



## 功能

MIC5225系列是一款基于SMOS工艺的高精度低压差线性温压器。它具有低静态功耗、高耐压等特性，MIC5225系列产品输入电压可达24V，固定输出电压范围在1.2V-5V。芯片内置有过流保护功能，可以保护产品在使用中安全运行。

MIC5225能在输入压差极小的情况下提供300mA的输出电流，并且仍能保持良好的调整率。由于输入输出间的电压差很小和静态偏置电流很小，这些器件适用于计算机、消费类产品和工业设备等。

## 产品特点

- 低输入功耗
- 低输入压差
- 输入端耐压：24 V
- 低静态电流：2.5 $\mu$ A
- 高输出精度：1%
- 短路保护功能、过流保护功能

## 产品应用

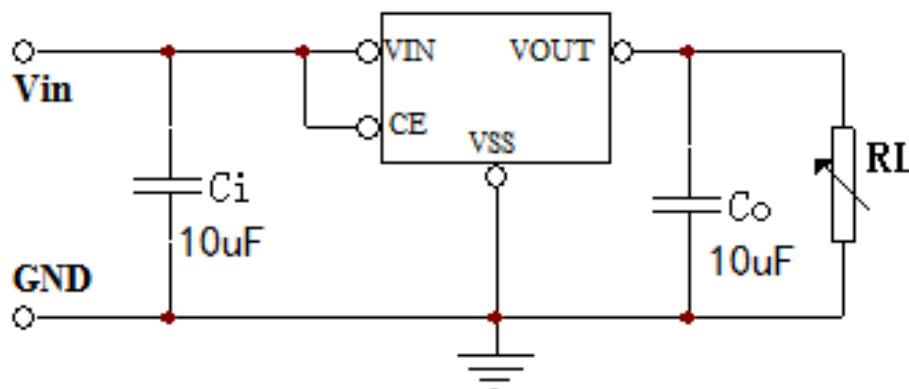
- 智能照明设备
- MCU控制系统供电
- 专用开关电源辅助供电
- 物联网传感器设备供电

## 器件信息

产品型号	封装	输出电压	包装信息
MIC5225-xxYM5	SOT-23-5L	1.2V-5V	3000/Reel

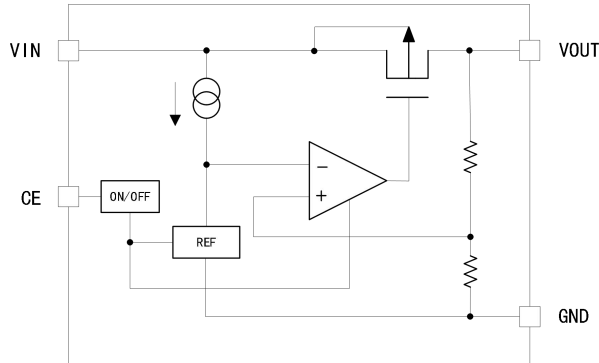
xx:From 1.2-5.0

## 推荐应用电路



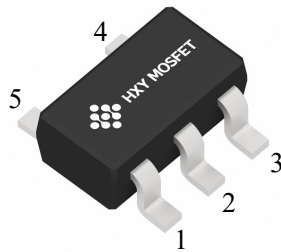


## 系统功能框图



## 引脚排列图

SOT-23-5L



## 电气特性

### 极限参数

常温下测试(除非特殊说明)<sup>(1)</sup>

Name	Min	Max	Unit
最大输入电源电压	VIN	32	V
最大输出电流	I <sub>OUT</sub>	420	mA
耗散功率	P <sub>D</sub>	250	mW
工作温度	T <sub>OPR</sub>	-40~+105	°C
存储温度	T <sub>STG</sub>	-40~+125	°C

(1) 在超出上面列出的绝对最大额定值条件下工作可能会造成器件的永久损坏。这些只是应力额定值，长时间处于最大绝对额定条件下会影响设备的可靠性。

(2) 所有电压值都是相对于 GND 的值，除非额外注明。

(3) 下列一个或两个条件可能会导致整体设备的使用寿命降低：

- 长期高温储存
- 长时间在最高温度下使用



ESD

Mode	Name	Max	Unit
H.B.M	POS/NEG	±3000	V

电气参数

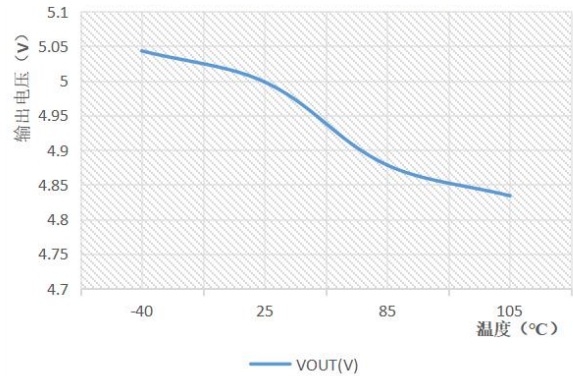
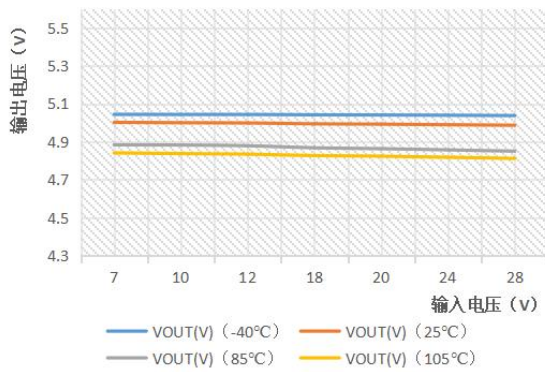
除非特殊说明,  $T_J = 25^\circ \text{C}$ .

参数	符号	测试条件	最小值	典型值	最大值	单位	
输入电压	VIN	ISS=5uA	—	—	24	V	
输出电压	VOUT	VIN=VOUT+1V, IOUT=10mA	VOUT*0.99	VOUT	VOUT*1.01	V	
使能开启电压	VCE	VIN=2.2V, IOUT=1mA	0.7	—	1.2	V	
输出电流	IOUT	VIN= VOUT+1V	—	300	—	mA	
线性调整度	$\Delta V_{OUT}$	VOUT+1V $\leq$ VIN $\leq$ 24V, IOUT=5mA	-10	—	10	mV	
负载调整度	$\Delta V_{OUT}$	VIN= VOUT+1V, 1mA $\leq$ IOUT $\leq$ 100mA	-50	—	50	mV	
最小压差	VDrop	IOUT=50mA, $\Delta V_{OUT} = \pm 1\% * V_{OUT}$	130	150	170	mV	
		IOUT150mA, $\Delta V_{OUT} = \pm 1\% * V_{OUT}$	230	250	270	mV	
纹波抑制比	PSRR	VIN= VOUT+1V, IOUT=10mA	f=100Hz	—	75	—	dB
			f=1kHz	—	60	—	
			f=10kHz	—	45	—	
停机电流	ISHD	VIN=VOUT+1V, VCE=0V	-1	—	1	uA	
静态电流	ISS	VIN= VOUT+1V	—	1.5	—	uA	
短路电流	ISCP	VOUT=GND	—	85	—	mA	
过流保护	IOCP	VIN=VCE=VOUT+1V	—	400	—	mA	
温度系数	$\Delta V_{OUT} /$ ( $\Delta T_a * V_{OUT}$ )	VIN= VOUT+1V, IOUT=10mA, -40 $^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	—	$\pm 50$	$\pm 100$	ppm/ $^\circ\text{C}$	

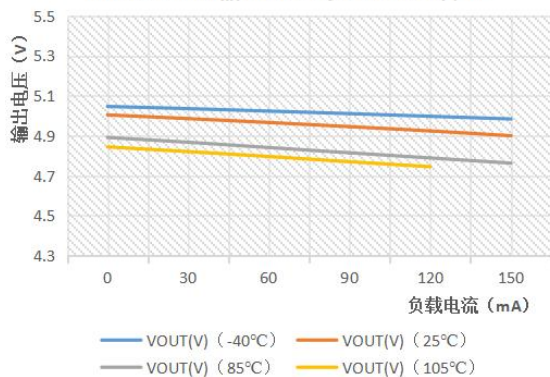


## 温度特性曲线 (除非特殊说明 $C_{IN}=C_{OUT}=1\mu F$ )

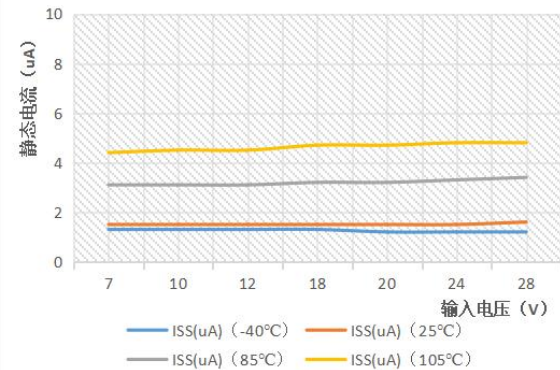
### 输出电压线性温度



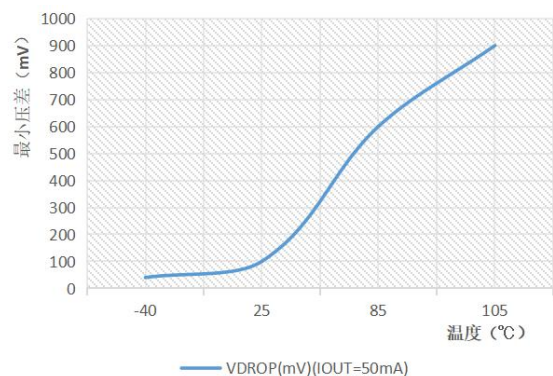
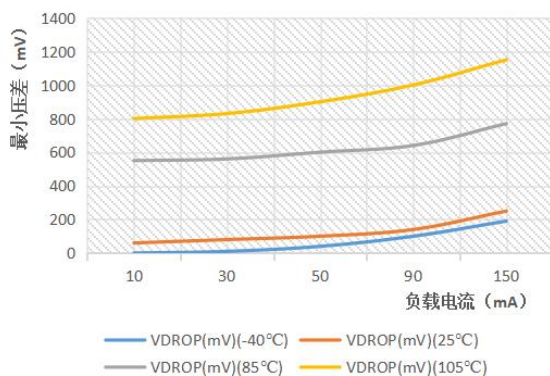
### 输出电压负载温度特性



### 静态电流温度特性

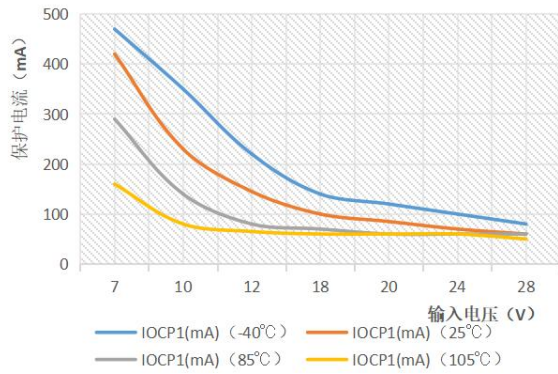


### 最小输入压差温度特性





### 过流保护温度特性





## 应用信息

该系列芯片为三端低压差系列线性稳压器。必须严格遵循下列应用要点以实现正确操作。

### 外部电路

输入和输出引脚必须要接上外部电容。对于输入引脚，尤其在采用电池供电时而产生高阻抗时，必须连接上合适的旁路电容，建议输入电容值至少为  $1\ \mu\text{F}$ ，并且为陶瓷电容，以实现更好的温度系数和更低的 ESR（等效串联电阻），如应用电路所示。而对于输出引脚，尤其在负载具有瞬态性能时，必须连接合适的电容，输出电容在保持输出电压稳定方面起着重要作用。对于陶瓷型电容器，电容值至少为  $1\ \mu\text{F}$ 。选择较大容值的电容可以限制瞬态电压输出。

### 热注意事项

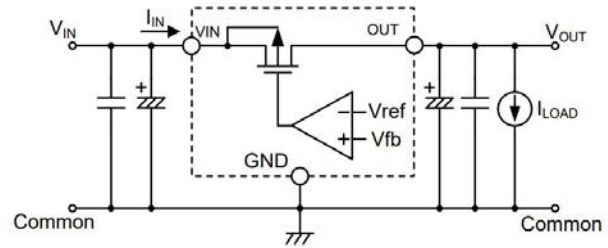
芯片最大功耗取决于 IC 封装的热阻、PCB 布局、周围气流速度以及结点与环境温度的温差。通过以下公式计算可得最大功耗： $PD_{(MAX)} = (T_{J(MAX)} - T_a) / \theta_{JA}$  此处的  $T_{J(MAX)}$  为结点最大温度， $T_a$  为环境温度，而  $\theta_{JA}$  为 IC 封装中每瓦度的结点到环境热阻。下表显示了 SOT-23-5L 的  $\theta_{JA}$  值。

封装类型	$\theta_{JA}$ ( $^{\circ}\text{C}/\text{W}$ )
SOT-23-5L	500 $^{\circ}\text{C}/\text{W}$

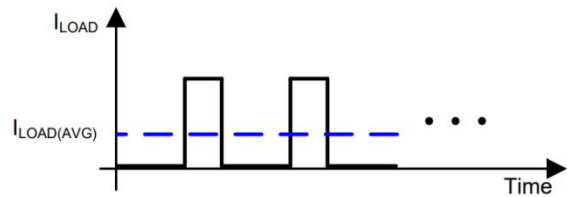
工作极限参数中，最大结温是  $150^{\circ}\text{C}$ 。尽管如此，建议正常工作时最大结温不超过  $125^{\circ}\text{C}$  以确保其可靠性。

### 功耗计算

为使芯片工作在极限范围内并保持一个稳定的输出电压，芯片的功耗 PD 一定不能超过最大功耗  $PD_{(MAX)}$ ，即  $PD \leq PD_{(MAX)}$ 。由下图可看出几乎所有功率都是通过晶体管产生，这等同于在负载上串联一个可变电阻，从而保持输出电压恒定。此处产生的功率表现为热能，必须保证芯片不能超过最大结点温度。



由于负载的瞬态性能，在实际应用中要求稳压器提供稳态和瞬态电流。虽然该系列芯片操作于限制范围内，并在其稳态电流下工作良好，但必须注意可能导致电流上升至接近极限参数的瞬态负载，这也将导致芯片结点温度的升高。电路中存在稳态电流和瞬态电流，最需考虑的应为芯片中产生热能的电流值均值，更确切地说是 RMS 值。下图显示了与瞬态电流相关的平均电流。



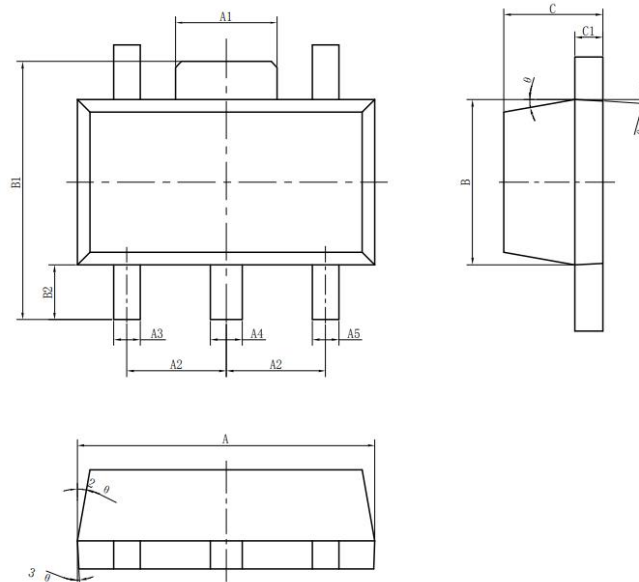
由于芯片的瞬态电流很小，一般可以忽略，故假设输入电流等于输出电流，则芯片的功耗 PD 可计算为输入电压和输出电压的压差乘以电流，即得公式  $PD = (V_{IN} - V_{OUT}) \times I_{IN}$ ，由于输入电流也等于负载电流，因此可得公式  $PD = (V_{IN} - V_{OUT}) \times I_{LOAD}$  但由于瞬态负载电流的存在，功耗 PD 应为  $PD = (V_{IN} - V_{OUT}) \times I_{LOAD(AVG)}$

### 电流保护功能

MIC5225 实现了过流保护和短路保护功能，它具有 2 级过电流保护阈值。一旦输出电压大于  $0.7\text{V}$ ，则过流保护功能生效，OCP 限制电流将设置为  $450\text{mA}$ 。若是输出电压低于  $0.7\text{V}$ ，短路保护功能生效，SCP 电流设置为  $20\text{mA}$ 。即使输出短路接地也可以防止 IC 损坏。当输出短路至地时，输出电流会被钳位到  $I_{SCP}$ 。



## 封装信息



尺寸 标注	最小 (mm)	最大 (mm)	尺寸 标注	最小 (mm)	最大 (mm)
A	4.40	4.60	B2	0.80	1.20
A1	1.55REF		C	1.40	1.60
A2	1.50BSC		C1	0.37	0.47
A3	0.35	0.45	$\theta$	6°	
A4	0.43	0.53	$\theta_1$	3°	
A5	0.35	0.45	$\theta_2$	6°	
B	2.40	2.60	$\theta_3$	3°	
B1	4.00	4.40			

注意:

1. 本图如有更改, 恕不另行通知, 使用前请注意获取产品对应版本资料。



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