

# 74LVC244A; 74LVCH244A

Octal buffer/line driver; 3-state

Rev. 12 — 16 September 2021

Product data sheet

## 1. General description

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The 74LVC244A; 74LVCH244A are 8-bit buffer/line drivers with 3-state outputs. The devices can be used as two 4-bit buffers or one 8-bit buffer. Both devices features two output enables (1 $\overline{O}E$  and 2 $\overline{O}E$ ), each controlling four of the 3-state outputs. A HIGH on n $\overline{O}E$  causes the outputs to assume a high-impedance OFF-state. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

## 2. Features and benefits

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- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low-power consumption
- Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Bus hold on all data inputs (74LVCH244A only)
- Complies with JEDEC standard:
  - JESD8-7A (1.65 V to 1.95 V)
  - JESD8-5A (2.3 V to 2.7 V)
  - JESD8-C/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115B exceeds 200 V
  - CDM JESD22-C101E exceeds 1000 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVC244AD	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LVCH244AD				
74LVC244APW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74LVCH244APW				
74LVC244ABQ	-40 °C to +125 °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
74LVCH244ABQ				
74LVC244ABZ	-40 °C to +125 °C	DHXQFN20	plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package; no leads; 20 terminals; 0.4 mm pitch; body 2 mm × 3.2 mm × 0.48 mm	SOT8020-1

### 4. Functional diagram

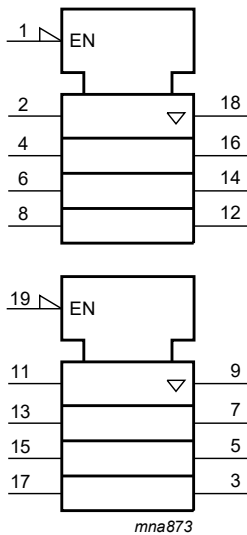


Fig. 1. IEC logic diagram

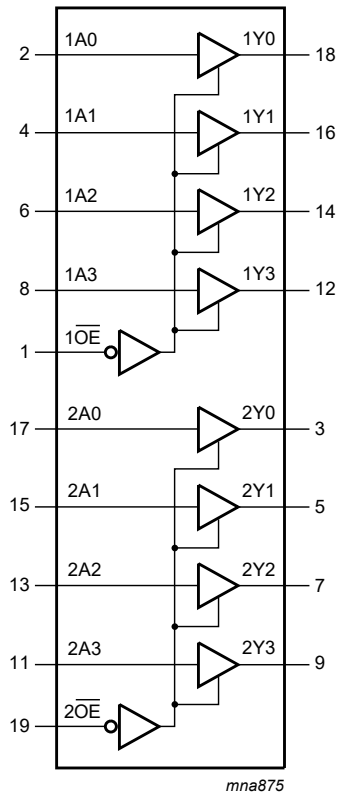


Fig. 2. Functional diagram

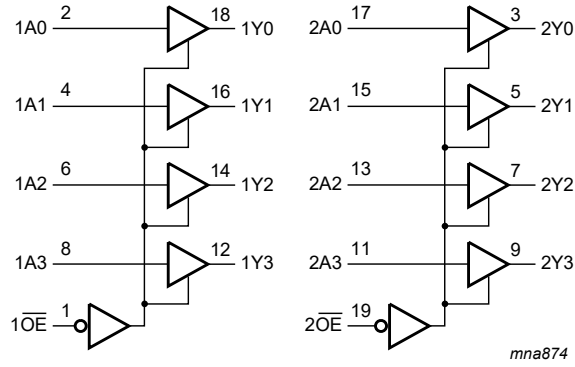


Fig. 3. Logic symbol

## 5. Pinning information

### 5.1. Pinning

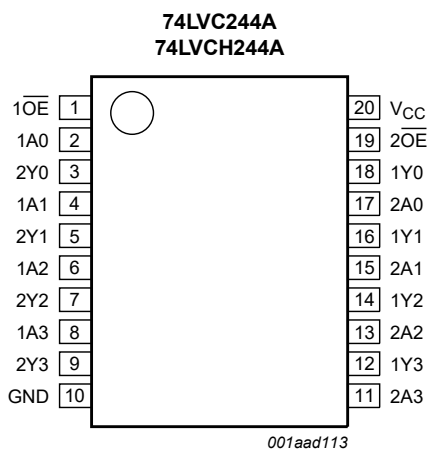
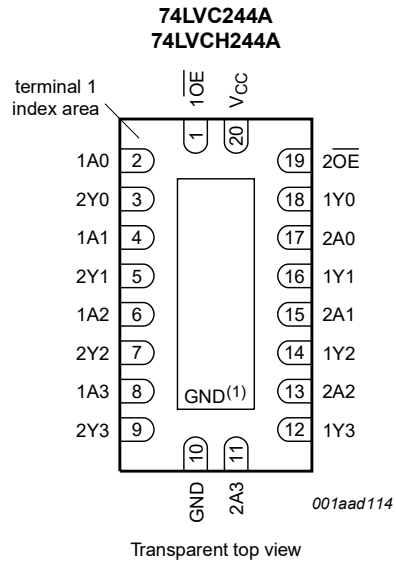
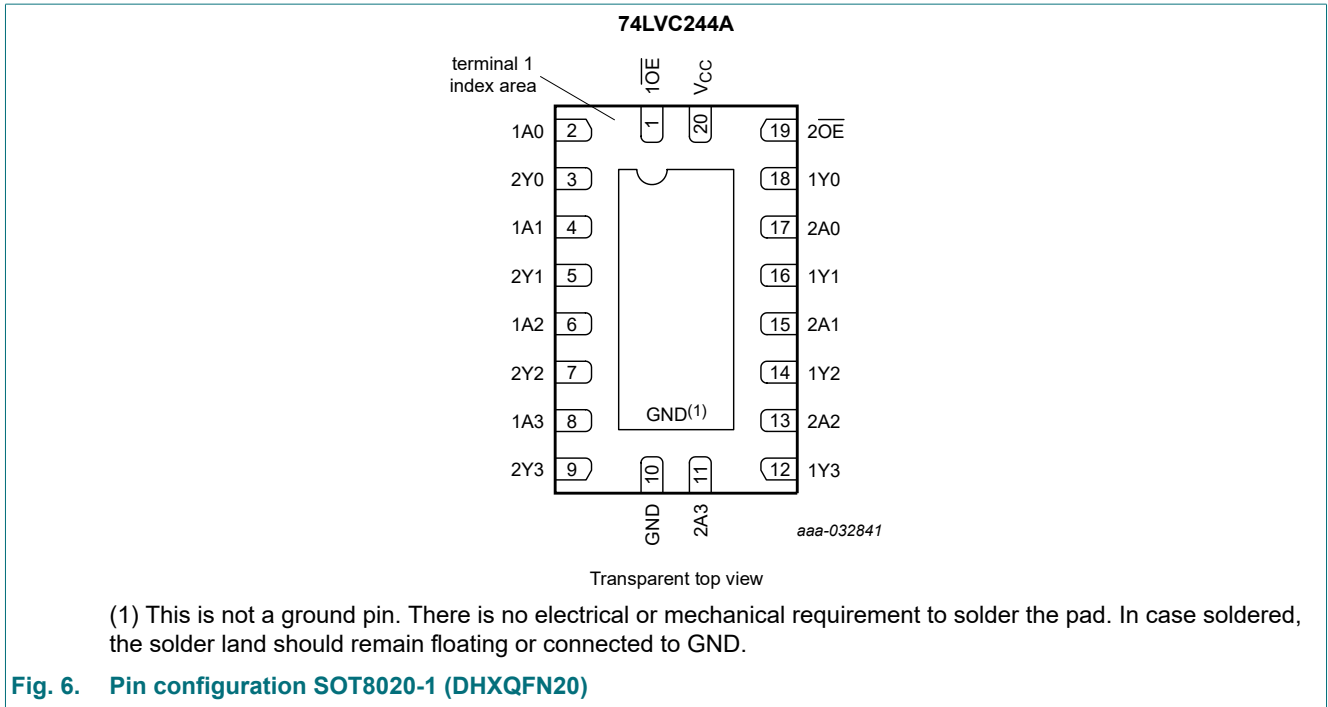


Fig. 4. Pin configuration SOT163-1 (SO20) and SOT360-1 (TSSOP20)



(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. 5. Pin configuration SOT764-1 (DHVQFN20)



## 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1OE, 2OE	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	data output
GND	10	ground (0 V)
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input
1Y0, 1Y1, 1Y2, 1Y3,	18, 16, 14, 12	data output
VCC	20	supply voltage

## 6. Functional description

Table 3. Function table

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

Control	Input	Output
nOE	nAn	nYn
L	L	L
L	H	H
H	X	Z

## 7. Limiting values

**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
$V_{CC}$	supply voltage		-0.5	+6.5	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$V_I$	input voltage		[1] -0.5	+6.5	V
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA
$V_O$	output voltage	output HIGH or LOW	[2] -0.5	$V_{CC} + 0.5$	V
		output 3-state	[2] -0.5	+6.5	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	±50	mA
$I_{CC}$	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +125 °C			
		SOT163-1; SOT360-1; SOT764-1	[3] -	500	mW
		SOT8020-1	-	250	mW

[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.

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

[3] For SOT163-1 (SO20) package:  $P_{tot}$  derates linearly with 12.3 mW/K above 109 °C.

For SOT360-1 (TSSOP20) package:  $P_{tot}$  derates linearly with 10.0 mW/K above 100 °C.

For SOT764-1 (DHVQFN20) package:  $P_{tot}$  derates linearly with 12.9 mW/K above 111 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		1.65	-	3.6	V
		functional	1.2	-	3.6	V
$V_I$	input voltage		0	-	5.5	V
$V_O$	output voltage	output HIGH or LOW	0	-	$V_{CC}$	V
		output 3-state	0	-	5.5	V
$T_{amb}$	ambient temperature	in free air	-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.2$ V to 2.7 V	0	-	20	ns/V
		$V_{CC} = 2.7$ 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	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.2 V	1.08	-	-	1.08	-	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.65V <sub>CC</sub>	-	-	0.65V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.2 V	-	-	0.12	-	0.12	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35V <sub>CC</sub>	-	0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V	V <sub>CC</sub> - 0.2	-	-	V <sub>CC</sub> - 0.3	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	1.05	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.8	-	-	1.65	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	2.05	-	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V	2.4	-	-	2.25	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V	-	-	0.2	-	0.3	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	-	0.65	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.6	-	0.8	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	-	0.6	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	-	0.8	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 3.6 V [2]	-	±0.1	±5	-	±20	µA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND; V <sub>CC</sub> = 3.6 V [2]	-	±0.1	±5	-	±20	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0.0 V	-	±0.1	±10	-	±20	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.6 V	-	0.1	10	-	40	µA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.7 V to 3.6 V	-	5	500	-	5000	µA
C <sub>I</sub>	input capacitance		-	4.0	-	-	-	pF

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
I <sub>BHL</sub>	bus hold LOW current	V <sub>CC</sub> = 1.65 V; V <sub>I</sub> = 0.58 V [3][4]	10	-	-	10	-	µA
		V <sub>CC</sub> = 2.3 V; V <sub>I</sub> = 0.7 V	30	-	-	25	-	µA
		V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 0.8 V	75	-	-	60	-	µA
I <sub>BHH</sub>	bus hold HIGH current	V <sub>CC</sub> = 1.65 V; V <sub>I</sub> = 1.07 V [3][4]	-10	-	-	-10	-	µA
		V <sub>CC</sub> = 2.3 V; V <sub>I</sub> = 1.7 V	-30	-	-	-25	-	µA
		V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 2.0 V	-75	-	-	-60	-	µA
I <sub>BHLO</sub>	bus hold LOW overdrive current	V <sub>CC</sub> = 1.95 V [3][5]	200	-	-	200	-	µA
		V <sub>CC</sub> = 2.7 V	300	-	-	300	-	µA
		V <sub>CC</sub> = 3.6 V	500	-	-	500	-	µA
I <sub>BHHO</sub>	bus hold HIGH overdrive current	V <sub>CC</sub> = 1.95 V [3][5]	-200	-	-	-200	-	µA
		V <sub>CC</sub> = 2.7 V	-300	-	-	-300	-	µA
		V <sub>CC</sub> = 3.6 V	-500	-	-	-500	-	µA

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

[2] The bus hold circuit is switched off when V<sub>I</sub> > V<sub>CC</sub> allowing 5.5 V on the input terminal.

[3] Valid for data inputs of bus hold parts only (74LVCH244A). Note that control inputs do not have a bus hold circuit.

[4] The specified sustaining current at the data input holds the input below the specified V<sub>I</sub> level.

[5] The specified overdrive current at the data input forces the data input to the opposite input state.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nAn to nYn; see Fig. 7 [2]						
		V <sub>CC</sub> = 1.2 V	-	17.0	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	6.4	13.7	1.5	15.8	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	3.4	7.1	1.0	8.2	ns
		V <sub>CC</sub> = 2.7 V	1.5	3.4	6.9	1.5	9.0	ns
t <sub>en</sub>	enable time	nOE to nYn; see Fig. 8 [2]						
		V <sub>CC</sub> = 1.2 V	-	24.0	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	7.0	17.3	1.5	20.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	3.9	9.5	1.5	11.0	ns
		V <sub>CC</sub> = 2.7 V	1.5	4.1	8.6	1.5	11.0	ns
t <sub>dis</sub>	disable time	nOE to nYn; see Fig. 8 [2]						
		V <sub>CC</sub> = 1.2 V	-	9.0	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.2	4.5	9.8	2.2	11.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	3.6	5.5	0.5	6.4	ns
		V <sub>CC</sub> = 2.7 V	1.5	3.3	6.8	1.5	8.5	ns
t <sub>sk(o)</sub>	output skew time	[3]	-	-	1.0	-	1.5	ns
C <sub>PD</sub>	power dissipation capacitance	per input; V <sub>I</sub> = GND to V <sub>CC</sub> [4]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	6.4	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	9.6	-	-	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	12.5	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.

[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>.

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[4] 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

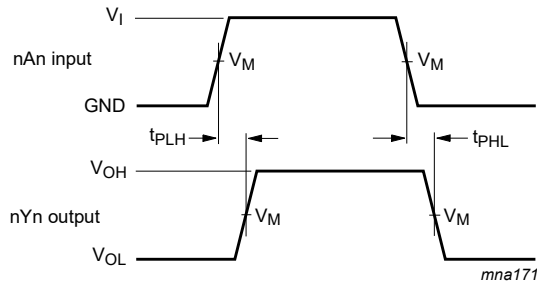
V<sub>CC</sub> = supply voltage in Volts

N = number of inputs switching

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



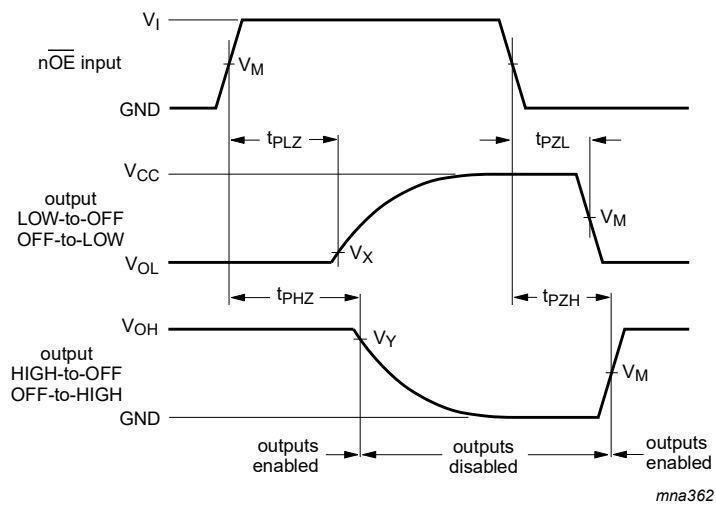
10.1. Waveforms and test circuit



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. 7. The input (nAn) to output (nYn) propagation delays



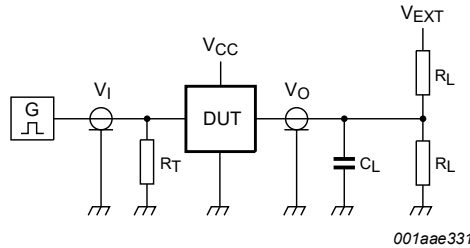
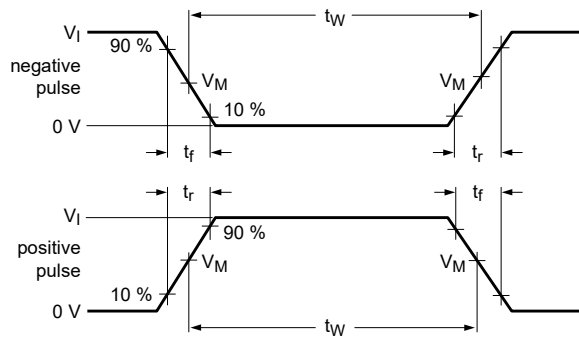
Measurement points are given in [Table 8](#).

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

Fig. 8. 3-state enable and disable times

Table 8. Measurement points

Supply voltage	Input		Output		
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
1.2 V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
1.65 V to 1.95 V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.3 V to 2.7 V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.7 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$



001aae331

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 output impedance  $Z_o$  of the pulse generator.

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

**Fig. 9. Test circuit for measuring switching times**

**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.2 V	$V_{CC}$	$\leq 2$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
1.65 V to 1.95 V	$V_{CC}$	$\leq 2$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2$ ns	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND

11. Package outline

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

SOT163-1

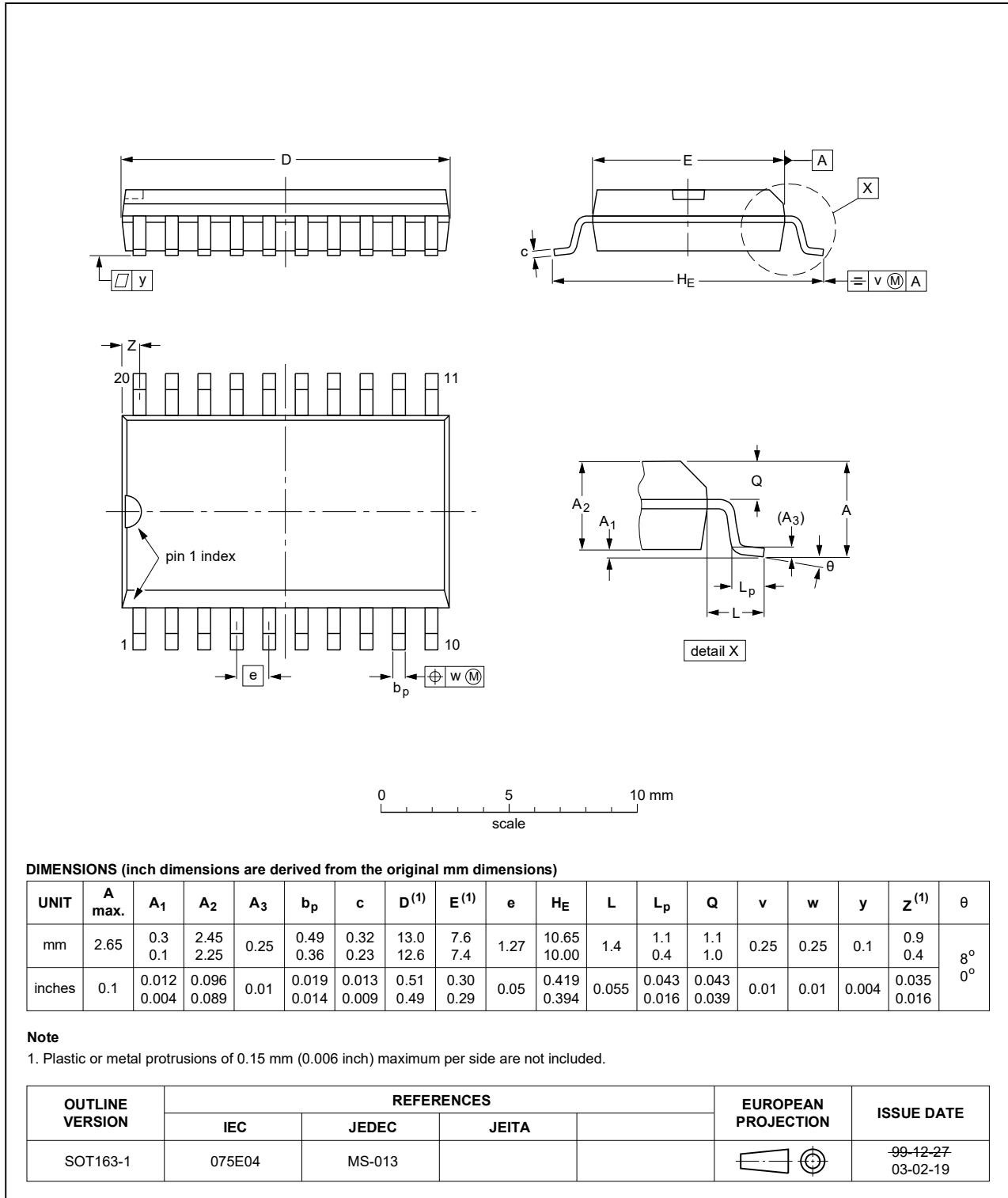


Fig. 10. Package outline SOT163-1 (SO20)

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)

DHXQFN20: plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package; no leads; 20 terminals; 0.4 mm pitch; body 2 mm x 3.2 mm x 0.48 mm

SOT8020-1

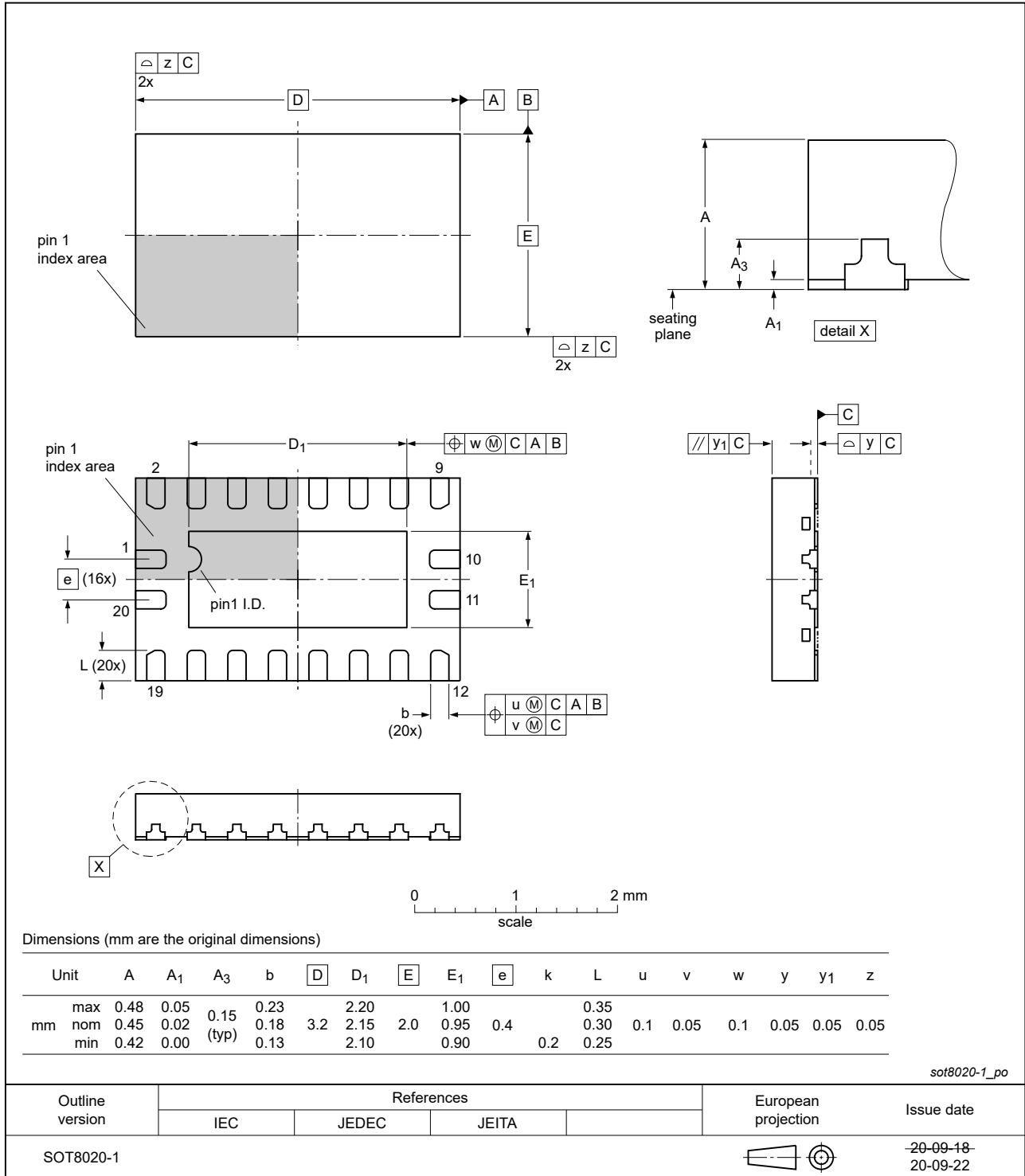


Fig. 13. Package outline SOT8020-1 (DHXQFN20)

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
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
74LVC_LVCH244A v.12	20210916	Product data sheet	-	74LVC_LVCH244A v.11
Modifications:	<ul style="list-style-type: none"> <li>Type number 74LVC244ADB (SOT339-1 / SSOP20) removed.</li> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> </ul>			
74LVC_LVCH244A v.11	20210429	Product data sheet	-	74LVC_LVCH244A v.10
Modifications:	<ul style="list-style-type: none"> <li>Type number 74LVC244ABZ (SOT8020-1 / DHXQFN20) added.</li> <li>Type number 74LVCH244ADB (SOT339-1 / SSOP20) removed.</li> </ul>			
74LVC_LVCH244A v.10	20200408	Product data sheet	-	74LVC_LVCH244A v.9
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74LVC_LVCH244A v.9	20180813	Product data sheet	-	74LVC_LVCH244A v.8
Modifications:	<ul style="list-style-type: none"> <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> <li>Type numbers 74LVC244ABX and 74LVCH244ABX (SOT1045-2) removed.</li> </ul>			
74LVC_LVCH244A v.8	20130626	Product data sheet	-	74LVC_LVCH244A v.7
Modifications:	<ul style="list-style-type: none"> <li>For type numbers 74LVC244ABX and 74LVCH244ABX DHXQFN20U (SOT1045-1) has changed to DHXQFN20 (SOT1045-2).</li> </ul>			
74LVC_LVCH244A v.7	20111122	Product data sheet	-	74LVC_LVCH244A v.6
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><a href="#">Table 4</a>, <a href="#">Table 5</a>, <a href="#">Table 6</a>, <a href="#">Table 7</a>, <a href="#">Table 8</a> and <a href="#">Table 9</a>: values added for lower voltage ranges.</li> </ul>			
74LVC_LVCH244A v.6	20090813	Product data sheet	-	74LVC_LVCH244A v.5
74LVC_LVCH244A v.5	20090709	Product data sheet	-	74LVC_LVCH244A v.4
74LVC_LVCH244A v.4	20031030	Product specification	-	74LVC_LVCH244A v.3
74LVC_LVCH244A v.3	20030520	Product specification	-	74LVC_H244A v.2
74LVC_H244A v.2	19980520	Product specification	-	74LVC244A_74LVCH244A v.1
74LVC244A_74LVCH244A v.1	19960906	Product specification	-	-

## 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".
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