ULN2803A new eight-way

high withstand voltage, high current Darlington transistor

describe

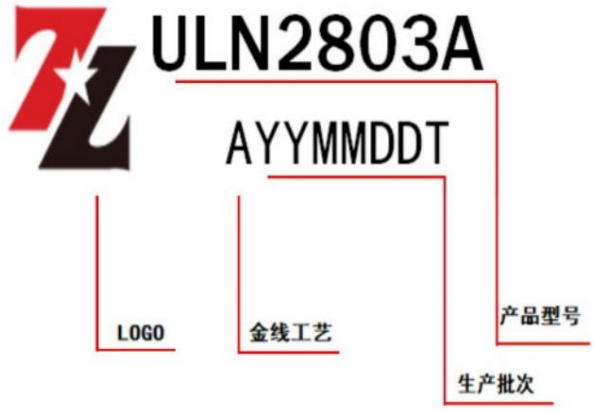
ULN2803A is a monolithic integrated high withstand voltage and high current Darlington tube array, and the circuit contains eight independent Darlington tube drive circuits. The freewheeling diode is designed inside the circuit, which can be used to drive inductive loads such as relays and stepping motors. A single Darlington collector can output 500mA current. Paralleling Darlingtons allows for higher output current capability. This circuit can be widely used in relay driving, lighting driving, display driving (LED), stepping motor driving and logic buffer.

Each Darlington tube of ULN2803A is connected in series with a 2.7K base resistor, which can be directly connected to TTL/CMOS circuit under the working voltage of 5V, and can directly process the data that originally required the standard logic buffer to process.

Features

1. 500mA collector output current (single channel); 2. High voltage resistance (50V); 3. Input compatible with TTL/CMOS logic signals; 4. Widely used in relay drive; 5. Electrostatic capacity: 8000V (HBM)

Instructions printed on the package surface



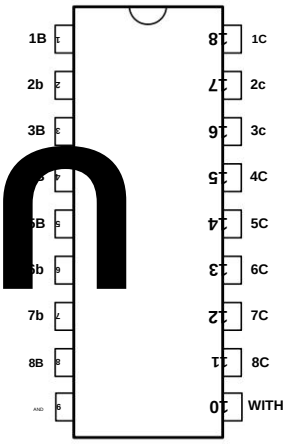
typical application

1. Relay drive; 2. Indicator light drive; 3. Display drive.

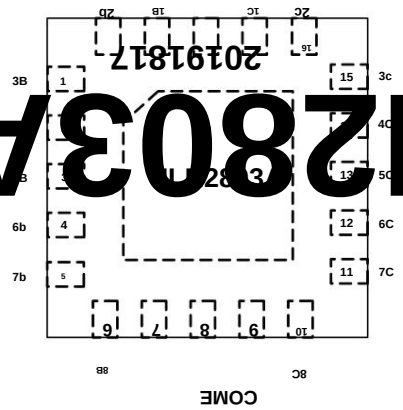
Ordering Information

model	package type	temperature range
ULN2803A SOP18 Pb-Free	-40ÿ ~ +85ÿ	
ULN2803A QFN20L Pb-Free	-40ÿ ~ +85ÿ	
ULN2803A SSOP24 Pb-Free	-40ÿ ~ +85ÿ	

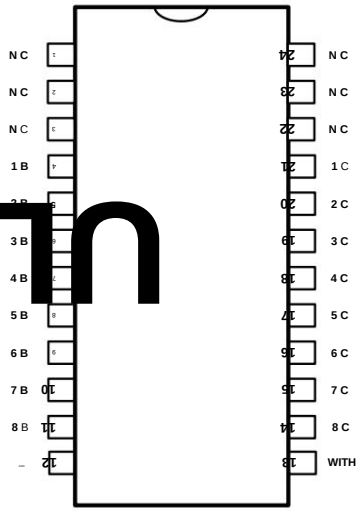
Array Pinout



SOP18 package

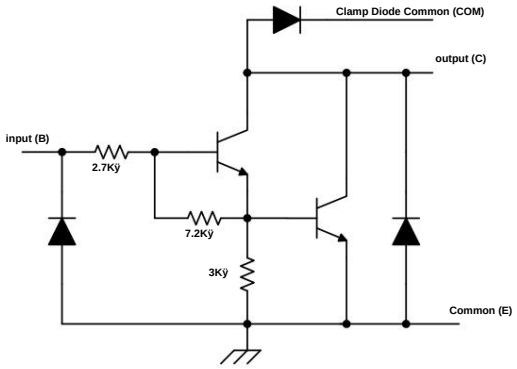


QFN20L package



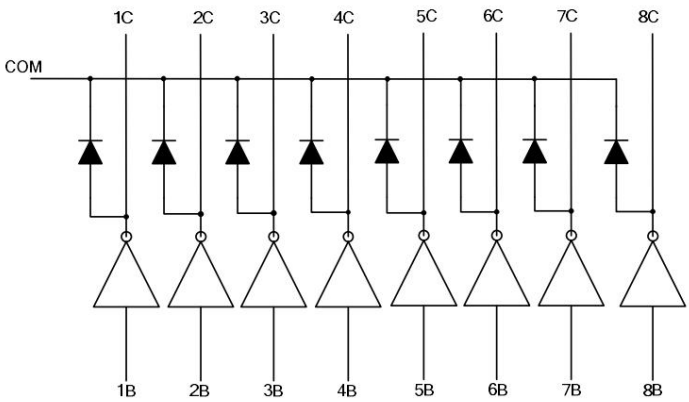
SSOP24 package

Circuit schematic diagram (single Darlington)



Schematic diagram of ULN2803A single drive circuit

logic diagram



pin definition

pin number			Pin Name Input/Output		Pin function description
SSOP 24	QFN20L	SOP1 8			
1			·	·	Empty pin
2			·	·	Empty pin
3	7		·	·	Empty pin
4	19	1	1B	.	1 channel input pin 2
5	20	2	2b	.	channel input pin 3 channel
6	1	3	3B	.	input pin 4 channel input
7	2	4	4B	.	pin 5 channel input pin 6
8	3	5	5B	.	channel input pin 7 channel
9	4	6	6b	.	input pin 8 channel input
10	5	7	7b	.	pin ground Clamp diode
11	6	8	8B	.	common 8 channel output
12	8	9	AND	·	pin 7 channel
13	9	10	WITH	·	output pin 6 channel output pin
14	10	11	8C	O	5 channel output pin 4 channel
15	11	12	7C	O	output pin 3 channel output
16	12	13	6C	O	pin 2 channel output pin 1
17	13	14	5C	O	channel output pin empty pin
18	14	15	4C	O	empty pin Empty pin
19	15	16	3c	O	
20	16	17	2c	O	
21	17	18	1C	O	
22	18		·	·	
23			·	·	
24			·	-	

Absolute Maximum Ratings

(TA=25ÿ, unless otherwise specified)

parameters		symbol	value	unit
Collector-emitter voltage		VCE	-0.5~50	IN
COM Terminal		VCOM	50	IN
Voltage Input Voltage		WE	-0.5~30	In
Collector Peak Current		ICP	500	mA/ch mA
Output Clamp Diode Forward Peak Current Total		IOC	500	
Emitter Maximum Peak Current Maximum Operating		GO	-2.5	A
Junction Temperature (2) Soldering Temperature		TJ	150	ÿ
Storage Temperature Range			260	ÿ,10s ÿ
		Tstg	-60 ~ +150	
Power Consumption(1) (2)	SOP18 package	PD	0.54/0.625(3)	IN
	QFN20L package		1.3	
	SSOP24 package Note:			

1. The maximum power consumption can be calculated according to the following

relationship ÿ ÿ /

2. Tj(max) ÿ=150ÿ, ÿA ÿ AND

indicates the ambient temperature of the circuit; 3. On the glass epoxy PCB board

(30×30×1.6mm copper 50%).

Recommended working conditions

(TA=25ÿ, unless otherwise specified)

Parameter Collector-	symbol	condition		min max unit		
Emitter Voltage	VCE			0	50	IN
Output current	IOUT	TPW=25ms TA=85ÿ TJ=120ÿ	Duty=10%	0	233	mA/ch
			Duty=50%	0	70	
Control Signal Input Voltage	COME			0	24	IN
Input Voltage (Output On) Input Voltage (Output Off)	VIN(ON)	Iout=400mA hFE=800		2.8	24	IN
Clamp Diode Reverse Voltage	VIN(OFF)			0	0.7	IN
Clamp Diode Peak Forward Current	VR				50	IN
Operating Temperature Range	IF				350	mA
	FACING			-40	+85	ÿ
power consumption	PD	TA = 85ÿ	SOP18 Package--		0.325 W 0.6 W	
			QFN20L Package--			
			SSOP24 package--			IN

Note: On glass epoxy PCB (30×30×1.6mm copper 50%).

Electrical parameter characteristic table

(TA=25ÿ, unless otherwise specified)

parameters	test pattern	ÿÿÿÿ IC=200mA		Min Typical Max Unit			
VI(ON) on-state input voltage	Figure 4	VCE=2V	IC=250mA		1.9	2.4	IN
			IC=300mA		2.0	2.7	
			VI=2.4V		2.1	3	
VCE (SAT) collector-emitter saturation voltage drop (1) Figure 5		IC=30mA VI=2.4V IC=60mA VI=2.4V			0.78	1.0	IN
		IC=120mA VI=2.4V IC=240mA VI=2.4V			0.82	1.1	
		IC=350mA IF=350mA VCE=50V II=0			0.9	1.2	
		VCE=50V TA=85ÿ VI=0V VIN=12V			1.1	1.4	
		VIN=6V VIN=4.5V VIN=2.4V VR=50V			1.25	1.6	
VF Clamp Diode Forward Voltage Drop	Figure				1.4	1.6	IN
ICEX collector turn-off leakage current	8 Figure					50	ÿA
	1 Figure 2					100	
II Input current (2)	Figure 4		IC=60mA		4	5.3	mA
					1.7	2.2	
					1.1	1.6	
					0.35	0.7	
IR Clamp Diode Reverse Current	Figure 7					100 ÿA pF	
CIN input capacitance tPLH					15		
Propagation delay low-high tPHL	Figure	VL=12V RL=45ÿ			0.15	1	ÿs
Propagation delay high-low Remarks:	9 Figure 9	VL=12V RL=45ÿ			0.15	1	ÿs

(1), VCE(SAT) (collector-emitter saturation voltage drop) parameters in the finished product test conditions are VI=5V, IC=100mA, VCE(SAT) parameter judgment standard

Standard is 0.75V~1.15V. VCE(SAT) parameters under other conditions are guaranteed by design;

(2), II (input current) parameters in the finished product test conditions are VIN=5V, IC=100mA, and the qualified standard of II parameters is 0.7mA~1.5mA. That

II parameters under other conditions are guaranteed by design.

Parametric Test Schematic

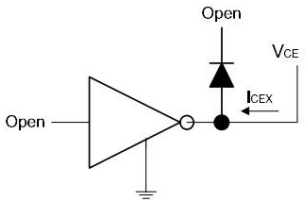


Figure 1 ICEX test circuit

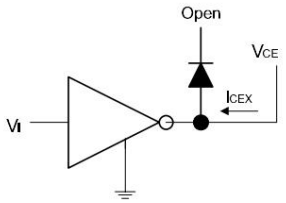


Figure 2 ICEX test circuit

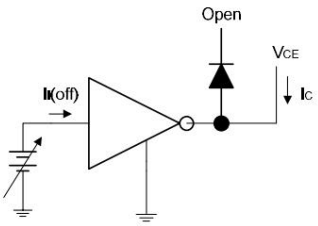


Figure 3 II (off) test circuit

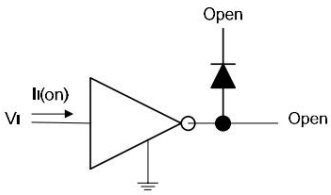


Figure 4 II Test Circuit

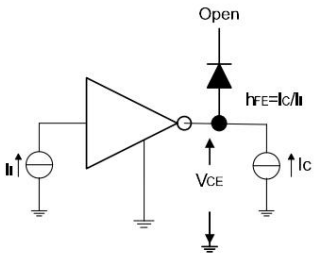


Figure 5 HFE, VCE (sat) test circuit

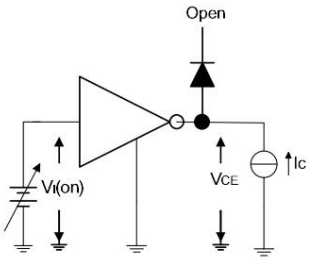


Figure 6 VI (on) test circuit

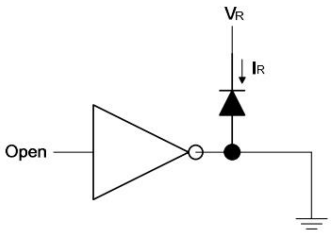


Figure 7 IR test circuit

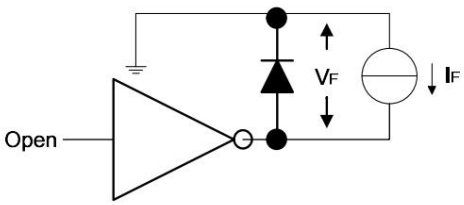
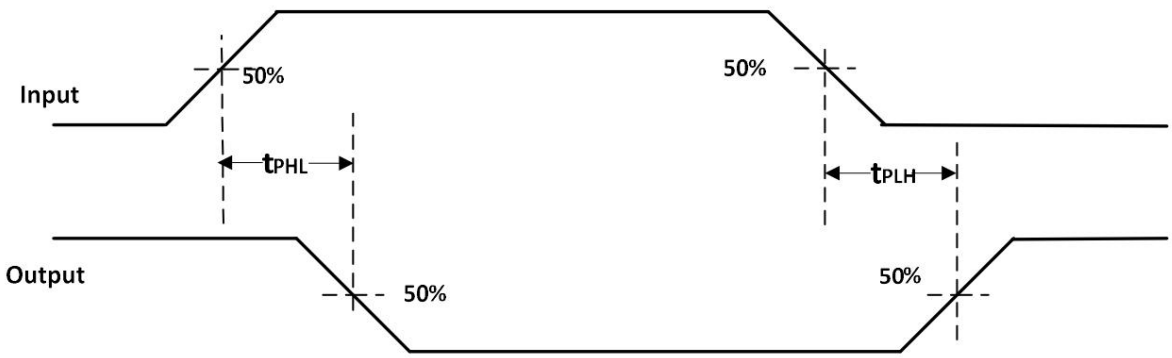


Figure 8 VR test circuit



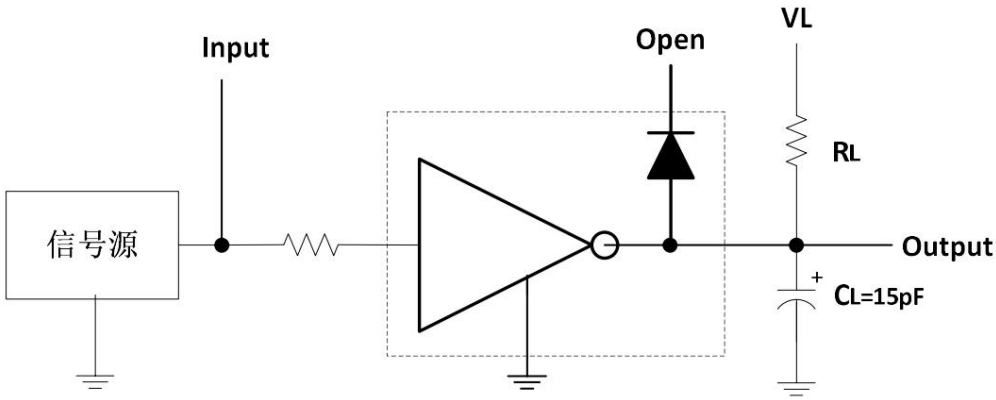


Figure 9 Transmission delay waveform

Note: The capacitive load in Figure 9 is the parasitic capacitance of the oscilloscope probe

typical application

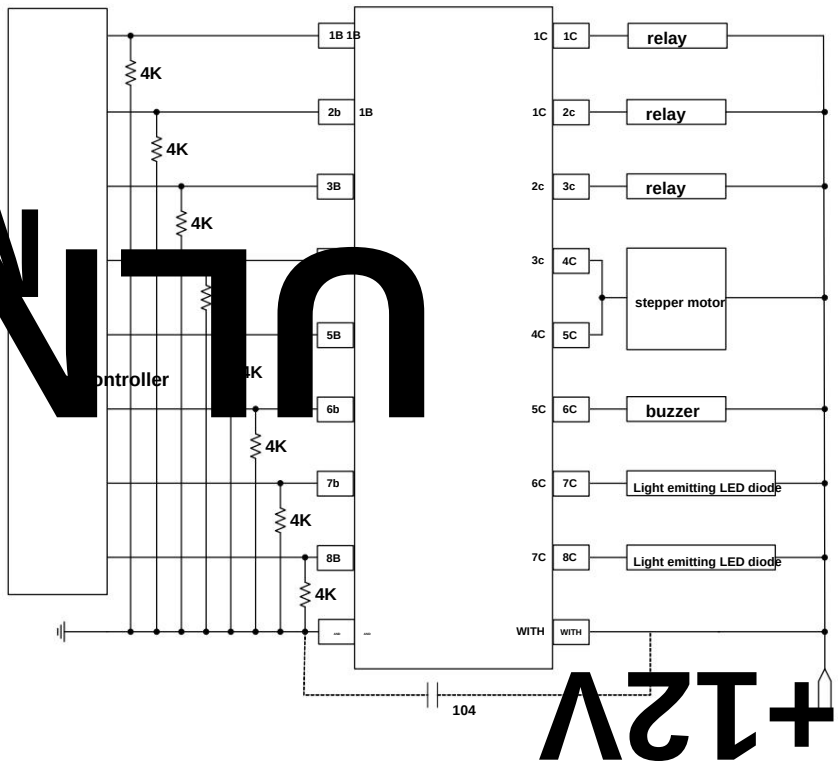
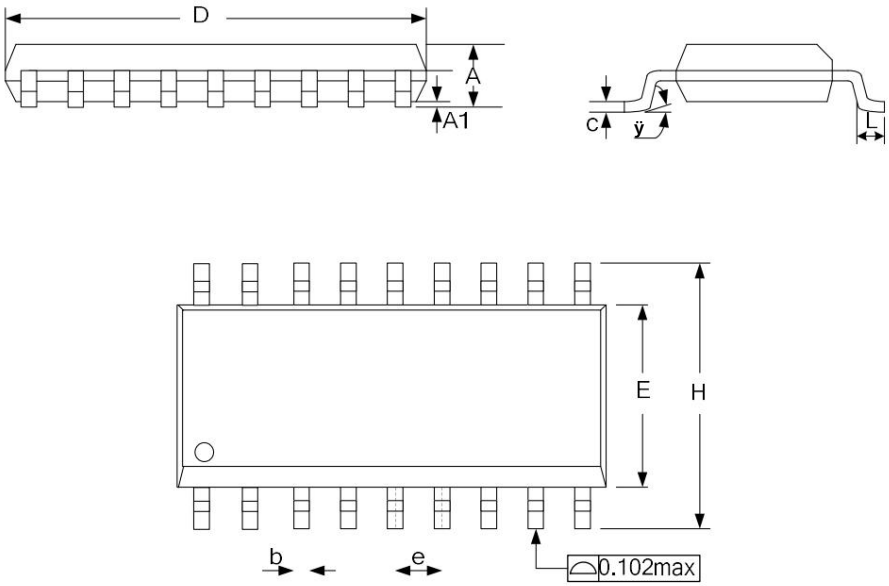


Figure 10 ULN2803A application schematic diagram

Considering that some applications currently use MCUs with pull-up resistors, the output status of MCUs is uncertain when powering on. At this time, the input stage of ULN2803A will be affected by the pull-up resistors of MCUs and the load will be turned on. In order to avoid load errors It is recommended that customers with such application problems connect a 4K pull-down resistor to ground at the input stage, as shown in the figure above

Package Outline Dimensions

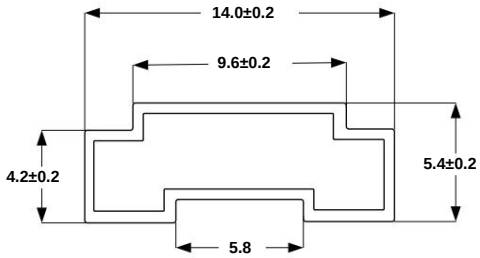
SOP18ÿ



SYMBOL	MILLMETER		
	MIN	TYPE	MAX
A	·	·	2.65
A1	0.10	·	0.30
b	0.35	·	0.53
c	0.24	0.32	0.40
D	11.25	11.45	11.76
AND	7.30	7.50	7.70
It is	·	1.27	·
H	10.10	10.30	10.64
L	0.50	-	1.00
a O	0	-	8

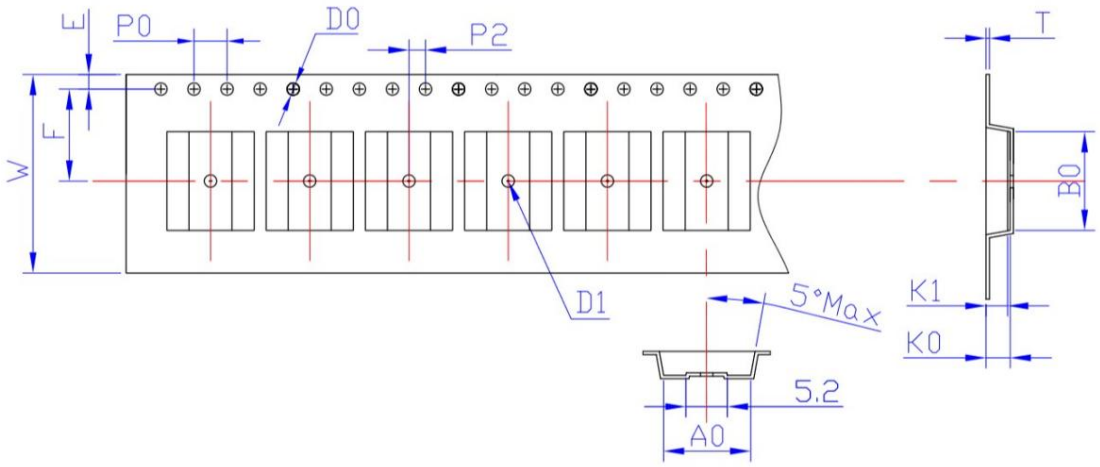
SOP18 Tube Filling Tube Specifications:

T=0.5±0.1



Description: 1. Pipe: PVC coated with anti-
static fluid; 2. Rounded corners: external
R=1.5mm max internal
r=1.0mm max 3. Surface impedance: 10E5~10~10 OHMS/SQ or
less; 4. Factory shipment : The white plug is shipped by the manufacturer and plugged in at the left end, and the black plug is included with the s

SOP18 carrier tape specification:

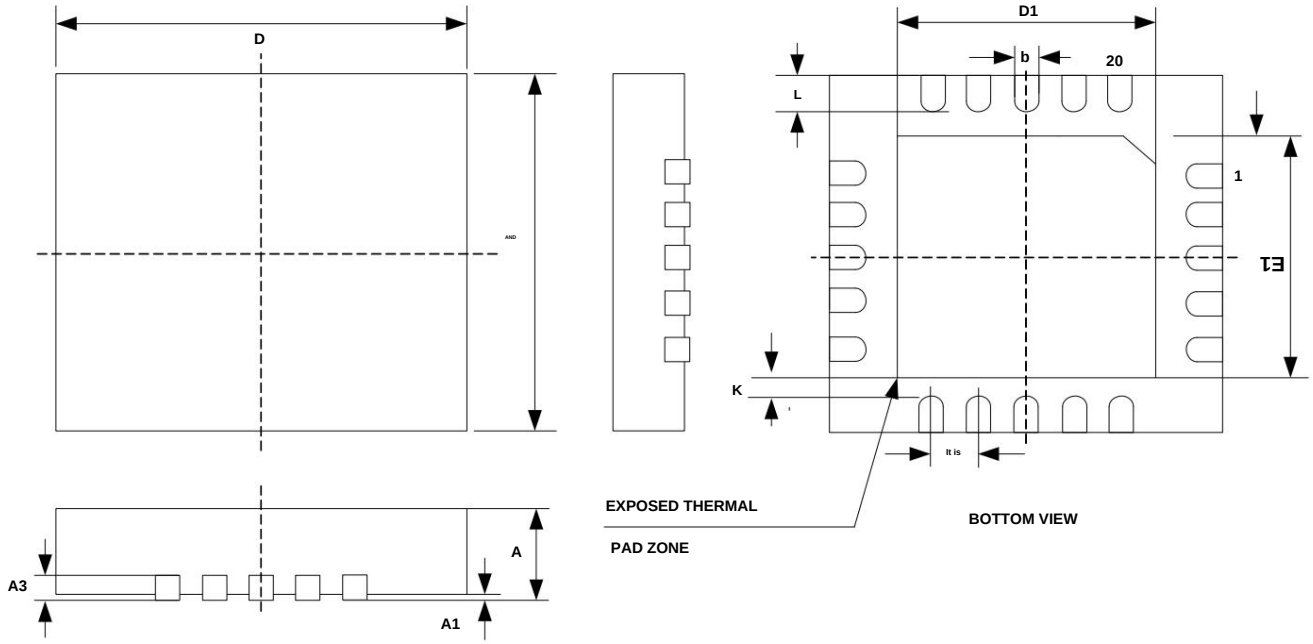


B-B SECTION

A-A SECTION

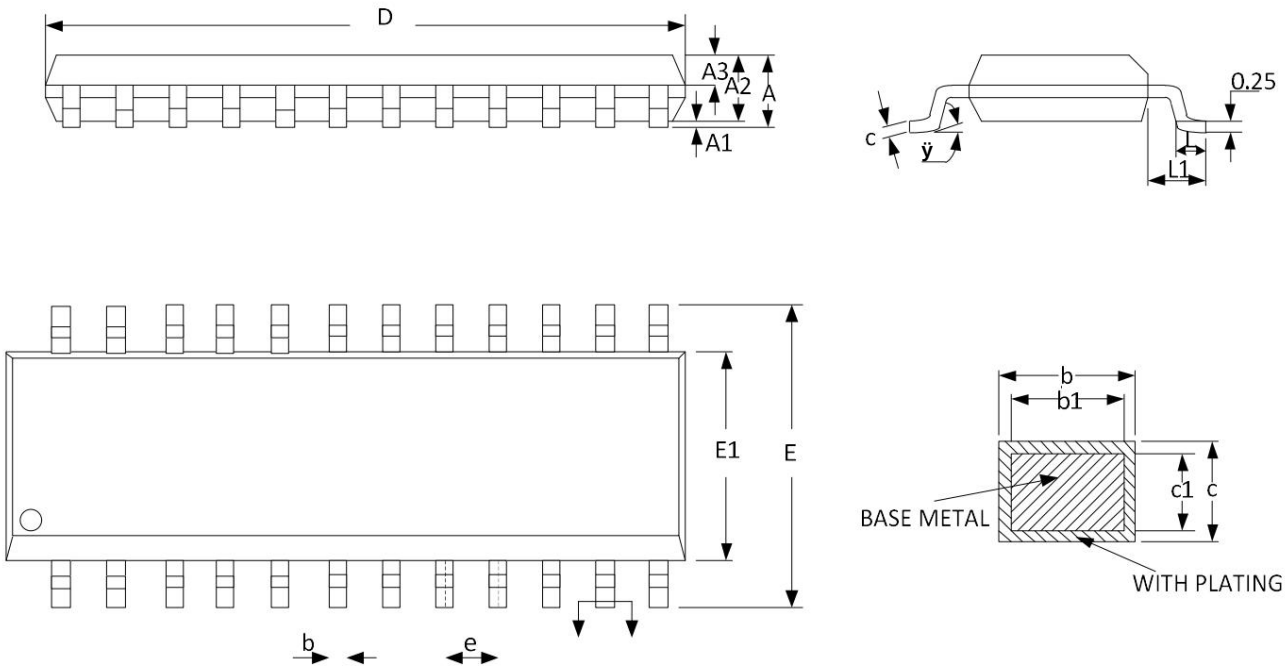
SYMBOL	MILLMETER		
	MIN	NAME	MAX
IN	23.70	24.00	24.30
A0	10.65	10.75	10.85
A1	-0.10	0.00	0.10
B0	11.85	11.95	12.05
B1	-0.10	0.00	0.10
K0	2.80	2.90	3.00
K1	2.50	2.60	2.70
AND	1.65	1.75	1.85
F	11.4	11.5	11.6
P	11.9	12.0	12.1
P0	3.9	4.0	4.1
P2	1.9	2.0	2.1
D0	1.40	1.50	1.60
D1	1.40	1.50	1.60
T	0.25	0.30	0.35

QFN20Lÿ



SYMBOL	MILLMETER		
	MIN	NAME	MAX
A	0.70	0.75	0.80
A1	0.00	·	0.05
A3	0.203REF		
b	0.20	0.25	0.30
D	3.90	4.00	4.10
AND	3.90	4.00	4.10
D1	2.20	2.30	2.40
E1	2.20	2.30	2.40
AND	0.50TYP		
K	0.20	·	·
L	0.30	0.40	0.50

SSOP24



SYMBOL	MILLMETER		
	MIN	NAME	MAX
A	-	-	1.77
A1	0.08	0.18	0.28
A2	1.20	1.40	1.60
A3	0.55	0.65	0.75
b	0.23	-	0.33
b1	0.22	0.25	0.28
c	0.21	-	0.26
c1	0.19	0.20	0.21
D	8.45	8.65	8.85
AND	5.80	6.00	6.20
E1	3.70	3.90	4.10
It is	0.635BSC		
L	0.50	0.65	0.80
L1	1.05BSC		
ÿ	0°	-	8°

Rev1.5 version update instructions: update SOP18 package dimensions, increase tube loading tube size, update SOP18 carrier tape size.