

74LVT244A-Q100; 74LVTH244A-Q100

3.3 V octal buffer/line driver; 3-state

Rev. 1 — 22 April 2013

Product data sheet

1. General description

The 74LVT244A-Q100; 74LVTH244A-Q100 is a high-performance BiCMOS product designed for V_{CC} operation at 3.3 V.

This device is an octal buffer that is ideal for driving bus lines. The device features two output enables (1OE, 2OE), each controlling four of the 3-state outputs.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 3) and is suitable for use in automotive applications.

2. Features and benefits

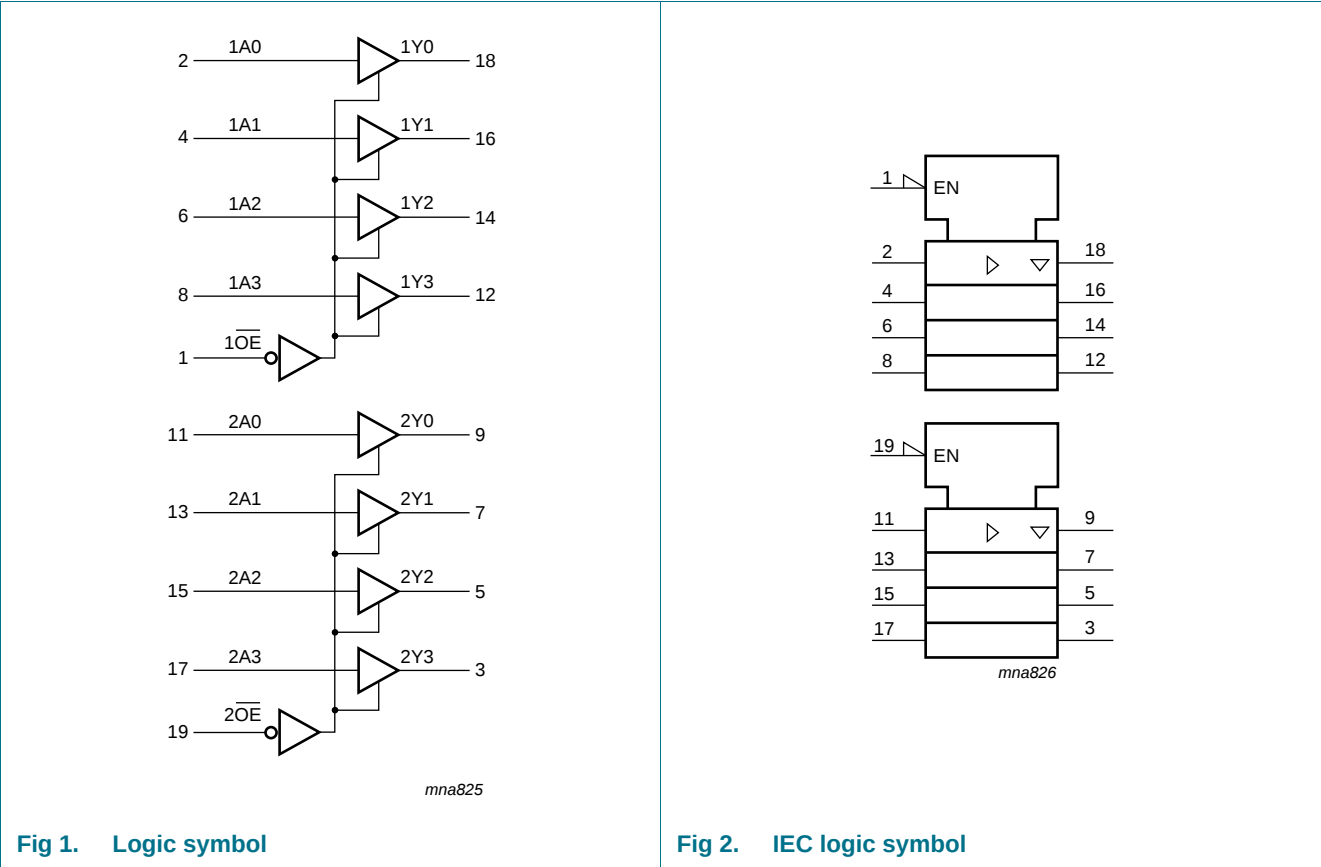
- Automotive product qualification in accordance with AEC-Q100 (Grade 3)
 - ◆ Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
- Octal bus interface
- 3-state buffers
- Output capability: +64 mA and -32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Bus hold data inputs eliminate need for external pull-up resistors to hold unused inputs
- Live insertion and extraction permitted
- Power-up 3-state
- No bus current loading when output is tied to 5 V bus
- Latch-up protection
 - ◆ JESD78 Class II exceeds 500 mA
- 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

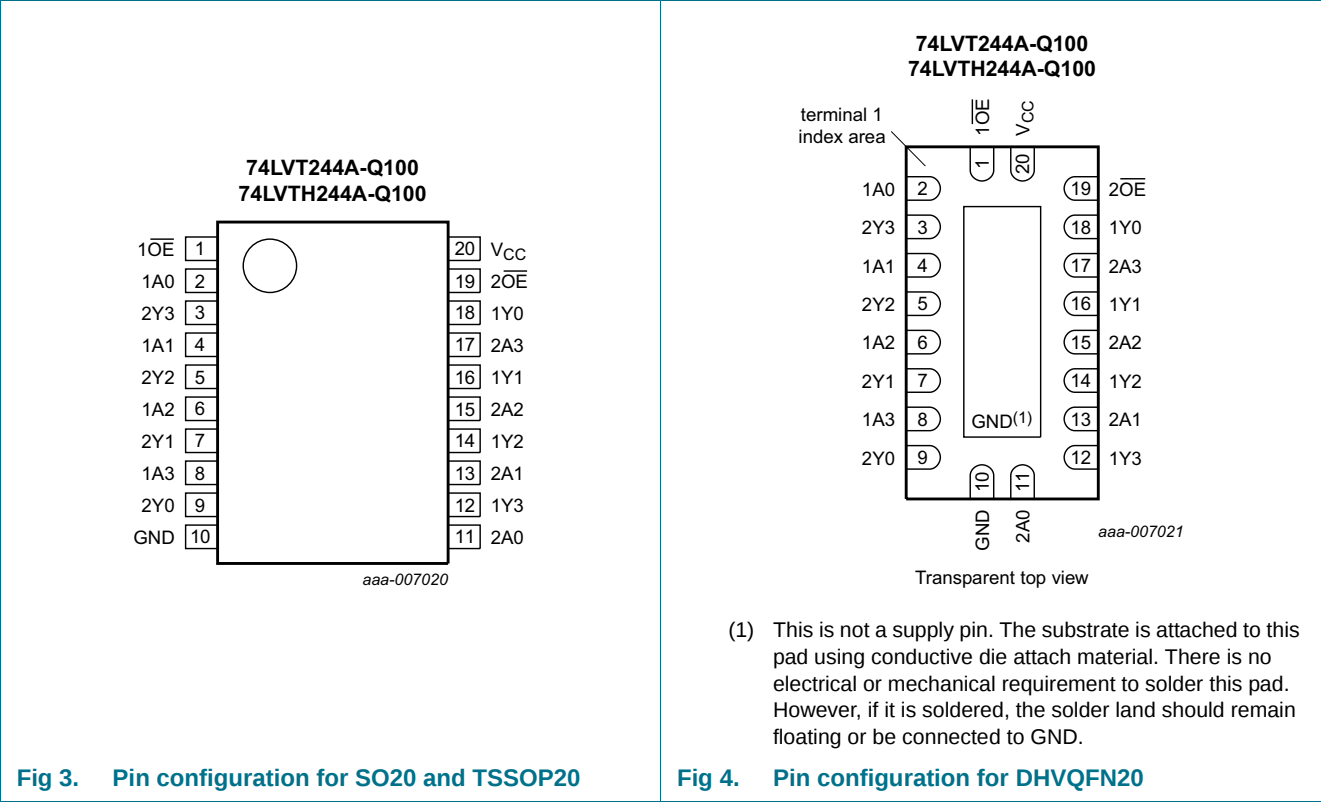
Type number	Package			
	Temperature range	Name	Description	Version
74LVT244AD-Q100	-40 °C to +85 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LVTH244AD-Q100				
74LVT244APW-Q100	-40 °C to +85 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74LVTH244APW-Q100				
74LVT244ABQ-Q100	-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
74LVTH244ABQ-Q100				

4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{1OE}$, $\overline{2OE}$	1, 19	output enable input (active low)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input
2Y0, 2Y1, 2Y2, 2Y3	9, 7, 5, 3	data output
GND	10	ground (0 V)
2A0, 2A1, 2A2, 2A3	11, 13, 15, 17	data input
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	data output
V _{CC}	20	supply voltage

6. Functional description

6.1 Function table

Table 3. Function table [\[1\]](#)

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

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

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	+4.6	V
V_I	input voltage		[1] -0.5	+7.0	V
V_O	output voltage	output in OFF-state or HIGH-state	[1] -0.5	+7.0	V
I_{IK}	input clamping current	$V_I < 0$ V	-	-50	mA
I_{OK}	output clamping current	$V_O < 0$ V	-	-50	mA
I_O	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-	-64	mA
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature		[2] -	150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ to $+85$ °C	[3]	500	mW

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

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

[3] For SO20 package: above 70 °C derate linearly with 8 mW/K.
 For TSSOP20 package: above 60 °C derate linearly with 5.5 mW/K.
 For DHVQFN20 package: above 60 °C derate linearly with 4.5 mW/K.

8. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		2.7	-	3.6	V
V_I	input voltage		0	-	5.5	V
I_{OH}	HIGH-level output current		-	-	-32	mA

Table 5. Operating conditions ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{OL}	LOW-level output current	none	-	-	32	mA
		current duty cycle $\leq 50\%$; $f_i \geq 1$ kHz	-	-	64	mA
T_{amb}	ambient temperature	in free-air	-40	-	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	outputs enabled	-	-	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	Min	Typ	Max	Unit
$T_{amb} = -40\text{ °C to }+85\text{ °C}$ [1]						
V_{IK}	input clamping voltage	$V_{CC} = 2.7\text{ V}$; $I_{IK} = -18\text{ mA}$	-1.2	-0.9	-	V
V_{IH}	HIGH-level input voltage		2.0	-	-	V
V_{IL}	LOW-level input voltage		-	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_{CC} = 2.7\text{ V to }3.6\text{ V}$; $I_{OH} = -100\text{ }\mu\text{A}$	$V_{CC} - 0.2$	$V_{CC} - 0.1$	-	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$; $I_{OH} = -8\text{ mA}$	2.4	2.5	-	V
		$V_{CC} = 3.0\text{ V}$; $I_{OH} = -32\text{ mA}$	2.0	2.2	-	V
V_{OL}	LOW-level output voltage	$V_{CC} = 2.7\text{ V}$; $I_{OL} = 100\text{ }\mu\text{A}$	-	0.1	0.2	V
		$V_{CC} = 2.7\text{ V}$; $I_{OL} = 24\text{ mA}$	-	0.3	0.5	V
		$V_{CC} = 3.0\text{ V}$; $I_{OL} = 16\text{ mA}$	-	0.25	0.4	V
		$V_{CC} = 3.0\text{ V}$; $I_{OL} = 32\text{ mA}$	-	0.3	0.5	V
		$V_{CC} = 3.0\text{ V}$; $I_{OL} = 64\text{ mA}$	-	0.4	0.55	V
I_I	input leakage current	all input pins				
		$V_{CC} = 0\text{ V or }3.6\text{ V}$; $V_I = 5.5\text{ V}$	-	0.1	10	μA
		control pins				
		$V_{CC} = 3.6\text{ V}$; $V_I = V_{CC}$ or GND	-	± 0.1	± 1	μA
		data pins [2]				
		$V_{CC} = 3.6\text{ V}$; $V_I = V_{CC}$	-	0.1	1	μA
		$V_{CC} = 3.6\text{ V}$; $V_I = 0\text{ V}$	-5	-1	-	μA
I_{OFF}	power-off leakage current	$V_{CC} = 0\text{ V}$; V_I or $V_O = 0\text{ V to }4.5\text{ V}$	-	1	± 100	μA
I_{BHL}	bus hold LOW current	$V_{CC} = 3\text{ V}$; $V_I = 0.8\text{ V}$ [3]	75	150	-	μA
I_{BHH}	bus hold HIGH current	$V_{CC} = 3\text{ V}$; $V_I = 2.0\text{ V}$	-	-150	-75	μA
I_{BHLO}	bus hold LOW overdrive current	nAn input; $V_{CC} = 0\text{ V to }3.6\text{ V}$; $V_I = 3.6\text{ V}$	500	-	-	μA
I_{BHHO}	bus hold HIGH overdrive current	nAn input; $V_{CC} = 0\text{ V to }3.6\text{ V}$; $V_I = 3.6\text{ V}$	-	-	-500	μA
I_{LO}	output leakage current	nYn output in HIGH-state when $V_O > V_{CC}$; $V_O = 5.5\text{ V}$; $V_{CC} = 3.0\text{ V}$	-	60	125	μA
$I_{O(pu/pd)}$	power-up/power-down output current	$V_{CC} \leq 1.2\text{ V}$; $V_O = 0.5\text{ V to }V_{CC}$; $V_I = \text{GND or }V_{CC}$; nOE = don't care [4]	-	± 1	± 100	μA

Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{OZ}	OFF-state output current	$V_{CC} = 3.6\text{ V}$; $V_I = V_{IH}$ or V_{IL}				
		$V_O = 3.0\text{ V}$	-	1	5	μA
		$V_O = 0.5\text{ V}$	-5	-1	-	μA
I_{CC}	supply current	$V_{CC} = 3.6\text{ V}$; $V_I = \text{GND}$ or V_{CC} ; $I_O = 0\text{ A}$				
		output HIGH	-	0.13	0.19	mA
		output LOW	-	3	12	mA
		outputs disabled [5]	-	0.13	0.19	mA
ΔI_{CC}	additional supply current	per input pin; $V_{CC} = 3.0\text{ V}$ to 3.6 V ; one input at $V_{CC} - 0.6\text{ V}$ and other inputs at V_{CC} or GND [6]	-	0.1	0.2	mA
C_I	input capacitance	$V_I = 0\text{ V}$ or 3.0 V	-	4	-	pF
C_O	output capacitance	outputs disabled; $V_O = 0\text{ V}$ or 3.0 V	-	8	-	pF

[1] All typical values are at $T_{amb} = 25\text{ }^\circ\text{C}$.[2] Unused pins at V_{CC} or GND.

[3] This is the bus hold overdrive current required to force the input to the opposite logic state.

[4] This parameter is valid for any V_{CC} between 0 V and 1.2 V with a transition time of up to 10 ms. From $V_{CC} = 1.2\text{ V}$ to $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ a transition time of 100 μs is permitted. This parameter is valid for $T_{amb} = 25\text{ }^\circ\text{C}$ only.[5] I_{CC} is measured with outputs pulled to V_{CC} or GND.[6] This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

10. Dynamic characteristics

Table 7. Dynamic characteristicsVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

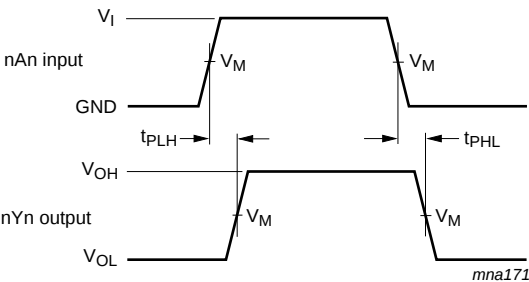
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$ [1]						
t_{PLH}	LOW to HIGH propagation delay	nAn to nYn; see Figure 5				
		$V_{CC} = 2.7\text{ V}$	-	-	5.0	ns
		$V_{CC} = 3.0\text{ V}$ to 3.6 V	1	2.5	4.1	ns
t_{PHL}	HIGH to LOW propagation delay	nAn to nYn; see Figure 5				
		$V_{CC} = 2.7\text{ V}$	-	-	5.1	ns
		$V_{CC} = 3.0\text{ V}$ to 3.6 V	1	2.6	4.1	ns
t_{PZH}	OFF-state to HIGH propagation delay	see Figure 6				
		$V_{CC} = 2.7\text{ V}$	-	-	6.3	ns
		$V_{CC} = 3.0\text{ V}$ to 3.6 V	1	3.2	5.2	ns
t_{PZL}	OFF-state to LOW propagation delay	see Figure 6				
		$V_{CC} = 2.7\text{ V}$	-	-	6.7	ns
		$V_{CC} = 3.0\text{ V}$ to 3.6 V	1.1	3.1	5.2	ns
t_{PHZ}	HIGH to OFF-state propagation delay	see Figure 6				
		$V_{CC} = 2.7\text{ V}$	-	-	6.3	ns
		$V_{CC} = 3.0\text{ V}$ to 3.6 V	1.9	3.3	5.6	ns

Table 7. Dynamic characteristics ...continued
Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 7.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t _{PLZ}	LOW to OFF-state propagation delay	see Figure 6				
		V _{CC} = 2.7 V	-	-	5.6	ns
		V _{CC} = 3.0 V to 3.6 V	1.8	3.3	5.1	ns

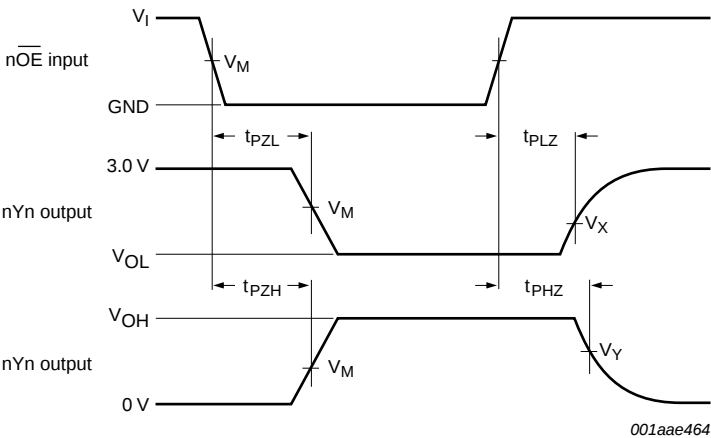
[1] All typical values are at V_{CC} = 3.3 V and T_{amb} = 25 °C.

11. Waveforms



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. Propagation delay input (nAn) to output (nYn) propagation delays

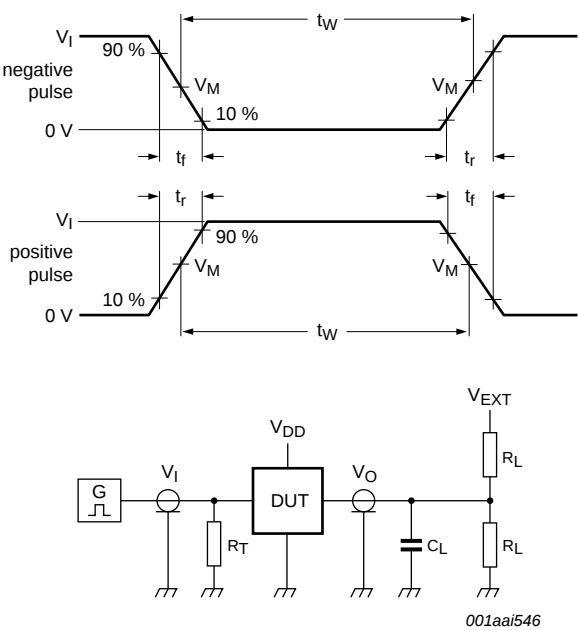


Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 6. 3-state output enable and disable times

Table 8. Measurement points

Input	Output		
V _M	V _M	V _X	V _Y
1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V



Test data is given in [Table 9](#).
Definitions 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} = Test voltage for switching times.

Fig 7. Test circuit for measuring switching times

Table 9. Test data

Input				Load		V_{EXT}		
V_I	f_i	t_W	t_r, t_f	C_L	R_L	t_{PHZ}, t_{PZH}	t_{PLZ}, t_{PZL}	t_{PLH}, t_{PHL}
2.7 V	≤ 10 MHz	500 ns	≤ 2.5 ns	50 pF	500 Ω	GND	6 V	open

12. Package outline

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

SOT163-1

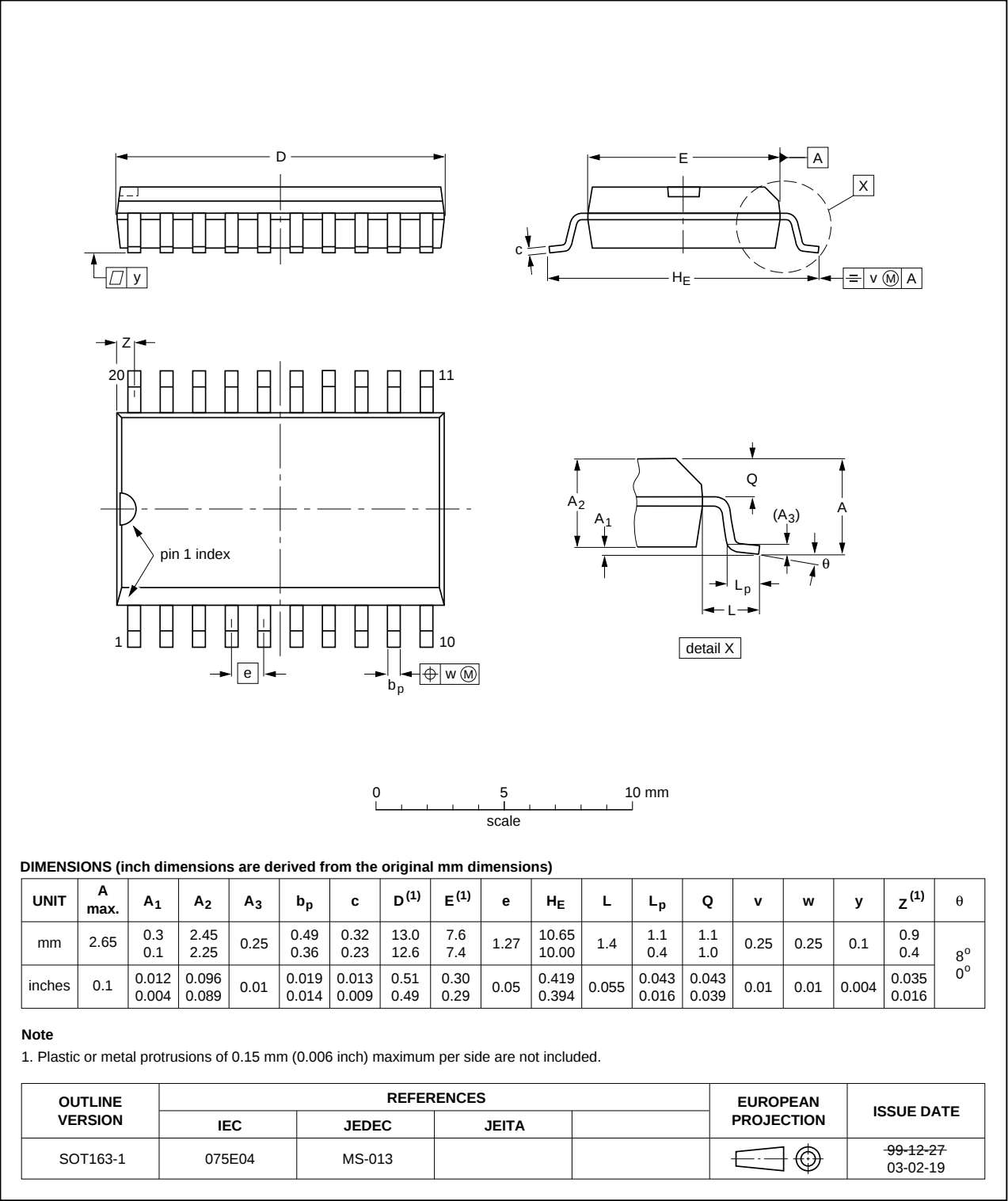


Fig 8. Package outline SOT163-1 (SO20)

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

SOT360-1

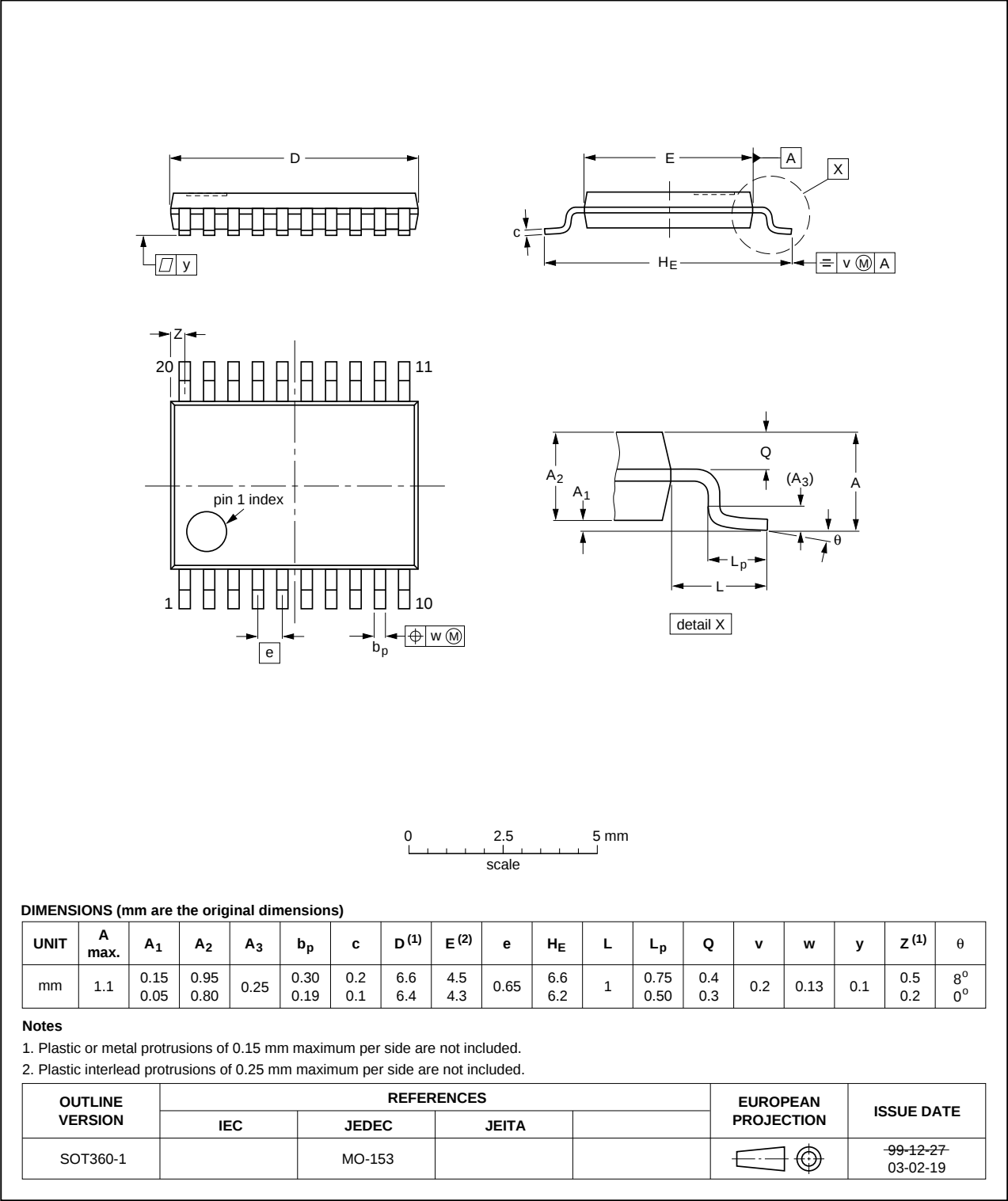


Fig 9. Package outline SOT360-1 (TSSOP20)

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

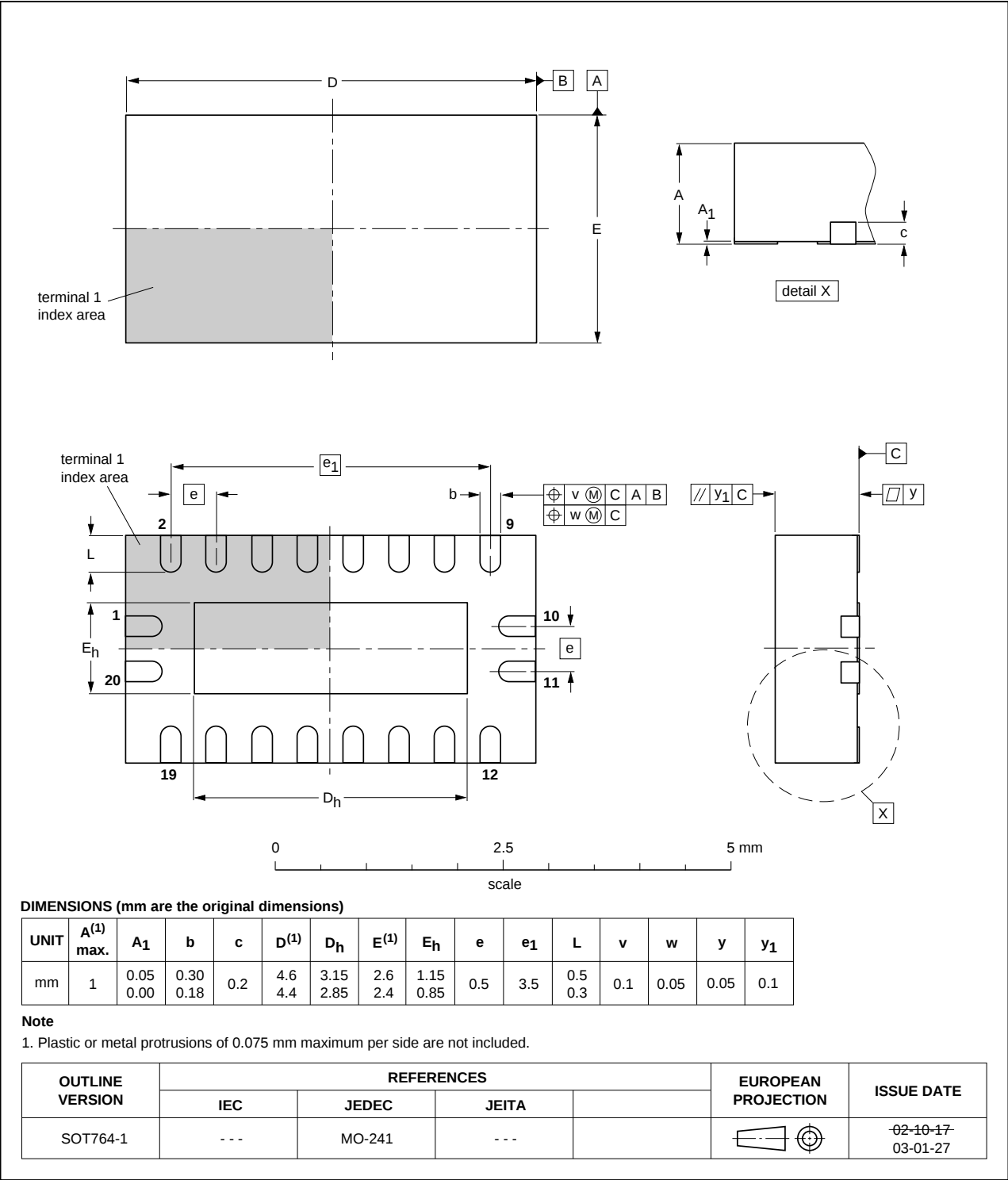


Fig 10. Package outline SOT764-1 (DHVQFN20)

13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH244A_Q100 v.1	20130422	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".

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