

# SN74LV164A 8 位并行输出串行移位寄存器

## 1 特性

- $V_{CC}$  工作电压范围为 2V 至 5.5V
- 5V 时  $t_{pd}$  最大值为 10.5 ns
- $V_{CC} = 3.3V$ 、 $T_A = 25^\circ C$  时,  $V_{OLP}$  (输出接地反弹) 典型值小于 0.8V
- $V_{CC} = 3.3V$ 、 $T_A = 25^\circ C$  时,  $V_{OHV}$  (输出  $V_{OH}$  下冲) 典型值大于 2.3V
- $I_{off}$  支持带电插入、局部关断模式以及后驱动保护
- 所有端口上均支持以混合模式电压运行
- 闩锁性能超过 250mA, 符合 JESD 17 规范

## 2 应用

- IP 路由器
- 企业交换机
- 门禁和安全: 门禁键盘和生物辨识
- 智能仪表: 电力线通信

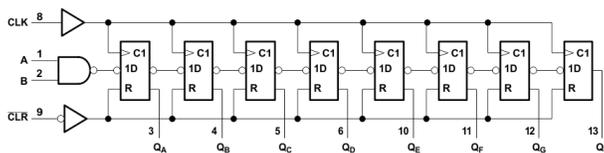
## 3 说明

SN74LV164A 器件是 8 位并行输出串行移位寄存器, 专为 2V 至 5.5V  $V_{CC}$  运行而设计。

### 封装信息(1)

器件型号	封装	封装尺寸 (标称值)
SN74LV164A	D (SOIC, 14)	8.65mm × 3.91mm
	DB (SSOP, 14)	6.20mm × 5.30mm
	DGV (TVSOP, 14)	3.60mm × 4.40mm
	NS (SOP, 14)	10.30mm × 5.30mm
	PW (TSSOP, 14)	5.00mm × 4.40mm
	RGY (VQFN, 14)	3.50mm × 3.50mm
	BQA (WQFN, 14)	3.00mm × 2.50mm

(1) 如需了解所有可用封装, 请参阅数据表末尾的可订购产品附录。



Pin numbers shown are for the D, DB, DGV, J, NS, PW, RGY, and W packages.

逻辑图 (正逻辑)

## Table of Contents

<b>1 特性</b> .....	<b>1</b>	<b>7 Parameter Measurement Information</b> .....	<b>10</b>
<b>2 应用</b> .....	<b>1</b>	<b>8 Detailed Description</b> .....	<b>11</b>
<b>3 说明</b> .....	<b>1</b>	8.1 Overview.....	11
<b>4 Revision History</b> .....	<b>2</b>	8.2 Functional Block Diagram.....	11
<b>5 Pin Configuration and Functions</b> .....	<b>3</b>	8.3 Feature Description.....	11
<b>6 Specifications</b> .....	<b>4</b>	8.4 Device Functional Modes.....	11
6.1 Absolute Maximum Ratings.....	4	<b>9 Application and Implementation</b> .....	<b>12</b>
6.2 ESD Ratings.....	4	9.1 Application Information.....	12
6.3 Recommended Operating Conditions.....	5	9.2 Typical Application.....	12
6.4 Thermal Information.....	5	9.3 Power Supply Recommendations.....	13
6.5 Electrical Characteristics.....	6	9.4 Layout.....	13
6.6 Timing Requirements: $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ .....	6	<b>10 Device and Documentation Support</b> .....	<b>15</b>
6.7 Timing Requirements: $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ .....	6	10.1 Documentation Support.....	15
6.8 Timing Requirements: $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .....	7	10.2 接收文档更新通知.....	15
6.9 Switching Characteristics: $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ .....	7	10.3 支持资源.....	15
6.10 Switching Characteristics: $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ .....	7	10.4 Trademarks.....	15
6.11 Switching Characteristics: $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .....	8	10.5 静电放电警告.....	15
6.12 Noise Characteristics.....	8	10.6 术语表.....	15
6.13 Operating Characteristics.....	8	<b>11 Mechanical, Packaging, and Orderable Information</b> .....	<b>15</b>
6.14 Typical Characteristics.....	9		

## 4 Revision History

注：以前版本的页码可能与当前版本的页码不同

<b>Changes from Revision J (December 2022) to Revision K (March 2023)</b> .....	<b>Page</b>
• 更新了文档的结构布局.....	1
• Updated thermal values for D package from $R_{\theta JA} = 92.6$ to $112.9$ , $R_{\theta JC(top)} = 53.9$ to $68.7$ , $R_{\theta JB} = 46.8$ to $69.4$ , $\Psi_{JT} = 18.9$ to $30$ , $\Psi_{JB} = 46.6$ to $69$ , all values in $^{\circ}\text{C}/\text{W}$ .....	5
<b>Changes from Revision I (February 2015) to Revision J (December 2022)</b> .....	<b>Page</b>
• 更新了整个文档中的表格、图和交叉参考的格式.....	1
<b>Changes from Revision H (April 2005) to Revision I (February 2015)</b> .....	<b>Page</b>
• 添加了引脚配置和功能部分、ESD 等级表、特性说明部分、器件功能模式、应用和实施部分、电源相关建议部分、布局部分、器件和文档支持部分以及机械、封装和可订购信息部分.....	1

## 5 Pin Configuration and Functions

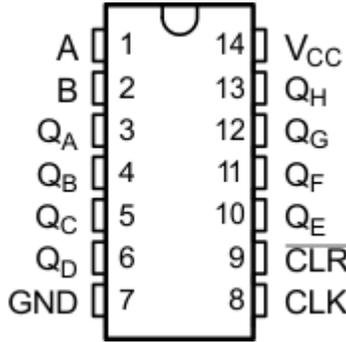


图 5-1. D, DB, DGV, NS, or PW Package 14-PIN SOIC, SSOP, TVSOP, SOP, or TSSOP (Top View)

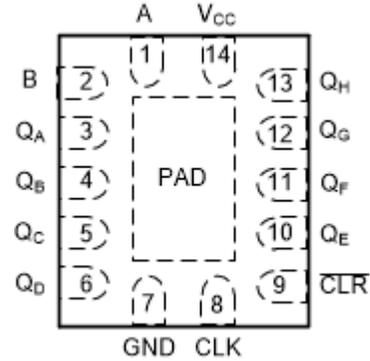


图 5-2. RGY or BQA Package 14-PIN VQFN or WQFN Top View

表 5-1. Pin Functions

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NO.	NAME		
1	A	I	Serial input A
2	B	I	Serial input B
3	Q <sub>A</sub>	O	Output A
4	Q <sub>B</sub>	O	Output B
5	Q <sub>C</sub>	O	Output C
6	Q <sub>D</sub>	O	Output D
7	GND	—	Ground pin
8	CLK	I	Storage clock
9	CLR	I	Storage clear
10	Q <sub>E</sub>	O	Output E
11	Q <sub>F</sub>	O	Output F
12	Q <sub>G</sub>	O	Output G
13	Q <sub>H</sub>	O	Output H
11	Q <sub>H</sub> '	O	Q <sub>H</sub> inverted
14	V <sub>CC</sub>	—	Power pin
-	PAD	—	Thermal Pad <sup>(2)</sup>

(1) I = input, O = output

(2) RGY and BQA packages only

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	- 0.5	7	V
$V_I$	Input voltage <sup>(1)</sup>	- 0.5	7	V
$V_O$	Voltage applied to any output in the high-impedance or power-off state <sup>(1)</sup>	- 0.5	7	V
$V_O$	Output voltage <sup>(1) (2)</sup>	- 0.5	$V_{CC} + 0.5$	V
$I_{IK}$	Input clamp current	$V_I < 0$	- 20	mA
$I_{OK}$	Output clamp current	$V_O < 0$	- 50	mA
$I_O$	Continuous output current	$V_O = 0$ to $V_{CC}$	$\pm 25$	mA
	Continuous current through $V_{CC}$ or GND		$\pm 50$	mA
$T_{stg}$	Storage temperature	- 65	150	°C

(1) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(2) This value is limited to 5.5 V maximum.

### 6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	$\pm 2000$	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup>	$\pm 1000$	

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

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

### 6.3 Recommended Operating Conditions

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

		SN74LV164A		UNIT
		MIN	MAX	
V <sub>CC</sub>	Supply voltage	2	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.7	
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.7	
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.7	
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.3	
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	V <sub>CC</sub> = 2 V	-50	μA
		V <sub>CC</sub> = 2.3 V to 2.7 V	-2	
		V <sub>CC</sub> = 3 V to 3.6 V	-6	
		V <sub>CC</sub> = 4.5 V to 5.5 V	-12	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V	50	μA
		V <sub>CC</sub> = 2.3 V to 2.7 V	2	
		V <sub>CC</sub> = 3 V to 3.6 V	6	
		V <sub>CC</sub> = 4.5 V to 5.5 V	12	
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 2.3 V to 2.7 V	200	ns/V
		V <sub>CC</sub> = 3 V to 3.6 V	100	
		V <sub>CC</sub> = 4.5 V to 5.5 V	20	
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*, literature number [SCBA004](#).

### 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>	SN74LV164A							UNIT	
	D (SOIC)	DB (SSOP)	DGV (TVSOP)	NS (SOP)	PW (TSSOP)	RGY (VQFN)	BQA (WQFN)		
	14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	14 PINS		
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	92.6	104.4	126.7	89.3	138.7	74.8	88.3	°C/W
R <sub>θJC(top)</sub>	Junction-to-case (top) thermal resistance	53.9	57	50	46.9	69.1	81.1	90.9	
R <sub>θJB</sub>	Junction-to-board thermal resistance	46.8	51.7	59.6	48	81.8	49.5	56.8	
ψ <sub>JT</sub>	Junction-to-top characterization parameter	18.9	18.6	5.8	13.7	20.3	15	9.9	
ψ <sub>JB</sub>	Junction-to-board characterization parameter	46.6	51.2	58.9	47.7	81.3	49.5	56.7	
R <sub>θJC(bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	32.5	33.4	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	SN74LV164A - 40°C to 85°C			SN74LV164A - 40°C to 125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = - 50 μA	2 V to 5.5 V	V <sub>CC</sub> - 0.1			V <sub>CC</sub> - 0.1			V
	I <sub>OH</sub> = - 2 mA	2.3 V	2			2			
	I <sub>OH</sub> = - 6 mA	3 V	2.48			2.48			
	I <sub>OH</sub> = - 12 mA	4.5 V	3.8			3.8			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	2 V to 5.5 V	0.1			0.1			V
	I <sub>OL</sub> = 2 mA	2.3 V	0.4			0.4			
	I <sub>OL</sub> = 6 mA	3 V	0.44			0.44			
	I <sub>OL</sub> = 12 mA	4.5 V	0.55			0.55			
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 to 5.5 V	±1			±1			μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5	20			20			μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V	0	5			5			μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	2.2			2.2			pF

## 6.6 Timing Requirements: V<sub>CC</sub> = 2.5 V ± 0.2 V

over recommended operating free-air temperature range, V<sub>CC</sub> = 2.5 V ± 0.2 V (unless otherwise noted)

			T <sub>A</sub> = 25°C		SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration	CLR low	6		6.5		6.5		ns
		CLK high or low	6.5		7.5		7.5		
t <sub>su</sub>	Setup time	Data before CLK ↑	6.5		8.5		8.5		ns
		CLR inactive	3		3		3		
t <sub>h</sub>	Hold time	Data after CLK ↑	- 0.5		0		0		ns

## 6.7 Timing Requirements: V<sub>CC</sub> = 3.3 V ± 0.3 V

over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted)

			T <sub>A</sub> = 25°C		SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration	CLR low	5		5		5		ns
		CLK high or low	5		5		5		
t <sub>su</sub>	Setup time	Data before CLK ↑	5		6		6		ns
		CLR inactive	2.5		2.5		2.5		
t <sub>h</sub>	Hold time	Data after CLK ↑	0		0		0		ns

## 6.8 Timing Requirements: $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

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

			$T_A = 25^\circ\text{C}$		SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	CLR low	5		5		5		ns
		CLK high or low	5		5		5		
$t_{su}$	Setup time	Data before CLK $\uparrow$	4.5		4.5		4.5		ns
		CLR inactive	2.5		2.5		2.5		
$t_h$	Hold time	Data after CLK $\uparrow$	1		1		1		ns

## 6.9 Switching Characteristics: $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{max}$			$C_L = 15\text{ pF}$	55 <sup>(1)</sup>	105 <sup>(1)</sup>		50		50		MHz
			$C_L = 50\text{ pF}$	45	85		40		40		
$t_{pd}$	CLK	Q	$C_L = 15\text{ pF}$		9.2 <sup>(1)</sup>	17.6 <sup>(1)</sup>	1	20	1	21	ns
$t_{PHL}$	CLR	Q			8.6 <sup>(1)</sup>	16 <sup>(1)</sup>	1	18	1	18.5	
$t_{pd}$	CLK	Q	$C_L = 50\text{ pF}$		11.5	21.1	1	24	1	25	ns
$t_{PHL}$	CLR	Q			10.8	19.5	1	22	1	22.5	

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

## 6.10 Switching Characteristics: $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{max}$			$C_L = 15\text{ pF}$	80 <sup>(1)</sup>	155 <sup>(1)</sup>		65		65		MHz
			$C_L = 50\text{ pF}$	50	120		45		45		
$t_{pd}$	CLK	Q	$C_L = 15\text{ pF}$		6.4 <sup>(1)</sup>	12.8 <sup>(1)</sup>	1	15	1	16	ns
$t_{PHL}$	CLR	Q			6 <sup>(1)</sup>	12.8 <sup>(1)</sup>	1	15	1	16	
$t_{pd}$	CLK	Q	$C_L = 50\text{ pF}$		8.3	16.3	1	18.5	1	19.5	ns
$t_{PHL}$	CLR	Q			7.9	16.3	1	18.5	1	19.5	

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

## 6.11 Switching Characteristics: $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV164A - 40°C to 85°C		SN74LV164A - 40°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{\text{max}}$			$C_L = 15\text{ pF}$	125 <sup>(1)</sup>	220 <sup>(1)</sup>		105		95		MHz
			$C_L = 50\text{ pF}$	85	165		75		65		
$t_{\text{pd}}$	CLK	Q	$C_L = 15\text{ pF}$		4.5 <sup>(1)</sup>	9 <sup>(1)</sup>	1	10.5	1	11.5	ns
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Q			4.2 <sup>(1)</sup>	8.6 <sup>(1)</sup>	1	10	1	11	
$t_{\text{pd}}$	CLK	Q	$C_L = 50\text{ pF}$		6	11	1	12.5	1	13	ns
$t_{\text{PHL}}$	$\overline{\text{CLR}}$	Q			5.8	10.6	1	12.5	1	13	

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

## 6.12 Noise Characteristics

$V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		SN74LV164A			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$		0.28	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$		- 0.22	- 0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$		3.09		V
$V_{IH(D)}$	High-level dynamic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

## 6.13 Operating Characteristics

$T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		$V_{CC}$	TYP	UNIT
$C_{\text{pd}}$	Power dissipation capacitance	$C_L = 50\text{ pF}$	$f = 10\text{ MHz}$	3.3 V	48.1	pF
				5 V	47.5	

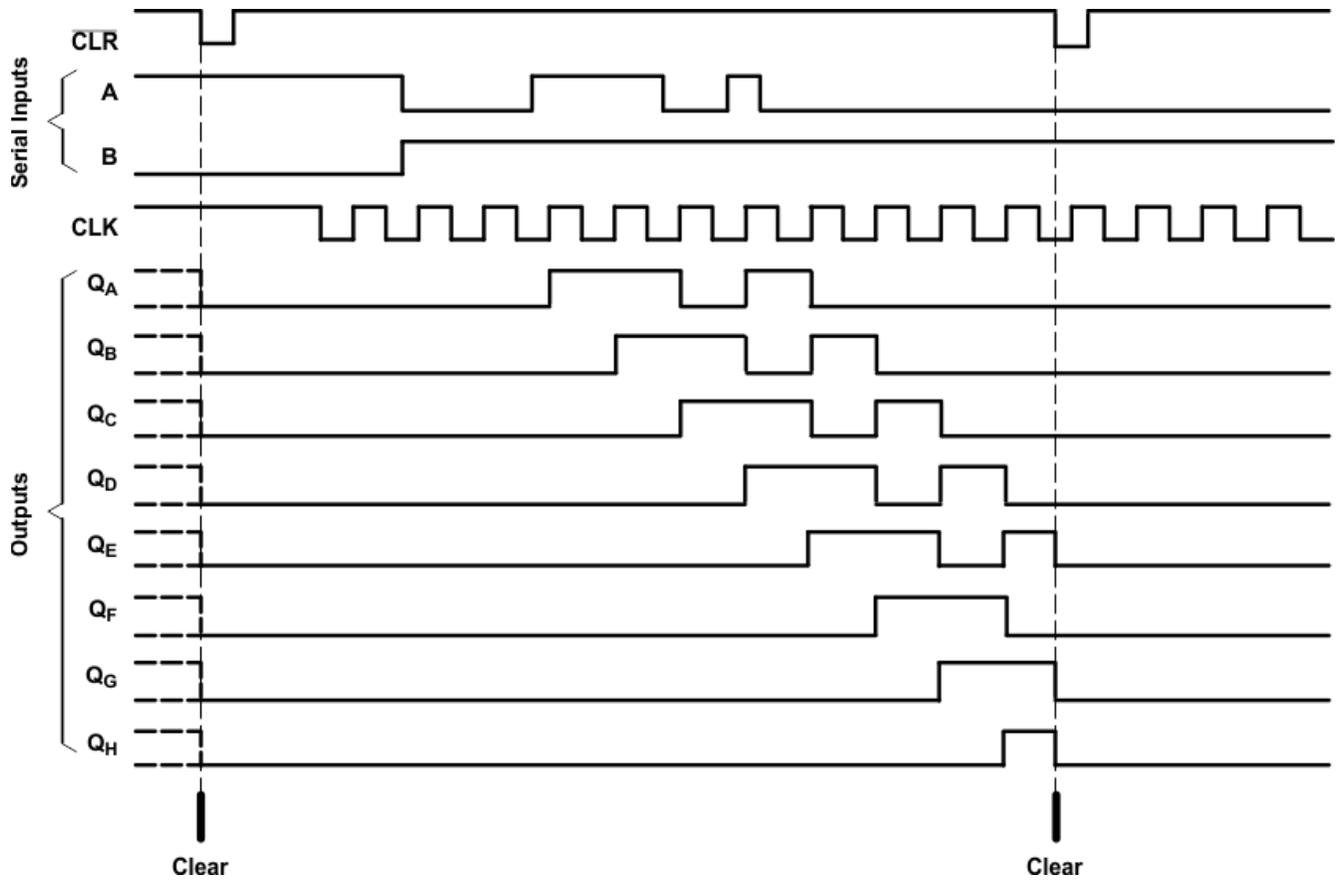
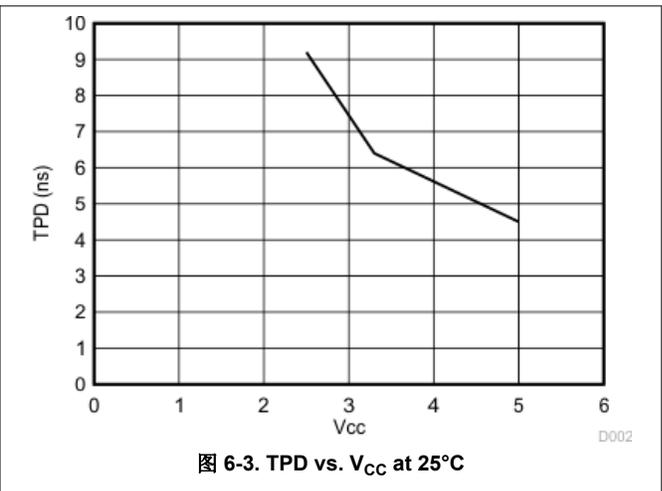
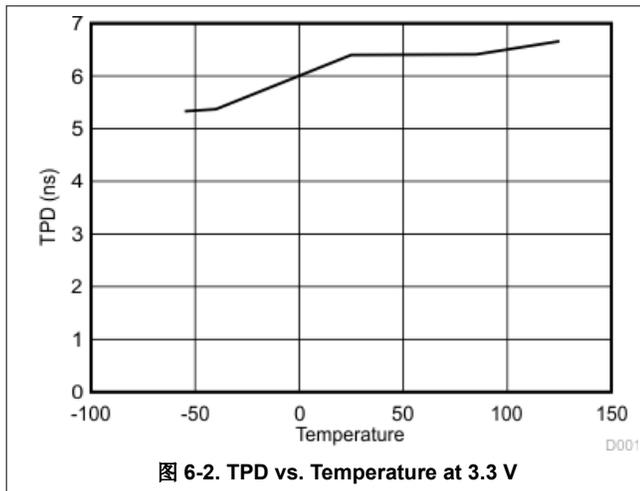
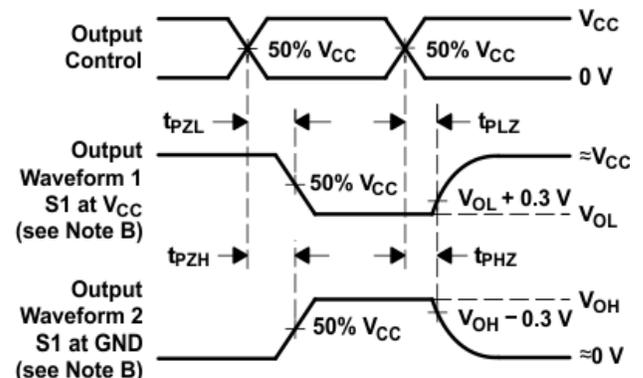
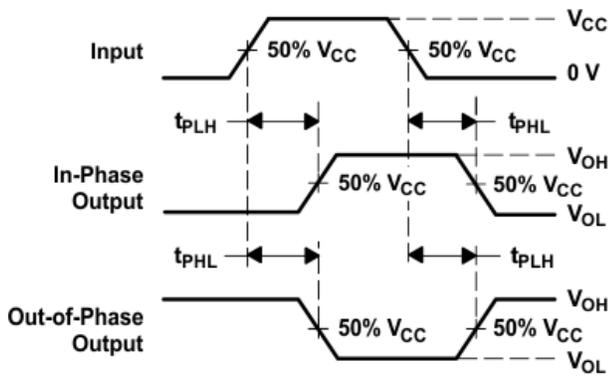
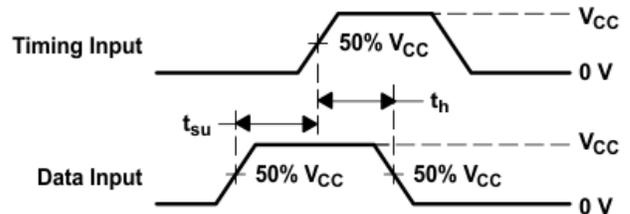
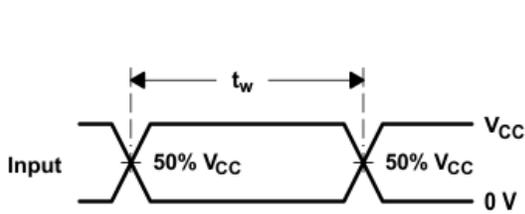
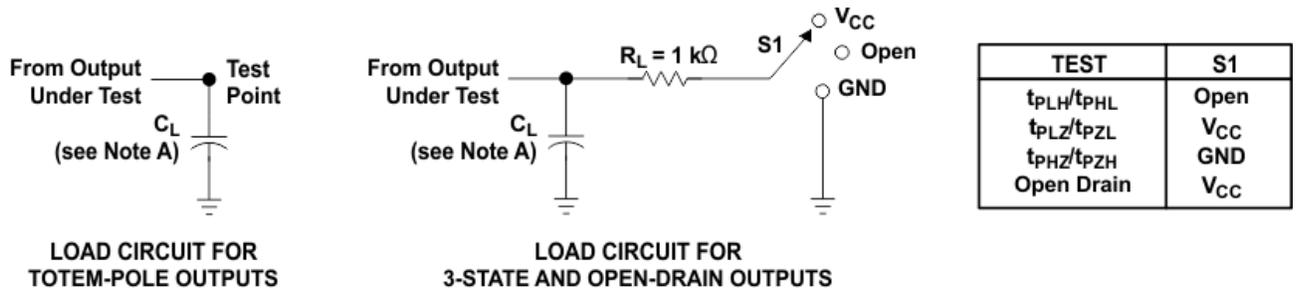


图 6-1. Typical Clear, Shift, and Clear Sequences

### 6.14 Typical Characteristics



## 7 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.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

图 7-1. Load Circuit and Voltage Waveforms

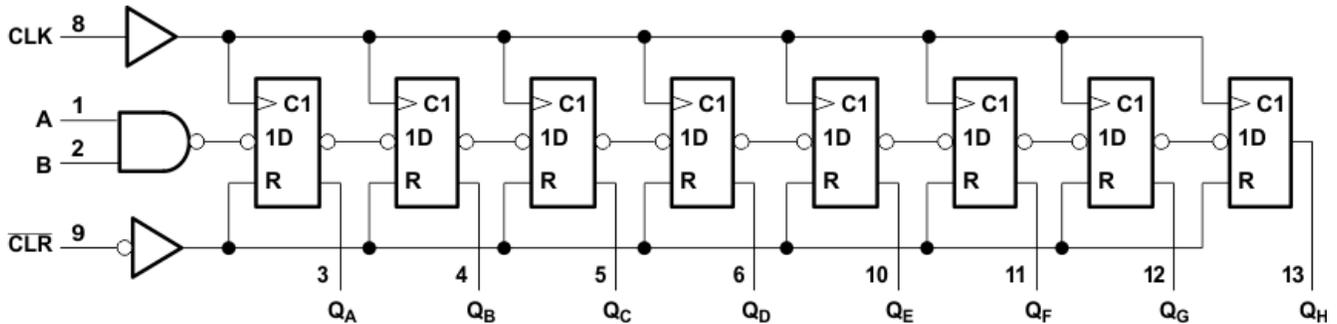
## 8 Detailed Description

### 8.1 Overview

The SNx4LV164A devices are 8-bit parallel-out serial shift registers designed for 2-V to 5.5-V  $V_{CC}$  operation.

These devices feature NAND-gated serial (A and B) inputs and an asynchronous clear ( $\overline{CLR}$ ) input. The gated serial inputs permit complete control over incoming data, as a low at either input inhibits entry of the new data and resets the first flip-flop to the low level at the next clock pulse. A high-level input enables the other input, which then determines the state of the first flip-flop. Data at the serial inputs can be changed while the clock is high or low, provided the minimum setup time requirements are met. Clocking occurs on the low-to-high-level transition of the clock (CLK) input.

### 8.2 Functional Block Diagram



Pin numbers shown are for the D, DB, DGV, J, NS, PW, RGY, and W packages.

图 8-1. Logic Diagram (Positive Logic)

### 8.3 Feature Description

The wide operating range allows the device to be used in a variety of systems that use different logic levels. The low propagation delay allows fast switching and higher speeds of operation. In addition, the low ground bounce stabilizes the performance of non-switching outputs while another output is switching.

### 8.4 Device Functional Modes

表 8-1. Function Table<sup>(1)(2)</sup>

INPUTS				OUTPUTS			
$\overline{CLR}$	CLK	A	B	$Q_A$	$Q_B$	...	$Q_H$
L	X	X	X	L	L		L
H	L	X	X	$Q_{A0}$	$Q_{B0}$		$Q_{H0}$
H	↑	H	H	H	$Q_{An}$		$Q_{Gn}$
H	↑	L	X	L	$Q_{An}$		$Q_{Gn}$
H	↑	X	L	L	$Q_{An}$		$Q_{Gn}$

- (1)  $Q_{A0}$ ,  $Q_{B0}$ ,  $Q_{H0}$  = the level of  $Q_A$ ,  $Q_B$ , or  $Q_H$ , respectively, before the indicated steady-state input conditions were established.
- (2)  $Q_{An}$ ,  $Q_{Gn}$  = the level of  $Q_A$  or  $Q_G$  before the most recent ↑ transition of the clock: indicates a 1-bit shift.

## 9 Application and Implementation

### 备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

### 9.1 Application Information

The SN74LV164A is a low drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low-drive and slow-edge rates will minimize overshoot and undershoot on the outputs.

### 9.2 Typical Application

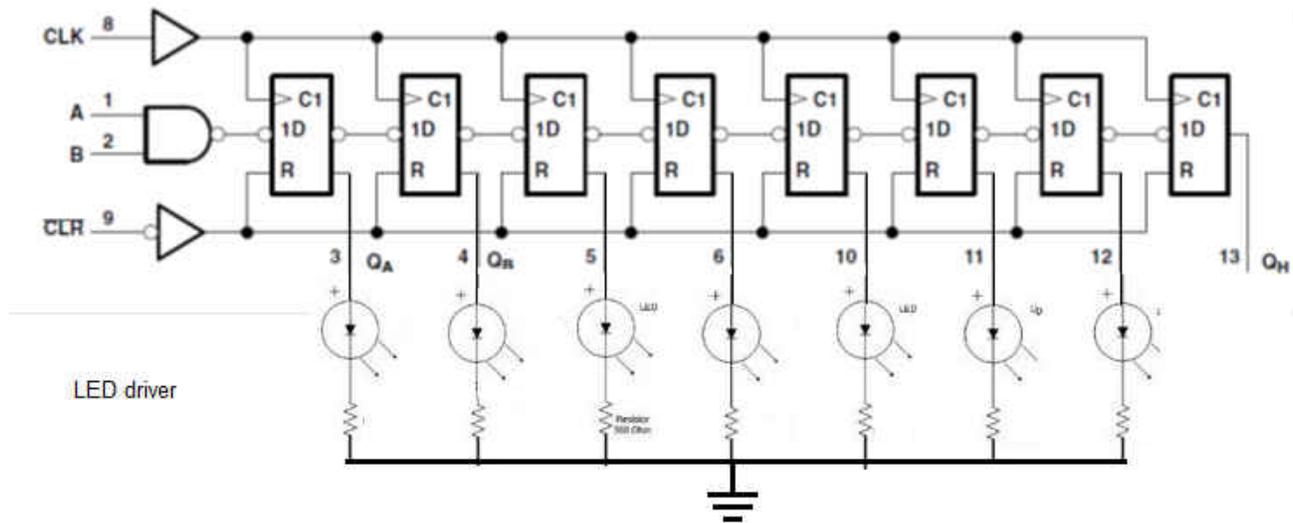


图 9-1. Typical Application Schematic

#### 9.2.1 Design Requirements

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

#### 9.2.2 Detailed Design Procedure

- Recommended input conditions:
  - Rise time and fall time specs. See  $(\Delta t / \Delta V)$  in [节 6.3](#).
  - Specified high and low level. See  $(V_{IH}$  and  $V_{IL})$  in [节 6.3](#).
  - 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  $V_{CC}$ .

### 9.2.3 Application Curves

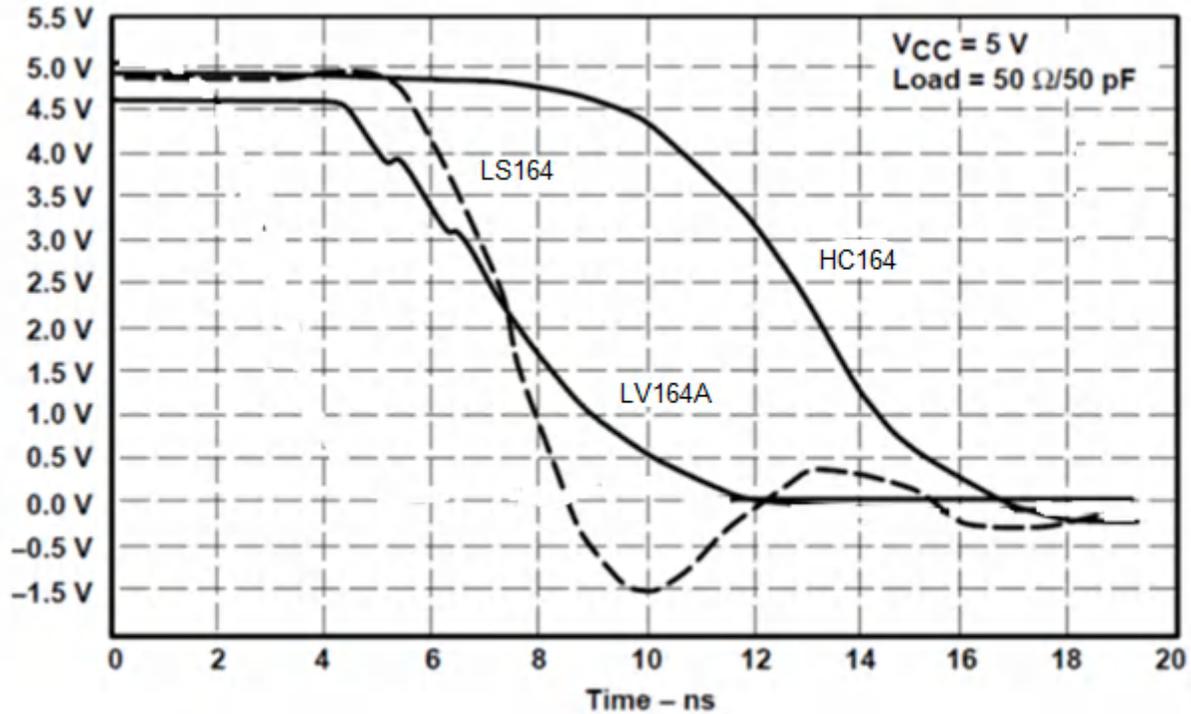


图 9-2. Switching Characteristics Comparison

### 9.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the [# 6.3](#). Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- $\mu$ F capacitor and if there are multiple  $V_{CC}$  terminals then TI recommends a 0.01- $\mu$ F or 0.022- $\mu$ F capacitor for each power terminal. Multiple bypass capacitors can be paralleled to reject different frequencies of noise. Frequencies of 0.1  $\mu$ F and 1  $\mu$ F are commonly used in parallel. The bypass capacitor should be installed as close as possible to the power terminal for best results.

### 9.4 Layout

#### 9.4.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever 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 three of the four buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified below are 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 make more sense or is more convenient. Floating outputs is generally acceptable, unless the part is a transceiver. If the transceiver has an output enable pin it will disable the outputs section of the part when asserted. This will not disable the input section of the I.O' s so they also cannot float when disabled.

### 9.4.2 Layout Example

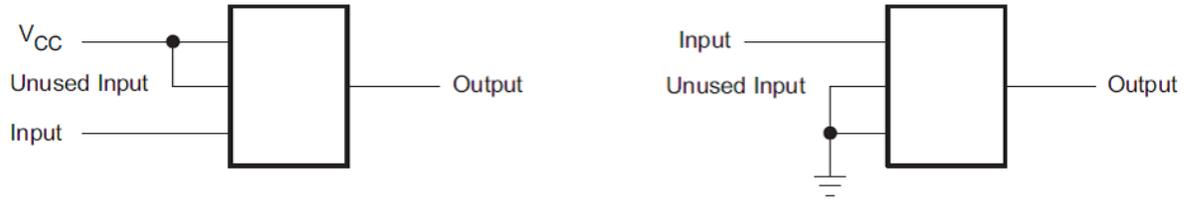


图 9-3. Layout Example

## 10 Device and Documentation Support

### 10.1 Documentation Support

#### 10.1.1 Related Documentation

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.

**表 10-1. Related Links**

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74LV164A	<a href="#">Click here</a>				

#### 10.2 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](http://ti.com) 上的器件产品文件夹。点击 [订阅更新](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

#### 10.3 支持资源

TI E2E™ [支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

#### 10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

#### 10.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

#### 10.6 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

## 11 Mechanical, Packaging, and Orderable Information

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

**PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74LV164ABQAR</a>	Active	Production	WQFN (BQA)   14	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LVA164
SN74LV164ABQAR.A	Active	Production	WQFN (BQA)   14	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LVA164
<a href="#">SN74LV164AD</a>	Obsolete	Production	SOIC (D)   14	-	-	Call TI	Call TI	-40 to 125	LV164A
<a href="#">SN74LV164ADBR</a>	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ADBR.A	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
<a href="#">SN74LV164ADGVR</a>	Active	Production	TVSOP (DGV)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ADGVR.A	Active	Production	TVSOP (DGV)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
<a href="#">SN74LV164ADR</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ADR.A	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ADRG4	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ADRG4.A	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
<a href="#">SN74LV164ANSR</a>	Active	Production	SOP (NS)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	74LV164A
SN74LV164ANSR.A	Active	Production	SOP (NS)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	74LV164A
<a href="#">SN74LV164APW</a>	Obsolete	Production	TSSOP (PW)   14	-	-	Call TI	Call TI	-40 to 125	LV164A
<a href="#">SN74LV164APWR</a>	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164APWR.A	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164APWRG4	Active	Production	TSSOP (PW)   14	2000   null	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164APWRG4	Active	Production	TSSOP (PW)   14	2000   null	No	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164APWRG4.A	Active	Production	TSSOP (PW)   14	2000   null	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164APWRG4.A	Active	Production	TSSOP (PW)   14	2000   null	No	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
<a href="#">SN74LV164APWT</a>	Obsolete	Production	TSSOP (PW)   14	-	-	Call TI	Call TI	-40 to 125	LV164A
<a href="#">SN74LV164ARGYR</a>	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ARGYR.A	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ARGYRG4	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A
SN74LV164ARGYRG4.A	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV164A

<sup>(1)</sup> **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.

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**OTHER QUALIFIED VERSIONS OF SN74LV164A :**

- Automotive : [SN74LV164A-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

**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
SN74LV164ABQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74LV164ADBDR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LV164ADGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74LV164ADRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LV164ANSR	SOP	NS	14	2000	330.0	16.4	8.45	10.55	2.5	12.0	16.2	Q1
SN74LV164APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV164APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV164ARGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1
SN74LV164ARGYRG4	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)
SN74LV164ABQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74LV164ADBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74LV164ADGVR	TVSOP	DGV	14	2000	353.0	353.0	32.0
SN74LV164ADRG4	SOIC	D	14	2500	353.0	353.0	32.0
SN74LV164ANSR	SOP	NS	14	2000	353.0	353.0	32.0
SN74LV164APWR	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74LV164APWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74LV164ARGYR	VQFN	RGY	14	3000	360.0	360.0	36.0
SN74LV164ARGYRG4	VQFN	RGY	14	3000	360.0	360.0	36.0

## GENERIC PACKAGE VIEW

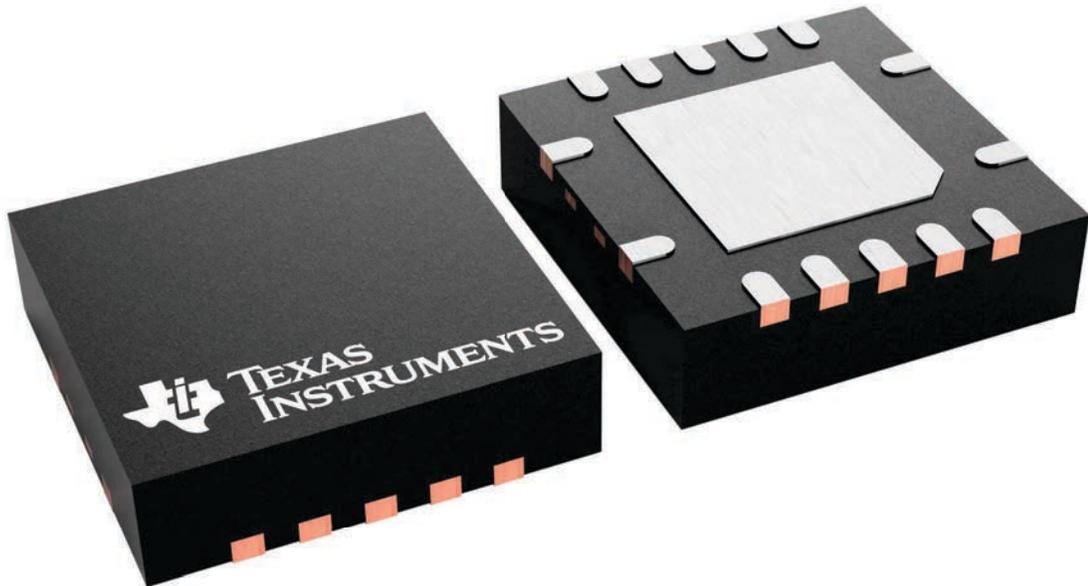
**RGY 14**

**VQFN - 1 mm max height**

3.5 x 3.5, 0.5 mm pitch

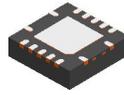
PLASTIC QUAD FLATPACK - NO LEAD

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



4231541/A

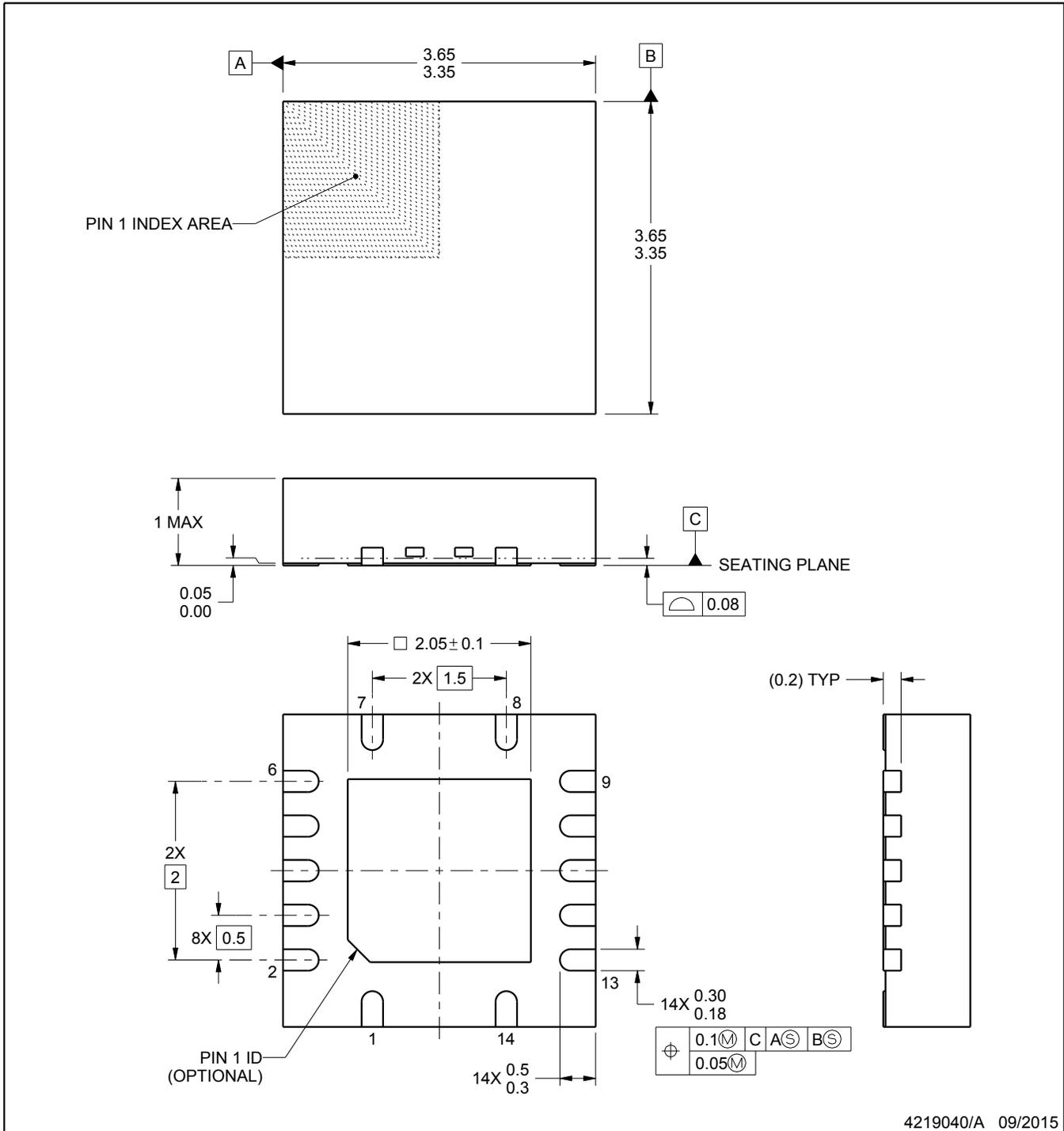
RGY0014A



PACKAGE OUTLINE

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4219040/A 09/2015

NOTES:

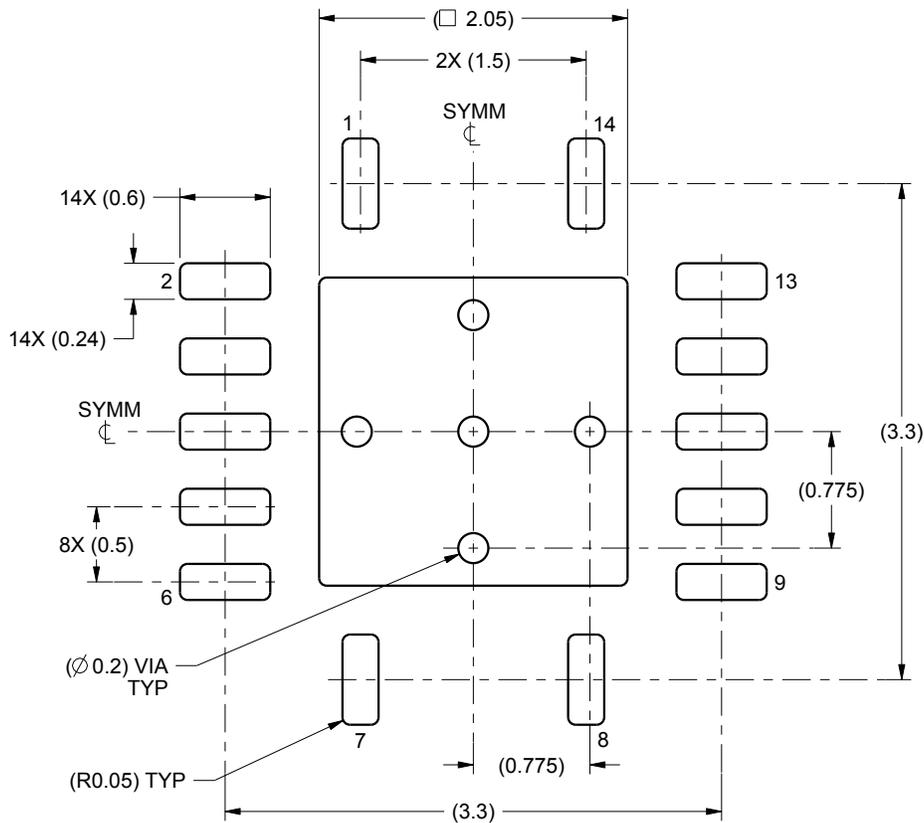
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

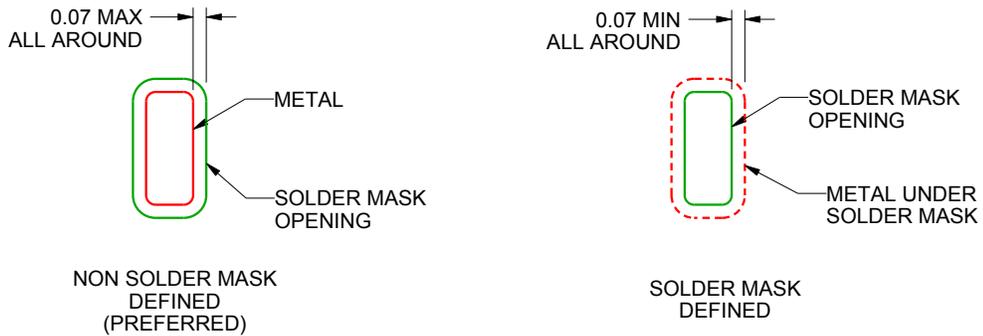
RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:20X



SOLDER MASK DETAILS

4219040/A 09/2015

NOTES: (continued)

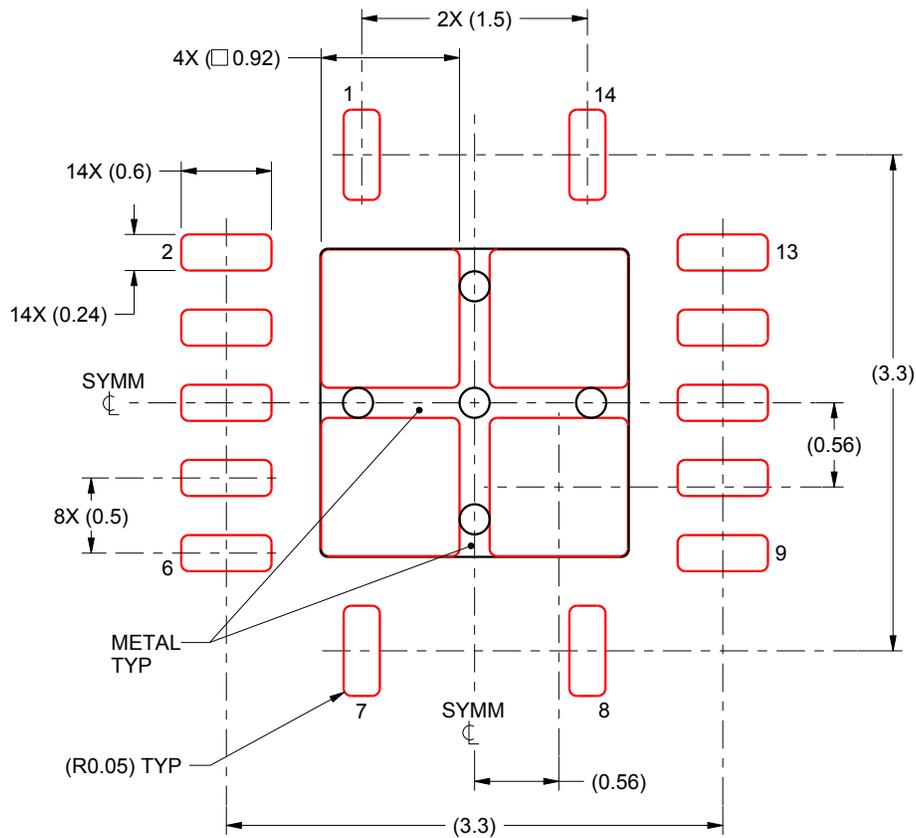
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slue271](http://www.ti.com/lit/slue271)).

# EXAMPLE STENCIL DESIGN

RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL

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

4219040/A 09/2015

NOTES: (continued)

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

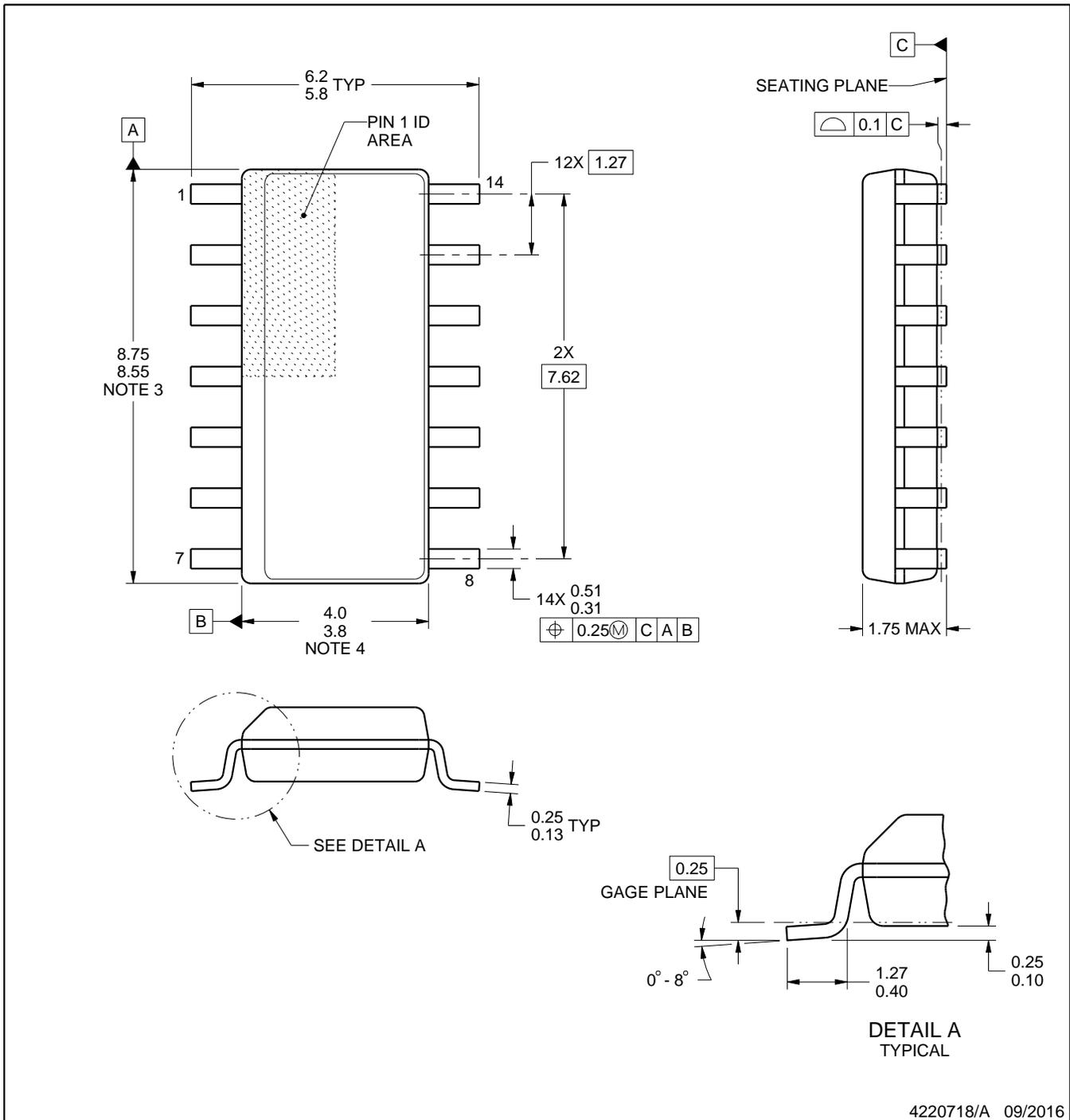
D0014A



# PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

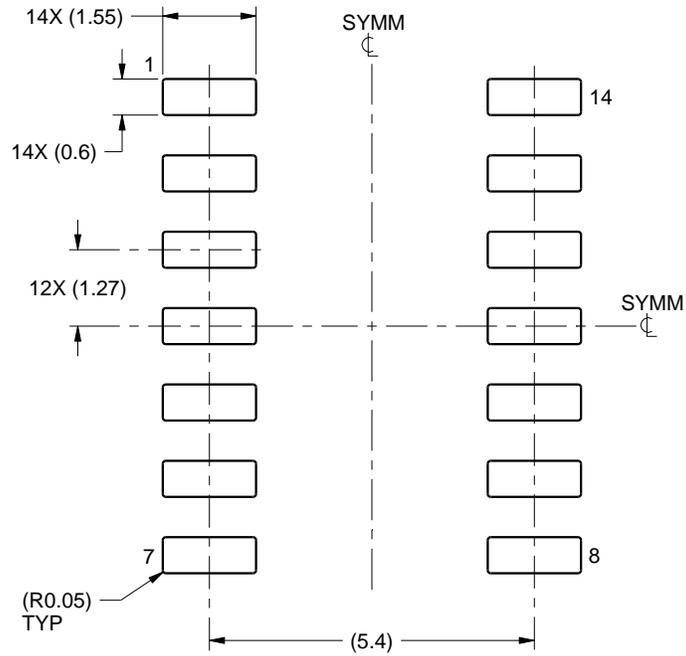
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

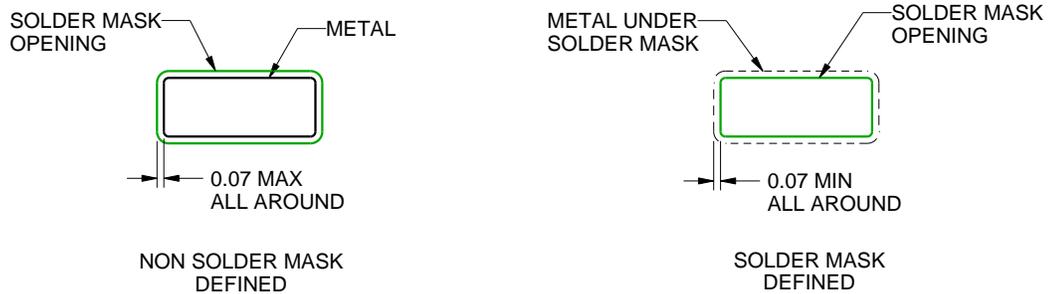
D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

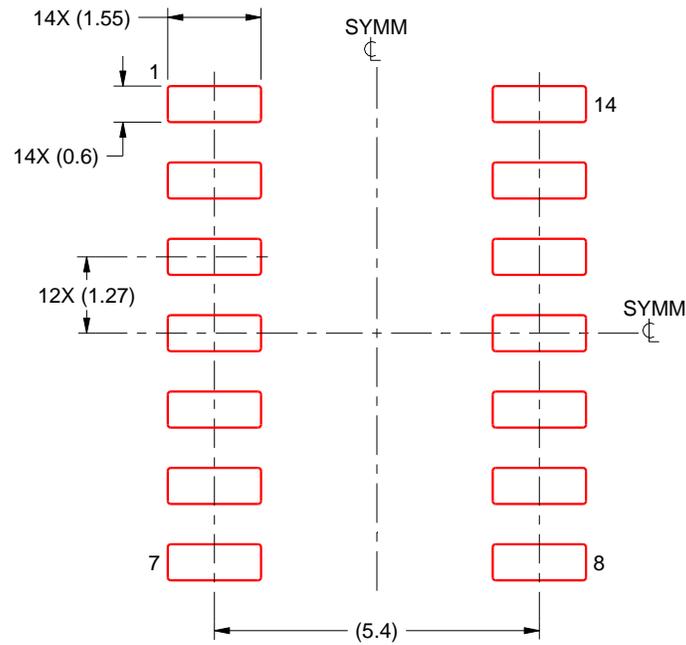
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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

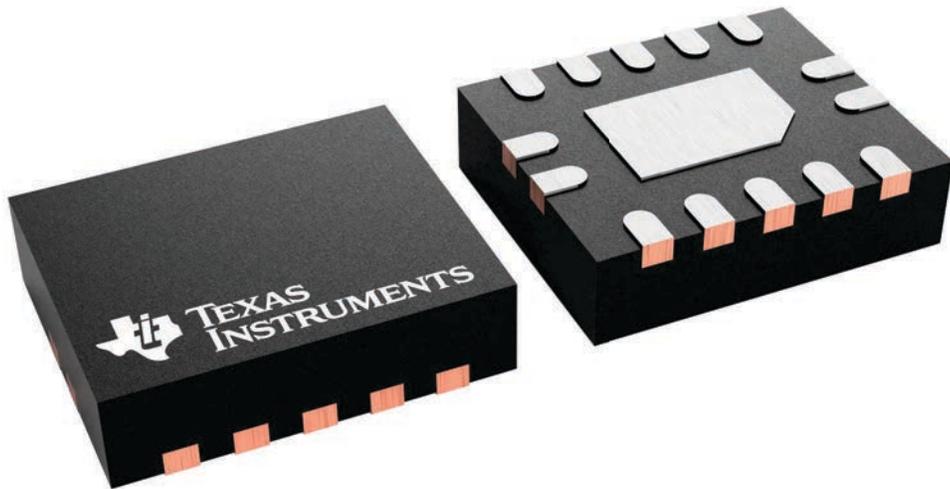
**BQA 14**

**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.



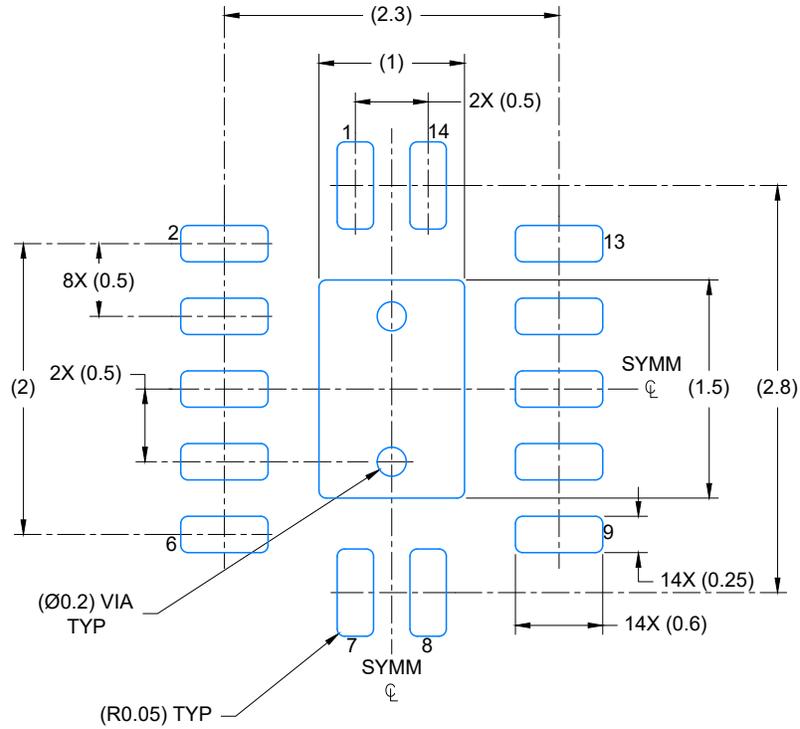


# EXAMPLE BOARD LAYOUT

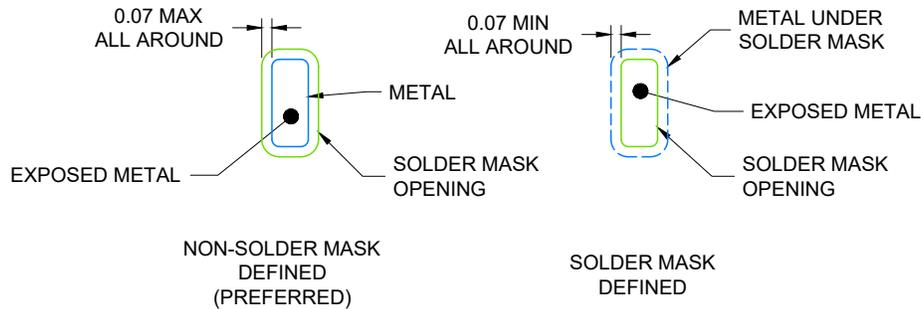
WQFN - 0.8 mm max height

BQA0014A

PLASTIC QUAD FLAT PACK-NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 20X



4224636/A 11/2018

NOTES: (continued)

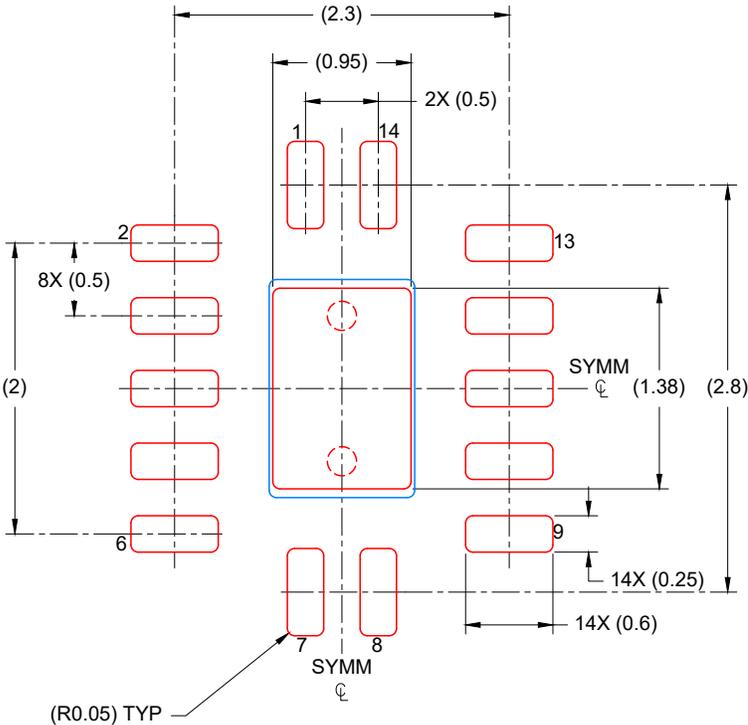
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

# EXAMPLE STENCIL DESIGN

BQA0014A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL

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

4224636/A 11/2018

NOTES: (continued)

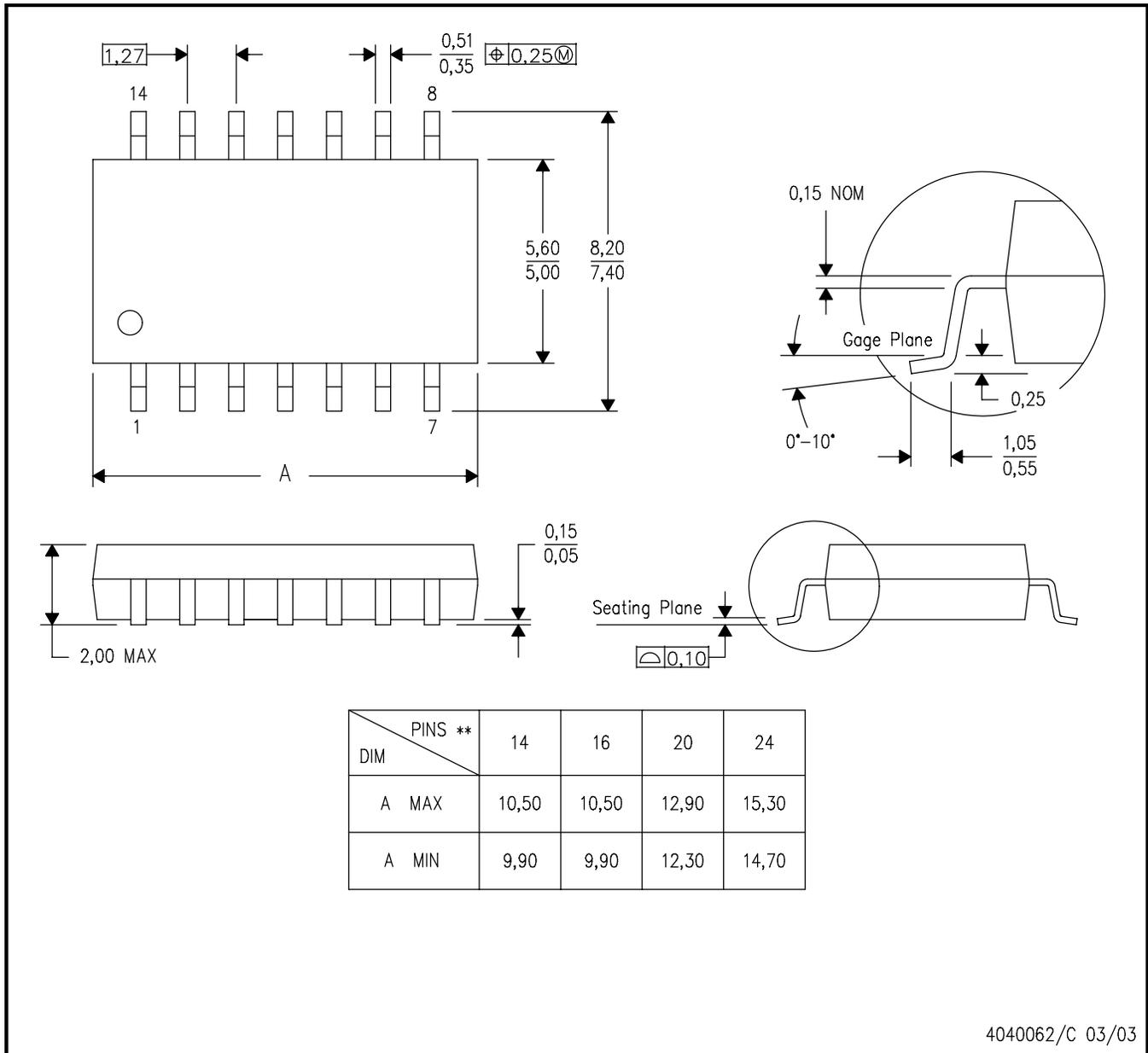
- 6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

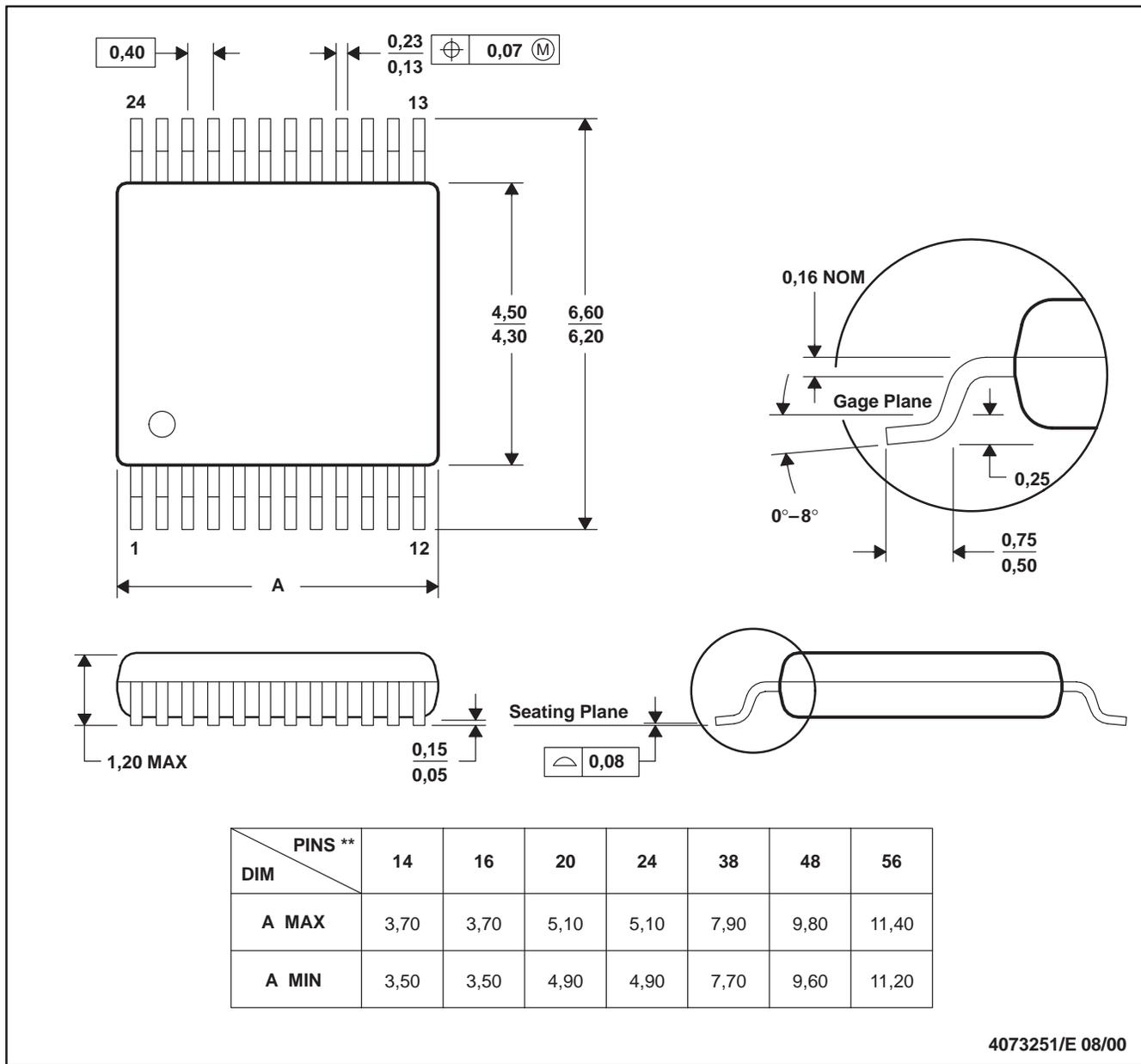


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



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

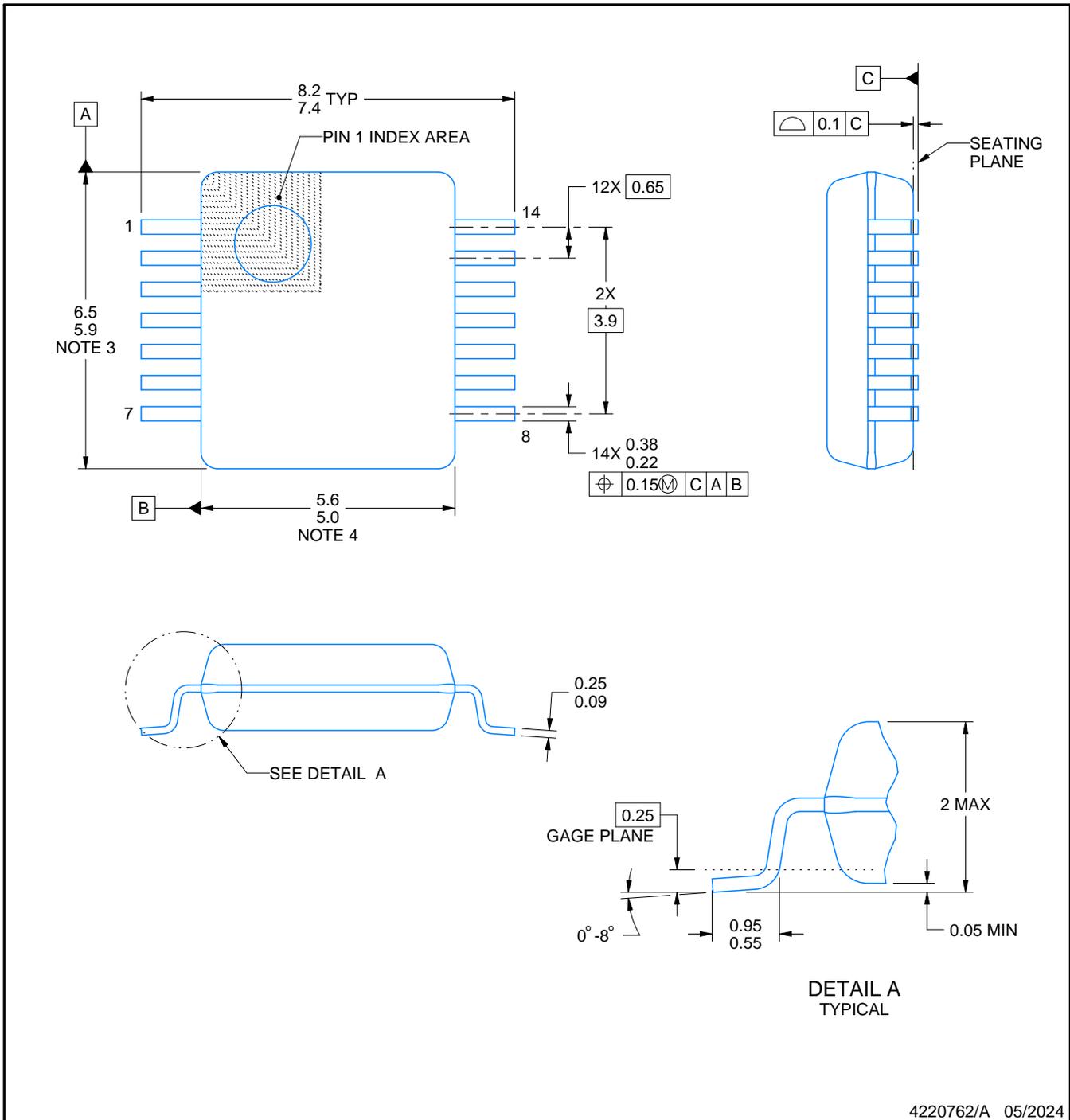
# DB0014A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



### NOTES:

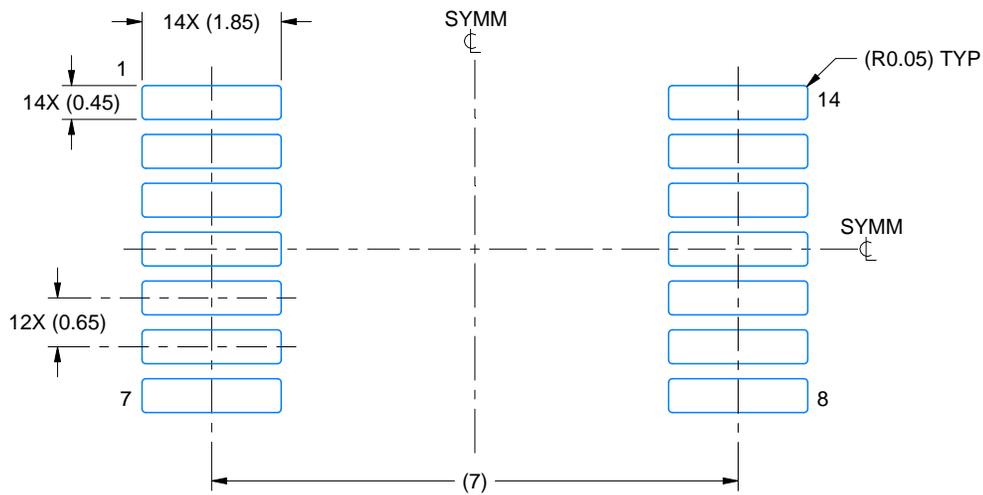
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

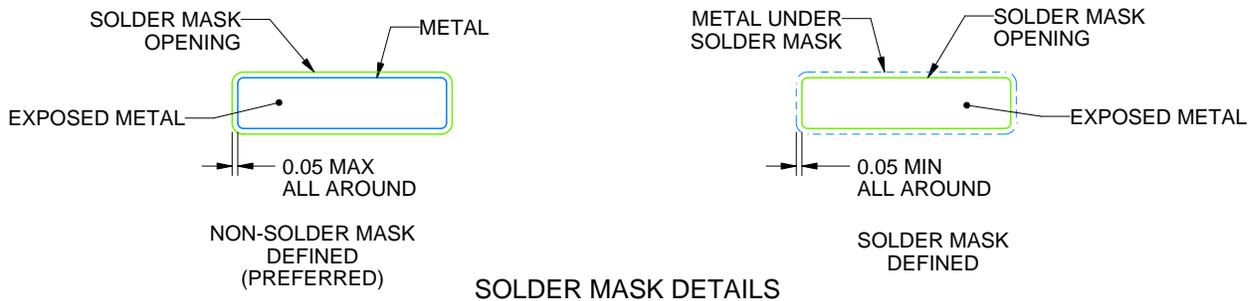
DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220762/A 05/2024

NOTES: (continued)

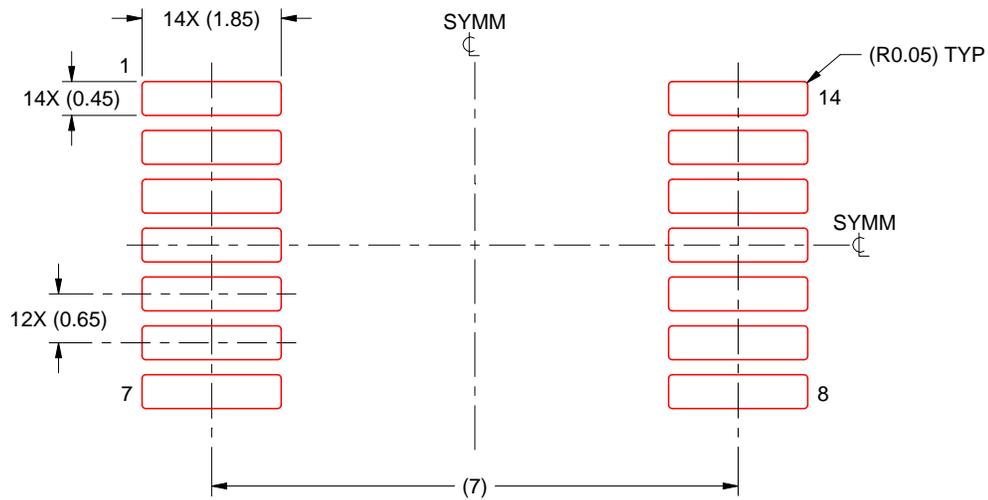
- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4220762/A 05/2024

NOTES: (continued)

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

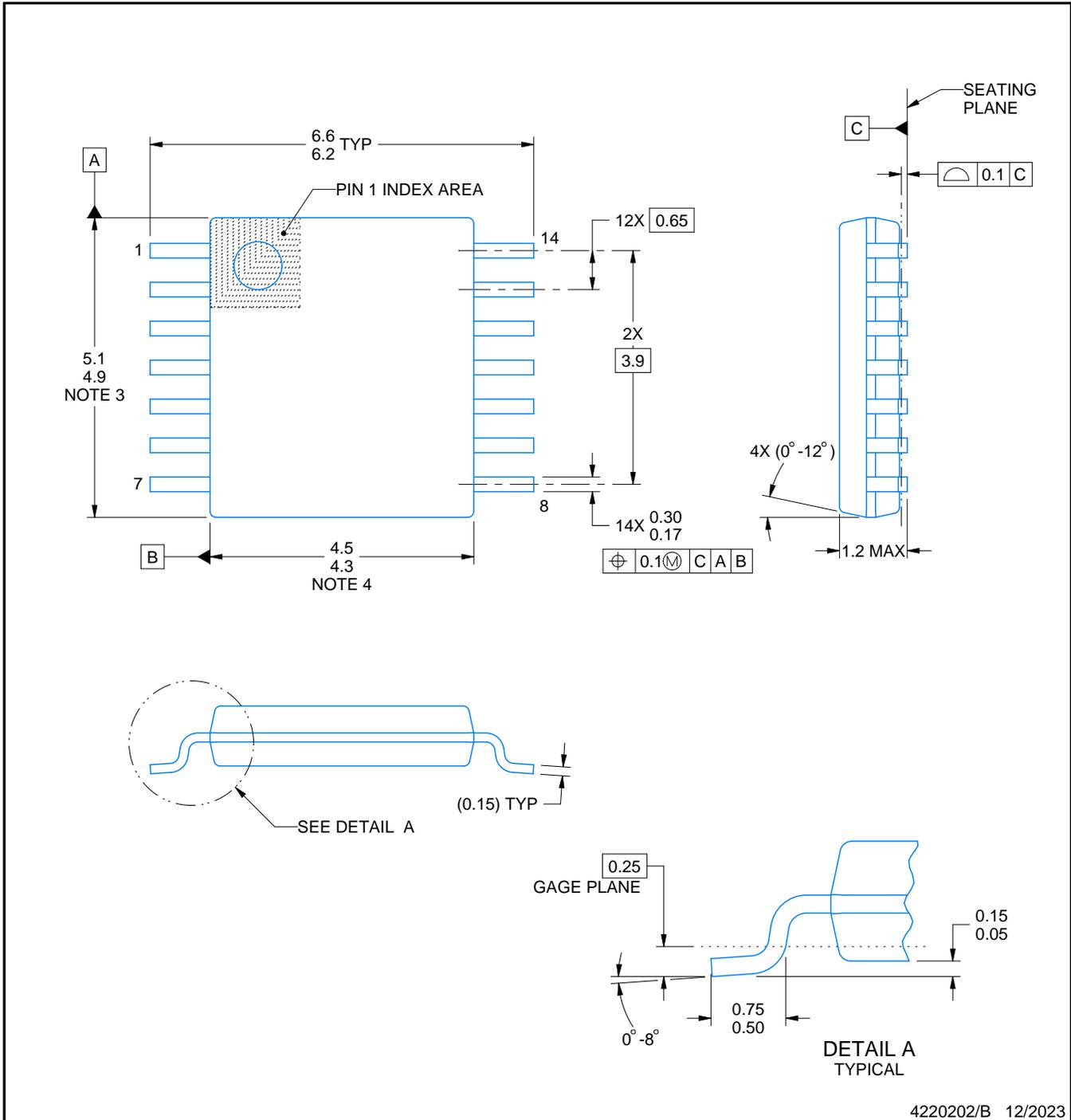
PW0014A



# PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220202/B 12/2023

NOTES:

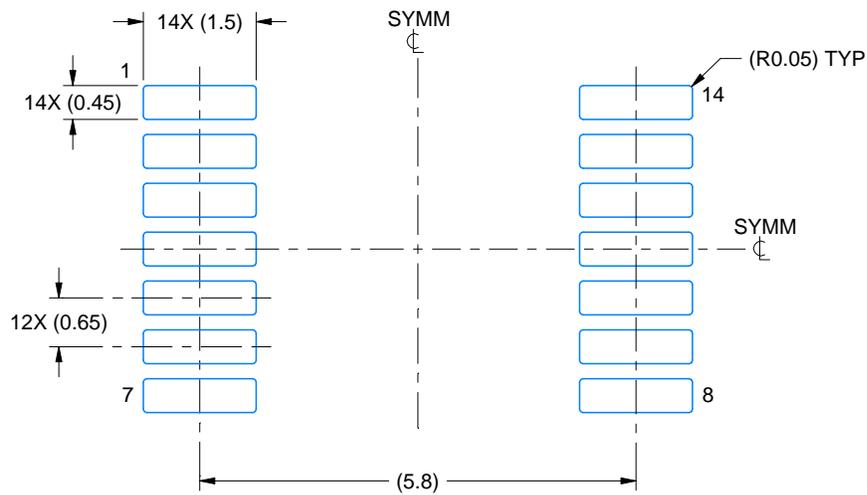
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220202/B 12/2023

NOTES: (continued)

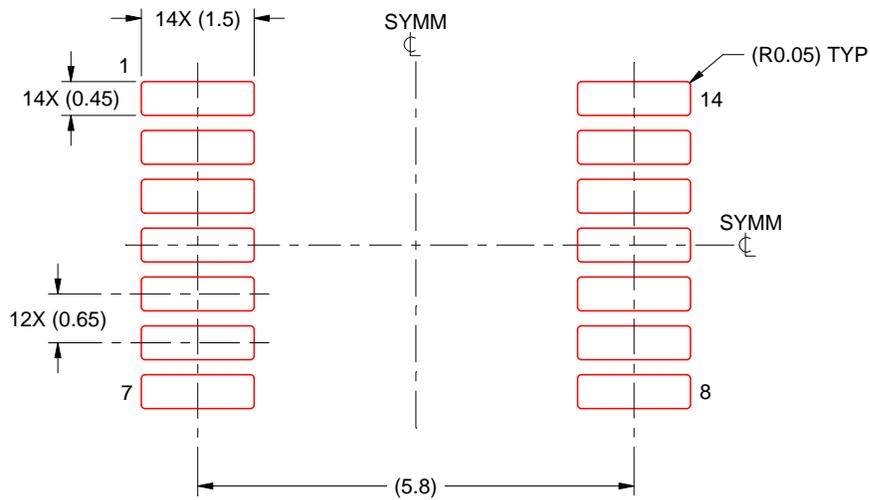
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220202/B 12/2023

NOTES: (continued)

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

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最后更新日期：2025 年 10 月