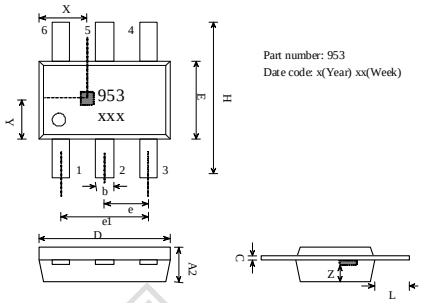
PROLIFIC TECHNOLOGY INC.

PT3953
Single coil Hall Driver IC

Applications

- Single coils DC brushless motor
- Support pre-driver application

Package: TSOT26F-6pin



SYMBOLS	DIMENSIONS IN MILLIMETERS(mm)		
	MIN	NOM	MAX
A2	0.70	0.75	0.775
b	0.35	-	0.50
C	0.10	-	0.20
D	2.70	2.90	3.10
E	1.40	1.60	1.80
H	3.60	3.80	4.00
e	-	0.95	-
e1	-	1.90	-
L	-	1.10	-
SENSOR LOCATION			
X	-	1.00	-
Y	-	0.85	-
Z	-	0.25	-

1. FG output
2. GND/DC ground
3. O1/First output pin
4. O2/Second output pin
5. PWM speed control input pin
6. VDD/DC power supply

Features

- Built-in hall sensor
- Single phase full wave driver
- Soft switching output driver
- Motor locked protection and automatic restart
- Speed controllable by PWM input signal
- FG output
- Built-in hysteresis comparator
- Built-in zener diode
- High balance and low thermal drift magnetic sensing
- Low power consumption and high driving efficiency
- 8KV ESD capability

Specifications

Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Conditions	Rating	Units
Maximum supply voltage	VDDmax		10	V
Allowable power dissipation	Pd		500*1	mW
Operating temperature	Ta		-40~+100	℃
Storage temperature	Ts		-50~+150	℃
Max. output current	Peak		1000	mA
	Hold	0.5sec	800*2	mA
Continuous output current	I_{CONT}	VDD=5V	450	mA
Junction Temperature	Tj		150	℃
Thermal resistance	Raj		250	℃/W

*1: Reduced by 4.0mW for each increase in Ta of 1°C over 25°C When mounted on 50mm x 50mm x 1.6mm glass epoxy board
*2: Should not exceed Pd

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Electrical Characteristics (T_A=+25°C, V_{DD}=5V)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Units
Supply Voltage	V_{DD}		1.8		8.5	V
Output High Voltage	$V_{OH(ON)}$	@ I_{OUT} =200mA	V_{DD}-0.4	V_{DD}-0.3		V
Output Low Voltage	$V_{OL(ON)}$	@ I_{OUT} =200mA		0.3	0.4	V
Output Voltage Clamp	V_{BV}		10			V
Supply Current	I_{DD}	Output open		6	10	mA
PWM input H level	$V_{PWM(H)}$		2.5			V
PWM input L level	$V_{PWM(L)}$				1.5	V
Input Frequency	F_{PWM}		0.02		50	kHz
Shutdown Time	T_{SD}		2.1	2.8	3.5	S
Restart Time	T_{RS}		0.3	0.4	0.5	S
Magnetic Characteristics (T_A=+25°C, V_{DD}=5V)						
Operate Point	B_{OP}		-	15	30	G
Release Point	B_{RP}		-30	-15	-	G
Hysteresis	B_{HYS}		10	30	50	G

General Specifications

The PT3953 is designed for magnetic actuating using a bipolar magnetic field. The built-in dynamic offset cancellation of pre-amplifier stage achieves optimal symmetrical magnetic sensing. The output driver provides a linear drive to eliminate switching noise. This Hall-effect IC is optimal for DC brushless fan application with speed controllable by PWM input signal. The supply voltage range is from 1.8V to 8.5V and the output current is 450mA.

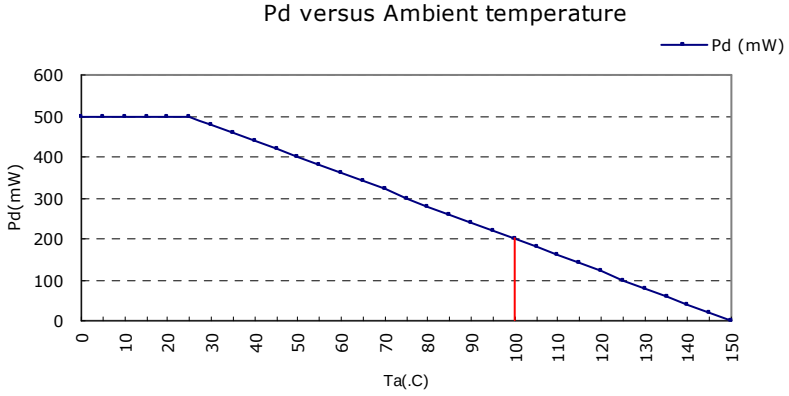


Fig 1 Pd vs ambient temperature

Lock Protection

In order to protect the motor, the driver IC will be shutdown to drive the coil when the motor is locked over 0.4 seconds. Then, it restarts to drive the motor after 2.8 seconds. Figure 2 shows the timing diagram between the hall input signal and driver's output state.

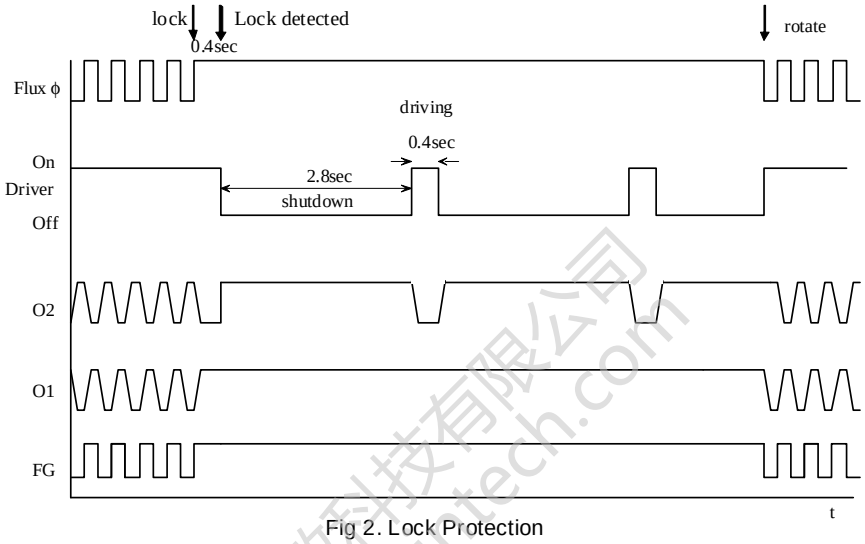


Fig 2. Lock Protection

Hall Sensor

This Hall effect sensor IC integrates the sensor, pre-amplifier with dynamic offset cancellation and the hysteresis comparator in single chip. The hysteresis characteristic is illustrated in Fig. 3 and the threshold of the magnetic flux density is +-15 Gauss.

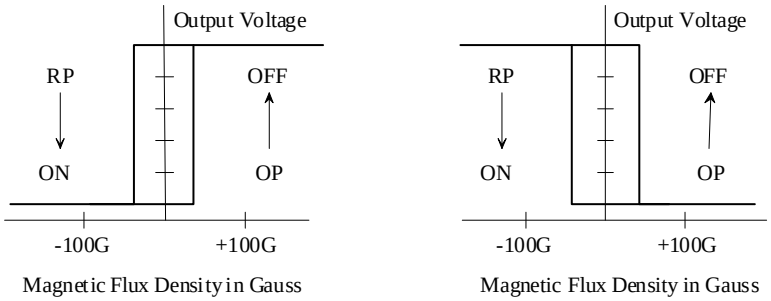


Fig 3. Magnetic Hysteresis Characteristics

The Hall IC architecture block diagram is shown in Fig. 4.

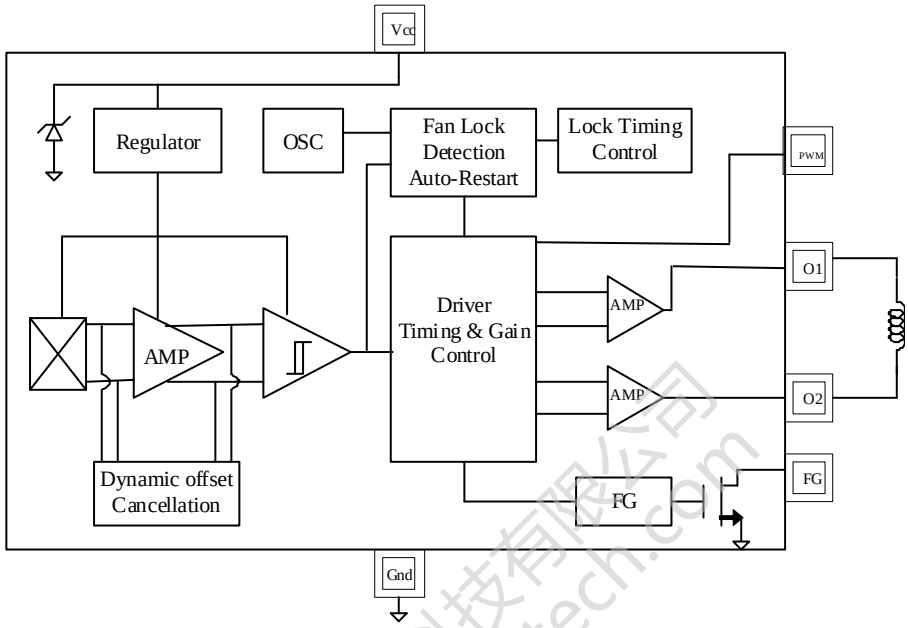


Fig. 4 Hall IC Architecture

PWM speed control

This PWM speed control make the lock protection off, when the PWM input keeps low level for more than 66.5mS. The lock protect function does not work if PWM input frequency is slower than 15Hz, please input faster frequency more than 20Hz.

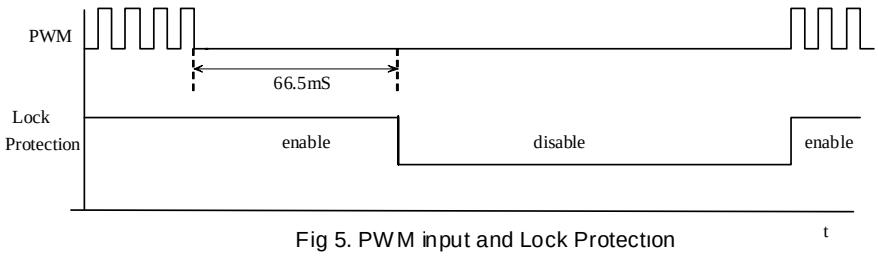
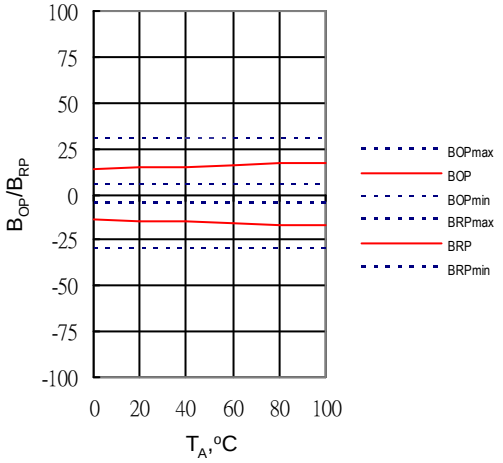
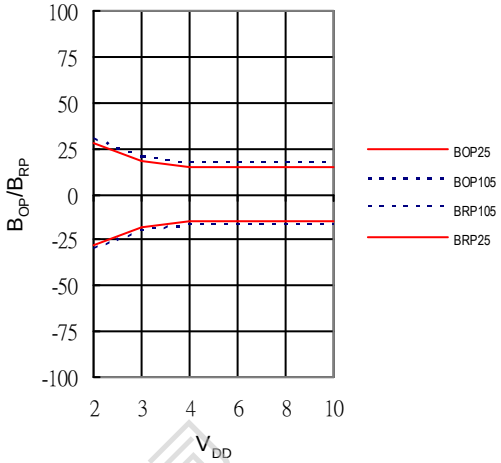


Fig 5. PWM input and Lock Protection

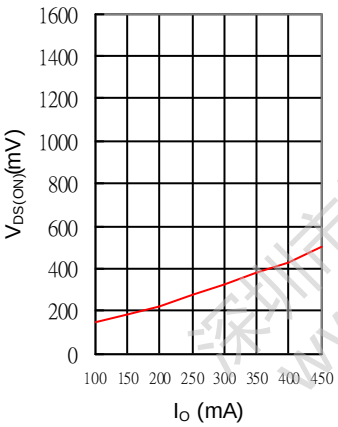
B_{OP}, B_{RP} versus temperature



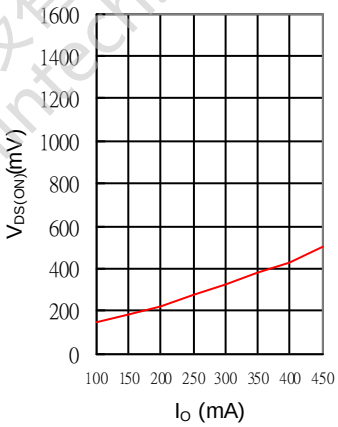
B_{OP}, B_{RP} versus supply voltage



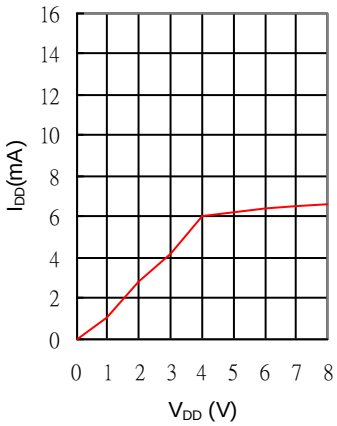
VOL(ON) versus I_O current



VOH(ON) versus I_O current

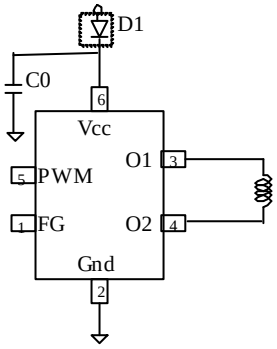


IDD versus power supply



Application circuits

5V application



C0: decoupling capacitor 1nF ~ 0.01uF

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