SNx4LVC08A Quadruple 2-Input Positive-AND Gates

1 Features

- Latch-up performance exceeds 250mA per JESD 17
- ESD protection exceeds JESD 22
  - 2000V Human-Body Model (A114-A)
  - 1000V Charged-Device Model (C101)
  - 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.
- SN74LVC08A operates from 1.65V to 3.6V
- SN54LVC08A operates from 2.0V to 3.6V
- SNx4LVC08A specified from –40°C to +85°C and –40°C to +125°C
- SN54LVC08A specified from –55°C to +125°C
- Inputs accept voltages to 5.5V
- Max t_{pd} of 4.1ns at 3.3V
- Typical V_{OLP} (output ground bounce) <0.8V at V_{CC} = 3.3V, T_A = 25°C
- Typical V_{OHV} (output V_{OH} undershoot) >2V at V_{CC} = 3.3V, T_A = 25°C

2 Applications

- Servers
- LED Displays
- Network Switches
- I/O Expanders
- Base Station Processor Board

3 Description

The SN54LVC08A quadruple 2-input positive-AND gate is designed for 2.7V to 3.6V V_{CC} operation, and the SN74LVC08A quadruple 2-input positive-AND gate is designed for 1.65V to 3.6V V_{CC} operation.

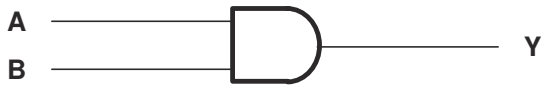
The SNx4LVC08A devices perform the Boolean function $Y = A \bullet B$ or $Y = \overline{\overline{A} + \overline{B}}$ in positive logic.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in a mixed 3.3V/5V system environment.

Device Information

PART NUMBER	PACKAGE(1)	PACKAGE SIZE(2)	BODY SIZE(3)
SNx4LVC08A	BQA (WQFN, 14)	3mm × 2.5mm	3mm × 2.5mm
	D (SOIC, 14)	8.65mm × 6mm	8.65mm × 3.91mm
	DB (SSOP, 14)	6.2mm × 7.8mm	6.20mm × 5.30mm
	NS (SOP, 14)	10.2mm × 7.8mm	10.30mm × 5.30mm
	PW (TSSOP, 14)	5mm × 4.4mm	5.00mm × 4.40mm
	RGY (VQFN, 14)	3.5mm × 3.5mm	3.50mm × 3.50mm
	FK (LCCC, 20)	8.9mm x 8.9mm	8.89mm × 8.89mm
	J (CDIP, 14)	19.55mm x 7.9mm	19.55mm x 6.7mm
	W (CFP, 14)	9.21mm x 9mm	9.21mm x 6.28mm

(1) For more information, see Section 11.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.
(3) The body size (length × width) is a nominal value and does not include pins.



Logic Diagram, Each Gate (Positive Logic)

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

Table of Contents

1 Features....1
2 Applications....1
3 Description....1
4 Pin Configuration and Functions....3
5 Specifications....5
5.1 Absolute Maximum Ratings....5
5.2 ESD Ratings....5
5.3 Recommended Operating Conditions, SN54LVC08A....5
5.4 Recommended Operating Conditions, SN74LVC08A....6
5.5 Thermal Information....6
5.6 Electrical Characteristics, SN54LVC08A....7
5.7 Electrical Characteristics, SN74LVC08A....7
5.8 Switching Characteristics, SN54LVC08A....8
5.9 Switching Characteristics, SN74LVC08A....8
5.10 Operating Characteristics....8
5.11 Typical Characteristics....9
6 Parameter Measurement Information....10
7 Detailed Description....11
7.1 Overview....11
7.2 Functional Block Diagram....11
7.3 Feature Description....11
7.4 Device Functional Modes....12
8 Application and Implementation....13
8.1 Application Information....13
8.2 Typical Application....13
8.3 Layout....14
9 Device and Documentation Support....16
9.1 Documentation Support (Analog)....16
9.2 Receiving Notification of Documentation Updates....16
9.3 Support Resources....16
9.4 Trademarks....16
9.5 Electrostatic Discharge Caution....16
9.6 Glossary....16
11 Mechanical, Packaging, and Orderable Information....17

Copyright © 2024 Texas Instruments Incorporated

4 Pin Configuration and Functions

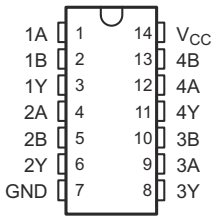


Figure 4-1. D, DB, NS, J, W, or PW Package 14-Pin SOIC, SSOP, SOP, CDIP, or TSSOP (Top View)

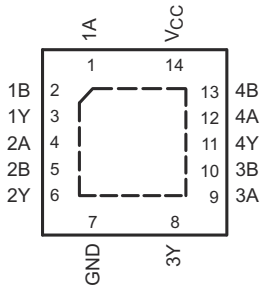


Figure 4-2. BQA or RGY Package 14-Pin WQFN or VQFN (Top View)

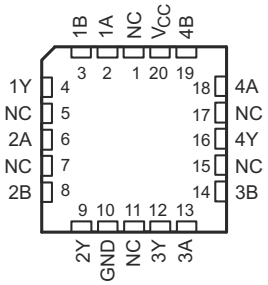


Figure 4-3. FK Package 20-Pin LCCC (Top View)

Copyright © 2024 Texas Instruments Incorporated

Table 4-1. Pin Functions

PIN			TYPE	DESCRIPTION
NAME	SOIC, SSOP, SOP, CDIP, TSSOP, VQFN,WQFN	LCCC		
1A	1	2	I	Channel 1 input A
1B	2	3	I	Channel 1 input B
1Y	3	4	O	Channel 1 output
2A	4	6	I	Channel 2 input A
2B	5	8	I	Channel 2 input B
2Y	6	9	O	Channel 2 output
GND	7	10	Ground	Ground
3Y	8	12	O	Channel 3 output
3A	9	13	I	Channel 3 input A
3B	10	14	I	Channel 3 input B
4Y	11	16	O	Channel 4 output
4A	12	18	I	Channel 4 input A
4B	13	19	I	Channel 4 input B
V_{CC}	14	20	Power	Positive supply
Thermal Information(1)			—	The thermal pad can be connected to GND or left floating. Do not connect to any other signal or supply.
NC(2)	—	1	—	No connect
		5		
		7		
		11		
		15		
		17		

(1) For BQA package only.
(2) NC – No internal connection

Copyright © 2024 Texas Instruments Incorporated

5 Specifications

5.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage		–0.5	6.5	V
V_I	Input voltage(2)		–0.5	6.5	V
V_O	Output voltage(2) (3)		–0.5	V_{CC} + 0.5	V
I_{IK}	Input clamp current	V_I < 0		–50	mA
I_{OK}	Output clamp current	V_O < 0		–50	mA
I_O	Continuous output current			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
P_{tot}	Power dissipation(4) (5)	T_A = –40°C to +125°C		500	mW
T_J	Junction temperature		–65	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, 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 negative-voltage ratings may be exceeded if the input and output current ratings are observed.
(3) The value of V_{CC} is provided in the *Recommended Operating Conditions* table.
(4) For the D package: above 70°C, the value of P_{tot} derates linearly with 8 mW/K.
(5) For the DB, NS, and PW packages: above 60°C, the value of P_{tot} derates linearly with 5.5 mW/K.

5.2 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)	±1000	
		Machine Model (MM) A115-A	200	

(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.

5.3 Recommended Operating Conditions, SN54LVC08A

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

			SN54LVC08A		UNIT
			–55°C to +125°C		
			MIN	MAX	
V_{CC}	Supply voltage	Operating	2	3.6	V
		Data retention only	1.5		
V_{IH}	High-level input voltage	V_{CC} = 2.7V to 3.6V	2		V
V_{IL}	Low-level input voltage	V_{CC} = 2.7V to 3.6V		0.8	V
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 2.7V		–12	mA
		V_{CC} = 3V		–24	
I_{OL}	Low-level output current	V_{CC} = 2.7V		12	mA
		V_{CC} = 3V		24	
Δt/Δv	Input transition rise or fall rate			8	ns/V

(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.

Copyright © 2024 Texas Instruments Incorporated

5.4 Recommended Operating Conditions, SN74LVC08A

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

			SN74LVC08A						UNIT
			T_A = 25°C		–40°C to +85°C		–40°C to +125°C		
			MIN	MAX	MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	Operating	1.65	3.6	1.65	3.6	1.65	3.6	V
		Data retention only	1.5		1.5		1.5		
V_{IH}	High-level input voltage	V_{CC} = 1.65V to 1.95V	0.65 × V_{CC}		0.65 × V_{CC}		0.65 × V_{CC}		V
		V_{CC} = 2.3V to 2.7V	1.7		1.7		1.7		
		V_{CC} = 2.7V to 3.6V	2		2		2		
V_{IL}	Low-level input voltage	V_{CC} = 1.65V to 1.95V		0.35 × V_{CC}		0.35 × V_{CC}		0.35 × V_{CC}	V
		V_{CC} = 2.3V to 2.7V		0.7		0.7		0.7	
		V_{CC} = 2.7V to 3.6V		0.8		0.8		0.8	
V_I	Input voltage		0	5.5	0	5.5	0	5.5	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 1.65V		–4		–4		–4	mA
		V_{CC} = 2.3V		–8		–8		–8	
		V_{CC} = 2.7 V		–12		–12		–12	
		V_{CC} = 3V		–24		–24		–24	
I_{OL}	Low-level output current	V_{CC} = 1.65V		4		4		4	mA
		V_{CC} = 2.3V		8		8		8	
		V_{CC} = 2.7V		12		12		12	
		V_{CC} = 3V		24		24		24	
Δt/Δv	Input transition rise or fall rate			8		8		8	ns/V

(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.

5.5 Thermal Information

THERMAL METRIC(1)		SN74LVC08A						UNIT
		BQA (WQFN)	D (SOIC)	DB (SSOP)	NS (SO)	PW (TSSOP)	RGY (LCCC)	
		14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	102.3	127.8	140.4	123.8	150.8	92.1	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	96.8	81.9	65.3	52.7	56.0	56.6	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	70.9	84.4	60.2	53.9	69.5	27.5	°C/W
ψ_{JT}	Junction-to-top characterization parameter	16.6	39.6	25.3	17.9	8.9	4.5	°C/W
ψ_{JB}	Junction-to-board characterization parameter	70.9	83.9	59.6	53.6	68.9	27.7	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	50.1	N/A	N/A	N/A	N/A	19.1	°C/W

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

Copyright © 2024 Texas Instruments Incorporated

5.6 Electrical Characteristics, SN54LVC08A

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

PARAMETER	TEST CONDITIONS	V_{CC}	SN54LVC08A –55°C to +125°C			UNIT
			MIN	TYP(1)	MAX	
V_{OH}	I_{OH} = –100 µA	2.7V to 3.6V	V_{CC} – 0.2			V
	I_{OH} = –12 mA	2.7V	2.2			
		3V	2.4			
	I_{OH} = –24 mA	3V	2.2			
V_{OL}	I_{OL} = 100 µA	2.7V to 3.6V			0.2	V
	I_{OL} = 12 mA	2.7V			0.4	
	I_{OL} = 24 mA	3V			0.55	
I_I	V_I = 5.5 V or GND	3.6V			±5	µA
I_{CC}	V_I = V_{CC} or GND, I_O = 0	3.6V			10	µA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	2.7V to 3.6V			500	µA
C_i	V_I = V_{CC} or GND	3.3V		5		pF

(1) T_A = 25°C

5.7 Electrical Characteristics, SN74LVC08A

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

PARAMETER	TEST CONDITIONS	V_{CC}	SN74LVC08A						UNIT
			T_A = 25°C			–40°C to +85°C		–40°C to +125°C	
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	I_{OH} = –100 µA	1.65V to 3.6V	V_{CC} – 0.2			V_{CC} – 0.2		V_{CC} – 0.3		V
	I_{OH} = –4 mA	1.65V	1.29			1.2		1.05		
	I_{OH} = –8 mA	2.3V	1.9			1.7		1.55		
	I_{OH} = –12 mA	2.7V	2.2			2.2		2.05		
		3V	2.4			2.4		2.25		
	I_{OH} = –24 mA	3V	2.3			2.2		2		
V_{OL}	I_{OL} = 100 µA	1.65V to 3.6V			0.1		0.2		0.3	V
	I_{OL} = 4 mA	1.65V			0.24		0.45		0.6	
	I_{OL} = 8 mA	2.3V			0.3		0.7		0.75	
	I_{OL} = 12 mA	2.7V			0.4		0.4		0.6	
	I_{OL} = 24 mA	3V			0.55		0.55		0.8	
I_I	V_I = 5.5 V or GND	3.6V			±1		±5		±20	µA
I_{CC}	V_I = V_{CC} or GND, I_O = 0	3.6V			1		10		40	µA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	2.7V to 3.6V			500		500		5000	µA
C_i	V_I = V_{CC} or GND	3.3V		5						pF

Copyright © 2024 Texas Instruments Incorporated

5.8 Switching Characteristics, SN54LVC08A

over recommended operating free-air temperature range (unless otherwise noted) (see Load Circuit and Voltage Waveforms)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN54LVC08A		UNIT
				–55°C to +125°C		
				MIN	MAX	
t_{pd}	A or B	Y	2.7V		4.8	ns
			3.3V ± 0.3V	1	4.1	

5.9 Switching Characteristics, SN74LVC08A

over recommended operating free-air temperature range (unless otherwise noted) (see Load Circuit and Voltage Waveforms)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN74LVC08A							UNIT
				T_A = 25°C			–40°C to +85°C		–40°C to +125°C		
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	Y	1.8V ± 0.15V	1	5	9.3	1	9.8	1	11.3	ns
			2.5V ± 0.2V	1	2.9	6.4	1	6.9	1	9	
			2.7V	1	3	4.6	1	4.8	1	6	
			3.3V ± 0.3V	1	2.6	3.9	1	4.1	1	5.5	
$t_{sk(o)}$			3.3V ± 0.3V					1		1.5	ns

5.10 Operating Characteristics

T_A = 25°C

PARAMETER		TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance per gate	f = 10 MHz	1.8 V	7	pF
			2.5 V	9.8	
			3.3 V	10	

Copyright © 2024 Texas Instruments Incorporated

5.11 Typical Characteristics

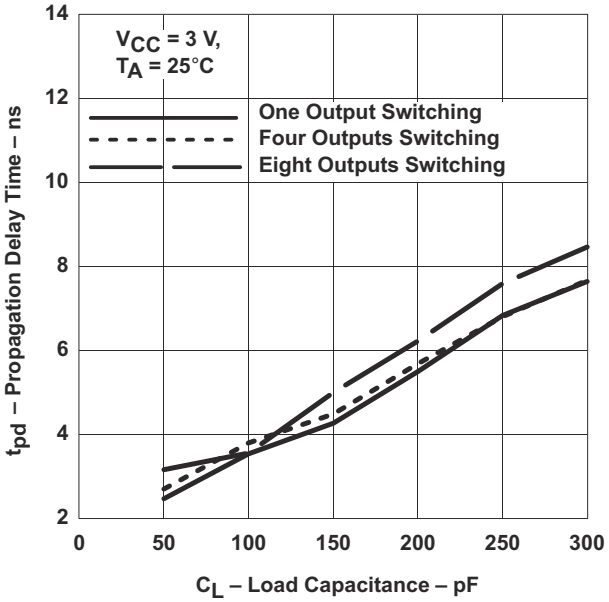


Figure 5-1. Propagation Delay (Low to High Transition) vs Load Capacitance

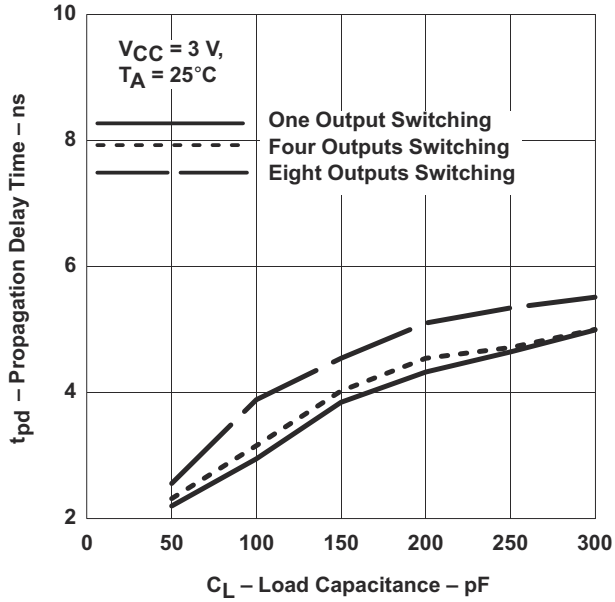
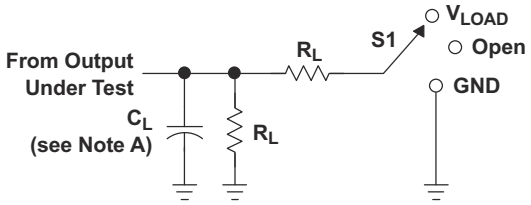


Figure 5-2. Propagation Delay (High to Low Transition) vs Load Capacitance

Copyright © 2024 Texas Instruments Incorporated

6 Parameter Measurement Information

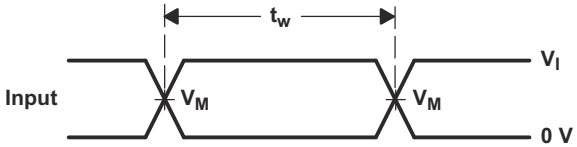
Load Circuit and Voltage Waveforms



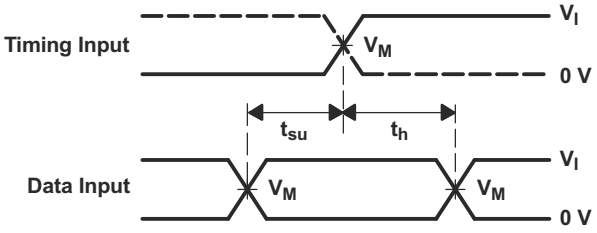
LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

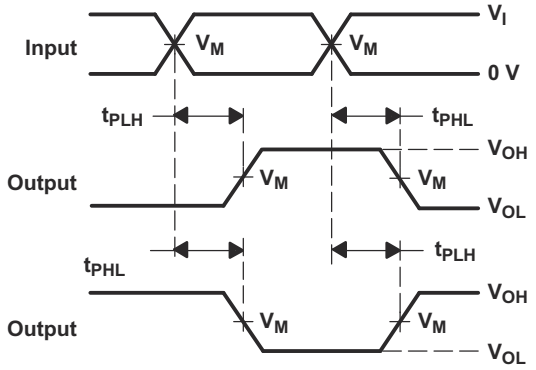
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_D
	V_I	t_r/t_f					
1.8 V ± 0.15 V	V_{CC}	≤2 ns	$V_{CC}/2$	2 × V_{CC}	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	V_{CC}	≤2 ns	$V_{CC}/2$	2 × V_{CC}	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
3.3 V ± 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V



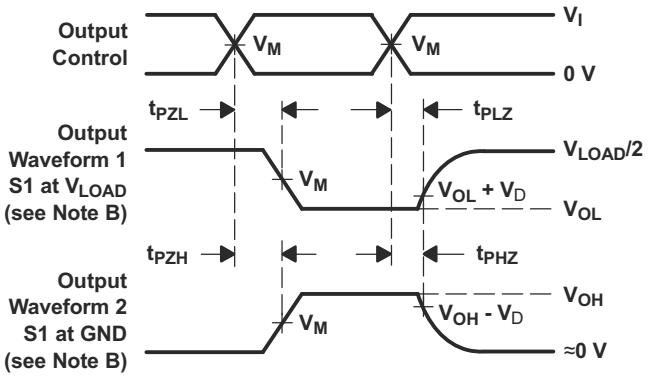
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. C_L includes probe and jig 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. All input pulses are supplied by generators having the following characteristics: PRR≤ 10 MHz, Z_O = 50 W.
D. The outputs are measured one at a time, with one 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}.
H. All parameters and waveforms are not applicable to all devices.

Copyright © 2024 Texas Instruments Incorporated

7 Detailed Description

7.1 Overview

The SN74LVC08 device contains four 2-input positive AND gate device and performs the Boolean function Y = A × B. This device is useful when multiple AND function is used in the system.

7.2 Functional Block Diagram



Figure 7-1. Logic Diagram, Each Gate (Positive Logic)

7.3 Feature Description

7.3.1 Balanced High-Drive CMOS Push-Pull Outputs

A balanced output allows the device to sink and source similar currents. The high drive capability of this device creates 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 power output of the device to be limited to avoid thermal runaway and damage due to over-current. The electrical and thermal limits defined the in the *Section 5.1* must be followed at all times.

7.3.2 Standard CMOS Inputs

Standard CMOS inputs are high impedance and are typically modelled as a resistor in parallel with the input capacitance given in the *Section 5.6* and *Section 5.7*. The worst case resistance is calculated with the maximum input voltage, given in the *Section 5.1*, and the maximum input leakage current, given in the*Section 5.6* and *Section 5.7*, using ohm's law (R = V ÷ I).

Signals applied to the inputs need to have fast edge rates, as defined by Δt/Δv in *Section 5.3* and *Section 5.4* to avoid excessive currents and oscillations. If a slow or noisy input signal is required, a device with a Schmitt-trigger input should be utilized to condition the input signal prior to the standard CMOS input.

7.3.3 Clamp Diodes

The inputs to this device have negative clamping diodes. The outputs to this device have both positive and negative clamping diodes as shown in Figure 7-2.

CAUTION

Voltages beyond the values specified in the *Section 5.1* table can cause damage to the device. The input negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

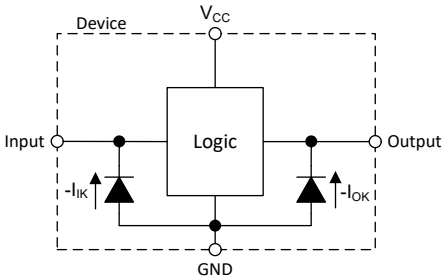


Figure 7-2. Electrical Placement of Clamping Diodes for Each Input and Output

7.3.4 Over-voltage Tolerant Inputs

Input signals to this device can be driven above the supply voltage so long as they remain below the maximum input voltage value specified in the *Section 5.1*.

7.4 Device Functional Modes

Table 7-1 lists the functional modes for the SN54LVC08A and SN74LVC08A devices.

Table 7-1. Truth Table

INPUTS		OUTPUT
A	**B**	**Y**
L	L	L
L	H	L
H	L	L
H	H	H

Copyright © 2024 Texas Instruments Incorporated

8 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.

8.1 Application Information

The SN74LVC08A is used to drive CMOS device and used for implementing AND logic. The LVC family can support current drive of about 24 mA at 3-V V_{CC}. The inputs for SN74LVC08A are 5.5-V tolerant allowing it to translate down to V_{CC}.

8.2 Typical Application

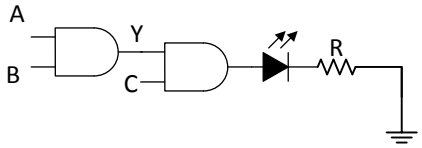


Figure 8-1. Three Input AND Gate Implementation and Driving LED

8.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads so routing and load conditions should be considered to prevent ringing.

8.2.2 Detailed Design Procedure

SN74LVC08A contains four AND gates in one package which can be used for individual AND function or to implement complex Boolean logic. Figure 8-1 shows an example of implementing 3input AND function. AB are inputs for AND gate which are connected to another AND gate. Z= A × B × C. SN74LVC08A support high drive current of 24 mA which can be used to drive LEDs of even Drive low current signal FETs, an example is shown in Figure 8-1 TI recommends to use a series resistance to limit the current. If V_{CC} is 3 V, and LED current should be 10 mA, and the forward-voltage of LED is 2.5 V, then R as shown in Figure 8-1 is calculated using Equation 1:

$$R = (V_{CC} – V_{LED}) / I \quad (1)$$

$$R = (3 – 2.5) / 0.01 = 50\ \Omega$$

Copyright © 2024 Texas Instruments Incorporated

8.2.3 Application Curves

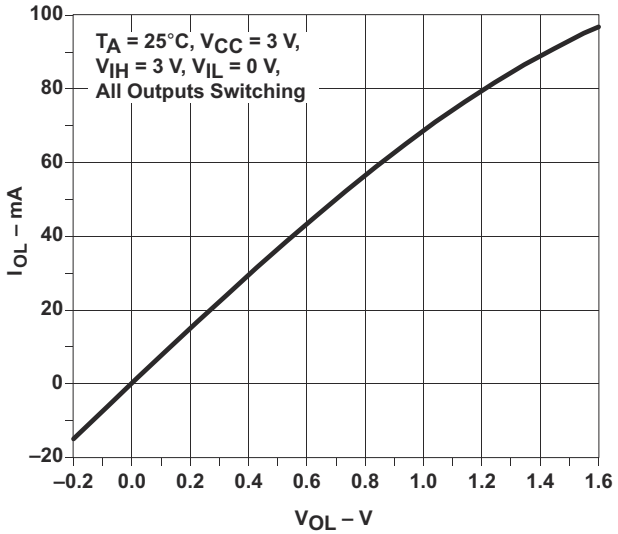


Figure 8-2. Output Drive Current (I_{OL}) vs LOW-level Output Voltage (V_{OL})

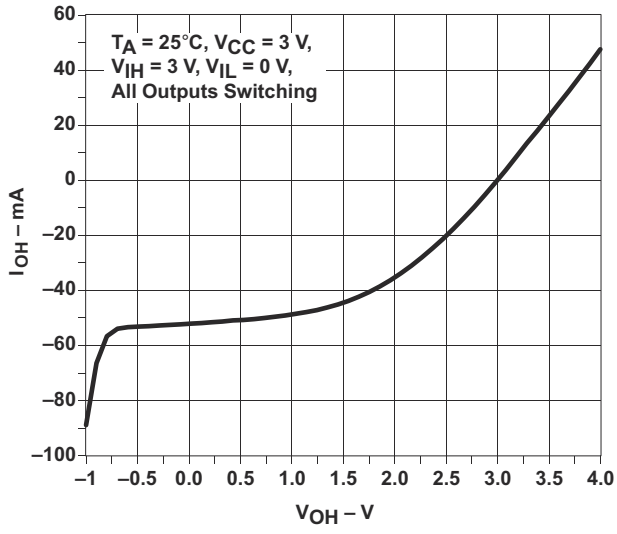


Figure 8-3. Output Drive Current (I_{OH}) vs HIGH-level Output Voltage (V_{OH})

Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions* table.

The V_{CC} pin must have a good bypass capacitor to prevent power disturbance. TI recommends to use a 0.1-µF capacitor. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1-µF and 1-µF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

8.3 Layout

8.3.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in Figure 8-4 are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or VCC, whichever makes more sense or is more convenient.

Even low data rate digital signals can have high frequency signal components due to fast edge rates. When a PCB trace turns a corner at a 90° angle, a reflection can occur. A reflection occurs primarily because of the change of width of the trace. At the apex of the turn, the trace width increases to 1.414 times the width. This increase upsets the transmission-line characteristics, especially the distributed capacitance and self–inductance of the trace which results in the reflection. Not all PCB traces can be straight and therefore some traces must turn corners. Figure 8-5 shows progressively better techniques of rounding corners. Only the last example (BEST) maintains constant trace width and minimizes reflections.

Copyright © 2024 Texas Instruments Incorporated

8.3.2 Layout Examples

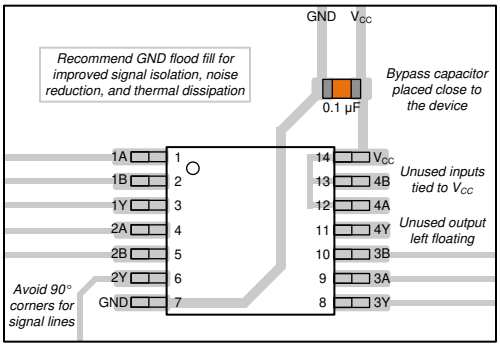


Figure 8-4. Example Layout

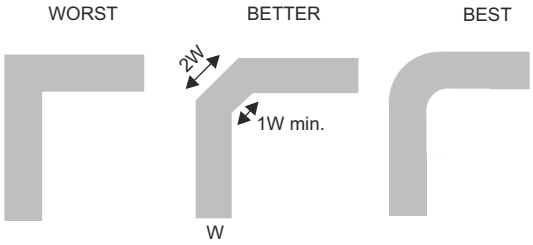


Figure 8-5. Trace Example

9 Device and Documentation Support

9.1 Documentation Support (Analog)

9.1.1 Related Documentation

For related documentation see the following:

Implications of Slow or Floating CMOS Inputs, SCBA004

9.1.2 Related Links

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

Table 9-1. Related Links

PARTS	PRODUCT FOLDER	ORDER NOW	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54LVC08A	Click here	Click here	Click here	Click here	Click here
SN74LVC08A	Click here	Click here	Click here	Click here	Click here

9.2 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.

9.3 Support Resources

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

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

9.3.1 Community Resources

9.4 Trademarks

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

9.5 Electrostatic Discharge Caution



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

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

9.6 Glossary

TI Glossary — This glossary lists and explains terms, acronyms, and definitions.

10

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

Changes from Revision V (May 2024) to Revision W (July 2024)	Page
• Updated thermal values for D package from RθJA = 98.6 to 127.8, RθJC(top) = 56.0 to 81.9, RθJB = 53.3 to 84.4, ΨJT = 16.4 to 39.6, ΨJB = 53.0 to 83.9, RθJC(bot) = N/A, all values in °C/W	6

Copyright © 2024 Texas Instruments Incorporated

Changes from Revision U (March 2024) to Revision V (May 2024)	Page
• Updated RθJA values: DB = 112.8 to 140.4, PW = 127.7 to 150.8, RGY = 51.1 to 92.1, NS = 95.1 to 123.8; updated DB, PW, RGY, and NS packages for RθJC(top), RθJB, ΨJT, ΨJB, and RθJC(bot), all values in °C/W	6

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.

Copyright © 2024 Texas Instruments Incorporated

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)
5962-9753401Q2A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401Q2A SNJ54LVC 08AFK
5962-9753401QCA	Active	Production	CDIP (J) | 14	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401QCA SNJ54LVC08AJ
5962-9753401QDA	Active	Production	CFP (W) | 14	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401QDA SNJ54LVC08AW
SN74LVC08ABQAR	Active	Production	WQFN (BQA) | 14	3000 | LARGE T&R	Yes	SELECTIVE AG (TOP SIDE)	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ABQAR.A	Active	Production	WQFN (BQA) | 14	3000 | LARGE T&R	Yes	SELECTIVE AG (TOP SIDE)	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08AD	Active	Production	SOIC (D) | 14	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08AD.B	Active	Production	SOIC (D) | 14	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADBR	Active	Production	SSOP (DB) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08ADBR.A	Active	Production	SSOP (DB) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08ADBR.B	Active	Production	SSOP (DB) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08ADBRE4	Active	Production	SSOP (DB) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08ADE4	Active	Production	SOIC (D) | 14	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADG4	Active	Production	SOIC (D) | 14	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADR	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADR.A	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADR.B	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADRE4	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADRG3	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADRG3.B	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADRG4	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADRG4.B	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ADT	Active	Production	SOIC (D) | 14	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A

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)
SN74LVC08ADT.B	Active	Production	SOIC (D) | 14	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ANSR	Active	Production	SOP (NS) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ANSR.A	Active	Production	SOP (NS) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ANSR.B	Active	Production	SOP (NS) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08ANSRE4	Active	Production	SOP (NS) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08A
SN74LVC08APW	Active	Production	TSSOP (PW) | 14	90 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APW.B	Active	Production	TSSOP (PW) | 14	90 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWG4	Active	Production	TSSOP (PW) | 14	90 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWR	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWR.A	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWR.B	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRE4	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRG3	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRG3.B	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRG4	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRG4.A	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWRG4.B	Active	Production	TSSOP (PW) | 14	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWT	Active	Production	TSSOP (PW) | 14	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWT.B	Active	Production	TSSOP (PW) | 14	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08APWTG4	Active	Production	TSSOP (PW) | 14	250 | SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC08A
SN74LVC08ARGYR	Active	Production	VQFN (RGY) | 14	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC08A
SN74LVC08ARGYR.A	Active	Production	VQFN (RGY) | 14	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC08A
SN74LVC08ARGYR.B	Active	Production	VQFN (RGY) | 14	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC08A
SN74LVC08ARGYRG4	Active	Production	VQFN (RGY) | 14	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC08A
SNJ54LVC08AFK	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401Q2A SNJ54LVC 08AFK
SNJ54LVC08AJ	Active	Production	CDIP (J) | 14	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401QC A SNJ54LVC08AJ

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)
SNJ54LVC08AW	Active	Production	CFP (W) | 14	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9753401QD A SNJ54LVC08AW

(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 SN54LVC08A, SN74LVC08A :

- Catalog : SN74LVC08A
- Automotive : SN74LVC08A-Q1, SN74LVC08A-Q1

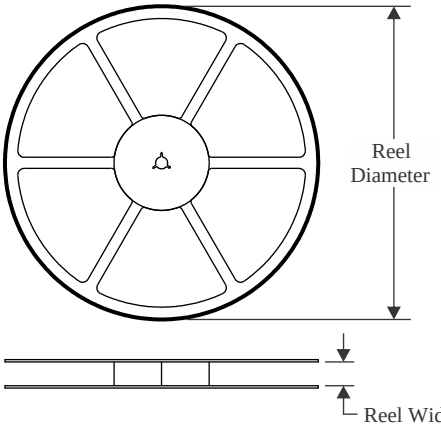
- Enhanced Product : SN74LVC08A-EP, SN74LVC08A-EP
- Military : SN54LVC08A

NOTE: Qualified Version Definitions:

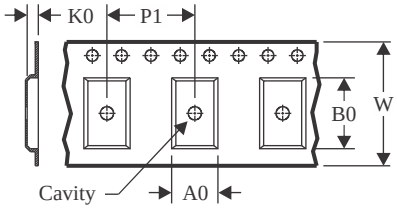
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

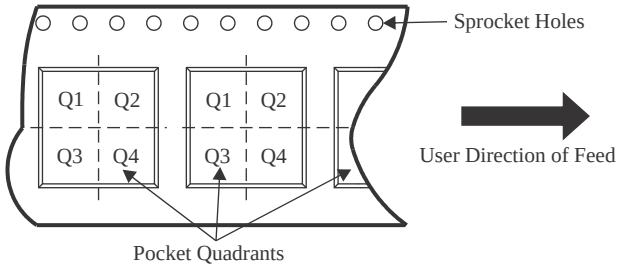


TAPE DIMENSIONS



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

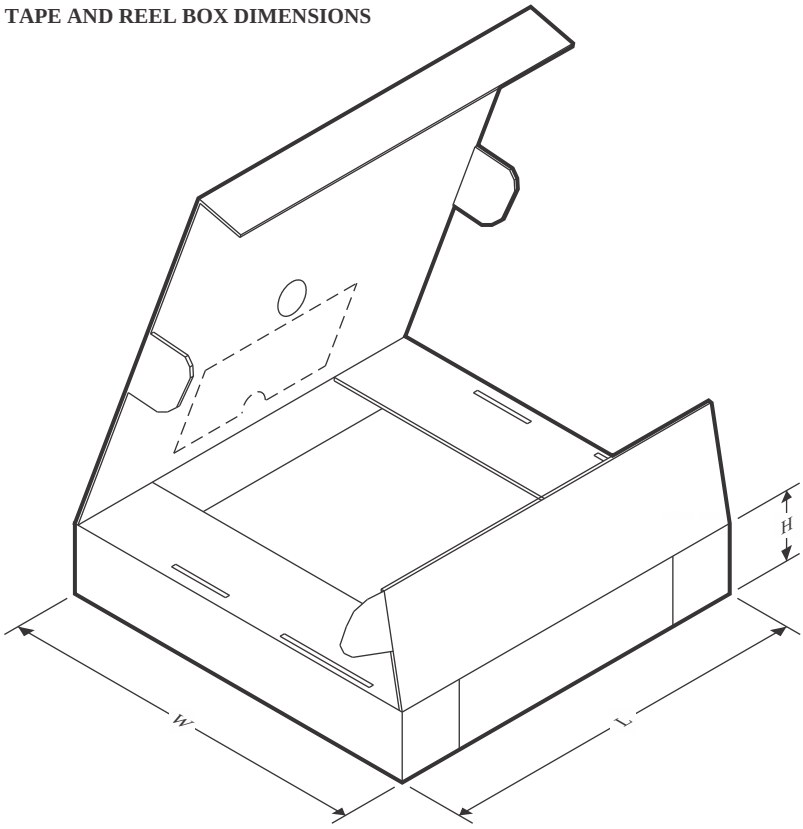
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74LVC08ABQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74LVC08ADBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LVC08ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC08ADRG3	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.1	8.0	16.0	Q1
SN74LVC08ADRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC08ADT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC08ANSR	SOP	NS	14	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1
SN74LVC08APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC08APWRG3	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC08APWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC08APWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC08ARGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1

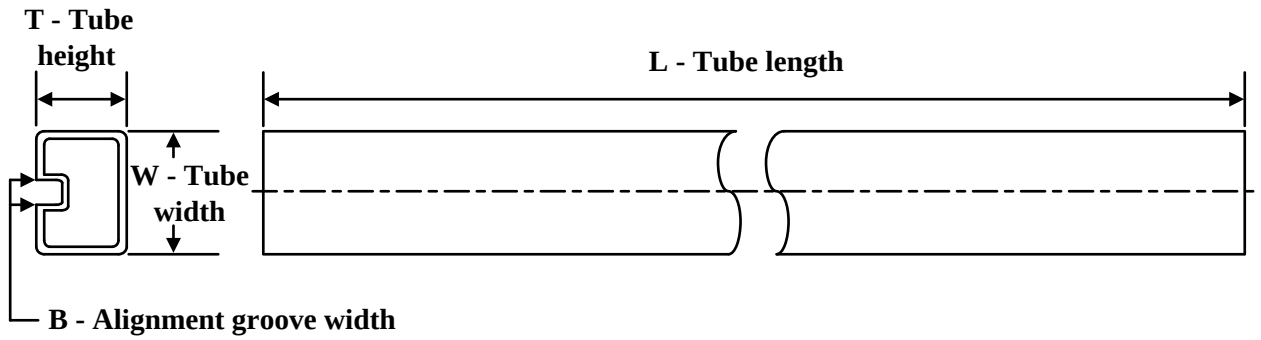
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC08ABQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74LVC08ADBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74LVC08ADR	SOIC	D	14	2500	353.0	353.0	32.0
SN74LVC08ADRG3	SOIC	D	14	2500	364.0	364.0	27.0
SN74LVC08ADRG4	SOIC	D	14	2500	353.0	353.0	32.0
SN74LVC08ADT	SOIC	D	14	250	213.0	191.0	35.0
SN74LVC08ANSR	SOP	NS	14	2000	353.0	353.0	32.0
SN74LVC08APWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74LVC08APWRG3	TSSOP	PW	14	2000	364.0	364.0	27.0
SN74LVC08APWRG4	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74LVC08APWT	TSSOP	PW	14	250	353.0	353.0	32.0
SN74LVC08ARGYR	VQFN	RGY	14	3000	360.0	360.0	36.0

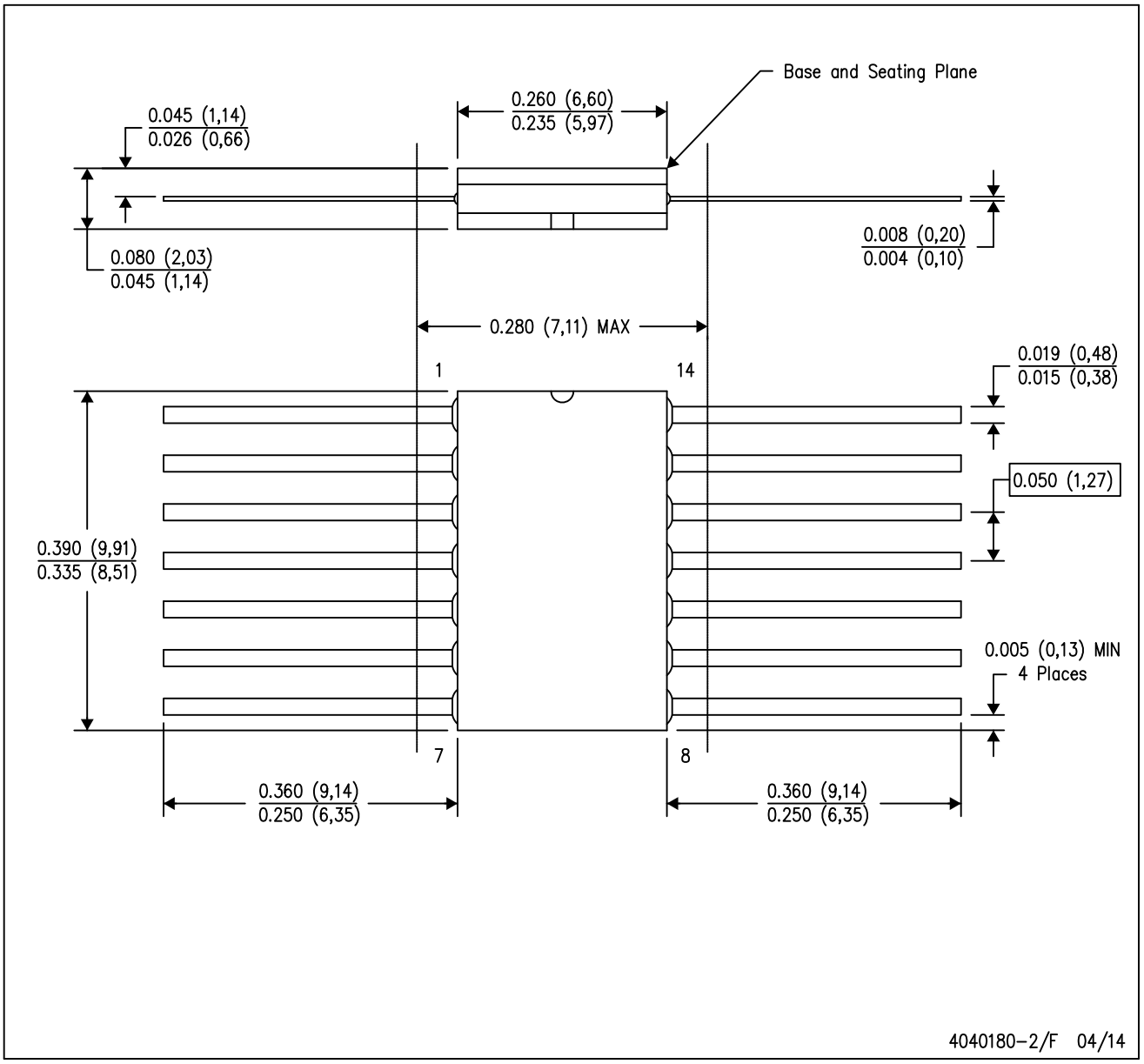
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-9753401Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9753401QDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74LVC08AD	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC08AD.B	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC08ADE4	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC08ADG4	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC08APW	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC08APW.B	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC08APWG4	PW	TSSOP	14	90	530	10.2	3600	3.5
SNJ54LVC08AFK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LVC08AW	W	CFP	14	25	506.98	26.16	6220	NA

W (R–GDFP–F14) CERAMIC DUAL FLATPACK



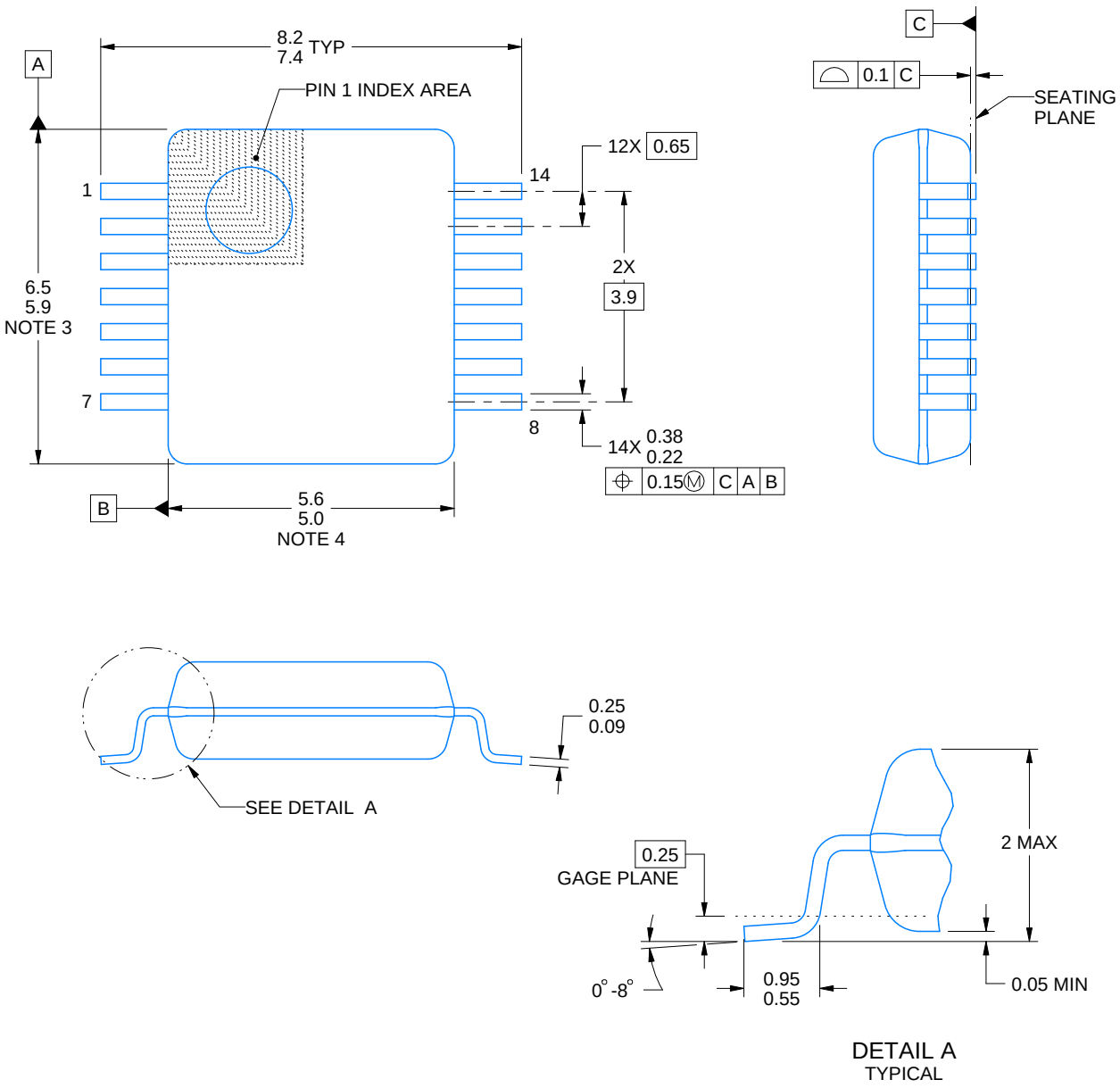
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F14

PACKAGE OUTLINE

DB0014A

SSOP - 2 mm max height

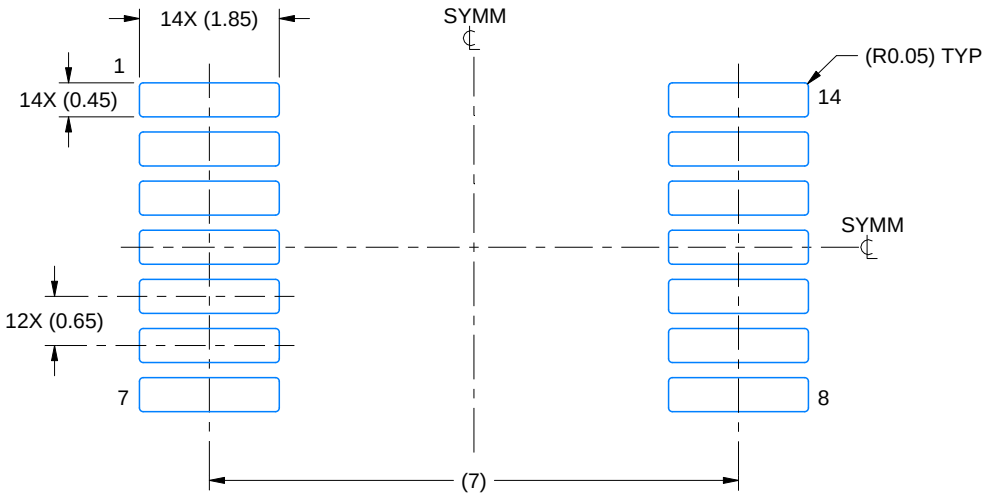
SMALL OUTLINE PACKAGE



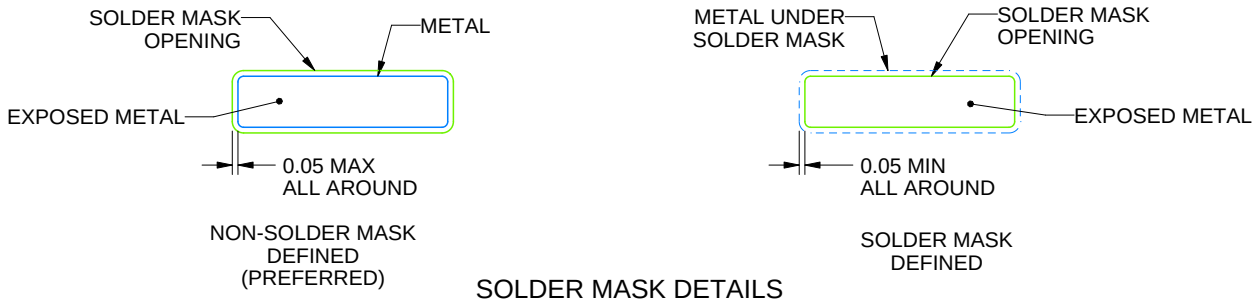
4220762/A 05/2024

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

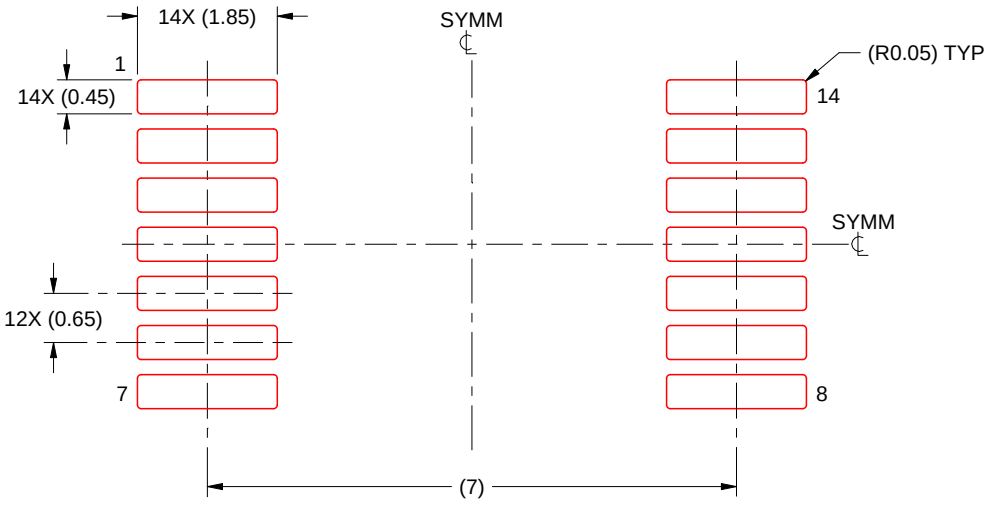


SOLDER MASK DETAILS

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.



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

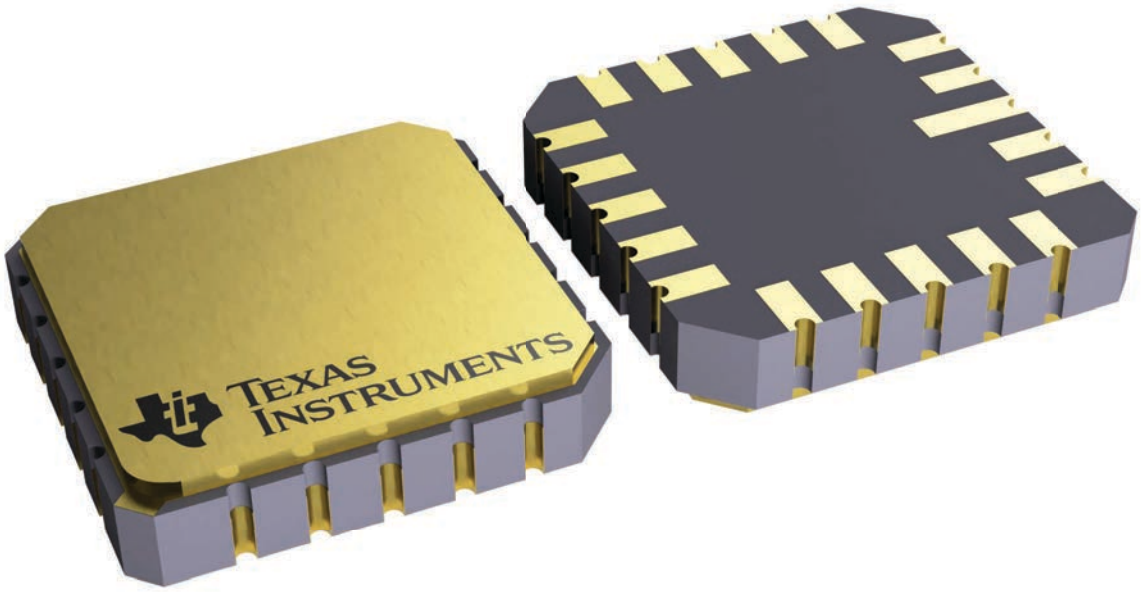
FK 20

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.

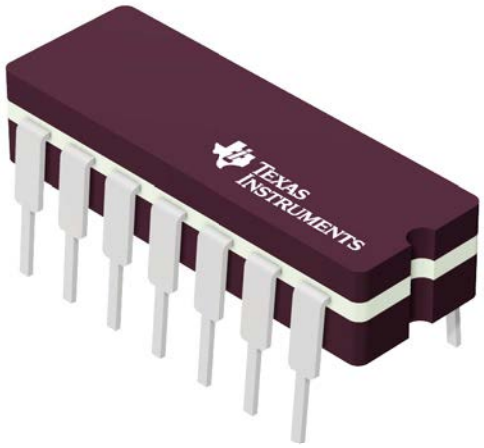


4229370VA\

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

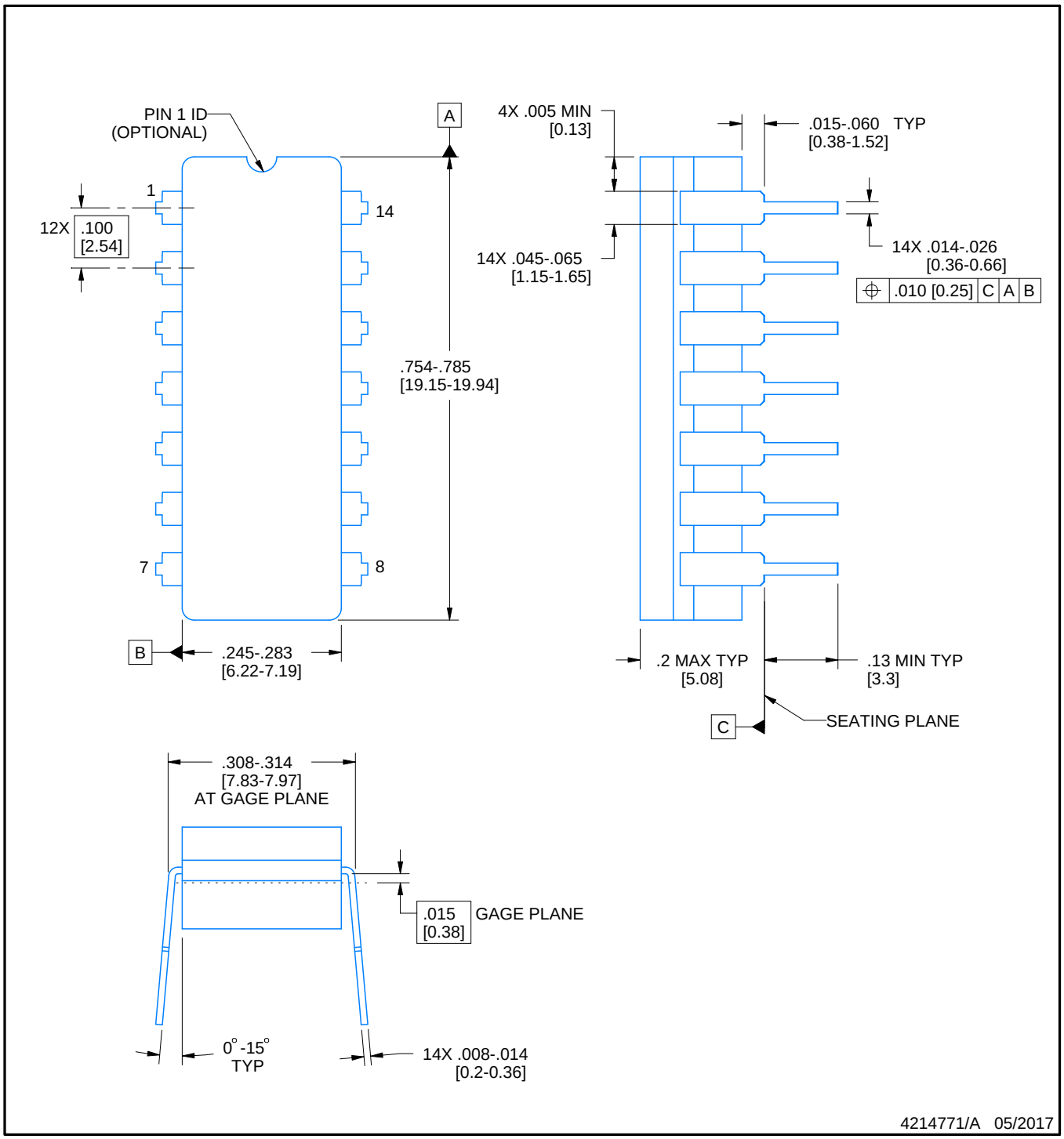


PACKAGE OUTLINE

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



NOTES:

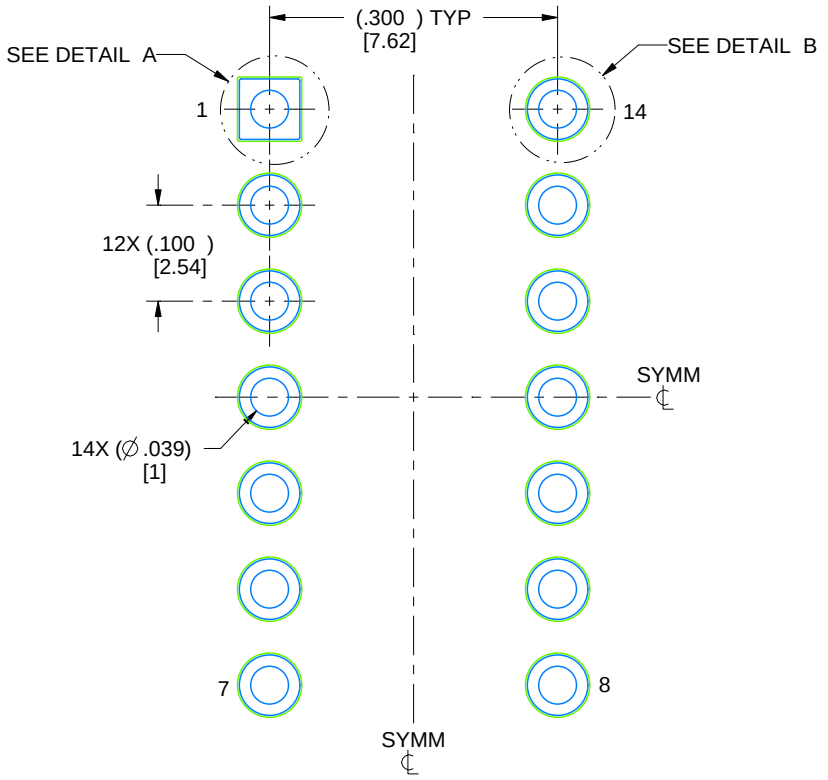
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermitically sealed with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

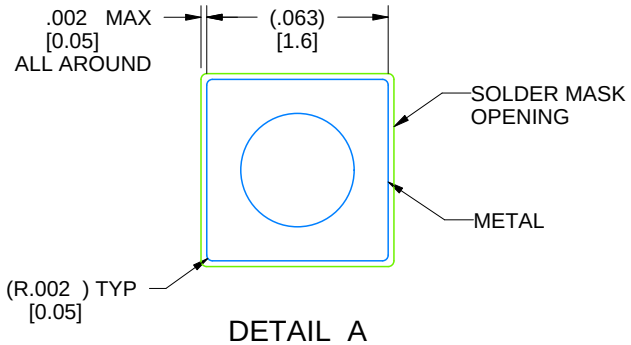
J0014A

CDIP - 5.08 mm max height

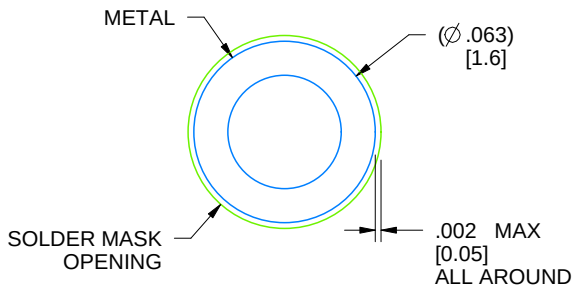
CERAMIC DUAL IN LINE PACKAGE



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



DETAIL A
SCALE: 15X



DETAIL B
13X, SCALE: 15X

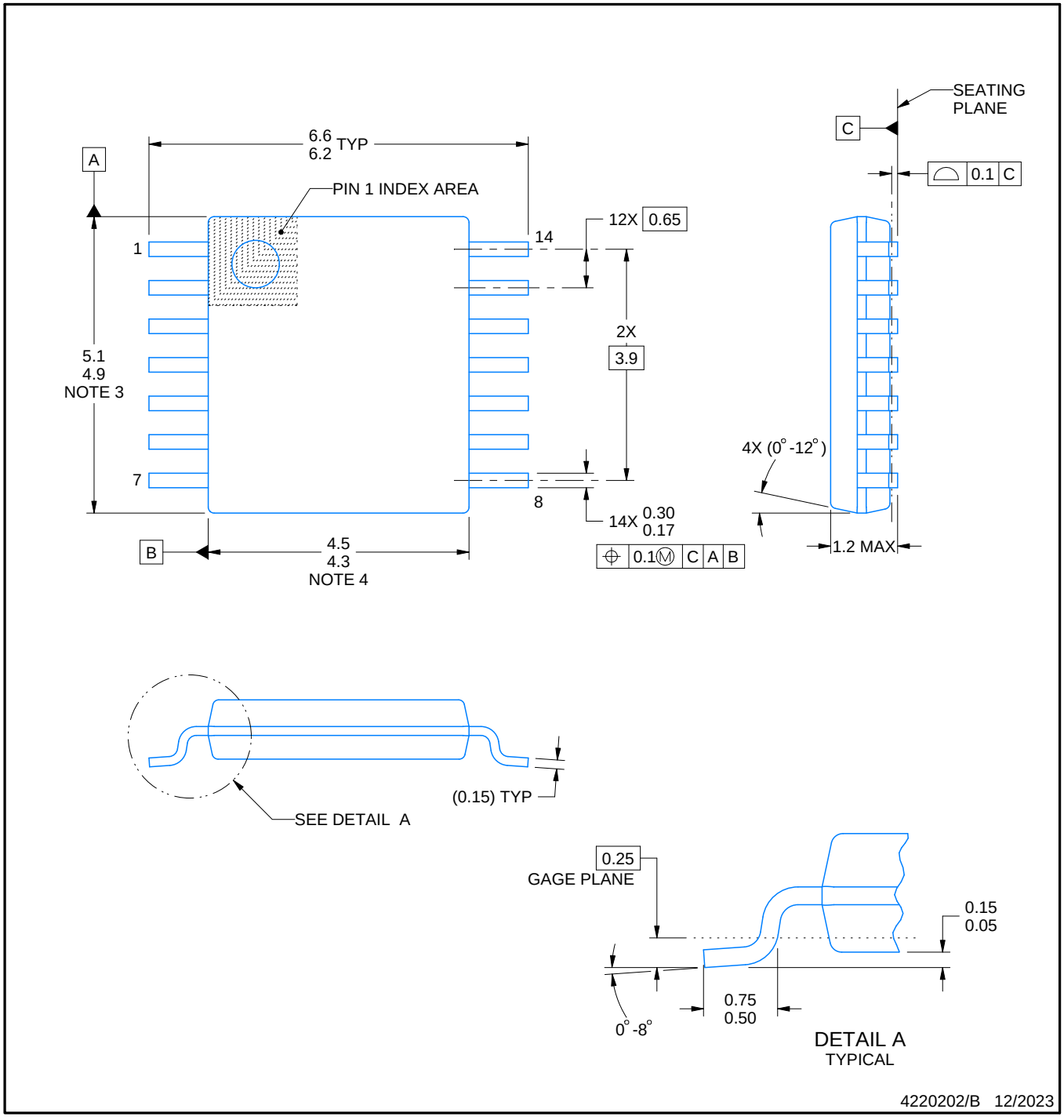
4214771/A 05/2017

PACKAGE OUTLINE

PW0014A

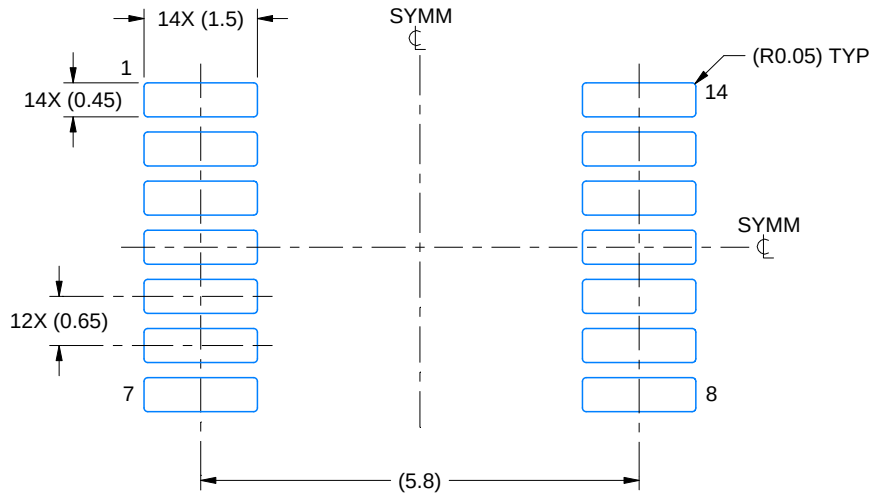
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

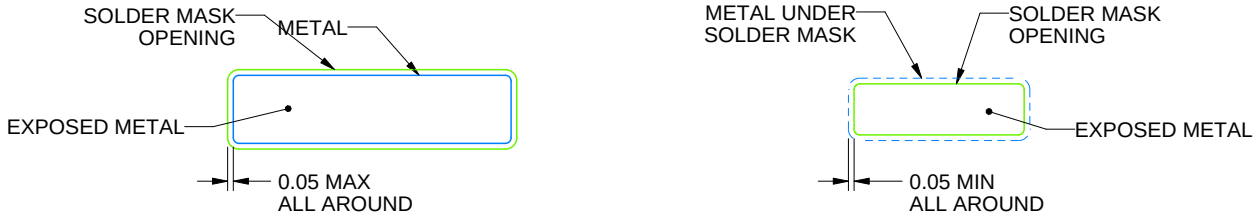


NOTES:

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



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

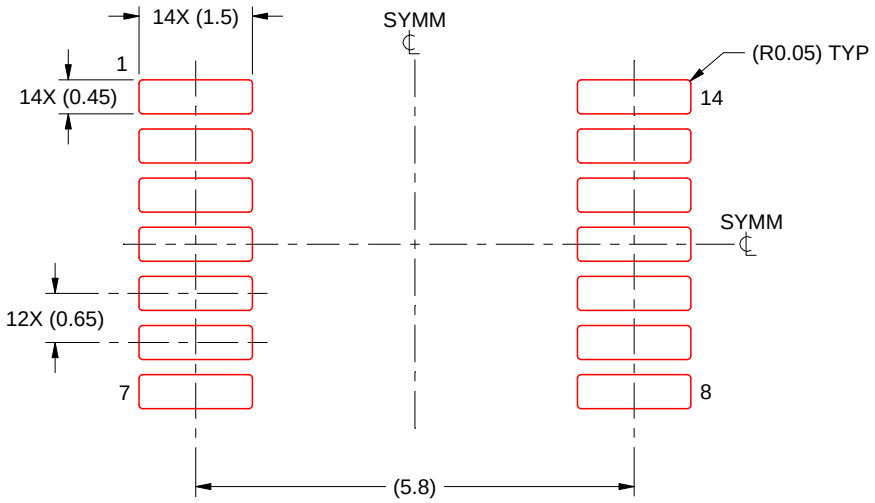


SOLDER MASK DETAILS

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.



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.

GENERIC PACKAGE VIEW

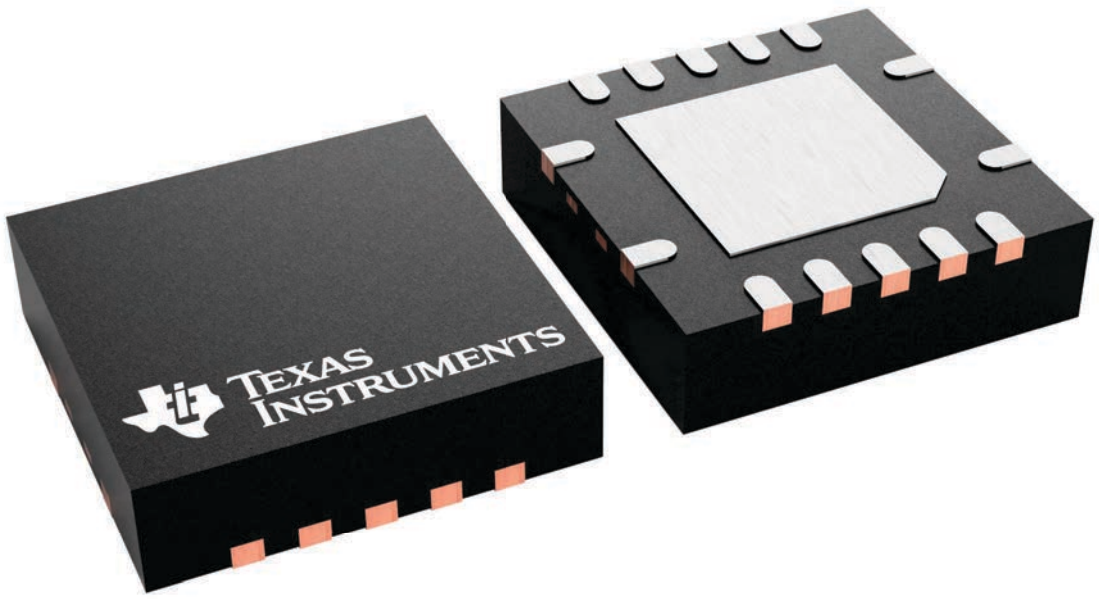
RGY 14

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.



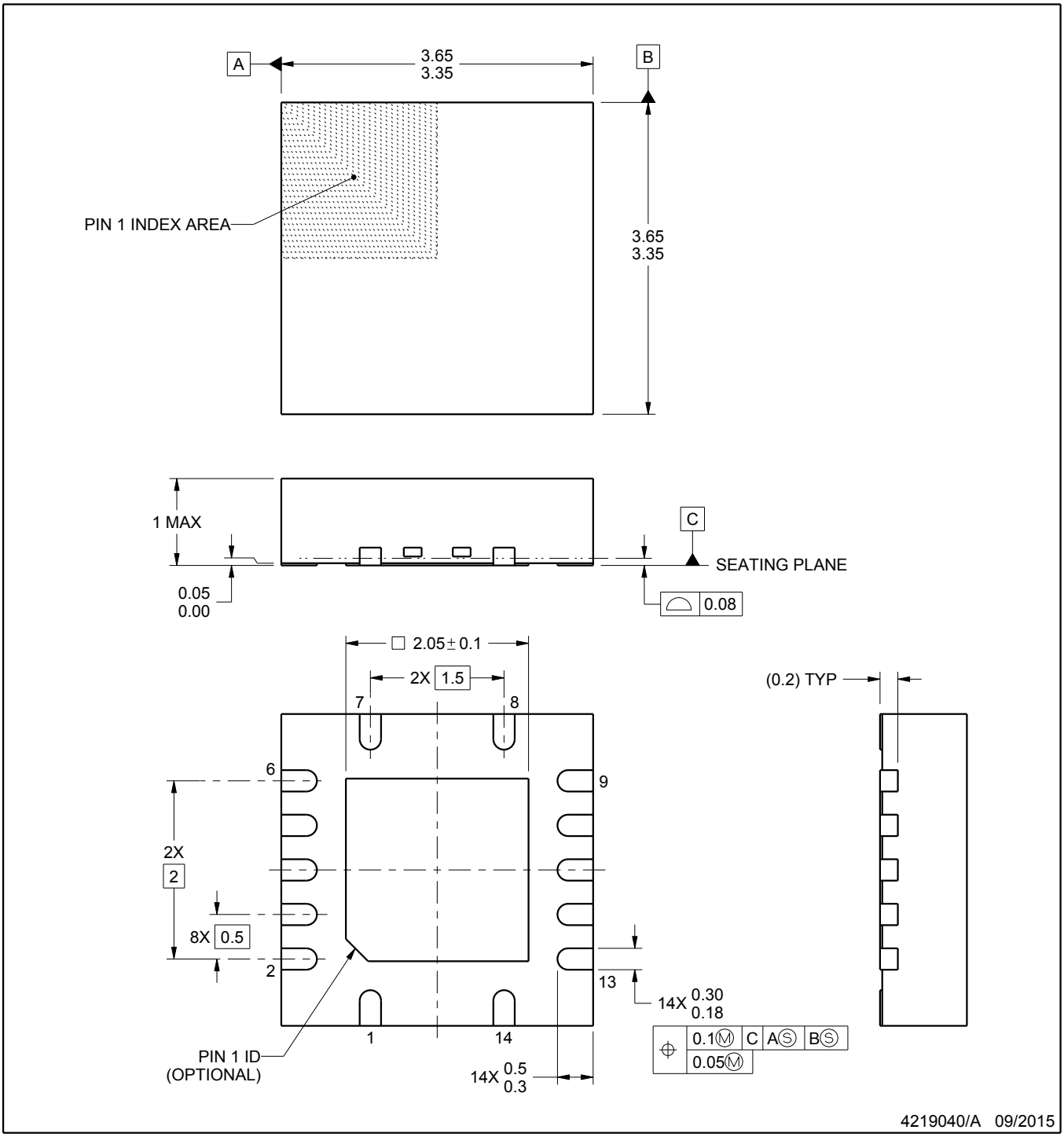
4231541/A

PACKAGE OUTLINE

RGY0014A

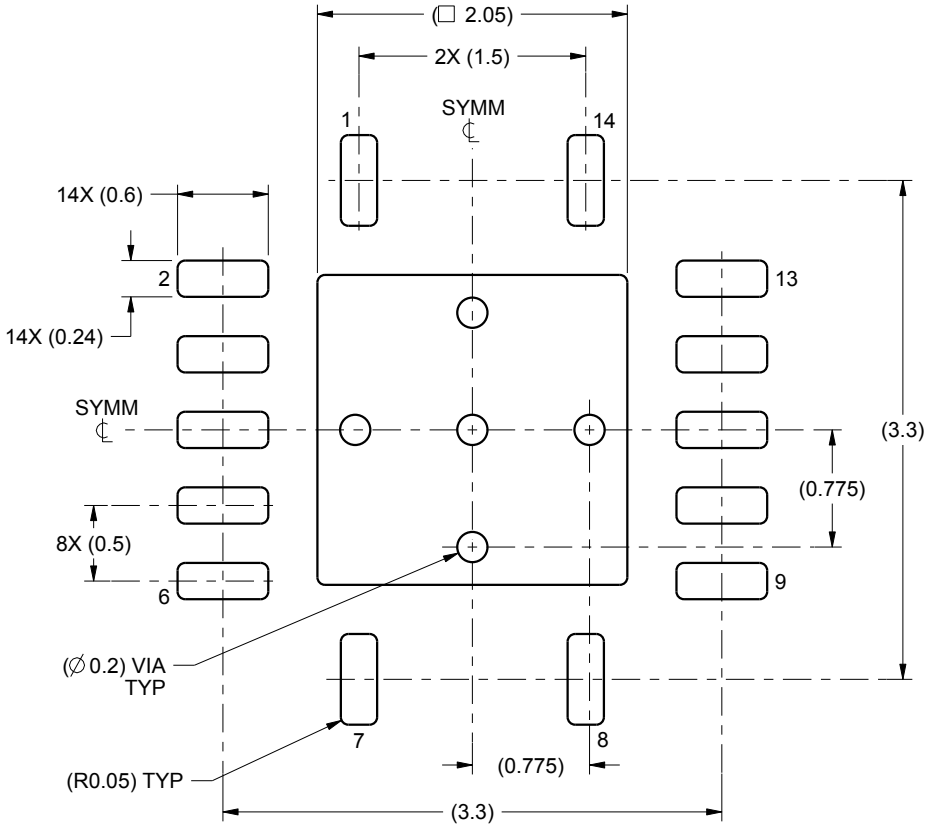
VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD

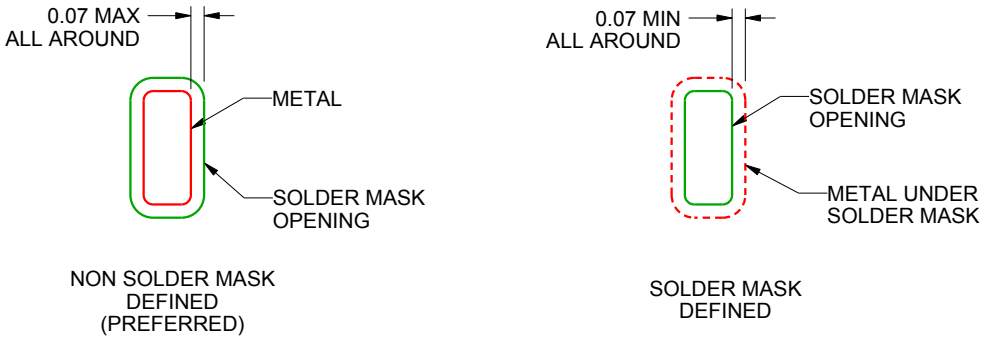


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:20X

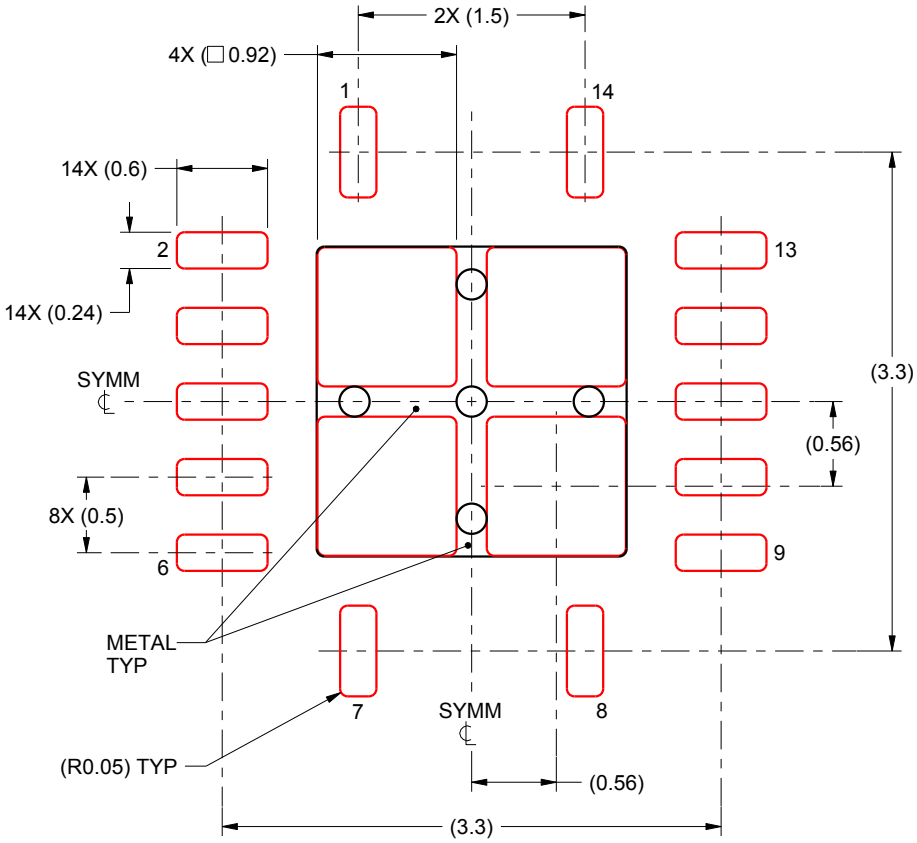


SOLDER MASK DETAILS

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).



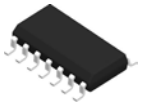
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

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.

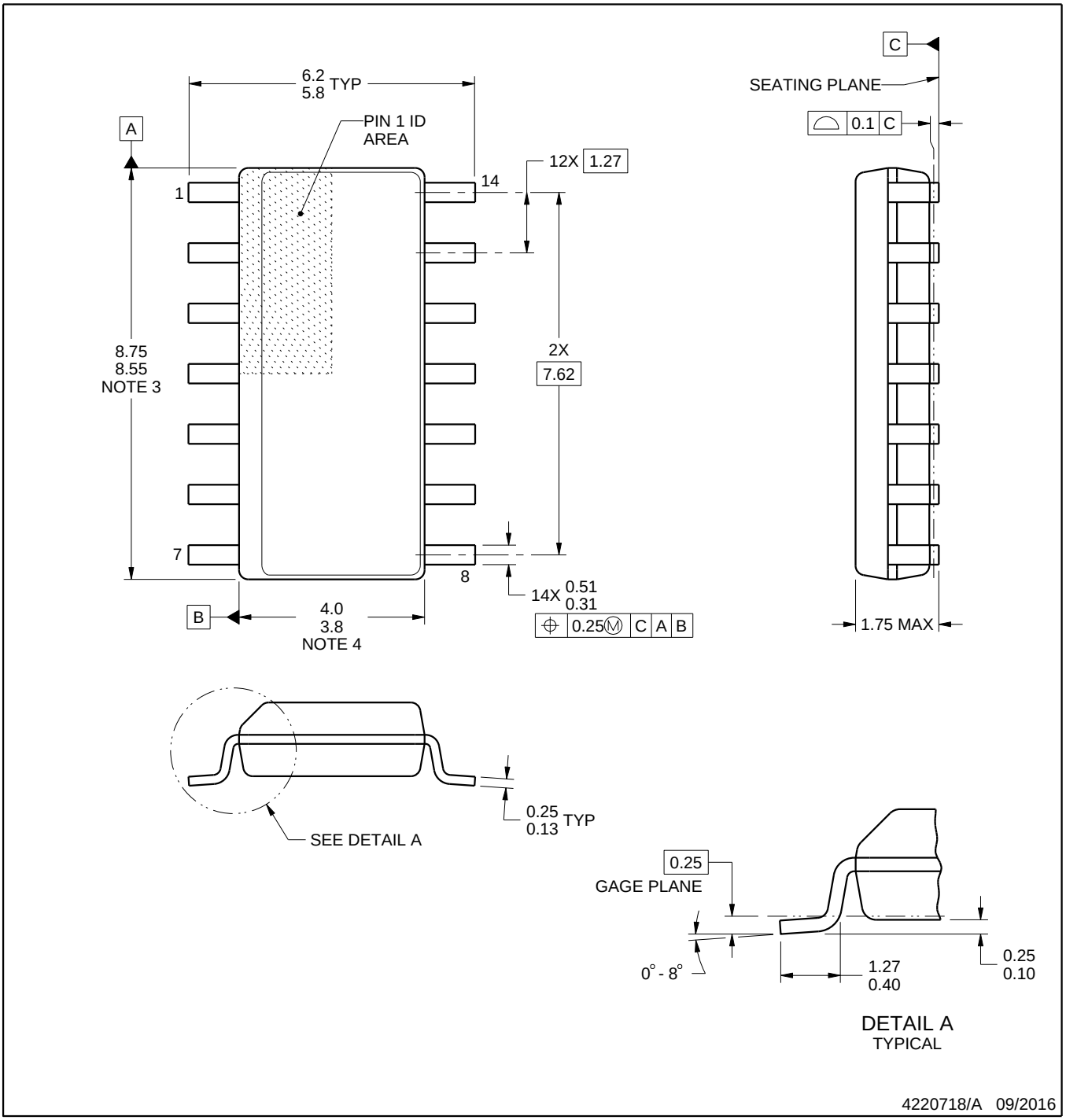


PACKAGE OUTLINE

D0014A

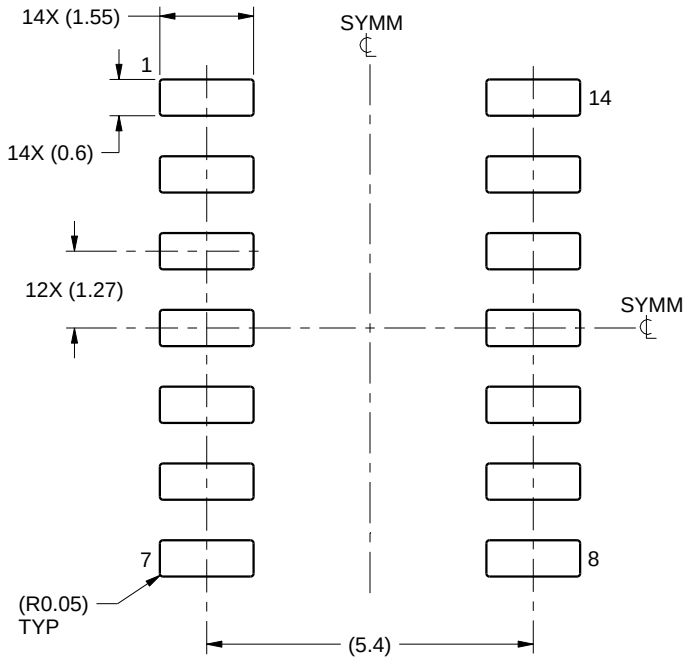
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

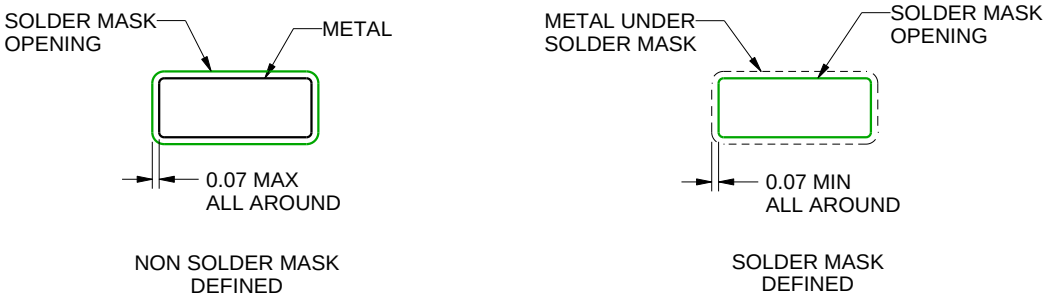


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

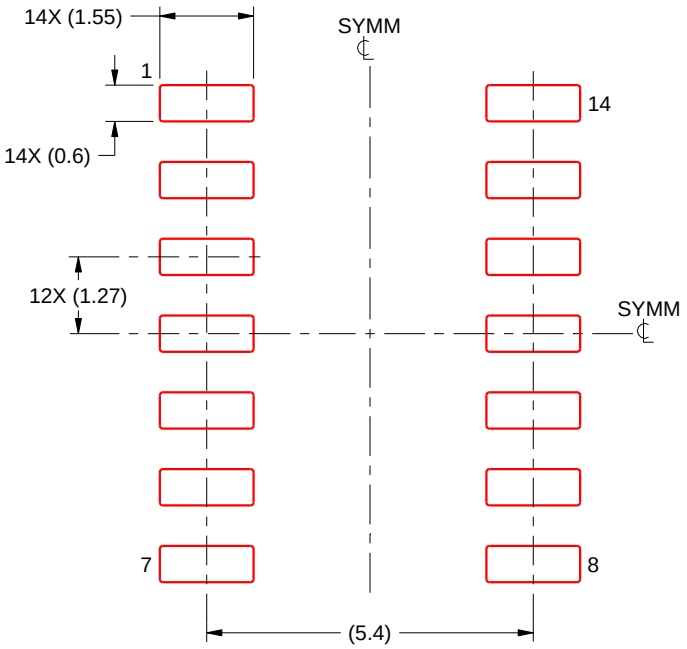
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

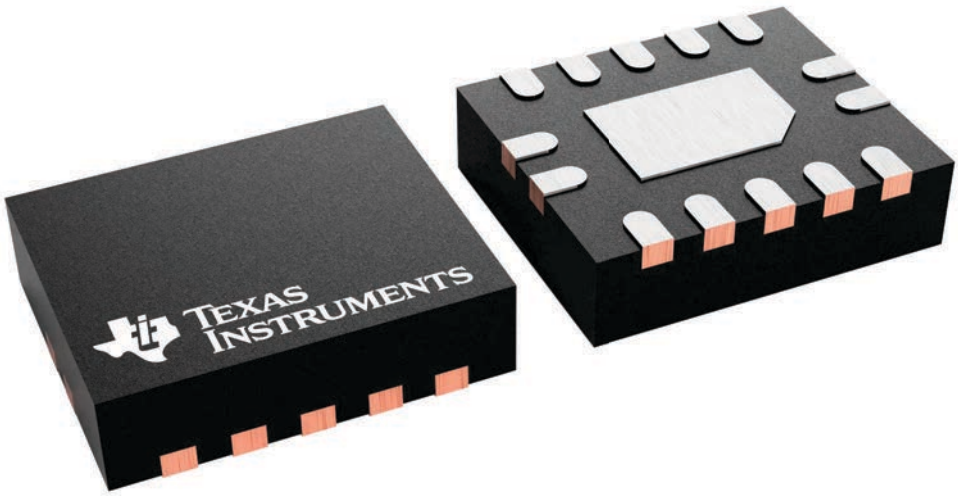
BQA 14

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.

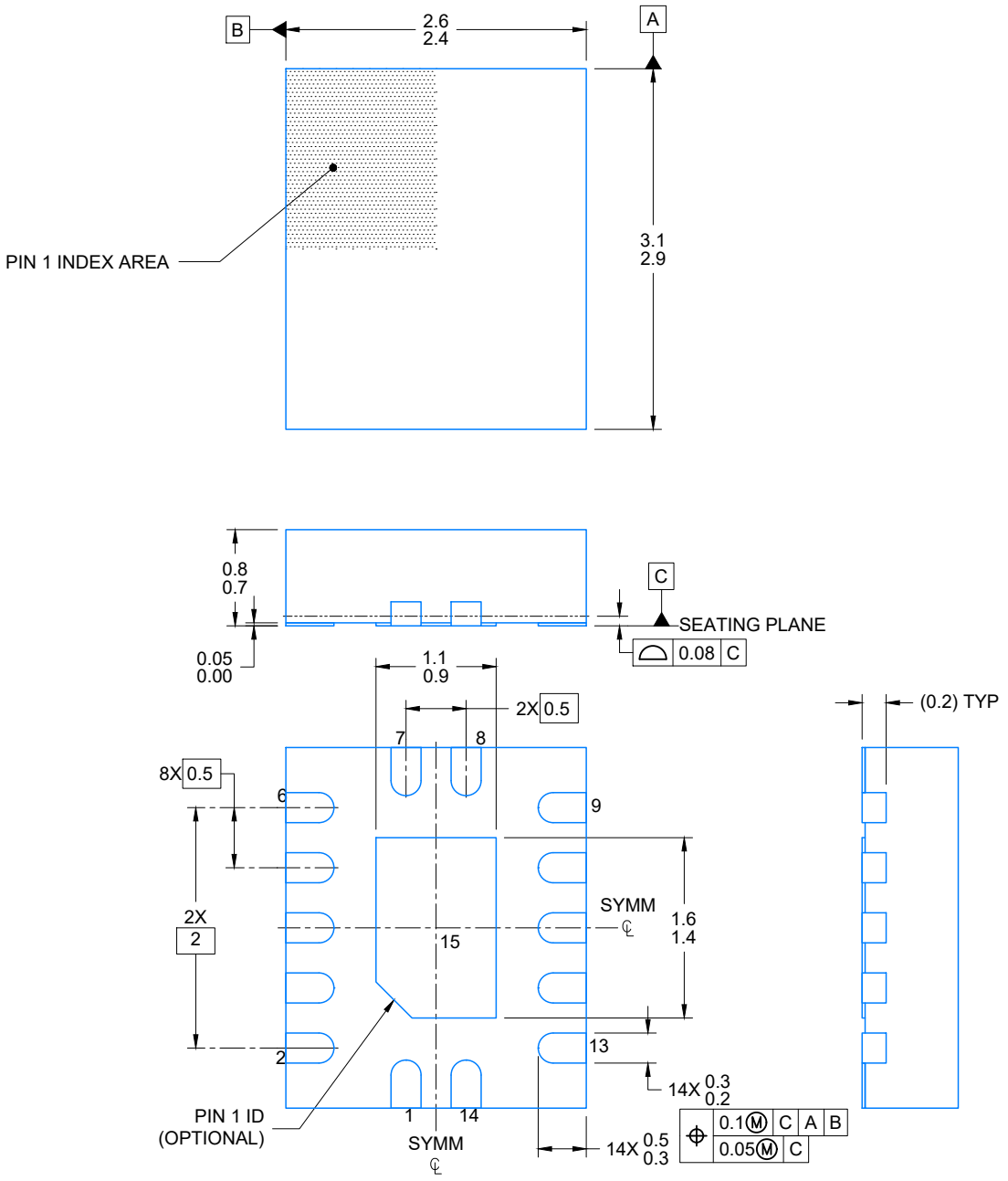


PACKAGE OUTLINE

BQA0014A

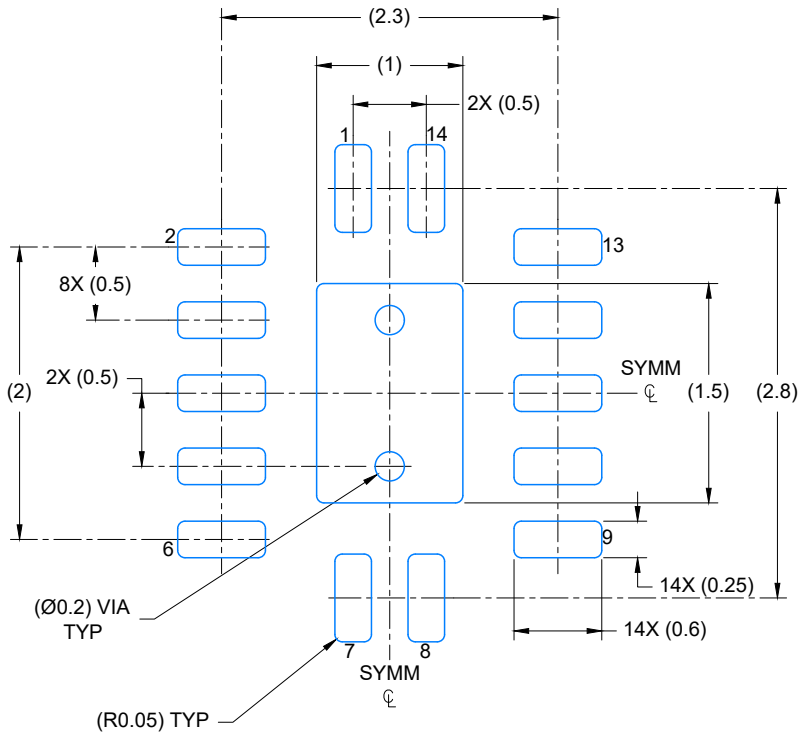
WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD

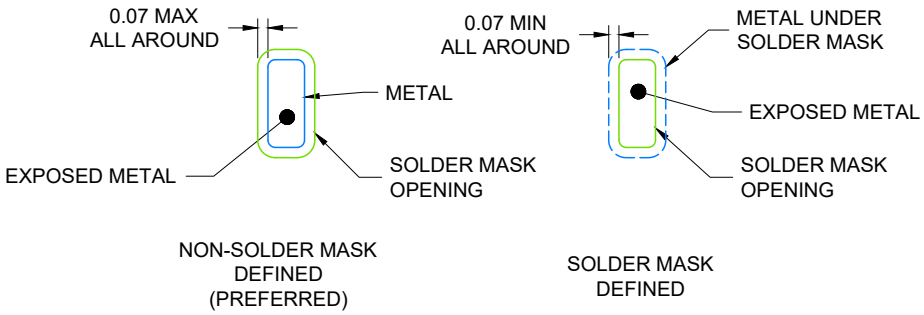


NOTES:

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 optimal thermal and mechanical performance.



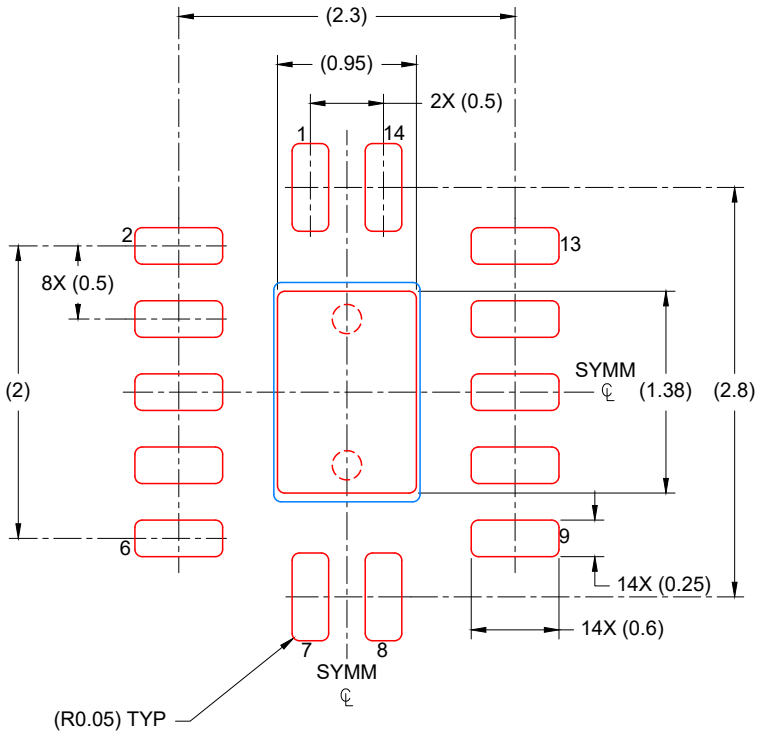
LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



4224636/A 11/2018

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).
5. 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.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

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

4224636/A 11/2018

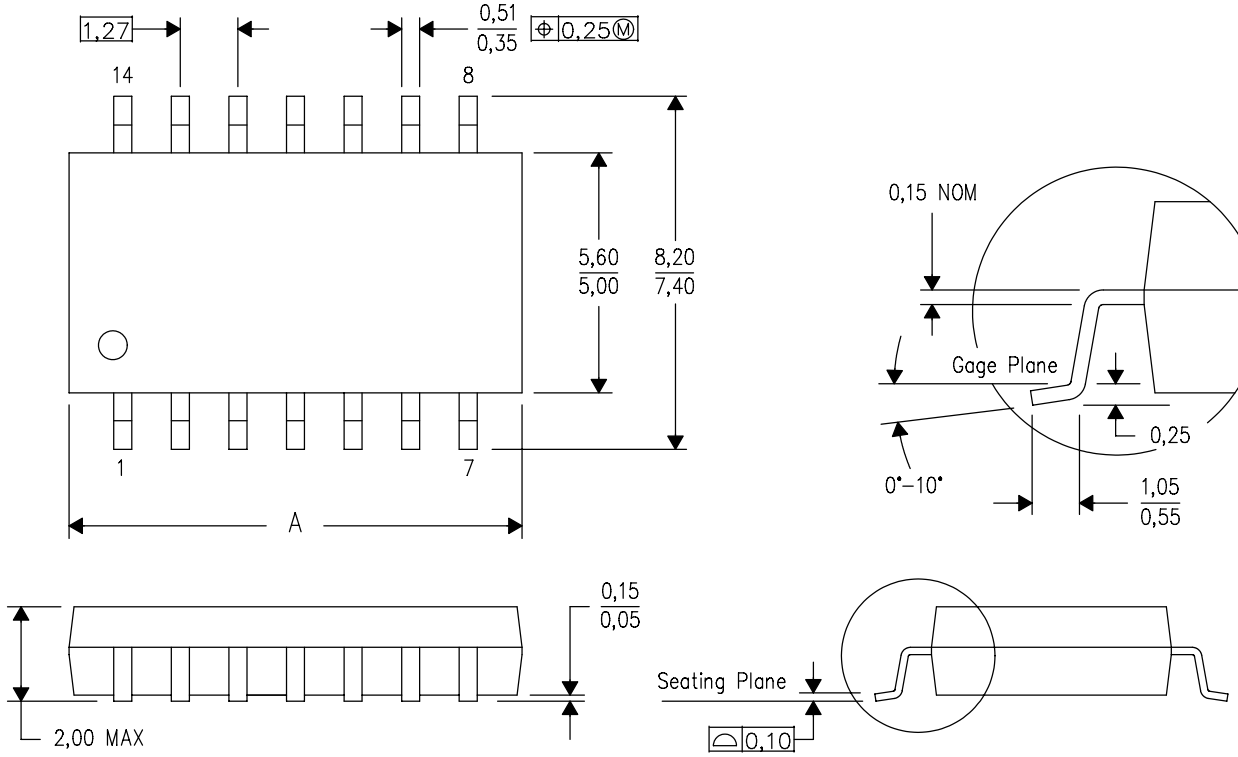
NOTES: (continued)

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



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.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale, TI’s General Quality Guidelines, or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2025, Texas Instruments Incorporated

Last updated 10/2025