

Motor driver ICs for industrial applications

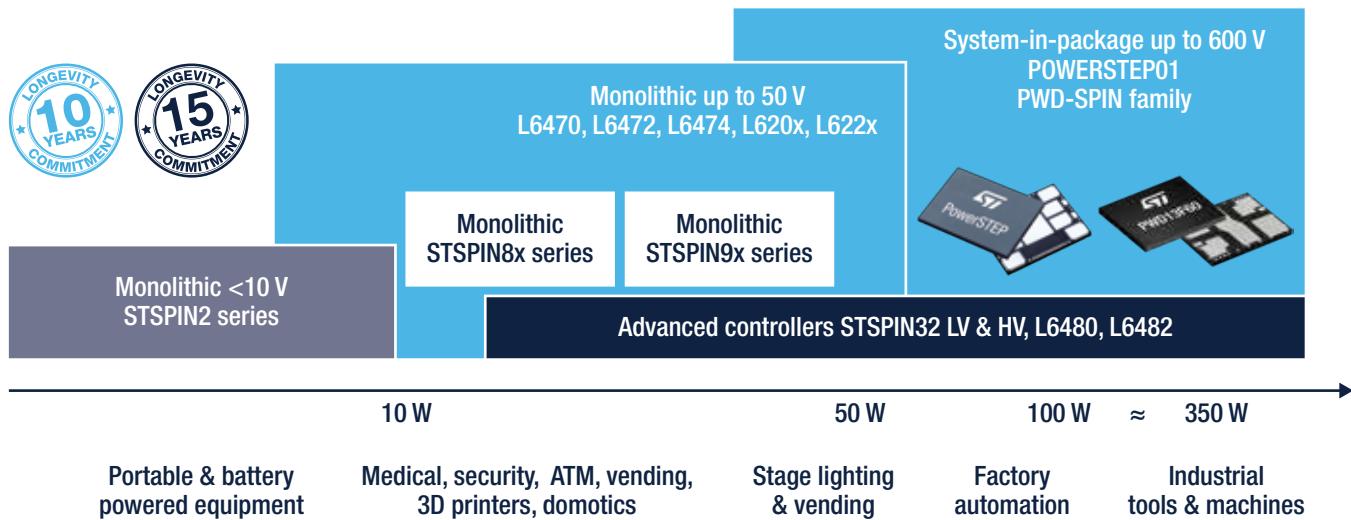
Selection guide



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STSPIN motor drivers overview



STSPIN motor drivers embed all the functions needed to drive motors efficiently and with the highest accuracy. They include an advanced motion profile generator to relieve the host microcontroller, while ensuring robustness and reliability thanks to a comprehensive set of protection and diagnostic features.

Particularly noteworthy are the adaptive current decay control scheme used in many of the STSPIN motor driver ICs as well as the innovative voltage mode driving used in micro-stepping motor drivers that provides enhanced torque control accuracy and thus motion smoothness.

More than
50
products in
motor driver
portfolio

MAIN APPLICATIONS

- Industrial and robotics
- Textile, sewing and pick and place machines
- Stage lighting
- Printers and 3D printers
- Point-of-sale, ATM and vending machines
- Medical equipment
- Security and surveillance
- Drones

Our line-up of STSPIN motor control ICs has been developed with the objectives of modularity, scalability and robustness to provide designers a wide choice of solutions to fit different requirements and system architectures.

All products have comprehensive built-in protection and diagnostic schemes to help attain the level of long-term reliability and robustness required to cope with harsh factory automation environments.

Available in a wide selection of space-saving, thermally optimized packages, you are sure to find a device in our STSPIN line-up that addresses your motor or motion control system requirements.

A complete ecosystem is provided to support design-in and shorten time-to-market

Designing motor control applications becomes much easier with the outstanding performance, features and full support of STSPIN motor driver ICs that make brushed DC, stepper and brushless motor control designs more efficient in a variety of applications.

A wide range of **evaluation boards** is provided, together with low-cost plug-and-play **discovery kits**: an ideal development tool for both beginners and experienced users that is autonomous and can be used with a software interface or with custom firmware thanks to the embedded microcontroller.

Schematics, BOMs and gerber files are available to give you a head start with your hardware design together with comprehensive technical documentation.

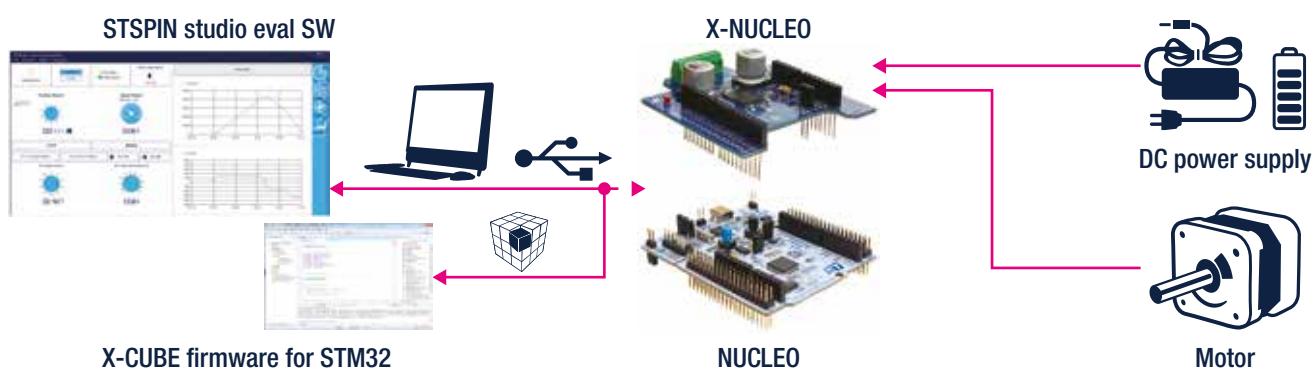
Software suites are also provided to enable quick and easy development of motor driving solutions.

In addition, STSPIN motor drivers can be easily evaluated in combination with an STM32 32-bit microcontroller in an open, flexible and affordable development environment to enable fast prototyping that can quickly be transformed into final designs.

The comprehensive development environment includes:

- **STM32 Nucleo development boards:**
a comprehensive range of affordable development boards for all STM32 microcontroller series
- **STM32 Nucleo expansion boards:**
based on STSPIN motor drivers, the expansion boards can be plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards

STM32 expansion boards (X-Nucleo) are equipped with standardized interconnections such as an Arduino Uno R3 connector or a morpho connector for a higher level of connectivity. Each expansion board is supported by STM32-based software modules.



 Find the X-Nucleo expansion board that best fits your application now on st.com/x-nucleo

STSPIN STUDIO SOFTWARE



STSPIN Studio – part number **STSW-STSPIN01** – is an easy-to-use software for the evaluation of brushed DC and stepper motors with the STSPIN family devices.

It allows the proper command for several evaluation boards of stepper and brush DC motor drivers while three-phase brushless DC motors can be configured with the STM32 ecosystem previously detailed in this document.

STSPIN STUDIO software platform allows to investigate a wide range of final applications through an intuitive GUI where the user can control and monitor motor operation.

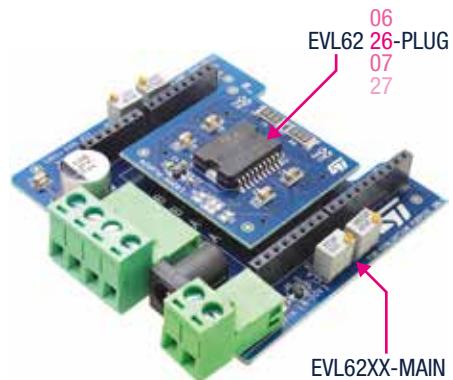
Its main purpose is to set parameters to apply the proper control of the motor and optimize the performance of the final application.

STSPIN Studio can also manage the on-line updating, allowing the user to easily download the last version of firmware for each device, ensuring the best performances.

STSPIN Studio can be used with STM32 Nucleo board development platform, to quickly evaluate and start a development with the expansion board of STSPIN device family.

Additionally, a brand-new platform of interchangeable plug-in boards has been released to make the evaluation even easier. Evaluation main board are designed to hold plug-in boards for the STSPIN2, STSPIN8, STSPIN9, L62 and L64 families creating a single hardware platform to be used in combination with STSPIN STUDIO.

STSPIN STUDIO works also in combination with general-purpose evaluation boards of those families.



STSPIN Studio supported boards

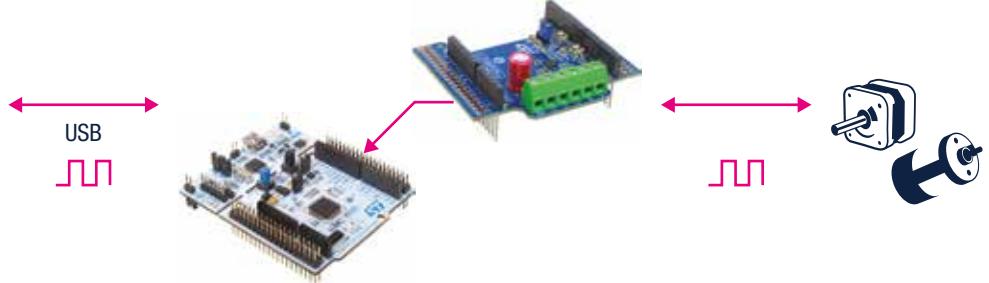
Development board	Description
NUCLEO-F401RE	STM32 Nucleo-64 development board with STM32F401RE MCU, supports Arduino and ST morpho connectivity
Evaluation board	Description
X-NUCLEO-IHM04A1	Low voltage dual brush DC motor driver expansion board based on L6206 for STM32 Nucleo
X-NUCLEO-IHM06A1	Low voltage stepper motor driver expansion board based on the STSPIN220 for STM32 Nucleo
X-NUCLEO-IHM12A1	Low voltage dual brush DC motor driver expansion board based on STSPIN240 for STM32 Nucleo
X-NUCLEO-IHM14A1	Stepper motor driver expansion board based on STSPIN820 for STM32 Nucleo
X-NUCLEO-IHM15A1	Dual brush DC motor driver expansion board based on STSPIN840 for STM32 Nucleo
EVL62xx-MAIN + EVL6208-PLUG + EVL6228-PLUG	Set of 2 boards for low voltage stepper motor driver based on the L62x8 for STM32 Nucleo
EVL62xx-MAIN + EVL6205/6/7-PLUG + EVL6225/6/7-PLUG	Set of 2 boards for dual brush DC motor driver based on the L62x5/6/7 for STM32 Nucleo

NUCLEO EXPANSION BOARD SETUP

STSPIN STUDIO



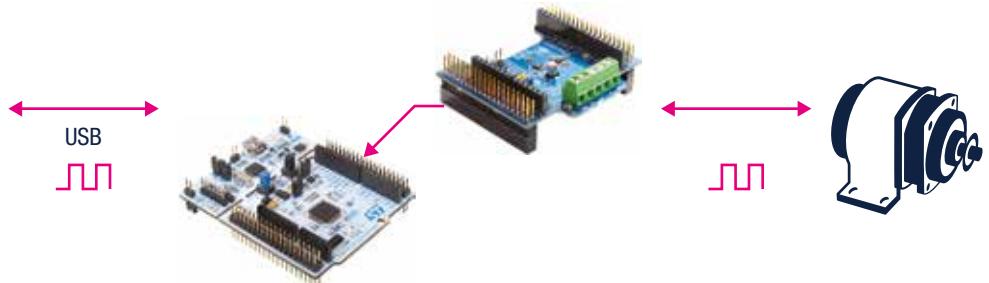
Expansion board plugged on the Nucleo board



MC SDK



Expansion board plugged on the Nucleo board

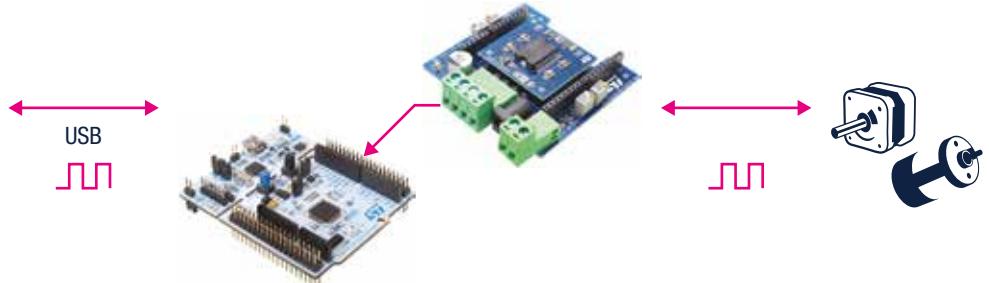


PLUG-IN BOARDS SETUP WITH NUCLEO

STSPIN STUDIO

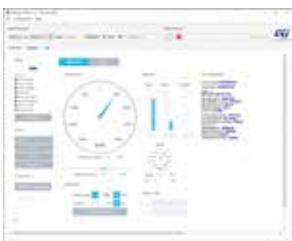


Main board + plug-in mounted on the Nucleo board



GENERAL PURPOSE BOARDS AND REFERENCE DESIGNS

MC SDK



Evaluation board or reference design



Ecosystem for stepper motor drivers and controllers

Part number	Tool type	Core product	Evaluation software	Firmware	Companion board
EVSPIN948	Evaluation board for STSPIN948	STSPIN948	STSW-STSPIN01	-	NUCLEO-F401RE
EVL6470*	Evaluation board for L6470	L6470	STSW-STSPIN01	-	NUCLEO-F401RE
EVL6472*	Evaluation board for L6472	L6472	STSW-STSPIN01	-	NUCLEO-F401RE
EVL6480*	Evaluation board for L6480	L6480	STSW-STSPIN01	-	NUCLEO-F401RE
EVL6482*	Evaluation board for L6482	L6482	STSW-STSPIN01	-	NUCLEO-F401RE
X-NUCLEO-IHM14A1	Expansion board for STM32 Nucleo board	STSPIN820	STSW-STSPIN01	X-CUBE-SPN14	STM32 Nucleo board F4, F0 or L0 series
X-NUCLEO-IHM06A1	Expansion board for STM32 Nucleo board	STSPIN220	STSW-STSPIN01	X-CUBE-SPN6	STM32 Nucleo board F4, F0 or L0 series
EVLPOWERSTEP01	Evaluation board	POWERSTEP01	STSW-SPIN002	X-CUBE-SPN3	STEVAL-PCC009V2 interface board
X-NUCLEO-IHM03A1	Expansion board for STM32 Nucleo board	POWERSTEP01	STSW-SPIN002	X-CUBE-SPN3	STM32 Nucleo board F4, F0 or L0 series
EVAL6482H-DISC	Discovery kit	L6482	STSW-SPIN002	STSW-SPIN005, STSW-SPINDISC01	-
EVAL6482H	Evaluation board	L6482	STSW-SPIN002	STSW-SPIN005	STEVAL-PCC009V2 interface board
EVAL6480H-DISC	Discovery kit	L6480	STSW-SPIN002	STSW-SPIN005, STSW-SPINDISC01	-
EVAL6480H	Evaluation board	L6480	STSW-SPIN002	STSW-SPIN005	STEVAL-PCC009V2 interface board
EVAL6474H	Evaluation board	L6474	STSW-SPIN002	X-CUBE-SPN1	STEVAL-PCC009V2 interface board
EVAL6474PD	Evaluation board	L6474	STSW-SPIN002	X-CUBE-SPN1	STEVAL-PCC009V2 interface board
X-NUCLEO-IHM01A1	Expansion board for STM32 Nucleo board	L6474	STSW-SPIN002	X-CUBE-SPN1	STM32 Nucleo board F4, F0 or L0 series
EVAL6472H-DISC	Discovery kit	L6472	STSW-SPIN002	STSW-SPIN004, STSW-SPINDISC01	-
EVAL6472H	Evaluation board	L6472	STSW-SPIN002	STSW-SPIN004	STEVAL-PCC009V2 interface board
EVAL6472PD	Evaluation board	L6472	STSW-SPIN002	STSW-SPIN004	STEVAL-PCC009V2 interface board
EVAL6470H-DISC	Discovery kit	L6470	STSW-SPIN002	STSW-SPIN004, STSW-SPINDISC01	-
EVAL6470H	Evaluation board	L6470	STSW-SPIN002	STSW-SPIN004	STEVAL-PCC009V2 interface board
EVAL6470PD	Evaluation board	L6470	STSW-SPIN002	STSW-SPIN004	STEVAL-PCC009V2 interface board
X-NUCLEO-IHM02A1	Expansion board for STM32 Nucleo board	L6470	-	X-CUBE-SPN2	STM32 Nucleo board F4, F0 or L0 series
STEVAL-IKM001V1	Evaluation kit EVAL6470H and STEVAL-PCC009V2	L6470	STSW-IKM001V1S	STSW-IKM001V1	-
X-NUCLEO-IHM05A1	Expansion board for STM32 Nucleo board	L6208	STSW-SPIN002	STSW-SPIN005	STM32 Nucleo board F4, F0 or L0 series
EVAL6208Q	Evaluation board	L6208Q	STSW-SPIN003	-	STEVAL-PCC009V2 interface board
EVALSP820-XS	Evaluation board	STSPIN820	-	-	-
STSPIN220 click board	3rd party expansion board	STSPIN220	-	-	-
STSPIN820 click board	3rd party expansion board	STSPIN820	-	-	-
EVL6208-PLUG	Evaluation kit environment for L62xx family plug board	L6208PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6228-PLUG	Evaluation kit environment for L62xx family plug board	L6228PD	STSW-STSPIN01	-	EVL62XX-MAIN

Note: * available in Q1 2024

Ecosystem for brushed DC motor drivers and controllers

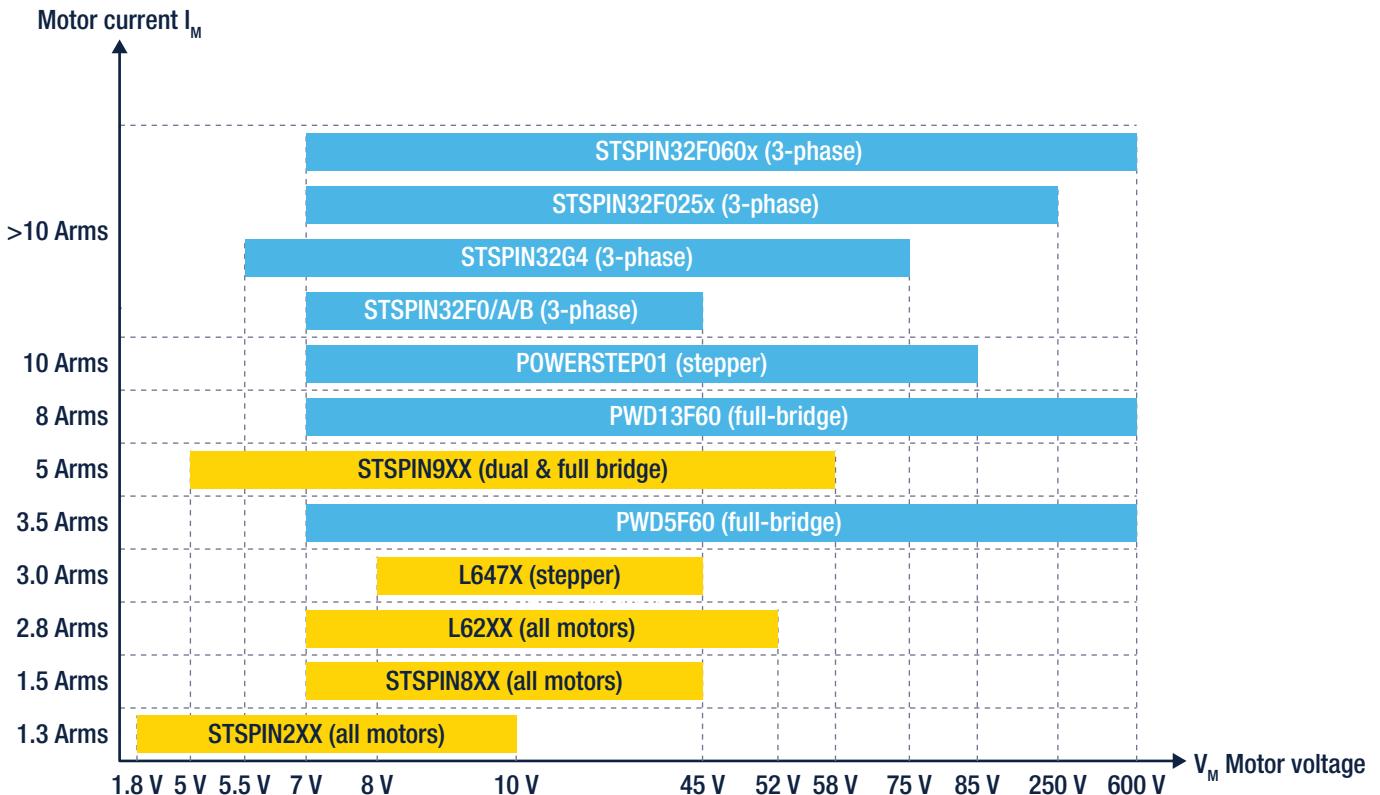
Part number	Tool type	Core product	Evaluation software	Firmware	Companion board
EVSPIN948	Evaluation board for STSPIN948	STSPIN948	STSW-STSPIN01	-	NUCLEO-F401RE
EVSPIN958	Evaluation board for STSPIN958	STSPIN958	STSW-STSPIN01	-	NUCLEO-F401RE
X-NUCLEO-IHM12A1	Expansion board for STM32 Nucleo board	STSPIN240	STSW-STSPIN01	X-CUBE-SPN12	STM32 Nucleo board F4, F0 or L0 series
X-NUCLEO-IHM13A1	Expansion board for STM32 Nucleo board	STSPIN250	STSW-STSPIN01	X-CUBE-SPN13	STM32 Nucleo board F4, F0 or L0 series
X-NUCLEO-IHM15A1	Expansion board for STM32 Nucleo board	STSPIN840	STSW-STSPIN01	X-CUBE-SPN15	STM32 Nucleo board F4, F0 or L0 series
EVSPIN32G4	Evaluation board	STSPIN32G4	-	-	-
EVSPIN32G4NH	Evaluation board	STSPIN32G4	-	-	-
EVALPWD5F60	Evaluation board	PWD5F60	-	-	-
EVALPWD13F60	Evaluation board	PWD13F60	-	-	-
EVAL6207Q	Evaluation board	L6207Q	STSW-SPN003	-	STEVAL-PCC009V2 interface board
X-NUCLEO-IHM04A1	Expansion board for STM32 Nucleo board	L6206	STSW-STSPIN01	X-CUBE-SPN4	STM32 Nucleo board F4, F0 or L0 series
EVAL2293Q	Evaluation board	L2293Q	-	-	-
STSPIN250 click board	3rd party expansion board	STSPIN250	-	-	-
EVL6205-PLUG	Evaluation kit environment for L62xx family plug board	L6205PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6225-PLUG	Evaluation kit environment for L62xx family plug board	L6225PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6206-PLUG	Evaluation kit environment for L62xx family plug board	L6206PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6226-PLUG	Evaluation kit environment for L62xx family plug board	L6226PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6207-PLUG	Evaluation kit environment for L62xx family plug board	L6207PD	STSW-STSPIN01	-	EVL62XX-MAIN
EVL6227-PLUG	Evaluation kit environment for L62xx family plug board	L6227PD	STSW-STSPIN01	-	EVL62XX-MAIN

Ecosystem for brushless DC motor drivers and controllers

Part number	Tool type	Core product	Evaluation software	Firmware	Companion board
EVSPIN32G4-ACT	Evaluation board for smart actuator	STSPIN32G4	X-CUBE MCSDK	-	STWIN.box
EVSPIN32G4-DUAL	Evaluation board for dual motor control	STSPIN32G4	X-CUBE MCSDK	-	-
STEVAL-SPIN3201	Evaluation board	STSPIN32F0	-	X-CUBE-MCSDK	-
X-NUCLEO-IHM11M1	Expansion board for STM32 Nucleo board	STSPIN230	-	X-CUBE-MCSDK	STM32 Nucleo board F4, F0 or L0 series
STEVAL-SPIN3202	Evaluation board	STSPIN32F0A	-	X-CUBE-MCSDK	NUCLEO-F030R8, NUCLEO-F103RB, NUCLEO-F302R8
X-NUCLEO-IHM16M1	Expansion board for STM32 Nucleo board	STSPIN830	-	X-CUBE-MCSDK	-
X-NUCLEO-IHM17M1	Expansion board for STM32 Nucleo board	STSPIN233	-	X-CUBE-MCSDK	NUCLEO-F030R8, NUCLEO-F103RB, NUCLEO-F302R8
STEVAL-PTOOL1V1	Evaluation board	STSPIN32F0B	-	STSW-PTOOL1V1	-
STEVAL-PTOOL2V1	Evaluation board	STSPIN32F0252	-	STSW-PTOOL2V1	-
EVALKIT-ROBOT-1	Evaluation board	STSPIN32F0A	-	STSW-ROBOT1	-
P-NUCLEO-IHM001	Nucleo pack with NUCLEO-F302R8 and X-NUCLEO-IHM07M1	L6230	-	X-CUBE-MCSDK	-
X-NUCLEO-IHM07M1	Expansion board for STM32 Nucleo board	L6230	-	X-CUBE-MCSDK	STM32 Nucleo board F4, F0 or L0 series
STEVAL-IHM042V1	Evaluation board	L6230	-	STSW-IHM041V1	-
STEVAL-IHM043V1	Evaluation board	L6234	-	X-CUBE-MCSDK	-
EVAL6235Q	Evaluation board	L6235Q	STSW-SPIN003	-	STEVAL-PCC009V2
STEVAL-CTM011V1	250 W Evaluation board for compressors based on IGBTs	STSPIN32F0601Q	-	STSW-CTM011	-
STEVAL-CTM012V1	250 W Evaluation board for compressors based on MOSFETs	STSPIN32F0601Q	-	STSW-CTM011	-

Target application	ST solution part number	Main ST products	Description
Fridge compressors	STEVAL-CTM011V1	STSPIN32F0601Q VIPER122, STGD5H60DF	Inverter for mainstream 250 W fridge compressors
	STEVAL-CTM012V1	STSPIN32F0601Q VIPER122, STD8N60DM2	Inverter for high efficiency 250 W fridge compressors
Power tools	STEVAL-PTOOL1V1	STSPIN32F0B 60 V MOS STL180/220N6F7	45 V/15 A _{rms} inverter for power tools supplied by battery packs up to 6 LiPo cells (36 V)
	STEVAL-PTOOL2V1	STSPIN32F0252 80 V MOS STL130N8F7	250 V/19 A _{rms} inverter for power tools supplied by battery packs up to 15 LiPo cells (60 V)
Inverters for battery powered	STEVAL-SPIN3201	STSPIN32F0 STD140N6F7	45 V/15 A _{rms} inverter - 3 shunts sensorless FOC
	STEVAL-SPIN3202	STSPIN32F0A STD140N6F7	45 V/15 A _{rms} inverter - 3 shunts sensorless FOC & 6-step
	STEVAL-SPIN3204	STSPIN32F0B STD140N6F7	45 V/15 A _{rms} inverter - 1 shunt 6-step
Inverters for high voltage applications	EVSPIN32F06Q1S1	STSPIN32F0601Q STGD6M65DF2	600 V/5.5 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVSPIN32F0601S1	STSPIN32F0601 STGD6M65DF2	600 V / 5.5 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVSPIN32F06Q1S3	STSPIN32F0601Q STGD6M65DF2	600 V / 4.5 A _{peak} inverter - FOC 3 shunts & 6 step sensorless/sensored FWs
	EVSPIN32F0601S3	STSPIN32F0601 STGD6M65DF2	600 V/4.5 A _{peak} inverter - FOC 3 shunts & 6 step sensorless/sensored FWs
	EVSPIN32F06Q2S1	STSPIN32F0602Q STD18N65M5	600 V/8.5 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVSPIN32F0602S1	STSPIN32F0602 STD18N65M5	600 V/8.5 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVSPIN32F0251S1	STSPIN32F0251Q STD17NF25	250 V/16 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVSPIN32F0251S1	STSPIN32F0251 STD17NF25	250 V/16 A _{peak} inverter - FOC 1 shunt & 6 step sensorless/sensored FWs
	EVALSTDRIE601	STDRIE601 STGD6M65DF2	600 V/5.5 A _{peak} inverter based on STDRIE601 triple gate driver
Inverters for high current batt powered	EVSPIN32G4	STSPIN32G4 STL110N10F7	75 V/20 A _{rms} general purpose inverter 3-shunt or 1-shunt configurable current sensing and support for hall sensors/encoders
	EVSPIN32G4NH	STSPIN32G4 STL110N10F7	75 V/15 A _{rms} general purpose inverter 3-shunt or 1-shunt configurable current sensing and support for hall sensors/encoders
	EVALSTDRIE101	STDRIE101 STL110N10F7	75 V/20 A _{rms} board - 3ph-BLDC 1 & 3 shunts - FOC & 6-step
Inverters for home appliances	STEVAL-IHM021V2	L6390 STD5N52U	520 V/4.4 A _{rms} reference design for 100 W home appliances
	STEVAL-IHM023V3	L6390 STGP10H60DF	600 V/6 A _{peak} reference design for 1 KW home appliances
Fans and pumps based (1-phase and 3-phase BLDC)	EVALPWD13F60	PWD13F60	600 V/2 A _{rms} full-bridge demonstration board for brushed DC motors
	EVALPWD5F60	PWD5F60	600 V/1 A _{rms} full-bridge demonstration board for 1phase BLDC or brushed DC motors
Compact servo control	EVALKIT-ROBOT-1	STSPIN32F0A STL7DN6LF3	36 V/6 A _{peak} reference design for 3phase BLDC 100 W servo drives includes motor + electronics
Gimbal for drones and portable	STEVAL-GMBL02V1	STSPIN233 STM32F303	10 V/1.3 A _{rms} reference design for portable & drones GIMBAL control
Drones electronic speed controller (ESC)	STEVAL-ESC002V1	STSPIN32F0A STL140N6F7	45 V/20 A _{rms} reference design for drones electronic speed control (ESC) can fit any high-speed 6-step application
FFF 3D printers	EVALSP820-XS	STSPIN820	45 V/2.5 A _{rms} RAMPS shield board for open source FFF 3D printers used also as super compact evaluation board
	STEVAL-3DP001V1	L6474H STL8N10F7 STL220N3LLH7	Reference design solution for FFF 3D printers including 6-axis stepper motors control

ST MOTOR DRIVER PORTFOLIO



A pioneer in the field of motor and motion control, ST offers a wide selection of ICs to best match an application spectrum covering a wide range of power ratings and motor types, as well as varied system partitioning. STSPIN motor drivers embed all the functions needed to drive motors efficiently and with the highest accuracy, and include an advanced motion profile generator to relieve the host microcontroller, while ensuring robustness and reliability thanks to a comprehensive set of protection and diagnostic features.

Particularly noteworthy are the adaptive current decay control scheme used in many of the STSPIN motor driver ICs as well as the innovative voltage mode driving used in micro-stepping motor drivers that provides enhanced torque control accuracy and thus motion smoothness.

Our line-up of STSPIN motor control ICs has been developed with the objectives of modularity, scalability and robustness to provide designers a wide choice of solutions to fit different requirements and system architectures.

All products have comprehensive built-in protection and diagnostic schemes to help attain the level of long term reliability and robustness required to cope with harsh factory automation environments. Available in a wide selection of space-saving, thermally-optimized packages, you are sure to find a device in our STSPIN line-up that addresses your motor or motion control system requirements.

Stepper motor drivers



Scalable and robust portfolio featuring accurate positioning and smooth motion profile with up to 256 micro-steps per step

Brushed DC motor drivers



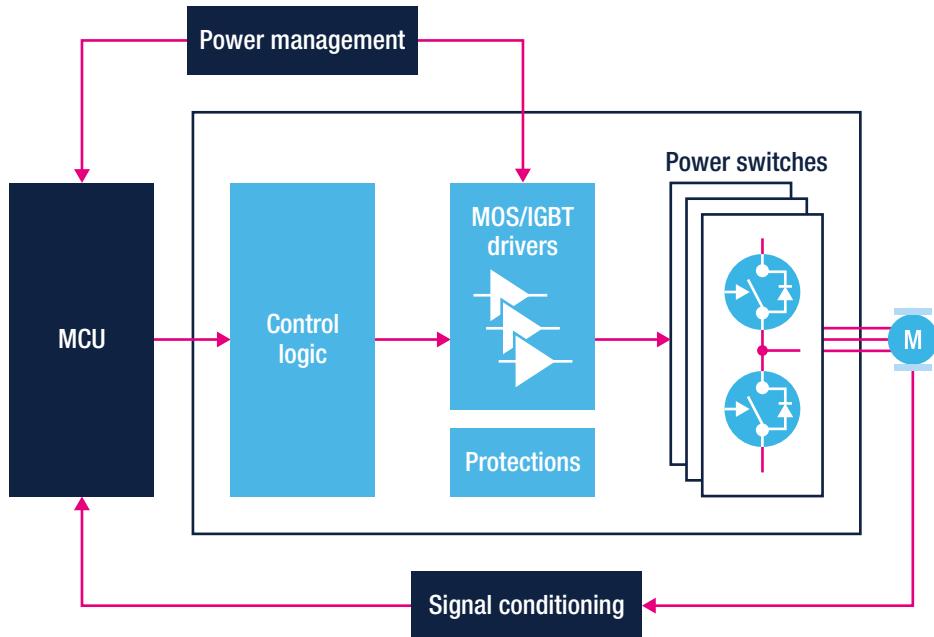
Simple, reliable and cost-effective solution to drive one or more brushed DC motors over a wide current and voltage range

Brushless DC motor drivers



Extensive diagnostics and fully-protected to reduce the number of external components, cost and complexity

PRODUCTS WITH AN EMBEDDED POWER STAGE



MONOLITIC SOLUTIONS WITH EMBEDDED POWER STAGE

STSPIN2 series

The STSPIN2 series is a perfect fit for portable solutions powered by two Li-Po cells, offering a complete set of ICs able to drive brushed DC, stepper or three-phase BLDC motors. Thanks to the extremely compact package (QFN 3 x 3 mm) and the lowest standby current available on the market (max. 80 nA), the STSPIN2 series represents the best performance-cost trade-off. Devices are equipped with control logic and fully protected power stage. STSPIN220 embeds advanced microstepping circuitry able to control a stepper motor with a high resolution of up to 256 microsteps, while STSPIN230/3 are field oriented control compliant allowing an easy implementation of 1-, 2- or 3-shunt topologies.



STSPIN220
stepper



STSPIN230/233
3phase BLDC



STSPIN240/250
dual/single DC



MAIN APPLICATIONS

- Portable health care
- E-valves, meters and e-lockers
- POS or label printers
- Smartphones & gimbals control
- Educational robots
- Medical and healthcare equipment

Product	Description	V _{IN} min (V)	V _{IN} max (V)	R _{DSON} (Ohm)	I _{OUT} max (Arms)
STSPIN220	Microstepping driver up to 256 microsteps				
STSPIN230	3-phase motor drivers (6 INx OR 3 INx + 3 ENx)	1.8	10	0.2	1.1
STSPIN233					
STSPIN240	Dual brushed DC motor driver				
STSPIN250	Single brushed DC motor driver			0.1	2.2

STSPIN8 series

The STSPIN8 series represents an extension of the STSPIN2 series, able to operate at a higher supply voltage. It consists of 3 fully integrated motor drivers packaged in a 4x4mm QFN package, integrating both the control logic and a fully protected low $R_{DS(on)}$ power stage making them a bullet-proof solution for the new wave of demanding industrial applications.

The STSPIN820 lets you control stepper motors with a high resolution of up to 256 microsteps. The STSPIN830 is field-oriented control compliant and enables a 3-shunt resistor implementation while the STSPIN840 can be used in parallel mode in order to drive a brushed DC motor at a higher equivalent current.



STSPIN820
stepper



STSPIN830
3phase BLDC



STSPIN840
dual/single DC

Product	Description	V_{IN} min (V)	V_{IN} max (V)	$R_{DS(on)}$ (Ohm)	I_{OUT} max (Arms)
STSPIN820	Microstepping driver up to 256 microsteps	7	45	0.5	1.5
STSPIN830	3-phase 3-shunts BLDC motor driver				
STSPIN840	Dual brushed DC motor driver			0.5 (0.25*)	1.5 (3*)

Note * features allowed in parallel mode driving

MAIN APPLICATIONS

- Stage lighting and antenna control
- 3D printers
- Vending and textile machines
- ATM and money handling machines
- Factory automation end-points
- Medical and healthcare equipment
- Video surveillance and dome cameras

STSPIN9 series

Available in a compact QFN package, the STSPIN9 high-current monolithic motor driver series integrates both the control logic and a fully protected low $R_{DS(on)}$ power stage making them ideal to meet the stringent requirements of demanding industrial applications. This makes STSPIN9 Series the best choice to drive motor at high current saving space on the PCB.

With a selectable 7-method input strategy, the controller embeds two analog operational amplifiers that can be used for the signal conditioning of analog Hall-effect sensors or shunt resistor signals. Thanks to its flexibility, STSPIN9 family can cover the needs of driving multiple different types of motors, including BDC, BLDC and stepper. The adjustable slew rate ensures the best ratio between performances and EMI.



Product	Description	I_{OUT} max (Arms)	V_{IN} min (V)	V_{IN} max (V)	$R_{DS(on)}$ (Ohm)
STSPIN948	Dual full bridge driver	4.5	5	58	0.4
STSPIN958	Full bridge driver				

MAIN APPLICATIONS

- Home appliances
- Robotics
- Stage lighting
- Antenna control
- Textile machines
- Vending machines
- Factory automation

L62 series

The L62 series includes a broad range of motor drivers which can drive any type of motor and fit a very wide range of applications. Designed for small- and medium-sized motors, they feature scalable offer of power stages. L6208 and L6228 are designed to drive stepper motors thanks to the embedded stepping sequence generator. L6205/06/07 and L6225/26/27 are general-purpose brushed DC motor drivers with a scalable power architecture and programmable overcurrent protection. L6229, L6230, L6234 and L6235 devices are ideal for both sensed and sensorless driving of 3-phase BLDC motors, thanks to the embedded PWM current control and decoding logic for Hall-effect sensors. The L62 series includes approximately 30 devices in a wide range of packages to meet all your soldering and thermal needs.



L62X8
stepper



L6229/L623X
3phase BLDC



L62X5/6/7
dual/single DC



MAIN APPLICATIONS

- Stage lighting
- Vending and textile machines
- ATM and money handling machines
- Medical equipment
- Factory automation end-points
- Small home appliances
- Antenna control

Topology	Product	Description	V _{IN} (V)		R _{DSON} (Ohm)	I _{OUT} max (Arms)
			min	max		
Dual DC motor drivers	L6205x*	DC or stepper; fixed OCP	7	52	0.3 (0.15*)	2.8 (5.6*)
	L6225x*				0.7 (0.35*)	1.4 (2.8*)
	L6206x*	DC or steppers; programmable OCP & diagnostic output			0.3 (0.15*)	2.8 (5.6*)
	L6226x*				0.7 (0.35*)	1.4 (2.8*)
	L6207x	DC or steppers			0.3	2.8
	L6227x	prog. OCP & Twin PWM current control			0.7	1.4
Stepper motor drivers	L6208x	Stepping seq generator	7	52	0.3	2.8
	L6228x	twin PWM current control			0.7	1.4
BLDC sensorless motor drivers	L6234	Opt for sensorless FOC	7	52	0.3	2.8
	L6230	programmable OCP & diagnostic output			0.7	1.4
BLDC sensed motor drivers	L6235	PWM current control	7	52	0.3	2.8
	L6229	hall sensor & speed control			0.7	1.4

Note: * features allowed in parallel mode driving

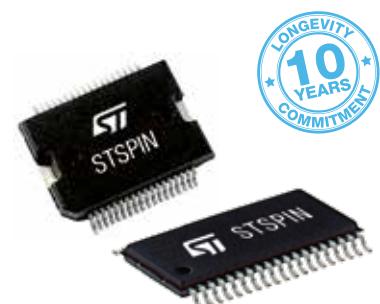
L64 series of STSPIN stepper motor drivers

The L64 series includes ST's most advanced microstepping motor drivers and controllers. Both L6470 and L6480 devices feature advanced voltage control functions ensuring very smooth and silent motion and reaching high positioning precision (up to 128 microsteps).

Unlike others, the L6472 and L6482 drive the motors using an advanced current control algorithm with self-adapting decay and guaranteeing the target current is always supplied to the motor, with no loss of steps or control.

Many other advanced features are available such as the full customization of the motion profile (acceleration, deceleration, speed, etc.), positioning calculations, sensorless stall detection, real-time diagnostics and user-configurable failure protections.

The L648x controllers allow higher voltage and current through external power MOSFETs.



MAIN APPLICATIONS

- ATM and money handling machines
- Medical equipment
- Video conferencing
- Antenna control
- Pick and place machines
- Home and factory appliances

Topology	Product	Description	V _{IN} min (V)	V _{IN} max (V)	R _{DSON} (Ohm)	I _{OUT} max (Arms)
Motor drivers	L6470	Voltage mode driving algorithm (1/128 µstep)	8	45	0.3	3
	L6472	Predictive current control adaptive decay (1/16 µstep)				
	L6474	Adaptive decay (1/16 µstep)				
Controllers	L6480	Voltage mode driving algorithm (1/128 µstep)	8	85	not applicable	
	L6482	Predictive current control adaptive decay (1/16 µstep)				

SYSTEM-IN-PACKAGE WITH AN EMBEDDED POWER STAGE

POWERSTEP01

The POWERSTEP01 is a highly configurable high-current stepper motor driver able to operate up to 85 V. It integrates an advanced microstepping controller and 8 power MOSFETs, featuring a 16 mΩ $R_{DS(on)}$.

Thanks to proprietary and patented technologies, the device can be configured to drive the motors in Voltage or Current mode. Voltage mode ensures very smooth and silent motion performance, while the current driving mode guarantees full control of the motor current. Many other advanced features are available such as the full customization of the motion profile (acceleration, deceleration, speed, etc.), positioning calculations, sensorless stall detection, real-time diagnostics and user-configurable failure protections. A very rich set of protections make the POWERSTEP01 ideal for the most demanding motor control applications.

Product	Description	V_{IN} min (V)	V_{IN} max (V)	$R_{DS(on)}$ (Ohm)	I_{OUT} max (Arms)
POWERSTEP01	System-in-package integrating microstepping controller and 10° power MOSFETs	7.5	85	0.016	10



MAIN APPLICATIONS

- Textile machines
- Sewing machines
- Stage lighting
- Robot welders
- Industrial label printers
- Industrial dozers and mixer

PWD series - Smart power drivers in QFN

PWD series are advanced power systems-in-package devices integrating smart gate drivers and N-channel power MOSFETs.

This series is available with two products embedding four N-channel power MOSFETs in dual half-bridge configuration. These full-bridge power drivers represent a uniquely efficient alternative for brushed DC or single-phase BLDC motors.

The PWD series then offers a range of products 600 V rated that can cover a wide range of different applications for brushed and brushless DC motos.

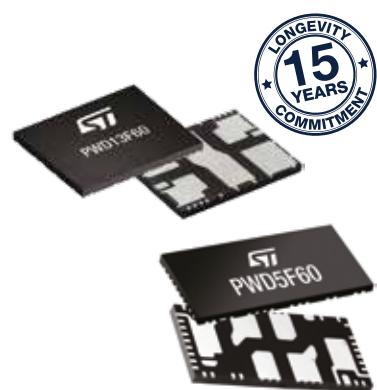
The embedded gate drivers integrate bootstrap diodes allowing BOM space and cost saving. Both devices are offered in highly thermally efficient tiny QFN packages.

PWD5F60 embeds also the peak-current control comparators that, in conjunction with positioning Hall-effect sensors, allow to achieve a stand-alone motor driver for single-phase BLDC motors (no need of a dedicated MCU), and thus significantly reducing the cost of such a driving system.

PWD5F60 and PWD13F60
Brushed DC



PWD5F60
1-phase BLDC

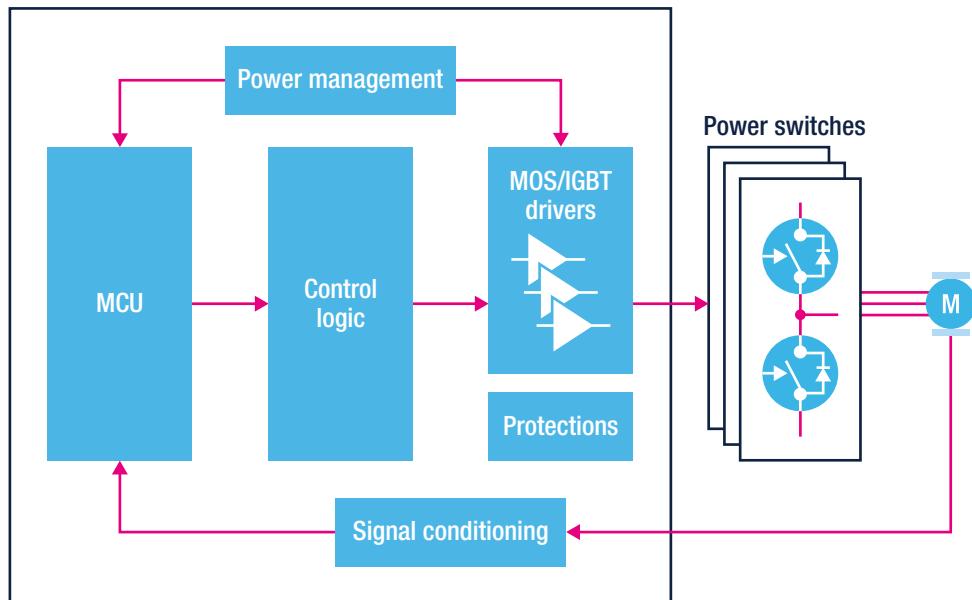


MAIN APPLICATIONS

- Fans & pumps
- Blowers
- Home appliances
- Factory automation

Product	Description	V_{IN} min (V)	V_{IN} max (V)	$R_{DS(on)}$ (Ohm)	I_{OUT} max (Arms)
PWD13F60	Full-bridge driver	6.5	17	0.32	8
PWD5F60		10	20	1.38	3.5

INTELLIGENT CONTROLLERS



STSPIN32F0 series of low-voltage BLDC controllers with embedded STM32 MCU

The **low-voltage STSPIN32F0 series** of self-supplied systems-in-package integrate a Cortex-M0 microcontroller and an advanced 3-phase gate driver. The embedded MCU gives the freedom to configure the device with the motion control algorithm which best fits application targets.

ST offers a set of pre-defined firmware algorithms, spanning from more classical 6-step to the advanced sensorless field-oriented control. An internal 3.3 V DC/DC buck converter and 12 V LDO linear regulator supply the MCU, external components and gate drivers. Operational amplifiers are available for signal conditioning of analog Hall-effect sensors or shunt resistor signals. Programmable threshold over current protection is guaranteed by the embedded comparator.



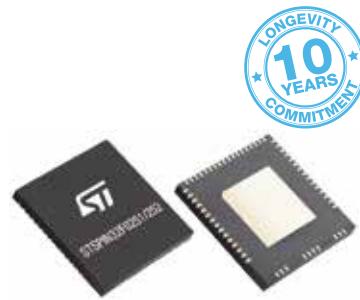
Product	Description	V _{IN} min (V)	V _{IN} max (V)	I _{GATE} (A)	OpAmps	#GPIOs
STSPIN32F0	FOC & 6-step gate drivers 3.3 V/12 V regulators 13 and 3 shunt architectures bootloader for FW on-the-field upgrade	8	45	0.6	4	15
STSPIN32F0A		6.6			3	16
STSPIN32F0B					1	20

MAIN APPLICATIONS

- Power tools
- Battery powered home appliances
- Fans and pumps
- Drones and aeromodelling
- Robotics
- E-bikes

STSPIN32F0 series of high-voltage BLDC controllers with embedded STM32 MCU

The **high-voltage STSPIN32F0 series** extends the flexibility and all the features of STM32-based motor controllers to high-voltage applications. Four pin-to-pin systems-in-package integrating an STM32 Cortex-M0 MCU and high voltage 3-phase gate drivers, with an embedded smartShutDown feature. These advanced, fully protected 3-phase BLDC controllers are available for applications running up to 250 V and 600 V, at respectively two different gate currents of 0.35 A and 1 A. Thanks to the motor controller's high scalability in home appliances and industrial applications, designers can easily design and reuse their current hardware and firmware in all applications fitting main voltage supplies (110 and 220 V_{AC}), without having to change PCBs.



Product	Description	V _{IN} min (V)	V _{IN} max (V)	V _{OUT} max (V)	I _{GATE} (A)
STSPIN32F0251	250 V 3-phase driver with STM32	9	20	250 V	0.35
STSPIN32F0252					1
STSPIN32F0601	600 V 3-phase driver with STM32	9	20	600 V	0.35
STSPIN32F0602					1

MAIN APPLICATIONS

- Compressors, pumps and fans
- Home appliances
- Industrial automation and control
- Power and garden tools
- Air conditioning

STSPIN32G4 series of low-voltage 3-phase motor controllers with embedded STM32G4 MCU

The low-voltage **STSPIN32G4 series** of extremely integrated and flexible motor controller for driving 3-phase brushless motors, helps designers choose the most suitable driving mode and reduce PCB area and overall BOM costs. It embeds a triple half-bridge gate driver able to drive power MOSFETs with a current capability of 1 A (sink and source). Three bootstrap diodes are also embedded.

The high- and low-side switches of the same half-bridge cannot be simultaneously driven high thanks to an integrated interlocking function. An additional protection feature is represented by hardware VDS monitoring circuitry that constantly monitors each of the six external MOSFETs and in case an overvoltage is detected across one of them, switches off all gate driver outputs. The overvoltage threshold is set through a dedicated short-circuit protection threshold (SCREF) pin.

An internal high-precision low-drop linear regulator (LDO) is used to generate the 3.3 V supply (VREG3V3) starting from the regulator input voltage. The 3.3 V output voltage supplies both the gate driver logic and the microcontroller. It is protected against short-circuit, overload and undervoltage conditions.

The integrated MCU (STM32G431VBx3) is based on the high-performance 32-bit Arm Cortex-M4 core, operating at a frequency up to 170 MHz and featuring a single-precision floating-point unit (FPU), full set of DSP (Digital Signal Processing) instructions and a memory protection unit (MPU), which enhances the application's security.

Finally, with an additional external three-phase driver (such as the STDRIVE101) two independent 3-phase BLDC motors can be efficiently driven from the STSPIN32G4, offering an unprecedented BOM savings and application optimization.



Product	Description	V _{IN} min (V)	V _{IN} max (V)	I _{GATE} (A)
STSPIN32G4	Advanced BLDC controller with embedded STM32 MCU	5.5	75	1

MAIN APPLICATIONS

- E-bikes
- Industrial automation
- Power tools
- Robotics and drones
- Battery powered home appliances
- Pumps and fans

Stepper motor drivers

Part number	Package	General description	$R_{DS(on)}$ (Ω)	Supply voltage (V)		Output current-max (A) RMS max
				Min	Max	
STSPIN948	VFQFPN 48 7x7x1.0 mm	58 V stepper motor driver 200 mΩ	0.2	5	58	4.5
STSPIN220	VFQFPN 16 3x3x1.0	Low voltage motor driver with up to 256 microsteps	0.2	1.8	10	1.3
L6472	HTSSOP28; PowerSO 36	Full features motor driver up to 16 microsteps with SPI, motion engine and advanced current control	0.3	8	45	3
L6470	HTSSOP28; PowerSO 36	Full features motor driver up to 128 microsteps with SPI, motion engine and advanced voltage mode control	0.3	8	45	3
L6474	HTSSOP28; PowerSO 36	Stepper driver with up to 16 microsteps with SPI and advanced current control	0.3	8	45	3
L6228Q	VFQFPN 32 5x5x1		0.7	8	52	1.4
L6228	PowerSO 36, SO-24	Stepper motor driver with embedded current control and sequence generator	0.7	8	52	1.4
L6208Q	VFQFPN 48 7x7x1		0.3	8	52	2.8
L6208	PowerSO 36, SO-24		0.3	8	52	2.8
STSPIN820	TFQFPN 4x4x1 - 24L	Compact advanced 256 microsteps motor driver with step-clock and direction interface	0.5	7	45	1.5
powerSTEP01	VFQFPN 11x14x1	System-in-package integrating an intelligent and programmable microstepping controller and 10 A power MOSFETs	0.016	7.5	85	10
L6482	HTSSOP38	Stepper controller with SPI, motion engine, programmable gate drivers and advanced current control featuring 16 microsteps	-	7.5	85	-
L6480	HTSSOP38	Stepper controller with SPI, motion engine, programmable gate drivers and advanced voltage mode control featuring 128 microsteps	-	7.5	85	-
L297	PDIP 20; SO-20	Stepper motor controller	-	4.75	7	-
L6258EX	PowerSO 36	PWM controlled high current DMOS universal motor drive	0.6	12	40	1.5
L6219	SO-24	Stepper motor driver	-	10	46	0.75

Brushed DC motor drivers

Part number	Package	General description	$R_{DS(on)}$ (Ω)	Supply voltage (V)		Output current-max (A) RMS max	Output current-max (A) max peak
				Min	Max		
STSPIN948	VFQFPN 48 7x7x1.0 mm	58 V dual DC motor driver 200 m Ω (single 100 m Ω)	0.2	5	58	4.5	7
STSPIN958	VFQFPN 32 5x5x1.0 mm	58 V single DC motor driver 200 m Ω	0.2	5	58	5	7
PWD13F60	VFQFPN 10x13x1	600 V full bridge with integrated smart driver	0.3	6.5	600	8	32
PWD5F60	VFQFPN 15x7x1 mm.	600 V full bridge with integrated smart driver and comparators for peak I control	1.4	10	600	5	14
STSPIN840	TFQFPN 4x4x1 - 24L	Compact dual brushed DC motor driver with embedded PWM current control	0.5	7	45	1.5	2.5
STSPIN240	VFQFPN 16 3x3x1.0	Low voltage dual brushed DC motor driver with embedded PWM current control	0.2	1.8	10	1.3	2
STSPIN250	VFQFPN 16 3x3x1.0	Low voltage single brushed DC motor driver	0.1	1.8	10	2.6	4
L6227Q	VFQFPN 32 5x5x1	Versatile DMOS dual full bridge motor drivers with embedded PWM current control	0.7	8	52	1.4	3.55
L6227	PowerSO 36; SO-24		0.7	8	52	1.4	3.55
L6226Q	VFQFPN 32 5x5x1		0.7	8	52	1.4	3.55
L6226	PowerSO 36; SO-24		0.7	8	52	1.4	3.55
L6225	PDIP20; PowerSO 20; SO-20		0.7	8	52	1.4	3.55
L6207Q	VFQFPN 48 7x7x1		0.3	8	52	2.8	7.1
L6207	PowerSO 36; SO-24		0.3	8	52	2.8	7.1
L6206Q	VFQFPN 48 7x7x1		0.3	8	52	2.8	7.1
L6206	PowerSO 36; SO-24		0.3	8	52	2.8	7.1
L6205	PDIP20; PowerSO 20; SO-20		0.3	8	52	2.8	7.1
L6203	MW 11L	DMOS full bridge motor driver	0.3	12	48	1	10
L6202	PDIP 18		0.3	12	48	1	10
L6201	PowerSO 20; SO-20		0.3	12	48	1	5
L298	MW 15L; PowerSO 20	Dual full bridge motor driver	-	4.5	36	2	-
L293E	PDIP 20	Push-pull four channels motor driver with diodes	-	4.5	36	1	2
L293D	PDIP 16; SO-20		-	4.5	36	0.6	1.2
L293B	PDIP 16		-	4.5	36	1	2
L2293Q	VFQFPN 32 5x5x1		-	4.5	36	0.6	1.2

3-phase Brushless DC motor drivers

Part number	Package	General description	$R_{DS(on)}$ (Ω)	Supply voltage (V)		Output current-max (A) RMS max	Output current-max (A) max peak
				Min	Max		
STSPIN32G4	VFQFPN 64 9x9x1	High performance 3-phase motor controller with embedded STM32G4, DC-DC; dual motor control	-	5.5	75	-	1
STSPIN32F0	VFQFPN 48 7x7x1	Advanced BLDC controller with embedded STM32, DC-DC; optimized for FOC	-	8	45	-	0.6
STSPIN32F0A	VFQFPN 48 7x7x1	Advanced BLDC controller with embedded STM32, DC-DC, extended V Range and optimized for 6-step control	-	6.7	45	-	0.6
STSPIN32F0B	VFQFPN 48 7x7x1	Advanced single shunt BLDC controller with embedded STM32, extended V Range and optimized for 6-step control	-	6.7	45	-	0.6
STSPIN32F0251	TQFP 10x10x1.2	250 V three-phase controller with STM32 MCU	-	9	20	-	0.35
STSPIN32F0252	TQFP 10x10x1.2	250 V three-phase controller with STM32 MCU	-	9	20	-	1
STSPIN32F0601	TQFP 10x10x1.2	600 V three-phase controller with STM32 MCU	-	9	20	-	0.35
STSPIN32F0602	TQFP 10x10x1.2	600 V three-phase controller with STM32 MCU	-	9	20	-	1
STSPIN830	TFQFPN 4x4x1 - 24L	Compact 3-phase integrated motor driver optimized for 3 shunts configuration	0.5	7	45	1.5	2.5
STSPIN230	VFQFPN 16 3x3x1	Low voltage 3-phase integrated motor driver	0.2	1.8	10	1.3	2
STSPIN233	VFQFPN 16 3x3x1	Low voltage 3-phase integrated motor driver optimized for 3 shunts control	0.2	1.8	10	1.3	2
L6229	PowerSO 36; SO-24	3-phase 6-step integrated motor drivers with embedded Hall sensors decoding logic	0.7	8	52	1.4	3.55
L6229Q	VFQFPN 32 5x5x1		0.7	8	52	1.4	3.55
L6235	PowerSO 36; SO-24		0.3	8	52	2.8	7.1
L6235Q	VFQFPN 48 7x7x1		0.3	8	52	2.5	7.1
L6230	PowerSO 36; VFQFPN 32 5x5x1	Triple half-bridge integrated motor drivers	0.7	8	52	1.4	3.55
L6234	PDIP 20; PowerSO-20		0.3	7	52	2.8	5

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