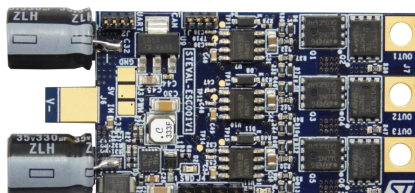


Electronic speed controller reference design for drones



Features

- Complete reference design for electronic speed controller implementing a sensorless FOC algorithm
- Designed for drones with 6S pack of LiPo batteries or systems with an equivalent suitable DC supply
- ESC ready for communication with any standard flight control unit (FCU): PWM or CAN
- Temperature overheating protection
- Nominal operating voltage range: 3S-6S Li-Po battery DC voltage level (11.1 to 22.2 V)
- Maximum RMS output current: 20 Arms
- Output peak current: 30 A
- Battery eliminator circuit (BEC): 5 V/0.5 A for external receiver or FCU
- Complete pre-configured firmware package available ([STSW-ESC001V1](#))
- Supported by ST motor control software SDK and ST motor profiler
- Compact PCB design: 29.1 x 58 mm
- Further target applications:
 - motor driving for RC vehicles: electric cars, helicopter, trucks, etc.
 - any three-phase BLDC or PMSM motor application
- RoHS and WEEE compliant

Description

The [STEVAL-ESC001V1](#) reference design for electronic speed controllers (ESC) for drones fits entry-level commercial drone designs and drives any three-phase brushless (or PMSM) motor running off 6S LiPo battery packs, or any equivalent DC supply, up to 30 A peak current.

The STEVAL-ESC001V1 lets you spin a motor and its propeller in minutes thanks to a complete pre-configured firmware package ([STSW-ESC001V1](#)), implementing a sensorless Field Oriented Controlled algorithm with 3-shunt current reading, speed control and full active braking.

The reference design board can accept commands from a flight control unit through PWM signals; other communication bus interfaces like UART, CAN, and I²C are also available. The reference embeds a battery eliminator circuit working at 5 V, an NTC sensor for temperature measurement and circuitry for overcurrent / overvoltage protection (OCP/OVP). The compact form factor and current capability render this reference design suitable for electronic speed controllers on small and light unmanned aerial vehicles like professional drones.

The STSW-ESC001V1 firmware/software package plus STM32 PMSM FOC software development kit - MC library let you refine your electronic speed controller design by acting on the field oriented control parameters embedded in the STM32 and experiment with the ST motor profiler to rapidly retrieve the motor parameters. The ST sensorless FOC algorithm ensures longer flight times and optimal dynamic performance.

The STEVAL-ESC001V1 has been designed around the highly efficient, low R_{dson} STripFET F7 power MOSFETs, the high-performance [STM32F303CBT7](#) microcontroller with ARM[®] Cortex[®]-M4 core and the [L6398](#) drivers.

Product summary	
Electronic speed controller reference design for drones	STEVAL-ESC001V1
Sensorless FOC reference design firmware for STEVAL-ESC001V1	STSW-ESC001V1
ARM Cortex-M4 core mainstream mixed signals MCUs with DSP and FPU	STM32F303CBT7
N-channel 40 V, 2.1 mOhm typ., 120 A STripFET F7 Power MOSFET	STL160N4F7

1 Schematic diagrams

Figure 1. STEVAL-ESC001V1 circuit schematic (1 of 4)

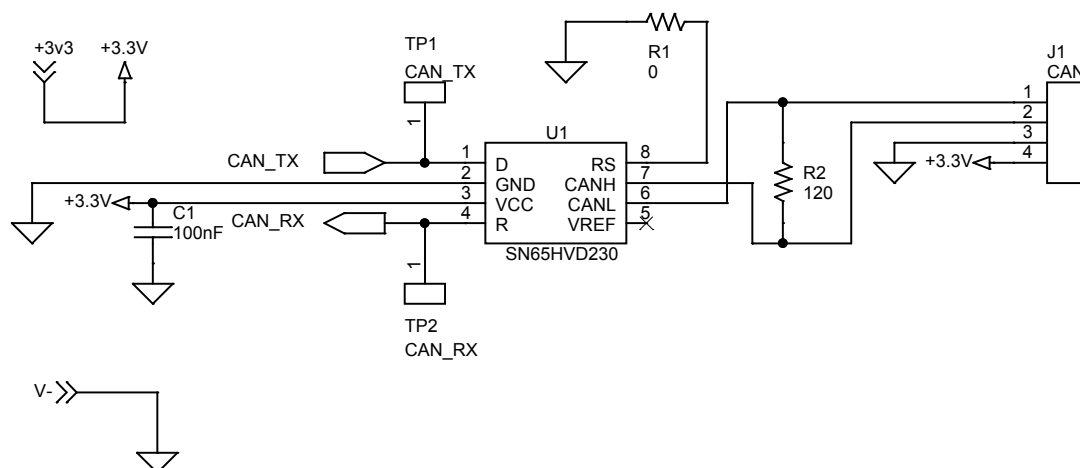


Figure 2. STEVAL-ESC001V1 circuit schematic (2 of 4)

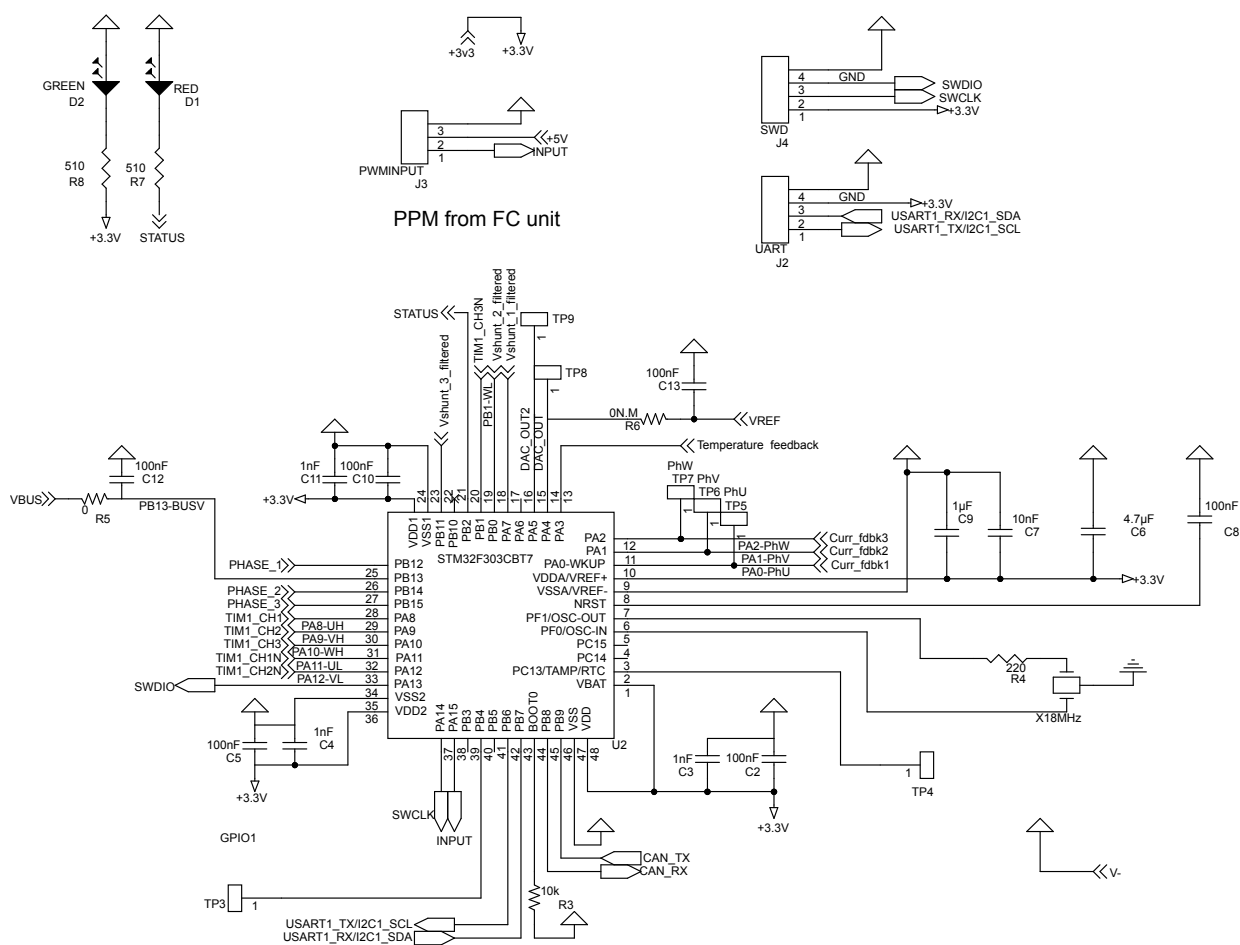
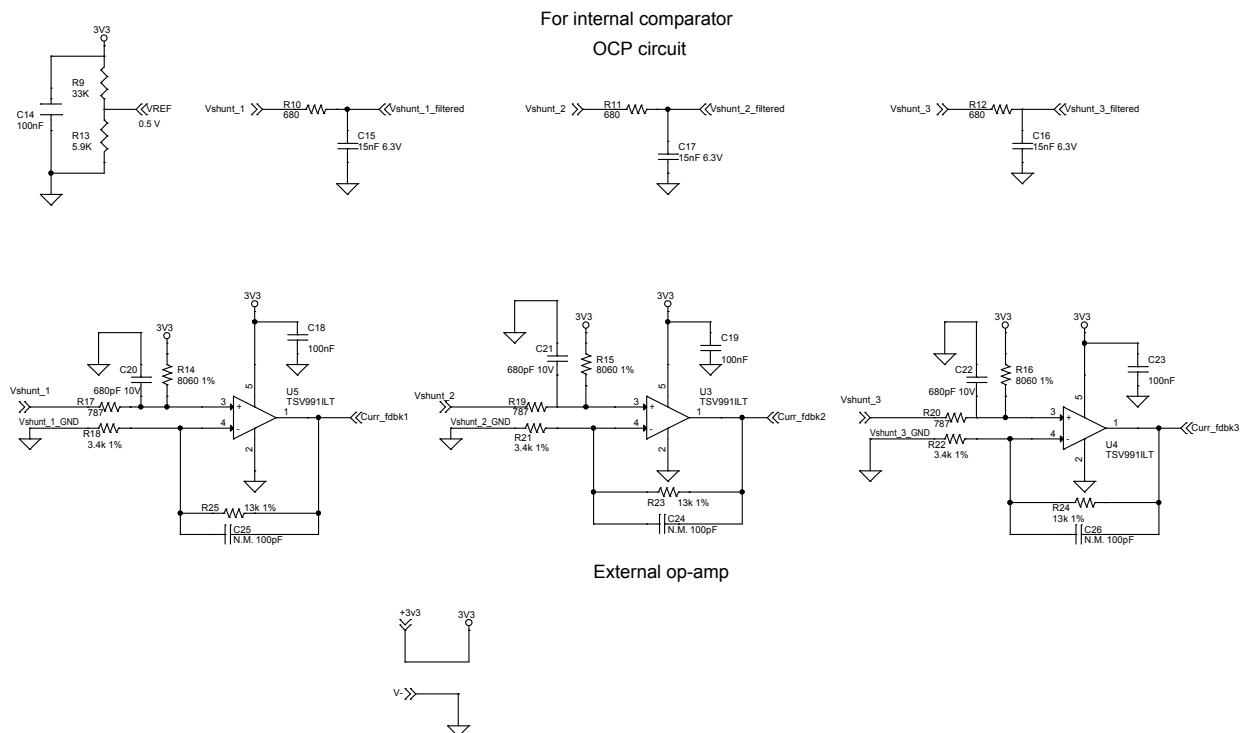
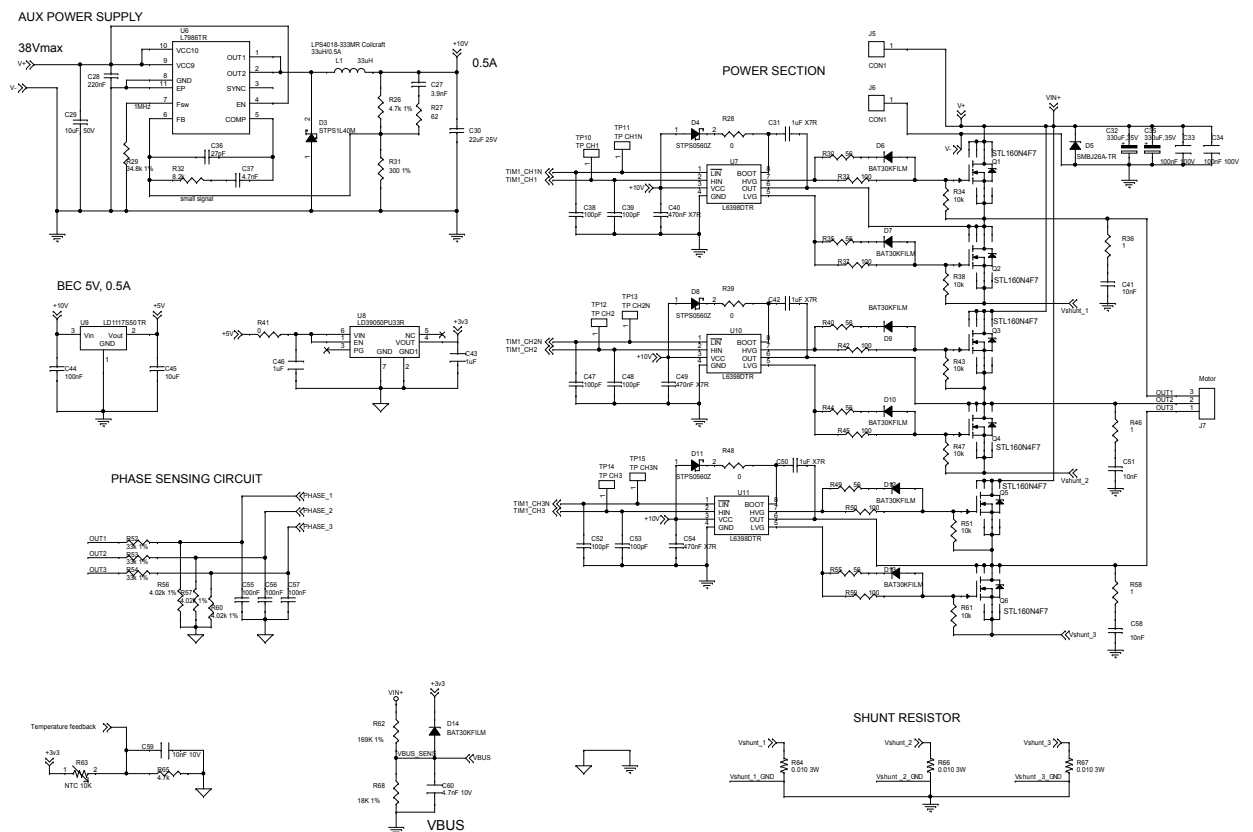


Figure 3. STEVAL-ESC001V1 circuit schematic (3 of 4)

Figure 4. STEVAL-ESC001V1 circuit schematic (4 of 4)


Revision history

Table 1. Document revision history

Date	Version	Changes
05-Apr-2017	1	Initial release.
09-Aug-2017	2	Updated cover page title, features and description.
13-Nov-2018	3	Updated Figure 4. STEVAL-ESC001V1 circuit schematic (4 of 4) . Added references to STL160N4F7.

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