## **74ALVC244**

# Octal buffer/line driver; 3-state Rev. 4 — 10 October 2017

**Product data sheet** 

#### **General description** 1

The 74ALVC244 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs 1OE and 2OE. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

## **Features and benefits**

- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V

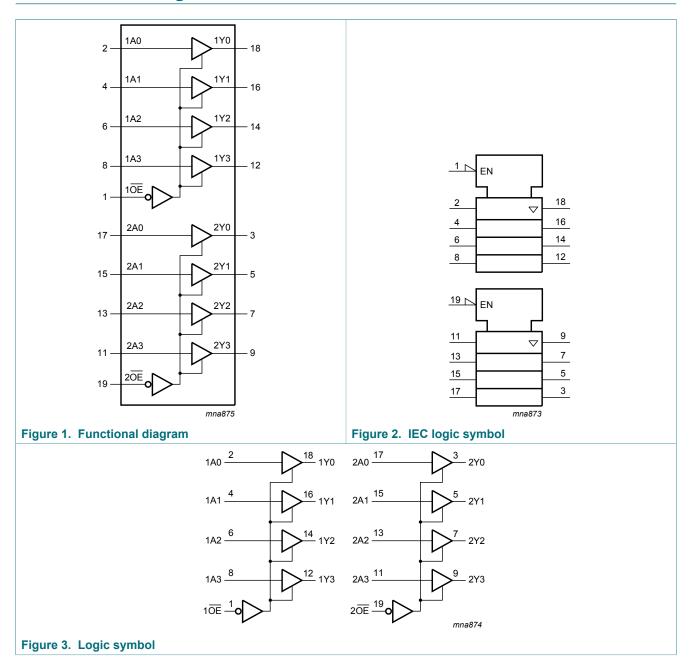
## **Ordering information**

Table 1. Ordering information

Type number	Package							
	Temperature range Name		Description	Version				
74ALVC244D	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1				
74ALVC244PW	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1				
74ALVC244BQ	-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				

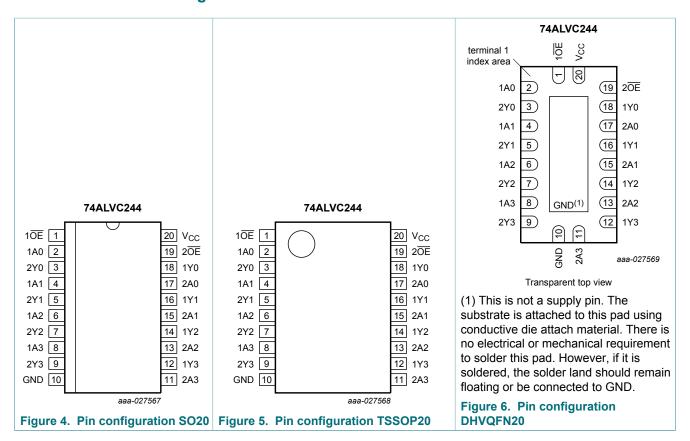


## 4 Functional diagram



## 5 Pinning information

### 5.1 Pinning



### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
10E, 20E	1, 19	output enable input (active LOW)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	bus output
GND	10	ground (0 V)
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	bus output
Vcc	20	supply voltage

## **Functional description**

### Table 3. Function table [1]

Input	Output	
nŌĒ	nAn	nYn
L	L	L
L	Н	Н
Н	Х	Z

<sup>[1]</sup> H = HIGH voltage level;

#### **Limiting values** 7

### Table 4. 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	+4.6	V
VI	input voltage	[1]	-0.5	+4.6	V
Vo	output voltage	output HIGH or LOW state [1]	-0.5	V <sub>CC</sub> + 0.5	V
		output OFF-state	-0.5	+4.6	V
		power-down mode, V <sub>CC</sub> = 0 V [2]	-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-	-50	mA
I <sub>OK</sub>	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA
Io	output current	$V_O = 0 \text{ V to } V_{CC}$	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +85  ^{\circ}\text{C}$ [3]	-	500	mW

<sup>[1]</sup> The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

L = LOW voltage level;

X = don't care;

Z = high-impedance OFF-state.

When V<sub>CC</sub> = 0 V (power-down mode), the output voltage can be 3.6 V in normal operation.
 For SO20 packages: above 70 °C derate linearly with 8 mW/K.

For TSSOP20 packages: above 60 °C derate linearly with 5.5 mW/K.

For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

## 8 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		1.65	3.6	V
VI	input voltage		0	3.6	V
V <sub>O</sub> output voltage	output voltage	V <sub>CC</sub> = 1.65 to 3.6 V; output HIGH or LOW state	0	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.65 to 3.6 V; output OFF-state	0	3.6	V
		V <sub>CC</sub> = 0 V; power-down mode	0	3.6	V
T <sub>amb</sub>	ambient temperature	in free air	-40	+85	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.65 V to 2.7 V	0	20	ns/V
		V <sub>CC</sub> = 2.7 V to 3.6 V	0	10	ns/V

### 9 Static characteristics

### **Table 6. Static characteristics**

At recommended operating conditions. 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	
V <sub>IH</sub>	HIGH-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
$V_{IL}$	LOW-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	0.65 × V <sub>CC</sub> -  1.7 -  2.0 -  (0)  1.65 V to 3.6 V V <sub>CC</sub> - 0.2 -  3.3 V 1.8 -  3.3 V 1.7 -  7.7 V 2.2 -  1.0 V 2.4 -	0.7	V	
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
V <sub>OH</sub> HIGH-level outp	HIGH-level output	$V_{I} = V_{IH}$ or $V_{IL}$				
	voltage	$I_{O}$ = -100 $\mu$ A; $V_{CC}$ = 1.65 V to 3.6 V	V <sub>CC</sub> - 0.2	-	-	V
		I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 1.65 V	1.25	Typ [1] M 0.35 0	-	V
		$I_{O}$ = -12 mA; $V_{CC}$ = 2.3 V	1.8	-	-	V
		$I_{O}$ = -18 mA; $V_{CC}$ = 2.3 V	1.7	-	-	V
		$I_{O}$ = -12 mA; $V_{CC}$ = 2.7 V	2.2	-	-	V
		$I_{\rm O}$ = -18 mA; $V_{\rm CC}$ = 3.0 V	2.4	-	-	V
		$I_{\rm O}$ = -24 mA; $V_{\rm CC}$ = 3.0 V	2.2	-	-	V

Symbol	Parameter	Conditions	T <sub>amb</sub>	= -40 °C to +	85 °C	Unit
			Min	Typ <sup>[1]</sup>	Max	
V <sub>OL</sub>	LOW-level output	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	$I_{O}$ = 100 $\mu$ A; $V_{CC}$ = 1.65 V to 3.6 V	-	-	0.2	V
		I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 1.65 V	-	-	0.3	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.3 V	-	-	0.4	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 2.3 V	-	-	0.6	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	V
		I <sub>O</sub> = 18 mA; V <sub>CC</sub> = 3.0 V	-	-	0.4	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	V
I <sub>I</sub>	input leakage current	$V_{CC} = 3.6 \text{ V}; V_I = 3.6 \text{ V or GND}$	-	±0.1	±5	μΑ
I <sub>OZ</sub>	OFF-state output current	$V_{CC} = 3.6 \text{ V}; V_{I} = V_{IH} \text{ or } V_{IL};$ $V_{O} = 3.6 \text{ V or GND}$	-	0.1	±10	μΑ
I <sub>OFF</sub>	power-off leakage current	$V_{CC} = 0 \text{ V}; V_{I} \text{ or } V_{O} = 3.6 \text{ V}$	-	±0.1	±10	μΑ
I <sub>CC</sub>	supply current	$V_{CC} = 3.6 \text{ V}; V_{I} = V_{CC} \text{ or GND}; I_{O} = 0 \text{ A}$	-	0.2	20	μΑ
ΔI <sub>CC</sub>	additional supply current	per input pin; $V_{CC} = 3.0 \text{ V}$ to $3.6 \text{ V}$ ; $V_{I} = V_{CC} - 0.6 \text{ V}$ ; $I_{O} = 0 \text{ A}$	-	5	750	μΑ
Cı	input capacitance		-	3.5	-	pF

<sup>[1]</sup> All typical values are measured at  $T_{amb}$  = 25 °C.

## 10 Dynamic characteristics

### **Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit, see Figure 9.

Symbol	Parameter	Conditions	T <sub>amb</sub>	= -40 °C to +	·85 °C	Unit
			Min	Typ <sup>[1]</sup>	Max	
t <sub>pd</sub>	propagation delay	nAn to nYn; see Figure 7	·]			
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	2.7	4.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.0	3.1	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.3	3.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.2	2.8	ns
t <sub>en</sub>	enable time	nOE to nYn; see Figure 8	3]			
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.4	6.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.6	5.4	ns
		V <sub>CC</sub> = 2.7 V	1.0	3.2	5.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.5	4.5	ns
t <sub>dis</sub>	disable time	nOE to nYn; see Figure 8	]			
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.8	5.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.2	4.1	ns
		V <sub>CC</sub> = 2.7 V	1.0	3.0	4.4	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.9	4.2	ns
$C_{PD}$	power dissipation capacitance	per buffer; $V_I$ = GND to $V_{CC}$ ; $V_{CC}$ = 3.3 V	_	20	-	pF

[1] Typical values are measured at  $T_{amb}$  = 25 °C

Typical values for  $V_{CC}$  = 1.65 V to 1.95 V are measured at  $V_{CC}$  = 1.8 V

Typical values for  $V_{\rm CC}$  = 2.3 V to 2.7 V are measured at  $V_{\rm CC}$  = 2.5 V

Typical values for  $V_{CC}$  = 3.0 V to 3.6 V are measured at  $V_{CC}$  = 3.3 V [2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

- [3] ten is the same as tezh and tezh.
- [4] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
   [5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz

f<sub>o</sub> = output frequency in MHz

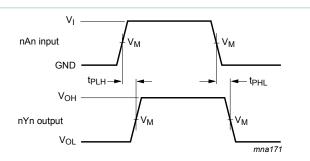
C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in Volt

N = number of inputs switching

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$  = sum of the outputs

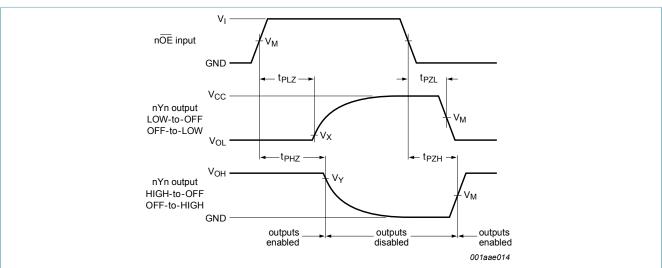
### 10.1 Waveforms and test circuit



Measurement points are given in Table 8.

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

Figure 7. Inputs nAn to output nYn propagation delays



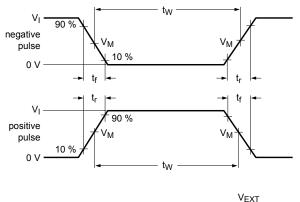
Measurement points are given in Table 8.

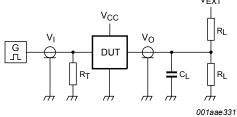
 $V_{\text{OL}}$  and  $V_{\text{OH}}$  are typical voltage output levels that occur with the output load.

Figure 8. 3-state enable and disable times

**Table 8. Measurement points** 

Supply voltage Input		Output	Output			
V <sub>CC</sub>	VI	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>	
1.65 V to 1.95 V	V <sub>CC</sub>	0.5 x V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V	
2.3 V to 2.7 V	V <sub>CC</sub>	0.5 x V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V	
2.7 V	2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V	
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V	





Test data is given in Table 9.

Definitions for test circuit:

R<sub>L</sub> = 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.

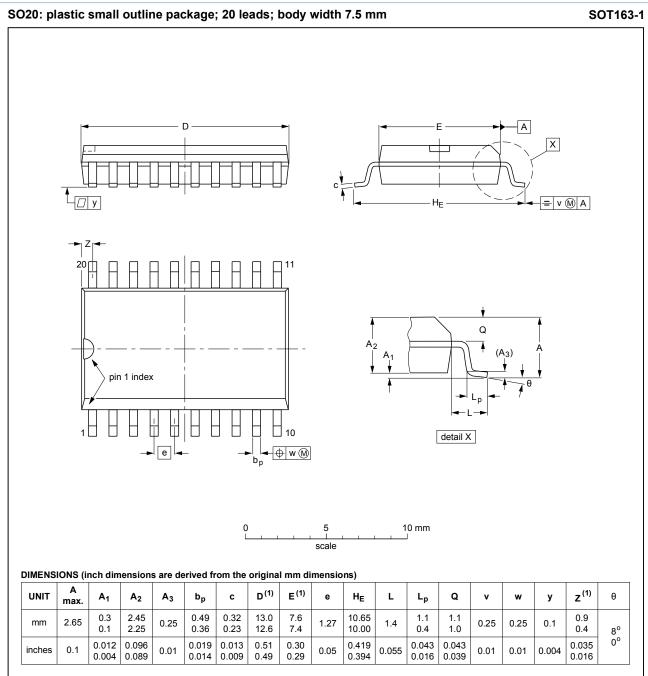
 $V_{EXT}$  = External voltage for measuring switching times.

Figure 9. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	pply voltage Input		Load	Load		V <sub>EXT</sub>		
V <sub>CC</sub>	V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	CL	R <sub>L</sub>	t <sub>PLH</sub> , t <sub>PHL</sub>	$t_{PLZ}, t_{PZL}$	t <sub>PHZ</sub> , t <sub>PZH</sub>	
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open	2 × V <sub>CC</sub>	GND	
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	open	2 × V <sub>CC</sub>	GND	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND	

## 11 Package outline



#### Note

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

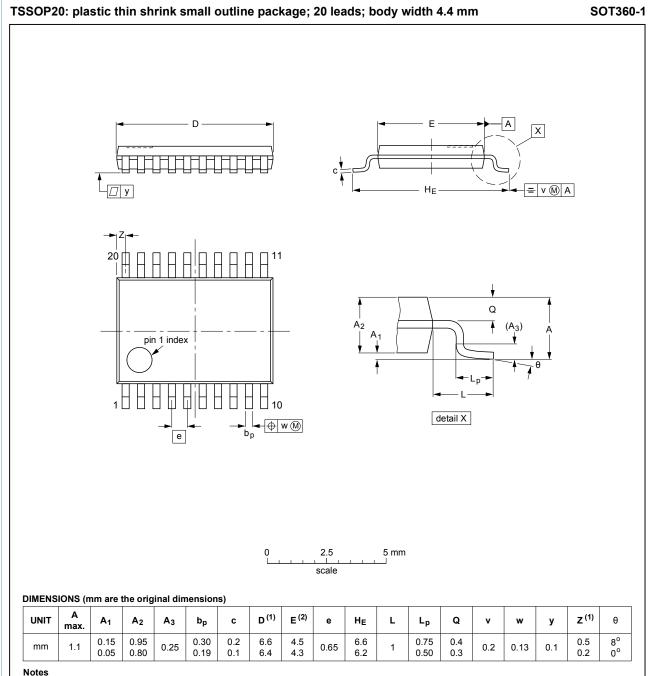
OUTLINE VERSION		REFER	EUROPEAN	ISSUE DATE		
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT163-1	075E04	MS-013				<del>99-12-27</del> 03-02-19

Figure 10. Package outline SOT163-1 (SO20)

74ALVC244

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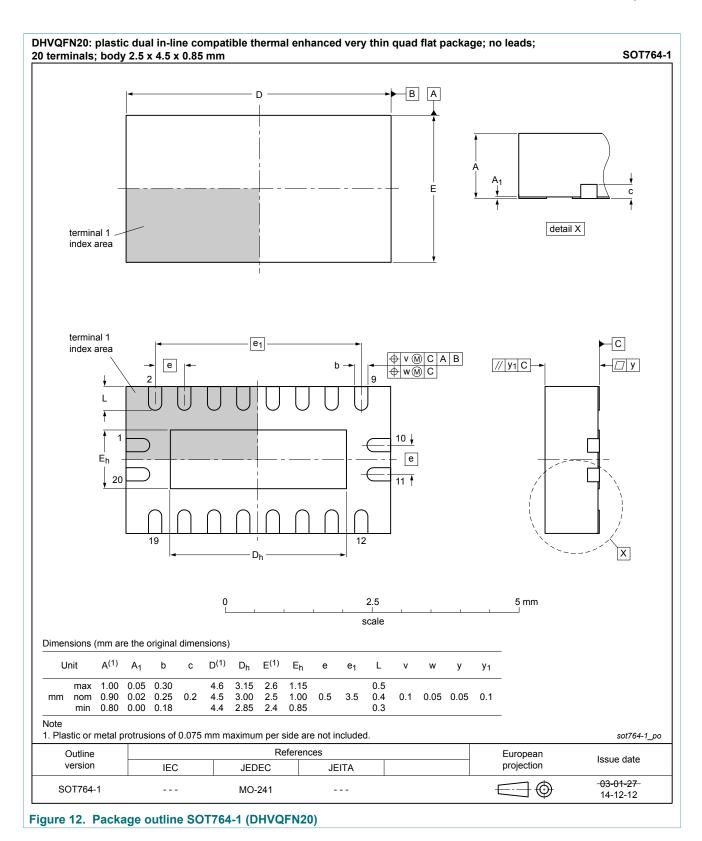
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- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER			EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT360-1		MO-153				<del>99-12-27</del> 03-02-19

Figure 11. Package outline SOT360-1 (TSSOP20)



## 12 Abbreviations

### Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	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		
74ALVC244 v.4	20171010	Product data sheet	-	74ALVC244 v.3		
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>					
74ALVC244 v.3	20030908	Product specification	-	74ALVC244 v.2		
74ALVC244 v.2	20030811	Product specification	-	74ALVC244 v.1		
74ALVC244 v.1	20011030	Product specification	-	-		

## 14 Legal information

### 14.1 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.

- Please consult the most recently issued document before initiating or completing a design.
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