

# LC898201

## CMOS LSI Iris/Zoom/Focus/Day-Night Switching Drive Controller

### 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.

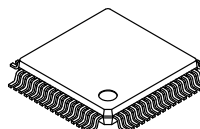
### Features

- 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<sub>o</sub> max = 200 mA
  - ◆ ch7: I<sub>o</sub> max = 300 mA
  - ◆ Built-in Thermal Protection Circuit
  - ◆ Built-in Low-voltage Malfunction Prevention Circuit

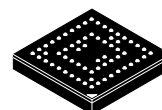


ON Semiconductor®

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TQFP64 7x7  
CASE 932BC



FBGA64 6x6  
CASE 113BL

### ORDERING INFORMATION

| Device        | Package                                   | Shipping <sup>†</sup> |
|---------------|---|-----------------------|
| LC898201TA-NH | TQFP64 7x7<br>(Pb-Free /<br>Halogen Free) | 1000 /<br>Tape & Reel |
| LC898201RA-NH | FBGA64 6x6<br>(Pb-Free /<br>Halogen Free) | 1000 /<br>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.

### Features (Continued)

- Operation Clock
  - ◆ Selective Usage either Internal OSC (Typ. 48 MHz) or External Oscillating Circuit (48 MHz)
- Package
  - ◆ LC898201TA-NH:  
TQFP64 (7 × 7) 0.4 mm Pitch
  - ◆ LC898201RA-NH:  
FBGA64 (6.0 × 6.0) 0.5 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)

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## BLOCK DIAGRAMS

### Application 1

Stepper 3ch-ex.1 & using Crystal oscillator (or Ceramic oscillator)

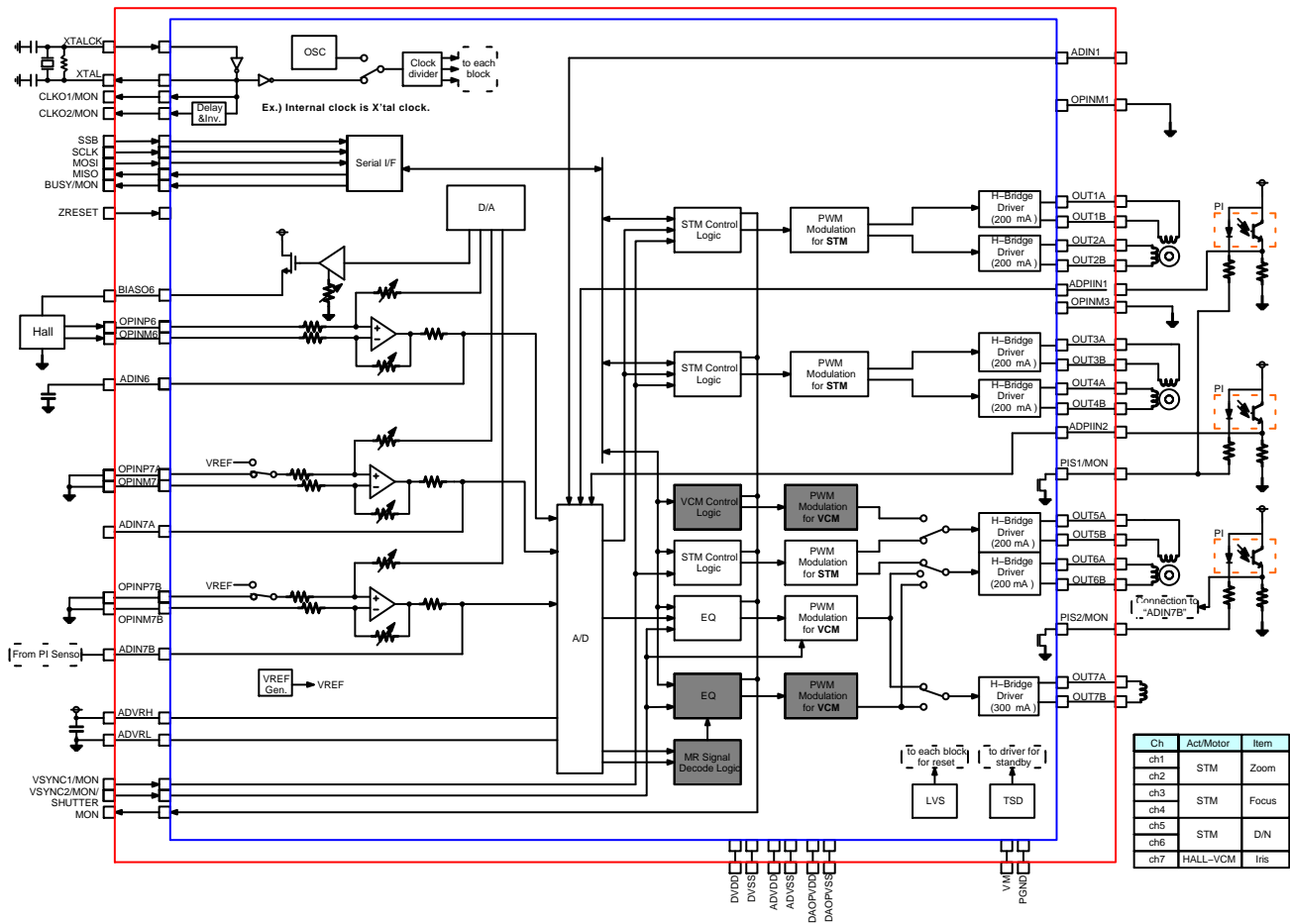


Figure 1. Application 1

Application 2  
Stepper 3ch-ex.2 & using internal OSC

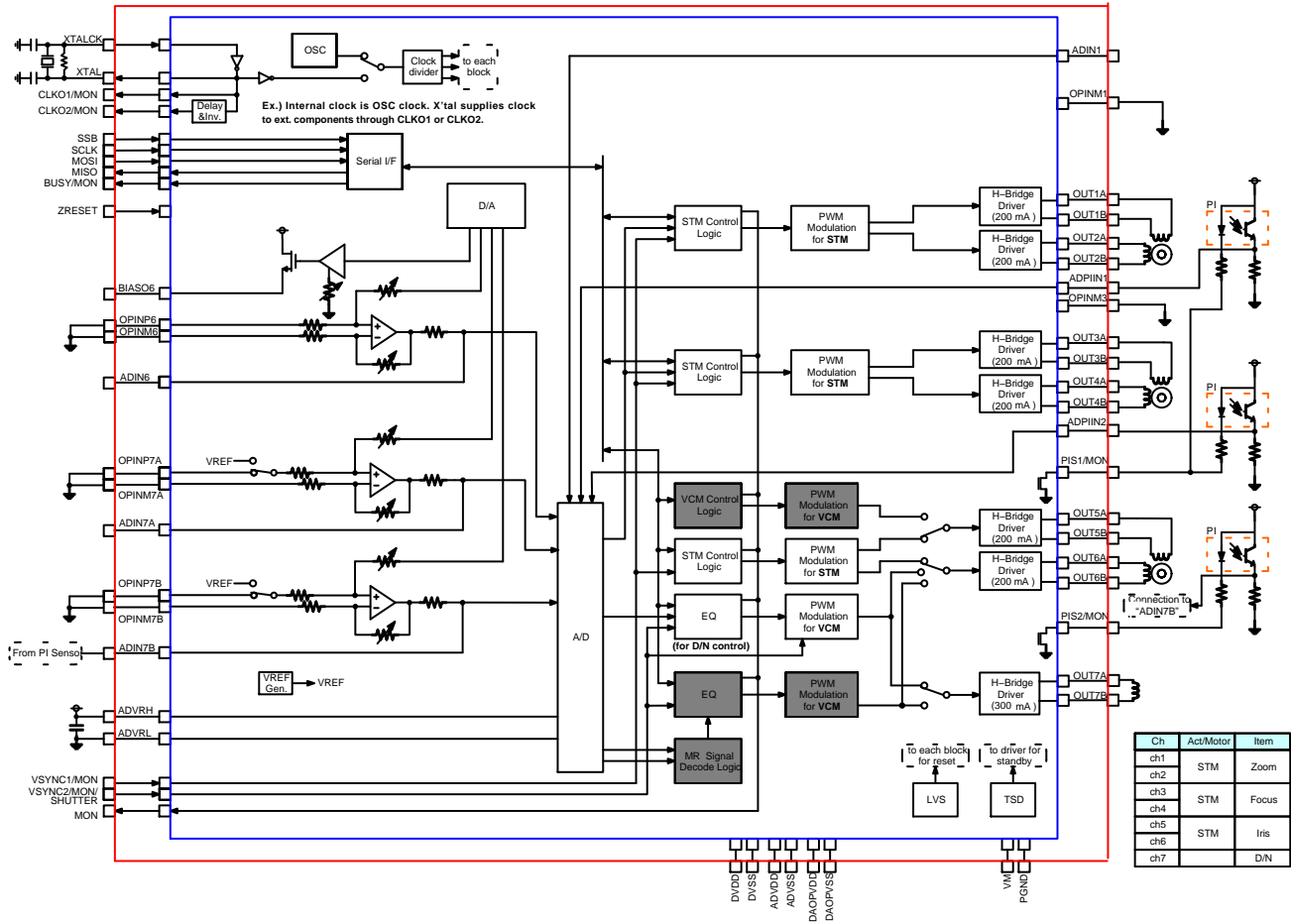


Figure 2. Application 2

Application-3  
Stepper 2ch & using internal OSC

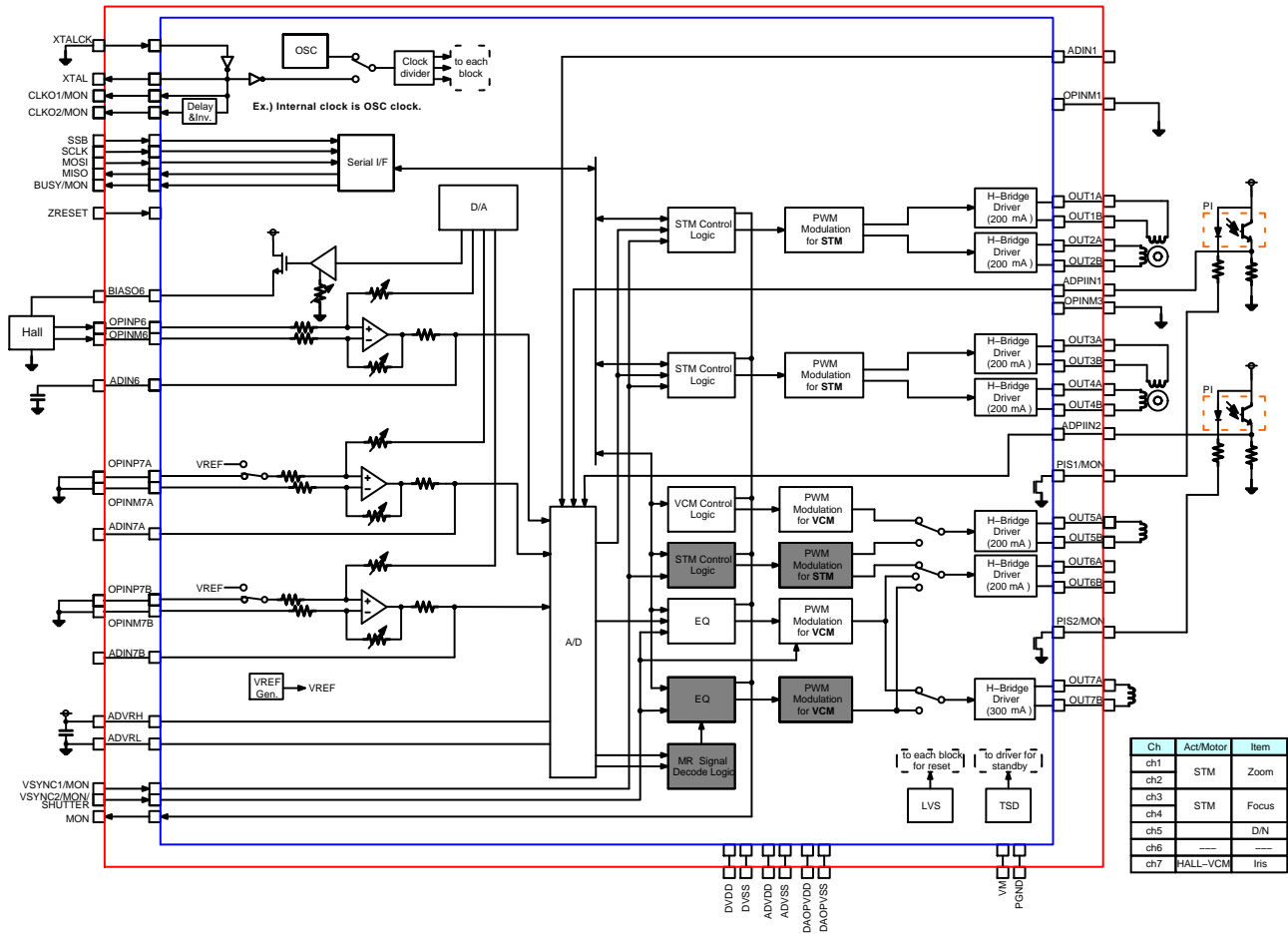
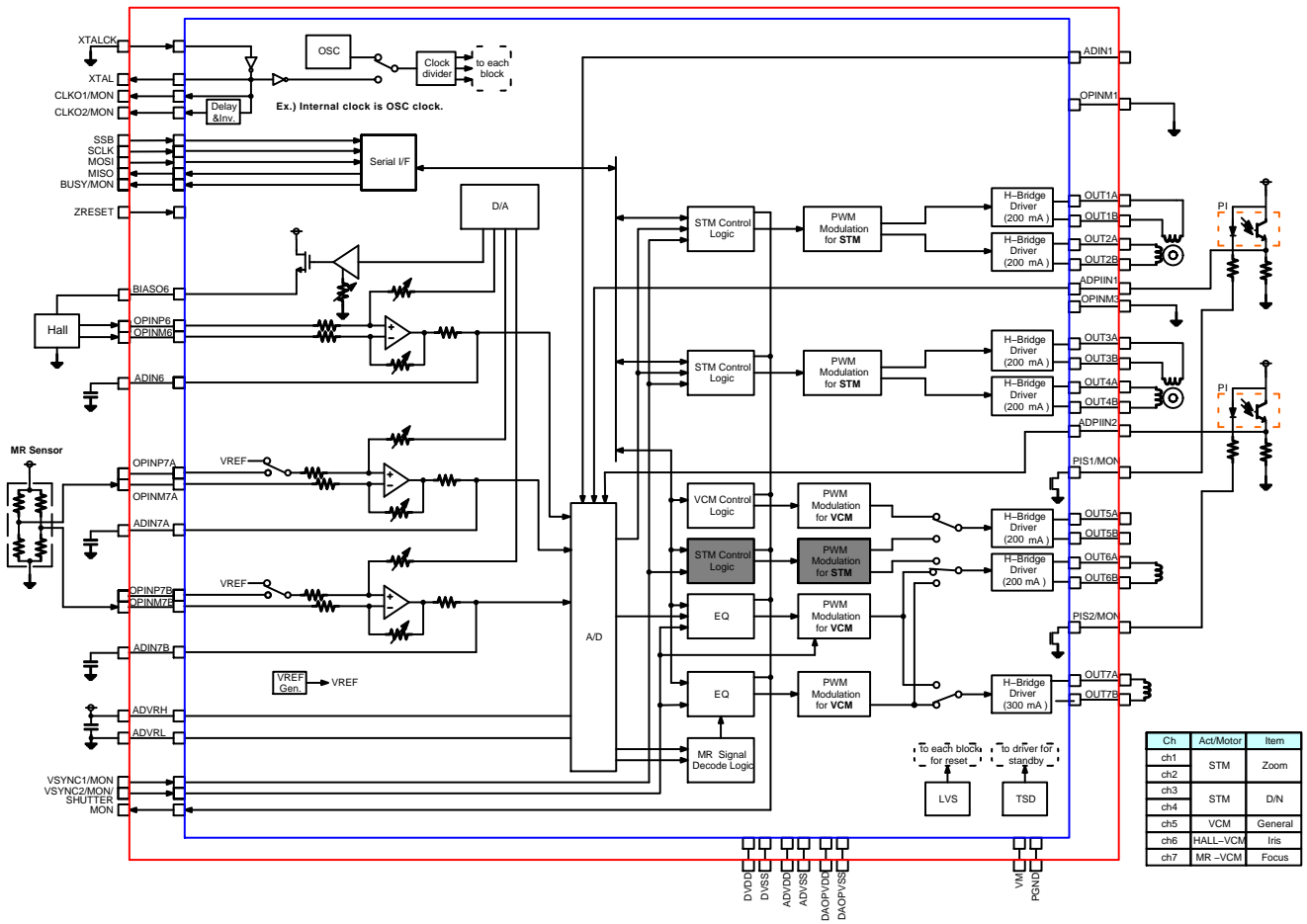


Figure 3. Application 3

Application-4  
MR-VCM & using internal OSC



| Ch  | Act/Motor | Item    |
|-----|-----------|---------|
| ch1 | STM       | Zoom    |
| ch2 | STM       | D/N     |
| ch3 | STM       | D/N     |
| ch4 | STM       | D/N     |
| ch5 | VCM       | General |
| ch6 | HALL-VCM  | Iris    |
| ch7 | MR-VCM    | Focus   |

Figure 4. Application 4

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## 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) |

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## 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

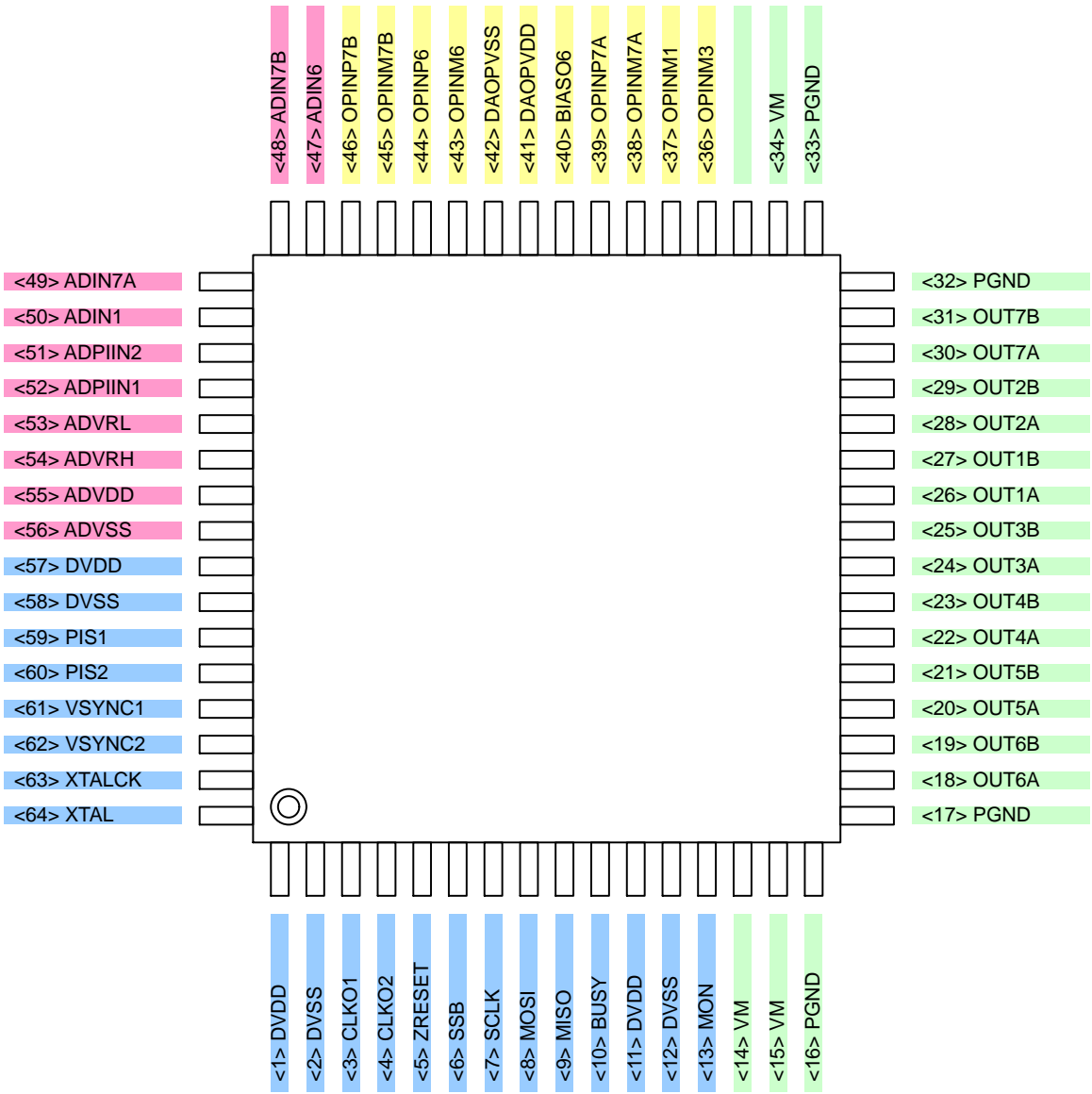
- PIN TYPE “O” – The pin must be left open
- PIN TYPE “I” – The pin must not be left open. Please make sure to connect the pin to  $V_{DD}$  or  $V_{SS}$  even when it is not used. (Please check with us whether to connect to  $V_{DD}$  or  $V_{SS}$ )
- PIN TYPE “B” – Please contact us if you are uncertain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

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## PIN ASSIGNMENT – TQFP64



(TOP VIEW)

Figure 5. TQFP64 (7x7)



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## PIN ASSIGNMENT – FBGA64

|    |       |        |        |        |       |       |             |             |        |             |
|----|-------|--------|--------|--------|-------|-------|-------------|-------------|--------|-------------|
| 10 | DVDD  | VSYNC2 | PIS2   | DVSS   | ADVSS | ADVDD | ADPI<br>IN1 | ADPI<br>IN2 | ADIN7A | ADIN7B      |
| 9  | DVSS  |        |        |        | ADVRL | ADVRH |             |             |        | ADIN6       |
| 8  | CLKO1 |        | XTALCK | VSYNC1 | PIS1  | DVDD  | ADIN1       | OPINM<br>7B |        | OPINP<br>7B |
| 7  | CLKO2 |        | XTAL   |        |       |       |             | OPINM6      |        | OPINP6      |
| 6  | SSB   |        | ZRESET | SCLK   |       |       | BIASO6      | DAOP<br>VSS |        | DAOP<br>VDD |
| 5  | MISO  |        | BUSY   | MOSI   |       |       | OPINM1      | OPINP<br>7A |        | OPINM<br>7A |
| 4  | DVDD  |        | DVSS   |        |       |       |             | OPINM3      |        | OUT7A       |
| 3  | MON   |        | OUT6A  | OUT5A  | OUT4A | OUT3A | OUT1A       | OUT2A       |        | OUT7B       |
| 2  | VM    | VM     |        |        |       |       |             |             | VM     | VM          |
| 1  | PGND  | PGND   | OUT6B  | OUT5B  | OUT4B | OUT3B | OUT1B       | OUT2B       | PGND   | PGND        |
|    | A     | B      | C      | D      | E     | F     | G           | H           | J      | K           |

(TOP VIEW)

Figure 6. FBGA64 (6.0x6.0)

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## PIN NUMBER

Table 2. PIN NUMBER

| Pin No. |        | Type | Pin name |
|---------|--------|------|----------|
| TQFP64  | FBGA64 |      |          |
| 1       | A10    | P    | DVDD     |
| 2       | A9     | P    | DVSS     |
| 3       | A8     | B(O) | CLKO1    |
| 4       | A7     | B(O) | CLKO2    |
| 5       | C6     | I    | ZRESET   |
| 6       | A6     | I    | SSB      |
| 7       | D6     | I    | SCLK     |
| 8       | D5     | I    | MOSI     |
| 9       | A5     | B(O) | MISO     |
| 10      | C5     | B(O) | BUSY     |
| 11      | A4     | P    | DVDD     |
| 12      | C4     | P    | DVSS     |
| 13      | A3     | B(O) | MON      |
| 14      | B2     | P    | VM       |
| 15      | A2     | P    | VM       |
| 16      | B1     | P    | PGND     |
| 17      | A1     | P    | PGND     |
| 18      | C3     | O    | OUT6A    |
| 19      | C1     | O    | OUT6B    |
| 20      | D3     | O    | OUT5A    |
| 21      | D1     | O    | OUT5B    |
| 22      | E3     | O    | OUT4A    |
| 23      | E1     | O    | OUT4B    |
| 24      | F3     | O    | OUT3A    |
| 25      | F1     | O    | OUT3B    |
| 26      | G3     | O    | OUT1A    |
| 27      | G1     | O    | OUT1B    |
| 28      | H3     | O    | OUT2A    |
| 29      | H1     | O    | OUT2B    |
| 30      | K4     | O    | OUT7A    |
| 31      | K3     | O    | OUT7B    |
| 32      | K1     | P    | PGND     |
| 33      | J1     | P    | PGND     |
| 34      | J2     | P    | VM       |
| 35      | K2     | P    | VM       |
| 36      | H4     | I    | OPINM3   |
| 37      | G5     | I    | OPINM1   |
| 38      | K5     | I    | OPINM7A  |
| 39      | H5     | I    | OPINP7A  |

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**Table 2. PIN NUMBER** (continued)

| Pin No. |        | Type | Pin name |
|---------|--------|------|----------|
| TQFP64  | FBGA64 |      |          |
| 40      | G6     | O    | BIAS06   |
| 41      | K6     | P    | DAOPVDD  |
| 42      | H6     | P    | DAOPVSS  |
| 43      | H7     | I    | OPINM6   |
| 44      | K7     | I    | OPINP6   |
| 45      | H8     | I    | OPINM7B  |
| 46      | K8     | I    | OPINP7B  |
| 47      | K9     | B    | ADIN6    |
| 48      | K10    | B    | ADIN7B   |
| 49      | J10    | B    | ADIN7A   |
| 50      | G8     | B    | ADIN1    |
| 51      | H10    | I    | ADPIIN2  |
| 52      | G10    | I    | ADPIIN1  |
| 53      | E9     | I    | ADVRL    |
| 54      | F9     | I    | ADVRH    |
| 55      | F10    | P    | ADVDD    |
| 56      | E10    | P    | ADVSS    |
| 57      | F8     | P    | DVDD     |
| 58      | D10    | P    | DVSS     |
| 59      | E8     | B(O) | PIS1     |
| 60      | C10    | B(O) | PIS2     |
| 61      | D8     | B(I) | VSYNC1   |
| 62      | B10    | B(I) | VSYNC2   |
| 63      | C8     | I    | XTALCK   |
| 64      | C7     | 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       | °C   |
| Operating Temperature | $T_{opr}$         |                             | -20 to 85        | °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  $85^\circ\text{C}$ , 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  $85^\circ\text{C}$ , 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 Schmidt                        | 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       | kΩ   | (3)             |
| Analog Input Voltage      | $V_{AI}$  |                                     | DVSS       |     | DVDD      | V    | (5)             |
|                           |           |                                     | PGND       |     | VM        | V    | (6)             |
| VGA Output Resistance     | $R_{out}$ |                                     |            | 1   |           | kΩ   | (7)             |
| Analog Output Current     | $I_{AO}$  | CMSDAC<br>= 001b & WH_DAV4<br>= 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

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## 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<br>$t \leq 10$ ms, On-duty $\leq 20\%$ | 300         | mA               |
|                           | $I_{opeak2}$ | OUT7A/B<br>$t \leq 10$ 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 |     | $\Omega$ | (9)             |
|                       | $R_{ond}$ | $I_O = 200$ mA Nch |     | 0.45 |     | $\Omega$ |                 |
| Output ON Resistance  | $R_{onu}$ | $I_O = 300$ mA Pch |     | 0.85 |     | $\Omega$ | (10)            |
|                       | $R_{ond}$ | $I_O = 300$ mA Nch |     | 0.45 |     | $\Omega$ |                 |
| 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:

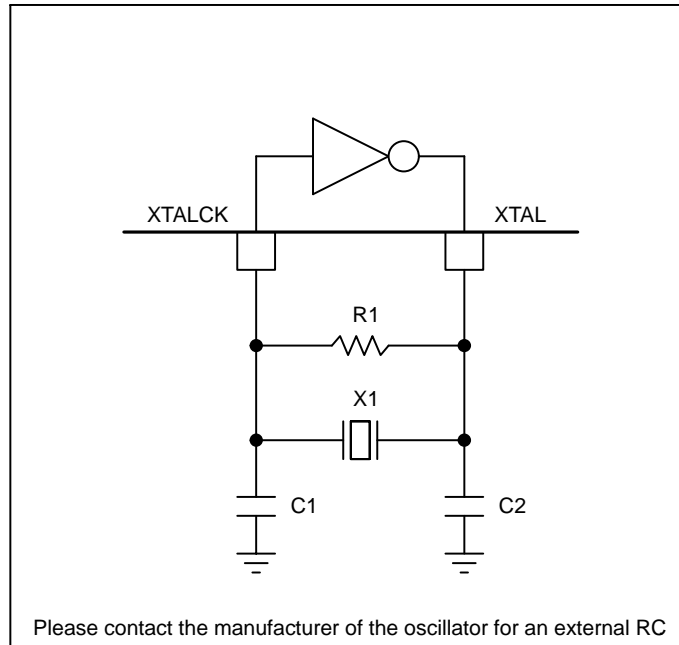
(9) OUT1A, OUT1B, OUT2A, OUT2B, OUT3A, OUT3B, OUT4A, OUT4B, OUT5A, OUT5B, OUT6A, OUT6B

(10) OUT7A, OUT7B

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## 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 7. Example of External Circuit**

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## AC CHARACTERISTICS

### 1-a) Power Supply, Reset Pin

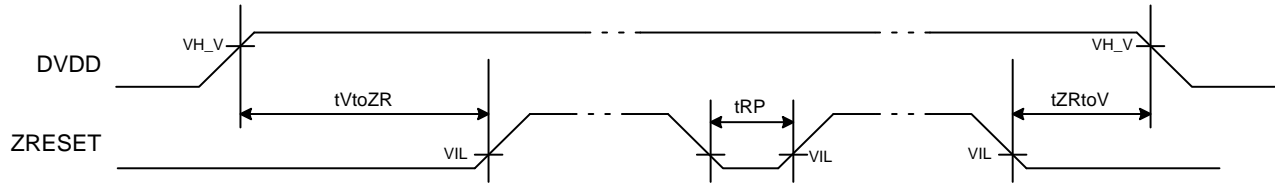


Figure 8.

### 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 |     |     | $\mu$ s |
| Low period of ZRESET                                 | tRP    | 100 |     |     | $\mu$ 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

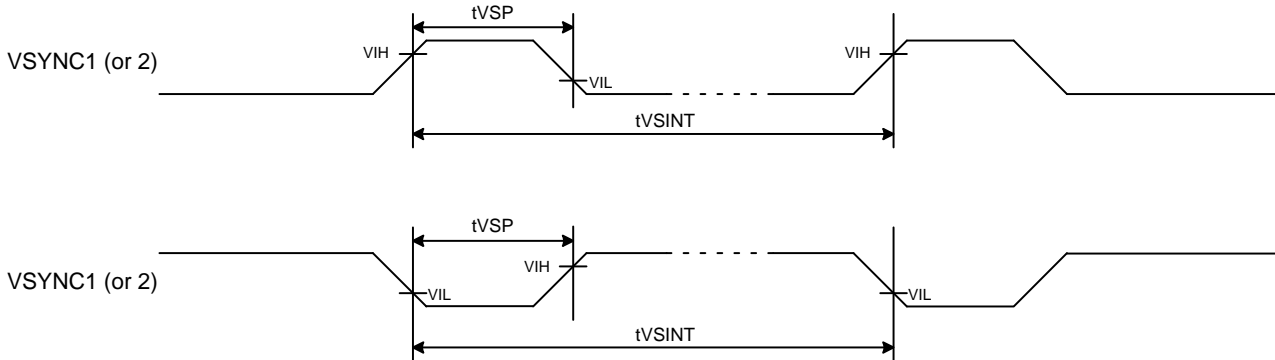


Figure 9.

### 2-b) Specification

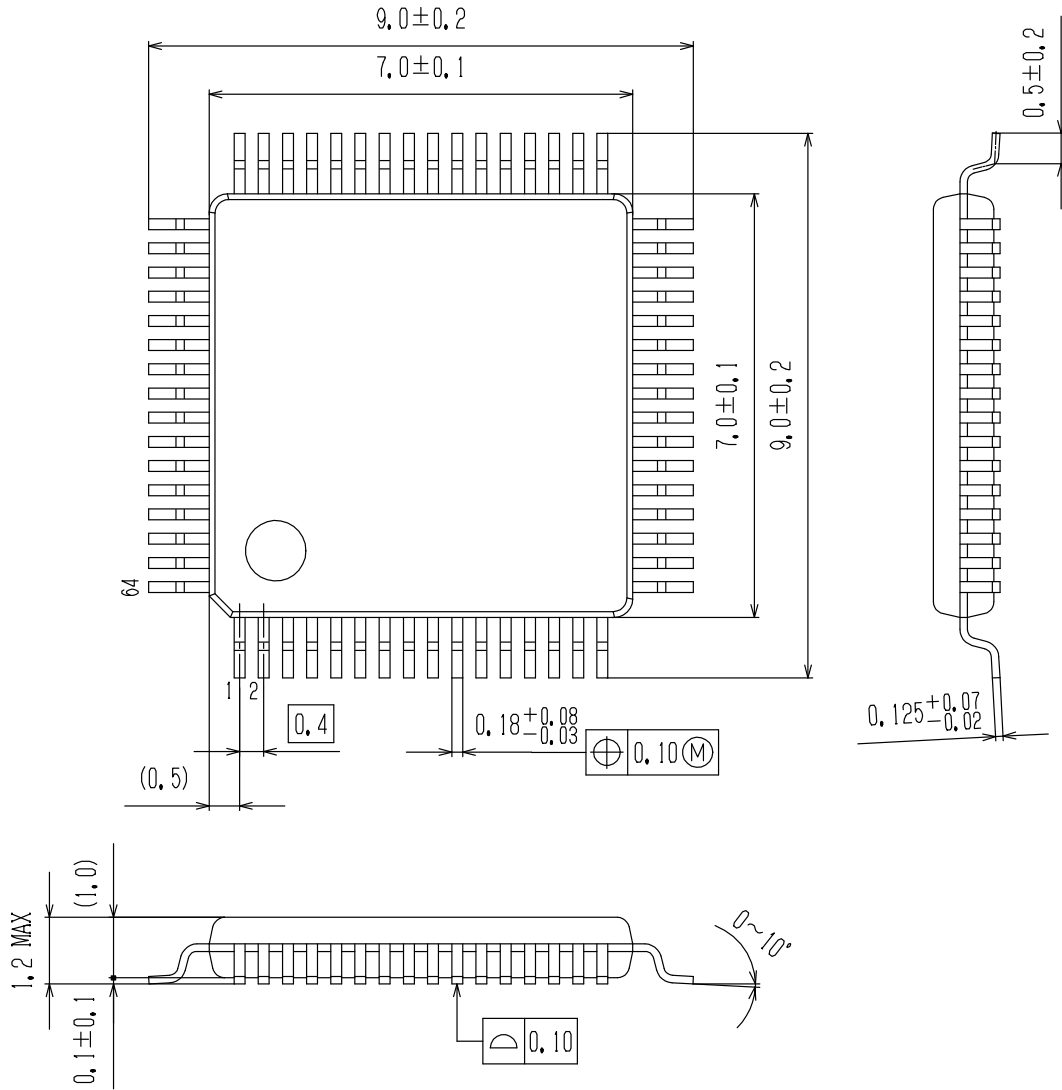
VIH:  $0.7 \times DVDD$   
 VIL:  $0.2 \times DVDD$

| 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   |

# LC898201

## PACKAGE DIMENSIONS

TQFP64 7x7 / TQFP64  
CASE 932BC  
ISSUE O

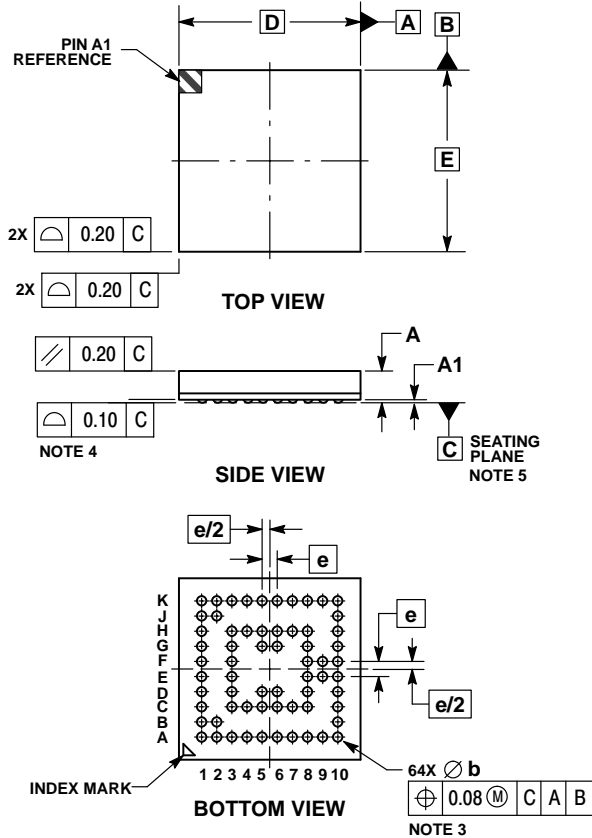




# LC898201

## PACKAGE DIMENSIONS

FBGA64 6x6  
CASE 113BL  
ISSUE O

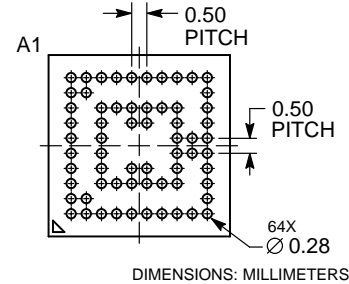


**NOTES:**

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

| MILLIMETERS |          |      |
|-------------|----------|------|
| DIM         | MIN      | MAX  |
| A           | ---      | 1.05 |
| A1          | 0.05     | 0.15 |
| b           | 0.24     | 0.34 |
| D           | 6.00 BSC |      |
| E           | 6.00 BSC |      |
| e           | 0.50 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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