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DF319

3-Phase Brushless DC Motor Controller

Data Sheet

Version 0.01 – Oct. 30, 2018

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Revision History:

Revision	Date	Description
0.00	2017/4/25	Preliminary version
0.01	2018/10/30	1. Updated company address & Tel No. 2. Amend Section 7.1 Marking Information

1. Key Features

- Support 3-Phase brushless DC motor with hall IC interface
- Support PWM control input or voltage control input
- Support FG/RD/ALM/RALM/RXX/RRXX output
- Support close loop control and open loop control
- Support current limitation and current protection
- Support soft-start
- Support lock-protect and auto-restart
- Built-in internal RC clock oscillator
- 5V operating voltage

2. DF319 Pin Assignment and Description

```
PWM_CL   1  ○        16  PWM_CH
PWM_BL   2            15  PWM_BH
PWM_AL   3            14  PWM_AH
NC       4            13  FG
GND      5            12  VDD
HALL_C   6            11  PWM_IN
HALL_B   7            10  NC
HALL_A   8             9  ISENSE_IN
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DF319 (SSOP16-150mil)
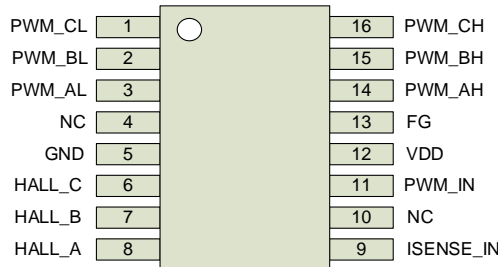
| SSOP16 Pin No.	Pin Name	I/O	Description
1	PWM_CL	Output	C output signal to control the low side of motor driver
2	PWM_BL	Output	B output signal to control the low side of motor driver
3	PWM_AL	Output	A output signal to control the low side of motor driver
4	NC	-	No connection
5	GND	-	Ground
6	HALL_C	Input	Digital input to sense motor position C
7	HALL_B	Input	Digital input to sense motor position B
8	HALL_A	Input	Digital input to sense motor position A
9	ISENSE_IN	Input	Analog input to sense motor current
10	NC	-	No connection
11	PWM_IN	Input	PWM control input
12	VDD	-	Power
13	FG	Output	Rotation speed detection
14	PWM_AH	Output	A output signal to control the high side of motor driver
15	PWM_BH	Output	B output signal to control the high side of motor driver
16	PWM_CH	Output	C output signal to control the high side of motor driver

3. DC Characteristics

Symbol	Description	Min.	Typ	Max.	Unit	Conditions (Ta=25 ^{o}C)
V_{DD}	Operating Voltage	4.75	5.0	5.25	V	
I_{OP}	Operating Current		10		mA	
V_{IL}	Input low voltage for IO lines	0		$0.3V_{DD}$	V	
V_{IH}	Input high voltage for IO lines	0.7 V_{DD}		V_{DD}	V	
I_{OL}	IO lines sink current		10		mA	V_{DD}=5.0V, V_{OL}=0.5V
I_{OH}	IO lines drive current		-7		mA	V_{DD}=5.0V, V_{OH}=4.5V
R_{PH}	Pull-high Resistance		100		KΩ	V_{DD}=5.0V
V_{BRD}	Broun-out Detect Voltage		3.5		V	After DF319 configuration
V_{POR}	Power-On Reset Voltage		2		V	
θ_{ja}	Thermal resistance from junction to ambient		75		°C/W	
θ_{jc}	Thermal resistance junction to top of case		25		°C/W	

3.1. Absolute Maximum Ratings

- Supply Voltage ………………………........ 4.75V ~ 5.25V
- Input Voltage …………………………………. -0.3V ~ V_{DD} + 0.3V
- Operating Temperature ……………………… -20 ^{o}C ~ 70 ^{o}C
- Storage Temperature ………………………… -50 ^{o}C ~ 125 ^{o}C

4. Block Diagram
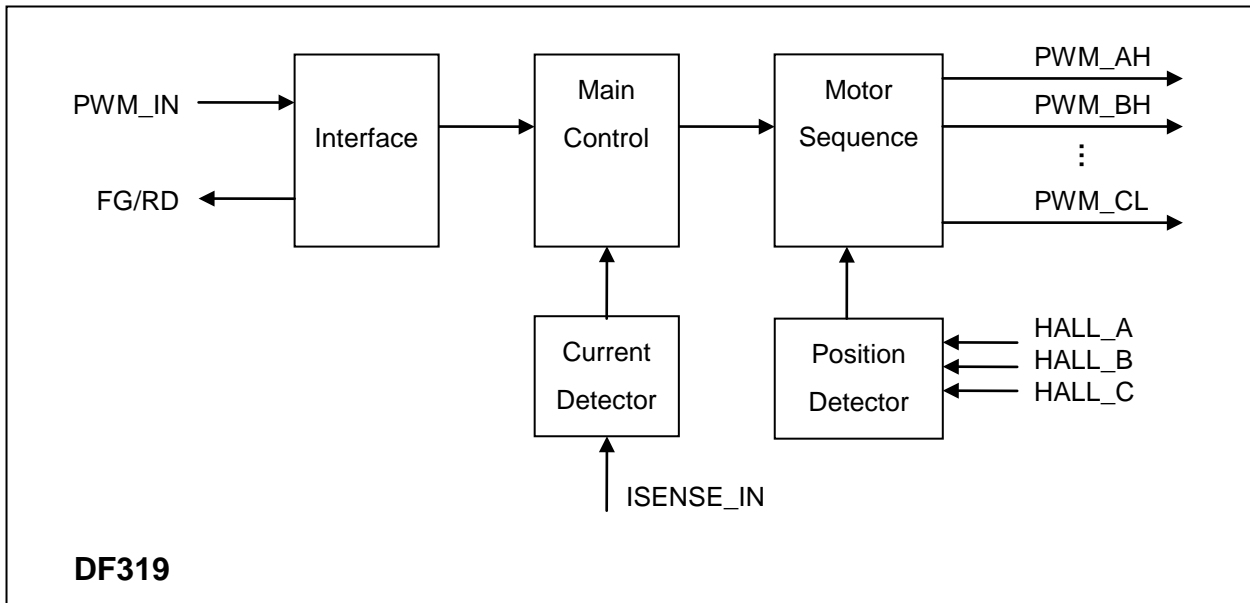
5. Functional Description

DF319 is a controller which is target for 3-phase brushless DC motor with hall sensor; there are five functional modules inside the DF319: Main Control, Current Detector, Motor Sequence Control, Position Detector and Interface. Its functional descriptions are shown as below:

5.1. Main Control

This Main Control module is coordinator to maintain the finite state of the system. It receives the command passed by user interface detector and motor current from current detector module, and then determines the next action for motor based on those two received conditions.

5.2. Current Detector

This module is used to detect the feedback current of motor (ISENSE_IN) and send to main control module, the main control will stop the motor whenever the sensing current reaches the value corresponding to over current protection.

5.3. Motor Sequence Control

The motor sequence control module controls the power MOSFET ON/OFF of motor. It depends on the position information sent by position detector module to output the six driving signals (PWM_AH, PWM_AL, PWM_BH, PWM_BL, PWM_CH, and PMW_CL) that can be directly associated to the sequence phase of motor.
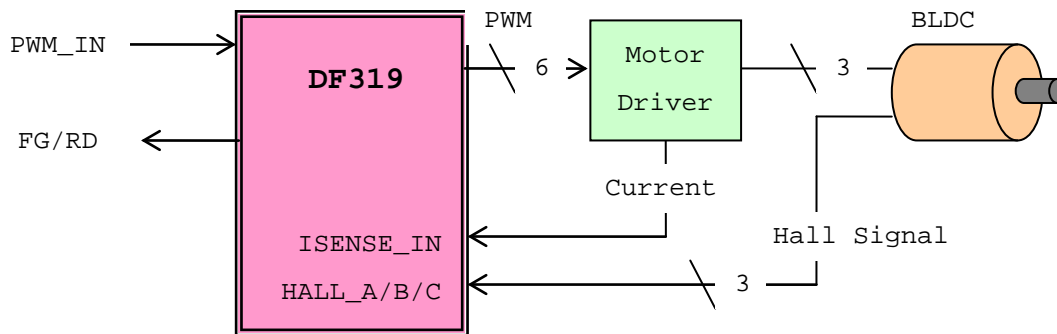
5.4. Position Detector

This module is used to detect the feedback hall signals of motor (HALL_A, HALL_B, and HALL_C) and send to motor sequence control module, the sequence control module will decide the next sequence phase to drive the motor.
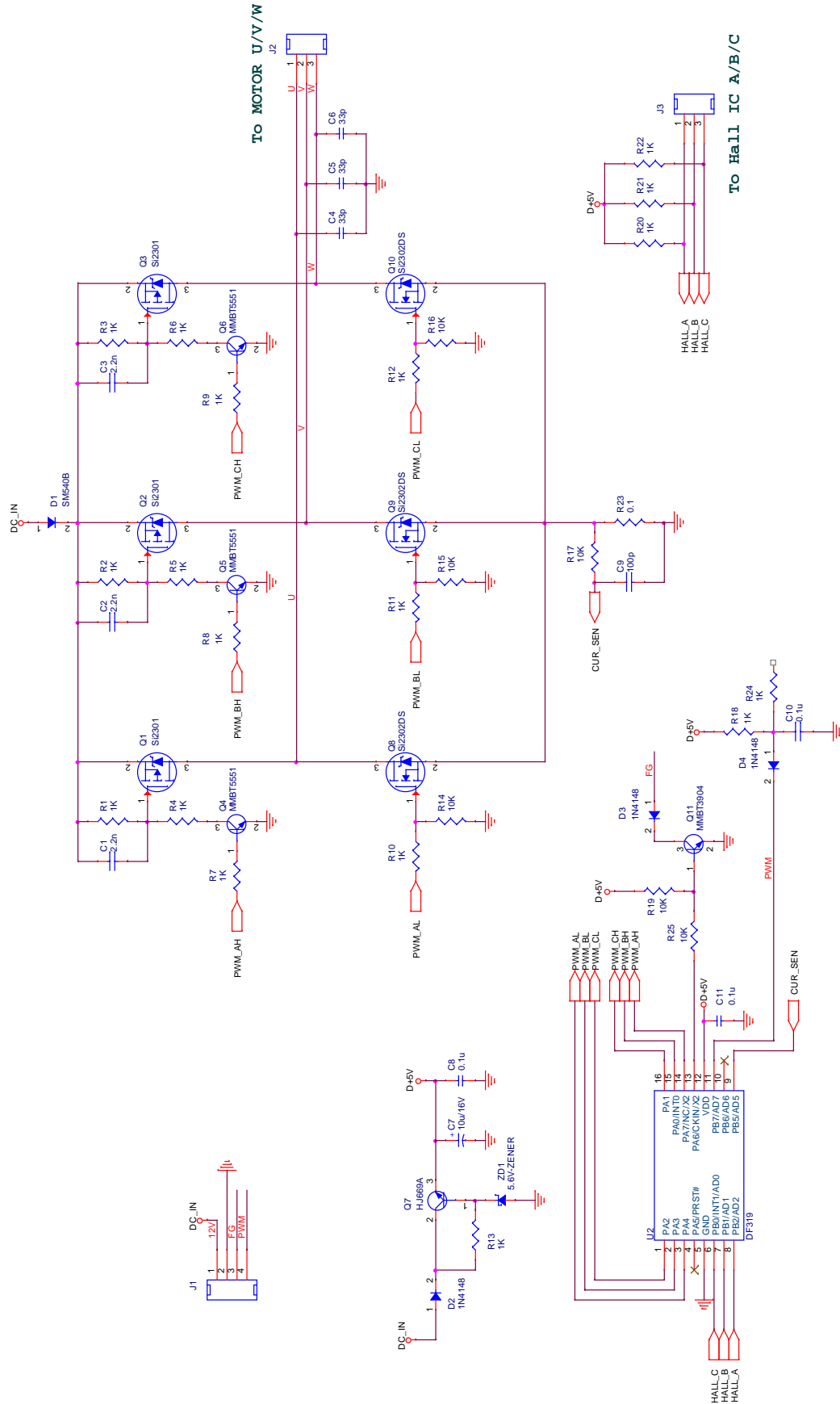
5.5. Interface

This module is used to detect the user interface, including PWM input and FG output.

6. Application Diagram

6.1. Reference Application Circuit

7. Package Marking Information

7.1. Marking Information

SSOP16	Example: blank	Example: code
PPPPPCCCC SSSSSSSSS ● yywwVXA	DF319PDFF HJ02351 ●1848ABK	DF319A001 HQ12345 ●1850ABK

Project Legend	
PPPPP	Product name (Ex: DF319)
CCCC	Customer's production code number (If blank that CCCC will be PDFF.)
yy	Year code (last 2 digits of calendar year)
ww	Week code
V	Vender code
X	Serial number
A	Wafer information

7.2. SSOP16 IC Drawing

SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
A2	–	0.059
b	0.008	0.012
b1	0.008	0.011
c	0.007	0.010
c1	0.007	0.009
D	0.189	0.197
E1	0.150	0.157
E	0.228	0.244
L	0.016	0.050
e	0.025 BASIC	
θ°	0	8

UNIT : INCH
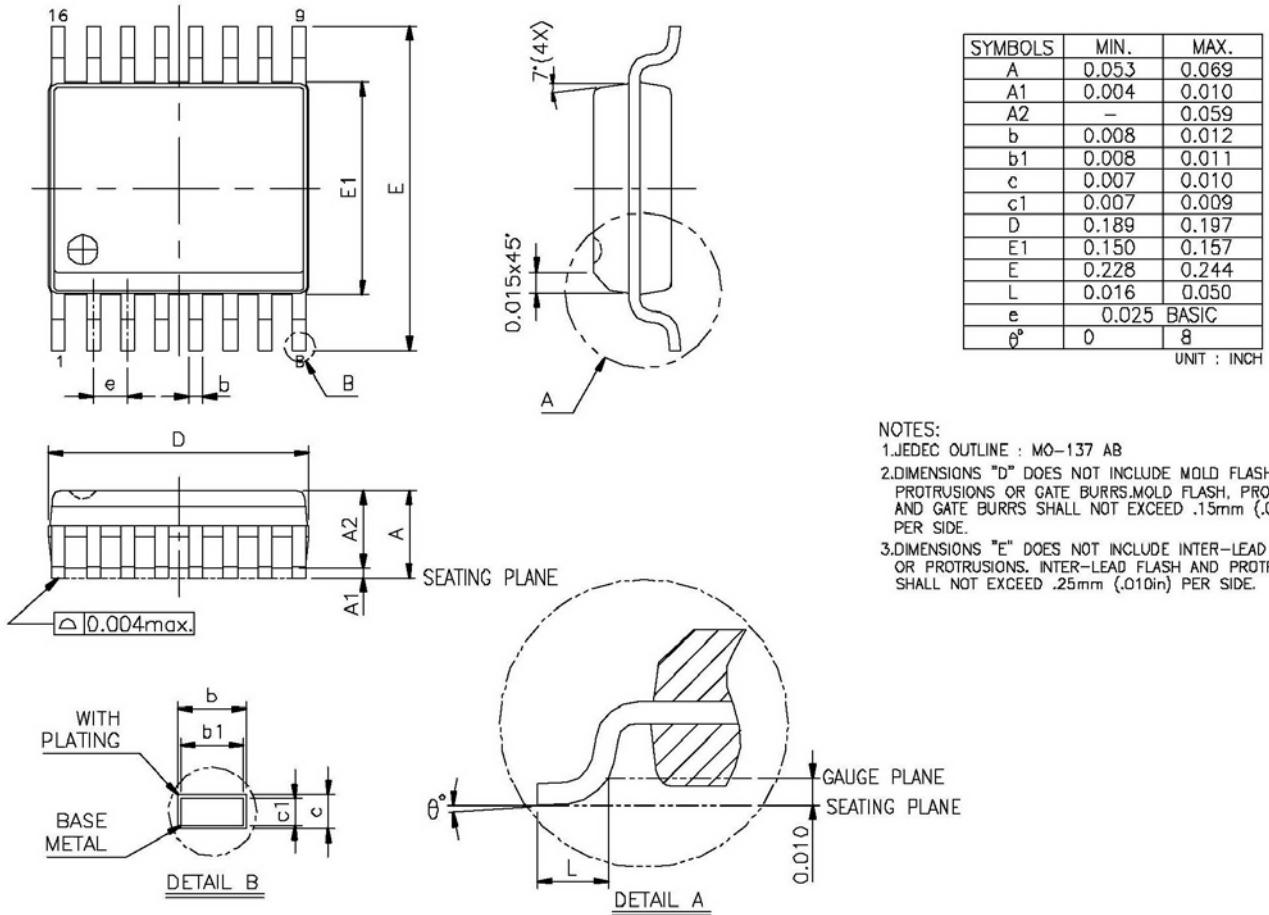
NOTES:
1. JEDEC OUTLINE : MO-137 AB
2. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .15mm (.006in) PER SIDE.
3. DIMENSIONS "E" DOES NOT INCLUDE INTER-LEAD FLASH. OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.010in) PER SIDE.