

# 74HC4514; 74HCT4514

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

Rev. 4 — 15 July 2021

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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- Wide supply voltage range from 2.0 to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Input levels:
  - For 74HC4514: CMOS level
  - For 74HCT4514: TTL level
- 16-line demultiplexing capability
- Decodes 4 binary-coded inputs into 16 mutually-exclusive outputs
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- 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

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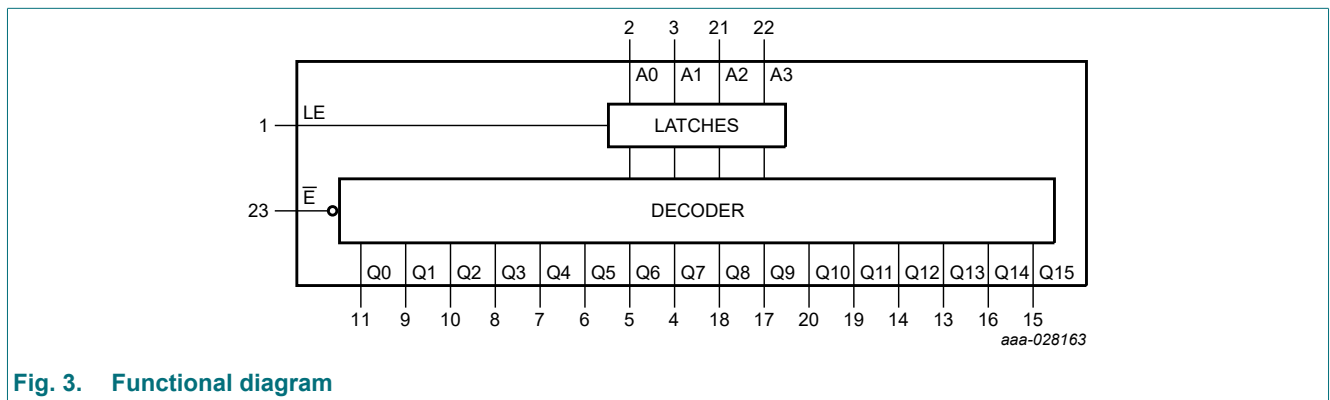
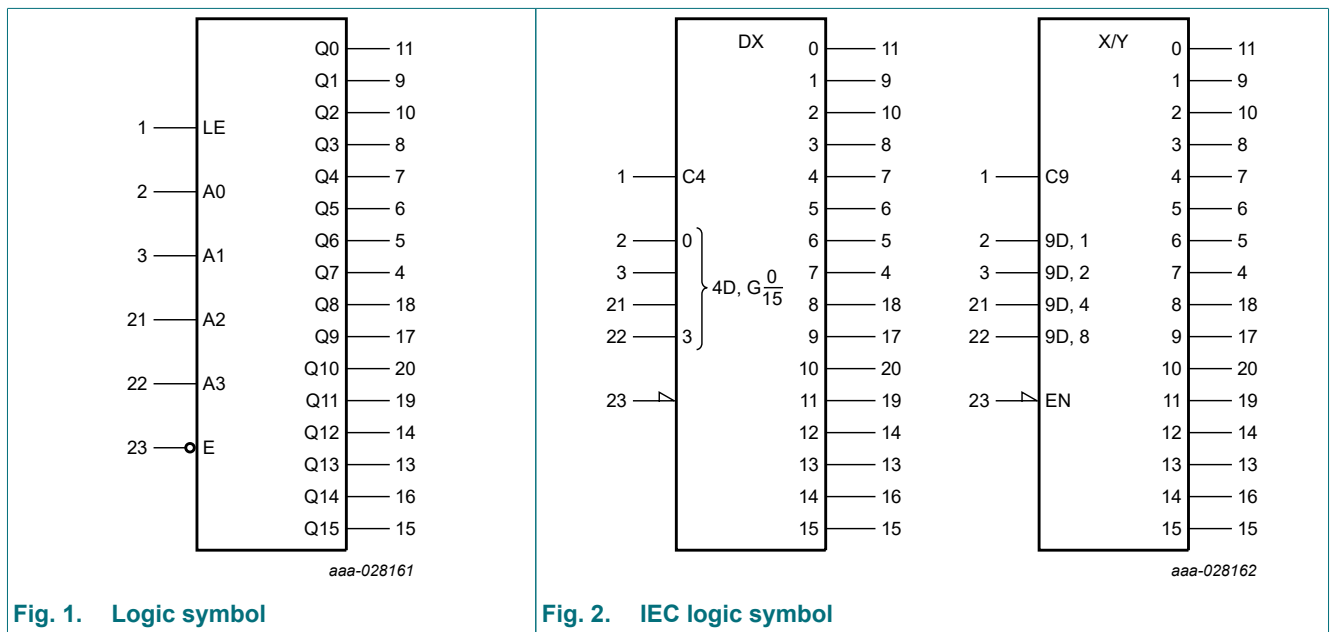
- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

### 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				
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



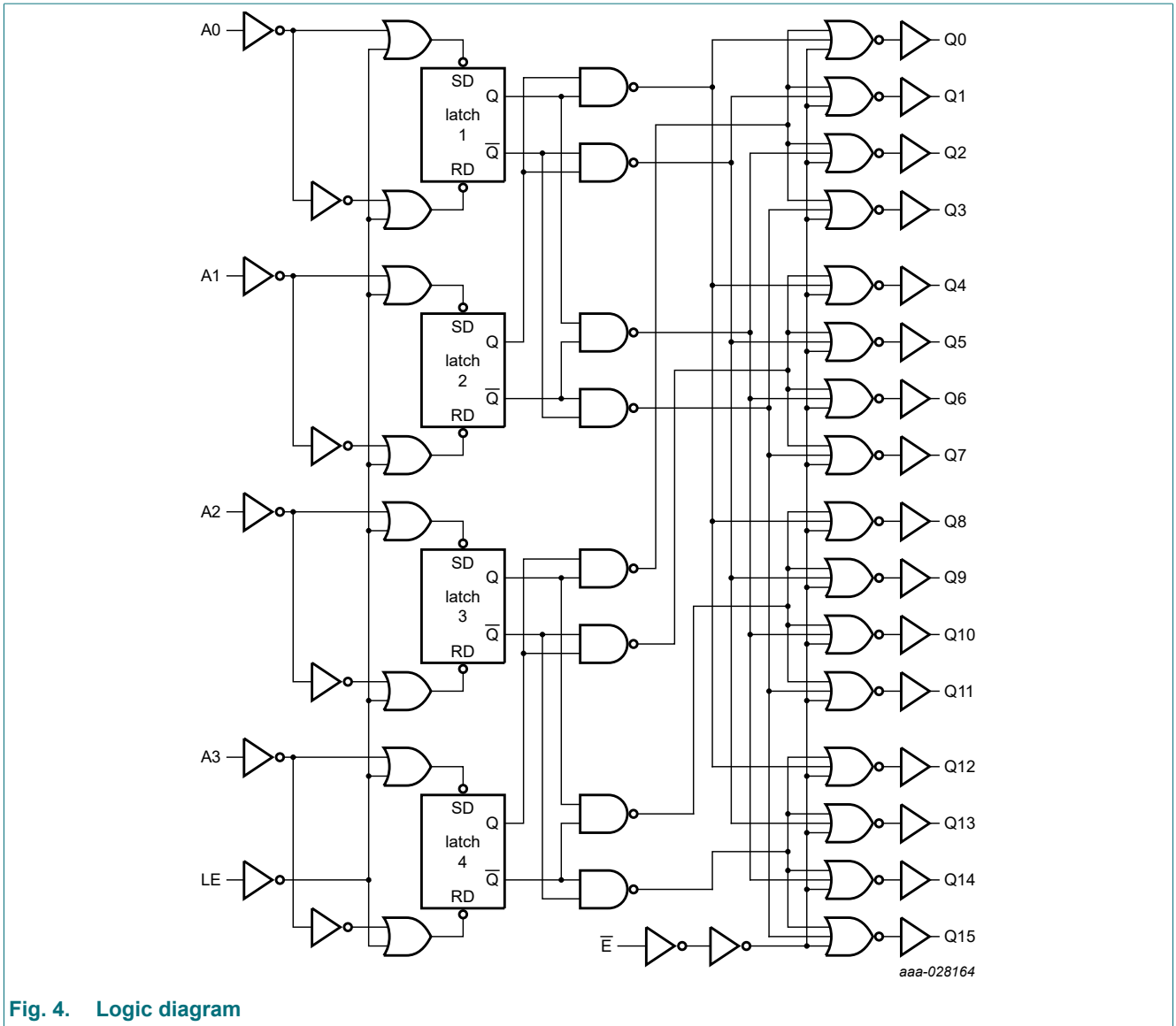


Fig. 4. Logic diagram

## 6. Pinning information

### 6.1. Pinning

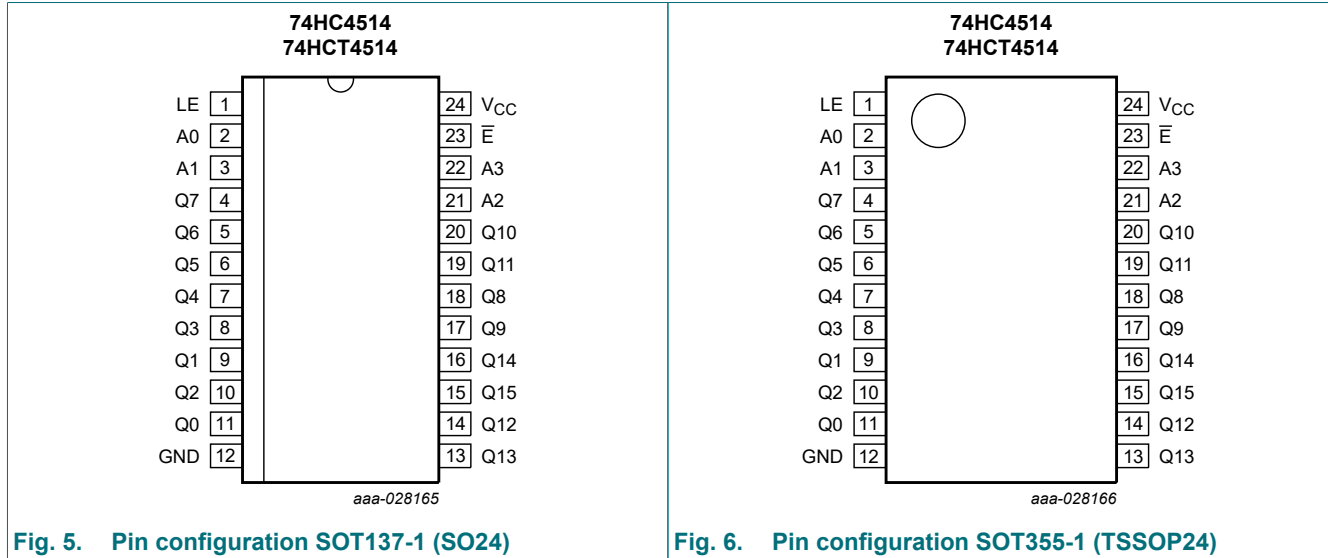


Fig. 5. Pin configuration SOT137-1 (SO24)

Fig. 6. Pin configuration SOT355-1 (TSSOP24)

### 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**

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

Input LE = HIGH

Inputs					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

## 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	$^{\circ}\text{C}$
$P_{tot}$	total power dissipation		[1]	500	mW

- [1] For SOT137-1 (SO24) package:  $P_{tot}$  derates linearly with 16.2 mW/K above 119  $^{\circ}\text{C}$ .  
 For SOT355-1 (TSSOP24) package:  $P_{tot}$  derates linearly with 12.4 mW/K above 110  $^{\circ}\text{C}$ .

## 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	+25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			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
V <sub>OL</sub>	LOW-level output voltage	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>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>I</sub>	input leakage current	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
		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

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

Symbol	Parameter	Conditions	+25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<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 Fig. 9.

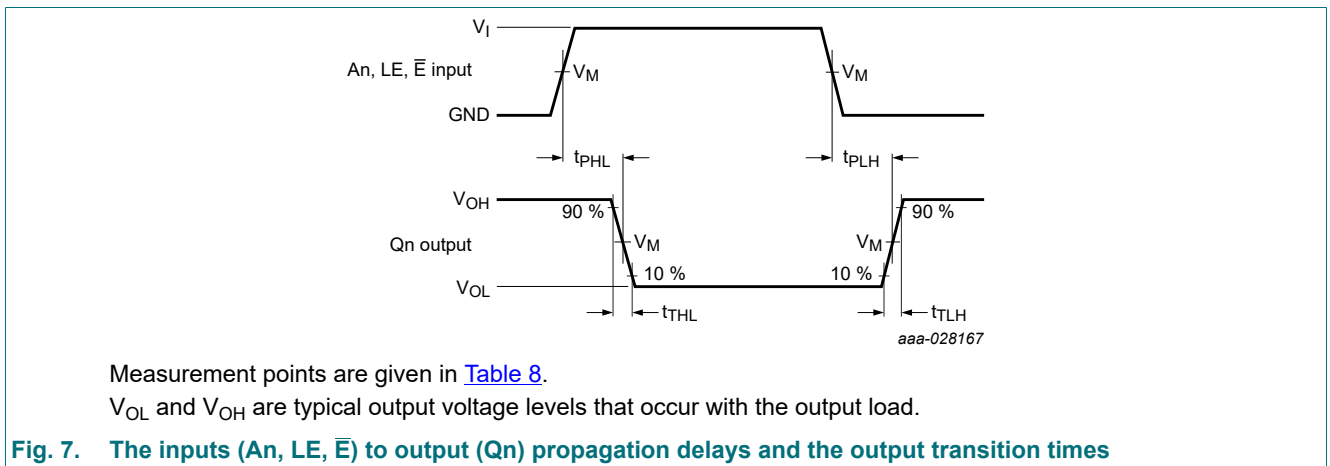
Symbol	Parameter	Conditions	+25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<b>74HC4514</b>										
$t_{pd}$	propagation delay	An to Qn; see Fig. 7 [1]								
		$V_{CC} = 2.0$ V	-	74	230	-	290	-	345	ns
		$V_{CC} = 4.5$ V	-	27	46	-	58	-	69	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	23	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	22	39	-	49	-	59	ns
		LE to Qn; see Fig. 7								
		$V_{CC} = 2.0$ 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 Fig. 7								
		$V_{CC} = 2.0$ 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 Fig. 7 [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 Fig. 8								
		$V_{CC} = 2.0$ 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 Fig. 8								
		$V_{CC} = 2.0$ 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 Fig. 8								
		$V_{CC} = 2.0$ 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; $V_I = \text{GND to } V_{CC}$ [3]	-	44	-	-	-	-	-	pF



Symbol	Parameter	Conditions	+25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<b>74HCT4514</b>										
t <sub>pd</sub>	propagation delay	An to Qn; see Fig. 7 [1]								
		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 Fig. 7	-	29	50	-	63	-	75	ns
		$\bar{E}$ to Qn; V <sub>CC</sub> = 4.5 V; see Fig. 7	-	17	40	-	50	-	60	ns
t <sub>t</sub>	transition time	Qn; V <sub>CC</sub> = 4.5 V; see Fig. 7 [2]	-	7	15	-	19	-	22	ns
t <sub>w</sub>	pulse width	LE HIGH; V <sub>CC</sub> = 4.5 V; see Fig. 8	16	4	-	20	-	24	-	ns
t <sub>su</sub>	set-up time	An to LE; V <sub>CC</sub> = 4.5 V; see Fig. 8	18	9	-	23	-	27	-	ns
t <sub>h</sub>	hold time	An to LE; V <sub>CC</sub> = 4.5 V; see Fig. 8	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 [3]	-	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).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  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;  
 $\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

### 11.1. Waveforms and test circuit



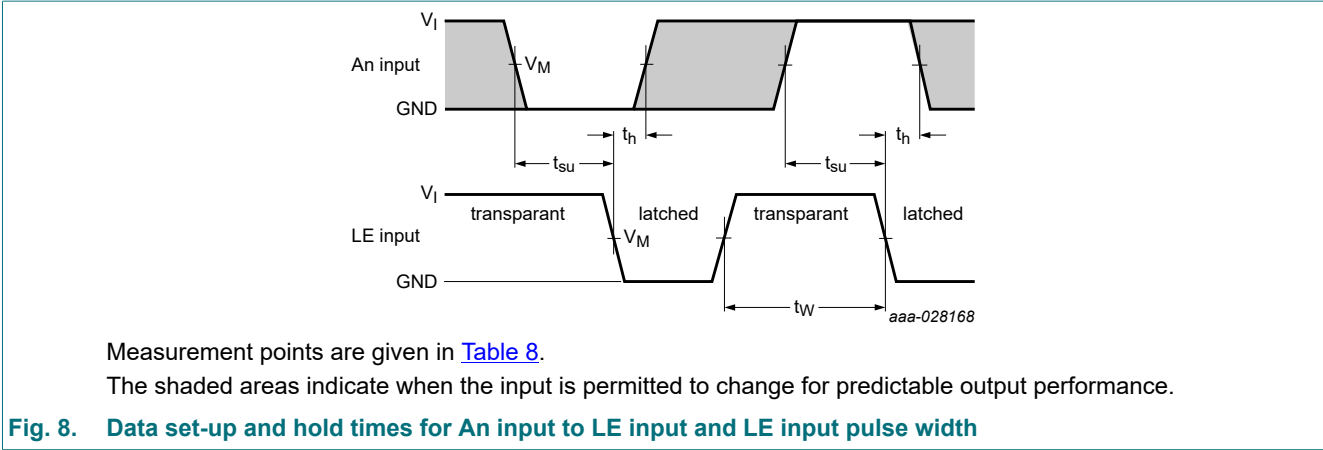


Table 8. Measurement points

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

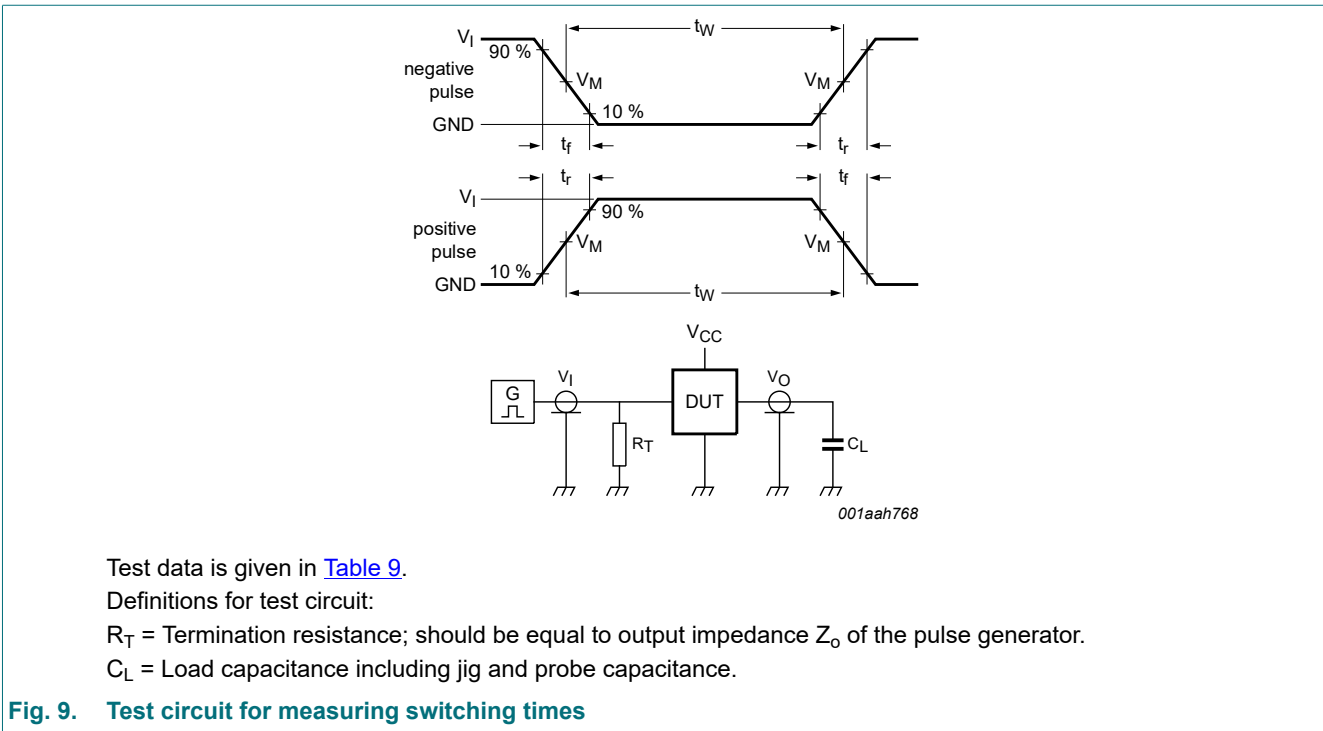


Table 9. Test data

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

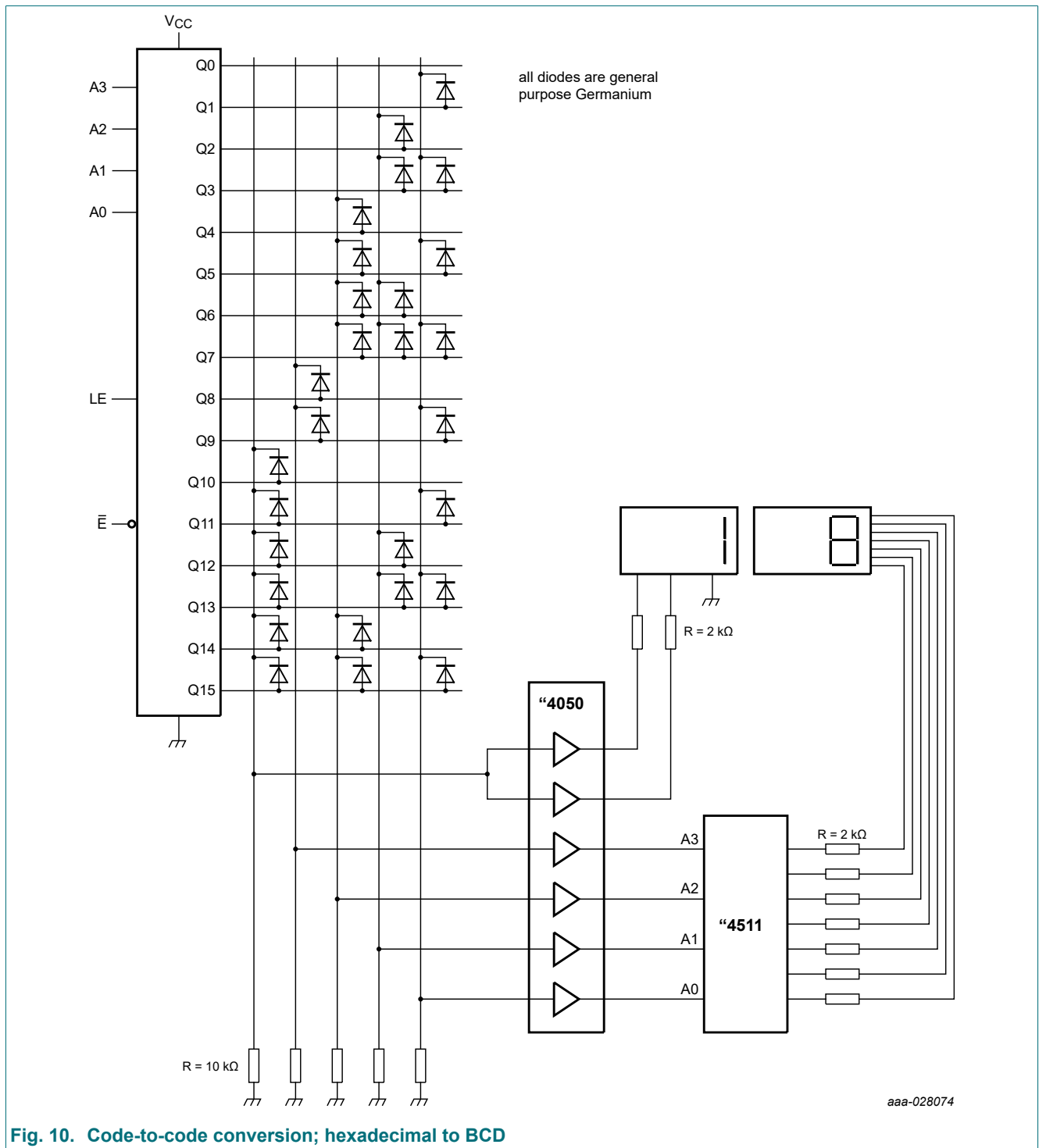


Fig. 10. Code-to-code conversion; hexadecimal to BCD

13. Package outline

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

SOT137-1

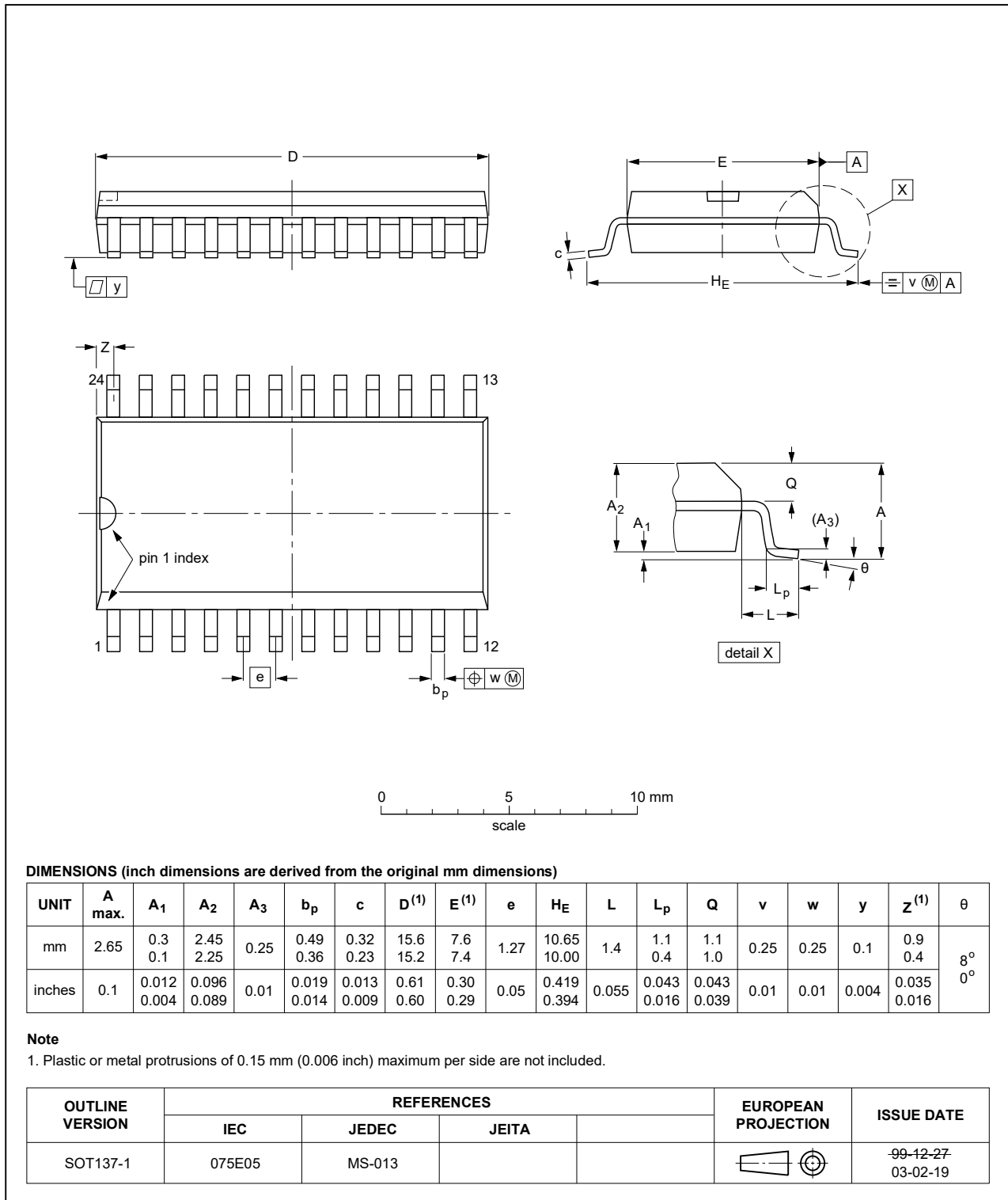


Fig. 11. Package outline SOT137-1 (SO24)

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

SOT355-1

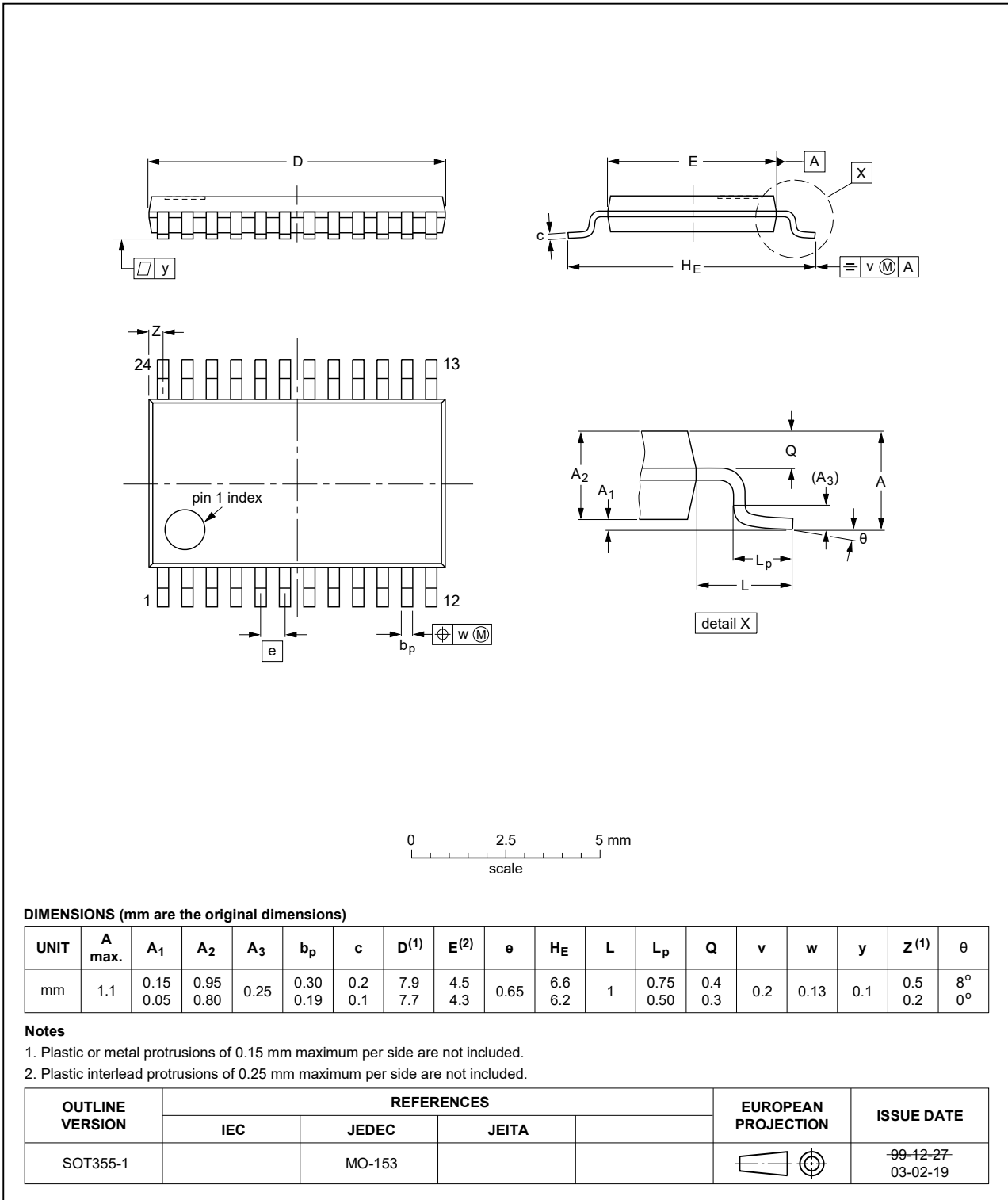


Fig. 12. Package outline SOT355-1 (TSSOP24)

## 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.4	20210715	Product data sheet	-	74HC_HCT4514 v.3
Modifications:	<ul style="list-style-type: none"> <li>Type number 74HC4514DB (SOT340-1/SSOP24) removed.</li> <li><a href="#">Section 2</a> updated.</li> <li><a href="#">Section 8</a>: Derating values for P<sub>tot</sub> total power dissipation updated.</li> </ul>			
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

### 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".
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