TOSHIBA

e-Learning

Basics of CMOS Logic ICs

Chapter4 How to Read Datasheets

Toshiba Electronic Devices & Storage Corporation

04

How to read datasheets

Reading datasheets

This section describes how to read datasheets using a datasheet for an IC of the 74VHC Series.

Part number

Function

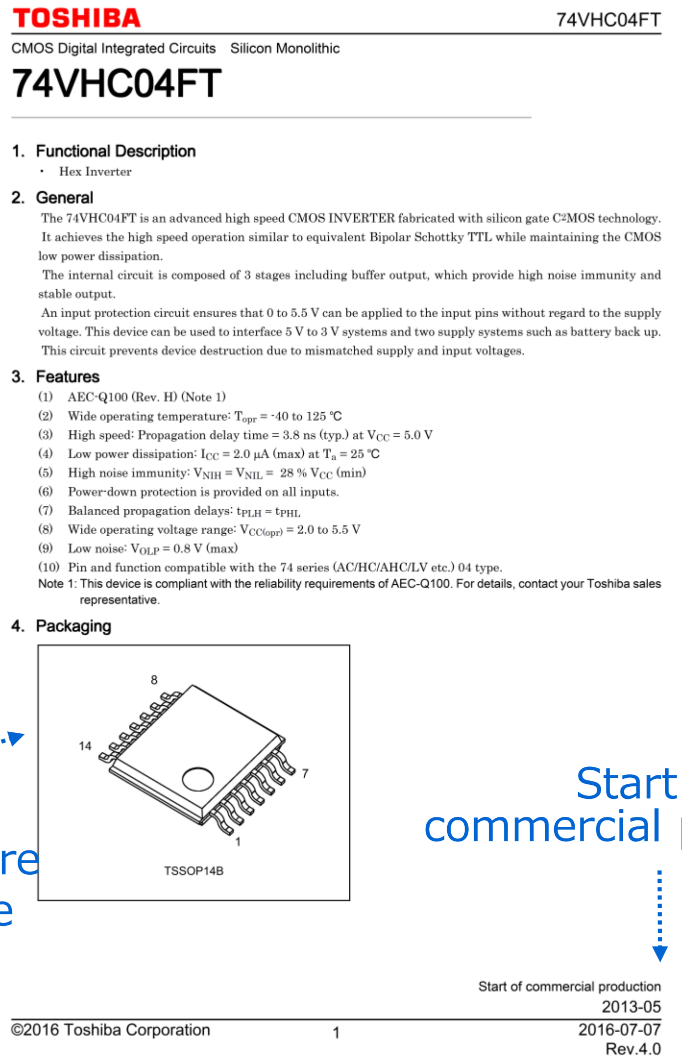
General description

Features

Packaging

*Package dimensions are shown at the end of the datasheet.

Start of commercial production



TOSHIBA 74VHC04FT

CMOS Digital Integrated Circuits Silicon Monolithic

74VHC04FT

1. Functional Description
   - Hex Inverter

2. General

The 74VHC04FT is an advanced high speed CMOS INVERTER fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.

An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

3. Features

(1) AEC-Q100 (Rev. H) (Note 1)
(2) Wide operating temperature: T_{opr} = -40 to 125 ℃
(3) High speed: Propagation delay time = 3.8 ns (typ.) at V_{CC} = 5.0 V
(4) Low power dissipation: I_{CC} = 2.0 μA (max) at T_a = 25 ℃
(5) High noise immunity: V_{NIH} = V_{NIL} = 28 % V_{CC} (min)
(6) Power-down protection is provided on all inputs.
(7) Balanced propagation delays: $t_{PLH} \approx t_{PHL}$
(8) Wide operating voltage range: $V_{CC(opr)}$ = 2.0 to 5.5 V
(9) Low noise: V_{OLP} = 0.8 V (max)
(10) Pin and function compatible with the 74 series (AC/HC/AHC/LV etc.) 04 type.

Note 1: This device is compliant with the reliability requirements of AEC-Q100. For details, contact your Toshiba sales representative.

4. Packaging

Start of commercial production
2013-05

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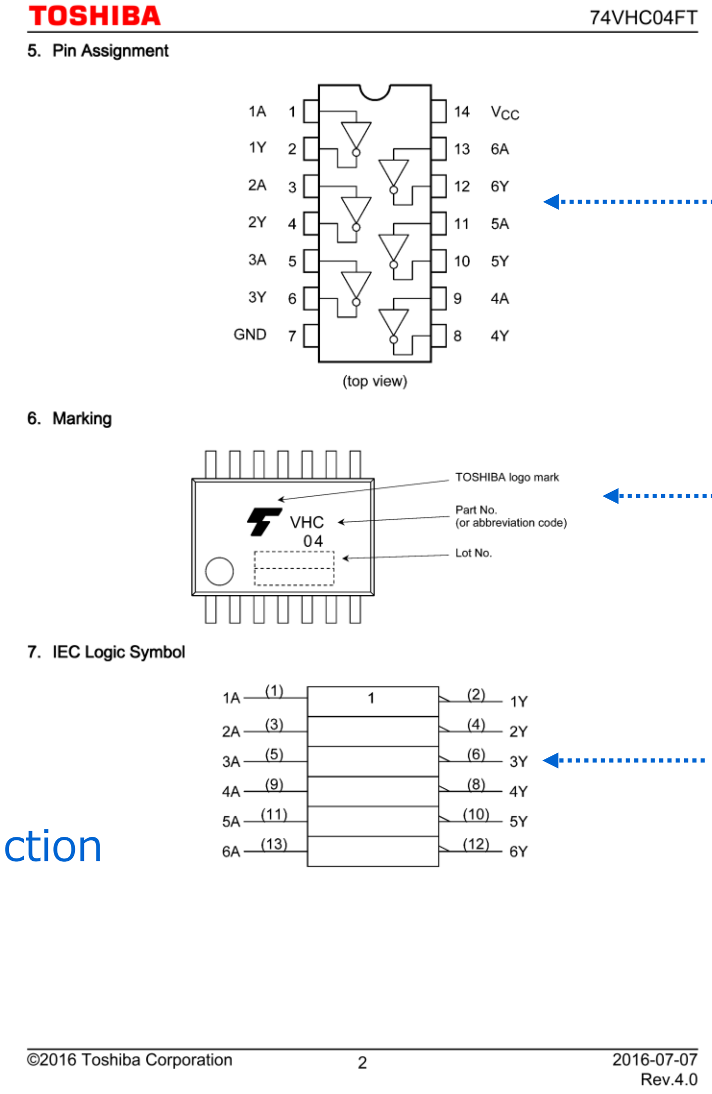

TOSHIBA 74VHC04FT

5. Pin Assignment

6. Marking

7. IEC Logic Symbol

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Pin names
Pin assignment

Marking

Number of circuits
In-out logic symbol

Absolute maximum ratings （74VHC04FT）

Exposure to stress exceeding absolute maximum ratings might cause permanent destruction or reliability degradation of an IC.

Absolute Maximum Ratings (Note)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{CC}		-0.5 to 7.0	V
Input voltage	V_{IN}		-0.5 to 7.0	V
Output voltage	V_{OUT}		-0.5 to V_{CC} + 0.5	V
Input diode current	I_{IK}		-20	mA
Output diode current	I_{OK}		±20	mA
Output current	I_{OUT}		±25	mA
V_{CC}/ground current	I_{CC}		±50	mA
Power dissipation	P_D	(Note 1)	180	mW
Storage temperature	T_{stg}		-65 to 150	℃

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: 180 mW in the range of T_a = -40 to 85 ℃. From T_a = 85 to 125 ℃ a derating factor of -3.25 mW/℃ shall be applied until 50 mW.

Operating ranges （74VHC04FT）

This table shows the conditions under which the functional operation of an IC is guaranteed.

Operating Ranges (Note)

Characteristics	Symbol	Test Condition	Rating	Unit
Supply voltage	V_{CC}		2.0 to 5.5	V
Input voltage	V_{IN}		0 to 5.5	V
Output voltage	V_{OUT}		0 to V_{CC}	V
Operating temperature	T_{opr}		-40 to 125	℃
Input rise and fall times	dt/dv	V_{CC} = 3.3 ± 0.3 V	0 to 100	ns/V
		V_{CC} = 5.0 ± 0.5 V	0 to 20	

Note: The operating ranges are required to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

4.2 Reading datasheets: DC electrical characteristics

DC electrical characteristics (74VHC04FT)

This section describes major DC characteristics shown below.

11.3. DC Characteristics (Unless otherwise specified, T_a = -40 to 125 °C)

	Characteristics	Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
#1	High-level input voltage	V_{IH}	—		2.0	1.50	—	V
					3.0 to 5.5	$V_{CC} \times 0.7$	—	
	Low-level input voltage	V_{IL}	—		2.0	—	0.50	V
					3.0 to 5.5	—	$V_{CC} \times 0.3$	
#2	High-level output voltage	V_{OH}	$V_{IN} = V_{IL}$	I_{OH} = -50 μA	2.0	1.9	—	V
					3.0	2.9	—	
					4.5	4.4	—	
				I_{OH} = -4 mA	3.0	2.40	—	
				I_{OH} = -8 mA	4.5	3.70	—	
	Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$	I_{OL} = 50 μA	2.0	—	0.1	V
					3.0	—	0.1	
					4.5	—	0.1	
				I_{OL} = 4 mA	3.0	—	0.55	
				I_{OL} = 8 mA	4.5	—	0.55	
#3	Input leakage current	I_{IN}	V_{IN} = 5.5 V or GND		0 to 5.5	—	±2.0	μA
#4	Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND		5.5	—	40.0	μA

DC characteristic #1: Input voltages (V_{IH} and V_{IL})

The voltage at which an input signal is determined to be High or Low is called threshold voltage.

DC characteristics of the 74VHC04FT

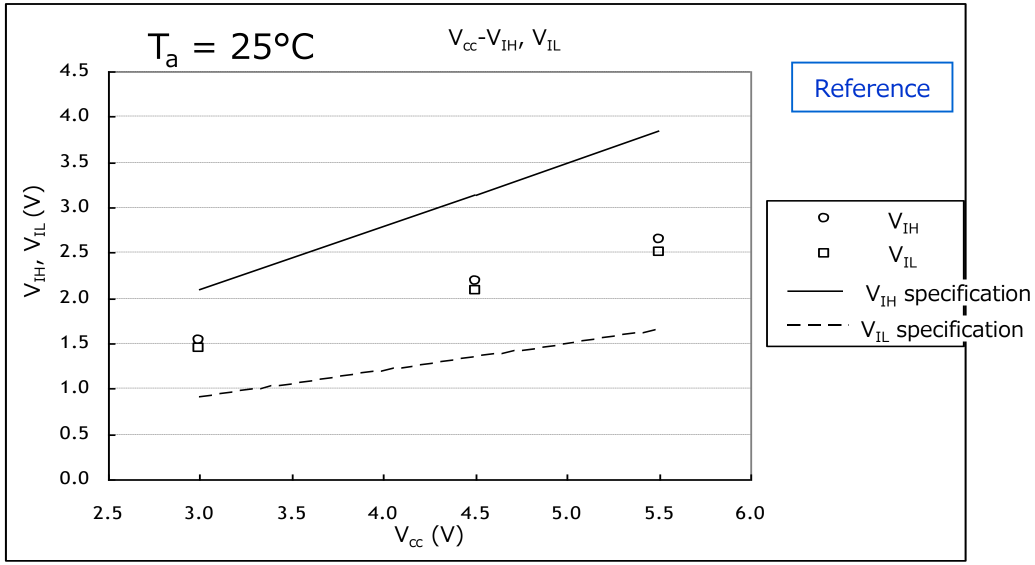
11.3. DC Characteristics (Unless otherwise specified, T_a = -40 to 125 ℃)

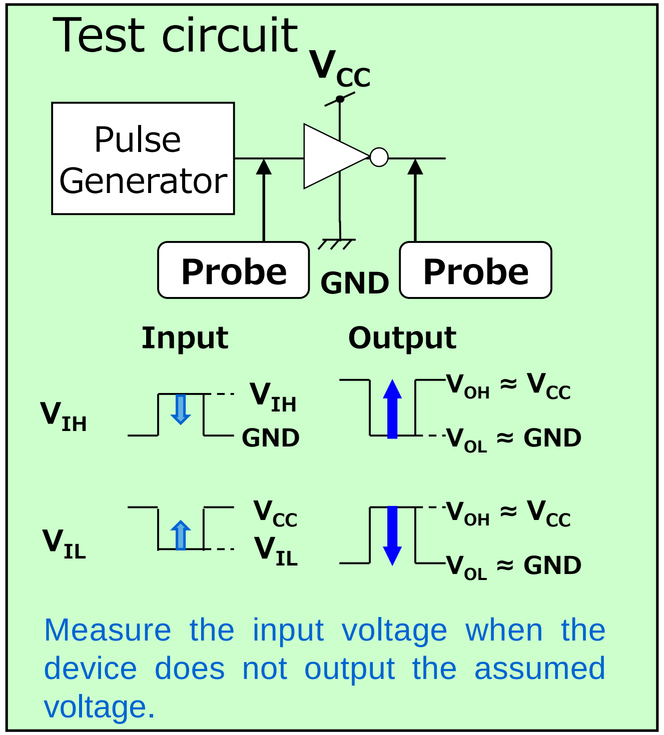
Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
High-level input voltage	V_{IH}	—	2.0	1.50	—	V
			3.0 to 5.5	$V_{CC} \times 0.7$	—	
Low-level input voltage	V_{IL}	—	2.0	—	0.50	V
			3.0 to 5.5	—	$V_{CC} \times 0.3$	

4.2.1 Reading datasheets: Input voltages (V_{IH} and V_{IL})

Example: Input voltages (V_{IH} and V_{IL}) vs supply voltage (V_{CC}) of the 74VHC04

The V_{IH} and V_{IL} of CMOS logic ICs are designed to be 1/2 V_{CC}.





4.2.2 Reading datasheets: Output currents (I_{OH} and I_{OL})

DC characteristic #2: Output currents (I_{OH} and I_{OL})

The drive capability of the output buffer and the guaranteed output current are important when connecting a CMOS logic IC with an LSI chip.

DC characteristics of the 74VHC04FT

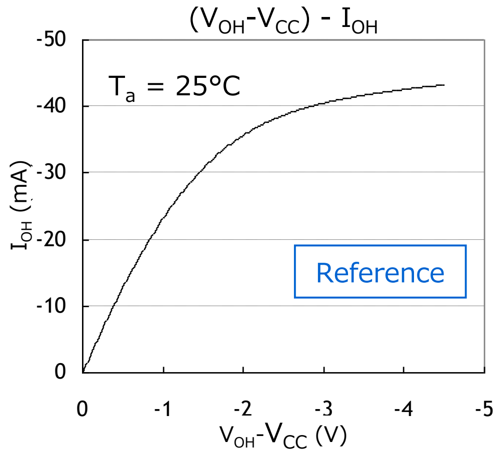
11.3. DC Characteristics (Unless otherwise specified, T_a = -40 to 125 ℃)

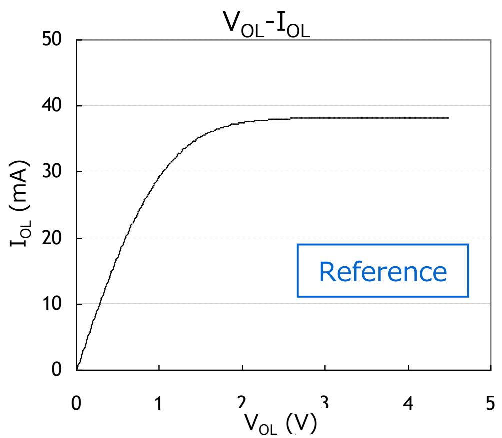
Characteristics	Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
High-level output voltage	V_{OH}	$V_{IN} = V_{IL}$	I_{OH} = -50 μA	2.0	1.9	—	V
				3.0	2.9	—	
				4.5	4.4	—	
			I_{OH} = -4 mA	3.0	2.40	—	
			I_{OH} = -8 mA	4.5	3.70	—	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$	I_{OL} = 50 μA	2.0	—	0.1	V
				3.0	—	0.1	
				4.5	—	0.1	
			I_{OL} = 4 mA	3.0	—	0.55	
			I_{OL} = 8 mA	4.5	—	0.55	

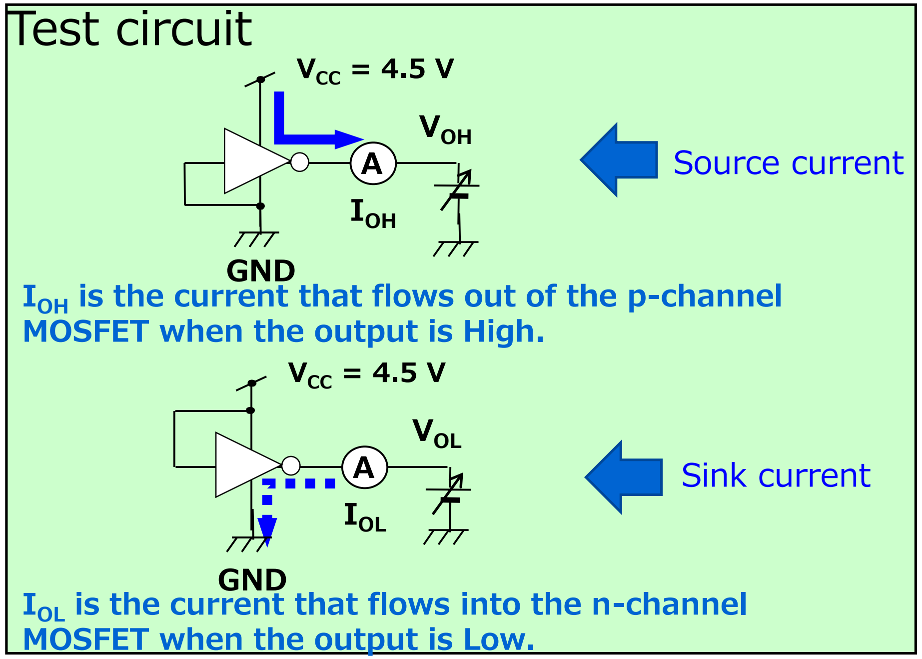
4.2.2 Reading datasheets: Output currents (I_{OH} and I_{OL})

Example: Output current (I_{OH}/I_{OL}) vs output voltage (V_{OH}/V_{OL}) curves of the 74VHC04

CMOS logic ICs are designed to provide almost the same drive capability at both I_{OH} and I_{OL}.







4.2.3 Reading datasheets: Input current (I_{IN})

DC characteristic #3: Input current (I_{IN})

Since the CMOS logic IC is a voltage-driven IC, almost no input current (I_{IN}) is required.

DC characteristics of the 74VHC04FT

11.3. DC Characteristics (Unless otherwise specified, T_a = -40 to 125 °C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Input leakage current	I_{IN}	V_{IN} = 5.5 V or GND	0 to 5.5	—	±2.0	μA

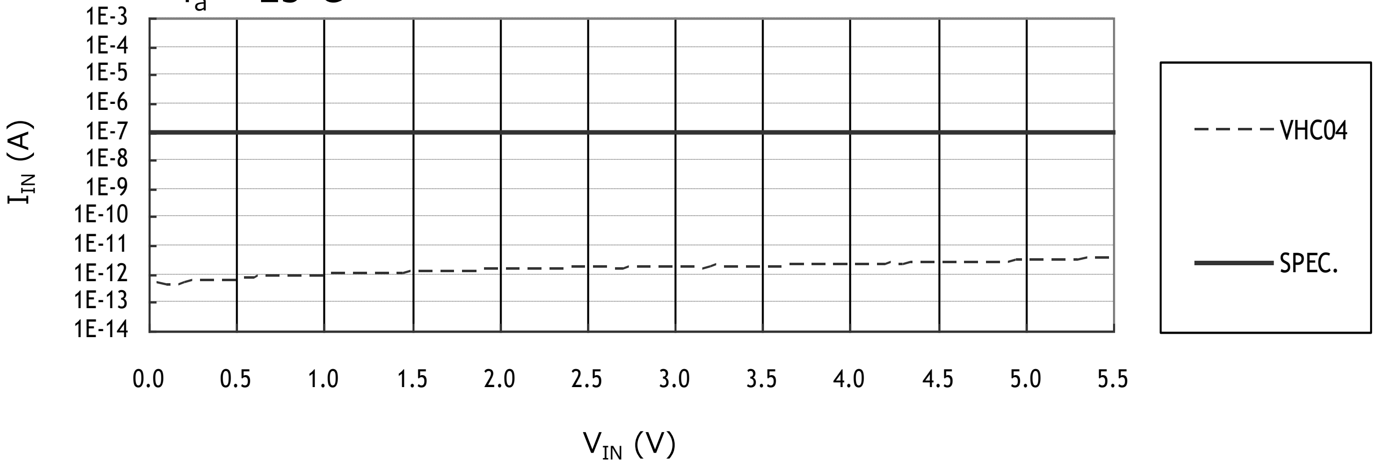
4.2.3 Reading datasheets: Input current (I_{IN})

Example: Input voltage (V_{IN}) vs input current (I_{IN}) curve of the 74VHC04

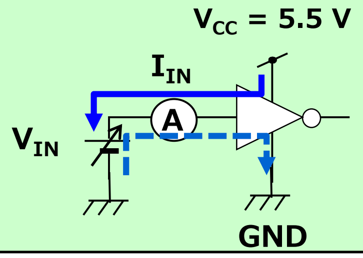
The input current (I_{IN}) is leakage only and as low as several nanoamperes (nA).

Reference

T_a = 25°C



Test circuit



Current signs:
Positive (+) when current flows into an IC (highlighted by a dashed line)
Negative (-) when current flows out of an IC (highlighted by a solid line)

DC characteristic #4: Quiescent supply current (I_{CC})

CMOS devices consume much lower current than other types of device when they are inactive.

DC characteristics of the 74VHC04

11.3. DC Characteristics (Unless otherwise specified, T_a = -40 to 125 °C)

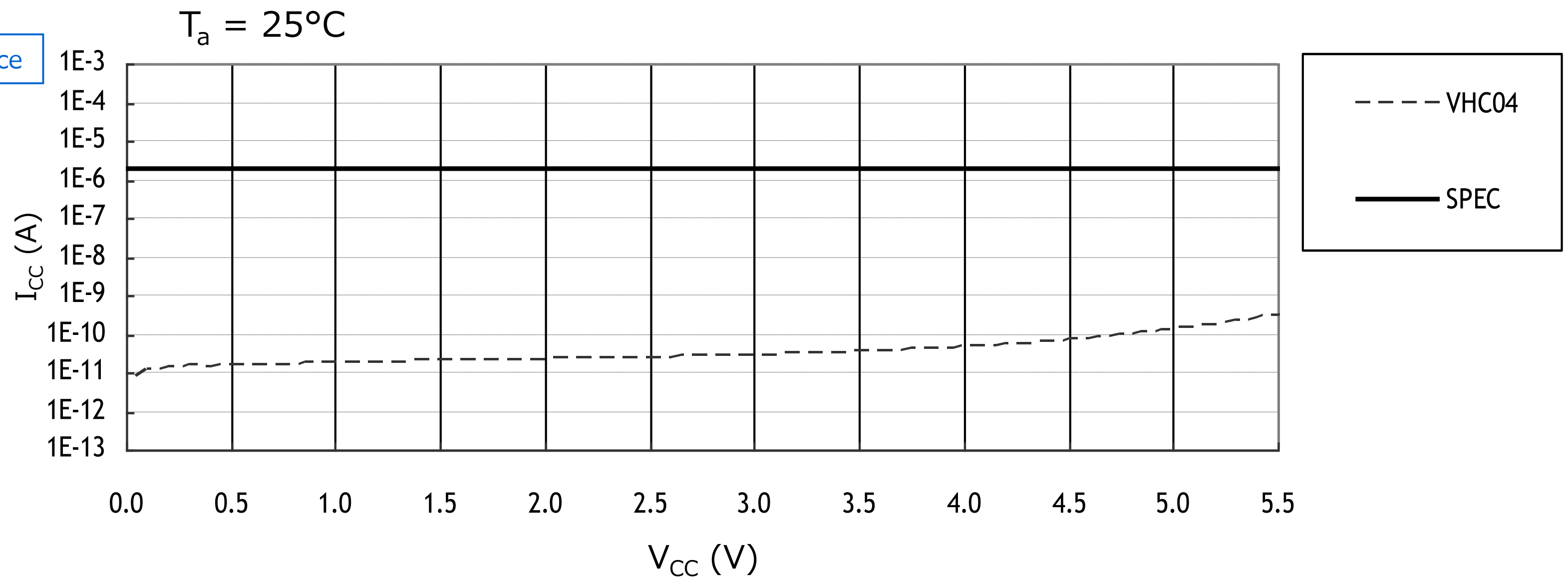
Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND	5.5	—	40.0	μA

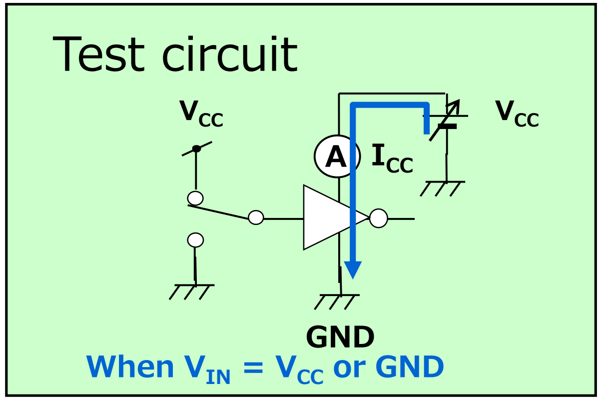
4.2.4 Reading datasheets: Quiescent supply current (I_{CC})

Example: Quiescent supply current (I_{CC}) vs supply voltage (V_{CC}) curve of the 74VHC04

The quiescent supply current (I_{CC}) of the CMOS device is leakage only and as low as several nanoamperes (nA).

Reference





AC electrical characteristics

AC characteristics of the 74VHC04FT

11.4. AC Characteristics (Unless otherwise specified, T_a = 25 °C, Input: $t_r = t_f$ = 3 ns)

	Characteristics	Symbol	Note	V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Unit
#5	Propagation delay time	t_{PLH},t_{PHL}		3.3 ± 0.3	15	—	5.0	7.1	ns
					50	—	7.5	10.6	
				5.0 ± 0.5	15	—	3.8	5.5	
					50	—	5.3	7.5	
	Input capacitance	C_{IN}				—	4	10	pF
#6	Power dissipation capacitance	C_{PD}	(Note 1)			—	18	—	pF

Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.

$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$ (per gate)

4.3.1 Reading datasheets: Propagation delay times (t_{pLH} and t_{pHL})

AC characteristic #5: Propagation delay times (t_{pLH} and t_{pHL})

Ideally, an output signal should change immediately in response to changes in an input signal, but there actually is a delay. The time required for an output to change in response to an input change is called a propagation delay time.

AC characteristics of the 74VHC04FT

11.4. AC Characteristics (Unless otherwise specified, T_a = 25 °C, Input: $t_r = t_f$ = 3 ns)

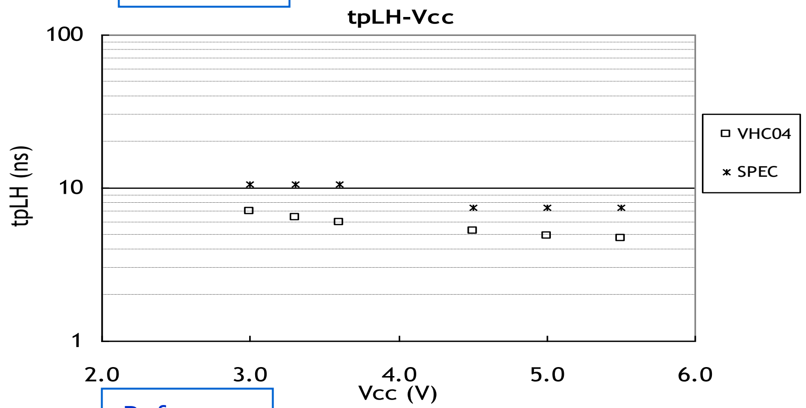
Characteristics	Symbol	Note	V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Unit
Propagation delay time	t_{PLH},t_{PHL}		3.3 ± 0.3	15	—	5.0	7.1	ns
				50	—	7.5	10.6	
			5.0 ± 0.5	15	—	3.8	5.5	
				50	—	5.3	7.5	

4.3.1 Reading datasheets: Propagation delay times (t_{pLH} and t_{pHL})

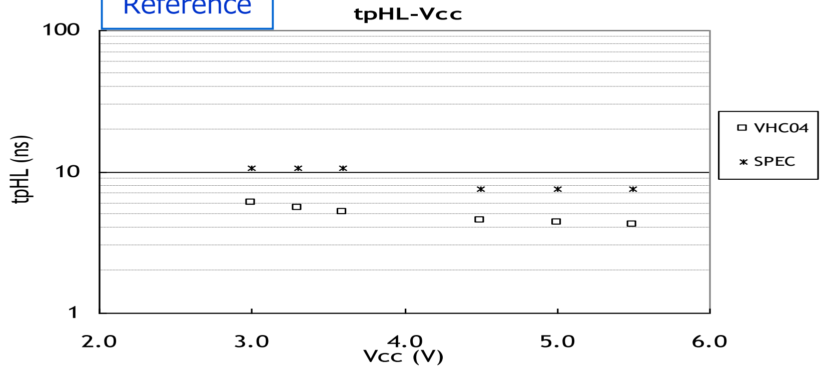
Example: 74VHC04

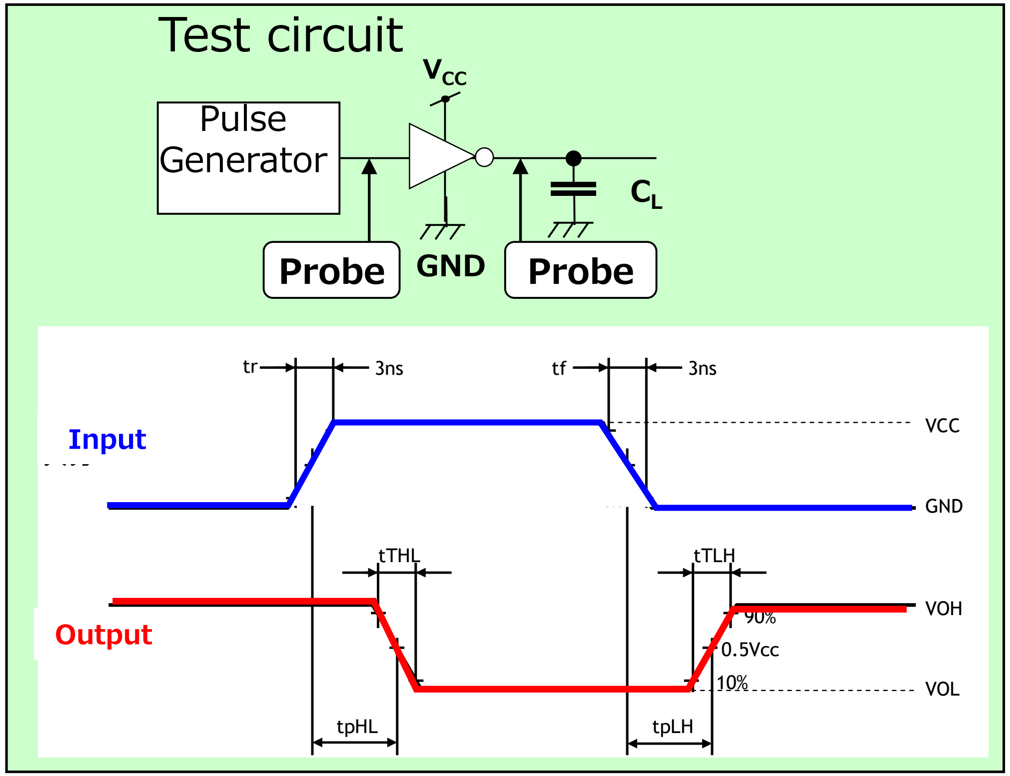
Reference

Ta = 25°C, C_L = 50 pF



Reference





AC characteristic #6: Power dissipation capacitance (C_{PD})

As the operating frequency increases, the supply current of a CMOS logic IC increases.

AC characteristics of the 74VHC04FT

11.4. AC Characteristics (Unless otherwise specified, T_a = 25 °C, Input: $t_r = t_f$ = 3 ns)

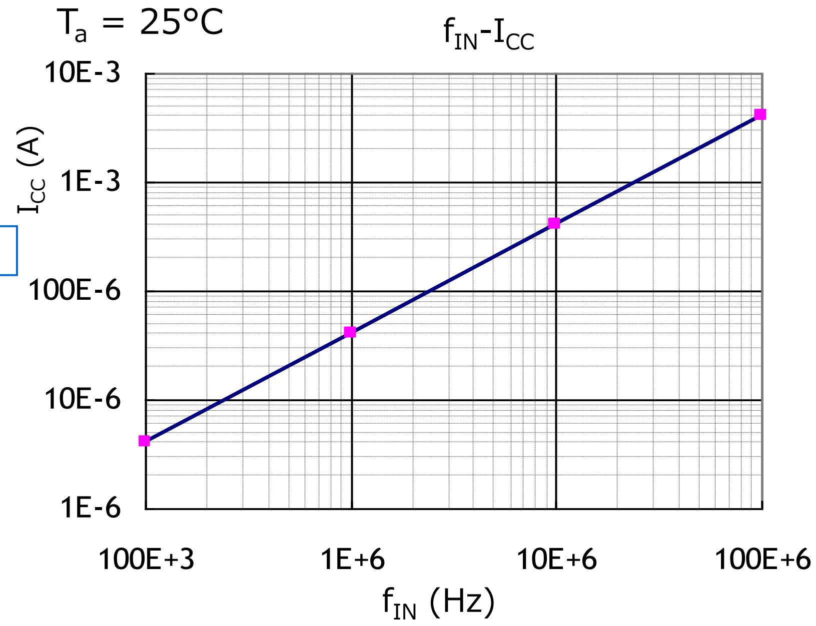
Characteristics	Symbol	Note	V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Unit
Power dissipation capacitance	C_{PD}	(Note 1)			—	18	—	pF

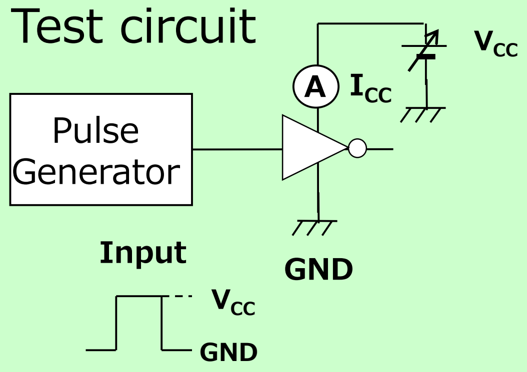
Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.
$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$ (per gate)

4.3.2 Reading datasheets: Power dissipation capacitance (C_{PD})

Example: Input frequency (f_{IN}) vs supply current (I_{CC}) slope of the 74VHC04

Reference





The operating supply current is determined by the charging and discharging current of internal equivalent capacitance and output load capacitance.
Therefore, the operating supply current is proportional to the input frequency (f_{IN}).

$I_{CC} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$ (quiescent supply current)

Example: When f_{IN} = 1 MHz, C_L = 15 pF

I_{CC} = (18+15) pF × 5 V × 1 MHz + 2 μA
=167 μA

Power dissipation (P_D) = I × V = 167 μA × 5 V = 0.84 mW

4.4 Reading datasheets: Input-tolerant function

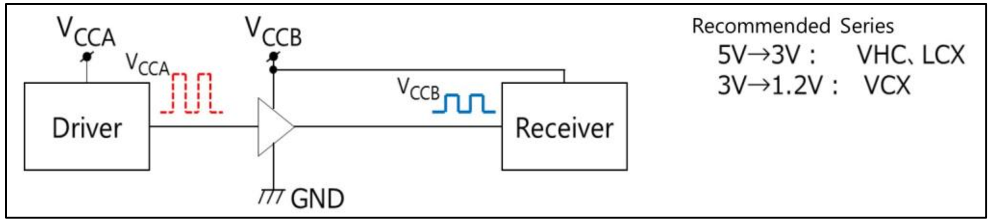
What is the input-tolerant function?

A CMOS logic IC with an input-tolerant function allows a voltage of up to the maximum operating voltage to be applied to an input while the power supply is active or at 0 V. The input-tolerant function allows level shifting from a higher voltage to a lower voltage.

Examples of level shifting

Down translation from 5 V to 3 V: Use the 74VHC or 74LCX Series.

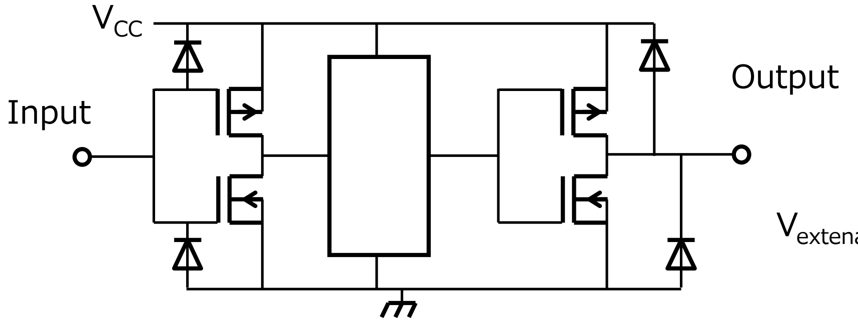
Down translation from 3 V to 1.2 V: Use the 74VCX Series.



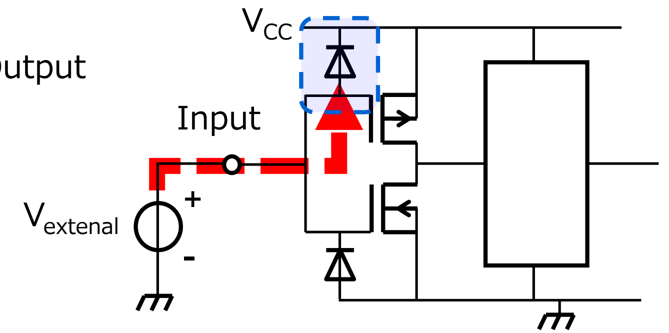
The following shows an equivalent circuit for a typical CMOS logic IC.

The diodes on the input side are inserted for the purpose of ESD protection whereas those on the output side are parasitic diodes.

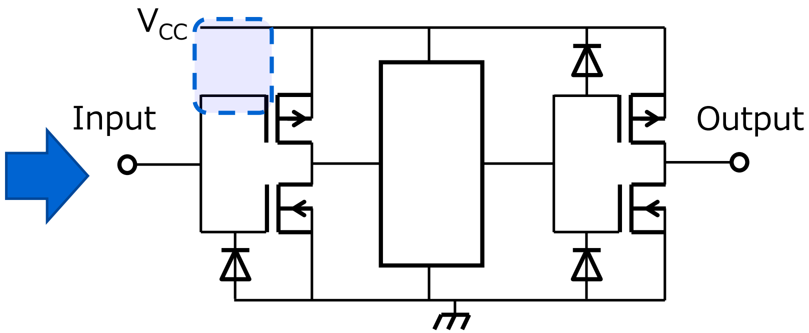
<u>The diode between the input and the power supply</u> might turn on if a voltage higher than V_{CC} is applied or voltage is applied when the IC is off. In this case, the IC might be destroyed by the resulting large current. Device destruction can be prevented by using an IC with an input-tolerant function, i.e., an IC <u>without a diode between the input and power supply</u>.



Equivalent circuit for a typical CMOS logic IC
Equivalent input/output circuit for a CMOS logic IC without input-tolerant and power-down protection functions



Without an input-tolerant function:
$V_{external} > V_{CC}$



Equivalent input/output circuit for a CMOS logic IC with an input-tolerant function

4.4 Reading datasheets: Input-tolerant function

It is easy to distinguish whether an IC has an input-tolerant function.

Let's look at the datasheets for ICs of the TC74HC and 74VHC Series.

See the input voltage shown in the Operating Ranges table.

The datasheet of the TC74HC Series shows V_{IN} = 0 to V_{CC}. This means that the input pin is tolerant of only up to V_{CC}. Therefore, **the TC74HC Series does not have an input-tolerant function**.

In contrast, the datasheet of the 74VHC Series shows V_{IN} = 0 to 5.5 V, meaning that up to 5.5 V can be applied to the input pin regardless of V_{CC}. Therefore, **the 74VHC Series has an input-tolerant function**.

Operating ranges of the TC74HC Series (Example: TC74HC244A)

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	–40 to 85	°C
Input rise and fall time	t_r, t_f	0 to 1000 (V_{CC} = 2.0 V) 0 to 500 (V_{CC} = 4.5 V) 0 to 400 (V_{CC} = 6.0 V)	ns

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Operating ranges of the 74VHC Series (Example: 74VHC244)

Operating Ranges (Note)

Characteristics	Symbol	Test Condition	Rating	Unit
Supply voltage	V_{CC}		2.0 to 5.5	V
Input voltage	V_{IN}		0 to 5.5	V
Output voltage	V_{OUT}		0 to V_{CC}	V
Operating temperature	T_{opr}		-40 to 125	°C
Input rise and fall times	dt/dv	V_{CC} = 3.3 ± 0.3 V	0 to 100	ns/V
		V_{CC} = 5 ± 0.5 V	0 to 20	

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

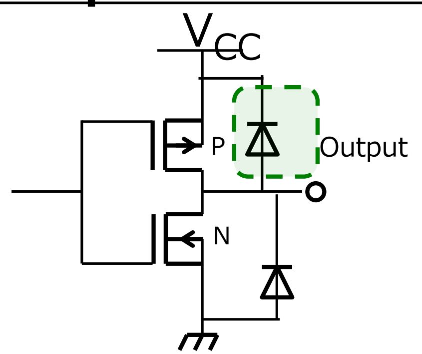
4.5 Reading datasheets: Output-tolerant function

What is the output-tolerant function?

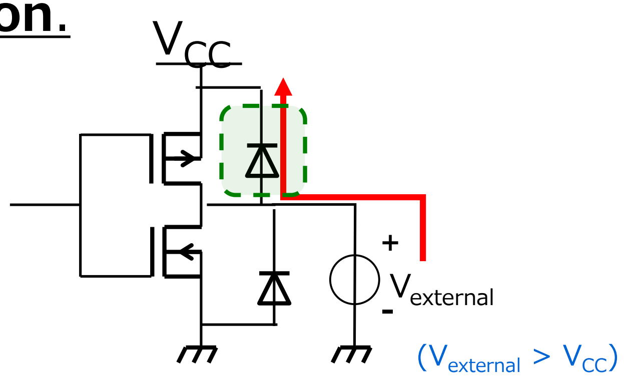
The output circuitry of CMOS logic ICs has a totem-pole configuration consisting of a pair of p-channel and n-channel MOSFETs as shown below. Typically, CMOS logic ICs have a parasitic diode between an output and power supply.

The parasitic diode turns on when voltage is applied to an IC when it is off or to an IC with a three-state output (such as the 74LCX245) when it is on. The IC might be destroyed by the resulting large current.

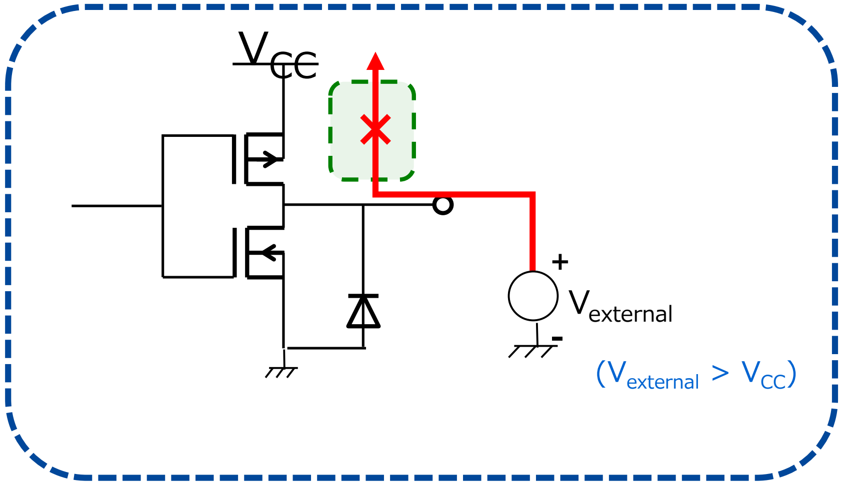
Even when a voltage higher than the supply voltage (V_{CC}) is applied to the output, current does not flow into **an IC with an output configuration that does not have this parasitic diode**. Such an IC **has an output-tolerant function**.



Equivalent output circuit for a CMOS logic IC without an output-tolerant function



When voltage exceeding the supply voltage ($V_{external}$) is applied to a CMOS logic IC without an output-tolerant function



When voltage exceeding the supply voltage ($V_{external}$) is applied to a CMOS logic IC with an output-tolerant function

4.5 Reading datasheets: Output-tolerant function

It is easy to distinguish whether an IC has an output-tolerant function.
Let's look at the datasheets for ICs of the 74VHC and 74LCX Series.

See the bus I/O voltage shown in the Operating Ranges table.
The datasheet of the 74VHC245 shows V_{IO} = 0 to V_{CC}. This means that the output pin is tolerant of only up to V_{CC}. Therefore, **the 74VHC245 does not have an output-tolerant function**.
In contrast, the datasheet of the 74LCX245 shows V_{IN} = 0 to 5.5 V, meaning that up to 5.5 V can be applied to the bus I/O pin regardless of V_{CC}. Therefore, **the 74LCX245 has an output-tolerant function.**

Operating ranges of the 74VHC245

Operating Ranges (Note)

Characteristics	Symbol	Test Condition	Rating	Unit
Supply voltage	V_{CC}		2.0 to 5.5	V
Input voltage(DIR,$\overline{G}$)	V_{IN}		0 to 5.5	V
Bus I/O voltage	$V_{I/O}$		0 to V_{CC}	V
Operating temperature	T_{opr}		-40 to 125	°C
Input rise and fall times	dt/dv	V_{CC} = 3.3 ± 0.3 V	0 to 100	ns/V
		V_{CC} = 5.0 ± 0.5 V	0 to 20	

Note: The operating ranges are required to ensure the normal operation of the device. Unused inputs and bus inputs must be tied to either V_{CC} or GND. Please connect both bus inputs and the bus outputs with V_{CC} or GND when the I/O of the bus terminal changes by the function. In this case, please note that the output is not short-circuited.

Operating ranges of the 74LCX245

Operating Ranges (Note)

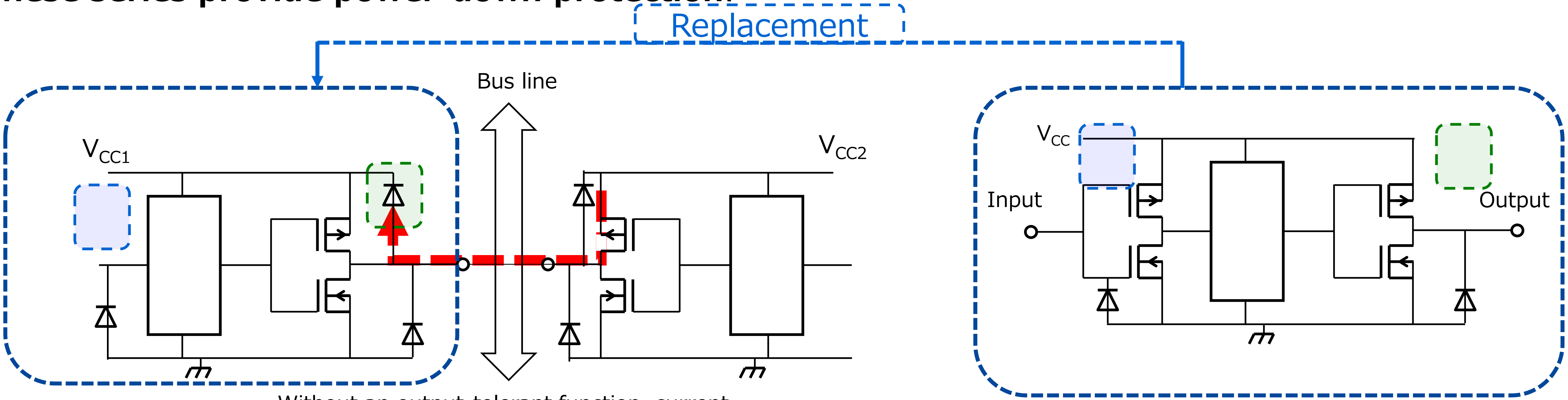
Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{CC}		1.65 to 3.6	V
		(Note 1)	1.5 to 3.6	
Input voltage (DIR,$\overline{OE}$)	V_{IN}		0 to 5.5	V
Bus I/O voltage	$V_{I/O}$	(Note 2)	0 to 5.5	V
		(Note 3)	0 to V_{CC}	
Output current	I_{OH},I_{OL}	(Note 4)	±24	mA
		(Note 5)	±12	
Operating temperature	T_{opr}		-40 to 85	°C
Input rise and fall times	dt/dv	(Note 6)	0 to 10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs and bus inputs must be tied to either V_{CC} or GND. Please connect both bus inputs and the bus outputs with V_{CC} or GND when the I/O of the bus terminal changes by the function. In this case, please note that the output is not short-circuited.
Note 1: Data retention only.
Note 2: Output in OFF state.

4.6 Reading datasheets: Power-down protection

What is power-down protection?

To reduce power consumption, a system with two voltage domains (V_{CC1} and V_{CC2}) might provide partial power-down mode in which the subsystem operating from V_{CC1} is shut down. Suppose, for example, that the 74VHC Series is used in the V_{CC1} domain. The 74VHC Series has an unintended parasitic diode between the output and power supply. Therefore, when $V_{CC2} > V_{CC1}$, this parasitic diode turns on. In this case, the IC might be destroyed by the resulting large current. Device destruction can be prevented by using an IC with neither an input nor output parasitic diode (e.g., 74VHCT, 74LCX, and 74VCX Series).
These series provide power-down protection.



Without an output-tolerant function, current flows into the IC from another IC (Output2).
$V_{CC2} > V_{CC1}$

Equivalent input/output circuit for a CMOS logic IC with a power-down protection function

4.6 Reading datasheets: Power-down protection

It is easy to distinguish whether an IC has a power-down protection function.

Let's look at the datasheets for ICs of the 74VHC and 74LCX Series.

See the DC Characteristics table.

Power-off leakage current (I_{OFF}) is specified in the datasheet for the 74LCX245, which indicates that leakage current does not flow even when power supply is off.

Therefore, **the 74LCX245 has a power-down protection function**.

In contrast, I_{OFF} is not specified for the 74VHC245.

Therefore, **the 74VHC245 does not have a power-down protection function**.

Note: The following four series provide a power-down protection function:

- 74VHCT Series
- 74VHCV Series
- 74LCX Series
- 74VCX Series

For the 74VHCT Series, power-down protection is specified by I_{OPD} and I_{IN} instead of I_{OFF}.

11.1. DC Characteristics (Unless otherwise specified, T_a = -40 to 85°C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
High-level input voltage	V_{IH}	—		1.65 to 2.3	$V_{CC} \times 0.9$	—	V
				2.3 to 2.7	1.7	—	
				2.7 to 3.6	2.0	—	
Low-level input voltage	V_{IL}	—		1.65 to 2.3	—	$V_{CC} \times 0.1$	V
				2.3 to 2.7	—	0.7	
				2.7 to 3.6	—	0.8	
High-level output voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	I_{OH} = -100 μA	1.65 to 3.6	V_{CC} - 0.2	—	V
			I_{OH} = -4 mA	1.65	1.05	—	
			I_{OH} = -8 mA	2.3	1.7	—	
			I_{OH} = -12 mA	2.7	2.2	—	
			I_{OH} = -18 mA	3.0	2.4	—	
			I_{OH} = -24 mA	3.0	2.2	—	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	I_{OL} = 100 μA	1.65 to 3.6	—	0.2	V
			I_{OL} = 4 mA	1.65	—	0.45	
			I_{OL} = 8 mA	2.3	—	0.7	
			I_{OL} = 12 mA	2.7	—	0.4	
			I_{OL} = 16 mA	3.0	—	0.4	
			I_{OL} = 24 mA	3.0	—	0.55	
Input leakage current	I_{IN}	V_{IN} = 0 to 5.5 V		1.65 to 3.6	—	±5.0	μA
3-state output OFF-state leakage current	I_{OZ}	$V_{IN} = V_{IH}$ or V_{IL} V_{OUT} = 0 to 5.5 V		1.65 to 3.6	—	±5.0	μA
Power-OFF leakage current	I_{OFF}	V_{IN}/V_{OUT} = 5.5 V		0	—	10.0	μA
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND		1.65 to 3.6	—	10.0	μA
		V_{IN}/V_{OUT} = 3.6 to 5.5 V		1.65 to 3.6	—	±10.0	
Quiescent supply current	ΔI_{CC}	$V_{IH} = V_{CC}$ - 0.6 V (per input)		2.7 to 3.6	—	500	μA

TOSHIBA