

## SN74LV595A 3 ステート出力レジスタ搭載 8 ビット・シフト・レジスタ

## 1 特長

- 2V～5.5V の  $V_{CC}$  で動作
- 最大  $t_{pd}$  7.1ns (5V 時)
- 標準  $V_{OLP}$  (出力グランド・バウンス)  
 $< 0.8V$  ( $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ )
- 標準  $V_{OHV}$  (出力  $V_{OH}$  アンダーシュート)  
 $> 2.3V$  ( $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ )
- すべてのポートで混在モード電圧動作をサポート
- 8 ビットのシリアル・イン / パラレル・アウト・シフト
- $I_{off}$  により活線挿抜、部分的パワーダウン・モード、バッカ・ドライブ保護をサポート
- シフト・レジスタはダイレクト・クリアを装備
- JESD 17 準拠で 250mA 超のラッチアップ性能

## 2 アプリケーション

- 出力拡張
- LED マトリクス制御
- 7 セグメント・ディスプレイ制御

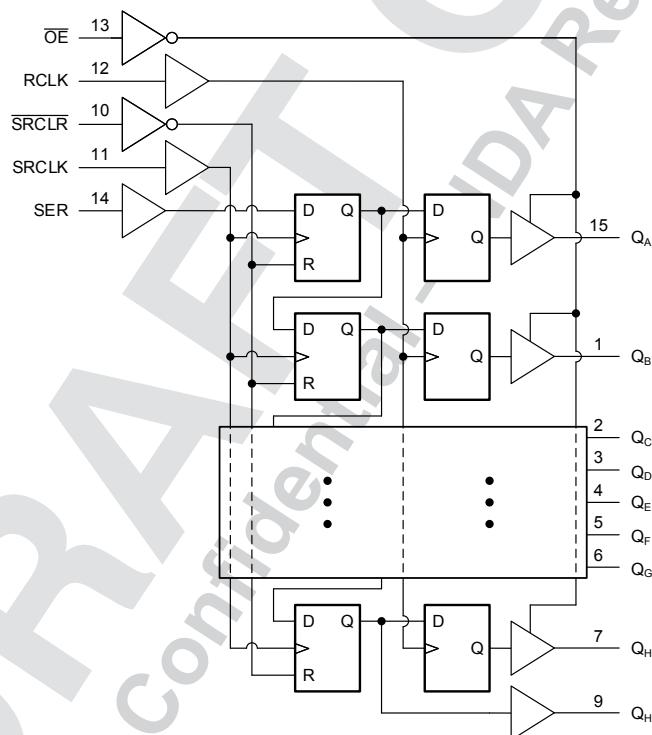
## 3 概要

SN74LV595A デバイスには 8 ビットのシリアル・イン、パラレル・アウトのシフト・レジスタが搭載されており、8 ビットの D タイプ・ストレージ・レジスタへデータを供給します。シフト・レジスタ・クロック (SRCLK) とストレージ・レジスタ・クロック (RCLK) はどちらもポジティブ・エッジ・トリガです。

パッケージ情報<sup>(1)</sup>

部品番号	パッケージ	本体サイズ (公称)
SN74LV595A	RGY (VQFN, 16)	4.00mm × 3.50mm
	PW (TSSOP, 16)	5.00mm × 4.40mm
	NS (SO, 16)	10.20mm × 5.30mm
	D (SOIC, 16)	9.00mm × 3.90mm
	BQB (WQFN, 16)	3.60mm × 2.60mm

(1) 利用可能なすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。



論理図 (正論理)



英語版の TI 製品についての情報を翻訳したこの資料は、製品の概要を確認する目的で便宜的に提供しているものです。該当する正式な英語版の最新情報は、[www.ti.com](http://www.ti.com) で閲覧でき、その内容が常に優先されます。TI では翻訳の正確性および妥当性につきましては一切保証いたしません。実際の設計などの前には、必ず最新版の英語版をご参照くださいますようお願いいたします。

## Table of Contents

1 特長	1	7 Parameter Measurement Information	11
2 アプリケーション	1	8 Detailed Description	12
3 概要	1	8.1 Overview	12
4 Revision History	2	8.2 Functional Block Diagram	12
5 Pin Configuration and Functions	3	8.3 Feature Description	13
6 Specifications	4	8.4 Device Functional Modes	14
6.1 Absolute Maximum Ratings	4	9 Application and Implementation	16
6.2 ESD Ratings	4	9.1 Application Information	16
6.3 Recommended Operating Conditions	5	9.2 Typical Application	16
6.4 Thermal Information	5	9.3 Power Supply Recommendations	18
6.5 Electrical Characteristics	6	9.4 Layout	19
6.6 Timing Requirements, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$	6	10 Device and Documentation Support	20
6.7 Timing Requirements, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$	7	10.1 Documentation Support	20
6.8 Timing Requirements, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$	7	10.2 ドキュメントの更新通知を受け取る方法	20
6.9 Switching Characteristics, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$	8	10.3 サポート・リソース	20
6.10 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$	8	10.4 Trademarks	20
6.11 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$	9	10.5 静電気放電に関する注意事項	20
6.12 Noise Characteristics	9	10.6 用語集	20
6.13 Operating Characteristics	9	11 Mechanical, Packaging, and Orderable	
6.14 Typical Characteristics	10	Information	20

## 4 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision S (November 2022) to Revision T (March 2023)	Page
• ドキュメントの構造レイアウトを現在の標準に更新	1
• Updated thermal values for NS package from $R_{θJA} = 79.4$ to $110.8$ , $R_{θJC(\text{top})} = 35.8$ to $72$ , $R_{θJB} = 40.2$ to $72.6$ , $Ψ_{JT} = 5.5$ to $39.7$ , $Ψ_{JB} = 39.9$ to $72.3$ , all values in $^{\circ}\text{C}/\text{W}$	5

Changes from Revision R (June 2022) to Revision S (November 2022)	Page
• データシートのステータスを「事前情報」から「量産データ」に変更	1

## 5 Pin Configuration and Functions

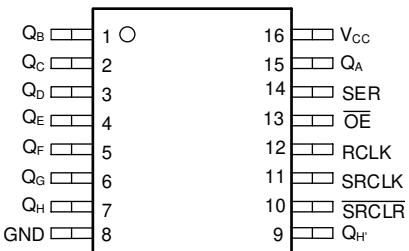


図 5-1. D, DW, or PW Package,  
16-Pin SOIC, SOP or TSSOP  
(Top View)

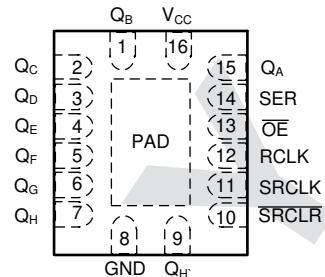


図 5-2. BQB or RGY Package,  
16-Pin WQFN or VQFN  
(Transparent Top View)

表 5-1. Pin Functions

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
GND	8	G	Ground Pin
OE	13	I	Output Enable Pin. Active LOW
Q <sub>A</sub>	15	O	Q <sub>A</sub> Output
Q <sub>B</sub>	1	O	Q <sub>B</sub> Output
Q <sub>C</sub>	2	O	Q <sub>C</sub> Output
Q <sub>D</sub>	3	O	Q <sub>D</sub> Output
Q <sub>E</sub>	4	O	Q <sub>E</sub> Output
Q <sub>F</sub>	5	O	Q <sub>F</sub> Output
Q <sub>G</sub>	6	O	Q <sub>G</sub> Output
Q <sub>H</sub>	7	O	Q <sub>H</sub> Output
Q <sub>H'</sub>	9	O	Q <sub>H'</sub> Output
RCLK	12	I	RCLK Input
SER	14	I	SER Input
SRCLK	11	I	SRCLK Input
SRCLR	10	I	SRCLR Input
V <sub>CC</sub>	16	P	Power Pin
Thermal Pad		—	Thermal Pad <sup>(2)</sup>

(1) I = Input, O = Output, I/O = Input or Output, G = Ground, P = Power

(2) RGY and BQB package only

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage range	-0.5	7	V
$V_I$	Input voltage range <sup>(2)</sup>	-0.5	7	V
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	7	V
$V_O$	Output voltage range applied in the high or low state <sup>(2) (3)</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 $V_{CC}$	$\pm 35$	mA
	Continuous current through $V_{CC}$ or GND		$\pm 70$	mA
$T_{stg}$	Storage temperature range	-65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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

(3) This value is limited to 5.5-V maximum.

### 6.2 ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	$\pm 2000$	V
	Machine Model (MM), per JEDEC specification	$\pm 200$	
	Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002 <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 operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage		2	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2\text{ V}$	1.5		V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.7$		
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.7$		
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.7$		
$V_{IL}$	Low-level input voltage	$V_{CC} = 2\text{ V}$	0.5		V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.3$		
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.3$		
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.3$		
$V_I$	Input voltage		0	5.5	V
$V_O$	Output voltage	High or low state	0	$V_{CC}$	V
		3-state	0	5.5	
$I_{OH}$	High-level output current	$V_{CC} = 2\text{ V}$		-50	$\mu\text{A}$
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		-2	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$		-8	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		-16	
$I_{OL}$	Low-level output current	$V_{CC} = 2\text{ V}$		50	$\mu\text{A}$
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		2	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$		8	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		16	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		200	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$		100	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		20	
$T_A$	Operating free-air temperature		-40	125	°C

(1) 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](#).

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74LV595A						UNIT
		D	DB	NS	PW	RGY	BQB	
		16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	80.2	97.8	110.8	131.2	39.5	85.9	°C/W
$R_{\theta JC(\text{top})}$	Junction-to-case (top) thermal resistance	40.3	48.1	72	69.4	50.5	82.4	
$R_{\theta JB}$	Junction-to-board thermal resistance	38.0	48.5	72.6	75.8	17.1	55.6	
$\Psi_{JT}$	Junction-to-top characterization parameter	9.0	10.0	39.7	21	0.9	9.4	
$\Psi_{JB}$	Junction-to-board characterization parameter	37.7	47.9	72.3	75.4	17.2	55.6	
$R_{\theta JC(\text{bot})}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	5.9	33.3	

(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>	-40°C to 85°C			-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			
	Q <sub>H</sub>	I <sub>OH</sub> = 6 mA	3 V	2.48		2.45			
	Q <sub>A</sub> – Q <sub>H</sub>	I <sub>OH</sub> = 8 mA		2.48		2.45			
	Q <sub>H</sub>	I <sub>OH</sub> = 12 mA	4.5 V	3.8		3.7			
	Q <sub>A</sub> – Q <sub>H</sub>	I <sub>OH</sub> = 16 mA		3.8		3.7			
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	
	Q <sub>H</sub>	I <sub>OL</sub> = 6 mA	3 V		0.44			0.5	
	Q <sub>A</sub> – Q <sub>H</sub>	I <sub>OL</sub> = 8 mA			0.44			0.5	
	Q <sub>H</sub>	I <sub>OL</sub> = 12 mA	4.5 V		0.55			0.6	
	Q <sub>A</sub> – Q <sub>H</sub>	I <sub>OL</sub> = 16 mA			0.55			0.6	
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 V to 5.5 V		±1				±1	µA
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	Q <sub>A</sub> – Q <sub>H</sub>	5.5 V		±5			±5	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	I <sub>O</sub> = 0	5.5 V		20			20	µA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V		0 V		5			5	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND		3.3 V		3.5			3.5	pF

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

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

		T <sub>A</sub> = 25°C	-40°C to 85°C		-40°C to 125°C		UNIT	
			MIN	MAX	MIN	MAX		
t <sub>w</sub>	Pulse duration	SRCLK high or low	7		7.5		8.5	ns
		RCLK high or low	7		7.5		8.5	
		SRCLR low	6		6.5		7.5	
t <sub>su</sub>	Setup time	SER before SRCLK ↑	5.5		5.5		6.5	ns
		SRCLK ↑ before RCLK ↑ <sup>(1)</sup>	8		9		10	
		SRCLR low before RCLK ↑	8.5		9.5		10.5	
		SRCLR high (inactive) before SRCLK ↑	4		4		5	
t <sub>h</sub>	Hold time	SER after SRCLK ↑	1.5		1.5		2.5	ns

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

## 6.7 Timing Requirements, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

		$T_A = 25^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 85^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 125^\circ\text{C}$		<b>UNIT</b>
		MIN	MAX	MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	SRCLK high or low	5.5	5.5		6.5		ns
		RCLK high or low	5.5	5.5		6.5		
		SRCLR low	5	5		6		
$t_{su}$	Setup time	SER before SRCLK $\uparrow$	3.5	3.5		4.5		ns
		SRCLK $\uparrow$ before RCLK $\uparrow$ <a href="#">(1)</a>	8	8.5		9.5		
		SRCLR low before RCLK $\uparrow$	8	9		10		
		SRCLR high (inactive) before SRCLK $\uparrow$	3	3		4		
$t_h$	Hold time	SER after SRCLK $\uparrow$	1.5	1.5		2.5		ns

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

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

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

		$T_A = 25^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 85^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 125^\circ\text{C}$		<b>UNIT</b>
		MIN	MAX	MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	SRCLK high or low	5	5		6		ns
		RCLK high or low	5	5		6		
		SRCLR low	5.2	5.2		6.2		
$t_{su}$	Setup time	SER before SRCLK $\uparrow$	3	3		4		ns
		SRCLK $\uparrow$ before RCLK $\uparrow$ <a href="#">(1)</a>	5	5		6		
		SRCLR low before RCLK $\uparrow$	5	5		6		
		SRCLR high (inactive) before SRCLK $\uparrow$	2.5	2.5		3.5		
$t_h$	Hold time	SER after SRCLK $\uparrow$	2	2		3		ns

(1) This setup time allows the storage register to receive stable data from the shift register. The clocks can be tied together, in which case the shift register is one clock pulse ahead of the storage register.

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

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C} \text{ to } 85^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 125^\circ\text{C}$		UNIT	
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
$f_{max}$			$C_L = 15 \text{ pF}$	65	80		45		45		MHz	
			$C_L = 50 \text{ pF}$	60	70		40		40			
$t_{PLH}$	RCLK	$Q_A - Q_H$	$C_L = 15 \text{ pF}$		8.4	14.2	1	15.8	1	16.8	ns	
$t_{PHL}$					8.4	14.2	1	15.8	1	16.8		
$t_{PLH}$	SRCLK	$Q_H'$			9.4	19.6	1	22.2	1	23.2		
$t_{PHL}$					9.4	19.6	1	22.2	1	23.2		
$t_{PHL}$	$\overline{OE}$	$Q_A - Q_H$			8.7	14.6	1	16.3	1	17.3		
$t_{PZH}$					8.2	13.9	1	15	1	16		
$t_{PZL}$	$\overline{OE}$	$Q_A - Q_H$			10.9	18.1	1	20.3	1	21.3		
$t_{PHZ}$					8.3	13.7	1	15.6	1	16.6		
$t_{PLZ}$	$\overline{OE}$	$Q_A - Q_H$			9.2	15.2	1	16.7	1	17.7		
$t_{PLH}$	RCLK	$Q_A - Q_H$	$C_L = 50 \text{ pF}$		11.2	17.2	1	19.3	1	21.3	ns	
$t_{PHL}$					11.2	17.2	1	19.3	1	21.3		
$t_{PLH}$	SRCLK	$Q_H'$			13.1	22.5	1	25.5	1	27.5		
$t_{PHL}$					13.1	22.5	1	25.5	1	27.5		
$t_{PHL}$	$\overline{SRCLR}$	$Q_H'$			12.4	18.8	1	21.1	1	23.1		
$t_{PZH}$					10.8	17	1	18.3	1	20.3		
$t_{PZL}$	$\overline{OE}$	$Q_A - Q_H$			13.4	21	1	23	1	25		
$t_{PHZ}$					12.2	18.3	1	19.5	1	21.5		
$t_{PLZ}$	$\overline{OE}$	$Q_A - Q_H$			14	20.9	1	22.6	1	24.6		

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

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C} \text{ to } 85^\circ\text{C}$		$-40^\circ\text{C} \text{ to } 125^\circ\text{C}$		UNIT	
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
$f_{max}$			$C_L = 15 \text{ pF}$	80	120		70		70		MHz	
			$C_L = 50 \text{ pF}$	55	105		50		50			
$t_{PLH}$	RCLK	$Q_A - Q_H$	$C_L = 15 \text{ pF}$		6	11.9	1	13.5	1	14.5	ns	
$t_{PHL}$					6	11.9	1	13.5	1	14.5		
$t_{PLH}$	SRCLK	$Q_H'$			6.6	13	1	15	1	16		
$t_{PHL}$					6.6	13	1	15	1	16		
$t_{PHL}$	$\overline{SRCLR}$	$Q_H'$			6.2	12.8	1	13.7	1	14.7		
$t_{PZH}$					6	11.5	1	13.5	1	14.5		
$t_{PZL}$	$\overline{OE}$	$Q_A - Q_H$			7.8	11.5	1	13.5	1	14.5		
$t_{PHZ}$					6.1	14.7	1	15.2	1	16.2		
$t_{PLZ}$	$\overline{OE}$	$Q_A - Q_H$			6.3	14.7	1	15.2	1	16.2		
$t_{PLH}$	RCLK	$Q_A - Q_H$	$C_L = 50 \text{ pF}$		7.9	15.4	1	17	1	19	ns	
$t_{PHL}$					7.9	15.4	1	17	1	19		
$t_{PLH}$	SRCLK	$Q_H'$			9.2	16.5	1	18.5	1	20.5		
$t_{PHL}$					9.2	16.5	1	18.5	1	20.5		
$t_{PHL}$	$\overline{SRCLR}$	$Q_H'$			9	16.3	1	17.2	1	19.2		
$t_{PZH}$					7.8	15	1	17	1	19		
$t_{PZL}$	$\overline{OE}$	$Q_A - Q_H$			9.6	15	1	17	1	19		
$t_{PHZ}$					8.1	15.7	1	16.2	1	18.2		
$t_{PLZ}$	$\overline{OE}$	$Q_A - Q_H$			9.3	15.7	1	16.2	1	18.2		

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

over recommended operating free-air temperature range (unless otherwise noted) (see [图 7-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	TA = 25°C			-40°C to 85°C		-40°C to 125°C		UNIT	
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
f <sub>max</sub>			C <sub>L</sub> = 15 pF	135	170		115		115		MHz	
			C <sub>L</sub> = 50 pF	120	140		95		95			
t <sub>PLH</sub>	RCLK	Q <sub>A</sub> –Q <sub>H</sub>	C <sub>L</sub> = 15 pF	4.3	7.4	1	8.5		1	9.5	ns	
t <sub>PHL</sub>				4.3	7.4	1	8.5		1	9.5		
t <sub>PLH</sub>	SRCLK	Q <sub>H'</sub>		4.5	8.2	1	9.4		1	10.4		
t <sub>PHL</sub>				4.5	8.2	1	9.4		1	10.4		
t <sub>PLH</sub>	SRCLR	Q <sub>H'</sub>		4.5	8	1	9.1		1	10.1		
t <sub>PHL</sub>				4.3	8.6	1	10		1	11		
t <sub>PZH</sub>	OE	Q <sub>A</sub> –Q <sub>H</sub>		5.4	8.6	1	10		1	11		
t <sub>PZL</sub>				2.4	6	1	7.1		1	7.1		
t <sub>PHZ</sub>	OE	Q <sub>A</sub> –Q <sub>H</sub>		2.7	5.1	1	7.2		1	7.2		
t <sub>PLH</sub>				5.6	9.4	1	10.5		1	12.5		
t <sub>PHL</sub>	RCLK	Q <sub>A</sub> –Q <sub>H</sub>	C <sub>L</sub> = 50 pF	5.6	9.4	1	10.5		1	12.5	ns	
t <sub>PLH</sub>				6.4	10.2	1	11.4		1	13.4		
t <sub>PHL</sub>	SRCLK	Q <sub>H'</sub>		6.4	10.2	1	11.4		1	13.4		
t <sub>PLH</sub>				6.4	10	1	11.1		1	13.1		
t <sub>PZH</sub>	OE	Q <sub>A</sub> –Q <sub>H</sub>		5.7	10.6	1	12		1	14		
t <sub>PZL</sub>				6.8	10.6	1	12		1	14		
t <sub>PHZ</sub>	OE	Q <sub>A</sub> –Q <sub>H</sub>		3.5	10.3	1	11		1	13		
t <sub>PLZ</sub>				3.4	10.3	1	11		1	13		

## 6.12 Noise Characteristics

$V_{CC} = 3.3 \text{ V}$ ,  $C_L = 50 \text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

PARAMETER	MIN	TYP	MAX	UNIT
V <sub>OL(P)</sub>	0.3			V
V <sub>OL(V)</sub>	-0.2			V
V <sub>OH(V)</sub>	2.8			V
V <sub>IH(D)</sub>	2.31			V
V <sub>IL(D)</sub>	0.99			V

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

## 6.13 Operating Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	TYP	UNIT	
C <sub>pd</sub>	Power dissipation capacitance	C <sub>L</sub> = 50 pF, f = 10 MHz	3.3 V	111	pF
			5 V	114	

## 6.14 Typical Characteristics

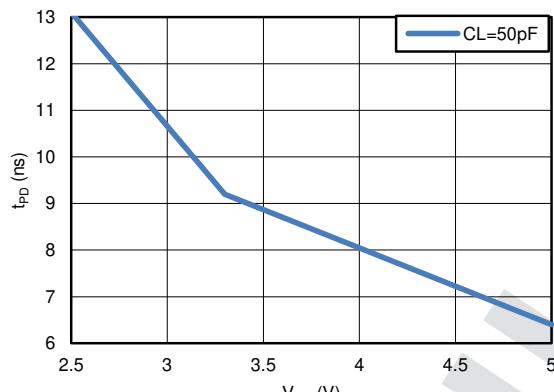
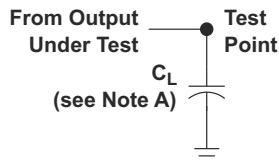
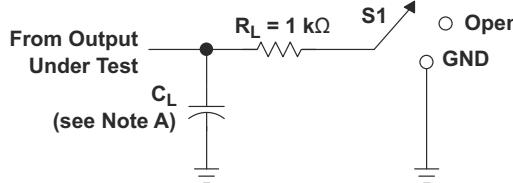


図 6-1. TPD vs  $V_{CC}$

## 7 Parameter Measurement Information

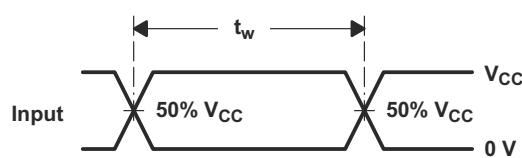


LOAD CIRCUIT FOR  
TOTEM-POLE OUTPUTS

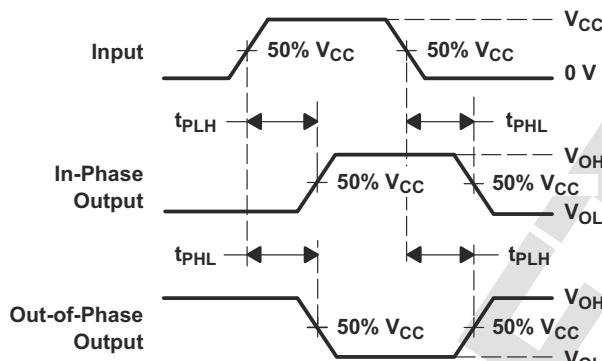


LOAD CIRCUIT FOR  
3-STATE AND OPEN-DRAIN OUTPUTS

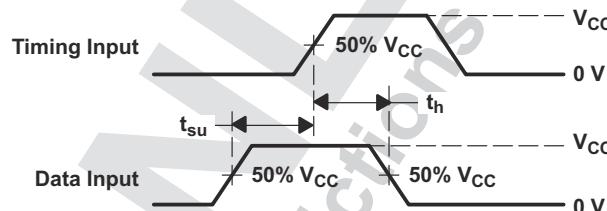
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{CC}$
$t_{PHZ}/t_{PZH}$	GND
Open Drain	$V_{CC}$



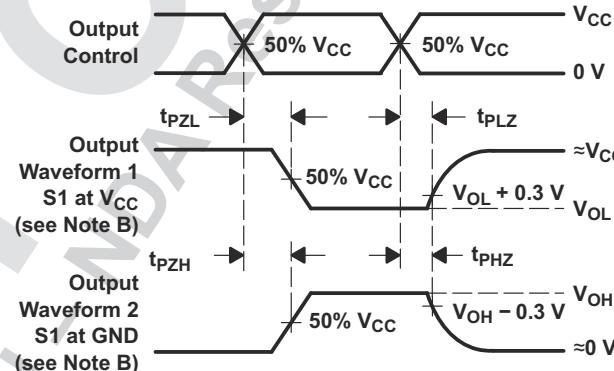
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



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

- $C_L$  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:  $PRR \leq 1 \text{ MHz}$ ,  $Z_0 = 50 \Omega$ ,  $t_r \leq 3 \text{ ns}$ ,  $t_f \leq 3 \text{ ns}$ .
- The outputs are measured one at a time, with one input transition per measurement.
- $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
- 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 SN74LV595A device contains an 8-bit serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. The storage register has parallel 3-state outputs. Separate clocks are provided for the shift and storage registers. The shift register has a direct overriding clear (SRCLR) input, serial (SER) input, and serial outputs for cascading. When the output-enable ( $\overline{OE}$ ) input is high, the outputs are in the high-impedance state. Both the shift register clock (SRCLK) and storage register clock (RCLK) are positive-edge triggered. If both clocks are connected together, then the shift register always is one clock pulse ahead of the storage register.

### 8.2 Functional Block Diagram

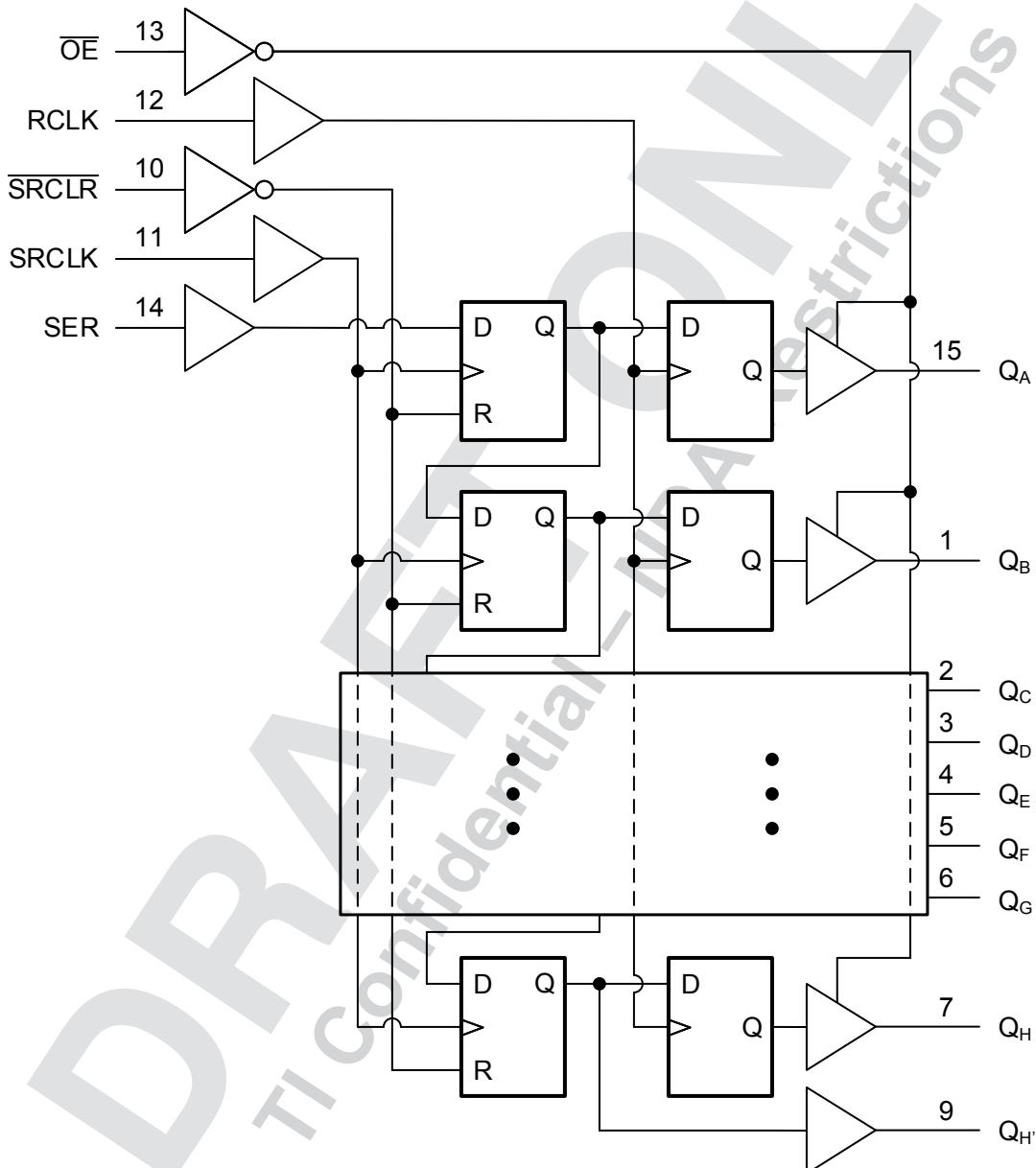


图 8-1. Logic Diagram (Positive Logic)

## 8.3 Feature Description

### 8.3.1 Balanced CMOS 3-State Outputs

This device includes balanced CMOS 3-state outputs. Driving high, driving low, and high impedance are the three states that these outputs can be in. The term *balanced* indicates that the device can sink and source similar currents. The drive capability of this device may create fast edges into light loads, so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device can drive larger currents than the device can sustain without being damaged. It is important for the output power of the device to be limited to avoid damage due to overcurrent. The electrical and thermal limits defined in the *Absolute Maximum Ratings* must be followed at all times.

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When placed into the high-impedance mode, the output will neither source nor sink current, with the exception of minor leakage current as defined in the *Electrical Characteristics* table. In the high-impedance state, the output voltage is not controlled by the device and is dependent on external factors. If no other drivers are connected to the node, then this is known as a floating node and the voltage is unknown. A pull-up or pull-down resistor can be connected to the output to provide a known voltage at the output while it is in the high-impedance state. The value of the resistor will depend on multiple factors, including parasitic capacitance and power consumption limitations. Typically, a 10-k $\Omega$  resistor can be used to meet these requirements.

Unused 3-state CMOS outputs should be left disconnected.

### 8.3.2 Latching Logic

This device includes latching logic circuitry. Latching circuits commonly include D-type latches and D-type flip-flops, but include all logic circuits that act as volatile memory.

When the device is powered on, the state of each latch is unknown. There is no default state for each latch at start-up.

The output state of each latching logic circuit only remains stable as long as power is applied to the device within the supply voltage range specified in the *Recommended Operating Conditions* table.

### 8.3.3 Partial Power Down ( $I_{off}$ )

This device includes circuitry to disable all outputs when the supply pin is held at 0 V. When disabled, the outputs will neither source nor sink current, regardless of the input voltages applied. The amount of leakage current at each output is defined by the  $I_{off}$  specification in the *Electrical Characteristics* table.

### 8.3.4 Clamp Diode Structure

图 8-2 shows the inputs and outputs to this device have negative clamping diodes only.

#### 注意

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

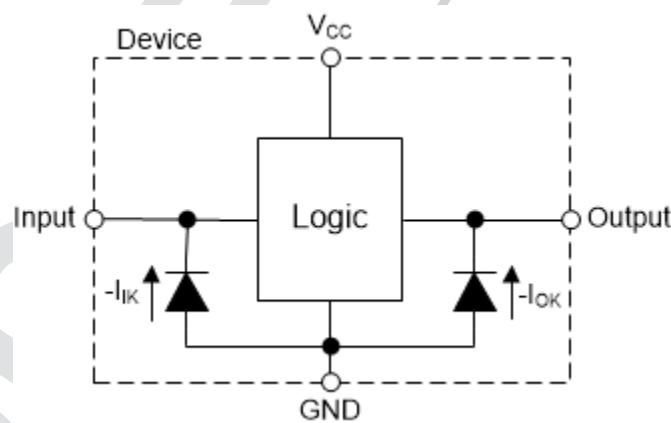


图 8-2. Electrical Placement of Clamping Diodes for Each Input and Output

## 8.4 Device Functional Modes

表 8-1. Function Table

INPUTS <sup>(1)</sup>					FUNCTION
SER	SRCLK	SRCLR	RCLK	OE	
X	X	X	X	H	Outputs Q <sub>A</sub> –Q <sub>H</sub> are disabled. Q <sub>H'</sub> Remains enabled.

**表 8-1. Function Table (continued)**

INPUTS <sup>(1)</sup>					FUNCTION
SER	SRCLK	SRCLR	RCLK	OE	
X	X	X	X	L	Outputs Q <sub>A</sub> –Q <sub>H</sub> are enabled.
X	X	L	X	X	Shift register is cleared.
L	↑	H	X	X	First stage of the shift register goes low. Other stages store the data of previous stage, respectively.
H	↑	H	X	X	First stage of the shift register goes high. Other stages store the data of previous stage, respectively.
X	X	X	↑	X	Shift-register data is stored in the storage register.

(1) H = High Voltage Level, L = Low Voltage Level, X = Do not Care, Z = High Impedance

## 9 Application and Implementation

### 注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくことになります。お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

### 9.1 Application Information

The SN74LV595A 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. The inputs are 5-V tolerant allowing for down translation to V<sub>CC</sub>.

### 9.2 Typical Application

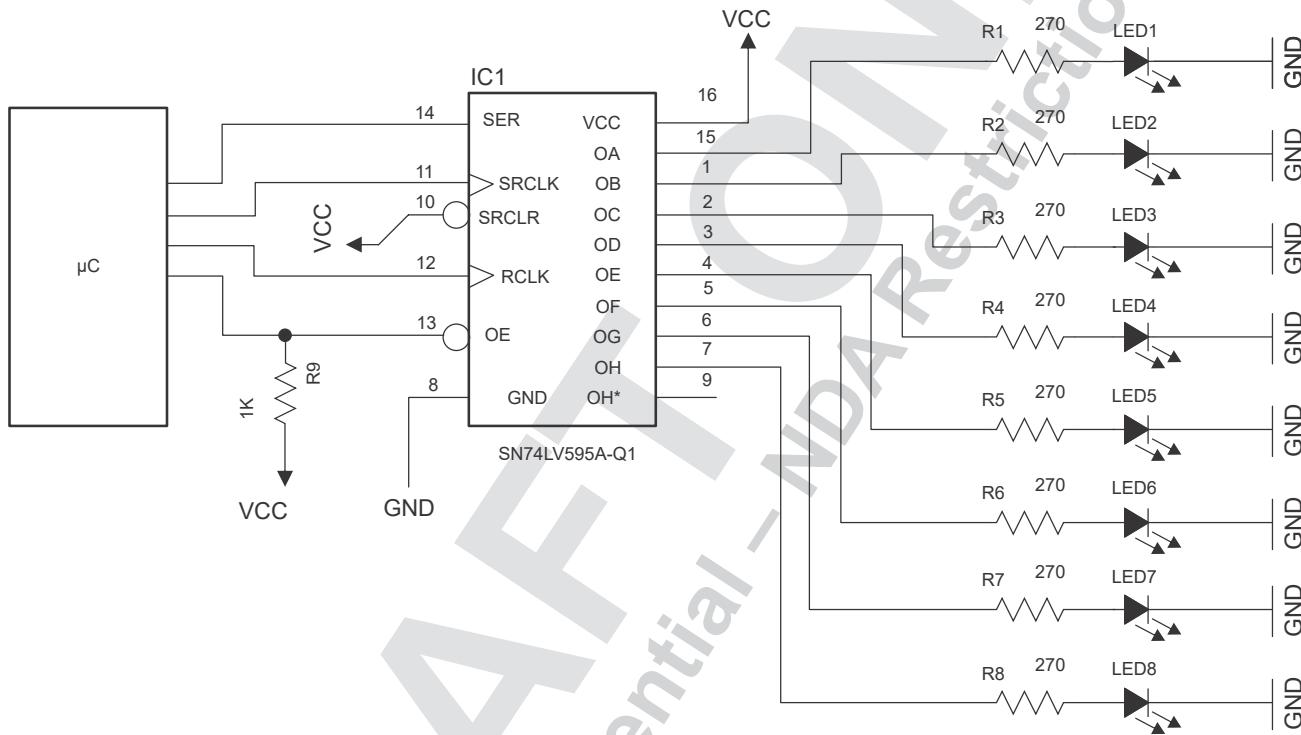


図 9-1. SN74LV595A Expanding IOs to Drive LEDs

#### 9.2.1 Power Considerations

Ensure the desired supply voltage is within the range specified in the *Recommended Operating Conditions*. The supply voltage sets the device's electrical characteristics as described in the *Electrical Characteristics* section.

The positive voltage supply must be capable of sourcing current equal to the total current to be sourced by all outputs of the SN74LV595A plus the maximum static supply current,  $I_{CC}$ , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only source as much current that is provided by the positive supply source. Be sure to not exceed the maximum total current through V<sub>CC</sub> listed in the *Absolute Maximum Ratings*.

The ground must be capable of sinking current equal to the total current to be sunk by all outputs of the SN74LV595A plus the maximum supply current,  $I_{CC}$ , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only sink as much current that can be sunk into its ground connection. Be sure to not exceed the maximum total current through GND listed in the *Absolute Maximum Ratings*.

The SN74LV595A can drive a load with a total capacitance less than or equal to 50 pF while still meeting all of the data sheet specifications. Larger capacitive loads can be applied; however, it is not recommended to exceed 50 pF.

The SN74LV595A can drive a load with total resistance described by  $R_L \geq V_O / I_O$ , with the output voltage and current defined in the *Electrical Characteristics* table with  $V_{OH}$  and  $V_{OL}$ . When outputting in the HIGH state, the output voltage in the equation is defined as the difference between the measured output voltage and the supply voltage at the  $V_{CC}$  pin.

Total power consumption can be calculated using the information provided in [CMOS Power Consumption and Cpd Calculation](#).

Thermal increase can be calculated using the information provided in [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices](#).

#### 注意

The maximum junction temperature,  $T_{J(max)}$  listed in the *Absolute Maximum Ratings*, is an additional limitation to prevent damage to the device. Do not violate any values listed in the *Absolute Maximum Ratings*. These limits are provided to prevent damage to the device.

### 9.2.2 Input Considerations

Input signals must cross  $V_{IL(max)}$  to be considered a logic LOW, and  $V_{IH(min)}$  to be considered a logic HIGH. Do not exceed the maximum input voltage range found in the *Absolute Maximum Ratings*.

Unused inputs must be terminated to either  $V_{CC}$  or ground. The unused inputs can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input will be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The drive current of the controller, leakage current into the SN74LV595A (as specified in the *Electrical Characteristics*), and the desired input transition rate limits the resistor size. A 10-k $\Omega$  resistor value is often used due to these factors.

The SN74LV595A has CMOS inputs and thus requires fast input transitions to operate correctly, as defined in the *Recommended Operating Conditions* table. Slow input transitions can cause oscillations, additional power consumption, and reduction in device reliability.

Refer to the *Feature Description* section for additional information regarding the inputs for this device.

### 9.2.3 Output Considerations

The positive supply voltage is used to produce the output HIGH voltage. Drawing current from the output will decrease the output voltage as specified by the  $V_{OH}$  specification in the *Electrical Characteristics*. The ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the  $V_{OL}$  specification in the *Electrical Characteristics*.

Push-pull outputs that could be in opposite states, even for a very short time period, should never be connected directly together. This can cause excessive current and damage to the device.

Two channels within the same device with the same input signals can be connected in parallel for additional output drive strength.

Unused outputs can be left floating. Do not connect outputs directly to  $V_{CC}$  or ground.

Refer to the *Feature Description* section for additional information regarding the outputs for this device.

### 9.2.4 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 so routing and load conditions should be considered to prevent ringing.

### 9.2.5 Detailed Design Procedure

1. Add a decoupling capacitor from  $V_{CC}$  to GND. The capacitor needs to be placed physically close to the device and electrically close to both the  $V_{CC}$  and GND pins. An example layout is shown in the *Layout* section.
2. Ensure the capacitive load at the output is  $\leq 50$  pF. This is not a hard limit; it will, however, ensure optimal performance. This can be accomplished by providing short, appropriately sized traces from the SN74LV595A to one or more of the receiving devices.
3. Ensure the resistive load at the output is larger than  $(V_{CC} / I_{O(max)}) \Omega$ . This will ensure that the maximum output current from the *Absolute Maximum Ratings* is not violated. Most CMOS inputs have a resistive load measured in M $\Omega$ ; much larger than the minimum calculated previously.
4. Thermal issues are rarely a concern for logic gates; the power consumption and thermal increase, however, can be calculated using the steps provided in the application report, *CMOS Power Consumption and Cpd Calculation*.

### 9.2.6 Application Curves

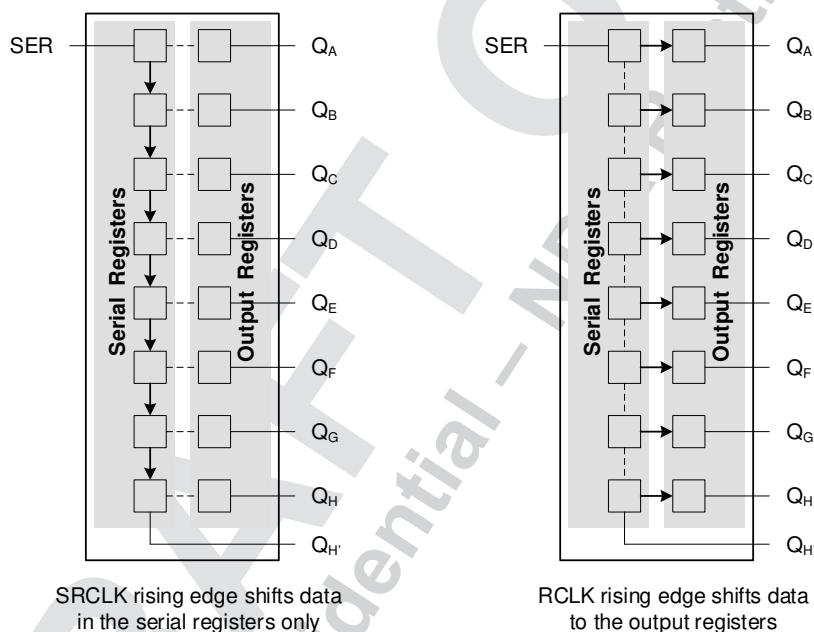


图 9-2. Simplified Functional Diagram Showing Clock Operation

### 9.3 Power Supply Recommendations

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

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1  $\mu$ F capacitor is recommended. If there are multiple  $V_{CC}$  terminals then 0.01  $\mu$ F or 0.022  $\mu$ F capacitors are recommended for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1  $\mu$ F and 1.0  $\mu$ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for the best results.

## 9.4 Layout

### 9.4.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V<sub>CC</sub>, whichever makes more sense for the logic function or is more convenient.

### 9.4.2 Layout Example

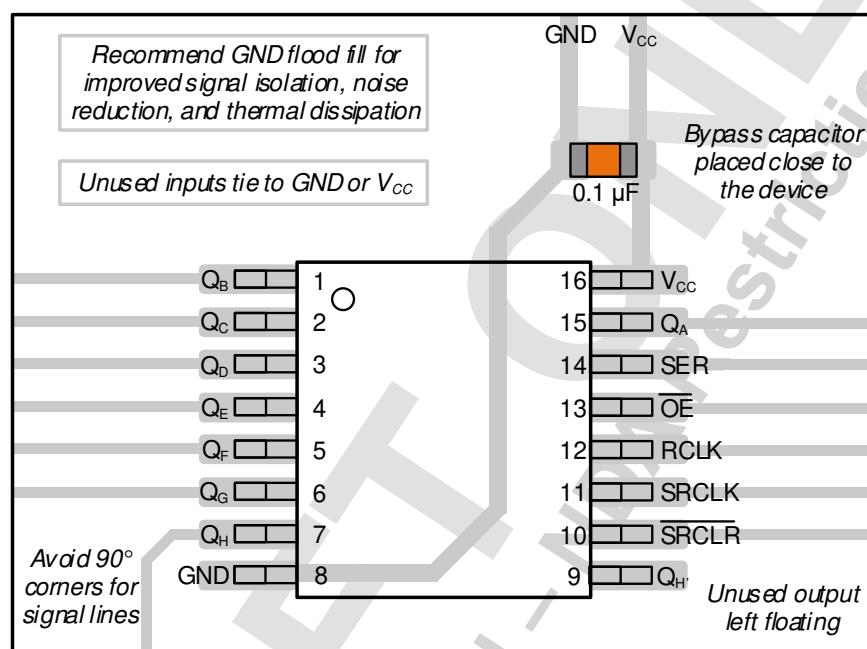


图 9-3. Layout Example for the SN74LV595A in TSSOP

## 10 Device and Documentation Support

### 10.1 Documentation Support

#### 10.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [CMOS Power Consumption and Cpd Calculation application report](#)
- Texas Instruments, [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application report](#)

### 10.2 ドキュメントの更新通知を受け取る方法

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### 10.6 用語集

#### テキサス・インスツルメンツ用語集

この用語集には、用語や略語の一覧および定義が記載されています。

## 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="#">SN74LV595ABQBR</a>	Active	Production	WQFN (BQB)   16	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595ABQBR.A	Active	Production	WQFN (BQB)   16	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595AD</a>	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	-40 to 125	LV595A
<a href="#">SN74LV595ADR</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595ADR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595ADRG3</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595ADRG3.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595ADRG4</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595ADRG4.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595ANSR</a>	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	74LV595A
SN74LV595ANSR.A	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	74LV595A
<a href="#">SN74LV595APWR</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595APWR.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595APWRG3</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595APWRG3.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595APWRG4</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595APWRG4.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595APWT</a>	Obsolete	Production	TSSOP (PW)   16	-	-	Call TI	Call TI	-40 to 125	LV595A
<a href="#">SN74LV595ARGYR</a>	Active	Production	VQFN (RGY)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
SN74LV595ARGYR.A	Active	Production	VQFN (RGY)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A
<a href="#">SN74LV595ARGYRG4</a>	Active	Production	VQFN (RGY)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LV595A

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **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.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

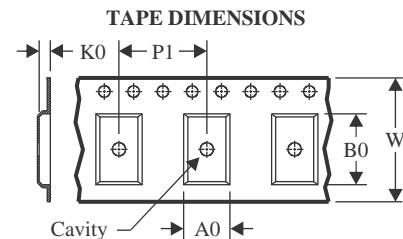
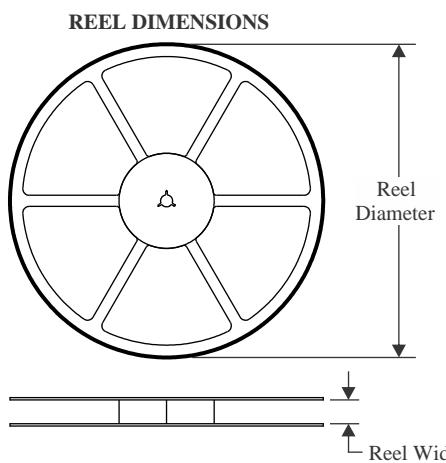
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN74LV595A :**

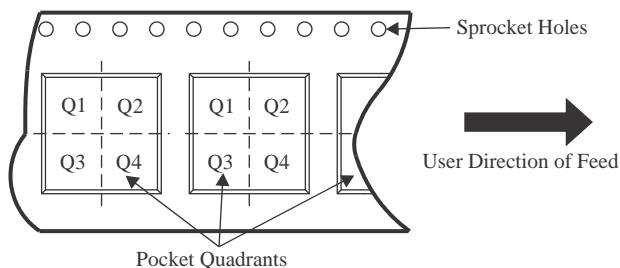
- Automotive : [SN74LV595A-Q1](#)
- Enhanced Product : [SN74LV595A-EP](#)

NOTE: Qualified Version Definitions:

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

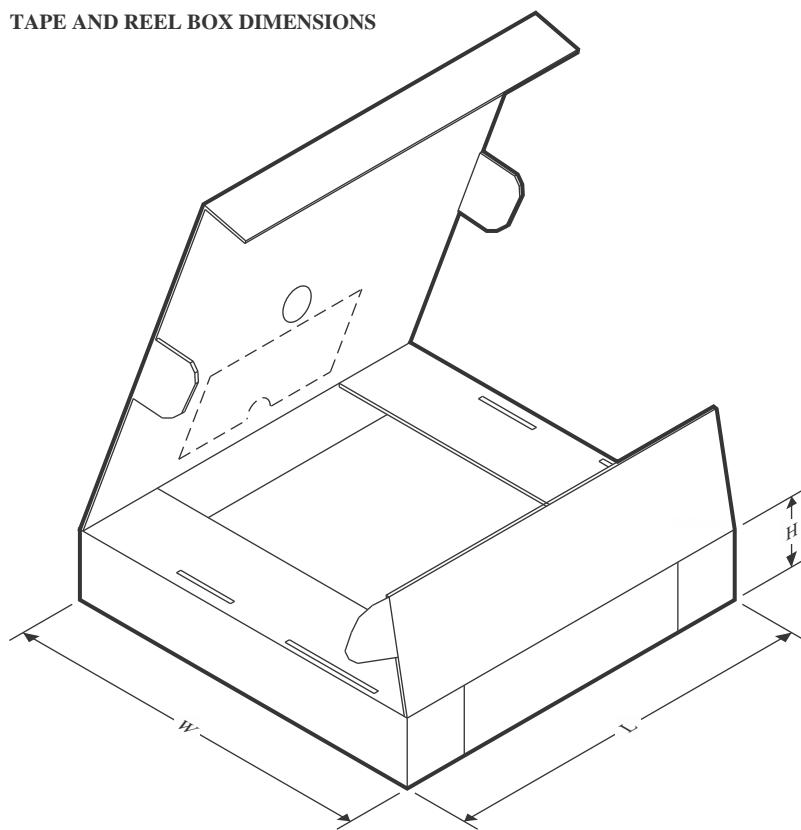
**TAPE AND REEL INFORMATION**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LV595ABQBR	WQFN	BQB	16	3000	180.0	12.4	2.8	3.8	1.2	4.0	12.0	Q1
SN74LV595ADR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LV595ADR	SOIC	D	16	2500	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1
SN74LV595ADRG3	SOIC	D	16	2500	330.0	16.8	6.5	10.3	2.1	8.0	16.0	Q1
SN74LV595ADRG4	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LV595ANSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74LV595APWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595APWRG3	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595APWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595APWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.3	1.6	8.0	12.0	Q1
SN74LV595APWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV595ARGYR	VQFN	RGY	16	3000	330.0	12.4	3.8	4.3	1.5	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

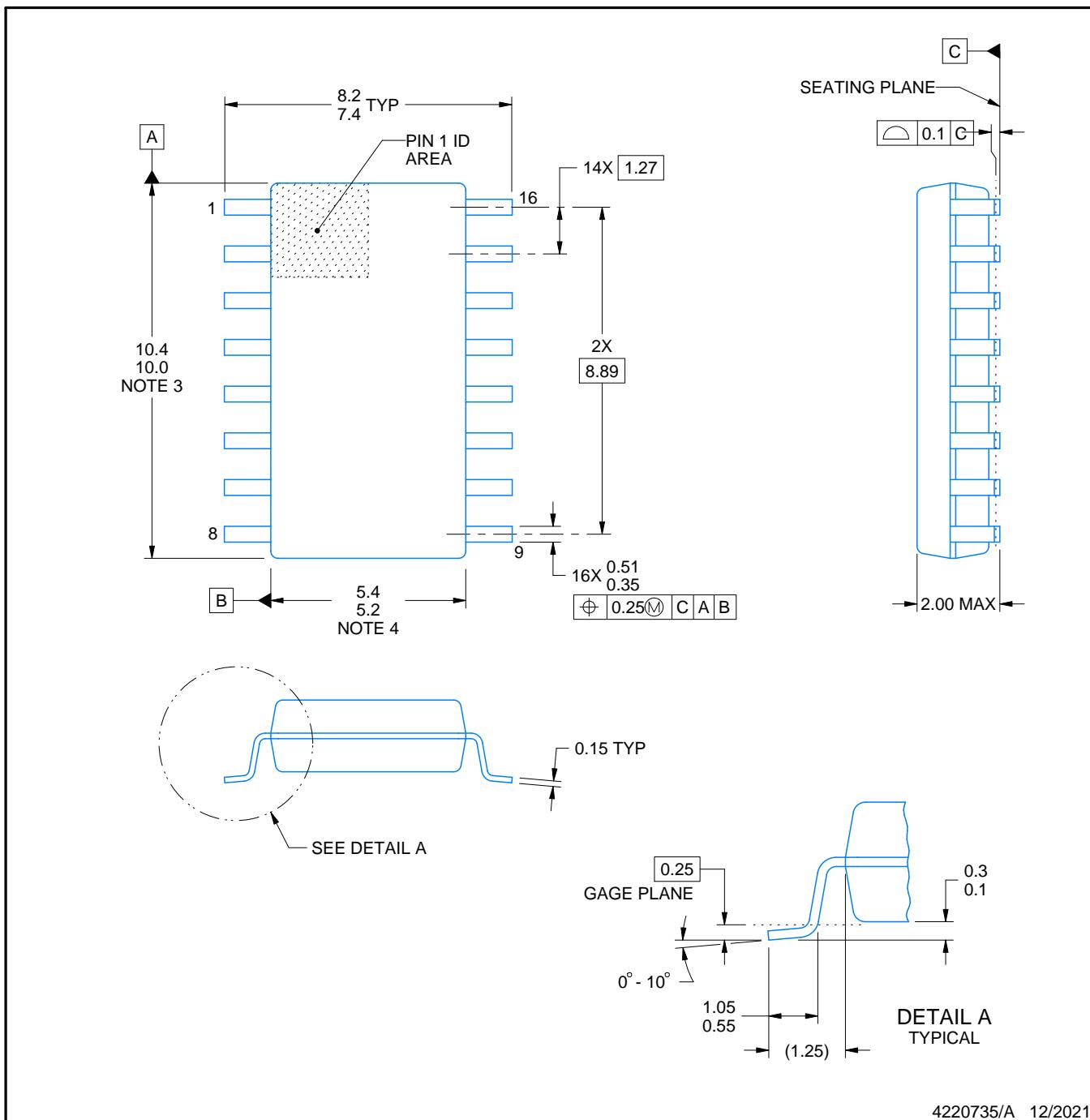
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LV595ABQBR	WQFN	BQB	16	3000	210.0	185.0	35.0
SN74LV595ADR	SOIC	D	16	2500	353.0	353.0	32.0
SN74LV595ADR	SOIC	D	16	2500	340.5	336.1	32.0
SN74LV595ADRG3	SOIC	D	16	2500	364.0	364.0	27.0
SN74LV595ADRG4	SOIC	D	16	2500	340.5	336.1	32.0
SN74LV595ANSR	SOP	NS	16	2000	353.0	353.0	32.0
SN74LV595APWR	TSSOP	PW	16	2000	353.0	353.0	32.0
SN74LV595APWRG3	TSSOP	PW	16	2000	364.0	364.0	27.0
SN74LV595APWRG4	TSSOP	PW	16	2000	353.0	353.0	32.0
SN74LV595APWRG4	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74LV595APWRG4	TSSOP	PW	16	2000	353.0	353.0	32.0
SN74LV595ARGYR	VQFN	RGY	16	3000	360.0	360.0	36.0



# PACKAGE OUTLINE

## SOP - 2.00 mm max height

SOP



### NOTES:

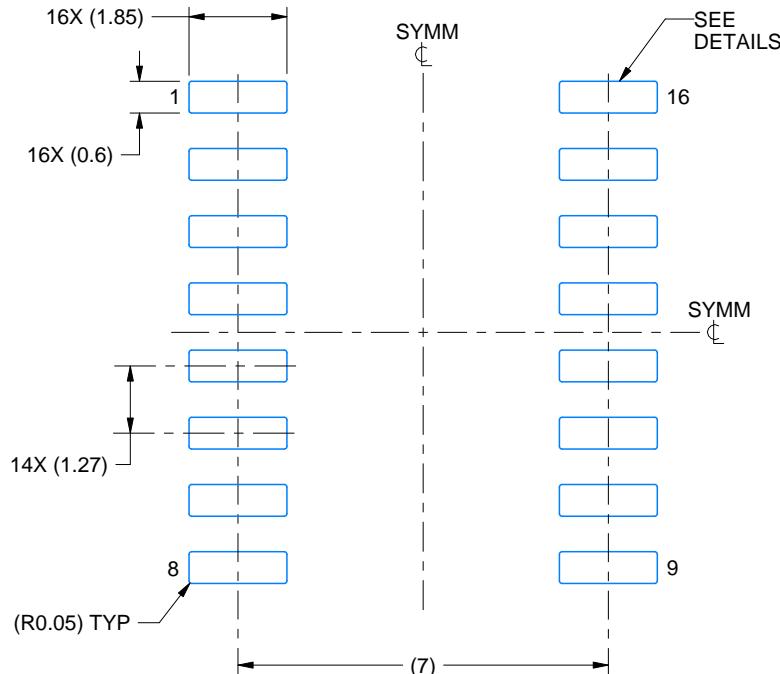
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

# EXAMPLE BOARD LAYOUT

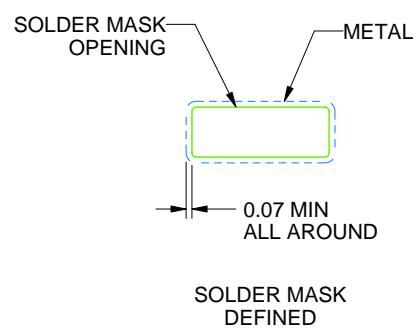
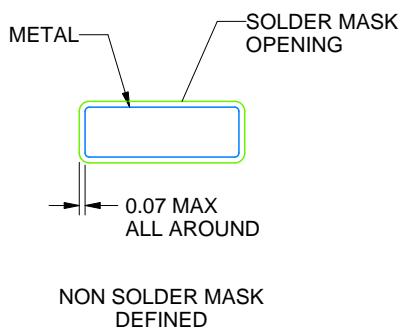
NS0016A

SOP - 2.00 mm max height

SOP



LAND PATTERN EXAMPLE  
SCALE:7X



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

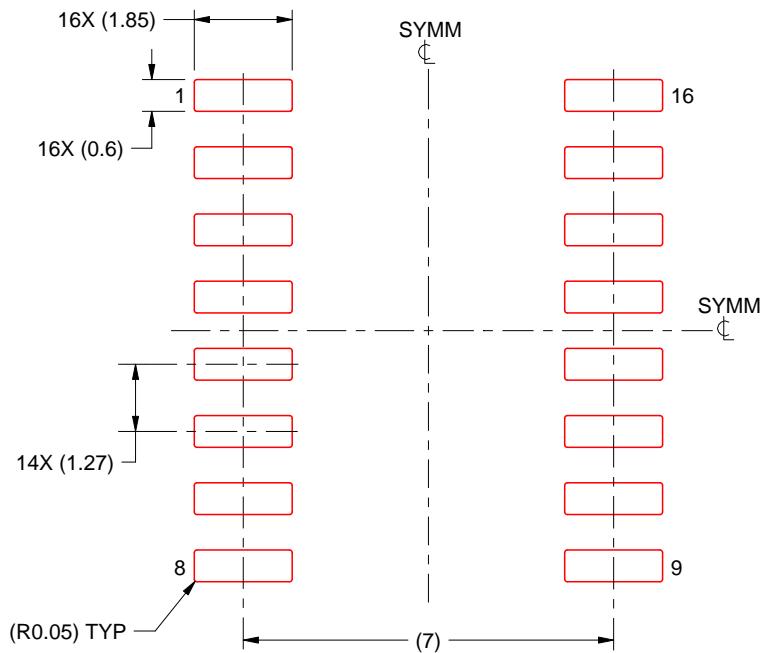
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

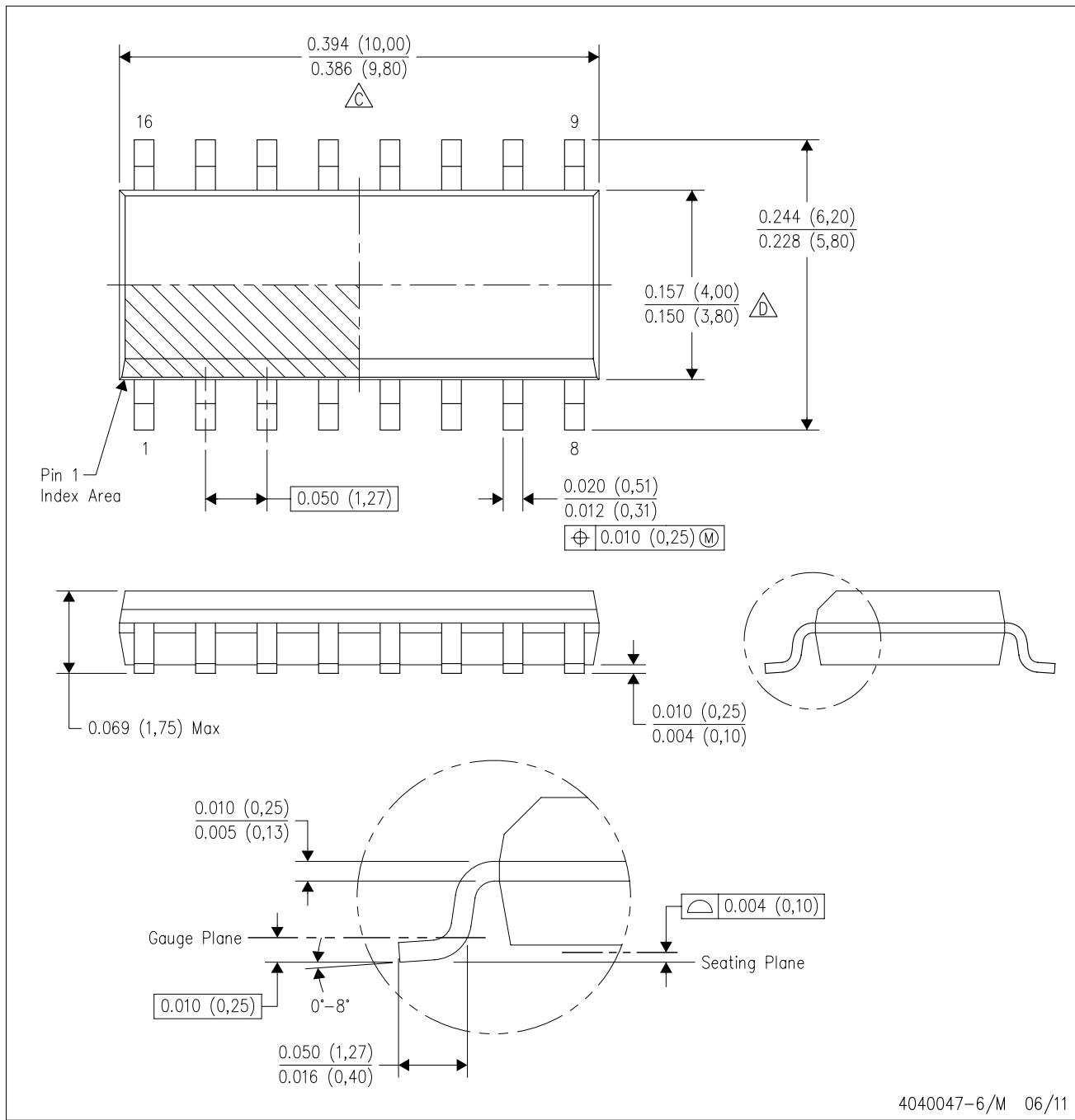
4220735/A 12/2021

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.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.

D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.

E. Reference JEDEC MS-012 variation AC.

## GENERIC PACKAGE VIEW

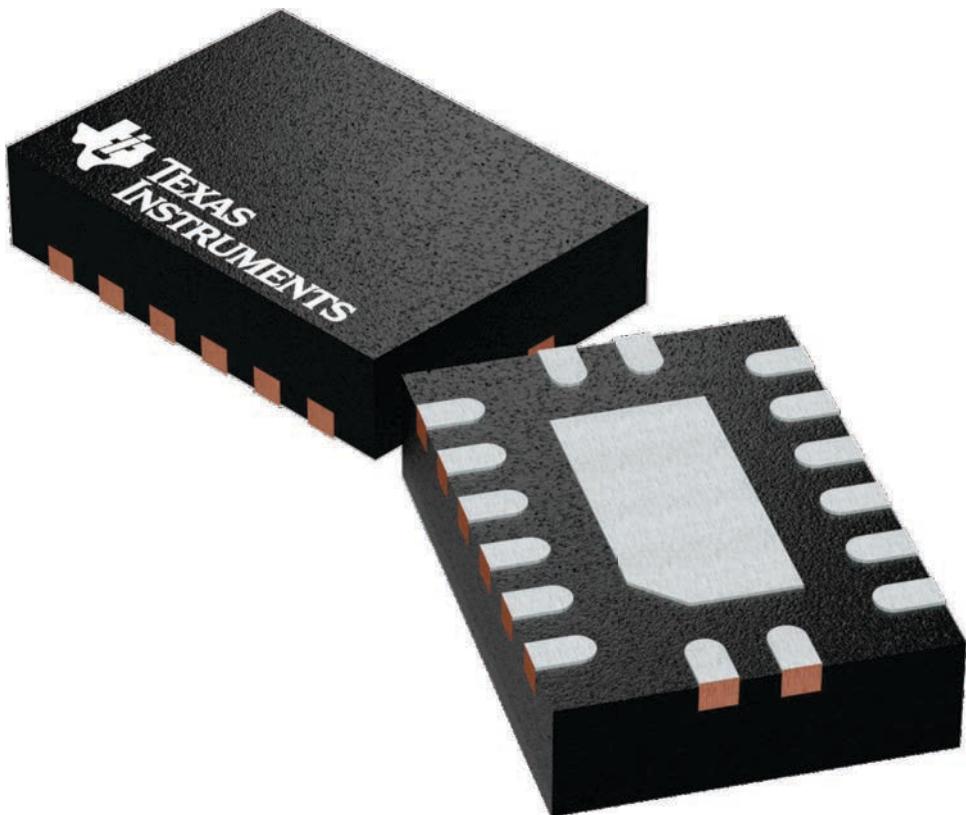
### BQB 16

### WQFN - 0.8 mm max height

2.5 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.



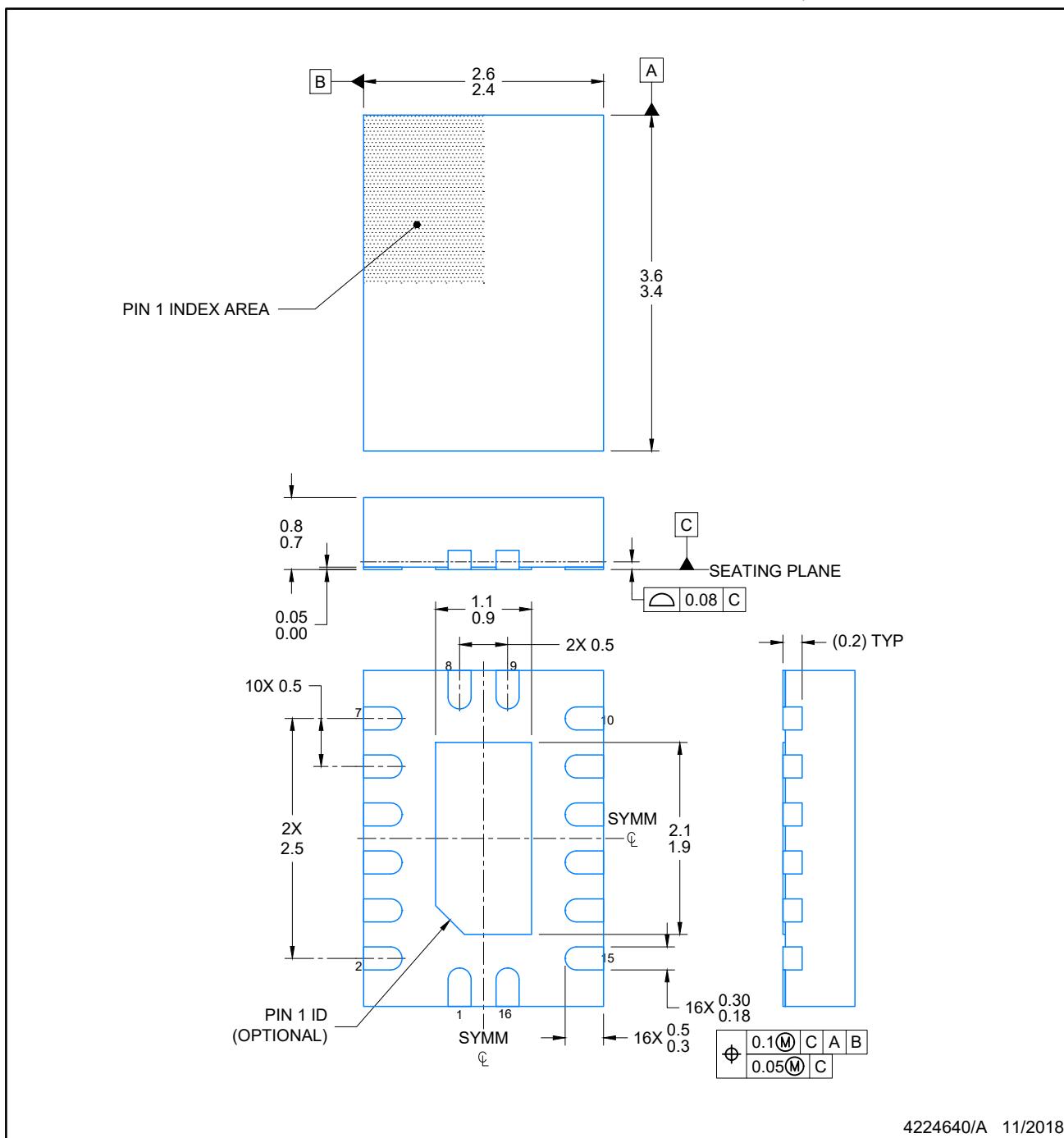
4226161/A

# PACKAGE OUTLINE

## WQFN - 0.8 mm max height

BQB0016A

PLASTIC QUAD FLAT PACK-NO LEAD



4224640/A 11/2018

### NOTES:

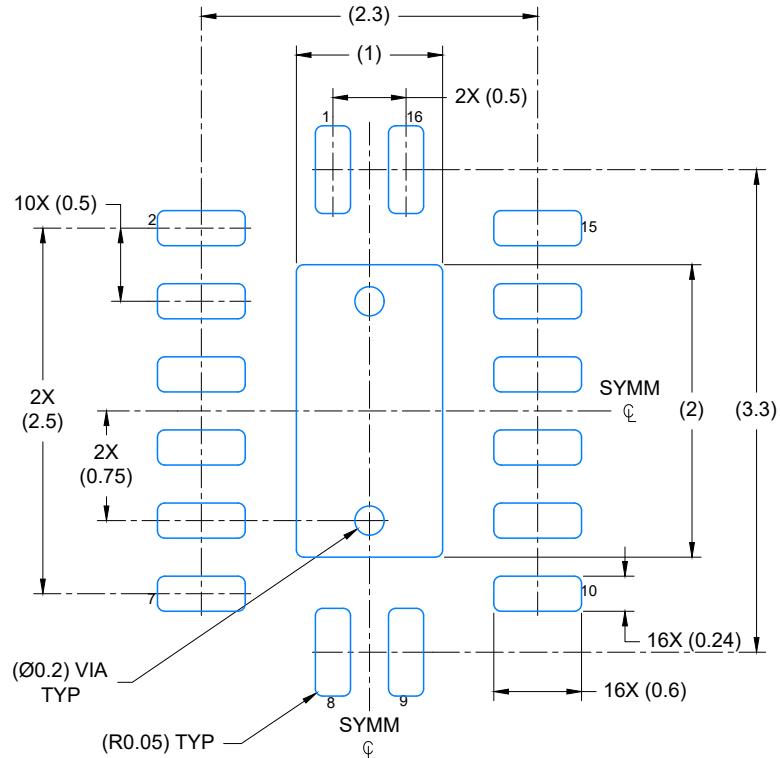
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical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

# EXAMPLE BOARD LAYOUT

BQB0016A

WQFN - 0.8 mm max height

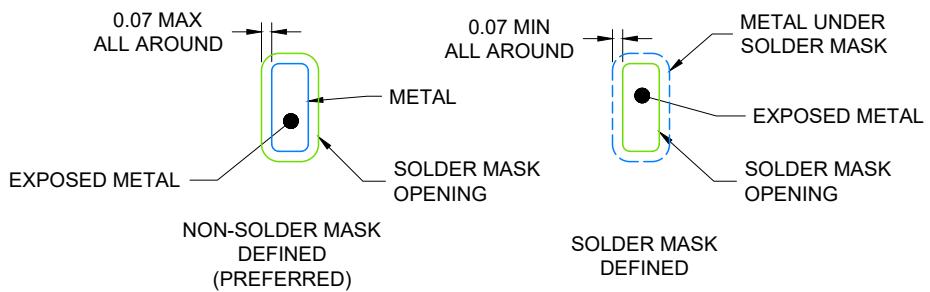
PLASTIC QUAD FLAT PACK-NO LEAD



## LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN

SCALE: 20X



4224640/A 11/2018

NOTES: (continued)

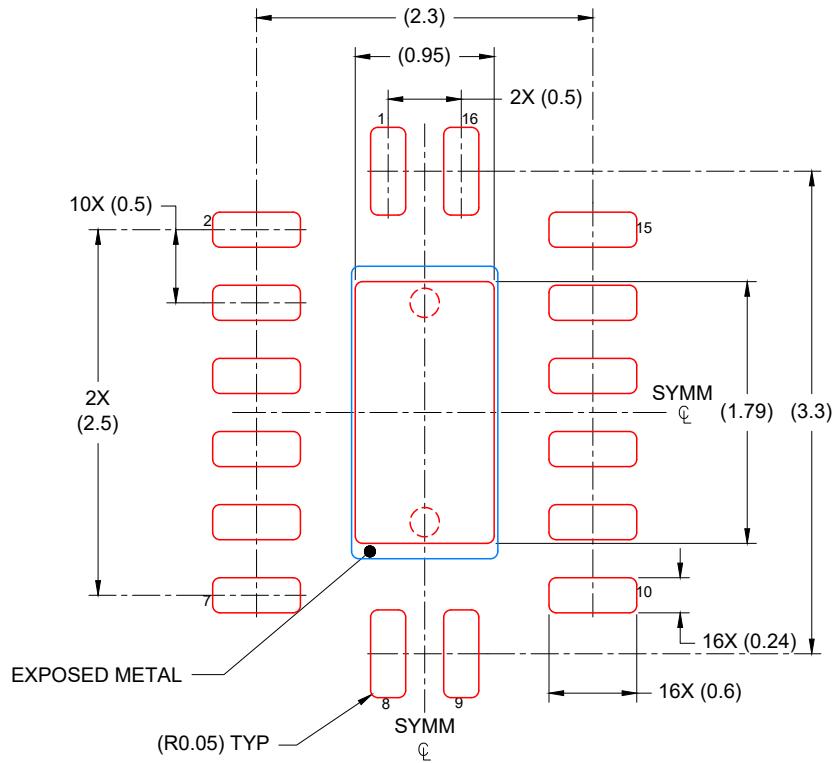
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented,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

# EXAMPLE STENCIL DESIGN

BQB0016A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
85% PRINTED COVERAGE BY AREA  
SCALE: 20X

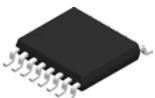
4224640/A 11/2018

NOTES: (continued)

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

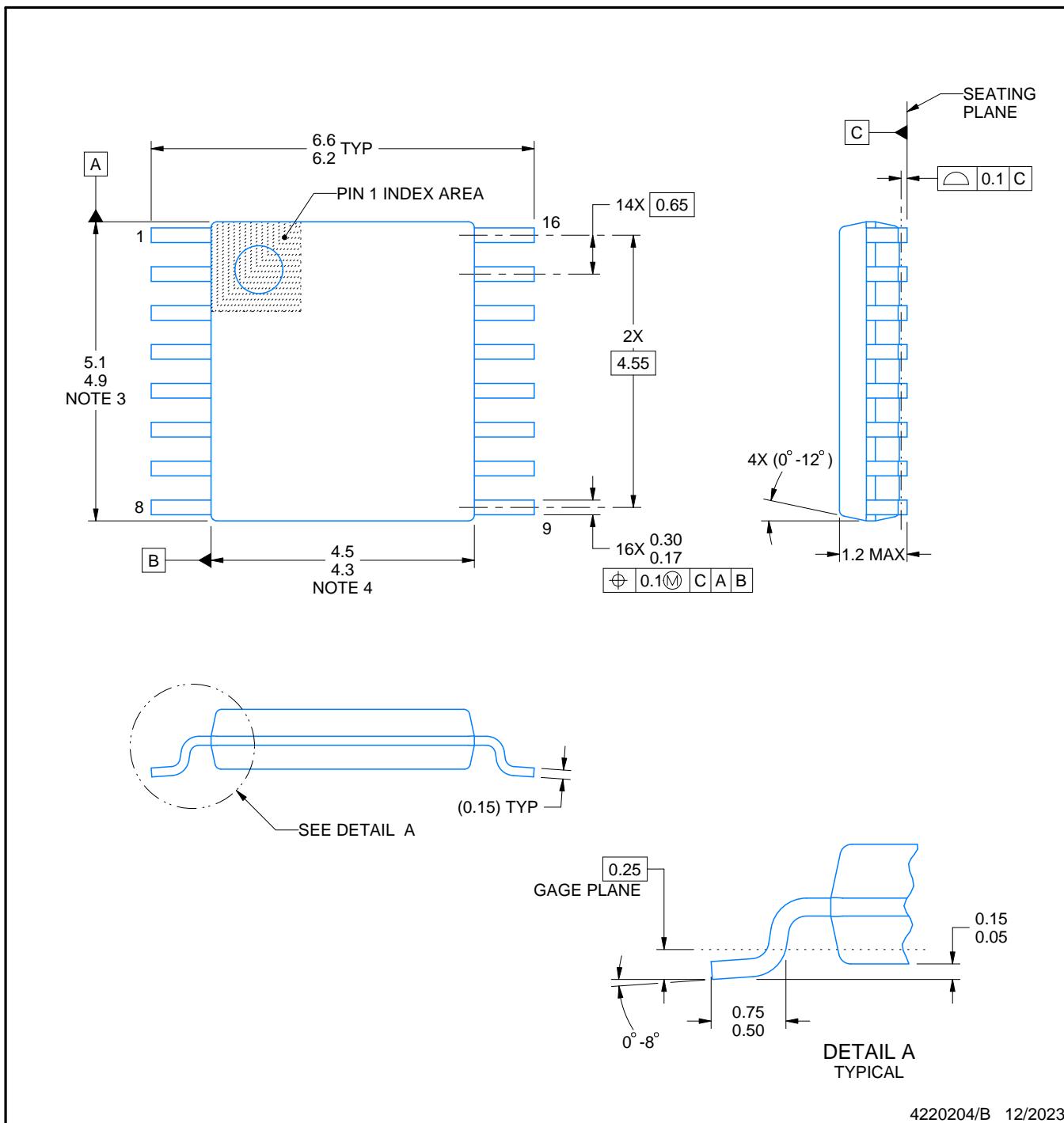
## PACKAGE OUTLINE

**PW0016A**



## **TSSOP - 1.2 mm max height**

## SMALL OUTLINE PACKAGE



## NOTES:

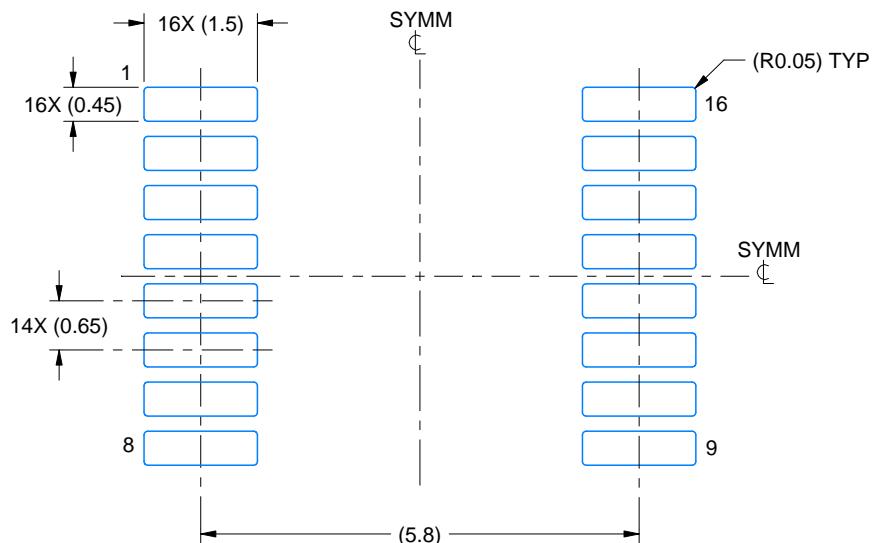
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

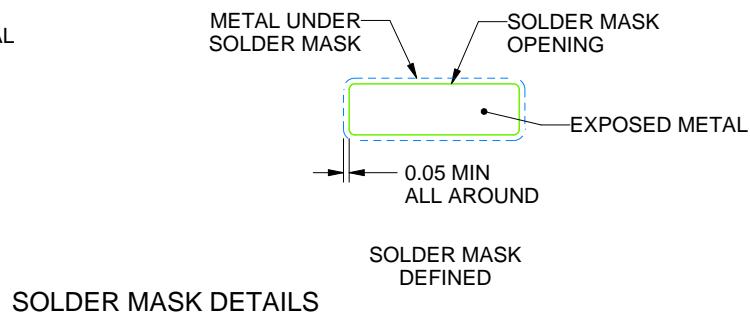
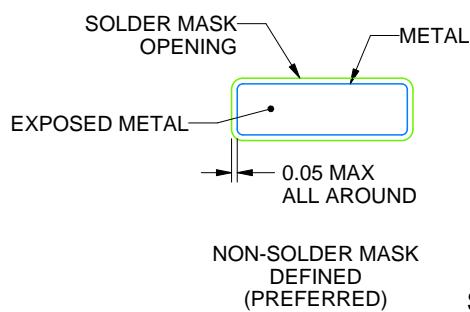
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/B 12/2023

NOTES: (continued)

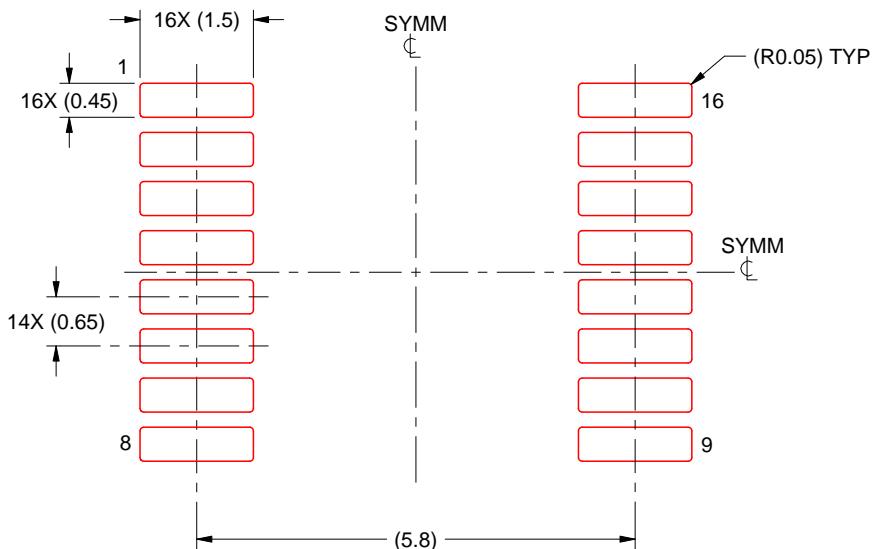
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/B 12/2023

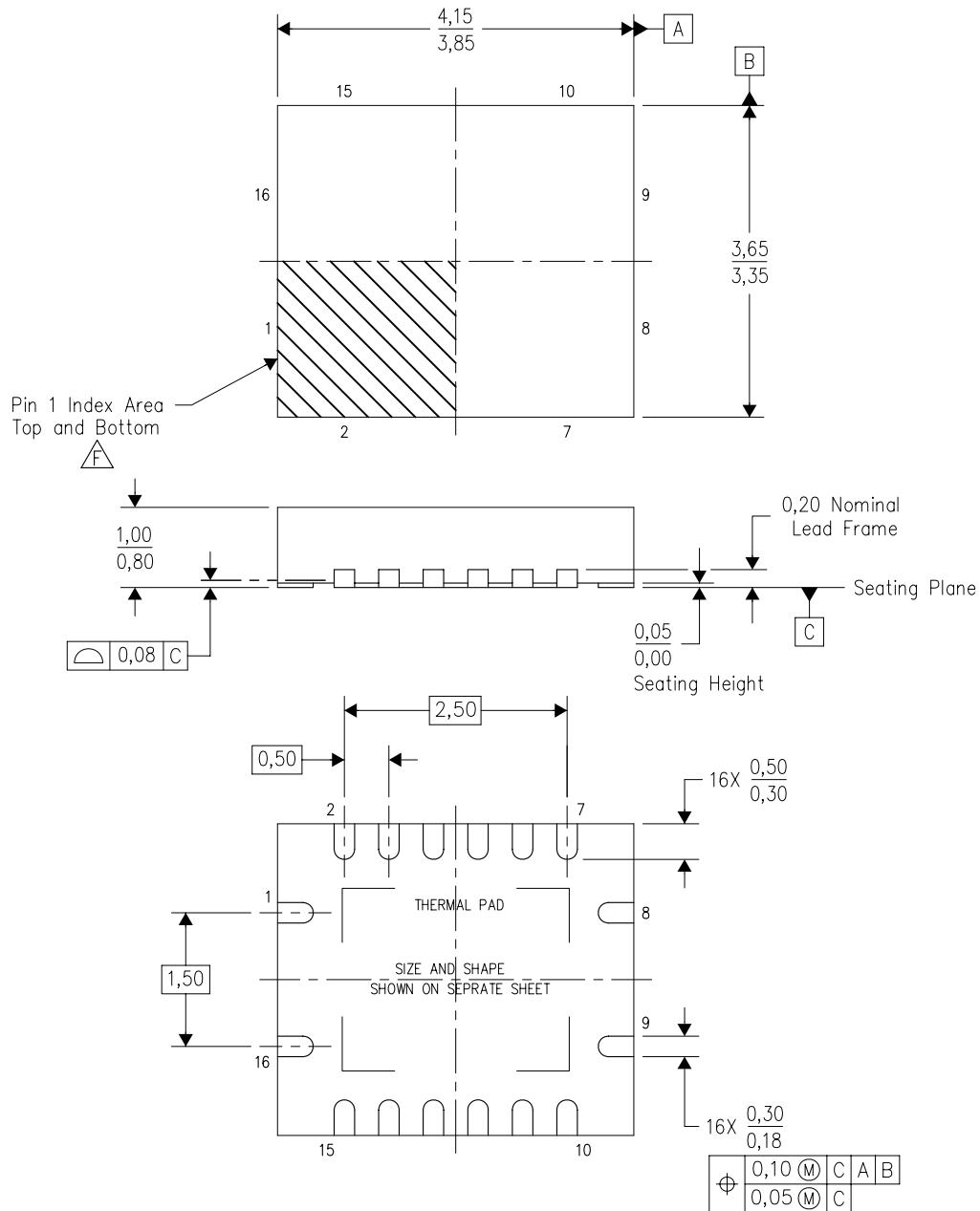
NOTES: (continued)

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.

## MECHANICAL DATA

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



### Bottom View

4203539-3/l 06/2011

NOTES:

- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- B. This drawing is subject to change without notice.
- C. QFN (Quad Flatpack No-Lead) package configuration.
- D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
- E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.

 F. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated.  
The Pin 1 identifiers are either a molded, marked, or metal feature.

- G. Package complies to JEDEC MO-241 variation BA.

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最終更新日：2025 年 10 月