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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.

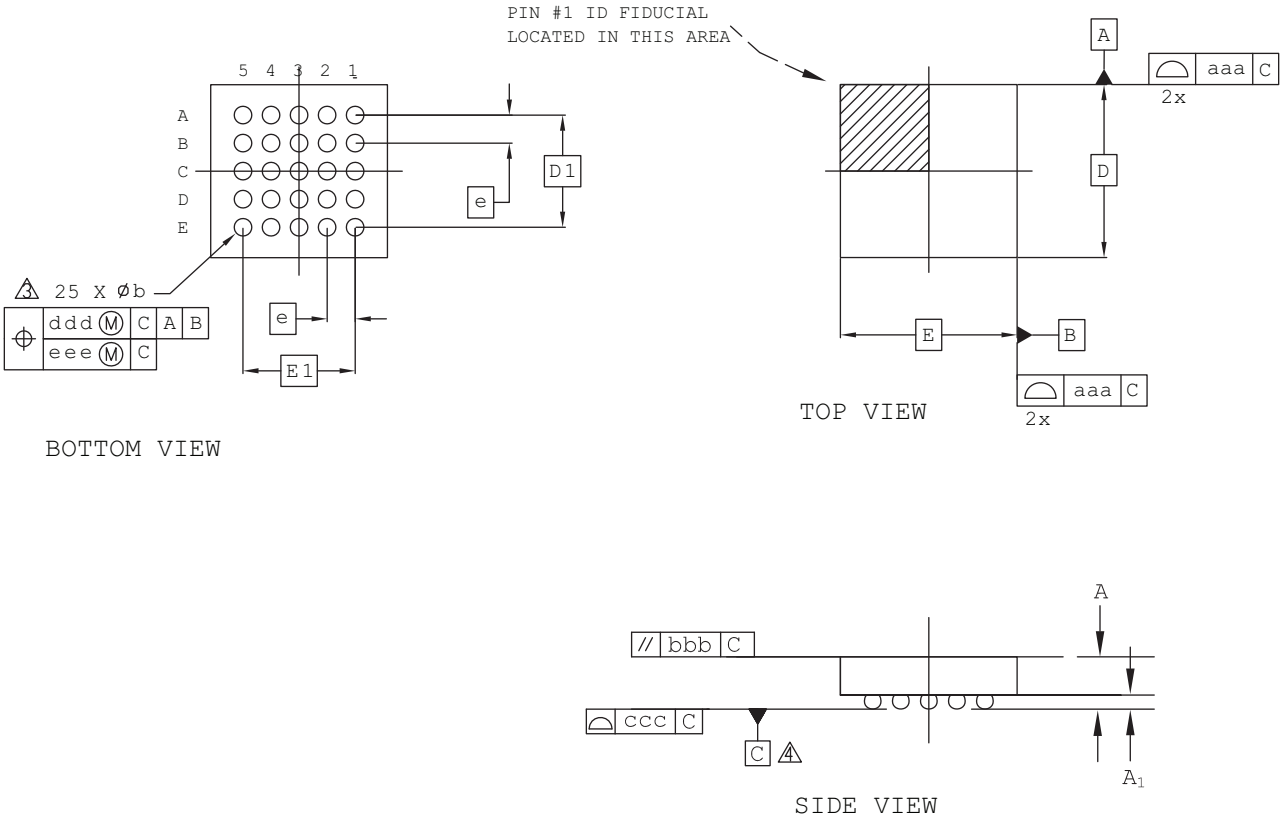
## Applications of Embedded - FPGAs

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 | 10200 |
| Total RAM Bits | 282624 |
| Number of I/O | 288 |
| Number of Gates | - |
| Voltage - Supply | 1.14V ~ 1.26V |
| Mounting Type | Surface Mount |
| Operating Temperature | 0°C ~ 85°C (TJ) |
| Package / Case | 484-BBGA |
| Supplier Device Package | 484-FPBGA (23x23) |
| Purchase URL | https://www.e-xfl.com/product-detail/lattice-semiconductor/lfecp10e-5f484c |

# 25-Ball WLCS Package (0.40 mm Pitch)

Dimensions in Millimeters




Notes:

1 ALL DIMENSIONS AND TOLERANCE PER ASME Y 14.5M - 1994.

2 ALL DIMENSIONS ARE IN MILLIMETERS.

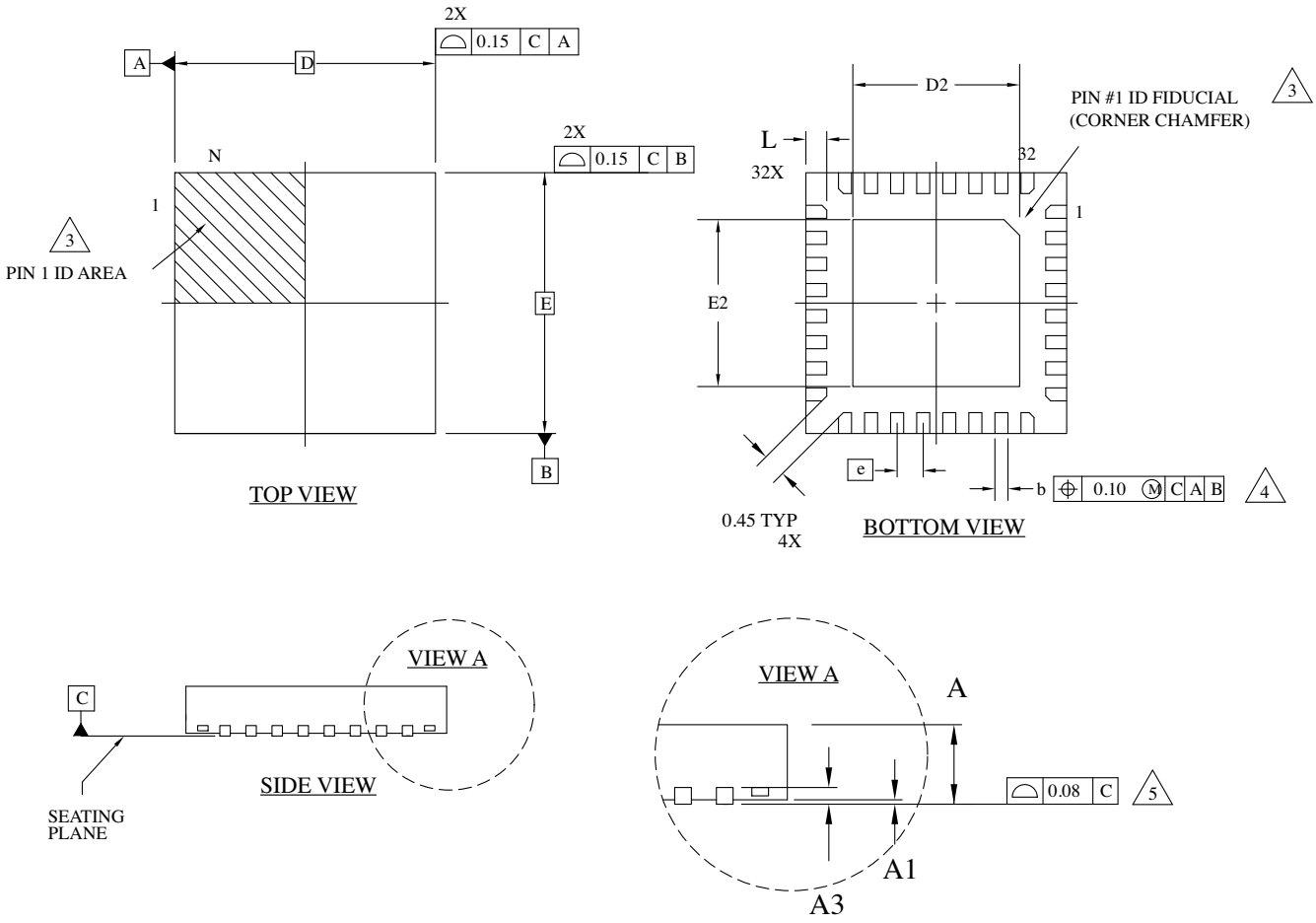
3 DIMENSION "b" IS MEASURED AT THE MAXIMUM BUMP DIAMETER PARALLEL TO PRIMARY DATUM C.

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

| REF. | Min. | Nom. | Max. |
|---|---|---|---|
| A | 0.535 | 0.575 | 0.615 |
| A1 | 0.170 | 0.200 | 0.230 |
| b | 0.220 | 0.250 | 0.280 |
| D | | 2.492 BSC | |
| E | | 2.546 BSC | |
| D1 | | 1.60 BSC | |
| E1 | | 1.60 BSC | |
| e | | 0.40 BSC | |
| aaa | | 0.025 | |
| bbb | | 0.060 | |
| ccc | | 0.015 | |
| ddd | | 0.150 | |
| eee | | 0.050 | |

# 32-Pin QFN Package Option 2: MachXO2™

Dimensions in Millimeters



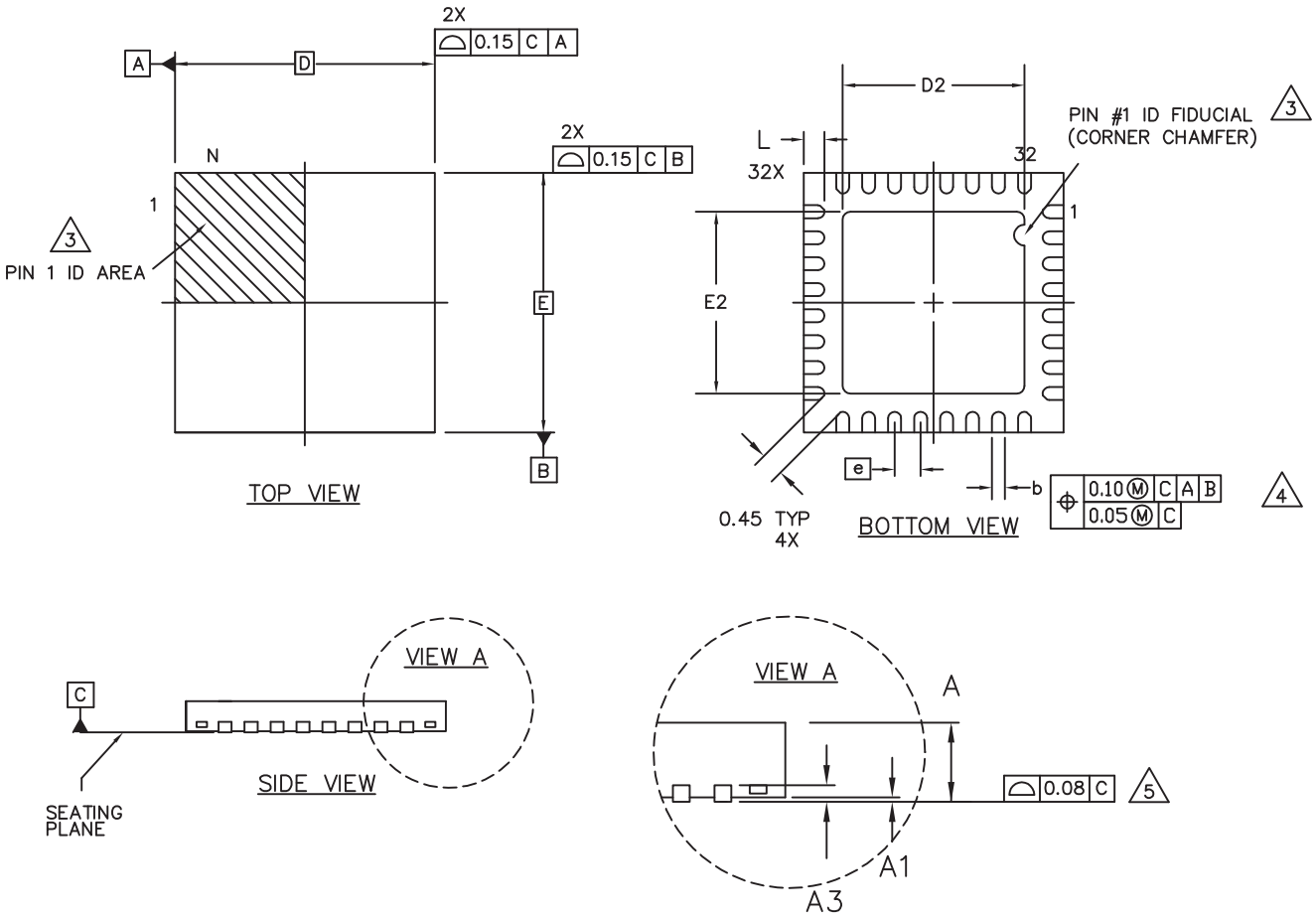

NOTES: UNLESS OTHERWISE SPECIFIED

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 | 0.50 | 0.55 | 0.60 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | | 0.2 REF | |
| D | | 5.0 BSC | |
| D2 | 3.10 | 3.20 | 3.30 |
| E | | 5.0 BSC | |
| E2 | 3.10 | 3.20 | 3.30 |
| b | 0.20 | 0.25 | 0.30 |
| e | | 0.50 BSC | |
| L | 0.35 | 0.40 | 0.45 |

# 32-Pin QFN Package Option 3: MachXO2 SG32C

Dimensions in Millimeters



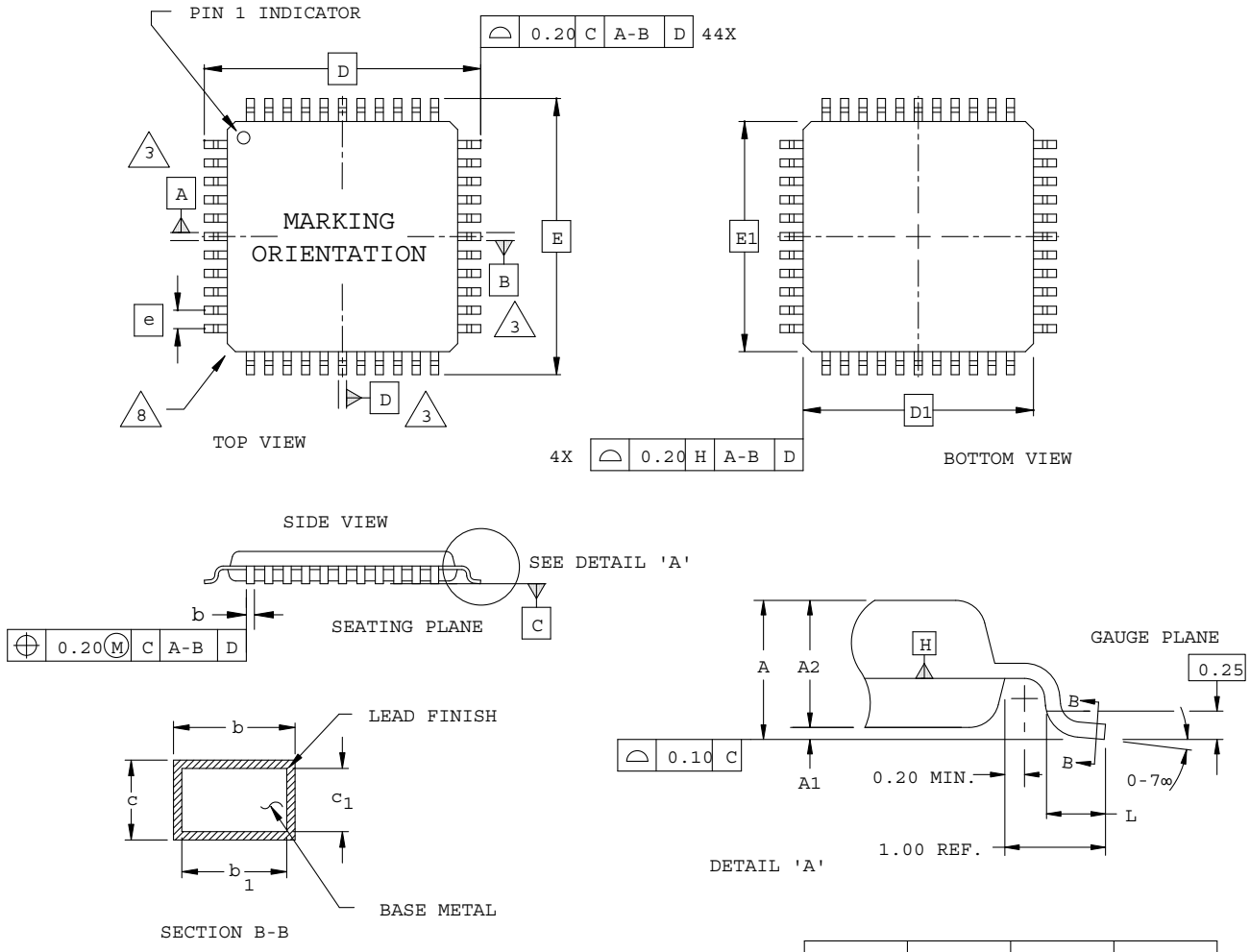

NOTES: UNLESS OTHERWISE SPECIFIED

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.
6. JEDEC REFERENCE MO-248 AND DR-4.2

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 0.50 | 0.55 | 0.65 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | | 0.2 REF | |
| D | | 5.0 BSC | |
| D2 | 3.40 | 3.50 | 3.60 |
| E | | 5.0 BSC | |
| E2 | 3.40 | 3.50 | 3.60 |
| b | 0.18 | 0.25 | 0.30 |
| e | | 0.50 BSC | |
| L | 0.35 | 0.40 | 0.45 |

# 44-Pin TQFP Package (1.0 mm thick)

Dimensions in Millimeters



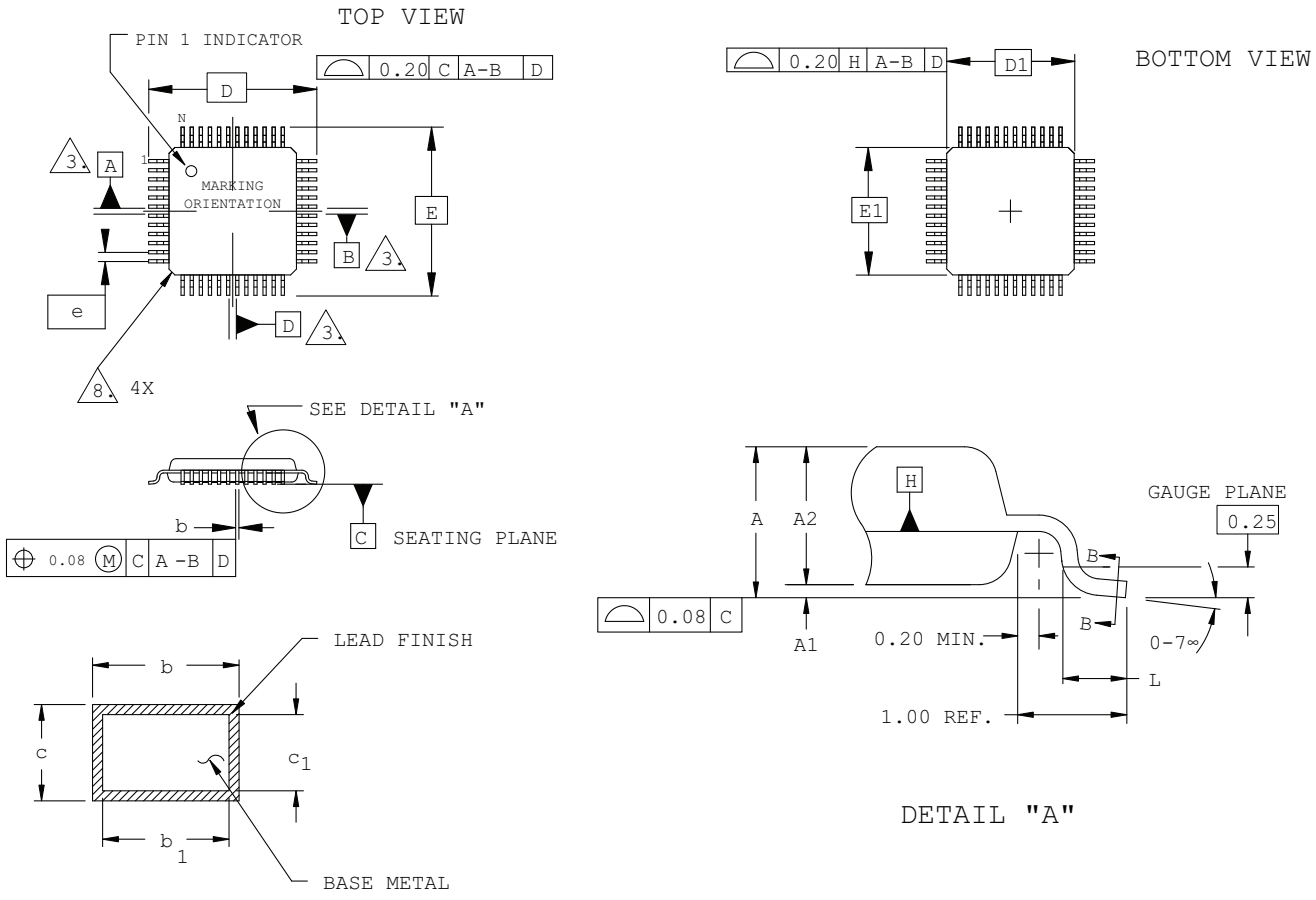

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
5. THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
6. 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. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
8. EXACT SHAPE OF EACH CORNER IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.20 |
| A1 | 0.05 | - | 0.15 |
| A2 | .95 | 1.00 | 1.05 |
| D | | 12.00 BSC | |
| D1 | | 10.00 BSC | |
| E | | 12.00 BSC | |
| E1 | | 10.00 BSC | |
| L | 0.45 | 0.60 | 0.75 |
| N | | 44 | |
| e | | 0.80 BSC | |
| b | 0.30 | 0.37 | 0.45 |
| b1 | 0.30 | 0.35 | 0.40 |
| c | 0.09 | 0.15 | 0.20 |
| c1 | 0.09 | 0.13 | 0.16 |

# 48-Pin TQFP Package (1.4 mm thick)

Dimensions in Millimeters



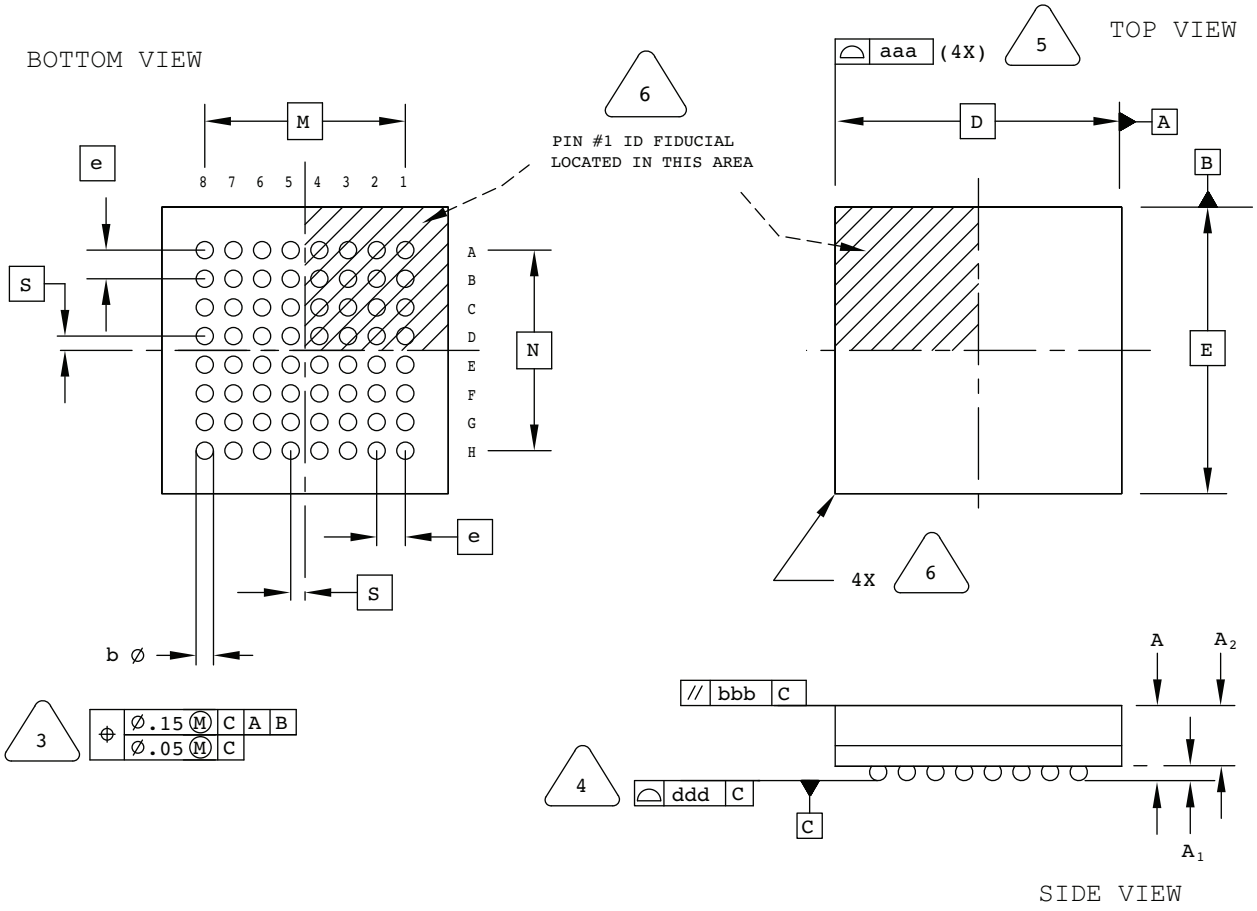

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
5. THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
6. 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. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
8. EXACT SHAPE OF EACH CORNER IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.60 |
| A1 | 0.05 | - | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| D | | 9.00 BSC | |
| D1 | | 7.00 BSC | |
| E | | 9.00 BSC | |
| E1 | | 7.00 BSC | |
| L | 0.45 | 0.60 | 0.75 |
| N | | 48 | |
| e | | 0.50 BSC | |
| b | 0.17 | 0.22 | 0.27 |
| b1 | 0.17 | 0.20 | 0.23 |
| c | 0.09 | 0.15 | 0.20 |
| c1 | 0.09 | 0.13 | 0.16 |

# 64-Ball csBGA Package

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.

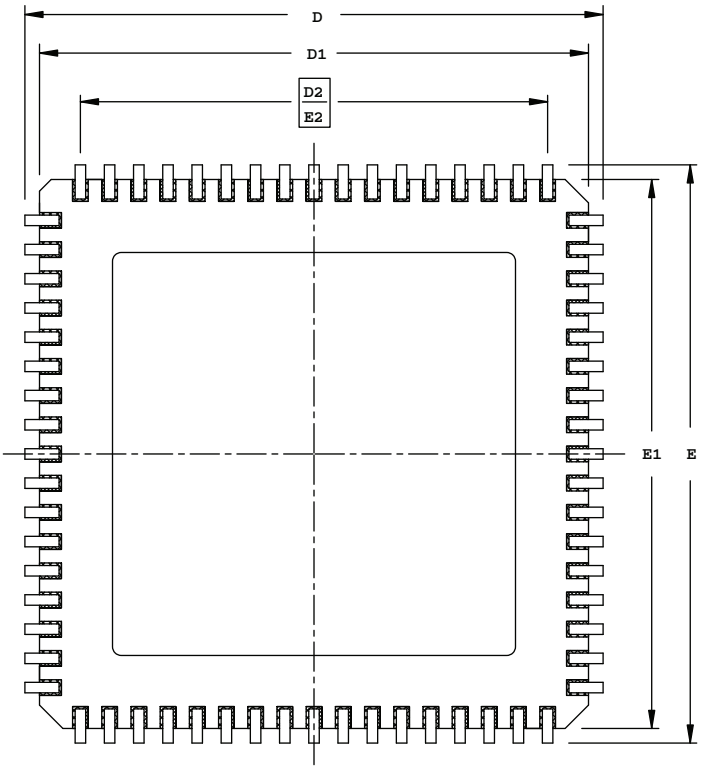
6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

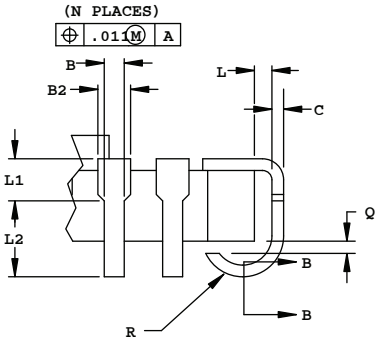
| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.15 | – | – |
| A2 | – | – | 0.85 |
| D/E | 5.00 BSC | | |
| M/N | 3.50 BSC | | |
| S | 0.25 BSC | | |
| b | 0.25 | 0.30 | 0.35 |
| e | 0.50 BSC | | |
| aaa | – | – | 0.10 |
| bbb | – | – | 0.10 |
| ddd | – | – | 0.08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

# 68-Pin JLCC Package

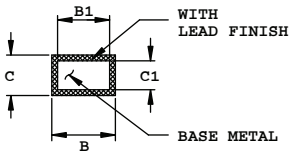
Dimensions in Inches

BOTTOM VIEW

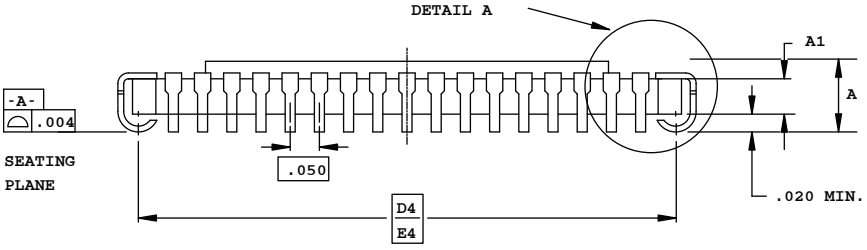



DETAIL A




SECTION B-B




SIDE VIEW

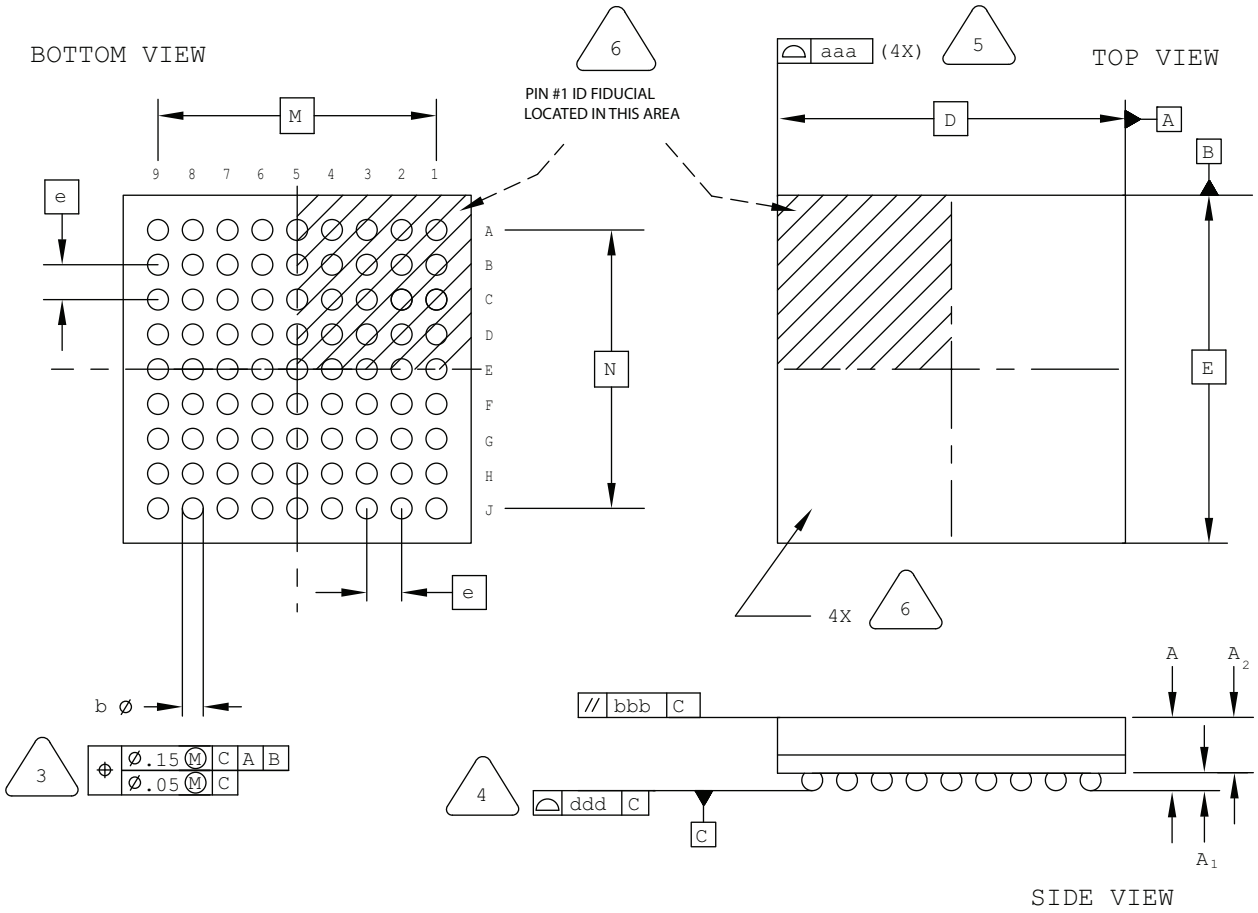
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN INCHES.
3. CORNER CHAMFERS AND/OR NOTCHES ARE OPTIONAL.

| SYMBOL | INCHES | | |
|---|---|---|---|
| | MIN. | | MAX. |
| A | .115 | - | .190 |
| A1 | .080 REF | | |
| B | .013 | - | .023 |
| B1 | .013 | - | .020 |
| B2 | .022 | - | .035 |
| C | .007 | - | .013 |
| C1 | .007 | - | .010 |
| D/E | .975 | .990 | 1.000 |
| D1/E1 | .920 | - | .960 |
| D2/E2 | .800 BSC | | |
| D4/E4 | .930 BSC | | |
| L | .005 | - | - |
| L1 | .020 | - | - |
| L2 | .025 | - | - |
| Q | .003 | - | - |
| R | .020 | - | .040 |
| N | 68 | | |

# 81-Ball csBGA Package

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.

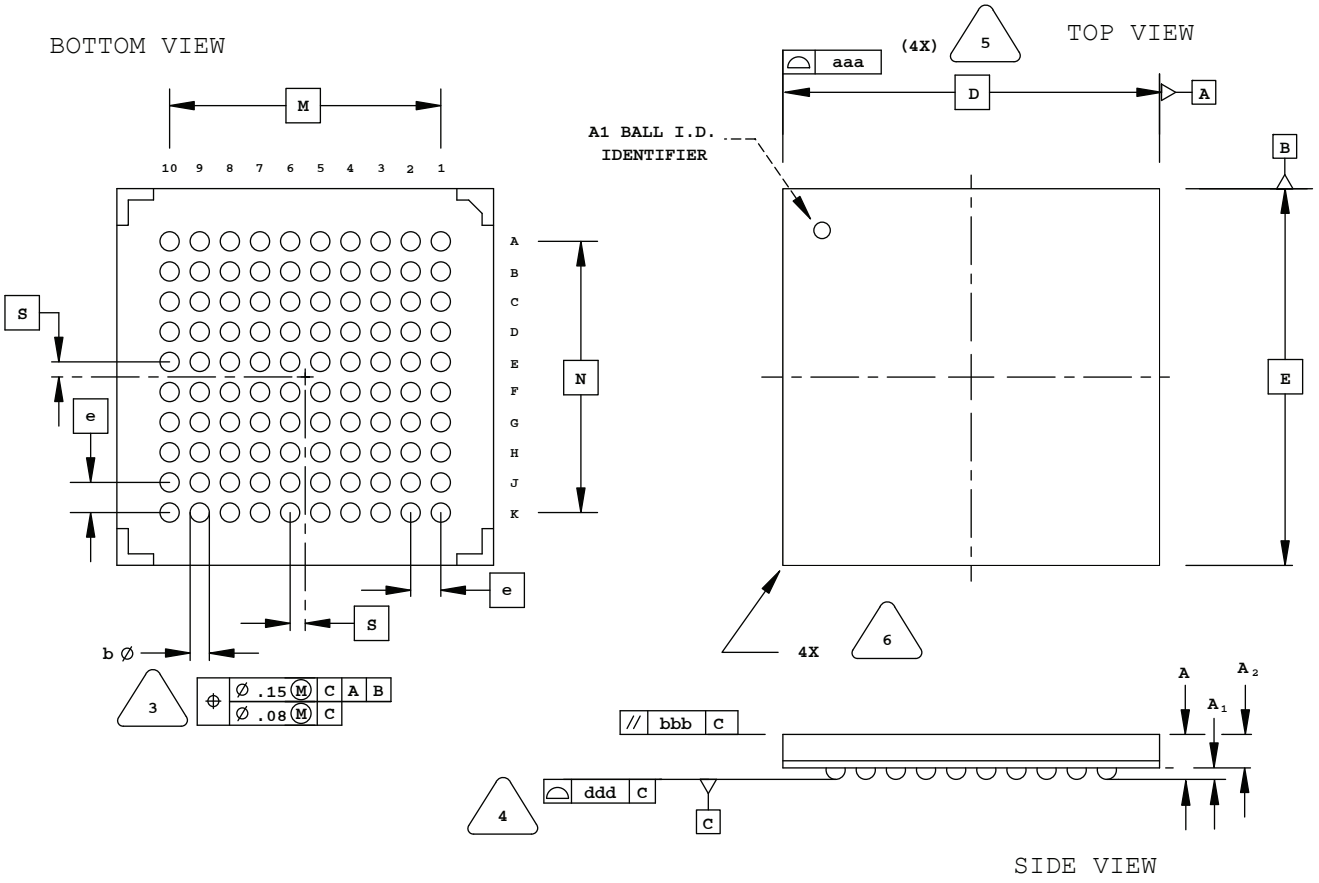
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.00 |
| A1 | 0.10 | - | - |
| A2 | - | - | 0.90 |
| D/E | 5.00 BSC | | |
| M/N | 4.00 BSC | | |
| b | 0.20 | 0.25 | 0.30 |
| e | 0.50 BSC | | |
| aaa | - | - | 0.10 |
| bbb | - | - | 0.10 |
| ddd | - | - | 0.10 |

# 100-Ball caBGA Package

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.

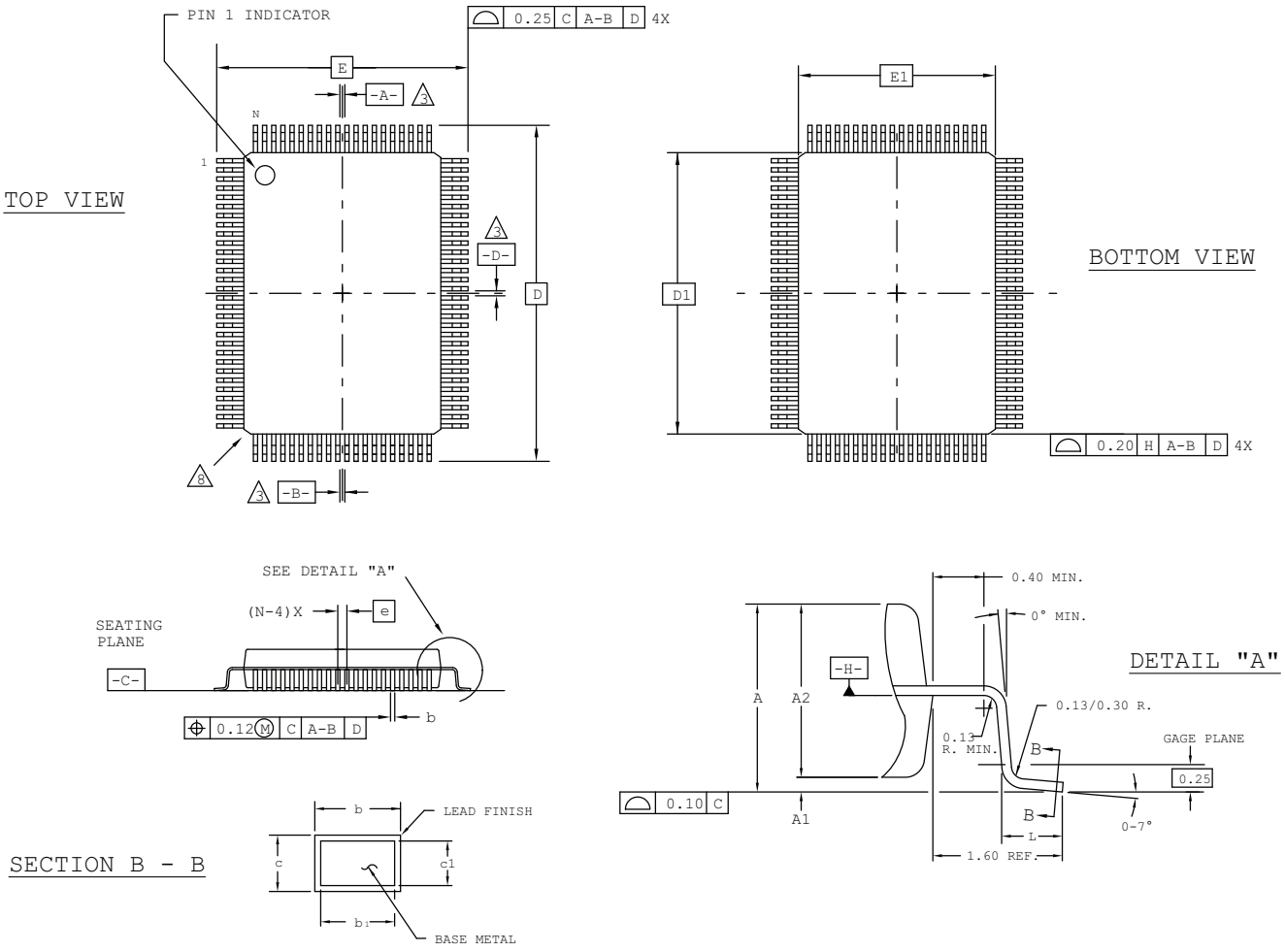
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.30 | 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-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 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.

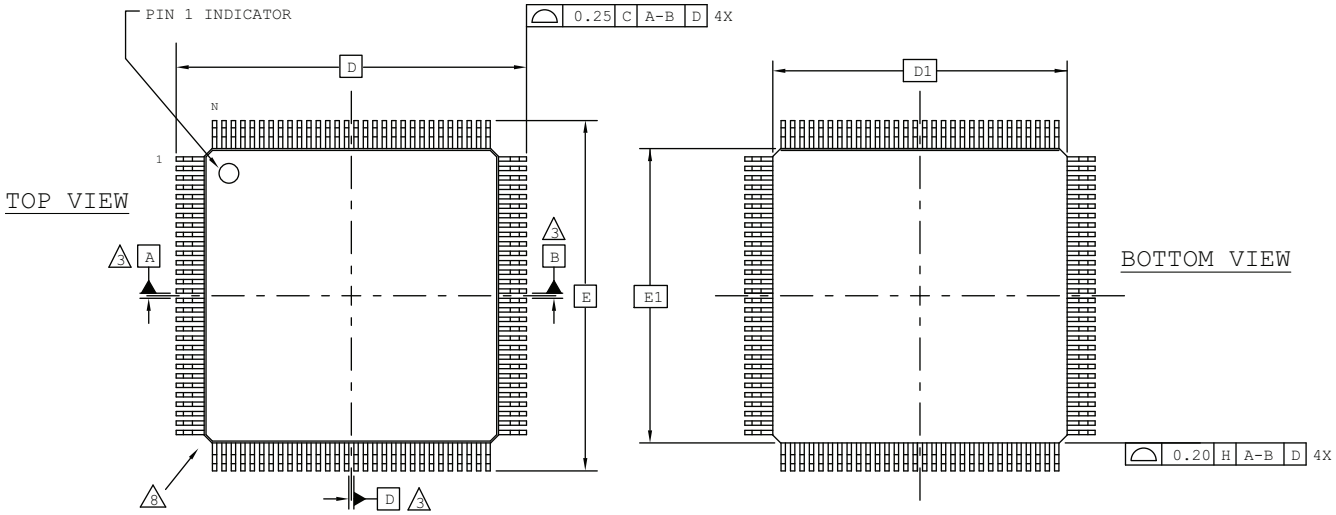
8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

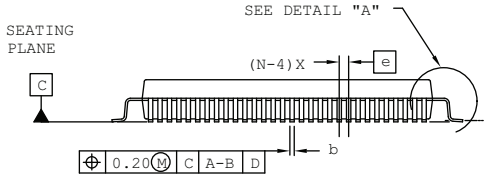
9 EXACT SHAPE OF EXPOSED HEATSINK IS OPTIONAL.

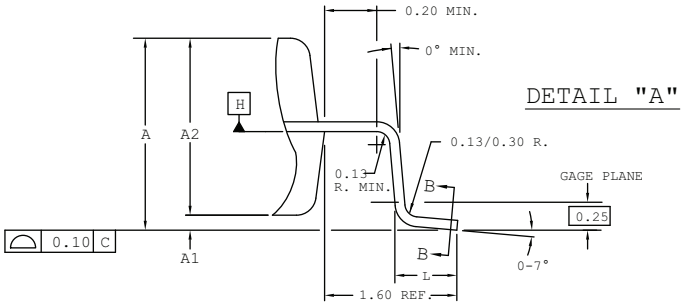
| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 3.40 |
| A1 | 0.25 | - | 0.50 |
| A2 | 2.50 | 2.70 | 2.90 |
| D | | 23.20 BSC | |
| D1 | | 20.00 BSC | |
| E | | 17.20 BSC | |
| E1 | | 14.00 BSC | |
| L | 0.73 | 0.88 | 1.03 |
| N | | 100 | |
| e | | 0.65 BSC | |
| b | 0.22 | - | 0.40 |
| b1 | 0.22 | 0.30 | 0.36 |
| c | 0.11 | - | 0.23 |
| c1 | 0.11 | 0.15 | 0.19 |

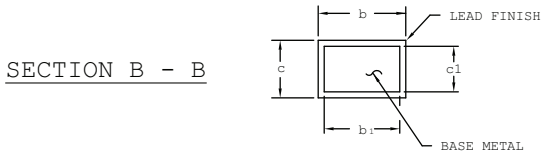
# 128-Pin PQFP Package

Dimensions in Millimeters




NOTES:

1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.

2.0 ALL DIMENSIONS ARE IN MILLIMETERS.

3 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.

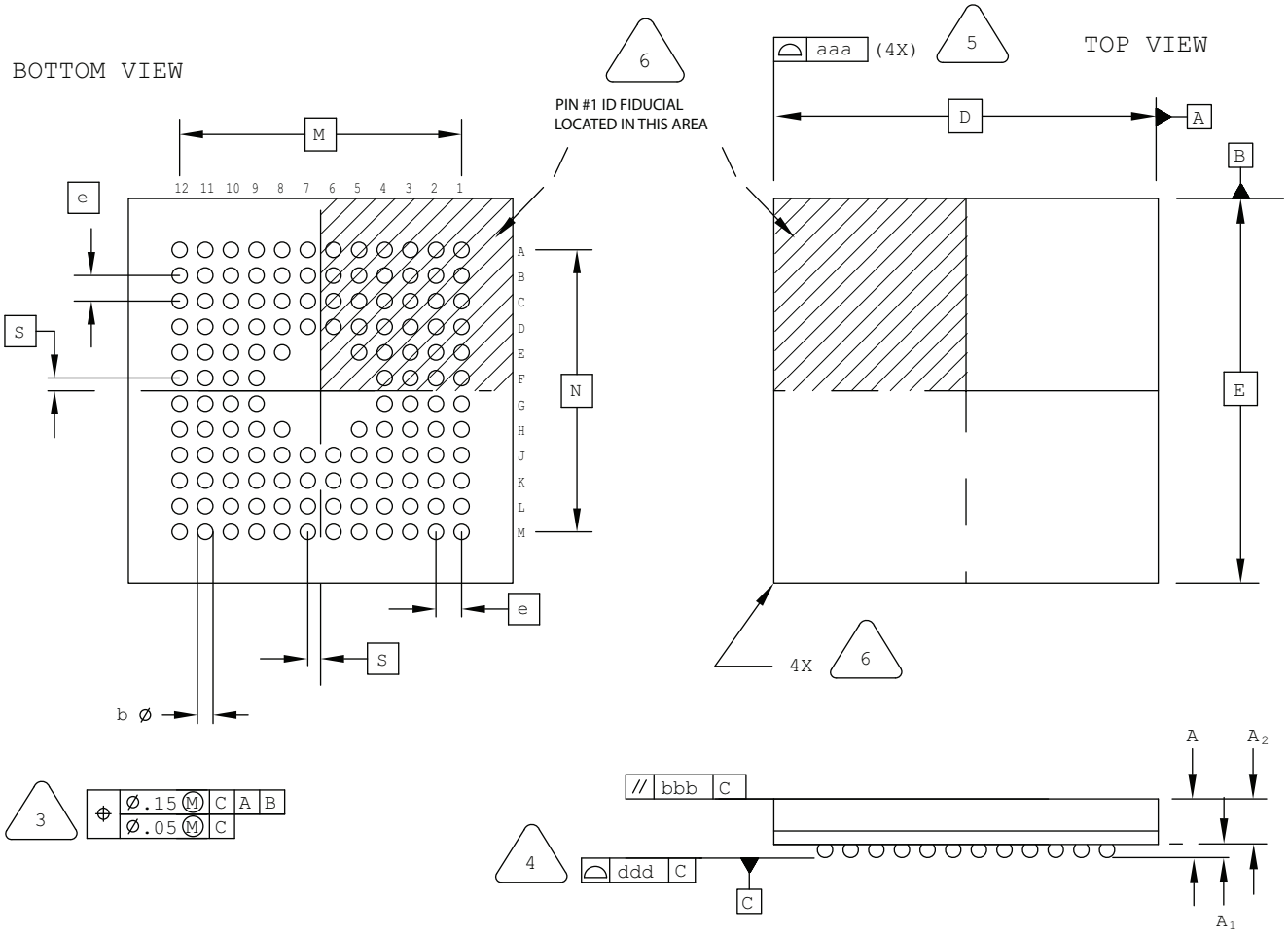
8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

9 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 |

# 132-Ball ucBGA Package

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.

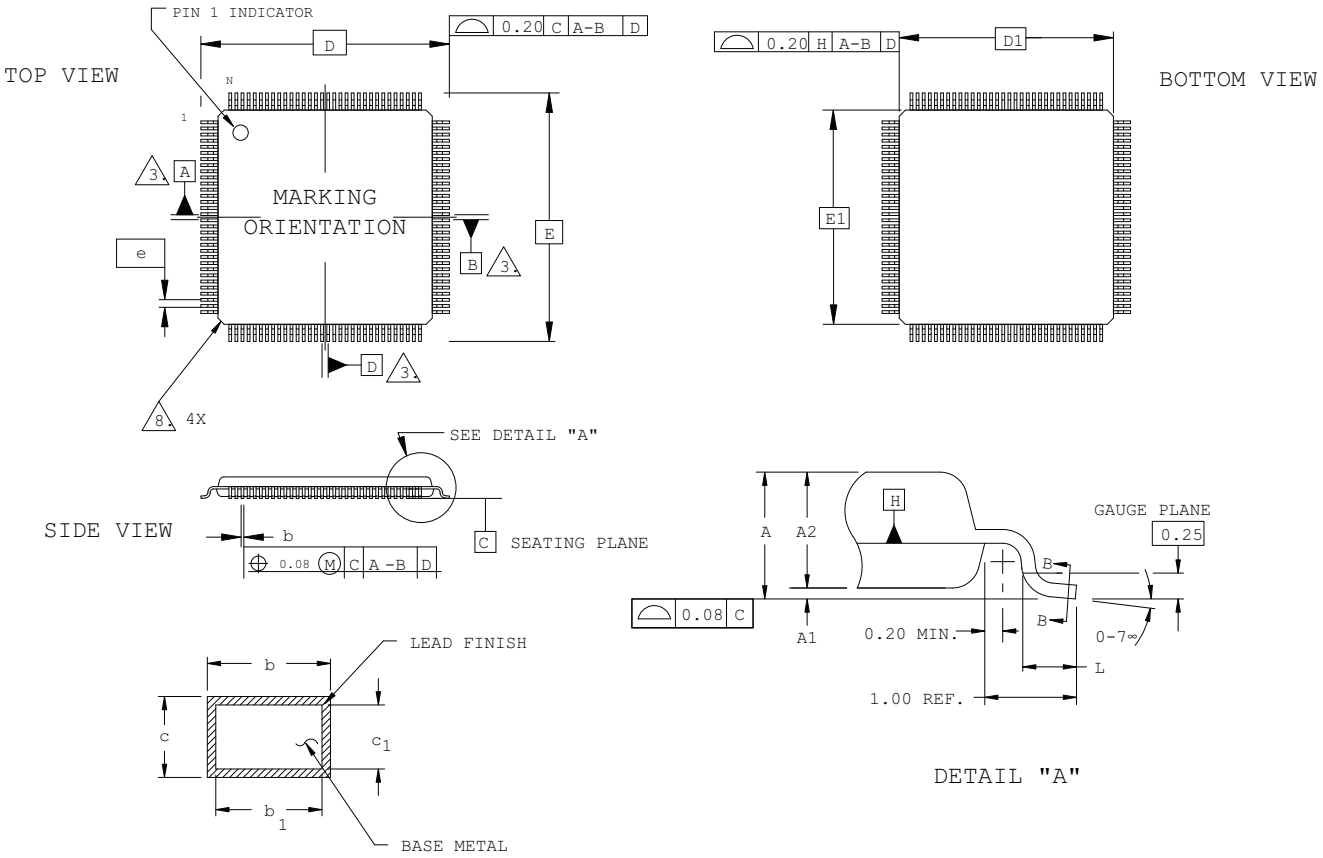
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.00 |
| A1 | 0.10 | - | - |
| A2 | - | - | 0.90 |
| D/E | 6.00 BSC | | |
| M/N | 4.40 BSC | | |
| S | 0.20 BSC | | |
| b | 0.20 | 0.25 | 0.30 |
| e | 0.40 BSC | | |
| aaa | - | - | 0.10 |
| bbb | - | - | 0.10 |
| ddd | - | - | 0.08 |

# 144-Pin TQFP Package

Dimensions in Millimeters



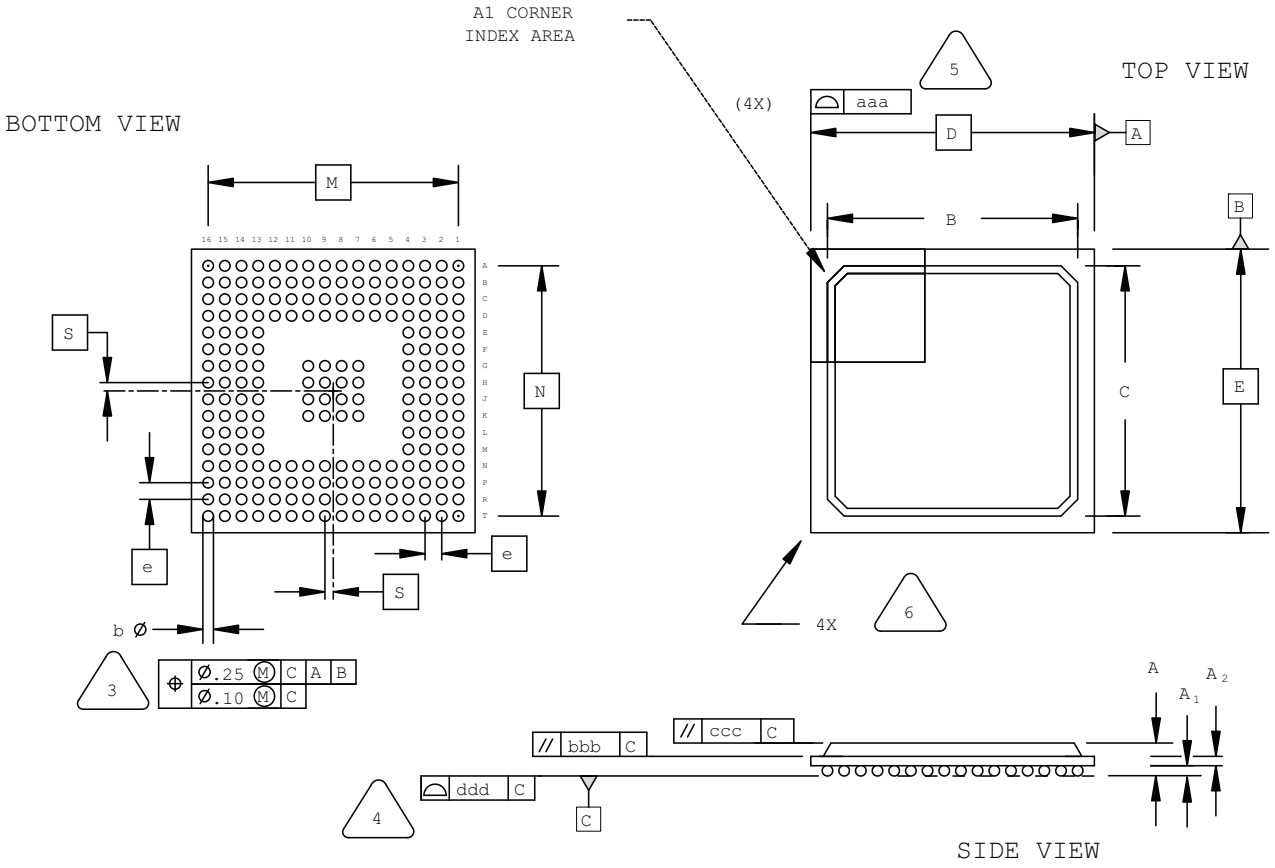

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
5. THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
6. 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. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
8. EXACT SHAPE OF EACH CORNER IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.60 |
| A1 | 0.05 | - | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| D | | 22.00 BSC | |
| D1 | | 20.00 BSC | |
| E | | 22.00 BSC | |
| E1 | | 20.00 BSC | |
| L | 0.45 | 0.60 | 0.75 |
| N | | 144 | |
| e | | 0.50 BSC | |
| b | 0.17 | 0.22 | 0.27 |
| b1 | 0.17 | 0.20 | 0.23 |
| c | 0.09 | 0.15 | 0.20 |
| c1 | 0.09 | 0.13 | 0.16 |

# 208-Ball fpBGA Package

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.

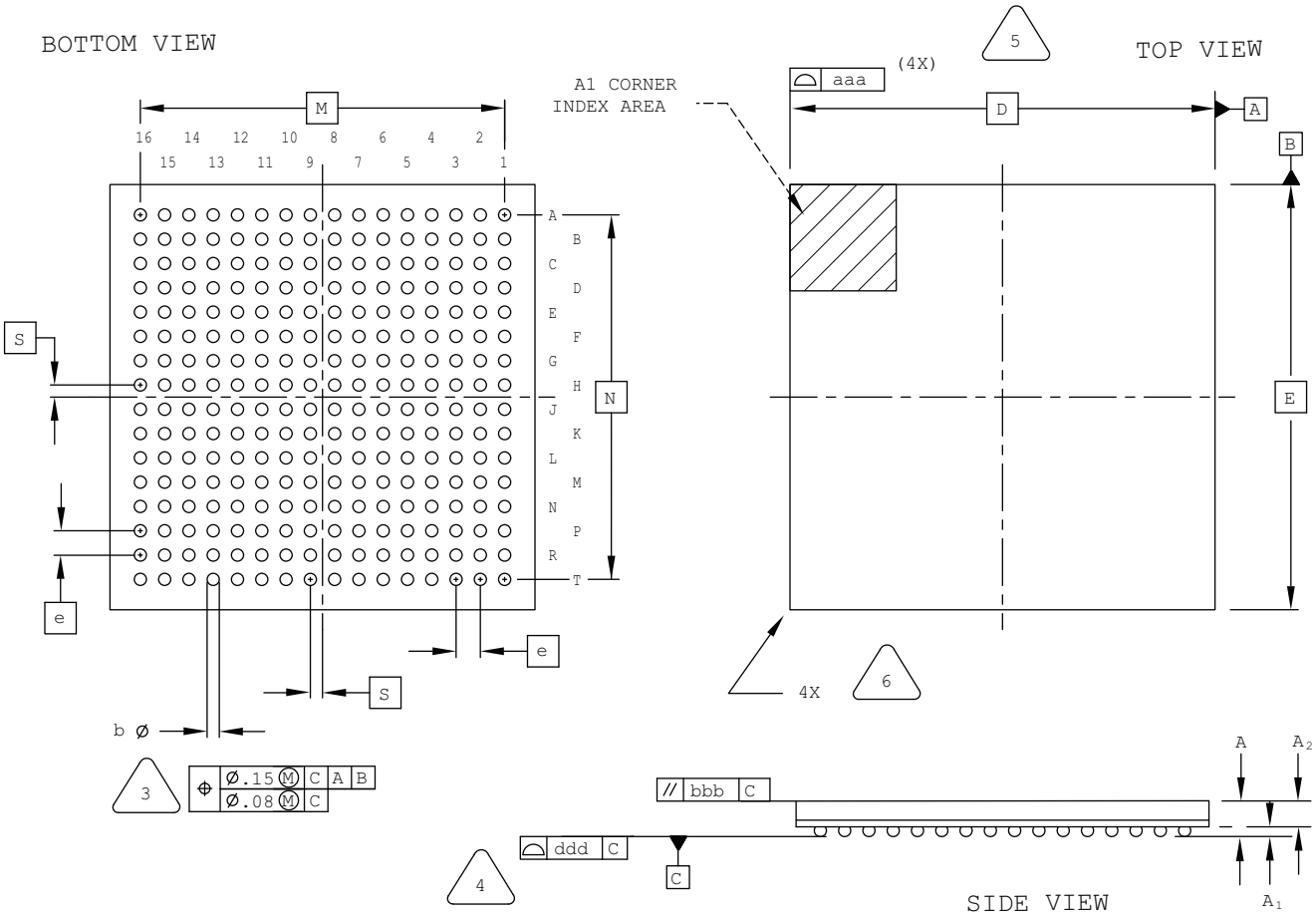
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.30 | 1.70 | 2.10 |
| A1 | 0.30 | 0.50 | 0.70 |
| A2 | 0.30 | 0.50 | 0.70 |
| B/C | 14.80 | 15.30 | 15.80 |
| D/E | 17.00 BSC | | |
| M/N | 15.00 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 |

# 256-Ball caBGA Package

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.

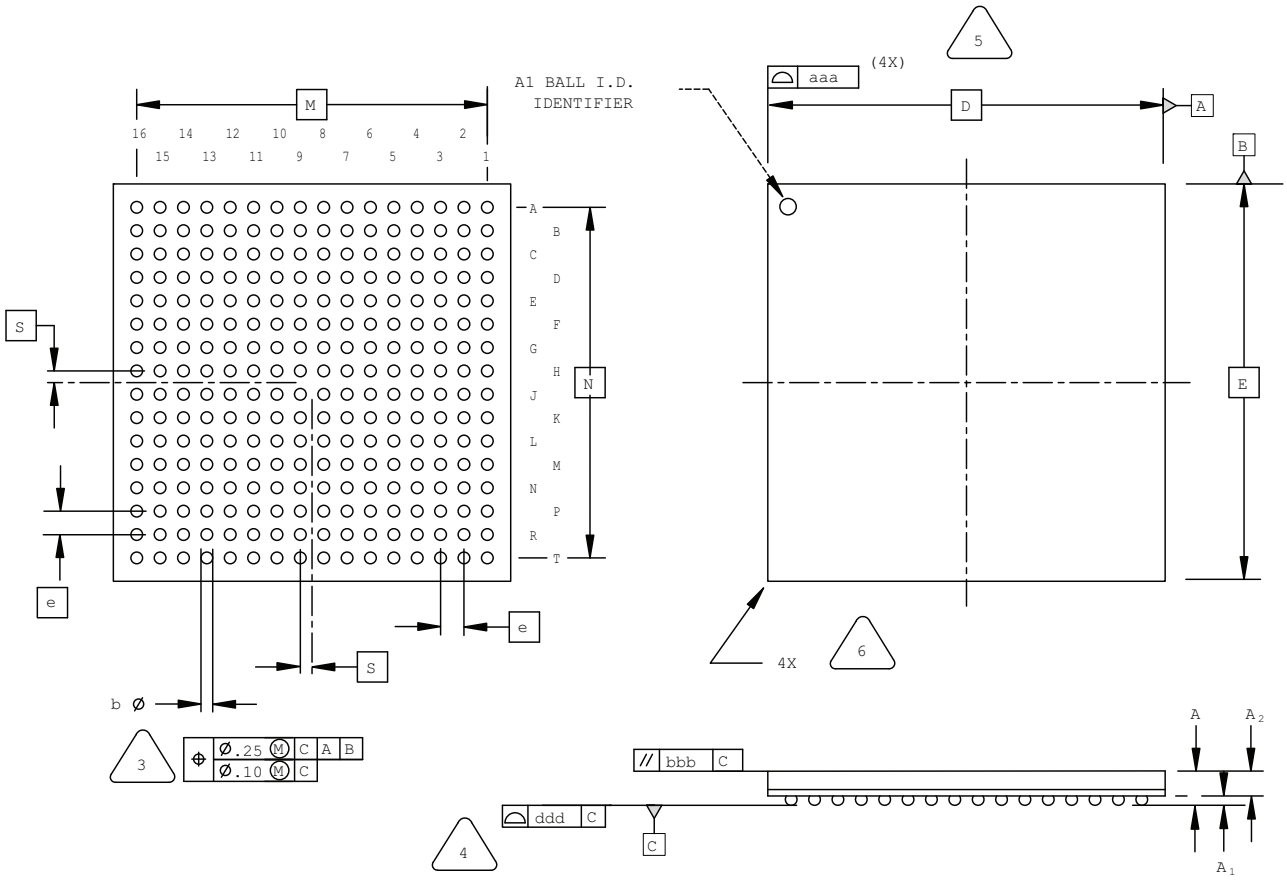
6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

7. REFERENCE JEDEC MO-275, VARIATION JJAB-2.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.70 |
| A1 | 0.25 | - | - |
| A2 | 0.65 | - | - |
| D/E | 14.0 BSC | | |
| M/N | 12.0 BSC | | |
| S | 0.40 BSC | | |
| b | 0.40 | 0.45 | 0.50 |
| e | 0.80 BSC | | |
| aaa | - | - | 0.15 |
| bbb | - | - | 0.20 |
| ddd | - | - | 0.20 |

# 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.

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.

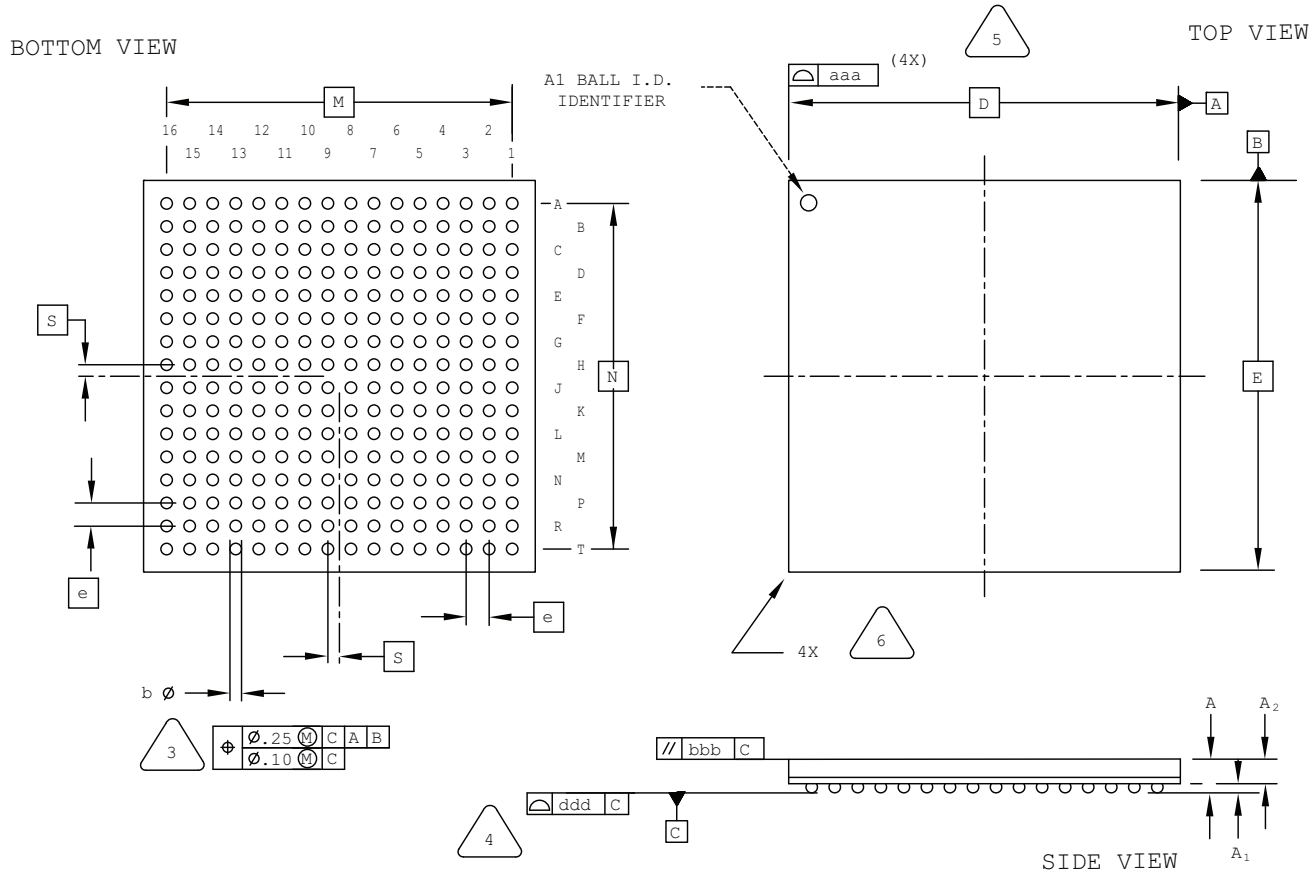
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.25 | 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.

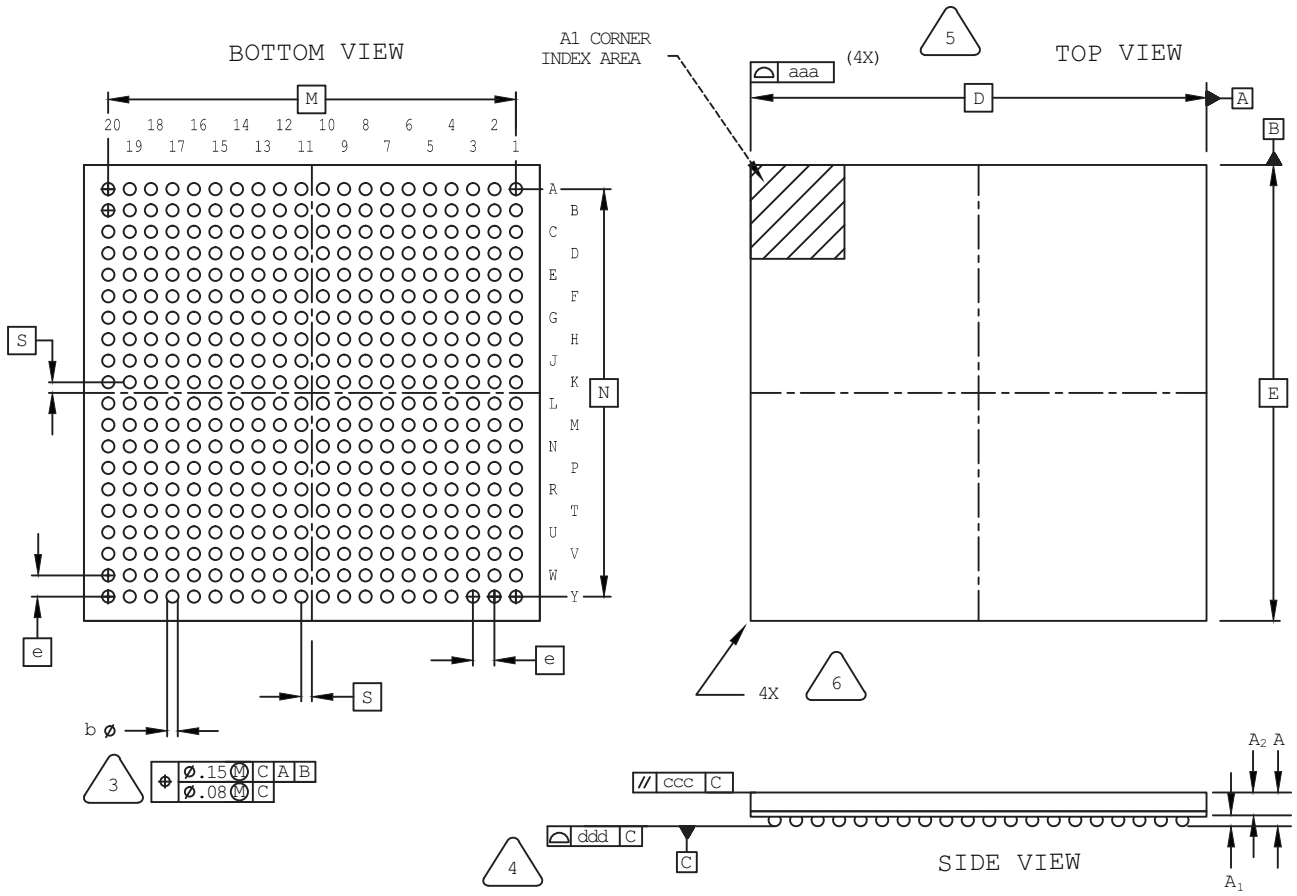
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

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 |

# 400-Ball caBGA Package

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.

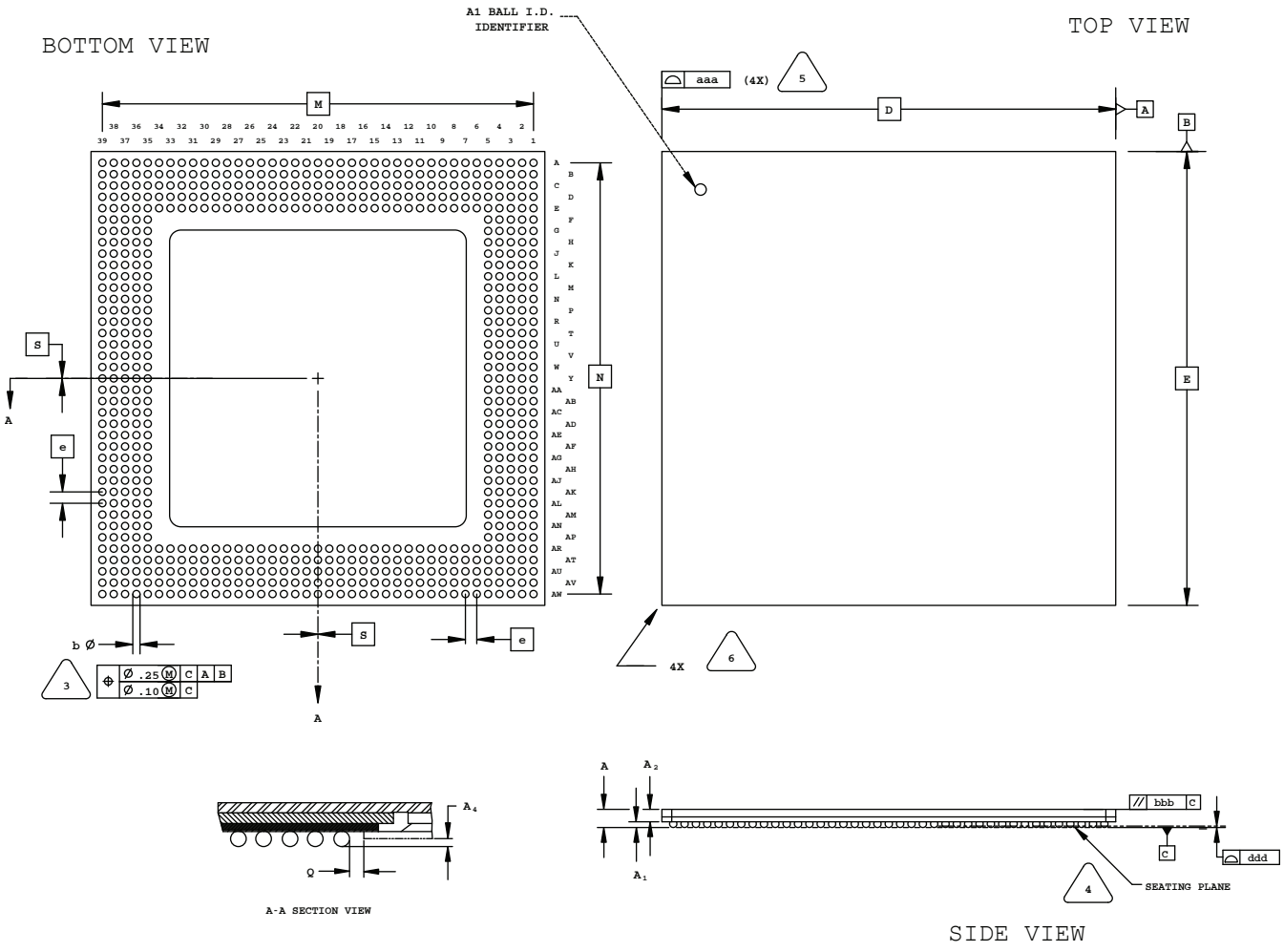
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.70 |
| A1 | 0.25 | 0.35 | - |
| A2 | 0.80 | 1.00 | - |
| D/E | 17.0 BSC | | |
| M/N | 15.2 BSC | | |
| S | 0.40 BSC | | |
| b | 0.40 | 0.45 | 0.50 |
| e | 0.80 BSC | | |
| aaa | - | - | 0.15 |
| ccc | - | - | 0.20 |
| ddd | - | - | 0.20 |

# 680-Ball fpSBGA Package

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.

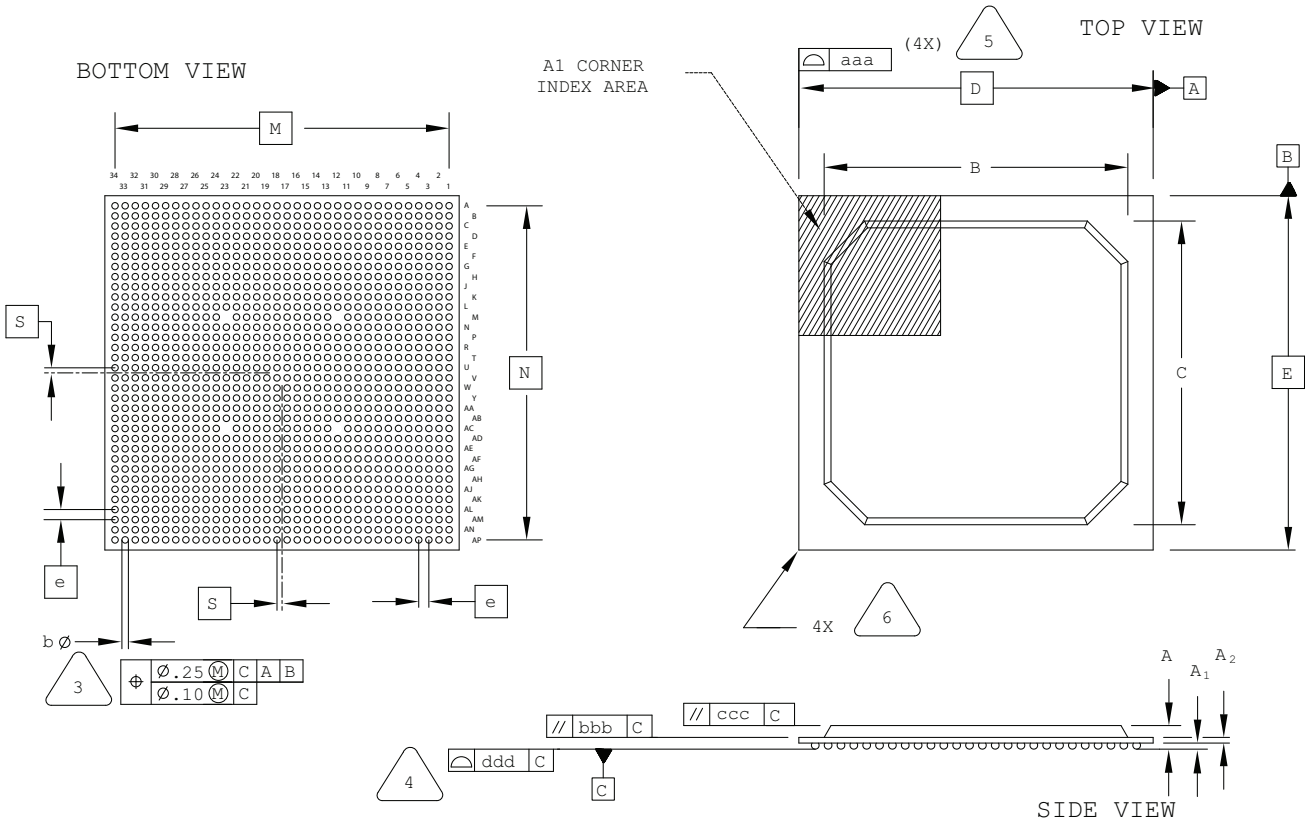
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.70 |
| A1 | 0.45 | 0.53 | 0.60 |
| A2 | 0.90 | 0.98 | 1.05 |
| D/E | 40.00 BSC | | |
| M/N | 38.00 BSC | | |
| S | 0.00 BSC | | |
| b | 0.50 | 0.65 | 0.80 |
| e | 1.00 BSC | | |
| Q | 0.25 | - | - |
| A4 | 0.10 | - | - |
| aaa | - | - | 0.20 |
| bbb | - | - | 0.25 |
| ddd | - | - | 0.20 |

# 1152-Ball fpBGA Package

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.

**Note:** Depopulated ball locations are M12, M23, AC12, and AC23.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.90 | 2.25 | 2.60 |
| A1 | 0.30 | 0.50 | 0.70 |
| A2 | 0.40 | 0.60 | 0.80 |
| B/C | 29.80 | 30.30 | 30.80 |
| D/E | 35.00 BSC | | |
| M/N | 33.00 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 |