

## Features

- Low power 3.3V 32 macrocell CPLD
- 4.5 ns pin-to-pin logic delays
- System frequencies up to 213 MHz
- 32 macrocells with 750 usable gates
- Available in small footprint packages
  - 48-ball CS BGA (36 user I/O pins)
  - 44-pin VQFP (36 user I/Os)
- Optimized for 3.3V systems
  - Ultra-low power operation
  - Typical Standby Current of 17  $\mu$ A at 25°C
  - 5V tolerant I/O pins with 3.3V core supply
  - Advanced 0.35 micron five layer metal EEPROM process
  - Fast Zero Power (FZP) CMOS technology
  - 3.3V PCI electrical specification compatible outputs (no internal clamp diode on any input or I/O, no minimum clock input capacitance)
- Advanced system features
  - In-system programming
  - Input registers
  - Predictable timing model
  - Up to 23 available clocks per function block
  - Excellent pin retention during design changes
  - Full IEEE Standard 1149.1 boundary-scan (JTAG)
  - Four global clocks
  - Eight product term control terms per function block
- Fast ISP programming times
- Port Enable pin for dual function of JTAG ISP pins
- 2.7V to 3.6V supply voltage at industrial temperature range
- Programmable slew rate control per macrocell
- Security bit prevents unauthorized access
- Refer to the CoolRunner XPLA3 family data sheet ([DS012](#)) for architecture description

## Description

The CoolRunner™ XPLA3 XCR3032XL device is a 3.3V, 32-macrocell CPLD targeted at power sensitive designs that require leading edge programmable logic solutions. A total of two function blocks provide 750 usable gates. Pin-to-pin propagation delays are as fast as 4.5 ns with a maximum system frequency of 213 MHz.

## TotalCMOS Design Technique for Fast Zero Power

CoolRunner XPLA3 CPLDs offer a TotalCMOS solution, both in process technology and design technique. Xilinx® CPLDs employ a cascade of CMOS gates to implement its sum of products instead of the traditional sense amp approach. This CMOS gate implementation allows Xilinx to offer CPLDs that are both high performance and low power, breaking the paradigm that to have low power, one must have low performance. Refer to [Figure 1](#) and [Table 1](#) showing the  $I_{CC}$  vs. Frequency of the XCR3032XL TotalCMOS CPLD (data taken with two resettable up/down, 16-bit counters at 3.3V, 25°C).

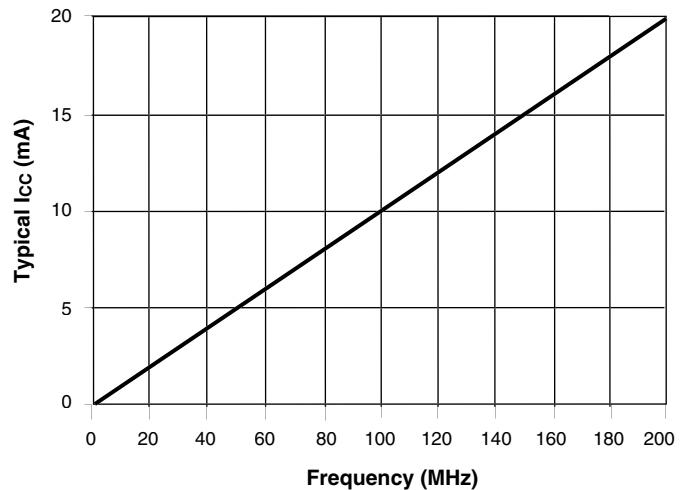


Figure 1:  $I_{CC}$  vs. Frequency at  $V_{CC} = 3.3V, 25^\circ C$

Table 1:  $I_{CC}$  vs. Frequency ( $V_{CC} = 3.3V, 25^\circ C$ )

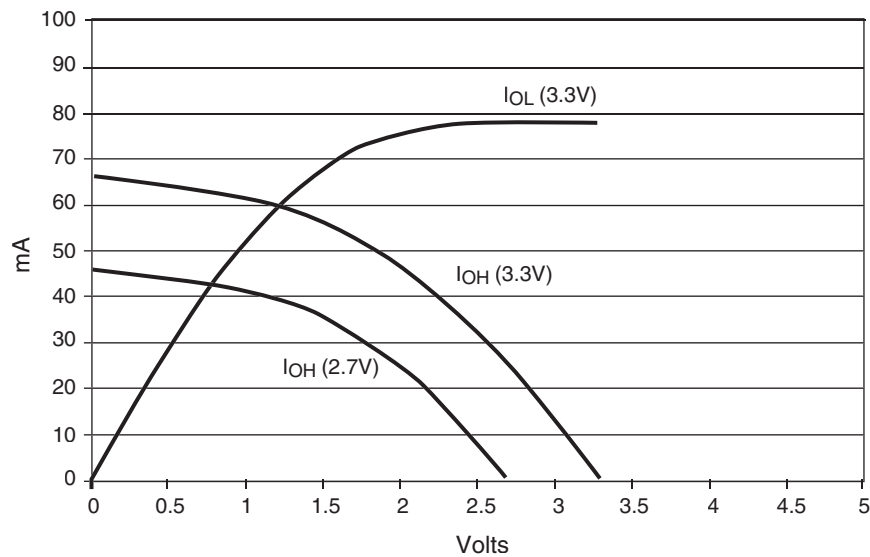
| Frequency (MHz)       | 0     | 1    | 5    | 10   | 20   | 50  | 100   | 200  |
|-----------------------|-------|------|------|------|------|-----|-------|------|
| Typical $I_{CC}$ (mA) | 0.017 | 0.13 | 0.54 | 1.06 | 2.09 | 5.2 | 10.26 | 20.3 |

## DC Electrical Characteristics Over Recommended Operating Conditions

| Symbol           | Parameter <sup>(1)</sup>               | Test Conditions                              | Typical | Min.               | Max. | Unit    |
|------------------|----------------------------------------|----------------------------------------------|---------|--------------------|------|---------|
| $V_{OH}^{(2)}$   | Output High voltage                    | $V_{CC} = 3.0V$ to $3.6V$ , $I_{OH} = -8$ mA | -       | 2.4                | -    | V       |
|                  |                                        | $V_{CC} = 2.7V$ to $3.0V$ , $I_{OH} = -8$ mA | -       | 2.0                | -    | V       |
|                  |                                        | $I_{OH} = -500$ $\mu A$                      | -       | 90% $V_{CC}^{(3)}$ | -    | V       |
| $V_{OL}$         | Output Low voltage                     | $I_{OL} = 8$ mA                              | -       | -                  | 0.4  | V       |
| $I_{IL}^{(4)}$   | Input leakage current                  | $V_{IN} = GND$ or $V_{CC}$ to $5.5V$         | -       | -10                | 10   | $\mu A$ |
| $I_{IH}^{(4)}$   | I/O High-Z leakage current             | $V_{IN} = GND$ or $V_{CC}$ to $5.5V$         | -       | -10                | 10   | $\mu A$ |
| $I_{CCSB}^{(8)}$ | Standby current                        | $V_{CC} = 3.6V$                              | 24.5    | -                  | 100  | $\mu A$ |
| $I_{CC}$         | Dynamic current <sup>(5,6)</sup>       | $f = 1$ MHz                                  | -       | -                  | 0.25 | mA      |
|                  |                                        | $f = 50$ MHz                                 | -       | -                  | 7.5  | mA      |
| $C_{IN}$         | Input pin capacitance <sup>(7)</sup>   | $f = 1$ MHz                                  | -       | -                  | 8    | pF      |
| $C_{CLK}$        | Clock input capacitance <sup>(7)</sup> | $f = 1$ MHz                                  | -       | -                  | 12   | pF      |
| $C_{I/O}$        | I/O pin capacitance <sup>(7)</sup>     | $f = 1$ MHz                                  | -       | -                  | 10   | pF      |

### Notes:

1. See the CoolRunner XPLA3 family data sheet ([DS012](#)) for recommended operating conditions.
2. See [Figure 2](#) for output drive characteristics of the XPLA3 family.
3. This parameter guaranteed by design and characterization, not by testing.
4. Typical leakage current is less than  $1$   $\mu A$ .
5. See [Table 1](#), [Figure 1](#) for typical values.
6. This parameter measured with a 16-bit, resettable up/down counter loaded into every function block, with all outputs disabled and unloaded. Inputs are tied to  $V_{CC}$  or ground. This parameter guaranteed by design and characterization, not testing.
7. Typical values, not tested.
8. Typical value at  $70^{\circ}C$ .



DS012\_10\_031802

Figure 2: Typical I/V Curve for the CoolRunner XPLA3 Family, 25°C

## AC Electrical Characteristics Over Recommended Operating Conditions

| Symbol                             | Parameter <sup>(1, 2)</sup>                         | -5   |      | -7   |      | -10  |      | Unit |
|------------------------------------|-----------------------------------------------------|------|------|------|------|------|------|------|
|                                    |                                                     | Min. | Max. | Min. | Max. | Min. | Max. |      |
| T <sub>PD1</sub>                   | Propagation delay time (single p-term)              |      | 4.5  | -    | 7.0  | -    | 9.1  | ns   |
| T <sub>PD2</sub>                   | Propagation delay time (OR array) <sup>(3)</sup>    |      | 5.0  | -    | 7.5  | -    | 10.0 | ns   |
| T <sub>CO</sub>                    | Clock to output (global synchronous pin clock)      |      | 3.5  |      | 5.0  | -    | 6.5  | ns   |
| T <sub>SUF</sub>                   | Setup time (fast input register)                    | 2.5  | -    | 3.0  | -    | 3.0  | -    | ns   |
| T <sub>SU1</sub> <sup>(4)</sup>    | Setup time (single p-term)                          | 3.0  | -    | 4.3  | -    | 5.4  | -    | ns   |
| T <sub>SU2</sub>                   | Setup time (OR array)                               | 3.5  | -    | 4.8  | -    | 6.3  | -    | ns   |
| T <sub>H</sub> <sup>(4)</sup>      | Hold time                                           | 0    | -    | 0    | -    | 0    | -    | ns   |
| T <sub>WLH</sub> <sup>(4)</sup>    | Global Clock pulse width (High or Low)              | 2.5  | -    | 3.0  | -    | 4.0  | -    | ns   |
| T <sub>PLH</sub> <sup>(4)</sup>    | P-term clock pulse width                            | 4.0  | -    | 5.0  | -    | 6.0  | -    | ns   |
| T <sub>APRPW</sub>                 | Asynchronous preset/reset pulse width (High or Low) | 4.0  | -    | 5.0  | -    | 6.0  | -    | ns   |
| T <sub>R</sub> <sup>(4)</sup>      | Input rise time                                     | -    | 20   | -    | 20   | -    | 20   | ns   |
| T <sub>L</sub> <sup>(4)</sup>      | Input fall time                                     | -    | 20   | -    | 20   | -    | 20   | ns   |
| f <sub>SYSTEM</sub> <sup>(4)</sup> | Maximum system frequency                            | -    | 213  | -    | 119  | -    | 95   | MHz  |
| T <sub>CONFIG</sub> <sup>(4)</sup> | Configuration time <sup>(5)</sup>                   | -    | 30   | -    | 30   | -    | 30   | μs   |
| T <sub>INIT</sub> <sup>(4)</sup>   | ISP initialization time                             | -    | 30   | -    | 30   | -    | 30   | μs   |
| T <sub>POE</sub> <sup>(4)</sup>    | P-term OE to output enabled                         | -    | 7.2  | -    | 9.3  | -    | 11.2 | ns   |
| T <sub>POD</sub> <sup>(4)</sup>    | P-term OE to output disabled <sup>(6)</sup>         | -    | 7.2  | -    | 9.3  | -    | 11.2 | ns   |
| T <sub>PCO</sub> <sup>(4)</sup>    | P-term clock to output                              | -    | 6.0  | -    | 8.3  | -    | 10.7 | ns   |
| T <sub>PAO</sub> <sup>(4)</sup>    | P-term set/reset to output valid                    | -    | 6.5  | -    | 9.3  | -    | 11.2 | ns   |

### Notes:

1. Specifications measured with one output switching.
2. See CoolRunner XPLA3 family data sheet ([DS012](#)) for recommended operating conditions.
3. See [Figure 4](#) for derating.
4. These parameters guaranteed by design and/or characterization, not testing.
5. Typical current draw during configuration is 3 mA at 3.6V.
6. Output C<sub>L</sub> = 5 pF.

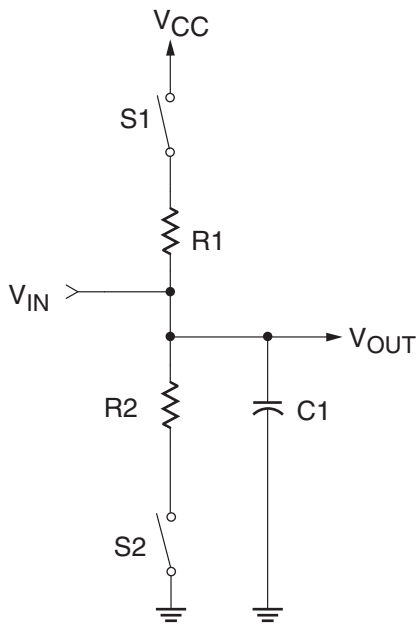
## Internal Timing Parameters

| Symbol                                                           | Parameter <sup>(1, 2)</sup>          | -5   |      | -7   |      | -10  |      | Unit |
|------------------------------------------------------------------|--------------------------------------|------|------|------|------|------|------|------|
|                                                                  |                                      | Min. | Max. | Min. | Max. | Min. | Max. |      |
| <b>Buffer Delays</b>                                             |                                      |      |      |      |      |      |      |      |
| T <sub>IN</sub>                                                  | Input buffer delay                   | -    | 0.7  | -    | 1.6  | -    | 2.2  | ns   |
| T <sub>FIN</sub>                                                 | Fast Input buffer delay              | -    | 2.2  | -    | 3.0  | -    | 3.1  | ns   |
| T <sub>GCK</sub>                                                 | Global Clock buffer delay            | -    | 0.7  | -    | 1.0  | -    | 1.3  | ns   |
| T <sub>OUT</sub>                                                 | Output buffer delay                  | -    | 1.8  | -    | 2.7  | -    | 3.6  | ns   |
| T <sub>EN</sub>                                                  | Output buffer enable/disable delay   | -    | 4.5  | -    | 5.0  | -    | 5.7  | ns   |
| <b>Internal Register, Product Term, and Combinatorial Delays</b> |                                      |      |      |      |      |      |      |      |
| T <sub>LDI</sub>                                                 | Latch transparent delay              | -    | 1.3  | -    | 1.6  | -    | 2.0  | ns   |
| T <sub>SUI</sub>                                                 | Register setup time                  | 1.0  | -    | 1.0  | -    | 1.2  | -    | ns   |
| T <sub>HI</sub>                                                  | Register hold time                   | 0.3  | -    | 0.5  | -    | 0.7  | -    | ns   |
| T <sub>ECSU</sub>                                                | Register clock enable setup time     | 2.0  | -    | 2.5  | -    | 3.0  | -    | ns   |
| T <sub>ECHO</sub>                                                | Register clock enable hold time      | 3.0  | -    | 4.5  | -    | 5.5  | -    | ns   |
| T <sub>COI</sub>                                                 | Register clock to output delay       | -    | 1.0  | -    | 1.3  | -    | 1.6  | ns   |
| T <sub>AOI</sub>                                                 | Register async. S/R to output delay  | -    | 2.0  | -    | 2.3  | -    | 2.1  | ns   |
| T <sub>RAI</sub>                                                 | Register async. recovery             | -    | 3.5  | -    | 5.0  | -    | 6.0  | ns   |
| T <sub>PTCK</sub>                                                | Product term clock delay             | -    | 2.5  | -    | 2.7  | -    | 3.3  | ns   |
| T <sub>LOGI1</sub>                                               | Internal logic delay (single p-term) | -    | 2.0  | -    | 2.7  | -    | 3.3  | ns   |
| T <sub>LOGI2</sub>                                               | Internal logic delay (PLA OR term)   | -    | 2.5  | -    | 3.2  | -    | 4.2  | ns   |
| <b>Feedback Delays</b>                                           |                                      |      |      |      |      |      |      |      |
| T <sub>F</sub>                                                   | ZIA delay                            | -    | 0.2  | -    | 2.9  | -    | 3.5  | ns   |
| <b>Time Adders</b>                                               |                                      |      |      |      |      |      |      |      |
| T <sub>LOGI3</sub>                                               | Foldback NAND delay                  | -    | 2.0  | -    | 2.5  | -    | 3.0  | ns   |
| T <sub>UDA</sub>                                                 | Universal delay                      | -    | 1.2  | -    | 2.0  | -    | 2.5  | ns   |
| T <sub>SLEW</sub>                                                | Slew rate limited delay              | -    | 4.0  | -    | 5.0  | -    | 6.0  | ns   |

### Notes:

1. These parameters guaranteed by design and characterization, not testing.
2. See the CoolRunner XPLA3 family data sheet ([DS012](#)) for timing model.

## Switching Characteristics



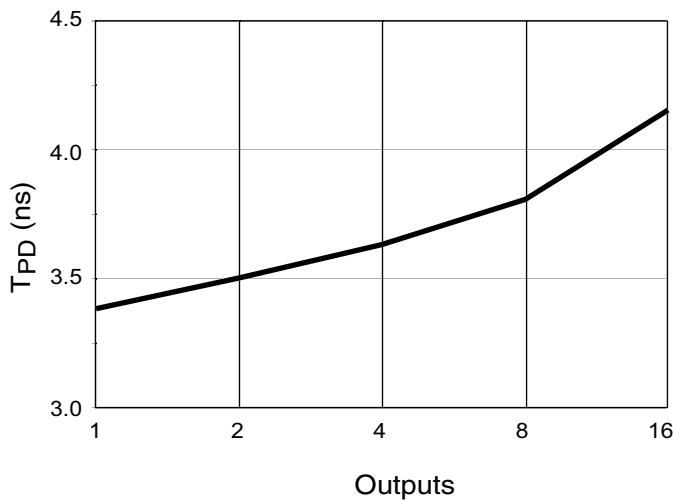
| Component | Values |
|-----------|--------|
| R1        | 390Ω   |
| R2        | 390Ω   |
| C1        | 35 pF  |

| Measurement             | S1     | S2     |
|-------------------------|--------|--------|
| T <sub>POE</sub> (High) | Open   | Closed |
| T <sub>POE</sub> (Low)  | Closed | Open   |
| T <sub>P</sub>          | Closed | Closed |

**Note:** For T<sub>POD</sub>, C1 = 5 pF. Delay measured at output level of V<sub>OL</sub> + 300 mV, V<sub>OH</sub> - 300 mV.

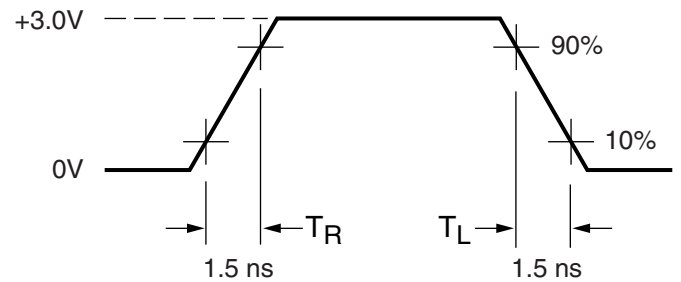
DS023\_03\_102401

Figure 3: AC Load Circuit



DS023\_05\_061101

Figure 4: Derating Curve for T<sub>PD2</sub>



**Measurements:**

All circuit delays are measured at the +1.5V level of inputs and outputs, unless otherwise specified.

DS023\_06\_042800

Figure 5: Voltage Waveform

## Pin Descriptions

Table 2: XCR3032XL User I/O Pins

|                     | PC44 <sup>(1)</sup> | VQ44 | CS48 |
|---------------------|---------------------|------|------|
| Total User I/O Pins | 36                  | 36   | 36   |

1. This is an obsolete package type. It remains here for legacy support only.

Table 3: XCR3032XL I/O Pins

| Function Block | Macrocell | PC44 <sup>(1)</sup> | VQ44              | CS48              |
|----------------|-----------|---------------------|-------------------|-------------------|
| 1              | 1         | 4                   | 42                | A2                |
| 1              | 2         | 5                   | 43                | A1                |
| 1              | 3         | 6                   | 44                | C4                |
| 1              | 4         | 7 <sup>(2)</sup>    | 1 <sup>(2)</sup>  | B1 <sup>(2)</sup> |
| 1              | 5         | 8                   | 2                 | C2                |
| 1              | 6         | 9                   | 3                 | C1                |
| 1              | 7         | 11                  | 5                 | D3                |
| 1              | 8         | 12                  | 6                 | D1                |
| 1              | 9         | 13 <sup>(2)</sup>   | 7 <sup>(2)</sup>  | D2 <sup>(2)</sup> |
| 1              | 10        | 14                  | 8                 | E1                |
| 1              | 11        | 16                  | 10                | F1                |
| 1              | 12        | 17                  | 11                | G1                |
| 1              | 13        | 18                  | 12                | E4                |
| 1              | 14        | 19                  | 13                | F2                |
| 1              | 15        | 20                  | 14                | G2                |
| 1              | 16        | 21                  | 15                | F3                |
| 2              | 1         | 41                  | 35                | C5                |
| 2              | 2         | 40                  | 34                | A6                |
| 2              | 3         | 39                  | 33                | B6                |
| 2              | 4         | 38 <sup>(2)</sup>   | 32 <sup>(2)</sup> | B7 <sup>(2)</sup> |
| 2              | 5         | 37                  | 31                | D4                |
| 2              | 6         | 36                  | 30                | C6                |
| 2              | 7         | 34                  | 28                | D6                |
| 2              | 8         | 33                  | 27                | D7                |
| 2              | 9         | 32 <sup>(2)</sup>   | 26 <sup>(2)</sup> | E5 <sup>(2)</sup> |

Table 3: XCR3032XL I/O Pins

| Function Block | Macrocell | PC44 <sup>(1)</sup> | VQ44 | CS48 |
|----------------|-----------|---------------------|------|------|
| 2              | 10        | 31                  | 25   | E7   |
| 2              | 11        | 29                  | 23   | F7   |
| 2              | 12        | 28                  | 22   | G7   |
| 2              | 13        | 27                  | 21   | G6   |
| 2              | 14        | 26                  | 20   | F5   |
| 2              | 15        | 25                  | 19   | G5   |
| 2              | 16        | 24                  | 18   | F4   |

**Notes:**

1. This is an obsolete package type. It remains here for legacy support only.
2. JTAG pins.

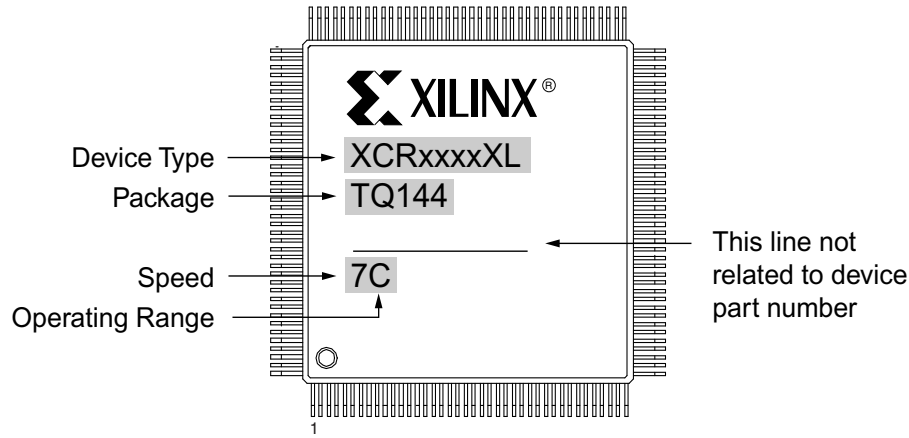
Table 4: XCR3032XL Global, JTAG, Port Enable, Power, and No Connect Pins

| Pin Type        | PC44 <sup>(1)</sup> | VQ44             | CS48              |
|-----------------|---------------------|------------------|-------------------|
| IN0 / CLK0      | 2                   | 40               | A3                |
| IN1 / CLK1      | 1                   | 39               | B4                |
| IN2 / CLK2      | 44                  | 38               | A4                |
| IN3 / CLK3      | 43                  | 37               | B5                |
| TCK             | 32                  | 26               | E5                |
| TDI             | 7                   | 1                | B1                |
| TDO             | 38                  | 32               | B7                |
| TMS             | 13                  | 7                | D2                |
| PORT_EN         | 10 <sup>(2)</sup>   | 4 <sup>(2)</sup> | C3 <sup>(2)</sup> |
| V <sub>CC</sub> | 3, 15, 23, 35       | 9, 17, 29, 41    | B3, C7, E2, G4    |
| GND             | 22, 30, 42          | 16, 24, 36       | A5, E3, E6        |
| No Connects     | -                   | -                | A7, B2, F6, G3    |

**Notes:**

1. This is an obsolete package type. It remains here for legacy support only.
2. Port Enable is brought High to enable JTAG pins when JTAG pins are used as I/O. See family data sheet ([DS012](#)) for full explanation.

## Device Part Marking



Sample package with part marking.

**Notes:**

- Due to the small size of chip scale packages, part marking on these packages does not follow the above sample and the complete part number cannot be included in the marking. Part marking on chip scale packages by line:
  - Line 1 = X (Xilinx logo), then truncated part number (no XC), i.e., 3064XL.
  - Line 2 = Not related to device part number.
  - Line 3 = Not related to device part number.
  - Line 4 = Package code, speed, operating temperature, three digits not related to device part number. Package codes; C1 = CS48, C2 = CSG48.

## 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> |
|-----------------------------------------|--------------------------|-------------|-------------|------------------------------------------|--------------------------------|
| XCR3032XL-5VQ44C                        | 5 ns                     | VQ44        | 44          | Very Thin Quad Flat Pack (VQFP)          | C                              |
| XCR3032XL-5VQG44C                       | 5 ns                     | VQG44       | 44          | Very Thin Quad Flat Pack (VQFP); Pb-Free | C                              |
| XCR3032XL-5CS48C                        | 5 ns                     | CS48        | 48          | Chip Scale Package (CSP)                 | C                              |
| XCR3032XL-5CSG48C                       | 5 ns                     | CSG48       | 48          | Chip Scale Package (CSP); Pb-Free        | C                              |
| XCR3032XL-7VQ44C                        | 7.5 ns                   | VQ44        | 44          | Very Thin Quad Flat Pack (VQFP)          | C                              |
| XCR3032XL-7VQG44C                       | 7.5 ns                   | VQG44       | 44          | Very Thin Quad Flat Pack (VQFP); Pb-Free | C                              |
| XCR3032XL-7CS48C                        | 7.5 ns                   | CS48        | 48          | Chip Scale Package (CSP)                 | C                              |
| XCR3032XL-7CSG48C                       | 7.5 ns                   | CSG48       | 48          | Chip Scale Package (CSP); Pb-Free        | C                              |
| XCR3032XL-7VQ44I                        | 7.5 ns                   | VQ44        | 44          | Very Thin Quad Flat Pack (VQFP)          | I                              |
| XCR3032XL-7VQG44I                       | 7.5 ns                   | VQG44       | 44          | Very Thin Quad Flat Pack (VQFP); Pb-Free | I                              |
| XCR3032XL-7CS48I                        | 7.5 ns                   | CS48        | 48          | Chip Scale Package (CSP)                 | I                              |
| XCR3032XL-7CSG48I                       | 7.5 ns                   | CSG48       | 48          | Chip Scale Package (CSP); Pb-Free        | I                              |
| XCR3032XL-10VQ44C                       | 10 ns                    | VQ44        | 44          | Very Thin Quad Flat Pack (VQFP)          | C                              |
| XCR3032XL-10VQG44C                      | 10 ns                    | VQG44       | 44          | Very Thin Quad Flat Pack (VQFP); Pb-Free | C                              |
| XCR3032XL-10CS48C                       | 10 ns                    | CS48        | 48          | Chip Scale Package (CSP)                 | C                              |
| XCR3032XL-10CSG48C                      | 10 ns                    | CSG48       | 48          | Chip Scale Package (CSP); Pb-Free        | C                              |
| XCR3032XL-10VQ44I                       | 10 ns                    | VQ44        | 44          | Very Thin Quad Flat Pack (VQFP)          | I                              |

## Ordering Combination Information *(Continued)*

| Device Ordering and Part Marking Number | Speed (pin-to-pin delay) | Pkg. Symbol | No. of Pins | Package Type                             | Operating Range <sup>(1)</sup> |
|-----------------------------------------|--------------------------|-------------|-------------|------------------------------------------|--------------------------------|
| XCR3032XL-10VQG44I                      | 10 ns                    | VQG44       | 44          | Very Thin Quad Flat Pack (VQFP); Pb-Free | I                              |
| XCR3032XL-10CS48I                       | 10 ns                    | CS48        | 48          | Chip Scale Package (CSP)                 | I                              |
| XCR3032XL-10CSG48I                      | 10 ns                    | CSG48       | 48          | Chip Scale Package (CSP); Pb-Free        | I                              |

**Notes:**

1. C = Commercial:  $T_A = 0^\circ$  to  $+70^\circ\text{C}$ ; I = Industrial:  $T_A = -40^\circ$  to  $+85^\circ\text{C}$



## Warranty Disclaimer

THESE PRODUCTS ARE SUBJECT TO THE TERMS OF THE XILINX LIMITED WARRANTY WHICH CAN BE VIEWED AT <http://www.xilinx.com/warranty.htm>. THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY USE OF THE PRODUCTS IN AN APPLICATION OR ENVIRONMENT THAT IS NOT WITHIN THE SPECIFICATIONS STATED ON THE THEN-CURRENT XILINX DATA SHEET FOR THE PRODUCTS. PRODUCTS ARE NOT DESIGNED TO BE FAIL-SAFE AND ARE NOT WARRANTED FOR USE IN APPLICATIONS THAT POSE A RISK OF PHYSICAL HARM OR LOSS OF LIFE. USE OF PRODUCTS IN SUCH APPLICATIONS IS FULLY AT THE RISK OF CUSTOMER SUBJECT TO APPLICABLE LAWS AND REGULATIONS.

## Additional Information

[CoolRunner XPLA3 CPLD Data Sheets and Application Notes](#)

[Device Packages](#)

[Device Package User Guide](#)

## Revision History

The following table shows the revision history for this document.

| Date     | Version | Revision                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11/18/00 | 1.0     | Initial Xilinx release.                                                                                                                                                                                                                                                                                                                                                                                                           |
| 02/05/01 | 1.1     | Removed Timing Model.                                                                                                                                                                                                                                                                                                                                                                                                             |
| 04/11/01 | 1.2     | Update TSUF spec to meet UMC characterization data. Added I <sub>CC</sub> vs. Freq. numbers, <a href="#">Table 1</a> and updated <a href="#">Figure 1</a> . Added Typical I/V curve, <a href="#">Figure 2</a> ; added <a href="#">Table 2</a> : Total User I/O; changed V <sub>OH</sub> spec.                                                                                                                                     |
| 04/19/01 | 1.3     | Updated Typical I/V curve, <a href="#">Figure 2</a> : added voltage levels.                                                                                                                                                                                                                                                                                                                                                       |
| 08/27/01 | 1.4     | Changed from Advance to Preliminary; updated DC Electrical Characteristics; AC Electrical Characteristics; Internal Timing Parameters; added Derating Curve; added -10 industrial packages. Added 200 MHz to <a href="#">Figure 1</a> and <a href="#">Table 1</a> . changed -5 F <sub>SYSTEM</sub> to 200 MHz, -5 T <sub>F</sub> to 0.5 ns.                                                                                       |
| 01/08/02 | 1.5     | Updated T <sub>HI</sub> spec to correct a typo. Added single p-term setup time (T <sub>SU1</sub> ) to AC Table, renamed T <sub>SU</sub> to T <sub>SU2</sub> for setup time through the OR array. Updated AC Load Circuit diagram to more closely resemble true test conditions, added note for T <sub>POD</sub> delay measurement. Updated note 5 in AC Characteristics table lowering typical current draw during configuration. |
| 01/06/03 | 1.6     | Added voltage and temperature to <a href="#">Figure 2</a> . Increased -5 T <sub>PCO</sub> to 6.0 (from 5.5 ns) by adding T <sub>PTCK</sub> parameter to internal timing model. Increased -5 F <sub>MAX</sub> . Updated Ordering Information format.                                                                                                                                                                               |
| 07/15/03 | 1.7     | Updated Device Part Marking. Updated test conditions for I <sub>IL</sub> and I <sub>IH</sub> .                                                                                                                                                                                                                                                                                                                                    |
| 08/21/03 | 1.8     | Updated Package Device Marking Pin 1 orientation.                                                                                                                                                                                                                                                                                                                                                                                 |
| 02/13/04 | 1.9     | Add solder temperature specification. Add links to data sheets, application notes and packages.                                                                                                                                                                                                                                                                                                                                   |
| 04/08/05 | 2.0     | Added I <sub>CCSB</sub> Typical and T <sub>APRPW</sub> specifications. Removed T <sub>SOL</sub> specification. Added note about Pb-free packages.                                                                                                                                                                                                                                                                                 |
| 03/31/06 | 2.1     | Added Warranty Disclaimer; Added Pb-Free ordering information.                                                                                                                                                                                                                                                                                                                                                                    |
| 09/15/08 | 2.2     | Added notes to tables to indicate PC44 and PCG44 packages are obsolete. Removed part number references to the obsolete PC44C and PCG44C packages in the <a href="#">Ordering Combination Information</a> . See Product Discontinuation Notice <a href="#">xcn07022.pdf</a> .                                                                                                                                                      |