

74HC4515

4-to-16 line decoder/demultiplexer with input latches; inverting

Rev. 3 — 2 July 2018

Product data sheet

1 General description

The 74HC4515 is a 4-to-16 line decoder/demultiplexer having four binary weighted address inputs (A0 to A3) with latches, a latch enable input (LE), an enable input ($\bar{E}$) and 16 inverting outputs ($\bar{Q}0$, to $\bar{Q}15$).

When LE is HIGH, the selected output is determined by the data on A_n. When LE goes LOW, the last data present at A_n are stored in the latches and the outputs remain stable. When $\bar{E}$ is LOW, the selected output, determined by the contents of the latch, is LOW. When $\bar{E}$ is HIGH, all outputs are HIGH. The enable input $\bar{E}$ does not affect the state of the latch. When the device is used as a demultiplexer, $\bar{E}$ is the data input and A0 to A3 are the address inputs.

Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

2 Features and benefits

- Inverting outputs
- CMOS input levels
- 16-line demultiplexing capability
- Decodes 4 binary-coded inputs into 16 mutually-exclusive outputs
- Complies with JEDEC standard no. 7 A
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3 Applications

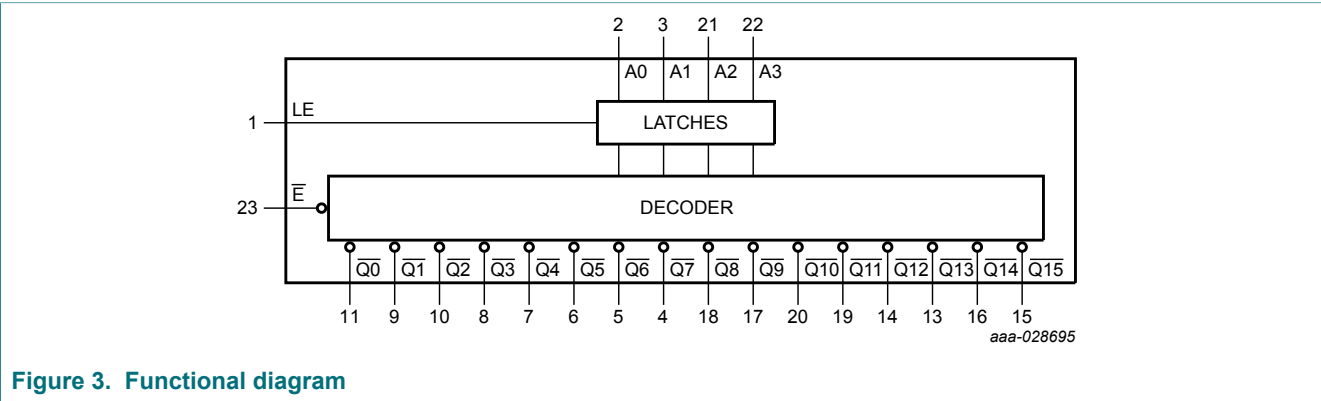
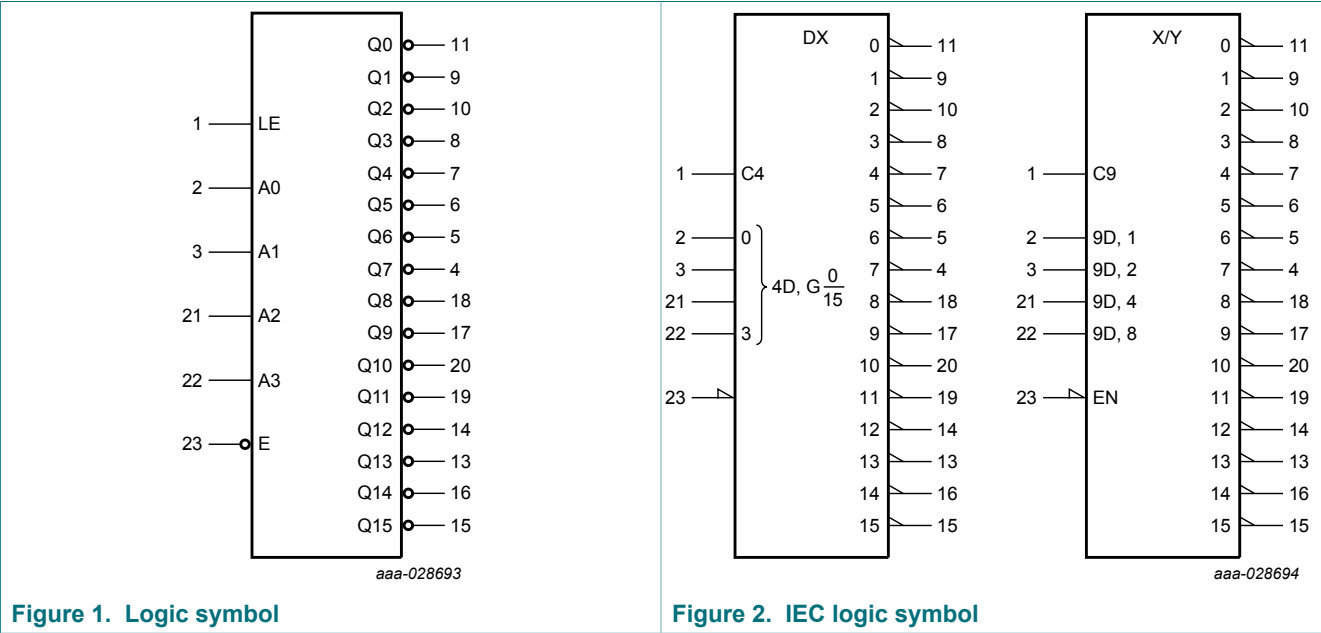
- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

4 Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC4515D	-40 °C to +125 °C	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1

5 Functional diagram



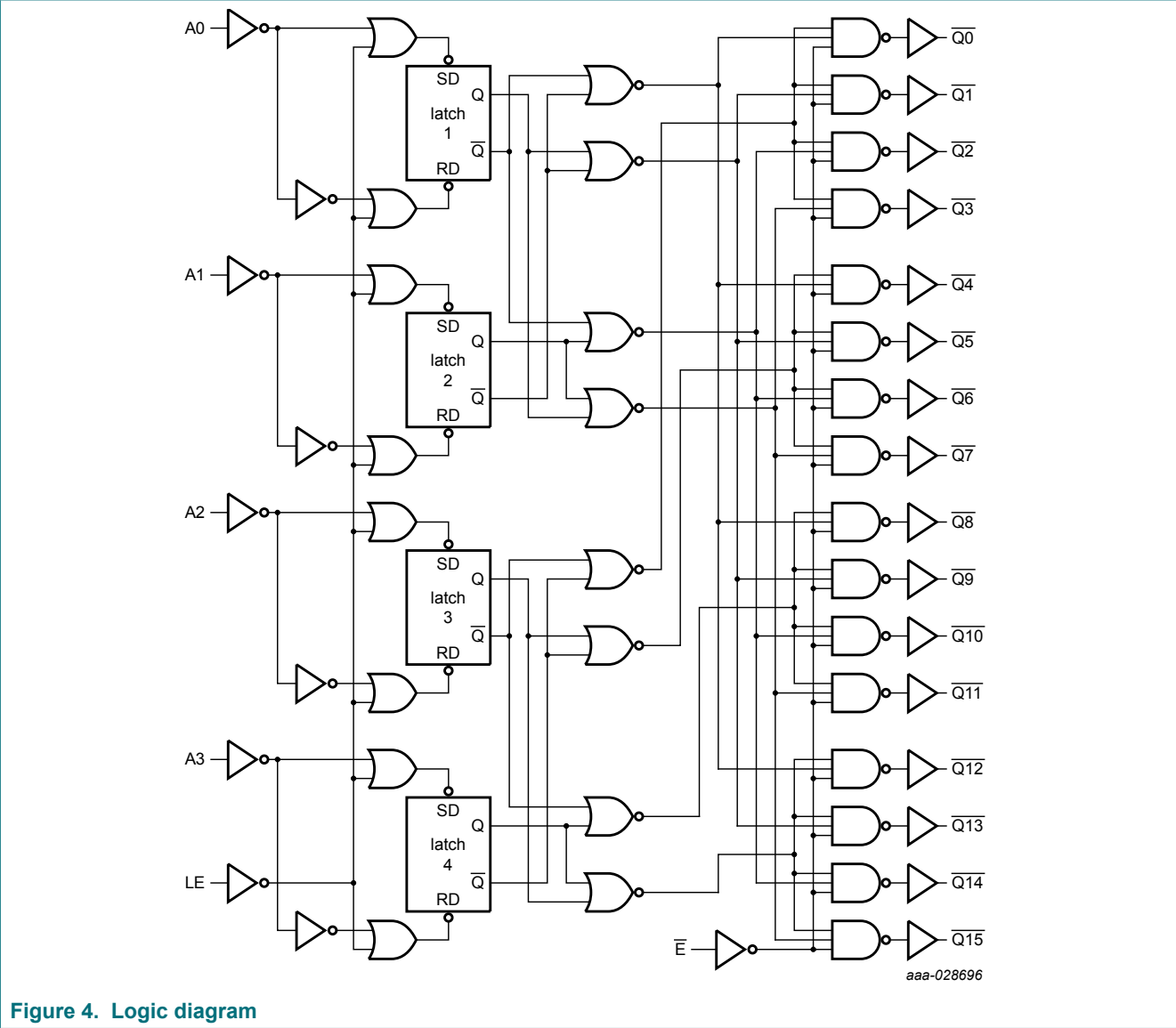


Figure 4. Logic diagram

6 Pinning information

6.1 Pinning

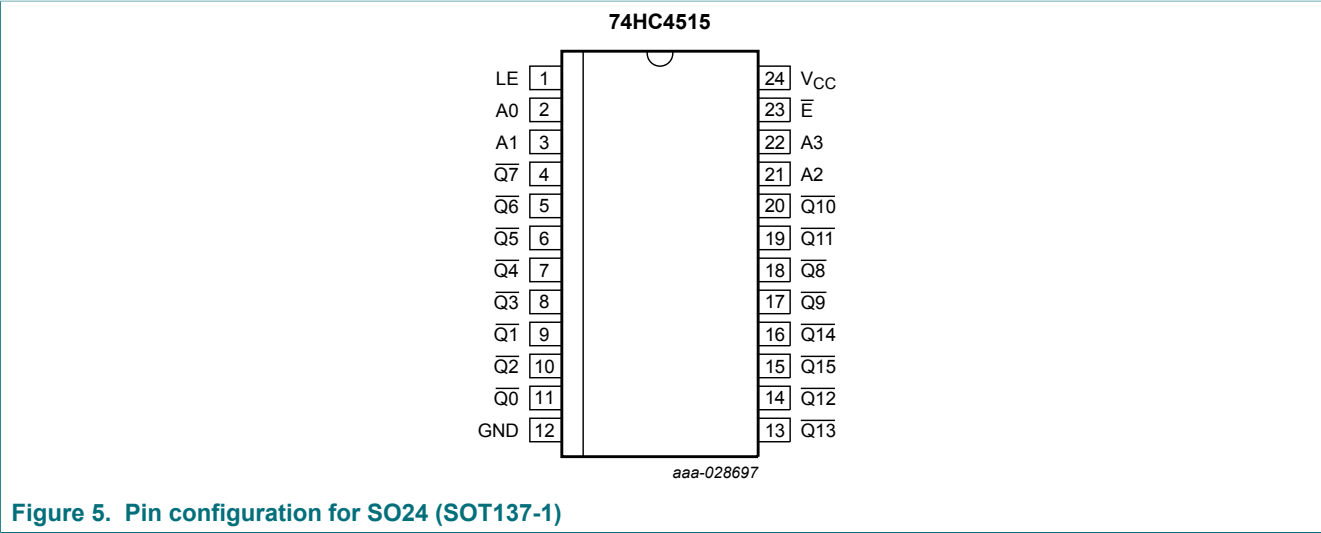


Figure 5. Pin configuration for SO24 (SOT137-1)

6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
LE	1	latch enable input (active HIGH)
$\overline{E}$	23	enable input (active LOW)
$\overline{Q0}$, $\overline{Q1}$, $\overline{Q2}$, $\overline{Q3}$, $\overline{Q4}$, $\overline{Q5}$, $\overline{Q6}$, $\overline{Q7}$, $\overline{Q8}$, $\overline{Q9}$, $\overline{Q10}$, $\overline{Q11}$, $\overline{Q12}$, $\overline{Q13}$, $\overline{Q14}$, $\overline{Q15}$	11, 9, 10, 8, 7, 6, 5, 4, 18, 17, 20, 19, 14, 13, 16, 15	multiplexer outputs (active LOW)
A0, A1, A2, A3	2, 3, 21, 22	address inputs
GND	12	ground (0 V)
V _{CC}	24	supply voltage

7 Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Inputs ^[1]					Outputs															
$\overline{E}$	A0	A1	A2	A3	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	H	L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	H	H	L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	H	L	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H
L	L	L	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L

[1] LE = HIGH

8 Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+7	V
I_{IK}	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	±20	mA
I_O	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	±25	mA
I_{CC}	supply current		-	50	mA
I_{GND}	ground current		-50	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	SO24 ^[1]	-	500	mW

[1] P_{tot} derates linearly with 8 mW/K above 70 °C.

9 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		2.0	5.0	6.0	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	ns/V
		$V_{CC} = 4.5\text{ V}$	-	1.67	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	ns/V
T_{amb}	ambient temperature		-40	-	+125	°C

10 Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T _{amb} (°C)							Unit
			+25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = -20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = 20 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V

Symbol	Parameter	Conditions	T _{amb} (°C)							Unit
			+25			−40 to +85		−40 to +125		
			Min	Typ	Max	Min	Max	Min	Max	
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

11 Dynamic characteristics

Table 7. Dynamic characteristics

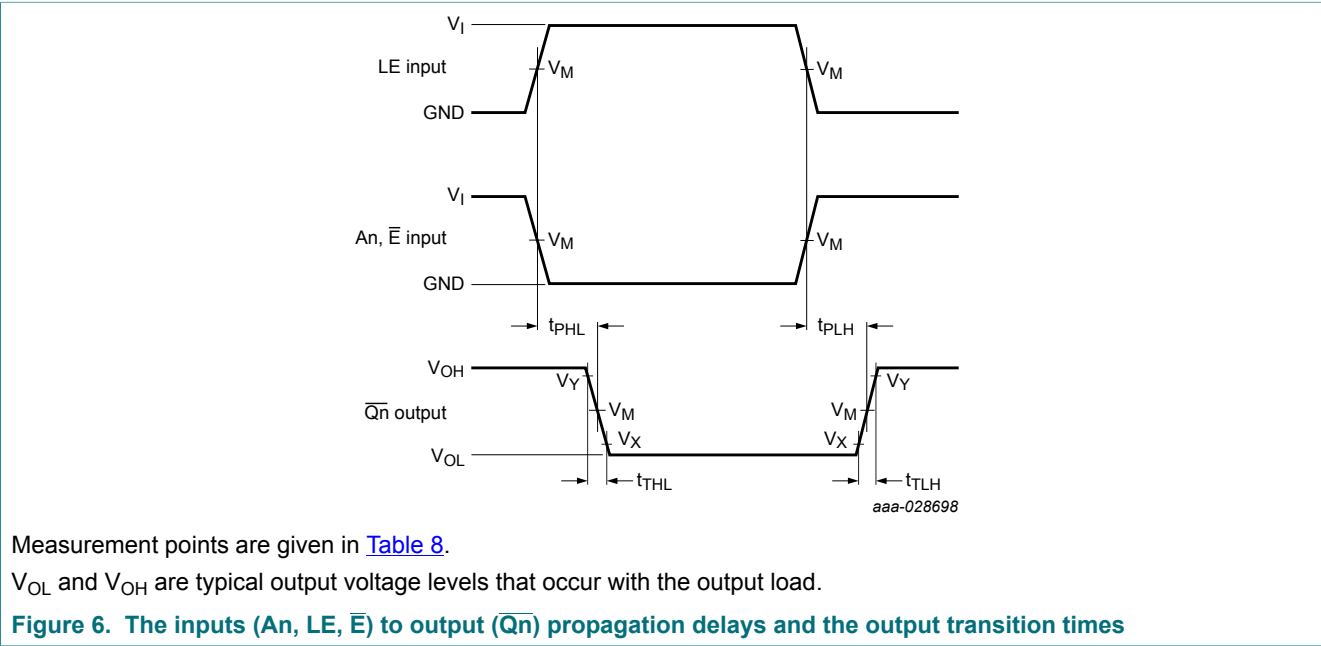
Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit, see [Figure 8](#).

Symbol	Parameter	Conditions	T _{amb} (°C)							Unit
			+25			−40 to +85		−40 to +125		
			Min	Typ	Max	Min	Max	Min	Max	
t _{pd}	propagation delay	An to $\overline{Qn}$; see Figure 6 ^[1]								
		V _{CC} = 2.0 V	-	80	250	-	315	-	375	ns
		V _{CC} = 4.5 V	-	29	50	-	63	-	75	ns
		V _{CC} = 5 V; C _L = 15 pF	-	25	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	23	43	-	54	-	64	ns
		LE to $\overline{Qn}$; see Figure 6								
		V _{CC} = 2.0 V	-	66	225	-	280	-	340	ns
		V _{CC} = 4.5 V	-	24	45	-	56	-	68	ns
		V _{CC} = 6.0 V	-	19	38	-	48	-	58	ns
		$\overline{E}$ to $\overline{Qn}$; see Figure 6								
		V _{CC} = 2.0 V	-	50	175	-	220	-	265	ns
		V _{CC} = 4.5 V	-	18	35	-	44	-	53	ns
		V _{CC} = 6.0 V	-	14	30	-	37	-	45	ns
t _t	transition time	$\overline{Qn}$; see Figure 6 ^[2]								
		V _{CC} = 2.0 V	-	19	75	-	95	-	110	ns
		V _{CC} = 4.5 V	-	7	15	-	19	-	22	ns
		V _{CC} = 6.0 V	-	6	13	-	16	-	19	ns
t _w	pulse width	LE HIGH; see Figure 7								
		V _{CC} = 2.0 V	75	14	-	95	-	110	-	ns
		V _{CC} = 4.5 V	15	5	-	19	-	22	-	ns
		V _{CC} = 6.0 V	13	4	-	16	-	19	-	ns

Symbol	Parameter	Conditions	T _{amb} (°C)						Unit
			+25			-40 to +85		-40 to +125	
			Min	Typ	Max	Min	Max	Min	Max
t _{su}	set-up time	An to LE; see Figure 7							
		V _{CC} = 2.0 V	90	28	-	115	-	135	-
		V _{CC} = 4.5 V	18	10	-	23	-	27	-
		V _{CC} = 6.0 V	15	8	-	20	-	23	-
t _h	hold time	An to LE; see Figure 7							
		V _{CC} = 2.0 V	0	-11	-	0	-	0	-
		V _{CC} = 4.5 V	0	-4	-	0	-	0	-
		V _{CC} = 6.0 V	0	-3	-	0	-	0	-
C _{PD}	power dissipation capacitance	per package; V _I = GND to V _{CC} ^[3]	-	44	-	-	-	-	-

[1] t_{pd} is the same as t_{PLH} and t_{PHL}
[2] t_t is the same as t_{TLH} and t_{THL}
[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
P_D = C_{PD} × V_{CC}² × f_i × N + Σ(C_L × V_{CC}² × f_o) where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = output load capacitance in pF;
V_{CC} = supply voltage in V;
N = number of load switching outputs;
Σ(C_L × V_{CC}² × f_o) = sum of the outputs.

11.1 Waveforms and test circuit



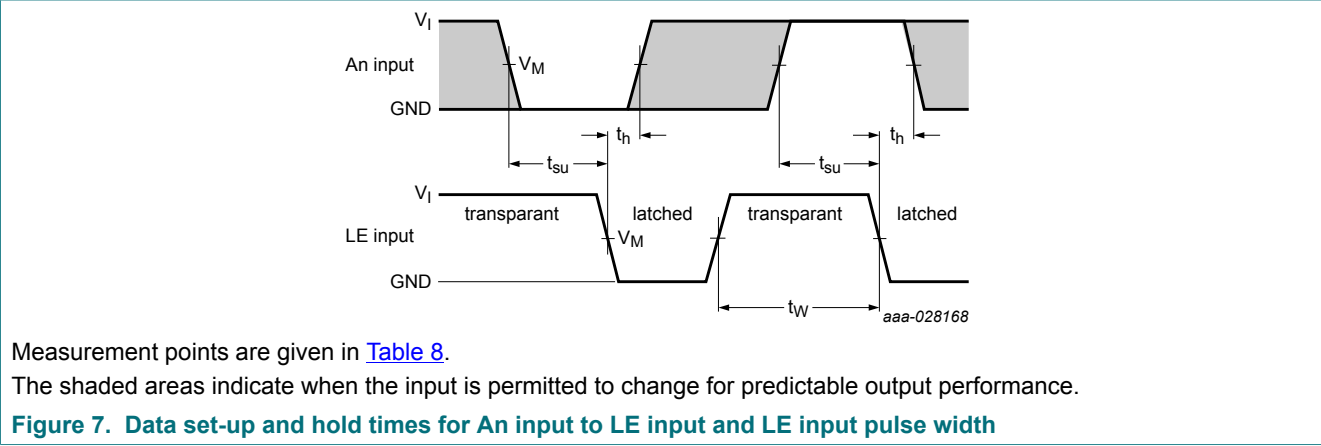


Table 8. Measurement points

Input	Output			
V _I	V _M	V _M	V _X	V _Y
GND to V _{CC}	0.5V _{CC}	0.5V _{CC}	0.1V _{CC}	0.9V _{CC}

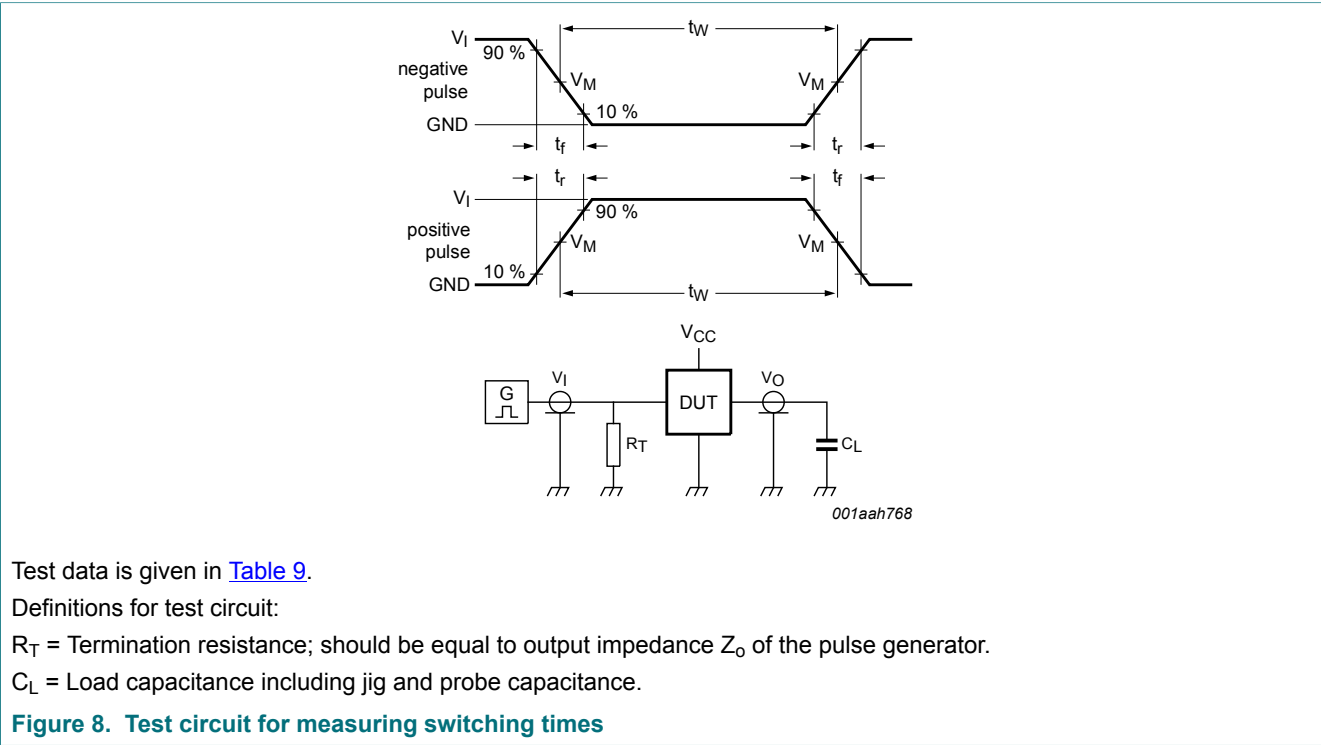
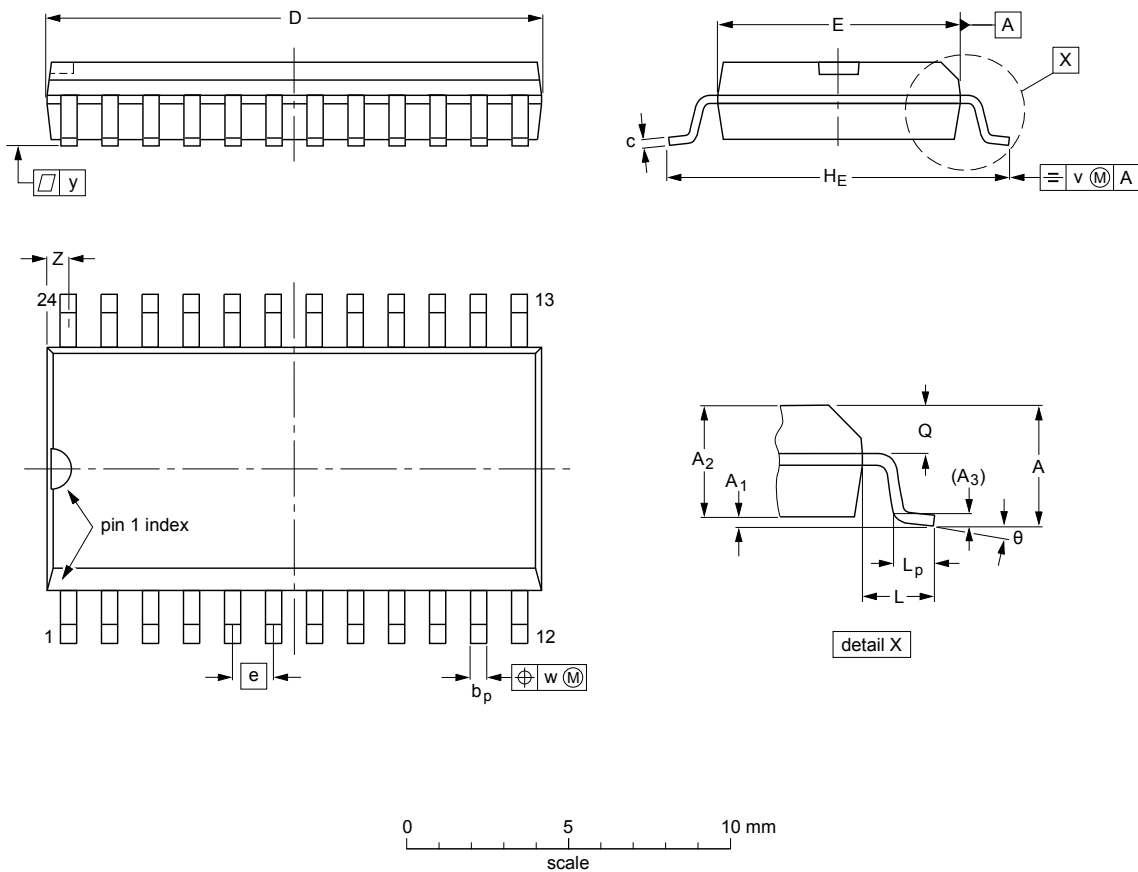


Table 9. Test data

Input	Load	
V _I	t _r , t _f	C _L
GND to V _{CC}	6 ns	15 pF, 50 pF

12 Package outline

SO24: plastic small outline package; 24 leads; body width 7.5 mm SOT137-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT137-1	075E05	MS-013				99-12-27 03-02-19

Figure 9. Package outline SOT137-1 (SO24)

13 Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

14 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC4515 v.3	20180702	Product data sheet	-	74HC_HCT4515 v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Type numbers 74HCT4515D (SOT137-1), 74HC4515N (SOT101) and 74HCT4515N (SOT101) removed.			
74HC_HCT4515 v.2	19930901	Product specification	-	74HC_HCT4515 v.1

15 Legal information

15.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

15.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

15.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia. In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical

systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

4-to-16 line decoder/demultiplexer with input latches; inverting

Non-automotive qualified products — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer

design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

15.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

1 General description 1

2 Features and benefits1

3 Applications1

4 Ordering information 1

5 Functional diagram2

6 Pinning information4

6.1 Pinning4

6.2 Pin description4

7 Functional description5

8 Limiting values5

9 Recommended operating conditions6

10 Static characteristics6

11 Dynamic characteristics7

11.1 Waveforms and test circuit 8

12 Package outline10

13 Abbreviations 11

14 Revision history 11

15 Legal information 12

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.