

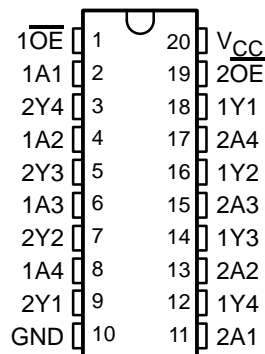
# SN74AHC244-EP OCTAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

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](http://www.ti.com/sc/package).



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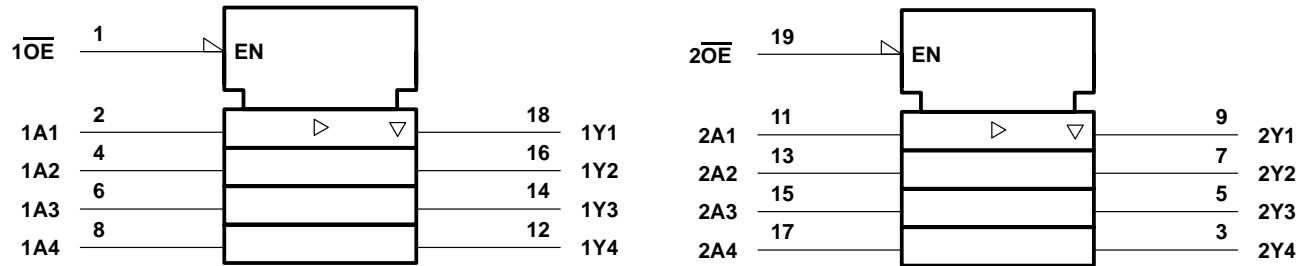
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FUNCTION TABLE  
(each 4-bit buffer/driver)

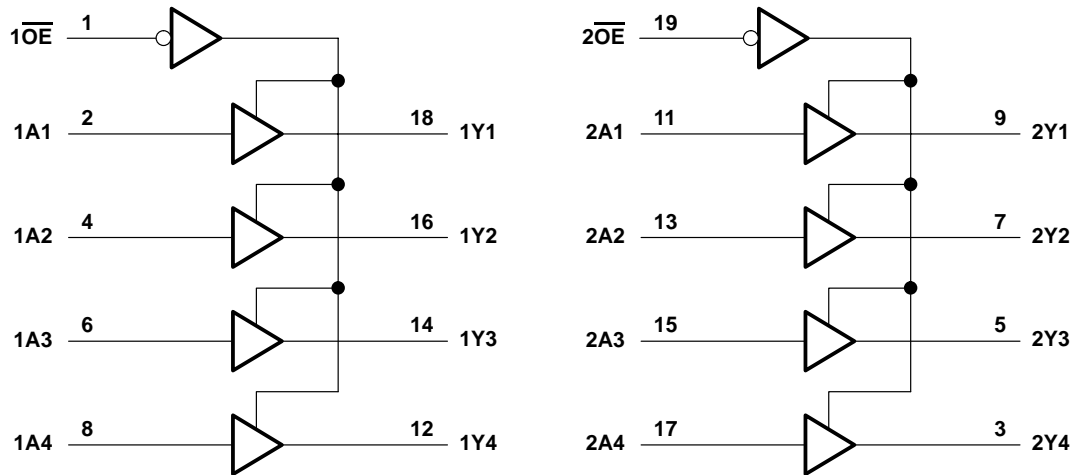
INPUTS		OUTPUT Y
$\overline{OE}$	A	
L	H	H
L	L	L
H	X	Z

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, $\theta_{JA}$ (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
		$V_{CC} = 3.3$ V ± 0.3 V		–4	mA
		$V_{CC} = 5$ V ± 0.5 V		–8	
$I_{OL}$	Low-level output current	$V_{CC} = 2$ V		50	µA
		$V_{CC} = 3.3$ V ± 0.3 V		4	mA
		$V_{CC} = 5$ V ± 0.5 V		8	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V		100	ns/V
		$V_{CC} = 5$ V ± 0.5 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.

# SN74AHC244-EP

## OCTAL BUFFER/DRIVER

### WITH 3-STATE OUTPUTS

SCLS486A – MAY 2003 – REVISED JUNE 2003

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V <sub>OH</sub>	I <sub>OH</sub> = -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 <sub>OH</sub> = -4 mA	3 V	2.58			2.48		
	I <sub>OH</sub> = -8 mA	4.5 V	3.94			3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	2 V			0.1		0.1	V
		3 V			0.1		0.1	
		4.5 V			0.1		0.1	
	I <sub>OL</sub> = 4 mA	3 V			0.36		0.5	
	I <sub>OL</sub> = 8 mA	4.5 V			0.36		0.5	
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 V to 5.5 V			±0.1		±1	µA
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>I</sub> ( $\overline{\text{OE}}$ ) = V <sub>IL</sub> or V <sub>IH</sub>	5.5 V			±0.25		±2.5	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			4		40	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		2	10			pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	5 V		3.5				pF

switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

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



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

SCLS486A – MAY 2003 – REVISED JUNE 2003

**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 <sub>A</sub> = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t <sub>PLH</sub>	A	Y	C <sub>L</sub> = 15 pF	3.9	5.5	1	6.5	ns	
t <sub>PHL</sub>				3.9	5.5	1	6.5		
t <sub>PZH</sub>	OE	Y	C <sub>L</sub> = 15 pF	4.7	7.3	1	8.5	ns	
t <sub>PZL</sub>				4.7	7.3	1	8.5		
t <sub>PHZ</sub>	OE	Y	C <sub>L</sub> = 15 pF	5	7.2	1	8.5	ns	
t <sub>PLZ</sub>				5	7.2	1	8.5		
t <sub>PLH</sub>	A	Y	C <sub>L</sub> = 50 pF	5.4	7.5	1	8.5	ns	
t <sub>PHL</sub>				5.4	7.5	1	8.5		
t <sub>PZH</sub>	OE	Y	C <sub>L</sub> = 50 pF	6.2	9.3	1	10.5	ns	
t <sub>PZL</sub>				6.2	9.3	1	10.5		
t <sub>PHZ</sub>	OE	Y	C <sub>L</sub> = 50 pF	6.7	9.2	1	10.5	ns	
t <sub>PLZ</sub>				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

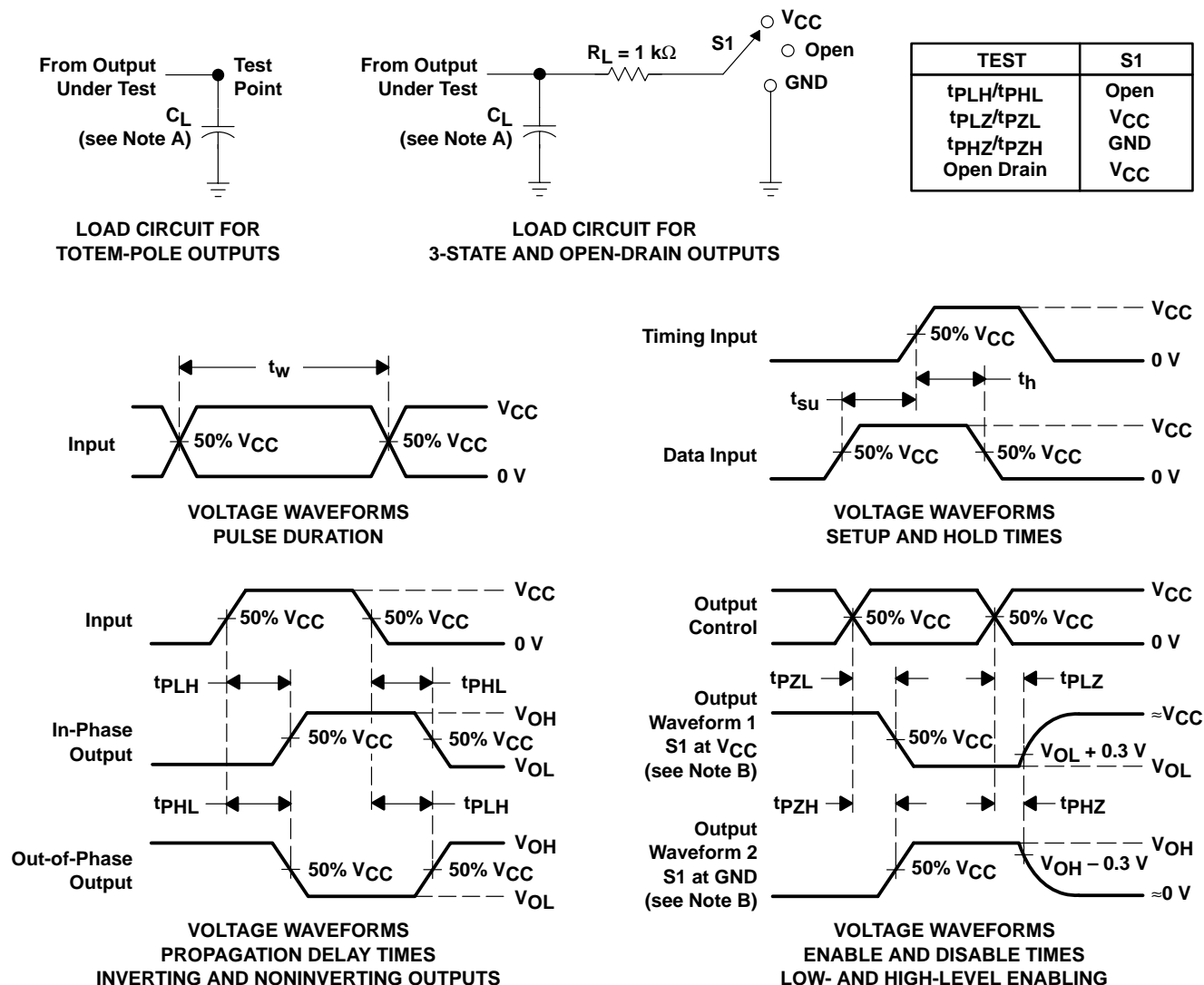
NOTE 4: Characteristics are for surface-mount packages only.

**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



## 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 part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74AHC244MDWREP</a>	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244MEP
SN74AHC244MDWREP.A	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244MEP
<a href="#">SN74AHC244MPWREP</a>	Last Time Buy	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244EP
<a href="#">SN74AHC244MPWREPG4</a>	Last Time Buy	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244EP
<a href="#">V62/03649-01XE</a>	Last Time Buy	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244EP
<a href="#">V62/03649-01YE</a>	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	AHC244MEP

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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	13.3	2.7	12.0	24.0	Q1
SN74AHC244MPWREP	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	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	356.0	356.0	45.0
SN74AHC244MPWREP	TSSOP	PW	20	2000	353.0	353.0	32.0

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