

# DATA SHEET

**74LV244**

Octal buffer/line driver (3-State)

Product specification  
Supersedes data of 1997 Feb 19  
IC24 Data Handbook

1998 May 20

Octal buffer/line driver (3-State)

74LV244

FEATURES

- Wide operating voltage: 1.0 to 5.5 V
- Optimized for low voltage applications: 1.0 to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Typical  $V_{OLP}$  (output ground bounce) < 0.8 V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25^{\circ}\text{C}$
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot) > 2 V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25^{\circ}\text{C}$
- Output capability: bus driver
- $I_{CC}$  category: MSI

QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25^{\circ}\text{C}$ ;  $t_r = t_f \leq 2.5$  ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	Propagation delay 1A <sub>n</sub> to 1Y <sub>n</sub> ; 2A <sub>n</sub> to 2Y <sub>n</sub>	$C_L = 15$ pF; $V_{CC} = 3.3$ V	8.0	ns
$C_I$	Input capacitance		3.5	pF
$C_{PD}$	Power dissipation capacitance per buffer	$V_{CC} = 3.3$ V $V_I = \text{GND to } V_{CC}^1$	35	pF

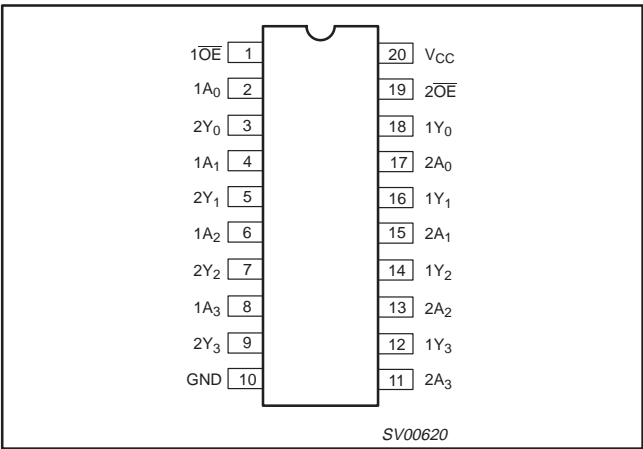
NOTE:

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ )  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  $C_L$  = output load capacitance in pF;  
 $f_o$  = output frequency in MHz;  $V_{CC}$  = supply voltage in V;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

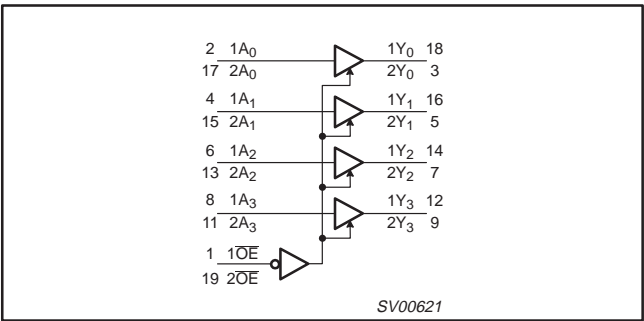
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
20-Pin Plastic DIL	−40°C to +125°C	74LV244 N	74LV244 N	SOT146-1
20-Pin Plastic SO	−40°C to +125°C	74LV244 D	74LV244 D	SOT163-1
20-Pin Plastic SSOP Type II	−40°C to +125°C	74LV244 DB	74LV244 DB	SOT339-1
20-Pin Plastic TSSOP Type I	−40°C to +125°C	74LV244 PW	74LV244PW DH	SOT360-1

PIN CONFIGURATION



LOGIC SYMBOL



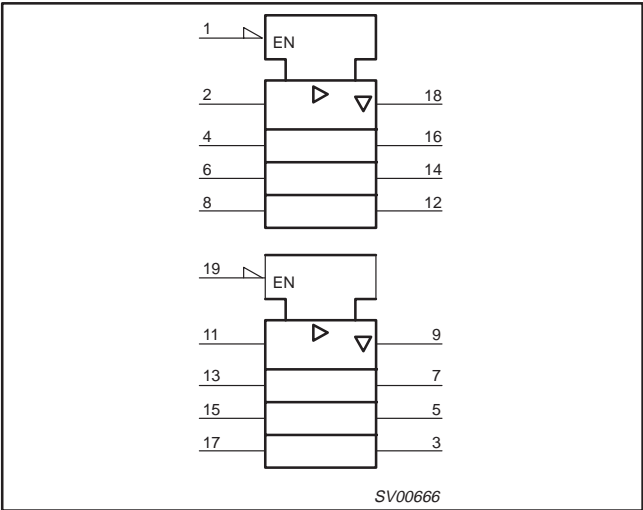
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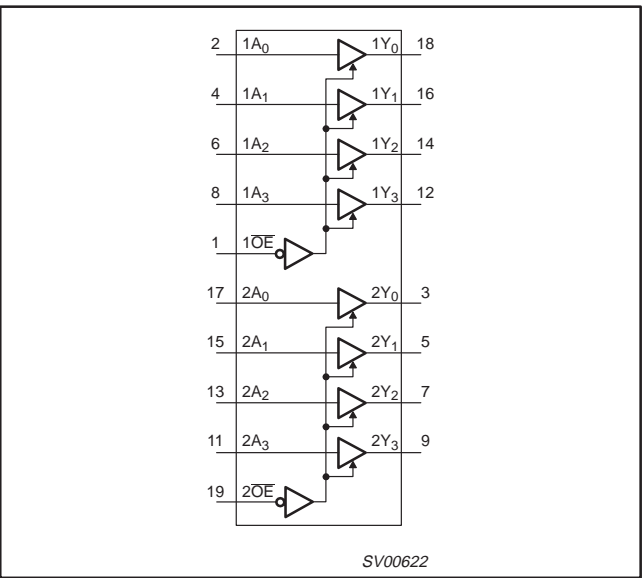
PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	1 $\overline{\text{OE}}$	Output enable input (active LOW)
2, 4, 6, 8	1A <sub>0</sub> to 1A <sub>3</sub>	Data inputs
3, 5, 7, 9	2Y <sub>0</sub> to 2Y <sub>3</sub>	Bus outputs
10	GND	Ground (0 V)
17, 15, 13, 11	2A <sub>0</sub> to 2A <sub>3</sub>	Data inputs
18, 16, 14, 12	1Y <sub>0</sub> to 1Y <sub>3</sub>	Bus outputs
19	2 $\overline{\text{OE}}$	Output enable input (active LOW)
20	V <sub>CC</sub>	Positive supply voltage

LOGIC SYMBOL (IEEE/IEC)



FUNCTIONAL DIAGRAM



FUNCTION TABLE

INPUTS		OUTPUT
n $\overline{\text{OE}}$	nA <sub>n</sub>	nY <sub>n</sub>
L	L	L
L	H	H
H	X	Z

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

## Octal buffer/line driver (3-State)

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## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$V_{CC}$	DC supply voltage	See Note 1	1.0	3.3	5.5	V
$V_I$	Input voltage		0	–	$V_{CC}$	V
$V_O$	Output voltage		0	–	$V_{CC}$	V
$T_{amb}$	Operating ambient temperature range in free air	See DC and AC characteristics	–40 –40		+85 +125	°C
$t_r, t_f$	Input rise and fall times	$V_{CC} = 1.0V$ to $2.0V$ $V_{CC} = 2.0V$ to $2.7V$ $V_{CC} = 2.7V$ to $3.6V$ $V_{CC} = 3.6V$ to $5.5V$	– – – –	– – – –	500 200 100 50	ns/V

## NOTE:

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

ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

In accordance with the Absolute Maximum Rating System (IEC 134).

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

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
$V_{CC}$	DC supply voltage		–0.5 to +7.0	V
$\pm I_{IK}$	DC input diode current	$V_I < -0.5$ or $V_I > V_{CC} + 0.5V$	20	mA
$\pm I_{OK}$	DC output diode current	$V_O < -0.5$ or $V_O > V_{CC} + 0.5V$	50	mA
$\pm I_O$	DC output source or sink current – bus driver outputs	$-0.5V < V_O < V_{CC} + 0.5V$	35	mA
$\pm I_{GND},$ $\pm I_{CC}$	DC $V_{CC}$ or GND current for types with – bus driver outputs		70	mA
$T_{stg}$	Storage temperature range		–65 to +150	°C
$P_{TOT}$	Power dissipation per package – plastic DIL – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	for temperature range: –40 to +125°C above +70°C derate linearly with 12 mW/K above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	750 500 400	mW

## NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## Octal buffer/line driver (3-State)

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**DC ELECTRICAL CHARACTERISTICS**

Over recommended operating conditions. Voltages are referenced to GND (ground = 0V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP <sup>1</sup>	MAX	MIN	MAX	
V <sub>IH</sub>	HIGH level Input voltage	V <sub>CC</sub> = 1.2V	0.9			0.9		V
		V <sub>CC</sub> = 2.0V	1.4			1.4		
		V <sub>CC</sub> = 2.7 to 3.6V	2.0			2.0		
		V <sub>CC</sub> = 4.5 to 5.5V	0.7 * V <sub>CC</sub>			0.7 * V <sub>CC</sub>		
V <sub>IL</sub>	LOW level Input voltage	V <sub>CC</sub> = 1.2V			0.3		0.3	V
		V <sub>CC</sub> = 2.0V			0.6		0.6	
		V <sub>CC</sub> = 2.7 to 3.6V			0.8		0.8	
		V <sub>CC</sub> = 4.5 to 5.5			0.3 * V <sub>CC</sub>		0.3 * V <sub>CC</sub>	
V <sub>OH</sub>	HIGH level output voltage; all outputs	V <sub>CC</sub> = 1.2V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100µA		1.2				V
		V <sub>CC</sub> = 2.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100µA	1.8	2.0		1.8		
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100µA	2.5	2.7		2.5		
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100µA	2.8	3.0		2.8		
		V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100µA	4.3	4.5		4.3		
V <sub>OH</sub>	HIGH level output voltage; BUS driver outputs	V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 8mA	2.40	2.82		2.20		V
		V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 16mA	3.60	4.20		3.50		
V <sub>OL</sub>	LOW level output voltage; all outputs	V <sub>CC</sub> = 1.2V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100µA		0				V
		V <sub>CC</sub> = 2.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100µA		0	0.2		0.2	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100µA		0	0.2		0.2	
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100µA		0	0.2		0.2	
		V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100µA		0	0.2		0.2	
V <sub>OL</sub>	LOW level output voltage; BUS driver outputs	V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 8mA		0.25	0.40		0.50	V
		V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 16mA		0.35	0.55		0.65	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 5.5V; 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> = 3.6V; 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>	Quiescent supply current; MSI	V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0			20.0		160	µA
ΔI <sub>CC</sub>	Additional quiescent supply current per input	V <sub>CC</sub> = 2.7V to 3.6V; V <sub>I</sub> = V <sub>CC</sub> - 0.6V			500		850	µA

**NOTE:**1. All typical values are measured at  $T_{amb} = 25^\circ C$ .

## Octal buffer/line driver (3-State)

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## AC CHARACTERISTICS

GND = 0V;  $t_r = t_f \leq 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 1\text{K}\Omega$ 

SYMBOL	PARAMETER	WAVEFORM	CONDITION	LIMITS					UNIT
				−40 to +85 °C			−40 to +125 °C		
			V <sub>CC</sub> (V)	MIN	TYP <sup>1</sup>	MAX	MIN	MAX	
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay 1A <sub>n</sub> to 1Y <sub>n</sub> ; 2A <sub>n</sub> to 2Y <sub>n</sub>	Figures 1, 2	1.2		50				ns
			2.0		17	24		31	
			2.7		13	17		23	
			3.0 to 3.6		9 <sup>2</sup>	14		18	
			4.5 to 5.5			12		15	
t <sub>PZH</sub> /t <sub>PZL</sub>	3-State output enable time 1OE to 1Y <sub>n</sub> ; 2OE to 2Y <sub>n</sub>	Figures 2, 3	1.2		65				ns
			2.0		22	39		49	
			2.7		16	29		36	
			3.0 to 3.6		12 <sup>2</sup>	23		29	
			4.5 to 5.5			19		24	
t <sub>PHZ</sub> /t <sub>PLZ</sub>	3-State output disable time 1OE to 1Y <sub>n</sub> ; 2OE to 2Y <sub>n</sub>	Figures 2, 3	1.2		60				ns
			2.0		22	34		43	
			2.7		17	24		32	
			3.0 to 3.6		13 <sup>2</sup>	21		26	
			4.5 to 5.5			16		19	

## NOTES:

1. Unless otherwise stated, all typical values are measured at  $T_{\text{amb}} = 25^\circ\text{C}$ .
2. Typical values are measured at  $V_{\text{CC}} = 3.3\text{ V}$ .

## AC WAVEFORMS

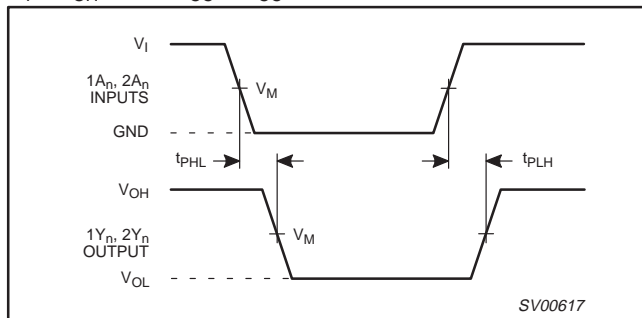
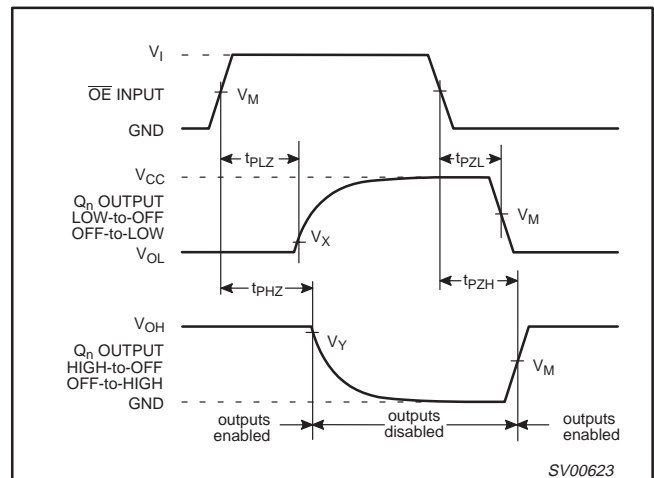
 $V_M = 1.5\text{ V}$  at  $V_{\text{CC}} \geq 2.7\text{ V}$  and  $\leq 3.6\text{ V}$  $V_M = 0.5 \times V_{\text{CC}}$  at  $V_{\text{CC}} < 2.7\text{ V}$  and  $\geq 4.5\text{ V}$  $V_{\text{OL}}$  and  $V_{\text{OH}}$  are the typical output voltage drop that occur with the output load. $V_X = V_{\text{OL}} + 0.3\text{ V}$  at  $V_{\text{CC}} \geq 2.7\text{ V}$  and  $\leq 3.6\text{ V}$  $V_X = V_{\text{OL}} + 0.1 \times V_{\text{CC}}$  at  $V_{\text{CC}} < 2.7\text{ V}$  and  $\geq 4.5\text{ V}$  $V_Y = V_{\text{OH}} - 0.3\text{ V}$  at  $V_{\text{CC}} \geq 2.7\text{ V}$  and  $\leq 3.6\text{ V}$  $V_Y = V_{\text{OH}} - 0.1 \times V_{\text{CC}}$  at  $V_{\text{CC}} < 2.7\text{ V}$  and  $\geq 4.5\text{ V}$ Figure 1. Input (1A<sub>n</sub>, 2A<sub>n</sub>) to output (1Y<sub>n</sub>, 2Y<sub>n</sub>) propagation delays.

Figure 2. 3-State enable and disable times.

Octal buffer/line driver (3-State)

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TEST CIRCUIT

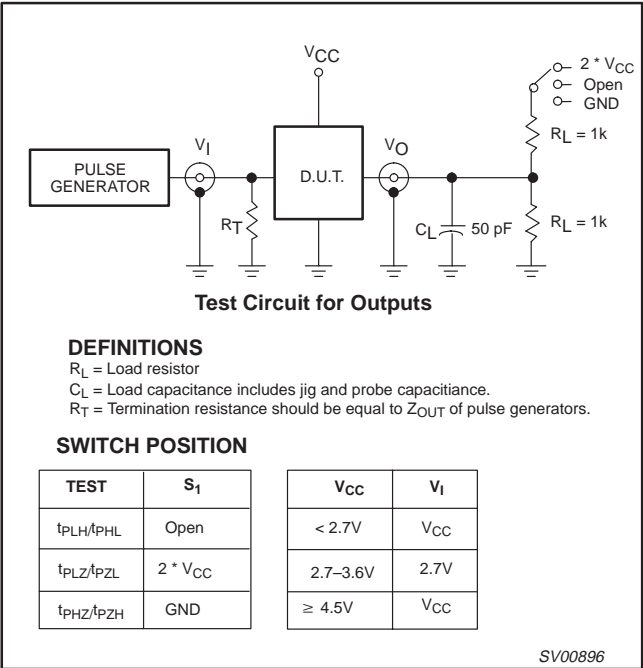


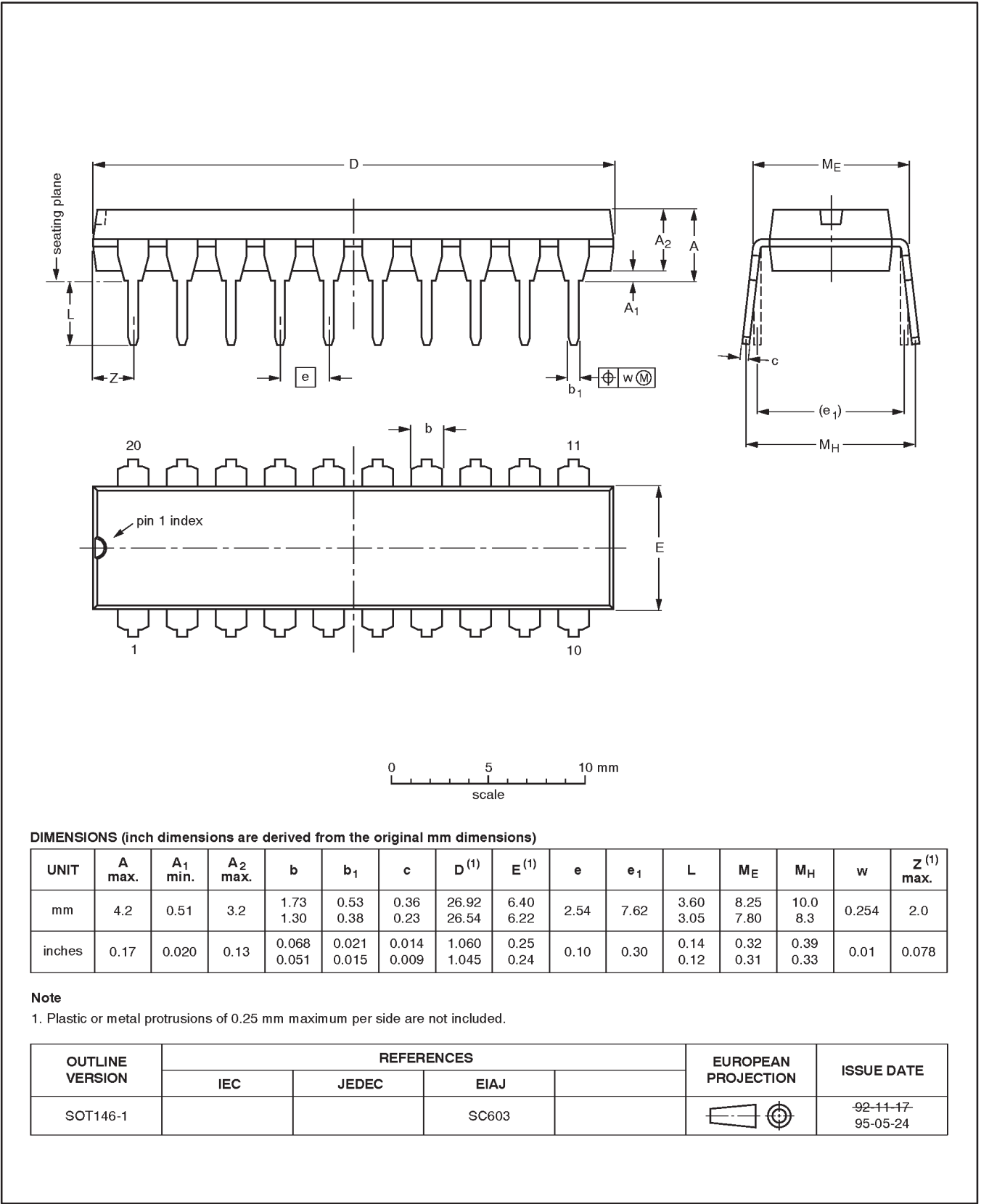
Figure 3. Load circuitry for switching times.

Octal buffer/line driver (3-State)

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

SOT146-1



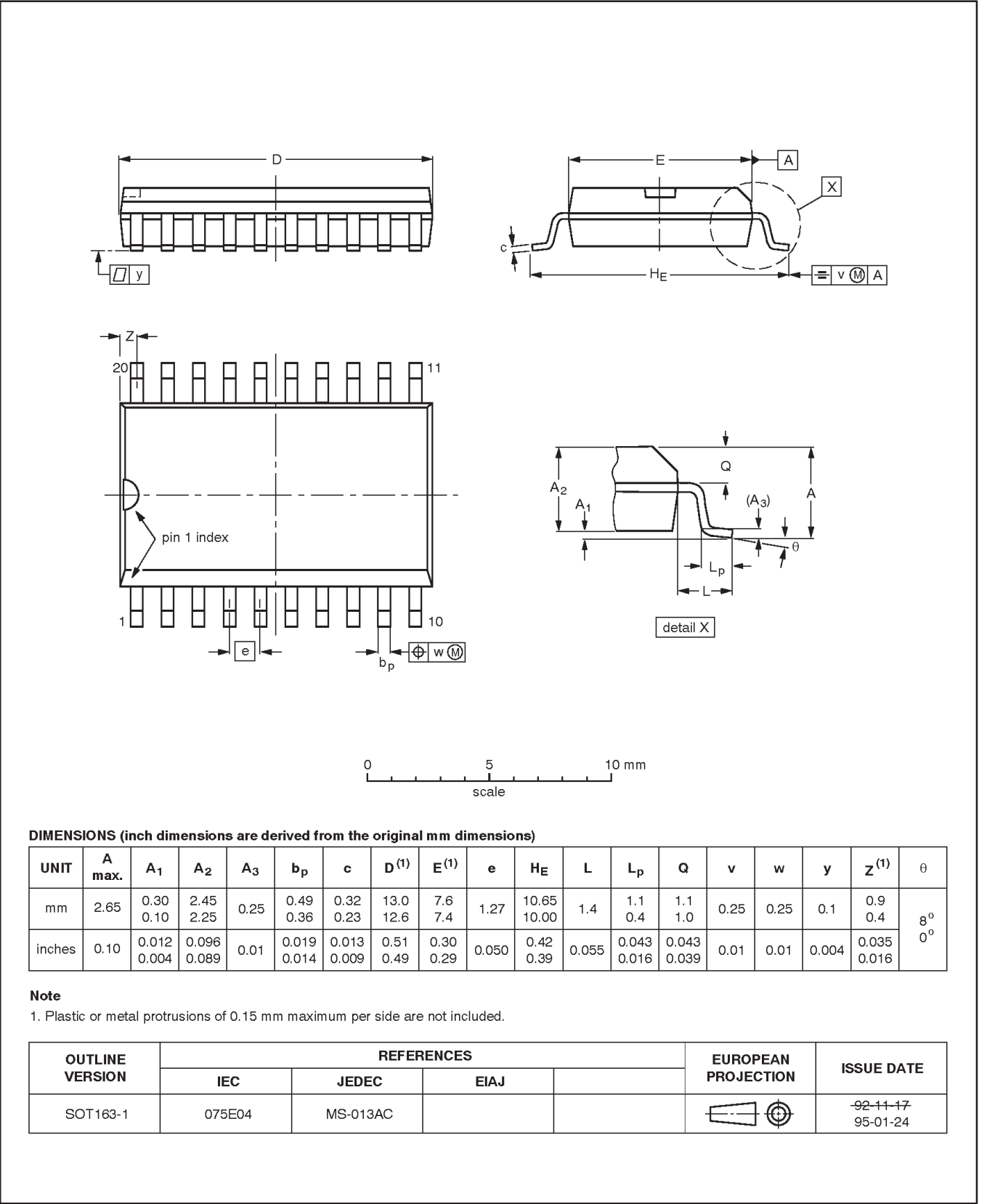


Octal buffer/line driver (3-State)

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

SOT163-1

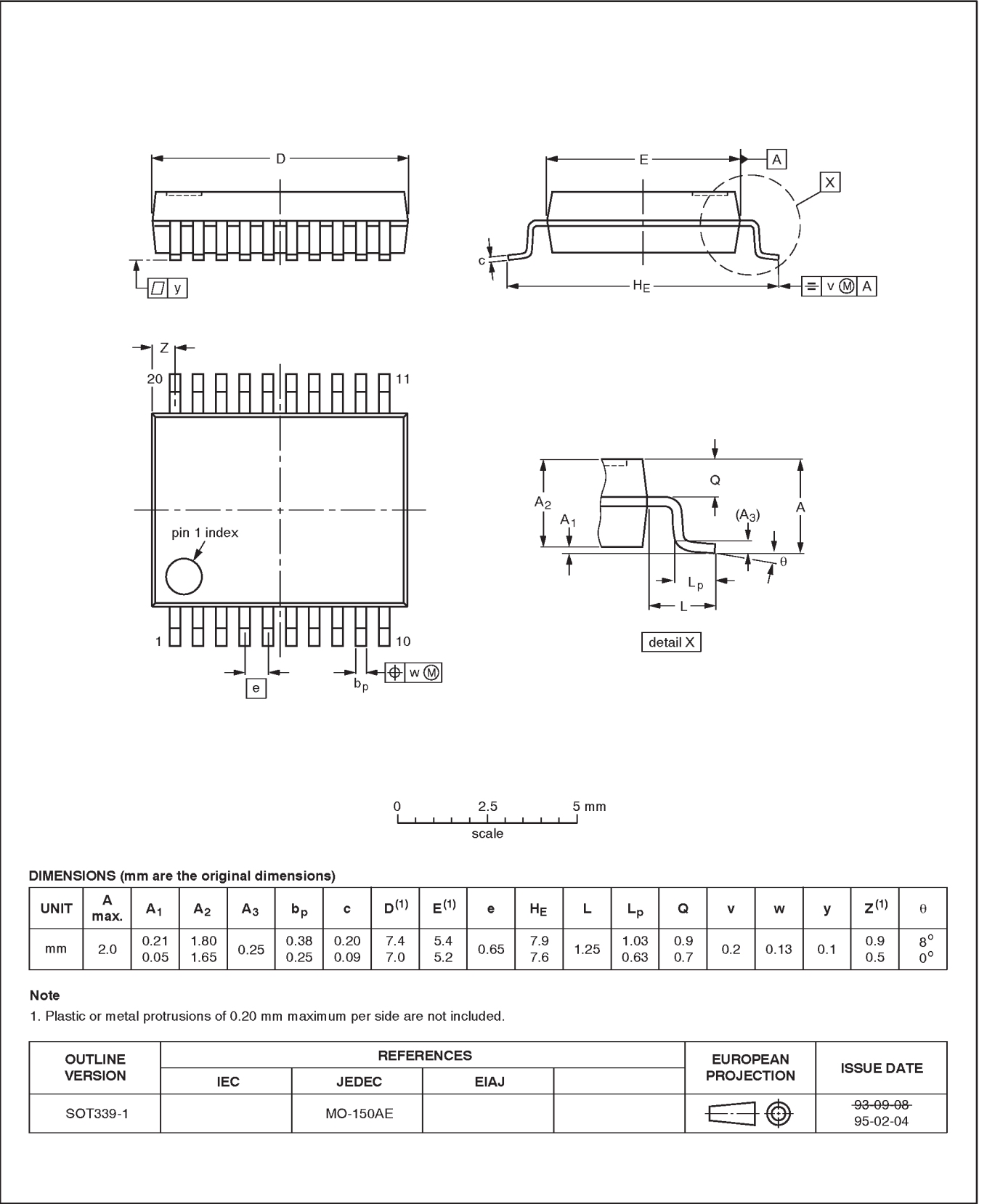


Octal buffer/line driver (3-State)

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

SOT339-1

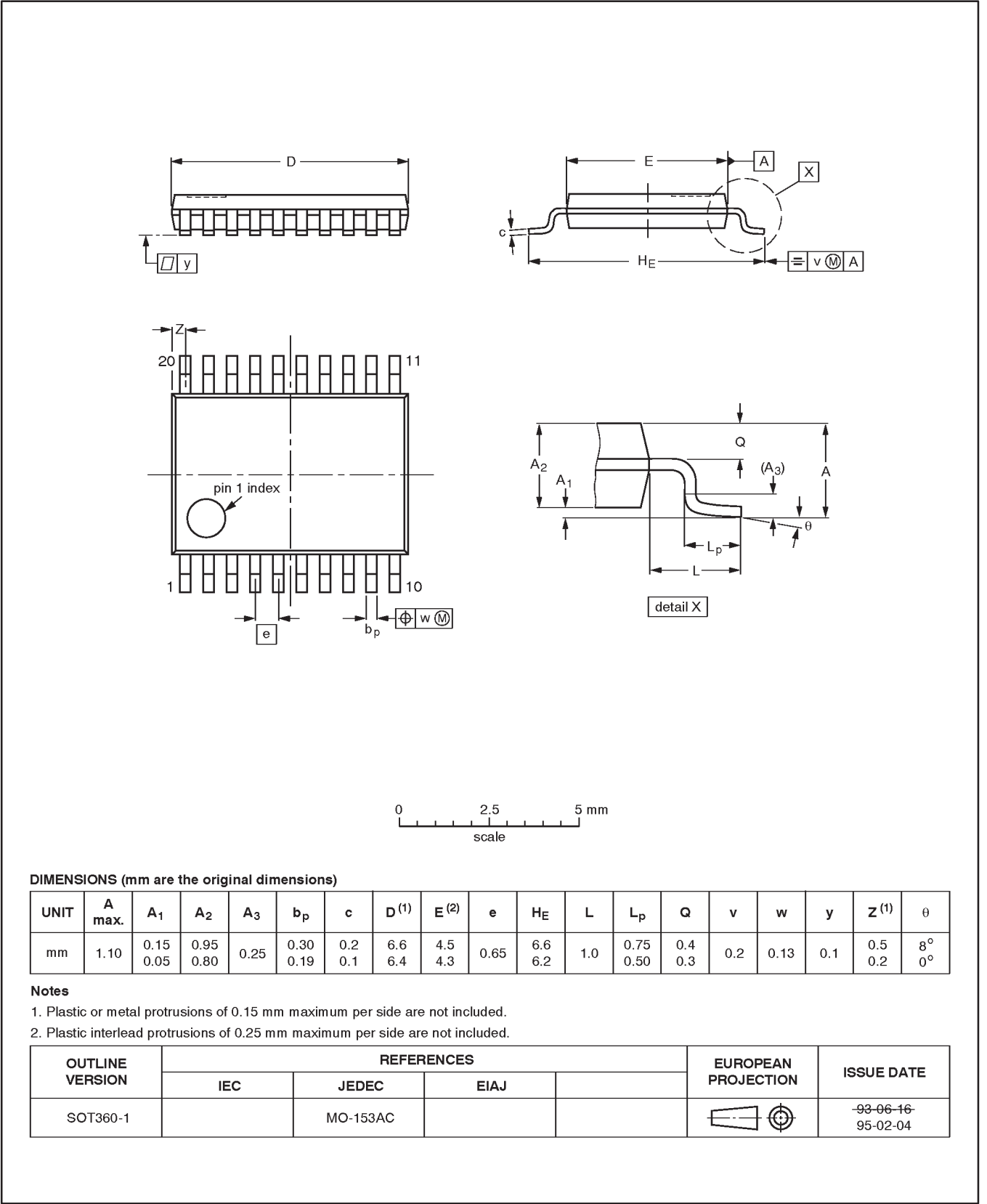


Octal buffer/line driver (3-State)

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

SOT360-1



Octal buffer/line driver (3-State)

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DEFINITIONS		
Data Sheet Identification	Product Status	Definition
Objective Specification	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
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print code

Document order number:

Date of release: 05-96

9397-750-04437

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