DESCRIPTION

The ULN2803A-CN device is a 40V , 500mA Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500mA. The Darlington pairs may be connected in parallel for higher current capability.

Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. The ULN2803A-CN device has a 2.7-kΩ series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS devices.

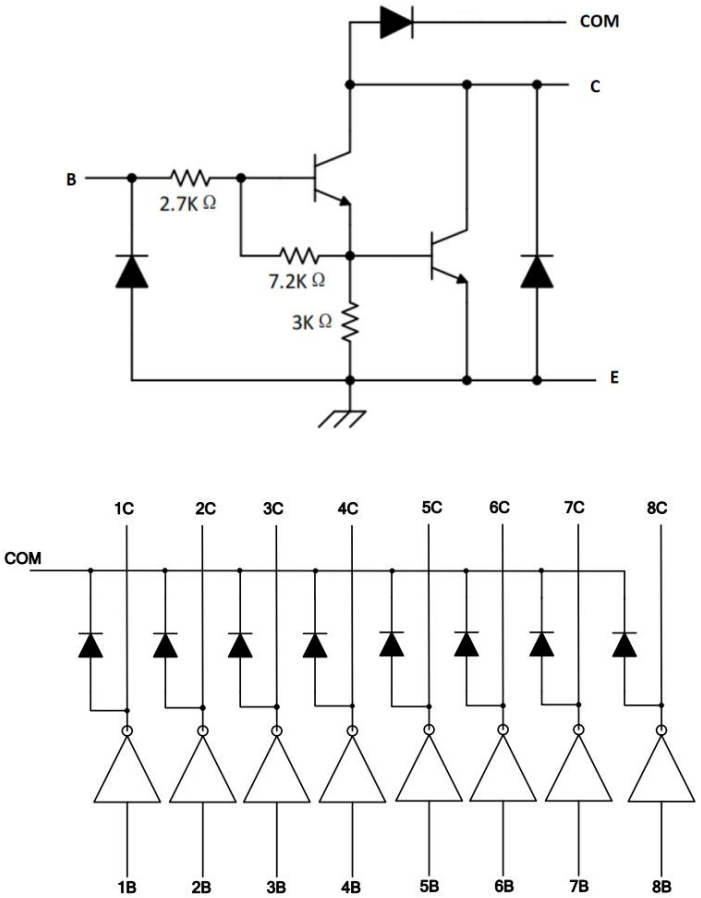
FEATURES

- 500-mA-Rated Collector Current (Single Output)
- High-Voltage Outputs: 40V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic

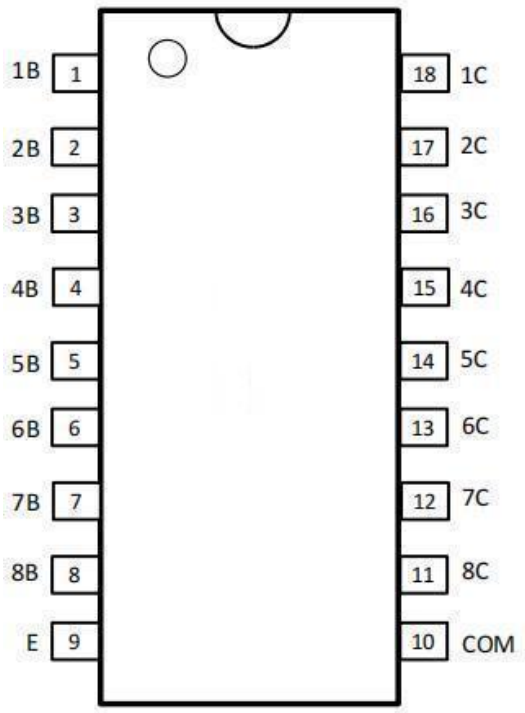
APPLICATIONS

- Relay Driver
- Lamp Driver
- Display Driver

Simplified Schematic



Pin Configuration



SOP18/DIP18

NUMBER SOP18/DIP18	NAME	I/O	DESCRIPTION
1	1B	I	Channel 1 through 8 Darlington base input
2	2B		
3	3B		
4	4B		
5	5B		
6	6B		
7	7B		
8	8B		
9	E	—	Common emitter shared by all channels (typically tied to ground)
10	COM	—	Common cathode node for flyback diodes (required for inductive loads)
11	8C	O	Channel 1 through 8 Darlington collector output
12	7C		
13	6C		
14	5C		
15	4C		
16	3C		
17	2C		
18	1C		

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBAL	MIN	MAX	UNIT
Collector-emitter voltage	V_{CE}		40	V
COM voltage	V_{COM}		40	V
Input voltage	V_I		30	V
Peak collector current	I_{CP}		500	mA
Output clamp current	I_{OK}		500	mA
Total substrate-terminal current	I_{ET}		-2.5	A
Junction temperature	T_J		150	℃
Lead Temperature(soldering, 10sec)	T_W		260	℃
Storage temperature	T_S	-65	+150	℃

Note: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBAL	MIN	TYP	MAX	UNIT
Collector-emitter voltage	V_{CE}	0		40	V
Collector Current(Continuous)	I_{OUT}			100	mA/ch
Input voltage	V_{IN}	0		24	V
Input voltage(ON)	$V_{IN(ON)}$	2.8		24	V
Input voltage(OFF)	$V_{IN(OFF)}$	0		0.7	V
Clamp diode reverse voltage	V_R			40	V
Clamp diode forward Current	I_F			350	mA
Ambient temperature	T_A	-20	+25	+85	℃

Electrical Characteristics

(At T_A=25℃, unless otherwise noted)

PARAMETER	SYMBOL	FIGURE	CONDITIONS		MIN	TYP	MAX	UNIT
On-state input voltage	$V_{IN(ON)}$	6	V_{CE}=2V	Ic=200mA		1.9	2.4	V
				Ic=250mA		2	2.7	
				Ic=300mA		2.1	3	
Collector-emitter saturation voltage	$V_{CE(SAT)}$	5	V_I=2.4V	Ic=30mA		0.78	1	V
				Ic=60mA		0.82	1.1	
				Ic=120mA		0.9	1.2	
				Ic=240mA		1.1	1.4	
				Ic=350mA		1.25	1.6	

Input current	I_I	4	I_C=60mA	V_I=12V		4	5.3	mA
				V_I=6V		1.7	2.2	
				V_I=4.5V		1.1	1.6	
				V_I=2.4V		0.35	0.7	
Clamp diode forward voltage	V_F	8	I_F=350mA			1.6	2	V
Collector cutoff current	I_{cex}	1	V_{CE}=40V, I_I=0				50	uA
Collector-emitter voltage	V_{CE}	1			40			V
Clamp diode reverse voltage	V_R	7			40			V
Clamp diode reverse current	I_R	7	V_R=40V				50	uA
Propagation delay time, low- to high-level output	t_{PLH}	9	VL=12V, RL=45Ω			0.15	1	us
Propagation delay time, high- to low-level output	t_{PHL}	9	VL=12V, RL=45Ω			0.15	1	us

Test Circuit

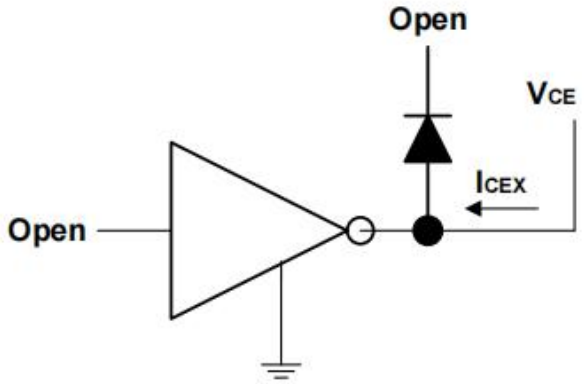


Figure 1. I_{CEX} Test Circuit

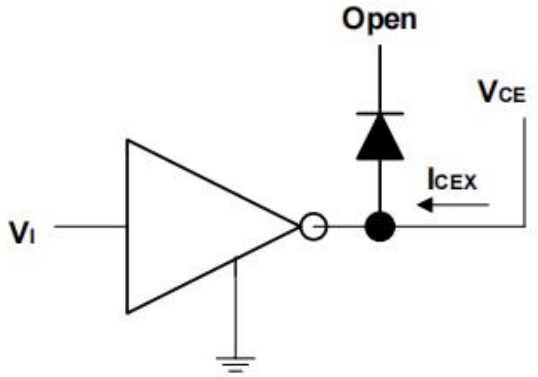


Figure 2. I_{CEX} Test Circuit

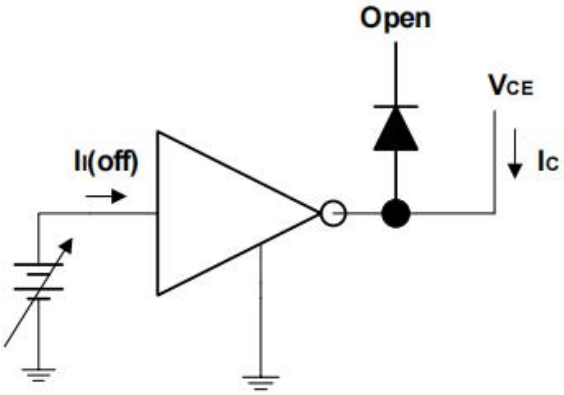


Figure 3. I_I(off) Test Circuit

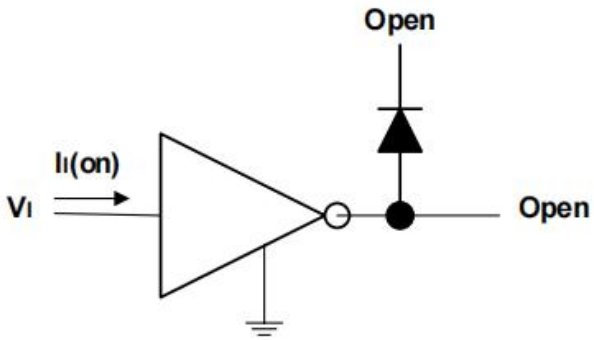


Figure 4. I_I(on) Test Circuit

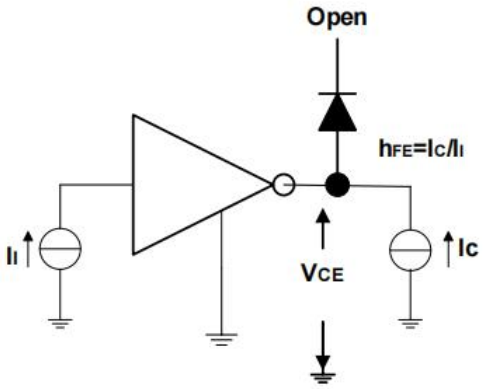


Figure 5. hFE, V_{CE}(sat) Test Circuit

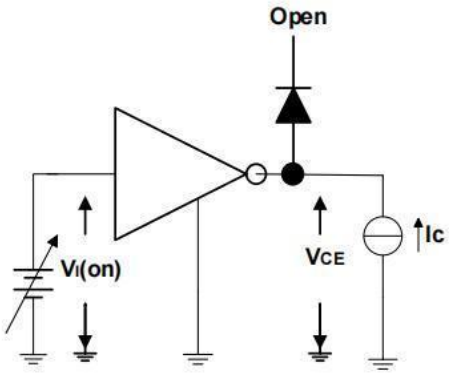


Figure 6. V_I(on) Test Circuit

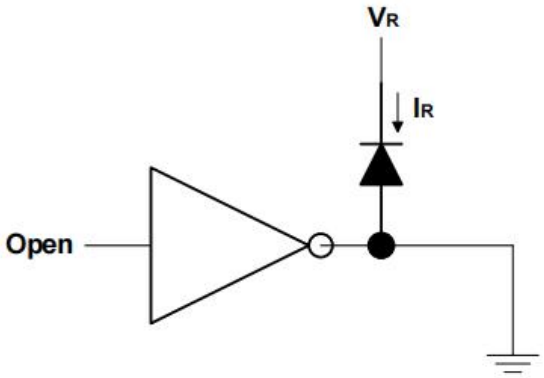


Figure 7. I_R Test Circuit

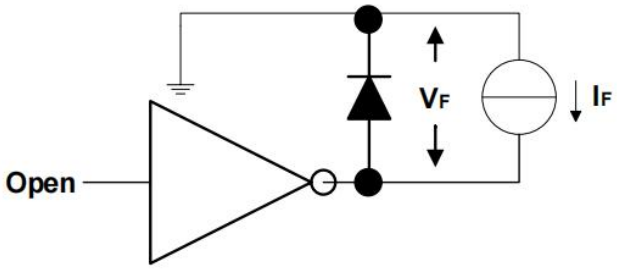
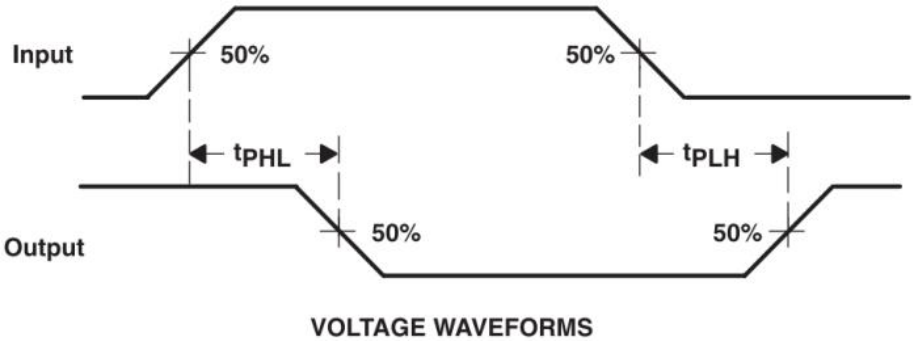


Figure 8. V_F Test Circuit



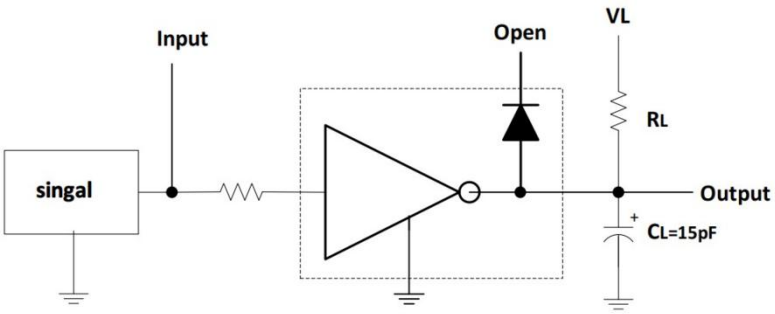


Figure 9. Propagation Delay Times(CL includes probe and jig capacitance)

Typical Application

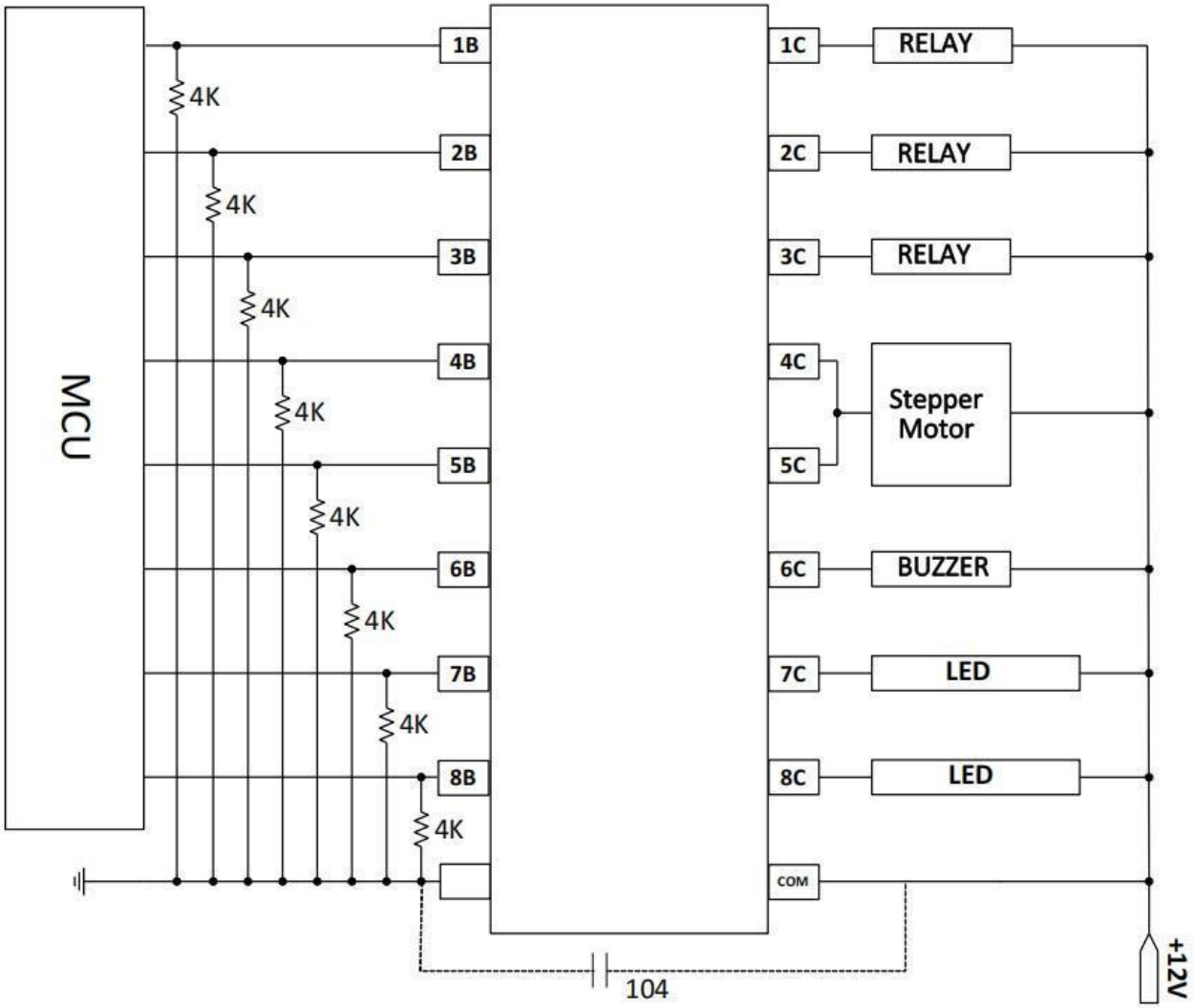
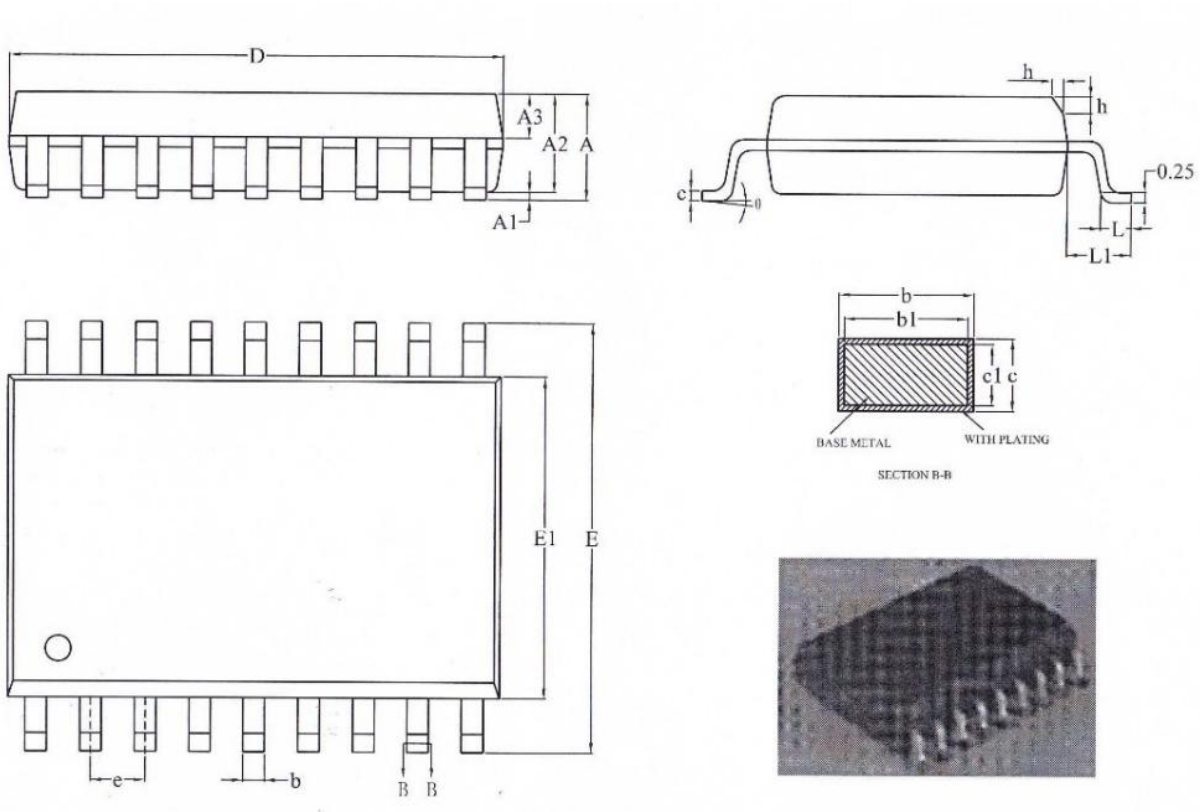


Figure 10. ULN2803A-CN as Driver

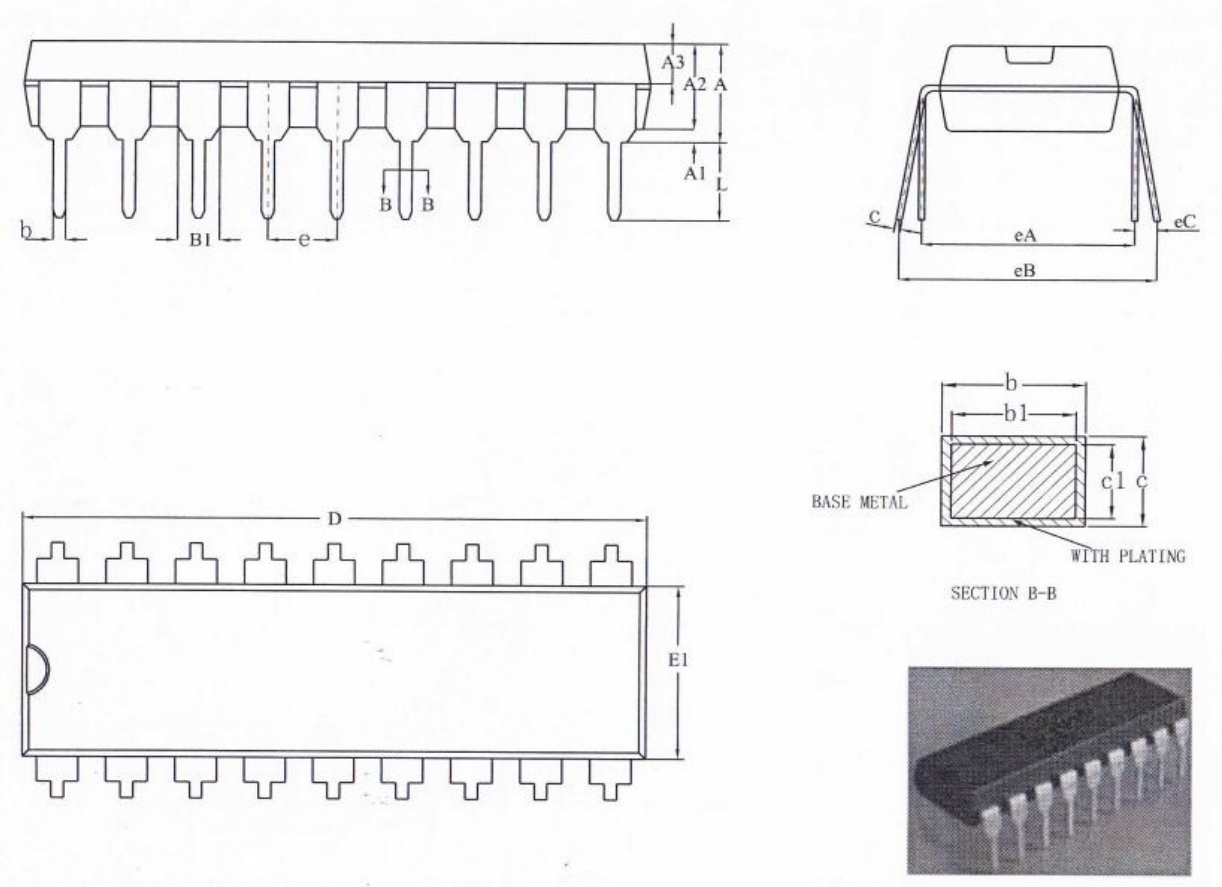
PACKAGE OUTLINE DIMENSIONS

SOP-18



SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	-	-	2.65	D	11.35	11.45	11.55
A1	0.10	-	0.30	E	10.10	10.30	10.50
A2	2.20	2.30	2.40	E1	7.40	7.50	7.60
A3	0.97	1.02	1.07	e	1.27 BSC		
b	0.35	-	0.43	L	0.70	-	1.00
b1	0.34	0.37	0.40	L1	1.40REF		
c	0.25	-	0.29	h	0.25	-	0.75
c1	0.24	0.25	0.26	θ	0°	-	8°

DIP-18



SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	3.60	3.80	4.00	c1	0.24	0.25	0.26
A1	0.51	-	-	D	22.80	22.90	23.00
A2	3.20	3.30	3.40	E1	6.45	6.55	6.65
A3	1.47	1.52	1.57	e	2.54 BSC		
b	0.44	-	0.52	eA	7.62REF		
b1	0.43	0.46	0.49	eB	7.62	-	9.30
B1	1.52REF			eC	0	-	0.84
c	0.25	-	0.29	L	3.00	-	-

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