

Four-channel, Low-voltage, 5V Full Bridge Driver

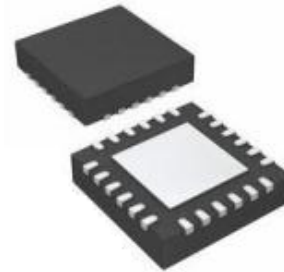
PRODUCT DESCRIPTION

The MS3114 is a 5V full bridge driver chip with four channels, which provides integrated motor driver solution for cameras, consumer products, toys and other low-voltage or battery-powered motion control applications.

The MS3114 can supply up to 0.8A output current and operate at the power supply voltage from 1.8V to 6V.

The MS3114 has the PWM (IN1/IN2) input interface, which is compatible with industry standard device and has over-temperature function.

The MS3114 has the power-saving mode.



QFN24

FEATURES

- Four-channel H Bridge Motor Driver
 - Drive DC Motor or Another Load
 - Low on-impedance (HS+LS)850mΩ
- 0.8A Maximum Drive Current
- Power Supply: 1.8 ~ 6V
- Interface Type: PWM (IN1/IN2) Input Mode
- Over-temperature Protection
- Power-saving Mode

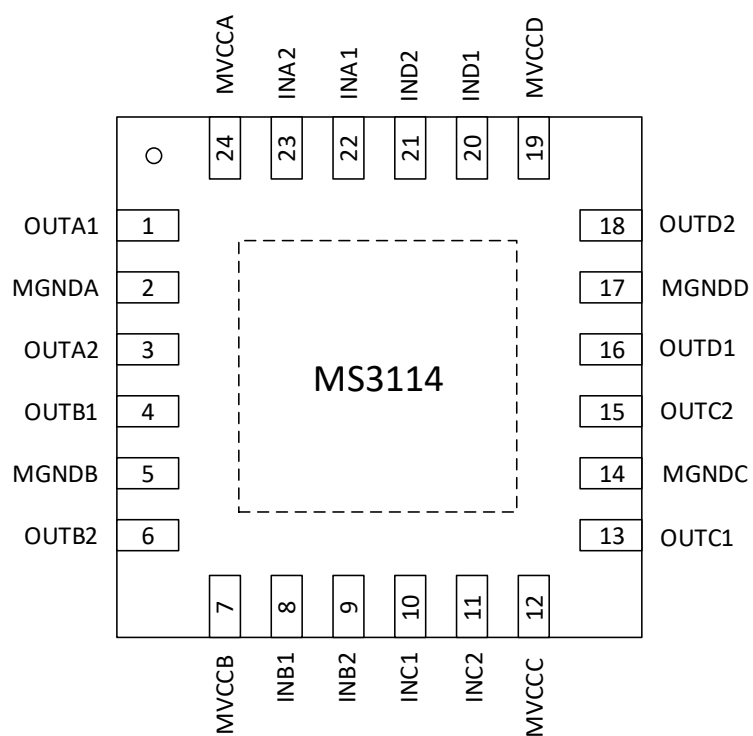
APPLICATIONS

- Camera
- Digital Single Lens Reflective (DSLR) Lens
- Consumer Products
- Toys
- Robot Technology
- Medical Device

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS3114	QFN24	MS3114

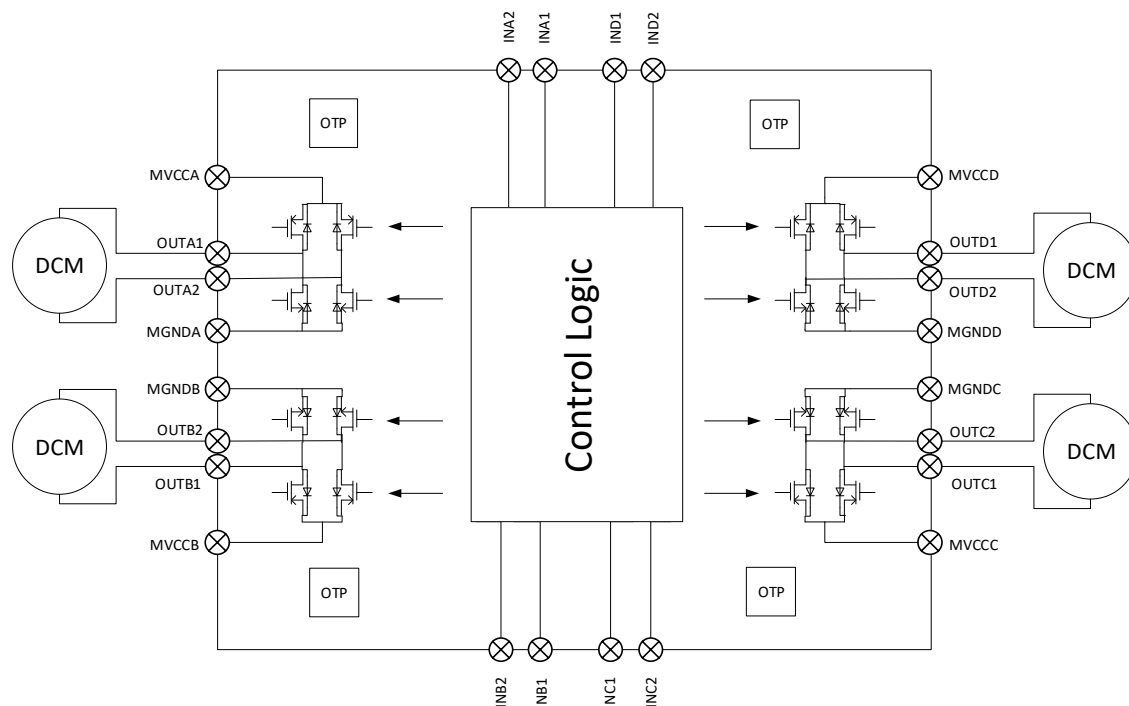
PIN CONFIGURATION



PIN DESCRIPTION

Pin	Name	Type	Description
22	INA1	I	Channel A Input Pin 1
23	INA2	I	Channel A Input Pin 2
24	MVCCA	-	Channel A Power Supply
1	OUTA1	IO	Channel A Output Pin 1
2	MGNDA	-	Channel A Ground
3	OUTA2	IO	Channel A Output Pin 2
4	OUTB1	IO	Channel B Output Pin 1
5	MGNDB	-	Channel B Ground
6	OUTB2	IO	Channel B Output Pin 2
7	MVCCB	-	Channel B Power Supply
8	INB1	I	Channel B Input Pin 1
9	INB2	I	Channel B Input Pin 2
10	INC1	I	Channel C Input Pin 1
11	INC2	I	Channel C Input Pin 2
12	MVCCC	-	Channel C Power Supply
13	OUTC1	IO	Channel C Output Pin 1
14	MGNDC	-	Channel C Ground
15	OUTC2	IO	Channel C Output Pin 2
16	OUTD1	IO	Channel D Output Pin 1
17	MGNDD	-	Channel D Ground
18	OUTD2	IO	Channel D Output Pin 2
19	MVCCD	-	Channel D Power Supply
20	IND1	I	Channel D Input Pin 1
21	IND2	I	Channel D Input Pin 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.

Unless otherwise noted, T=25°C.

Parameter	Symbol	Ratings	Unit
Maximum Power Supply	MVCCX	-0.3 ~ 6	V
Control Input Voltage Range	INxx	-0.5 ~ 6	V
Drive Peak Current	I _{Max}	0 ~ 1	A
Junction Temperature	T _{jMax}	-40 ~ 150	°C
Storage Temperature	T _{stg}	-60 ~ 150	°C
ESD(HBM)	ESD	±2500	V

RECOMMENDED OPERATING CONDITIONS

Unless otherwise noted, T=25°C

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power Supply	MVCCX		1.8		6	V
Output Current	I _{OUT}		0		0.8	A
External PWM Frequency	f _{PWM}		0		250	kHz
Logic Input Voltage	V _{logic}		0		6	V
Operating Temperature	T _A		-40		85	°C

ELECTRICAL CHARACTERISTICS

Electrical Characteristics

Unless otherwise noted, T=25°C, MVCCX=5V

Parameter	Symbol	Condition	Min	Typ	Max	Unit
MVCCX Operating Voltage	MVCCX		1.8	5	6	V
MVCCX Operating Current 1	I _{MVCCX}	MVCCX=5V, Without PWM		100	550	μA
MVCCX Operating Current 2	I _{MVCCX}	MVCCX=5V, INx1=INx2 Power- saving Mode, MVCCx Current		0.01	1	μA
Output Module						
Upper-side+Lower- side On-resistance	R _{dsON}	MVCCX=5V, I _o =500mA; T _j =25°C		850	1000	mΩ
Off-state Leakage Current	I _{OFF}	V _{OUT} =0V	-200		200	nA
Control Input Pins(IN1, IN2)						
Logic Low Input Voltage	V _{IL}		0.20×MVCCX	0.27×MVCCX		V
Logic High Input Voltage	V _{IH}			0.40×MVCCX	0.5×MVCCX	V
Input Logic Hysteresis	V _{HY}			0.13×MVCCX		mV
Logic Low Input Current	I _{IL}	V _{IN} =0	-5		5	μA
Logic High Input Current	I _{IH}	V _{IN} =3.3V			50	μA
Pull-down Resistor	R _{pd}			100		kΩ
Protection Circuit						
Over-temperature Protection	TSD		150	160	180	°C
Over-temperature Hysteresis	ΔTSD			20		°C

Timing Requirements

 $T_A=25^{\circ}\text{C}$, $MVCCX=5\text{V}$, $R_L=20\Omega$

Parameter	Condition	Ratings		Unit
		Min	Max	
T1	On-time		100	μs
T2	Off-time		300	ns
T3	Delay from Input High to Output High		160	ns
T4	Delay from Input Low to Output Low		160	ns
T5	Output Rising Edge	30	188	ns
T6	Output Falling Edge	30	188	ns

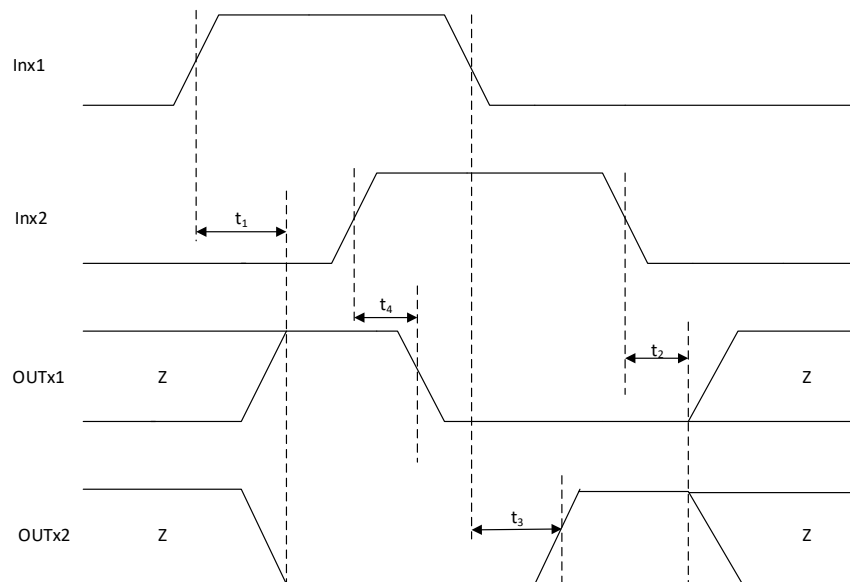


Figure 1. The MS3114 Input and Output Time Parameter 1

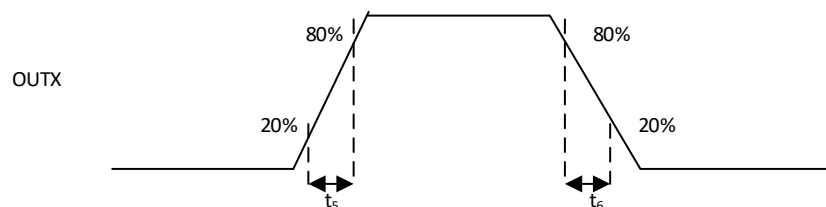


Figure 2. The MS3114 Input and Output Time Parameter 2

FUNCTION DESCRIPTION

Independent Channel

The four channels of the MS3114 are totally independent, such as INA1 and INA2 controlling OUTA1 and OUTA2. And each channel is equipped with low-voltage detection and over-temperature detection and any channel that is abnormal will be closed.

Bridge Control

The MS3114 is controlled by the PWM input interface, which is also called IN/IN input mode. Its control truth table is as follows:

INx1	INx2	OUTx1	OUTx2	Function
0	0	Z	Z	Freely-rotating
0	1	L	H	Reverse
1	0	H	L	Forward
1	1	L	L	Brake

Drive Stepper Motor

Taking AB Channel as an Example

Input State (0 is 'Low', 1 is 'High')				Output State ('H' Turn on the Upper-side Transistor, 'L' Turn on the Lower-side Transistor)				Function	
INA1	INA2	INB1	INB2	OUTA1	OUTA2	OUTB1	OUTB2	Full Step	1/2 Step
0	0	0	0	OFF	OFF	OFF	OFF	Sleep State	Sleep State
1	0	1	0	H	L	H	L	Step1	Step1
0	0	1	0	OFF	OFF	H	L	-	Step2
0	1	1	0	L	H	H	L	Step2	Step3
0	1	0	0	L	H	OFF	OFF	-	Step4
0	1	0	1	L	H	L	H	Step3	Step5
0	0	0	1	OFF	OFF	L	H	-	Step6
1	0	0	1	H	L	L	H	Step4	Step7
1	0	0	0	H	L	OFF	OFF	-	Step8

Power-saving Mode

When INx1=INx2='L', channel x output is turned off, motor rotates freely and drive part of channel x enters the power-saving mode to reduce power dissipation.

Input Pin

There is 100kΩ pull-down resistors inside the input pin, which are defaulted to low-level input.

In application, it is necessary to connect a 0.1μF ceramic capacitor to ground on the MVCCX pin and try to be close to the chip as much as possible.

Protection Circuit**Over-temperature Protection**

When the junction temperature exceeds 160°C, the over-temperature protection circuit is activated and the output transistor of this channel is off. When the temperature drops by a hysteresis temperature of 20°C, the output transistor resumes.

But over-temperature protection is only activated when the junction temperature exceeds the setting value, which can not ensure that the products with the circuit are not damaged.

Invalid	Condition	H Bridge	Recovery
Over-temperature Protection	$T_j > 160^{\circ}\text{C}$	Off	$T_j < 140^{\circ}\text{C}$

TYPICAL APPLICATION

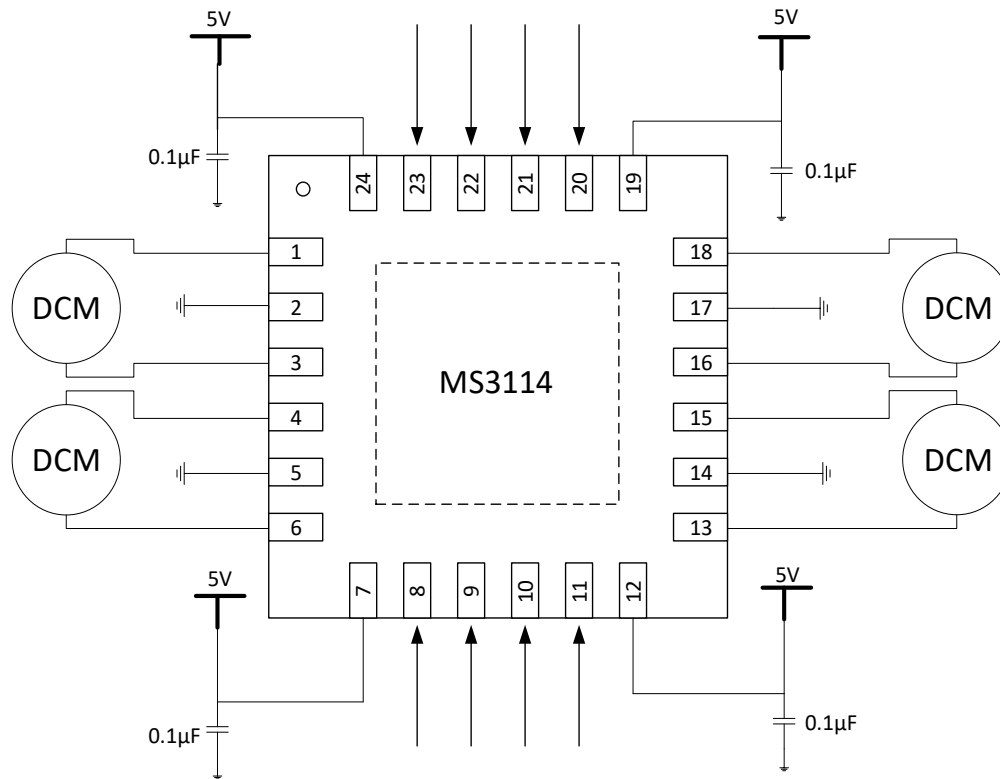
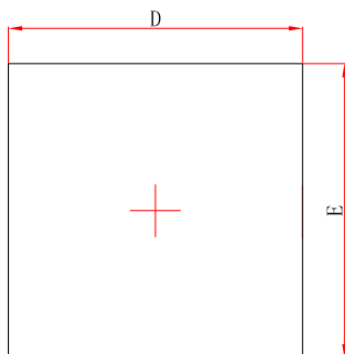


Figure 3. The MS3114 Typical Application Diagram

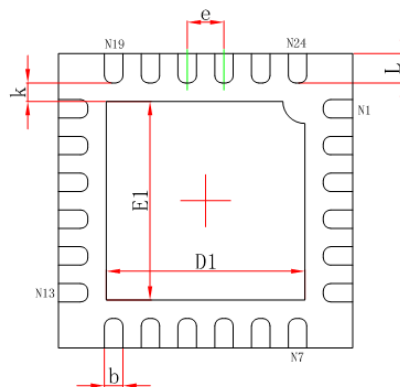
- Under no circumstances can the absolute parameters of the chip be exceeded.
- The bypass capacitor of the MVCCX, especially the connection of ceramic capacitors should be as close as possible to the MVCCX pin.
- The grounding wire connecting the motor needs to be isolated in the layout design.

PACKAGE OUTLINE DIMENSIONS

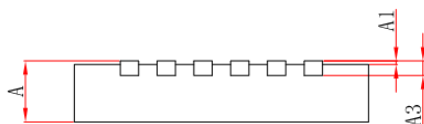
QFN24



Top View



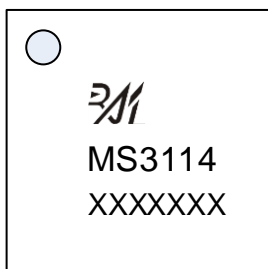
Bottom View



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF		0.008REF	
D	3.900	4.100	0.154	0.161
E	3.900	4.100	0.154	0.161
D1	2.600	2.800	0.102	0.110
E1	2.600	2.800	0.102	0.110
k	0.200MIN		0.008MIN	
b	0.180	0.300	0.007	0.012
e	0.500TYP		0.020TYP	
L	0.300	0.500	0.012	0.020

MARKING and PACKAGING SPECIFICATIONS

1. Marking Drawing Description



Product Name: MS3114

Product Code: XXXXXXX

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
MS3114	QFN24	2000	1	2000	8	16000

STATEMENT

- All Revision Rights of Datasheets Reserved for Ruimeng. Don't release additional notice.
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- When using Ruimeng products to design and produce, purchaser has the responsibility to observe safety standard and adopt corresponding precautions, in order to avoid personal injury and property loss caused by potential failure risk.
- 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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