

74LV244

Octal buffer/line driver; 3-state

Rev. 03 — 28 September 2007

Product data sheet

1. General description

The 74LV244 is a low-voltage Si-gate CMOS device that is pin and function compatible with 74HC244 and 74HCT244.

The 74LV244 has octal non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $\overline{1OE}$ and $\overline{2OE}$. A HIGH on \overline{nOE} causes the outputs to assume a high-impedance OFF-state. The 74LV244 is identical to the 74LV240 but has non-inverting outputs.

2. Features

- Wide operating voltage: 1.0 V to 5.5 V
- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Typical output ground bounce < 0.8 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- Typical HIGH-level output voltage (V_{OH}) undershoot: > 2 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- ESD protection:
 - ◆ HBM JESD22-A114E exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LV244N	-40 °C to $+125$ °C	DIP20	plastic dual in-line package; 20 leads (300 mil)	SOT146-1
74LV244D	-40 °C to $+125$ °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74LV244DB	-40 °C to $+125$ °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74LV244PW	-40 °C to $+125$ °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74LV244BQ	-40 °C to $+125$ °C	DHVQFN20	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body $2.5 \times 4.5 \times 0.85$ mm	SOT764-1

4. Functional diagram

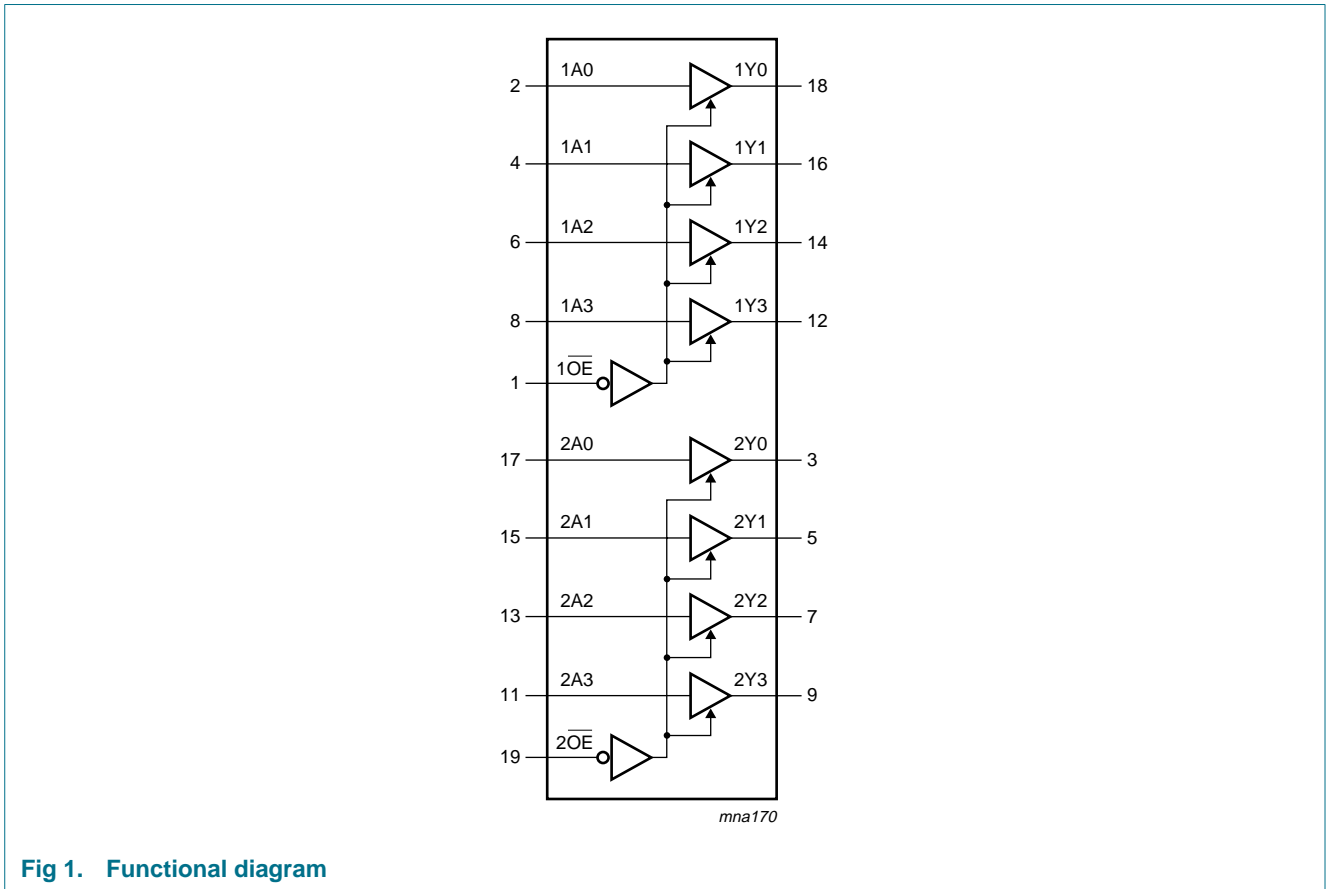


Fig 1. Functional diagram

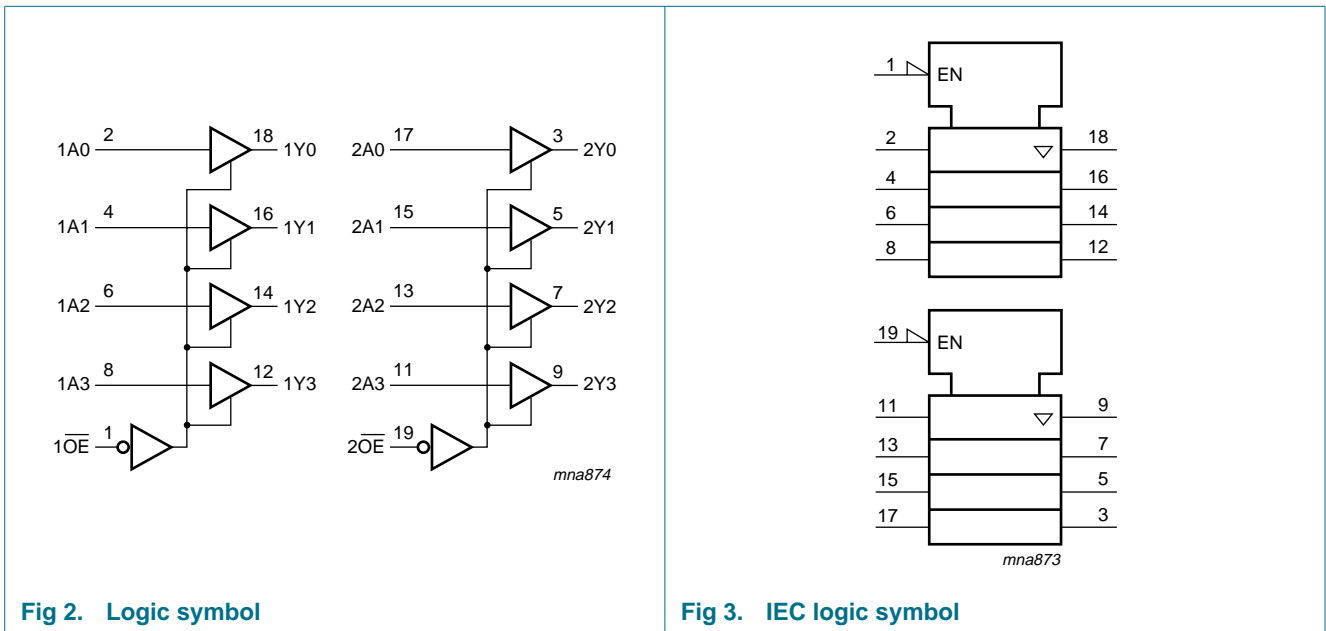
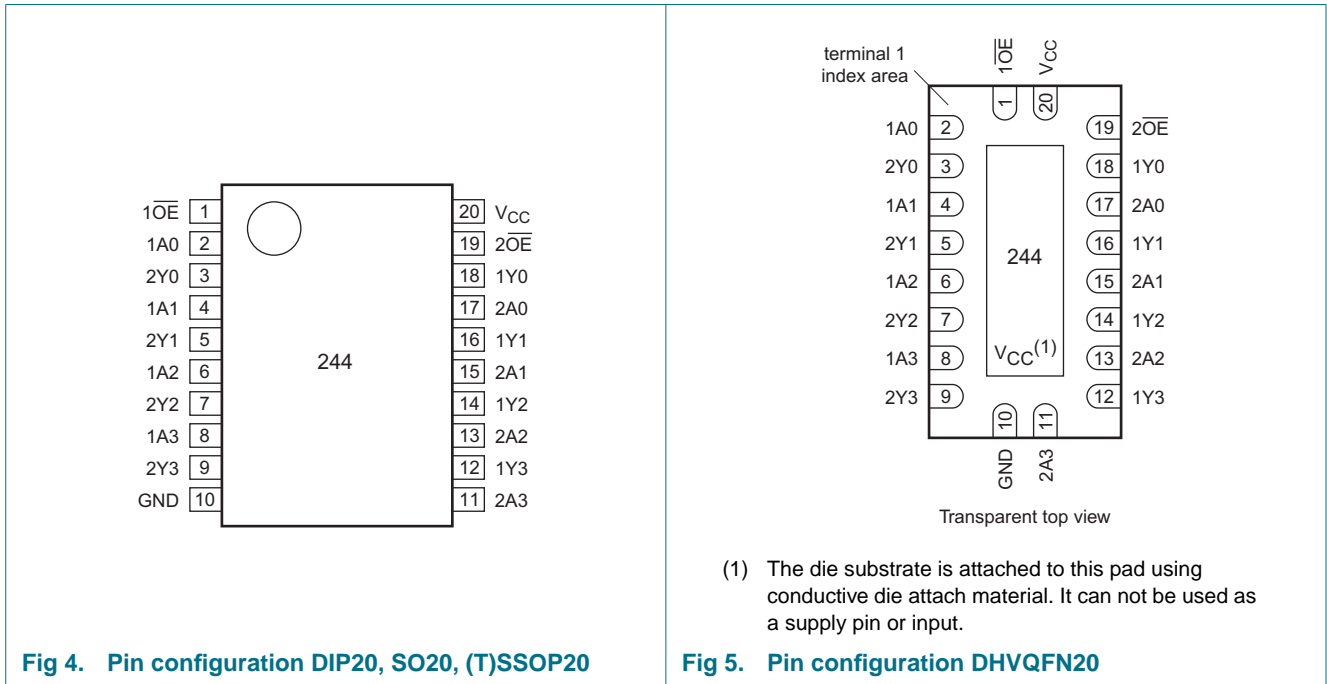


Fig 2. Logic symbol

Fig 3. IEC logic symbol

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2: Pin description

Symbol	Pin	Description
1OE	1	output enable input (active LOW)
1A[0:3]	2, 4, 6, 8	data input
2A[0:3]	17, 15, 13, 11	data input
1Y[0:3]	18, 16, 14, 12	data output
2Y[0:3]	3, 5, 7, 9	data output
GND	10	ground (0 V)
2OE	19	output enable input (active LOW)
V _{CC}	20	supply voltage

6. Functional description

Table 3: Function table^[1]

Control	Input	Output
$\overline{\text{nOE}}$	nAn	nYn
L	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	+7.0	V
I_{IK}	input clamping current	$V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$	[1] -	± 20	mA
I_{OK}	output clamping current	$V_O < -0.5 \text{ V}$ or $V_O > V_{CC} + 0.5 \text{ V}$	[1] -	± 50	mA
I_O	output current	$V_O = -0.5 \text{ V}$ to $(V_{CC} + 0.5 \text{ V})$	-	± 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 $+125 \text{ °C}$			
	DIP20 package		[2] -	750	mW
	SO20 package		[3] -	500	mW
	(T)SSOP20 package		[4] -	500	mW
	DHVQFN20 package		[5] -	500	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] P_{tot} derates linearly with 12 mW/K above 70 °C.
[3] P_{tot} derates linearly with 8 mW/K above 70 °C.
[4] P_{tot} derates linearly with 5.5 mW/K above 60 °C.
[5] P_{tot} derates linearly with 4.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

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

Table 5. Recommended operating conditions ...continued

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb}	ambient temperature		-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.0\text{ V to }2.0\text{ V}$	-	-	500	ns/V
		$V_{CC} = 2.0\text{ V to }2.7\text{ V}$	-	-	200	ns/V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	-	-	100	ns/V
		$V_{CC} = 3.6\text{ V to }5.5\text{ V}$	-	-	50	ns/V

[1] The static characteristics are guaranteed from $V_{CC} = 1.2\text{ V}$ to $V_{CC} = 5.5\text{ V}$, but LV devices are guaranteed to function down to $V_{CC} = 1.0\text{ V}$ (with input levels GND or V_{CC}).

9. Static characteristics

Table 6. Static characteristics

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_{IH}	HIGH-level input voltage	$V_{CC} = 1.2\text{ V}$	0.9	-	-	0.9	-	V
		$V_{CC} = 2.0\text{ V}$	1.4	-	-	1.4	-	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2.0	-	-	2.0	-	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.2\text{ V}$	-	-	0.3	-	0.3	V
		$V_{CC} = 2.0\text{ V}$	-	-	0.6	-	0.6	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	-	-	0.8	-	0.8	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 1.2\text{ V}$	-	1.2	-	-	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	1.8	2.0	-	1.8	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 2.7\text{ V}$	2.5	2.7	-	2.5	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 3.0\text{ V}$	2.8	3.0	-	2.8	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	4.3	4.5	-	4.3	-	V
		$I_O = -8\text{ mA}; V_{CC} = 3.0\text{ V}$	2.4	2.82	-	2.2	-	V
$I_O = -16\text{ mA}; V_{CC} = 4.5\text{ V}$	3.6	4.2	-	3.5	-	V		
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = 100\text{ }\mu\text{A}; V_{CC} = 1.2\text{ V}$	-	0	-	-	-	V
		$I_O = 100\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	-	0	0.2	-	0.2	V
		$I_O = 100\text{ }\mu\text{A}; V_{CC} = 2.7\text{ V}$	-	0	0.2	-	0.2	V
		$I_O = 100\text{ }\mu\text{A}; V_{CC} = 3.0\text{ V}$	-	0	0.2	-	0.2	V
		$I_O = 100\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	-	0	0.2	-	0.2	V
		$I_O = 8\text{ mA}; V_{CC} = 3.0\text{ V}$	-	0.25	0.40	-	0.50	V
$I_O = 16\text{ mA}; V_{CC} = 4.5\text{ V}$	-	0.35	0.55	-	0.65	V		
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	1.0	-	1.0	μA

Table 6. Static characteristics ...continued
 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	
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V	-	-	5	-	10	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	20	-	160	μA
ΔI _{CC}	additional supply current	per input; V _I = V _{CC} - 0.6 V; V _{CC} = 2.7 V to 3.6 V	-	-	500	-	850	μA
C _I	input capacitance		-	3.5	-	-	-	pF

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

10. Dynamic characteristics

Table 7. Dynamic characteristics
 GND = 0 V; For test circuit see [Figure 8](#).

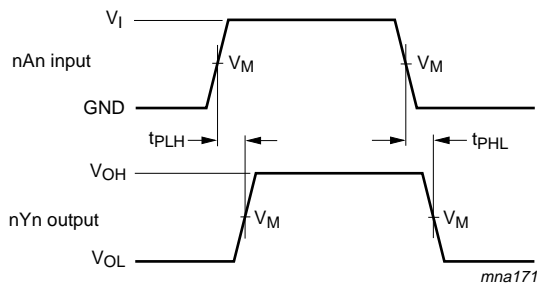
Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
t _{pd}	propagation delay	nAn to nYn; see Figure 6 ^[2]						
		V _{CC} = 1.2 V	-	50	-	-	-	ns
		V _{CC} = 2.0 V	-	17	24	-	31	ns
		V _{CC} = 2.7 V	-	13	17	-	23	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3]	-	8	-	-	-	ns
		V _{CC} = 3.0 V to 3.6 V ^[3]	-	9	14	-	18	ns
		V _{CC} = 4.5 V to 5.5 V	-	-	12	-	15	ns
t _{en}	enable time	nOE to nYn; see Figure 7 ^[2]						
		V _{CC} = 1.2 V	-	65	-	-	-	ns
		V _{CC} = 2.0 V	-	22	39	-	49	ns
		V _{CC} = 2.7 V	-	16	29	-	36	ns
		V _{CC} = 3.0 V to 3.6 V ^[3]	-	12	23	-	29	ns
		V _{CC} = 4.5 V to 5.5 V	-	-	19	-	24	ns
t _{dis}	disable time	nOE to nYn; see Figure 7 ^[2]						
		V _{CC} = 1.2 V	-	60	-	-	-	ns
		V _{CC} = 2.0 V	-	22	34	-	43	ns
		V _{CC} = 2.7 V	-	17	24	-	32	ns
		V _{CC} = 3.0 V to 3.6 V ^[3]	-	13	21	-	26	ns
		V _{CC} = 4.5 V to 5.5 V	-	-	16	-	19	ns

Table 7. Dynamic characteristics ...continued
GND = 0 V; For test circuit see Figure 8.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
C _{PD}	power dissipation capacitance	C _L = 50 pF; f _i = 1 MHz; V _I = GND to V _{CC}	-	35	-	-	-	pF

- [1] All typical values are measured at T_{amb} = 25 °C.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}.
 t_{en} is the same as t_{PZL} and t_{PZH}.
 t_{dis} is the same as t_{PLZ} and t_{PHZ}.
- [3] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V).
- [4] C_{PD} is used to determine the dynamic power dissipation (P_D 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_i = input frequency in MHz, f_o = output frequency in MHz
 C_L = output load capacitance in pF
 V_{CC} = supply voltage in Volts
 N = number of inputs switching
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

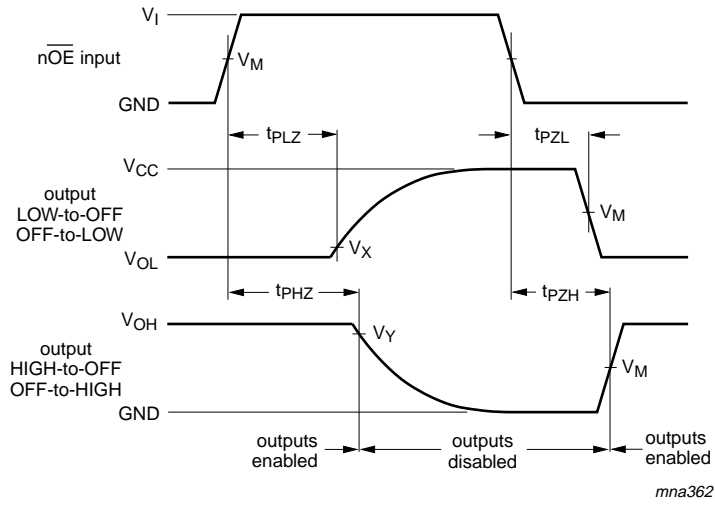
11. Waveforms



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

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

Fig 6. The input (nAn) to output (nYn) propagation delays



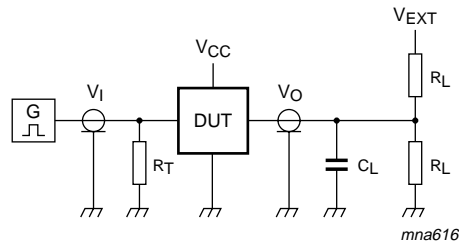
Measurement points are given in [Table 8](#).

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

Fig 7. 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
≥ 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_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.

Fig 8. Load circuit for 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}	$\leq 2.5 \text{ ns}$	50 pF	1 k Ω	open	GND	$2V_{CC}$
2.7 V to 3.6 V	2.7 V	$\leq 2.5 \text{ ns}$	15 pF, 50 pF	1 k Ω	open	GND	$2V_{CC}$
$\geq 4.5 \text{ V}$	V_{CC}	$\leq 2.5 \text{ ns}$	50 pF	1 k Ω	open	GND	$2V_{CC}$

12. Package outline

DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1

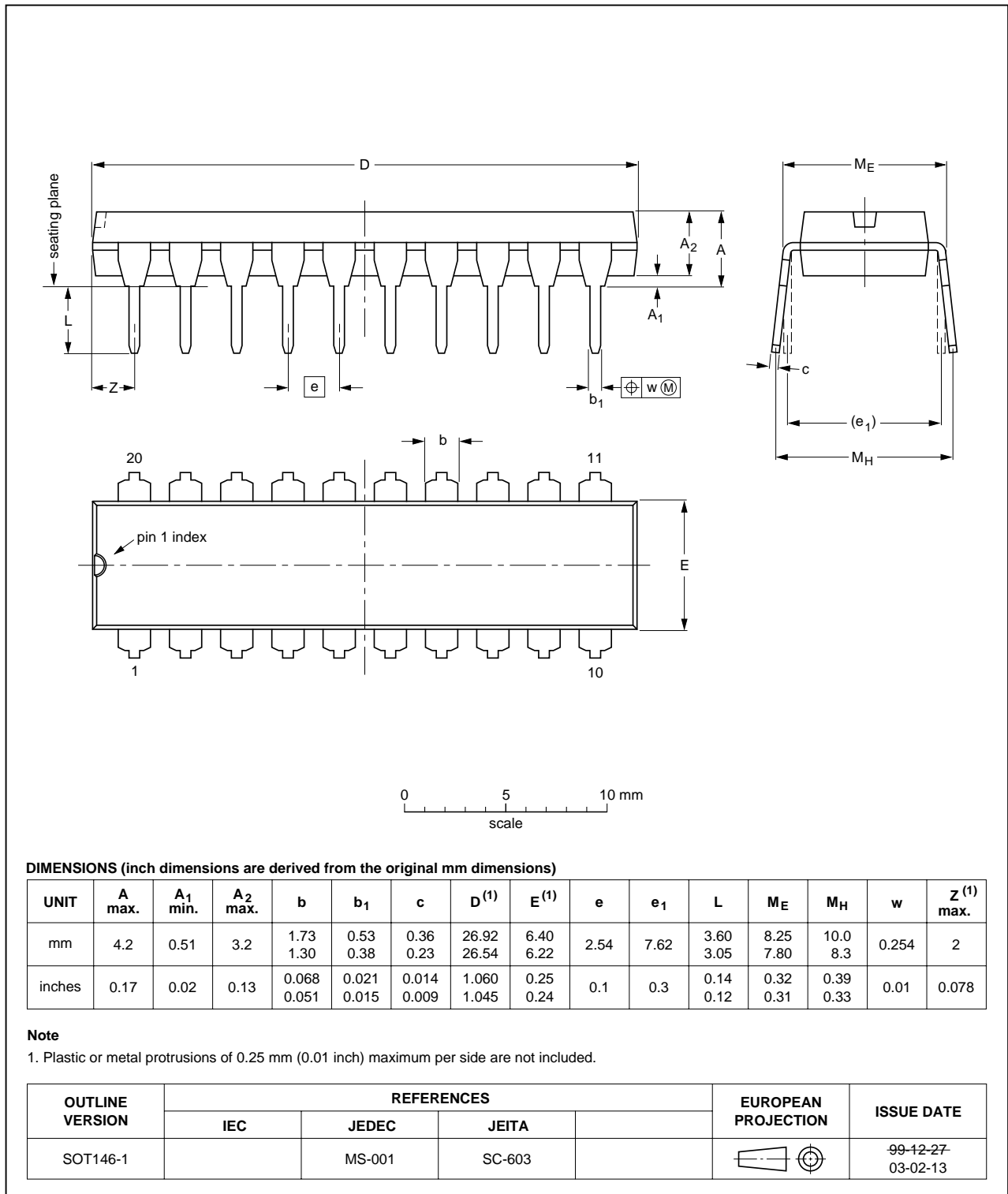


Fig 9. Package outline SOT146-1 (DIP20)

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

SOT163-1

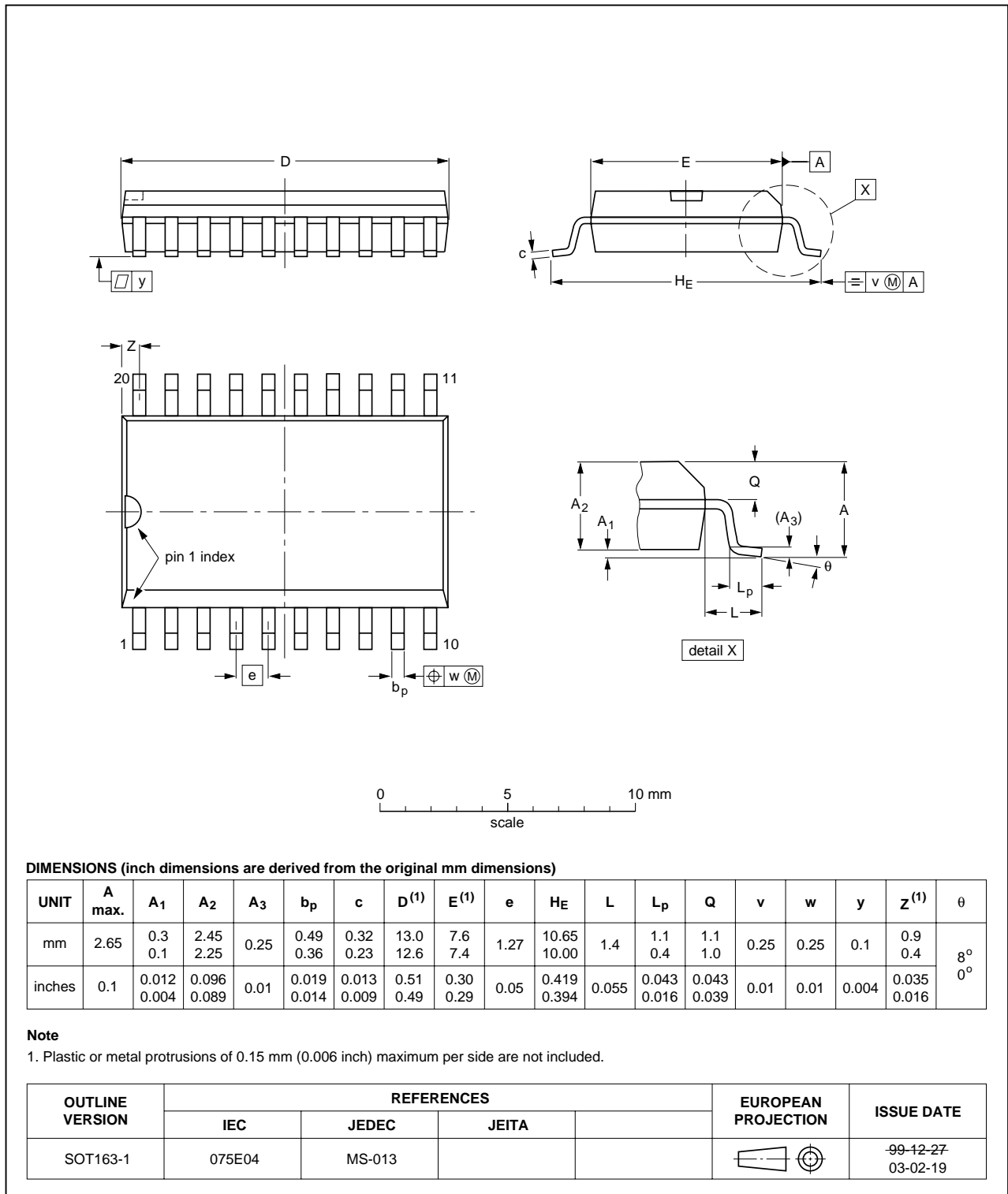


Fig 10. Package outline SOT163-1 (SO20)

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

SOT339-1

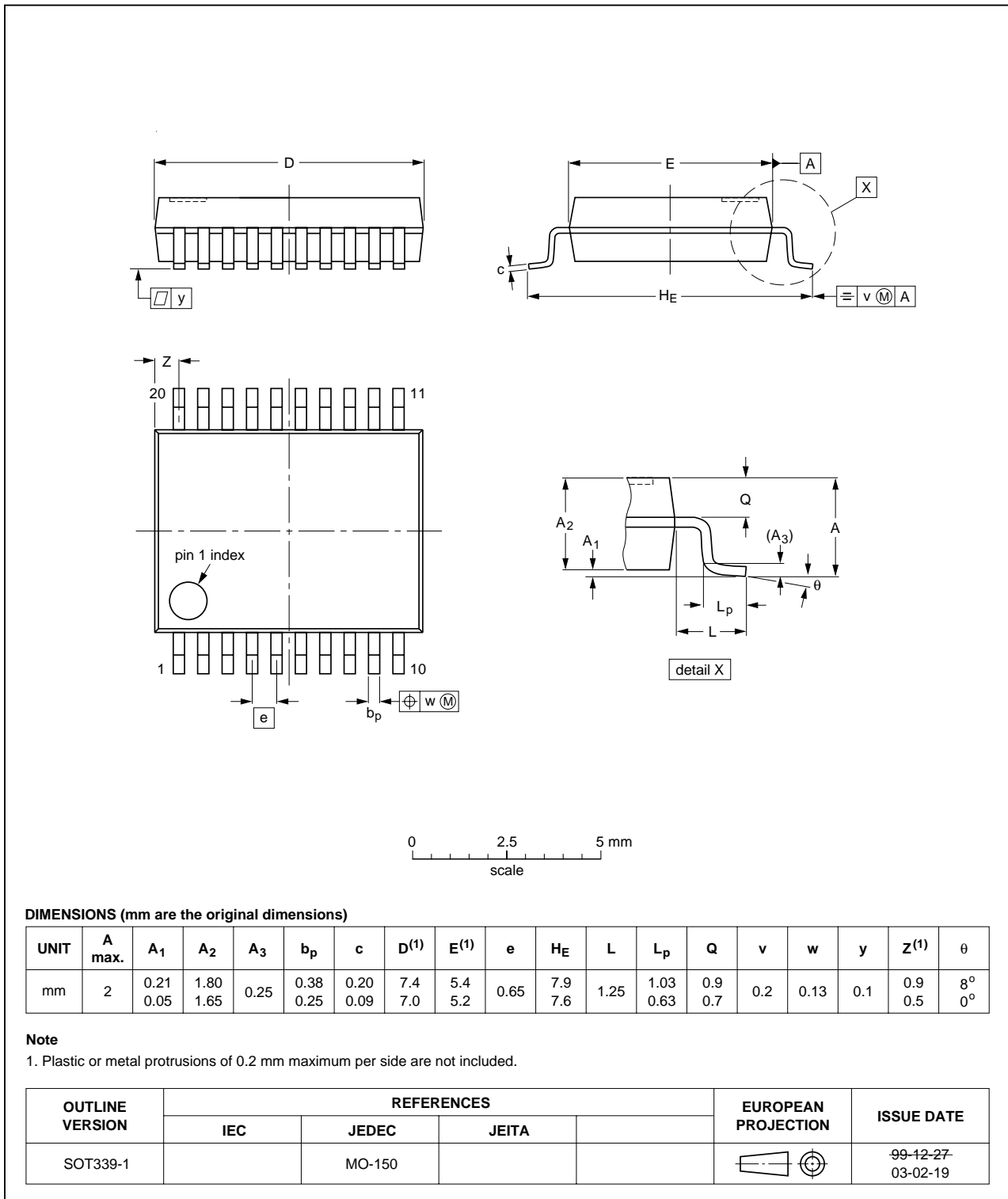


Fig 11. Package outline SOT339-1 (SSOP20)

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

SOT360-1

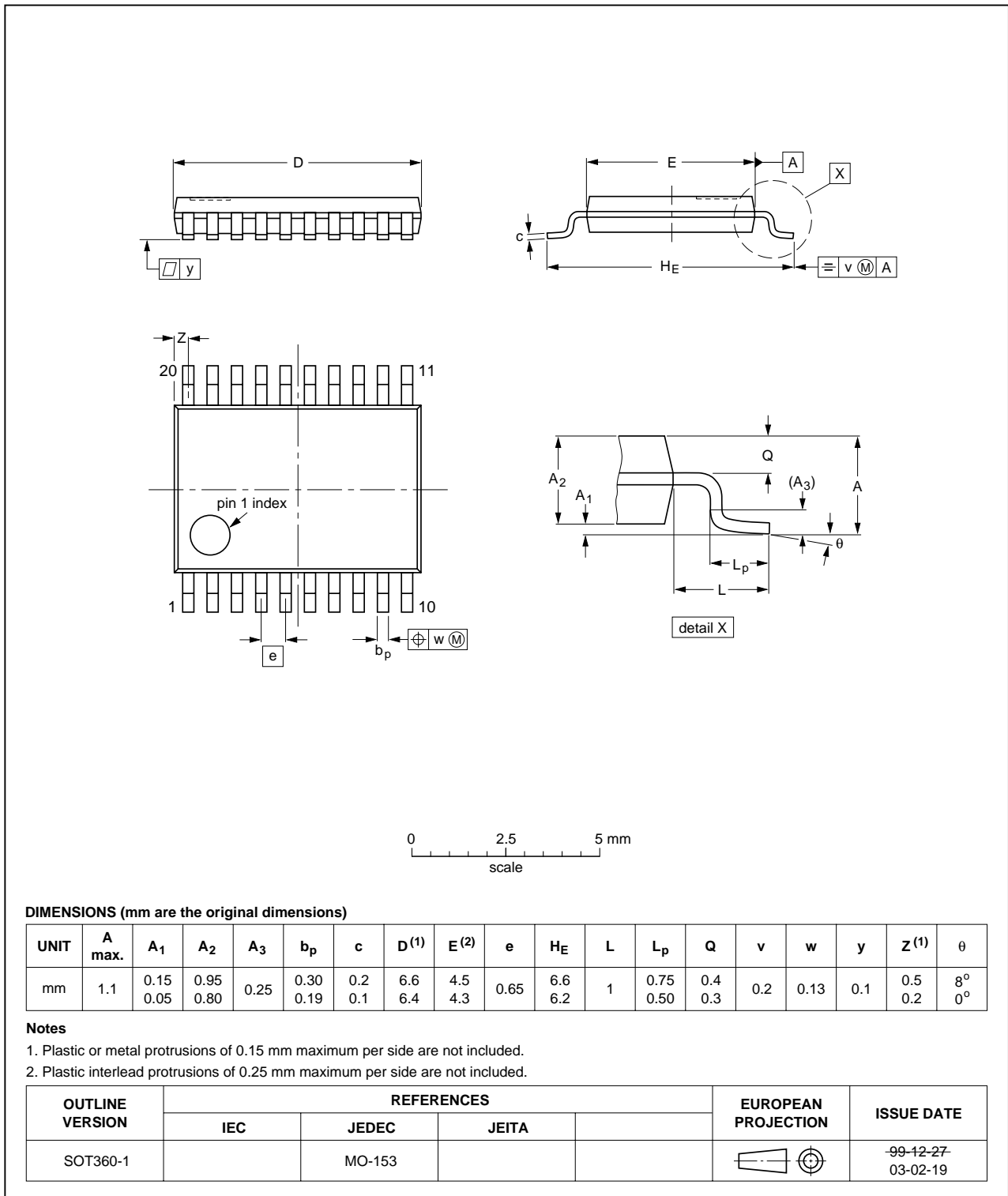


Fig 12. Package outline SOT360-1 (TSSOP20)

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

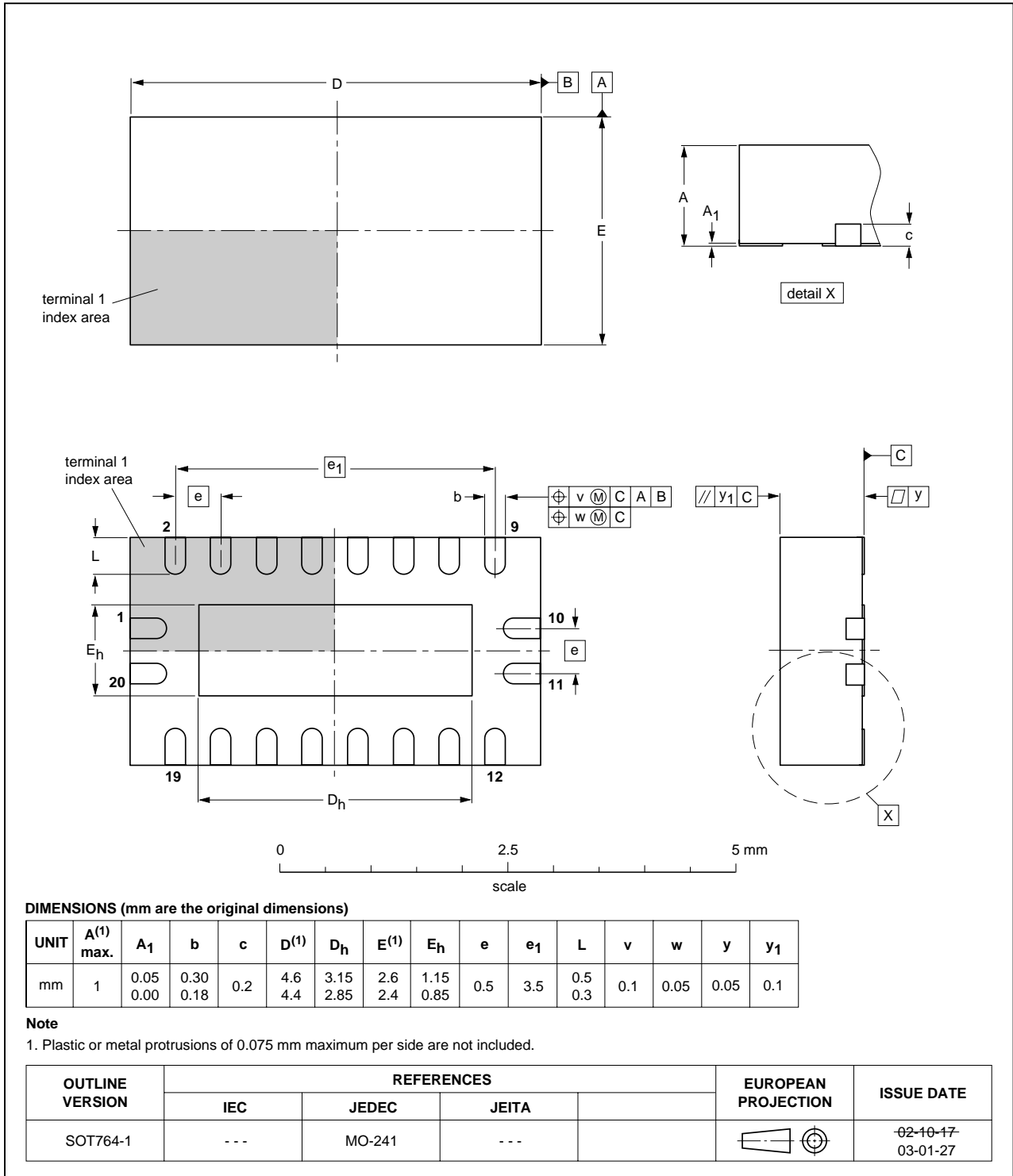


Fig 13. Package outline SOT764-1 (DHVQFN20)

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LV244_3	20070928	Product data sheet	-	74LV244_2
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name when appropriate. Section 3: DHVQFN20 package added. Section 8: derating values added for DHVQFN20 package. Section 12: outline drawing added for DHVQFN20 package. 			
74LV244_2	19980520	Product specification	-	74LV244_1
74LV244_1	19970219	Product specification	-	-

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.nxp.com>.

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17. Contents

1	General description	1
2	Features	1
3	Ordering information	1
4	Functional diagram	2
5	Pinning information	3
5.1	Pinning	3
5.2	Pin description	3
6	Functional description	4
7	Limiting values	4
8	Recommended operating conditions	4
9	Static characteristics	5
10	Dynamic characteristics	6
11	Waveforms	7
12	Package outline	10
13	Abbreviations	15
14	Revision history	15
15	Legal information	16
15.1	Data sheet status	16
15.2	Definitions	16
15.3	Disclaimers	16
15.4	Trademarks	16
16	Contact information	16
17	Contents	17

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