

EIGHT DARLINGTON ARRAYS

- EIGHT DARLINGTONS 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

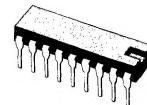
DESCRIPTION

The ULN2801A-ULN2805A each contain eight darlington transistors with common emitters and integral suppression diodes for inductive loads. Each darlington features a peak load current rating of 600 mA (500 mA continuous) and can withstand at least 50 V in the off state. Outputs may be paralleled for higher current capability.

Five versions are available to simplify interfacing to standard logic families : the ULN2801A is designed for general purpose applications with a current limit resistor ; the ULN2802A has a 10.5 K Ω input resistor and zener for 14-25 V PMOS ; the ULN2803A has a 2.7 K Ω input resistor for 5 V TTL and CMOS ;

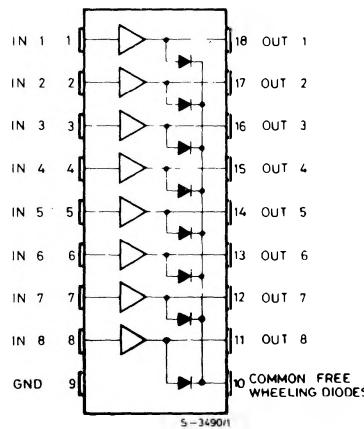
the ULN2804A has a 10.5 K Ω input resistor for 6-15 V CMOS and the ULN2805A is designed to sink a minimum of 350 mA for standard and Schottky TTL where higher output current is required.

All types are supplied in a 18-lead plastic DIP with a copper lead from and feature the convenient input-opposite-output pinout to simplify board layout.



DIP-18
(Plastic)

CONNECTION DIAGRAM (top view)

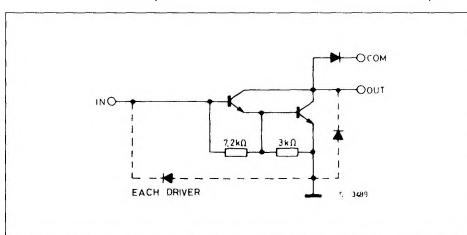


ABSOLUTE MAXIMUM RATINGS

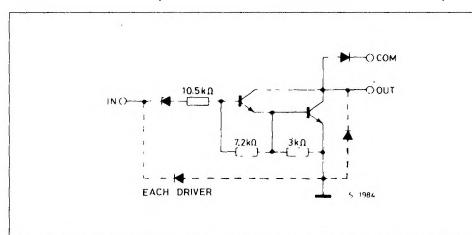
Symbol	Parameter	Value	Unit
V_o	Output Voltage	50	V
V_i	Input Voltage for ULN2802A, 2803A, 2804A	30	V
	for ULN2805A	15	V
I_C	Continuous Collector Current	500	mA
I_B	Continuous Base Current	25	mA
P_{tot}	Power Dissipation (one Darlington pair)	1.0	W
	(total package)	2.25	W
T_{amb}	Operating Ambient Temperature Range	-20 to 85	°C
T_{stg}	Storage Temperature Range	-55 to 150	°C

SCHEMATIC DIAGRAM AND ORDER CODES

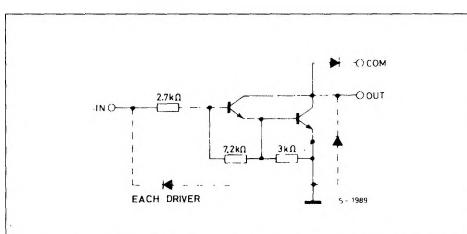
For ULN2801A (each driver for PMOS-CMOS)



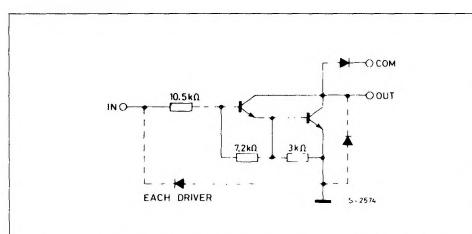
For ULN2802A (each driver for 14-15 V PMOS)



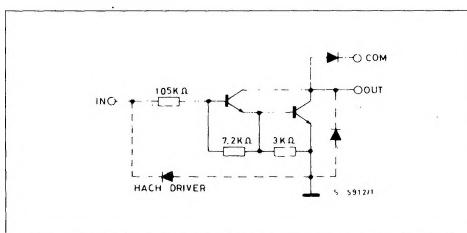
For ULN2803A (each driver for 5 V, TTL/CMOS)



For ULN2804A (each driver for 6-15 V CMOS/PMOS)



For ULN2805A (each driver for high out TTL)



THERMAL DATA

$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max.	55	$^{\circ}\text{C/W}$
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ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.	
I_{CEX}	Output Leakage Current	$V_{CE} = 50\text{ V}$ $T_{amb} = 70^{\circ}\text{C}$ $V_{CE} = 50\text{ V}$ $T_{amb} = 70^{\circ}\text{C}$ for ULN2802A $V_{CE} = 50\text{ V}$ $V_i = 6\text{ V}$ for ULN2804A $V_{CE} = 50\text{ V}$ $V_i = 1\text{ V}$			50 100	μA μA	1a 1a	
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	$I_C = 100\text{ mA}$ $I_B = 250\text{ }\mu\text{A}$ $I_C = 200\text{ mA}$ $I_B = 350\text{ }\mu\text{A}$ $I_C = 350\text{ mA}$ $I_B = 500\text{ }\mu\text{A}$		0.9 1.1 1.3 1.6	1.1 1.3 1.6	V V V	2	
$I_{i(on)}$	Input Current	for ULN2802A $V_i = 17\text{ V}$ for ULN2803A $V_i = 3.85\text{ V}$ for ULN2804A $V_i = 5\text{ V}$ for ULN2805A $V_i = 12\text{ V}$ $V_i = 3\text{ V}$		0.82 0.93 0.35 1 1.5	1.25 1.35 0.5 1.45 2.4	mA mA mA mA mA	3	
$I_{i(off)}$	Input Current	$T_{amb} = 70^{\circ}\text{C}$ $I_C = 500\text{ }\mu\text{A}$	50	65		μA	4	
$V_{i(on)}$	Input Voltage	for ULN2802A $V_{CE} = 2\text{ V}$ $I_C = 300\text{ mA}$ for ULN2803A $V_{CE} = 2\text{ V}$ $I_C = 200\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 250\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 300\text{ mA}$ for ULN2804A $V_{CE} = 2\text{ V}$ $I_C = 125\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 200\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 275\text{ mA}$ $V_{CE} = 2\text{ V}$ $I_C = 350\text{ mA}$ for ULN2805A $V_{CE} = 2\text{ V}$ $I_C = 350\text{ mA}$			13 2.4 2.7 3 5 6 7 8 2.4	V V V V V V V V	5	
h_{FE}	DC Forward Current Gain	for ULN2801A $V_{CE} = 2\text{ V}$ $I_C = 350\text{ mA}$	1000			-	2	
C_i	Input Capacitance				15	pF	-	
t_{PLH}	Turn-on Delay Time	0.5 V_i to 0.5 V_o			0.25	1	μs	-
t_{PHL}	Turn-off Delay Time	0.5 V_i to 0.5 V_o			0.25	1	μs	-
I_R	Clamp Diode Leakage Current	$V_R = 50\text{ V}$ $T_{amb} = 70^{\circ}\text{C}$ $V_R = 50\text{ V}$			50 100	μA μA	6	
V_F	Clamp Diode Forward Voltage	$I_F = 350\text{ mA}$			1.7	2	V	7

TEST CIRCUITS

Figure 1a.

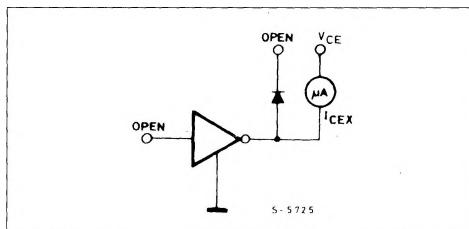


Figure 1b.

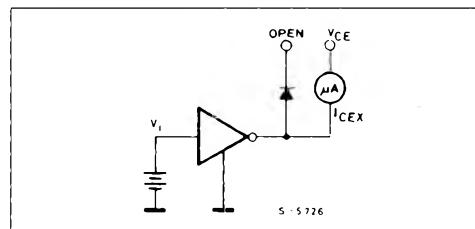


Figure 2.

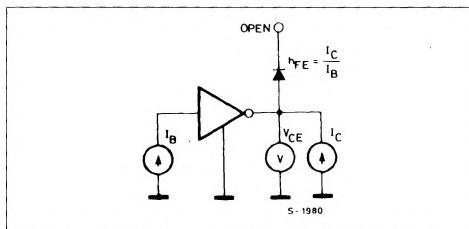


Figure 3.

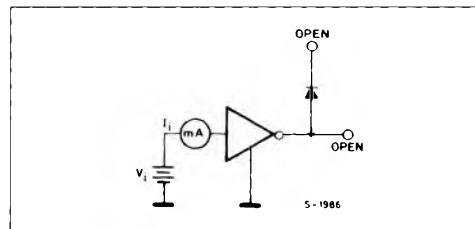


Figure 4.

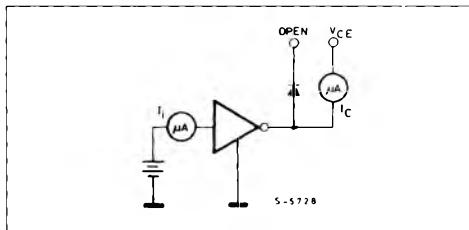


Figure 5.

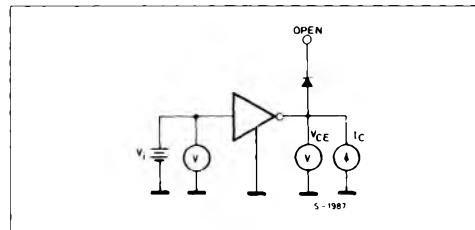


Figure 6.

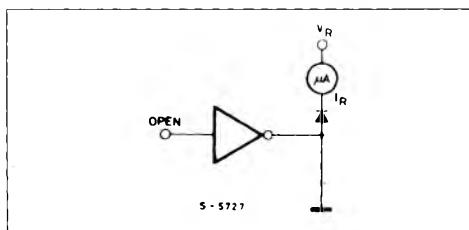


Figure 7.

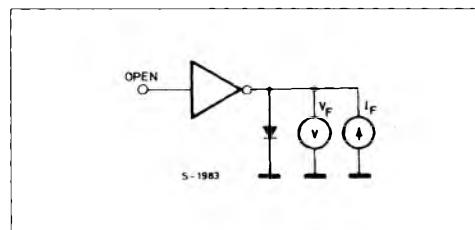


Figure 8 : Collector Current as a Function of Saturation Voltage.

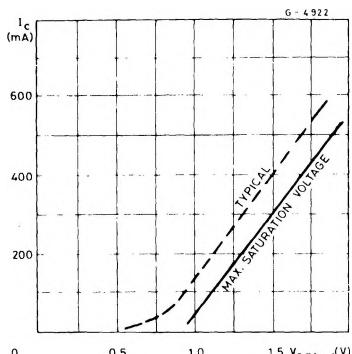


Figure 9 : Collector Current as a Function of Input Current.

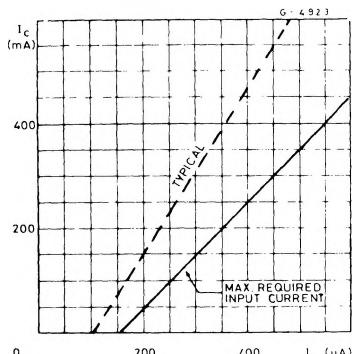


Figure 10 : Allowable Average Power Dissipation as a Function of Ambient Temperature.

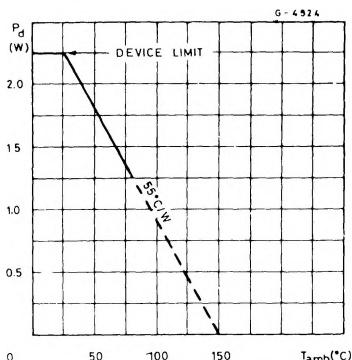


Figure 11 : Peak Collector Current as a Function of Duty Cycle.

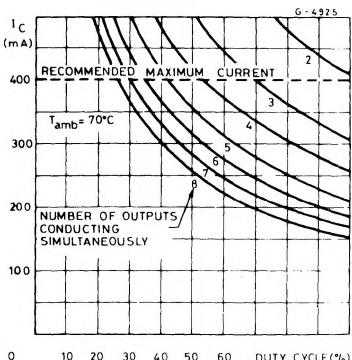


Figure 12 : Peak Collector Current as a Function of Duty.

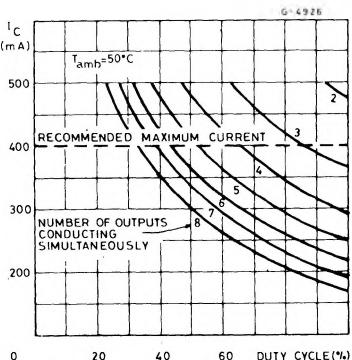


Figure 13 : Input Current as a Function of Input Voltage (for ULN2802A).

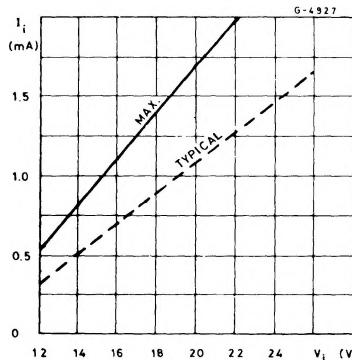


Figure 14 : Input Current as a Function of Input Voltage (for ULN2804A)

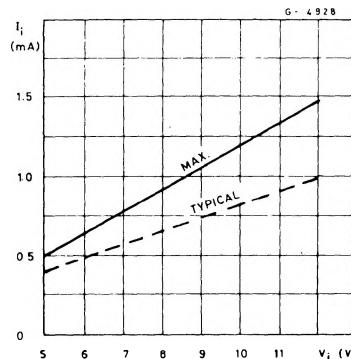


Figure 15 : Input Current as a Function of Input Voltage (for ULN2803A)

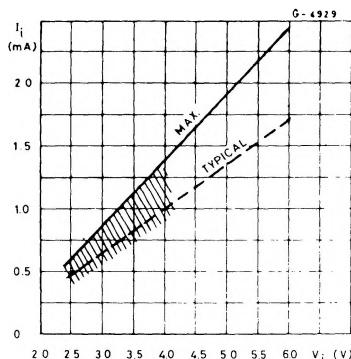


Figure 16 : Input Current as a Function of Input Voltage (for ULN2805A)

