



**ON Semiconductor®**

<http://onsemi.com>

# LC898212XA

CMOS LSI

## AF Control LSI

### Overview

The AF control device, LC898212XA (LC898212XA-MH), provides an ideal way to implement the reduced power consumption and the improved autofocus precision and speed (reduced convergence time) required in high-pixel-count camera modules for use in smartphones.

The LC898212XA integrates on a single chip an equalizer circuit employing digital calculation, and it can be combined with position sensors to build a closed-loop actuator control system. Since closed-loop control provides better ability to maintain the control object than conventional open-loop systems and is not affected by position differences, the LC898212XA is ideal for use in AF systems used in a wide variety of cameras. A closed-loop system uses position sensors for position control, and power consumption is lower than with conventional open-loop control, which uses current values for position control.

In addition, a new PWM drive system employed suppresses noise that could affect image quality while achieving reduced power consumption, making this IC ideal for use in mobile devices such as smartphones. The filter coefficients of the equalizer circuit can be adjusted to any values desired by making register settings via I<sup>2</sup>C communication. This makes it possible to build a control circuit optimized to the various types of actuators and thereby achieve faster autofocus (reduced convergence time) performance.

The integrated ADC provides up to 10-bit precision for highly accurate AF position control. Also integrated on-chip are a constant current supply DAC for drive and an op-amp with adjustable gain for use with the position sensors indispensable for building a closed-loop control system.

\* I<sup>2</sup>C Bus is a trademark of Philips Corporation.

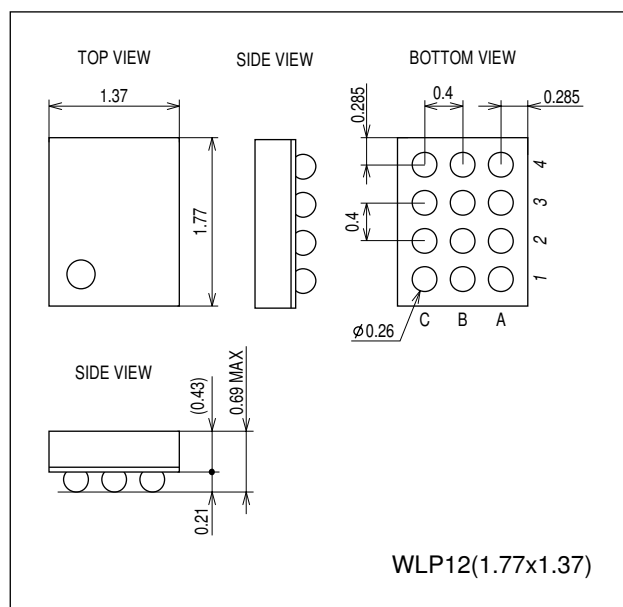
## Features

- Built-in equalizer circuit using digital operation  
AF control equalize circuit  
Any coefficient can be specified by I<sup>2</sup>C I/F
- I<sup>2</sup>C Interface
- Built-in A/D converter  
Maximum 10-bit  
Input 2 channel
- Built-in D/A converter  
8-bit  
Output 2-channel (Hall offset, Constant current Bias)
- Built-in OP Amp  
1 channel  
Hall Amp
- Built-in OSC  
48MHz (Frequency adjustment function)
- Built-in PWM pulse generator circuit  
PWM circuit for AF control
- 1-chip motor driver  
Saturation drive H bridge 1 channel
- Package  
WL-CSP 12-pin  
Lead-free, halogen-free
- Supply voltage  
Logic unit: Internal core typ 1.2V (1.08V to 1.32V), AV<sub>DD</sub> (2.6V to 3.6V)  
Driver unit: VM (2.6V to 3.6V)

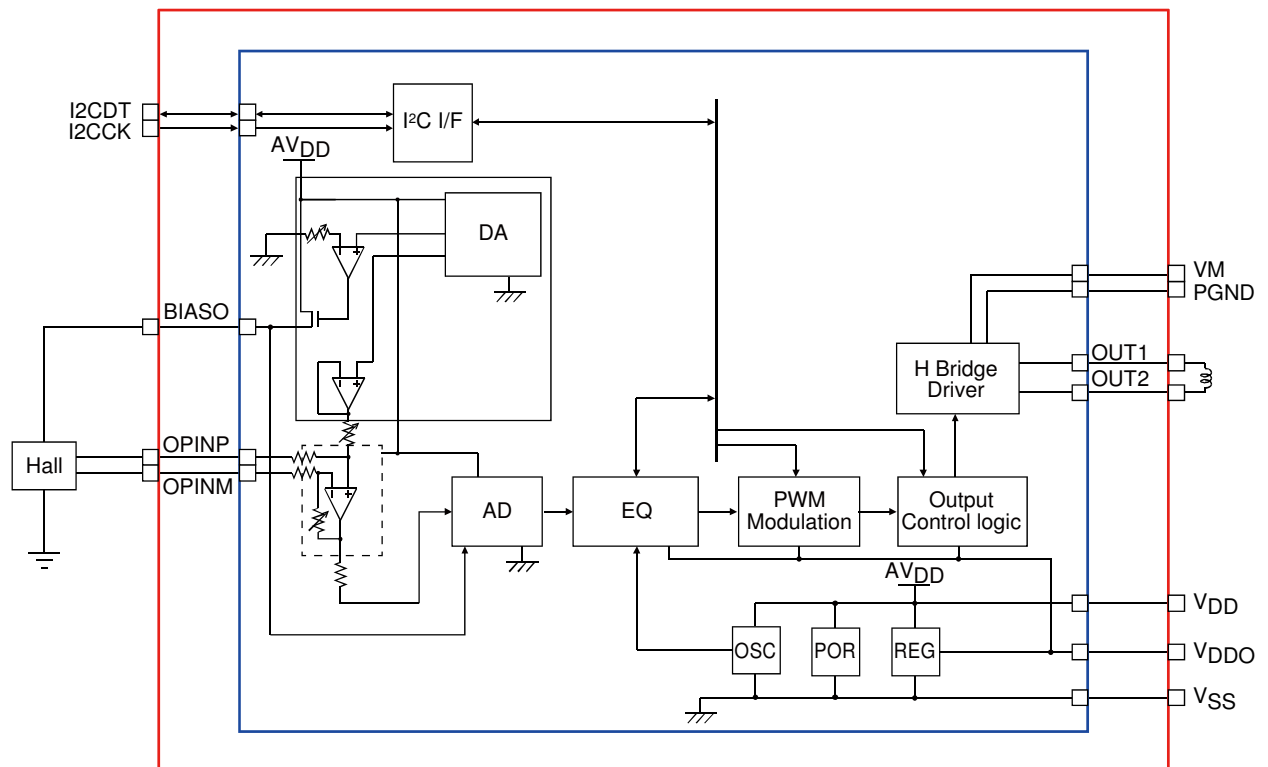
## Package Dimensions

unit : mm (typ)

3440



# Block Diagram



# LC898212XA

## Pin Description

TYPE					
I	INPUT	P	Power supply, GND	NC	NOT CONNECT
O	OUTPUT				
B	BIDIRECTION				

### I<sup>2</sup>C interface

I2CCK	B	I <sup>2</sup> C Clock pin
I2CDT	B	I <sup>2</sup> C Data pin

### D/A interface

BIASO	O	D/A output (Hall bias input)
-------	---	------------------------------

### Op-Amp interface

OPINP	I	Op-Amp input
OPINM	I	Op-Amp input

### Driver interface

OUT1	O	Actuator output pin
OUT2	O	Actuator output pin

### Power supply pin

V <sub>DD</sub>	P	Digital power supply
V <sub>SS</sub>	P	Digital GND
V <sub>DDO</sub>	P	LDO power supply out
VM	P	Motor power supply
PGND	P	Power GND

PIN TYPE “O” – Ensure that it is set to OPEN.

PIN TYPE “I” – OPEN is inhibited. Ensure that it is connected to the V<sub>DD</sub> or V<sub>SS</sub> even when it is unused.  
(Please contact Our company for more information about selection of V<sub>DD</sub> or V<sub>SS</sub>.)

PIN TYPE “B” – If you are unsure about processing method on the pin description of pin layout table, please contact us.

Note that incorrect processing of unused pins may result in defects.

If you have any question, please feel free to contact us.

## Pin Layout

Circuit Name	Number of Pins	Circuit Name	Number of Pins
Analog	4	Driver	4
Logic	4		

Backside pin layout diagram (Top View from the mold side)

4	V <sub>DDO</sub>	VM	PGND
3	AV <sub>DD</sub>	I2CDT	OUT1
2	OPINP	I2CCK	OUT2
1	V <sub>SS</sub>	OPINM	BIASO
	A	B	C

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](http://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.