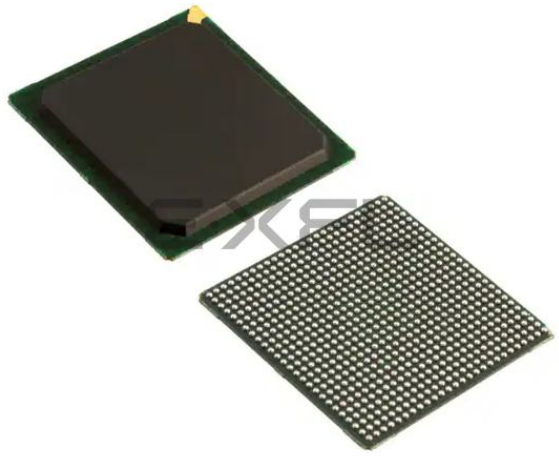


**Welcome to E-XFL.COM**

## 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 | 8064 |
| Number of Logic Elements/Cells | - |
| Total RAM Bits | 73728 |
| Number of I/O | 336 |
| Number of Gates | 500000 |
| Voltage - Supply | 1.425V ~ 1.575V |
| Mounting Type | Surface Mount |
| Operating Temperature | 0°C ~ 70°C (TA) |
| Package / Case | 676-BGA |
| Supplier Device Package | 676-FBGA (27x27) |
| Purchase URL | https://www.e-xfl.com/product-detail/microchip-technology/ax500-2fg676 |

***Figure 1-2 •*** **Axcelerator Family Interconnect Elements**

## Logic Modules

Microsemi's Axcelerator family provides two types of logic modules: the register cell (R-cell) and the combinatorial cell (C-cell). The Axcelerator device can implement more than 4,000 combinatorial functions of up to five inputs (Figure 1-3).

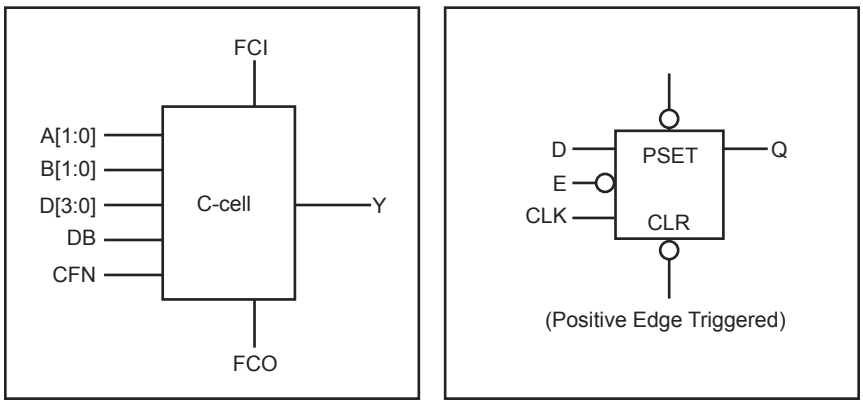



***Figure 1-3 •*** **AX C-Cell and R-Cell**

The R-cell contains a flip-flop featuring asynchronous clear, asynchronous preset, and active-low enable control signals (Figure 1-3). The R-cell registers feature programmable clock polarity selectable on a register-by-register basis. This provides additional flexibility (e.g., easy mapping of dual-data-rate functions into the FPGA) while conserving valuable clock resources. The clock source for the R-cell can be chosen from the hardwired clocks, routed clocks, or internal logic.

***Poutputs = PI/O * po * Fpo***

$C_{load}$ = the output load (technology dependent)
VCCI = the output voltage (technology dependent)
po = the number of outputs
$F_{po}$ = the average output frequency

***Pmemory = P11 * Nblock * FRCLK + P12 * Nblock * FWCLK***

$N_{block}$ = the number of RAM/FIFO blocks (1 block = 4k)
$F_{RCLK}$ = the read-clock frequency of the memory
$F_{WCLK}$ = the write-clock frequency of the memory

***PPLL = P13 * FCLK***

$F_{RefCLK}$ = the clock frequency of the clock input of the PLL
$F_{CLK}$ = the clock frequency of the first clock output of the PLL

## Power Estimation Example

This example employs an AX1000 shift-register design with 1,080 R-cells, one C-cell, one reset input, and one LVTTL 12 mA output, with high slew.

This design uses one HCLK at 100 MHz.

ms = 1,080 (in a shift register - 100% of R-cells are toggling at each clock cycle)
Fs = 100 MHz
s = 1080
=> $P_{HCLK}$ = (P1 + P2 * s + P3 * sqrt[s]) * Fs = 79 mW
and Fs = 100 MHz
=> $P_{R\text{-}cells}$ = P7 * ms * Fs = 173 mW
mc = 1 (1 C-cell in this shift-register)
and Fs = 100 MHz
=> $P_{C\text{-}cells}$ = P8 * mc * Fs = 0.14 mW
$F_{pi}$ ~ 0 MHz
and pi= 1 (1 reset input => this is why $F_{pi}$=0)
=> $P_{inputs}$ = P9 * pi * $F_{pi}$ = 0 mW
$F_{po}$ = 50 MHz
and po = 1
=> $P_{outputs}$ = $P_{I/O}$ * po * $F_{po}$= 27.10 mW
No RAM/FIFO in this shift-register
=> $P_{memory}$ = 0 mW
No PLL in this shift-register
=> $P_{PLL}$ = 0 mW
$P_{ac} = P_{HCLK} + P_{CLK} + P_{R\text{-}cells} + P_{C\text{-}cells} + P_{inputs} + P_{outputs} + P_{memory} + P_{PLL}$ = 276 mW
$P_{dc}$ = 7.5mA * 1.5V = 11.25 mW
$P_{total} = P_{dc} + P_{ac}$ = 11.25 mW + 276mW = 290.30 mW

## I/O Standard Electrical Specifications

***Table 2-18 •*** **Input Capacitance**

| Symbol | Parameter | Conditions | Min. | Max. | Units |
|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | VIN = 0, f = 1.0 MHz | | 10 | pF |
| $C_{INCLK}$ | Input Capacitance on HCLK and RCLK Pin | VIN = 0, f = 1.0 MHz | | 10 | pF |

***Table 2-19 •*** **I/O Input Rise Time and Fall Time***

| Input Buffer | Input Rise/Fall Time (min.) | Input Rise/Fall Time (max.) |
|---|---|---|
| LVTTL | No Requirement | 50 ns |
| LVCMOS 2.5V | No Requirement | 50 ns |
| LVCMOS 1.8V | No Requirement | 50 ns |
| LVCMOS 1.5V | No Requirement | 50 ns |
| PCI | No Requirement | 50 ns |
| PCIX | No Requirement | 50 ns |
| GTL+ | No Requirement | 50 ns |
| HSTL | No Requirement | 50 ns |
| SSTL2 | No Requirement | 50 ns |
| HSTL3 | No Requirement | 50 ns |
| LVDS | No Requirement | 50 ns |
| LVPECL | No Requirement | 50 ns |

*Note: *Input Rise/Fall time applies to all inputs, be it clock or data. Inputs have to ramp up/down linearly, in a monotonic way. Glitches or a plateau may cause double clocking. They must be avoided. For output rise/fall time, refer to the IBIS models for extraction.*

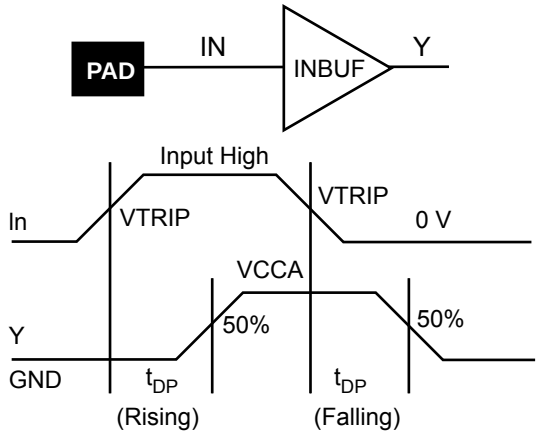



***Figure 2-9 •*** **Input Buffer Delays**

***Table 2-22* • 3.3 V LVTTL I/O Module**
**Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 3.0 V, $T_J$ = 70°C (continued)**

| | | –2 Speed | | –1 Speed | | Std Speed | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Description** | **Min.** | **Max.** | **Min.** | **Max.** | **Min.** | **Max.** | **Units** |
| **LVTTL Output Drive Strength = 2 (12 mA) / High Slew Rate** | | | | | | | | |
| $t_{DP}$ | Input Buffer | | 1.68 | | 1.92 | | 2.26 | ns |
| $t_{PY}$ | Output Buffer | | 3.30 | | 3.76 | | 4.42 | ns |
| $t_{ENZL}$ | Enable to Pad Delay through the Output Buffer—Z to Low | | 3.74 | | 4.26 | | 5.00 | ns |
| $t_{ENZH}$ | Enable to Pad Delay through the Output Buffer—Z to High | | 3.06 | | 3.49 | | 4.10 | ns |
| $t_{ENLZ}$ | Enable to Pad Delay through the Output Buffer—Low to Z | | 1.89 | | 1.91 | | 1.91 | ns |
| $t_{ENHZ}$ | Enable to Pad Delay through the Output Buffer—High to Z | | 2.29 | | 2.30 | | 2.31 | ns |
| $t_{IOCLKQ}$ | Sequential Clock-to-Q for the I/O Input Register | | 0.67 | | 0.77 | | 0.90 | ns |
| $t_{IOCLKY}$ | Clock-to-output Y for the I/O Output Register and the I/O Enable Register | | 0.67 | | 0.77 | | 0.90 | ns |
| $t_{SUD}$ | Data Input Set-Up | | 0.23 | | 0.27 | | 0.31 | ns |
| $t_{SUE}$ | Enable Input Set-Up | | 0.26 | | 0.30 | | 0.35 | ns |
| $t_{HD}$ | Data Input Hold | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{HE}$ | Enable Input Hold | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{CPWHL}$ | Clock Pulse Width High to Low | 0.39 | | 0.39 | | 0.39 | | ns |
| $t_{CPWLH}$ | Clock Pulse Width Low to High | 0.39 | | 0.39 | | 0.39 | | ns |
| $t_{WASYN}$ | Asynchronous Pulse Width | 0.37 | | 0.37 | | 0.37 | | ns |
| $t_{REASYN}$ | Asynchronous Recovery Time | | 0.13 | | 0.15 | | 0.17 | ns |
| $t_{HASYN}$ | Asynchronous Removal Time | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{CLR}$ | Asynchronous Clear-to-Q | | 0.23 | | 0.27 | | 0.31 | ns |
| $t_{PRESET}$ | Asynchronous Preset-to-Q | | 0.23 | | 0.27 | | 0.31 | ns |

## Timing Characteristics

***Table 2-25* • 2.5V LVCMOS I/O Module**
**Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 2.3 V, $T_J$ = 70°C**

| | | –2 Speed | | –1 Speed | | Std Speed | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Description** | **Min.** | **Max.** | **Min.** | **Max.** | **Min.** | **Max.** | **Units** |
| **LVCMOS25 I/O Module Timing** | | | | | | | | |
| $t_{DP}$ | Input Buffer | | 1.95 | | 2.22 | | 2.61 | ns |
| $t_{PY}$ | Output Buffer | | 3.29 | | 3.74 | | 4.40 | ns |
| $t_{ENZL}$ | Enable to Pad Delay through the Output Buffer—Z to Low | | 2.48 | | 2.50 | | 2.51 | ns |
| $t_{ENZH}$ | Enable to Pad Delay through the Output Buffer—Z to High | | 2.48 | | 2.50 | | 2.51 | ns |
| $t_{ENLZ}$ | Enable to Pad Delay through the Output Buffer—Low to Z | | 5.74 | | 6.54 | | 7.69 | ns |
| $t_{ENHZ}$ | Enable to Pad Delay through the Output Buffer—High to Z | | 6.60 | | 7.51 | | 8.83 | ns |
| $t_{IOCLKQ}$ | Sequential Clock-to-Q for the I/O Input Register | | 0.67 | | 0.77 | | 0.90 | ns |
| $t_{IOCLKY}$ | Clock-to-output Y for the I/O Output Register and the I/O Enable Register | | 0.67 | | 0.77 | | 0.90 | ns |
| $t_{SUD}$ | Data Input Set-Up | | 0.23 | | 0.27 | | 0.31 | ns |
| $t_{SUE}$ | Enable Input Set-Up | | 0.26 | | 0.30 | | 0.35 | ns |
| $t_{HD}$ | Data Input Hold | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{HE}$ | Enable Input Hold | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{CPWHL}$ | Clock Pulse Width High to Low | 0.39 | | 0.39 | | 0.39 | | ns |
| $t_{CPWLH}$ | Clock Pulse Width Low to High | 0.39 | | 0.39 | | 0.39 | | ns |
| $t_{WASYN}$ | Asynchronous Pulse Width | 0.37 | | 0.37 | | 0.37 | | ns |
| $t_{REASYN}$ | Asynchronous Recovery Time | | 0.13 | | 0.15 | | 0.17 | ns |
| $t_{HASYN}$ | Asynchronous Removal Time | | 0.00 | | 0.00 | | 0.00 | ns |
| $t_{CLR}$ | Asynchronous Clear-to-Q | | 0.23 | | 0.27 | | 0.31 | ns |
| $t_{PRESET}$ | Asynchronous Preset-to-Q | | 0.23 | | 0.27 | | 0.31 | ns |

### TDO

TDO is normally tristated, and it is active only when the TAP controller is in the "Shift_DR" state or "Shift_IR" state. The least significant bit of the selected register (i.e. IR or DR) is clocked out to TDO first by the falling edge of TCK.

### TAP Controller

The TAP Controller is compliant with the IEEE Standard 1149.1. It is a state machine of 16 states that controls the Instruction Register (IR) and the Data Registers (such as BSR, IDCODE, USRCODE, BYPASS, etc.). The TAP Controller steps into one of the states depending on the sequence of TMS at the rising edges of TCK.

### Instruction Register (IR)

The IR has five bits (IR4 to IR0). At the TRST state, IR is reset to IDCODE. Each time when IR is selected, it goes through "select IR-Scan," "Capture-IR," "Shift-IR," all the way through "Update-IR." When there is no test error, the first five data bits coming out of TDO during the "Shift-IR" will be "10111". If a test error occurs, the last three bits will contain one to three zeroes corresponding to negatively asserted signals: "TDO_ERRORB," "PROBA_ERRORB," and "PROBB_ERRORB." The error(s) will be erased when the TAP is at the "Update-IR" or the TRST state. When in user mode start-up sequence, if the micro-probe has not been used, the "PROBA_ERRORB" is used as a "Power-up done successfully" flag.

### Data Registers (DRs)

Data registers are distributed throughout the chip. They store testing/programming vectors. The MSB of a data register is connected to TDI, while the LSB is connected to TDO. There are different types of data registers. Descriptions of the main registers are as follow:

1. IDCODE:

   The IDCODE is a 20-bit hard coded JTAG Silicon Signature. It is a hardwired device ID code, which contains the Microsemi identity, part number, and version number in a specific JTAG format.

2. USERCODE:

   The USERCODE is a 33-bit programmable register. However, only 20 bits are allocated to use as JTAG Silicon Signature. It is a supplementary identity code for the user to program information to distinguish different programmed parts. USERCODE fuses will read out as "zeroes" when not programmed, so only the "1" bits need to be programmed.

3. Boundary-Scan Register (BSR):

   Each I/O contains three Boundary-Scan Cells. Each cell has a shift register bit, a latch, and two MUXes. The boundary-scan cells are used for the Output-enable (E), Output (O), and Input (I) registers. The bit order of the boundary-scan cells for each of them is E-O-I. The boundary-scan cells are then chained serially to form the Boundary-Scan Register (BSR). The length of the BSR is the number of I/Os in the die multiplied by three.

4. Bypass Register (BYR):

   This is the "1-bit" register. It is used to shorten the TDI-TDO serial chain in board-level testing to only one bit per device not being tested. It is also selected for all "reserved" or unused instructions.

### Probing

Internal activities of the JTAG interface can be observed via the Silicon Explorer II probes: "PRA," "PRB," "PRC," and "PRD."

## Special Fuses

### Security

Microsemi antifuse FPGAs, with FuseLock technology, offer the highest level of design security available in a programmable logic device. Since antifuse FPGAs are live-at power-up, there is no bitstream that can be intercepted, and no bitstream or programming data is ever downloaded to the device during power-up, thus protecting against device cloning. In addition, special security fuses are hidden

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO163PB5F15 | AA14 |
| IO164NB5F15 | AE13 |
| IO164PB5F15 | AF13 |
| IO165NB5F15 | AF12 |
| IO165PB5F15 | AG12 |
| IO166NB5F15 | AD12 |
| IO166PB5F15 | AE12 |
| IO167NB5F15 | Y13 |
| IO167PB5F15 | AA13 |
| IO168NB5F15 | AD11 |
| IO168PB5F15 | AE11 |
| IO169NB5F15 | AG11 |
| IO169PB5F15 | AF11 |
| IO170NB5F15 | AB11 |
| IO170PB5F15 | AC11 |
| IO171NB5F16 | AF10 |
| IO171PB5F16 | AG10 |
| IO172NB5F16 | AD10 |
| IO172PB5F16 | AE10 |
| IO173NB5F16 | Y12 |
| IO173PB5F16 | AA12 |
| IO174NB5F16 | AB10 |
| IO174PB5F16 | AC10 |
| IO175NB5F16 | AF9 |
| IO175PB5F16 | AG9 |
| IO176NB5F16 | AD9 |
| IO176PB5F16 | AE9 |
| IO177NB5F16 | Y11 |
| IO177PB5F16 | AA11 |
| IO178NB5F16 | AF8 |
| IO178PB5F16 | AG8 |
| IO179NB5F16 | AD8 |
| IO179PB5F16 | AE8 |
| IO180NB5F16 | AB9 |
| IO180PB5F16 | AC9 |
| IO181NB5F17 | Y10 |
| IO181PB5F17 | AA10 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO182NB5F17 | AF7 |
| IO182PB5F17 | AG7 |
| IO183NB5F17 | AD7 |
| IO183PB5F17 | AE7 |
| IO184NB5F17 | AC7 |
| IO184PB5F17 | AC8 |
| IO185NB5F17 | AF6 |
| IO185PB5F17 | AG6 |
| IO186NB5F17 | AB7 |
| IO186PB5F17 | AB8 |
| IO187NB5F17 | Y9 |
| IO187PB5F17 | AA9 |
| IO188NB5F17 | AD6 |
| IO188PB5F17 | AE6 |
| IO189NB5F17 | AB6 |
| IO189PB5F17 | AC6 |
| IO190NB5F17 | AF5 |
| IO190PB5F17 | AG5 |
| IO191NB5F17 | AA6 |
| IO191PB5F17 | AA7 |
| IO192NB5F17 | Y8 |
| IO192PB5F17 | AA8 |
| **Bank 6** | |
| IO193NB6F18 | W8 |
| IO193PB6F18 | Y7 |
| IO194NB6F18 | AB5 |
| IO194PB6F18 | AC5 |
| IO195NB6F18 | AC2 |
| IO195PB6F18 | AC3 |
| IO196NB6F18 | AC4 |
| IO196PB6F18 | AD4 |
| IO197NB6F18 | Y5 |
| IO197PB6F18 | Y6 |
| IO198NB6F18 | AB3 |
| IO198PB6F18 | AB4 |
| IO199NB6F18 | V7 |
| IO199PB6F18 | W7 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO200NB6F18 | AA4 |
| IO200PB6F18 | AA5 |
| IO201NB6F18 | W5 |
| IO201PB6F18 | W6 |
| IO202NB6F18 | AB1 |
| IO202PB6F18 | AC1 |
| IO203NB6F19 | Y3 |
| IO203PB6F19 | AA3 |
| IO204NB6F19 | AA2 |
| IO204PB6F19 | AB2 |
| IO205NB6F19 | U8 |
| IO205PB6F19 | V8 |
| IO206NB6F19 | V5 |
| IO206PB6F19 | V6 |
| IO207NB6F19 | Y1 |
| IO207PB6F19 | AA1 |
| IO208NB6F19 | W4 |
| IO208PB6F19 | Y4 |
| IO209NB6F19 | T7 |
| IO209PB6F19 | U7 |
| IO210NB6F19 | W2 |
| IO210PB6F19 | Y2 |
| IO211NB6F19 | U5 |
| IO211PB6F19 | U6 |
| IO212NB6F19 | V3 |
| IO212PB6F19 | W3 |
| IO213NB6F19 | R9 |
| IO213PB6F19 | T8 |
| IO214NB6F20 | U4 |
| IO214PB6F20 | V4 |
| IO215NB6F20 | T5 |
| IO215PB6F20 | T6 |
| IO216NB6F20 | V1 |
| IO216PB6F20 | W1 |
| IO217NB6F20 | R7 |
| IO217PB6F20 | R8 |
| IO218NB6F20 | U2 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO218PB6F20 | V2 |
| IO219NB6F20 | T1 |
| IO219PB6F20 | U1 |
| IO220NB6F20 | R5 |
| IO220PB6F20 | R6 |
| IO221NB6F20 | T3 |
| IO221PB6F20 | T4 |
| IO222NB6F20 | R2 |
| IO222PB6F20 | T2 |
| IO223NB6F20 | P8 |
| IO223PB6F20 | P9 |
| IO224NB6F20 | R3 |
| IO224PB6F20 | R4 |
| **Bank 7** | |
| IO225NB7F21 | P1 |
| IO225PB7F21 | R1 |
| IO226NB7F21 | P3 |
| IO226PB7F21 | P2 |
| IO227NB7F21 | N7 |
| IO227PB7F21 | P7 |
| IO228NB7F21 | P5 |
| IO228PB7F21 | P4 |
| IO229NB7F21 | N2 |
| IO229PB7F21 | N1 |
| IO230NB7F21 | N6 |
| IO230PB7F21 | P6 |
| IO231NB7F21 | N9 |
| IO231PB7F21 | N8 |
| IO232NB7F21 | N4 |
| IO232PB7F21 | N3 |
| IO233NB7F21 | M2 |
| IO233PB7F21 | M1 |
| IO234NB7F21 | M4 |
| IO234PB7F21 | M3 |
| IO235NB7F21 | M5 |
| IO235PB7F21 | N5 |
| IO236NB7F22 | L2 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO236PB7F22 | L1 |
| IO237NB7F22 | L4 |
| IO237PB7F22 | L3 |
| IO238NB7F22 | L6 |
| IO238PB7F22 | M6 |
| IO239NB7F22 | M8 |
| IO239PB7F22 | M7 |
| IO240NB7F22 | K2 |
| IO240PB7F22 | K1 |
| IO241NB7F22 | K4 |
| IO241PB7F22 | K3 |
| IO242NB7F22 | K5 |
| IO242PB7F22 | L5 |
| IO243NB7F22 | J2 |
| IO243PB7F22 | J1 |
| IO244NB7F22 | J4 |
| IO244PB7F22 | J3 |
| IO245NB7F22 | H2 |
| IO245PB7F22 | H1 |
| IO246NB7F22 | H4 |
| IO246PB7F22 | H3 |
| IO247NB7F23 | L8 |
| IO247PB7F23 | L7 |
| IO248NB7F23 | J6 |
| IO248PB7F23 | K6 |
| IO249NB7F23 | H5 |
| IO249PB7F23 | J5 |
| IO250NB7F23 | G2 |
| IO250PB7F23 | G1 |
| IO251NB7F23 | K8 |
| IO251PB7F23 | K7 |
| IO252NB7F23 | G4 |
| IO252PB7F23 | G3 |
| IO253NB7F23 | F2 |
| IO253PB7F23 | F1 |
| IO254NB7F23 | G6 |
| IO254PB7F23 | H6 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| IO255NB7F23 | F5 |
| IO255PB7F23 | G5 |
| IO256NB7F23 | F3 |
| IO256PB7F23 | F4 |
| IO257NB7F23 | H7 |
| IO257PB7F23 | J7 |
| **Dedicated I/O** | |
| GND | A1 |
| GND | A2 |
| GND | A25 |
| GND | A26 |
| GND | A27 |
| GND | A3 |
| GND | AC24 |
| GND | AE1 |
| GND | AE2 |
| GND | AE25 |
| GND | AE26 |
| GND | AE27 |
| GND | AE3 |
| GND | AE5 |
| GND | AF1 |
| GND | AF2 |
| GND | AF25 |
| GND | AF26 |
| GND | AF27 |
| GND | AF3 |
| GND | AG1 |
| GND | AG2 |
| GND | AG25 |
| GND | AG26 |
| GND | AG27 |
| GND | AG3 |
| GND | B1 |
| GND | B2 |
| GND | B25 |
| GND | B26 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| GND | B27 |
| GND | B3 |
| GND | C1 |
| GND | C2 |
| GND | C25 |
| GND | C26 |
| GND | C27 |
| GND | C3 |
| GND | E27 |
| GND | L11 |
| GND | L12 |
| GND | L13 |
| GND | L14 |
| GND | L15 |
| GND | L16 |
| GND | L17 |
| GND | M11 |
| GND | M12 |
| GND | M13 |
| GND | M14 |
| GND | M15 |
| GND | M16 |
| GND | M17 |
| GND | N11 |
| GND | N12 |
| GND | N13 |
| GND | N14 |
| GND | N15 |
| GND | N16 |
| GND | N17 |
| GND | P11 |
| GND | P12 |
| GND | P13 |
| GND | P14 |
| GND | P15 |
| GND | P16 |
| GND | P17 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| GND | R11 |
| GND | R12 |
| GND | R13 |
| GND | R14 |
| GND | R15 |
| GND | R16 |
| GND | R17 |
| GND | T11 |
| GND | T12 |
| GND | T13 |
| GND | T14 |
| GND | T15 |
| GND | T16 |
| GND | T17 |
| GND | U11 |
| GND | U12 |
| GND | U13 |
| GND | U14 |
| GND | U15 |
| GND | U16 |
| GND | U17 |
| GND/LP | J8 |
| NC | U3 |
| PRA | J14 |
| PRB | D14 |
| PRC | V14 |
| PRD | AB14 |
| TCK | E4 |
| TDI | D4 |
| TDO | J9 |
| TMS | H8 |
| TRST | E3 |
| VCCA | AA21 |
| VCCA | AD5 |
| VCCA | E1 |
| VCCA | G22 |
| VCCA | K10 |

| BG729 | |
|---|---|
| AX1000 Function | Pin Number |
| VCCA | K11 |
| VCCA | K17 |
| VCCA | K18 |
| VCCA | L10 |
| VCCA | L18 |
| VCCA | U10 |
| VCCA | U18 |
| VCCA | V10 |
| VCCA | V11 |
| VCCA | V17 |
| VCCA | V18 |
| VCCPLA | A13 |
| VCCPLB | J13 |
| VCCPLC | B15 |
| VCCPLD | C15 |
| VCCPLE | AG14 |
| VCCPLF | AF14 |
| VCCPLG | AB13 |
| VCCPLH | AG13 |
| VCCDA | A11 |
| VCCDA | AB12 |
| VCCDA | AC12 |
| VCCDA | AC25 |
| VCCDA | AD16 |
| VCCDA | AD17 |
| VCCDA | E16 |
| VCCDA | E2 |
| VCCDA | E24 |
| VCCDA | F12 |
| VCCDA | F16 |
| VCCDA | F7 |
| VCCDA | K14 |
| VCCDA | P10 |
| VCCDA | P18 |
| VCCDA | W14 |
| VCCDA | W9 |
| VCCIB0 | A4 |

| FG256-Pin FBGA | |
|---|---|
| **AX125 Function** | **Pin Number** |
| **Bank 6** | |
| IO60NB6F6 | L4 |
| IO60PB6F6 | M4 |
| IO61NB6F6 | L3 |
| IO61PB6F6 | M3 |
| IO63NB6F6 | P2 |
| IO63PB6F6 | N2 |
| IO64NB6F6 | J4 |
| IO64PB6F6 | K4 |
| IO65NB6F6 | N1 |
| IO65PB6F6 | P1 |
| IO67NB6F6 | L2 |
| IO67PB6F6 | M2 |
| IO69NB6F6 | L1 |
| IO69PB6F6 | M1 |
| IO70NB6F6 | J3 |
| IO70PB6F6 | K3 |
| IO71NB6F6 | J2 |
| IO71PB6F6 | K2 |
| **Bank 7** | |
| IO72NB7F7 | J1 |
| IO72PB7F7 | K1 |
| IO73NB7F7 | G2 |
| IO73PB7F7 | H2 |
| IO74NB7F7 | G3 |
| IO74PB7F7 | H3 |
| IO75NB7F7 | E1 |
| IO75PB7F7 | F1 |
| IO76NB7F7 | G1 |
| IO77NB7F7 | E2 |
| IO77PB7F7 | F2 |
| IO78NB7F7 | G4 |
| IO78PB7F7 | H4 |
| IO79NB7F7 | C1 |
| IO79PB7F7 | D1 |

| FG256-Pin FBGA | |
|---|---|
| **AX125 Function** | **Pin Number** |
| IO81NB7F7 | C2 |
| IO81PB7F7 | B1 |
| IO82NB7F7 | D2 |
| IO82PB7F7 | D3 |
| IO83NB7F7 | E3 |
| IO83PB7F7 | F3 |
| **Dedicated I/O** | |
| VCCDA | E4 |
| GND | A1 |
| GND | A16 |
| GND | B15 |
| GND | B2 |
| GND | D15 |
| GND | E12 |
| GND | E5 |
| GND | F11 |
| GND | F6 |
| GND | G10 |
| GND | G7 |
| GND | G8 |
| GND | G9 |
| GND | H10 |
| GND | H7 |
| GND | H8 |
| GND | H9 |
| GND | J10 |
| GND | J7 |
| GND | J8 |
| GND | J9 |
| GND | K10 |
| GND | K7 |
| GND | K8 |
| GND | K9 |
| GND | L11 |
| GND | L6 |

| FG256-Pin FBGA | |
|---|---|
| **AX125 Function** | **Pin Number** |
| GND | M12 |
| GND | M5 |
| GND | P13 |
| GND | P3 |
| GND | R15 |
| GND | R2 |
| GND | T1 |
| GND | T16 |
| GND/LP | D4 |
| NC | A11 |
| NC | R11 |
| NC | R5 |
| PRA | D8 |
| PRB | C8 |
| PRC | N9 |
| PRD | P9 |
| TCK | D5 |
| TDI | C6 |
| TDO | C4 |
| TMS | C3 |
| TRST | C5 |
| VCCA | D14 |
| VCCA | F10 |
| VCCA | F4 |
| VCCA | F7 |
| VCCA | F8 |
| VCCA | F9 |
| VCCA | G11 |
| VCCA | G6 |
| VCCA | H11 |
| VCCA | H6 |
| VCCA | J11 |
| VCCA | J6 |
| VCCA | K11 |
| VCCA | K6 |

| FG676 | |
|---|---|
| AX500 Function | Pin Number |
| **Bank 0** | |
| IO00NB0F0 | F8 |
| IO00PB0F0 | E8 |
| IO01NB0F0 | A5 |
| IO01PB0F0 | A4 |
| IO02NB0F0 | E7 |
| IO02PB0F0 | E6 |
| IO03NB0F0 | D6 |
| IO03PB0F0 | D5 |
| IO04NB0F0 | B5 |
| IO04PB0F0 | C5 |
| IO05NB0F0 | B6 |
| IO05PB0F0 | C6 |
| IO06NB0F0 | C7 |
| IO06PB0F0 | D7 |
| IO07NB0F0 | A7 |
| IO07PB0F0 | A6 |
| IO08NB0F0 | C8 |
| IO08PB0F0 | D8 |
| IO09NB0F0 | F10 |
| IO09PB0F0 | F9 |
| IO10NB0F0 | B8 |
| IO10PB0F0 | B7 |
| IO11NB0F0 | D10 |
| IO11PB0F0 | E10 |
| IO12NB0F1 | B9 |
| IO12PB0F1 | C9 |
| IO13NB0F1 | F11 |
| IO13PB0F1 | G11 |
| IO14NB0F1 | D11 |
| IO14PB0F1 | E11 |
| IO15NB0F1 | B10 |
| IO15PB0F1 | C10 |
| IO16NB0F1 | A10 |
| IO16PB0F1 | A9 |

| FG676 | |
|---|---|
| AX500 Function | Pin Number |
| IO17NB0F1 | F12 |
| IO17PB0F1 | G12 |
| IO18NB0F1 | C12 |
| IO18PB0F1 | C11 |
| IO19NB0F1/HCLKAN | A12 |
| IO19PB0F1/HCLKAP | B12 |
| IO20NB0F1/HCLKBN | C13 |
| IO20PB0F1/HCLKBP | B13 |
| **Bank 1** | |
| IO21NB1F2/HCLKCN | C15 |
| IO21PB1F2/HCLKCP | C14 |
| IO22NB1F2/HCLKDN | A15 |
| IO22PB1F2/HCLKDP | B15 |
| IO23NB1F2 | F15 |
| IO23PB1F2 | G15 |
| IO24NB1F2 | B16 |
| IO24PB1F2 | A16 |
| IO25NB1F2 | A18 |
| IO25PB1F2 | A17 |
| IO26NB1F2 | D16 |
| IO26PB1F2 | E16 |
| IO27NB1F2 | F16 |
| IO27PB1F2 | G16 |
| IO28NB1F2 | C18 |
| IO28PB1F2 | C17 |
| IO29NB1F2 | B19 |
| IO29PB1F2 | B18 |
| IO30NB1F2 | D19 |
| IO30PB1F2 | C19 |
| IO31NB1F2 | F17 |
| IO31PB1F2 | E17 |
| IO32NB1F3 | B20 |
| IO32PB1F3 | A20 |
| IO33NB1F3 | B22 |
| IO33PB1F3 | B21 |

| FG676 | |
|---|---|
| AX500 Function | Pin Number |
| IO34NB1F3 | D20 |
| IO34PB1F3 | C20 |
| IO35NB1F3 | D21 |
| IO35PB1F3 | C21 |
| IO36NB1F3 | D22 |
| IO36PB1F3 | C22 |
| IO37NB1F3 | F19 |
| IO37PB1F3 | E19 |
| IO38NB1F3 | B23 |
| IO38PB1F3 | A23 |
| IO39NB1F3 | E21 |
| IO39PB1F3 | E20 |
| IO40NB1F3 | D23 |
| IO40PB1F3 | C23 |
| IO41NB1F3 | D25 |
| IO41PB1F3 | C25 |
| **Bank 2** | |
| IO42NB2F4 | G24 |
| IO42PB2F4 | G23 |
| IO43NB2F4 | G26 |
| IO43PB2F4 | F26 |
| IO44NB2F4 | F25 |
| IO44PB2F4 | E25 |
| IO45NB2F4 | J21 |
| IO45PB2F4 | J22 |
| IO46NB2F4 | H25 |
| IO46PB2F4 | G25 |
| IO47NB2F4 | K23 |
| IO47PB2F4 | J23 |
| IO48NB2F4 | J24 |
| IO48PB2F4 | H24 |
| IO49NB2F4 | K21 |
| IO49PB2F4 | K22 |
| IO50NB2F4 | K25 |
| IO50PB2F4 | J25 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO65PB1F6 | H20 |
| IO66NB1F6 | B23 |
| IO66PB1F6 | B21 |
| IO67NB1F6 | H21 |
| IO67PB1F6 | G21 |
| IO68NB1F6 | D22 |
| IO68PB1F6 | C22 |
| IO69NB1F6 | A25 |
| IO69PB1F6 | A24 |
| IO70NB1F6 | F22 |
| IO70PB1F6 | E22 |
| IO71NB1F6 | F21 |
| IO71PB1F6 | E21 |
| IO73NB1F6 | C24 |
| IO73PB1F6 | C23 |
| IO74NB1F6 | D24 |
| IO74PB1F6 | D23 |
| IO75NB1F6 | H23 |
| IO75PB1F6 | H22 |
| IO76NB1F7 | B25 |
| IO76PB1F7 | B24 |
| IO78NB1F7 | B26 |
| IO78PB1F7 | A26 |
| IO79NB1F7 | F23 |
| IO79PB1F7 | E23 |
| IO80NB1F7 | D25 |
| IO80PB1F7 | C25 |
| IO81NB1F7 | G23 |
| IO81PB1F7 | G22 |
| IO82NB1F7 | B27 |
| IO82PB1F7 | A27 |
| IO83NB1F7 | F24 |
| IO83PB1F7 | E24 |
| IO84NB1F7 | D26 |
| IO84PB1F7 | C26 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO85NB1F7 | F25 |
| IO85PB1F7 | E25 |
| **Bank 2** | |
| IO86NB2F8 | G26 |
| IO86PB2F8 | G25 |
| IO87NB2F8 | K23 |
| IO87PB2F8 | J23 |
| IO88NB2F8 | J24 |
| IO88PB2F8 | H24 |
| IO89NB2F8 | E29 |
| IO89PB2F8 | D29 |
| IO90NB2F8 | F27 |
| IO90PB2F8 | E27 |
| IO91NB2F8 | H26 |
| IO91PB2F8 | H25 |
| IO92NB2F8 | G28 |
| IO92PB2F8 | F28 |
| IO93NB2F8 | J26 |
| IO93PB2F8 | J25 |
| IO94NB2F8 | H27 |
| IO94PB2F8 | G27 |
| IO95NB2F8 | H29 |
| IO95PB2F8 | G29 |
| IO96NB2F9 | G30 |
| IO96PB2F9 | F30 |
| IO97NB2F9 | K25 |
| IO97PB2F9 | K24 |
| IO98NB2F9 | J28 |
| IO98PB2F9 | H28 |
| IO99NB2F9 | L23 |
| IO99PB2F9 | L24 |
| IO100NB2F9 | K27 |
| IO100PB2F9 | J27 |
| IO101PB2F9 | J30 |
| IO102NB2F9 | E30 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO102PB2F9 | D30 |
| IO103NB2F9 | L26 |
| IO103PB2F9 | K26 |
| IO104NB2F9 | F29 |
| IO105NB2F9 | M25 |
| IO105PB2F9 | L25 |
| IO106NB2F9 | K30 |
| IO106PB2F9 | K29 |
| IO107NB2F10 | M23 |
| IO107PB2F10 | M24 |
| IO109NB2F10 | M27 |
| IO109PB2F10 | L27 |
| IO110NB2F10 | M28 |
| IO110PB2F10 | L28 |
| IO111NB2F10 | N22 |
| IO111PB2F10 | N23 |
| IO112NB2F10 | M29 |
| IO112PB2F10 | L29 |
| IO113NB2F10 | N26 |
| IO113PB2F10 | M26 |
| IO114NB2F10 | M30 |
| IO114PB2F10 | L30 |
| IO115NB2F10 | N28 |
| IO115PB2F10 | N27 |
| IO117NB2F10 | N25 |
| IO117PB2F10 | N24 |
| IO118NB2F11 | N29 |
| IO119NB2F11 | P22 |
| IO119PB2F11 | P23 |
| IO121NB2F11 | P25 |
| IO121PB2F11 | P24 |
| IO122NB2F11 | P28 |
| IO122PB2F11 | P27 |
| IO123NB2F11 | R26 |
| IO123PB2F11 | P26 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO124NB2F11 | P29 |
| IO124PB2F11 | P30 |
| IO125NB2F11 | R22 |
| IO125PB2F11 | R23 |
| IO127NB2F11 | R24 |
| IO127PB2F11 | R25 |
| IO128NB2F11 | R29 |
| IO128PB2F11 | R30 |
| **Bank 3** | |
| IO129NB3F12 | T27 |
| IO129PB3F12 | R27 |
| IO130NB3F12 | T29 |
| IO130PB3F12 | T30 |
| IO131NB3F12 | T22 |
| IO131PB3F12 | T23 |
| IO132NB3F12 | U26 |
| IO132PB3F12 | T26 |
| IO133NB3F12 | U24 |
| IO133PB3F12 | T24 |
| IO135NB3F12 | U23 |
| IO135PB3F12 | U22 |
| IO136NB3F12 | U29 |
| IO136PB3F12 | U30 |
| IO137NB3F12 | V28 |
| IO137PB3F12 | U28 |
| IO138NB3F12 | V27 |
| IO138PB3F12 | U27 |
| IO139NB3F13 | V25 |
| IO139PB3F13 | U25 |
| IO141NB3F13 | V23 |
| IO141PB3F13 | V22 |
| IO142NB3F13 | W29 |
| IO142PB3F13 | V29 |
| IO143NB3F13 | W26 |
| IO143PB3F13 | V26 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO145NB3F13 | W24 |
| IO145PB3F13 | V24 |
| IO146NB3F13 | W27 |
| IO146PB3F13 | W28 |
| IO147NB3F13 | Y28 |
| IO147PB3F13 | Y27 |
| IO148NB3F13 | Y30 |
| IO148PB3F13 | W30 |
| IO149NB3F13 | Y25 |
| IO149PB3F13 | W25 |
| IO150NB3F14 | AA29 |
| IO150PB3F14 | Y29 |
| IO151NB3F14 | AC29 |
| IO152NB3F14 | AA26 |
| IO152PB3F14 | Y26 |
| IO153NB3F14 | Y23 |
| IO153PB3F14 | W23 |
| IO154NB3F14 | AB30 |
| IO154PB3F14 | AA30 |
| IO155NB3F14 | AB27 |
| IO155PB3F14 | AA27 |
| IO156NB3F14 | AC28 |
| IO156PB3F14 | AB28 |
| IO157NB3F14 | AA24 |
| IO157PB3F14 | Y24 |
| IO158NB3F14 | AF29 |
| IO158PB3F14 | AF30 |
| IO159NB3F14 | AB25 |
| IO159PB3F14 | AA25 |
| IO160NB3F14 | AE30 |
| IO160PB3F14 | AD30 |
| IO161NB3F15 | AE29 |
| IO161PB3F15 | AD29 |
| IO162NB3F15 | AD27 |
| IO162PB3F15 | AC27 |

| FG896 | |
|---|---|
| AX2000 Function | Pin Number |
| IO163NB3F15 | AC26 |
| IO163PB3F15 | AB26 |
| IO164NB3F15 | AE28 |
| IO164PB3F15 | AD28 |
| IO165NB3F15 | AC24 |
| IO165PB3F15 | AB24 |
| IO166NB3F15 | AG28 |
| IO166PB3F15 | AF28 |
| IO167NB3F15 | AE26 |
| IO167PB3F15 | AD26 |
| IO168NB3F15 | AD25 |
| IO168PB3F15 | AC25 |
| IO169NB3F15 | AF27 |
| IO169PB3F15 | AE27 |
| IO170NB3F15 | AB23 |
| IO170PB3F15 | AA23 |
| **Bank 4** | |
| IO171NB4F16 | AG29 |
| IO171PB4F16 | AG30 |
| IO172NB4F16 | AF24 |
| IO172PB4F16 | AF25 |
| IO173NB4F16 | AG25 |
| IO173PB4F16 | AG26 |
| IO174NB4F16 | AJ25 |
| IO174PB4F16 | AJ26 |
| IO175NB4F16 | AK26 |
| IO175PB4F16 | AK27 |
| IO176NB4F16 | AE23 |
| IO176PB4F16 | AE24 |
| IO177NB4F16 | AH24 |
| IO177PB4F16 | AH25 |
| IO178NB4F16 | AD23 |
| IO178PB4F16 | AC23 |
| IO179PB4F16 | AJ27 |
| IO180NB4F16 | AG23 |

| FG1152 | |
|---|---|
| AX2000 Function | Pin Number |
| GND | N1 |
| GND | N13 |
| GND | N22 |
| GND | N34 |
| GND | P14 |
| GND | P15 |
| GND | P16 |
| GND | P17 |
| GND | P18 |
| GND | P19 |
| GND | P20 |
| GND | P21 |
| GND | R14 |
| GND | R15 |
| GND | R16 |
| GND | R17 |
| GND | R18 |
| GND | R19 |
| GND | R20 |
| GND | R21 |
| GND | R3 |
| GND | R32 |
| GND | T14 |
| GND | T15 |
| GND | T16 |
| GND | T17 |
| GND | T18 |
| GND | T19 |
| GND | T20 |
| GND | T21 |
| GND | U14 |
| GND | U15 |
| GND | U16 |
| GND | U17 |
| GND | U18 |

| FG1152 | |
|---|---|
| AX2000 Function | Pin Number |
| GND | U19 |
| GND | U20 |
| GND | U21 |
| GND | U30 |
| GND | U5 |
| GND | V14 |
| GND | V15 |
| GND | V16 |
| GND | V17 |
| GND | V18 |
| GND | V19 |
| GND | V20 |
| GND | V21 |
| GND | V30 |
| GND | V5 |
| GND | W14 |
| GND | W15 |
| GND | W16 |
| GND | W17 |
| GND | W18 |
| GND | W19 |
| GND | W20 |
| GND | W21 |
| GND | Y14 |
| GND | Y15 |
| GND | Y16 |
| GND | Y17 |
| GND | Y18 |
| GND | Y19 |
| GND | Y20 |
| GND | Y21 |
| GND | Y3 |
| GND | Y32 |
| GND/LP | G6 |
| NC | A17 |

| FG1152 | |
|---|---|
| AX2000 Function | Pin Number |
| NC | A26 |
| NC | AB2 |
| NC | AB33 |
| NC | AC34 |
| NC | AD3 |
| NC | AD34 |
| NC | AE31 |
| NC | AE33 |
| NC | AE34 |
| NC | AF1 |
| NC | AF34 |
| NC | AG2 |
| NC | AG4 |
| NC | AH1 |
| NC | AH2 |
| NC | AH31 |
| NC | AH32 |
| NC | AH34 |
| NC | AJ1 |
| NC | AJ2 |
| NC | AJ3 |
| NC | AJ31 |
| NC | AJ32 |
| NC | AJ33 |
| NC | AJ34 |
| NC | AJ4 |
| NC | AL29 |
| NC | AM19 |
| NC | AM7 |
| NC | AN13 |
| NC | AN17 |
| NC | AN25 |
| NC | AN27 |
| NC | AN8 |
| NC | AP17 |

| CQ352 | |
|---|---|
| AX1000 Function | Pin Number |
| GND | 21 |
| GND | 27 |
| GND | 33 |
| GND | 39 |
| GND | 45 |
| GND | 51 |
| GND | 57 |
| GND | 63 |
| GND | 69 |
| GND | 75 |
| GND | 81 |
| GND | 88 |
| GND | 89 |
| GND | 97 |
| GND | 103 |
| GND | 109 |
| GND | 115 |
| GND | 121 |
| GND | 133 |
| GND | 145 |
| GND | 151 |
| GND | 157 |
| GND | 163 |
| GND | 169 |
| GND | 176 |
| GND | 177 |
| GND | 186 |
| GND | 192 |
| GND | 198 |
| GND | 204 |
| GND | 210 |
| GND | 216 |
| GND | 222 |
| GND | 228 |
| GND | 234 |

| CQ352 | |
|---|---|
| AX1000 Function | Pin Number |
| GND | 240 |
| GND | 246 |
| GND | 252 |
| GND | 258 |
| GND | 264 |
| GND | 265 |
| GND | 274 |
| GND | 280 |
| GND | 286 |
| GND | 292 |
| GND | 298 |
| GND | 310 |
| GND | 322 |
| GND | 330 |
| GND | 334 |
| GND | 340 |
| GND | 345 |
| GND | 352 |
| NC | 91 |
| NC | 130 |
| NC | 131 |
| NC | 174 |
| NC | 268 |
| NC | 307 |
| NC | 308 |
| PRA | 312 |
| PRB | 311 |
| PRC | 135 |
| PRD | 134 |
| TCK | 349 |
| TDI | 348 |
| TDO | 347 |
| TMS | 350 |
| TRST | 351 |
| VCCA | 3 |

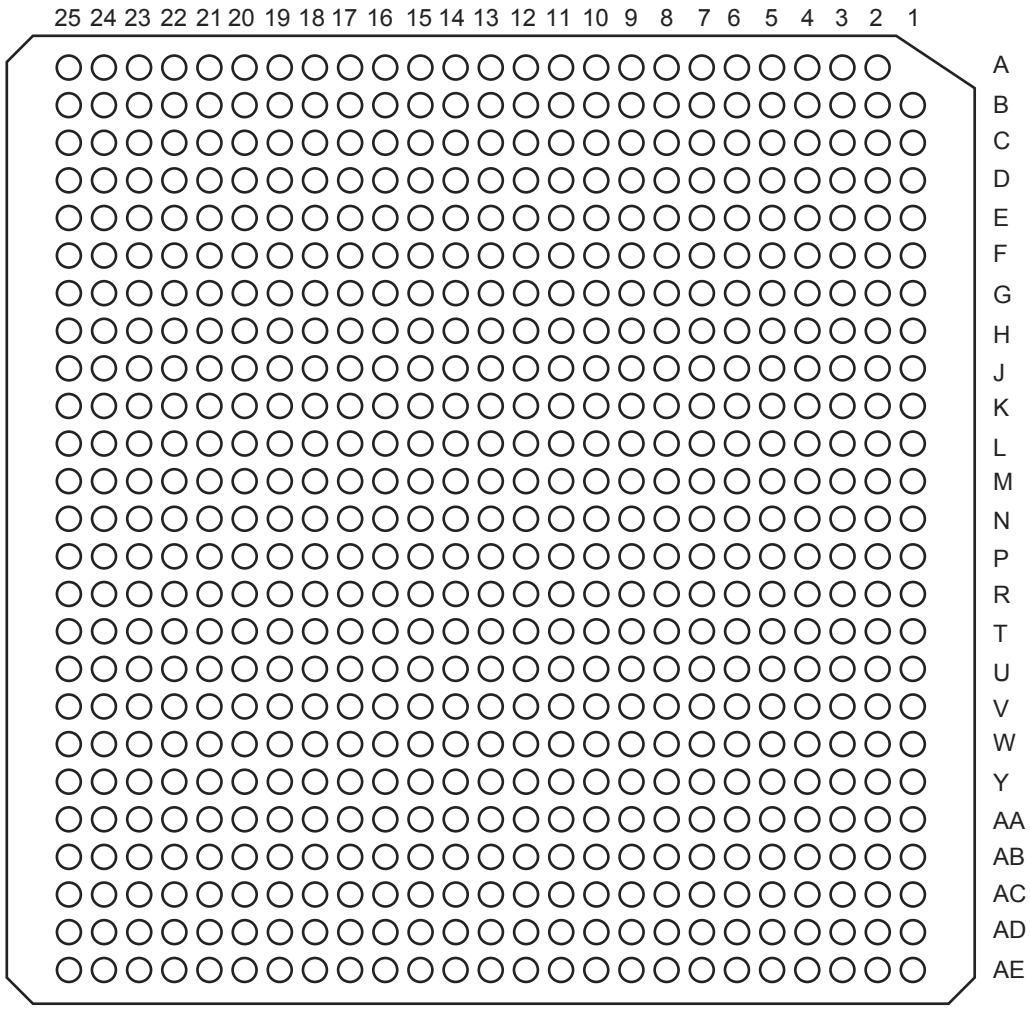
| CQ352 | |
|---|---|
| AX1000 Function | Pin Number |
| VCCA | 14 |
| VCCA | 32 |
| VCCA | 56 |
| VCCA | 74 |
| VCCA | 87 |
| VCCA | 102 |
| VCCA | 114 |
| VCCA | 150 |
| VCCA | 162 |
| VCCA | 175 |
| VCCA | 191 |
| VCCA | 209 |
| VCCA | 233 |
| VCCA | 251 |
| VCCA | 263 |
| VCCA | 279 |
| VCCA | 291 |
| VCCA | 329 |
| VCCA | 339 |
| VCCDA | 2 |
| VCCDA | 44 |
| VCCDA | 90 |
| VCCDA | 116 |
| VCCDA | 117 |
| VCCDA | 132 |
| VCCDA | 148 |
| VCCDA | 149 |
| VCCDA | 178 |
| VCCDA | 221 |
| VCCDA | 266 |
| VCCDA | 293 |
| VCCDA | 294 |
| VCCDA | 309 |
| VCCDA | 327 |
| VCCDA | 328 |

| CQ352 | |
|---|---|
| AX2000 Function | Pin Number |
| IO182PB4F17 | 171 |
| IO183NB4F17 | 166 |
| IO183PB4F17 | 167 |
| IO184NB4F17 | 164 |
| IO184PB4F17 | 165 |
| IO185NB4F17 | 160 |
| IO185PB4F17 | 161 |
| IO190NB4F17 | 158 |
| IO190PB4F17 | 159 |
| IO191NB4F17 | 154 |
| IO191PB4F17 | 155 |
| IO192NB4F17 | 152 |
| IO192PB4F17 | 153 |
| IO207NB4F19 | 146 |
| IO207PB4F19 | 147 |
| IO212NB4F19/CLKEN | 142 |
| IO212PB4F19/CLKEP | 143 |
| IO213NB4F19/CLKFN | 136 |
| IO213PB4F19/CLKFP | 137 |
| **Bank 5** | |
| IO214NB5F20/CLKGN | 128 |
| IO214PB5F20/CLKGP | 129 |
| IO215NB5F20/CLKHN | 122 |
| IO215PB5F20/CLKHP | 123 |
| IO217NB5F20 | 118 |
| IO217PB5F20 | 119 |
| IO236NB5F22 | 110 |
| IO236PB5F22 | 111 |
| IO237NB5F22 | 112 |
| IO237PB5F22 | 113 |
| IO238NB5F22 | 104 |
| IO238PB5F22 | 105 |
| IO239NB5F22 | 106 |
| IO239PB5F22 | 107 |
| IO240NB5F22 | 100 |

| CQ352 | |
|---|---|
| AX2000 Function | Pin Number |
| IO240PB5F22 | 101 |
| IO242NB5F22 | 94 |
| IO242PB5F22 | 95 |
| IO243NB5F22 | 98 |
| IO243PB5F22 | 99 |
| IO244NB5F22 | 92 |
| IO244PB5F22 | 93 |
| **Bank 6** | |
| IO257PB6F24 | 86 |
| IO258NB6F24 | 84 |
| IO258PB6F24 | 85 |
| IO261NB6F24 | 82 |
| IO261PB6F24 | 83 |
| IO262NB6F24 | 78 |
| IO262PB6F24 | 79 |
| IO265NB6F24 | 76 |
| IO265PB6F24 | 77 |
| IO279NB6F26 | 72 |
| IO279PB6F26 | 73 |
| IO280NB6F26 | 70 |
| IO280PB6F26 | 71 |
| IO281NB6F26 | 66 |
| IO281PB6F26 | 67 |
| IO282NB6F26 | 64 |
| IO282PB6F26 | 65 |
| IO284NB6F26 | 60 |
| IO284PB6F26 | 61 |
| IO285NB6F26 | 58 |
| IO285PB6F26 | 59 |
| IO286NB6F26 | 54 |
| IO286PB6F26 | 55 |
| IO287NB6F26 | 52 |
| IO287PB6F26 | 53 |
| IO294NB6F27 | 48 |
| IO294PB6F27 | 49 |

| CQ352 | |
|---|---|
| AX2000 Function | Pin Number |
| IO296NB6F27 | 46 |
| IO296PB6F27 | 47 |
| **Bank 7** | |
| IO300NB7F28 | 42 |
| IO300PB7F28 | 43 |
| IO303NB7F28 | 40 |
| IO303PB7F28 | 41 |
| IO310NB7F29 | 34 |
| IO310PB7F29 | 35 |
| IO311NB7F29 | 36 |
| IO311PB7F29 | 37 |
| IO312NB7F29 | 28 |
| IO312PB7F29 | 29 |
| IO315NB7F29 | 30 |
| IO315PB7F29 | 31 |
| IO316NB7F29 | 22 |
| IO316PB7F29 | 23 |
| IO317NB7F29 | 24 |
| IO317PB7F29 | 25 |
| IO318NB7F29 | 18 |
| IO318PB7F29 | 19 |
| IO320NB7F29 | 16 |
| IO320PB7F29 | 17 |
| IO334NB7F31 | 10 |
| IO334PB7F31 | 11 |
| IO335NB7F31 | 12 |
| IO335PB7F31 | 13 |
| IO338NB7F31 | 6 |
| IO338PB7F31 | 7 |
| IO341NB7F31 | 4 |
| IO341PB7F31 | 5 |
| **Dedicated I/O** | |
| GND | 1 |
| GND | 9 |
| GND | 15 |

# CG624




## *Note*

For Package Manufacturing and Environmental information, visit Resource center at http://www.microsemi.com/soc/products/rescenter/package/index.html.

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| IO157PB3F14 | U20 |
| IO158NB3F14 | AB25 |
| IO158PB3F14 | AA25 |
| IO160PB3F14 | W24 |
| IO161NB3F15 | U24 |
| IO161PB3F15 | U23 |
| IO162NB3F15 | AA24 |
| IO162PB3F15 | Y24 |
| IO163NB3F15 | V22 |
| IO163PB3F15 | U22 |
| IO164NB3F15 | V23 |
| IO164PB3F15 | V24 |
| IO166NB3F15 | AB24 |
| IO167NB3F15 | V21 |
| IO167PB3F15 | U21 |
| IO168NB3F15 | Y23 |
| IO168PB3F15 | AA23 |
| IO169NB3F15 | W22* |
| IO169PB3F15 | W23* |
| IO170NB3F15 | Y22 |
| IO170PB3F15 | Y21 |
| **Bank 4** | |
| IO171NB4F16 | AC20* |
| IO171PB4F16 | AC21* |
| IO172NB4F16 | W20 |
| IO172PB4F16 | Y20 |
| IO173NB4F16 | AD21 |
| IO173PB4F16 | AD22 |
| IO174NB4F16 | AA19 |
| IO176NB4F16 | Y18 |
| IO176PB4F16 | Y19 |
| IO177NB4F16 | AB19 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| IO177PB4F16 | AB18 |
| IO182NB4F17 | V19 |
| IO182PB4F17 | W19 |
| IO183PB4F17 | AC19 |
| IO184NB4F17 | AB17 |
| IO184PB4F17 | AC17 |
| IO185NB4F17 | AD19 |
| IO185PB4F17 | AD20 |
| IO187PB4F17 | AC18 |
| IO188NB4F17 | Y17 |
| IO188PB4F17 | AA17 |
| IO189PB4F17 | AE22 |
| IO191NB4F17 | W18 |
| IO191PB4F17 | V18 |
| IO192PB4F17 | U18 |
| IO195PB4F18 | AE21 |
| IO196NB4F18 | AB16 |
| IO197NB4F18 | AD17 |
| IO197PB4F18 | AD18 |
| IO198NB4F18 | V17 |
| IO198PB4F18 | W17 |
| IO199NB4F18 | AE19 |
| IO199PB4F18 | AE20 |
| IO200NB4F18 | AC15 |
| IO201NB4F18 | AD15 |
| IO201PB4F18 | AD16 |
| IO202NB4F18 | Y15 |
| IO202PB4F18 | Y16 |
| IO206NB4F19 | AB14 |
| IO206PB4F19 | AB15 |
| IO207NB4F19 | AE15 |
| IO207PB4F19 | AE16 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| IO208PB4F19 | W16 |
| IO209NB4F19 | AE14 |
| IO210NB4F19 | V15 |
| IO210PB4F19 | V16 |
| IO211NB4F19 | AD14 |
| IO211PB4F19 | AC14 |
| IO212NB4F19/CLKEN | W14 |
| IO212PB4F19/CLKEP | W15 |
| IO213NB4F19/CLKFN | AC13 |
| IO213PB4F19/CLKFP | AD13 |
| **Bank 5** | |
| IO214NB5F20/CLKGN | W13 |
| IO214PB5F20/CLKGP | Y13 |
| IO215NB5F20/CLKHN | AC12 |
| IO215PB5F20/CLKHP | AD12 |
| IO216NB5F20 | U13 |
| IO216PB5F20 | V13 |
| IO217NB5F20 | AE10 |
| IO217PB5F20 | AE11 |
| IO218NB5F20 | W11 |
| IO218PB5F20 | W12 |
| IO222NB5F20 | AA11 |
| IO222PB5F20 | Y11 |
| IO223PB5F21 | AE9 |
| IO225NB5F21 | AE6 |
| IO225PB5F21 | AE7 |
| IO226NB5F21 | Y10 |
| IO226PB5F21 | W10 |
| IO227PB5F21 | T13 |
| IO228NB5F21 | AB10 |
| IO228PB5F21 | AB11 |
| IO229NB5F21 | AD9 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| GND | M11 |
| GND | M12 |
| GND | M13 |
| GND | M14 |
| GND | M15 |
| GND | N11 |
| GND | N12 |
| GND | N13 |
| GND | N14 |
| GND | N15 |
| GND | P11 |
| GND | P12 |
| GND | P13 |
| GND | P14 |
| GND | P15 |
| GND | R11 |
| GND | R12 |
| GND | R13 |
| GND | R14 |
| GND | R15 |
| GND | T21 |
| GND | T23 |
| GND | T3 |
| GND | T5 |
| GND | V1 |
| GND | V25 |
| GND | V5 |
| PRA | F13 |
| PRB | A13 |
| PRC | AB12 |
| PRD | AE13 |
| TCK | F5 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| TDI | C5 |
| TDO | F6 |
| TMS | D6 |
| TRST | E6 |
| VCCA | AB20 |
| VCCA | F22 |
| VCCA | F4 |
| VCCA | J17 |
| VCCA | J9 |
| VCCA | K10 |
| VCCA | K11 |
| VCCA | K15 |
| VCCA | K16 |
| VCCA | L10 |
| VCCA | L16 |
| VCCA | R10 |
| VCCA | R16 |
| VCCA | T10 |
| VCCA | T11 |
| VCCA | T15 |
| VCCA | T16 |
| VCCA | U17 |
| VCCA | U9 |
| VCCA | Y4 |
| VCCDA | A12 |
| VCCDA | A14 |
| VCCDA | AA13 |
| VCCDA | AA15 |
| VCCDA | AA20 |
| VCCDA | AA7 |
| VCCDA | AB13 |
| VCCDA | AC11 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*

| CG624 | |
|---|---|
| **AX2000 Function** | **Pin Number** |
| VCCDA | AD11 |
| VCCDA | AD4 |
| VCCDA | AE12 |
| VCCDA | AE17 |
| VCCDA | B15 |
| VCCDA | C15 |
| VCCDA | C6 |
| VCCDA | D13 |
| VCCDA | E13 |
| VCCDA | E19 |
| VCCDA | F21 |
| VCCDA | G10 |
| VCCDA | G5 |
| VCCDA | N21 |
| VCCDA | N5 |
| VCCDA | W21 |
| VCCIB0 | A3 |
| VCCIB0 | B3 |
| VCCIB0 | C4 |
| VCCIB0 | D5 |
| VCCIB0 | J10 |
| VCCIB0 | J11 |
| VCCIB0 | K12 |
| VCCIB1 | A23 |
| VCCIB1 | B23 |
| VCCIB1 | C22 |
| VCCIB1 | D21 |
| VCCIB1 | J15 |
| VCCIB1 | J16 |
| VCCIB1 | K14 |
| VCCIB2 | C24 |
| VCCIB2 | C25 |

*Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.*