μPD16510A

VERTICAL DRIVER FOR CCD SENSOR

Description

The μPD16510A is a vertical driver dedicated for CCD area image sensors that incorporates a level conversion circuit and a three-level output function. It contains a CCD vertical register driver (4 channels) and a VOD shutter driver (1 channel).

The μPD16510A, which uses the CMOS process, provides optimum transmission delay and output ON resistance characteristics for the vertical drive of CCD sensors. It can be used for low-voltage logic (logic power-supply voltage: 2.0 to 5.5 V).

Features

- CCD vertical register driver : 4 channels, VOD shutter driver: 1 channel
- Small package : 20-pin plastic SSOP (5.72 mm (225))
- High breakdown voltage : 33 V MAX.
- Low output ON resistance : 30 Ω TYP.
- Low voltage operation (logic power-supply voltage: 2.0 to 5.5 V)
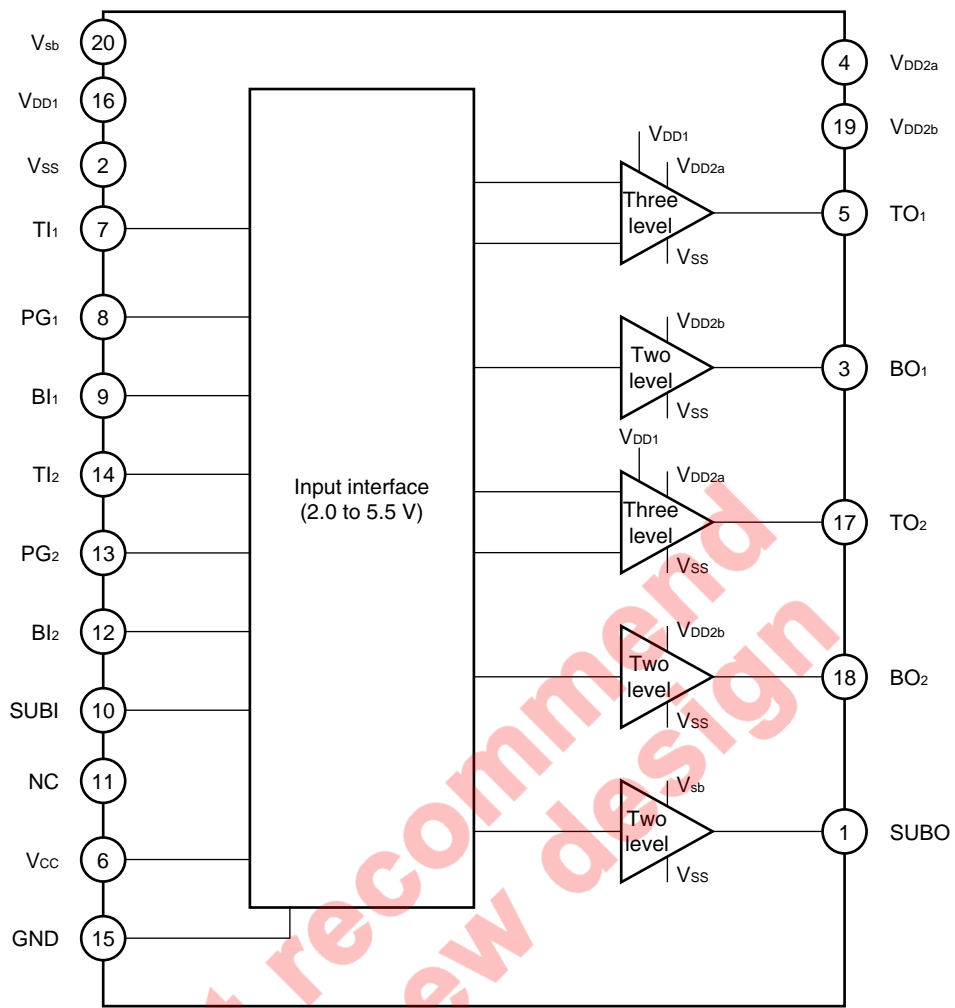- Latch-up free

Applications

- Camcorders

Ordering Information

Part No.	Packing	Package
μPD16510AGR-8JG-E1-A [1]	Tape 2500 p/reel	20-pin plastic SSOP (5.72 mm (225))
μPD16510AGR-8JG-E2-A [1]	Tape 2500 p/reel	20-pin plastic SSOP (5.72 mm (225))

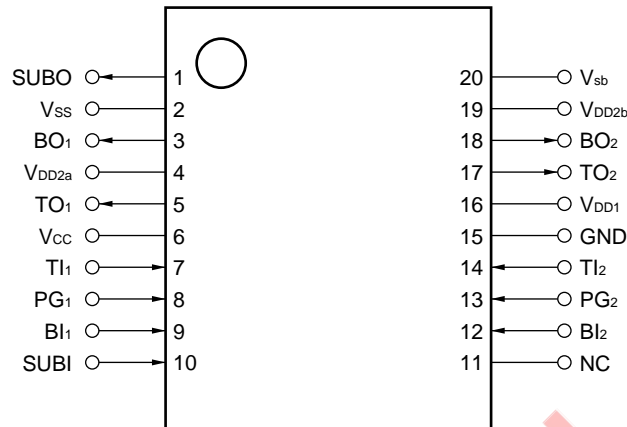Note: [1]. Pb-free (This product does not contain Pb in the external electrode and other parts.)

Block Diagram

Pin Configuration

20-pin plastic SSOP (5.72 mm (225))

Pin Functions

No	Symbol	I/O	Pin Function
1	SUBO	O	VOD shutter drive pulse output
2	V_{SS}	–	V_L power supply
3	BO_1	O	Two-level pulse output
4	V_{DD2a}	–	V_{Ma} (Three-level driver) power supply
5	TO_1	O	Three-level pulse output
6	V_{CC}	–	Logic power supply
7	TI_1	I	Three-level driver input (See Functions table on p. 4)
8	PG_1	I	
9	BI_1	I	Two-level driver input (See Functions table on p. 4)
10	SUBI	I	VOD shutter drive pulse input
11	NC	–	Non connect
12	BI_2	I	Two-level driver input (See Functions table on p. 4)
13	PG_2	I	Three-level driver input (See Functions table on p. 4)
14	TI_2	I	
15	GND	–	Ground
16	V_{DD1}	–	V_H power supply
17	TO_2	O	Three-level pulse output
18	BO_2	O	Two-level pulse output
19	V_{DD2b}	–	V_{Mb} (Two-level driver) power supply
20	V_{sb}	–	V_{HH} (for SUB drive) power supply

Functions

$V_L = V_{SS}$, $V_{Ma} = V_{DD2a}$, $V_{Mb} = V_{DD2b}$, $V_H = V_{DD1}$, $V_{HH} = V_{sb}$

Pin TO$_1$

Input		Output (TO$_1$)
TI$_1$	PG$_1$	
L	L	V_H
L	H	V_{Ma}
H	L	V_L
H	H	

Pin TO$_2$

Input		Output (TO$_2$)
TI$_2$	PG$_2$	
L	L	V_H
L	H	V_{Ma}
H	L	V_L
H	H	

Pin BO$_1$

Input	Output (BO$_1$)
BI$_1$	
L	V_{Mb}
H	V_L

Pin BO$_2$

Input	Output (BO$_2$)
BI$_2$	
L	V_{Mb}
H	V_L

Pin SUBO

Input	Output (SUBO)
SUBI	
L	V_{HH}
H	V_L

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Electrical Specifications

ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified, T_A = 25°C, GND = 0 V)

Parameter	Symbol	Conditions	Rating	Unit
Power Supply Voltage	V_{CC}		V_{SS}–0.3 to V_{SS}+20.0	V
	V_{DD1}		V_{SS}–0.3 to V_{SS}+33.0	V
	V_{DD2}		V_{SS}–0.3 to V_{SS}+33.0	V
	V_{Sb}		V_{SS}–0.3 to V_{SS}+33.0	V
Input Voltage	V_I		V_{SS}–0.3 to V_{CC}+0.3	V
Operating Ambient Temperature	T_A		–25 to +85	°C
Storage Temperature	T_{Stg}		–40 to +125	°C
Power Dissipation	P_d	T_A = 85°C	260	mW

Caution Exposure to Absolute Maximum Rating for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The parameters apply independently.

Recommended Operating Conditions (T_A = 25°C, GND = 0 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Power Supply Voltage	V_{CC}		2.0		5.5	V
	V_{DD1}	Note	10.5	15.0	21.0	V
	V_{DD1}-V_{SS}		20.5		31.0	V
	V_{DD2a}	Note	–1.0		+4.0	V
	V_{DD2b}		–1.0		+4.0	V
	V_{SS}		–10.0		–6.0	V
	V_{Sb}-V_{SS}	Note			31.0	V
Input Voltage, high	V_{IH}		0.8 V_{CC}		V_{CC}	V
Input Voltage, low	V_{IL}		0		0.3 V_{CC}	V
Operating Ambient Temperature	T_A		–20		+70	°C

Note: Set the values of V_{DD1} and V_{SS} to conform to V_{DD1}–V_{SS} specification value.

Electrical Characteristics

(Unless otherwise specified, V_{DD1} = +15 V, V_{DD2a} = 0 V, V_{DD2b} = +1.0 V, V_{sb} = +21.5 V, V_{CC} = +2.5 V, V_{SS} = –7.0 V, T_A = 25°C, GND = 0 V)

| Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage, high	V_H	I_O = –20 μA	V_{DD1} –0.1		V_{DD1}	V
Output Voltage, middle	V_{Ma}		V_{DD2a} –0.1		V_{DD2a}	V
	V_{Mb}	I_O = 20 μA	V_{DD2b} –0.1		V_{DD2b}	V
Output Voltage, low	V_L		V_{SS} +0.1		V_{SS}	V
Output Voltage, sub high	V_{subH}	I_O = –20 μA	V_{Sb} –0.1		V_{sb}	V
Output Voltage, sub low	V_{subL}	I_O = 20 μA	V_{SS} +0.1		V_{SS}	V
Output ON Resistance	R_L	I_O = 10 mA		20	30	Ω
	R_M	I_O = ±10 mA		30	45	Ω
	R_H	I_O = –10 mA		30	40	Ω
	R_{sub}			30	40	Ω
Transmission Delay Time 1	T_{D1}	No load, see Figure 2. Timing Chart.			200	ns
Transmission Delay Time 2	T_{D2}				200	ns
Transmission Delay Time 3	T_{D3}				200	ns
Rise/Fall Time 1	T_{P1}	See Figure 1. Output Load Circuit.			500	ns
Rise/Fall Time 2	T_{P2}	See Figure 2. Timing Chart.			500	ns
Rise/Fall Time 3	T_{P3}				200	ns
Consumption Current	I_{CC}	See Figure 1. Output Load Circuit.		0.5	1.0	mA
	I_{DD2a}	See Figure 3. Input Waveform.		3.0	5.0	mA
	I_{DD2b}			3.0	5.0	mA
	I_{DD1}			1.5	3.0	mA
	I_{Sb}			1.2	1.8	mA

Figure 1. Output Load Circuit
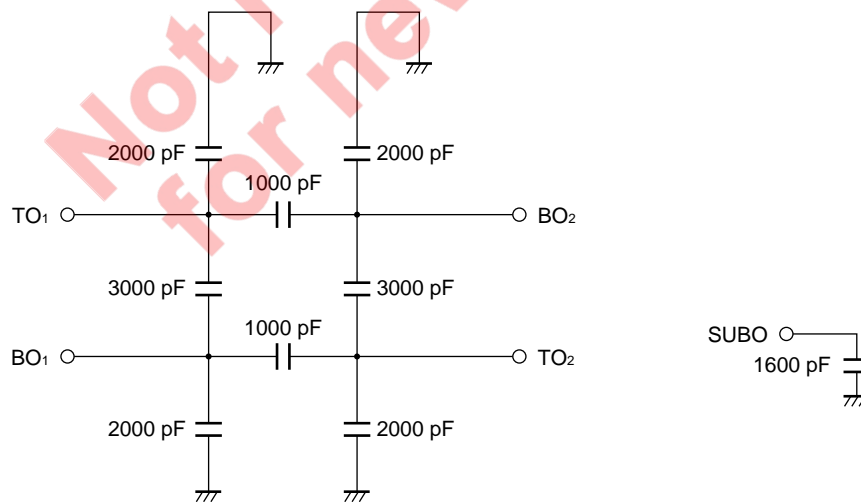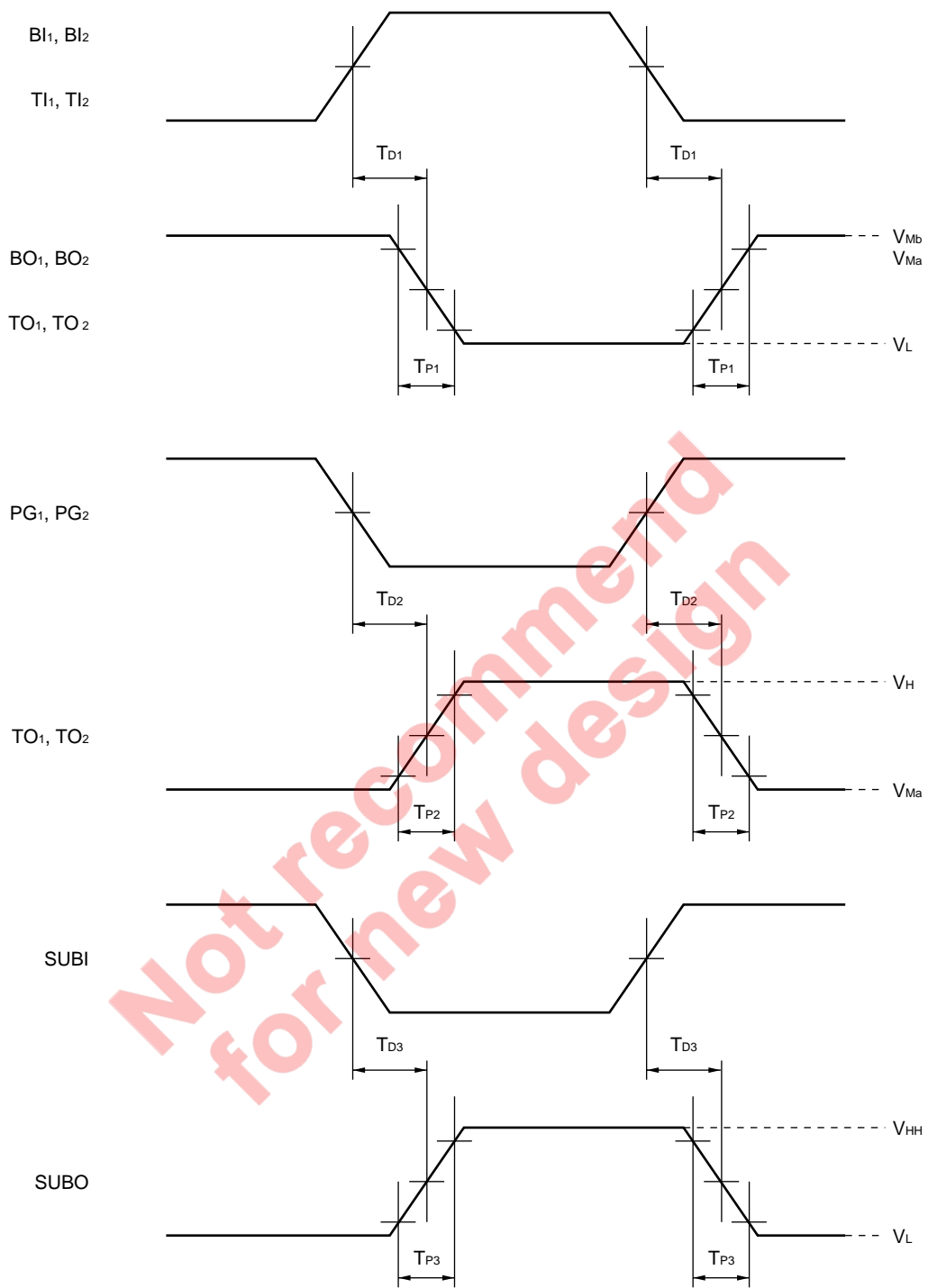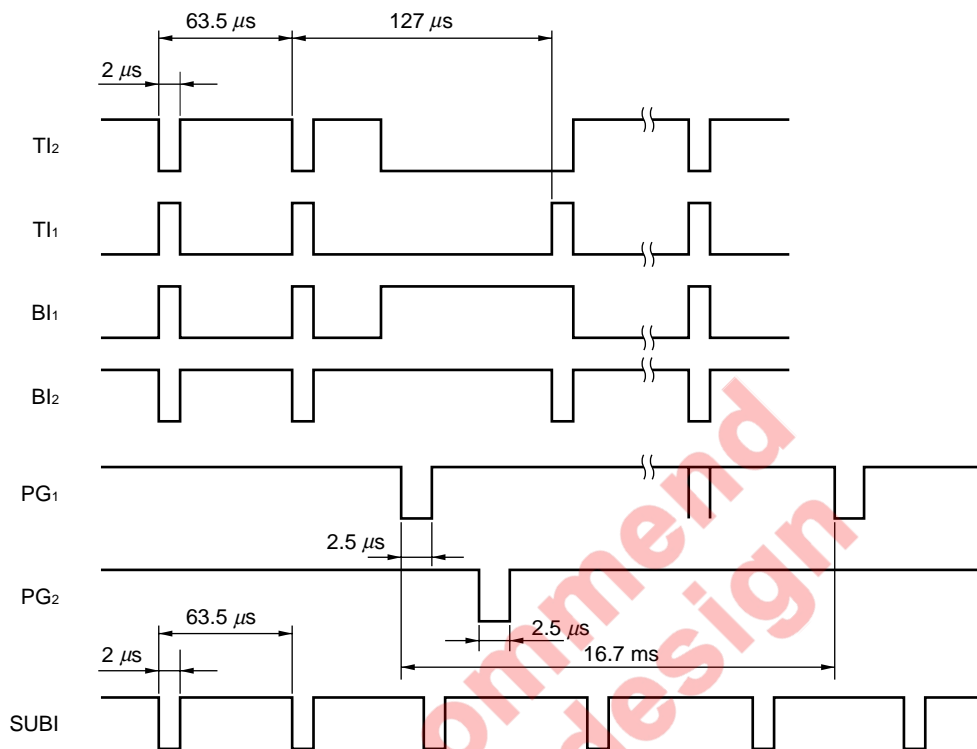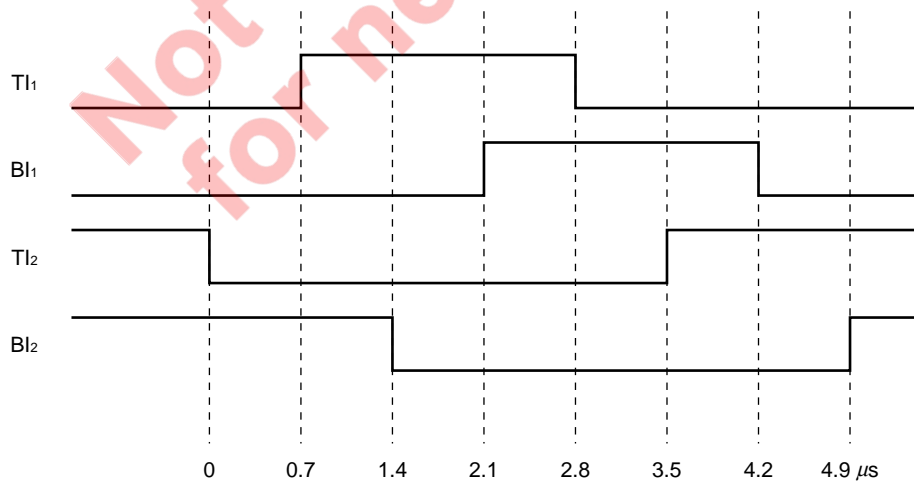
Figure 2. Timing Chart

Figure 3. Input Waveform

Input pulse timing diagram

Overlap section enlarged diagram

Note On Use

Power ON/OFF Sequence

In the µPD16510A, a PN junction (diode) exists between $V_{DD2} \rightarrow V_{DD1}$, input pin (TI$_1$, TI$_2$, PG$_1$, PG$_2$, BI$_1$, BI$_2$ and SUBI) $\rightarrow V_{CC}$, so that in the case of voltage conditions: $V_{DD2} > V_{DD1}$, input pin voltage (TI$_1$, TI$_2$, PG$_1$, PG$_2$, BI$_1$, BI$_2$ and SUBI) $> V_{CC}$, an abnormal current flows. Therefore, when turning the power ON/OFF, make sure that the following voltage conditions are satisfied: $V_{DD2} \leq V_{DD1}$, input pin voltage (TI$_1$, TI$_2$, PG$_1$, PG$_2$, BI$_1$, BI$_2$ and SUBI) $\leq V_{CC}$. Also, to minimize the negative potential applied to the SUB pin of the CCD image sensor, following the power ON/OFF sequence described below.
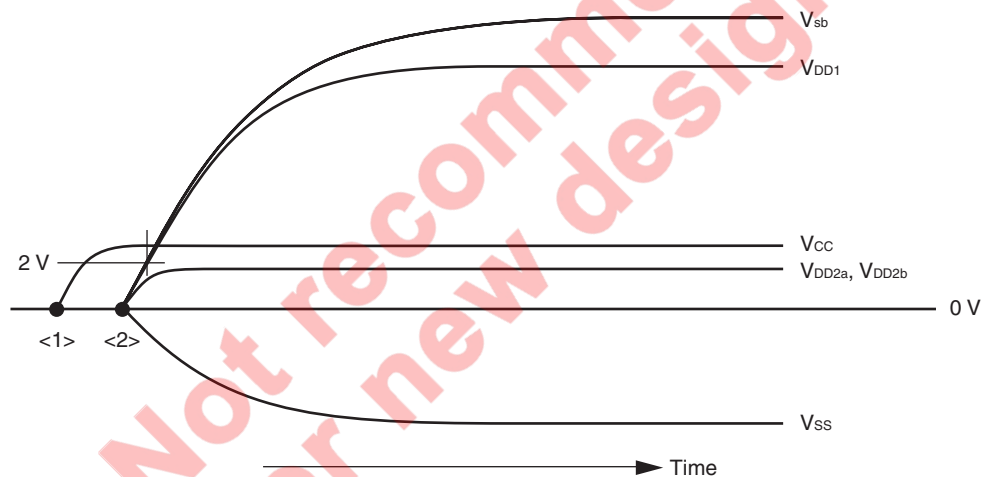
(1) Power ON

<1> Powering ON V_{CC}

Make sure that input pin voltage (TI$_1$ TI$_2$, PG$_1$, PG$_2$, BI$_1$, BI$_2$ and SUBI) $\leq V_{CC}$. Also, when V_{sb} = 2 V, make sure that V_{CC} reaches the rated voltage.

<2> Powering ON V_{sb}, V_{DD1}, V_{DD2a}, V_{DD2b} and V_{SS}

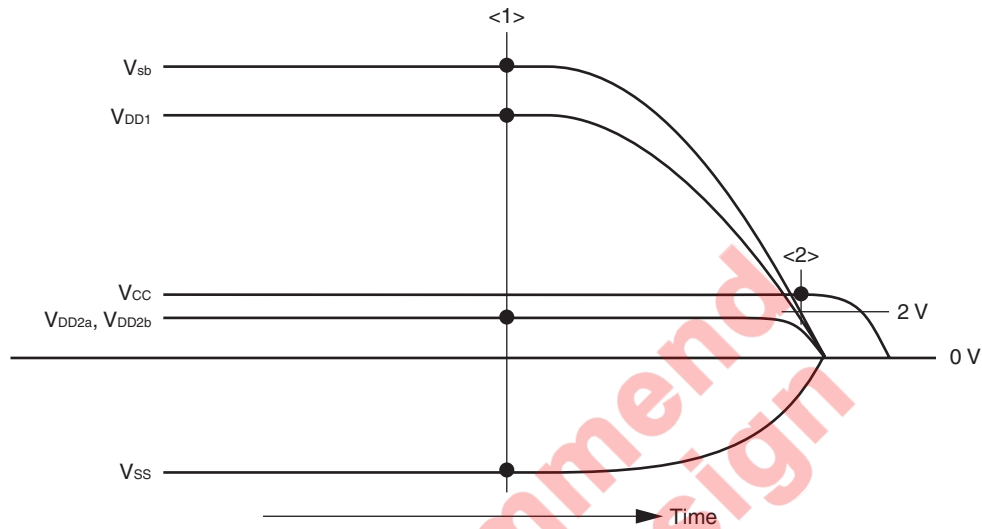At this time, make SUBI high level (0.8V_{CC} or higher)

(2) Power OFF

<1> Powering OFF V_{sb}, V_{DD1}, V_{DD2a}, V_{DD2b} and V_{SS}

Until V_{cc} power OFF, keep SUBI high level (0.8 V_{cc} or higher).

<2> Powering OFF V_{CC}

Power OFF V_{CC} when Vsb becomes 2 V or lower. At this time, make sure that the input pin voltage (TI_1, TI_2, PG_1, PG_2, BI_1, BI_2 and SUBI) $\leq V_{CC}$.
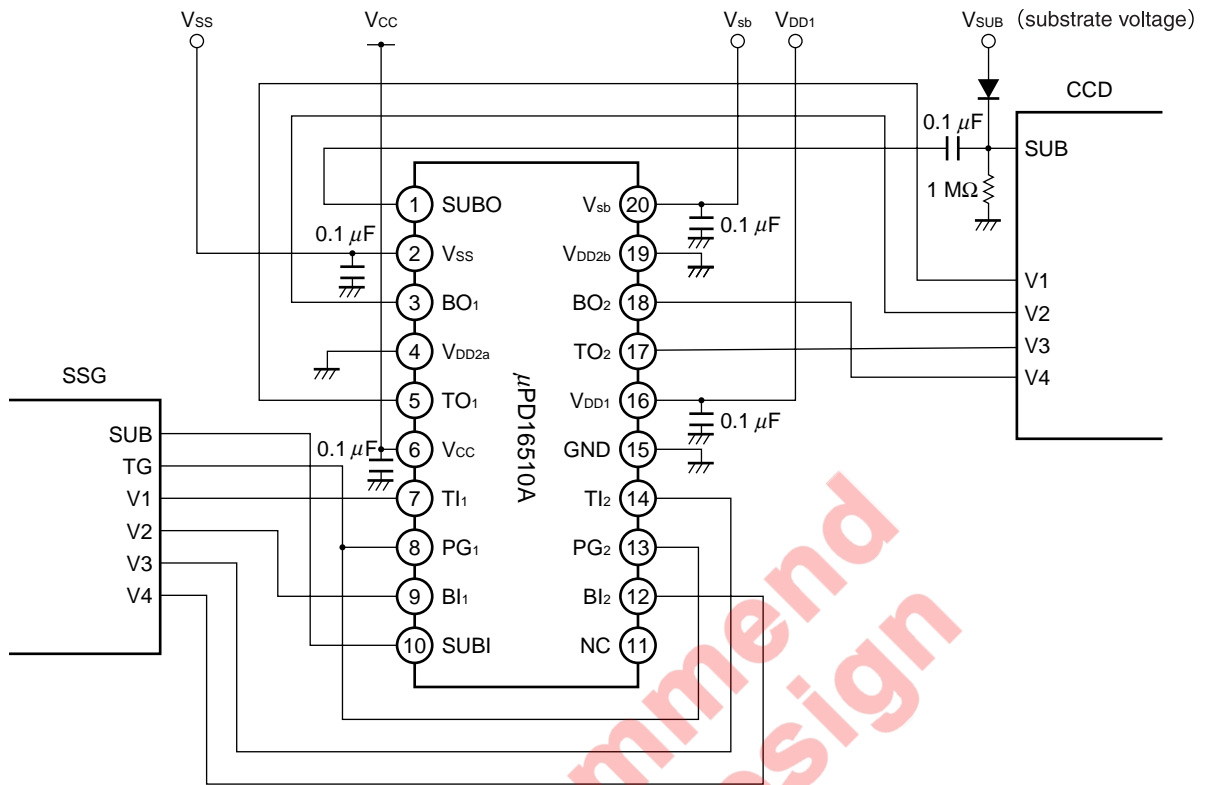

Recommended Connection of Unused Pins

Handle input pins and output pins that are not used as follows.

Input pin   : High level (connect to V_{cc})
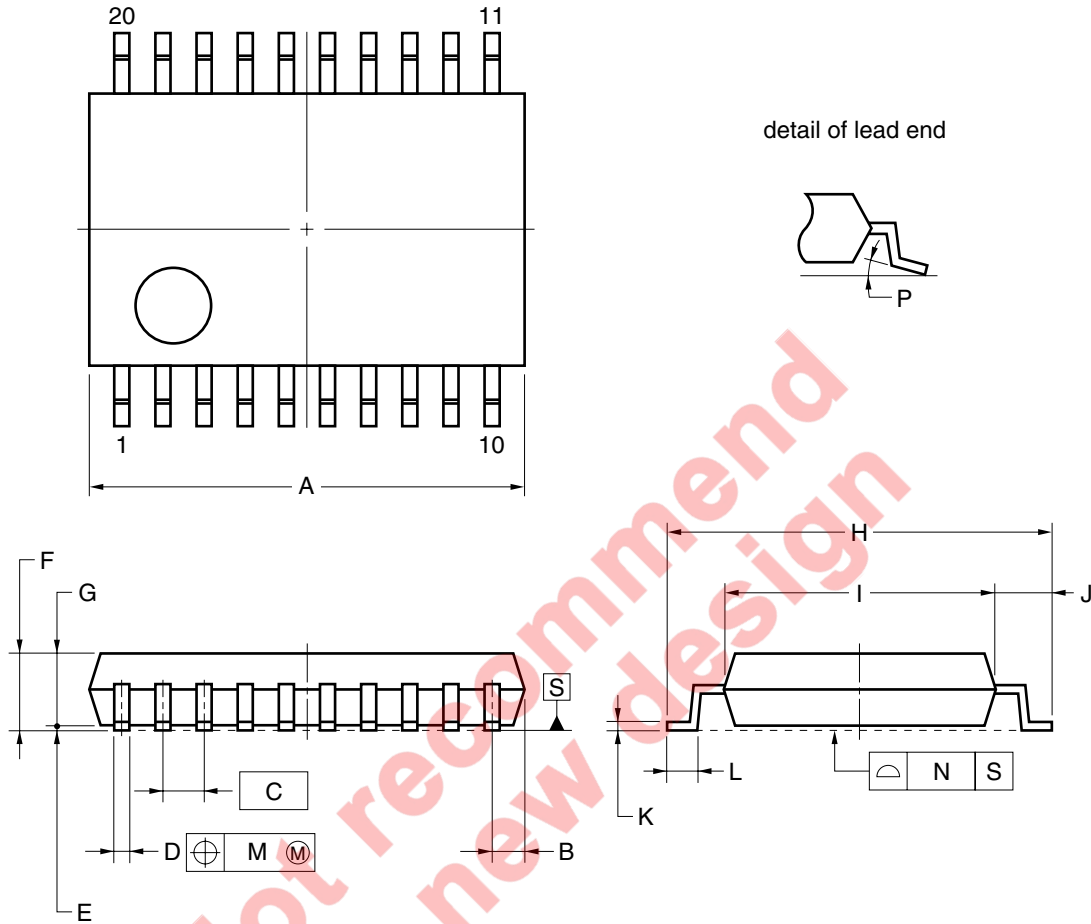
Output pin: Leave open

Application Circuit Example

Package Drawings

20-PIN PLASTIC SSOP (5.72 mm (225))

detail of lead end

NOTE

Each lead centerline is located within 0.10 mm of
its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	6.7±0.3
B	0.575 MAX.
C	0.65 (T.P.)
D	$0.22^{+0.10}_{-0.05}$
E	0.1±0.1
F	1.45 MAX.
G	1.15±0.1
H	6.4±0.2
I	4.4±0.1
J	1.0±0.2
K	$0.15^{+0.10}_{-0.05}$
L	0.5±0.2
M	0.10
N	0.10
P	$3°^{+7°}_{-3°}$

P20GR-65-225C-3

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Recommended Soldering Conditions

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For technical information, see the following website.

Semiconductor Device Mount Manual (http:// www.renesas.com/prod/package/manual/)

Surface Mount Device

μPD16510AGR-8JG: 20-pin plastic SSOP (225 mil)

Process	Conditions	Symbol
Infrared ray reflow	Peak temperature: 260°C or below (Package surface temperature), Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 times.	IR60-00-3
Wave soldering	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature).	WS60-00-1
Partial heating method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device).	–

Caution Apply only one kind of soldering condition to a device, except for "partial heating method", or the device will be damaged by heat stress.

Rev.	Date	Description	
		Page	Summary
1.00	Feb 03, 2011	–	First Edition Issued

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