



***ULN2003-000-16***

**规格书**

***Rev 1.0***

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## 修改记录

| 版本   | 日期      | 描述 |
|------|---------|----|
| V1.0 | 2023/06 | 新颁 |

## 七路高耐压、大电流达林顿晶体管阵列

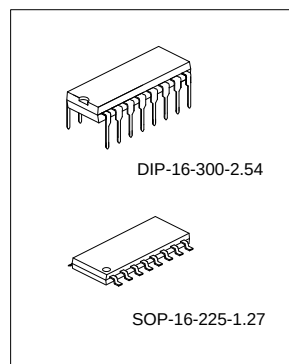
### 描述

ULN2003 是单片集成高耐压、大电流达林顿管阵列，电路内部包含七个独立的达林顿管驱动单元。电路内部设计有续流二极管，可用于驱动继电器、步进电机等感性负载。单个达林顿管集电极可输出 500mA 电流。将达林顿管并联可实现更高的输出电流能力。该电路可广泛应用于继电器驱动、照明驱动、显示屏驱动(LED)、步进电机驱动和逻辑缓冲器。

ULN2003 的每一路达林顿管串联一个 2.7K 的基极电阻，在 5V 的工作电压下可直接与 TTL/CMOS 电路连接，可直接处理原先需要标准逻辑缓冲器来处理的数据。

### 特点

- \* 500mA 额定集电极电流（单个输出）
- \* 高电压输出：50V
- \* 输入和各种逻辑类型兼容
- \* 继电器驱动器
- \* 防静电(ESD)能力：CLASS 3A (HBM JESD22-A-114)



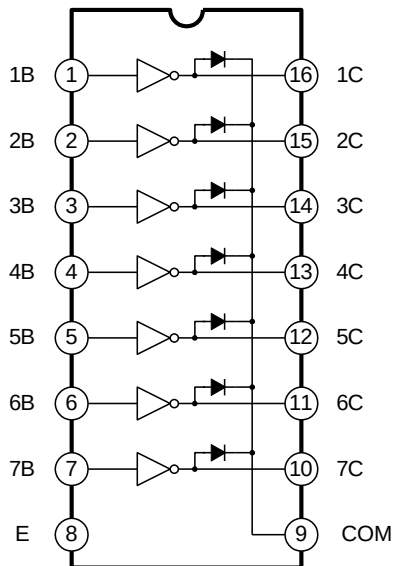
### 典型应用

- \* 继电器驱动
- \* 指示灯驱动
- \* 显示屏驱动

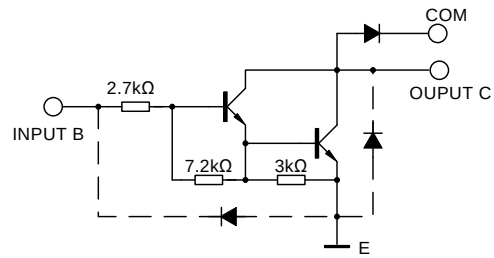
### 产品订购信息

| 产品名称            | 封装形式            | 打印名称    | 环保等级 | 包装 |
|-----------------|-----------------|---------|------|----|
| ULN2003-DIA-R-T | DIP-16-300-2.54 | ULN2003 | RoHS | 料管 |
| ULN2003-SOA-R-T | SOP-16-225-1.27 | ULN2003 | RoHS | 料管 |
| ULN2003-000-16  | SOP-16-225-1.27 | ULN2003 | RoHS | 编带 |

逻辑框图



示意图(单路达林顿驱动电路)


绝对最大额定值（除非特别说明， $T_A=25^{\circ}\text{C}$ ）<sup>(1)</sup>

| 参 数          | 符 号       | 参数范围                                        | 单 位                |
|--------------|-----------|---------------------------------------------|--------------------|
| 集电极和发射极之间的电压 | $V_{CE}$  | 70                                          | V                  |
| 输入电压         | $V_I$     | 30                                          | V                  |
| 集电极峰值电流      | $I_O$     | 500                                         | mA                 |
| 输出端钳位电流      | $I_{OK}$  | 500                                         | mA                 |
| 发射极总电流       | $I_{ET}$  | -2.5                                        | A                  |
| 功率消耗         | $P_d$     | (DIP-16)1.47<br>(SOP-16)1.25 <sup>(2)</sup> | W<br>W             |
| 工作温度         | $T_{opr}$ | -40 ~ +85                                   | $^{\circ}\text{C}$ |
| 贮存温度         | $T_{stg}$ | -65 ~ +150                                  | $^{\circ}\text{C}$ |

注：(1) 除非特别指定，所有的电压都相对于发射极/衬底端E

(2) PCB板上

**电气特性参数**(除非特别指定, TA=25°C)

| 参数                | 测试图 | 符号       | 测试条件                     | 最小值   | 典型值  | 最大值  | 单位 |
|-------------------|-----|----------|--------------------------|-------|------|------|----|
| 输入电压              | 6   | VI(ON)   | VCE=2V, Ic=200mA         |       |      | 2.4  | V  |
|                   |     |          | VCE=2V, Ic=250mA         |       |      | 2.7  |    |
|                   |     |          | VCE=2V, Ic=300mA         |       |      | 3    |    |
| 集电极-发射极饱和电压       | 5   | VCE(SAT) | II=250μA, Ic=100mA       |       | 0.9  | 1.1  | V  |
|                   |     |          | II=350μA, Ic=200mA       |       | 1    | 1.3  |    |
|                   |     |          | II=500μA, Ic=350mA       |       | 1.2  | 1.6  |    |
| 集电极切断电流           | 1   | ICEX     | VCE=50V, II=0            |       |      | 50   | μA |
|                   | 2   |          | VCE=50V, II=0, Tamb=70°C |       |      | 100  |    |
| 前进箝位电压            | 8   | VF       | IF=350mA                 |       | 1.7  | 2    | V  |
| 关闭状态输入电流          | 3   | II(OFF)  | IC=500μA, Tamb=70°C      | 50    | 65   |      | μA |
| 输入电流              | 4   | II       | VI=3.85V                 |       | 0.95 | 1.35 | mA |
| 反向箝位电流            | 7   | IR       | VR=50V                   |       |      | 50   | μA |
|                   |     |          | VR=50V, Tamb=70°C        |       |      | 100  |    |
| 输入电容              | --  | CI       | VI=0, f=1MHz             |       | 15   | 25   | pF |
| 传播延迟时间, 低电平到高电平输出 | 9   | tPLH     | VIH=3V, VOH=50V          |       | 0.25 | 1    | μs |
| 传播延迟时间, 高电平到低电平输出 | 9   | tPHL     | VIH=3V, VOH=50V          |       | 0.25 | 1    | μs |
| 转换后高电平输出电压        | 10  | VOH      | Vs=50V, Io=300mA         | Vs-20 |      |      | mV |

## 测试电路图

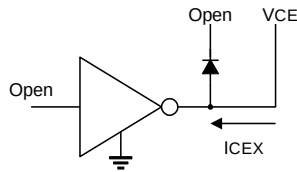


图 1 ICEX测试电路图

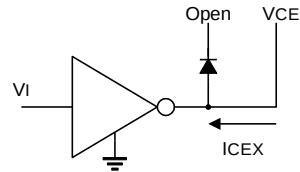


图 2 ICEX测试电路图

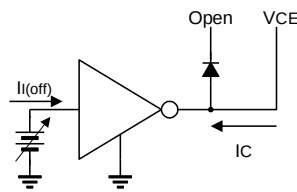


图3 II(off)测试电路图

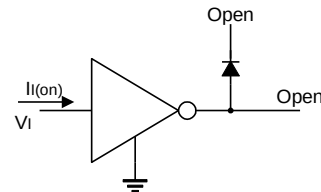
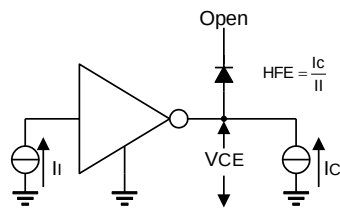


图 4 II(on)测试电路图



注：II 是固定的测量VCE(sat)，也可测量HFE.

图 5 HFE,VCE(sat)测试电路图

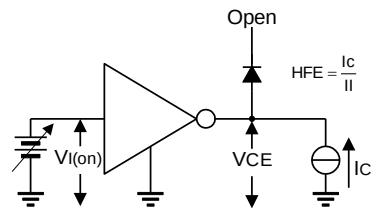


图 6 VI(on) 测试电路图

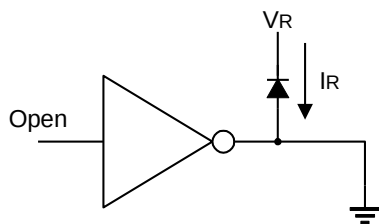


图 7 IR 测试电路图

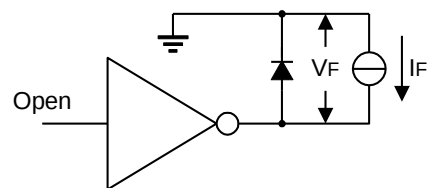


图8 VF 测试电路图

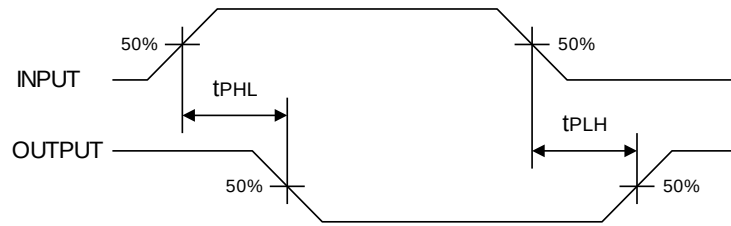
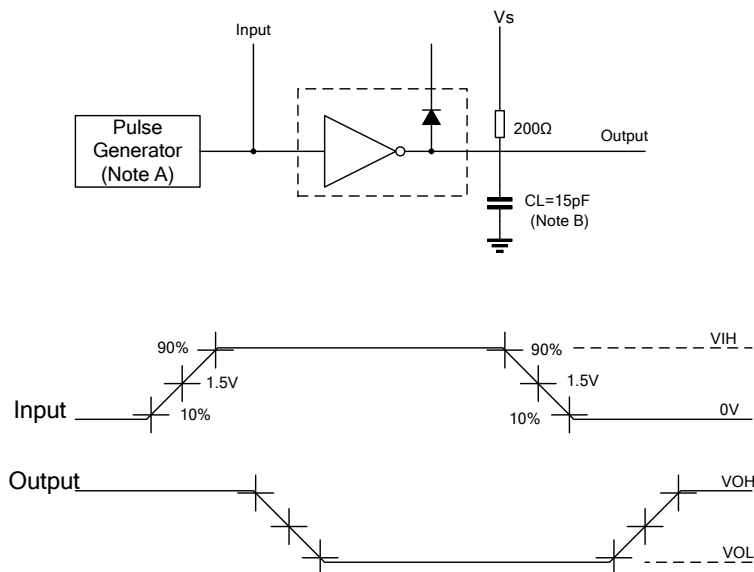


图 9. 传播延迟时间波形

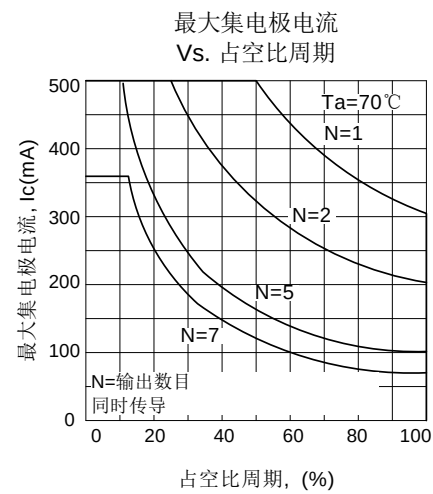
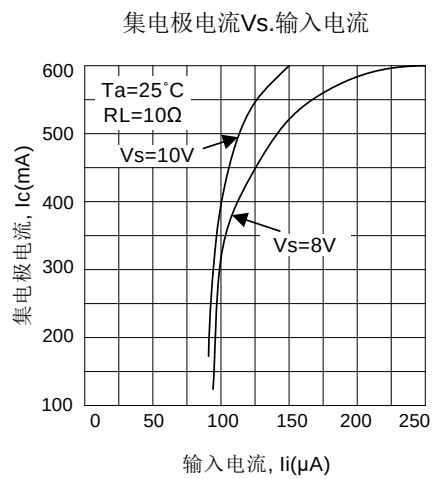
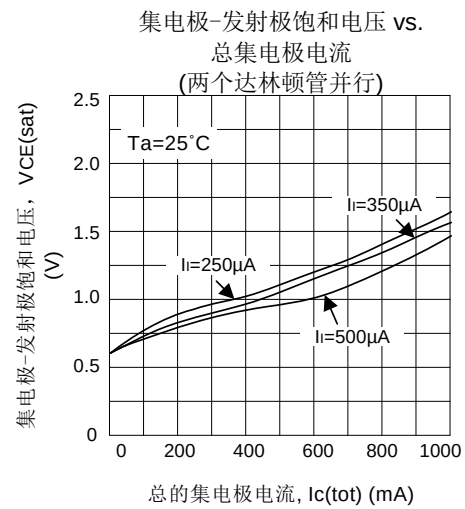
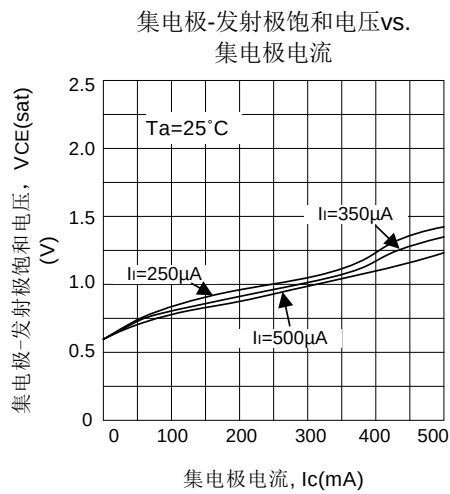


注：A. 脉冲发生器有以下特性：PRR=12.5kHz, Zo=50Ω

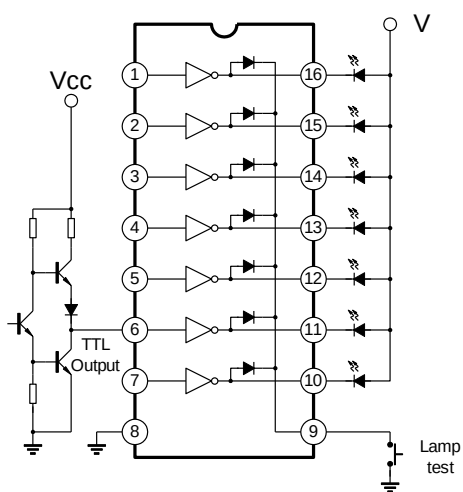
B. CL 包括探针和模具电容

图 10. 锁存测试电路图和电压波形

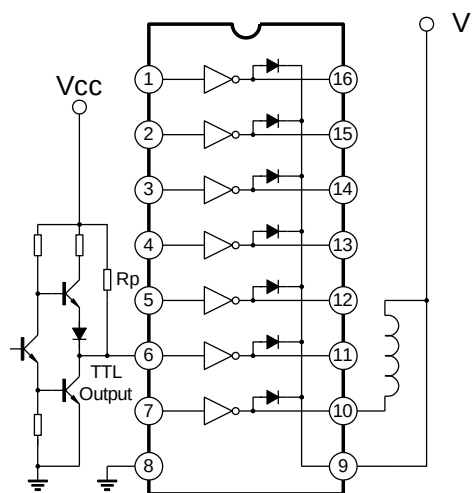
### 典型特性曲线图



# 典型应用电路图



TTL to Load



通过上拉电阻增加驱动电流

## 封装外形图

