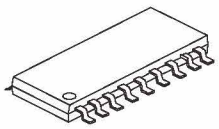
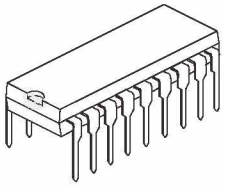
EIGHT HIGH VOLTAGE, HIGH CURRENT DARLINGTON ARRAYS

■ Description

The **ULN2804** is a high voltage, high current Darlington array comprised of eight NPN Darlington pairs. The device features open-collector outputs with suppression diodes for inductive loads and is ideally suited for interfacing between low-level logic circuitry and high power loads. Typical loads including relays DC motors, filament lamps, LED displays, printer hammers and high power buffers.



SOP-18



DIP-18

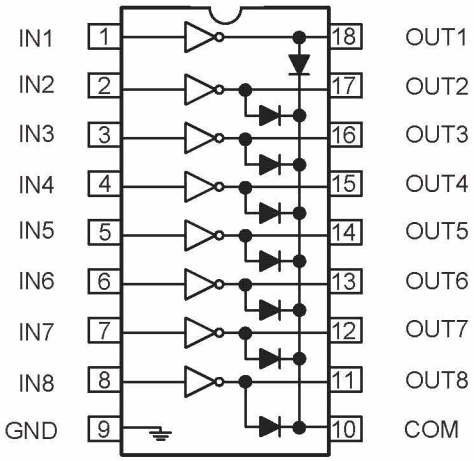
■ Features

- TTL, PMOS or CMOS Compatible inputs
- Eight Darlington transistors with common emitters
- Output current to 500 mA
- Output voltage to 50 V
- Integral suppression diodes
- Versions for all popular logic families
- Output can be paralleled
- Inputs pinned opposite outputs to simplify board layout

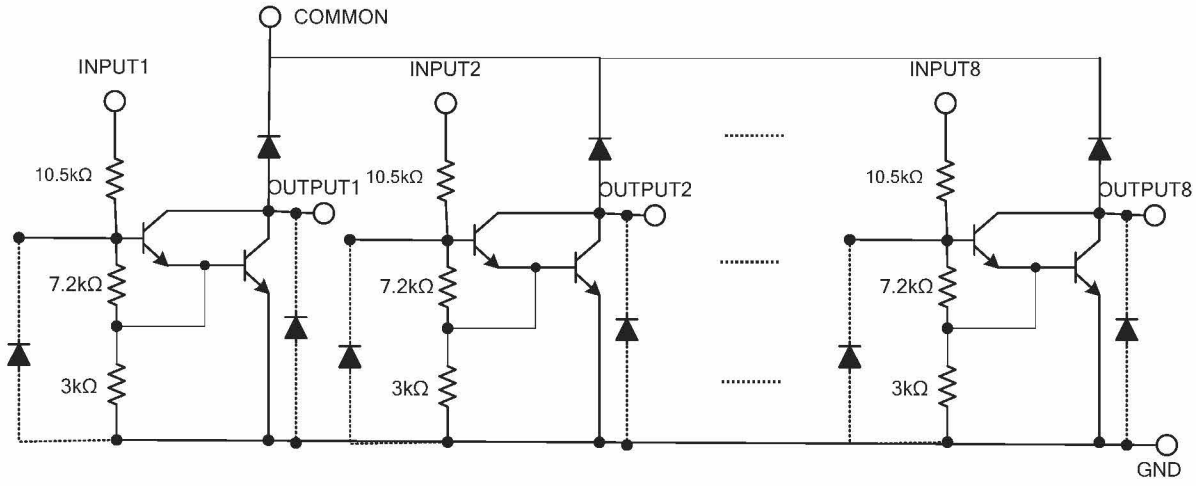
■ Ordering information

Part Number	Package	Packing	Temperature (T_A)	Package Qty	Note
ULN2804AN	DIP-18	Tube	-40°C ~ 85°C	1500	
ULN2804AD	SOIC-18	Reel	-40°C ~ 85°C	2000	

■ PIN Configurations



■ Schematics



■ Absolute Maximum Ratings

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	30	V
Output Voltage		V_{OUT}	50	V
Collector Current – Continuous		I_C	500	mA
Base Current – Continuous		I_B	25	mA
Power Dissipation	DIP-18	P_D	1.5	W
	SOP-18		0.95	W
Junction Temperature		T_J	+120	°C
Operating Ambient Temperature		T_{OPR}	-40 ~ +85	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Note Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied

■ Thermal data

PARAMETER		SYMBOL	RATING	UNIT
Thermal resistance from junction to Ambient	DIP-18	θ_{JA}	60	°C /W
	SOP-18		80	°C /W

■ Electrical Characteristics (Ta = 25°C, unless otherwise specified.)

PARAMETER		SYMBOL	TEST FIGURE	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Collector-Emitter Saturation Voltage		$V_{CE(SAT)}$	1	I_{OUT}=350mA, I_{IN}=500μA			1.3	1.6	V
				I_{OUT}=200mA, I_{IN}=350μA			1.1	1.3	V
				I_{OUT}=100mA, I_{IN}=250μA			0.9	1.1	V
Input Voltage		$V_{IN(ON)}$	2	V_{CE}=2.0V	I_{OUT}=125mA			5.0	V
					I_{OUT}=200mA			6.0	V
					I_{OUT}=275mA			7.0	V
					I_{OUT}=350mA			8.0	V
Clamp Diode Forward Voltage		V_F	3	I_F=350mA			1.5	2.0	V
Output Leakage Current		I_{CEX}	4a	V_{OUT}=50V, Ta=70°C				100	μA
			4b	V_{OUT}=50V, Ta=70°C, V_{IN} =1.0V				500	
Input Current	ON	$I_{IN(ON)}$	5	V_{IN} =5V			0.35	0.5	mA
				V_{IN} =12V			1.0	1.45	mA
	OFF	$I_{IN(OFF)}$	6	I_{OUT}=500μA, Ta=70°C		50	100		μA
Clamp Diode Reverse Current		I_R	7	V_R=50V, Ta=25°C				50	μA
				V_R=50V, Ta=70°C				100	μA
DC Current Gain		h_{FE}		V_{OUT}=2V, I_{OUT}=350mA		1000			
Input Capacitance		C_{IN}					15	25	pF
Turn-On Delay		t_{ON}	8				0.25	1	μS
Turn-Off Delay		t_{OFF}	8				0.25	1	μS

■ Test Figures

Figure 1.

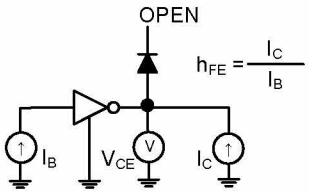


Figure 2.

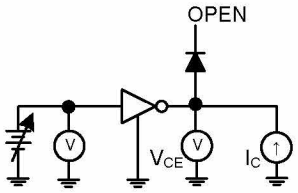


Figure 3.

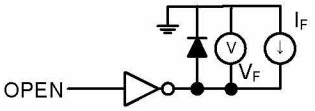


Figure 4a.

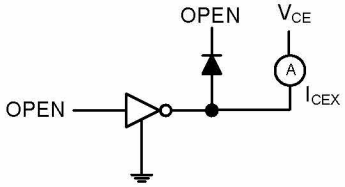


Figure 4b.

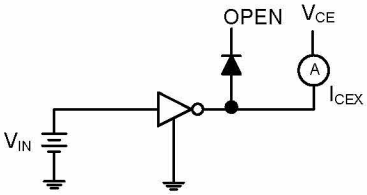


Figure 5.

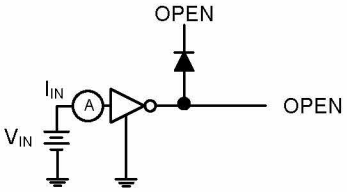


Figure 6.

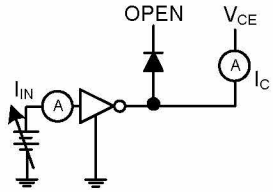


Figure 7.

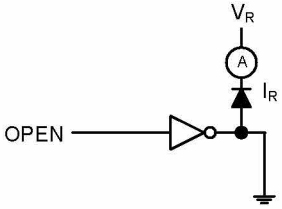
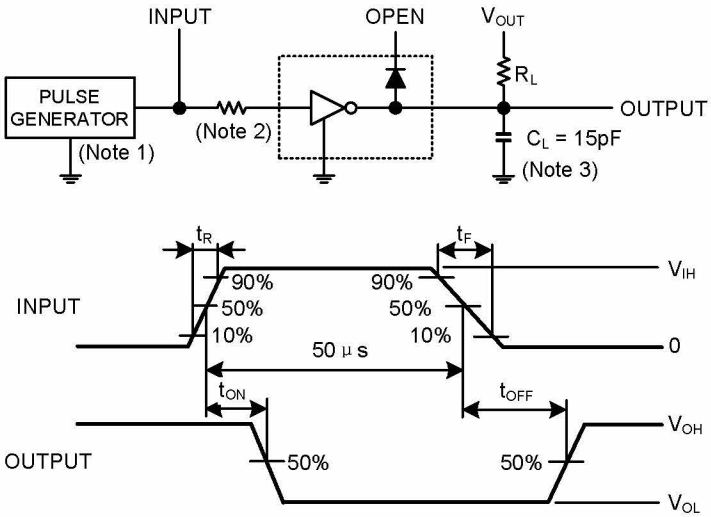


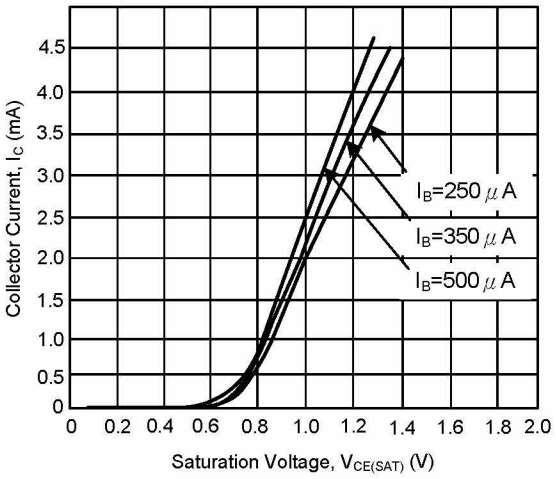
Figure 8.



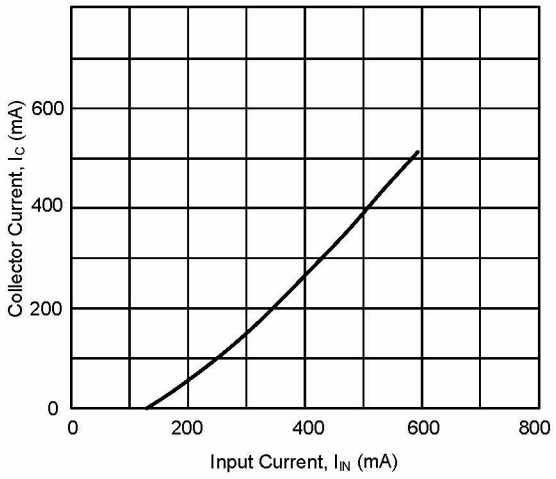
Note1: Pulse width 50μs, duty cycle 10%
Output impedance 50Ω, t_R≤5ns, t_F≤10ns
Note2: R1: 0, V_{IH}: 3V
Note3: C_L includes probe and jig capacitance.

■ Typical Characteristics

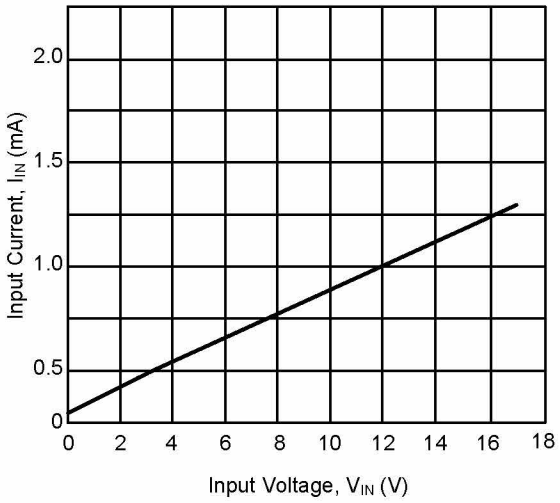
Output Current vs. Saturation Voltage



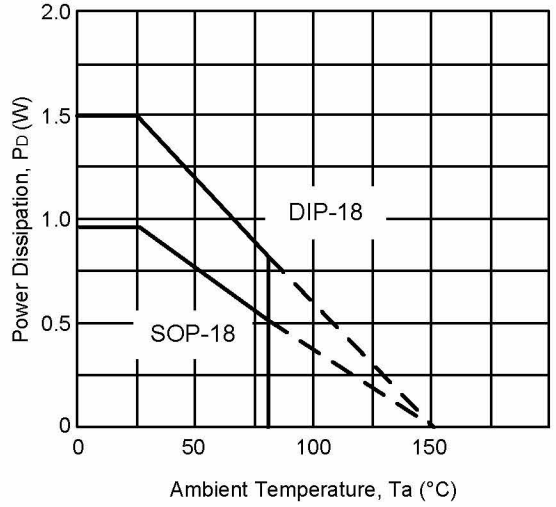
Output Current vs. Input Current



Input Current vs. Input Voltage



Power Dissipation vs. Ambient Temperature



DIP-18 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
a1	0.254		
B	1.39		1.65
b		0.46	
b1		0.25	
D			23.24
E		8.5	
e		2.54	
e3		20.32	
F			7.1
I			3.93
L		3.3	
Z		1.27	1.59

DIP-18 package dimensions