

# XC95216-15PQG160C Datasheet



|                              |                                     |
|------------------------------|-------------------------------------|
| DiGi Electronics Part Number | XC95216-15PQG160C-DG                |
| Manufacturer                 | <a href="#">AMD</a>                 |
| Manufacturer Product Number  | XC95216-15PQG160C                   |
| Description                  | IC CPLD 216MC 15NS 160QFP           |
| Detailed Description         | Embedded, Integrated Circuits (ICs) |

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## Purchase and inquiry

Manufacturer Product Number:

XC95216-15PQG160C

Series:

XC9500

DiGi-Electronics Programmable:

Not Verified

Delay Time tpd(1) Max:

15 ns

Number of Logic Elements/Blocks:

12

Number of Gates:

4800

Operating Temperature:

0°C ~ 70°C (TA)

Package / Case:

160-BQFP

Base Product Number:

XC95216

Manufacturer:

AMD

Product Status:

Obsolete

Programmable Type:

In System Programmable (min 10K program/erase cycles)

Voltage Supply - Internal:

4.75V ~ 5.25V

Number of Macrocells:

216

Number of I/O:

133

Mounting Type:

Surface Mount

Supplier Device Package:

160-PQFP (28x28)

## Environmental & Export classification

Moisture Sensitivity Level (MSL):

3 (168 Hours)

ECCN:

EAR99

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001



# XC95216 In-System Programmable CPLD

DS068 (v5.0) May 17, 2013

## Product Specification

### Features

- 10 ns pin-to-pin logic delays on all pins
- $f_{CNT}$  to 111 MHz
- 216 macrocells with 4,800 usable gates
- Up to 166 user I/O pins
- 5V in-system programmable
  - Endurance of 10,000 program/erase cycles
  - Program/erase over full commercial voltage and temperature range
- Enhanced pin-locking architecture
- Flexible 36V18 Function Block
  - 90 product terms drive any or all of 18 macrocells within Function Block
  - Global and product term clocks, output enables, set and reset signals
- Extensive IEEE Std 1149.1 boundary-scan (JTAG) support
- Programmable power reduction mode in each macrocell
- Slew rate control on individual outputs
- User programmable ground pin capability
- Extended pattern security features for design protection
- High-drive 24 mA outputs
- 3.3V or 5V I/O capability
- Advanced CMOS 5V FastFLASH™ technology
- Supports parallel programming of more than one XC9500 concurrently
- Available 160-pin PQFP, 352-pin BGA, and 208-pin HQFP packages (Note: 352-pin BGA packages are being discontinued for this device)

### Description

The XC95216 is a high-performance CPLD providing advanced in-system programming and test capabilities for general purpose logic integration. It is comprised of eight 36V18 Function Blocks, providing 4,800 usable gates with propagation delays of 10 ns. See [Figure 2](#) for the architecture overview.

### Power Management

Power dissipation can be reduced in the XC95216 by configuring macrocells to standard or low-power modes of operation. Unused macrocells are turned off to minimize power dissipation.

Operating current for each design can be approximated for specific operating conditions using the following equation:

$$I_{CC} \text{ (mA)} = MC_{HP} (1.7) + MC_{LP} (0.9) + MC (0.006 \text{ mA/MHz}) f$$

Where:

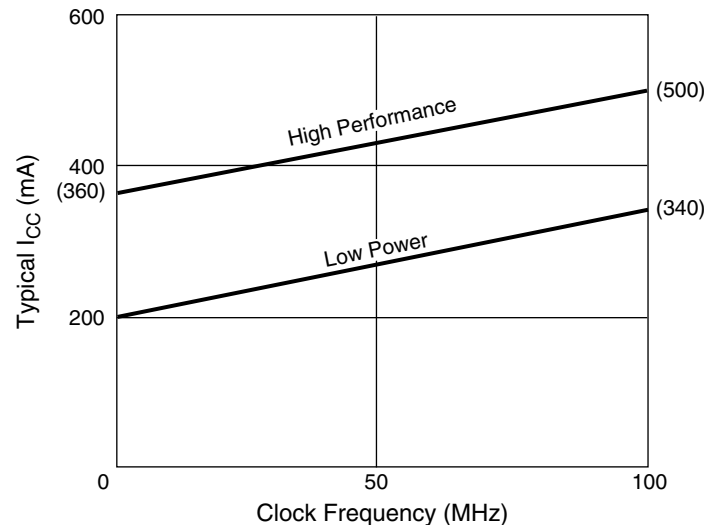
$MC_{HP}$  = Macrocells in high-performance mode

$MC_{LP}$  = Macrocells in low-power mode

$MC$  = Total number of macrocells used

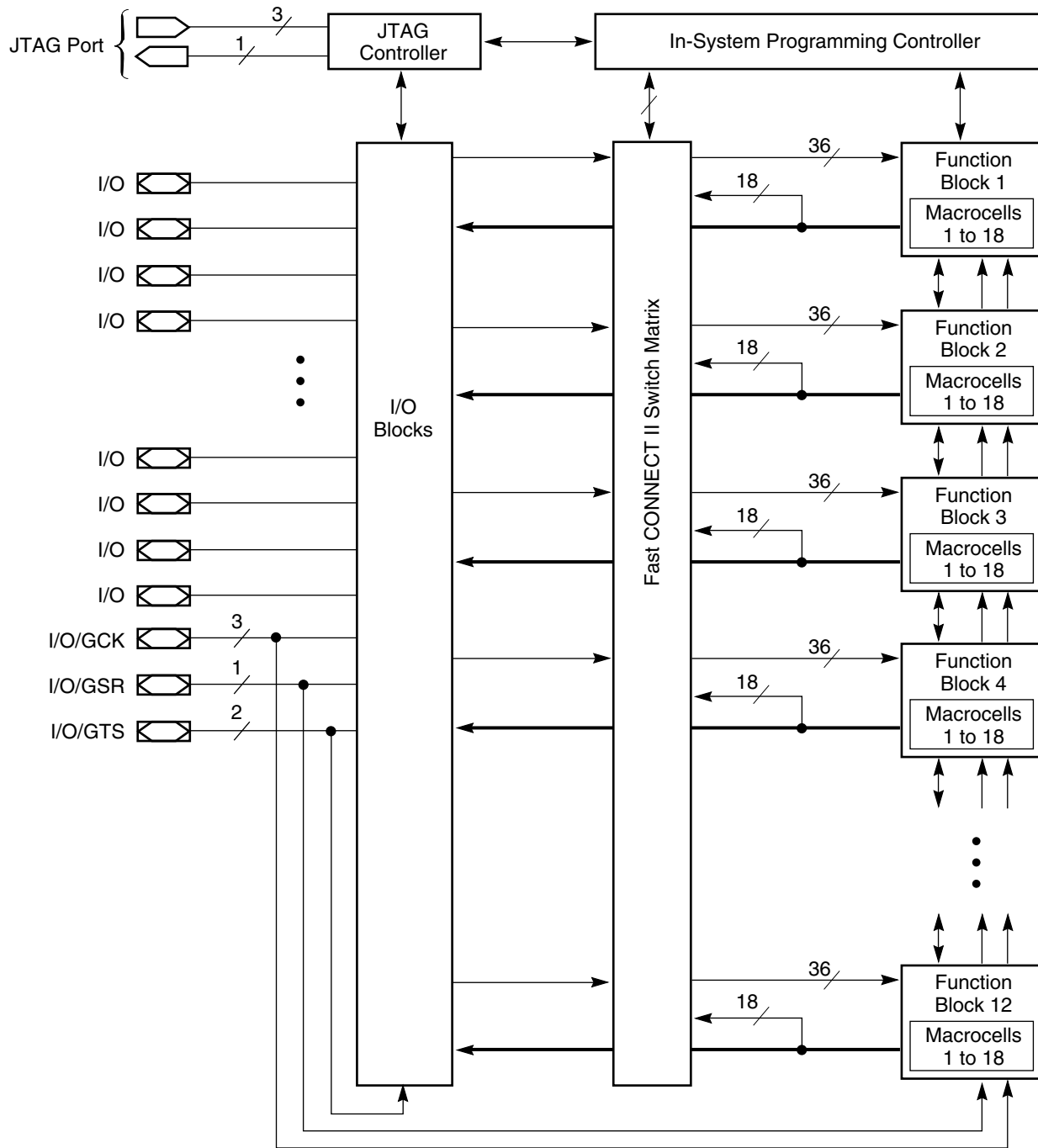
$f$  = Clock frequency (MHz)

[Figure 1](#) shows a typical calculation for the XC95216 device.



DS068\_01\_110101

Figure 1: Typical  $I_{CC}$  vs. Frequency for XC95216



DS068\_02\_110101

Figure 2: XC95216 Architecture

Function block outputs (indicated by the bold line) drive the I/O blocks directly.

## Absolute Maximum Ratings

| Symbol    | Description                       | Value                  | Units |
|-----------|-----------------------------------|------------------------|-------|
| $V_{CC}$  | Supply voltage relative to GND    | -0.5 to 7.0            | V     |
| $V_{IN}$  | Input voltage relative to GND     | -0.5 to $V_{CC} + 0.5$ | V     |
| $V_{TS}$  | Voltage applied to 3-state output | -0.5 to $V_{CC} + 0.5$ | V     |
| $T_{STG}$ | Storage temperature (ambient)     | -65 to +150            | °C    |
| $T_J$     | Junction temperature              | +150                   | °C    |

### Notes:

- Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those listed under Operating Conditions is not implied. Exposure to Absolute Maximum Ratings conditions for extended periods of time may affect device reliability.

## Recommended Operation Conditions

| Symbol      | Parameter  |   | Min  | Max               | Units |
|-------------|--|---|------|-------------------|-------|
| $V_{CCINT}$ | Supply voltage for internal logic and input buffers  | Commercial $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$    | 4.75 | 5.25              | V     |
|             |  | Industrial $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | 4.5  | 5.5               |       |
| $V_{CCIO}$  | Supply voltage for output drivers for 5V operation   | Commercial $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$    | 4.75 | 5.25              | V     |
|             |  | Industrial $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | 4.5  | 5.5               |       |
|             | Supply voltage for output drivers for 3.3V operation | 3.0   | 3.6  |                   |       |
| $V_{IL}$    | Low-level input voltage                              |   | 0    | 0.80              | V     |
| $V_{IH}$    | High-level input voltage                             |   | 2.0  | $V_{CCINT} + 0.5$ | V     |
| $V_O$       | Output voltage                                       |   | 0    | $V_{CCIO}$        | V     |

## Quality and Reliability Characteristics

| Symbol   | Parameter                        | Min    | Max | Units  |
|----------|----------------------------------|--------|-----|--------|
| $T_{DR}$ | Data Retention                   | 20     | -   | Years  |
| $N_{PE}$ | Program/Erase Cycles (Endurance) | 10,000 | -   | Cycles |

## DC Characteristic Over Recommended Operating Conditions

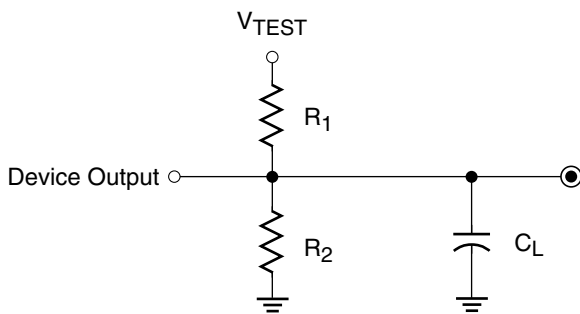
| Symbol   | Parameter   | Test Conditions   | Min           | Max      | Units         |
|----------|---|---|---------------|----------|---------------|
| $V_{OH}$ | Output high voltage for 5V outputs                | $I_{OH} = -4.0\text{ mA}$ , $V_{CC} = \text{Min}$         | 2.4           | -        | V             |
|          | Output high voltage for 3.3V outputs              | $I_{OH} = -3.2\text{ mA}$ , $V_{CC} = \text{Min}$         | 2.4           | -        | V             |
| $V_{OL}$ | Output low voltage for 5V outputs                 | $I_{OL} = 24\text{ mA}$ , $V_{CC} = \text{Min}$           | -             | 0.5      | V             |
|          | Output low voltage for 3.3V outputs               | $I_{OL} = 10\text{ mA}$ , $V_{CC} = \text{Min}$           | -             | 0.4      | V             |
| $I_{IL}$ | Input leakage current                             | $V_{CC} = \text{Max}$<br>$V_{IN} = \text{GND or } V_{CC}$ | -             | $\pm 10$ | $\mu\text{A}$ |
| $I_{IH}$ | I/O high-Z leakage current                        | $V_{CC} = \text{Max}$<br>$V_{IN} = \text{GND or } V_{CC}$ | -             | $\pm 10$ | $\mu\text{A}$ |
| $C_{IN}$ | I/O capacitance                                   | $V_{IN} = \text{GND}$<br>$f = 1.0\text{ MHz}$             | -             | 10       | pF            |
| $I_{CC}$ | Operating supply current (low power mode, active) | $V_I = \text{GND}$ , No load<br>$f = 1.0\text{ MHz}$      | 200 (Typical) |          | mA            |

## AC Characteristics

| Symbol             | Parameter   | XC95216-10 |      | XC95216-15 |      | XC95216-20 |      | Units |
|--------------------|---|------------|------|------------|------|------------|------|-------|
|                    |   | Min        | Max  | Min        | Max  | Min        | Max  |       |
| $T_{PD}$           | I/O to output valid                                 | -          | 10.0 | -          | 15.0 | -          | 20.0 | ns    |
| $T_{SU}$           | I/O setup time before GCK                           | 6.0        | -    | 8.0        | -    | 10.0       | -    | ns    |
| $T_H$              | I/O hold time after GCK                             | 0          | -    | 0          | -    | 0          | -    | ns    |
| $T_{CO}$           | GCK to output valid                                 | -          | 6.0  | -          | 8.0  | -          | 10.0 | ns    |
| $f_{CNT}^{(1)}$    | 16-bit counter frequency                            | 111.1      | -    | 95.2       | -    | 83.3       | -    | MHz   |
| $f_{SYSTEM}^{(2)}$ | Multiple FB internal operating frequency            | 66.7       | -    | 55.6       | -    | 50.0       | -    | MHz   |
| $T_{PSU}$          | I/O setup time before p-term clock input            | 2.0        | -    | 4.0        | -    | 4.0        | -    | ns    |
| $T_{PH}$           | I/O hold time after p-term clock input              | 4.0        | -    | 4.0        | -    | 6.0        | -    | ns    |
| $T_{PCO}$          | P-term clock output valid                           | -          | 10.0 | -          | 12.0 | -          | 16.0 | ns    |
| $T_{OE}$           | GTS to output valid                                 | -          | 6.0  | -          | 11.0 | -          | 16.0 | ns    |
| $T_{OD}$           | GTS to output disable                               | -          | 6.0  | -          | 11.0 | -          | 16.0 | ns    |
| $T_{POE}$          | Product term OE to output enabled                   | -          | 10.0 | -          | 14.0 | -          | 18.0 | ns    |
| $T_{POD}$          | Product term OE to output disabled                  | -          | 10.0 | -          | 14.0 | -          | 18.0 | ns    |
| $T_{WLH}$          | GCK pulse width (High or Low)                       | 4.5        | -    | 5.5        | -    | 5.5        | -    | ns    |
| $T_{APRPW}$        | Asynchronous preset/reset pulse width (High or Low) | 7.5        | -    | 8.0        | -    | 8.0        | -    | ns    |

**Notes:**

- $f_{CNT}$  is the fastest 16-bit counter frequency available, using the local feedback when applicable.  $f_{CNT}$  is also the Export Control Maximum flip-flop toggle rate,  $f_{TOG}$ .
- $f_{SYSTEM}$  is the internal operating frequency for general purpose system designs spanning multiple FBs.



| Output Type | VCCIO | VTEST | R1   | R2   | CL    |
|-------------|-------|-------|------|------|-------|
|             | 5.0V  | 5.0V  | 160Ω | 120Ω | 35 pF |
|             | 3.3V  | 3.3V  | 260Ω | 360Ω | 35 pF |

DS067\_03\_110101

Figure 3: AC Load Circuit

## Internal Timing Parameters

| Symbol  | Parameter                                | XC95216-10 |      | XC95216-15 |      | XC95216-20 |      | Units |
|---|--|------------|------|------------|------|------------|------|-------|
|   |  | Min        | Max  | Min        | Max  | Min        | Max  |       |
| <b>Buffer Delays</b>                              |  |            |      |            |      |            |      |       |
| $T_{IN}$  | Input buffer delay                       | -          | 3.5  | -          | 4.5  | -          | 6.5  | ns    |
| $T_{GCK}$   | GCK buffer delay                         | -          | 2.5  | -          | 3.0  | -          | 3.0  | ns    |
| $T_{GSR}$   | GSR buffer delay                         | -          | 6.0  | -          | 7.5  | -          | 9.5  | ns    |
| $T_{GTS}$   | GTS buffer delay                         | -          | 6.0  | -          | 11.0 | -          | 16.0 | ns    |
| $T_{OUT}$   | Output buffer delay                      | -          | 3.0  | -          | 4.5  | -          | 6.5  | ns    |
| $T_{EN}$  | Output buffer enable/disable delay       | -          | 0    | -          | 0    | -          | 0    | ns    |
| <b>Product Term Control Delays</b>                |  |            |      |            |      |            |      |       |
| $T_{PTCK}$  | Product term clock delay                 | -          | 3.0  | -          | 2.5  | -          | 2.5  | ns    |
| $T_{PTSR}$  | Product term set/reset delay             | -          | 2.5  | -          | 3.0  | -          | 3.0  | ns    |
| $T_{PTTS}$  | Product term 3-state delay               | -          | 3.5  | -          | 5.0  | -          | 5.0  | ns    |
| <b>Internal Register and Combinatorial Delays</b> |  |            |      |            |      |            |      |       |
| $T_{PDI}$   | Combinatorial logic propagation delay    | -          | 1.0  | -          | 3.0  | -          | 4.0  | ns    |
| $T_{SUI}$   | Register setup time                      | 2.5        | -    | 3.5        | -    | 3.5        | -    | ns    |
| $T_{HI}$  | Register hold time                       | 3.5        | -    | 4.5        | -    | 6.5        | -    | ns    |
| $T_{COI}$   | Register clock to output valid time      | -          | 0.5  | -          | 0.5  | -          | 0.5  | ns    |
| $T_{AOI}$   | Register async. S/R to output delay      | -          | 7.0  | -          | 8.0  | -          | 8.0  | ns    |
| $T_{RAI}$   | Register async. S/R recover before clock | 10.0       | -    | 10.0       | -    | 10.0       | -    | ns    |
| $T_{LOGI}$  | Internal logic delay                     | -          | 2.5  | -          | 3.0  | -          | 3.0  | ns    |
| $T_{LOGILP}$                                      | Internal low power logic delay           | -          | 11.0 | -          | 11.5 | -          | 11.5 | ns    |
| <b>Feedback Delays</b>                            |  |            |      |            |      |            |      |       |
| $T_F$   | FastCONNECT feedback delay               | -          | 9.5  | -          | 11.0 | -          | 13.0 | ns    |
| $T_{LF}$  | Function block local feedback delay      | -          | 3.5  | -          | 3.5  | -          | 5.0  | ns    |
| <b>Time Adders</b>                                |  |            |      |            |      |            |      |       |
| $T_{PTA}^{(1)}$                                   | Incremental product term allocator delay | -          | 1.0  | -          | 1.0  | -          | 1.5  | ns    |
| $T_{SLEW}$  | Slew-rate limited delay                  | -          | 4.5  | -          | 5.0  | -          | 5.5  | ns    |

**Notes:**

- $T_{PTA}$  is multiplied by the span of the function as defined in the XC9500 family data sheet.

## XC95216 I/O Pins

| Function Block | Macro-cell | PQ160            | HQ208            | BG352 <sup>(2)</sup> | BScan Order | Function Block | Macro-cell | PQ160              | HQ208              | BG352 <sup>(2)</sup> | BScan Order |
|----------------|------------|------------------|------------------|----------------------|-------------|----------------|------------|--------------------|--------------------|----------------------|-------------|
| 1              | 1          | –                | –                | –                    | 645         | 3              | 1          | –                  | –                  | –                    | 537         |
| 1              | 2          | 18               | 22               | M25                  | 642         | 3              | 2          | 32                 | 43                 | AA26                 | 534         |
| 1              | 3          | 19               | 23               | M26                  | 639         | 3              | 3          | 33 <sup>[1]</sup>  | 44 <sup>[1]</sup>  | Y24 <sup>[1]</sup>   | 531         |
| 1              | 4          | –                | 28               | N26                  | 636         | 3              | 4          | –                  | 39                 | U23                  | 528         |
| 1              | 5          | 21               | 25               | N25                  | 633         | 3              | 5          | 34                 | 45                 | AB25                 | 525         |
| 1              | 6          | 22               | 30               | P23                  | 630         | 3              | 6          | 35 <sup>[1]</sup>  | 46 <sup>[1]</sup>  | AA24 <sup>[1]</sup>  | 522         |
| 1              | 7          | –                | –                | –                    | 627         | 3              | 7          | –                  | –                  | –                    | 519         |
| 1              | 8          | 23               | 31               | P24                  | 624         | 3              | 8          | 36                 | 47                 | Y23                  | 516         |
| 1              | 9          | 24               | 32               | R26                  | 621         | 3              | 9          | 37                 | 49                 | AA23                 | 513         |
| 1              | 10         | –                | 12               | G26                  | 618         | 3              | 10         | –                  | 67                 | AD18                 | 510         |
| 1              | 11         | 25               | 33               | R24                  | 615         | 3              | 11         | 38                 | 50                 | AB24                 | 507         |
| 1              | 12         | 26               | 34               | T26                  | 612         | 3              | 12         | 39                 | 51                 | AD25                 | 504         |
| 1              | 13         | –                | –                | –                    | 609         | 3              | 13         | –                  | –                  | –                    | 501         |
| 1              | 14         | 27               | 35               | T25                  | 606         | 3              | 14         | 42 <sup>[1]</sup>  | 55 <sup>[1]</sup>  | AD23 <sup>[1]</sup>  | 498         |
| 1              | 15         | 28               | 36               | T23                  | 603         | 3              | 15         | 43                 | 56                 | AF24                 | 495         |
| 1              | 16         | 29               | 37               | V26                  | 600         | 3              | 16         | –                  | 80                 | AE12                 | 492         |
| 1              | 17         | 30               | 38               | U24                  | 597         | 3              | 17         | 44                 | 57                 | AE23                 | 489         |
| 1              | 18         | –                | –                | –                    | 594         | 3              | 18         | –                  | –                  | –                    | 486         |
| 2              | 1          | –                | –                | –                    | 591         | 4              | 1          | –                  | –                  | –                    | 483         |
| 2              | 2          | 6 <sup>[1]</sup> | 7 <sup>[1]</sup> | E25 <sup>[1]</sup>   | 588         | 4              | 2          | 152                | 198                | D18                  | 480         |
| 2              | 3          | 7                | 8                | G24                  | 585         | 4              | 3          | 153                | 199                | A21                  | 477         |
| 2              | 4          | –                | 29               | P25                  | 582         | 4              | 4          | –                  | 196                | B19                  | 474         |
| 2              | 5          | 8 <sup>[1]</sup> | 9 <sup>[1]</sup> | F26 <sup>[1]</sup>   | 579         | 4              | 5          | 154                | 200                | B20                  | 471         |
| 2              | 6          | 9                | 10               | H23                  | 576         | 4              | 6          | 155                | 201                | C20                  | 468         |
| 2              | 7          | –                | –                | –                    | 573         | 4              | 7          | –                  | –                  | –                    | 465         |
| 2              | 8          | 11               | 15               | K23                  | 570         | 4              | 8          | 156                | 202                | B22                  | 462         |
| 2              | 9          | 12               | 16               | K24                  | 567         | 4              | 9          | 158                | 205                | B24                  | 459         |
| 2              | 10         | –                | –                | –                    | 564         | 4              | 10         | –                  | –                  | –                    | 456         |
| 2              | 11         | 13               | 17               | J25                  | 561         | 4              | 11         | 159 <sup>[1]</sup> | 206 <sup>[1]</sup> | C23 <sup>[1]</sup>   | 453         |
| 2              | 12         | 14               | 18               | L24                  | 558         | 4              | 12         | 2 <sup>[1]</sup>   | 3 <sup>[1]</sup>   | E23 <sup>[1]</sup>   | 450         |
| 2              | 13         | –                | –                | –                    | 555         | 4              | 13         | –                  | –                  | –                    | 447         |
| 2              | 14         | 15               | 19               | K25                  | 552         | 4              | 14         | 3                  | 4                  | C26                  | 444         |
| 2              | 15         | 16               | 20               | L26                  | 549         | 4              | 15         | 4 <sup>[1]</sup>   | 5 <sup>[1]</sup>   | E24 <sup>[1]</sup>   | 441         |
| 2              | 16         | –                | 14               | H25                  | 546         | 4              | 16         | –                  | 203                | D20                  | 438         |
| 2              | 17         | 17               | 21               | M24                  | 543         | 4              | 17         | 5                  | 6                  | F24                  | 435         |
| 2              | 18         | –                | –                | –                    | 540         | 4              | 18         | –                  | –                  | –                    | 432         |

**Notes:**

1. Global control pin.
2. 352-pin BGA package is being discontinued for the XC95216. See [XC95216](#) for details.

### XC95216 I/O Pins (Continued)

| Function Block | Macro-cell | PQ160 | HQ208 | BG352 <sup>(2)</sup> | BScan Order | Function Block | Macro-cell | PQ160 | HQ208 | BG352 <sup>(2)</sup> | BScan Order |
|----------------|------------|-------|-------|----------------------|-------------|----------------|------------|-------|-------|----------------------|-------------|
| 5              | 1          | –     | –     | –                    | 429         | 7              | 1          | –     | –     | –                    | 321         |
| 5              | 2          | 45    | 58    | AE22                 | 426         | 7              | 2          | 58    | 76    | AE13                 | 318         |
| 5              | 3          | 47    | 60    | AE21                 | 423         | 7              | 3          | 59    | 77    | AC13                 | 315         |
| 5              | 4          | –     | 41    | W25                  | 420         | 7              | 4          | –     | 54    | AE24                 | 312         |
| 5              | 5          | 48    | 61    | AF21                 | 417         | 7              | 5          | 60    | 78    | AD13                 | 309         |
| 5              | 6          | 49    | 63    | AD19                 | 414         | 7              | 6          | 62    | 82    | AD12                 | 306         |
| 5              | 7          | –     | –     | –                    | 411         | 7              | 7          | –     | –     | –                    | 303         |
| 5              | 8          | 50    | 64    | AE20                 | 408         | 7              | 8          | 63    | 83    | AC12                 | 300         |
| 5              | 9          | 52    | 70    | AF18                 | 405         | 7              | 9          | 64    | 84    | AF11                 | 297         |
| 5              | 10         | –     | 109   | AD1                  | 402         | 7              | 10         | –     | 91    | AD8                  | 294         |
| 5              | 11         | 53    | 71    | AE17                 | 399         | 7              | 11         | 65    | 85    | AE11                 | 291         |
| 5              | 12         | 54    | 72    | AE16                 | 396         | 7              | 12         | 66    | 86    | AE9                  | 288         |
| 5              | 13         | –     | –     | –                    | 393         | 7              | 13         | –     | –     | –                    | 285         |
| 5              | 14         | 55    | 73    | AF16                 | 390         | 7              | 14         | 67    | 87    | AD9                  | 282         |
| 5              | 15         | 56    | 74    | AE14                 | 387         | 7              | 15         | 68    | 88    | AC10                 | 279         |
| 5              | 16         | –     | 40    | Y26                  | 384         | 7              | 16         | –     | 48    | AC26                 | 276         |
| 5              | 17         | 57    | 75    | AF14                 | 381         | 7              | 17         | 69    | 89    | AF7                  | 273         |
| 5              | 18         | –     | –     | –                    | 378         | 7              | 18         | –     | –     | –                    | 270         |
| 6              | 1          | –     | –     | –                    | 375         | 8              | 1          | –     | –     | –                    | 267         |
| 6              | 2          | 140   | 180   | A12                  | 372         | 8              | 2          | 126   | 162   | B5                   | 264         |
| 6              | 3          | 142   | 182   | A13                  | 369         | 8              | 3          | 128   | 164   | B6                   | 261         |
| 6              | 4          | –     | 208   | D22                  | 366         | 8              | 4          | –     | 143   | J1                   | 258         |
| 6              | 5          | 143   | 185   | C14                  | 363         | 8              | 5          | 129   | 166   | D8                   | 255         |
| 6              | 6          | 144   | 186   | A15                  | 360         | 8              | 6          | 130   | 167   | B7                   | 252         |
| 6              | 7          | –     | –     | –                    | 357         | 8              | 7          | –     | –     | –                    | 249         |
| 6              | 8          | 145   | 187   | B15                  | 354         | 8              | 8          | 131   | 170   | C10                  | 246         |
| 6              | 9          | 146   | 188   | C15                  | 351         | 8              | 9          | 132   | 171   | B9                   | 243         |
| 6              | 10         | –     | 183   | B14                  | 348         | 8              | 10         | –     | 195   | A20                  | 240         |
| 6              | 11         | 147   | 191   | A16                  | 345         | 8              | 11         | 133   | 173   | A9                   | 237         |
| 6              | 12         | 148   | 192   | C16                  | 342         | 8              | 12         | 134   | 174   | D11                  | 234         |
| 6              | 13         | –     | –     | –                    | 339         | 8              | 13         | –     | –     | –                    | 231         |
| 6              | 14         | 149   | 193   | C17                  | 336         | 8              | 14         | 135   | 175   | B11                  | 228         |
| 6              | 15         | 150   | 194   | B18                  | 333         | 8              | 15         | 138   | 178   | C12                  | 225         |
| 6              | 16         | –     | 169   | D9                   | 330         | 8              | 16         | –     | 189   | D15                  | 222         |
| 6              | 17         | 151   | 197   | C19                  | 327         | 8              | 17         | 139   | 179   | B12                  | 219         |
| 6              | 18         | –     | –     | –                    | 324         | 8              | 18         | –     | –     | –                    | 216         |

**Notes:**

1. Global control pin.
2. 352-pin BGA package is being discontinued for the XC95216. See [XCN07010](#) for details.

### XC95216 I/O Pins (Continued)

| Function Block | Macro-cell | PQ160 | HQ208 | BG352 <sup>(2)</sup> | BScan Order | Function Block | Macro-cell | PQ160 | HQ208 | BG352 <sup>(2)</sup> | BScan Order |
|----------------|------------|-------|-------|----------------------|-------------|----------------|------------|-------|-------|----------------------|-------------|
| 9              | 1          | –     | –     | –                    | 213         | 11             | 1          | –     | –     | –                    | 105         |
| 9              | 2          | 72    | 95    | AD7                  | 210         | 11             | 2          | 87    | 115   | Y1                   | 102         |
| 9              | 3          | 74    | 97    | AE5                  | 207         | 11             | 3          | 88    | 116   | V4                   | 99          |
| 9              | 4          | –     | 101   | AD4                  | 204         | 11             | 4          | –     | 119   | U4                   | 96          |
| 9              | 5          | 76    | 99    | AC7                  | 201         | 11             | 5          | 89    | 117   | V3                   | 93          |
| 9              | 6          | 77    | 100   | AE3                  | 198         | 11             | 6          | 90    | 118   | W2                   | 90          |
| 9              | 7          | –     | –     | –                    | 195         | 11             | 7          | –     | –     | –                    | 87          |
| 9              | 8          | 78    | 102   | AC5                  | 192         | 11             | 8          | 91    | 121   | V2                   | 84          |
| 9              | 9          | 79    | 103   | AD3                  | 189         | 11             | 9          | 92    | 122   | U2                   | 81          |
| 9              | 10         | –     | 90    | AE8                  | 186         | 11             | 10         | –     | 107   | AC3                  | 78          |
| 9              | 11         | 82    | 110   | AA4                  | 183         | 11             | 11         | 93    | 123   | T2                   | 75          |
| 9              | 12         | 83    | 111   | AB2                  | 180         | 11             | 12         | 95    | 125   | R4                   | 72          |
| 9              | 13         | –     | –     | –                    | 177         | 11             | 13         | –     | –     | –                    | 69          |
| 9              | 14         | 84    | 112   | AC1                  | 174         | 11             | 14         | 96    | 126   | R3                   | 66          |
| 9              | 15         | 85    | 113   | AA2                  | 171         | 11             | 15         | 97    | 127   | R2                   | 63          |
| 9              | 16         | –     | 62    | AC19                 | 168         | 11             | 16         | –     | 120   | U3                   | 60          |
| 9              | 17         | 86    | 114   | AA1                  | 165         | 11             | 17         | 98    | 128   | R1                   | 57          |
| 9              | 18         | –     | –     | –                    | 162         | 11             | 18         | –     | –     | –                    | 54          |
| 10             | 1          | –     | –     | –                    | 159         | 12             | 1          | –     | –     | –                    | 51          |
| 10             | 2          | 113   | 147   | H3                   | 156         | 12             | 2          | 101   | 131   | P1                   | 48          |
| 10             | 3          | 114   | 148   | J4                   | 153         | 12             | 3          | 102   | 133   | N2                   | 45          |
| 10             | 4          | –     | 144   | K3                   | 150         | 12             | 4          | –     | 106   | AD2                  | 42          |
| 10             | 5          | 115   | 149   | G2                   | 147         | 12             | 5          | 103   | 134   | N4                   | 39          |
| 10             | 6          | 116   | 150   | G3                   | 144         | 12             | 6          | 104   | 135   | N3                   | 36          |
| 10             | 7          | –     | –     | –                    | 141         | 12             | 7          | –     | –     | –                    | 33          |
| 10             | 8          | 117   | 152   | E2                   | 138         | 12             | 8          | 105   | 136   | M1                   | 30          |
| 10             | 9          | 118   | 154   | D2                   | 135         | 12             | 9          | 106   | 137   | M3                   | 27          |
| 10             | 10         | –     | 168   | A7                   | 132         | 12             | 10         | –     | 151   | F2                   | 24          |
| 10             | 11         | 119   | 155   | F4                   | 129         | 12             | 11         | 107   | 138   | M4                   | 21          |
| 10             | 12         | 122   | 158   | B3                   | 126         | 12             | 12         | 108   | 139   | L1                   | 18          |
| 10             | 13         | –     | –     | –                    | 123         | 12             | 13         | –     | –     | –                    | 15          |
| 10             | 14         | 123   | 159   | A3                   | 120         | 12             | 14         | 109   | 140   | L2                   | 12          |
| 10             | 15         | 124   | 160   | D6                   | 117         | 12             | 15         | 111   | 145   | G1                   | 9           |
| 10             | 16         | –     | 165   | A6                   | 114         | 12             | 16         | –     | 142   | L3                   | 6           |
| 10             | 17         | 125   | 161   | C6                   | 111         | 12             | 17         | 112   | 146   | H2                   | 3           |
| 10             | 18         | –     | –     | –                    | 108         | 12             | 18         | –     | –     | –                    | 0           |

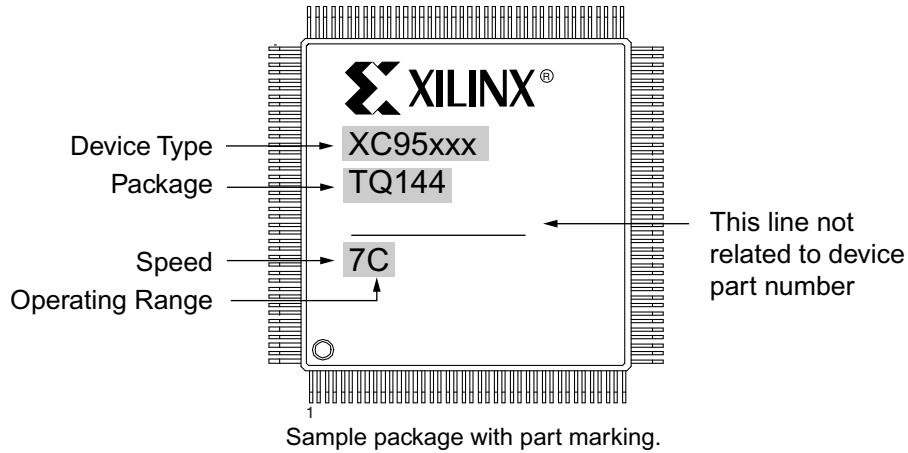
**Notes:**

1. Global control pin.
2. 352-pin BGA package is being discontinued for the XC95216. See [XCN07010](#) for details.

## XC95216 Global, JTAG and Power Pins

| Pin Type                  | PQ160  | HQ208   | BG352   |
|---------------------------|--|---|---|
| I/O/GCK1                  | 33   | 44  | Y24   |
| I/O/GCK2                  | 35   | 46  | AA24  |
| I/O/GCK3                  | 42   | 55  | AD23  |
| I/O/GTS1                  | 6  | 7   | E25   |
| I/O/GTS2                  | 8  | 9   | F26   |
| I/O/GTS3                  | 2  | 3   | E23   |
| I/O/GTS4                  | 4  | 5   | E24   |
| I/O/GSR                   | 159  | 206   | C23   |
| TCK                       | 75   | 98  | AD6   |
| TDI                       | 71   | 94  | AF6   |
| TDO                       | 136  | 176   | D12   |
| TMS                       | 73   | 96  | AE6   |
| V <sub>CCINT</sub> 5V     | 10,46,94,157   | 11, 59, 124, 153, 204   | H24, AF23, T1, G4, C22  |
| V <sub>CCIO</sub> 3.3V/5V | 1,41,61,81,121,141                                       | 1, 26, 53, 65, 79, 92, 105, 132, 157, 172, 181, 184   | A10, A17, B2, B25, D7, D13, D19, G23, H4, K1, K26, N23, P4, U1, U26, W23, Y4, AC8, AC14, AC20, AE25, AF10, AF17   |
| GND                       | 20, 31, 40, 51, 70, 80, 99, 100, 110, 120, 127, 137, 160 | 2, 13, 24, 27, 42, 52, 66, 68, 69, 81, 93, 104, 108, 129, 130, 141, 156, 163, 177, 190, 207 | A1, A2, A5, A8, A14, A19, A22, A25, A26, B1, B26, C7, E1, E26, H1, H26, N1, P3, P26, V23, W1, W26, AB1, AB4, AB26, AC9, AC17, AE1, AE26, AF1, AF2, AF5, AF8, AF13, AF19, AF20, AF22, AF25, AF26   |
| No Connects               | –  | –   | A4, A11, A18, A23, A24, B4, B8, B10, B13, B16, B17, B21, B23, C1, C2, C3, C4, C5, C8, C9, C11, C13, C18, C21, C24, C25, D1, D3, D4, D5, D10, D14, D16, D17, D21, D23, D24, D25, D26, E3, E4, F1, F3, F23, F25, G25, J2, J3, J23, J24, J26, K2, K4, L4, L23, L25, M2, M23, N24, P2, R23, R25, T3, T4, T24, U25, V1, V24, V25, W3, W4, W24, Y2, Y3, Y25, AA3, AA25, AB3, AB23, AC2, AC4, AC6, AC11, AC15, AC16, AC18, AC21, AC22, AC23, AC24, AC25, AD5, AD10, AD11, AD14, AD15, AD16, AD17, AD20, AD21, AD22, AD24, AD26, AE2, AE4, AE7, AE10, AE15, AE18, AE19, AF3, AF4, AF9, AF12, AF15 |

## Device Part Marking and Ordering Combination Information



| Device Ordering and Part Marking Number | Speed (pin-to-pin delay) | Pkg. Symbol | No. of Pins | Package Type                           | Operating Range <sup>(1)</sup> |
|---|--------------------------|-------------|-------------|--|--------------------------------|
| XC95216-10PQ160C                        | 10 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | C                              |
| XC95216-10PQG160C                       | 10 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | C                              |
| XC95216-10HQ208C                        | 10 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | C                              |
| XC95216-10BG352C                        | 10 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | C                              |
| XC95216-10PQ160I                        | 10 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | I                              |
| XC95216-10PQG160I                       | 10 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | I                              |
| XC95216-10HQ208I                        | 10 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | I                              |
| XC95216-10BG352I                        | 10 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | I                              |
| XC95216-15PQ160C                        | 15 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | C                              |
| XC95216-15PQG160C                       | 15 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | C                              |
| XC95216-15HQ208C                        | 15 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | C                              |
| XC95216-10BG352C                        | 15 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | C                              |
| XC95216-15PQ160I                        | 15 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | I                              |
| XC95216-15PQG160I                       | 15 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | I                              |
| XC95216-15HQ208I                        | 15 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | I                              |
| XC95216-15BG352I                        | 15 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | I                              |
| XC95216-20PQ160C                        | 20 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | C                              |
| XC95216-20PQG160C                       | 20 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | C                              |
| XC95216-20HQ208C                        | 20 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | C                              |
| XC95216-20BG352C                        | 20 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | C                              |
| XC95216-20PQ160I                        | 20 ns                    | PQ160       | 160-pin     | Plastic Quad Flat Pack (PQFP)          | I                              |
| XC95216-20PQG160I                       | 20 ns                    | PQG160      | 160-pin     | Plastic Quad Flat Pack (PQFP); Pb-Free | I                              |
| XC95216-20HQ208I                        | 20 ns                    | HQ208       | 208-pin     | Heat Sink Quad Flat Pack (HQFP)        | I                              |
| XC95216-20BG352I                        | 20 ns                    | BG352       | 352-ball    | Ball Grid Array (BGA)                  | I                              |

**Notes:**

1. C = Commercial:  $T_A = 0^\circ$  to  $+70^\circ\text{C}$ ; I = Industrial:  $T_A = -40^\circ$  to  $+85^\circ\text{C}$
2. 352-pin BGA package is being discontinued for the XC95216. See [XC95216](#) for details.

## Warranty Disclaimer

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## Revision History

The following table shows the revision history for this document.

| Date       | Version | Revision   |
|------------|---------|--|
| 12/04/1998 | 3.0     | Update AC characteristics and internal parameters.   |
| 08/21/2001 | 3.1     | Added Note 1 to page 6.  |
| 06/18/2003 | 4.0     | Updated format.  |
| 08/21/2003 | 4.1     | Updated Package Device Marking Pin 1 orientation.  |
| 04/15/2005 | 4.2     | Added asynchronous preset/reset pulse width specification ( $T_{APRPW}$ )  |
| 04/03/2006 | 4.3     | Added Warranty Disclaimer. Added Pb-Free package ordering information.   |
| 06/25/2007 | 4.4     | Discontinuance of BG352 and BGG252 packages.   |
| 05/17/2013 | 5.0     | The products listed in this data sheet are obsolete. See <a href="#">XCN11010</a> for further information. Removed note added in v4.4 about the 352-pin BGA packages. The <a href="#">XCN07010</a> covered this discontinuation. |

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