

# SNxAHCT74 Dual Positive-Edge-Triggered D-Type Flip-Flops With Clear And Preset

## 1 Features

- Operating range of 4.5 V to 5.5 V
- Low power consumption, 10- $\mu$ A maximum  $I_{CC}$
- $\pm 8$ -mA output drive at 5 V
- Inputs are TTL-voltage compatible
- Latch-up performance exceeds 250 mA per JESD 17

## 2 Applications

- [Convert a momentary switch to a toggle switch](#)
- [Hold a signal during controller reset](#)
- [Input slow edge-rate signals](#)
- [Operate in noisy environments](#)
- Divide a clock signal by two

## 3 Description

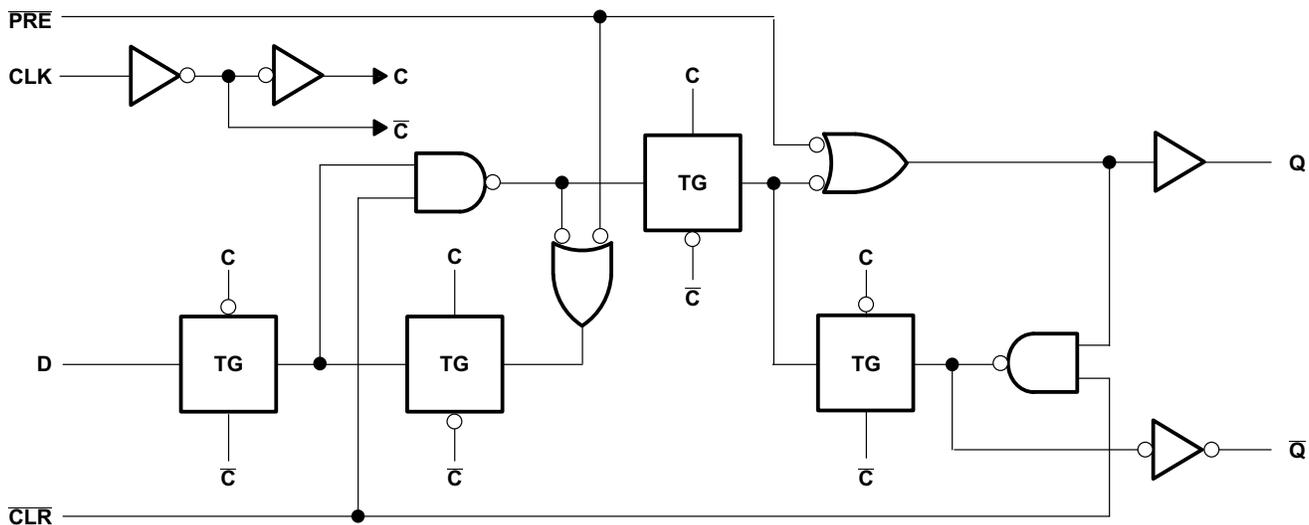
The 'AHCT74 dual positive-edge-triggered devices are D-type flip-flops.

A low level at the preset ( $\overline{PRE}$ ) or clear ( $\overline{CLR}$ ) inputs sets or resets the outputs, regardless of the levels of the other inputs. When  $\overline{PRE}$  and  $\overline{CLR}$  are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

### Device Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>	BODY SIZE (NOM) <sup>(3)</sup>
SN54AHCT74	J (CDIP, 14)	21.3 mm $\times$ 7.6 mm	19.56 mm $\times$ 6.67 mm
	W (CFP, 14)	13.1 mm $\times$ 6.92 mm	13.1 mm $\times$ 6.92 mm
	FK (LCCC, 20)	8.9 mm $\times$ 8.9 mm	8.9 mm $\times$ 8.9 mm
SN74AHCT74	N (PDIP, 14)	19.3 mm $\times$ 8 mm	19.3 mm $\times$ 6.35 mm
	D (SOIC, 14)	8.7 mm $\times$ 6 mm	8.7 mm $\times$ 3.91 mm
	NS (SOP, 14)	10.3 mm $\times$ 7.8 mm	10.3 mm $\times$ 5.3 mm
	DB (SSOP, 14)	6.2 mm $\times$ 7.8 mm	6.2 mm $\times$ 5.3 mm
	PW (TSSOP, 14)	5 mm $\times$ 6.4 mm	5 mm $\times$ 4.4 mm
	DGV (TVSOP, 14)	3.6 mm $\times$ 6.4 mm	3.6 mm $\times$ 4.4 mm
	RGY (VQFN, 14)	3.5 mm $\times$ 3.5 mm	3.50 mm $\times$ 3.50 mm
	BQA (WQFN, 14)	3 mm $\times$ 2.5 mm	3.00 mm $\times$ 2.50 mm

- (1) For all available packages, see the orderable addendum at the end of the data sheet.
- (2) The package size (length  $\times$  width) is a nominal value and includes pins, where applicable.
- (3) The body size (length  $\times$  width) is a nominal value and does not include pins.



Logic Diagram, Each Flip-Flop (Positive Logic)



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## 4 Revision History

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

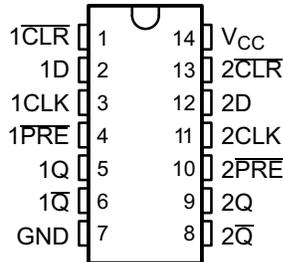
<b>Changes from Revision Q (July 2023) to Revision R (October 2023)</b>	<b>Page</b>
• Updated title and format of <i>Device Information</i> table.....	1
• Updated R $\theta$ JA values: D = 86 to 124.5, all values in °C/W .....	5

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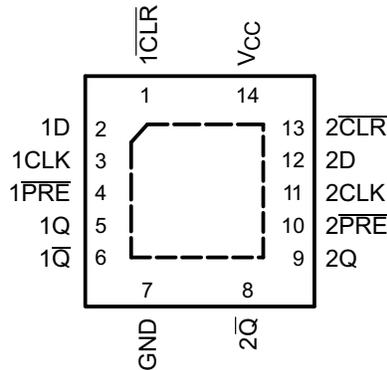
<b>Changes from Revision P (May 2023) to Revision Q (July 2023)</b>	<b>Page</b>
• Updated thermal values for PW package from R $\theta$ JA = 113 to 147.7, all values in °C/W.....	5

## 5 Pin Configuration and Functions

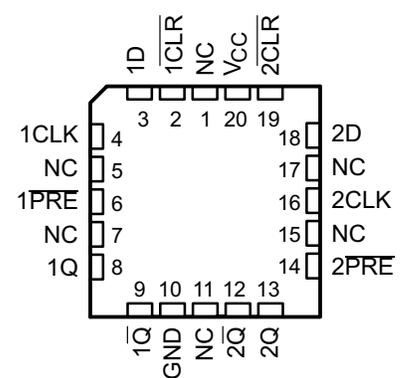
SN54AHCT74 . . . J or W PACKAGE  
SN74AHCT74 . . . D, DB, DGV, N, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74AHCT74 . . . RGY PACKAGE  
(TOP VIEW)



SN54AHCT74 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

Figure 5-1. Title

Table 5-1. Pin Functions

NAME	PIN				TYPE <sup>(1)</sup>	DESCRIPTION
	SN74AHCT74		SN54AHCT74			
	D, DB, DGV, N, NS, PW	RGY, BQA	J, W	FK		
1CLR	1	1	1	2	I	1A Input
1D	2	2	2	3	I	1B Input
1CLK	3	3	3	4	O	1Y Output
1PRE	4	4	4	6	I	2A Input
1Q	5	5	5	8	I	2B Input
1Q̄	6	6	6	9	O	2Y Output
2Q̄	8	8	8	12	O	3Y Output
2Q	9	9	9	13	I	3A Input
2PRE	10	10	10	14	I	3B Input
2CLK	11	11	11	16	O	4Y Output
2D	12	12	12	18	I	4A Input
2CLR	13	13	13	19	I	4B Input
GND	7	7	7	10	—	Ground Pin
NC	—	—	—	1, 5, 7, 11, 15, 17	—	No Connection
V <sub>CC</sub>	14	14	14	20	—	Power Pin
Thermal Pad	—	PAD	—	—	—	Thermal Pad

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

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	7	V
V <sub>I</sub> <sup>(2)</sup>	Input voltage range	-0.5	7	V
V <sub>O</sub> <sup>(2)</sup>	Output voltage range	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current, (V <sub>I</sub> < 0)		-20	mA
I <sub>OK</sub>	Output clamp current (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> )		±20	mA
I <sub>O</sub>	Continuous output current (V <sub>O</sub> = 0 to V <sub>CC</sub> )		±25	mA
Continuous current through V <sub>CC</sub> or GND			±50	mA
T <sub>stg</sub>	Storage temperature range	-65	150	°C

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

### 6.2 ESD Ratings

		VALUE	UNIT
V <sub>(ESD)</sub>	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	±2000
		Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002 <sup>(2)</sup>	±1000

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

### 6.3 Recommended Operating Conditions

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

		SN54AHCT74		SN74AHCT74		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2		2		V
V <sub>IL</sub>	Low-level Input voltage		0.8		0.8	V
V <sub>I</sub>	Input voltage	0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current		-8		-8	mA
I <sub>OL</sub>	Low-level output current		8		8	mA
Δt/Δv	Input Transition rise or fall rate		20		20	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	125	°C

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

## 6.4 Thermal Information

THERMAL METRIC <sup>1</sup>	SNx4AHCT74								UNIT
	D	DB	DGV	N	NS	PW	RGY	BQA	
	14 PINS								
R <sub>θJA</sub> Junction-to-ambient thermal resistance	124.5	96	127	80	76	147.7	47	88.3	°C/W

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

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C		T <sub>A</sub> = –55°C TO 125°C		T <sub>A</sub> = –40°C TO 85°C		T <sub>A</sub> = –40°C TO 125°C		UNIT
					SN54AHCT74		SN74AHCT74		Recommended		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	MIN	
V <sub>OH</sub>	I <sub>OH</sub> = –50 μA	4.5 V	4.4	4.5	4.4		4.4		4.4		V
	I <sub>OH</sub> = –8 mA		3.94		3.8		3.8		3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	4.5 V			0.1		0.1		0.1		V
	I <sub>OH</sub> = 8 mA				0.36		0.44		0.44		
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 V to 5.5 V			±0.1		±1 <sup>(1)</sup>		±1		μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			2		20		20		μA
ΔI <sub>CC</sub>	One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	5.5 V			1.35		1.5		1.5		mA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V			2		10		10		pF

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

## 6.6 Timing Requirements

over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see [Section 6.6](#))

PARAMETER		T <sub>A</sub> = 25°C		T <sub>A</sub> = –55°C TO 125°C		T <sub>A</sub> = –40°C TO 85°C		T <sub>A</sub> = –40°C TO 125°C		UNIT
				SN54AHCT74		SN54AHCT74		Recommended		
		TYP	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration	PRE or CLR low	5		5		5		5	ns
		CLK	5		5		5		5	
t <sub>su</sub>	Setup time before CLK↑	Data	5		5		5		5	ns
		PRE or CLR inactive	3.5		3.5		3.5		3.5	
t <sub>h</sub>	Hold time, data after CLK↑		0		0		0		0	ns

## 6.7 Switching Characteristics

over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see [Figure 7-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T <sub>A</sub> = 25°C			T <sub>A</sub> = –55°C TO 125°C		T <sub>A</sub> = –40°C TO 85°C		T <sub>A</sub> = –40°C TO 125°C		UNIT
							SN54AHCT74		SN54AHCT74		Recommended		
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			C <sub>L</sub> = 15 pF	100 <sup>(1)</sup>	160 <sup>(1)</sup>		90		80		80	ns	
			C <sub>L</sub> = 50pF	80	140		65		65		65		

**SN54AHCT74, SN74AHCT74**

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 over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 7-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			$T_A = -55^\circ\text{C TO } 125^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	Recommended		
											MIN	MAX	
$t_{PLH}$	PRE or CLR	Q or $\bar{Q}$	$C_L = 15\text{ pF}$	7.6 <sup>(1)</sup>	10.4 <sup>(1)</sup>	1 <sup>(1)</sup>	12 <sup>(1)</sup>	1	12	1	12	ns	
$t_{PHL}$				7.6 <sup>(1)</sup>	10.4 <sup>(1)</sup>	1 <sup>(1)</sup>	12 <sup>(1)</sup>	1	12	1	12		
$t_{PLH}$	CLK	Q or $\bar{Q}$	$C_L = 15\text{ pF}$	5.8 <sup>(1)</sup>	7.8 <sup>(1)</sup>	1 <sup>(1)</sup>	9 <sup>(1)</sup>	1	9	1	9.0	ns	
$t_{PHL}$				5.8 <sup>(1)</sup>	7.8 <sup>(1)</sup>	1 <sup>(1)</sup>	9 <sup>(1)</sup>	1	9	1	9.0		
$t_{PLH}$	PRE or CLR	Q or $\bar{Q}$	$C_L = 50\text{ pF}$	8.1	11.4	1	13	1	13	1	13	ns	
$t_{PHL}$				8.1	11.4	1	13	1	13	1	13		
$t_{PLH}$	CLK	Q or $\bar{Q}$	$C_L = 50\text{ pF}$	6.3	8.8	1	10	1	10	1	10	ns	
$t_{PHL}$				6.3	8.8	1	10	1	10	1	10		

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 6.8 Noise Characteristics

 $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

PARAMETER		SN54AHCT74		UNIT
		MIN	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$	0.8		V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$	-0.8		V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$	4		V
$V_{IH(D)}$	High-level dynamic input voltage	2		V
$V_{IL(D)}$	Low-level dynamic input voltage	0.8		V

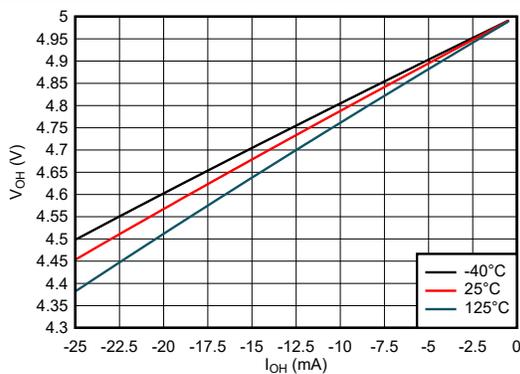
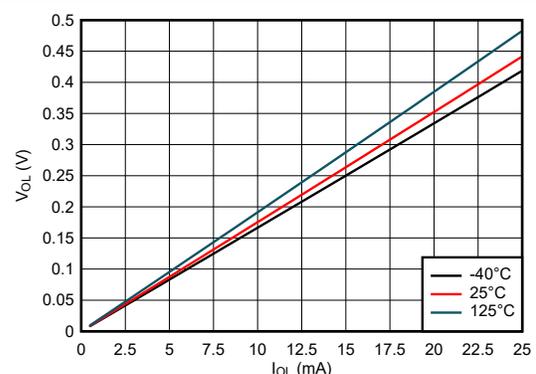
(1) Characteristics are for surface-mount packages only.

### 6.9 Operating Characteristics

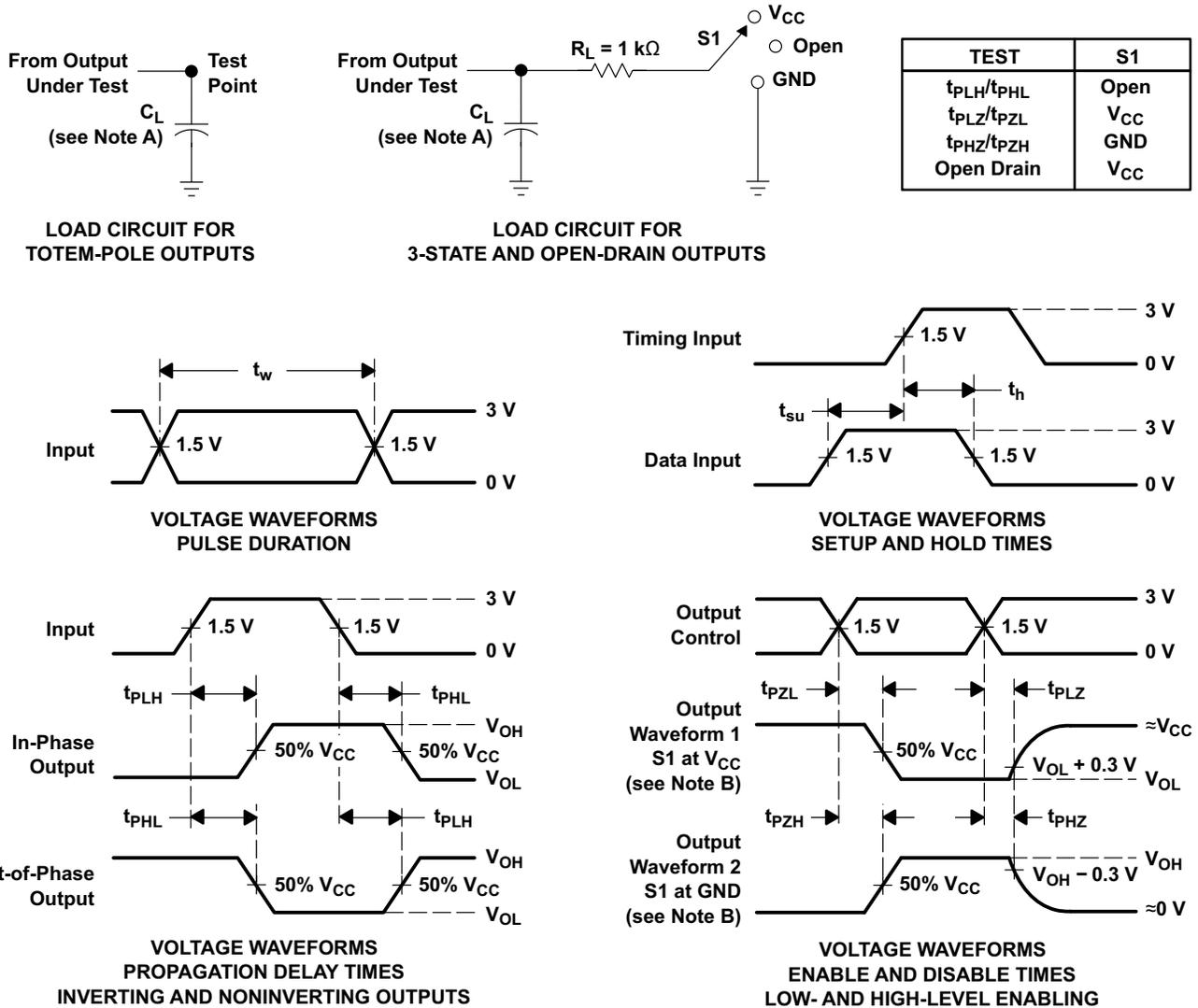
 $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ 

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$	No load, $f = 1\text{ MHz}$	32	pF

### 6.10 Typical Characteristics

 $T_A = 25^\circ\text{C}$  (unless otherwise noted)

**Figure 6-1. Output Voltage vs Current in HIGH State; 5-V Supply**

**Figure 6-2. Output Voltage vs Current in LOW State; 5-V Supply**

## 7 Parameter Measurement Information



- $C_L$  includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.
- The outputs are measured one at a time with one input transition per measurement.
- All parameters and waveforms are not applicable to all devices.

Figure 7-1. Load Circuit and Voltage Waveforms



### 8.3.2 Balanced CMOS Push-Pull Outputs

This device includes balanced CMOS push-pull outputs. The term *balanced* indicates that the device can sink and source similar currents. The drive capability of this device may create fast edges into light loads, so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important for the output power of the device to be limited to avoid damage due to overcurrent. The electrical and thermal limits defined in the *Absolute Maximum Ratings* must be followed at all times.

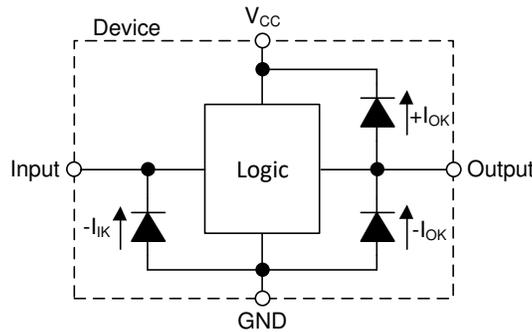
Unused push-pull CMOS outputs should be left disconnected.

### 8.3.3 Clamp Diode Structure

As [Figure 8-2](#) shows, the outputs to this device have both positive and negative clamping diodes, and the inputs to this device have negative clamping diodes only.

**CAUTION**

Voltages beyond the values specified in the *Absolute Maximum Ratings* table can cause damage to the device. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.



**Figure 8-2. Electrical Placement of Clamping Diodes for Each Input and Output**

## 8.4 Device Functional Modes

**Table 8-1. Functional Table (Each Flip-Flop)**

INPUTS				OUTPUT	
PRE	CLR	CLK	D	Q	$\bar{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H <sup>(1)</sup>	H <sup>(1)</sup>
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q <sub>0</sub>	$\bar{Q}_0$

(1) This configuration is non-stable; that is, it does not persist when PRE or CLR returns to its inactive (high) level.

## 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

Toggle switches are typically large, mechanically complex and relatively expensive. It is desirable to use a momentary switch instead because they are small, mechanically simple and low cost. Some systems require a toggle switch's functionality but are space or cost constrained and must use a momentary switch instead. External Schmitt-trigger buffers are used to remove noisy inputs into the (CLK) and (D) inputs.

If the data input (D) of the SNx4AHCT74 is tied to the inverted output ( $\overline{Q}$ ), then each clock pulse will cause the value at the output (Q) to toggle. The momentary switch can be debounced and directly connected to the clock input (CLK) to toggle the output.

### 9.2 Typical Application

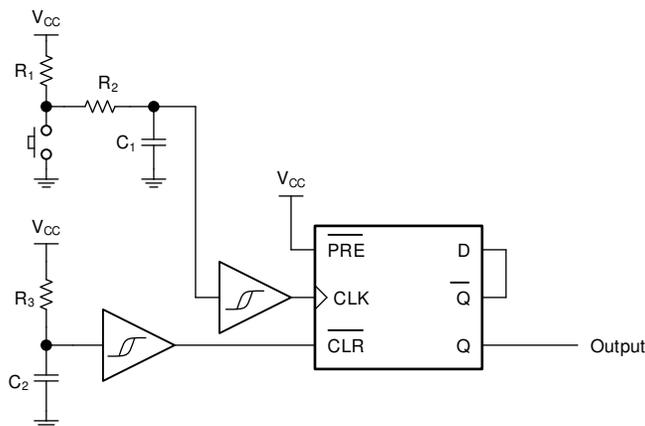


Figure 9-1. Typical Application Block Diagram

#### 9.2.1 Design Requirements

##### 9.2.1.1 Input Considerations

Input signals must cross to be considered a logic LOW, and to be considered a logic HIGH. Do not exceed the maximum input voltage range found in the *Absolute Maximum Ratings*.

Unused inputs must be terminated to either  $V_{CC}$  or ground. The unused inputs can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input will be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The drive current of the controller, leakage current into the SNx4AHCT74 (as specified in the *Electrical Characteristics*), and the desired input transition rate limits the resistor size. A 10-k $\Omega$  resistor value is often used due to these factors.

Refer to the *Feature Description* section for additional information regarding the inputs for this device.

##### 9.2.1.2 Output Considerations

The ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the  $V_{OL}$  specification in the *Electrical Characteristics*.

Unused outputs can be left floating. Do not connect outputs directly to  $V_{CC}$  or ground.

Refer to the *Feature Description* section for additional information regarding the outputs for this device.

### 9.2.1.3 Power Considerations

Ensure the desired supply voltage is within the range specified in the *Recommended Operating Conditions*. The supply voltage sets the electrical characteristics of the device as described in the *Electrical Characteristics* section.

The positive voltage supply must be capable of sourcing current equal to the maximum static supply current,  $I_{CC}$ , listed in the *Electrical Characteristics*, and any transient current required for switching.

The ground must be capable of sinking current equal to the total current to be sunk by all outputs of the SNx4AHCT74 plus the maximum supply current,  $I_{CC}$ , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only sink as much current that can be sunk into its ground connection. Be sure to not exceed the maximum total current through GND listed in the *Absolute Maximum Ratings*.

The SNx4AHCT74 can drive a load with a total capacitance less than or equal to 50 pF while still meeting all of the data sheet specifications. Larger capacitive loads can be applied; however, it is not recommended to exceed 50 pF.

The SNx4AHCT74 can drive a load with total resistance described by  $R_L \geq V_O / I_O$ , with the output voltage and current defined in the *Electrical Characteristics* table with  $V_{OL}$ . When outputting in the HIGH state, the output voltage in the equation is defined as the difference between the measured output voltage and the supply voltage at the  $V_{CC}$  pin.

Total power consumption can be calculated using the information provided in [CMOS Power Consumption and Cpd Calculation](#) application note.

Thermal increase can be calculated using the information provided in [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices](#) application note.

#### CAUTION

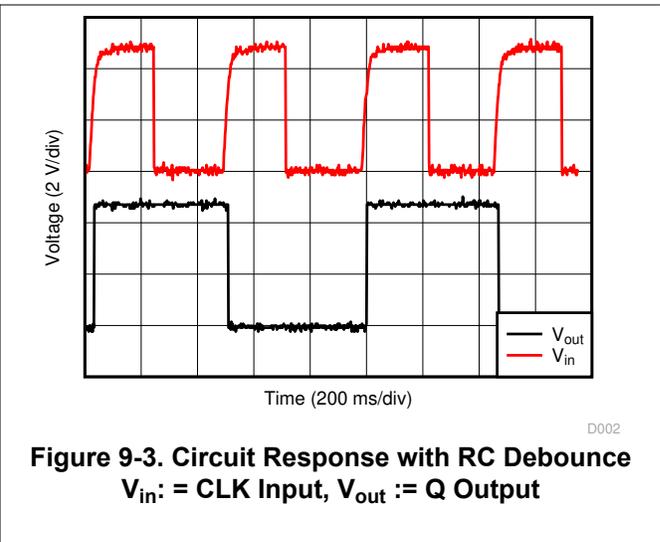
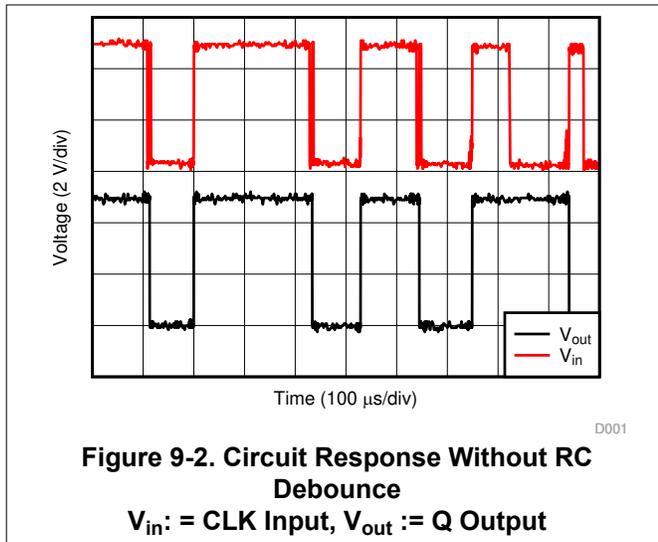
The maximum junction temperature,  $T_{J(max)}$  listed in the *Absolute Maximum Ratings*, is an additional limitation to prevent damage to the device. Do not violate any values listed in the *Absolute Maximum Ratings*. These limits are provided to prevent damage to the device.

### 9.2.2 Detailed Design Procedure

1. Add a decoupling capacitor from  $V_{CC}$  to GND. The capacitor needs to be placed physically close to the device and electrically close to both the  $V_{CC}$  and GND pins. An example layout is shown in the *Layout* section.
2. Ensure the capacitive load at the output is  $\leq 50$  pF. This is not a hard limit; by design, however, it will optimize performance. This can be accomplished by providing short, appropriately sized traces from the SNx4AHCT74 to one or more of the receiving devices.
3. Ensure the resistive load at the output is larger than  $(V_{CC} / I_{O(max)}) \Omega$ . Doing this will prevent the maximum output current from the *Absolute Maximum Ratings* from being violated. Most CMOS inputs have a resistive load measured in  $M\Omega$ ; much larger than the minimum calculated previously.
4. Thermal issues are rarely a concern for logic gates; the power consumption and thermal increase, however, can be calculated using the steps provided in the application report, [CMOS Power Consumption and Cpd Calculation](#).

### 9.2.3 Application Curves

Figure 9-2 shows an example of a single button press bouncing and causing the output to toggle multiple times. This will cause issues in the desired application. Figure 9-3 shows 4 button presses with an added debounce circuit, fixing the unwanted toggling and allowing for proper toggle switch operation.



### 9.3 Power Supply Recommendations

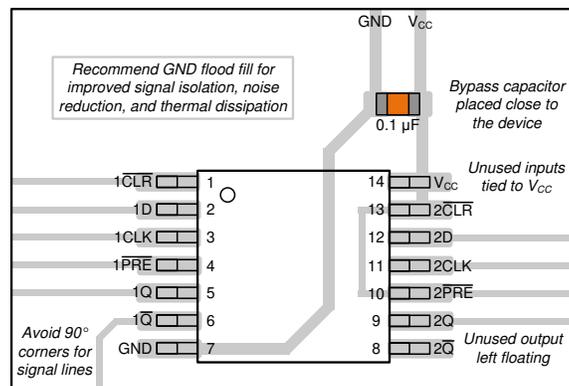
The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- $\mu\text{F}$  capacitor is recommended for this device. It is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

### 9.4 Layout

#### 9.4.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices, inputs must never be left floating. In many cases, functions or parts of functions of digital logic devices are unused (for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used). Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or  $V_{CC}$ , whichever makes more sense for the logic function or is more convenient.

##### 9.4.1.1 Layout Example



**Figure 9-4. Layout Example of the SNx4AHCT74**

## 10 Device and Documentation Support

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

### 10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 10.2 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](#).

### 10.3 Trademarks

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

### 10.4 Electrostatic Discharge Caution



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

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

### 10.5 Glossary

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

## 11 Mechanical, Packaging, and Orderable Information

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

**PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">5962-9686101Q2A</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9686101Q2A SNJ54AHCT 74FK
<a href="#">5962-9686101QCA</a>	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QC A SNJ54AHCT74J
<a href="#">5962-9686101QDA</a>	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QD A SNJ54AHCT74W
<a href="#">SN74AHCT74BQAR</a>	Active	Production	WQFN (BQA)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74BQAR.A</a>	Active	Production	WQFN (BQA)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74D</a>	Obsolete	Production	SOIC (D)   14	-	-	Call TI	Call TI	-40 to 125	AHCT74
<a href="#">SN74AHCT74DBR</a>	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74DBR.A</a>	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74DBR.B</a>	Active	Production	SSOP (DB)   14	2000   LARGE T&R	-	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74DGVR</a>	Active	Production	TVSOP (DGV)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74DGVR.A</a>	Active	Production	TVSOP (DGV)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74DR</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74DR.A</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74DR.B</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	-	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74DRG4</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74DRG4.A</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74N</a>	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	SN74AHCT74N
<a href="#">SN74AHCT74N.A</a>	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	SN74AHCT74N
<a href="#">SN74AHCT74NSR</a>	Active	Production	SOP (NS)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74NSR.A</a>	Active	Production	SOP (NS)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT74
<a href="#">SN74AHCT74PW</a>	Obsolete	Production	TSSOP (PW)   14	-	-	Call TI	Call TI	-40 to 125	HB74
<a href="#">SN74AHCT74PWR</a>	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74PWR.A</a>	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74PWRG4</a>	Active	Production	TSSOP (PW)   14	2000   null	No	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74

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)
SN74AHCT74PWRG4	Active	Production	TSSOP (PW)   14	2000   null	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
SN74AHCT74PWRG4.A	Active	Production	TSSOP (PW)   14	2000   null	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
SN74AHCT74PWRG4.A	Active	Production	TSSOP (PW)   14	2000   null	No	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB74
<a href="#">SN74AHCT74RGYR</a>	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HB74
SN74AHCT74RGYR.A	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HB74
<a href="#">SNJ54AHCT74FK</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101Q2A SNJ54AHCT 74FK
SNJ54AHCT74FK.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101Q2A SNJ54AHCT 74FK
<a href="#">SNJ54AHCT74J</a>	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QC A SNJ54AHCT74J
SNJ54AHCT74J.A	Active	Production	CDIP (J)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QC A SNJ54AHCT74J
<a href="#">SNJ54AHCT74W</a>	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QD A SNJ54AHCT74W
SNJ54AHCT74W.A	Active	Production	CFP (W)   14	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9686101QD A SNJ54AHCT74W

(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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

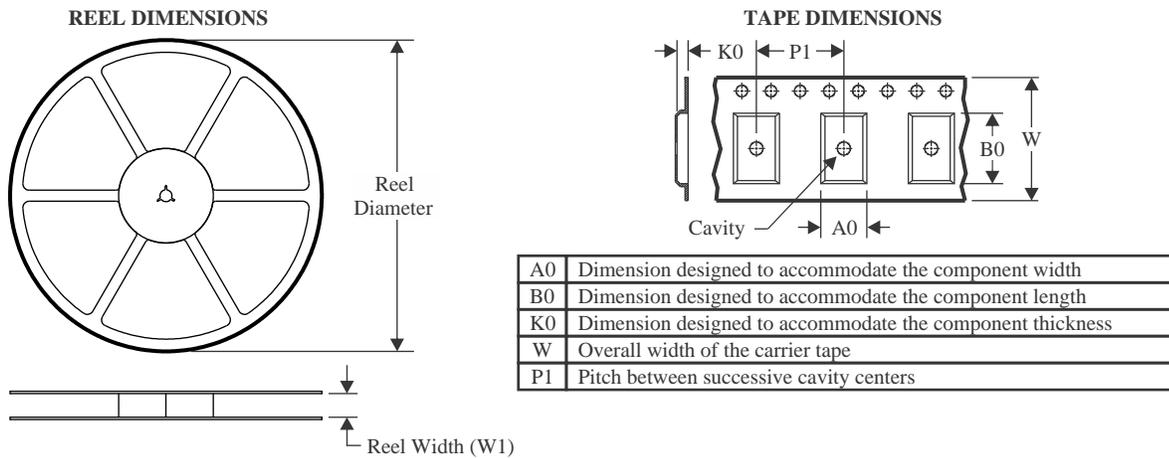
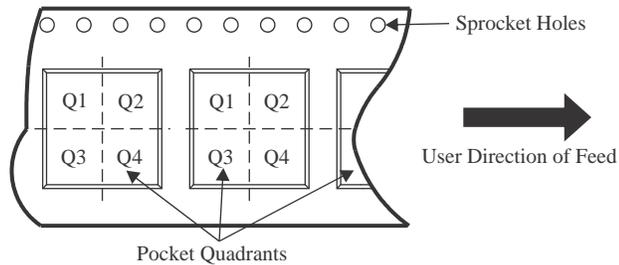
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN54AHCT74, SN74AHCT74 :**

- Catalog : [SN74AHCT74](#)
- Enhanced Product : [SN74AHCT74-EP](#), [SN74AHCT74-EP](#)
- Military : [SN54AHCT74](#)

NOTE: Qualified Version Definitions:

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

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


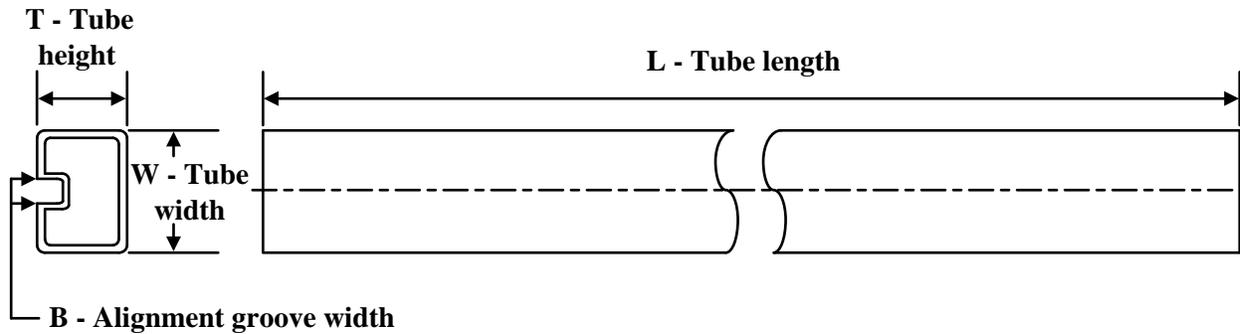
\*All dimensions are nominal

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
SN74AHCT74BQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74AHCT74DBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74AHCT74DGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74AHCT74DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AHCT74DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74AHCT74NSR	SOP	NS	14	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74AHCT74PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT74RGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	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)
SN74AHCT74BQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74AHCT74DBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74AHCT74DGVR	TVSOP	DGV	14	2000	353.0	353.0	32.0
SN74AHCT74DR	SOIC	D	14	2500	353.0	353.0	32.0
SN74AHCT74DRG4	SOIC	D	14	2500	353.0	353.0	32.0
SN74AHCT74NSR	SOP	NS	14	2000	353.0	353.0	32.0
SN74AHCT74PWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74AHCT74RGYR	VQFN	RGY	14	3000	353.0	353.0	32.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9686101Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9686101QDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74AHCT74N	N	PDIP	14	25	506	13.97	11230	4.32
SN74AHCT74N	N	PDIP	14	25	506	13.97	11230	4.32
SN74AHCT74N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74AHCT74N.A	N	PDIP	14	25	506	13.97	11230	4.32
SNJ54AHCT74FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54AHCT74FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54AHCT74W	W	CFP	14	25	506.98	26.16	6220	NA
SNJ54AHCT74W.A	W	CFP	14	25	506.98	26.16	6220	NA

## GENERIC PACKAGE VIEW

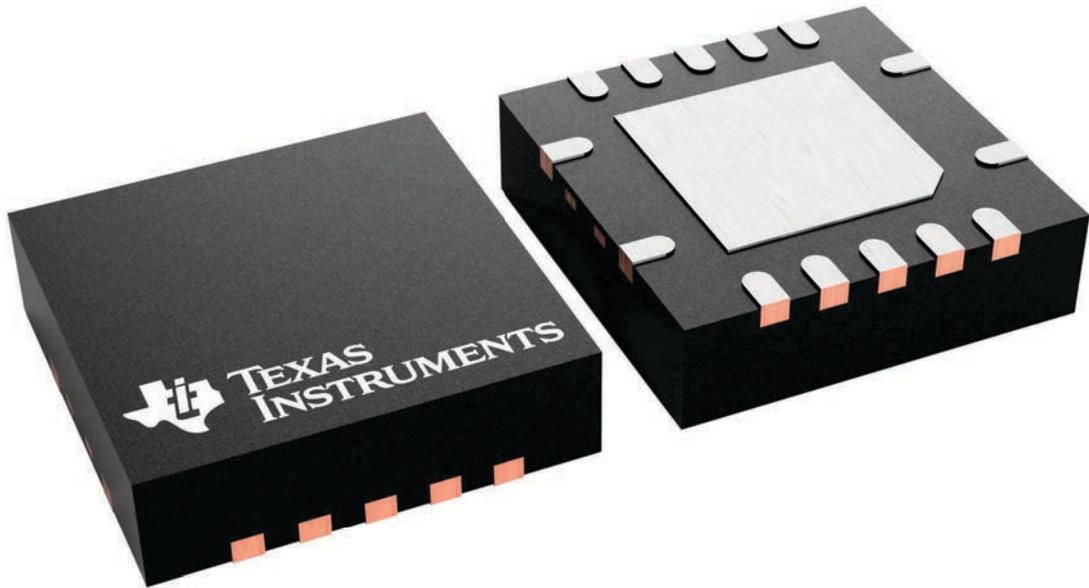
**RGY 14**

**VQFN - 1 mm max height**

3.5 x 3.5, 0.5 mm pitch

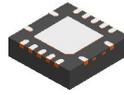
PLASTIC QUAD FLATPACK - NO LEAD

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



4231541/A

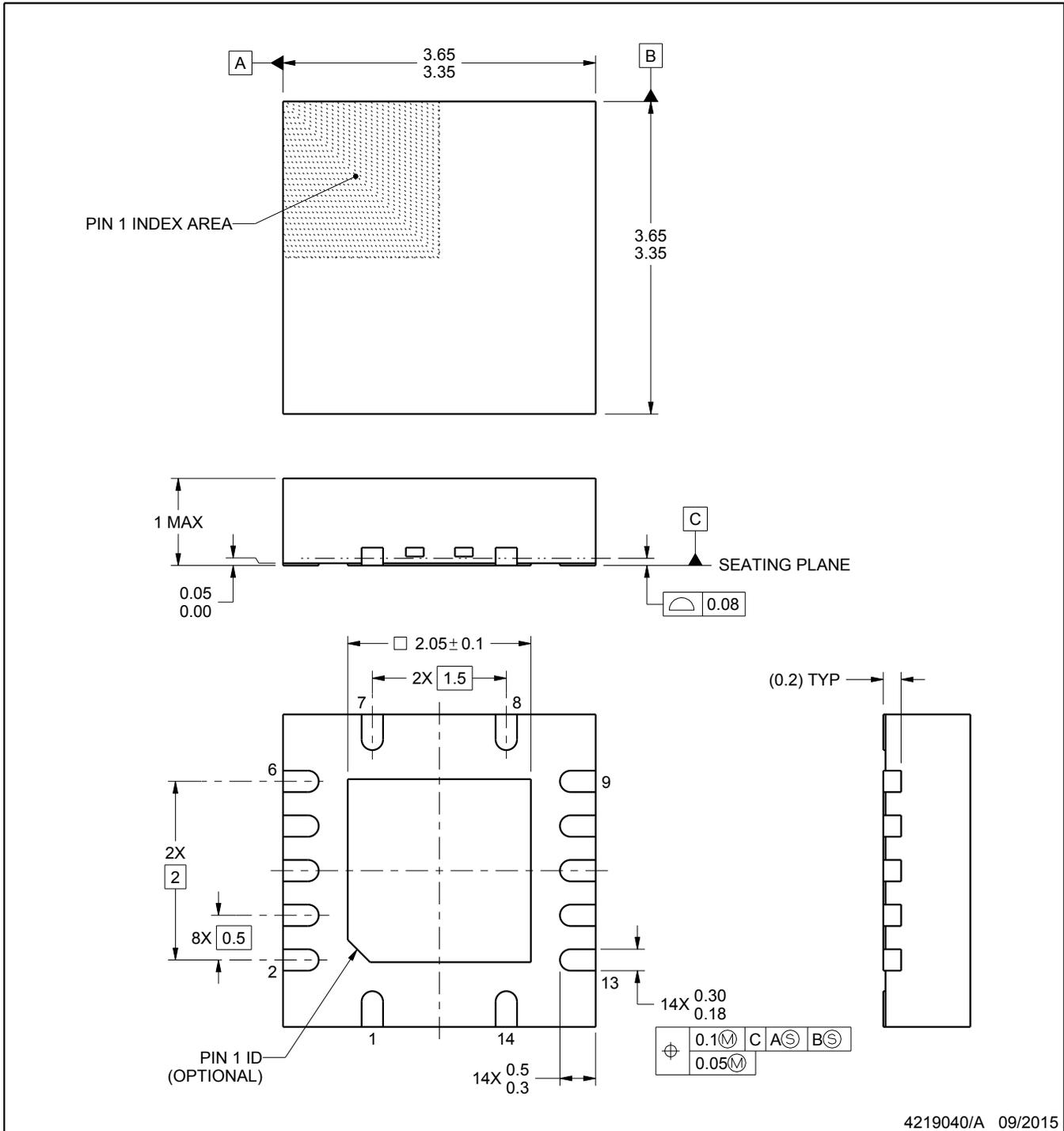
RGY0014A



PACKAGE OUTLINE

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4219040/A 09/2015

NOTES:

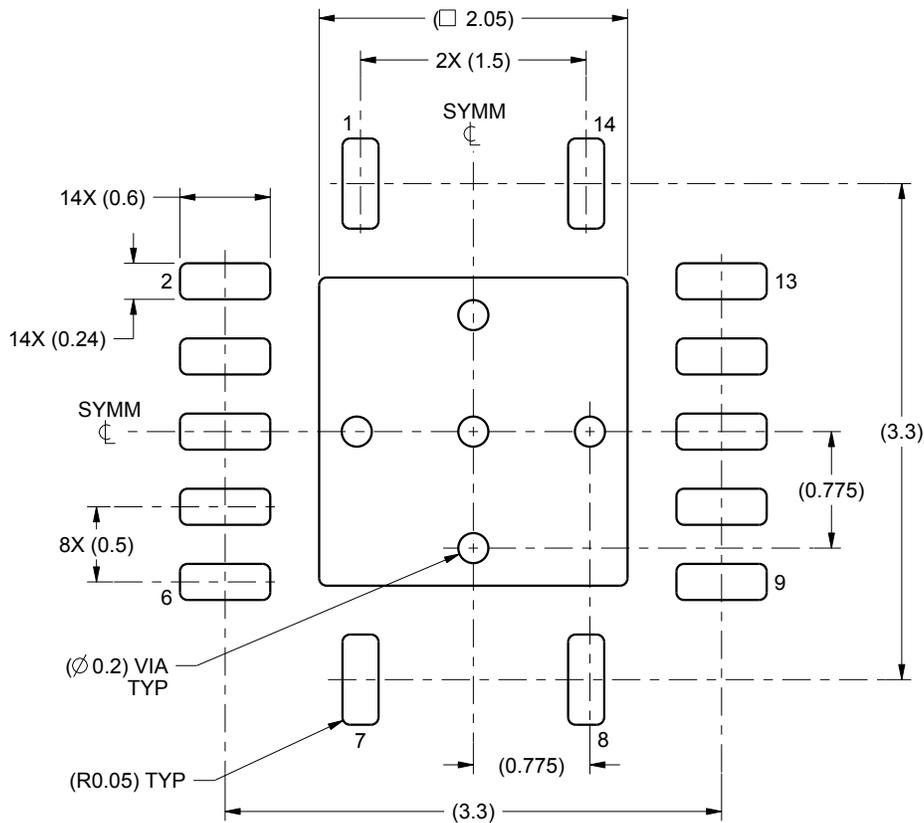
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

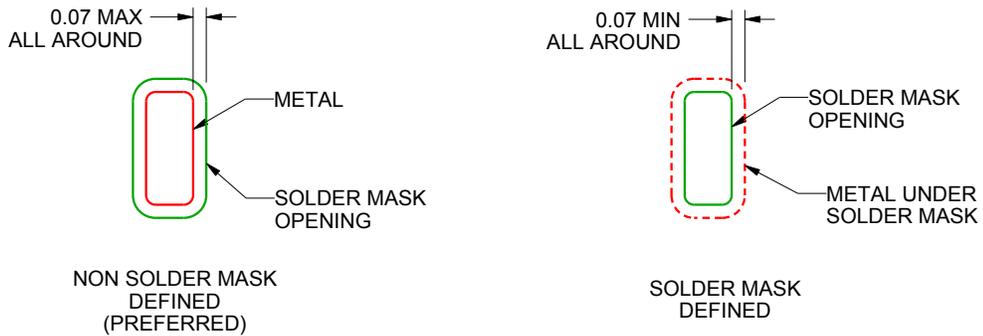
RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:20X



SOLDER MASK DETAILS

4219040/A 09/2015

NOTES: (continued)

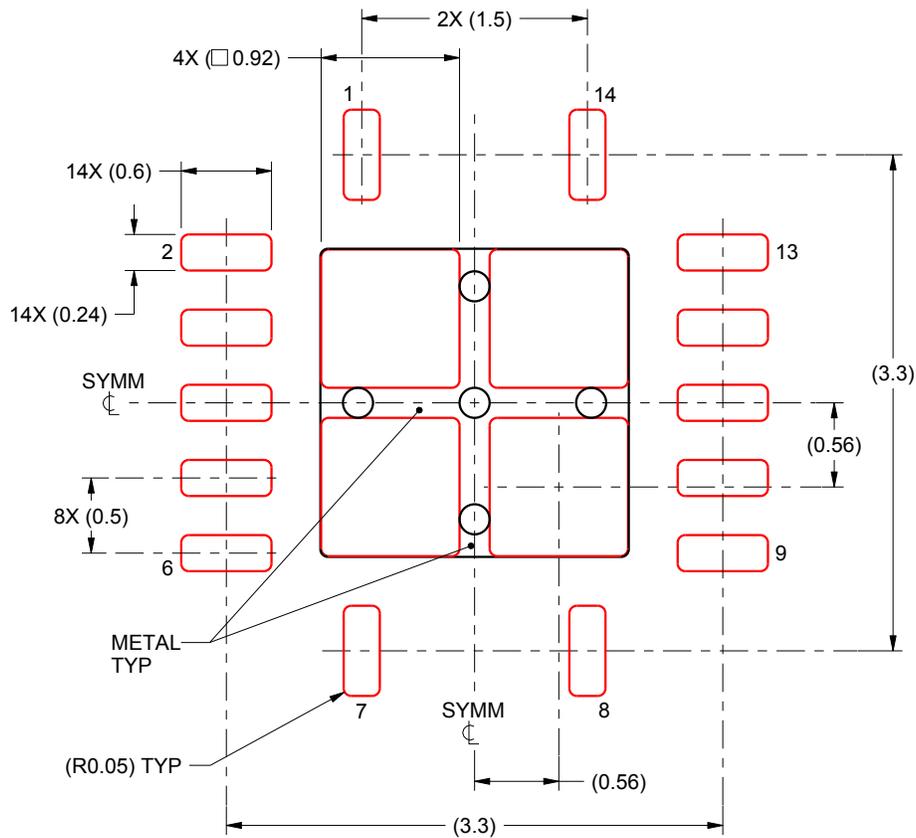
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
80% PRINTED SOLDER COVERAGE BY AREA  
SCALE:20X

4219040/A 09/2015

NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

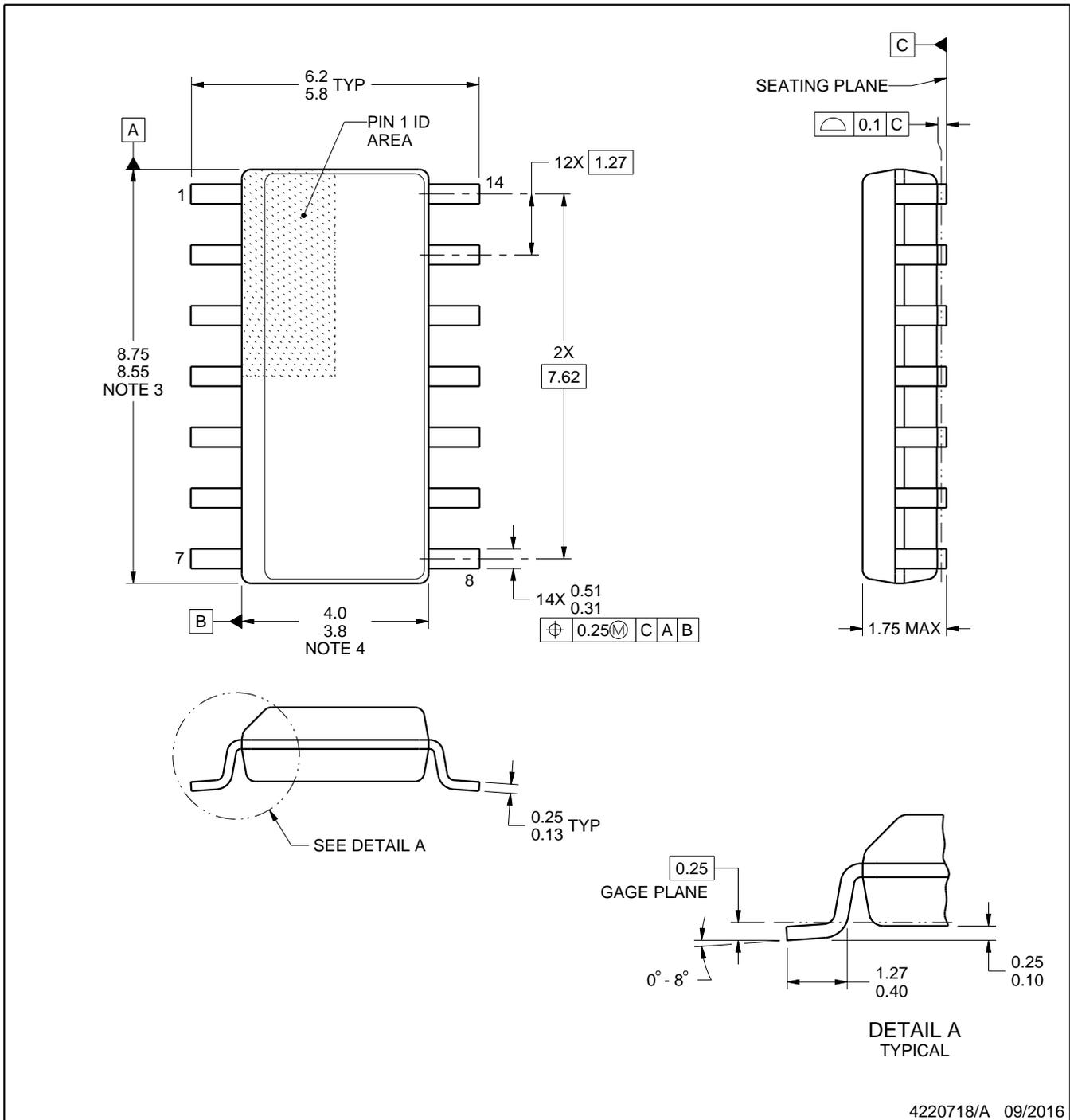
D0014A



# PACKAGE OUTLINE

## SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



NOTES:

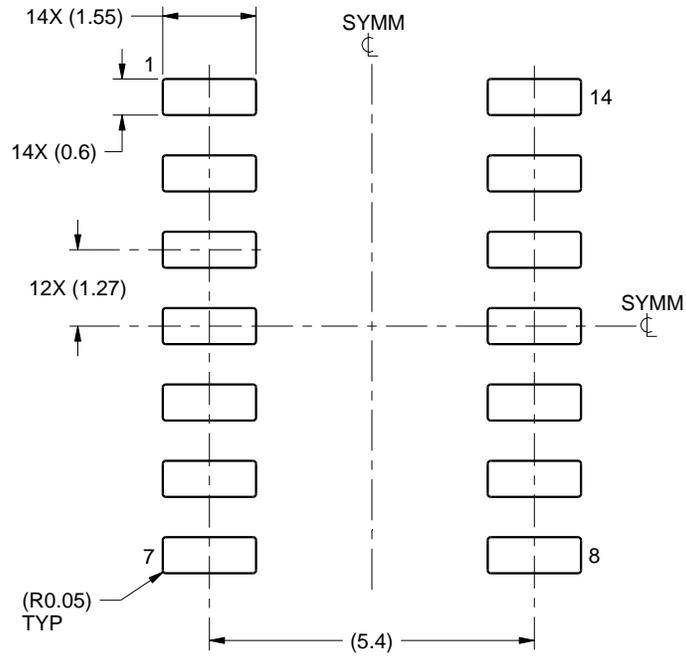
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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-012, variation AB.

# EXAMPLE BOARD LAYOUT

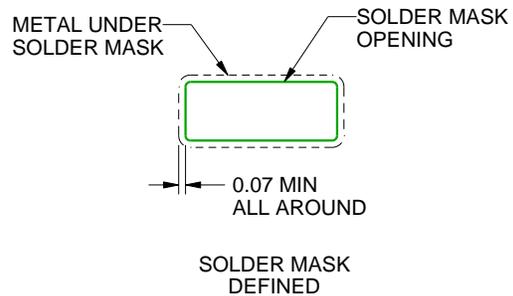
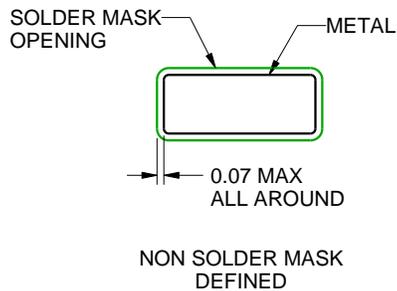
D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

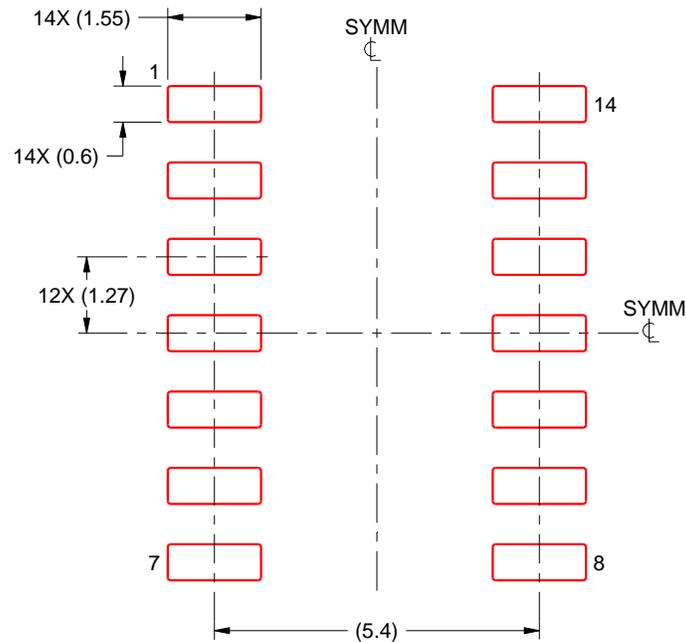
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:8X

4220718/A 09/2016

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.

## GENERIC PACKAGE VIEW

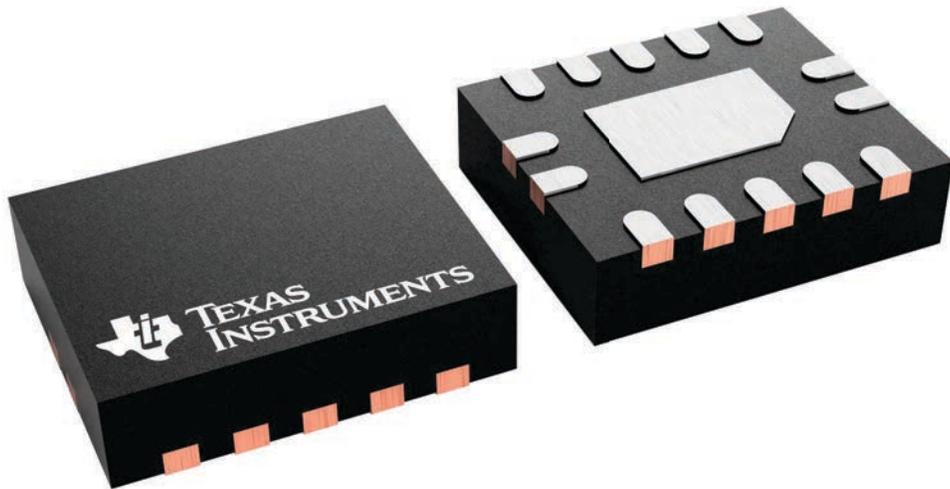
**BQA 14**

**WQFN - 0.8 mm max height**

2.5 x 3, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

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



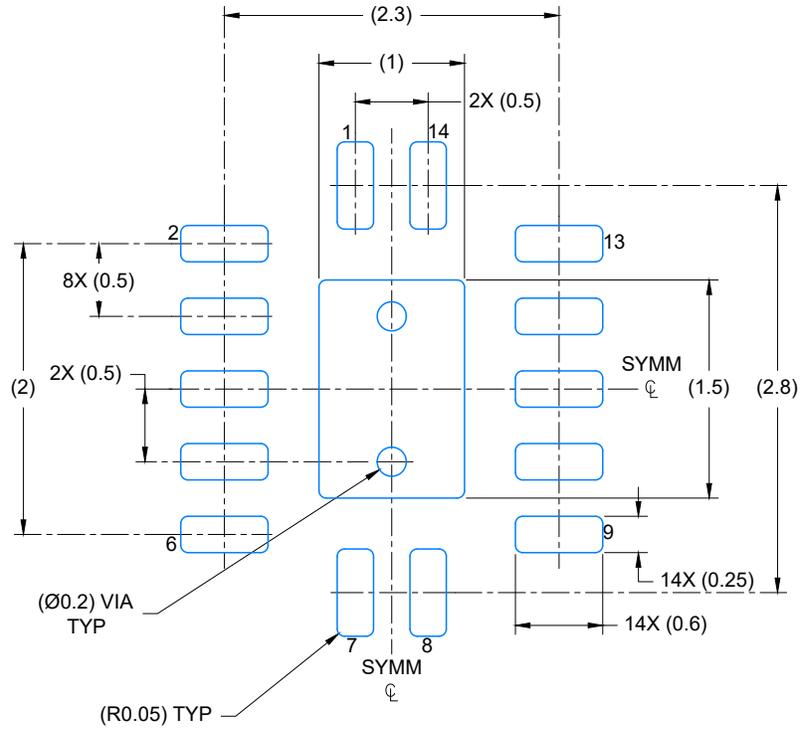


# EXAMPLE BOARD LAYOUT

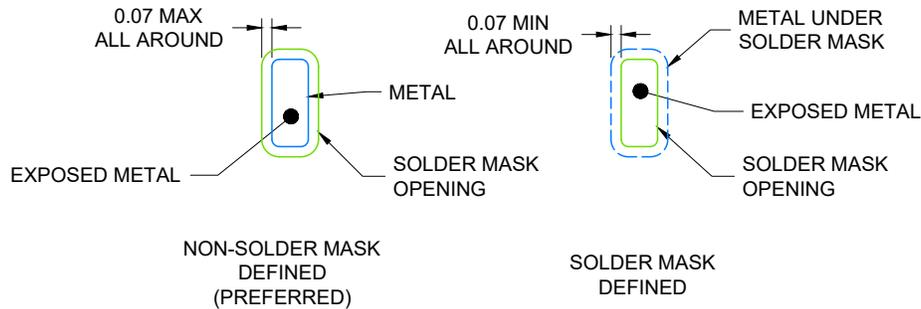
WQFN - 0.8 mm max height

BQA0014A

PLASTIC QUAD FLAT PACK-NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 20X



4224636/A 11/2018

NOTES: (continued)

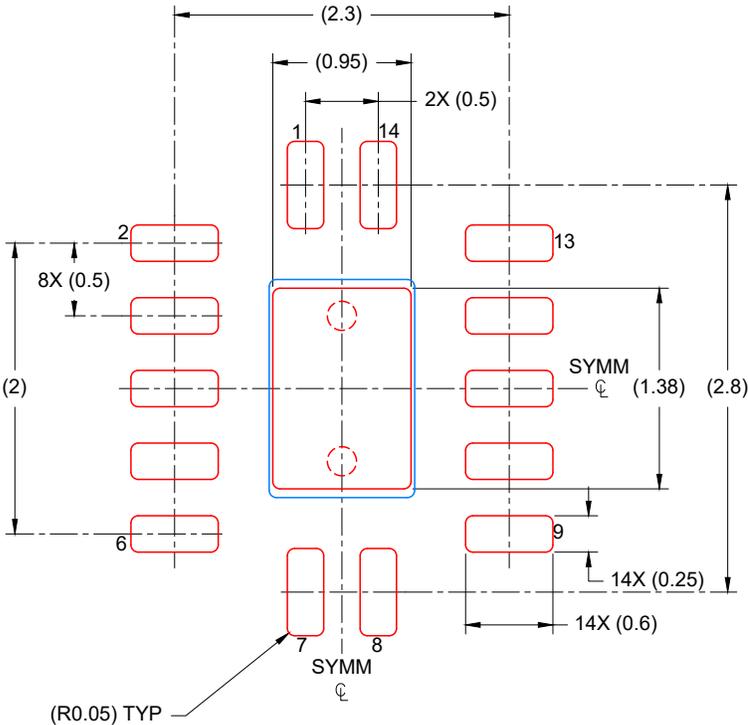
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
- Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

# EXAMPLE STENCIL DESIGN

BQA0014A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
 88% PRINTED COVERAGE BY AREA  
 SCALE: 20X

4224636/A 11/2018

NOTES: (continued)

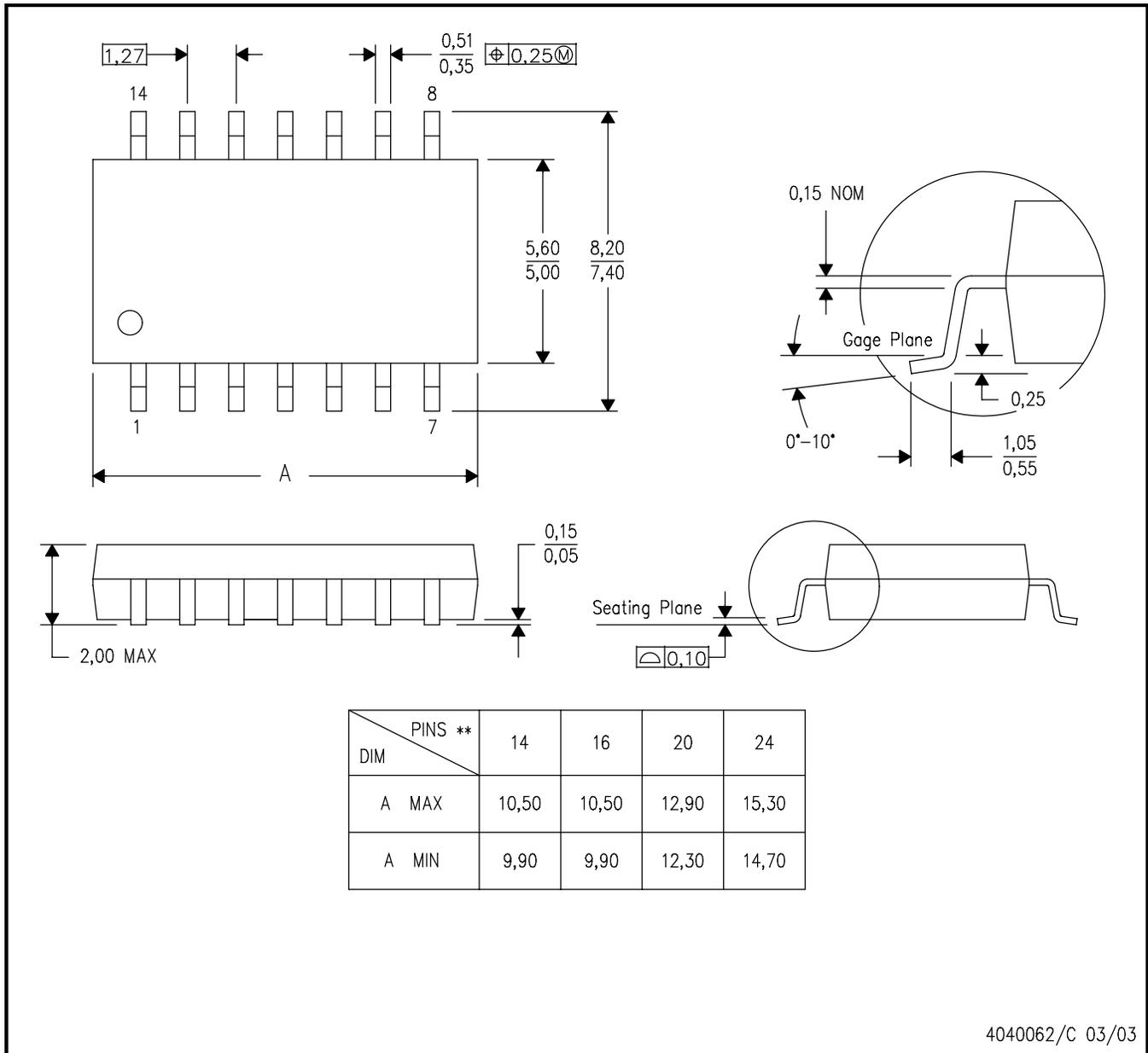
- 6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

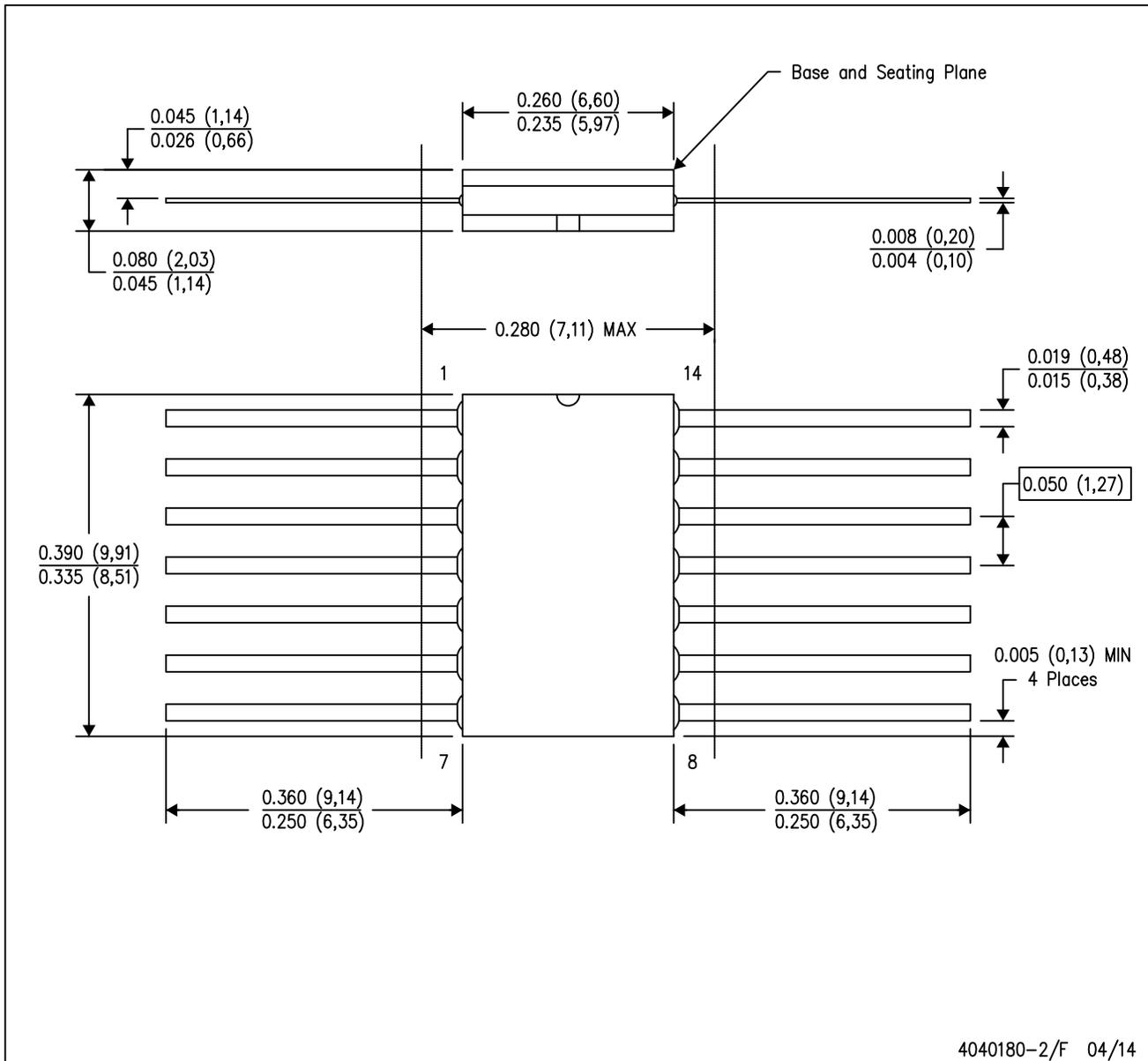
14-PINS SHOWN



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

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK

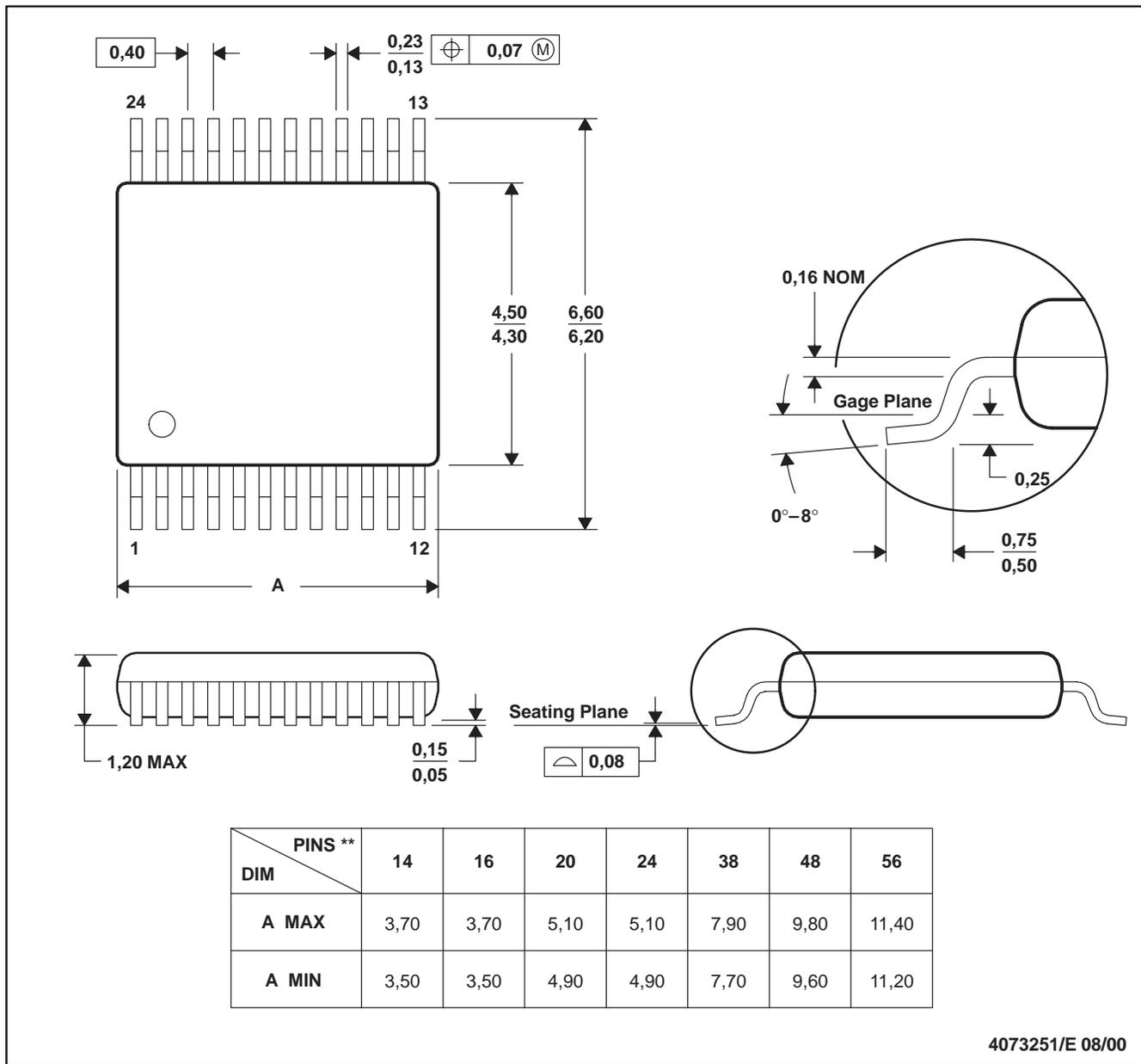


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL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

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

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

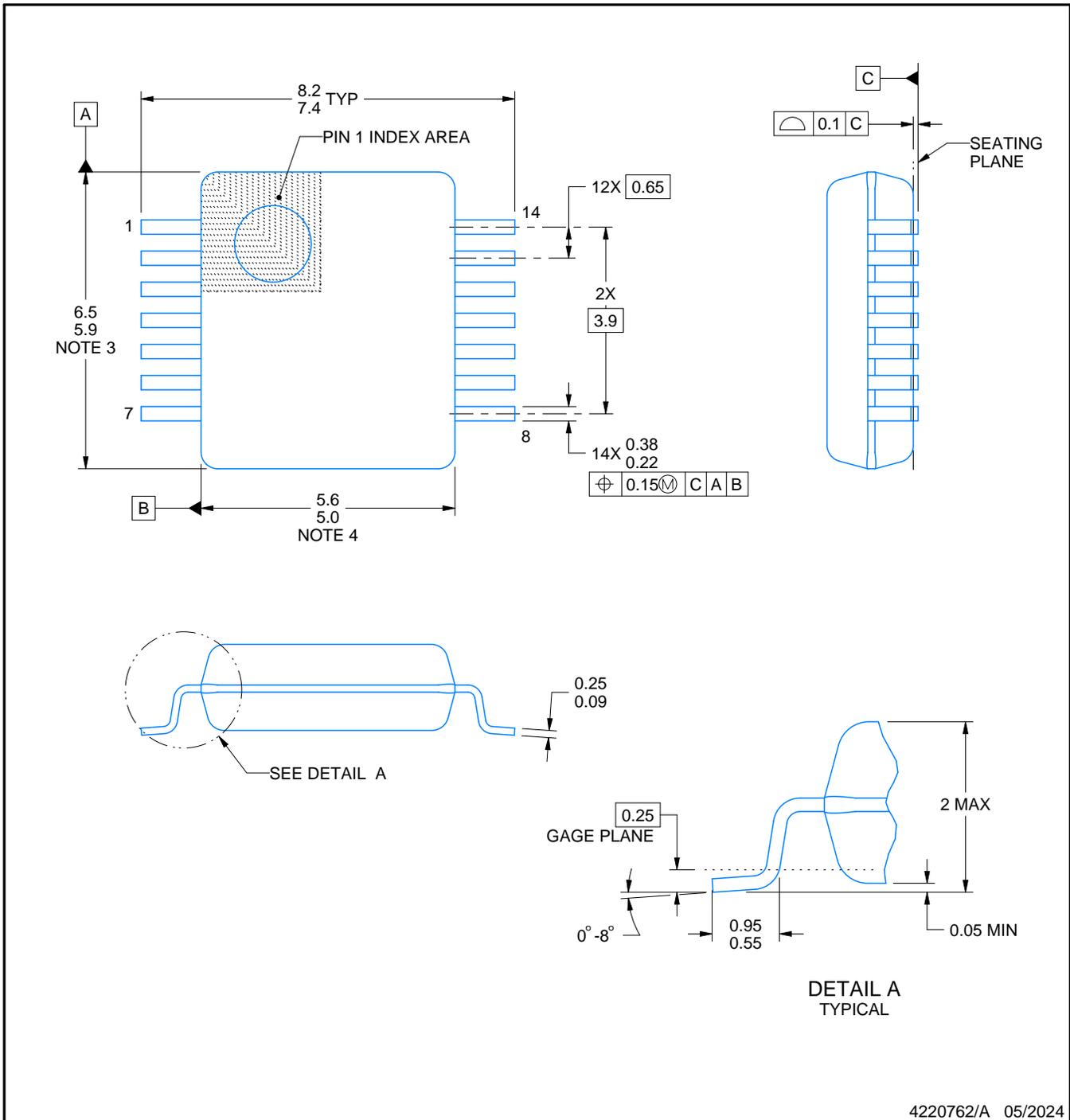
# DB0014A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



### NOTES:

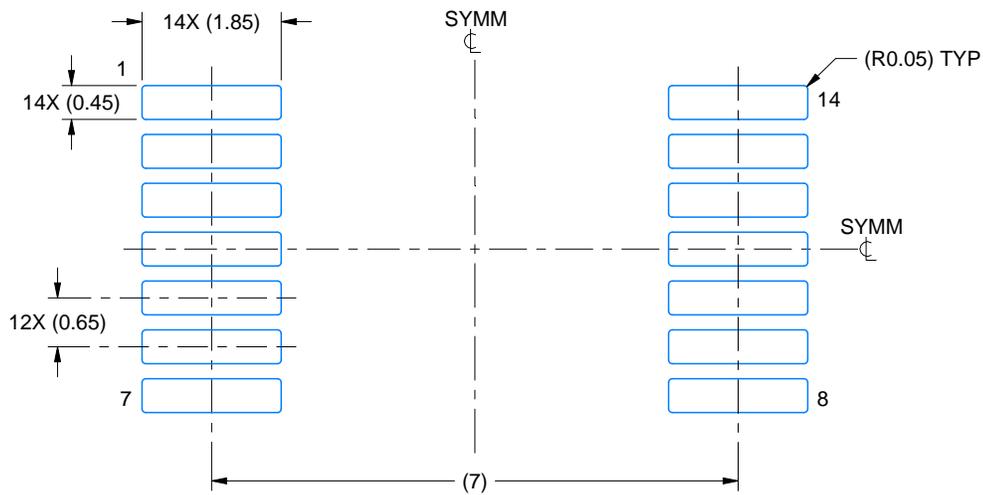
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

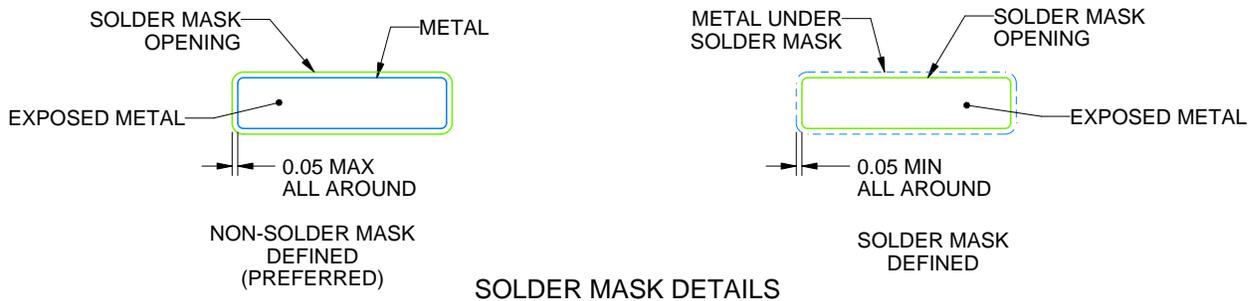
DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220762/A 05/2024

NOTES: (continued)

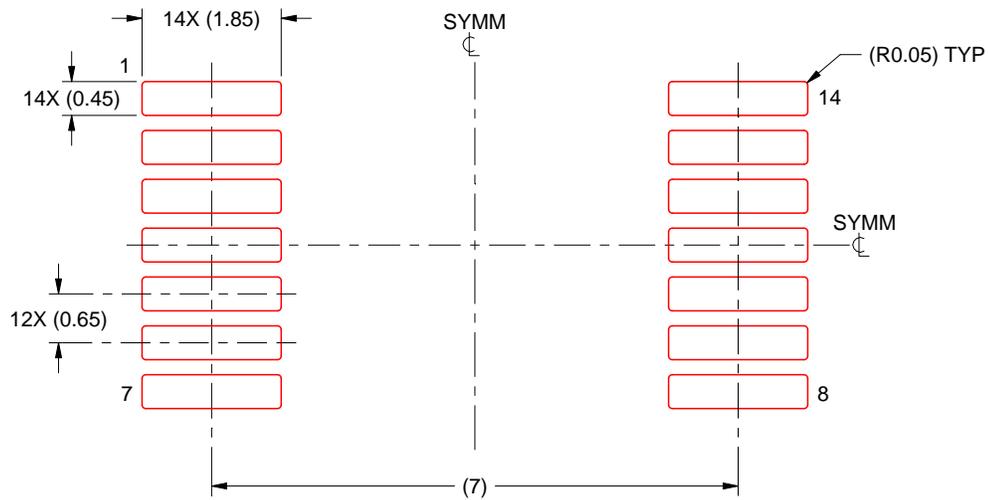
- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4220762/A 05/2024

NOTES: (continued)

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

## GENERIC PACKAGE VIEW

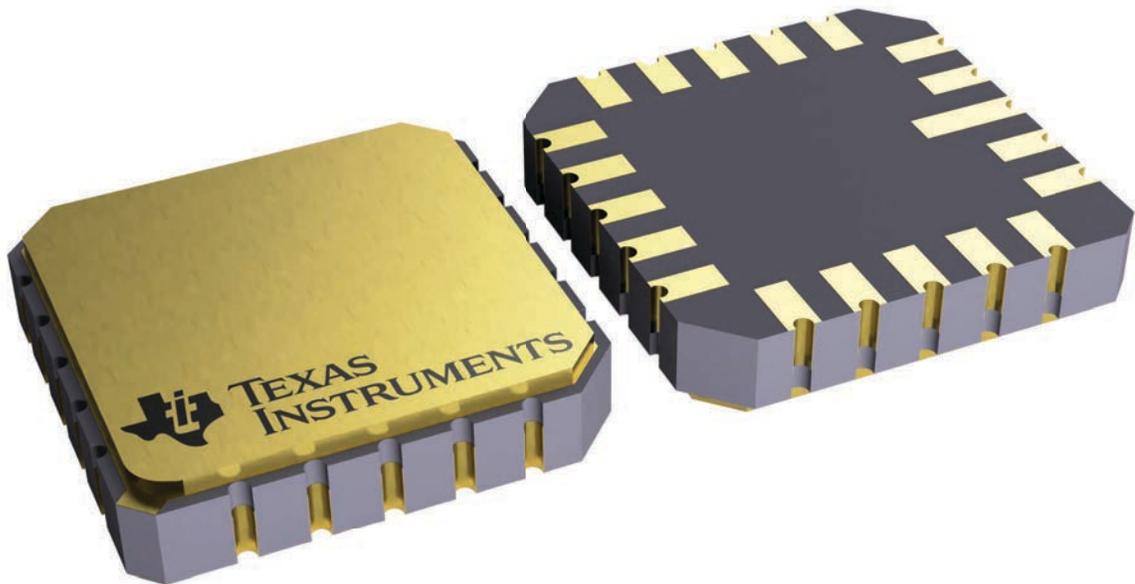
**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

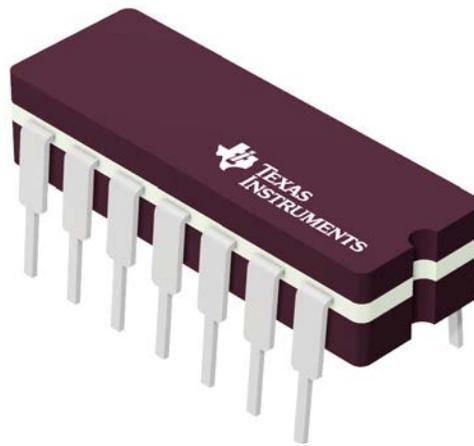
This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\

J 14

**GENERIC PACKAGE VIEW**  
**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

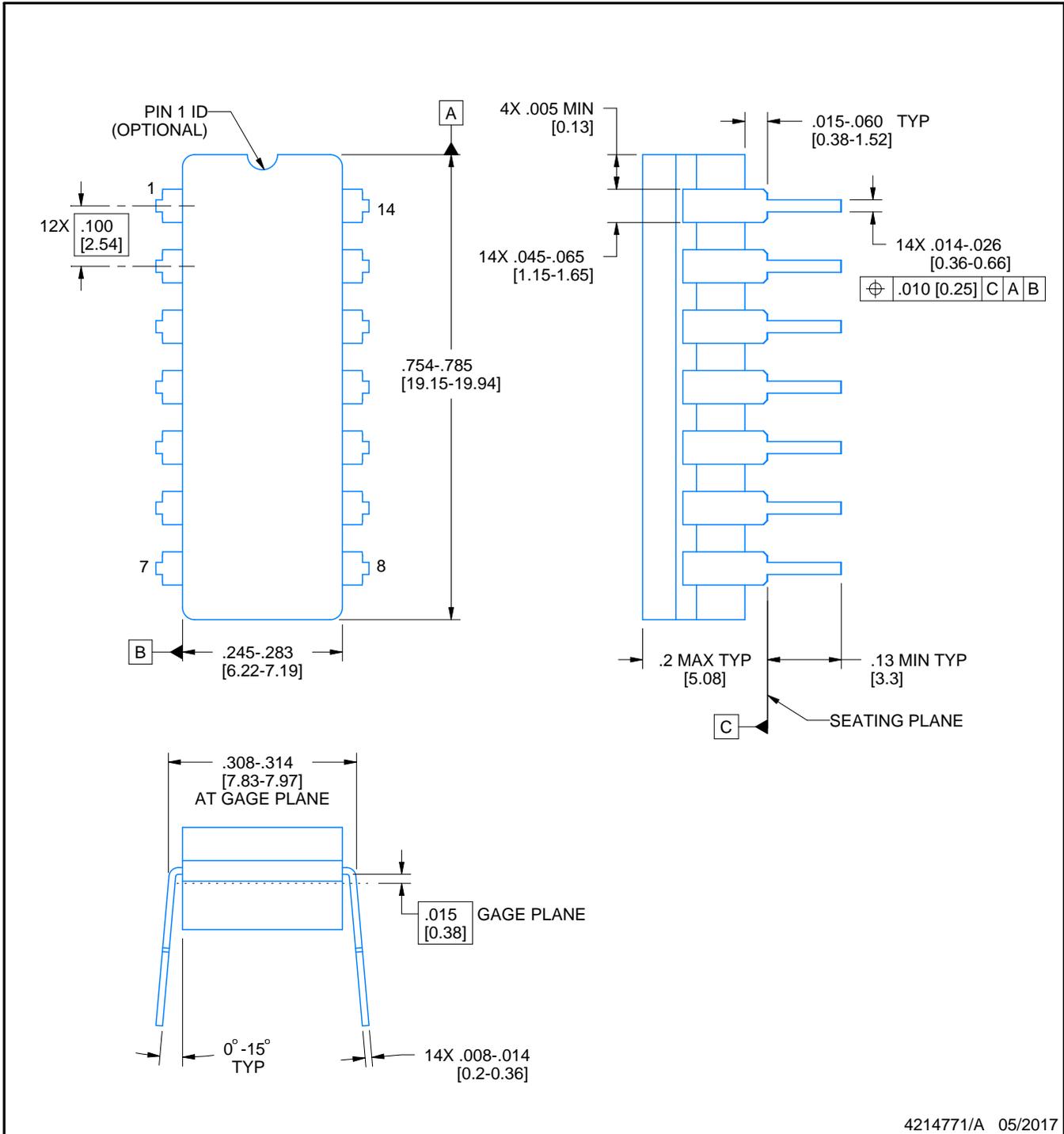
J0014A



# PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

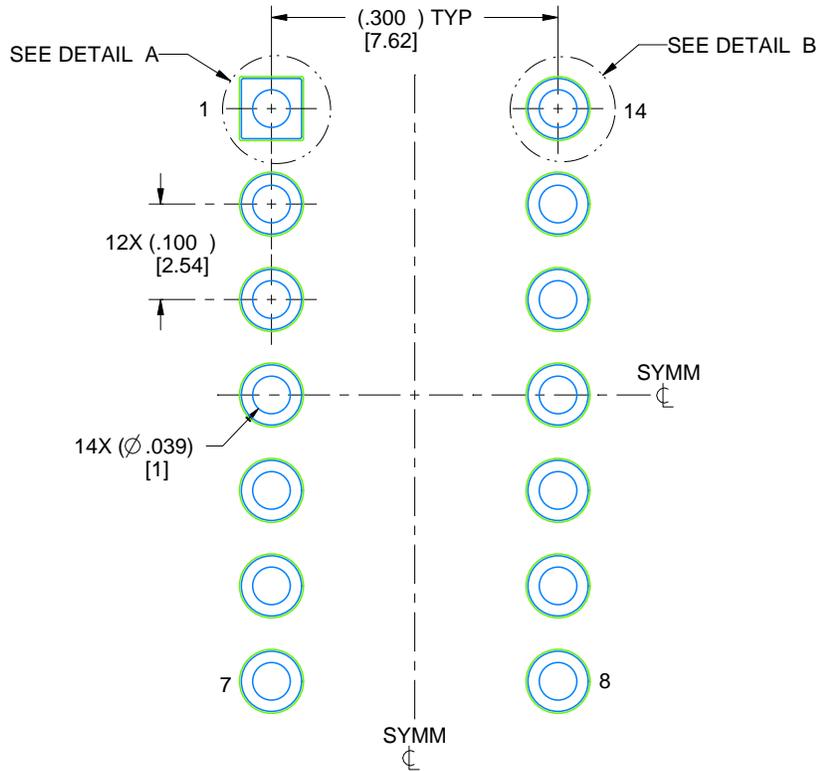
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with 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

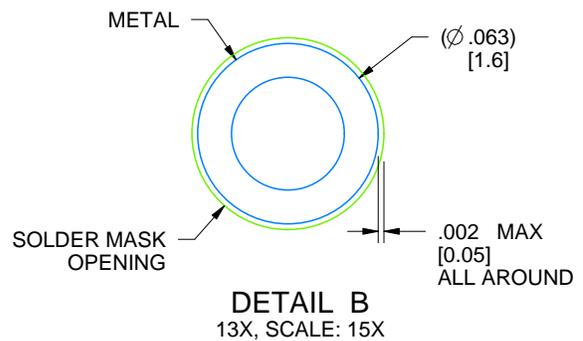
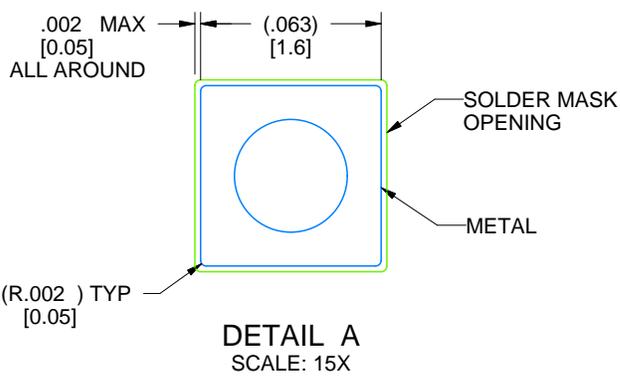
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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

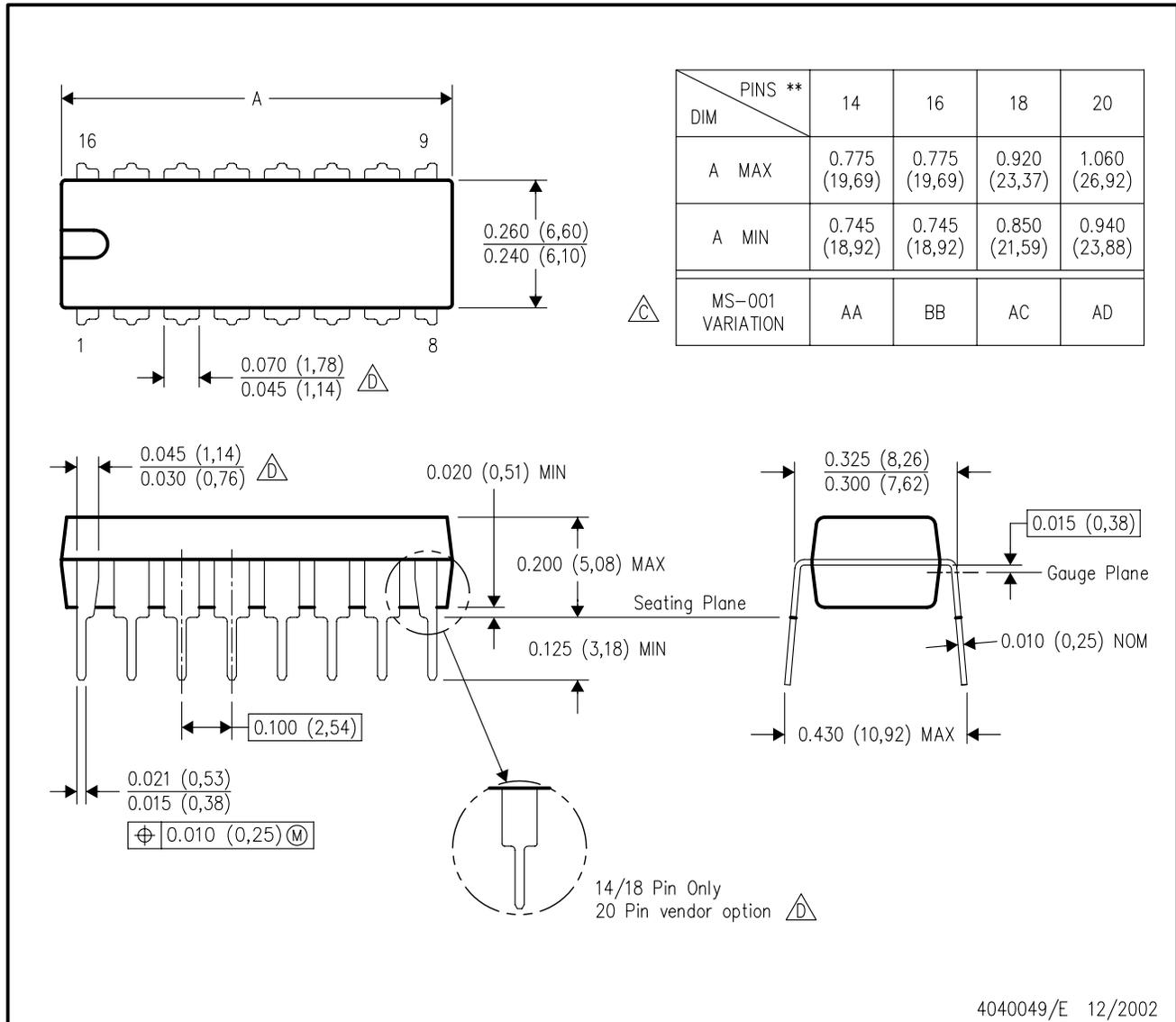


4214771/A 05/2017

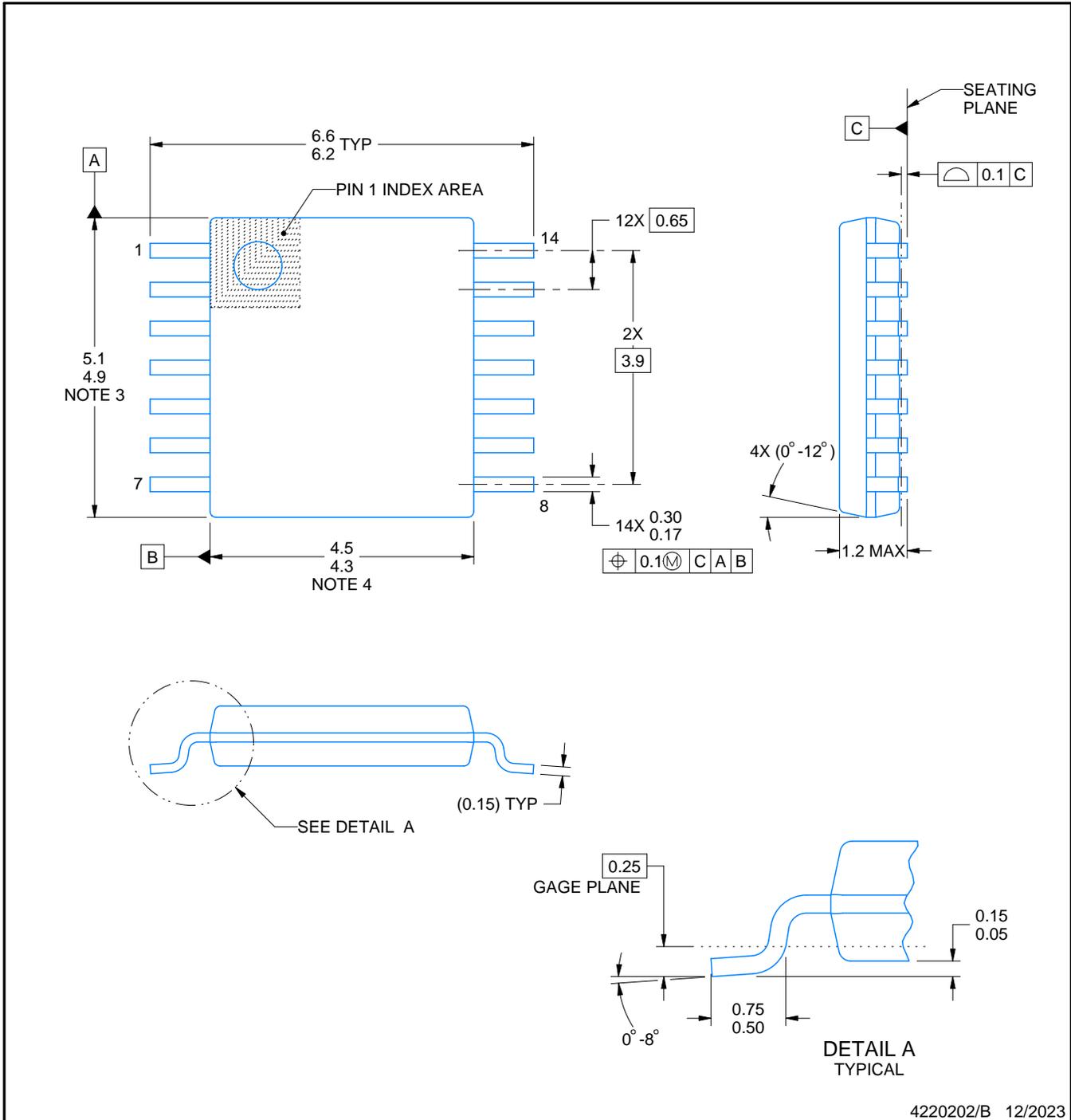
N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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



4220202/B 12/2023

NOTES:

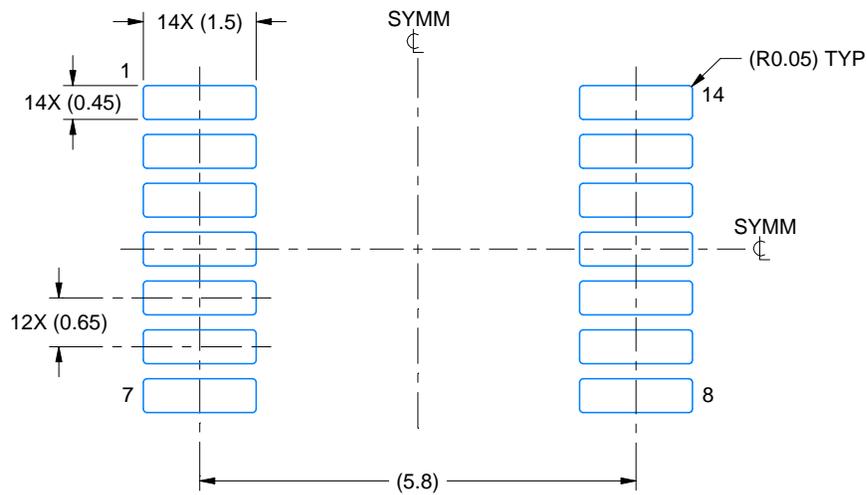
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220202/B 12/2023

NOTES: (continued)

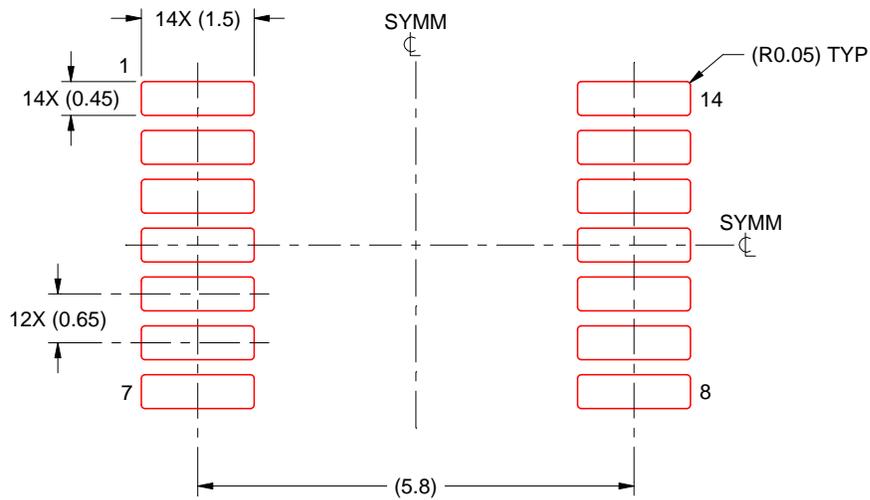
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220202/B 12/2023

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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