

# AF Control LSI

## LC898249XH

### Overview

This LSI is Closed-Auto Focus control LSI equipped with hall sensor. It consists of 1 system of feedback circuit and constant current driver. It has also a built-in EEPROM and temperature sensor.

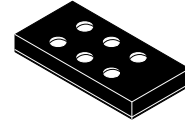
### Features

- Built-in Equalizer Circuit Using Digital Operation
  - ◆ AF Control Equalizer Circuit
  - ◆ Any Coefficient can be Specified by 2-wire Serial I/F (TWIF)
- 2-wire Serial Interface  
(The Communication Protocol is Compatible with I<sup>2</sup>C)
  - ◆ 4 Selectable Slave Addresses
    - 50h(W)/51h(R), 53h(R)
    - 74h(W)/75h(R), 77h(R)
    - E8h(W)/E9h(R), EBh(R)
    - E4h(W)/E5h(R), E7h(R) factory-configuredRight Side Addresses are Used at the Access of Built-in EEPROM
- Built-in A/D Converter
- Built-in D/A Converter
  - ◆ Hall Offset
  - ◆ Constant Current Bias
- Built-in Hall Sensor
  - ◆ Si Hall Sensor
- Built-in EEPROM
  - ◆ 64 Byte (16 Byte / Page)
- Built-in OSC
- Built-in Constant Current Driver
  - ◆ 150 mA
- Package
  - ◆ WLCSP 6-pin (2 x 3 Pin), Thickness Max 0.29 mm, with Backside Coat
- Supply Voltage
  - ◆ VDD (2.6 V to 3.3 V)
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant



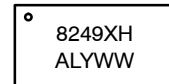
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**WLCSP6, 0.86x1.75x0.265  
CASE 567XD**

### MARKING DIAGRAM



8249XH = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

| Device        | Package | Shipping†          |
|---------------|---------|--------------------|
| LC898249XHTBG | WLCSP6  | 4000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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## PIN DESCRIPTION

**Table 1. PIN DESCRIPTION**

| Pin Name | Description       |
|----------|-------------------|
| I        | Input             |
| P        | Power Supply, GND |
| NC       | Not Connect       |
| O        | Output            |
| B        | Bidirection       |

- 2-wire serial interface
  - SCL I 2-wire serial interface clock pin
  - SDA B 2-wire serial interface data pin
- Driver interface
  - OUT1 O Driver output (to Actuator)
  - OUT2 O Driver output (to Actuator)
- Power supply pin
  - VDD P Power Supply
  - VSS P GND

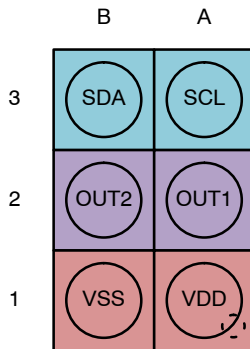
*\*Process when pins are not used*

PIN TYPE “O” – Ensure that it is set to OPEN.  
 PIN TYPE “I” – OPEN is inhibited. Ensure that it is connected to the VDD or VSS even when it is unused.  
 (Please contact ON Semiconductor for more information about selection of VDD or VSS.)  
 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.

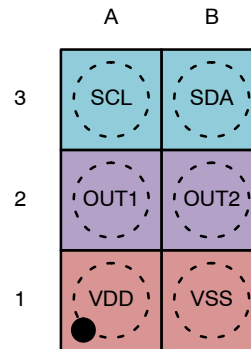
## PIN LAYOUT

**Table 2. PIN LAYOUT**

| Circuit Name | Number of PINs |
|--------------|----------------|
| Driver       | 2              |
| Power        | 2              |
| Logic        | 2              |



BOTTOM VIEW

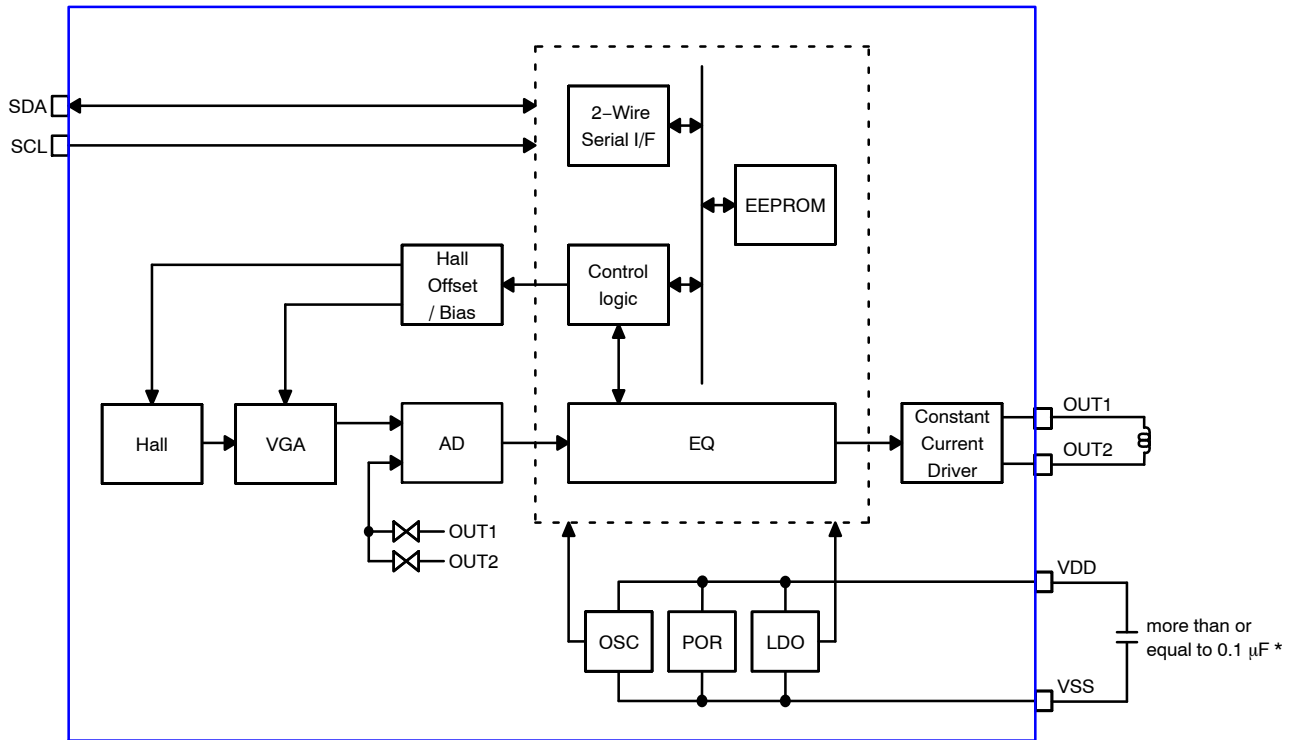


TOP VIEW

**Figure 1. Pin Layout**

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## BLOCK DIAGRAM



\*Consider capacitance of capacitor between VDD and VSS. According to power source environment, attach an additional capacitor in camera module.

Figure 2. Block Diagram

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## HALL ELEMENT POSITION

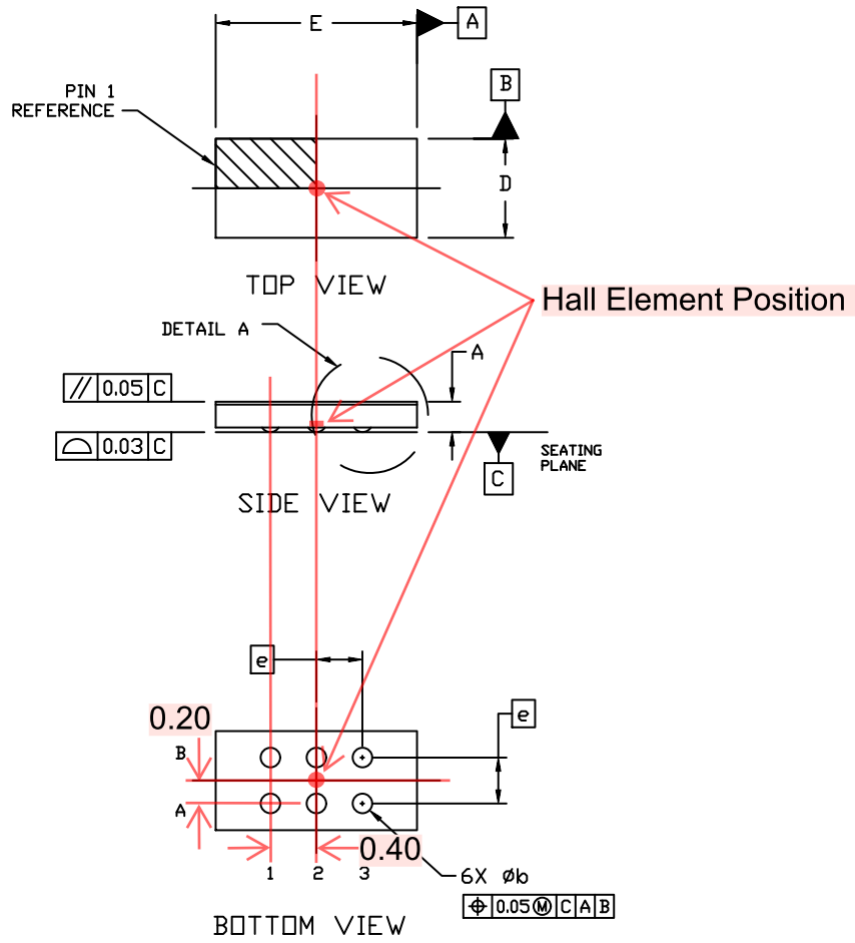


Figure 3. Hall Element Position

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## ELECTRICAL CHARACTERISTICS

**Table 3. ABSOLUTE MAXIMUM RATINGS** (VSS = 0 V)

| Symbol                             | Item                          | Condition | Rating                       | Unit |
|------------------------------------|-------------------------------|-----------|------------------------------|------|
| V <sub>DD33</sub> max              | Supply voltage                | Ta ≤ 25°C | -0.3~4.6                     | V    |
| V <sub>I33</sub> ,V <sub>O33</sub> | Input/output voltage          | Ta ≤ 25°C | -0.3~V <sub>DD33</sub> + 0.3 | V    |
| Tstg                               | Storage ambient temperature   |           | -55~125                      | °C   |
| Topr                               | Operating ambient temperature |           | -30~70                       | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Table 4. ACCEPTABLE OPERATION RANGE** (Ta = -30~70°C, VSS = 0 V, 3 V power supply (VDD))

| Symbol            | Item                | Min | Typ | Max               | Unit |
|-------------------|---------------------|-----|-----|-------------------|------|
| V <sub>DD33</sub> | Supply voltage      | 2.6 | 2.8 | 3.3               | V    |
| V <sub>IN</sub>   | Input voltage range | 0   | -   | V <sub>DD33</sub> | V    |

**Table 5. DC CHARACTERISTICS** (Input / output level at VSS = 0 V, VDD = 2.6 V~3.3V, Ta = -30~70°C)

| Symbol          | Item                     | Condition              | Min | Typ | Max | Unit | Applicable Pins |
|-----------------|--------------------------|------------------------|-----|-----|-----|------|-----------------|
| V <sub>IH</sub> | High-level input voltage | CMOS compliant schmitt | 1.4 | -   | -   | V    | SCL, SDA        |
| V <sub>IL</sub> | Low-level input voltage  |                        | -   | -   | 0.4 | V    |                 |
| V <sub>OL</sub> | Low-level output voltage | IOL = 2 mA             | -   | -   | 0.2 | V    | SDA             |

**Table 6. DRIVER OUTPUT (OUT1, OUT2)** (VSS = 0 V, VDD = 2.8 V, Ta = 25°C)

| Symbol            | Item            | Condition | Min   | Typ | Max   | Unit | Applicable Pins |
|-------------------|-----------------|-----------|-------|-----|-------|------|-----------------|
| I <sub>full</sub> | Maximum current |           | 142.5 | 150 | 157.5 | mA   | OUT1, OUT2      |

**Table 7. NON-VOLATILE MEMORY CHARACTERISTICS**

| Symbol          | Item           | Condition | Min | Typ | Max  | Unit   | Applicable Circuit |
|-----------------|----------------|-----------|-----|-----|------|--------|--------------------|
| EN              | Endurance      |           | -   | -   | 1000 | Cycles | EEPROM             |
| RT              | Data retention |           | 10  | -   | -    | Years  |                    |
| t <sub>WT</sub> | Write time     |           | -   | -   | 20   | ms     |                    |

AC CHARACTERISTICS

VDD Supply Timing

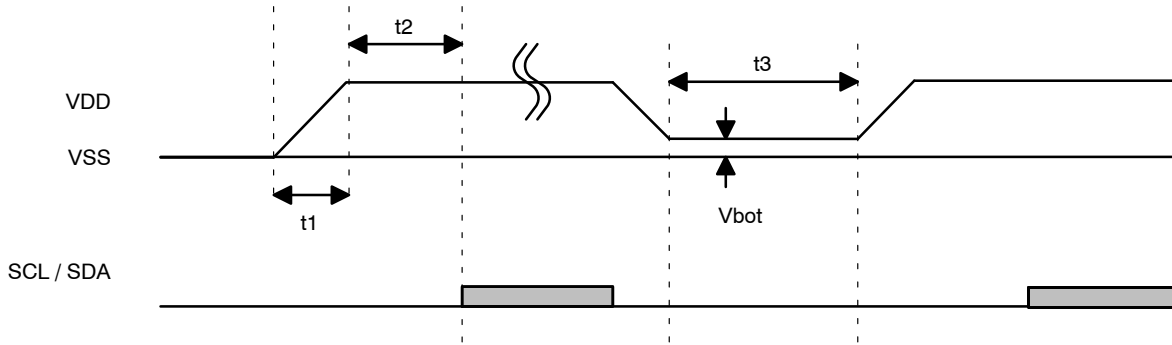


Figure 4. VDD Supply Timing

It is available to use 2-wire serial interface 5ms later for Power On Reset of VDD.

Table 8. VDD SUPPLY TIMING

| Symbol | Item   | Min | Typ | Max | Unit |
|--------|--|-----|-----|-----|------|
| t1     | VDD turn on time                               | -   | -   | 3   | ms   |
| t2     | 2-wire serial interface start time from VDD on | 5   | -   | -   | ms   |
| t3     | VDD off time                                   | 100 | -   | -   | ms   |
| Vbot   | Bottom Voltage                                 | -   | -   | 0.1 | V    |

AC Specification

Figure 5 shows interface timing definition and Table 9 shows electric characteristics.

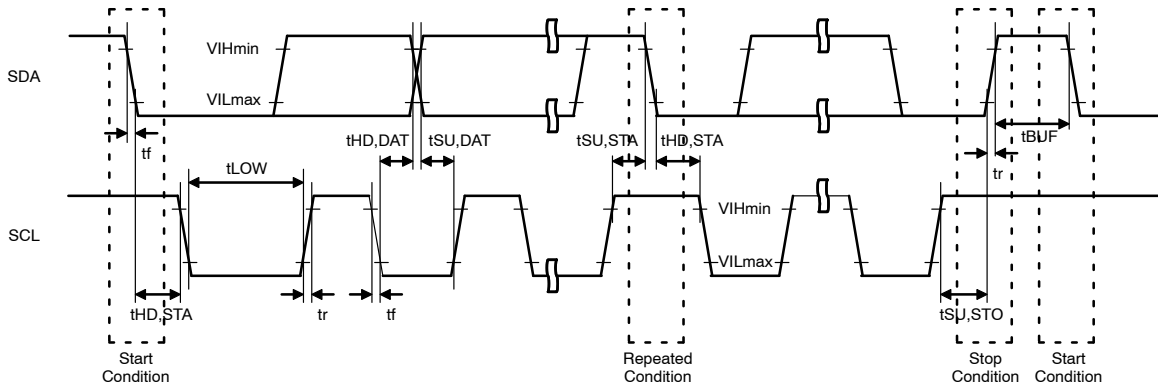


Figure 5. 2-wire Serial Interface Timing Definition

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**Table 9. ELECTRICAL CHARACTERISTICS FOR 2-WIRE SERIAL INTERFACE (AC CHARACTERISTICS)**

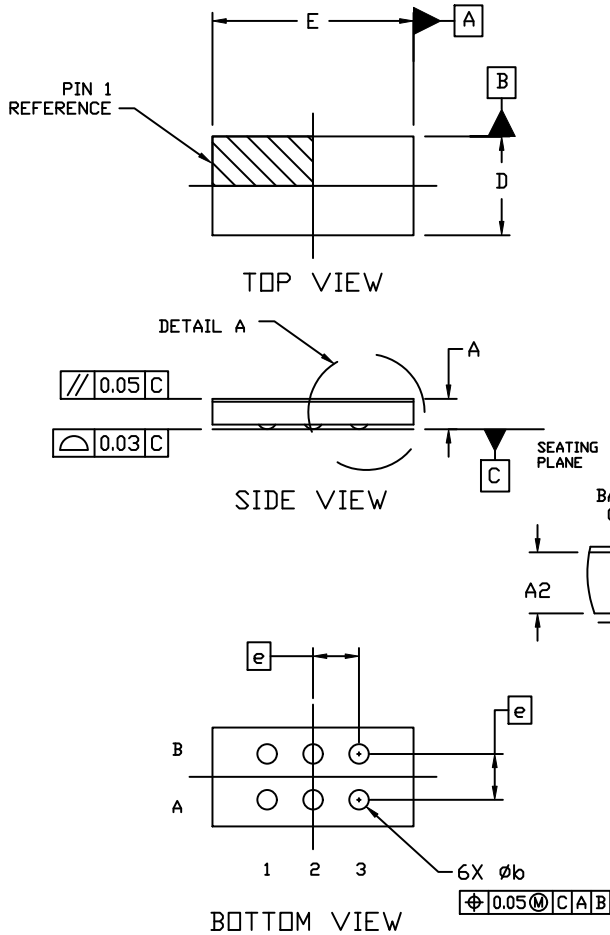
| Symbol              | Item                                      | Pin Name   | Fast-mode     |     |     | Fast-mode Plus |     |      | Unit |
|---------------------|---|------------|---------------|-----|-----|----------------|-----|------|------|
|                     |   |            | Min           | Typ | Max | Min            | Typ | Max  |      |
| F_SCL               | SCL clock frequency                       | SCL        | -             | -   | 400 | -              | -   | 1000 | kHz  |
| t <sub>HD,STA</sub> | START condition hold time                 | SCL<br>SDA | 0.6           | -   | -   | 0.26           | -   | -    | μs   |
| t <sub>LOW</sub>    | SCL clock Low period                      | SCL        | 1.3           | -   | -   | 0.5            | -   | -    | μs   |
| t <sub>HIGH</sub>   | SCL clock High period                     | SCL        | 0.6           | -   | -   | 0.26           | -   | -    | μs   |
| t <sub>SU,STA</sub> | Setup time for repetition START condition | SCL<br>SDA | 0.6           | -   | -   | 0.26           | -   | -    | μs   |
| t <sub>HD,DAT</sub> | Data hold time                            | SCL<br>SDA | 0<br>(Note 1) | -   | 0.9 | 0<br>(Note 1)  | -   | -    | μs   |
| t <sub>SU,DAT</sub> | Data setup time                           | SCL<br>SDA | 100           | -   | -   | 50             | -   | -    | ns   |
| t <sub>r</sub>      | SDA, SCL rising time                      | SCL<br>SDA | -             | -   | 300 | -              | -   | 120  | ns   |
| t <sub>f</sub>      | SDA, SCL falling time                     | SCL<br>SDA | -             | -   | 300 | -              | -   | 120  | ns   |
| t <sub>SU,STO</sub> | STOP condition setup time                 | SCL<br>SDA | 0.6           | -   | -   | 0.26           | -   | -    | μs   |
| t <sub>BUF</sub>    | Bus free time between STOP and START      | SCL<br>SDA | 1.3           | -   | -   | 0.5            | -   | -    | μs   |

1. This LSI is designed for a condition with typ. 20 ns of hold time. If SDA signal is unstable around falling point of SCL signal, please implement an appropriate treatment on board, such as inserting a resistor.



**WLCSP6, 0.86x1.75x0.265**  
**CASE 567XD**  
**ISSUE O**

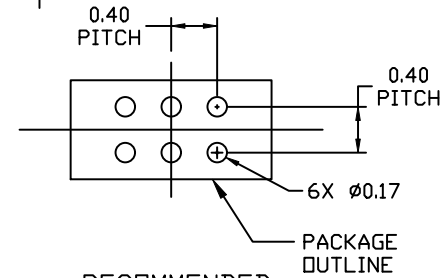
DATE 23 OCT 2018



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DATUM C, THE SEATING PLANE, IS DEFINED BY THE SPHERICAL CROWNS OF THE CONTACT BALLS.
4. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE CONTACT BALLS.
5. DIMENSION *b* IS MEASURED AT THE MAXIMUM CONTACT BALL DIAMETER PARALLEL TO DATUM C.

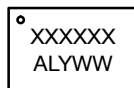
| DIM      | MILLIMETERS |       |      |
|----------|-------------|-------|------|
|          | MIN.        | NOM.  | MAX. |
| A        | 0.24        | 0.265 | 0.29 |
| A1       | 0.04 REF    |       |      |
| A2       | 0.20 REF    |       |      |
| A3       | 0.025 REF   |       |      |
| <i>b</i> | 0.12        | 0.17  | 0.22 |
| D        | 0.81        | 0.86  | 0.91 |
| E        | 1.70        | 1.75  | 1.80 |
| <i>e</i> | 0.40 BSC    |       |      |



**RECOMMENDED MOUNTING FOOTPRINT\***

\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

**GENERIC MARKING DIAGRAM\***



XXXX = Specific Device Code  
 A = Assembly Location  
 L = Wafer Lot  
 Y = Year  
 WW = Work Week

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                         |                                |  |
|-------------------------|--------------------------------|--|
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| <b>DESCRIPTION:</b>     | <b>WLCSP6, 0.86x1.75x0.265</b> | <b>PAGE 1 OF 1</b>   |

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