Digital Single Phase BLDC All in one Motor Controller

1. Description

The iT8330S is a single phase, brushless DC motor controller. It is composed of MOSFET, gate driver and control logic which can provide minimal components of total BOM to save total cost.

The iT8330S provides various parameters to tune motor efficiently and quickly, ex: poles, Lead Angel, target speed and PWM duty …etc.

The iT8330S is equipped with TSD, OCP, OVP, Lockout protections

The iT8330S can drive AC synchronous motor by sinusoidal waveform with 50Hz or 66Hz.

All the parameters shall be set via inergy's software "INGUI".

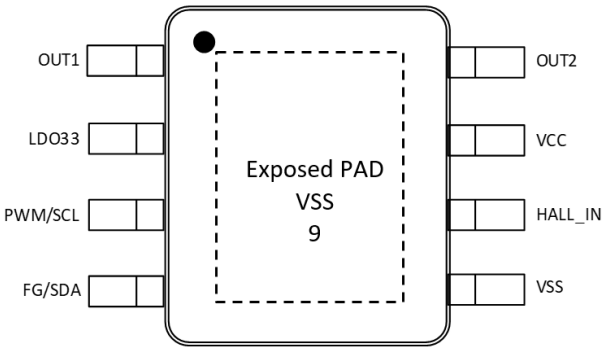
2. Applications

BLDC motors and fans

3. Features

- Direct PWM control
- DC VSP control 0.2V~3.3V
- Supports Hall IC
- 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

4. Pin Assignments



SOP-8L EP

5. Marking Information

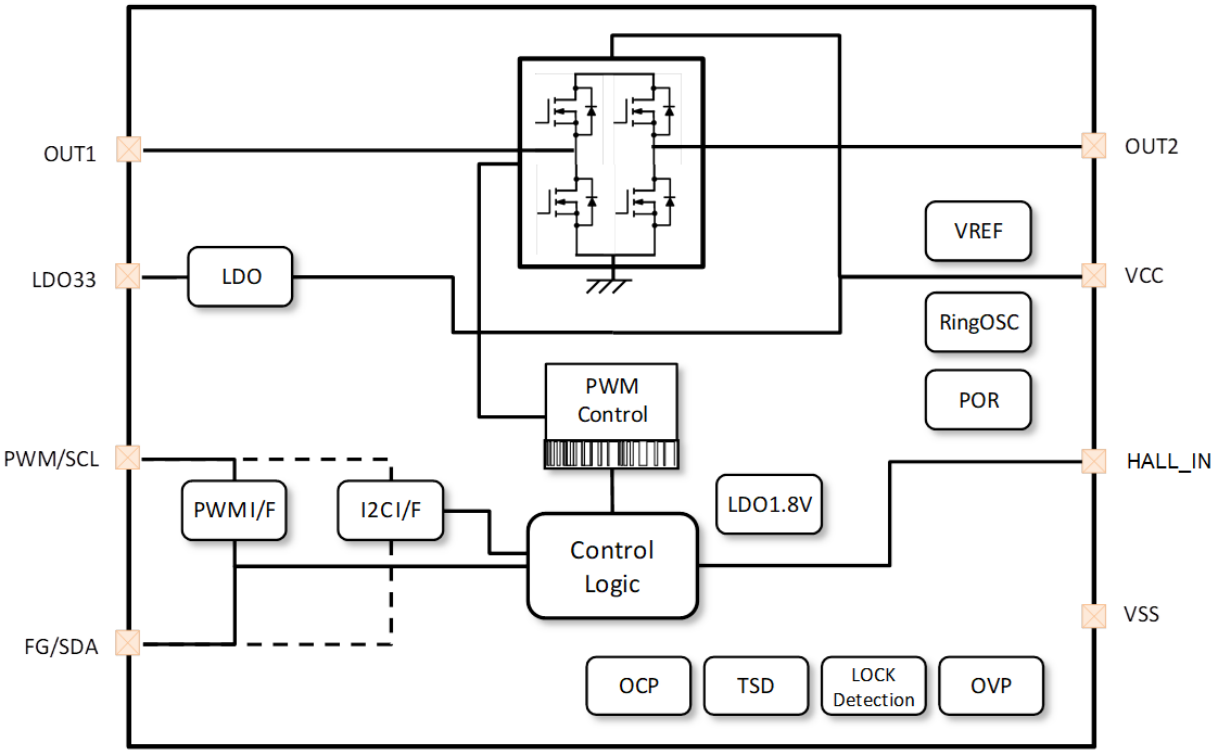
Ordering code	Marking
iT8330S	 X：Date code Y：Checksum □□：Internal code

Note: inergy defines " Green " as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)

6. Pin Definitions

Pin No.	Symbol	Description	For Synchronous Motor
1	**OUT1**	Driving motor output	Driving motor output
2	**LDO33**	DC3.3V output	DC3.3V output
3	**PWM/SCL**	Direct PWM input / SCL	Switch on：5V/off：0V
4	**FG/SDA**	Speed signal output / SDA	N/A
5	**VSS**	Ground pin	Ground pin
6	**HALL_IN**	External hall IC signal in	Frequency input
7	**VCC**	Power supply pin	Power supply pin
8	**OUT2**	Driving motor output	Driving motor output
9	**VSS**	Ground pin (Exposed pad)	Ground pin (Exposed pad)

7. Block Diagram



8. Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND, all currents are defined positive into any lead. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	-0.3	35	V
I_O	Output Current (peak, <100ms)	-	1.6	A
P_D	Package power dissipation @ $T_A \leq +25\ ^oC$	-	2.9	W
V_{PWM}	PWM/SCL signal input voltage	-0.3	6	V
V_{FG}	FG/Alarm/RD signal output voltage	-0.3	35	V
I_{FG}	FG/Alarm/RD signal sink current	-	0.01	A
R_{thJA}	Thermal resistance, junction to ambient	-	120	℃ / W
R_{thJC}	Thermal resistance, junction to case	-	30	℃ / W
T_J	Junction temperature	-	150	℃
T_S	Storage temperature	-55	150	
T_L	Lead temperature (soldering 10 seconds)	-	260	

9. Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Operating supply voltage	3.0	28	V
V_{PWM}	PWM input voltage	-0.3	5.5	V
V_{FG}	FG/Alarm/RD signal output voltage	-0.3	28	V
D_{PWM}	Duty of PWM input	0	100	%
F_{PWMIN}	Frequency of PWM input	1K	100K	Hz
T_A	Ambient temperature (*1)	- 40	125	℃

*1 Note：Please do not exceed T_j limitation

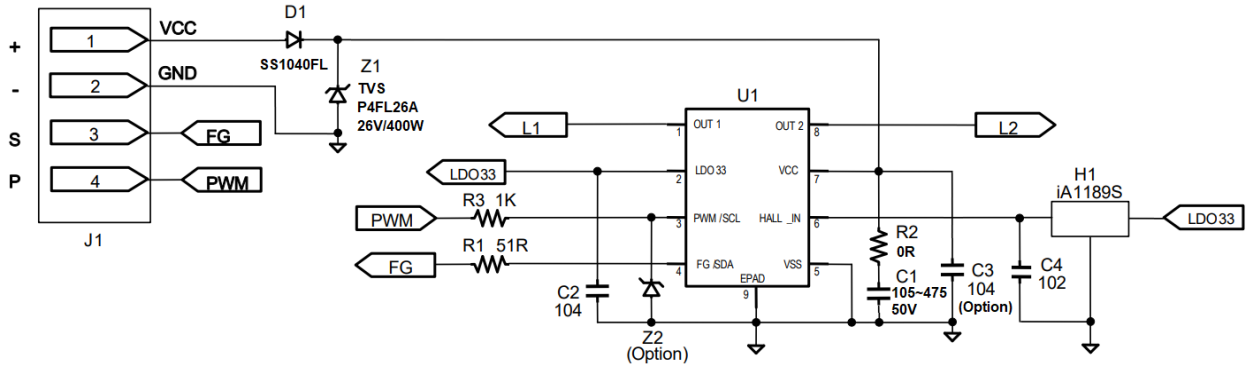
10. Electrical Characteristics

V_{CC}=24V, T_A = 25 ºC, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{cc}	Circuit Current	Vcc=24V		11		mA
TH_{PG}	Vcc power good threshold		-15%	2.8	+15%	V
HYS_{PG}	Vcc power good hysteresis			0.2		V
TH_{ov}	Vcc over voltage threshold	Select by GUI	31.5		33.5	V
HYS_{ov}	Vcc Over voltage hysteresis			1		V
TH_{tsd}	Thermal shutdown threshold	Select by GUI	100		175	℃
HYS_{tsd}	Thermal shutdown hysteresis			50		℃
TH_{tam}	Thermal alarm threshold	Select by GUI	100		175	℃
HYS_{tam}	Thermal alarm hysteresis			25		℃
V_{LDO33}	LDO33 output voltage	C_{Load}=47nf IO_{MAX}=10mA		3.3		V
V_{PWMH}	PWM input high voltage		2.6		5.5	V
V_{PWML}	PWM input low voltage		-0.3		0.8	
F_{PWM}	PWM input frequency		1		100	kHz
R_{PWM}	PWM input internal pull-up resistance			20		kΩ
R_{PWM}	PWM input internal pull-down resistance			800		kΩ
V_{FGL}	FG low level voltage	I=10mA		0.3		V
R_{FG}	Internal resistance of FG	I_{FG}=10mA		12		Ω
R_{on}	High side + Low side resistance	I_O=0.5A Vcc=12V		0.6		Ω
I_{oc}	Over current threshold	Select by GUI	1.2		1.6	A
I_{lim}	Output current limit range	Select by GUI	0.1		1.2	A
F_{osc}	Internal oscillator frequency		-5%	26	+5%	MHz
F_{PWM}	PWM output frequency	Select by GUI	-5%	25	+5%	kHz
			-5%	50	+5%	
LA	Lead Angle	Program by GUI	-45		+45	°
T_{locd}	Lockout detect time	0.25/0.5sec	-5%	0.25	+5%	sec
T_{lodr}	Lock recovery time	2.5/7/7.5/10sec	-5%	2.5	+5%	sec

11. Application Circuit

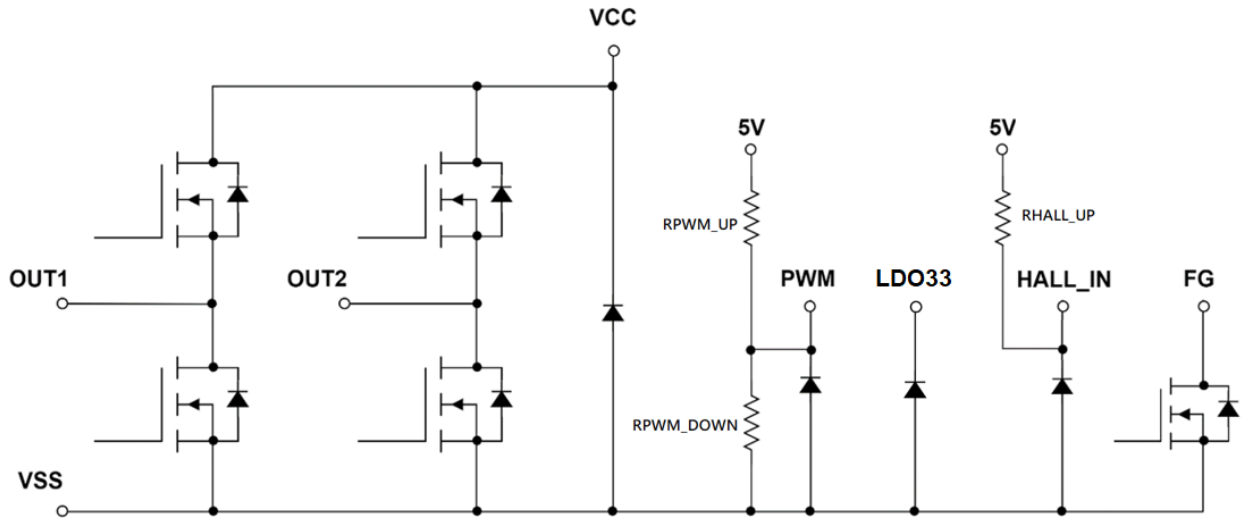
<Typical>



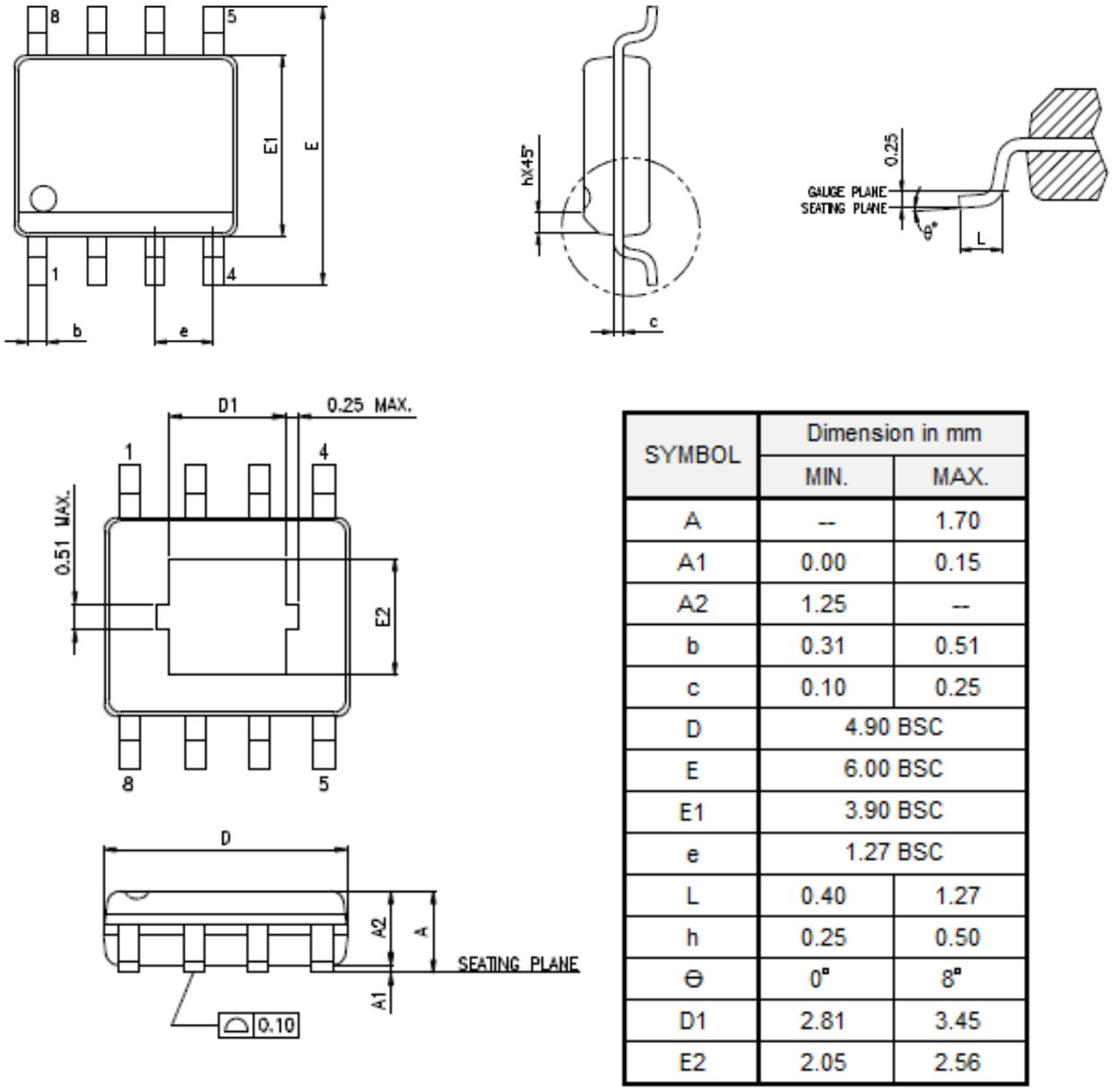
Note：

1. (IMPORTANT) C1 must be placed as close as possible to VCC pin.
2. Z1 must be TVS. Withstand voltage depends on application.
3. C3 is optional.C3 must be placed as close as possible to VCC pin.
4. Z2 is optional. It can be removed if PWM input voltage will not exceed to 5.5V.
5. R1 and R3 are optional for ESD protection.
6. The value of R3 will affect VPWMH and VPWML of PWM.

12. I/O Equivalent Circuit



13. Package Information



SYMBOL	Dimension in mm	
	MIN.	MAX.
A	--	1.70
A1	0.00	0.15
A2	1.25	--
b	0.31	0.51
c	0.10	0.25
D	4.90 BSC	
E	6.00 BSC	
E1	3.90 BSC	
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.50
Θ	0°	8°
D1	2.81	3.45
E2	2.05	2.56

Notes：

1. Jedec outline ： MS-012BA
2. Dimensions ” D ” does not include mold flash, protrusions and gate burrs shall not exceed 0.15 mm per side .
3. Dimensions “ E1 ” does not include inter-lead flash, or protrusions. Inter-lead flash and protrusions shall not exceed 0.25 mm per side.

Important Notice

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