

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

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.

DESCRIPTION

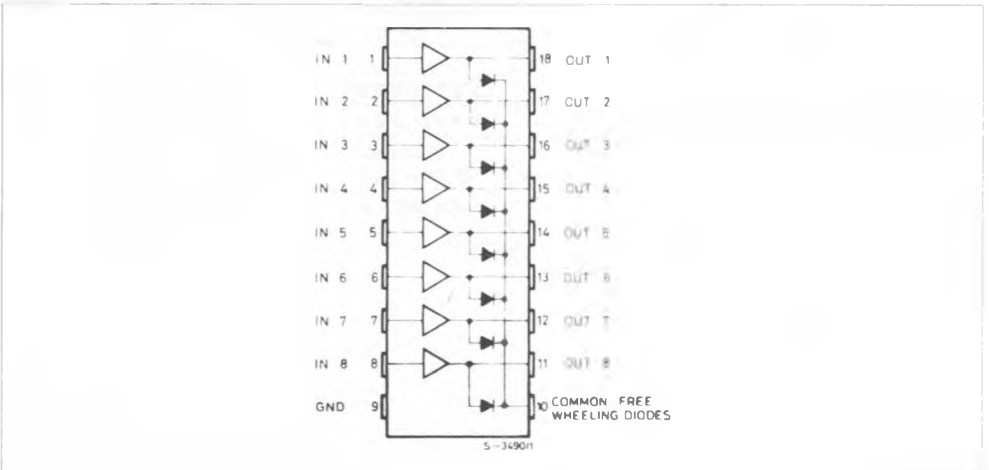
The ULN2801A-ULN2805A each contain eight darlington transistors with common emitters and integral suppression diodes for inductive loads. Each darlington features a peak load current rating of 600 mA (500 mA continuous) and can withstand at least 50 V in the off state. Outputs may be paralleled for higher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



DIP-18
(Plastic)

CONNECTION DIAGRAM (top view)

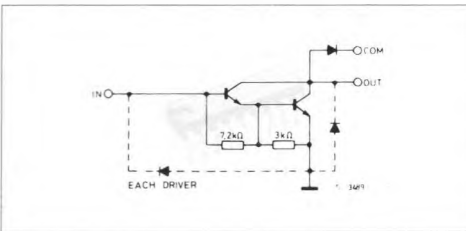


ABSOLUTE MAXIMUM RATINGS

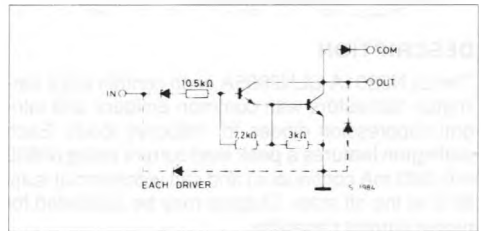
Symbol	Parameter	Value	Unit
V_o	Output Voltage	50	V
V_i	Input Voltage for ULN2802A, 2803A, 2804A for ULN2805A	30 15	V V
I_C	Continuous Collector Current	500	mA
I_B	Continuous Base Current	25	mA
P_{tot}	Power Dissipation (one Darlington pair) (total package)	1.0 2.25	W W
T_{amb}	Operating Ambient Temperature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

SCHEMATIC DIAGRAM AND ORDER CODES

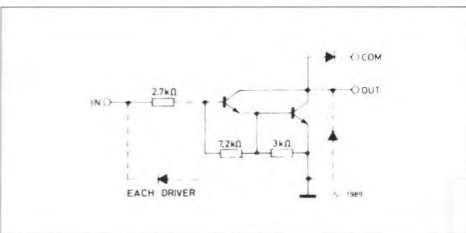
For ULN2801A (each driver for PMOS-CMOS)



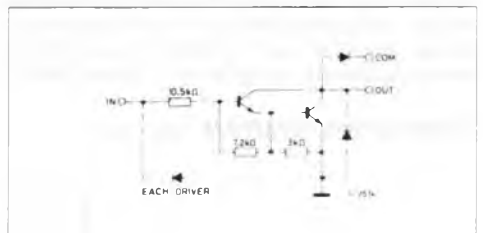
For ULN2802A (each driver for 14-15 V PMOS)



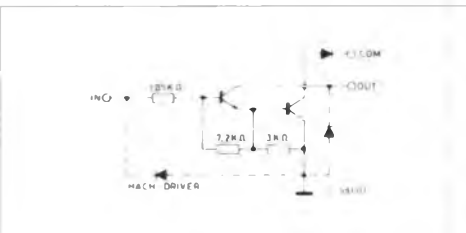
For ULN2803A (each driver for 5 V, TTL/CMOS)



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	°C/W
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ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ °C}$ unless otherwise specified)

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

TEST CIRCUITS

Figure 1a.

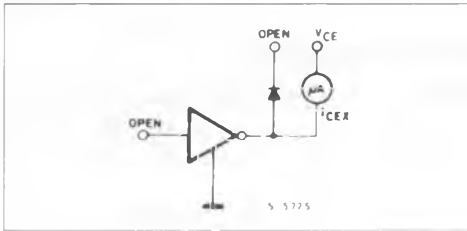


Figure 1b.

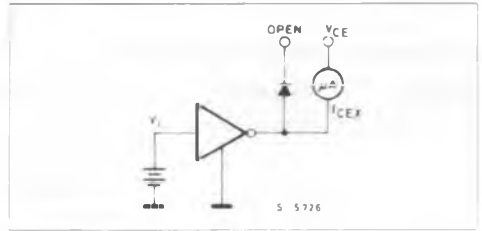


Figure 2.

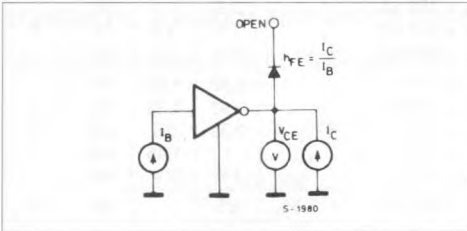


Figure 3.

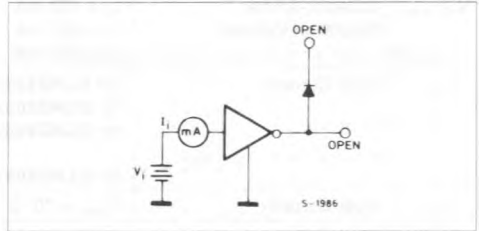


Figure 4.

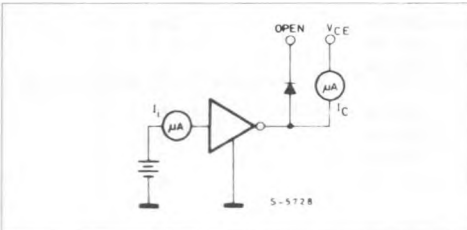


Figure 5.

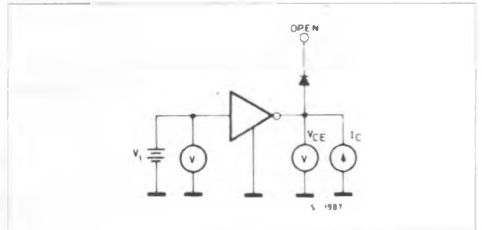


Figure 6.

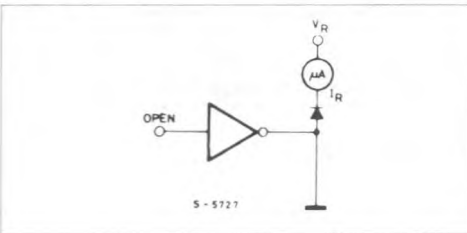


Figure 7.

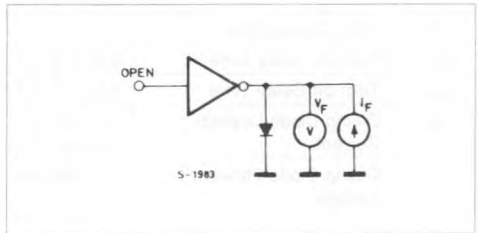


Figure 8 : Collector Current as a Function of Saturation Voltage.

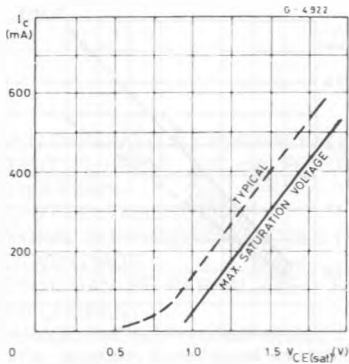


Figure 9 : Collector Current as a Function of Input Current.

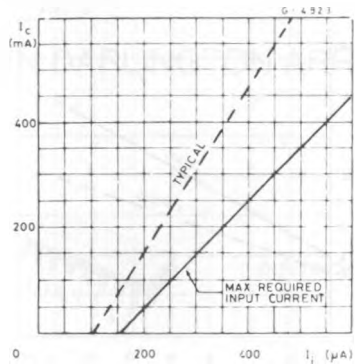


Figure 10 : Allowable Average Power Dissipation as a Function of Ambient Temperature.

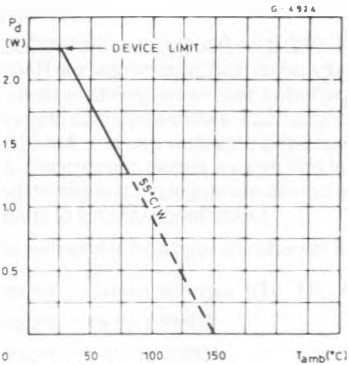


Figure 11 : Peak Collector Current as a Function of Duty Cycle.

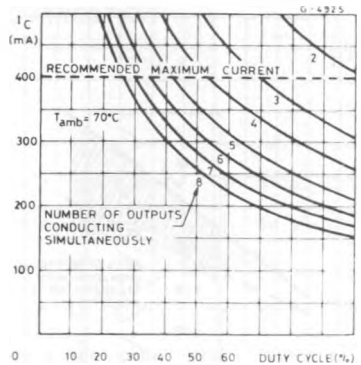


Figure 12 : Peak Collector Current as a Function of Duty.

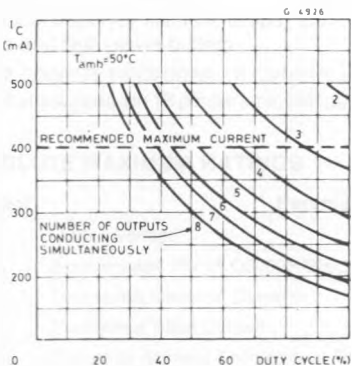


Figure 13 : Input Current as a Function of Input Voltage (for ULN2802A).

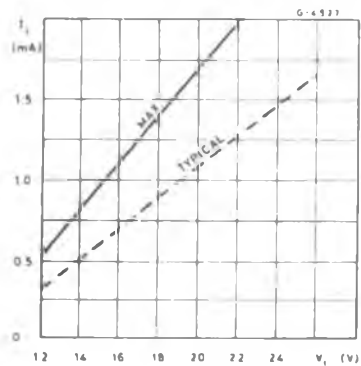


Figure 14 : Input Current as a Function of Input Voltage (for ULN2804A)

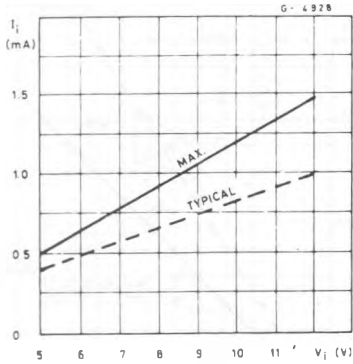


Figure 15 : Input Current as a Function of Input Voltage (for ULN2803A)

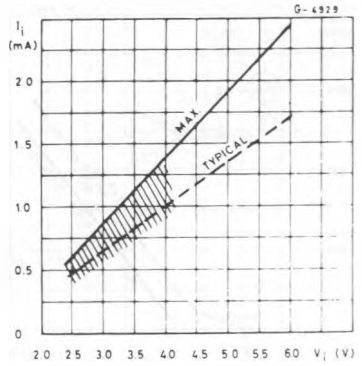


Figure 16 : Input Current as a Function of Input Voltage (for ULN2805A)

