Three Phase Sensorless BLDC Motor Controller

Description

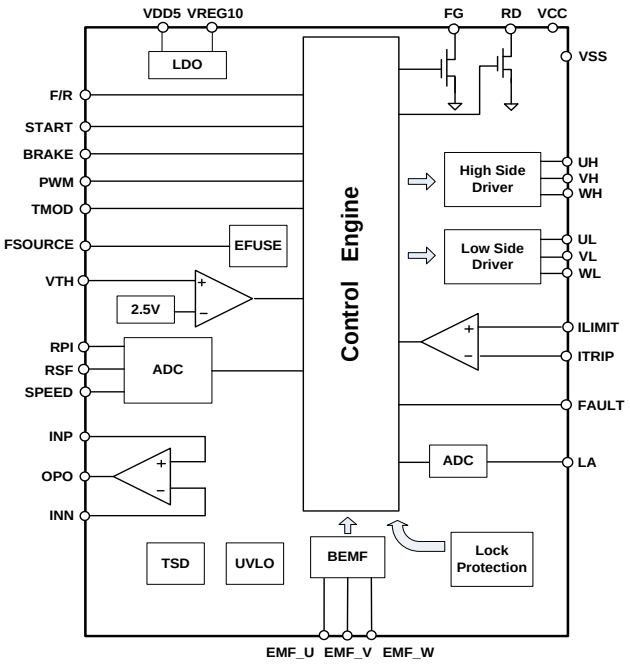
The FT3103 is a Three Phase sensorless BLDC Motor controller with built-in driver. Due to its adaptive features and wide power-supply range capabilities, FT3103 is intended to cover a wide range of motor characteristics, while requiring minimal tuning from the user. Two drive modes are provided, namely SBLDC (quasi-sine-wave) modulation or BLDC (120°). Speed can be controlled either by setting the closed speed reference directly or through the adjustment of PWM duty cycle linearly proportional to the output speed. Speed indicator is provided through a Frequency Generator output (FG×3), generating digital pulse with its frequency proportional to the speed of the motor.

Protection functions of FT3103 are comprehensive including lock protection and automatic recovery, under voltage, thermal shutdown, current limit and over current protections. These prevent the control circuits and the motor from being damaged, particularly under stressed applications and demanding environments.

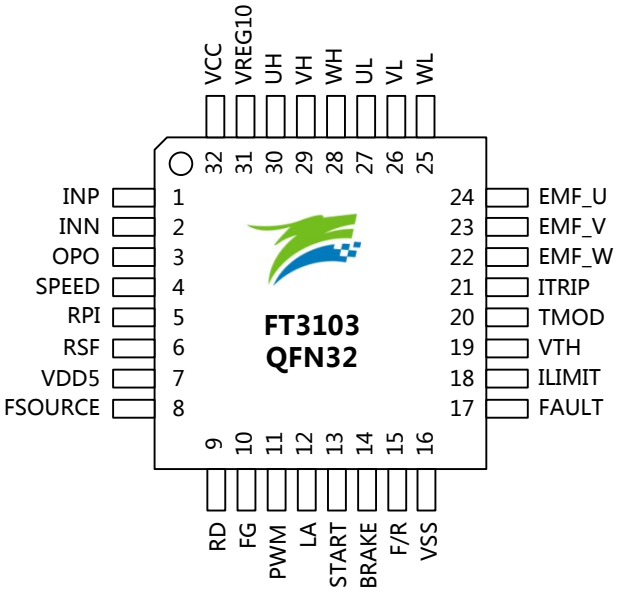
Feature

- Position sensorless BLDC controller
- Selectable SBLDC (quasi-sine-wave) or BLDC (120°) drives
- Lead angle control
- Closed loop speed control
- Direct or PWM duty cycle adjusted (linear) closed loop speed control
- FG (Frequency Generator) and RD (Rotation detection) output
- Current limit and over current protection
- Built-in independent operational amplifier
- Built-in lock protection and automatic recovery circuit
- Built-in thermal shutdown protection (TSD)
- Built-in under voltage lock out protection. (UVLO)

Block Diagram



Pin Assignment



Pin Configuration

PIN NO.	PIN Name	Type	Description
1	INP	I	The positive input of the operational amplifier
2	INN	I	The negative input of the operational amplifier
3	OPO	O	The output of the operational amplifier
4	SPEED	I	Reference speed analog input
5	RPI	I	Initial PWM duty cycle analog input
6	RSF	I	Initial starting frequency analog input
7	VDD5	O	Digital power output, LDO DC5V output for digital signal
8	FSOURCE	I	Test signal input, connect to GND.
9	RD	O	Open drain. Motor rotate detection output
10	FG	O	Open drain. Frequency Generator, speed signal output.
11	PWM	I	PWM duty cycle input for linear reference speed adjustment. Internal pull-up.
12	LA	I	Lead angle select analog input
13	START	I	Motor start input. High: Start; Low: Free. Internal pull-up
14	BRAKE	I	Brake signal input, Low: Brake. Internal pull-up
15	F/R	I	Motor rotation direction input
16	VSS	GND	Signal and power ground.
17	FAULT	I	Over current protection input. Internal pull-up
18	ILIMIT	I	Current limit analog input
19	VTH	I	Over-temperature protection

PIN NO.	PIN Name	Type	Description
20	TMOD	I	Test mode select, normal application connect to GND
21	ITRIP	I	Current sensor voltage feedback analog input
22	EMF_W	I	Phase W back EMF
23	EMF_V	I	Phase V back EMF
24	EMF_U	I	Phase U back EMF
25	WL	O	Low side phase W NMOS driver
26	VL	O	Low side phase V NMOS driver
27	UL	O	Low side phase U NMOS driver
28	WH	O	High side phase W PMOS driver
29	VH	O	High side phase V PMOS driver
30	UH	O	High side phase U PMOS driver
31	VREG10	O	LDO output
32	VCC	POWER	Power supply

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may be damaged or may not function or be operational above these ratings and stressing the device to/above these levels is not recommended. Fortior does not recommend exceeding or designing about the Absolute Maximum Ratings.

Parameter	Symbol	Condition	Ratings	Unit
Power supply voltage	V_{cc}max		30.0	V
Logic input pin withstand voltage	V_{logic}max		5.5	V
RD/FG output current	I_{FG}max		10	mA
Operating temperature	Topr		-40~+125	℃
Storage temperature	Tstg		-65~+150	℃

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications.

Symbol	Parameter	Min.	Typ.	Max.	Unit
Power supply voltage	V_{cc}	3.7	12	28	V