

## 6-channel CCD Vertical Clock Driver

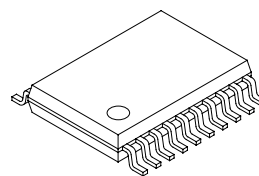
### Description

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  $\times$  4  
    2 levels driver  $\times$  2
  - Electronic shutter output   2 levels driver  $\times$  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

20 pin SSOP (Plastic)



### Applications

Digital still camera

### Structure

CMOS

### Absolute Maximum Ratings

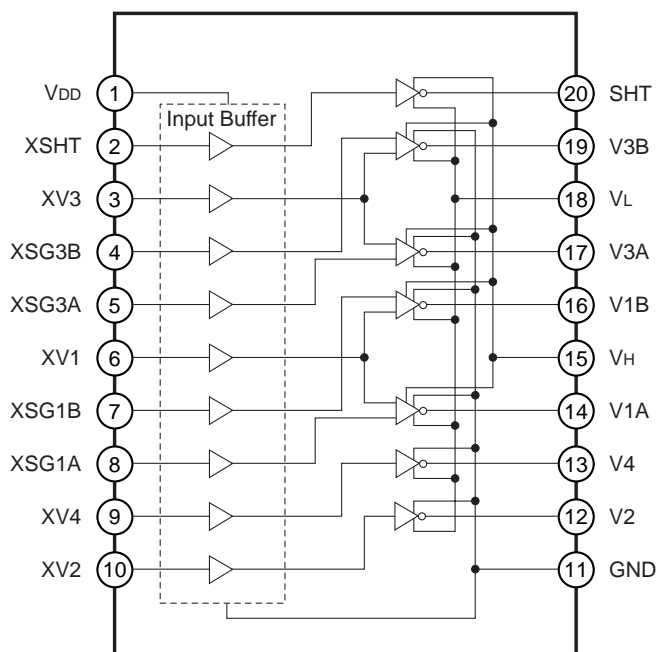
• Supply voltage	$V_{DD}$	GND – 0.3 to +7.0	V
• Supply voltage	$V_L$	GND to –10	V
• Supply voltage	$V_H$	$V_L + 26$	V
• Input voltage	$V_{IN}$	GND – 0.3V to $V_{DD} + 0.3$	V
• Operating temperature	$T_{opr}$	–20 to +75	°C
• Storage temperature	$T_{stg}$	–55 to +150	°C

### 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

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## Block Diagram



## Pin Description

Pin No.	Symbol	I/O	Functions
1	V <sub>DD</sub>	—	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 <sub>M</sub> )
12	V2	O	High voltage output (2 levels: V <sub>M</sub> , V <sub>L</sub> )
13	V4	O	High voltage output (2 levels: V <sub>M</sub> , V <sub>L</sub> )
14	V1A	O	High voltage output (3 levels: V <sub>H</sub> , V <sub>M</sub> , V <sub>L</sub> )
15	V <sub>H</sub>	—	Positive power supply for high voltage output (15V system)
16	V1B	O	High voltage output (3 levels: V <sub>H</sub> , V <sub>M</sub> , V <sub>L</sub> )
17	V3A	O	High voltage output (3 levels: V <sub>H</sub> , V <sub>M</sub> , V <sub>L</sub> )
18	V <sub>L</sub>	—	Negative power supply for high voltage output (−7.5V system)
19	V3B	O	High voltage output (3 levels: V <sub>H</sub> , V <sub>M</sub> , V <sub>L</sub> )
20	SHT	O	High voltage output (2 levels: V <sub>H</sub> , V <sub>L</sub> )

## 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 <sub>H</sub>	X	X
L	H	X	X	V <sub>M</sub>	X	X
H	L	X	X	Z	X	X
H	H	X	X	V <sub>L</sub>	X	X
X	X	L	X	X	V <sub>M</sub>	X
X	X	H	X	X	V <sub>L</sub>	X
X	X	X	L	X	X	V <sub>H</sub>
X	X	X	H	X	X	V <sub>L</sub>

Z: High impedance X: Don't care

## Electrical Characteristics

## DC Characteristics

(V<sub>DD</sub> = 3.3V, V<sub>H</sub> = 15V, V<sub>M</sub> = GND, V<sub>L</sub> = -8.5V)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
"H" level input voltage	V <sub>IH</sub>		0.7V <sub>DD</sub>	—	—	V
"L" level input voltage	V <sub>IL</sub>		—	—	0.3V <sub>DD</sub>	V
Input current	I <sub>IN</sub>	V <sub>IN</sub> = GND to 5V	-10	0.0	10	μA
Operating supply current	I <sub>H</sub>	*1	—	0.10	0.20	mA
Operating supply current	I <sub>DD</sub>	*1	—	0.25	0.50	mA
Operating supply current	I <sub>L</sub>	*1	-8.5	-5.5	—	mA
Output current	I <sub>OL</sub>	V1A, 1B, 3A, 3B, V2, 4 = -8.25V	10	—	—	mA
Output current	I <sub>OM1</sub>	V1A, 1B, 3A, 3B, V2, 4 = -0.25V	—	—	-5.0	mA
Output current	I <sub>OM2</sub>	V1A, 1B, 3A, 3B = 0.25V	5.0	—	—	mA
Output current	I <sub>OH</sub>	V1A, 1B, 3A, 3B = 14.75V	—	—	-7.2	mA
Output current	I <sub>OSL</sub>	SHT = -8.25V	5.4	—	—	mA
Output current	I <sub>OSH</sub>	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<sub>DD</sub> = 3.3V, V<sub>H</sub> = 15V, V<sub>M</sub> = GND, V<sub>L</sub> = -7.5V)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time	T <sub>PLM</sub>	*1	50	70	100	ns
Propagation delay time	T <sub>PMH</sub>	*1	50	70	100	ns
Propagation delay time	T <sub>PLH</sub>	*1	50	70	100	ns
Propagation delay time	T <sub>PML</sub>	*1	10	30	50	ns
Propagation delay time	T <sub>PHM</sub>	*1	10	30	50	ns
Propagation delay time	T <sub>PHL</sub>	*1	10	30	50	ns
Rise time	T <sub>TLM</sub>	V <sub>L</sub> → V <sub>M</sub> *1	200	350	500	ns
Rise time	T <sub>TMH</sub>	V <sub>M</sub> → V <sub>H</sub> *1	200	350	500	ns
Rise time	T <sub>TLH</sub>	V <sub>L</sub> → V <sub>H</sub> *1	30	60	90	ns
Fall time	T <sub>TML</sub>	V <sub>M</sub> → V <sub>L</sub> *1	200	350	500	ns
Fall time	T <sub>THM</sub>	V <sub>H</sub> → V <sub>M</sub> *1	200	350	500	ns
Fall time	T <sub>THL</sub>	V <sub>H</sub> → V <sub>L</sub> *1	30	60	90	ns
Output noise voltage	V <sub>CLH</sub>	*2	—	—	1.0	V
Output noise voltage	V <sub>CLL</sub>	*2	—	—	1.0	V
Output noise voltage	V <sub>CMH</sub>	*2	—	—	1.0	V
Output noise voltage	V <sub>CML</sub>	*2	—	—	1.0	V

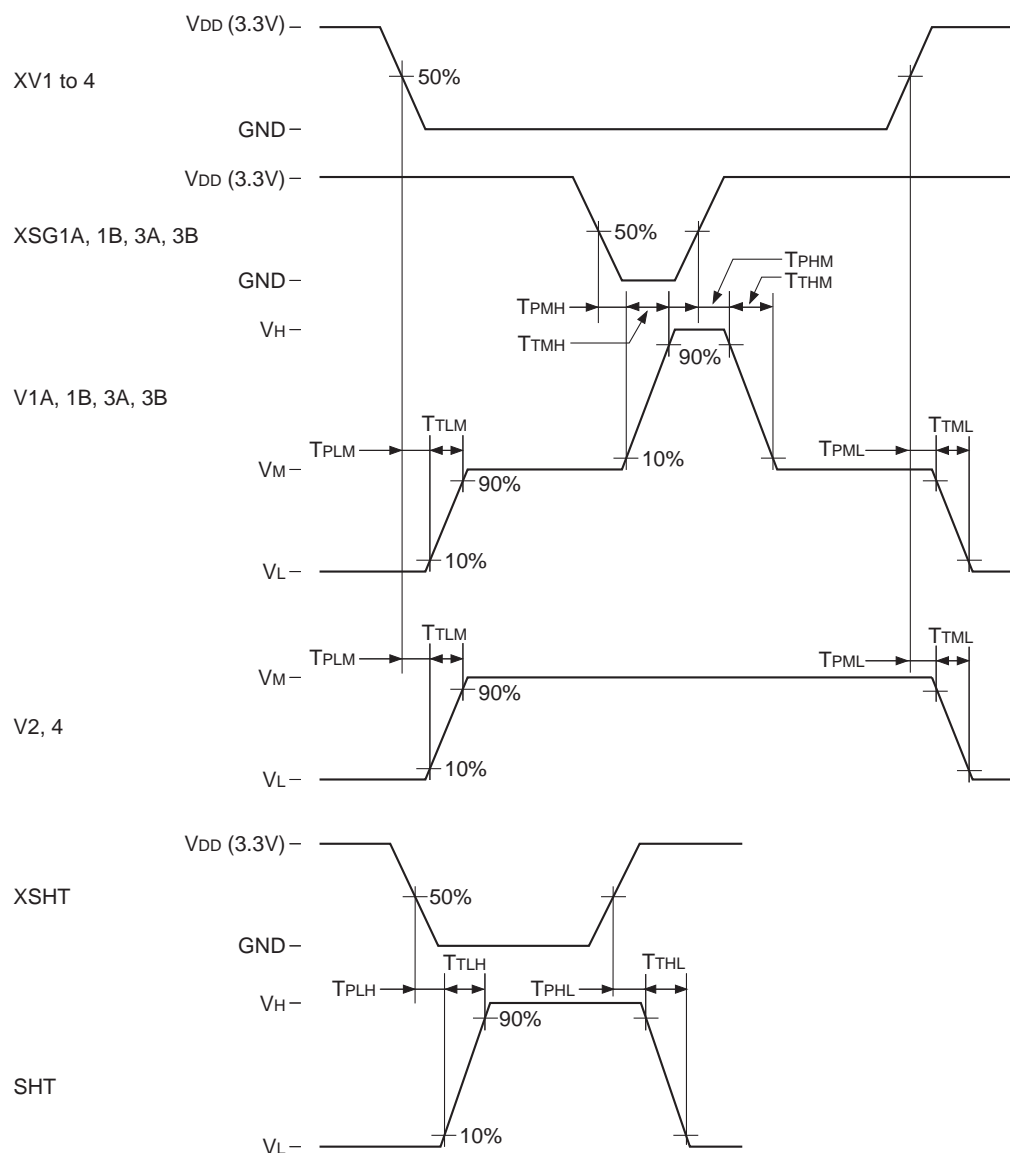
\*1 See Switching Waveform.

\*2 See Noise on a Waveform.

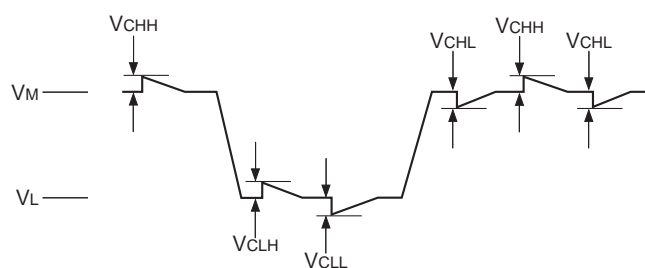
**Note)** Each item is evaluated by Measurement Circuit.**Notes on Operation** (See Application Circuit.)

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<sub>H</sub>, V<sub>DD</sub>, V<sub>L</sub>).
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<sub>H</sub>.

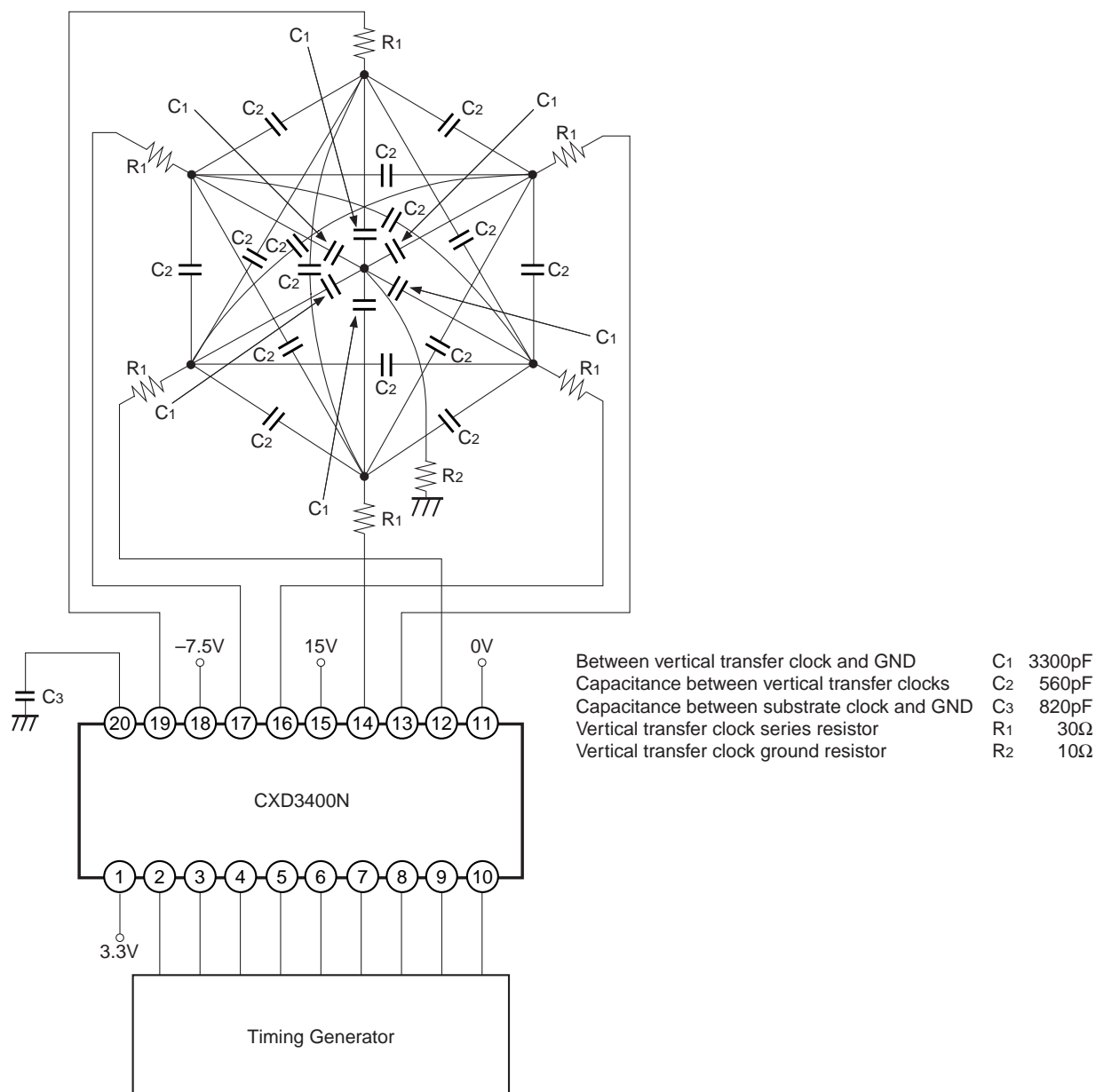
## Switching Waveform



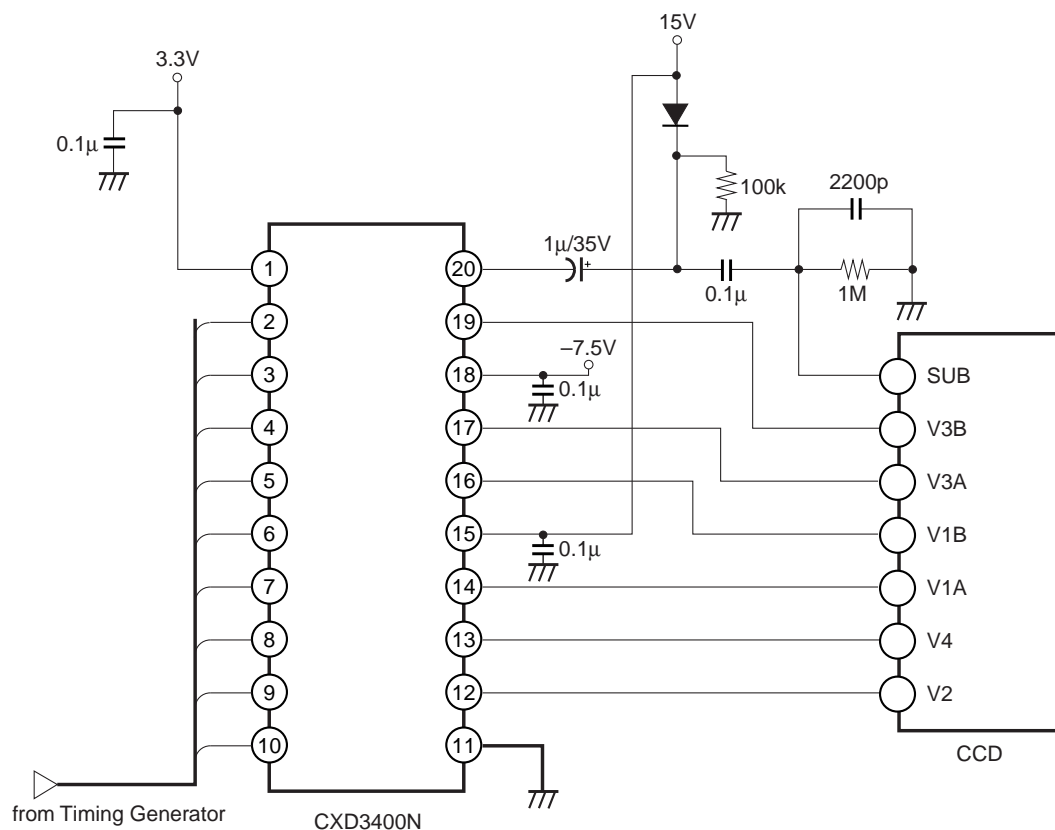
## Noise on a Waveform



# Measurement Circuit



## Application Circuit



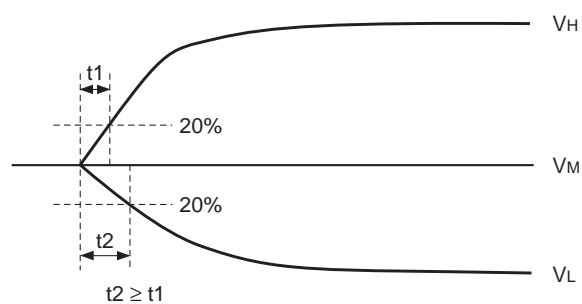
\* See with drive circuit of CCD image sensor.

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## Note with Power-on Sequence

To protect CCD image sensor, rise two power supplies,  $V_L$  and  $V_H$  as follows.

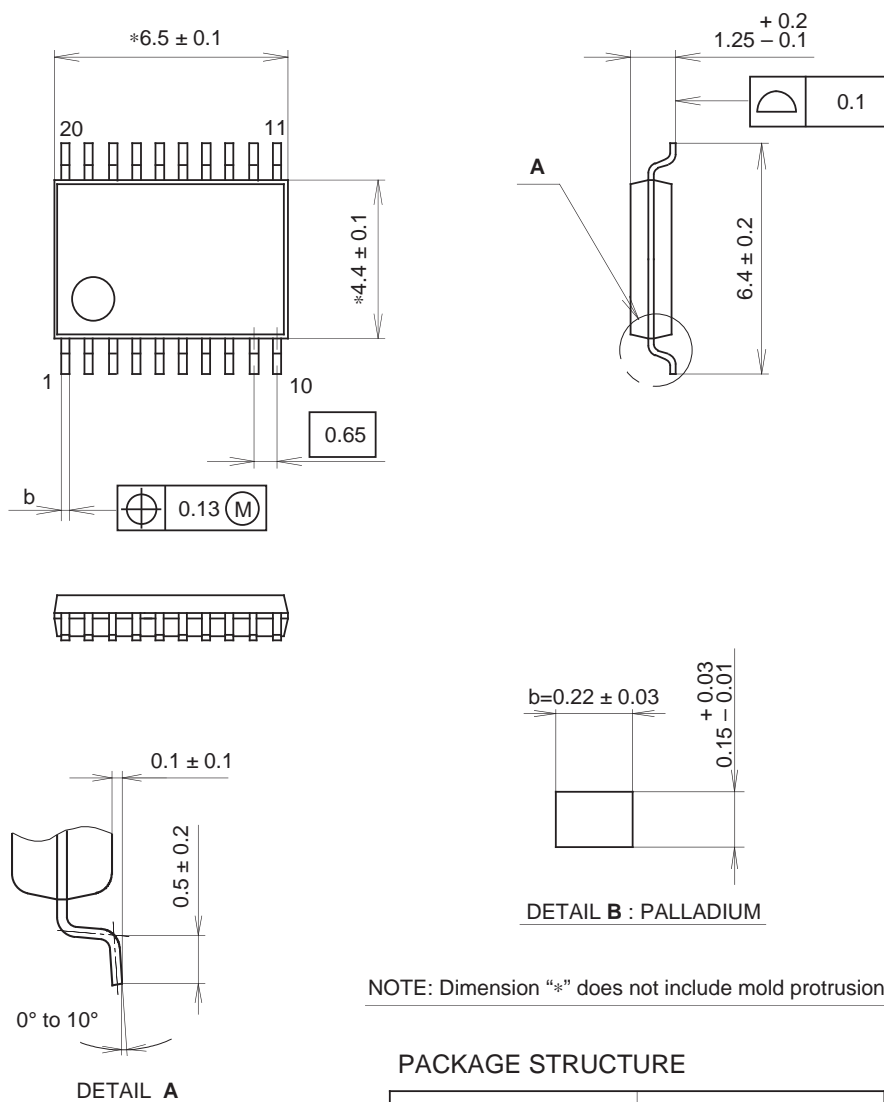
Note that rise  $V_{DD}$  first.



## 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