



# ULN2804

## LINEAR INTEGRATED CIRCUIT

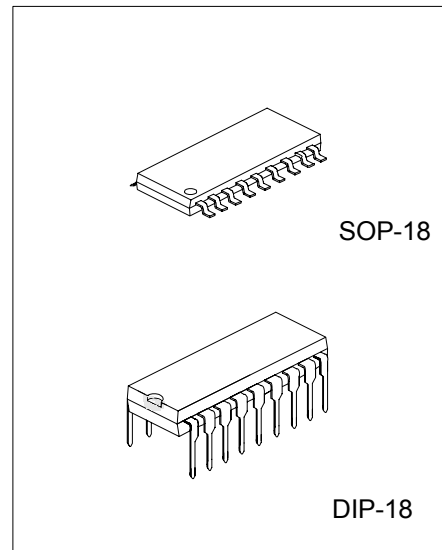
### EIGHT HIGH VOLTAGE, HIGH CURRENT DARLINGTON ARRAYS

#### 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.

#### FEATURE

- \* Eight Darlingtons with common emitters
- \* TTL, PMOS or CMOS Compatible inputs
- \* Peak output current to 500mA
- \* Output voltage to 50V
- \* Clamp diodes for transient suppression



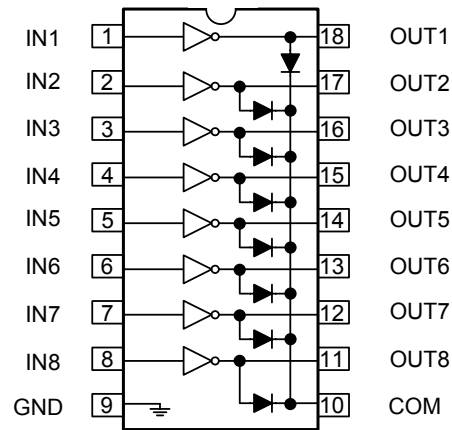
\*Pb-free plating product number: ULN2804L

#### ORDERING INFORMATION

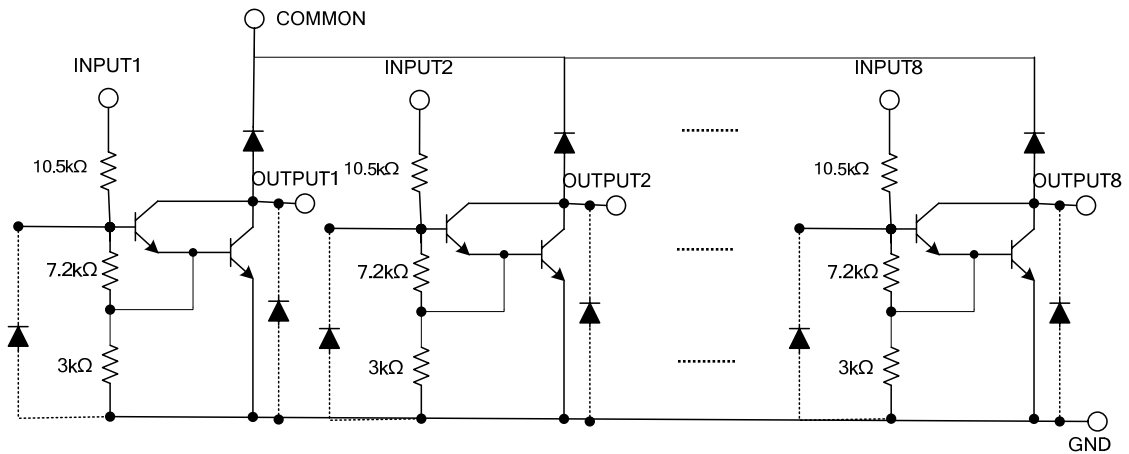
Order Number		Package	Packing
Normal	Lead Free Plating		
ULN2804-D18-T	ULN2804L-D18-T	DIP-18	Tube
ULN2804-S18-R	ULN2804L-S18-R	SOP-18	Tape Reel
ULN2804-S18-T	ULN2804L-S18-T	SOP-18	Tube

<p>ULN2804L-D18-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) D18: DIP-18, S18: SOP-18 (3) L: Lead Free Plating, Blank: Pb/Sn</p>
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## ■ 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		$T_{OPR}$	0 ~ +70	°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	$\theta_{JA}$	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	$I_{OUT}=350mA, I_{IN}=500\mu A$		1.3	1.6	V	
			$I_{OUT}=200mA, I_{IN}=350\mu A$		1.1	1.3	V	
			$I_{OUT}=100mA, I_{IN}=250\mu A$		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	$V_{OUT}=50V, Ta=70^\circ C$			100	$\mu A$	
		4b	$V_{OUT}=50V, Ta=70^\circ C, V_{IN}=1.0V$			500	$\mu A$	
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	$I_{OUT}=500\mu A, Ta=70^\circ C$	50	100	$\mu A$	
Clamp Diode Reverse Current	$I_R$	7	$V_R=50V, Ta=25^\circ C$			50	$\mu A$	
			$V_R=50V, Ta=70^\circ C$			100	$\mu A$	
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	$\mu S$	
Turn-Off Delay	$t_{OFF}$	8			0.25	1	$\mu S$	

## ■ TEST FIGURES

Figure 1.

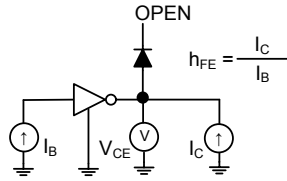


Figure 2.

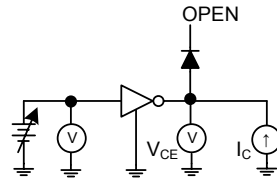


Figure 3.

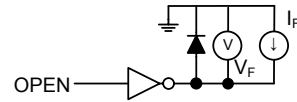


Figure 4a.

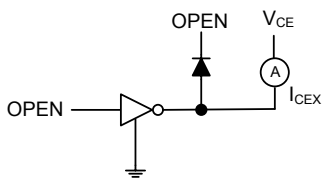


Figure 4b.

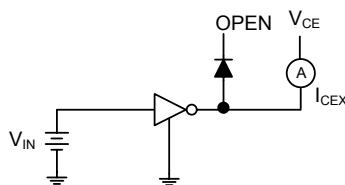


Figure 5.

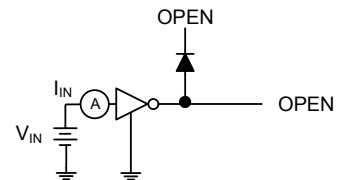


Figure 6.

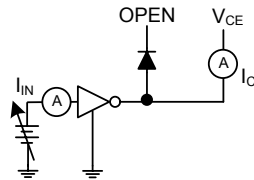


Figure 7.

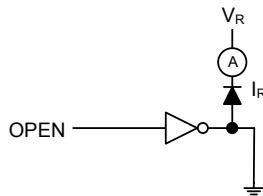
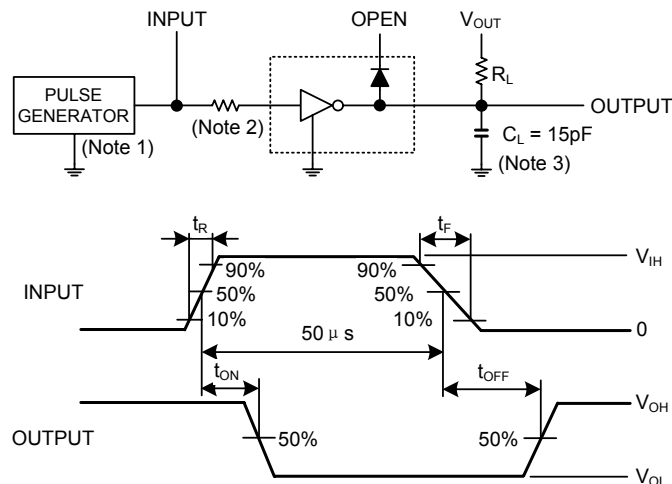


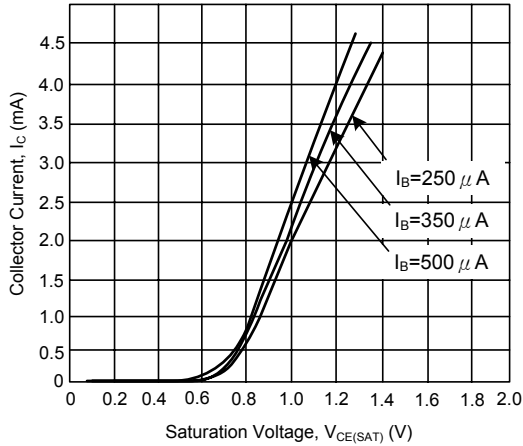
Figure 8.



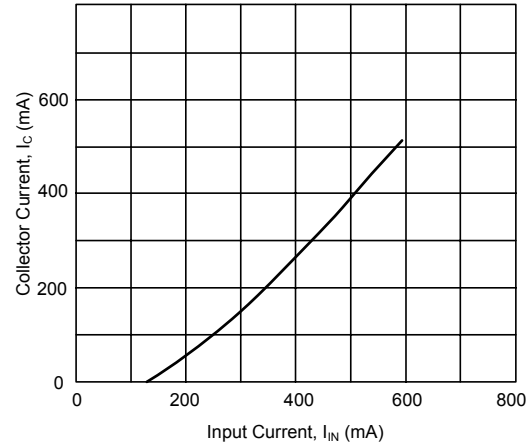
Note1: Pulse width 50μs, duty cycle 10%  
 Output impedance 50Ω,  $t_r \leq 5\text{ns}$ ,  $t_f \leq 10\text{ns}$   
 Note2: R1: 0,  $V_{IH}$ : 3V  
 Note3:  $C_L$  includes probe and jig capacitance.

## TYPICAL CHARACTERISTICS

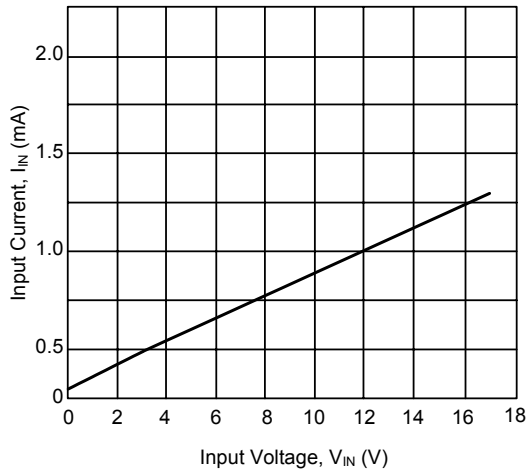
Output Current vs. Saturation Voltage



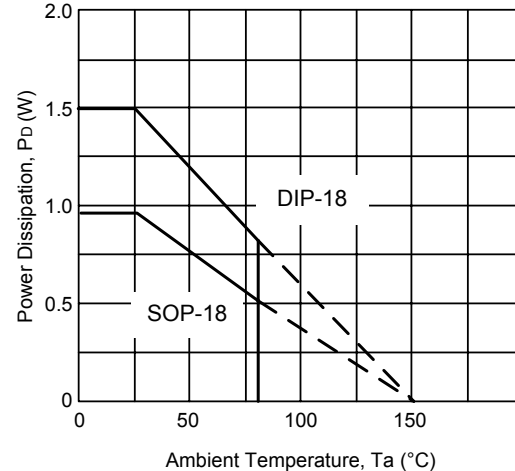
Output Current vs. Input Current



Input Current vs. Input Voltage



Power Dissipation vs. Ambient Temperature



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