LC898113

CMOS LSI

OIS Controller & Driver

ON Semiconductor®

http://onsemi.com

Overview

The LC898113-TBM-H and LC898113RA-WH (referred to collectively as the LC898113 in this data sheet) are devices integrating digital gyro interface, gyro filter, stepping motor control circuit, and motor driver functions needed to implement an image stabilization system using stepping motors. These functions make it possible to build a system using a minimal software program that enables the host microcontroller to turn image stabilization on and off, for example.

The gyro filter coefficients may be set to any values by the host microcontroller, making it possible to build filter circuits optimized for the system. The LC898113 integrates a signal determination circuit for pan/tilt processing and a filter circuit, enabling implementation of a variety of processing in response to camera movements.

The LC898113 integrates four saturation-drive H-bridge channels for stepping motor drive, and PWM drive with 1-2-phase control to 8W1-2-phase control is supported.

Also integrated are a photo sensor drive circuit for control object position detection (for example, a CMOS sensor), a position determination circuit, and a circuit for moving to the optical center based on the results from the preceding circuits. Thus, the host microcontroller can specify detection start and the LC898113 will automatically move the control object to the initial position.

Both SPI and I^2C are supported as serial interfaces for communication with the host microcontroller. This allows the customer to choose based on the specifications of the host microcontroller. The I^2C interface also supports a 1.8 V interface.

* I^2C Bus is a trademark of Philips Corporation.

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Features

- Serial interface
  SPI (mode0, mode3)
  I^2C (F/S mode)
    Selection with MODE0 pin

- Built in Gyro filter

- Digital Gyro Support
  Built in Digital Gyro I/F for each manufacturer

- Stepping motor drive mode
  1-2 phase
  W1-2 phase
  2W1-2 phase
  4W1-2 phase
  8W1-2 phase

- Stepping motor driver integrated in an MCP
  Saturation driven H bridge 4ch
  Built in thermal protection circuit
  Built in low voltage malfunction prevention circuit
  Built in transistor for photo sensor drive
  Two driver power supplies (VM : for motor, V_{CC} : for others)

- Operation Clock
  Clock generated from built in oscillation amplifier
  Clock input directly from CLKIN pin
    Selection with MODE1 pin
  Recommended drive frequency 24MHz, Permission drive frequency 15MHz to 36MHz

- Package
  FLGA49 (4mm × 4mm)
  Lead free
  Halogen free

- Power supply voltage (Typical voltage)
  Logic LSI : Pin 3.3V, Inside 1.8V (External supply required)
  Driver LSI : VM 5.0V, V_{CC} 3.3V

Electrical Characteristics

Difference between LC898113-TBM-H and LC898113RA-WH

 a*) : LC898113-TBM-H
 b*) : LC898113RA-WH

Absolute Maximum Ratings at at $V_{SS} = 0V$

Parameter	Symbol	Conditions	Ratings		unit
			a*)	b*)	
Power supply voltage	$V_{DD}18$ max	Ta ≤25°C	-0.3 to 3.6	-0.3 to 2.2	V
	$V_{DD}33$ max	Ta ≤25°C	-0.3 to 4.6		V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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D.C. Characteristics: Input/output level/$V_{SS} = 0V$, $V_{DD} = 2.7$ to 3.6V, Ta = -30 to 85°C

Parameter	Symbol	Conditions	min	typ	max	unit	Applicable pin	
							a*)	b*)
High-level input voltage	V_{IH}	CMOS schmidt	1.4			V	(1)	
Low-level input voltage	V_{IL}				0.36	V		
High-level input voltage	V_{IH}	CMOS schmidt	1.4			V	(2)	(1) (2) (3)
Low-level input voltage	V_{IL}				0.50	V		
High-level input voltage	V_{IH}	CMOS schmidt	1.5			V	(3)	
Low-level input voltage	V_{IL}				0.36	V		

*Applicable pin
(1)ZRESET
(2)CLKIN
(3)SCLK, MOSI

Package Dimensions
unit : mm (typ)
3441

FLGA49(4.0X4.0)
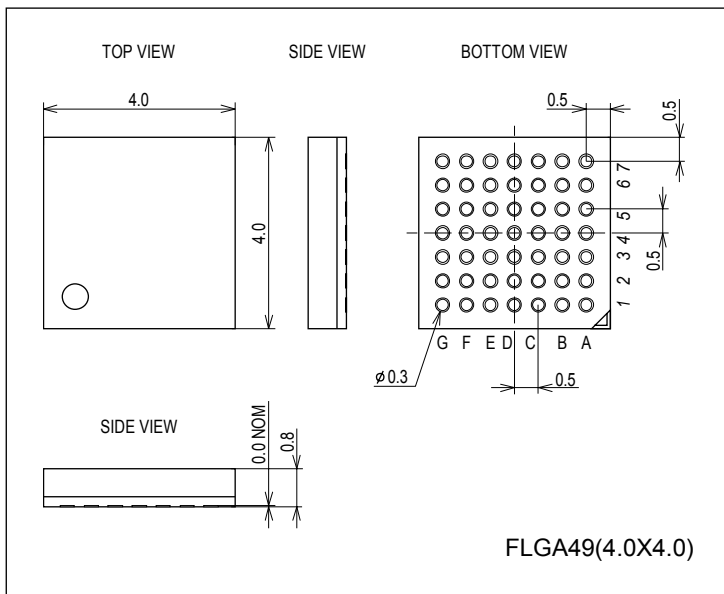
Block Diagram
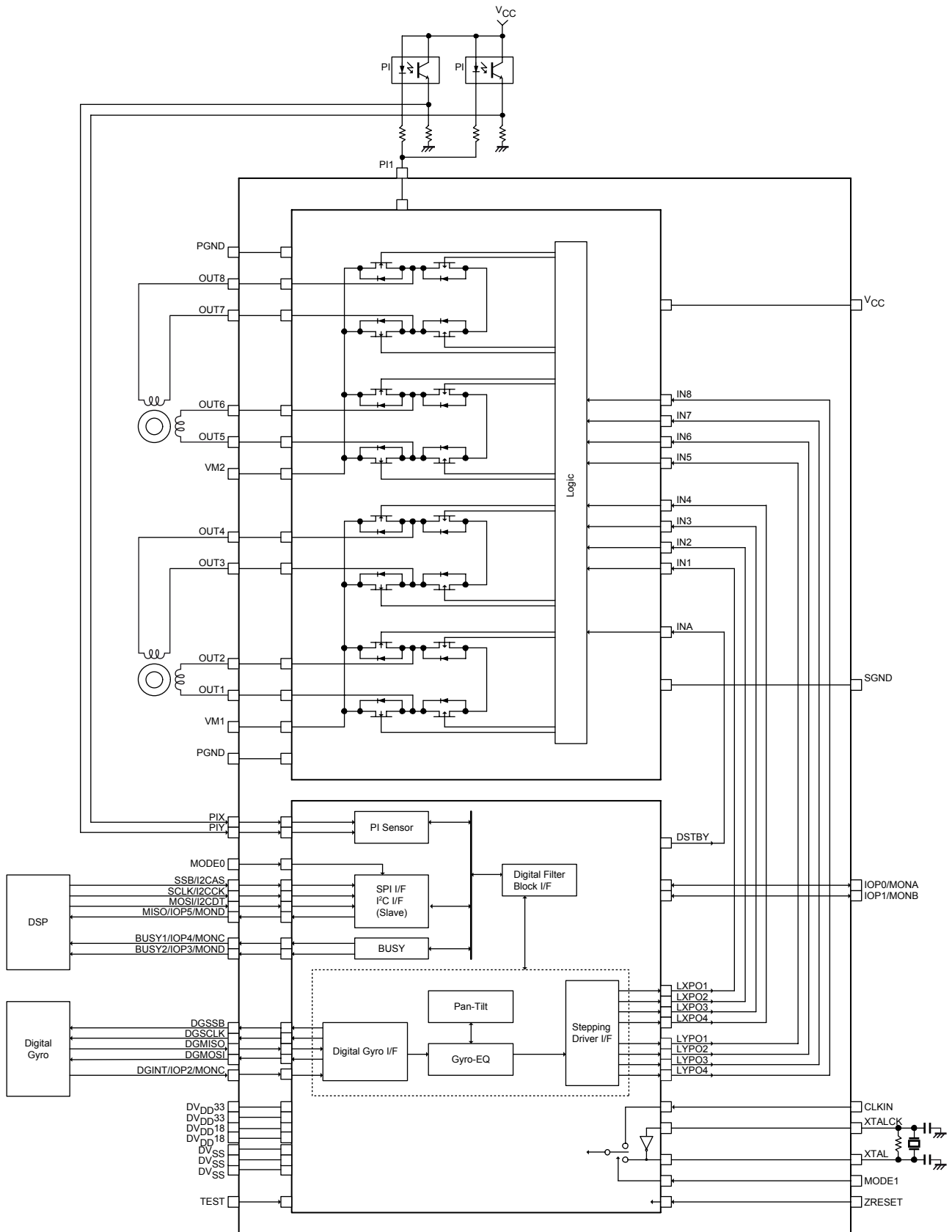
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Pin Description

TYPE					
I	INPUT	P	Power, GND	NC	NOT CONNECT
O	OUTPUT				
B (I)	BIDIRECTION : INPUT at reset				
B (O)	BIDIRECTION : OUTPUT at reset				

Logic LSI

SPI/I^2C interface (Slave)

SSB/I2CSA	I	SPI chip select/ I^2C slave address select (L: 0100100, H: 0100101, Please make sure to connect the pin to L level or H level.)
SCLK/I2CCK	B (I)	SPI clock/I^2C clock
MOSI/I2CDT	B (I)	SPI received data/I^2C data
MISO/IOP5/MOND	B (O)	SPI transmit data/Monitor pin

Sensor output signal input for reference point detection

PIX	B(I)	
PIY	B(I)	

Digital gyro interface

DGSSB	O	Digital gyro I/F chip select
DGSCLK	O	Digital gyro I/F transfer clock
DGMOSI	O	Digital gyro I/F transmit data
DGMISO	I	Digital gyro I/F received data
DGINT/IOP2/MONC	B (I)	Digital gyro I/F timing signal/General-purpose port/Monitor pin

PIO interface

IOP0/MONA	B (I)	General-purpose port/Monitor pin
IOP1/MONB	B (I)	General-purpose port/Monitor pin

BUSY flag

BUSY1/IOP4/MONC	B (O)	BUSY pin (RAM access BUSY signal when SPI I/F is selected)
BUSY2/IOP3/MOND	B (O)	BUSY pin (Stepping motor force movement busy, measurement busy etc.)

Clock, Reset pin

XTALCK	I	Oscillation amplifier input (recommended drive frequency : 24MHz, permission drive frequency : 15MHz to 36MHz)
XTAL	O	Oscillation amplifier output
CLKIN	I	Clock input (Refer to XTALCK description about both recommended and permission drive frequency)
ZRESET	I	Power-on reset

Mode select pin

MODE0	I	Interface select : L→SPI, H→I^2C
MODE1	I	Clock select : L→XTALCK/XTAL use, H→CLKIN use

Test pin

TEST	I	For test mode setting (fixed to L for normal operation)

Power supply pin

$DV_{DD}33$	P	3.3V digital power supply
$DV_{DD}18$	P	1.8V digital power supply
DV_{SS}	P	Digital ground

*Process when pins are not used

PIN TYPE "O" —— The pin must be left open.
PIN TYPE "I" —— The pin must not be left open. Please make sure to connect the pin to V_{DD} or V_{SS} even when it is not used. (Please check with us whether to connect to V_{DD} or V_{SS}.)
PIN TYPE "B" —— Please contact us if you are uncertain about a processing method in the pin description in the PIN layout table.

A problem may occur if the processing method is used wrongly for any unused pin.
Please make sure to contact us.

Driver LSI

Saturation-driven H bridge output
     OUT1 to OUT8   O   Motor control pulse output

Power supply pin
     VM1,VM2   P   Motor power supply
     V_{CC} P   Other power supply
     SGND   P   Signal ground
     PGND   P   Power ground

Photo sensor pin
     PI1   I   Photo sensor connectiong pin

Pin Layout

Top View

	A	B	C	D	E	F	G
7	OUT7	OUT8	PGND2	VM2	DV_{SS}	IOP1	CLKIN
6	OUT6	NC	NC	$DV_{DD}33$	$DV_{DD}18$	PIX	XTAL
5	OUT5	NC	DGMISO	ZRESET	DV_{SS}	PIY	XTALCK
4	OUT4	DGINT	DGSSB	DGMOSI	BUSY2	BUSY1	MODE1
3	OUT3	NC	DGSCLK	MODE0	SSB	MOSI	SCLK
2	OUT2	IOP0	NC	TEST	$DV_{DD}18$	MISO	$DV_{DD}33$
1	PGND1	OUT1	VM1	V_{CC}	SGND	PI1	DV_{SS}