

## SNx4HCT244 Octal Buffers and Line Drivers With 3-State Outputs

### 1 Features

- Operating Voltage Range of 4.5 V to 5.5 V
- High-Current Outputs Drive up to 15 LSTTL Loads
- Low Power Consumption: 80- $\mu$ A Maximum  $I_{CC}$
- Typical  $t_{pd} = 13$  ns
- $\pm 6$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Maximum
- Inputs Are TTL-Voltage Compatible
- 3-State Outputs Drive Bus Lines and Buffer Memory Address Registers

### 2 Applications

- Servers
- LED Displays
- Network Switches
- Telecom Infrastructure
- Motor Drivers
- I/O Expanders

### 3 Description

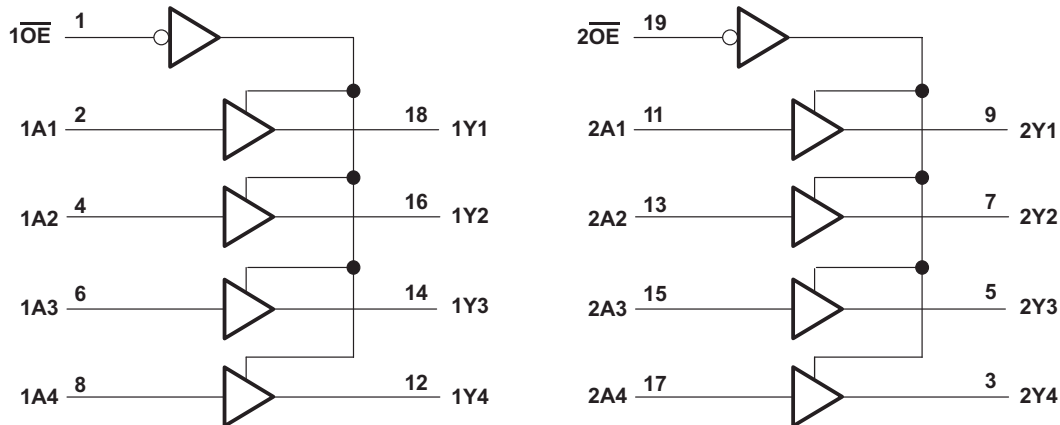
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clockdrivers, and bus-oriented receivers and transmitters. The SNx4HCT244 devices are organized as two 4-bit buffers or drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes noninverted data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

#### Device Information<sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74HCT244DB	SSOP (20)	7.20 mm x 5.30 mm
SN74HCT244DW	SOIC (20)	12.80 mm x 7.50 mm
SN74HCT244N	PDIP (20)	24.33 mm x 6.35 mm
SN74HCT244NS	SO (20)	12.60 mm x 5.30 mm
SN74HCT244PW	TSSOP (20)	6.50 mm x 4.40 mm
SN54HCT244	CDIP (20)	24.20 mm x 6.92 mm
	LCCC (20)	8.89 mm x 8.89 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

#### Logic Diagram (Positive Logic)



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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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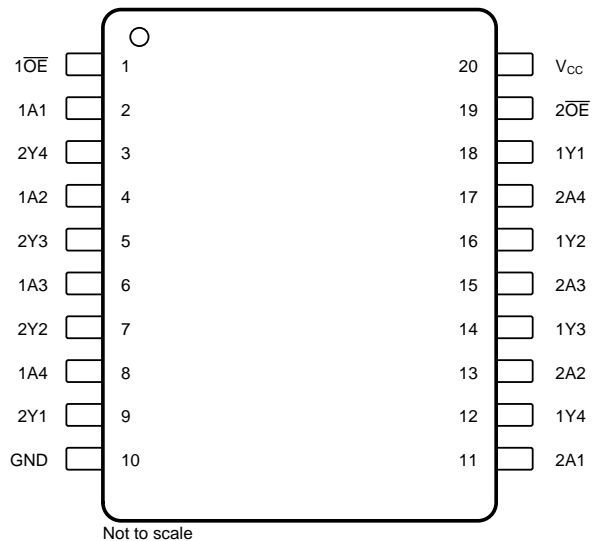
## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

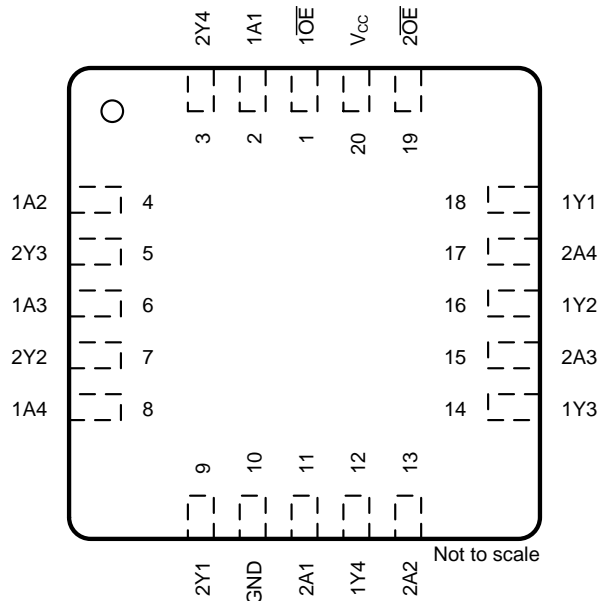
<b>Changes from Revision D (August 2013) to Revision E</b>	<b>Page</b>
• Added <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section .....	<b>1</b>
• Deleted <i>Ordering Information</i> table; see POA at the end of the data sheet .....	<b>1</b>
• Changed <i>Thermal Information</i> table .....	<b>5</b>
• Added ESD warning .....	<b>9</b>

## 5 Pin Configuration and Functions

**J, W, DB, DW, N, NS, or PW Packages**  
**20-Pin CDIP, CFP, SSOP, SOIC, PDIP, SO, or TSSOP**  
 Top View



**FK Package**  
**20-Pin LCCC**  
 Top View



### Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	1OE	I	Output enable
2	1A1	I	Input
3	2Y4	O	Output
4	1A2	I	Input
5	2Y3	O	Output
6	1A3	I	Input
7	2Y2	O	Output
8	1A4	I	Input
9	2Y1	O	Output
10	GND	—	Ground
11	2A1	I	Input
12	1Y4	O	Output
13	2A2	I	Input
14	1Y3	O	Output
15	2A3	I	Input
16	1Y2	O	Output
17	2A4	I	Input
18	1Y1	O	Output
19	2OE	I	Output enable
20	V <sub>CC</sub>	—	Power pin

## 6 Specifications

### 6.1 Absolute Maximum Ratings

 over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage		-0.5	7	V
$I_{IK}$	Input clamp current <sup>(2)</sup>	$V_I < 0$ or $V_I > V_{CC}$		$\pm 20$	mA
$I_{OK}$	Output clamp current <sup>(2)</sup>	$V_O < 0$ or $V_O > V_{CC}$		$\pm 20$	mA
$I_O$	Continuous output current	$V_O = 0$ to $V_{CC}$		$\pm 35$	mA
	Continuous channel current through $V_{CC}$ or GND			$\pm 70$	mA
$T_J$	Junction temperature			150	°C
$T_{stg}$	Storage temperature		-65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### 6.2 ESD Ratings

			VALUE	UNIT
<b>SN74HCT244 in DB, DW, N, NS, or PW package</b>				
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	$\pm 2000$	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup>	$\pm 1000$	
<b>SN54HCT244 in J, W, or FK package</b>				
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM)	$\pm 1500$	V

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 6.3 Recommended Operating Conditions

 over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

			MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage		4.5	5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V	2			V
$V_{IL}$	Low-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V			0.8	V
$V_I$	Input voltage		0		$V_{CC}$	V
$V_O$	Output voltage		0		$V_{CC}$	V
$\Delta t/\Delta v$	Input transition rise and fall time				500	ns
$T_A$	Operating free-air temperature	SN54HCT244	-55		125	°C
		SN74HCT244	-40		85	

- (1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. See the [Implications of Slow or Floating CMOS Inputs](#) application report.

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74HCT244					UNIT
		DB (SSOP)	DW (SOIC)	N (PDIP)	NS (SO)	PW (TSSOP)	
		20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	89.4	76.6	44.8	71.8	97.4	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	50.8	42.1	30.9	38.1	32.5	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	44.5	44.5	25.7	39.2	49.3	°C/W
$\Psi_{JT}$	Junction-to-top characterization parameter	16.9	15.9	16.3	14.9	1.7	°C/W
$\Psi_{JB}$	Junction-to-board characterization parameter	44.1	44	25.6	38.8	47.7	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS		$V_{CC}$	MIN	TYP	MAX	UNIT	
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu A$	4.5 V	4.4	4.499	V	V	
								SN54HCT244
								SN74HCT244
		$I_{OH} = -6 mA$		3.98	4.3			
								SN54HCT244
								SN74HCT244
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_{OL} = 20 \mu A$	4.5 V	0.001	0.1	V	V	
								SN54HCT244
								SN74HCT244
		$I_{OL} = 6 mA$		0.17	0.26			
								SN54HCT244
								SN74HCT244
$I_I$	$V_I = V_{CC}$ or 0	$T_A = 25^\circ C$	5.5 V	±0.1	±100	nA	nA	
								SN54HCT244
								SN74HCT244
$I_{OZ}$	$V_O = V_{CC}$ or 0, $V_I = V_{IH}$ or $V_{IL}$	$T_A = 25^\circ C$	5.5 V	±0.01	±0.5	μA	μA	
								SN54HCT244
								SN74HCT244
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$	$T_A = 25^\circ C$	5.5 V	8	160	μA	μA	
								SN54HCT244
								SN74HCT244
$\Delta I_{CC}^{(1)}$	One input at 0.5 V or 2.4 V, Other inputs at 0 or $V_{CC}$	$T_A = 25^\circ C$	5.5 V	1.4	2.4	mA	mA	
								SN54HCT244
								SN74HCT244
$C_i$	$T_A = 25^\circ C$	4.5 V to 5.5 V	3	10	pF	pF	pF	
								SN54HCT244
								SN74HCT244

(1) This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or  $V_{CC}$ .

## 6.6 Switching Characteristics: $C_L = 50 \text{ pF}$

 over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{pd}$	A	Y	4.5 V	$T_A = 25^\circ\text{C}$		15	28	ns
				SN54HCT244			42	
				SN74HCT244			35	
			5.5 V	$T_A = 25^\circ\text{C}$		13	25	
				SN54HCT244			38	
				SN74HCT244			32	
$t_{en}$	$\overline{OE}$	Y	4.5 V	$T_A = 25^\circ\text{C}$		21	35	ns
				SN54HCT244			53	
				SN74HCT244			44	
			5.5 V	$T_A = 25^\circ\text{C}$		19	32	
				SN54HCT244			48	
				SN74HCT244			40	
$t_{dis}$	$\overline{OE}$	Y	4.5 V	$T_A = 25^\circ\text{C}$		19	35	ns
				SN54HCT244			53	
				SN74HCT244			44	
			5.5 V	$T_A = 25^\circ\text{C}$		18	32	
				SN54HCT244			48	
				SN74HCT244			40	
$t_t$		Y	4.5 V	$T_A = 25^\circ\text{C}$		8	12	ns
				SN54HCT244			18	
				SN74HCT244			15	
			5.5 V	$T_A = 25^\circ\text{C}$		7	11	
				SN54HCT244			16	
				SN74HCT244			14	

## 6.7 Switching Characteristics: $C_L = 150 \text{ pF}$

 over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$  (unless otherwise noted) (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{pd}$	A	Y	4.5 V	$T_A = 25^\circ\text{C}$		21	45	ns
				SN54HCT244			68	
				SN74HCT244			56	
			5.5 V	$T_A = 25^\circ\text{C}$		18	40	
				SN54HCT244			61	
				SN74HCT244			51	
$t_{en}$	$\overline{OE}$	Y	4.5 V	$T_A = 25^\circ\text{C}$		25	52	ns
				SN54HCT244			79	
				SN74HCT244			65	
			5.5 V	$T_A = 25^\circ\text{C}$		22	47	
				SN54HCT244			71	
				SN74HCT244			59	

**Switching Characteristics:  $C_L = 150$  pF (continued)**

over recommended operating free-air temperature range,  $C_L = 150$  pF (unless otherwise noted) (see [Figure 2](#))

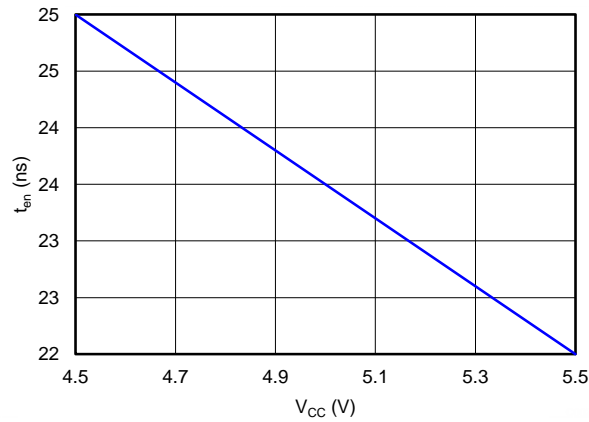
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_t$		Y	4.5 V	$T_A = 25^\circ\text{C}$		17	42	ns
				SN54HCT244			63	
				SN74HCT244			53	
			5.5 V	$T_A = 25^\circ\text{C}$		14	38	
				SN54HCT244			57	
				SN74HCT244			48	

**6.8 Operating Characteristics**

$T_A = 25^\circ\text{C}$

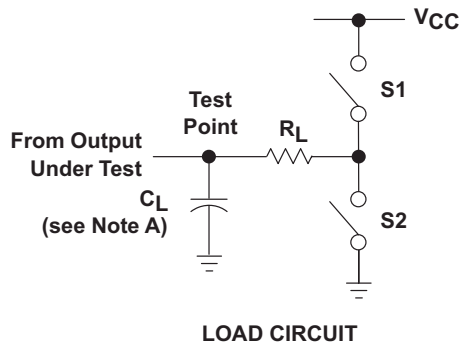
PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per buffer or driver	No load	40	pF

**6.9 Typical Characteristics**

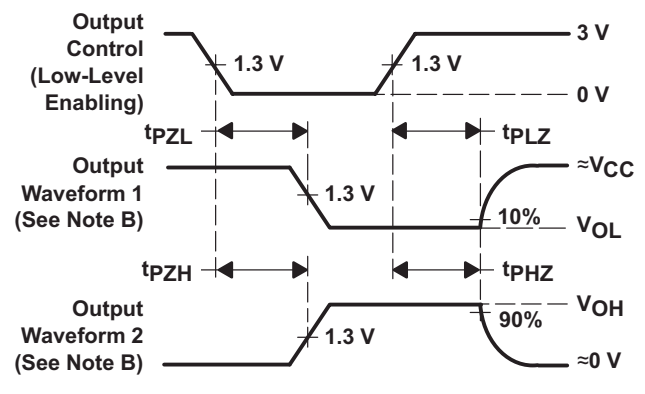
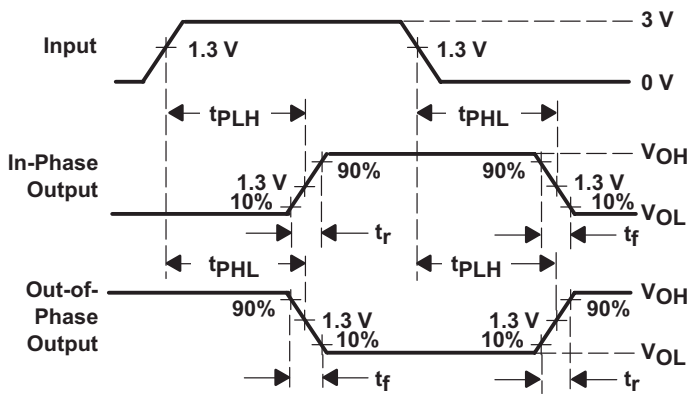
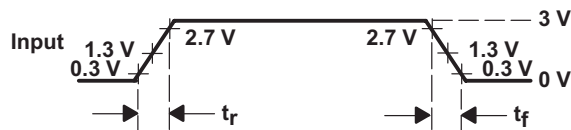


**Figure 1. Enable Time vs  $V_{CC}$**

## 7 Parameter Measurement Information



PARAMETER		$R_L$	$C_L$	S1	S2
$t_{en}$	$t_{pZH}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
	$t_{pZL}$			Closed	Open
$t_{dis}$	$t_{pHZ}$	1 k $\Omega$	50 pF	Open	Closed
	$t_{pLZ}$			Closed	Open
$t_{pd}$ or $t_t$		—	50 pF or 150 pF	Open	Open



- NOTES:
- A.  $C_L$  includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - D. The outputs are measured one at a time with one input transition per measurement.
  - E.  $t_{pLZ}$  and  $t_{pHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{pZL}$  and  $t_{pZH}$  are the same as  $t_{en}$ .
  - G.  $t_{pLH}$  and  $t_{pHL}$  are the same as  $t_{pd}$ .

**Figure 2. Load Circuit and Voltage Waveforms**



## 8 Detailed Description

### 8.1 Overview

The SNx4HCT244 device is organized as two 4-bit buffers and 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,  $\overline{OE}$  must 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.

### 8.2 Functional Block Diagram

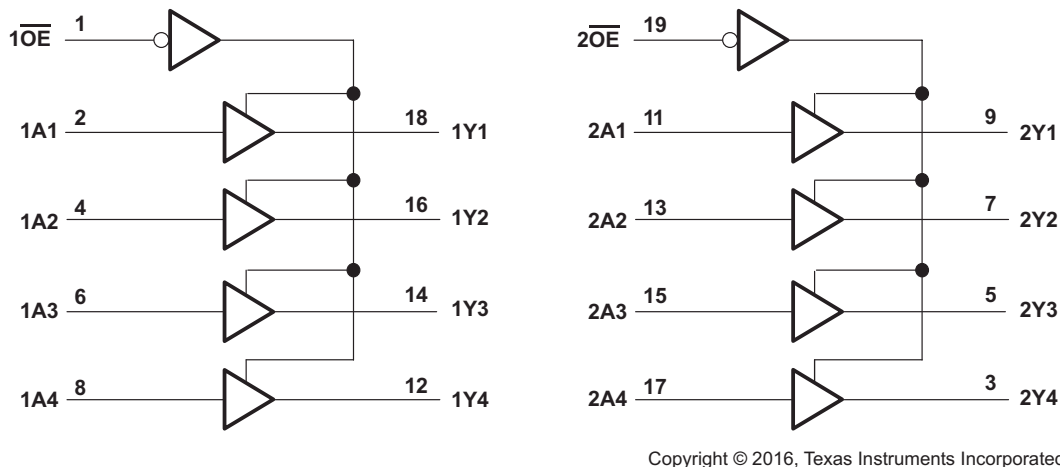


Figure 3. Logic Diagram (Positive Logic)

### 8.3 Feature Description

The SN74HCT244 device can drive up to 15 LSTTL loads. This device has low power consumption of 80- $\mu$ A  $I_{CC}$ . The SN74HCT244 also has 3 state outputs that allow the outputs to go to high impedance, low or high.

### 8.4 Device Functional Modes

Table 1 lists the functions of the SNx4HC244.

Table 1. Function Table

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

## 9 Application and Implementation

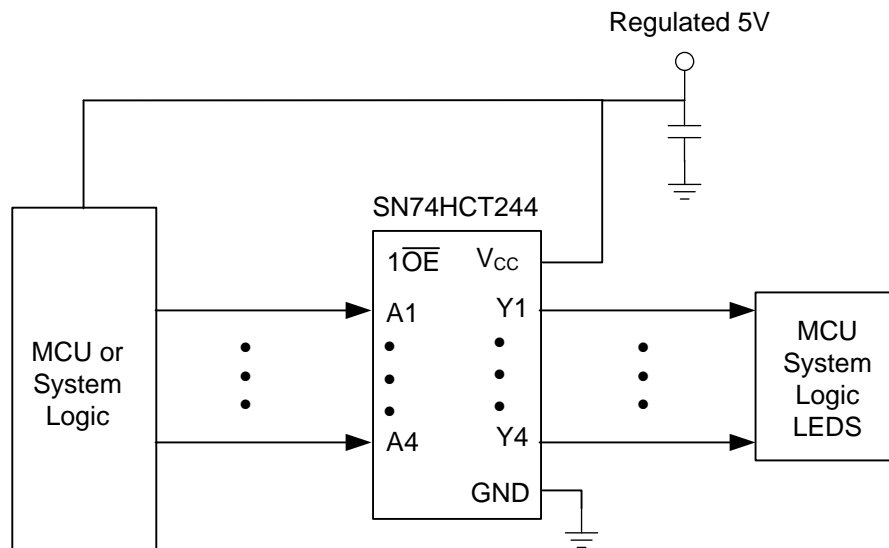
### NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 9.1 Application Information

The SN74HC244 is a high-drive CMOS device that can be used for a multitude of bus interface type applications where output drive or PCB trace length is a concern.

### 9.2 Typical Application



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**Figure 4. Application Schematic**

#### 9.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Avoid bus contention because it can drive currents in excess of maximum limits. The high drive creates fast edges into light loads, so consider routing and load conditions to prevent ringing.

#### 9.2.2 Detailed Design Procedure

1. Recommended input conditions:
  - For rise time and fall time specifications, see  $\Delta t/\Delta V$  in [Recommended Operating Conditions](#).
  - For specified high and low levels, see  $V_{IH}$  and  $V_{IL}$  in [Recommended Operating Conditions](#).
2. Recommend output conditions:
  - Load currents must not exceed the  $I_O$  maximum per output and must not exceed the continuous current through  $V_{CC}$  or GND total current for the part. These limits are located in [Absolute Maximum Ratings](#).
  - Outputs must not be pulled above  $V_{CC}$ .

## Typical Application (continued)

### 9.2.3 Application Curve

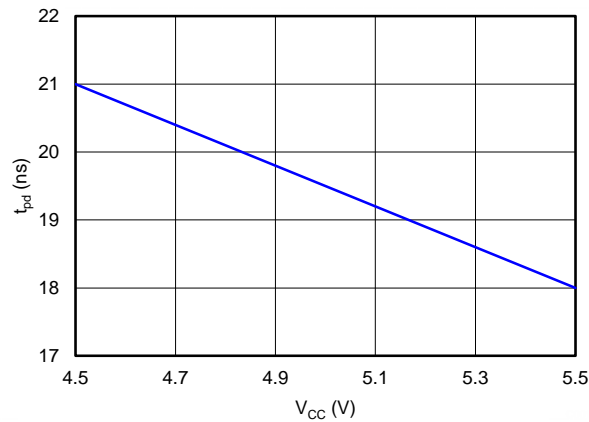


Figure 5. Propagation Delay vs V<sub>CC</sub>

## 10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in [Recommended Operating Conditions](#).

Each V<sub>CC</sub> terminal must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1-μF capacitor. If there are multiple V<sub>CC</sub> terminals, then TI recommends 0.01-μF or 0.022-μF capacitors for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. Multiple bypass capacitors may be paralleled to reject different frequencies of noise. The bypass capacitor must be installed as close to the power terminal as possible for the best results.

## 11 Layout

### 11.1 Layout Guidelines

When using multiple bit logic devices, inputs must not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input and gate are used, or when only 3 of the 4-buffer gates are used. Such input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in [Figure 6](#) are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally they are tied to GND or V<sub>CC</sub>, whichever makes more sense or is more convenient.

### 11.2 Layout Example

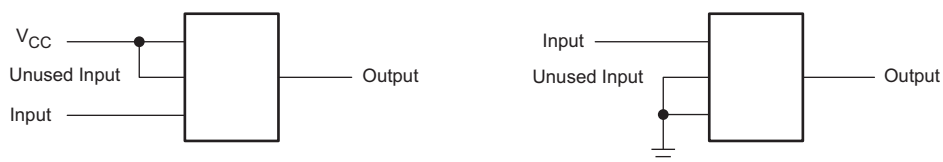


Figure 6. Layout Diagram

## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

For related documentation, see the following:

[Implications of Slow or Floating CMOS Inputs](#) (SCBA004)

### 12.2 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

**Table 2. Related Links**

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54HCT244	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
SN74HCT244	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>

### 12.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 12.4 Community Resource

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

**Design Support** *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 12.5 Trademarks

E2E is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

### 12.6 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 12.7 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8513001VRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8513001VR A SNV54HCT244J	<a href="#">Samples</a>
5962-8513001VSA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8513001VS A SNV54HCT244W	<a href="#">Samples</a>
85130012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85130012A SNJ54HCT 244FK	<a href="#">Samples</a>
8513001RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8513001RA SNJ54HCT244J	<a href="#">Samples</a>
JM38510/65755B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755B2A	<a href="#">Samples</a>
JM38510/65755BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755BRA	<a href="#">Samples</a>
M38510/65755B2A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755B2A	<a href="#">Samples</a>
M38510/65755BRA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755BRA	<a href="#">Samples</a>
SN54HCT244J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HCT244J	<a href="#">Samples</a>
SN74HCT244DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244DW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244DWE4	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244DWG4	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244DWRE4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244DWRG4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244N	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT244N	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HCT244NE4	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT244N	<a href="#">Samples</a>
SN74HCT244NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	<a href="#">Samples</a>
SN74HCT244PW	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244PWE4	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244PWG4	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244PWRG4	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SN74HCT244PWT	ACTIVE	TSSOP	PW	20	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	<a href="#">Samples</a>
SNJ54HCT244FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85130012A SNJ54HCT 244FK	<a href="#">Samples</a>
SNJ54HCT244J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8513001RA SNJ54HCT244J	<a href="#">Samples</a>

(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.

**OBSELETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead finish/Ball material - Orderable Devices 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.

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**OTHER QUALIFIED VERSIONS OF SN54HCT244, SN54HCT244-SP, SN74HCT244 :**

- Catalog : [SN74HCT244](#), [SN54HCT244](#)
- Automotive : [SN74HCT244-Q1](#), [SN74HCT244-Q1](#)
- Enhanced Product : [SN74HCT244-EP](#), [SN74HCT244-EP](#)
- Military : [SN54HCT244](#)
- Space : [SN54HCT244-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

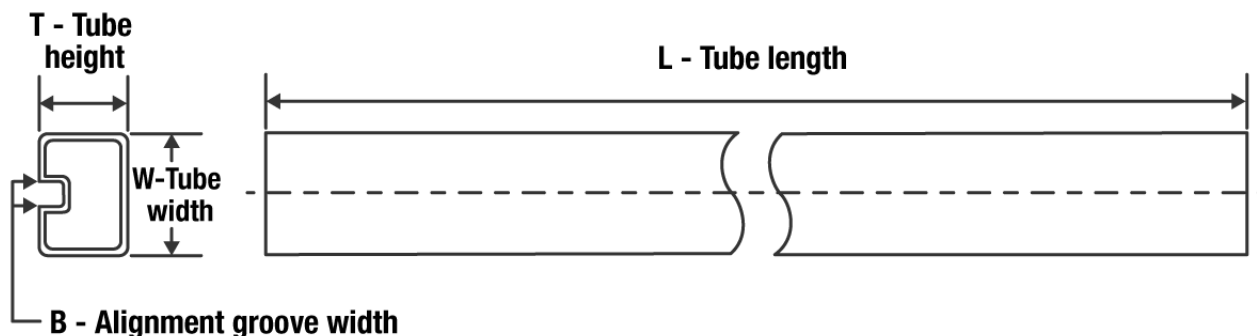
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT244DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HCT244DWR	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1
SN74HCT244NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74HCT244PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74HCT244PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT244PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT244PWT	TSSOP	PW	20	250	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)
SN74HCT244DBR	SSOP	DB	20	2000	853.0	449.0	35.0
SN74HCT244DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HCT244NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HCT244PWR	TSSOP	PW	20	2000	364.0	364.0	27.0
SN74HCT244PWR	TSSOP	PW	20	2000	853.0	449.0	35.0
SN74HCT244PWRG4	TSSOP	PW	20	2000	853.0	449.0	35.0
SN74HCT244PWT	TSSOP	PW	20	250	853.0	449.0	35.0

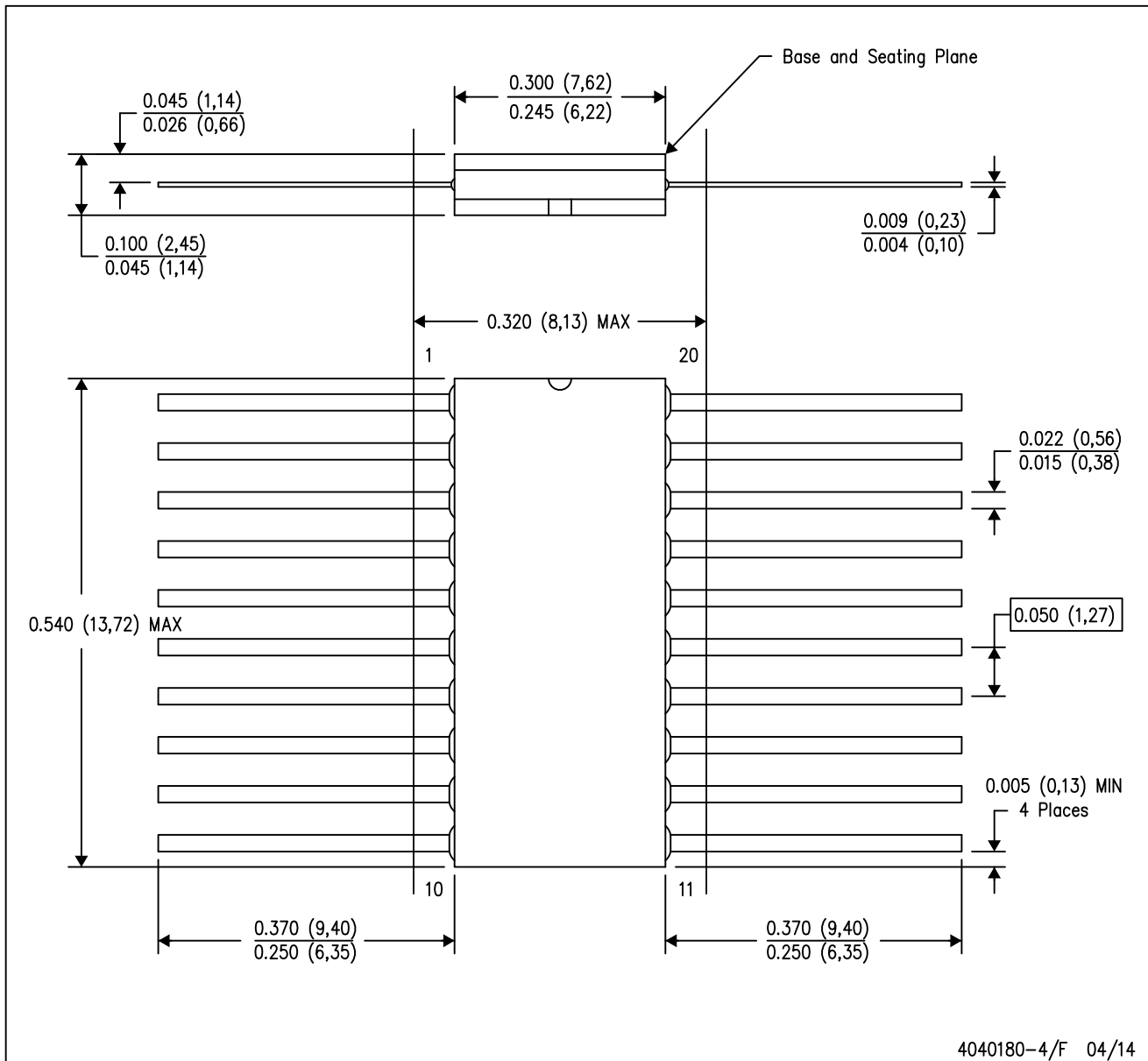
**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-8513001VSA	W	CFP	20	1	506.98	26.16	6220	NA
85130012A	FK	LCCC	20	1	506.98	12.06	2030	NA
JM38510/65755B2A	FK	LCCC	20	1	506.98	12.06	2030	NA
M38510/65755B2A	FK	LCCC	20	1	506.98	12.06	2030	NA
SN74HCT244DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74HCT244DWE4	DW	SOIC	20	25	507	12.83	5080	6.6
SN74HCT244DWG4	DW	SOIC	20	25	507	12.83	5080	6.6
SN74HCT244N	N	PDIP	20	20	506	13.97	11230	4.32
SN74HCT244NE4	N	PDIP	20	20	506	13.97	11230	4.32
SN74HCT244PW	PW	TSSOP	20	70	530	10.2	3600	3.5
SN74HCT244PWE4	PW	TSSOP	20	70	530	10.2	3600	3.5
SN74HCT244PWG4	PW	TSSOP	20	70	530	10.2	3600	3.5
SNJ54HCT244FK	FK	LCCC	20	1	506.98	12.06	2030	NA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

# PW0020A



# PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220206/A 02/2017

### NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220206/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220206/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004



# DB0020A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/B 08/2019

### NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4214851/B 08/2019

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4214851/B 08/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## MECHANICAL DATA

**NS (R-PDSO-G\*\*)**

**PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

# J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - (C) Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - (D) The 20 pin end lead shoulder width is a vendor option, either half or full width.

# DW0020A



# PACKAGE OUTLINE

## SOIC - 2.65 mm max height

SOIC



### NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



# EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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