

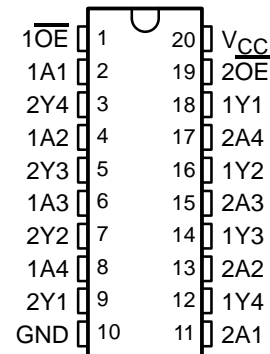
SN74AHC244-EP OCTAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

SCLS486A – MAY 2003 – REVISED JUNE 2003

- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree†**
- **EPIC™ (Enhanced-Performance Implanted CMOS) Process**
- **Operating Range 2-V to 5.5-V V_{CC}**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds 1500 V Per MIL-STD-883, Method 3015; Exceeds 150 V Using Machine Model (C = 200 pF, R = 0)**

† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

DW OR PW PACKAGE
(TOP VIEW)



description/ordering information

This octal buffer/driver is designed specifically to improve the performance and density of 3-state memory-address drivers, clock drivers, and bus-oriented receivers and transmitters.

The SN74AHC244 is organized as two 4-bit buffers/line drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION

TA	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	SOIC – D	Tape and reel	SN74AHC244MDWREP	AHC244MEP
	TSSOP – PW	Tape and reel	SN74AHC244MPWREP	AHC244EP

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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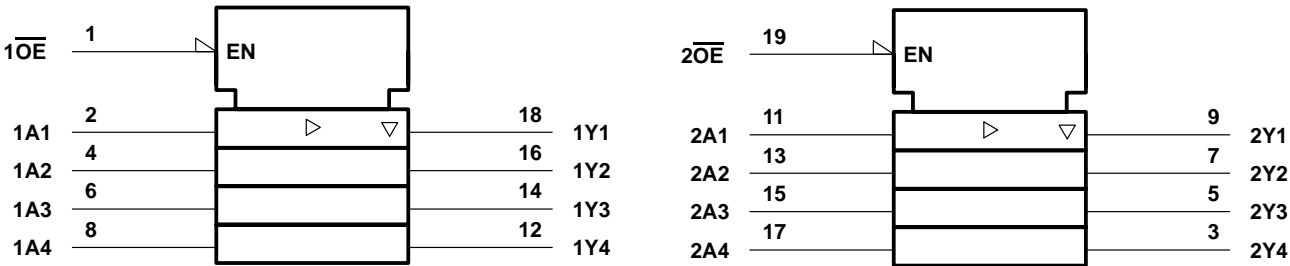
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FUNCTION TABLE
(each 4-bit buffer/driver)

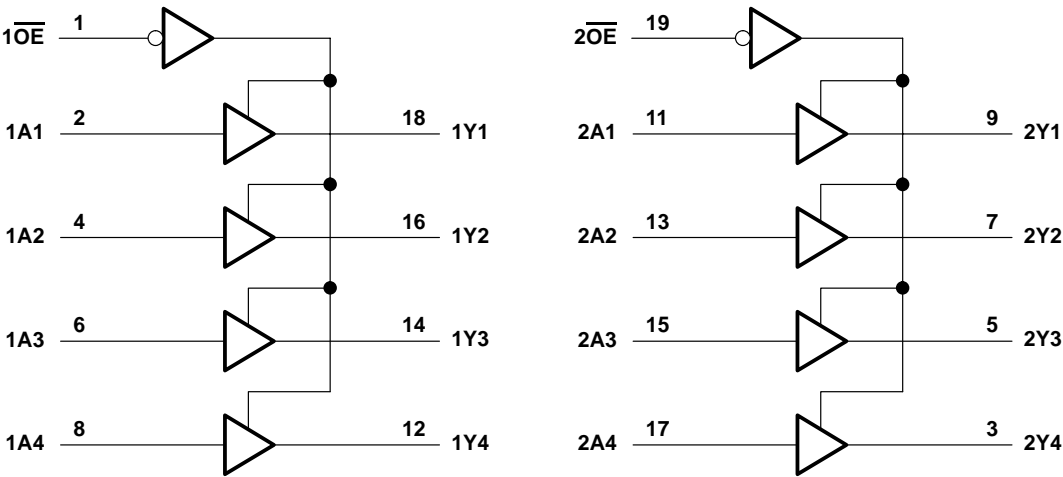
INPUTS		OUTPUT Y
\overline{OE}	A	
L	H	H
L	L	L
H	X	Z

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 2): DW package	58°C/W
PW package	83°C/W

Storage temperature range, T_{stg} –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5		V
		$V_{CC} = 3$ V	2.1		
		$V_{CC} = 5.5$ V	3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5	V
		$V_{CC} = 3$ V		0.9	
		$V_{CC} = 5.5$ V		1.65	
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V		–50	µA
		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		–4	mA
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		–8	
I_{OL}	Low-level output current	$V_{CC} = 2$ V		50	µA
		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		4	mA
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		8	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		100	ns/V
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		20	
T_A	Operating free-air temperature		–55	125	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V _{OH}	I _{OH} = –50 µA	2 V	1.9	2		1.9		V
		3 V	2.9	3		2.9		
		4.5 V	4.4	4.5		4.4		
	I _{OH} = –4 mA	3 V	2.58			2.48		
	I _{OH} = –8 mA	4.5 V	3.94			3.8		
V _{OL}	I _{OL} = 50 µA	2 V			0.1		0.1	V
		3 V			0.1		0.1	
		4.5 V			0.1		0.1	
	I _{OL} = 4 mA	3 V			0.36		0.5	
	I _{OL} = 8 mA	4.5 V			0.36		0.5	
I _I	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1	µA
I _{OZ}	V _O = V _{CC} or GND, V _I ($\overline{\text{OE}}$) = V _{IL} or V _{IH}	5.5 V			±0.25		±2.5	µA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40	µA
C _i	V _I = V _{CC} or GND	5 V		2	10			pF
C _o	V _O = V _{CC} or GND	5 V		3.5				pF

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{PLH}	A	Y	C _L = 15 pF		5.8	8.4	1	10	ns
t _{PHL}					5.8	8.4	1	10	
t _{PZH}	$\overline{\text{OE}}$	Y	C _L = 15 pF		6.6	10.6	1	12.5	ns
t _{PZL}					6.6	10.6	1	12.5	
t _{PHZ}	$\overline{\text{OE}}$	Y	C _L = 15 pF		5	9.7	1	11	ns
t _{PLZ}					5	9.7	1	11	
t _{PLH}	A	Y	C _L = 50 pF		8.3	11.9	1	13.5	ns
t _{PHL}					8.3	11.9	1	13.5	
t _{PZH}	$\overline{\text{OE}}$	Y	C _L = 50 pF		9.1	14.1	1	16	ns
t _{PZL}					9.1	14.1	1	16	
t _{PHZ}	$\overline{\text{OE}}$	Y	C _L = 50 pF		10.3	14	1	16	ns
t _{PLZ}					10.3	14	1	16	



switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{PLH}	A	Y	C _L = 15 pF	3.9	5.5	1	6.5	ns	
t _{PHL}				3.9	5.5	1	6.5		
t _{PZH}	\overline{OE}	Y	C _L = 15 pF	4.7	7.3	1	8.5	ns	
t _{PZL}				4.7	7.3	1	8.5		
t _{PHZ}	\overline{OE}	Y	C _L = 15 pF	5	7.2	1	8.5	ns	
t _{PLZ}				5	7.2	1	8.5		
t _{PLH}	A	Y	C _L = 50 pF	5.4	7.5	1	8.5	ns	
t _{PHL}				5.4	7.5	1	8.5		
t _{PZH}	\overline{OE}	Y	C _L = 50 pF	6.2	9.3	1	10.5	ns	
t _{PZL}				6.2	9.3	1	10.5		
t _{PHZ}	\overline{OE}	Y	C _L = 50 pF	6.7	9.2	1	10.5	ns	
t _{PLZ}				6.7	9.2	1	10.5		

noise characteristics, $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

PARAMETER		MIN	TYP	MAX	UNIT
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.5		V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		-0.2		V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		4.8		V
$V_{IH(D)}$	High-level dynamic input voltage	3.5			V
$V_{IL(D)}$	Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are for surface-mount packages only.

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load, $f = 1\text{ MHz}$	8.6	pF

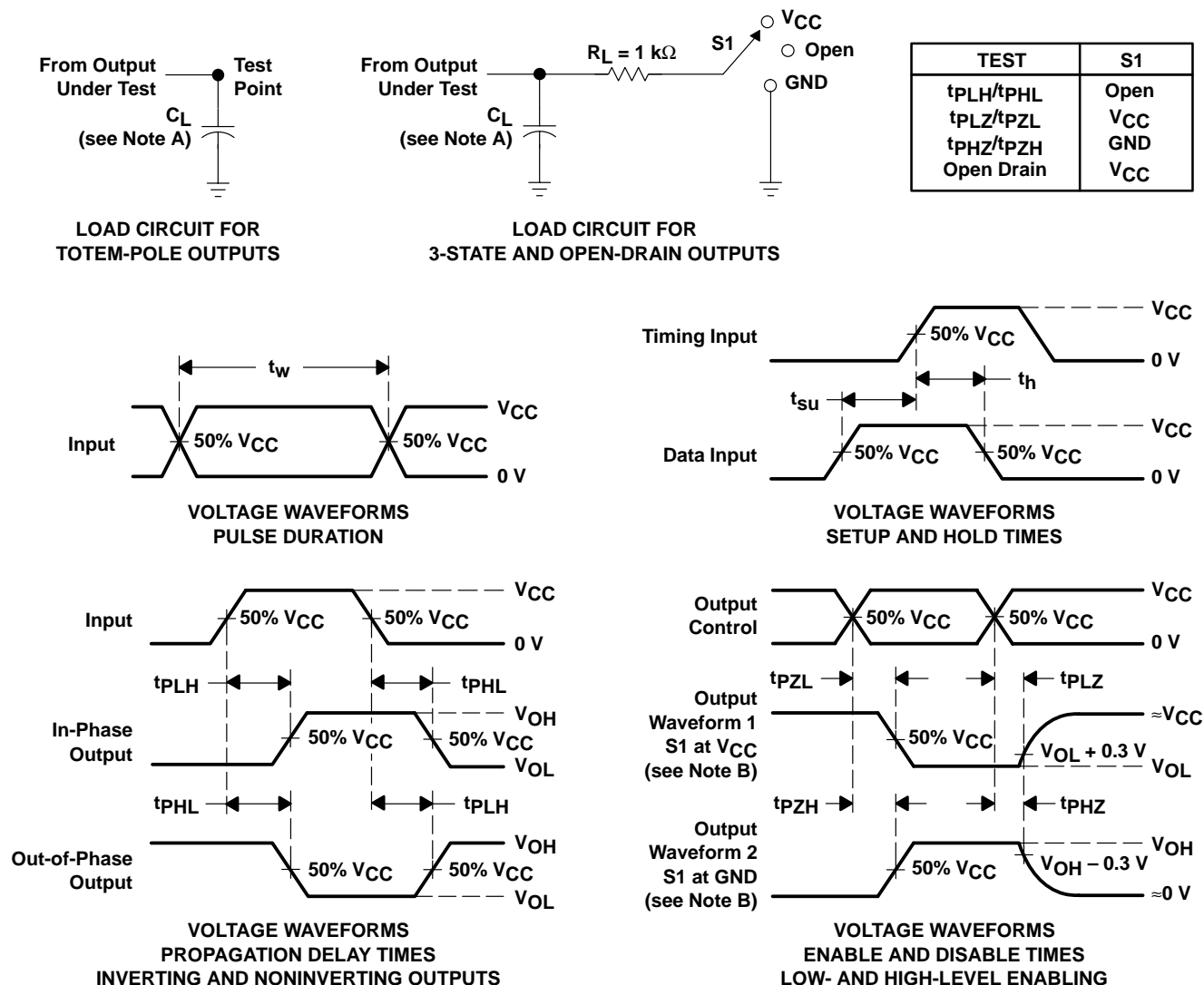
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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
- D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74AHC244MDWREP	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC244MPWREP	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AHC244MPWREPG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/03649-01XE	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/03649-01YE	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBsolete: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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OTHER QUALIFIED VERSIONS OF SN74AHC244-EP :

- Catalog: [SN74AHC244](#)
- Automotive: [SN74AHC244-Q1](#)
- Military: [SN54AHC244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AHC244MDWREP	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74AHC244MPWREP	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHC244MDWREP	SOIC	DW	20	2000	346.0	346.0	41.0
SN74AHC244MPWREP	TSSOP	PW	20	2000	346.0	346.0	33.0

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