MH3610KSRF is a DC motor driver IC designed with digital-analog hybrid technology. The IC integrates a precision voltage source, Hall sensor, controller, and power driver module. It supports a wide voltage range of 3.5V~16V. The IC has built-in power ground reverse connection protection, and no external anti-reverse connection diode is required. Under under voltage, the IC will automatically stop driving until the voltage returns to normal. It is suitable for driving single-phase DC brush less motors, PWM speed control cooling fans, etc. The simple SOT23-6 package is more convenient to use.

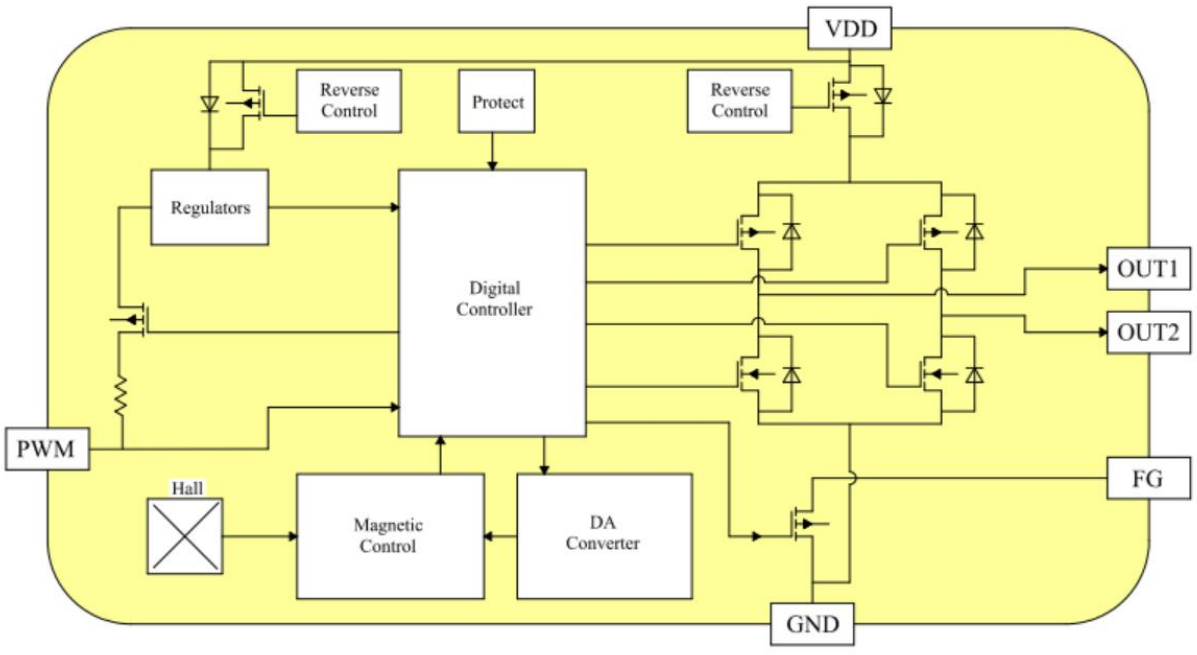
Features and Benefits

- Working voltage range: 3.5V~16V
- PWM speed regulation: The speed can be adjusted by adjusting the duty cycle of the PWM signal
- PWM input range: 100Hz~100KHz
- Soft start function can eliminate the peak current generated during startup and reduce the commutation impact
- The PWM terminal has an internal integrated 10KΩ equivalent pull-up resistor to a high level
- Soft switch function design effectively reduces fan switching noise
- Complete protection functions: Reverse protection, Rotation-clogging protection, Under voltage protection, Over-temperature protection
- Built-in FG output
- Package type: Flat-foot SOT23-6

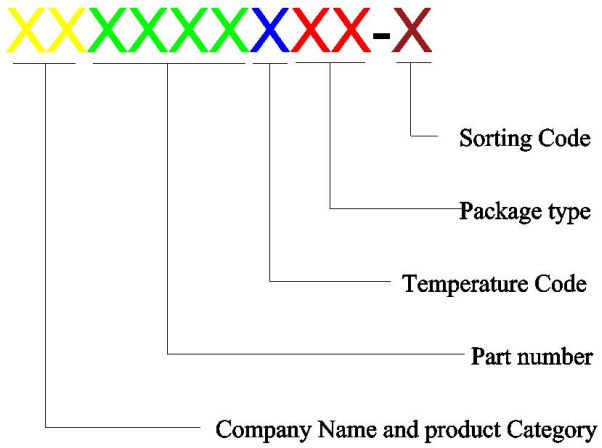
Applications

- Single-phase DC Brush less motor
- Single-phase DC Brush less fan
- CPU, GPU cooling fans

Functional Diagram



Ordering Information



Company Name and Product Category

MH:MST Hall Effect/MP:MST Power MOSFETs

Part number

181,182,183,184,185,248,249,276,477,381,381F,381R,382…..

If part # is just 3 digits, the forth digit will be omitted.

Temperature range

E: 85 ℃, I: 105 ℃, K: 125 ℃, L: 150 ℃

Package type

UA:TO-92S,VK:TO-92S(4pin),VF:TO-92S(5pin),VS/VP:SOP8

SO:SOT-23,SQ:QFN-3,ST:TSOT-23,SN:SOT-553,SD:DFN2*2-6L

SR:SOT-26L,SM:DFN1.6*1.6-6L,SY:DFN3*3*1-10L

Sorting

α,β,Blank…..

Part No.	**Temperature Suffix**	**Package Type**
MH3610KSRF	K (-40°C to +125°C)	SRF (SOT23-6L Flat Lead）

K spec is using in industrial and automotive application. Special Hot Testing is utilized.

Absolute Maximum Ratings At (Ta=25℃)

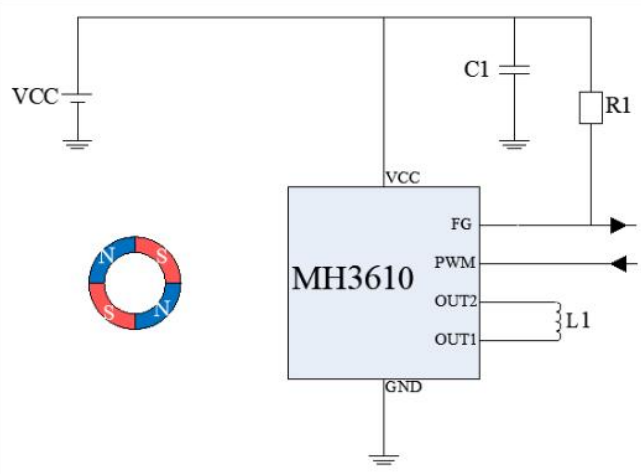
Parameter		Value	Units
Supply voltage，(V_{DD})		+18	V
Supply Current，(I_{DD})		+20	mA
Power supply reverse voltage，(V_{DDREV})		-14	V
Power supply reverse current，(I_{DDREV})		-20	mA
FG output voltage，(V_{FG})		+18	V
FG output current，(I_{FG})		+30	mA
FG reverse output current，(I_{FG})		-50	mA
PWM input voltage，(V_{PWM})		+7	V
PWM reverse input voltage，(V_{PWM})		-0.3	V
PWM reverse current，(I_{MINSP}, I_{PWM})		-10	mA
Average output current，(I_{OUT})		+550	mA
Pulse output current，(I_{OUT})		+1000	mA
Operating temperature range，(T_A)		-40to+150	℃
Storage temperature range，(T_S)		-55to+165	℃
Maximum Junction Temperature，(V_{DD})		+165	℃
ESD capability HBM		6000	V
magnetic flux，(B)		Unlimited	Gauss
Thermal Resistance	(θ_{JA})SRF	543	℃/W
	(θ_{JC})SRF	410	℃/W
Package Power Dissipation,(P_D)SRF		230	mW

Electrical Specifications

Ta=25℃,VDD=12V,unless otherwise stated

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply voltage	V_{DD}		3.5	12	16	V
Supply Current	I_{DD}		-	3	6	mA
Reverse current	I_{DDREV}	VDD= -16V	-	-	10	uA
PWM input low level	V_{IL}		-	-	0.8	V
PWM input high level	V_{IH}		2.1		5.5	V
PWM Input Frequency	F_{IN}	-2%<DCERR<2%	0.1	-	100	KHz
PWM internal pull-up resistor	R_{IN}		-	10	-	kΩ
Full bridge on-resistance	R_{DSON}	T_J=25℃	-	3.0	-	Ω
Full bridge on-resistance	R_{DSON}	T_J=105℃	-	4.0	-	Ω
PWM output range	F_{OUT}	10%<DCIN<100%	-	22.5	-	KHz
Output duty cycle range	DC_{OUT}		0	-	100	%
Output duty cycle error	DC_{ERR}	DCOUT - DCIN, VDD=12V,TA=25℃	-2	-	2	%
Inertia freewheeling time	T_{FW}		-	1	-	ms
Soft start acceleration area	K_{SOFT}		-	30	-	%
Soft start detection	E_{SOFT}		-	4	-	edges
Soft start duration	T_{SOFT}		-	1.0	-	s
FG output saturation voltage drop	V_{OL}	B>BOP,IOUT=5mA	-	0.2	0.5	V
FG maximum output current	I_{CL}	B>BOP	-	25	-	mA
FG leakage current	I_{OFF}	VOUT=16V,VDD=12V, B<Brp	-	0.1	10	uA
Magnetic field sensitivity	B_{HALL}	BOP=|BHALL|, BRP= -|BHALL|	-	± 15	± 25	Gs
Output commutation time range	T_{SLOPE}	Total Regulation Range	300	-	4000	us
Output commutation time ratio	SL_{RATIO}		-	12.5	-	%
Under voltage protection value	V_{BOD}		2.8	3.1	3.4	V
Under voltage detection delay	T_{BOD}		-	8	-	ms
Lock protection opening time	T_{ON}		-	1.0	-	s
Lock protection off time	T_{OFF}		-	4.0	-	s

Typical application circuit

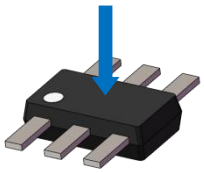


Output Behavior versus Magnetic Pole

(Ta=25℃,VCC=12V,unless otherwise specified)

Parameter	*Test Conditions*	*OUT1*	*OUT2*	*FG*
South	B>BOP	High	Low	High
North	B<BRP	Low	High	Low

South

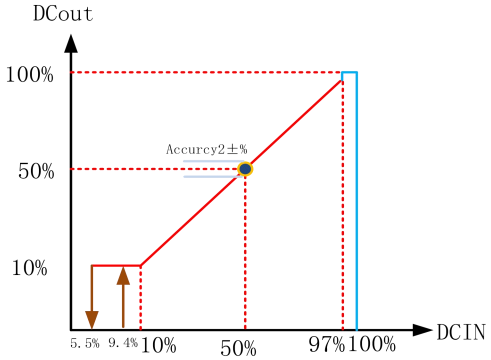


SO Package

Functional Description

PWM speed regulation

The PWM input has a wide frequency range (100Hz~100KHz), while maintaining a constant output drive frequency above the audio frequency. The PWM input duty cycle is equal to the drive output duty cycle, and the error is no more than ±2%, as shown in the following figure:



PWM has a built-in 10K equivalent pull-up resistor to the logic high level, eliminating the need for an external pull-up resistor. When an open-circuit fault occurs on the external PWM signal line, the output duty cycle is 100% and the motor runs at full speed.

Soft switch

The micro-power soft switch design optimizes the quiet effect without increasing the heat of the IC. The IC will automatically determine the commutation period, and through real-time closed-loop control, the ratio of soft commutation time to rotation period is fixed at 12.5%, thereby optimizing the quiet effect at different speeds.

Soft start

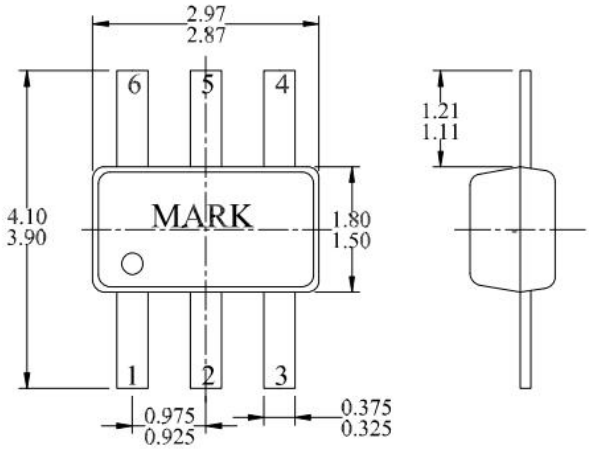
The soft start function effectively suppresses the inrush current at motor startup. At the same time, when the PWM input duty cycle is low, it will automatically adjust the drive duty cycle to achieve a smooth start. After the motor runs for one week, the output duty cycle will gradually adjust to be consistent with the input duty cycle.

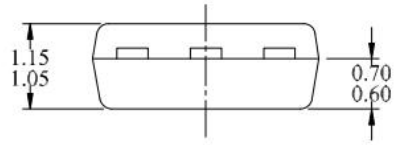
FG output:

The FG output can feed back the motor speed signal to the system so that the system can monitor the motor rotation status. At the same time, the open-drain FG output is set with a current limiting function to prevent system damage in the event of a short circuit between the FG output and the power supply.

Sensor Location, Package Dimension and Marking

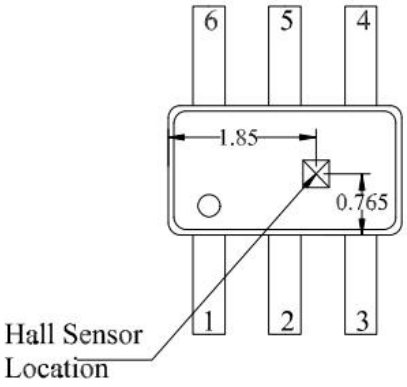
SRF Package



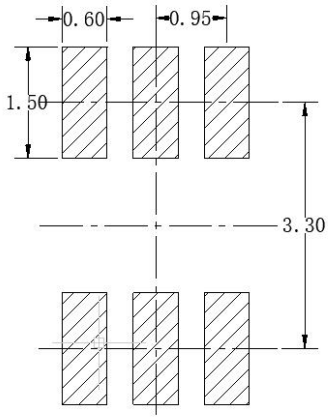


(Top View)

Hall Plate Chip Location
(Top View)



（For reference only）Land pattern



NOTES:

1. Controlling dimension: mm
2. Leads must be free of flash and plating voids
3. Lead coplanarity (bottom of leads after forming) shall be 0.10 millimeters max.
4. PINOUT:

Pin No.	Pin Name	Pin No.	Pin Name
1	VDD	4	PWM
2	GND	5	OUT1
3	FG	6	OUT2