

DATA SHEET

74AC244/74ACT244

Octal buffer/line driver (3-State)

Product specification

1997 Apr 07

Octal buffer/line driver (3-State)

74AC244
74ACT244

FEATURES

- 74ACT244 has TTL-compatible inputs
- 74AC244 has CMOS-compatible inputs
- 3-State outputs source/sink 24mA
- 3-State outputs drive bus lines or buffer memory address registers
- Meets or exceeds JEDEC standard for 74AC(T)XX family
- Superior ground bounce noise immunity

DESCRIPTION

The 74AC244/74ACT244 is an octal non-inverting buffer/line driver with 3-State outputs. The 3-State outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

The '244' is functionally identical to the '240', but the '244' has non-inverting outputs.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYPICAL			UNIT
			AC		ACT	
			$V_{CC} = 3.3V$	$V_{CC} = 5.0V$	$V_{CC} = 5.0V$	
t_{PHL}/t_{PLH}	Propagation delay I_n to Y_n	$C_L = 50pF$	4.3	3.1	4.1	ns
C_I	Input capacitance		4.5			pF
C_{PD}	Power dissipation capacitance per buffer	$V_I = GND$ to V_{CC}^1 outputs enabled outputs disabled	25 5		25 5	pF

NOTE:

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

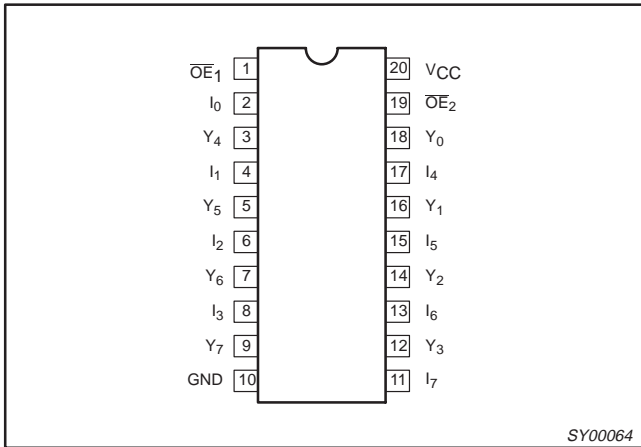
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DRAWING NUMBER
20-Pin Plastic SO	-40°C to +85°C	74AC244 D 74ACT244 D	74AC244 D 74ACT244 D	SOT163-1
20-Pin Plastic SSOP Type II	-40°C to +85°C	74AC244 DB 74ACT244 DB	74AC244 DB 74ACT244 DB	SOT339-1
20-Pin Plastic TSSOP Type I	-40°C to +85°C	74AC244 PW 74ACT244 PW	74AC244PW DH 74ACT244PW DH	SOT360-1

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74AC244
74ACT244

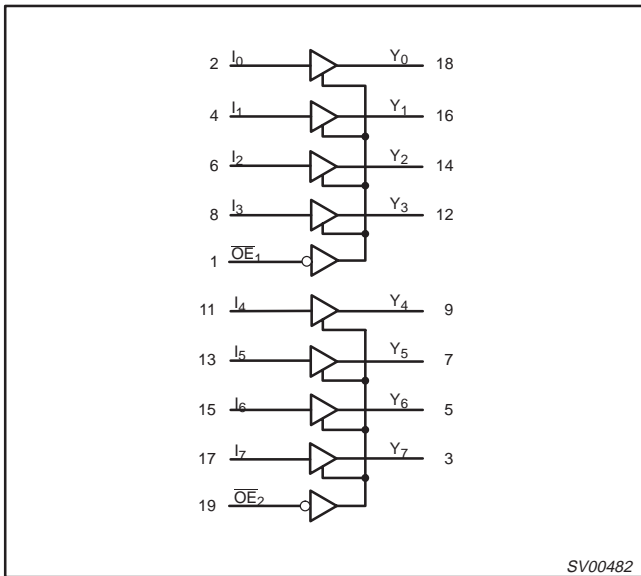
PIN CONFIGURATION



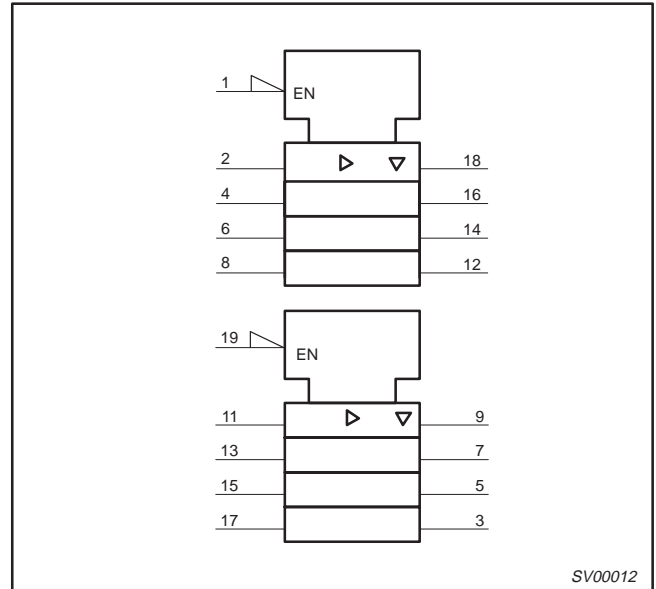
PIN LABEL DESCRIPTIONS

SYMBOL	NAME AND FUNCTION
$\overline{OE}_1, \overline{OE}_2$	Output enable inputs (active LOW)
$I_0 - I_7$	Inputs
$Y_0 - Y_7$	Outputs
VCC	Positive power supply
GND	Ground (0V)

LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

INPUTS		OUTPUTS (pins 12, 14, 16, 18)
\overline{OE}_1	I_n	
L	L	L
L	H	H
H	X	Z
INPUTS		OUTPUTS (pins 3, 5, 7, 9)
\overline{OE}_2	I_n	
L	L	L
L	H	H
H	X	Z

H = HIGH voltage level
 L = LOW voltage level
 X = Don't care
 Z = High impedance "OFF"-state

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74AC244
74ACT244

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V_{CC}	DC supply voltage for 'AC	2.0	6.0	V
V_{CC}	DC supply voltage for 'ACT	4.5	5.5	V
V_{IN}	DC input voltage range	0	V_{CC}	V
V_O	DC output voltage range	0	V_{CC}	V
T_{amb}	Operating free-air temperature range	-40	+85	°C
$\Delta V/\Delta t$	Minimum input edge rate — AC devices V_{IN} from 30% to 70% of V_{CC} V_{CC} @ 3.3V, 4.5V, 5.5V	125		mV/ns
	— ACT devices V_{IN} from 0.8V to 2.0V V_{CC} @ 4.5V, 5.5V	125		

ABSOLUTE MAXIMUM RATINGS¹

in accordance with the Absolute Maximum Rating System (IEC134)
Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 to +7.0	V
I_{IK}	DC input diode current	$V_{IN} = -0.5V$	-20	mA
		$V_{IN} = V_{CC} + 0.5V$	+20	
V_{IN}	DC input voltage		-0.5 to $V_{CC} + 0.5$	V
I_{OK}	DC output diode current	$V_O = -0.5V$	-20	mA
		$V_O = V_{CC} + 0.5V$	+20	
V_O	DC output voltage		-0.5 to $V_{CC} + 0.5$	V
I_O	DC output source or sink current		± 50	mA
I_{CC}, I_{GND}	DC V_{CC} or GND current per output		± 50	mA
I_{CC}, I_{GND}	DC V_{CC} or GND current		± 200	mA
T_{stg}	Storage temperature range		-65 to 150	°C
P_{TOT}	Power dissipation per package — plastic mini-pack (SO) — plastic shrink mini-pack (SSOP and TSSOP)	above +70°C derate linearly with 8 mW/K	500	mW
		above +60°C derate linearly with 5.5 mW/K	500	

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.

Octal buffer/line driver (3-State)

74AC244
74ACT244**DC ELECTRICAL CHARACTERISTICS (74AC244)**

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

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC} (V)	LIMITS			UNIT	
				Temp = -40°C to +85°C				
				MIN	TYP ¹	MAX		
V _{IH}	HIGH level Input voltage	V _{OUT} = 0.1V or (V _{CC} - 0.1V)	3.0	2.1	1.5		V	
			4.5	3.15	2.25			
			5.5	3.85	2.75			
V _{IL}	LOW level Input voltage	V _{OUT} = 0.1V or (V _{CC} - 0.1V)	3.0		1.5	0.9	V	
			4.5		2.25	1.35		
			5.5		2.75	1.65		
V _{OH}	HIGH level output voltage	I _{OUT} = -50 μA	3.0	2.9	2.99		V	
			4.5	4.4	4.49			
			5.5	5.4	5.49			
			V _{IN} = V _{IL} or V _{IH} , I _{OH} = -12mA ¹	3.0	2.46			V
			V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ¹	4.5	3.76			
			V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ¹	5.5	4.76			
V _{OL}	LOW level output voltage	I _{OUT} = 50 μA	3.0		0.01	0.1	V	
			4.5		0.01	0.1		
			5.5		0.01	0.1		
			V _{IN} = V _{IL} or V _{IH} , I _{OL} = 12mA ¹	3.0			0.44	V
			V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ¹	4.5			0.44	
			V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ¹	5.5			0.44	
I _{IN}	Input leakage current	V _{IN} = V _{CC} , GND	5.5			±1.0	μA	
I _{OZ}	3-State output OFF-state current	V _{IN} (OE) = V _{IL} , V _{IH} V _{IN} = V _{CC} , GND V _{OUT} = V _{CC} , GND	5.5			±2.5	μA	
I _{OLD} ²	Dynamic output current ²	V _{OLD} = 1.65V max	5.5	75			mA	
I _{OHD} ²	Dynamic output current ²	V _{OHD} = 3.85V min	5.5			-75	mA	
I _{CC}	Quiescent supply current	V _{IN} = V _{CC} or GND	5.5			40	μA	

NOTES:

1. All outputs loaded
2. Maximum test duration 2.0 ms; one output loaded at a time

Octal buffer/line driver (3-State)

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74ACT244**DC ELECTRICAL CHARACTERISTICS (74ACT244)**

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

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC} (V)	LIMITS			UNIT
				Temp = -40°C to +85°C			
				MIN	TYP ¹	MAX	
V _{IH}	HIGH level Input voltage	V _{OUT} = 0.1V or (V _{CC} - 0.1V)	4.5	2.0	1.5		V
			5.5	2.0	1.5		
V _{IL}	LOW level Input voltage	V _{OUT} = 0.1V or (V _{CC} - 0.1V)	4.5		1.5	0.8	V
			5.5		1.5	0.8	
V _{OH}	HIGH level output voltage	I _{OUT} = -50 μA	4.5	4.4	4.49		V
			5.5	5.4	5.49		
		V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ¹	4.5	3.76			V
		V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ¹	5.5	4.76			
V _{OL}	LOW level output voltage	I _{OUT} = 50 μA	4.5		0.01	0.1	V
			5.5		0.01	0.1	
		V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ¹	4.5			0.44	V
		V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ¹	5.5			0.44	
I _{IN}	Input leakage current	V _{IN} = V _{CC} , GND	5.5			±1.0	μA
I _{OZ}	3-State output OFF-state current	V _{IN} (OE) = V _{IL} , V _{IH} V _{IN} = V _{CC} , GND V _{OUT} = V _{CC} , GND	5.5			±2.5	μA
ΔI _{CC}	Additional quiescent supply current per input pin	V _{IN} = V _{CC} - 2.1V Other inputs at V _{CC} or GND; I _{OUT} = 0	5.5			1.5	mA
I _{OLD} ²	Dynamic output current	V _{OLD} = 1.65V max	5.5	75			mA
I _{OHD} ²	Dynamic output current	V _{OHD} = 3.85V min	5.5			-75	mA
I _{CC}	Quiescent supply current	V _{IN} = V _{CC} or GND	5.5			40	μA

NOTES:

1. All outputs loaded
2. Maximum test duration 2.0ms, one output loaded at a time

Octal buffer/line driver (3-State)

74AC244
74ACT244**AC CHARACTERISTICS FOR 74AC244**GND = 0V; $t_r = t_f = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; .

SYMBOL	PARAMETER	V_{CC}^1 (V)	LIMITS					UNIT	WAVEFORM
			$T_{amb} = +25^\circ\text{C}$			$T_{amb} = -40^\circ\text{C to } +85^\circ\text{C}$			
			MIN	TYP	MAX	MIN	MAX		
t_{PLH}	Propagation delay I_n to Y_n	3.3 5.0	2.0 1.5	4.2 3.0	9.0 6.5	1.5 1.0	10.0 7.5	ns	1
t_{PHL}	Propagation delay I_n to Y_n	3.3 5.0	2.0 1.5	4.4 3.2	9.0 6.5	1.5 1.0	10.0 7.5	ns	1
t_{PZH}	3-State output enable time \overline{OE} to Y_n	3.3 5.0	2.0 1.5	4.9 3.5	9.5 7.0	1.5 1.0	11.0 8.0	ns	2
t_{PZL}	3-State output enable time \overline{OE} to Y_n	3.3 5.0	2.0 1.5	5.2 3.9	9.5 7.0	1.5 1.0	11.0 8.0	ns	2
t_{PHZ}	3-State output disable time \overline{OE} to Y_n	3.3 5.0	2.0 1.5	4.5 3.9	9.0 7.5	1.5 1.0	10.0 7.5	ns	2
t_{PLZ}	3-State output disable time \overline{OE} to Y_n	3.3 5.0	2.0 1.5	4.0 3.0	9.5 7.5	1.5 1.0	10.0 7.5	ns	2

NOTE:

1. Voltage range 3.3V is $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$
Voltage range 5.0V is $V_{CC} = 5.0\text{V} \pm 0.5\text{V}$

AC CHARACTERISTICS FOR 74ACT244GND = 0V; $t_r = t_f = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; .

SYMBOL	PARAMETER	V_{CC}^1 (V)	LIMITS					UNIT	WAVEFORM
			$T_{amb} = +25^\circ\text{C}$			$T_{amb} = -40^\circ\text{C to } +85^\circ\text{C}$			
			MIN	TYP	MAX	MIN	MAX		
t_{PLH}	Propagation delay I_n to Y_n	5.0	2.0	4.0	9.0	1.5	10.0	ns	1
t_{PHL}	Propagation delay I_n to Y_n	5.0	2.0	4.2	9.0	1.5	10.0	ns	1
t_{PZH}	3-State output enable time \overline{OE} to Y_n	5.0	2.0	4.2	8.5	1.5	9.5	ns	2
t_{PZL}	3-State output enable time \overline{OE} to Y_n	5.0	2.0	5.1	8.5	1.5	9.5	ns	2
t_{PHZ}	3-State output disable time \overline{OE} to Y_n	5.0	2.0	4.4	8.0	1.5	9.0	ns	2
t_{PLZ}	3-State output disable time \overline{OE} to Y_n	5.0	2.0	4.0	8.0	1.5	9.0	ns	2

NOTE:

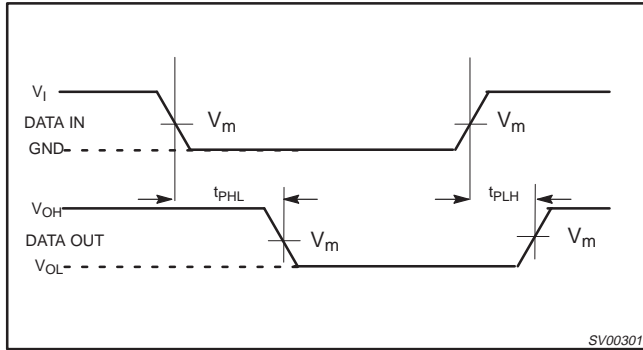
1. These values are at $V_{CC} = 5.0\text{V} \pm 0.5\text{V}$

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74AC244
74ACT244

AC WAVEFORMS

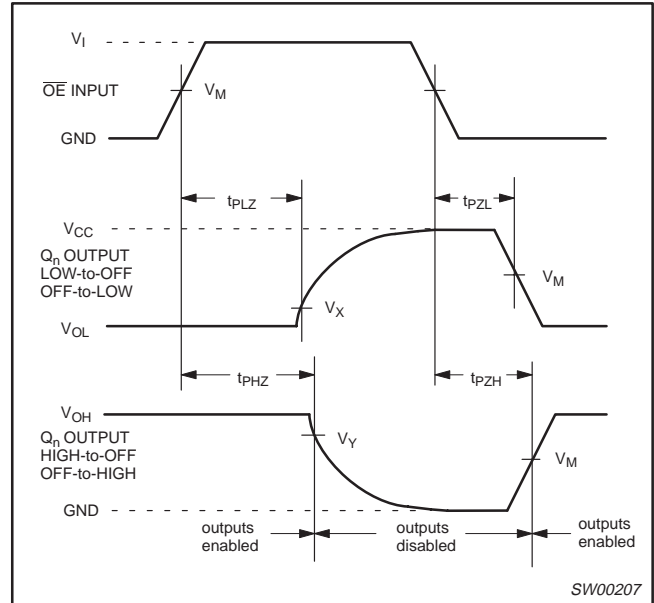
V_{OL} and V_{OH} are the typical output voltage drops that occur with the output load.



Waveform 1. Waveforms showing the input (I_n) to output (Y_n) propagation delays.

$$V_X = V_{OL} + 0.3V$$

$$V_Y = V_{OH} - 0.3V$$



Waveform 2. Waveforms showing the 3-State output enable and disable times.

TEST CIRCUIT

Test Circuit for 3-State Outputs

SWITCH POSITION		FAMILY	V_I Input Requirements	V_m Input	V_m Output
TEST	SWITCH				
t_{PLH}/t_{PHL}	Open	AC	GND to V_{CC}	50% V_{CC}	50% V_{CC}
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$				
t_{PHZ}/t_{PZH}	Open	ACT	GND to 3.0V	1.5V	50% V_{CC}

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance, see AC characteristics

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Waveform 3. Load circuitry for switching times.

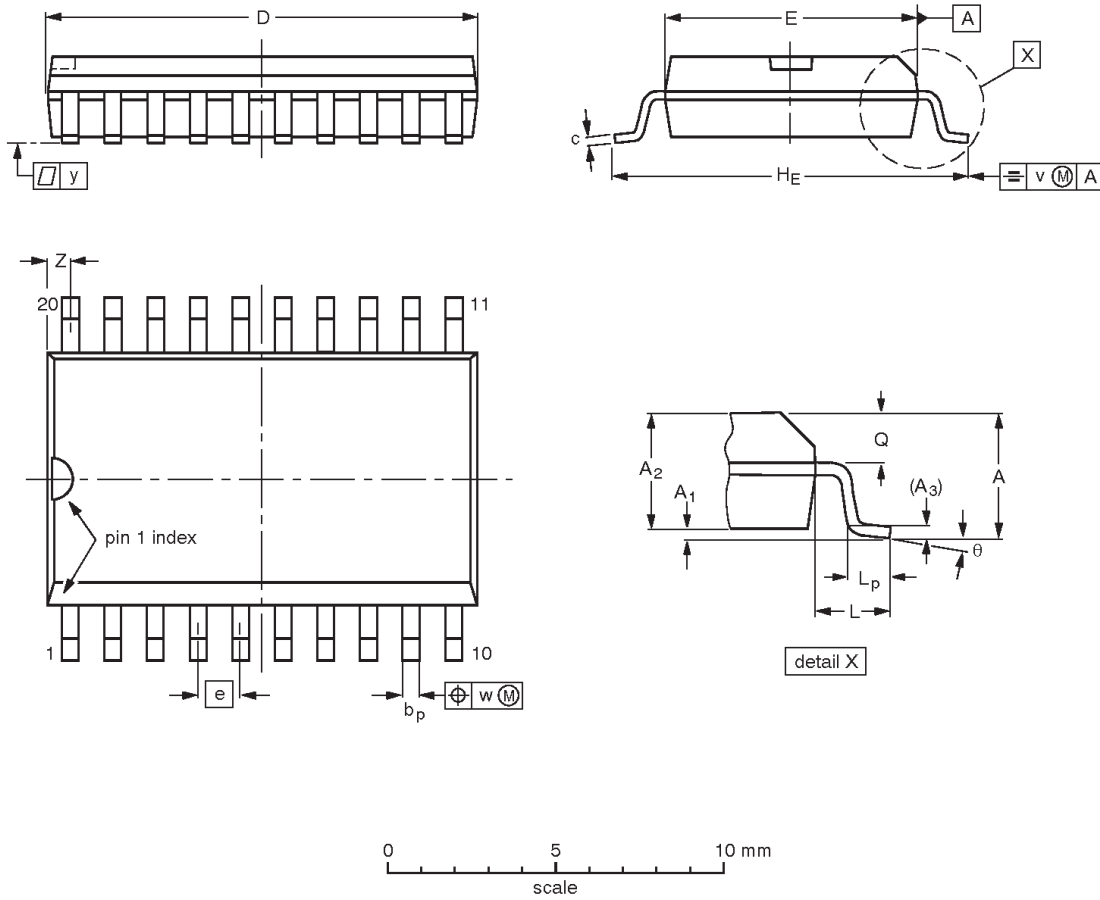
SV00451

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74AC244
74ACT244

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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.65	0.30 0.10	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	0.10	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	0.050	0.42 0.39	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 maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				92-11-17 95-01-24

Octal buffer/line driver (3-State)

74AC244
74ACT244

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

SOT339-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	7.4 7.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.9 0.5	8° 0°

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

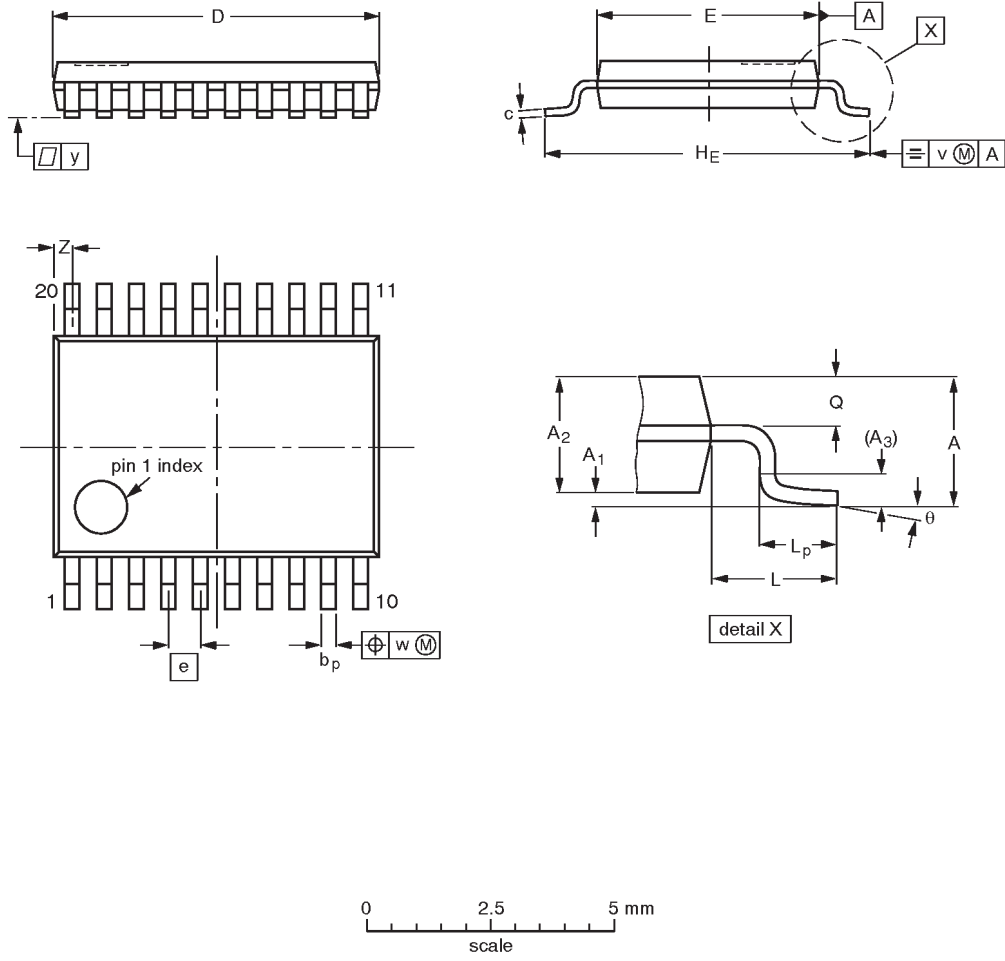
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT339-1		MO-150AE				93-09-08 95-02-04

Octal buffer/line driver (3-State)

74AC244
74ACT244

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

SOT360-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT360-1		MO-153AC				-93-06-16- 95-02-04

Octal buffer/line driver (3-State)

74AC244
74ACT244

DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	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.
<i>Preliminary Specification</i>	Preproduction Product	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
<i>Product Specification</i>	Full Production	This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.

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