SGS-THOMSON MICROELECTRONICS

ULN2801A
ULN2802A ULN2803A
ULN2804A ULN2805A

EIGHT DARLINGTON ARRAYS

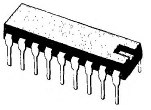
- EIGHT DARLINGTONS WITH COMMON EMITTERS
- OUTPUT CURRENT TO 500 mA
- OUTPUT VOLTAGE TO 50 V
- INTEGRAL SUPPRESSION DIODES
- VERSIONS FOR ALL POPULAR LOGIC FAMILIES
- OUTPUT CAN BE PARALLELED
- INPUTS PINNED OPPOSITE OUTPUTS TO SIMPLIFY BOARD LAYOUT

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.

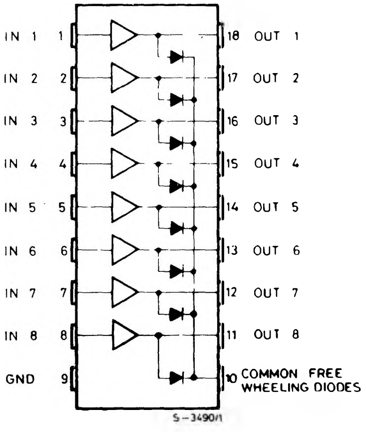
Five versions are available to simplify interfacing to standard logic families : the ULN2801A is designed for general purpose applications with a current limit resistor ; the ULN2802A has a 10.5 KΩ input resistor and zener for 14-25 V PMOS ; the ULN2803A has a 2.7 KΩ input resistor for 5 V TTL and CMOS ; the ULN2804A has a 10.5 KΩ 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)

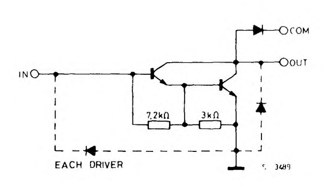


ABSOLUTE MAXIMUM RATINGS

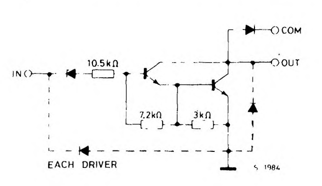
Symbol	Parameter	Value	Unit
V_o	Output Voltage	50	V
V_i	Input Voltage for ULN2802A, 2803A, 2804A for ULN2805A	30 15	V V
I_C	Continuous Collector Current	500	mA
I_B	Continuous Base Current	25	mA
P_{tot}	Power Dissipation (one Darlington pair) (total package)	1.0 2.25	W W
T_{amb}	Operating Ambient Temperature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

SCHEMATIC DIAGRAM AND ORDER CODES

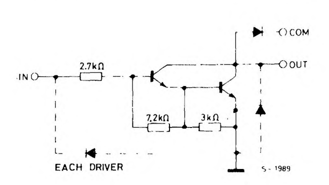
For ULN2801A (each driver for PMOS-CMOS)



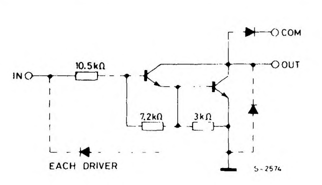
For ULN2802A (each driver for 14-15 V PMOS)



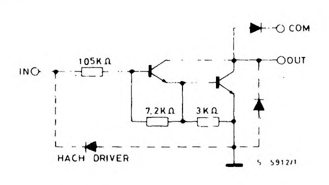
For ULN2803A (each driver for 5 V, TTL/CMOS)



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

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
I_{CEX}	Output Leakage Current	V_{CE} = 50 V			50	μA	1a
		T_{amb} = 70 °C V_{CE} = 50 V			100	μA	1a
		T_{amb} = 70 °C for **ULN2802A** V_{CE} = 50 V V_i = 6 V			500	μA	1b
		for **ULN2804A** V_{CE} = 50 V V_i = 1 V			500	μA	1b
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	I_C = 100 mA I_B = 250 μA		0.9	1.1	V	2
		I_C = 200 mA I_B = 350 μA		1.1	1.3	V	
		I_C = 350 mA I_B = 500 μA		1.3	1.6	V	
$I_{i(on)}$	Input Current	for **ULN2802A** V_i = 17 V		0.82	1.25	mA	3
		for **ULN2803A** V_i = 3.85 V		0.93	1.35	mA	
		for **ULN2804A** V_i = 5 V		0.35	0.5	mA	
		V_i = 12 V		1	1.45	mA	
		for **ULN2805A** V_i = 3 V		1.5	2.4	mA	
$I_{i(off)}$	Input Current	T_{amb} = 70 °C I_C = 500 μA	50	65		μA	4
$V_{i(on)}$	Input Voltage	for **ULN2802A** V_{CE} = 2 V I_C = 300 mA			13	V	5
		for **ULN2803A** V_{CE} = 2 V I_C = 200 mA			2.4	V	
		V_{CE} = 2 V I_C = 250 mA			2.7	V	
		V_{CE} = 2 V I_C = 300 mA			3	V	
		for **ULN2804A** V_{CE} = 2 V I_C = 125 mA			5	V	
		V_{CE} = 2 V I_C = 200 mA			6	V	
		V_{CE} = 2 V I_C = 275 mA			7	V	
		V_{CE} = 2 V I_C = 350 mA			8	V	
		for **ULN2805A** V_{CE} = 2 V I_C = 350 mA			2.4	V	
h_{FE}	DC Forward Current Gain	for **ULN2801A** V_{CE} = 2 V I_C = 350 mA	1000			–	2
C_i	Input Capacitance			15	25	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 V			50	μA	6
		T_{amb} = 70 °C V_R = 50 V			100	μA	
V_F	Clamp Diode Forward Voltage	I_F = 350 mA		1.7	2	V	7

TEST CIRCUITS

Figure 1a.

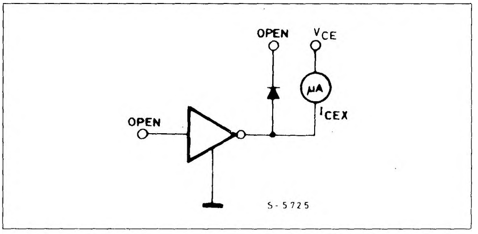


Figure 1b.

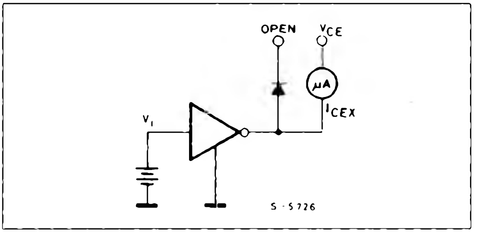


Figure 2.

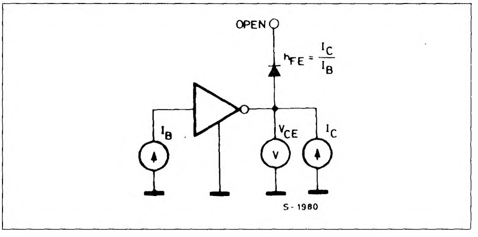


Figure 3.

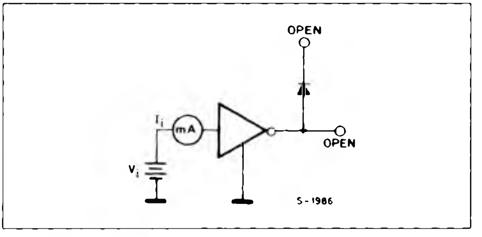


Figure 4.

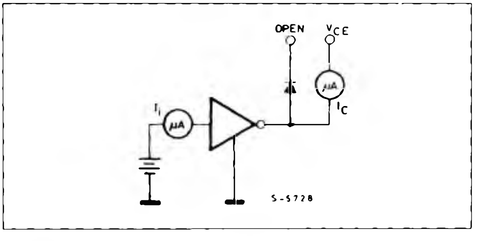


Figure 5.

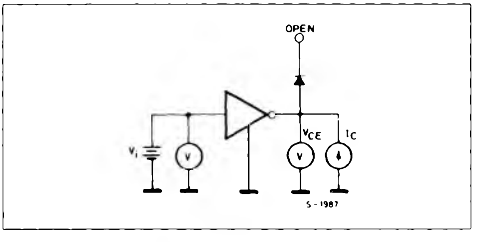


Figure 6.

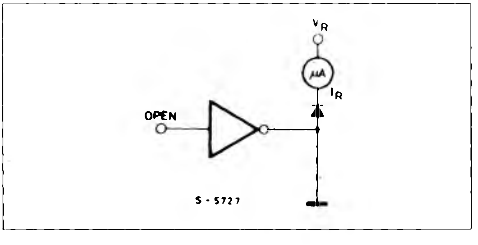


Figure 7.

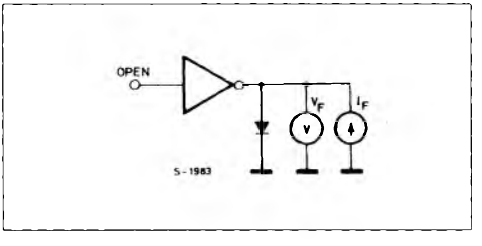


Figure 8 : Collector Current as a Function of Saturation Voltage.

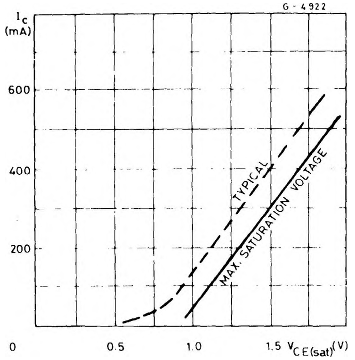


Figure 9 : Collector Current as a Function of Input Current.

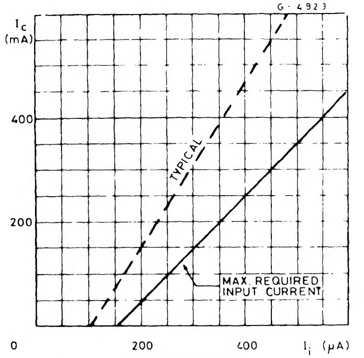


Figure 10 : Allowable Average Power Dissipation as a Function of Ambient Temperature.

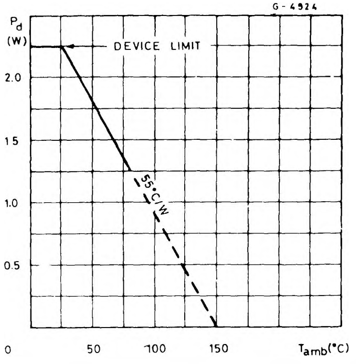


Figure 11 : Peak Collector Current as a Function of Duty Cycle.

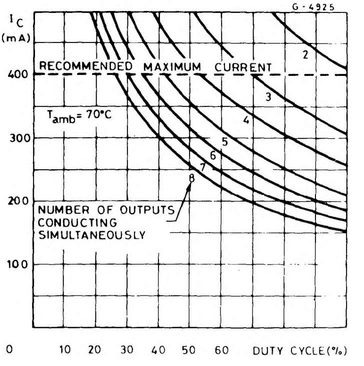


Figure 12 : Peak Collector Current as a Function of Duty.

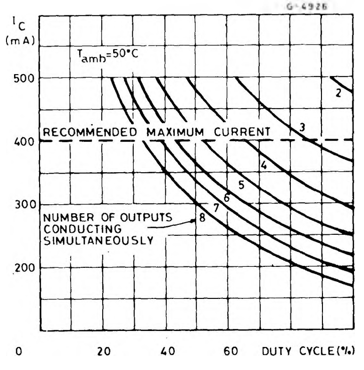


Figure 13 : Input Current as a Function of Input Voltage (for ULN2802A).

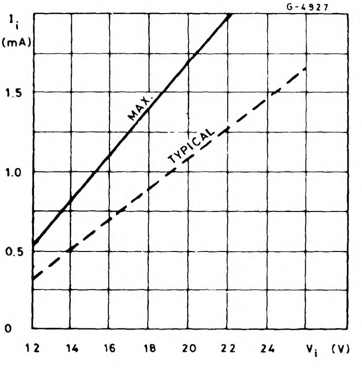


Figure 14 : Input Current as a Function of Input Voltage (for ULN2804A)

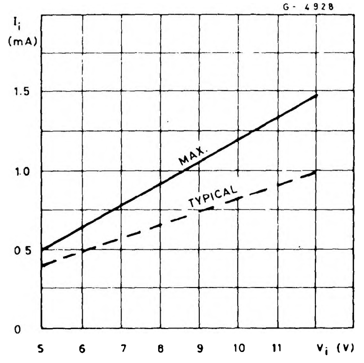


Figure 15 : Input Current as a Function of Input Voltage (for ULN2803A)

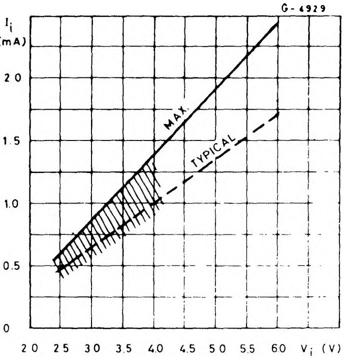


Figure 16 : Input Current as a Function of Input Voltage (for ULN2805A)