NEC

MOS INTEGRATED CIRCUIT
μPD16342

96-BIT AC-PDP DRIVER

DESCRIPTION

The μPD16342 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

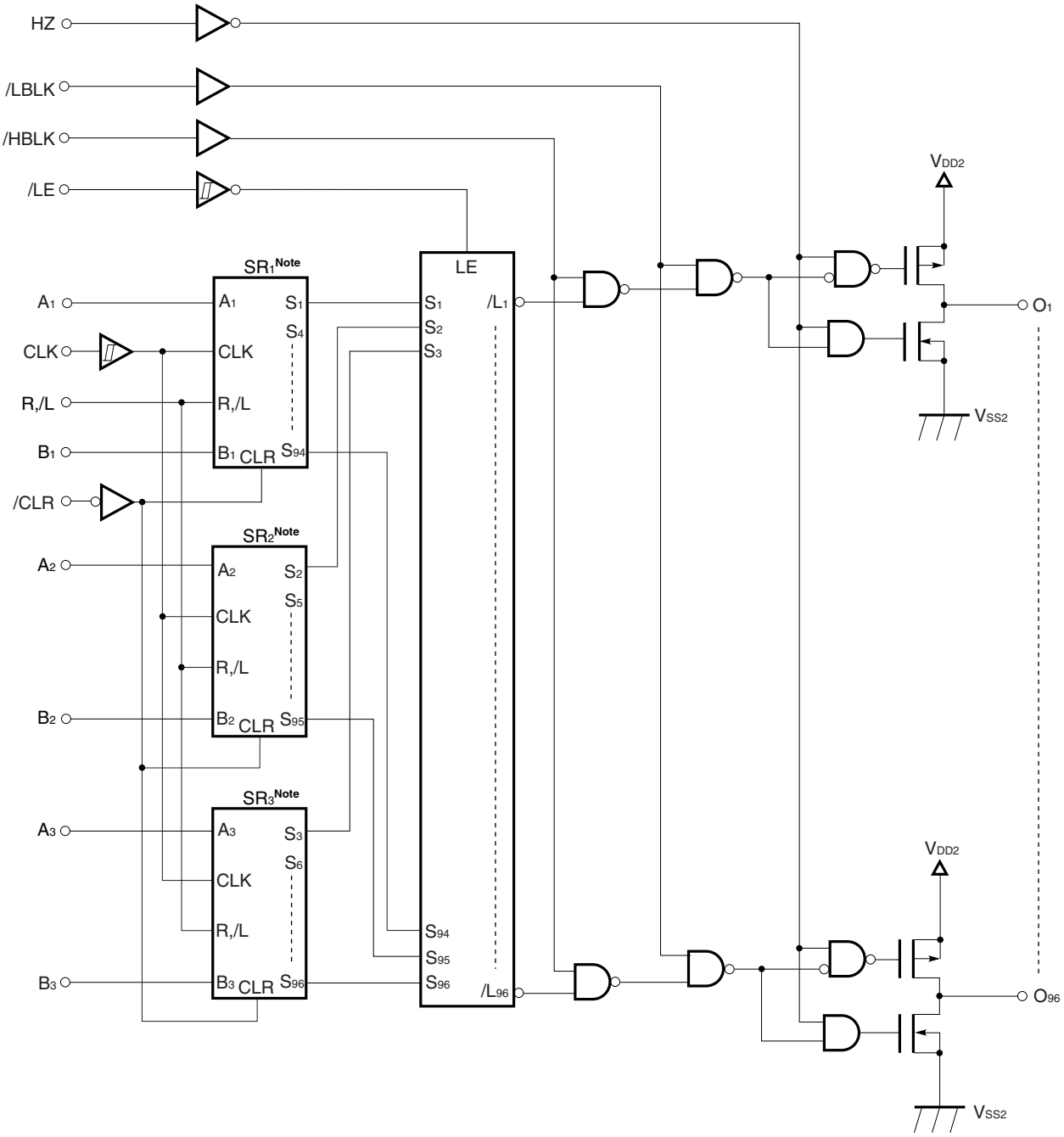
Part Number	Package
μPD16342	Module/TCP

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.

Document No. S15090EJ2V0DS00 (2nd edition)
Date Published September 2001 NS CP (K)
Printed in Japan

The mark ★ shows major revised points.

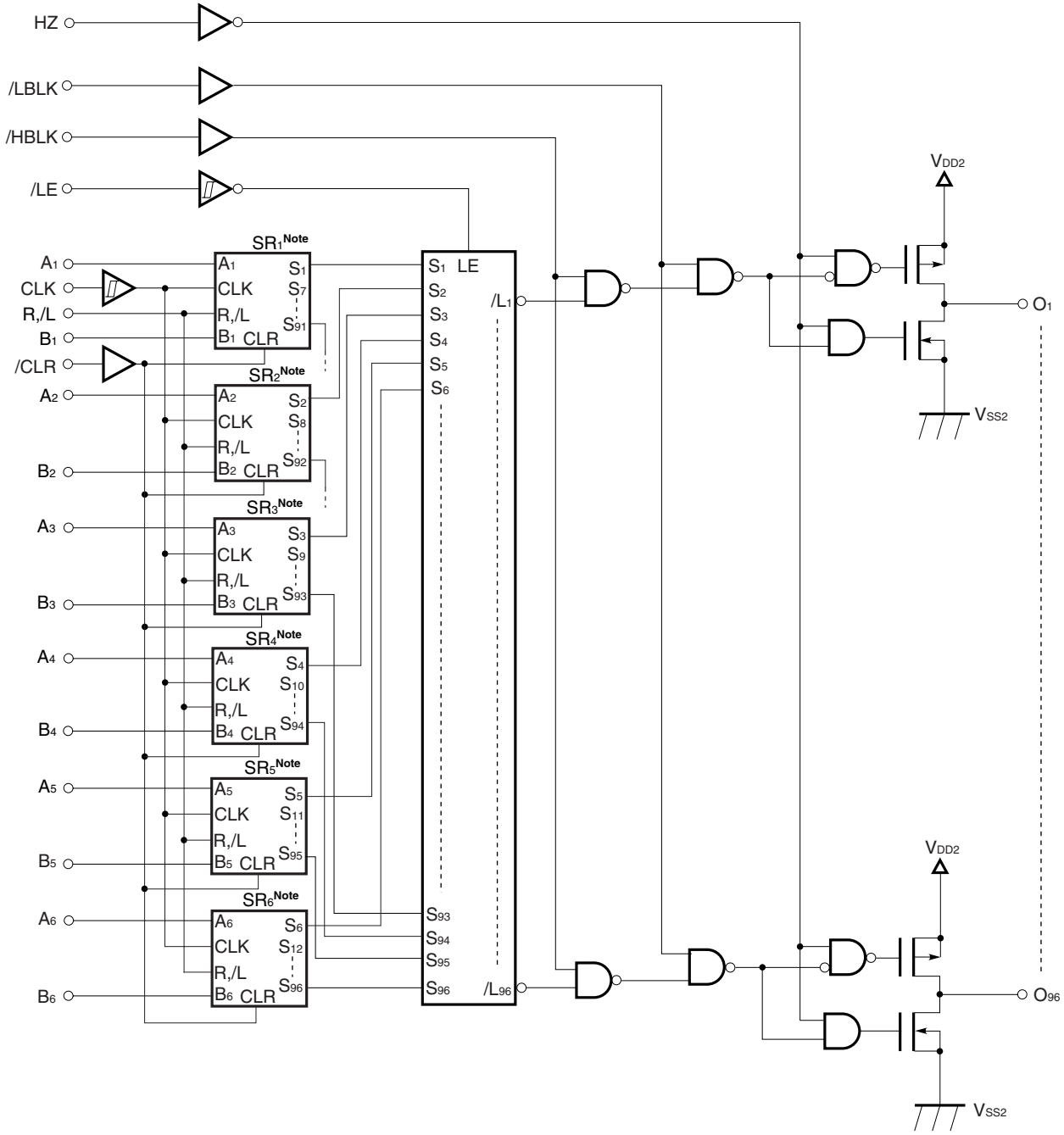
★ 1. BLOCK DIAGRAM (1) (IBS = H, 3-BIT INPUT, 32-BIT LENGTH SHIFT REGISTER)



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: $A_1 \rightarrow S_1$.....$S_{94} \rightarrow B_1$ (SR_2 and SR_6 also shift in the same direction.) Left shift mode SR_1: $B_1 \rightarrow S_{94}$.....$S_1 \rightarrow A_1$ (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 S_{91} to S_{93} (S_{85} to S_{90}) is shifted to S_{94} to S_{96} (S_{91} to S_{96}), and is output from B_1 to B_3 (B_1 to B_6) (The parenthesized pins are used in 6-bit input mode.).

2. On the rising edge of the clock, the data of S_4 to S_6 (S_7 to S_{12}) is shifted to S_1 to S_3 (S_1 to S_6), and is output from A_1 to A_3 (A_1 to A_6) (The parenthesized pins are used in 6-bit input mode.).

Latch Block

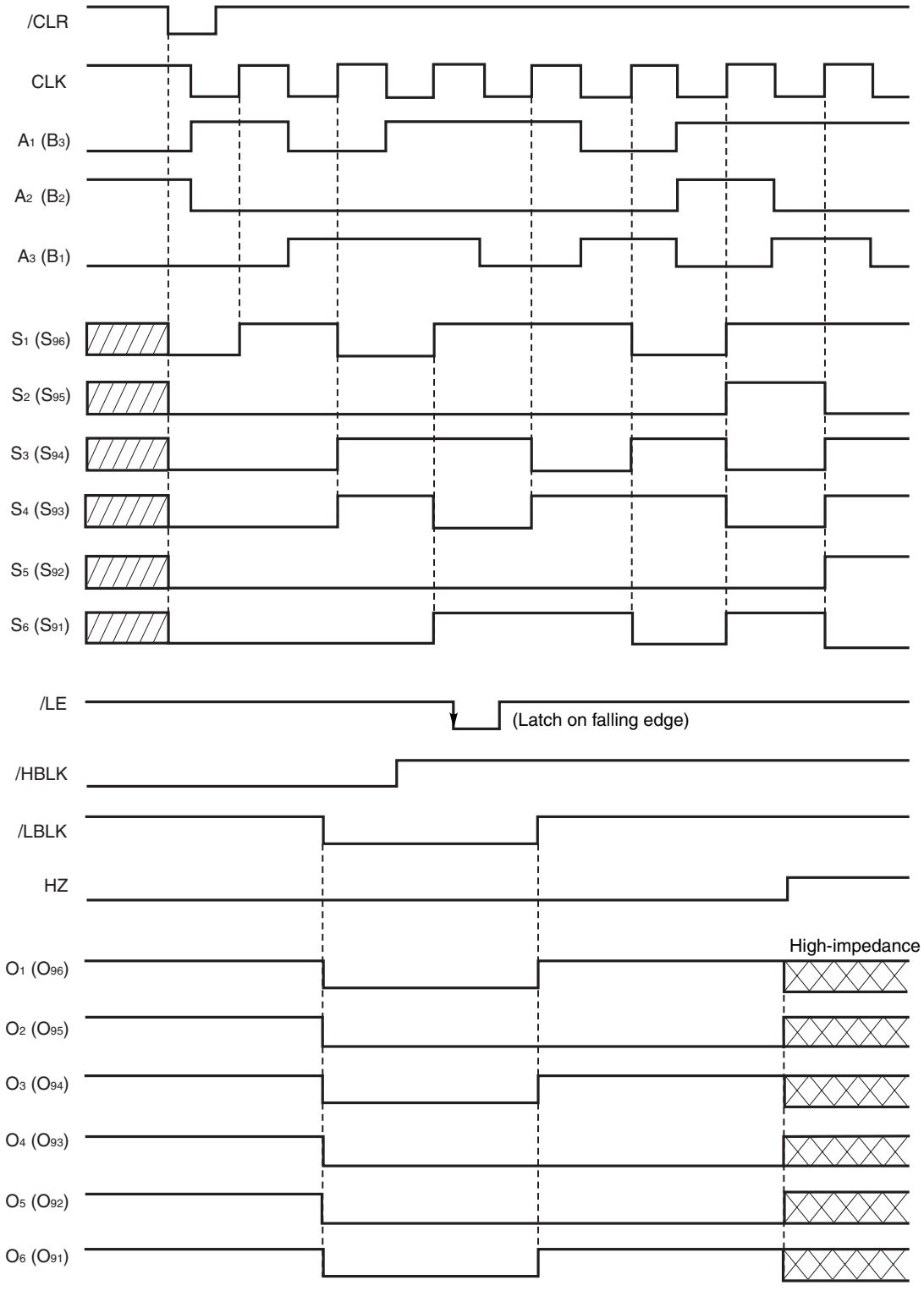
/LE	Output State of Latch Section ($/L_n$)
↓	Latch S_n data
H or L	Hold latch (output) data

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

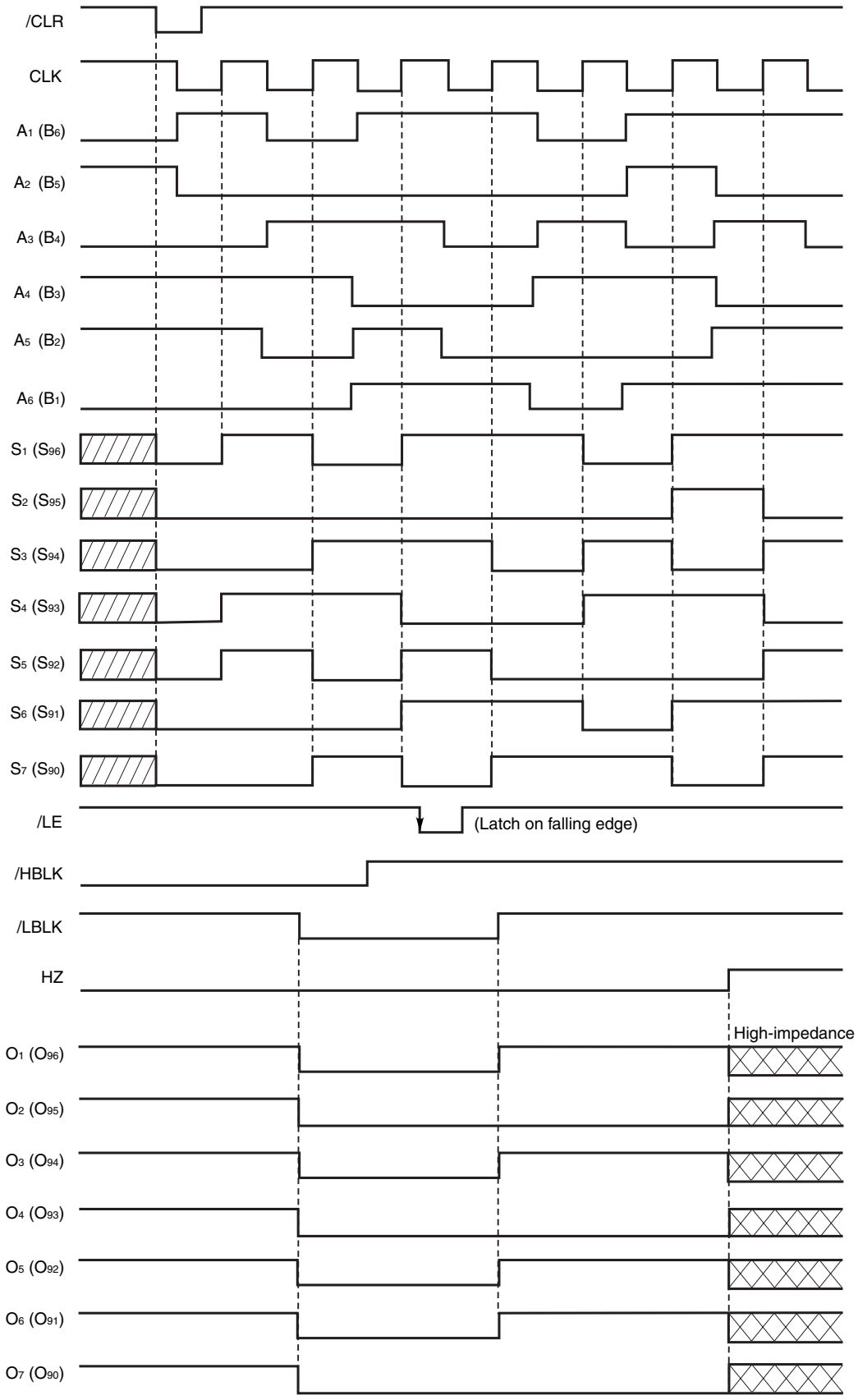
Remark x: H or L, H: High level, L: Low level

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_1 = V_{DD1} or V_{SS1}			±1.0	μA
High-Level Intput 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})

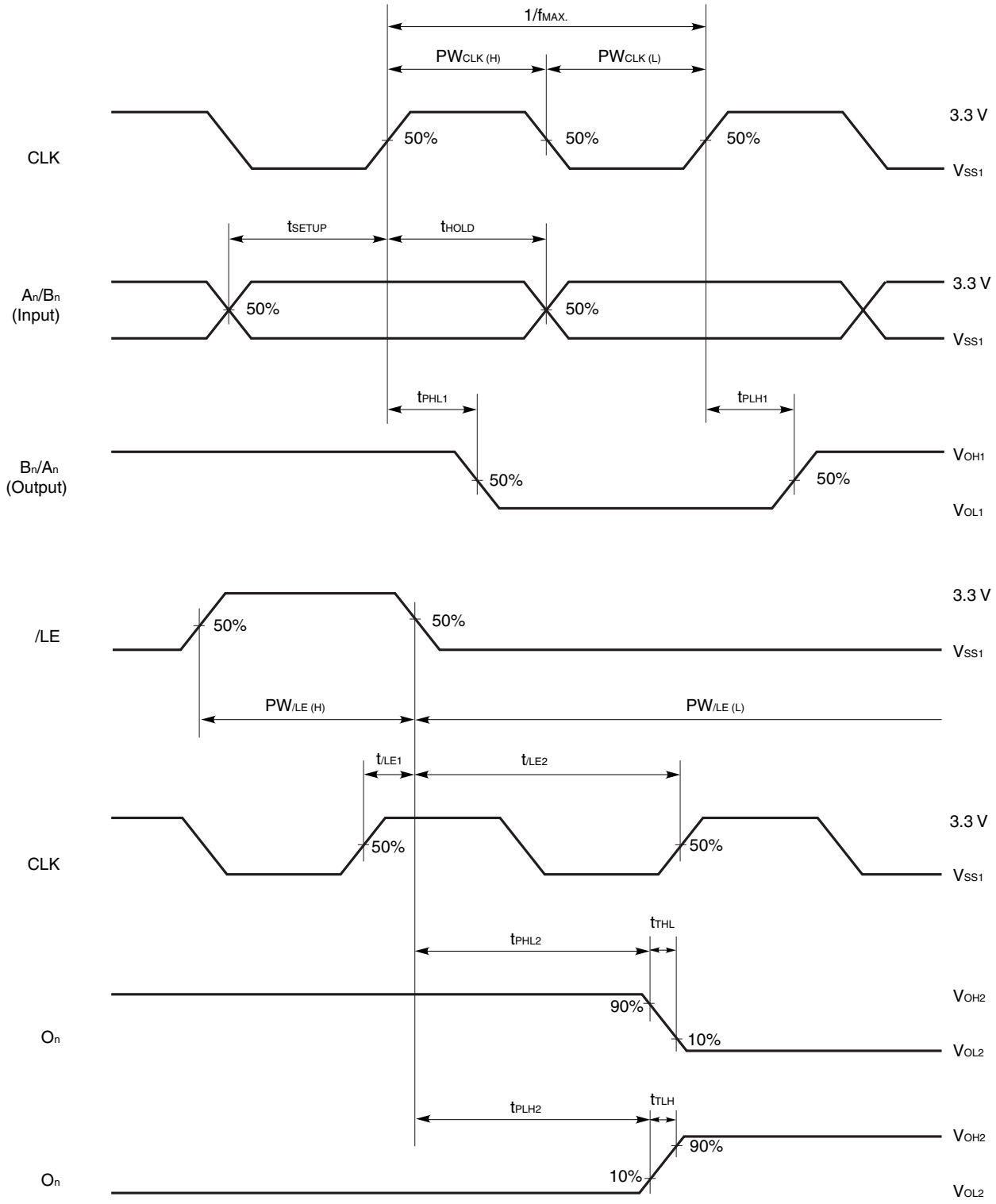
Switching Characteristics (T_A = 25°C, V_{DD1} = 5.0 V, V_{DD2} = 70 V, V_{SS1} = V_{SS2} = 0 V, Logic C_L = 15 pF, Driver C_L = 50 pF, t_r = t_f = 6.0 ns)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Propagation Delay Time	t_{PHL1}	CLK ↑ → A/B			34	ns
	t_{PLH1}				34	ns
	t_{PHL2}	/LE ↓ → O_1 to O_{96}			220	ns
	t_{PLH2}				220	ns
	t_{PHL3}	/HBLK → O_1 to O_{96}			205	ns
	t_{PLH3}				205	ns
	t_{PHL4}	/LBLK → O_1 to O_{96}			200	ns
	t_{PLH4}				200	ns
	t_{PHZ}	HZ → O_1 to O_{96},			340	ns
	t_{PZH}	R_L = 10 kΩ			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 kΩ			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 kΩ			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

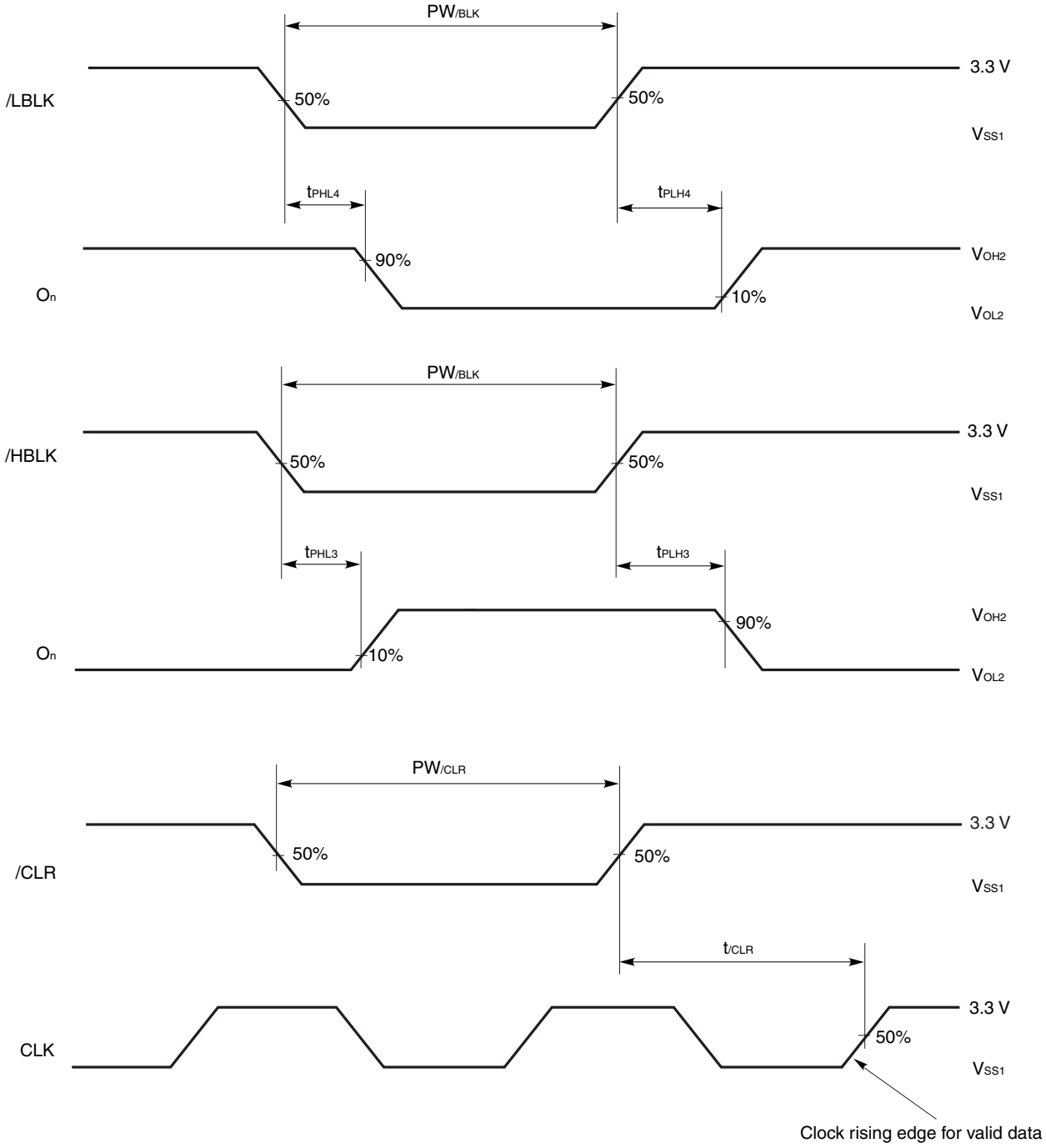
Timing Requirement (T_A = –40 to +85°C, V_{DD1} = 4.75 to 5.25 V, V_{SS1} = V_{SS2} = 0 V, t_r = t_f = 6.0 ns)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Clock Pulse Width	$PW_{CLK(H)}$ $PW_{CLK(L)}$		12			ns
Latch Enable Pulse Width	$PW_{/LE(H)}$ $PW_{/LE(L)}$		12			ns
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

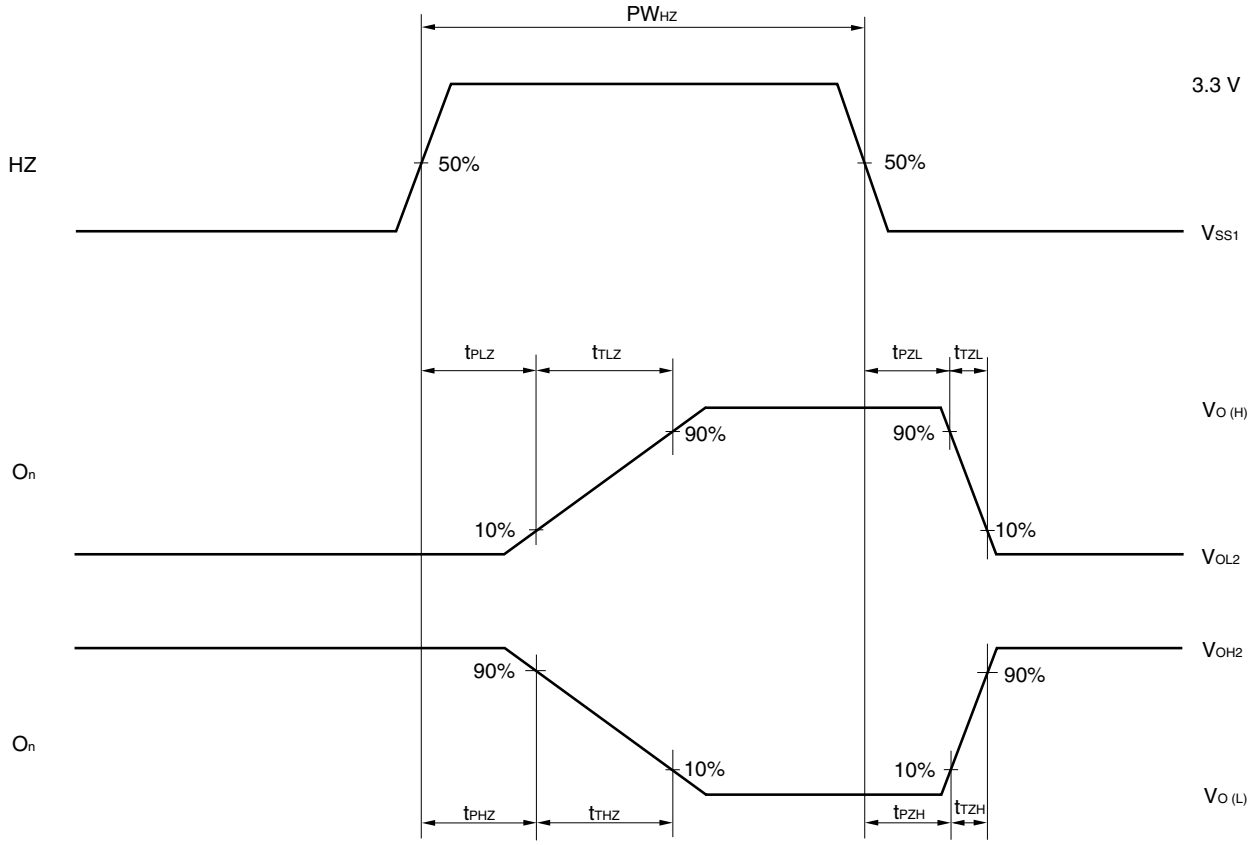
★ **Switching Characteristics Waveform (1/3)**



★ **Switching Characteristics Waveform (2/3)**



★ **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)

- **The information in this document is current as of September, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

  (Note)

  (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4