

# AFE812x Octal/Quad-Channel RF Transceiver with Feedback Paths

## 1 Features

- Eight (AFE8128)/ four (AFE8124) RF sampling 12GSPS transmit DACs
- Eight (AFE8128)/ four (AFE8124) RF sampling 6GSPS receive ADCs
- Two RF sampling 6GSPS feedback ADCs
- Maximum RF signal bandwidth:
  - TX/FB: 880MHz.
  - RX: 800MHz
- RF frequency range: 400MHz to 7.2GHz
- Digital Step Attenuators (DSA):
  - TX: 39dB range, 1dB analog and 0.125dB digital steps
  - RX/FB: 31dB range, 1dB step
- Dual DUC/DDCs per chain
- Supports TDD operation with fast switching between TX and RX
- Internal PLL/VCO to generate DAC/ADC clocks
  - Optional external CLK at DAC or ADC rate
- SerDes data interface:
  - JESD204B, JESD204C
  - 8 SerDes transceivers up to 32.5Gbps (NRZ)
  - 12-bit, 16-bit, 24-bit, and 32-bit resolution
  - Subclass 1 multi-device synchronization
- Package:
  - 17mm × 17mm FCBGA, 0.8mm pitch

## 2 Applications

- Macro remote radio unit (RRU)
- Active antenna system mMIMO (AAS)
- Small cell base station
- Distributed Antenna Systems (DAS)
- Repeater

## 3 Description

The AFE812x is a high performance, wide bandwidth multi-channel transceiver, integrating eight (AFE8128) / four (AFE8124) RF sampling transmitter chains, eight (AFE8128) / four (AFE8124) RF sampling receiver chains and two separate RF sampling auxiliary chains (feedback paths). The high dynamic range of the transmitter and receiver chains allows generating and receiving 2G, 3G, 4G and 5G signals for wireless base stations, while the wide bandwidth capability makes the AFE812x an excellent choice for multi-band 4G and 5G base stations.

Each receiver chain includes a 30dB range DSA (Digital Step Attenuator), followed by a 6GSPS ADC (analog-to-digital converter). Each receiver channel has analog peak power detectors and digital peak and power detectors to assist an external or internal autonomous automatic gain controller, and RF overload detectors for device reliability protection. The digital down converters (DDC) provides up to 800MHz of combined signal BW .

Each transmitter chain includes digital up converters (DUCs) supporting up to 800MHz combined signal bandwidth with a mixed mode output option to enhance 2<sup>nd</sup> Nyquist operation. The DAC output includes a variable gain amplifier (TX DSA) with 39dB range and 1dB analog and 0.125dB digital steps.

### Package Information

| PART NUMBER | PACKAGE <sup>(1)</sup> | PACKAGE SIZE <sup>(2)</sup> |
|-------------|------------------------|-----------------------------|
| AFE812x     | APK (FC-BGA 400)       | 17.00mm x 17.00mm           |

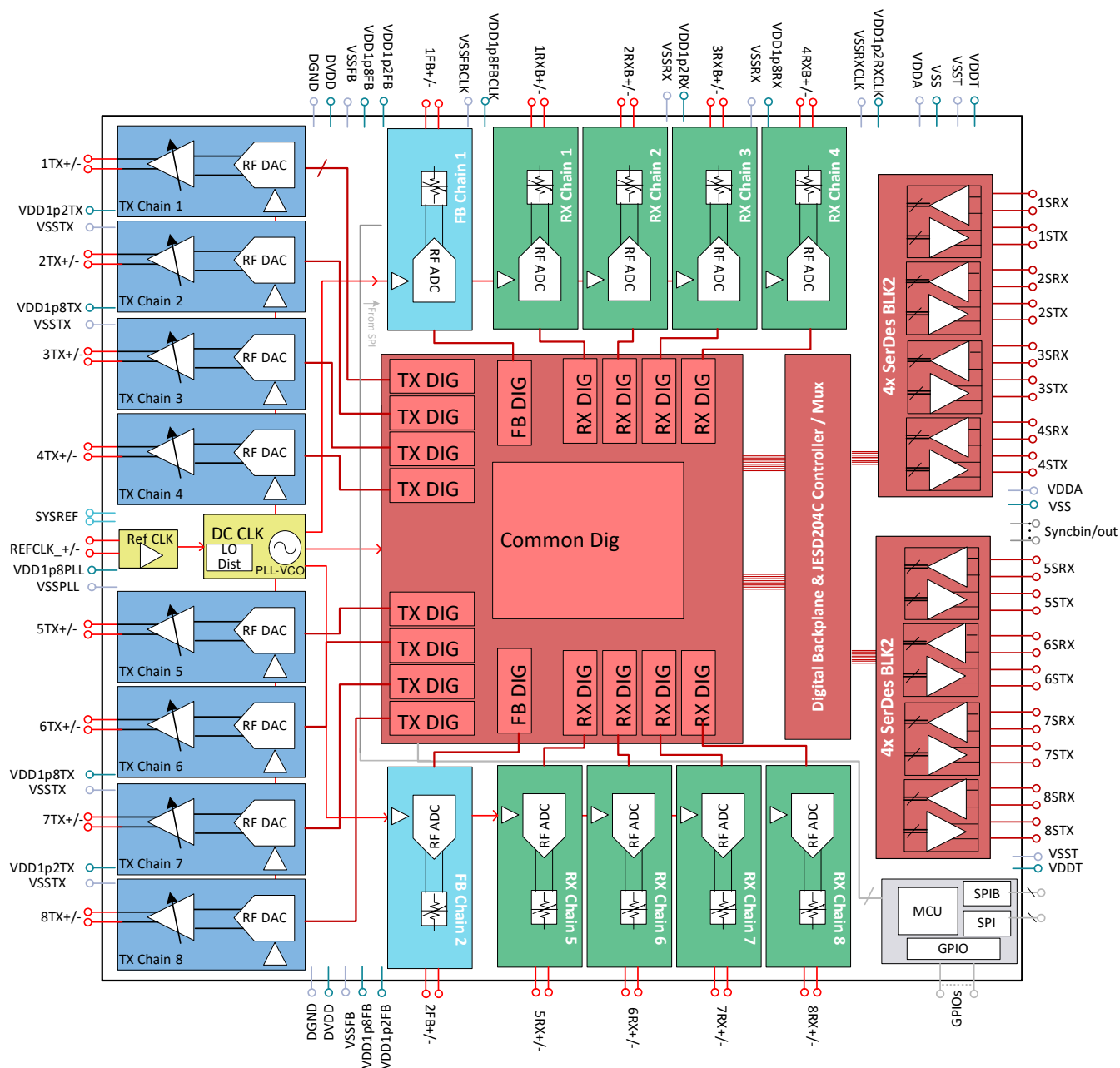
- (1) For all available packages, see the orderable addendum at the end of the data sheet.
- (2) The package size (17.00mm × 17.00mm) is a nominal value and includes pins, where applicable.

### Device Information

| PART NUMBER | STATUS                 | NUMBER OF TX CHAINS | NUMBER OF RX CHAINS | NUMBER OF FB CHAINS |
|-------------|------------------------|---------------------|---------------------|---------------------|
| AFE8128     | Active                 | 8                   | 8                   | 2                   |
| AFE8124     | Preview <sup>(1)</sup> | 4                   | 4                   | 2                   |

- (1) Product Preview





## AFE8128 Functional Block Diagram



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## 4 Device Comparison

**Table 4-1. Device Comparison**

| DEVICE NAME | DESCRIPTION                                                                                      |
|-------------|--------------------------------------------------------------------------------------------------|
| AFE8128     | High Performance RF Transceiver with eight transmitters, eighth receivers and two feedback paths |
| AFE8124     | Same as AFE8128 but with four transmitters, four receivers and two feedback paths                |

## 5 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

### 5.1 Device Support

#### 5.1.1 Third-Party Products Disclaimer

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### 5.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 5.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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### 5.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 5.5 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.

### 5.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| DATE       | REVISION | NOTES           |
|------------|----------|-----------------|
| March 2026 | *        | Initial Release |

## 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.

## PACKAGING INFORMATION

| Orderable part number | Status<br>(1) | Material type<br>(2) | Package   Pins    | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|-----------------------|---------------|----------------------|-------------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| AFE8128IAPK           | Active        | Production           | FCBGA (APK)   400 | 90   JEDEC TRAY (5+1) | Yes         | SNAGCU                               | Level-3-260C-168 HR               | -40 to 85    | AFE8128             |

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

<sup>(2)</sup> **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.

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

<sup>(4)</sup> **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.

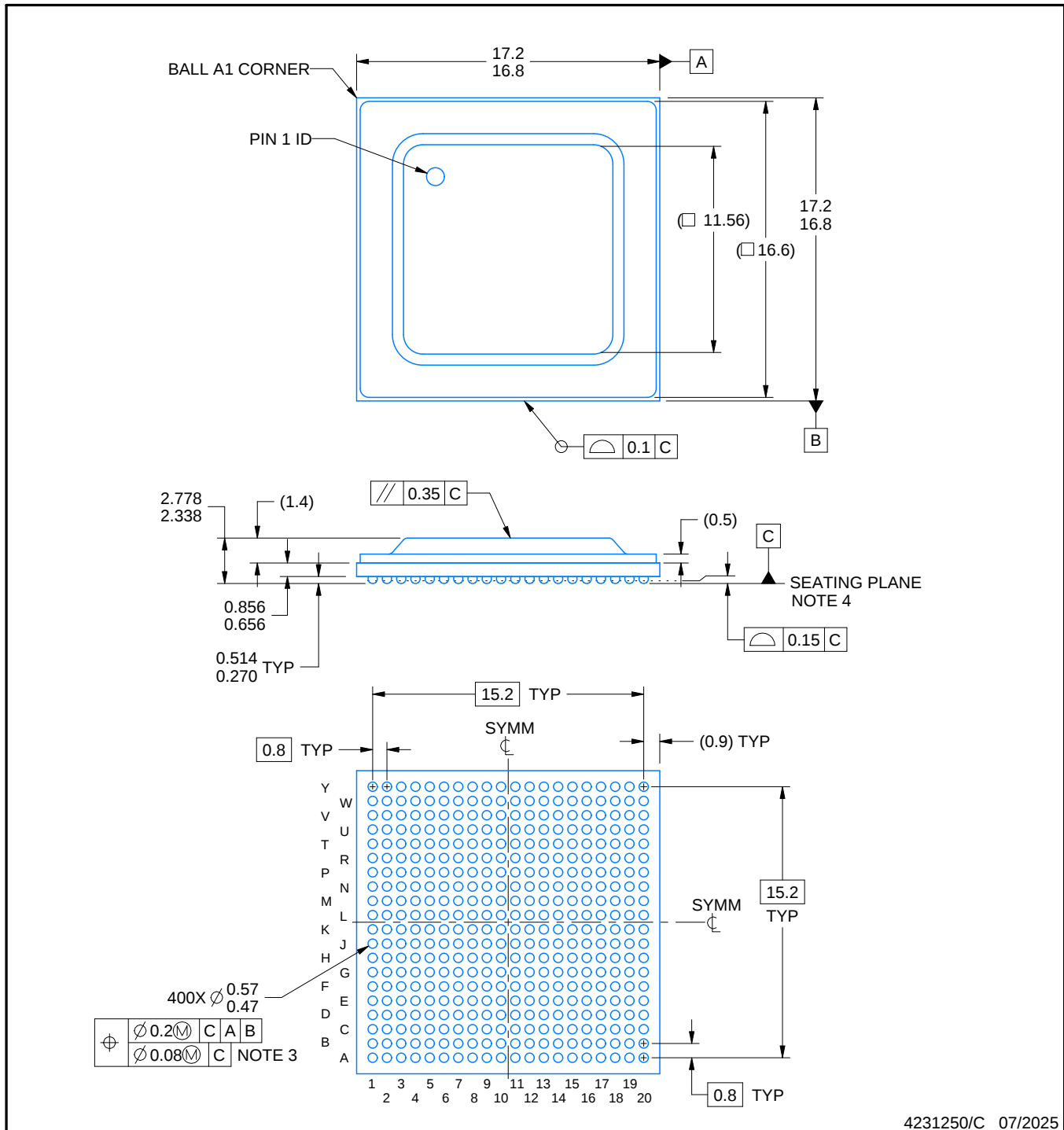
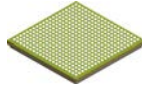
<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature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

<sup>(6)</sup> **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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## NOTES:

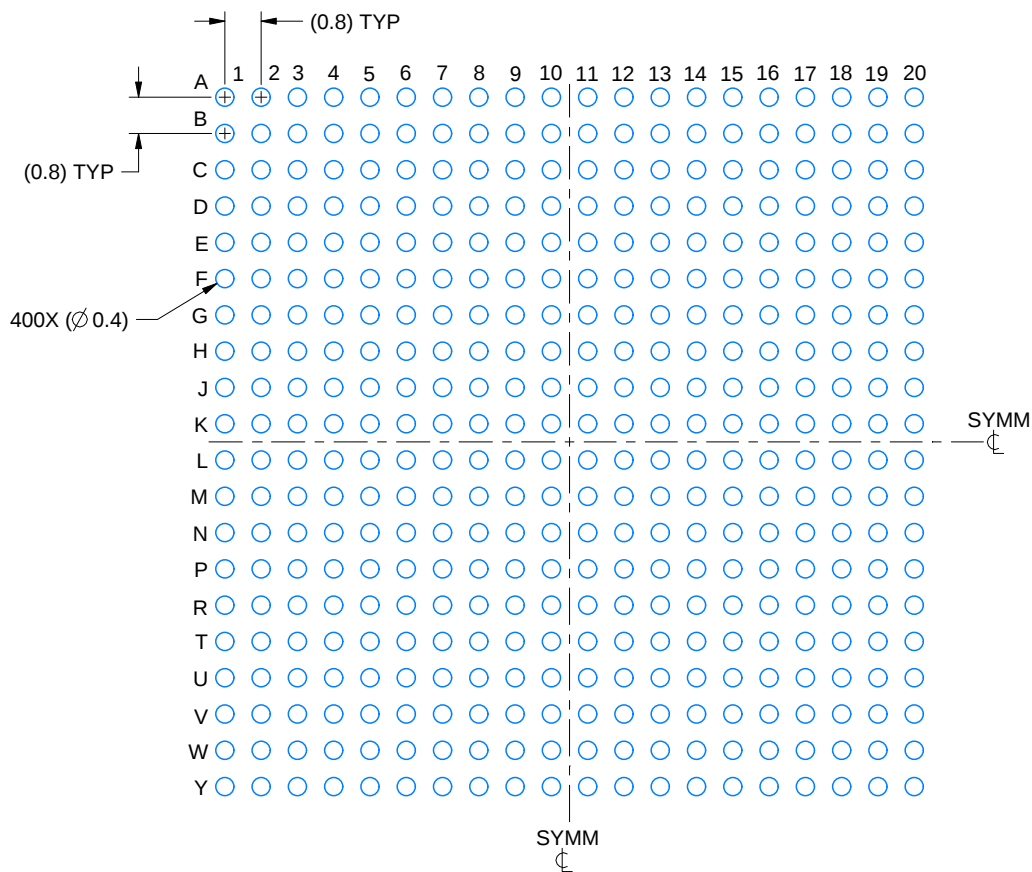
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Dimension is measured at the maximum solder ball diameter, parallel to primary datum C.
4. Primary datum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

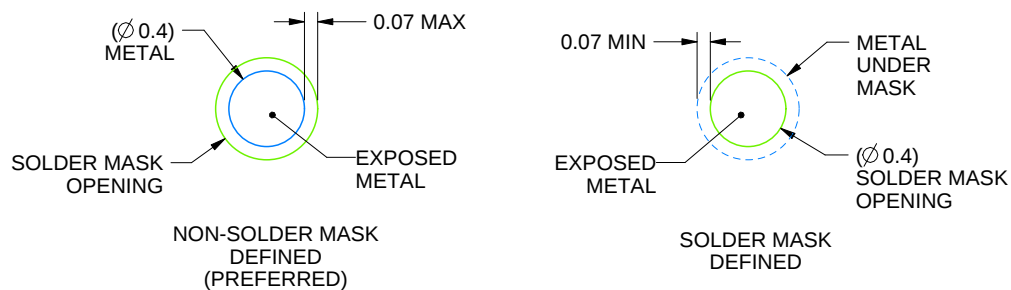
APK0400A

FCBGA - 2.778 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)

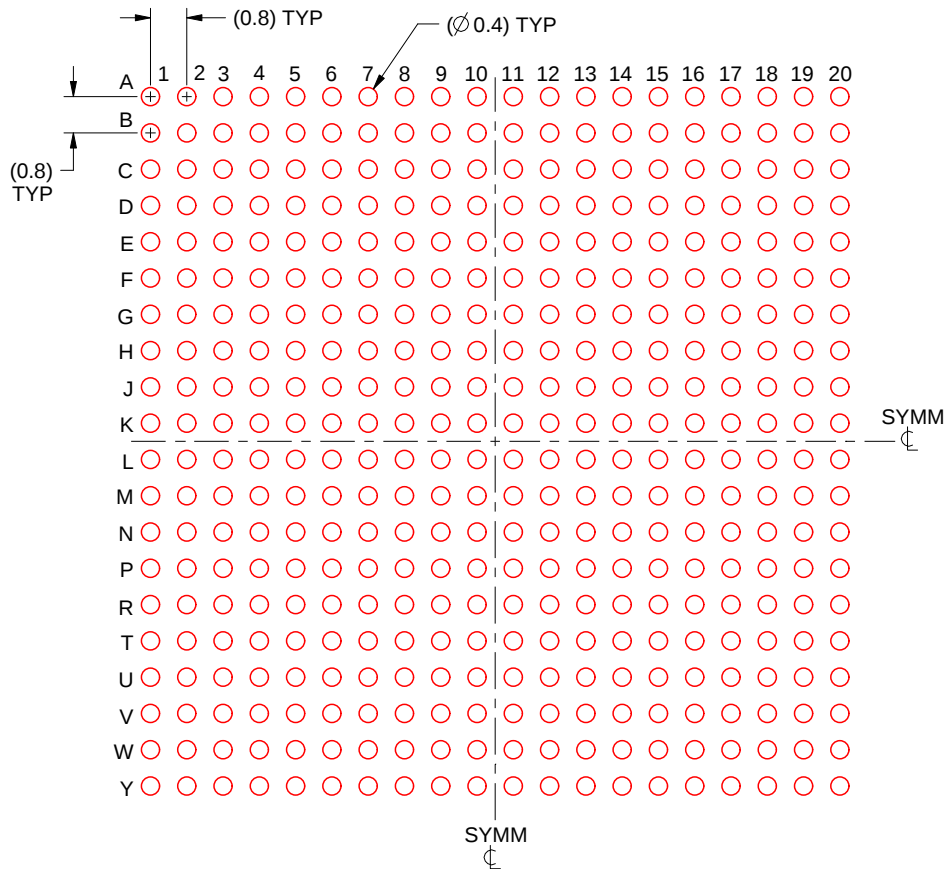
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SPRU811 ([www.ti.com/lit/spru811](http://www.ti.com/lit/spru811)).

# EXAMPLE STENCIL DESIGN

APK0400A

FCBGA - 2.778 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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