

LC898300XA

Recommended Operating Conditions at Ta = -30 to 85°C, VSS = 0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage range	VDD		2.7	3.0	3.3	V
Input voltage range	VIN1		0	-	VDD	V

*1: Input voltage without diode connection to VDD. (SDA, SCL)

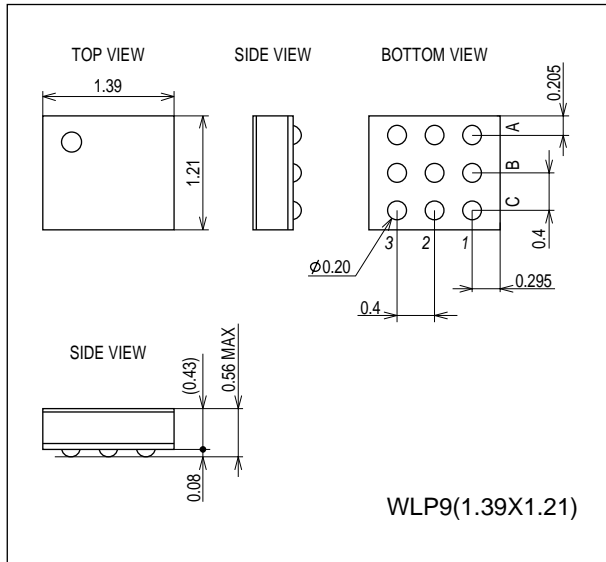
Electrical Characteristics

Parameter	Symbol	Conditions	Applied pin	Ratings			Unit
				min	typ	max	
DC characteristics at V _{SS} = 0V, V _{DD} = 2.7 to 3.3V, Ta = -30 to 85°C							
High level input voltage	V _{IH1}	CMOS	TEST	0.7V _{DD}	-	-	V
Low level input voltage	V _{IL1}			-	-	0.2V _{DD}	V
High level input voltage	V _{IH2}	CMOS	EN	1.5	-	-	V
Low level input voltage	V _{IL2}			-	-	0.36	V
High level input voltage	V _{IH3}	CMOS Schmitt	RSTB, SDA , SCL	1.5	-	-	V
Low level input voltage	V _{IL3}			-	-	0.36	V
Low level output voltage	V _{OL}	I _{OL} = 4mA	SDA	-	-	0.4	V
Input leakage current	I _{IL}	V _I = V _{DD} , V _{SS}	RSTB, EN , SDA, SCL	-10	-	+10	μA
Analog characteristics at V _{SS} = 0V, V _{DD} = 3V, Ta = 25°C							
H-bridge ON resistance Pch	R _{ONP}	I _F = 100mA		-	2.5	-	Ω
H-bridge ON resistance Nch	R _{ONN}	I _S = 100mA		-	1.5	-	Ω
Adjustable resonance frequency range	F _{mo}	vs typ value		-10	-	+10	%

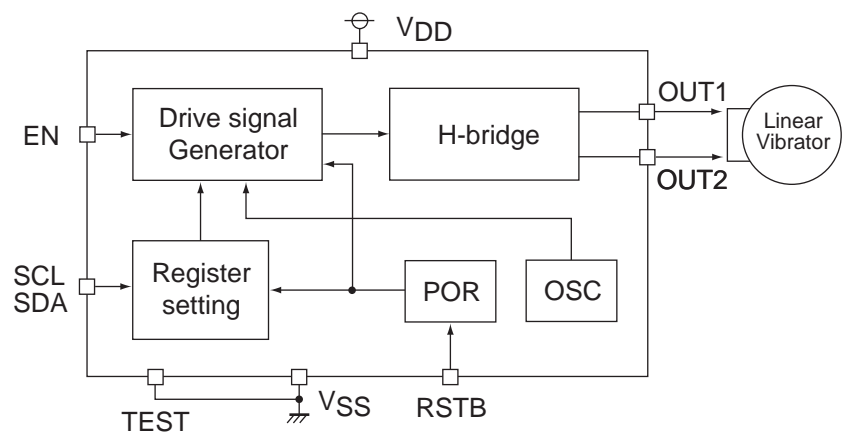
Package Dimensions

unit : mm (typ)

3429



Block Diagram



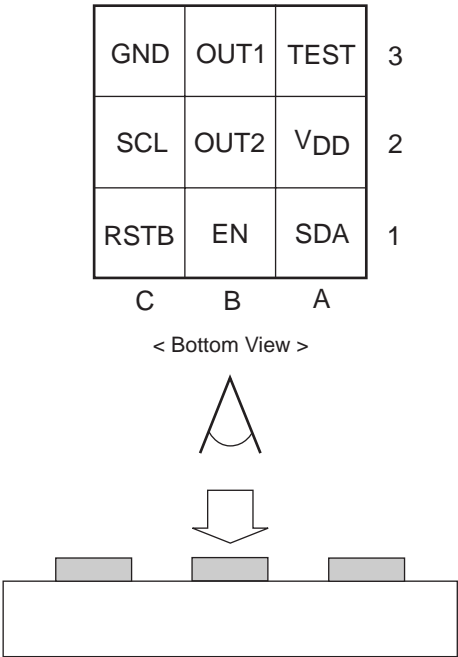
Pin Assignment

Pin list

I/O (I: input, O: output, B: bi-direction, P: power supply, NC: not connected)

No	Name	I/O	No	Name	I/O	No	Name	I/O
1A	SDA	B	1B	EN	I	1C	RSTB	I
2A	V _{DD}	P	2B	OUT2	O	2C	SCL	I
3A	TEST	I	3B	OUT1	O	3C	GND	P

Pin layout



Pin description

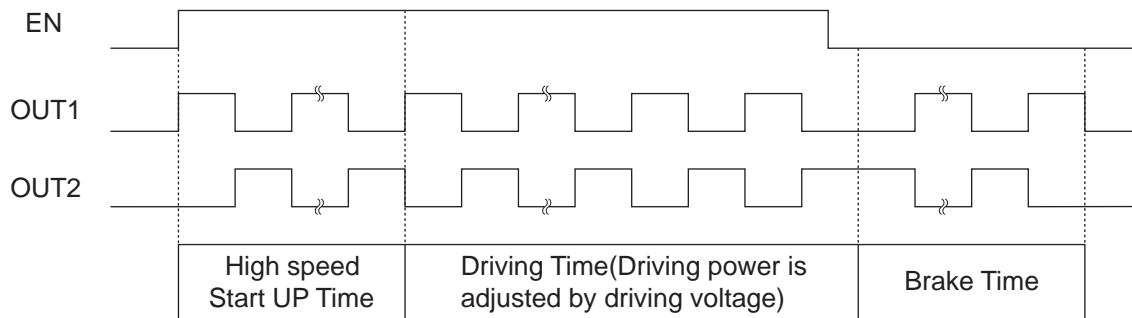
I/O (I: input, O: output, B: bi-direction, P: power supply, NC: not connected)

Signal name	I/O	Function	Remarks
OUT1	O	Motor drive pin	H-bridge output
OUT2	O	Motor drive pin	H-bridge output
RSTB	I	Reset and standby control	L: enable, H: disable
EN	I	Motor drive ON/OFF	L: disable, H: enable
SCL	I	I ² C I/F clock pin	
SDA	B	I ² C I/F data pin	Open drain
TEST	I	TEST pin	L: disable, H: enable (normally Low fix)
V _{DD}	P	Power supply pin	
V _{SS}	P	GND pin	

Timing chart

Motor drive timing

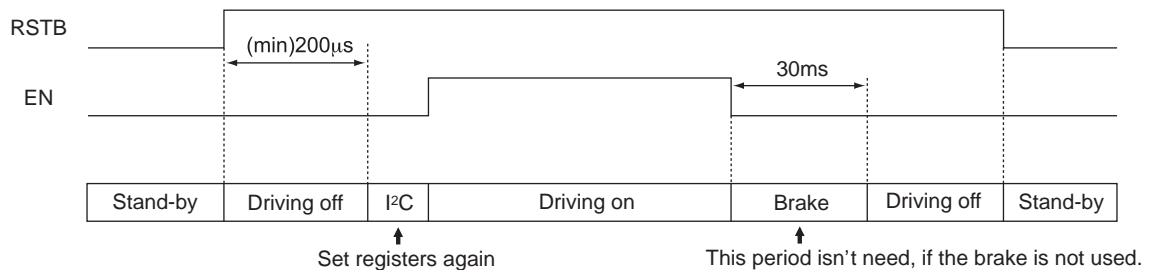
The Motor is driven by EN pin, and the driving time is controlled by keeping EN pin "H". The High speed start UP time, driving power and Brake time can be modified by I²C setting. The initial driving frequency must be set by I²C I/F at the center of resonance frequency of the linear vibrators, when the initial driving frequency is inadequate. The minimum width of EN signal must be larger than the cycle of initial driving frequency setting.



Stand-by Control

The Stand-by mode is controlled by RSTB pin. (RSTB="L" → Stand-by mode is ON.)

When the stand-by mode is "ON", the register value is set to initial value. So, the register must be set again after the stand-by mode is "OFF". And, the "EN" signal and I²C command must wait over 200us after "RSTB" pin is set to "H".

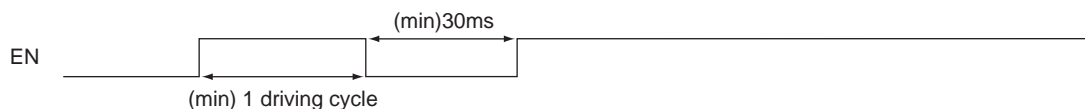


EN Control

The width of EN=High should be set at least 1 driving cycle.

ex) 0x02 RESOFRQ=0x0A (175Hz) → (min) 5.71ms

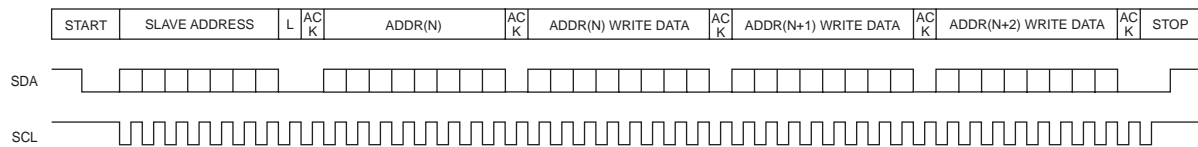
The width of EN=Low should be kept over 30ms, if the pre-driving period is over 30ms. On the other hand, If the pre-driving period is less than 30ms, the minimum width of EN=Low is same as the pre-driving width.



I²C Serial Interface

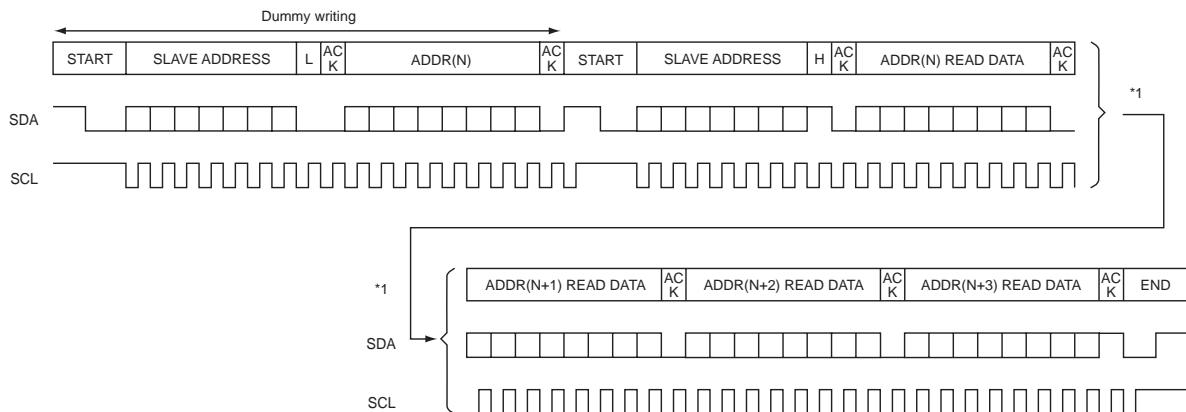
Writing format (Sequential Writing is possible)

After the start condition, slave address (7bit) and “L”(Write mode) are received, the flag “ACK=L” is replied. Next, after the 8bit address is received, the flag “ACK=L” is replied. Next, after the 8bit write data is received, the flag “ACK=L” is replied. Next, when the stop condition is received, the write data can be written in the specified address. Moreover, it is possible to write data in the incremental address by the continuous input of the 8bit data confirming the flag “ACK=L” after the every 8bit write data input.



Reading format (Sequential Reading is possible)

After the dummy writing, the start condition, slave address (7bit) and “H”(Read mode) are received, the flag “ACK=L” is replied. Next, the 8bit read data is output. After them, when the stop condition is not received, and the read condition is continued, the read data of incremental address is output one by one. The read condition is end when the end condition is received after the flag “ACK=H”.



Slave Address

The Slave Address is as follows.

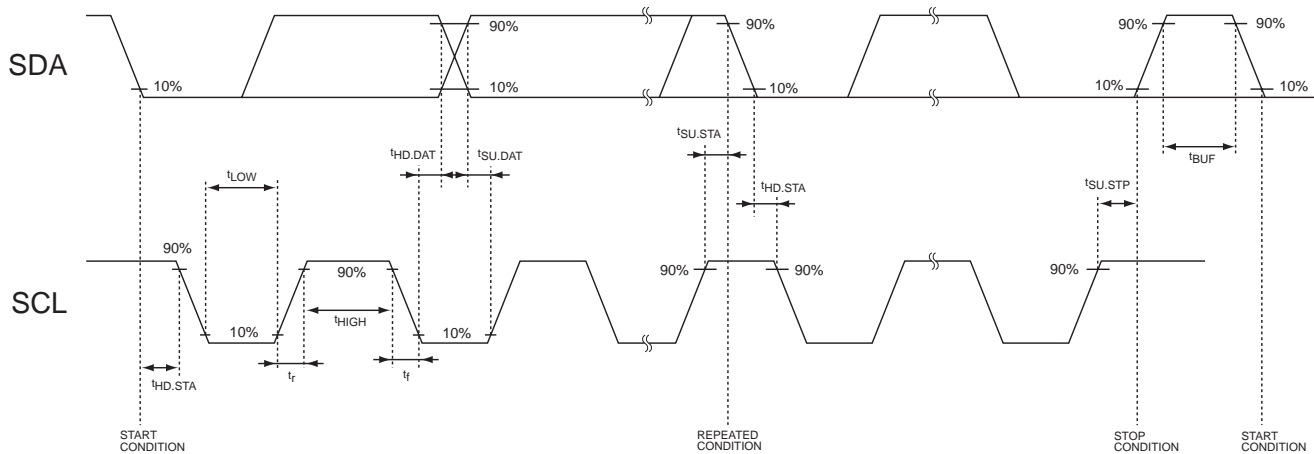
Slave Address	1001001
---------------	---------

LC898300XA

AC Characteristics (I²C Serial Interface) at V_{SS} = 0V, V_{DD} = 2.7 to 3.3V, Ta = -30 to 85°C

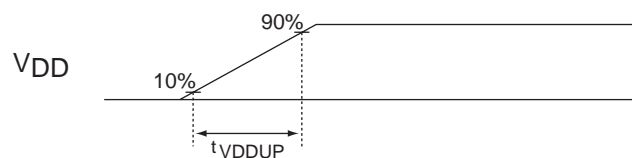
Parameter	Symbol	Pin	Min	Typ	Max	Unit	comment
SCL clock frequency	f _{SCL}	SCL	-	-	400	kHz	
START condition Hold time	t _{HD,STA}	SCL SDA	0.6	-	-	us	
SCL clock Low width	t _{LOW}	SCL	1.3	-	-	us	
SCL clock High width	t _{HIGH}	SCL	0.6	-	-	us	
RE-START condition Setup time	t _{SU,STA}	SCL SDA	0.6	-	-	us	
SDA Hold time	t _{HD,DAT}	SCL SDA	0	-	0.9	us	
SDA Setup time	t _{SU,DAT}	SCL SDA	0.2	-	-	us	*1
SDA, SCL Rise time	t _r	SCL SDA		-	0.3	us	*1
SDA, SCL Fall time	t _f	SCL SDA		-	0.3	us	*1
STOP condition Setup time	t _{SU,STP}	SCL SDA	0.6	-	-	us	
STOP to START BUS open time	t _{BUF}	SCL SDA	1.3	-	-	us	

*1) Design Assurance (Shipment test none)



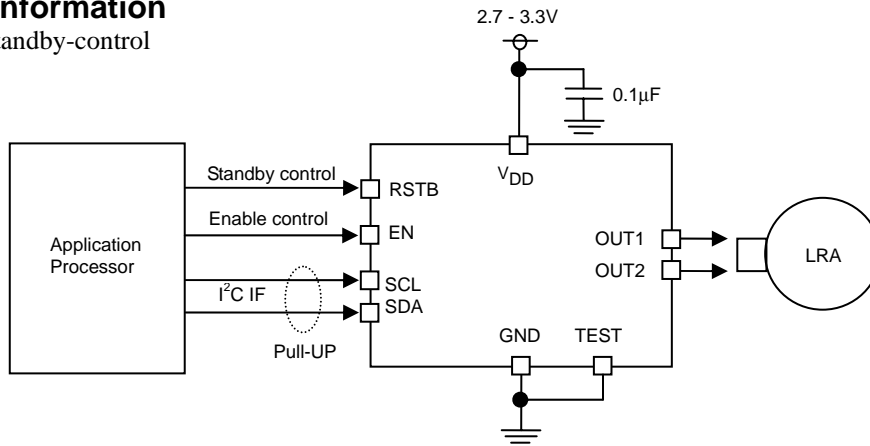
AC Characteristic (Power On Reset) at V_{SS} = 0V, V_{DD} = 2.7 to 3.3V, Ta = -30 to 85°C

Parameter	Symbol	Min	Typ	Max	Unit	comment
V _{DD} Rise Up Time	t _{VDDUP}	-	-	100	ms	-



Application information

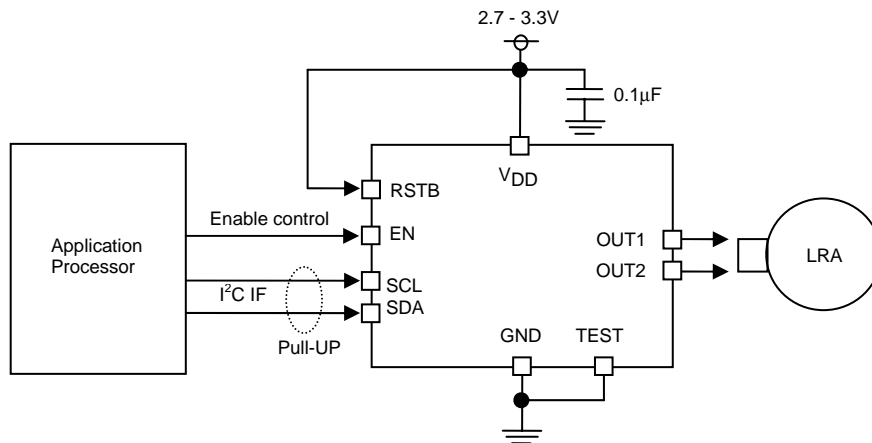
1) Case-1: With standby-control



Note) When SDA&SCL signal voltages are different from V_{DD} , even if the RSTB pin is set to Low, the IO leak current flows.
ex) In case of $V_{DD}=3.0V$ & $SDA=SCL=1.8V$, the current consumption is about $100\mu A$ (typ).

2) Case-2: Without standby-control

Note) In case of $V_{DD}=3.0V$, the current consumption is about $1.5mA$ (typ).



ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.