



**THE DATASHEET OF  
SMBJ5387C/TR13**



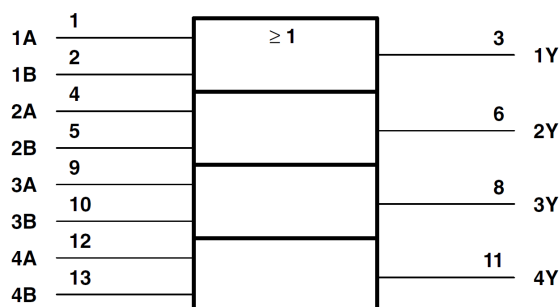
# SN74AHCT32-Q1 Automotive Quadruple 2-Input Positive-OR Gate

## 1 Features

- AEC-Q100 qualified for automotive applications:
  - Device temperature grade 1: -40°C to +125°C
  - Device HBM ESD classification level 2
  - Device CDM ESD classification level C4B
- Available in [wetttable flank](#) QFN (WBQA) package
- Operating range of 4.5V to 5.5V
- Low power consumption, 10µA maximum I<sub>CC</sub>
- ±8mA output drive at 5V
- Inputs are TTL-voltage compatible

## 2 Applications

- [Enable or disable a digital signal](#)
- [Controlling an indicator LED](#)
- [Translation between communication modules and system controllers](#)



Logic Symbol

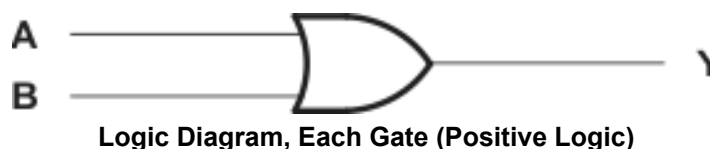
## 3 Description

The SN74AHCT32 is a quadruple 2-input positive-OR gate. This device performs the Boolean function  $Y = \bar{A} \times \bar{B}$  or  $Y = A + B$  in positive logic.

### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>	BODY SIZE <sup>(3)</sup>
SN74AHCT32-Q1	D (SOIC, 14)	8.7mm × 6mm	8.7mm × 3.9mm
	PW (TSSOP, 14)	5mm × 6.4mm	5mm × 4.4mm
	BQA (WQFN, 14)	3mm × 2.5mm	3mm × 2.5mm

- (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.



1

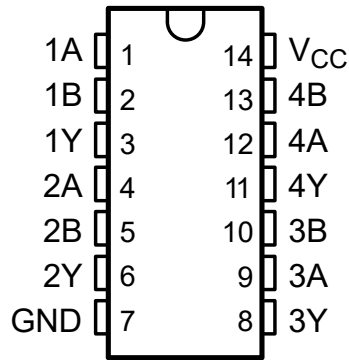
<sup>1</sup> The † symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12



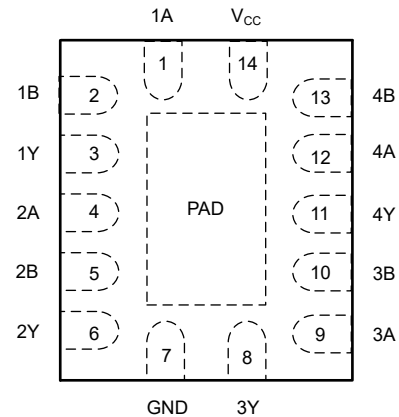
## Table of Contents

<b>1 Features</b> .....	1	7.2 Functional Block Diagram.....	8
<b>2 Applications</b> .....	1	7.3 Device Functional Modes.....	8
<b>3 Description</b> .....	1	<b>8 Application and Implementation</b> .....	9
<b>4 Pin Configuration and Functions</b> .....	3	8.1 Application Information.....	9
<b>5 Specifications</b> .....	4	8.2 Typical Application.....	9
5.1 Absolute Maximum Ratings.....	4	8.3 Power Supply Recommendations.....	11
5.2 ESD Ratings.....	4	8.4 Layout.....	11
5.3 Recommended Operating Conditions.....	4	<b>9 Device and Documentation Support</b> .....	13
5.4 Thermal Information.....	4	9.1 Receiving Notification of Documentation Updates....	13
5.5 Electrical Characteristics.....	5	9.2 Support Resources.....	13
5.6 Switching Characteristics.....	5	9.3 Trademarks.....	13
5.7 Noise Characteristics.....	5	9.4 Electrostatic Discharge Caution.....	13
5.8 Operating Characteristics.....	5	9.5 Glossary.....	13
5.9 Typical Characteristics.....	6	<b>10 Revision History</b> .....	13
<b>6 Parameter Measurement Information</b> .....	7	<b>11 Mechanical, Packaging, and Orderable Information</b> .....	13
<b>7 Detailed Description</b> .....	8		
7.1 Overview.....	8		

## 4 Pin Configuration and Functions



**Figure 4-1. D or PW Package, 14-Pin SOIC or TSSOP (Top View)**



**Figure 4-2. BQA (Preview) Package, 14-Pin WQFN (Top View)**

**Table 4-1. Pin Functions**

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO		
1A	1	I	1A Input
1B	2	I	1B Input
1Y	3	O	1Y Output
2A	4	I	2A Input
2B	5	I	2B Input
2Y	6	O	2Y Output
GND	7	—	Ground Pin
3Y	8	O	3Y Output
3A	9	I	3A Input
3B	10	I	3B Input
4Y	11	O	4Y Output
4A	12	I	4A Input
4B	13	I	4B Input
V <sub>CC</sub>	14	I	Power Pin
Thermal Pad <sup>(2)</sup>		—	The thermal pad can be connected to GND or left floating. Do not connect to any other signal or supply.

(1) I = input, O = output

(2) BQA Package Only

## 5 Specifications

### 5.1 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>	Input voltage range <sup>(2)</sup>	-0.5	7	V
V <sub>O</sub>	Output voltage range <sup>(2)</sup>	-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	-65	150	°C

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### 5.2 ESD Ratings

			VALUE	UNIT
V <sub>(ESD)</sub>	Electrostatic discharge	Human body model (HBM), per AEC Q100-002 <sup>(1)</sup>	All pins	±2000
		Charged device model (CDM), per AEC Q100-011	All pins	±100

- (1) AEC Q100-002 indicates HBM stressing is done in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

### 5.3 Recommended Operating Conditions

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

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

### 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74AHCT32-Q1			UNIT
		D	PW	BQA	
		14PINS	14PINS	14 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	124.6	147.7	88.3	°C/W

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

## 5.5 Electrical Characteristics

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

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

(1) This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V<sub>CC</sub>.

## 5.6 Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 15 pF		5	6.9	1	8	ns
t <sub>PHL</sub>					5	6.9	1	8	
t <sub>PLH</sub>	A or B	Y	C <sub>L</sub> = 50 pF		5.5	7.9	1	9	ns
t <sub>PHL</sub>					5.5	7.9	1	9	

## 5.7 Noise Characteristics

V<sub>CC</sub> = 5 V, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C<sup>(1)</sup>

PARAMETER		SN74AHCT32-Q1			UNIT
		MIN	TYP	MAX	
V <sub>OL(P)</sub>	Quiet output, maximum dynamic V <sub>OL</sub>		0.4	0.8	V
V <sub>OL(V)</sub>	Quiet output, minimum dynamic V <sub>OL</sub>		-0.4	-0.8	V
V <sub>OH(V)</sub>	Quiet output, minimum dynamic V <sub>OH</sub>		4.5		V
V <sub>IH(D)</sub>	High-level dynamic input voltage		2		V
V <sub>IL(D)</sub>	Low-level dynamic input voltage			0.8	V

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

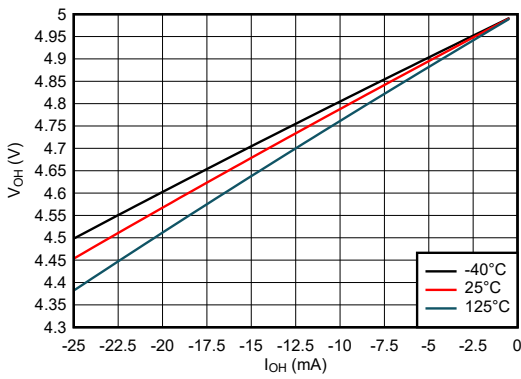
## 5.8 Operating Characteristics

V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

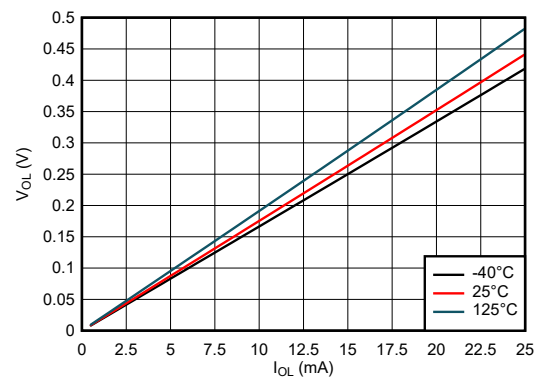
PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance No load, f = 1 MHz	11.5	pF

### 5.9 Typical Characteristics

T<sub>A</sub> = 25°C (unless otherwise noted)

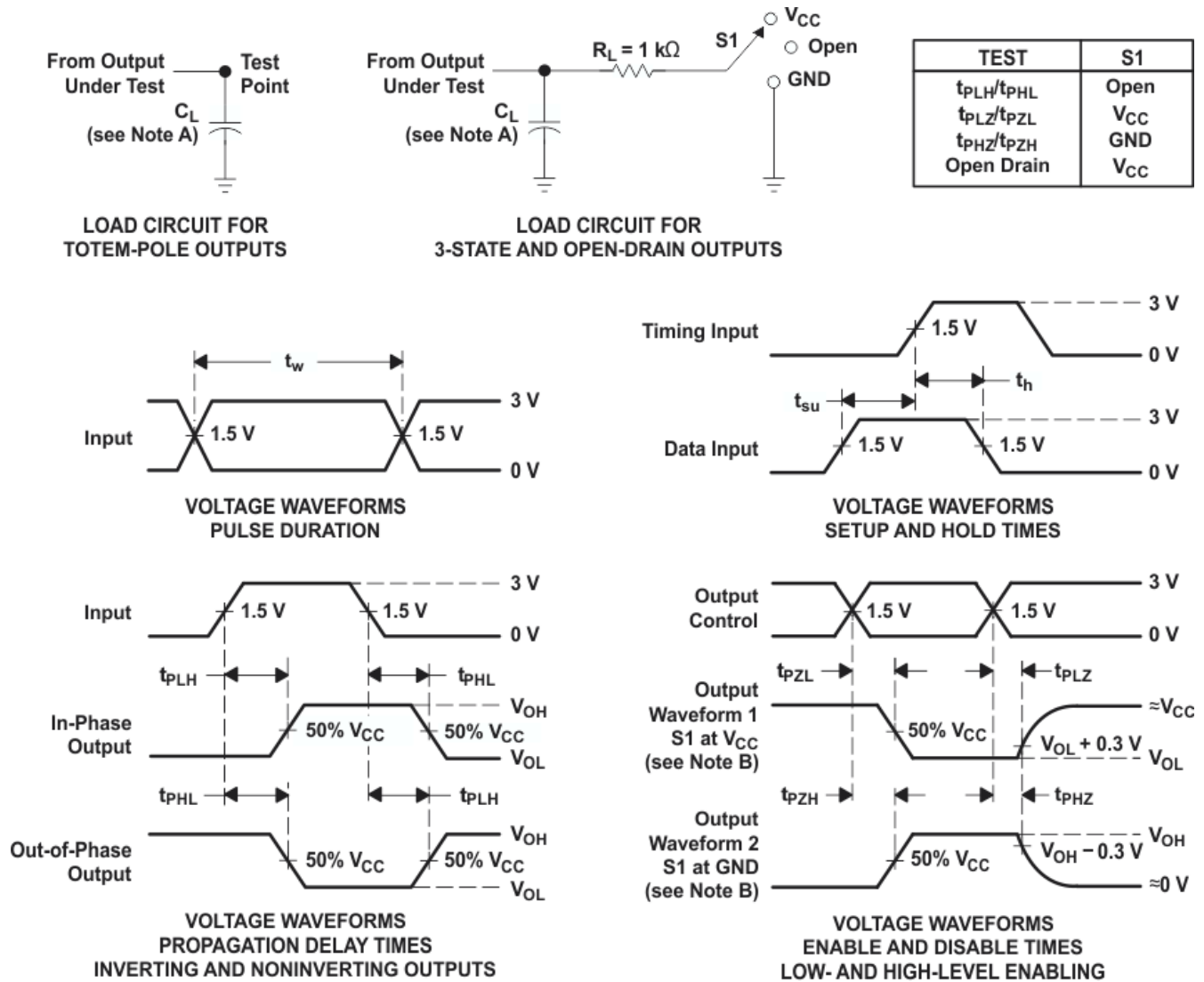


**Figure 5-1. Output Voltage vs Current in HIGH State; 5-V Supply**



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

## 6 Parameter Measurement Information



- 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:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.
  - D. The outputs are measured one at a time with one input transition per measurement.
  - E. All parameters and waveforms are not applicable to all devices.

Figure 6-1. Load Circuit and Voltage Waveforms

## 7 Detailed Description

### 7.1 Overview

The SN74AHCT32-Q1 is a quadruple 2-input positive-OR gate with low drive that will produce slow rise and fall times. This slow transition reduces ringing on the output signal. The device has TTL inputs that allow up translation from 3.3 V to 5 V. The inputs are high impedance when  $V_{CC} = 0$  V.

### 7.2 Functional Block Diagram



### 7.3 Device Functional Modes

Table 7-1. Function Table  
(Each Gate)

INPUTS		OUTPUT Y
A	B	
H	X	H
X	H	H
L	L	L

## 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. Customers should validate and test their design implementation to confirm system functionality.

### 8.1 Application Information

In this application, three 2-input OR gates are combined to produce a 4-input OR gate function as shown in [Typical Application Block Diagram](#). The fourth gate can be used for another application in the system, or the inputs can be grounded and the channel left unused.

The SN74AHCT32-Q1 is used to directly control the Enable pin of a fan driver. The fan driver requires only one input signal to be HIGH before being enabled, and should be disabled in the event that all signals go LOW. The 4-input OR gate function combines the four individual overhear signals into a single active-high enable signal.

Temperature sensors can often be spread throughout a system rather than being in a centralized location. This would mean longer length traces or wires to pass signals through leading to slower edge transitions. This makes the SN74AHCT32-Q1 useful for combining the incoming signals.

### 8.2 Typical Application

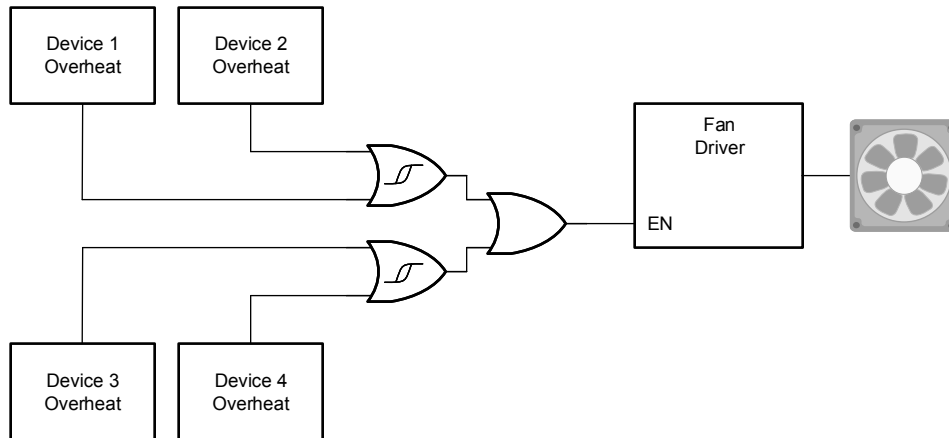


Figure 8-1. Typical Application Block Diagram

#### 8.2.1 Design Requirements

##### 8.2.1.1 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 SN74AHCT32-Q1 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 SN74AHCT32-Q1 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 SN74AHCT32-Q1 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.

### 8.2.1.2 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 SN74AHCT32-Q1 (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.

### 8.2.1.3 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.

## 8.2.2 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 SN74AHCT32-Q1 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](#).

### 8.2.2.1 Application Curves

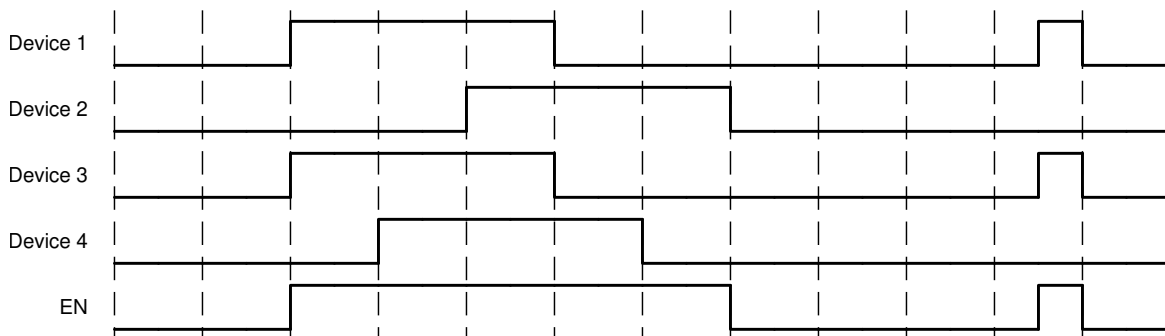


Figure 8-2. Application Timing Diagram

## 8.3 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply-voltage rating located in [Section 5.3](#).

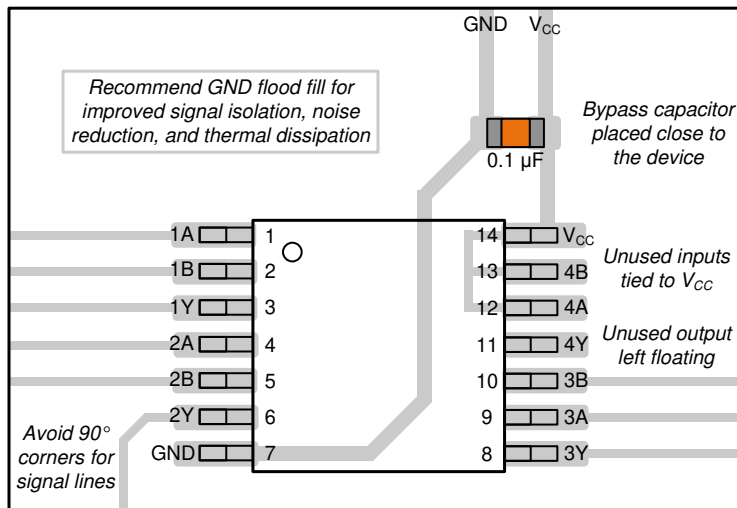
The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- $\mu$ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. The 0.1- $\mu$ F and 1- $\mu$ 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 *Layout Example*.

## 8.4 Layout

### 8.4.1 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.

**8.4.1.1 Layout Example**



**Figure 8-3. Example Layout for the SN74AHCT32-Q1**

## 9 Device and Documentation Support

### 9.1 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 *Notifications* 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.

### 9.2 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](#).

### 9.3 Trademarks

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

### 9.4 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.

### 9.5 Glossary

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

## 10 Revision History

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

<b>Changes from Revision C (July 2023) to Revision D (February 2024)</b>	<b>Page</b>
--	-------------

- |   |   |
|---|---|
| • Updated RθJA value: D = 86 to 124.6, all values in °C/W ..... | 4 |
|---|---|

<b>Changes from Revision B (May 2023) to Revision C (July 2023)</b>	<b>Page</b>
---	-------------

- |   |   |
|---|---|
| • Updated thermal values for PW package from RθJA = 113 to 147.7, all values in °C/W..... | 4 |
|---|---|

## 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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74AHCT32QDRG4Q1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT32Q	<a href="#">Samples</a>
SN74AHCT32QDRQ1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT32Q	<a href="#">Samples</a>
SN74AHCT32QPWRG4Q1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT32Q	<a href="#">Samples</a>
SN74AHCT32QPWRQ1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(AHCT32Q, HB32Q)	<a href="#">Samples</a>
SN74AHCT32QWBQARQ1	ACTIVE	WQFN	BQA	14	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHT32Q	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSELETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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

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

**OTHER QUALIFIED VERSIONS OF SN74AHCT32-Q1 :**

- Catalog : [SN74AHCT32](#)
- Enhanced Product : [SN74AHCT32-EP](#)
- Military : [SN54AHCT32](#)

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
SN74AHCT32QPWRG4Q1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT32QPWRQ1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT32QPWRQ1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT32QWBQARQ1	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	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)
SN74AHCT32QPWRG4Q1	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74AHCT32QPWRQ1	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74AHCT32QPWRQ1	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74AHCT32QWBQARQ1	WQFN	BQA	14	3000	210.0	185.0	35.0

## GENERIC PACKAGE VIEW

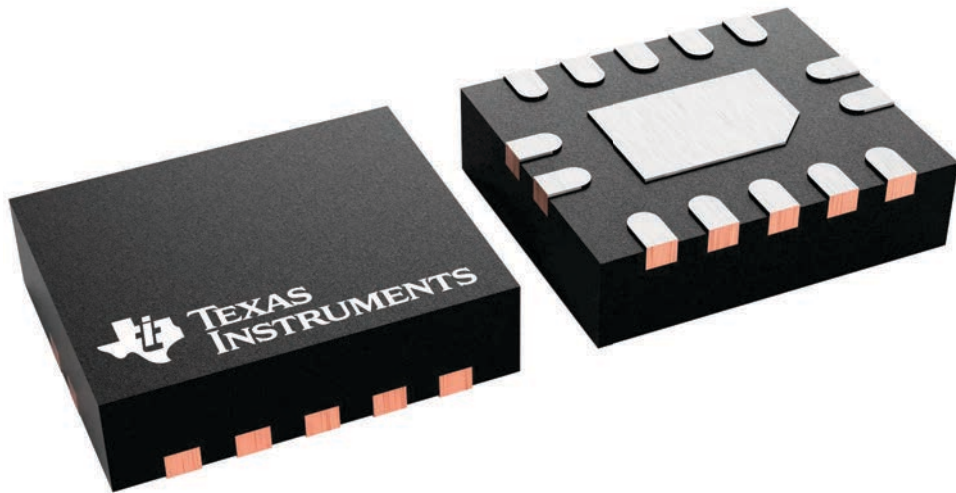
**BQA 14**

**WQFN - 0.8 mm max height**

2.5 x 3, 0.5 mm pitch

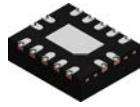
PLASTIC QUAD FLATPACK - NO LEAD

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



4227145/A

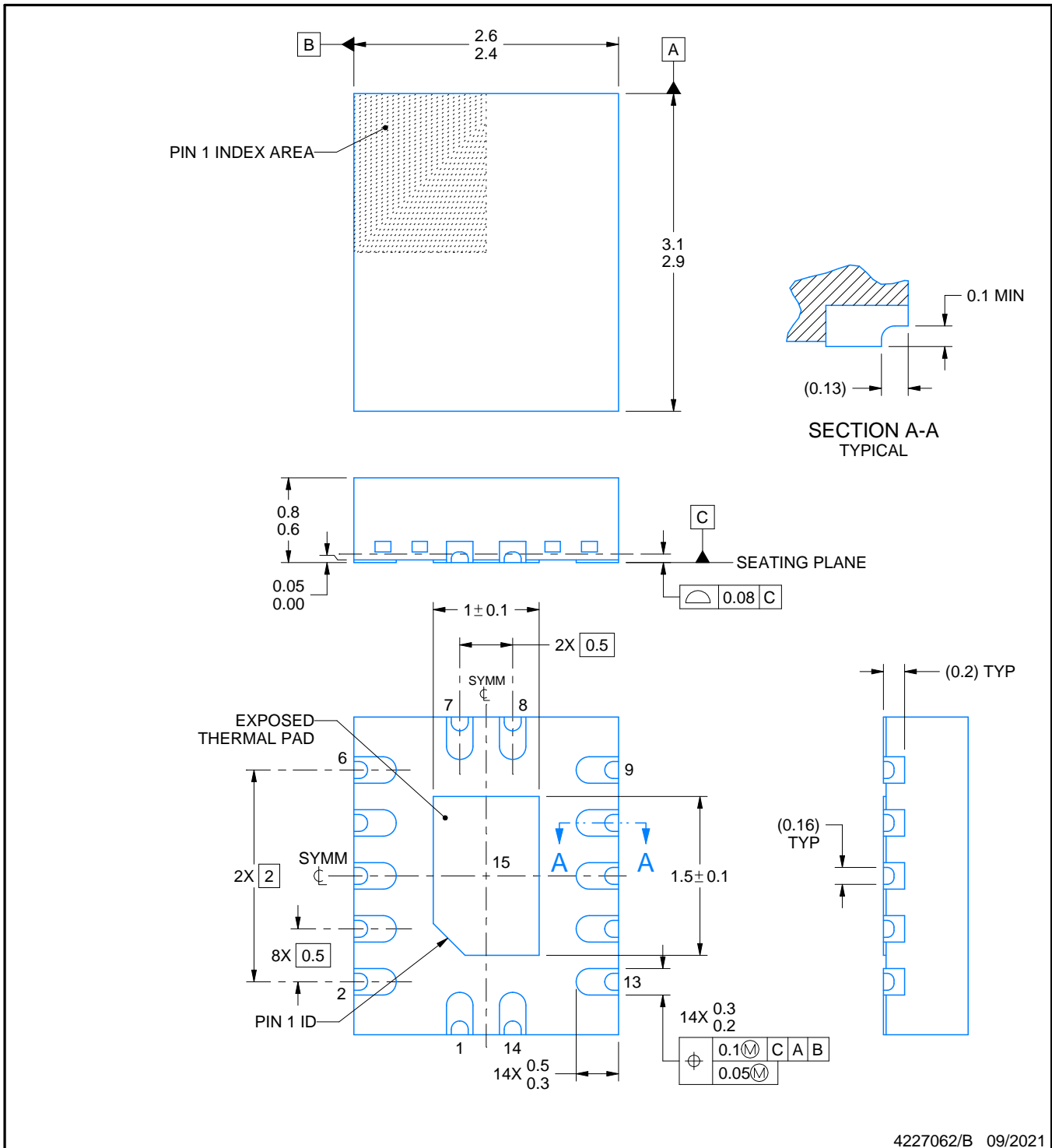
# BQA0014B



# PACKAGE OUTLINE

## WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4227062/B 09/2021

### NOTES:

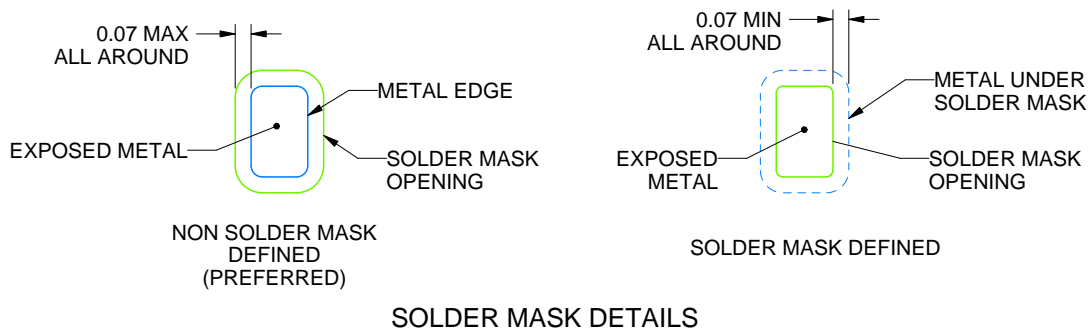
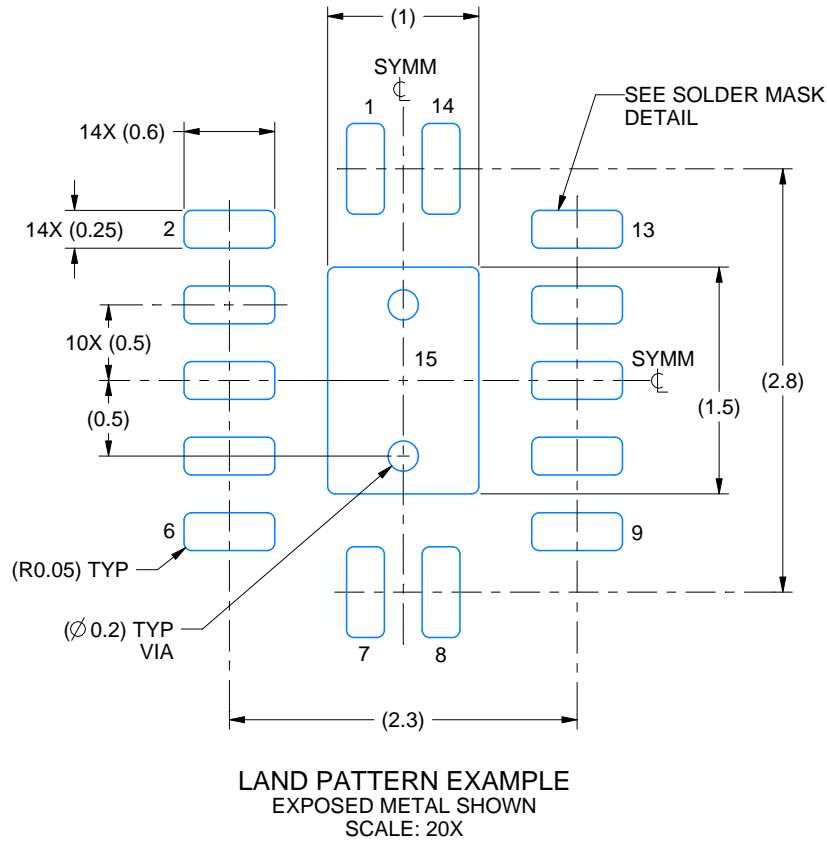
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

**BQA0014B**

**WQFN - 0.8 mm max height**

PLASTIC QUAD FLATPACK - NO LEAD



4227062/B 09/2021

NOTES: (continued)

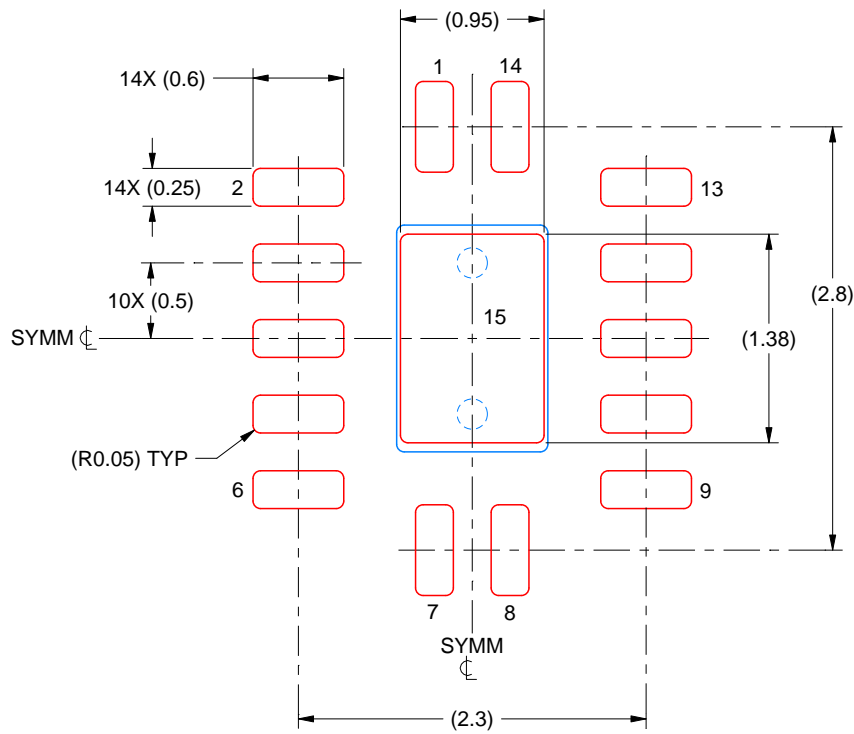
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented,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

# EXAMPLE STENCIL DESIGN

BQA0014B

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 MM THICK STENCIL  
SCALE: 20X

EXPOSED PAD 15  
87% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

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NOTES: (continued)



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

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

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



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211284-2/G 08/15

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

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