

# DATA SHEET

## **74LVC543A**

Octal D-type registered transceiver;  
3-state

Product specification  
Supersedes data of 2004 Feb 05

2004 Apr 07

## Octal D-type registered transceiver; 3-state

## 74LVC543A

## FEATURES

- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Supply voltage range from 1.2 V to 3.6 V
- Complies with JEDEC standard JESD8-B/JESD36
- CMOS low-power consumption
- Direct interface with TTL levels
- 8-bit octal transceiver with D-type latch
- Back-to-back registers for storage
- Separate controls for data flow in each direction
- 3-state non-inverting outputs for bus oriented applications
- High-impedance when  $V_{CC} = 0$  V
- ESD protection:
  - HBM EIA/JESD22-A114-B exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V.
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C.

## DESCRIPTION

The 74LVC543A is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74LVC543A is an octal registered transceiver containing two sets of D-type latches for temporary storage of the data flow in either direction. Separate latch enable inputs (pins  $\overline{LE}_{AB}$  and  $\overline{LE}_{BA}$ ) and output enable inputs (pins  $\overline{OE}_{AB}$  and  $\overline{OE}_{BA}$ ) are provided for each register to permit independent control of inputting and outputting in either direction of the data flow.

The 74LVC543A contains eight D-type latches, with separate inputs and controls for each set. For data flow from pins A to B, for example, the A to B enable input (pin  $\overline{E}_{AB}$ ) must be LOW in order to enter data from pins A0 to A7 or take data from pins B0 to B7, as indicated in the "Function table". With pin  $\overline{E}_{AB}$  LOW, a LOW signal on the A to B latch enable input (pin  $\overline{LE}_{AB}$ ) makes the A to B latches transparent; a subsequent LOW-to-HIGH transition on pin  $\overline{LE}_{AB}$  puts the A data into the latches where it is stored and the B outputs no longer change with the A inputs. With pins  $\overline{E}_{AB}$  and  $\overline{OE}_{AB}$  both LOW, the 3-state B output buffers are active and display the data present at the outputs of the A latches.

## QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25$  °C;  $t_r = t_f \leq 2.5$  ns.

| SYMBOL            | PARAMETER                               | CONDITIONS                      | TYPICAL | UNIT |
|-------------------|-----------------------------------------|---------------------------------|---------|------|
| $t_{PHL}/t_{PLH}$ | propagation delay An to Bn; Bn to An    | $C_L = 50$ pF; $V_{CC} = 3.3$ V | 3.0     | ns   |
| $C_I$             | input capacitance                       |                                 | 4.0     | pF   |
| $C_{I/O}$         | input/output capacitance                |                                 | 5.0     | pF   |
| $C_{PD}$          | power dissipation capacitance per latch | $V_{CC} = 3.3$ V; notes 1 and 2 |         |      |
|                   |                                         | outputs enabled                 | 15.0    | pF   |
|                   |                                         | outputs disabled                | 3.0     | pF   |

## Notes

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in Volts;

$N$  = total load switching outputs;

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

2. The condition is  $V_I = \text{GND to } V_{CC}$ .

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## FUNCTION TABLE

See note 1.

| OPERATING MODES     | INPUT                |                     |                      |      | OUTPUT |
|---------------------|----------------------|---------------------|----------------------|------|--------|
|                     | $\overline{OE}_{XX}$ | $\overline{E}_{XX}$ | $\overline{LE}_{XX}$ | DATA |        |
| Disabled            | H                    | X                   | X                    | X    | Z      |
|                     | X                    | H                   | X                    | X    | Z      |
| Disabled plus latch | L                    | ↑                   | L                    | h    | Z      |
|                     | L                    | ↑                   | L                    | l    | Z      |
| Latch plus display  | L                    | L                   | ↑                    | h    | H      |
|                     | L                    | L                   | ↑                    | l    | L      |
| Transparent         | L                    | L                   | L                    | H    | H      |
|                     | L                    | L                   | L                    | L    | L      |
| Hold (do nothing)   | L                    | L                   | H                    | X    | NC     |

## Note

1. XX = AB for A to B direction; BA for B to A direction;

H = HIGH voltage level;

L = LOW voltage level;

h = HIGH state must be present one set-up time before the LOW-to-HIGH transition of  $\overline{LE}_{AB}$ ,  $\overline{LE}_{BA}$ ,  $\overline{E}_{AB}$  and  $\overline{E}_{BA}$ ;

l = LOW state must be present one set-up time before the LOW-to-HIGH transition of  $\overline{LE}_{AB}$ ,  $\overline{LE}_{BA}$ ,  $\overline{E}_{AB}$  and  $\overline{E}_{BA}$ ;

X = don't care;

↑ = LOW-to-HIGH level transition;

NC = no change;

Z = high-impedance OFF-state.

## ORDERING INFORMATION

| TYPE NUMBER | TEMPERATURE RANGE | PACKAGE |          |          |          |
|-------------|-------------------|---------|----------|----------|----------|
|             |                   | PINS    | PACKAGE  | MATERIAL | CODE     |
| 74LVC543AD  | −40 °C to +125 °C | 24      | SO24     | plastic  | SOT137-1 |
| 74LVC543ADB | −40 °C to +125 °C | 24      | SSOP24   | plastic  | SOT340-1 |
| 74LVC543APW | −40 °C to +125 °C | 24      | TSSOP24  | plastic  | SOT355-1 |
| 74LVC543ABQ | −40 °C to +125 °C | 24      | DHVQFN24 | plastic  | SOT815-1 |

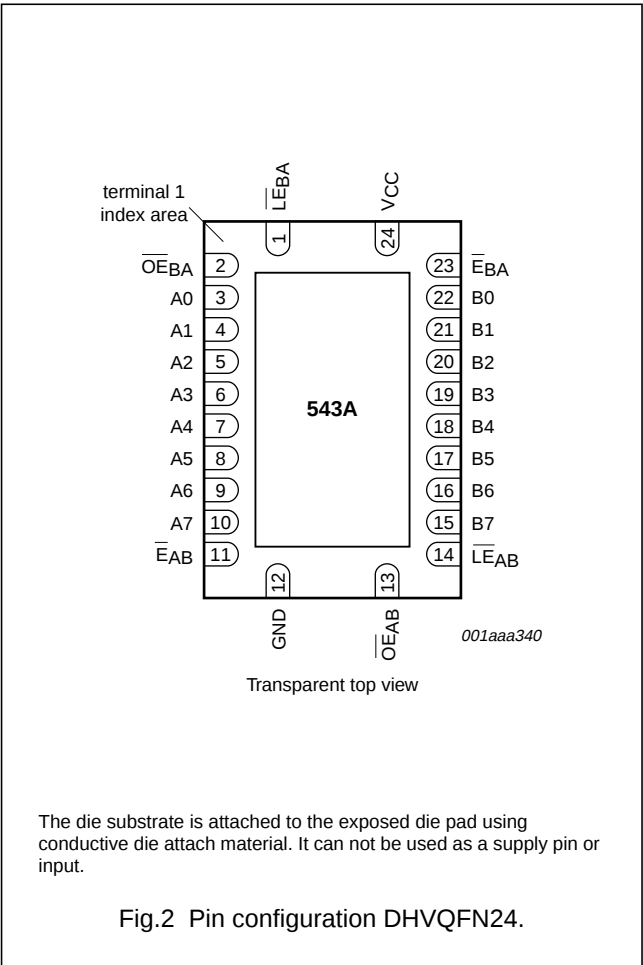
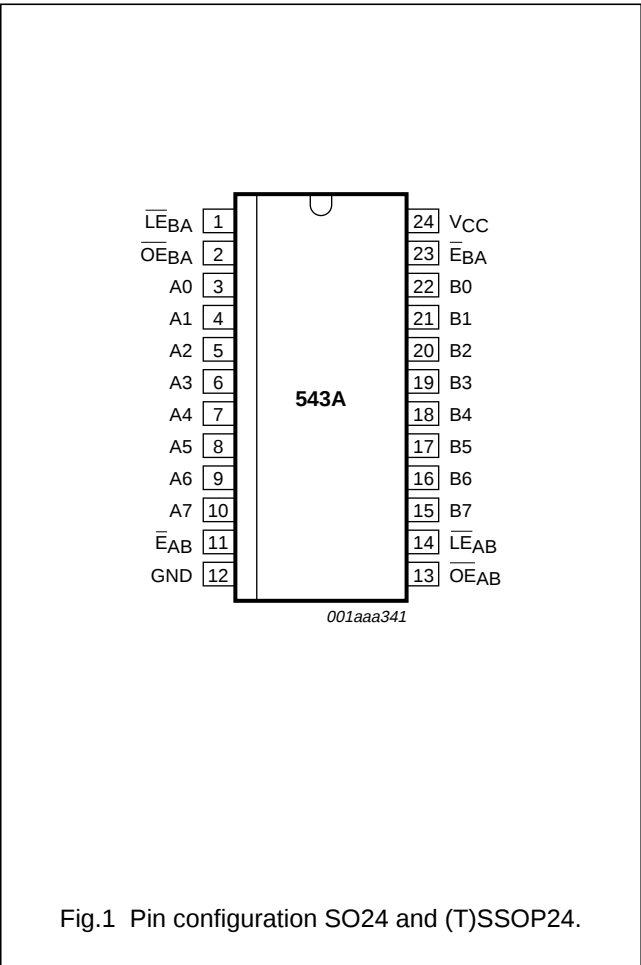
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PINNING

| PIN | SYMBOL                             | DESCRIPTION                             |
|-----|------------------------------------|-----------------------------------------|
| 1   | $\overline{\text{LE}}_{\text{BA}}$ | B to A latch enable input (active LOW)  |
| 2   | $\overline{\text{OE}}_{\text{BA}}$ | B to A output enable input (active LOW) |
| 3   | A0                                 | A data input or output                  |
| 4   | A1                                 | A data input or output                  |
| 5   | A2                                 | A data input or output                  |
| 6   | A3                                 | A data input or output                  |
| 7   | A4                                 | A data input or output                  |
| 8   | A5                                 | A data input or output                  |
| 9   | A6                                 | A data input or output                  |
| 10  | A7                                 | A data input or output                  |
| 11  | $\overline{\text{E}}_{\text{AB}}$  | A to B enable input (active LOW)        |
| 12  | GND                                | ground (0 V)                            |

| PIN | SYMBOL                             | DESCRIPTION                             |
|-----|------------------------------------|-----------------------------------------|
| 13  | $\overline{\text{OE}}_{\text{AB}}$ | A to B output enable input (active LOW) |
| 14  | $\overline{\text{LE}}_{\text{AB}}$ | A to B latch enable input (active LOW)  |
| 15  | B7                                 | B data output or input                  |
| 16  | B6                                 | B data output or input                  |
| 17  | B5                                 | B data output or input                  |
| 18  | B4                                 | B data output or input                  |
| 19  | B3                                 | B data output or input                  |
| 20  | B2                                 | B data output or input                  |
| 21  | B1                                 | B data output or input                  |
| 22  | B0                                 | B data output or input                  |
| 23  | $\overline{\text{E}}_{\text{BA}}$  | B to A enable input (active LOW)        |
| 24  | V <sub>CC</sub>                    | positive supply voltage                 |



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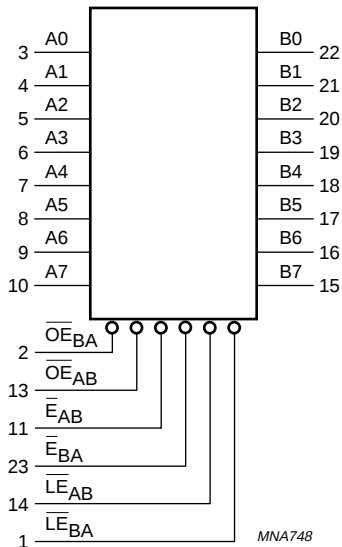


Fig.3 Logic symbol.

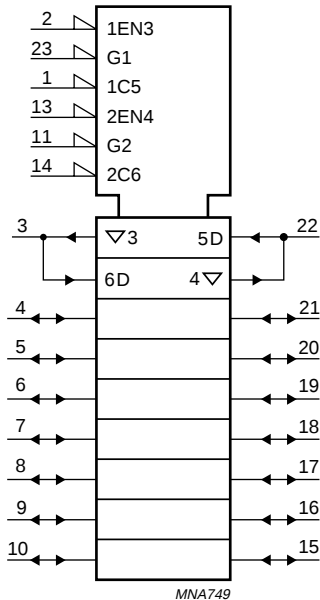


Fig.4 Logic symbol (IEEE/IEC).

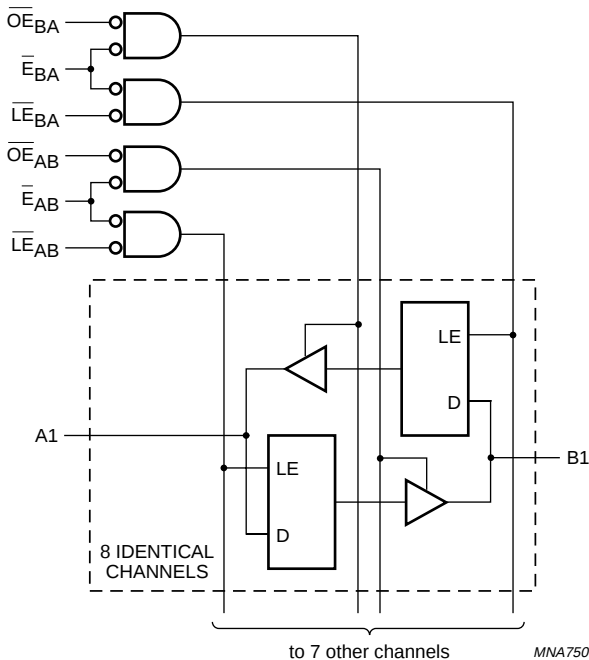


Fig.5 Logic diagram.

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## RECOMMENDED OPERATING CONDITIONS

| SYMBOL                          | PARAMETER                     | CONDITIONS                       | MIN. | MAX.            | UNIT |
|---------------------------------|-------------------------------|----------------------------------|------|-----------------|------|
| V <sub>CC</sub>                 | supply voltage                | for maximum speed performance    | 2.7  | 3.6             | V    |
|                                 |                               | for low-voltage applications     | 1.2  | 3.6             | V    |
| V <sub>I</sub>                  | input voltage                 |                                  | 0    | 5.5             | V    |
| V <sub>O</sub>                  | output voltage                | output HIGH or LOW state         | 0    | V <sub>CC</sub> | V    |
|                                 |                               | output 3-state                   | 0    | 5.5             | V    |
| T <sub>amb</sub>                | operating ambient temperature | in free air                      | −40  | +125            | °C   |
| t <sub>r</sub> , t <sub>f</sub> | input rise and fall times     | V <sub>CC</sub> = 1.2 V to 2.7 V | 0    | 20              | ns/V |
|                                 |                               | V <sub>CC</sub> = 2.7 V to 3.6 V | 0    | 10              | ns/V |

## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134); voltages are referenced to GND (ground = 0 V); note 1.

| SYMBOL                             | PARAMETER                      | CONDITIONS                                               | MIN. | MAX.                  | UNIT |
|------------------------------------|--------------------------------|----------------------------------------------------------|------|-----------------------|------|
| V <sub>CC</sub>                    | supply voltage                 |                                                          | −0.5 | +6.5                  | V    |
| I <sub>IK</sub>                    | input diode current            | V <sub>I</sub> < 0 V                                     | −    | −50                   | mA   |
| V <sub>I</sub>                     | input voltage                  | note 2                                                   | −0.5 | +6.5                  | V    |
| I <sub>OK</sub>                    | output diode current           | V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V | −    | ±50                   | mA   |
| V <sub>O</sub>                     | output voltage                 | output HIGH or LOW state; note 2                         | −0.5 | V <sub>CC</sub> + 0.5 | V    |
|                                    |                                | output 3-state; note 2                                   | −0.5 | +6.5                  | V    |
| I <sub>O</sub>                     | output source or sink current  | V <sub>O</sub> = 0 V to V <sub>CC</sub>                  | −    | ±50                   | mA   |
| I <sub>CC</sub> , I <sub>GND</sub> | V <sub>CC</sub> or GND current |                                                          | −    | ±100                  | mA   |
| T <sub>stg</sub>                   | storage temperature            |                                                          | −65  | +150                  | °C   |
| P <sub>tot</sub>                   | power dissipation              | T <sub>amb</sub> = −40 °C to +125 °C; note 3             | −    | 500                   | mW   |

## Notes

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "Recommended operating conditions" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- For SO24 packages: above 70 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.  
For (T)SSOP24 packages: above 60 °C the value of P<sub>tot</sub> derates linearly with 5.5 mW/K.  
For DHVQFN24 packages: above 60 °C the value of P<sub>tot</sub> derates linearly with 4.5 mW/K.

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## DC CHARACTERISTICS

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

| SYMBOL                                      | PARAMETER                                   | TEST CONDITIONS                                                                                                                                                  |                     | MIN.                  | TYP.                           | MAX. | UNIT |
|---------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|--------------------------------|------|------|
|                                             |                                             | OTHER                                                                                                                                                            | V <sub>CC</sub> (V) |                       |                                |      |      |
| T <sub>amb</sub> = −40 °C to +85 °C; note 1 |                                             |                                                                                                                                                                  |                     |                       |                                |      |      |
| V <sub>IH</sub>                             | HIGH-level input voltage                    |                                                                                                                                                                  | 1.2                 | V <sub>CC</sub>       | −                              | −    | V    |
|                                             |                                             |                                                                                                                                                                  | 2.7 to 3.6          | 2.0                   | −                              | −    | V    |
| V <sub>IL</sub>                             | LOW-level input voltage                     |                                                                                                                                                                  | 1.2                 | −                     | −                              | GND  | V    |
|                                             |                                             |                                                                                                                                                                  | 2.7 to 3.6          | −                     | −                              | 0.8  | V    |
| V <sub>OH</sub>                             | HIGH-level output voltage                   | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = −100 μA<br>I <sub>O</sub> = −12 mA<br>I <sub>O</sub> = −18 mA<br>I <sub>O</sub> = −24 mA | 2.7 to 3.6          | V <sub>CC</sub> − 0.2 | V <sub>CC</sub> <sup>(2)</sup> | −    | V    |
|                                             |                                             |                                                                                                                                                                  | 2.7                 | V <sub>CC</sub> − 0.5 | −                              | −    | V    |
|                                             |                                             |                                                                                                                                                                  | 3.0                 | V <sub>CC</sub> − 0.6 | −                              | −    | V    |
|                                             |                                             |                                                                                                                                                                  | 3.0                 | V <sub>CC</sub> − 0.8 | −                              | −    | V    |
| V <sub>OL</sub>                             | LOW-level output voltage                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 100 μA<br>I <sub>O</sub> = 12 mA<br>I <sub>O</sub> = 24 mA                               | 2.7 to 3.6          | −                     | GND <sup>(2)</sup>             | 0.2  | V    |
|                                             |                                             |                                                                                                                                                                  | 2.7                 | −                     | −                              | 0.4  | V    |
|                                             |                                             |                                                                                                                                                                  | 3.0                 | −                     | −                              | 0.55 | V    |
|                                             |                                             |                                                                                                                                                                  |                     |                       |                                |      |      |
| I <sub>LI</sub>                             | input leakage current                       | V <sub>I</sub> = 5.5 V or GND                                                                                                                                    | 3.6                 | −                     | ±0.1                           | ±5   | μA   |
| I <sub>OZ</sub>                             | 3-state output OFF-state current            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>O</sub> = 5.5 V or GND;<br>note 3                                                                | 3.6                 | −                     | 0.1                            | ±10  | μA   |
| I <sub>off</sub>                            | power-off leakage supply                    | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                                                                                                         | 0.0                 | −                     | 0.1                            | ±10  | μA   |
| I <sub>CC</sub>                             | quiescent supply current                    | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A                                                                                                 | 3.6                 | −                     | 0.1                            | 10   | μA   |
| ΔI <sub>CC</sub>                            | additional quiescent supply current per pin | V <sub>I</sub> = V <sub>CC</sub> − 0.6 V;<br>I <sub>O</sub> = 0 A                                                                                                | 2.7 to 3.6          | −                     | 5 <sup>(2)</sup>               | 500  | μA   |

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| SYMBOL                               | PARAMETER                                      | TEST CONDITIONS                                                                                                                                                  |                     | MIN.                   | TYP. | MAX. | UNIT |
|--------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|------|------|------|
|                                      |                                                | OTHER                                                                                                                                                            | V <sub>CC</sub> (V) |                        |      |      |      |
| T <sub>amb</sub> = −40 °C to +125 °C |                                                |                                                                                                                                                                  |                     |                        |      |      |      |
| V <sub>IH</sub>                      | HIGH-level input voltage                       |                                                                                                                                                                  | 1.2                 | V <sub>CC</sub>        | —    | —    | V    |
|                                      |                                                |                                                                                                                                                                  | 2.7 to 3.6          | 2.0                    | —    | —    | V    |
| V <sub>IL</sub>                      | LOW-level input voltage                        |                                                                                                                                                                  | 1.2                 | —                      | —    | 0    | V    |
|                                      |                                                |                                                                                                                                                                  | 2.7 to 3.6          | —                      | —    | 0.8  | V    |
| V <sub>OH</sub>                      | HIGH-level output voltage                      | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = −100 μA<br>I <sub>O</sub> = −12 mA<br>I <sub>O</sub> = −18 mA<br>I <sub>O</sub> = −24 mA | 2.7 to 3.6          | V <sub>CC</sub> − 0.3  | —    | —    | V    |
|                                      |                                                |                                                                                                                                                                  | 2.7                 | V <sub>CC</sub> − 0.65 | —    | —    | V    |
|                                      |                                                |                                                                                                                                                                  | 3.0                 | V <sub>CC</sub> − 0.75 | —    | —    | V    |
|                                      |                                                |                                                                                                                                                                  | 3.0                 | V <sub>CC</sub> − 1    | —    | —    | V    |
| V <sub>OL</sub>                      | LOW-level output voltage                       | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 100 μA<br>I <sub>O</sub> = 12 mA<br>I <sub>O</sub> = 24 mA                               | 2.7 to 3.6          | —                      | —    | 0.3  | V    |
|                                      |                                                |                                                                                                                                                                  | 2.7                 | —                      | —    | 0.6  | V    |
|                                      |                                                |                                                                                                                                                                  | 3.0                 | —                      | —    | 0.8  | V    |
|                                      |                                                |                                                                                                                                                                  |                     |                        |      |      |      |
| I <sub>LI</sub>                      | input leakage current                          | V <sub>I</sub> = 5.5 V or GND                                                                                                                                    | 3.6                 | —                      | —    | ±20  | μA   |
| I <sub>OZ</sub>                      | 3-state output<br>OFF-state current            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>O</sub> = 5.5 V or GND;<br>note 3                                                                | 3.6                 | —                      | —    | ±20  | μA   |
| I <sub>off</sub>                     | power-off leakage<br>supply                    | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                                                                                                         | 0.0                 | —                      | —    | ±20  | μA   |
| I <sub>CC</sub>                      | quiescent supply<br>current                    | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A                                                                                                 | 3.6                 | —                      | —    | 40   | μA   |
| ΔI <sub>CC</sub>                     | additional quiescent<br>supply current per pin | V <sub>I</sub> = V <sub>CC</sub> − 0.6 V;<br>I <sub>O</sub> = 0 A                                                                                                | 2.7 to 3.6          | —                      | —    | 5000 | μA   |

**Notes**

1. All typical values are measured T<sub>amb</sub> = 25 °C.
2. These typical values are measured at V<sub>CC</sub> = 3.3 V.
3. For transceivers, the parameter I<sub>OZ</sub> includes the input leakage current.

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## AC CHARACTERISTICS

GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF.

| SYMBOL                                      | PARAMETER                                                                             | CONDITIONS        |                     | MIN. | TYP.                | MAX. | UNIT |
|---------------------------------------------|---------------------------------------------------------------------------------------|-------------------|---------------------|------|---------------------|------|------|
|                                             |                                                                                       | WAVEFORMS         | V <sub>CC</sub> (V) |      |                     |      |      |
| T <sub>amb</sub> = −40 °C to +85 °C; note 1 |                                                                                       |                   |                     |      |                     |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub>          | propagation delay An to Bn; Bn to An                                                  | see Figs 6 and 10 | 1.2                 | –    | 15                  | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 8.0  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.0  | 3.0 <sup>(2)</sup>  | 7.0  | ns   |
|                                             | propagation delay $\overline{LE}_{BA}$ to An;<br>LE <sub>AB</sub> to Bn               | see Figs 7 and 10 | 1.2                 | –    | 16                  | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 9.5  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.2  | 4.2 <sup>(2)</sup>  | 8.5  | ns   |
| t <sub>PZH</sub> /t <sub>PZL</sub>          | 3-state output enable time $\overline{OE}_{BA}$ to An;<br>OE <sub>AB</sub> to Bn      | see Figs 8 and 10 | 1.2                 | –    | 17                  | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 9.2  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.3  | 3.4 <sup>(2)</sup>  | 7.7  | ns   |
|                                             | 3-state output enable time<br>$\overline{E}_{BA}$ to An; $\overline{E}_{AB}$ to Bn    | see Figs 8 and 10 | 1.2                 | –    | 18                  | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 9.3  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.3  | 3.6 <sup>(2)</sup>  | 8.0  | ns   |
| t <sub>PHZ</sub> /t <sub>PLZ</sub>          | 3-state output disable time $\overline{OE}_{BA}$ to An;<br>$\overline{OE}_{AB}$ to Bn | see Figs 8 and 10 | 1.2                 | –    | 8.0                 | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 7.5  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.5  | 3.2 <sup>(2)</sup>  | 7.0  | ns   |
|                                             | 3-state output disable time<br>$\overline{E}_{BA}$ to An; $\overline{E}_{AB}$ to Bn   | see Figs 8 and 10 | 1.2                 | –    | 8.5                 | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | 7.5  | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.5  | 3.3 <sup>(2)</sup>  | 7.0  | ns   |
| t <sub>W</sub>                              | $\overline{LE}_{XX}$ pulse with LOW                                                   | see Fig.7         | 1.2                 | –    | 4.0                 | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 3.0  | –                   | –    | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 3.0  | 0.9 <sup>(2)</sup>  | –    | ns   |
| t <sub>SU</sub>                             | set-up time An, Bn to $\overline{LE}_{XX}$ ;<br>An, Bn to $\overline{E}_{XX}$         | see Fig.9         | 1.2                 | –    | −1.5                | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | –    | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | +1.5 | −0.5 <sup>(2)</sup> | –    | ns   |
| t <sub>H</sub>                              | hold time An, Bn to $\overline{LE}_{XX}$ ; An, Bn to $\overline{E}_{XX}$              | see Fig.9         | 1.2                 | –    | 2.0                 | –    | ns   |
|                                             |                                                                                       |                   | 2.7                 | 1.5  | –                   | –    | ns   |
|                                             |                                                                                       |                   | 3.0 to 3.6          | 1.5  | 0.6 <sup>(2)</sup>  | –    | ns   |
| t <sub>sk(0)</sub>                          | skew                                                                                  | note 3            |                     | –    | –                   | 1.0  | ns   |

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| SYMBOL                               | PARAMETER                                                                             | CONDITIONS        |                     | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|---------------------------------------------------------------------------------------|-------------------|---------------------|------|------|------|------|
|                                      |                                                                                       | WAVEFORMS         | V <sub>CC</sub> (V) |      |      |      |      |
| T <sub>amb</sub> = −40 °C to +125 °C |                                                                                       |                   |                     |      |      |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub>   | propagation delay An to Bn; Bn to An                                                  | see Figs 6 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 10.0 | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.0  | –    | 9.0  | ns   |
|                                      | propagation delay $\overline{LE}_{BA}$ to An;<br>LE <sub>AB</sub> to Bn               | see Figs 7 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 12.0 | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.2  | –    | 11.0 | ns   |
| t <sub>PZH</sub> /t <sub>PZL</sub>   | 3-state output enable time $\overline{OE}_{BA}$ to An;<br>OE <sub>AB</sub> to Bn      | see Figs 8 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 11.5 | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.3  | –    | 10.0 | ns   |
|                                      | 3-state output enable time<br>$\overline{E}_{BA}$ to An; $\overline{E}_{AB}$ to Bn    | see Figs 8 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 12.0 | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.3  | –    | 10.0 | ns   |
| t <sub>PHZ</sub> /t <sub>PLZ</sub>   | 3-state output disable time $\overline{OE}_{BA}$ to An;<br>$\overline{OE}_{AB}$ to Bn | see Figs 8 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 9.5  | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.5  | –    | 9.0  | ns   |
|                                      | 3-state output disable time<br>$\overline{E}_{BA}$ to An; $\overline{E}_{AB}$ to Bn   | see Figs 8 and 10 | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | 11.5 | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.5  | –    | 9.0  | ns   |
| t <sub>w</sub>                       | $\overline{LE}_{XX}$ pulse with LOW                                                   | see Fig.7         | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 3.0  | –    | –    | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 3.0  | –    | –    | ns   |
| t <sub>su</sub>                      | set-up time An, Bn to $\overline{LE}_{XX}$ ; An,<br>Bn to $\overline{E}_{XX}$         | see Fig.9         | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | –    | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.5  | –    | –    | ns   |
| t <sub>h</sub>                       | hold time An, Bn to $\overline{LE}_{XX}$ ; An, Bn to $\overline{E}_{XX}$              | see Fig.9         | 1.2                 | –    | –    | –    | ns   |
|                                      |                                                                                       |                   | 2.7                 | 1.5  | –    | –    | ns   |
|                                      |                                                                                       |                   | 3.0 to 3.6          | 1.5  | –    | –    | ns   |
| t <sub>sk(0)</sub>                   | skew                                                                                  | note 3            |                     | –    | –    | 1.5  | ns   |

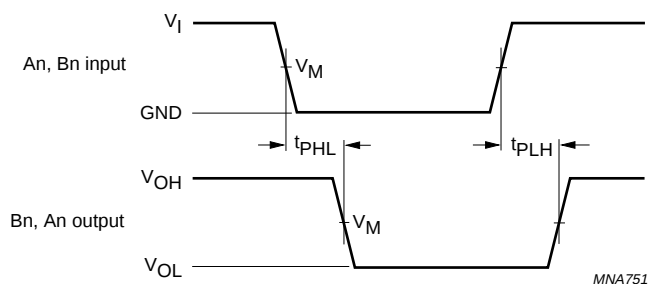
**Notes**

1. All typical values are measured at T<sub>amb</sub> = 25 °C.
2. These typical values are measured at V<sub>CC</sub> = 3.3 V.
3. Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

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## AC WAVEFORMS

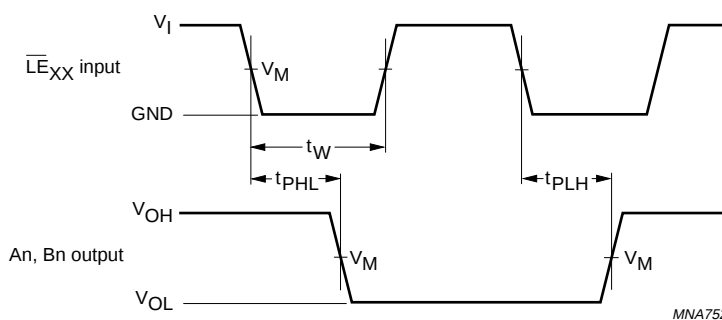


$V_M = 1.5 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ .

$V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

$V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

Fig.6 Input (An and Bn) to output (Bn and An) propagation delays.



$V_M = 1.5 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ .

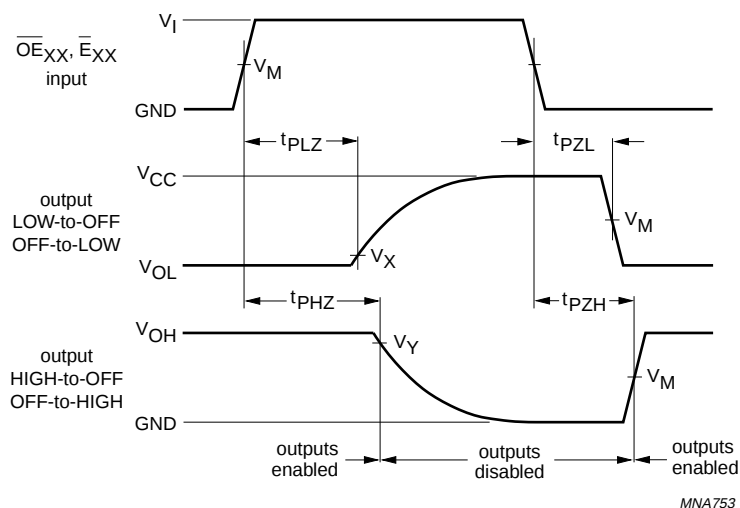
$V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

$V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

Fig.7 Latch enable input ( $\overline{LE_{XX}}$ ) pulse width and latch enable input to output An and Bn propagation delays.

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MNA753

$V_M = 1.5 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ .

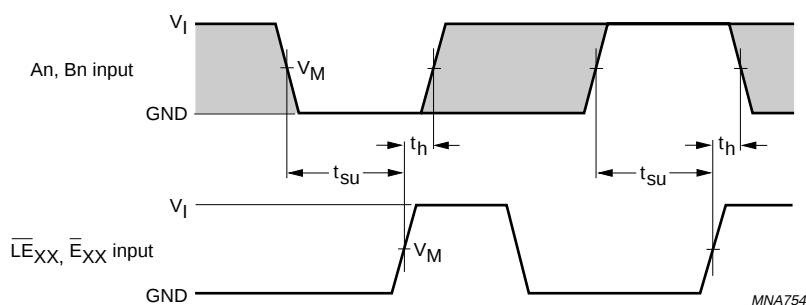
$V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

$V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

$V_X = V_{OL} + 0.3 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ ;  $V_X = V_{OL} + 0.1 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

$V_Y = V_{OH} - 0.3 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ ;  $V_Y = V_{OH} - 0.1 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

Fig.8 3-state enable and disable times.



MNA754

$V_M = 1.5 \text{ V}$  at  $V_{CC} \geq 2.7 \text{ V}$ .

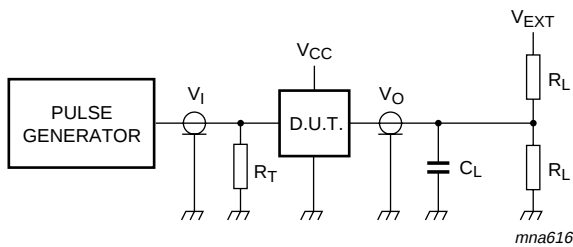
$V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7 \text{ V}$ .

The shaded areas indicate when the input is permitted to change for predictable output performance.

Fig.9 Data set-up and hold times for the inputs An and Bn to  $\overline{LE}_{XX}$  and  $\overline{E}_{XX}$  inputs.

Octal D-type registered transceiver; 3-state

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| V <sub>CC</sub> | V <sub>I</sub>  | C <sub>L</sub> | R <sub>L</sub>       | V <sub>EXT</sub>                   |                                    |                                    |
|-----------------|-----------------|----------------|----------------------|------------------------------------|------------------------------------|------------------------------------|
|                 |                 |                |                      | t <sub>PLH</sub> /t <sub>PHL</sub> | t <sub>PZH</sub> /t <sub>PHZ</sub> | t <sub>PZL</sub> /t <sub>PLZ</sub> |
| 1.2 V           | V <sub>CC</sub> | 50 pF          | 500 Ω <sup>(1)</sup> | open                               | GND                                | 2 × V <sub>CC</sub>                |
| 2.7 V           | 2.7 V           | 50 pF          | 500 Ω                | open                               | GND                                | 2 × V <sub>CC</sub>                |
| 3.0 V to 3.6 V  | 2.7 V           | 50 pF          | 500 Ω                | open                               | GND                                | 2 × V <sub>CC</sub>                |

Note

1. The circuit performs better when R<sub>L</sub> = 1000 Ω.

Definitions for test circuits:  
R<sub>L</sub> = Load resistor.  
C<sub>L</sub> = Load capacitance including jig and probe capacitance.  
R<sub>T</sub> = Termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator.

Fig.10 Load circuitry for switching times.

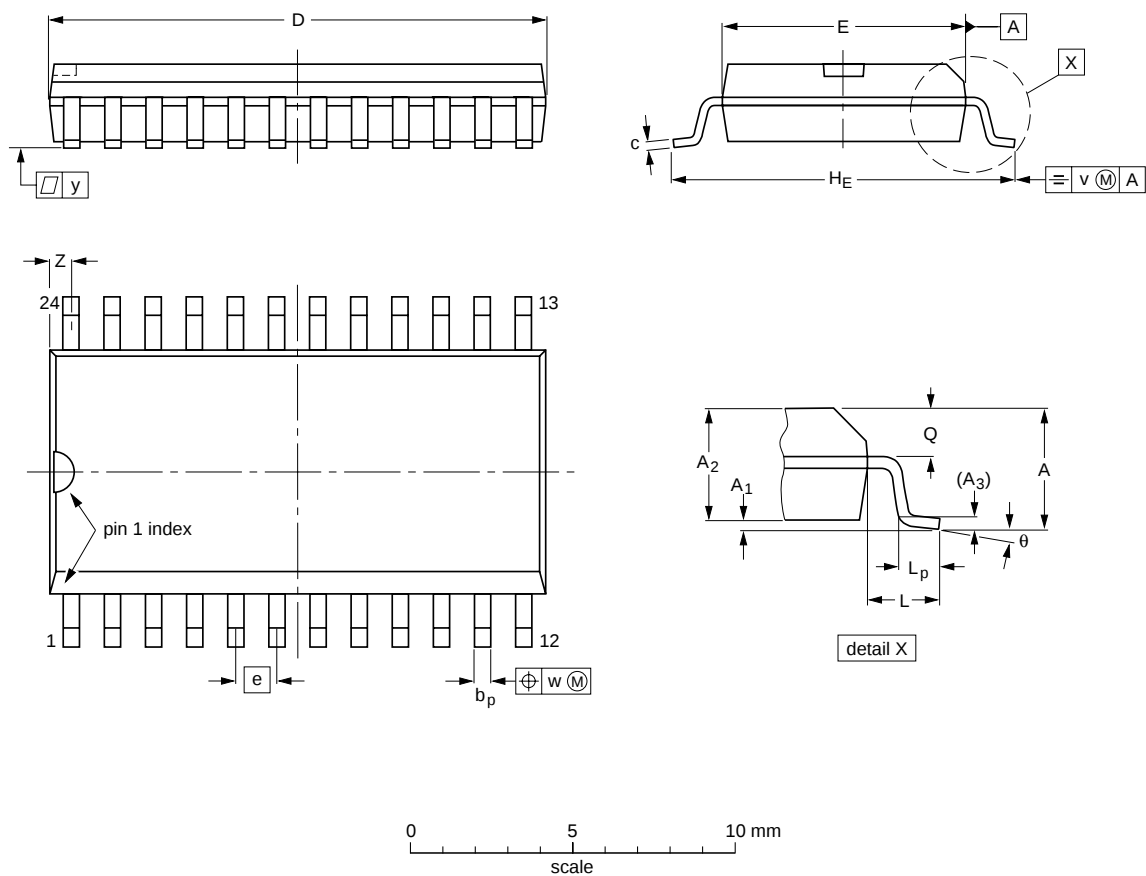
Octal D-type registered transceiver; 3-state

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PACKAGE OUTLINES

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.

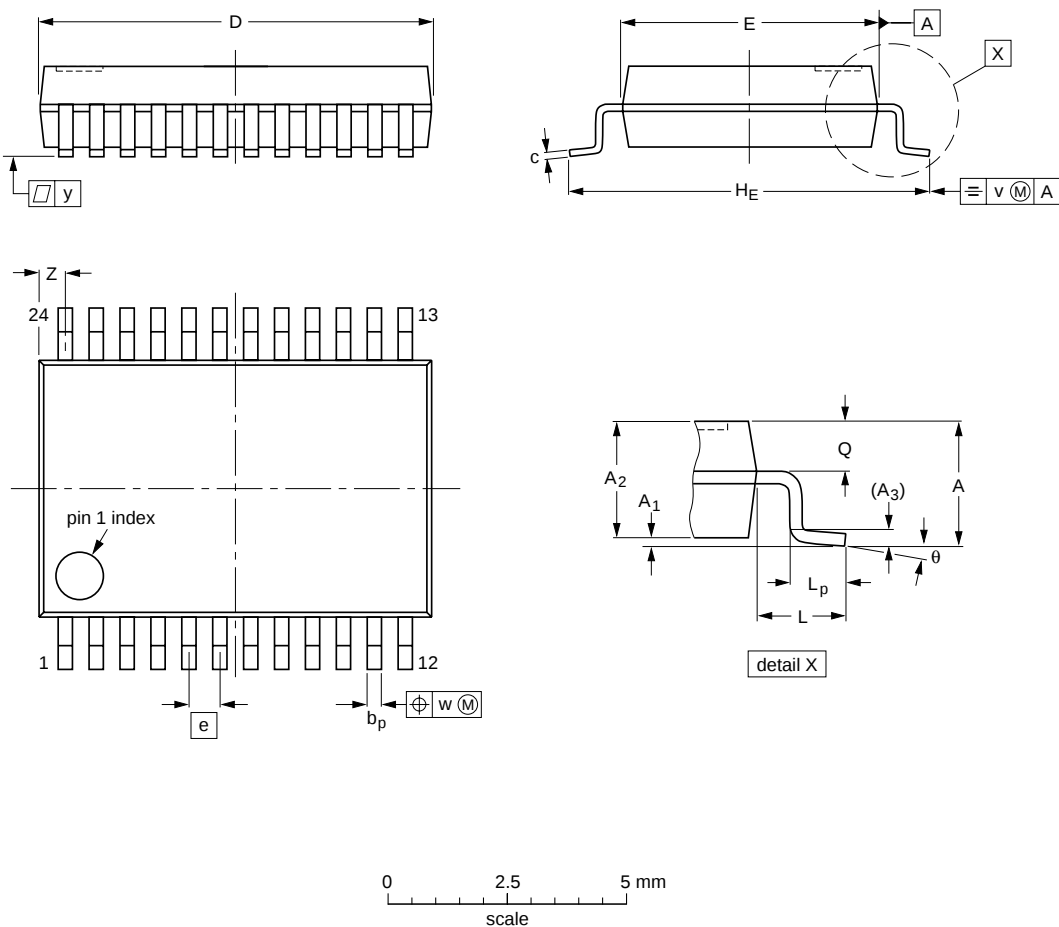
| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |            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

Octal D-type registered transceiver; 3-state

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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.

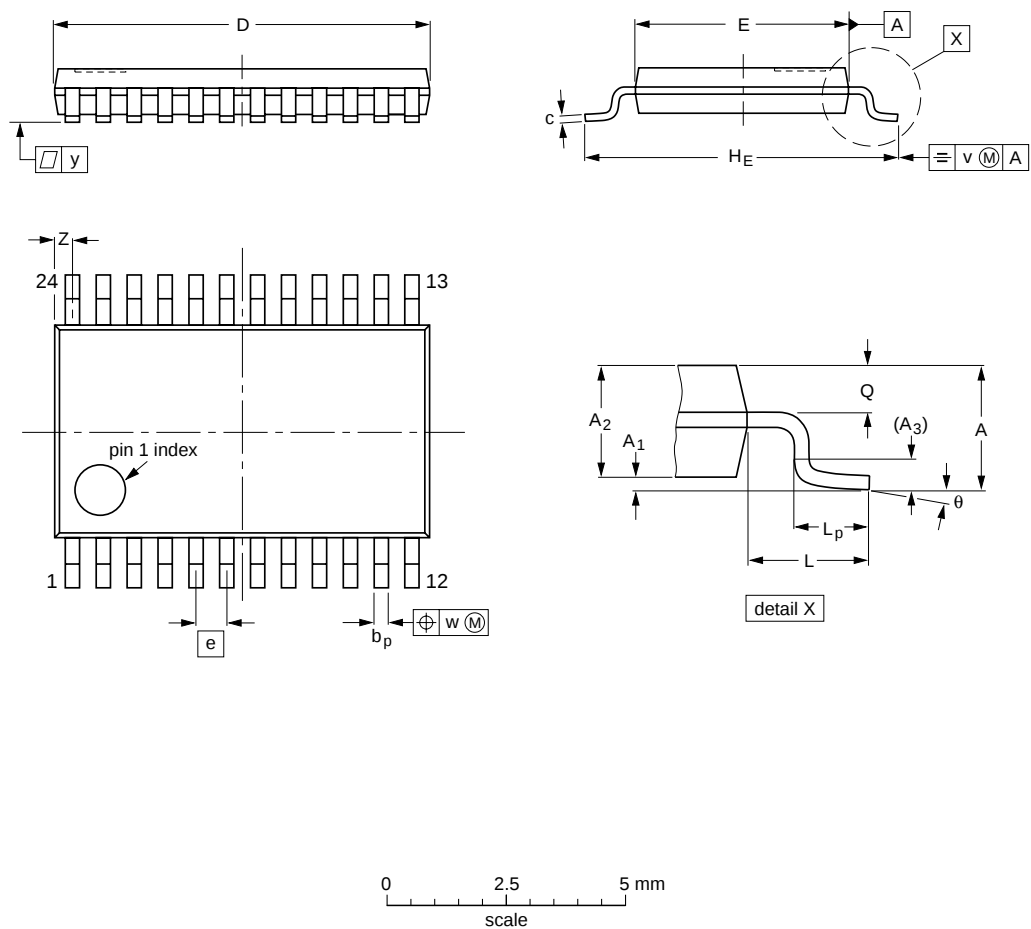
| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |            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

Octal D-type registered transceiver; 3-state

74LVC543A

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

SOT355-1



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>(2)</sup> | e    | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y   | z <sup>(1)</sup> | $\theta$ |
|------|-----------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| 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.

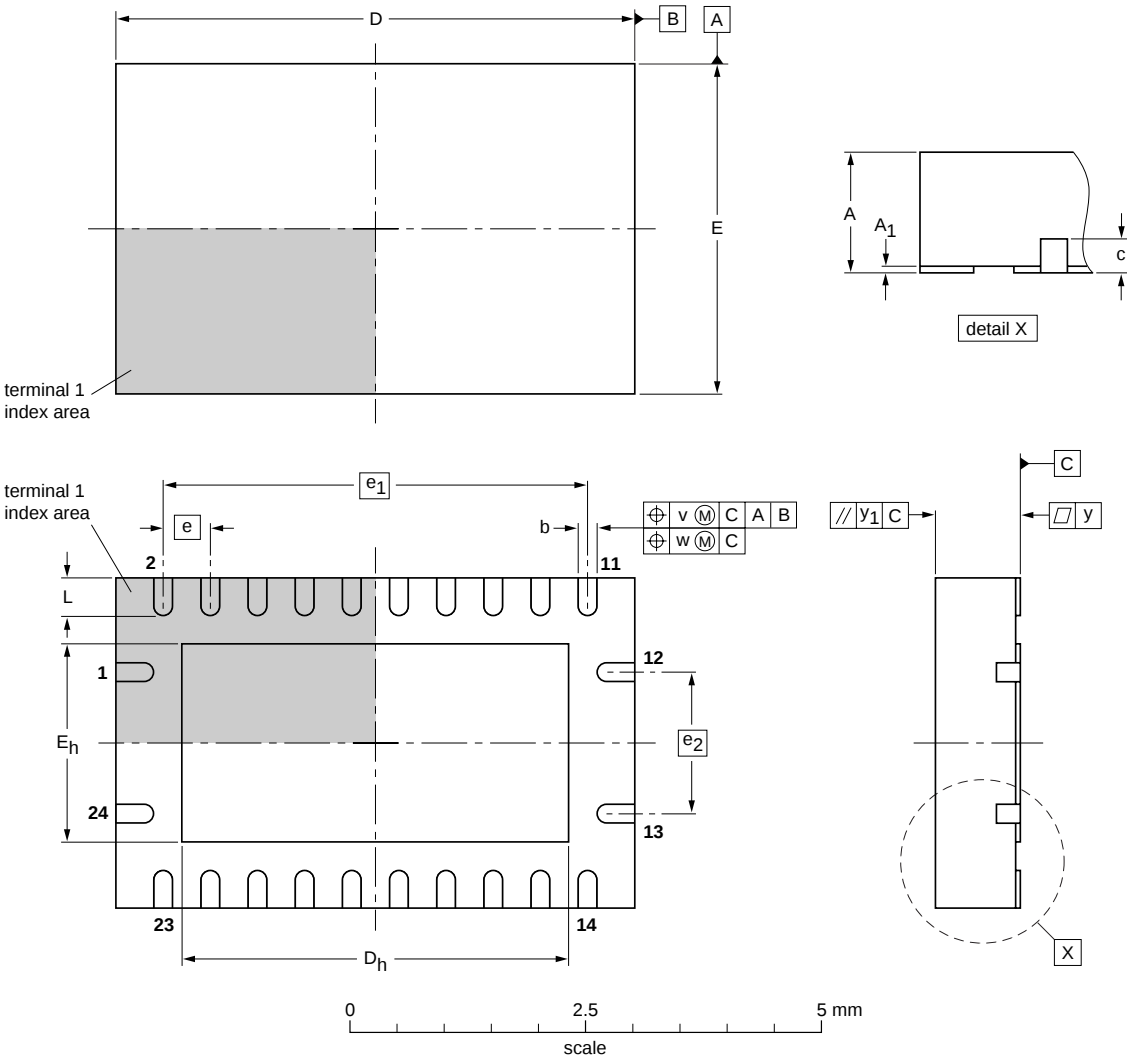
| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|----------------------|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

Octal D-type registered transceiver; 3-state

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DHVQFN24: plastic dual in-line compatible thermal enhanced very thin quad flat package;  
no leads; 24 terminals; body 3.5 x 5.5 x 0.85 mm

SOT815-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sup>(1)</sup><br>max. | A <sub>1</sub> | b            | c   | D <sup>(1)</sup> | D <sub>h</sub> | E <sup>(1)</sup> | E <sub>h</sub> | e   | e <sub>1</sub> | e <sub>2</sub> | L          | v   | w    | y    | y <sub>1</sub> |
|------|--------------------------|----------------|--------------|-----|------------------|----------------|------------------|----------------|-----|----------------|----------------|------------|-----|------|------|----------------|
| mm   | 1                        | 0.05<br>0.00   | 0.30<br>0.18 | 0.2 | 5.6<br>5.4       | 4.25<br>3.95   | 3.6<br>3.4       | 2.25<br>1.95   | 0.5 | 4.5            | 1.5            | 0.5<br>0.3 | 0.1 | 0.05 | 0.05 | 0.1            |

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|------------|
|                    | IEC        | JEDEC | JEITA |  |                        |            |
| SOT815-1           | ---        | ---   | ---   |  |                        | 03-04-29   |

## Octal D-type registered transceiver; 3-state

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## DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)(3)</sup> | DEFINITION                                                                                                                                                                                                                                                                                     |
|-------|----------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                      | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
| II    | Preliminary data                 | Qualification                    | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                       | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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