

CBT3244A

Octal bus switch with quad output enables

Rev. 3 — 8 September 2017

Product data sheet

1 General description

The CBT3244A provides eight bits of high-speed TTL-compatible bus switching in a standard '244 device pinout. The low ON-state resistance of the switch allows connections to be made with minimal propagation delay.

The CBT3244A device is organized as two 4-bit low-impedance switches with separate output-enable (\overline{OE}) inputs. When \overline{OE} is LOW, the switch is on and data can flow from port A to port B, or vice versa. When \overline{OE} is HIGH, the switch is open and high-impedance state exists between the two ports.

The CBT3244A is characterized for operation from -40 °C to +85 °C.

2 Features and benefits

- Standard '244-type pinout
- 5 Ω switch connection between two ports
- TTL compatible control input levels
- Latch-up protection exceeds 500 mA per JESD78
- ESD protection:
 - HBM JESD22-A114 exceeds 2000 V
 - MM JESD22-A115 exceeds 200 V
 - CDM JESD22-C101 exceeds 1000 V

3 Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
CBT3244ABQ	-40 °C to + 85 °C	DHVQFN20	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	SOT764-1
CBT3244APW	-40 °C to + 85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
CBT3244ADB	-40 °C to + 85 °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
CBT3244AD	-40 °C to + 85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1

4 Marking

Table 2. Marking codes

Type number	Marking code
CBT3244ABQ	CT3244A
CBT3244APW	CT3244A
CBT3244ADB	CT3244A
CBT3244AD	CBT3244AD

5 Functional diagram

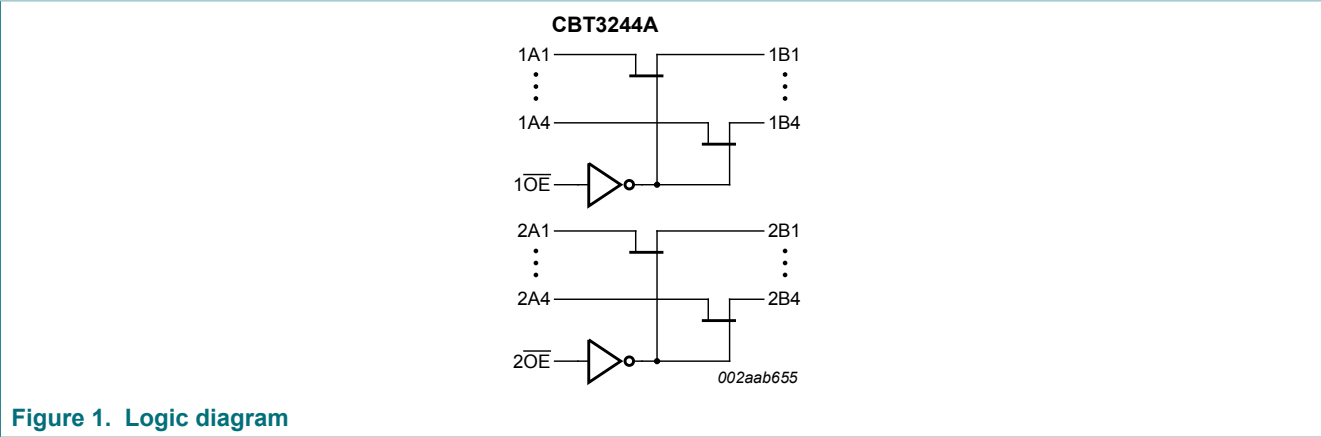


Figure 1. Logic diagram

6 Pinning information

6.1 Pinning

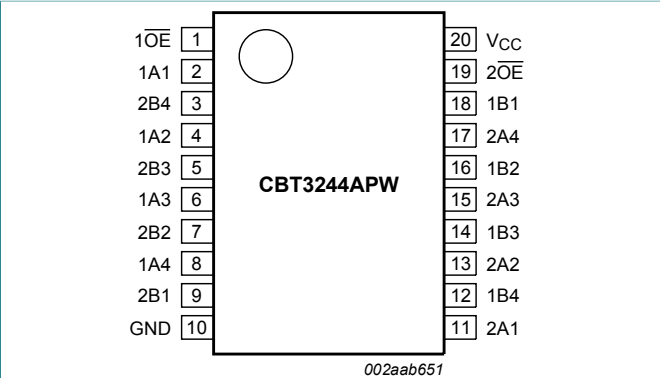


Figure 2. Pin configuration for TSSOP20

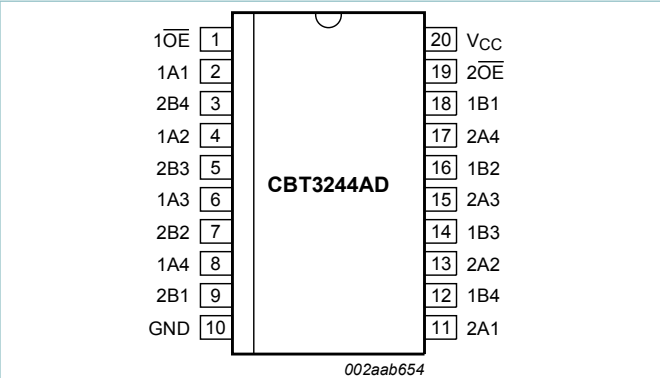


Figure 3. Pin configuration for SO20

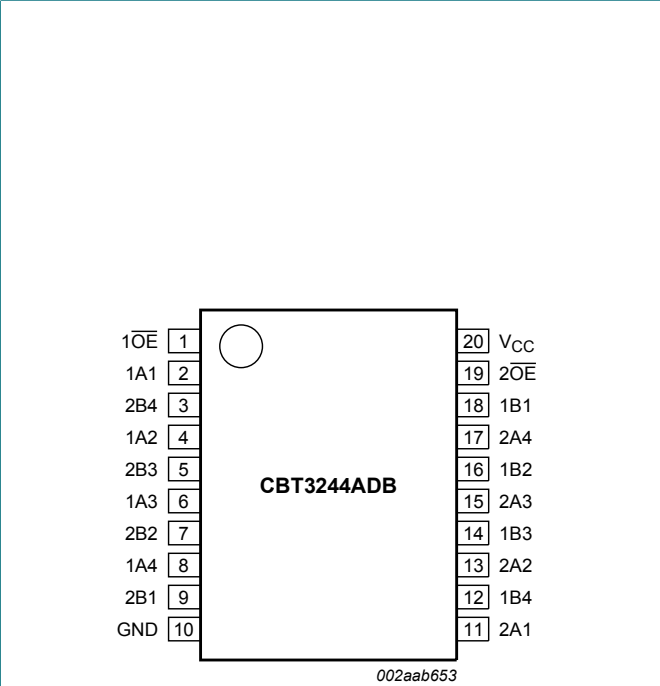
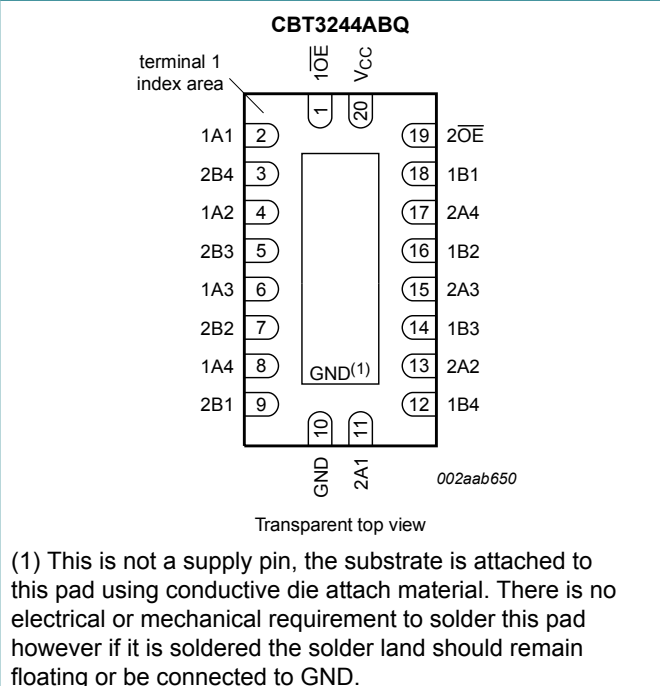


Figure 4. Pin configuration for SSOP20



(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.

Figure 5. Pin configuration for DHVQFN20

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
$1\overline{OE}$, $2\overline{OE}$	1, 19	output enable (active LOW)
1A1, 1A2, 1A3, 1A4, 2A1, 2A2, 2A3, 2A4	2, 4, 6, 8, 11, 13, 15, 17	inputs
1B1, 1B2, 1B3, 1B4, 2B1, 2B2, 2B3, 2B4	18, 16, 14, 12, 9, 7, 5, 3	outputs
GND	10	ground (0 V)
V_{CC}	20	positive supply voltage

7 Functional description

Table 4. Function selection ^[1]

Inputs		Outputs	
$1\overline{OE}$	$2\overline{OE}$	1An, 1Bn	2An, 2Bn
L	L	1An = 1Bn	2An = 2Bn
L	H	1An = 1Bn	Z
H	L	Z	2An = 2Bn
H	H	Z	Z

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

8 Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).^[1]

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+7.0	V
V_I	input voltage		^[2] -1.2	+7.0	V
V_O	output voltage	output in OFF or HIGH state	^[2] -0.5	+7.0	V
I_{IK}	input clamping current	$V_I < 0$ V	-	-18	mA
I_{OK}	output clamping current	$V_O < 0$ V	-	-50	mA
I_O	output current	output in LOW state	-	128	mA
T_{stg}	storage temperature		-65	+150	°C

[1] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

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

9 Recommended operating conditions

Table 6. Operating conditions

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		4.5	-	5.5	V
T_{amb}	ambient temperature	operating in free-air	-40	-	+85	°C

10 Static characteristics

Table 7. Static characteristics

$T_{amb} = -40\text{ °C}$ to $+85\text{ °C}$. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
V_{IK}	input clamping voltage	$V_{CC} = 4.5\text{ V}$; $I_I = -18\text{ mA}$	-	-	-1.2	V
V_{IH}	HIGH-state input voltage		2.0	-	-	V
V_{IL}	LOW-state input voltage		-	-	0.8	V
I_I	input leakage current	$V_{CC} = 5.5\text{ V}$; $V_I = V_{CC}$ or GND	-	-	± 1	μA
I_{CC}	supply current	$V_{CC} = 5.5\text{ V}$; $I_O = 0\text{ mA}$; $V_I = V_{CC}$ or GND	-	1	3	μA
ΔI_{CC}	additional supply current	per input; $V_{CC} = 5.5\text{ V}$; one input at 3.4 V; other inputs at V_{CC} or GND ^[2]	-	-	2.5	mA
C_i	input capacitance	control pins; $V_I = 3\text{ V}$ or 0 V ; $n\overline{OE} = V_{CC}$	-	3	-	pF
$C_{I/O}$	input/output capacitance	$n\overline{OE} = V_{CC} = 5.0\text{ V}$	-	3	-	pF
R_{on}	ON-state resistance	$V_{CC} = 4.5\text{ V}$; $V_I = 0\text{ V}$; $I_I = 64\text{ mA}$ ^[3]	-	4	7	Ω
		$V_{CC} = 4.5\text{ V}$; $V_I = 0\text{ V}$; $I_I = 30\text{ mA}$	-	4	7	Ω
		$V_{CC} = 4.5\text{ V}$; $V_I = 2.4\text{ V}$; $I_I = 15\text{ mA}$	-	8	15	Ω

[1] All typical values are measured at $V_{CC} = 5\text{ V}$; $T_{amb} = 25\text{ °C}$.

[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 level between the A and the B terminals at the indicated current through the switch. ON-state resistance is determined by the lowest voltage of the two (A or B) terminals.

11 Dynamic characteristics

Table 8. Dynamic characteristics

$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$; Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{pd}	propagation delay	nAn to nBn, or nBn to nAn; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$; see Figure 6	-	-	0.25	ns
t_{en}	enable time	\overline{nOE} to nAn or nBn; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$; see Figure 7	1.0	-	5.6	ns
t_{dis}	disable time	\overline{nOE} to nAn or nBn; $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$; see Figure 7	1.0	-	6.0	ns

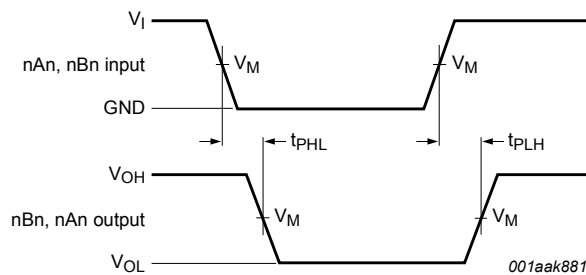
[1] This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON-state resistance of the switch and a load capacitance of 50 pF, when driven by an ideal voltage source (zero output impedance).

[2] t_{pd} is the same as t_{PHL} and t_{PLH} .

[3] t_{en} is the same as t_{PZH} and t_{PZL} .

[4] t_{dis} is the same as t_{PHZ} and t_{PLZ} .

11.1 Waveforms and test circuit



Measurement points are given in [Table 9](#).

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

Figure 6. The data input (A) to output (nYn) propagation delay times

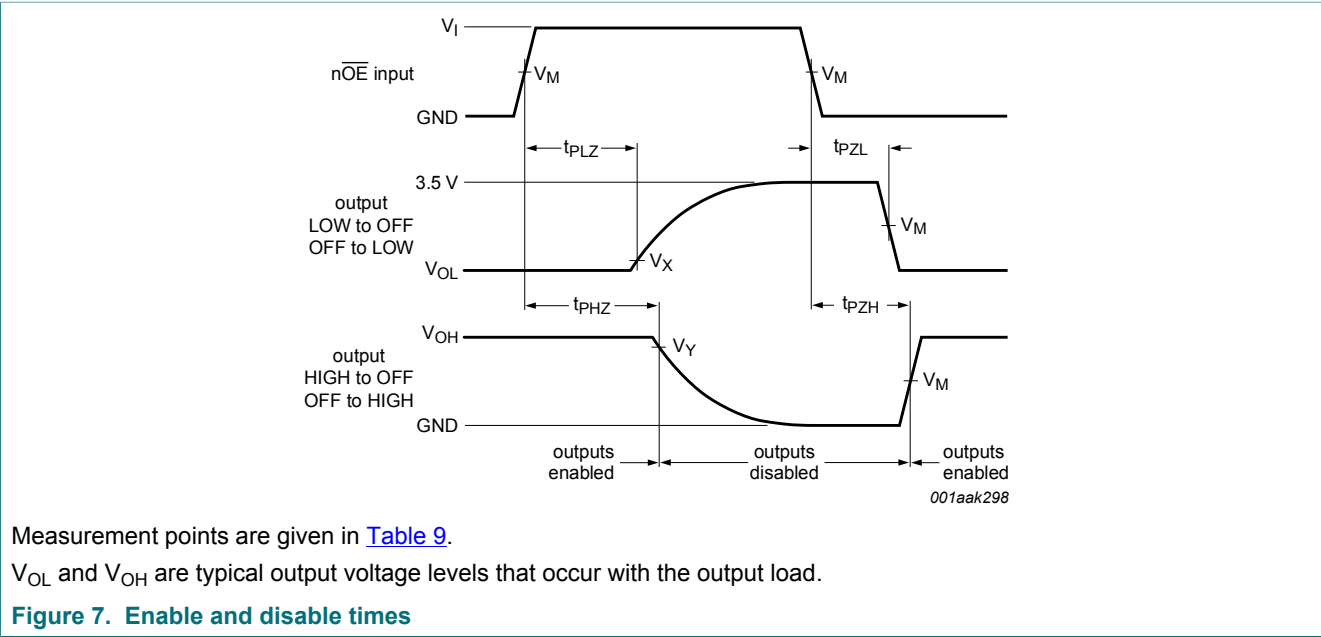
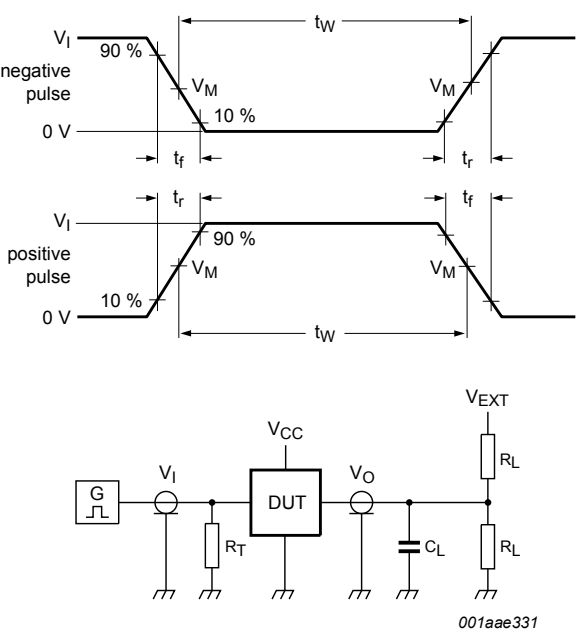


Table 9. Measurement points

Input		Output		
V_I	V_M	V_M	V_X	V_Y
3.0 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$



Test data is given in [Table 10](#)

All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$; $Z_o = 50\ \Omega$

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

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.

Figure 8. Test circuit for measuring switching times

Table 10. Test data

Input		Load		V_{EXT}		
V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
V_{CC}	$\leq 2.5\text{ ns}$	50 pF	500 Ω	open	open	7 V

12 Package outline

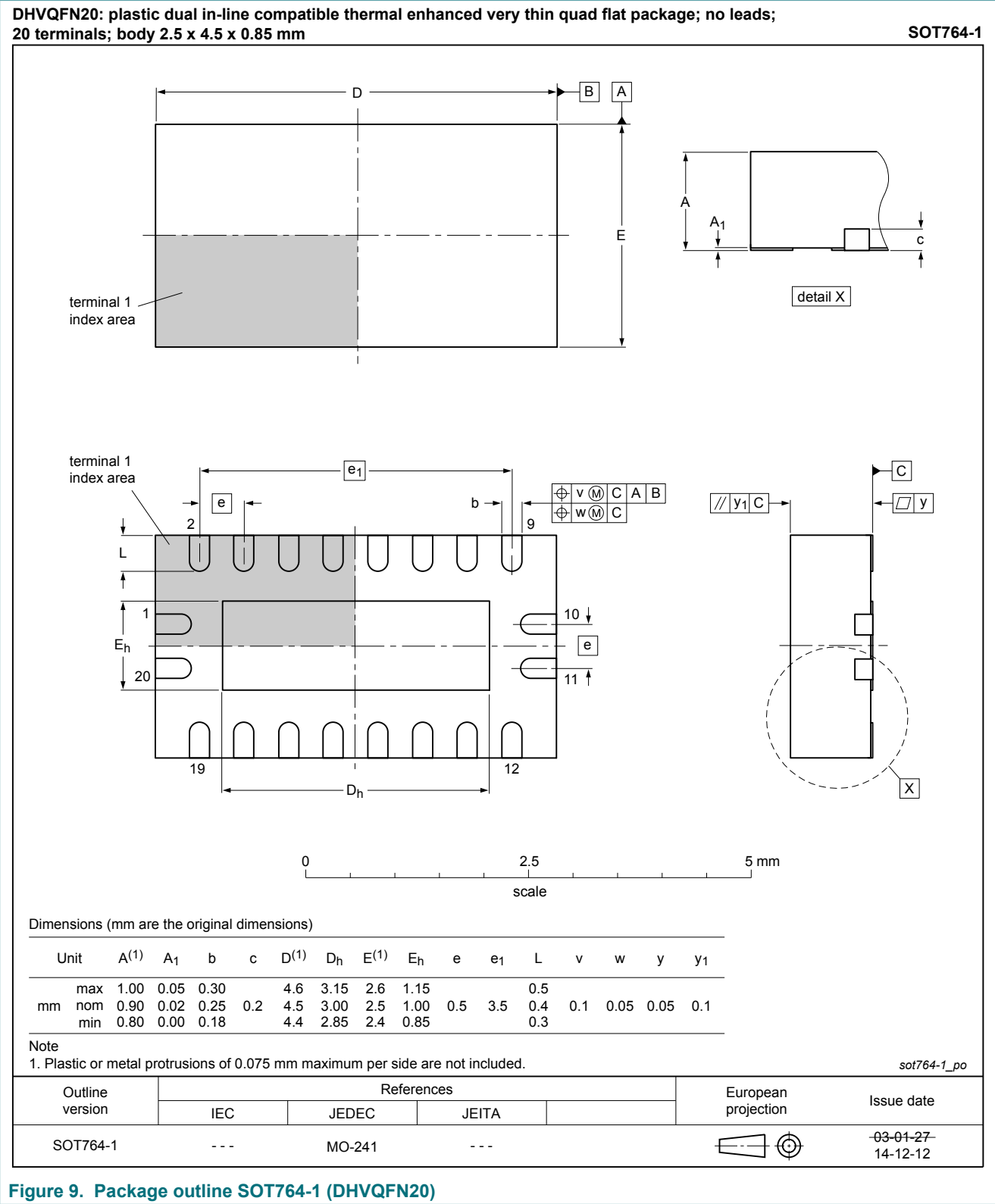


Figure 9. Package outline SOT764-1 (DHVQFN20)

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

SOT360-1

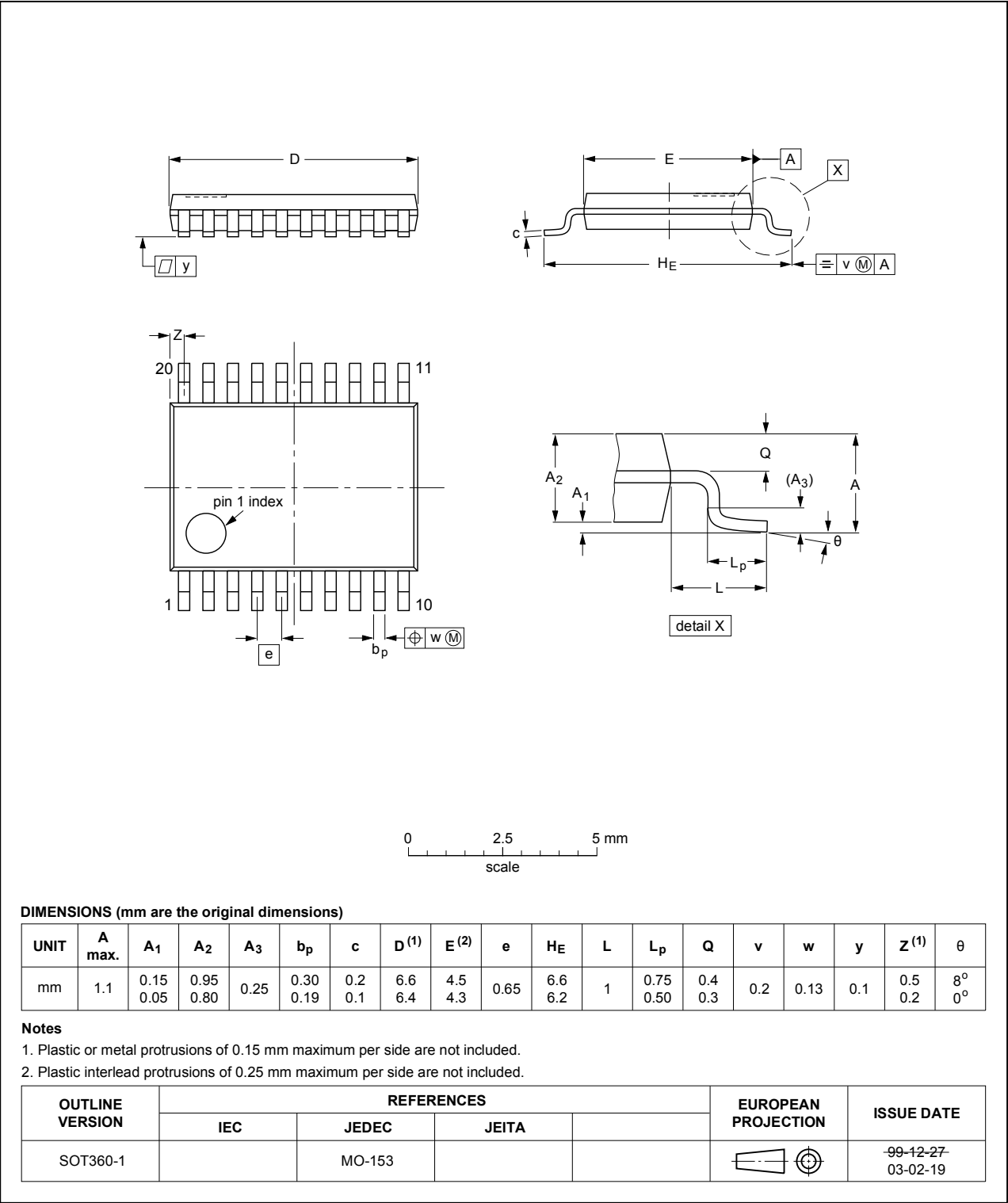
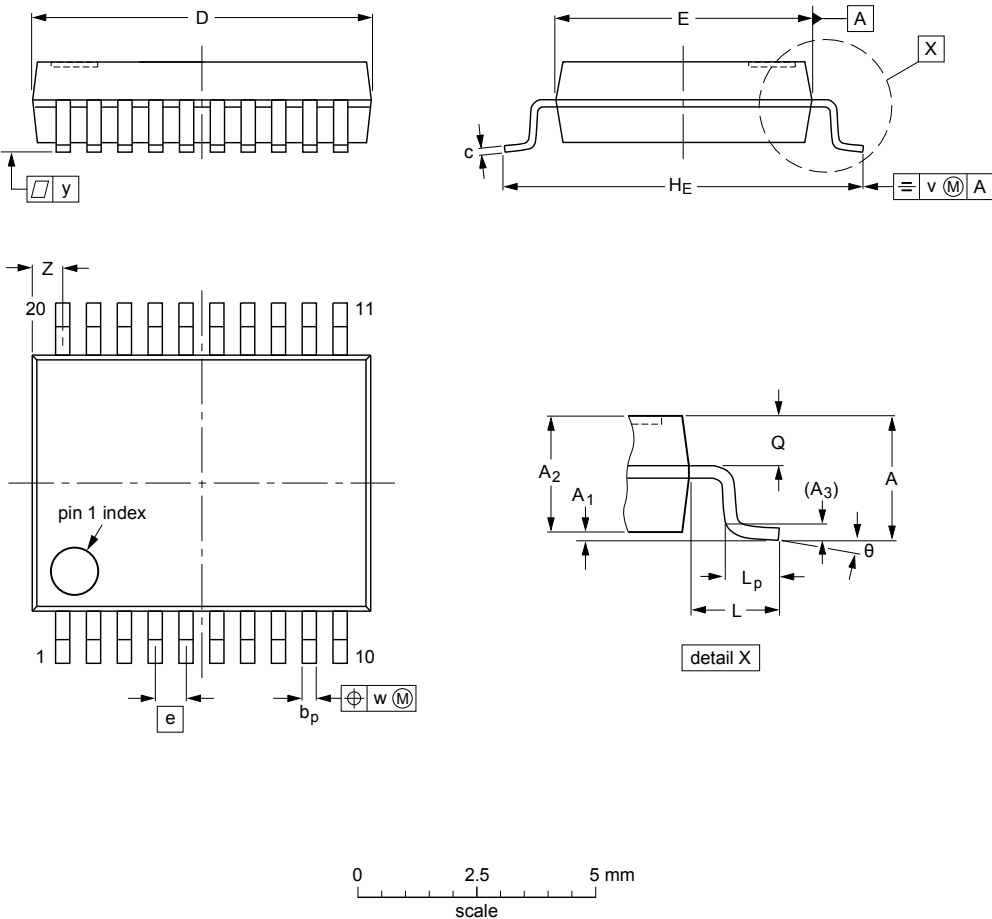


Figure 10. Package outline SOT360-1 (TSSOP20)

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

SOT339-1



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 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	7.4 7.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.9 0.5	8° 0°

Note

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

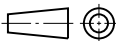
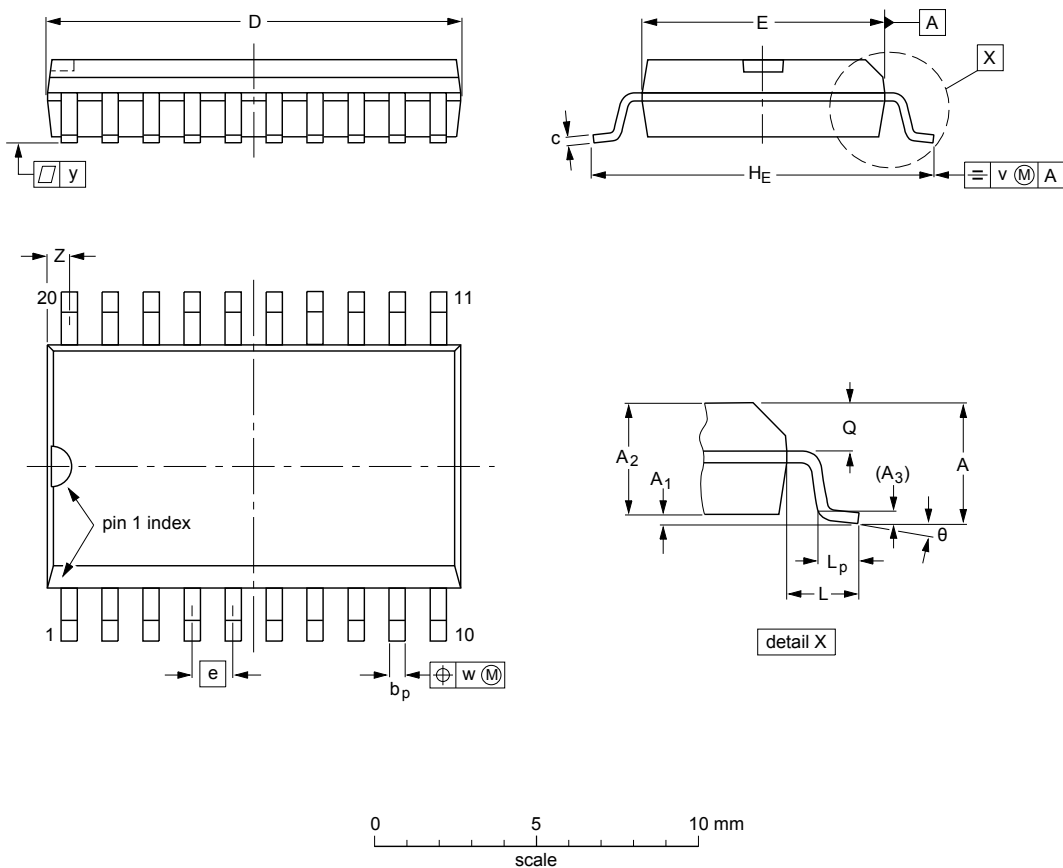
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT339-1		MO-150				99-12-27- 03-02-19

Figure 11. Package outline SOT339-1 (SSOP20)

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 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	2.65	0.3 0.1	2.45 2.25	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° 0°
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	

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

Figure 12. Package outline SOT163-1 (SO20)

13 Abbreviations

Table 11. Abbreviations

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

14 Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
CBT3244A v.3	20170908	Product data sheet	-	CBT3244A v.2
Modifications:	<ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.• Legal texts have been adapted to the new company name where appropriate.• Type number CBT3244ADS removed.			
CBT3244A v.2	20050915	Product data sheet	-	CBT3244A v.1
Modifications:	<ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.• added DHVQFN20 package option.• Section 2, 5th bullet: changed from 'exceeds 1000 V HBM ...' to 'exceeds 2000 V HBM ...'• added Section 13 Abbreviations			
CBT3244A v.1	20040526	Product data sheet	-	-

15 Legal information

15.1 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 URL <http://www.nexperia.com>.

15.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

15.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia. In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical

systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer

design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

15.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

1	General description	1
2	Features and benefits	1
3	Ordering information	1
4	Marking	2
5	Functional diagram	2
6	Pinning information	3
6.1	Pinning	3
6.2	Pin description	4
7	Functional description	4
8	Limiting values	4
9	Recommended operating conditions	5
10	Static characteristics	5
11	Dynamic characteristics	6
11.1	Waveforms and test circuit	6
12	Package outline	9
13	Abbreviations	13
14	Revision history	13
15	Legal information	14

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© Nexperia B.V. 2017.

All rights reserved.

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

Date of release: 8 September 2017
Document identifier: CBT3244A