Flash Memory Products
1999 Data Book Amendment, Revision 10

AMD

Table of Contents

Introduction

The changes and corrections in this amendment apply to the 1999 AMD Flash Memory Products Data Book, publication number 11796F. Updates to this amendment will be available only through AMD's web site, at http://www.amd.com/products/nvd/techdocs/tech-

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docs.html, and will be periodically revised as devices in the data book are updated or obsoleted. The updated, individual data sheets and the product selector guide mentioned in this amendment are also available at this same URL.

New changes or additions since the previous revision of this amendment are indicated by a entry with a leading asterisk (*).

Note: *The flash memory data book will no longer be printed beginning in the year 2000. All data sheets will only be available online through the AMD web site or a periodically published Flash Memory CD-ROM.*

Global Data Sheet Change: *In all Program Operation and Chip/Sector Erase Operation timing diagrams, ignore the parameter t_{GHWL}. OE# should not be low when addresses for a write operation are present. All data sheets are in the revision process currently, and should be updated by the first quarter of 2000.*

Product Selector Guide
Publication Number 22290A

For the latest version of the product selector guide, please download it at http://www.amd.com/products/nvd/techdocs/22290.pdf. The revision summary has been removed from this amendment and incorporated into the product selector guide.

Section 1: 3 Volt-only UltraNAND™ Flash Memory

Am30LV0064D
Publication Number 22203B

Amendment +1 (January)
General Description
Page 1-4: The following has been added after the first paragraph:

The device is suited to high-density applications in which data is sequential and requires frequent, fast write capability. The UltraNAND™ block and page architecture is capable of accommodating applications requiring IDE disk drive-compatible blocks.

Ordering Information
Page 1-11: The FBGA designator has now been determined as "WE." In the valid combinations table, all TDBx combinations should be replaced by WEx combinations. In the performance range description, "usable sectors" should read "usable blocks."

Device Operations
Page 1-14: In fourth paragraph, third sentence, disregard the phrase "during erase." In the fifth paragraph, change "Read Data" to "Wait For."

Pages 1-16, 1-22: Note that the gapless read, erase suspend, and erase resume commands are superset.

Page 1-20, *Page Program:* In the second paragraph, fourth sentence, note that after ten consecutive partial program operations within a given page, the block containing that page is erased.

Operating Ranges
Page 1-24: The following V_{CCQ} supply voltage ratings apply to this device:

V_{CCQ} Supply Voltages
V_{CCQ} for full voltage range . . . . 2.7 V to 3.6 V
V_{CCQ} for 5 volt I/O tolerance . . . . 4.5 V to 5.5 V

DC Characteristics
Page 1-25: The following replaces the Test Specifications table:

Test Conditions	$V_{CC} = 3.0 V \pm 10\%$	$V_{CC} = 3.3 V \pm 10\%$	Unit
Output Load	1 TTL Gate		
Output Load Capacitance, C_L (including jig capacitance)	50	100	pF
Input Rise and Fall Times	5		ns
Input Pulse Levels	0.0 – 2.4		V
Input Timing Measurement Reference Levels	1.5		V
Output Timing Measurement Reference Levels	1.5		V

AC Characteristics
Pages 1-27 to 1-35: In various figures, note that breaks should apply vertically across all waveforms.

Pages 1-30, 1-31: *Status Read Cycle, Read Data, and Read Data (Interrupted by CE#), and Read Spare Area figures:* The beginning of the t_{WB} parameter should begin at the same point as the beginning of the t_{ALH} and t_R parameters.

Page 1-33: *Erase Suspend figure:* In the I/O7-0 waveform, the last data cell should be I/O 5.

Amendment +2 (February)
The FBE040 physical dimensions drawing, which is shown on page 28 of this amendment, has been added to the online data sheet.

Amendment+3 (March 8)
Ordering Information
Page 1-11: The designator for the FBGA package should be WG. The valid combinations shown in the table should be WGC, WGI.

Amendment +4 (April 21)

Physical Dimensions

The drawing on page 11 has changed. The BSC length and width dimensions for the ball grid array have been corrected.

Amendment +5 (June 17)

Page 1-1: Endurance is now 10,000 cycles. Added bullets for industrial range and 100% good blocks.

Page 1-11: Deleted references to K40 ordering part number and commercial temperature range.

AC Characteristics

Page 1-26: Changed t_{WH} to 20 ns. Added note for t_{REA}.

Section 2: 1.8 Volt-only Super Low Voltage Flash Memory

Am29SL800C
Publication Number 22230B

Amendment +1 (March 5)

The FBB048 package shown on page 10-14 for this device has been corrected.

Am29SL160C
Publication Number 21635A

Amendment +1 (January)

Distinctive Characteristics

Page 2-31, *WP#/ACC pin:* In the third subbullet, ignore the reference to increased erase performance.

Device Bus Operations

Page 2-38, *Accelerated Program and Erase Operations:* Disregard all references to accelerated erase operations.

Pages 2-39, 2-40, *Sector/Sector Block Protection and Unprotection:* The following tables show the sector blocks that apply when protecting or unprotecting sectors.

Table 1.   Top Boot Sector/Sector Block Addresses for Protection/Unprotection

Sector / Sector Block	A19–A12	Sector / Sector Block Size
SA0	00000XXX	64 Kbytes
SA1-SA3	00001XXX, 00010XXX, 00011XXX	192 (3x64) Kbytes
SA4-SA7	001XXXXX	256 (4x64) Kbytes
SA8-SA11	010XXXXX	256 (4x64) Kbytes
SA12-SA15	011XXXXX	256 (4x64) Kbytes
SA16-SA19	100XXXXX	256 (4x64) Kbytes
SA20-SA23	101XXXXX	256 (4x64) Kbytes
SA24-SA27	110XXXXX	256 (4x64) Kbytes
SA28-SA30	11100XXX, 11101XXX, 11110XXX	192 (3x64) Kbytes
SA31	11111000	8 Kbytes
SA32	11111001	8 Kbytes
SA33	11111010	8 Kbytes
SA34	11111011	8 Kbytes
SA35	11111100	8 Kbytes
SA36	11111101	8 Kbytes
SA37	11111110	8 Kbytes
SA38	11111111	8 Kbytes

Table 2.   Bottom Boot Sector/Sector Block Addresses for Protection/Unprotection

Sector / Sector Block	A19–A12	Sector / Sector Block Size
SA38	11111XXX	64 Kbytes
SA37-SA35	11110XXX, 11101XXX, 11100XXX	192 (3x64) Kbytes
SA34-SA31	110XXXXX	256 (4x64) Kbytes
SA30-SA27	101XXXXX	256 (4x64) Kbytes
SA26-SA23	100XXXXX	256 (4x64) Kbytes
SA22-SA19	011XXXXX	256 (4x64) Kbytes
SA18-SA15	010XXXXX	256 (4x64) Kbytes
SA14-SA11	001XXXXX	256 (4x64) Kbytes
SA10-SA8	00001XXX, 00010XXX, 00011XXX	192 (3x64) Kbytes
SA7	00000111	8 Kbytes
SA6	00000110	8 Kbytes
SA5	00000101	8 Kbytes
SA4	00000100	8 Kbytes
SA3	00000011	8 Kbytes
SA2	00000010	8 Kbytes
SA1	00000001	8 Kbytes
SA0	00000000	8 Kbytes

AC Characteristics

Page 2-59, *Accelerated Program/Erase Timing Diagram:* Ignore reference in title to accelerated erase.

Amendment +2 (March 23)

Connection Diagrams

Page 2-34: The callouts on pins 13 and 14 are reversed. Pin 13 should be NC and pin 14 should be WP#/ACC.

Amendment +3 (April 12)

Pages 2-31, -41, -45: An 8-byte unique ESN is also programmed into the SecSi Sector, in addition to the random ESN.

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Pages 2-38, 2-69, *Accelerated Program Operations*: Note that this operation is intended for use during system production only.

Ordering Information

Page 2-37: The OPN now contains an N to indicate that all parts are factory locked and serialized.

Device Bus Operations table

Page 2-38: The following replaces Note 3 and applies to write, sector unprotect, and temporary sector unprotect operations for the WP#/ACC column:

If WP#/ACC = V_{IL}, the two outermost boot sectors will be protected. If WP#/ACC = V_{IH}, the two outermost boot sectors will be protected or unprotected as previously set by the system. If WP#/ACC = V_{HH}, all sectors, including the two outermost boot sectors, will be unprotected.

Amendment +4 (May 14)

Pages 2-31, -41, -45: Removed the references to the unique ESN added in amendment +3.

Amendment +5 (July 23)

Pages 2-31 through 2-60: The device is now offered at 90 ns.

Amendment A+6 (September 1)

Page 2-52, *Hardware Reset (RESET#) table:* Deleted t_{RPD} specification.

Page 2-54, *Erase/Program Operations table:* Deleted t_{OES} specification.

Amendment A+7 (September 7)

Distinctive Characteristics

Page 2-31, *Ultra low power consumption bullet:* Corrected values to match those in the DC Characteristics table.

AC Characteristics

Page 2-60, *Alternate CE# Controlled Erase/Program Operations:* Deleted t_{OES} specification.

Device Bus Operations, Command Definitions, and Write Operation Status

Page 2-68, *Reset Command*: Ignore the last paragraph. The reset command operation is separate from the operation of the RESET# input pin.

Section 3: 3.0 Volt-only, Simultaneous Operation Flash Memory

Am29DL400B
Publication Number 21606D

Amendment +1 (March 23)

Page 3-18, *Read-only Operations table*: The parameters t_{RC}, t_{ACC}, and t_{CE} for the 90 ns device should be 90 ns.

Am29DL800B
Publication Number 21519B

Amendment +1

Page 10-14: The corrected drawing for the FBB048 package is shown on page 25 of this amendment.

Amendment +2 (July 2)

Test Conditions

Page 3-46: *Test Specifications table:* Corrected to indicate that the 70 ns speed is tested at 30 pF loading.

* Am29DL16xC
Publication Number 21533C

Amendment +1 (March 19)

SecSi (Secured Silicon) Sector Flash Memory Region

Page 3-71: In the bullets, the text should refer to the "three-cycle Enter SecSi Sector Region command sequence."

Amendment +2 (June 14)

Global

Changed data sheet status to Preliminary.

Amendment+3 (August 9)

Pages 3-66 to 3-69: Added DL164 ordering and sector information.

Page 3-66: Added the 70R speed option of the DL163; deleted the SSOP for the DL162.

Page 3-79: The 90 ns speed option is tested at 100 pF.

Amendment +4 (August 23)

Pages 3-66, -76: Added the commercial temperature operating range.

*Amendment +5 (October 18)

Page 3-70: Added Am29DL164 devices to the Autoselect Codes table.

* Am29DL322C/Am29DL323C
Publication Number 21534C

Command Definitions

Page 3-111: Note 14 is the second sentence of Note 13. Note 15 is missing and should read as follows:

Command is valid when device is ready to read array data or when device is an autoselect mode.
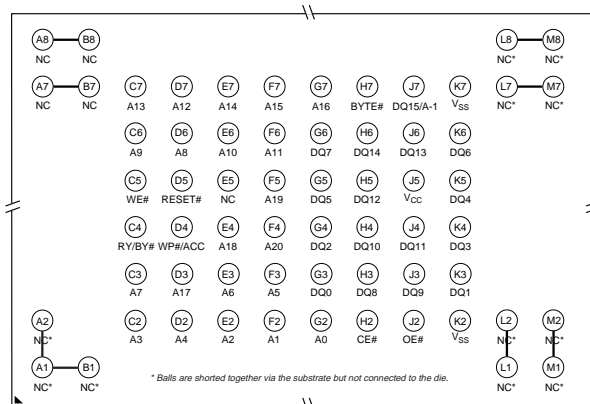
Amendment +1 (January)

Device Bus Operations

Page 3-106, Sector/Sector Block Protection and Unprotection tables: The sector/sector block address range should be A20–A12.

Amendment +2 (March 17)

Connection Diagrams

Page 3-98: The FBGA drawing has been modified to show how the outrigger balls are shorted:

Device Bus Operations

Page 3-107: *SecSi (Secured Silicon) Sector Flash Memory Region:* In the Customer Lockable subsection, all references to Secure Sector should read "SecSi."

In the second bullet, the section reference should be "Sector Protection/Unprotection." The section is located on page 3-132.

Amendment +3 (June 14)

Global

Changed data sheet status to Preliminary. Deleted all references to the 56-pin TSOP package.

Amendment +4 (July 2)

Device Bus Operations

Pages 3-101 to 3-106: *Sector Address Tables*: In the note below the tables, corrected the bank address bit range for Am29DL323.

*Amendment +5 (September 27)

Device Bus Operations

Pages 3-103, -105: Corrected the bank address bits specified in the note to Tables 3 and 5.

Device Bus Operations, Command Definitions, and Write Operation Status

Page 3-135, *Reset Command*: Ignore the last paragraph. The reset command operation is separate from the operation of the RESET# input pin.

Write Operation Status

Pages 3-139 to 3-142: Note that when reading status bits (DQ2, DQ3, DQ5, DQ6, DQ7), the bank address (BA) is required.

Section 4: 3.0 Volt-only Page Mode and Burst Mode Flash Memory

Am29PL160C
Publication Number 22143B

Amendment +1 (February)

DC Characteristics Table

Page 4-27: The typical and maximum currents for I_{CC4} are 8 and 20 µA, respectively.

Amendment +2 (March 5)

Distinctive Characteristics

Page 4-3: In the first subbullet under Flexible Sector Architecture, ignore the reference to "one 8 Kbyte."

Amendment +3 (May 14)

Pages 4-5, -8, 4-29 to 4-37: The 60R speed option has been replaced by the 65R speed option. The specifications that have changed from 60 to 65 ns are t_{ACC}, t_{OE}, t_{RC} (page 4-30), t_{FHQV} (page 4-32) and t_{WC} (page 4-33).

Common Flash Memory Interface (CFI)

Pages 4-15, -16: The following are corrected CFI word addresses and data: 38h = 0003h; 39h = 0006h; 3Ch = 0004h; 4C = 0002h.

Absolute Maximum Ratings

Page 4-26: The maximum voltage on "All other pins" should be +5.5 V.

Amendment +4 (June 25)

Global

Changed data sheet status to preliminary.

Pages 4-5, -8, 4-29 to 4-37: Deleted the 70 ns, full voltage range speed option.

Amendment +5 (July 26)

Pages 4-6, -8: The device is available in a reverse SO package. See the online data sheet for details.

Amendment +6 (September 2)

Connection Diagrams

Page 4-6: Corrected the pinouts of pins 1, 2, 43, and 44 on the reverse SO diagram. (See also Amendment +5.)

Am29BL802C
Publication Number 22371

This 8 Mb, burst mode device is now available. For full specifications, please refer to the online data sheet at http://www.amd.com/products/nvd/techdocs/22371.pdf. The latest version is Amendment +1, released June 25.

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* Am29BL162C
Publication Number 22142E

Significant differences exist between the data book version, Revision C, and the present version, Revision E. The latest verion of the data sheet, which was released on November 2, is available online at http://www.amd.com/products/nvd/techdocs/22142.pdf. The changes are listed in the revision summary on the final page of the data sheet.

Section 5: 3.0 Volt-only Flash Memory

* Am29LV010B
Publication Number 22140C

Amendment +1 (March 22)

Product Selector Guide

Page 4-5: The parameter t_{CE} should be 25 ns for the -45R device and 30 ns for the -70 device.

Revision Summary

Page 5-48: Ignore the draft revision items.

*Amendment +2 (October 5)

Page 5-37: Ignore I_{CC4} parameters. in the table. This device does not have a RESET# pin.

Am29LV002B
Publication Number 21520C

Operating Ranges

Page 5-58: The V_{CC} supply voltage for regulated devices is 3.0–3.6 V. The V_{CC} supply voltage for full voltage range devices is 2.7–3.6 V.

Am29LV200B
Publication Number 21521C

Page 5-74: The issue date of the data sheet should read January 1999.

Amendment +1 (March 27)

(The actual release date for this amendment is February 1999, not February 1998 as marked.)

Ordering Information

Page 5-79: The example part number should have an "R" after the "-50".

Operating Ranges

Page 5-83: The V_{CC} supply voltage for regulated devices is 3.0–3.6 V. The V_{CC} supply voltage for full voltage range devices is 2.7–3.6 V.

Amendment +2 (May 17)

Ordering Information

Page 5-79: The boot code sector architecture designator description should include both a "T" for top boot and "B" for bottom boot.

Amendment +3 (June 1)

Physical Dimensions

Page 38 of the online full data sheet, *TS 048:* The drawing previously showed the TSR 048 package; now shows the proper package.

Amendment +4 (July 2)

Pages 5-74 to 5-96: The 50R speed option is no longer available.

Amendment +5 (August 25)

Change applies to online data sheet only.

* Am29LV040B
Publication Number 21354C

Amendment +1 (May 18)

The data sheet preliminary status was removed.

Amendment +2 (July 20)

Relates to online data sheet only.

*Amendment +3 (November 11)

Global

The 55R speed option has been replaced by a 60R speed option.

Page 5-139: Ignore t_{GHWL} parameter in Figures 8 and 9. The parameter should not be shown in the illustration.

Am29LV400B
Publication Number 21521C

Amendment +1 (July 2)

Global

Deleted references to the 50R speed option.

Am29LV081B
Publication Number 21525C

Amendment +1 (May 17)

Page 5-199, -204: Note that the Am29LV081B is a uniform sector device.

Am29LV800B
Publication Number 21490F

Amendment +1 (February)

(Amendment +1 corrects the online data sheet. The FBB048 drawing was replaced with the one shown on page 25 of this document.)

Amendment +2 (February)

Distinctive Characteristics

Page 5-224: In the first and third bullets, ignore references to full or regulated voltage ranges. All Am29LV800B devices operate at 2.7–3.6 V.

Operating Ranges

Page 5-234: The data sheet should indicate that the V_{CC} voltage range for all devices is 2.7–3.6 V.

Amendment +3 (July 2)

Global

Added references to availability of device in Known Good Die (KGD) form.

Amendment +4 (July 26)

Page 5-230: A 70R speed option is now available in commercial, industrial and extended temperature ranges. The device is not available in the FBGA package with the extended temperature range.

*Amendment +5 (November 10)

Page 5-230: Deleted the commercial and industrial temeperature ranges for the 70R speed option, which was added in Amendment +4.

Pages 5-242, -243: Ignore parameter t_{GHWL} in Figures 11 and 12. It should not be shown in the diagrams.

Am29LV017B
Publication Number 21415D

Amendment +1 (April 12)

Connection Diagrams

Page 5-254: The FBGA drawing shows the top view, balls facing down, not the bottom view.

Am29LV160B
Publication Number 21358G

This device has been replaced by the Am29LV160D.

Am29LV160D
Publication Number 22358A

This device replaces the Am29LV160B. For full specifications on the device, please refer to the online data sheet at http://www.amd.com/products/nvd/techdocs/22358.pdf.

Amendment A+1 (April 19)

The data sheet status is now preliminary. The 70 ns speed option is now available at the industrial and extended temperature ranges.

Am29LV033C
Publication Number 22268A

Amendment +1 (January)

Device Bus Operations

Page 5-346, *Sector/Sector Block Addresses for Protection/Unprotection Table:* The following replaces the table. The middle column has been corrected.

Sector/ Sector Block	A21–A16	Sector/ Sector Block Size
SA0	000000	64 Kbytes
SA1-SA3	000001, 000010, 000011	192 (3x64) Kbytes
SA4-SA7	000100, 000101, 000110, 000111	256 (4x64) Kbytes
SA8-SA11	001000, 001001, 001010, 001011	256 (4x64) Kbytes
SA12-SA15	001100, 001101, 001110, 001111	256 (4x64) Kbytes
SA16-SA19	010000, 010001, 010010, 010011	256 (4x64) Kbytes
SA20-SA23	010100, 010101, 010110, 010111	256 (4x64) Kbytes
SA24-SA27	011000, 011001, 011010, 011011	256 (4x64) Kbytes
SA28-SA31	011100, 011101, 011110, 011111	256 (4x64) Kbytes
SA32-SA35	100000, 100001, 100010, 100011	256 (4x64) Kbytes
SA36-SA39	100100, 100101, 100110, 100111	256 (4x64) Kbytes
SA40-SA43	101000, 101001, 101010, 101011	256 (4x64) Kbytes
SA44-SA47	101100, 101101, 101110, 101111	256 (4x64) Kbytes
SA48-SA51	110000, 110001, 110010, 110011	256 (4x64) Kbytes
SA52-SA55	110100, 110101, 110110, 110111	256 (4x64) Kbytes
SA56-SA59	111000, 111001, 111010, 111011	256 (4x64) Kbytes
SA60-SA62	111100, 111101, 111110	192 (4x64) Kbytes
SA63	111111	64 Kbytes

Page 5-345, *Autoselect Codes (High Voltage Method Table:* The device ID should be A3h.
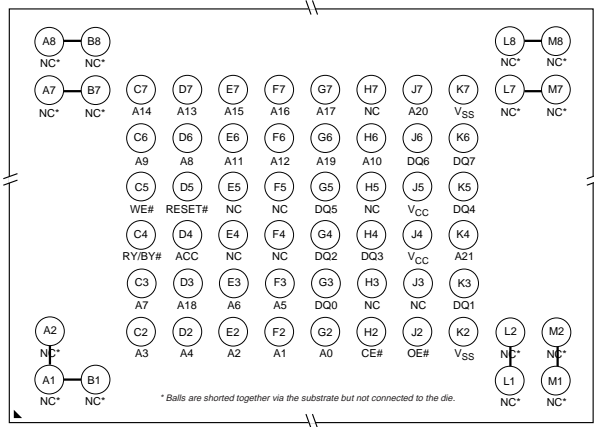
Amendment +2 (January)

Page 5-349, *Command Definitions Table*. The Device ID data in the fourth cycle should be A3h.

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Amendment +3 (March 17)

Connection Diagrams

Page 5-340. The updated drawing shows how the out-rigger balls are shorted:

Amendment +4 (May 17)

Global

Page 5-343, *Accelerated Program Operation*; page 5-348, *Accelerated Program Operations*; page 5-341, V_{HH} specification: The references to "WP#/ACC" should be "ACC". This device does not offer the WP# function.

Device Bus Operations

Page 5-346: In table 4, ignore the phrase "top boot."

Amendment +5 (June 7)

Global

The 70 ns speed option now operates over the full 2.7–3.6 V V_{CC} range.

Common Flash Memory Interface

Pages 5-347 to 5-348: Corrected data for the following addresses: 27h, 2Dh, 37h, 48h, and 49h. Modified the description for 48h and 49h.

Amendment +6 (June 25)

Command Definitions Table

Page 5-349: Indicated that address bit A21 must be specified in the third cycle when entering the autoselect mode.

Amendment +7 (August 2)

Page 5-338: The ACC signal should be shown as an input to the state control block.

Page 5-348: The following statement should be added to the *Accelerated Program Operations* section: If

ACC is to be permanently set, it is recommended that it be tied to V_{CC} to minimize current consumption.

Page 5-357: Ignore the WP# designation in Figure 10.

Amendment +8 (August 18)

Page 5-342 and 10-16: The dimensions of the FBGA package should be stated as 8 x 14 mm.

* Am29LV640DU/Am29LV641DU
Publication Number 22366

This 64 Mb, uniform sector device is now available. For full specifications, please refer to the online data sheet at http://www.amd.com/products/nvd/techdocs/22366.pdf. The latest data sheet version is Amendment +7, released on November 3.

Device Bus Operations, Command Definitions, and Write Operation Status

Page 5-366, *Am29LVxxx Devices*: Note that all Am29LV devices now offer in-system sector protection/unprotection.

Section 6, 5.0 Volt-only Flash Memory

Am29F010A
Publication Number 22181B

* Am29F010B
Publication Number 22336A+2

The Am29F010A is now obsolete and has been replaced by the Am29F010B. For full specifications on the Am29F010B, please refer to the latest version of the data sheet, which was released on Spetember 27, at http://www.amd.com/products/nvd/techdocs/22336.pdf.

Am29F100
Publication Number 18926D

This device is now obsolete.

Am29F200B
Publication Number 21526B

Amendment +1 (April 12)

Page 6-73, *Product Selector Guide*: The 55 ns speed option now has a V_{CC} voltage range of ±10% (V_{CC} = 4.5 – 5.5 V).

Amendment +2 (July 2)

Global

Added references to availability of device in Known Good Die (KGD) form.

Am29F004B
Publication Number 22286

Revision B

Ref. page 6-97: The full data sheet, with complete specifications, is now available on the AMD web site. The commercial temperature range listed in Revision A has been deleted.

Amendments +1 to +3

Please see the online document at http://www.amd.com/products/nvd/techdocs/22286.pdf. The data sheet status is now preliminary, and the PDIP shown on pages 6-100 and 6-102 is not available. This data sheet is now in amendment B+3, released July 12.

Am29F040B
Publication Number 21445C

Amendment +1 (February)

Command Definitions

Page 6-109, *Command Definitions table.* In the data column of the fourth cycle for the Sector Protect Verify command, ignore the "XX." The Am29F040 is a byte-wide device.

Amendment +2 (May 17)

Page 6-112, *Test Conditions table*. In the "All others" column, the entries for both the input timing measurement reference levels and the output timing measurement reference levels should be "0.8, 2.0 V."

Am29F400B
Publication Number 21505D

Amendment +1 (July 2)

Global

Added references to availability of device in Known Good Die (KGD) form.

Am29F080B
Publication Number 21503E

Amendment +1 (March 23)

Operating Ranges

Page 6-155: The temperature ranges specified are at ambient, not case.

Amendment +2 (April 9)

Page 6-151: The extended temperature range (–55°C to +125°C) should be listed under the "Temperature Range" heading.

Page 6-155: The extended temperature range (–55°C to +125°C) should be listed under the "Operating Ranges" heading.

Am29F800B
Publication Number 21504D

Amendment +1 (March 23)

Command Definitions table

Page 6-178: In Note 5, the address bits that are don't care should be A18–A11. In the legend, the sector address bits should be A18–A12.

Amendment +2 (July 2)

Global

Added references to availability of device in Known Good Die (KGD) form.

Am29F016B
Publication Number 21444C

Amendment +1 (March 23)

Operating Ranges

Page 6-207: The temperature ranges specified are at ambient, not case.

Amendment +2 (May 17)

Product Selector Guide

Page 6-198: The t_{OE} specification (maximum OE# access time) for the -150 device should be 55 ns.

Operating Ranges

Page 6-207: The V_{CC} for ±5% devices should be listed, and specified as +4.75 V to +5.25 V.

Amendment +3 (July 2)

Global

Added references to availability of device in Known Good Die (KGD) form.

Am29F017B
Publication Number 21195C

Amendment +1 (March 23)

Operating Ranges

Page 6-232: The temperature ranges specified are at ambient, not case.

Amendment +2 (May 17)

Product Selector Guide

Page 6-223: The t_{OE} specification (maximum OE# access time) for the -150 device should be 55 ns.

Operating Ranges

Page 6-232: The V_{CC} for ±5% devices should be listed, and specified as +4.75 V to +5.25 V.

Am29F160D
Publication Number 22288B

Revisions B to B+4

Global

Expanded data sheet into document with full specifications. Please refer to the online data sheet at http://www.amd.com/products/nvd/techdocs/22388.pdf. The latest data sheet version is Amendment +4, released on September 10.

Am29F032B
Publication Number 21610C

Amendment +1 (May 17)

Page 6-274: The following data retention table should be included on this page.

Parameter	Test Conditions	Min.	Unit
Minimum Pattern Data Retention Time	150°C	10	Years
	125°C	20	Years

Section 7, Known Good Die Data Sheet Supplements

* Am29F010 Known Good Die
Publication Number 21116E

This device is now obsolete, and has been replaced by the Am29F010B. The new data sheet can be downloaded from the AMD web site at http://www.amd.com/products/nvd/techdocs/22939.pdf.

* Am29F200B Known Good Die
Publication Number 21257D

Amendment +1 (June 14)

Physical Specifications

Page 7-30: Corrected bond pad dimensions and deleted Si from the bond pad metallization specification.

Amendment +2 (July 12)

Global

The device is now available in the high temperature range (–55°C to +140°C). T_J (max) for this range is +145°C.

*Amendment +3 (November 17)

Global

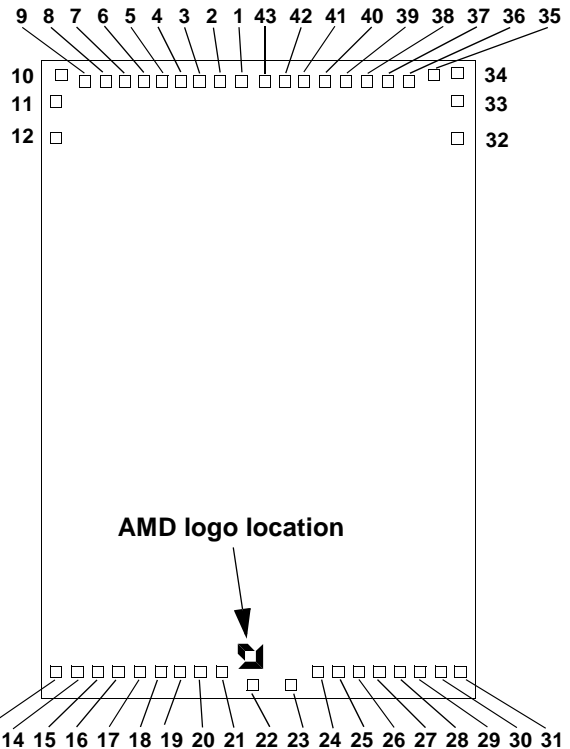Replaced references to high temperature ratings with a note to contact AMD for such devices.

* Am29F400B Known Good Die
Publication Number 21258E

Amendment +1 (February)

Die Pad Locations

Page 7-35: Some pad callouts for the top row are incorrect. The labeling should be as follows:

AMD logo location

Amendment +2 (June 14)

Physical Specifications

Page 7-40: Corrected the bond pad dimensions.

Amendment +3 (July 12)

Ordering Information

Page 7-37: Corrected the die revision indicated in the example and the valid combinations to 2.

*Amendment +4 (November 17)

Page 7-37: Added a note to contact AMD for devices with higher temperature ratings.

Am29F800B Known Good Die
Publication Number 21631C

Amendment +1 (June 14)

Physical Specifications

Page 7-50: Corrected bond pad dimensions and deleted Si from the bond pad metallization specification.

* Am29LV400B Known Good Die
Publication Number 23427A

The Am29LV400B is a 3 volt-only, 4 Mbit device that is newly available in KGD form. The data sheet supplement can be downloaded from AMD's web site at http://www.amd.com/products/nvd/techdocs/23427.pdf.

Am29LV800B Known Good Die
Publication Number 21356D

Amendment +1 (June 14)
Physical Specifications

Page 7-70: Corrected the bond pad dimensions. Deleted Si from the bond pad metallization specification.

Amendment +2 (July 2)
Ordering Information

Page 7-67: The quantities for each packaging type is now listed. Contacting AMD for this information is no longer required.

Section 8, General Information and Application Notes

The following application notes are now available online:

Simple System Interface for UltraNAND Flash
Released April 20.

Migrating between Boot and Uniform Sectored Flash Devices
Released May 12.

Migrating between Flash Device Densities
Revision B was released September 10.

Migrating from 16 Megabit to 64 Megabit Flash Memory Devices
Revision B was released September 13.

The complete list of application notes is located online at http://www.amd.com/products/nvd/techdocs/techdocs.html.

* Section 10, Physical Dimensions

You may notice that some of the physical dimensions drawings in certain online data sheets are different from those in the 1999 data book. The physical dimensions drawings in all flash memory data sheets are in the process of being updated to a new template, which incorporates more detailed information about packages than previous illustrations. The data sheets are expected to be entirely updated with the new drawings by the first quarter of 2000. The following pages show all of the new illustrations.

Pages 10-9, -10: AMD flash memory devices are currently not offered in the TS056 and TSR056 packages.

Page 10-13: The FGA048 package has been replaced by the FBA048. The FBA048 package is currenlty offered only on the Am29LV400B.

PD032: 32-Pin PDIP
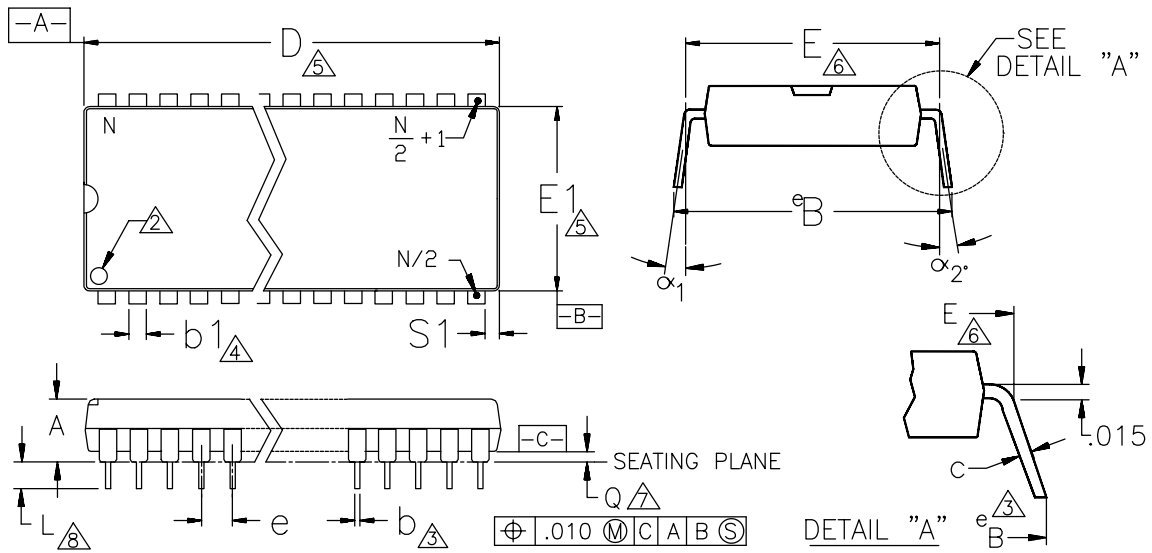
Dwg rev AD; 10/99

PACKAGE	PD 032	
JEDEC	MO-015(G)AP	
SYMBOL	MIN	MAX
A	.140	.225
b	.016	.022
b1	.045	.065
c	.009	.015
D	1.640	1.670
E1	.530	.580
E	.600	.625
e	.090	.110
L	.120	.150
Q	.015	.060
S1	.005	–
e_B	.630	.700
N	32	
($\alpha_1 - \alpha_2$)	0°	10°
(α_1 , α_2)	0°	15°

NOTES:

1. ALL DIMENSIONS ARE GIVEN IN INCHES.

2. A NOTCH, TAB, OR PIN ONE IDENTIFICATION MARK SHALL BE LOCATED ADJACENT TO PIN ONE.

3. ALL LEADS IN DIMENSIONS b AND c INCREASE BY 3 MILS MAX. WHEN TIN PLATE /SOLDER DIP LEAD FINISH IS APPLIED.

4. THE MINIMUM LIMIT FOR DIMENSION b1 MAY BE .030 INCH IN FOUR CORNER LEADS FOR PD 016, PD3 024, PDW 024, PD3 028, PDW 028.

5. D AND E1 DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSION.

6. E IS MEASURED FROM THE OUTSIDE OF LEADS AND 15 MILS BELOW PLANE OF PKG EXIT DEFINED BY LEAD TOP.

7. Q IS MEASURED FROM THE SEATING PLANE TO THE BASE PLANE.

8. L IS MEASURED FROM SEATING PLANE OR .040 INCH LEAD SHOULDER WIDTH/GAUGE HOLE SOCKET TO THE LEAD TIP.

9. WHEN STANDOFF HAS RADII, THE SEATING PLANE LOCATION IS DEFINED WHERE LEAD WIDTH EQUALS .040".

10. 'N' IS THE LEAD COUNT.

PL 032: 32-Pin PLCC

TOP VIEW

DETAIL A

FRONT VIEW

SIDE VIEW

BOTTOM VIEW
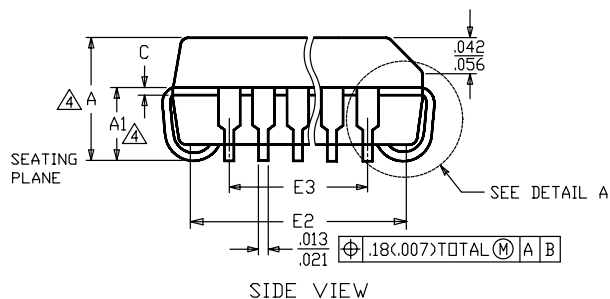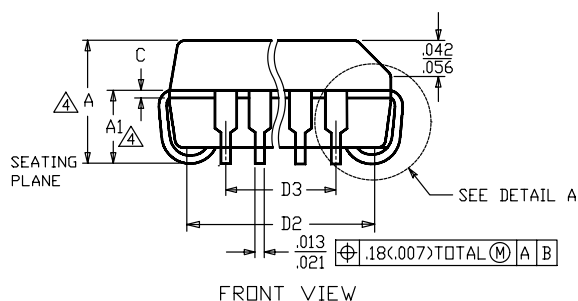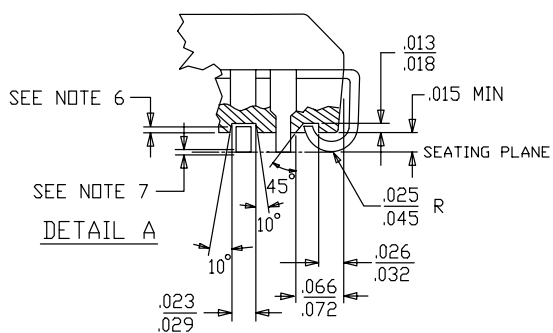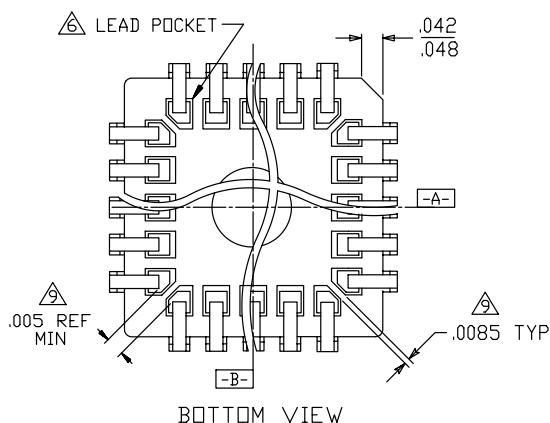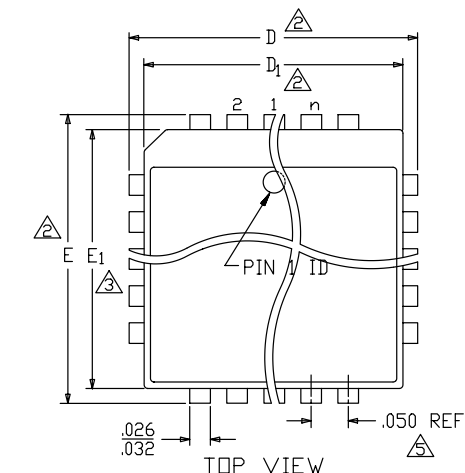
| PACKAGE	PL32	
JEDEC	MO-052(A)AE	
SYMBOL	MIN	MAX
A	.125	.140
A1	.080	.095
D	.485	.495
D1	.447	.453
D2	.390	.430
D3	.300	REF
E	.585	.595
E1	.547	.553
E2	.490	.530
E3	.400	REF
C	.009	.015

Dwg rev AH; 10/99

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.

2. DIMENSIONS "D" AND "E" ARE MEASURED FROM OUTERMOST POINT.

3. DIMENSIONS D1 AND E1 DO NOT INCLUDE CORNER MOLD FLASH. ALLOWABLE CORNER MOLD FLASH IS .010"

4. DIMENSIONS "A", "A1", "D2" AND "E2" ARE MEASURED AT THE POINTS OF CONTACT TO BASE PLANE

5. LEAD SPACING AS MEASURED FROM CENTERLINE TO CENTERLINE SHALL BE WITHIN ±.005".

6. J-LEAD TIPS SHOULD BE LOCATED INSIDE THE "POCKET.

7. LEAD COPLANARITY SHALL BE WITHIN .004" AS MEASURED FROM SEATING PLANE. COPLANARITY IS MEASURED PER AMD 06-500.

8. LEAD TWEEZE SHALL BE WITHIN .0045" ON EACH SIDE AS MEASURED FROM A VERTICAL FLAT PLANE. TWEEZE IS MEASURED PER AMD 06-500.

9. LEAD POCKET MAY BE RECTANGULAR (AS SHOWN) OR OVAL. IF CORNER LEAD POCKETS ARE CONNECTED THEN 5 MILS MINIMUM CORNER LEAD SPACING IS REQUIRED.

SO 44: 44-Pin Standard Pinout SO

STANDARD FORM (DIE UP) PINOUT (TOP VIEW)

SEE DETAIL "B"

SECTION A-A

WITH LEAD FINISH

BASE METAL

DETAIL "B"

GAUGE PLANE

SEATING PLANE
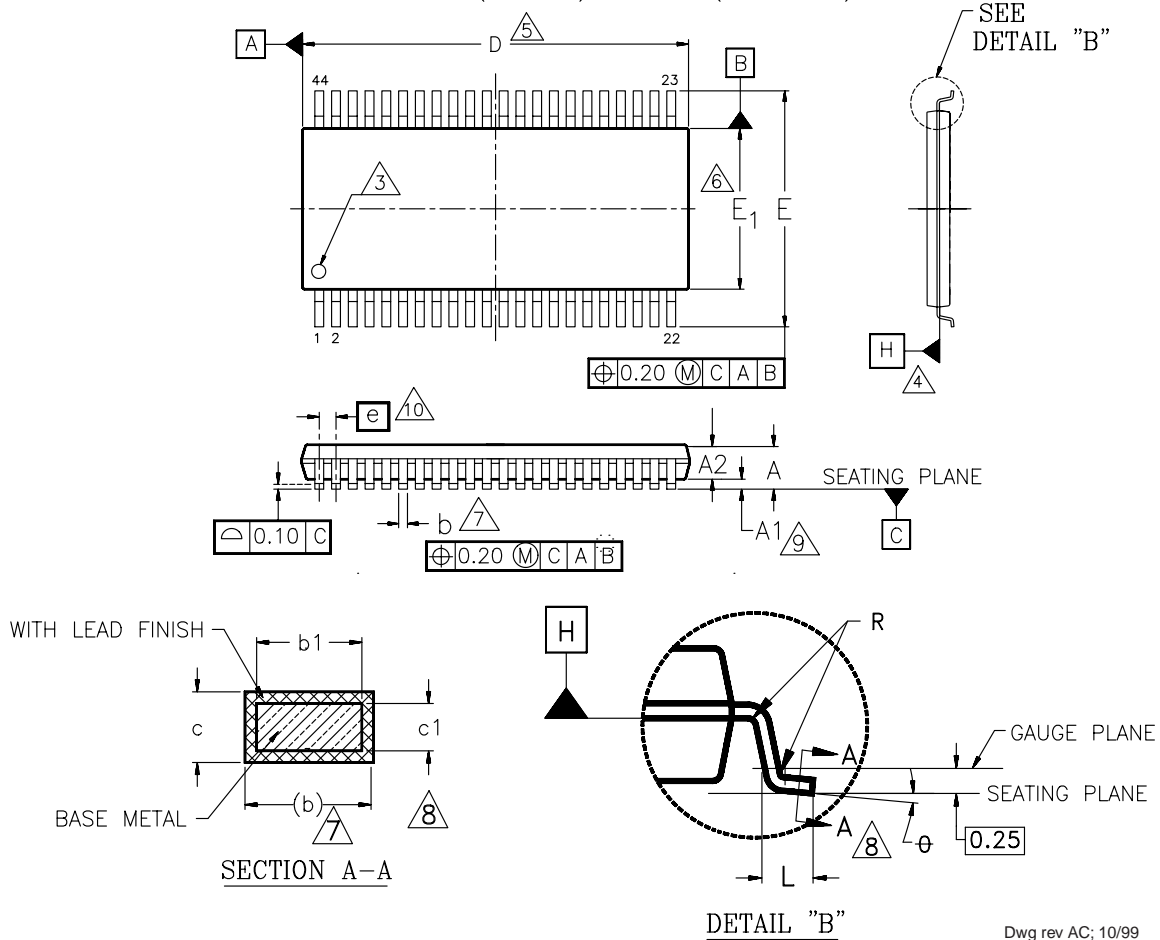
Dwg rev AC; 10/99

PACKAGE	SO 044		
JEDEC	MO−180 (A) AA		
SYMBOL	MIN	NOM	MAX
A	—	—	2.80
A1	0.15	0.23	0.35
A2	2.17	2.30	2.45
b	0.35	—	0.50
b1	0.35	0.40	0.45
c	0.10	—	0.21
c1	0.10	0.15	0.18
D	28.00	28.20	28.40
E	15.70	16.00	16.30
E1	13.10	13.30	13.50
e	1.27 BSC		
L	0.60	0.80	1.00
R	0.09	—	—
θ	0°	4°	8°

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
2. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M−1994.
3. PIN 1 IDENTIFIER FOR STANDARD FORM (DIE UP) OR REVERSE FORM (DIE DOWN) PINOUTS.
4. DATUMS A AND B AND DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH. PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 mm PER END.
6. DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 mm PER SIDE.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT EXCEED 0.15 mm PER SIDE. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION b BY MORE THAN 0.07 mm AT LEAST MATERIAL CONDITION.
8. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 mm AND 0.25 mm FROM THE LEAD TIPS.
9. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE.
10. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
11. LEAD COPLANARITY SHALL BE WITHIN 0.10 mm AS MEASURED FROM THER SEATING PLANE.

SOR44: 44-Pin Reverse Pinout SO
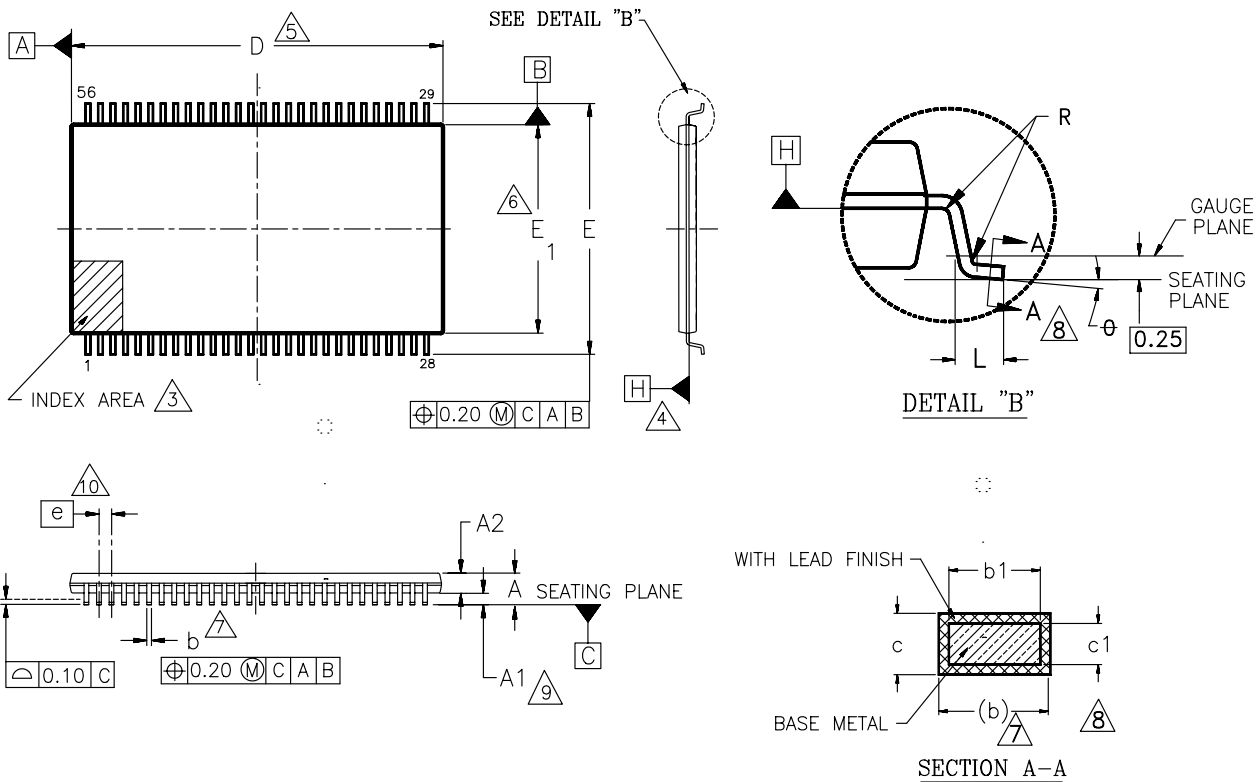
REVERSE FORM (DIE DOWN) PINOUT (TOP VIEW)

SECTION A-A

DETAIL "B"
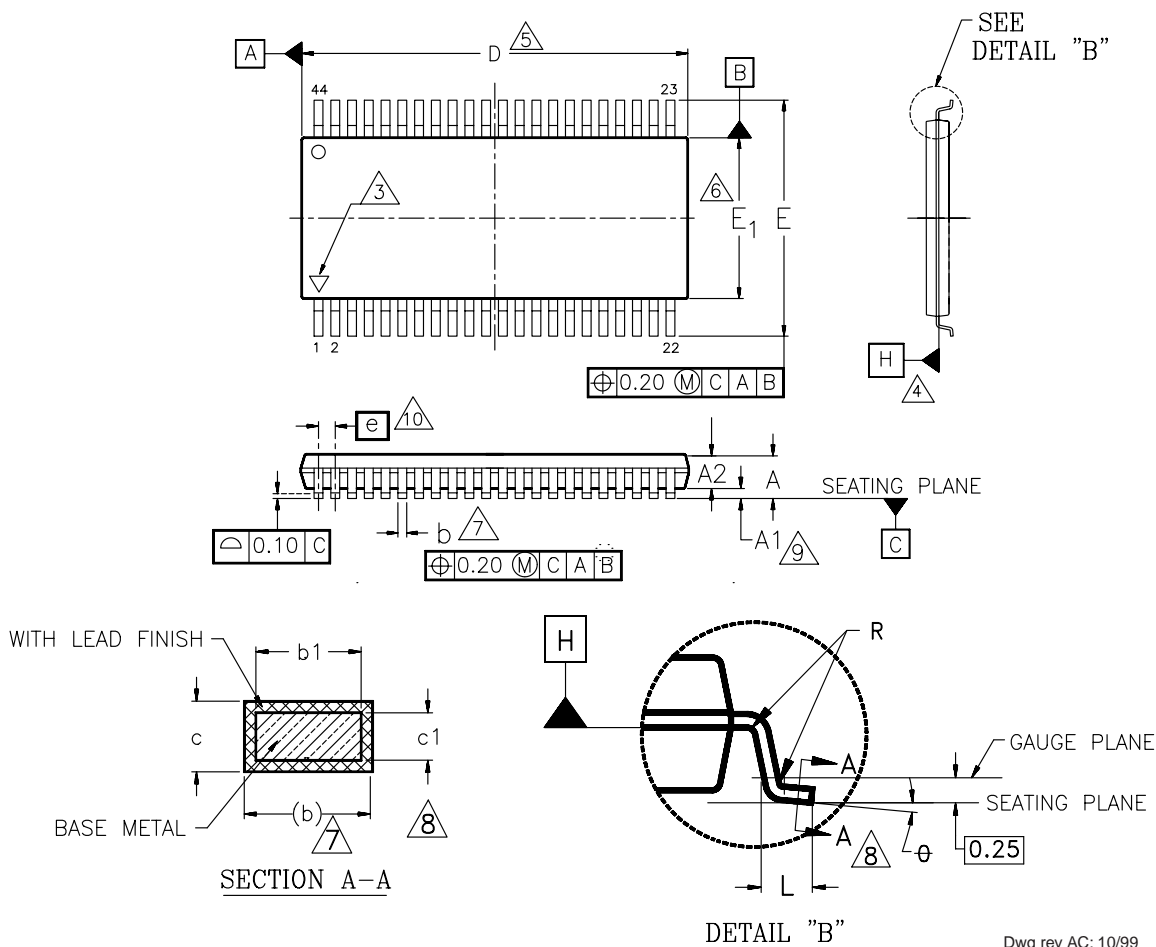
Dwg rev AC; 10/99

PACKAGE	SOR 044		
JEDEC	MO-180 (A) AA		
SYMBOL	MIN	NOM	MAX
A	—	—	2.80
A1	0.15	0.23	0.35
A2	2.17	2.30	2.45
b	0.35	—	0.50
b1	0.35	0.40	0.45
c	0.10	—	0.21
c1	0.10	0.15	0.18
D	28.00	28.20	28.40
E	15.70	16.00	16.30
E1	13.10	13.30	13.50
e	1.27 BSC		
L	0.60	0.80	1.00
R	0.09	—	—
θ	0°	4°	8°

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
2. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-1994.
3. PIN 1 IDENTIFIER FOR STANDARD FORM (DIE UP) OR REVERSE FORM (DIE DOWN) PINOUTS.
4. DATUMS A AND B AND DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 mm PER END.
6. DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 mm PER SIDE.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT EXCEED 0.15 mm PER SIDE. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION b BY MORE THAN 0.07 mm AT LEAST MATERIAL CONDITION.
8. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 mm AND 0.25 mm FROM THE LEAD TIPS.
9. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE.
10. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
11. LEAD COPLANARITY SHALL BE WITHIN 0.10 mm AS MEASURED FROM THER SEATING PLANE.

SSO56: 56-Pin SSOP

SEE DETAIL "B"

INDEX AREA /3\

DETAIL "B"

GAUGE PLANE

SEATING PLANE

WITH LEAD FINISH

BASE METAL

SECTION A-A

Dwg rev AB; 10/99

PACKAGE	SSO 056		
JEDEC	MO-180 (A) BA		
SYMBOL	MIN	NOM	MAX
A	—	—	2.00
A1	0.45	—	0.65
A2	1.15	1.25	1.35
b	* 0.25	—	0.45
b1	0.30	0.35	0.40
c	0.10	—	0.21
c1	0.10	0.15	0.18
D	23.40	23.70	24.00
E	15.70	16.00	16.30
E1	13.10	13.30	13.50
e	0.80 BSC		
L	0.60	0.80	1.00
R	0.09	—	—
θ	0°	4°	8°

* —DEVIATES FROM JEDEC (0.30)

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
2. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-1994.
3. A VISUAL INDEX FEATURE MUST BE LOCATED WITHIN THE CROSSHATCHED AREA.
4. DATUMS A AND B AND DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 mm PER END.
6. DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15 mm PER SIDE.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT EXCEED 0.15 mm PER SIDE. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION b BY MORE THAN 0.07 mm AT LEAST MATERIAL CONDITION.
8. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 mm AND 0.25 mm FROM THE LEAD TIPS.
9. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE.
10. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
11. LEAD COPLANARITY SHALL BE WITHIN 0.10 mm AS MEASURED FROM THE SEATING PLANE.

TS 032: 32-Pin Standard Pinout TSOP

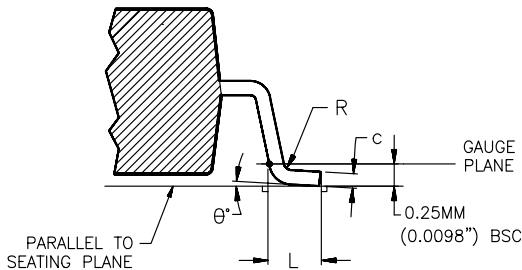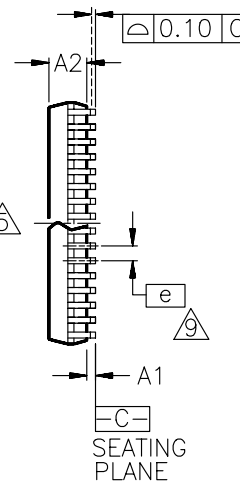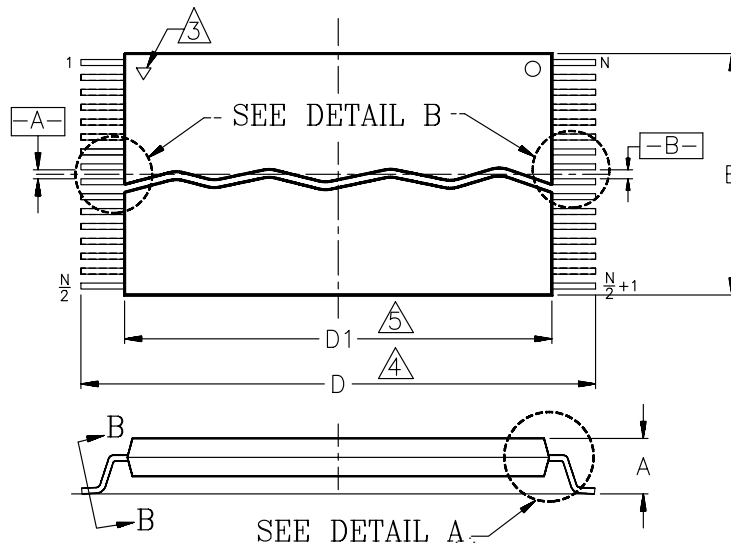STANDARD PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

SECTION B-B

X = A OR B
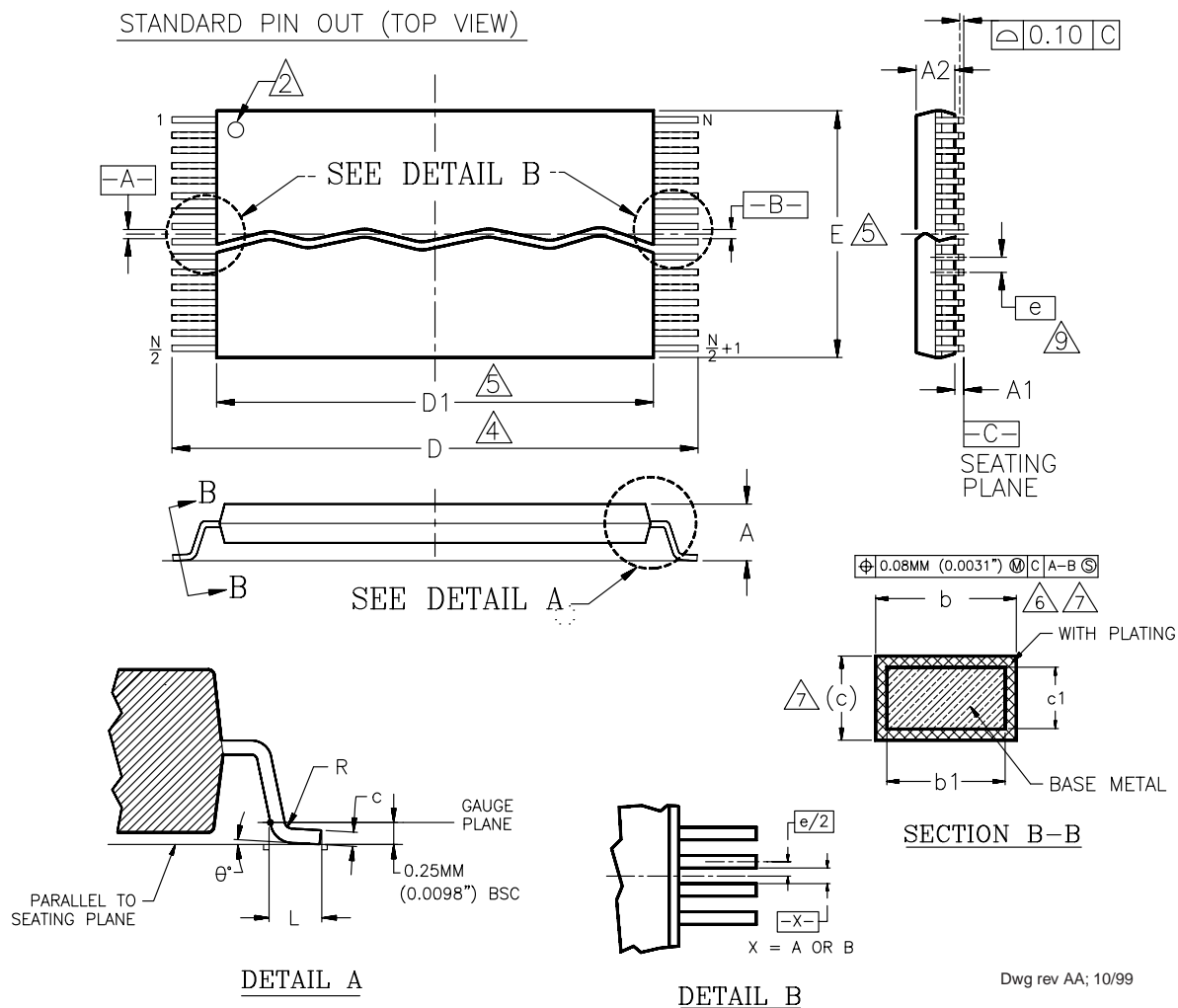
Dwg rev AA; 10/99

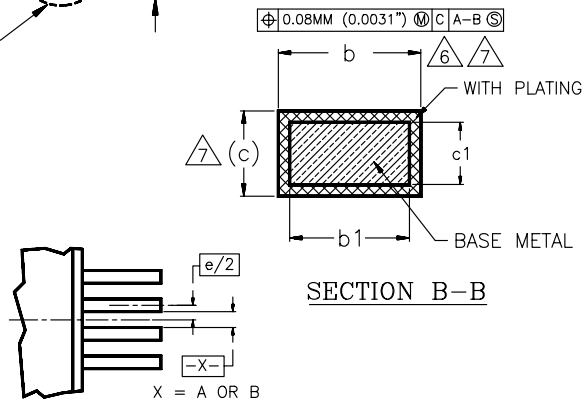| Package	TS 32		
Jedec	MO-142 (B) BD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	7.90	8.00	8.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	32		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm). (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE -C-. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.

AMD

TSR032: 32-Pin Reverse Pinout TSOP

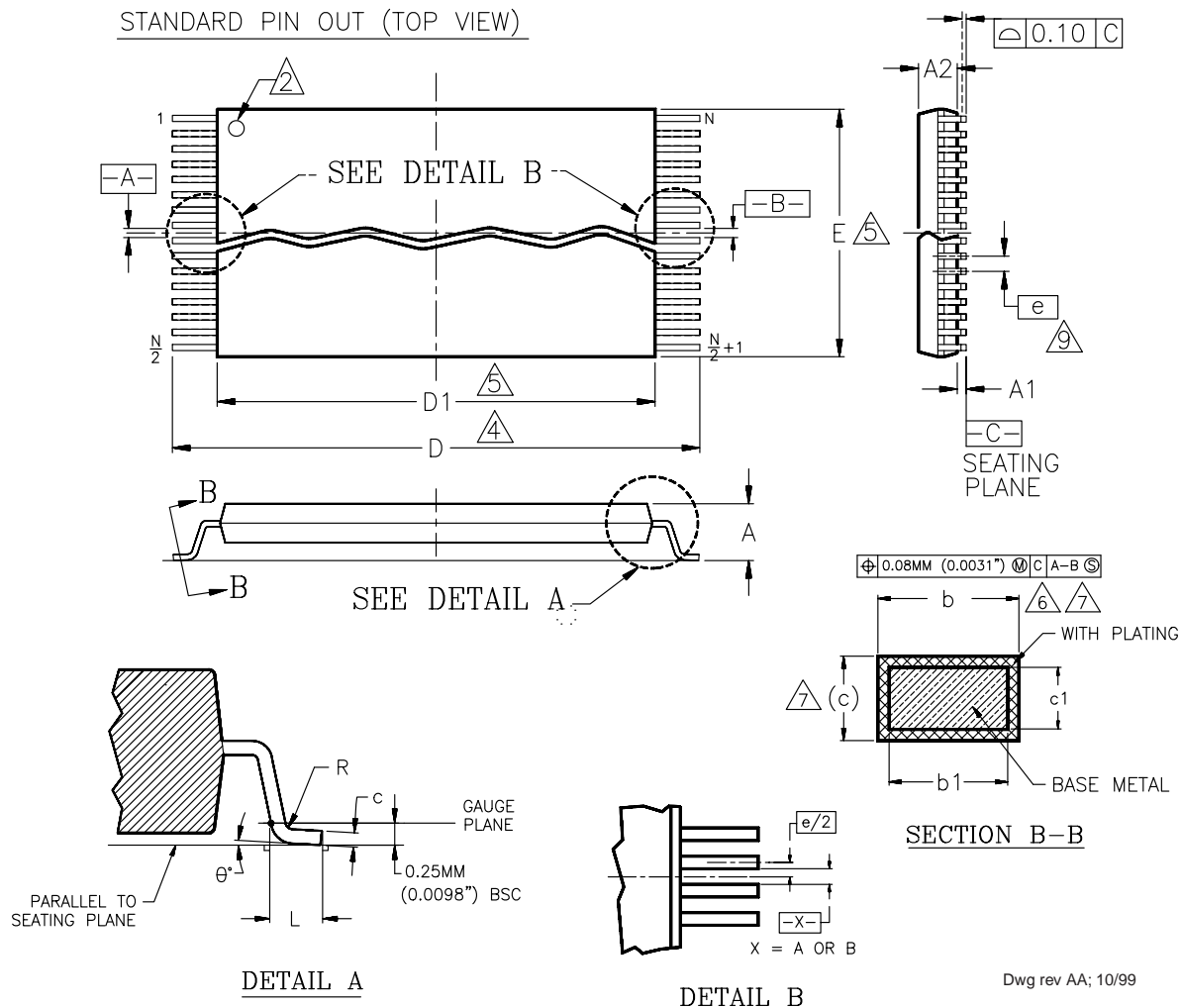REVERSE PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

X = A OR B

SECTION B-B

WITH PLATING

BASE METAL

SEATING PLANE

GAUGE PLANE

0.25MM (0.0098") BSC

PARALLEL TO SEATING PLANE

Dwg rev AA; 10/99

Package	TSR32		
Jedec	MO-142 (B) BD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	7.90	8.00	8.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	32		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm). (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE -C-. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
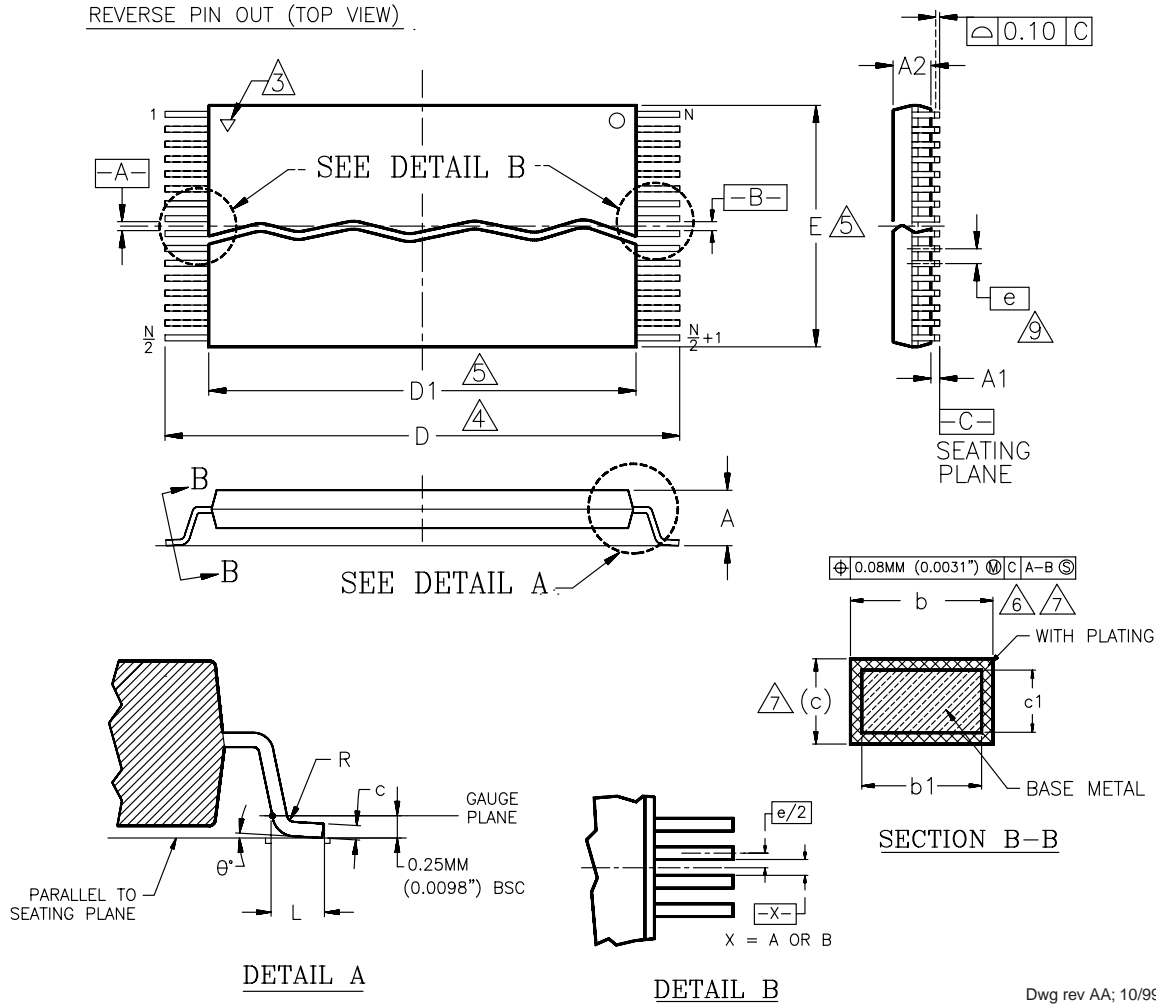
TS 040: 40-Pin Standard Pinout TSOP

STANDARD PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

SECTION B-B

SEATING PLANE

Dwg rev AA; 10/99

Package	TS 40		
Jedec	MO-142 (B) CD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	9.90	10.00	10.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	40		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
   (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE �ł-C-. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.

TSR040: 40-Pin Reverse Pinout TSOP

REVERSE PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

SECTION B—B

X = A OR B

WITH PLATING

c1

BASE METAL

GAUGE PLANE

0.25MM (0.0098") BSC

PARALLEL TO SEATING PLANE

SEATING PLANE

Dwg rev AA; 10/99

Package	TSR 40		
Jedec	MO−142 (B) CD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	9.90	10.00	10.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	40		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm). (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE [−C−]. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
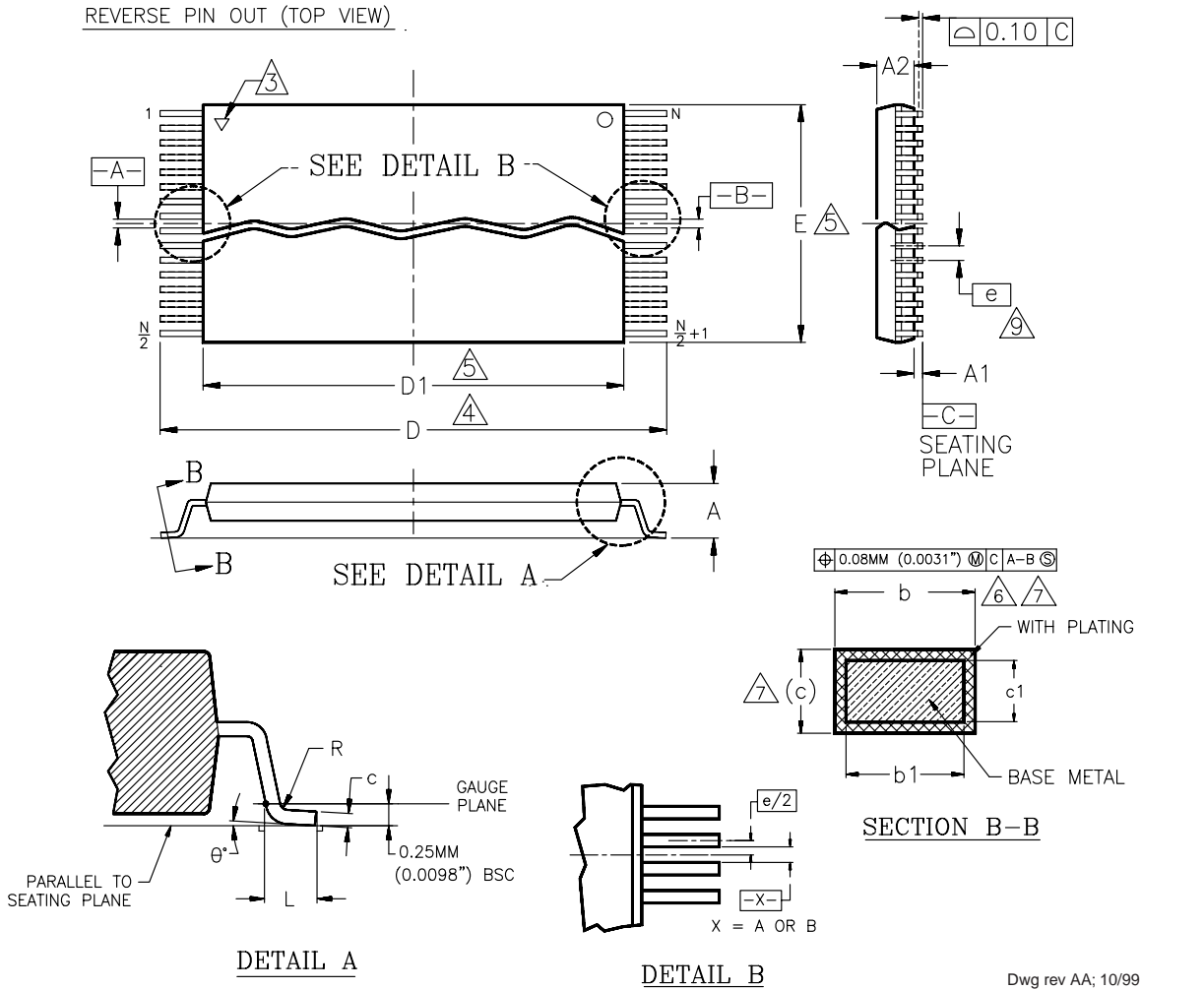
TS 048: 48-Pin Standard Pinout TSOP

STANDARD PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

SECTION B-B

Dwg rev AA; 10/99
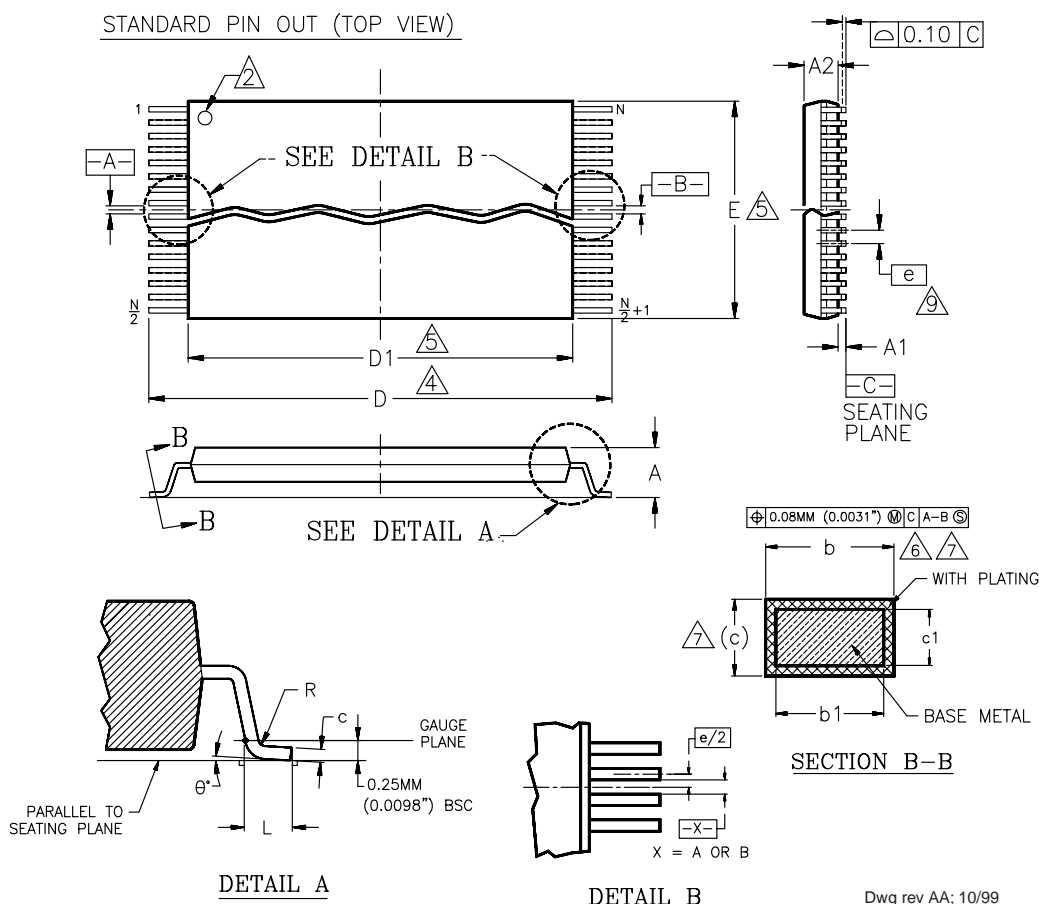
Package	TS 48		
Jedec	MO-142 (B) DD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	11.90	12.00	12.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	48		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm). (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE -C-. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.
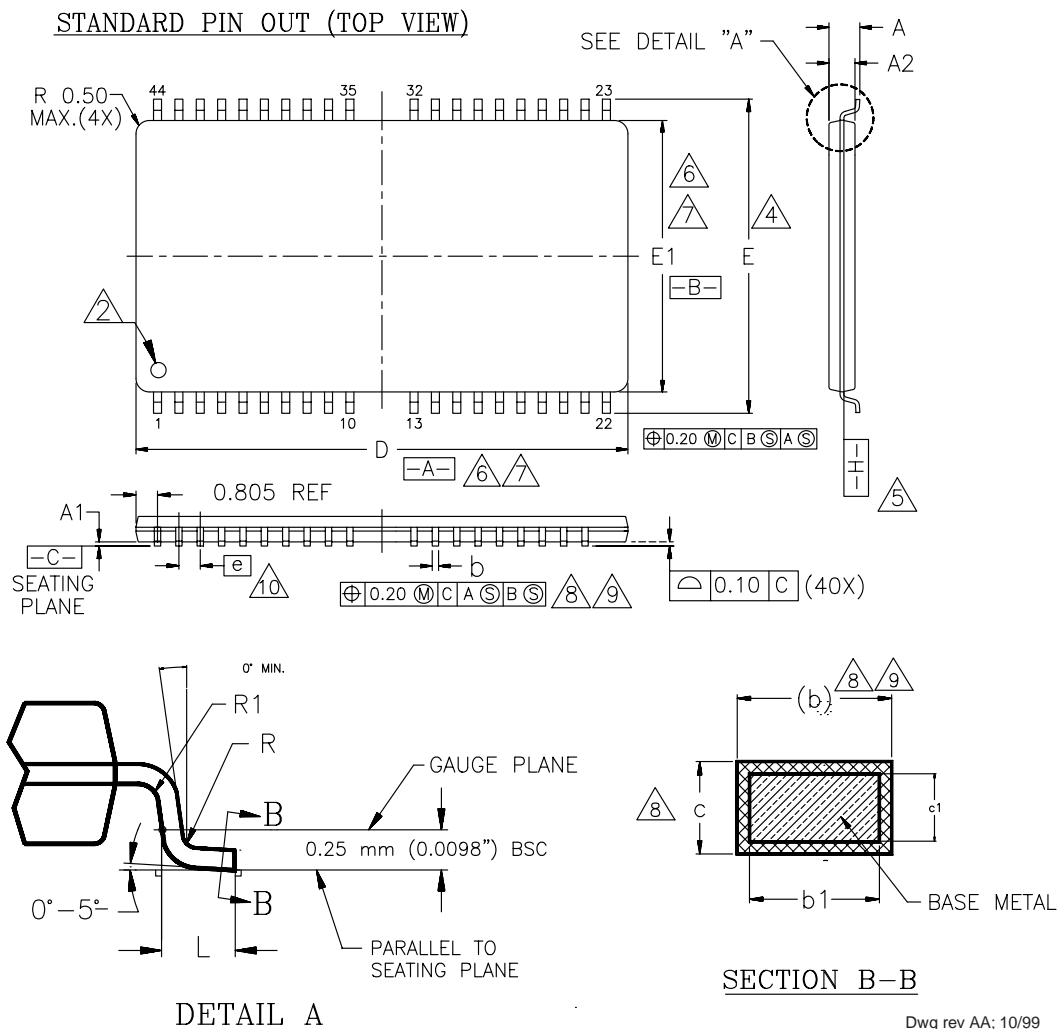
TSR048: 48-Pin Reverse Pinout TSOP

REVERSE PIN OUT (TOP VIEW)

SEE DETAIL B

SEE DETAIL A

DETAIL A

DETAIL B

SECTION B-B

GAUGE PLANE

0.25MM (0.0098") BSC

PARALLEL TO SEATING PLANE

X = A OR B

WITH PLATING

BASE METAL

SEATING PLANE

Dwg rev AA; 10/99

Package	TSR 48		
Jedec	MO-142 (B) DD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	11.90	12.00	12.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	3°	5°
R	0.08	—	0.20
N	48		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
   (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)

2. PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

4. TO BE DETERMINED AT THE SEATING PLANE ⌐C⌐. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.

5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.

6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08mm (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07mm (0.0028").

7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10mm (.0039") AND 0.25mm (0.0098") FROM THE LEAD TIP.

8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.

9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.

TS 044: 44-Pin Standard or Reverse TSOP

STANDARD PIN OUT (TOP VIEW)

SEE DETAIL "A"

R 0.50 MAX.(4X)

0.805 REF

SEATING PLANE

DETAIL A

0° MIN.

GAUGE PLANE

0.25 mm (0.0098") BSC

PARALLEL TO SEATING PLANE

0°–5°

SECTION B–B

BASE METAL

Dwg rev AA; 10/99

Package	T2 44 (40)		
Jedec	MO−024 (C) AC		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b	0.30		0.45
b1	0.30	0.35	0.40
c	0.12	—	0.21
c1	0.12	0.15	0.16
D	18.28	18.41	18.54
E	11.56	11.76	11.96
E1	10.03	10.16	10.29
e	0.80 BASIC		
L	0.40	0.50	0.60
R	0.12	—	0.25
R1	.0.12	—	—
Note: All Dimensions are in Millimeters. ⚠1			

NOTES:

⚠1 CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm).
(DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M−1982).

⚠2 PIN 1 IDENTIFIER FOR STANDARD PIN OUT (DIE UP).

⚠3 PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN): INK OR LASER MARK.

⚠4 TO BE DETERMINED AT SEATING PLANE ⎣−C−⎦.
THE SEATING PLANE IS DEFINED AS THE PLANE OF THE CONTACT THAT IS
MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT
HORIZONTAL SURFACE.

⚠5 DATUM PLANE ⎣−H−⎦ COINCIDENT WITH BOTTOM OF LEAD, WHERE LEAD EXITS BODY.

⚠6 DATUMS ⎣−A−⎦ AND ⎣−B−⎦ TO BE DETERMINED AT DATUM ⎣−H−⎦.

⚠7 DIMENSIONS D AND E1 ARE DETERMINED AT DATUM ⎣−H−⎦. DIMENSION D
DOES NOT INCLUDE MOLD PROTRUSIONS OR GATE BURRS. MOLD
PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15 mm PER SIDE.

⚠8 THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN
0.10 mm AND 0.25 mm FROM THE LEAD TIP.

⚠9 DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.
ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD TO BE WIDER
THAN THE MAXIMUM b DIMENSION BY MORE THAN 0.13 mm. DAMBAR INTRUSION
SHALL NOT CAUSE THE LEAD TO BE NARROWER THAN THE MINIMUM b DIMENSION
BY MORE THAN 0.07 mm.

⚠10 DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.

11. LEAD COPLANARITY SHALL BE WITHIN 0.10 mm (0.004 INCHES) AS
MEASURED FROM THE SEATING PLANE.
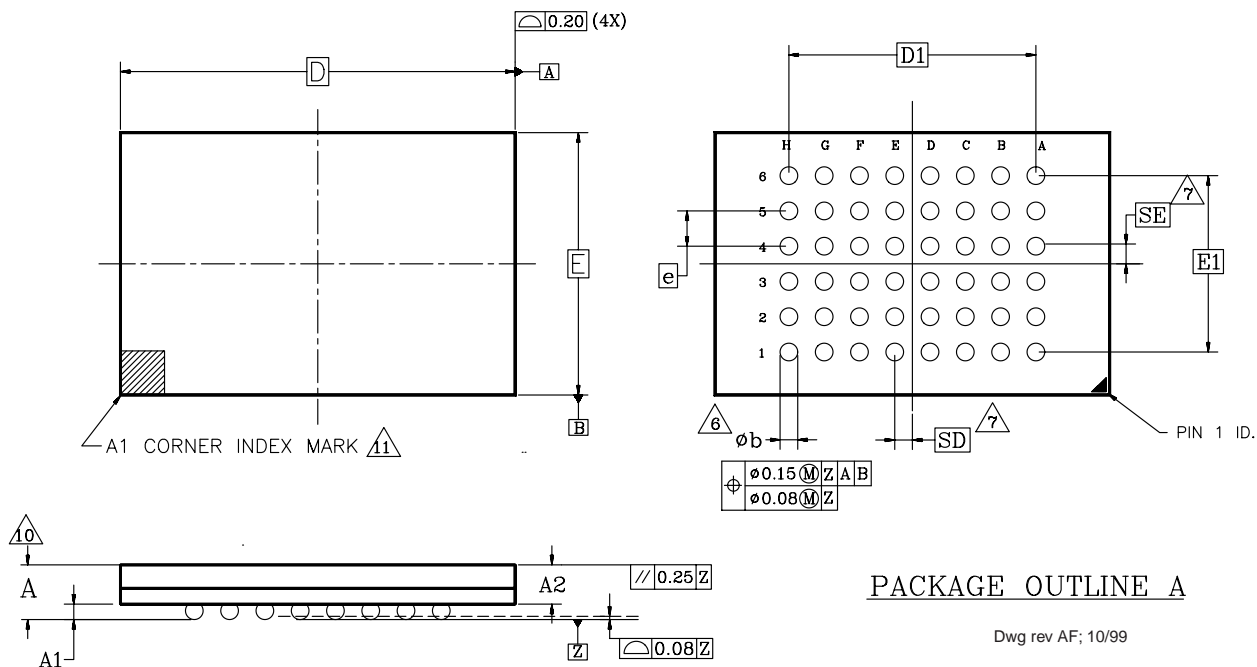
FBA048: 48-Ball 6 x 8 mm FBGA

PACKAGE OUTLINE A

Dwg rev AF; 10/99
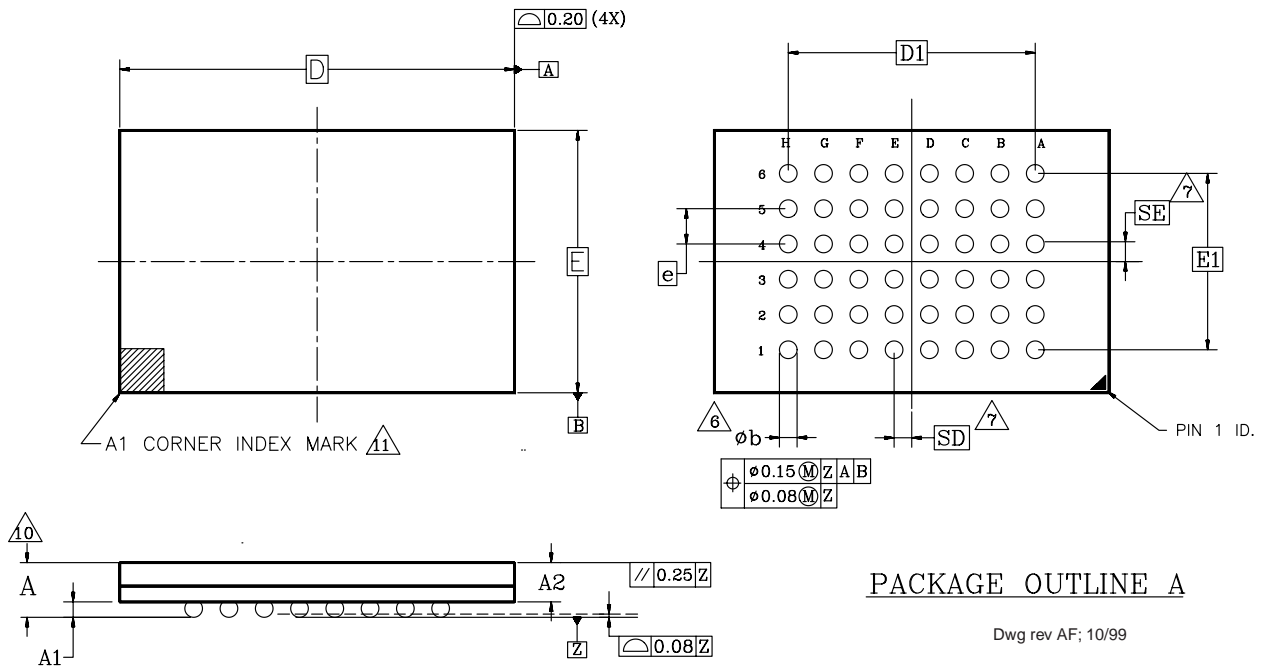
PACKAGE	xFBA 048			
JEDEC	N/A			
	6.15mm×8.15mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	—	—	1.20	OVERALL THICKNESS
A1	0.20	—	—	BALL HEIGHT
A2	0.84	—	0.94	BODY THICKNESS
D	8.15 BSC			BODY SIZE
E	6.15 BSC			BODY SIZE
D1	5.60 BSC			BALL FOOTPRINT
E1	4.00 BSC			BALL FOOTPRINT
MD	8			ROW MATRIX SIZE D DIRECTION
ME	6			ROW MATRIX SIZE E DIRECTION
N	48			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	0.40 BSC			SOLDER BALL PLACEMENT

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95−1, SPP−010.

4. $\boxed{e}$ REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = $\boxed{e/2}$

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.
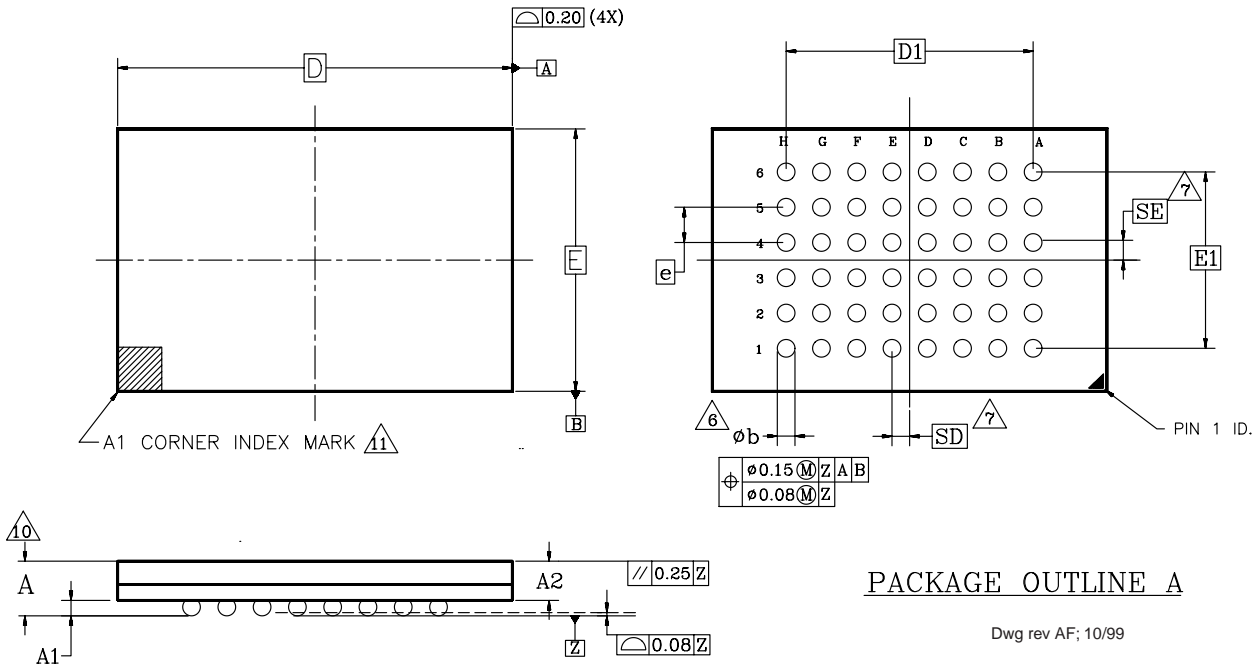
FBB048: 48-Ball 6 x 9 mm FBGA

PACKAGE OUTLINE A

Dwg rev AF; 10/99

PACKAGE	xFBB 048			
JEDEC	N/A			
	6.00mmx9.00mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	OVERALL THICKNESS
A1	0.20	–	–	BALL HEIGHT
A2	0.84	–	0.94	BODY THICKNESS
D	9.00 BSC			BODY SIZE
E	6.00 BSC			BODY SIZE
D1	5.60 BSC			BALL FOOTPRINT
E1	4.00 BSC			BALL FOOTPRINT
MD	8			ROW MATRIX SIZE D DIRECTION
ME	6			ROW MATRIX SIZE E DIRECTION
N	48			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	0.40 BSC			SOLDER BALL PLACEMENT

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95–1, SPP–010.

4. $\boxed{e}$ REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = $\boxed{e/2}$

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.

FBC048: 48-Ball 8 x 9 mm FBGA
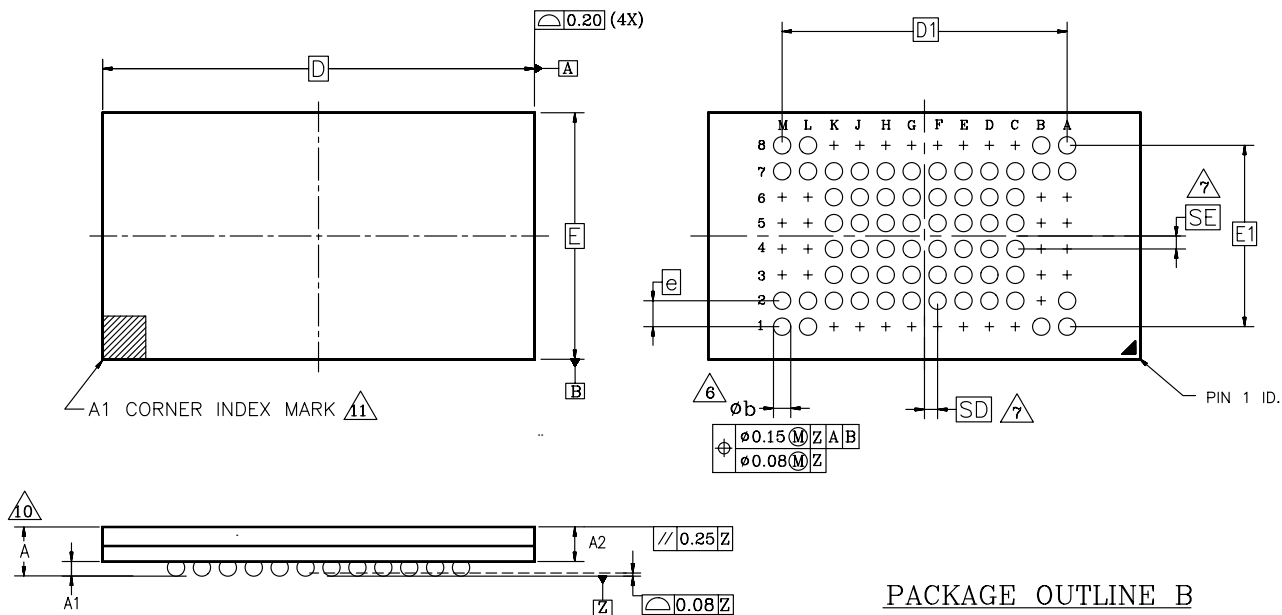

PACKAGE OUTLINE A

Dwg rev AF; 10/99

PACKAGE	FBC 048			
JEDEC	N/A			
	8.00mmx9.00mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	OVERALL THICKNESS
A1	0.20	–	–	BALL HEIGHT
A2	0.84	–	0.94	BODY THICKNESS
D	9.00 BSC			BODY SIZE
E	8.00 BSC			BODY SIZE
D1	5.60 BSC			BALL FOOTPRINT
E1	4.00 BSC			BALL FOOTPRINT
MD	8			ROW MATRIX SIZE D DIRECTION
ME	6			ROW MATRIX SIZE E DIRECTION
N	48			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	0.40 BSC			SOLDER BALL PLACEMENT

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95−1, SPP−010.

4. $\boxed{e}$ REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = $\boxed{e/2}$

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.

FBD063: 63-Ball 8 x 14 mm FBGA

Page 10-16: The dimensions of the FBGA package should be stated as 8 x 14 mm.
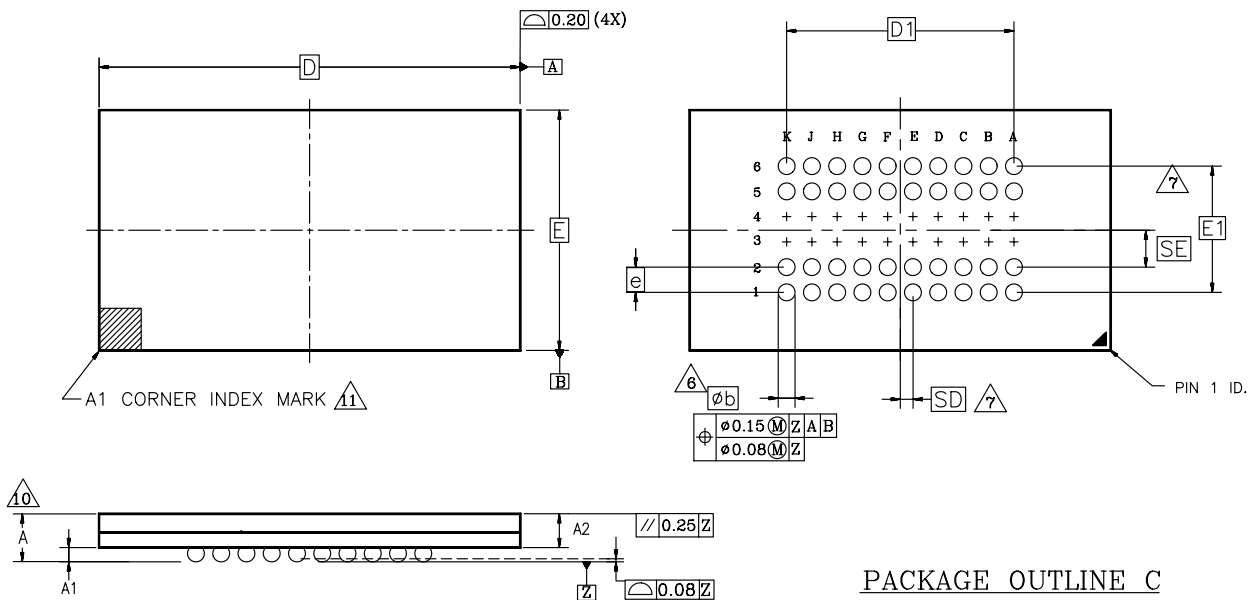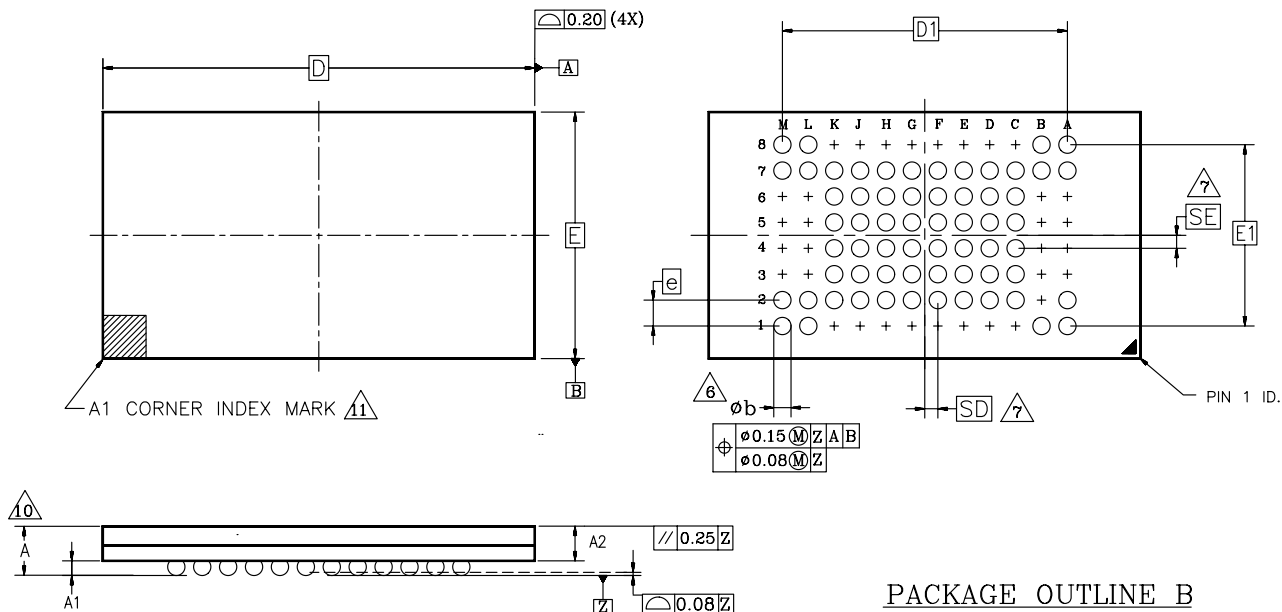

PACKAGE OUTLINE B

Dwg rev AF; 10/99

PACKAGE	xFBD 063			
JEDEC	N/A			
	8.00mmx14.00mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	—	—	1.20	OVERALL THICKNESS
A1	0.20	—	—	BALL HEIGHT
A2	0.84	—	0.94	BODY THICKNESS
D	14.00 BSC			BODY SIZE
E	8.00 BSC			BODY SIZE
D1	8.80 BSC			BALL FOOTPRINT
E1	5.60 BSC			BALL FOOTPRINT
MD	12			ROW MATRIX SIZE D DIRECTION
ME	8			ROW MATRIX SIZE E DIRECTION
N	63			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	0.40 BSC			SOLDER BALL PLACEMENT
	A3-A6,B2-B6, L3-L6,M3-M6, C1-K1,C8-K8			DEPOPULATED SOLDER BALLS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95-1, SPP-010.

4. e REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = e/2

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.

FBE040: 40-Ball 8 x 15 mm FBGA

A1 CORNER INDEX MARK

PACKAGE OUTLINE C

Dwg rev AF; 10/99

PACKAGE	xFBE 040			
JEDEC	N/A			
	8.00mmx15.00mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	OVERALL THICKNESS
A1	0.20	–	–	BALL HEIGHT
A2	0.84	–	0.94	BODY THICKNESS
D	15.00 BSC			BODY SIZE
E	8.00 BSC			BODY SIZE
D1	7.20 BSC			BALL FOOTPRINT
E1	4.00 BSC			BALL FOOTPRINT
MD	10			ROW MATRIX SIZE D DIRECTION
ME	6			ROW MATRIX SIZE E DIRECTION
N	40			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	1.20/0.40 BSC			SOLDER BALL PLACEMENT
	A3–K3, A4–K4			DEPOPULATED SOLDER BALLS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95−1, SPP−010.

4. e REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = e/2

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.

FBE063: 63-Ball 11 x 12 mm FBGA

PACKAGE OUTLINE B

Dwg rev AF; 10/99

PACKAGE	xFBE 063			
JEDEC	N/A			
	12.00mmx11.00mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	OVERALL THICKNESS
A1	0.20	–	–	BALL HEIGHT
A2	0.84	–	0.94	BODY THICKNESS
D	12.00 BSC			BODY SIZE
E	11.00 BSC			BODY SIZE
D1	8.80 BSC			BALL FOOTPRINT
E1	5.60 BSC			BALL FOOTPRINT
MD	12			ROW MATRIX SIZE D DIRECTION
ME	8			ROW MATRIX SIZE E DIRECTION
N	63			TOTAL BALL COUNT
b	0.25	0.30	0.35	BALL DIAMETER
e	0.80 BSC			BALL PITCH
SD/SE	0.40 BSC			SOLDER BALL PLACEMENT
	A3–A6,B2–B6 L3–L6, M3–M6 C1–K1,C8–K8			DEPOPULATED SOLDER BALLS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. BALL POSITION DESIGNATION PER JESD 95−1, SPP−010.

4. $\boxed{e}$ REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL ROW MATRIX SIZE IN THE "D" DIRECTION. SYMBOL "ME" IS THE BALL COLUMN MATRIX SIZE IN THE "E" DIRECTION. N IS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZE MD x ME.

6. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM Z.

7. SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION, RESPECTIVELY, SD OR SE = 0.000 WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = $\boxed{e/2}$

8. "X" IN THE PACKAGE VARIATIONS DENOTES PART IS UNDER QUALIFICATION.

9. "+" IN THE PACKAGE DRAWING INDICATE THE THEORETICAL CENTER OF DEPOPULATED BALLS.

10. FOR PACKAGE THICKNESS A IS THE CONTROLING DIMENSION.

11. A1 CORNER TO BE IDENTIFIED BY CHAMFER, INK MARK, METALLIZED MARKINGS INDENTION OR OTHER MEANS.

AMD◣

Trademarks