

## Low Voltage 5V DC Motor Driver

### PRODUCT DESCRIPTION

The MS3111S is a low voltage 5V DC motor driver. It provides integrated motor driver solution for motion control applications such as camera, consumer product, toy or battery supply.

The MS3111S could provide up to 0.8A output current and operate from 1.8V~6V power supply.

The MS3111S has PWM (IN/IN) input interface, compatible with industry standard device, and also has thermal shutdown protection.



SOT23-6

### FEATURES

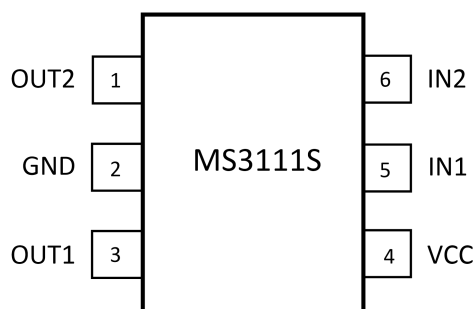
- H Bridge Motor Driver
  - Drive DC Motor or Other loads
  - Low On-Resistance(HS+LS)850mΩ
- Drive Current: 0.8A
- Power Supply: 1.8V~6V
- Interface Type: PWM(IN1/IN2)Input Mode
- Thermal Shutdown Protection
- Low Current Sleep Mode(Enter when IN1=IN2=0 )

### APPLICATIONS

- Camera
- Digital Single Lens Reflex (DSLR) Camera
- Consumer Product
- Toy
- Robot Technology
- Medical Device

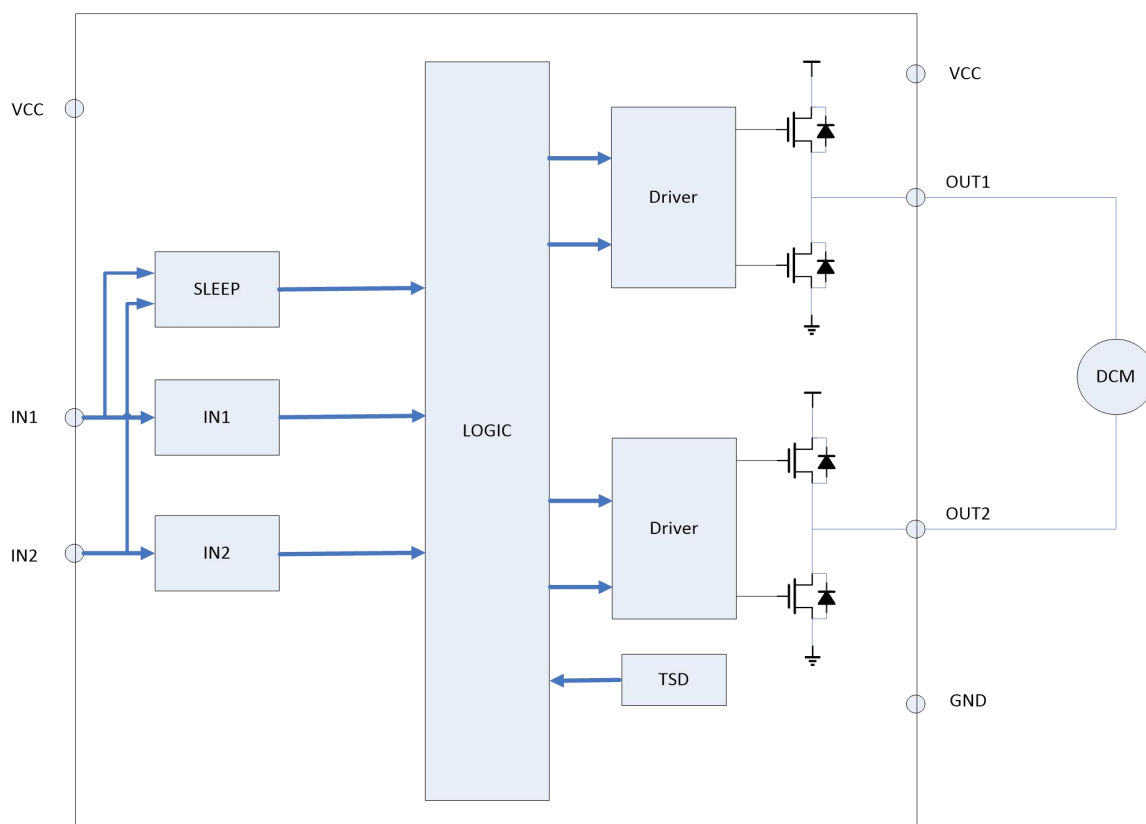
### PRODUCT SPECIFICATION

Part Number	Package	Marking
MS3111S	SOT23-6	3111S

**PIN CONFIGURATION**

**PIN DESCRIPTION**

Pin	Name	Type	Description
1	OUT2	O	Output 2
2	GND	-	Ground
3	OUT1	O	Output 1
4	VCC	-	Power Supply
5	IN1	I	Input 1
6	IN2	I	Input 2

## BLOCK DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions. T=25°C, unless otherwise noted.

Parameter	Symbol	Ratings	Unit
Supply Voltage	VCC	-0.3 ~ 6	V
Control Input Voltage	INX	-0.5 ~ 6	V
Drive Peak Current	I <sub>max</sub>	0 ~ 1	A
Junction Temperature	T <sub>jmax</sub>	-40 ~ 150	°C
Storage Temperature Range	T <sub>stg</sub>	-60 ~ 150	°C
ESD(HBM)	ESD	±2500	V

### RECOMMENDED OPERATING CONDITIONS

T=25°C, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	1.8		6	V
Output Current	I <sub>OUT</sub>	0		0.8	A
External PWM Frequency	f <sub>PWM</sub>	0		250	KHZ
Logical Input Voltage	V <sub>logic</sub>	0		6	V
Operating Temperature	T <sub>a</sub>	-40		85	°C

**ELECTRICAL CHARACTERISTICS**
**Electrical Characteristics**

VCC = 3V, VM=5V, T=+25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
VCC Operating Voltage	VCC		1.8		6	V
VCC Operating Current 1	I <sub>VCC</sub>	VCC=5V, No PWM		100	550	uA
VCC Operating Current 2	I <sub>VCCQ</sub>	VCC=5V, IN1=IN2=0 Power Saving Mode		0.01	1	uA
<b>Output Module</b>						
On-Resistance (HS+LS)	R <sub>dsON</sub>	VCC=5V, I <sub>o</sub> =500mA		850	1000	mΩ
Off-state Leakage Current	I <sub>OFF</sub>	V <sub>out</sub> =0V	-200		200	nA
<b>Control Input Pin(IN1,IN2)</b>						
Logical Input Low Voltage	V <sub>IL</sub>				0.27×VCC	V
Logical Input High Voltage	V <sub>IH</sub>		0.40×VCC			V
Input Hysteresis	V <sub>HY</sub>			0.13×VCC		mV
Logical Input Low Current	I <sub>IL</sub>	V <sub>in</sub> =0	-5		5	uA
Logical Input High Current	I <sub>IH</sub>	V <sub>in</sub> =3.3V			50	uA
Pulldown Resistance	R <sub>pd</sub>			100		kΩ
<b>Protection Circuit</b>						
Thermal Shutdown	TSD		150	160	180	°C
Thermal Shutdown Hysteresis	ΔTSD			20		°C

**Timing**

TA=25°C, VCC = 5V, RL=20Ω.

Parameter	Symbol	Range		单位
		Min	Max	
Start Time	t1		100	us
Shutdown Time	t2		300	ns
Input High to Output High	t3		160	ns
Input Low to Output Low	t4		160	ns
Output Rising Edge	t5	30	188	ns
Output Falling Edge	t6	30	188	ns

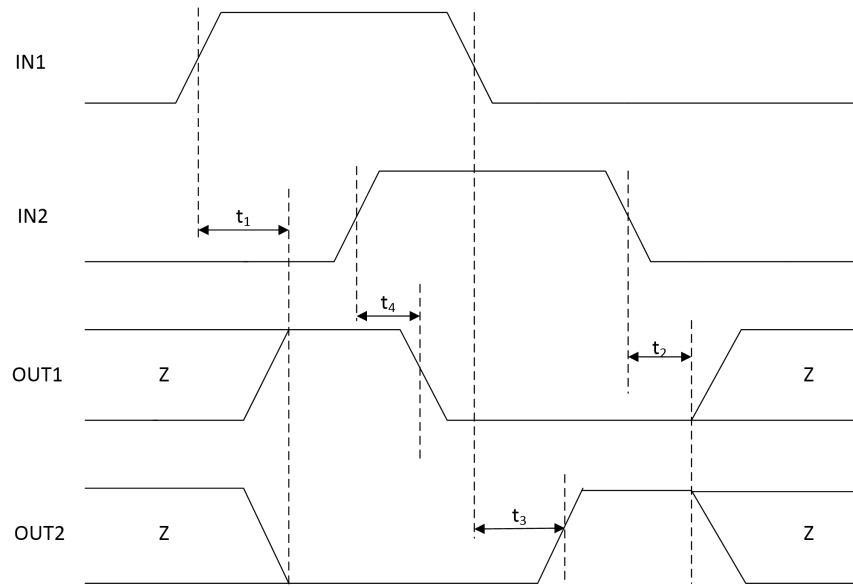


Figure 1. MS3111S Input and Output Time Parameter 1

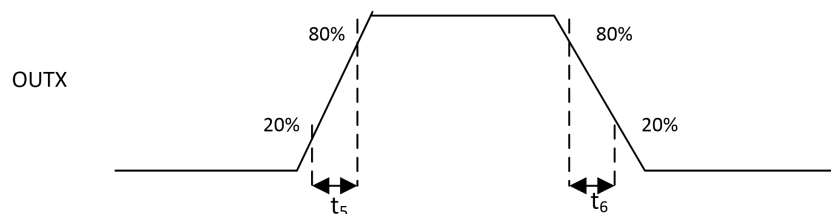


Figure 2. MS3111S Input and Output Time Parameter 2

## FUNCTION DESCRIPTION

### Bridge Control

The MS3111S is controlled By PWM input interface, which is also called IN/IN input mode. The control truth table is as followed.

IN1	IN2	OUT1	OUT2	Function
0	0	Z	Z	Sleep
0	1	L	H	Reverse
1	0	H	L	Forward
1	1	L	L	Brake

### Sleep Mode

When IN1 and IN2 aren't low level at the same time, the MS3111S operates normally.

When IN1=IN2=0, the MS3111S enters sleep mode with low dissipation, and all internal necessary circuits stop working.

### Input Pin

The default state of input pin is low level with 100kΩ pull-down resistor.

In application, it is necessary to connect 0.1uF ceramic capacitor with VCC to ground, and as close to the chip as possible.

### Protection Circuit

#### Thermal Shutdown

When the junction temperature exceeds 160°C, the thermal shutdown circuit would be activated and all outputs would be off. When the temperature drops one hysteresis temperature 20°C and then reaches 140°C, all outputs recovery working.

However, thermal shutdown protection just acts when the junction temperature exceeds the default. Therefore it couldn't ensure the device against being destroyed.

Failure	Condition	H Bridge	Recovery
Thermal Shutdown	$T_j > 160^\circ\text{C}$	Off	$T_j < 140^\circ\text{C}$

### Operation Mode

The MS3111 enters sleep mode when IN1=IN2 are low level. In sleep mode, all H bridges are off and output high impedance. Meanwhile, the most circuits are disabled and then enter power save mode. When IN1 and IN2 aren't low level simultaneously, the device recovers normal operation automatically. The H bridge would also be off when the thermal shutdown protection detects failure.

Mode	Condition	H Bridge
Operation	IN1, IN2 $\neq$ 0 simultaneously	Operation
Sleep	IN1=IN2=0	Off
Failure	INX=X	Off

## TYPICAL APPLICATION DIAGRAM

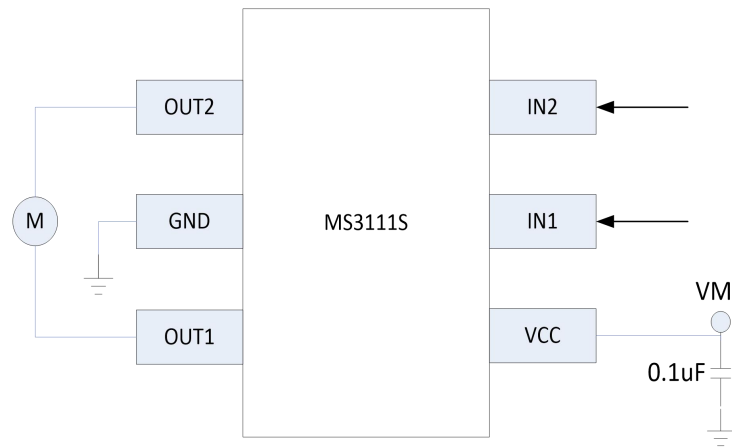
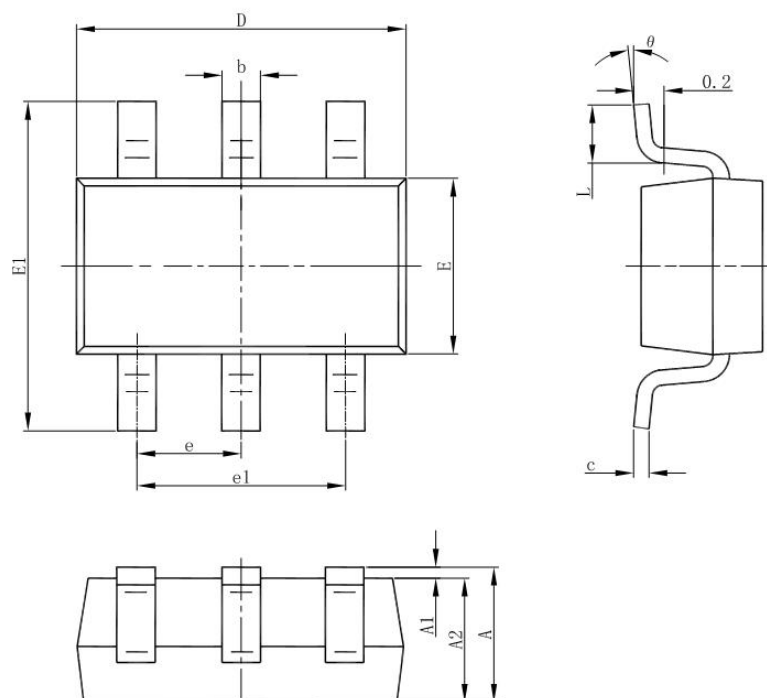


Figure 3. MS3111S Typical Application Diagram

- In any condition, the parameter can't exceed absolute maximum rating.
- The bypass capacitor of VCC, especially ceramic capacitor, should be as close to VCC pin as possible.
- It's necessary to isolate ground trays connected with motor in layout design.



**PACKAGE OUTLINE DIMENSIONS**
**SOT23-6L**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0	8	0	8

## MARKING and PACKAGING SPECIFICATIONS

### 1. Marking Drawing Description



Product Name : 3111S

Product Code : XXXXX

### 2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

### 3. Packaging Specifications

Device	Package	Piece/Tray	Tray/Box	Piece /Box	Box/Carton	Piece/Carton
MS3111S	SOT23-6	3000	10	30000	4	120000

**STATEMENT**

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- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

**MOS CIRCUIT OPERATION PRECAUTIONS**

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.



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