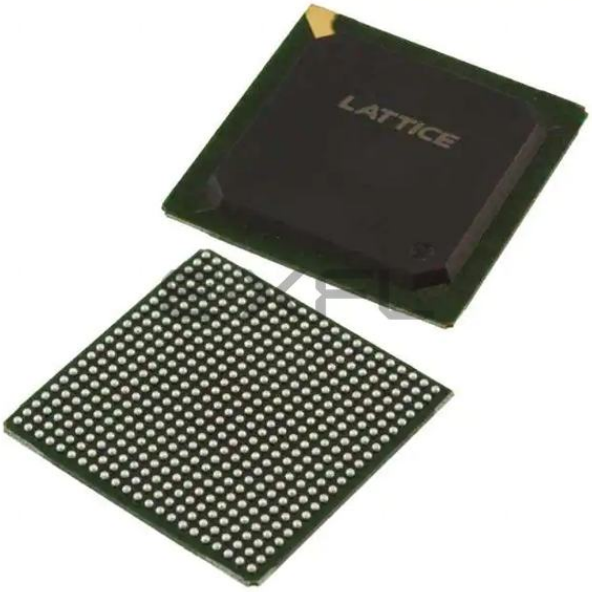
# Lattice Semiconductor Corporation - LFEC10E-4F484I Datasheet



## 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.

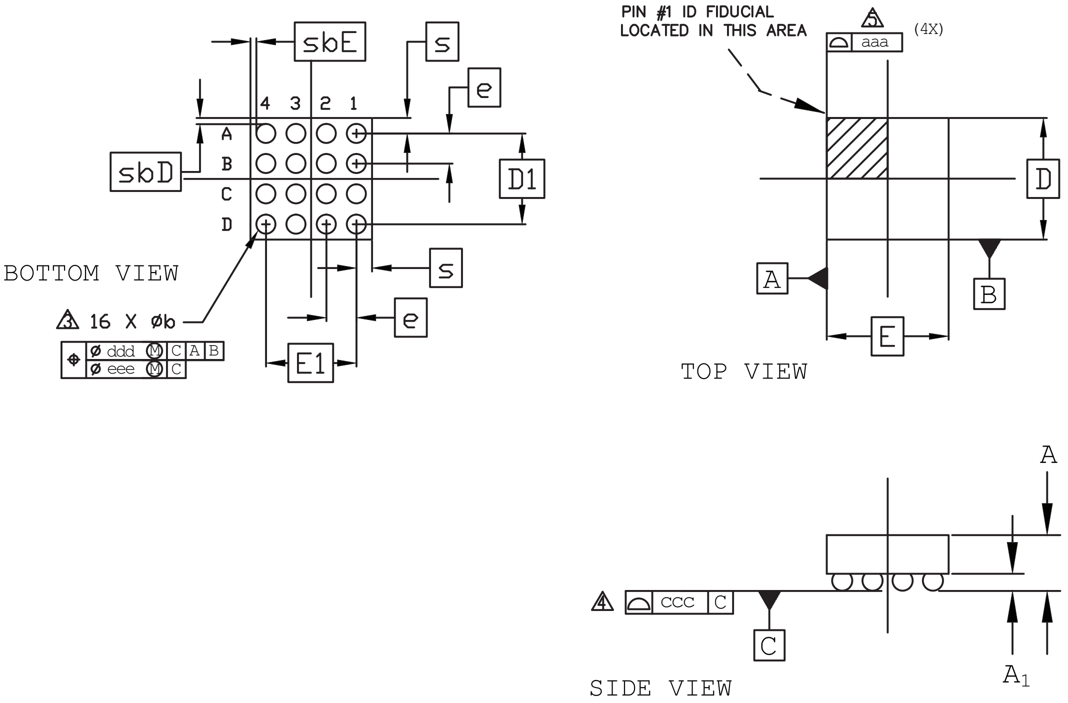
## Applications of Embedded - FPGAs

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 | -40°C ~ 100°C (TJ) |
| Package / Case | 484-BBGA |
| Supplier Device Package | 484-FPBGA (23x23) |
| Purchase URL | https://www.e-xfl.com/product-detail/lattice-semiconductor/lfec10e-4f484i |

# 16-Ball WLCS Package Option 2: iCE40 UltraLite$^{TM}$

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 MEASURES AT THE MAXIMUM BUMP DIAMETER PARALLEL TO PRIMARY DATUM C.

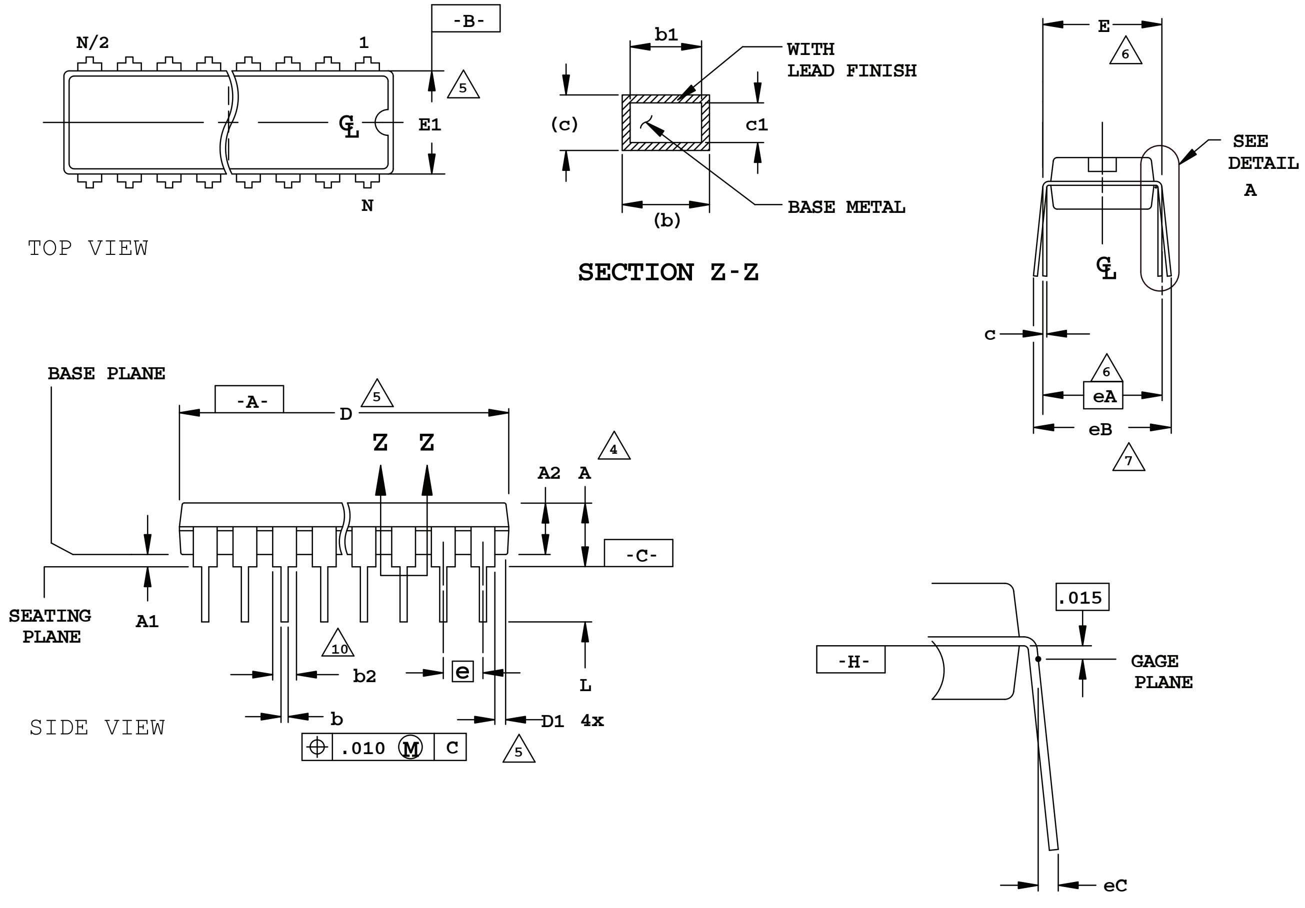
△4 PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BUMPS.

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

| REF. | Min. | Nom. | Max. |
|---|---|---|---|
| A | 0.413 | 0.452 | 0.491 |
| A1 | 0.122 | 0.152 | 0.182 |
| b | 0.188 | 0.218 | 0.248 |
| D | 1.409 BSC | | |
| E | 1.409 BSC | | |
| D1 | 1.05 BSC | | |
| E1 | 1.05 BSC | | |
| e | 0.35 BSC | | |
| s | – | 0.180 | – |
| sbD | 0.067 | 0.071 | 0.072 |
| sbE | 0.067 | 0.071 | 0.072 |
| aaa | 0.03 | | |
| ccc | 0.03 | | |
| ddd | 0.050 | | |
| eee | 0.015 | | |

# 20-Pin Plastic DIP Package

Dimensions in Inches



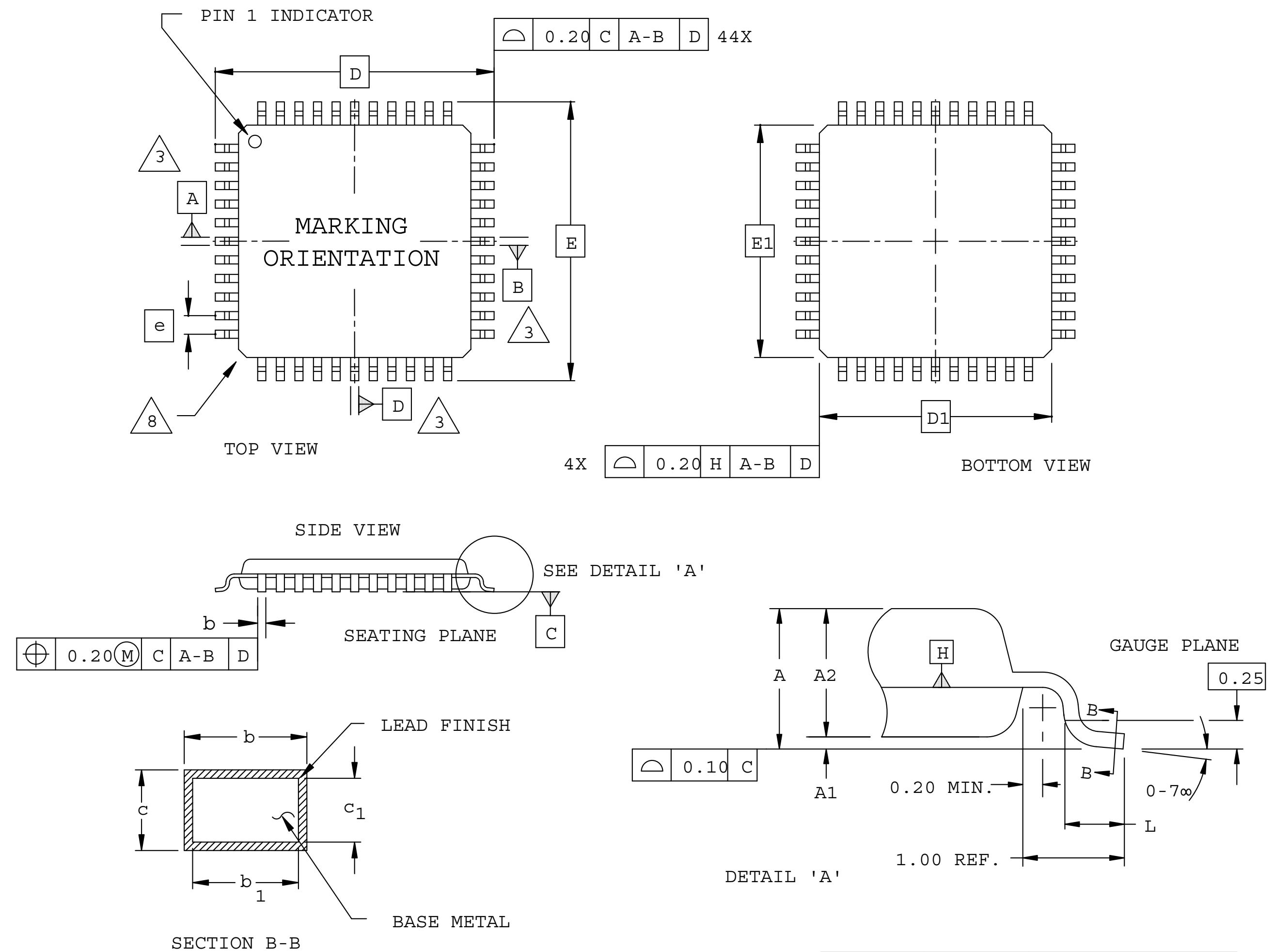
NOTES:

1. CONTROLLING DIMENSION: INCH.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M
3. DISTANCE BETWEEN LEADS INCLUDING DAMBAR PROTRUSIONS TO BE .005 MINIMUM.
4. DIMENSIONS A, A1 & L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.
5. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010
6. E AND eA MEASURED WITH THE LEADS CONSTRAINED TO BE PERPENDICULAR TO DATUM -C-
7. eB AND eC ARE MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
8. N IS THE MAXIMUM NUMBER OF LEAD POSITIONS.
9. POINTED OR ROUNDED LEAD TIPS ARE PREFERRED TO EASE INSERTION
10. b2 MAXIMUM DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED .010
11. DATUM PLANE -H- COINCIDENT WITH THE BOTTOM OF LEAD , WHERE LEAD EXITS BODY

| SYMBOL | N = 20 | | | NOTE |
|---|---|---|---|---|
| | INCHES | | | |
| | MIN. | NOM. | MAX. | |
| A | - | - | .210 | 4 |
| A1 | .015 | - | - | 4 |
| A2 | .115 | .130 | .195 | |
| b | .014 | .018 | .022 | |
| b1 | .014 | .018 | .020 | |
| b2 | .045 | .060 | .070 | 10 |
| c | .008 | .010 | .014 | |
| c1 | .008 | .010 | .011 | |
| D | .980 | 1.030 | 1.060 | 5 |
| D1 | .005 | - | - | 5 |
| E | .300 | .310 | .325 | 6 |
| E1 | .240 | .250 | .280 | 5 |
| e | .100 BSC | | | |
| eA | .300 BSC | | | 6 |
| eB | - | - | .430 | 7 |
| eC | .000 | - | .060 | 7 |
| L | .115 | .130 | .150 | 4 |

## 44-Pin TQFP Package (1.0 mm thick)

Dimensions in Millimeters



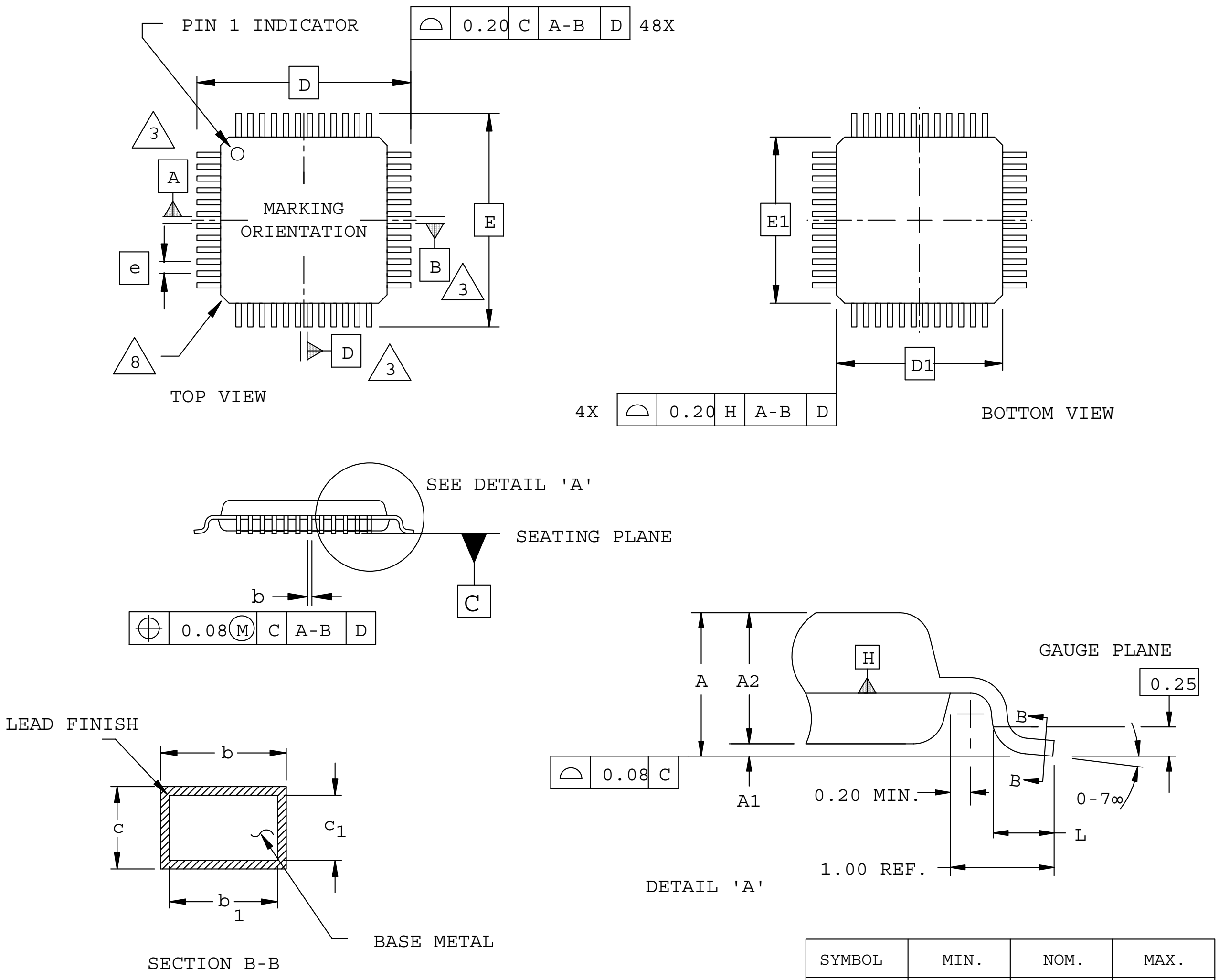
NOTES:

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 (1.0 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.

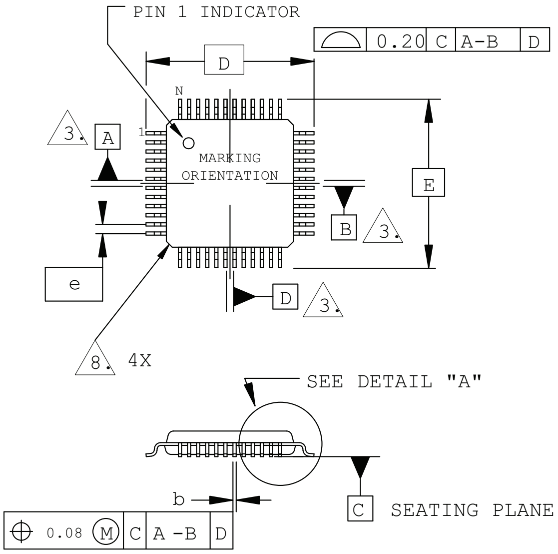
△8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.20 |
| A1 | 0.05 | - | 0.15 |
| A2 | .95 | 1.00 | 1.05 |
| D | 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 |

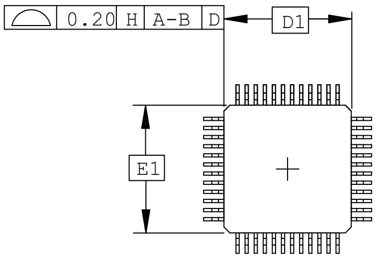
## 48-Pin TQFP Package (1.4 mm thick)

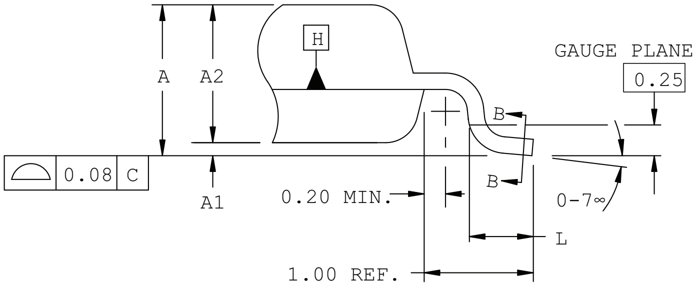
Dimensions in Millimeters

TOP VIEW

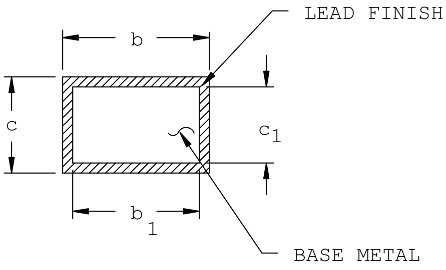


BOTTOM VIEW





DETAIL "A"



SECTION B - B

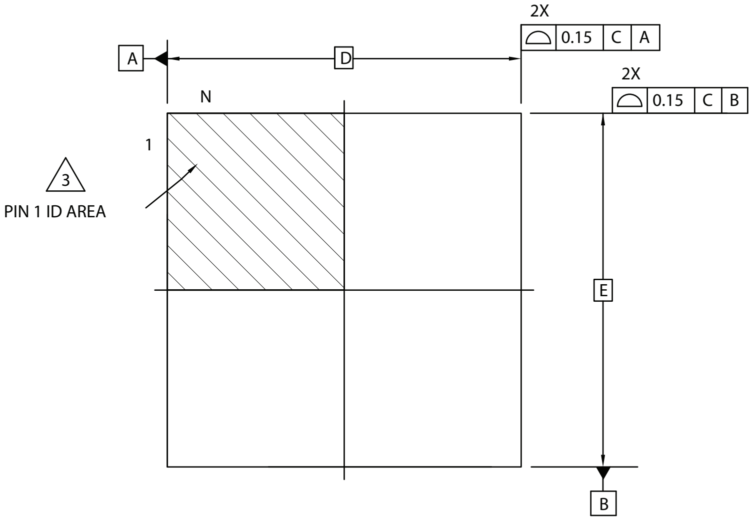
| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.60 |
| A1 | 0.05 | - | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| D | 9.00 BSC | | |
| D1 | 7.00 BSC | | |
| E | 9.00 BSC | | |
| E1 | 7.00 BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| N | 48 | | |
| e | 0.50 BSC | | |
| b | 0.17 | 0.22 | 0.27 |
|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

NOTES:

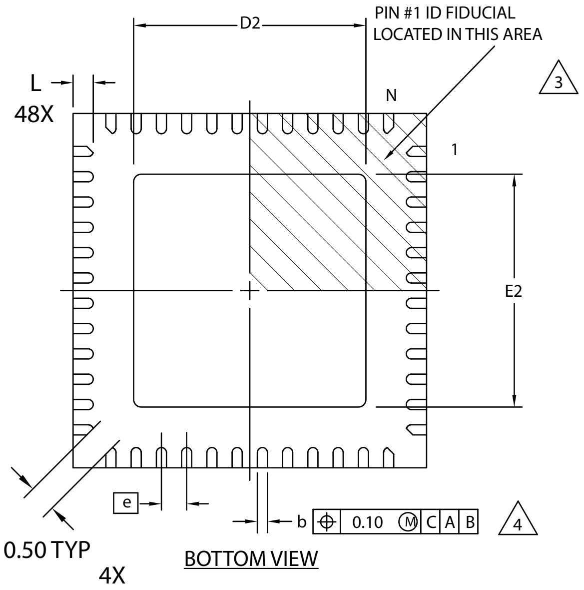
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
5. THE TOP OF PACKAGE MAY BE SMALLER 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.

## 48-Pin QFN Package Option 1

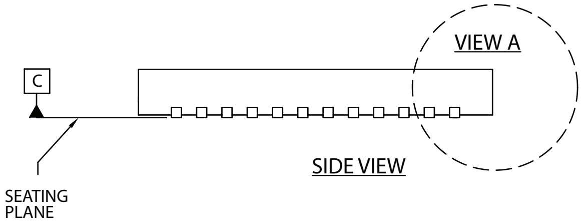
Dimensions in Millimeters



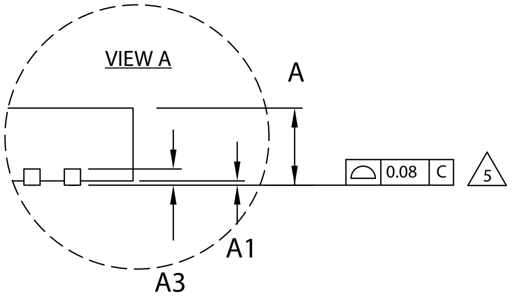
TOP VIEW



BOTTOM VIEW



SIDE VIEW



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.

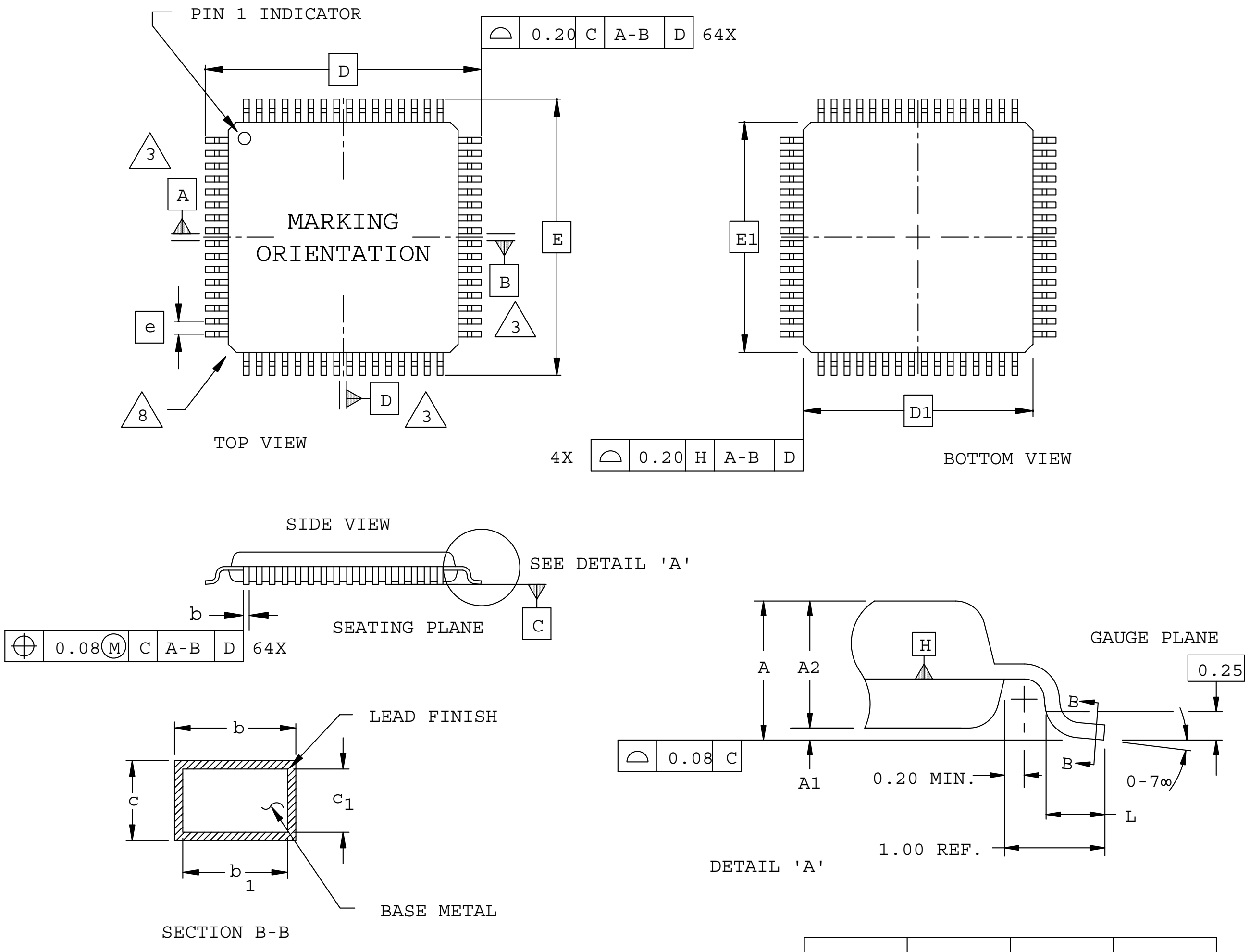
△4 DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.

△5 APPLIES TO EXPOSED PORTION OF TERMINALS.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 0.80 | 0.90 | 1.00 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | 0.2 REF | | |
| D | 7.0 BSC | | |
| D2 | 3.00 | - | 5.80 |
| E | 7.0 BSC | | |
| E2 | 3.00 | - | 5.80 |
| b | 0.18 | 0.24 | 0.30 |
| e | 0.50 BSC | | |
| L | 0.30 | 0.40 | 0.50 |

## 64-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.

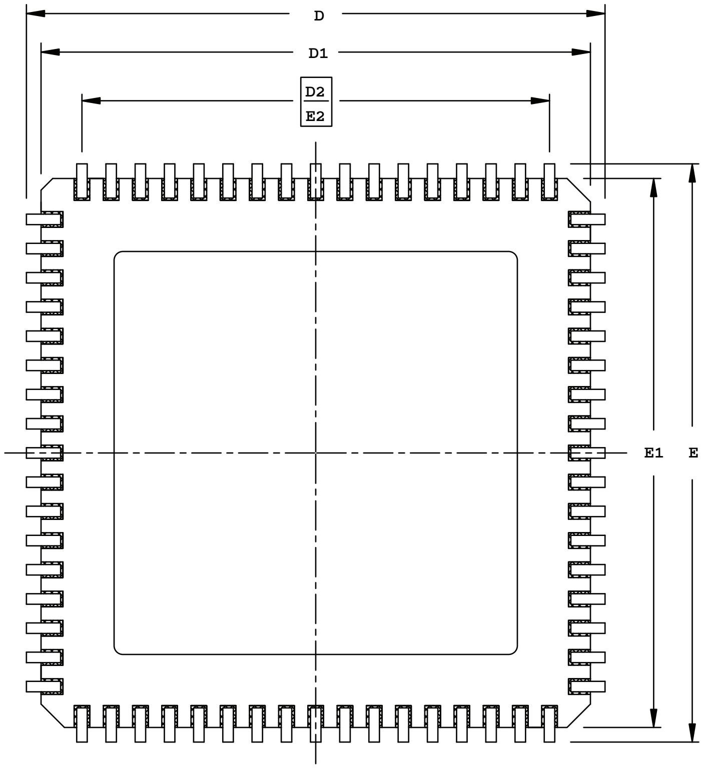
△8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

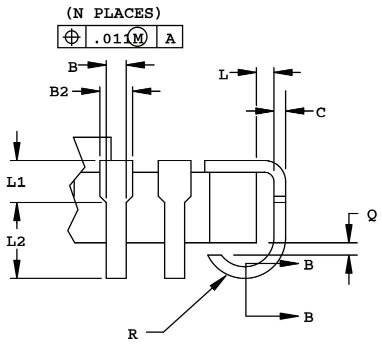
| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | - | - | 1.60 |
| A1 | 0.05 | - | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| D | 12.00 BSC | | |
| D1 | 10.00 BSC | | |
| E | 12.00 BSC | | |
| E1 | 10.00 BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| N | 64 | | |
| e | 0.50 BSC | | |
| b | 0.17 | 0.22 | 0.27 |
| b1 | 0.17 | 0.20 | 0.23 |
| c | 0.09 | - | 0.20 |
| c1 | 0.09 | - | 0.16 |

## 68-Pin JLCC Package

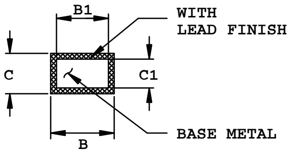
Dimensions in Inches

BOTTOM VIEW

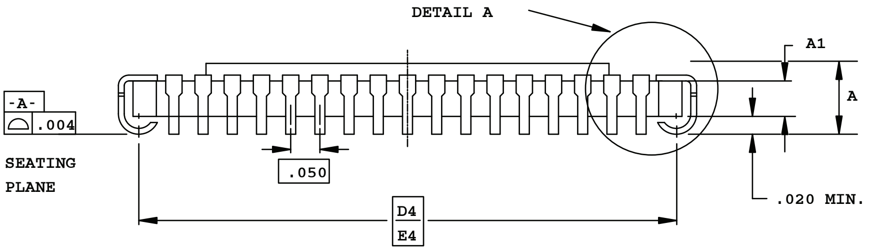




DETAIL A



SECTION B-B



SIDE VIEW

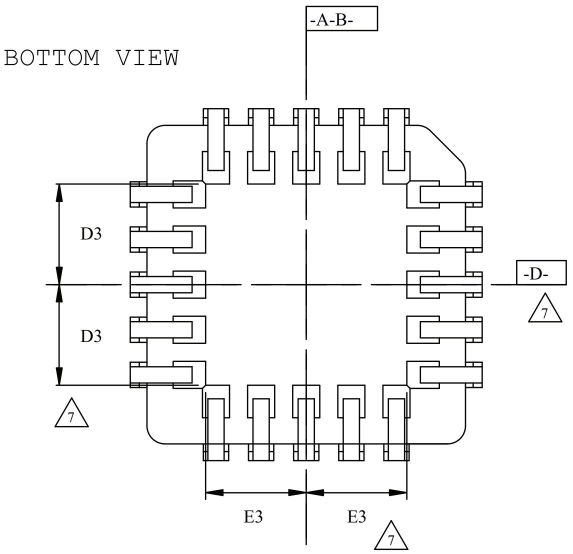
NOTES:

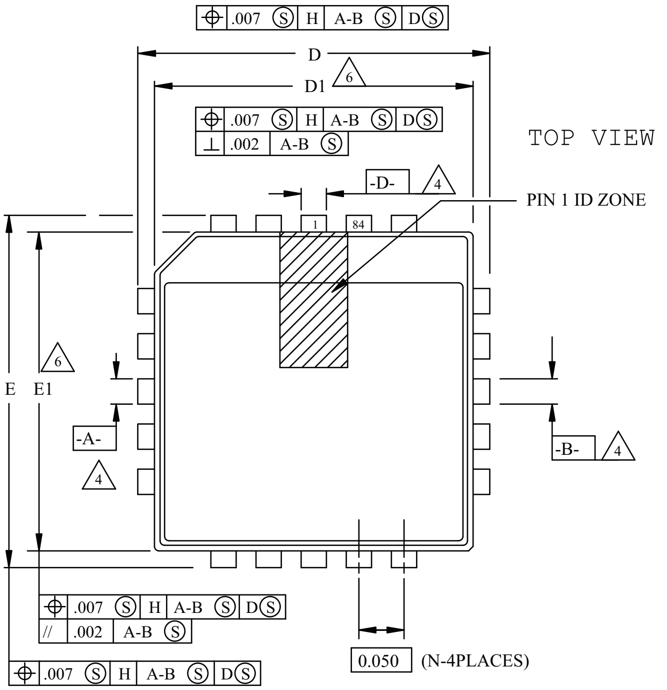
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN INCHES.
3. CORNER CHAMFERS AND/OR NOTCHES ARE OPTIONAL.

| 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 | | |

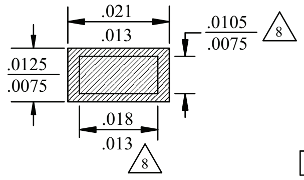
# 84-Pin PLCC Package

Dimensions in Inches

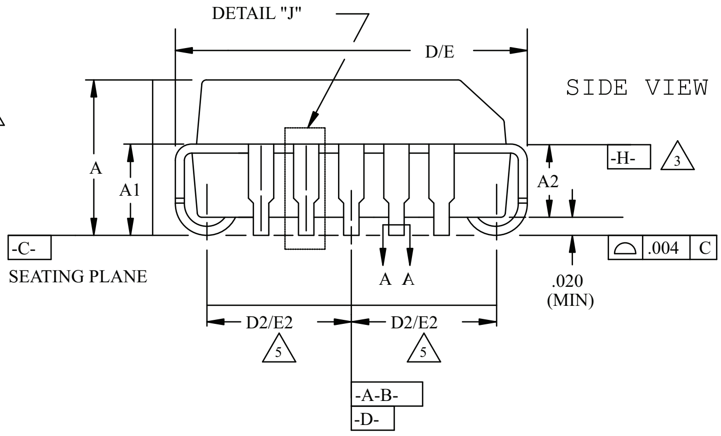




| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | .165 | .172 | .180 |
| A1 | .090 | .105 | .120 |
| A2 | .059 | - | .080 |
| D | 1.185 | 1.190 | 1.195 |
| D1 | 1.150 | 1.154 | 1.158 |
| D2 | .541 | .555 | .569 |
| D3 | | .475 | |
| E | 1.185 | 1.190 | 1.195 |
| E1 | 1.150 | 1.154 | 1.158 |
| E2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



SECTION A-A



NOTES:

1. ALL DIMENSIONS AND TOLERANCES CONFORM TO ANSI Y14.5M-1982
2. ALL DIMENSIONS IN INCHES

△3 DATUM PLANE -H- LOCATED AT TOP OF MOLD PARTING LINE AND COINCIDENT WITH TOP OF LEAD WHERE LEAD EXITS PLASTIC BODY

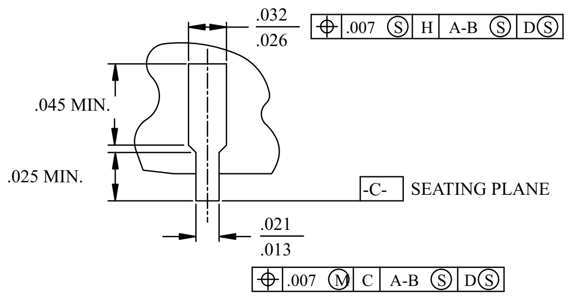
△4 DATUMS -A-B AND -D- TO BE DETERMINED WHERE CENTER LEADS EXIT PLASTIC BODY AT DATUM PLANE -H-

△5 TO BE MEASURED AT SEATING PLANE -C- CONTACT POINT

△6 DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .010 PER SIDE.

△7 TOP POINT OF MEASUREMENT IS DATUM -H- ; BOTTOM POINT OF MEASUREMENT IS AT MAJOR FLAT AREA OF LOWER PLASTIC SURFACE DEFINED BY D3/E3

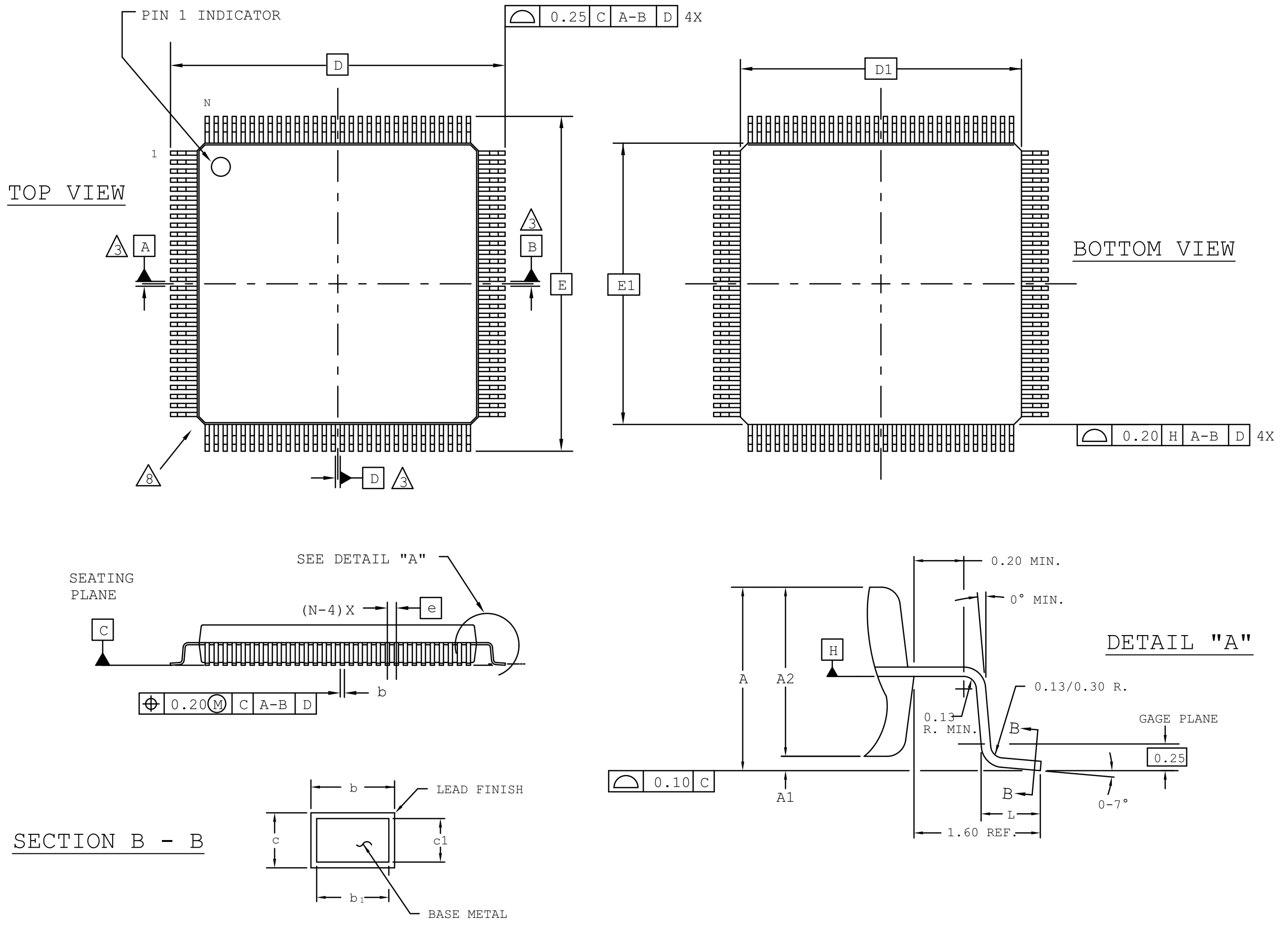
△8 DIMENSION APPLIES TO BASE METAL ONLY



DETAIL "J" (TYP ALL SIDES)

## 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 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.

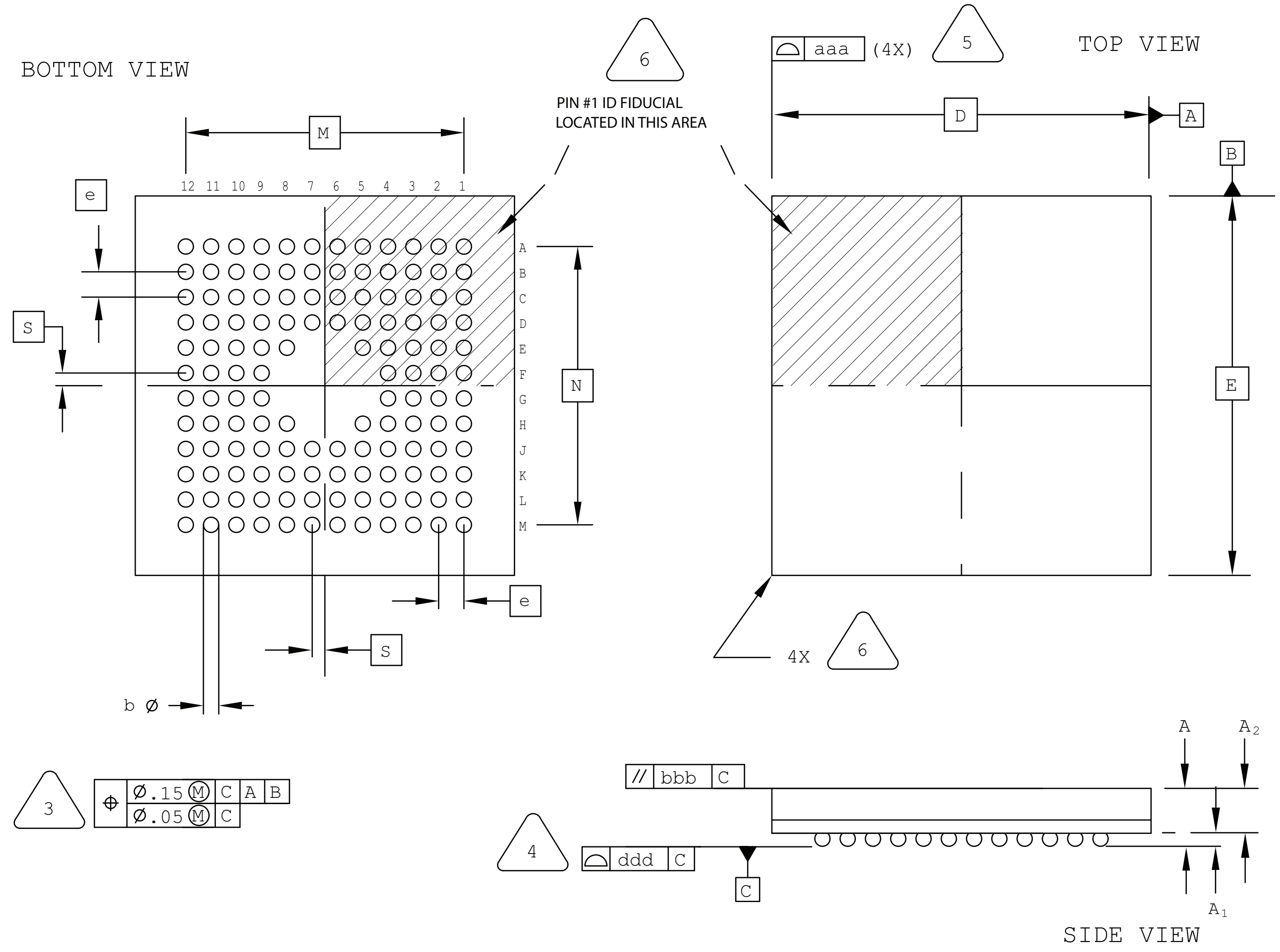
△8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

△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 | 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 |

## 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.

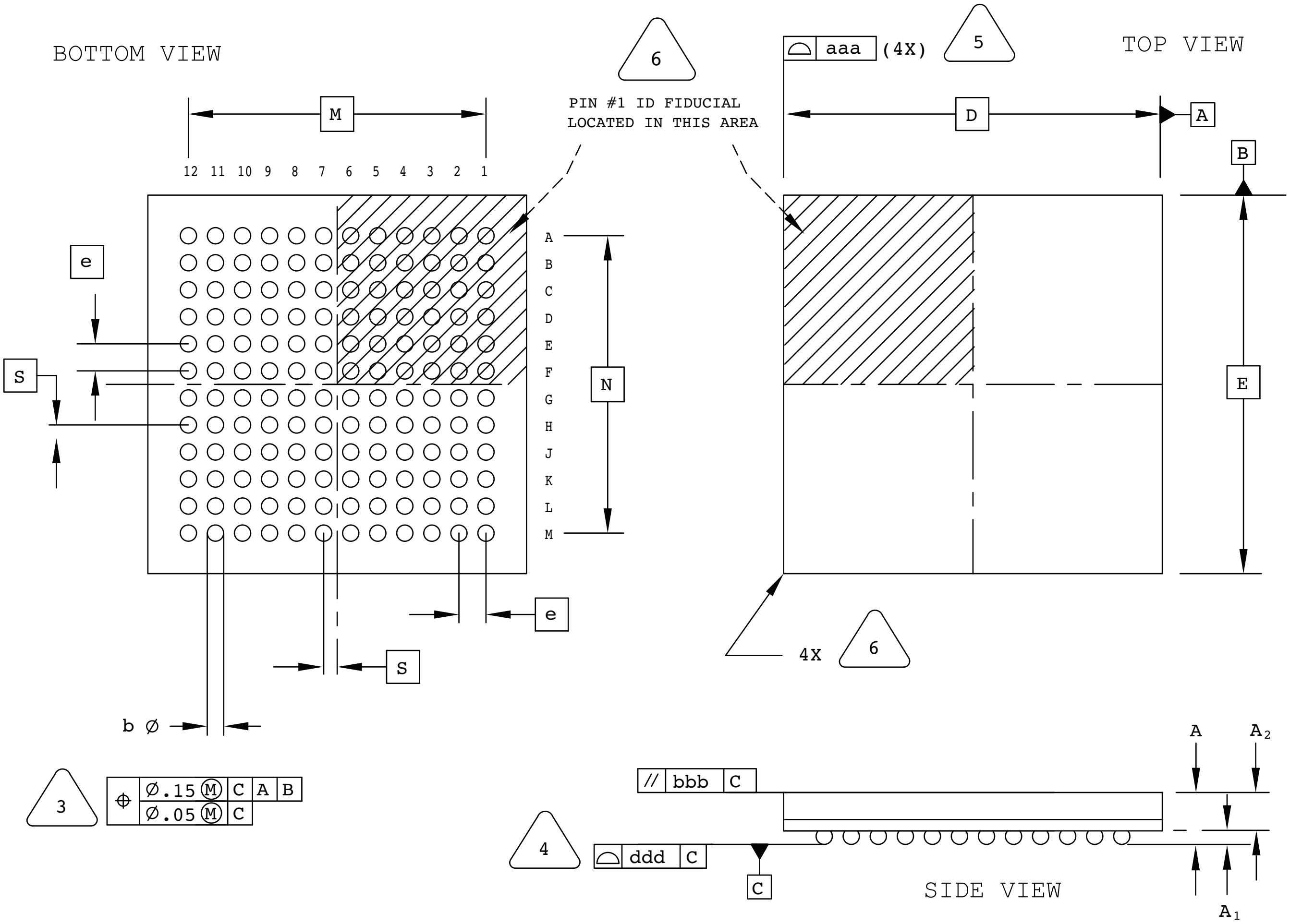
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

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-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.

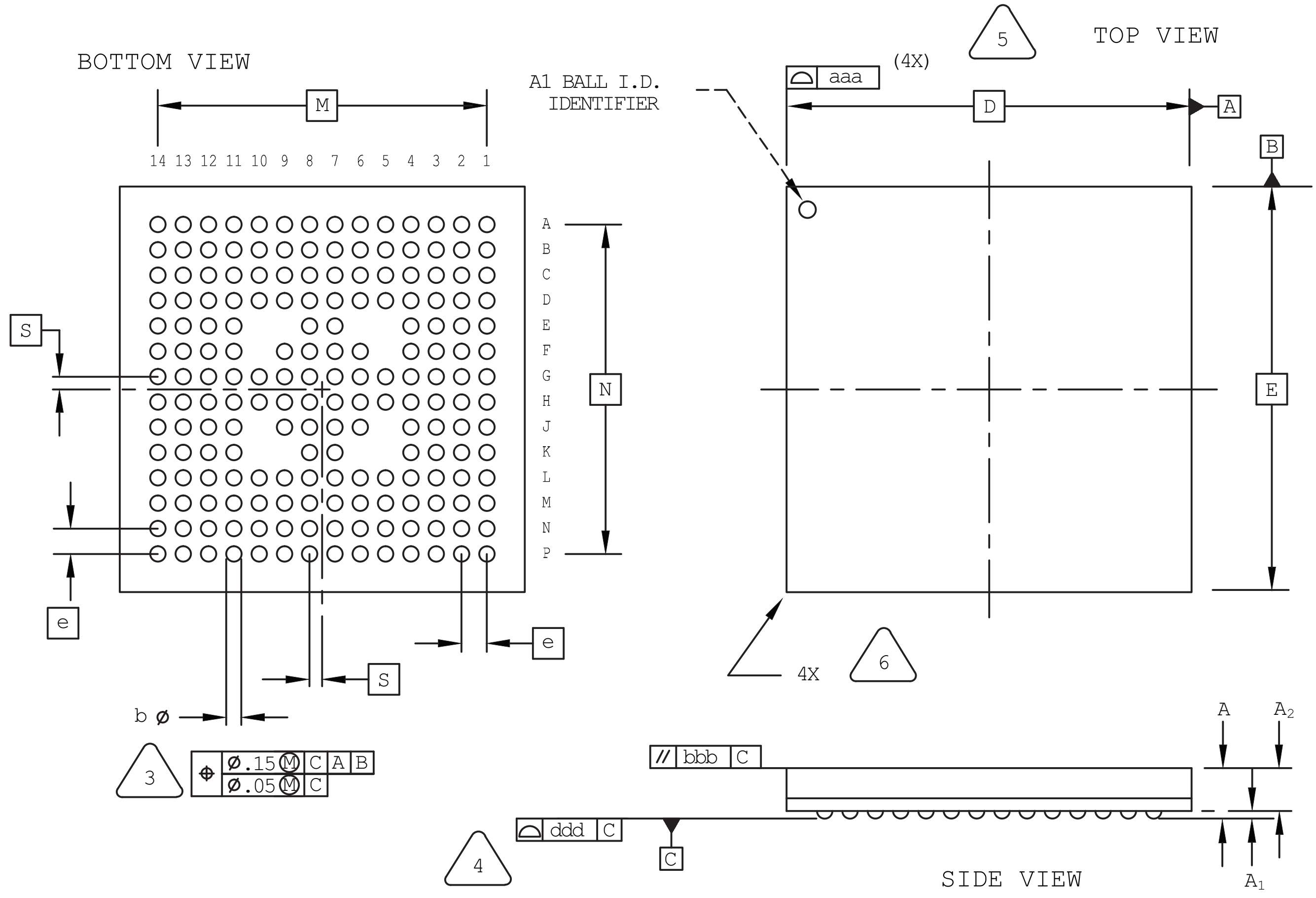
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

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 | 7.00 BSC | | |
| M/N | 5.50 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 |

# 184-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.

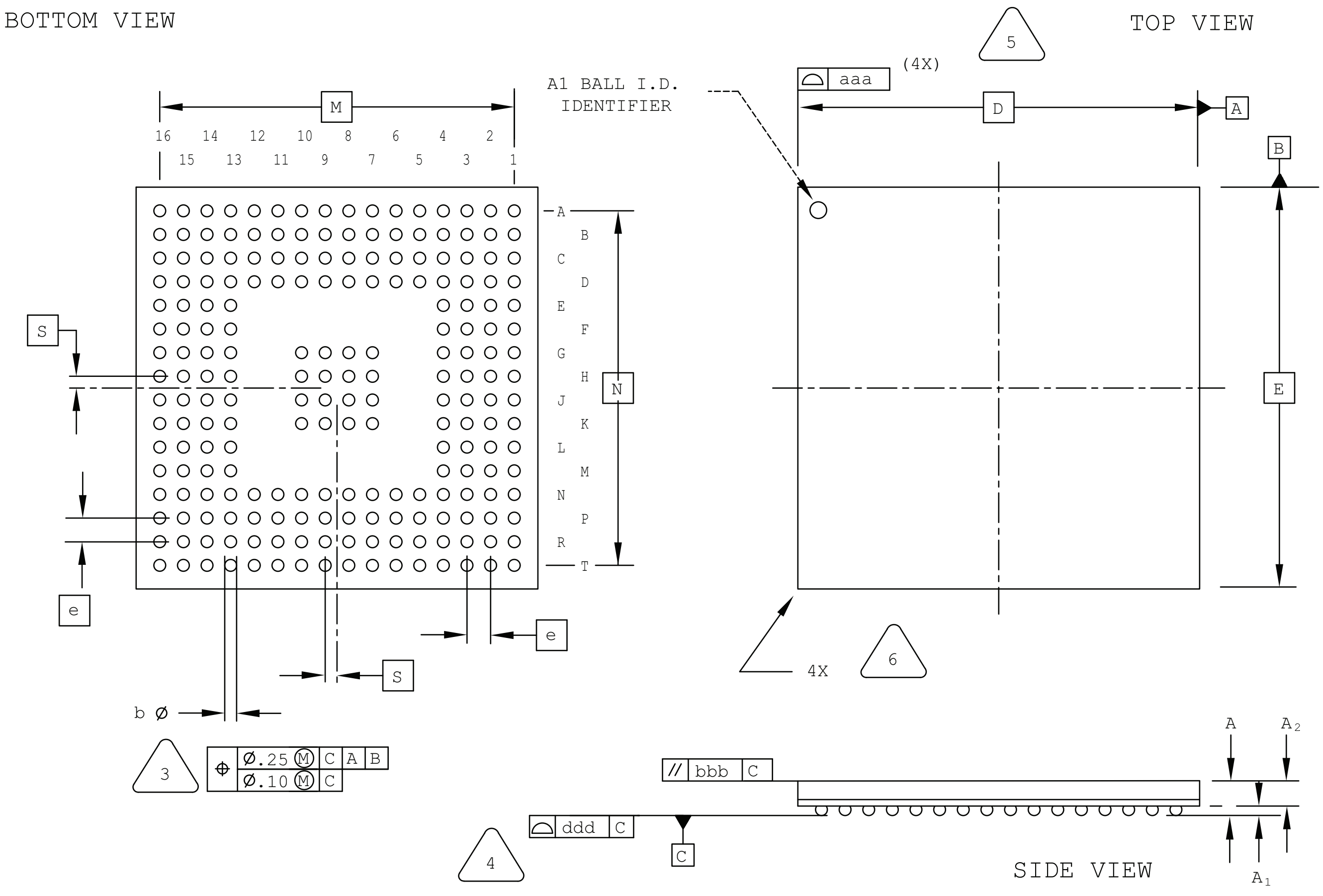
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.20 | 1.35 | 1.50 |
| A1 | 0.16 | - | - |
| A2 | - | - | 1.34 |
| 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 |

## 208-Ball ftBGA 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.

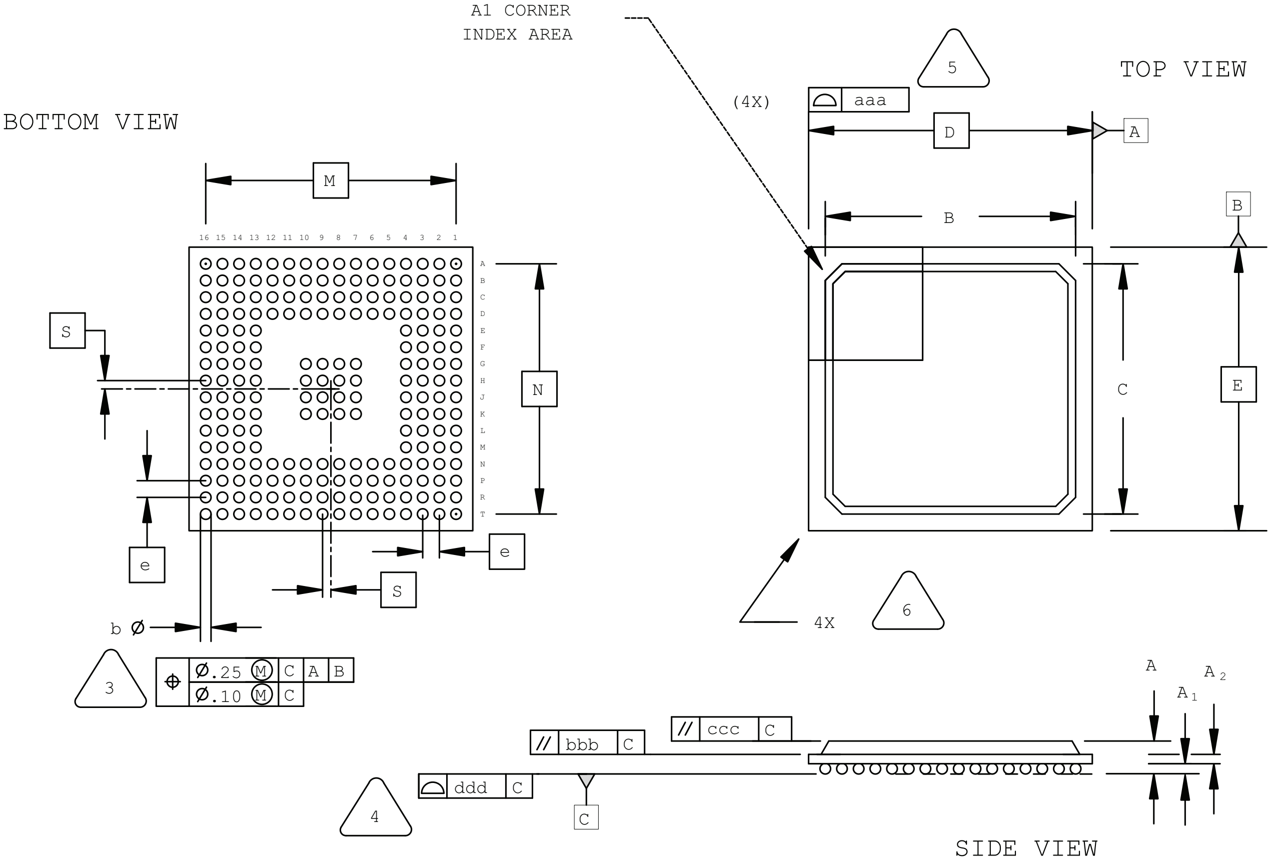
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.25 | 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 | 1.0 BSC | | |
| aaa | - | - | 0.20 |
| bbb | - | - | 0.25 |
| ddd | - | - | 0.12 |

# 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.

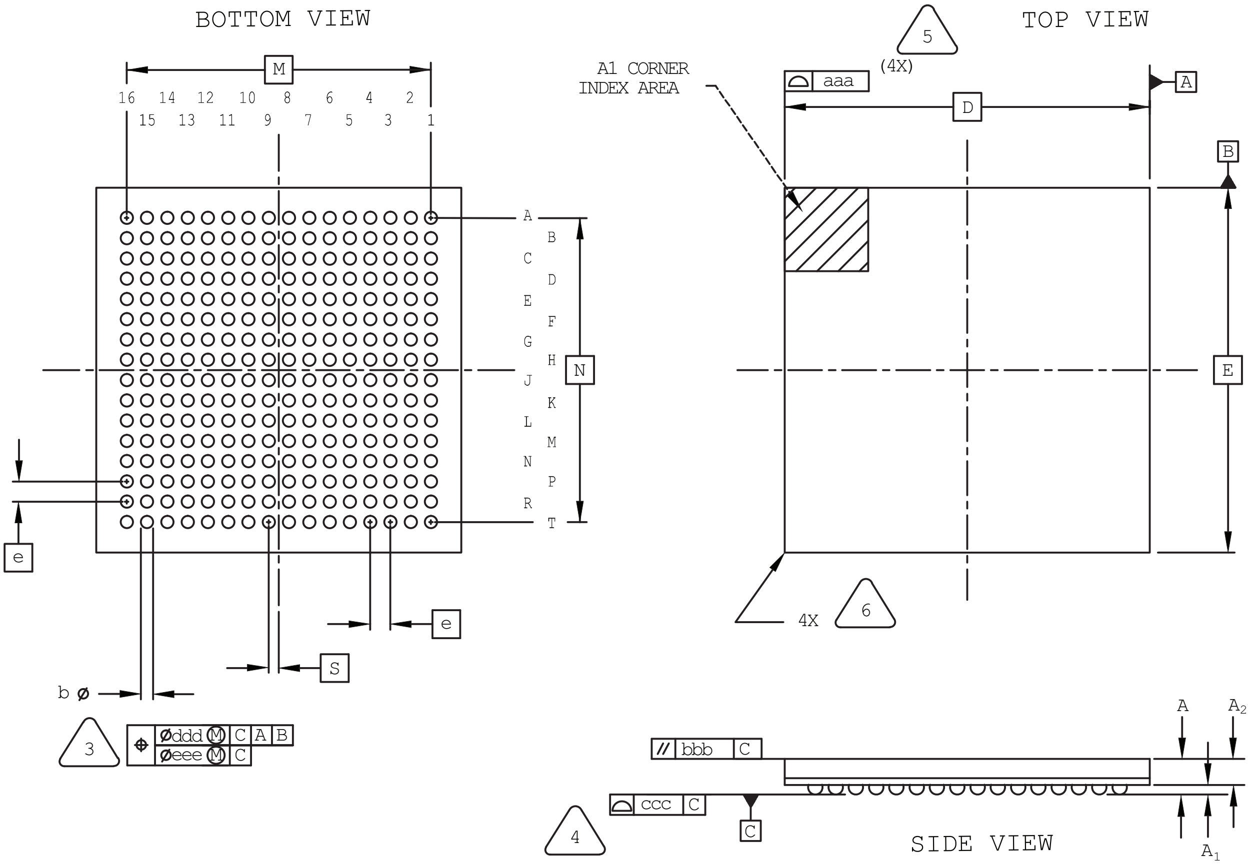
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

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 csfBGA 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.

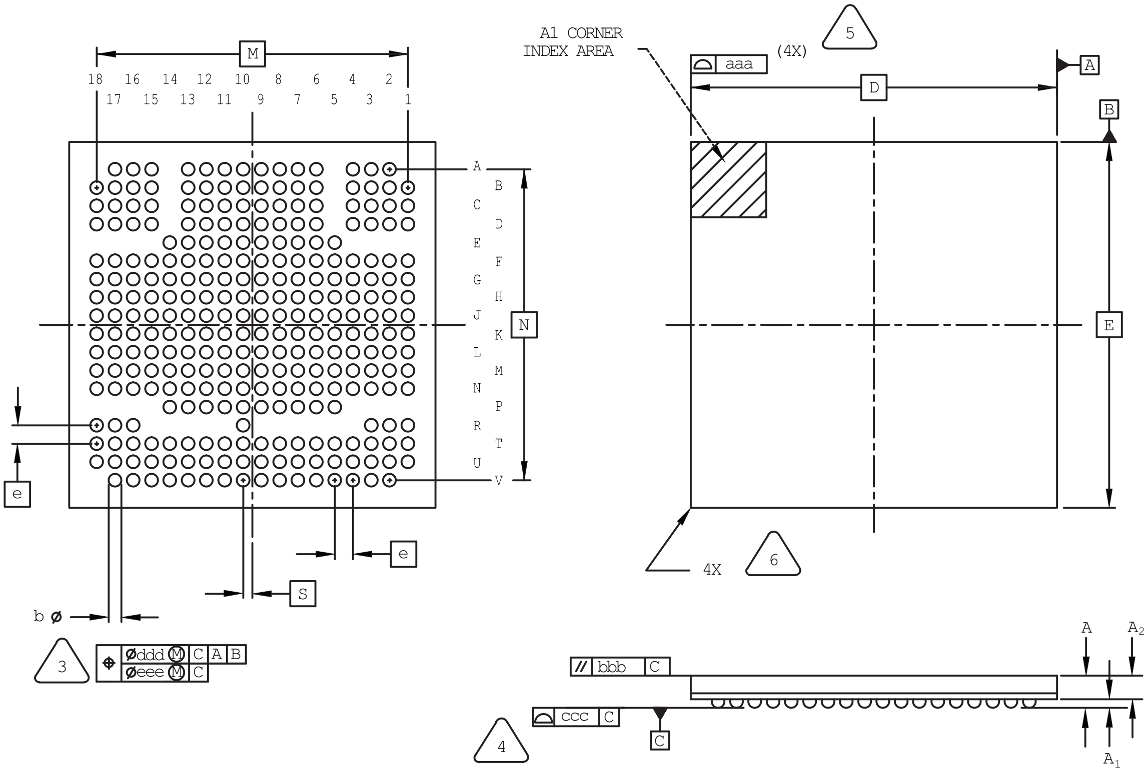
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | – | – | 1.00 |
| A1 | 0.15 | 0.24 | – |
| A2 | – | 0.66 | – |
| D/E | 9.00 BSC | | |
| M/N | 7.50 BSC | | |
| S | 0.25 BSC | | |
| b | 0.25 | 0.30 | 0.35 |
| e | 0.50 BSC | | |
| aaa | 0.10 | | |
| bbb | 0.10 | | |
| ccc | 0.08 | | |
| ddd | 0.15 | | |
| eee | 0.05 | | |

## 285-Ball csfBGA 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.

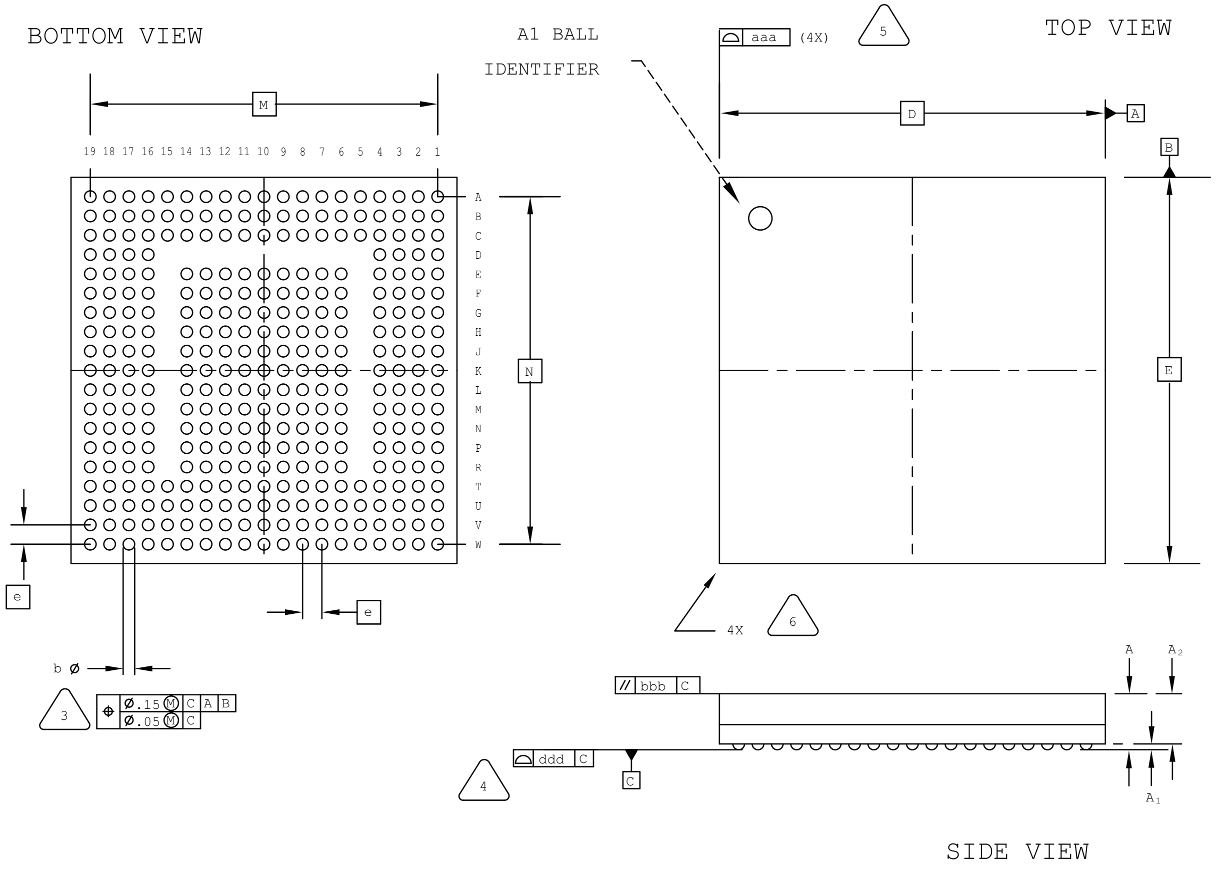
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

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

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | – | – | 1.30 |
| A1 | 0.15 | – | – |
| A2 | – | – | 1.00 |
| D/E | 10.00 BSC | | |
| M/N | 8.50 BSC | | |
| S | 0.25 BSC | | |
| b | 0.25 | 0.30 | 0.35 |
| e | 0.50 BSC | | |
| aaa | 0.10 | | |
| bbb | 0.10 | | |
| ccc | 0.08 | | |
| ddd | 0.15 | | |
| eee | 0.05 | | |

## 328-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.

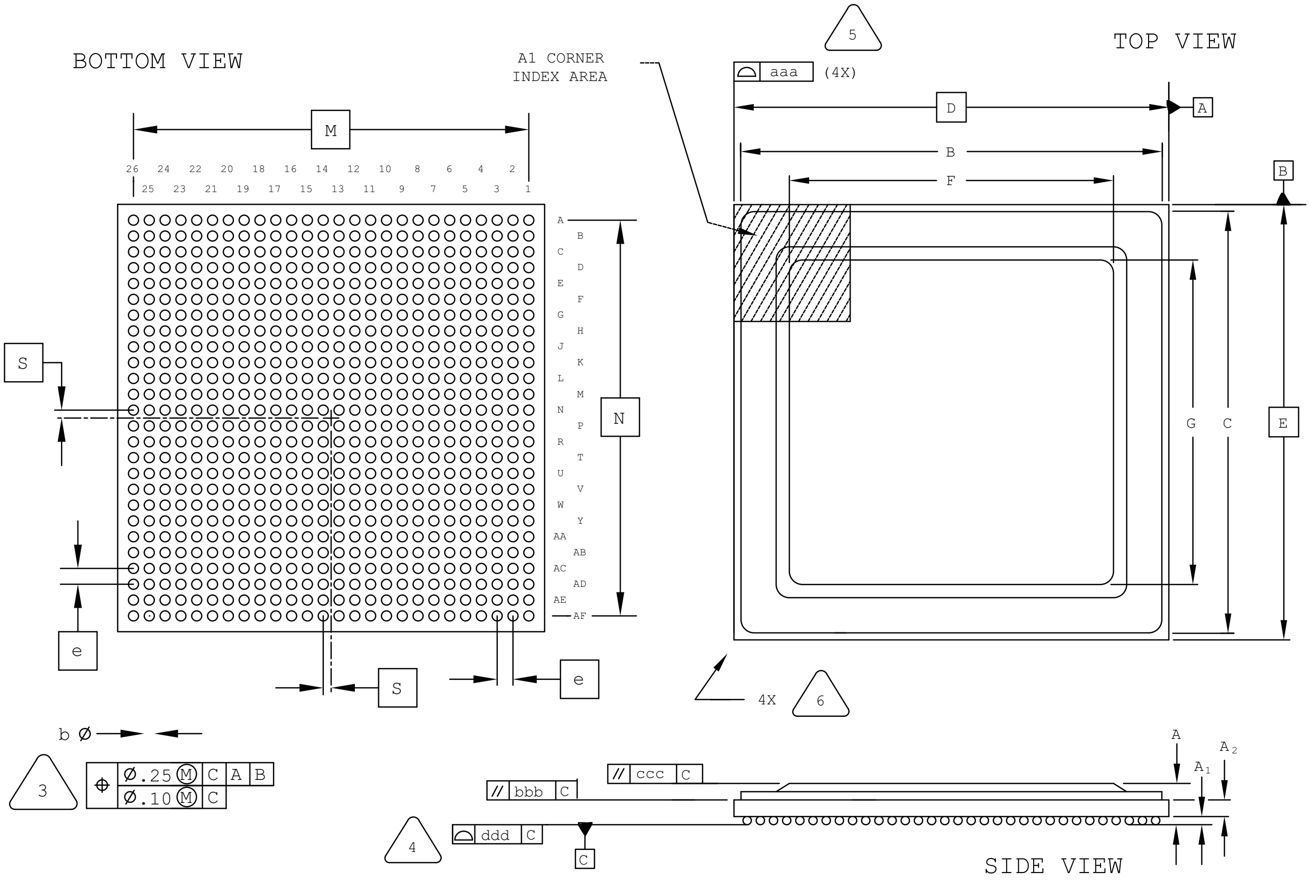
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 1.05 | 1.35 | 1.50 |
| A1 | 0.15 | - | - |
| A2 | - | - | 1.20 |
| D/E | 10.0 BSC | | |
| M/N | 9.00 BSC | | |
| b | 0.25 | 0.30 | 0.35 |
| e | 0.50 BSC | | |
| aaa | - | - | 0.10 |
| bbb | - | - | 0.10 |
| ddd | - | - | 0.08 |

## 676-Ball fcBGA 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.

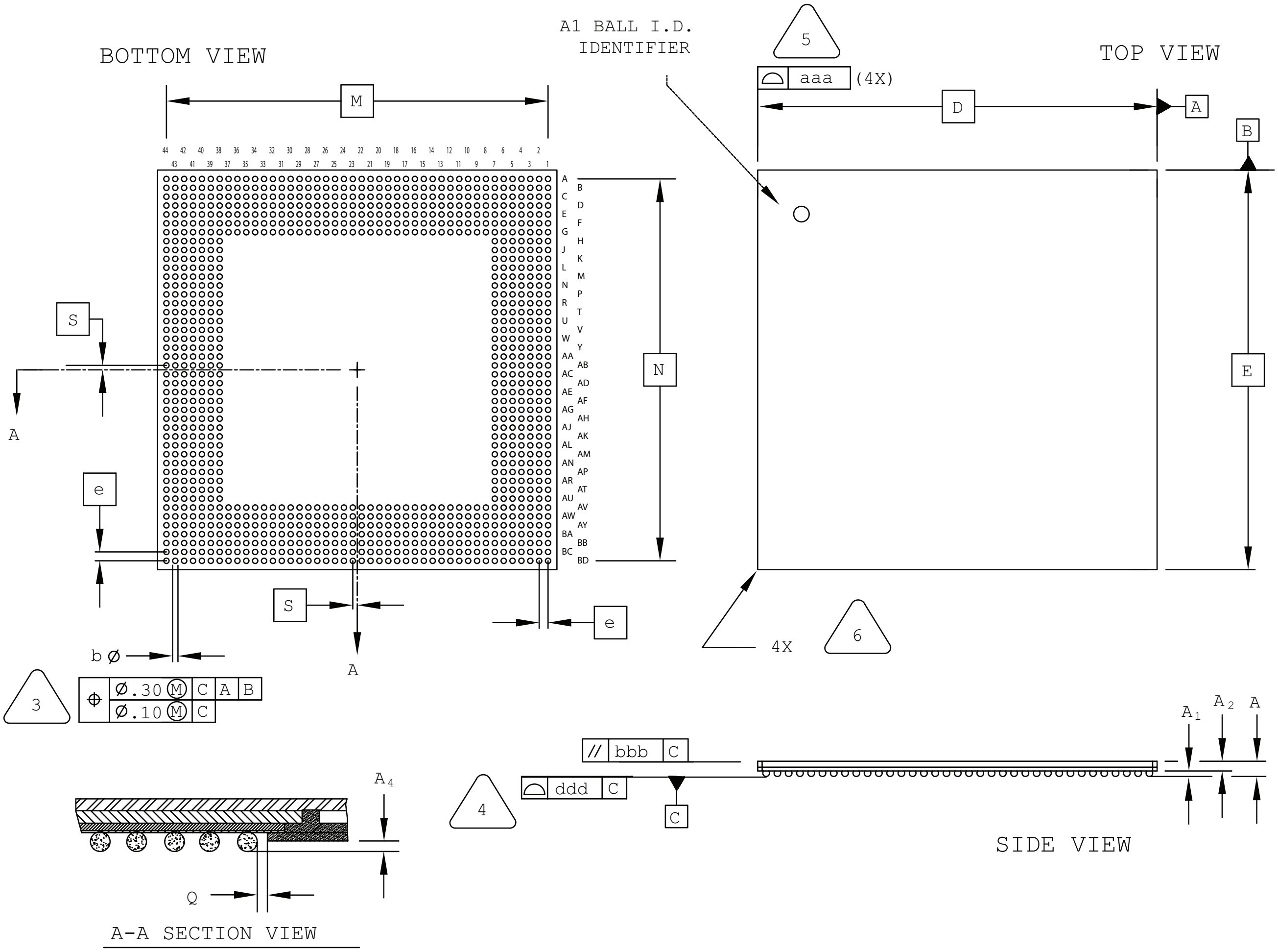
5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

| SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 2.55 | 2.90 | 3.25 |
| A1 | 0.40 | 0.50 | 0.60 |
| A2 | 1.20 REF | | |
| B/C | 26.55 | 26.60 | 26.65 |
| D/E | 27.00 BSC | | |
| F/G | 18.55 | 18.60 | 18.65 |
| M/N | 25.00 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 |

## 1036-Ball ftSBGA 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 | - | - | 1.80 |
| A1 | 0.40 | 0.55 | 0.70 |
| A2 | 0.90 | 0.98 | 1.10 |
| D/E | 45.00 BSC | | |
| M/N | 43.00 BSC | | |
| S | 0.50 BSC | | |
| b | 0.50 | 0.65 | 0.80 |
| e | 1.00 BSC | | |
| Q | 0.25 | - | - |
| A4 | 0.10 | - | - |
| aaa | - | - | 0.20 |
| bbb | - | - | 0.35 |
| ddd | - | - | 0.20 |