

# 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 A<sub>n</sub>. When LE goes LOW, the last data present at A<sub>n</sub> 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<sub>CC</sub>.

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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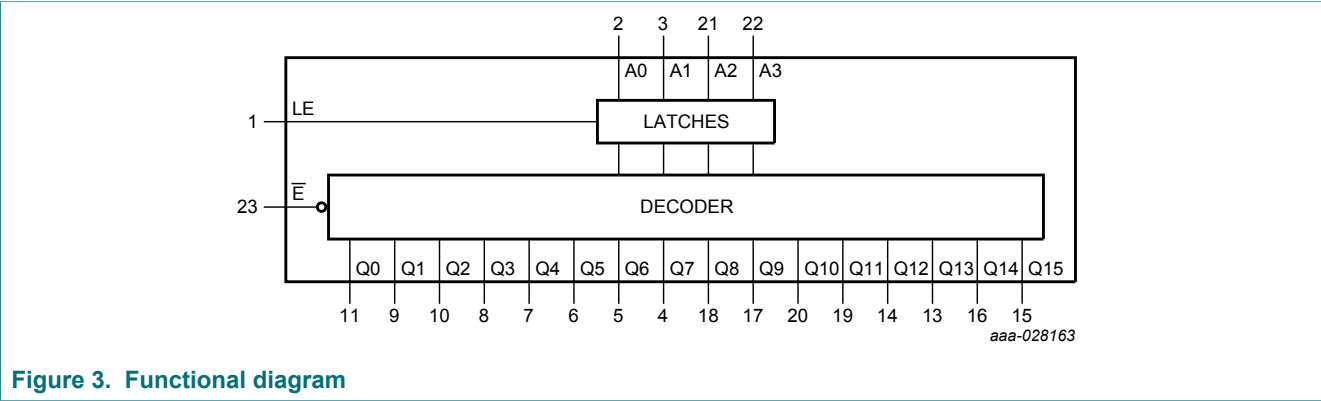
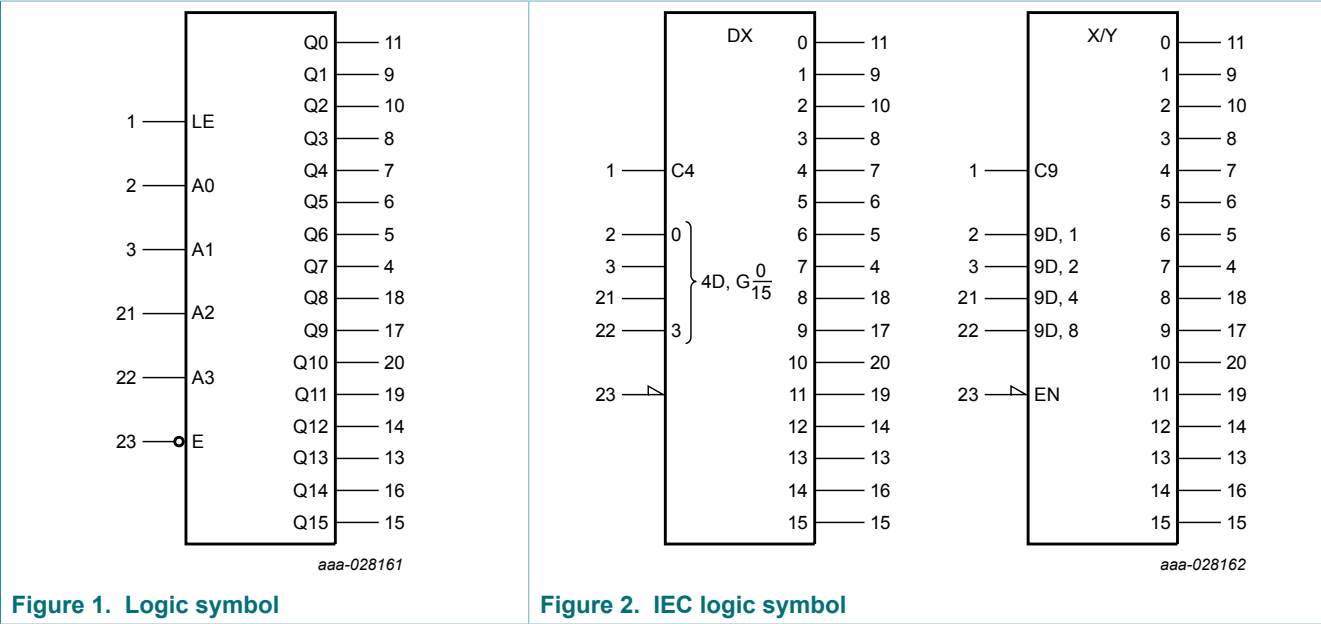
- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding

4 Ordering information

Table 1. Ordering information

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

5 Functional diagram



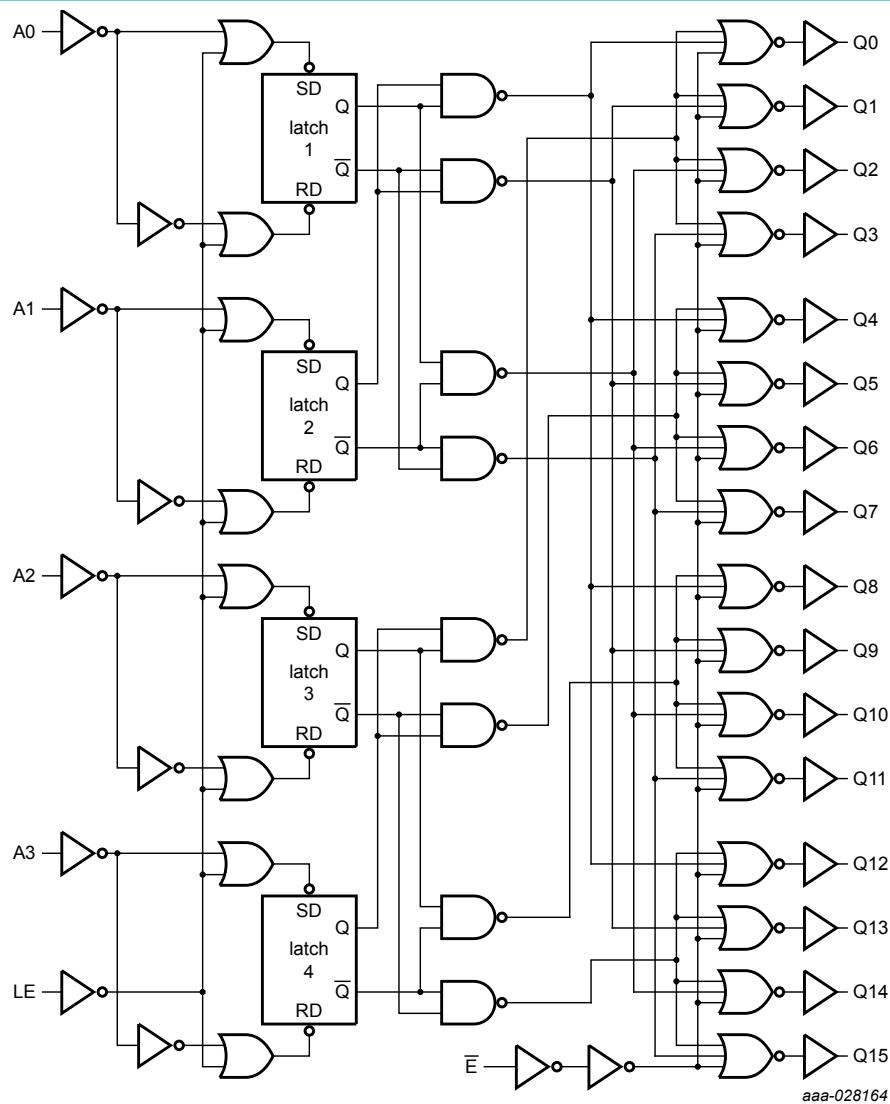
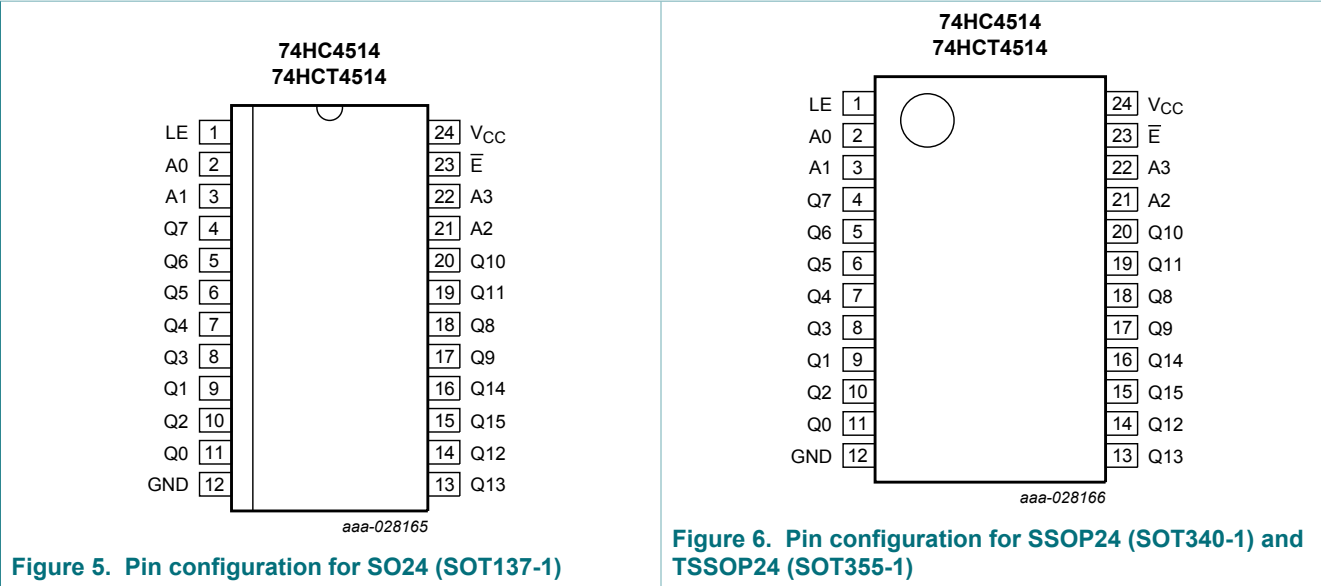


Figure 4. Logic diagram

6 Pinning information

6.1 Pinning



6.2 Pin description

Table 2. Pin description

| Symbol                                                               | Pin                                                      | Description                       |
|----------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------|
| LE                                                                   | 1                                                        | latch enable input (active HIGH)  |
| 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  | H       | 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  | H  | L  | L  | L       | L  | H  | 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  | H  | L  | L       | L  | L  | L  | H  | 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  | H  | H  | L  | L       | L  | L  | L  | L  | L  | H  | 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  | H  | L       | L  | L  | L  | L  | L  | L  | L  | H  | 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  | H  | L  | H  | L       | L  | L  | L  | L  | L  | L  | L  | L  | L  | H   | 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  | H  | H  | L       | L  | L  | L  | L  | L  | L  | L  | L  | L  | L   | L   | H   | 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  | H  | H  | H  | 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   | 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 $V_I > V_{CC} + 0.5\text{ V}$ | -    | ±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, 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      |      |
| $V_{CC}$            | supply voltage                      |                         | 2.0      | 5.0  | 6.0      | 4.5       | 5.0  | 5.5      | V    |
| $V_I$               | input voltage                       |                         | 0        | -    | $V_{CC}$ | 0         | -    | $V_{CC}$ | V    |
| $V_O$               | output voltage                      |                         | 0        | -    | $V_{CC}$ | 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      | -         | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$ | -        | -    | 83       | -         | -    | -        | ns/V |
| $T_{amb}$           | 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 |
| 74HC4514        |                           |                                                     |                       |      |      |            |      |             |      |     |
| 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   |
| 74HCT4514        |                           |                                                                                                                                                         |                       |      |      |            |       |             |       |      |
| 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   |
|                  |                           | $\overline{E}$                                                                                                                                          | -                     | 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 <sub>amb</sub> (°C) |     |     |            |     |             | Unit |     |
|-----------------|-------------------------------|---------------------------------------------------------------------|-----------------------|-----|-----|------------|-----|-------------|------|-----|
|                 |                               |                                                                     | +25                   |     |     | −40 to +85 |     | −40 to +125 |      |     |
|                 |                               |                                                                     | Min                   | Typ | Max | Min        | Max | Min         |      | Max |
| 74HC4514        |                               |                                                                     |                       |     |     |            |     |             |      |     |
| t <sub>pd</sub> | propagation delay             | An to Qn; see <a href="#">Figure 7</a> <sup>[1]</sup>               |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | -                     | 74  | 230 | -          | 290 | -           | 345  | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | -                     | 27  | 46  | -          | 58  | -           | 69   | ns  |
|                 |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                       | -                     | 23  | -   | -          | -   | -           | -    | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | -                     | 22  | 39  | -          | 49  | -           | 59   | ns  |
|                 |                               | LE to Qn; see <a href="#">Figure 7</a>                              |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | -                     | 74  | 230 | -          | 290 | -           | 345  | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | -                     | 27  | 46  | -          | 58  | -           | 69   | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | -                     | 22  | 39  | -          | 49  | -           | 59   | ns  |
|                 |                               | E to Qn; see <a href="#">Figure 7</a>                               |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | -                     | 41  | 175 | -          | 220 | -           | 265  | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | -                     | 15  | 35  | -          | 44  | -           | 53   | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | -                     | 12  | 30  | -          | 37  | -           | 45   | ns  |
| t <sub>t</sub>  | transition time               | Qn; see <a href="#">Figure 7</a> <sup>[2]</sup>                     |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | -                     | 19  | 75  | -          | 95  | -           | 110  | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | -                     | 7   | 15  | -          | 19  | -           | 22   | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | -                     | 6   | 13  | -          | 16  | -           | 19   | ns  |
| t <sub>W</sub>  | pulse width                   | LE HIGH; see <a href="#">Figure 8</a>                               |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | 80                    | 14  | -   | 100        | -   | 120         | -    | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | 16                    | 5   | -   | 20         | -   | 24          | -    | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | 14                    | 4   | -   | 17         | -   | 20          | -    | ns  |
| t <sub>su</sub> | set-up time                   | An to LE; see <a href="#">Figure 8</a>                              |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | 90                    | 25  | -   | 115        | -   | 135         | -    | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | 18                    | 9   | -   | 23         | -   | 27          | -    | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | 15                    | 7   | -   | 20         | -   | 23          | -    | ns  |
| t <sub>h</sub>  | hold time                     | An to LE; see <a href="#">Figure 8</a>                              |                       |     |     |            |     |             |      |     |
|                 |                               | V <sub>CC</sub> = 2.0 V                                             | 1                     | −11 | -   | 1          | -   | 1           | -    | ns  |
|                 |                               | V <sub>CC</sub> = 4.5 V                                             | 1                     | −4  | -   | 1          | -   | 1           | -    | ns  |
|                 |                               | V <sub>CC</sub> = 6.0 V                                             | 1                     | −3  | -   | 1          | -   | 1           | -    | ns  |
| C <sub>PD</sub> | power dissipation capacitance | per package; V <sub>I</sub> = GND to V <sub>CC</sub> <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 |
| 74HCT4514           |                               |                                                                             |                       |     |     |            |     |             |      |     |
| 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  |
|                     |                               | $\overline{E}$ 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).

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

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

11.1 Waveforms and test circuit

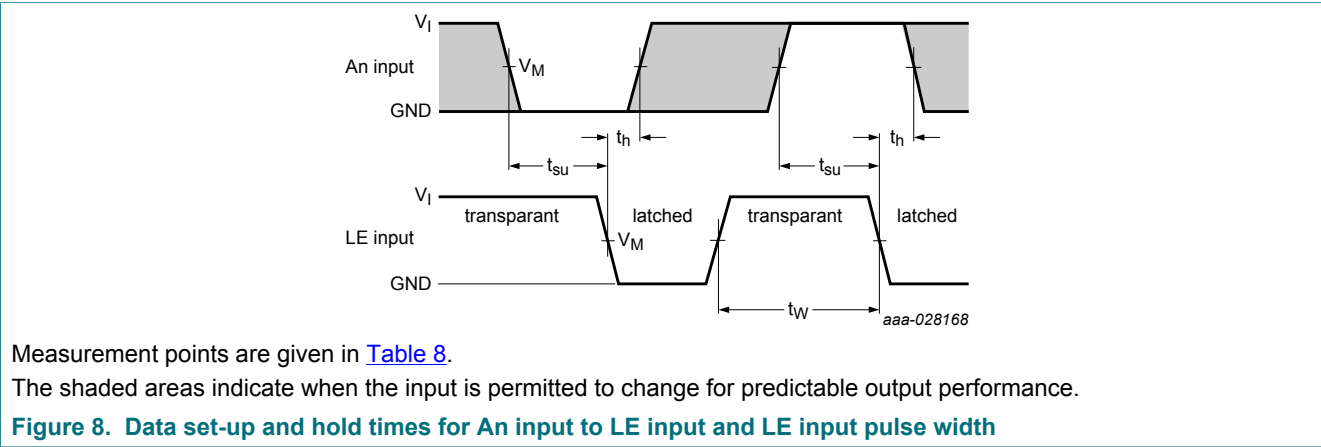
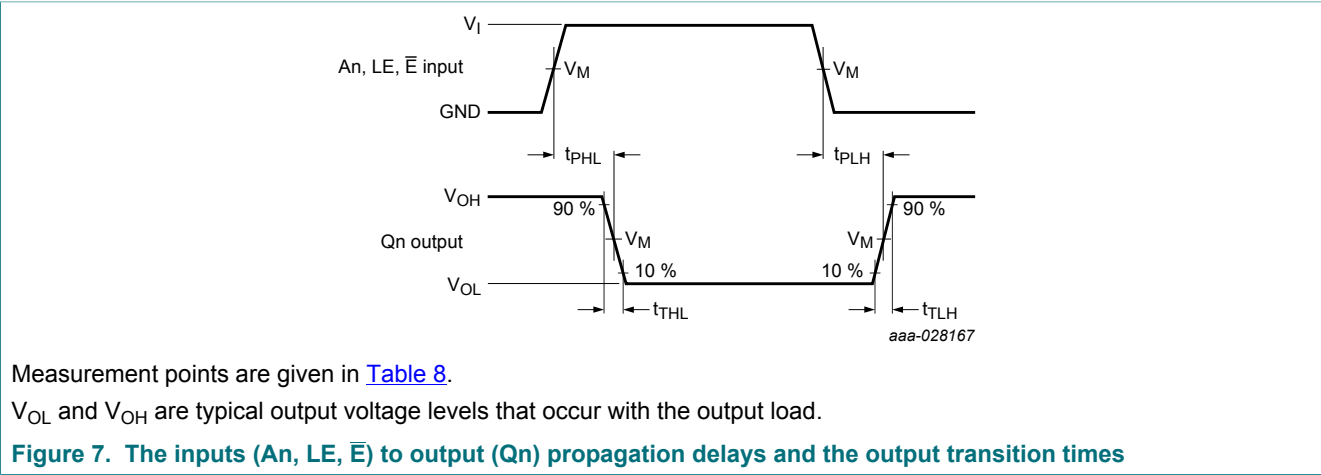
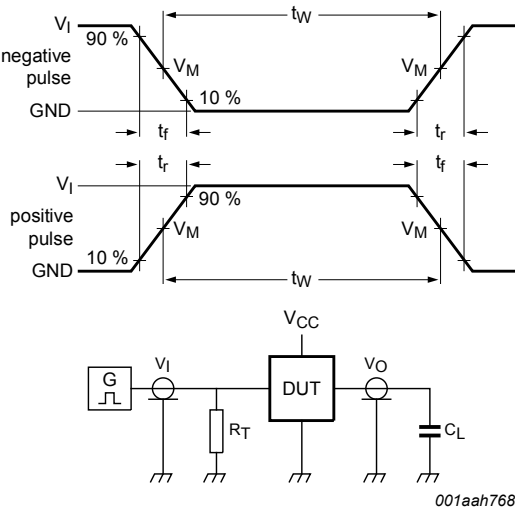


Table 8. Measurement points

| 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       |



Test data is given in [Table 9](#).  
Definitions for test circuit:  
 $R_T$  = Termination resistance; should be equal to output impedance  $Z_o$  of the pulse generator.  
 $C_L$  = Load capacitance including jig and probe capacitance.

Figure 9. Test circuit for measuring switching times

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

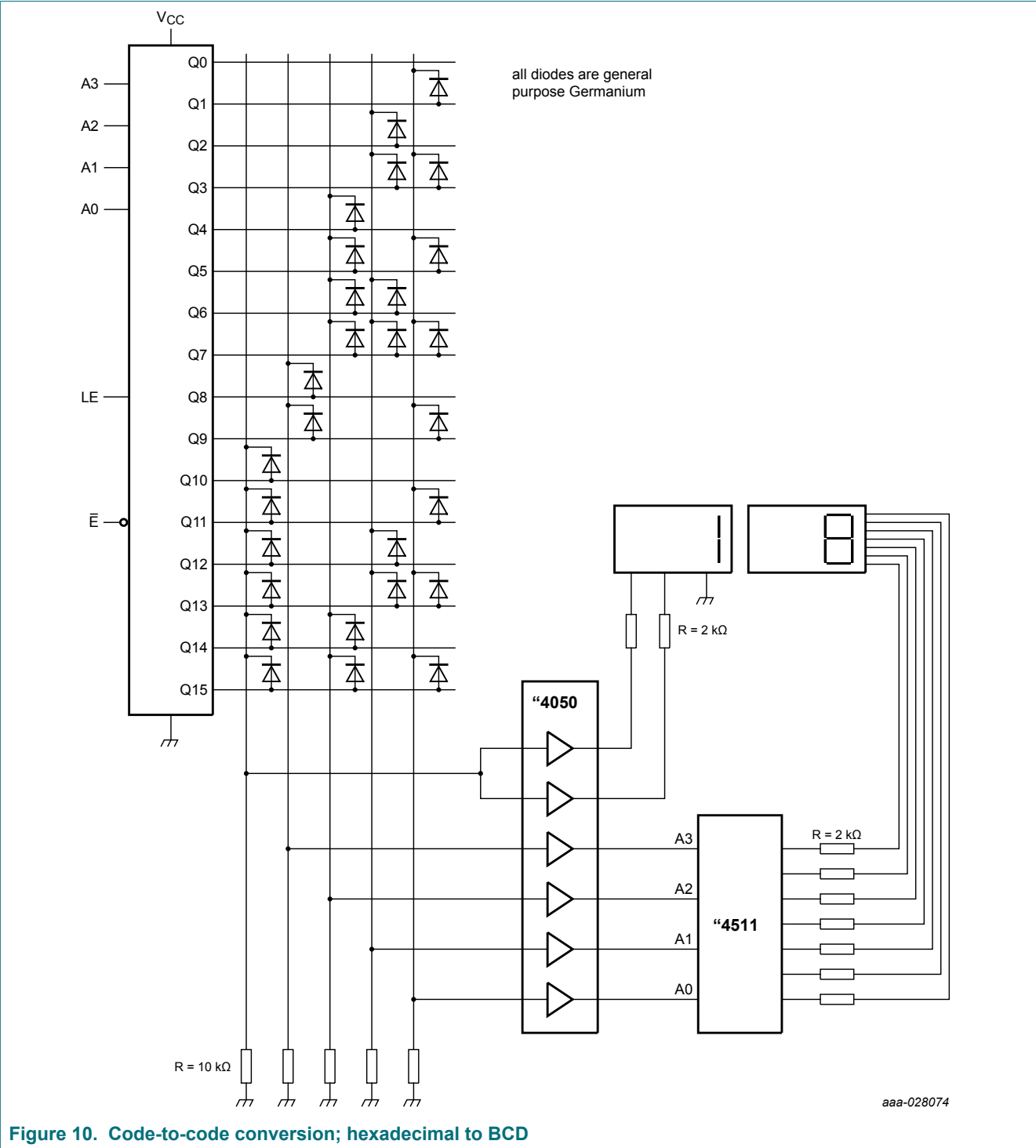
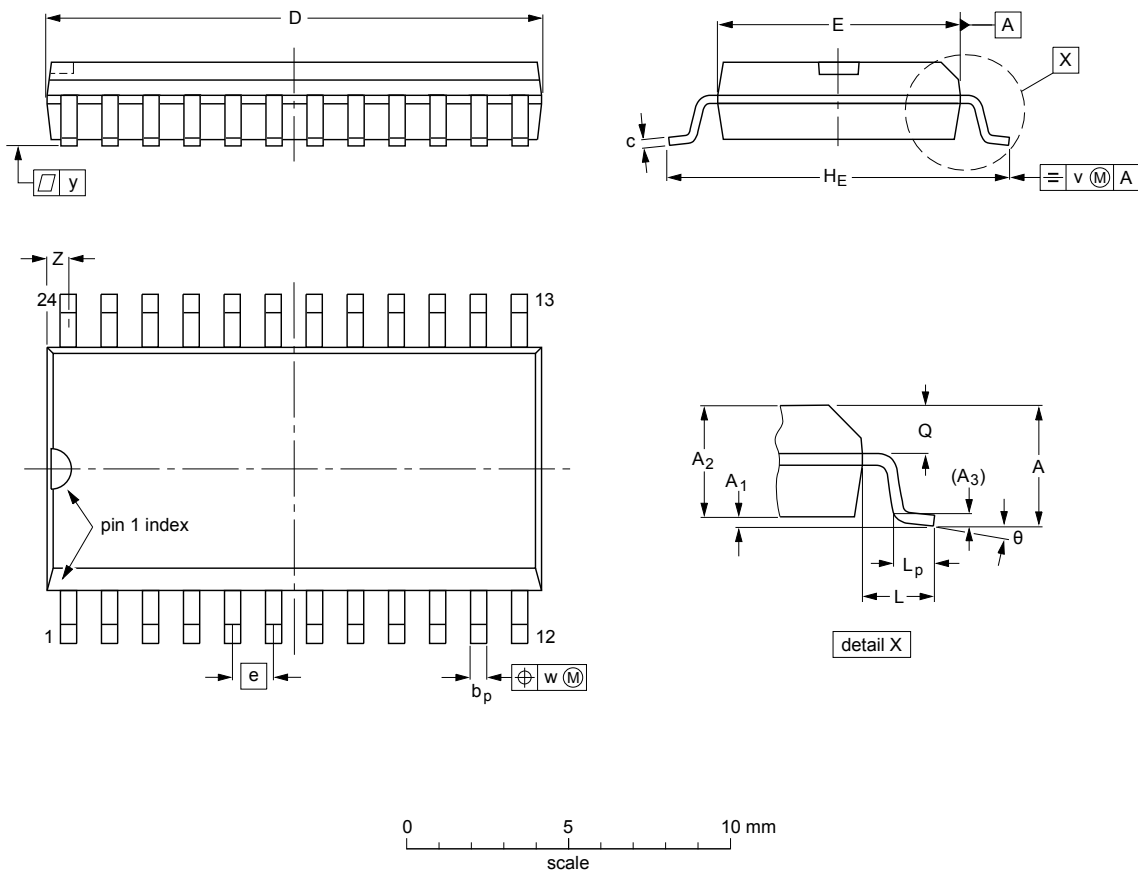


Figure 10. Code-to-code conversion; hexadecimal to BCD

13 Package outline

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<br>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     | 2.65      | 0.3<br>0.1     | 2.45<br>2.25   | 0.25           | 0.49<br>0.36   | 0.32<br>0.23   | 15.6<br>15.2     | 7.6<br>7.4       | 1.27 | 10.65<br>10.00 | 1.4   | 1.1<br>0.4     | 1.1<br>1.0     | 0.25 | 0.25 | 0.1   | 0.9<br>0.4       | 8°<br>0° |
| inches | 0.1       | 0.012<br>0.004 | 0.096<br>0.089 | 0.01           | 0.019<br>0.014 | 0.013<br>0.009 | 0.61<br>0.60     | 0.30<br>0.29     | 0.05 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016   |          |

Note

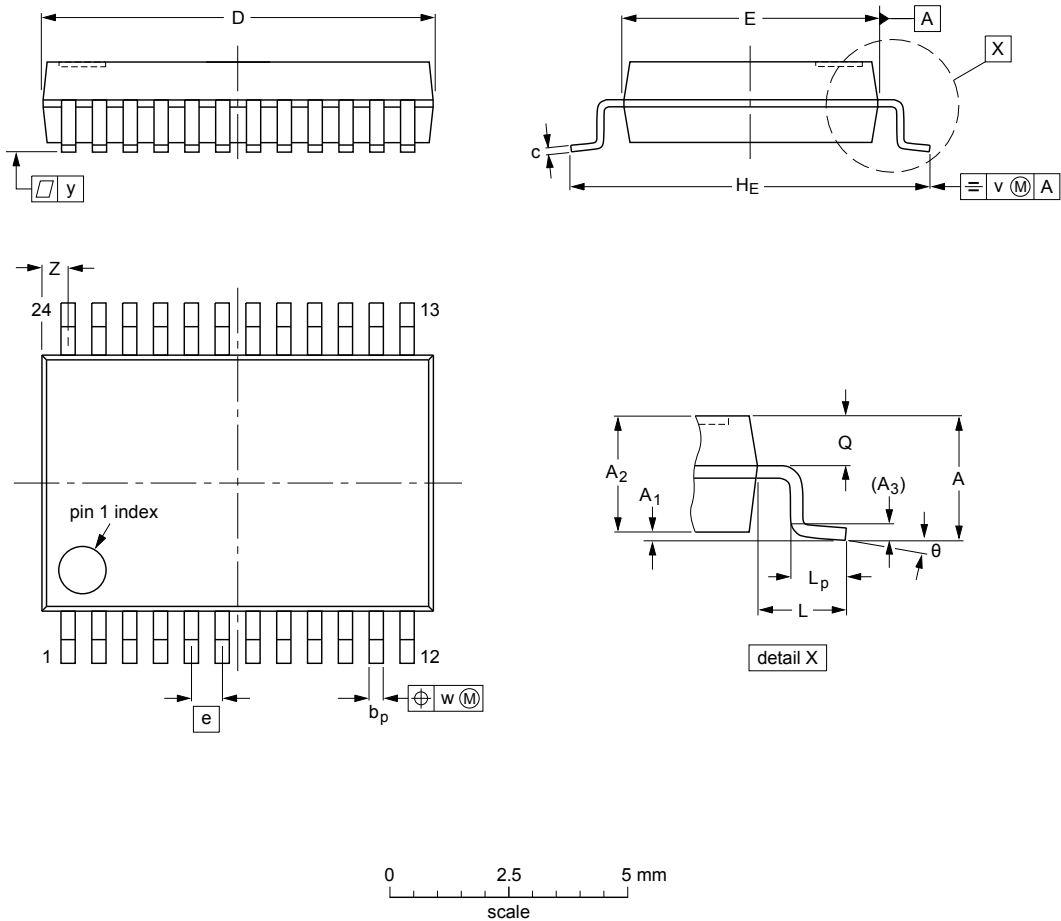
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

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

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<br>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<br>0.05   | 1.80<br>1.65   | 0.25           | 0.38<br>0.25   | 0.20<br>0.09 | 8.4<br>8.0       | 5.4<br>5.2       | 0.65 | 7.9<br>7.6     | 1.25 | 1.03<br>0.63   | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 0.8<br>0.4       | 8°<br>0° |

Note

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

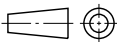
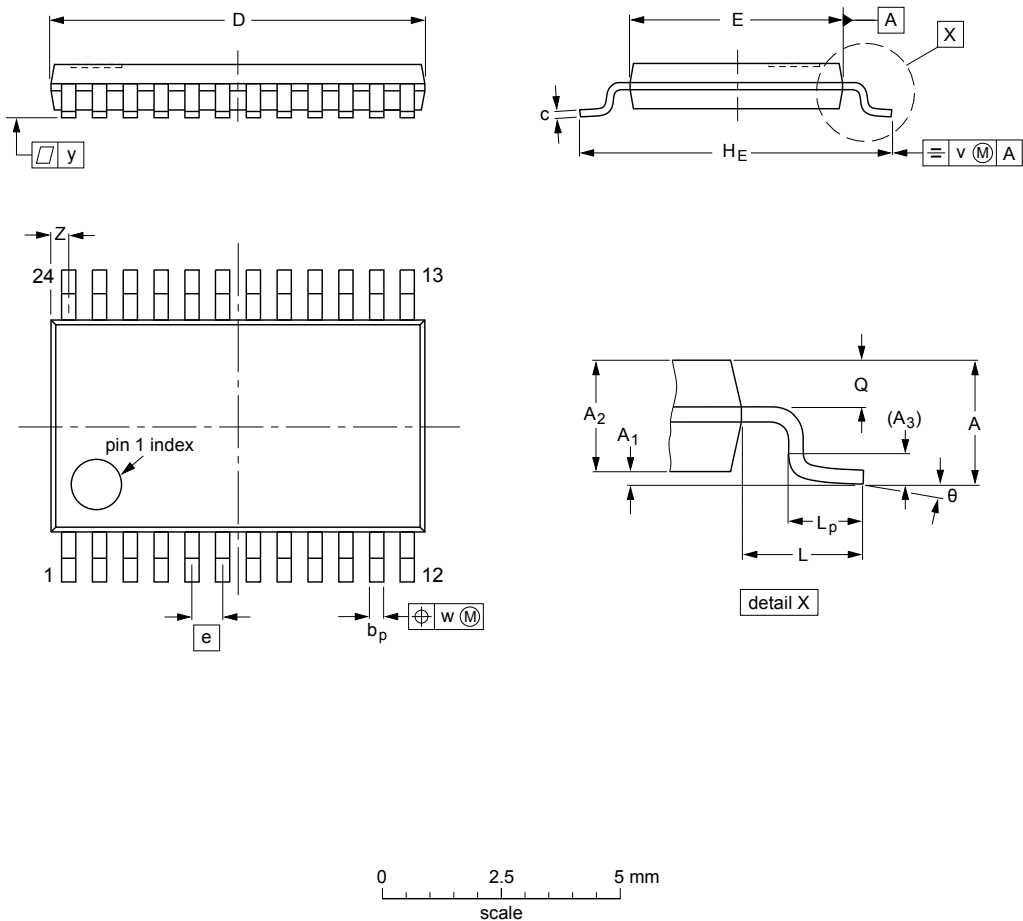
| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE            |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|-----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                                                                                       |                       |
| SOT340-1           |            | MO-150 |       |  |  | 99-12-27-<br>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 <sub>max.</sub> | 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<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 7.9<br>7.7       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.5<br>0.2       | 8°<br>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<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE             |
|--------------------|------------|--------|-------|--|------------------------|------------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                        |
| SOT355-1           |            | MO-153 |       |  |                        | -99-12-27-<br>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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Contents

1 General description ..... 1

2 Features and benefits .....1

3 Applications .....1

4 Ordering information ..... 2

5 Functional diagram .....2

6 Pinning information ..... 4

6.1 Pinning .....4

6.2 Pin description .....4

7 Functional description .....5

8 Limiting values .....5

9 Recommended operating conditions ..... 6

10 Static characteristics .....6

11 Dynamic characteristics .....8

11.1 Waveforms and test circuit ..... 10

12 Application information .....12

13 Package outline .....13

14 Abbreviations ..... 16

15 Revision history ..... 16

16 Legal information ..... 17

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