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### Understanding [Embedded - FPGAs \(Field Programmable Gate Array\)](#)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

### Applications of Embedded - FPGAs

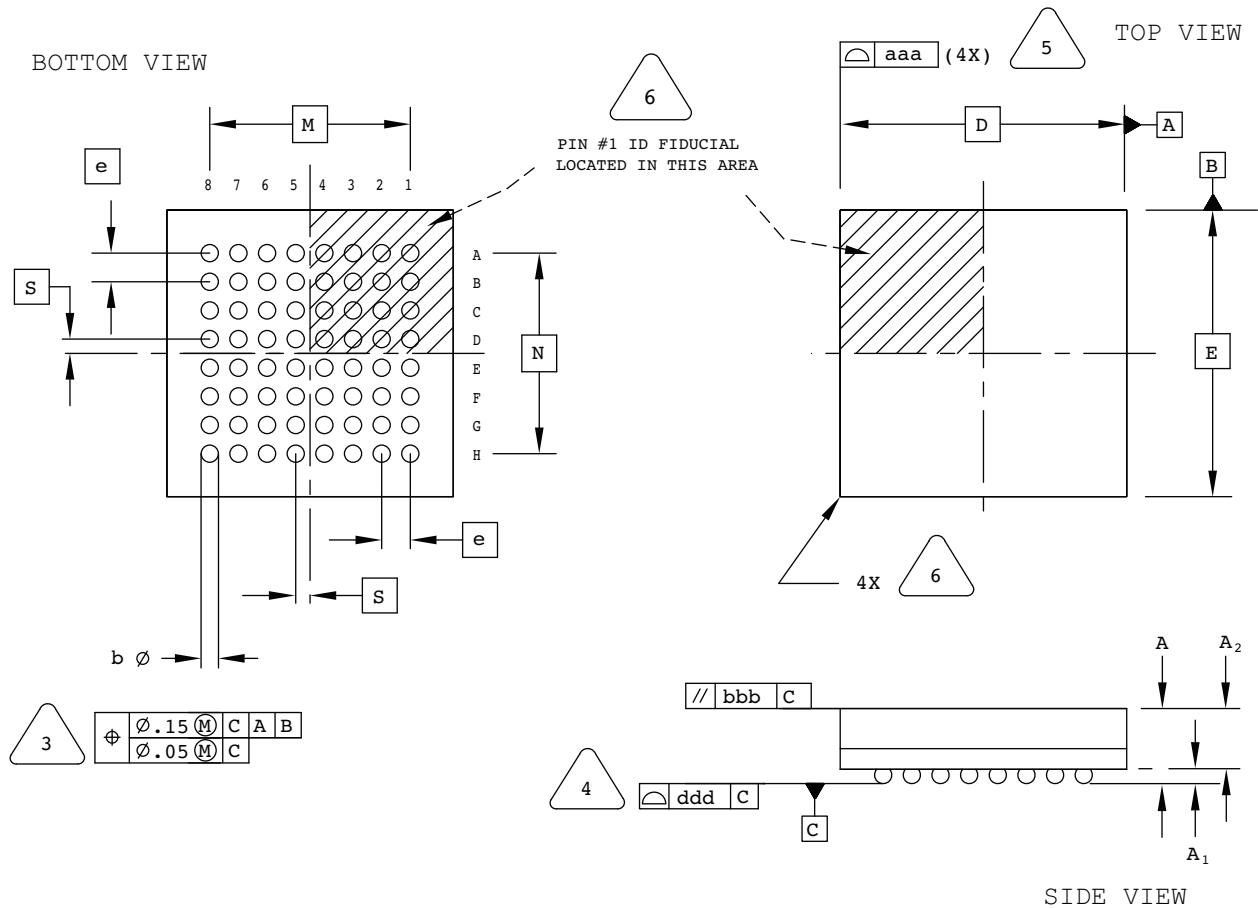
The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

#### Details

|                                |                                                                                                                                                                     |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status                 | Obsolete                                                                                                                                                            |
| Number of LABs/CLBs            | -                                                                                                                                                                   |
| Number of Logic Elements/Cells | 32800                                                                                                                                                               |
| Total RAM Bits                 | 434176                                                                                                                                                              |
| Number of I/O                  | 360                                                                                                                                                                 |
| Number of Gates                | -                                                                                                                                                                   |
| Voltage - Supply               | 1.14V ~ 1.26V                                                                                                                                                       |
| Mounting Type                  | Surface Mount                                                                                                                                                       |
| Operating Temperature          | -40°C ~ 100°C (TJ)                                                                                                                                                  |
| Package / Case                 | 484-BBGA                                                                                                                                                            |
| Supplier Device Package        | 484-FPBGA (23x23)                                                                                                                                                   |
| Purchase URL                   | <a href="https://www.e-xfl.com/product-detail/lattice-semiconductor/lfecp33e-4f484i">https://www.e-xfl.com/product-detail/lattice-semiconductor/lfecp33e-4f484i</a> |

## 64-Ball csBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM  $C$



PRIMARY DATUM  $C$  AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

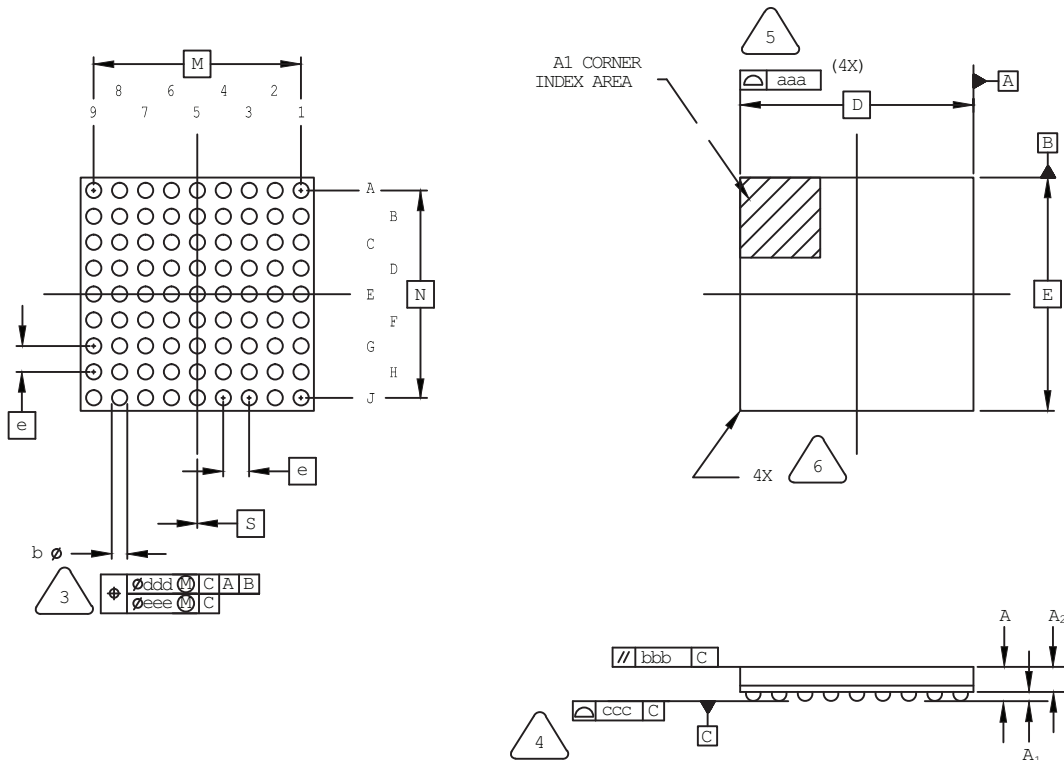


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | 0.90     | 1.00 | 1.10 |
| A1     | 0.15     | -    | -    |
| A2     | -        | -    | 0.85 |
| D/E    | 5.00 BSC |      |      |
| M/N    | 3.50 BSC |      |      |
| S      | 0.25 BSC |      |      |
| b      | 0.25     | 0.30 | 0.35 |
| e      | 0.50 BSC |      |      |
| aaa    | -        | -    | 0.10 |
| bbb    | -        | -    | 0.10 |
| ddd    | -        | -    | 0.08 |

## 81-Ball csfBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C].



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

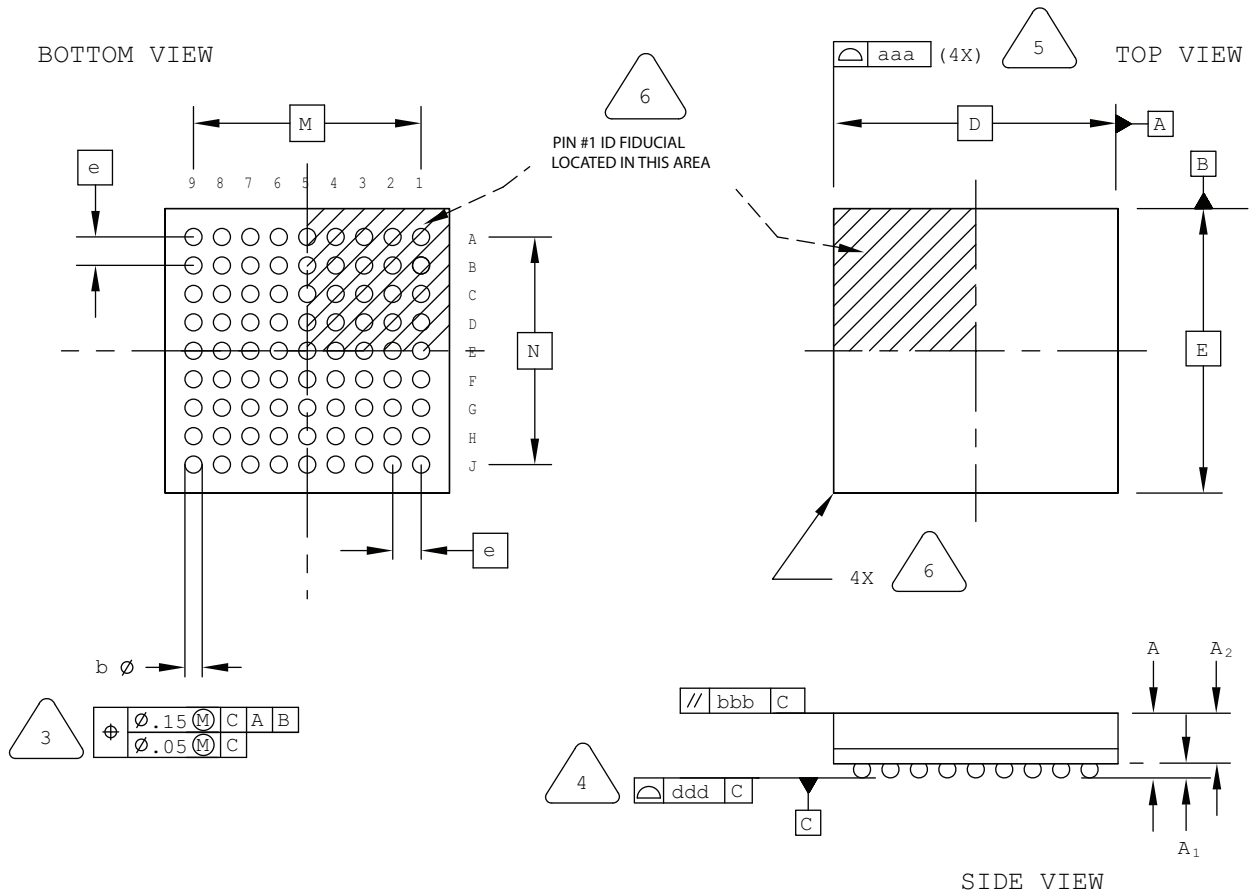


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | -        | -    | 1.00 |
| A1     | 0.11     | -    | -    |
| A2     | 0.64     | -    | -    |
| D/E    | 4.50 BSC |      |      |
| M/N    | 4.00 BSC |      |      |
| S      | 0.00 BSC |      |      |
| b      | 0.20     | 0.25 | 0.30 |
| e      | 0.50 BSC |      |      |
| aaa    | 0.10     |      |      |
| bbb    | 0.10     |      |      |
| ccc    | 0.08     |      |      |
| ddd    | 0.15     |      |      |
| eee    | 0.08     |      |      |

# 81-Ball ucBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM C



PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



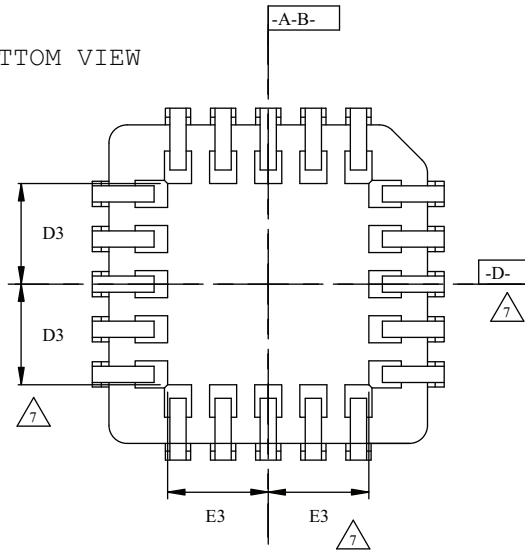
EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | -        | -    | 1.00 |
| A1     | 0.10     | -    | -    |
| A2     | -        | -    | 0.90 |
| D/E    | 4.00 BSC |      |      |
| M/N    | 3.20 BSC |      |      |
| b      | 0.20     | 0.25 | 0.30 |
| e      | 0.40 BSC |      |      |
| aaa    | -        | -    | 0.10 |
| bbb    | -        | -    | 0.10 |
| ddd    | -        | -    | 0.10 |

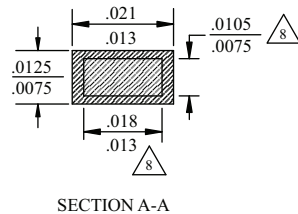
# 84-Pin PLCC Package

Dimensions in Inches

BOTTOM VIEW



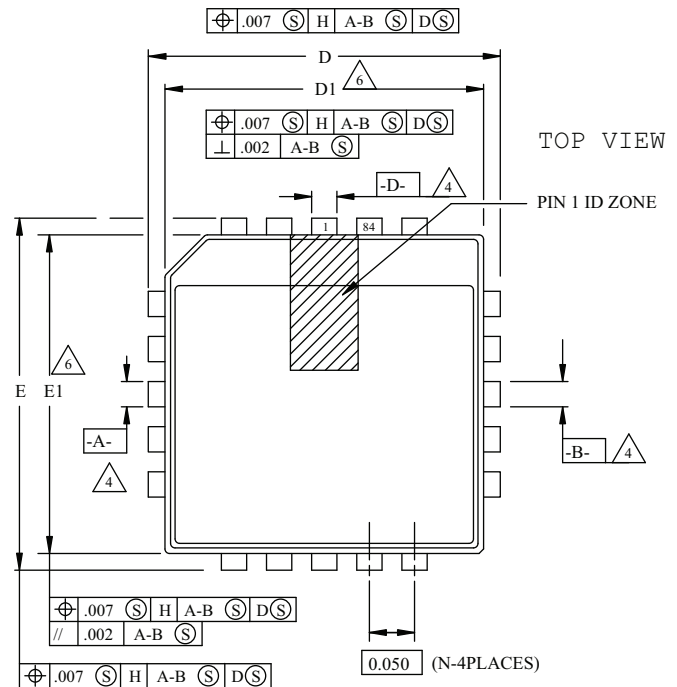
|    | MIN.  | NOM.  | MAX.  |
|----|-------|-------|-------|
| A  | .165  | .172  | .180  |
| A1 | .090  | .105  | .120  |
| A2 | .059  | -     | .080  |
| D  | 1.185 | 1.190 | 1.195 |
| D1 | 1.150 | 1.154 | 1.158 |
| D2 | .541  | .555  | .569  |
| D3 |       | .475  |       |
| E  | 1.185 | 1.190 | 1.195 |
| E1 | 1.150 | 1.154 | 1.158 |
| E2 | .541  | .555  | .569  |
| E3 |       | .475  |       |
| N  | 84    |       |       |



SECTION A-A

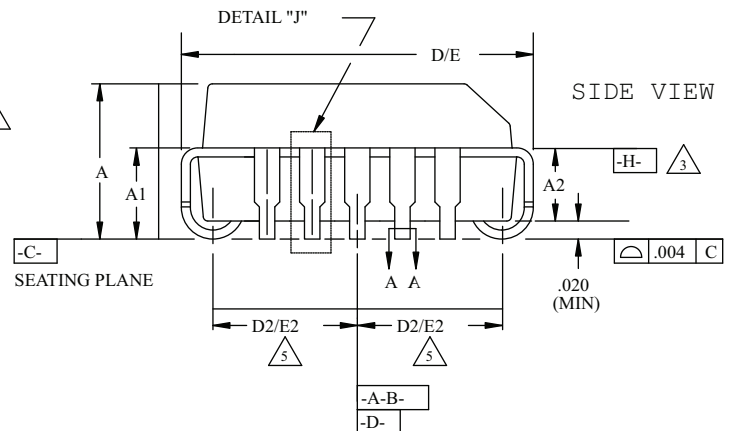
## NOTES:

- ALL DIMENSIONS AND TOLERANCES CONFORM TO ANSI Y14.5M-1982
- ALL DIMENSIONS IN INCHES
- DATUM PLANE **-H-** LOCATED AT TOP OF MOLD PARTING LINE AND COINCIDENT WITH TOP OF LEAD WHERE LEAD EXITS PLASTIC BODY
- DATUMS **-A-B** AND **-D-** TO BE DETERMINED WHERE CENTER LEADS EXIT PLASTIC BODY AT DATUM PLANE **-H-**
- TO BE MEASURED AT SEATING PLANE **-C-** CONTACT POINT
- DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .010 PER SIDE.
- TOP POINT OF MEASUREMENT IS DATUM **-H-**; BOTTOM POINT OF MEASUREMENT IS AT MAJOR FLAT AREA OF LOWER PLASTIC SURFACE DEFINED BY D3/E3
- DIMENSION APPLIES TO BASE METAL ONLY



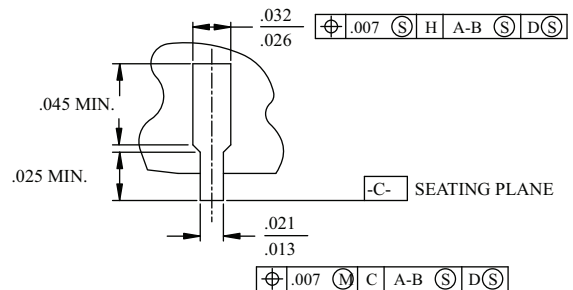
TOP VIEW

PIN 1 ID ZONE



SIDE VIEW

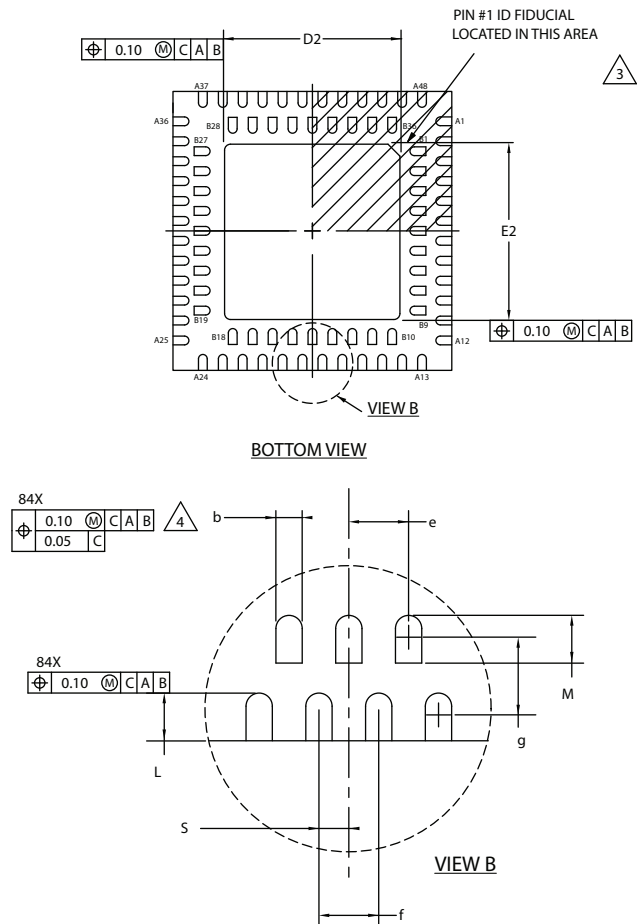
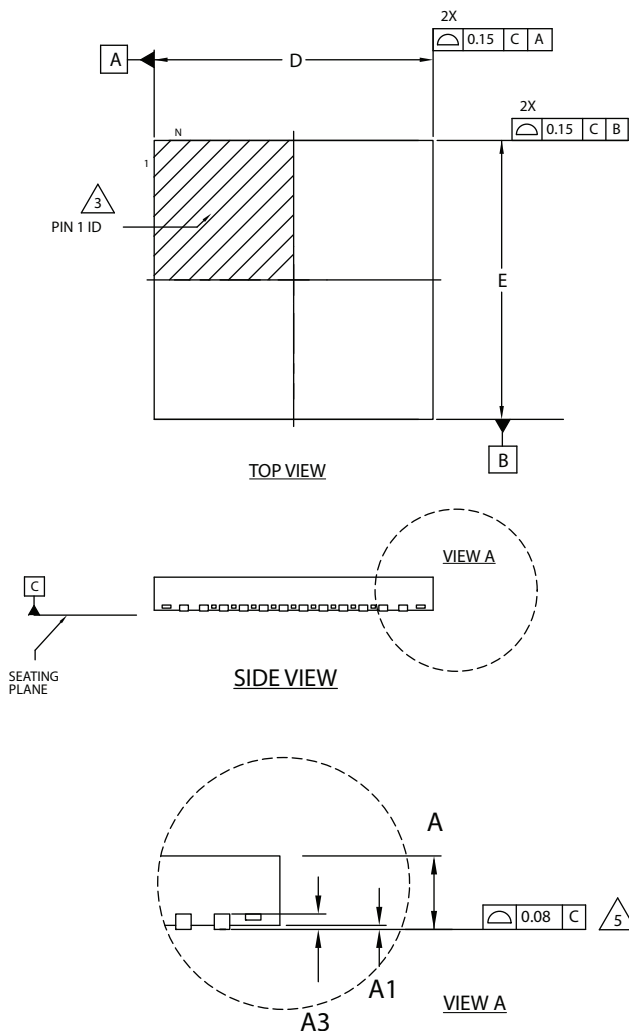
SEATING PLANE



DETAIL "J" (TYP ALL SIDES)

## 84-Pin QFN Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

3 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

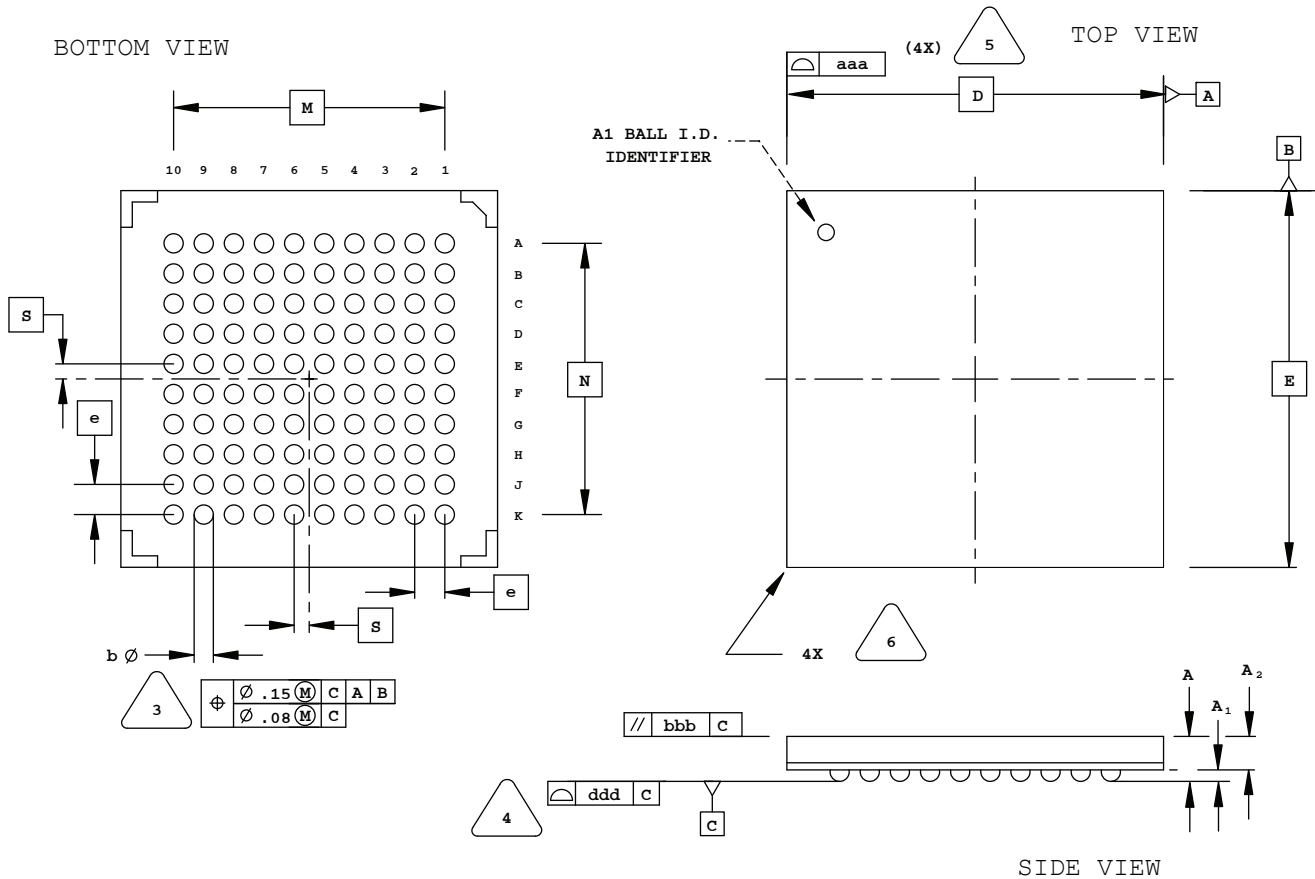
4 DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.

5 APPLIES TO EXPOSED PORTION OF TERMINALS.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | 0.75     | 0.85 | 0.95 |
| A1     | 0.00     | 0.02 | 0.05 |
| A3     | 0.15 REF |      |      |
| D      | 7.0 BSC  |      |      |
| D2     | 4.30     | -    | 4.50 |
| E      | 7.0 BSC  |      |      |
| E2     | 4.30     | -    | 4.50 |
| b      | 0.17     | 0.22 | 0.27 |
| e      | 0.50 BSC |      |      |
| f      | 0.50 BSC |      |      |
| g      | 0.65 BSC |      |      |
| S      | 0.25 BSC |      |      |
| L      | 0.30     | 0.40 | 0.50 |
| M      | 0.30     | 0.40 | 0.50 |

## 100-Ball caBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM **C**



PRIMARY DATUM **C** AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

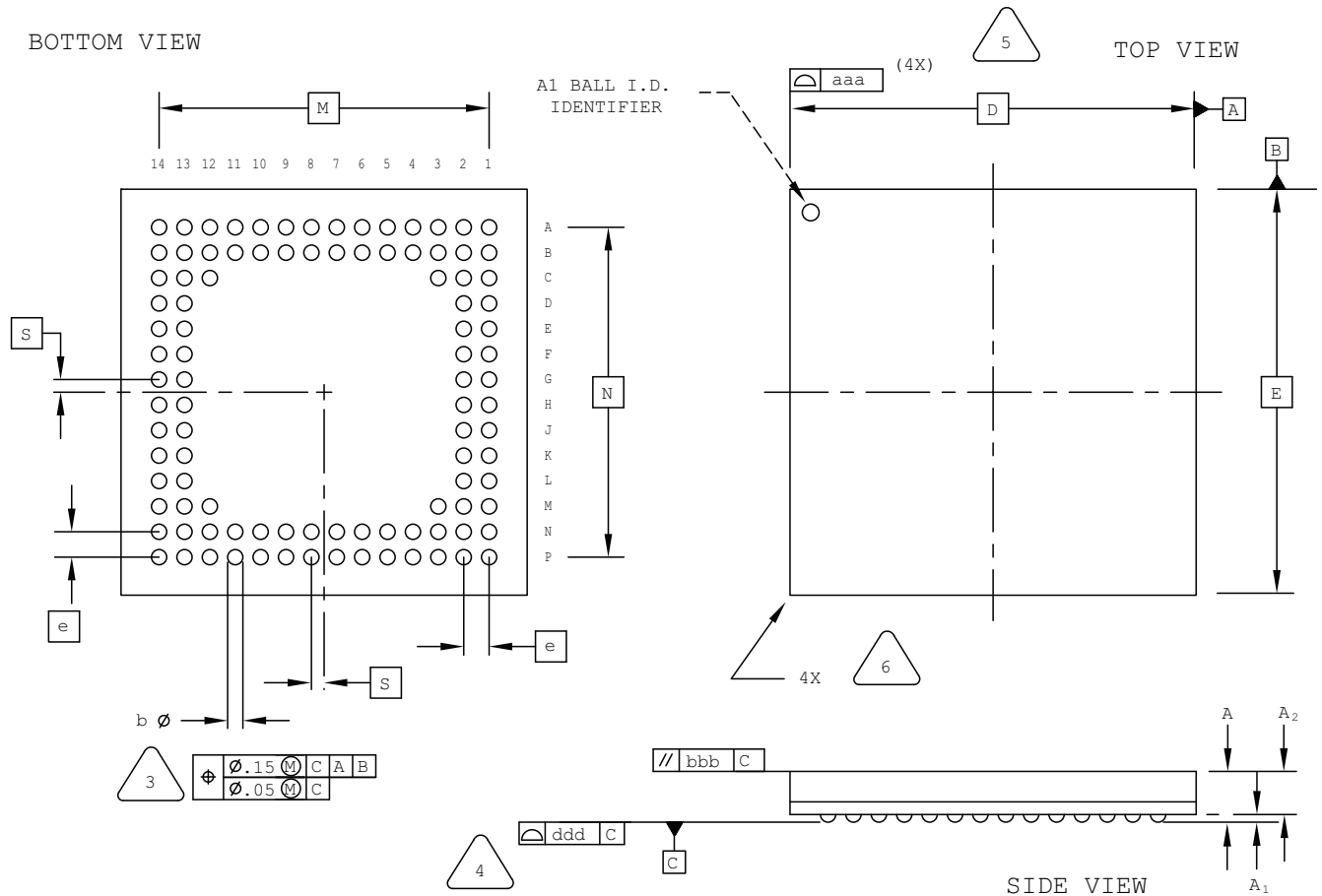


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.      | NOM. | MAX. |
|--------|-----------|------|------|
| A      | 1.30      | 1.40 | 1.50 |
| A1     | 0.31      | 0.36 | 0.41 |
| A2     | 0.99      | 1.04 | 1.09 |
| D/E    | 10.00 BSC |      |      |
| M/N    | 7.20 BSC  |      |      |
| S      | 0.40 BSC  |      |      |
| b      | 0.40      | 0.46 | 0.52 |
| e      | 0.80 BSC  |      |      |
| aaa    | -         | -    | 0.10 |
| bbb    | -         | -    | 0.10 |
| ddd    | -         | -    | 0.12 |

## 100-Ball csBGA Package

### Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES  
PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

 DIMENSION "b" IS MEASURED AT THE  
MAXIMUM SOLDER BALL DIAMETER,  
PARALLEL TO PRIMARY DATUM C


 PRIMARY DATUM C AND SEATING  
 PLANE ARE DEFINED BY THE SPHERICAL  
 CROWNS OF THE SOLDER BALLS.



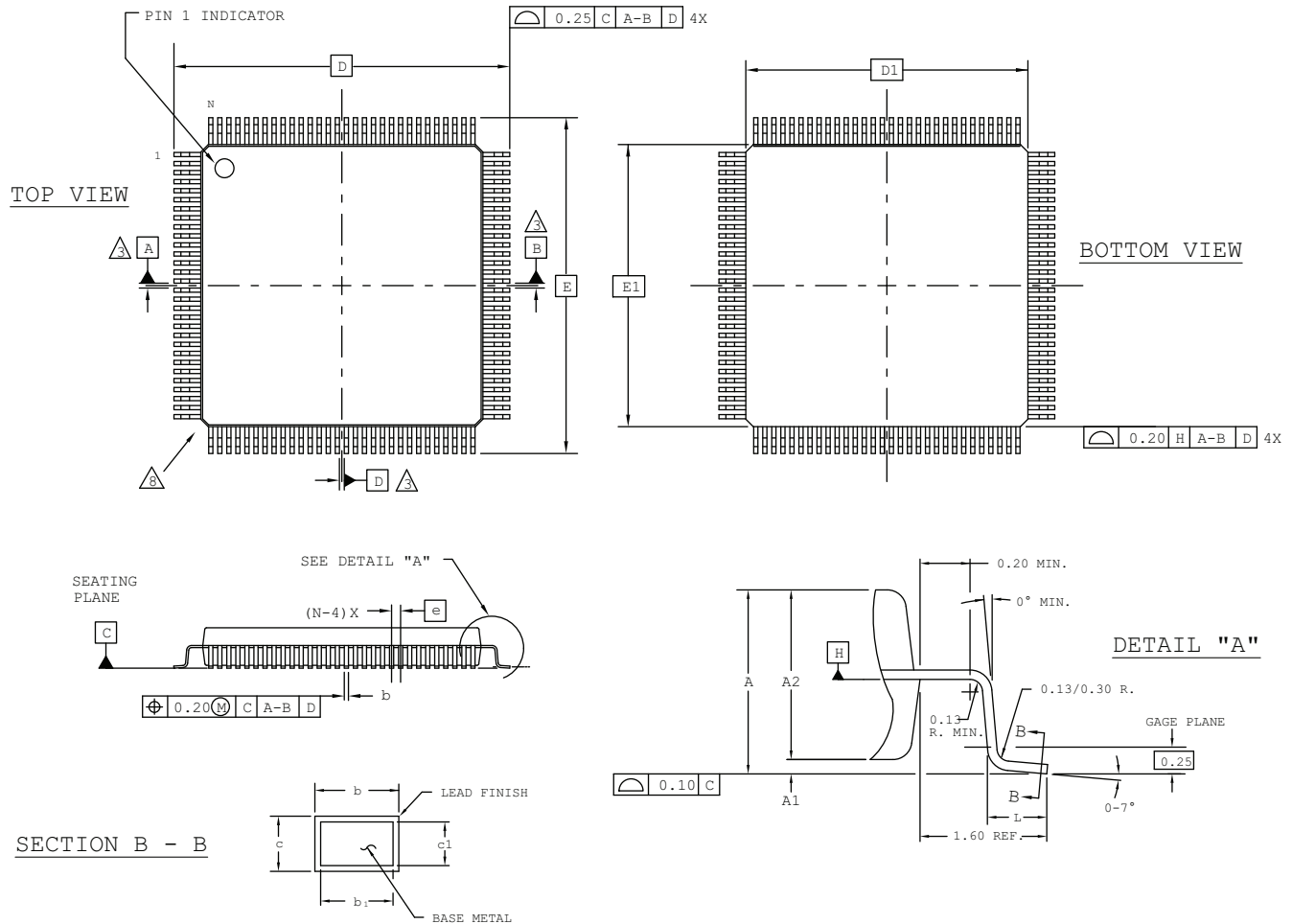
BILATERAL TOLERANCE ZONE IS APPLIED  
TO EACH SIDE OF THE PACKAGE BODY.

EXACT SHAPE AND SIZE OF THIS FEATURE  
IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | 0.90     | 1.23 | 1.35 |
| A1     | 0.15     | —    | —    |
| A2     | —        | —    | 1.10 |
| D/E    | 8.00 BSC |      |      |
| M/N    | 6.50 BSC |      |      |
| S      | 0.25 BSC |      |      |
| b      | 0.25     | 0.30 | 0.35 |
| e      | 0.50 BSC |      |      |
| aaa    | —        | —    | 0.10 |
| bbb    | —        | —    | 0.10 |
| ddd    | —        | —    | 0.08 |

## 120-Pin PQFP Package

Dimensions in Millimeters



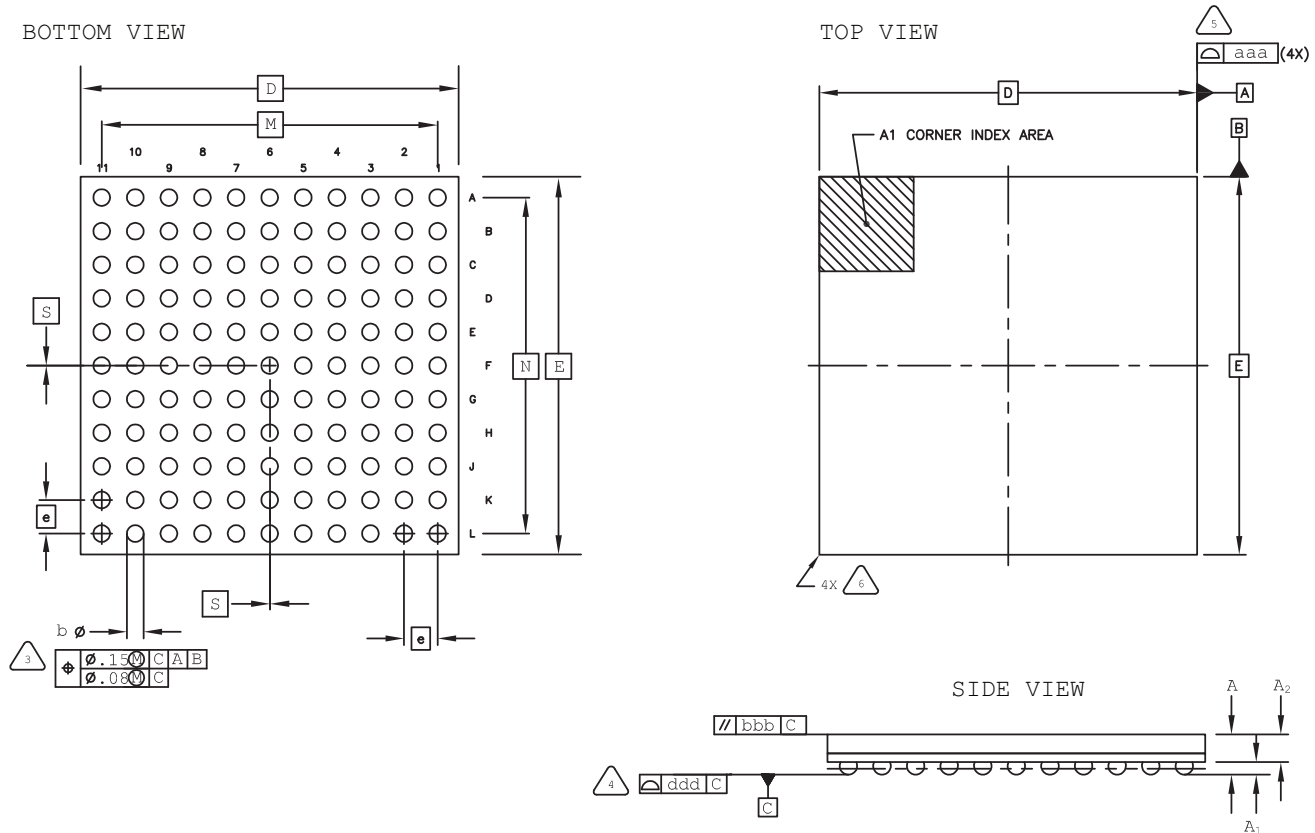
### NOTES:

- 1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
- 2.0 ALL DIMENSIONS ARE IN MILLIMETERS.
- 3.0 DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- 4.0 DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- 5.0 THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- 6.0 SECTION B-B:  
THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- 7.0 A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
- 8.0 EXACT SHAPE OF EACH CORNER IS OPTIONAL.
- 9.0 EXACT SHAPE OF EXPOSED HEATSINK IS OPTIONAL.

| SYMBOL | MIN.      | NOM. | MAX. |
|--------|-----------|------|------|
| A      | -         | -    | 4.10 |
| A1     | 0.25      | -    | 0.50 |
| A2     | 3.20      | 3.40 | 3.60 |
| D      | 31.20 BSC |      |      |
| D1     | 28.00 BSC |      |      |
| E      | 31.20 BSC |      |      |
| E1     | 28.00 BSC |      |      |
| L      | 0.73      | 0.88 | 1.03 |
| N      | 120       |      |      |
| e      | 0.80 BSC  |      |      |
| b      | 0.29      | -    | 0.45 |
| b1     | 0.29      | 0.35 | 0.41 |
| c      | 0.11      | -    | 0.23 |
| c1     | 0.11      | 0.15 | 0.19 |

## 121-Ball caBGA Package (9x9 mm Body)

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM C



PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

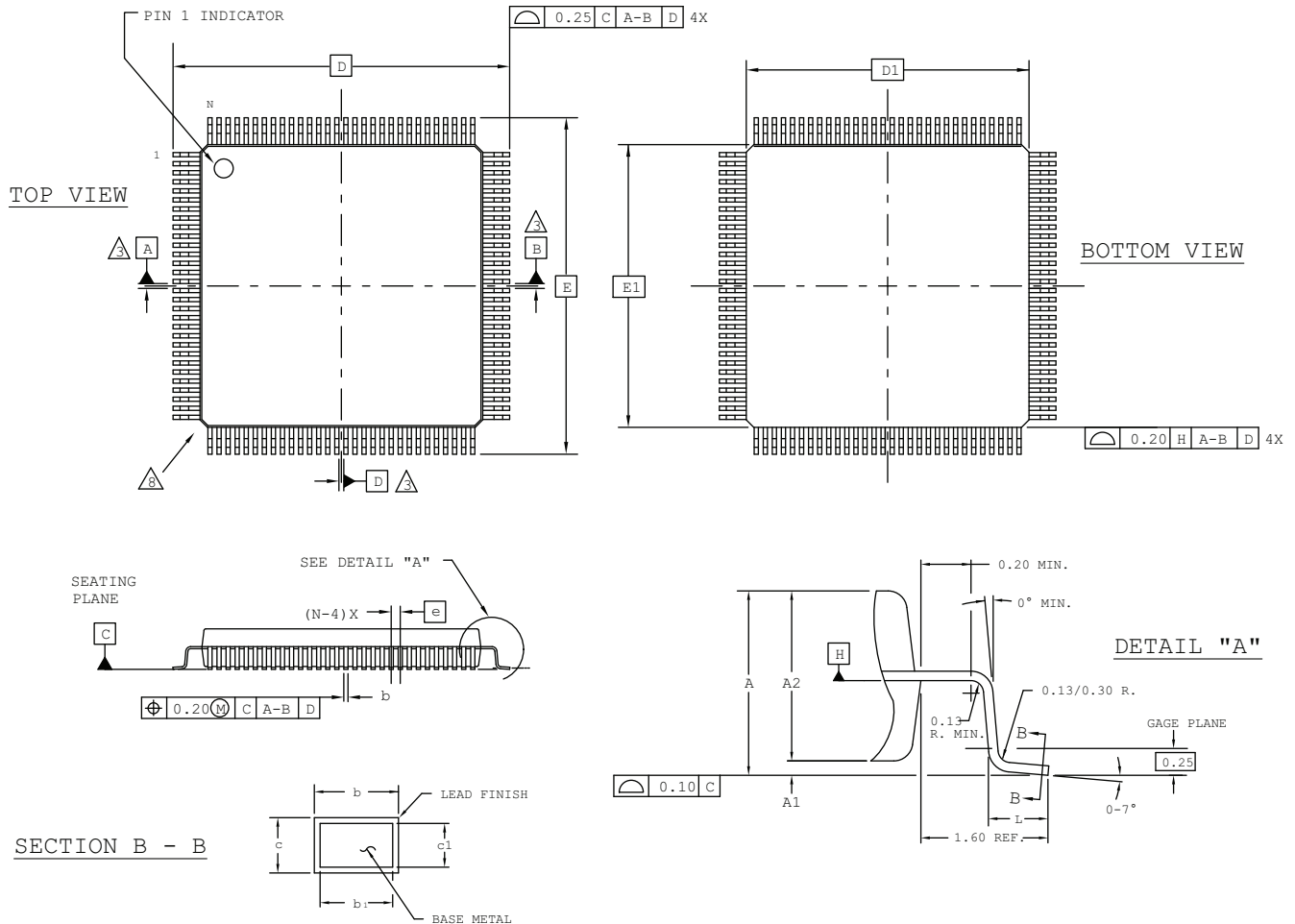


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | -        | -    | 1.10 |
| A1     | 0.15     | -    | -    |
| A2     | 0.55     | -    | -    |
| D/E    | 9.00 BSC |      |      |
| M/N    | 8.00 BSC |      |      |
| S      | 0.00 BSC |      |      |
| b      | 0.30     | 0.40 | 0.50 |
| e      | 0.80 BSC |      |      |
| aaa    | 0.15     |      |      |
| bbb    | 0.20     |      |      |
| ddd    | 0.10     |      |      |

## 128-Pin PQFP Package

Dimensions in Millimeters



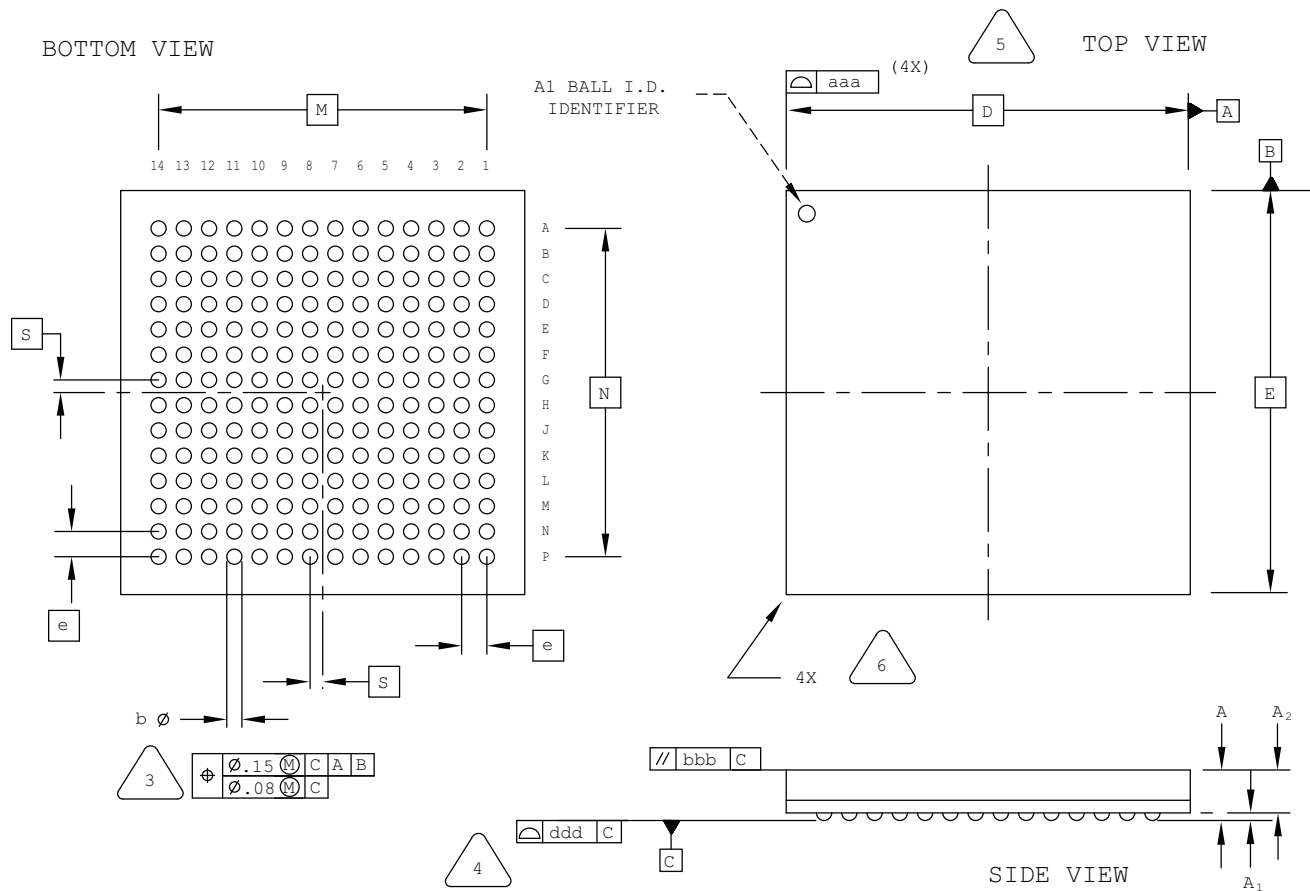
### NOTES:

- 1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
- 2.0 ALL DIMENSIONS ARE IN MILLIMETERS.
- 3.0 DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- 4.0 DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- 5.0 THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- 6.0 SECTION B-B:  
THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- 7.0 A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
- 8.0 EXACT SHAPE OF EACH CORNER IS OPTIONAL.
- 9.0 EXACT SHAPE OF EXPOSED HEATSINK IS OPTIONAL.

| SYMBOL | MIN.      | NOM. | MAX. |
|--------|-----------|------|------|
| A      | -         | -    | 4.10 |
| A1     | 0.25      | -    | 0.50 |
| A2     | 3.20      | 3.40 | 3.60 |
| D      | 31.20 BSC |      |      |
| D1     | 28.00 BSC |      |      |
| E      | 31.20 BSC |      |      |
| E1     | 28.00 BSC |      |      |
| L      | 0.73      | 0.88 | 1.03 |
| N      | 128       |      |      |
| e      | 0.80 BSC  |      |      |
| b      | 0.29      | -    | 0.45 |
| b1     | 0.29      | 0.35 | 0.41 |
| c      | 0.11      | -    | 0.23 |
| c1     | 0.11      | 0.15 | 0.19 |

## 196-Ball csBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

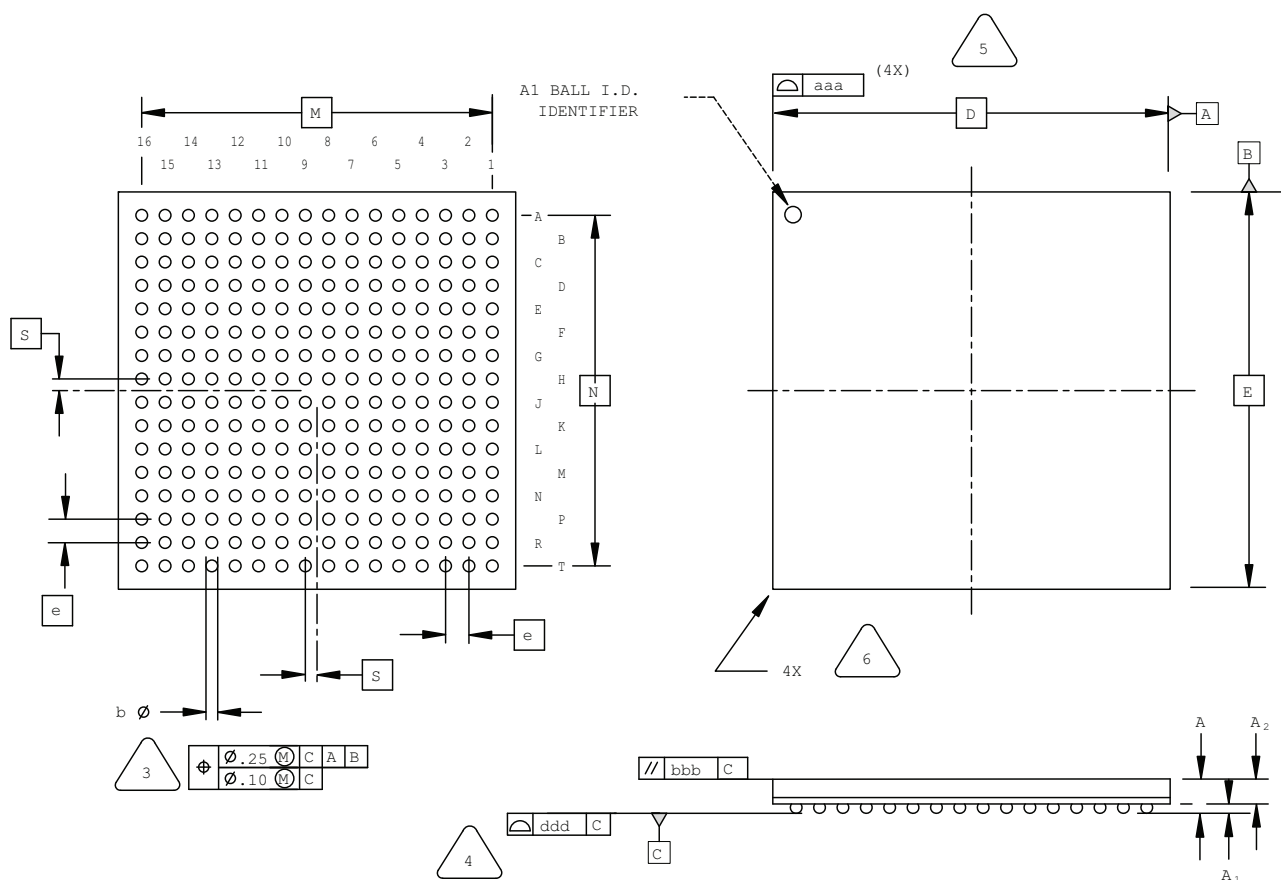


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | -        | -    | 1.00 |
| A1     | 0.15     | -    | -    |
| A2     | -        | -    | 0.85 |
| D/E    | 8.00 BSC |      |      |
| M/N    | 6.50 BSC |      |      |
| S      | 0.25 BSC |      |      |
| b      | 0.25     | 0.30 | 0.35 |
| e      | 0.50 BSC |      |      |
| aaa    | -        | -    | 0.10 |
| bbb    | -        | -    | 0.10 |
| ddd    | -        | -    | 0.08 |

## 256-Ball ftBGA Package Option 1: ispMACH 4000, MachXO, LatticeXP2

### Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES  
PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE  
MAXIMUM SOLDER BALL DIAMETER,  
PARALLEL TO PRIMARY DATUM C



PRIMARY DATUM C AND SEATING  
PLANE ARE DEFINED BY THE SPHERICAL  
CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED  
TO EACH SIDE OF THE PACKAGE BODY.

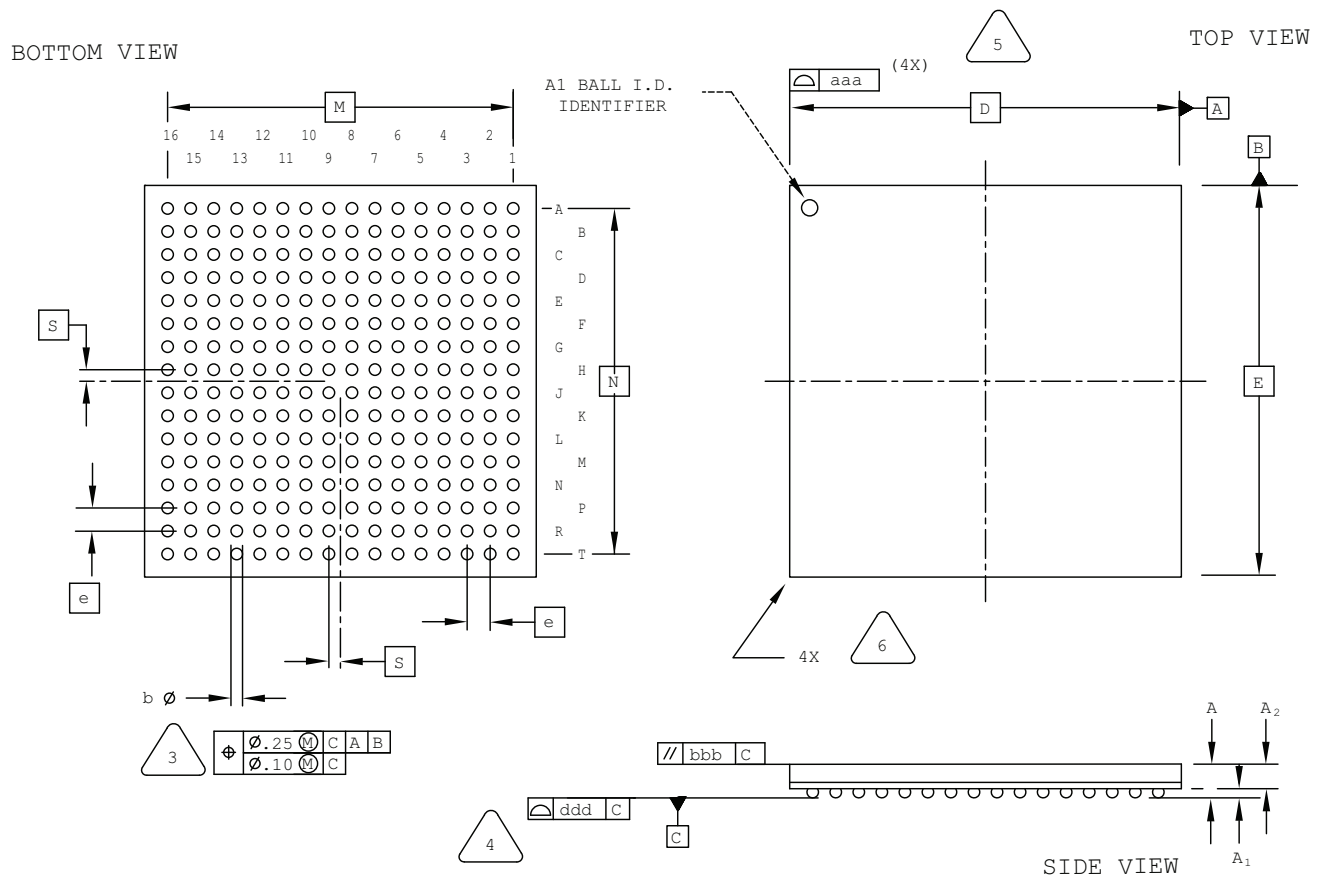


EXACT SHAPE AND SIZE OF THIS FEATURE  
IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | 1.25     | 1.40 | 1.55 |
| A1     | 0.30     | -    | -    |
| A2     | -        | -    | 1.25 |
| D/E    | 17.0 BSC |      |      |
| M/N    | 15.0 BSC |      |      |
| S      | 0.50 BSC |      |      |
| b      | 0.40     | 0.50 | 0.60 |
| e      | 1.00 BSC |      |      |
| aaa    | -        | -    | 0.20 |
| bbb    | -        | -    | 0.25 |
| ddd    | -        | -    | 0.12 |

## 256-Ball ftBGA Package Option 3: MachXO2

### Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES  
PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

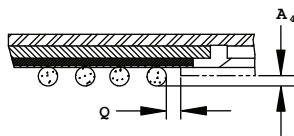
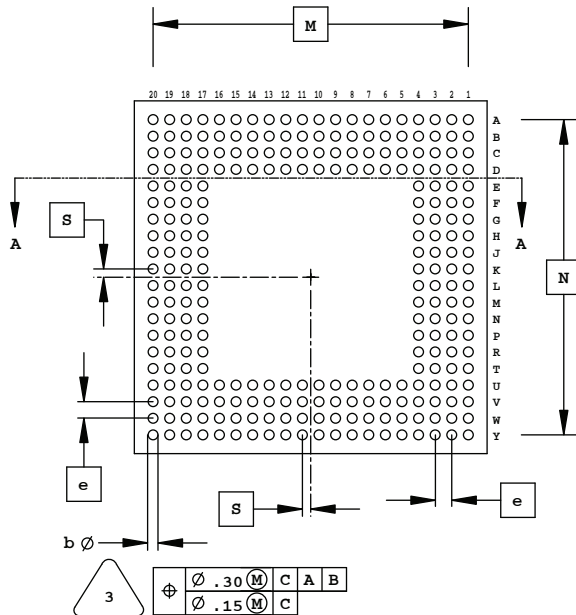
- 3
- DIMENSION "b" IS MEASURED AT THE  
MAXIMUM SOLDER BALL DIAMETER,  
PARALLEL TO PRIMARY DATUM [C]
- 4
- PRIMARY DATUM [C] AND SEATING  
PLANE ARE DEFINED BY THE SPHERICAL  
CROWNS OF THE SOLDER BALLS.
- 5
- BILATERAL TOLERANCE ZONE IS APPLIED  
TO EACH SIDE OF THE PACKAGE BODY.
- 6
- EXACT SHAPE AND SIZE OF THIS FEATURE  
IS OPTIONAL.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | 1.40     | 1.55 | 1.70 |
| A1     | 0.30     | —    | —    |
| A2     | 1.00     | —    | —    |
| D/E    | 17.0 BSC |      |      |
| M/N    | 15.0 BSC |      |      |
| S      | 0.50 BSC |      |      |
| b      | 0.40     | 0.50 | 0.60 |
| e      | 1.0 BSC  |      |      |
| aaa    | —        | —    | 0.20 |
| bbb    | —        | —    | 0.25 |
| ddd    | —        | —    | 0.12 |

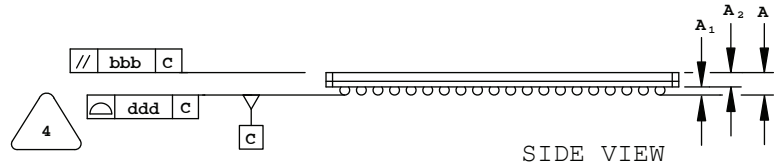
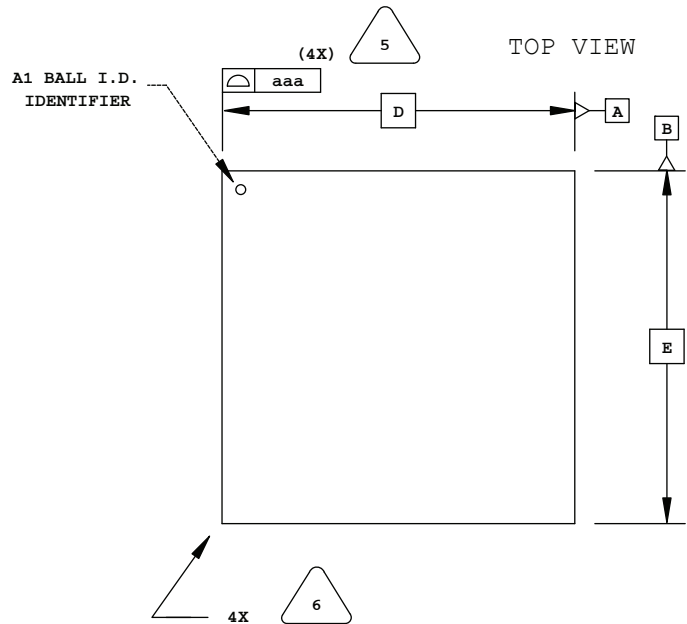
## 256-Ball SBGA Package

Dimensions in Millimeters

BOTTOM VIEW



A-A SECTION VIEW



SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

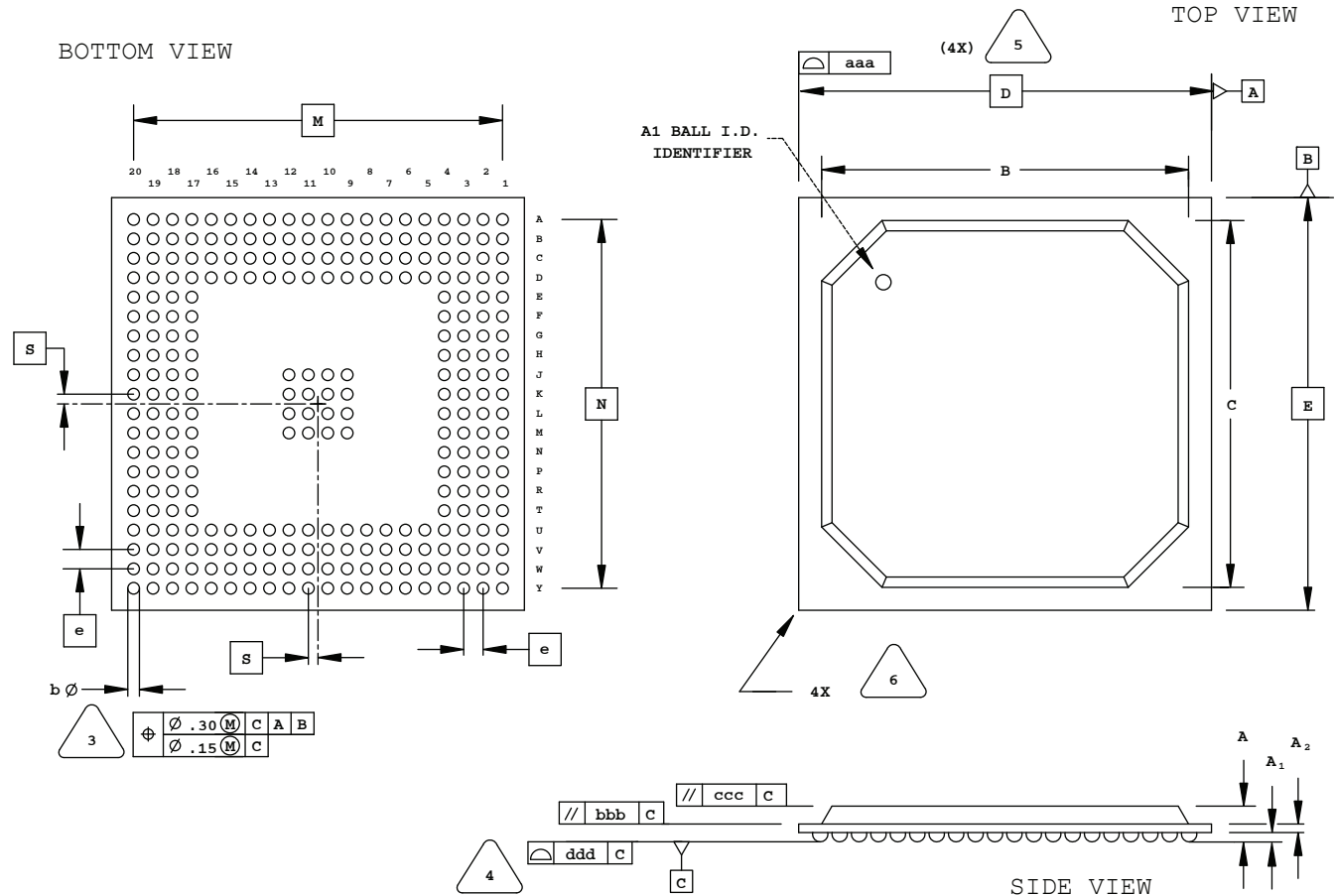


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.      | NOM. | MAX. |
|--------|-----------|------|------|
| A      | -         | -    | 1.70 |
| A1     | 0.50      | 0.65 | 0.80 |
| A2     | 0.80      | 0.90 | 1.00 |
| D/E    | 27.00 BSC |      |      |
| M/N    | 24.13 BSC |      |      |
| S      | 0.635 BSC |      |      |
| b      | 0.60      | 0.75 | 0.90 |
| e      | 1.27 BSC  |      |      |
| Q      | 0.25      | -    | -    |
| A4     | 0.10      | -    | -    |
| aaa    | -         | -    | 0.20 |
| bbb    | -         | -    | 0.25 |
| ddd    | -         | -    | 0.20 |

## 272-Ball BGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

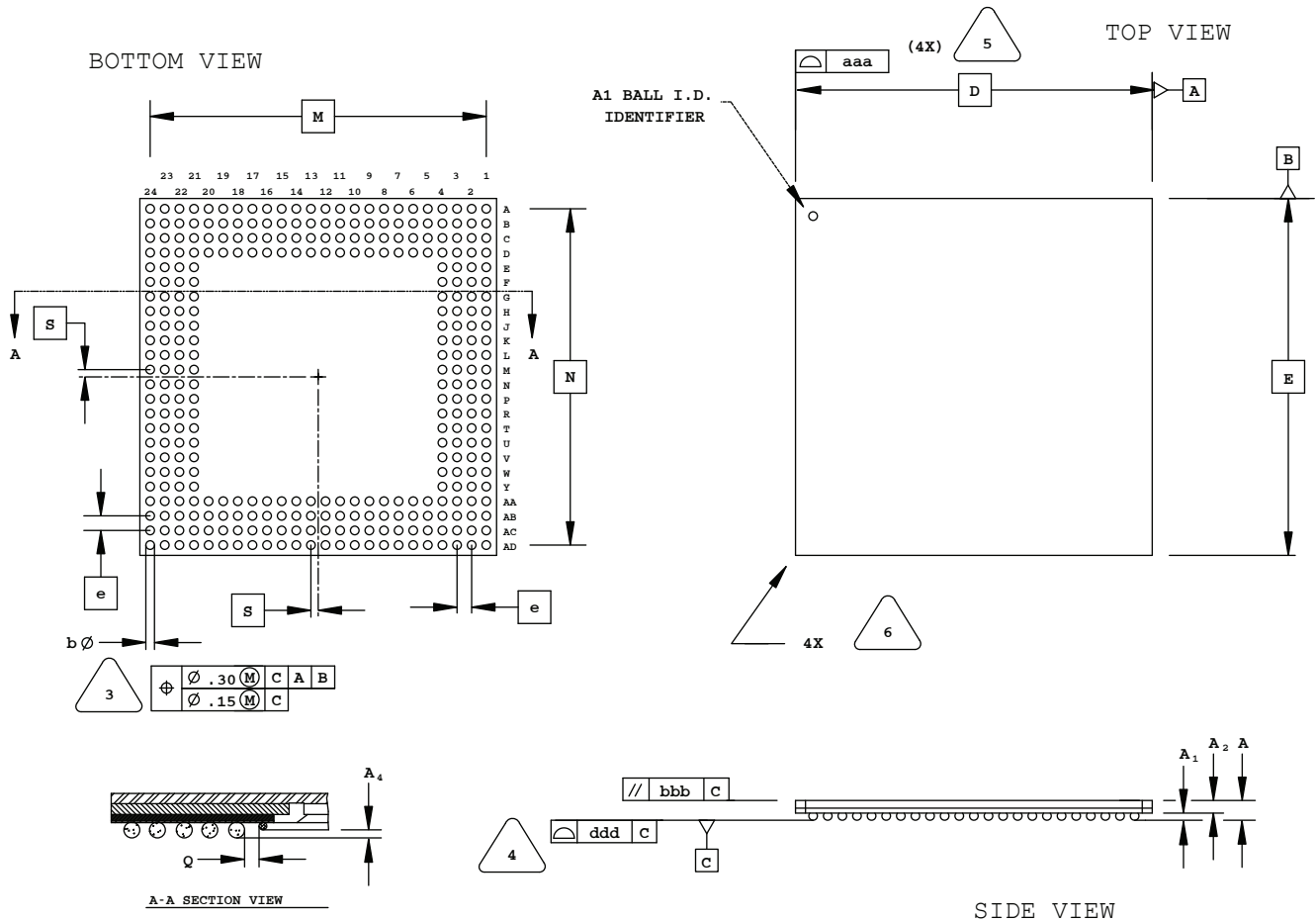


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.      | NOM.  | MAX.  |
|--------|-----------|-------|-------|
| A      | 1.90      | 2.25  | 2.80  |
| A1     | 0.50      | 0.65  | 0.80  |
| A2     | 0.28      | 0.54  | 0.80  |
| B/C    | 23.80     | 24.30 | 24.80 |
| D/E    | 27.00 BSC |       |       |
| M/N    | 24.13 BSC |       |       |
| S      | 0.635 BSC |       |       |
| b      | 0.60      | 0.75  | 0.90  |
| e      | 1.27 BSC  |       |       |
| aaa    | -         | -     | 0.20  |
| bbb    | -         | -     | 0.25  |
| ccc    | -         | -     | 0.35  |
| ddd    | -         | -     | 0.20  |

## 320-Ball SBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM **C**



PRIMARY DATUM **C** AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

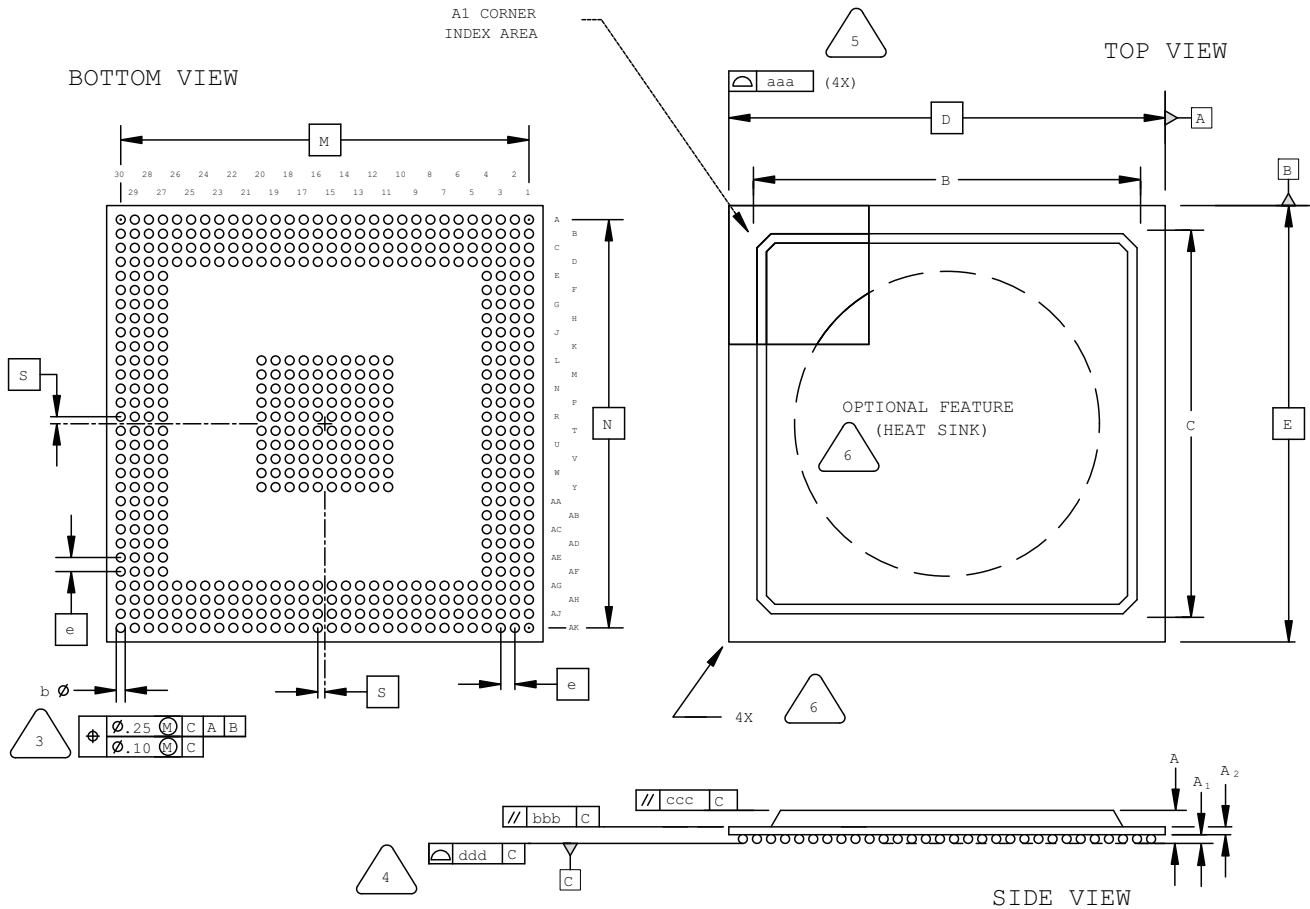


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.      | NOM. | MAX. |
|--------|-----------|------|------|
| A      | -         | -    | 1.70 |
| A1     | 0.50      | 0.65 | 0.80 |
| A2     | 0.80      | 0.90 | 1.00 |
| D/E    | 31.00 BSC |      |      |
| M/N    | 29.21 BSC |      |      |
| S      | 0.635 BSC |      |      |
| b      | 0.60      | 0.75 | 0.90 |
| e      | 1.27 BSC  |      |      |
| Q      | 0.25      | -    | -    |
| A4     | 0.10      | -    | -    |
| aaa    | -         | -    | 0.20 |
| bbb    | -         | -    | 0.25 |
| ddd    | -         | -    | 0.20 |

# 516-Ball fpBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

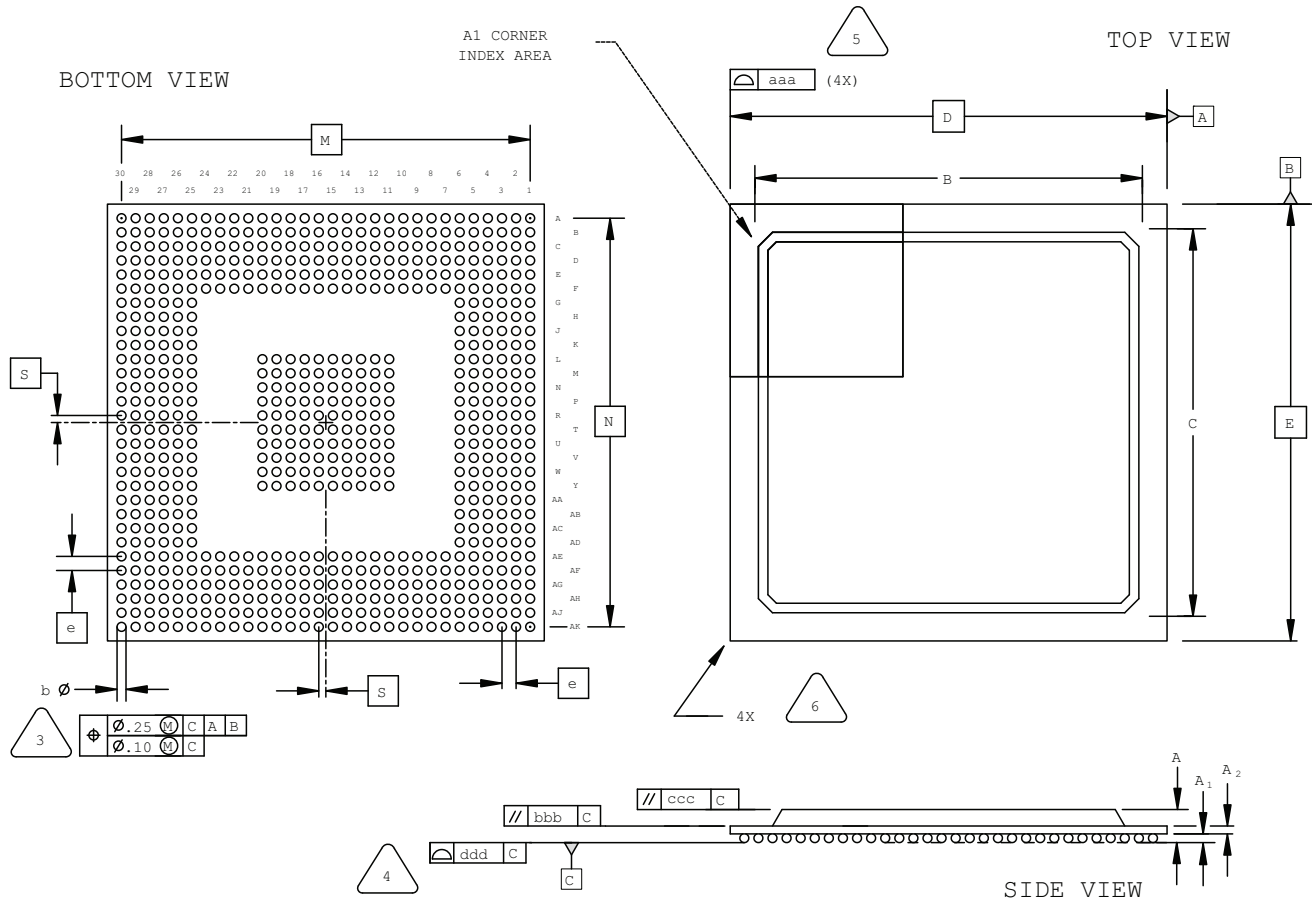


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN.      | NOM.  | MAX.  |
|--------|-----------|-------|-------|
| A      | 1.70      | 2.15  | 2.60  |
| A1     | 0.30      | 0.50  | 0.70  |
| A2     | 0.30      | 0.50  | 0.70  |
| B/C    | 25.80     | 27.55 | 29.30 |
| D/E    | 31.00 BSC |       |       |
| M/N    | 29.00 BSC |       |       |
| S      | 0.50 BSC  |       |       |
| b      | 0.50      | 0.60  | 0.70  |
| e      | 1.00 BSC  |       |       |
| aaa    | -         | -     | 0.20  |
| bbb    | -         | -     | 0.25  |
| ccc    | -         | -     | 0.35  |
| ddd    | -         | -     | 0.20  |

## 676-Ball fpBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM C.



PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

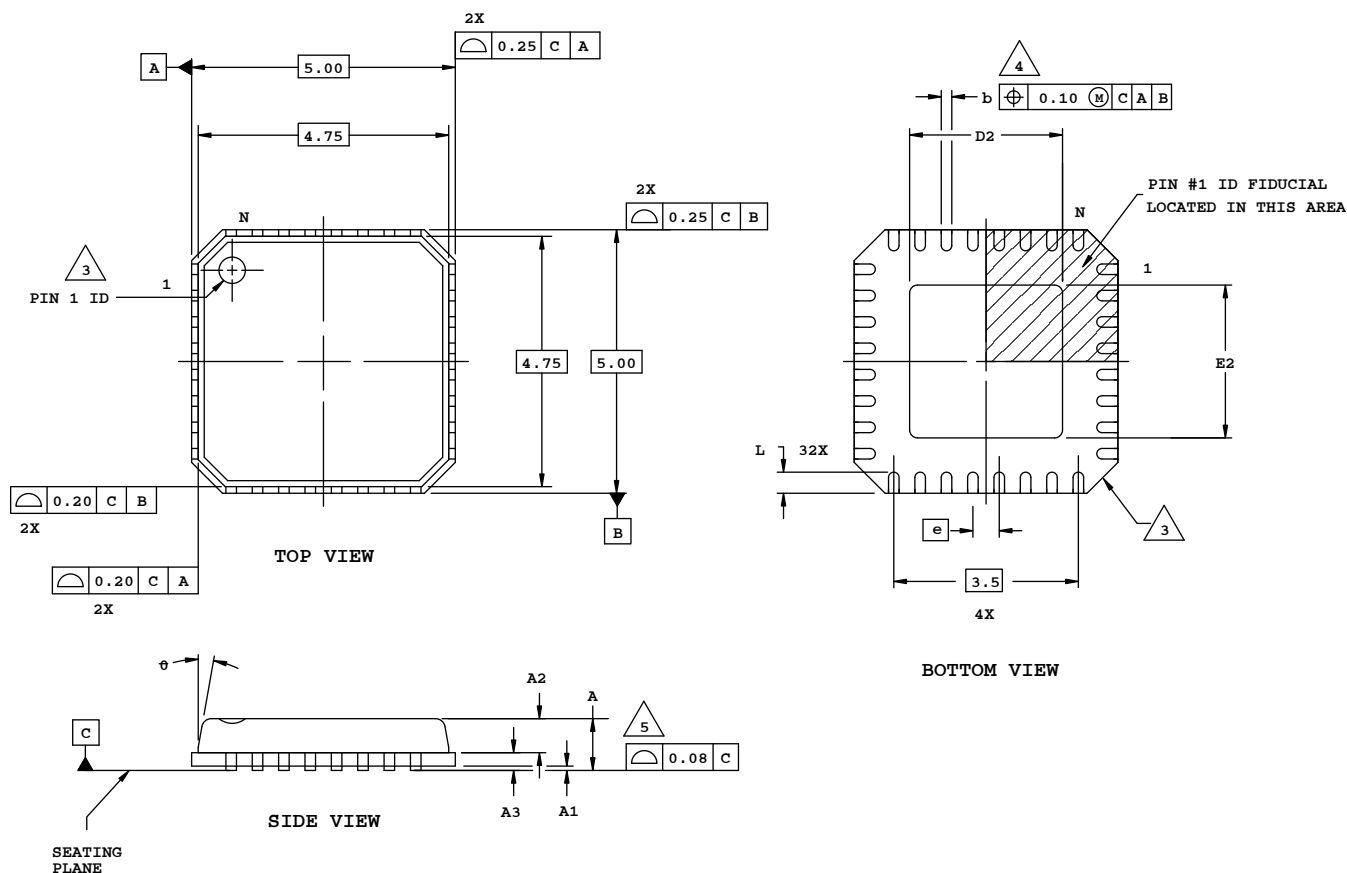
| SYMBOL | MIN.      | NOM.  | MAX.  |
|--------|-----------|-------|-------|
| A      | 1.70      | 2.15  | 2.60  |
| A1     | 0.30      | 0.50  | 0.70  |
| A2     | 0.30      | 0.50  | 0.70  |
| B/C    | 25.80     | 27.55 | 29.30 |
| D/E    | 31.00 BSC |       |       |
| M/N    | 29.00 BSC |       |       |
| S      | 0.50 BSC  |       |       |
| b      | 0.50      | 0.60  | 0.70  |
| e      | 1.00 BSC  |       |       |
| aaa    | -         | -     | 0.20  |
| bbb    | -         | -     | 0.25  |
| ccc    | -         | -     | 0.35  |
| ddd    | -         | -     | 0.20  |

| Date          | Version | Change Summary                                                                                                                                                        |
|---------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| May 2009      | 02.0    | Added new 256-ball caBGA and 256-ball ftBGA (Option A) packages.                                                                                                      |
| April 2009    | 01.9    | Added 24-pin QFNS package diagram. Removed discontinued and obsolete packages (16 SOIC, 20 SOIC, 24 SOIC, 28 SOIC, 16 PDIP, 240 MQFP, 269 fcBGA, 304 MQFP, 600 SBGA). |
| December 2008 | 01.8    | Added 32-pin QFNS, 48-pin QFNS and 64-pin QFNS package diagrams.                                                                                                      |
| November 2008 | 01.7    | Added 64-ball ucBGA and 132-ball ucBGA package diagrams.                                                                                                              |
| April 2008    | 01.6    | Added 64-ball csBGA and 144-ball csBGA package diagrams.                                                                                                              |
| November 2007 | 01.5    | Added 1152-ball fpBGA package diagram.                                                                                                                                |
| October 2007  | 01.4    | Revised 1036 ftSBGA package diagram. Removed 1036 fpSBGA.                                                                                                             |
| June 2007     | 01.3    | Added 1036 ftSBGA package diagram.                                                                                                                                    |
| February 2007 | 01.2    | Revised 1704 fcBGA package drawing: removed lid dimension, clarified package body dimension as the combination of substrate and lid.                                  |
| January 2007  | 01.1    | Added Marking Orientation text for all TQFP packages (1.0 mm and 1.4 mm thick).                                                                                       |
| October 2006  | 01.0    | Added 64-pin TQFP and 1704-ball fcBGA package diagrams.                                                                                                               |
| —             | —       | Previous Lattice releases.                                                                                                                                            |

## Appendix A. Package Archive

### 32-Pin QFN (Punch Singulated) Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.



DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.25 mm FROM TERMINAL TIP.



APPLIES TO EXPOSED PORTION OF TERMINALS.

| SYMBOL | MIN.     | NOM. | MAX. |
|--------|----------|------|------|
| A      | -        | 0.85 | 1.00 |
| A1     | 0.00     | 0.01 | 0.05 |
| A2     | 0.00     | 0.65 | 1.00 |
| A3     | 0.20 REF |      |      |
| D2     | 1.25     | 2.70 | 3.25 |
| E2     | 1.25     | 2.70 | 3.25 |
| e      | 0.50 BSC |      |      |
| b      | 0.18     | 0.24 | 0.30 |
| L      | 0.30     | 0.40 | 0.50 |
| θ      | -        | -    | 12   |