UMW ULN2803

Darlington Array Driver IC

1.Description

The ULN2803 is high-voltage, high-current darlington driver IC composed of 8 NPN darlington pairs. All units share the emitter in common, and each unit adopts open-collector output. A 2.7KΩ resistor is connected to each darlington pair in serial, which is compatible with TTL and 5V CMOS for data processing without logic buffer. Sink current of ULN2803 is up to 500mA, when it is off state, the withstand voltage is 50V and the output can runs with high load current, which provides solutions for various interface.

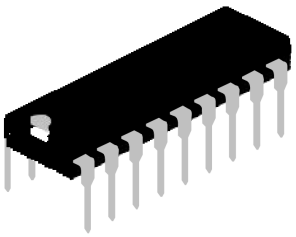
2.Features

- Wide operating voltage range
- 8-ch high-gain darlington array
- High output voltage (up to 50V)
- High output current (up to 500mA)
- Able to connect to TTL, CMOS, PMOS directly
- Clamp diodes for switching inductive loads

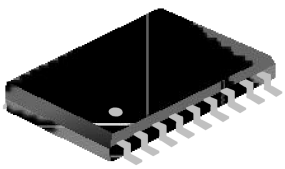
3.Applications

- Relay driver
- DC lamp driver
- Step motor driver
- Magnet valve
- DC brushless motor driver

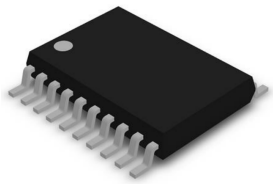
4.Pinning Information



DIP-18-300-2.54

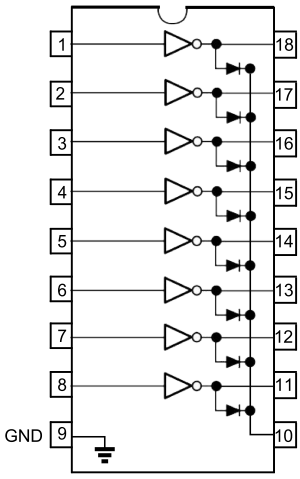


SOP-18-375-1.27

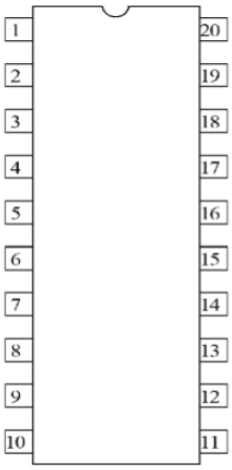


TSSOP-20

5.Bolbk Diagram



DIP-18/SOP-18



TSSOP-20

Pin Descriptions (DIP/SOP-18)

Pin Name	Pin	I/O	Description
<1:8>	1-8	Input	Channel 1~8 darlington input
<11:18>	18-11	Output	Channel 1~8 darlington output
(GND)	9	GND	Ground
COM	10	Input/ Output	Positive of clamp diode (used with inductive load)

Pin Descriptions (TSSOP-20)

Pin Name	Pin	I/O	Description
<1:8>	1-8	Input	Channel 1~8 darlington input
<13:20>	13-20	Output	Channel 1~8 darlington output
(GND)	9	GND	Ground
NC	10,11	-	NC
COM	12	Input/ Output	Positive of clamp diode (used with inductive load)

6.Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Input Voltage	V_{IN}	-0.5 to 30	V
Collector-emitter Voltage	V_{CE}	-0.5 to 50	V
Clamp Diode Reverse Voltage	V_R	55	V
Output Current	I_{OUT}	500	mA
Output Clamp Current	I_{OK}	500	mA
Emit Total Current Of Extremal Electrons		2.5	A
Storage Temperature	T_{STG}	-55 to 150	°C
Operating Temperature	T_{OPR}	-40 to 85	°C
Operating Junction Temperature	T_J	-40 to 150	°C

7.Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Leakage Current	I_{CEX}	T_A=25°C, V_{CE}=50V (Figure 1)			50	μA
		T_A=85°C, V_{CE}=50V (Figure 1)			100	μA
CE Saturation Voltage	$V_{CE(sat)}$	I_{OUT}=350mA, I_{IN}=500μA (Figure 3)		1.3	1.6	V
		I_{OUT}=250mA, I_{IN}=350μA (Figure 3)		1.1	1.3	V
		I_{OUT}=100mA, I_{IN}=250μA (Figure 3)		0.9	1.1	V
Input Current (Output ON)	$I_{I(ON)}$	V_I=3.85V (Figure 4)		0.93	1.35	mA
Input Current (Output OFF)	$I_{I(OFF)}$	T_A=25°C, I_C=500μA (Figure 5)	50	70		μA
Input Voltage (Output ON)	$V_{I(ON)}$	V_{CE}=2.0V, I_C=200mA (Figure 6)			2.4	V
		V_{CE}=2.0V, I_C=250mA (Figure 6)			2.7	V
		V_{CE}=2.0V, I_C=300mA (Figure 6)			3	V
Input Capacitance	C_I			15	30	pF
Turn-on Delay	t_{MH}	0.5V_I to 0.5 V_0			1	μS
Turn-off Delay	t_{ML}	0.5V_I to 0.5 V_0			1	μS
Clamp Diode Reverse Current	I_R	T_A=25°C, V_R=50V (Figure 7)			50	μA
		T_A=85°C, V_R=50V (Figure 7)			100	μA
Clamp Diode Forward Voltage	V_F	I_F=350mA (Figure 8)		1.7	2	V

Notes: 1. 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. Electrical Characteristics are for normal operating range;

2. All the conditions are suitable for darlington pairs unless otherwise noted;

3. In general, with 70°C, $V_{CE(Sat)}$=1.6V, pulse width=20ms, the continuous operating current of each channel is 350mA.

8.Typical Characterisitics

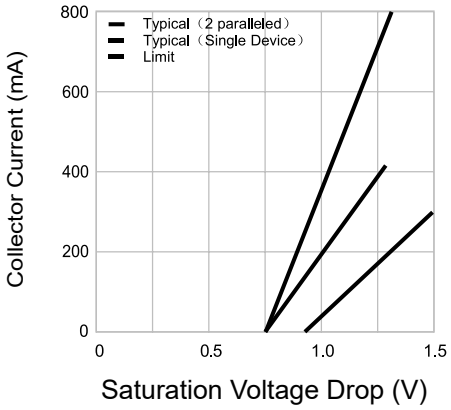


Figure 1: Collector Current vs. Saturation Voltage Drop

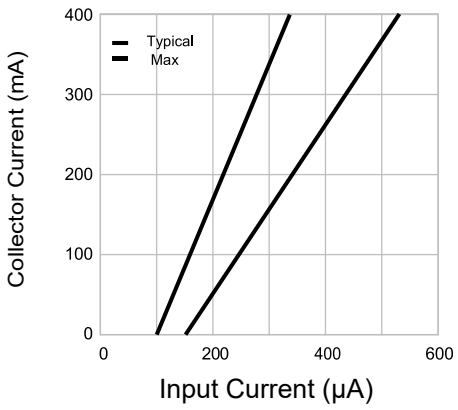


Figure 2: Collector Current vs. Input Current

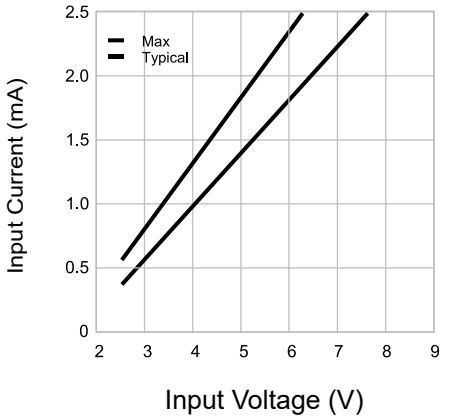


Figure 3: Input Current vs. Input Voltage

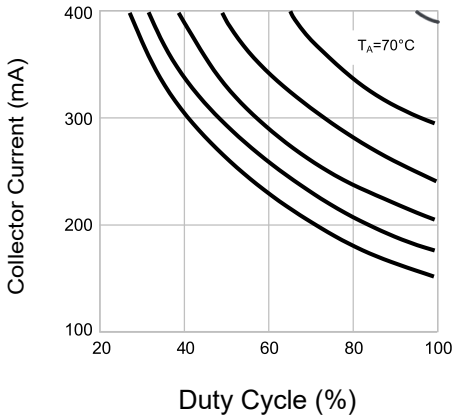
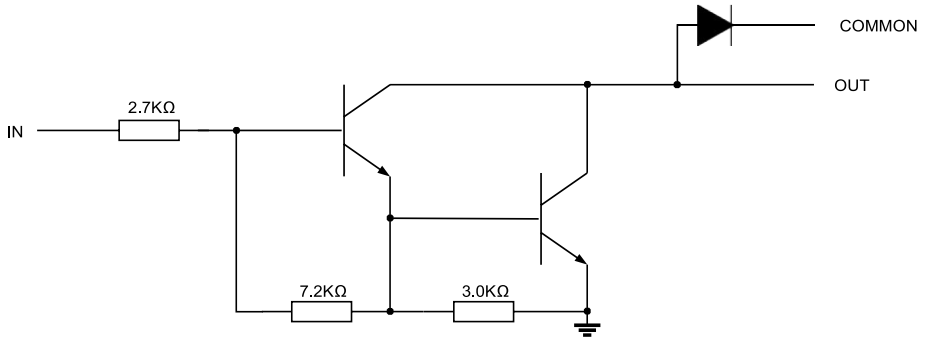


Figure 4: Collector Current vs. Duty Cycle

9.Internal Equivalent Circuit



10.Test Circuits

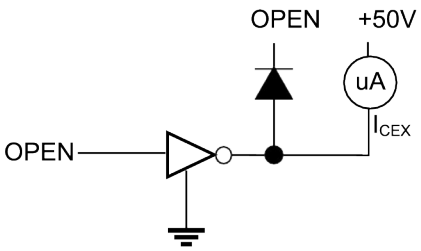


Figure 1

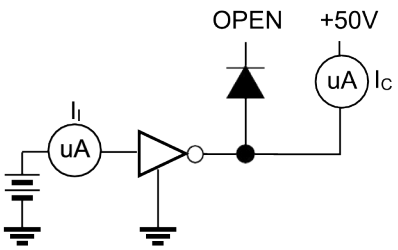


Figure 5

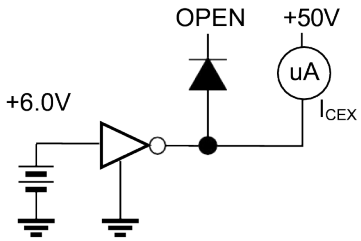


Figure 2

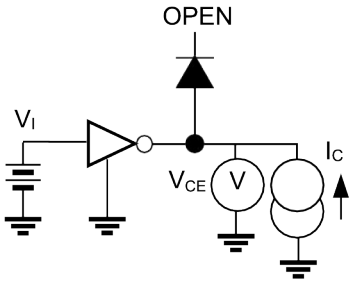


Figure 6

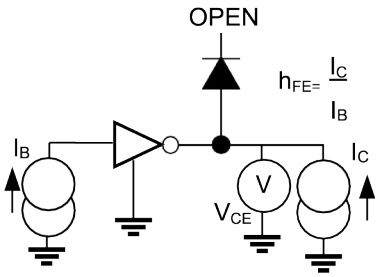


Figure 3

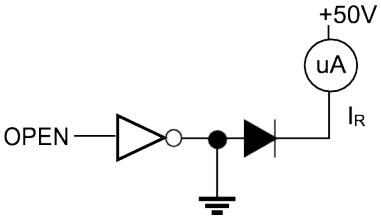


Figure 7

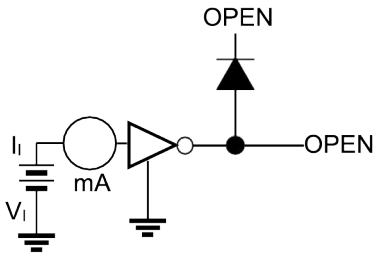


Figure 4

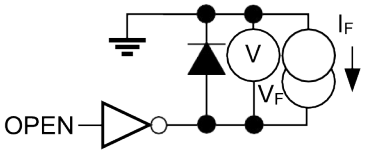
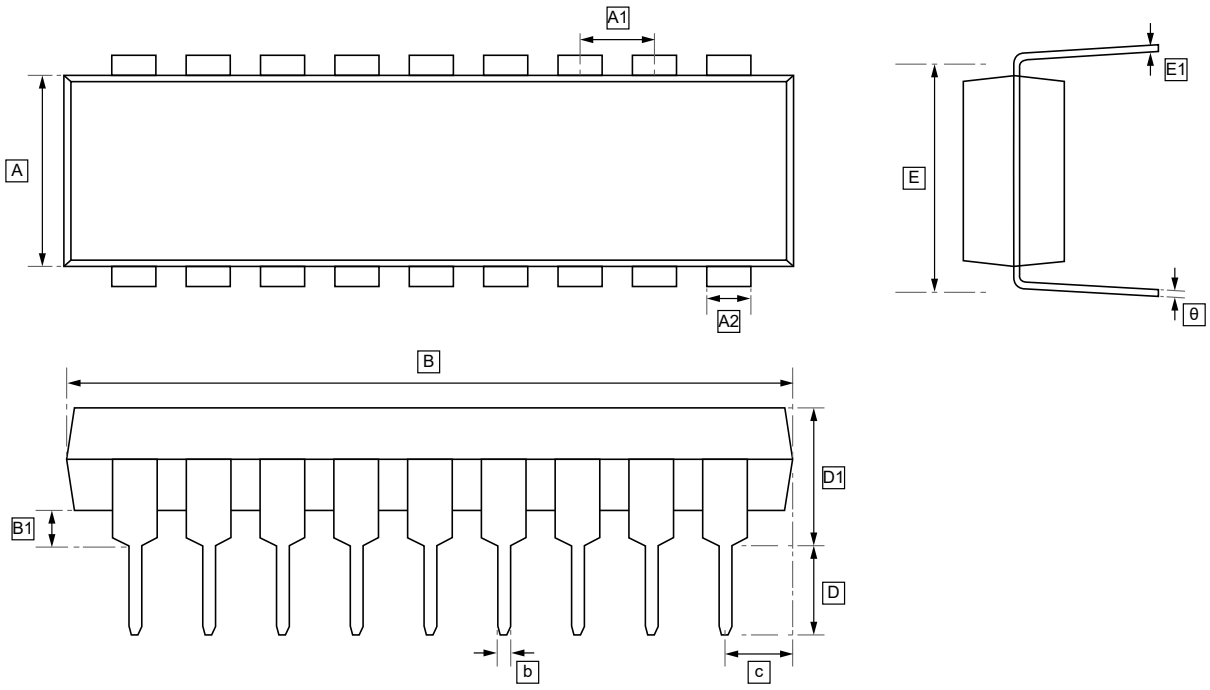


Figure 8

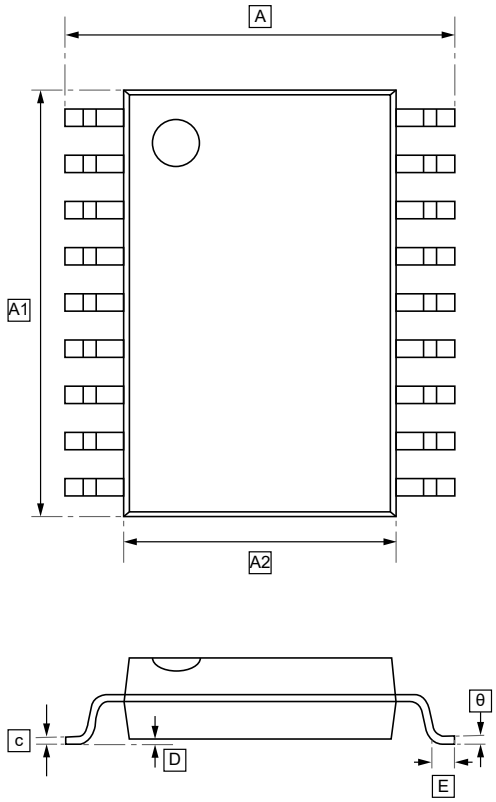
11.1 DIP-18 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	b	c	D	D1	E	E1	θ
Min	6.15	2.54	1.22	22.82	0.50	0.38	-	3.00	-	7.62	0.20	0°
Max	6.65		1.82	23.42	-	0.54	1.27	-	4.36		0.30	15°

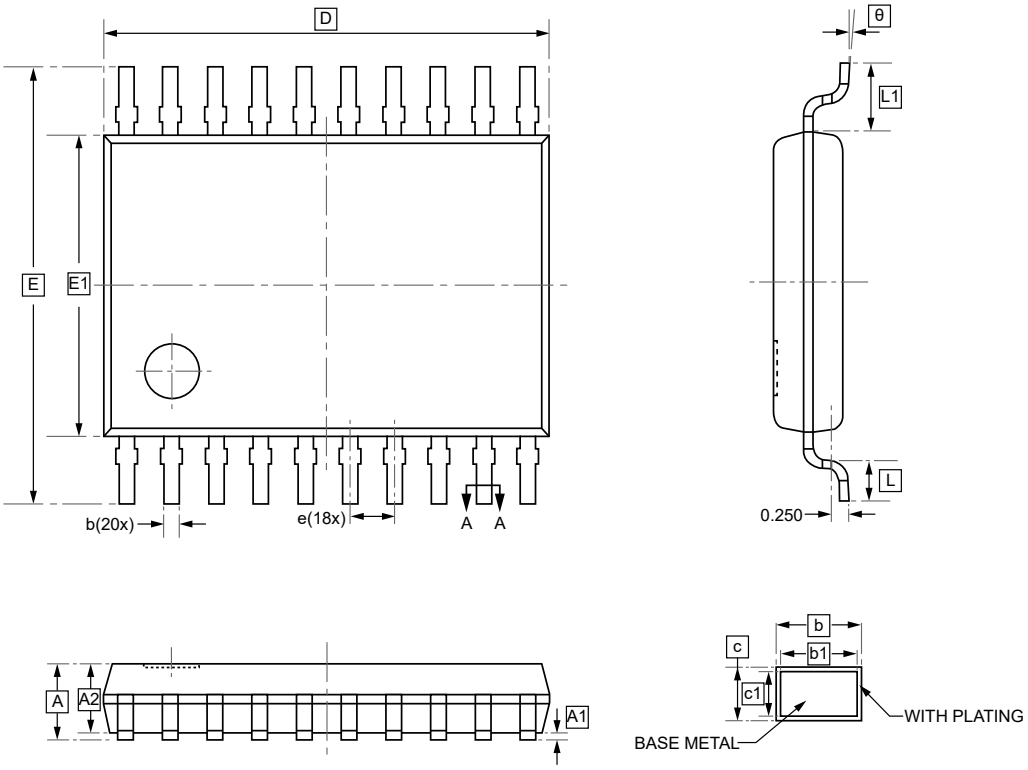
11.2 SOP-18 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	b	c	D	E	θ
Min	10.40	11.50	7.30	2.20	0.40	1.22	0.15	0	0.62	0°
Max	10.80	11.70	7.50	2.40	0.50	1.32	0.25	0.15		5°

11.3 TSSOP-20 Package Outline Dimensions

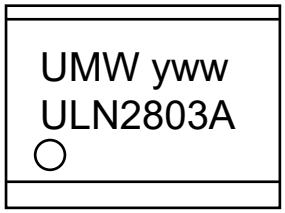


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	6.40	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	6.60	6.60	4.50	BSC	1.15

Symbol	L	θ
Min	0.45	0°
Max	0.75	8°

12.Ordering Information



yww: Batch Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW ULN2803A	ULN2803A	SOP-18	2000	Tape and reel
UMW ULN2803AN	ULN2803A	DIP-18	2000	Tape and reel
UMW ULN2803AT	ULN2803A	TSSOP-20	4000	Tape and reel

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