

# CBT3245A

## Octal bus switch

Rev. 3 — 5 January 2012

Product data sheet

## 1. General description

The CBT3245A provides eight bits of high-speed TTL-compatible bus switching. The low ON resistance of the switch allows connections to be made with minimal propagation delay.

The CBT3245A is organized as one 8-bit bus switches with one output enable ( $\overline{OE}$ ) input. When  $OE$  is LOW, the switch is on and port A is connected to the B port. When  $OE$  is HIGH, each switch is disabled. The CBT3245A is characterized for operation from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

## 2. Features and benefits

- 5  $\Omega$  switch connection between two ports
- TTL-compatible control input levels
- Multiple package options
- Latch-up protection exceeds 500 mA per JESD78
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115B exceeds 150 V
  - ◆ CDM JESD22-C101C exceeds 1000 V

## 3. Ordering information

Table 1. Ordering information

Type number	Package				Version
	Temperature range	Name	Description		
CBT3245AD	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm		SOT163-1
CBT3245ADB	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm		SOT339-1
CBT3245ADS	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	SSOP20 <sup>[1]</sup>	plastic shrink small outline package; 20 leads; body width 3.9 mm; lead pitch 0.635 mm		SOT724-1
CBT3245APW	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm		SOT360-1
CBT3245ABQ	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	DHVQFN20	plastic dual-in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body $2.5 \times 4.5 \times 0.85$ mm		SOT764-1

[1] Also known as QSOP20 package

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## 4. Functional diagram

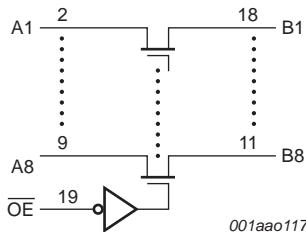


Fig 1. Logic diagram

## 5. Pinning information

### 5.1 Pinning

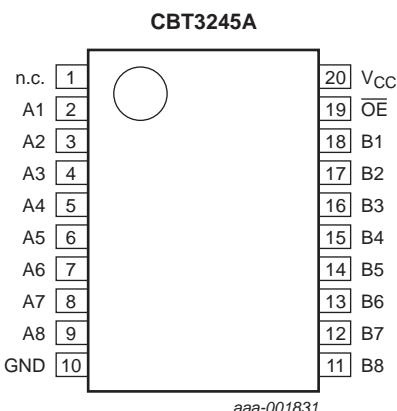


Fig 2. Pin configuration for SOT163-1 (SO20), SOT339-1 (SSOP20) and SOT360-1 (TSSOP20)

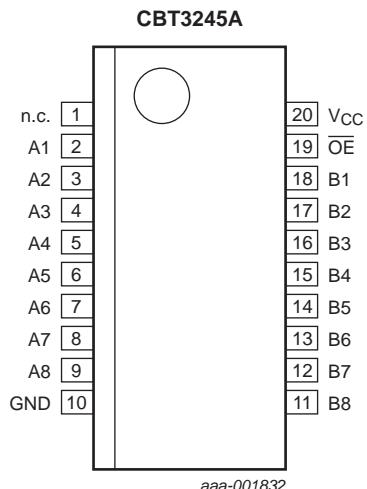
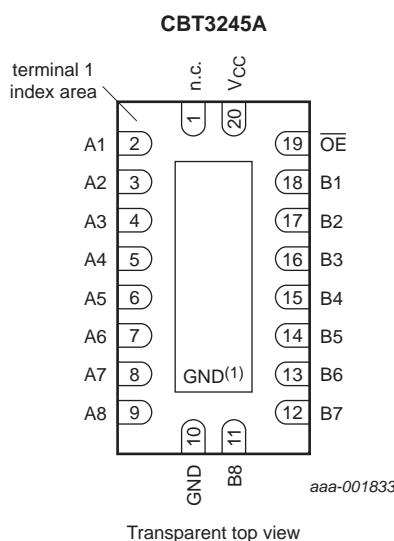


Fig 3. Pin configuration for SOT724-1 (SSOP20)



(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

**Fig 4.** Pin configuration for SOT764-1 (DHVQFN20)

## 5.2 Pin description

**Table 2.** Pin description

Symbol	Pin	Description
n.c.	1	not connected
A1 to A8	2, 3, 4, 5, 6, 7, 8, 9	data input/output (A port)
GND	10	ground (0 V)
B1 to B8	18, 17, 16, 15, 14, 13, 12, 11	data input/output (B port)
OE	19	output enable input (active LOW)
V <sub>CC</sub>	20	positive supply voltage

## 6. Functional description

**Table 3.** Function selection<sup>[1]</sup>

Input	Input/output
OE	An, Bn
L	An = Bn
H	Z

[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

## 7. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).<sup>[1]</sup>

$T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
$V_I$	input voltage		[2] -0.5	+7.0	V
$I_{OK}$	output clamping current	$V_O < 0\text{ V}$	-50	-	mA
$V_O$	output voltage		[2] -0.5	+7.0	V
$I_O$	output current	$V_O < 0\text{ V}$	-	$\pm 128$	mA
$I_{IK}$	input clamping current	$V_I = 0\text{ V}$	-50	-	mA
$T_{stg}$	storage temperature		-65	+150	$^{\circ}\text{C}$

[1] 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 [Section 8](#). is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[2] 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	Typ	Max	Unit
$V_{CC}$	supply voltage		4.0	-	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	$^{\circ}\text{C}$

## 9. Static characteristics

**Table 6. Static characteristics**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	$T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$			Unit
			Min	Typ <sup>[1]</sup>	Max	
$V_{IK}$	input clamping voltage	$V_{CC} = 4.5\text{ V}$ ; $I_I = -18\text{ mA}$	-	-	-1.2	V
$I_I$	input leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $5.5\text{ V}$	-	-	$\pm 5$	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 5.5\text{ V}$ ; $I_O = 0\text{ mA}$ ; $V_I = V_{CC}$ or GND	-	1	3	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 5.5\text{ V}$ ; one input at <sup>[2]</sup> 3.4 V, other inputs at $V_{CC}$ or GND	-	-	3.5	mA
$C_I$	input capacitance	control pins; $V_I = 3\text{ V}$ or 0 V	-	3.2	-	pF
$C_{IO(off)}$	off-state input/output capacitance	port off; $V_I = 3\text{ V}$ or 0 V; $\overline{OE} = V_{CC}$	-	6.6	-	pF

**Table 6. Static characteristics ...continued**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			Unit	
			Min	Typ <sup>[1]</sup>	Max		
R <sub>ON</sub>	ON resistance	V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 64 mA	[3]	-	5	7	Ω
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 30 mA	[3]	-	5	7	Ω
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 2.4 V; I <sub>I</sub> = -15 mA	[3]	-	10	15	Ω

[1] All typical values are at V<sub>CC</sub> = 5 V, T<sub>amb</sub> = 25 °C.[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

[3] Measured by the voltage drop between the An and the Bn terminals at the indicated current through the switch. ON resistance is determined by the lowest voltage of the two (An or Bn) terminals.

## 10. Dynamic characteristics

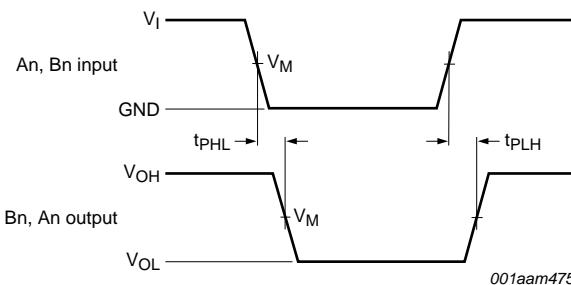
**Table 7. Dynamic characteristics**Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C		Unit
			Min	Max	
t <sub>pd</sub>	propagation delay	An, Bn to Bn, An; see <a href="#">Figure 5</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	[1][2]	-	0.25 ns
t <sub>en</sub>	enable time	OE to An or Bn; see <a href="#">Figure 6</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	[2]	1.0	5.9 ns
t <sub>dis</sub>	disable time	OE to An or Bn; see <a href="#">Figure 6</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	[2]	1.0	6.0 ns

[1] The propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

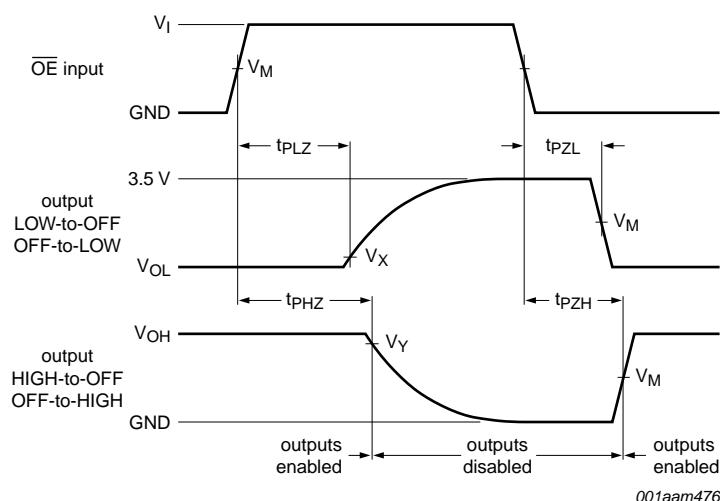
## 11. Waveforms



Measurement points are given in [Table 8](#).

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

**Fig 5. The data input (An, Bn) to output (Bn, An) propagation delay times**



Measurement points are given in [Table 8](#).

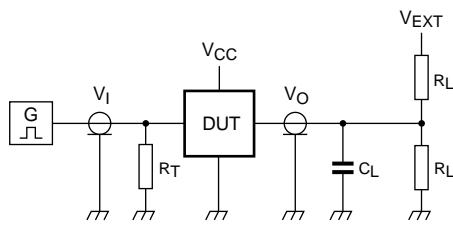
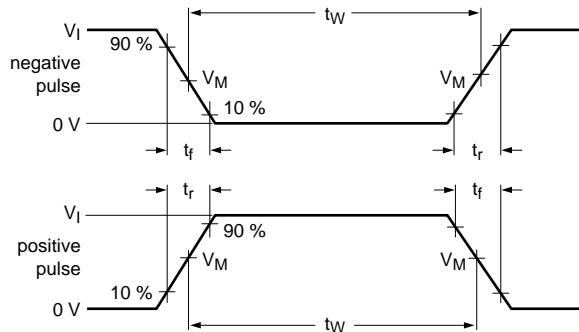
Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 6. Enable and disable times**

**Table 8. Measurement points**

Supply voltage	Input	Output		
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_X$
$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	GND to 3.0 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$

## 12. Test information



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Test data is given in [Table 9](#).

All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz;  $Z_0 = 50 \Omega$ .

The outputs are measured one at a time with one transition per measurement.

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 output impedance  $Z_0$  of the pulse generator.

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

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

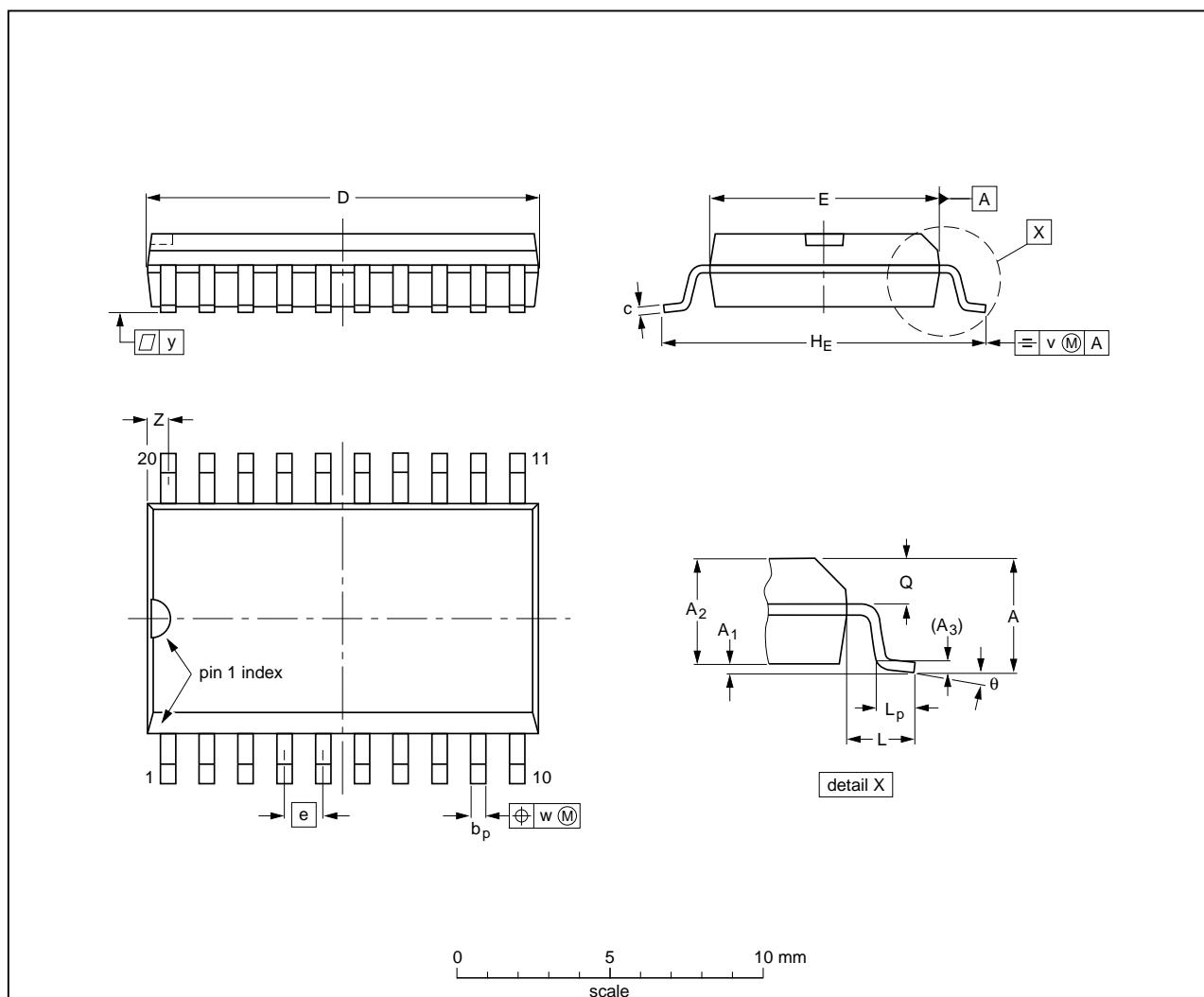
**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	GND to 3.0 V	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	7.0 V	open

## 13. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



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

UNIT	A 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 0.1	0.3 2.25	2.45	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	0°

### 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		
SOT163-1	075E04	MS-013			99-12-27 03-02-19

Fig 8. Package outline SOT163-1 (SO20)

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1

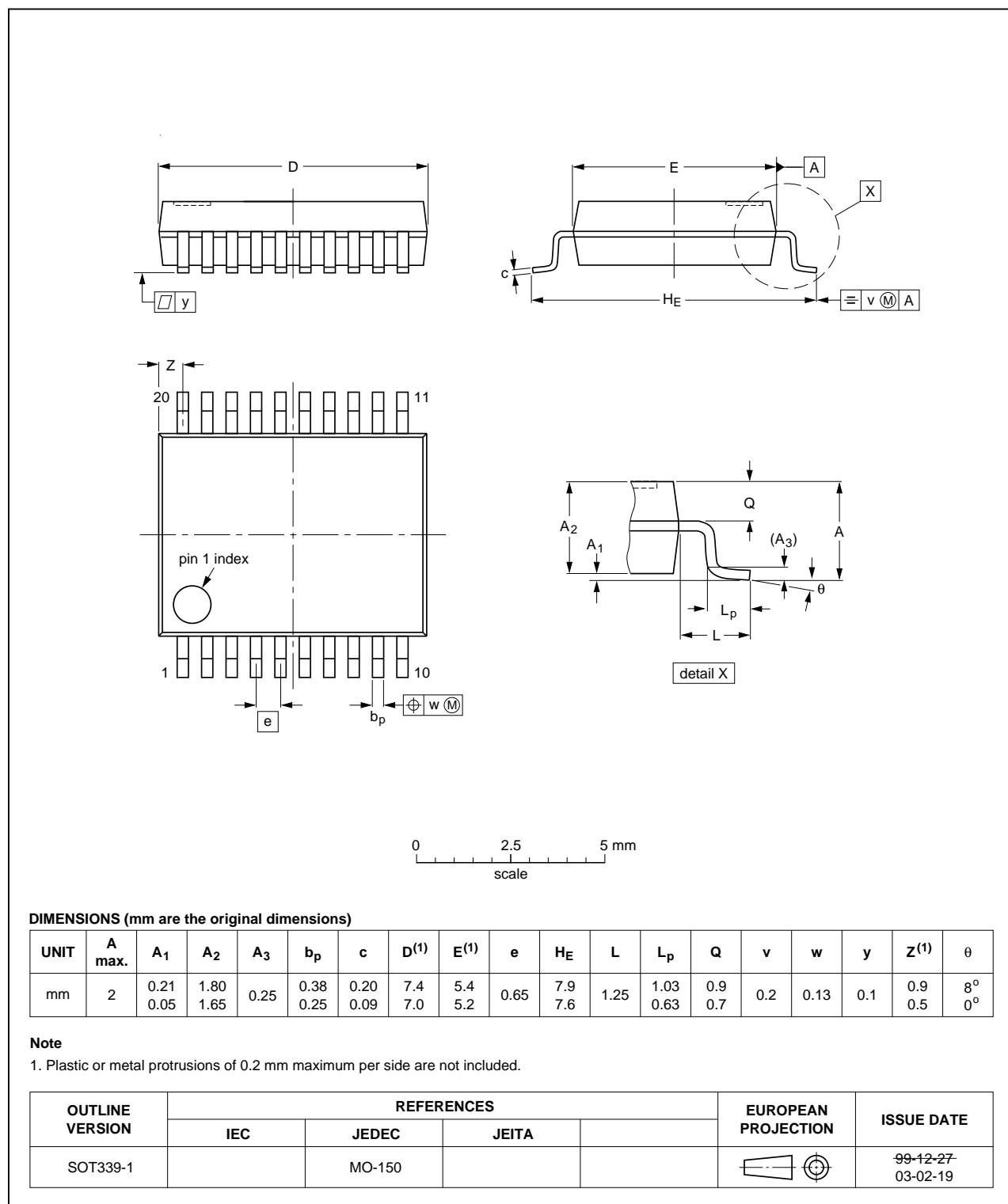
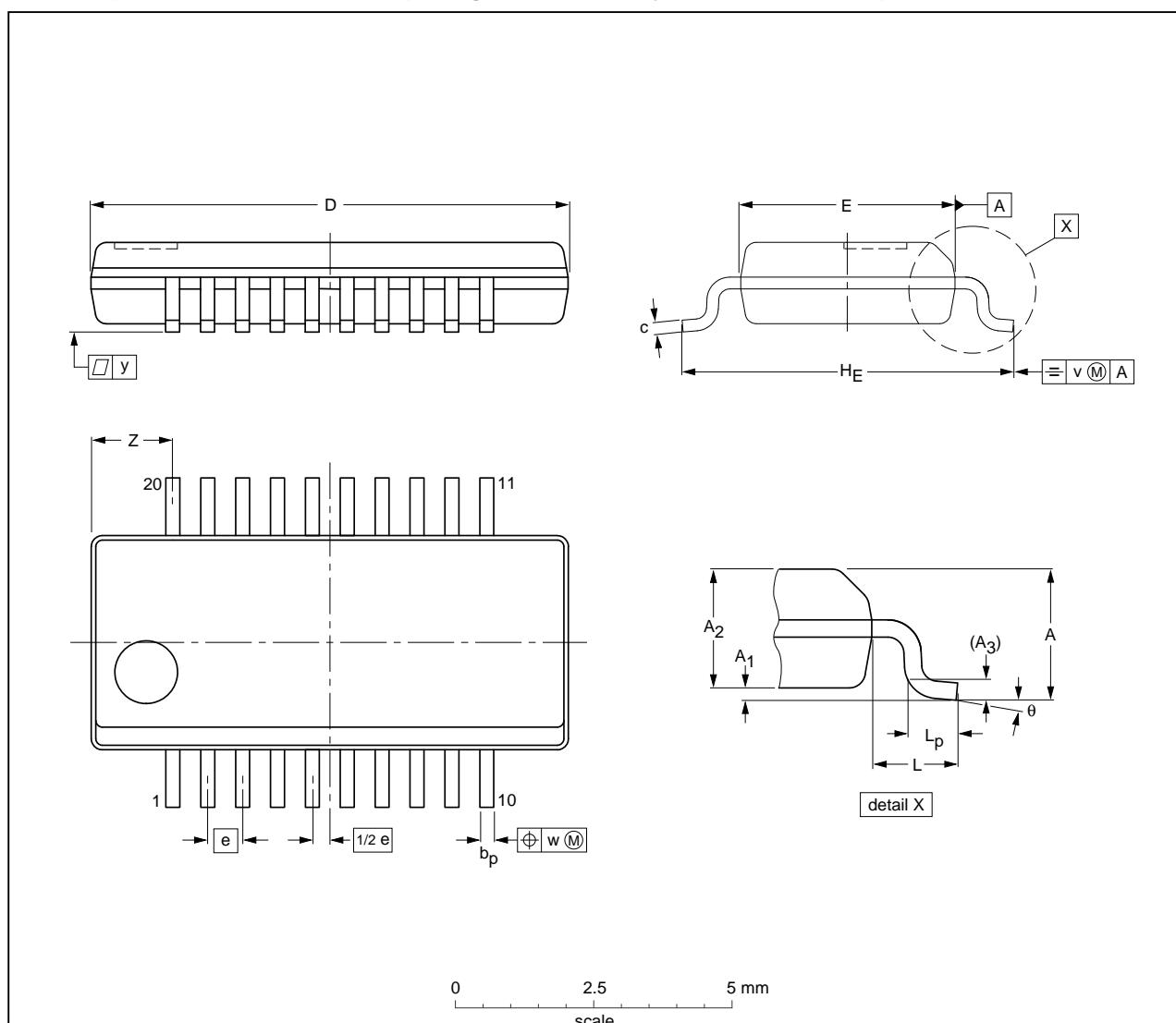


Fig 9. Package outline SOT339-1 (SSOP20)

**SSOP20: plastic shrink small outline package; 20 leads; body width 3.9 mm; lead pitch 0.635 mm SOT724-1**



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

DIMENSIONS (Millimetric dimensions are derived from the original inch dimensions)																	
UNIT	A 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>	v	w	y	Z <sup>(1)</sup>	θ
mm	1.73	0.25 0.10	1.55 1.40	0.25	0.31 0.20	0.25 0.18	8.8 8.6	4.0 3.8	0.635 5.8	6.2 5.8	1	0.89 0.41	0.25	0.18	0.1	1.67 1.28	8° 0°

### 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			
SOT724-1		MO-137			 	01-07-04 03-02-18

**Fig 10. Package outline SOT724-1 (SSOP20)**

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

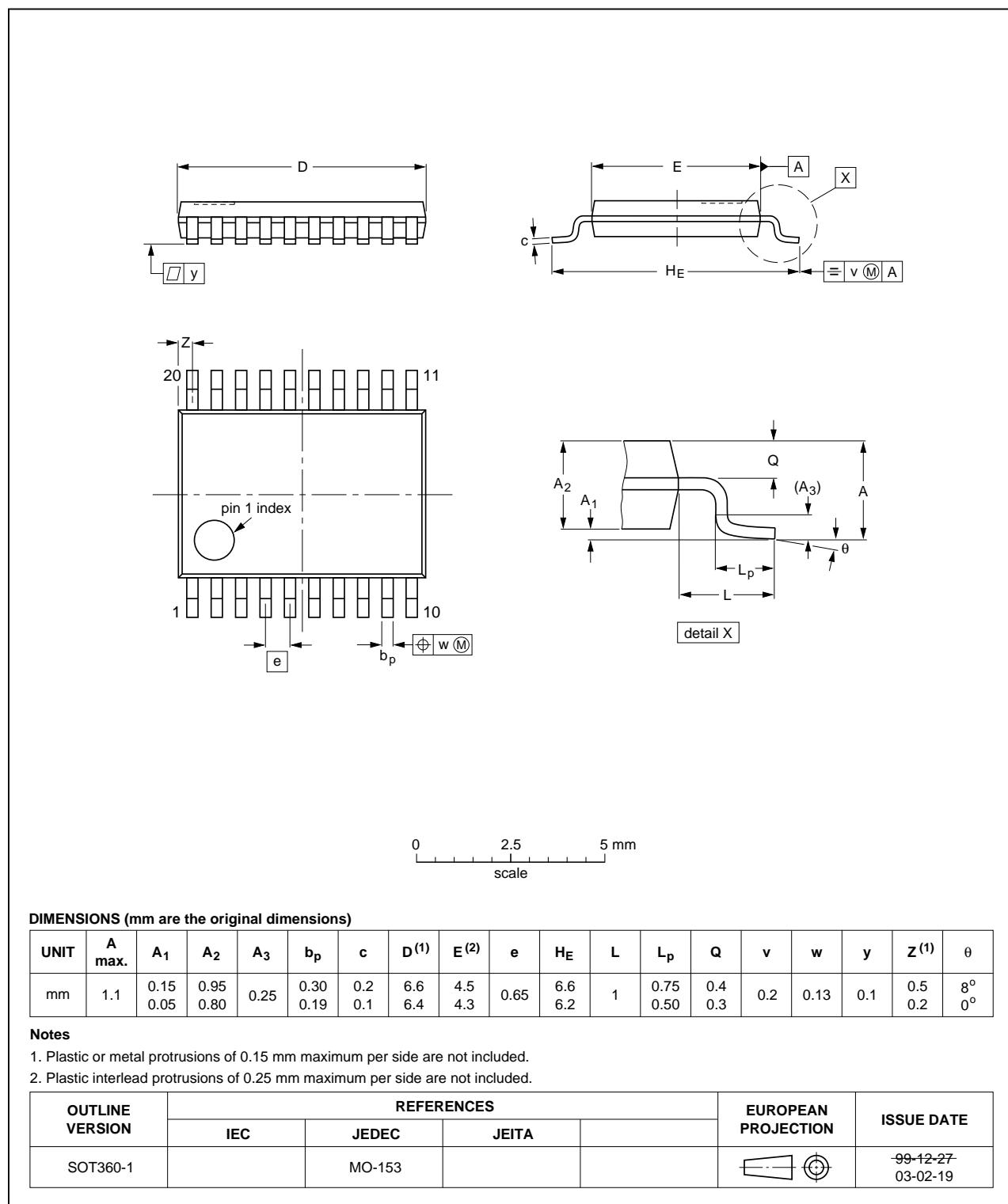


Fig 11. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads;  
20 terminals; body 2.5 x 4.5 x 0.85 mm SOT764-1

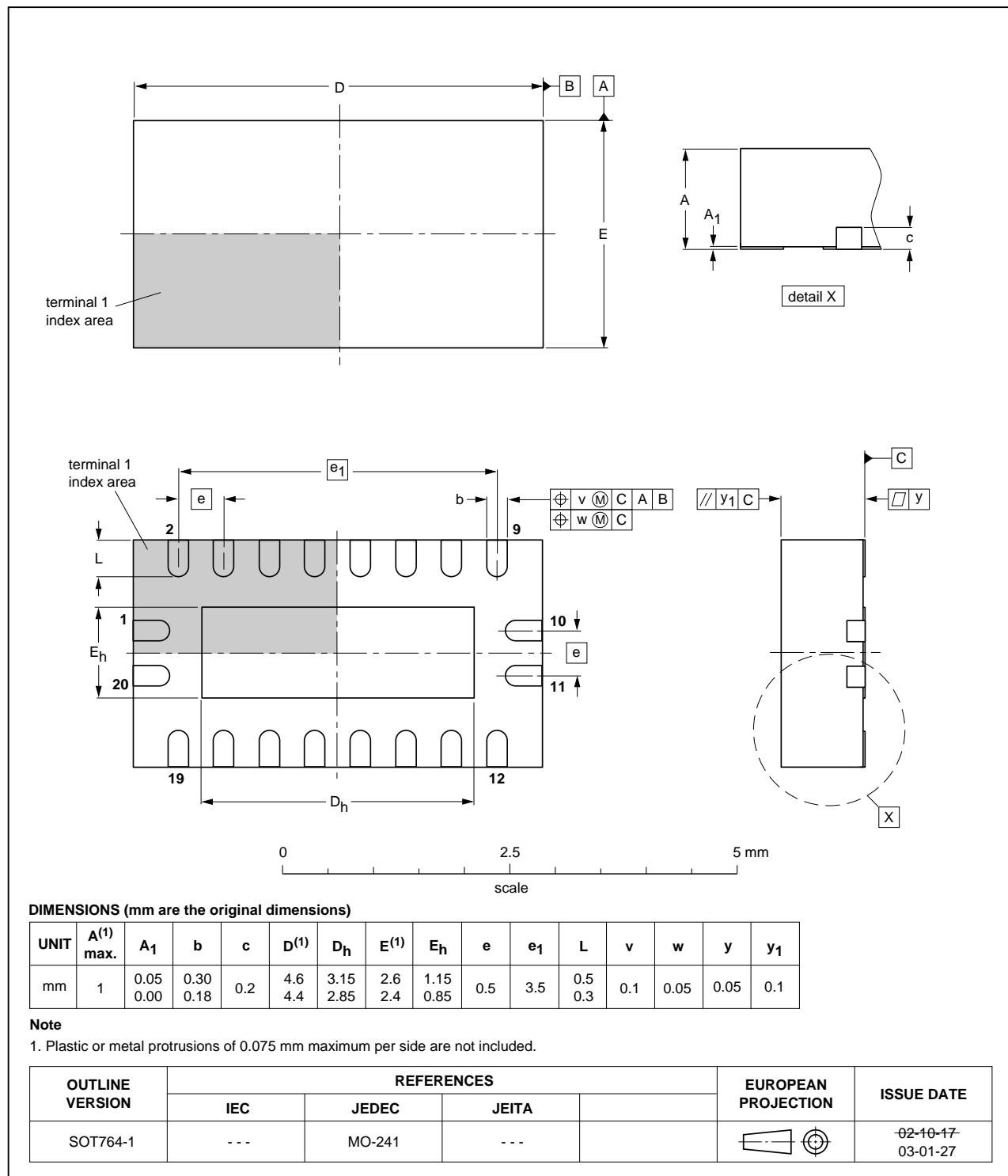


Fig 12. Package outline SOT764-1 (DHVQFN20)

## 14. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
CDM	Charged Device Model
ESD	ElectroStatic Discharge
DUT	Device Under Test
HBM	Human Body Model
MM	Machine Model
PRR	Pulse Rate Repetition
TTL	Transistor-Transistor Logic

## 15. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
CBT3245A v.3	20120105	Product data sheet	-	CBT3245A v.2
Modifications:		<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Marking code removed from order information section.</li> <li>Description of <math>C_l</math> and <math>C_{l/O}</math> corrected (errata).</li> </ul>		
CBT3245A v.2	20020627	Product data sheet	-	CBT3245A v.1
CBT3245A v.1	20020218	Product data sheet	-	-

## 16. Legal information

### 16.1 Data sheet status

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

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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