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XINBOLE

Product Specification

ULN2804A

Eight channel high-voltage,
high current Darlington transistor array

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Description

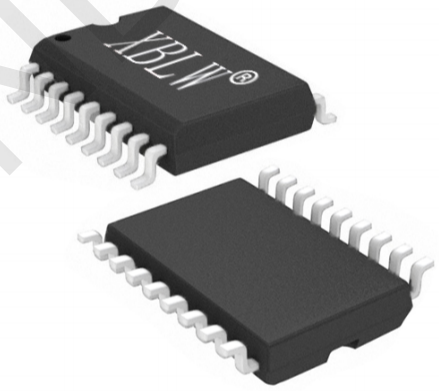
ULN2804A is an 8-channel Darlington structure circuit, with an output current of 500mA per channel, a peak current of 600mA, and an output voltage of 50V. It adopts a common emitter structure, and each channel can output independently.
This circuit is commonly used to drive various loads, such as DC engines, LED display lights, high-power buffers, and general-purpose logic circuits such as 5V TTL and CMOS.
The chip is packaged in DIP18 or SOP18 form factor.

Features

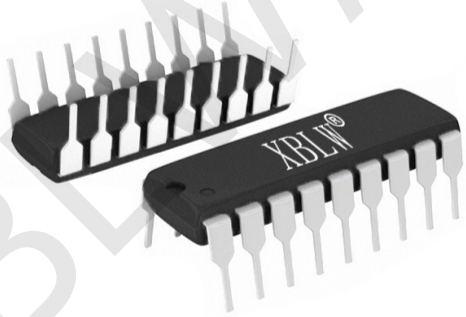
- High Voltage Outputs: 50 V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- 500mA Rated Collector Current (Single Output)

Applications

- Line Drivers
- Logic Buffers
- Stepper Motors
- IP Camera
- Relay Drivers
- Hammer Drivers
- Lamp Drivers
- HVAC Valve and LED Dot Matrix



SOP-18

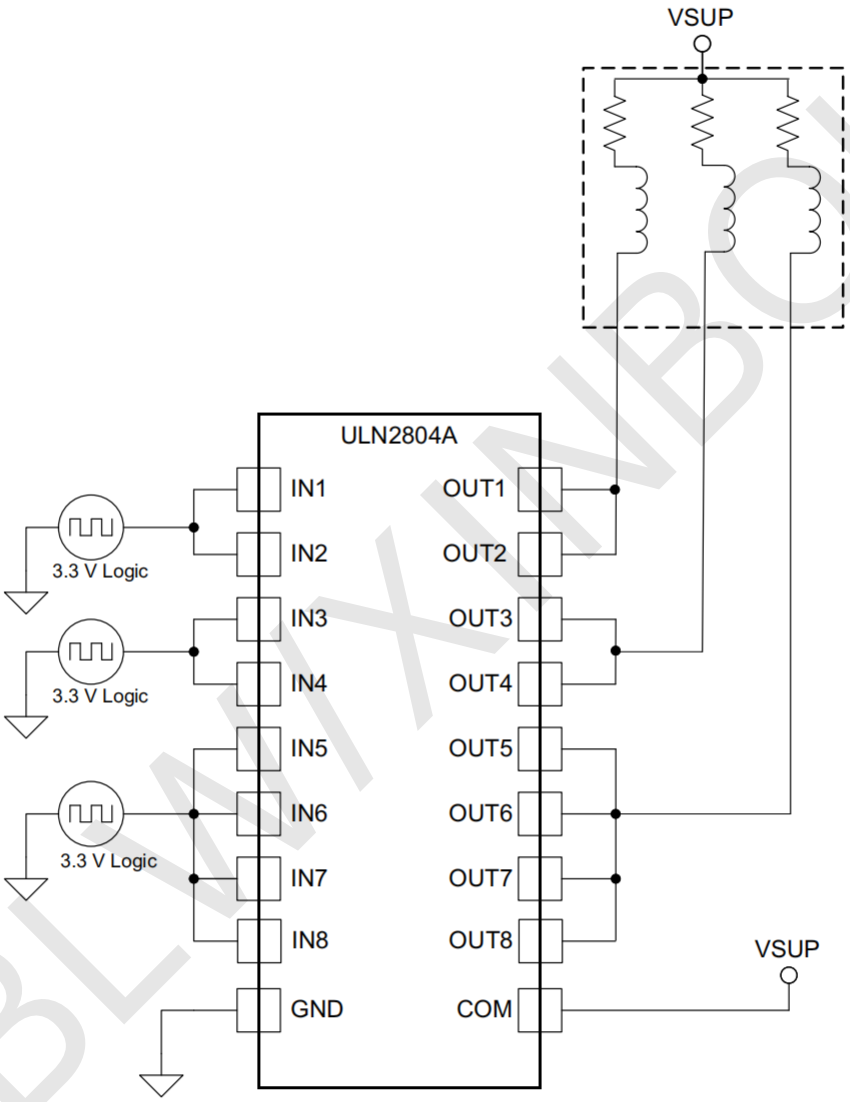


DIP-18

Ordering Information

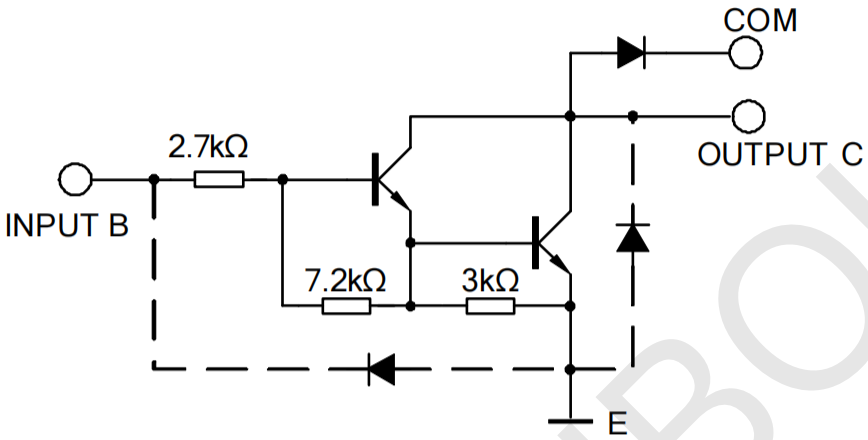
Product Model	Package Type	Marking	Packing	Packing Qty
XBLW ULN2804AN	DIP-18	ULN2804AN	Tube	1000pcs/Box
XBLW ULN2804ADTR	SOP-18	ULN2804A	Tape	2000pcs/Reel

Typical Application

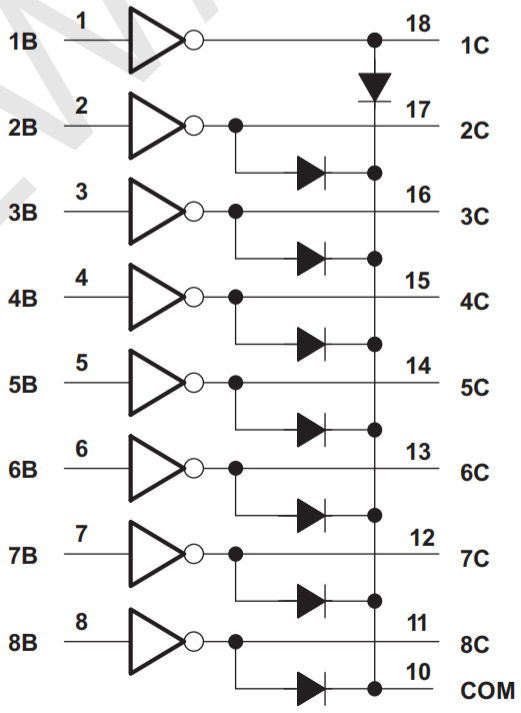


ULN2804A as Inductive Load Driver

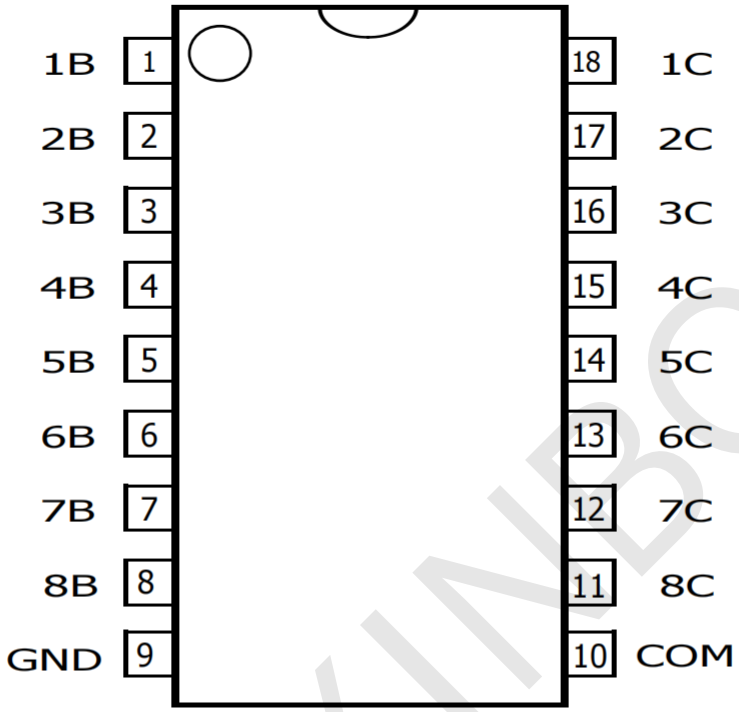
Circuit schematic (single Darlington)



Logic diagram



Pin Configurations



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
1B	1	I	Channel 1 through 8 Darlington base input
2B	2		
3B	3		
4B	4		
5B	5		
6B	6		
7B	7		
8B	8		
1C	18	O	Channel 1 through 8 Darlington collector output
2C	17		
3C	16		
4C	15		
5C	14		
6C	13		
7C	12		
8C	11		
GND	9	—	Common emitter shared by all channels (typically tied to ground)
COM	10	I/O	Common cathode node for flyback diodes (required for inductive loads)

Absolute Maximum Ratings

(T_A=25 ℃, unless otherwise specified)

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	-0.5~30	V
Output Voltage	V_{OUT}	-0.5~50	V
Clamp Diode Reverse Voltage	V_R	60	V
Output Current	I_{OUT}	500	mA
Clamp Diode Forward Current	I_F	500	mA
Storage Temperature	T_{STG}	-55~150	℃
Operating Junction Temperature	T_I	-40~150	℃

Recommended Operating Conditions

(T_A=25 ℃, unless otherwise specified)

Parameter	Symbol	Value		Units
		Min	Max	
Collector-Emitter Voltage	V_{CE}	0	50	V
Operating Temperature Range	T_{OPR}	–40	+85	℃

Typical Characteristics

ELECTRICAL CHARACTERISTICS

(T_A=25 ℃, unless otherwise specified)

Parameter		Test Conditions		ULN2804A			Units
				Min	Typ	Max	
I_{CEX}	Collector cutoff current	V_{CE} = 50 V, I_I = 0 see Figure 3				50.0	μA
$I_{I(off)}$	Off-state input current	V_{CE} = 50 V, I_C = 500 μA, T_A = 70°C see Figure 4		50.0	65.0		μA
$I_{I(on)}$	Input current	V_I = 3.85 V, See Figure 5				1.35	mA
$V_{I(on)}$	On-state input voltage	V_{CE} = 2 V, see Figure 6	I_C = 200 mA			2.4	V
			I_C = 250 mA			2.7	
			I_C = 300 mA			3.0	
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_I = 250 μA, see Figure 7	I_C = 100 mA		0.9	1.1	V
		I_I = 350 μA, see Figure 7	I_C = 200 mA		1	1.3	
		I_I = 500 μA, see Figure 7	I_C = 350 mA		1.3	1.6	
I_R	Clamp diode reverse current	V_R = 50 V, see Figure 8		-4.0		50.0	μA
V_F	Clamp diode forward voltage	IF = 350 mA see Figure 9		0.5		2.0	V
I_{CEX-1V}	Collector cutoff current	V_{CE} = 50 V, V_{IN} = 1V see Figure 10		-5.0		80.0	μA
C_i	Input capacitance	V_I = 0, f = 1 MHz			15	25	pF

Switching Characteristics Ta=25°C

Parameter		Test Conditions	Min	Typ	Max	Units
t_{PLH}	Propagation delay time, low- to high-level output	V_S = 50 V, C_L = 15 pF, R_L = 163 Ω, See Figure 11		130		ns
t_{PHL}	Propagation delay time, high- to low-level output			20		
V_{OH}	High-level output voltage after switching	V_S = 50 V, I_O = 300 mA, see Figure 12	V_S – 20			mV

Typical Characteristics

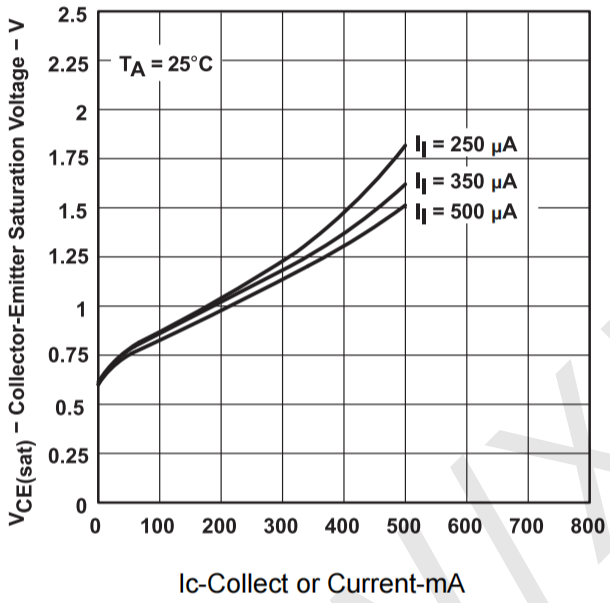


Figure 1.Collector-Emitter Saturation Voltage vs Collector Current(One Darlington)

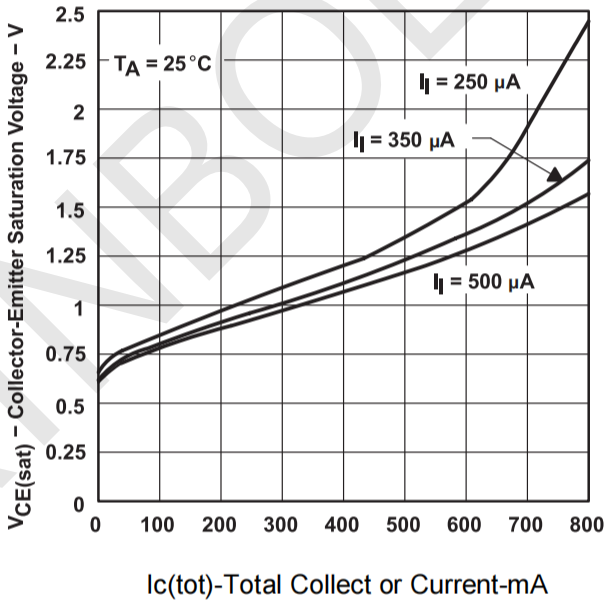


Figure 2.Collector-Emitter Saturation Voltage vs Total Collector Current(Two Darlingtons in Parallel)

Typical Characteristics Measurement

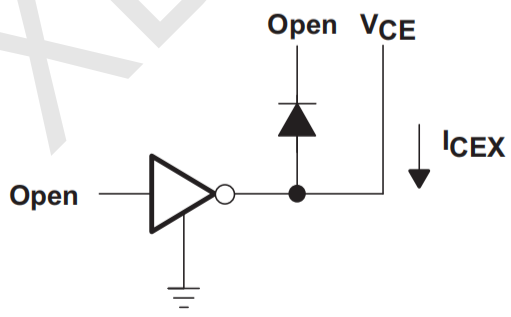


Figure 3. I_{CEX} Test Circuit

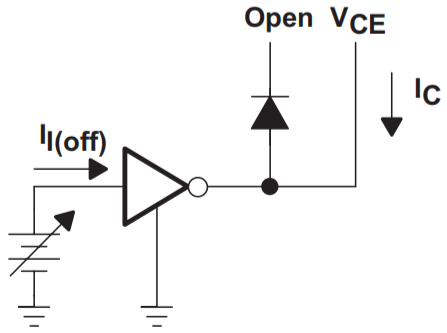


Figure 4. $I_{I(off)}$ Test Circuit

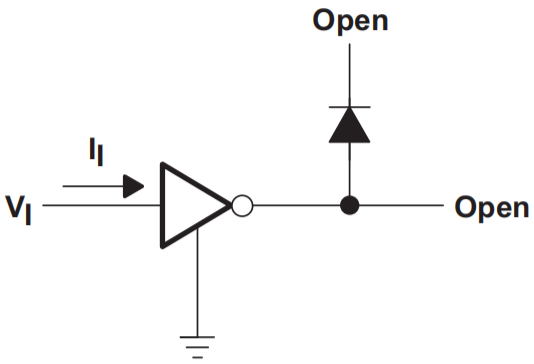


Figure 5. $I_{I(on)}$ Test Circuit

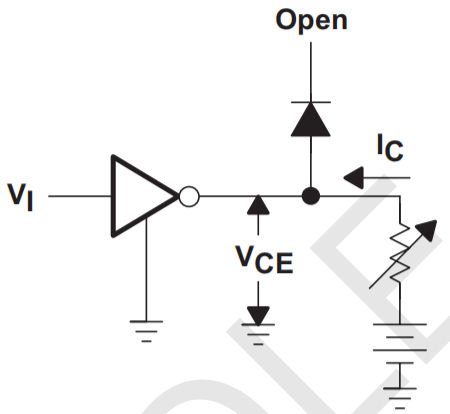


Figure 6. $V_{I(on)}$ Test Circuit

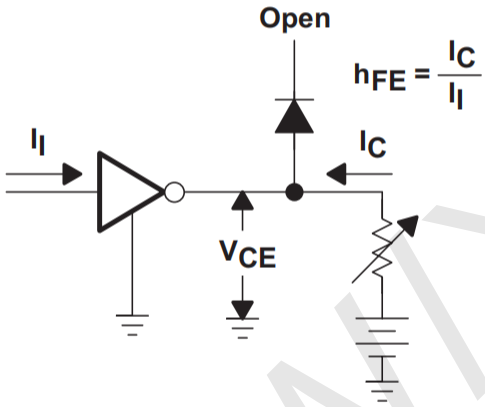


Figure 7. h_{FE}, $V_{CE(sat)}$ Test Circuit

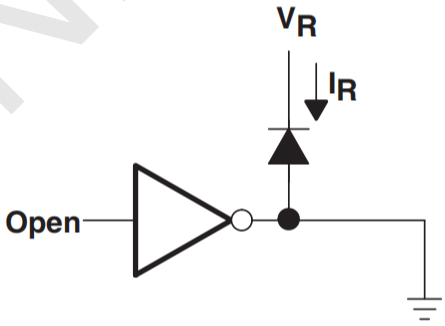


Figure 8. I_R Test Circuit

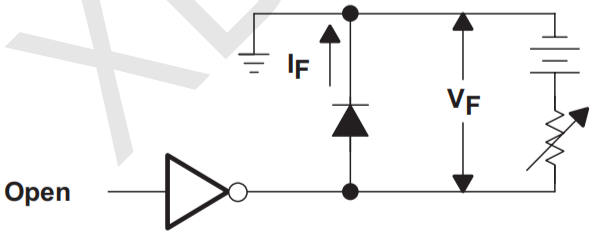


Figure 9. V_F Test Circuit

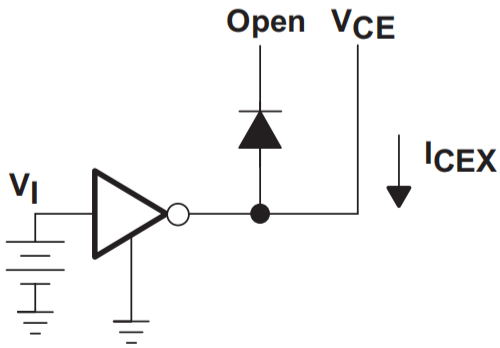
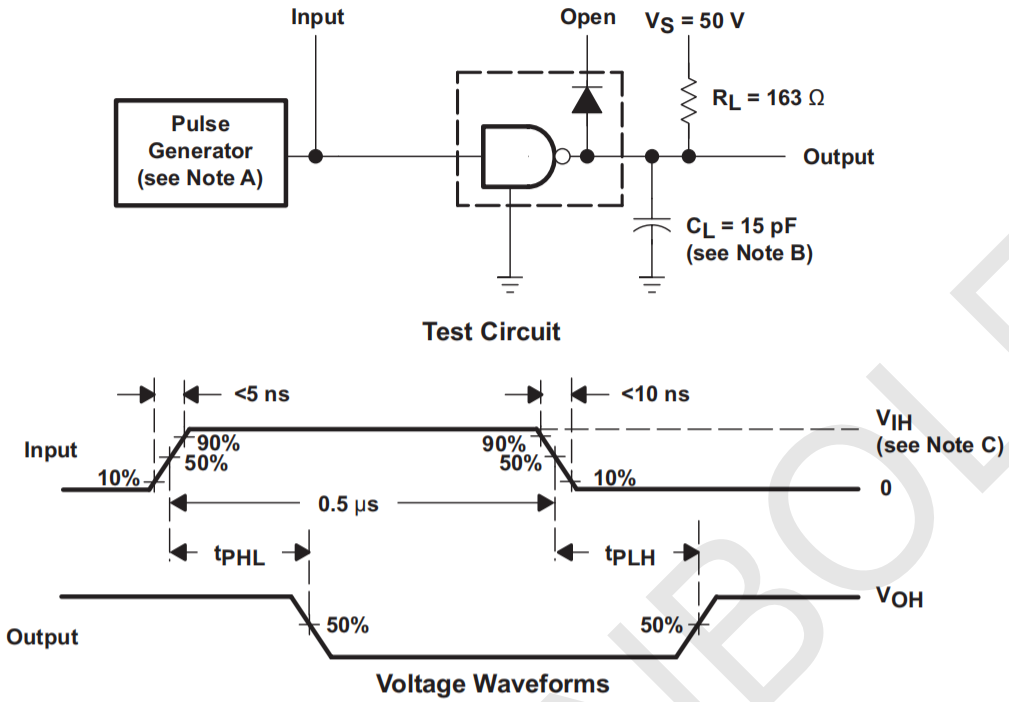


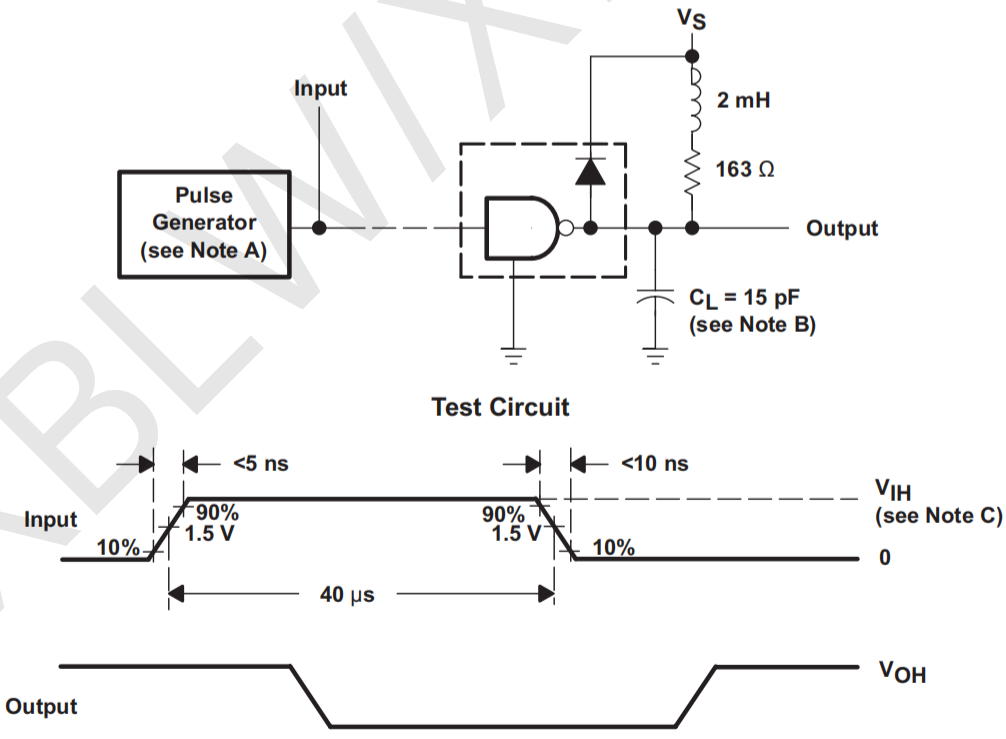
Figure 10. I_{CEX-1V} Test Circuit

Typical Characteristics Measurement



A. The pulse generator has the following characteristics: PRR = 12.5 kHz, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.
C. V_{IH} = 3 V

Figure 11. Propagation Delay Times

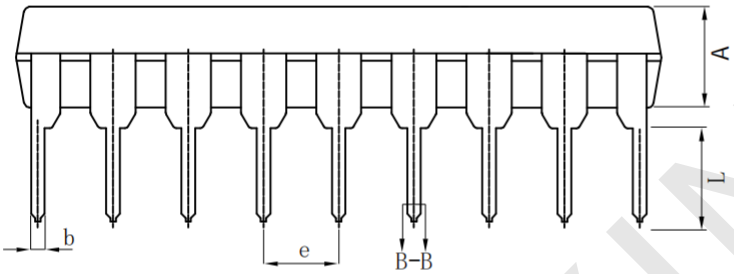


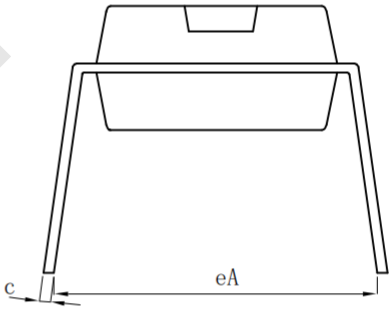
A. The pulse generator has the following characteristics: PRR = 12.5 kHz, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.
C. V_{IH} = 3 V

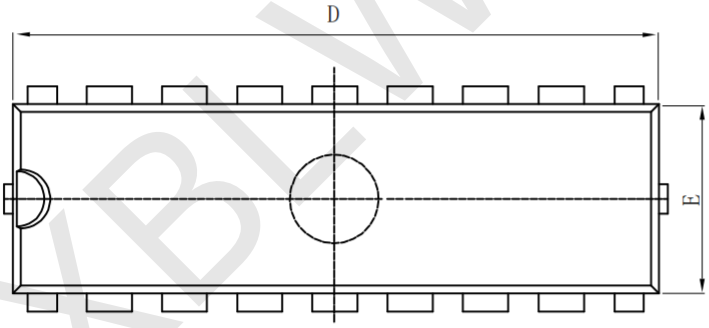
Figure 12. Latch-Up Test

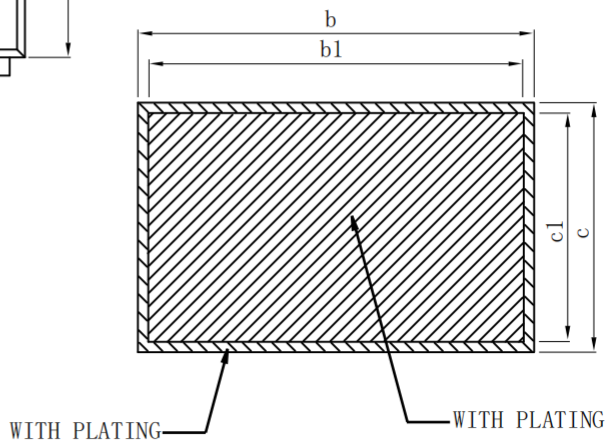
· DIP-18

Size / Symbol	Dimensions In Millimeters			Size / Symbol	Dimensions In Inches		
	Min(mm)	Nom(mm)	Max(mm)		Min(in)	Nom(in)	Max(in)
A	3.200	3.300	3.400	A	0.126	0.130	0.134
b	0.440		0.530	b	0.017		0.021
b1	0.430	0.460	0.490	b1	0.017	0.018	0.019
c	0.250		0.300	c	0.010		0.012
c1	0.240	0.250	0.260	c1	0.009	0.010	0.010
D	22.80	22.90	23.00	D	0.898	0.902	0.906
E	6.400	6.500	6.600	E	0.252	0.256	0.260
e	2.54(BSC)			e	0.1(BSC)		
eA	7.620		9.500	eA	0.300		0.374
L	3.000			L	0.118		





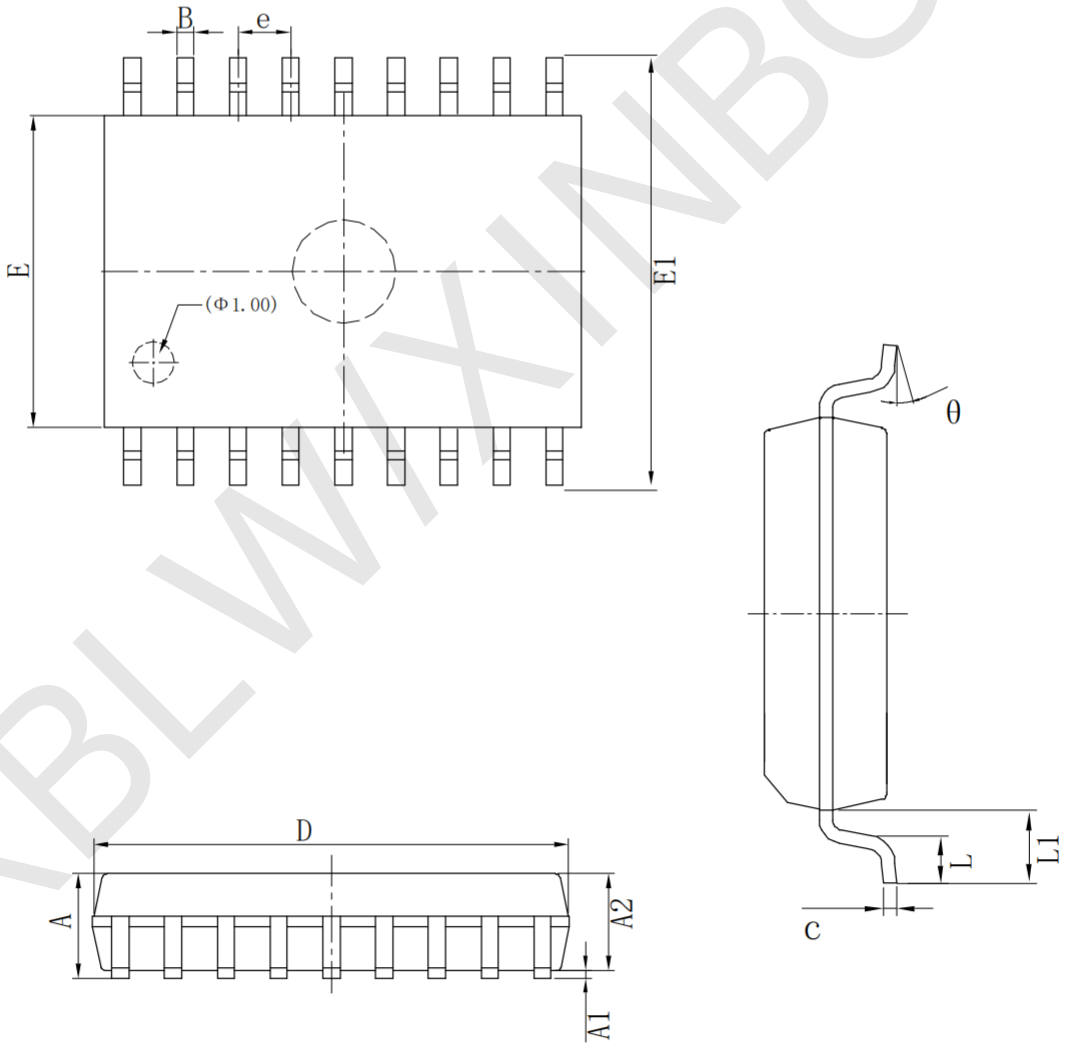




SECTION B-B

· SOP-18

Symbol \ Size	Dimensions In Millimeters			Symbol \ Size	Dimensions In Inches		
	Min(mm)	Nom(mm)	Max(mm)		Min(in)	Nom(in)	Max(in)
D	11.25	11.45	11.65	D	0.443	0.451	0.459
E	7.300	7.500	7.700	E	0.287	0.295	0.303
E1	10.10	10.30	10.50	E1	0.398	0.406	0.413
B	0.4(TYP)			B	0.016(TYP)		
e	1.27(TYP)			e	0.050(TYP)		
c	0.200	0.250	0.300	c	0.008	0.010	0.012
A2	2.240	2.340	2.440	A2	0.088	0.092	0.096
A1	0.100	0.150	0.250	A1	0.004	0.006	0.010
A			2.590	A			0.102
L1	1.300	1.400	1.500	L1	0.051	0.055	0.059
L	0.700	0.800	1.000	L	0.028	0.031	0.039
θ		4°	8°	θ		4°	8°



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