

AFE7958 具有 12GSPS DAC 和 3GSPS ADC 的 4T6R 射频采样 AFE

1 特性

- [申请完整数据表](#)
- 四个射频采样 12GSPS DAC
- 六个射频采样 3GSPS ADC
- 最大射频信号带宽：
 - 4TX : 1200MHz ; 2TX : 2400MHz
 - 4RX : 1200MHz ; 6RX : 600MHz
- 射频频率范围：
 - TX : 600MHz 至 12GHz
 - RX : 5MHz 至 12GHz
- 数字步进衰减器 (DSA) :
 - TX : 39dB 范围, 0.125dB 步长
 - RX : 25dB 范围, 0.5dB 步长
- 数字上变频器 (DUC) 和数字下变频器 (DDC) : 在 DDC 和 DUC 中使用 16 个可预配置的数控振荡器 (NCO) 实现快速跳频
- 灵活的时钟选项：
 - 外部射频时钟
 - 具有低速输入时钟的内部 PLL 模式
- 串行器/解串行器数据接口：
 - 可兼容 JESD204B 和 JESD204C
 - TX : 8 个通道, RX/FB : 8 个通道, 速率高达 24.75Gbps
 - 子类 1 多器件同步
 - SYSREF 对齐检测器
- 封装 : 17mm × 17mm FCBGA, 间距为 0.8mm

2 应用

- [雷达](#)
- [导引头前端](#)
- [国防无线电](#)
- [战术通信基础设施](#)
- [无线通信测试](#)
- [卫星星座地面站](#)

3 说明

AFE7958 是一款高性能、宽带宽、多通道收发器，集成了四个 (4T) 射频采样发送器 (TX) 链和总共六个 (6R) 射频采样接收器。AFE 具有高达 12GHz 的工作频率，支持直接在 L、S、C 和 X 带频率范围内进行射频采样，无需额外的频率转换级。高密度和可配置性支持高通道数、多任务系统。

TX 和 RX 接口数据速率可以根据信号带宽进行选择，并受到 JESD204B/C 接口速度的限制。使用 DUC 中的内插或 DDC 中的抽取功能，数据流与 DAC 更新速率或 ADC 转换率匹配。

DAC 以 12GSPS 的最大速率运行，并具有在第二奈奎斯特区域运行的模式，能够生成高达 12GHz 的射频信号。可变增益放大器 (称为 TDSA) 能够改变发送器的功率输出。

每个接收链都有一个数字步进衰减器 (RDSA)，后跟一个 3GSPS ADC，ADC 可转换更高的奈奎斯特区域，以数字化高达 12GHz 的射频信号。ADC 输出端的数字峰值检测器可配置为辅助外部自动增益控制 (AGC) 环路，以控制 LNA (外部) 增益和 DSA (内部) 衰减。

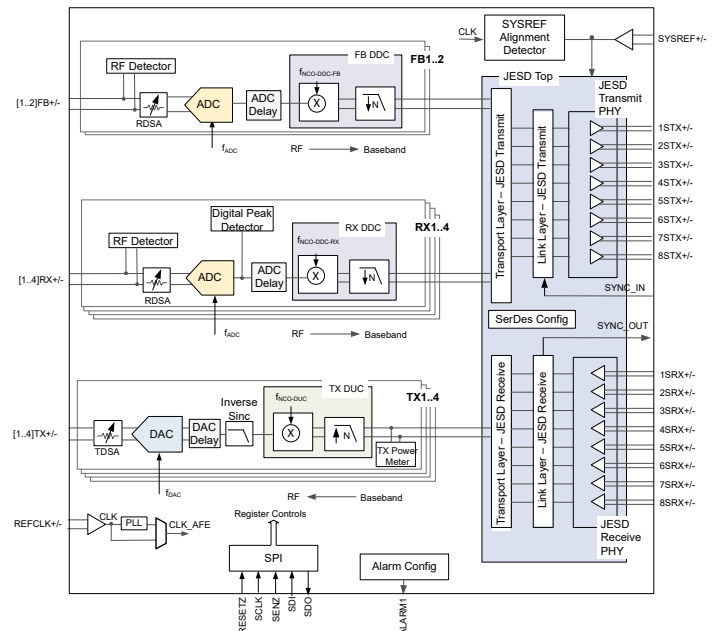
可以使用 SPI 接口对 AFE7958 进行编程。该器件还具有多个 GPIO，可对 GPIO 进行配置，以提供中断并实现 NCO 切换等功能的快速控制。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
AFE7958	FC-BGA	17mm × 17mm

(1) 提供无铅和 SnPb BGA 选项。有关更多信息，请参阅 [节 6](#)。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。



功能方框图



4 器件和文档支持

4.1 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。

4.2 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](#)。

4.3 商标

TI E2E™ is a trademark of Texas Instruments.
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4.4 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。

4.5 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

日期	修订版本	注释
August 2025	*	初始发行版

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。

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)
AFE7958IABJ	Active	Production	FCBGA (ABJ) 400	90 JEDEC TRAY (5+1)	Yes	SNAGCU	Level-3-260C-168 HR	-40 to 85	AFE7958
AFE7958IALK	Active	Production	FCBGA (ALK) 400	90 JEDEC TRAY (5+1)	No	SNPB	Level-3-220C-168 HR	-40 to 85	AFE7958 SNPB

⁽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.

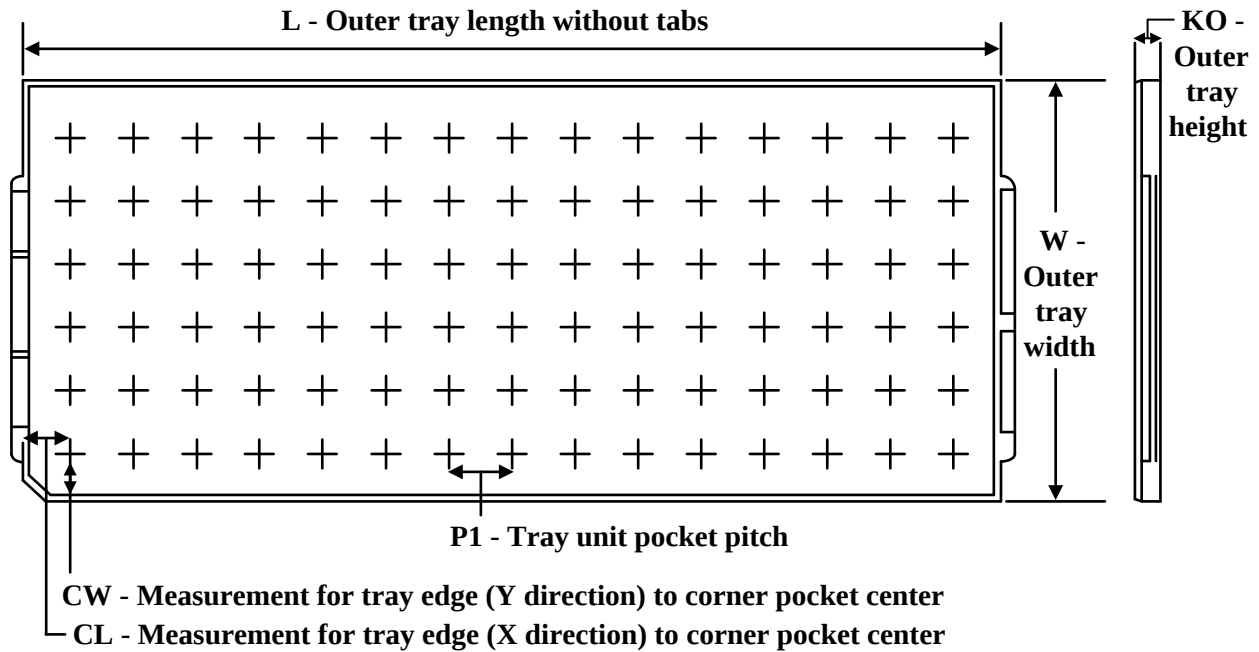
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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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)
AFE7958IABJ	ABJ	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2
AFE7958IALK	ALK	FCBGA	400	90	6 x 15	150	315	135.9	7620	19.5	21	19.2

FCBGA - 2.65 mm max height

Technical drawing of a 400X ball grid array (BGA) showing top, side, and bottom views with dimensions and callouts.

Top View:

- Overall dimensions: 17.2 (nominal) x 17.2 (nominal).
- Inner dimensions: 16.8 (nominal) x 16.8 (nominal).
- Callout: BALL A1 CORNER.
- Callout: (16).

Side View:

- Dimensions: 2.65 (nominal), 2.29 (nominal), (1.4), 0.76, 0.56, 0.5 TYP, 0.3.
- Callout: BALL TYP.
- Callout: SEATING PLANE NOTE 4.
- Callout: 0.12 C.

Bottom View:

- Dimensions: 15.2 TYP, (0.8) TYP, (0.9) TYP, 15.2 TYP, 0.8 TYP.
- Callout: SYMM.
- Callout: SYMM.
- Callout: 400X $\varnothing$ 0.55 / 0.45.
- Callout: NOTE 3.
- Callout: 50 C A B.
- Callout: 18 C.

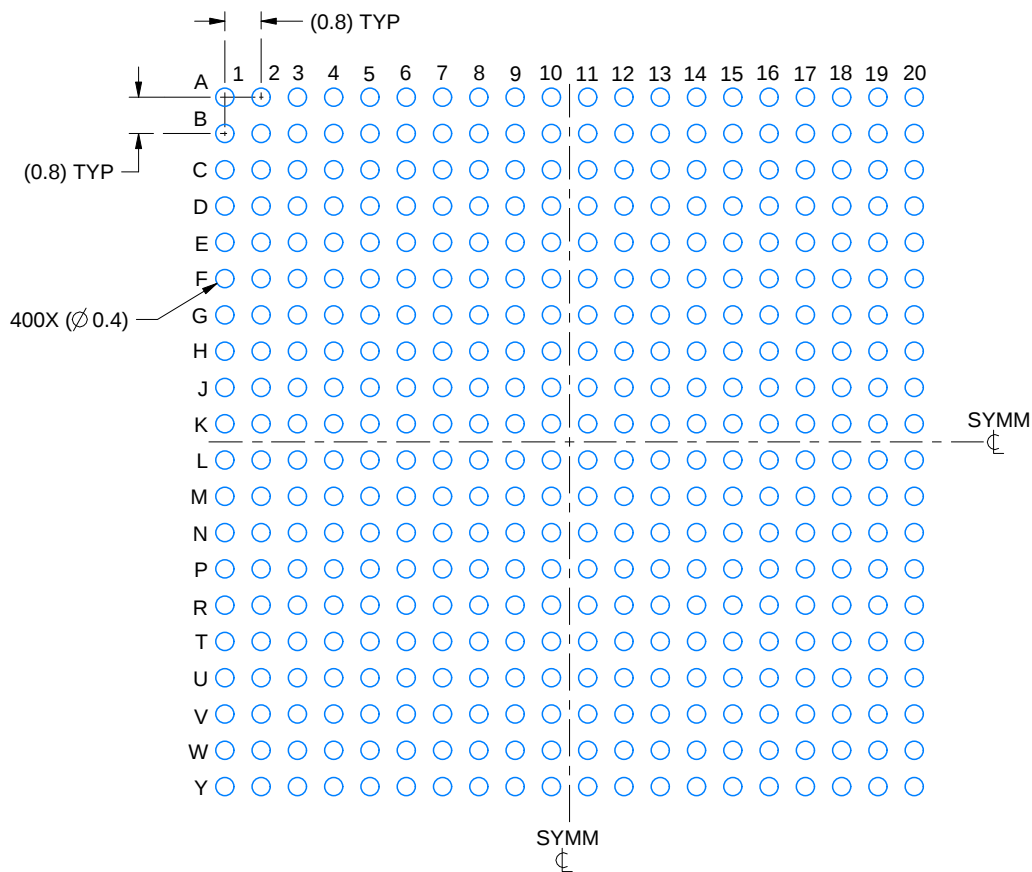
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

EXAMPLE BOARD LAYOUT

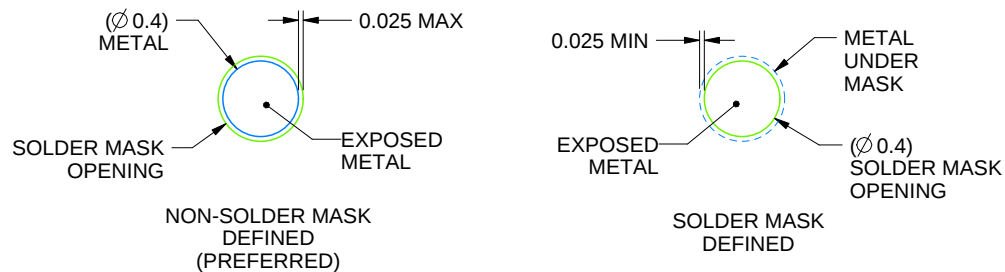
ALK0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X



SOLDER MASK DETAILS
NOT TO SCALE

4225930/C 03/2023

NOTES: (continued)

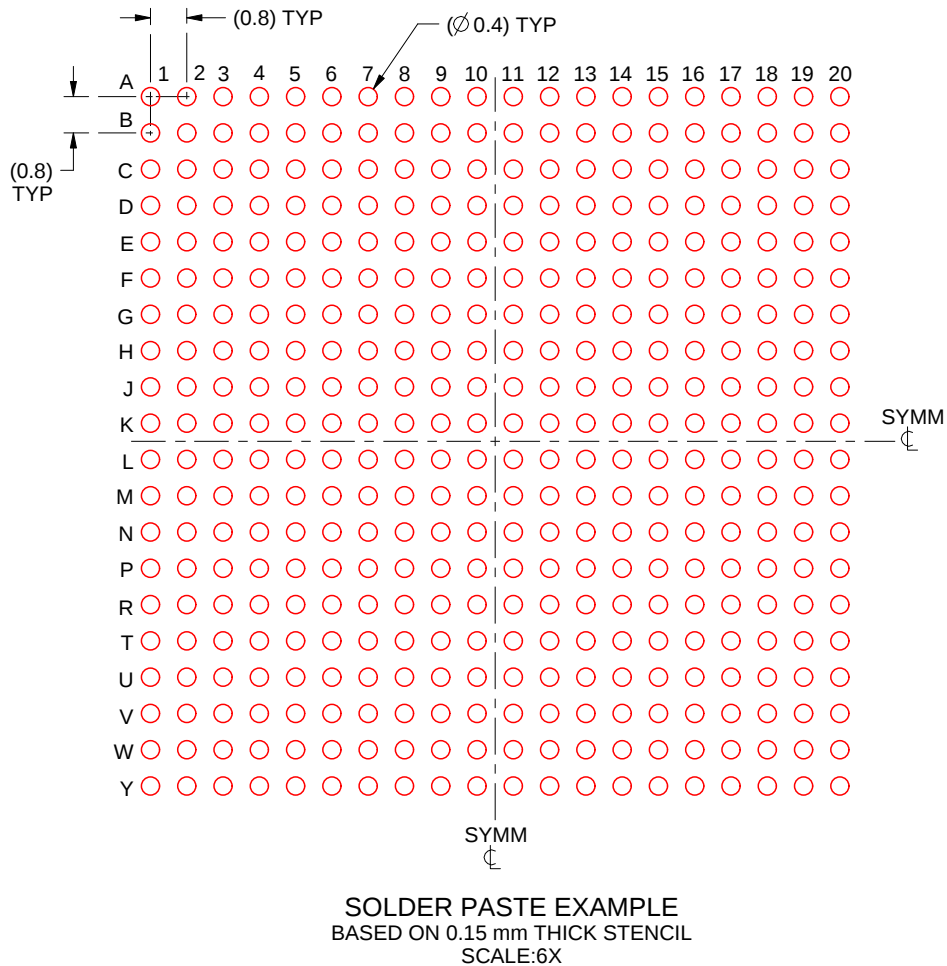
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ALK0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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NOTES: (continued)

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

FCBGA - 2.65 mm max height

Top View: Shows a square package with overall dimensions of 17.2 x 17.2. The mounting pad pitch is 16.8. A corner chamfer is indicated as BALL A1 CORNER. A dashed square indicates the internal core area.

Side View: Shows the package profile with a maximum height of 2.65. The mounting pad thickness is 0.76, and the core thickness is 0.56. The ball height is 0.5 TYP. The seating plane is defined by a 0.12 C fillet. The package is labeled with a 0.2 C tolerance.

Bottom View: Shows the 400X ball grid array. The ball pitch is 0.55, with a tolerance of 0.45. The ball diameter is 0.8 TYP. The package is symmetrical (SYMM) about the center. The mounting pad pitch is 15.2 TYP. The package is labeled with a 0.8 TYP tolerance.

Callouts: BALL A1 CORNER, BALL TYP, SEATING PLANE NOTE 4, SYMM, 0.8 TYP, 15.2 TYP, 0.55, 0.45, 0.76, 0.56, 0.5 TYP, 0.12 C, 0.2 C, 17.2, 16.8, 2.65, 2.29, (1.4), (0.9) TYP, 15.2, 0.8 TYP, 400X, 50, 18, C, A, B, NOTE 3.

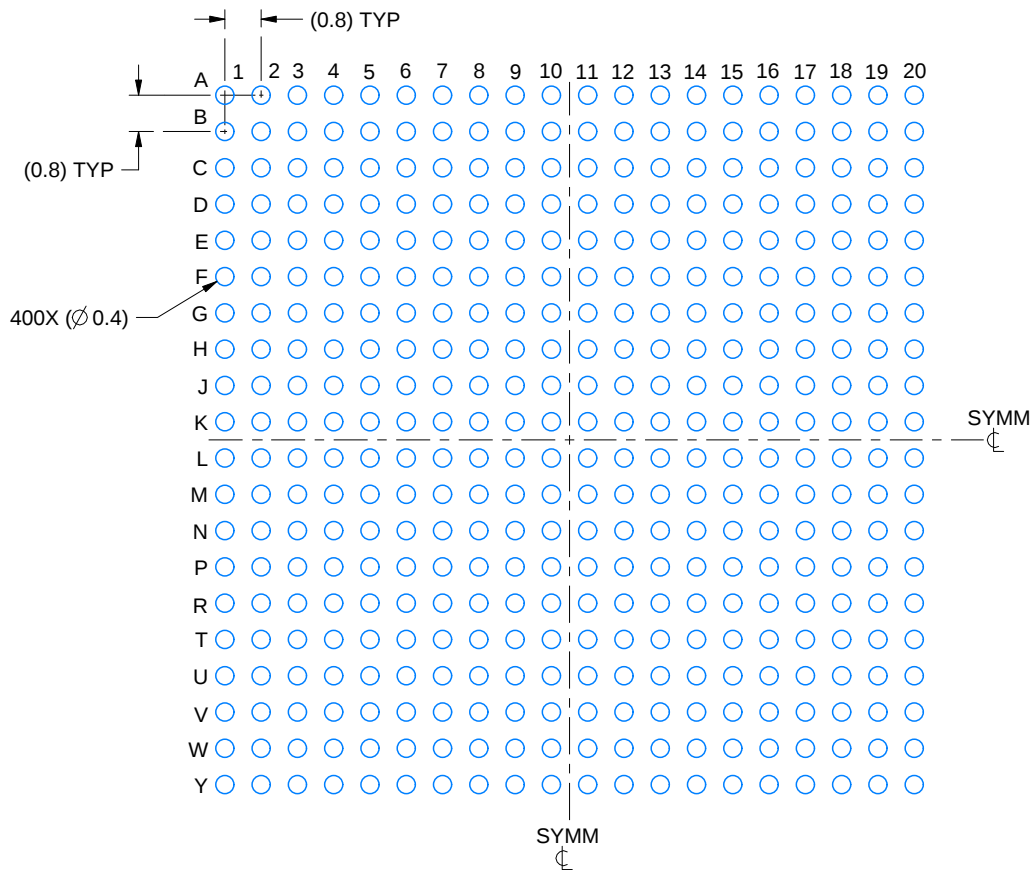
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

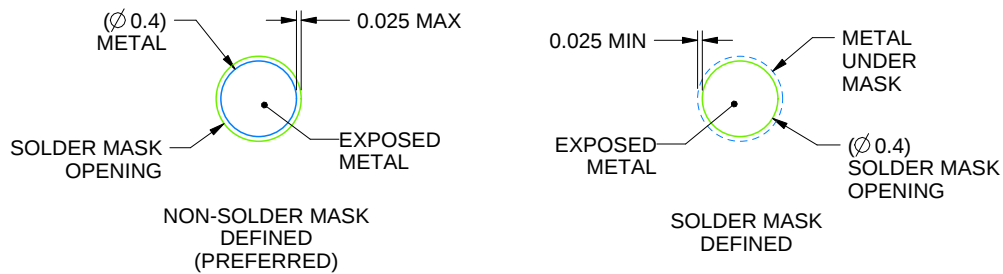
ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X



SOLDER MASK DETAILS
NOT TO SCALE

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NOTES: (continued)

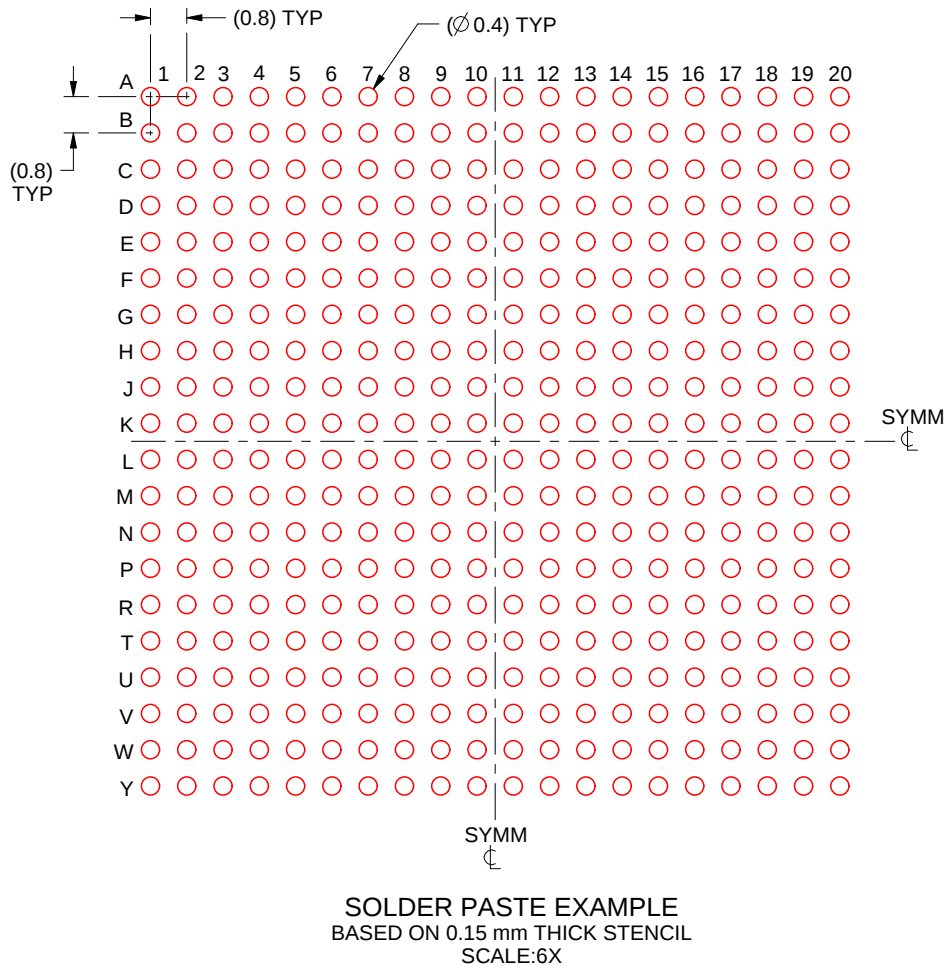
6. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 (www.ti.com/lit/spru811).

EXAMPLE STENCIL DESIGN

ABJ0400A

FCBGA - 2.65 mm max height

BALL GRID ARRAY



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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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