

# DATA SHEET

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## 74ALVC245

### Octal bus transceiver; 3-state

Product specification

2003 Jul 10

## Octal bus transceiver; 3-state

## 74ALVC245

## FEATURES

- Wide supply voltage range from 1.65 to 3.6 V
- Complies with JEDEC standard:  
JESD8-7 (1.65 to 1.95 V)  
JESD8-5 (2.3 to 2.7 V)  
JESD8B/JESD36 (2.7 to 3.6 V).
- 3.6 V tolerant inputs/outputs
- CMOS LOW power consumption
- Direct interface with TTL levels (2.7 to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- ESD protection:  
HBM EIA/JESD22-A114-A exceeds 2000 V  
MM EIA/JESD22-A115-A exceeds 200 V.

## DESCRIPTION

The 74ALVC245 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74ALVC245 features an output enable input ( $\overline{OE}$ ) for easy cascading and send/receive input (DIR) for direction control.  $\overline{OE}$  controls the outputs, so that the buses are effectively isolated.

## QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	propagation delay inputs An to Bn; Bn to An	$V_{CC} = 1.8\text{ V}; C_L = 30\text{ pF}; R_L = 1\text{ k}\Omega$	2.7	ns
		$V_{CC} = 2.5\text{ V}; C_L = 30\text{ pF}; R_L = 500\text{ }\Omega$	2.1	ns
		$V_{CC} = 2.7\text{ V}; C_L = 50\text{ pF}; R_L = 500\text{ }\Omega$	3.0	ns
		$V_{CC} = 3.3\text{ V}; C_L = 50\text{ pF}; R_L = 500\text{ }\Omega$	2.3	ns
$C_I$	input capacitance		3.5	pF
$C_{I/O}$	input/output capacitance		3.5	pF
$C_{PD}$	power dissipation capacitance per buffer	$V_{CC} = 3.3\text{ V}$ ; notes 1 and 2 outputs enable	25	pF
		outputs disabled	1	pF

## Notes

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in Volts;

$N$  = total load switching outputs;

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

2. The condition is  $V_I = \text{GND to } V_{CC}$ .

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ORDERING INFORMATION

TYPE NUMBER	PACKAGE			
	PINS	PACKAGE	MATERIAL	CODE
74ALVC245D	20	SO20	plastic	SOT163-1
74ALVC245PW	20	TSSOP20	plastic	SOT360-1

FUNCTION TABLE

See note 1.

INPUT		INPUT/OUTPUT	
OE	DIR	An	Bn
L	L	A = B	input
L	H	input	B = A
H	X	Z	Z

Note

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

PINNING

PIN	SYMBOL	DESCRIPTION
1	DIR	direction control
2	A0	data input/output
3	A1	data input/output
4	A2	data input/output
5	A3	data input/output
6	A4	data input/output
7	A5	data input/output
8	A6	data input/output
9	A7	data input/output
10	GND	ground (0 V)

PIN	SYMBOL	DESCRIPTION
11	B7	data input/output
12	B6	data input/output
13	B5	data input/output
14	B4	data input/output
15	B3	data input/output
16	B2	data input/output
17	B1	data input/output
18	B0	data input/output
19	OE	output enable input (active LOW)
20	V <sub>CC</sub>	supply voltage

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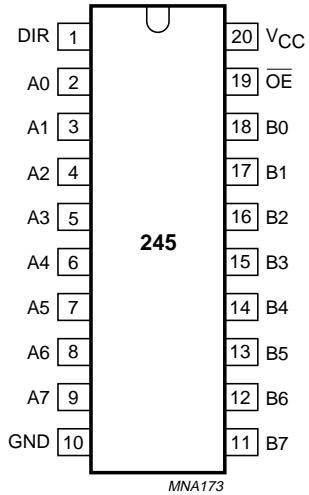


Fig.1 Pin configuration..

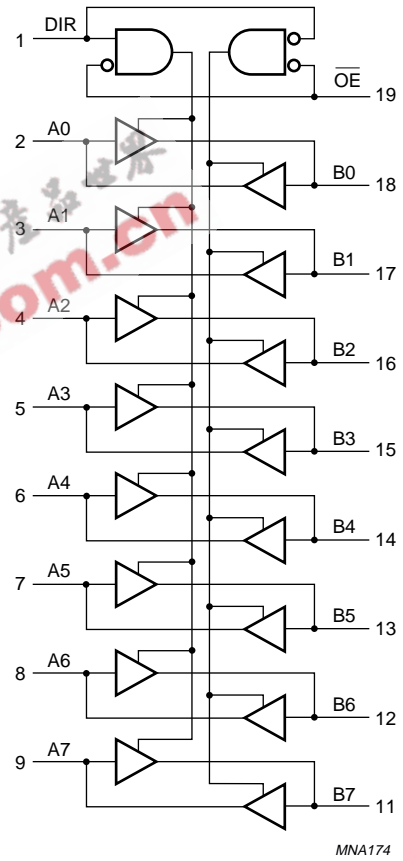


Fig.3 Logic symbol.

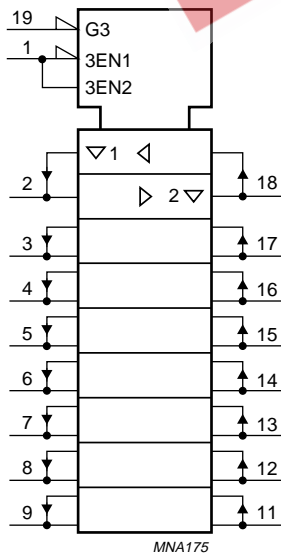


Fig.2 IEE/IEC logic symbol.

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## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CC}$	supply voltage		1.65	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	$V_{CC} = 1.65$ to $3.6$ V; enable mode	0	$V_{CC}$	V
		$V_{CC} = 1.65$ to $3.6$ V; disable mode	0	3.6	V
		$V_{CC} = 0$ V; Power-down mode	0	3.6	V
$T_{amb}$	operating ambient temperature		-40	+85	°C
$t_r, t_f$	input rise and fall times	$V_{CC} = 1.65$ to $2.7$ V	0	20	ns/V
		$V_{CC} = 2.7$ to $3.6$ V	0	10	ns/V

## 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
$I_{IK}$	input diode current	$V_I < 0$		-50	mA
$V_I$	input voltage		-0.5	+4.6	V
$I_{OK}$	output diode current	$V_O > V_{CC}$ or $V_O < 0$	-	±50	mA
$V_O$	output voltage	enable mode; notes 1 and 2	-0.5	$V_{CC} + 0.5$	V
		disable mode	-0.5	+4.6	V
		Power-down mode; note 2	-0.5	+4.6	V
$I_O$	output source or sink current	$V_O = 0$ to $V_{CC}$	-	±50	mA
$I_{GND}, I_{CC}$	$V_{CC}$ or GND current		-	±100	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	power dissipation				
	SO20 package	above 70 °C derate linearly with 8 mW/K	-	500	mW
	TSSOP20 package	above 60 °C derate linearly with 5.5 mW/K	-	500	mW

## Notes

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. When  $V_{CC} = 0$  V (Power-down mode), the output voltage can be 3.6 V in normal operation.

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## DC CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		OTHER	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +85 °C</b>							
V <sub>IH</sub>	HIGH-level input voltage		1.65 to 1.95	0.65 × V <sub>CC</sub>	–	–	V
			2.3 to 2.7	1.7	–	–	V
			2.7 to 3.6	2	–	–	V
V <sub>IL</sub>	LOW-level input voltage		1.65 to 1.95	–	–	0.35 × V <sub>CC</sub>	V
			2.3 to 2.7	–	–	0.7	V
			2.7 to 3.6	–	–	0.8	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 3.6	–	–	0.2	V
		I <sub>O</sub> = 100 μA	1.65	–	–	0.3	V
		I <sub>O</sub> = 6 mA	2.3	–	–	0.4	V
		I <sub>O</sub> = 12 mA	2.3	–	–	0.6	V
		I <sub>O</sub> = 18 mA	2.7	–	–	0.4	V
		I <sub>O</sub> = 18 mA	3.0	–	–	0.4	V
		I <sub>O</sub> = 24 mA	3.0	–	–	0.55	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 3.6	V <sub>CC</sub> – 0.2	–	–	V
		I <sub>O</sub> = –100 μA	1.65	1.25	–	–	V
		I <sub>O</sub> = –6 mA	2.3	1.8	–	–	V
		I <sub>O</sub> = –12 mA	2.3	1.7	–	–	V
		I <sub>O</sub> = –18 mA	2.7	2.2	–	–	V
		I <sub>O</sub> = –18 mA	3.0	2.4	–	–	V
		I <sub>O</sub> = –24 mA	3.0	2.2	–	–	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = 3.6 V or GND	3.6	–	±0.1	±5	μA
I <sub>OZ</sub>	3-state output OFF-state current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 3.6 V or GND; note 2	3.6	–	0.1	±10	μA
I <sub>off</sub>	power OFF leakage current	V <sub>I</sub> or V <sub>O</sub> = 3.6 V	0.0	–	±0.1	±10	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0	3.6	–	0.2	10	μA
ΔI <sub>CC</sub>	additional quiescent supply current per input pin	V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; I <sub>O</sub> = 0	3.0 to 3.6	–	5	750	μA

## Notes

1. All typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.
2. For transceivers, the parameters I<sub>OZ</sub> includes the input leakage current.

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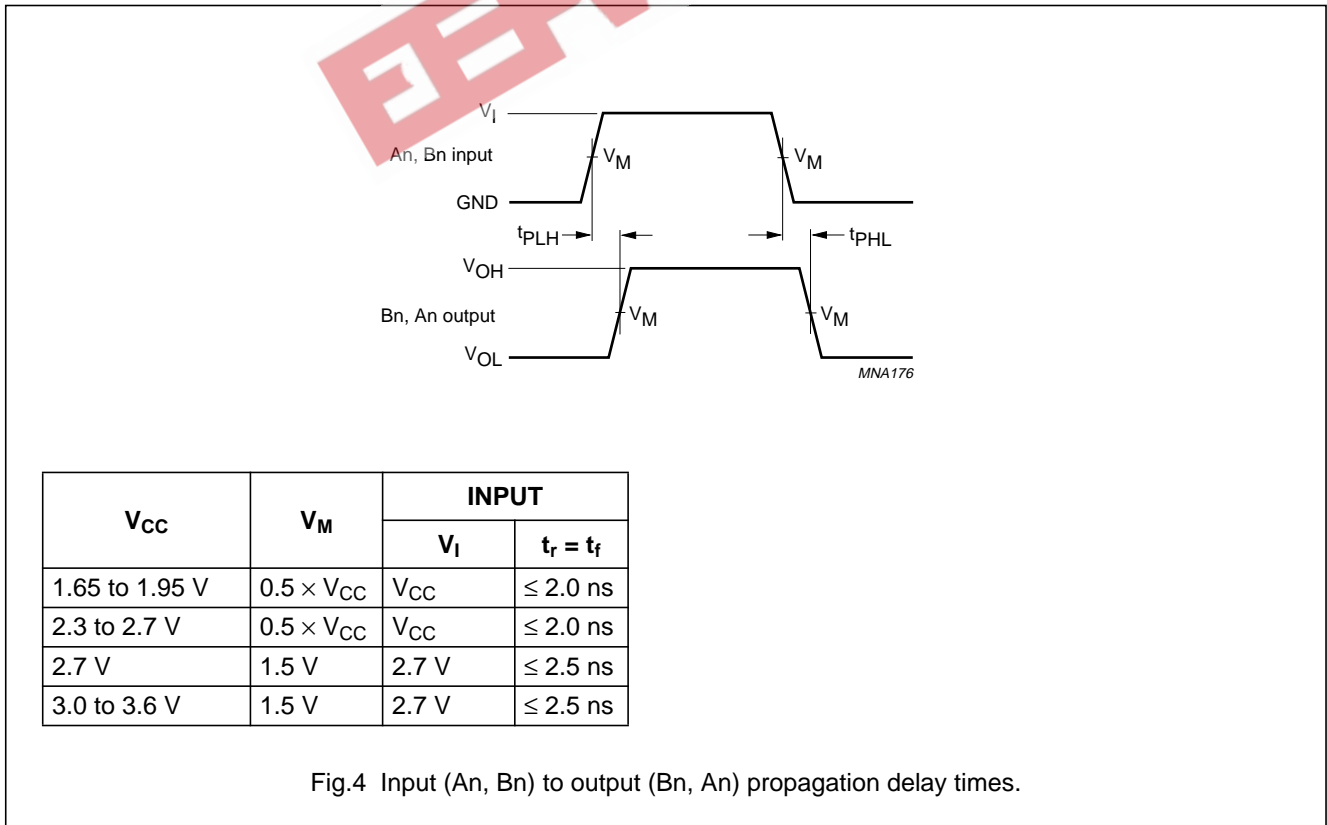
AC CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		WAVEFORMS	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +85 °C</b>							
t <sub>PHL</sub> /t <sub>PLH</sub>	propagation delay An to Bn; Bn to An	see Figs 4 and 6	1.65 to 1.95	1.0	2.7	6.0	ns
			2.3 to 2.7	1.0	2.1	3.5	ns
			2.7	1.0	3.0	3.6	ns
			3.0 to 3.6	1.0	2.3	3.4	ns
t <sub>PZH</sub> /t <sub>PZL</sub>	3-state output enable time OE to An; OE to Bn	see Figs 5 and 6	1.65 to 1.95	1.0	4.0	8.6	ns
			2.3 to 2.7	1.0	3.0	6.0	ns
			2.7	1.0	2.6	6.3	ns
			3.0 to 3.6	1.0	2.9	5.5	ns
t <sub>PHZ</sub> /t <sub>PLZ</sub>	3-state output disable time OE to An; OE to Bn	see Figs 5 and 6	1.65 to 1.95	1.0	4.4	8.0	ns
			2.3 to 2.7	1.0	2.3	4.8	ns
			2.7	1.0	3.3	5.3	ns
			3.0 to 3.6	1.0	3.2	5.5	ns

Note

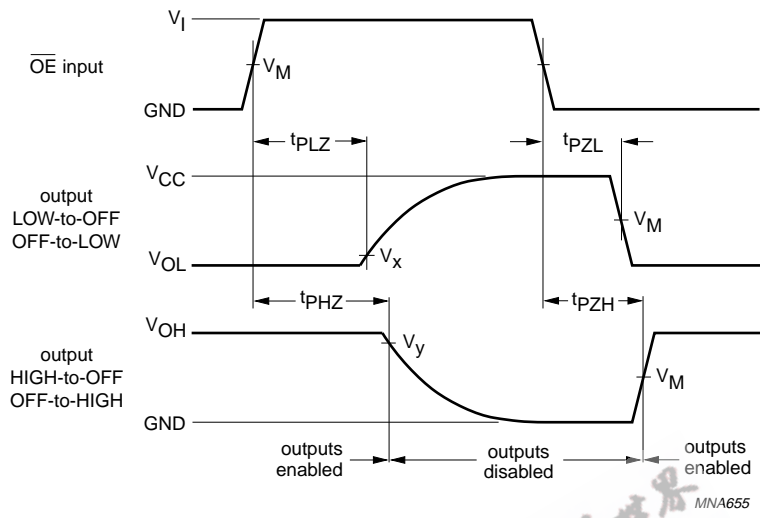
- 1. All typical values are measured at T<sub>amb</sub> = 25 °C.

AC WAVEFORMS



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V <sub>CC</sub>	V <sub>M</sub>	INPUT	
		V <sub>I</sub>	t <sub>r</sub> = t <sub>f</sub>
1.65 to 1.95 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 2.0 ns
2.3 to 2.7 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns

V<sub>x</sub> = V<sub>OL</sub> + 0.3 V at V<sub>CC</sub> ≥ 2.7 V;  
 V<sub>x</sub> = V<sub>OL</sub> + 0.15 V at V<sub>CC</sub> < 2.7 V;  
 V<sub>y</sub> = V<sub>OH</sub> - 0.3 V at V<sub>CC</sub> ≥ 2.7 V;  
 V<sub>y</sub> = V<sub>OH</sub> - 0.15 V at V<sub>CC</sub> < 2.7 V.

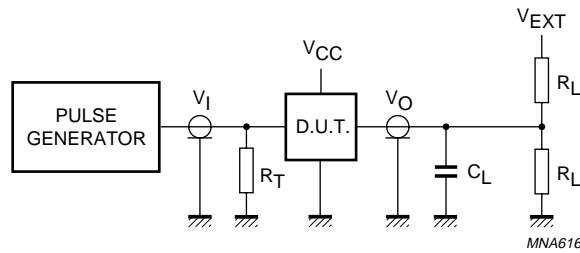
V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage drop that occur with the output load.

Fig.5 3-state enable and disable times.



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V <sub>CC</sub>	V <sub>I</sub>	C <sub>L</sub>	R <sub>L</sub>	V <sub>EXT</sub>		
				t <sub>PLH</sub> /t <sub>PHL</sub>	t <sub>PZH</sub> /t <sub>PHZ</sub>	t <sub>PZL</sub> /t <sub>PLZ</sub>
1.65 to 1.95 V	V <sub>CC</sub>	30 pF	1 kΩ	open	GND	2 × V <sub>CC</sub>
2.3 to 2.7 V	V <sub>CC</sub>	30 pF	500 Ω	open	GND	2 × V <sub>CC</sub>
2.7 V	2.7 V	50 pF	500 Ω	open	GND	6 V
3.0 to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V

Definitions for test circuit:

R<sub>L</sub> = Load resistor.

C<sub>L</sub> = Load capacitance including jig and probe capacitance.

R<sub>T</sub> = Termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator.

Fig.6 Load circuitry for switching times.

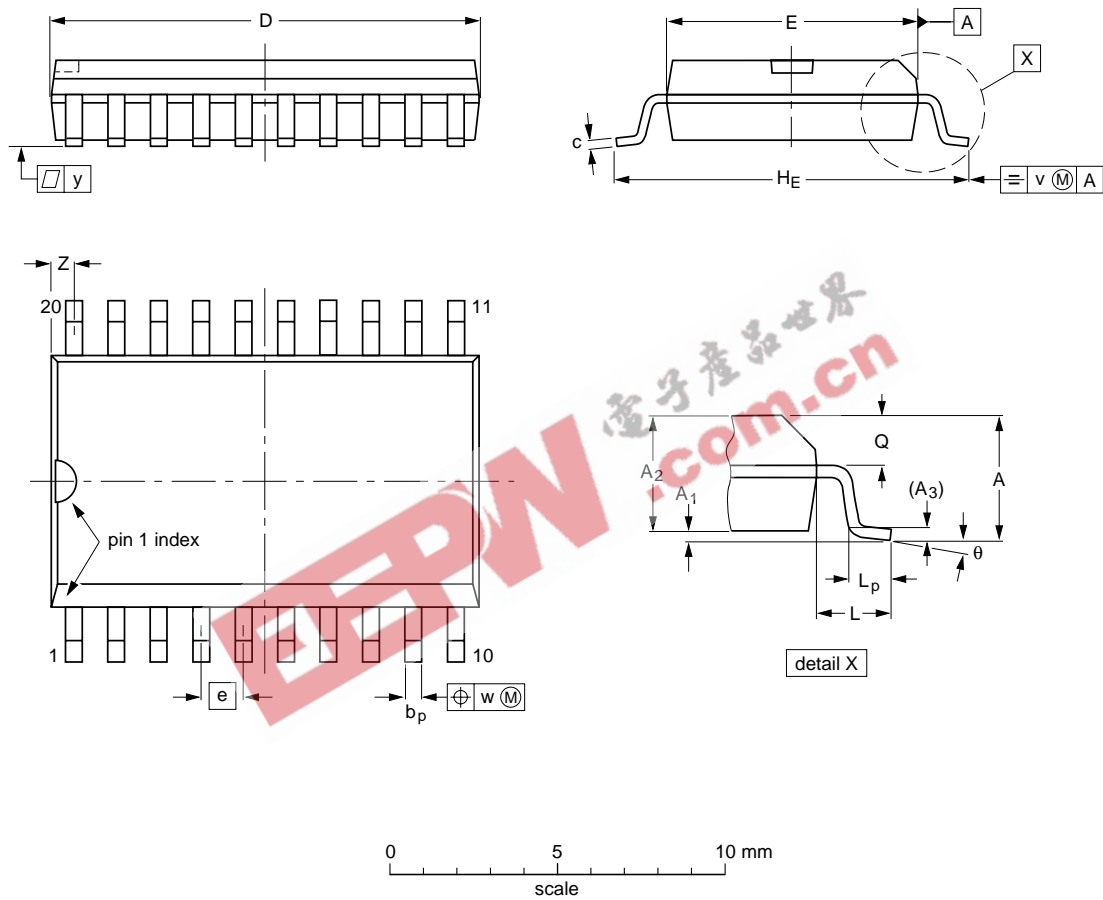
Octal bus transceiver; 3-state

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PACKAGE OUTLINES

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

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

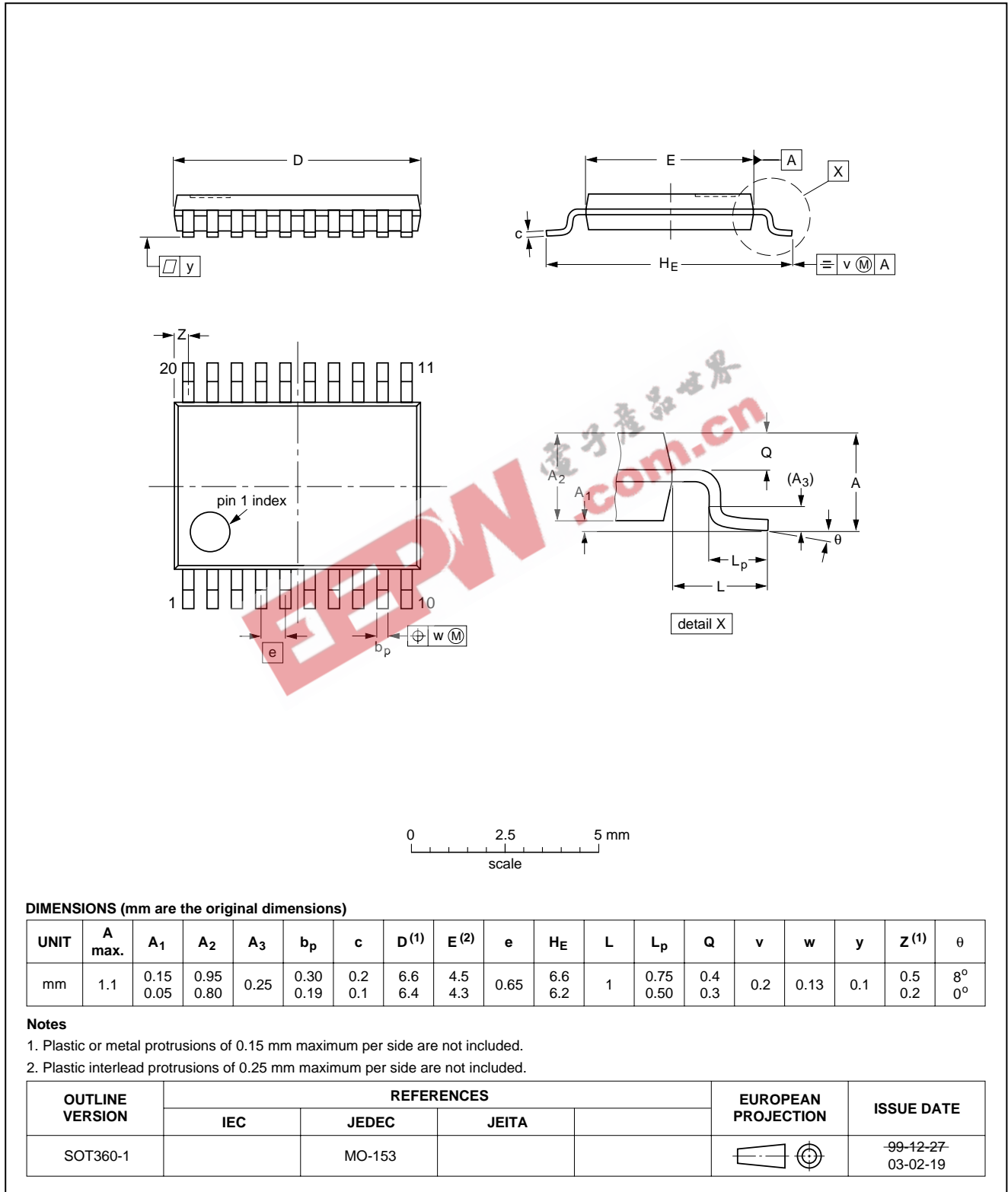
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT163-1	075E04	MS-013				99-12-27 03-02-19

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

SOT360-1



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## DATA SHEET STATUS

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