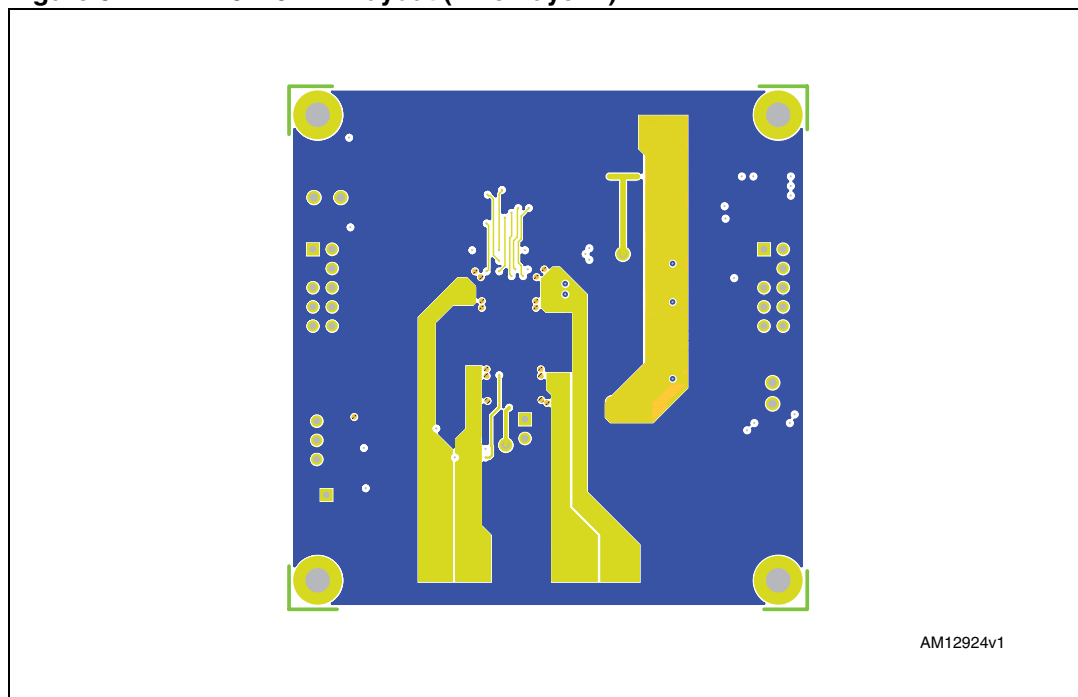


Figure 6. EVAL6470PD - Layout (inner layer 3)

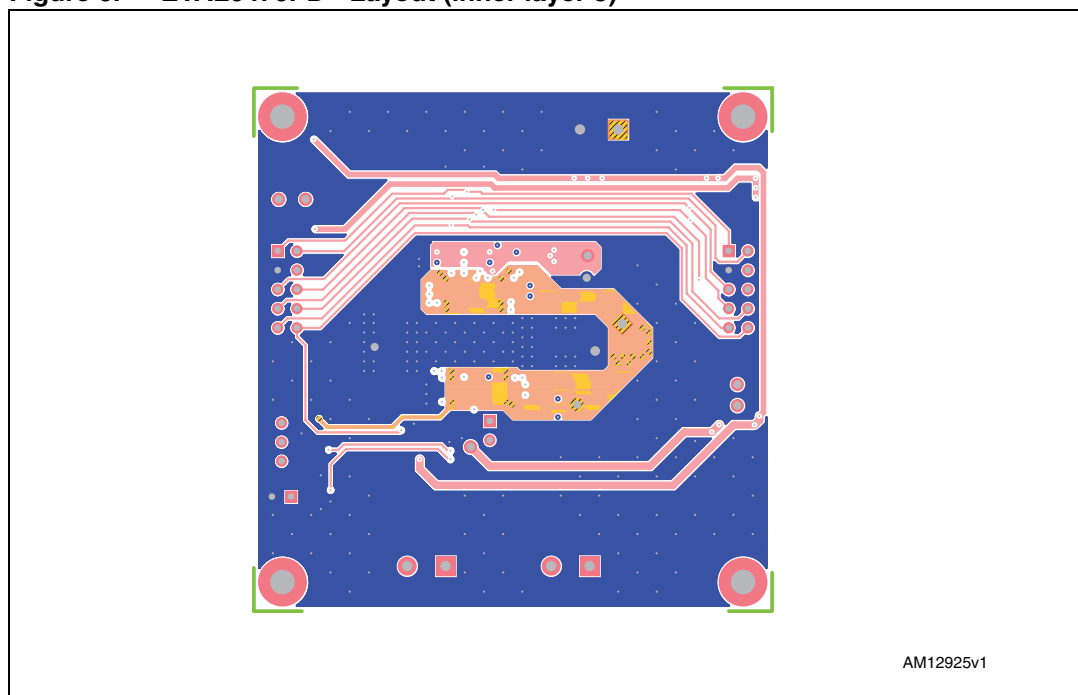
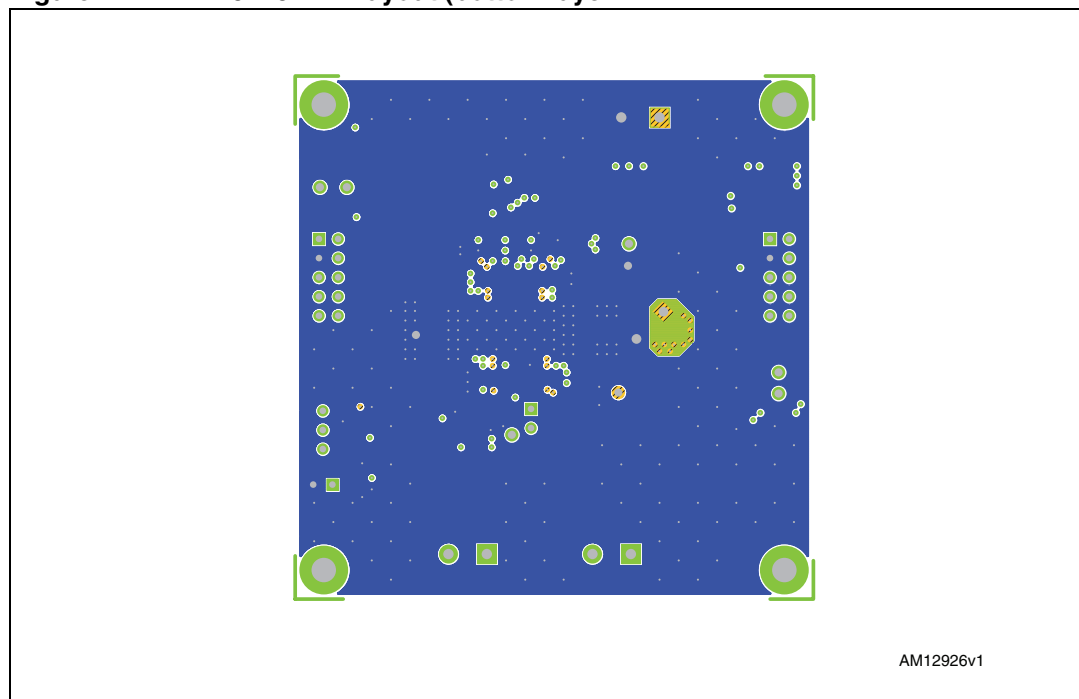


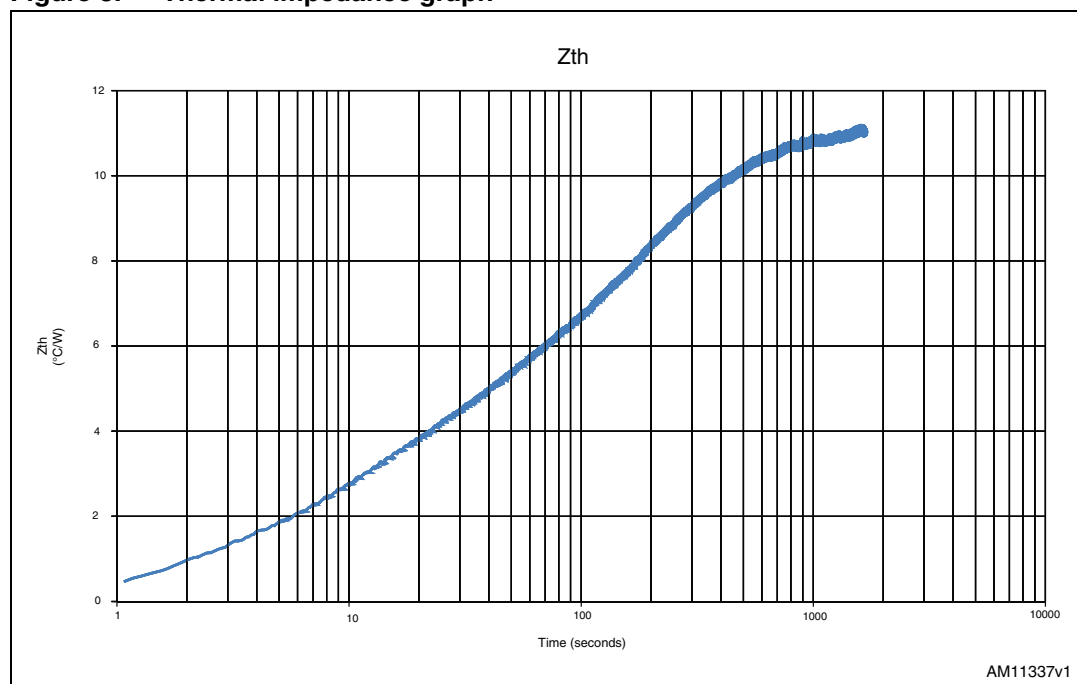


Figure 7. EVAL6470PD - Layout (bottom layer)



## 1.1 Thermal data

Figure 8. Thermal impedance graph



## 2 Revision history

**Table 6. Document revision history**

Date	Revision	Changes
23-Dec-2011	1	Initial release.
31-May-2012	2	Updated: <a href="#">Figure 2</a> , <a href="#">Figure 3</a> , <a href="#">Figure 4</a> , <a href="#">Figure 5</a> , <a href="#">Figure 6</a> , <a href="#">Figure 7</a> . Updated TP9 (STBY/RES) function in <a href="#">Table 2</a> ; Updated pin 1 and pin 10 description both in <a href="#">Table 3</a> and in <a href="#">Table 4</a> . Updated <a href="#">Table 5: EVAL6470PD - bill of material</a> .

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)