

# 74HC4514; 74HCT4514

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

Rev. 3 — 20 February 2018

Product data sheet

## 1 General description

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The 74HC4514; 74HCT4514 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 outputs (Q0 to Q15). When LE is HIGH, the selected output is determined by the data on An. When LE goes LOW, the last data present at An 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 HIGH. At  $\bar{E}$  HIGH, all outputs are LOW. 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  $V_{CC}$ .

The 74HCT4514 features reduced input threshold levels to allow interfacing to TTL logic levels.

## 2 Features and benefits

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- Input levels:
  - For 74HC4514: CMOS level
  - For 74HCT4514: TTL level
- 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
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

## 3 Applications

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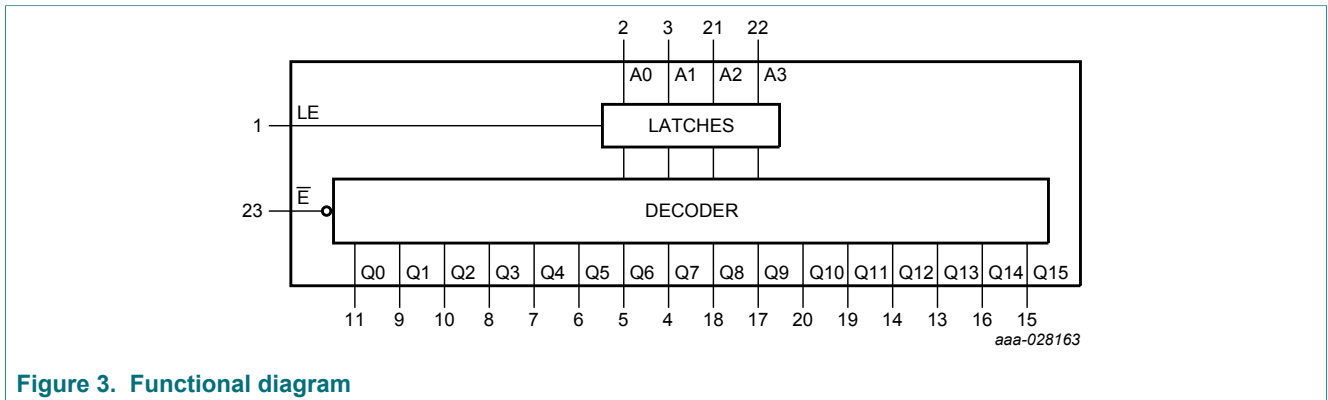
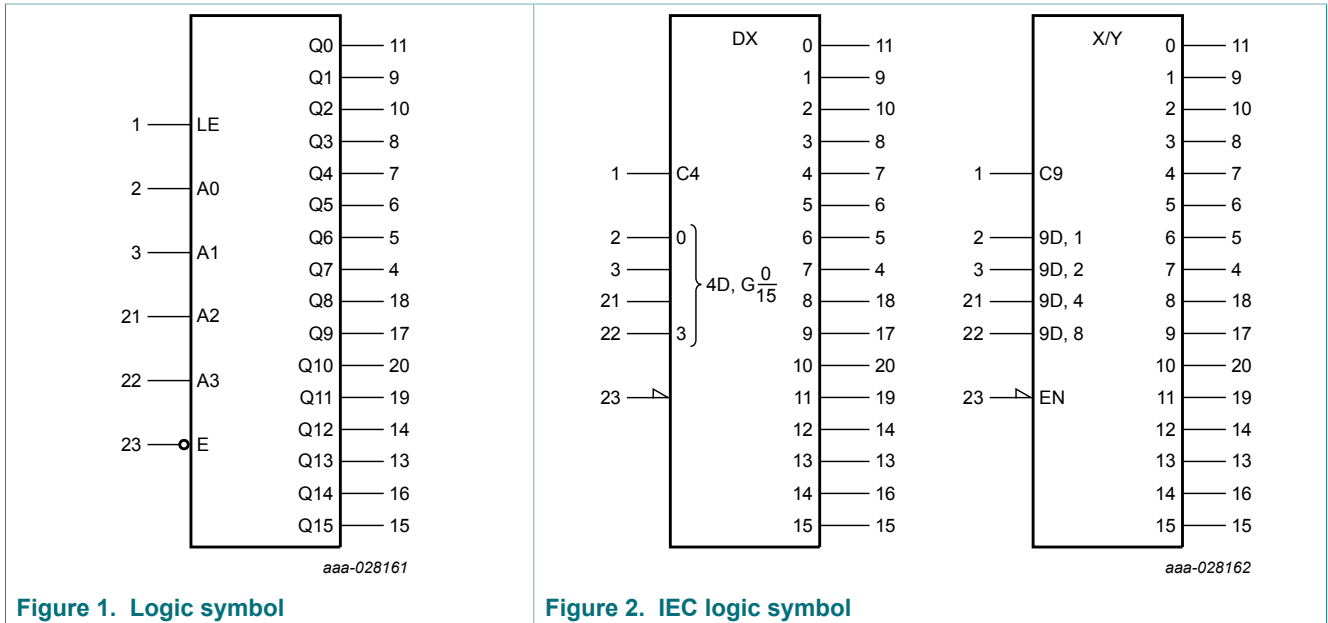
- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

## 4 Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC4514D	-40 °C to +125 °C	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
74HCT4514D				
74HC4514DB	-40 °C to +125 °C	SSOP24	plastic shrink small outline package; 24 leads; body width 5.3 mm	SOT340-1
74HC4514PW	-40 °C to +125 °C	TSSOP24	plastic thin shrink small outline package; 24 leads; body width 4.4 mm	SOT355-1
74HCT4514PW				

## 5 Functional diagram



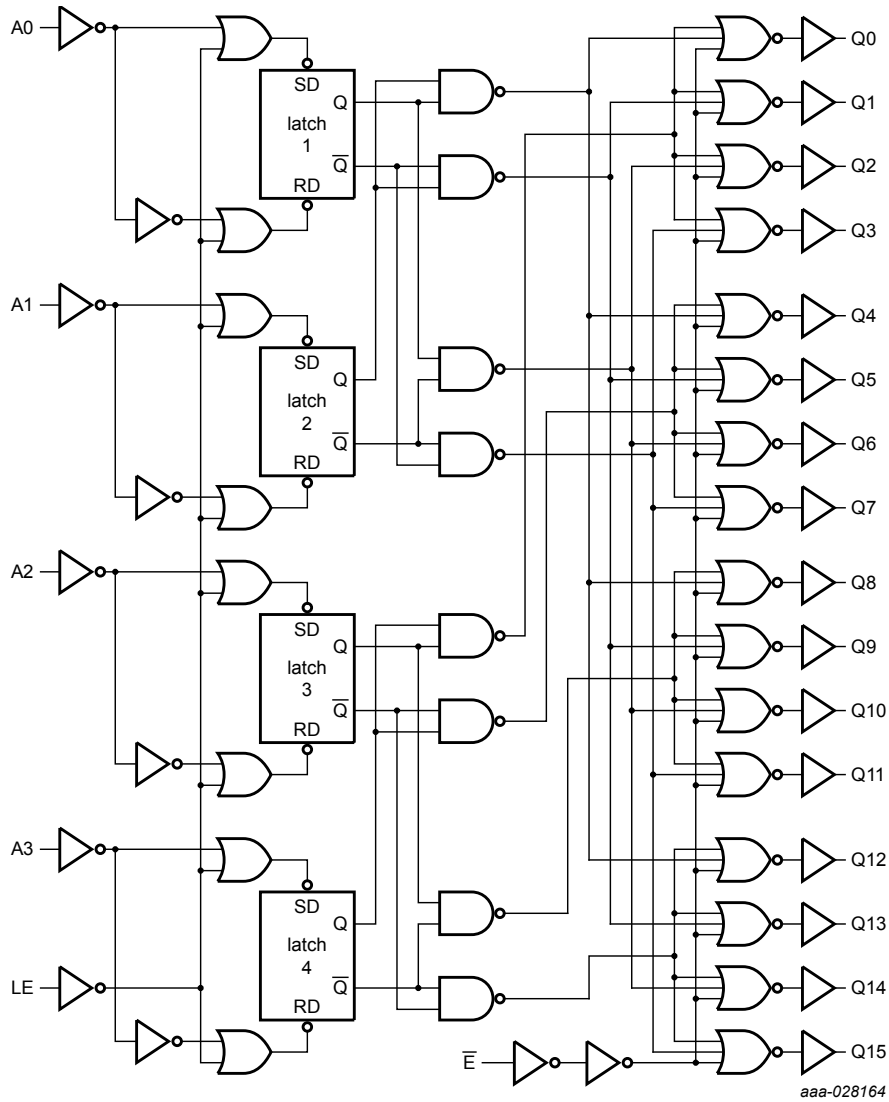
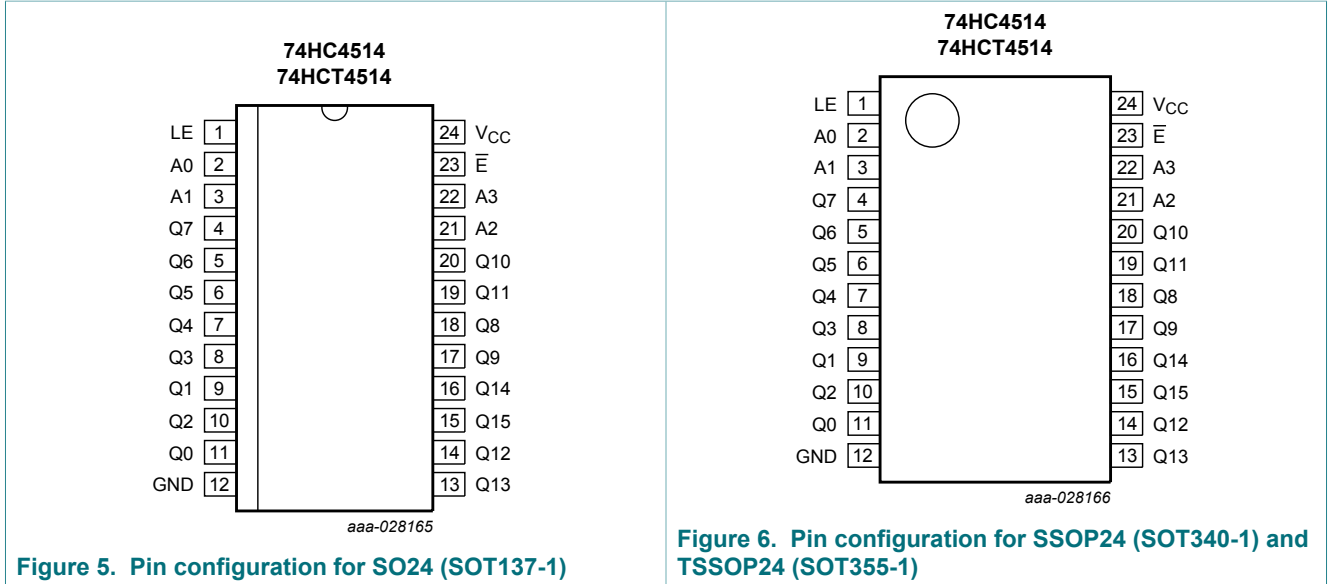


Figure 4. Logic diagram

## 6 Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 2. Pin description

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

## 7 Functional description

Table 3. Function table <sup>[1]</sup>

Inputs <sup>[2]</sup>					Outputs																
$\bar{E}$	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	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
L	L	H	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L
L	H	H	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L
L	L	L	L	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L
L	H	L	L	H	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L
L	L	H	L	H	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L
L	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L
L	L	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L
L	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L
L	L	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L
L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L
L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H

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

[2] 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 $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_O$	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	$\pm 25$	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, SSOP24 and TSSOP24 <sup>[1]</sup>	-	500	mW

[1] For SO24 packages:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

For SSOP24 and TSSOP24 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

## 9 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	74HC4514			74HCT4514			Unit
			Min	Typ	Max	Min	Typ	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	-	-	-	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	-	-	-	ns/V
T <sub>amb</sub>	ambient temperature		-40	-	+125	-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 <sub>amb</sub> (°C)						Unit	
			+25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
<b>74HC4514</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V

Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)						Unit	
			+25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	8.0	-	80	-	160	µA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF
<b>74HCT4514</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = -20 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -4 mA	3.98	4.32	-	3.84	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = 20 µA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0 A	-	-	8.0	-	80	-	160	µA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A								
		A <sub>n</sub>	-	65	234	-	292.5	-	318.5	µA
		LE	-	140	504	-	630	-	686	µA
		$\bar{E}$	-	100	360	-	450	-	490	µA
C <sub>I</sub>	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 9](#).

Symbol	Parameter	Conditions	$T_{amb}$ (°C)						Unit	
			+25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
<b>74HC4514</b>										
$t_{pd}$	propagation delay	An to Qn; see <a href="#">Figure 7</a> <sup>[1]</sup>								
		$V_{CC} = 2.0$ V	-	74	230	-	290	-	345	ns
		$V_{CC} = 4.5$ V	-	27	46	-	58	-	69	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	23	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	22	39	-	49	-	59	ns
		LE to Qn; see <a href="#">Figure 7</a>								
		$V_{CC} = 2.0$ V	-	74	230	-	290	-	345	ns
		$V_{CC} = 4.5$ V	-	27	46	-	58	-	69	ns
		$V_{CC} = 6.0$ V	-	22	39	-	49	-	59	ns
		$\bar{E}$ to Qn; see <a href="#">Figure 7</a>								
		$V_{CC} = 2.0$ V	-	41	175	-	220	-	265	ns
		$V_{CC} = 4.5$ V	-	15	35	-	44	-	53	ns
$V_{CC} = 6.0$ V	-	12	30	-	37	-	45	ns		
$t_t$	transition time	Qn; see <a href="#">Figure 7</a> <sup>[2]</sup>								
		$V_{CC} = 2.0$ 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 <a href="#">Figure 8</a>								
		$V_{CC} = 2.0$ V	80	14	-	100	-	120	-	ns
		$V_{CC} = 4.5$ V	16	5	-	20	-	24	-	ns
		$V_{CC} = 6.0$ V	14	4	-	17	-	20	-	ns
$t_{su}$	set-up time	An to LE; see <a href="#">Figure 8</a>								
		$V_{CC} = 2.0$ V	90	25	-	115	-	135	-	ns
		$V_{CC} = 4.5$ V	18	9	-	23	-	27	-	ns
		$V_{CC} = 6.0$ V	15	7	-	20	-	23	-	ns
$t_h$	hold time	An to LE; see <a href="#">Figure 8</a>								
		$V_{CC} = 2.0$ V	1	-11	-	1	-	1	-	ns
		$V_{CC} = 4.5$ V	1	-4	-	1	-	1	-	ns
		$V_{CC} = 6.0$ V	1	-3	-	1	-	1	-	ns
$C_{PD}$	power dissipation capacitance	per package; $V_1 = \text{GND to } V_{CC}$ <sup>[3]</sup>	-	44	-	-	-	-	-	pF



Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)						Unit	
			+25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
<b>74HCT4514</b>										
t <sub>pd</sub>	propagation delay	An to Qn; see <a href="#">Figure 7</a> <sup>[1]</sup>								
		V <sub>CC</sub> = 4.5 V	-	30	55	-	69	-	83	ns
		V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF	-	26	-	-	-	-	-	ns
		LE to Qn; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	-	29	50	-	63	-	75	ns
		$\bar{E}$ to Qn; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	-	17	40	-	50	-	60	ns
t <sub>t</sub>	transition time	Qn; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a> <sup>[2]</sup>	-	7	15	-	19	-	22	ns
t <sub>W</sub>	pulse width	LE HIGH; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 8</a>	16	4	-	20	-	24	-	ns
t <sub>su</sub>	set-up time	An to LE; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 8</a>	18	9	-	23	-	27	-	ns
t <sub>h</sub>	hold time	An to LE; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 8</a>	3	-3	-	3	-	3	-	ns
C <sub>PD</sub>	power dissipation capacitance	per package; V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V <sup>[3]</sup>	-	45	-	-	-	-	-	pF

[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>

[2] t<sub>t</sub> is the same as t<sub>TLH</sub> and t<sub>THL</sub>

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

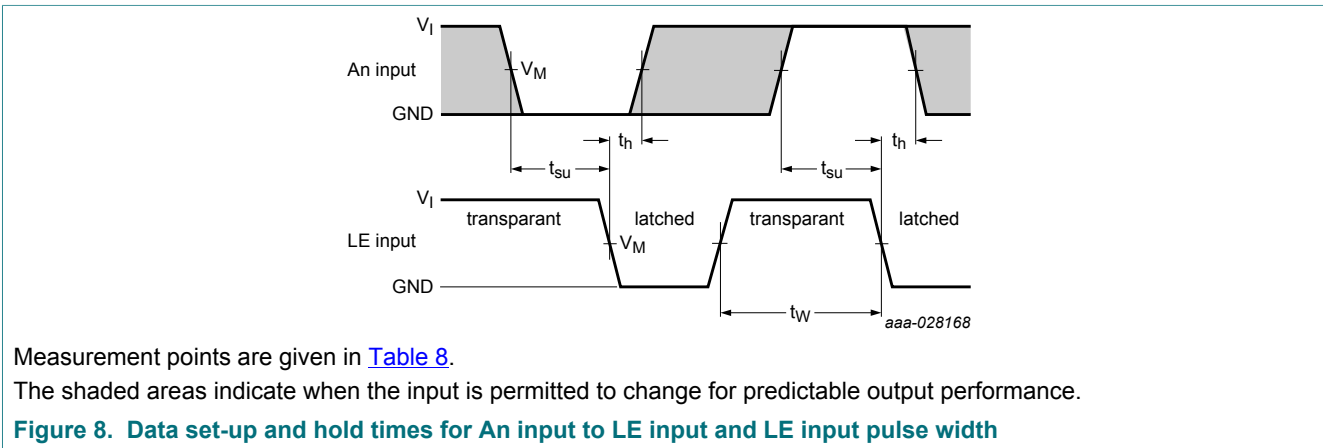
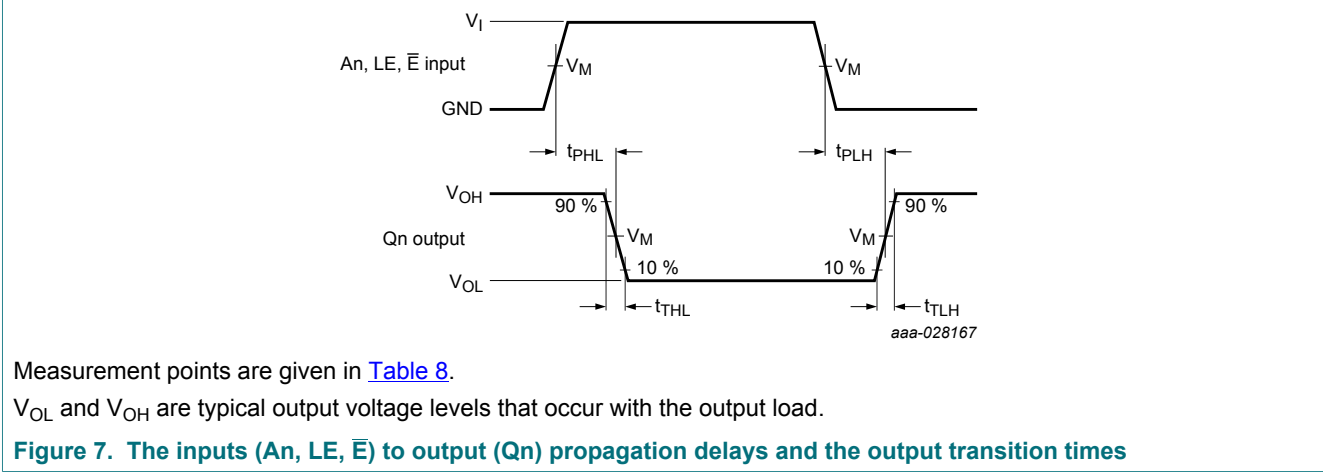
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of load switching outputs;

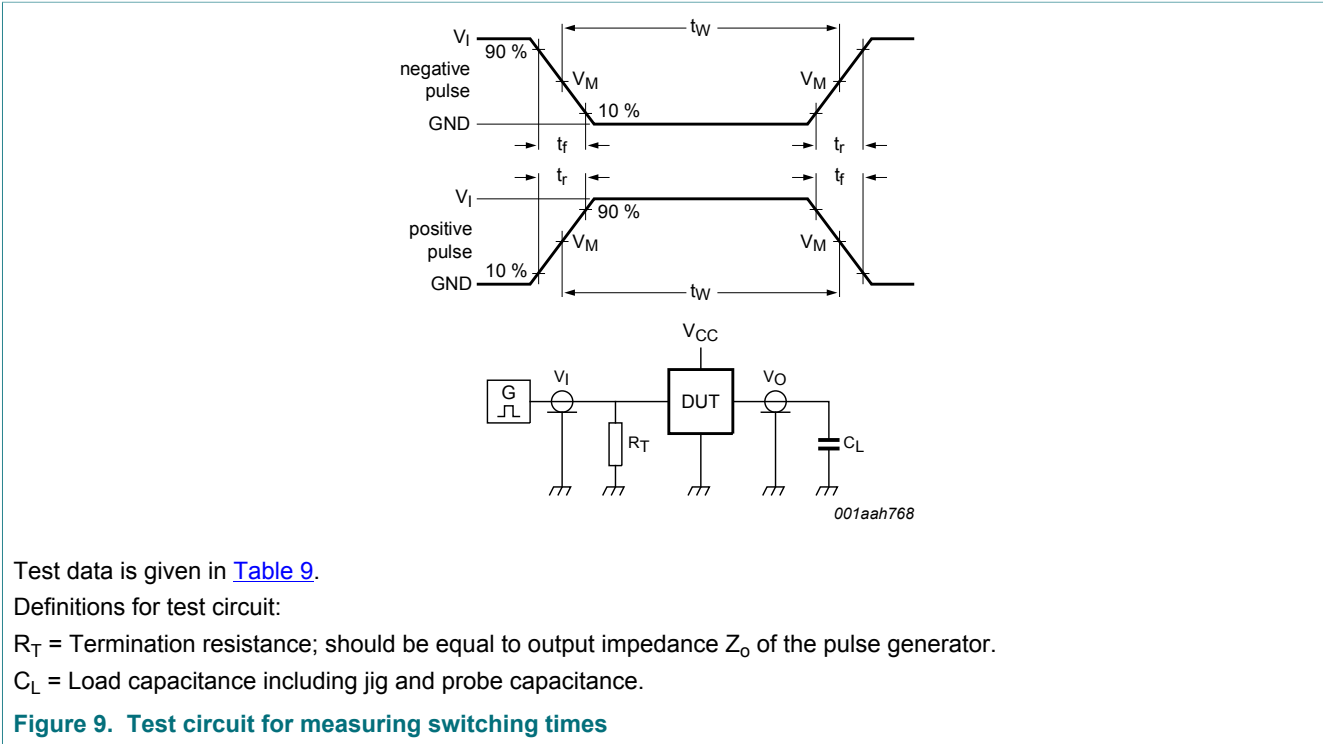
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

## 11.1 Waveforms and test circuit



**Table 8. Measurement points**

Type	Input		Output
	$V_I$	$V_M$	$V_M$
74HC4514	GND to $V_{CC}$	$0.5V_{CC}$	$0.5V_{CC}$
74HCT4514	GND to 3 V	1.3 V	1.3 V



**Table 9. Test data**

Type	Input		Load
	$V_I$	$t_r, t_f$	$C_L$
74HC4514	GND to $V_{CC}$	6 ns	15 pF, 50 pF
74HCT4514	GND to 3 V	6 ns	15 pF, 50 pF

## 12 Application information

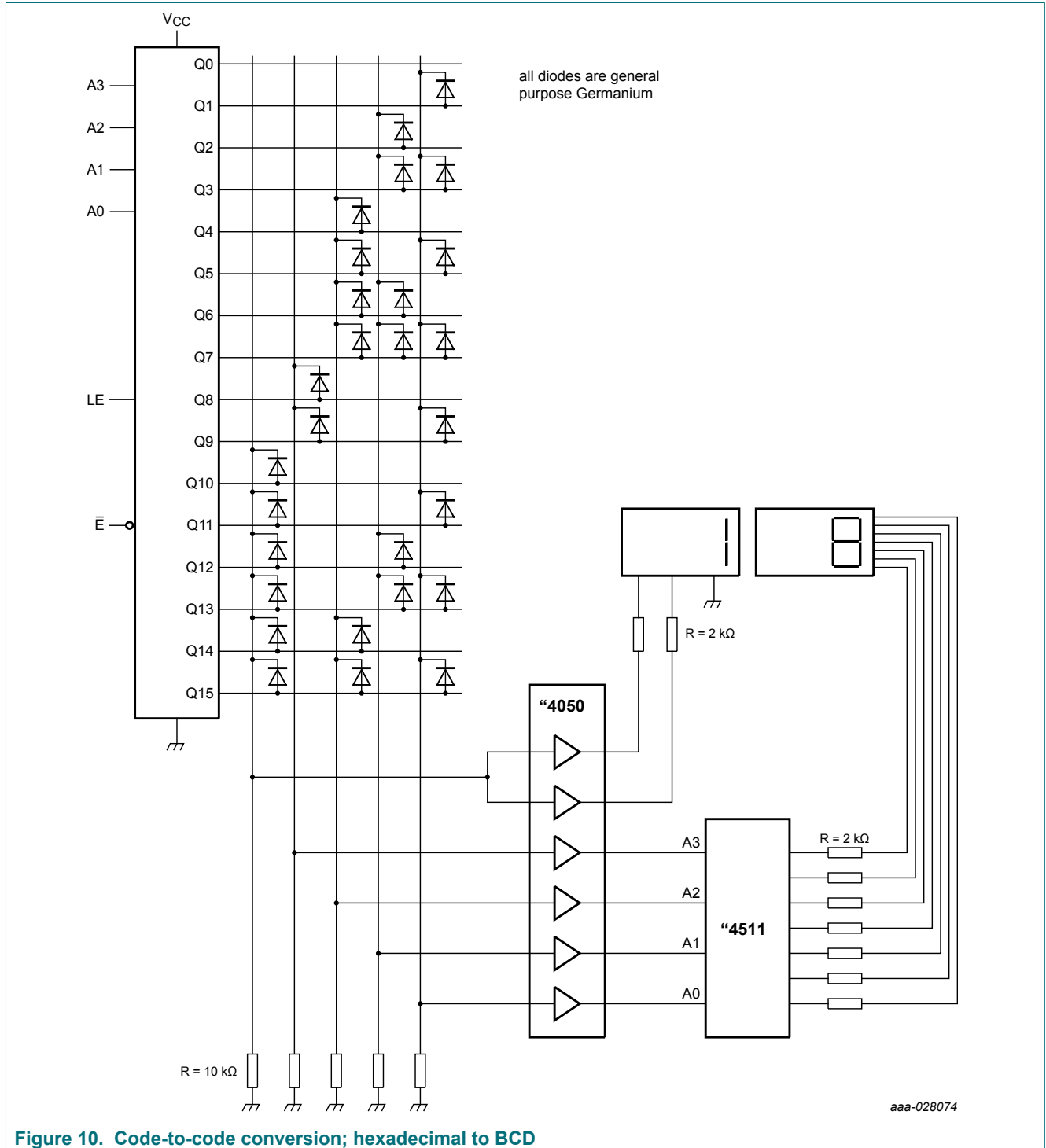


Figure 10. Code-to-code conversion; hexadecimal to BCD

## 13 Package outline

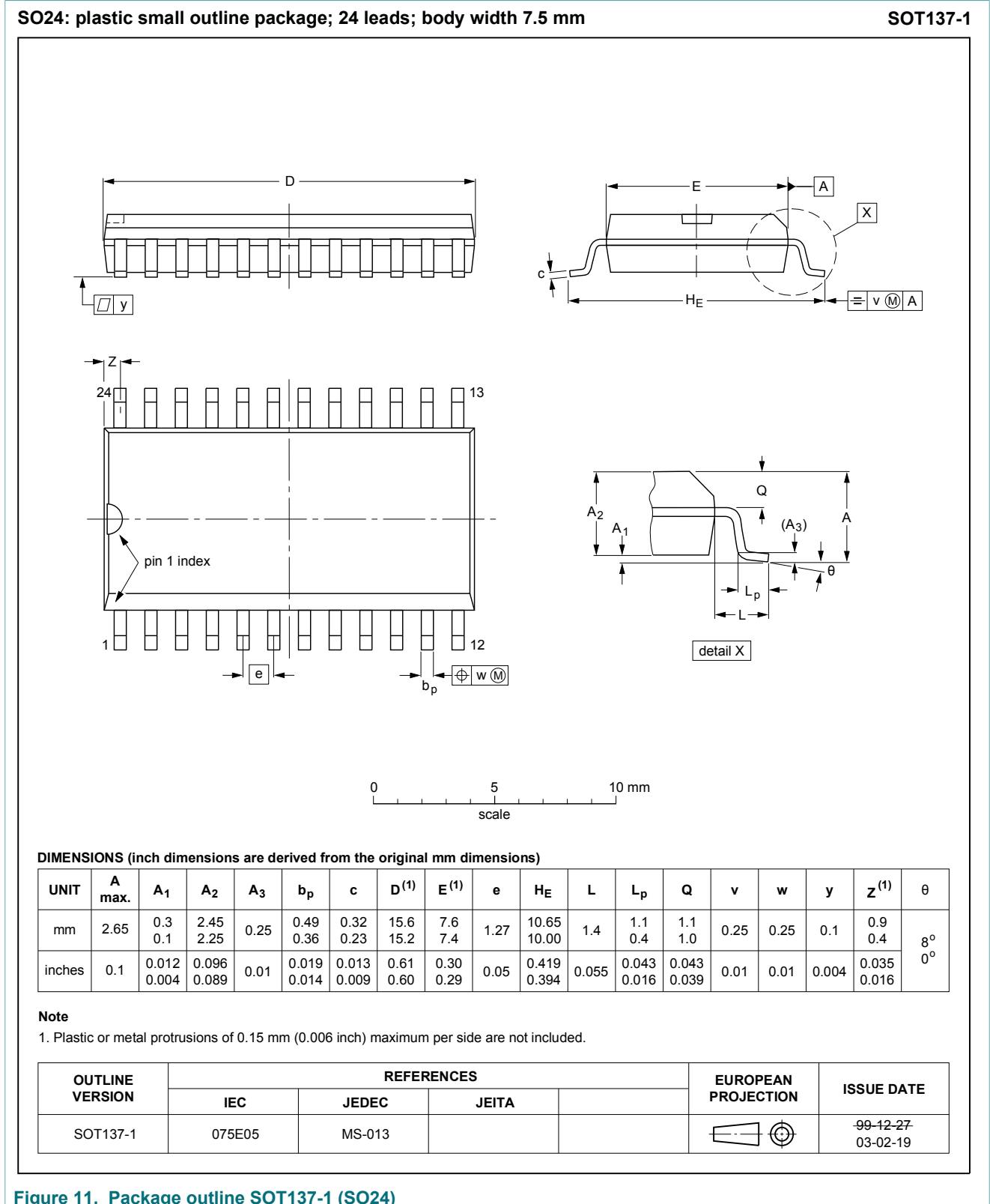
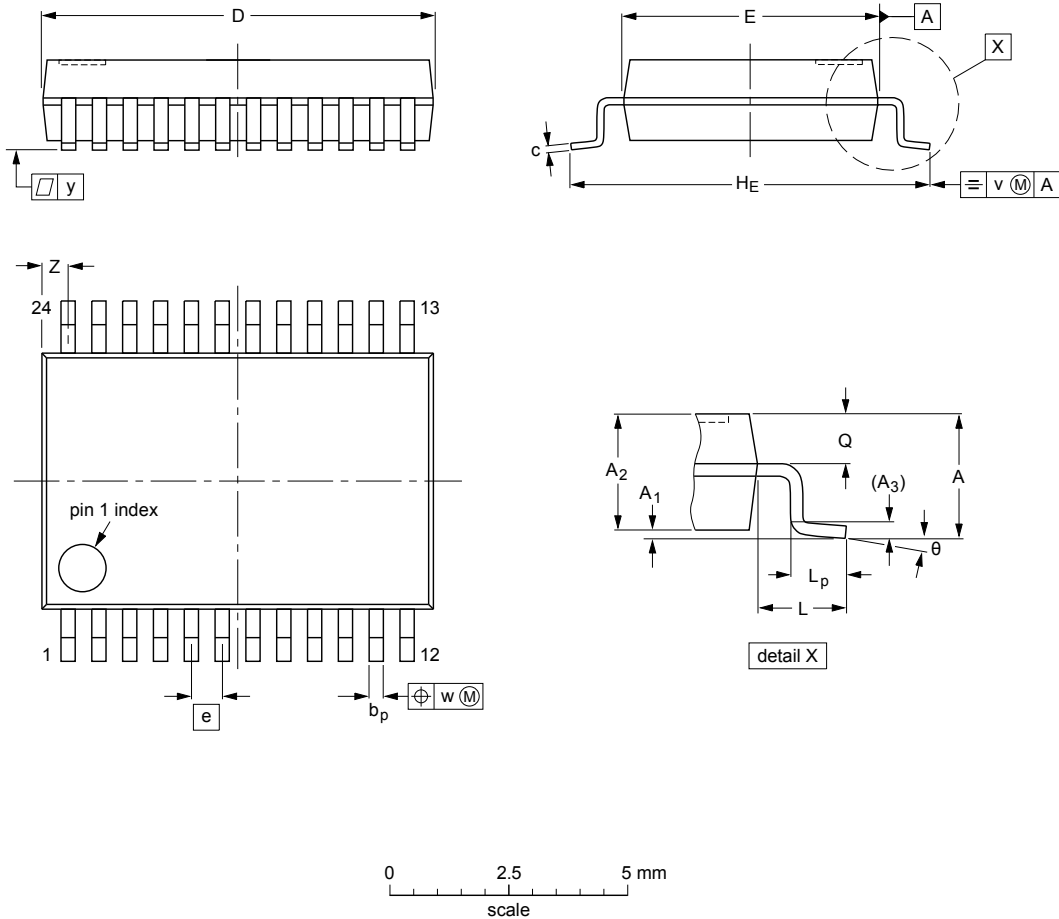


Figure 11. Package outline SOT137-1 (SO24)

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	8.4 8.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.8 0.4	8° 0°

**Note**

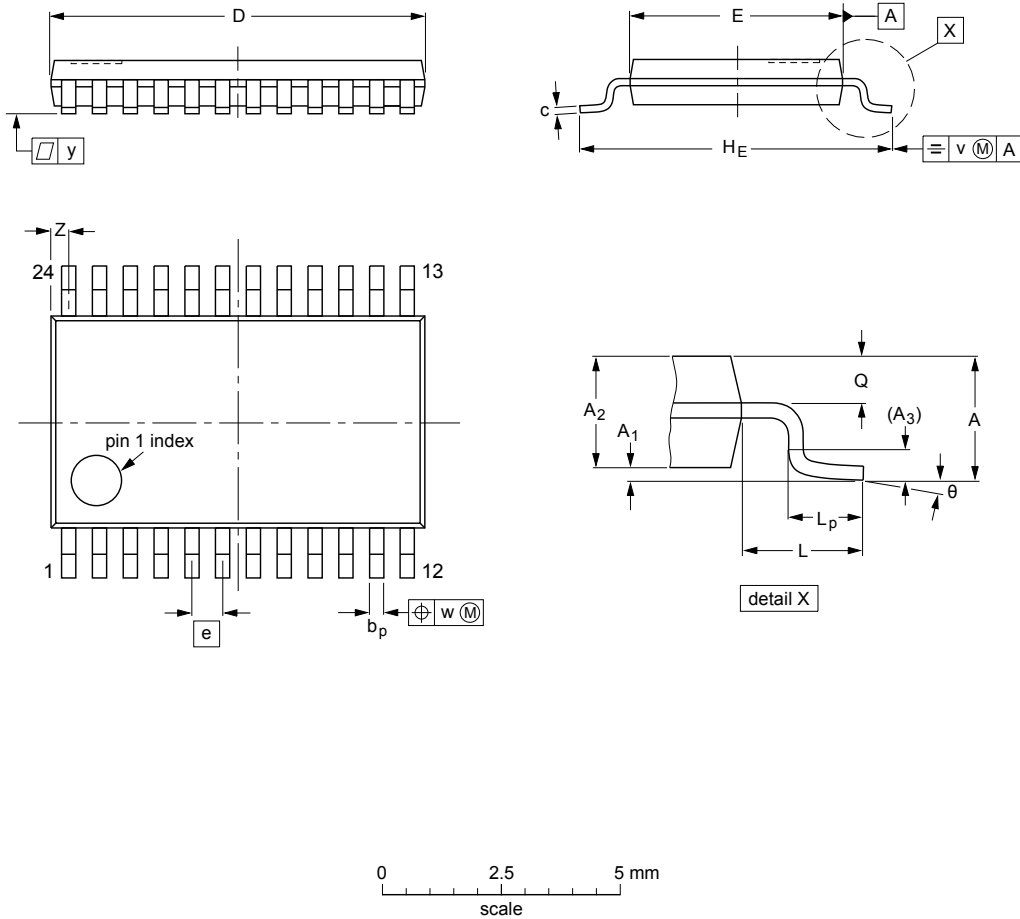
1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT340-1		MO-150				99-12-27 03-02-19

Figure 12. Package outline SOT340-1 (SSOP24)

TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	7.9 7.7	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT355-1		MO-153				-99-12-27 03-02-19

Figure 13. Package outline SOT355-1 (TSSOP24)

## 14 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
TTL	Transistor-Transistor Logic

## 15 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4514 v.3	20180220	Product data sheet	-	74HC_HCT4514 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
74HC_HCT4514 v.2	19930901	Product specification	-	74HC_HCT4514 v.1



## 16 Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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>.

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Date of release: 20 February 2018  
Document identifier: 74HC\_HCT4514

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