ASIC IC INTRODUCTION

Agenda

1. Introduction to iT1300E/iT8300T
2. Introduction to iT8320/iT8321
3. Introduction to iT8310/iT8311
4. Introduction to iT8330
5. Emulator connection and iNGUI software operation
6. Hall sensor placement position

1. iT1300E/iT8300T 介紹

1.iT1300E/iT8300T introduction

Digital Single Phase BLDC Motor Controller

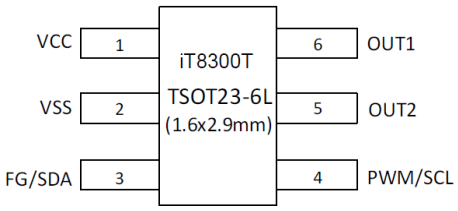
Features

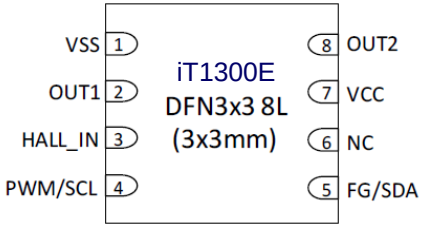
- Direct PWM control
- Embedded Hall Sensor
- Wide Range 3.5V to 16V Operating Input
- Integrated Power MOSFETs
- Programmable Speed Curve
- Adjustable Lead Angle ± 90°
- Adjustable Lockout Detection and Automatic Recovery
- Adjustable Silence Current Control
- Selectable FG/Alarm/RD Signal Output
- 1KHz~100KHz PWM Input Frequency Range
- 25K/50KHz Output Switching Frequency
- Cycle by Cycle Current Limit
- Selectable Open Loop and Close Loop
- Adjustable Input Duty and Output Duty Slope
- Soft Start and Kick Start
- TSD, OCP, OVP, UVP, and Automatic Recovery

Applications

- Cooling Fan

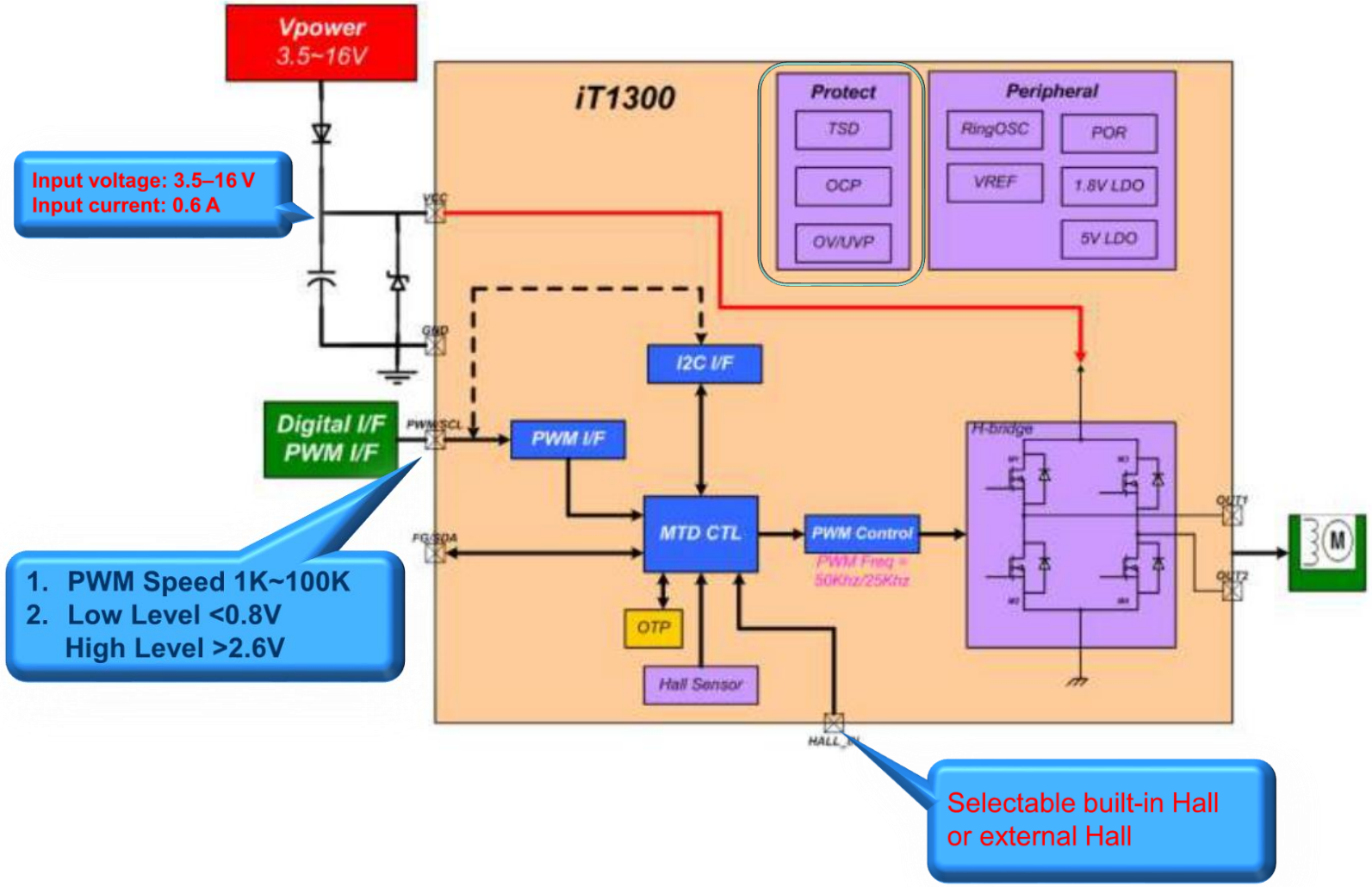
Pin Assignment





1.iT1300E/iT8300T introduction

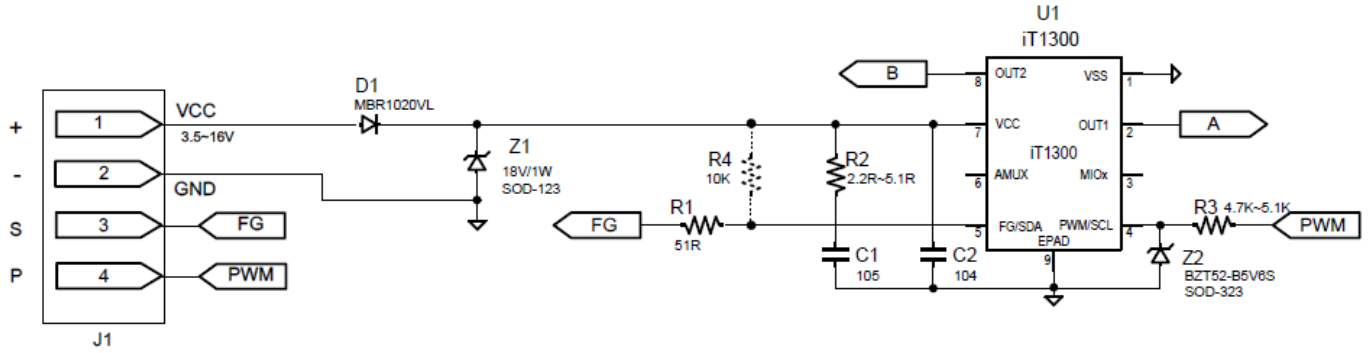
-- iT1300E Block Diagram



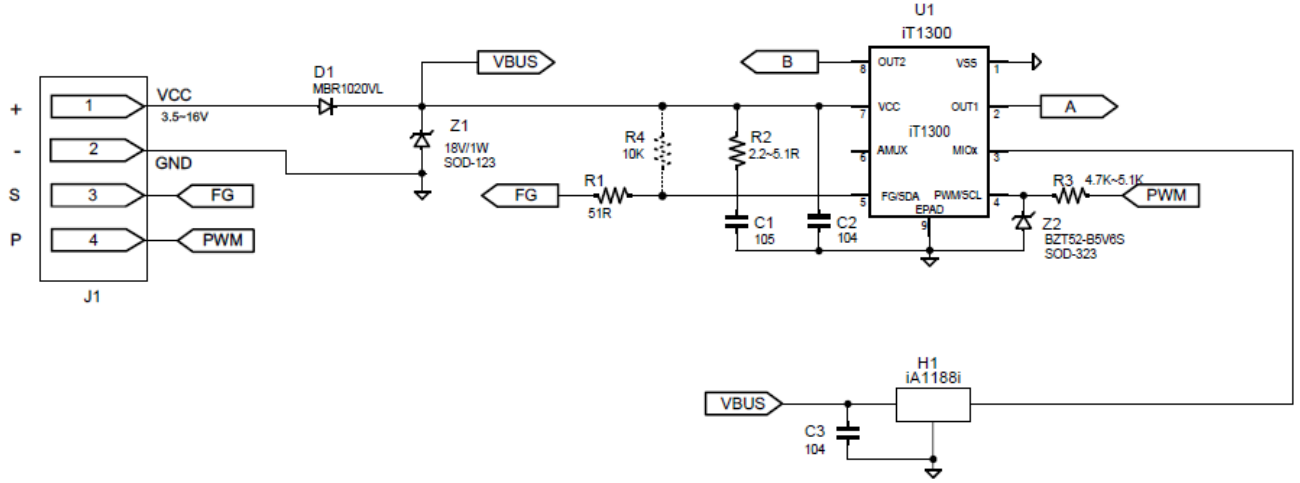
1. iT1300E/iT8300T introduction

-- iT1300E Application Scheme

<Typical>

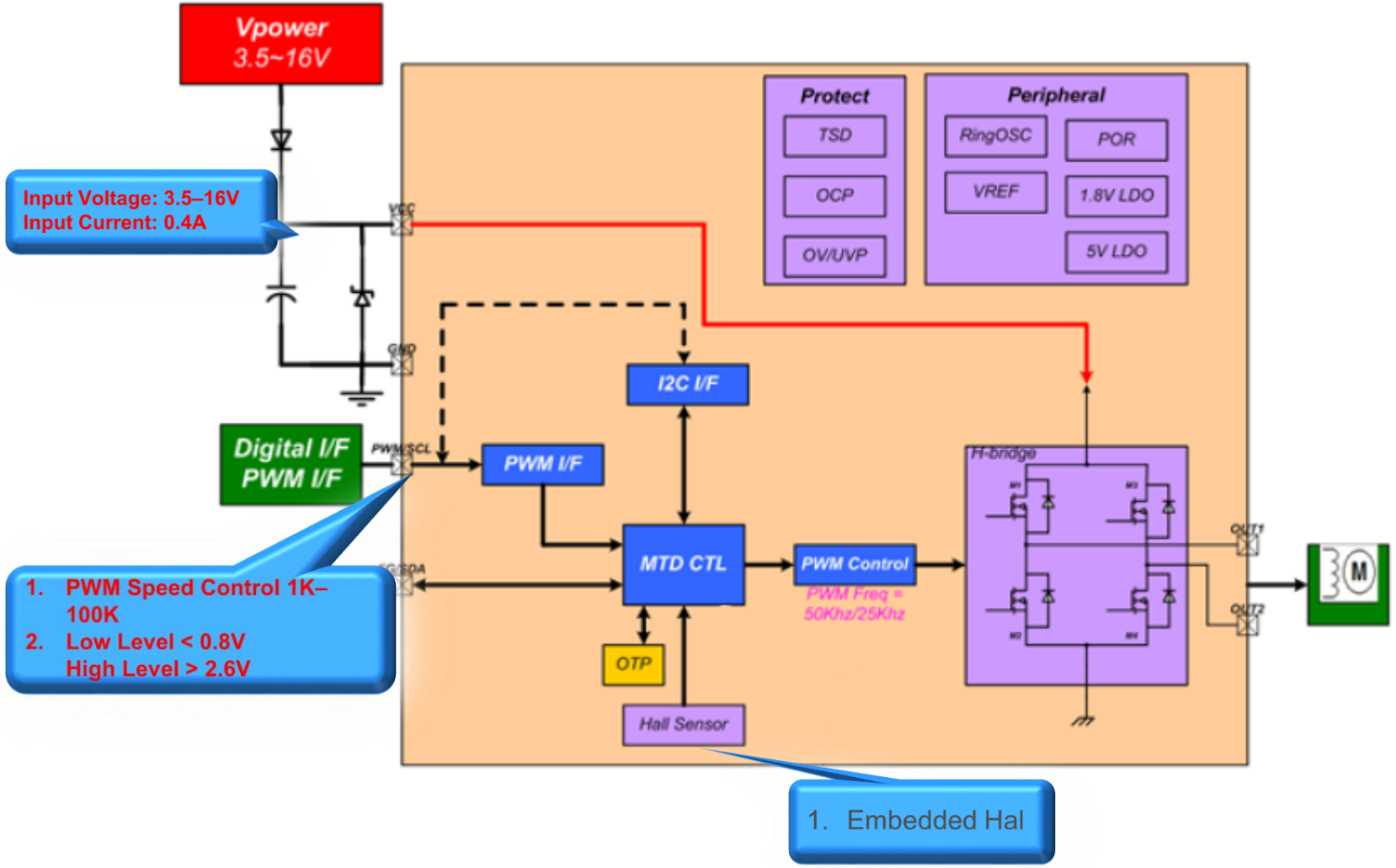


<To use external hall IC>



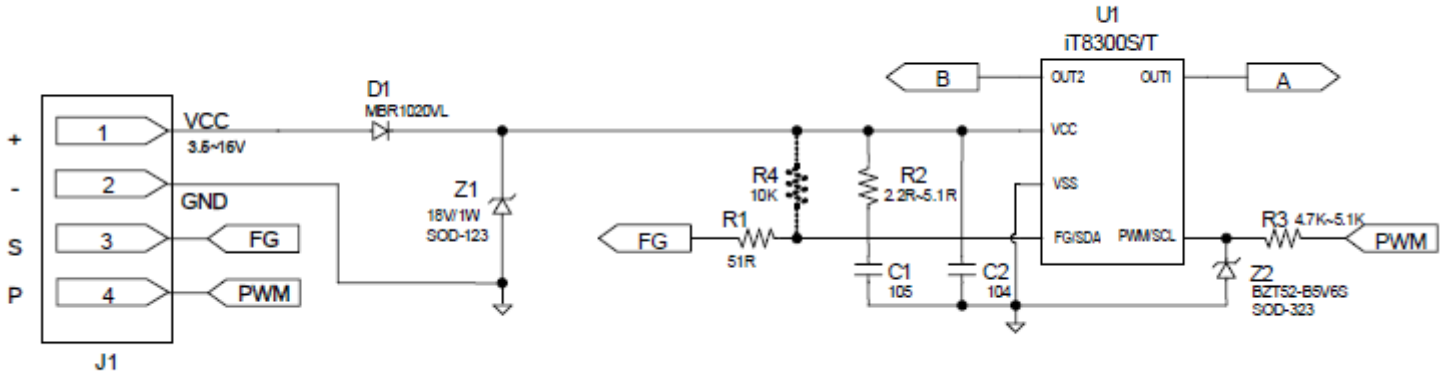
1.iT1300E/iT8300T introduction

-- *iT8300T Block Diagram*



1. iT1300E/iT8300T introduction

-- iT8300T Application Scheme



2. iT8320E / iT8321E Introduction

2. iT8320E / iT8321E introduction

Digital Single Phase BLDC Motor Controller

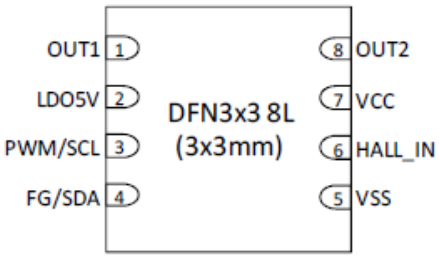
Features

- Direct PWM control
- Supports Hall IC(iT8320E)
- Wide Range 3.5V to 16V Operating Input
- Integrated Power MOSFETs
- Programmable Multi Points Speed Curve
- Adjustable Lead Angle ± 45°
- Adjustable Lockout Detection and Automatic Recovery
- Adjustable Silence Current Control
- Selectable FG/Alarm/RD Signal Output
- 1KHz~100KHz PWM Input Frequency Range
- 25K/50KHz Output Switching Frequency
- Cycle by Cycle Current Limit
- Selectable Open Loop and Close Loop
- Adjustable Input Duty and Output Duty Slope
- Soft Start and Kick Start
- TSD, OCP, OVP and Automatic Recovery

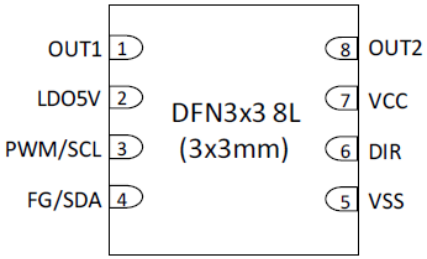
Applications

Cooling Fan

Pin Assignment



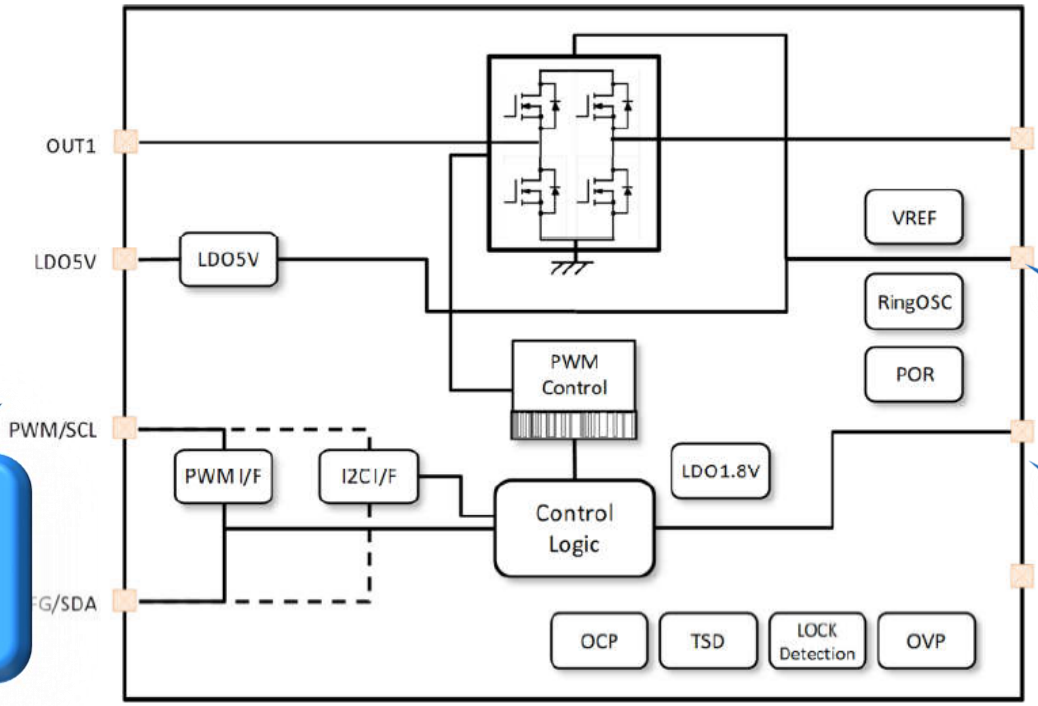
iT8320E



iT8321E

2. iT8320E / iT8321E introduction

-- *iT8320E Block Diagram*



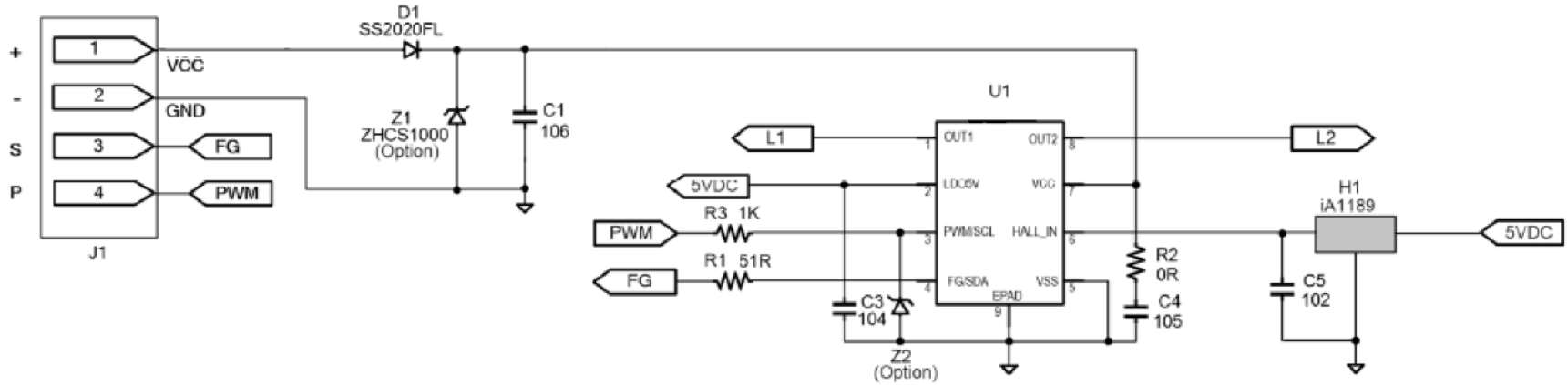
1. PWM Speed Control 1K–100K
2. Low Level < 0.8VHigh Level > 2.6V

Input Voltage: 3.5–16V
Input Current: 0.8A

3. External Hall

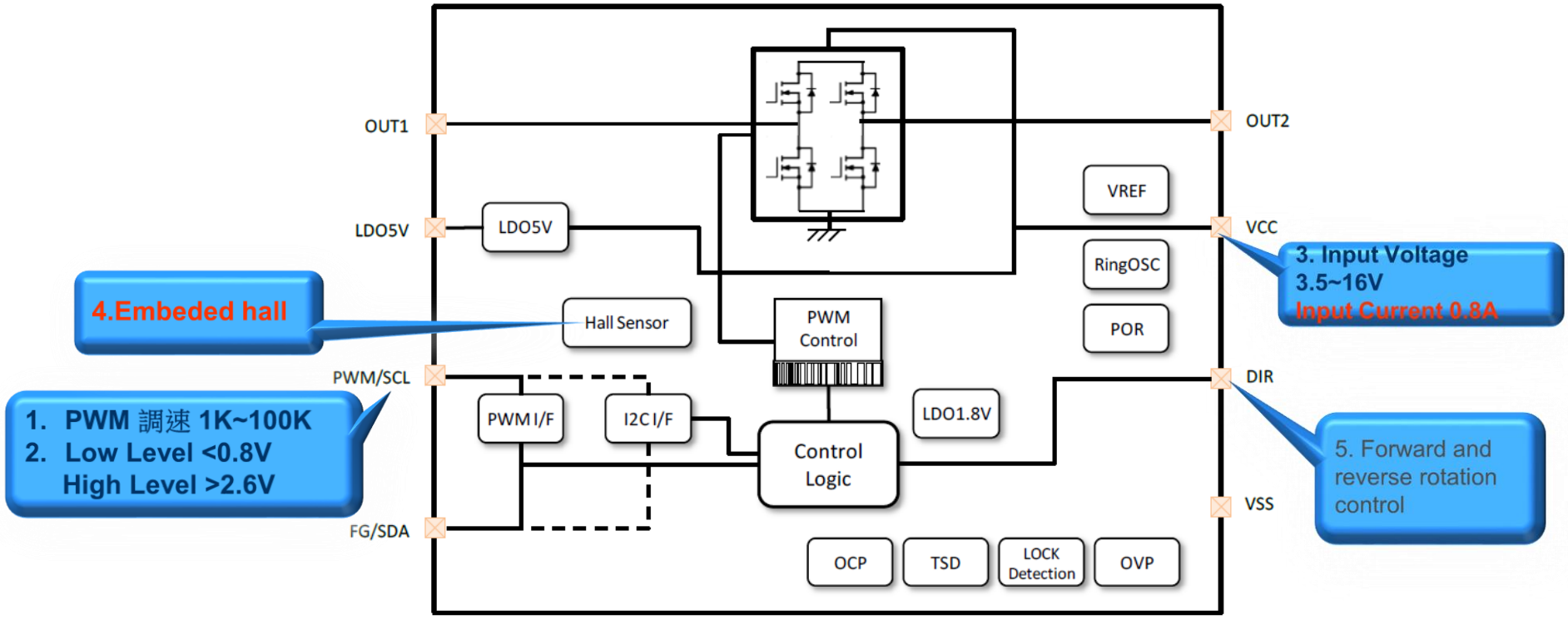
2. iT8320E / iT8321E introduction

-- iT8320E Application Scheme



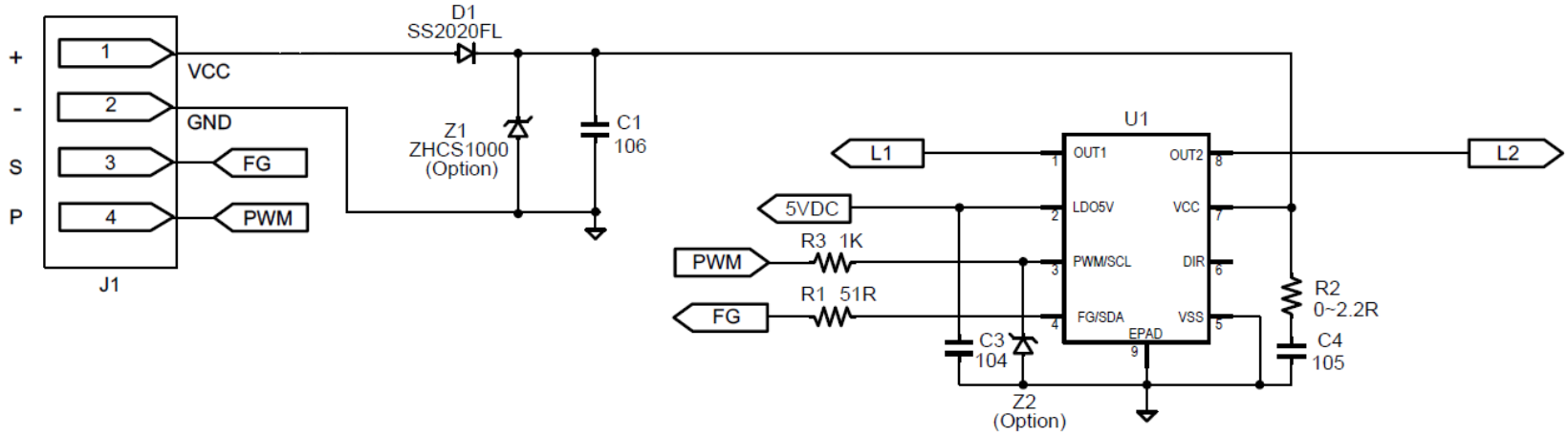
2. iT8320E / iT8321E introduction

-- *iT8321E Block Diagram*



2. iT8320E / iT8321E introduction

-- iT8321E Application Scheme



3. iT8310/iT8311 Introduction

3. iT8310/iT8311 introduction

Digital Single Phase BLDC Motor Controller

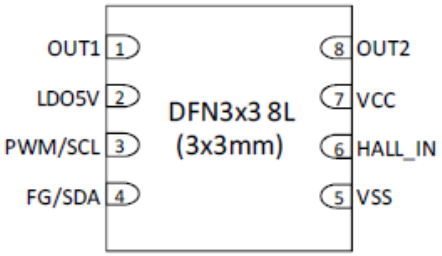
Features

- Direct PWM control
- Supports Hall IC(iT8311E)
- Wide Range 3.5V to 16V Operating Input
- Integrated Power MOSFETs
- Programmable Multi Points Speed Curve
- Adjustable Lead Angle ± 45∘
- Adjustable Lockout Detection and Automatic Recovery
- Adjustable Silence Current Control
- Selectable FG/Alarm/RD Signal Output
- 1KHz~100KHz PWM Input Frequency Range
- 25K/50KHz Output Switching Frequency
- Cycle by Cycle Current Limit
- Selectable Open Loop and Close Loop
- Adjustable Input Duty and Output Duty Slope
- Soft Start and Kick Start
- TSD, OCP, OVP and Automatic Recovery

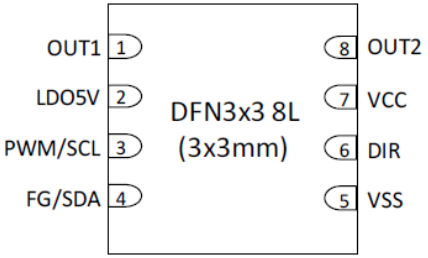
Applications

- Cooling Fan

Pin Assignment



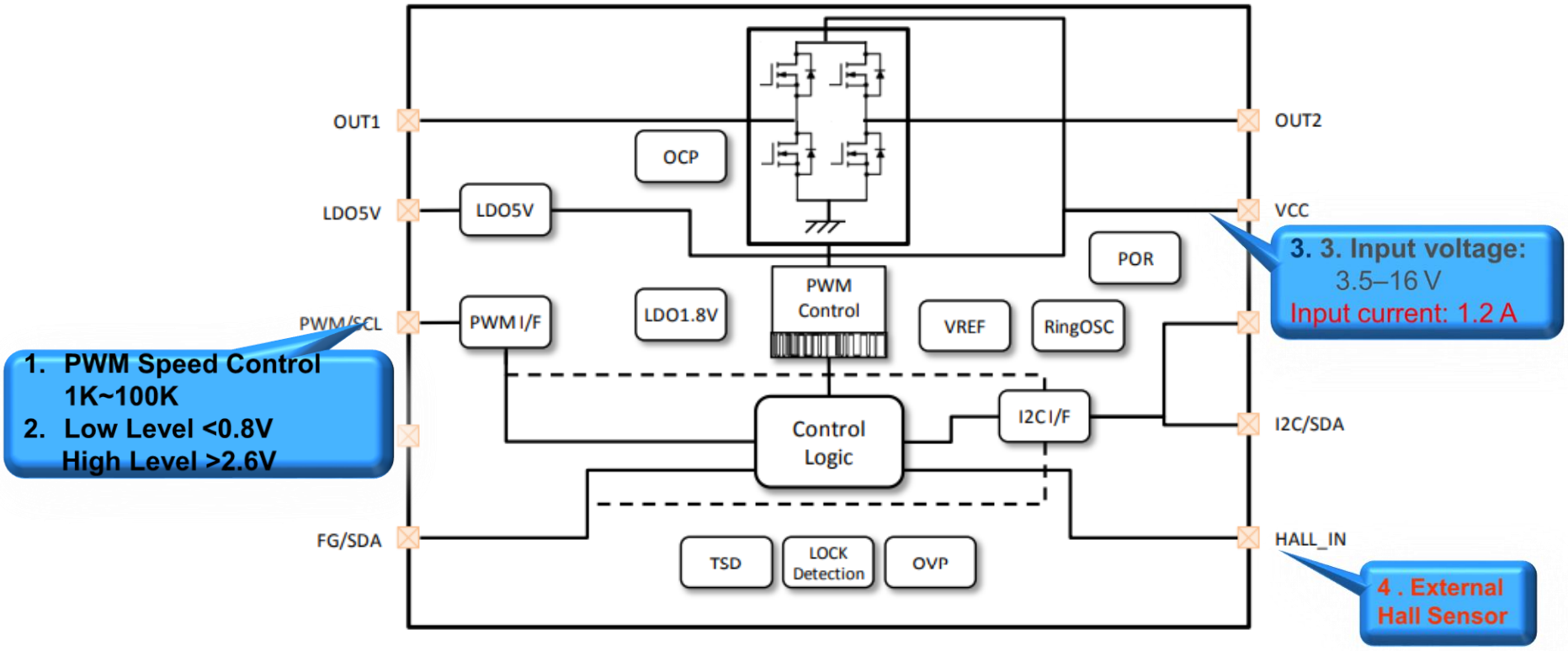
iT8310E



iT8311E

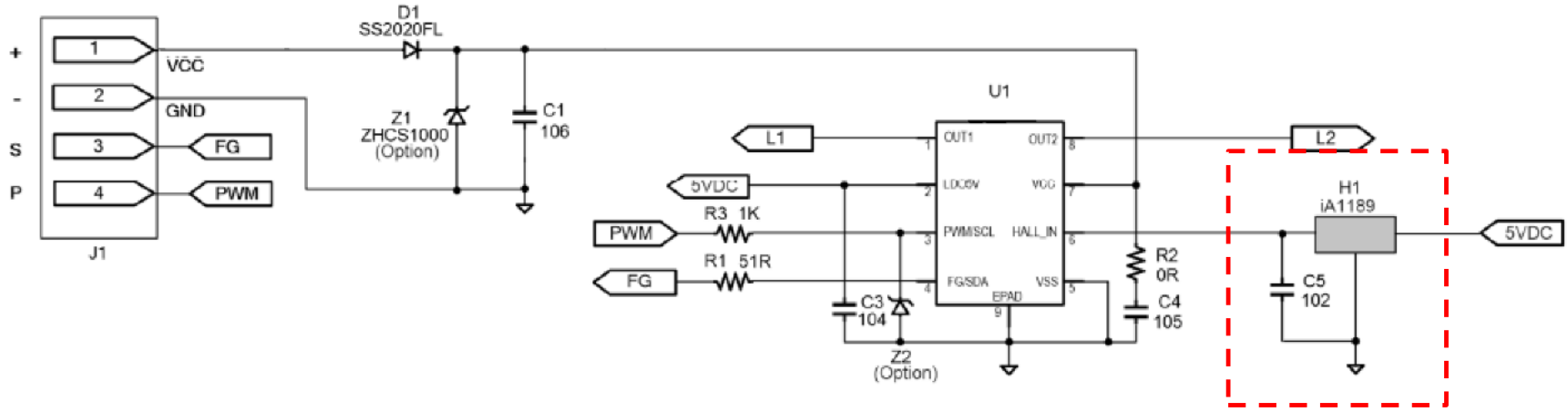
3. iT8310/iT8311 introduction

-- iT8310E Block Diagram



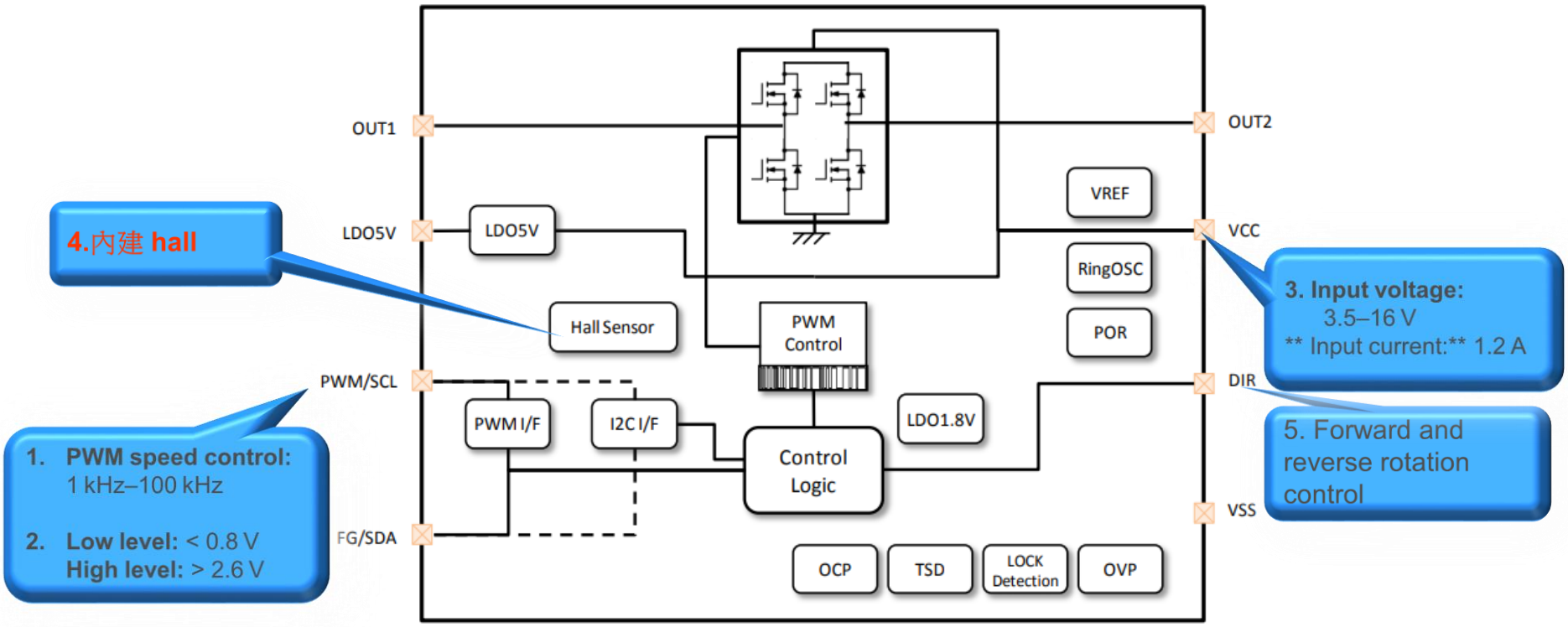
3. iT8310/iT8311 introduction

-- iT8310E Application Scheme



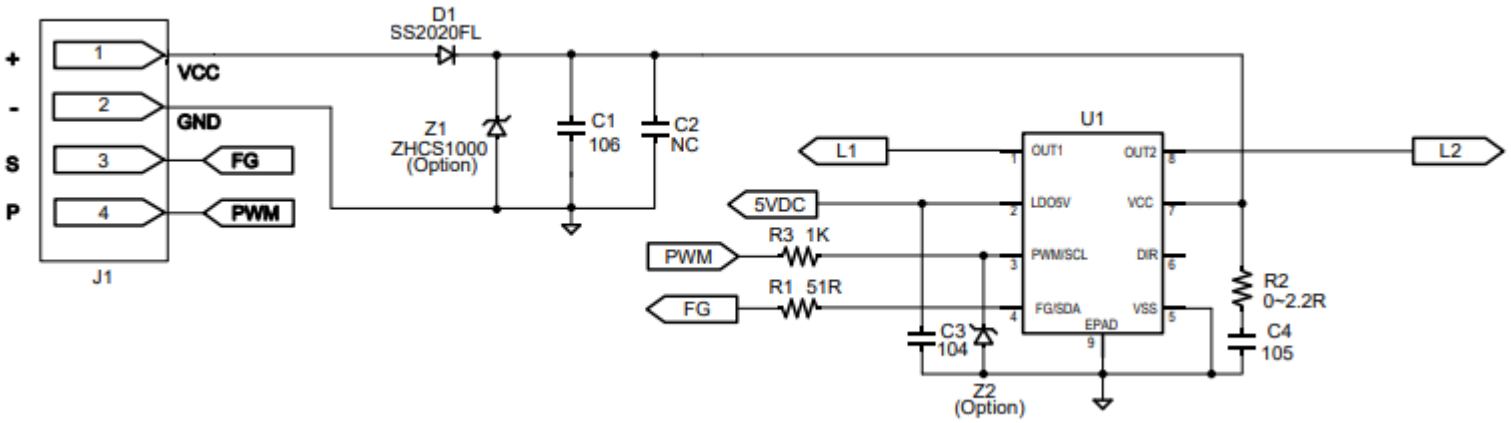
3. iT8310/iT8311 introduction

-- iT8311E Block Diagram



3. iT8310/iT8311 introduction

-- iT8311E Application Scheme



4. iT8330 Introduction

4. iT8330E introduction

Digital Single Phase BLDC Motor Controller

Features

- Direct PWM control
- DC **VSP control 0.2V~3.3V**
- Supports Hall IC (DFN8)
- Wide Range **3.0V to 28V** Operating Input
- Integrated Power MOSFETs
- Programmable Multi Points Speed Curve
- Adjustable Lead Angle ± 45◦
- Selectable Lockout Detection Time and Automatic Recovery Time
- Adjustable Silence Current Control
- Selectable FG/Alarm/RD Signal Output
- 1KHz~100KHz PWM Input Frequency Range
- 25K/50KHz Output Switching Frequency
- Cycle by Cycle Current Limit
- Selectable Open Loop and Close Loop
- Adjustable Input Duty and Output Duty Slope
- Soft Start and Kick Start
- Low Voltage Kick Duty Compensation
- TSD, OCP, OVP and Automatic Recovery

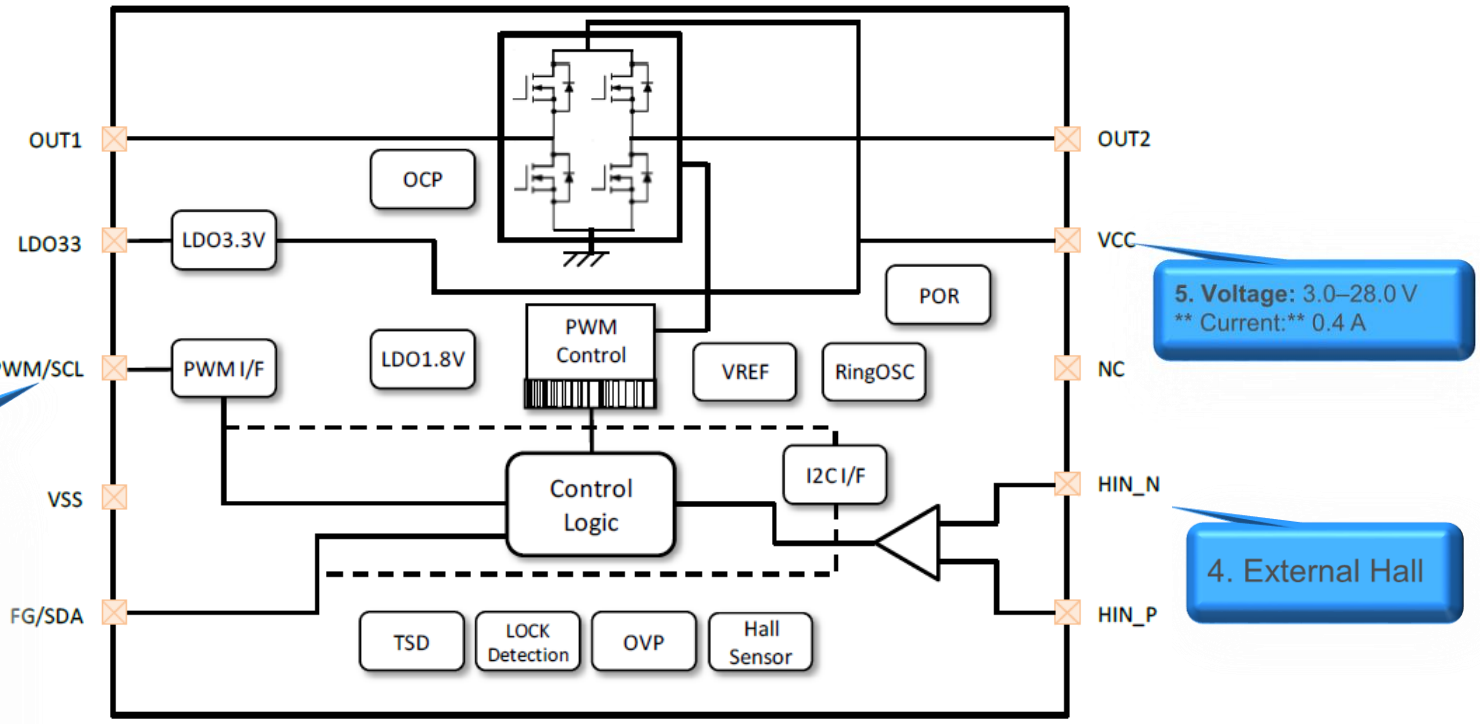
Pin Assignment

Applications

Cooling Fan

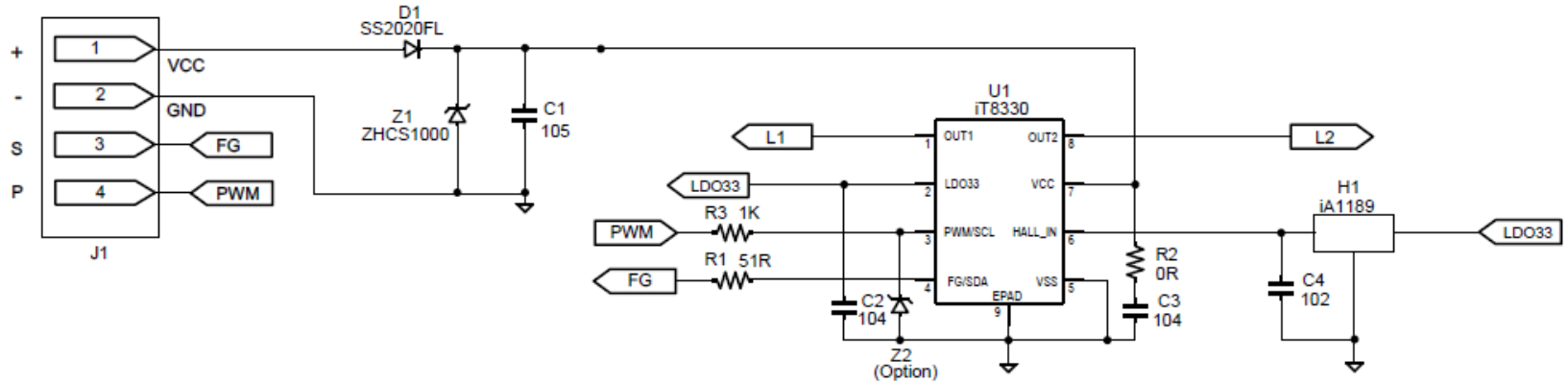
4. iT8330E introduction

-- *iT8330E Block Diagram*



4. iT8330E introduction

-- iT8330E Application Scheme



Performance Comparison Matrix

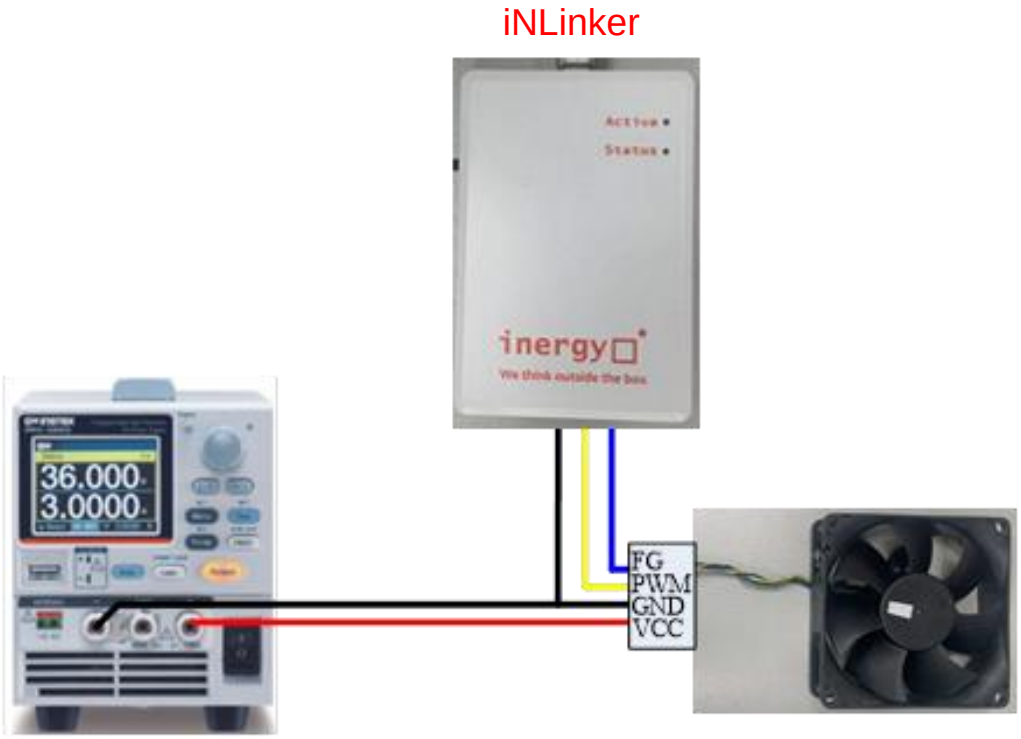
Part No.	iT1300E	iT8310E	iT8311E	iT8320E	iT8321E	iT8300T	iT8330E
Package	DFN8 3x3	DFN8 3x3	DFN8 3x3	DFN8 3x3	DFN8 3x3	TSOT23-6	DFN8 3x3
Hall sensor	Embedded	Hall IC	Embedded	Hall IC	Embedded	Embedded	Hall IC/Element
Input Voltage (V)	3.5-16	3.5-16	3.5-16	3.5-16	3.5-16	3.5-16	3- 24
Max. Voltage (V)	20	22	22	22	22	20	35
Driving MOS	N+N	N+N	N+N	N+N	N+N	N+N	N+N
Tuning I/F	I2C	I2C	I2C	I2C	I2C	I2C	I2C
Motor	Single	Single	Single	Single	Single	Single	Single
Continuous Current (A)	0.6	1.2	1.2	0.8	0.8	0.4	0.6A@12V
Speed Command	Direct PWM	Direct PWM	Direct PWM	Direct PWM	Direct PWM	Direct PWM	Direct PWM VSP
Speed Control	Close loop Open loop	Close loop Open loop	Close loop Open loop	Close loop Open loop	Close loop Open loop	Close loop Open loop	Close loop Open loop (feedback)
Speed Curve Fitting	X	3 points	3 points	3 points	3 points	X	3 points
PWM ON /OFF Duty	O	O	O	O	O	O	O
PWM Pull UP/DOWN	O	O	O	O	O	O	O
Soft start	Current limit	Current limit PWM step	Current limit PWM step	Current limit PWM step	Current limit PWM step	Current limit	Current limit KP, KI PWM step
Kick Start	6.25%~100%	6.25%~100%	6.25%~100%	6.25%~100%	6.25%~100%	6.25%~100%	6.25%~100%
Phase Angle	Fixed/Linear	Fixed/Linear	Fixed/Linear	Fixed/Linear	Fixed/Linear	Fixed/Linear	Fixed/Linear
Cycle by Cycle current limit	O	O	O	O	O	O	O
Waveform Adjustment	O	O	O	O	O	O	O
FG output	8 kinds	8 kinds	8 kinds	8 kinds	8 kinds	8 kinds	8 kinds
Over Voltage Protection	O	O	O	O	O	O	O
Over Current Protection	O	O	O	O	O	O	O
Thermal Shutdown Protection	O	O	O	O	O	O	O
Lock Detection	0.25s/0.5s	0.25s/0.5s	0.25s/0.5s	0.25s/0.5s	0.25s/0.5s	0.25s/0.5s	0.25s/0.5s
Lock Restart	2.5/5/7.5/10sec	2.5/5/7.5/10sec	2.5/5/7.5/10sec	2.5/5/7.5/10sec	2.5/5/7.5/10sec	2.5/5/7.5/10sec	2.5/5/7.5/10sec
OTP	2 banks	2 banks	2 banks	2 banks	2 banks	2 banks	2 banks

5. Emulator connection and iNGUI software operation

5. Emulator connection and iNGUI software operation

5-1. iNLinker Tuning Mode:

Applicable when the ASIC IC has not been programmed. You can use iNLinker alone for tuning. The DC power can be supplied directly to the motor, without any voltage drop in the circuit.



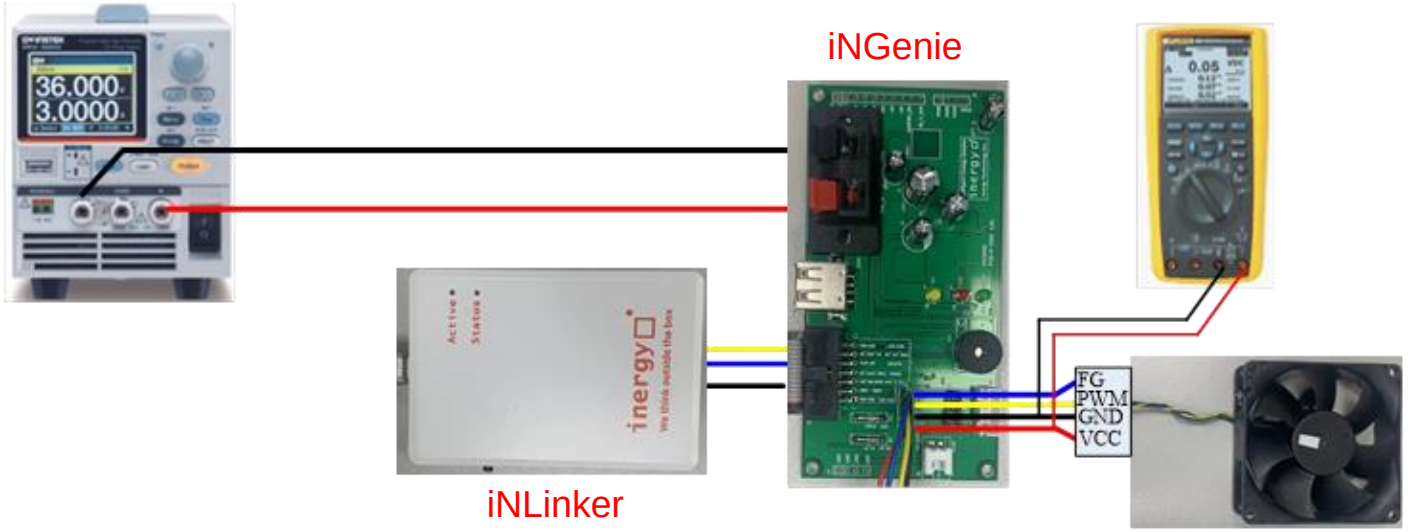
Note: During programming, the input voltage must be manually set to 7.5 V before proceeding.

5. Emulator connection and iNGUI software operation

5-2. iNLinker + iNGenie Tuning Mode:

Connect the DC source to the iNGenie input. Since iNGenie has a built-in production-line programming

control circuit, this circuit includes a MOSFET switch and a reverse-protection diode, which cause a voltage drop. When tuning, it is recommended to connect a multimeter to the motor input lines and manually fine-tune the input voltage under various loads to compensate for the voltage drop in the circuit, preventing differences in motor speed.



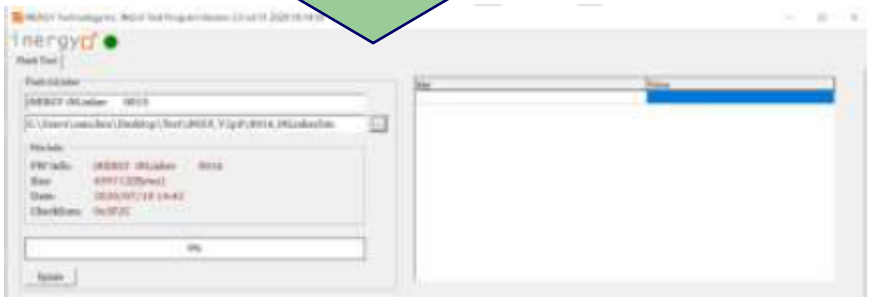
5. Emulator connection and iNGUI software operation

5.3-1 Launching the iNGUI Simulation Software: After unzipping, open **“iNGUI.exe”** to enter the simulator.

XML	2023/2/24 上午 11:36	檔案資料夾	
B00D.bin	2023/2/24 上午 11:36	BIN 檔案	488 KB
iNERGY.ini	2023/2/24 上午 11:37	組態設定	13 KB
iNGUI.exe	2023/2/24 上午 11:36	應用程式	2,858 KB

5.3-2 iNLinker Firmware Update:
After running **iNGUI.exe**, it will automatically check the iNLinker firmware. If the firmware is outdated, an update screen will appear. Please perform the update to ensure normal usage.

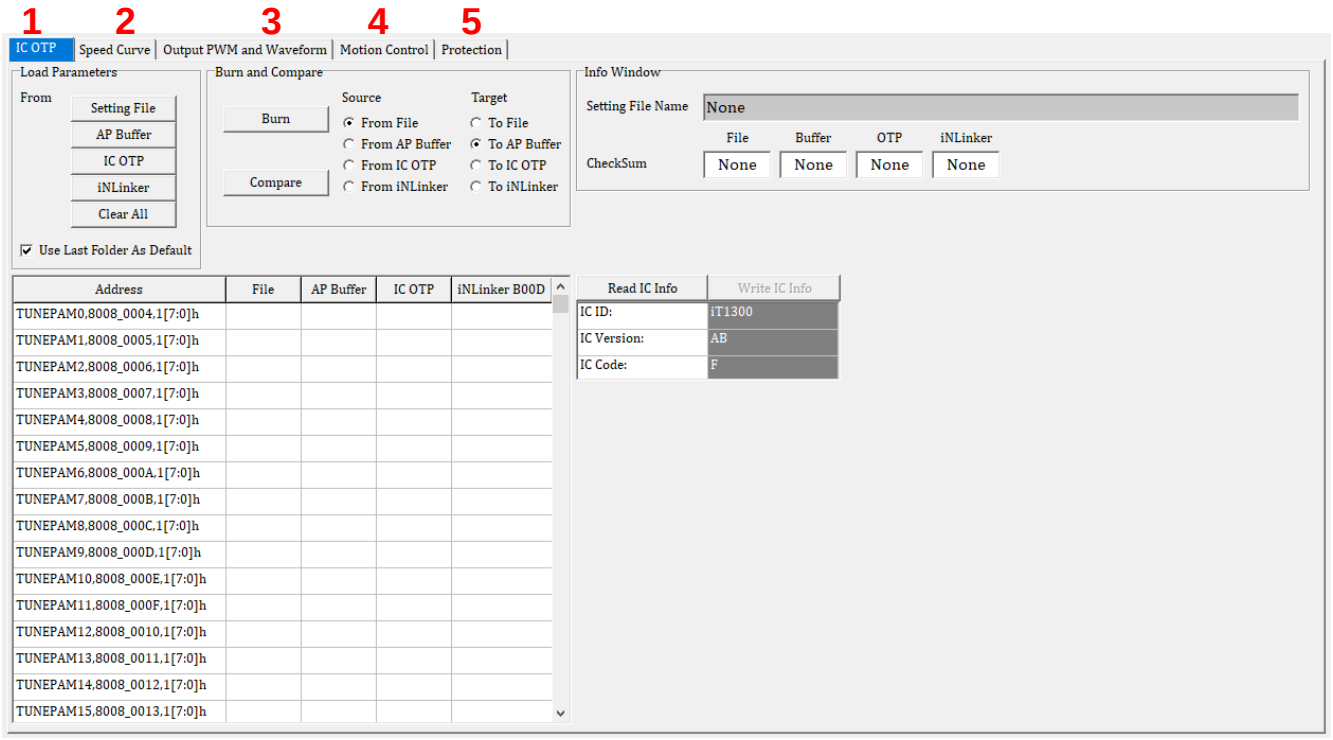
System prompt: iNLinker firmware is outdated.



Perform iNLinker firmware update.

5. Emulator connection and iNGUI software operation

5.3-3 Introduction to iNGUI Software



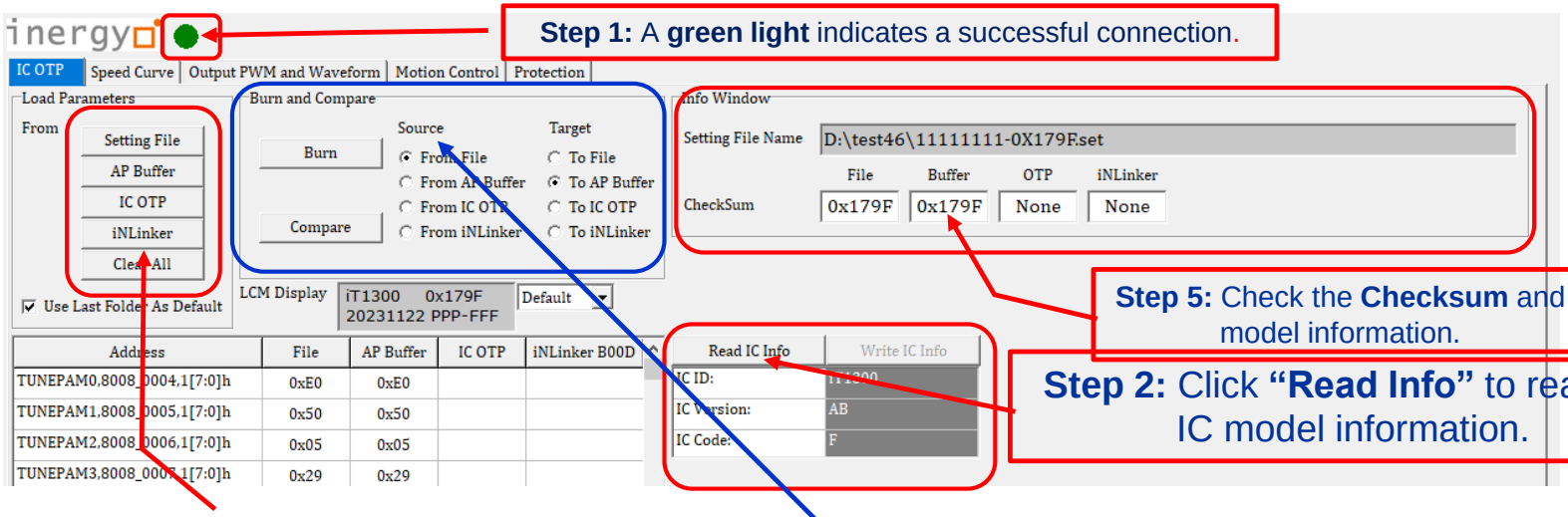
iNGUI is divided into 5 main pages, as follows:

- File Information
- Speed Curve Settings
- Output Waveform Settings
- Settings for Advance Angle, Rotation Direction, Startup, Simulation, etc.
- Protection Settings

5. Emulator connection and iNGUI software operation

5.3-4 Introduction to iNGUI Software — Page 1: File Information

When iNLinker and iNGUI are properly connected, the software will show a **green light**. If iNLinker is not connected, it will show a **red light**.



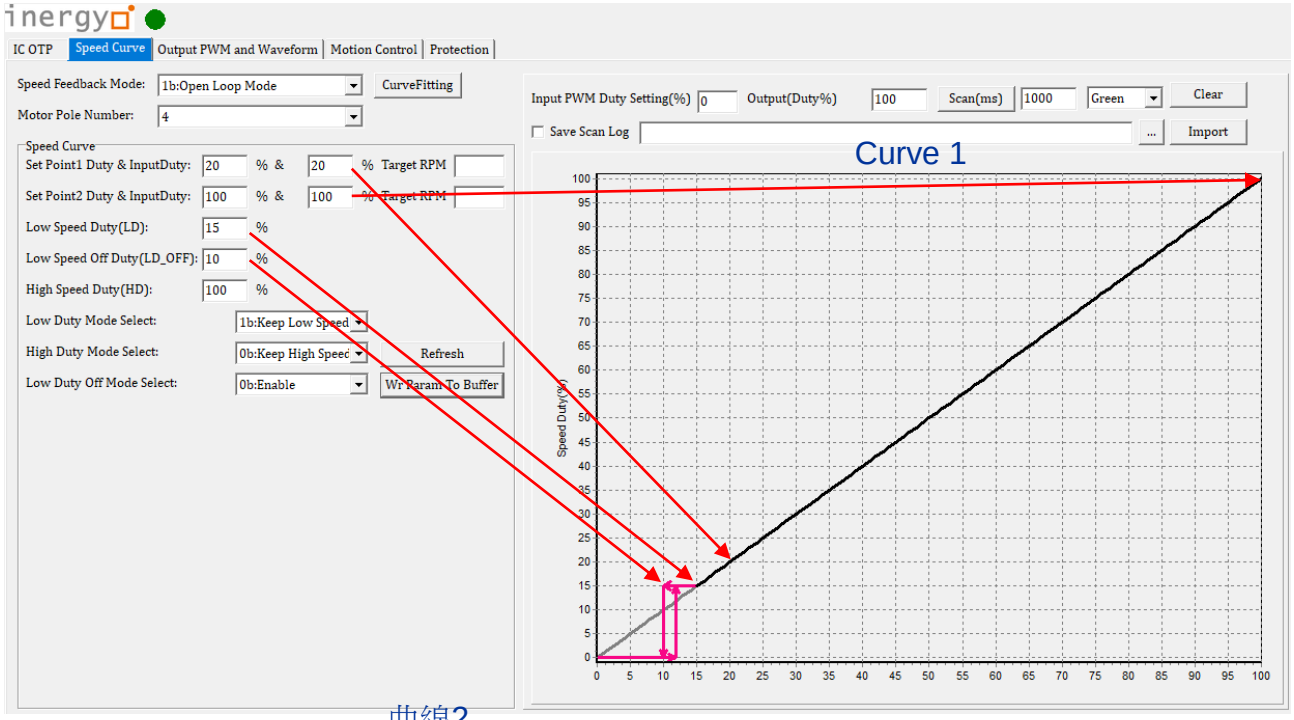
Step3: Load Parameters
From:
1. Setting file
2.AP Buffer
3.IC OTP
4.iNLinker
5.Clear All

Step4: Burn and Compare

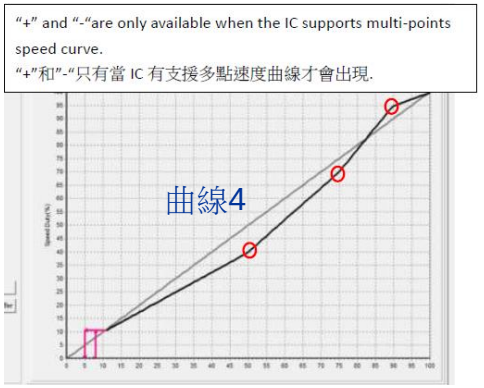
Source:	Target:
From file	To File
From AP Buffer	To AP Buffer
From IC OTP	TO IC OTP
From iNLinker	To iNLinker

5. Emulator connection and iNGUI software operation

5.3-5 Introduction to iNGUI Software — Page 2: Speed Curve



1iT1300 & iT8300 support a 2-point slope curve.iT832x & iT831x support a 2-point slope curve and allow adding 3 additional breakpoints to the curve.



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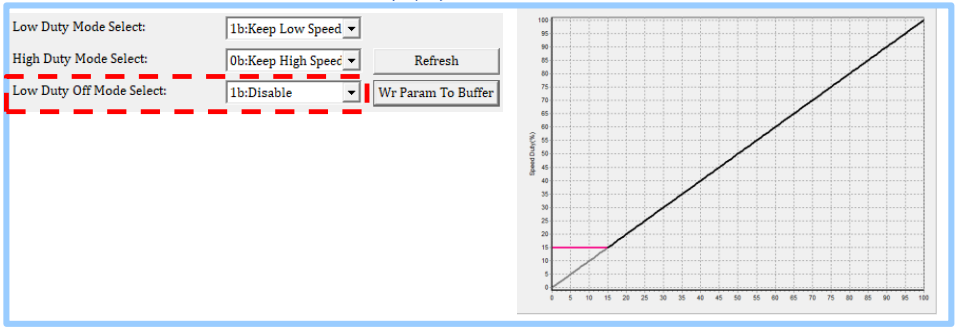
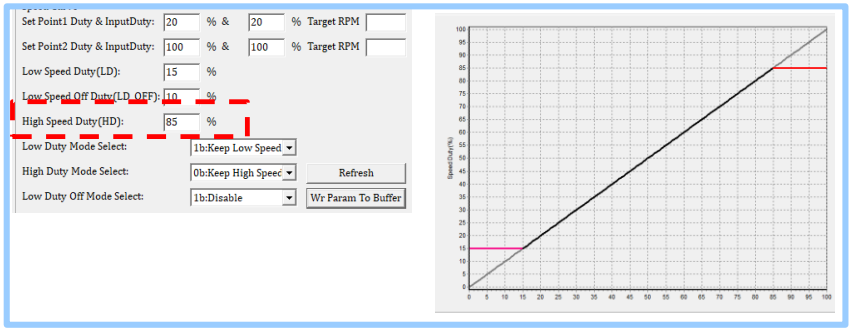
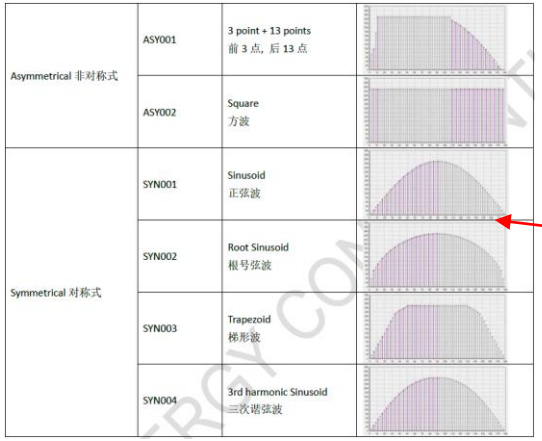


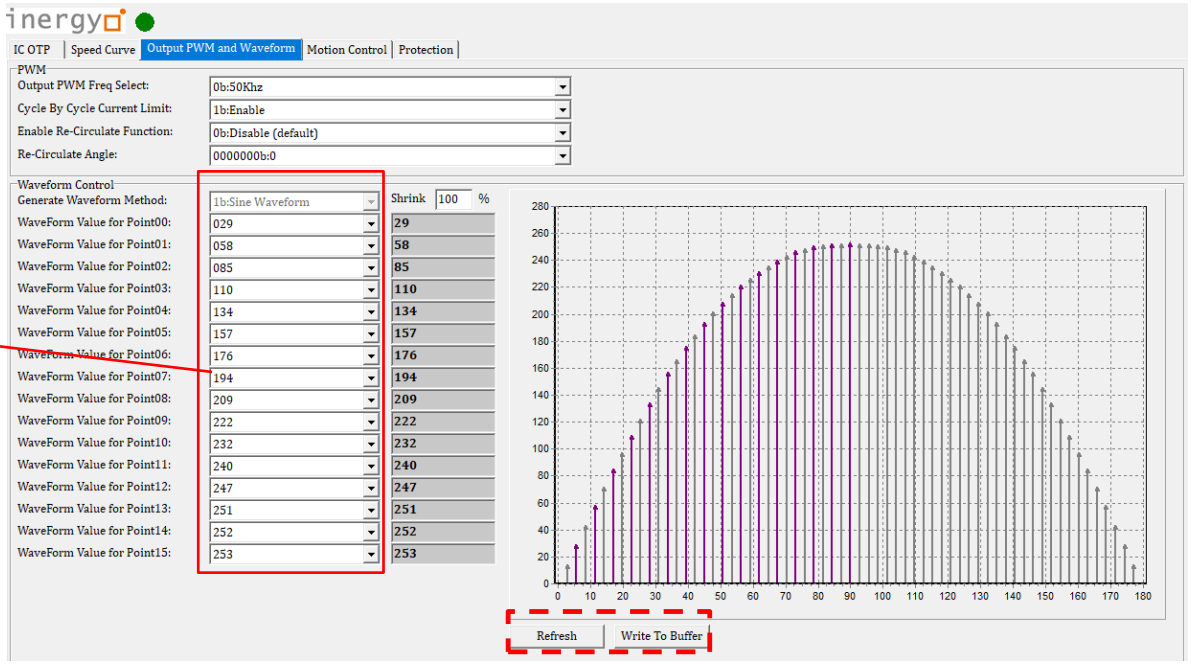
曲線3



5. Emulator connection and iNGUI software operation

5.3-6 Introduction to iNGUI Software — Page 3: Waveform Settings

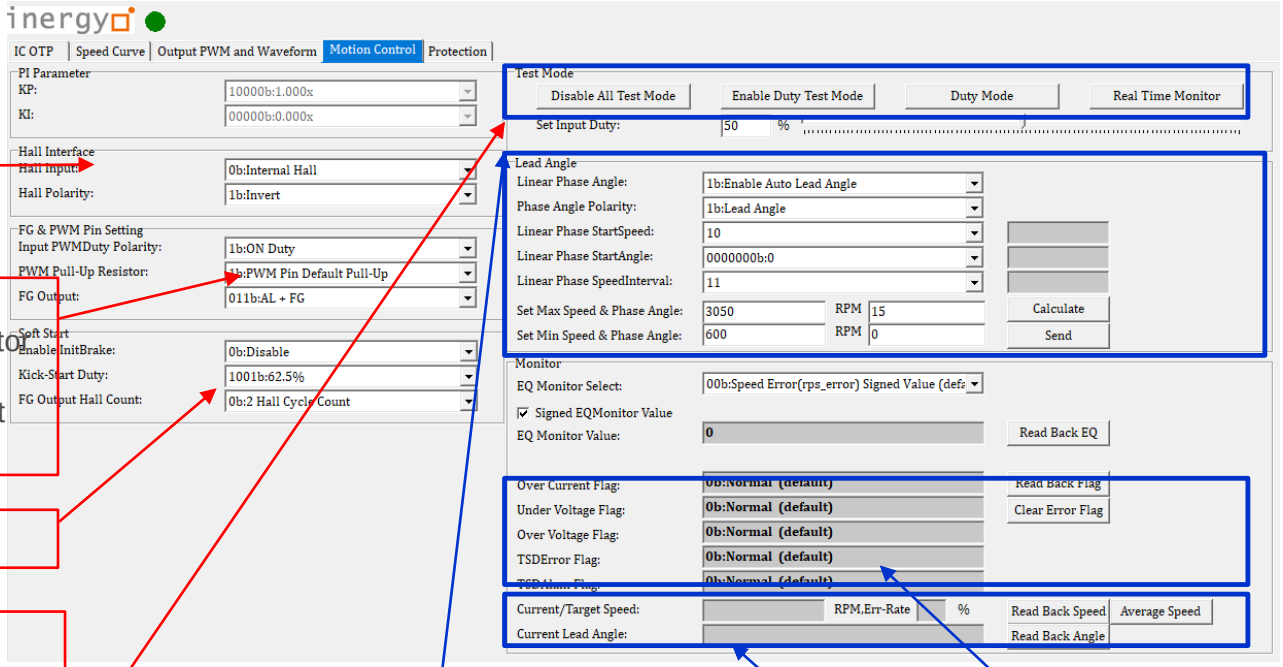




Right-click inside the red box to display six built-in waveform parameters. After confirming, click **“Write To Buffer”** to download them to the simulator.

5. Emulator connection and iNGUI software operation

5.3-7 iNGUI 軟件介紹 ----第四頁 轉向,FG訊號,進角調整和線上實測模式.



1-1. Built-in Hall or External Hall option
1-2. Polarity option

2-1. PWM pull-up resistor 20 kΩ and pull-down resistor 800 kΩ options
2-2. FG has 8 signal output options

3. Kick Start duty setting

4. Advance angle adjustment: Currently, the IC only supports forward angle adjustments from 0 upwards.

5. Real-time simulation control

6. Speed reading

7. Protection flag reading

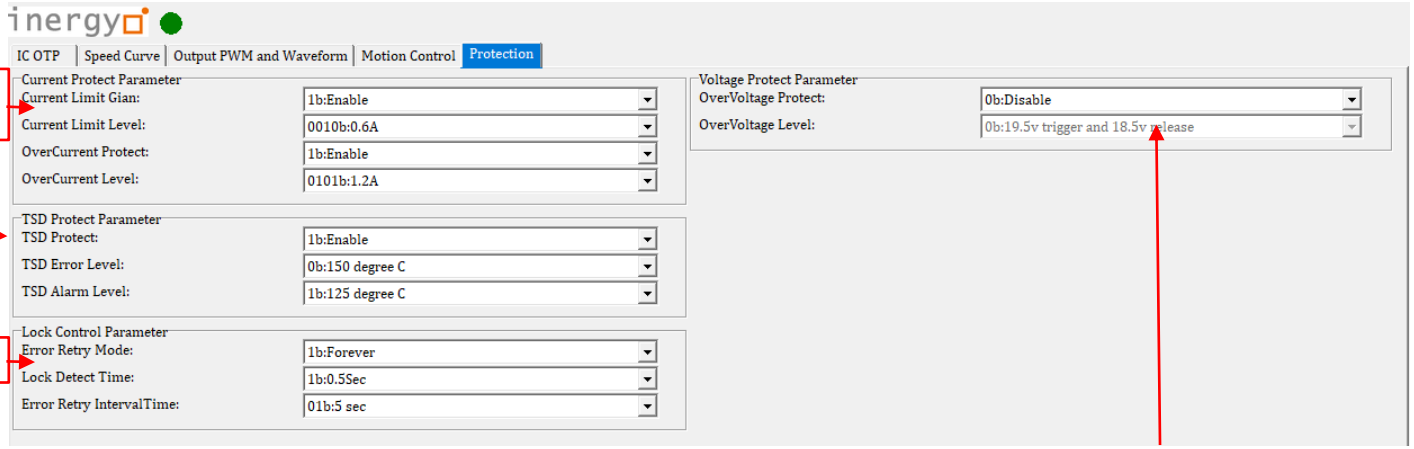
5. Emulator connection and iNGUI software operation

5.3-8 Introduction to iNGUI Software — Page 5: Protection Settings

1. Overcurrent protection setting.

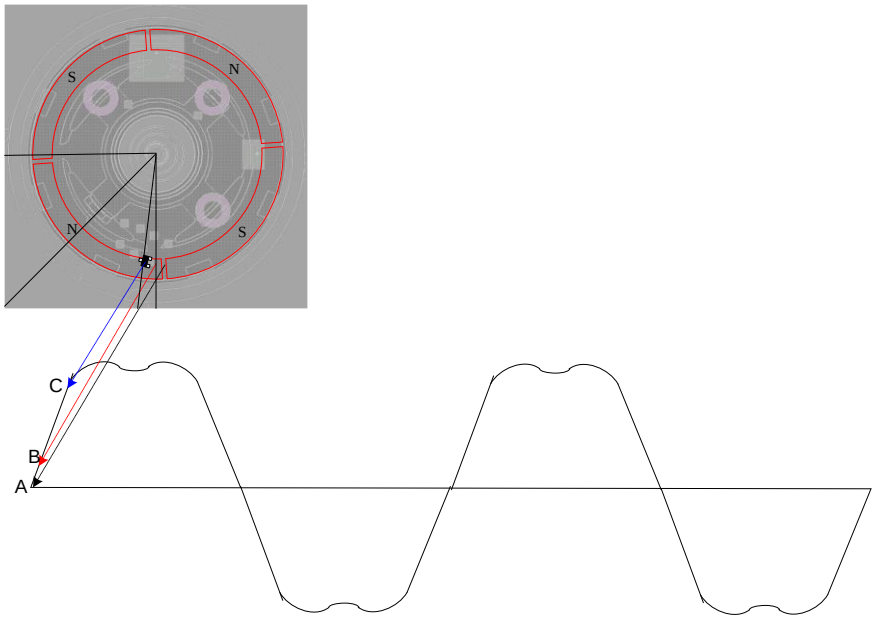
2. Overtemperature protection setting

3. Lock protection setting



4. Overvoltage protection setting

6. Hall sensor placement position



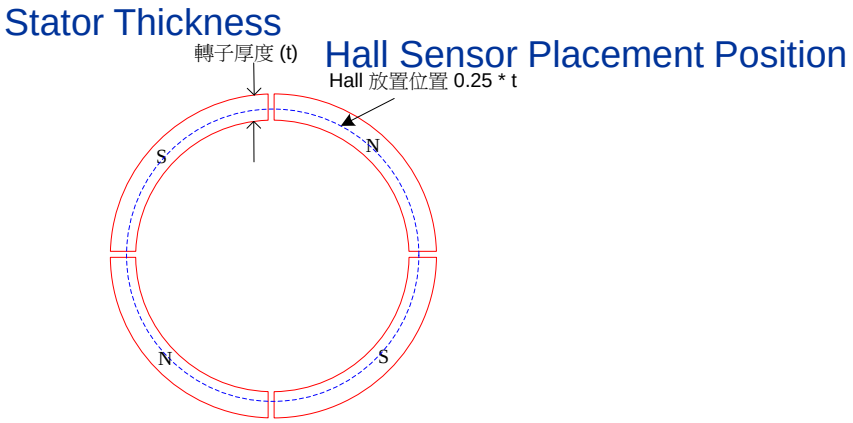
Hall Sensor Placement: Explained by magnetic field strength. In the diagram, points A, B, and C are shown.

At **point A**, the sensed magnetic field is near the null point, where the field is almost zero, which can easily cause poor detection.

At **point B**, the sensed field is relatively better.

The **optimal placement is point C**, where the magnetic field is at a relatively high level, ensuring the Hall sensor can reliably detect and trigger commutation.

6. Hall sensor placement position



To ensure that the Hall sensor detects the magnetic field from the magnet, it is recommended to place the Hall sensing point **under the rotor**. This ensures a stable magnetic field for reliable detection.

●If placed near the outer edge of the silicon steel sheets, the Hall sensor may be influenced by the stator's magnetic field, causing large variations in current.

●It is recommended to place the Hall sensor at approximately **0.25 × rotor thickness** (blue circle in the diagram). At this position, the magnetic field is stable and less affected by the stator field.

Q & A.

Thank You.