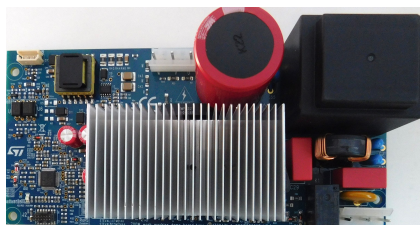


700 W reference design for washing machine and home appliances



Features

- Motor control solution for a 3-Phase BLDC up to 700 W
- Compliant with new STM32 ZEST software algorithm
- Input voltage: AC 230 V / 50 Hz
- Inverter switch frequency: 16 kHz
- DC bus overvoltage protection
- Overcurrent protection in the intelligent power module (IPM)
- Over temperature protection in the IPM
- Three-shunt current sensing
- Back electromotive force sampling of motor
- STLINK-V3 connection for debug and configuration
- Isolated one-wire half-duplex serial communication
- Control stage based on STM32G431 to perform motor control algorithms, current, voltage, and temperature sampling
- Power stage based on the STGIPQ8C60T-HZ IPM
 - NTC (UL 1434 CA 2 and 4)
 - UL recognition: UL 1557, file E81734

Description

The **STEVAL-CTM014A** has been designed to drive a 3-phase brushless DC motor up to 700 W typically of a washing machine appliance.

The circuit is composed of four parts: the control part, the compressor drive part, the auxiliary power supply circuit, and the communication circuit.

The control part uses **STM32G431CB** as the main control chip, which is mainly used to control motors. It also includes: current, voltage, temperature sampling, the realization of communication, overcurrent protection, over voltage protection, over temperature protection.

The compressor drive part includes a three-phase inverter circuit, lower bridge current sampling of IPM (current sampling is realized by **STM32G431CB** internal integrated operational amplifier).

The three-phase inverter bridge adopts **STGIPQ8C60T-HZ** intelligent power module. The **STGIPQ8C60T-HZ** includes six IGBTs and gate drive circuits, as well as NTC temperature sampling and overcurrent comparison circuits.

The auxiliary power supply circuit includes: transformer, switching power supply controller, power switch tube, rectifier diode, etc.

The **VIPER122** integrates a switching power supply control chip and power MOSFET, and also has short-circuit protection functions. Mentioned functions simplify the design of the power supply and reduce the size of the power supply.

About the communication circuit, the **STEVAL-CTM014A** designs a single-line half-duplex serial communication circuit with isolation, this allows convenient communication with the washing machine control panel.

Product summary	
700 W reference design for washing machine and home appliances	STEVAL-CTM014A
Mainstream Arm Cortex-M4 MCU 170 MHz with 128 Kbytes of Flash memory, Math Accelerator, Medium Analog level integration	STM32G431CBT6
SLLIMM nano 2nd series IPM, 3-phase inverter, 8 A, 600 V, short-circuit rugged IGBT	STGIPQ8C60T-HZ
High voltage converter	VIPER122LSTR
Applications	Motor Control

1 User interface introduction

Figure 1. User interface

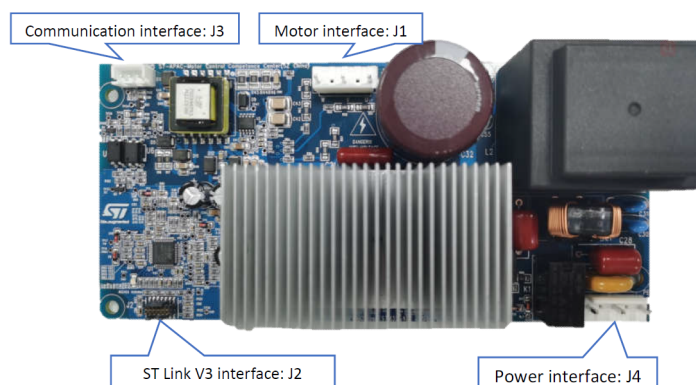
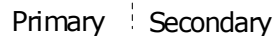


Table 1. Motor parts

Item	Name	Description
J1	Motor interface	U: connect the U phase of the motor V: connect the V phase of the motor W: connect the W phase of the motor
J2	ST link V3 interface	Connect the ST LINK V3 for software debugging, wich contains the SWD and UART interfaces
J3	Communication interface	VCC: communication secondary side isolated 5v power supply GND: communication secondary side isolated GND R/T: single line half duplex communication signal
J4	Power interface	L: live line of the input power supply N: neutral line of the input power supply PE: earth line of the input powee supply

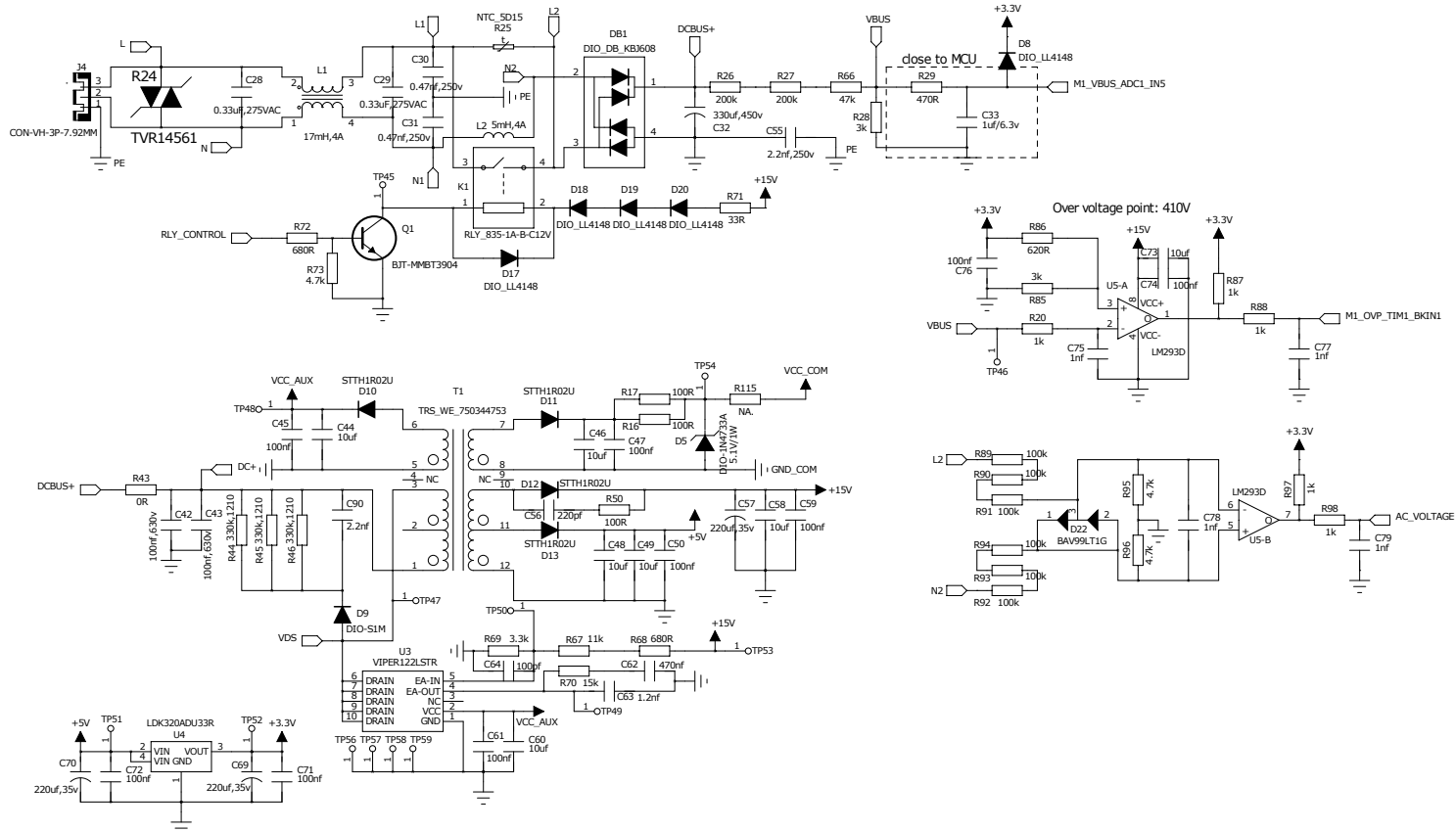
2

Figure 2. STEVAL-CTM014A circuit schematic (1 of 3)



STEVAL-CTM014A

Schematic diagrams



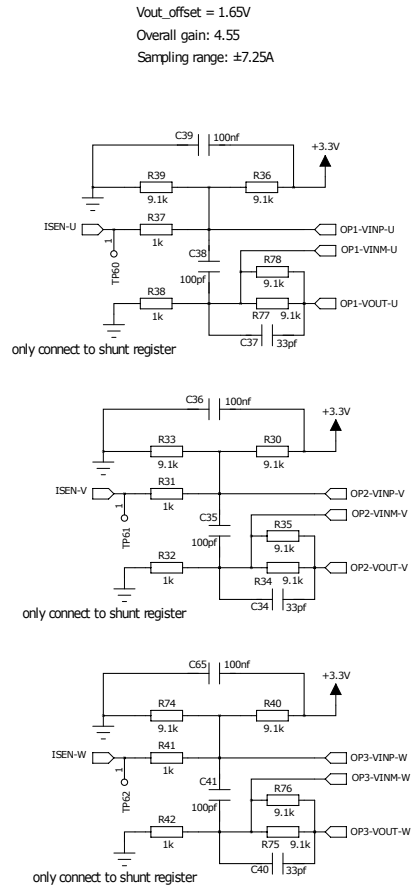
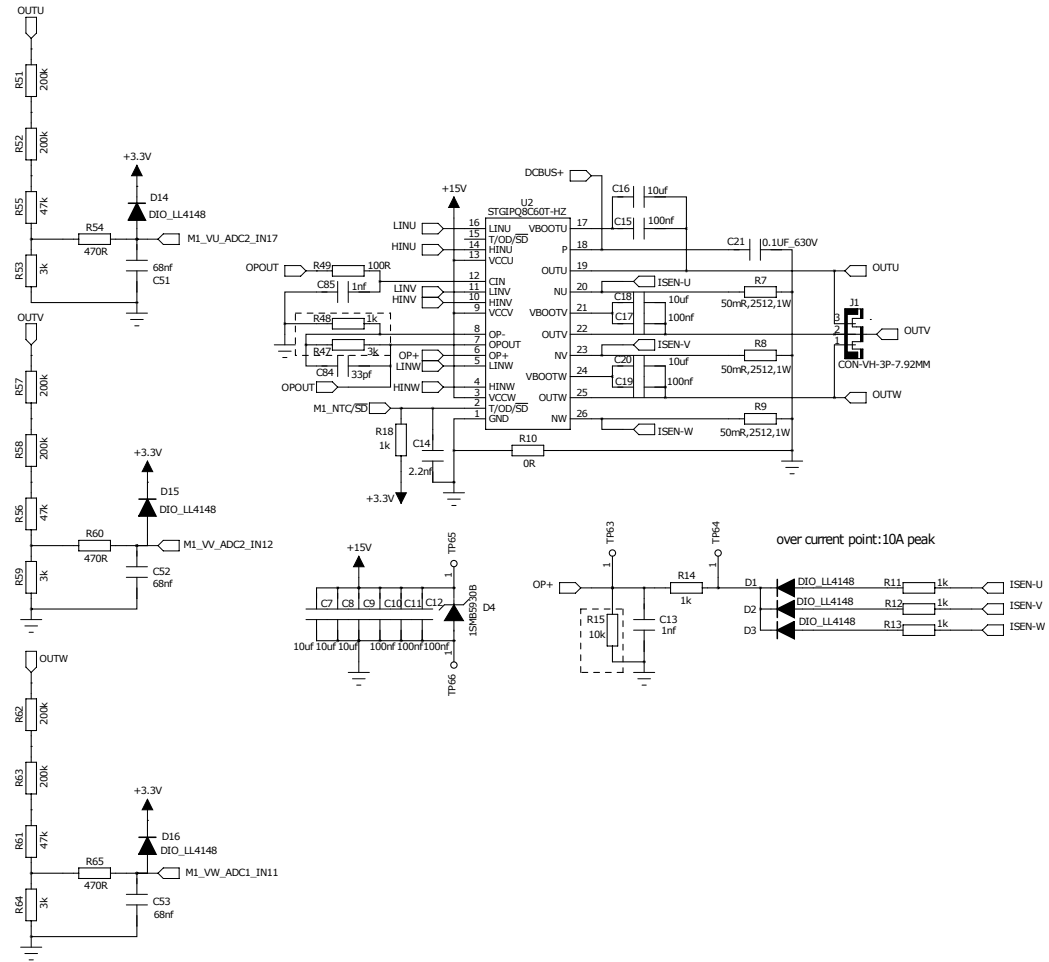


Figure 4. STEVAL-CTM014A circuit schematic (3 of 3)



3 Board versions

Table 2. STEVAL-CTM014A versions

Finished good	Schematic diagrams	Bill of materials
STEVAL\$CTM014AA ⁽¹⁾	STEVAL\$CTM014AA schematic diagrams	STEVAL\$CTM014AA bill of materials

1. This code identifies the STEVAL-CTM014A evaluation board first version.

Revision history

Table 3. Document revision history

Date	Revision	Changes
16-Oct-2025	1	Initial release.

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice.

In the event of any conflict between the provisions of this document and the provisions of any contractual arrangement in force between the purchasers and ST, the provisions of such contractual arrangement shall prevail.

The purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgment.

The purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of the purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

If the purchasers identify an ST product that meets their functional and performance requirements but that is not designated for the purchasers' market segment, the purchasers shall contact ST for more information.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2025 STMicroelectronics – All rights reserved