SNx4HCT245 Octal Bus Transceivers With 3-State Outputs

1 Features

- Operating voltage range of 4.5 V to 5.5 V
- High-Current 3-state outputs drive bus lines directly or up to 15-LSTTL loads
- Low power consumption, 80-µA maximum I_{CC}
- Typical t_{pd} = 14 ns
- ±6-mA output drive at 5 V
- Low input current of 1 µA maximum
- Inputs are TTL-voltage compatible

2 Applications

- Factory Automation and Control
- Grid Infrastructure
- Electronic Point of Sale
- Multi-Function Printers
- Motor Drives
- Storage
- Telecom Infrastructure

3 Description

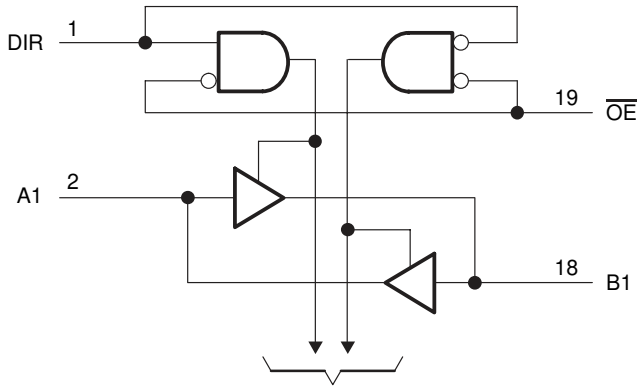
The SNx4HCT245 octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The SNx4HCT245 devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic level at the direction-control (DIR) input. The output-enable ($\overline{OE}$) input can be used to disable the device so that the buses are effectively isolated.

Device Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
SN54HCT245	J (CDIP, 20)	24.20 mm × 6.92 mm
	FK (LCCC, 20)	8.89 mm × 8.89 mm
	W (CFP, 20)	13.09 mm × 6.92 mm
SN74HCT245	DW (SOIC, 20)	12.80 mm × 7.50 mm
	N (PDIP, 20)	24.33 mm × 6.35 mm
	NS (SO, 20)	12.60 mm × 5.30 mm
	PW (TSSOP, 20)	6.50 mm × 4.40 mm
	DB (SSOP, 20)	7.80 mm × 7.20 mm
	DGS (VSSOP, 20)	5.10 mm × 3.00 mm

(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 (September 2022) to Revision H (December 2022)	Page
• Added DGS package information	1
• Added DGS package values in the *Thermal Information* table	5

Changes from Revision F (August 2016) to Revision G (September 2022)	Page
• Updated the numbering format for tables, figures and cross-references throughout the document	1

Changes from Revision E (August 2003) to Revision F (August 2016)	Page
• Deleted Ordering Information, see POA at the end of the datasheet	1
• 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
• Updated values in the *Thermal Information* table	5

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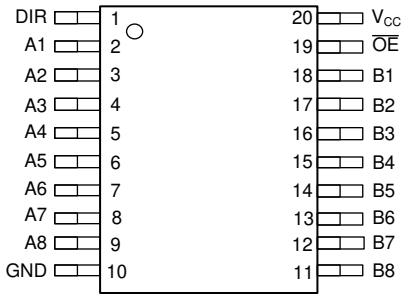
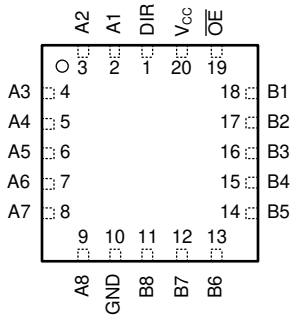
5 Pin Configuration and Functions



J, W, 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

Pin Functions

PIN		TYPE(1)	DESCRIPTION
NO.	NAME		
1	DIR	I	Direction select. High = A to B, Low = B to A
2	A1	I/O	Channel 1 port A
3	A2	I/O	Channel 2 port A
4	A3	I/O	Channel 3 port A
5	A4	I/O	Channel 4 port A
6	A5	I/O	Channel 5 port A
7	A6	I/O	Channel 6 port A
8	A7	I/O	Channel 7 port A
9	A8	I/O	Channel 8 port A
10	GND	—	Ground
11	B8	O/I	Channel 8 port B
12	B7	O/I	Channel 7 port B
13	B6	O/I	Channel 6 port B
14	B5	O/I	Channel 5 port B
15	B4	O/I	Channel 4 port B
16	B3	O/I	Channel 3 port B
17	B2	O/I	Channel 2 port B
18	B1	O/I	Channel 1 port B
19	$\overline{OE}$	I	Output enable, active low. High = all ports in high impedance mode, Low = all ports active
20	V_{CC}	—	Power supply

(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 current through V_{CC} or GND			±70	mA
T_J	Operating virtual 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
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±1500	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±2000	

(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	SN54HCT245	–55		125	°C
		SN74HCT245	–40		85	

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs* (SCBA004).

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6.4 Thermal Information

THERMAL METRIC[1]		SNx4HCT245									UNIT
		J (CDIP)	W (CFP)	FK (LCCC)	DB (SSOP)	DW (SOIC)	N (PDIP)	NS (SO)	PW (TSSOP)	DGS (VSSOP)	
		20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	20 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	—	—	—	84.6	70.4	43.4	68.9	94.9	118.4	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	38.7	60.8	37.1	44.3	36.5	29.5	34.7	30.2	57.7	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	49.8	100.4	36.1	40.2	38.1	24.3	36.4	45.7	73.1	°C/W
ψ_{JT}	Junction-to-top characterization parameter	—	—	—	11.1	11.3	15	11.6	1.5	5.7	°C/W
ψ_{JB}	Junction-to-board characterization parameter	—	—	—	39.7	37.7	24.2	36	45.1	72.7	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	11.5	8.5	4.3	—	—	—	—	—	—	°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}	High-Level Output Voltage		$V_I = V_{IH}$ or V_{IL}	I_{OH} = –20 µA	T_A = 25°C	4.5 V	4.4	4.499		V
					SN54HCT245		4.4			
					SN74HCT245		4.4			
				I_{OH} = –6 mA	T_A = 25°C		3.98	4.3		
					SN54HCT245		3.7			
					SN74HCT245		3.84			
V_{OL}	Low-Level Output Voltage		$V_I = V_{IH}$ or V_{IL}	I_{OL} = 20 µA	T_A = 25°C	4.5 V		0.001	0.1	V
					SN54HCT245				0.1	
					SN74HCT245				0.1	
				I_{OL} = 6 mA	T_A = 25°C			0.17	0.26	
					SN54HCT245				0.4	
					SN74HCT245				0.33	
I_I	Input Current	DIR or $\overline{OE}$	$V_I = V_{CC}$ or 0	T_A = 25°C		5.5 V		±0.1	±100	nA
				SN54HCT245					±1000	
				SN74HCT245					±1000	
I_{OZ}	Off-State Output Current	A or B	$V_O = V_{CC}$ or 0	T_A = 25°C		5.5 V		±0.01	±0.5	µA
				SN54HCT245					±10	
				SN74HCT245					±5	
I_{CC}	Supply Current		$V_I = V_{CC}$ or 0	I_O = 0	T_A = 25°C	5.5 V			8	µA
					SN54HCT245				160	
					SN74HCT245				80	
ΔI_{CC} [1]	Supply-Current Change		One input at 0.5 V or 2.4 V, Other inputs at 0 or VCC	T_A = 25°C		5.5 V		1.4	2.4	mA
				SN54HCT245					3	
				SN74HCT245					2.9	

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

PARAMETER			TEST CONDITIONS	V_{CC}	MIN	TYP	MAX	UNIT
C_i (2)	Input Capacitance	DIR or $\overline{OE}$	T_A = 25°C	4.5 V to 5.5 V		3	10	pF
			SN54HCT245				10	
			SN74HCT245				10	

(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}.
(2) Parameter C_i does not apply to transceiver I/O ports.

6.6 Switching Characteristics: C_L = 50 pF

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{pd}	A or B	B or A	4.5 V	T_A = 25°C		16	22	ns
				SN54HCT245			33	
				SN74HCT245			28	
			5.5 V	T_A = 25°C		14	20	
				SN54HCT245			30	
				SN74HCT245			25	
t_{en}	$\overline{OE}$	A or B	4.5 V	T_A = 25°C		25	46	ns
				SN54HCT245			69	
				SN74HCT245			58	
			5.5 V	T_A = 25°C		22	41	
				SN54HCT245			62	
				SN74HCT245			52	
t_{dis}	$\overline{OE}$	A or B	4.5 V	T_A = 25°C		26	40	ns
				SN54HCT245			60	
				SN74HCT245			50	
			5.5 V	T_A = 25°C		23	36	
				SN54HCT245			54	
				SN74HCT245			45	
t_t		A or B	4.5 V	T_A = 25°C		9	12	ns
				SN54HCT245			18	
				SN74HCT245			15	
			5.5 V	T_A = 25°C		8	11	
				SN54HCT245			16	
				SN74HCT245			14	

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6.7 Switching Characteristics: C_L = 150 pF

over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see Figure 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{pd}	A or B	B or A	4.5 V	T_A = 25°C		20	30	ns
				SN54HCT245			45	
				SN74HCT245			38	
			5.5 V	T_A = 25°C		18	27	
				SN54HCT245			41	
				SN74HCT245			34	
t_{en}	$\overline{OE}$	A or B	4.5 V	T_A = 25°C		36	59	ns
				SN54HCT245			89	
				SN74HCT245			74	
			5.5 V	T_A = 25°C		30	53	
				SN54HCT245			80	
				SN74HCT245			67	
t_t		A or B	4.5 V	T_A = 25°C		17	42	ns
				SN54HCT245			63	
				SN74HCT245			53	
			5.5 V	T_A = 25°C		14	38	
				SN54HCT245			57	
				SN74HCT245			48	

6.8 Operating Characteristics

T_A = 25°C

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

6.9 Typical Characteristics

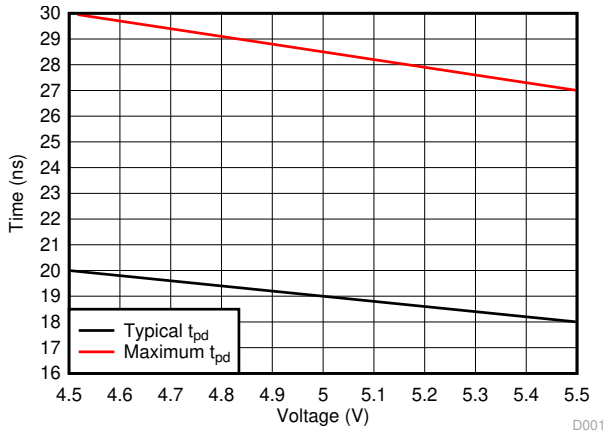

Figure 6-1. Propagation Delay Over Operating Voltage Range, T_A = 25°C

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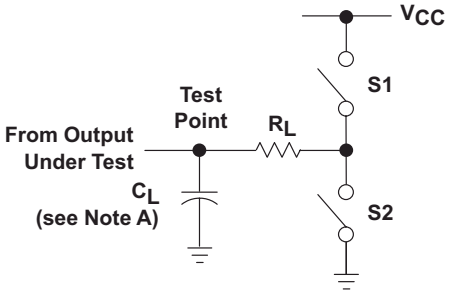
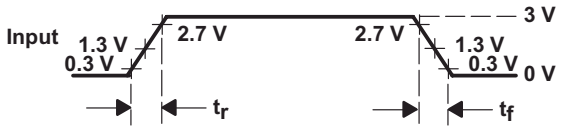
7 Parameter Measurement Information

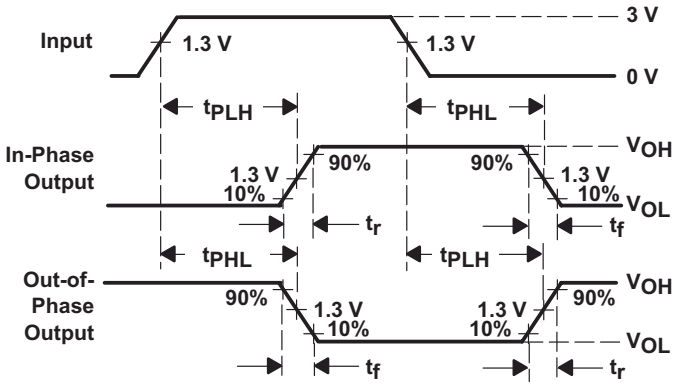


LOAD CIRCUIT

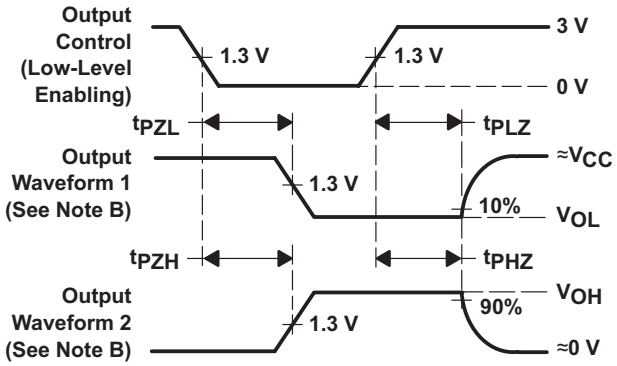
PARAMETER		R_L	C_L	S1	S2
t_{en}	t_{PZH}	1 kΩ	50 pF or 150 pF	Open	Closed
	t_{PZL}			Closed	Open
t_{dis}	t_{PHZ}	1 kΩ	50 pF	Open	Closed
	t_{PLZ}			Closed	Open
t_{pd} or t_t		—	50 pF or 150 pF	Open	Open



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

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 SNx4HCT245 is a bidirectional buffer with direction control and active low output enable. This device is commonly used in logic systems for isolation and increasing drive strength.

8.2 Functional Block Diagram

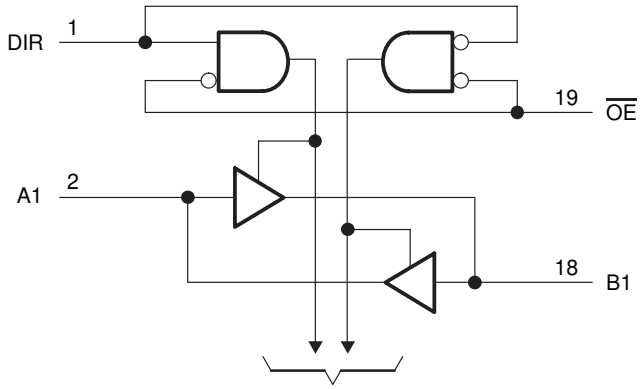

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Figure 8-1. Logic Diagram (Positive Logic)

8.3 Feature Description

Voltage operating range from 4.5 V to 5.5 V is forgiving of 5-V power supply rail accuracy. Outputs can operate up to 15 LSTTL loads. This device has balanced propagation delay, typically 14 ns, and balanced output drive of ±6 mA at 5 V. It has low power consumption of only 80-µA maximum static supply current. The center V_{CC} and GND pin configurations minimize high-speed switching noise. Inputs are TTL-voltage compatible.

8.4 Device Functional Modes

This device is a standard '245 logic function. It has an active low output enable, a direction pin, and eight communication channels.

Table 8-1. Function Table

INPUTS(1)		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

(1) H = High Voltage Level, L = Low Voltage Level, X = Don't Care

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 SNx4HCT245 is a versatile device with many available applications. The application chosen as an example here is connecting a master and slave device through a ribbon cable. This configuration is common due to losses in this type of cable.

9.2 Typical Application

Logic transceivers are commonly seen in back plane and ribbon cable applications where a signal direct from an FPGA or MCU would be too weak to reach the distant end. The transceiver acts as an amplifier to get the signal across the line, and since it is bidirectional, data can be sent from master to slave or slave to master. The additional buffer on the direction line is necessary to ensure the direction signal can always reach the distant end.

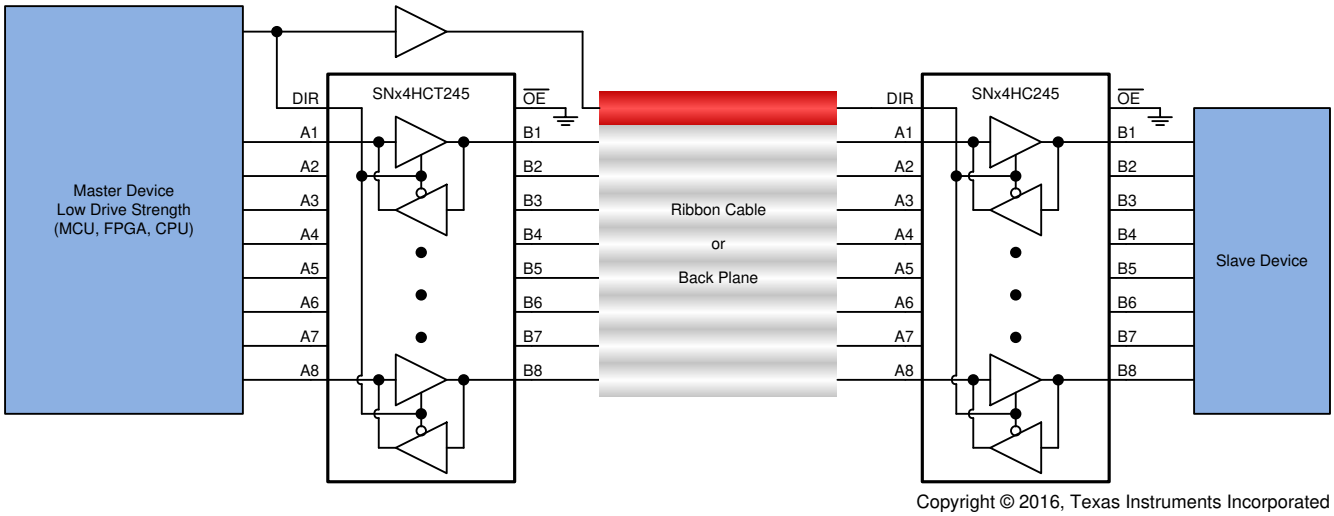

Figure 9-1. Typical application for SNx4HC245

9.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care must be taken to avoid bus contention because it can drive currents that would exceed maximum limits. Outputs can be combined to produce higher drive, but the high drive also creates faster edges into light loads, so routing and load conditions must be considered to prevent ringing.

9.2.2 Detailed Design Procedure

1. Recommended Input Conditions
   - Rise time and fall time specs: See (Δt/ΔV) in the *Recommended Operating Conditions*.
   - Specified high and low levels: See (VIH and VIL) in the *Recommended Operating Conditions*.
2. Recommended Output Conditions
   - Load currents should not exceed 35 mA per output and 70 mA total for the part.
   - Outputs should not be pulled above V_{CC}.

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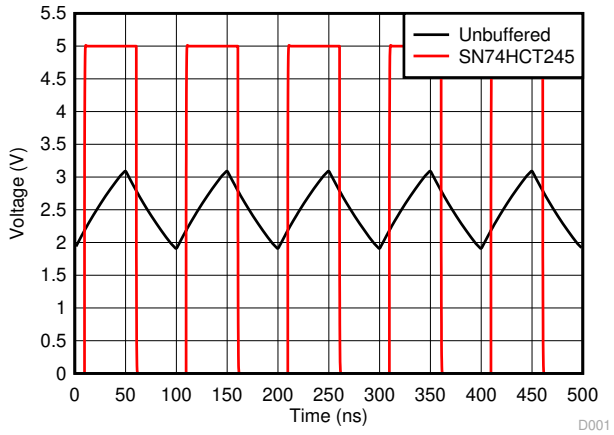
9.2.3 Application Curve

It is common to see significant losses in ribbon cables and back planes. The plot shown in Figure 9-2 is a simplified simulation of a ribbon cable from a 5-V, 10-MHz low drive strength source. It shows the difference between an input signal from a weak driver like an MCU or FPGA compared to a strong driver like the SN74HCT245 when measured at the distant end of the cable. By adding a high-current drive transceiver before the cable, the signal strength can be significantly improved, and subsequently the cable can be longer.



Unbuffered line is directly connected to low current source, SN74HCT245 line is buffered through the transceiver. Both signals are measured at the distant end of the ribbon cable.

Figure 9-2. Simulated Outputs From Ribbon Cable With a 5-V, 10-MHz Source

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10 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} pin must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 µF is recommended; if there are multiple VCC pins, then 0.01 µF or 0.022 µF is recommended for each power pin. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1 µF and a 1 µF are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

11 Layout

11.1 Layout Guidelines

When using multiple-bit logic devices, inputs should never float.

In many cases, functions or parts of functions of digital logic devices are unused, for example, when only six channels of an eight channel transceiver are used. Such input pins should 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 high or low bias to prevent them from floating. The logic level that should 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.

The output enable pin disables the output section of the part when asserted. This does not disable the input section of the IOs, so they cannot float when disabled.

Figure 11-1 shows the proper method to terminate unused channels using a large resistance (in this example, 10-kΩ resistors). This avoids overloading the outputs , and maintains a valid voltage on the inputs. Note that it is also valid to tie both sides of an unused transceiver directly to ground or V_{CC}; however, the two sides must never be tied to different states directly.

11.2 Layout Example

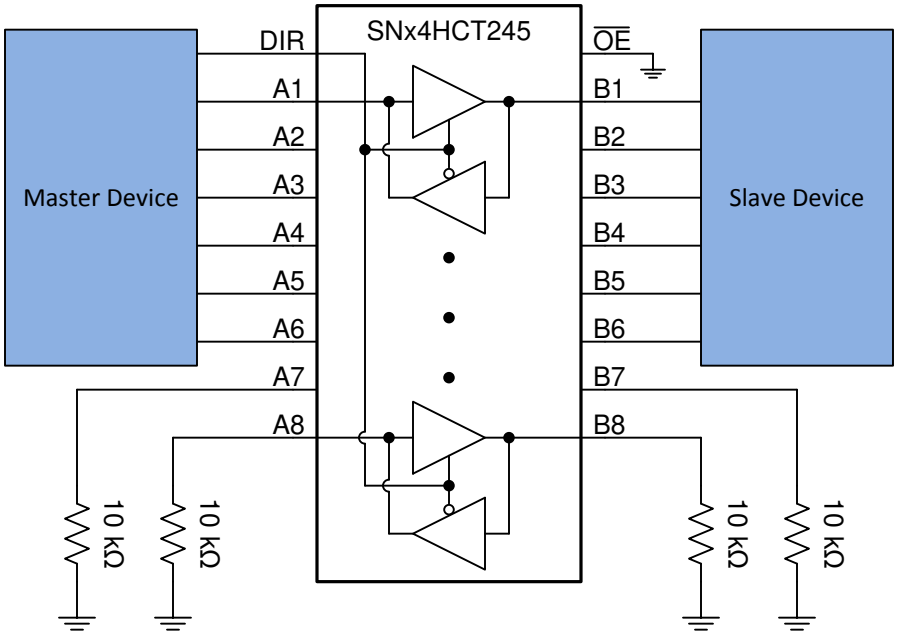

Figure 11-1. Proper Termination of $\overline{OE}$ Pin And Unused Channels 7 and 8

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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 12-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54HCT245	Click here	Click here	Click here	Click here	Click here
SN74HCT245	Click here	Click here	Click here	Click here	Click here

12.3 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.

12.4 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.

12.5 Trademarks

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

12.6 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.

12.7 Glossary

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.

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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)
5962-8550601VRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8550601VRA SNV54HCT245J
5962-8550601VRA.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8550601VRA SNV54HCT245J
5962-8550601VSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8550601VSA SNV54HCT245W
5962-8550601VSA.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8550601VSA SNV54HCT245W
85506012A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	85506012A SNJ54HCT 245FK
8550601RA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8550601RA SNJ54HCT245J
JM38510/65553BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BRA
JM38510/65553BRA.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BRA
JM38510/65553BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BSA
JM38510/65553BSA.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BSA
M38510/65553BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BRA
M38510/65553BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65553BSA
SN54HCT245J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HCT245J
SN54HCT245J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HCT245J
SN74HCT245DBR	Active	Production	SSOP (DB) | 20	2000 | LARGE T&R	Yes	NIPDAU | NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT245
SN74HCT245DBR.A	Active	Production	SSOP (DB) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT245

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)
SN74HCT245DBRG4	Active	Production	SSOP (DB) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT245
SN74HCT245DGSR	Active	Production	VSSOP (DGS) | 20	5000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT245
SN74HCT245DGSR.A	Active	Production	VSSOP (DGS) | 20	5000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT245
SN74HCT245DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	-40 to 85	HCT245
SN74HCT245DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT245
SN74HCT245DWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT245
SN74HCT245DWRE4	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT245
SN74HCT245DWRG4	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT245
SN74HCT245N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT245N
SN74HCT245N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	SN74HCT245N
SN74HCT245NE4	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT245N
SN74HCT245NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU | NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT245
SN74HCT245NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HCT245
SN74HCT245PW	Obsolete	Production	TSSOP (PW) | 20	-	-	Call TI	Call TI	-40 to 85	HT245
SN74HCT245PWR	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT245
SN74HCT245PWR.A	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT245
SN74HCT245PWRE4	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT245
SN74HCT245PWRG4	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT245
SN74HCT245PWRG4.A	Active	Production	TSSOP (PW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HT245
SN74HCT245PWT	Obsolete	Production	TSSOP (PW) | 20	-	-	Call TI	Call TI	-40 to 85	HT245
SNJ54HCT245FK	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	85506012A SNJ54HCT 245FK
SNJ54HCT245FK.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	85506012A SNJ54HCT 245FK
SNJ54HCT245J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8550601RA SNJ54HCT245J
SNJ54HCT245J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8550601RA SNJ54HCT245J
SNJ54HCT245W	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54HCT245W
SNJ54HCT245W.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54HCT245W

(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.

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 SN54HCT245, SN54HCT245-SP, SN74HCT245 :

- Catalog : SN74HCT245, SN54HCT245
- Military : SN54HCT245
- Space : SN54HCT245-SP

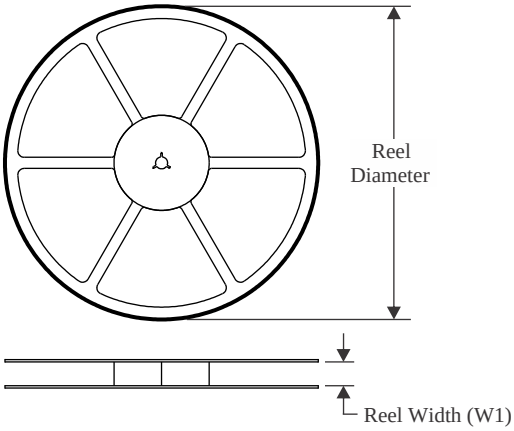
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

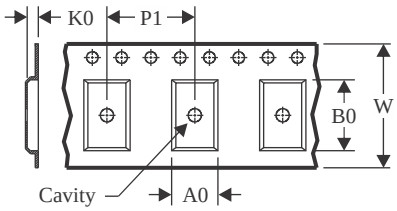
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

REEL DIMENSIONS

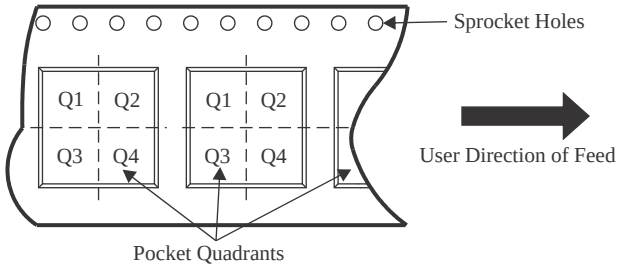


TAPE DIMENSIONS



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

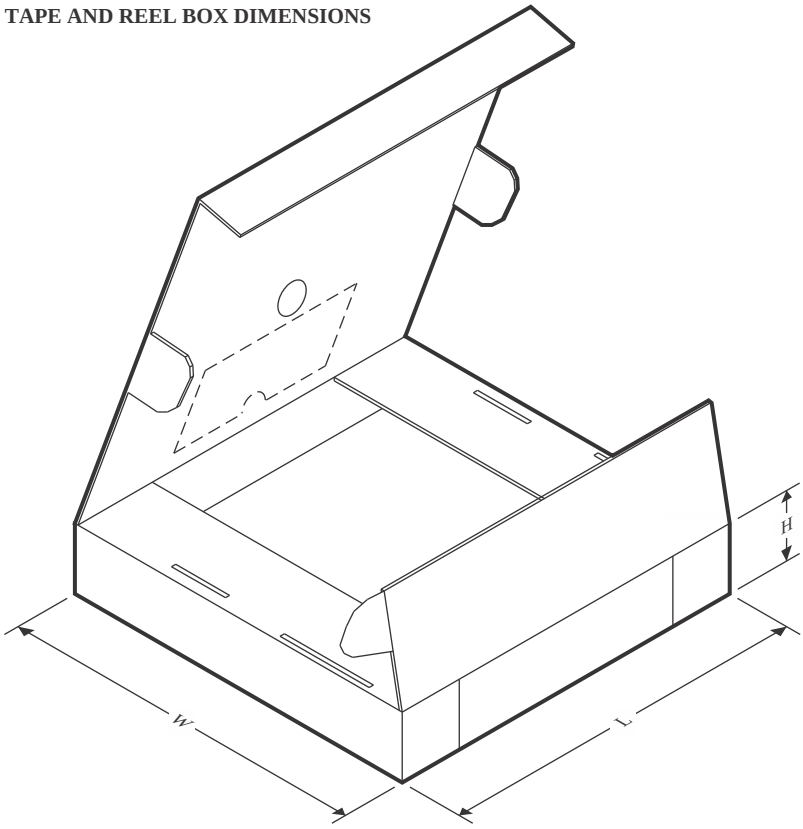
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74HCT245DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HCT245DGSR	VSSOP	DGS	20	5000	330.0	16.4	5.4	5.4	1.45	8.0	16.0	Q1
SN74HCT245DWR	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1
SN74HCT245DWR	SOIC	DW	20	2000	330.0	24.4	10.9	13.3	2.7	12.0	24.0	Q1
SN74HCT245NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74HCT245NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74HCT245PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT245PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1
SN74HCT245PWRG4	TSSOP	PW	20	2000	330.0	16.4	6.95	7.0	1.4	8.0	16.0	Q1

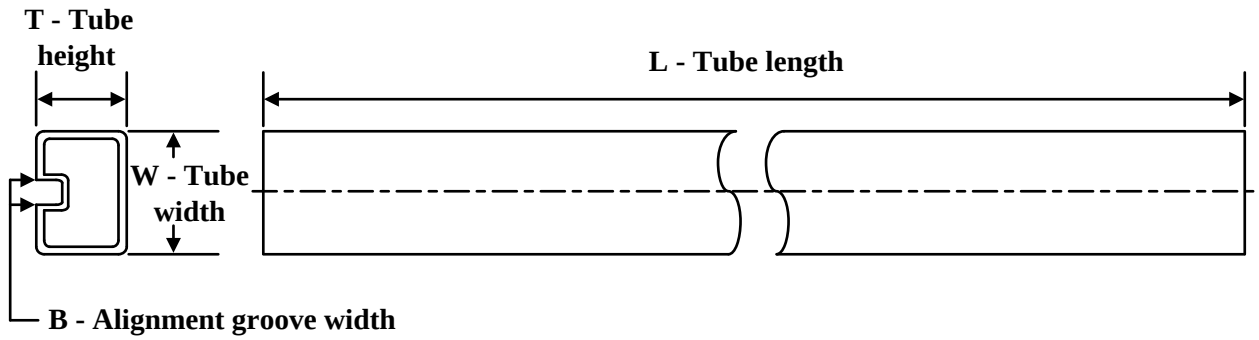
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT245DBR	SSOP	DB	20	2000	356.0	356.0	35.0
SN74HCT245DGSR	VSSOP	DGS	20	5000	356.0	356.0	35.0
SN74HCT245DWR	SOIC	DW	20	2000	356.0	356.0	41.0
SN74HCT245DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HCT245NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74HCT245NSR	SOP	NS	20	2000	356.0	356.0	41.0
SN74HCT245PWR	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT245PWRG4	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74HCT245PWRG4	TSSOP	PW	20	2000	356.0	356.0	35.0

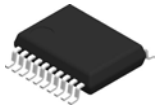
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-8550601VSA	W	CFP	20	25	506.98	26.16	6220	NA
5962-8550601VSA.A	W	CFP	20	25	506.98	26.16	6220	NA
85506012A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/65553BSA	W	CFP	20	25	506.98	26.16	6220	NA
JM38510/65553BSA.A	W	CFP	20	25	506.98	26.16	6220	NA
M38510/65553BSA	W	CFP	20	25	506.98	26.16	6220	NA
SN74HCT245N	N	PDIP	20	20	506	13.97	11230	4.32
SN74HCT245N.A	N	PDIP	20	20	506	13.97	11230	4.32
SN74HCT245NE4	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54HCT245FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HCT245FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HCT245W	W	CFP	20	25	506.98	26.16	6220	NA
SNJ54HCT245W.A	W	CFP	20	25	506.98	26.16	6220	NA

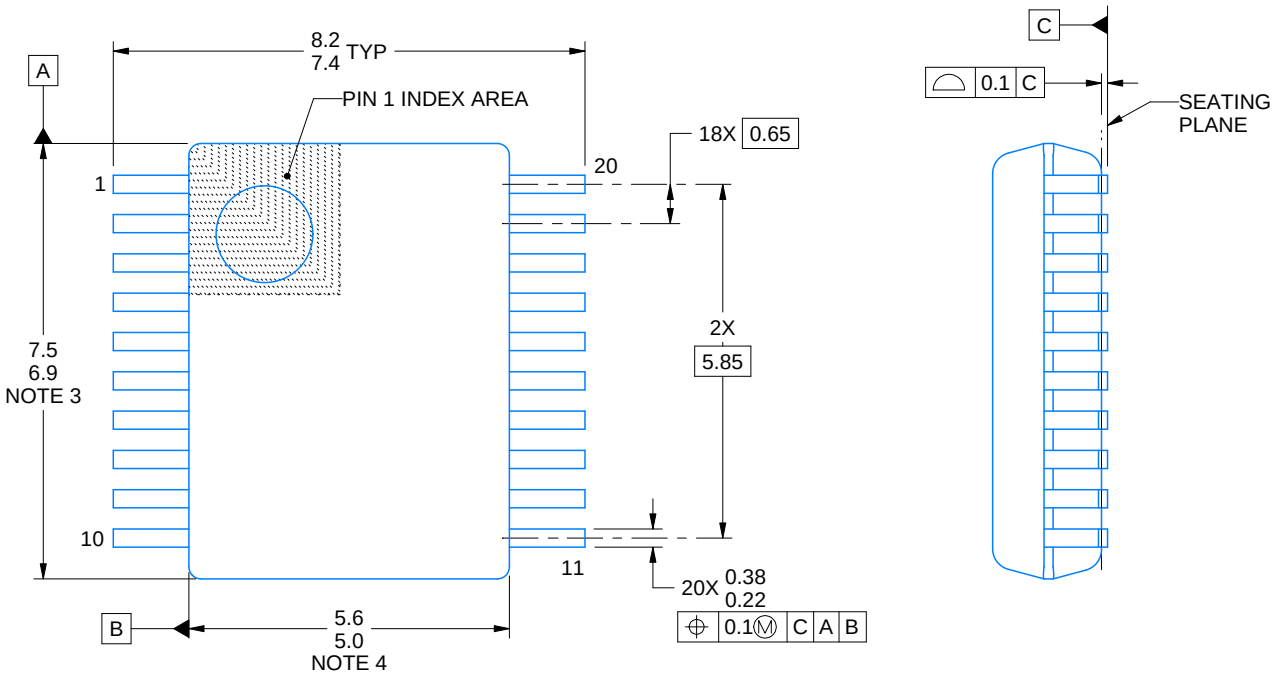
DB0020A

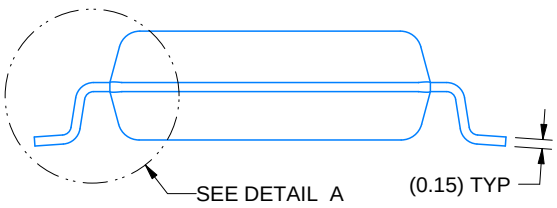


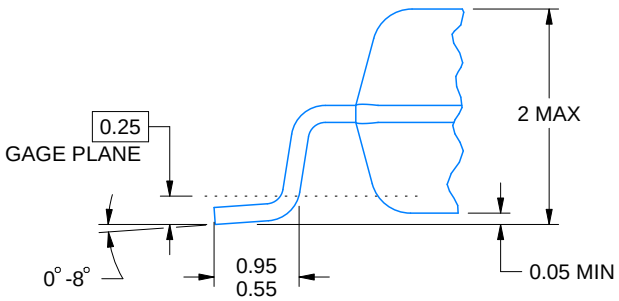
PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE





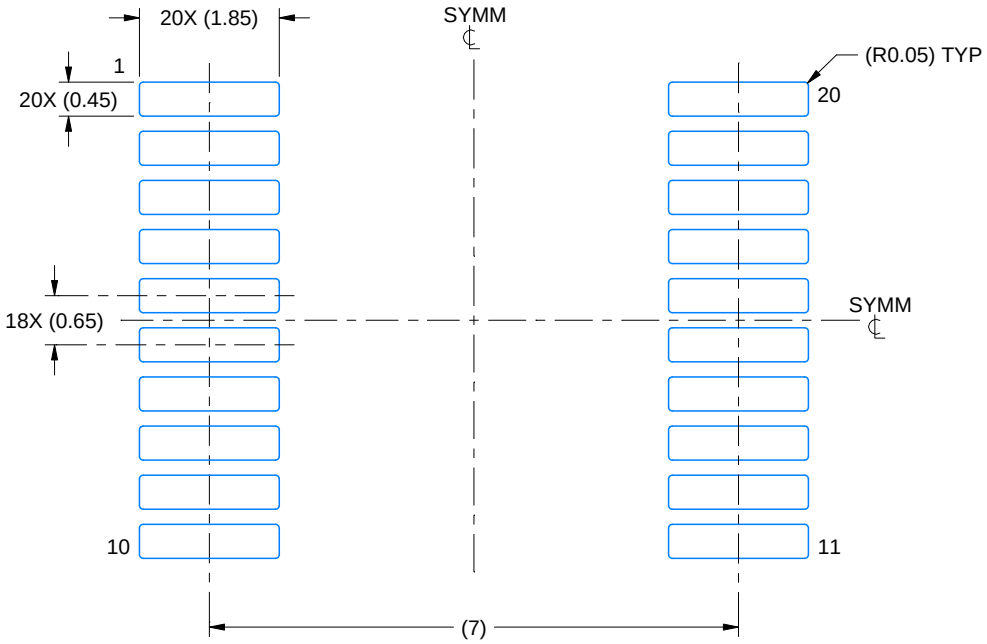


DETAIL A
TYPICAL

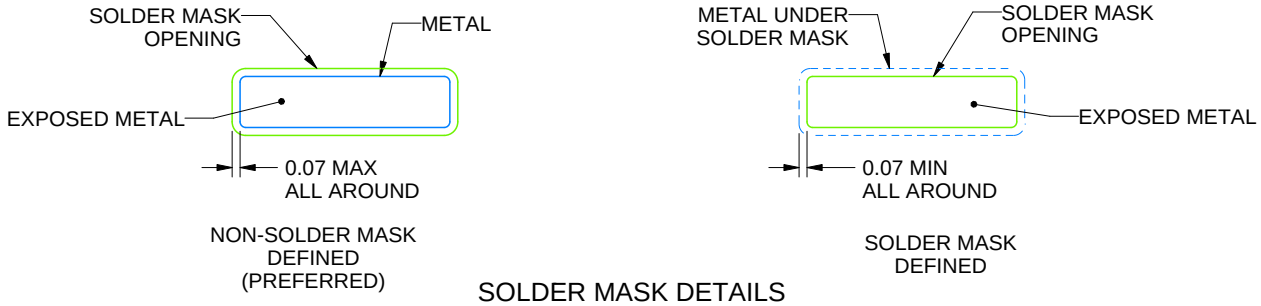
4214851/B 08/2019

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4214851/B 08/2019

NOTES: (continued)

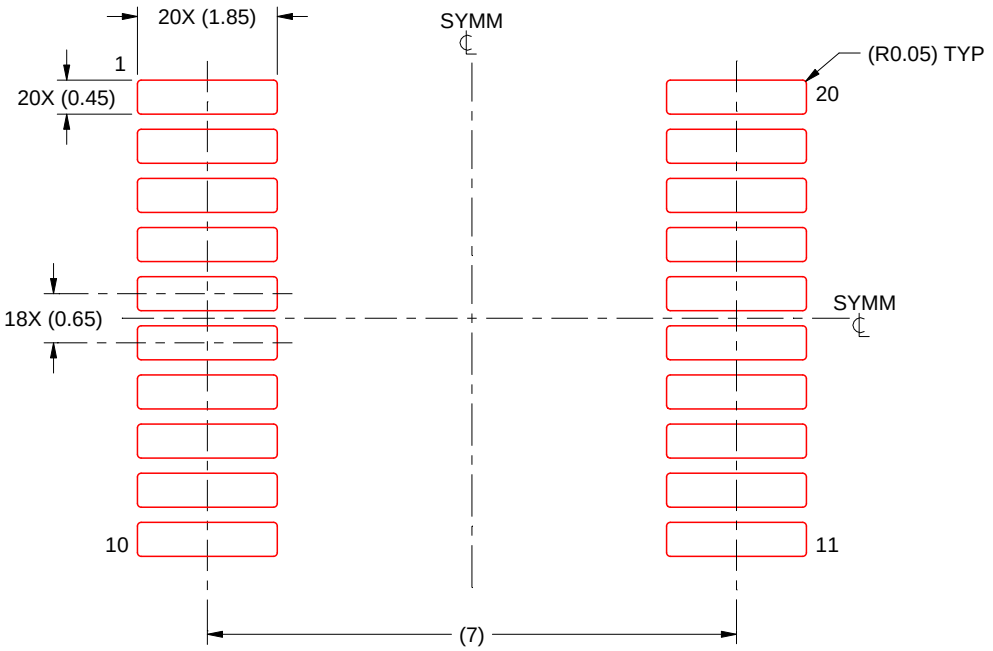
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

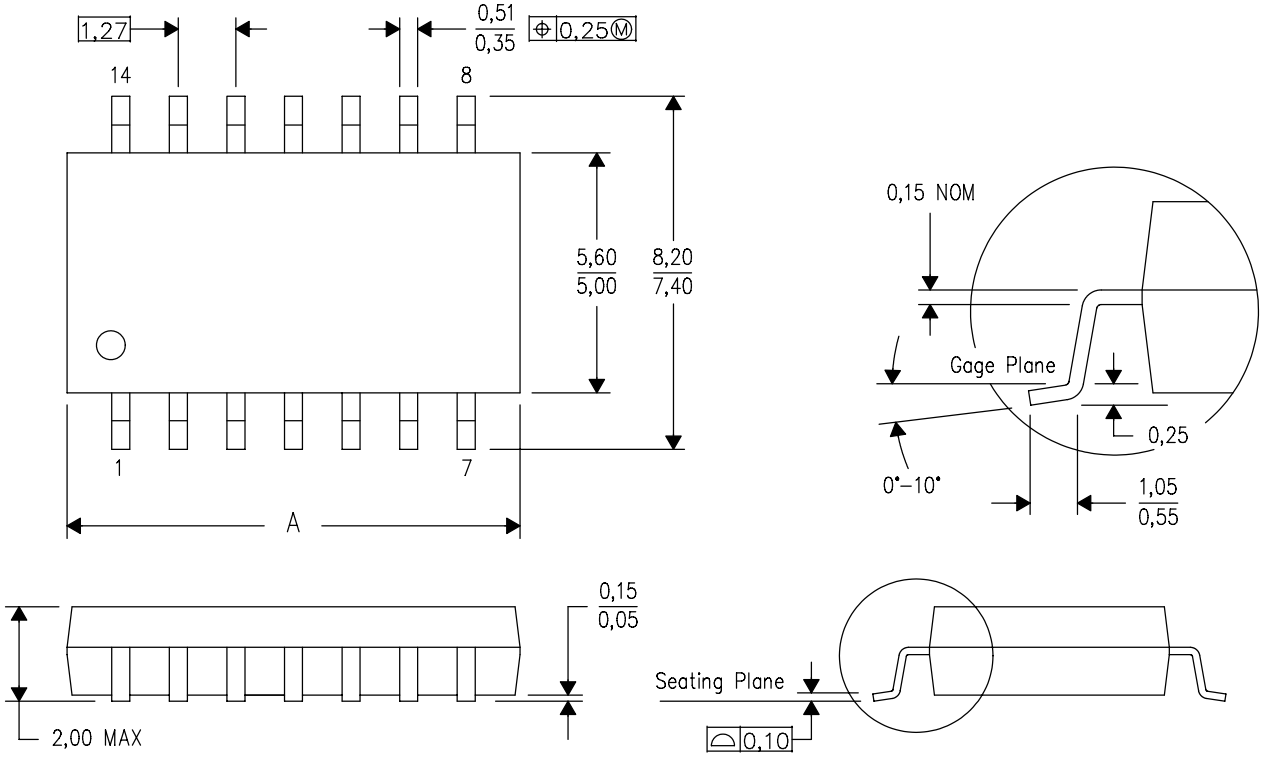
NOTES: (continued)

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

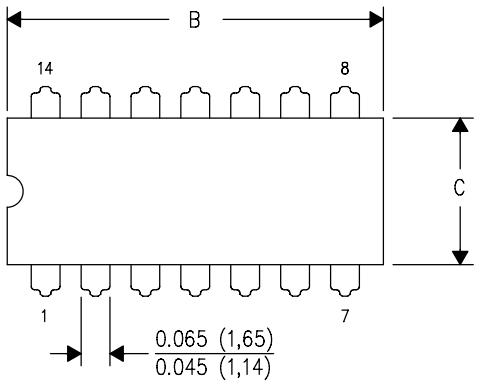
4040062/C 03/03

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.

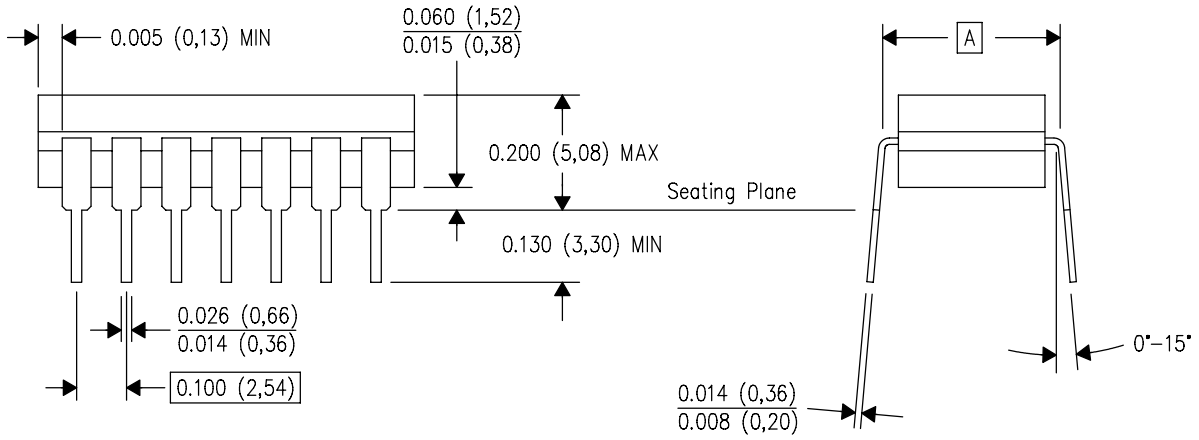
J (R–GDIP–T**)

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

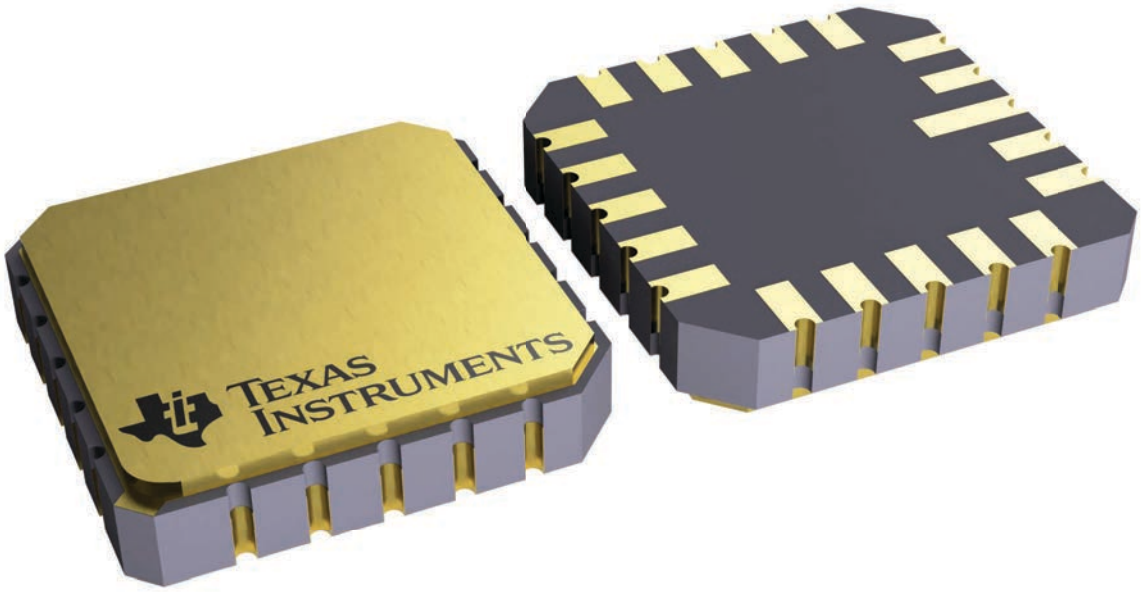
FK 20

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.

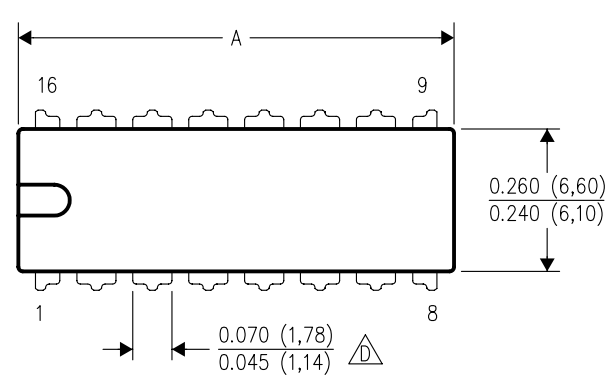


4229370VA\

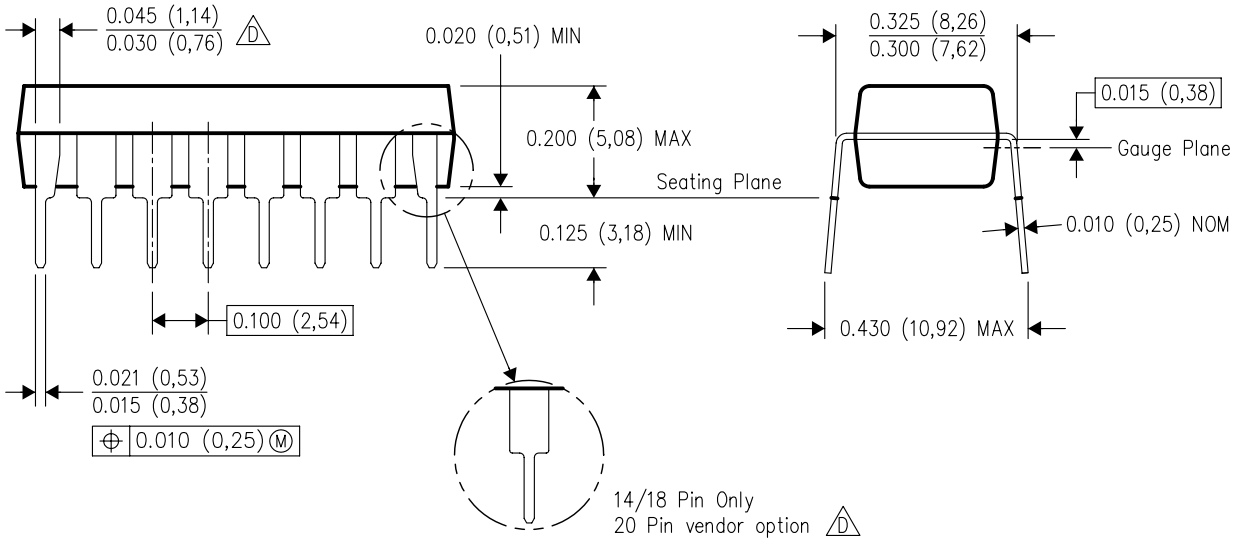
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

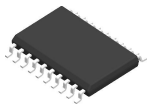


DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



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.

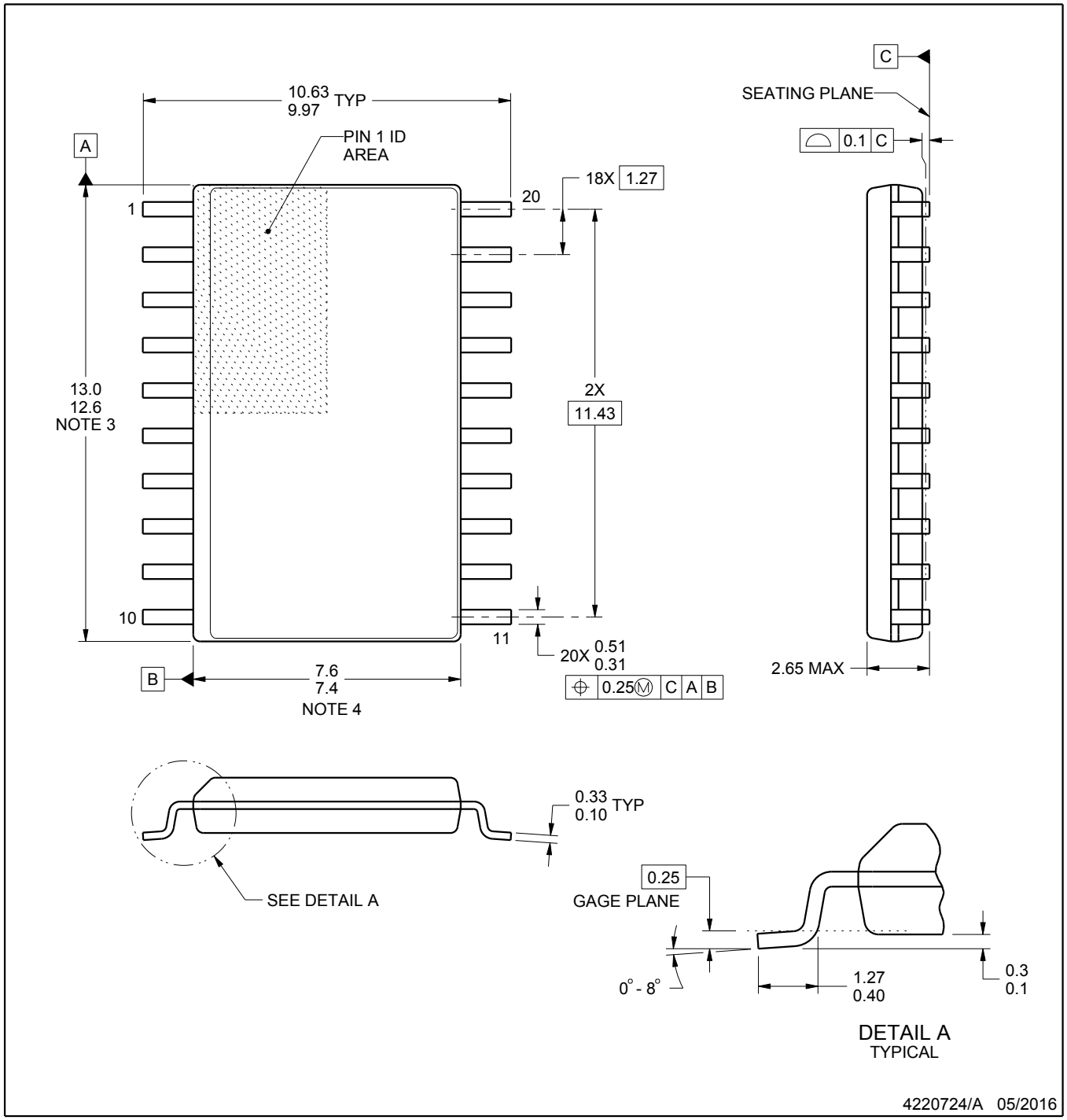


PACKAGE OUTLINE

DW0020A

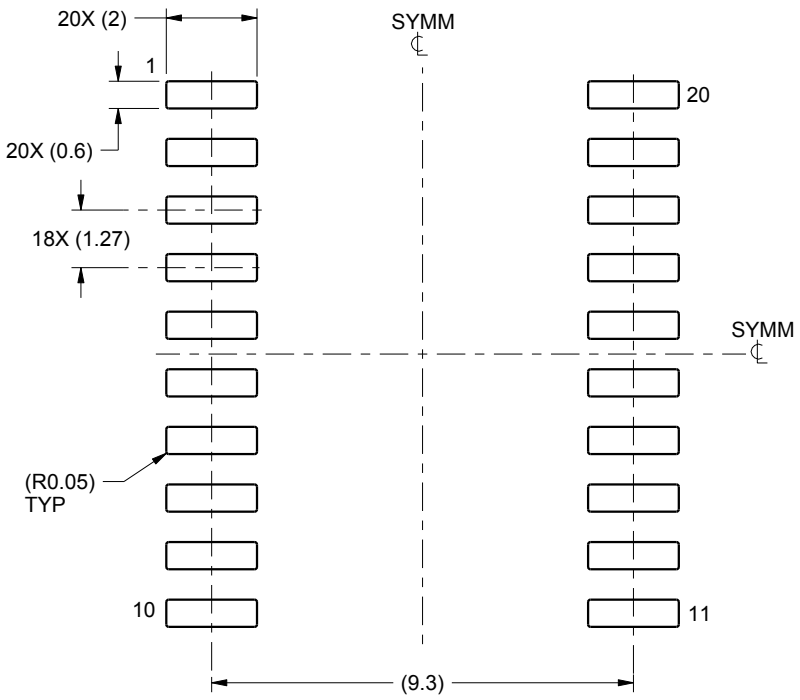
SOIC - 2.65 mm max height

SOIC

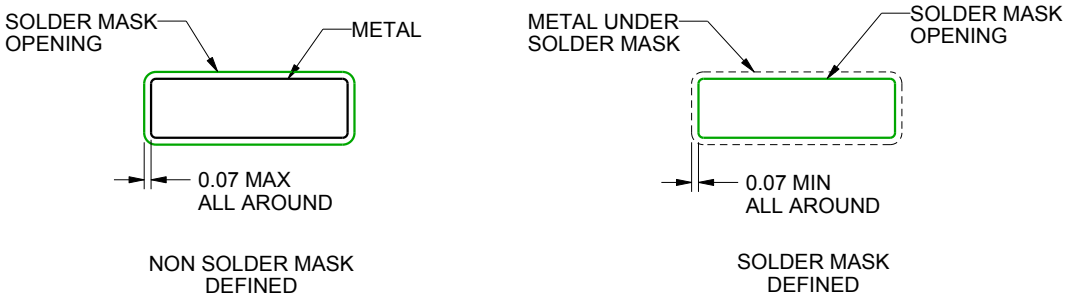


NOTES:

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

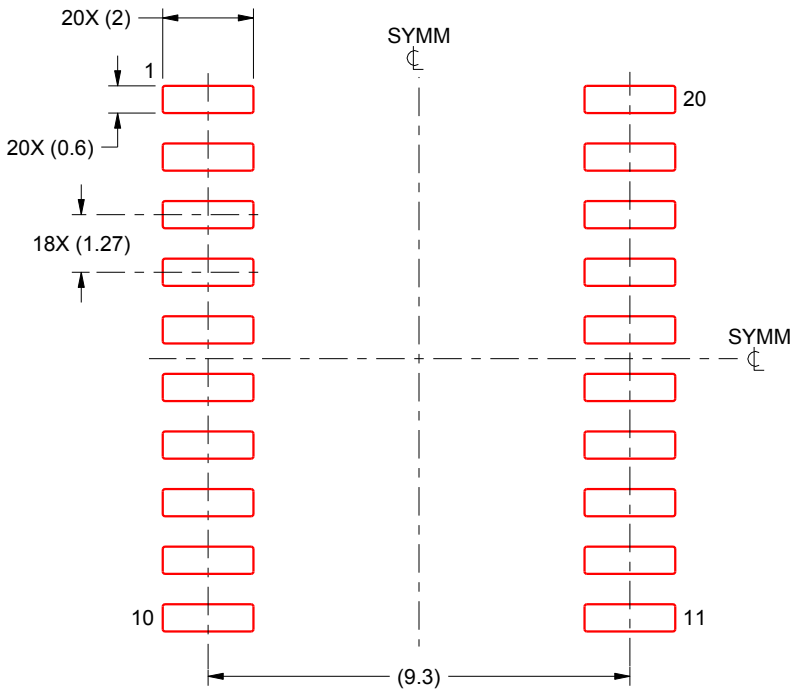


SOLDER MASK DETAILS

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.



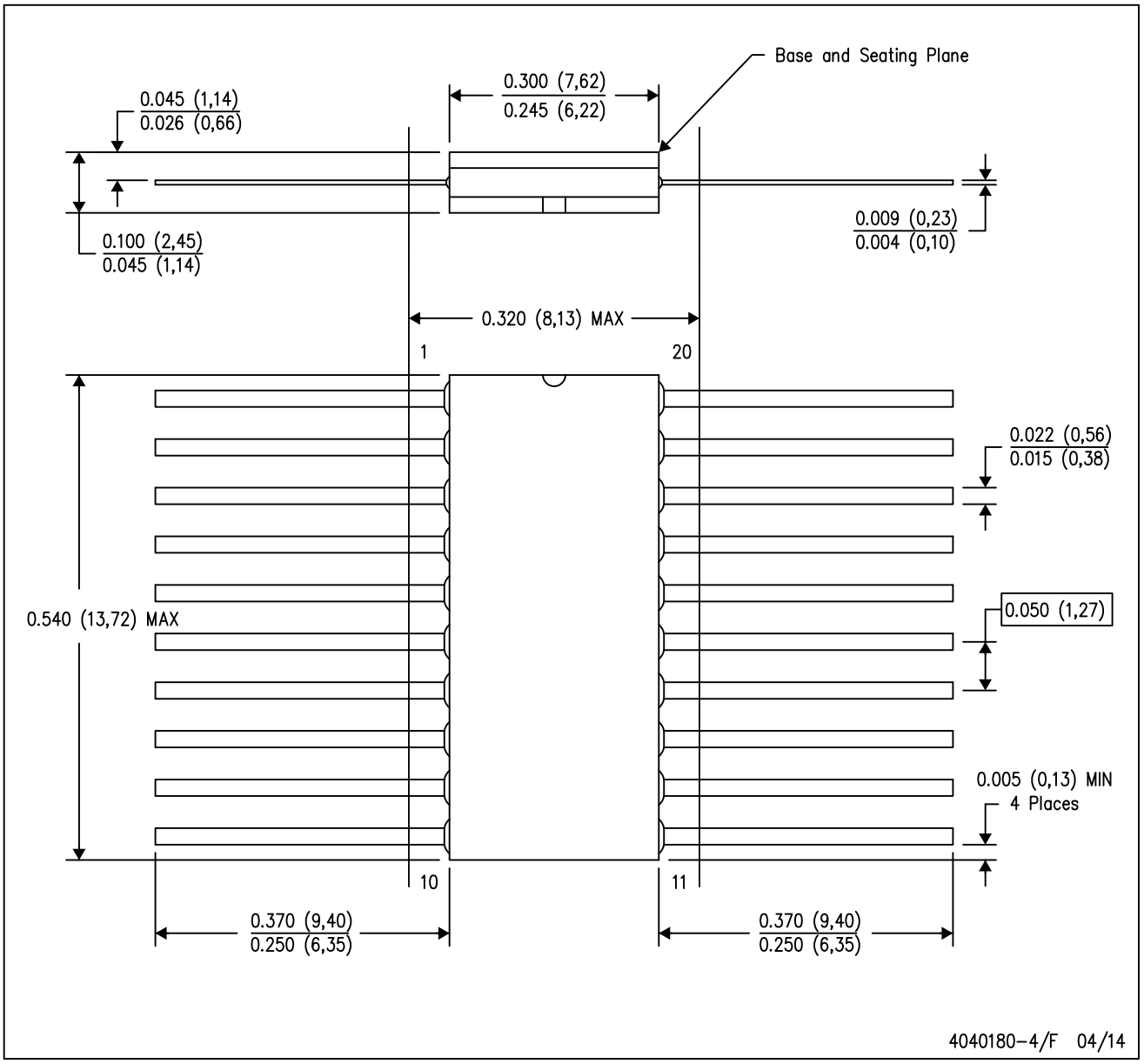
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

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



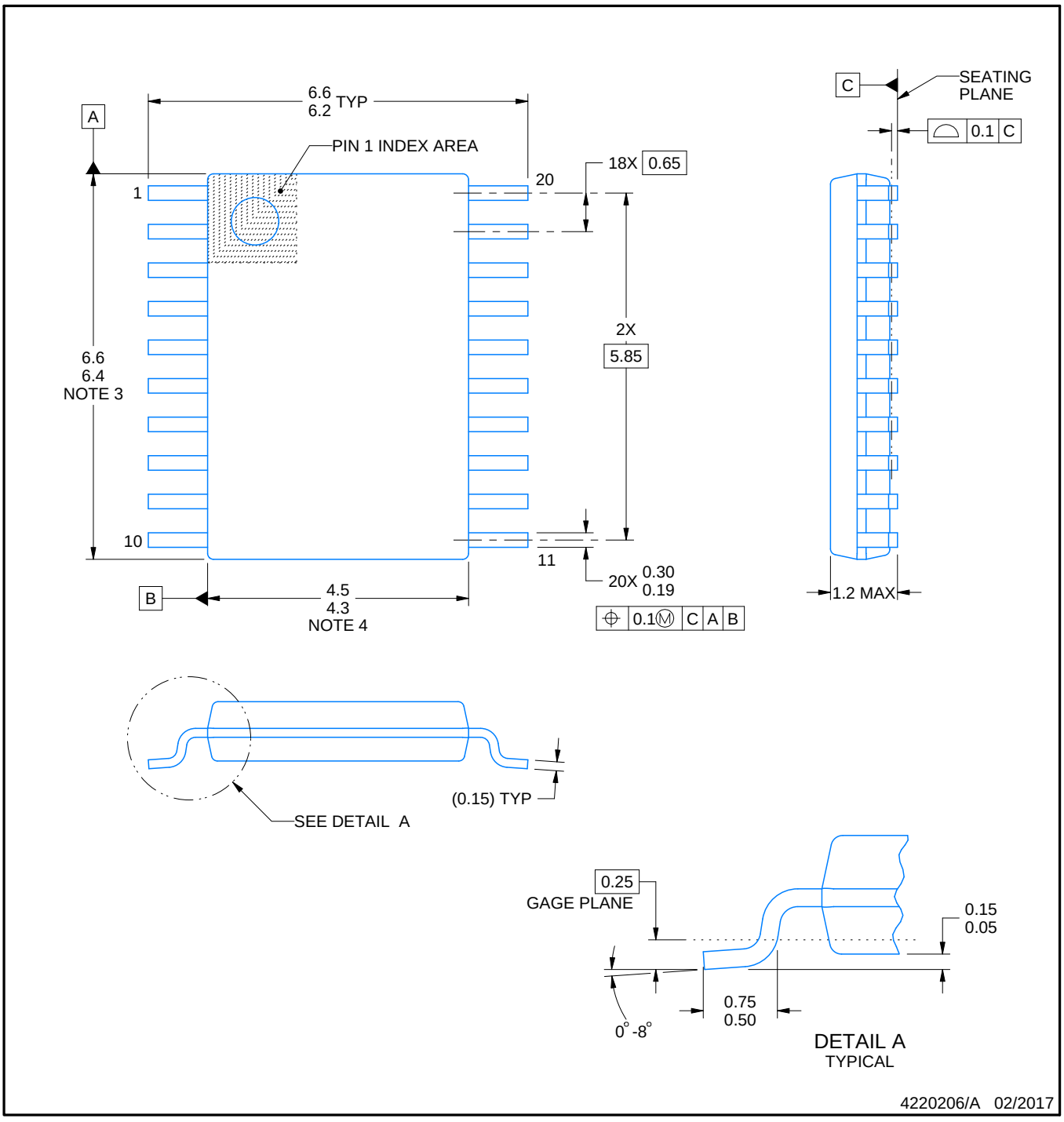
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within Mil–Std 1835 GDFP2–F20

PACKAGE OUTLINE

PW0020A

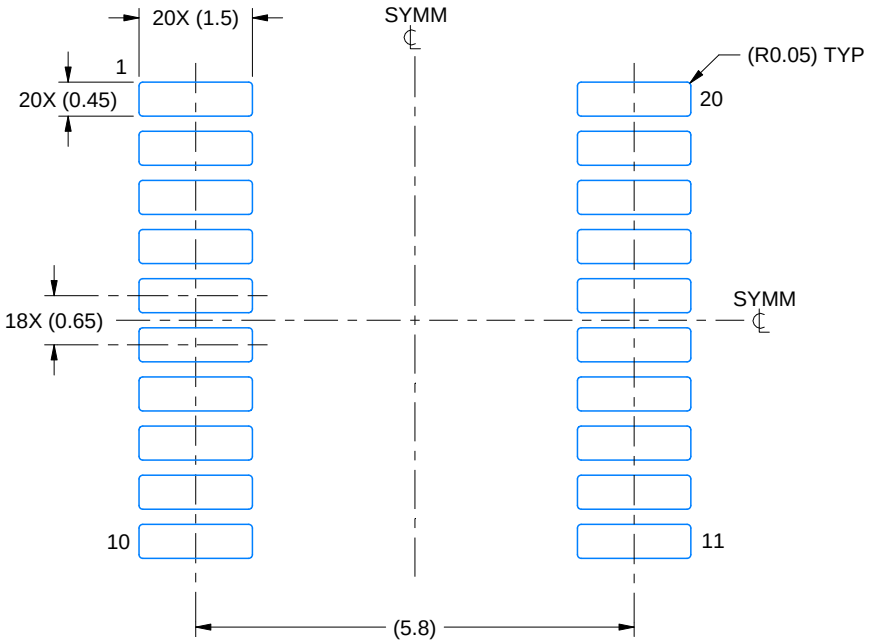
TSSOP - 1.2 mm max height

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

NON-SOLDER MASK DEFINED (PREFERRED)

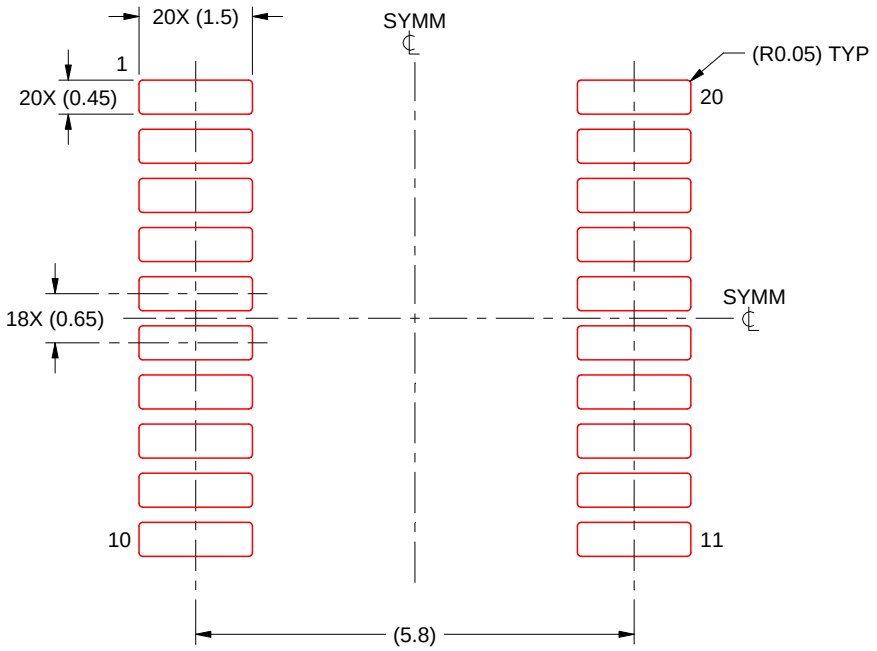
SOLDER MASK DEFINED

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)

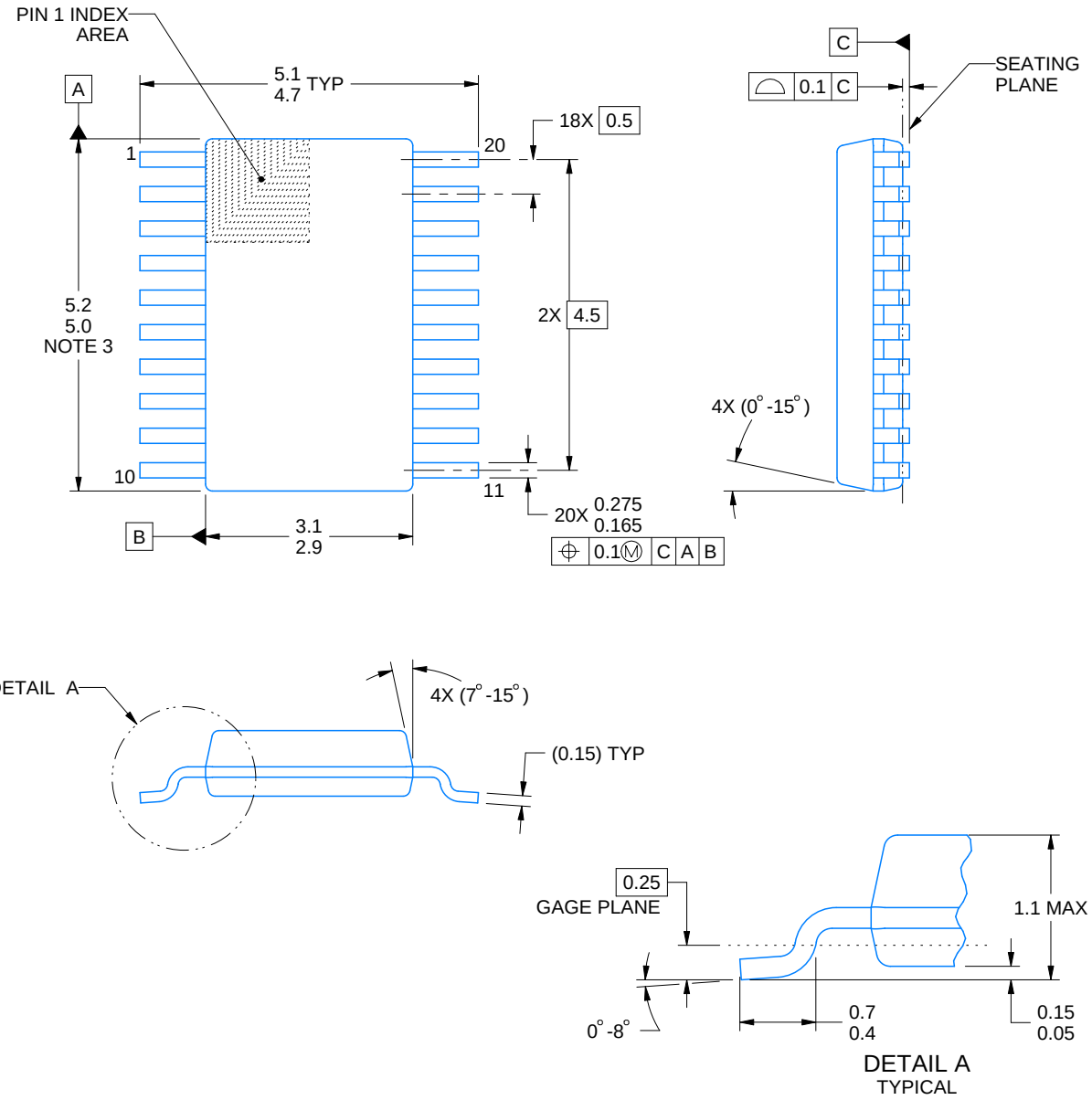
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PACKAGE OUTLINE

DGS0020A

VSSOP - 1.1 mm max height

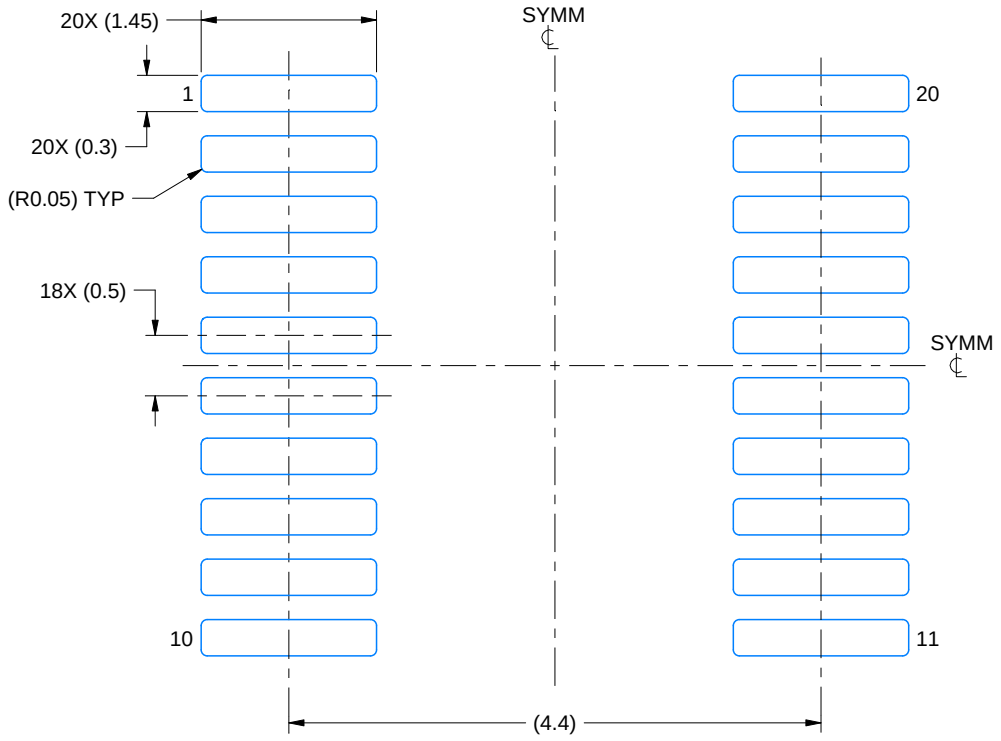
SMALL OUTLINE PACKAGE



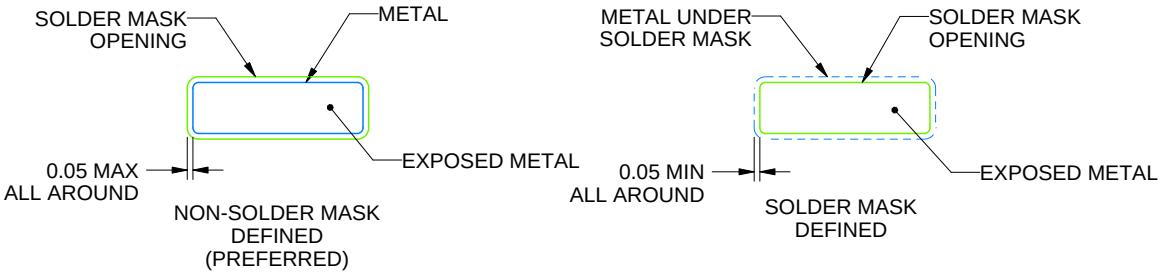
PowerPAD is a trademark of Texas Instruments.

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. No JEDEC registration as of September 2020.
5. Features may differ or may not be present.



LAND PATTERN EXAMPLE
SCALE: 16X

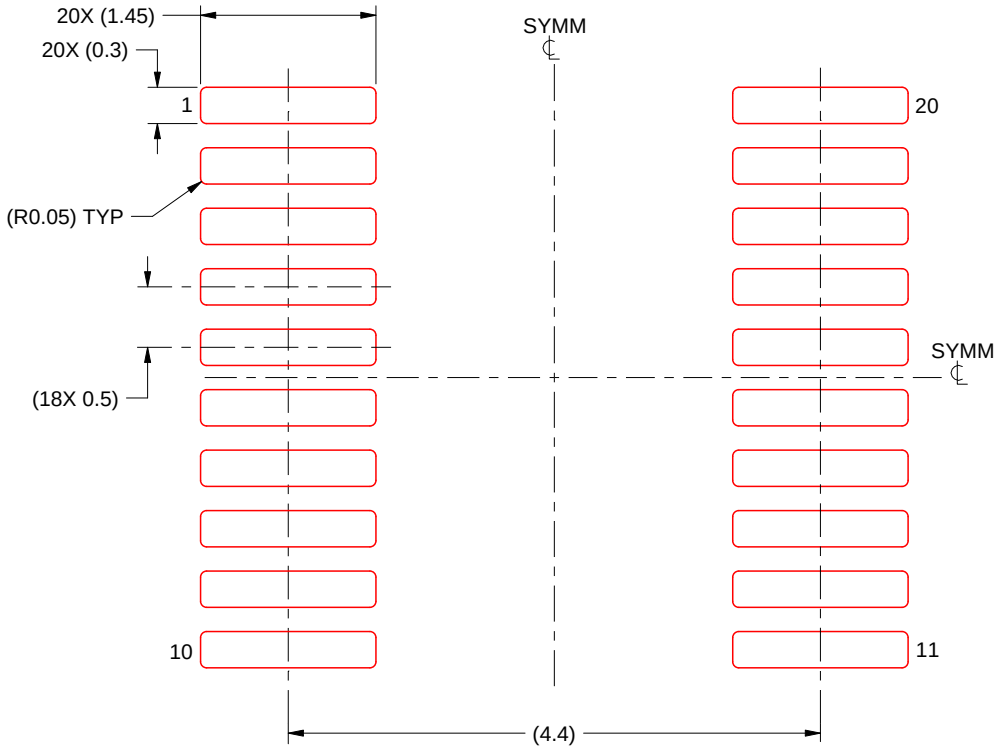


SOLDER MASK DETAILS

4226367/A 10/2020

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.
8. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature numbers SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Size of metal pad may vary due to creepage requirement.
10. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 16X

4226367/A 10/2020

NOTES: (continued)

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

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