Three Phase single Hall sinusoidal BLDC Motor controller

Description

The FT1016 is a Three Phase sinusoidal Brushless DC (BLDC) Motor controller. It comes with the advanced single Hall sensor design. Using the single Hall sensor signals, the control system is able to execute the PWM commutation by switching the 3-Phase inverter. Due to its adaptive features and wide power-supply range capabilities, it is intended to cover a wide range of motor characteristics, while requiring little tuning from the user. Speed adjustment can be achieved through either direct-PWM or analog voltage control. 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 FT1016 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

- Advanced single Hall design
- Support space vector pulse width modulation (SVPWM)
- 180° sinusoidal drive, for high efficiency and low acoustic noise
- Two speed adjustment methods can be selected (direct-PWM and analog voltage control)
- Lead angle control
- FG (Frequency Generator) and RD (Rotation detection) output
- Current limit and over current protection
- Built-in lock protection and automatic recovery circuit
- Built-in thermal shutdown protection (TSD)
- Built-in under voltage lock out protection. (UVLO)

Block Diagram
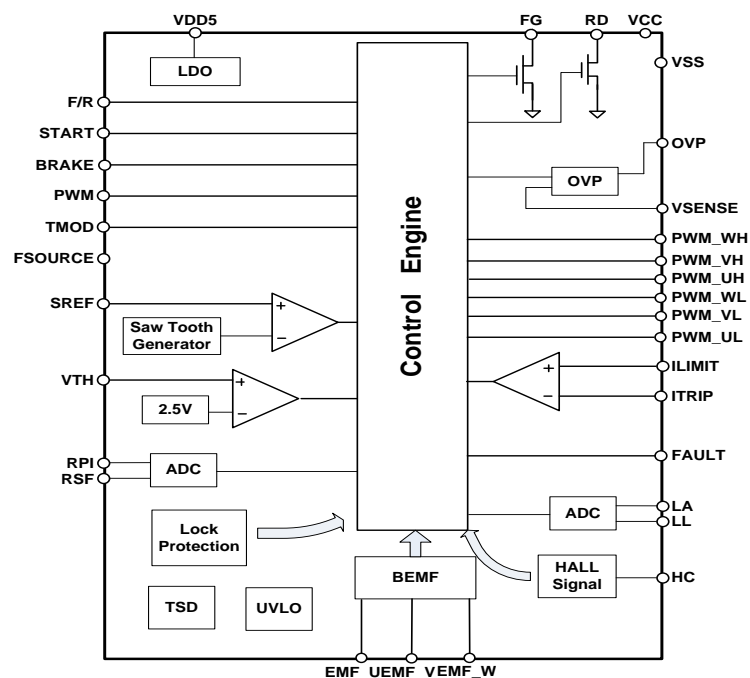
Pin Assignment
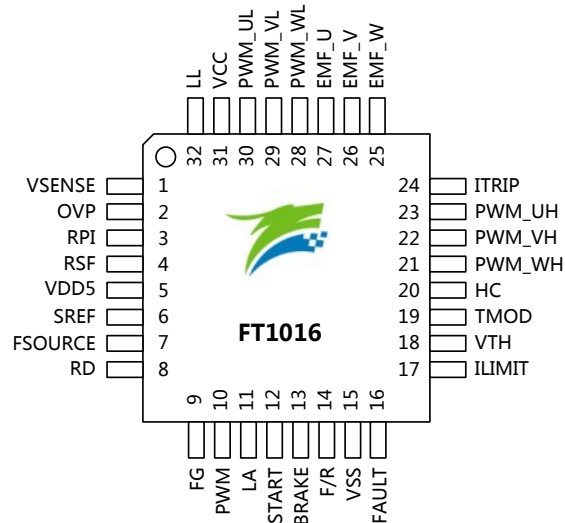
Pin Configuration

PIN NO.	PIN Name	Type	Description
1	VSENSE	I	Motor Drive Voltage-Sensing Resistor. Designed for determining the voltage level of over-voltage protections.
2	OVP	O	Motor Drive Over-Voltage Protection Output. It can be connected to an external power transistor for discharging the back EMF
3	RPI	I	Initial PWM duty cycle analog input
4	RSF	I	Initial starting frequency analog input
5	VDD5	O	Digital power output, LDO DC5V output for digital signal.
6	SREF	I	Analog input voltage for speed adjustment.
7	FSOURCE	I	Test signal input, connect to GND
8	RD	O	Open drain. Motor rotate detection output
9	FG	O	Open drain. Frequency Generator, speed signal output.
10	PWM	I	PWM input for speed adjustment. Internal pull-up
11	LA	I	Lead angle select analog input
12	START	I	Motor start input. High: Start; Low: Free. Internal pull-up
13	BRAKE	I	Brake signal input, Low: Brake. Internal pull-up.
14	F/R	I	Motor rotation direction input
15	VSS	GND	Signal and power ground
16	FAULT	I	Over current protection input. Internal pull-up
17	ILIMIT	I	Current limit analog input
18	VTH	I	Over-temperature protection
19	TMOD	I	Test signal input, connect to GND

PIN NO.	PIN Name	Type	Description
20	HC	I	Hall C Sensor Input Phase-W magnetic field detection
21	PWM_WH	O	PWM output of phase W. High side
22	PWM_VH	O	PWM output of phase V. High side
23	PWM_UH	O	PWM output of phase U. High side
24	ITRIP	I	Current sensor voltage feedback analog input
25	EMF_W	I	Phase W back EMF
26	EMF_V	I	Phase V back EMF
27	EMF_U	I	Phase U back EMF
28	PWM_WL	O	PWM output of phase W. Low side
29	PWM_VL	O	PWM output of phase V. low side
30	PWM_UL	O	PWM output of phase U. low side
31	VCC	POWER	Power supply
32	LL	I	Lower limit control for lead angle

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
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	18	V