

SNx4LVC32A Quadruple 2-Input Positive-OR Gates

1 Features

- Operate from 1.65V to 3.6V
- Specified from -40°C to $+85^{\circ}\text{C}$, -40°C to $+125^{\circ}\text{C}$, and -55°C to $+125^{\circ}\text{C}$
- Inputs accept voltages to 5.5V
- Max t_{pd} of 3.8ns at 3.3V
- Typical V_{OLP} (output ground bounce) $< 0.8\text{V}$ at $V_{CC} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$
- Typical V_{OHV} (output V_{OH} undershoot) $> 2\text{V}$ at $V_{CC} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$
- Latch-up performance exceeds 250mA per JESD 17
- 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.
- ESD protection exceeds JESD 22
 - 2000V human-body model
 - 1000V charged-device model

2 Applications

- AV Receivers
- Audio Docks: Portable
- Blu-ray Players and Home Theater
- MP3 Players or Recorders
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drives (SSDs): Client and Enterprise
- TVs: LCD, Digital, and High-Definition (HDTV)
- Tablets: Enterprise
- Video Analytics: Server
- Wireless Headsets, Keyboards, and Mice

3 Description

The SN54LVC32A quadruple 2-input positive-OR gate is designed for 2.7V to 3.6V V_{CC} operation, and the SN74LVC32A quadruple 2-input positive-OR gate is designed for 1.65V to 3.6V V_{CC} operation.

The SNx4LVC32A devices perform the Boolean function $Y = A + B$ or $Y = \overline{A} \cdot \overline{B}$ 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⁾
SNx4LVC32A	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 × 6.4mm	5.00mm × 4.40mm
	RGY (VQFN, 14)	3.50mm × 3.50mm	3.50mm × 3.50mm
	FK (LCCC, 20)	8.9mm × 8.9mm	8.9mm × 8.9mm
	J (CDIP, 14)	19.55mm × 7.9mm	19.55 mm × 6.7mm
	W (CFP, 14)	9.21mm × 9mm	9.21mm × 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.

Simplified Schematic

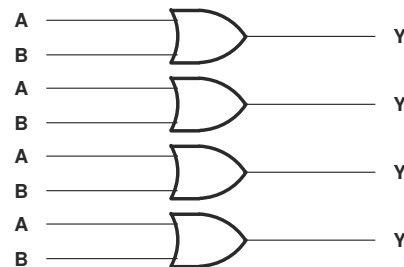


Table of Contents

1 Features	1	5.11 Typical Characteristics.....	7
2 Applications	1	6 Parameter Measurement Information	8
3 Description	1	7 Detailed Description	9
4 Pin Configuration and Functions	3	7.1 Overview.....	9
5 Specifications	4	7.2 Functional Block Diagram.....	9
5.1 Absolute Maximum Ratings.....	4	7.3 Feature Description.....	9
5.2 ESD Ratings.....	4	7.4 Device Functional Modes.....	9
5.3 Recommended Operating Conditions, SN54LVC32A.....	5	8 Device and Documentation Support	12
5.4 Recommended Operating Conditions, SN74LVC32A.....	5	8.1 Documentation Support.....	12
5.5 Thermal Information.....	6	8.2 Receiving Notification of Documentation Updates....	12
5.6 Electrical Characteristics, SN54LVC32A.....	6	8.3 Support Resources.....	12
5.7 Electrical Characteristics, SN74LVC32A.....	6	8.4 Trademarks.....	12
5.8 Switching Characteristics, SN54LVC32A.....	7	8.5 Electrostatic Discharge Caution.....	12
5.9 Switching Characteristics, SN74LVC32A.....	7	8.6 Glossary.....	12
5.10 Operating Characteristics.....	7	9 Revision History	12
		10 Mechanical, Packaging, and Orderable Information	13

4 Pin Configuration and Functions

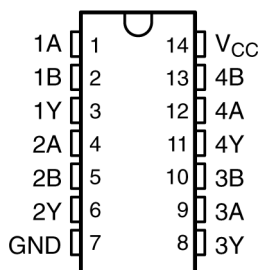


Figure 4-1. SN54LVC32A J or W Package, 14-Pin (Top View)

SN74LVC32A D, DB, NS, or PW Package, 14-Pin CDIP, CFP, SOIC, SSOP, SOP, TSSOP (Top View)

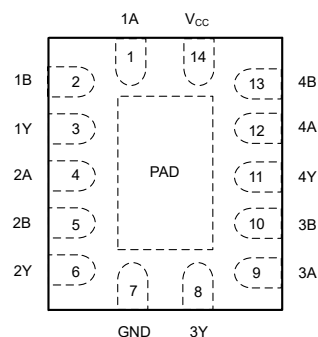


Figure 4-2. SN74LVC32A RGY or BQA Package, 14-Pin VQFN or WQFN (Top View)

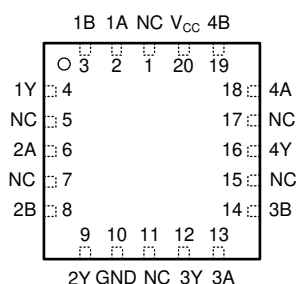


Figure 4-3. SN54LVC32A FK Package, 20-Pin LCCC (Top View)

Table 4-1. Pin Functions

PIN					TYPE	DESCRIPTION
NAME	SN74LVC32A		SN54LVC32A			
	D, DB, NS, PW	BQA, RGY	J, W	FK		
1A	1	1	1	2	I	Gate 1 input
1B	2	2	2	3	I	Gate 1 input
1Y	3	3	3	4	O	Gate 1 output
2A	4	4	4	6	I	Gate 2 input
2B	5	5	5	8	I	Gate 2 input
2Y	6	6	6	9	O	Gate 2 output
GND	7	7	7	10	—	Ground Pin
3Y	8	8	8	12	O	Gate 3 output
3A	9	9	9	13	I	Gate 3 input
3B	10	10	10	14	I	Gate 3 input
4Y	11	11	11	16	O	Gate 4 output
4A	12	12	12	18	I	Gate 4 input
4B	13	13	13	19	I	Gate 4 input
V _{CC}	14	14	14	20	—	Power Pin
NC	—	—	—	1, 5, 7, 11, 15, 17	—	No Connection

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	T _A = –40°C to +125°C ^{(4) (5)}		500	mW
T _J	Junction temperature			150	°C
T _{stg}	Storage temperature		–65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, 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 negative-voltage and output 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* tables.
- (4) For the D package: above 70°C, the value of P_{tot} derates linearly with 8 mW/K.
- (5) For the DB, DGV, 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⁾	V
		Charged device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	
		±2000	
		±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.

5.3 Recommended Operating Conditions, SN54LVC32A

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

			SN54LVC32A		UNIT
			–55 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} = 2.7 V to 3.6 V	2		V
V _{IL}	Low-level input voltage	V _{CC} = 2.7 V to 3.6 V		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} = 2.7 V		–12	mA
		V _{CC} = 3 V		–24	
I _{OL}	Low-level output current	V _{CC} = 2.7 V		12	mA
		V _{CC} = 3 V		24	
Δt/Δv	Input transition rise and fall rate			7	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.

5.4 Recommended Operating Conditions, SN74LVC32A

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

			SN74LVC32A						UNIT
			T _A = 25°C		–40 to +85°C		–40 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} = 1.65 V to 1.95 V	0.65 × V _{CC}		0.65 × V _{CC}		0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		1.7		1.7		
		V _{CC} = 2.7 V to 3.6 V	2		2		2		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.35 × V _{CC}		0.35 × V _{CC}		0.35 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	0.7		0.7		0.7		
		V _{CC} = 2.7 V to 3.6 V	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} = 1.65 V	–4		–4		–4		mA
		V _{CC} = 2.3 V	–8		–8		–8		
		V _{CC} = 2.7 V	–12		–12		–12		
		V _{CC} = 3 V	–24		–24		–24		
I _{OL}	Low-level output current	V _{CC} = 1.65 V	4		4		4		mA
		V _{CC} = 2.3 V	8		8		8		
		V _{CC} = 2.7 V	12		12		12		
		V _{CC} = 3 V	24		24		24		
Δt/Δv	Input transition rise and fall rate		7		7		7		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⁾	SN74LVC32A						UNIT
	BQA (WQFN)	D (SOIC)	DB (SSOP)	NS (SOP)	PW (TSSOP)	RGY (VQFN)	
	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

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

5.6 Electrical Characteristics, SN54LVC32A

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

PARAMETER	TEST CONDITIONS		V _{CC}	SN54LVC32A		UNIT
				–55 to +125°C		
				MIN	MAX	
V _{OH}	I _{OH} = –100 μA		2.7 V to 3.6 V	V _{CC} – 0.2		V
	I _{OH} = –12 mA		2.7 V	2.2		
			3 V	2.4		
	I _{OH} = –24 mA		3 V	2.2		
V _{OL}	I _{OL} = 100 μA		2.7 V to 3.6 V	0.2		V
	I _{OL} = 12 mA		2.7 V	0.4		
	I _{OL} = 24 mA		3 V	0.55		
I _I	V _I = 5.5 V or GND		3.6 V	±5		μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0		3.6 V	10		μA
ΔI _{CC}	One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND		2.7 V to 3.6 V	500		μA

5.7 Electrical Characteristics, SN74LVC32A

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

PARAMETER	TEST CONDITIONS	V _{CC}	SN74LVC32A						UNIT	
			T _A = 25°C			−40 to +85°C		−40 to +125°C		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = −100 μA	1.65 V to 3.6 V	V _{CC} − 0.2			V _{CC} − 0.2		V _{CC} − 0.3		V
	I _{OH} = −4 mA	1.65 V	1.29			1.2		1.05		
	I _{OH} = −8 mA	2.3 V	1.9			1.7		1.55		
	I _{OH} = −12 mA	2.7 V	2.2			2.2		2.05		
		3 V	2.4			2.4		2.25		
I _{OH} = −24 mA	3 V	2.3			2.2		2			
V _{OL}	I _{OL} = 100 μA	1.65 V to 3.6 V	0.1			0.2		0.3		V
	I _{OL} = 4 mA	1.65 V	0.24			0.45		0.6		
	I _{OL} = 8 mA	2.3 V	0.3			0.7		0.85		
	I _{OL} = 12 mA	2.7 V	0.4			0.4		0.6		
	I _{OL} = 24 mA	3 V	0.55			0.55		0.8		
I _I	V _I = 5.5 V or GND	3.6 V	±1			±5		±20		μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	3.6 V	1			10		40		μA
ΔI _{CC}	One input at V _{CC} − 0.6 V, Other inputs at V _{CC} or GND	2.7 V to 3.6 V	500			500		5000		μA

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

Operating free air temperature range (unless otherwise noted)										
PARAMETER	TEST CONDITIONS	V _{CC}	SN74LVC32A						UNIT	
			T _A = 25°C			–40 to +85°C		–40 to +125°C		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
C _i	V _I = V _{CC} or GND	3.3 V	5							pF

5.8 Switching Characteristics, SN54LVC32A

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	SN54LVC32A		UNIT
				–55 to +125°C		
				MIN	MAX	
t _{pd}	A or B	Y	2.7V	4.4		ns
			3.3V ± 0.3V	1	3.8	

5.9 Switching Characteristics, SN74LVC32A

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	SN74LVC32A						UNIT	
				T _A = 25°C			–40 to +85°C		–40 to +125°C		
				MIN	TYP	MAX	MIN	MAX	MIN		MAX
t _{pd}	A or B	Y	1.8V ± 0.15V	1	4.2	8.2	1	8.7	1	10.2	ns
			2.5V ± 0.2V	1	2.6	4.9	1	5.4	1	6.9	
			2.7V	1	3	4.2	1	4.4	1	5.5	
			3.3V ± 0.3V	1	2.5	3.6	1	3.8	1	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	1.8V	7.5	pF
			2.5V	10.6	
			3.3V	12.5	

5.11 Typical Characteristics

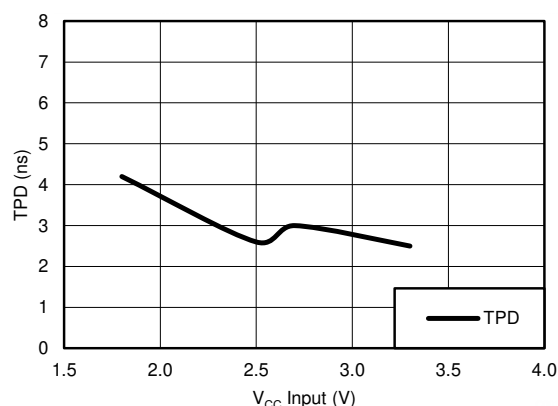
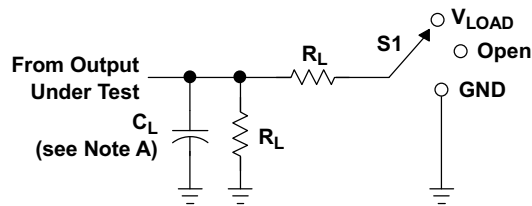


Figure 5-1. TPD vs V_{CC} (T_A = 25°C)

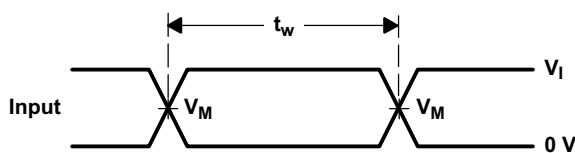
6 Parameter Measurement Information



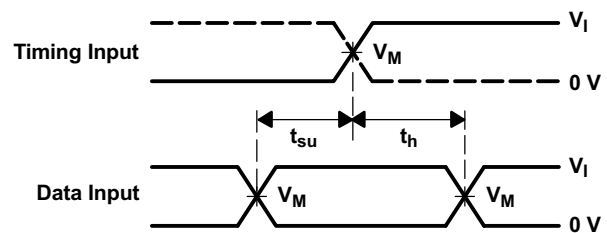
LOAD CIRCUIT

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

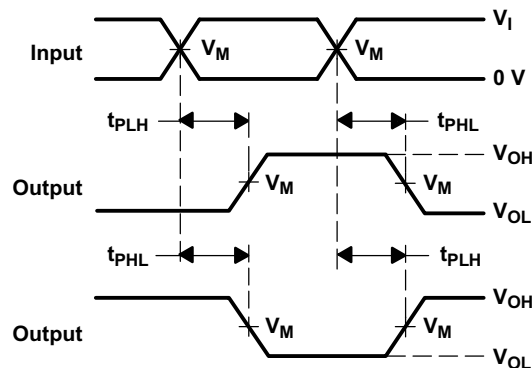
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V
$3.3\text{ V} \pm 0.3\text{ V}$	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V



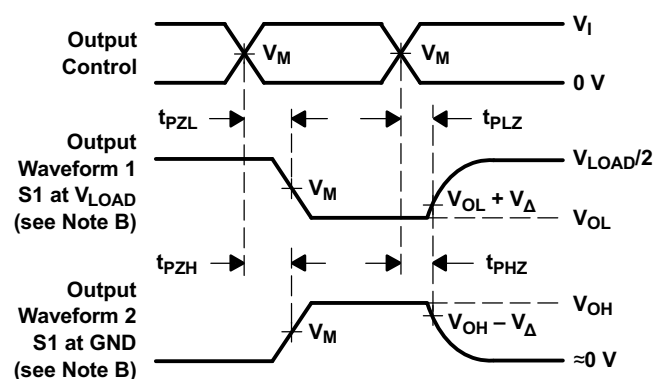
VOLTAGE WAVEFORMS
PULSE DURATION



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:
- 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 $\leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - 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 SN54LVC32A quadruple 2-input positive-OR gate is designed for 2-V to 3.6-V V_{CC} operation, and the SN74LVC32A quadruple 2-input positive-OR gate is designed for 1.65-V to 3.6-V V_{CC} operation.

The SNx4LVC32A devices perform the Boolean function $Y = A + B$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic.

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

7.2 Functional Block Diagram



Logic Diagram, Each Gate (Positive Logic)

7.3 Feature Description

- Wide operating voltage range
 - Operates from 1.65 V to 3.6 V
- Allows up or down voltage translation
 - Inputs accept voltages to 5.5 V

7.4 Device Functional Modes

Table 7-1 lists the functional modes of SNx4LVC32A.

**Table 7-1. Function Table
(Each Gate)**

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

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.

1 Application Information

SN74LVC32A device is a high-drive, CMOS device that can be used for a multitude of buffer-type functions. It can produce 24 mA of drive current at 3 V. Therefore, this device is ideal for driving multiple inputs and for high-speed applications up to 100 MHz. The inputs and outputs are 5.5-V tolerant allowing the device to translate down to V_{CC} .

2 Typical Application

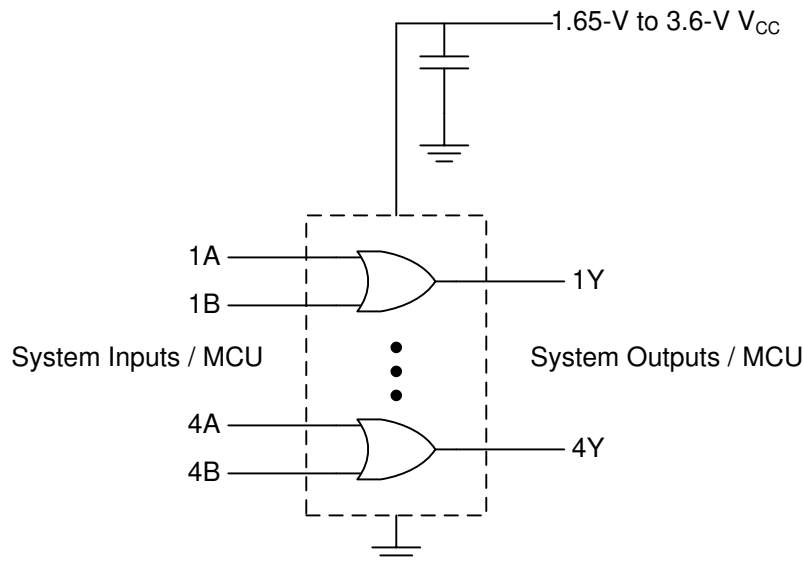


Figure 8-1. Typical OR Gate Application and Supply Voltage

2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken 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; therefore, routing and load conditions should be considered to prevent ringing.

2.2 Detailed Design Procedure

- Recommended Input Conditions
 - Rise time and fall time specs: See $(\Delta t/\Delta V)$ in the [Section 5.4](#) table.
 - Specified high and low levels: See $(V_{IH}$ and V_{IL}) in the [Section 5.4](#) table.
 - Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid V_{CC} .
- Recommended Output Conditions
 - Load currents should not exceed 25 mA per output and 50 mA total for the part.
 - Outputs should not be pulled above 5.5 V.

2.3 Application Curve

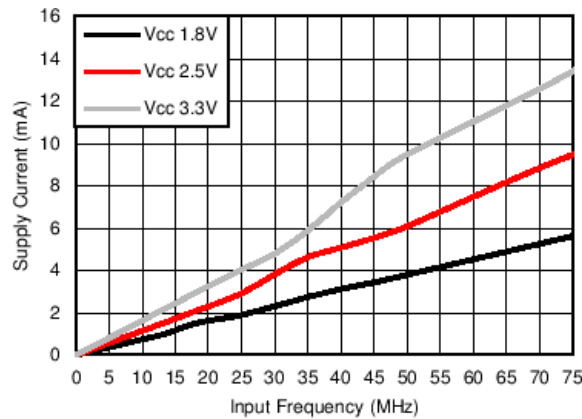


Figure 8-2. Supply Current vs Input Frequency

Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Section 5.4](#) table.

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 μ F is recommended; if there are multiple V_{CC} pins, then 0.01 μ F or 0.022 μ F is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1 μ F and a 1 μ F are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

3 Layout

3.1 Layout Guidelines

When using multiple bit logic devices inputs should never float.

In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used or only 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. [Section 8.3.2](#) specifies the 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 V_{CC}, whichever makes more sense or is more convenient. It is generally acceptable to float outputs, unless the part is a transceiver.

3.2 Layout Example

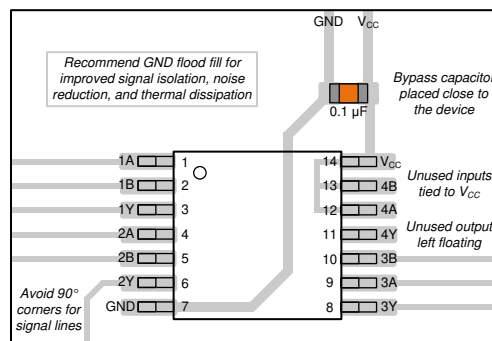


Figure 8-3. Layout Diagram

8 Device and Documentation Support

8.1 Documentation Support

8.1.1 Related Links

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

Table 8-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54LVC32A	Click here	Click here	Click here	Click here	Click here
SN74LVC32A	Click here	Click here	Click here	Click here	Click here

8.2 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.

8.3 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](#).

8.3.1 Community Resources

8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

8.5 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.

8.6 Glossary

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

9 Revision History

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

Changes from Revision T (May 2024) to Revision U (July 2024)	Page
• Updated thermal values for D package from RθJA = 86 to 127.8, all values in °C/W	6

Changes from Revision S (March 2024) to Revision T (May 2024)	Page
• Updated RθJA values: DB = 96 to 140.4, NS = 76 to 123.8, PW = 113 to 150.8, RGY = 47 to 92.1; Updated DB, NS, PW, and RGY packages for RθJC(top), RθJB, ΨJT, ΨJB, and RθJC(bot), all values in °C/W.....	6

10 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)
5962-9761801Q2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9761801Q2A SNJ54LVC 32AFK
5962-9761801QCA	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9761801QC A SNJ54LVC32AJ
5962-9761801QDA	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9761801QD A SNJ54LVC32AW
SN74LVC32ABQAR	Active	Production	WQFN (BQA) 14	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ABQAR.A	Active	Production	WQFN (BQA) 14	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32AD	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32AD.B	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADBR	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32ADBR.A	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32ADBR.B	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32ADBRG4	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32ADR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADR.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADR.B	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADRE4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADT	Active	Production	SOIC (D) 14	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ADT.B	Active	Production	SOIC (D) 14	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ANS.B	Active	Production	SOP (NS) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ANSR	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ANSR.A	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32ANSR.B	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC32A
SN74LVC32APW	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APW.B	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWE4	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A

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)
SN74LVC32APWG4	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWR	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWR.A	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWR.B	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRE4	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRG3	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRG3.B	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRG4	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRG4.A	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWRG4.B	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWT	Active	Production	TSSOP (PW) 14	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32APWT.B	Active	Production	TSSOP (PW) 14	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC32A
SN74LVC32ARGYR	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SN74LVC32ARGYR.A	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SN74LVC32ARGYR.B	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SN74LVC32ARGYRG4	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SN74LVC32ARGYRG4.A	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SN74LVC32ARGYRG4.B	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC32A
SNJ54LVC32AFK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9761801Q2A SNJ54LVC32AFK
SNJ54LVC32AJ	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9761801QC A SNJ54LVC32AJ
SNJ54LVC32AW	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9761801QD A SNJ54LVC32AW

⁽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 SN54LVC32A, SN74LVC32A :

- Catalog : [SN74LVC32A](#)
- Automotive : [SN74LVC32A-Q1](#), [SN74LVC32A-Q1](#)
- Enhanced Product : [SN74LVC32A-EP](#), [SN74LVC32A-EP](#)
- Military : [SN54LVC32A](#)

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



*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
SN74LVC32ABQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74LVC32ADBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LVC32ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC32ADT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC32ANSR	SOP	NS	14	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74LVC32APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC32APWRG3	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC32APWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC32APWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC32ARGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1
SN74LVC32ARGYRG4	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)
SN74LVC32ABQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74LVC32ADBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74LVC32ADR	SOIC	D	14	2500	353.0	353.0	32.0
SN74LVC32ADT	SOIC	D	14	250	213.0	191.0	35.0
SN74LVC32ANSR	SOP	NS	14	2000	353.0	353.0	32.0
SN74LVC32APWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74LVC32APWRG3	TSSOP	PW	14	2000	364.0	364.0	27.0
SN74LVC32APWRG4	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74LVC32APWT	TSSOP	PW	14	250	353.0	353.0	32.0
SN74LVC32ARGYR	VQFN	RGY	14	3000	353.0	353.0	32.0
SN74LVC32ARGYRG4	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)
5962-9761801Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9761801QDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74LVC32AD	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC32AD.B	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC32ANS.B	NS	SOP	14	50	530	10.5	4000	4.1
SN74LVC32APW	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC32APW.B	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC32APWE4	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC32APWG4	PW	TSSOP	14	90	530	10.2	3600	3.5
SNJ54LVC32AFK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LVC32AW	W	CFP	14	25	506.98	26.16	6220	NA

GENERIC PACKAGE VIEW

RGY 14

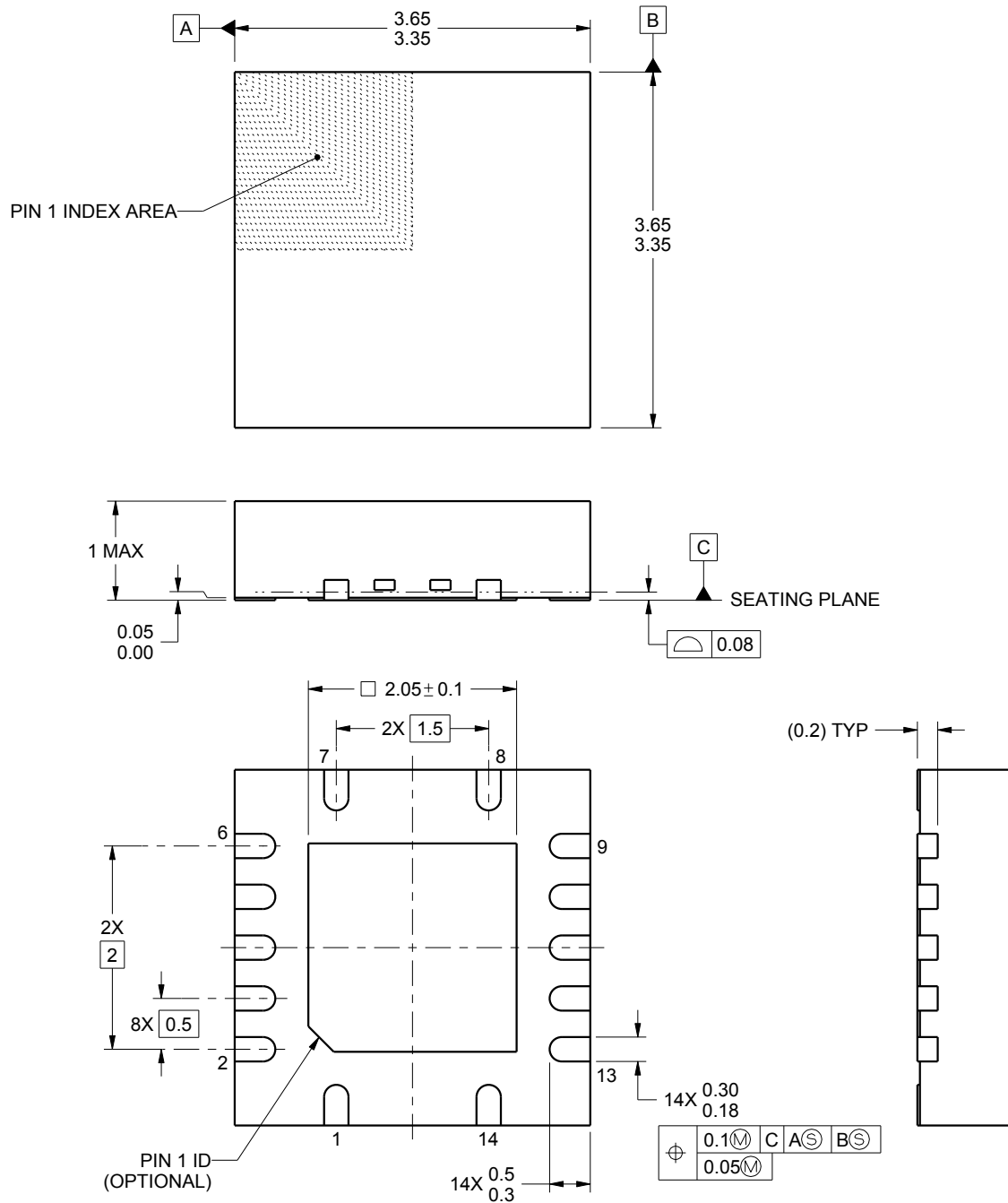
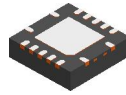
VQFN - 1 mm max height

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.





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 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.

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

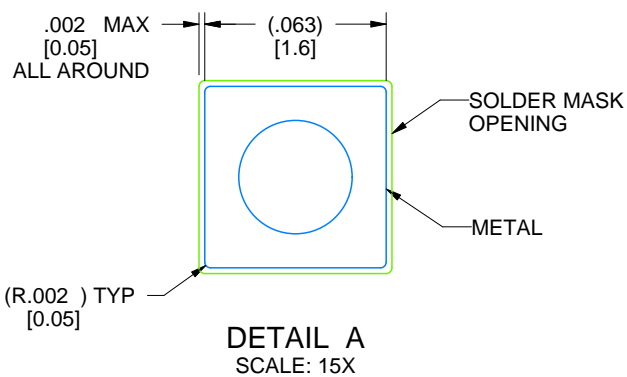
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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



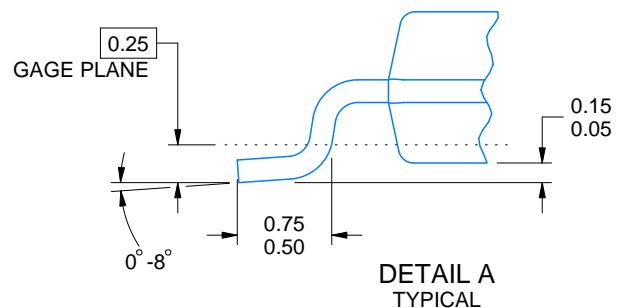
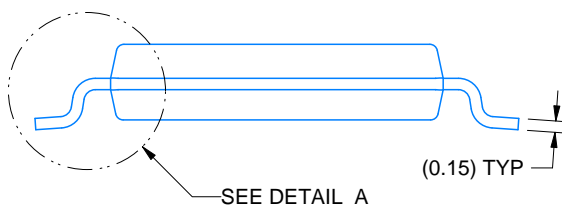
4214771/A 05/2017



TSSOP - 1.2 mm max height

The drawing shows a 14-pin connector with the following features and dimensions:

- Top View:**
 - Overall width: 6.6 TYP, 6.2
 - Overall height: 5.1, 4.9 (NOTE 3)
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
- Side View:**
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
- Detail View:**
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.
 - Pin 1 Index Area: A circular area on the top edge.
 - Pin 14 Index Area: A circular area on the right edge.



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



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.

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.

D0014A**PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

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

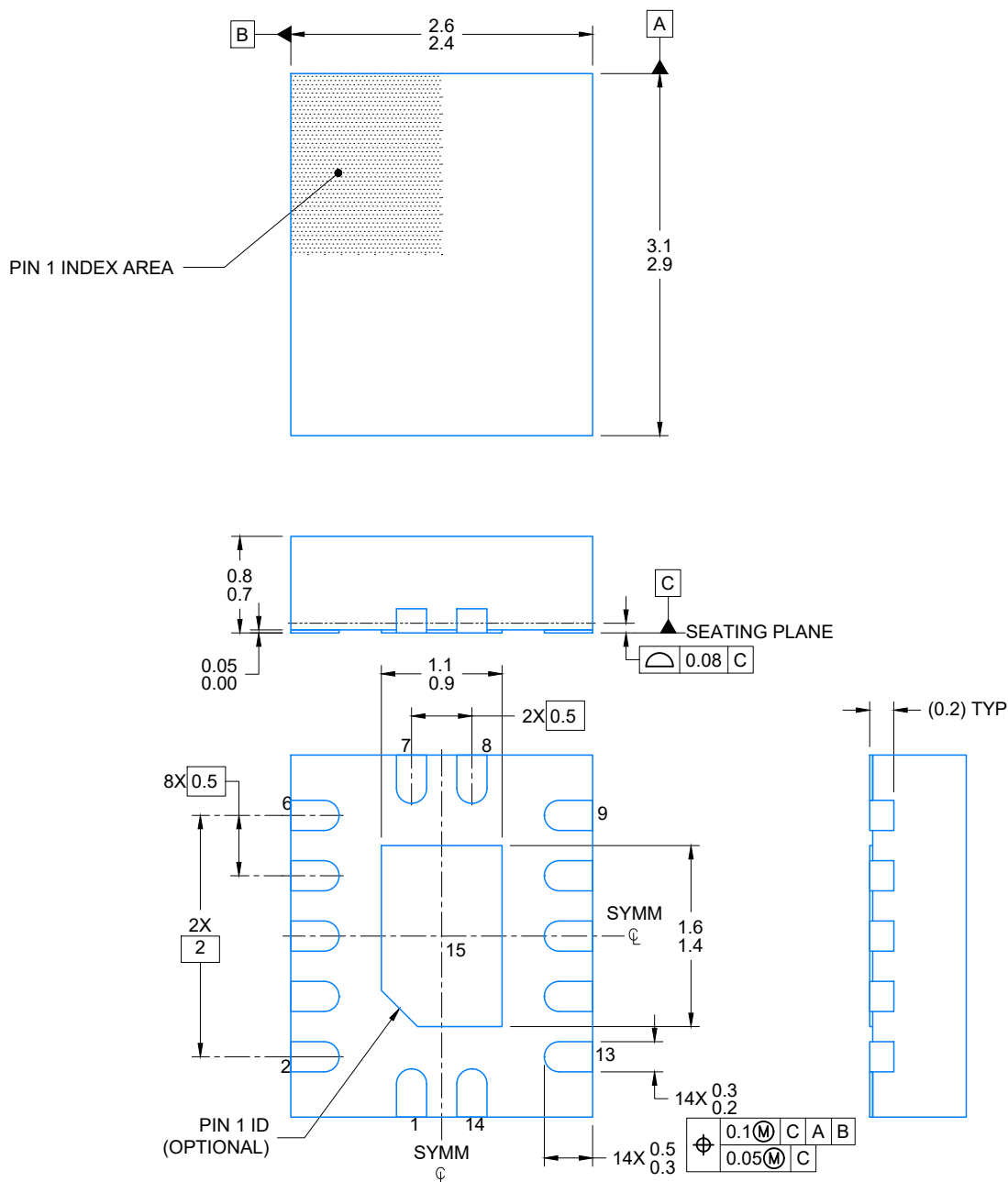
PLASTIC QUAD FLATPACK - NO LEAD

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



WQFN - 0.8 mm max height

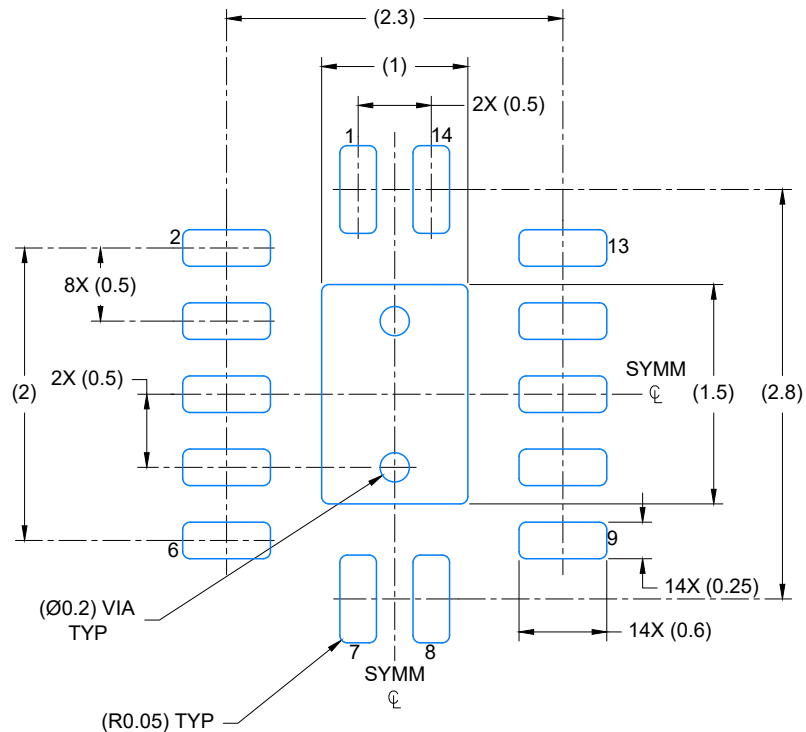
PLASTIC QUAD FLAT PACK-NO LEAD



4224636/A 11/2018

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

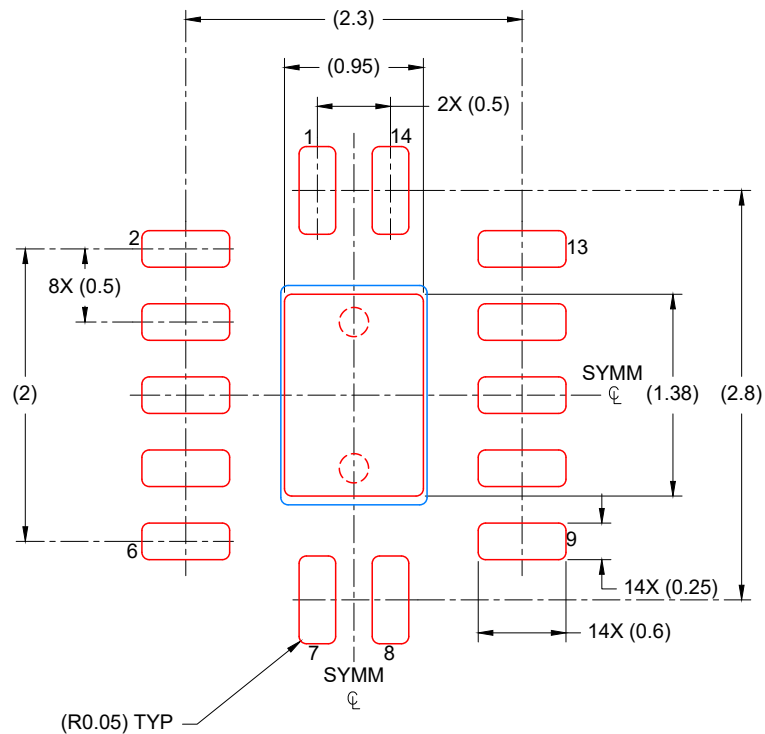
NOTES: (continued)

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.

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



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

4040062/C 03/03

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

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



NOTES:

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



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.

EXAMPLE BOARD LAYOUT

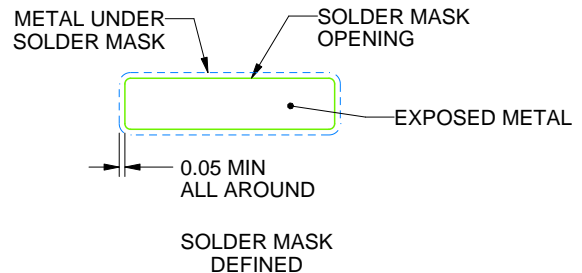
DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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.

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.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), 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 will 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](#) 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.

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

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2025, Texas Instruments Incorporated