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Single-phase DC Brushless Motor Driver IC

■ GENERAL DESCRIPTION

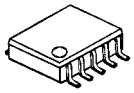
The NJU7361 is single-phase DC brushless motor driver IC. And It features MOS-FET driver circuit for better output characteristics.

NJU7361 features Frequency Generator Output, Thermal Shutdown Circuit, Hall Bias Terminal and PWM_IN INPUT for Rotation Speed Control.

Maximum output current is 700mA and Continuance output current is 250mA.

It is suitable for variable speed FAN required Low Noise & Good Efficiency characteristics.

■ PACKAGE OUTLINE

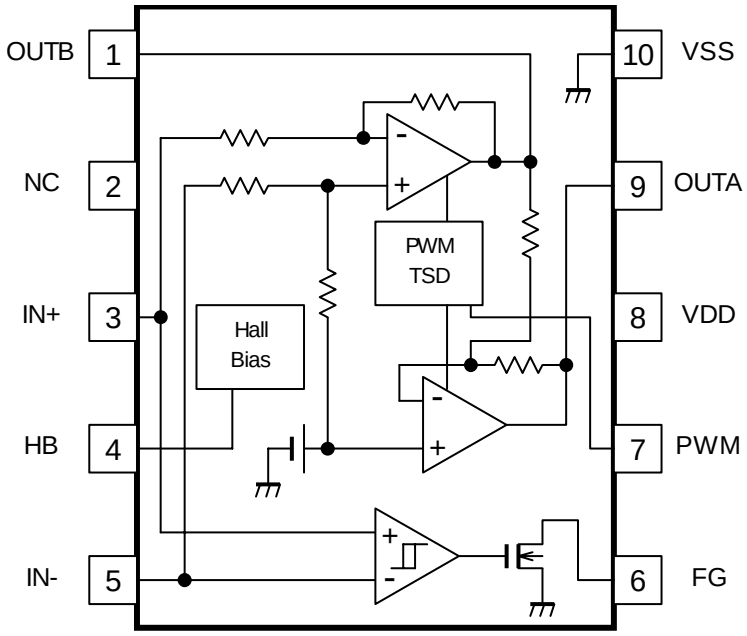


NJU7361RB2

■ FEATURES

- Operating Voltage V_{DD} =2.4 ~ 5.5V
- Low Operating Current I_{DD} = 1mA(Typ.)
- Low Saturation Output Voltage
  V_{OM}=±0.30V @Io=±250mA
- PWM_IN Input
- Hall Bias Terminal
- Frequency Generator Output
- Thermal Shutdown Circuit
- CMOS Technology
- Package Outline TVSP 1 0

■ BLOCK DIAGRAM



■ PIN CONFIGURATION

PIN NUMBER	PIN NAME
1	OUTB
2	NC
3	IN+
4	HB
5	IN-
6	FG
7	PWM
8	VDD
9	OUTA
10	VSS

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	+7.0	V
Input Voltage	V_{ID}	-0.3 ~ V_{DD}(*1)	V
Output Current (Peak)	$I_{O\ PEAK}$	700(*2)	mA
FG Output Current	I_{FG}	10	mA
FG Output Voltage	V_{FG}	+7.0	V
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-50 ~ +150	°C
Power Dissipation	P_D	400(*3)	mW
Junction Temperature	Tjmax	+150	°C

(*1) Input voltage is not to be over supply voltage to really use.

(*2) This value is not to be over Pd.

(*3) Device itself

■ OPERATING CONDITIONS (Ta=25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	-	2.2	5.0	5.5	V

■ ELECTRICAL CHARACTERISTICS (V_{DD} =5V, Ta=25°C)

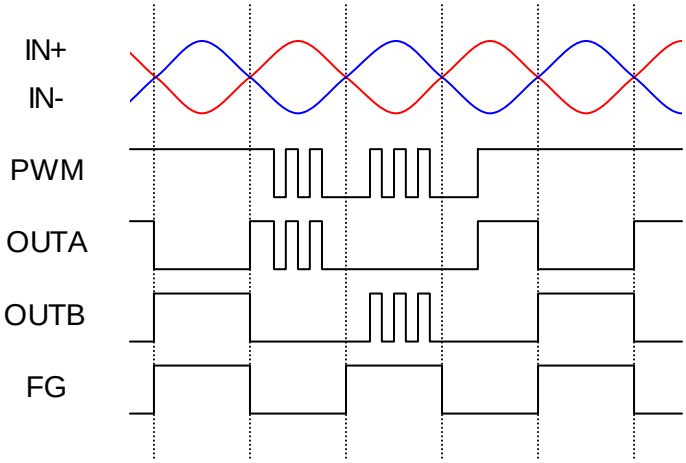
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
General						
Operating Current	I_{DD}	IN+=5V, IN-=0V	-	1.0	2.0	mA
Thermal Shutdown Temperature	T_{TSD}	-	-	180	-	°C
Thermal Shutdown Hysteresis	T_{HYS}	-	-	50	-	°C
Hall Amplifier						
Input Offset Voltage	V_{IO}	-	-10	-	10	mV
Close Loop Gain	A_V	-	—	44	—	dB
Input Common Mode Voltage Range	V_{ICM}	-	0.4	-	4.0	V
Output						
Maximum Output Voltage Range	V_{OH}	I_O =250mA	4.55	4.70	—	V
	V_{OL}	I_O =-250mA	-	0.30	0.45	
FG L Output Voltage	V_{FG}	I_{FG} =3mA	-	-	0.3	V
FG H Leak Current	$I_{FG-LEAK}$	V_{FG}=5V	-	-	1.0	μA
Hall Bias						
Hall Bias Voltage	V_{HB}	I_{HB}=5mA	1.0	1.3	1.5	V
PWM Input						
PWM Input Frequency Ratio	f_{PWM}	-	-	-	50	kHz
PWM pull-up Resistance	R_{PWM}	-	-	50	-	kΩ
Input H Level Voltage	V_{IHP}	-	0.7V_{DD}	-	V_{DD}	V
Input L Level Voltage	V_{ILP}	-	0	-	0.3V_{DD}	V

■ INPUT-OUTPUT TRUTH TABLE

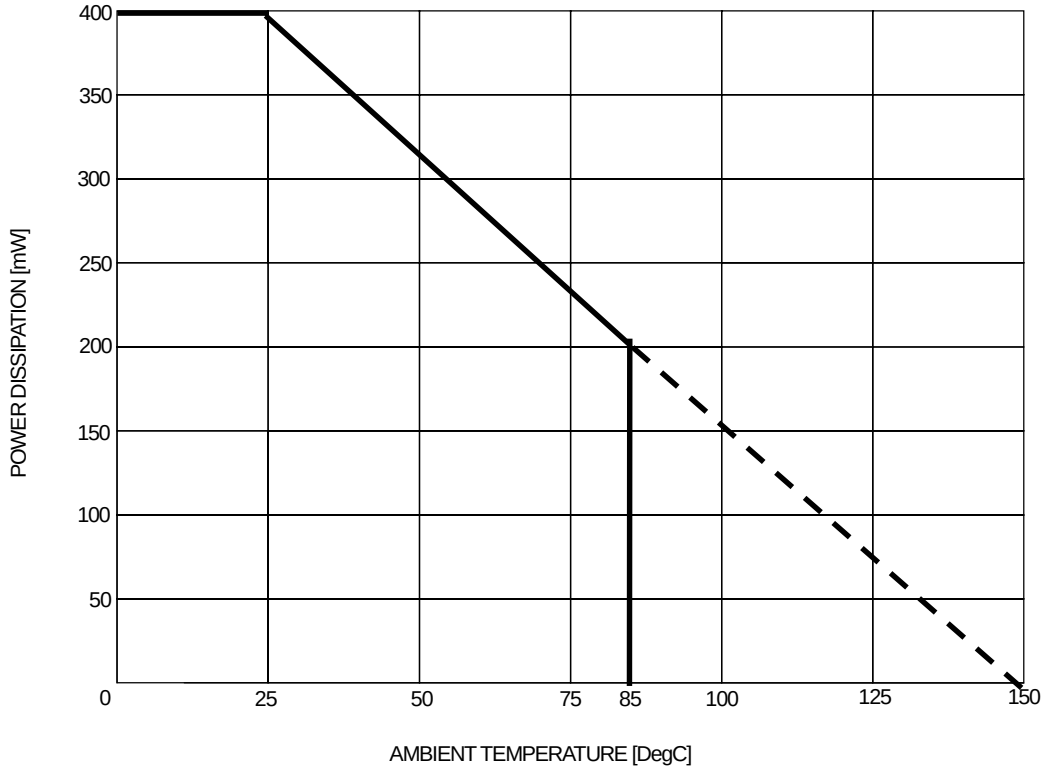
No.	IN+	IN-	PWM	TSD	OUTA	OUTB	FG
1	H	L	H	OFF	H	L	L
2	L	H	H	OFF	L	H	Z
3	H	L	L	OFF	Z	L	L
4	L	H	L	OFF	L	Z	Z
5	H	L	H	ON	Z	L	L
6	L	H	H	ON	L	Z	Z
7	H	L	L	ON	Z	L	L
8	L	H	L	ON	L	Z	Z

* Z : High-impedance

■ TIMING CHART



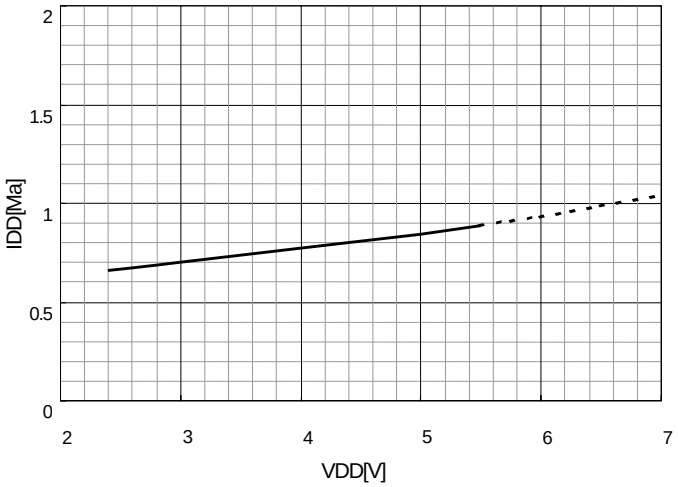
■ DERATING CURVE



■ ELECTRICAL CHARACTERISTICS

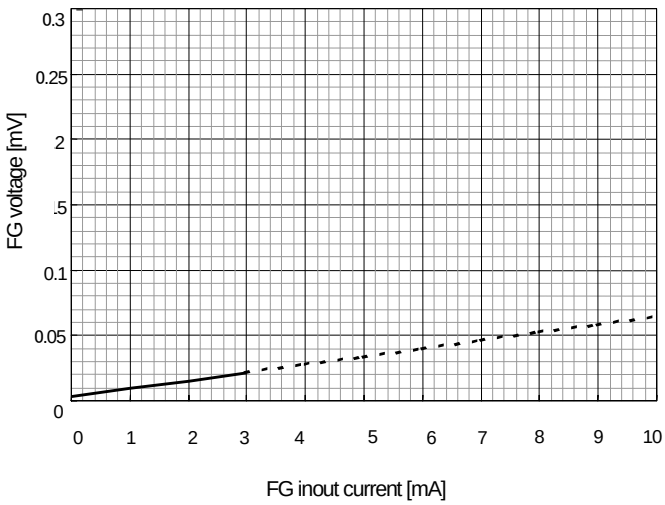
IDD vs VDD

IN+=VDD, IN-=GND



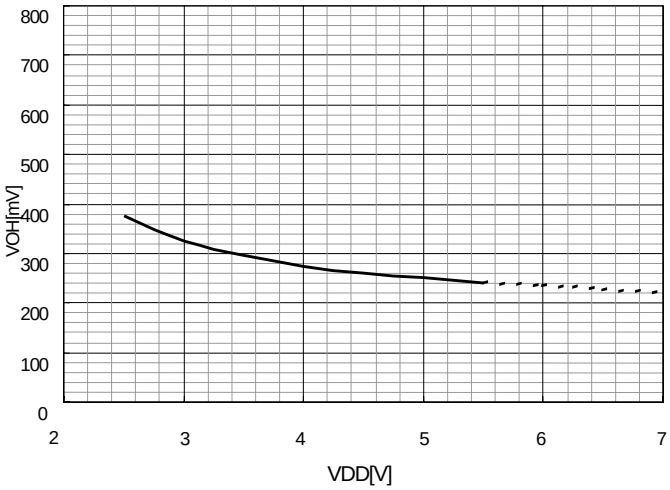
FG voltage vs FG input current

VDD=5V, IN+=2.5V, IN=GND



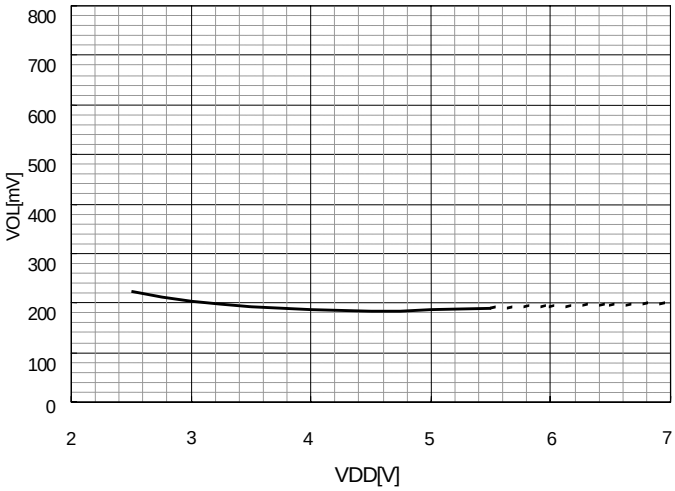
VOH vs VDD

IN+=VDD, IN-=GND, Io=250mA



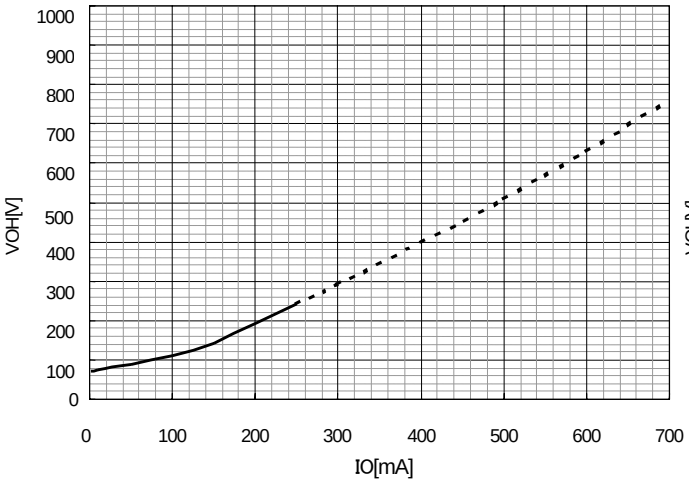
VOL vs VDD

IN+=GND, IN-=VDD, Io=250mA



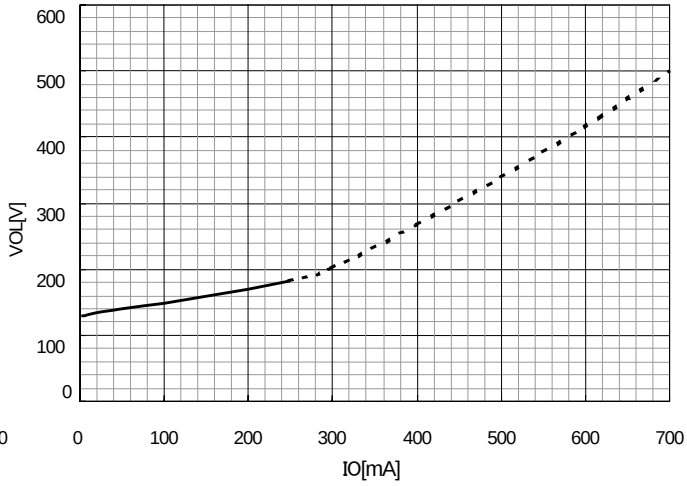
VOH vs IO

VDD=5V, IN+=VDD, IN-=GND



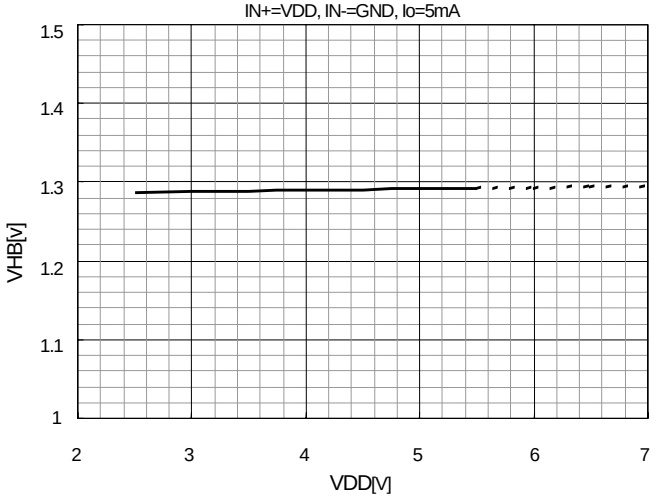
VOL vs IO

VDD=5V, IN+=GND, IN-=VDD



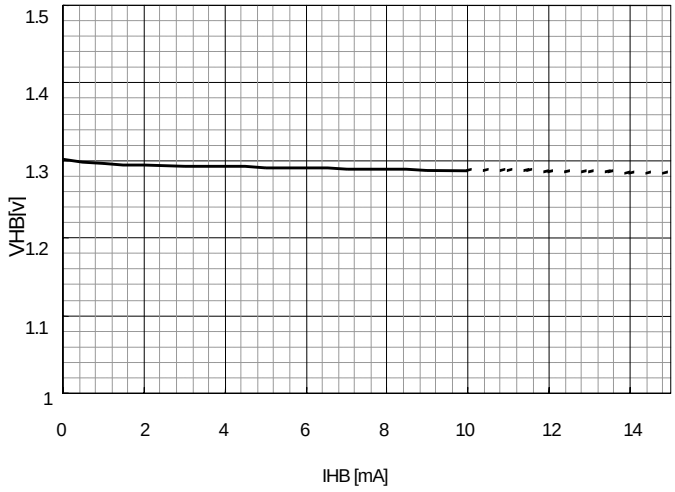
VHB vs VDD

IN+=VDD, IN-=GND, Io=5mA



VHB vs IHB

VDD=5V, IN+=2.5V, IN-=GND

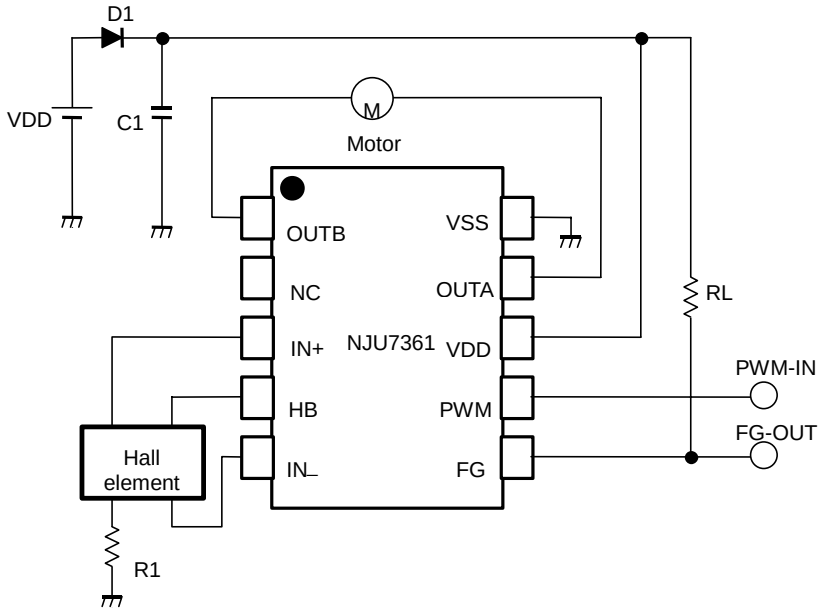


■ APPLICATION NOTE

The NJU7360 are single-phase DC brushless motor driver IC in small TVSP8 package.
With minimal external components, that can drive up to 250mA of motor current for small fan application.

[Application Circuit Example]

1) Hall Bias unused application circuit



[Design Notes]

Above application example is designed for 5V operation with motor current of 250mA. It uses the following components:

Hall elements: HW101A (AKE)

1. Selection of C1 and D1:

C1 is used for a noise reduction purpose. A typical value is 0.1uF.
Optimize the value in actual operating conditions if necessary. D1 is a diode for protection against reverse voltage supply. Silicon rectifier diode (WO3C, 10D1 and equivalent) is appropriate.

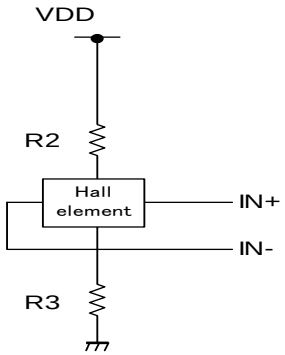
2. Position Detection Circuit Hall Device

2-1. When using HB (R1 design)

By connecting a Hall device to the Hall bias terminal (HB), a constant Hall output amplitude that has good temperature characteristics is obtained, resulting in stable linear drive. If it is necessary to adjust the Hall output amplitude, perform adjustment with R1.

2-2. When using V_{DD} (R2 and R3 design)

When it is necessary to increase the Hall bias current to increase the Hall output amplitude, obtain Hall bias from V_{DD}. The input bias voltage for the amplifier must be used within the Hall input common mode voltage (0.4 - V_{DD}-1 V) including the amplitude of the signal. It is recommended that the Hall bias voltage be one half of the power supply voltage, that is, V_{DD}/2.



3. Design of FG output resistance (**R_L**)

FG Out (FG: Pin5) is an open drain output and R_L is a pull up register. A typical value of R_L is 10kΩ.