

SN54AC240, SN74AC240 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCAS512C – JUNE 1995 – REVISED SEPTEMBER 1996

- **EPIC™** (Enhanced-Performance Implanted CMOS) 1-μm Process
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and DIP (N) Packages, Ceramic Chip Carriers (FK), Flat (W), and DIP (J) Packages

description

These octal buffers and line drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

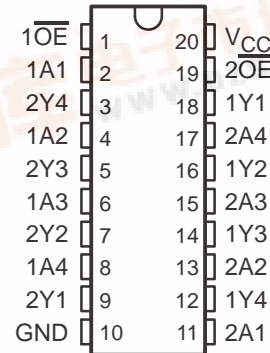
The 'AC240 are organized as two 4-bit buffers/drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes inverted data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

The SN54AC240 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AC240 is characterized for operation from -40°C to 85°C .

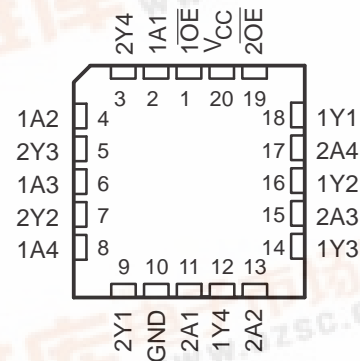
FUNCTION TABLE
(each buffer)

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

SN54AC240 ... J OR W PACKAGE
SN74AC240 ... DB, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54AC240 ... FK PACKAGE
(TOP VIEW)



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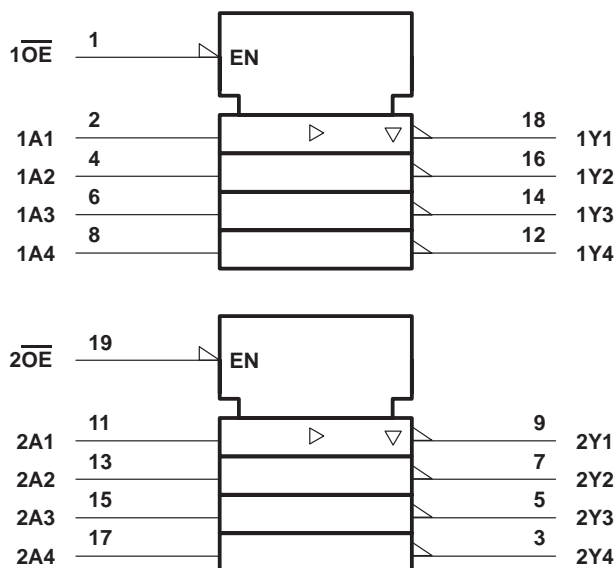
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OCTAL BUFFERS/DRIVERS

WITH 3-STATE OUTPUTS

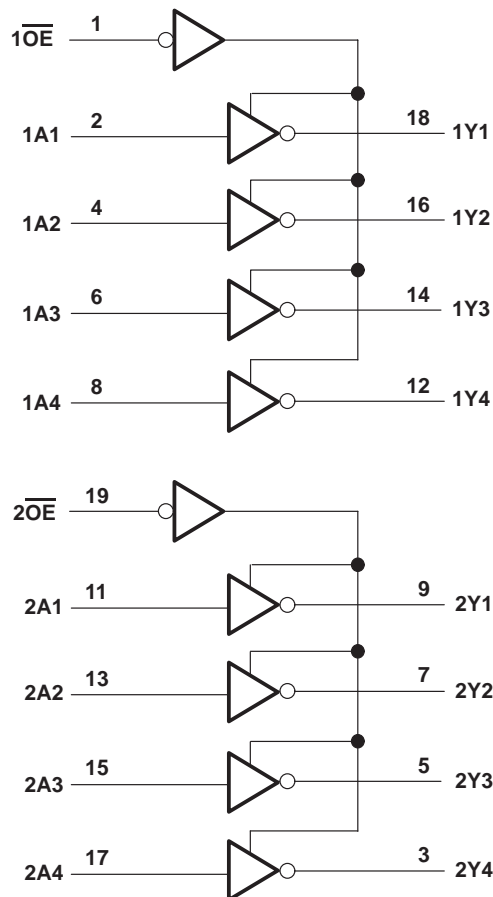
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logic symbol†



† 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 $V_{CC} + 0.5$ V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	± 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})	± 50 mA
Continuous current through V_{CC} or GND	± 200 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	
DB package	0.6 W
DW package	1.6 W
N package	1.3 W
PW package	0.7 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 maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

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recommended operating conditions (see Note 3)

			SN54AC240		SN74AC240		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		2	6	2	6	V
V_{IH}	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1		2.1		V
		$V_{CC} = 4.5\text{ V}$	3.15		3.15		
		$V_{CC} = 5.5\text{ V}$	3.85		3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 3\text{ V}$		0.9		0.9	V
		$V_{CC} = 4.5\text{ V}$		1.35		1.35	
		$V_{CC} = 5.5\text{ V}$		1.65		1.65	
V_I	Input voltage		0	V_{CC}	0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 3\text{ V}$		-12		-12	mA
		$V_{CC} = 4.5\text{ V}$		-24		-24	
		$V_{CC} = 5.5\text{ V}$		-24		-24	
I_{OL}	Low-level output current	$V_{CC} = 3\text{ V}$		12		12	mA
		$V_{CC} = 4.5\text{ V}$		24		24	
		$V_{CC} = 5.5\text{ V}$		24		24	
$\Delta t/\Delta v$	Input transition rise or fall rate		0	8	0	8	ns/V
T_A	Operating free-air temperature		-55	125	-40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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OCTAL BUFFERS/DRIVERS

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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			SN54AC240		SN74AC240		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = – 50 µA		3 V	2.9			2.9		2.9		V
			4.5 V	4.4			4.4		4.4		
			5.5 V	5.4			5.4		5.4		
	I _{OH} = – 12 mA		3 V	2.56			2.4		2.46		
			4.5 V	3.86			3.7		3.76		
	I _{OL} = – 24 mA		4.5 V	3.86			3.7		3.76		
			5.5 V	4.86			4.7		4.76		
V _{OL}	I _{OL} = 50 µA		3 V			0.1			0.1		V
			4.5 V			0.1			0.1		
			5.5 V			0.1			0.1		
	I _{OL} = 12 mA		3 V			0.36			0.5		
			4.5 V			0.36			0.5		
	I _{OL} = 24 mA		4.5 V			0.36			0.5		
			5.5 V			0.36			0.5		
I _I	Data inputs	V _I = V _{CC} or GND	5.5 V			±0.1			±1		µA
	Control inputs	V _I = V _{CC} or GND	5.5 V			±0.1			±1		
I _{OZ} [†]		V _O = V _{CC} or GND, V _{I(OE)} = V _{IL} or V _{IH}	5.5 V			±0.25			±5		µA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	5.5 V			4			80		µA
C _i		V _I = V _{CC} or GND	5 V			2.5					pF

[†] Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

[‡] For I/O ports, the parameter I_{OZ} includes the input leakage current.

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)	T _A = 25°C			SN54AC240		SN74AC240		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1.5	6	8	1	11	1	9	ns
t _{PHL}			1.5	5.5	8	1	10.5	1	8.5	
t _{PZH}	$\overline{\text{OE}}$	Y	1.5	6	10.5	1	11.5	1	11	ns
t _{PZL}			1.5	7	10	1	13	1	11	
t _{PHZ}	$\overline{\text{OE}}$	Y	1.5	7	10	1	12.5	1	10.5	ns
t _{PLZ}			1.5	7.5	10.5	1	13.5	1	11.5	

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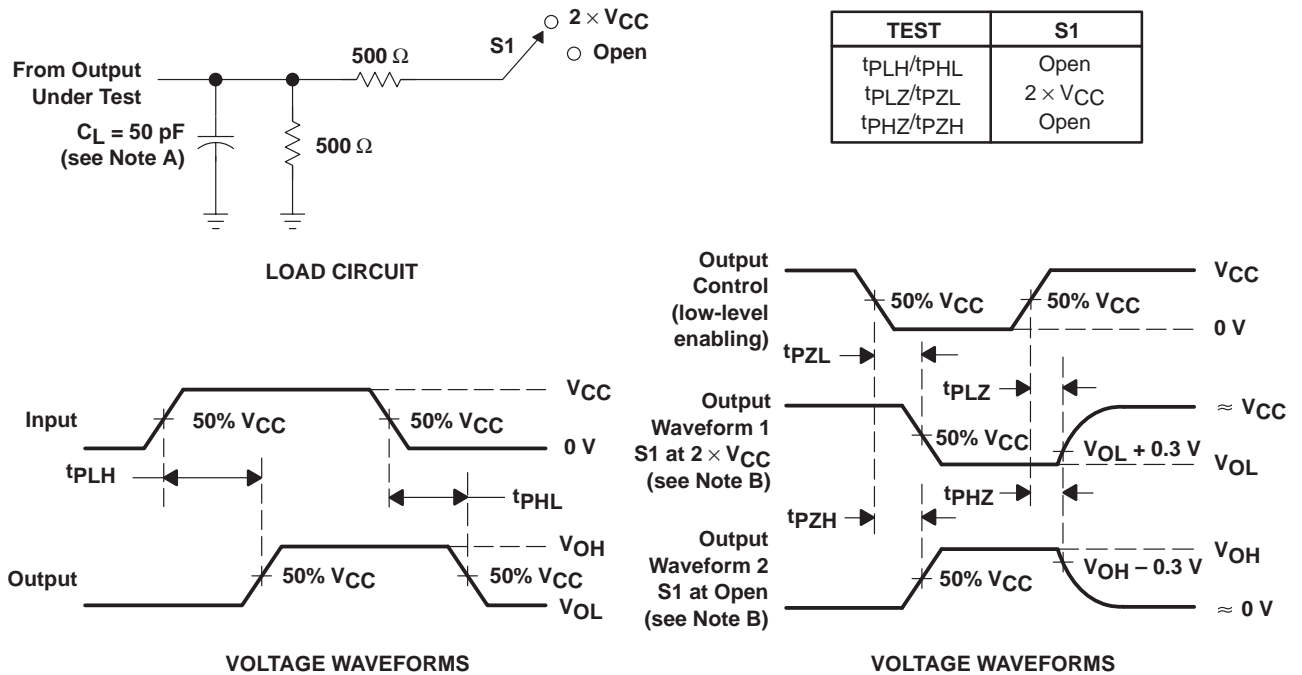
switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			SN54AC240		SN74AC240		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	1.5	4.5	6.5	1	8.5	1	7	ns
t_{PHL}			1.5	4.5	6	1	8	1	6.5	
t_{PZH}	\overline{OE}	Y	1.5	5	7	1	9	1	8	ns
t_{PZL}			1.5	5.5	8	1	10.5	1	8.5	
t_{PHZ}	\overline{OE}	Y	2.5	6.5	9	1	10.5	1	9.5	ns
t_{PLZ}			2	6.5	9	1	11	1	9.5	

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

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per buffer/driver	$C_L = 50\text{ pF}$, $f = 1\text{ MHz}$	45	pF

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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 - D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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