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SEMICONDUCTOR

ESD TVS TSS MOV GDT PLED

ULN2803Ax-MS

Product specification

General Description

The ULN2803Ax-MS is high-voltage high-current Darlington transistor arrays each containing eight open collector common emitter pairs. Each pair is rated at 500mA. Suppression diodes are included for inductive load driving, the inputs and outputs are pinned in opposition to simplify board layout.

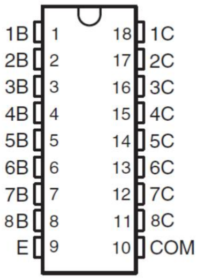
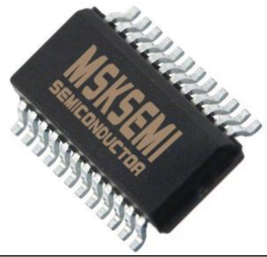
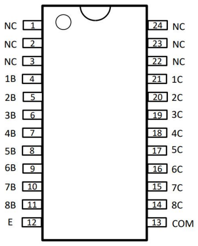
These devices are capable of driving a wide range of loads including solenoids, relays, DC motors, LED displays, filament lamps, thermal print-heads and high-power buffers.

The ULN2803Ax-MS is available in both a small outline 18-pin package (SOP18) and 24-pin package (SSOP24/QSOP24).

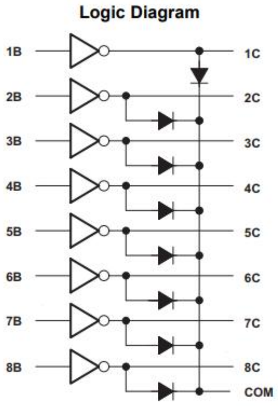
Features

- 500-mA-Rated Collector Current(single output)
- High-Voltage Outputs:50V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay-Driver Applications

Encapsulation form and pin definition function

PACKAGE OUTLINE	Pin Assignments	Marking
 SOP-18	 	ULN2803
 SSOP-24/QSOP24	 	ULN2803 ****

Connection Diagram



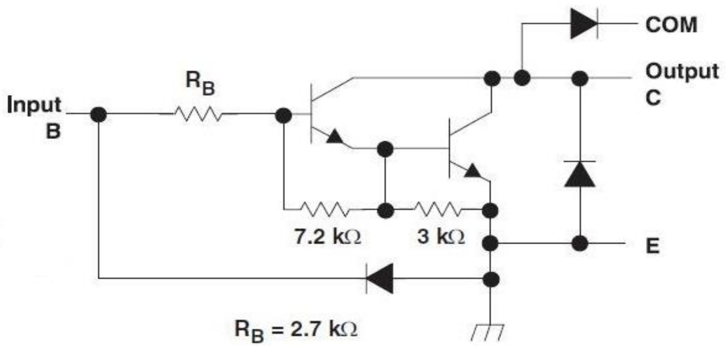
Pin Descriptions

SOP18 Pin	SSOP24/QSOP24 Pin	Pin Name	Function
---	1	NC	---
---	2	NC	---
---	3	NC	---
1	4	1B	Input pair1
2	5	2B	Input pair2
3	6	3B	Input pair3
4	7	4B	Input pair4
5	8	5B	Input pair5
6	9	6B	Input pair6
7	10	7B	Input pair7
8	11	8B	Input pair8
9	12	E	Common Emitter (ground)
10	13	COM	Common Clamp Diodes
11	14	8C	Output pair8
12	15	7C	Output pair7
13	16	6C	Output pair6
14	17	5C	Output pair5
15	18	4C	Output pair4
16	19	3C	Output pair3
17	20	2C	Output pair2
18	21	1C	Output pair1
---	22	NC	---
---	23	NC	---
---	24	NC	---

Order Information

Designator	Package	Packing type
ULN2803AG-MS	SOP-18	1500
ULN2803AT-MS	SSOP-24/QSOP24	4000

Functional Block Diagram



Note: All resistor values shown are nominal.

The collentor-emitter diode is a parasitic structure and should not be used to conduct current.If the collector(s) go below ground an external Schoottky diode should be added to clamp negative undershoots.

Absolute Maximum Ratings (1)

At 25°C free-air temperature (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Collector to emitter voltage			50	V
V_R	Clamp diode reverse voltage(2)			50	V
V_I	Input voltage(2)			30	V
I_{CP}	Peak collector current	See typical characteristics		500	mA
I_{OK}	Output clamp current			500	mA
I_{TE}	Total emitter-terminal current			–2.5	A
T_A	Operating free-air temperature range	ULN2803	–30	+105	°C
θ_{JA}	Thermal Resistance Junction-to-Ambient(3)			63	°C/W
θ_{JC}	Thermal Resistance Junction-to-Case(4)			12	
TJ	Operating virtual junction temperature			150	°C
T_{STG}	Storage temperature range		–40	150	°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.

(3) Maximum power dissipation is a function of TJ(max), θJA, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ(max) – TA)/θJA. Operating at the absolute maximum TJ of 150°C can affect reliability.

(4) Maximum power dissipation is a function of TJ(max), θJC, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ(max) – TA)/θJC. Operating at the absolute maximum TJ of 150°C can affect reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
VCC	Collector to Emitter voltage	-	50	V
TA	Operating Ambient Temperature	-30	+105	℃

Electrical Characteristics(TA=+25℃, unless otherwise specified)

Parameter		Test Figure	Test Conditions		MIN	TYP	MAX	Unit
$V_{I(on)}$	On-state input voltage	Figure 6	VCE = 2 V	IC = 200 mA	--	--	2.4	V
				IC = 250 mA	--	--	2.7	
				IC = 300 mA	--	--	3	
$V_{CE(sat)}$	Collector-emitter saturation voltage	Figure 5	II = 250 μA,	IC = 100 mA	--	0.9	1.1	
			II = 350 μA,	IC = 200 mA	--	1	1.3	V
			II = 500 μA,	IC = 350 mA	--	1.2	1.6	
I_{CEX}	Collector cutoff current	Figure 1	VCE = 50 V,	II = 0	--	--	50	μA
		Figure 2	VCE = 50 V, TA = +105°C	II = 0	--	--	100	
V_F	Clamp forward voltage	Figure 8	IF = 350 mA		--	1.7	2	V
$I_{I(off)}$	Off-state input current	Figure 3	VCE = 50 V,	IC = 500 μA	50	65	--	μA
II	Input current	Figure 4	VI = 3.85 V		--	0.93	1.35	mA
			VI = 5 V		--	--	--	
			VI = 12 V		--	--	--	
IR	Clamp reverse current	Figure 7	VR = 50 V		--	--	50	μA
				TA = 70°C	--	--	100	
Ci	Input capacitance		VI = 0,	f = 1 MHz	--	15	25	pF

Switching Characteristics (TA = +25°C, unless otherwise specified)

Parameter		Test Conditions	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to high-level output	See Figure 9		0.25	1	μs
t_{PHL}	Propagation delay time, high- to low-level output	See Figure 9		0.25	1	μs
V_{OH}	High-level output voltage after switching	VS = 50 V, IO = 300 mA, See Figure 9	VS–20			mV

Parameter Measurement Information

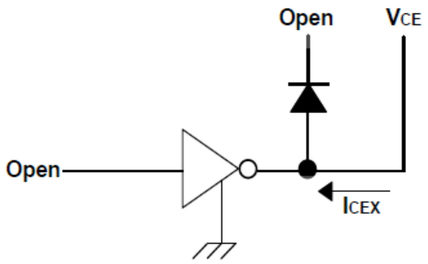


Fig.1 I_{CEX} Test Circuit

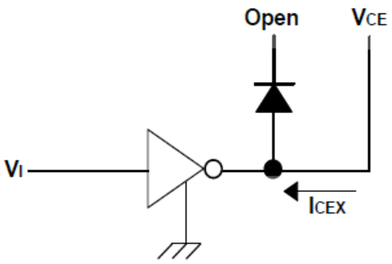


Fig.2 I_{CEX} Test Circuit

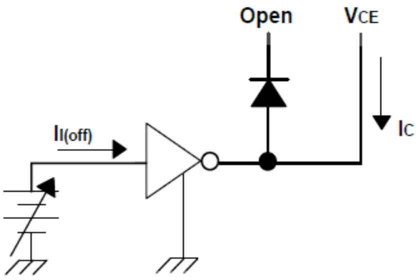


Fig.3 $I_{I(off)}$ Test Circuit

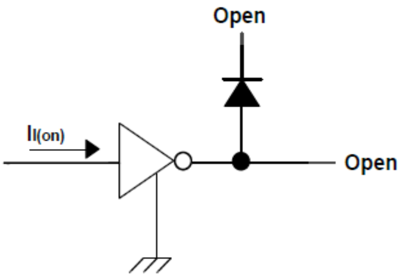


Fig.4 I_I Test Circuit

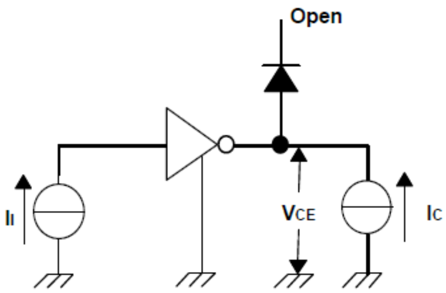


Fig. 5 h_{FE} , $V_{CE(sat)}$ Test Circuit

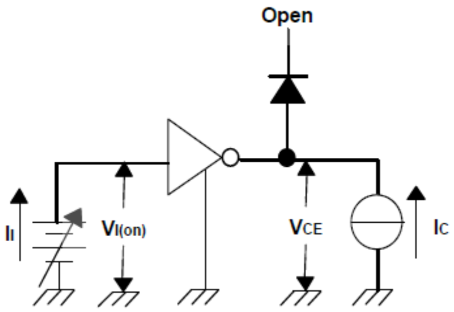


Fig. 6 $V_{I(on)}$ Test Circuit

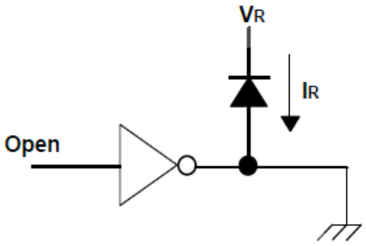


Fig. 7 I_R Test Circuit

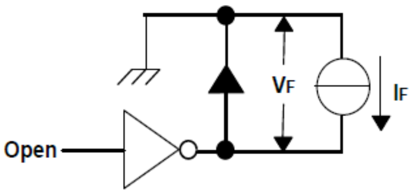
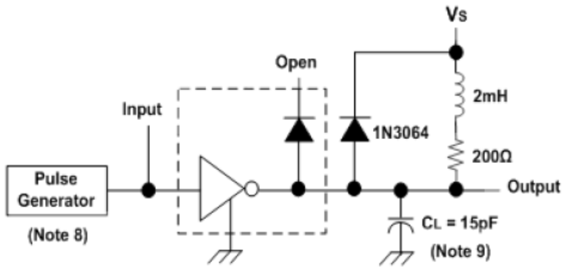
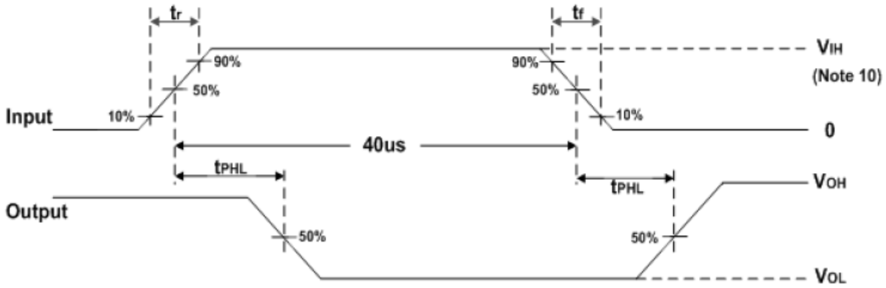


Fig. 8 V_F Test Circuit



t_{ON}, t_{OFF} Test Circuit



Voltage Waveform

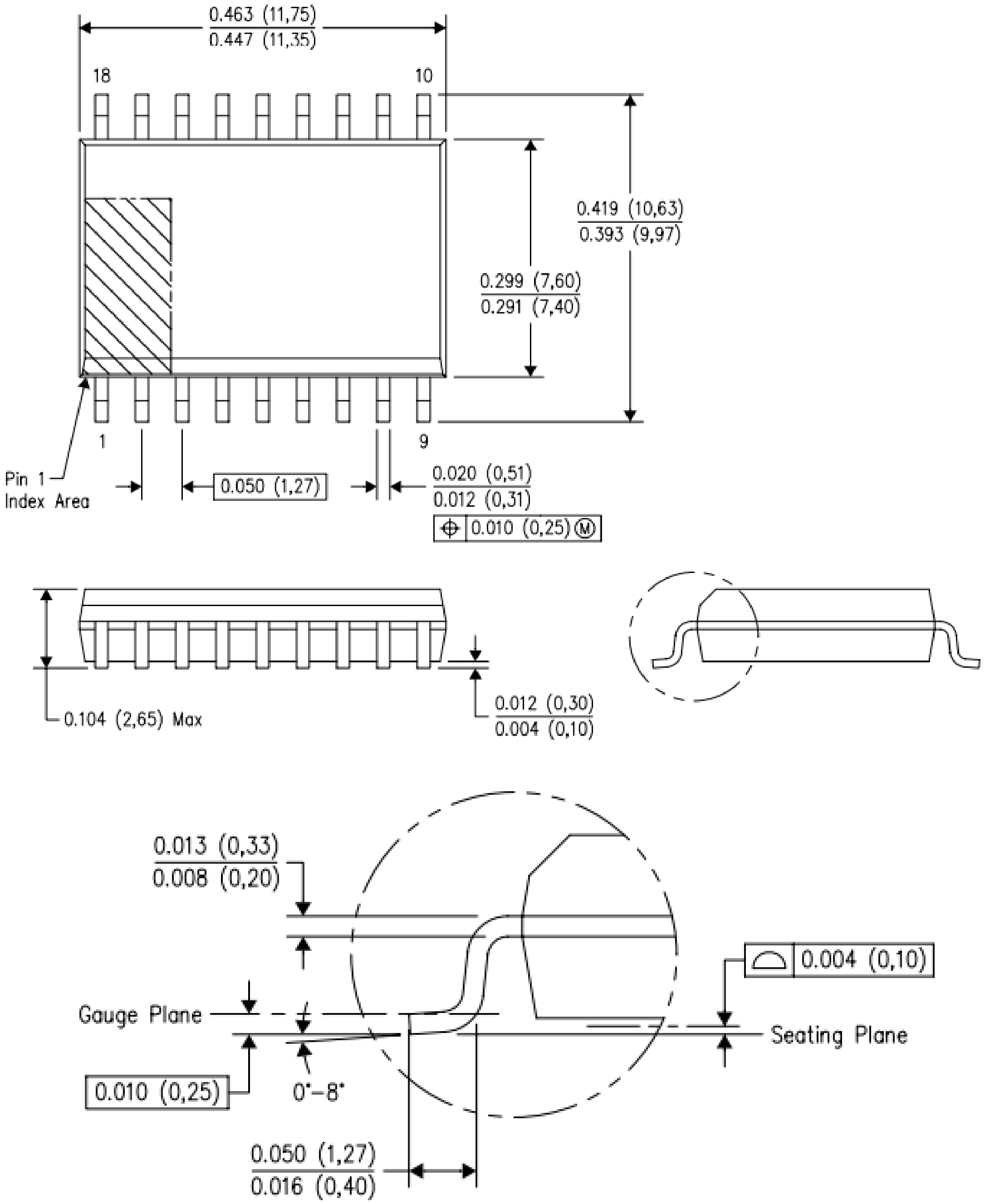
Fig. 9 Latch-Up Test Circuit and Voltage Waveform

Notes: 9. The pulse generator has the following characteristics: PRR = 12.5 kHz, Z_O = 50 Ω.

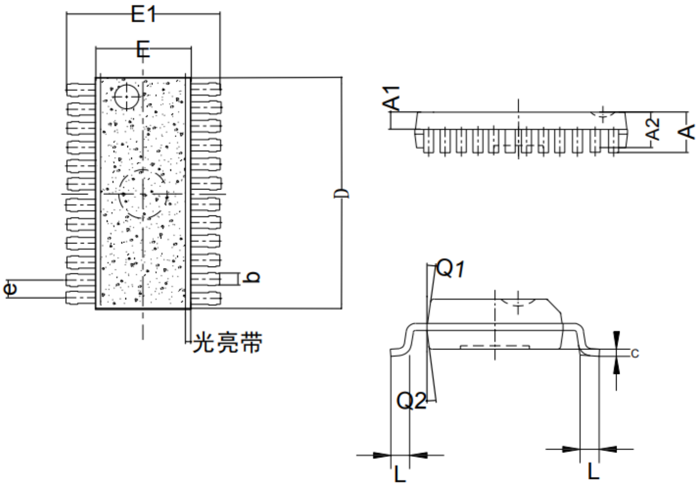
10. C_L includes prove and jig capacitance.

11. V_{IH}=3V

SOP-18 Outline Dimensions



SSOP24/QSOP24 Outline Dimensions



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER			
SYMBOL	MIN	MID	MAX
A	1. 35	1. 60	1. 75
A1	0. 65	0. 70	0. 75
A2	1. 35	1. 45	1. 55
b	0. 20	0. 25	0. 30
c	0. 17	0. 20	0. 25
D	8. 60	8. 65	8. 70
e	–	0. 635TYP	–
E1	5. 76	5. 96	6. 16
E	3. 80	3. 90	4. 00
L	0. 40	0. 60	0. 80
Q1	0°	/	8°
Q2	0°	/	8°

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