



概述

MIC29302WU-TR是一款低压差、大电流且精度高的电压调节器电路。以超 β 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-TR 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-TR 采用 T0-263-5L(T0263-5)。

特点

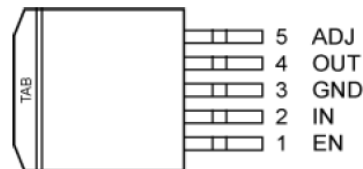
- ✧ 大电流
- ✧ 低压差
- ✧ 地端电流小
- ✧ 精度高
- ✧ 瞬态响应快
- ✧ 电池反接和过载保护
- ✧ 零电流关断模式

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）

TO-263-5L(TO-263-5)

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^{注1}

- ✧ 输入电压 V_{IN} ^{注1}: -20V~+60V
- ✧ 使能电压 V_{EN} : -0.3V~ V_{IN}
- ✧ 焊接温度 (5S): 260℃
- ✧ 功耗: 内部限制
- ✧ 存储温度: -65℃~150℃
- ✧ 静电敏感极限: 见注 2

工作极限条件^{注3}

- ✧ 工作结温: -40℃~125℃
- ✧ 最大输入电压: 26V
- ✧ 热阻: 2℃/W



电参数^{注4} (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
器件总体					
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		20	100	ppm/ $^{\circ}C$
输入输出压差	$\Delta V_{OUT} = -1\%$ ^{注6}	$I_{OUT}=100mA$		80	mV
		$I_{OUT}=1.5A$		250	mV
		$I_{OUT}=3A$		370	mV
地端电流	$V_{IN} = V_{OUT} + 1V$, $I_{OUT}=1.5A$		10	35	mA
	$V_{IN} = V_{OUT} + 1V$, $I_{OUT}=3A$		37		mA
输出限制电流	$V_{OUT}=0V$ ^{注7}		4.5	5	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		$\mu V(rms)$
基准部分					
基准电压		1.228 1.215	1.240	1.252 1.265	V
调整端偏置电流			40	80 120	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/ $^{\circ}C$
使能部分					
使能低电平 (关)				0.8	
使能高电平 (开)		2.4			
使能端输入电流	$V_{EN}=26V$		100	600 750	μA
	$V_{EN}=0.8V$	0.7		2 4	μA
关断输出电流	注 8		10	500	μA

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。

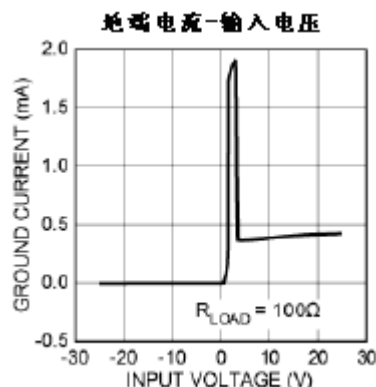
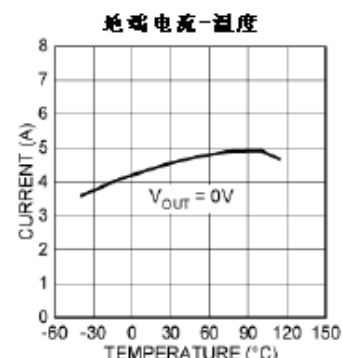
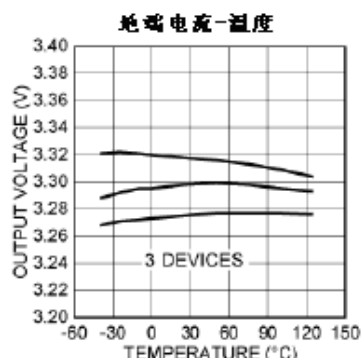
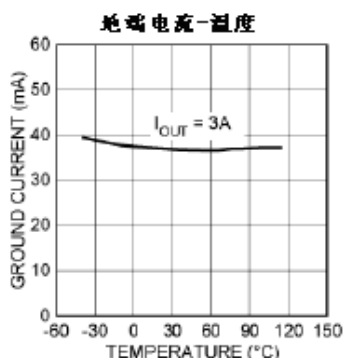
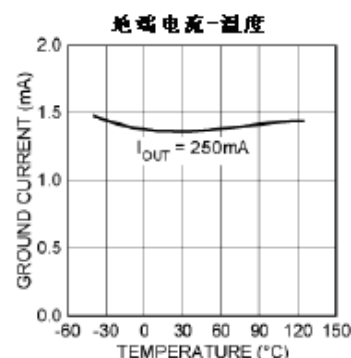
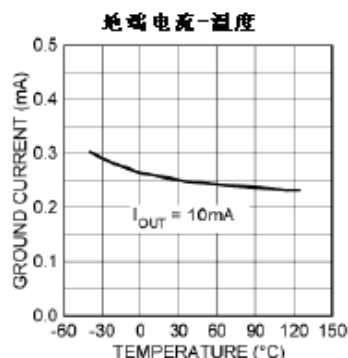
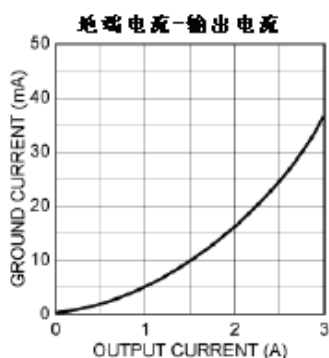
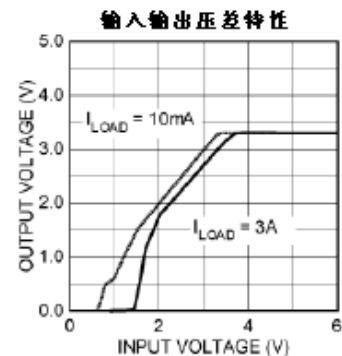
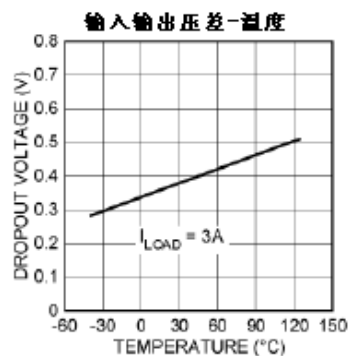
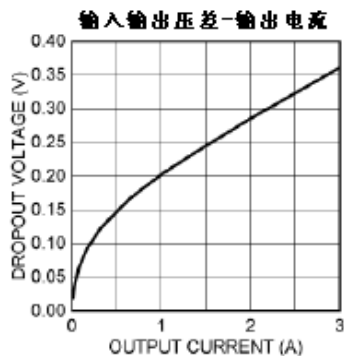
注 6: 输入输出压差定义为, 施加 $V_{OUT}+1V$ 到 V_{IN} , 降低 V_{IN} , 当输出电压降低到其正常值的 99%时, 输入电压与输出电压之间的压差。

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 $V_{IN} \leq 26V$, $V_{OUT}=0V$ 。

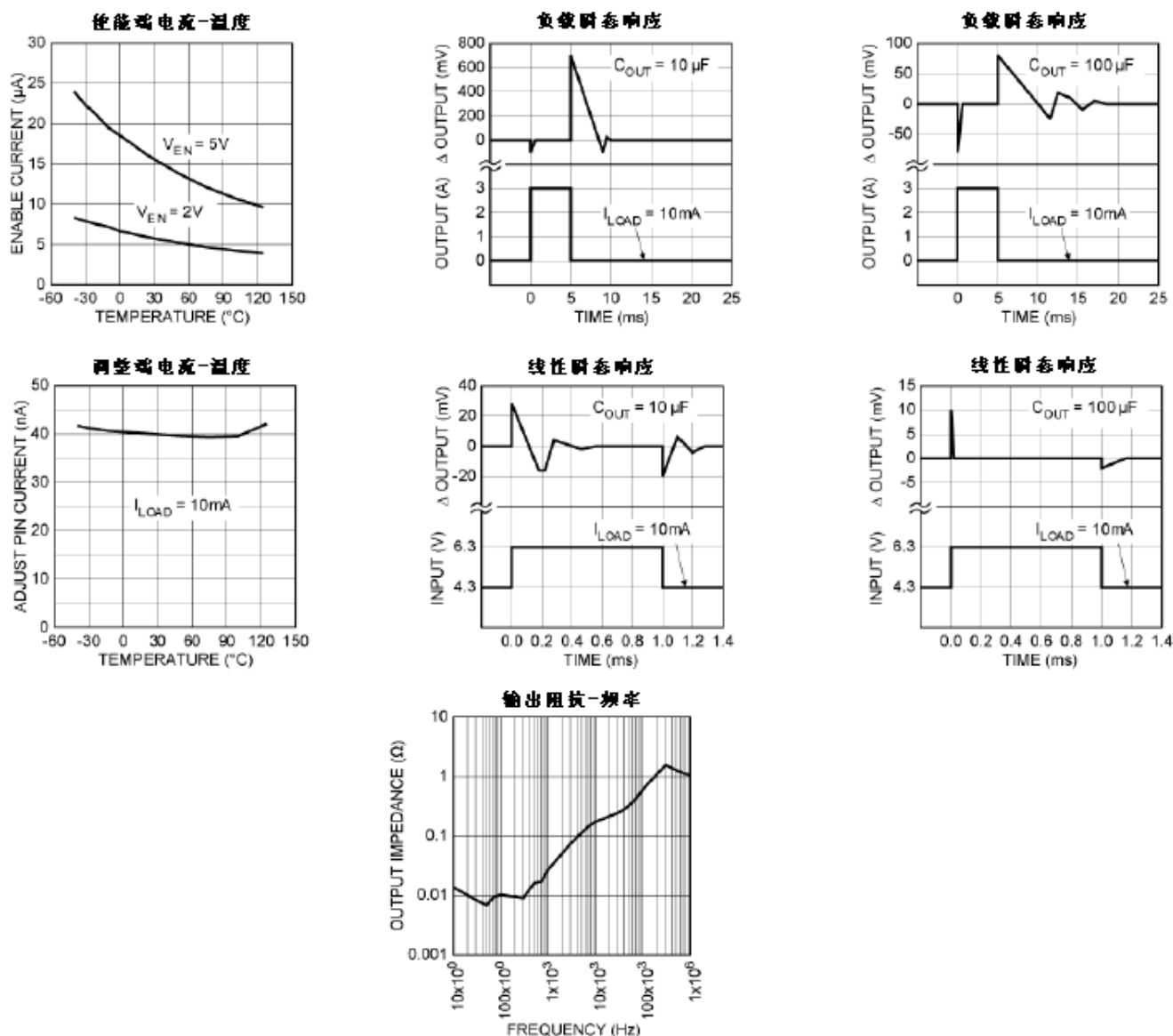


典型特性曲线

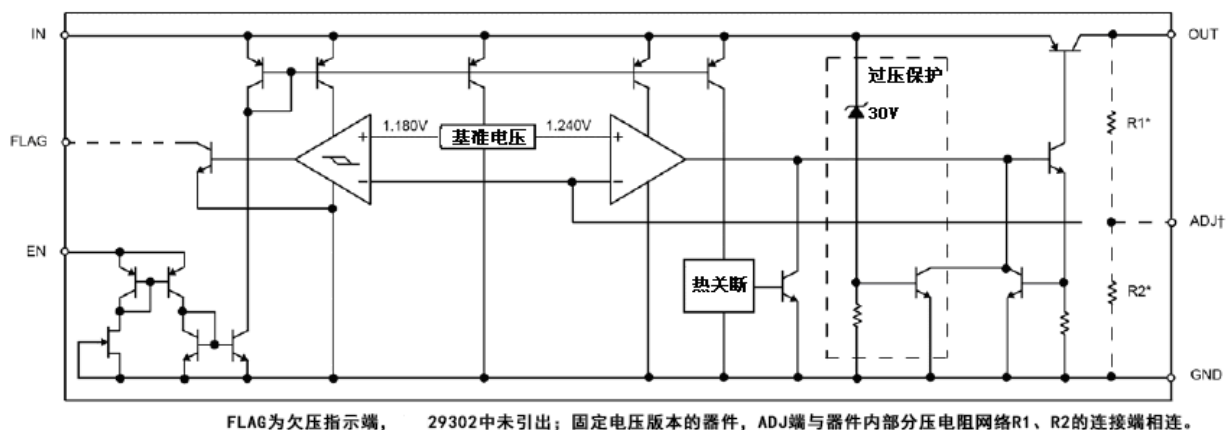




典型特性曲线 (续)



原理框图





应用指南

保护功能

MIC29302WU-TR 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-TR 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

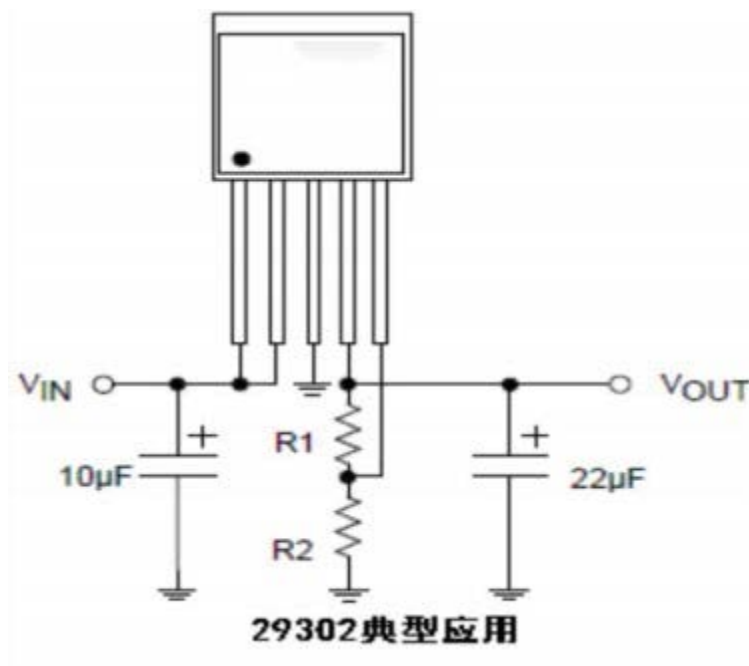
如果负载电流过小，漏电流影响会使输出电压升高。因此需要最小 7mA 的负载电流，以保证 MIC29302WU-TR 正常工作。



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

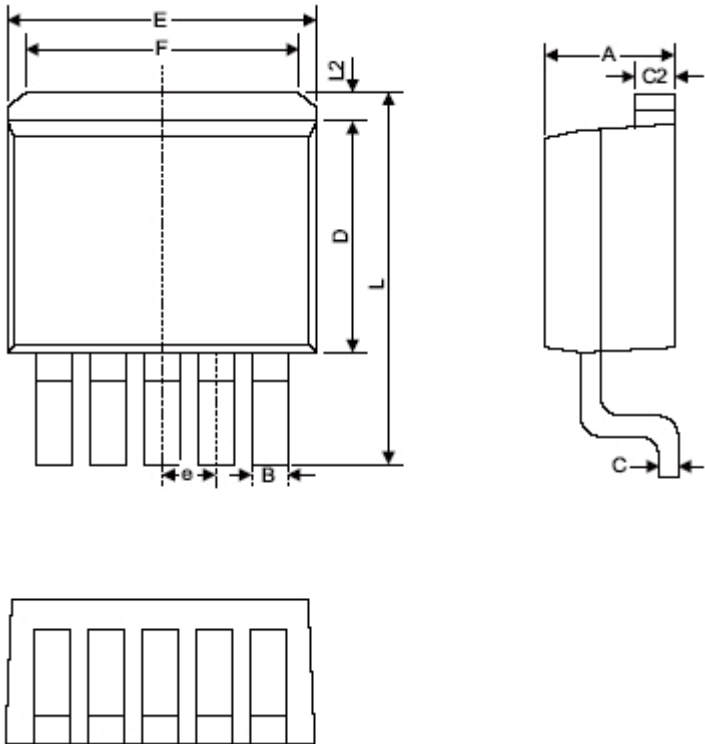


$$R_1 = R_2 \times \left(\frac{V_{OUT}}{1.240} - 1 \right)$$



Package Information

TO-263-5L(TO-263-5)



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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