

EIGHT DARLINGTON ARRAYS

■ Description

The device **ULN2803A** is high-voltage, high-current Darlington drivers comprised of eight NPN Darlington pairs.

■ Features

- Output current (single output) 500mA MAX.
- High-Voltage Outputs: 50 V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay-Driver Applications

■ Applications

- Relay Drivers
- Hammer Drivers
- Lamp Drivers
- Display Drivers (LED and Gas Discharge)
- Line Drivers
- Logic Buffers

■ Detailed Description

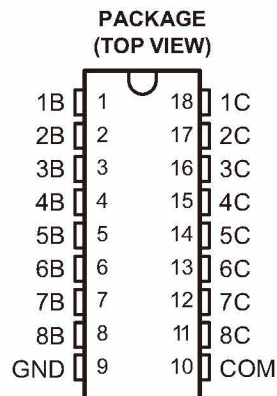
The ULN2803A device is a high-voltage, high-current Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500 mA. The Darlington pairs may be connected in parallel for higher current capability.

Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. The ULN2803A device has a 2.7-k Ω series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS devices.

■ Ordering Information

Part Number	Package	Packing	Temperature (T _A)	Package Qty	Note
ULN2803AN	DIP-18	Reel	-40°C ~ 85°C	1500	
ULN2803AD	SOIC-18	Reel	-40°C ~ 85°C	2000	

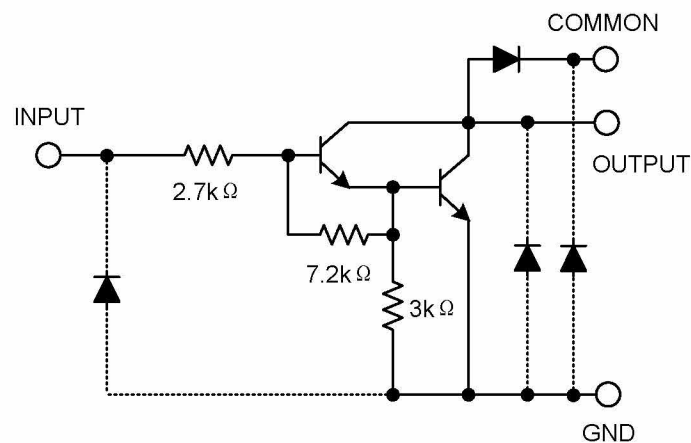
■ PIN Configurations



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
<1:8>B	1 - 8	I	Channel 1 through 7 darlington base input
<1:8>C	18 - 11	O	Channel 1 through 7 darlington collector output
GND	7	—	Common Emmitter shared by all channels (typically tied to ground)
COM	8	I/O	Common cathode node for flyback diodes (required for inductive loads)

■ Schematics (each driver)



Note: The input and output parasitic diodes cannot be used as clamp diodes.

■ Absolute Maximum Ratings

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	-0.5 ~ 30	V
Output Sustaining Voltage		$V_{CE(SUS)}$	-0.5 ~ 50	V
Output Current		I_{OUT}	500	mA/ch
Clamp Diode Reverse Voltage		V_R	50	V
Clamp Diode Forward Current		I_F	500	mA
Power Dissipation	DIP-18	P_D	1.47	W
	SOP-18		0.92 / 1.31 (Note 2)	W
Operating Temperature		T_{OPR}	-40 ~ +85	°C
Storage Temperature		T_{STG}	-40 ~ +150	°C

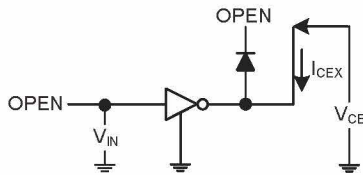
Notes: 1. Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.
2. On glass epoxy PCB (75x144x1.6mm Cu 20%).

■ Electrical characteristics ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

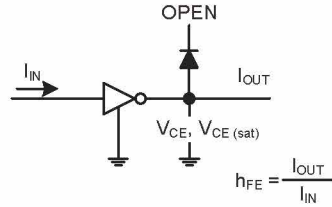
PARAMETER		SYMBOL	TEST CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Leakage Current		I_{CEX}	1	$V_{CE}=50\text{V}, T_A=25^{\circ}\text{C}$ $V_{CE}=50\text{V}, T_A=85^{\circ}\text{C}$			50 100	μA
Collector-Emitter Saturation Voltage		$V_{CE(SAT)}$	2	$I_{OUT}=350\text{mA}, I_{IN}=500\mu\text{A}$ $I_{OUT}=200\text{mA}, I_{IN}=350\mu\text{A}$ $I_{OUT}=100\text{mA}, I_{IN}=250\mu\text{A}$		1.3 1.1 0.9	1.6 1.3 1.1	V
Input Current	ON	$I_{IN(ON)}$	3	$V_{IN}=3.85\text{V}, I_{OUT}=350\text{mA}$		0.93	1.35	mA
	OFF	$I_{IN(OFF)}$	4	$I_{OUT}=500\mu\text{A}, T_A=85^{\circ}\text{C}$	50	65		μA
Input Voltage (output on)		$V_{IN(ON)}$	5	$V_{CE}=2.0\text{V}$ $I_{OUT}=200\text{mA}$ $I_{OUT}=250\text{mA}$ $I_{OUT}=300\text{mA}$			2.4 2.7 3.0	V
Clamp Diode Reverse Current		I_R	6	$V_R=50\text{V}, T_A=25^{\circ}\text{C}$ $V_R=50\text{V}, T_A=85^{\circ}\text{C}$			50 100	μA
Clamp Diode Forward Voltage		V_F	7	$I_F=350\text{mA}$			2.0	V
Input Capacitance		C_{IN}				15	25	pF
Turn-On Delay		t_{ON}	8	$V_{OUT}=50\text{V}, R_L=125\Omega, C_L=15\text{pF}$		0.1	1	μs
Turn-Off Delay		t_{OFF}	8	$V_{OUT}=50\text{V}, R_L=125\Omega, C_L=15\text{pF}$		0.2	1	μs

■ Test Circuit

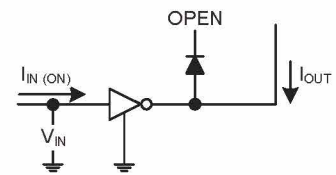
1. I_{CEX}



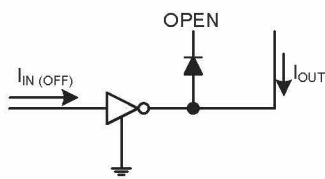
2. $V_{CE(sat)}$, h_{FE}



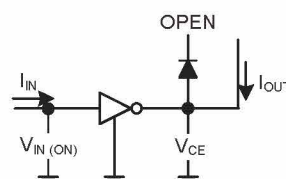
3. $I_{IN(ON)}$



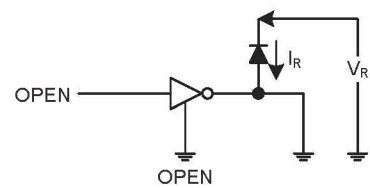
4. $I_{IN(OFF)}$



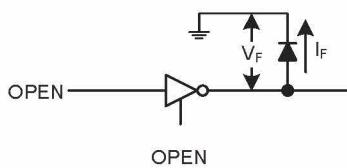
5. $V_{IN(ON)}$



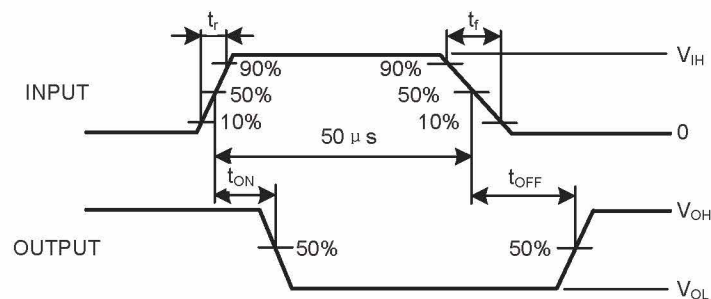
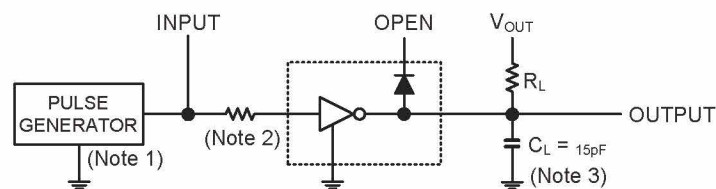
6. I_R



7. V_F

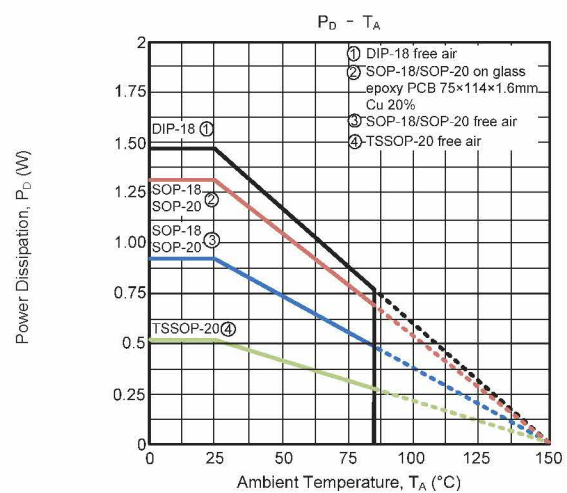
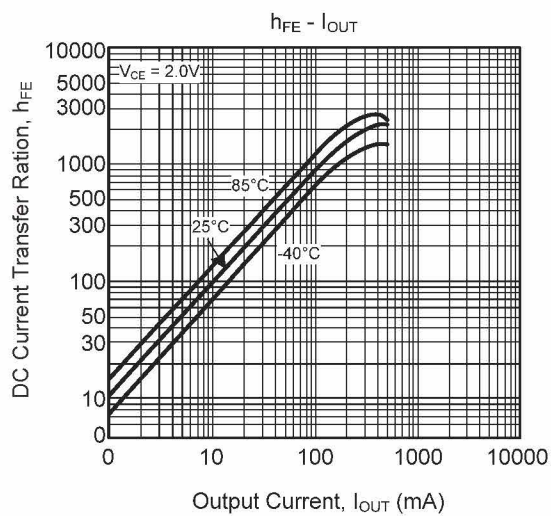
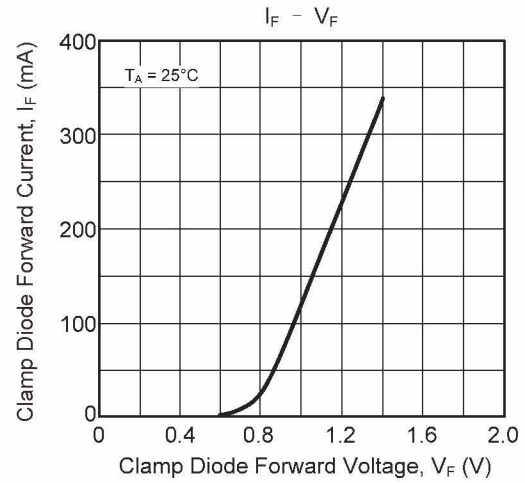
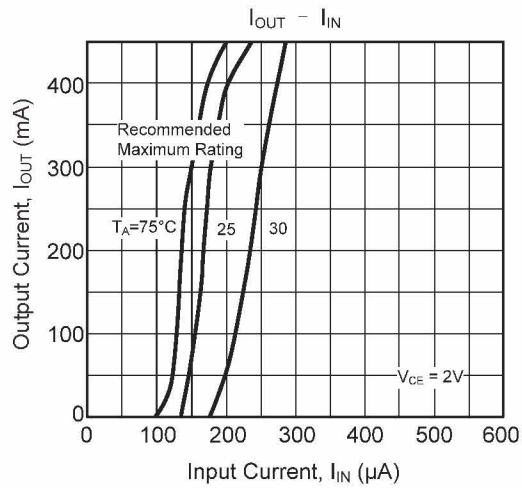
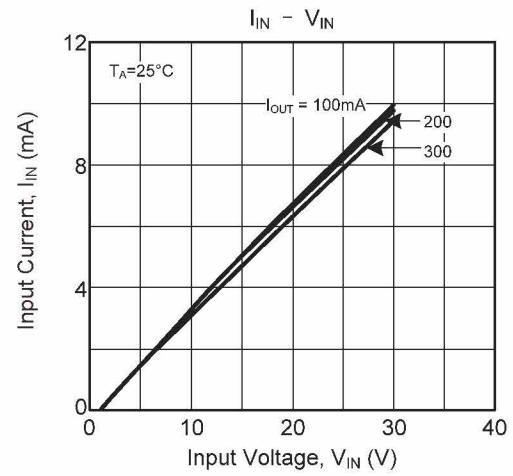
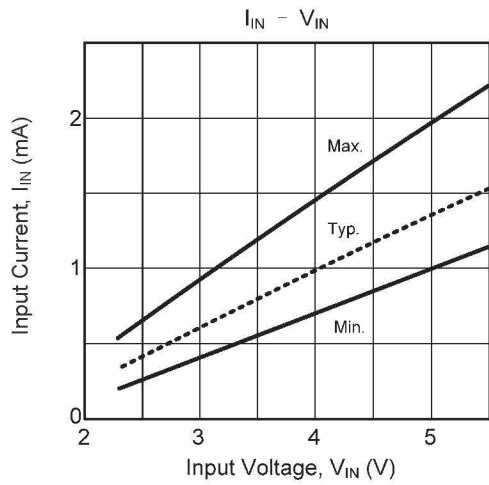


8. t_{ON} , t_{OFF}

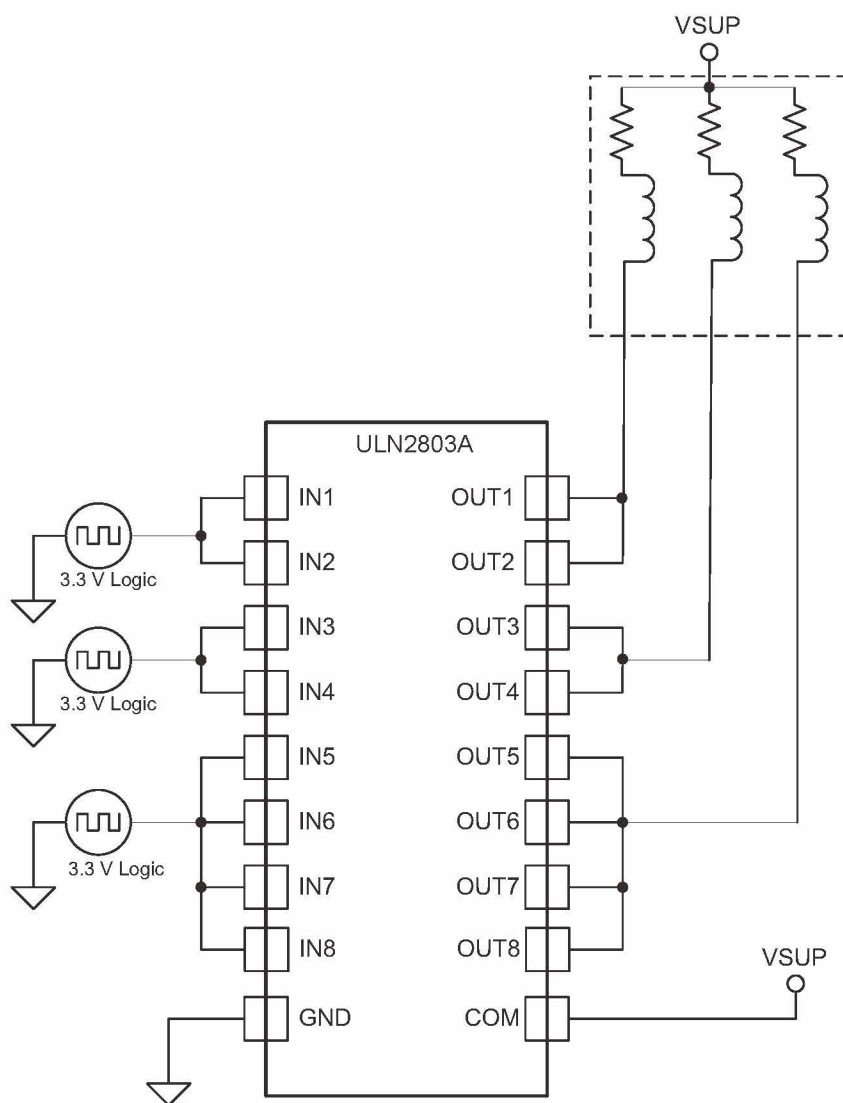


- Notes: 1. Pulse width 50μs, duty cycle 10%
 Output impedance 50Ω, $t_r \leq 5ns$, $t_f \leq 10ns$
 2. R_L : 0, V_{IH} : 3V
 3. C_L includes probe and jig capacitance.

■ Typical Characteristics



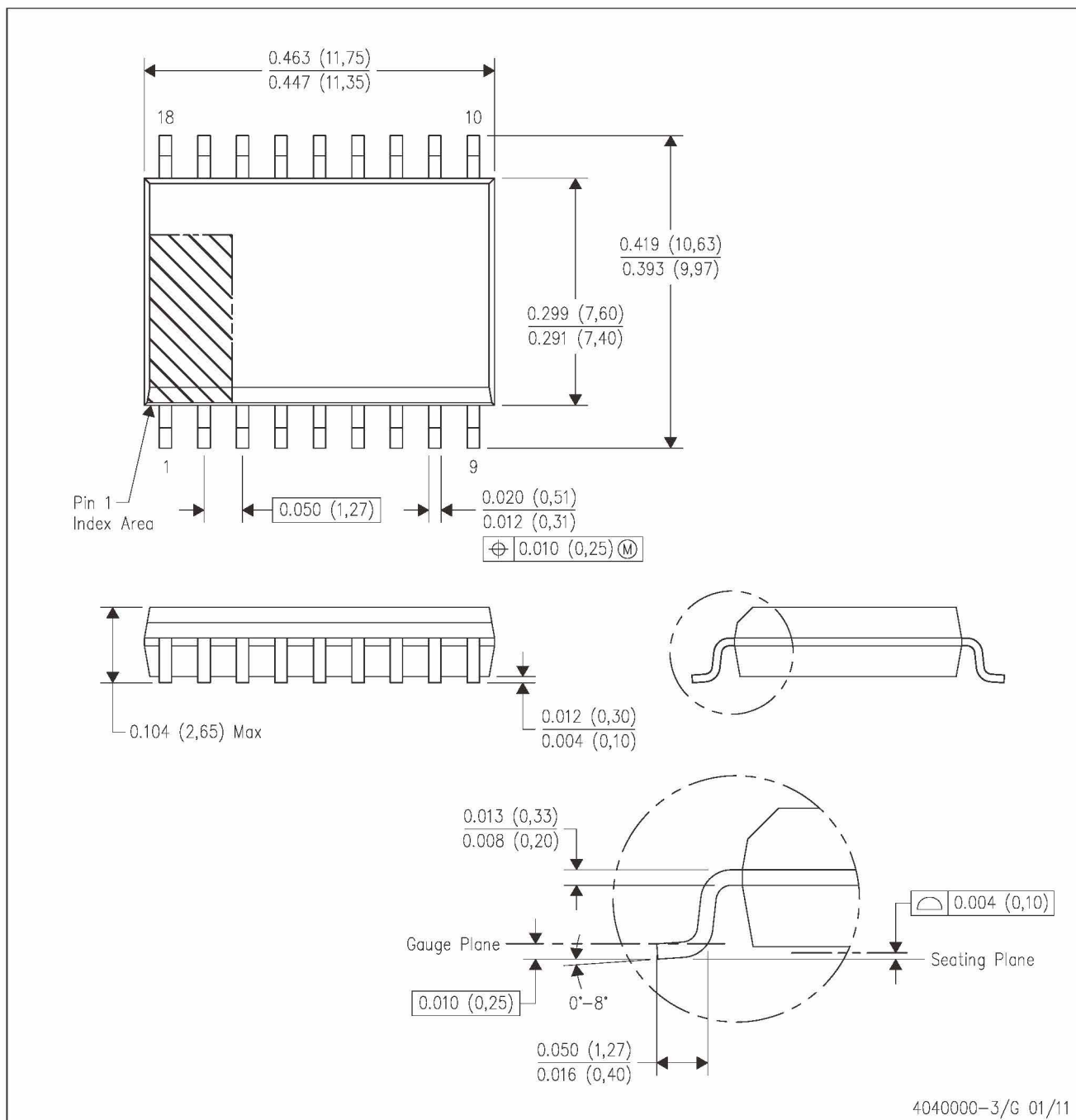
■ Typical Application



ULN2803A as Inductive Load Driver

DW (R-PDSO-G18)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AB.