SM2103H Single Phase full-wave BLDC Motor Driver IC

1. Features

- Built in Hall sensor
- Automatic PWM mode
- Thermal Shut Down(TSD)
- Under Voltage Lock Out(UVLO)
- Package：WLCSP

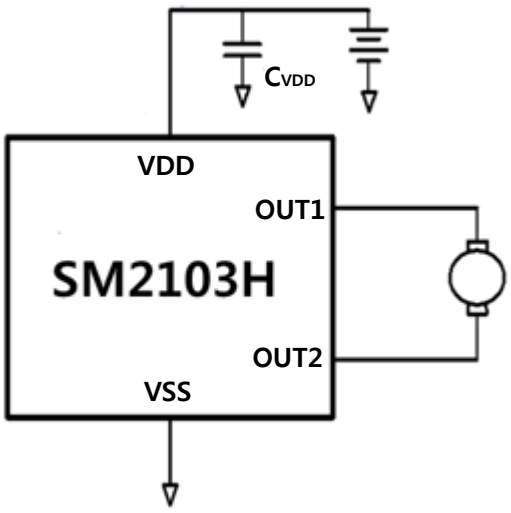
2. Application

- Vibration motor for mobile equipment

3. Description

The SM2103H is a single-phase full-wave motor driver IC built in hall sensor with thermal shut down protection circuit, lock detector and frequency generator.

Simplified Schematic



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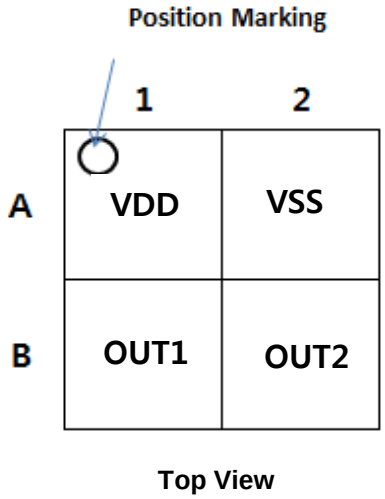
4. Pin Configuration and Functions



Top View

Pin No.	Symbol	Type	Function
1A	VDD	Source	Voltage source terminal for IC. Needs to use bypass capacitor to GND.
2A	VSS	GND	Ground
1B	OUT1	Output	Motor drive output terminal 1. Needs to connect motor coil.
2B	OUT2	Output	Motor drive output terminal 2. Needs to connect motor coil.

5. Specifications

5.1 Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Rating	Unit
Supply voltage	VDD	6	V
Power dissipation	Pd	510	mW
Output voltage	V_{OUT1}、V_{OUT2}	6.0	V
Output current	I_{OUT1}、I_{OUT2}	300	mA
ESD	HBM	2	KV
	MM	200	V
Junction Temperature	Tjmax	150	℃
Storage temperature range	T_{stg}	– 55 ~ +150	℃

5.2 Recommended Operating Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Voltage Source	VDD	2.7	3.3	3.6	V
External parts	C_{VDD}		1		uF
Operating temperature	T_{opr}	-25		+85	℃

5.3 Electrical Characteristics (VDD = 3V, Ta=25℃)

Item	Symbol	Description	MIN	TYP	MAX	Unit
Current consumption	I_{DD}	Output=open		2.2	3.2	mA
Output Voltage (upper+lower)	V_{SAT}	I_{OUT}=100mA	-	-	0.45	V
Start up Full ON time	T_{FULL}	Full ON time before PWM driver changing from power supply on. (VDD=3V)	108	180	252	ms
PWM frequency	F_{PWM}	-	60	100	150	KHz
PWM Duty (output load)	D_{PWM}	with Load (L=250uH, R=25Ω)	69	75	91	%
Operating magnetic flux density (forward)	B_{FWD}		-	3.5	6.5	mT
Operating magnetic flux density (reverse)	B_{REV}		-6.5	-3.5	-	mT

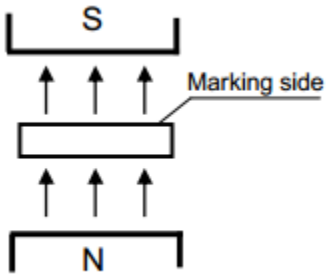


Fig 1. Input magnetic direction

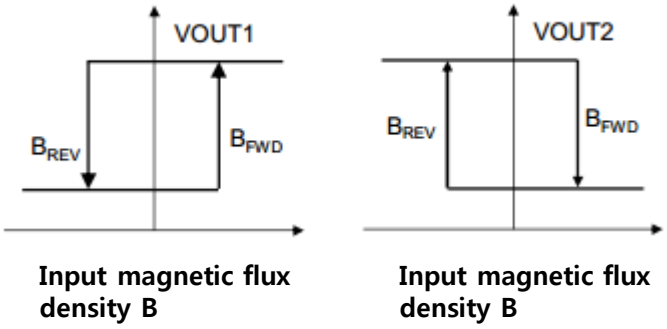


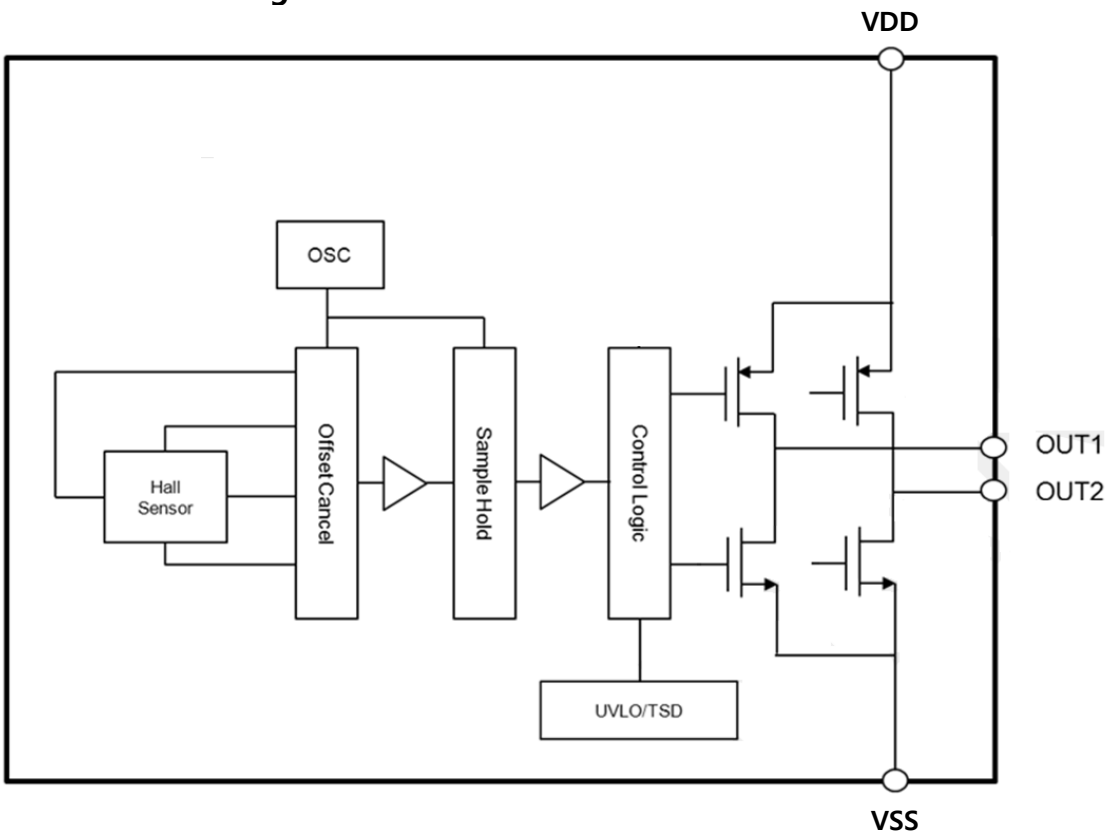
Fig 2. Operating magnetic flux density

6. Detailed Description

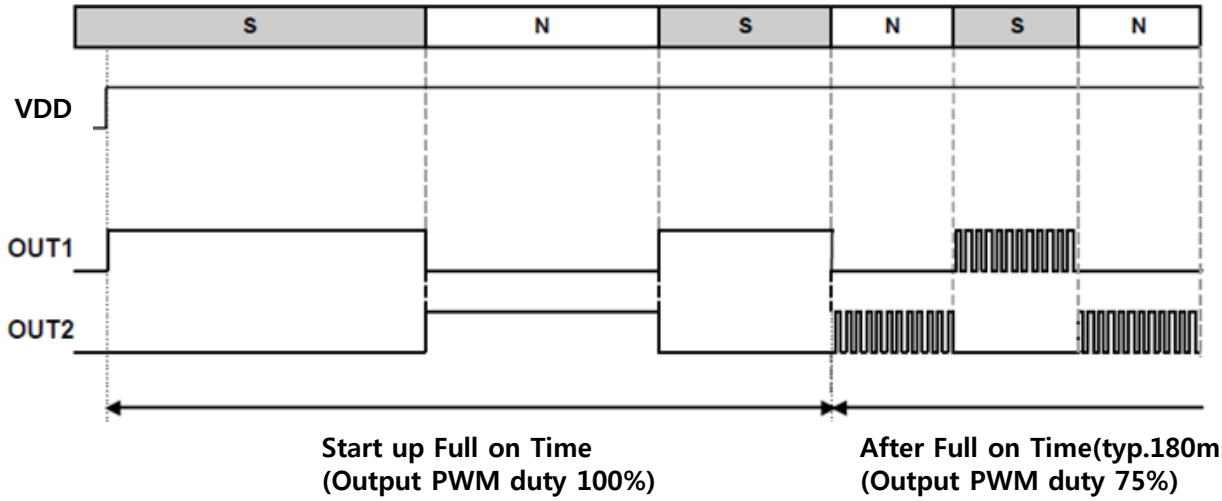
6.1 Overview

The SM2103H is a single-phase full-wave motor driver IC built in hall sensor with thermal shut down protection circuit, lock detector and frequency generator..

6.2 Function Block Diagram



6.3 Waveform

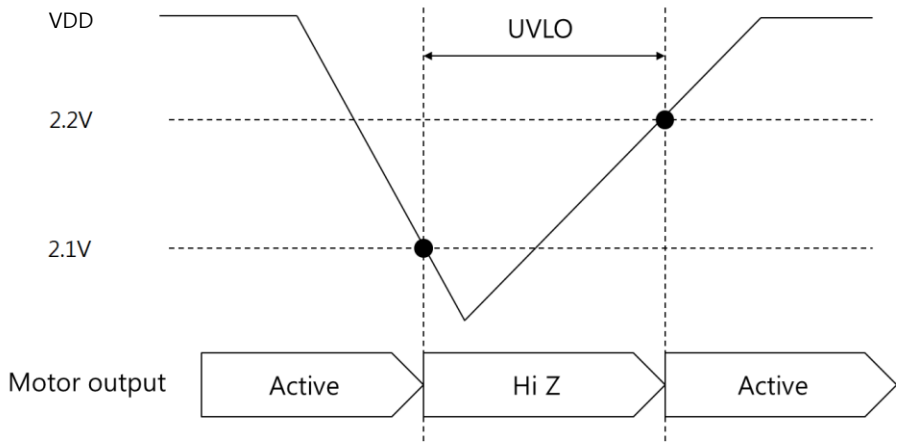


6.4 Protection

6.4.1 UVLO

UVLO is active when VDD is under 2.1V, motor output is Hi-Z.

And protection is release when VDD is or more 2.2V, motor output is active again.

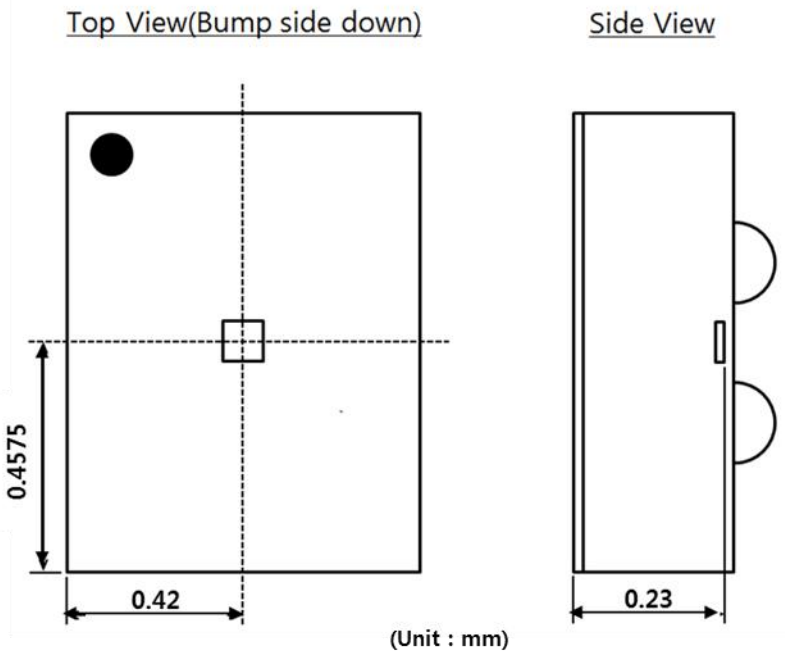


6.4.2 TSD

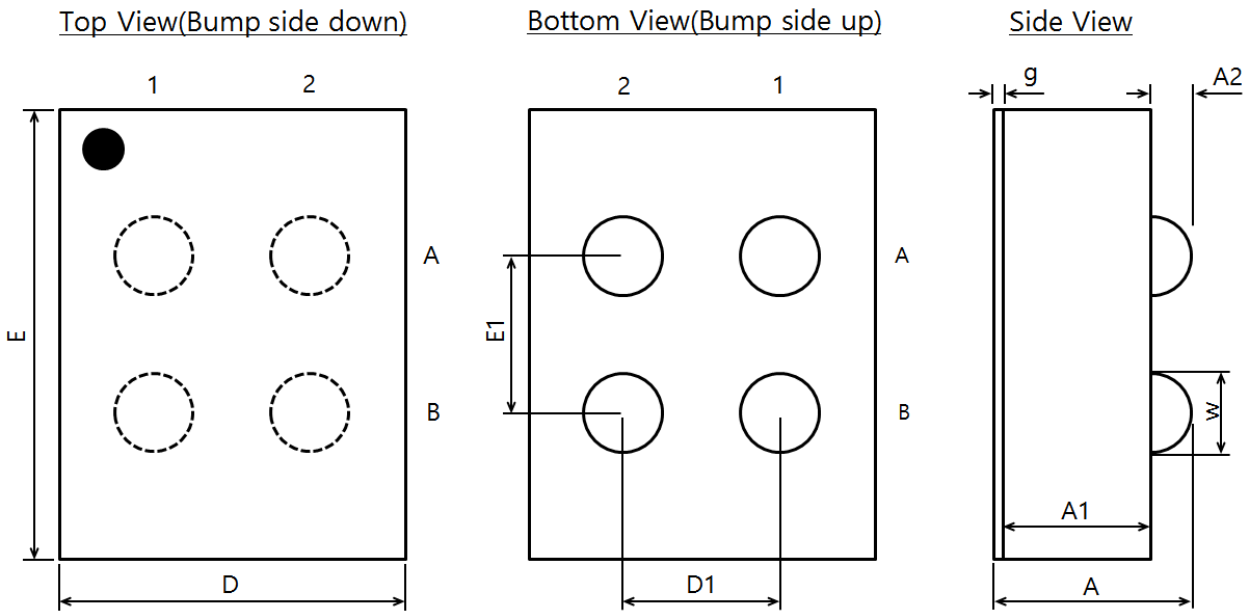
SM2103H has a built-in thermal shut down function that prevents heat damage to the IC. Normal operation should always be within the IC's power dissipation rating. If however the rating is exceeded for a continued period, the junction temperature will rise which will activate the TSD circuit that will turn OFF all output pins. When the junction temperature falls below the TSD threshold, the circuits are automatically restored to normal operation.

Note that the TSD circuit operates in a situation that exceeds the absolute maximum ratings and therefore, under no circumstances, should the TSD circuit be used in a set design or for any purpose other than protecting the IC from heat damage.

6.5 Hall Sensor Location



7. PKG Dimension



DIMENSION **Unit: mm**

Symbol	MIN	NOM	MAX	Note
A	0.297	0.330	0.363	±0.033
A1	0.190	0.205	0.220	±0.015
A2	0.085	0.100	0.115	±0.015
D	0.810	0.840	0.870	±0.030
E	0.885	0.915	0.945	±0.030
D1		0.400		
E1		0.400		
g	0.022	0.025	0.228	±0.003
w	0.018	0.200	0.220	±0.020

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