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# STSPIN32Fxx portfolio

Industrial  
Motor Control  
Competence Center





# STSPIN32 family from analog to digital motor control



Power Transistors



Motor Control



Microcontroller

For  
Smart Industry and High-End Consumer



- Highly integrated systems-in-package:
  - 7x7 mm QFN, 10x10 mm QFP, ...
- Complete ST ecosystem: tools, FWs, SWs (motor-control algorithms)

## High integration

embedded 32-bit STM32F0  
ARM Cortex-M0

## High performance 3-phase gate driver

0.6A and 45V  
0.35 / 1A and up to 600V

## Versatile Control

cost-effective sensorless  
or accurate Hall sensors

## Maximum efficiency

on-chip supplies for MCU,  
driver and external circuitry



# STSPIN32F0 Series Overview

3phase BLDC



+



## Low Voltage

6.7 – 45 V

### STSPIN32F0/A/B

- 0.6A FOC/6-step gate drivers
- 12V / 3.3V V reg embedded
- 1 and 3 shunt topologies



## High Voltage

9 – 250 V

### STSPIN32F0251/2

- 0.3A / 1A FOC/6-step gate drivers
- Smart ShutDown protection
- Outstanding below-gnd robustness
- 1 and 3 shunt topologies



pin to pin



9 – 600 V

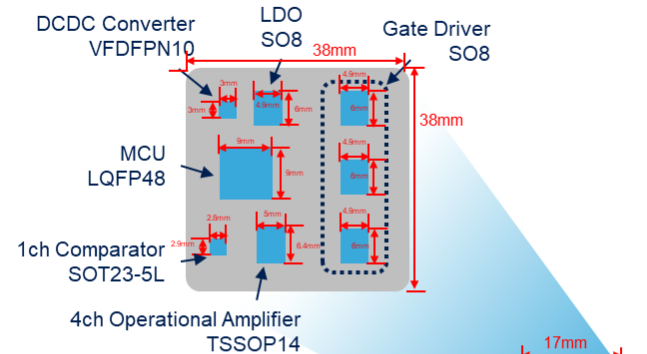
### STSPIN32F0601/2

- 0.3A / 1A FOC/6-step gate drivers
- Smart ShutDown protection
- Outstanding below-gnd robustness
- 1 and 3 shunt topologies

## Main Applications

- Compressors, pumps and fans
- Power tools
- Vacuum cleaners
- Industrial automation and control
- Home Appliances
- Drones (gimbal and ESC control)

## STSPIN32F0 vs discrete solution



Area reduction  
up to **80%**

STSPIN32F0/A/B  
VFQFPN48L

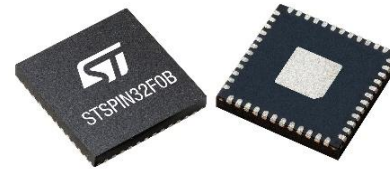
## We sell in





# STSPIN32F0 LV Series Overview

## Advanced 3-phase BLDC Drivers with embedded STM32 MCU



### KEY BENEFITS & FEATURES

#### Flexible and compact

- VS = 6.6V - 45 V, I = 600mA capability
- 48 MHz, 32k Flash, 4k SRAM & 12 bit ADC
- Up to 4 Op-Amps, 1 Comp; up to 20 GPIOs

#### Self-supplied

- 12V LDO and 3.3V DC-DC buck regulators on board

#### Exhaustive ecosystem for fast design

- 6step & FOC sensorless / sensored algorithms
- FW examples available on st.com

#### Very reliable and robust

- UVLO, OCP and thermal shutdown
- Extended temperature range: -40 to 125°C

#### Extremely compact

- QFN package 7 x 7 mm

| Product     | Description                                                          | Vin min (V) | Vin max (V) | I <sub>GATE</sub> (A) | OpAmps | #GPIOs |
|-------------|----------------------------------------------------------------------|-------------|-------------|-----------------------|--------|--------|
| STSPIN32F0  | FOC & 6-step gate drivers                                            | 8           | 45          | 0.6                   | 4      | 15     |
| STSPIN32F0A | Embedded 3.3V / 12V Vregulators<br>1 shunt and 3 shunt architectures | 6.6         |             |                       | 3      | 16     |
| STSPIN32F0B | Bootloader for FW on-the-field upgrade                               | 6.6         |             |                       | 1      | 20     |



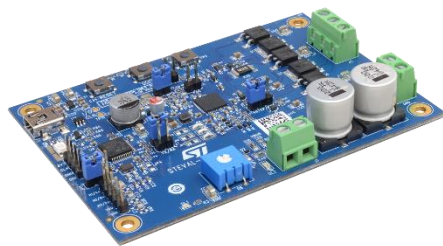
# STSPIN32F0/A/B easy comparison

| Feature                        | STSPIN32F0                           | STSPIN32F0A                          | STSPIN32F0B                          |
|--------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Operating voltage              | 7.9 V to 45 V                        | 6.6 to 45 V                          | 6.6 to 45 V                          |
| Embedded MCU                   | STM32F031x6 with extended temp range | STM32F031x6 with extended temp range | STM32F031x6 with extended temp range |
| Gate drivers                   | 600 mA triple half-bridge            | 600 mA triple half-bridge            | 600 mA triple half-bridge            |
| 3.3 V DC/DC buck conv          | Embedded                             | Embedded                             | Embedded                             |
| 12 V LDO                       | Embedded                             | Embedded                             | Embedded                             |
| OpAmps                         | 4                                    | 3                                    | 1                                    |
| 3FG decoding logic             | Embedded                             | Not embedded                         | Not embedded                         |
| Comparator                     | Embedded                             | Embedded                             | Embedded                             |
| # of GPIOs                     | 15                                   | 16                                   | 20                                   |
| OC protection via comparator   | Available                            | Available                            | Available                            |
| Current control via comparator | Not available                        | Available                            | Available                            |
| Standby                        | Available                            | Available                            | Available                            |
| UVLO                           | Available                            | Available                            | Available                            |
| Firmware upgrade on the field  | Not available                        | Available                            | Available                            |



# STSPIN32F0/A/B Ecosystem

| Board                                                                                         | Firmware                                                        | Ecosystem                                        | Documentation                                                                                                                                                                              | Availability |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>STEVAL-SPIN3201</b><br>(STSPIN32F0)<br><br>3-shunts dev board with ST-LINKV2-1             | <b>STSW-SPIN3201</b><br><br>FOC library<br>(X-CUBE-MCSDK)       | <b>SDK 5.1</b>                                   | Eval board manual ( <a href="#">UM2154</a> )<br>FW manual ( <a href="#">UM2152</a> )<br>Overcurrent AN ( <a href="#">AN4999</a> )<br>MC Workbench guidelines<br>( <a href="#">UM2168</a> ) | On stock     |
| <b>STEVAL-SPIN3202</b><br>(STSPIN32F0A)<br><br>1 shunt dev board with ST-LINKV2-1             | <b>STSW-SPIN3202</b><br><br>FOC library (*)<br>(X-CUBE-MCSDK)   | <b>SDK 5.1</b>                                   | Eval board manual ( <a href="#">UM2278</a> )<br>FW manual ( <a href="#">UM2310</a> )<br>Overcurrent AN ( <a href="#">AN4999</a> )                                                          | On stock     |
| <b>STEVAL-ESC002V1</b><br>(STSPIN32F0A)<br><br>Drones ESC 6-step reference design             | <b>High speed 6-step Firmware</b>                               |                                                  | Eval board manual<br>FW manual                                                                                                                                                             | On stock     |
| <b>STEVAL-SPIN3204</b><br>(STSPIN32F0B)<br><br>1 shunt dev board with ST-LINKV2-1             | <b>STSW-SPIN3204</b><br><br>6-step FW example<br>(X-CUBE-MCSDK) | <b>Will be integrated in SDK</b>                 | Eval board manual<br>FW manual                                                                                                                                                             | On stock     |
| <b>EVALKIT-ROBOT-1</b><br>(STSPIN32F0A & 3-ph BLDC motor from maxon)<br><br>Servo control kit | <b>STSW-ROBOT-1</b><br><br>Flashed into STSPIN32F032A           | <b>Communication SW based on MODBUS protocol</b> | user manual (UM2653)                                                                                                                                                                       | On stock     |



25 mm x 40 mm

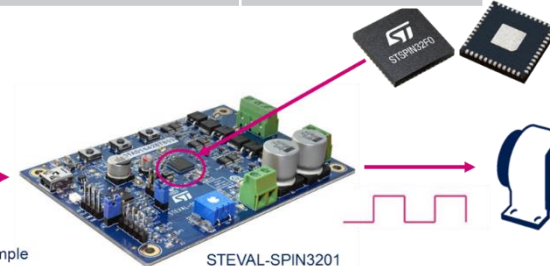


40 mm x 40 mm



Download the STSW-SPIN3201 FW example on PC and run your BLDC motor

USB

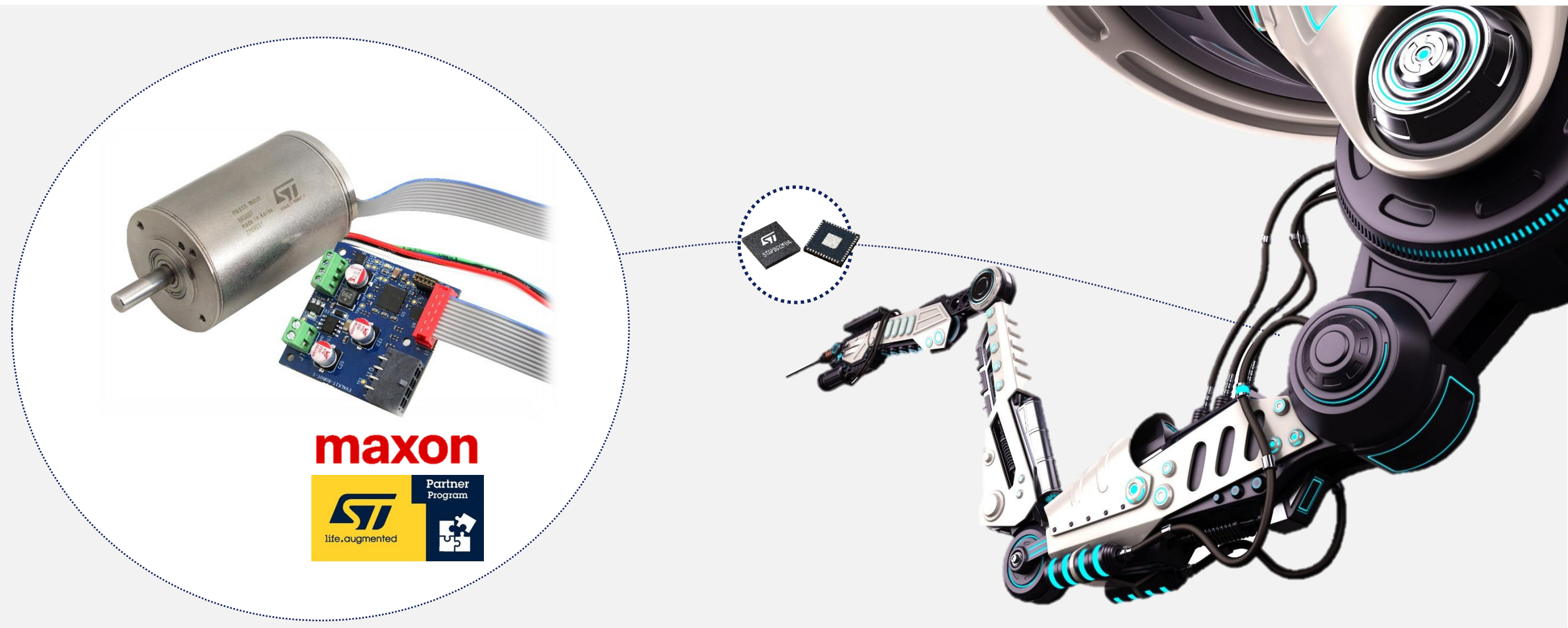


STEVAL-SPIN3201



# EVALKIT-ROBOT-1

## Compact Brushless Servo Control Kit





NEW

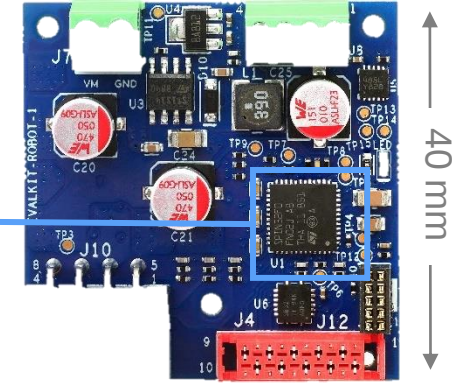
# EVALKIT-ROBOT-1

## Compact Brushless Servo Control Kit

- 36 V and 6 A<sub>PEAK</sub> power stage
- Maxon EC-i40 100 W 3-phase BLDC
- **STSPIN32F0A** advanced 3-phase motor controller embedding Cortex-M0 MCU
- **STL7DN6LF3** 60V, 35 mΩ Dual N-channel MOSFETs
- 1024 pulses incremental encoder
- Hall sensors
- Position control loop based on Field Oriented Control
- MODBUS communication protocol through RS-485
- Extremely compact footprint (40mm x 40mm)

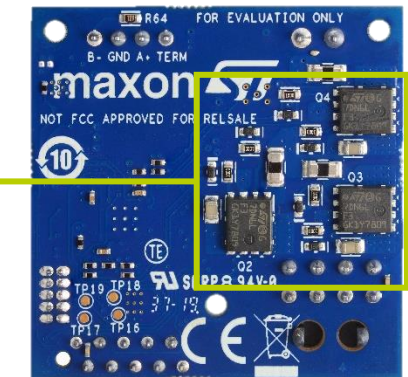
### STSPIN32F0A

45V fully integrated  
3phase BLDC driver (600mA)



### STL7DN6LF3

60V, 35mΩ MOSFET



### Maxon EC-i40

100 W 3-phase BLDC

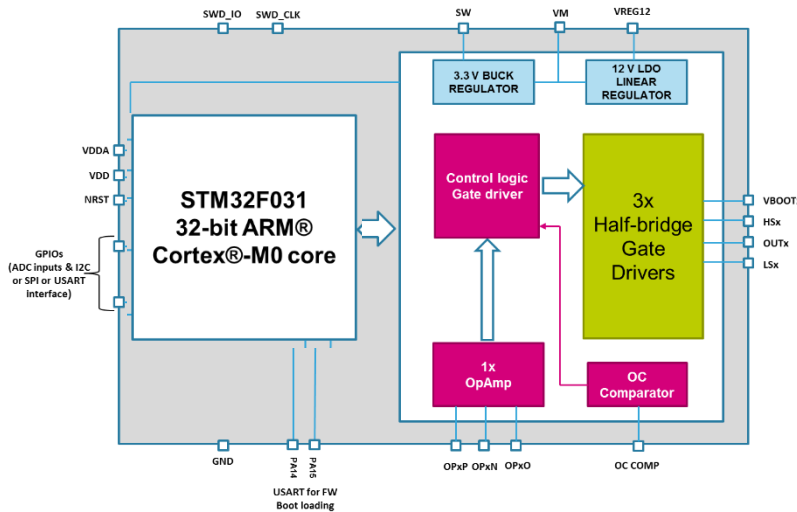




# STSPIN32 Technology, from LV to HV

STSPIN32 evolution: from 45V to High Voltage advanced 3-phase BLDC Driver

## 45V STSPIN32F0/A/B



High integration with embedded 32-bit STM32F0 MCU with ARM® Cortex®-M0

High immunity  
Extremely robust  
Full protection

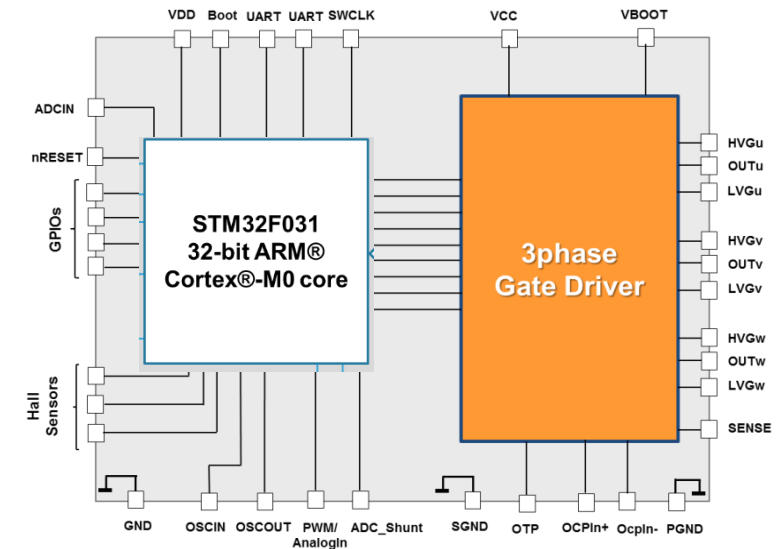
Exhaustive STSPIN Ecosystem  
X-CUBE Firmware for STM32

### KEY APPLICATIONS:

- Industrial automation
- Robotics
- Fans
- Battery powered Home Appliances
- Drones and aeromodelling
- Power tools



## 250V & 600V STSPIN32F0H



### KEY APPLICATIONS

- Home Appliances
- Air conditioning
- Home and Industrial refrigerators
- Industrial Pumps
- High-end power tools
- Industrial automation





# STSPIN32F0 HV Series Overview

## 250V/600V Advanced 3-phase BLDC Drivers with embedded STM32 MCU



### KEY BENEFITS & FEATURES

All devices are P2P to allow maximum HW & FW reuse

Flexible and compact solution (MCU + 3-phase Driver)

- 250V and 600V gate drivers with integrated bootstrap Diodes
- $I_{GATE}$  up to 0.35 A and 1 A
- STM32 Cortex-M0, 48 MHz, 32k Flash & 4k SRAM
- FOC & 6-step FW support, sensored and sensorless

High energy efficiency

- Standby mode to minimize power consumption

Very reliable and robust

- Outstanding below-ground robustness
- UVLO, Short-Circuit, over current with smart shutdown
- Extended temperature range: -40 to 125°C

TQFP package 10 x 10 mm

| Product       | Description                    | Vin min (V) | Vin max (V) | Vout max (V) | $I_{GATE}$ (A) |
|---------------|--------------------------------|-------------|-------------|--------------|----------------|
| STSPIN32F0251 | 250V 3-phase driver with STM32 | 9           | 20          | 250V         | 0.35           |
| STSPIN32F0252 |                                |             |             |              | 1              |
| STSPIN32F0601 | 600V 3-phase driver with STM32 | 9           | 20          | 600V         | 0.35           |
| STSPIN32F0602 |                                |             |             |              | 1              |

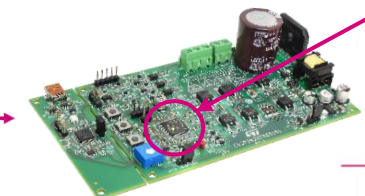
# STSPIN32F0 HV Ecosystem

| Board                                                                            | Firmware                                                 | Ecosystem | Documentation                  | Availability |
|----------------------------------------------------------------------------------|----------------------------------------------------------|-----------|--------------------------------|--------------|
| <b>EVSPIN32F0601s1</b><br>(STSPIN32F0601)<br>1-shunts dev board with ST-LINKV2-1 | <b>SW-SPIN32F0601S1</b><br>FOC library<br>(X-CUBE-MCSDK) | SDK 5.4.1 | Eval board manual<br>FW manual | On stock     |
| <b>EVSPIN32F0601s3</b><br>(STSPIN32F0601)<br>3-shunts dev board with ST-LINKV2-1 | <b>SW-SPIN32F0601S3</b><br>FOC library<br>(X-CUBE-MCSDK) | SDK 5.4.1 | Eval board manual<br>FW manual | On stock     |
| <b>EVSPIN32F0602s1</b><br>(STSPIN32F0602)<br>1-shunts dev board with ST-LINKV2-1 | <b>SW-SPIN32F0602S1</b><br>FOC library<br>(X-CUBE-MCSDK) | SDK 5.4.1 | Eval board manual<br>FW manual | On stock     |
| <b>EVSPIN32F0251s1</b><br>(STSPIN32F0251)<br>1-shunts dev board with ST-LINKV2-1 | <b>SW-SPIN32F0251S1</b><br>FOC library<br>(X-CUBE-MCSDK) | SDK 5.4.1 | Eval board manual<br>FW manual | On stock     |

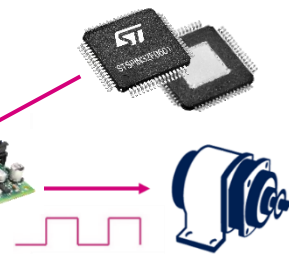


USB

Download the FW example on PC  
and run your BLDC motor



EVSPIN32F0601s1





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Power & SPIN Microsite

