

AFE7952 四通道射频收发器

1 特性

- 四通道射频采样 12 GSPS 发送 DAC
- 四通道射频采样 3 GSPS 接收 ADC
- 双通道射频采样 3GSPS 反馈 ADC
- 最大射频信号带宽：
 - TX：2TX 为 2400MHz，4TX 为 1200MHz
 - FB：1200 MHz
 - RX：1200MHz (无 FB)；600MHz (带 FB)
- 射频频率范围：高达 12GHz
- 数字步进衰减器 (DSA)：
 - TX：40dB 范围、1dB 模拟和 0.125dB 数字步进
 - RX：25 dB 范围，0.5 dB 步进
- 用于 TX 和 RX 的双频带 DUC/DDC
- 用于快速频率开关的双通道 NCO
- 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：
 - 符合 JESD204B 和 JESD204C 标准
 - 8 个高达 29.5Gbps 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 0.8 mm

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](#)
- [中继器](#)
- 5G 毫米波无线电
- 分布式天线系统 (DAS)

3 说明

高性能、宽带宽、多通道收发器，集成了四个射频采样发送器链四个射频采样接收器链和两个射频采样数字化辅助链（反馈路径）。发送器链和接收器链的高动态范围使器件能够从无线基站生成和接收 3G、4G 和 5G 信号，而的宽带宽功能专为多频带 4G 和 5G 基站而设计。

每个接收器链均包含一个 25dB 范围的数字步进衰减器 (DSA)，后跟一个 3GSPS 模数转换器 (ADC)。每个接收器通道都有一个模拟峰值功率检测器和各种数字功率检测器，用于支持外部或内部自主自动增益控制器，另外还具有射频过载检测器，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 600MHz 的组合信号带宽（双通道 DDC 模式）或 1200MHz 的组合信号带宽（单通道 DDC 模式）。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两种用途。

每个发送器链都包含一个单通道或双通道数字上变频器 (DUC)，支持高达 2400MHz（对于 2TX）或 1200MHz（对于 4TX）的组合信号带宽。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或第三奈奎斯特区域的运行。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)。

反馈路径包括一个驱动 3GSPS 射频采样 ADC 的 25dB 范围 DSA，后跟一个带宽高达 1200MHz 的 DDC。

封装信息⁽¹⁾

器件型号	封装	封装尺寸
AFE7952	FC BGA	17.00mm × 17.00mm

(1) 如需了解详情，请参阅 [机械、封装和可订购信息](#)。



4 功能方框图

4.1 AFE7952 Functional Block Diagram

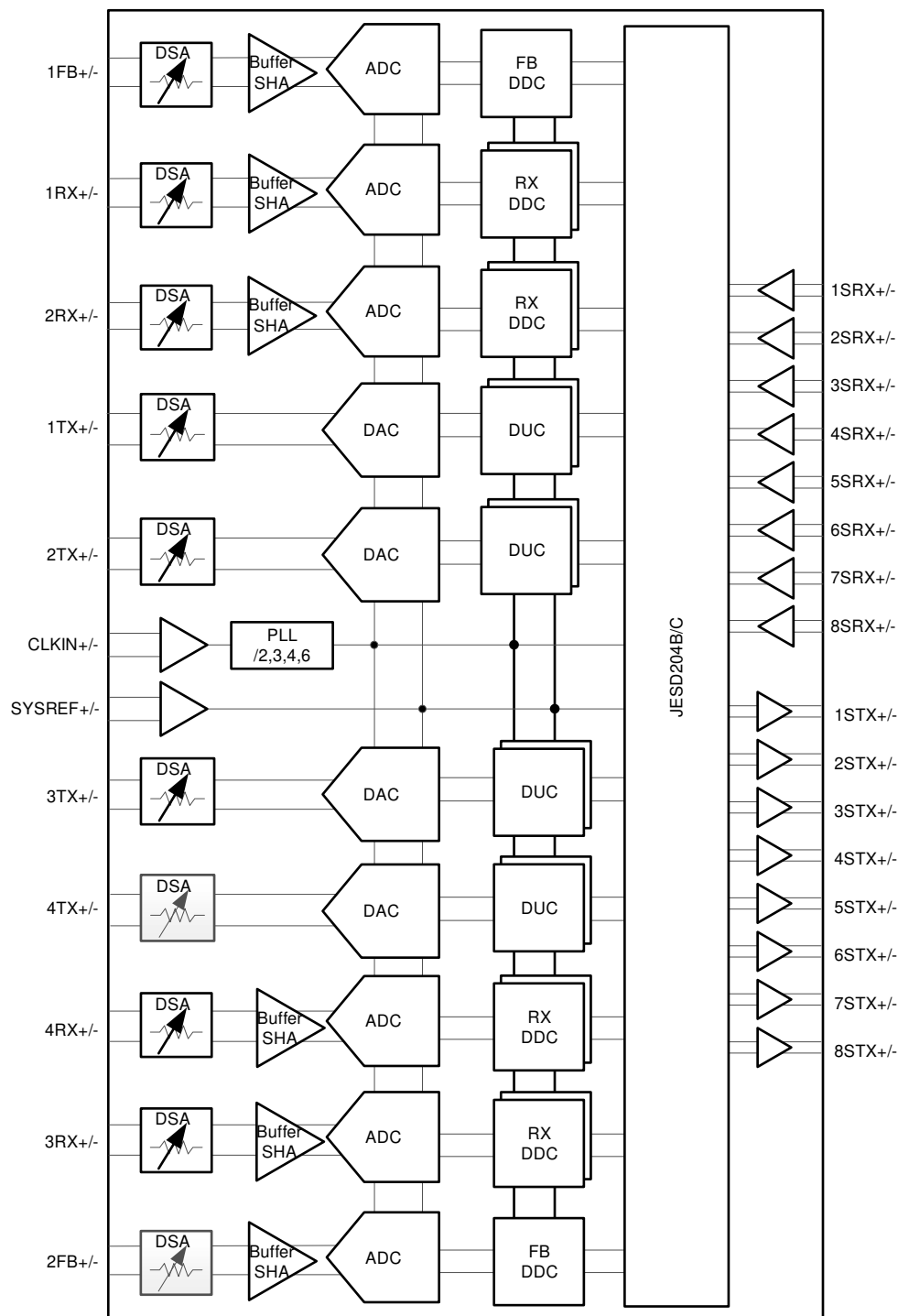


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5 Revision History

注：以前版本的页码可能与当前版本的页码不同

DATE	VERSION	NOTES
November 2022	*	Initial release.

6 Device and Documentation Support

6.1 Trademarks

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6.2 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.

6.3 术语表

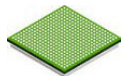
TI 术语表

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

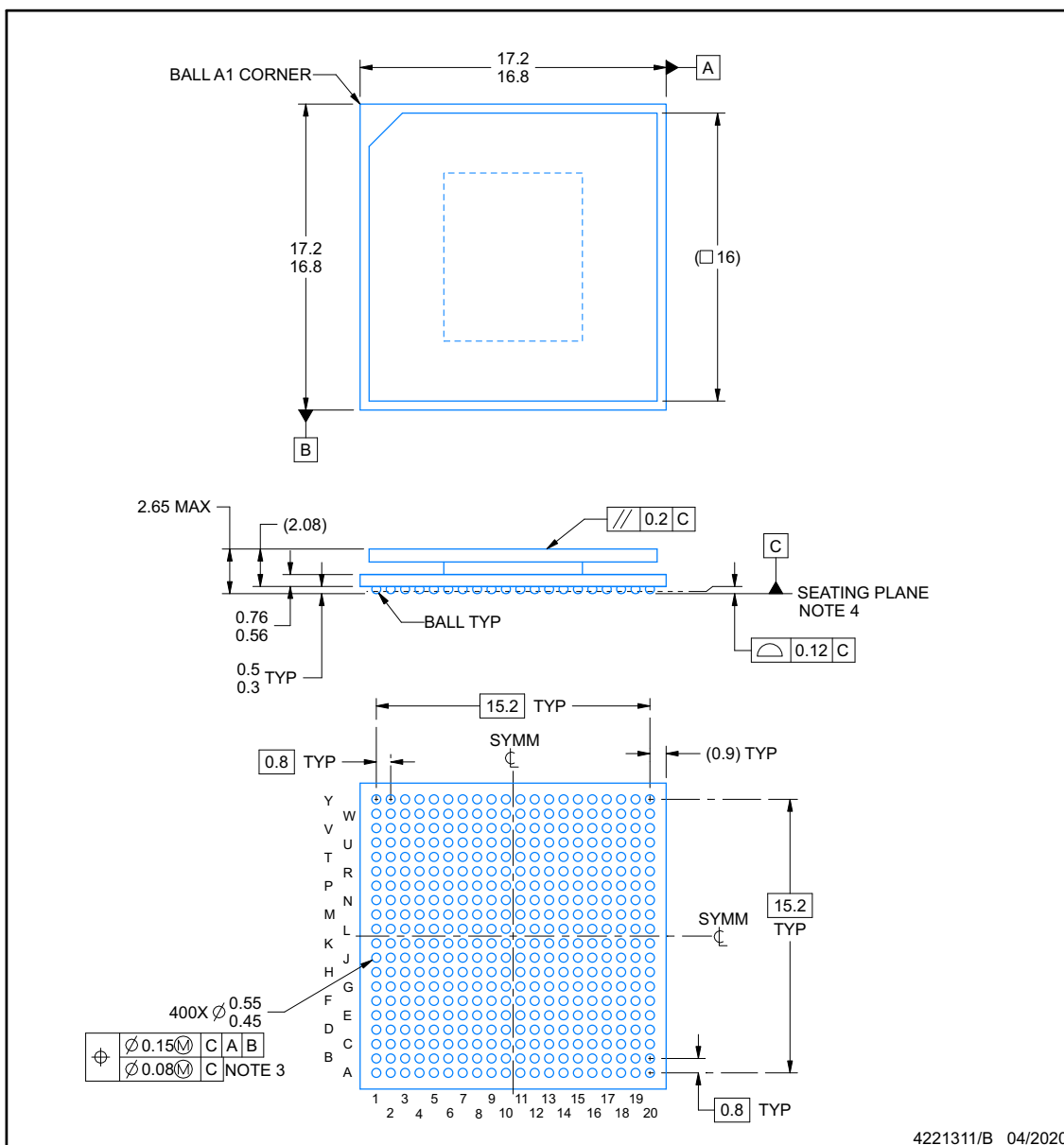
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand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

ABJ0400A



PACKAGE OUTLINE FCBGA - 2.65 mm max height

BALL GRID ARRAY



NOTES:

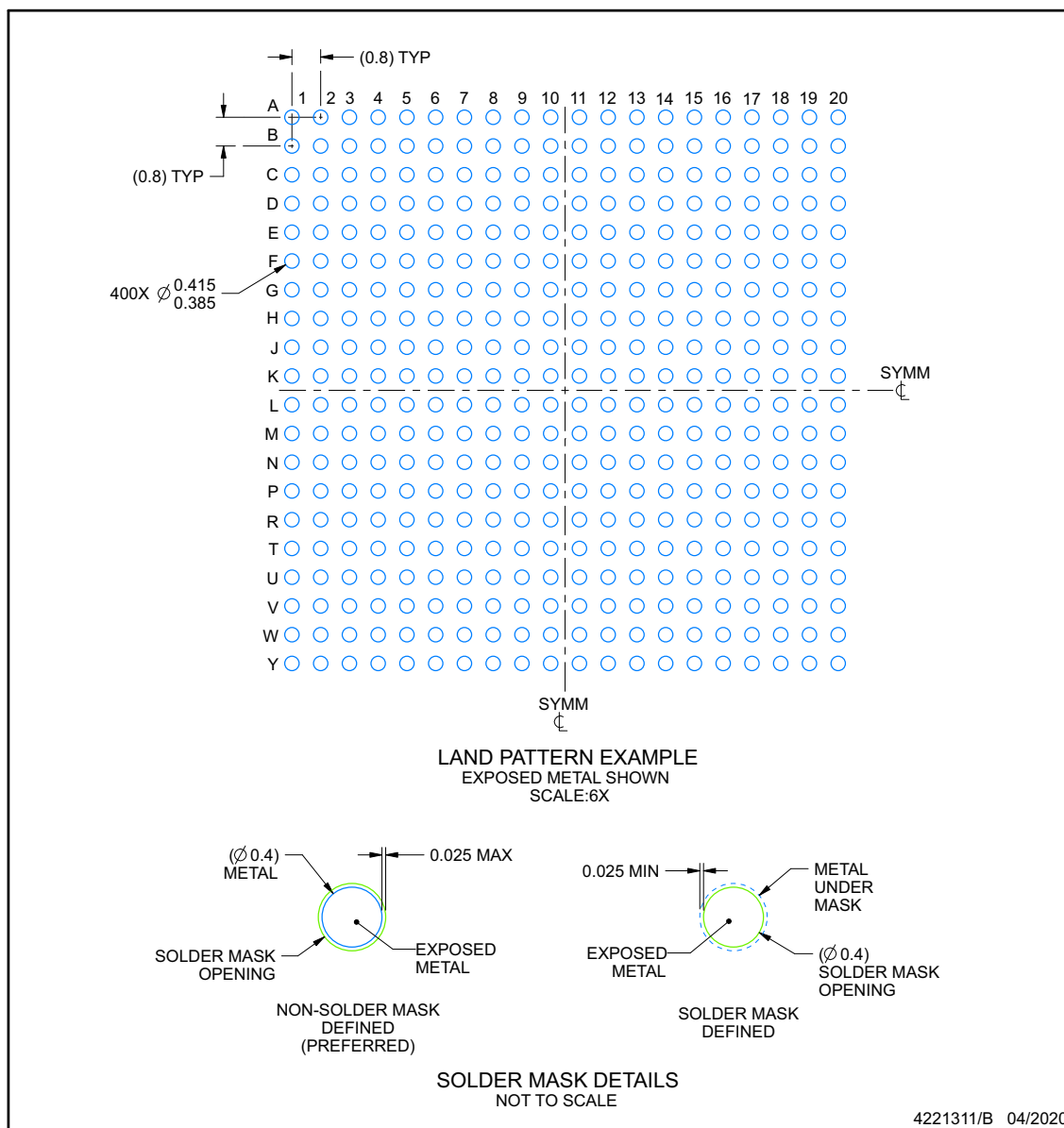
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

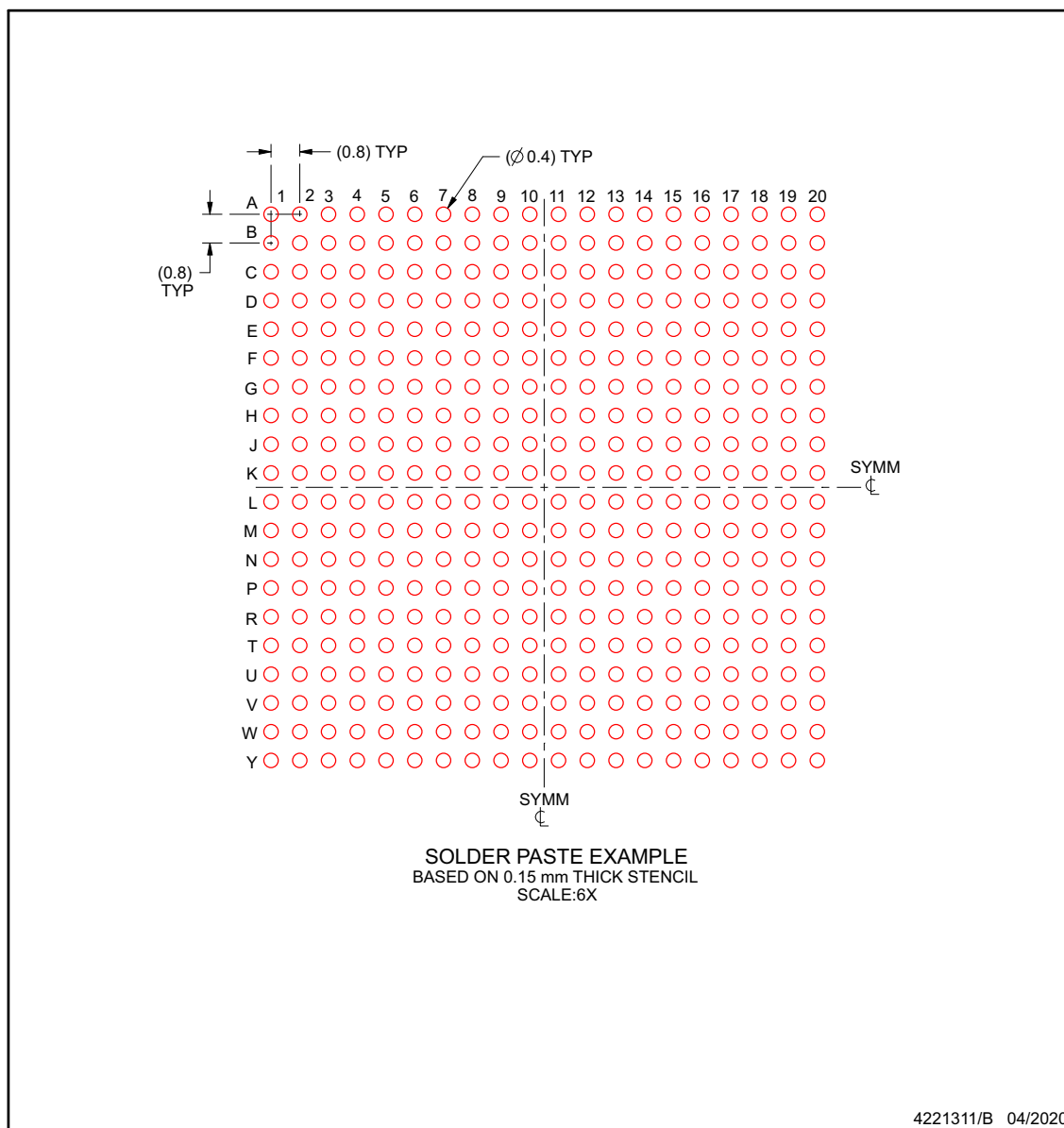
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

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 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)
AFE7952IABJ	Active	Production	FCBGA (ABJ) 400	90 JEDEC TRAY (5+1)	Yes	SNAGCU SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE7952I
AFE7952IABJ.B	Active	Production	FCBGA (ABJ) 400	90 JEDEC TRAY (5+1)	Yes	SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE7952I

- (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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FCBGA - 2.65 mm max height

Technical drawing of a 400X ball grid array (BGA) component, showing three views: a top view, a side view, and a detailed grid view.

Top View: Shows the square footprint of the component. The overall dimensions are 17.2 (width) and 16.8 (height). A dashed line indicates the internal square area, with dimensions 16.8 (width) and 16.8 (height). The component is labeled "BALL A1 CORNER" at the top-left corner.

Side View: Shows the component's profile. The total height is 2.65. The mounting pad height is 2.29. The ball pitch is 0.76. The component is labeled "BALL TYP" and "SEATING PLANE NOTE 4". The mounting pad thickness is 0.56. The component is labeled "0.2 C" and "0.12 C".

Grid View: Shows the 20x20 ball array. The grid is labeled with rows A-W and columns 1-20. The ball pitch is 0.55. The component is labeled "400X Ø 0.55 0.45". The grid dimensions are 15.2 TYP (width) and 15.2 TYP (height). The component is labeled "0.8 TYP" and "0.8 TYP". The component is labeled "SYMM" and "SYMM".

Notes:

- SEATING PLANE NOTE 4
- NOTE 3

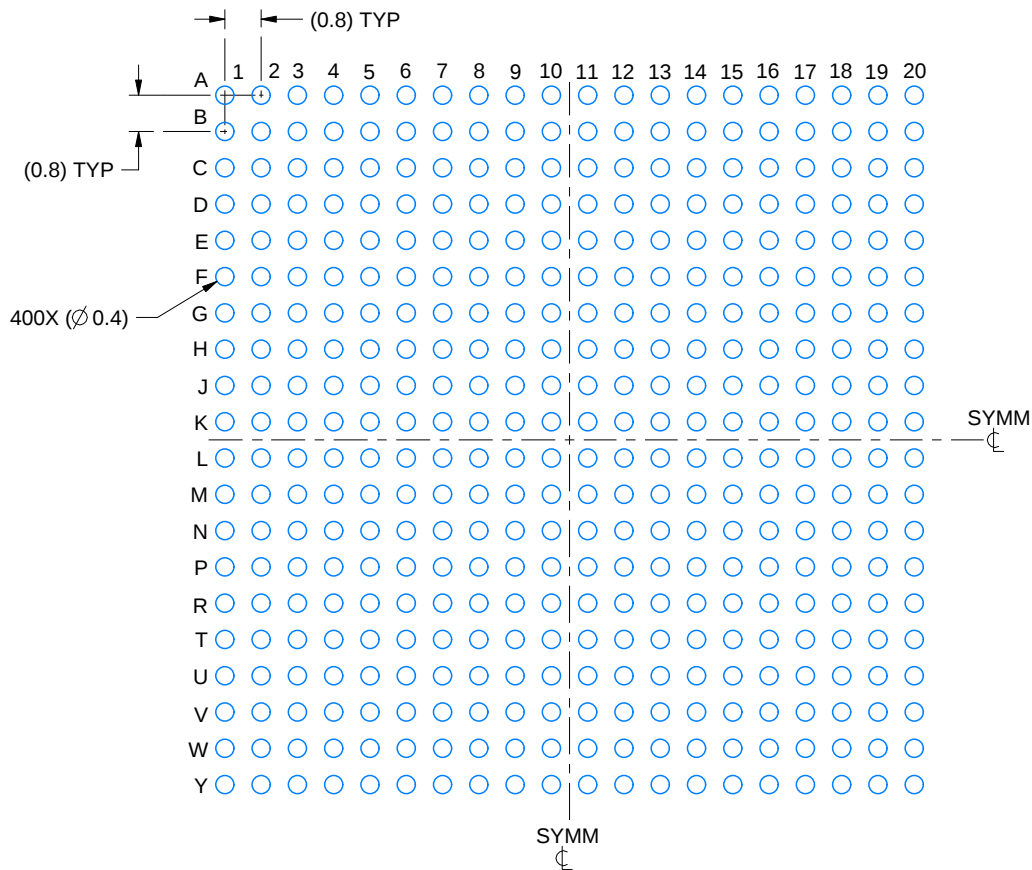
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

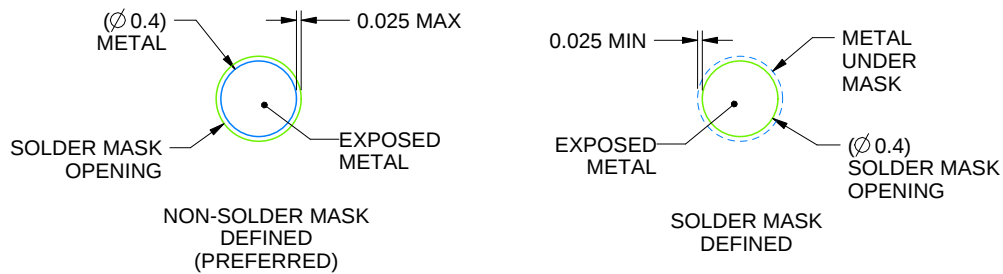
ABJ0400A

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)

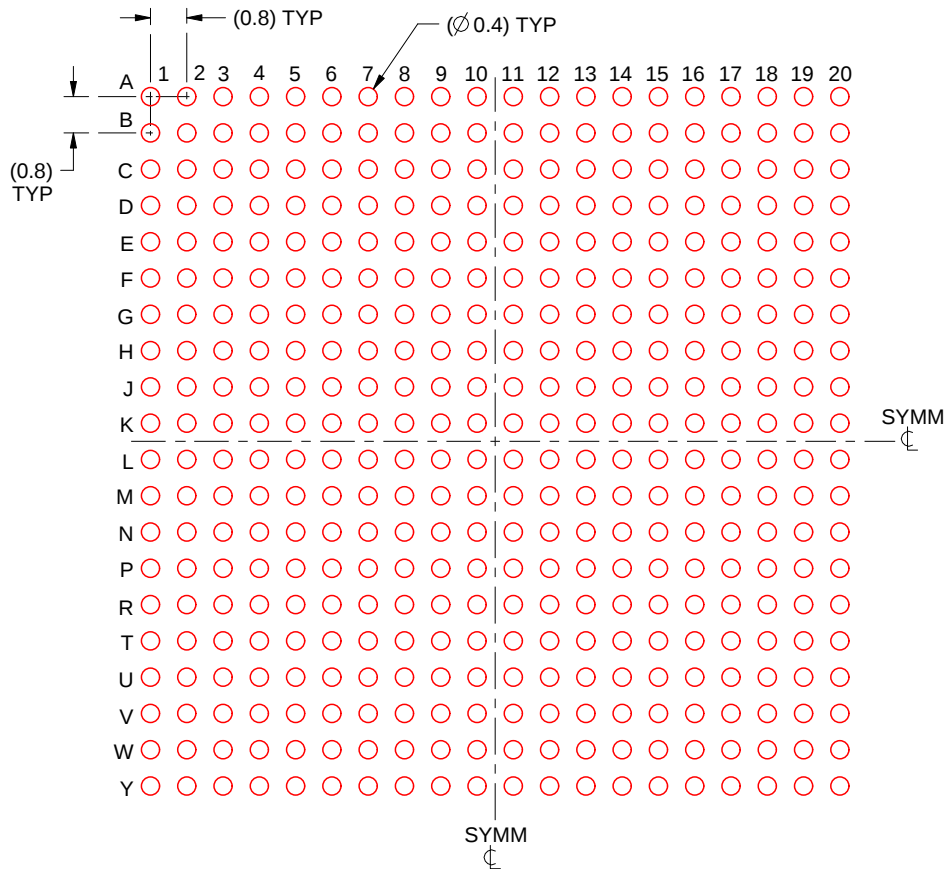
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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

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NOTES: (continued)

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

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