



### 概述:

LM393DR是由两个独立、精确的电压比较器组成，其失调电压不超过 2.0mV。可在单电源下或双电源下工作。并且其电流大小不受电源电压幅度大小影响。这些比较器有一个独特的性能，就是即使在单电源下工作时，其输入共模电压范围也能达到零电平。主要用于消费类和工业类电子产品中。

采用 SOP-8 封装形式。

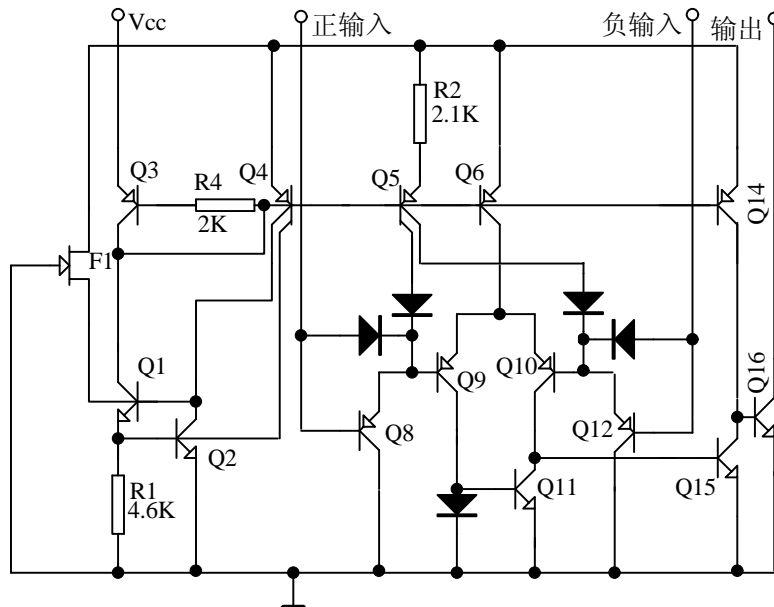
### 主要特点:

- 工作电源电压范围宽： 单电源： 2.0V~36V  
双电源：  $\pm 1.0V \sim \pm 18V$
- 电源电流小： 0.8mA 与电源电压无关
- 输入偏置电流低： 25nA
- 输入失调电流低： 5.0nA
- 输入失调电压低： 5.0mV
- 输入共模电压范围可达零电平
- 输入差分电压的范围与电源电压的范围一致。
- 可与 TTL、DTL、ECL、MOS 和 CMOS 兼容。



SOP-8

### 内部电路图





引出端序号	功 能	符 号	引出端序号	功 能	符 号
1	比较器 1 输出	OUT1	5	比较器 2 正相输入	IN2+
2	比较器 1 反相输入	IN1-	6	比较器 2 反相输入	IN2-
3	比较器 1 正相输入	IN1+	7	比较器 2 输出	OUT2
4	地	GND	8	电源	Vcc

**极限值**（绝对最大额定值，若无其它规定， $T_{amb}=25^{\circ}\text{C}$ ）

参 数 名 称		符 号	数 值		单 位
			最 小	最 大	
电源电压	双电源电压	Vcc	-	$\pm 18$	V
	单电源电压			36	
输入差分电压		V <sub>IDR</sub>		36	V
输入共模电压		V <sub>ICR</sub>	-0.3	36	V
输出对地短路电流		I <sub>OG</sub>		20	mA
最大工作结温		T <sub>J</sub> (MAX)		125	$^{\circ}\text{C}$
功耗 (*)		P <sub>D</sub>		570	mW
工作环境温度		T <sub>amb</sub>	0	70	$^{\circ}\text{C}$
贮存温度		T <sub>stg</sub>	-65	150	$^{\circ}\text{C}$

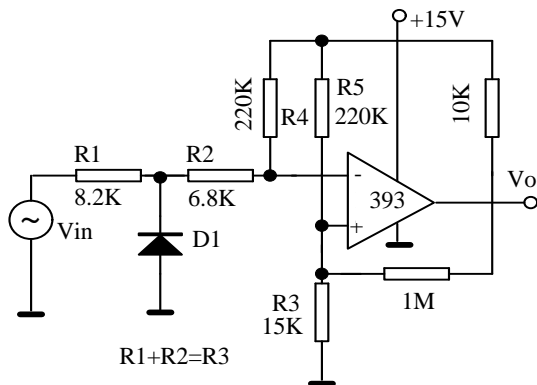
**电特性**（若无其它规定， $V_{cc}=5\text{V}$ ， $T_{amb}=25^{\circ}\text{C}$ ）

特 性	测 试 条 件	符 号	规 范 值			单 位
			最 小	典 型	最 大	
输入失调电压	T <sub>a</sub> =25 $^{\circ}\text{C}$	V <sub>IO</sub>		$\pm 1.0$	$\pm 5.0$	mV
	0 $^{\circ}\text{C}$ ≤ T <sub>a</sub> ≤ 70 $^{\circ}\text{C}$				$\pm 9.0$	
输入失调电流	T <sub>a</sub> =25 $^{\circ}\text{C}$	I <sub>IO</sub>		$\pm 5.0$	$\pm 50$	nA
	0 $^{\circ}\text{C}$ ≤ T <sub>a</sub> ≤ 70 $^{\circ}\text{C}$				$\pm 150$	
输入偏置电流	T <sub>a</sub> =25 $^{\circ}\text{C}$	I <sub>IB</sub>		25	250	nA
	0 $^{\circ}\text{C}$ ≤ T <sub>a</sub> ≤ 70 $^{\circ}\text{C}$				400	
输入共模电压范围	T <sub>a</sub> =25 $^{\circ}\text{C}$	V <sub>ICR</sub>	0		V <sub>cc</sub> -1.5	V
	0 $^{\circ}\text{C}$ ≤ T <sub>a</sub> ≤ 70 $^{\circ}\text{C}$		0		V <sub>cc</sub> -2.0	
电源电流	R <sub>L</sub> =∞ 双比较器	I <sub>CC</sub>		0.4	1.0	mA
	R <sub>L</sub> =∞ 双比较器，V <sub>cc</sub> =30V				2.5	
电压增益	R <sub>L</sub> ≥ 15K $\Omega$ ，V <sub>cc</sub> =15V	G <sub>v</sub>	50	200		V/mV

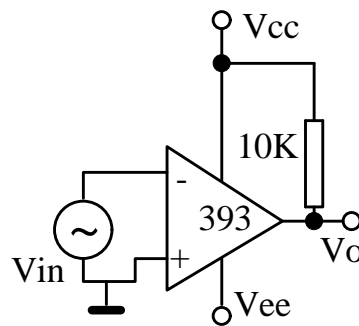


大信号响应时间	$V_{IN}=TTL$ 逻辑摆幅, $V_{REF}=1.4V$ , $V_{RL}=5.0V$ , $R_L=5.1K\Omega$	$t_{RES}$		300		ns
响应时间	$V_{RL}=5.0V$ , $R_L=5.1K\Omega$	$t_{RES}$		1.3		ns
输入差分电压		$V_{ID}$			$V_{CC}$	V
输出饱和电压	$V_{IN(-)} \geq 1.0V$ , $V_{IN(+)} = 0V$ , $I_{SINK} \leq 4.0mA$	$V_{SAT}$		150	400	mV
	$V_{IN(-)} \geq 1.0V$ , $V_{IN(+)} = 0V$ , $I_{SINK} \leq 4.0mA$ $0^\circ C \leq T_a \leq 70^\circ C$				700	
输出漏电流	$V_{IN(+)} \geq 1.0V$ , $V_{IN(-)} = 0V$ , $V_o = 5.0V$	$I_{OL}$		0.1		nA
	$V_{IN(+)} \geq 1.0V$ , $V_{IN(-)} = 0V$ , $V_o = 30V$ $0^\circ C \leq T_a \leq 70^\circ C$				1000	

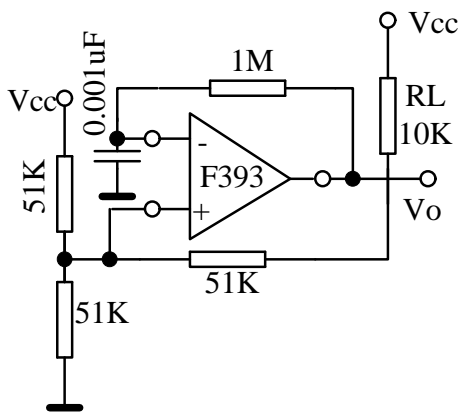
应用图



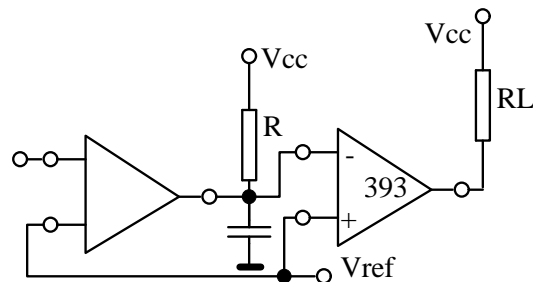
过零检波器(单电源应用)



过零检波器(双电源应用)



方波振荡器



延时发生器



### 使用说明:

LM393DR是高增益、宽频带器件，象大多数比较器一样，如果输出端到输入端有寄生电容而产生耦合，则很容易产生振荡。这种现象仅仅出现在当比较器改变状态时，输出电压过渡的间隙。电源加旁路滤波并不能解决这个问题，标准PC板的设计对减小输入—输出寄生电容耦合是有助的。减小输入电阻至小于 $10K\Omega$ 将减小反馈信号，而且增加甚至很小的正反馈量（滞回 $1.0\sim 10mV$ ）能导致快速转换，使得不可能产生由于寄生电容引起的振荡。除非利用滞后，否则直接插入IC并在引脚上加上电阻将引起输入—输出在很短的转换周期内振荡，如果输入信号是脉冲波形，并且上升和下降时间相当快，则滞回将不需要。

比较器的所有没有用的引脚必须接地。

LM393DR偏置网络确立了其静态电流与电源电压范围 $2.0\sim 30V$ 无关。

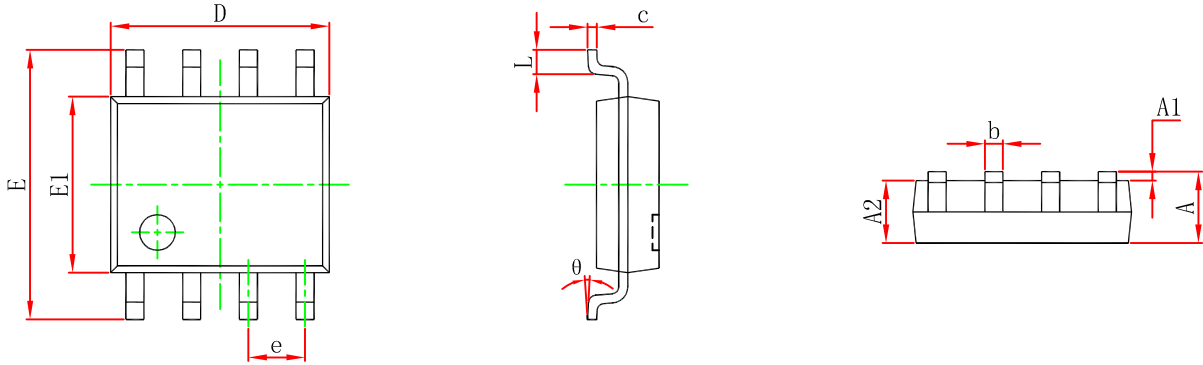
通常电源不需要加旁路电容。

差分输入电压可以大于 $V_{CC}$ 并不损坏器件。保护部分必须能阻止输入电压向负端超过 $-0.3V$ 。

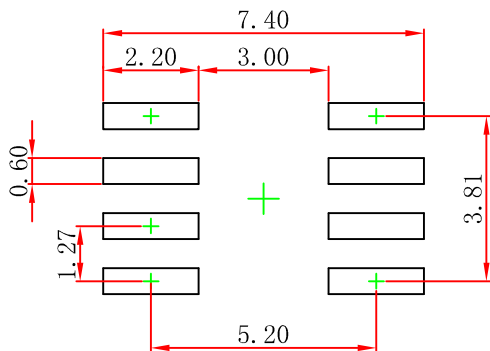
LM393DR的输出部分是集电极开路，发射极接地的NPN输出晶体管，可以用多集电极输出提供或功能。输出负载电阻能衔接在可允许电源电压范围内的任何电源电压上，不受 $V_{CC}$ 端电压值的限制。此输出能作为一个简单的对地SPS开路（当不用负载电阻没被运用），输出部分的陷电流被可能得到的驱动和器件的 $\beta$ 值所限制。当达到极限电流（ $16mA$ ）时，输出晶体管将退出而且输出电压将很快上升。输出饱和电压被输出晶体管大约 $60\Omega$ 的 $r_{SAT}$ 限制。当负载电流很小时，输出晶体管的低失调电压（约 $1.0mV$ ）允许输出箝位在零电平。



### SOP-8 Package Outline Dimensions



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°



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.



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