



# Datasheet

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**ILI2301S**

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## ILI2301S

# Capacitive Touch Sensor Controller

## Specification

Version: V1.00

Date: 2014/12/25

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## Revision History

Version No.	Date	Page	Description
V0.00	2012/12/25		Draft specification
V0.01	2013/1/22		Preliminary specification
V0.02	2013/3/21		Add ILI2301S description
V0.03	2013/5/21		Modify VDD3D, VDD3A absolute supply voltage from 3.6V to 3.3V
V0.04	2013/9/18		Modify VDD16 description
V0.05	2013/9/25		<ol style="list-style-type: none"> <li>1. Modify pin description</li> <li>2. Modify Vtx maximum rating from 35 to 32V</li> <li>3. Modify application circuit.</li> </ol>
V1.00	2014/12/25		Add dc characteristic.

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## 1. Description

The ILI2301S is a compact capacitive touch sensor controller optimized for NB and AIO touch panel design. It integrates high speed CDC (capacitance to digital converter), 68CH high voltage driving and sensing I/O channels and high voltage charge pump controller in a compact 88-pin QFN 10mm\*10mm\*0.9mm package. It meets all Windows 8 requirements with best human touch performance.

## 2. Features

- 68 channels for capacitive touch panel.
- Flexible driving or sensing channel assignment
- Programmable driving voltage with skew control for driving channels
- High speed ADC with programmable 8-bit or 10-bit resolution
- Support auto baseline calibration circuit
- Support smart edge sensing
- Support smart touch detection
- Built-in noise processing function
- High voltage charge pump controller with programmable clamp voltage function
- Input voltage low level detection circuit
- Input voltage power on reset circuit
- Support power down mode
- Driving to Sensing mutual capacitance: 1pF to 4pF

### 3. Block Diagram

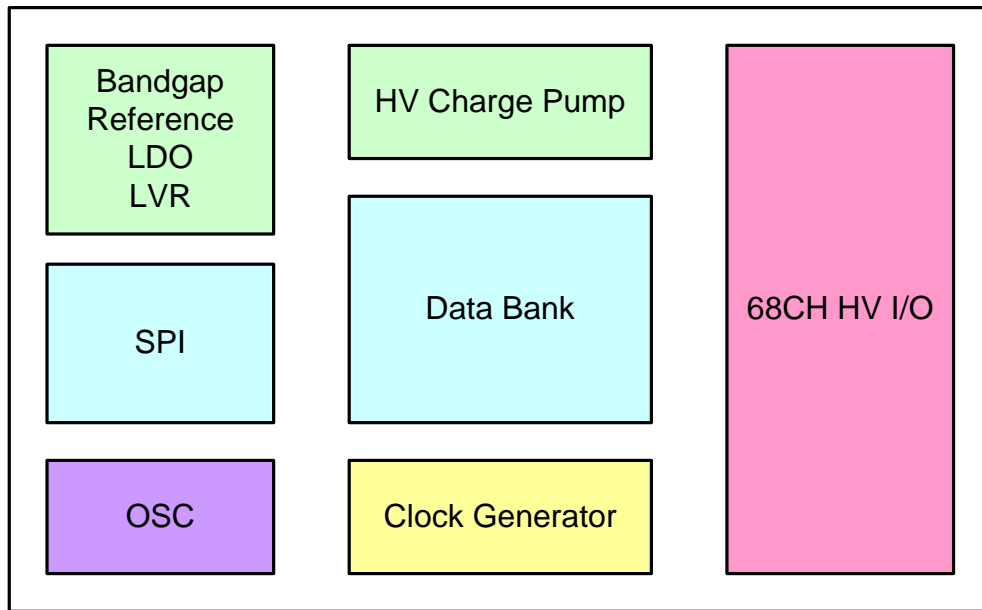
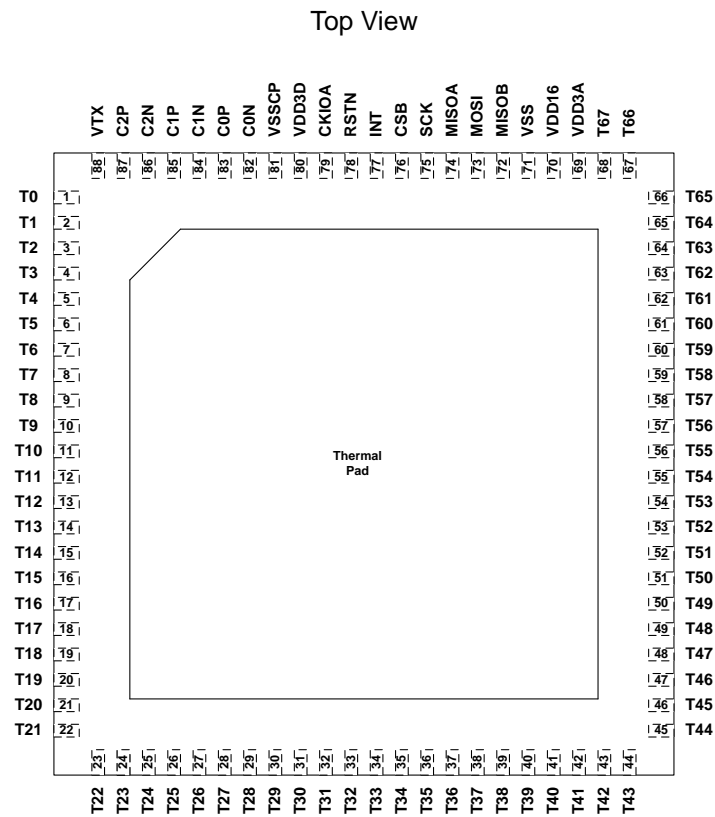


Figure 3-1: ILI2301S Block Diagram

## 4. Pin Definition

### 4.1 QFN-88 Pin Assignment



### 4.2 Pin Description

Pin No.	Pin Name	Pin Type*	Description
1	T0	I/O	HV I/O channel 0
2	T1	I/O	HV I/O channel 1
3	T2	I/O	HV I/O channel 2
4	T3	I/O	HV I/O channel 3
5	T4	I/O	HV I/O channel 4
6	T5	I/O	HV I/O channel 5
7	T6	I/O	HV I/O channel 6
8	T7	I/O	HV I/O channel 7
9	T8	I/O	HV I/O channel 8
10	T9	I/O	HV I/O channel 9
11	T10	I/O	HV I/O channel 10
12	T11	I/O	HV I/O channel 11
13	T12	I/O	HV I/O channel 12
14	T13	I/O	HV I/O channel 13
15	T14	I/O	HV I/O channel 14
16	T15	I/O	HV I/O channel 15

Pin No.	Pin Name	Pin Type*	Description
17	T16	I/O	HV I/O channel 16
18	T17	I/O	HV I/O channel 17
19	T18	I/O	HV I/O channel 18
20	T19	I/O	HV I/O channel 19
21	T20	I/O	HV I/O channel 20
22	T21	I/O	HV I/O channel 21
23	T22	I/O	HV I/O channel 22
24	T23	I/O	HV I/O channel 23
25	T24	I/O	HV I/O channel 24
26	T25	I/O	HV I/O channel 25
27	T26	I/O	HV I/O channel 26
28	T27	I/O	HV I/O channel 27
29	T28	I/O	HV I/O channel 28
30	T29	I/O	HV I/O channel 29
31	T30	I/O	HV I/O channel 30
32	T31	I/O	HV I/O channel 31
33	T32	I/O	HV I/O channel 32
34	T33	I/O	HV I/O channel 33
35	T34	I/O	HV I/O channel 34
36	T35	I/O	HV I/O channel 35
37	T36	I/O	HV I/O channel 36
38	T37	I/O	HV I/O channel 37
39	T38	I/O	HV I/O channel 38
40	T39	I/O	HV I/O channel 39
41	T40	I/O	HV I/O channel 40
42	T41	I/O	HV I/O channel 41
43	T42	I/O	HV I/O channel 42
44	T43	I/O	HV I/O channel 43
45	T44	I/O	HV I/O channel 44
46	T45	I/O	HV I/O channel 45
47	T46	I/O	HV I/O channel 46
48	T47	I/O	HV I/O channel 47
49	T48	I/O	HV I/O channel 48
50	T49	I/O	HV I/O channel 49
51	T50	I/O	HV I/O channel 50
52	T51	I/O	HV I/O channel 51
53	T52	I/O	HV I/O channel 52



Pin No.	Pin Name	Pin Type*	Description
54	T53	I/O	HV I/O channel 53
55	T54	I/O	HV I/O channel 54
56	T55	I/O	HV I/O channel 55
57	T56	I/O	HV I/O channel 56
58	T57	I/O	HV I/O channel 57
59	T58	I/O	HV I/O channel 58
60	T59	I/O	HV I/O channel 59
61	T60	I/O	HV I/O channel 60
62	T61	I/O	HV I/O channel 61
63	T62	I/O	HV I/O channel 62
64	T63	I/O	HV I/O channel 63
65	T64	I/O	HV I/O channel 64
66	T65	I/O	HV I/O channel 65
67	T66	I/O	HV I/O channel 66
68	T67	I/O	HV I/O channel 67
69	VDD3A	P	Input power supply. Connect a bypass capacitor 2.2uF to GND.
70	VDD16	P	Internal regulator 1.6V decoupling pin. Connect a bypass capacitor 2.2uF to GND.
71	VSS	P	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C0P.
72	MISOB	O	Output data signal B of SPI.
73	MOSI	I	Input data signal of SPI.
74	MISOA	O	Output data signal A of SPI.
75	SCK	I	Input clock signal of SPI.
76	CSB	I	Input chip selection signal of SPI.
77	INT	O	Output interrupt signal for host controller.
78	RSTN	I	Input reset signal. Low active reset.
79	CKIOA	I/O	Clock signal for cascade application.
80	VDD3D	P	Input power supply. Connect a bypass capacitor 2.2uF to GND.
81	VSSCP	P	Charge pump circuit reference ground. Connect to GND.
82	C0N	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C0P.
83	C0P	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C0N.
84	C1N	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C1P.
85	C1P	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C1N.
86	C2N	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C2P.
87	C2P	O	Output clock signal of charge pump. Connect a fly capacitor 0.1uF to C2N.
88	VTX	P	Charge pump output decoupling pin. Connect a bypass capacitor 0.1uF to GND.
Thermal Pad	AGND	P	Analog circuit reference ground. Connect to GND.

\*Pin type: P=power or ground; I=input only; O=output only (push-pull); I/O=bi-direction

## 5. Electrical Characteristics

### 5.1 Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Min	Max	Unit
VDD3D	VDD3D	-0.3	3.3	V
VDD3A	VDD3A	-0.3	3.3	V
VDD16 to GND	VDD16	-0.3	1.65	V
VTX to GND	VTX	-0.3	32	V
ESD Susceptibility HBM (Human Body Mode) (Note 2)	HBM		2000	V
ESD Susceptibility MM (Machine Mode) (Note 2)	MM		200	V

**Note 1:** Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

**Note 2:** Devices are ESD sensitive. Handling precaution is recommended.

### 5.2 Recommended Operating Conditions (Note 3)

Parameter	Symbol	Min	Typ	Max	Unit
VDD3D	VDD3D	2.7	3	3.3	V
VDD3A	VDD3A	2.7	3	3.3	V
Operating Ambient Temperature Range	T <sub>A</sub>	-40		85	°C
Operating Junction Temperature Range	T <sub>J</sub>	-40		125	°C
Storage Ambient Temperature Range	T <sub>ST</sub>	-40		150	°C

**Note 3:** The device is not guaranteed to function outside its operating conditions.

### 5.3 DC Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
VDD3D Ripple	VDD3D_R			0.6	V
VDD3A Ripple	VDD3A_R			0.6	V
VTX Range	VTX	2.7	16	26.4	V
VTX Ripple (Note 4.)	VTX_R		1	2	V
Rx Voltage	V <sub>Rx</sub>		0.8		V
Total Operation Current (Note 5.)	I <sub>op</sub>			25	mA

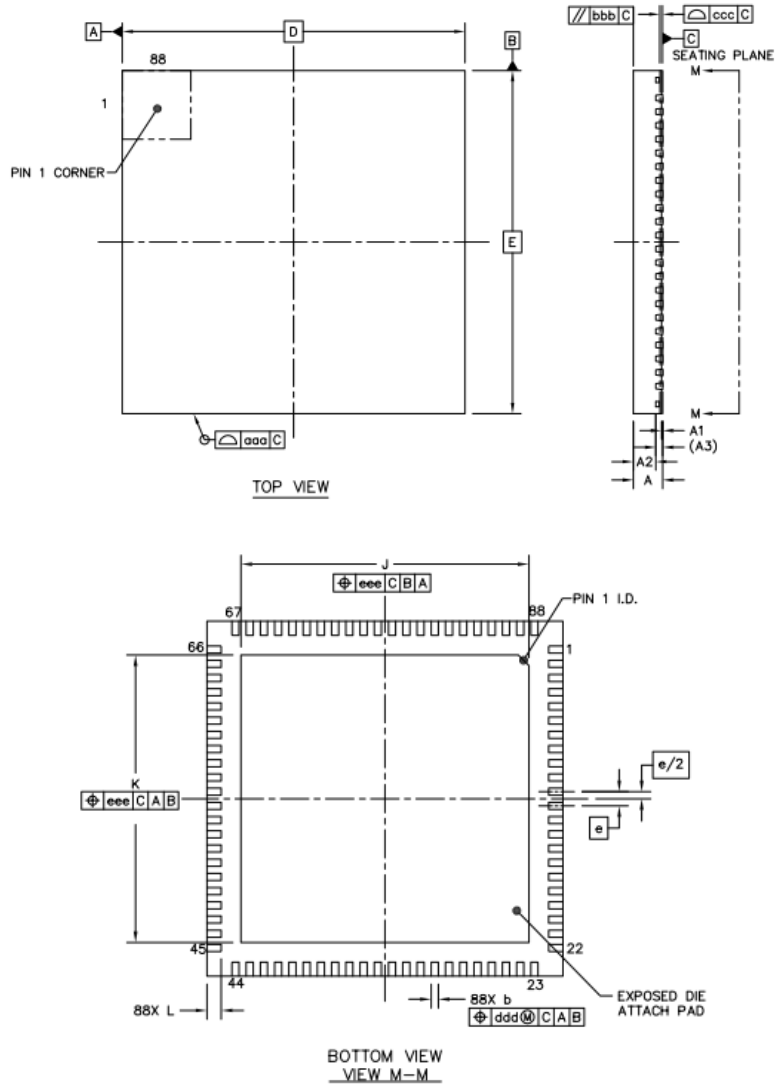
**Note 4:** The VTX ripple highly depends on flying cap quality, sensor loading and temperature. The maximum value was defined under room temperature with X7R flying capacitance of max. 28 inch sensor loading.

**Note 5 :** The operation current is total current of 3.0V power with max. 28 inch sensor loading.

## 6. Package Information

### 6.1 QFN-88 Package Dimension

Unit: mm



	SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS	A	0.7	0.75	0.8
STAND OFF	A1	0	0.035	0.05
MOLD THICKNESS	A2	---	0.55	0.57
L/F THICKNESS	A3		0.203 REF	
LEAD WIDTH	b	0.15	0.20	0.25
BODY SIZE	X	D	10 BSC	
	Y	E	10 BSC	
LEAD PITCH	e		0.4 BSC	
EP SIZE	X	J	8	8.1
	Y	K	8	8.1
LEAD LENGTH	L	0.35	0.4	0.45
PACKAGE EDGE TOLERANCE	aaa		0.1	
MOLD FLATNESS	bbb		0.1	
COPLANARITY	ccc		0.08	
LEAD OFFSET	ddd		0.1	
EXPOSED PAD OFFSET	eee		0.1	

## 7. Typical Application Circuit

### 7.1 Single Slave Application Circuit

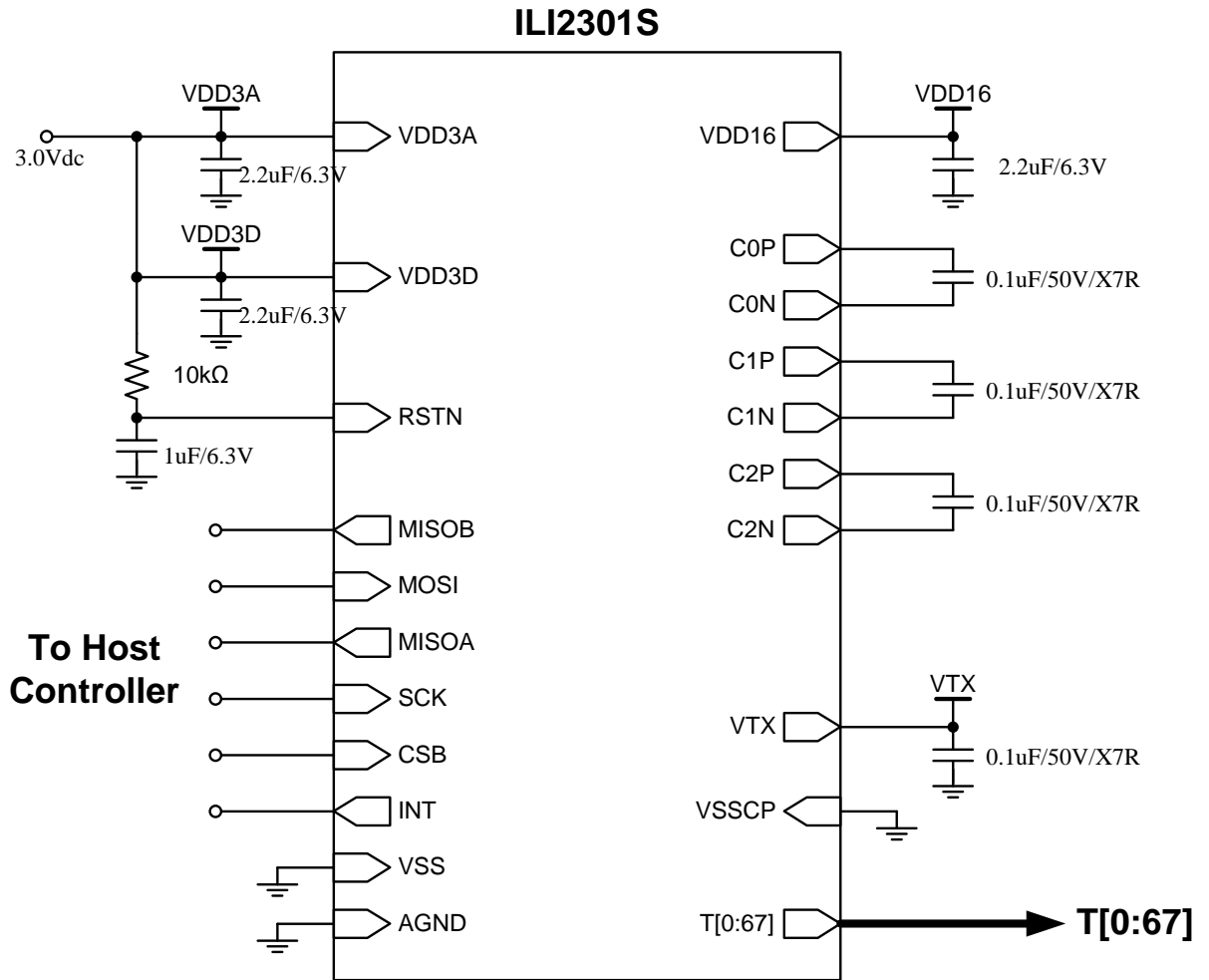


Figure 7-1: ILI2301S Single Slave Application Circuit

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