



## 概述

MIC29302WU 是一款低压差、大电流且精度高的电压调节器电路。以超 $\beta$  PNP 工艺制作的 PNP 管作为调节元件。满载条件（3A）下，输入输出压差仅 370mV（典型值）、地端电流仅 37mA（典型值）。该器件也可应用于小电流、极低压差的电源系统。

MIC29302WU 具有过流保护、输入电压反接保护、过热保护以及瞬态尖峰电压保护功能。通过设置使能端的逻辑电位，可控制器件工作或休眠，在休眠状态下，器件的功率消耗极低；使能端也可直接与输入端电源连接，使器件处于工作状态。

MIC29302WU 采用 T0263-5L。

## 特点

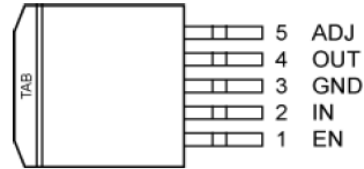
- ◇ 大电流
- ◇ 低压差
- ◇ 地端电流小
- ◇ 精度高
- ◇ 瞬态响应快
- ◇ 电池反接和过载保护
- ◇ 零电流关断模式

## 应用

- ◇ 电源设备
- ◇ 高效“绿色”计算机系统
- ◇ 自动化电子应用
- ◇ 高效线性电源
- ◇ 高效无调节开关电源



## 引脚定义



引脚排列（顶视）

## TO263-5L

引脚序号	引脚符号	引脚功能
1	EN	使能端，与 CMOS 逻辑电平兼容。EN=H 时，器件工作；EN=L 时，器件休眠。
2	IN	输入端，输入电压
3	GND	地端，框架衬底也连接到器件地端
4	OUT	输出端
5	ADJ	调整反馈端，连接于输出端与地端电阻分压网络，以设定输出电压值

引脚功能说明

## 极限参数<sup>注1</sup>

- ◇ 输入电压  $V_{IN}$ <sup>注1</sup>: -20V~+60V
- ◇ 使能电压  $V_{EN}$ : -0.3V~ $V_{IN}$
- ◇ 焊接温度 (5S): 260°C
- ◇ 功耗: 内部限制
- ◇ 存储温度: -65°C~150°C
- ◇ 静电敏感极限: 见注 2

## 工作极限条件<sup>注3</sup>

- ◇ 工作结温: -40°C~125°C
- ◇ 最大输入电压: 26V
- ◇ 热阻: 2°C/W



**电参数**<sup>注4</sup> (除注明外, 测试条件均为:  $V_{IN}=V_{OUT}+1V$ ,  $T_J=25^{\circ}C$ , 粗体数值表示  $-40^{\circ}C \leq T_J \leq +125^{\circ}C$ )

参数名称	测试条件	最小值	典型值	最大值	单位	
<b>器件总体</b>						
输出电压	$I_{OUT} = 10mA$	-1		1	%	
	$10mA \leq I_{OUT} \leq I_{FL}$ , ( $V_{OUT}+1V$ ) $\leq V_{IN} \leq 26V$	-2		2		
线性调整率	$I_{OUT} = 10mA$ , ( $V_{OUT}+1V$ ) $\leq V_{IN} \leq 26V$		0.06	0.5	%	
负载调整率	$V_{IN} = V_{OUT} + 1V$ , $10mA \leq I_{OUT} \leq 1.5A$		0.2	1	%	
输出电压温度系数	注5		<b>20</b>	<b>100</b>	ppm/ $^{\circ}C$	
输入输出压差	$\Delta V_{OUT} = -1\%$ <sup>注6</sup>	$I_{OUT} = 100mA$		80	<b>175</b>	mV
		$I_{OUT} = 1.5A$		250		mV
		$I_{OUT} = 3A$		370	<b>600</b>	mV
地端电流	$V_{IN} = V_{OUT} + 1V$ , $I_{OUT} = 1.5A$		10	<b>35</b>	mA	
	$V_{IN} = V_{OUT} + 1V$ , $I_{OUT} = 3A$		37		mA	
输出限制电流	$V_{OUT} = 0V$ <sup>注7</sup>		4.5	<b>5</b>	A	
输出噪声电压*	$I_{OUT} = 100mA$ , $C_L = 10\mu F$		400		$\mu V(rms)$	
	$I_{OUT} = 100mA$ , $C_L = 33\mu F$		260		$\mu V(rms)$	
<b>基准部分</b>						
基准电压		1.228 <b>1.215</b>	1.240	1.252 <b>1.265</b>	V	
调整端偏置电流			40	80 <b>120</b>	nA	
基准电压温度系数			20		ppm/ $^{\circ}C$	
调整端偏置电流温度系数			0.1		nA/ $^{\circ}C$	
<b>使能部分</b>						
使能低电平(关)				<b>0.8</b>		
使能高电平(开)		<b>2.4</b>				
使能端输入电流	$V_{EN} = 26V$		100	600 <b>750</b>	$\mu A$	
	$V_{EN} = 0.8V$	0.7		2 <b>4</b>	$\mu A$	
关断输出电流	注8		10	<b>500</b>	$\mu A$	

注1: 正电源电压的施加条件:  $<100mS$ , 占空比 $\leq 1\%$ , 器件最大持续工作电源电压为 26V。超过极限条件的电源电压会造成器件损坏。

注2: 静电敏感器件, 建议采取防静电措施。

注3: 不允许超过极限应用条件使用。

注4: 参数定义针对成品器件; 在双电源供电系统中, 调节器负载与负电源连接, 输出电压必须用二极管钳位到地。

注5: 输出电压温度系数定义为, 最坏情况输出电压变化与全温度范围变化的比值。

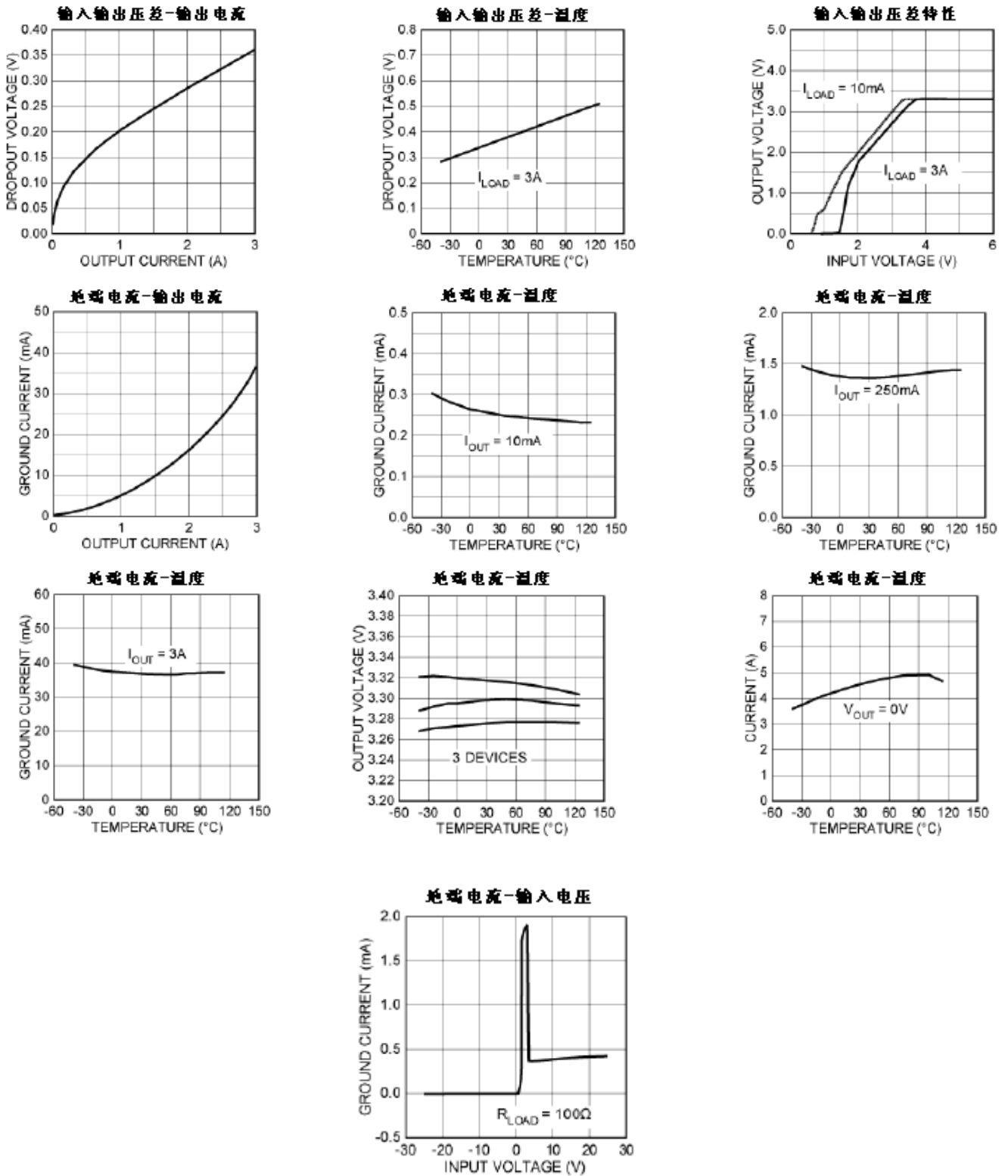
注6: 输入输出压差定义为, 施加  $V_{OUT}+1V$  到  $V_{IN}$ , 降低  $V_{IN}$ , 当输出电压降低到其正常值的 99%时, 输入电压与输出电压之间的压差。

注7: 设定  $V_{IN}=V_{OUT}+1V$ , 采用脉冲测试输出电流。

注8:  $V_{EN} \leq 0.8V$  且  $V_{IN} \leq 26V$ ,  $V_{OUT} = 0V$ 。

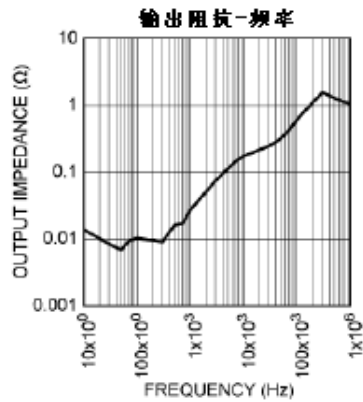
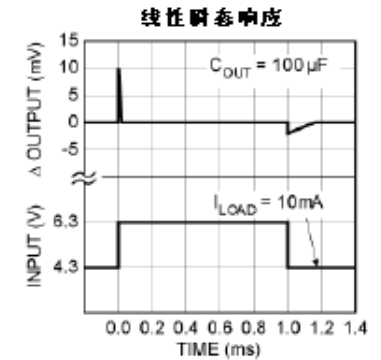
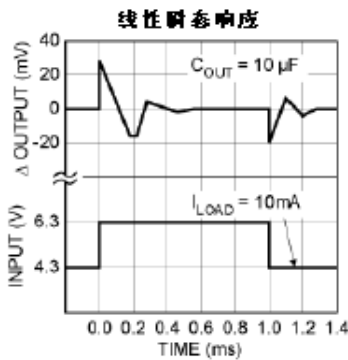
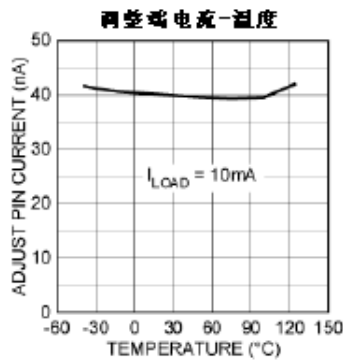
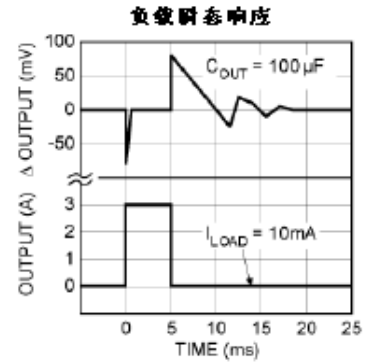
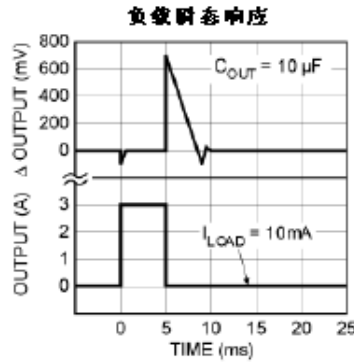
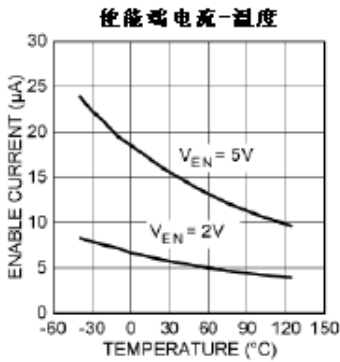


## 典型特性曲线

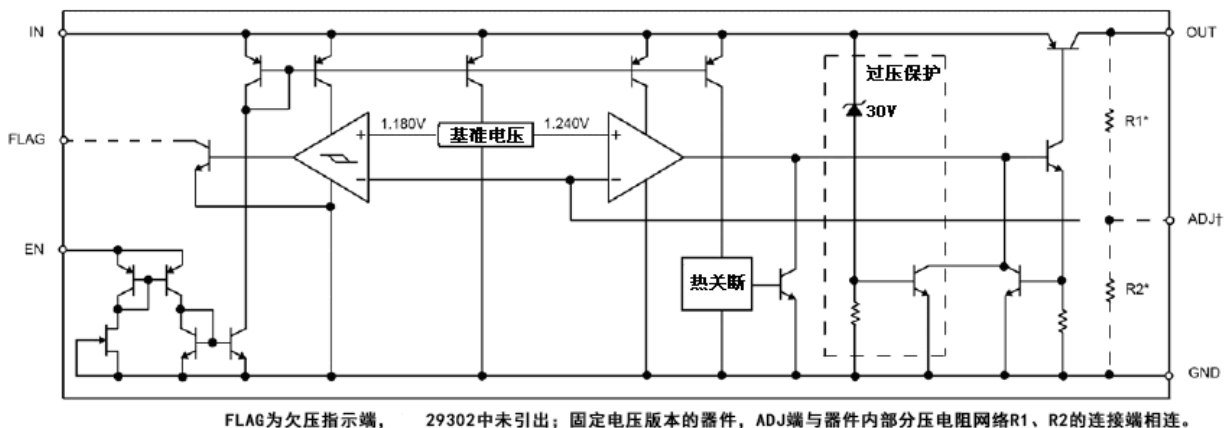




典型特性曲线 (续)



原理框图





## 应用指南

### 保护功能

MIC29302WU具有线性电流限制功能，在过载时输出电流是持续的；当温度超多器件最大安全工作温度150℃时，热关断功能启动，有效关断输出；线性瞬态保护功能使器件能够承受-20V~+60V的输入电压尖峰冲击；当输入电压超过约30V 时过压检测功能启动，有效关断输出；逻辑电平就可以控制器件工作或关断，在关断状态下，器件消耗电流几乎为0。

### 热设计举例

MIC29302WU应用简单，热特性是最复杂也必须考虑的因素，热设计举例如下：

设输入电压  $V_{IN} = 5V$ ，输出电压  $V_{out} = 3.3V$ ，负载电流  $I_{out} = 1A$ ，环境温度  $T_A = 50^\circ C$ ，结到环境的热阻  $\theta_{JA} = 31.4^\circ C/W$ ，地端电流大约为  $I_{OUT}$  的 0.01

计算器件的功耗

$$P_D = I_{OUT} \cdot (1.01 V_{IN} - V_{OUT}) = 1.75W$$

器件工作结温

$$T_J = T_A + P_D \cdot \theta_{JA} = 50 + 1.75 \cdot 31.4 = 104.95^\circ C$$

小于器件正常工作的最高结温 125℃，可以保证器件可靠工作。

### 电容选择

为减小输出电压噪声，稳定输出电压，输出端需要滤波电容，容值的大小取决于输出电流，电流越小，容值选择可以越小。在全负载范围内，选取 10uF 铝电解电容就能满足应用，在要求负载瞬态响应快的应用领域，建议采用钽电容。

输入端与地之间建议采用 0.1uF 的电容进行滤波。

### 最小负载电流

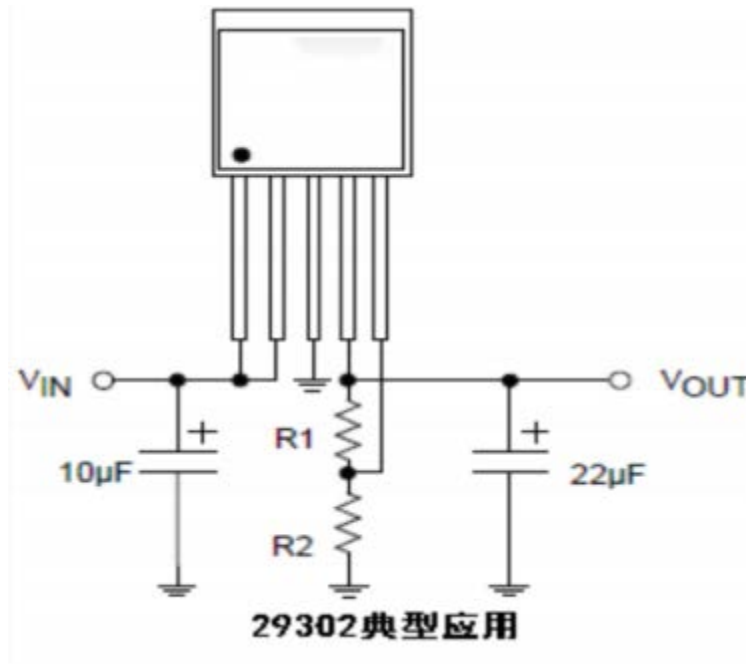
如果负载电流过小，漏电流影响会使输出电压升高。因此需要最小 7mA 的负载电流，以保证 MIC29302WU 正常工作。



### 使能输入

使能输入端电位与 TTL/CMOS 电平兼容，可与逻辑器件直接接口，也可直接连接 30V 以下的电压。器件正常工作的使能端电流大约 20uA。

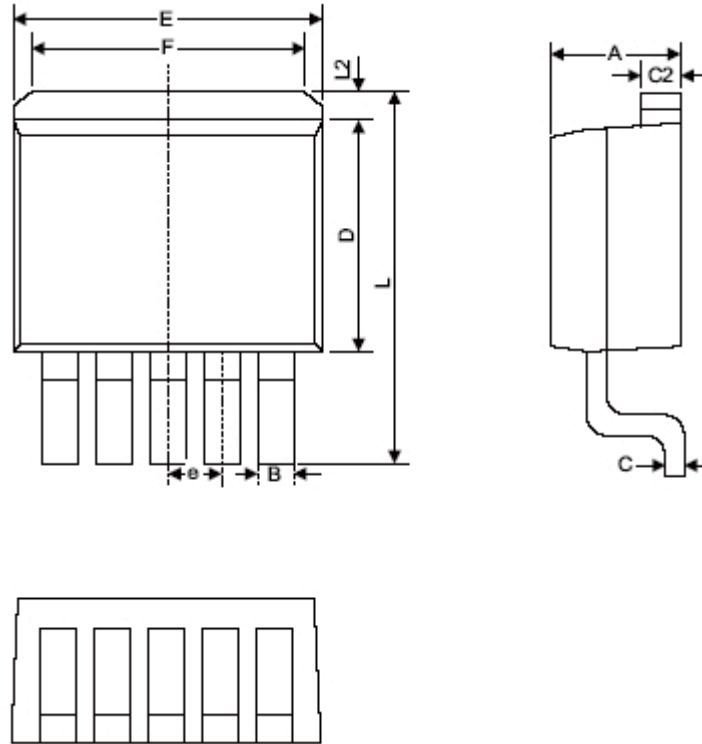
### 典型应用



$$R_1 = R_2 \times \left( \frac{V_{OUT}}{1.240} - 1 \right)$$



### Package Information (TO263-5L)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	0.160	0.190
B	0.76	1.02	0.030	0.040
C	0.36	0.64	0.014	0.025
C2	1.14	1.40	0.045	0.055
D	8.64	9.65	0.340	0.380
E	9.78	10.54	0.385	0.415
e	1.57	1.85	0.062	0.073
F	6.60	7.11	0.260	0.280
L	15.11	15.37	0.595	0.605
L2	-	1.40	-	0.055





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