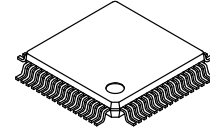


CMOS LSI

Iris/Zoom/Focus/Day-Night Switching Drive Controller

LC898201



TQFP64 7x7
CASE 932BC

Overview

LC898201 is the appropriate motor control LSI for the surveillance camera usage, and it can drive iris, focus, zoom and Day/Night switching simultaneously.

It incorporates feedback control circuits (max 2-systems), stepper motor control circuits (max 3-system) and VCM control circuit (1-system).

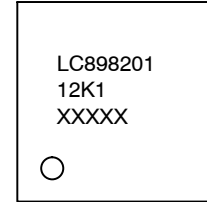
- Feedback Control Applies Iris
Stepper Motor Controls Apply Focus, Zoom and Day/Night Switching
- Feedback Control Applies Iris
Stepper Motor Controls Apply Focus and Zoom
VCM Applies Day/Night Switching

LC898201 can control a variety of lens units like these examples.

Features

- Built-in Equalizer Circuit by Digital Operation
 - ◆ Iris Control Equalizer Circuit
 - ◆ Focus Control Equalizer Circuit (MR sensor can be connected)
 - ◆ Coefficients can be Set Arbitrarily through the SPI Interface
 - ◆ Computed Values in the Equalizer can be Monitored
- Built-in 3ch Stepper Motor Control Circuits
- SPI Bus Interface
- PI Control Circuit
 - ◆ 30 mA Sink Output Terminal
 - ◆ Built-in PI Detecting Function (A/D method)
- A/D Converter
 - ◆ 12bit (6ch): Iris, Focus, PI Detection, General
- D/A Converter
 - ◆ 8bit (4ch): Hall Offset, Constant Current Bias, MR Sensor Offset
- Operation Amplifier
 - ◆ 3ch (Iris Control ×1, Focus Control ×2)
- PWM Pulse Generator
 - ◆ PWM Pulse Generator for Feedback Control (Up to 12 bit Accuracy)
 - ◆ PWM Pulse Generator for Stepper Motor Control (Up to 1024 Micro Steps)
 - ◆ PWM Pulse Generator for General-purpose H-Bridge (128 Voltage Levels)
- Motor Driver
 - ◆ ch1 to ch6: I_o max = 200 mA
 - ◆ ch7: I_o max = 300 mA
 - ◆ Built-in Thermal Protection Circuit
 - ◆ Built-in Low-voltage Malfunction Prevention Circuit

MARKING DIAGRAM



LC898201 = Specific Device Code 1
12K1 = Specific Device Code 2
XXXXX = Lot Number

ORDERING INFORMATION

Device	Package	Shipping [†]
LC898201TA-NH	TQFP64 7x7 (Pb-Free / Halogen Free)	1000 / Tape & Reel

[†]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](#).

Features (Continued)

- Operation Clock
 - ◆ Selective Usage either Internal OSC (Typ. 48 MHz) or External Oscillating Circuit (48 MHz)
- Package
 - ◆ TQFP64 (7 × 7) 0.4 mm Pitch
 - ◆ Lead-free, Halogen-free
- Power Supply Voltage
 - ◆ Logic Unit: 2.7 V to 3.6 V (IO, Internal Core)
 - ◆ Driver Unit: 2.7 V to 5.5 V (Motor Drive)

Application 2

Stepper 3ch-ex.2 & using internal OSC & PI sensor: R_L collector connection.

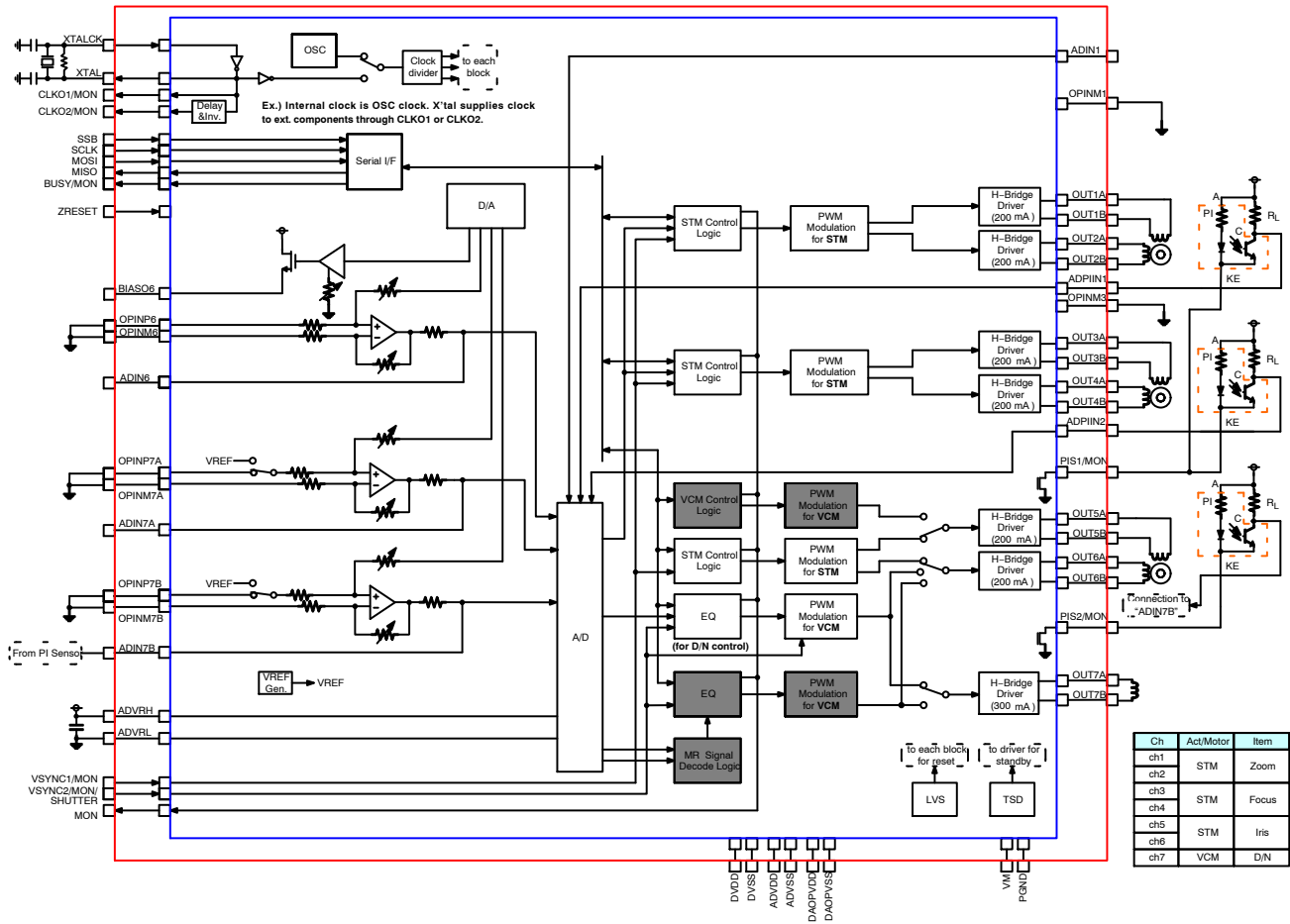


Figure 2. Application 2

Application-3

Stepper 2ch & using internal OSC & PI sensor: R_L emitter connection.

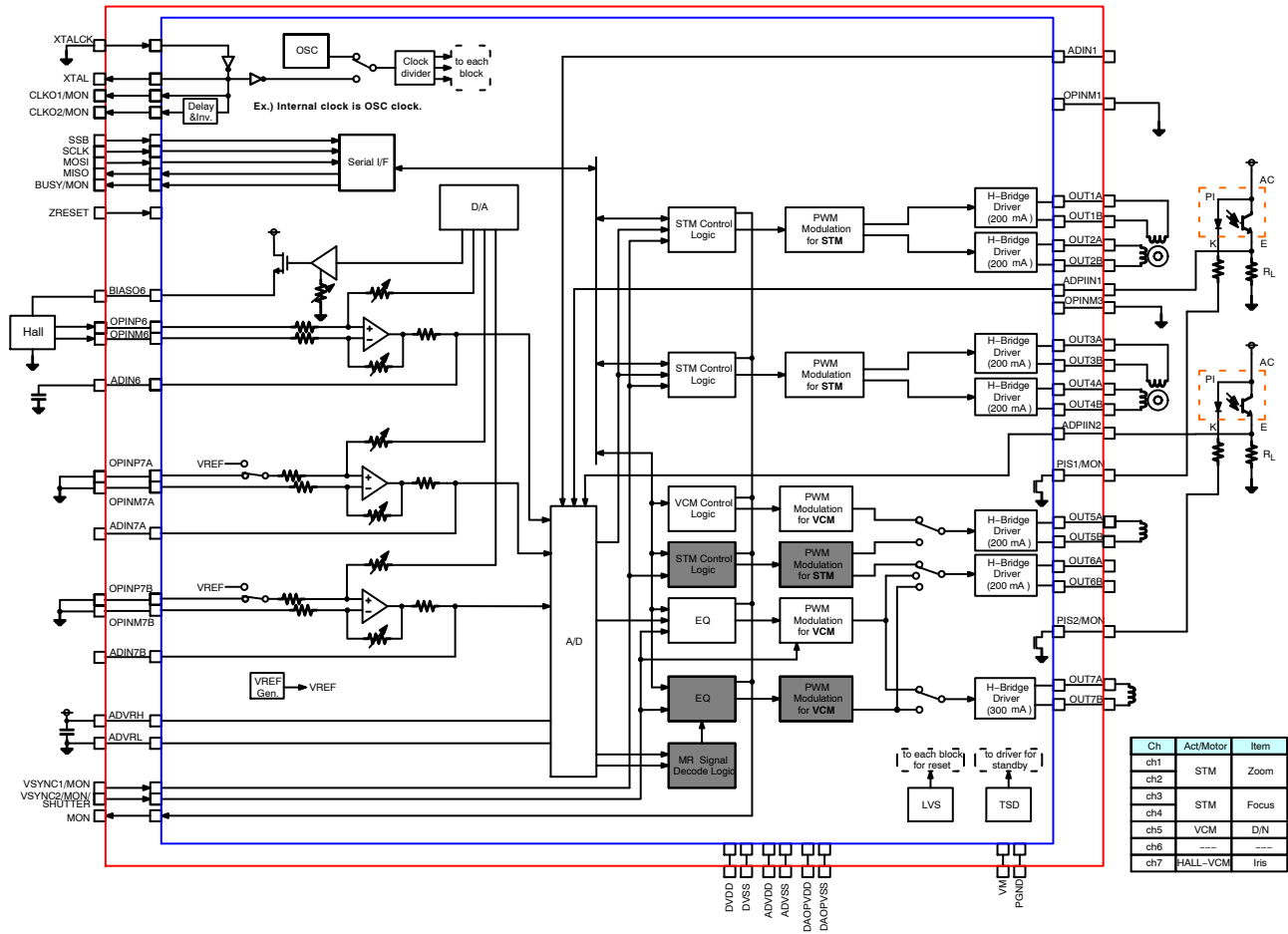


Figure 3. Application 3

Application-4

MR-VCM & using internal OSC & PI sensor: R_L emitter connection.

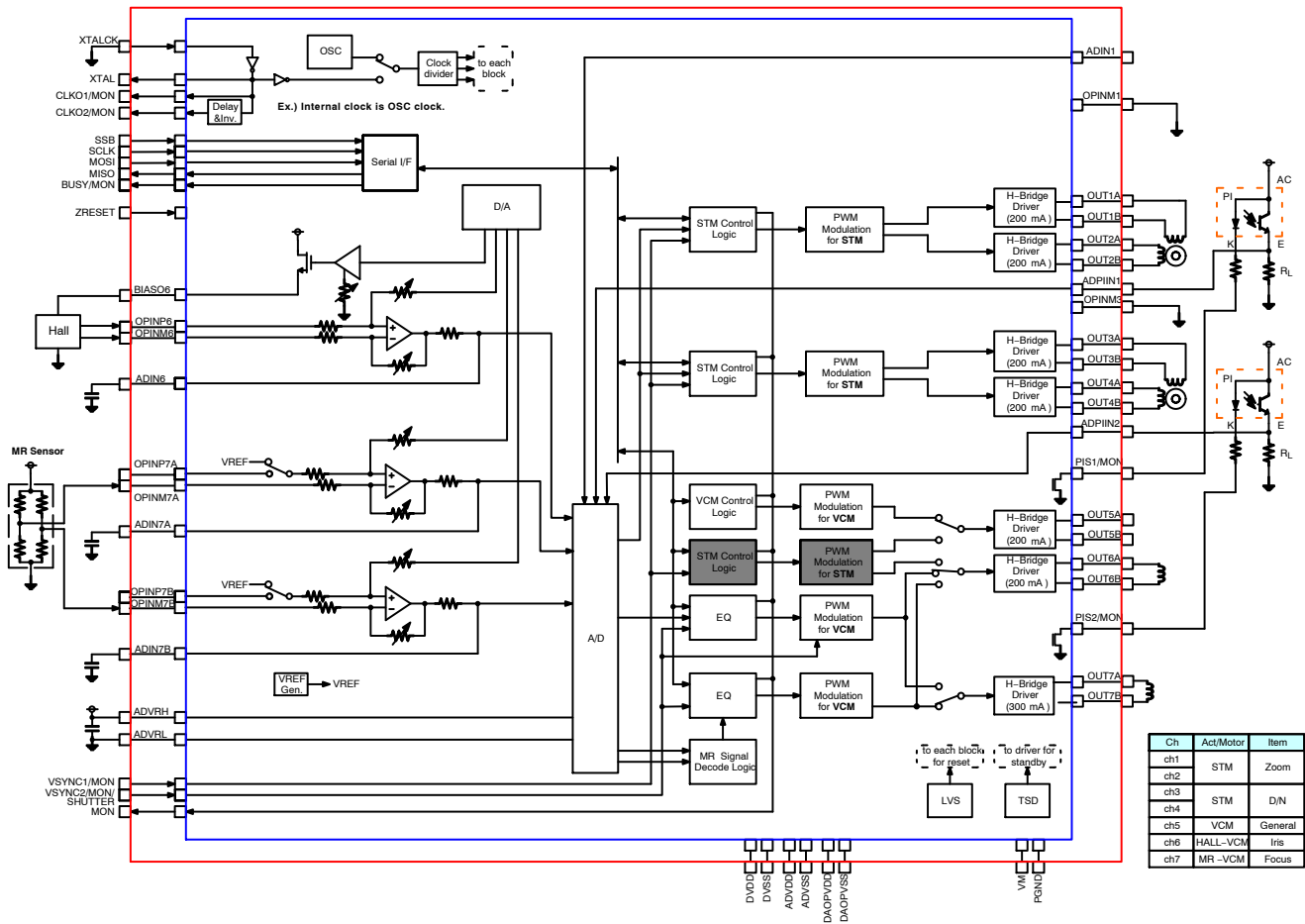


Figure 4. Application 4

LC898201

PIN DESCRIPTION

Table 1. 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				

SPI INTERFACE (SLAVE)

SSB	I	Chip select
SCLK	I	Clock
MOSI	I	Received data
MISO	B(O)	Transmit data
BUSY/MON	B(O)	Transfer busy / Monitor output

PI SENSOR DRIVE SIGNAL OUTPUT

PIS1/MON	B(O)	PI sensor drive signal output 1 / Monitor output
PIS2/MON	B(O)	PI sensor drive signal output 2 / Monitor output

VIDEO SYNCHRONIZING SIGNAL INPUT

VSYNC1/MON	B(I)	Video synchronizing signal input / Monitor output (with pull-down resistance)
VSYNC2/MON /SHUTTER	B(I)	Video synchronizing signal input / Monitor output / Shutter input (with pull-down resistance)

MONITOR OUTPUT

MON	B(O)	Monitor output
-----	------	----------------

CLOCK OUTPUT

XTALCK	I	Oscillation amplifier input
XTAL	O	Oscillation amplifier output
CLKO1/MON	B(O)	Clock output 1 / Monitor output
CLKO2/MON	B(O)	Clock output 2 / Monitor output

RESET

ZRESET	I	Reset signal input (Low active)
--------	---	---------------------------------

BIAS CURRENT PIN

BIASO6	O	CH6 Bias current output
--------	---	-------------------------

OP AMP PIN

OPINP6	I	CH6 OP Amp input (+)
OPINM6	I	CH6 OP Amp input (-)
OPINP7A	I	CH7-A OP Amp input (+)
OPINM7A	I	CH7-A OP Amp input (-)
OPINP7B	I	CH7-B OP Amp input (+)
OPINM7B	I	CH7-B OP Amp input (-)

A/D INPUT PIN

ADIN1	B	General A/D input
ADIN6	B	CH6 A/D input (CH6 OP Amp output)
ADIN7A	B	CH7-A A/D input (CH7 OP Amp output)

LC898201

A/D INPUT PIN

ADIN7B	B	CH7-B A/D input (CH7 OP Amp output)
ADPIIN1	I	CH1/2 PI sensor signal A/D input
ADPIIN2	I	CH3/4 PI sensor signal A/D input
ADVRL	I	A/D conversion range standard voltage
ADVRH	I	A/D conversion range standard voltage

H-BRIDGE

OUT1A	O	CH1 H-Bridge output
OUT1B	O	CH1 H-Bridge output
OUT2A	O	CH2 H-Bridge output
OUT2B	O	CH2 H-Bridge output
OUT3A	O	CH3 H-Bridge output
OUT3B	O	CH3 H-Bridge output
OUT4A	O	CH4 H-Bridge output
OUT4B	O	CH4 H-Bridge output
OUT5A	O	CH5 H-Bridge output
OUT5B	O	CH5 H-Bridge output
OUT6A	O	CH6 H-Bridge output
OUT6B	O	CH6 H-Bridge output
OUT7A	O	CH7 H-Bridge output
OUT7B	O	CH7 H-Bridge output

MISCELLANEOUS

OPINM1	I	Connect to GND (DAOPVSS)
OPINM3	I	Connect to GND (DAOPVSS)

POWER PIN

DVDD	P	Digital VDD
DVSS	P	Digital GND
DAOPVDD	P	D/A, OP Amp VDD
DAOPVSS	P	D/A, OP Amp GND
ADVDD	P	A/D VDD
ADVSS	P	A/D GND
VM	P	H-Bridge VDD
PGND	P	H-Bridge GND

Process when pins are not used

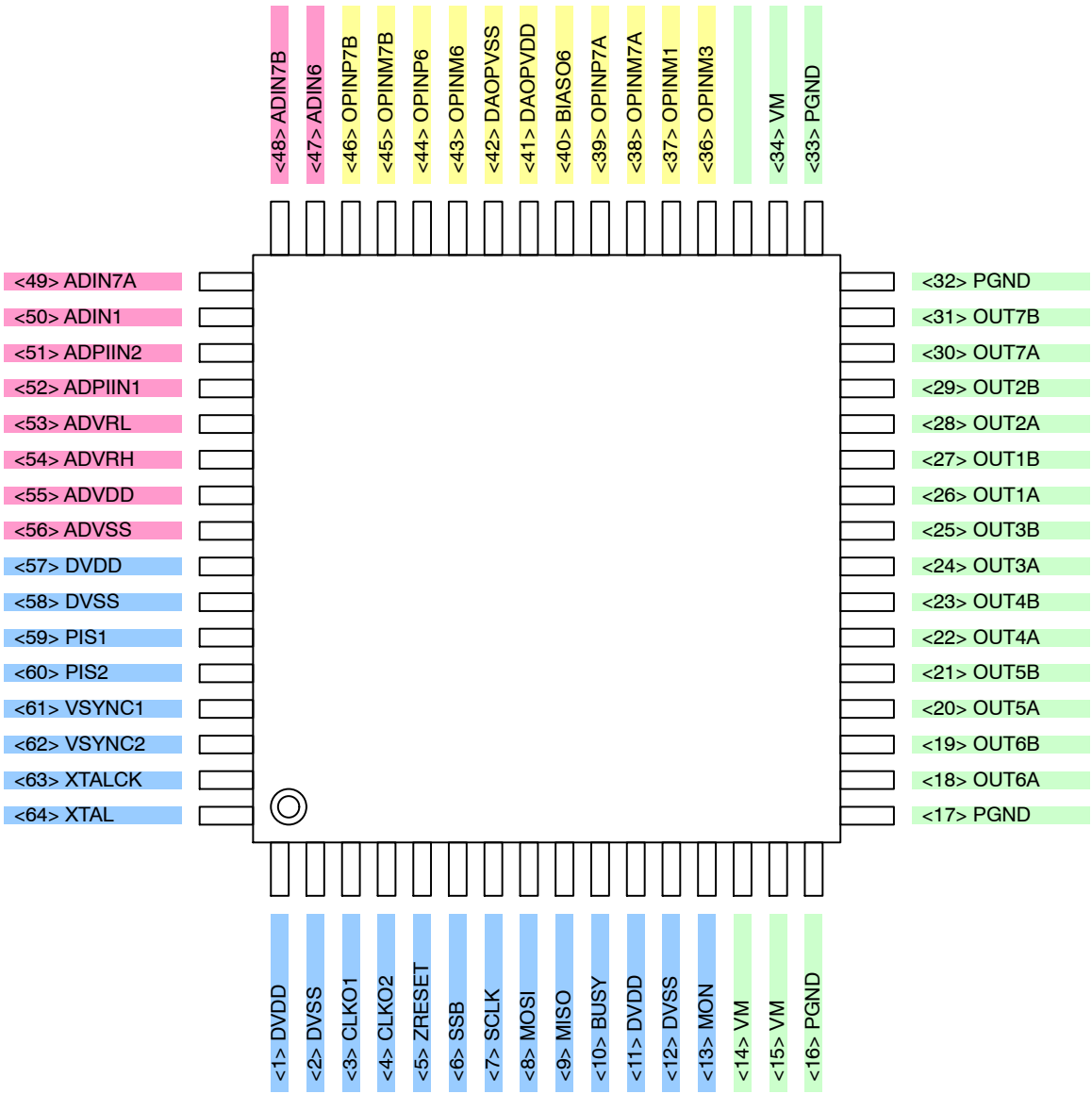
- PIN TYPE “O” – The pin must be left open
- PIN TYPE “I” – The pin must not be left open. Please make sure to connect the pin to V_{DD} or V_{SS} even when it is not used. (Please check with us whether to connect to V_{DD} or V_{SS})
- PIN TYPE “B” – Please contact us if you are uncertain about a processing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

LC898201

PIN ASSIGNMENT



(TOP VIEW)

Figure 5. TQFP64 (7x7)

LC898201

PIN NUMBER

Table 2. PIN NUMBER

Pin No.	Type	Pin name
1	P	DVDD
2	P	DVSS
3	B(O)	CLKO1
4	B(O)	CLKO2
5	I	ZRESET
6	I	SSB
7	I	SCLK
8	I	MOSI
9	B(O)	MISO
10	B(O)	BUSY
11	P	DVDD
12	P	DVSS
13	B(O)	MON
14	P	VM
15	P	VM
16	P	PGND
17	P	PGND
18	O	OUT6A
19	O	OUT6B
20	O	OUT5A
21	O	OUT5B
22	O	OUT4A
23	O	OUT4B
24	O	OUT3A
25	O	OUT3B
26	O	OUT1A
27	O	OUT1B
28	O	OUT2A
29	O	OUT2B
30	O	OUT7A
31	O	OUT7B
32	P	PGND
33	P	PGND
34	P	VM
35	P	VM
36	I	OPINM3
37	I	OPINM1
38	I	OPINM7A
39	I	OPINP7A
40	O	BIASO6

LC898201

Table 2. PIN NUMBER (continued)

Pin No.	Type	Pin name
41	P	DAOPVDD
42	P	DAOPVSS
43	I	OPINM6
44	I	OPINP6
45	I	OPINM7B
46	I	OPINP7B
47	B	ADIN6
48	B	ADIN7B
49	B	ADIN7A
50	B	ADIN1
51	I	ADPIIN2
52	I	ADPIIN1
53	I	ADVRL
54	I	ADVRH
55	P	ADVDD
56	P	ADVSS
57	P	DVDD
58	P	DVSS
59	B(O)	PIS1
60	B(O)	PIS2
61	B(I)	VSYNC1
62	B(I)	VSYNC2
63	I	XTALCK
64	O	XTAL

ELECTRICAL CHARACTERISTICS

Logic, Analog

Logic, Analog power: DVDD/DVSS, OPDAVDD/ OPDAVSS, ADVDD/ADVSS, these should be connected at the same voltage. They are shown DVDD/DVSS as follows.

ABSOLUTE MAXIMUM RATINGS (DVSS = 0 V)

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	DVDD max	$T_A \leq 25^\circ\text{C}$	-0.3 to 4.6	V
Input/Output Voltage	V_{IN}, V_{OUT}	$T_A \leq 25^\circ\text{C}$	-0.3 to DVDD+0.3	V
Storage Temperature	T_{stg}		-55 to 125	$^\circ\text{C}$
Operating Temperature	T_{opr}		-20 to 85	$^\circ\text{C}$

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.

ALLOWABLE OPERATING RANGES ($T_A = -20$ to 85°C , DVSS = 0 V)

Parameter	Symbol	Min	Typ	Max	Unit	Applicable Pins
Power Supply Voltage	DVDD	2.7	3.3	3.6	V	
Input Voltage Range	V_{IN}	0	-	DVDD	V	Except for OPINM1, OPINM3
		0	-	VM	V	OPINM1, OPINM3

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.

DC CHARACTERISTICS: INPUT/OUTPUT LEVEL ($T_A = -20$ to 85°C , DVSS = 0 V, DVDD = 2.7 to 3.6 V)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	Applicable Pins
High-level Input Voltage	V_{IH}	CMOS	0.7 DVDD			V	(2)(3)
Low-level Input Voltage	V_{IL}				0.2 DVDD	V	
High-level Input Voltage	V_{IH}	CMOS Schmitt	0.75 DVDD			V	(1)
Low-level Input Voltage	V_{IL}				0.15 DVDD	V	
High-level Output Voltage	V_{OH}	$I_{OH} = -4$ mA	DVDD - 0.4			V	(2)(3)(4)
Low-level Output Voltage	V_{OL}	$I_{OL} = 4$ mA			0.4	V	(2)(3)
		$I_{OL} = 30$ mA			0.4	V	(4)
PullDown Resistance	Rdn		40	80	200	k Ω	(3)
Analog Input Voltage	V_{AI}		DVSS		DVDD	V	(5)
			PGND		VM	V	(6)
VGA Output Resistance	R_{out}			1		k Ω	(7)
Analog Output Current	I_{AO}	CMSDAC = 001b & WH_DAV4 = 00h		1		mA	(8)

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.

NOTE: Applicable Pins:

- (1) ZRESET, SSB, SCLK, MOSI
- (2) MISO, BUSY, MON, CLK01, CLK02
- (3) VSYNC1, VSYNC2
- (4) PIS1, PIS2
- (5) OPINP6, OPINM6, OPINP7A, OPINM7A, OPINP7B, OPINM7B, ADPIIN1, ADPIIN2
- (6) OPINM1, OPINM3
- (7) ADIN1, ADIN6, ADIN7A, ADIN7B
- (8) BIASO6

LC898201

VM

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, PGND = 0 V)

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V_{Mmax}		-0.3 to 7.0	V
Output Peak Current	I_{opeak1}	OUT1A/B to OUT6A/B $t \leq 10$ ms, On-duty $\leq 20\%$	300	mA
	I_{opeak2}	OUT7A/B $t \leq 10$ ms, On-duty $\leq 20\%$	450	mA
Output Continuous Current	I_{omax1}	OUT1A/B to OUT6A/B	200	mA
	I_{omax2}	OUT7A/B	300	mA
Storage Temperature	T_{stg}		-55 to 125	$^\circ\text{C}$
Operating Temperature	T_{opr}		-20 to 85	$^\circ\text{C}$

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.

ALLOWABLE OPERATING RANGES ($T_A = 25^\circ\text{C}$, PGND = 0 V)

Parameter	Symbol	Conditions	Ratings	Unit
Power Supply Voltage	VM		2.7 to 5.5	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.

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, PGND = 0 V, VM = 5 V)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	Applicable Pins
Output ON Resistance	R_{onu}	$I_O = 200$ mA Pch		0.85		Ω	(9)
	R_{ond}	$I_O = 200$ mA Nch		0.45		Ω	
Output ON Resistance	R_{onu}	$I_O = 300$ mA Pch		0.85		Ω	(10)
	R_{ond}	$I_O = 300$ mA Nch		0.45		Ω	
Diode Forward Voltage	V_D	$I_D = -200$ mA		0.9		V	(9)
		$I_D = -300$ mA		0.9		V	(10)

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.

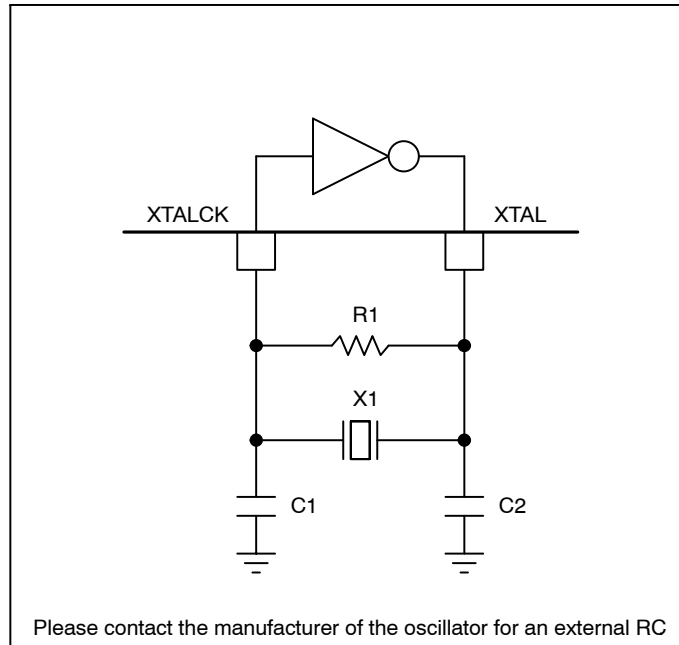
NOTE: Applicable Pins:

(9) OUT1A, OUT1B, OUT2A, OUT2B, OUT3A, OUT3B, OUT4A, OUT4B, OUT5A, OUT5B, OUT6A, OUT6B

(10) OUT7A, OUT7B

EXAMPLE OF EXTERNAL CIRCUIT

Connection example of oscillation circuit.



* In the case of X'tal, it takes about 50 ms for oscillation to stabilize (please check with the manufacturer for a precise time period).

Figure 6. Example of External Circuit

AC CHARACTERISTICS

1-a) Power Supply, Reset Pin

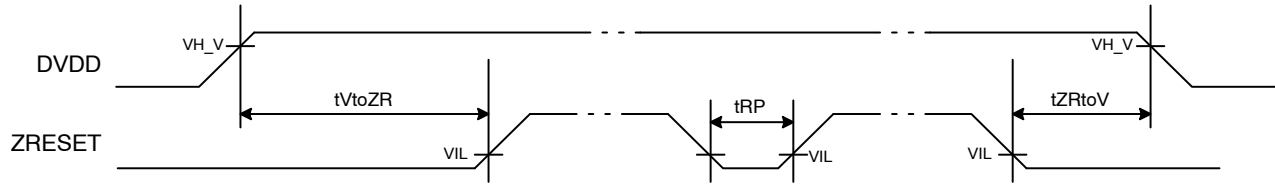


Figure 7.

1-b) Specification

DVDD: DVDD, OPDAVDD, ADVDD
 VH_V: 2.7 V
 VIL: $0.15 \times DVDD$

Parameter	Symbol	Min	Typ	Max	Unit
The time from the rise of DVDD to the rise of ZRESET	tVtoZR	1			ms
The time from the fall of DVDD to the fall of ZRESET	tZRtoV	500			μ s
Low period of ZRESET	tRP	100			μ s

VM can be turn on/off regardless above power supply AC timing.

2-a) Power Supply, Reset Pin

Upper: "H" active Use setting of 0250h-0253h-bit2 = 0
 Lower: "L" active Use setting of the above bit = 1

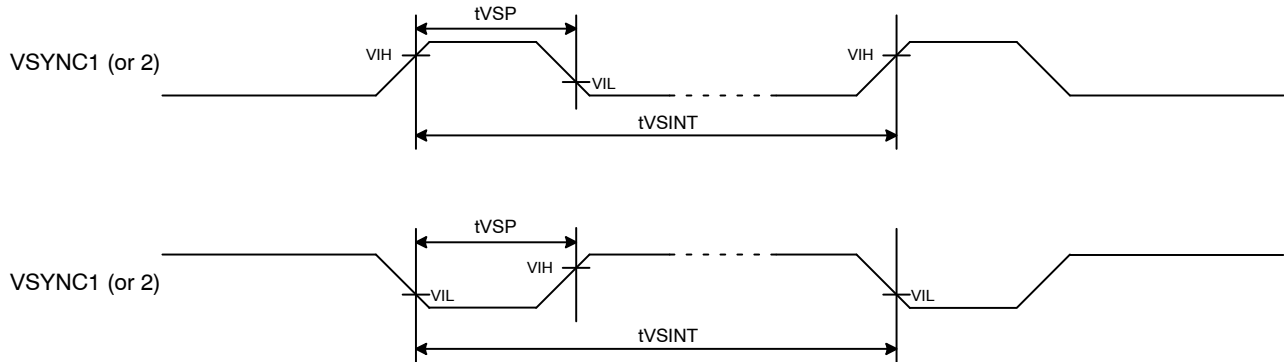


Figure 8.

2-b) Specification

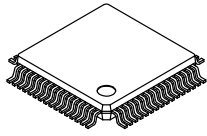
VIH: $0.7 \times DVDD$
 VIL: $0.2 \times DVDD$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Active period of VSYNC1(or 2)	tVSP	STMCLK = 12 MHz	100			ns
Interval time of VSYNC1(or 2)	tVSINT		2			ms

MECHANICAL CASE OUTLINE

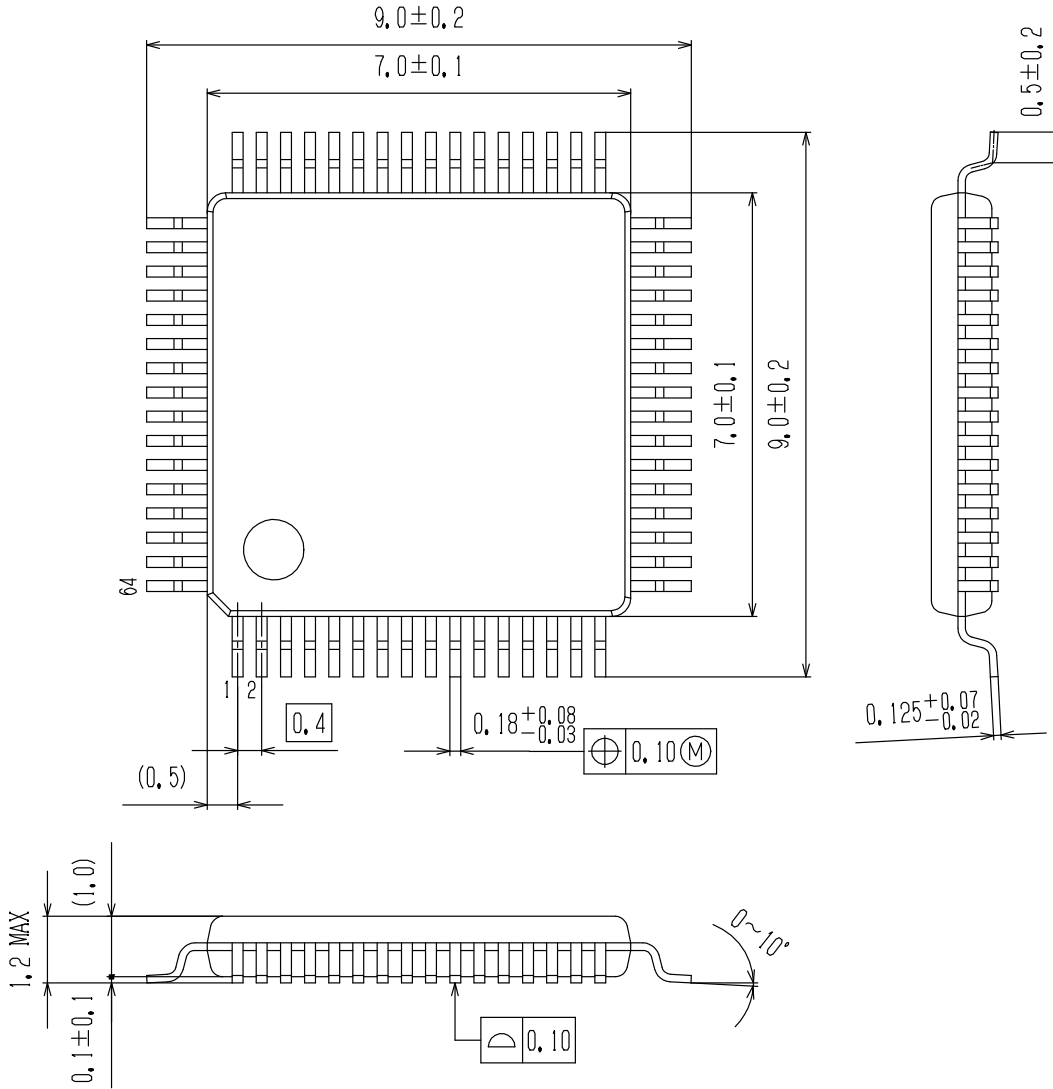
PACKAGE DIMENSIONS

ON Semiconductor®



TQFP64 7x7 / TQFP64
CASE 932BC
ISSUE 0

DATE 31 MAY 2012



DOCUMENT NUMBER:	98AON80202E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TQFP64 7X7 / TQFP64	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative