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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 | Active |
| Number of LABs/CLBs | - |
| Number of Logic Elements/Cells | - |
| Total RAM Bits | 110592 |
| Number of I/O | 165 |
| Number of Gates | 600000 |
| Voltage - Supply | 1.425V ~ 1.575V |
| Mounting Type | Surface Mount |
| Operating Temperature | 0°C ~ 85°C (TJ) |
| Package / Case | 256-LBGA |
| Supplier Device Package | 256-FPBGA (17x17) |
| Purchase URL | https://www.e-xfl.com/product-detail/microchip-technology/a3pe600-fgg256 |

## Advanced Architecture

The proprietary ProASIC3E architecture provides granularity comparable to standard-cell ASICs. The ProASIC3E device consists of five distinct and programmable architectural features (Figure 1-1 on page 3):

- FPGA VersaTiles
- Dedicated FlashROM
- Dedicated SRAM/FIFO memory
- Extensive CCCs and PLLs
- Pro I/O structure

The FPGA core consists of a sea of VersaTiles. Each VersaTile can be configured as a three-input logic function, a D-flip-flop (with or without enable), or a latch by programming the appropriate flash switch interconnections. The versatility of the ProASIC3E core tile as either a three-input lookup table (LUT) equivalent or as a D-flip-flop/latch with enable allows for efficient use of the FPGA fabric. The VersaTile capability is unique to the ProASIC family of third-generation architecture Flash FPGAs. VersaTiles are connected with any of the four levels of routing hierarchy. Flash switches are distributed throughout the device to provide nonvolatile, reconfigurable interconnect programming. Maximum core utilization is possible for virtually any design.

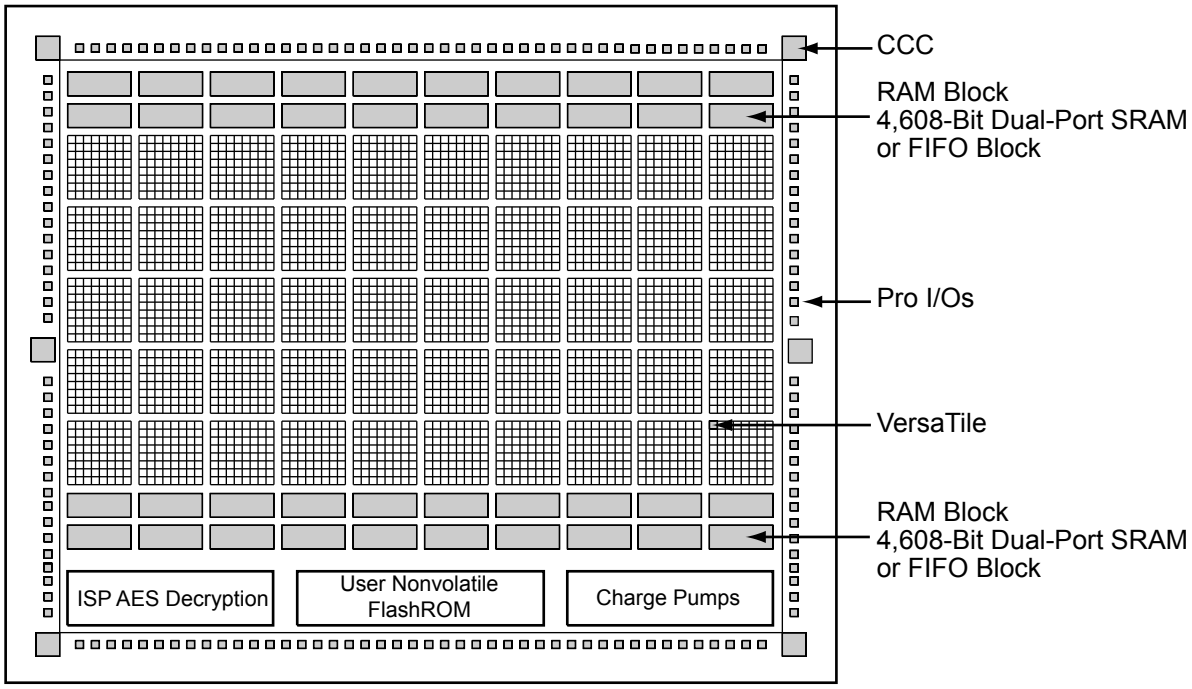
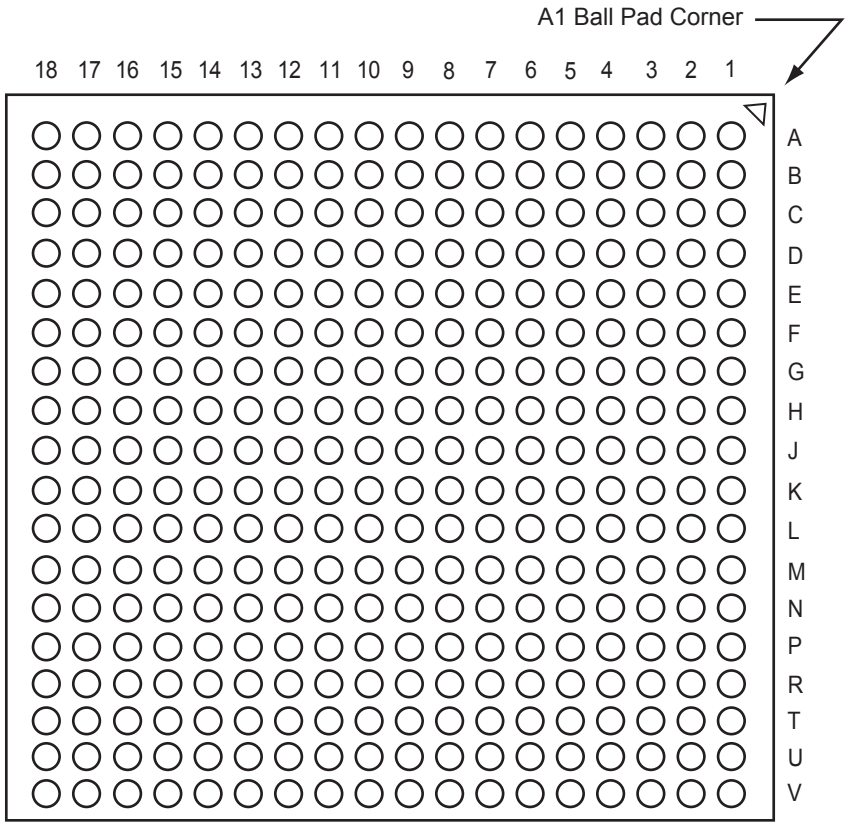



***Figure 1-1 •*** **ProASIC3E Device Architecture Overview**

# FG324




*Note: This is the bottom view of the package.*

## Note

For Package Manufacturing and Environmental information, visit the Resource Center at *http://www.microsemi.com/products/fpga-soc/solutions*.

| FG324 | |
|---|---|
| Pin Number | A3PE3000 FBGA |
| G1 | GND |
| G2 | IO287PDB7V1 |
| G3 | IO287NDB7V1 |
| G4 | IO283PPB7V1 |
| G5 | VCCIB7 |
| G6 | IO279PDB7V0 |
| G7 | IO291NPB7V2 |
| G8 | VCC |
| G9 | IO26NDB0V3 |
| G10 | IO34NDB0V4 |
| G11 | VCC |
| G12 | IO94NPB2V1 |
| G13 | IO98PDB2V2 |
| G14 | VCCIB2 |
| G15 | GCC0/IO112NPB2V3 |
| G16 | IO104PDB2V2 |
| G17 | IO104NDB2V2 |
| G18 | GND |
| H1 | IO267PDB6V4 |
| H2 | VCCIB7 |
| H3 | IO283NPB7V1 |
| H4 | GFB1/IO274PPB7V0 |
| H5 | GND |
| H6 | IO279NDB7V0 |
| H7 | VCC |
| H8 | VCC |
| H9 | GND |
| H10 | GND |
| H11 | VCC |
| H12 | VCC |
| H13 | IO98NDB2V2 |
| H14 | GND |
| H15 | GCB1/IO113PDB2V3 |
| H16 | GCC1/IO112PPB2V3 |
| H17 | VCCIB2 |
| H18 | IO108PDB2V3 |

| FG324 | |
|---|---|
| Pin Number | A3PE3000 FBGA |
| J1 | IO267NDB6V4 |
| J2 | GFA0/IO273NDB6V4 |
| J3 | VCOMPLF |
| J4 | GFA2/IO272PDB6V4 |
| J5 | GFB0/IO274NPB7V0 |
| J6 | GFC0/IO275NDB7V0 |
| J7 | GFC1/IO275PDB7V0 |
| J8 | GND |
| J9 | GND |
| J10 | GND |
| J11 | GND |
| J12 | GCA2/IO115PDB3V0 |
| J13 | GCA1/IO114PDB3V0 |
| J14 | GCA0/IO114NDB3V0 |
| J15 | GCB0/IO113NDB2V3 |
| J16 | VCOMPLC |
| J17 | IO120NPB3V0 |
| J18 | IO108NDB2V3 |
| K1 | IO263PDB6V3 |
| K2 | GFA1/IO273PDB6V4 |
| K3 | VCCPLF |
| K4 | IO272NDB6V4 |
| K5 | GFC2/IO270PPB6V4 |
| K6 | GFB2/IO271PDB6V4 |
| K7 | IO271NDB6V4 |
| K8 | GND |
| K9 | GND |
| K10 | GND |
| K11 | GND |
| K12 | IO115NDB3V0 |
| K13 | GCB2/IO116PDB3V0 |
| K14 | IO116NDB3V0 |
| K15 | GCC2/IO117PDB3V0 |
| K16 | VCCPLC |
| K17 | IO124NPB3V1 |
| K18 | IO120PPB3V0 |

| FG324 | |
|---|---|
| Pin Number | A3PE3000 FBGA |
| L1 | IO263NDB6V3 |
| L2 | VCCIB6 |
| L3 | IO259PDB6V3 |
| L4 | IO259NDB6V3 |
| L5 | GND |
| L6 | IO270NPB6V4 |
| L7 | VCC |
| L8 | VCC |
| L9 | GND |
| L10 | GND |
| L11 | VCC |
| L12 | VCC |
| L13 | IO132PDB3V2 |
| L14 | GND |
| L15 | IO117NDB3V0 |
| L16 | IO128NPB3V1 |
| L17 | VCCIB3 |
| L18 | IO124PPB3V1 |
| M1 | GND |
| M2 | IO255PDB6V2 |
| M3 | IO255NDB6V2 |
| M4 | IO251PPB6V2 |
| M5 | VCCIB6 |
| M6 | GEB0/IO235NDB6V0 |
| M7 | GEB1/IO235PDB6V0 |
| M8 | VCC |
| M9 | IO192PPB4V4 |
| M10 | IO154NPB4V0 |
| M11 | VCC |
| M12 | GDA0/IO153NPB3V4 |
| M13 | IO132NDB3V2 |
| M14 | VCCIB3 |
| M15 | IO134NDB3V2 |
| M16 | IO134PDB3V2 |
| M17 | IO128PPB3V1 |
| M18 | GND |

| FG484 | |
|---|---|
| Pin Number | A3PE1500 Function |
| A1 | GND |
| A2 | GND |
| A3 | VCCIB0 |
| A4 | IO05NDB0V0 |
| A5 | IO05PDB0V0 |
| A6 | IO11NDB0V1 |
| A7 | IO11PDB0V1 |
| A8 | IO15PDB0V1 |
| A9 | IO17PDB0V2 |
| A10 | IO27NDB0V3 |
| A11 | IO27PDB0V3 |
| A12 | IO32PDB1V0 |
| A13 | IO43PDB1V1 |
| A14 | IO47NDB1V1 |
| A15 | IO47PDB1V1 |
| A16 | IO51NDB1V2 |
| A17 | IO51PDB1V2 |
| A18 | IO54NDB1V3 |
| A19 | NC |
| A20 | VCCIB1 |
| A21 | GND |
| A22 | GND |
| AA1 | GND |
| AA2 | VCCIB6 |
| AA3 | NC |
| AA4 | IO161PDB5V3 |
| AA5 | IO155NDB5V2 |
| AA6 | IO155PDB5V2 |
| AA7 | IO154NDB5V2 |
| AA8 | IO154PDB5V2 |
| AA9 | IO143PDB5V1 |
| AA10 | IO143NDB5V1 |
| AA11 | IO131PPB4V2 |
| AA12 | IO129NDB4V2 |
| AA13 | IO129PDB4V2 |
| AA14 | NC |

| FG484 | |
|---|---|
| Pin Number | A3PE1500 Function |
| AA15 | NC |
| AA16 | IO117NDB4V0 |
| AA17 | IO117PDB4V0 |
| AA18 | IO115NDB4V0 |
| AA19 | IO115PDB4V0 |
| AA20 | NC |
| AA21 | VCCIB3 |
| AA22 | GND |
| AB1 | GND |
| AB2 | GND |
| AB3 | VCCIB5 |
| AB4 | IO159NDB5V3 |
| AB5 | IO159PDB5V3 |
| AB6 | IO149NDB5V1 |
| AB7 | IO149PDB5V1 |
| AB8 | IO138NDB5V0 |
| AB9 | IO138PDB5V0 |
| AB10 | NC |
| AB11 | NC |
| AB12 | IO127NDB4V2 |
| AB13 | IO127PDB4V2 |
| AB14 | IO125NDB4V1 |
| AB15 | IO125PDB4V1 |
| AB16 | IO122NDB4V1 |
| AB17 | IO122PDB4V1 |
| AB18 | NC |
| AB19 | NC |
| AB20 | VCCIB4 |
| AB21 | GND |
| AB22 | GND |
| B1 | GND |
| B2 | VCCIB7 |
| B3 | NC |
| B4 | IO03NDB0V0 |
| B5 | IO03PDB0V0 |
| B6 | IO10NDB0V1 |

| FG484 | |
|---|---|
| Pin Number | A3PE1500 Function |
| B7 | IO10PDB0V1 |
| B8 | IO15NDB0V1 |
| B9 | IO17NDB0V2 |
| B10 | IO20PDB0V2 |
| B11 | IO29PDB0V3 |
| B12 | IO32NDB1V0 |
| B13 | IO43NDB1V1 |
| B14 | NC |
| B15 | NC |
| B16 | IO53NDB1V2 |
| B17 | IO53PDB1V2 |
| B18 | IO54PDB1V3 |
| B19 | NC |
| B20 | NC |
| B21 | VCCIB2 |
| B22 | GND |
| C1 | VCCIB7 |
| C2 | NC |
| C3 | NC |
| C4 | NC |
| C5 | GND |
| C6 | IO07NDB0V0 |
| C7 | IO07PDB0V0 |
| C8 | VCC |
| C9 | VCC |
| C10 | IO20NDB0V2 |
| C11 | IO29NDB0V3 |
| C12 | NC |
| C13 | NC |
| C14 | VCC |
| C15 | VCC |
| C16 | NC |
| C17 | NC |
| C18 | GND |
| C19 | NC |
| C20 | NC |

| FG484 | |
|---|---|
| **Pin Number** | **A3PE1500 Function** |
| H19 | IO67PDB2V1 |
| H20 | VCC |
| H21 | VMV2 |
| H22 | IO74PSB2V2 |
| J1 | IO212NDB7V2 |
| J2 | IO212PDB7V2 |
| J3 | VMV7 |
| J4 | IO206PDB7V1 |
| J5 | IO204PDB7V1 |
| J6 | IO210PDB7V2 |
| J7 | IO215NDB7V3 |
| J8 | VCCIB7 |
| J9 | GND |
| J10 | VCC |
| J11 | VCC |
| J12 | VCC |
| J13 | VCC |
| J14 | GND |
| J15 | VCCIB2 |
| J16 | IO60NDB2V0 |
| J17 | IO65NDB2V1 |
| J18 | IO65PDB2V1 |
| J19 | IO75PPB2V2 |
| J20 | GNDQ |
| J21 | IO77PDB2V2 |
| J22 | IO79PDB2V3 |
| K1 | IO200NDB7V1 |
| K2 | IO200PDB7V1 |
| K3 | GNDQ |
| K4 | IO206NDB7V1 |
| K5 | IO204NDB7V1 |
| K6 | IO210NDB7V2 |
| K7 | GFC1/IO192PPB7V0 |
| K8 | VCCIB7 |
| K9 | VCC |
| K10 | GND |

| FG484 | |
|---|---|
| **Pin Number** | **A3PE1500 Function** |
| K11 | GND |
| K12 | GND |
| K13 | GND |
| K14 | VCC |
| K15 | VCCIB2 |
| K16 | GCC1/IO85PPB2V3 |
| K17 | IO73NDB2V2 |
| K18 | IO73PDB2V2 |
| K19 | IO81NPB2V3 |
| K20 | IO75NPB2V2 |
| K21 | IO77NDB2V2 |
| K22 | IO79NDB2V3 |
| L1 | NC |
| L2 | IO196PDB7V0 |
| L3 | IO196NDB7V0 |
| L4 | GFB0/IO191NPB7V0 |
| L5 | GFA0/IO190NDB6V2 |
| L6 | GFB1/IO191PPB7V0 |
| L7 | VCOMPLF |
| L8 | GFC0/IO192NPB7V0 |
| L9 | VCC |
| L10 | GND |
| L11 | GND |
| L12 | GND |
| L13 | GND |
| L14 | VCC |
| L15 | GCC0/IO85NPB2V3 |
| L16 | GCB1/IO86PPB2V3 |
| L17 | GCA0/IO87NPB3V0 |
| L18 | VCOMPLC |
| L19 | GCB0/IO86NPB2V3 |
| L20 | IO81PPB2V3 |
| L21 | IO83NDB2V3 |
| L22 | IO83PDB2V3 |
| M1 | GNDQ |
| M2 | IO185NPB6V2 |

| FG484 | |
|---|---|
| **Pin Number** | **A3PE1500 Function** |
| M3 | IO189NDB6V2 |
| M4 | GFA2/IO189PDB6V2 |
| M5 | GFA1/IO190PDB6V2 |
| M6 | VCCPLF |
| M7 | IO188NDB6V2 |
| M8 | GFB2/IO188PDB6V2 |
| M9 | VCC |
| M10 | GND |
| M11 | GND |
| M12 | GND |
| M13 | GND |
| M14 | VCC |
| M15 | GCB2/IO89PPB3V0 |
| M16 | GCA1/IO87PPB3V0 |
| M17 | GCC2/IO90PPB3V0 |
| M18 | VCCPLC |
| M19 | GCA2/IO88PDB3V0 |
| M20 | IO88NDB3V0 |
| M21 | IO93PDB3V0 |
| M22 | NC |
| N1 | IO185PPB6V2 |
| N2 | IO183NDB6V2 |
| N3 | VMV6 |
| N4 | GFC2/IO187PPB6V2 |
| N5 | IO184PPB6V2 |
| N6 | IO186PDB6V2 |
| N7 | IO186NDB6V2 |
| N8 | VCCIB6 |
| N9 | VCC |
| N10 | GND |
| N11 | GND |
| N12 | GND |
| N13 | GND |
| N14 | VCC |
| N15 | VCCIB3 |
| N16 | IO89NPB3V0 |

| FG676 | |
|---|---|
| **Pin Number** | **A3PE1500 Function** |
| W25 | IO96PDB3V1 |
| W26 | IO94NDB3V0 |
| Y1 | IO175NDB6V1 |
| Y2 | IO175PDB6V1 |
| Y3 | IO173NDB6V0 |
| Y4 | IO173PDB6V0 |
| Y5 | GEC1/IO169PPB6V0 |
| Y6 | GNDQ |
| Y7 | VMV6 |
| Y8 | VCCIB5 |
| Y9 | IO163NDB5V3 |
| Y10 | IO159PDB5V3 |
| Y11 | IO153PDB5V2 |
| Y12 | IO147PDB5V1 |
| Y13 | IO139PDB5V0 |
| Y14 | IO137PDB5V0 |
| Y15 | IO125NDB4V1 |
| Y16 | IO125PDB4V1 |
| Y17 | IO115NDB4V0 |
| Y18 | IO115PDB4V0 |
| Y19 | VCC |
| Y20 | VPUMP |
| Y21 | VCOMPLD |
| Y22 | VCCPLD |
| Y23 | IO100NDB3V1 |
| Y24 | IO100PDB3V1 |
| Y25 | IO96NDB3V1 |
| Y26 | IO98PDB3V1 |

| FG896 | |
|---|---|
| Pin Number | A3PE3000 Function |
| J5 | IO295NDB7V2 |
| J6 | IO299NDB7V3 |
| J7 | VCCIB7 |
| J8 | VCCPLA |
| J9 | VCC |
| J10 | IO04NPB0V0 |
| J11 | IO18NDB0V2 |
| J12 | IO20NDB0V2 |
| J13 | IO20PDB0V2 |
| J14 | IO32NDB0V3 |
| J15 | IO32PDB0V3 |
| J16 | IO42PDB1V0 |
| J17 | IO44NDB1V0 |
| J18 | IO44PDB1V0 |
| J19 | IO54NDB1V1 |
| J20 | IO54PDB1V1 |
| J21 | IO76NPB1V4 |
| J22 | VCC |
| J23 | VCCPLB |
| J24 | VCCIB2 |
| J25 | IO90PDB2V1 |
| J26 | IO90NDB2V1 |
| J27 | GBB2/IO83PDB2V0 |
| J28 | IO83NDB2V0 |
| J29 | IO91PDB2V1 |
| J30 | IO91NDB2V1 |
| K1 | IO288NDB7V1 |
| K2 | IO288PDB7V1 |
| K3 | IO304NDB7V3 |
| K4 | IO304PDB7V3 |
| K5 | GAB2/IO308PDB7V4 |
| K6 | IO308NDB7V4 |
| K7 | IO301PDB7V3 |
| K8 | IO301NDB7V3 |
| K9 | GAC2/IO307PPB7V4 |
| K10 | VCC |

| FG896 | |
|---|---|
| Pin Number | A3PE3000 Function |
| K11 | IO04PPB0V0 |
| K12 | VCCIB0 |
| K13 | VCCIB0 |
| K14 | VCCIB0 |
| K15 | VCCIB0 |
| K16 | VCCIB1 |
| K17 | VCCIB1 |
| K18 | VCCIB1 |
| K19 | VCCIB1 |
| K20 | IO76PPB1V4 |
| K21 | VCC |
| K22 | IO78PPB1V4 |
| K23 | IO88NDB2V0 |
| K24 | IO88PDB2V0 |
| K25 | IO94PDB2V1 |
| K26 | IO94NDB2V1 |
| K27 | IO85PDB2V0 |
| K28 | IO85NDB2V0 |
| K29 | IO93PDB2V1 |
| K30 | IO93NDB2V1 |
| L1 | IO286NDB7V1 |
| L2 | IO286PDB7V1 |
| L3 | IO298NDB7V3 |
| L4 | IO298PDB7V3 |
| L5 | IO283PDB7V1 |
| L6 | IO291NDB7V2 |
| L7 | IO291PDB7V2 |
| L8 | IO293PDB7V2 |
| L9 | IO293NDB7V2 |
| L10 | IO307NPB7V4 |
| L11 | VCC |
| L12 | VCC |
| L13 | VCC |
| L14 | VCC |
| L15 | VCC |
| L16 | VCC |

| FG896 | |
|---|---|
| Pin Number | A3PE3000 Function |
| L17 | VCC |
| L18 | VCC |
| L19 | VCC |
| L20 | VCC |
| L21 | IO78NPB1V4 |
| L22 | IO104NPB2V2 |
| L23 | IO98NDB2V2 |
| L24 | IO98PDB2V2 |
| L25 | IO87PDB2V0 |
| L26 | IO87NDB2V0 |
| L27 | IO97PDB2V1 |
| L28 | IO101PDB2V2 |
| L29 | IO103PDB2V2 |
| L30 | IO119NDB3V0 |
| M1 | IO282NDB7V1 |
| M2 | IO282PDB7V1 |
| M3 | IO292NDB7V2 |
| M4 | IO292PDB7V2 |
| M5 | IO283NDB7V1 |
| M6 | IO285PDB7V1 |
| M7 | IO287PDB7V1 |
| M8 | IO289PDB7V1 |
| M9 | IO289NDB7V1 |
| M10 | VCCIB7 |
| M11 | VCC |
| M12 | GND |
| M13 | GND |
| M14 | GND |
| M15 | GND |
| M16 | GND |
| M17 | GND |
| M18 | GND |
| M19 | GND |
| M20 | VCC |
| M21 | VCCIB2 |
| M22 | NC |

| Revision | Changes | Page |
|---|---|---|
| Advance v0.3 (continued) | The "Methodology" section was updated. | 3-9 |
| | The A3PE3000 "208-Pin PQFP" pin table was updated. | 4-6 |

51700098-15/06.15