

SNx4LVC02A 四路双输入正或非门

1 特性

- 1.65V 到 3.6V 的范围内运行
- 额定温度范围为 -40°C 至 85°C 、 -40°C 至 125°C 以及 -55°C 至 125°C
- 输入电压高达 5.5V
- 电压为 3.3V 时, t_{pd} 最大值为 4.4ns
- V_{OLP} (输出接地反弹) 典型值 $< 0.8\text{V}$ ($V_{CC} = 3.3\text{V}$ 、 $T_A = 25^{\circ}\text{C}$)
- V_{OHV} (输出 V_{OH} 下冲) 典型值 $> 2\text{V}$ ($V_{CC} = 3.3\text{V}$ 、 $T_A = 25^{\circ}\text{C}$)
- 门锁性能超过 250mA, 符合 JESD 17 规范

2 说明

输入可以由 3.3V 或 5V 器件驱动。此功能允许在 3.3V/5V 的混合系统环境中将这些器件用作转换器。

该器件以正逻辑执行布尔函数 $Y = \overline{A + B}$ 或 $Y = \overline{A} \cdot \overline{B}$ 。

输入可以由 3.3V 或 5V 器件驱动。此功能允许在 3.3V/5V 的混合系统环境中将该器件用作转换器。

器件信息

器件型号	封装尺寸 ⁽¹⁾	封装尺寸 ⁽²⁾	封装尺寸 ⁽³⁾
SNx4LVC02A	BQA (WQFN , 14)	3mm × 2.5mm	3mm × 2.5mm
	D (SOIC , 14)	8.65mm × 6mm	8.65mm × 3.9mm
	DB (SSOP , 14)	6.2mm × 7.8mm	6.2mm × 5.3mm
	NS (SOP , 14)	10.2mm × 7.8mm	10.3mm × 5.3mm
	PW (TSSOP , 14)	5mm × 6.4mm	5mm × 4.4mm
	RGY (VQFN , 14)	3.5mm × 3.5mm	3.5mm × 3.5mm
	FK (LCCC , 20)	8.9mm × 8.9mm	8.89mm × 8.89mm
	J (CDIP , 14)	19.55mm × 7.9mm	19.55mm × 6.7mm
	W (CFP , 14)	9.21mm × 9mm	9.21mm × 6.28mm

- (1) 更多相关信息, 请参阅第 10 节。
- (2) 封装尺寸 (长 × 宽) 为标称值, 并包括引脚 (如适用)。
- (3) 封装尺寸 (长 × 宽) 为标称值, 不包括引脚。



逻辑图, 每个逻辑门 (正逻辑)



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3 Pin Configuration and Functions

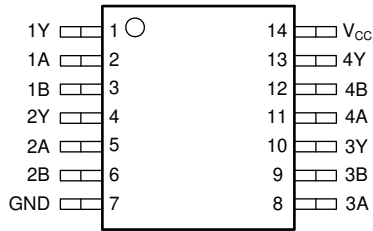


图 3-1. SN54LVC02A J or W Package, 14-Pin (Top View)

SN74LVC02A D, DB, NS, or PW Package, 14-Pin SOIC, SSOP, SOP or TSSOP (Top View)

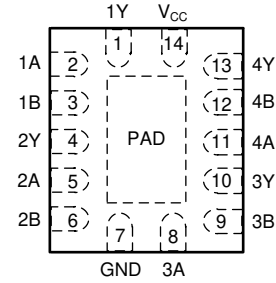


图 3-2. SN74LVC02A RGY or BQA Package, 14-Pin VQFN or WQFN (Top View)

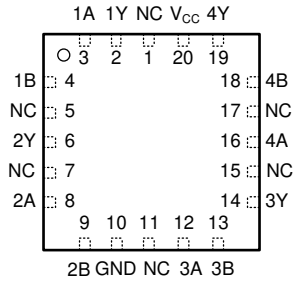


图 3-3. SN54LVC02A FK Package, 20-Pin (Top View)

表 3-1. Pin Functions

PIN				TYPE ⁽¹⁾	DESCRIPTION
NAME	SN74LVC02A	SN54LVC02A			
	D, DB, NS, PW, RGY, BQA	J, W	FK		
1Y	1	1	2	O	1Y Output
1A	2	2	3	I	1A Input
1B	3	3	4	I	1B Input
2Y	4	4	6	O	2Y Output
2A	5	5	8	I	2A Input
2B	6	6	9	I	2B Input
GND	7	7	10	—	Ground Pin
3A	8	8	12	I	3A Input
3B	9	9	13	I	3B Input
3Y	10	20	14	O	3Y Output
4A	11	11	16	I	4A Input
4B	12	12	18	I	4B Input
4Y	13	13	19	O	4Y Output
V _{CC}	14	14	20	—	Power Pin
NC	—	—	1, 5, 7, 11, 15, 17	—	No Connection

(1) I = input, O = output

4 Specifications

4.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V_{CC}	Supply voltage range	–0.5	6.5	V
V_I	Input voltage range ⁽¹⁾	–0.5	6.5	V
V_O	Output voltage range ^{(1) (2)}	–0.5	$V_{CC} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$		–50 mA
I_{OK}	Output clamp current	$V_O < 0$		–50 mA
I_O	Continuous output current		±50	mA
	Continuous current through V_{CC} or GND		±100	mA
T_{stg}	Storage temperature range	–65	150	°C
P_{tot}	Power dissipation	$T_A = -40^{\circ}\text{C to } 125^{\circ}\text{C}^{(3) (4)}$		500 mW

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

(2) The value of V_{CC} is provided in the recommended operating conditions table.

(3) For the D package: above 70°C, the value of P_{tot} derates linearly with 8 mW/K.

(4) For the DB, NS, and PW packages: above 60°C, the value of P_{tot} derates linearly with 5.5 mW/K.

4.2 ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000
		Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002 ⁽²⁾	±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.

4.3 Recommended Operating Conditions, SN54LVC02A

			SN54LVC02A		UNIT
			–55°C to 125°C		
			MIN	MAX	
V _{CC}	Supply voltage	Operating	2	3.6	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 2.7V to 3.6V	2		V
V _{IL}	Low-level input voltage	V _{CC} = 2.7V to 3.6V		0.8	V
V _I	Input voltage		0	5.5	V
V _O	Output voltage		0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 2.7V		–12	mA
		V _{CC} = 3V		–24	
I _{OL}	Low-level output current	V _{CC} = 2.7V		12	mA
		V _{CC} = 3V		24	

4.4 Recommended Operating Conditions, SN74LVC02A

			SN74LVC02A						UNIT
			T _A = 25°C		–40°C to 85°C		–40°C to 125°C		
			MIN	MAX	MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage	Operating	1.65	3.6	1.65	3.6	1.65	3.6	V
		Data retention only	1.5		1.5		1.5		

		SN74LVC02A						UNIT	
		T _A = 25°C		−40°C to 85°C		−40°C to 125°C			
		MIN	MAX	MIN	MAX	MIN	MAX		
V _{IH}	High-level input voltage	V _{CC} = 1.65V to 1.95V	0.65 × V _{CC}	0.65 × V _{CC}		0.65 × V _{CC}		V	
		V _{CC} = 2.3V to 2.7V	1.7	1.7		1.7			
		V _{CC} = 2.7V to 3.6V	2	2		2			
V _{IL}	Low-level input voltage	V _{CC} = 1.65V to 1.95V	0.35 × V _{CC}	0.35 × V _{CC}		0.35 × V _{CC}		V	
		V _{CC} = 2.3V to 2.7 V	0.7	0.7		0.7			
		V _{CC} = 2.7V to 3.6 V	0.8	0.8		0.8			
V _I	Input voltage		0	5.5	0	5.5	0	5.5	V
V _O	Output voltage		0	V _{CC}	0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 1.65V	−4		−4		−4		mA
		V _{CC} = 2.3V	−8		−8		−8		
		V _{CC} = 2.7V	−12		−12		−12		
		V _{CC} = 3V	−24		−24		−24		
I _{OL}	Low-level output current	V _{CC} = 1.65V	4		4		4		mA
		V _{CC} = 2.3V	8		8		8		
		V _{CC} = 2.7V	12		12		12		
		V _{CC} = 3V	24		24		24		

4.5 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74LVC02A						UNIT
		BQA (WQFN)	D (SOIC)	DB (SSOP)	NS (SOP)	PW (TSSOP)	RGY (VQFN)	
		14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	102.3	127.8	140.4	123.8	150.8	92.1	°C/W

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

4.6 Electrical Characteristics, SN54LVC02A

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

PARAMETER	TEST CONDITIONS	V _{CC}	SN54LVC02A			UNIT
			–55°C to 125°C			
			MIN	TYP	MAX	
V _{OH}	I _{OH} = –100μA	2.7V to 3.6V	V _{CC} – 0.2			V
	I _{OH} = –12mA	2.7V	2.2			
		3V	2.4			
		I _{OH} = –24mA	3V	2.2		
V _{OL}	I _{OL} = 100μA	2.7V to 3.6V	0.2			V
	I _{OL} = 12mA	2.7V	0.4			
	I _{OL} = 24mA	3V	0.55			
I _I	V _I = 5.5V or GND	3.6V	±5			μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	3.6V	10			μA
ΔI _{CC}	One input at V _{CC} – 0.6V, Other inputs at V _{CC} or GND	2.7V to 3.6V	500			μA
C _i	V _I = V _{CC} or GND	3.3V	5 ⁽¹⁾			pF

(1) T_A = 25°C

4.7 Electrical Characteristics, SN74LVC02A

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

PARAMETER	TEST CONDITIONS	V_{CC}	SN74LVC02A						UNIT
			$T_A = 25^\circ\text{C}$			$-40^\circ\text{C to } 85^\circ\text{C}$		$-40^\circ\text{C to } 125^\circ\text{C}$	
			MIN	TYP	MAX	MIN	MAX	MIN MAX	
V_{OH}	$I_{OH} = -100\mu\text{A}$	1.65V to 3.6V	$V_{CC} - 0.2$			$V_{CC} - 0.2$		$V_{CC} - 0.3$	V
	$I_{OH} = -4\text{mA}$	1.65V	1.29			1.2		1.05	
	$I_{OH} = -8\text{mA}$	2.3V	1.9			1.7		1.55	
	$I_{OH} = -12\text{mA}$	2.7V	2.2			2.2		2.05	
		3V	2.4			2.4		2.25	
	$I_{OH} = -24\text{mA}$	3V	2.3			2.2		2	
V_{OL}	$I_{OL} = 100\mu\text{A}$	1.65V to 3.6V	0.1			0.2		0.3	V
	$I_{OL} = 4\text{mA}$	1.65V	0.24			0.45		0.6	
	$I_{OL} = 8\text{mA}$	2.3V	0.3			0.7		0.75	
	$I_{OL} = 12\text{mA}$	2.7V	0.4			0.4		0.6	
	$I_{OL} = 24\text{mA}$	3V	0.55			0.55		0.8	
I_I	$V_I = 5.5\text{V}$ or GND	3.6V	± 1			± 5		± 20	μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	3.6V	1			10		40	μA
ΔI_{CC}	One input at $V_{CC} - 0.6\text{V}$, Other inputs at V_{CC} or GND	2.7V to 3.6V	500			500		5000	μA
C_i	$V_I = V_{CC}$ or GND	3.3 V	5						pF

4.8 Switching Characteristics, SN54LVC02A

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	SN54LVC02A		UNIT
				−55°C to 125°C		
				MIN	MAX	
t _{pd}	A or B	Y	2.7V	5.4		ns
			3.3V ± 0.3V	1	4.4	

4.9 Switching Characteristics, SN74LVC02A

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

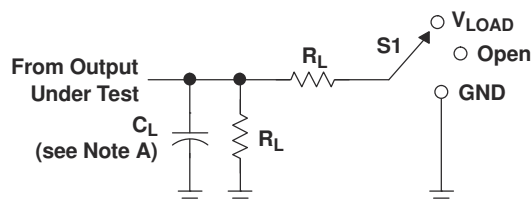
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN74LVC02A						UNIT
				$T_A = 25^\circ\text{C}$			$-40^\circ\text{C to } 85^\circ\text{C}$		$-40^\circ\text{C to } 125^\circ\text{C}$	
				MIN	TYP	MAX	MIN	MAX	MIN MAX	
t_{pd}	A or B	Y	1.8V $\pm$ 0.15V	1	3.8	8.4	1	8.9	1 10.4	ns
			2.5V $\pm$ 0.2V	1	2.9	6.9	1	7.4	1 9.5	
			2.7V	1	3	5.2	1	5.4	1 7	
			3.3V $\pm$ 0.3V	1	3.6	4.2	1	4.4	1 5.5	
$t_{sk(o)}$			3.3V $\pm$ 0.3V				1		1.5	ns

4.10 Operating Characteristics

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

PARAMETER		TEST CONDITIONS	V _{CC}	TYP	UNIT
C _{pd}	Power dissipation capacitance per gate	f = 10MHz	1.8V	7.5	pF
			2.5V	8.5	
			3.3V	9.5	

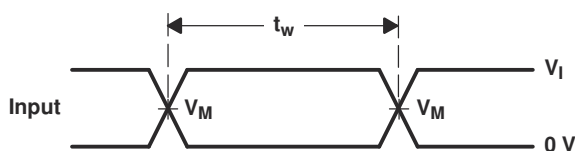
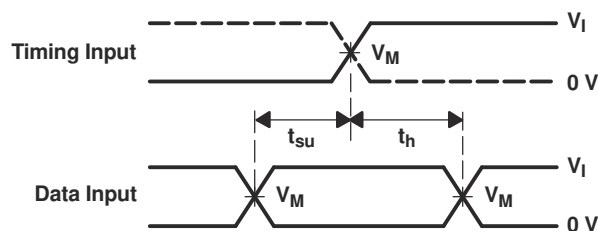
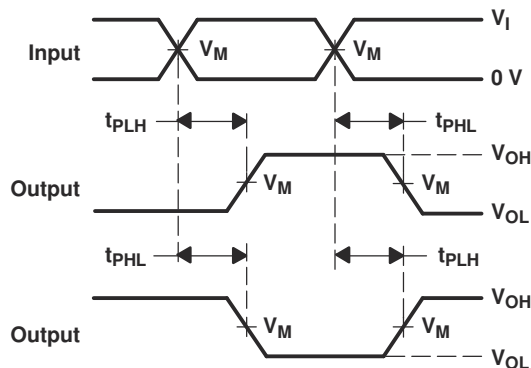
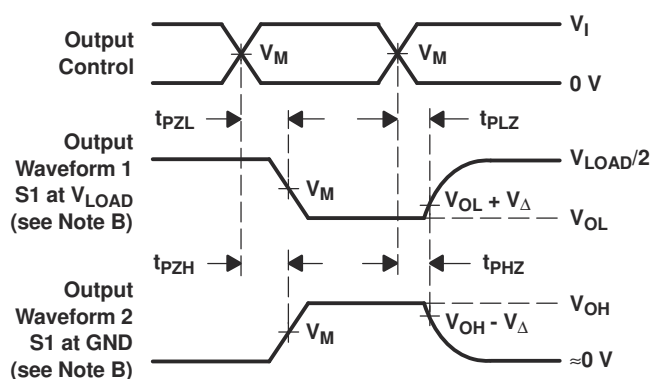
5 Parameter Measurement Information



LOAD CIRCUIT

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

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

VOLTAGE WAVEFORMS
PULSE DURATIONVOLTAGE WAVEFORMS
SETUP AND HOLD TIMESVOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTSVOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: PRR $\leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - All parameters and waveforms are not applicable to all devices.

图 5-1. Load Circuit and Voltage Waveforms

6 Detailed Description

6.1 Functional Block Diagram



图 6-1. Logic Diagram, Each Gate (Positive Logic)

6.2 Device Functional Modes

Function Table
(Each Gate)

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

7 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。

7.1 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- μF capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μF and 1- μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results, as shown in given example layout image.

7.2 Layout

7.2.1 Layout Guidelines

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

7.2.2 Layout Example

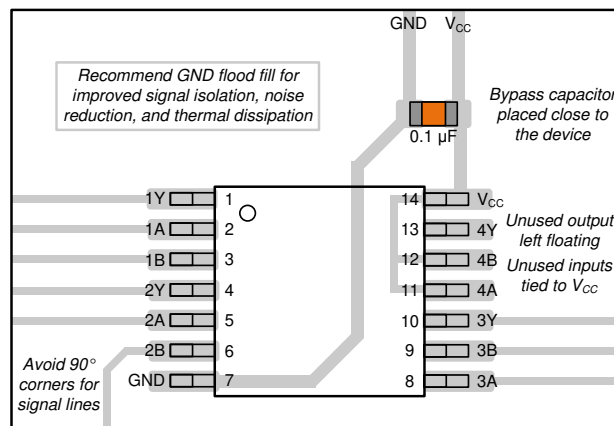


图 7-1. Example Layout for the SNx4LVC02A

8 Device and Documentation Support

8.1 Documentation Support

8.1.1 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 8-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN54LVC02A	Click here	Click here	Click here	Click here	Click here
SN74LVC02A	Click here	Click here	Click here	Click here	Click here

8.2 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 [通知](#) 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。

8.3 支持资源

[TI E2E™ 中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、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，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](#)。

8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

8.5 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。

8.6 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。

9 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision S (May 2024) to Revision T (December 2024)	Page
• Updated RθJA values: D = 86 to 127.8, all values in °C/W.....	5

Changes from Revision R (March 2024) to Revision S (May 2024)	Page
• Updated RθJA values: DB = 96 to 140.4, NS = 76 to 123.8, PW = 113 to 150.8, RGY = 47 to 92.1; Updated DB, NS, PW, and RGY packages for RθJC(top), RθJB, ΨJT, ΨJB, and RθJC(bot), all values in °C/W.....	5

10 Mechanical, Packaging, and Orderable Information

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

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-9760401Q2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9760401Q2A SNJ54LVC 02AFK
5962-9760401QCA	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9760401QC A SNJ54LVC02AJ
5962-9760401QDA	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9760401QD A SNJ54LVC02AW
SN74LVC02ABQAR	Active	Production	WQFN (BQA) 14	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC02A
SN74LVC02AD	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC02A
SN74LVC02ADBR	Active	Production	SSOP (DB) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC02A
SN74LVC02ADR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC02A
SN74LVC02ADRG4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC02A
SN74LVC02ANSR	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC02A
SN74LVC02APW	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC02A
SN74LVC02APWE4	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC02A
SN74LVC02APWR	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC02A
SN74LVC02APWT	Active	Production	TSSOP (PW) 14	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC02A
SN74LVC02ARGYR	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	LC02A
SNJ54LVC02AFK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9760401Q2A SNJ54LVC 02AFK
SNJ54LVC02AJ	Active	Production	CDIP (J) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9760401QC A SNJ54LVC02AJ
SNJ54LVC02AW	Active	Production	CFP (W) 14	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9760401QD A SNJ54LVC02AW

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

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

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

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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 SN54LVC02A, SN74LVC02A :

- Catalog : [SN74LVC02A](#)
- Automotive : [SN74LVC02A-Q1](#), [SN74LVC02A-Q1](#)
- Enhanced Product : [SN74LVC02A-EP](#), [SN74LVC02A-EP](#)
- Military : [SN54LVC02A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION


*All dimensions are nominal

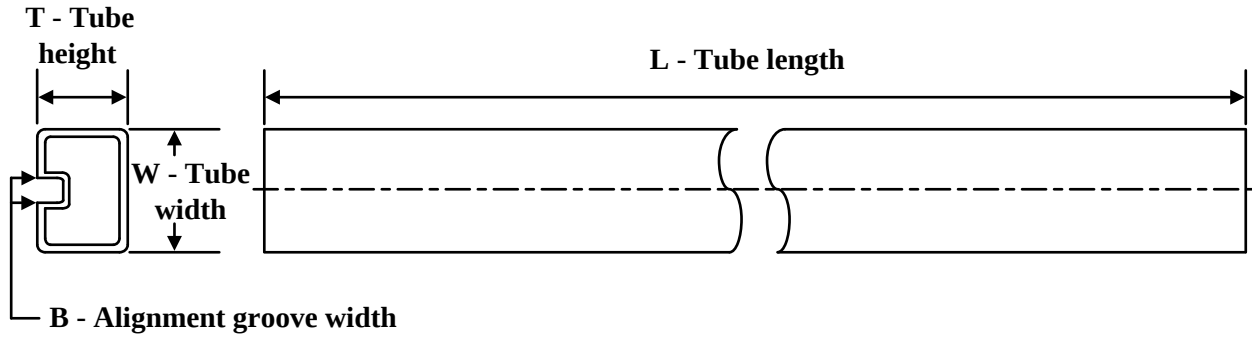
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC02ABQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74LVC02ADBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LVC02ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC02ANSR	SOP	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LVC02APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC02APWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC02ARGYR	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)
SN74LVC02ABQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74LVC02ADBR	SSOP	DB	14	2000	356.0	356.0	35.0
SN74LVC02ADR	SOIC	D	14	2500	356.0	356.0	35.0
SN74LVC02ANSR	SOP	NS	14	2000	356.0	356.0	35.0
SN74LVC02APWR	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74LVC02APWT	TSSOP	PW	14	250	356.0	356.0	35.0
SN74LVC02ARGYR	VQFN	RGY	14	3000	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9760401Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9760401QDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74LVC02AD	D	SOIC	14	50	506.6	8	3940	4.32
SN74LVC02APW	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74LVC02APWE4	PW	TSSOP	14	90	530	10.2	3600	3.5
SNJ54LVC02AFK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LVC02AW	W	CFP	14	25	506.98	26.16	6220	NA

GENERIC PACKAGE VIEW

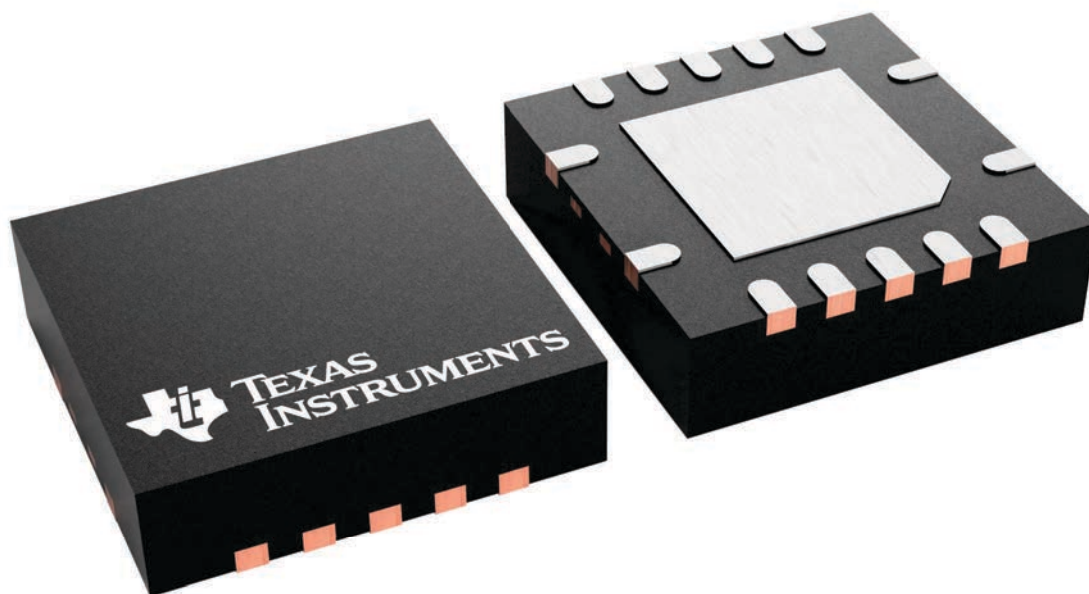
RGY 14

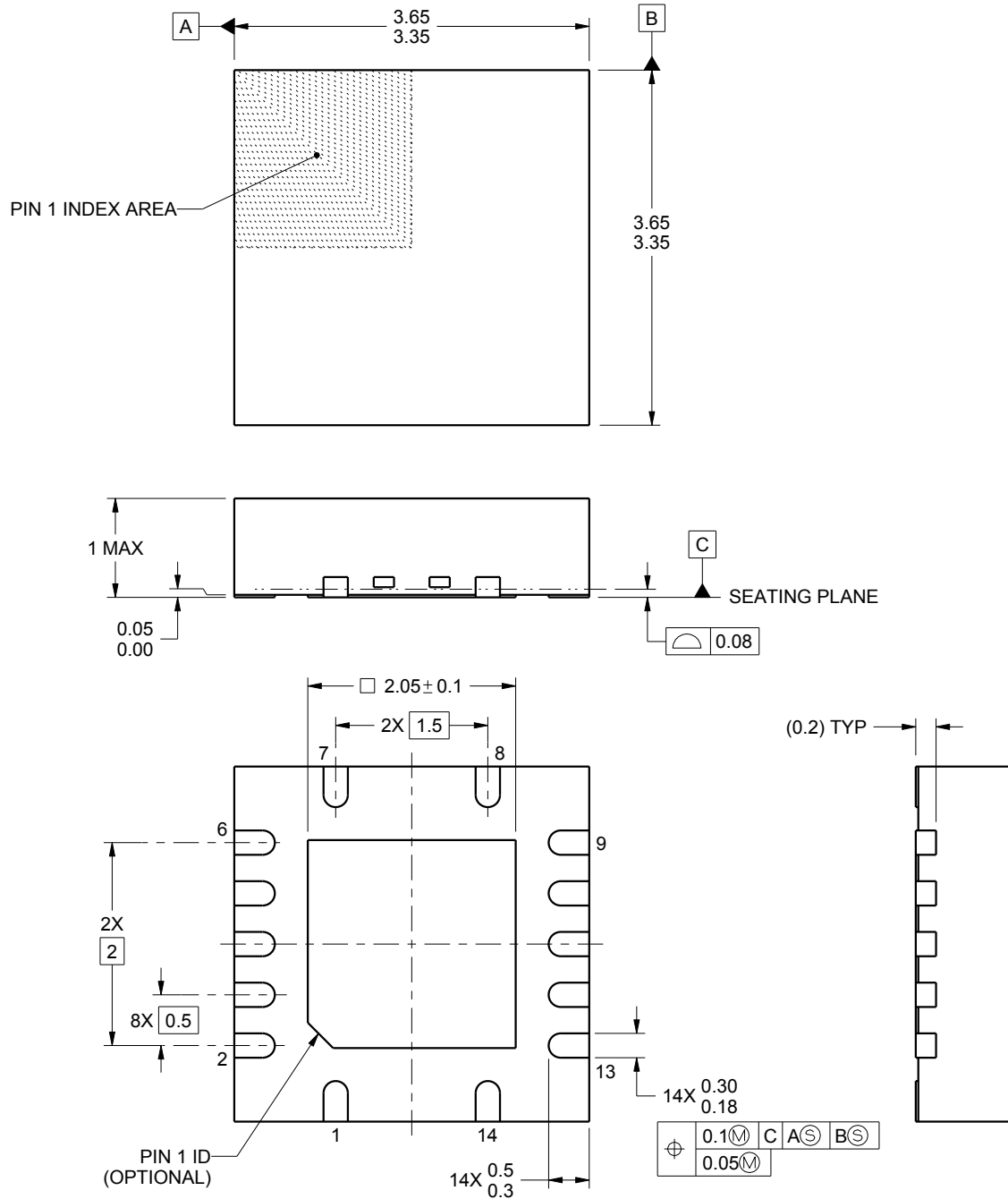
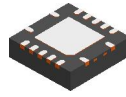
VQFN - 1 mm max height

3.5 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

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





4219040/A 09/2015

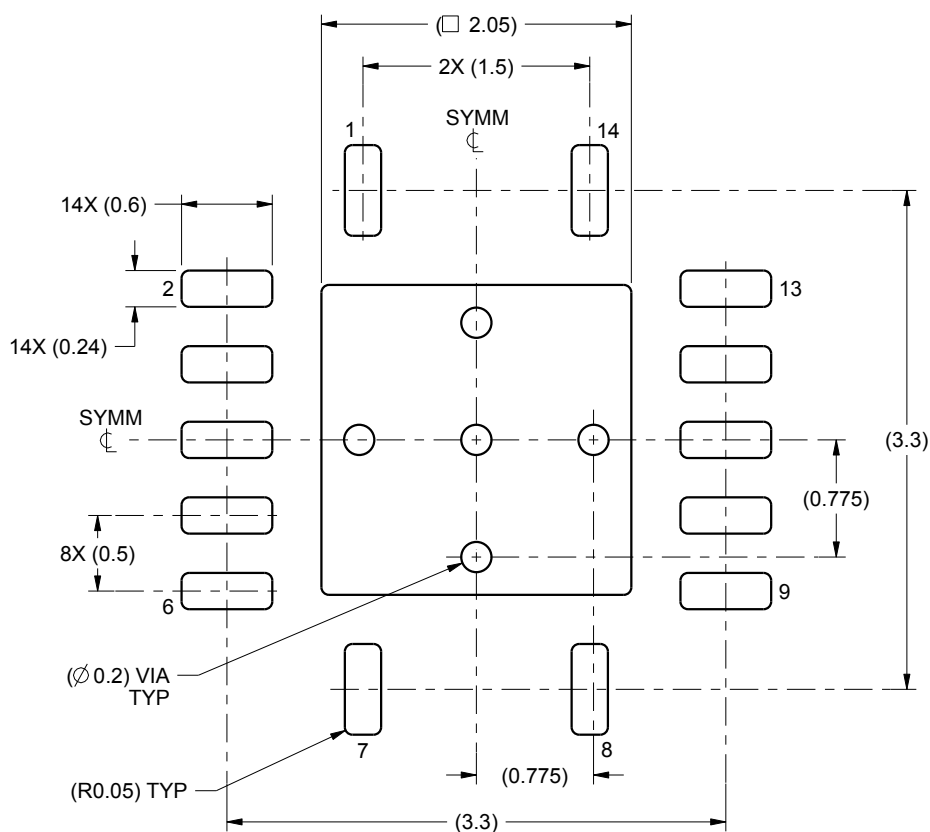
NOTES:

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

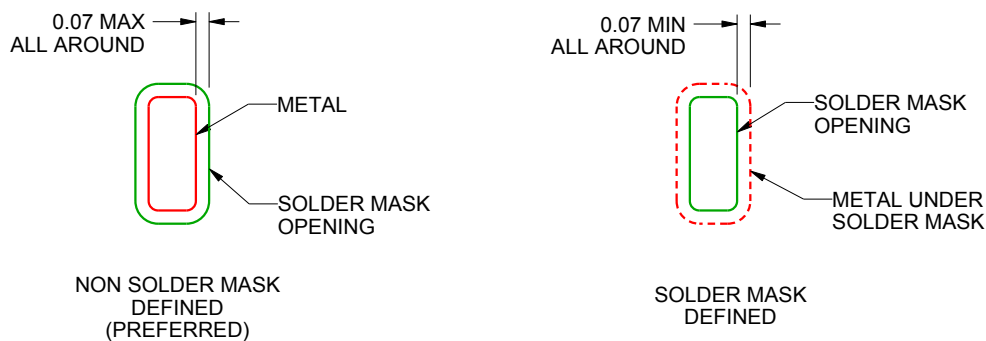
RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
SCALE:20X



SOLDER MASK DETAILS

4219040/A 09/2015

NOTES: (continued)

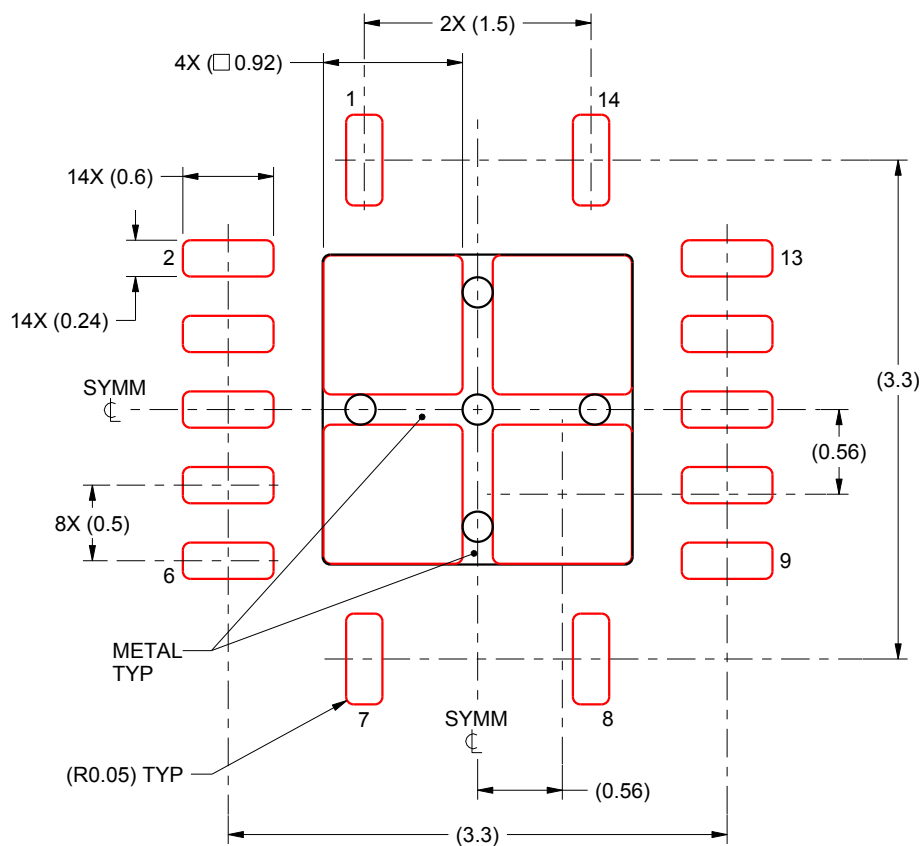
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).

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

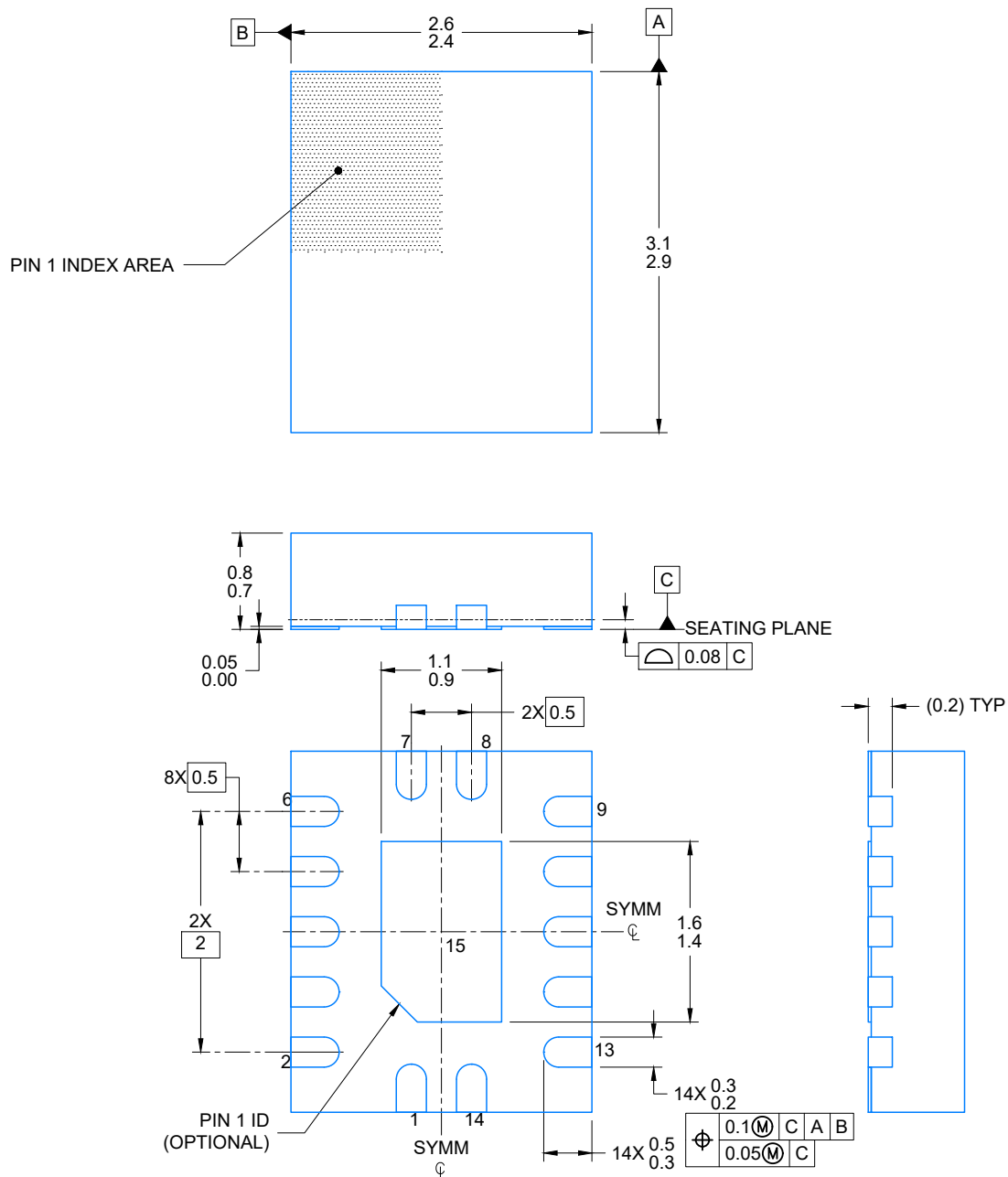
PLASTIC QUAD FLATPACK - NO LEAD

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



4227145/A

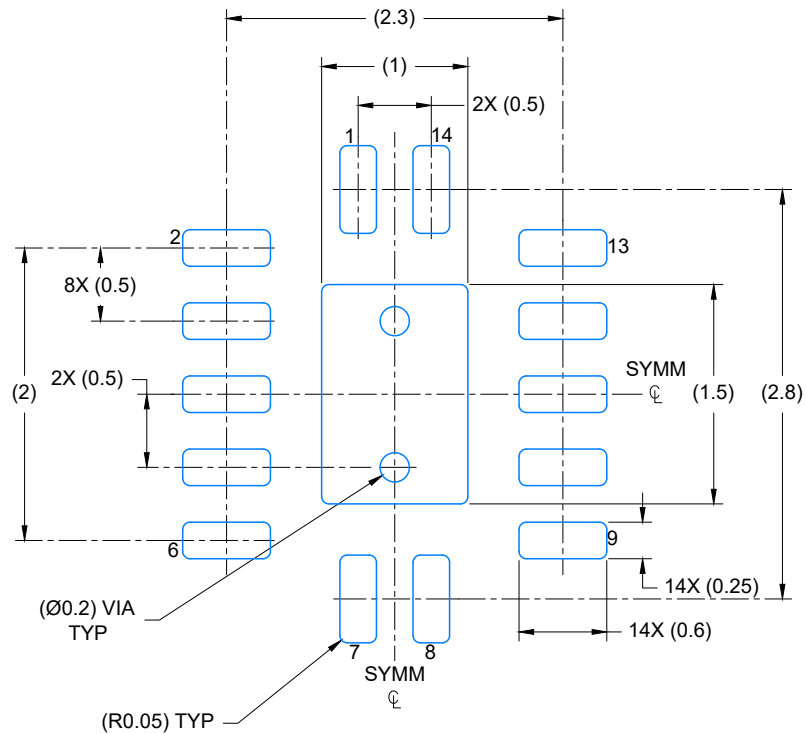
PLASTIC QUAD FLAT PACK-NO LEAD



4224636/A 11/2018

NOTES:

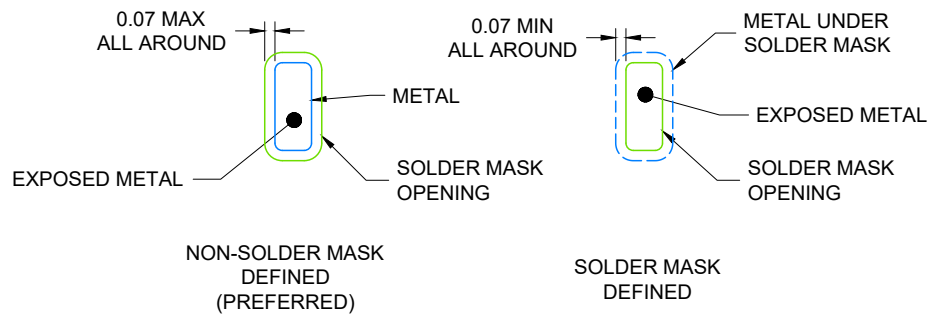
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical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



LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN

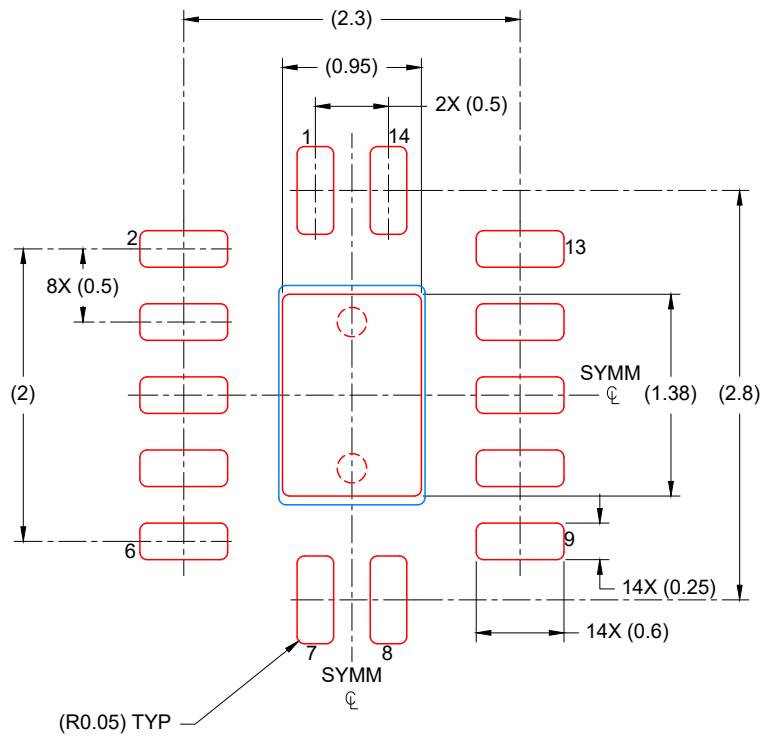
SCALE: 20X



4224636/A 11/2018

NOTES: (continued)

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



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

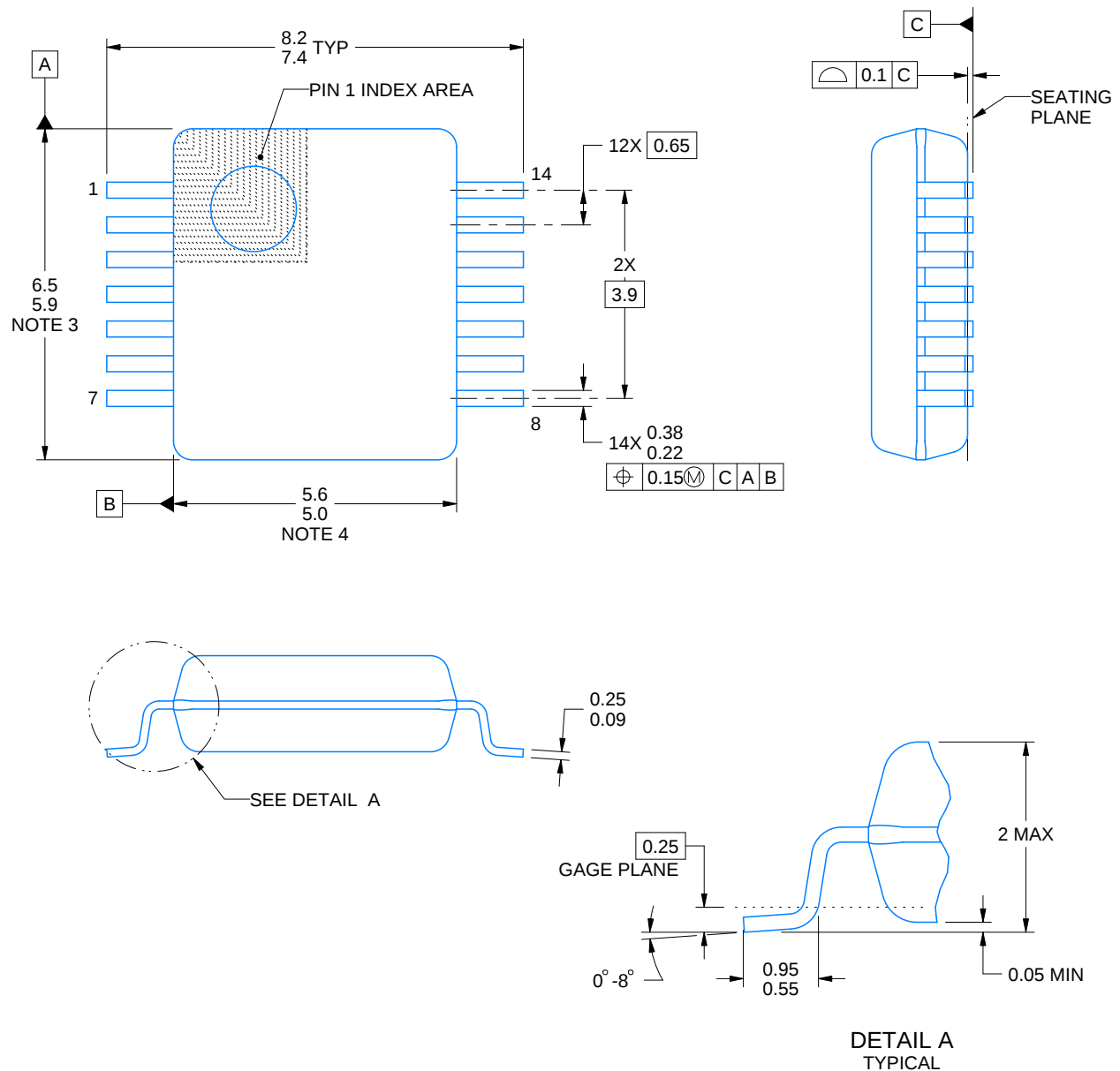
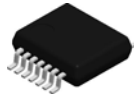
W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



NOTES:

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



4220762/A 05/2024

NOTES:

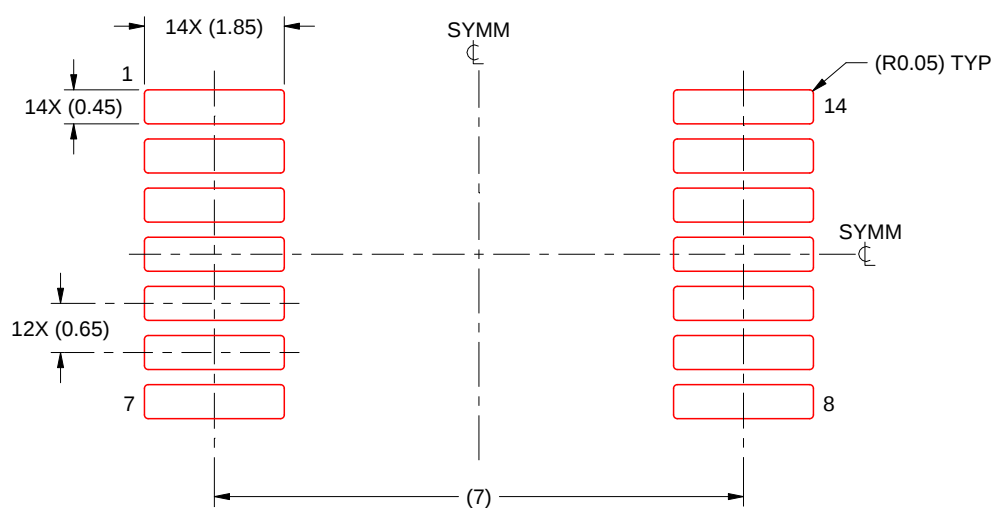
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE 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.

GENERIC PACKAGE VIEW

FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

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



4229370VA\

J 14

GENERIC PACKAGE VIEW

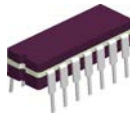
CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE

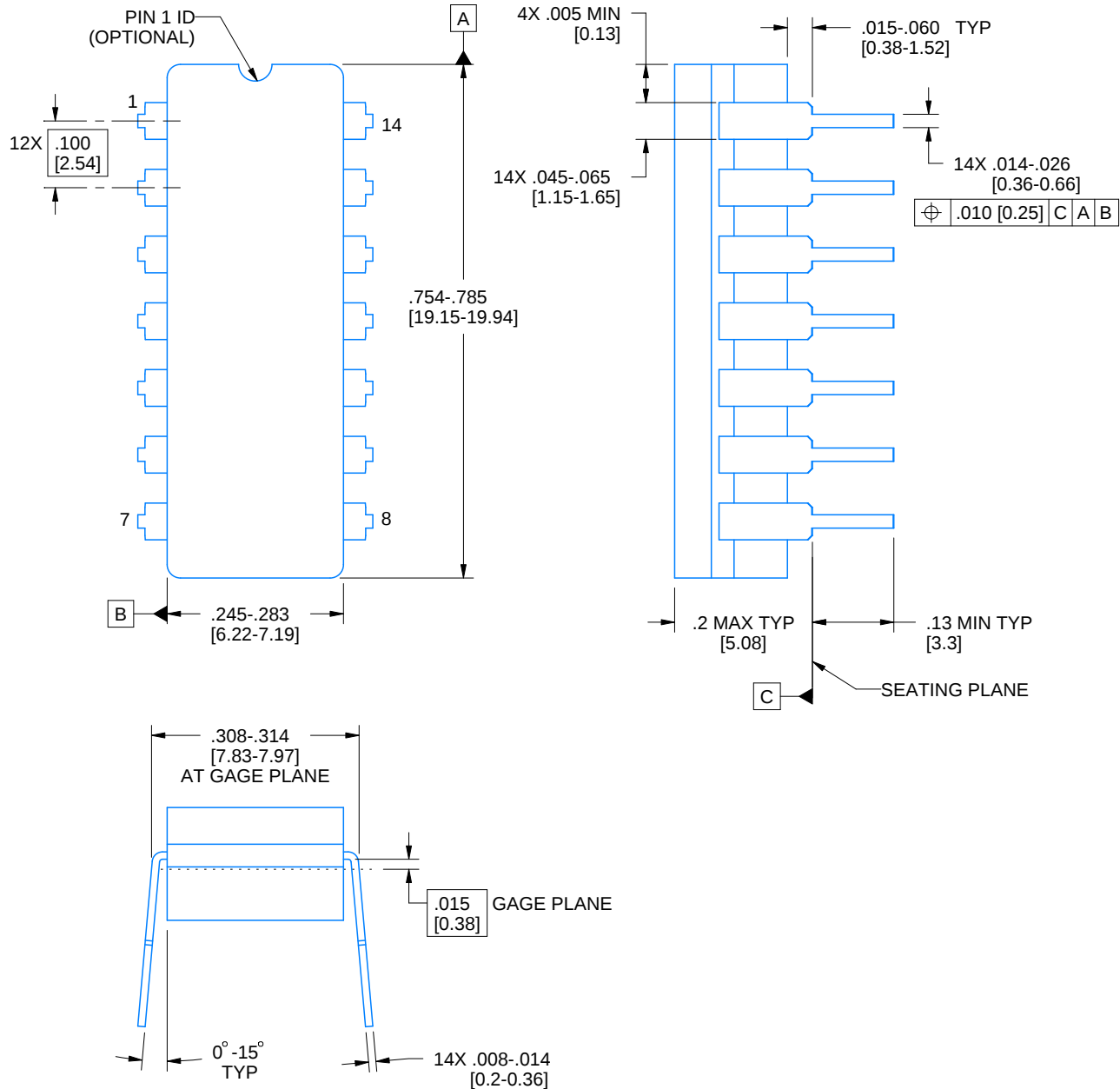


Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040083-5/G

J0014A**PACKAGE OUTLINE****CDIP - 5.08 mm max height**

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.



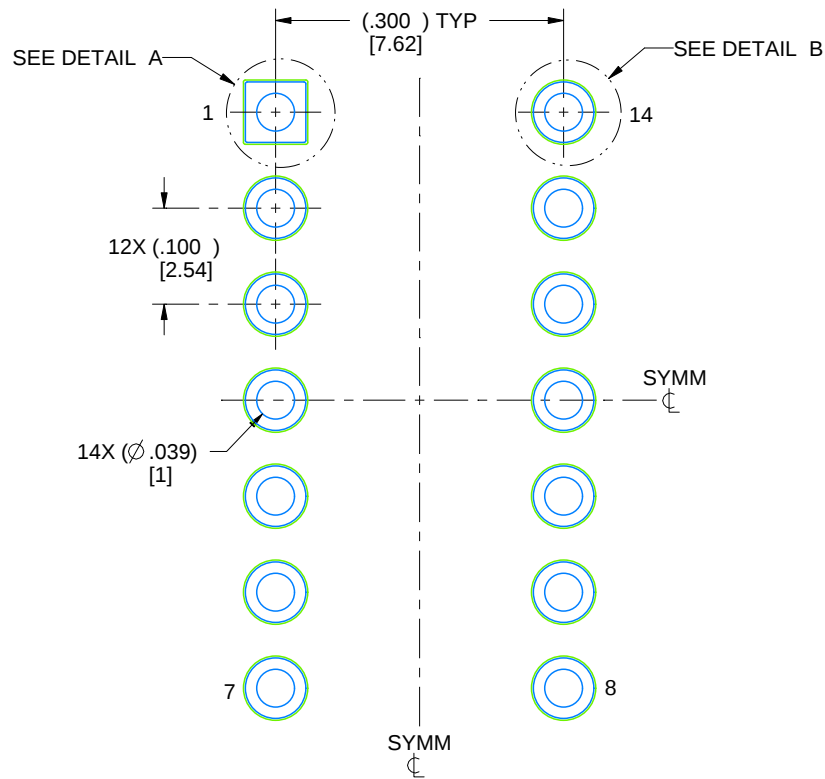
**TEXAS
INSTRUMENTS**
www.ti.com

EXAMPLE BOARD LAYOUT

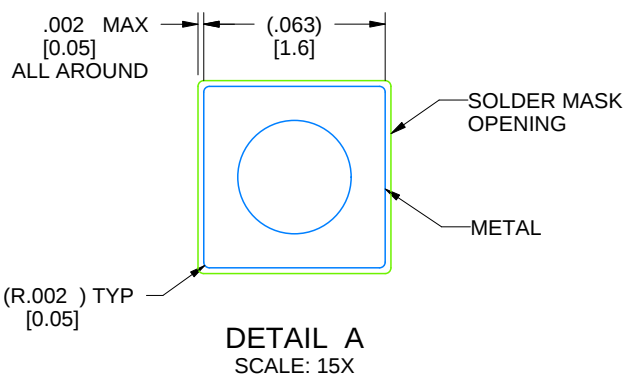
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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



4214771/A 05/2017

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



SOLDER MASK DETAILS

4220202/B 12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

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

EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220202/B 12/2023

NOTES: (continued)

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

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