

# 74LV244-Q100

Octal buffer/line driver; 3-state

Rev. 2 — 24 September 2021

Product data sheet

## 1. General description

The 74LV244-Q100 is an 8-bit buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ( $1\overline{OE}$  and  $2\overline{OE}$ ), each controlling four of the 3-state outputs. A HIGH on  $n\overline{OE}$  causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess  $V_{CC}$ .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- Wide supply voltage range from 1.0 to 5.5 V
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7\text{ V}$  and  $V_{CC} = 3.6\text{ V}$
- Typical  $V_{OLP}$  (output ground bounce)  $< 0.8\text{ V}$  at  $V_{CC} = 3.3\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot)  $> 2\text{ V}$  at  $V_{CC} = 3.3\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- Complies with JEDEC standards:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 V)
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LV244D-Q100	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LV244PW-Q100	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

### 4. Block diagram

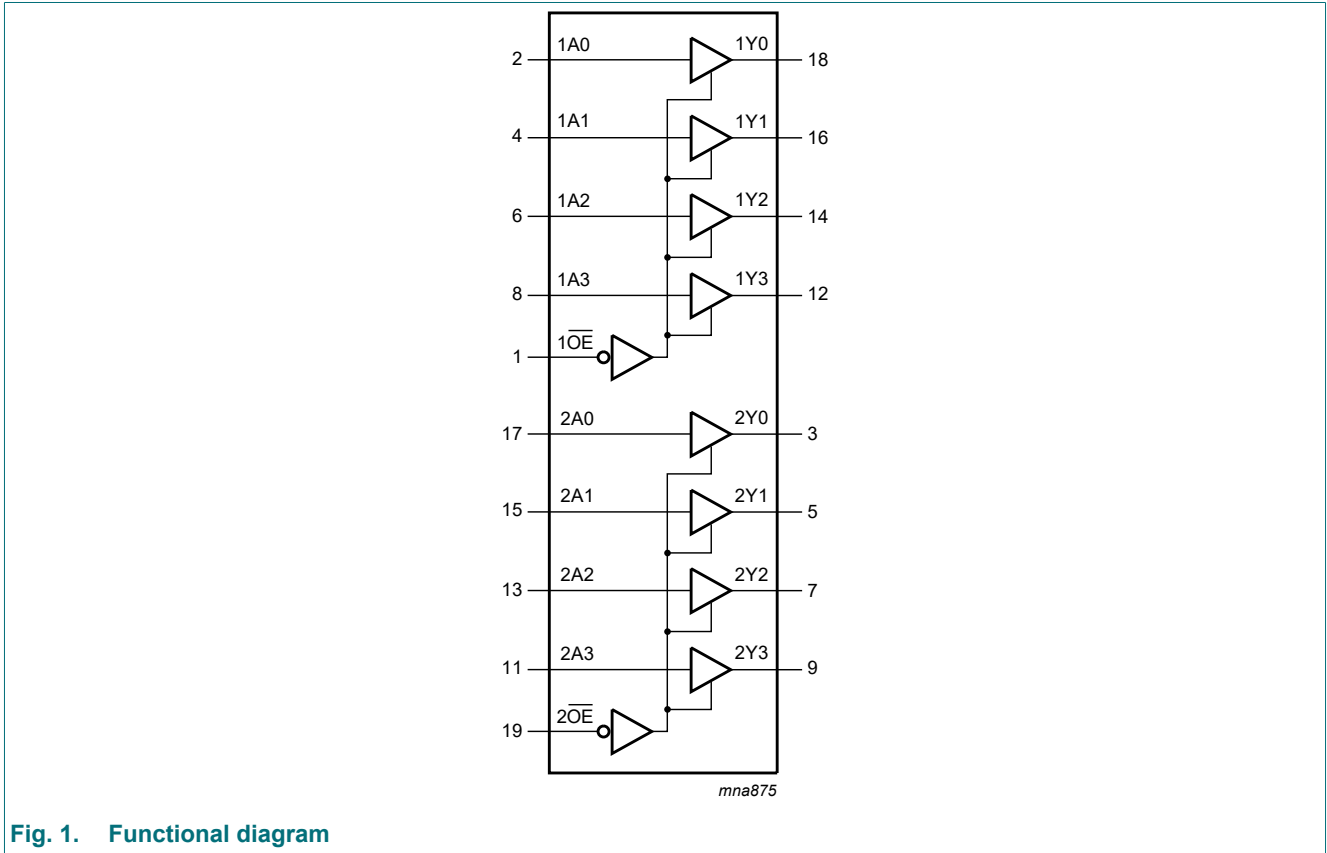


Fig. 1. Functional diagram

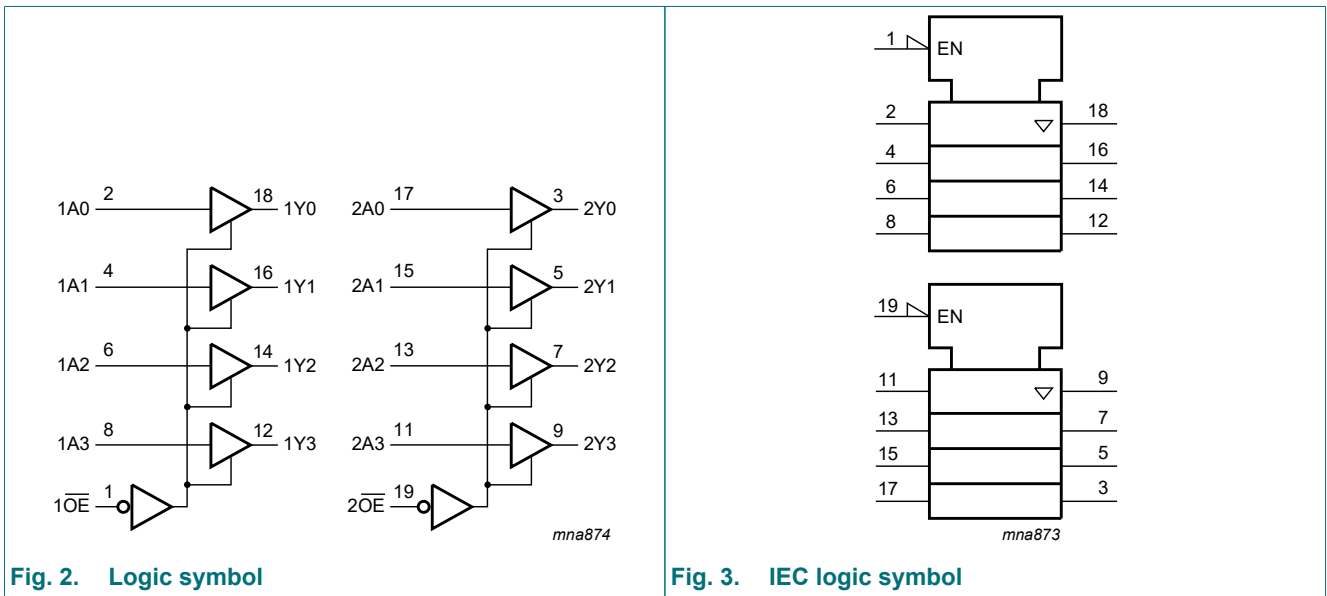


Fig. 2. Logic symbol

Fig. 3. IEC logic symbol

## 5. Pinning information

### 5.1. Pinning

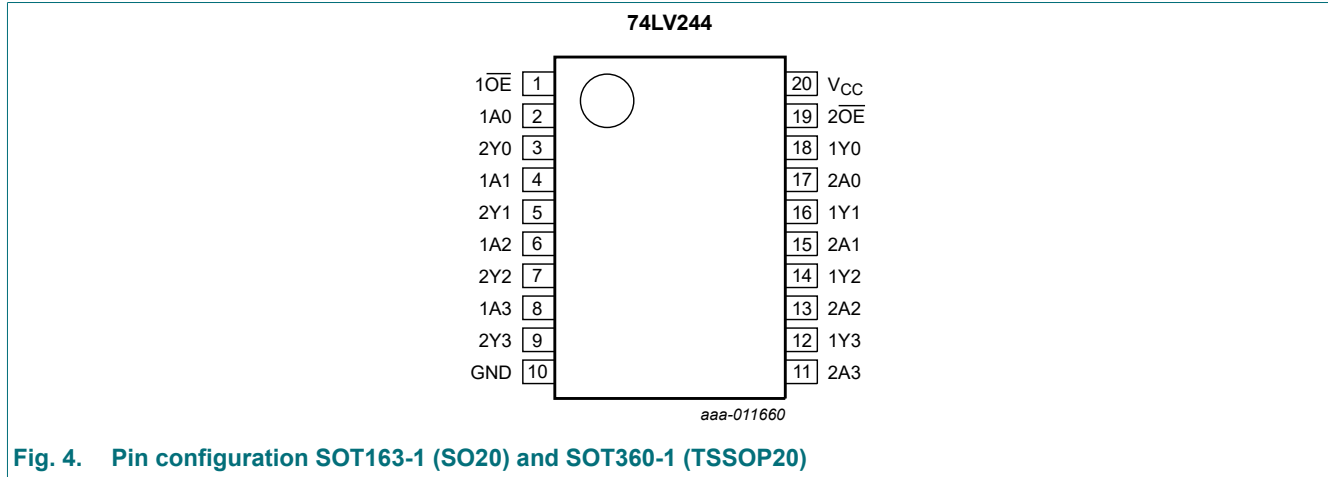


Fig. 4. Pin configuration SOT163-1 (SO20) and SOT360-1 (TSSOP20)

### 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	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
V <sub>CC</sub>	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.

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	+7.0	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 50$	mA
$I_O$	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	$\pm 35$	mA
$I_{CC}$	supply current		-	70	mA
$I_{GND}$	ground current		-70	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [1]	-	500	mW

- [1] 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.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	[1]	1.0	3.3	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$T_{amb}$	ambient temperature		-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.0\text{ V}$ to $2.0\text{ V}$	0	-	500	ns/V
		$V_{CC} = 2.0\text{ V}$ to $2.7\text{ V}$	0	-	200	ns/V
		$V_{CC} = 2.7\text{ V}$ to $3.6\text{ V}$	0	-	100	ns/V
		$V_{CC} = 3.6\text{ V}$ to $5.5\text{ V}$	0	-	50	ns/V

- [1] The LV is guaranteed to function down to  $V_{CC} = 1.0\text{ V}$  (input levels GND or  $V_{CC}$ ). DC characteristics are guaranteed from  $V_{CC} = 1.2\text{ V}$  to  $V_{CC} = 5.5\text{ V}$ .

## 9. Static characteristics

**Table 6. Static characteristics**

Over 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	0.9	-	-	0.9		V
		V <sub>CC</sub> = 2.0 V	1.4	-	-	1.4		V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0		V
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7V <sub>CC</sub>	-	-	0.7V <sub>CC</sub>		V
V <sub>IL</sub>	LOW level input voltage	V <sub>CC</sub> = 1.2 V	-	-	0.3		0.3	V
		V <sub>CC</sub> = 2.0 V	-	-	0.6		0.6	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8		0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3V <sub>CC</sub>		0.3V <sub>CC</sub>	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> = 1.2 V	-	1.2	-	-	-	V
		V <sub>CC</sub> = 2.0 V	1.8	2.0	-	1.8	-	V
		V <sub>CC</sub> = 2.7 V	2.5	2.7	-	2.5	-	V
		V <sub>CC</sub> = 3.0 V	2.8	3.0	-	2.8	-	V
		V <sub>CC</sub> = 4.5 V	4.3	4.5	-	4.3	-	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = -8 mA	2.40	2.82	-	2.20	-	V
V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -16 mA	3.60	4.20	-	3.50	-	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> = 1.2 V	-	0	-	-	-	V
		V <sub>CC</sub> = 2.0 V	-	0	0.2	-	0.2	V
		V <sub>CC</sub> = 2.7 V	-	0	0.2	-	0.2	V
		V <sub>CC</sub> = 3.0 V	-	0	0.2	-	0.2	V
		V <sub>CC</sub> = 4.5 V	-	0	0.2	-	0.2	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = 8 mA	-	0.25	0.40	-	0.50	V
		V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 16 mA	-	0.35	0.55	-	0.65	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	-	1.0	-	1.0	μA
I <sub>OZ</sub>	3-State output OFF-state current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND	-	-	5	-	10	μA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	-	20	-	160	μA
ΔI <sub>CC</sub>	additional supply current	per input; V <sub>CC</sub> = 2.7 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V	-	-	500	-	850	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	pF

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

GND (ground = 0 V); for test circuit, see Fig. 7

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	1An to 1Yn; 2An to 2Yn; see Fig. 5 [2]						
		V <sub>CC</sub> = 1.2 V	-	50		-	-	ns
		V <sub>CC</sub> = 2.0 V	-	17	24	-	31	ns
		V <sub>CC</sub> = 2.7 V	-	13	17	-	23	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	9	14	-	18	ns
		V <sub>CC</sub> = 3.3 V; C <sub>L</sub> = 15 pF	-	8	-	-	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	12	-	15	ns
t <sub>en</sub>	enable time	1 $\overline{O}E$ to 1Yn; 2 $\overline{O}E$ to 2Yn; see Fig. 6 [2]						
		V <sub>CC</sub> = 1.2 V	-	65	-	-	-	ns
		V <sub>CC</sub> = 2.0 V	-	22	39	-	49	ns
		V <sub>CC</sub> = 2.7 V	-	16	29	-	36	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	12	23	-	29	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	19	-	24	ns
t <sub>dis</sub>	disable time	1 $\overline{O}E$ to 1Yn; 2 $\overline{O}E$ to 2Yn; see Fig. 6 [2]						
		V <sub>CC</sub> = 1.2 V	-	60		-	-	ns
		V <sub>CC</sub> = 2.0 V	-	22	34	-	43	ns
		V <sub>CC</sub> = 2.7 V	-	17	24	-	32	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	13	21	-	26	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	16	-	19	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V [3]	-	35	-	-	-	ns

[1] Unless otherwise stated, all typical values are measured at T<sub>amb</sub> = 25 °C and nominal V<sub>CC</sub>.

[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] C<sub>PD</sub> is used to determine the dynamic power dissipation P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> + Σ (C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) (P<sub>D</sub> in μW), where:

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

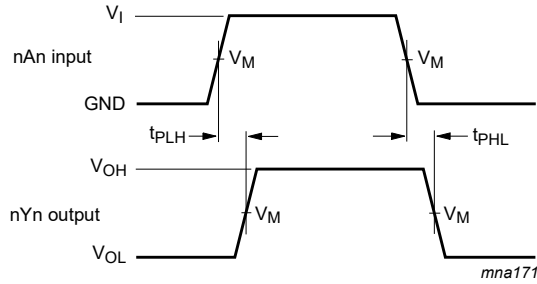
f<sub>o</sub> = output frequency in MHz;

Σ (C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs;

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

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

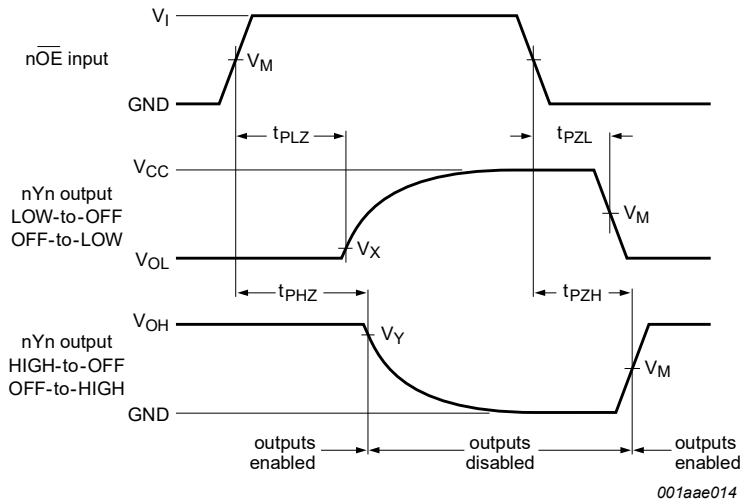
10.1. Waveforms and test circuit



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. Input (nAn) to output (nYn) propagation delays



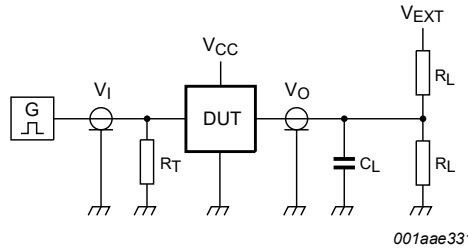
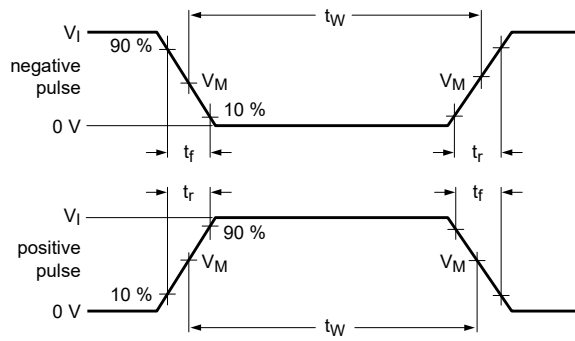
Measurement points are given in [Table 8](#).

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

Fig. 6. 3-state enable and disable times

Table 8. Measurement points

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
< 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.1V_{CC}$	$V_{OH} - 0.1V_{CC}$
2.7 V to 3.6 V	1.5 V	1.5 V	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$
$\geq 4.5 V$	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.1V_{CC}$	$V_{OH} - 0.1V_{CC}$



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

Definitions test circuit:

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

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

$R_L$  = Load resistance.

S1 = Test selection switch.

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

**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$		
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
< 2.7 V	$V_{CC}$	$\leq 2.5$ ns	50 pF	1 k $\Omega$	open	GND	$2V_{CC}$
2.7 V to 3.6 V	2.7 V	$\leq 2.5$ ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$2V_{CC}$
$\geq 4.5$ V	$V_{CC}$	$\leq 2.5$ ns	50 pF	1 k $\Omega$	open	GND	$2V_{CC}$



### 11. Package outline

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

SOT163-1

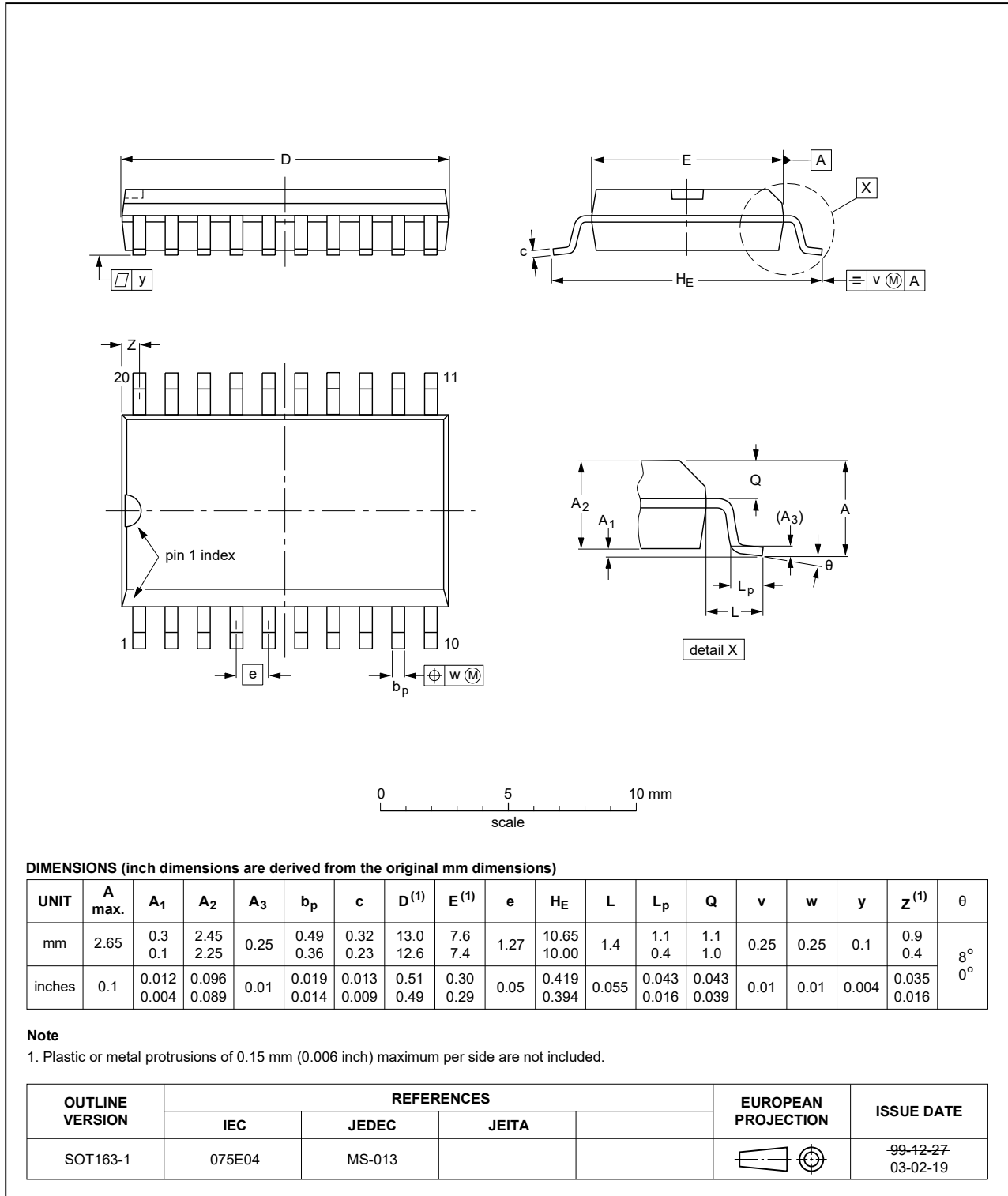


Fig. 8. Package outline SOT163-1 (SO20)

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

SOT360-1

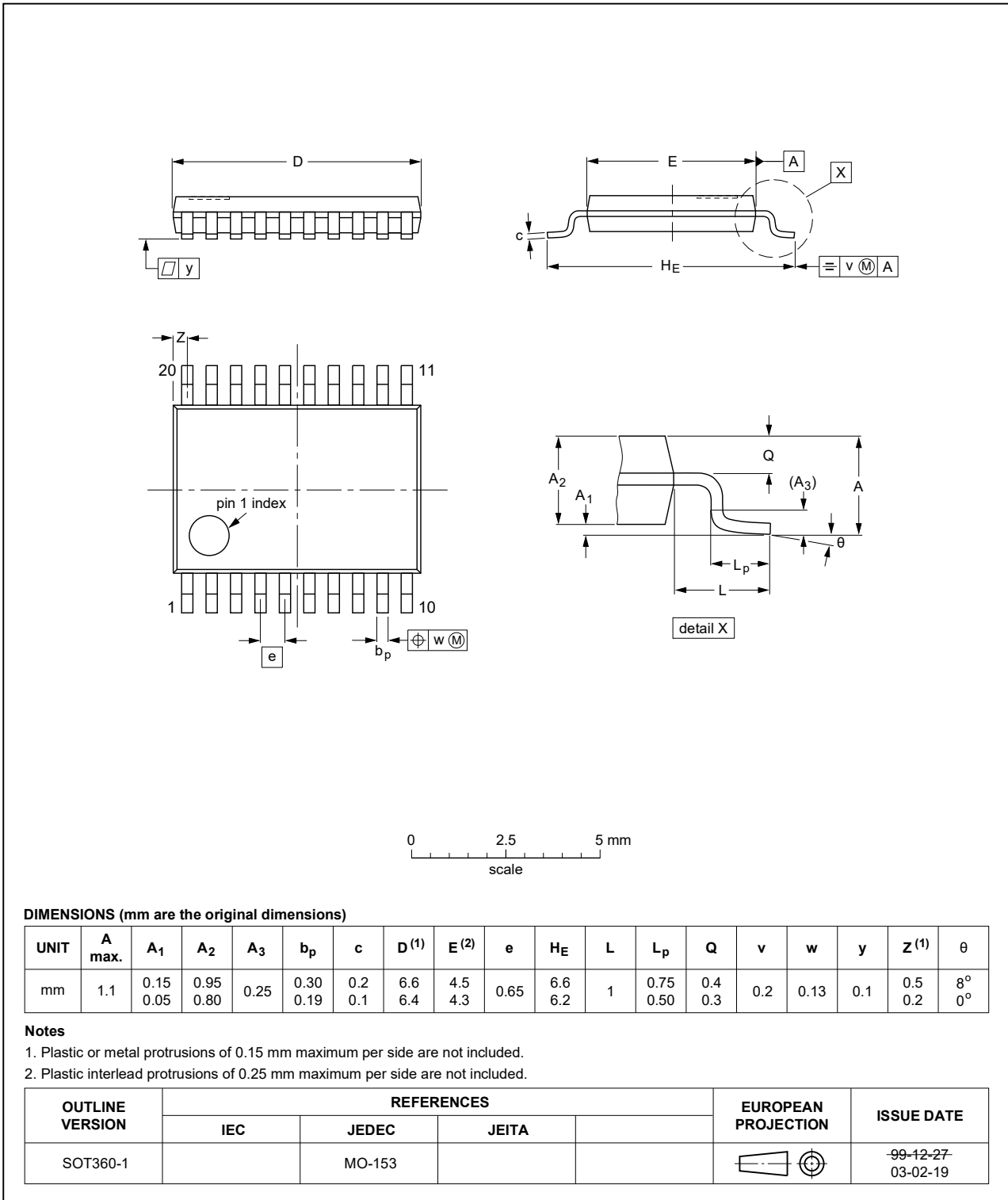


Fig. 9. Package outline SOT360-1 (TSSOP20)

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LV244_Q100 v.2	20210924	Product data sheet	-	74LV244_Q100 v.1
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><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li><a href="#">Section 7</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74LV244_Q100 v.1	20140519	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".
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