



## XC95144 In-System Programmable CPLD

December 4, 1998 (Version 4.0)

Product Specification

### Features

- 7.5 ns pin-to-pin logic delays on all pins
- $f_{CNT}$  to 111 MHz
- 144 macrocells with 3,200 usable gates
- Up to 133 user I/O pins
- 5 V 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
- 3.3 V or 5 V I/O capability
- Advanced CMOS 5V FastFLASH technology
- Supports parallel programming of more than one XC9500 concurrently
- Available in 100-pin PQFP, 100-pin TQFP, and 160-pin PQFP packages

### Description

The XC95144 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 3,200 usable gates with propagation delays of 7.5 ns. See Figure 2 for the architecture overview.

### Power Management

Power dissipation can be reduced in the XC95144 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 XC95144 device.

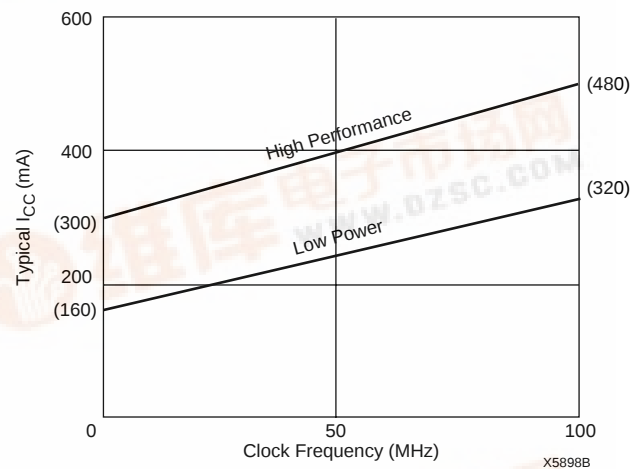


Figure 1: Typical  $I_{CC}$  vs. Frequency for XC95144





Function Block outputs (indicated by the bold line) drive the I/O Blocks directly.

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## Absolute Maximum Ratings

| Symbol    | Parameter                                             | Value                  | Units |
|-----------|-------------------------------------------------------|------------------------|-------|
| $V_{CC}$  | Supply voltage relative to GND                        | -0.5 to 7.0            | V     |
| $V_{IN}$  | DC input voltage relative to GND                      | -0.5 to $V_{CC} + 0.5$ | V     |
| $V_{TS}$  | Voltage applied to 3-state output with respect to GND | -0.5 to $V_{CC} + 0.5$ | V     |
| $T_{STG}$ | Storage temperature                                   | -65 to +150            | °C    |
| $T_{SOL}$ | Max soldering temperature (10 s @ 1/16 in = 1.5 mm)   | +260                   | °C    |

**Warning:** 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 Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Rating conditions for extended periods of time may affect device reliability.

## Recommended Operation Conditions<sup>1</sup>

| Symbol      | Parameter                                             | Min           | Max               | Units |
|-------------|-------------------------------------------------------|---------------|-------------------|-------|
| $V_{CCINT}$ | Supply voltage for internal logic and input buffer    | 4.75<br>(4.5) | 5.25<br>(5.5)     | V     |
| $V_{CCIO}$  | Supply voltage for output drivers for 5 V operation   | 4.75 (4.5)    | 5.25 (5.5)        | V     |
|             | Supply voltage for output drivers for 3.3 V operation | 3.0           | 3.6               | V     |
| $V_{IL}$    | 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     |

**Note:** 1. Numbers in parenthesis are for industrial-temperature range versions.

## Endurance Characteristics

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

## XC95144 In-System Programmable CPLD

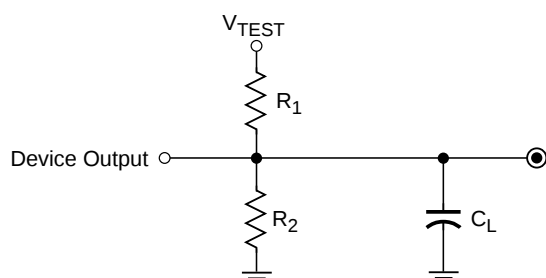
### DC Characteristics Over Recommended Operating Conditions

| Symbol          | Parameter                                            | Test Conditions                                                   | Min       | Max   | Units |
|-----------------|------------------------------------------------------|-------------------------------------------------------------------|-----------|-------|-------|
| V <sub>OH</sub> | Output high voltage for 5 V operation                | I <sub>OH</sub> = -4.0 mA<br>V <sub>CC</sub> = Min                | 2.4       |       | V     |
|                 | Output high voltage for 3.3 V operation              | I <sub>OH</sub> = -3.2 mA<br>V <sub>CC</sub> = Min                | 2.4       |       | V     |
| V <sub>OL</sub> | Output low voltage for 5 V operation                 | I <sub>OL</sub> = 24 mA<br>V <sub>CC</sub> = Min                  |           | 0.5   | V     |
|                 | Output low voltage for 3.3 V operation               | I <sub>OL</sub> = 10 mA<br>V <sub>CC</sub> = Min                  |           | 0.4   | V     |
| I <sub>IL</sub> | Input leakage current                                | V <sub>CC</sub> = Max<br>V <sub>IN</sub> = GND or V <sub>CC</sub> |           | ±10.0 | μA    |
| I <sub>IH</sub> | I/O high-Z leakage current                           | V <sub>CC</sub> = Max<br>V <sub>IN</sub> = GND or V <sub>CC</sub> |           | ±10.0 | μA    |
| C <sub>IN</sub> | I/O capacitance                                      | V <sub>IN</sub> = GND<br>f = 1.0 MHz                              |           | 10.0  | pF    |
| I <sub>CC</sub> | Operating Supply Current<br>(low power mode, active) | V <sub>I</sub> = GND, No load<br>f = 1.0 MHz                      | 160 (Typ) |       | ma    |

### AC Characteristics

| Symbol                           | Parameter                                | XC95144-7 |     | XC95144-10 |      | XC95144-15 |      | Units |
|----------------------------------|------------------------------------------|-----------|-----|------------|------|------------|------|-------|
|                                  |                                          | Min       | Max | Min        | Max  | Min        | Max  |       |
| t <sub>PD</sub>                  | I/O to output valid                      |           | 7.5 |            | 10.0 |            | 15.0 | ns    |
| t <sub>SU</sub>                  | I/O setup time before GCK                | 4.5       |     | 6.0        |      | 8.0        |      | ns    |
| t <sub>H</sub>                   | I/O hold time after GCK                  | 0.0       |     | 0.0        |      | 0.0        |      | ns    |
| t <sub>CO</sub>                  | GCK to output valid                      |           | 4.5 |            | 6.0  |            | 8.0  | ns    |
| f <sub>CNT</sub> <sup>1</sup>    | 16-bit counter frequency                 | 125.0     |     | 111.1      |      | 95.2       |      | MHz   |
| f <sub>SYSTEM</sub> <sup>2</sup> | Multiple FB internal operating frequency | 83.3      |     | 66.7       |      | 55.6       |      | MHz   |
| t <sub>PSU</sub>                 | I/O setup time before p-term clock input | 0.5       |     | 2.0        |      | 4.0        |      | ns    |
| t <sub>PH</sub>                  | I/O hold time after p-term clock input   | 4.0       |     | 4.0        |      | 4.0        |      | ns    |
| t <sub>PCO</sub>                 | P-term clock to output valid             |           | 8.5 |            | 10.0 |            | 12.0 | ns    |
| t <sub>OE</sub>                  | GTS to output valid                      |           | 5.5 |            | 6.0  |            | 11.0 | ns    |
| t <sub>OD</sub>                  | GTS to output disable                    |           | 5.5 |            | 6.0  |            | 11.0 | ns    |
| t <sub>POE</sub>                 | Product term OE to output enabled        |           | 9.5 |            | 10.0 |            | 14.0 | ns    |
| t <sub>POD</sub>                 | Product term OE to output disabled       |           | 9.5 |            | 10.0 |            | 14.0 | ns    |
| t <sub>WLH</sub>                 | GCK pulse width (High or Low)            | 4.0       |     | 4.5        |      | 5.5        |      | ns    |

- Note:** 1. f<sub>CNT</sub> is the fastest 16-bit counter frequency available, using the local feedback when applicable.  
f<sub>CNT</sub> is also the Export Control Maximum flip-flop toggle rate, f<sub>TOG</sub>.  
2. f<sub>SYSTEM</sub> is the internal operating frequency for general purpose system designs spanning multiple FBs.



| Output Type | V <sub>CCIO</sub> | V <sub>TEST</sub> | R <sub>1</sub> | R <sub>2</sub> | C <sub>L</sub> |
|-------------|-------------------|-------------------|----------------|----------------|----------------|
|             | 5.0 V             | 5.0 V             | 160 Ω          | 120 Ω          | 35 pF          |
|             | 3.3 V             | 3.3 V             | 260 Ω          | 360 Ω          | 35 pF          |

X5906

Figure 3: AC Load Circuit

## Internal Timing Parameters

| Symbol                                     | Parameter                                 | XC95144-7 |      | XC95144-10 |      | XC95144-15 |      | Units |
|--------------------------------------------|-------------------------------------------|-----------|------|------------|------|------------|------|-------|
|                                            |                                           | Min       | Max  | Min        | Max  | Min        | Max  |       |
| Buffer Delays                              |                                           |           |      |            |      |            |      |       |
| t <sub>IN</sub>                            | Input buffer delay                        |           | 2.5  |            | 3.5  |            | 4.5  | ns    |
| t <sub>GCK</sub>                           | GCK buffer delay                          |           | 1.5  |            | 2.5  |            | 3.0  | ns    |
| t <sub>GSR</sub>                           | GSR buffer delay                          |           | 4.5  |            | 6.0  |            | 7.5  | ns    |
| t <sub>GTS</sub>                           | GTS buffer delay                          |           | 5.5  |            | 6.0  |            | 11.0 | ns    |
| t <sub>OUT</sub>                           | Output buffer delay                       |           | 2.5  |            | 3.0  |            | 4.5  | ns    |
| t <sub>EN</sub>                            | Output buffer enable/disable delay        |           | 0.0  |            | 0.0  |            | 0.0  | ns    |
| Product Term Control Delays                |                                           |           |      |            |      |            |      |       |
| t <sub>PTCK</sub>                          | Product term clock delay                  |           | 3.0  |            | 3.0  |            | 2.5  | ns    |
| t <sub>PTSR</sub>                          | Product term set/reset delay              |           | 2.0  |            | 2.5  |            | 3.0  | ns    |
| t <sub>PTTS</sub>                          | Product term 3-state delay                |           | 4.5  |            | 3.5  |            | 5.0  | ns    |
| Internal Register and Combinatorial delays |                                           |           |      |            |      |            |      |       |
| t <sub>PDI</sub>                           | Combinatorial logic propagation delay     |           | 0.5  |            | 1.0  |            | 3.0  | ns    |
| t <sub>SUI</sub>                           | Register setup time                       | 1.5       |      | 2.5        |      | 3.5        |      | ns    |
| t <sub>HI</sub>                            | Register hold time                        | 3.0       |      | 3.5        |      | 4.5        |      | ns    |
| t <sub>COI</sub>                           | Register clock to output valid time       |           | 0.5  |            | 0.5  |            | 0.5  | ns    |
| t <sub>AOI</sub>                           | Register async. S/R to output delay       |           | 6.5  |            | 7.0  |            | 8.0  | ns    |
| t <sub>RAI</sub>                           | Register async. S/R recovery before clock | 7.5       |      | 10.0       |      | 10.0       |      | ns    |
| t <sub>LOGI</sub>                          | Internal logic delay                      |           | 2.0  |            | 2.5  |            | 3.0  | ns    |
| t <sub>LOGILP</sub>                        | Internal low power logic delay            |           | 10.0 |            | 11.0 |            | 11.5 | ns    |
| Feedback Delays                            |                                           |           |      |            |      |            |      |       |
| t <sub>F</sub>                             | FastCONNECT matrix feedback delay         |           | 8.0  |            | 9.5  |            | 11.0 | ns    |
| t <sub>LF</sub>                            | Function Block local feedback delay       |           | 4.0  |            | 3.5  |            | 3.5  | ns    |
| Time Adders                                |                                           |           |      |            |      |            |      |       |
| t <sub>PTA</sub> <sup>3</sup>              | Incremental Product Term Allocator delay  |           | 1.0  |            | 1.0  |            | 1.0  | ns    |
| t <sub>SLEW</sub>                          | Slew-rate limited delay                   |           | 4.0  |            | 4.5  |            | 5.0  | ns    |

**Note:** 3. t<sub>PTA</sub> is multiplied by the span of the function as defined in the family data sheet.

## XC95144 In-System Programmable CPLD

### XC95144 I/O Pins

| Function Block | Macrocell | TQ 100 | PQ 100 | PQ 160 | BScan Order | Notes |
|----------------|-----------|--------|--------|--------|-------------|-------|
| 1              | 1         | –      | –      | 25     | 429         |       |
| 1              | 2         | 11     | 13     | 18     | 426         |       |
| 1              | 3         | 12     | 14     | 19     | 423         |       |
| 1              | 4         | –      | –      | 27     | 420         |       |
| 1              | 5         | 13     | 15     | 21     | 417         |       |
| 1              | 6         | 14     | 16     | 22     | 414         |       |
| 1              | 7         | –      | –      | 32     | 411         |       |
| 1              | 8         | 15     | 17     | 23     | 408         |       |
| 1              | 9         | 16     | 18     | 24     | 405         |       |
| 1              | 10        | –      | –      | 34     | 402         |       |
| 1              | 11        | 17     | 19     | 26     | 399         |       |
| 1              | 12        | 18     | 20     | 28     | 396         |       |
| 1              | 13        | –      | –      | 38     | 393         |       |
| 1              | 14        | 19     | 21     | 29     | 390         |       |
| 1              | 15        | 20     | 22     | 30     | 387         |       |
| 1              | 16        | –      | –      | 39     | 384         |       |
| 1              | 17        | 22     | 24     | 33     | 381         | [1]   |
| 1              | 18        | –      | –      | –      | 378         |       |
| 2              | 1         | –      | –      | 158    | 375         |       |
| 2              | 2         | 99     | 1      | 159    | 372         | [1]   |
| 2              | 3         | –      | –      | 3      | 369         |       |
| 2              | 4         | –      | –      | 5      | 366         |       |
| 2              | 5         | 1      | 3      | 2      | 363         | [1]   |
| 2              | 6         | 2      | 4      | 4      | 360         | [1]   |
| 2              | 7         | –      | –      | 7      | 357         |       |
| 2              | 8         | 3      | 5      | 6      | 354         | [1]   |
| 2              | 9         | 4      | 6      | 8      | 351         | [1]   |
| 2              | 10        | –      | –      | 9      | 348         |       |
| 2              | 11        | 6      | 8      | 11     | 345         |       |
| 2              | 12        | 7      | 9      | 12     | 342         |       |
| 2              | 13        | –      | –      | 14     | 339         |       |
| 2              | 14        | 8      | 10     | 13     | 336         |       |
| 2              | 15        | 9      | 11     | 15     | 333         |       |
| 2              | 16        | –      | –      | 16     | 330         |       |
| 2              | 17        | 10     | 12     | 17     | 327         |       |
| 2              | 18        | –      | –      | –      | 324         |       |

| Function Block | Macrocell | TQ 100 | PQ 100 | PQ 160 | BScan Order | Notes |
|----------------|-----------|--------|--------|--------|-------------|-------|
| 3              | 1         | –      | –      | 43     | 321         |       |
| 3              | 2         | 23     | 25     | 35     | 318         | [1]   |
| 3              | 3         | –      | –      | 45     | 315         |       |
| 3              | 4         | –      | –      | 48     | 312         |       |
| 3              | 5         | 24     | 26     | 36     | 309         |       |
| 3              | 6         | 25     | 27     | 37     | 306         |       |
| 3              | 7         | –      | –      | 50     | 303         |       |
| 3              | 8         | 27     | 29     | 42     | 300         | [1]   |
| 3              | 9         | 28     | 30     | 44     | 297         |       |
| 3              | 10        | –      | –      | 52     | 294         |       |
| 3              | 11        | 29     | 31     | 47     | 291         |       |
| 3              | 12        | 30     | 32     | 49     | 288         |       |
| 3              | 13        | –      | –      | 53     | 285         |       |
| 3              | 14        | 32     | 34     | 54     | 282         |       |
| 3              | 15        | 33     | 35     | 56     | 279         |       |
| 3              | 16        | –      | –      | 55     | 276         |       |
| 3              | 17        | 34     | 36     | 57     | 273         |       |
| 3              | 18        | –      | –      | –      | 270         |       |
| 4              | 1         | –      | –      | 132    | 267         |       |
| 4              | 2         | 87     | 89     | 140    | 264         |       |
| 4              | 3         | –      | –      | 147    | 261         |       |
| 4              | 4         | –      | –      | 149    | 258         |       |
| 4              | 5         | 89     | 91     | 142    | 255         |       |
| 4              | 6         | 90     | 92     | 143    | 252         |       |
| 4              | 7         | –      | –      | 150    | 249         |       |
| 4              | 8         | 91     | 93     | 144    | 246         |       |
| 4              | 9         | 92     | 94     | 145    | 243         |       |
| 4              | 10        | –      | –      | 151    | 240         |       |
| 4              | 11        | 93     | 95     | 146    | 237         |       |
| 4              | 12        | 94     | 96     | 148    | 234         |       |
| 4              | 13        | –      | –      | 153    | 231         |       |
| 4              | 14        | 95     | 97     | 152    | 228         |       |
| 4              | 15        | 96     | 98     | 154    | 225         |       |
| 4              | 16        | –      | –      | 155    | 222         |       |
| 4              | 17        | 97     | 99     | 156    | 219         |       |
| 4              | 18        | –      | –      | –      | 216         |       |

**Notes:** [1] Global control pin.

Macrocell outputs to package pins subject to change, contact factory for latest information. Power, GND, JTAG and Global Signals are fixed.

## XC95144 I/O Pins (continued)

| Function Block | Macrocell | TQ 100 | PQ 100 | PQ 160 | BScan Order | Notes |
|----------------|-----------|--------|--------|--------|-------------|-------|
| 5              | 1         | —      | —      | 65     | 213         |       |
| 5              | 2         | 35     | 37     | 58     | 210         |       |
| 5              | 3         | —      | —      | 66     | 207         |       |
| 5              | 4         | —      | —      | 67     | 204         |       |
| 5              | 5         | 36     | 38     | 59     | 201         |       |
| 5              | 6         | 37     | 39     | 60     | 198         |       |
| 5              | 7         | —      | —      | 74     | 195         |       |
| 5              | 8         | 39     | 41     | 62     | 192         |       |
| 5              | 9         | 40     | 42     | 63     | 189         |       |
| 5              | 10        | —      | —      | 76     | 186         |       |
| 5              | 11        | 41     | 43     | 64     | 183         |       |
| 5              | 12        | 42     | 44     | 68     | 180         |       |
| 5              | 13        | —      | —      | 78     | 177         |       |
| 5              | 14        | 43     | 45     | 69     | 174         |       |
| 5              | 15        | 46     | 48     | 72     | 171         |       |
| 5              | 16        | —      | —      | 83     | 168         |       |
| 5              | 17        | 49     | 51     | 77     | 165         |       |
| 5              | 18        | —      | —      | —      | 162         |       |
| 6              | 1         | —      | —      | —      | 159         |       |
| 6              | 2         | 74     | 76     | 117    | 156         |       |
| 6              | 3         | —      | —      | 119    | 153         |       |
| 6              | 4         | —      | —      | 123    | 150         |       |
| 6              | 5         | 76     | 78     | 122    | 147         |       |
| 6              | 6         | 77     | 79     | 124    | 144         |       |
| 6              | 7         | —      | —      | 125    | 141         |       |
| 6              | 8         | 78     | 80     | 126    | 138         |       |
| 6              | 9         | 79     | 81     | 129    | 135         |       |
| 6              | 10        | —      | —      | 128    | 132         |       |
| 6              | 11        | 80     | 82     | 133    | 129         |       |
| 6              | 12        | 81     | 83     | 134    | 126         |       |
| 6              | 13        | —      | —      | 130    | 123         |       |
| 6              | 14        | 82     | 84     | 135    | 120         |       |
| 6              | 15        | 85     | 87     | 138    | 117         |       |
| 6              | 16        | —      | —      | 131    | 114         |       |
| 6              | 17        | 86     | 88     | 139    | 111         |       |
| 6              | 18        | —      | —      | —      | 108         |       |

| Function Block | Macrocell | TQ 100 | PQ 100 | PQ 160 | BScan Order | Notes |
|----------------|-----------|--------|--------|--------|-------------|-------|
| 7              | 1         | —      | —      | —      | 105         |       |
| 7              | 2         | 50     | 52     | 79     | 102         |       |
| 7              | 3         | —      | —      | 84     | 99          |       |
| 7              | 4         | —      | —      | 85     | 96          |       |
| 7              | 5         | 52     | 54     | 82     | 93          |       |
| 7              | 6         | 53     | 55     | 86     | 90          |       |
| 7              | 7         | —      | —      | 87     | 87          |       |
| 7              | 8         | 54     | 56     | 88     | 84          |       |
| 7              | 9         | 55     | 57     | 90     | 81          |       |
| 7              | 10        | —      | —      | 89     | 78          |       |
| 7              | 11        | 56     | 58     | 92     | 75          |       |
| 7              | 12        | 58     | 60     | 95     | 72          |       |
| 7              | 13        | —      | —      | 91     | 69          |       |
| 7              | 14        | 59     | 61     | 96     | 66          |       |
| 7              | 15        | 60     | 62     | 97     | 63          |       |
| 7              | 16        | —      | —      | 93     | 60          |       |
| 7              | 17        | 61     | 63     | 98     | 57          |       |
| 7              | 18        | —      | —      | —      | 54          |       |
| 8              | 1         | —      | —      | —      | 51          |       |
| 8              | 2         | 63     | 65     | 101    | 48          |       |
| 8              | 3         | —      | —      | 105    | 45          |       |
| 8              | 4         | —      | —      | 107    | 42          |       |
| 8              | 5         | 64     | 66     | 102    | 39          |       |
| 8              | 6         | 65     | 67     | 103    | 36          |       |
| 8              | 7         | —      | —      | 109    | 33          |       |
| 8              | 8         | 66     | 68     | 104    | 30          |       |
| 8              | 9         | 67     | 69     | 106    | 27          |       |
| 8              | 10        | —      | —      | 112    | 24          |       |
| 8              | 11        | 68     | 70     | 108    | 21          |       |
| 8              | 12        | 70     | 72     | 111    | 18          |       |
| 8              | 13        | —      | —      | 114    | 15          |       |
| 8              | 14        | 71     | 73     | 113    | 12          |       |
| 8              | 15        | 72     | 74     | 115    | 9           |       |
| 8              | 16        | —      | —      | 118    | 6           |       |
| 8              | 17        | 73     | 75     | 116    | 3           |       |
| 8              | 18        | —      | —      | —      | 0           |       |

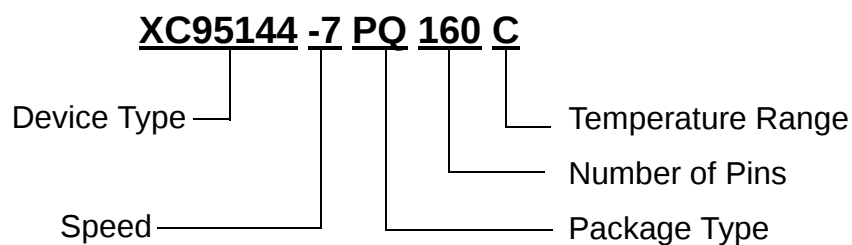
## XC95144 In-System Programmable CPLD

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### XC95144 Global, JTAG and Power Pins

| Pin Type                    | TQ100                              | PQ100                            | PQ160                                                          |
|-----------------------------|------------------------------------|----------------------------------|----------------------------------------------------------------|
| I/O/GCK1                    | 22                                 | 24                               | 33                                                             |
| I/O/GCK2                    | 23                                 | 25                               | 35                                                             |
| I/O/GCK3                    | 27                                 | 29                               | 42                                                             |
| I/O/GTS1                    | 3                                  | 5                                | 6                                                              |
| I/O/GTS2                    | 4                                  | 6                                | 8                                                              |
| I/O/GTS3                    | 1                                  | 3                                | 2                                                              |
| I/O/GTS4                    | 2                                  | 4                                | 4                                                              |
| I/O/GSR                     | 99                                 | 1                                | 159                                                            |
| TCK                         | 48                                 | 50                               | 75                                                             |
| TDI                         | 45                                 | 47                               | 71                                                             |
| TDO                         | 83                                 | 85                               | 136                                                            |
| TMS                         | 47                                 | 49                               | 73                                                             |
| V <sub>CCINT</sub> 5 V      | 5, 57, 98                          | 7, 59, 100                       | 10, 46, 94, 157                                                |
| V <sub>CCIO</sub> 3.3 V/5 V | 26, 38, 51, 88                     | 28, 40, 53, 90                   | 1, 41, 61, 81, 121, 141                                        |
| GND                         | 100, 21, 31, 44, 62, 69,<br>75, 84 | 2, 23, 33, 46, 64, 71,<br>77, 86 | 20, 31, 40, 51, 70, 80,<br>99, 100, 110, 120, 127,<br>137, 160 |
| No Connects                 | —                                  | —                                | —                                                              |

## Ordering Information



### Speed Options

- 15 15 ns pin-to-pin delay
- 10 10 ns pin-to-pin delay
- 7 7 ns pin-to-pin delay

### Packaging Options

- PQ100 100-Pin Plastic Quad Flat Pack (PQFP)
- TQ100 100-Pin Very Thin Quad Flat Pack (TQFP)
- PQ160 160-Pin Plastic Quad Flat Pack (PQFP)

### Temperature Options

- C Commercial 0°C to 70°C
- I Industrial -40°C to 85°C

## Component Availability

| Pins    |     | 100          |              | 160          |
|---------|-----|--------------|--------------|--------------|
| Type    |     | Plastic PQFP | Plastic TQFP | Plastic PQFP |
| Code    |     | PQ100        | TQ100        | PQ160        |
| XC95144 | -15 | C,I          | C,I          | C,I          |
|         | -10 | C,I          | C,I          | C,I          |
|         | -7  | C            | C            | C            |

C = Commercial = 0°C to +70°C I = Industrial = -40°C to +85°C

## Revision Control

| Date     | Revision                                           |
|----------|----------------------------------------------------|
| 12/04/98 | Update AC characteristics and internal parameters. |
|          |                                                    |