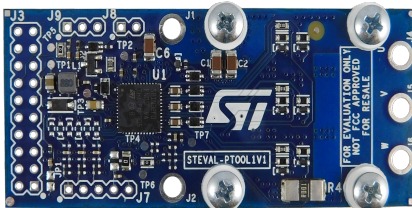


## Compact reference design for low voltage brushless power tools based on STSPIN32F0B



### Features

- 7 V - 45 V motor voltage rating supported
- Recommended for power tools supplied from 2S to 6S batteries
- Output current up to 15 Arms
- STSPIN32F0B advanced 3-phase motor controller tailored for single-shunt applications
- STL180N6F7 60 V, 1.9 mΩ N-channel power MOSFET
- Ultra-low standby current below 1 μA thanks to an external turn-on/off trigger
- Heat sink for improved power dissipation
- Extremely compact footprint (70 mm x 30 mm)
- Input connector for Hall effect sensors and encoder
- Plug-and-play capability through six-step firmware with Hall effect sensor feedback
- Six-steps sensorless control available through dedicated BEMF sensing circuitry and sensorless / sensed Field Oriented Control
- Speed regulation through an external trimmer
- Protections: thermal shutdown, UVLO, overcurrent and reverse biasing of power stage outputs
- SWD debug interface and direct firmware update (DFU) via UART

### Description

This **STEVAL-PTOOL1V1** compact 70 mm x 30 mm reference design board is tailored for low voltage power tools driven by 3-phase brushless motors, supplied by 2S to 6S batteries. The design is based on the **STSPIN32F0B** controller and **STL180N6F7** (or **STL220N6F7**) Power MOSFET.

The board is ready for sensorless and sensed FOC, and can be configured for six-step sensorless control through available BEMF sensing circuitry. The accompanying six-step **STSW-PTOOL1V1** firmware uses position feedback from Hall effect sensors, with debugging and programming capability available through the SWD interface and the direct firmware update feature.

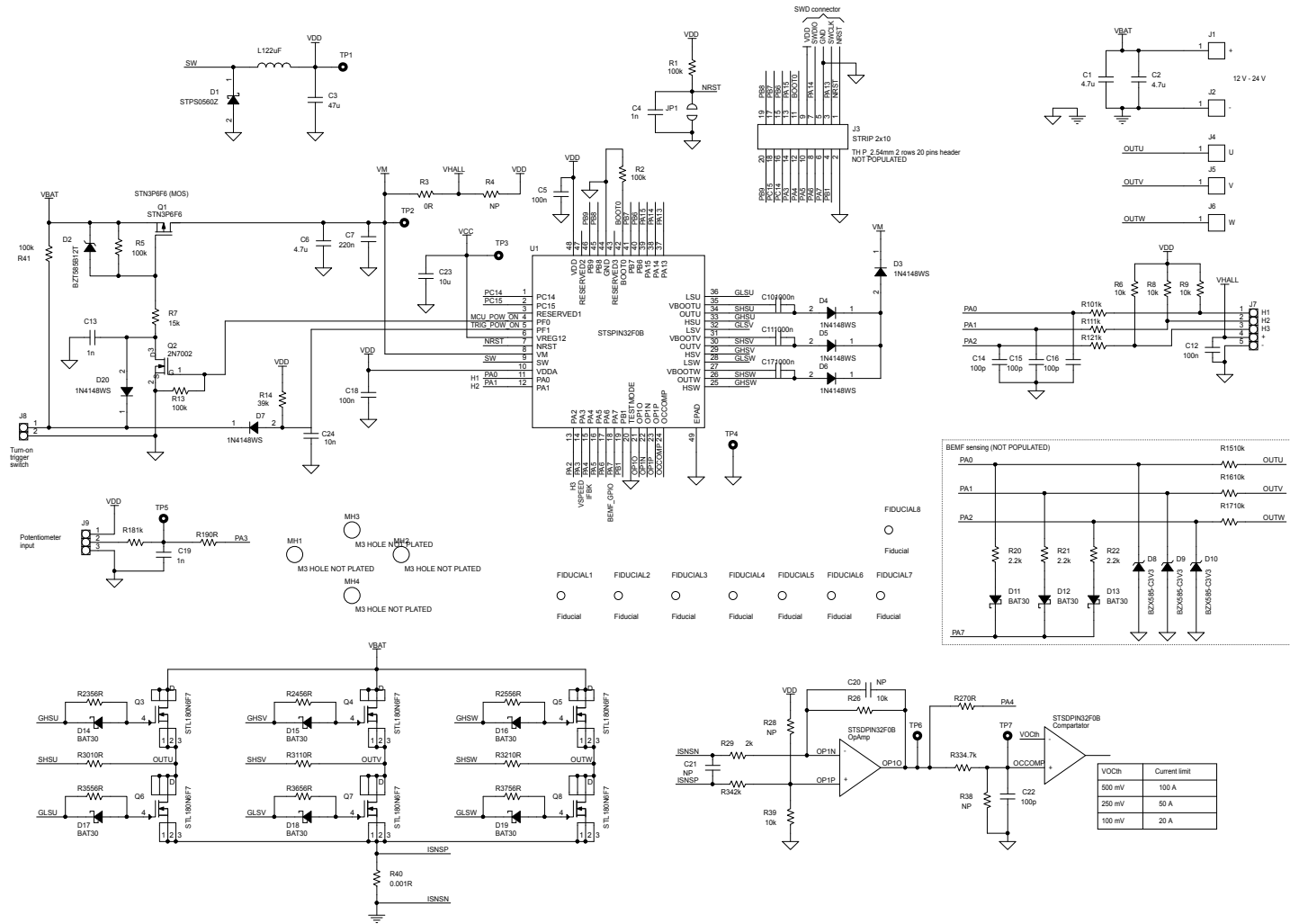
The board can deliver up to 15 A continuous current, thanks also to the optimal thermal dissipation provided by an embedded heatsink. It embeds a fast power-on circuit that connects and disconnects the battery, allowing standby consumption below 1 μA for extended battery duration. Several protection features are included, such as thermal shutdown, undervoltage lockout, overcurrent protection with programmable threshold and reverse biasing of power stage outputs.

This reference design is predominately intended for power tools, but is very suitable for any battery-powered application involving similar architecture, rating and performance. A potentiometer input for speed variation is available.

Product summary	
Reference design based on STSPIN32F0B for power tools driven by LV BLDC motors	<a href="#">STEVAL-PTOOL1V1</a>
Reference firmware for low voltage three-phase brushless DC motors with STEVAL-PTOOL1V1	<a href="#">STSW-PTOOL1V1</a>
N-channel 60 V STripFET F7 Power MOSFET in PowerFLAT 5x6 package	<a href="#">STL180N6F7</a>
Advanced single shunt BLDC controller with embedded STM32 MCU	<a href="#">STSPIN32F0B</a>
N-channel 60 V STripFET F7 Power MOSFET in PowerFLAT 5x6 package	<a href="#">STL220N6F7</a>

# 1 Schematic diagrams

Figure 1. STEVAL-PTOOL1V1 schematic diagram



## Revision history

**Table 1. Document revision history**

Date	Version	Changes
22-Sep-2020	1	Initial release.

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