

MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

MX1603-MS

Product specification

产品概述

MX1603-MS 是一款 DC 双向马达驱动电路，它适用玩具等类的电机驱动、自动阀门电机驱动、电磁门锁驱动等。它有两个逻辑输入端子用来控制电机前进、后退及制动。该电路具有良好的抗干扰性，微小的待机电流、低的输出内阻，同时，它还具有内置二极管能释放感性负载的反向冲击电流。

MX1603-MS 的封装形式是 SOP-8，符合 ROHS 规范，引脚框架 100%无铅。

特征

- 驱动一路有刷直流电机
- 微小的待机电流，小于 1uA
- 低 RDS (ON) 电阻
- 最大输出持续电流 5.0A
- 工作电压范围：3.0V-18V
- 有紧急停止功能
- 有过热保护功能
- 有过流嵌流及短路保护功能
- 封装：SOP-8

应用

- 电子锁
- 玩具
- 无线充电
- 机器人

包装和订单信息

产品编号	封装		管体标记	最小包装 (PCS)
MX1603-MS	SOP-8			4000

脚位定义

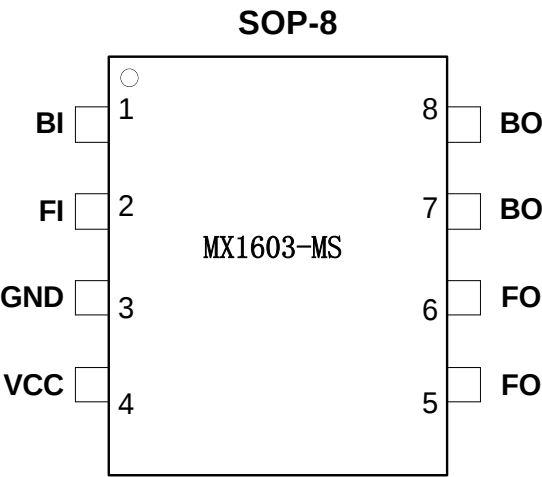


图 1. 顶视图

引脚名称	输入/输出	描述	引脚编号
BI	输入	后退输入	1
FI	输入	前进输入	2
GND	电源	地	3
VCC	电源	功率电源	4
FO	输出	前进输出	5,6
BO	输出	后退输出	7,8

绝对最大额定值

最大工作温度范围（除非另有说明）⁽¹⁾ ⁽²⁾

参数	符号	数值	单位
电源电压	VCC	20	V
输出持续电流	Iout	9.0	A
工作温度	Top	-25~+85	°C
储存温度	Tstg	-55~+150	°C

(1) 超出绝对最大额定值的范围可能对设备造成永久性损坏。这些只是等级强调。在那些任何其他超过建议条件下的芯片功能未说明。长时间暴露在绝对最大额定值的条件下可能影响芯片的可靠性。

(2) 所有电压值都对应接地端子。

(3) 基于 40mm² 单面 PCB，FR4 PCB（1 oz.）

推荐工作条件 ($T_A=25^{\circ}\text{C}$)

参数	符号	最小	典型	最大	单位
工作电压范围	VCC	3	-	18	V
输入信号电压 INH and INL	VINH	-0.3	-	18	V
输出持续电流	V_{OUT_X}	0	-	5.0*	A
逻辑输入频率	F_{IN_X}	-	-	30	KHz

*基于 40mm2 单面 PCB, FR4 PCB (1 oz.)

电特性参数

如无特殊规定, $T_A=25^{\circ}\text{C}$

参数	符号	条件	最小	典型	最大	单位
电源参数						
工作电压	Vopr		3.0	-	18	V
待机电流	I_{CCST}	VCC=12V, FI=BI=0V, no load	-	-	1	uA
静态电流	I_{CC}	VCC=12V, FI=BI=5V or FI=5V & BI=0V or FI=0V & BI=5V, no load	-	1.0	-	mA
PWM 电流	I_{CCPWM1}	VCC=12V, FI=5V, BI=50KHz, no load	-	2.5	-	mA
低压保护	UVLO	VCC rising	1.9	2.2	2.8	V
逻辑输入参数						
输入高电平	V_{INH}		2.2	-	-	V
输入低电平	V_{INL}		-	-	0.7	V
输入高电平时电流	I_{INH}	VCC = 12V, VIN = 5V	-	110	200	uA
输入低电平时电流	I_{INL}	VCC = 12V, VIN= 0V	-	-	1	uA
H-bridge FETs 参数						
	$R_{ds(on)}$	$I_{LOAD}=1A$, HS+LS	-	58	-	mΩ
	$R_{ds(on)}$	$I_{LOAD}=3A$, HS+LS	-	71	-	mΩ
过热温保护参数						
过热保护温度	T_{OTP}		-	160	-	°C
恢复工作温度	T_{SDR}		-	130	-	°C
过流保护参数						
过流保护电流	I_{OCP}		-	12	-	A

框图

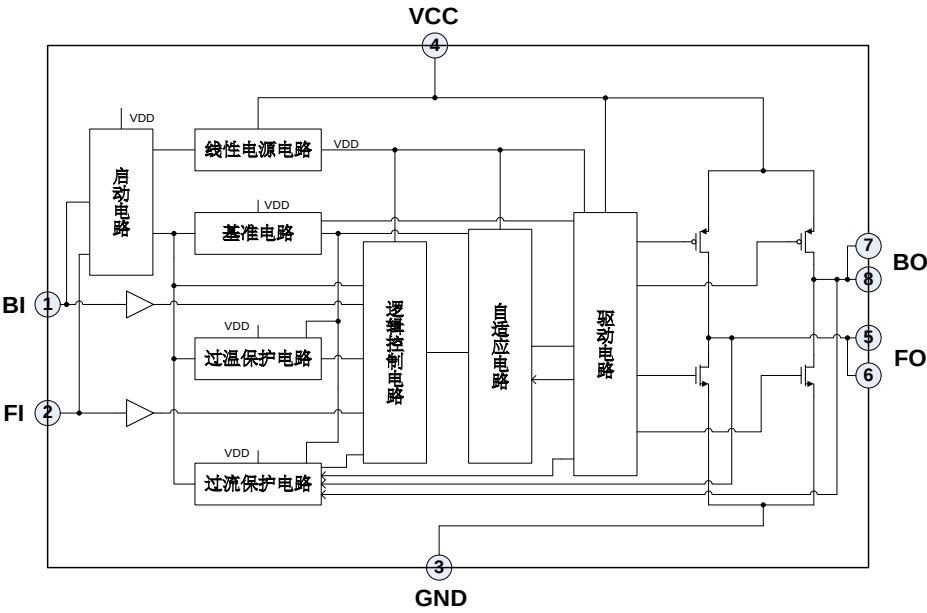


图 2. 主要模块框图

功能描述

输出真值表

FI	BI	FO	BO	状态
H	L	H	L	前进
L	H	L	H	后退
H	H	L	L	刹车
L	L	Open	Open	停止

输出时序图

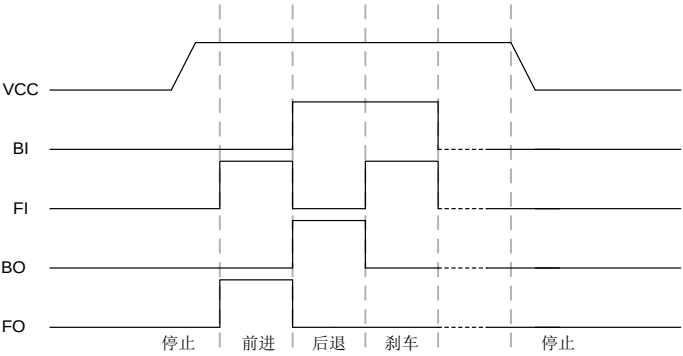


图 3. 输出时序图

应用电路

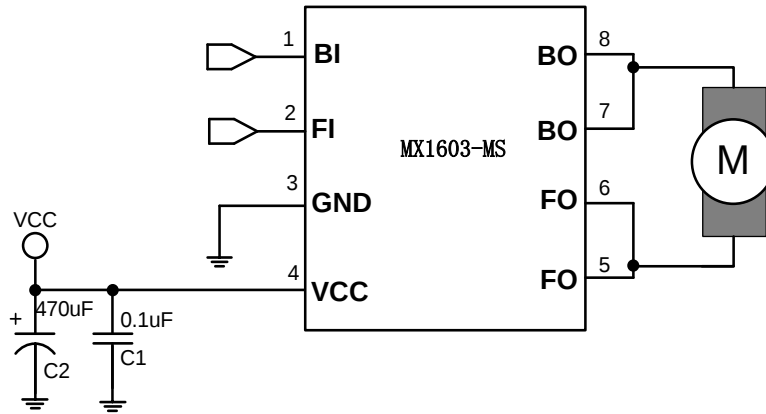


图 4. 应用原理图

应用电路说明

应用电路上的挂载组件，说明如下：

C1,C2 为 VCC 输入电容

- 1) 吸收马达向电源释放的能量，稳定电源电压，避免 IC 因突波电压过高而被直接击穿，且有滤波之功能。
- 2) 在马达启动的瞬间，能释放电流，帮助马达迅速启动。
- 3) VCC 输入电容 C2 的选择需依照 VCC 的电压稳定性及马达负载电流大小去选择电容，如果 VCC 的电压纹波较大或是马达负载电流较大，则须选择更大的电容值。
- 4) 在 PCB 配置上 C1,C2 电容需要尽量靠近 VCC。

BI,FI 输入端建议悬空，避免高温时，由于 IC 本体 P/N 接面间存在微弱漏电流，该漏电流流过下拉电阻会导致悬空引脚的输入电位由低电位变高电位，造成电路输出错误的信号。

工作模式说明

基本工作模式

a) 前进模式

前进模式定义：BI=L, FI=H, 此时 BO=L, FO=H

b) 后退模式

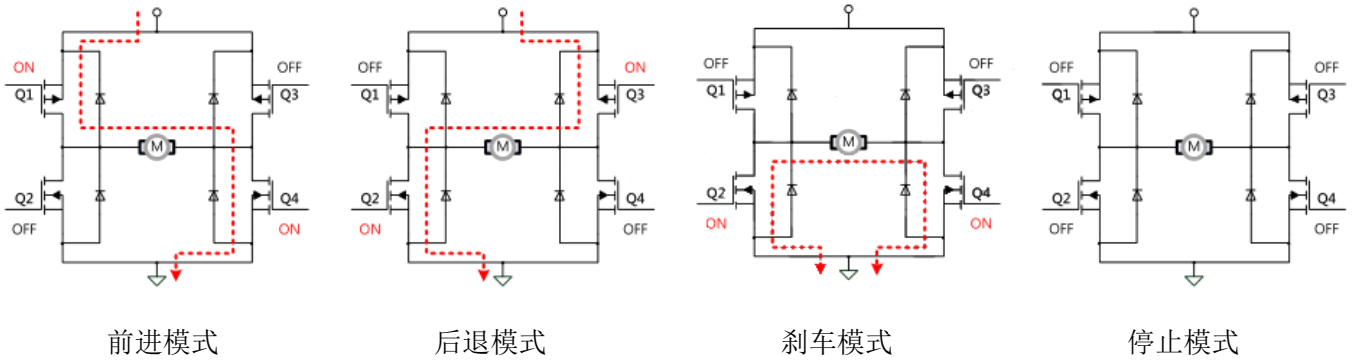
后退模式定义：BI=H, FI=L, 此时 BO=H, FO=L

c) 刹车模式

刹车模式定义：BI=H, FI=H, 此时 BO=L, FO=L

d) 停止模式

停止模式定义：BI=L, FI=L, 此时 BO=Open, FO=Open



保护机制说明

- 1) 使用此 IC 时，当 IC 温度超过 150℃（典型值），此是内置设计的 IC 过热保护电路会强制关闭部分驱动 MOS 晶体管，确保客户产品的安全。当 IC 温度降至 120℃（典型值）是，IC 会迅速自动恢复开始工作。

上电时序

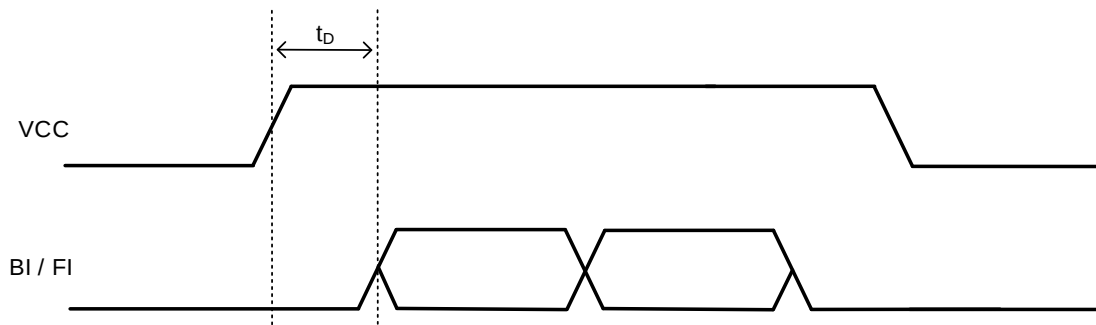


图 5. 上电时序图

如图 5，在 VCC 上电之前，BI / FI 必须保持低电平或无输入高阻状态，不能对 BI / FI 输入高电平，直到 VCC 上电并延时 3ms (t_D) 后，才能对 BI / FI 进行逻辑控制；

输入控制时序

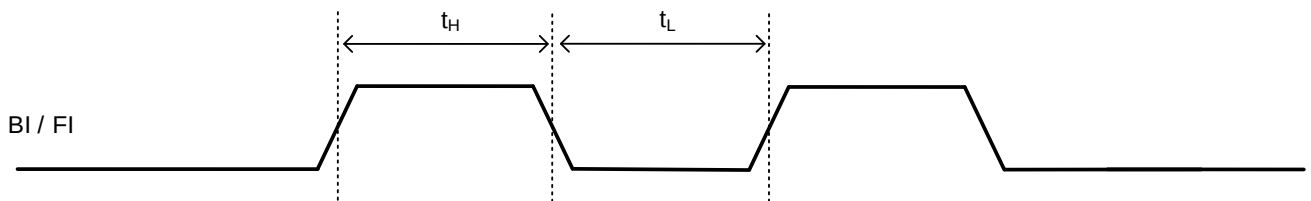
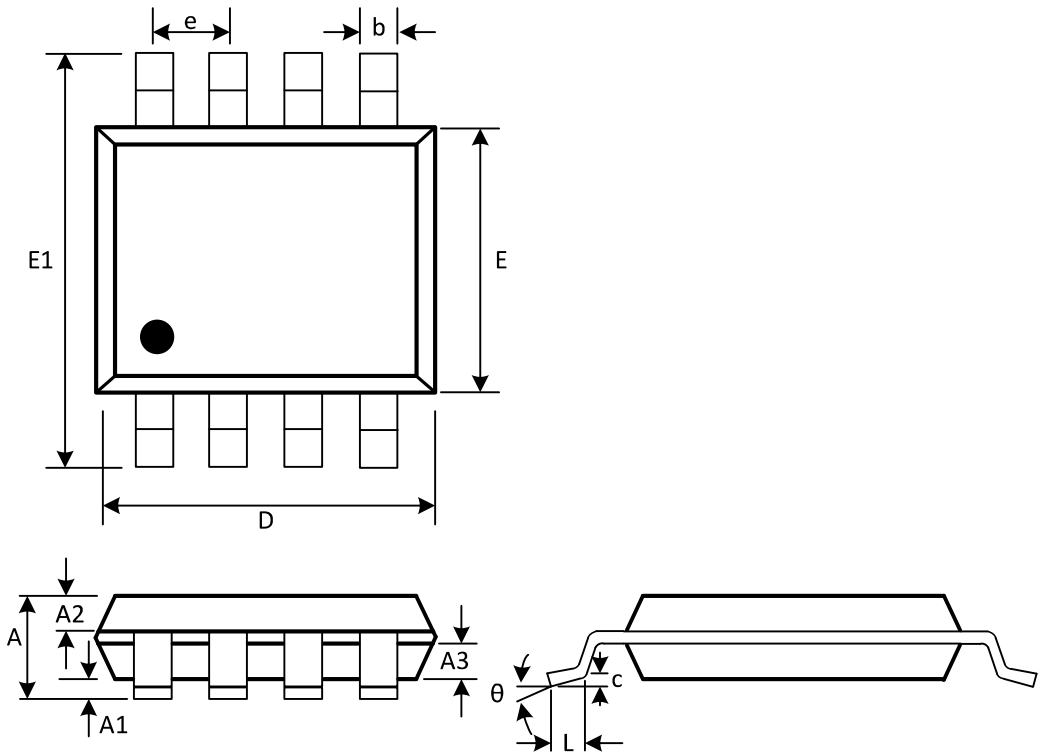


图 6. 上电时序图

如图 6，输入控制脚 BI / FI 的频率不能超过 30kHz, $t_H + t_L > 33\mu s$ 。同时需要注意， t_H 和 t_L 都不能小于 100ns

SOP-8



(Unit: mm)

Symbol	Min	Max
A	1.300	1.600
A1	0.050	0.200
A2	0.550	0.650
A3	0.550	0.650
b	0.356	0.456
c	0.203	0.233
D	4.800	5.000
e	1.270(BSC)	
E	3.800	4.000
E1	5.800	6.200
L	0.400	0.800
θ	0°	8°

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