



ULN2804

LINEAR INTEGRATED CIRCUIT

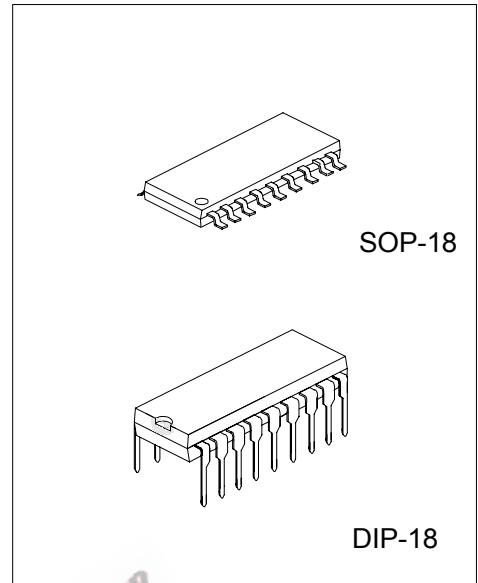
EIGHT HIGH VOLTAGE, HIGH CURRENT DARLINGTON ARRAYS

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



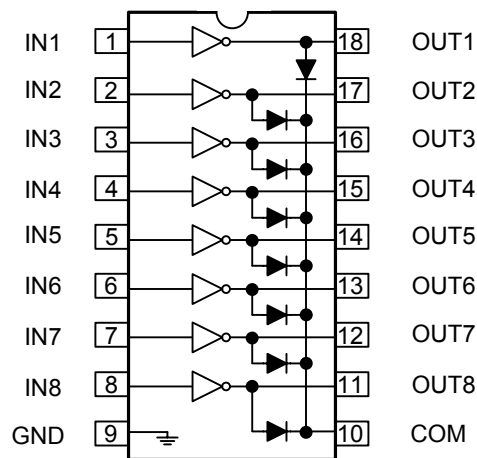
*Pb-free plating product number: ULN2804L

ORDERING INFORMATION

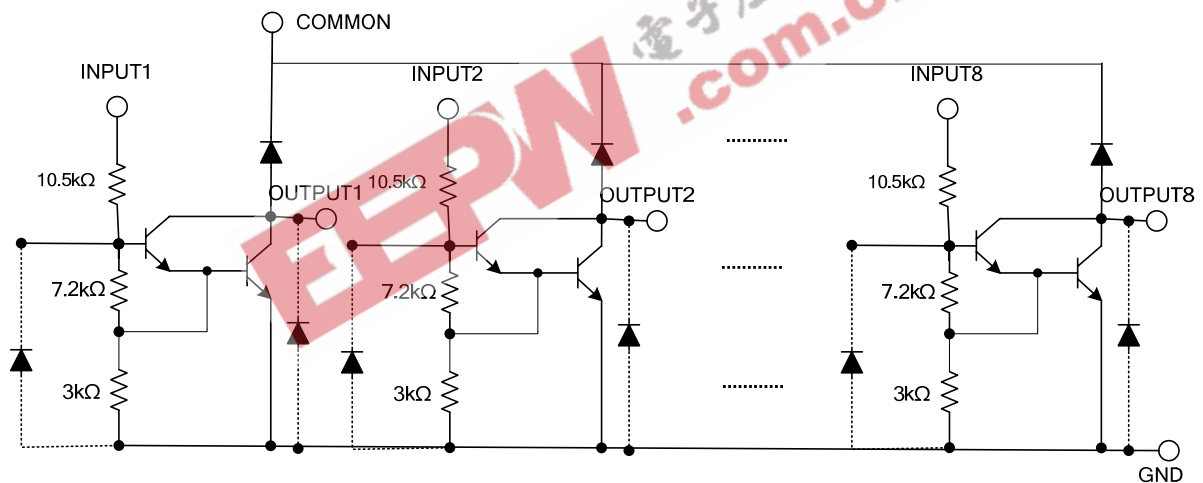
Order Number		Package	Packing
Normal	Lead Free Plating		
ULN2804-D18-T	ULN2804L-D18-T	DIP-18	Tube
ULN2804-S18-R	ULN2804L-S18-R	SOP-18	Tape Reel
ULN2804-S18-T	ULN2804L-S18-T	SOP-18	Tube

<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	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	$I_{OUT}=350mA, I_{IN}=500\mu A$		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	$V_{CE}=2.0V$			5.0	V	
					$I_{OUT}=125mA$			6.0	V
					$I_{OUT}=200mA$			7.0	V
					$I_{OUT}=275mA$			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	μA	
				4b	$V_{OUT}=50V, Ta=70^\circ C, V_{IN}=1.0V$				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	$I_{OUT}=500\mu A, Ta=70^\circ C$	50	100		μA	
Clamp Diode Reverse Current		I_R	7	$V_R=50V, Ta=25^\circ C$			50	μA	
				$V_R=50V, Ta=70^\circ C$			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.

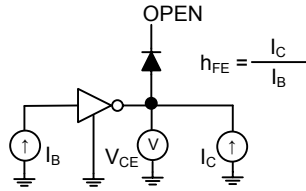


Figure 2.

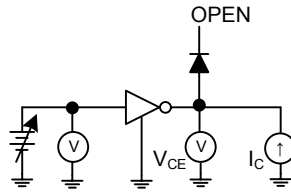


Figure 3.

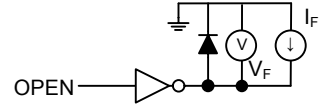


Figure 4a.

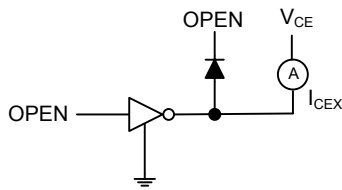


Figure 4b.

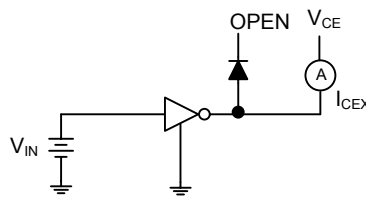


Figure 5.

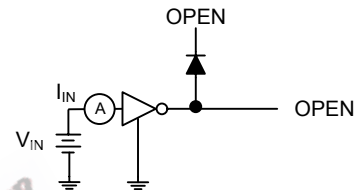


Figure 6.

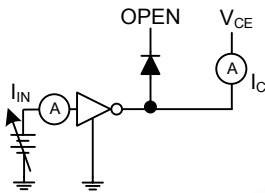


Figure 7.

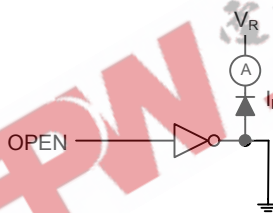
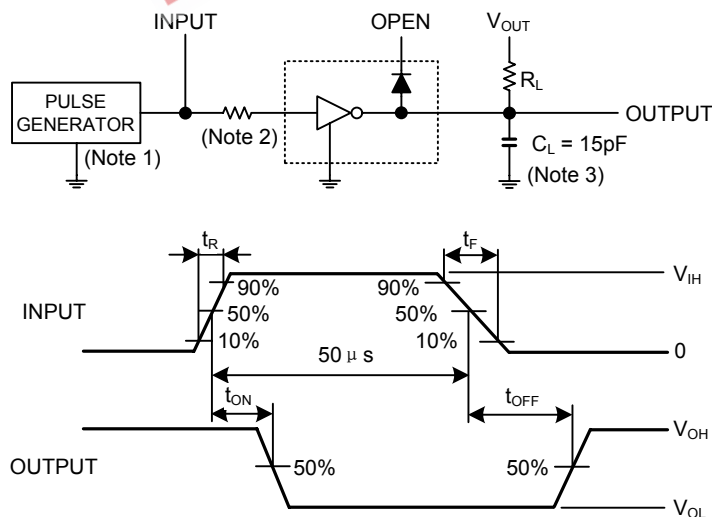


Figure 8.



Note1: Pulse width 50μs, duty cycle 10%

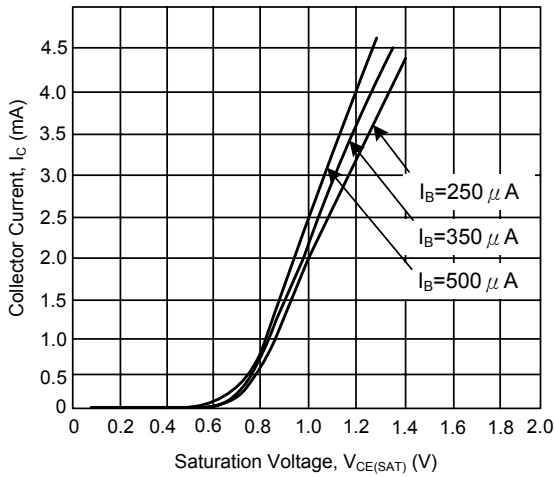
Output impedance 50Ω, $t_R \leq 5\text{ns}$, $t_F \leq 10\text{ns}$

Note2: $R_1 = 0$, $V_{IH} = 3\text{V}$

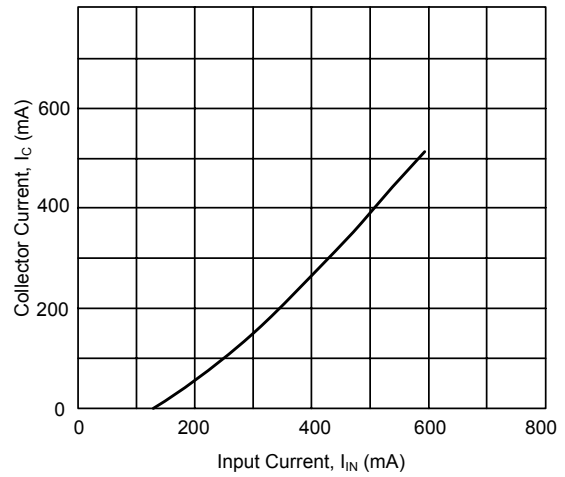
Note3: C_L includes probe and jig capacitance.

■ TYPICAL CHARACTERISTICS

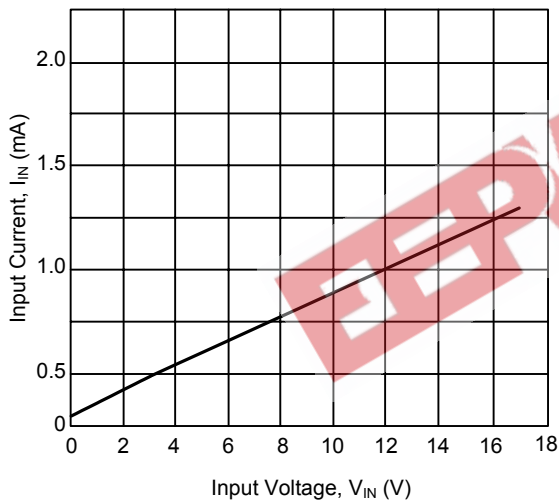
Output Current vs. Saturation Voltage



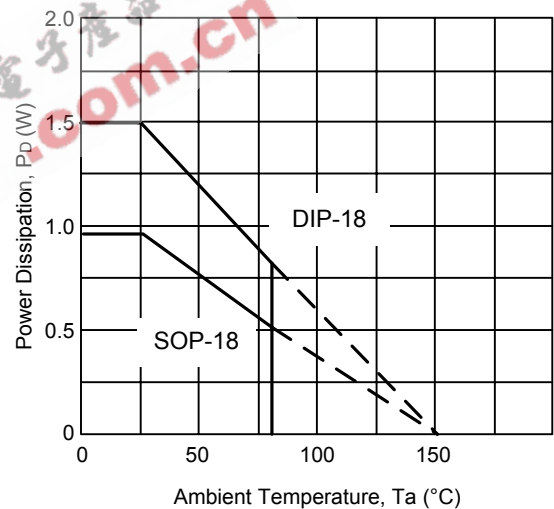
Output Current vs. Input Current



Input Current vs. Input Voltage



Power Dissipation vs. Ambient Temperature



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