SNx4HC14 Hex Schmitt-Trigger Inverters

1 Features

- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up to 10 LSTTL Loads
- Low Power Consumption, 20-μA Max I_{CC}
- Typical t_{pd} = 11 ns
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- On Products Compliant to MIL-PRF-38535, All Parameters Are Tested Unless Otherwise Noted. On All Other Products, Production Processing Does Not Necessarily Include Testing of All Parameters.

2 Applications

- Microwave Oven
- Mice
- Printers
- AC Inverter Drives
- UPS
- AC Servo Drives
- Other Motor Drives

3 Description

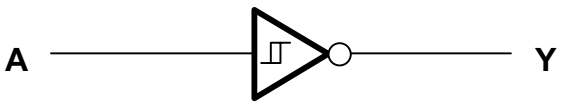
The SNx4HC14 are Schmitt-trigger devices that contain six independent inverters. They perform the Boolean function $Y = \overline{A}$ in positive logic.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SNJ54HC14J	CDIP (14)	7.62 mm x 19.94 mm
SNJ54HC14W	CFP (14)	7.11 mm x 9.11 mm
SNJ54HC14FK	LCCC (20)	8.89 mm x 8.89 mm
SN74HC14D	SOIC (14)	6.00 mm x 8.65 mm
SN74HC14DB	SSOP (14)	367.00 mm x 367.00 mm
SN74HC14N	PDIP (14)	7.94 mm x 10.35 mm
SN74HC14NS	SO (14)	7.80 mm x 10.20 mm
SN74HC14PW	TSSOP (14)	6.40 mm x 5.00 mm

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

Logic Diagram (Positive Logic)



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4 Revision History

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

Changes from Revision I (February 2016) to Revision J — **Page**

- Changed " Y = A" to "Y = $\overline{A}$" throughout ... 1
- Added The SNx4HC14 to *Description* section ... 1
- Deleted *Device Comparison Table* section ... 1
- Added *Receiving Notification of Documentation Updates* section ... 12

Changes from Revision H (September 2015) to Revision I — **Page**

- Changed part number from SN54HC08 to SN54HC14 in *Switching Characteristics* table ... 5
- Changed part number from SN74HC08 to SN74HC14 in *Switching Characteristics* table ... 5

Changes from Revision G (January 2014) to Revision H — **Page**

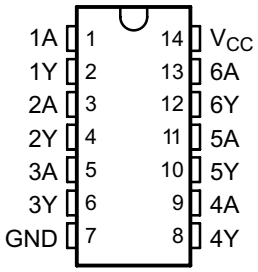
- Added *Applications* ... 1
- Added Military Disclaimer to *Features* list. ... 1
- Added *Pin Configuration and Functions* section, *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section ... 1

Changes from Revision F (December 2010) to Revision G — **Page**

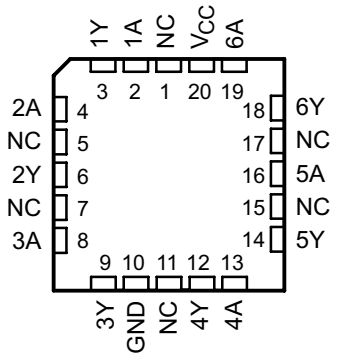
- Updated document to new TI data sheet format - no specification changes. ... 1

5 Pin Configuration and Functions

SN54HC14 J or W Package
SN74HC14 D, DB, N, NS, or PW Package
14-Pin CDIP, CFP, SOIC, SSOP, PDIP, SO, or TSSOP
Top View



SN54HC14 FK Package
20-Pin LCCC
Top View



Pin Functions

PIN			I/O	DESCRIPTION
NAME	CDIP, CFP, SOIC, SSOP, PDIP, SO, TSSOP	LCCC		
1A	1	2	I	Channel 1 input
1Y	2	3	O	Channel 1 output
2A	3	4	I	Channel 2 input
2Y	4	6	O	Channel 2 output
3A	5	8	I	Channel 3 input
3Y	6	9	O	Channel 3 output
GND	7	10	—	Ground
4Y	8	12	O	Channel 4 output
4A	9	13	I	Channel 4 input
5Y	10	14	O	Channel 5 output
5A	11	16	I	Channel 5 input
6Y	12	18	O	Channel 6 output
6A	13	19	I	Channel 6 input
V_{CC}	14	20	—	Power supply
NC(1)	—	1	—	No internal connection
		5		
		7		
		11		
		15		
		17		

(1) NC – No internal connection

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)	$V_O < 0$		±20	mA
I_O	Continuous output current	$V_O = 0$ to V_{CC}		±25	mA
	Continuous current through V_{CC} or GND			±50	mA
T_j	Junction temperature			150	°C
T_{stg}	Storage temperature		–65	150	

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

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	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)	±1500	

(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

See note(1).

		SN54HC14			SN74HC14			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	2	5	6	2	5	6	V
V_I	Input voltage	0		V_{CC}	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	0		V_{CC}	V
T_A	Operating free-air temperature	–55		125	–40		85	°C

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

6.4 Thermal Information

THERMAL METRIC(1)		SNx4HC14					UNIT
		D (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	
		14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	86	96	80	76	113	°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 operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		V_{CC}	T_A = 25°C			SN54HC14		SN74HC14		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{T+}			2 V	0.7	1.2	1.5	0.7	1.5	0.7	1.5	V
			4.5 V	1.55	2.5	3.15	1.55	3.15	1.55	3.15	
			6 V	2.1	3.3	4.2	2.1	4.2	2.1	4.2	
V_{T-}			2 V	0.3	0.6	1	0.3	1	0.3	1	V
			4.5 V	0.9	1.6	2.45	0.9	2.45	0.9	2.45	
			6 V	1.2	2	3.2	1.2	3.2	1.2	3.2	
$V_{T+} - V_{T-}$			2 V	0.2	0.6	1.2	0.2	1.2	0.2	1.2	V
			4.5 V	0.4	0.9	2.1	0.4	2.1	0.4	2.1	
			6 V	0.5	1.3	2.5	0.5	2.5	0.5	2.5	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	I_{OH} = –20 μA	2 V	1.9	1.998		1.9		1.9		V
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		I_{OH} = –4 mA	4.5 V	3.98	4.3		3.7		3.84		
		I_{OH} = –5.2 mA	6 V	5.48	5.8		5.2		5.34		
V_{OL}	$V_I = V_{IH}$ or V_{IL}	I_{OL} = 20 μA	2 V		0.002	0.1		0.1		0.1	V
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	
		I_{OL} = 4 mA	4.5 V		0.17	0.26		0.4		0.33	
		I_{OL} = 5.2 mA	6 V		0.15	0.26		0.4		0.33	
I_I	$V_I = V_{CC}$ or 0		6 V			±0.1	±100		±1000		±1000	nA
I_{CC}	$V_I = V_{CC}$ or 0,	I_O = 0	6 V			2		40		20	μA
C_i			2 V to 6 V		3	10		10		10	pF

6.6 Switching Characteristics

over operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC14		SN74HC14		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2 V		55	125		190		155	ns
			4.5 V		12	25		38		31	
			6 V		11	21		22		26	
t_t		Y	2 V		38	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

6.7 Operating Characteristics

T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per inverter	No load	20	pF

6.8 Typical Characteristics

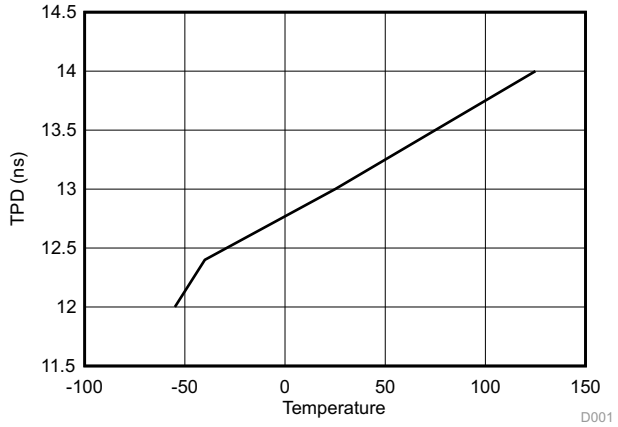


Figure 1. TPD vs Temperature at 4.5 V, 25°C

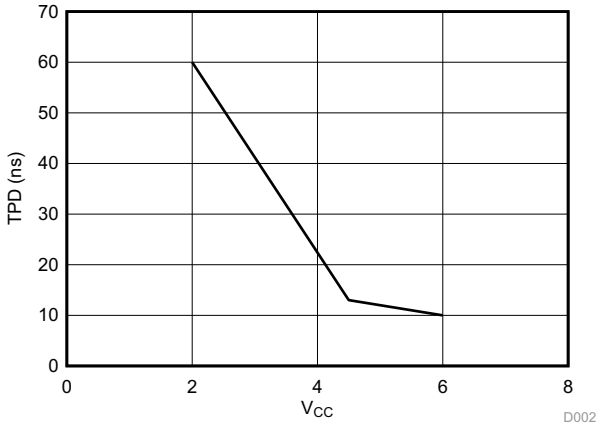


Figure 2. TPD vs V_{CC} at 25°C

7 Parameter Measurement Information

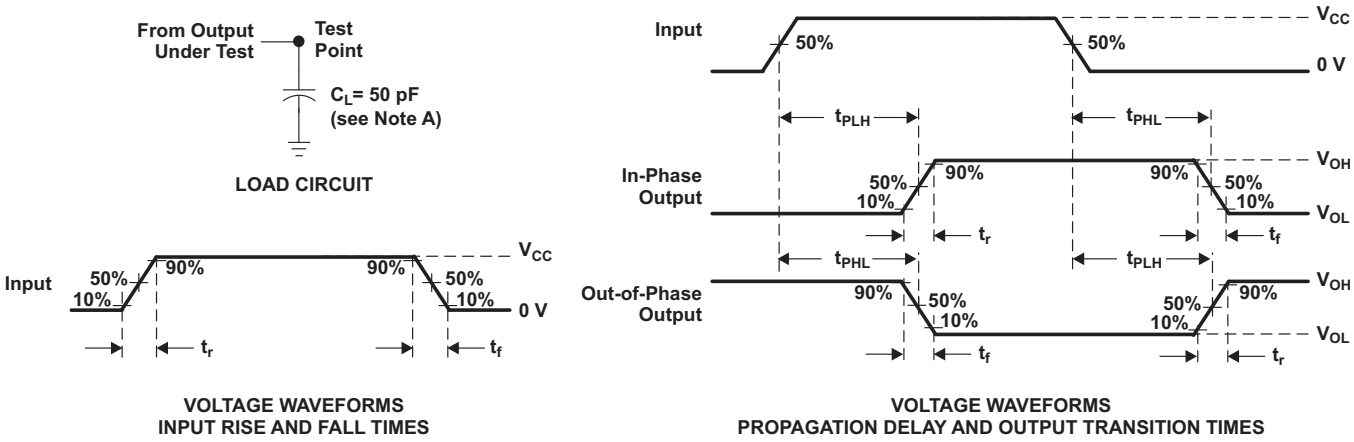


Figure 3. Load Circuit and Voltage Waveforms

8 Detailed Description

8.1 Overview

These Schmitt-trigger devices contain six independent inverters. They perform the Boolean function $Y = \overline{A}$ in positive logic.

Schmitt-trigger inputs are designed to provide a minimum separation between positive and negative switching thresholds. This allows for noisy or slow inputs that would cause problems such as oscillation or excessive current draw with normal CMOS inputs.

8.2 Functional Block Diagram

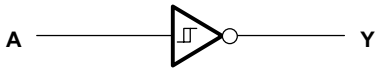


Figure 4. Logic Diagram (Positive Logic)

8.3 Feature Description

The wide operating range of the device allows it to be used in a variety of systems that use different logic levels. The outputs can drive up to 10 LSTTL loads each. The device has very low power consumption, with 20-μA Max I_{CC}. Typical propagation delay is also low at 11 ns. The balanced drive outputs can source or sink 4 mA at 5-V V_{CC}. The input leakage current is 1 μA Max.

8.4 Device Functional Modes

Table 1 lists the functional modes of the SNx4HC14.

Table 1. Function Table (Each Inverter)

INPUTS A	OUTPUT Y
H	L
L	H

9 Application and Implementation

NOTE

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

9.1 Application Information

The SNx4HC14 are Schmitt-trigger input CMOS devices that can be used for a multitude of inverting buffer type functions. The application shown in Figure 5 takes advantage of the Schmitt-trigger inputs to produce a delay for a logic output.

9.2 Typical Application

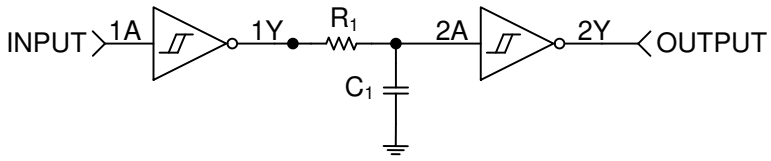


Figure 5. Simplified Application Schematic

9.2.1 Design Requirements

This device uses CMOS technology. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. Parallel output drive can create fast edges into light loads so consider routing and load conditions to prevent ringing.

9.2.2 Detailed Design Procedure

This circuit is designed around an RC network that produces a slow input to the second inverter. The RC time constant, τ, is calculated from: $\tau = R \times C$

The delay time for this circuit is between 1.2τ and 0.42τ. The delay is consistent for each device, but because the switching threshold is only guaranteed between a minimum and maximum value, the output pulse length varies between the devices. These values were calculated by using the minimum and maximum guaranteed V_{T+} values.

The resistor value should be chosen such that the maximum current from and to the SNx4HC14 is 4 mA.

- Recommended input conditions:
  - Schmitt-trigger inputs allow for slow inputs.
  - Specified high and low levels. See (V_{IH} and V_{IL}) in *Recommended Operating Conditions*.
- Recommended output conditions:
  - Load currents should not exceed 4 mA per output.

Typical Application (continued)

9.2.3 Application Curve

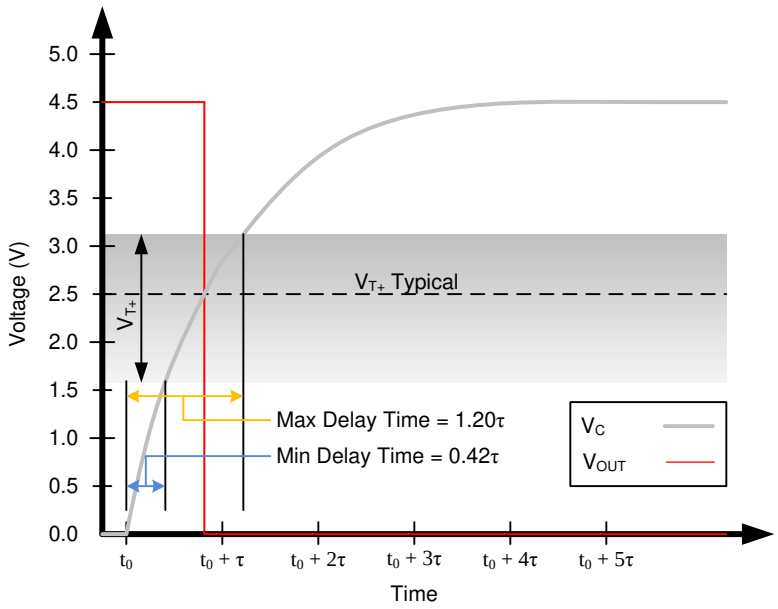


Figure 6. Ideal Capacitor Voltage and Output Voltage With Positive Switching Threshold Range Representation

10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1-µF capacitor. If there are multiple VCC terminals, then TI recommends a 0.01-µF or 0.022-µF capacitor for each power terminal. Multiple bypass capacitors can be paralleled to reject different frequencies of noise. Frequencies of 0.1 µF and 1 µF are commonly used in parallel. The bypass capacitor should be installed as close as possible to the power terminal 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 two inputs of a triple-input AND gate are used or only three of the four buffer gates 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 will be tied to GND or V_{CC} whichever makes more sense or is more convenient. Floating outputs is generally acceptable, unless the part is a transceiver.

11.2 Layout Example

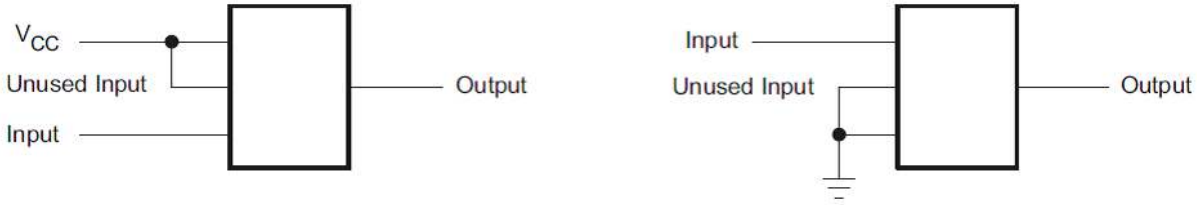


Figure 7. Layout Recommendation

12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation, see the following:

Implications of Slow or Floating CMOS Inputs, SCBA004

12.2 Related Links

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

Table 2. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54HC05	Click here	Click here	Click here	Click here	Click here
SN74HC05	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. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.4 Community Resources

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

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

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

12.5 Trademarks

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

12.6 Electrostatic Discharge Caution

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

12.7 Glossary

SLYZ022 — *TI Glossary*.

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

13 Mechanical, Packaging, and Orderable Information

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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8409101VCA	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	5962-8409101VC A SNV54HC14J	Samples
5962-8409101VDA	ACTIVE	CFP	W	14	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8409101VD A SNV54HC14W	Samples
84091012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84091012A SNJ54HC 14FK	Samples
8409101CA	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	8409101CA SNJ54HC14J	Samples
8409101DA	ACTIVE	CFP	W	14	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8409101DA SNJ54HC14W	Samples
JM38510/65702BCA	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65702BCA	Samples
JM38510/65702BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	JM38510/ 65702BDA	Samples
M38510/65702BCA	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65702BCA	Samples
M38510/65702BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	JM38510/ 65702BDA	Samples
SN54HC14J	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	SN54HC14J	Samples
SN74HC14D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	HC14	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
SN74HC14DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DRG3	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14DTG4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14N	ACTIVE	PDIP	N	14	25	Green (RoHS & no Sb/Br)	NIPDAU | SN	N / A for Pkg Type	-40 to 85	SN74HC14N	Samples
SN74HC14NE4	ACTIVE	PDIP	N	14	25	Green (RoHS & no Sb/Br)	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC14N	Samples
SN74HC14NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SN74HC14PWTG4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC14	Samples
SNJ54HC14FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84091012A	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
										SNJ54HC 14FK	
SNJ54HC14J	ACTIVE	CDIP	J	14	1	TBD	SNPB	N / A for Pkg Type	-55 to 125	8409101CA SNJ54HC14J	Samples
SNJ54HC14W	ACTIVE	CFP	W	14	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8409101DA SNJ54HC14W	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.

OTHER QUALIFIED VERSIONS OF SN54HC14, SN54HC14-SP, SN74HC14 :

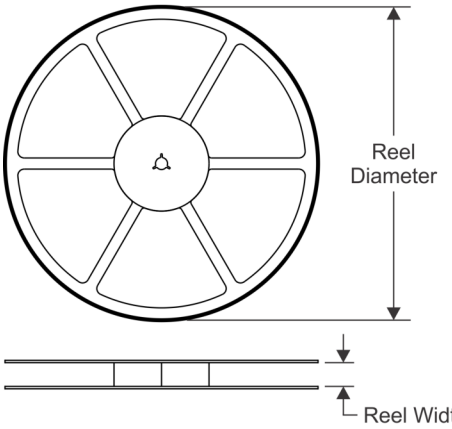
- Catalog: SN74HC14, SN54HC14
- Automotive: SN74HC14-Q1, SN74HC14-Q1
- Military: SN54HC14
- Space: SN54HC14-SP

NOTE: Qualified Version Definitions:

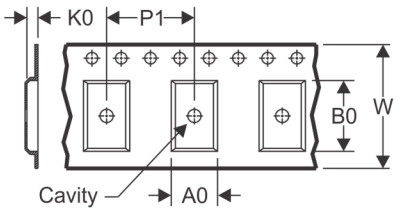
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

REEL DIMENSIONS

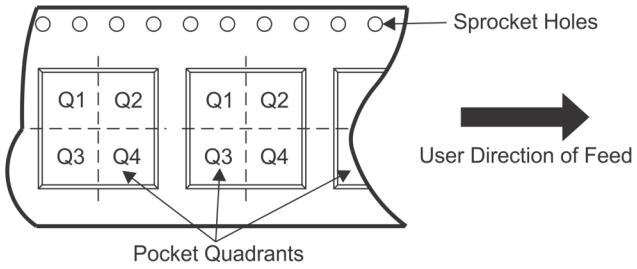


TAPE DIMENSIONS



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

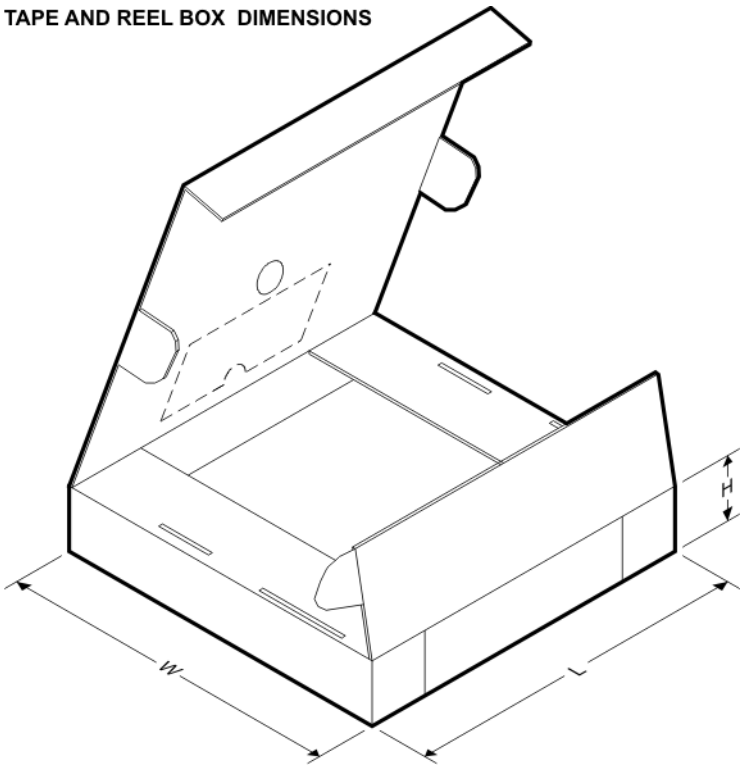
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74HC14DR	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.1	8.0	16.0	Q1
SN74HC14DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HC14DRG3	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.1	8.0	16.0	Q1
SN74HC14DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HC14DT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HC14PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC14PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC14PWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC14PWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

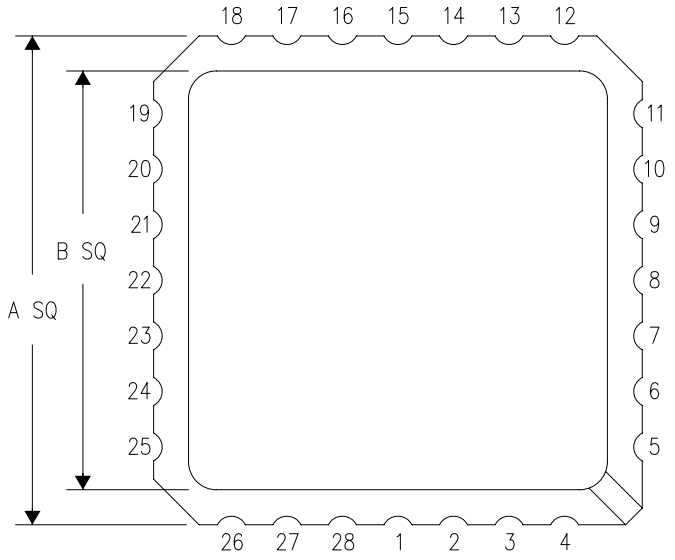


*All dimensions are nominal

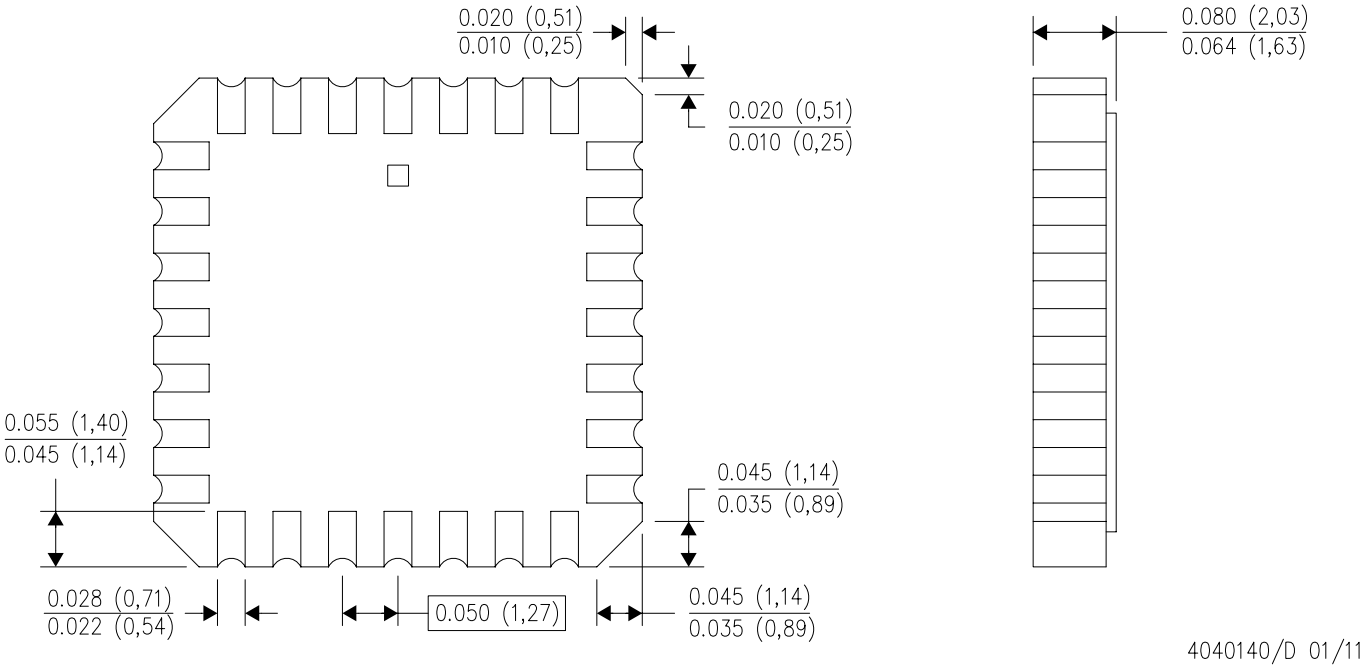
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC14DR	SOIC	D	14	2500	364.0	364.0	27.0
SN74HC14DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74HC14DRG3	SOIC	D	14	2500	364.0	364.0	27.0
SN74HC14DRG4	SOIC	D	14	2500	333.2	345.9	28.6
SN74HC14DT	SOIC	D	14	250	210.0	185.0	35.0
SN74HC14PWR	TSSOP	PW	14	2000	364.0	364.0	27.0
SN74HC14PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74HC14PWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74HC14PWT	TSSOP	PW	14	250	367.0	367.0	35.0

FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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



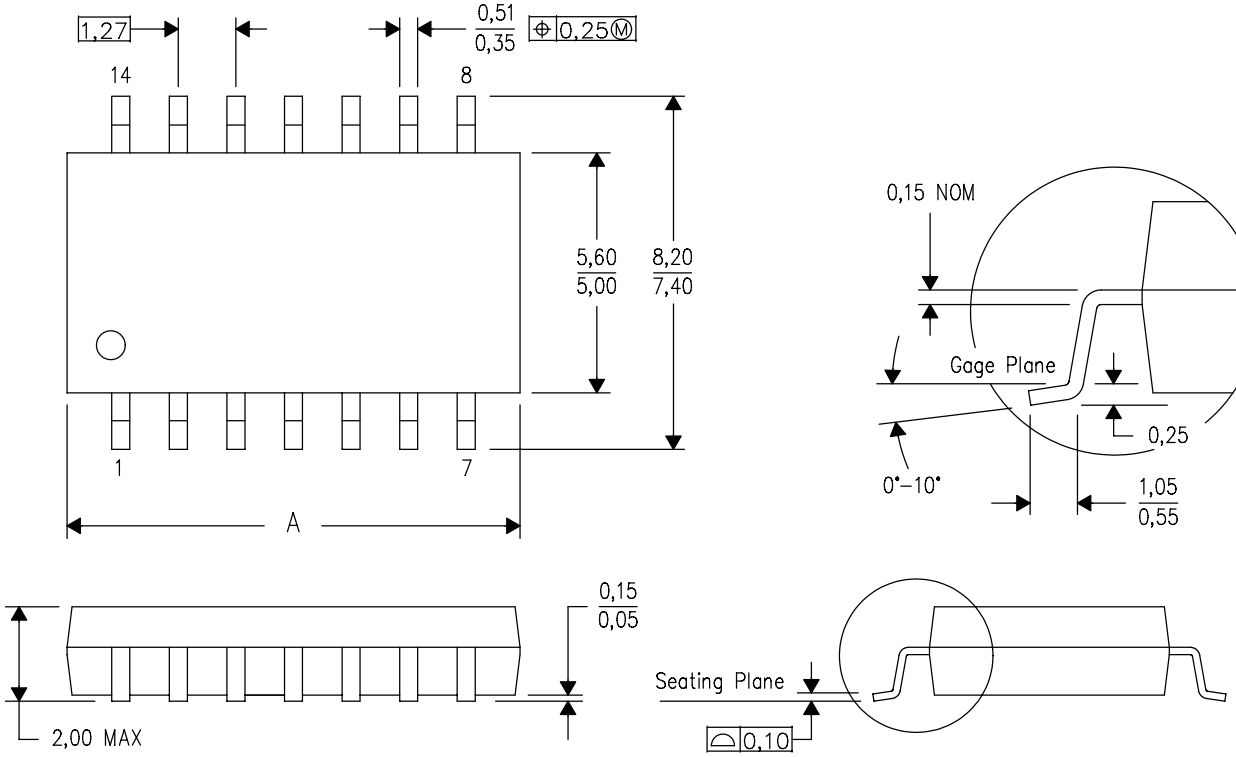
4040140/D 01/11

NOTES:
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 metal lid.
D. Falls within JEDEC MS–004

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN

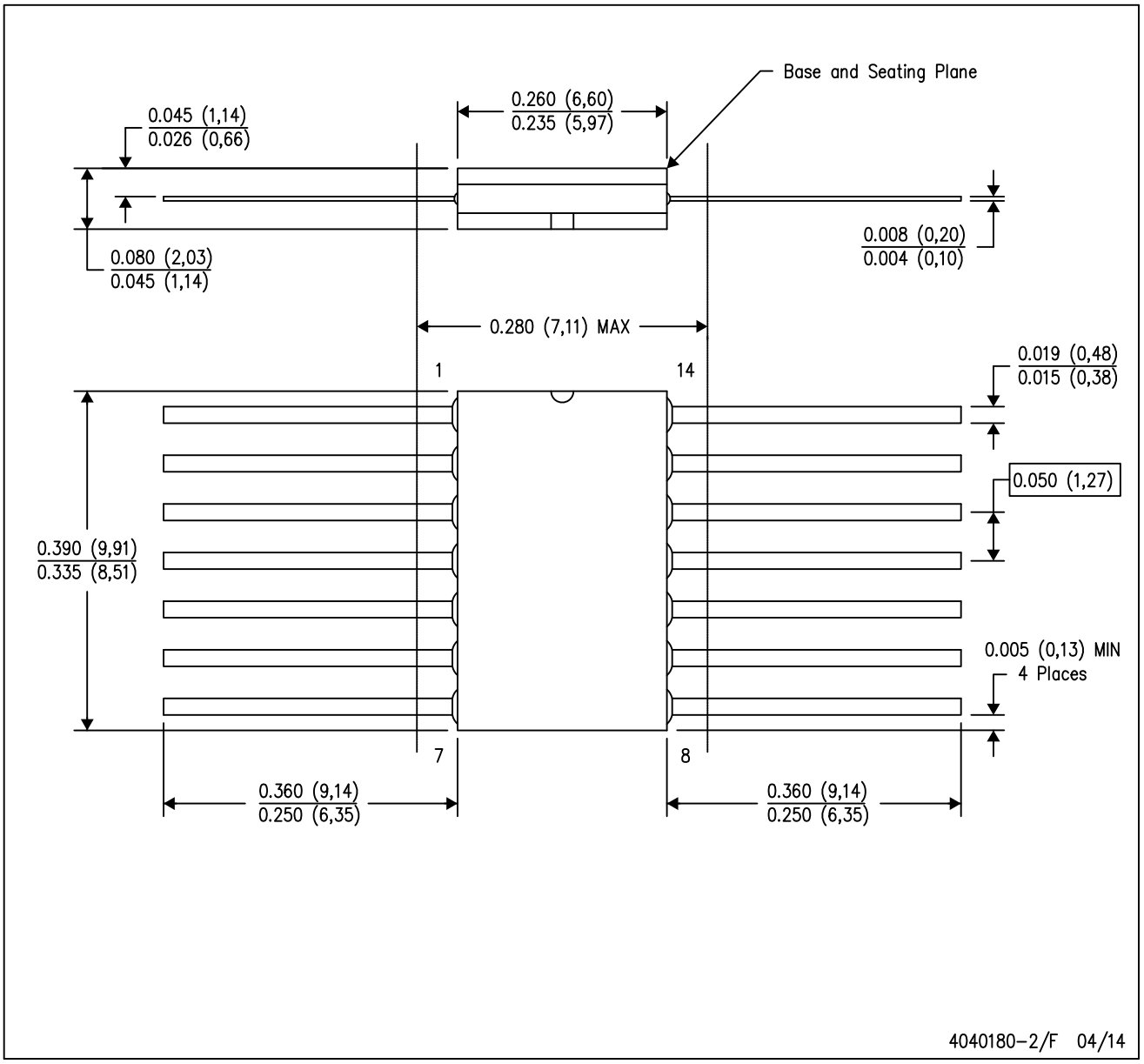


DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

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.

W (R–GDFP–F14) CERAMIC DUAL FLATPACK

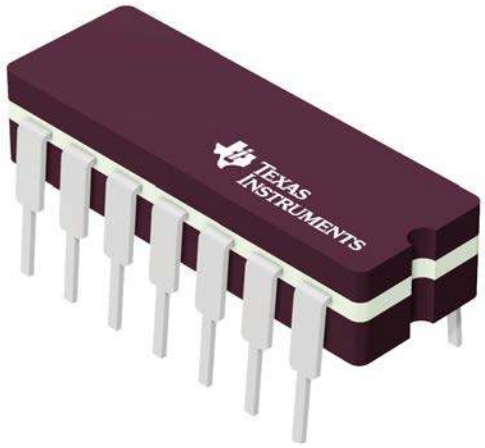


NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F14

GENERIC PACKAGE VIEW

J 14 CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

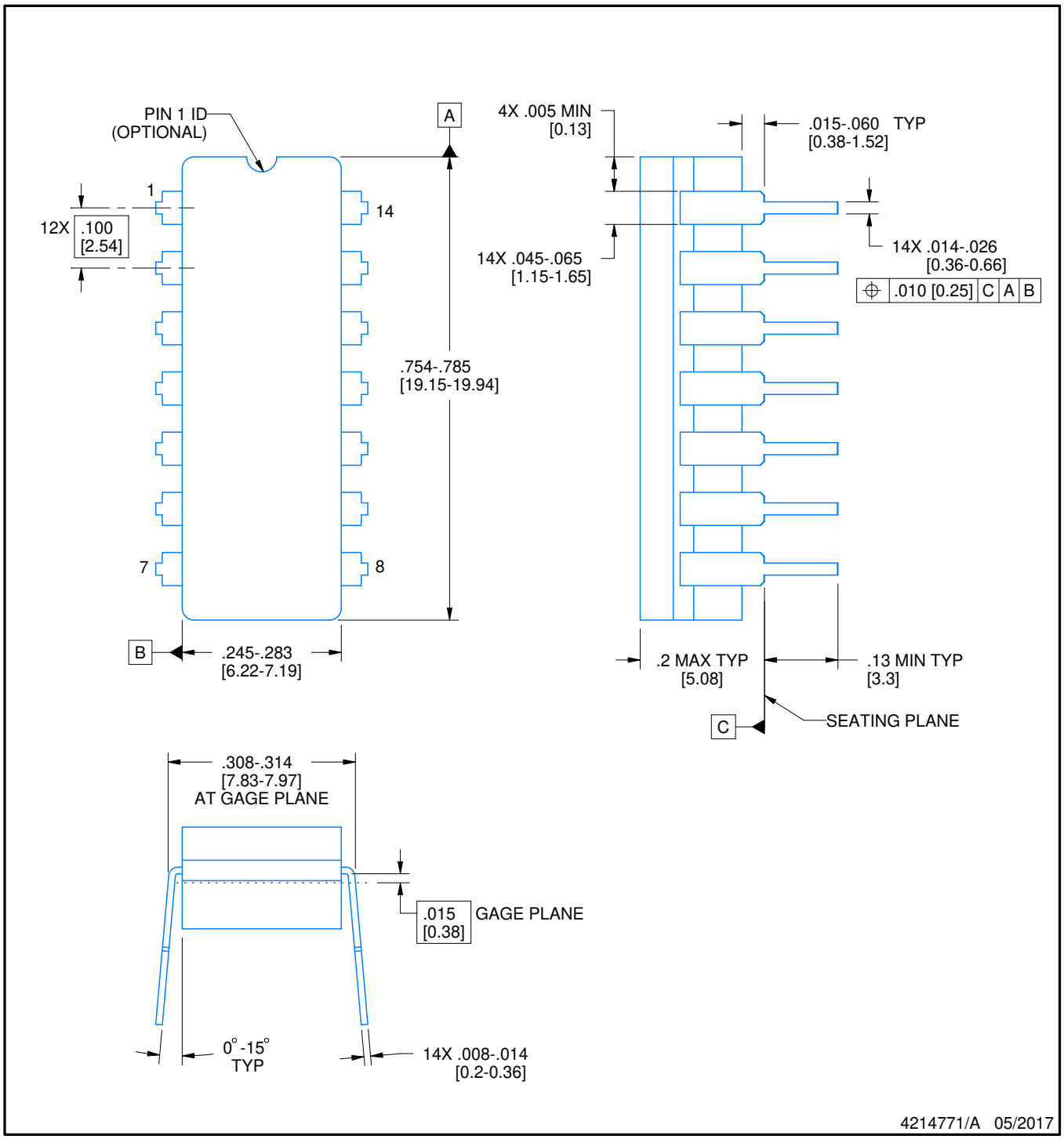
4040083-5/G

PACKAGE OUTLINE

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



NOTES:

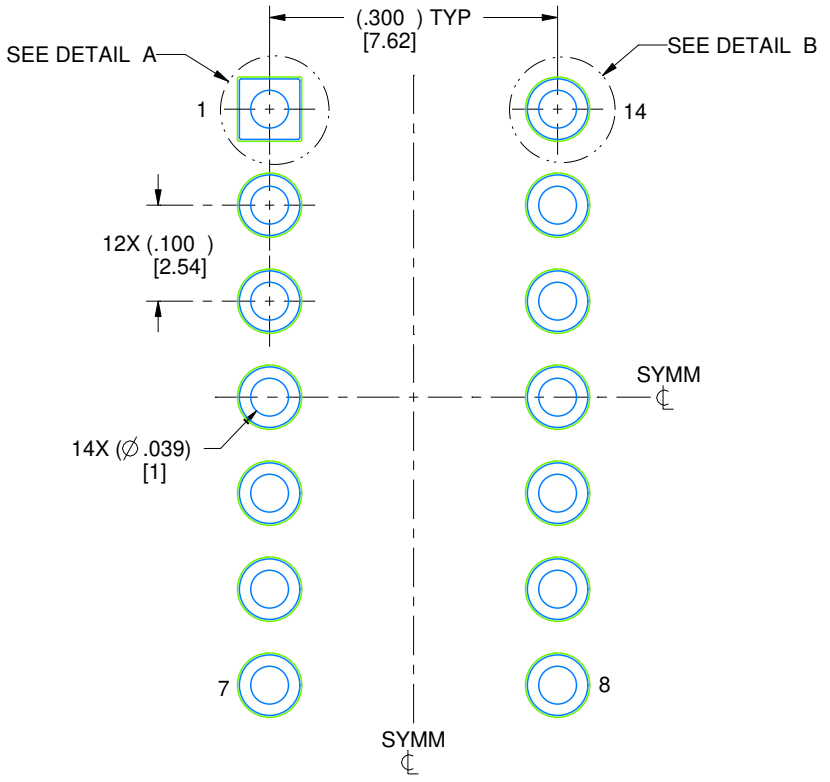
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermitically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

EXAMPLE BOARD LAYOUT

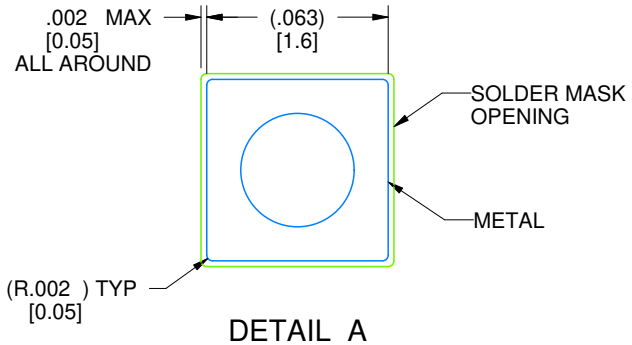
J0014A

CDIP - 5.08 mm max height

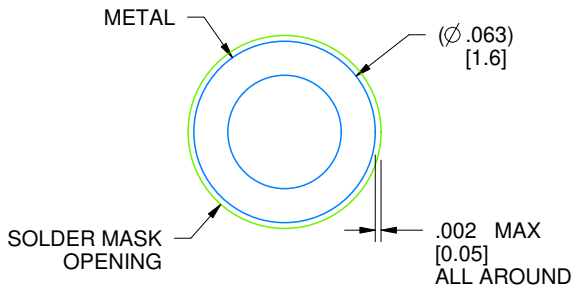
CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 5X



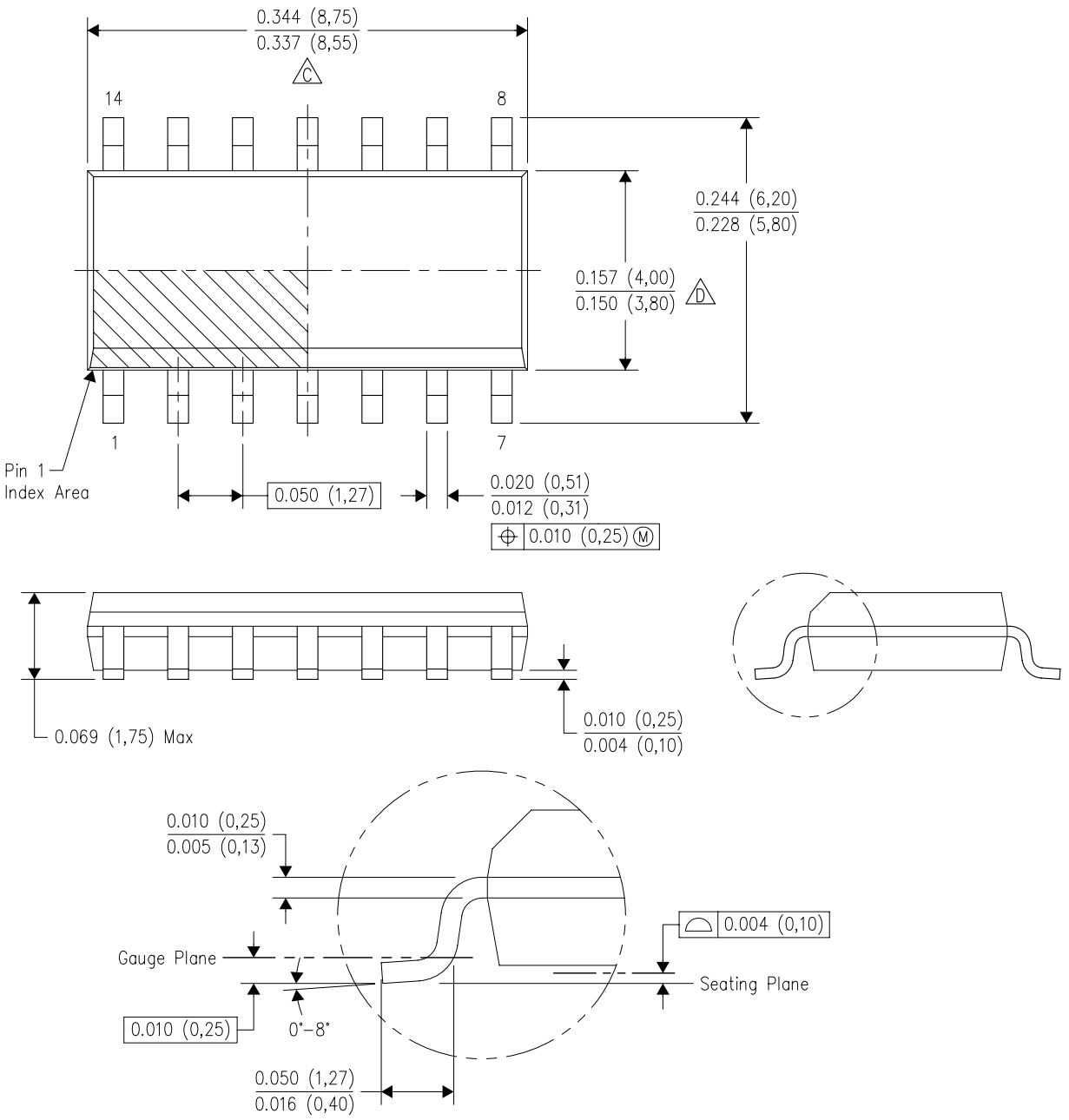
DETAIL A
SCALE: 15X



DETAIL B
13X, SCALE: 15X

4214771/A 05/2017

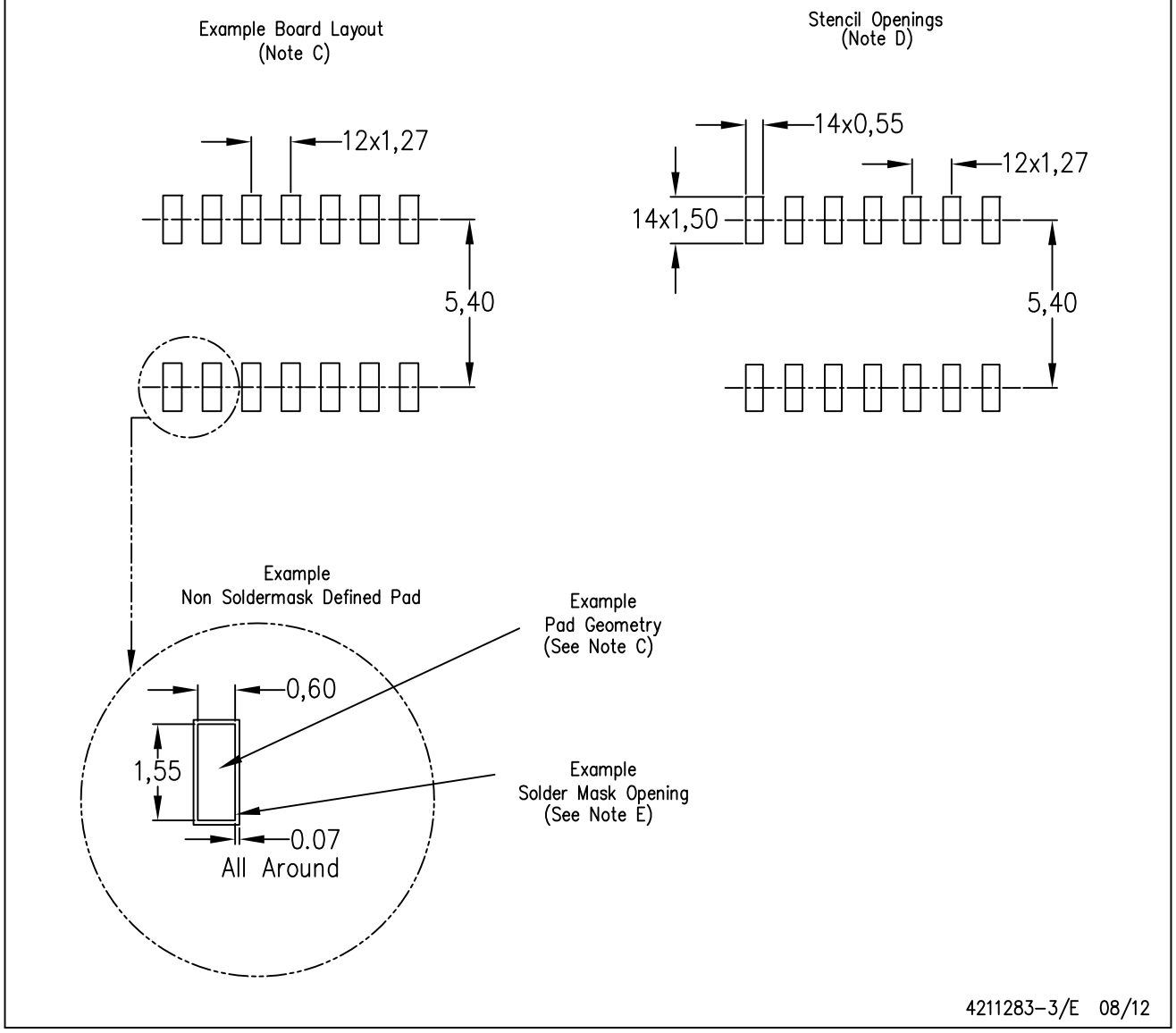
D (R–PDSO–G14) PLASTIC SMALL OUTLINE



4040047–5/M 06/11

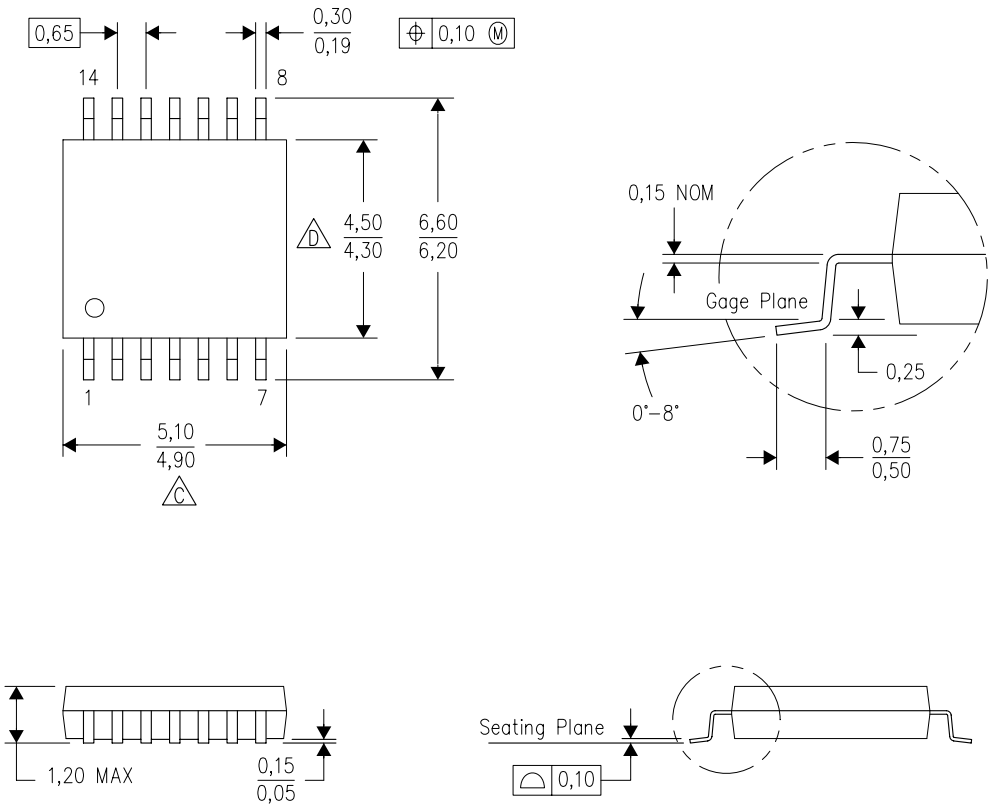
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AB.

D (R–PDSO–G14) PLASTIC SMALL OUTLINE



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

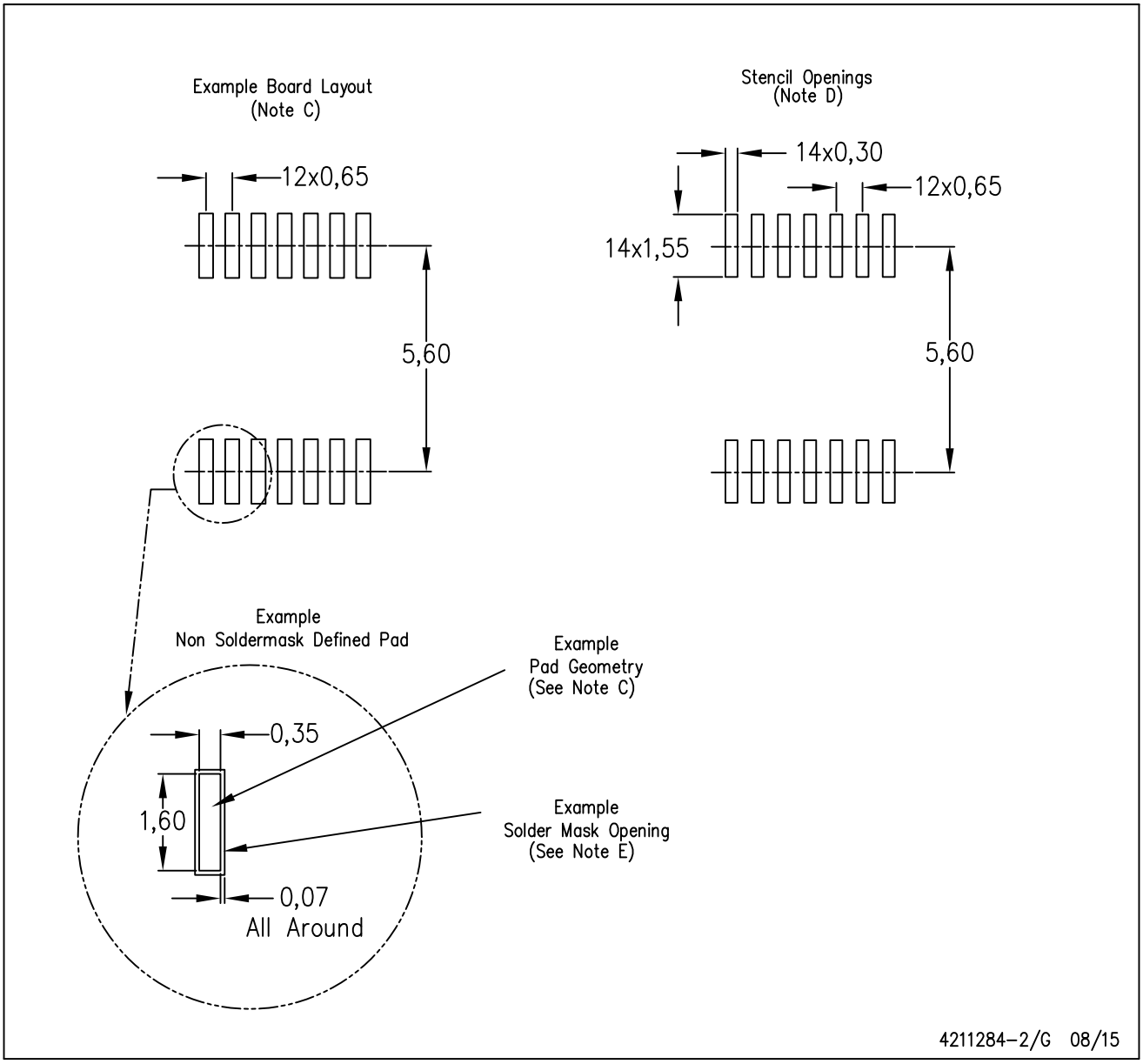
PW (R–PDSO–G14) PLASTIC SMALL OUTLINE



4040064–3/G 02/11

NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO–153

PW (R–PDSO–G14) PLASTIC SMALL OUTLINE

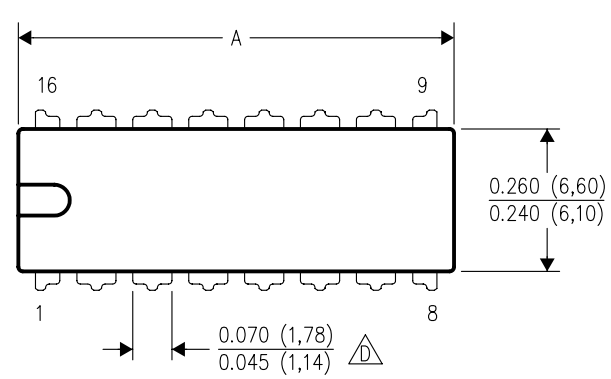


NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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

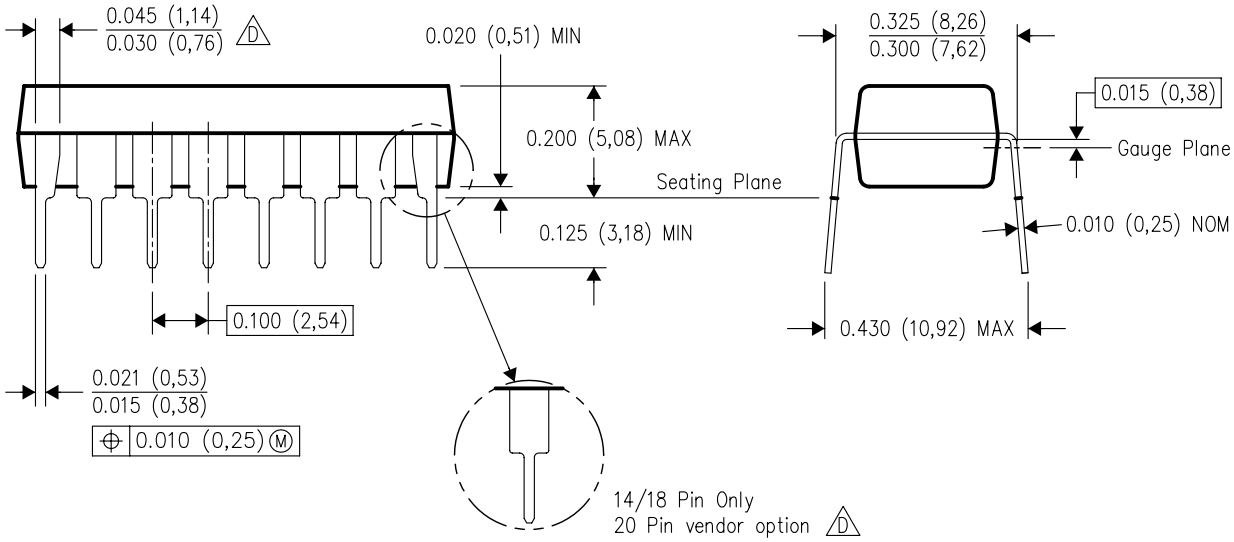
N (R–PDIP–T**)

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

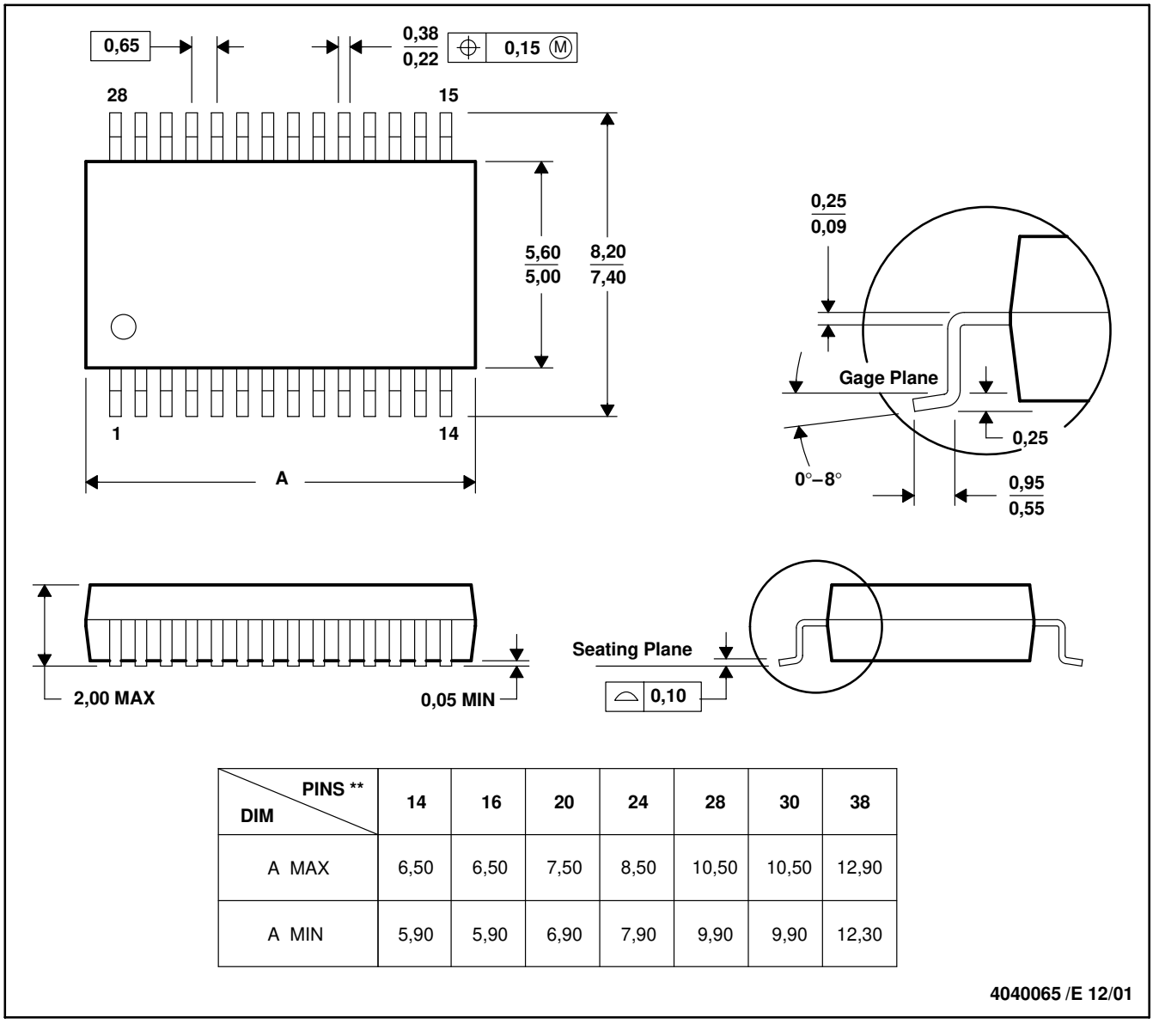


4040049/E 12/2002

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.

DB (R-PDSO-G)** **PLASTIC SMALL-OUTLINE**

28 PINS SHOWN



DIM \ PINS **	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

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.
D. Falls within JEDEC MO-150

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