

AFE8092 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 3GSPS 接收 ADC
- 最大射频信号带宽：
 - TX/FB：800MHz
 - 4 通道模式中为 1200MHz
 - RX：600MHz
- 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
- 每个链一个 DUC/DDC
- 每链两个 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，间距为 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

AFE8092 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 AFE8092 器件适用于多频带 4G 和 5G 基站。

每个接收链均包含一个 31dB 范围的 DSA (数字步进衰减器)，后跟一个 3GSPS ADC (模数转换器)。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。数字下变频器 (DDC) 在和在 4 通道模式下均可提供高达 800MHz 的组合信号带宽。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数字下变频器 (DUC)，支持最高 800MHz 的组合信号带宽 (4 通道模式下为 1200MHz)。DUC 的输出驱动一个 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 数字步进的可选增益放大器 (TX DSA)。

反馈路径包含一个驱动 3GSPS 射频采样 ADC、与接收器链共用的后跟一个单通道宽带或双通道窄带 DDC 高达的组合带宽 (在 4 通道模式下为 1200MHz)。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
AFE8092	(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。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。



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4 器件和文档支持

4.1 器件支持

4.2 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。

4.3 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](#)。

4.4 商标

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4.5 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。

4.6 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。

5 修订历史记录

注：以前版本的页码可能与当前版本的页码不同

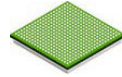
Changes from Revision A (October 2021) to Revision B (November 2024)	Page
• 删除了 4GSPS ADC 时钟支持.....	1
• 将 <i>器件信息</i> 表更改为 <i>封装信息</i>	1

Changes from Revision * (May 2021) to Revision A (October 2021)	Page
• 添加了对 4 通道宽带模式的支持.....	1

6 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件可用的最新数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。有关此数据表的浏览器版本，请查阅左侧的导航栏。

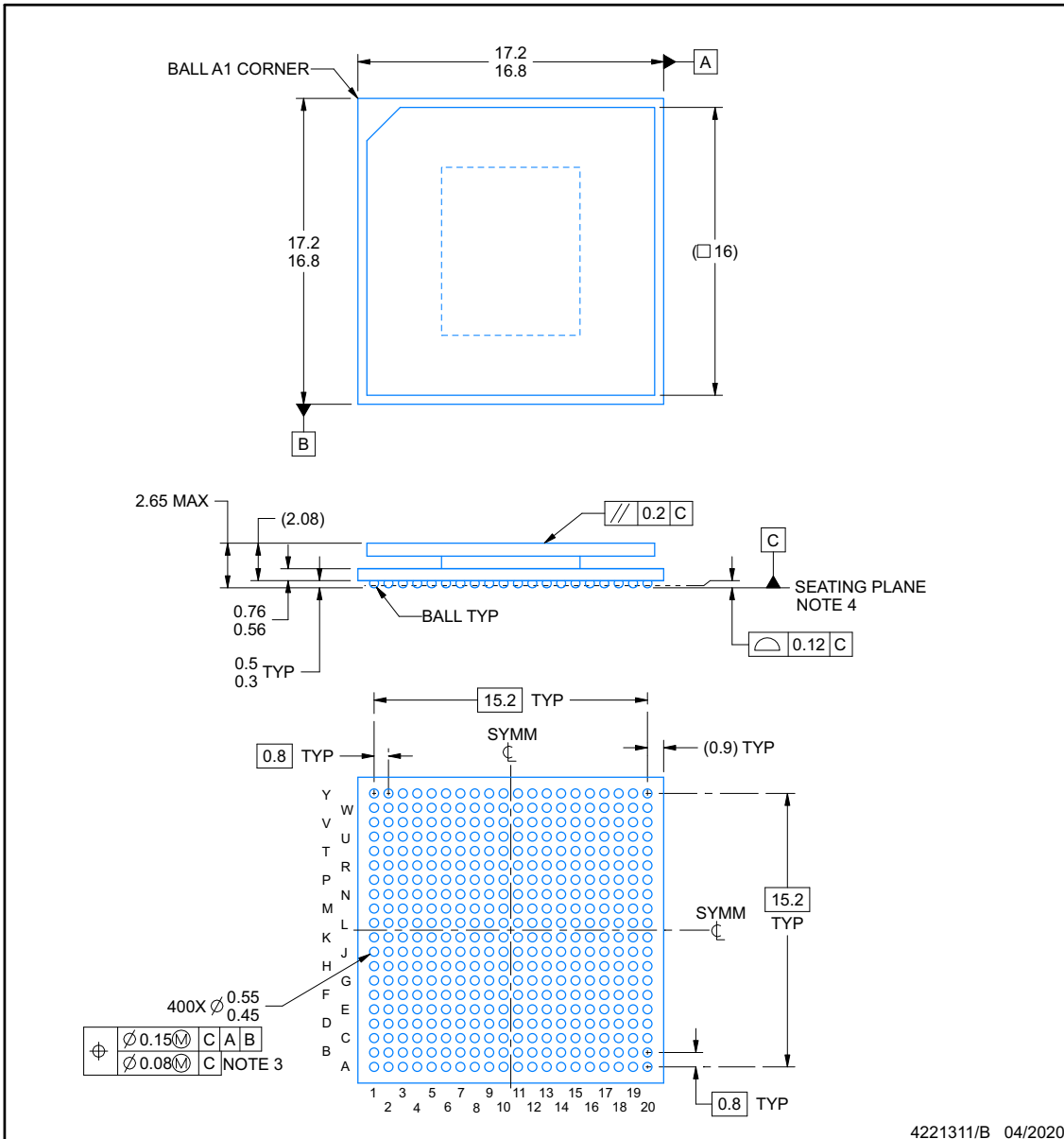
ABJ0400A



PACKAGE OUTLINE

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES:

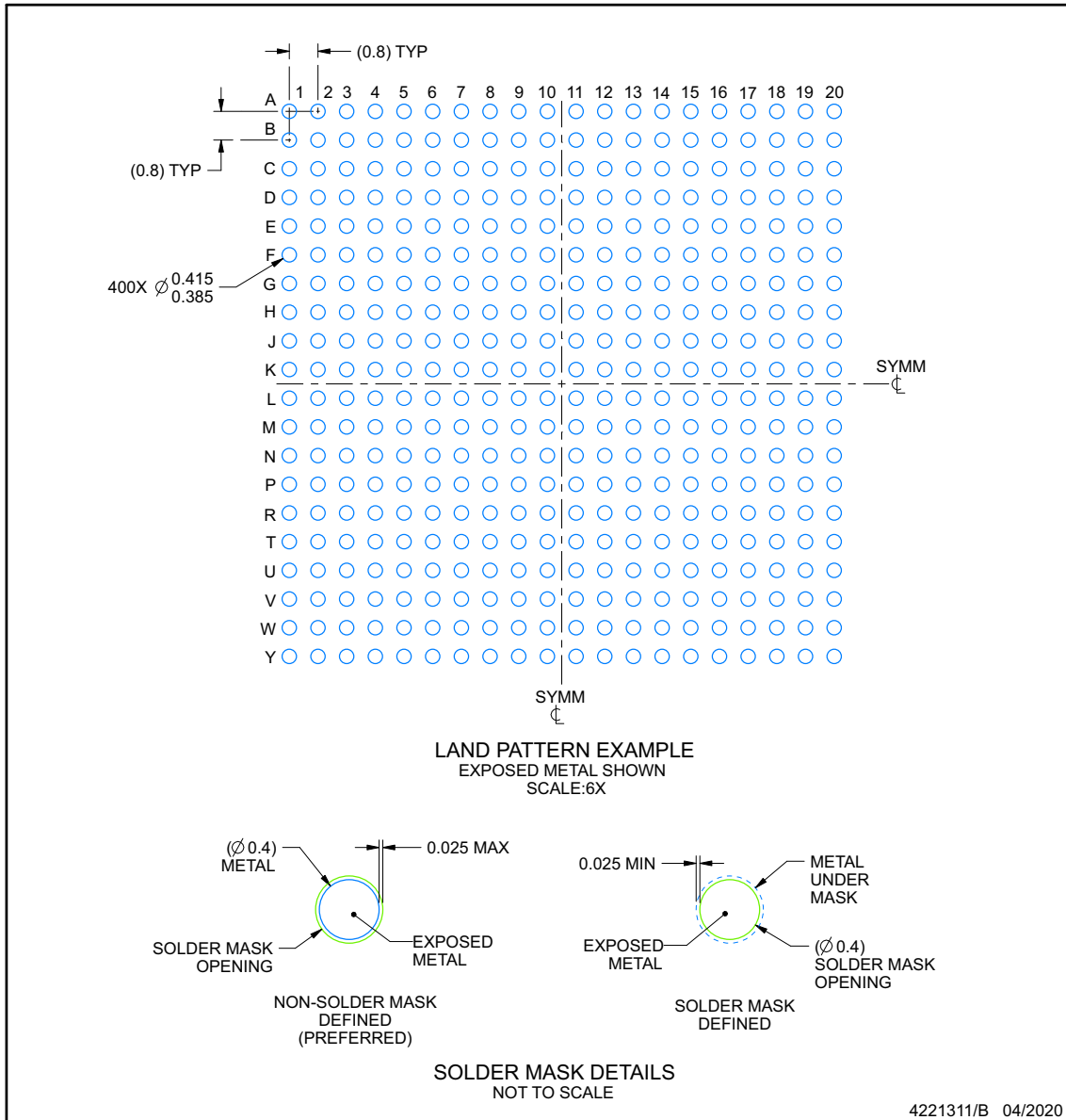
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

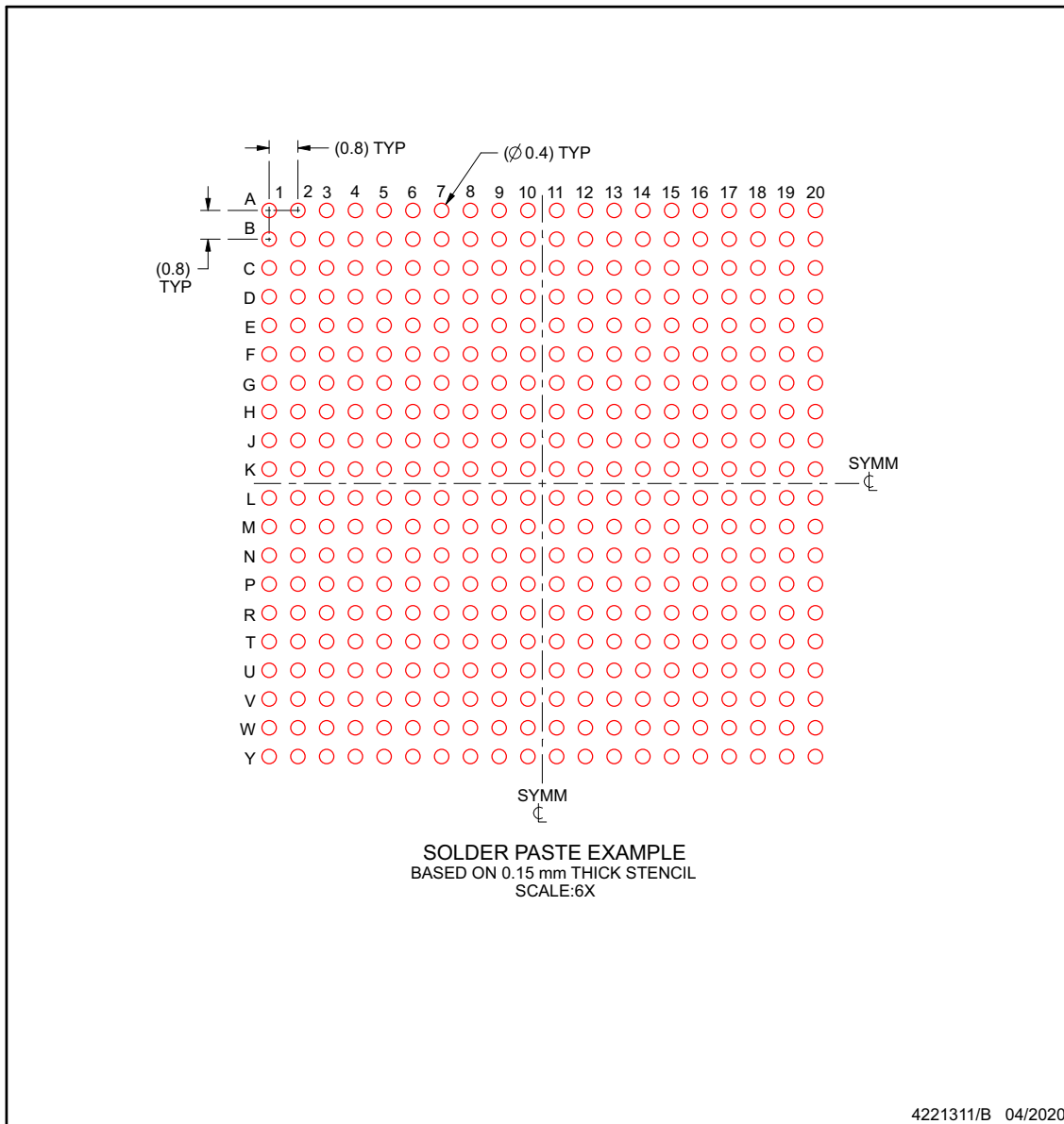
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES: (continued)

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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
AFE8092HIABJ	ACTIVE	FCBGA	ABJ	400	90	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE8092	Samples
AFE8092IABJ	ACTIVE	FCBGA	ABJ	400	90	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE8092	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

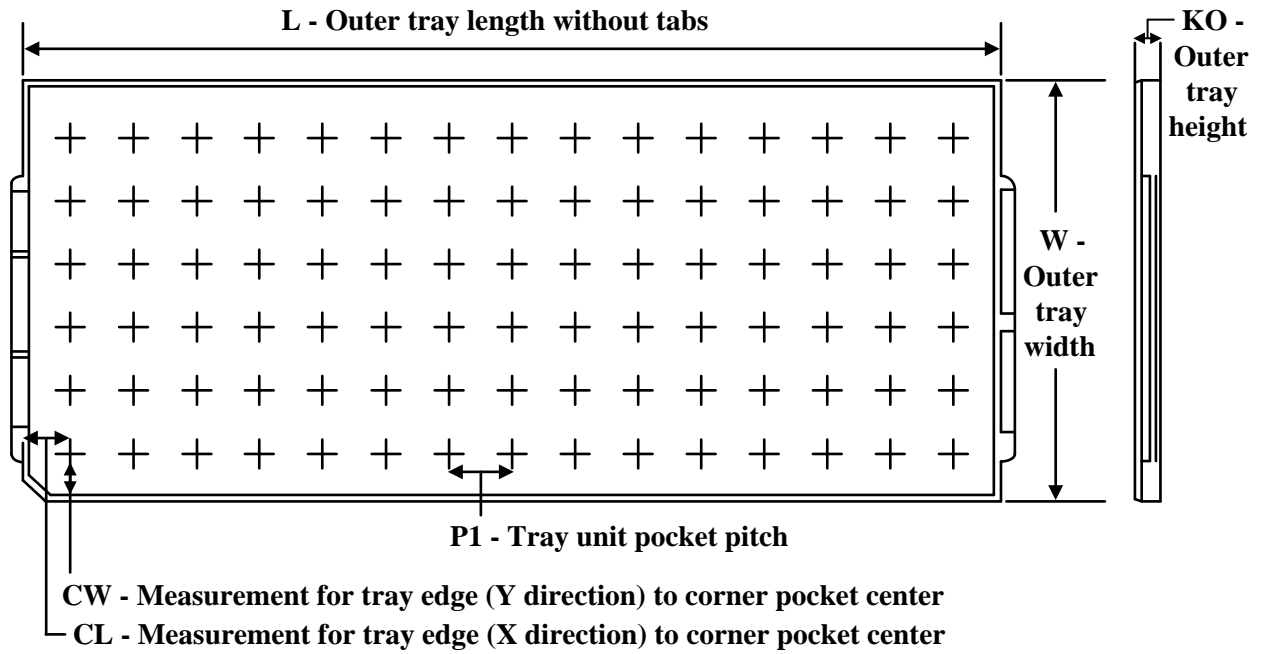
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

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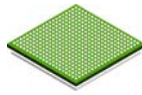
TRAY


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)
AFE8092HIABJ	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE8092IABJ	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2

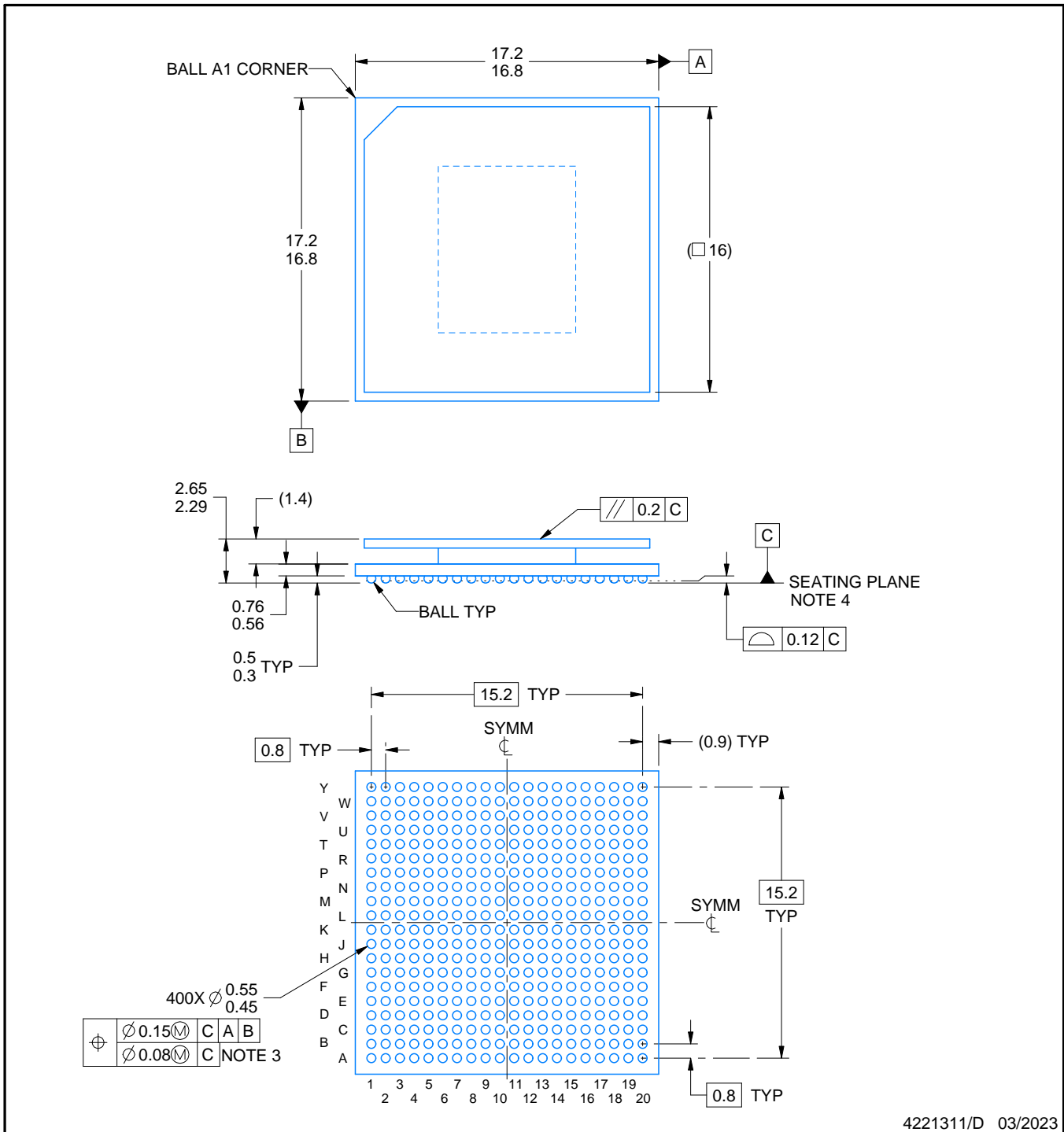
ABJ0400A



PACKAGE OUTLINE

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES:

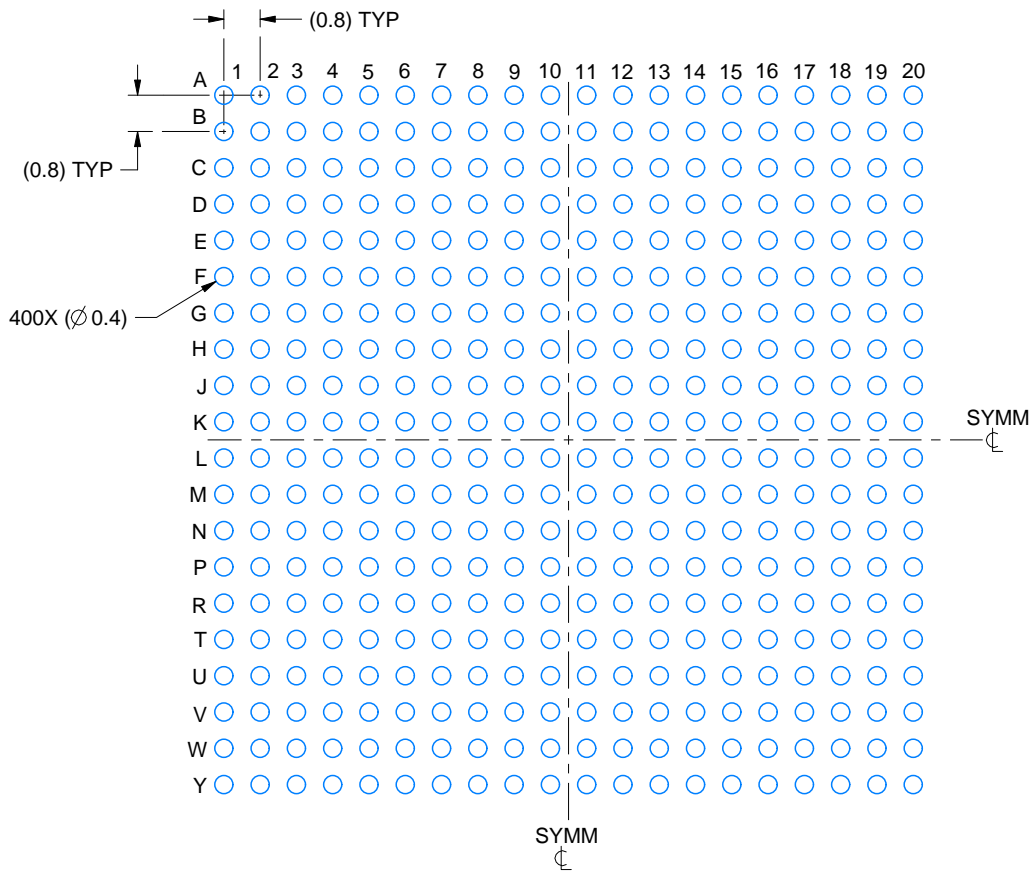
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum C and seating plane are defined by the spherical crowns of the solder balls.
5. The lids are electrically floating (e.g. not tied to GND).

EXAMPLE BOARD LAYOUT

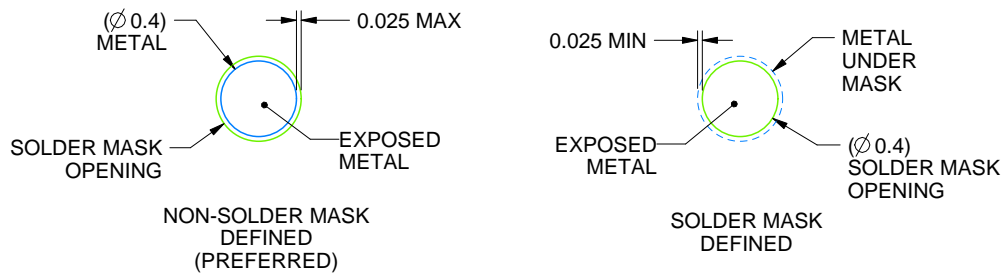
ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X



SOLDER MASK DETAILS
NOT TO SCALE

4221311/D 03/2023

NOTES: (continued)

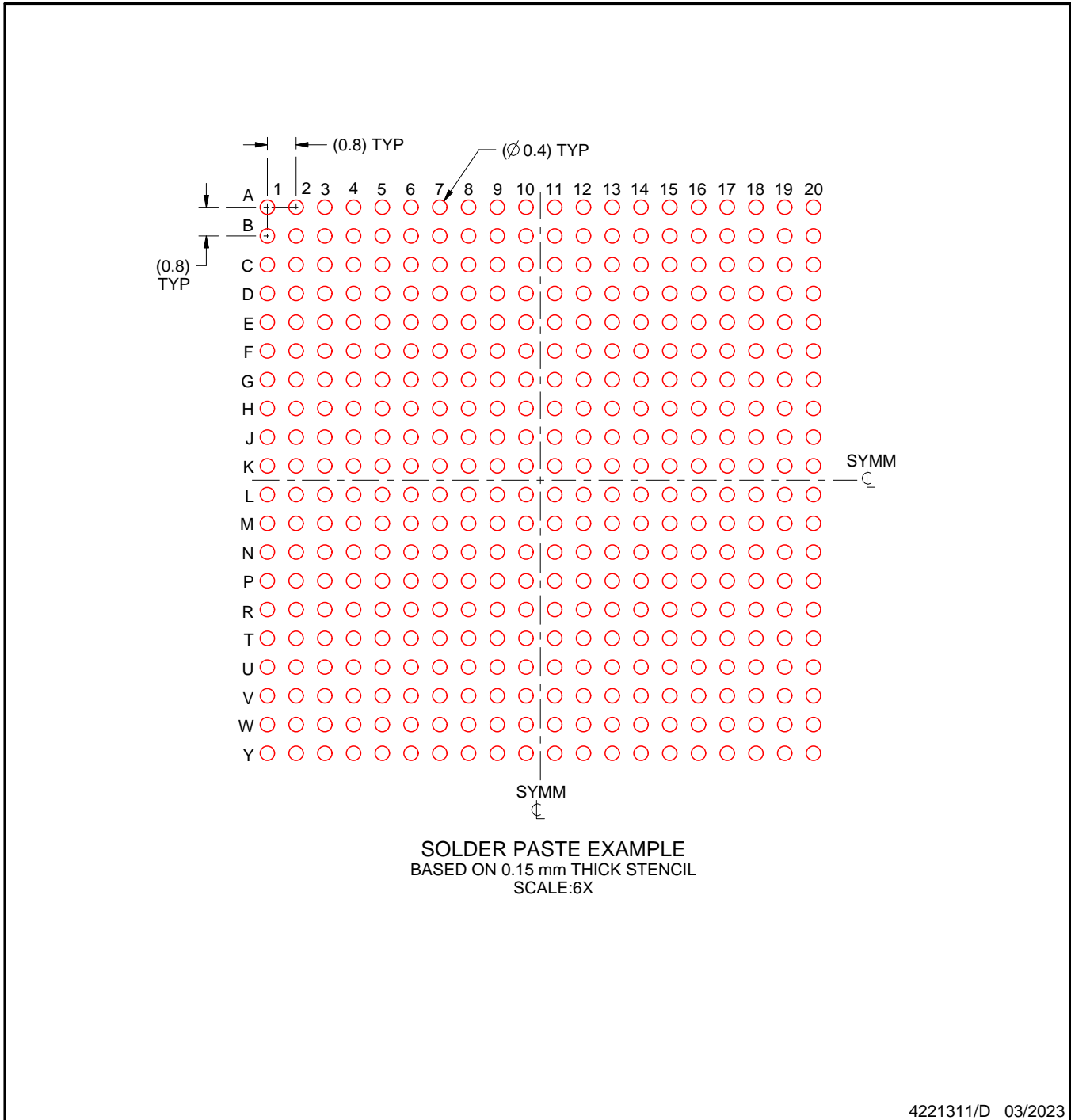
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES: (continued)

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

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