

## 12V H bridge driver IC

### DESCRIPTION

The MS8837 provides an integrated motor-driver, solution for cameras, consumer products, toys, and other low-voltage or battery-powered motion-control applications. The device has one H-bridge driver, and can drive one dc motor or one winding of a stepper motor, as well as other devices like solenoids. The output driver block consists of N-channel power MOSFETs configured as an H-bridge to drive the motor winding. An internal charge pump generates needed gate-drive voltages.

The MS8837 can supply up to 1 A of output current. It operates on a motor power-supply voltage from 1.8 V to 12 V, and a device power-supply voltage of 1.8 V to 7 V

The MS8837 has a PWM (IN/IN) input interface which is compatible with industry-standard devices. There are internal under voltage lockout protection and over temperature protection.

### FEATURES

- H-Bridge Motor Driver
  - Drives a DC Motor or One Winding of a Stepper Motor or Other Loads
  - Low MOSFET On-Resistance: HS + LS 520 m $\Omega$
- 1 A MAX Drive Current
- Separate Motor and Logic Supply Pins
  - motor supply VM: 1.8~12V
  - logic supply VCC: 1.8~7V
- PWM (IN/IN) Interface
- under voltage lockout protection and over temperature protection
- Low-Power Sleep Mode

### Package

Part Number	Package	Marking
MS8837	DFN2X2-8L(P0.50)	8837



### APPLICATIONS

- Cameras
- DSLR Lenses
- Consumer Products
- Toys
- Robotics
- Medical Devices

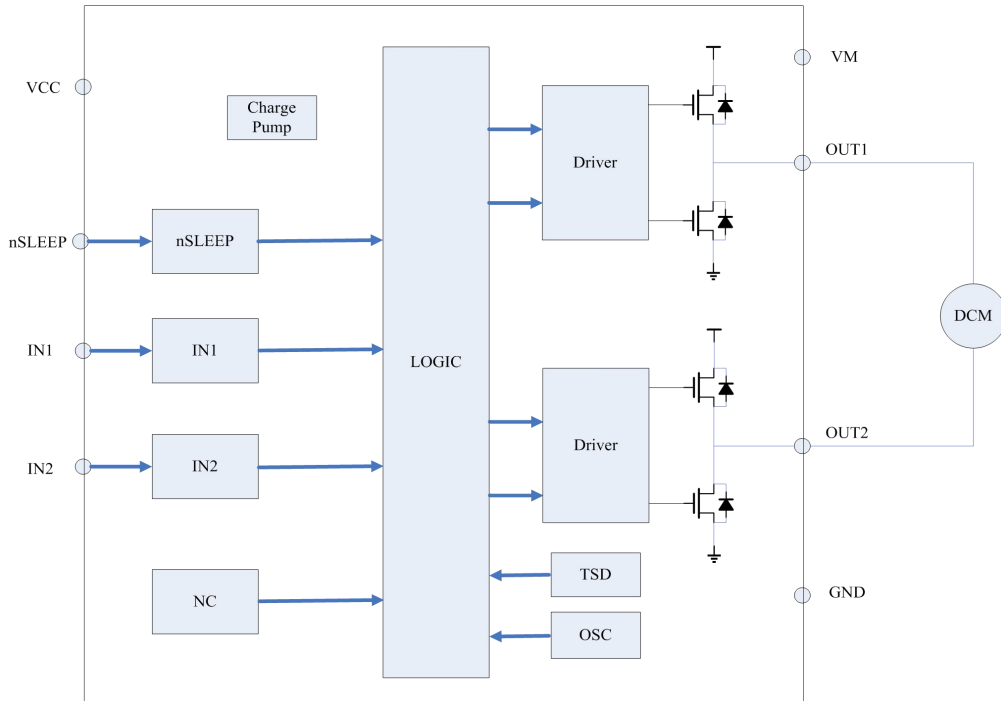
**FUNCTIONAL BLOCK DIAGRAM**


Figure 1 : MS8837 Functional block

**ABSOLUTE MAXIMUM RATINGS**

parameter	symbol	Range	Unit
Power supply voltage range	VM	-0.3~15	V
Power supply voltage range	VCC	-0.3~7	V
Digital pin voltage range	INX nSLEEP	-0.5~7	V
Peak motor drive output current	Imax	0~1.2	A
Operating virtual junction temperature range	Tjmax	-40~150	°C
Storage temperature range	Tstg	-60~150	°C
Junction-to-ambient thermal resistance	RθJA	73.57	°C/W

ELECTRICAL CHARACTERISTICS (unless otherwise noted, T=25°C, VCC=3V, VM=5V)

**RECOMMENDED OPERATING CONDITIONS:** (T=25°C, unless otherwise noted)

parameter	symbol	min	typical	max	unit
Motor power-supply voltage range	VM	0		12	V
Device power supply voltage range	VCC	2		7	V
H-bridge output current	I <sub>OUT</sub>	0		1	A
Device power supply voltage range	f <sub>PWM</sub>	0		250	KHZ
Logic-level input voltage	V <sub>logic</sub>	0		5.5	V
Working temperature range	T <sub>a</sub>	-40		85	°C

**ELECTRICAL CHARACTERISTICS:** (T=25°C, VCC=3V, VM=5V, unless otherwise noted)

parameter	symbol	TEST CONDITIONS	min	typical	max	unit
VM operating supply current1	I <sub>VM</sub>	VM=5V, VCC=3V, No PWM		82	140	uA
VM operating supply current2	I <sub>VMQ</sub>	VM=5V, VCC=3V, nSLEEP=0		20	95	nA
VCC supply voltage	VCC		1.6		7	V
VCC operating supply current1	I <sub>VCC</sub>	VM=5V, VCC=3V, 无 PWM		840	1000	uA
VCC operating supply current2	I <sub>VCCQ</sub>	VM=5V, VCC=3V, nSLEEP=0		5	25	nA
<b>H-Bridge FETs</b>						
HS + LS FET on-resistance	R <sub>dsON</sub>	VM=5V, VCC=3V, I <sub>o</sub> =800mA; T <sub>j</sub> =25		520	630	mΩ
Off-state leakage current	I <sub>OFF</sub>	V <sub>out</sub> =0V	-200		200	nA
<b>Logic-Level Inputs (IN1, IN2, nSLEEP)</b>						
Input low voltage	V <sub>IL</sub>		0.25*VCC	0.38*VCC		V
Input high voltage	V <sub>IH</sub>			0.46*VCC	0.6*VCC	V
Input hysteresis	V <sub>HY</sub>			0.08*VCC		mV
Input low current	I <sub>IL</sub>	V <sub>in</sub> =0	-5		5	uA
Input high current	I <sub>IH</sub>	V <sub>in</sub> =3.3V, pin INx			60	uA
		V <sub>in</sub> =3.3V, pin nsleep		47		uA
Pulldown resistance	R <sub>pd</sub>			70		kΩ
<b>Protection Circuits</b>						
Overcurrent protection trip level	TSD		130	150	180	°C
Thermal shutdown temperature	UVLO	VCC		1.6	1.7	V

**TIMING REQUIREMENTS**

TA = 25°C, VM = 5 V, VCC = 3 V, RL = 20 Ω

parameter	Test conditions	range		unit
		min	max	
T1	Output enable time		300	ns
T2	Output disable time		300	ns
T3	Delay time, INx high to OUTx high		160	ns
T4	Delay time, INx low to OUTx low		160	ns
T5	Output rise time	30	188	ns
T6	Output fall time	30	188	ns

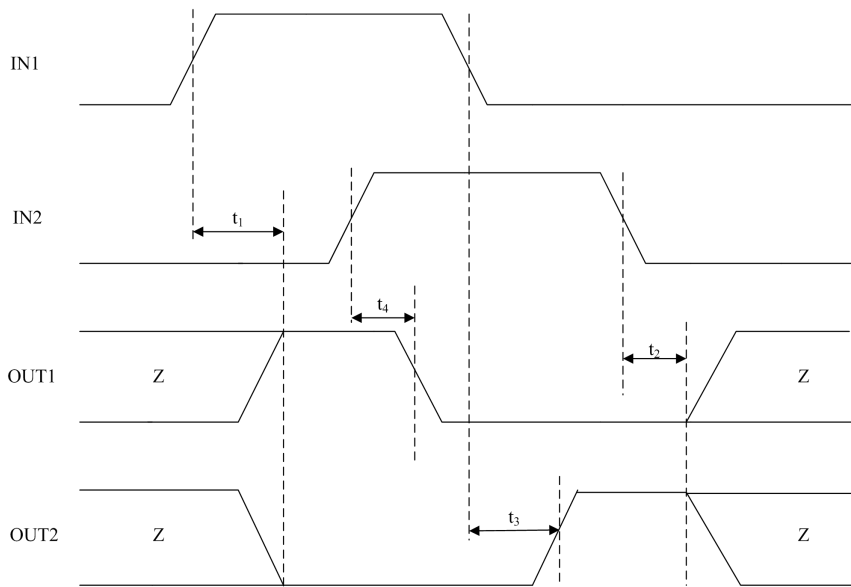


Figure 2 MS8837 Input/Output Timing1

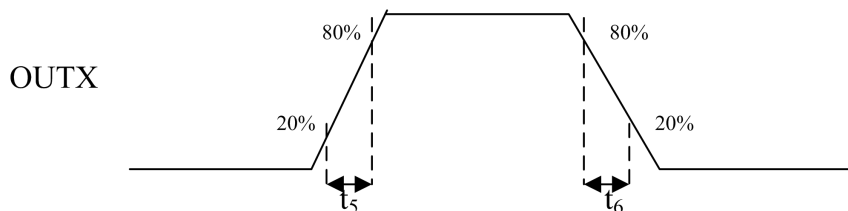
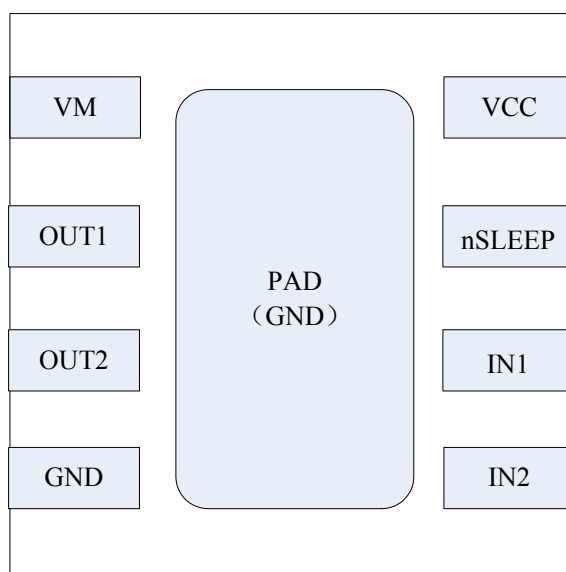


Figure 3 MS8837 Input/Output Timing2

## Pin diagram



## PIN DESCRIPTIONS

Pin Number	name	I/O	Pin Description
1	VM	I/O	Motor supply
2	OUT1	O	Output 1
3	OUT2	O	Output 2
4	GND	I/O	gnd
5	IN2	I	Input 2
6	IN1	I	Input 1
7	nSLEEP	I	Sleep mode input
8	VCC	I/O	Device supply

## Functional Description

### Bridge Control

The MS8837 is controlled using a PWM input interface , also called an IN/IN interface. Each output is controlled by a corresponding input pin.

The following table shows the logic for the MS8837:

nsleep	IN1	IN2	OUT1	OUT2	Functional
0	X	X	Z	Z	Sleep mode
1	0	0	Z	Z	Coast
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake

## Sleep Mode

If the nSLEEP pin is brought to a logic-low state, the MS8837 enters a low-power sleep mode. In this state, all unnecessary internal circuitry is powered down.

## Power Supplies and Input Pins

The input pins may be driven within their recommended operating conditions with or without the VCC and/or VM power supplies present. No leakage current path exists to the supply. There is a weak pulldown resistor (approximately 100 k $\Omega$ ) to ground on each input pin.

If the supply voltage is between 1.8 V and 7 V, VCC and VM may be connected together

## Protection Circuits

### (1) UNDERVOLTAGE LOCKOUT (UVLO)

If at any time the voltage on the VCC pin falls below the undervoltage lockout threshold voltage, all circuitry in the device is disabled and internal logic is reset. Operation resumes when VCC rises above the UVLO threshold.

### (2) THERMAL SHUTDOWN (TSD)

If the die temperature exceeds safe limits, all FETs in the H-bridge are disabled. Once the die temperature has fallen to a safe level, operation automatically resumes.

The MS8837 has thermal shutdown (TSD) as described in the Protection Circuits section. If the die temperature exceeds approximately 150 $^{\circ}$  C, the device is disabled until the temperature drops to a safe level.

Any tendency of the device to enter thermal shutdown is an indication of either excessive power dissipation, insufficient heatsinking, or too high an ambient temperature.

protection	conditions	Hbridge state	Resume conditions
UVLO	VCC<1.6V	disable	VCC>1.7V
TSD	Tj>150 $^{\circ}$ C	disable	Tj<135 $^{\circ}$ C

## Sleep Mode

If the nSLEEP pin is brought to a logic-low state, the MS8837 enters a low-power sleep mode. In this state, all unnecessary internal circuitry is powered down.

mode	nSLEEP	Hbridge state
Normal working	NSLEEP=1	enable
Sleeping model	NSLEEP=0	disable
UVLO or TSD	NSLEEP=0 or 1	disable

## Application circuit Example

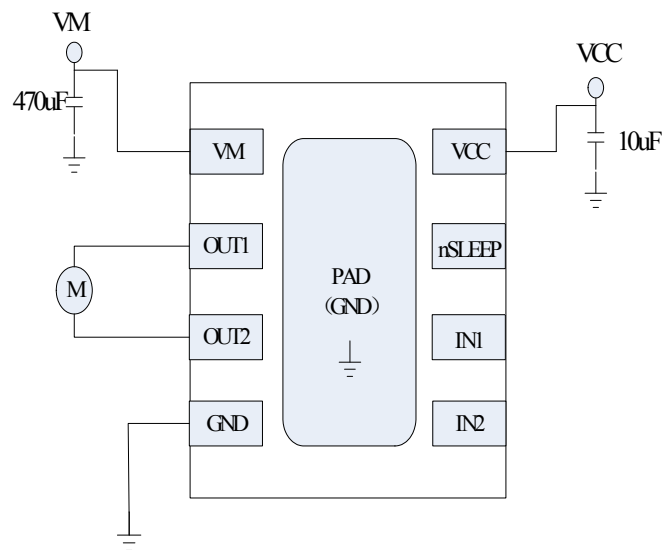


Figure 4 Application circuit Example

### Layout

The printed circuit board should use a heavy groundplane. For optimum electrical and thermal performance, the MS8837 must be soldered directly onto the board. On the underside of the MS8837 package is an exposed pad, which provides a path for enhanced thermal dissipation. The thermal pad should be soldered directly to an exposed surface on the PCB. Thermal vias are used to transfer heat to other layers of the PCB.

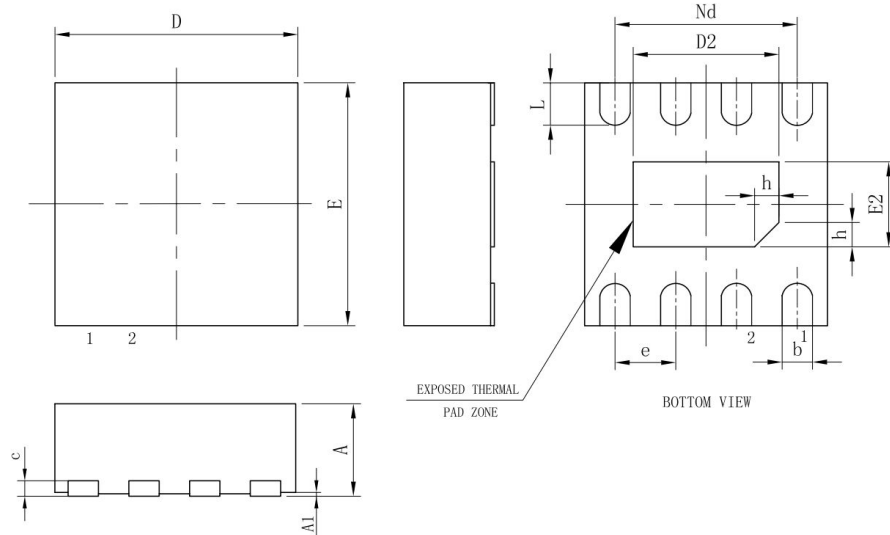
### Grounding

In order to minimize the effects of ground bounce and offset issues, it is important to have a low impedance singlepoint ground, known as a star ground, located very close to the device. By making the connection between the exposed thermal pad and the groundplane directly under the MS8837, that area becomes an ideal location for a star ground point. A low impedance ground will prevent ground bounce during high current operation and ensure that the supply voltage remains stable at the input terminal. The recommended PCB layout shown in the diagram below, illustrates how to create a star ground under the device, to serve both as low impedance ground point and thermal path.

## Package Information

DFN2X2-8L(P0.50)

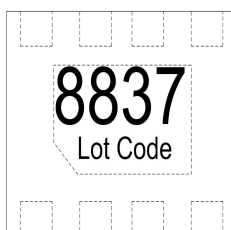
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	1.90	2.00	2.10
D2	1.10	1.20	1.30
e	0.50BSC		
Nd	1.50BSC		
E	1.90	2.00	2.10
E2	0.60	0.70	0.80
L	0.30	0.35	0.40
h	0.15	0.20	0.25
载体尺寸 (mil)	63X39		



## Marking drawing criterion

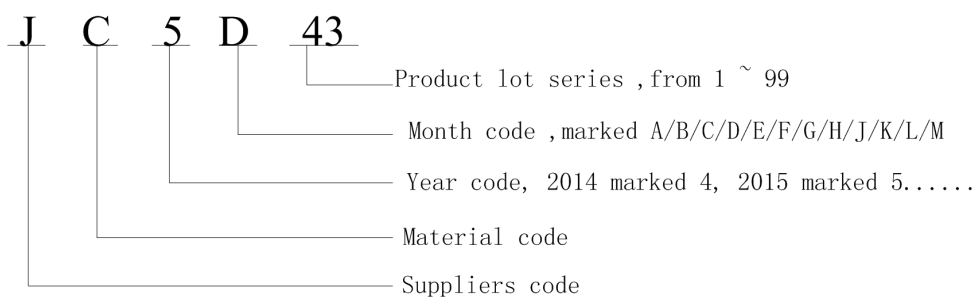


### 一、Marking drawing description

8837: product name

Product code

example: JC5D43



### 二、Marking drawing pattern

Laser printing, contents in the middle, font type Arial

### 三、Package pattern

product	Pieces/group	group/plate	pieces/plate	plate/box	piece/box
MS8837	3000	10	30000	4	120000