AFE8030 具有反馈路径的八通道射频收发器

1 特性

- 八通道射频采样 12GSPS 发送 DAC
- 八通道射频采样 4GSPS 接收 ADC
- 双通道射频采样 4GSPS 反馈 ADC
- 最大射频信号带宽：
  - TX/FB：800MHz。
    - 4 通道模式中为 1200MHz
  - RX：400MHz
    - 4 通道模式中为 800MHz
- 射频频率范围：高达 6GHz
- 数字步进衰减器 (DSA)：
  - TX：40dB 范围、1dB 模拟和 0.125dB 数字步进
  - RX/FB：31/25dB 范围，1dB 步进
- 单通道或双通道 DUC/DDC
- 每个链两个 NCO，支持快速频率切换
- 通过在 TX 和 RX 之间快速切换来支持 TDD 操作
- 用于生成 DAC/ADC 时钟的内部 PLL/VCO
- DAC 或 ADC 速率下的可选外部 CLK
- 串行器/解串器数据接口：
  - JESD204B 和 JESD204C
  - 8 个高达 32.5Gbps 的串行器/解串器收发器
  - 8b/10b 和 64b/66b 编码
  - 12 位、16 位、24 位和 32 位分辨率
  - 子类 1 多器件同步
- 封装：
  - 17mm × 17mm FCBGA，间距 0.8mm

2 应用

- 宏远程无线电单元 (RRU)
- 有源天线系统 mMIMO (AAS)
- 小型蜂窝基站
- 分布式天线系统 (DAS)
- 中继器

3 说明

AFE8030 是一款高性能、高带宽、多通道收发器，集成了八个射频采样发送器链、八个射频采样接收器链和两个用于 辅助链（反馈路径）的独立射频前端。发送器链和接收器链的高动态范围支持从无线基站生成和接收 3G、4G 和 5G 信号，而高带宽能力则使 AFE8030 器件适用于多频带 4G 和 5G 基站。

每个接收器链均包含一个 31dB 范围的数字步进衰减器 (DSA)，后跟一个 4GSPS 模数转换器 (ADC)。每个接收器通道都有多个模拟峰值功耗检测器和数字峰值及功耗检测器，可辅助进行外部或内部自主自动增益控制器，另外还具有一个射频过载检测器，用于提供器件可靠性保护。单通道或双通道数字下变频器 (DDC) 可提供高达 400MHz 的组合信号带宽（在 8 通道模式下，而在 4 通道模式下为 800MHz）。在 TDD 模式下，接收器通道经过配置可在流量接收器 (TDD RX) 和宽带反馈接收器 (TDD FB) 间动态切换，能够重复使用同一模拟输入来实现这两个目的。

每个发送器链包含一个单通道或双通道数字上变频器 (DUC)，支持最高 800MHz 的组合信号带宽（4 通道模式下为 1200MHz）。DUC 的输出驱动 12GSPS DAC（数模转换器），通过混合模式输出选项增强在第二奈奎斯特区的运行。DAC 输出包括一个具有 40dB 范围以及 1dB 模拟和 0.125dB 数字步进的可变增益放大器 (TX DSA)。

反馈路径包含一个驱动 4GSPS 射频采样 ADC、25dB 范围 DSA，后跟一个单通道宽带或双通道窄带 DDC，该 DDC 具有高达 800MHz 的组合带宽（在 4 通道模式下为 1200MHz）。

封装信息(1)

器件型号	封装	封装尺寸（标称值）
AFE8030	ABJ FCBGA (400)	17.00mm × 17.00mm
	ALK FCBGA (400)	17.00mm × 17.00mm

(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。

4 AFE8030 Functional Block Diagram

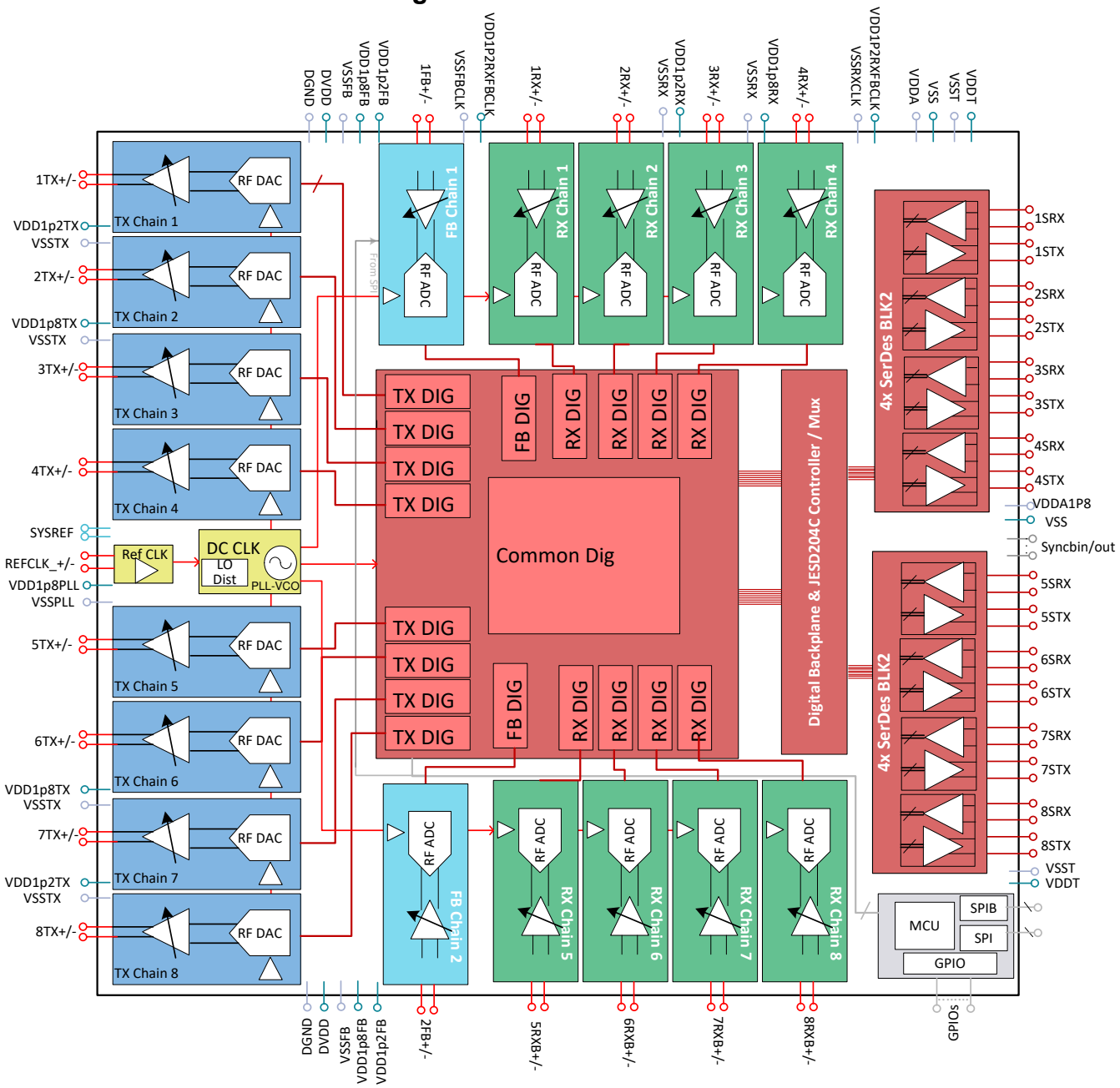


Table of Contents

5 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 * (December 2021) to Revision A (September 2022)	Page
• 向数据表中添加了 ALK (FCBGA) 封装	1
• 将*器件信息*表更改为*封装信息*	1

6 Device and Documentation Support

6.1 Device Support

6.2 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 *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。

6.3 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》。

6.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

6.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

6.6 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。

7 Mechanical, Packaging, and Orderable Information

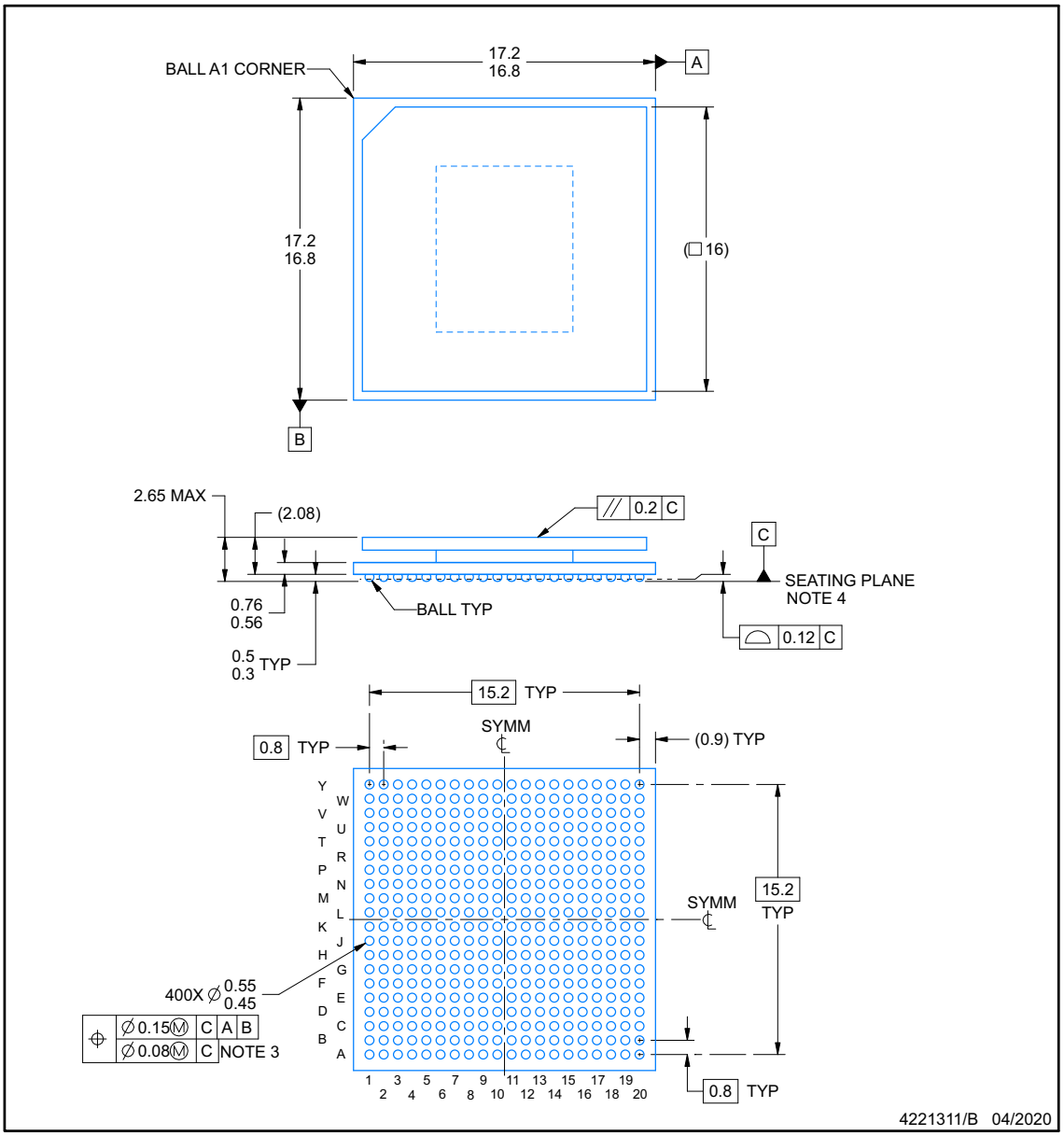
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand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

PACKAGE OUTLINE

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES:

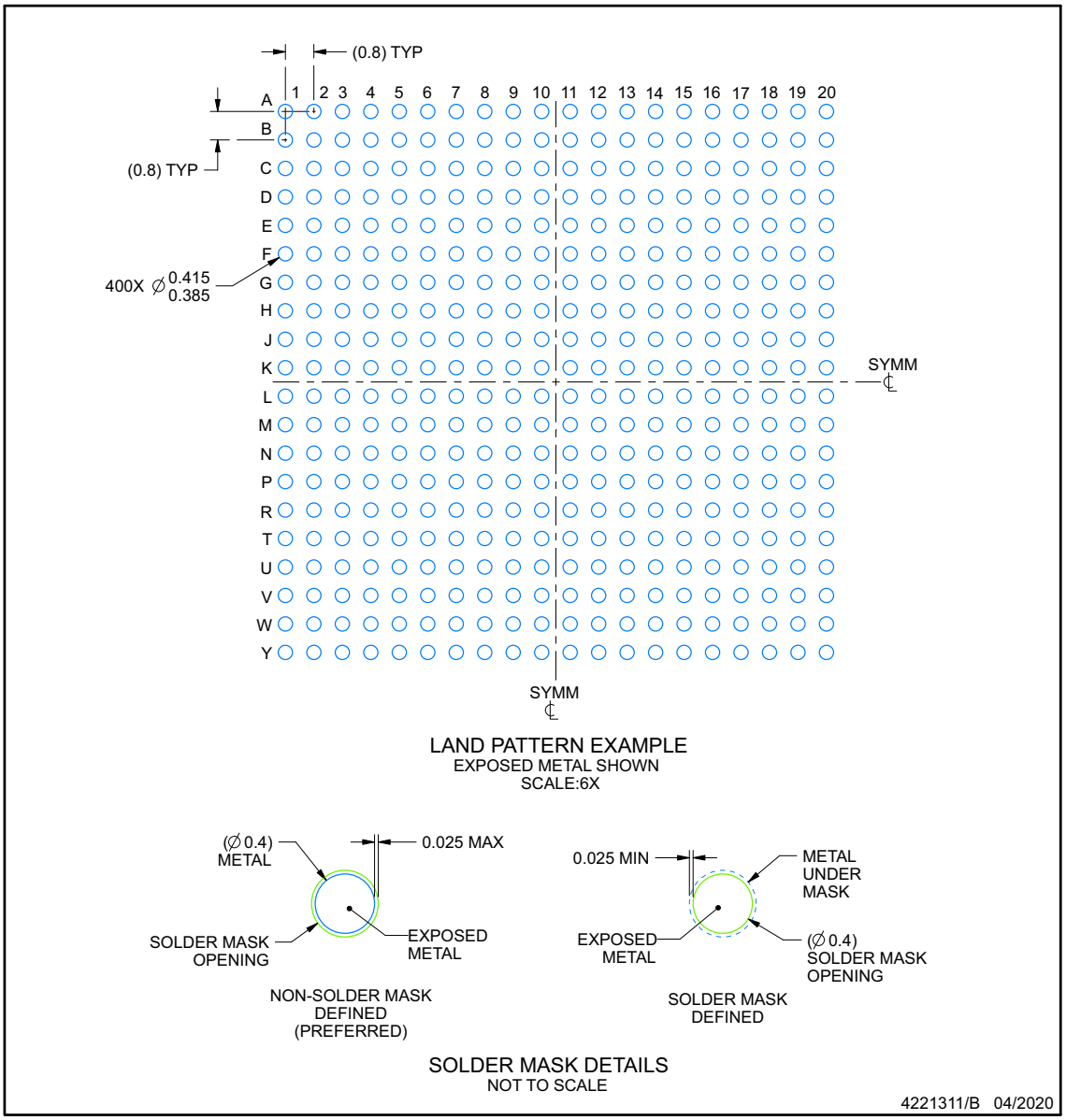
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum C and seating plane are defined by the spherical crowns of the solder balls.

EXAMPLE BOARD LAYOUT

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES: (continued)

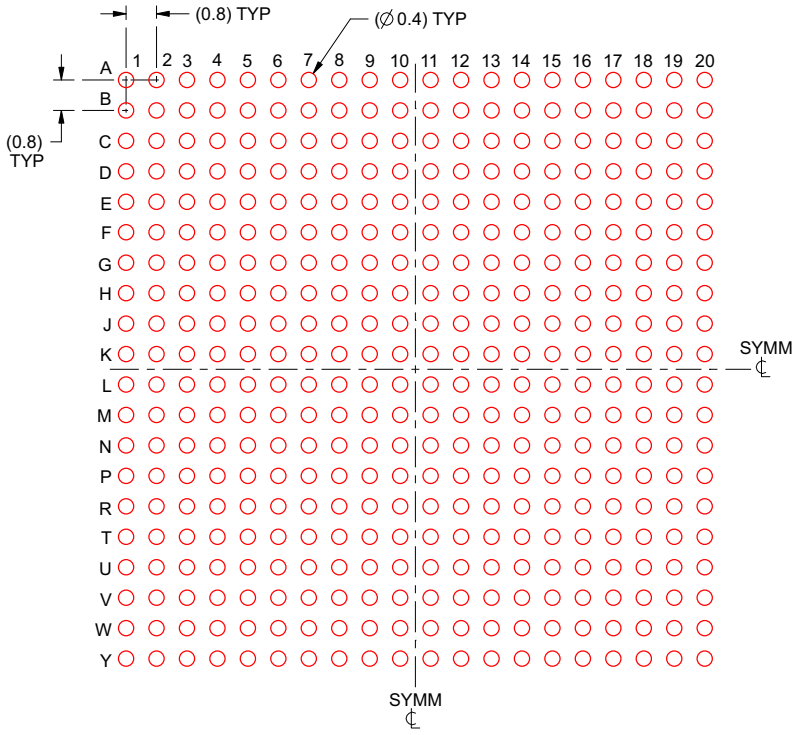
5. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



SOLDER PASTE EXAMPLE
BASED ON 0.15 mm THICK STENCIL
SCALE:6X

4221311/B 04/2020

NOTES: (continued)

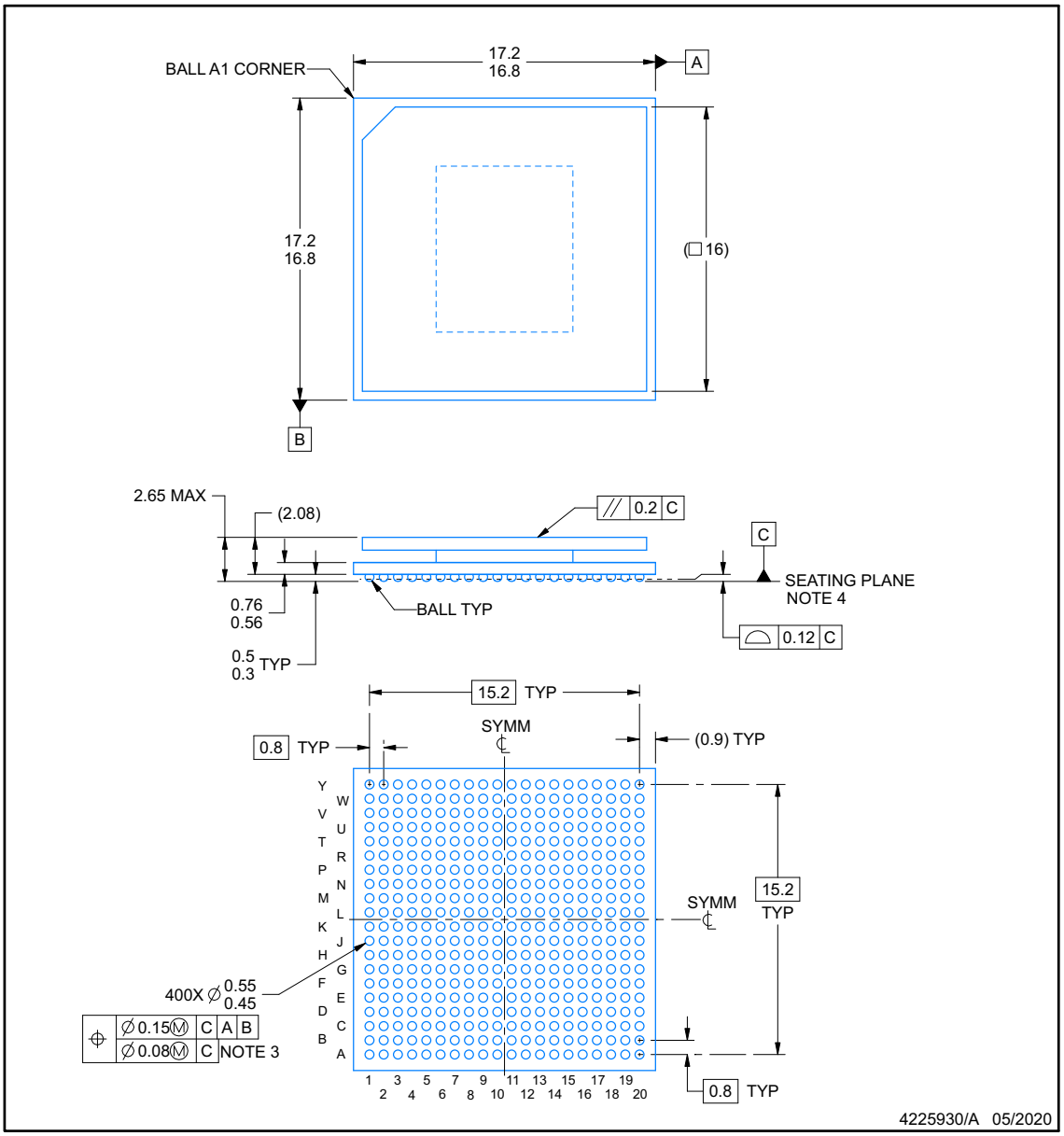
6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

PACKAGE OUTLINE

ALK0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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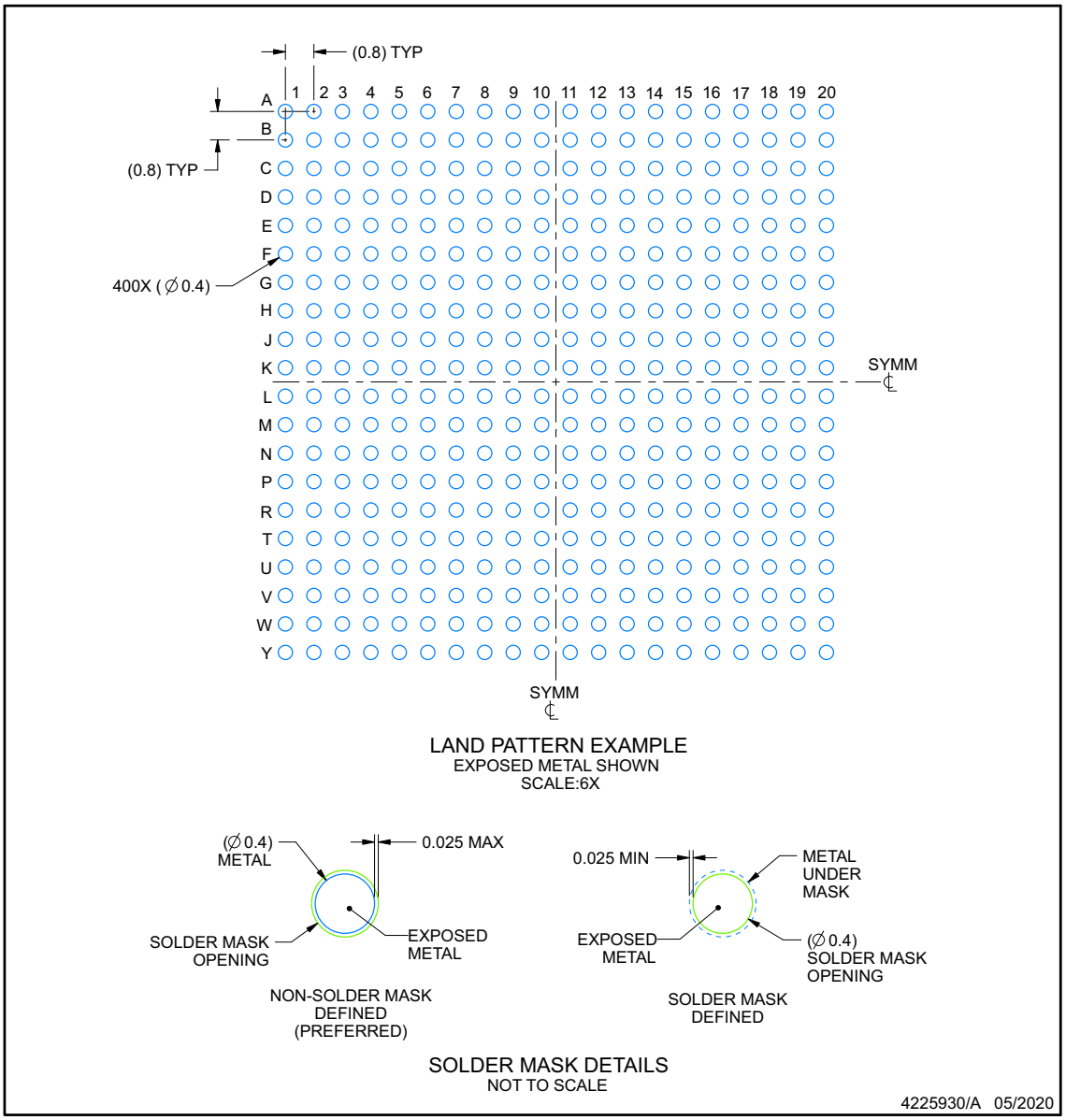
5. Pb-Free die bump and SnPb solder ball.

EXAMPLE BOARD LAYOUT

ALK0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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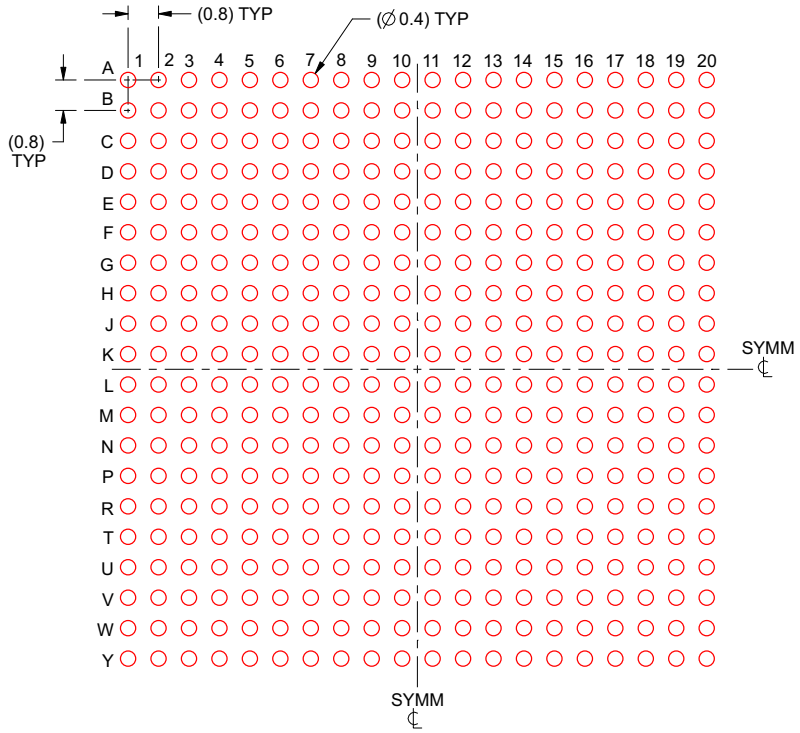
EXAMPLE STENCIL DESIGN

ALK0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



SOLDER PASTE EXAMPLE
BASED ON 0.15 mm THICK STENCIL
SCALE:6X

4225930/A 05/2020

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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)
AFE8030EDIABJ	Active	Production	FCBGA (ABJ) | 400	90 | JEDEC TRAY (5+1)	Yes	SNAGCU | SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE8030
AFE8030EDIALK	Active	Production	FCBGA (ALK) | 400	90 | JEDEC TRAY (5+1)	No	Call TI	Level-3-220C-168 HR	-40 to 85	AFE8030 SNPB
AFE8030IABJ	Active	Production	FCBGA (ABJ) | 400	90 | JEDEC TRAY (5+1)	Yes	SNAGCU | SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE8030

(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.

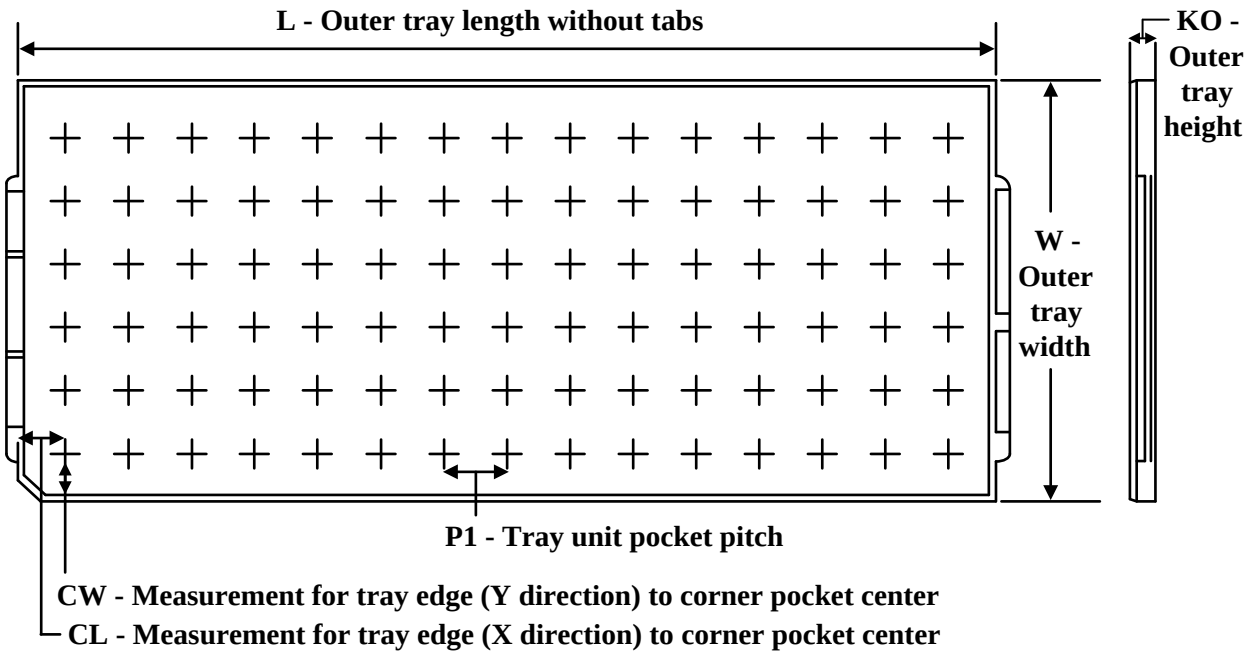
(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(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.

TRAY



Chamfer on Tray corner indicates Pin 1 orientation of packed units.

*All dimensions are nominal

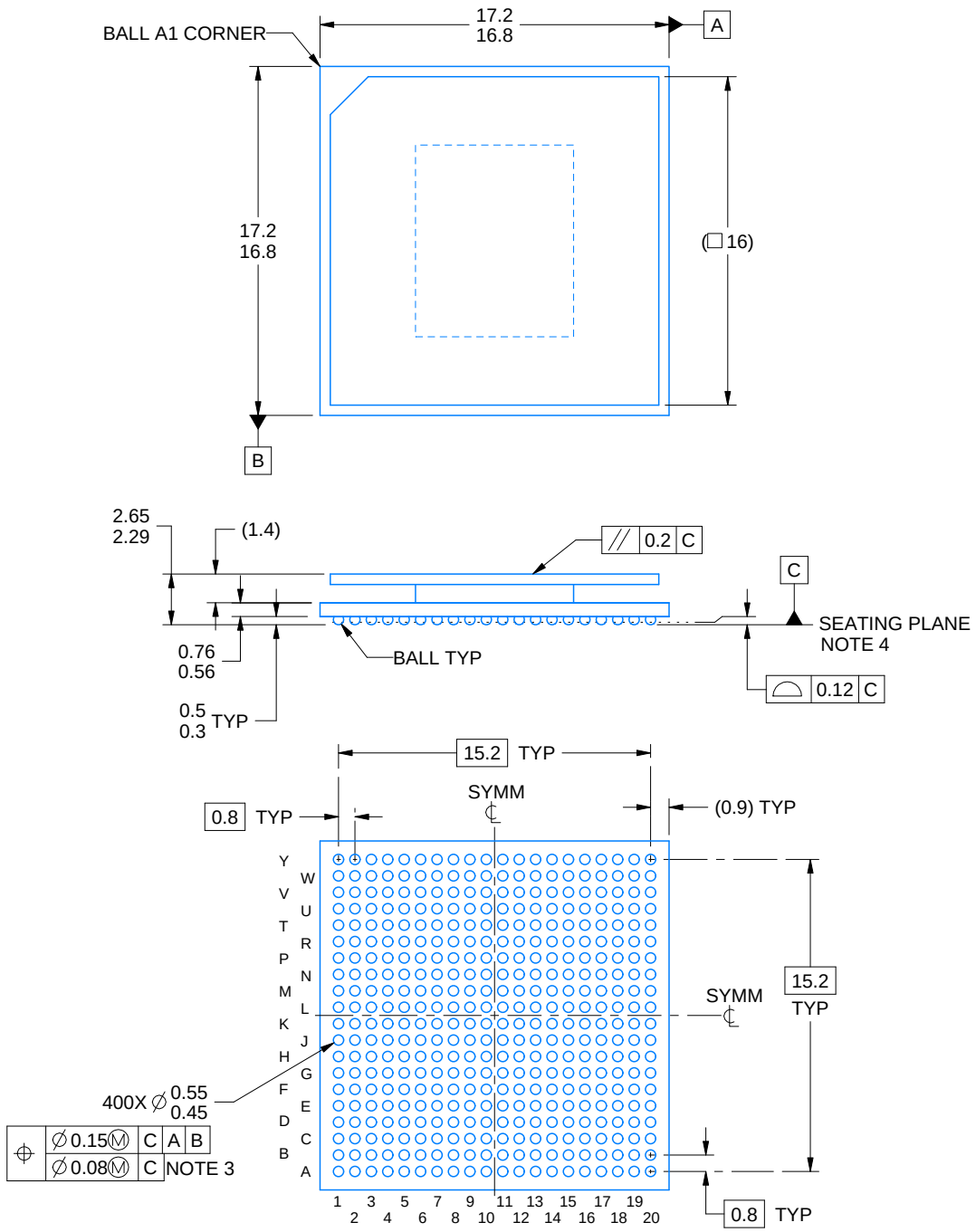
Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
AFE8030EDIABJ	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8030EDIABJ.Z	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8030EDIALK	ALK	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8030EDIALK.Z	ALK	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8030IABJ	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8030IABJ.Z	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2

ALK0400A

PACKAGE OUTLINE

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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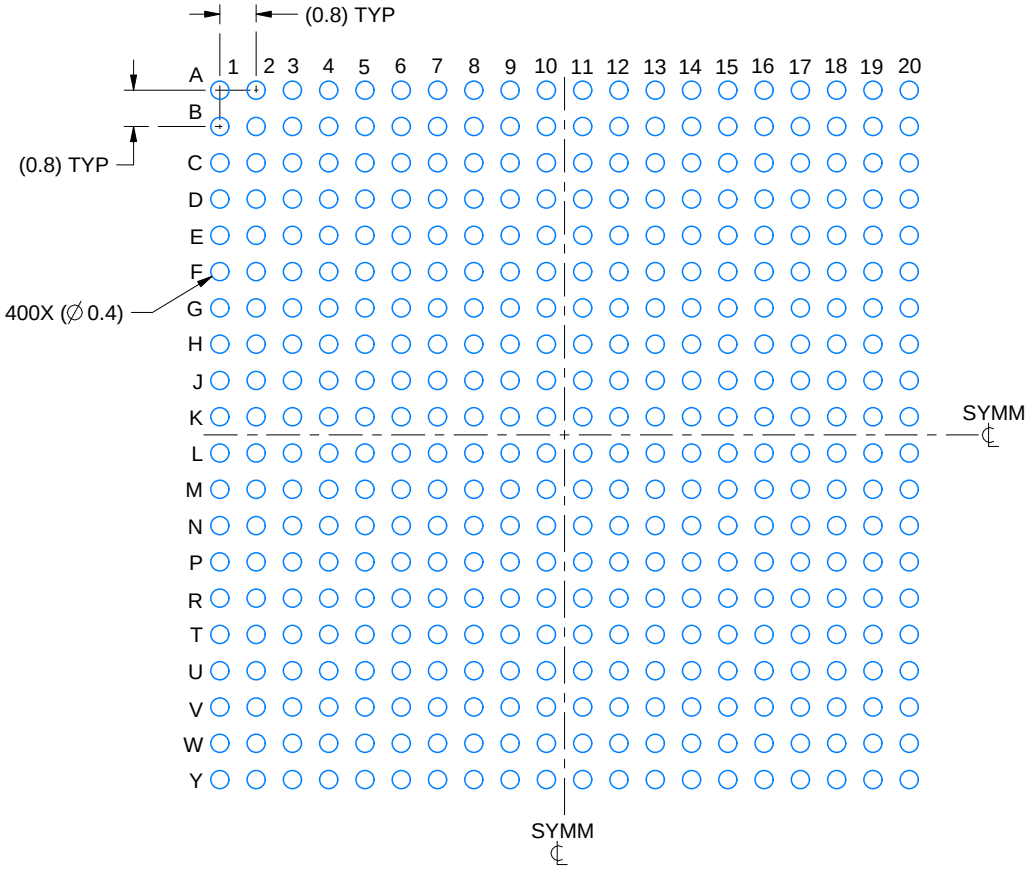
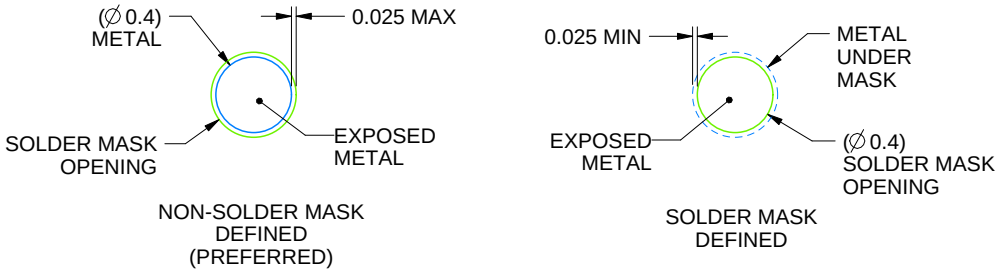
5. Pb-Free die bump and SnPb solder ball.
6. The lids are electrically floating (e.g. not tied to GND).



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X

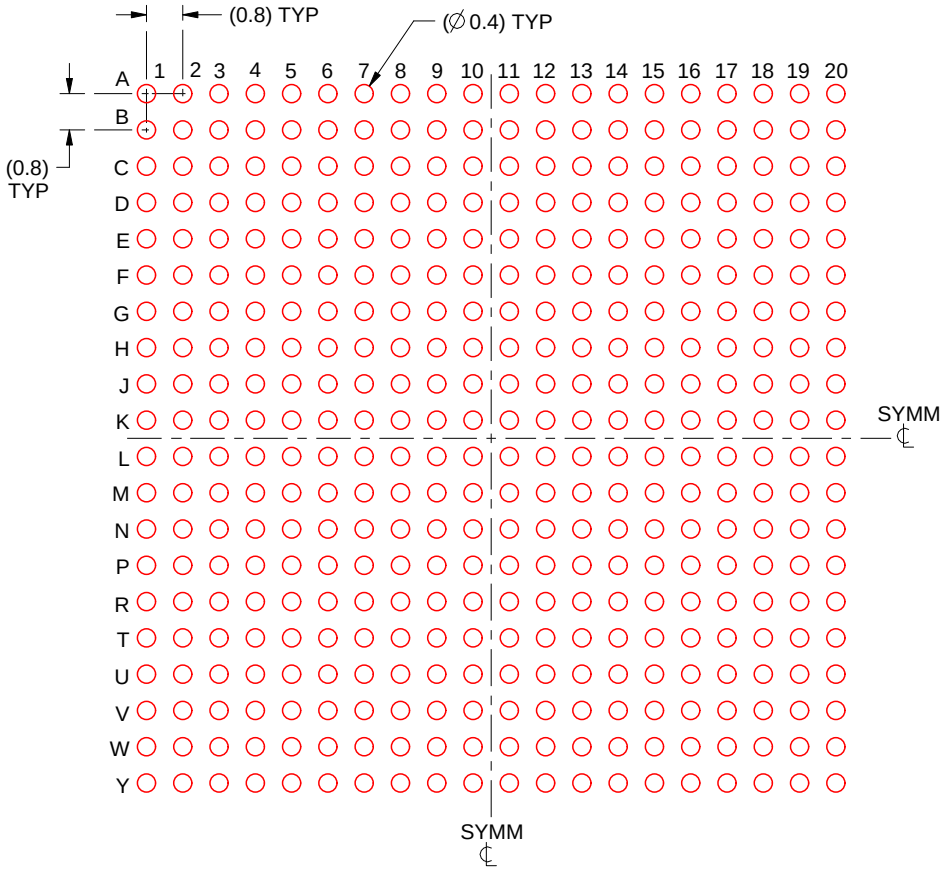


SOLDER MASK DETAILS
NOT TO SCALE

4225930/C 03/2023

NOTES: (continued)

7. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).



SOLDER PASTE EXAMPLE
BASED ON 0.15 mm THICK STENCIL
SCALE:6X

4225930/C 03/2023

NOTES: (continued)

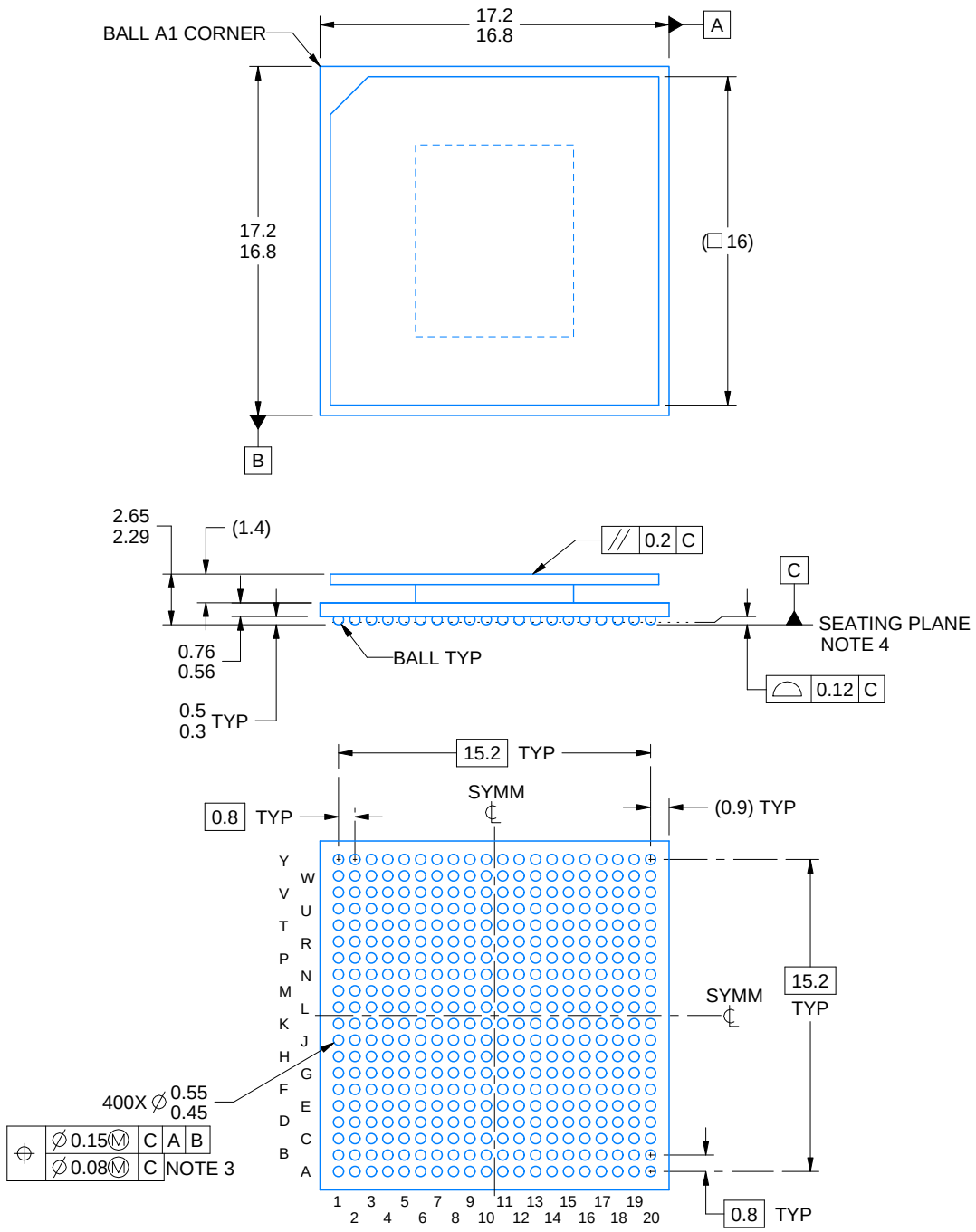
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

PACKAGE OUTLINE

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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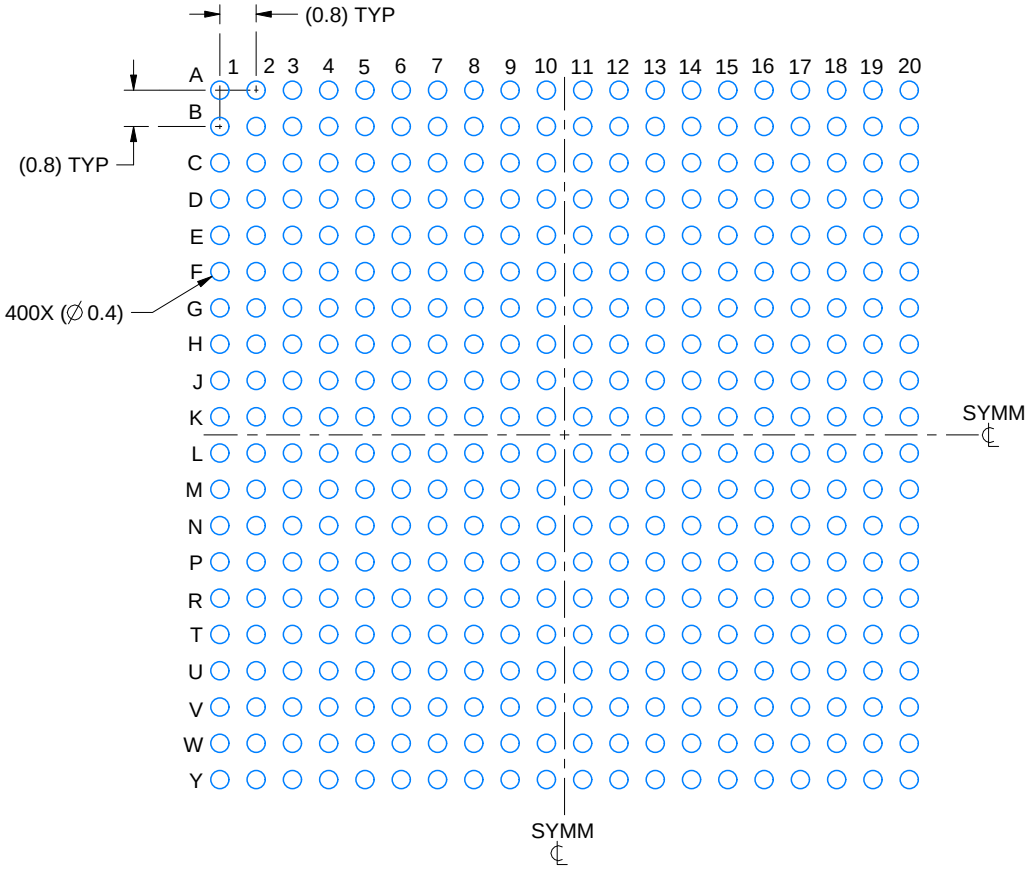
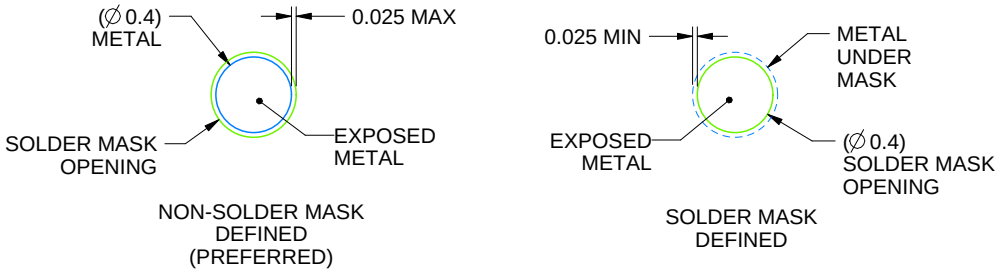


LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X



SOLDER MASK DETAILS
NOT TO SCALE

4221311/D 03/2023

NOTES: (continued)

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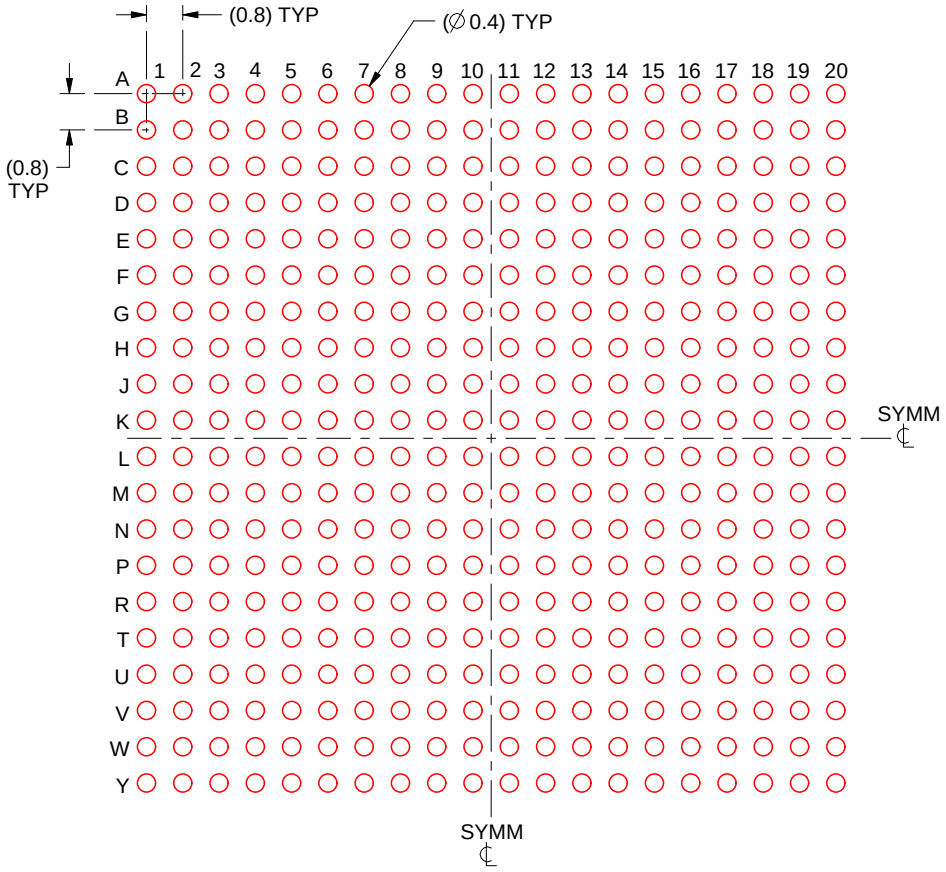

SOLDER PASTE EXAMPLE
BASED ON 0.15 mm THICK STENCIL
SCALE:6X

4221311/D 03/2023

NOTES: (continued)

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