

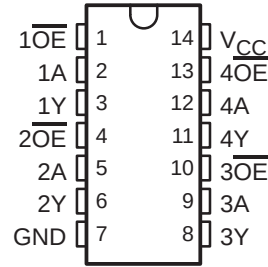
SN74LVT125

3.3-V ABT QUADRUPLE BUS BUFFER WITH 3-STATE OUTPUTS

SCBS133F – MAY 1992 – REVISED OCTOBER 2003

- Supports Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V V_{CC})
- Supports Unregulated Battery Operation Down to 2.7 V
- Typical V_{OLP} (Output Ground Bounce) <0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- I_{off} Supports Partial-Power-Down Mode Operation
- Bus-Hold Data Inputs Eliminate the Need for External Pullup Resistors
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

D, DB, NS, OR PW PACKAGE
(TOP VIEW)



description/ordering information

This bus buffer is designed specifically for low-voltage (3.3-V) V_{CC} operation, but with the capability to provide a TTL interface to a 5-V system environment.

The SN74LVT125 features independent line drivers with 3-state outputs. Each output is in the high-impedance state when the associated output-enable ($\overline{OE}$) input is high.

Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION

T_A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tube	SN74LVT125D	LVT125
		Tape and reel	SN74LVT125DR	
	SOP – NS	Tape and reel	SN74LVT125NSR	LVT125
	SSOP – DB	Tape and reel	SN74LVT125DBR	LX125
	TSSOP – PW	Tube	SN74LVT125PW	LX125
		Tape and reel	SN74LVT125PWR	

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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SN74LVT125

3.3-V ABT QUADRUPLE BUS BUFFER

WITH 3-STATE OUTPUTS

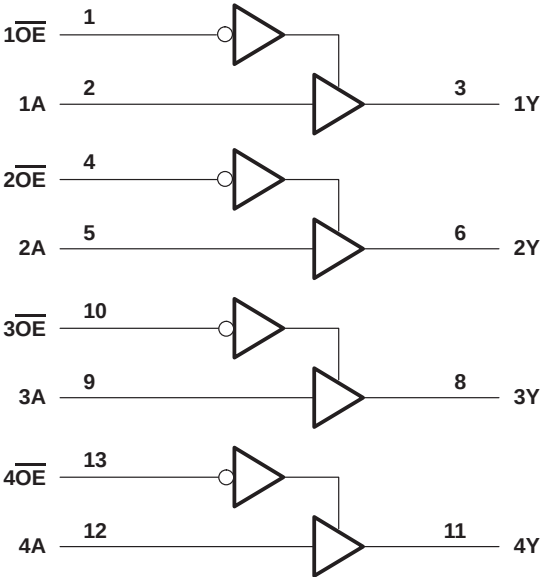
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FUNCTION TABLE

(each buffer)

INPUTS		OUTPUT
$\overline{\text{OE}}$	A	Y
L	H	H
L	L	L
H	X	Z

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high state or power-off state, V_O (see Note 1)	–0.5 V to 7 V
Current into any output in the low state, I_O	128 mA
Current into any output in the high state, I_{OH} (see Note 2)	64 mA
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 3):	
D package	86°C/W
DB package	96°C/W
NS package	76°C/W
PW package	113°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

[†] 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.

- NOTES:
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

2. This current flows only when the output is in the high state and $V_O > V_{CC}$.

3. The package thermal impedance is calculated in accordance with JESD 51-7.

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3.3-V ABT QUADRUPLE BUS BUFFER WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2.7	3.6	V
V_{IH}	High-level input voltage	2		V
V_{IL}	Low-level input voltage		0.8	V
V_I	Input voltage		5.5	V
I_{OH}	High-level output current		-32	mA
I_{OL}	Low-level output current		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10 ns/V
T_A	Operating free-air temperature	-40	85	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS			MIN	TYP [†]	MAX	UNIT
V_{IK}	$V_{CC} = 2.7\text{ V}$,	$I_I = -18\text{ mA}$				-1.2	V
V_{OH}	$V_{CC} = \text{MIN to MAX}^\ddagger$,	$I_{OH} = -100\text{ }\mu\text{A}$		$V_{CC}-0.2$			V
	$V_{CC} = 2.7\text{ V}$,	$I_{OH} = -8\text{ mA}$		2.4			
	$V_{CC} = 3\text{ V}$	$I_{OH} = -32\text{ mA}$		2			
V_{OL}	$V_{CC} = 2.7\text{ V}$	$I_{OL} = 100\text{ }\mu\text{A}$				0.2	V
		$I_{OL} = 24\text{ mA}$				0.5	
	$V_{CC} = 3\text{ V}$	$I_{OL} = 16\text{ mA}$				0.4	
		$I_{OL} = 32\text{ mA}$				0.5	
		$I_{OL} = 64\text{ mA}$				0.55	
I_I	$V_{CC} = 0\text{ or MAX}^\ddagger$,	$V_I = 5.5\text{ V}$				10	μA
	$V_{CC} = 3.6\text{ V}$	$V_I = V_{CC}\text{ or GND}$	Control inputs			± 1	
		$V_I = V_{CC}$	Data inputs			1	
		$V_I = 0$				-5	
I_{off}	$V_{CC} = 0$,	$V_I\text{ or }V_O = 0\text{ to }4.5\text{ V}$				± 100	μA
$I_{I(\text{hold})}$	$V_{CC} = 3\text{ V}$	$V_I = 0.8\text{ V}$	Data inputs	75			μA
		$V_I = 2\text{ V}$		-75			μA
I_{OZH}	$V_{CC} = 3.6\text{ V}$,	$V_O = 3\text{ V}$				5	μA
I_{OZL}	$V_{CC} = 3.6\text{ V}$,	$V_O = 0.5\text{ V}$				-5	μA
I_{CC}	$V_{CC} = 3.6\text{ V}$, $V_I = V_{CC}\text{ or GND}$	$I_O = 0$,	Outputs high	0.12	0.19		mA
			Outputs low	4.5	7		
			Outputs disabled	0.12	0.19		
$\Delta I_{CC}^\S$	$V_{CC} = 3\text{ V to }3.6\text{ V}$,	One input at $V_{CC} - 0.6\text{ V}$, Other inputs at $V_{CC}\text{ or GND}$				0.2	mA
C_i	$V_I = 3\text{ V or }0$					4	pF
C_O	$V_O = 3\text{ V or }0$					8	pF

[†] All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[§] This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.



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3.3-V ABT QUADRUPLE BUS BUFFER WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF
(unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$			$V_{CC} = 2.7\text{ V}$		UNIT
			MIN	TYP†	MAX	MIN	MAX	
t_{PLH}	A	Y	1	2.7	4	4.5		ns
t_{PHL}			1	2.9	3.9	4.9		
t_{PZH}	$\overline{OE}$	Y	1	3.4	4.7	6		ns
t_{PZL}			1.1	3.4	4.7	6.5		
t_{PHZ}	$\overline{OE}$	Y	1.8	3.7	5.1	5.7		ns
t_{PLZ}			1.3	2.6	4.5	4		

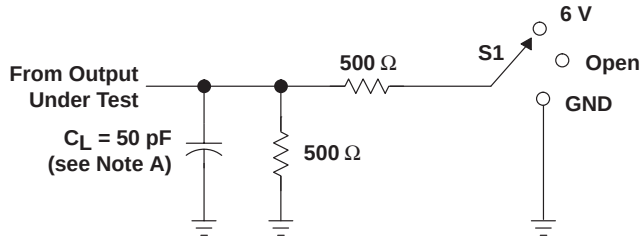
† All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

SN74LVT125

3.3-V ABT QUADRUPLE BUS BUFFER WITH 3-STATE OUTPUTS

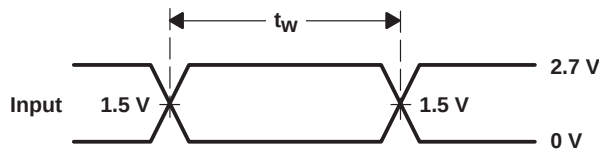
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PARAMETER MEASUREMENT INFORMATION

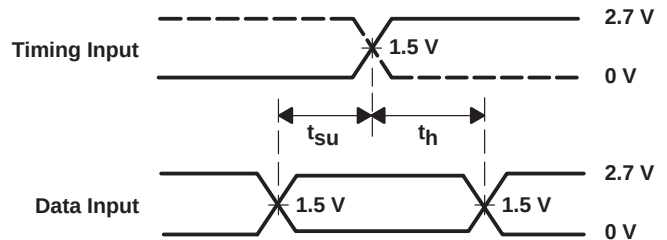


LOAD CIRCUIT FOR OUTPUTS

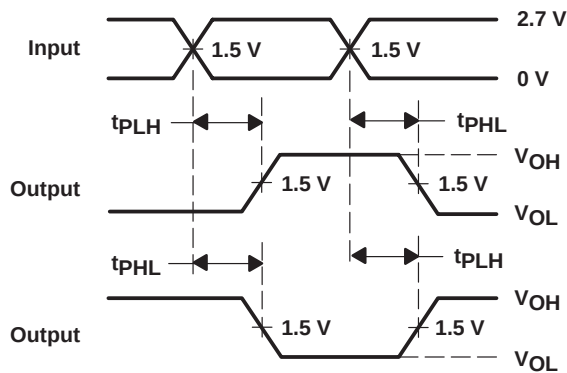
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6 V
t_{PHZ}/t_{PZH}	GND



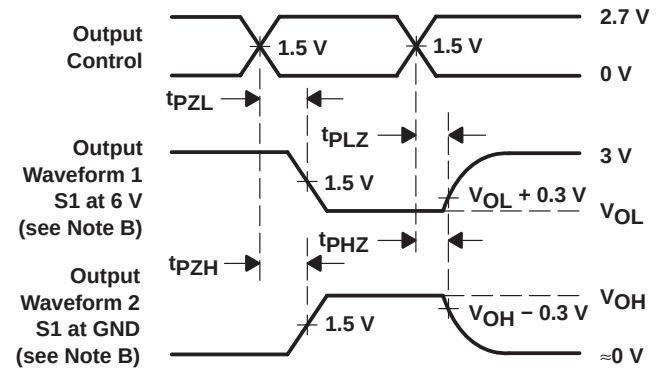
VOLTAGE WAVEFORMS
PULSE DURATION



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: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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)
SN74LVT125D	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125D.B	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125D1G4	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125D1G4.B	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125DBR	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125DBR.B	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125DBR1G4	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125DBR1G4.B	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125DR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125DR.B	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125DRG4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125NSR	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125NSR.B	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVT125
SN74LVT125PW	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125PW.B	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125PWR	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125PWR.B	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125
SN74LVT125PWRG4	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LX125

⁽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.

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OTHER QUALIFIED VERSIONS OF SN74LVT125 :

- Automotive : [SN74LVT125-Q1](#)
- Enhanced Product : [SN74LVT125-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

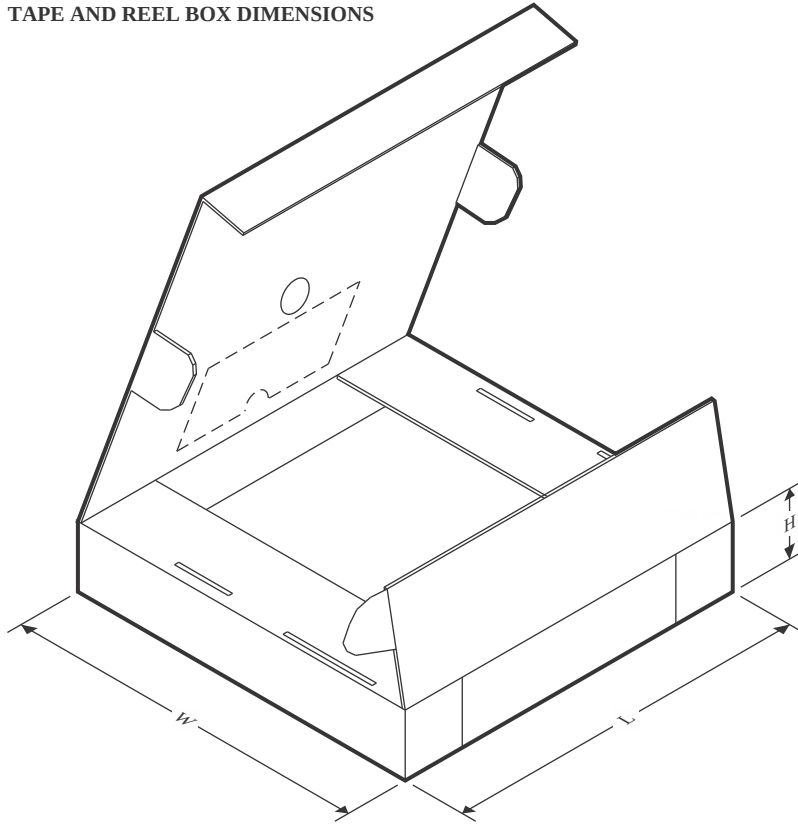
TAPE AND REEL INFORMATION



*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
SN74LVT125DBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LVT125DBR1G4	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LVT125DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVT125NSR	SOP	NS	14	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74LVT125PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



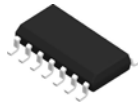
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVT125DBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74LVT125DBR1G4	SSOP	DB	14	2000	353.0	353.0	32.0
SN74LVT125DR	SOIC	D	14	2500	340.5	336.1	32.0
SN74LVT125NSR	SOP	NS	14	2000	353.0	353.0	32.0
SN74LVT125PWR	TSSOP	PW	14	2000	353.0	353.0	32.0

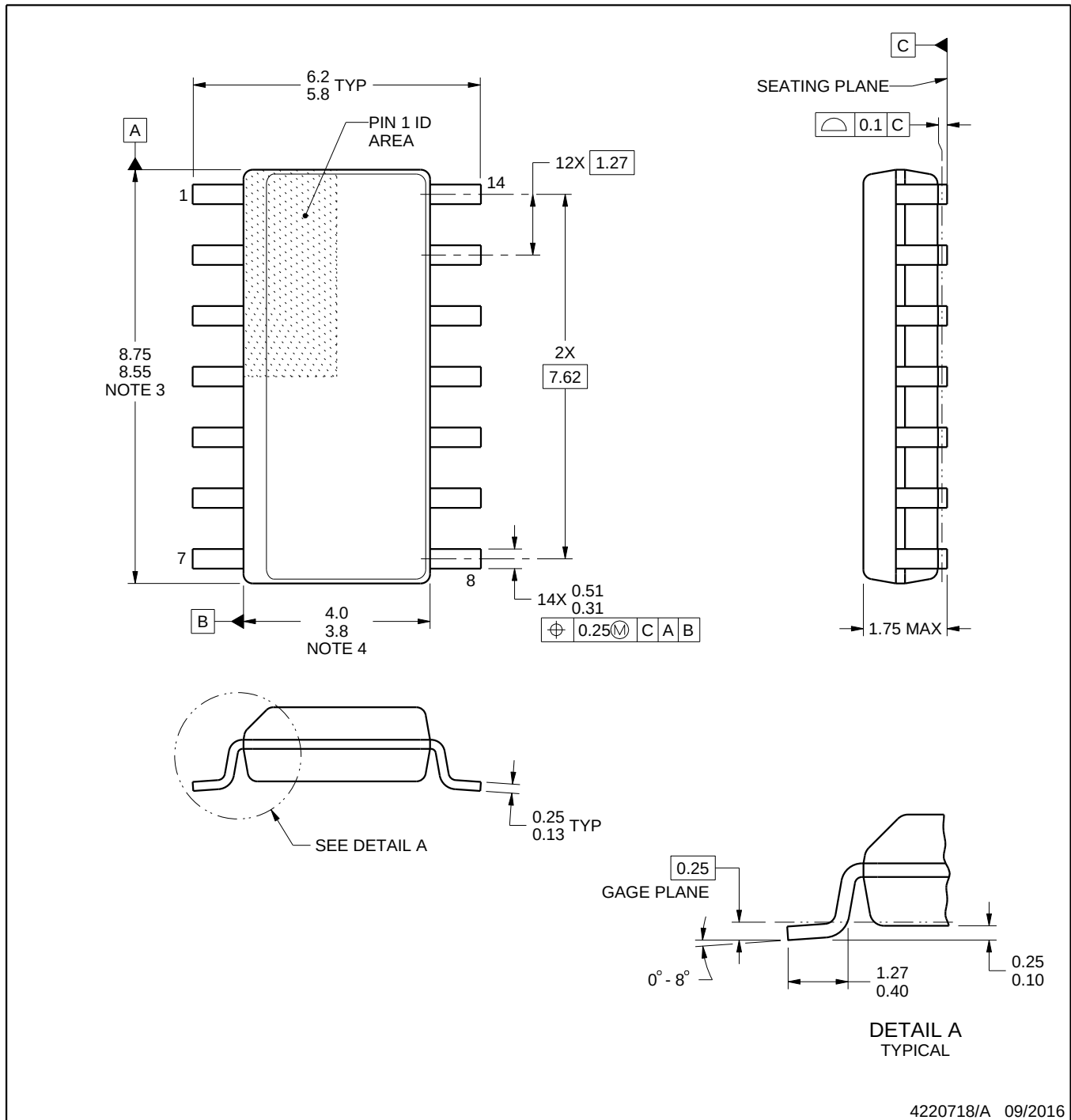
TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74LVT125D	D	SOIC	14	50	507	8	3940	4.32
SN74LVT125D	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVT125D.B	D	SOIC	14	50	507	8	3940	4.32
SN74LVT125D.B	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVT125D1G4	D	SOIC	14	50	507	8	3940	4.32
SN74LVT125D1G4.B	D	SOIC	14	50	507	8	3940	4.32
SN74LVT125PW	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVT125PW.B	PW	TSSOP	14	90	530	10.2	3600	3.5

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

SMALL OUTLINE INTEGRATED CIRCUIT

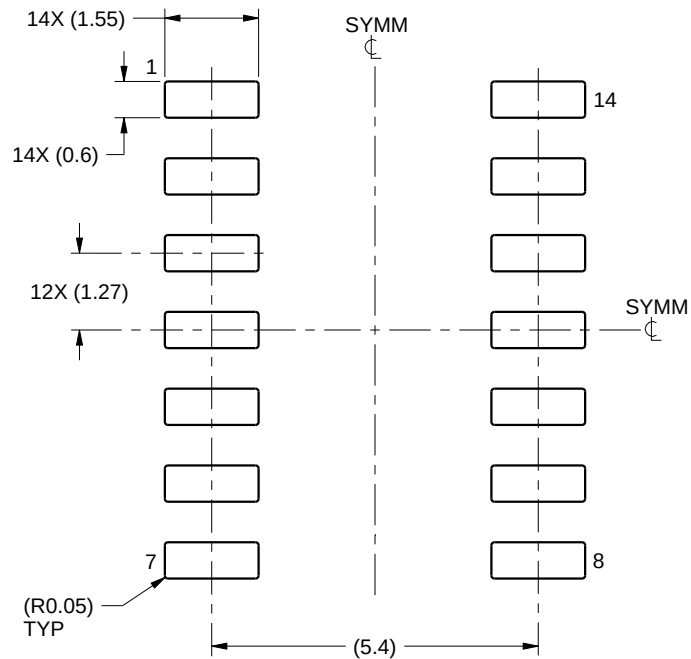


EXAMPLE BOARD LAYOUT

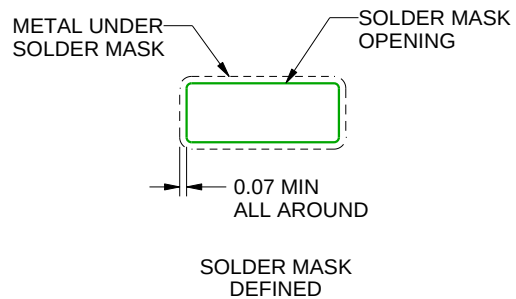
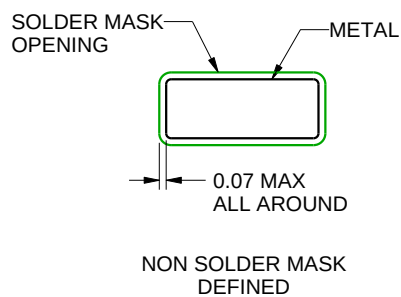
D0014A

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.

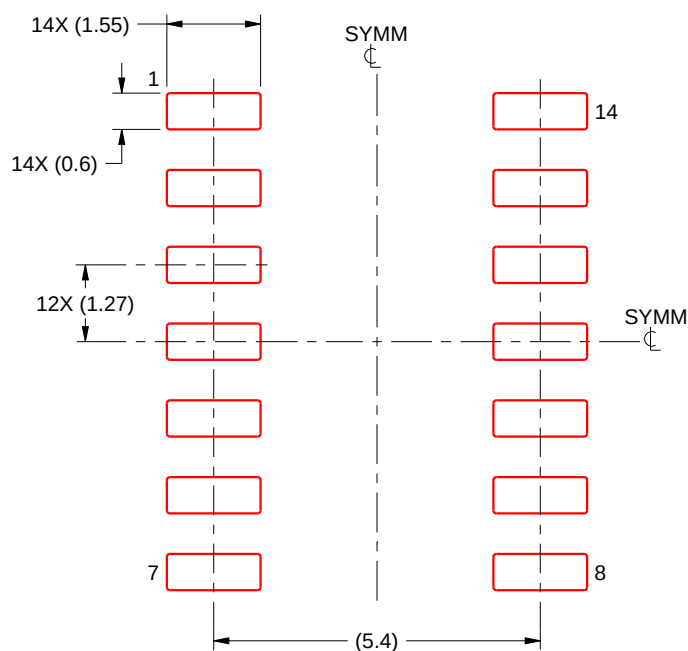
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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)

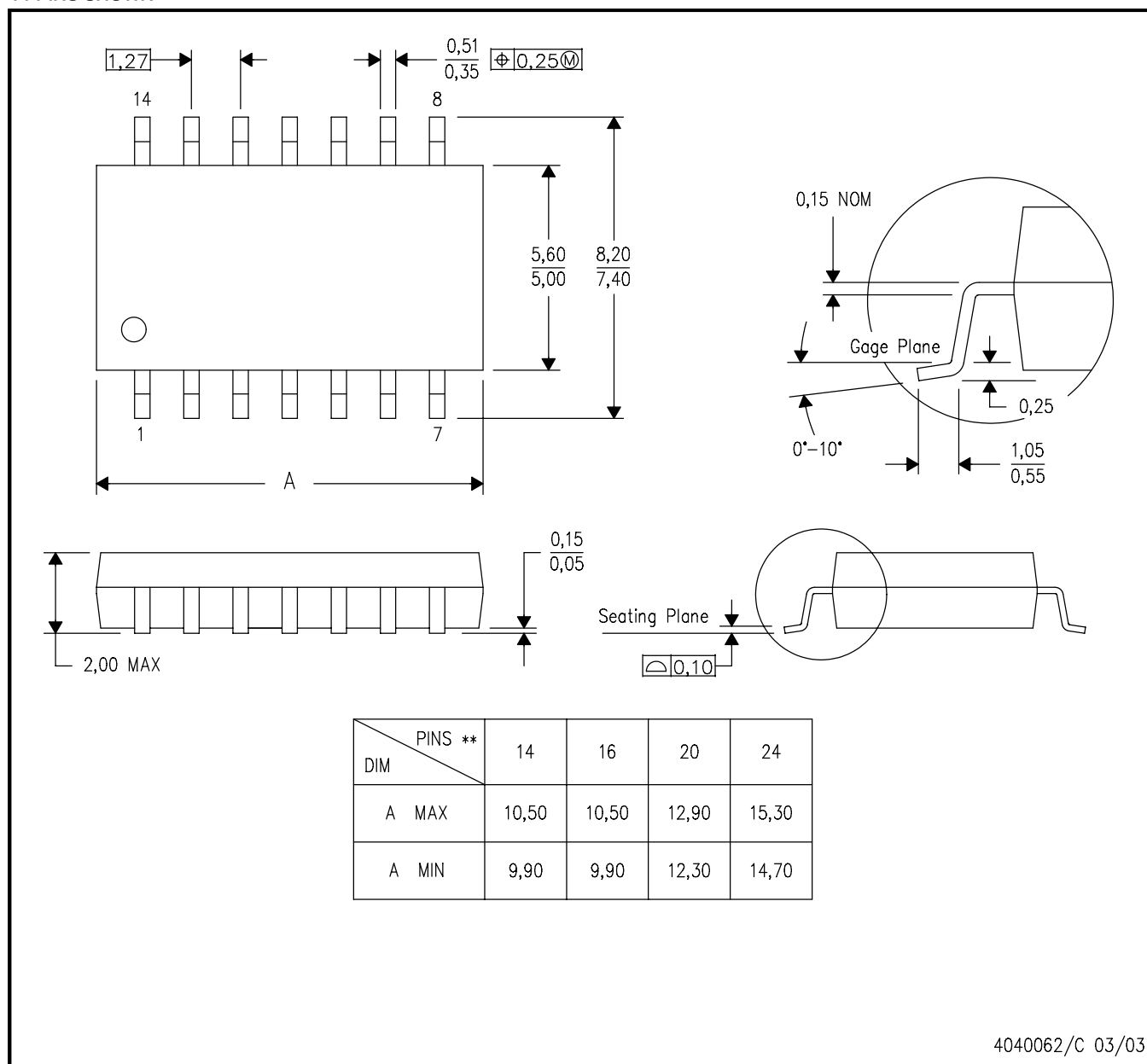
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

MECHANICAL DATA

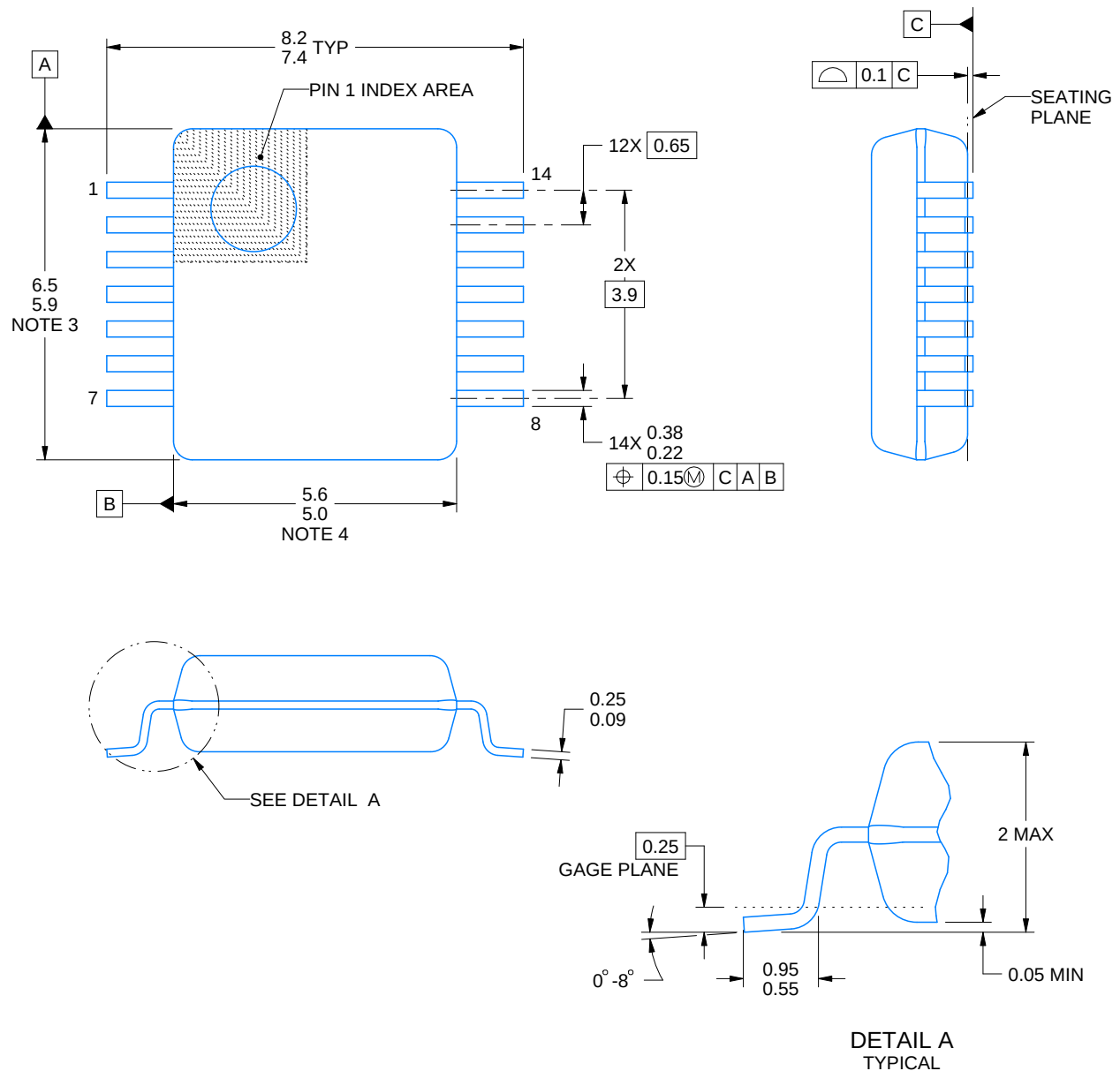
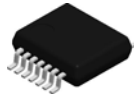
NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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



4220762/A 05/2024

NOTES:

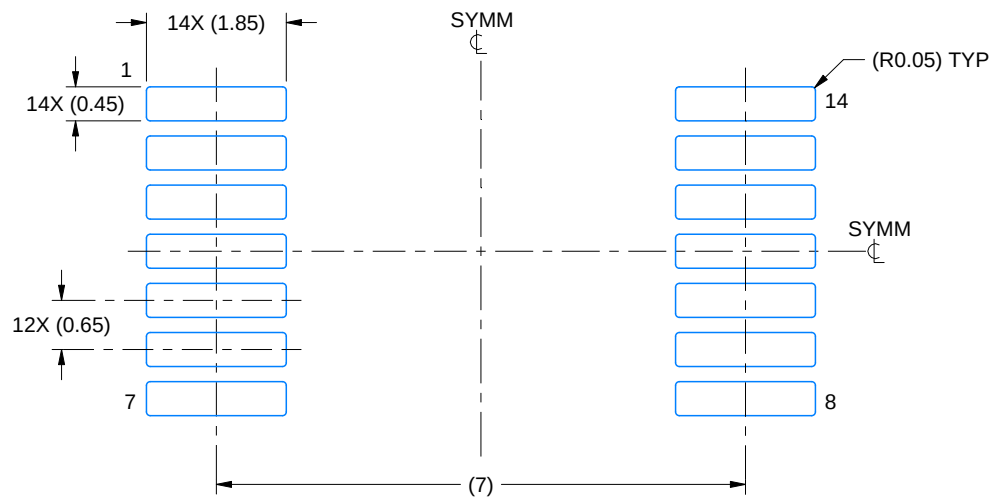
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE BOARD LAYOUT

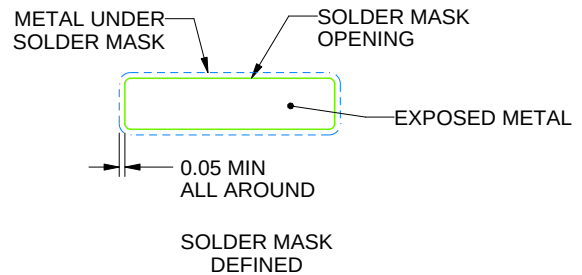
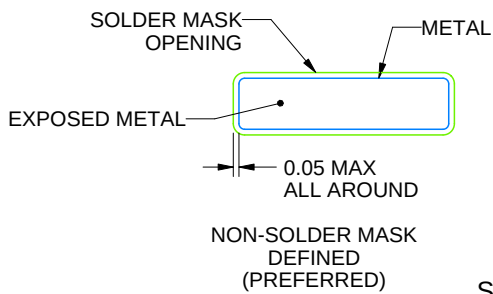
DB0014A

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)

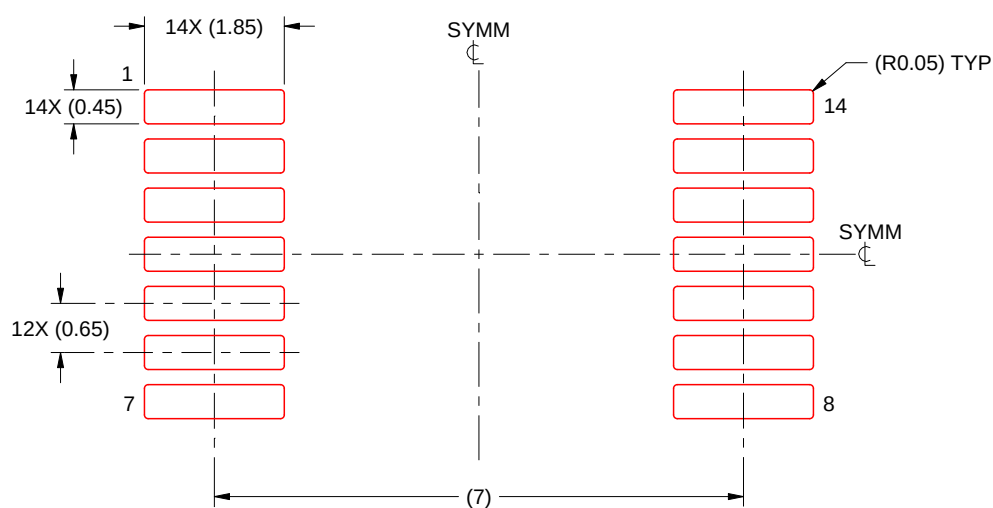
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE

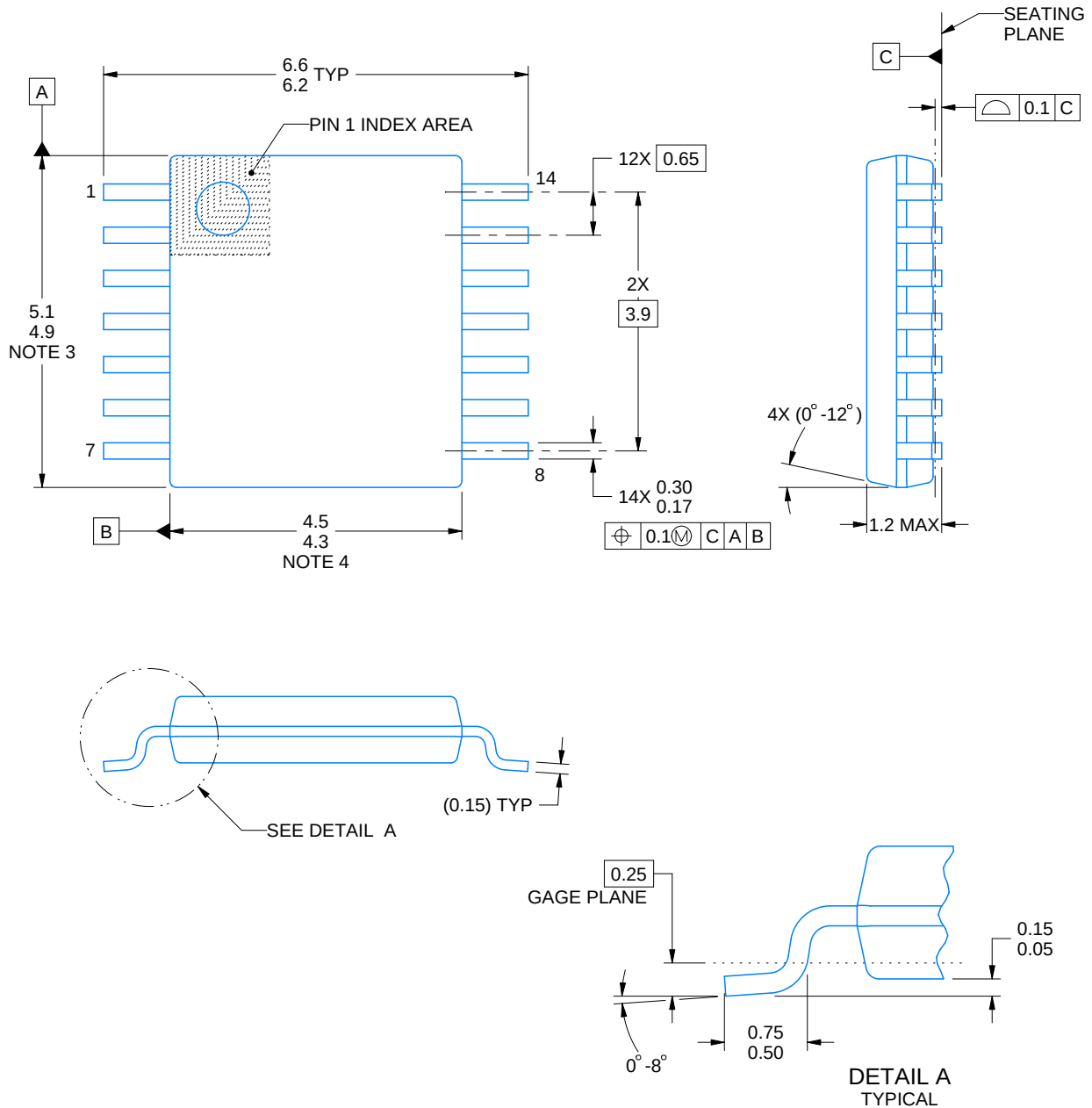
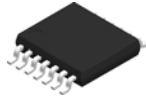


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

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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.



4220202/B 12/2023

NOTES:

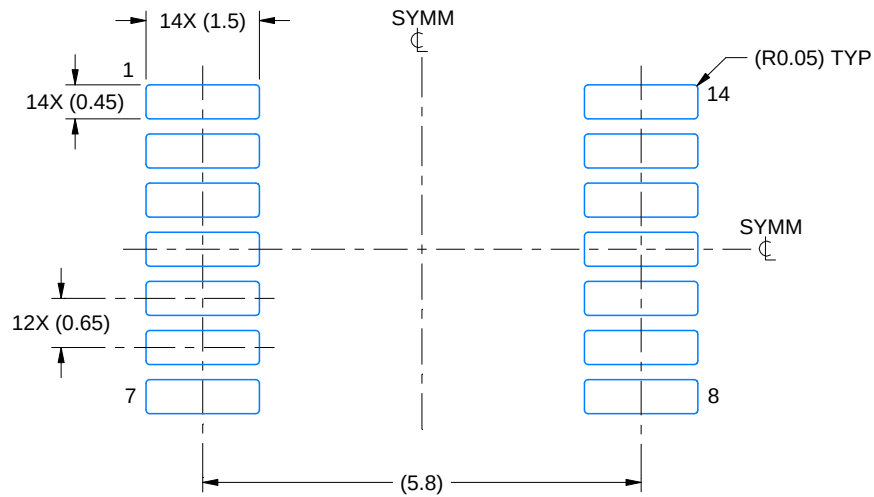
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE BOARD LAYOUT

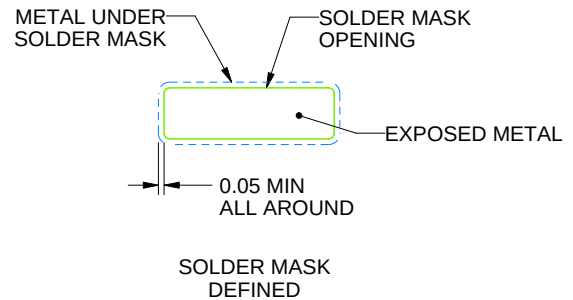
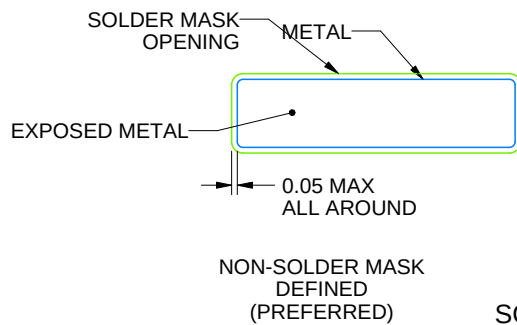
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

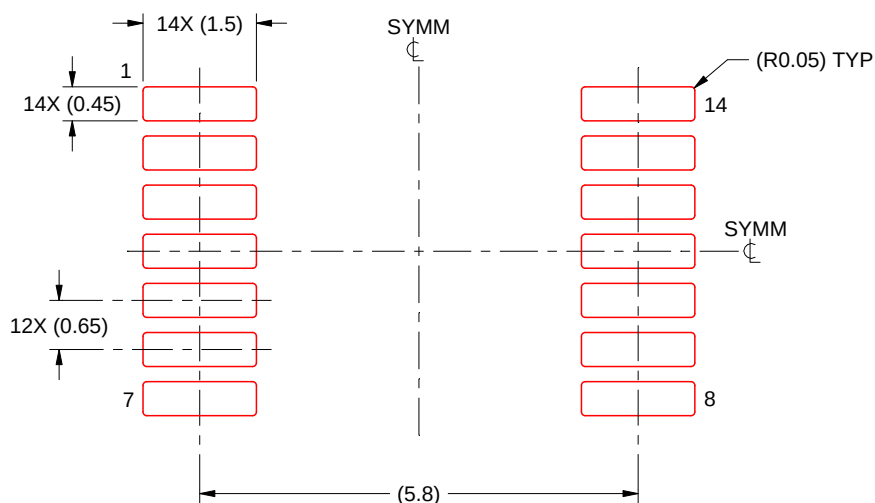
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

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NOTES: (continued)

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

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