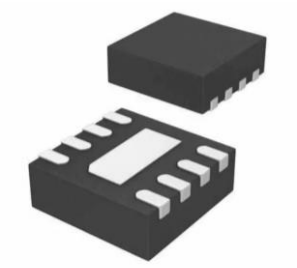
12V DC Motor Drive

PRODUCT DESCRIPTION

The MS8837 is a DC motor drive chip, which provides an integrated motor drive solution for cameras, consumer products, toys, another low-voltage or battery-powered motion-control applications. The output drive module consists of N-channel driver DMOS. And an internal charge pump generates needed gate voltages.

The MS8837 can supply up to 1.2A output current. It operates on a motor power supply from 1.8 V to 12 V and logic power supply from 2V to 7V.

The MS8837 has a PWM (IN/IN) input interface, which is compatible with industry-standard devices. And it is featured with functions such as undervoltage protection , thermal shutdown and so on.



DFN8

FEATURES

- H-bridge Motor Driver
  -- Drive DC Motors or Other Loads
  -- Low On-resistance (HS+LS)420mΩ
- 1.2A Drive Current
- Independent Power Supply
  --Motor Supply VM: 1.8 ~ 12V
  --Logic Supply VCC: 2 ~ 7V
- Interface Type
  PWM(IN1/IN2) Input Mode
- Thermal Shutdown Protection and Undervoltage Protection
- Low-Power Sleep Mode

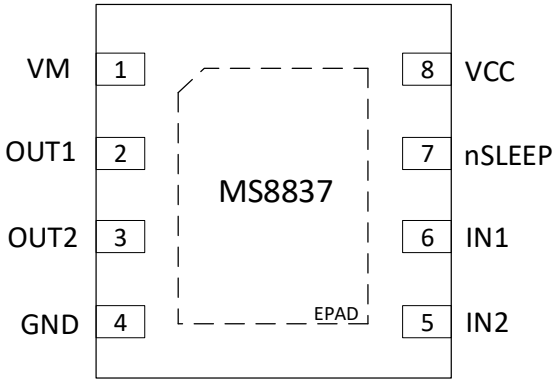
APPLICATIONS

- Cameras
- Digital Single-lens Reflex Camera(DSLR)
- Consumer Products
- Toys
- Robotics
- Medical Device

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS8837	DFN8	8837

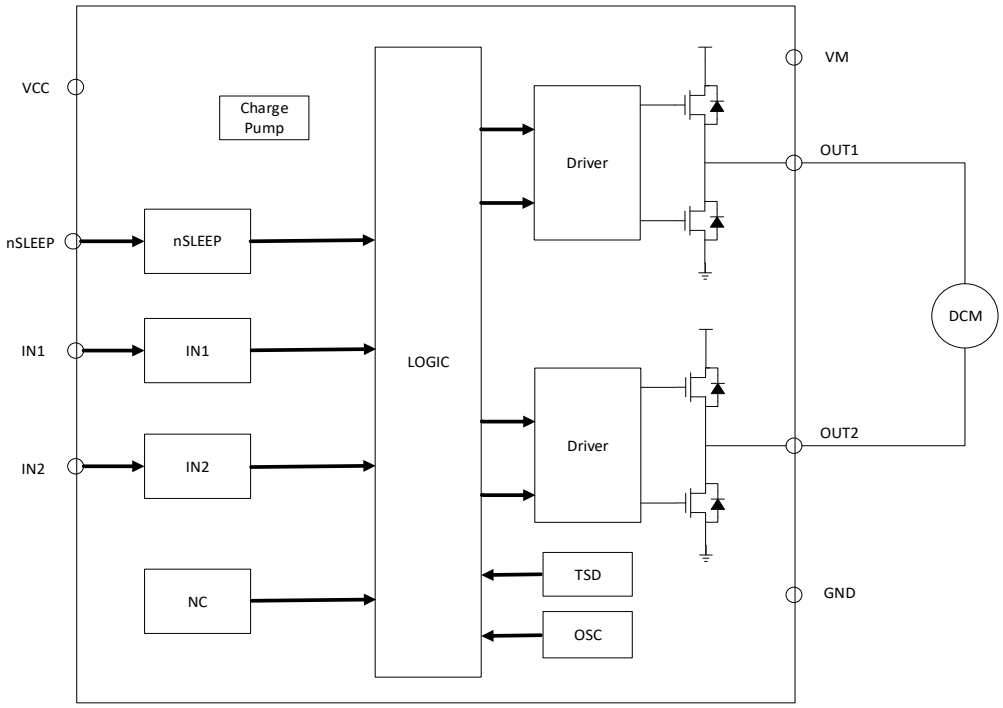
PIN CONFIGURATION



PIN DESCRIPTION

Pin	Name	Type	Description
1	VM	-	Motor Power Supply
2	OUT1	O	Output 1
3	OUT2	O	Output 2
4	GND	-	Ground
5	IN2	I	Input 2
6	IN1	I	Input 1
7	nSLEEP	I	Sleep Mode Input
8	VCC	-	Logic Power Supply
-	EPAD	-	Heat Sink, Connected to Ground

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.

Unless otherwise noted, T_A=25°C.

Parameter	Symbol	Range	Unit
Maximum Operating Voltage	V_M	-0.3 ~ 15	V
	V_{CC}	-0.3 ~ 7	V
Control Input Voltage Range	V_{INX}, V_{nSLEEP}	-0.5 ~ 7	V
Driver Peak Current	I_{MAX}	0 ~ 1.2	A
Junction Temperature	T_J	-40 ~ 150	°C
Storage Temperature	T_{STG}	-65 ~ 150	°C
Junction-to-ambient Thermal Resistance	$R_{\theta JA}$	73.57	°C/W

RECOMMENDED OPERATING CONDITIONS

Unless otherwise noted, T_A=25°C.

Parameter	Symbol	Min	Typ	Max	Unit
Motor Power Supply	V_M	1.8		12	V
Logic Power Supply	V_{CC}	2		7	V
Output Current	I_{OUT}	0		1.2	A
External PWM Frequency	f_{PWM}	0		250	kHz
Logic Input Voltage	V_{LOGIC}	0		5.5	V
Operating Temperature	T_A	-40		85	°C

ELECTRICAL CHARACTERISTICS

Unless otherwise noted, T_A=25°C, V_{CC}=3V, V_M=5V.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
VM Operating Voltage	V_M		1.8		12	V
VM Operating Current 1	I_{VM}	V_M=5V, V_{CC}=3V, No PWM		82	140	μA
VM Operating Current 2	I_{VMQ}	V_M=5V, V_{CC}=3V, nSLEEP=0, IN1=IN2=0		20	95	nA
VCC Operating Voltage	V_{CC}		1.6		7	V
VCC Operating Current 1	I_{VCC}	V_M=5V, V_{CC}=3V, No PWM		840	1000	μA
VCC Operating Current 2	I_{VCCQ}	V_M=5V, V_{CC}=3V, nSLEEP=0, IN1=IN2=0		5	25	nA
Output Module						
HS+LS FET On-resistance	R_{DSON}	V_M=5V, V_{CC}=3V, I_O=800mA; T_J=25°C		420	550	mΩ
Off-state Leakage Current	I_{OFF}	V_{OUT}=0V	-200		200	nA
Control Input Pins (IN1, IN2,nSLEEP)						
Logic Low-level Input Voltage	V_{IL}		0.25×V_{CC}	0.38×V_{CC}		V
Logic Low-level Input Voltage	V_{IH}			0.46×V_{CC}	0.6×V_{CC}	V
Logic Input Hysteresis	V_{HY}			0.08×V_{CC}		mV
Logic Low-level Input Current	I_{IL}	V_{IN}=0	-5		5	μA
Logic High-level Input Current	I_{IH}	V_{IN}=3.3V, INx Pin			60	μA
		V_{IN}=3.3V, nSLEEP Pin		47		μA
Protection Circuit						
Thermal Shutdown Protection	T_{TSD}		130	150	180	°C
Undervoltage Protection	V_{UVLO}	Logic Power Supply V_{CC}		1.6	1.7	V

Timing Requirement

T_A = 25°C, V_M = 5 V, V_{CC} = 3 V, R_L = 20 Ω

Parameter	Condition	Range		Unit
		Min	Max	
T1	Enable Time		300	ns
T2	Disable Time		300	ns
T3	Delay, Input High to Output High		160	ns
T4	Delay, Input Low to Output Low		160	ns
T5	Output Rising Time	30	188	ns
T6	Output Falling Time	30	188	ns

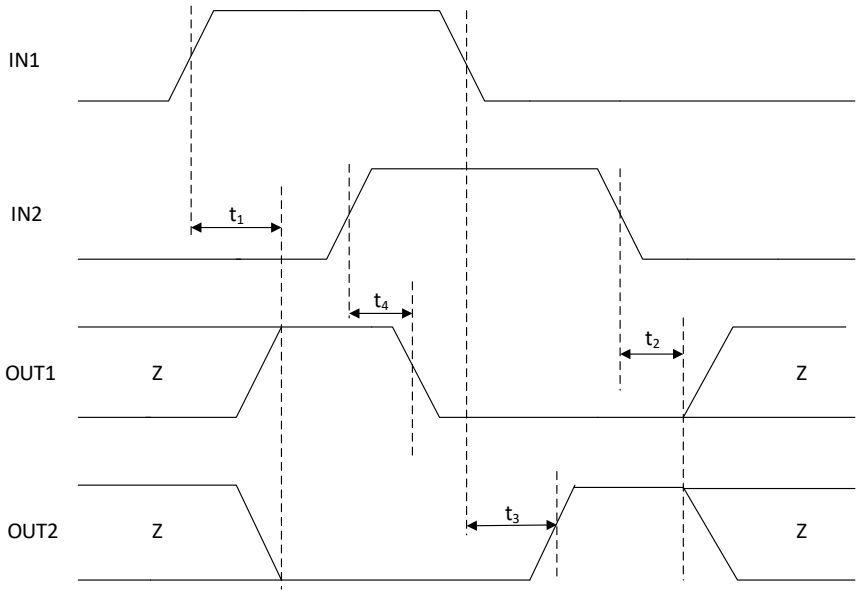


Figure 1. The MS8837 Input/Output Timing Parameter 1

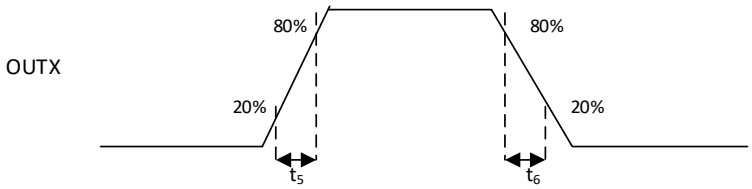


Figure 2. The MS8837 Input/Output Timing Parameter 2

Function Description

Bridge Control

The MS8837 is controlled by PWM input interface, which is also called the IN/IN input mode. The truth table is as follows:

nSLEEP	IN1	IN2	OUT1	OUT2	Function
0	X	X	Z	Z	Sleep Mode
1	0	0	Z	Z	Free Rotation
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake

Sleep Mode

When nSLEEP is high, the chip works normally.

When nSLEEP is low, the chip enters the low-power sleep mode, all necessary internal circuit is powered down. If IN1=IN2=0, the chip current is about 25nA; If IN1 or IN2 is high, V_{IN}/100k drive current is generated separately because of the 100kΩ pull-down resistor between the IN1 and IN2 pins. For example, 50μA current is generated by the 5V input.

Input Pin

The input pins work normally and are powered by VCC. There is no leakage current on the power supply path. A 100kΩ resistor is pulled down, which defaults to low-level input.

The 0.1μF ceramic capacitor should be connected to ground on the VM and VCC pins for applications and placed as close to the chip as possible.

There is no undervoltage protection for VM, only when V_{CC} is greater than 1.7V, the chip can operate. This means that VM can be lower than 0V. But the motor drive efficiency will be low in low VM.

Protection Circuits

（1）Undervoltage Protection

Threshold is set to 1.7V. Only when V_{CC} is lower than 1.6V, all H-bridge drive transistors are disabled. When V_{CC} exceeds 1.7V, operation will be reset.

（2）Thermal Shutdown Protection

When junction temperature exceeds 150°C, thermal shutdown protection will be active, and all output transistors are disabled. When hysteresis temperature recovers to 20°C, all output transistors resume operation. But, only when junction temperature exceeds the setting value, thermal shutdown protection will be active, which can not protect the product from being damaged.

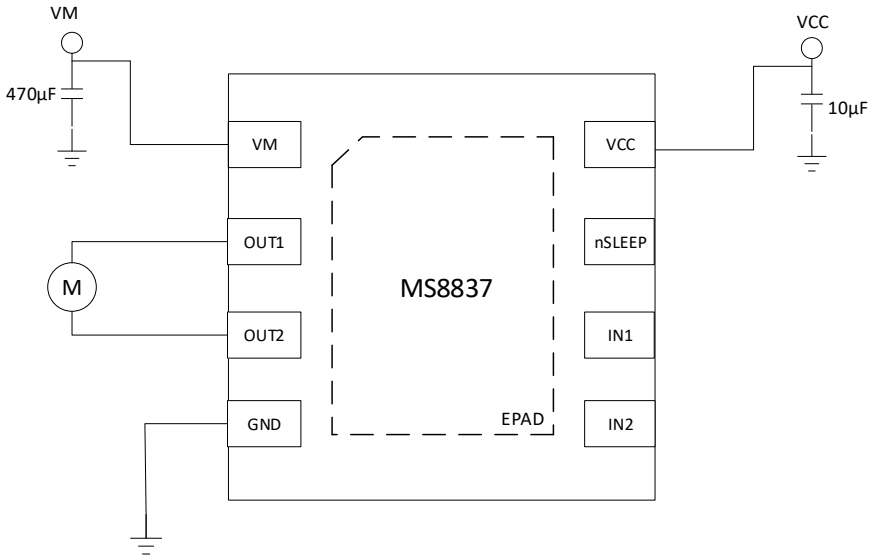
Protection	Conditions	H-bridge	Resume Conditions
UVLO	V_{CC}<1.6V	Disabled	V_{CC}>1.7V
Thermal Shutdown Protection	T_J>150°C	Disabled	T_J<135°C

Operation Modes

The MS8837 is in sleep mode when nSLEEP equals zero. In this mode, all H-bridges are disabled and outputs are in high-impedance state. When nSLEEP is high, normal operation is resumed automatically. When failure protection like thermal shutdown protection and undervoltage detection is active, H-bridge is also disabled.

Modes	Condition	H-bridge
Operation	nSLEEP=1	Enabled
Sleep Mode	nSLEEP=0	Disabled
Failure Detection	nSLEEP=0 or 1	Disabled

TYPICAL APPLICATION



1. Under any circumstances, the absolute ratings of the chip can not be exceeded;

2. VM with large flowing current as well as output pins should be as wide and short as possible in layout;

3. Bypass capacitor of VCC and VM, especially the connection for ceramic capacitor should be as close as possible to VCC and VM pins;

4. The ground wire connected with motor should be isolated in layout;

PACKAGE OUTLINE DIMENSIONS

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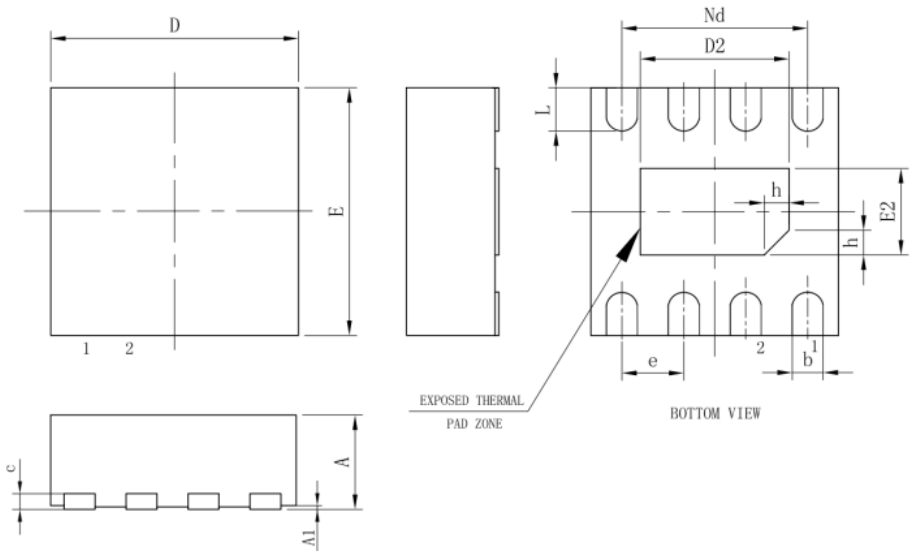
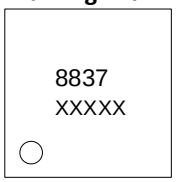


Symbol	Dimensions in Millimeters		
	Min	Typ	Max
A	0.70	0.75	0.80
A1	-	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	1.90	2.00	2.10
D2	1.10	1.20	1.30
e	0.50BSC		
Nd	1.50BSC		
E	1.90	2.00	2.10
E2	0.60	0.70	0.80
L	0.30	0.35	0.40
h	0.15	0.20	0.25

MARKING and PACKAGING SPECIFICATIONS

1. Marking Drawing Description



Product Name: 8837

Product Code: XXXXX

2. Marking Drawing Demand

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

3. Packaging Specification

Device	Package	Piece/Reel	Reel/Box	Piece/Box	Box/Carton	Piece/Carton
MS8837	DFN8	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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