# CBT3257A

## Quad 1-of-2 multiplexer/demultiplexer

Rev. 6 — 20 June 2019 Product data sheet

## 1. General description

The CBT3257A is a quad 1-of-2 high-speed TTL-compatible multiplexer/demultiplexer. The low ON resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

Output enable ($\overline{OE}$) and select-control (S) inputs select the appropriate nB1 and nB2 outputs for the nA input data.

The CBT3257A is characterized for operation from -40 °C to +85 °C.

## 2. Features and benefits

- 5 Ω switch connection between two ports
- TTL-compatible input levels
- Minimal propagation delay through the switch
- Latch-up protection exceeds 100 mA per JEDEC standard JESD78 class II level A
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Temperature range | Package | | |
|---|---|---|---|---|
| | | Name | Description | Version |
| CBT3257AD | -40 °C to +85 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| CBT3257ADB | -40 °C to +85 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| CBT3257ADS | -40 °C to +85 °C | SSOP16[1] | plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm | SOT519-1 |
| CBT3257APW | -40 °C to +85 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| CBT3257ABQ | -40 °C to +85 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm | SOT763-1 |

[1] Also known as QSOP16.

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# 4. Functional diagram

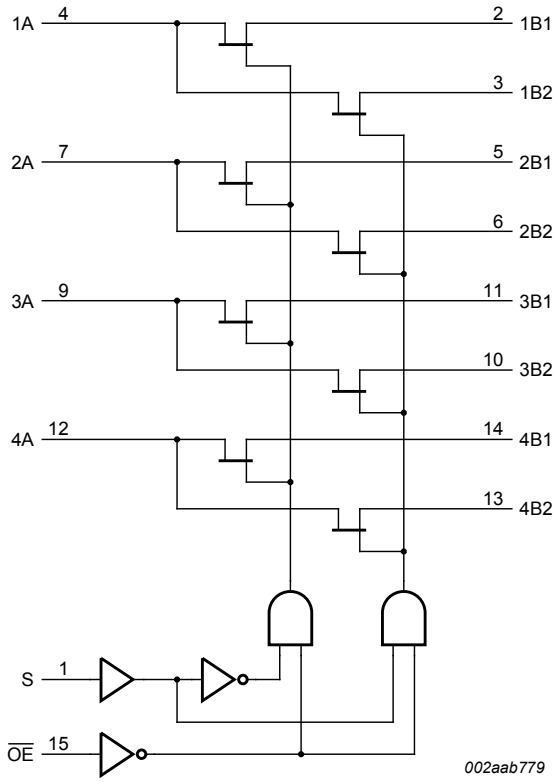



**Fig. 1. Logic diagram**

# 5. Pinning information

## 5.1. Pinning

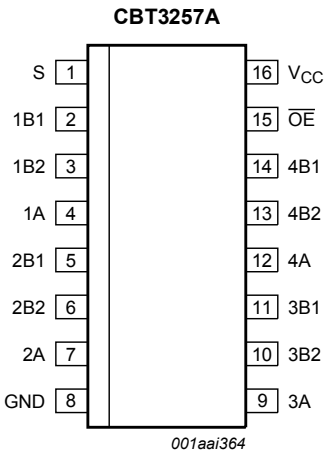



**Fig. 2. Pin configuration SOT109-1 (SO16) and SOT519-1 (SSOP16)**

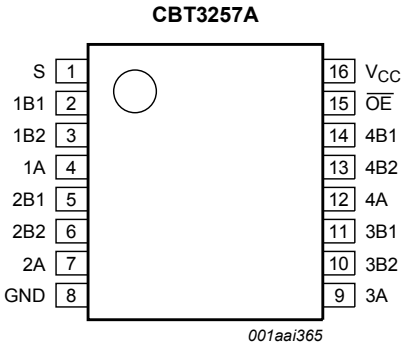
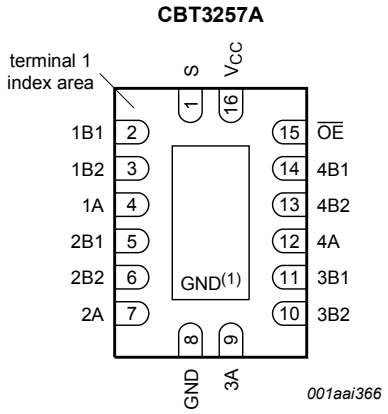



**Fig. 3. Pin configuration SOT338-1 (SSOP16) and SOT403-1 (TSSOP16)**




Transparent top view

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

**Fig. 4. Pin configuration SOT763-1 (DHVQFN16)**

### 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| S | 1 | select control input |
| 1B1, 2B1, 3B1, 4B1, | 2, 5, 11, 14 | B1 outputs/inputs |
| 1B2, 2B2, 3B2, 4B2 | 3, 6, 10, 13 | B2 outputs/inputs |
| 1A, 2A, 3A, 4A | 4, 7, 9, 12 | A inputs/outputs |
| GND | 8 | ground (0 V) |
| $\overline{OE}$ | 15 | output enable (active LOW) |
| $V_{CC}$ | 16 | positive supply voltage |

## 6. Functional description

**Table 3. Function selection**

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

| Inputs | | Switch |
|---|---|---|
| $\overline{OE}$ | S | |
| L | L | nA to nB1 |
| L | H | nA to nB2 |
| H | X | switch off |

## 7. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | -0.5 | +7.0 | V |
| $V_I$ | input voltage | [1] | -0.5 | +7.0 | V |
| $I_{SW}$ | switch current | continuous current through each switch | - | 128 | mA |

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $I_{IK}$ | input clamping current | $V_I$ < 0 V | -50 | - | mA |
| $T_{stg}$ | storage temperature | | -65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = -40 °C to +85 °C | | | |
| | | SO16, (T)SSOP16 and DHVQFN16 packages | - | 500 | mW |

[1] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

## 8. Recommended operating conditions

**Table 5. Operating conditions**

*All unused control inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation.*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | 4.5 | 5.5 | V |
| $V_{IH}$ | HIGH-level input voltage | | 2.0 | - | V |
| $V_{IL}$ | LOW-level input voltage | | - | 0.8 | V |
| $T_{amb}$ | ambient temperature | operating in free-air | -40 | +85 | °C |

## 9. Static characteristics

**Table 6. Static characteristics**

*$T_{amb}$ = -40 °C to +85 °C.*

| Symbol | Parameter | Conditions | Min | Typ[1] | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{IK}$ | input clamping voltage | $V_{CC}$ = 4.5 V; $I_I$ = -18 mA | - | - | -1.2 | V |
| $V_{pass}$ | pass voltage | $V_I$ = $V_{CC}$ = 5.0 V; $I_O$ = -100 µA | 3.6 | 3.9 | 4.2 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 5.5 V; $V_I$ = GND or 5.5 V | - | - | ±1 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 5.5 V; $I_O$ = 0 mA; $V_I$ = $V_{CC}$ or GND | - | - | 3 | µA |
| $\Delta I_{CC}$ | additional supply current | per input; $V_{CC}$ = 5.5 V; one input at 3.4 V, other inputs at $V_{CC}$ or GND [2] | - | - | 2.5 | mA |
| $C_I$ | input capacitance | control pins; $V_I$ = 3 V or 0 V | - | 3.3 | - | pF |
| $C_{io(off)}$ | off-state input/output capacitance | A port; $V_O$ = 3 V or 0 V; $\overline{OE}$ = $V_{CC}$ | - | 9.9 | - | pF |
| | | B port; $V_O$ = 3 V or 0 V; $\overline{OE}$ = $V_{CC}$ | - | 6.4 | - | pF |
| $R_{ON}$ | ON resistance | $V_{CC}$ = 4.5 V [3] | | | | |
| | | $V_I$ = 0 V; $I_I$ = 64 mA | - | 5 | 7 | Ω |
| | | $V_I$ = 0 V; $I_I$ = 30 mA | - | 5 | 7 | Ω |
| | | $V_I$ = 2.4 V; $I_I$ = 15 mA | - | 10 | 15 | Ω |

[1] All typical values are measured at $V_{CC}$ = 5 V; $T_{amb}$ = 25 °C.
[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than $V_{CC}$ or GND.
[3] Measured by the voltage drop between the nA and the nBn terminals at the indicated current through the switch. The lowest voltage of the two (nA or nBn) terminals determines the ON resistance.

# 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

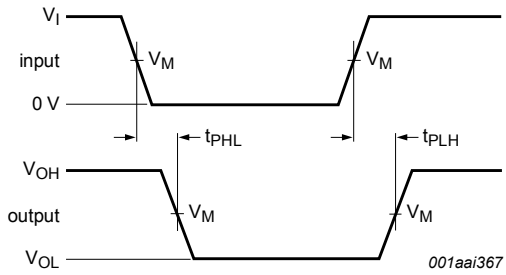
*$T_{amb}$ = -40 °C to +85 °C; $V_{CC}$ = 4.5 V to 5.5 V; for test circuit see Fig. 7.*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $t_{pd}$ | propagation delay | nA to nBn or nBn to nA; see Fig. 5 | [1][2] | - | 0.25 | ns |
| | | S to nA; see Fig. 5 | [1][2] | 1.4 | 5.0 | ns |
| $t_{en}$ | enable time | $\overline{OE}$ to nA or nBn; see Fig. 6 | [2] | 1.5 | 5.1 | ns |
| | | S to nBn; see Fig. 6 | [2] | 1.4 | 5.2 | ns |
| $t_{dis}$ | disable time | $\overline{OE}$ to nA or nBn; see Fig. 6 | [2] | 2.2 | 5.5 | ns |
| | | S to nBn; see Fig. 6 | [2] | 1.0 | 5.0 | ns |

[1] This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON resistance of the switch and a load capacitance, when driven by an ideal voltage source (zero output impedance).

[2] $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$; $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$; $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.

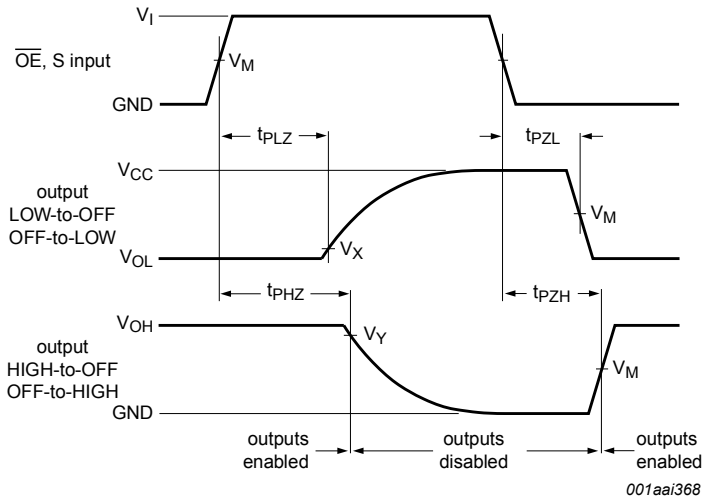
## 10.1. Waveforms and test circuit




Measurement points are given in Table 8.

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

**Fig. 5. The input (nA; nBn) to output (nBn; nA) or input (S) to output (nA) propagation delay times**



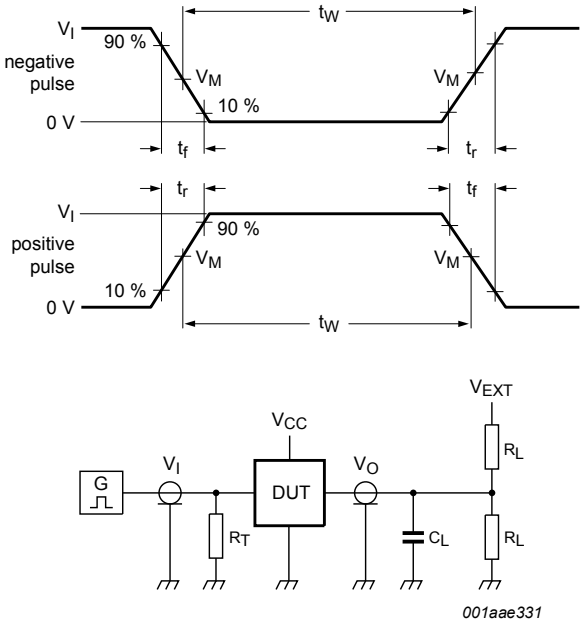

Measurement points are given in Table 8.

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

**Fig. 6. Enable and disable times**

**Table 8. Measurement points**

| Supply voltage | Input | | Output | | |
|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 4.5 V to 5.5 V | GND to 3.0 V | 1.5 V | 1.5 V | $V_{OL}$ + 0.3 V | $V_{OH}$ - 0.3 V |




Test data is given in Table 9.

Definitions for test circuit:

$R_L$ = Load resistance.

$C_L$ = Load capacitance including jig and probe capacitance.

$R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.

$V_{EXT}$ = External voltage for measuring switching times.

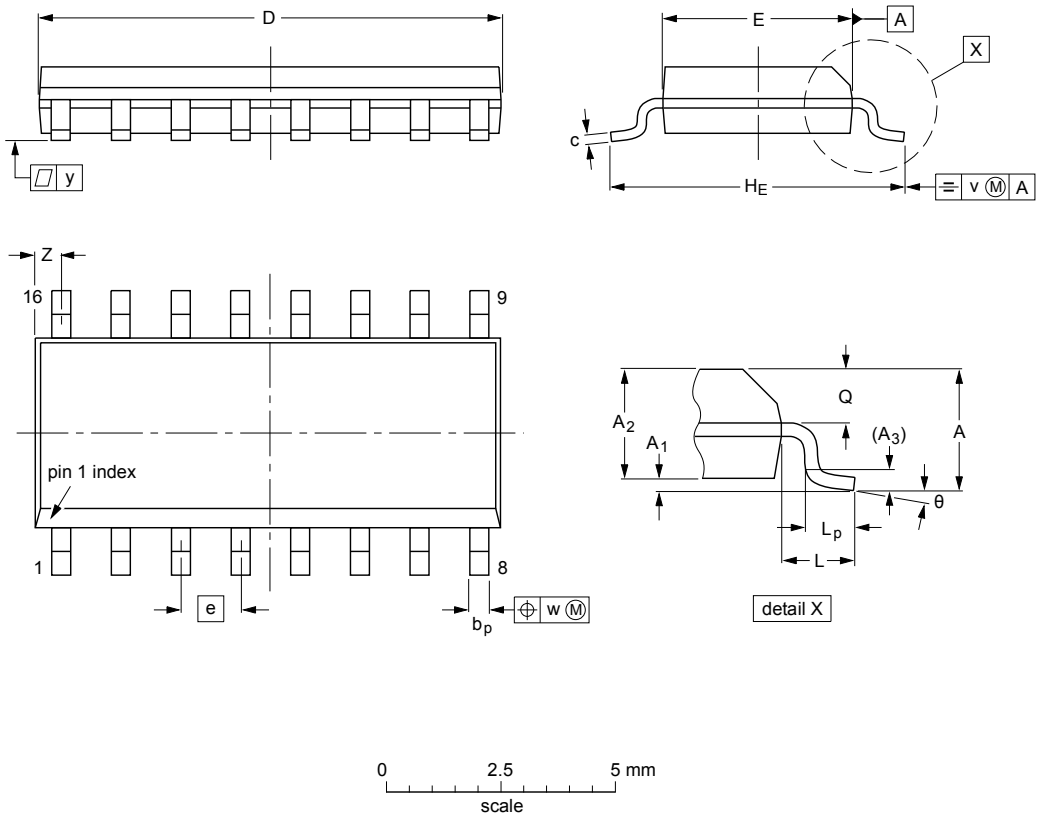
**Fig. 7. Test circuit for measuring switching times**

**Table 9. Test data**

| Supply voltage | Input | | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ | $t_{PLZ}$, $t_{PZL}$ | $t_{PHZ}$, $t_{PZH}$ |
| 4.5 V to 5.5 V | GND to 3.0 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | 7.0 V | open |

# 11. Package outline

**SO16: plastic small outline package; 16 leads; body width 3.9 mm** **SOT109-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.75 | 0.25<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 10.0<br>9.8 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | $8^o$<br>$0^o$ |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.39<br>0.38 | 0.16<br>0.15 | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.020 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

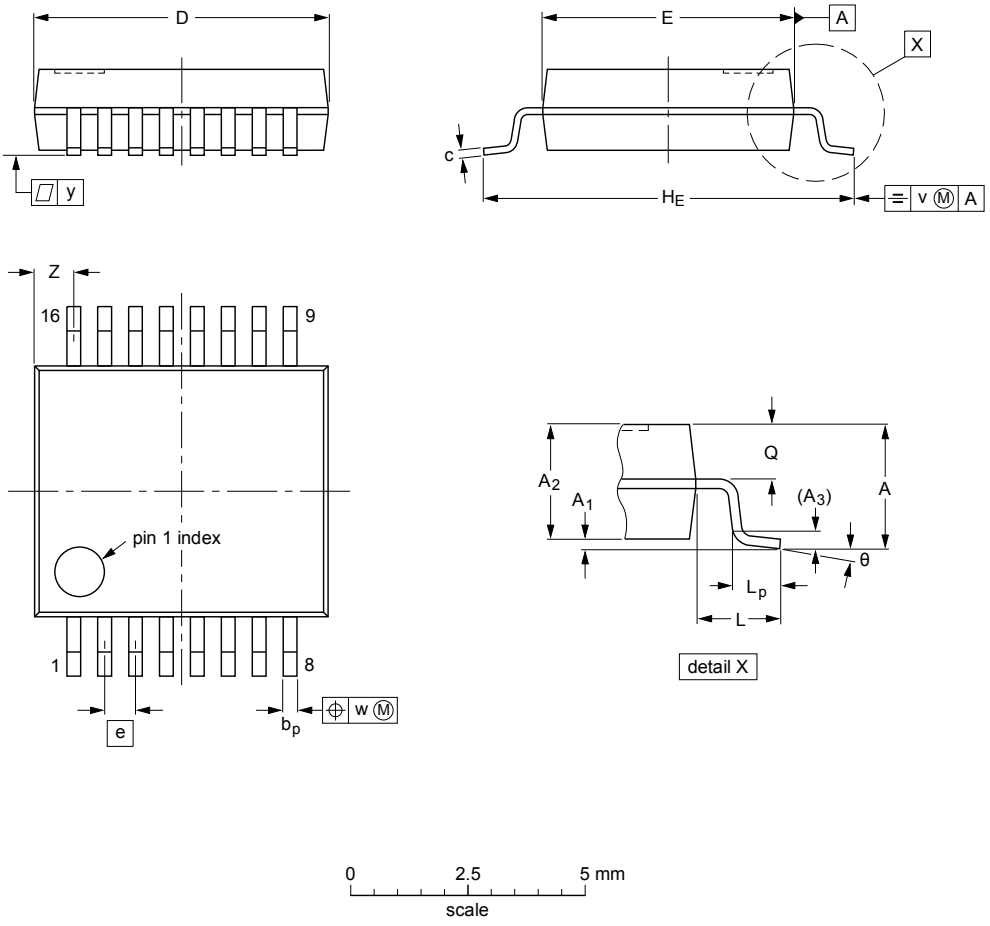
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT109-1 | 076E07 | MS-012 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig. 8. Package outline SOT109-1 (SO16)**

**SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm** **SOT338-1**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | 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 | 6.4<br>6.0 | 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 | 1.00<br>0.55 | 8°<br>0° |

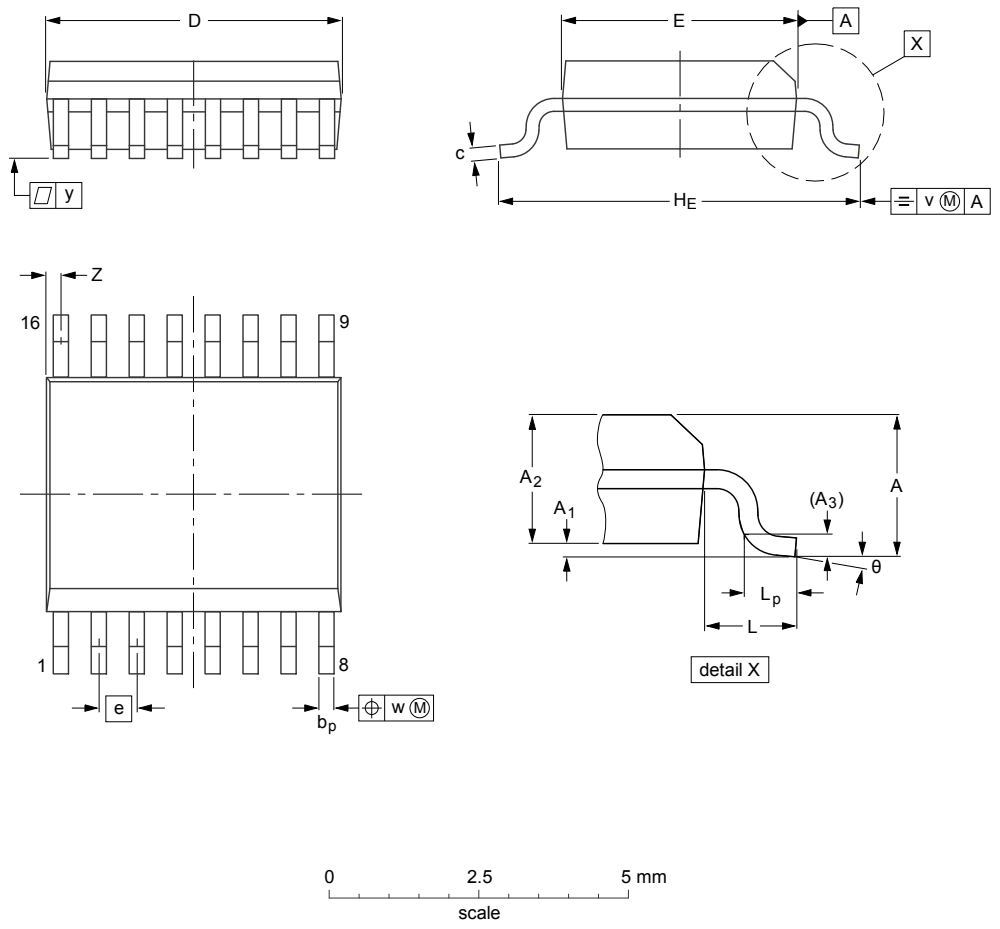
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT338-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig. 9. Package outline SOT338-1 (SSOP16)**

**SSOP16: plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm** **SOT519-1**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.73 | 0.25<br>0.10 | 1.55<br>1.40 | 0.25 | 0.31<br>0.20 | 0.25<br>0.18 | 5.0<br>4.8 | 4.0<br>3.8 | 0.635 | 6.2<br>5.8 | 1 | 0.89<br>0.41 | 0.2 | 0.18 | 0.09 | 0.18<br>0.05 | $8^o$<br>$0^o$ |

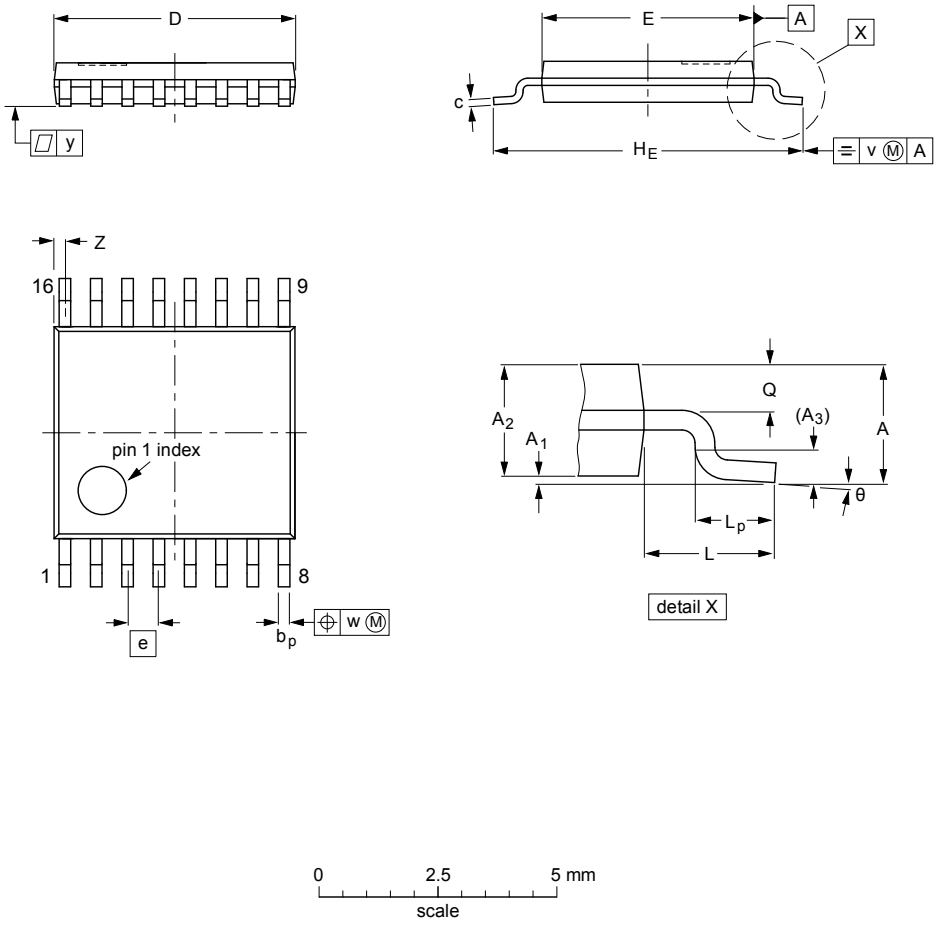
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT519-1 | | | | | | ~~99-05-04~~<br>03-02-18 |

**Fig. 10. Package outline SOT519-1 (SSOP16)**

**TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm** **SOT403-1**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (2) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 5.1<br>4.9 | 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 | 0.40<br>0.06 | 8°<br>0° |

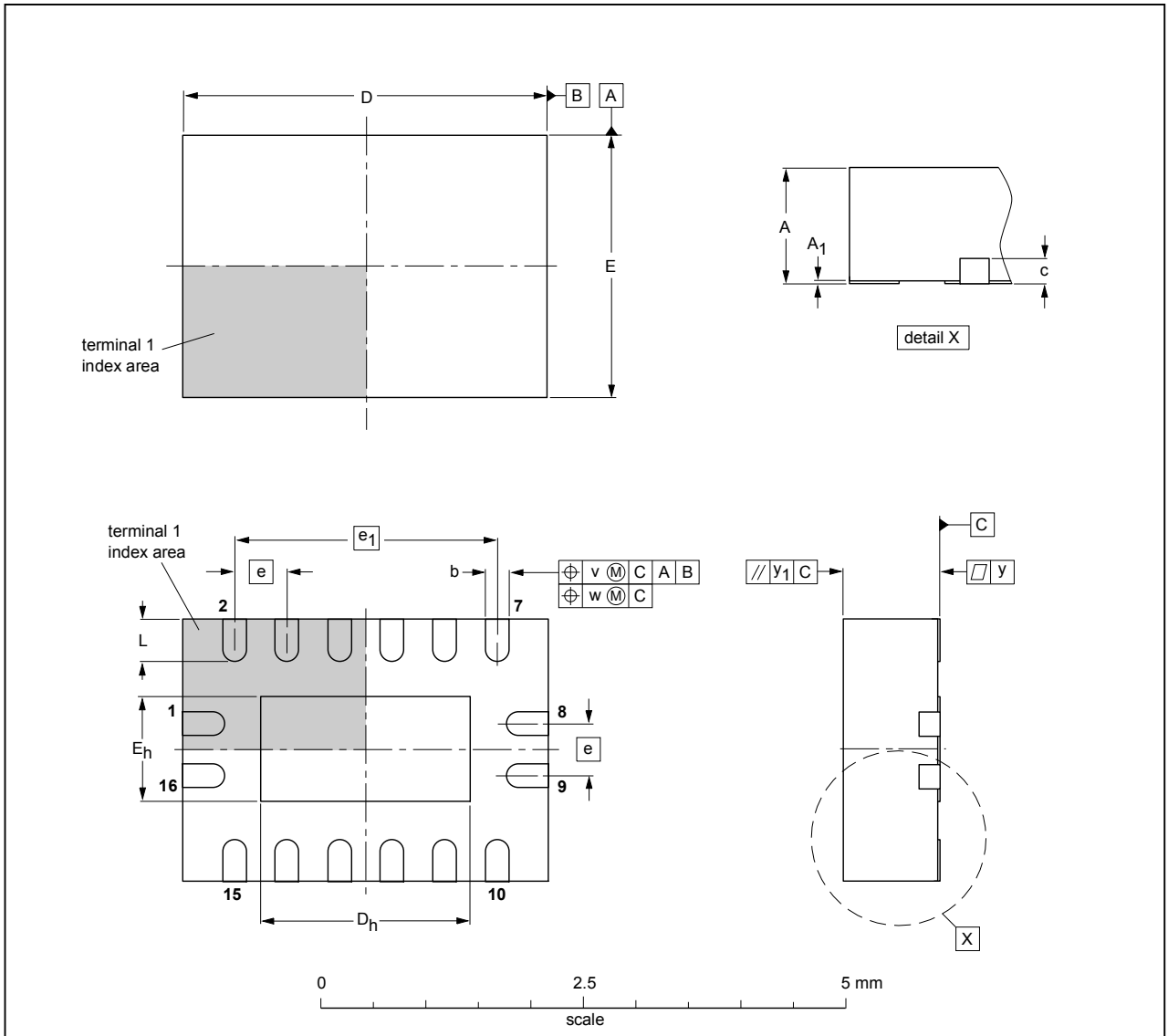
**Notes**

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 VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT403-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig. 11. Package outline SOT403-1 (TSSOP16)**

**DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm** **SOT763-1**




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

| UNIT | $A^{(1)}$ max. | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1 | 0.05<br>0.00 | 0.30<br>0.18 | 0.2 | 3.6<br>3.4 | 2.15<br>1.85 | 2.6<br>2.4 | 1.15<br>0.85 | 0.5 | 2.5 | 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 VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT763-1 | - - - | MO-241 | - - - | | | ~~02-10-17~~<br>03-01-27 |

**Fig. 12. Package outline SOT763-1 (DHVQFN16)**

## 12. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description |
|---|---|
| CDM | Charged Device Model |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

## 13. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| CBT3257A v.6 | 20190620 | Product data sheet | - | CBT3257A v.5 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| CBT3257A v.5 | 20130404 | Product data sheet | - | CBT3257A v.4 |
| Modifications: | Table 6: values for pass voltage modified. | | | |
| CBT3257A v.4 | 20090319 | Product data sheet | - | CBT3257A v.3 |
| CBT3257A v.3 | 20080704 | Product data sheet | - | CBT3257A v.2 |
| CBT3257A v.2 | 20070704 | Product data sheet | - | CBT3257A v.1 |
| CBT3257A v.1 | 20051027 | Product data sheet | - | - |

# 14. Legal information

## Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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# Contents





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LifeElectronics
Живое партнерство

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