

96-BIT AC-PDP DRIVER

DESCRIPTION

The μ PD16342 is a high withstand voltage CMOS driver designed for use with a flat display panel such as a PDP, VFD, or EL panel. It consists of a 96-bit bi-directional shift register, 96-bit latch and high withstand voltage CMOS driver. The logic block operates with a 5-V power supply interface (CMOS level input) so that it can be directly connected to a gate array and CPU. The driver block provides a high withstand voltage output: 80 V, +15/-30 mA MAX. The logic and driver blocks are made of CMOS circuits, consuming lower power.

FEATURES

- Circuit configuration switched by the IBS pin between three 32-bit bi-directional shift registers and six 16-bit bi-directional shift registers.
- Data control with transfer clock (external) and latch
- High-speed data transfer ($f_{MAX.} = 40$ MHz MIN. at data latch)
($f_{MAX.} = 25$ MHz MIN. at cascade connection)
- High withstand output voltage (80 V, +15/-30 mA MAX.)
- High withstand voltage CMOS structure

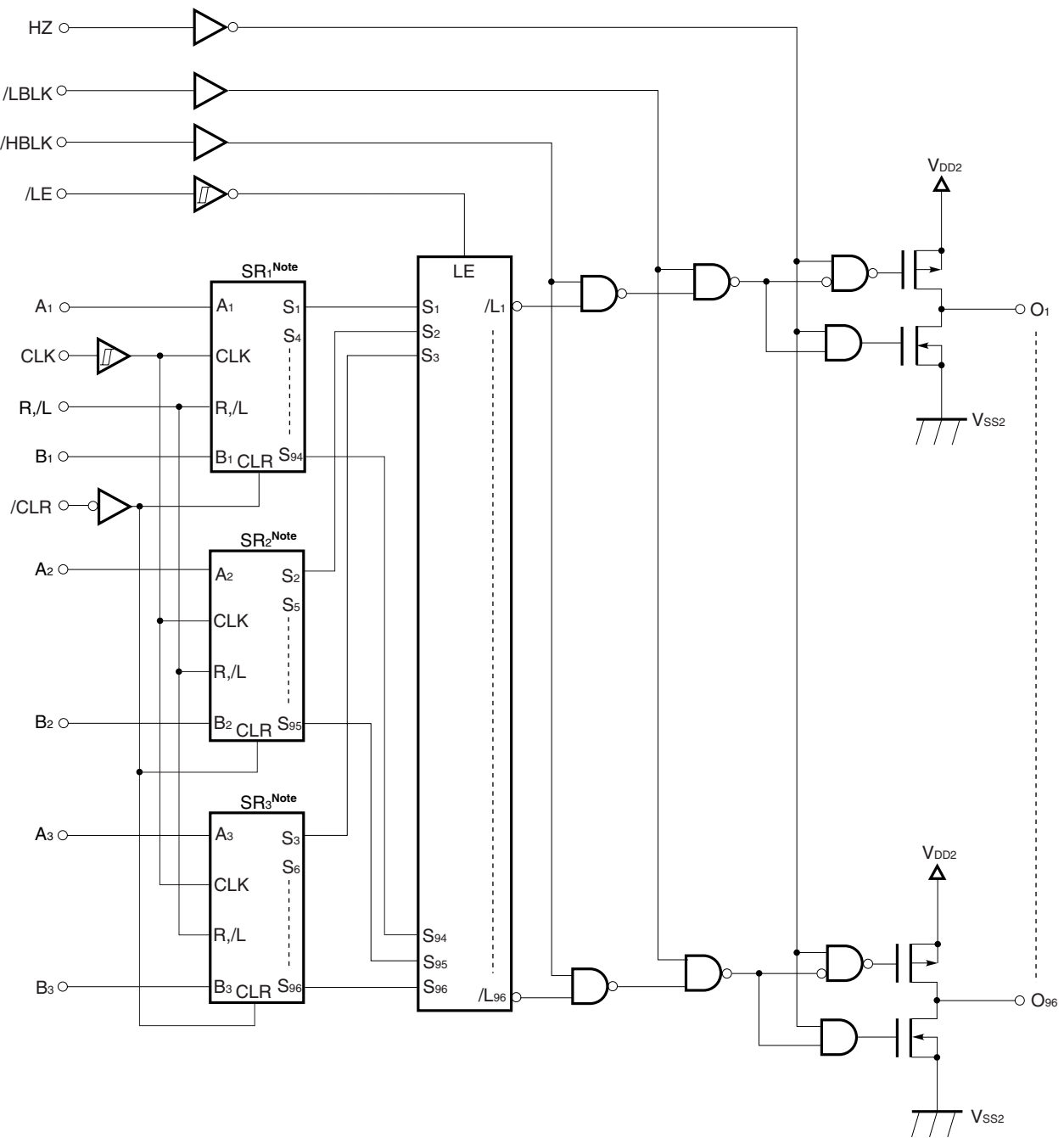
ORDERING INFORMATION

Part Number	Package
μ PD16342	Module/TCP

Remark Consult an our sales representative regarding the module. Since the module characteristics is based on the module specifications, there may be differences between the contents written in this document and real characteristics.

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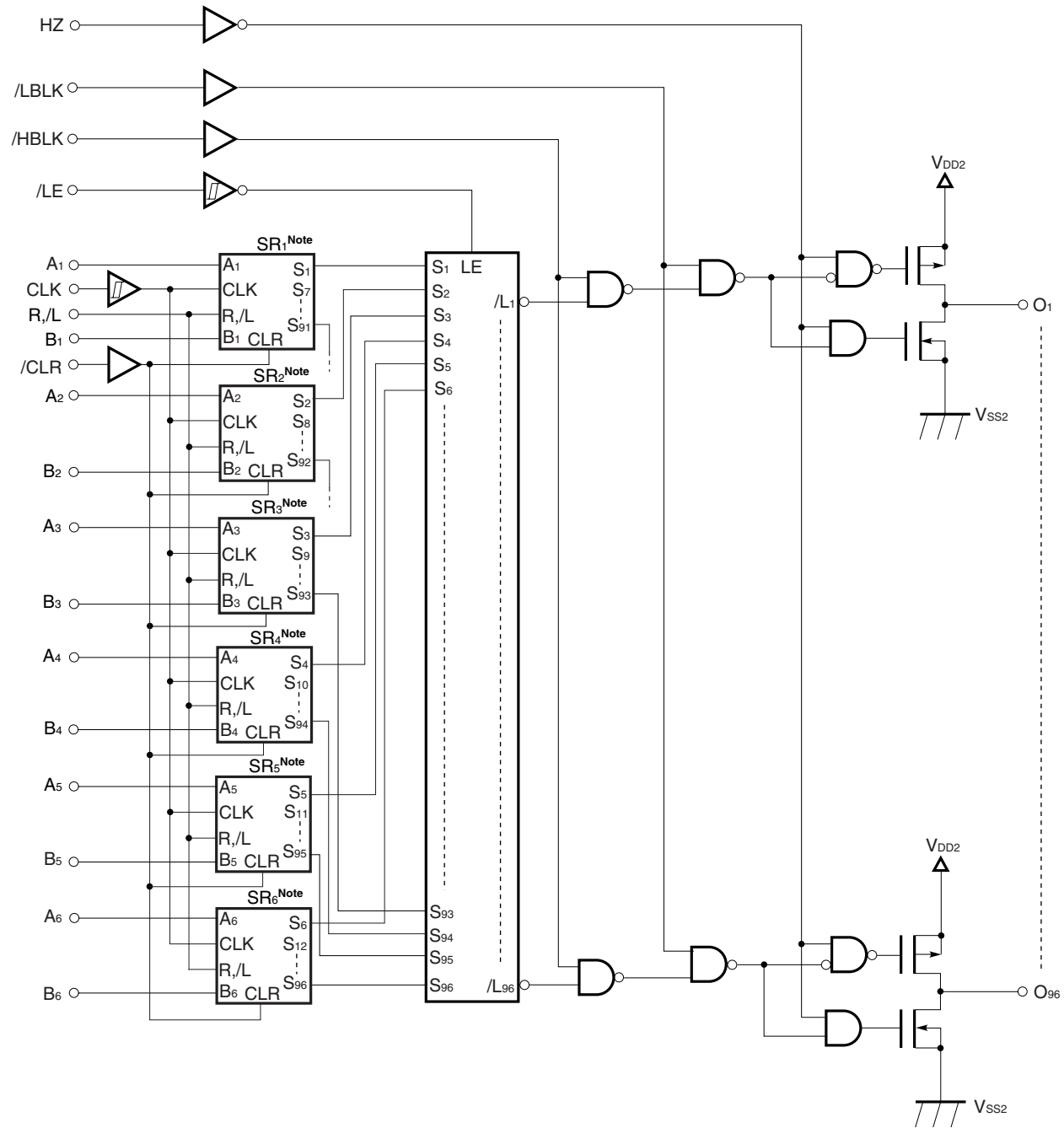
★ 1. BLOCK DIAGRAM (1) (IBS = H, 3-BIT INPUT, 32-BIT LENGTH SHIFT REGISTER)



Note SR_n: 32-bit shift register

Remark /xxx indicates active low signal.

1. BLOCK DIAGRAM (2) (IBS = L, 6-BIT INPUT, 16-BIT LENGTH SHIFT REGISTER)



Note SR_n: 16-bit shift register

2. PIN FUNCTIONS

Symbol	Pin Name	I/O	Description
/LBLK	Low blanking	Input	/LBLK = L: All output = L
/HBLK	High blanking	Input	/HBLK = L: All output = H
/LE	Latch enable	Input	Latch on a falling edge
HZ	Output high impedance	Input	H: All output set to the high-impedance state
/CLR	Register clear	Input	L: All shift register data cleared to the L level
A ₁ to A ₃₍₆₎	RIGHT data	I/O ^{Note}	R,/L = H, A ₁ to A ₃₍₆₎ : Input, B ₁ to B ₃₍₆₎ : Output The parenthesized pins are used in 6-bit input mode.
B ₁ to B ₃₍₆₎	LEFT data	I/O ^{Note}	R,/L = L, A ₁ to A ₃₍₆₎ : Output, B ₁ to B ₃₍₆₎ : Input The parenthesized pins are used in 6-bit input mode.
CLK	Clock	Input	Shift on a rising edge
R,/L	Shift control	Input	H: Right shift mode SR ₁ : A ₁ → S ₁S ₉₄ → B ₁ (SR ₂ and SR ₆ also shift in the same direction.) Left shift mode SR ₁ : B ₁ → S ₉₄S ₁ → A ₁ (SR ₂ and SR ₆ also shift in the same direction.)
IBS	Input mode switch	Input	H: 32-bit shift registers, 3-bit input mode L: 16-bit shift registers, 6-bit input mode
O ₁ to O ₉₆	High withstand voltage	Output	80 V, +15/-30 mA MAX.
V _{DD1}	Logic power supply	-	5 V ± 5%
V _{DD2}	Driver power supply	-	15 to 70 V
V _{SS1}	Logic ground	-	Connect to system ground
V _{SS2}	Driver ground	-	Connect to system ground

Note In 3-bit input mode, unused I/O pins must be held at the L level.

To use for module, the back side of IC chip must be held at the V_{SS} (GND) level.

3. TRUTH TABLE

Shift Register Block

Input		Output		Shift Register
R/L	CLK	A	B	
H	↑	Input	Output ^{Note1}	Right shift operation performed
H	H or L		Output	Hold
L	↑	Output ^{Note2}	Input	Left shift operation performed
L	H or L	Output		Hold

- Notes**
1. On the rising edge of the clock, the data of S₉₁ to S₉₃ (S₈₅ to S₉₀) is shifted to S₉₄ to S₉₆ (S₉₁ to S₉₆), and is output from B₁ to B₃ (B₁ to B₆) (The parenthesized pins are used in 6-bit input mode.).
 2. On the rising edge of the clock, the data of S₄ to S₆ (S₇ to S₁₂) is shifted to S₁ to S₃ (S₁ to S₆), and is output from A₁ to A₃ (A₁ to A₆) (The parenthesized pins are used in 6-bit input mode.).

Latch Block

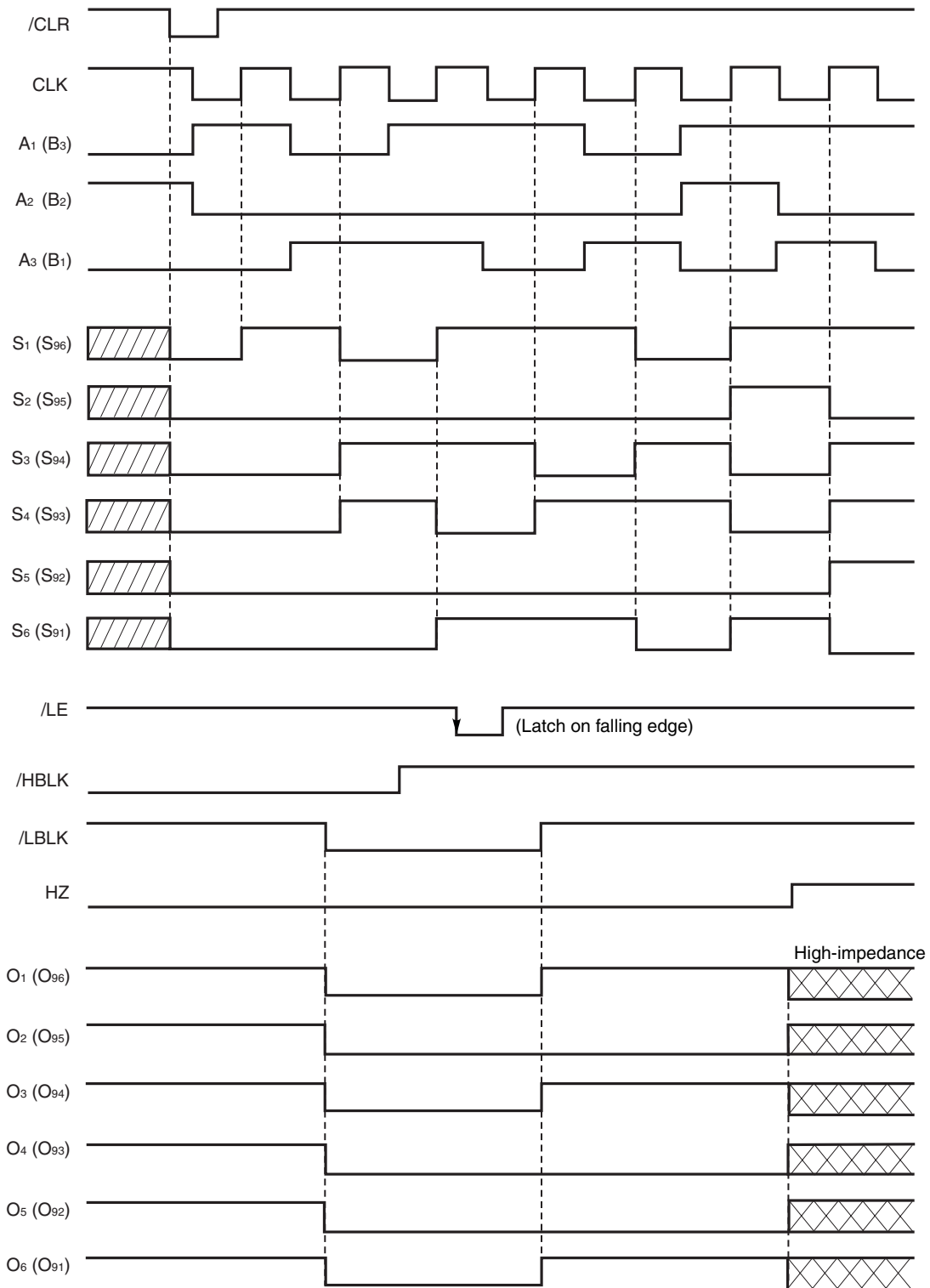
/LE	Output State of Latch Section (/L _n)
↓	Latch S _n data
H or L	Hold latch (output) data

Driver Block

A (B)	/HBLK	/LBLK	HZ	Output State of Driver Block
x	L	H	L	All driver output: H
x	x	L	L	All driver output: L
x	x	x	H	All driver output: High Impedance
L	H	H	L	L
H	H	H	L	H

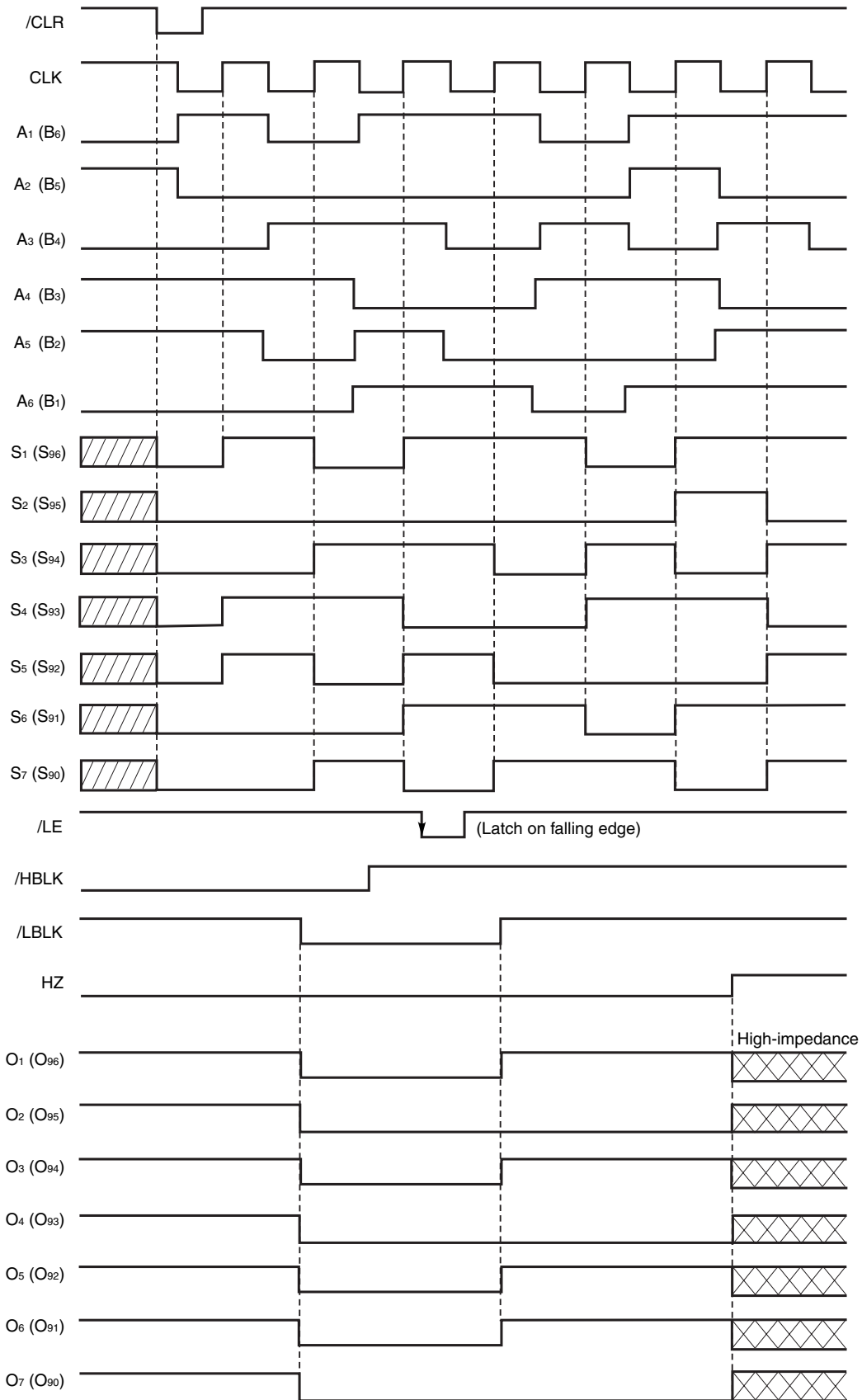
Remark x: H or L, H: High level, L: Low level

Timing Chart (1) (IBS = H, 3-bit input, right shift)



Remark Values in parentheses are when R,/L = L.

Timing Chart (2) (IBS = L, 6-bit input, right shift)



Remark Values in parentheses are when R,/L = L.

4. ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings (T_A = 25°C, V_{SS1} = V_{SS2} = 0 V)

Parameter	Symbol	Ratings	Unit
Logic Supply Voltage	V _{DD1}	-0.5 to +6.0	V
Driver Supply Voltage	V _{DD2}	-0.5 to +80	V
Logic Input Voltage	V _I	-0.5 to V _{DD1} + 0.5	V
Driver Output Current	I _{O2}	+15/-30	mA
Operating Junction Temperature	T _J	+125	°C
Storage Temperature	T _{stg}	-65 to +150	°C

Caution Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

Recommended Operating Range (T_A = -40 to +85°C, V_{SS1} = V_{SS2} = 0 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Logic Supply Voltage	V _{DD1}		4.75	5.0	5.25	V
Driver Supply Voltage	V _{DD2}		15		70	V
High-Level Input Voltage	V _{IH}		2.7		V _{DD1}	V
Low-Level Input Voltage	V _{IL}		0		0.6	V
Driver Output Current	I _{OH2}				-24	mA
	I _{OL2}				+13	mA

Electrical Characteristics (T_A = 25°C, V_{DD1} = 5.0 V, V_{DD2} = 70 V, V_{SS1} = V_{SS2} = 0 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
High-Level Output Voltage	V _{OH1}	Logic, I _{OH1} = -1.0 mA	0.9 V _{DD1}		V _{DD1}	V
Low-Level Output Voltage	V _{OL1}	Logic, I _{OL1} = 1.0 mA	0		0.1 V _{DD1}	V
High-Level Output Voltage	V _{OH21}	O ₁ to O ₉₆ , I _{OH2} = -0.52 mA	69			V
	V _{OH22}	O ₁ to O ₉₆ , I _{OH2} = -5.2 mA	65			V
Low-Level Output Voltage	V _{OL21}	O ₁ to O ₉₆ , I _{OL2} = 1.6 mA			1.0	V
	V _{OL22}	O ₁ to O ₉₆ , I _{OL2} = 13 mA			10	V
Input Leakage Current	I _{IL}	V _I = V _{DD1} or V _{SS1}			±1.0	μA
High-Level Input Voltage	V _{IH}	V _{DD1} = 4.75 to 5.25 V	2.7		V _{DD1}	V
Low-Level Input Voltage	V _{IL}	V _{DD1} = 4.75 to 5.25 V	0		0.6	V
Static Current Dissipation	I _{DD11}	Logic, T _A = -40 to +85°C			500	μA
		Logic, T _A = 25°C			300	μA
	I _{DD12}	Logic, T _A = -40 to +85°C			10 ^{Note}	mA
		Logic, T _A = 25°C			10 ^{Note}	mA
	I _{DD2}	Driver, T _A = -40 to +85°C			1000	μA
		Driver, T _A = 25°C			100	μA

Note When input all input high-level (V_{IH} = 2.7 V to V_{DD1}, but both R/L and IBS pin are fixed by V_I = V_{SS1} or V_{DD1})

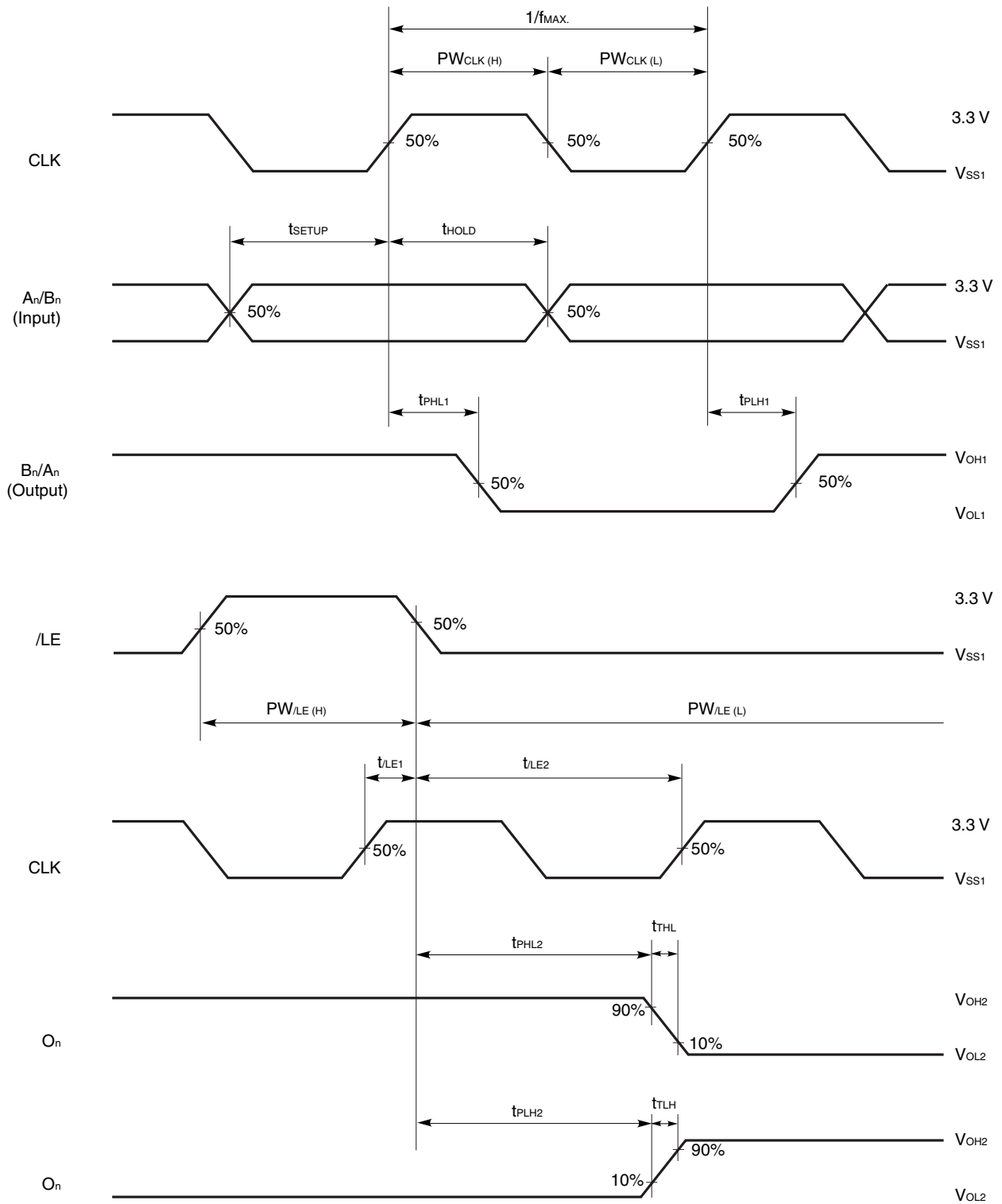
Switching Characteristics ($T_A = 25^\circ\text{C}$, $V_{DD1} = 5.0\text{ V}$, $V_{DD2} = 70\text{ V}$, $V_{SS1} = V_{SS2} = 0\text{ V}$, Logic $C_L = 15\text{ pF}$,
 Driver $C_L = 50\text{ pF}$, $t_r = t_f = 6.0\text{ ns}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Propagation Delay Time	t_{PHL1}	CLK $\uparrow \rightarrow$ A/B			34	ns
	t_{PLH1}				34	ns
	t_{PHL2}	/LE $\downarrow \rightarrow$ O ₁ to O ₉₆			220	ns
	t_{PLH2}				220	ns
	t_{PHL3}	/HBLK \rightarrow O ₁ to O ₉₆			205	ns
	t_{PLH3}				205	ns
	t_{PHL4}	/LBLK \rightarrow O ₁ to O ₉₆			200	ns
	t_{PLH4}				200	ns
	t_{PHZ}	HZ \rightarrow O ₁ to O ₉₆ ,			340	ns
	t_{PZH}	$R_L = 10\text{ k}\Omega$			220	ns
	t_{PLZ}				340	ns
	t_{PZL}				220	ns
Rise Time	t_{TLH}	O ₁ to O ₉₆			220	ns
	t_{TLZ}	O ₁ to O ₉₆ ,			3	μs
	t_{TZH}	$R_L = 10\text{ k}\Omega$			220	ns
Fall Time	t_{THL}	O ₁ to O ₉₆			350	ns
	t_{THZ}	O ₁ to O ₉₆ ,			3	μs
	t_{TZL}	$R_L = 10\text{ k}\Omega$			350	ns
Maximum Clock Frequency	f_{MAX}	Data latch, duty = 50%	40			MHz
		Cascade connection, duty = 50%	25			MHz
Input Capacitance	C_i				15	pF

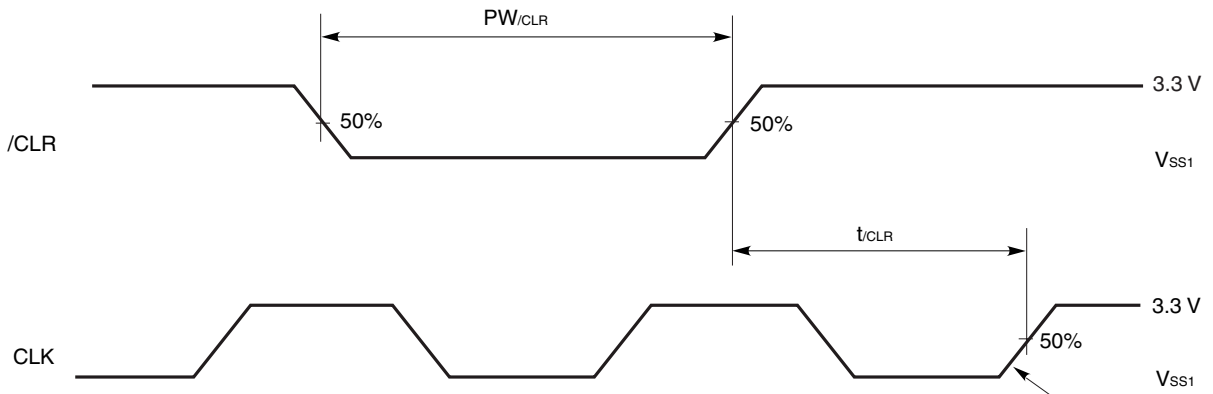
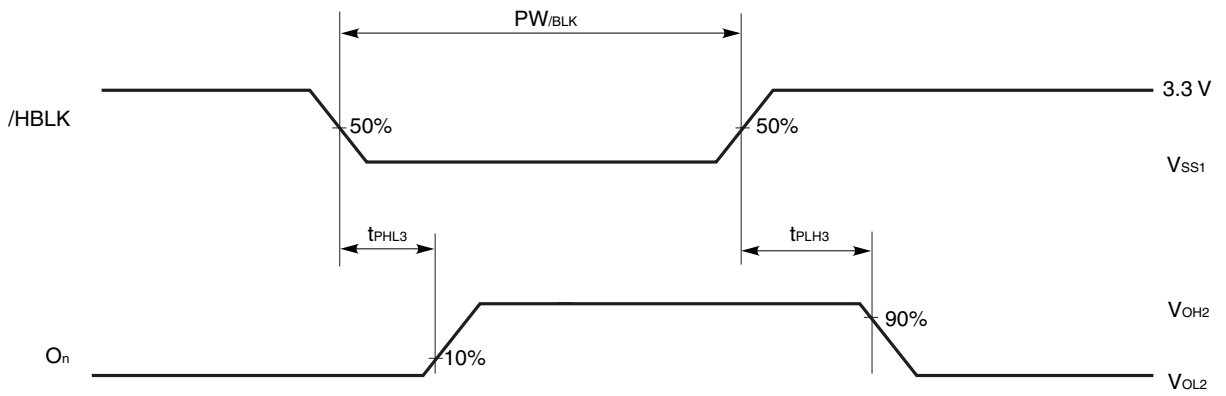
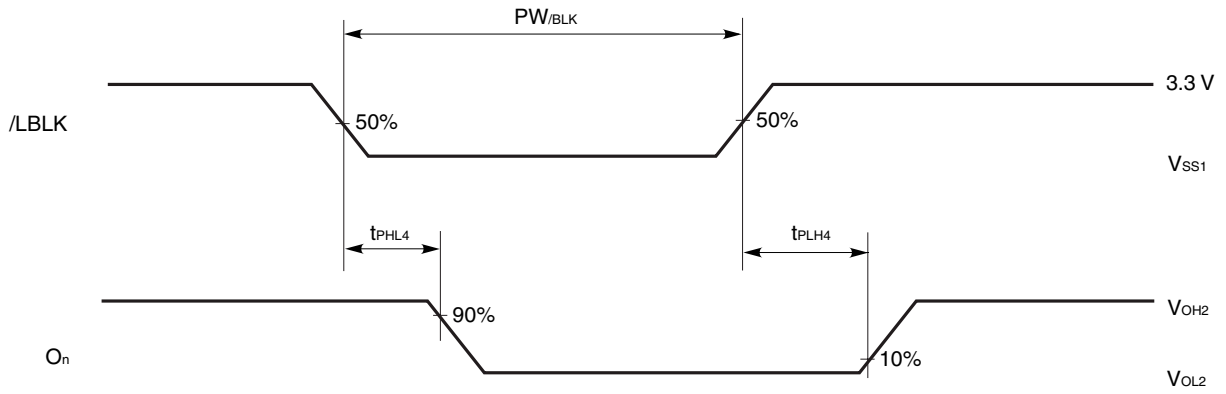
Timing Requirement (T_A = -40 to +85°C, V_{DD1} = 4.75 to 5.25 V, V_{SS1} = V_{SS2} = 0 V, t_r = t_f = 6.0 ns)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Clock Pulse Width	PW _{CLK(H)}		12			ns
	PW _{CLK(L)}					
Latch Enable Pulse Width	PW _{/LE(H)}		12			ns
	PW _{/LE(L)}					
Blank Pulse Width	PW _{/BLK}	/HBLK, /LBLK	600			ns
HZ Pulse Width	PW _{HZ}	R _L = 10 kΩ	3.3			μs
/CLR Pulse Width	PW _{/CLR}		12			ns
Data Setup Time	t _{SETUP}		4			ns
Data Hold Time	t _{HOLD}		6			ns
Latch Enable Time	t _{LE1}		12			ns
	t _{LE2}		12			ns
/CLR Timing	t _{CLR}		6			ns

★ Switching Characteristics Waveform (1/3)

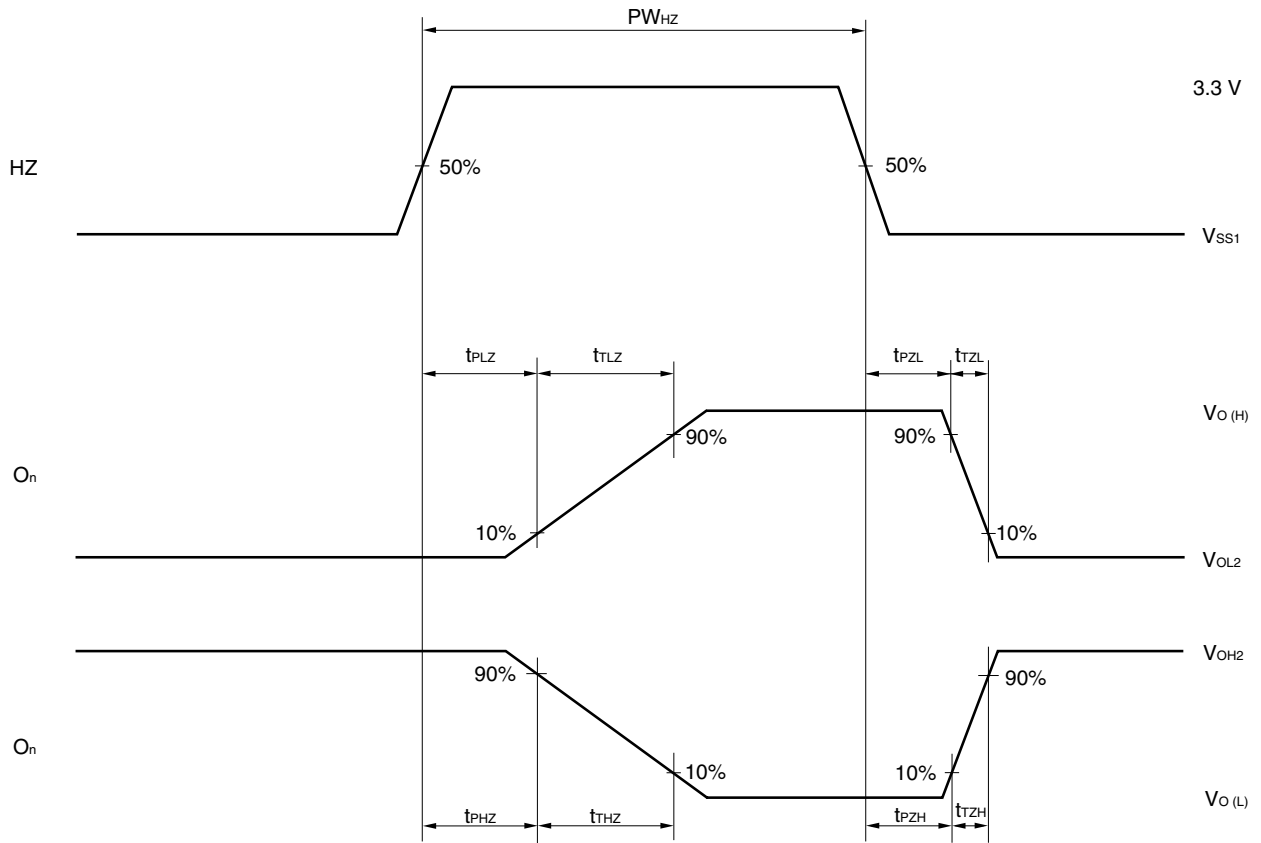


★ Switching Characteristics Waveform (2/3)



Clock rising edge for valid data

★ Switching Characteristics Waveform (3/3)



NOTES FOR CMOS DEVICES**① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS**

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

② HANDLING OF UNUSED INPUT PINS FOR CMOS

Note:

No connection for CMOS device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

③ STATUS BEFORE INITIALIZATION OF MOS DEVICES

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

Reference Documents

NEC Semiconductor Device Reliability/Quality Control System (C10983E)

Quality Grades On NEC Semiconductor Devices (C11531E)

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