

SN74HCT244-Q1 3 ステート出力付きオクタール・バッファおよびライン・ドライバ

1 特長

- 車載アプリケーション認定済み
- MIL-STD-883、手法 3015 に従い 1000V を超える ESD 保護、マシン・モデルで 200V 超 (C = 200pF、R = 0)
- 4.5V ~ 5.5V の動作電源電圧範囲
- 大電流出力は最大 15 個の LSTTL 負荷を駆動可能
- 低消費電力、ICC : 80μA 以下
- $t_{pd} = 13\text{ns}$ (標準値)
- 5V で $\pm 6\text{mA}$ の出力駆動能力
- 低い入力電流 : 最大 1μA
- 入力は TTL 電圧互換
- バス・ラインまたはバッファ・メモリ・アドレス・レジスタを駆動できる 3 ステート出力

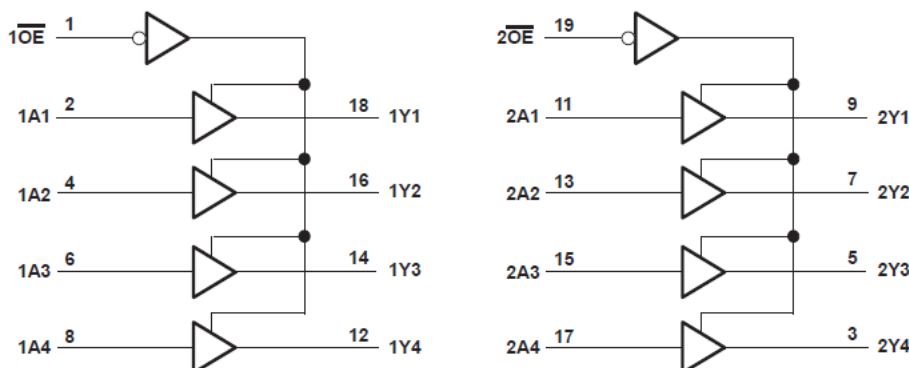
2 概要

このオクタール・バッファ / ライン・ドライバは、3 ステート・メモリ・アドレス・ドライバ、クロック・ドライバ、バス用レシーバ / トランスミッタの性能と密度の両方が向上するように特に設計されています。HCT244 デバイスは、独立した出力イネーブル ($\overline{\text{OE}}$) 入力を備えた 2 つの 4 ビット・バッファ / ドライバで構成されています。 $\overline{\text{OE}}$ が LOW の場合、本デバイスは A 入力からの非反転型データを Y 出力に渡します。 $\overline{\text{OE}}$ が HIGH の場合、出力は高インピーダンス状態になります。

製品情報

部品番号	パッケージ ⁽¹⁾	本体サイズ (公称)
SN74HCT244QPW-Q1	TSSOP (20)	6.50mm × 4.40mm

(1) 利用可能なパッケージについては、このデータシートの末尾にある注文情報を参照してください。



機能ブロック図



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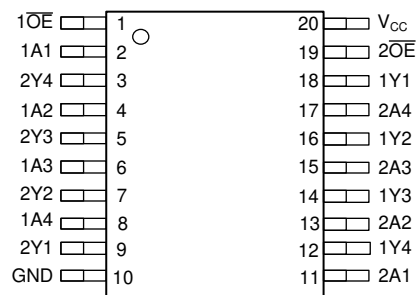
3 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision B (February 2022) to Revision C (June 2022)	Page
• Junction-to-ambient thermal resistance values increased. PW was 83 is now 131.8.....	4

Changes from Revision A (February 2008) to Revision B (February 2022)	Page
• 最新のデータシート規格を反映するように、文書全体の表、図、相互参照の採番と書式設定を更新.....	1

4 Pin Configuration and Functions



PW Package
20-Pin TSSOP
Top View

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage range		–0.5	7	V
I _{IK}	Input clamp current ⁽²⁾	V _I < 0 or V _I > V _{CC}		± 20	mA
I _{OK}	Output clamp current ⁽²⁾	V _O < 0 or V _O > V _{CC}		± 20	mA
I _O	Continuous output current	V _O = 0 to V _{CC}		± 35	mA
	Continuous current through V _{CC} or GND			± 70	mA
T _J	Junction temperature			150	°C
T _{stg}	Storage temperature range		–65	150	°C

- (1) 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.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 Recommended Operating Conditions⁽¹⁾

			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
Δt/Δv	Input transition rise/fall time				500	ns
T _A	Operating free-air temperature		–40		125	°C

- (1) 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](#).

5.3 Thermal Information

THERMAL METRIC		PW (TSSOP)	UNIT
		20 PINS	
R _{θJA}	Junction-to-ambient thermal resistance ⁽¹⁾	131.8	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	72.2	°C/W
R _{θJB}	Junction-to-board thermal resistance	82.8	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	21.5	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	82.4	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	N/A	°C/W

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

5.4 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}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 µA	4.5 V	4.4	4.499		4.4		V
		I _{OH} = -6 mA		3.98	4.3		3.7		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 µA	4.5 V		0.001	0.1		0.1	V
		I _{OL} = 6 mA			0.17	0.26		0.4	
I _I	V _I = V _{CC} or 0		5.5 V		±0.1	±100		±1000	nA
I _{OZ}	V _O = V _{CC} or 0, V _I = V _{IH} or V _{IL}		5.5 V		±0.01	±0.5		±10	µA
I _{CC}	V _I = V _{CC} or 0, I _O = 0		5.5 V			8		160	µA
ΔI _{CC} ⁽¹⁾	One input at 0.5 V or 2.4 V, Other inputs at 0 or V _{CC}		5.5 V		1.4	2.4		3	mA
C _i			4.5 V to 5.5 V		3	10		10	pF

(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}.

5.5 Switching Characteristics

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{pd}	A	Y	4.5 V		15	28		42	ns
			5.5 V		13	25		38	
t _{en}	$\overline{\text{OE}}$	Y	4.5 V		21	35		53	ns
			5.5 V		19	32		48	
t _{dis}	$\overline{\text{OE}}$	Y	4.5 V		19	35		53	ns
			5.5 V		18	32		48	
t _t		Y	4.5 V		8	12		18	ns
			5.5 V		7	11		16	

5.6 Switching Characteristics

over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see [Figure 6-1](#))

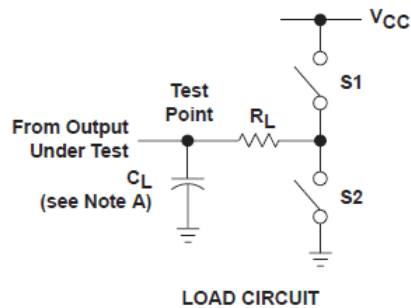
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t _{pd}	A	Y	4.5 V		21	45		68	ns
			5.5 V		18	40		61	
t _{en}	$\overline{\text{OE}}$	Y	4.5 V		25	52		79	ns
			5.5 V		22	47		71	
t _t		Y	4.5 V		17	42		63	ns
			5.5 V		14	38		57	

5.7 Operating Characteristics

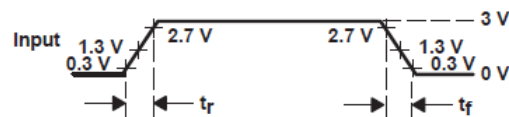
T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance per buffer/driver	No load	40	pF

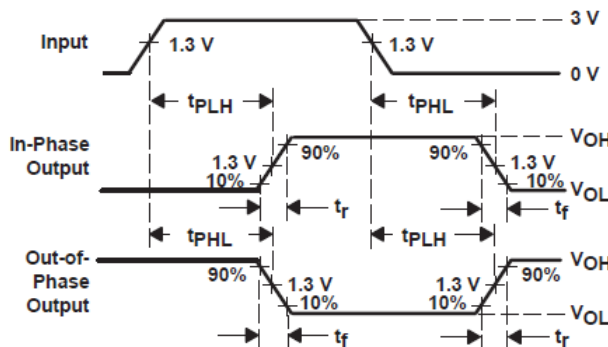
6 Parameter Measurement Information



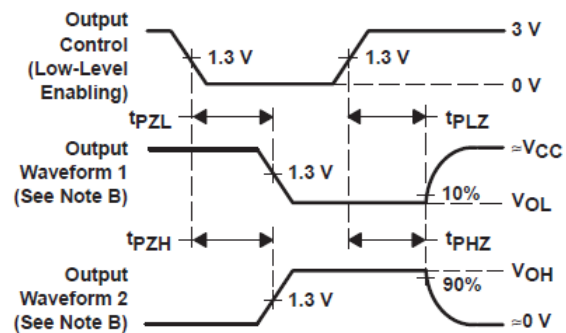
PARAMETER	R_L	C_L	S1	S2
t_{en}	$1\text{ k}\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
t_{dis}	$1\text{ k}\Omega$	50 pF	Open	Closed
			Closed	Open
t_{pd} or t_t	--	50 pF or 150 pF	Open	Open



VOLTAGE WAVEFORM
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- C_L includes probe and test-fixture capacitance.
- 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.
- Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r = 6\text{ ns}$, $t_f = 6\text{ ns}$.
- The outputs are measured one at a time with one input transition per measurement.
- t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- t_{PZL} and t_{PZH} are the same as t_{en} .
- t_{PLH} and t_{PHL} are the same as t_{pd} .

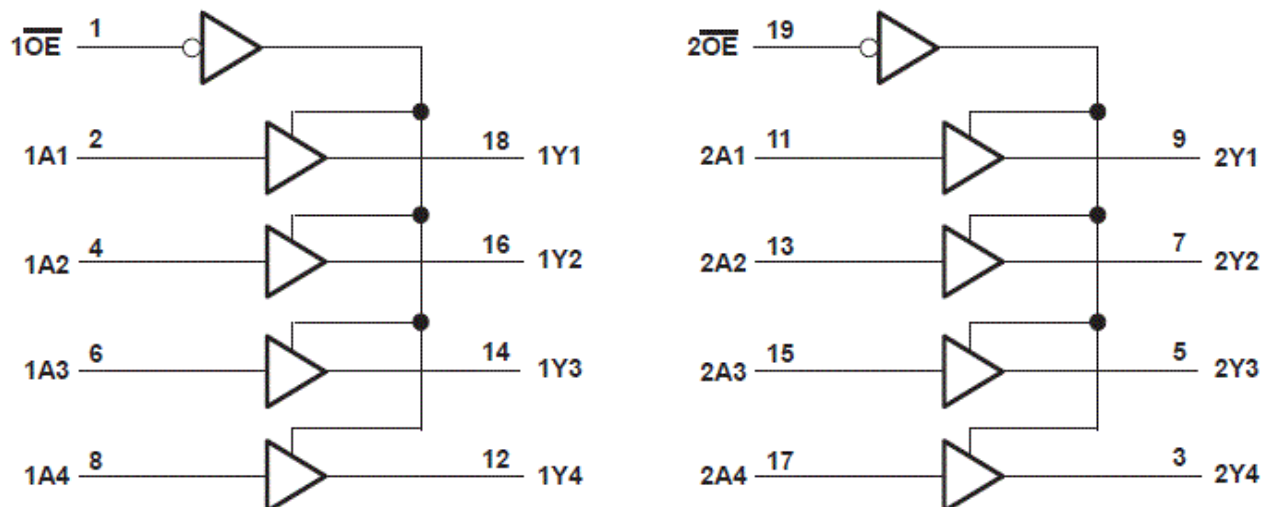
图 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

This octal buffer and line driver is designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The 'HCT244 device is organized as two 4-bit buffers/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.

7.2 Functional Block Diagram



7.3 Device Functional Modes

表 7-1. Function Table
(Each Buffer/Driver)

INPUTS		OUTPUT Y
OE	A	
L	H	H
L	L	L
H	X	Z

8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- μ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μ F and 1- μ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

9 Layout

9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, 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, the inputs are tied to GND or V_{CC} , whichever makes more sense for the logic function or is more convenient.

10 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Subscribe to updates* 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.

10.2 サポート・リソース

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10.3 Trademarks

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10.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

10.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

11 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 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)
SN74HCT244QPWRG4Q1	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT244Q
SN74HCT244QPWRG4Q1.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT244Q
SN74HCT244QPWRQ1	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 125	HT244Q
SN74HCT244QPWRQ1.A	Active	Production	TSSOP (PW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 125	HT244Q

⁽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 SN74HCT244-Q1 :

- Catalog : [SN74HCT244](#)
- Enhanced Product : [SN74HCT244-EP](#)
- Military : [SN54HCT244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



*All dimensions are nominal

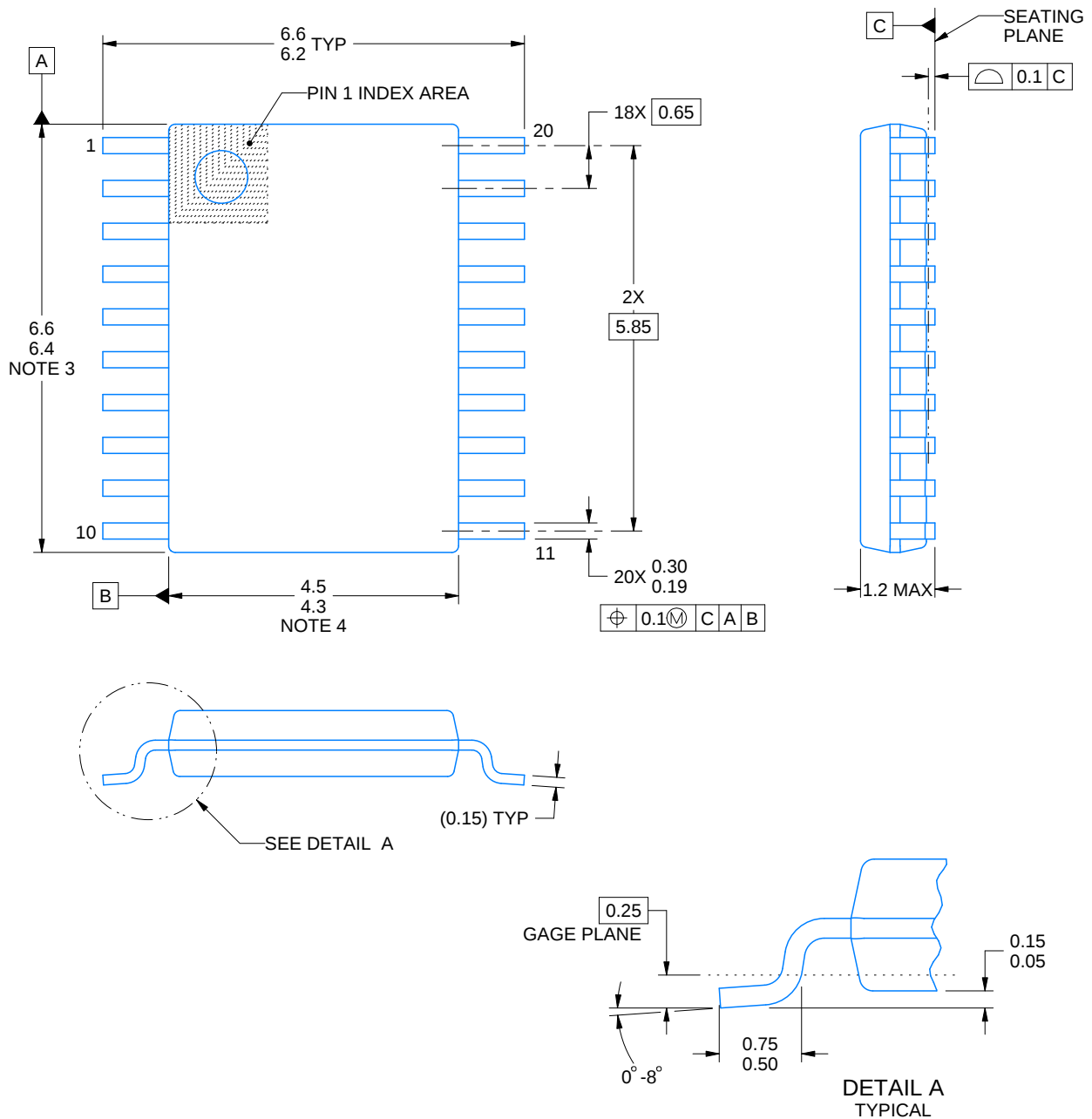
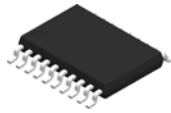
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT244QPWRG4Q1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT244QPWRQ1	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT244QPWRQ1	TSSOP	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)
SN74HCT244QPWRG4Q1	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT244QPWRQ1	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT244QPWRQ1	TSSOP	PW	20	2000	356.0	356.0	35.0



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NOTES:

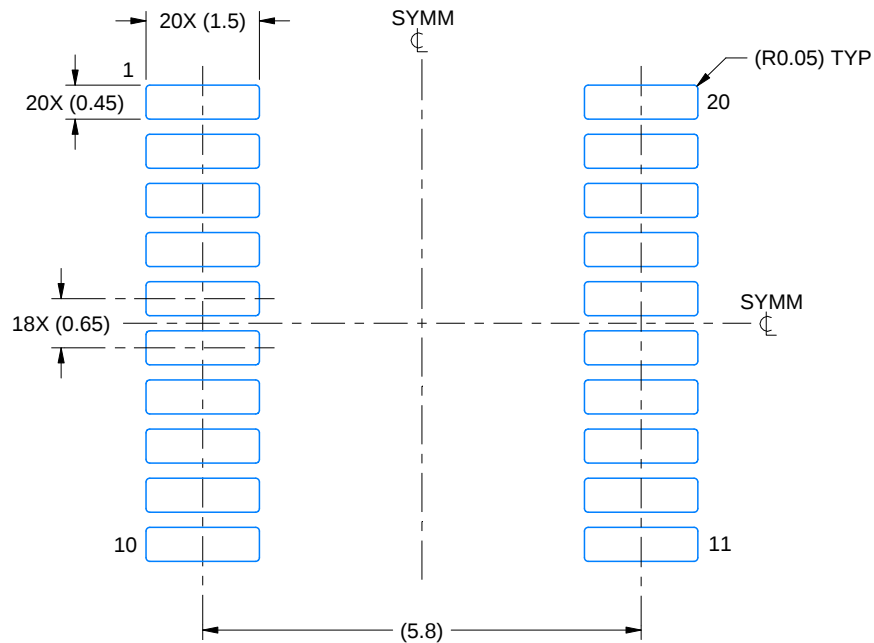
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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

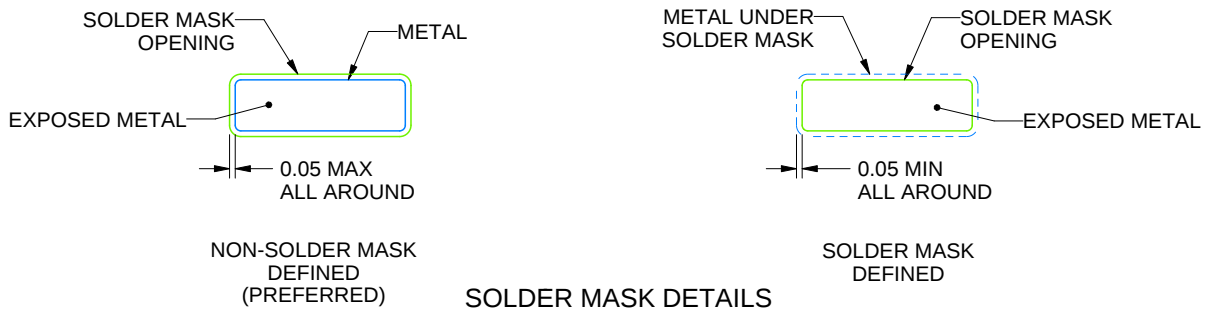
PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220206/A 02/2017

NOTES: (continued)

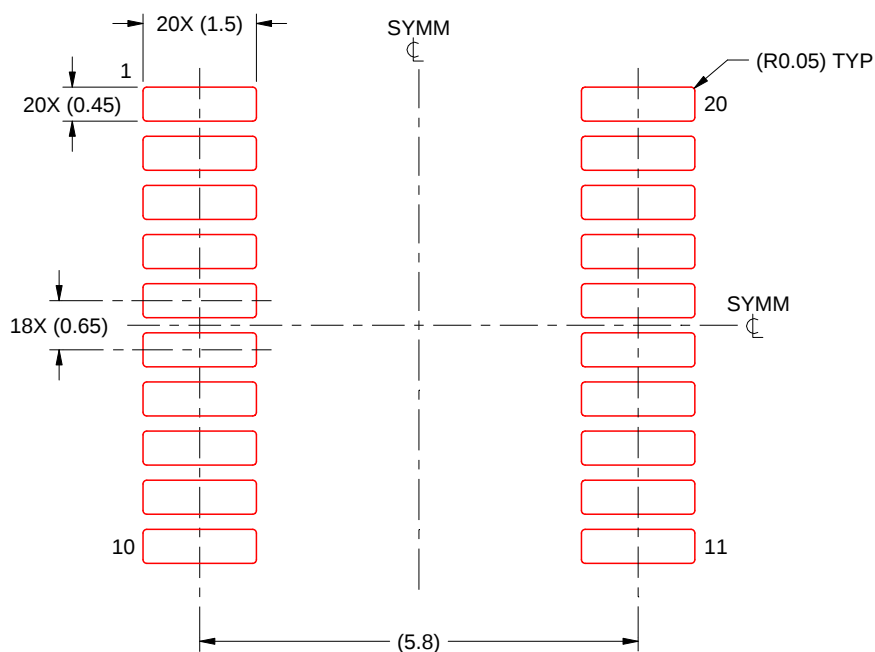
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

重要なお知らせと免責事項

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