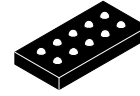


# Auto Focus (AF) Controller & Driver

## LC898217XH



WLCSP10, 1.04x2.04x0.265  
 CASE 567TH

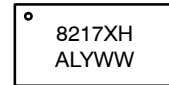
### Overview

LC898217XH is the AF control LSI. It consists of 1 system of feedback circuit for AF control. Built-in equalizer circuit using digital operation. Built-in A/D converter, D/A converter, Constant Current Driver. LC898217XH contains an internal EEPROM. It easily accomplishes Hall calibration and power-on sequence. Also LC898217XH has fast settling function for quickly moving focus lens. This is suitable for small & thinner camera module.

### 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)
- Built-in A/D Converter
  - ◆ Input 1 Channel
- Built-in D/A Converter
  - ◆ Output 2 Channel (Hall Offset, Constant Current Bias)
- Built-in VGA
  - ◆ Hall Amp
  - ◆ 1 Channel
- Built-in EEPROM
  - ◆ 128 Byte (16 Byte/Page)
- Built-in OSC
- Built-in Constant Current Driver
  - ◆ 110 mA
  - ◆ 1 Channel
- Package
  - ◆ WLCSP 10-pin
- Supply Voltage
  - ◆ V<sub>DD</sub> (2.6 V to 3.3 V)
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

### MARKING DIAGRAM



8217XH = Specific Device Code  
 A = Assembly Location  
 L = Wafer Lot  
 Y = Year  
 WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
LC898217XH-MH	WLCSP10	4000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

# LC898217XH

## 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
- Hall interface
  - BIASO O D/A output (to Hall element)
  - OPINP I VGA input (from Hall element)
  - OPINM I VGA input (from Hall element)
- Driver interface
  - OUT1 O Driver output (to Actuator)
  - OUT2 O Driver output (to Actuator)
- Power supply pin
  - V<sub>DD</sub> P Power Supply
  - V<sub>SS</sub> P GND
- Test pin
  - PORT B Analog test signal input/output  
Convergence detection monitor output  
VSYNC input

*\*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 V<sub>DD</sub> or V<sub>SS</sub> even when it is unused. (Please contact **onsemi** 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.

*\*In case of connecting PORT pin with HOST CPU*

When LC898217XH is power off and HOST CPU is power on, a HOST CPU pin connected with PORT pin have to be fixed “L” level.

# LC898217XH

## PIN LAYOUT

**Table 2. PIN LAYOUT**

Circuit Name	Number of PINs	Circuit Name	Number of PINs
Analog	4	Driver	2
Logic	2	Power	2

“PORT” pin has analog function and digital function.

	A	B
1	OUT2	OUT1
2	VSS	VDD
3	PORT	SCL
4	BIASO	SDA
5	OPINM	OPINP

BOTTOM VIEW

**Figure 1. Pin Layout**

# LC898217XH

## BLOCK DIAGRAM

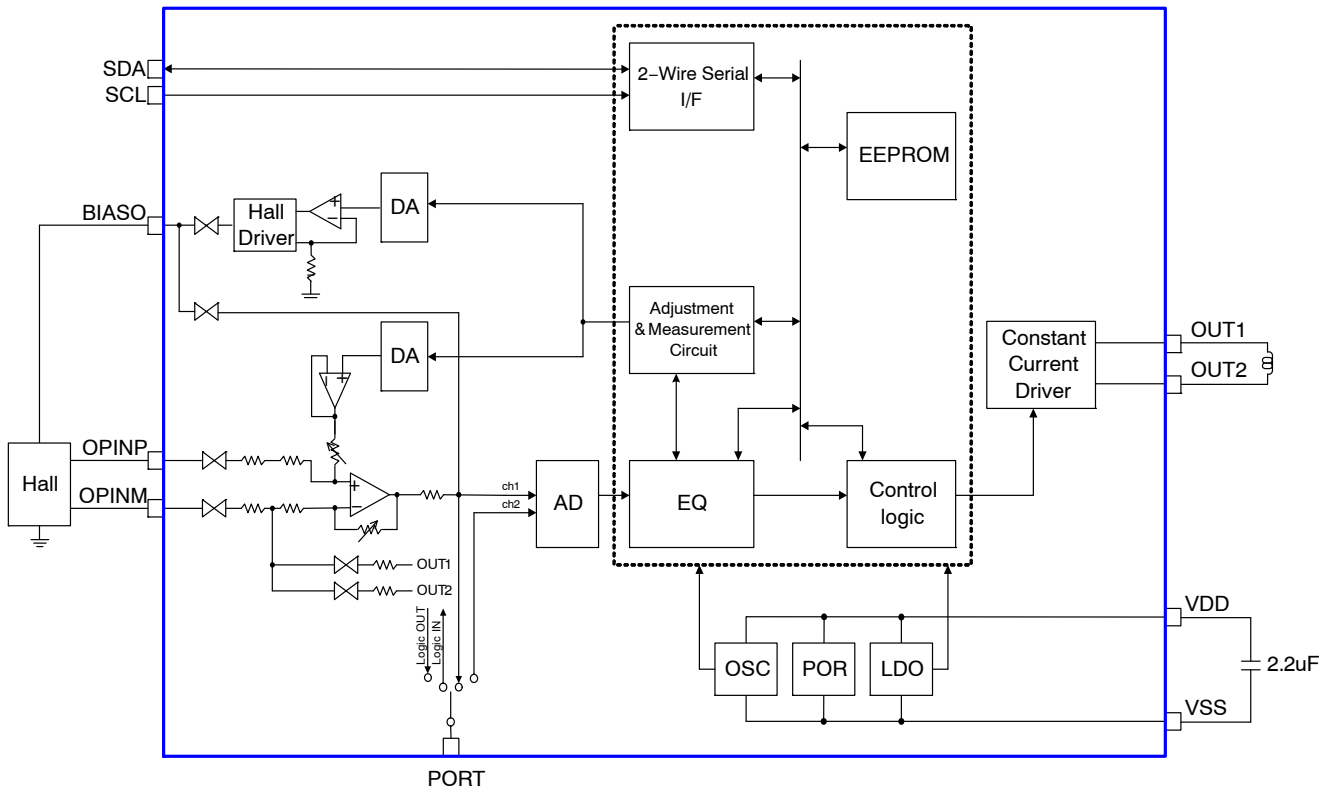


Figure 2. Block Diagram

# LC898217XH

## ELECTRICAL CHARACTERISTICS

**Table 3. ABSOLUTE MAXIMUM RATINGS** ( $V_{SS} = 0\text{ V}$ )

Symbol	Item	Condition	Rating	Unit
$V_{DD33\text{ max}}$	Supply voltage	$T_a \leq 25^\circ\text{C}$	-0.3 to 4.6	V
$V_{I33}, V_{O33}$	Input/output voltage	$T_a \leq 25^\circ\text{C}$	-0.3 to $V_{DD33} + 0.3$	V
Tstg	Storage ambient temperature		-55 to 125	$^\circ\text{C}$
Topr	Operating ambient temperature		-30 to 70	$^\circ\text{C}$

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. ALLOWABLE OPERATING RATINGS** ( $T_a = -30$  to  $70^\circ\text{C}$ ,  $V_{SS} = 0\text{ V}$ , 3 V power supply ( $V_{DD}$ ))

Symbol	Item	Min	Typ	Max	Unit
$V_{DD33}$	Supply voltage	2.6	2.8	3.3	V
$V_{IN}$	Input voltage range	0		$V_{DD33}$	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

**Table 5. DC CHARACTERISTICS** (Input / output level at  $V_{SS} = 0\text{ V}$ ,  $V_{DD} = 2.6$  to  $3.6\text{ V}$ ,  $T_a = -30$  to  $70^\circ\text{C}$ )

Symbol	Item	Condition	Min	Typ	Max	Unit	Applicable Pins
$V_{IH}$	High-level input voltage	CMOS compliant Schmitt	1.4			V	SCL, SDA, PORT
$V_{IL}$	Low-level input voltage				0.4	V	
$V_{OH}$	High-level output voltage	$I_{OH} = -2\text{ mA}$	$V_{DD}-0.4$			V	PORT
$V_{OL}$	Low-level output voltage	$I_{OL} = 2\text{ mA}$			0.4	V	SDA, PORT
Rdn	Pulldown resistor		50		220	$\text{k}\Omega$	PORT

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**Table 6. DRIVER OUTPUT (OUT1, OUT2)** ( $V_{SS} = 0\text{ V}$ ,  $V_{DD} = 2.8\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )

Symbol	Item	Condition	Min	Typ	Max	Unit	Applicable Pins
I <sub>full</sub>	Maximum current		105		115	mA	OUT1, OUT2
I <sub>leak</sub>	Output leak current			1		$\mu\text{A}$	

**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	

# LC898217XH

## AC CHARACTERISTICS

### V<sub>DD</sub> Supply Timing

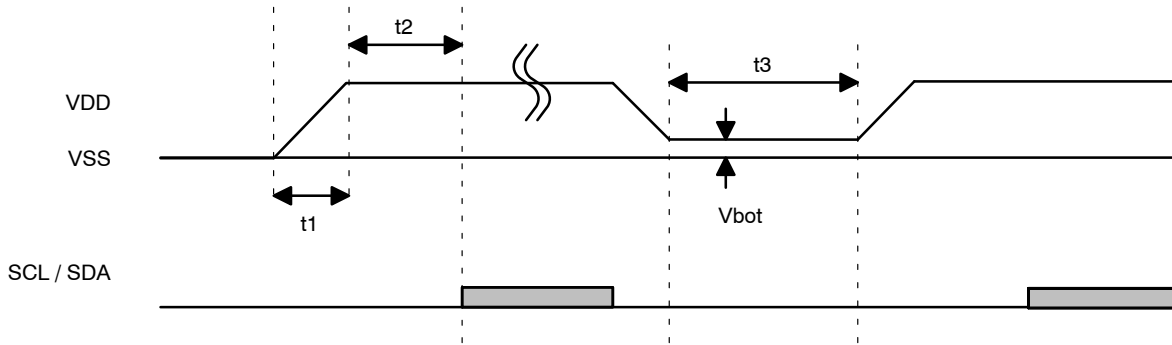


Figure 3. V<sub>DD</sub> Supply Timing

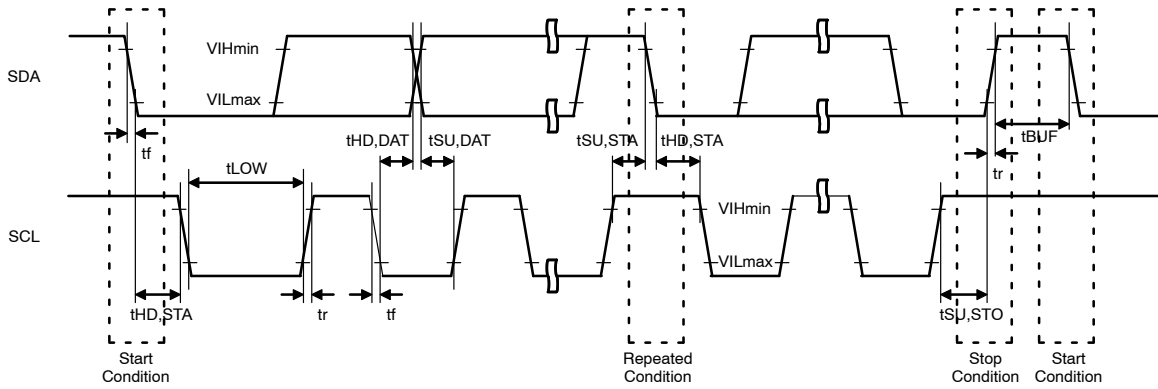
It is available to use 2-wire serial interface 5 ms later for Power On Reset of V<sub>DD</sub>.

Table 8. V<sub>DD</sub> SUPPLY TIMING

Symbol	Item	Min	Typ	Max	Unit
t <sub>1</sub>	V <sub>DD</sub> turn on time			3	ms
t <sub>2</sub>	2-wire serial interface start time from V <sub>DD</sub> on	5			ms
t <sub>3</sub>	V <sub>DD</sub> off time	100			ms
V <sub>bot</sub>	Bottom Voltage			0.1	V

**AC Specification**

Figure 4 shows interface timing definition and Table 9 shows electric characteristics.



**Figure 4. 2-wire Serial Interface Timing Definition**

**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 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 SDA	0.6			0.26			μs
t <sub>HD,DAT</sub>	Data hold time	SCL SDA	0 (Note 1)		0.9	0 (Note 1)			μs
t <sub>SU,DAT</sub>	Data setup time	SCL SDA	100			50			ns
t <sub>r</sub>	SDA, SCL rising time	SCL SDA			300			120	ns
t <sub>f</sub>	SDA, SCL falling time	SCL SDA			300			120	ns
t <sub>SU,STO</sub>	STOP condition setup time	SCL SDA	0.6			0.26			μs
t <sub>BUF</sub>	Bus free time between STOP and START	SCL SDA	1.3			0.5			μs

1. LC898217XH 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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

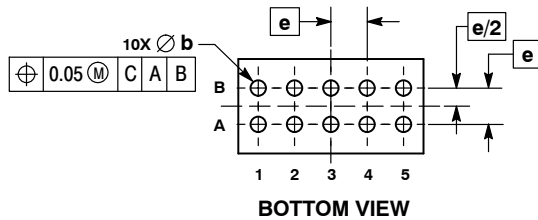
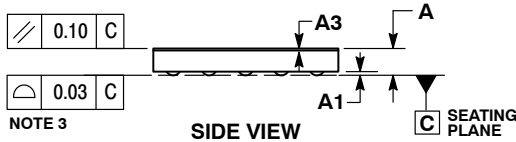
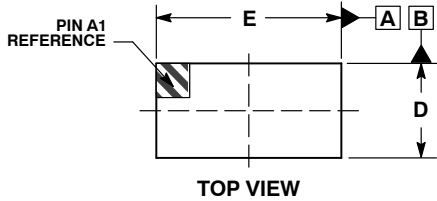
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SCALE 4:1

WLCSP10, 1.04x2.04x0.265  
CASE 567TH  
ISSUE O

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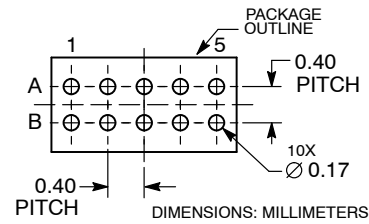


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.240	0.265	0.290
A1	0.040 REF		
A3	0.025 REF		
b	0.12	0.17	0.22
D	0.99	1.04	1.09
E	1.99	2.04	2.09
e	0.40 BSC		

**RECOMMENDED SOLDERING FOOTPRINT\***



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

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