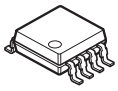
Single-phase DC Brushless Motor Driver IC

■ GENERAL DESCRIPTION

The NJU7360 is a single-phase DC brushless motor driver IC designed for small and high power fan-motor applications.

It provides a low operating current of 2mA (typ.) and low saturation output voltage at high output current operation, which offers a high efficiency motor driving. It also has a high output current capability of 1000mA (peak) and 400mA (continuous). The NJU7360 has a hall bias circuit and hall signal amplifier for output wave optimization, which offers a low noise motor driving. It also has useful functions such as a FG (frequency generator) output for speed detection and thermal shutdown. The NJU7360 is available in a small and thin package of MSOP8 (TVSP8), which provides downsizing and thinning in motor applications.

■ PACKAGE OUTLINE



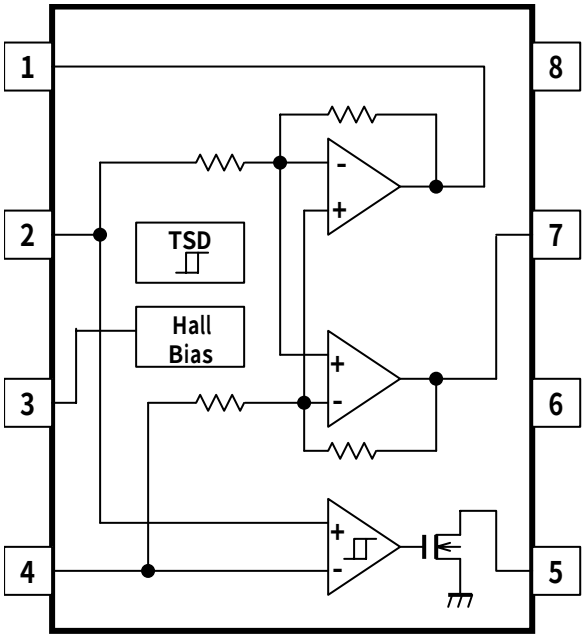
NJU7360RB1
(MSOP8 (TVSP8))

■ FEATURES

- Operating Voltage V_{DD} =2.2 to 5.5V
- Low Operating Current I_{DD} = 2mA(typ.)
- Low Saturation Output Voltage
  V_{OM}=±0.30V @Io=±250mA
- Thermal Shutdown Circuit
- Frequency Generator Output
- Hall Bias Terminal
- C-MOS Technology
- Package outline MSOP8 (TVSP8)*

*MEET JEDEC MO-187-DA / THIN TYPE

■BLOCK DIAGRAM



■ PIN FUNCTION

PIN no.	PIN NAME
1	OUT B
2	IN+
3	HB
4	IN-
5	FG
6	VDD
7	OUT A
8	GND

■ **ABSOLUTE MAXIMUM RATINGS** (Ta=25°C)

PARAMETER	RATINGS	SYMBOL (unit)	NOTE
Supply Voltage	+7.0	V_{DD} (V)	
Input Voltage	-0.3 to V_{DD}	V_{ID} (V)	1)
Output Current (Peak)	600	$I_{O\ PEAK}$ (mA)	
FG Output Current	5	I_{FG} (mA)	
Operating Temperature Range	-40 to +85	Topr (°C)	
Storage Temperature Range	-50 to +150	Tstg (°C)	
Power Dissipation	400	P_D (mW)	Device itself
Junction Temperature	150	Tjmax (°C)	

1): The Input Voltage (V_{ID}) never exceeds the Supply Voltage (V_{DD}).

■ **RECOMMENDED OPERATING CONDITIONS** (Ta=25°C, V_{DD}=5V)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	-	2.2	5.0	5.5	V
Input Common Mode Voltage Range	V_{ICM}	-	0.4	-	4.0	V

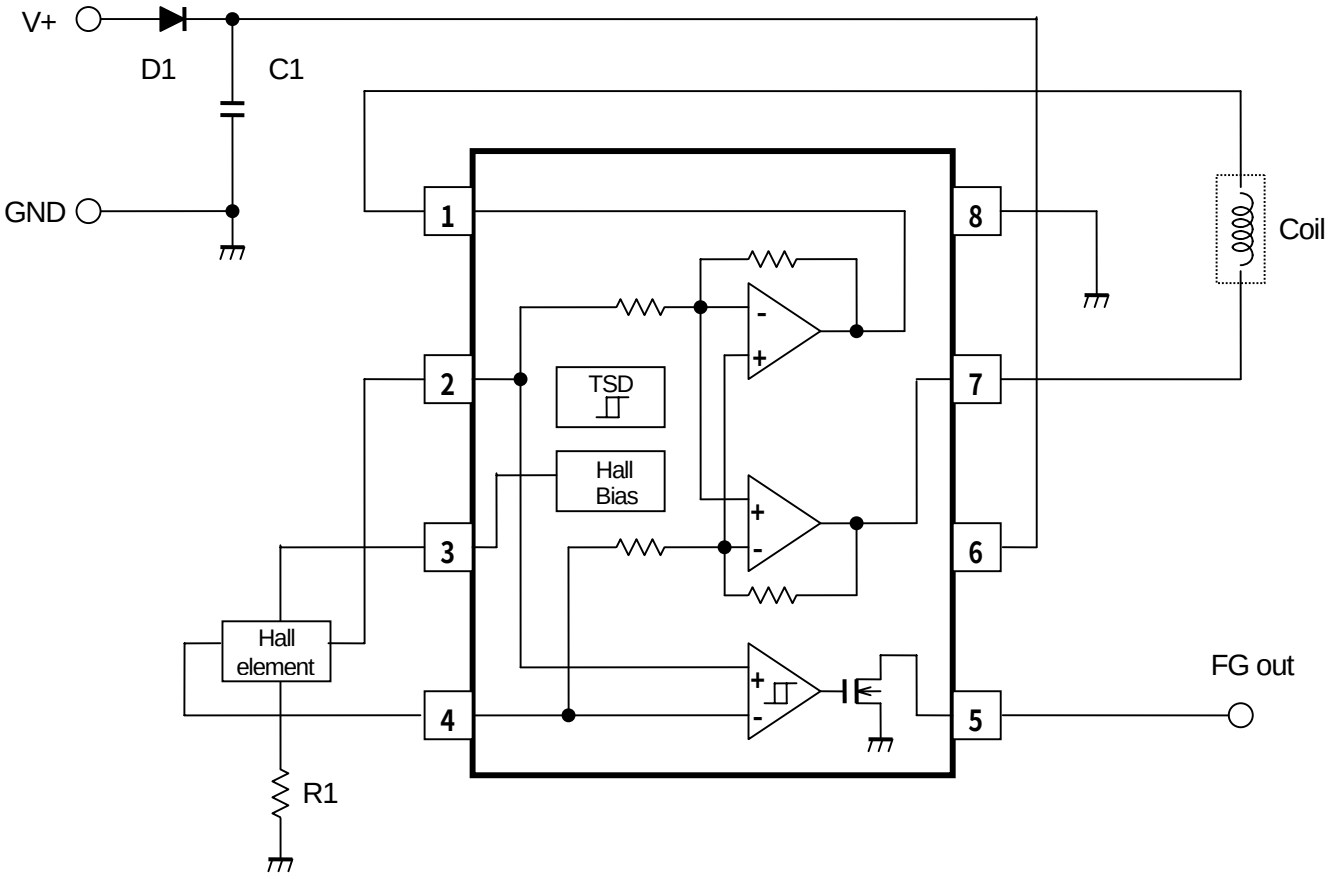
■ **ERECTRICAL CHARACTERISTICS** (Ta=25°C, V_{DD}= 5V)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
■ General						
Operating Current	I_{DD}	-	-	2.0	5.0	mA
Thermal Shutdown Temperature	T_{TSD}	-	-	180	-	°C
Thermal Shutdown Hysteresis	T_{HYS}	-	-	50	-	°C
■ Hall Amplifier						
Close Loop Gain	A_V	-	43	46	49	dB
Input Offset Voltage	V_{IO}	-	-12	-	12	mV
■ Output						
Maximum Output Voltage Range	V_{OH}	Io=250mA	4.55	4.70	-	V
	V_{OL}	Io= -250mA	-	0.30	0.45	
FGL Output Voltage	V_{FG}	R_{FG}=10kΩ	-	-	0.3	V
FGH Leak Current	$I_{FG-LEAK}$	-	-	-	5.0	μA
■ Hall Bias						
Hall Bias Voltage	V_{HB}	-	1.1	1.3	1.5	V

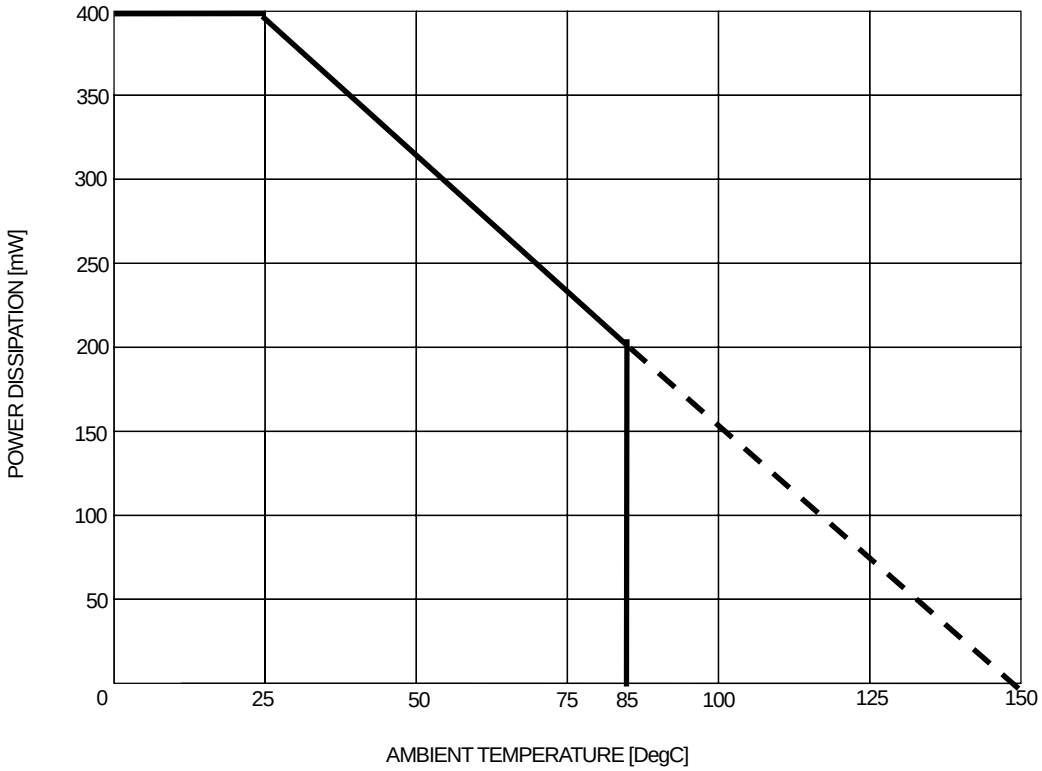
■ INPUT-OUTPUT TRUTH TABLE

IN+	IN-	OUTA	OUTB	FG
H	L	H	L	L (Output TR : ON)
L	H	L	H	Z (Output TR : OFF)

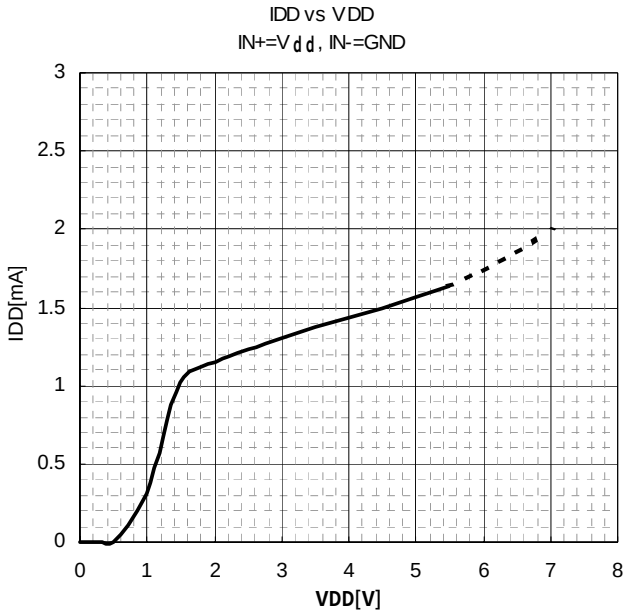
■ APPLICATION CIRCUIT EXAMPLE

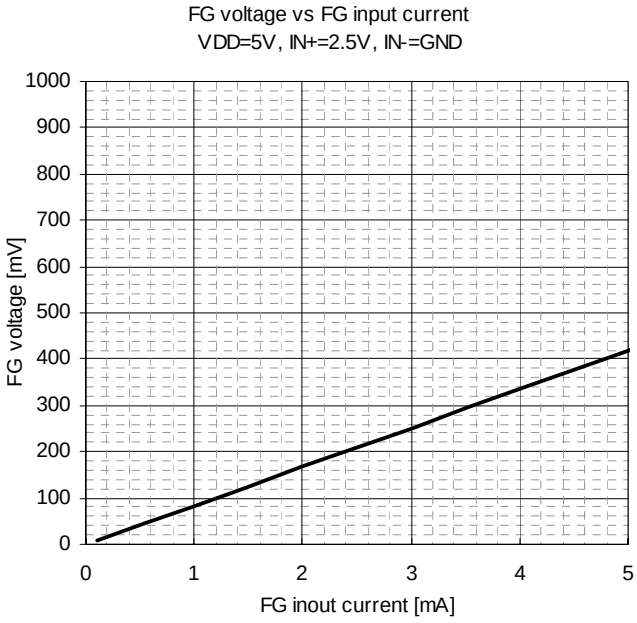


■ POWER DISSIPATION



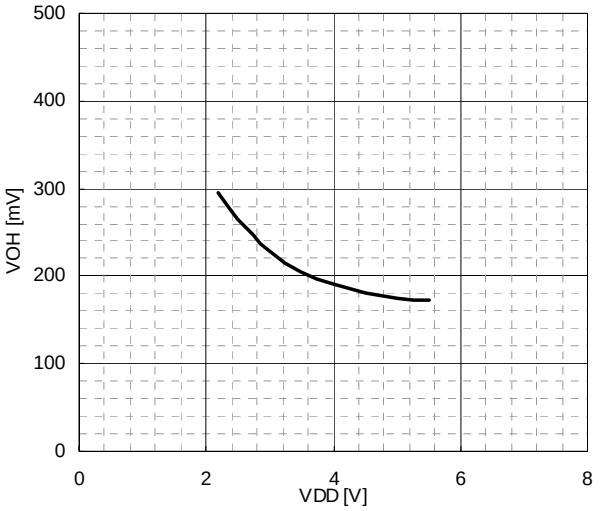
■ TYPICAL CHARACTERISTICS



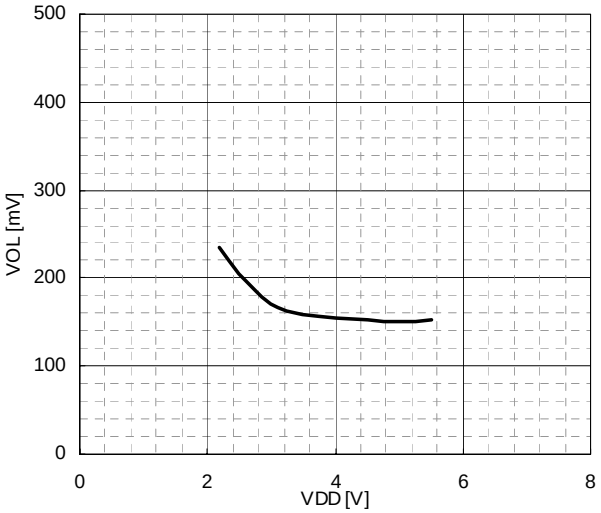


■ TYPICAL CHARACTERISTICS

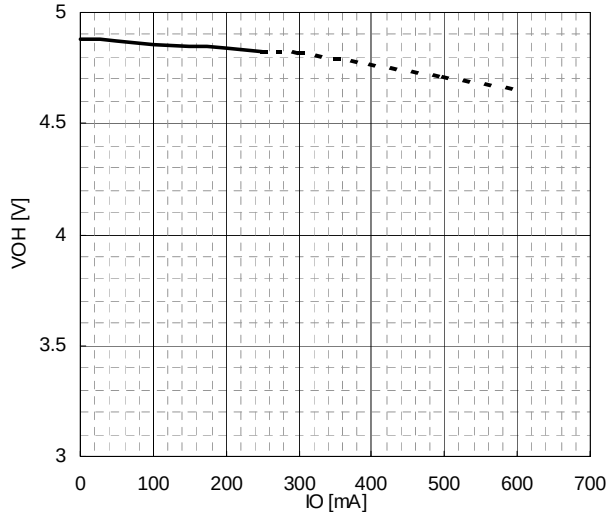
VOH vs VDD
IN+=VDD, IN-=GND, Io=+250mA



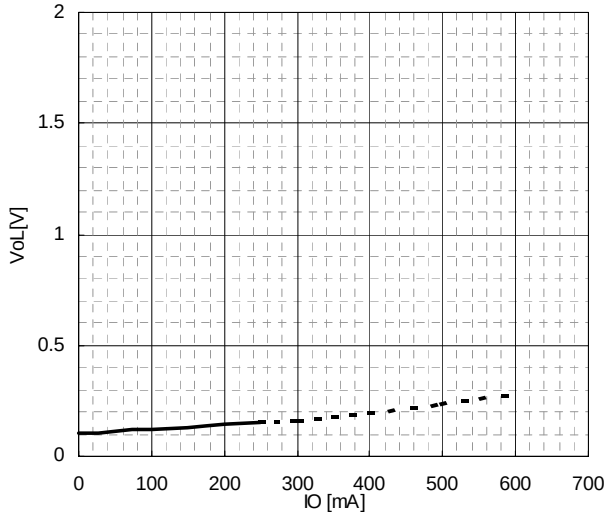
VOL vs VDD
IN+=GND, IN-=VDD, Io=-250mA



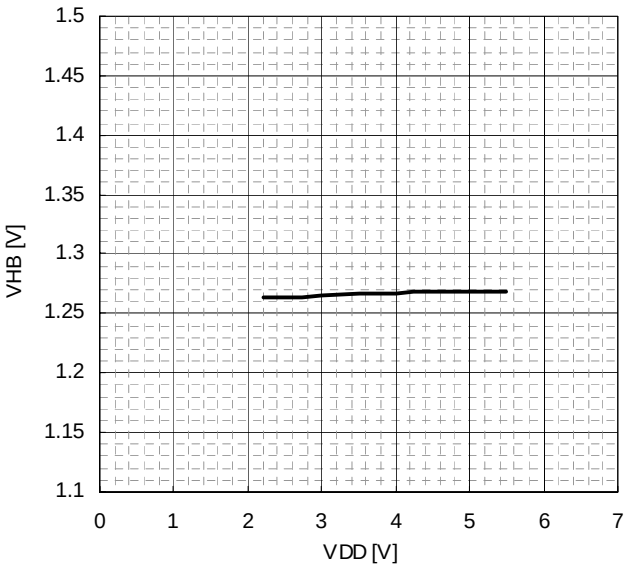
VOH vs IO
VDD=5V, IN+=VDD, IN-=GND



VOL vs IO
VDD=5V, IN+=GND, IN-=VDD



VHB vs VDD
IN+=VDD/2, IN-=GND, Io=5mA

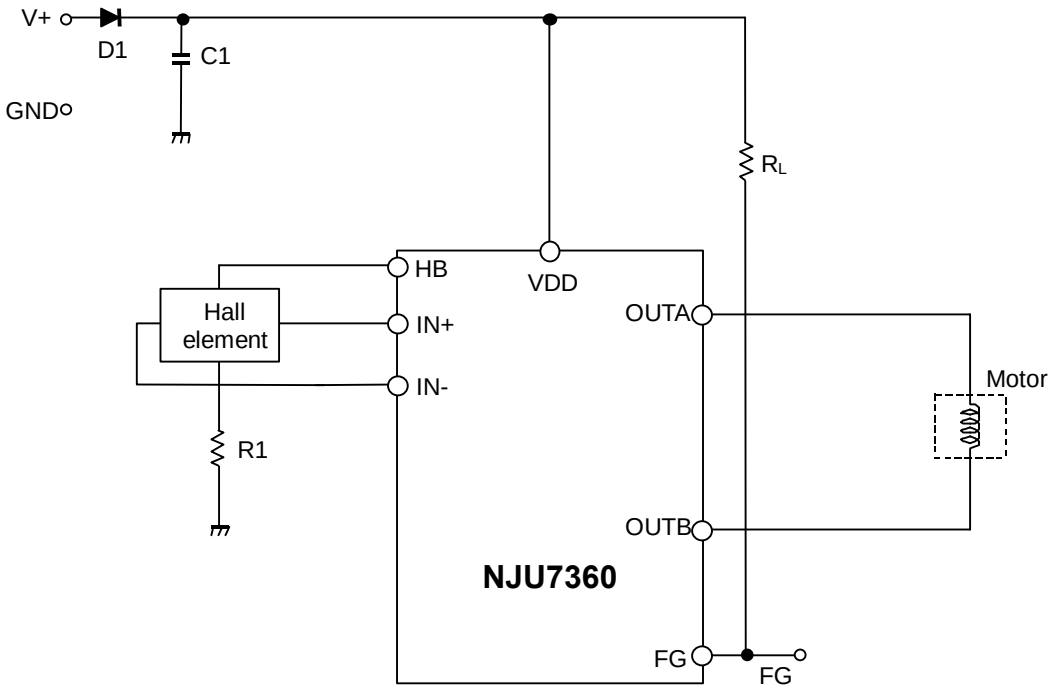


■ APPLICATION NOTE

The NJU7360 is a single-phase DC brushless motor driver IC in a small MSOP8 (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.

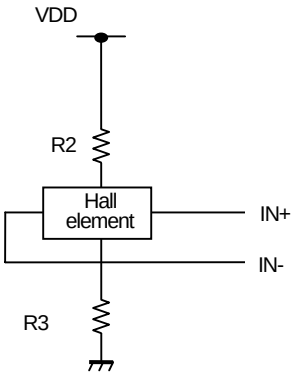
2. Position Detection Circuit Hall Device

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.
The timing chart of FG Out is as follows.
Note that the pull up resistance shall be connected to below supply voltage.