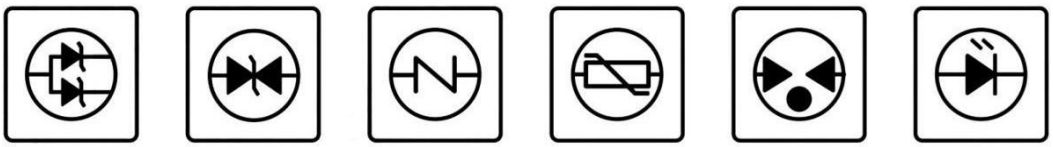
MSKSEMI 美森科
SEMICONDUCTOR



MS4950ELJTR-T

产品手册

产品简介

MS4950ELJTR-T是一款全桥DMOS有刷电机驱动芯片，最大工作范围可以达±3.5A和40V输入电压，用PWM来控制马达驱动的速度和方向。如果将两个输入均置为低电平，则电机驱动器将进入低功耗休眠模式。
MS4950ELJTR-T集成电流限制功能，该功能基于模拟输入VREF以及ISEN引脚的电压。该器件能够将电流限制在某一已知水平，这可显著降低系统功耗要求，并且无需大容量电容来维持稳定电压，尤其是在电机启动和停转时。
内部关断功能包含过流保护、短路保护、欠压锁定和过温保护。
MS4950ELJTR-T提供一种带有裸露焊盘的SOP-8封装，能有效改善 散热性能，且是无铅产品，引脚框采用100%无锡电镀。

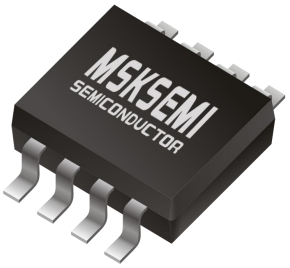
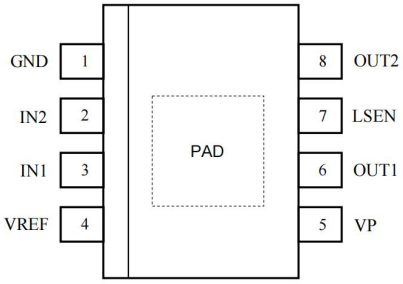
产品特点

- 宽电压供电， 6.5V-40V
- RDS(ON) 电阻为 600mΩ
- 3.5A 峰值驱动输出， 2A 持续输出能力
- 支持欠压锁定保护
- 低功耗休眠模式
- PWM 电流整流/限流/调向
- 支持短路保护
- 支持过温关断电路
- 自动故障恢复

产品用途

- 打印机及办公自动化设备
- 电器
- 机器人
- 工业设备

参考信息

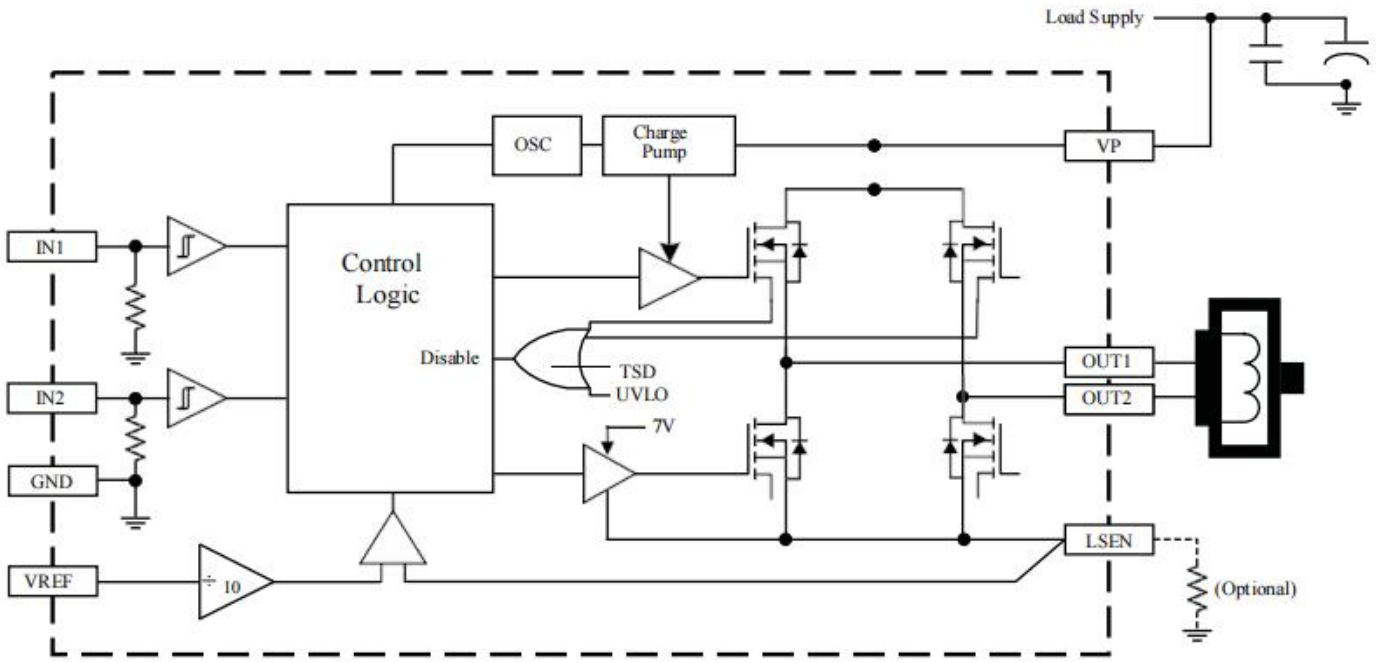
封装	管脚定义	丝印
 SOIC-8-EP		MSKSEMI A4950T

管脚定义

Number	Name	Function
1	GND	地
2	IN2	逻辑输入 2
3	IN1	逻辑输入 1
4	VREF	模拟输入
5	VP	功率电源
6	OUT1	DMOS 全桥输出 1
7	LSEN	检测电阻连接
8	OUT2	DMOS 全桥输出 2
_	PAD	散热 pad

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功能框图


Load Supply
OSC
Charge Pump
VP
IN1
IN2
GND
VREF
Control Logic
Disable
TSD
UVLO
7V
OUT1
OUT2
LSEN
÷ 10
(Optional)

极限参数

Characteristic	Symbol	Notes	Rating	Unit
功率电源	VP		40	V
逻辑输入	V_{IN}		–0.3 ~ 6	V
V_{LSEN} 输入范围	V_{LSEN}		–0.3 ~ 6	V
Sense Voltage (LSEN pin)	V_{LSEN}		–0.5 ~ 0.5	V
输出电流	I_{OUT}	Duty cycle = 100%	3.5	A
工作温度	T_A	Temperature Range E	–40 ~ 85	°C
最大结温	T_J(max)		150	°C
储藏温度	T_{stg}		–55 ~ 150	°C

电特性参数

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
General						
Load Supply Voltage Range	VP		6.5	_	40	V
$R_{DS(on)}$ Sink + Source Total	$R_{DS(on)}$	I_{OUT} = | 1 A|, T_J = 25°C	_	0.6	0.8	Ω
		I_{OUT} = | 1 A|, T_J = 150°C	_	1	1.4	Ω
Load Supply Current	I_{VP}	f_{PWM} < 30 kHz	_	5	20	mA
		Low Power Standby mode	_	_	10	µA
Body Diode Forward Voltage	V_f	Source diode, I_f = –2.5 A	_	_	1.5	V
		Sink diode, I_f = 2.5 A	_	_	1.5	V
Logic Inputs						
Logic Input Voltage Range	$V_{IN(1)}$		2.0	_	_	V
	$V_{IN(0)}$		_	_	0.8	V
	$V_{IN(STANDBY)}$	Low Power Standby mode	_	_	0.4	V
Logic Input Current	$I_{IN(1)}$	V_{IN} = 2.0 V	_	40	100	µA
	$I_{IN(0)}$	V_{IN} = 0.8 V	_	16	40	µA
Logic Input Pull-Down Resistance	$R_{LOGIC(PD)}$	V_{IN} = 0 V = IN1 = IN2	_	50	_	kΩ
Timing						
Crossover Delay	$_{COD}$		50	_	500	ns
VREF Input Voltage Range	V_{REF}		0	_	5	V
Current Gain	A_V	V_{REF} / I_{SEN} , V_{REF} = 5 V	9.5	_	10.5	V/V
Blank Time	$_{BLANK}$		2	3		µs
Constant Off-time	t_{off}		16	25	34	µs
Standby Timer	t_{st}	IN1 = IN2 < $V_{IN(STANDBY)}$	_	1	1.5	ms
Power-Up Delay	$_{pu}$		_	_	30	µs
Protection Circuits						
UVLO Enable Threshold	V_{UVLO}	V_p increasing	7	7.4	7.8	V
UVLO Hysteresis	$V_{UVLOhys}$		_	300	_	mV
Thermal Shutdown Temperature	T_{JTSD}	Temperature increasing	_	160	_	°C
Thermal Shutdown Hysteresis	T_{TSDhys}	Recovery = T_{JTSD} – T_{TSDhys}	_	15		°C

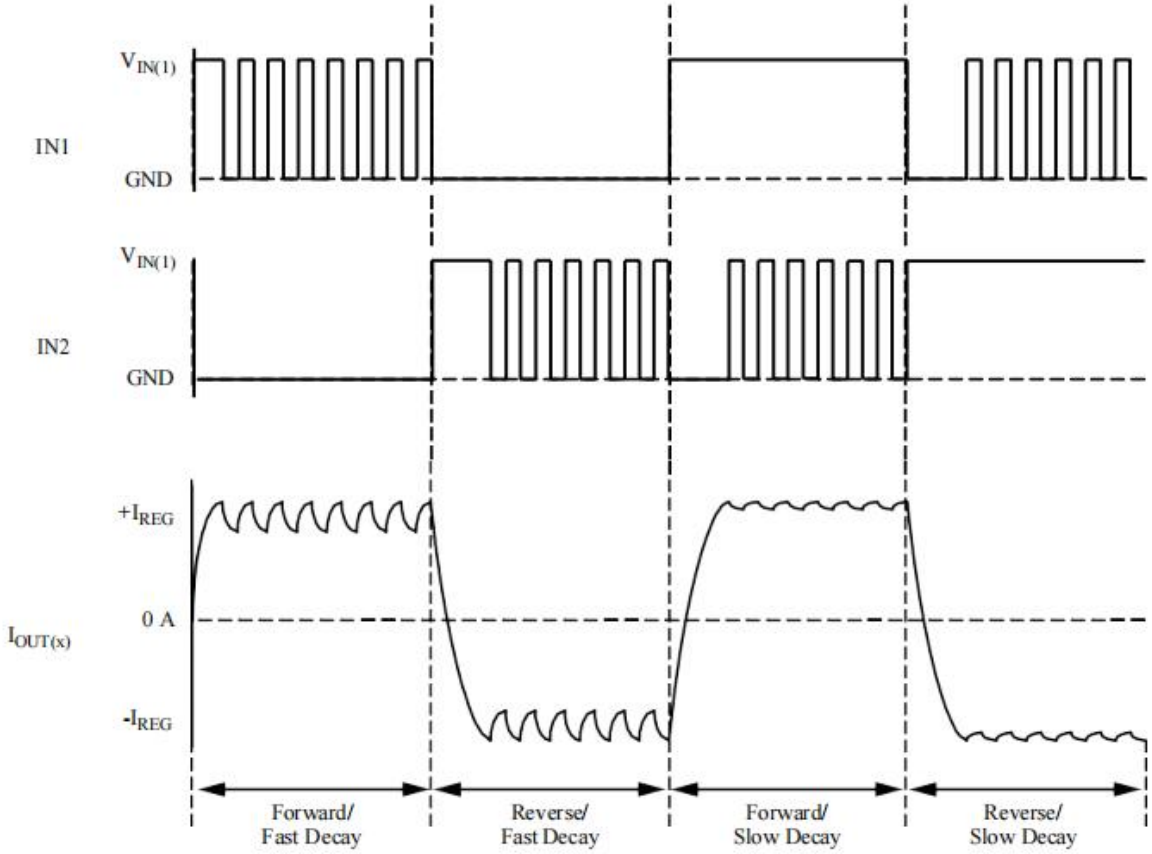
模块功能描述

MS4950ELJTR-T是一款有刷直流电机驱动器，VP单电源供电， 内置电荷泵。两个逻辑输入控制H桥驱动器，该驱动器由四个N-MOS组成，能够以高达3.5A的峰值电流双向控制电机。该芯片利用电流衰减预置最大输出电流，能够将电流限制在某一已知水平。如果将两个输入均置为低电平，则电机驱动器将进入低功耗休眠模式。内部关断功能包含过流保护、短路保护、欠压锁定和过温保护。

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Characteristic Performance

PWM Control Timing Diagram



PWM Control Truth Table

IN1	IN2	$10\times V_S > V_{REF}$	OUT1	OUT2	Function
0	1	False	L	H	Reverse
1	0	False	H	L	Forward
0	1	True	H/L	L	Chop (mixed decay), reverse
1	0	True	L	H/L	Chop (mixed decay), forward
1	1	False	L	L	Brake (slow decay)
0	0	False	Z	Z	Coast, enters Low Power Standby mode after 1 ms

Note: Z indicates high impedance.

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CurrentControl

通过固定频率的 PWM 电流整流器，流过电机驱动桥臂的电流是被限制的或者是被控制的。在 DC 电机应用中，电流控制功能作用于限制开启电流和停转电流。

当一个H桥被使能，流过相应桥臂的电流以一个斜率上升，此斜率由直流电压VP和电机的电感特性决定。当电流达到设定的阈值，驱动器会关闭此电流，直到下一个PWM循环开始。注意，在电流被使能的那一刻，LSEN管脚上的电压是被忽略的，经过一个固定时间后，电流检测电路才被使能。这个消隐时间一般固定在2μs。这个消隐时间同时决定了在操作电流衰减时的最小PWM时间。PWM目标电流是由比较器比较连接在LSEN管脚上的电流检测电阻上的电压乘以一个10倍因子和一个参考电压决定。参考电压通过VREF输入。以下公式为100%计算目标电流：

$$I_{\mathrm{Trip}}(\mathrm{A}) = \frac{V_{\mathrm{REF}}(\mathrm{V})}{A_{\mathrm{V}} \times R_{\mathrm{LSEN}}(\Omega)} = \frac{V_{\mathrm{REF}}(\mathrm{V})}{10 \times R_{\mathrm{LSEN}}(\Omega)}$$

电流衰减时序

当电流达到I_{Trip}，H 桥的两个下管打开， 维持一个t_{off} 时间(25μs)， 然后相应上管再打开。

DEAD TIME

当输出由高电平转变成低电平，或者由低电平转变为高电平，死区时间的存在是为了防止上下管同时导通。死区时间内，输出是一 个高阻态。当需要在输出上测量死区时间，需要根据相应管脚当时的电流方向来测量。如果电流是流出此管脚，此时输出端电压是低于 地电平一个二极管压降；如果电流是流入此管脚， 此时输出端电压是高于电源电压VP 一个二极管压降。

休眠模式

当IN1、IN2 都为低维持 1ms 以上，器件将进入休眠模式，从而大大降低器件空闲的功耗。进入休眠模式后，器件的H 桥被禁止， 电 荷泵电路停止工作。在 VP 上电时候，如果 IN1、IN2 都为低，芯片是立马进去休眠模式。当 IN1 或 IN2 翻转为高电平且至少维持 5μs ， 经过延迟约 50μs，芯片恢复到正常的操作状。

保护电路

MS4950ELJTR-T 有过流保护，过温保护和欠压保护。

过流保护

芯片内置电流监测以保护芯片不被烧坏。如果输出短路到 VP 或 GND，芯片会输出高阻态并关断输出。这种锁存状态只能通过芯片重新 上电来消除。在过流保护过程中，允许芯片超出最大工作条件一段时间后才会触发锁存。

过温保护 (TSD)

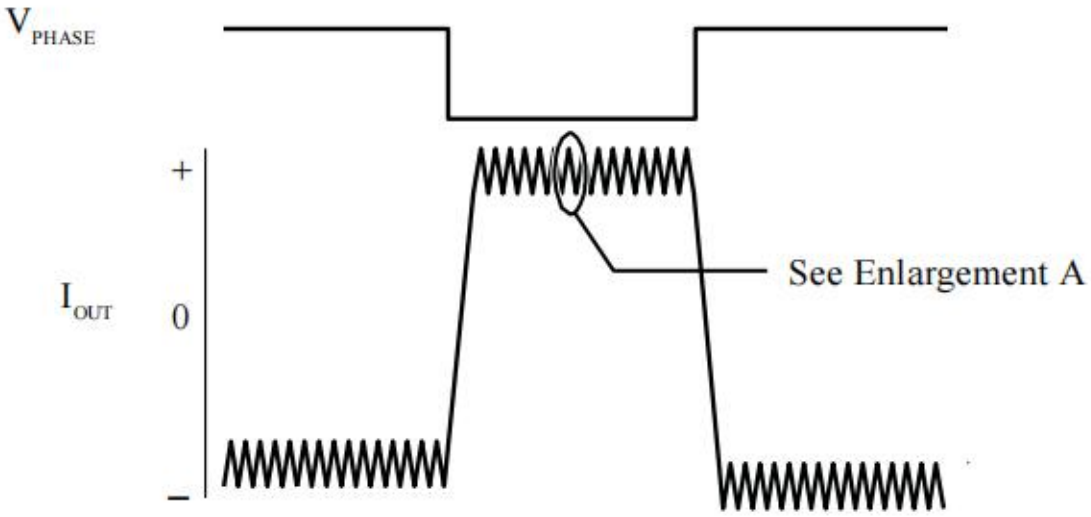
如果结温超过安全限制阈值， H 桥的 FET 被禁止。一旦结温降到一个安全水平，所有操作会自动恢复正常。

欠压锁定保护(UVLO)

在任何时候，如果 VP 管脚上的电压降到低于欠压锁定阈值，内部所有电路会被禁止，内部所有复位。当 VP 上的电压上升到 UVLO 以上，所有功能自动恢复。

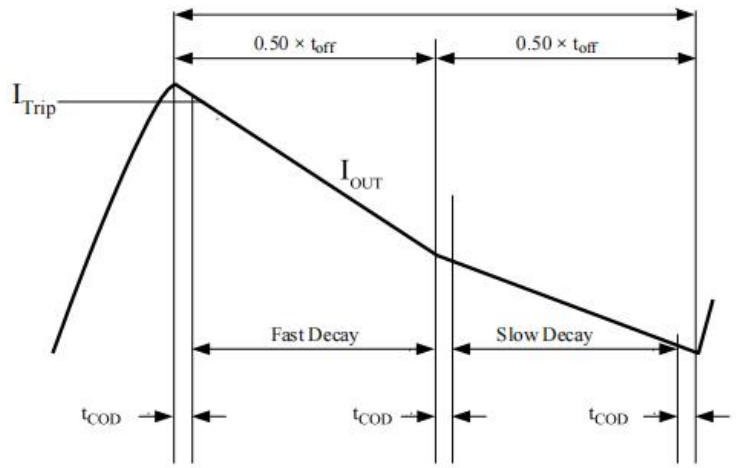
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Mixed Decay 运行模式



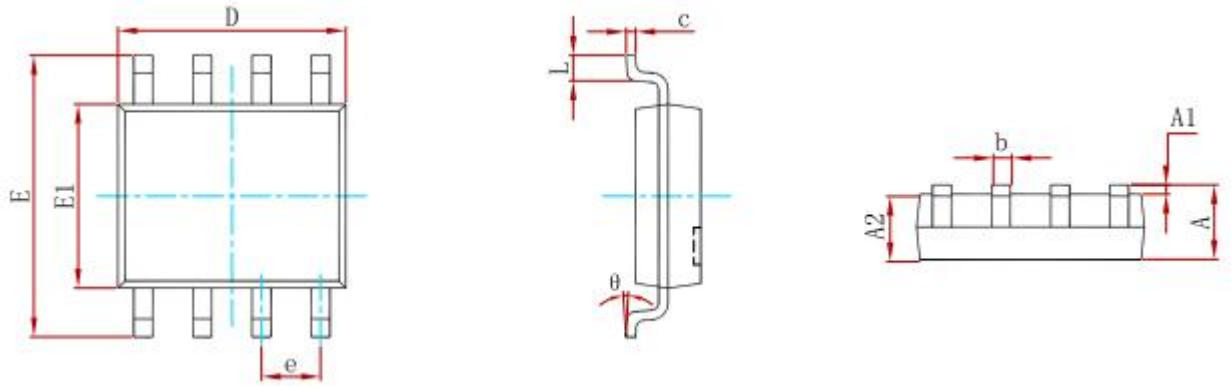
Enlargement A

Fixed Off-Time, t_{off} = 25 µs



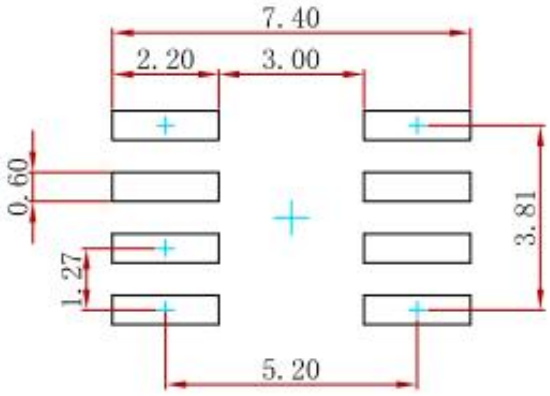
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PACKAGE MECHANICAL DATA



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Suggested Pad Layout



Note:
1.Controlling dimension:In millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.

REEL SPECIFICATION

P/N	PKG	QTY
MS4950ELJTR-T	SOIC-8-EP	4000

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