Spartan-XL 3.3V FPGA Automotive IQ Family: Introduction and Ordering

DS107-1 (v1.1) February 3, 2003

Advance Product Specification

Introduction

The Spartan™-XL 3.3V FPGA Automotive IQ product family is a high-volume production FPGA solution that delivers all the key requirements for ASIC replacement up to 40,000 gates. These requirements include high-performance, on-chip RAM, core solutions, and prices that, in high volume, approach and in many cases, are equivalent to mask programmed ASIC devices. By streamlining the Spartan-XL series feature set, leveraging process technology and focusing on total cost management, the Spartan-XL series delivers the key features required by ASIC and other high-volume logic users while avoiding the initial cost, long development cycles, and inherent risk of conventional ASICs.

Features

- Guaranteed to meet full electrical specifications over T_J = –40°C to +125°C
- ASIC replacement FPGA for high-volume production with on-chip RAM
- Density up to 1,862 logic cells or 40,000 system gates
- Streamlined feature set based on XC4000 architecture
- Broad set of AllianceCORE™ and LogiCORE™ predefined solutions available
- Unlimited reprogrammability
- System level features
  - On-chip SelectRAM™ memory
  - Full readback capability for program verification and internal node observability
  - Dedicated high-speed carry logic
  - Internal 3-state bus capability
  - Eight global low-skew clock or signal networks
  - IEEE 1149.1-compatible Boundary Scan logic
  - Footprint compatibility in common packages
- Fully supported by powerful Xilinx development system
  - ISE Foundation™ Series: Integrated, shrink-wrap software
  - ISE Alliance Series™: Dozens of PC and workstation third party development systems supported
  - Fully automatic mapping, placement and routing
- 3.3V supply for low power with 5V tolerant I/Os
- Power down input
- Higher performance
- Faster carry logic
- More flexible high-speed clock network
- Latch capability in Configurable Logic Blocks
- Input fast capture latch
- Optional mux or 2-input function generator on outputs
- 12 mA or 24 mA output drive
- Enhanced Boundary Scan
- Express Mode configuration
- Refer to Spartan-XL and Spartan FPGAs complete data sheet (DS060) for product description, AC and DC specifications

Table 1: **Spartan-XL Field Programmable Gate Arrays**

Device	Logic Cells	Max System Gates	Typical Gate Range (Logic and RAM)(1)	CLB Matrix	Total CLBs	No. of Flip-flops	Max. Avail. User I/O	Total Distributed RAM Bits
XCS05XL	238	5,000	2,000-5,000	10 x 10	100	360	77	3,200
XCS10XL	466	10,000	3,000-10,000	14 x 14	196	616	112	6,272
XCS20XL	950	20,000	7,000-20,000	20 x 20	400	1,120	160	12,800
XCS30XL	1,368	30,000	10,000-30,000	24 x 24	576	1,536	192	18,432
XCS40XL	1,862	40,000	13,000-40,000	28 x 28	784	2,016	224	25,088

Notes:

1. Max values of Typical Gate Range include 20-30% of CLBs used as RAM.

DC Specifications

Spartan-XL Absolute Maximum Ratings(1)

Symbol	Description	Min	Max	Units
V_{CC}	Supply voltage relative to GND(2)	–0.5	7.0	V
V_{IN}	Input voltage relative to GND(2,3)	–0.5	V_{CC} + 0.5	V
V_{TS}	Voltage applied to 3-state output(2,3)	–0.5	V_{CC} + 0.5	V
T_{STG}	Storage temperature (ambient)	–65	+150	°C
T_J	Junction temperature	-	+135	°C

Notes:

1. 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.
2. With 5V Tolerant I/Os selected, the Maximum DC overshoot must be limited to either +5.5V or 10 mA and undershoot (below GND) must be limited to either 0.5V or 10 mA, whichever is easier to achieve.
3. With 5V Tolerant I/Os selected, the Maximum AC (during transitions) conditions are as follows; the device pins may undershoot to –2.0V or overshoot to + 7.0V, provided this overshoot or undershoot lasts no more than 11 ns with a forcing current no greater than 100 mA.
4. Without 5V Tolerant I/Os selected, the Maximum DC overshoot or undershoot must be limited to either 0.5V or 10 mA, whichever is easier to achieve.
5. Without 5V Tolerant I/Os selected, the Maximum AC conditions are as follows; the device pins may undershoot to –2.0V or overshoot to V_{CC} + 2.0V, provided this overshoot or undershoot lasts no more than 11 ns with a forcing current no greater than 100 mA.
6. For soldering guidelines, see the Package Infomation on the Xilinx website.

Spartan-XL Recommended Operating Conditions

Symbol	Description	Min	Max	Units
T_J	Junction temperature	–40	+125	°C
V_{CC}	Supply voltage relative to GND	3.0	3.6	V
V_{IH}	High-level input voltage(1)	50% of V_{CC}	5.5	V
V_{IL}	Low-level input voltage(1)	0	30% of V_{CC}	V
T_{IN}	Input signal transition time	-	250	ns

Notes:

1. Input and output measurement threshold is ~50% of V_{CC}.

Spartan-XL Product Availability

Table 2 shows the package and speed grades available for Spartan-XL family devices. Table 3 shows the maximum user I/Os available on the device and the number of user I/Os available for each device/package combination.

Table 2: **Spartan-XL Package and Speed Grade Availability**

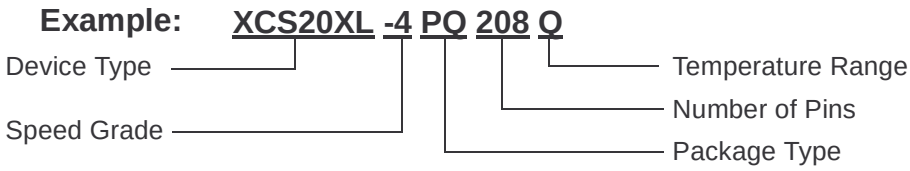
	Pins	100	144	208	256
	Type	Plastic VQFP	Plastic TQFP	Plastic PQFP	Plastic BGA
Device	Code	VQ100	TQ144	PQ208	BG256
XCS05XL	-4	Q	-	-	-
XCS10XL	-4	Q	-	-	-
XCS20XL	-4	-	Q	Q	-
XCS30XL	-4	-	Q	Q	-
XCS40XL	-4	-	-	Q	Q

Notes:
1. Q = Automotive IQ, T_J = –40°C to +125°C

Table 3: **Spartan-XL User I/O Chart**

		Package Type			
Device	Max I/O	VQ100	TQ144	PQ208	BG256
XCS05XL	80	77	-	-	-
XCS10XL	112	77	-	-	-
XCS20XL	160	-	113	160	-
XCS30XL	192	-	113	169	-
XCS40XL	224	-	-	169	205

Ordering Information



Device Ordering Options

Device
XCS05XL
XCS10XL
XCS20XL
XCS30XL
XCS40XL

Speed Grade	
-4	Standard Performance

Number of Pins / Package Type	
VQ100	100-pin Plastic Very Thin QFP
TQ144	144-pin Plastic Thin QFP
PQ208	208-pin Plastic QFP
BG256	256-ball Plastic BGA

Temperature Range (T_J)	
Q = Automotive IQ	–40°C to +125°C

For more details about the Spartan-XL 3.3V FPGA Automotive IQ device, refer to specification:

DS107, *Spartan-II 3.3V FPGA Automotive IQ Family*

Revision History

The following table shows the revision history for this document.

Date	Version	Description
07/17/02	1.0	Initial Xilinx release.
02/03/03	1.1	Added reference to Spartan/XL data sheet in features.