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-µA maximum I_{CC}
- Typical t_{pd} = 13 ns
- ±6-mA output drive at 5 V
- Low input current of 1 µA 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

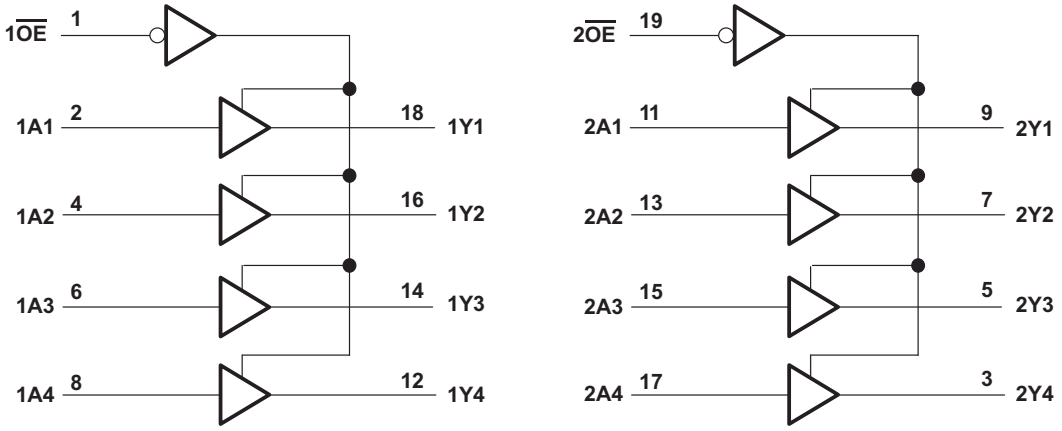
3 Description

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, 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 non inverted data from the A inputs to the Y outputs. When $\overline{OE}$ is high, the outputs are in the high-impedance state.

Device Information

PART NUMBER	RATING	PACKAGE(1)
SN74HCT244	Catalog	DB (SSOP, 20)
		DW (SOIC, 20)
		N (PDIP, 20)
		NS (SO, 20)
		PW (TSSOP, 20)
		DGS (VSSOP, 20)
SN54HCT244	Military	J (CDIP, 20)
		FK (LCCC, 20)

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



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Logic Diagram (Positive Logic)

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4 Revision History

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

Changes from Revision G (December 2022) to Revision H (August 2023)	Page
• Added supporting information for the DGS (SOT) package	1
• Updated the *Device Information* table to include rating	1
• Removed the *W (CFP, 20)* package from the data sheet	1

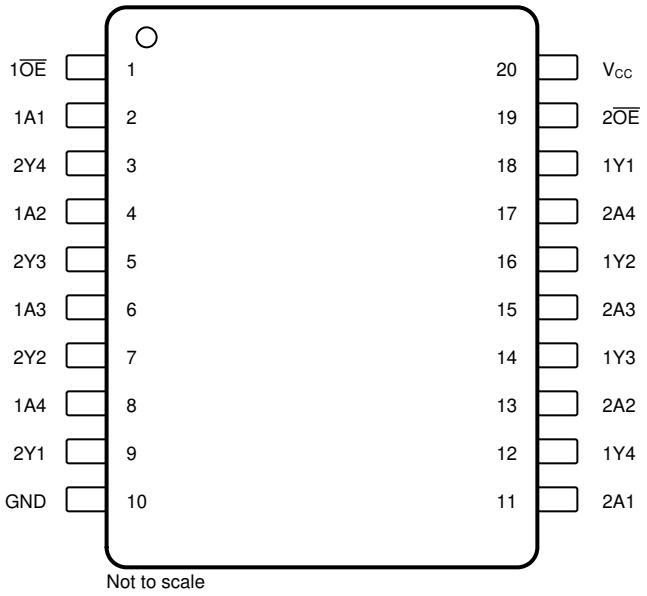
Changes from Revision F (May 2022) to Revision G (December 2022)	Page
• Added DGS (SOT) package information	1
• Added DGS (SOT) package information	3
• Added DGS (SOT) package thermal information	5

Changes from Revision E (August 2016) to Revision F (May 2022)	Page
• Junction-to-ambient thermal resistance values increased. DW was 76.6 is now 109.1, DB was 89.4 is now 122.7, N was 44.8 is now 84.6, NS was 71.8 is now 113.4, PW was 97.4 is now 131.8	5

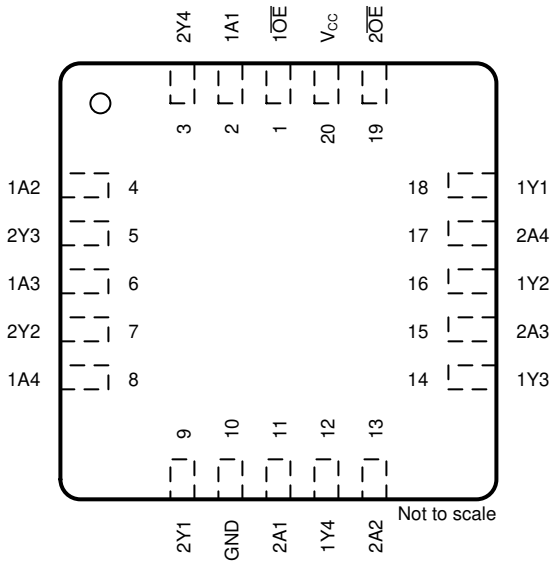
Changes from Revision D (August 2013) to Revision E (August 2016)	Page
• Added *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section	1
• Deleted *Ordering Information* table; see POA at the end of the data sheet	1
• Changed *Thermal Information* table	5
• Added ESD warning	9

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5 Pin Configuration and Functions



J, DB, DW, N, NS, PW or DGS Packages, 20-Pin CDIP, CFP, SSOP, SOIC, PDIP, SO, TSSOP, or VSSOP (Top View)



FK Package, 20-Pin LCCC (Top View)

Table 5-1. Pin Functions

PIN		TYPE[1]	DESCRIPTION
NAME	NO.		
1 $\overline{OE}$	1	I	Output enable
1A1	2	I	Input
2Y4	3	O	Output
1A2	4	I	Input
2Y3	5	O	Output
1A3	6	I	Input
2Y2	7	O	Output
1A4	8	I	Input
2Y1	9	O	Output
GND	10	—	Ground
2A1	11	I	Input
1Y4	12	O	Output
2A2	13	I	Input
1Y3	14	O	Output
2A3	15	I	Input
1Y2	16	O	Output
2A4	17	I	Input
1Y1	18	O	Output
2 $\overline{OE}$	19	I	Output enable
V_{CC}	20	—	Power pin

(1) Signal Types: I = Input, O = Output, I/O = Input or Output.

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6 Specifications

6.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage		–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 channel current through V_{CC} or GND			±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
SN74HCT244 in DB, DW, N, NS, or PW package				
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±1000	
SN54HCT244 in J or FK package				
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM)	±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)(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
$\Delta t/\Delta v$	Input transition rise and fall time				500	ns
T_A	Operating free-air temperature	SN54HCT244	–55		125	°C
		SN74HCT244(2)	–40		85	
			–40		125	

(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.
(2) For correct operating free-air temperature, see the orderable addendum at the end of the data sheet.

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6.4 Thermal Information

THERMAL METRIC		SN74HCT244						UNIT
		DW (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	DGS (VSSOP)	
		20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance[1]	109.1	122.7	84.6	113.4	131.8	130.6	°C/W
$R_{\theta JC\ (top)}$	Junction-to-case (top) thermal resistance	76	81.6	72.5	78.6	72.2	68.7	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	77.6	77.5	65.3	78.4	82.8	85.4	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	51.5	46.1	55.3	47.1	21.5	10.5	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	77.1	77.1	65.2	78.1	82.4	85.0	°C/W
$R_{\theta JC\ (bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	N/A	°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 - SN54HCT244

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

PARAMETER	TEST CONDITIONS		V_{CC}	T_A = 25°C			-55°C to 125°C			UNIT
				MIN	TYP	MAX	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}.

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6.6 Electrical Characteristics - SN74HCT244

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

PARAMETER	TEST CONDITIONS		V_{CC}	T_A = 25°C			-40°C to 85°C			-40°C to 125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	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			4.4			V
		I_{OH} = –6 mA		3.98	4.3		3.84			3.7			
V_{OL}	V_I = V_{IH} or V_{IL}	I_{OL} = 20 µA	4.5 V		0.001	0.1			0.1			0.1	V
		I_{OL} = 6 mA			0.17	0.26			0.33			0.4	
I_I	V_I = V_{CC} or 0		5.5 V		±0.1	±100			±1000			±1000	nA
I_{OZ}	V_O = V_{CC} or 0, V_I = V_{IH} or V_{IL}		5.5 V		±0.01	±0.5			±5			±10	µA
I_{CC}	V_I = V_{CC} or 0, I_O = 0		5.5 V			8			80			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			2.9			3	mA
C_i			4.5 V to 5.5 V		3	10			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}.

6.7 Switching Characteristics: SN54HCT244

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	LOAD CAPACITANCE	T_A = 25°C			-55°C to 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	
t_{pd}	A	Y	4.5 V	C_L = 50 pF		15	28		42	ns
				C_L = 150 pF		21	45		68	
			5.5 V	C_L = 50 pF		13	25		38	
				C_L = 150 pF		18	40		61	
t_{en}	$\overline{OE}$	Y	4.5 V	C_L = 50 pF		21	35		53	ns
				C_L = 150 pF		25	52		79	
			5.5 V	C_L = 50 pF		19	32		48	
				C_L = 150 pF		22	47		71	
t_{dis}	$\overline{OE}$	Y	4.5 V	C_L = 50 pF		19	35		53	ns
			5.5 V	C_L = 50 pF		18	32		48	
t_t		Y	4.5 V	C_L = 50 pF		8	12		18	ns
				C_L = 150 pF		17	42		63	
			5.5 V	C_L = 50 pF		7	11		16	
				C_L = 150 pF		14	38		57	

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6.8 Switching Characteristics: SN74HCT244

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	LOAD CAPACITANCE	T_A = 25°C			-40°C to 85°C		-40°C to 125°C		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	4.5 V	C_L = 50 pF		15	28		35		42	ns
				C_L = 150 pF		21	45		56		68	
			5.5 V	C_L = 50 pF		13	25		32		38	
				C_L = 150 pF		18	40		51		61	
t_{en}	$\overline{OE}$	Y	4.5 V	C_L = 50 pF		21	35		44		53	ns
				C_L = 150 pF		25	52		65		79	
			5.5 V	C_L = 50 pF		19	32		40		48	
				C_L = 150 pF		22	47		59		71	
t_{dis}	$\overline{OE}$	Y	4.5 V	C_L = 50 pF		19	35		44		53	ns
			5.5 V			18	32		40		48	
t_t		Y	4.5 V	C_L = 50 pF		8	12		15		18	ns
				C_L = 150 pF		17	42		53		63	
			5.5 V	C_L = 50 pF		7	11		14		16	
				C_L = 150 pF		14	38		48		57	

6.9 Operating Characteristics

T_A = 25°C

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

6.10 Typical Characteristics

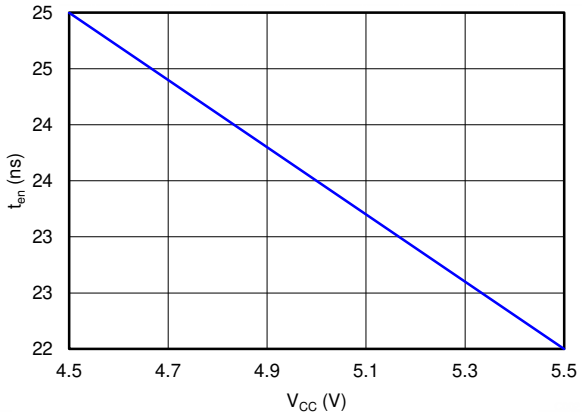
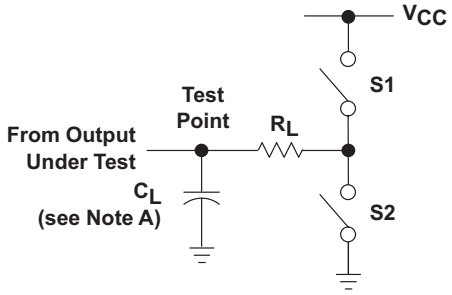


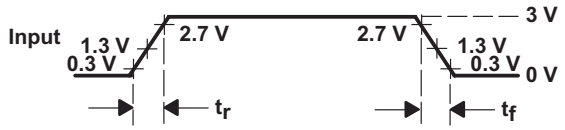
Figure 6-1. Enable Time vs V_{CC}

7 Parameter Measurement Information

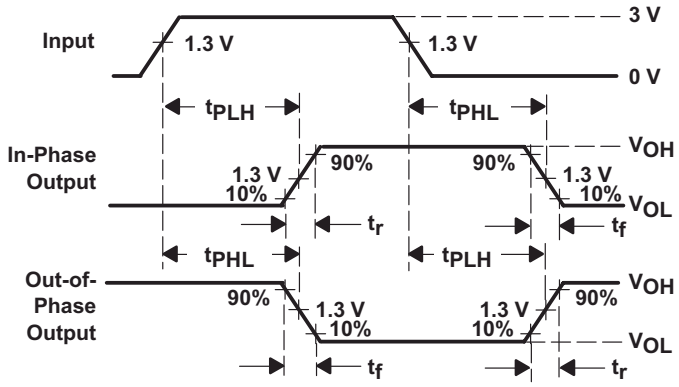


LOAD CIRCUIT

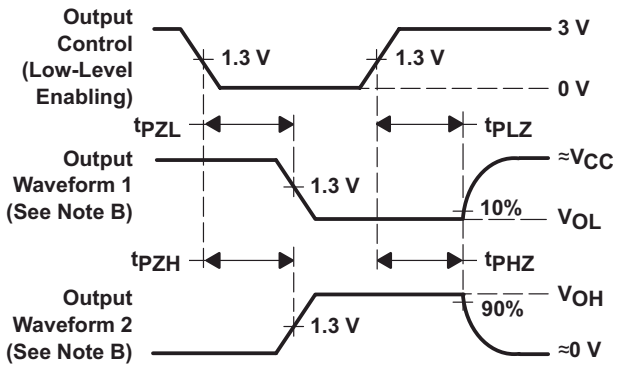
PARAMETER		R_L	C_L	S1	S2
t_{en}	t_{PZH}	1 kΩ	50 pF or 150 pF	Open	Closed
	t_{PZL}			Closed	Open
t_{dis}	t_{PHZ}	1 kΩ	50 pF	Open	Closed
	t_{PLZ}			Closed	Open
t_{pd} or t_t		—	50 pF or 150 pF	Open	Open



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

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 ≤ 1 MHz, Z_O = 50 Ω, 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 7-1. Load Circuit and Voltage Waveforms

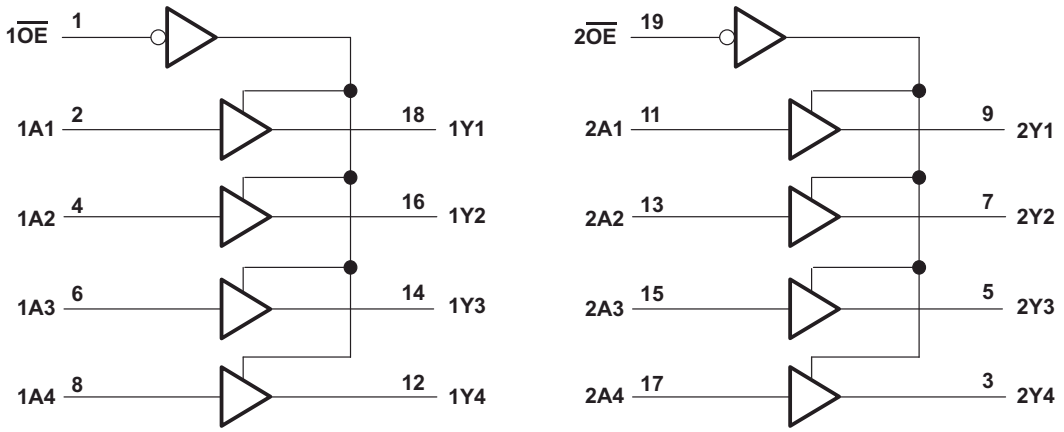
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8 Detailed Description

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. For 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



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Figure 8-1. 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-µA 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 8-1 lists the functions of the SNx4HC244.

Table 8-1. Function Table

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

9 Application and Implementation

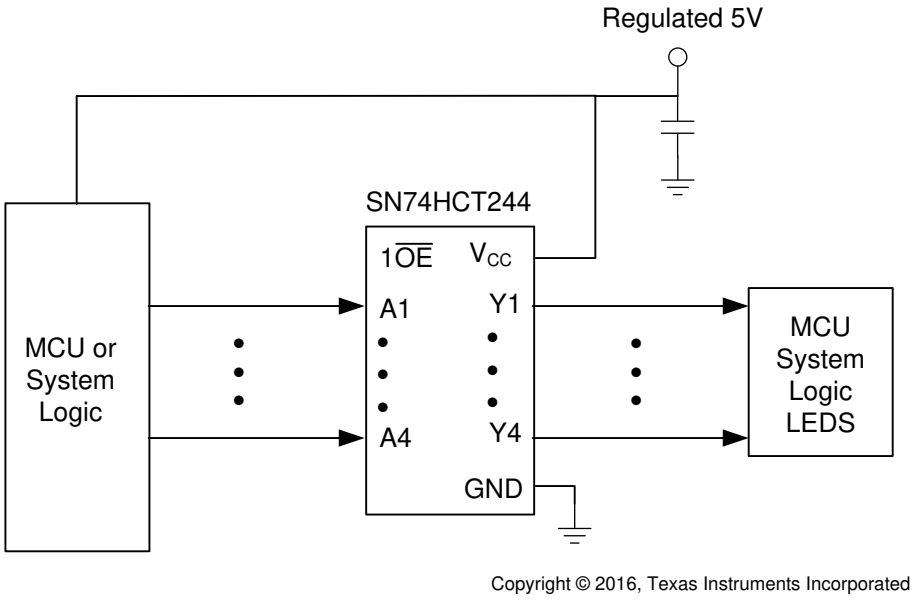
Note

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, as well as validating and testing 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 9-1. 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 Δt/ΔV 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}.

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9.2.3 Application Curve

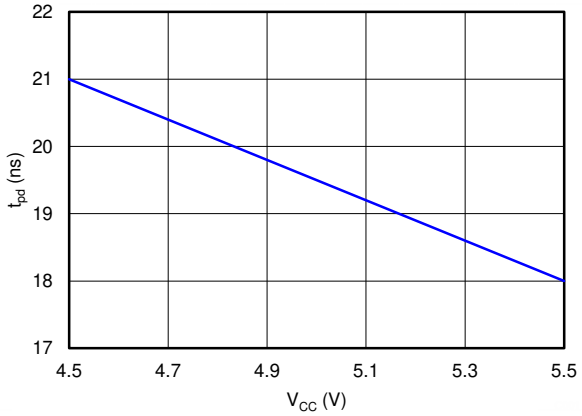


Figure 9-2. Propagation Delay vs V_{CC}

9.3 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_{CC} 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_{CC} terminals, then TI recommends 0.01-µF or 0.022-µF capacitors for each power terminal. It is okay 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.

9.4 Layout

9.4.1 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 9-3 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_{CC}, whichever makes more sense or is more convenient.

9.4.2 Layout Example

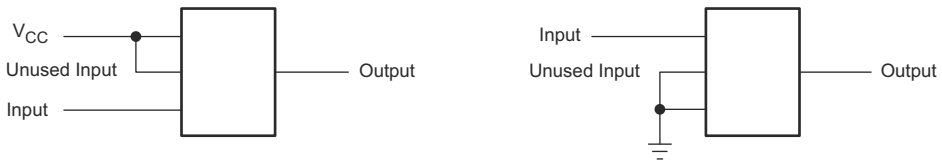


Figure 9-3. Layout Diagram

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10 Device and Documentation Support

10.1 Documentation Support

10.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Implications of Slow or Floating CMOS Inputs*

10.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on 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.

10.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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.

10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

10.5 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.

10.6 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.

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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	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8513001VR A SNV54HCT244J	Samples
5962-8513001VSA	ACTIVE	CFP	W	20	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8513001VS A SNV54HCT244W	Samples
85130012A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85130012A SNJ54HCT 244FK	Samples
8513001RA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8513001RA SNJ54HCT244J	Samples
JM38510/65755B2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755B2A	Samples
JM38510/65755BRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755BRA	Samples
M38510/65755B2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755B2A	Samples
M38510/65755BRA	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65755BRA	Samples
SN54HCT244J	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HCT244J	Samples
SN74HCT244DBR	ACTIVE	SSOP	DB	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT244	Samples
SN74HCT244DGSR	ACTIVE	VSSOP	DGS	20	5000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT244	Samples
SN74HCT244DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI	-40 to 85	HCT244	
SN74HCT244DWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	Samples
SN74HCT244DWRE4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	Samples
SN74HCT244DWRG4	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	Samples
SN74HCT244N	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT244N	Samples
SN74HCT244NE4	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT244N	Samples

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
SN74HCT244NSR	ACTIVE	SO	NS	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT244	Samples
SN74HCT244PW	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85	HT244	
SN74HCT244PWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT244	Samples
SN74HCT244PWRG4	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT244	Samples
SN74HCT244PWT	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85	HT244	
SNJ54HCT244FK	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	85130012A SNJ54HCT 244FK	Samples
SNJ54HCT244J	ACTIVE	CDIP	J	20	20	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8513001RA SNJ54HCT244J	Samples

(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) **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.

(5) 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.

(6) 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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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

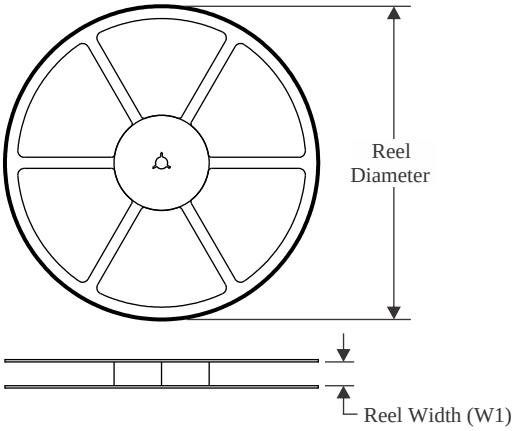
- Catalog : SN74HCT244, SN54HCT244
- Automotive : SN74HCT244-Q1, SN74HCT244-Q1
- Enhanced Product : SN74HCT244-EP, SN74HCT244-EP
- Military : SN54HCT244
- Space : SN54HCT244-SP

NOTE: Qualified Version Definitions:

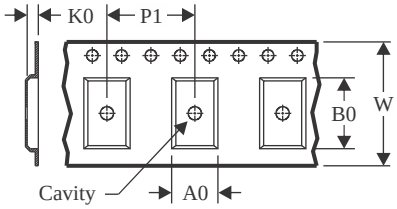
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation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

TAPE AND REEL INFORMATION

REEL DIMENSIONS

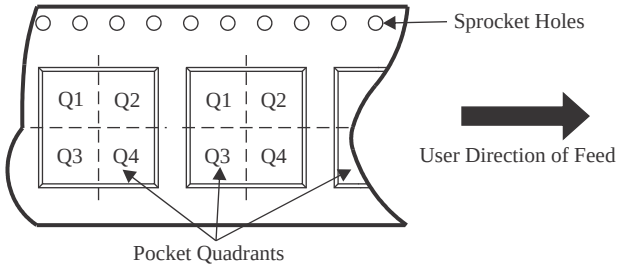


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

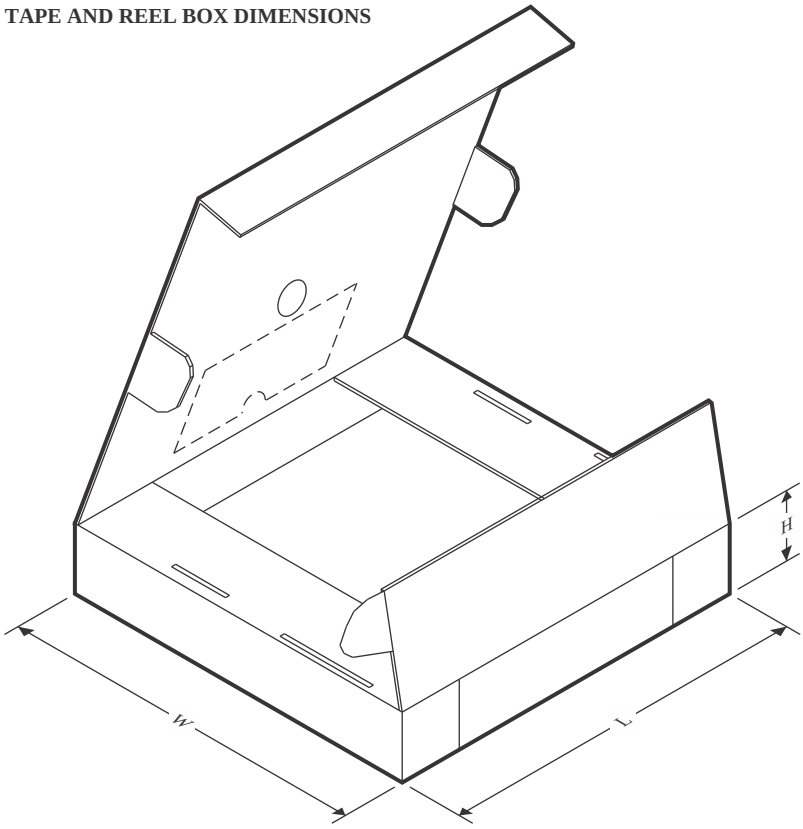
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74HCT244DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HCT244DGSR	VSSOP	DGS	20	5000	330.0	16.4	5.4	5.4	1.45	8.0	16.0	Q1
SN74HCT244DWR	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	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
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	7.0	1.4	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
SN74HCT244PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

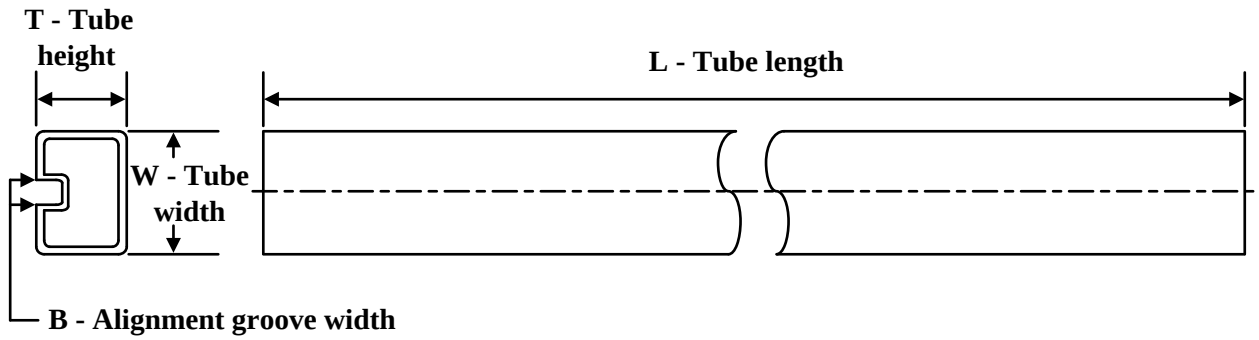
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT244DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74HCT244DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74HCT244DGSR	VSSOP	DGS	20	5000	356.0	356.0	35.0
SN74HCT244DWR	SOIC	DW	20	2000	356.0	356.0	41.0
SN74HCT244DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HCT244NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HCT244NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HCT244PWR	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT244PWR	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT244PWRG4	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT244PWRG4	TSSOP	PW	20	2000	356.0	356.0	35.0

TUBE



*All dimensions are nominal

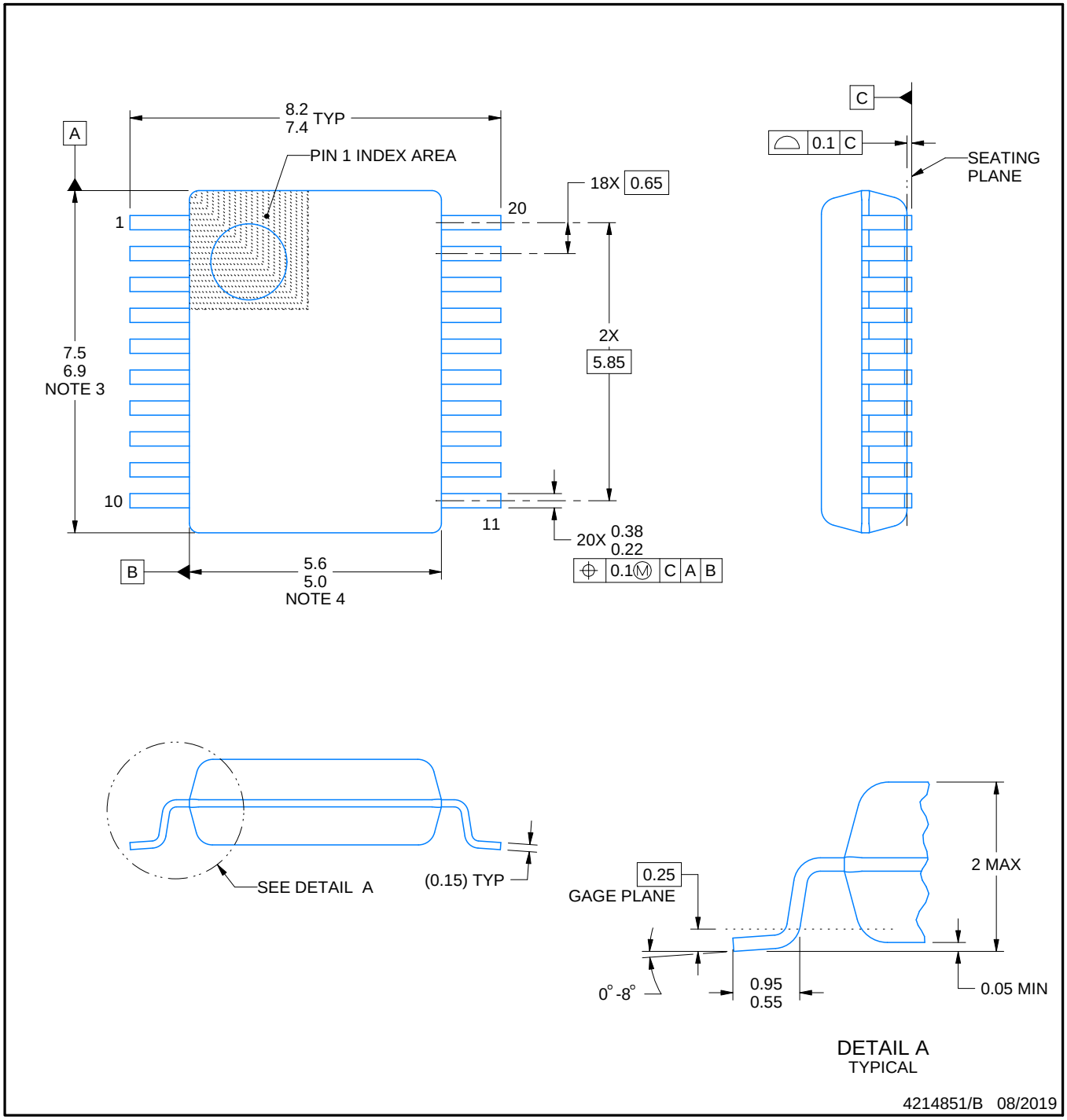
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-8513001VSA	W	CFP	20	25	506.98	26.16	6220	NA
85130012A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/65755B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
M38510/65755B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
SN74HCT244N	N	PDIP	20	20	506	13.97	11230	4.32
SN74HCT244NE4	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54HCT244FK	FK	LCCC	20	55	506.98	12.06	2030	NA

PACKAGE OUTLINE

DB0020A

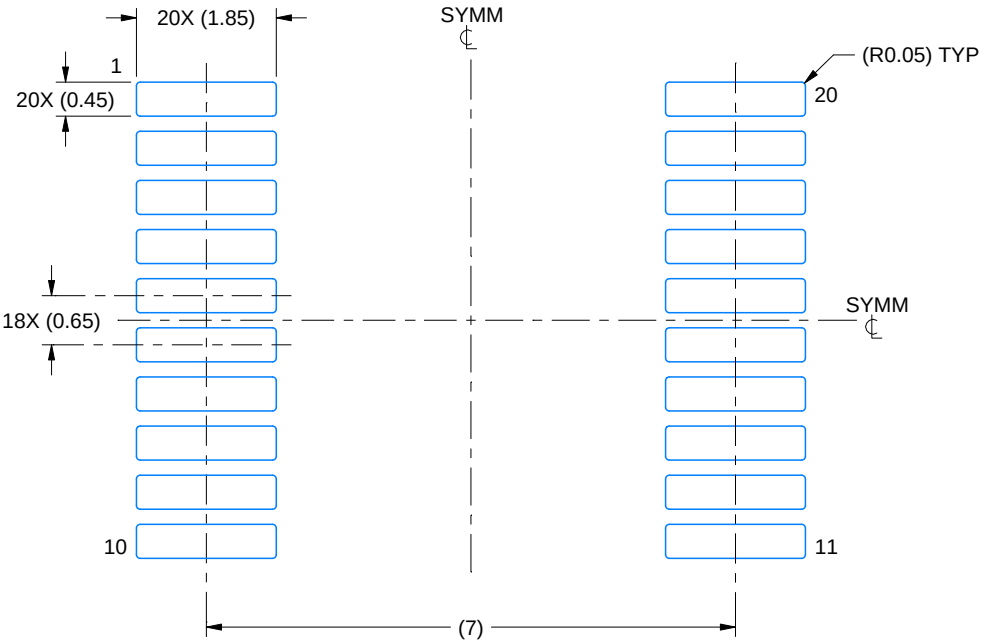
SSOP - 2 mm max height

SMALL OUTLINE PACKAGE

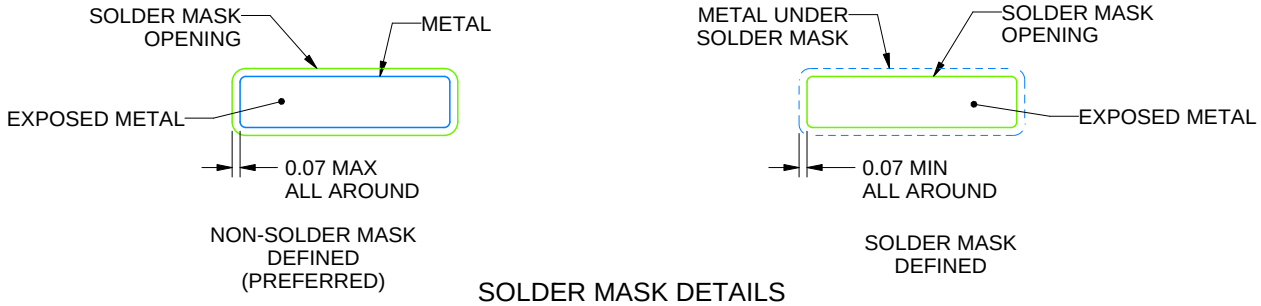


NOTES:

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4214851/B 08/2019

NOTES: (continued)

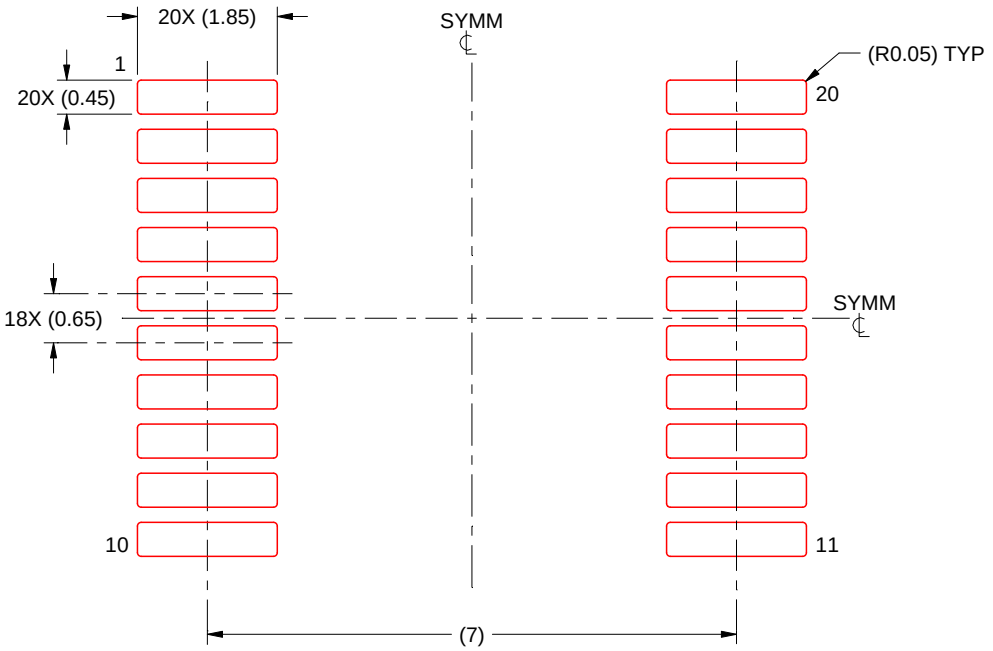
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

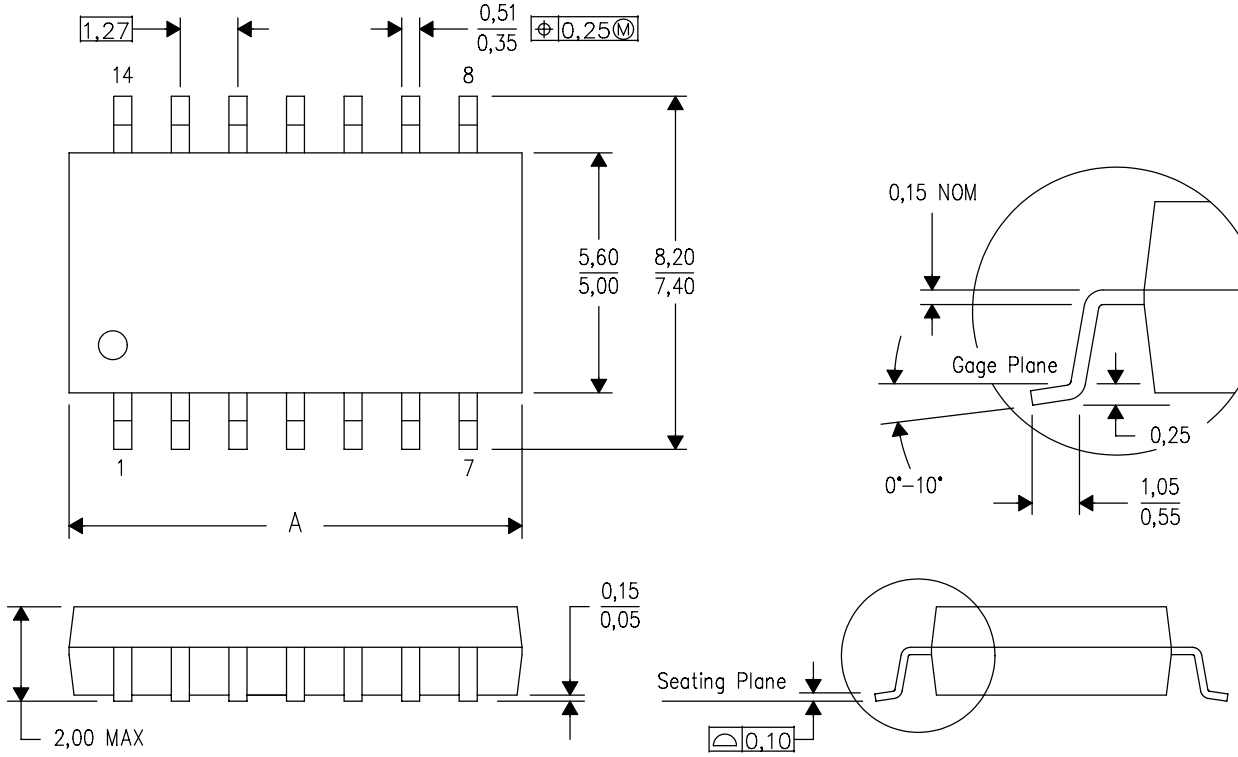
NOTES: (continued)

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



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

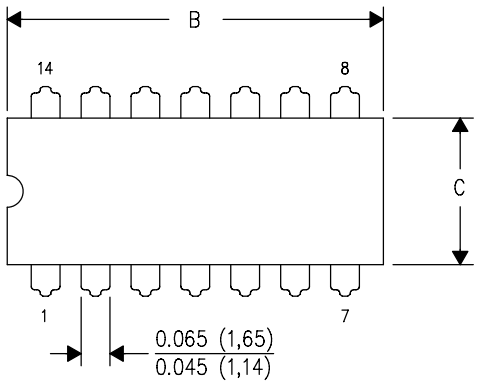
4040062/C 03/03

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.

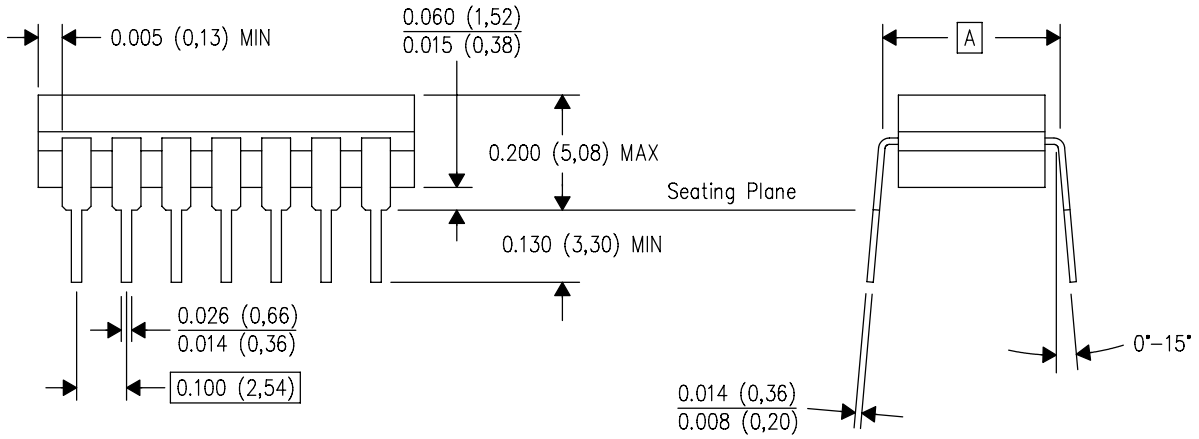
J (R–GDIP–T**)

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.

GENERIC PACKAGE VIEW

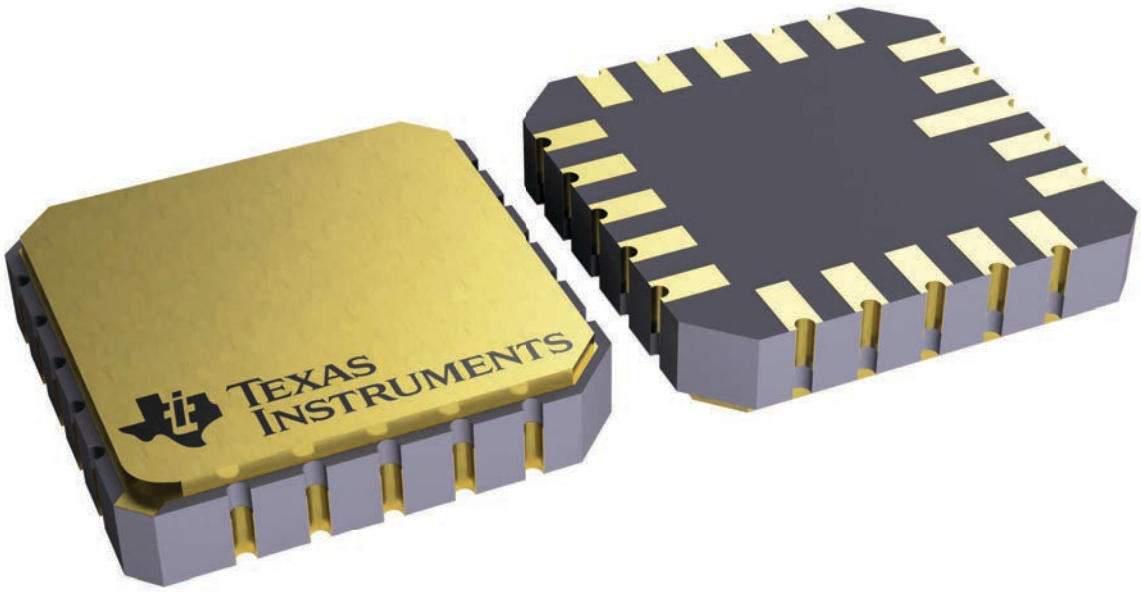
FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

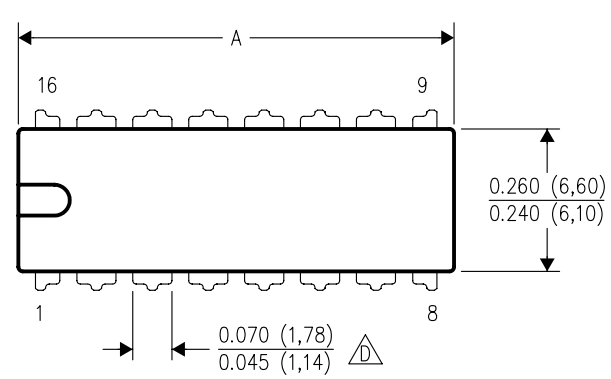


4229370VA\

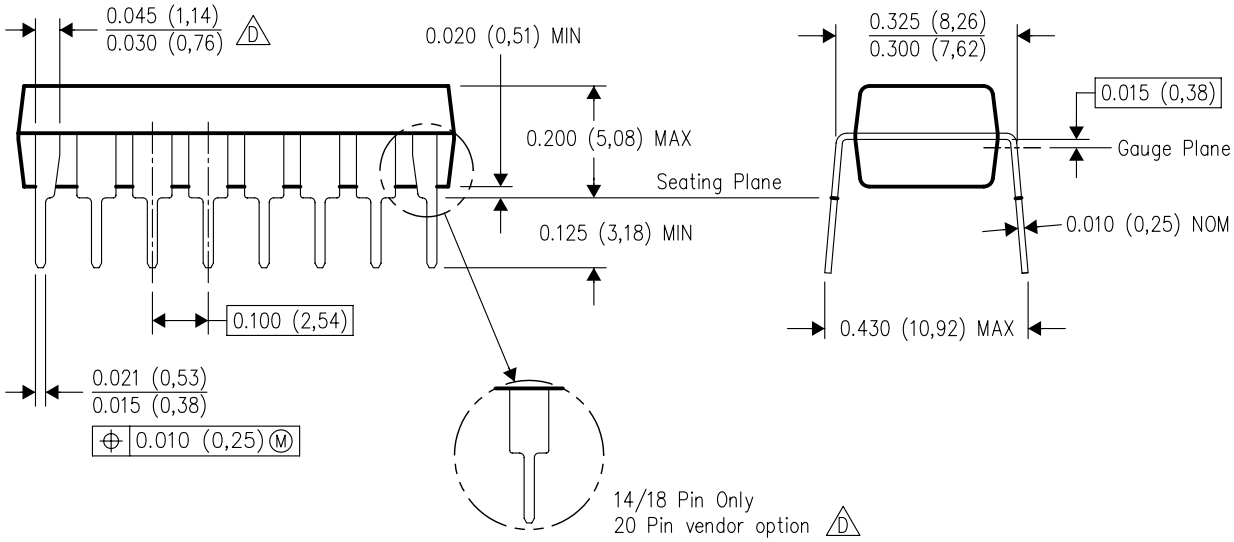
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

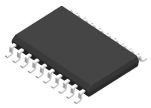


DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

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.

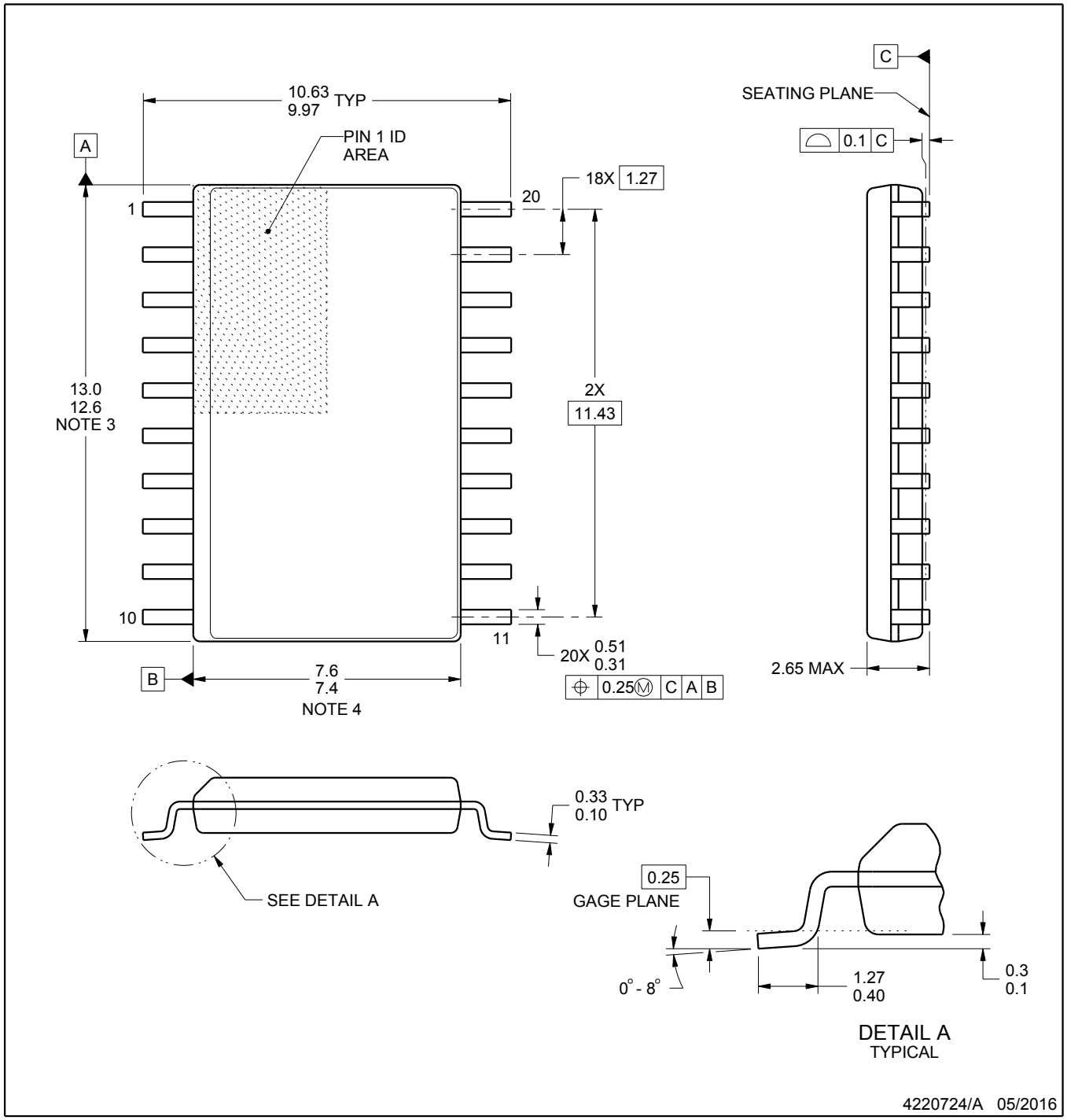


PACKAGE OUTLINE

DW0020A

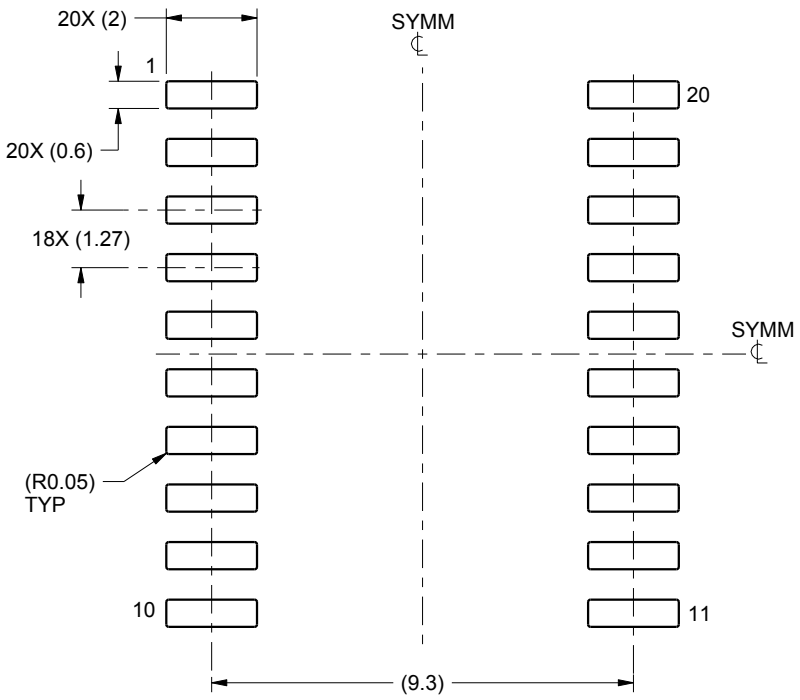
SOIC - 2.65 mm max height

SOIC

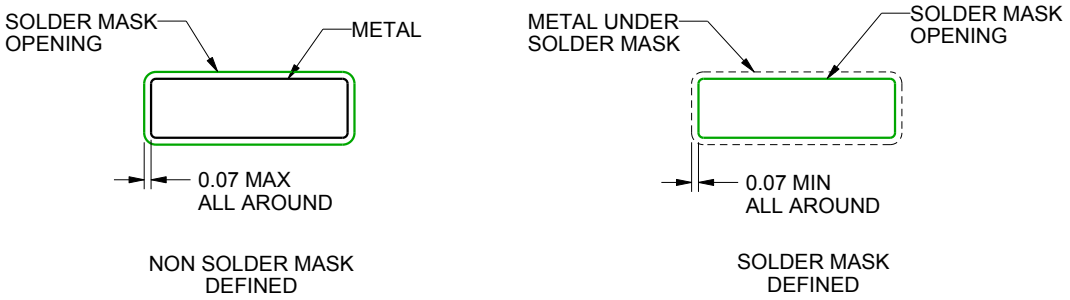


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:6X

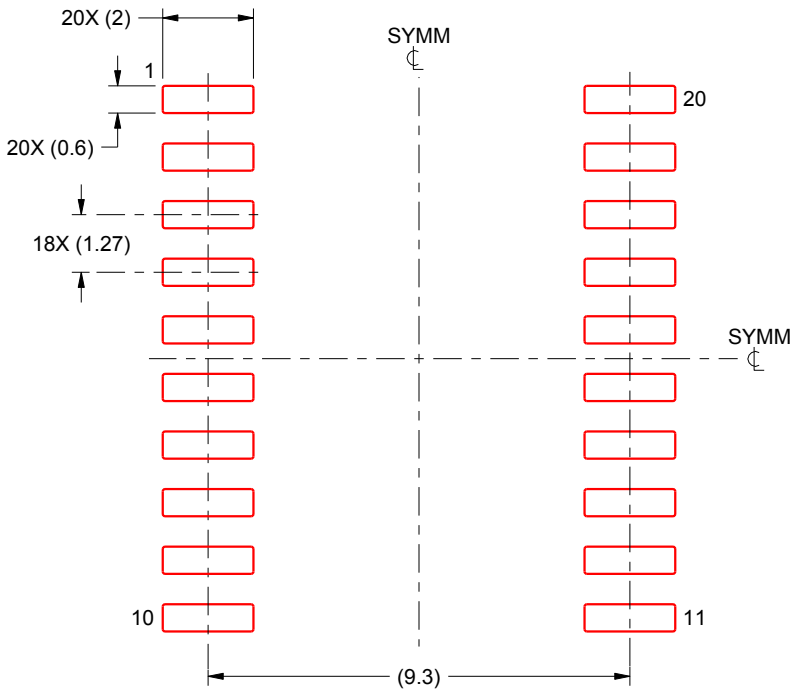


SOLDER MASK DETAILS

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.



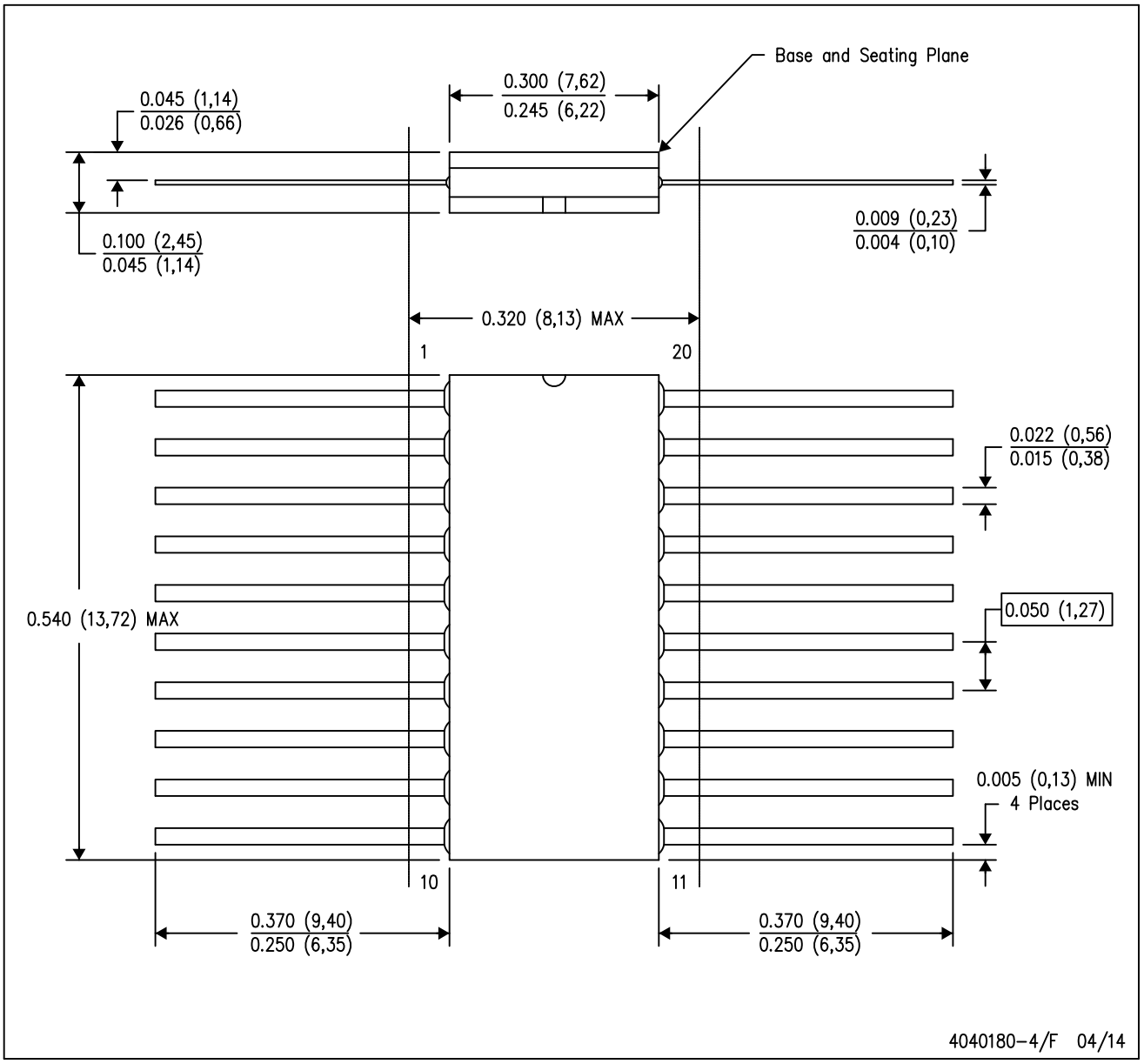
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

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.

W (R–GDFP–F20) CERAMIC DUAL FLATPACK



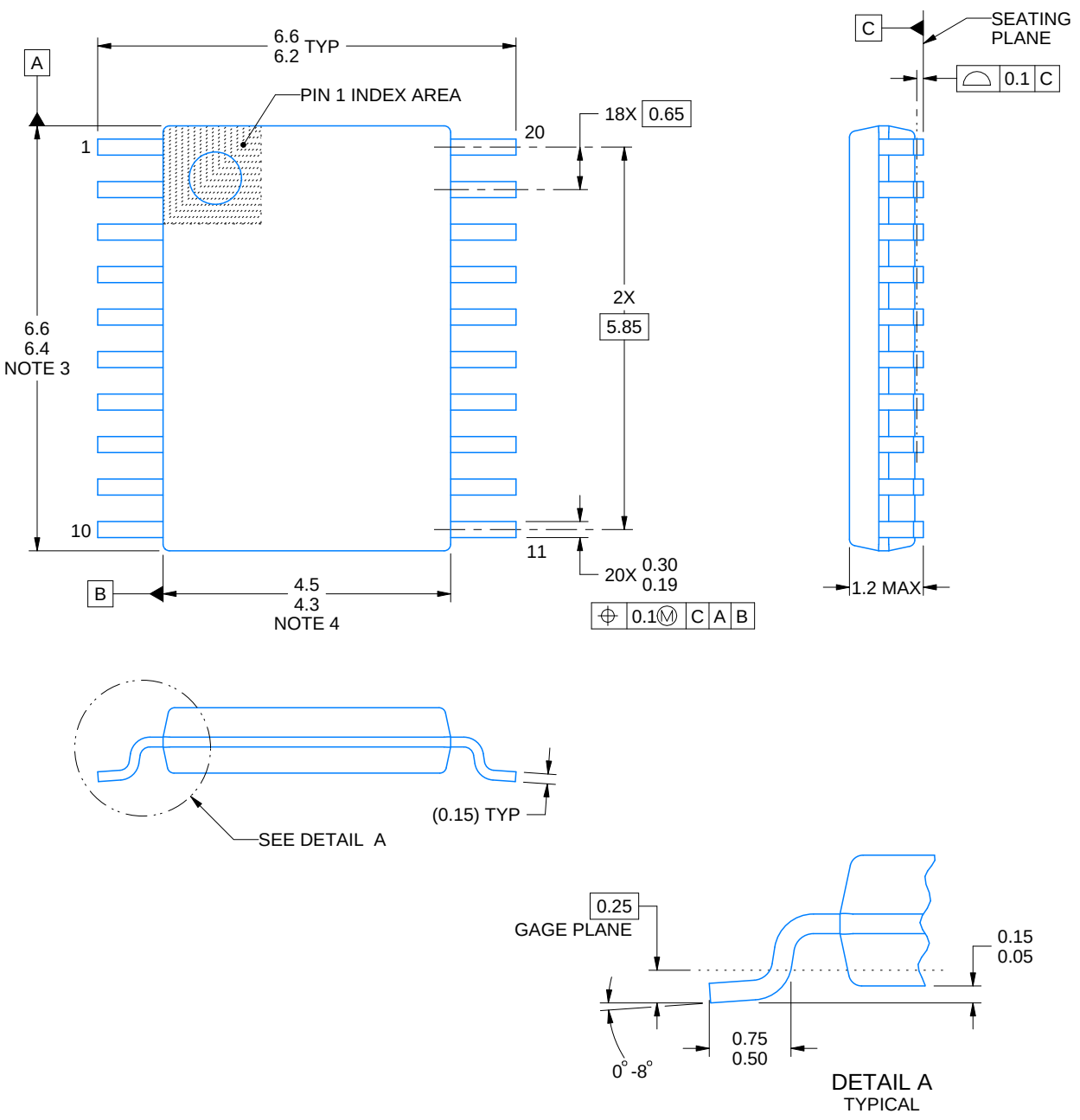
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within Mil–Std 1835 GDFP2–F20

PACKAGE OUTLINE

PW0020A

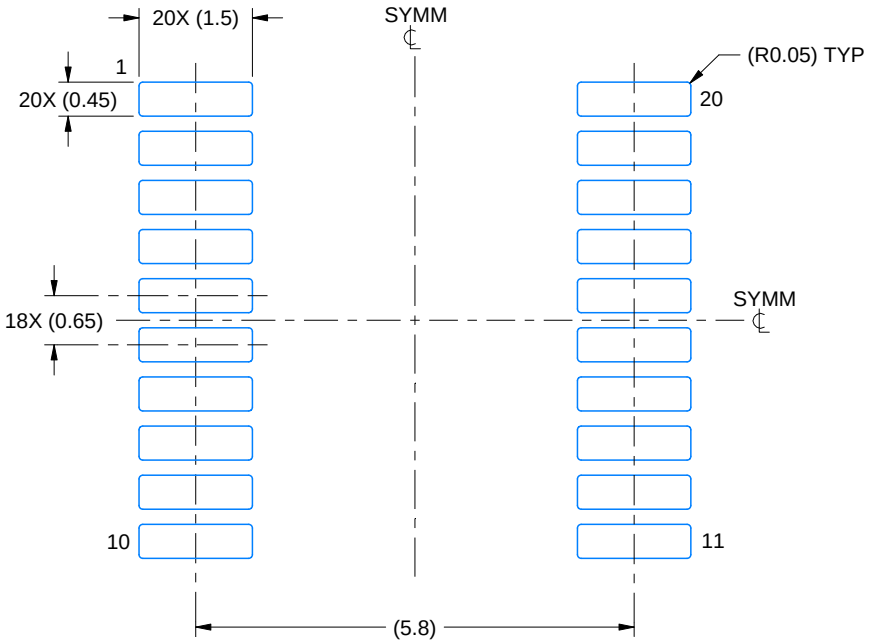
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

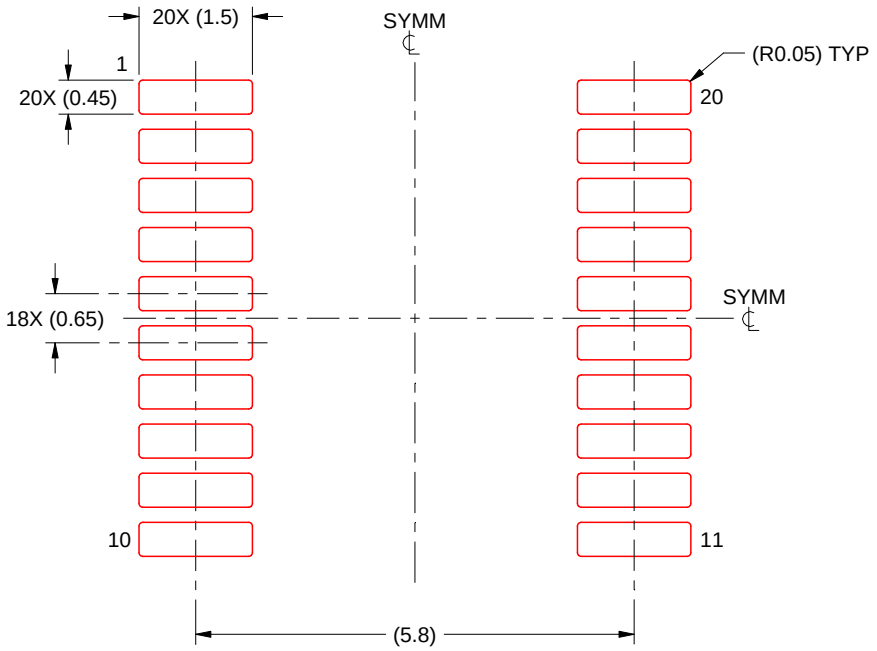


SOLDER MASK DETAILS

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.



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.

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