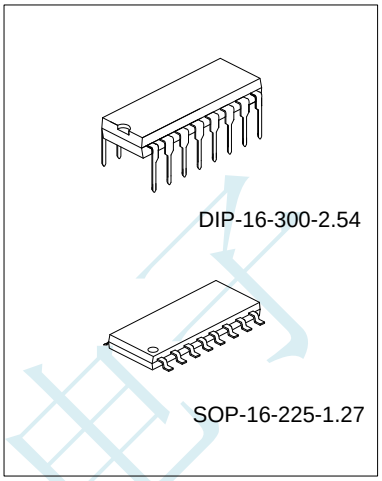
HIGH VOLTAGE AND HIGH CURRENT DARLINGTON TRANSISTOR ARRAY



DESCRIPTION

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN darlington pairs that features high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single darlington pair is 500mA. The darlington pairs may be parrlleled for higher current capability. Applications include relay drivers,hammer drivers, lampdrivers,display drivers(LED gas discharge),line drivers, and logic buffers.

The ULN2003 has a 2.7kΩ series base resistor for each darlington pair for operation directly with TTL or 5V CMOS devices.

FEATURES

* 500mA rated collector current(Single output)
* High-voltage outputs: 50V
* Inputs compatibale with various types of logic.
* Relay driver application

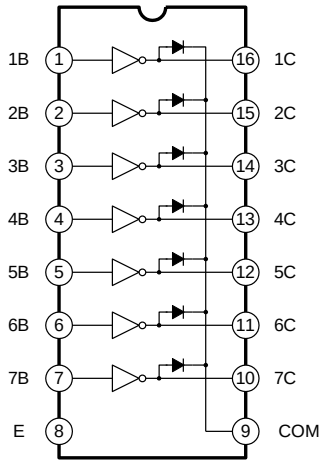
ORDERING INFORMATION

Ordering Number	Package	Print Number	Free	Packing
ULN2003-DIA-R-T	DIP-16-300-2.54	ULN2003	RoHS	Tube
ULN2003-SOA-R-T	SOP-16-225-1.27	ULN2003	RoHS	Tube
ULN2003-SOA-R-R	SOP-16-225-1.27	ULN2003	RoHS	Tape Reel

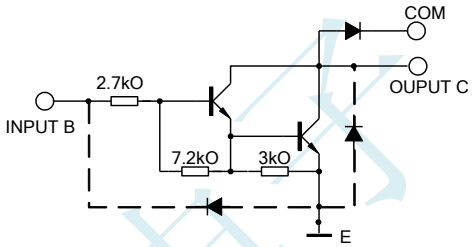
ULN2003 - DIA - R - T

- T: Packing Type: T:Tube, R:Tape Reel, K: Bulk, B: Tape Box
- R: Green Package: R:RoHS
- DIA: Package: DIA:DIP-16-300-2.54; SOA:SOP-16-225-1.27
- ULN2003: Number

LOGIC DIAGRAM



SCHEMATIC(EACH DARLINGTON PAIR)



ABSOLUTE MAXIMUM RATINGS(Ta=25°C)

Characteristic	Symbol	Value	Unit
Colletor-Emitter Voltage	V_{CE}	50	V
Input Voltage	V_I	30	V
Peak Collector Current	Io	500	mA
Total Emitter-terminal	I_{OK}	500	mA
Power Dissipation	Pd	(DIP-16)1.47 (SOP-16)1.25(Note2)	W W
Operating Temperature	Topr	-20~ +85	°C
Storage Temperature	Tstg	-65 ~ +150	°C

Note: 1. All volatge values are with repect to the emitter/substrate terminal E, unless otherwise noted.
2. On PCB

ELECTRICAL CHARACTERISTICS (Ta=25°C,unless otherwise specified)

Characteristic	Test Figure	Symbol	Test Conditions	Min	Typ	Max	Units
On-state Input Voltage	6	$V_{I(ON)}$	V_{CE}=2V,Ic=200mA			2.4	V
			V_{CE}=2V,Ic=250mA			2.7	
			V_{CE}=2V,Ic=300mA			3	
Collector-Emitter Saturation Voltage	5	$V_{CE(SAT)}$	I_I=250μA,Ic=100mA		0.9	1.1	V
			I_I=350μA,Ic=200mA		1	1.3	
			I_I=500μA,Ic=350mA		1.2	1.6	
Collector Cutoff Current	1	I_{CEX}	V_{CE}=50V,I_I=0			50	μA
	2		V_{CE}=50V,I_I=0,Ta=70°C			100	
Clamp Forward Voltage	8	V_F	I_F=350mA		1.7	2	V
Off-state Input Current	3	$I_{I(OFF)}$	Ic=500μA, Ta=70°C	50	65		μA
Input Current	4	I_I	V_I=3.85V		0.95	1.35	mA
Clamp Reverse Current	7	I_R	V_R=50V			50	μA
			V_R=50V, Ta=70°C			100	
Input Capacitance	--	C_I	V_I=0,f=1MHz		15	25	pF
Propagation delay time, low-to-high-level output	9	t_{PLH}			0.25	1	μs
Propagation delay time, high-to-low-level output	9	t_{PHL}			0.25	1	μs
High-level output Voltage after switching	10	V_{OH}	Vs=50V,Io=300mA	Vs-20			mV

TEST CIRCUITS

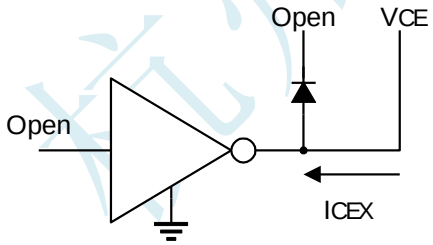


Figure 1 ICEX Test Circuit

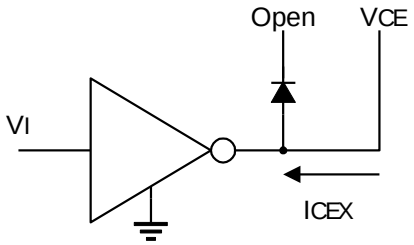


Figure 2 ICEX Test Circuit

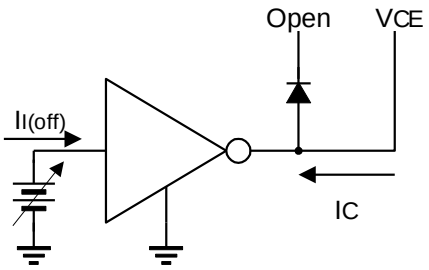


Figure 3 II(off) Test Circuit

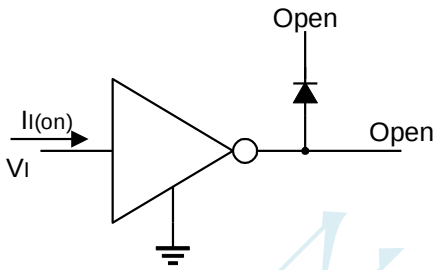
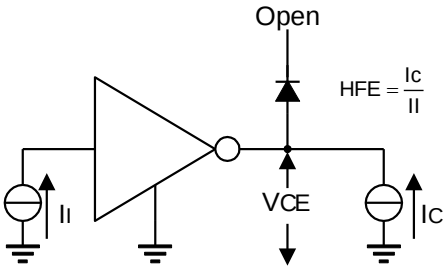


Figure 4 II(on) Test Circuit



Note: II is fixed for measuring VCE(sat),variable for measuring HFE.

Figure 5 HFE,VCE(sat) Test Circuit

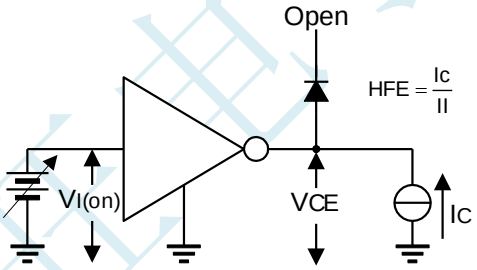


Figure 6 VI(on) Test Circuit

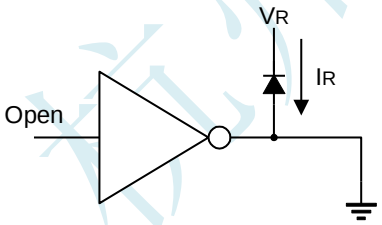


Figure 7 IR Test Circuit

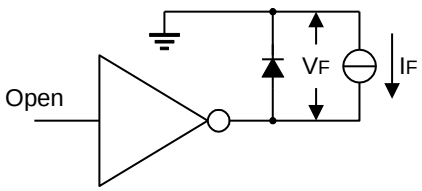


Figure 8 VF Test Circuit

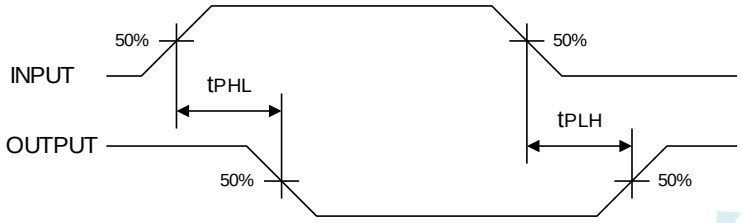
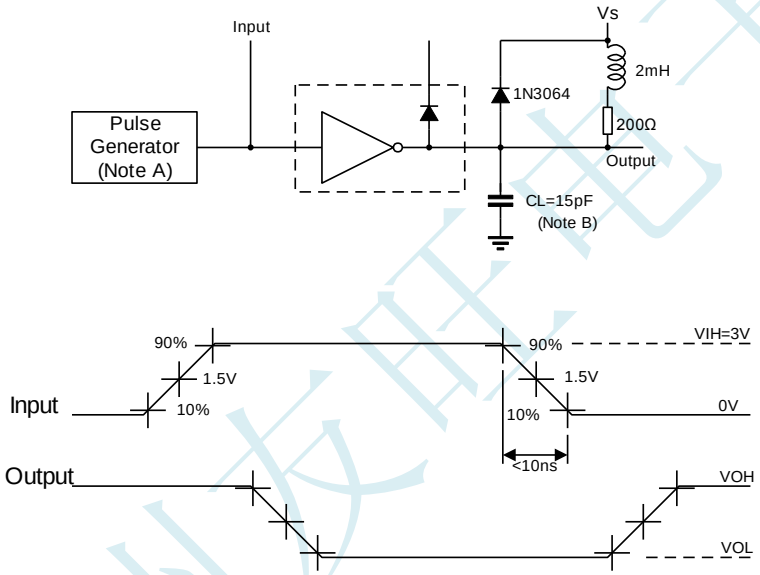


Figure 9. Propagation Delay Time Waveforms



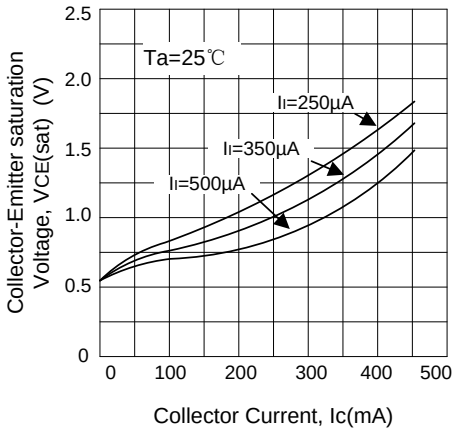
Note: A. The Pulse generatoe has the following characteristics: PRR=12.5kHz, Zo=50Ω

B. CL includes proble and jig capacitance.

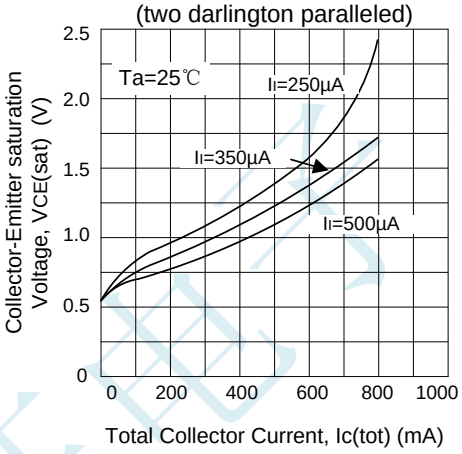
Figure 10. Latch-up Test Circuit and Voltage Waveforms

TYPICAL PERFORMANCE CHARACTERISTICS

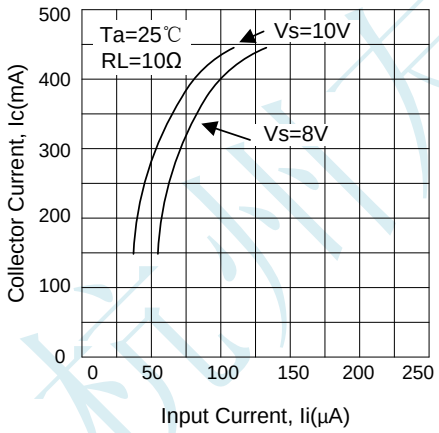
Collector-Emitter saturation Voltage vs. Collector Current



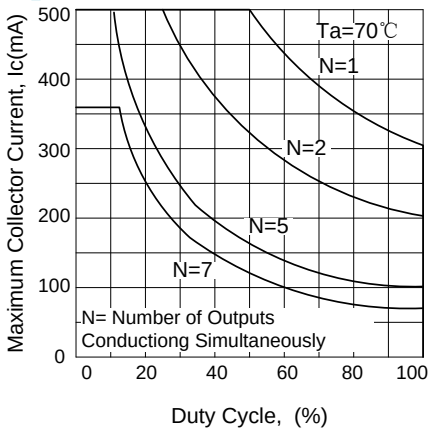
Collector-Emitter saturation Voltage vs. Total Collector Current (two darlington paralleled)



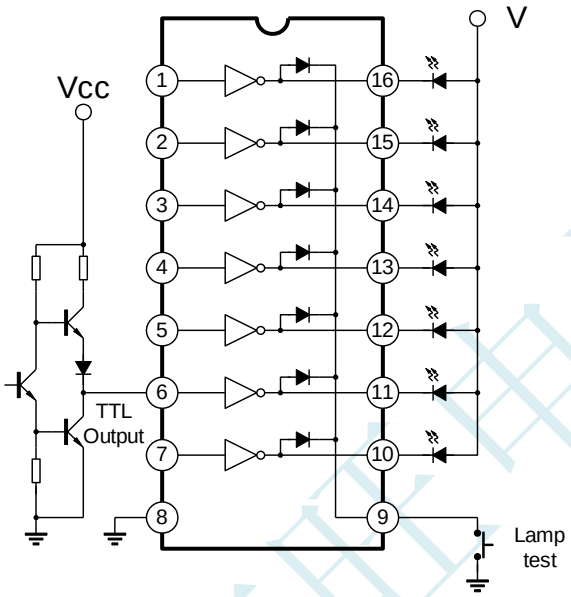
Collector Current Vs. Input Current



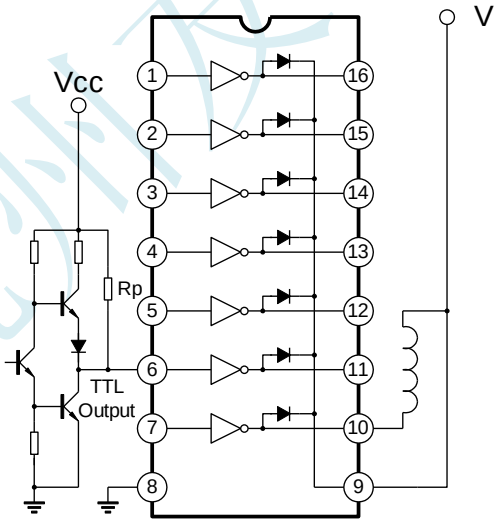
Maximum Collector Current Vs. Duty cycle



TYPICAL APPLICATION CIRCUIT



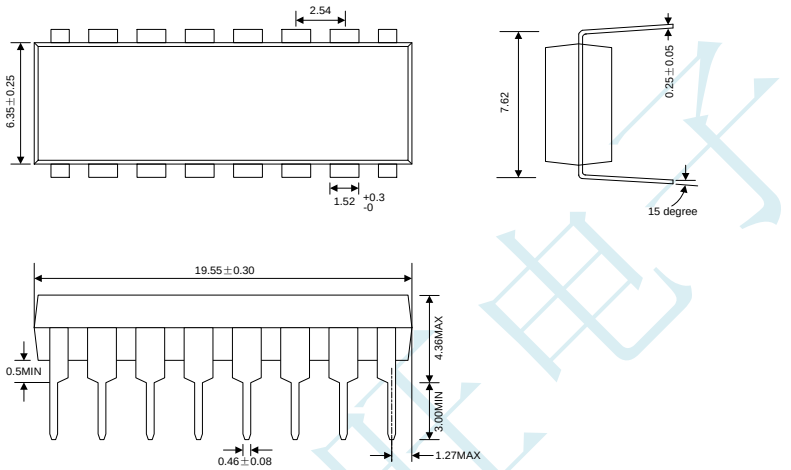
TTL to Load



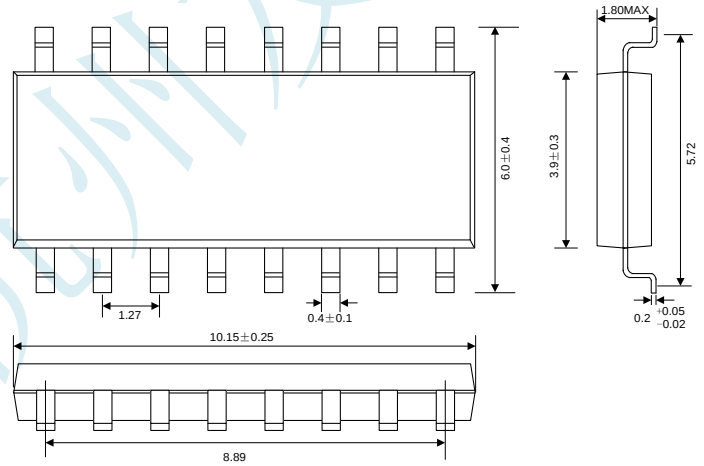
Use of pullup Resistor to increase drive Current

PACKAGE OTLINE

DIP-16-300-2.54 UNIT：mm



SOPP-16-225-1.27 UNIT：mm



ELECTROSTATIC DISCHARGE CAUTION

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage handing to prevent electrostatic damage to the device.

NOTICE

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