

6-channel CCD Vertical Clock Driver**Description**

The CXD3400N is a vertical clock driver for CCD image sensor. This IC is composed of 6 channels which supports high frame rate readout mode.

Features

- Composition
 - Vertical transfer output 3 levels driver × 4
2 levels driver × 2
 - Electronic shutter output 2 levels driver × 1
- Suitable drive capability for high-pixel CCD (40% improved compared to current device)
- Small package (20-pin SSOP)
- 2.7 to 5.5V supported input interface

Applications

Digital still camera

Structure

CMOS

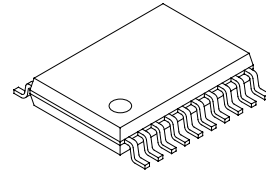
Absolute Maximum Ratings

| | | | |
|-------------------------|------------------|-------------------------------------|----|
| • Supply voltage | V _{DD} | GND – 0.3 to +7.0 | V |
| • Supply voltage | V _L | GND to –10 | V |
| • Supply voltage | V _H | V _L + 26 | V |
| • Input voltage | V _{IN} | GND – 0.3V to V _{DD} + 0.3 | V |
| • Operating temperature | T _{opr} | –20 to +75 | °C |
| • Storage temperature | T _{stg} | –55 to +150 | °C |

Recommended Operating Conditions

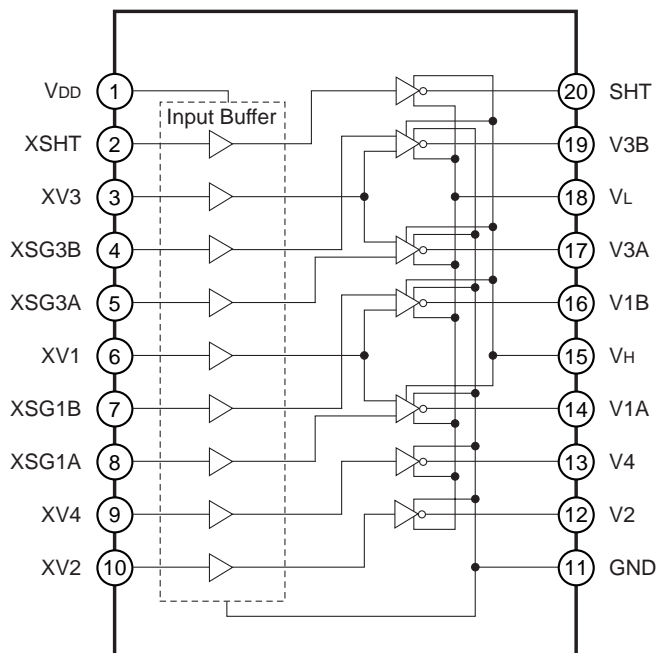
| | | | |
|-------------------------|------------------|--------------|----|
| • Supply voltage | V _{DD} | 2.7 to 5.5 | V |
| • Supply voltage | V _L | –5.0 to –9.0 | V |
| • Supply voltage | V _H | 11.5 to 15.5 | V |
| • Operating temperature | T _{opr} | –20 to +75 | °C |

20 pin SSOP (Plastic)



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Block Diagram



Pin Description

| Pin No. | Symbol | I/O | Functions |
|---------|----------------|-----|---|
| 1 | VDD | — | Input power supply (3.3V system) |
| 2 | XSHT | I | SHT pulse input |
| 3 | XV3 | I | V3A and V3B transfer pulse input |
| 4 | XSG3B | I | V3B readout pulse input |
| 5 | XSG3A | I | V3A readout pulse input |
| 6 | XV1 | I | V1A and V1B readout pulse input |
| 7 | XSG1B | I | V1B readout pulse input |
| 8 | XSG1A | I | V1A readout pulse input |
| 9 | XV4 | I | V4 transfer pulse input |
| 10 | XV2 | I | V2 transfer pulse input |
| 11 | GND | — | GND (= V _M) |
| 12 | V2 | O | High voltage output (2 levels: V _M , V _L) |
| 13 | V4 | O | High voltage output (2 levels: V _M , V _L) |
| 14 | V1A | O | High voltage output (3 levels: V _H , V _M , V _L) |
| 15 | V _H | — | Positive power supply for high voltage output (15V system) |
| 16 | V1B | O | High voltage output (3 levels: V _H , V _M , V _L) |
| 17 | V3A | O | High voltage output (3 levels: V _H , V _M , V _L) |
| 18 | V _L | — | Negative power supply for high voltage output (−7.5V system) |
| 19 | V3B | O | High voltage output (3 levels: V _H , V _M , V _L) |
| 20 | SHT | O | High voltage output (2 levels: V _H , V _L) |

Truth Table

| Input | | | | Output | | |
|--------|-------------------|--------|------|-----------------|----------------|----------------|
| XV1, 3 | XSG1A, 1B, 3A, 3B | XV2, 4 | XSHT | V1A, 1B, 3A, 3B | V2, 4 | SHT |
| L | L | X | X | V _H | X | X |
| L | H | X | X | V _M | X | X |
| H | L | X | X | Z | X | X |
| H | H | X | X | V _L | X | X |
| X | X | L | X | X | V _M | X |
| X | X | H | X | X | V _L | X |
| X | X | X | L | X | X | V _H |
| X | X | X | H | X | X | V _L |

Z: High impedance X: Don't care

Electrical Characteristics

DC Characteristics

(V_{DD} = 3.3V, V_H = 15V, V_M = GND, V_L = -8.5V)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------|------------------|---------------------------------|--------------------|------|--------------------|------|
| "H" level input voltage | V _{IH} | | 0.7V _{DD} | — | — | V |
| "L" level input voltage | V _{IL} | | — | — | 0.3V _{DD} | V |
| Input current | I _{IN} | V _{IN} = GND to 5V | -10 | 0.0 | 10 | μA |
| Operating supply current | I _H | *1 | — | 0.10 | 0.20 | mA |
| Operating supply current | I _{DD} | *1 | — | 0.25 | 0.50 | mA |
| Operating supply current | I _L | *1 | -8.5 | -5.5 | — | mA |
| Output current | I _{OL} | V1A, 1B, 3A, 3B, V2, 4 = -8.25V | 10 | — | — | mA |
| Output current | I _{OM1} | V1A, 1B, 3A, 3B, V2, 4 = -0.25V | — | — | -5.0 | mA |
| Output current | I _{OM2} | V1A, 1B, 3A, 3B = 0.25V | 5.0 | — | — | mA |
| Output current | I _{OH} | V1A, 1B, 3A, 3B = 14.75V | — | — | -7.2 | mA |
| Output current | I _{OSL} | SHT = -8.25V | 5.4 | — | — | mA |
| Output current | I _{OSH} | SHT = 14.75V | — | — | -4.0 | mA |

*1 See Measurement Circuit. Shutter speed 1/10000

Note) Current direction +: inflow to IC; -: outflow from IC

Switching Characteristics

(V_{DD} = 3.3V, V_H = 15V, V_M = GND, V_L = -7.5V)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------|------------------|------------------------------------|------|------|------|------|
| Propagation delay time | T _{PLM} | *1 | 50 | 70 | 100 | ns |
| Propagation delay time | T _{PMH} | *1 | 50 | 70 | 100 | ns |
| Propagation delay time | T _{PLH} | *1 | 50 | 70 | 100 | ns |
| Propagation delay time | T _{PML} | *1 | 10 | 30 | 50 | ns |
| Propagation delay time | T _{PHM} | *1 | 10 | 30 | 50 | ns |
| Propagation delay time | T _{PHL} | *1 | 10 | 30 | 50 | ns |
| Rise time | T _{TLM} | V _L → V _M *1 | 200 | 350 | 500 | ns |
| Rise time | T _{TMH} | V _M → V _H *1 | 200 | 350 | 500 | ns |
| Rise time | T _{TLH} | V _L → V _H *1 | 30 | 60 | 90 | ns |
| Fall time | T _{TML} | V _M → V _L *1 | 200 | 350 | 500 | ns |
| Fall time | T _{THM} | V _H → V _M *1 | 200 | 350 | 500 | ns |
| Fall time | T _{THL} | V _H → V _L *1 | 30 | 60 | 90 | ns |
| Output noise voltage | V _{CLH} | *2 | — | — | 1.0 | V |
| Output noise voltage | V _{CLL} | *2 | — | — | 1.0 | V |
| Output noise voltage | V _{CMH} | *2 | — | — | 1.0 | V |
| Output noise voltage | V _{CML} | *2 | — | — | 1.0 | V |

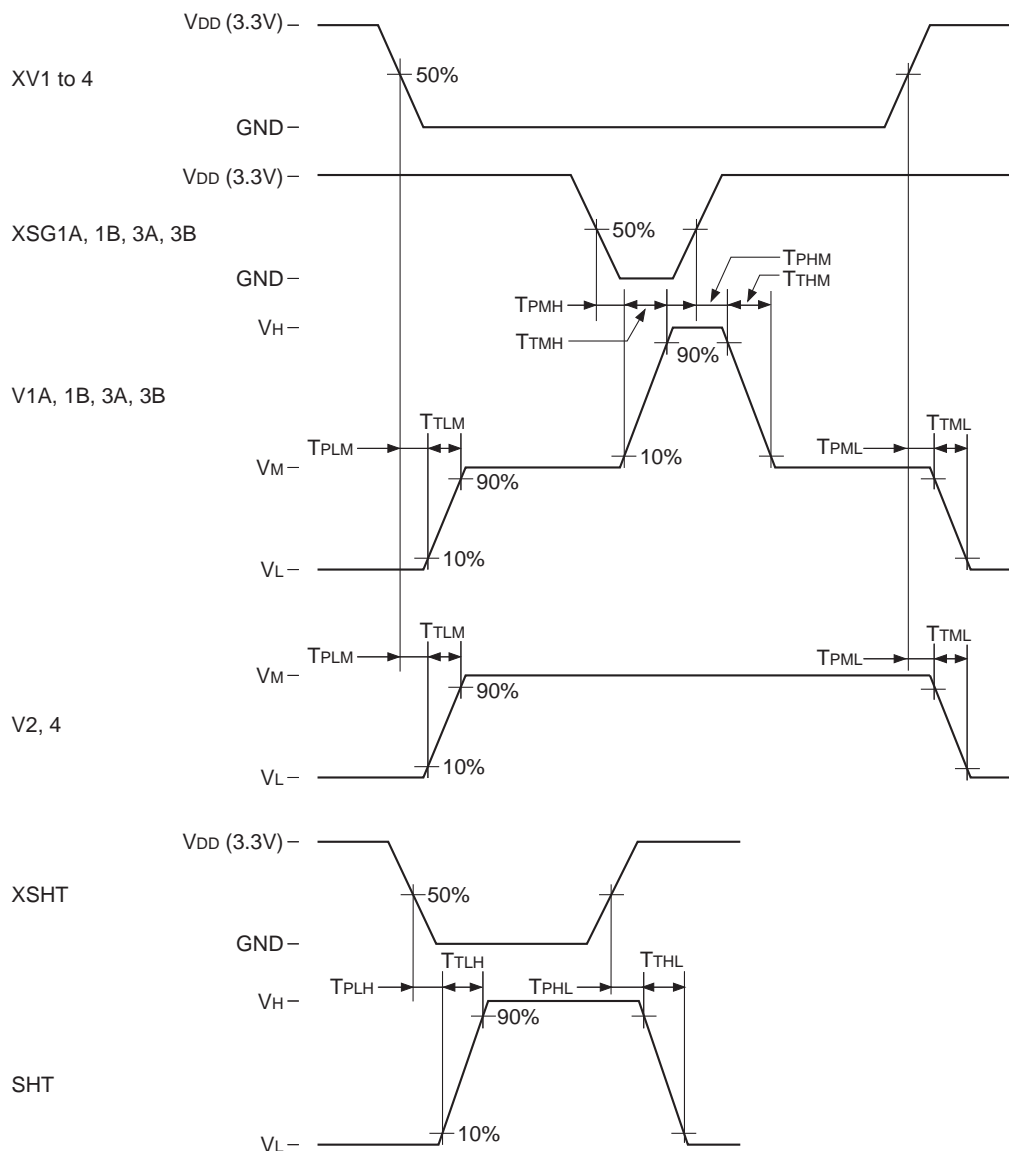
*1 See Switching Waveform.

*2 See Noise on a Waveform.

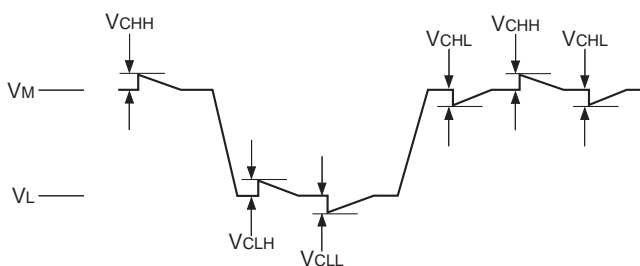
Note) Each item is evaluated by Measurement Circuit.**Notes on Operation** (See Application Circuit.)

1. Be sure to protect against static electricity because this IC is MOS structure.
2. A bypass capacitor (0.1μF or more) is connected between GND and near each power supply (V_H, V_{DD}, V_L).
3. In order to protect CCD image sensor, input SHT pin output to SUB pin of CCD image sensor after that has been clamped at V_H.

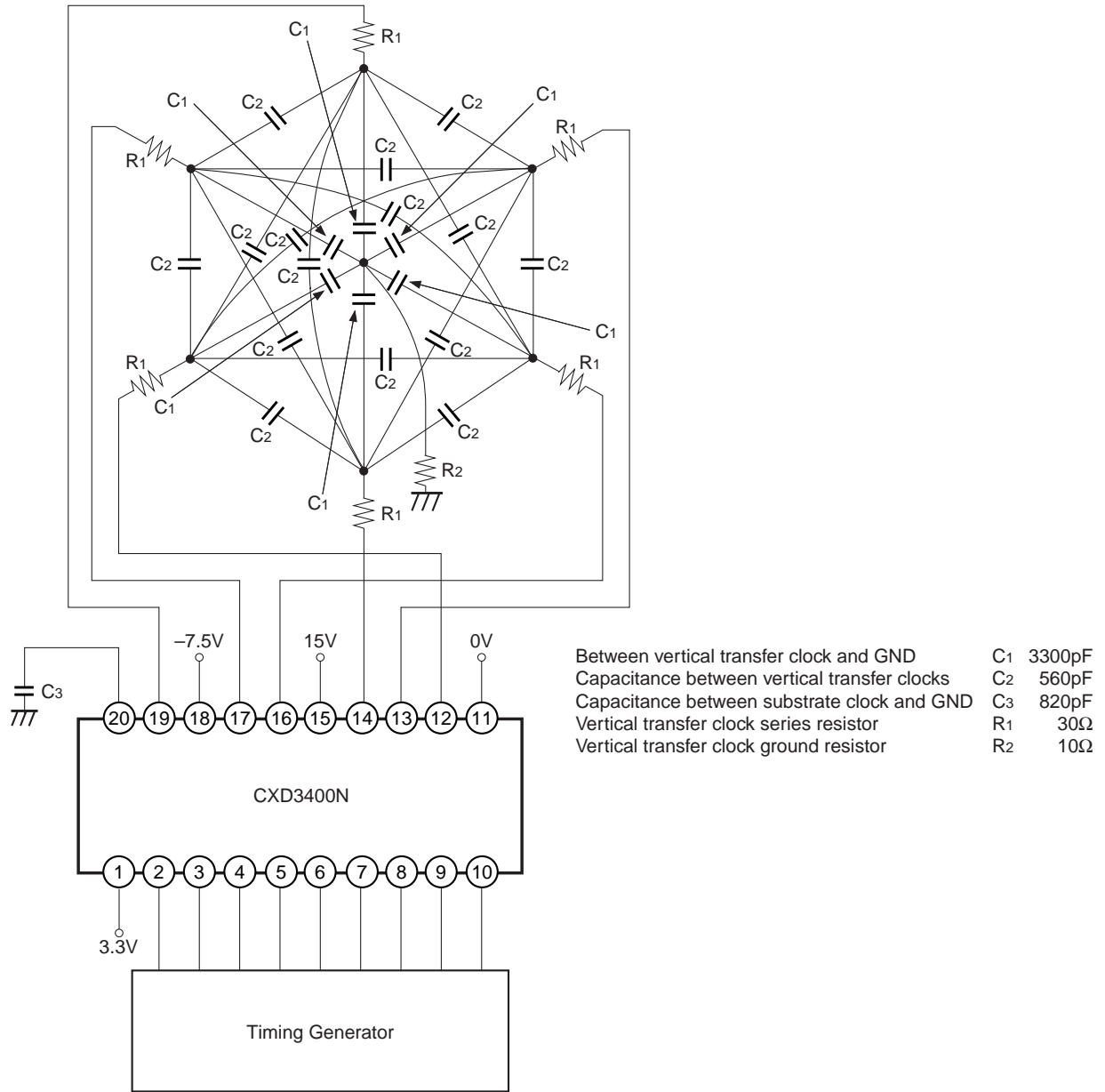
Switching Waveform



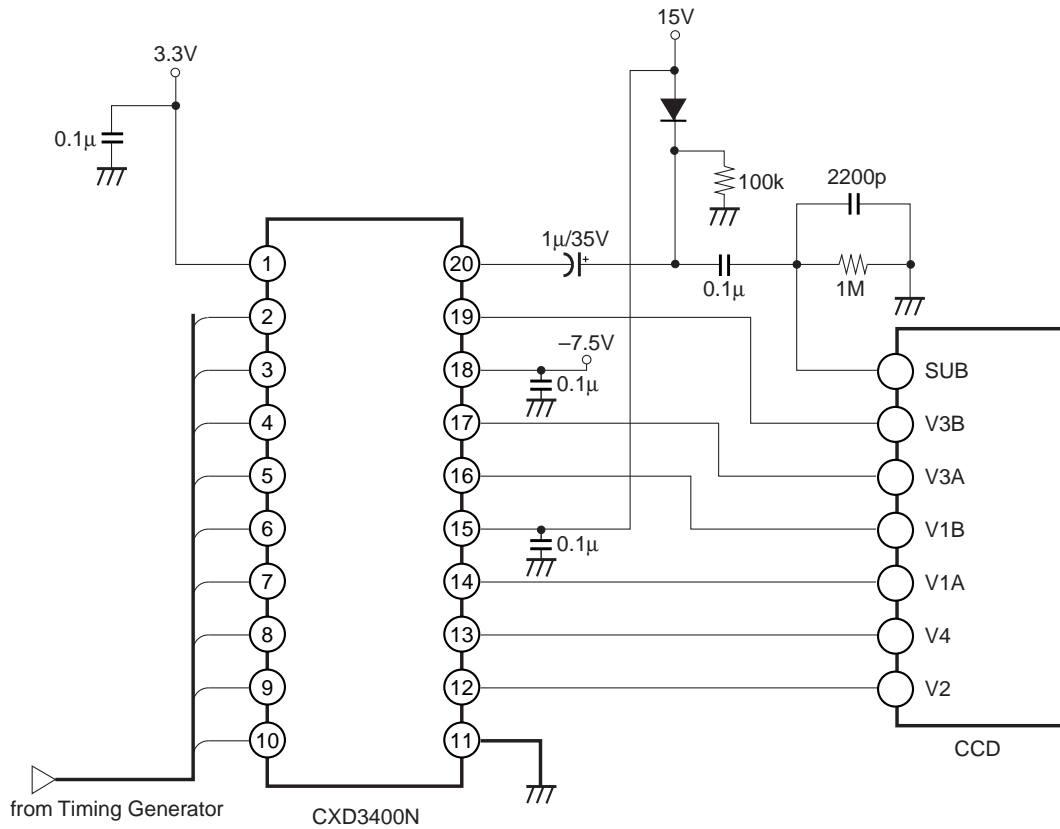
Noise on a Waveform



Measurement Circuit



Application Circuit

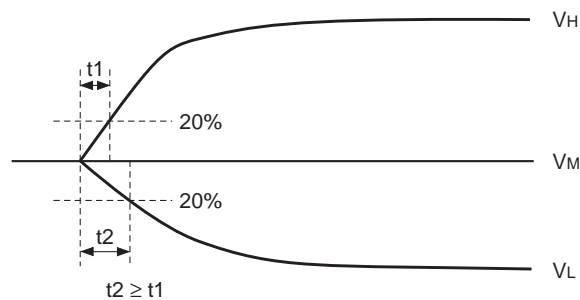


* See with drive circuit of CCD image sensor.

Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Note with Power-on Sequence

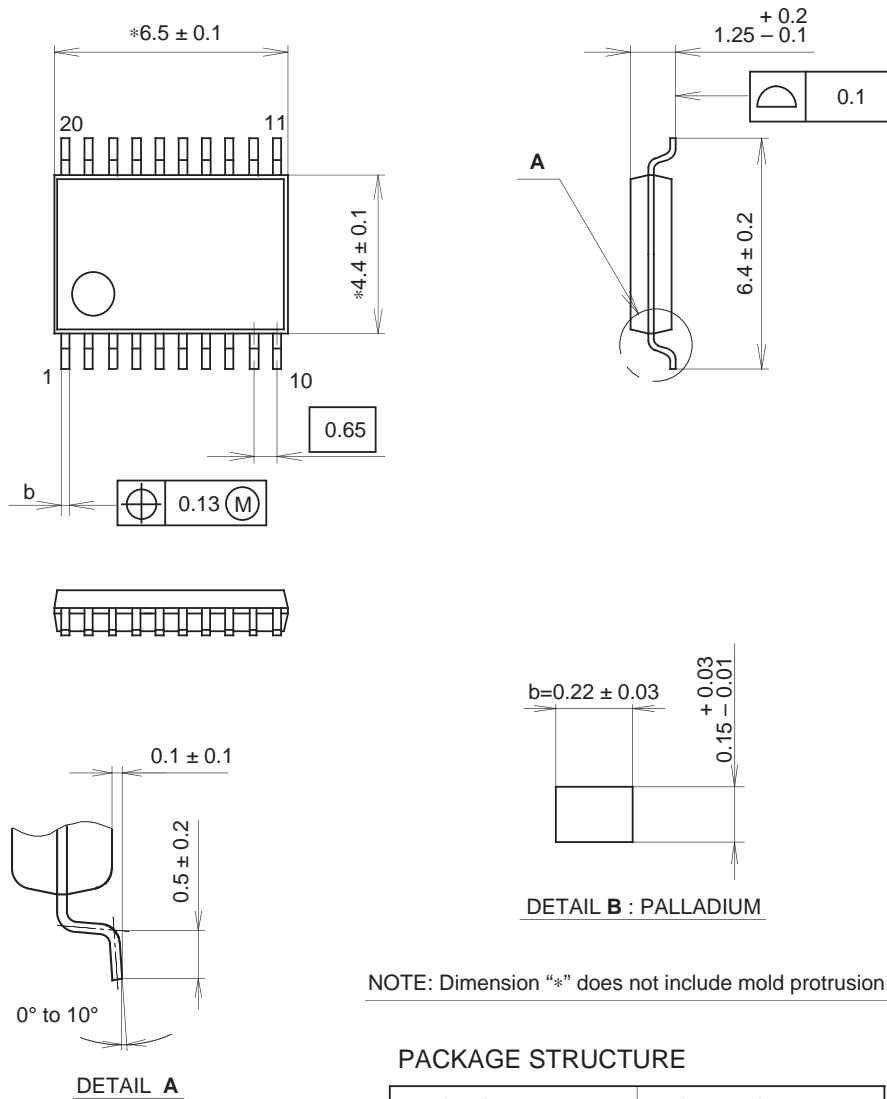
To protect CCD image sensor, rise two power supplies, V_L and V_H as follows. Note that rise V_{DD} first.



Package Outline

Unit: mm

20PIN SSOP (PLASTIC)



NOTE: Dimension "*" does not include mold protrusion.

PACKAGE STRUCTURE

| | |
|------------|----------------|
| SONY CODE | SSOP-20P-L01 |
| EIAJ CODE | SSOP020-P-0044 |
| JEDEC CODE | _____ |

| | |
|------------------|-------------------|
| PACKAGE MATERIAL | EPOXY RESIN |
| LEAD TREATMENT | PALLADIUM PLATING |
| LEAD MATERIAL | COPPER ALLOY |
| PACKAGE MASS | 0.1g |