

MN3114

Vertical Driver (8 channels) for CCD Area Image Sensors

■ Overview

The MN3114 is an 8-channel vertical driver for two-dimensional interline CCD area image sensors that also integrates a single SUB driver channel on the same chip.

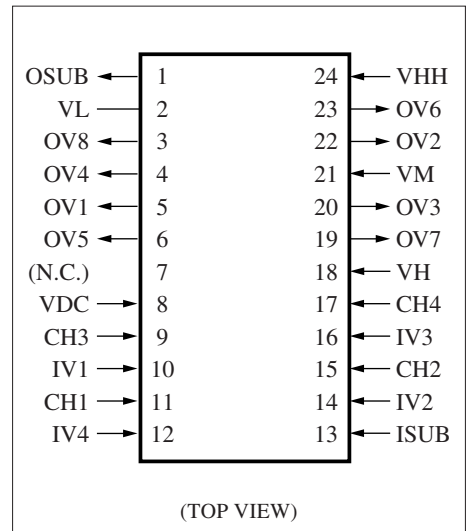
Adoption of this IC can reduce both power consumption and parts counts in end products.

■ Features

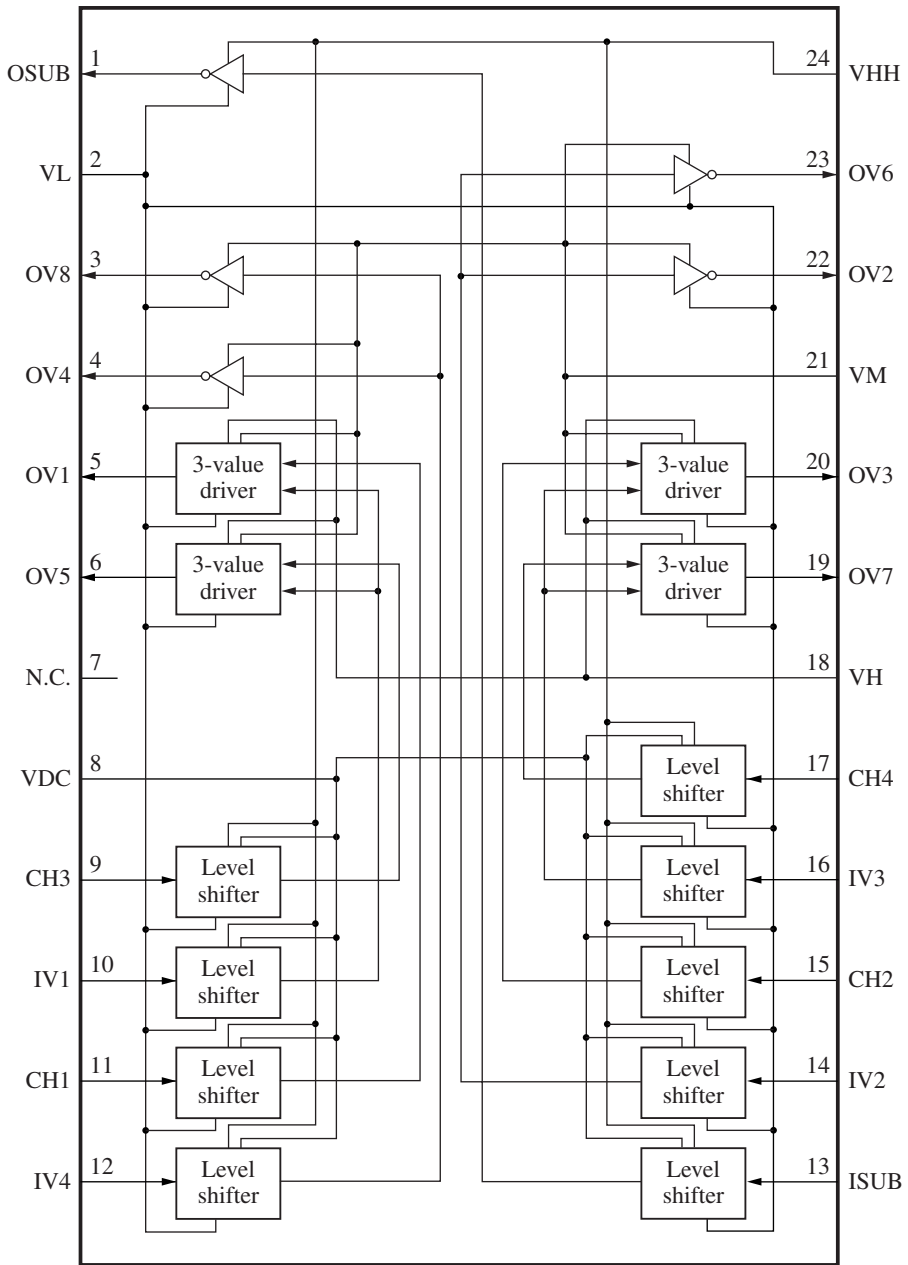
- Vertical driver block:
Consists of level shifters and 2-value/3-value output driver circuits.
- SUB driver block:
Consists of a level shifter and a 2-value output driver circuit.
- Package: 24-pin SSOP

■ Applications

- Digital still cameras, video cameras



■ Block Diagram



Note) VDC, VL, and VM: Common power supply

VHH and VH: SUB driver block and vertical driver 3-value independent power supply

■ Pin Descriptions

Pin No.	Pin name		I/O	Description
8	VDC	Input block high-level supply voltage	I	Low-voltage system high-level input
18	VH	Vertical driver block high-level supply voltage	I	High-voltage system high-level input
24	VHH	SUB driver block high-level supply voltage	I	High-voltage system high-level input
21	VM	Middle-level supply voltage	I	High-voltage system middle-level input
2	VL	Low-level supply voltage	I	High-voltage system low-level input
10	IV1	Transfer pulse input	I	Charge transfer pulse input
14	IV2	Transfer pulse input	I	Charge transfer pulse input
16	IV3	Transfer pulse input	I	Charge transfer pulse input
12	IV4	Transfer pulse input	I	Charge transfer pulse input
11	CH1	Charge pulse input	I	Charge readout pulse input
15	CH2	Charge pulse input	I	Charge readout pulse input
9	CH3	Charge pulse input	I	Charge readout pulse input
17	CH4	Charge pulse input	I	Charge readout pulse input
13	ISUB	SUB pulse input	I	Unneeded charge sweep-out pulse input
5	OV1	3-value transfer pulse output	O	3-value transfer pulse output (VH, VM, or VL)
22	OV2	2-value transfer pulse output	O	2-value transfer pulse output (VM or VL)
20	OV3	3-value transfer pulse output	O	3-value transfer pulse output (VH, VM, or VL)
4	OV4	2-value transfer pulse output	O	2-value transfer pulse output (VM or VL)
6	OV5	3-value transfer pulse output	O	3-value transfer pulse output (VH, VM, or VL)
23	OV6	2-value transfer pulse output	O	2-value transfer pulse output (VM or VL)
19	OV7	3-value transfer pulse output	O	3-value transfer pulse output (VH, VM, or VL)
3	OV8	2-value transfer pulse output	O	2-value transfer pulse output (VM or VL)
1	OSUB	SUB pulse output	O	Unneeded charge sweep-out pulse output (VHH or VL)
7	N.C.		—	

■ Operating Mode Table

1. 2-value transfer pulse (vertical driver block)

IV2	OV2, OV6
IV4	OV4, OV8
High	Low
Low	Mid

2. 3-value transfer pulse

CH1	IV1	OV1
CH2	IV3	OV3
CH3	IV1	OV5
CH4	IV3	OV7
High	High	Low
	Low	Mid
Low	High	Low
	Low	High

Note) IV1, IV2, IV3, IV4, CH1, CH2

High: VDC

Low: GND

OV1, OV2, OV3, OV4, OV5, OV6, OV7, OV8

High: VH

Mid: VM

Low: VL

3. Unneeded charge sweep-out pulse (SUB driver block)

ISUB	OSUB
High	Low
Low	High

Note) ISUB

High: VDC

Low: GND

OSUB

High: VHH

Low: VL

■ Timing Charts

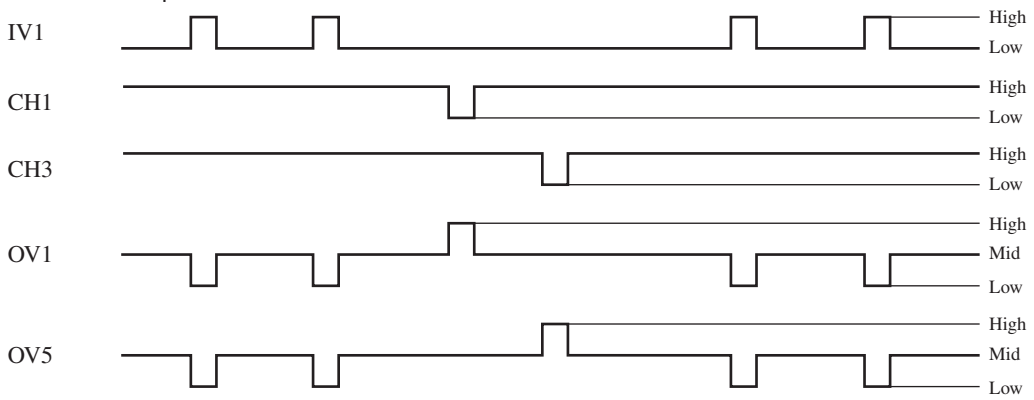
1. 2-value transfer pulse



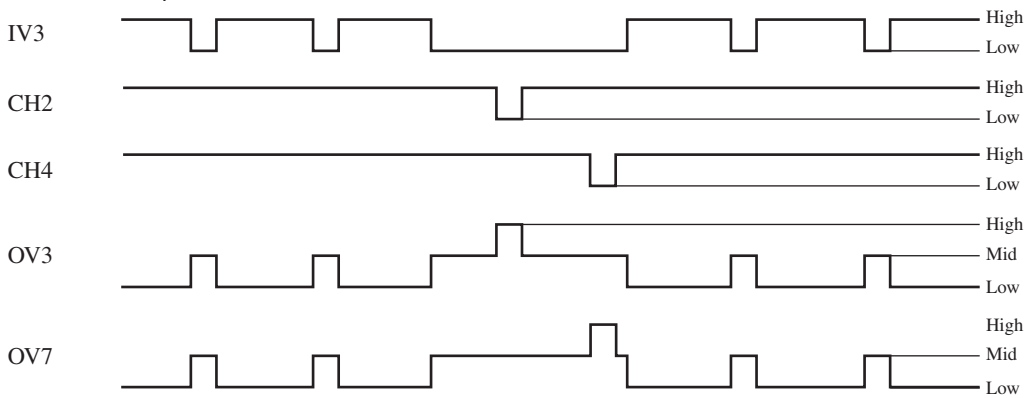
2. 2-value transfer pulse



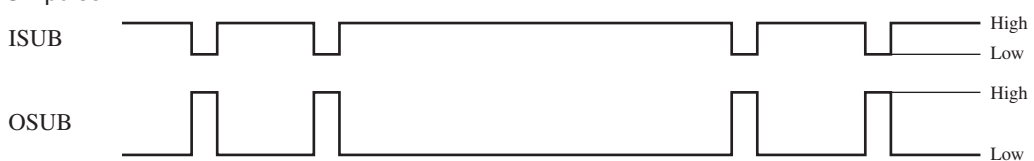
3. 3-value transfer pulse



4. 3-value transfer pulse



5. SUB pulse



■ Electrical Characteristics

1. Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage 1	VHH-VL	27	V
Supply voltage 2	VH-VL	27	V
Supply voltage 3	VM	VL to 6	V
Supply voltage 4	VDC	0 to 5.5	V
Negative supply voltage	VL	-8.5 to 0	V
Input voltage	VI	VL- 0.3 to VDC+0.3	V
Input and output clamp diode current	IIC, IOC	±10	mA
Maximum DC load current	IODC	±3	mA
Maximum load capacitance	CL	5500	pF/pin
Power dissipation *	PD	260	mW
Operating temperature	Topr	-20 to +75	°C
Storage temperature	Tstg	-50 to +125	°C

Note) 1. The absolute maximum ratings are limit values for stresses applied to the chip so that the chip will not be destroyed.
Operation is not guaranteed within these ranges.

2. *: Four-layers glass epoxy board. (Maximum $T_a = 75^\circ\text{C}$)

2. Operating Conditions at $T_a = -20^\circ\text{C}$ to $+75^\circ\text{C}$

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Negative supply voltage	VL		-8.5	—	-4	V
Supply voltage 1	VDC		2.7	—	5.5	V
Supply voltage 2	VHH		11.5	—	18.5	V
Supply voltage 3	VH		11.5	—	18.5	V
Supply voltage 4	VM		-2	—	2	V
Input frequency	fIN		—	—	500	kHz

3. DC Characteristics at VHH = 15.0 V, VH = 15.0 V, VL = -7.5 V, VDC = 2.7 V to 3.6 V, $T_a = -20^\circ\text{C}$ to $+75^\circ\text{C}$

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Quiescent supply current	IDDST	VHH, VH, VM, VL, VDC Total VI = VDC	—	—	10	μA
Operating supply current	IVHHDDYN	Refer to ■ Test conditions, 2. Input pulse timing chart and 3. Load circuit connection diagram. VI = GND, VDC	—	—	0.5	mA
	IVHDDYN		—	—	0.5	
	IVMDDYN		—	—	8	
	IVLDDYN		—	—	8.5	
	IVDCDDYN		—	—	1	

1) Input pins: IV1, IV2, IV3, IV4, CH1, CH2, CH3, CH4, ISUB

High-level voltage	VIH		VDC × 0.7	—	VDC	V
Low-level voltage	VIL		0.0	—	VDC × 0.3	V
Input leakage current	IILK	VI = 0 to VDC	-1.0	—	1.0	μA

■ Electrical Characteristics (continued)

3. DC Characteristics (continued) at V_{HH} = 15.0 V, V_H = 15.0 V, V_L = -7.5 V, V_{DC} = 2.7 V to 3.6 V, T_a = -20°C to +75°C

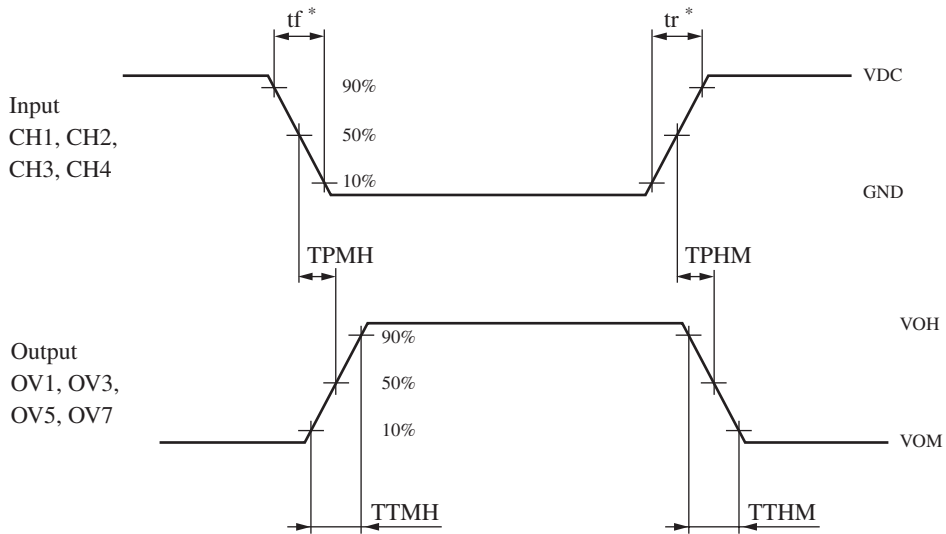
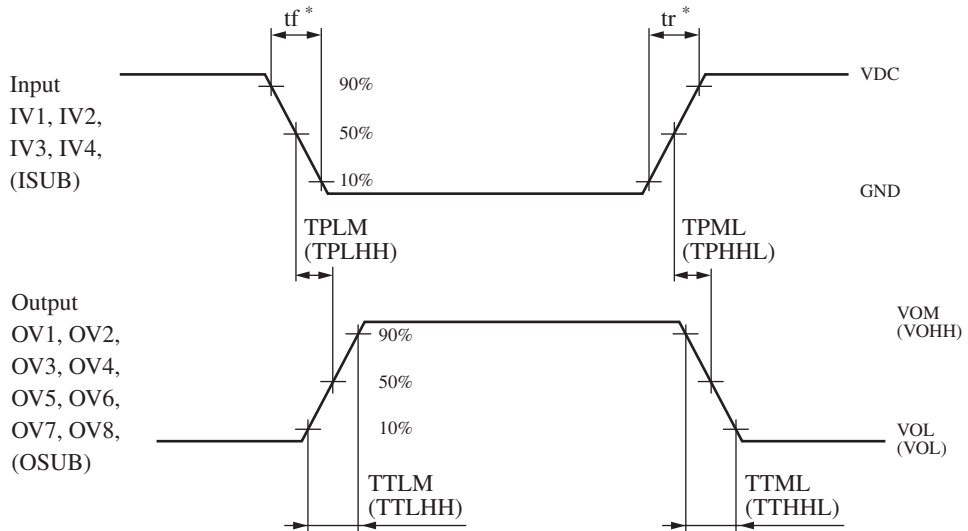
Parameter	Symbol	Condition	Min	Typ	Max	Unit
2) Output pins 1 (2-value output): OV2, OV4, OV6, OV8						
Mid-level output voltage	VOM1	IOM1 = -1 mA	-0.1	—	V _M	V
Low-level output voltage	VOL1	IOL1 = 1 mA	V _L	—	-7.4	V
Mid-level output on resistance	RONM1	IOM1 = -10 mA	—	—	40	Ω
Low-level output on resistance	RONL1	IOL1 = 10 mA	—	—	30	Ω
3) Output pins 2 (3-value output): OV1, OV3, OV5, OV7						
High-level output voltage	VOH2	IOH2 = 1 mA	14.9	—	V _H	V
Mid-level output voltage	VOM2	IOM2 = 1 mA	-0.1	—	V _M	V
Low-level output voltage	VOL2	IOL2 = 1 mA	V _L	—	-7.4	V
Output on resistance (high level)	RONH2	IOH2 = 10 mA	—	—	40	Ω
Output on resistance (mid level)	RONM2	IOM2 = ±10 mA	—	—	30	Ω
Output on resistance (low level)	RONL2	IOL2 = 10 mA	—	—	30	Ω
4) Output pins 3 (SUB output): OSUB						
High-level output voltage	VOHH3	IOHH3 = -1 mA	14.9	—	V _{HH}	V
Low-level output voltage	VOL3	IOL3 = 1 mA	V _L	—	-7.4	V
Output on resistance (high level)	RONHH3	IONHH3 = -10 mA	—	—	40	Ω
Output on resistance (low level)	RONL3	IOL3 = 10 mA	—	—	30	Ω

4. AC Characteristics at V_{HH} = 15.0 V, V_H = 15.0 V, V_L = -7.5 V, V_{DC} = 2.7 V to 3.6 V, T_a = -20°C to +75°C

Parameter	Symbol	Condition	Min	Typ	Max	Unit
1) Output pins 1 (2-value output): OV2, OV4, OV6, OV8						
Transmission delay time	TPLM TPML	No load	—	100	200	ns
Rise time Fall time	TTLM TTML	Load circuit	—	200	400	ns
2) Output pins 2 (3-value output): OV1, OV3, OV5, OV7						
Transmission delay time	TPLM TPML	No load	—	100	200	ns
	TPMH TPHM		—	100	200	
Rise time Fall time	TTLM TTML	Load circuit	—	200	400	ns
	TTMH TTHM		—	200	400	
3) Output pins 3 (SUB output): OSUB						
Transmission delay time	TPLHH TPHHL	No load	—	100	200	ns
Rise time Fall time	TTLHH TTHHL		—	200	400	ns

■ Test Conditions

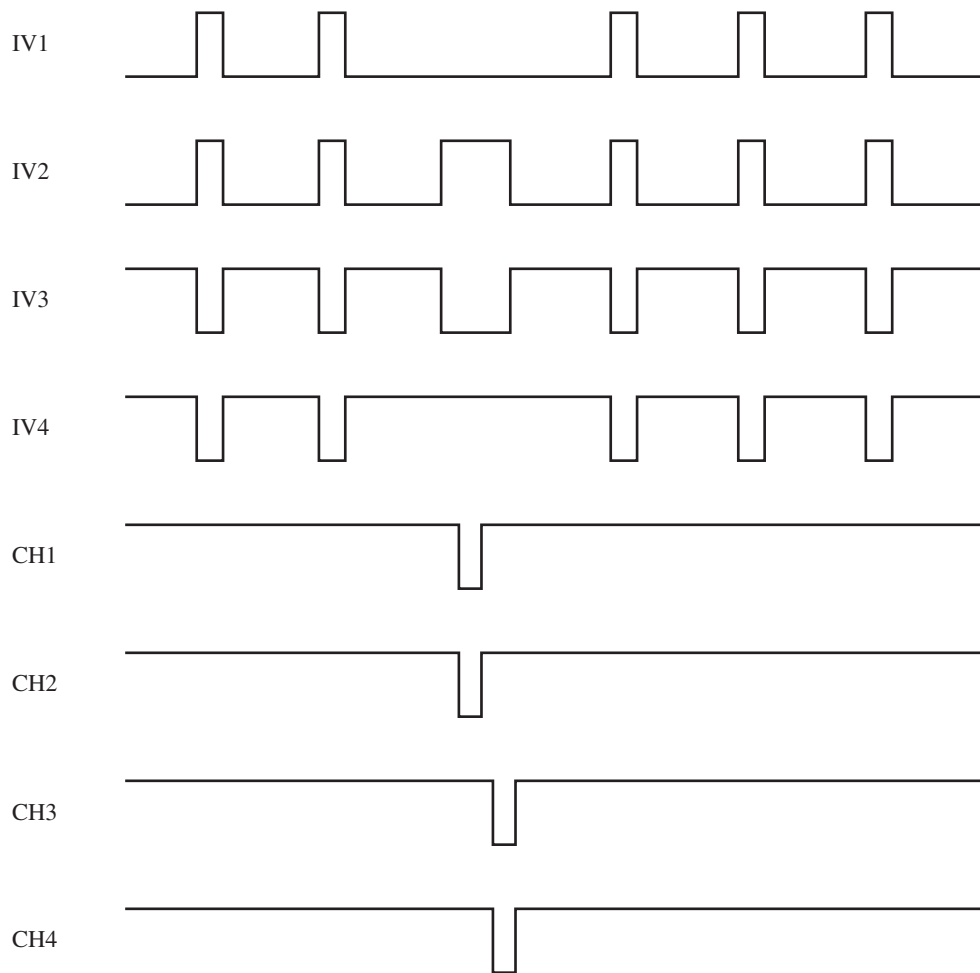
1. Transmission delay time, rise time, and fall time



Note *: $tr = tf = 20 \text{ ns}$ (typ.)

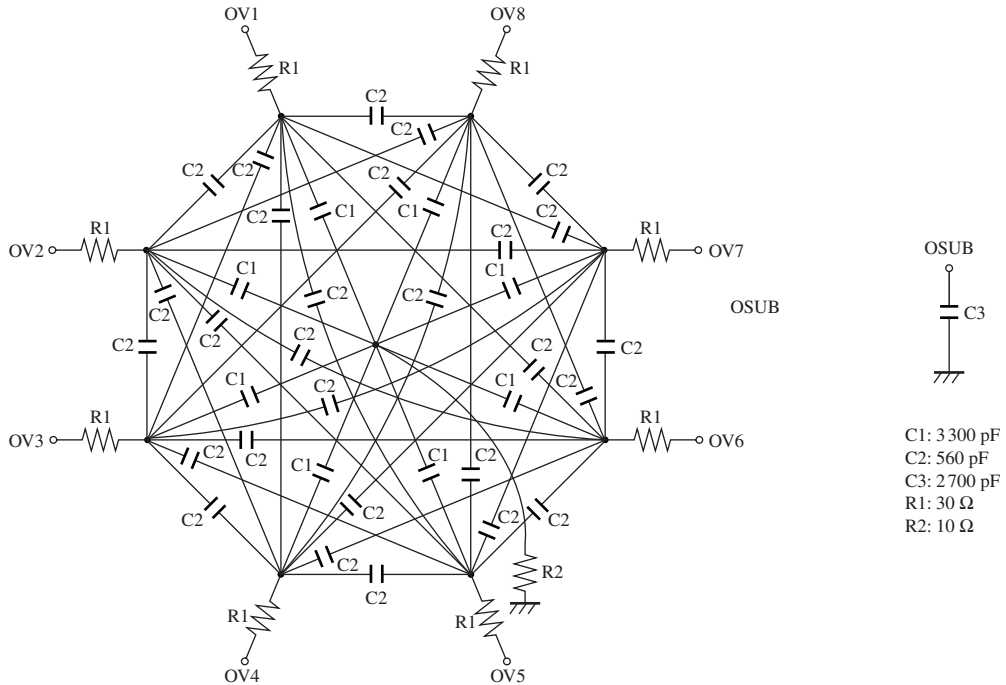
■ Test Conditions (continued)

2. Input pulse timing chart



■ Test Conditions (continued)

3. Load circuit connection diagram

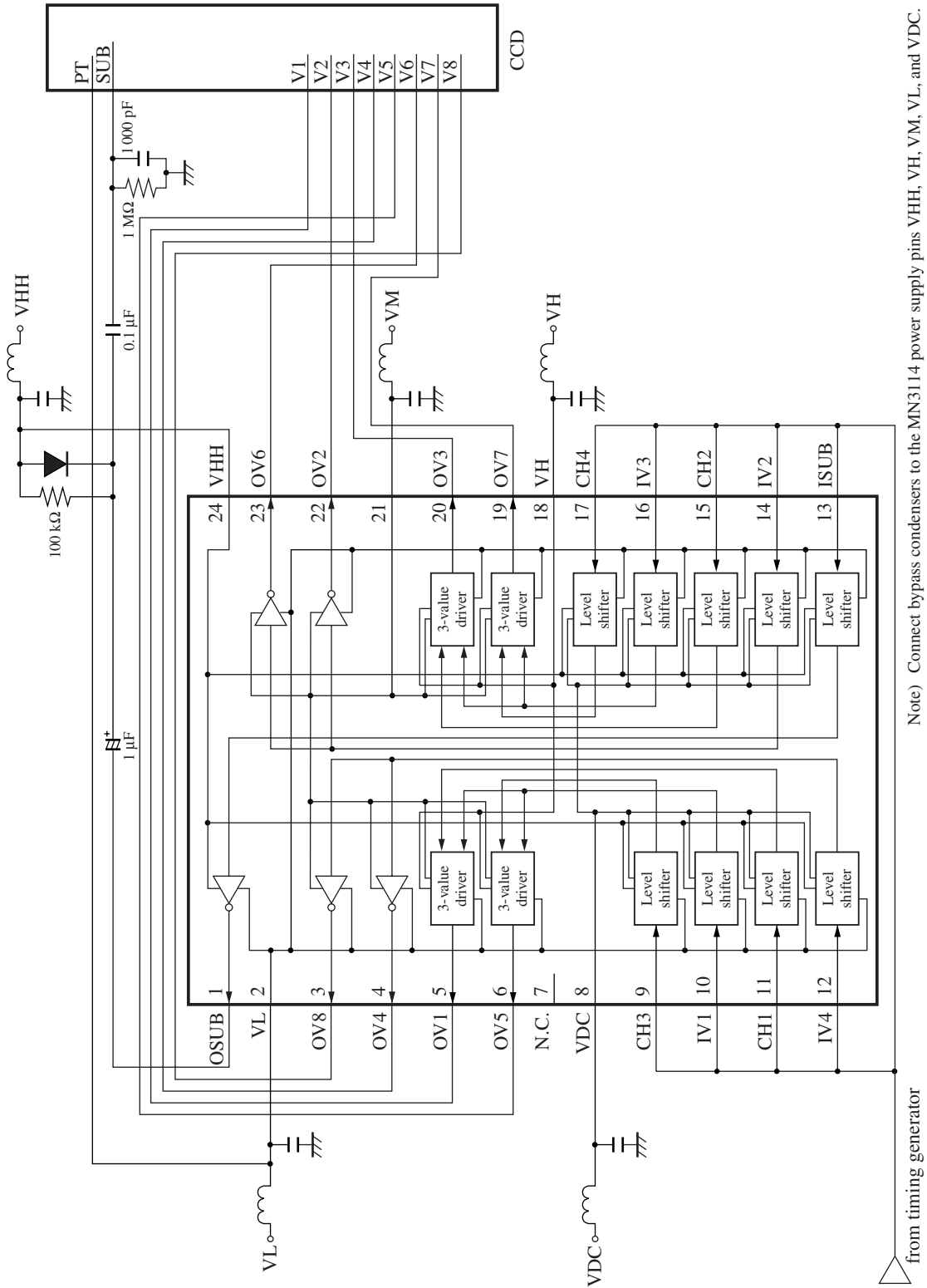


■ Usage Notes

1. If the SUB driver is not used:
 - 1) Connect VHH to VH.
 - 2) Connect ISUB to VDC.
 - 3) Leave OSUB (pin 1) open.
2. Connect bypass condensers to the MN3114 power supply pins VHH, VH, VM, VL, and VDC. Locate these bypass condensers as close to the IC as possible.
3. Guarantee period after opening the sealed packing:

The guarantee period after opening the sealed desiccated packing is three weeks under environment temperature and humidity conditions of 30°C and 70% RH.
4. The recommended reflow temperature is 230°C.

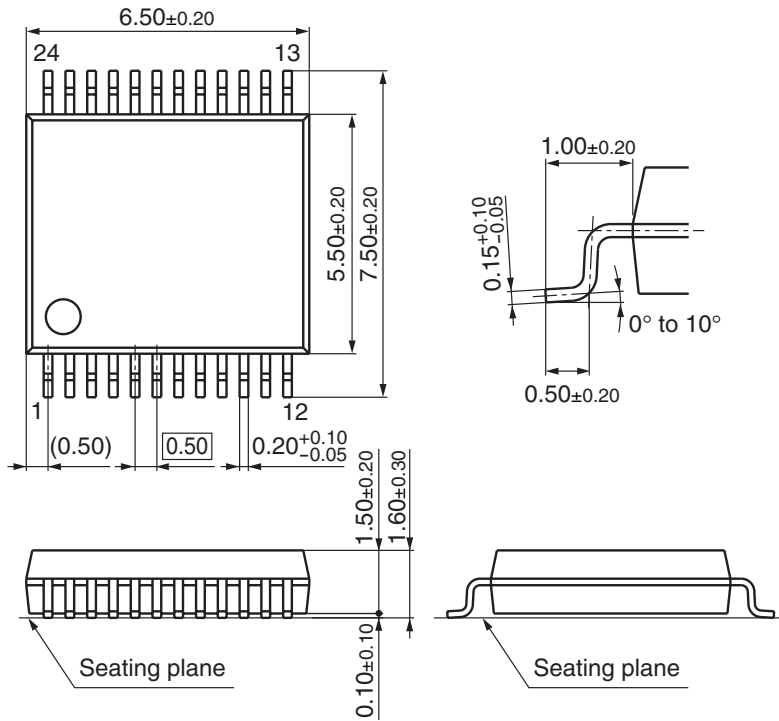
■ Application Circuit Example



(Note) Connect bypass condensers to the MN3114 power supply pins VHH, VM, VL, and VDC. Locate these bypass condensers as close to the IC as possible.

■ Package Dimensions (unit: mm)

- SSOP024-P-0300C (Lead-free package)



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