

# DATA SHEET

## **74LVC16245A; 74LVCH16245A** 16-bit bus transceiver with direction pin; 5 V tolerant; 3-state

Product specification  
Supersedes data of 2003 Jan 30

2003 Nov 25

# 16-bit bus transceiver with direction pin; 5 V tolerant; 3-state

## 74LVC16245A; 74LVCH16245A

### FEATURES

- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range from 1.2 to 3.6 V
- CMOS low power consumption
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- High-impedance when  $V_{CC} = 0$  V
- All data inputs have bushold (74LVCH16245A only)
- Complies with JEDEC standard no. 8-1A
- ESD protection:  
HBM EIA/JESD22-A114-A exceeds 2000 V  
MM EIA/JESD22-A115-A exceeds 200 V.

### DESCRIPTION

The 74LVC(H)16245A is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families. Inputs can be driven from either 3.3 or 5 V devices. In 3-state operation, outputs can handle 5 Volt. These features allow the use of these devices as a mixed 3.3 and 5 V environment.

The 74LVC(H)16245A is a 16-bit transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The device features two output enable ( $\overline{nOE}$ ) inputs for easy cascading and two send/receive ( $\overline{nDIR}$ ) inputs for direction control.  $\overline{nOE}$  controls the outputs so that the buses are effectively isolated. This device can be used as two 8-bit transceivers or one 16-bit transceiver.

The 74LVCH16245A bushold data inputs eliminates the need for external pull-up resistors to hold unused inputs.

### 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 nAn to nBn; nBn to nAn | $C_L = 50$ pF; $V_{CC} = 3.3$ V | 2.2     | ns   |
| $C_I$             | input capacitance                        |                                 | 5.0     | pF   |
| $C_{I/O}$         | input/output capacitance                 |                                 | 10      | pF   |
| $C_{PD}$          | power dissipation capacitance per gate   | $V_{CC} = 3.3$ V; notes 1 and 2 | 30      | 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  $V_I = \text{GND to } V_{CC}$ .

16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

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#### ORDERING INFORMATION

| TYPE NUMBER     | PACKAGE           |      |         |          |          |
|-----------------|-------------------|------|---------|----------|----------|
|                 | TEMPERATURE RANGE | PINS | PACKAGE | MATERIAL | CODE     |
| 74LVC16245ADL   | −40 to +125 °C    | 48   | SSOP48  | plastic  | SOT370-1 |
| 74LVCH16245ADL  | −40 to +125 °C    | 48   | SSOP48  | plastic  | SOT370-1 |
| 74LVC16245ADGG  | −40 to +125 °C    | 48   | TSSOP48 | plastic  | SOT362-1 |
| 74LVCH16245ADGG | −40 to +125 °C    | 48   | TSSOP48 | plastic  | SOT362-1 |
| 74LVC16245AEV   | −40 to +125 °C    | 56   | VFBGA56 | plastic  | SOT702-1 |
| 74LVCH16245AEV  | −40 to +125 °C    | 56   | VFBGA56 | plastic  | SOT702-1 |

#### FUNCTION TABLE

See note 1.

| INPUT |      | OUTPUT |        |
|-------|------|--------|--------|
| nOE   | nDIR | nAn    | nBn    |
| L     | L    | A = B  | inputs |
| L     | H    | inputs | B = A  |
| H     | X    | Z      | Z      |

#### Note

1. H = HIGH voltage level;  
L = LOW voltage level;  
X = don't care;  
Z = high-impedance OFF-state.

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# PINNING

| SYMBOL                   | PIN                           | BALL                           | DESCRIPTION                      |
|--------------------------|-------------------------------|--------------------------------|----------------------------------|
| 1DIR                     | 1                             | A1                             | direction control input          |
| 1B0                      | 2                             | B2                             | data input/output                |
| 1B1                      | 3                             | B1                             | data input/output                |
| GND                      | 4, 10, 15, 21, 28, 34, 39, 45 | B3, B4, D3, D4, G3, G4, J3, J4 | ground (0 V)                     |
| 1B2                      | 5                             | C2                             | data input/output                |
| 1B3                      | 6                             | C1                             | data input/output                |
| V <sub>CC</sub>          | 7, 18, 31, 42                 | C3, C4, H3, H4                 | supply voltage                   |
| 1B4                      | 8                             | D2                             | data input/output                |
| 1B5                      | 9                             | D1                             | data input/output                |
| 1B6                      | 11                            | E2                             | data input/output                |
| 1B7                      | 12                            | E1                             | data input/output                |
| 2B0                      | 13                            | F1                             | data input/output                |
| 2B1                      | 14                            | F2                             | data input/output                |
| 2B2                      | 16                            | G1                             | data input/output                |
| 2B3                      | 17                            | G2                             | data input/output                |
| 2B4                      | 19                            | H1                             | data input/output                |
| 2B5                      | 20                            | H2                             | data input/output                |
| 2B6                      | 22                            | J1                             | data input/output                |
| 2B7                      | 23                            | J2                             | data input/output                |
| 2DIR                     | 24                            | K1                             | direction control input          |
| 2 $\overline{\text{OE}}$ | 25                            | K6                             | output enable input (active LOW) |
| 2A7                      | 26                            | J5                             | data input/output                |
| 2A6                      | 27                            | J6                             | data input/output                |
| 2A5                      | 29                            | H5                             | data input/output                |
| 2A4                      | 30                            | H6                             | data input/output                |
| 2A3                      | 32                            | G5                             | data input/output                |
| 2A2                      | 33                            | G6                             | data input/output                |
| 2A1                      | 35                            | F5                             | data input/output                |
| 2A0                      | 36                            | F6                             | data input/output                |
| 1A7                      | 37                            | E6                             | data input/output                |
| 1A6                      | 38                            | E5                             | data input/output                |
| 1A5                      | 40                            | D6                             | data input/output                |
| 1A4                      | 41                            | D5                             | data input/output                |
| 1A3                      | 43                            | C6                             | data input/output                |
| 1A2                      | 44                            | C5                             | data input/output                |
| 1A1                      | 46                            | B6                             | data input/output                |
| 1A0                      | 47                            | B5                             | data input/output                |
| 1 $\overline{\text{OE}}$ | 48                            | A6                             | output enable input (active LOW) |
| n.c.                     | –                             | A2, A3, A4, A5, K2, K3, K4, K5 | not connected                    |

16-bit bus transceiver with direction pin; 5 V tolerant;  
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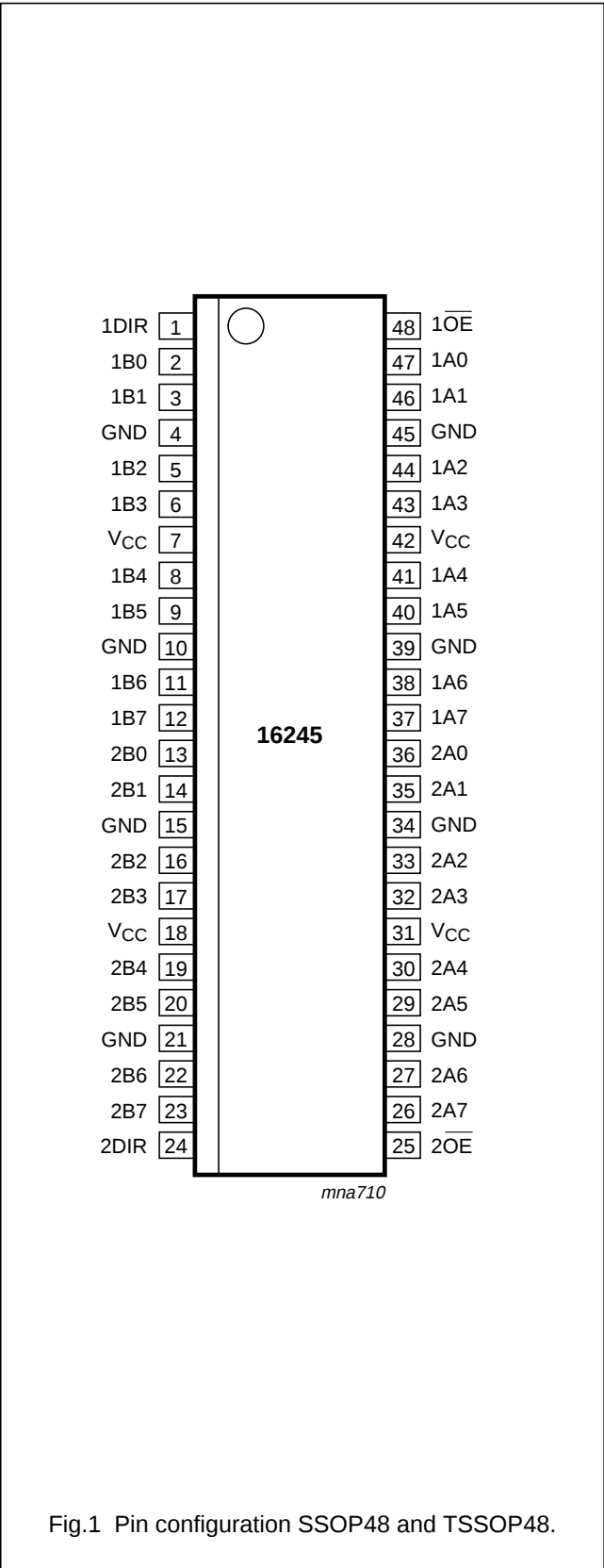


Fig.1 Pin configuration SSOP48 and TSSOP48.

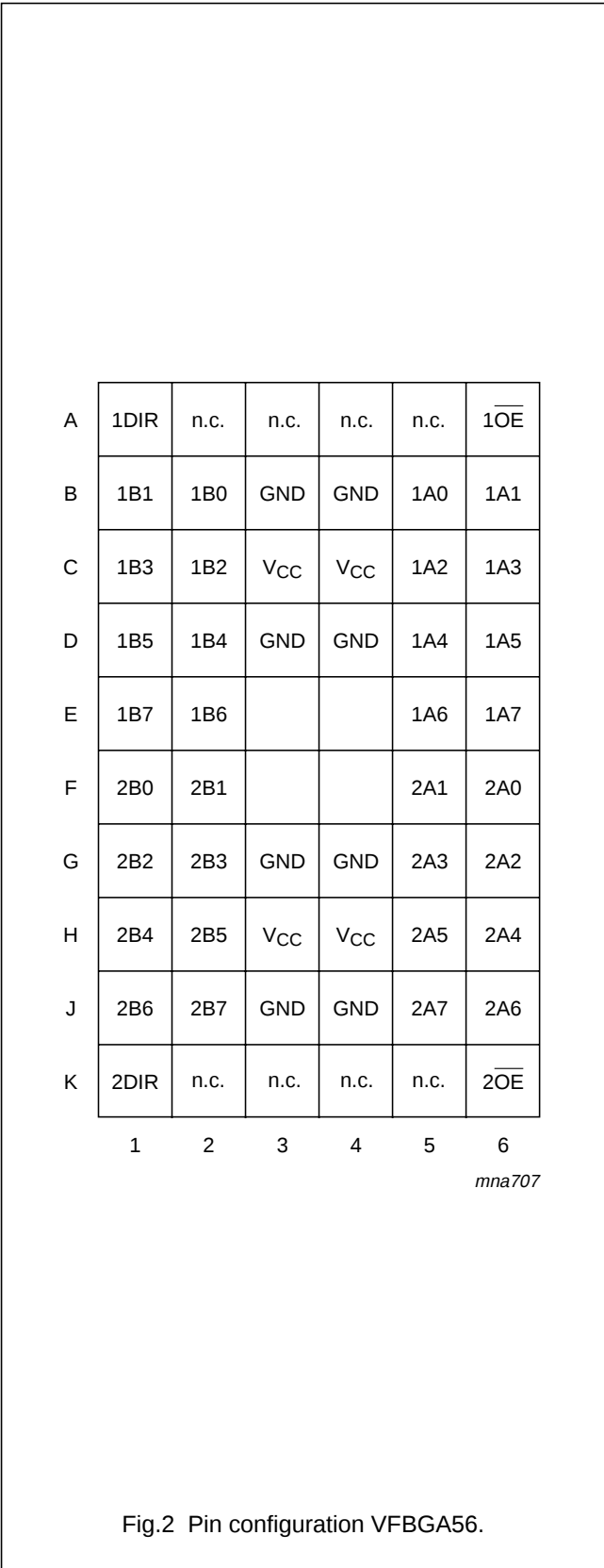


Fig.2 Pin configuration VFBGA56.

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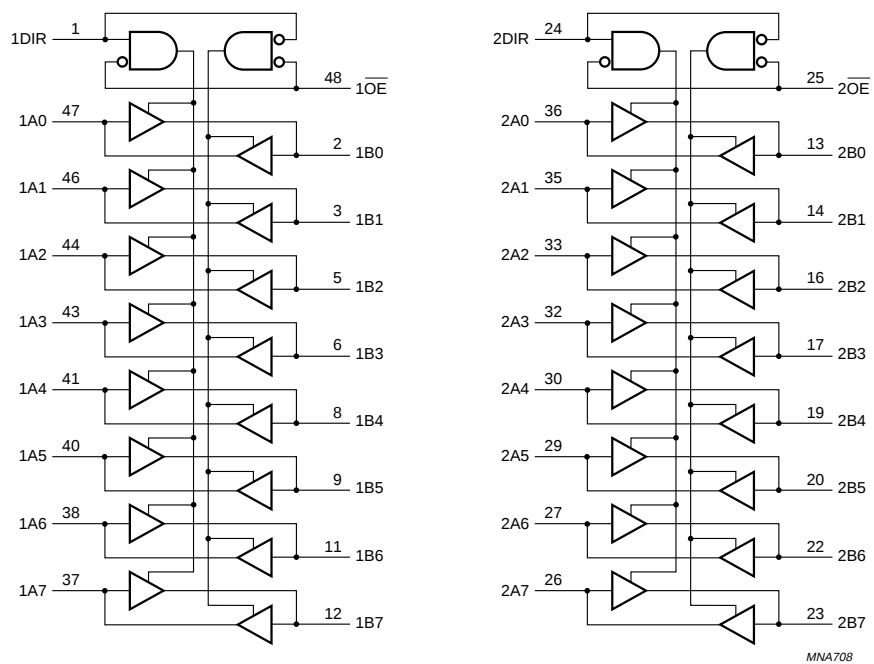


Fig.3 Logic symbol.

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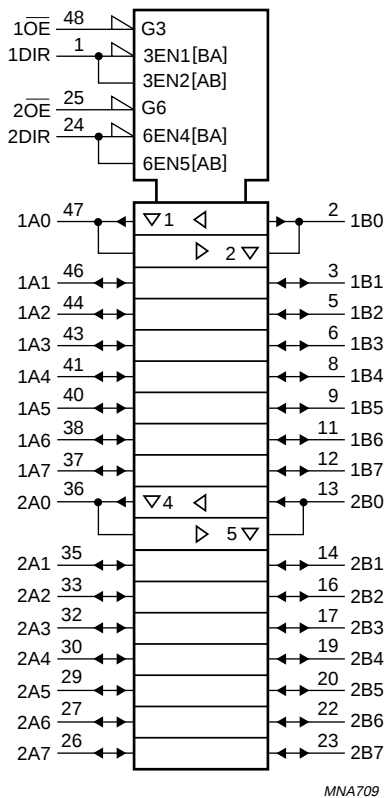


Fig.4 Logic symbol (IEEE/IEC).

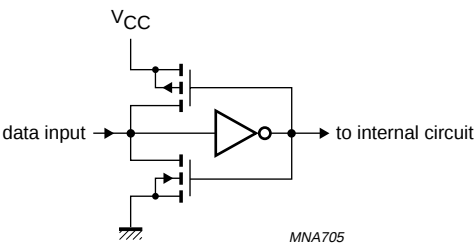


Fig.5 Bushold circuit.

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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 to 2.7 V | 0    | 20              | ns/V |
|                                 |                               | V <sub>CC</sub> = 2.7 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).

| 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                                     | −    | −50                   | mA   |
| V <sub>I</sub>                     | input voltage                  | note 1                                                 | −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 | −    | ±50                   | mA   |
| V <sub>O</sub>                     | output voltage                 | output HIGH or LOW state;<br>note 1                    | −0.5 | V <sub>CC</sub> + 0.5 | V    |
|                                    |                                | output 3-state; note 1                                 | −0.5 | +6.5                  | V    |
| I <sub>O</sub>                     | output source or sink current  | V <sub>O</sub> = 0 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              |                                                        |      |                       |      |
|                                    | SSOP and TSSOP package         | T <sub>amb</sub> = −40 to +125 °C; note 2              | −    | 500                   | mW   |
|                                    | VFBGA package                  | T <sub>amb</sub> = −40 to +125 °C; note 3              | −    | 1000                  | mW   |

#### Notes

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. Above 60 °C the value of P<sub>D</sub> derates linearly with 5.5 mW/K.
3. Above 70 °C the value of P<sub>D</sub> derates linearly with 1.8 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. <sup>(1)</sup> | MAX. | UNIT |
|----------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------|---------------------|-----------------------|---------------------|------|------|
|                                  |                                             | OTHER                                                                                   | V <sub>CC</sub> (V) |                       |                     |      |      |
| T <sub>amb</sub> = −40 to +85 °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>                                     | 2.7 to 3.6          | V <sub>CC</sub> − 0.2 | V <sub>CC</sub>     | −    | V    |
|                                  |                                             | I <sub>O</sub> = −100 μA                                                                |                     | V <sub>CC</sub> − 0.5 | −                   | −    | V    |
|                                  |                                             | I <sub>O</sub> = −12 mA                                                                 |                     | V <sub>CC</sub> − 0.6 | −                   | −    | V    |
|                                  |                                             | I <sub>O</sub> = −18 mA                                                                 |                     | 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>                                     | 2.7 to 3.6          | −                     | 0                   | 0.20 | V    |
|                                  |                                             | I <sub>O</sub> = 100 μA                                                                 |                     | −                     | −                   | 0.40 | V    |
|                                  |                                             | I <sub>O</sub> = 12 mA                                                                  |                     | −                     | −                   | 0.55 | V    |
|                                  |                                             | I <sub>O</sub> = 24 mA                                                                  |                     | −                     | −                   | −    | −    |
| I <sub>LI</sub>                  | input leakage current                       | V <sub>I</sub> = 5.5 V or GND ; notes 2 and 3                                           | 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 GN D | 3.6                 | −                     | 0.1                 | ±5   | 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                          | 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                          | 2.7 to 3.6          | −                     | 5                   | 500  | μA   |
| I <sub>BHL</sub>                 | bushold LOW sustaining current              | V <sub>I</sub> = 0.8 V;<br>notes 4, 5 and 6                                             | 3.0                 | 75                    | −                   | −    | μA   |
| I <sub>BHH</sub>                 | bushold HIGH sustaining current             | V <sub>I</sub> = 2.0 V;<br>notes 4, 5 and 6                                             | 3.0                 | −75                   | −                   | −    | μA   |
| I <sub>BHLO</sub>                | bushold LOW overdrive current               | notes 4, 5 and 7                                                                        | 3.6                 | 500                   | −                   | −    | μA   |
| I <sub>BHHO</sub>                | bushold HIGH overdrive current              | notes 4, 5 and 7                                                                        | 3.6                 | −500                  | −                   | −    | μA   |

**16-bit bus transceiver with direction pin; 5 V tolerant;  
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| SYMBOL                            | PARAMETER                                   | TEST CONDITIONS                                                                                     |                     | MIN.                   | TYP. <sup>(1)</sup> | MAX. | UNIT |
|-----------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------|------------------------|---------------------|------|------|
|                                   |                                             | OTHER                                                                                               | V <sub>CC</sub> (V) |                        |                     |      |      |
| T <sub>amb</sub> = –40 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                 | –                      | –                   | 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>                                                 | 2.7 to 3.6          | V <sub>CC</sub> – 0.3  | –                   | –    | V    |
|                                   |                                             | I <sub>O</sub> = –100 μA                                                                            |                     | V <sub>CC</sub> – 0.65 | –                   | –    | V    |
|                                   |                                             | I <sub>O</sub> = –12 mA                                                                             |                     | V <sub>CC</sub> – 0.75 | –                   | –    | V    |
|                                   |                                             | I <sub>O</sub> = –18 mA                                                                             |                     | 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>                                                 | 2.7 to 3.6          | –                      | 0                   | 0.3  | V    |
|                                   |                                             | I <sub>O</sub> = 100 μA                                                                             |                     | –                      | –                   | 0.6  | V    |
|                                   |                                             | I <sub>O</sub> = 12 mA                                                                              |                     | –                      | –                   | 0.8  | V    |
|                                   |                                             | I <sub>O</sub> = 24 mA                                                                              |                     | –                      | –                   |      |      |
| I <sub>LI</sub>                   | input leakage current                       | V <sub>I</sub> = 5.5 V or GND ; note 2                                                              | 3.6                 | –                      | –                   | ±20  | μA   |
| I <sub>OZ</sub>                   | 3-state output OFF-state current            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GN D; notes 2 and 3 | 3.6                 | –                      | –                   | ±20  | μA   |
| I <sub>off</sub>                  | power off leakage supply                    | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                                            | 0.0                 | –                      | –                   | ±20  | μA   |
| I <sub>CC</sub>                   | quiescent supply current                    | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0                                         | 3.6                 | –                      | –                   | 40   | μA   |
| ΔI <sub>CC</sub>                  | additional quiescent supply current per pin | V <sub>I</sub> =V <sub>CC</sub> – 0.6 V; I <sub>O</sub> = 0                                         | 2.7 to 3.6          | –                      | –                   | 5000 | μA   |
| I <sub>BHL</sub>                  | bushold LOW sustaining current              | V <sub>I</sub> = 0.8 V; notes 4, 5 and 6                                                            | 3.0                 | 60                     | –                   | –    | μA   |
| I <sub>BHH</sub>                  | bushold HIGH sustaining current             | V <sub>I</sub> = 2.0 V; notes 4, 5 and 6                                                            | 3.0                 | –60                    | –                   | –    | μA   |
| I <sub>BHLO</sub>                 | bushold LOW overdrive current               | notes 4, 5 and 7                                                                                    | 3.6                 | 500                    | –                   | –    | μA   |
| I <sub>BHHO</sub>                 | bushold HIGH overdrive current              | notes 4, 5 and 7                                                                                    | 3.6                 | –500                   | –                   | –    | μA   |

**Notes**

1. All typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.
2. For bushold parts, the bushold circuit is switched off when V<sub>I</sub> > V<sub>CC</sub> allowing 5.5 V on the input terminal.
3. For I/O ports the parameter I<sub>OZ</sub> includes the input leakage current.
4. Valid for data inputs of bushold parts (74LVCH16245A) only.
5. For data inputs only, control inputs do not have a bushold circuit.
6. The specified sustaining current at the data input holds the input below the specified V<sub>I</sub> level.
7. The specified overdrive current at the data input forces the data input to the opposite input state.

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### AC CHARACTERISTICS

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

| SYMBOL                             | PARAMETER                                                                                       | TEST CONDITIONS  |                     | MIN. | TYP. <sup>(1)</sup> | MAX. | UNIT |
|------------------------------------|-------------------------------------------------------------------------------------------------|------------------|---------------------|------|---------------------|------|------|
|                                    |                                                                                                 | WAVEFORMS        | V <sub>CC</sub> (V) |      |                     |      |      |
| T <sub>amb</sub> = −40 to +85 °C   |                                                                                                 |                  |                     |      |                     |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub> | propagation delay nAn to nBn;<br>nBn to nAn                                                     | see Figs 6 and 8 | 1.2                 | –    | 13.0                | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.0  | 2.7                 | 4.7  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.0  | 2.2 <sup>(2)</sup>  | 4.5  | ns   |
| t <sub>PZH</sub> /t <sub>PZL</sub> | 3-state output enable time n $\overline{\text{OE}}$<br>to nAn; n $\overline{\text{OE}}$ to nBn  | see Figs 7 and 8 | 1.2                 | –    | 15.0                | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.5  | 3.6                 | 6.7  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.0  | 2.8 <sup>(2)</sup>  | 5.5  | ns   |
| t <sub>PHZ</sub> /t <sub>PLZ</sub> | 3-state output disable time n $\overline{\text{OE}}$<br>to nAn; n $\overline{\text{OE}}$ to nBn | see Figs 7 and 8 | 1.2                 | –    | 11.0                | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.5  | 3.4                 | 6.6  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.5  | 3.2 <sup>(2)</sup>  | 5.6  | ns   |
| T <sub>amb</sub> = −40 to +125 °C  |                                                                                                 |                  |                     |      |                     |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub> | propagation delay nAn to nBn;<br>nBn to nAn                                                     | see Figs 6 and 8 | 1.2                 | –    | –                   | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.0  | –                   | 6.0  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.0  | –                   | 6.0  | ns   |
| t <sub>PZH</sub> /t <sub>PZL</sub> | 3-state output enable time n $\overline{\text{OE}}$<br>to nAn; n $\overline{\text{OE}}$ to nBn  | see Figs 7 and 8 | 1.2                 | –    | –                   | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.5  | –                   | 8.5  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.0  | –                   | 7.0  | ns   |
| t <sub>PHZ</sub> /t <sub>PLZ</sub> | 3-state output disable time n $\overline{\text{OE}}$<br>to nAn; n $\overline{\text{OE}}$ to nBn | see Figs 7 and 8 | 1.2                 | –    | –                   | –    | ns   |
|                                    |                                                                                                 |                  | 2.7                 | 1.5  | –                   | 8.5  | ns   |
|                                    |                                                                                                 |                  | 3.0 to 3.6          | 1.5  | –                   | 7.0  | ns   |

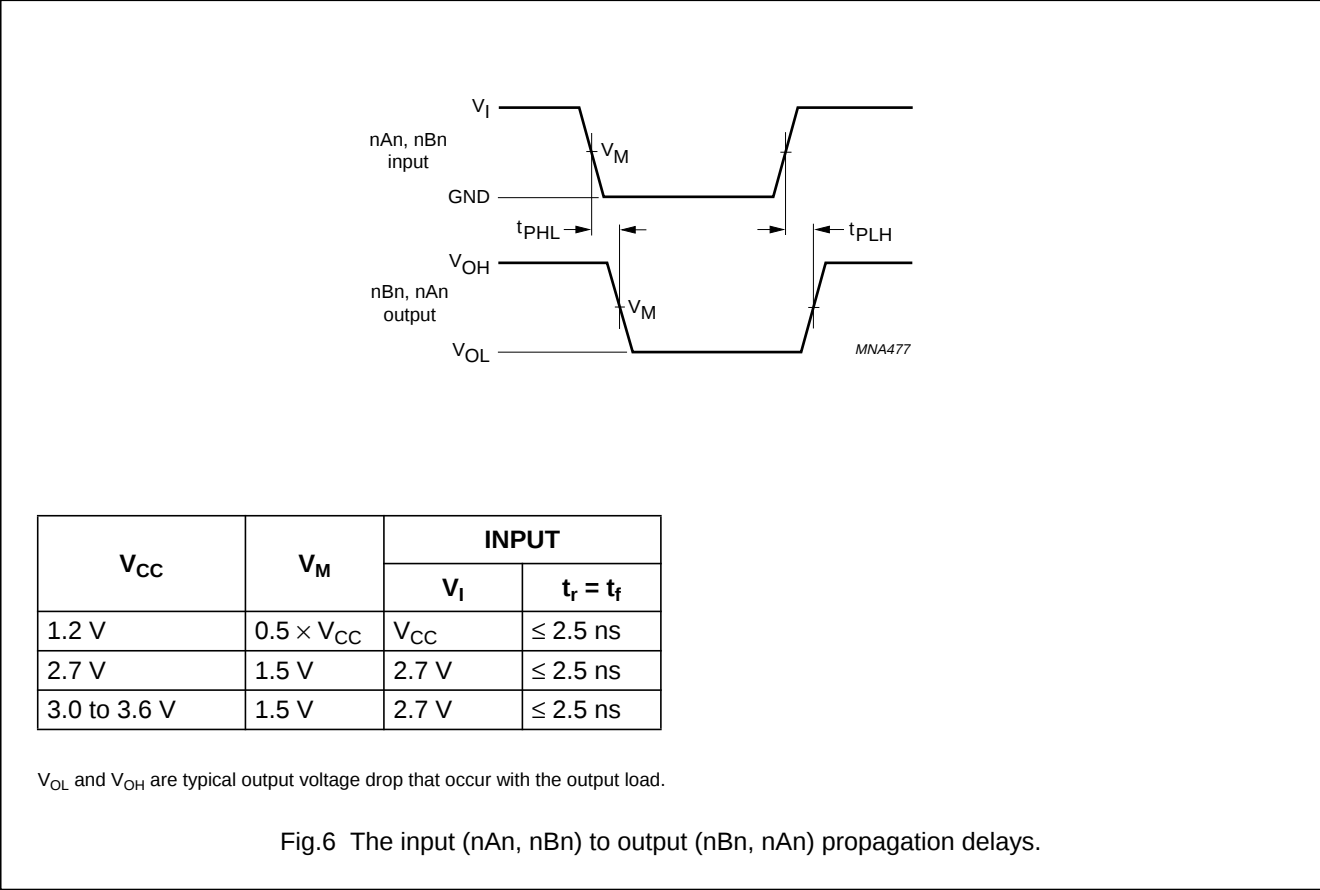
### Notes

1. All typical values are measured at T<sub>amb</sub> = 25 °C.
2. Typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

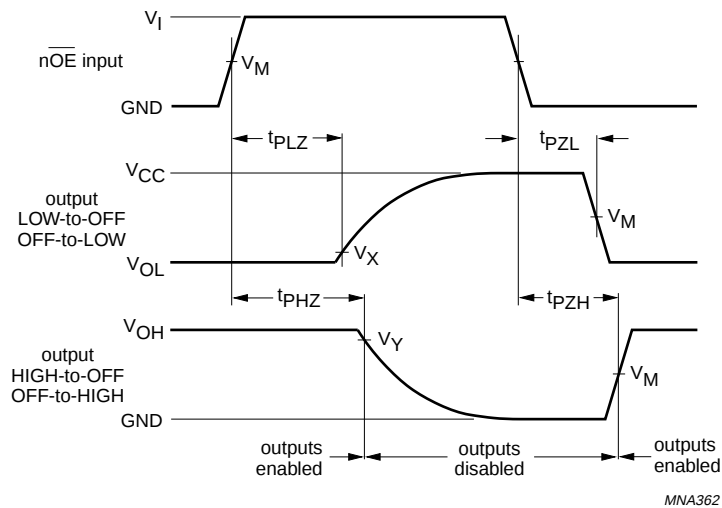
74LVC16245A;  
74LVCH16245A

AC WAVEFORMS



16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A



| V <sub>CC</sub> | V <sub>M</sub>        | INPUT           |                                 |
|-----------------|-----------------------|-----------------|---------------------------------|
|                 |                       | V <sub>I</sub>  | t <sub>r</sub> = t <sub>f</sub> |
| 1.2 V           | 0.5 × V <sub>CC</sub> | V <sub>CC</sub> | ≤ 2.5 ns                        |
| 2.7 V           | 1.5 V                 | 2.7 V           | ≤ 2.5 ns                        |
| 3.0 to 3.6 V    | 1.5 V                 | 2.7 V           | ≤ 2.5 ns                        |

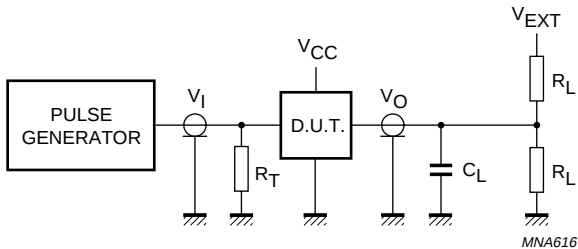
V<sub>X</sub> = V<sub>OL</sub> + 0.3 V at V<sub>CC</sub> ≥ 2.7 V;  
V<sub>X</sub> = V<sub>OL</sub> + 0.1 V at V<sub>CC</sub> < 2.7 V.  
V<sub>Y</sub> = V<sub>OH</sub> - 0.3 V at V<sub>CC</sub> ≥ 2.7 V;  
V<sub>Y</sub> = V<sub>OH</sub> - 0.1 V at V<sub>CC</sub> < 2.7 V.

V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage drop that occur with the output load.

Fig.7 3-state enable and disable times.

16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A



| V <sub>CC</sub> | V <sub>I</sub>  | C <sub>L</sub> | R <sub>L</sub> <sup>(1)</sup> | 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                         | 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 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 circuit:  
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.8 Load circuitry for switching times.

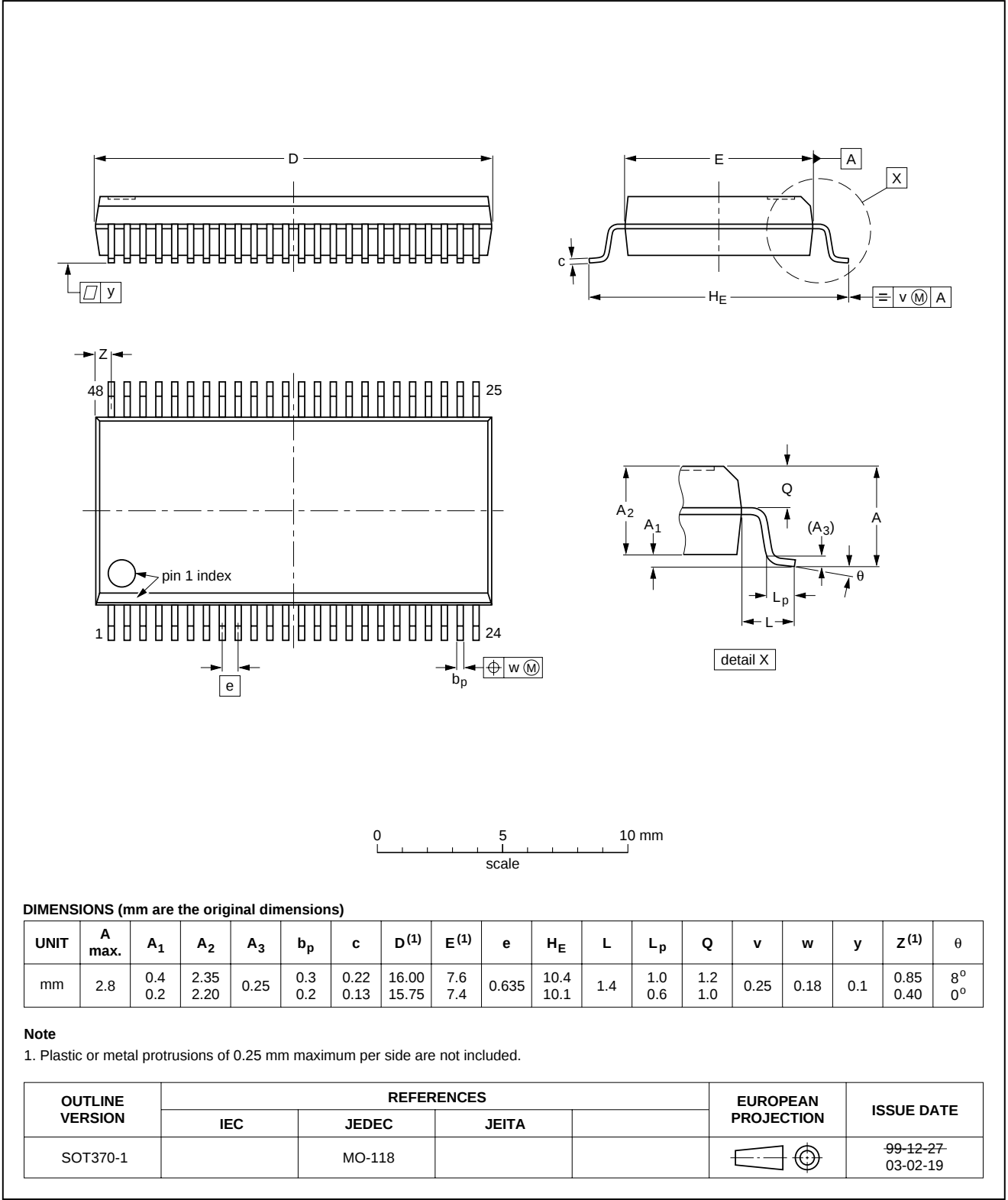
16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A

PACKAGE OUTLINES

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1

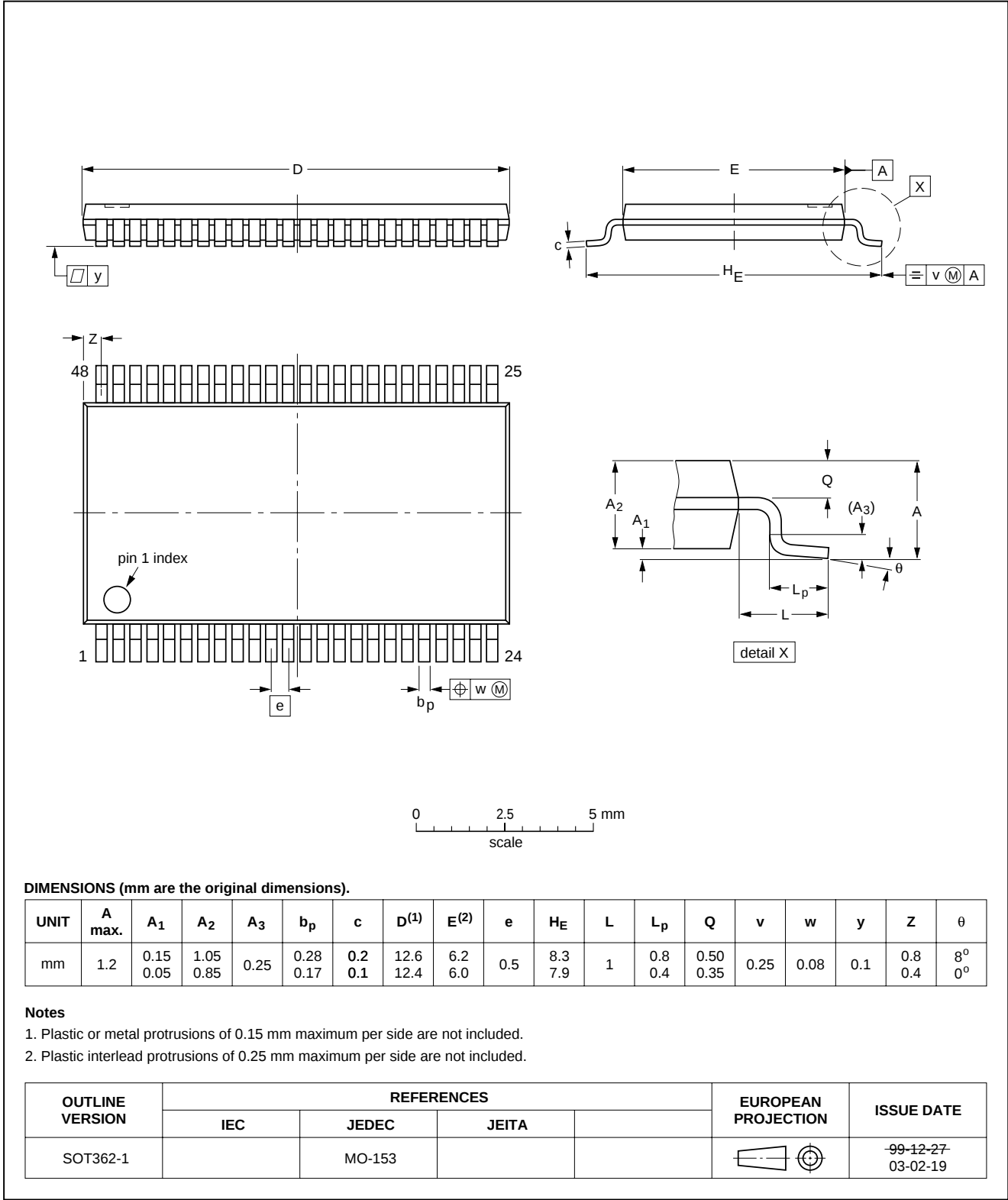


16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1

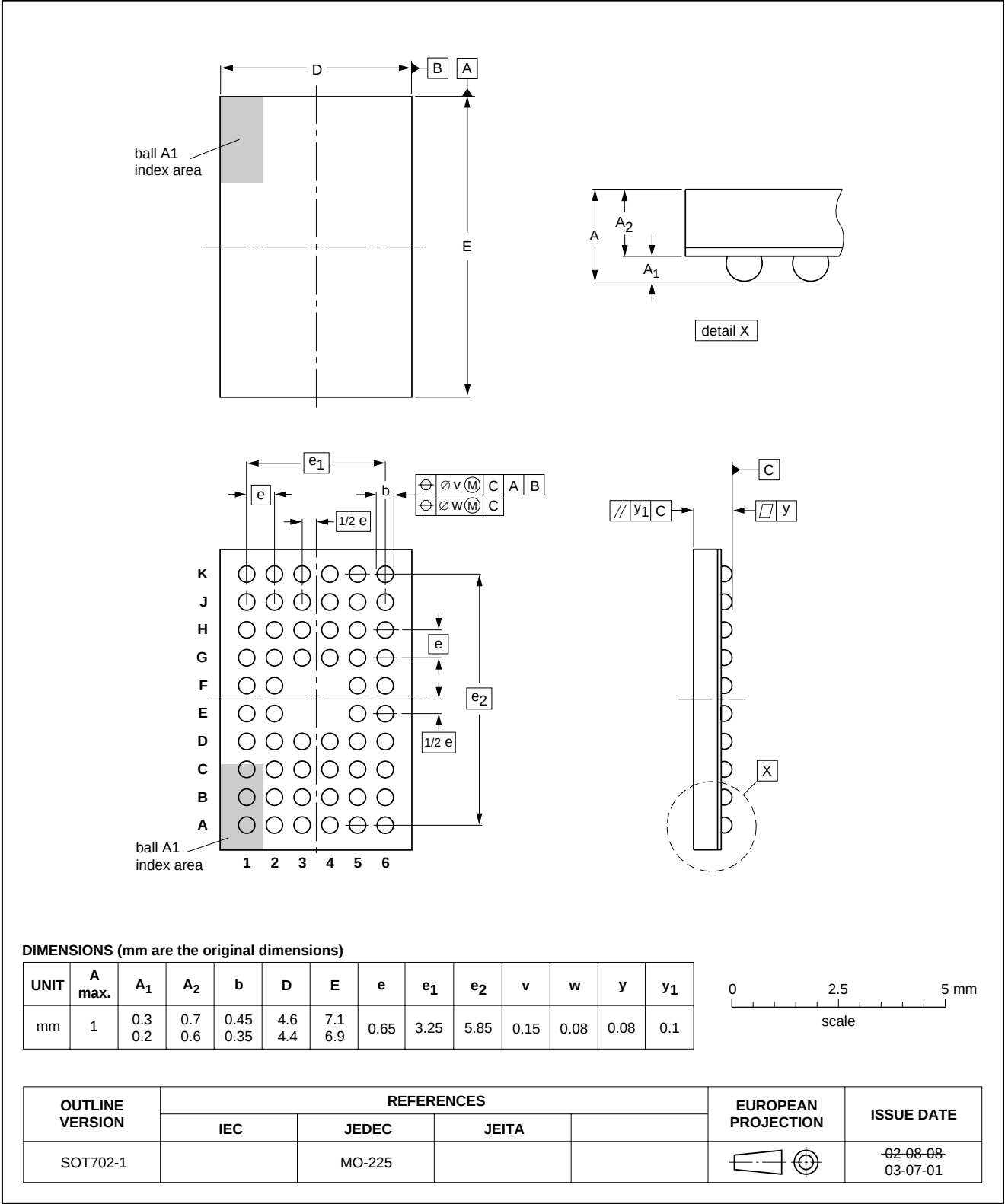


16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A

VFBGA56: plastic very thin fine-pitch ball grid array package; 56 balls; body 4.5 x 7 x 0.65 mm

SOT702-1



16-bit bus transceiver with direction pin; 5 V tolerant;  
3-state

74LVC16245A;  
74LVCH16245A

#### 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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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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