



# FPGA Replacement for 3.3-Volt Xilinx Products

## Introduction

Proteus is a Chip Express FPGA replacement program. In its initial release, Proteus is available as a 5-volt product family serving the needs of specific Xilinx 4000E/EX devices and a Proteus 3.3-volt product family serving the Xilinx 4000XL/XLA family of devices.

Using the single-wafer/one-mask and wafer-lot/two-mask manufacturing capabilities of Chip Express, Proteus products deliver cost-effective component value as compared to an FPGA. Proteus replacement parts are designed and implemented in 0.35 $\mu$ m and 0.6 $\mu$ m CMOS technologies that offer performance/power benefits over comparable FPGAs.

## Features

- Pin list compatible Xilinx 4000XL/XLA replacement
- Fabricated using 0.35 $\mu$ m CMOS process

- Supports 3.3-volt and 5-volt core supplies
- Supports 3.3-volt I/O
- High-speed embedded synchronous memory
- On-chip analog phase locked loops
- Hard-wired connectivity
- Low power consumption

## Additional Information

For further information on the Proteus family of replacement solutions, please refer to the following documents:

- Proteus FPGA Replacement for 5-Volt Products (CEC003)
- Proteus Reliability Test Data Reports (CEC004)

## Proteus 3.3-Volt Product Family Overview

Parameter	R4013	R4020	R4028	R4036	R4044	R4052	R4062	R4085
Available gates	13000	20000	28000	36000	44000	52000	62000	85000
Min RAM bits	24576	24576	24576	24576	24576	24576	65536	98304
Max user I/O	192	224	256	288	320	352	384	448

## DC Electrical Specifications – 3.3-Volt Proteus Products

### Absolute Maximum Ratings

Symbol	Description	Min	Max	Unit
V <sub>DD</sub>	Supply voltage	-0.3	4.6	V
V <sub>DDIO</sub>	I/O supply voltage	-0.3	6.5	V
V <sub>IN</sub>	DC input voltage	-0.3	3.9	V
T <sub>J</sub>	Junction temperature	--	150	°C
T <sub>STG</sub>	Storage temperature	-65	150	°C
T <sub>SOL</sub>	Soldering lead temperature (10 seconds)	--	210	°C

### Recommended Operating Conditions

Symbol	Description		Min	Max	Units
V <sub>DD</sub>	Supply voltage	Commercial (0°C ≤ T <sub>J</sub> ≤ 100°C)	3.0	3.6	V
		Industrial (-40°C ≤ T <sub>J</sub> ≤ 115°C)	3.0	3.6	V
V <sub>IH</sub>	Input high voltage	TTL inputs	2.0	V <sub>DD</sub>	V
		CMOS inputs	0.7 V <sub>DD</sub>	V <sub>DD</sub>	V
V <sub>IL</sub>	Input low voltage	TTL inputs	0	0.8	V
		CMOS inputs	0	0.3 V <sub>DD</sub>	V
T <sub>in</sub>	Input signal transition time		--	10	nS

### DC Characteristics Over Operating Conditions

Symbol	Description		Min	Max	Units
V <sub>OH</sub>	Output high voltage	TTL outputs	2.45	--	V
		CMOS outputs	0.7V <sub>DD</sub>	--	V
V <sub>OL</sub>	Output low voltage	TTL outputs	--	0.45	V
		CMOS outputs	--	0.3 V <sub>DD</sub>	V
I <sub>IN</sub>	Input leakage current		-10	10	μA
C <sub>IN</sub>	Input capacitance	QFP packages	--	--	Note 1
		BGA packages	--	--	Note 1

Note 1: Please refer to the Proteus Package Guide (CEC006).

## Package and Device Availability

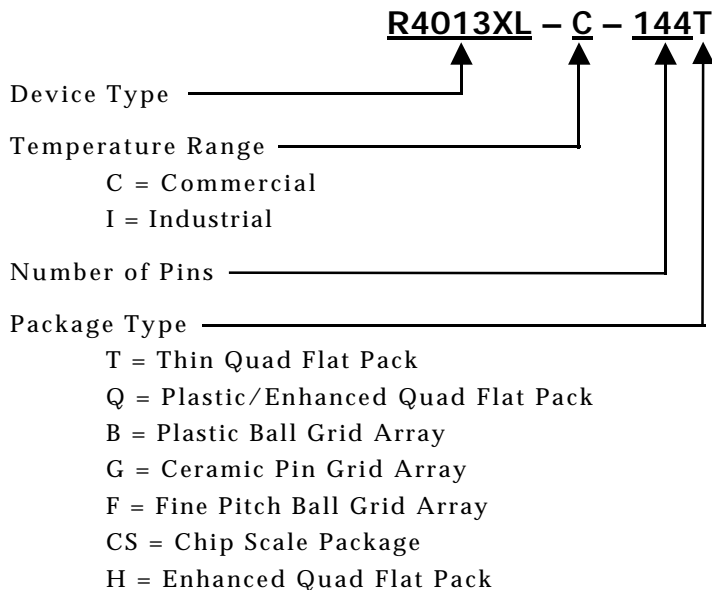
FPGA	SERIES	PLCC84	100PQFP	100VQFP	144TQFP	144HTFP	160HQFP	160PQFP	176TQFP	176HTFP	208HQFP	208PQFP	240HQFP	240PQFP	256PBGA	299CPGA	304HOPF	352PBGA	411CPGA	432PBGA	475CPGA	559CPGA	560PBGA
XC4013	XL					X	X		X		X		X	N/A									
XC4020	XL					X	X		X		X		X	N/A									
XC4028	XL						X				X		X	N/A	X	X	X						
XC4036	XL						X				X		X				X	X	N/A	X			
XC4044	XL						X				X		X				X	X	N/A	X			
XC4052	XL												X				X		N/A	X			X
XC4062	XL												X				X			X	N/A		X
XC4085	XL																			X		N/A	X
XC4013	XLA						X				X		X	N/A									
XC4020	XLA						X				X		X	N/A									
XC4028	XLA						X				X		X	N/A			X						
XC4036	XLA						X				X		X				X			X			
XC4044	XLA						X				X		X				X	X		X			
XC4052	XLA						X				X		X				X	X		X			X
XC4062	XLA						X				X		X				X	X		X			X
XC4085	XLA						X				X		X				X	X		X			X

X = Compatibility match between Xilinx and Proteus devices

N/A = Xilinx device exists, but there is no Proteus solution

Note: All Xilinx speed grades are supported by Proteus

## Ordering Information



## Package Compatibility Matrix

Proteus Part Number	Temperature Range	Package Type	Xilinx Equivalent
R4013XL-C-144T	Commercial	144 TQFP	XC4013XL-HT144C
R4013XL-C-160Q	Commercial	160 PQFP	XC4013XL-PQ160C
R4013XL-C-176Q	Commercial	176 QQFP	XC4013XL-HT176C
R4013XL-C-208Q	Commercial	208 PQFP	XC4013XL-PQ208C
R4013XL-C-240Q	Commercial	240 PQFP	XC4013XL-PQ240C
R4013XL-I-144T	Industrial	144 TQFP	XC4013XL-HT144I
R4013XL-I-160Q	Industrial	160 PQFP	XC4013XL-PQ160I
R4013XL-I-176Q	Industrial	176 QQFP	XC4013XL-HT176I
R4013XL-I-208Q	Industrial	208 PQFP	XC4013XL-PQ208I
R4013XL-I-240Q	Industrial	240 PQFP	XC4013XL-PQ240I
R4020XL-C-144T	Commercial	144 TQFP	XC4020XL-HT144C
R4020XL-C-160Q	Commercial	160 PQFP	XC4020XL-PQ160C
R4020XL-C-176T	Commercial	176 TQFP	XC4020XL-HT176C
R4020XL-C-208Q	Commercial	208 PQFP	XC4020XL-PQ208C
R4020XL-C-240Q	Commercial	240 PQFP	XC4020XL-PQ240C
R4020XL-I-144T	Industrial	144 TQFP	XC4020XL-HT144I
R4020XL-I-160Q	Industrial	160 PQFP	XC4020XL-PQ160I
R4020XL-I-176T	Industrial	176 TQFP	XC4020XL-HT176I
R4020XL-I-208Q	Industrial	208 PQFP	XC4020XL-PQ208I
R4020XL-I-240Q	Industrial	240 PQFP	XC4020XL-PQ240I
R4028XL-C-160H	Commercial	160 HQFP	XC4028XL-HQ160C
R4028XL-C-208H	Commercial	208 HQFP	XC4028XL-HQ208C
R4028XL-C-240H	Commercial	240 HQFP	XC4028XL-HQ240C
R4028XL-C-299G	Commercial	299 CPGA	XC4028XL-PG299C
R4028XL-C-304Q	Commercial	304 PQFP	XC4028XL-HQ304C
R4028XL-C-352B	Commercial	352 PBGA	XC4028XL-BG352C
R4028XL-I-160H	Industrial	160 HQFP	XC4028XL-HQ160I
R4028XL-I-208H	Industrial	208 HQFP	XC4028XL-HQ208I
R4028XL-I-240H	Industrial	240 HQFP	XC4028XL-HQ240I
R4028XL-I-299G	Industrial	299 CPGA	XC4028XL-PG299I
R4028XL-I-304Q	Industrial	304 PQFP	XC4028XL-HQ304I
R4028XL-I-352B	Industrial	352 PBGA	XC4028XL-BG352I
R4036XL-C-160H	Commercial	160 HQFP	XC4036XL-HQ160C
R4036XL-C-208H	Commercial	208 HQFP	XC4036XL-HQ208C
R4036XL-C-240H	Commercial	240 HQFP	XC4036XL-HQ240C
R4036XL-C-304Q	Commercial	304 PQFP	XC4036XL-HQ304C
R4036XL-C-352B	Commercial	352 PBGA	XC4036XL-BG352C
R4036XL-C-432B	Commercial	432 PBGA	XC4036XL-BG432C
R4036XL-I-160H	Industrial	160 HQFP	XC4036XL-HQ160I
R4036XL-I-208H	Industrial	208 HQFP	XC4036XL-HQ208I
R4036XL-I-240H	Industrial	240 HQFP	XC4036XL-HQ240I

Proteus Part Number	Temperature Range	Package Type	Xilinx Equivalent
R4036XL-I-304Q	Industrial	304 PQFP	XC4036XL-HQ304I
R4036XL-I-352B	Industrial	352 PBGA	XC4036XL-BG352I
R4036XL-I-432B	Industrial	432 PBGA	XC4036XL-BG432I
R4044XL-C-160H	Commercial	160 HQFP	XC4044XL-HQ160C
R4044XL-C-208H	Commercial	208 HQFP	XC4044XL-HQ208C
R4044XL-C-240H	Commercial	240 HQFP	XC4044XL-HQ240C
R4044XL-C-304Q	Commercial	304 PQFP	XC4044XL-HQ304C
R4044XL-C-352B	Commercial	352 PBGA	XC4044XL-BG352C
R4044XL-C-432B	Commercial	432 PBGA	XC4044XL-BG432C
R4044XL-I-160H	Industrial	160 HQFP	XC4044XL-HQ160I
R4044XL-I-208H	Industrial	208 HQFP	XC4044XL-HQ208I
R4044XL-I-240H	Industrial	240 HQFP	XC4044XL-HQ240I
R4044XL-I-304Q	Industrial	304 PQFP	XC4044XL-HQ304I
R4044XL-I-352B	Industrial	352 PBGA	XC4044XL-BG352I
R4044XL-I-432B	Industrial	432 PBGA	XC4044XL-BG432I
R4052XL-C-240H	Commercial	240 HQFP	XC4052XL-HQ240C
R4052XL-C-304Q	Commercial	304 PQFP	XC4052XL-HQ304C
R4052XL-C-432B	Commercial	432 PBGA	XC4052XL-BG432C
R4052XL-C-560B	Commercial	560 PBGA	XC4052XL-BG560C
R4052XL-I-240H	Industrial	240 HQFP	XC4052XL-HQ240I
R4052XL-I-304Q	Industrial	304 PQFP	XC4052XL-HQ304I
R4052XL-I-432B	Industrial	432 PBGA	XC4052XL-BG432I
R4052XL-I-560B	Industrial	560 PBGA	XC4052XL-BG560I
R4062XL-C-240H	Commercial	240 HQFP	XC4062XL-HQ240C
R4062XL-C-304Q	Commercial	304 PQFP	XC4062XL-HQ304C
R4062XL-C-432B	Commercial	432 PBGA	XC4062XL-BG432C
R4062XL-C-560B	Commercial	560 PBGA	XC4062XL-BG560C
R4062XL-I-240H	Industrial	240 HQFP	XC4062XL-HQ240I
R4062XL-I-304Q	Industrial	304 PQFP	XC4062XL-HQ304I
R4062XL-I-432B	Industrial	432 PBGA	XC4062XL-BG432I
R4062XL-I-560B	Industrial	560 PBGA	XC4062XL-BG560I
R4085XL-C-432B	Commercial	432 PBGA	XC4085XL-BG432C
R4085XL-C-560B	Commercial	560 PBGA	XC4085XL-BG560C
R4085XL-I-432B	Industrial	432 PBGA	XC4085XL-BG432I
R4085XL-I-560B	Industrial	560 PBGA	XC4085XL-BG560I
R4013XLA-C-160Q	Commercial	160 PQFP	XC4013XLA-PQ160C
R4013XLA-C-208Q	Commercial	208 PQFP	XC4013XLA-PQ208C
R4013XLA-C-240Q	Commercial	240 PQFP	XC4013XLA-PQ240C
R4013XLA-I-160Q	Industrial	160 PQFP	XC4013XLA-PQ160I
R4013XLA-I-208Q	Industrial	208 PQFP	XC4013XLA-PQ208I
R4013XLA-I-240Q	Industrial	240 PQFP	XC4013XLA-PQ240I

Proteus Part Number	Temperature Range	Package Type	Xilinx Equivalent
R4020XLA-C-160Q	Commercial	160 PQFP	XC4020XLA-PQ160C
R4020XLA-C-208Q	Commercial	208 PQFP	XC4020XLA-PQ208C
R4020XLA-C-240Q	Commercial	240 PQFP	XC4020XLA-PQ240C
R4020XLA-I-160Q	Industrial	160 PQFP	XC4020XLA-PQ160I
R4020XLA-I-208Q	Industrial	208 PQFP	XC4020XLA-PQ208I
R4020XLA-I-240Q	Industrial	240 PQFP	XC4020XLA-PQ240I
R4028XLA-C-160H	Commercial	160 HQFP	XC4028XLA-HQ160C
R4028XLA-C-208H	Commercial	208 HQFP	XC4028XLA-HQ208C
R4028XLA-C-240H	Commercial	240 HQFP	XC4028XLA-HQ240C
R4028XLA-C-304Q	Commercial	304 PQFP	XC4028XLA-HQ304C
R4028XLA-C-352B	Commercial	352 PBGA	XC4028XLA-BG352C
R4028XLA-I-160H	Industrial	160 HQFP	XC4028XLA-HQ160I
R4028XLA-I-208H	Industrial	208 HQFP	XC4028XLA-HQ208I
R4028XLA-I-240H	Industrial	240 HQFP	XC4028XLA-HQ240I
R4028XLA-I-304Q	Industrial	304 PQFP	XC4028XLA-HQ304I
R4028XLA-I-352B	Industrial	352 PBGA	XC4028XLA-BG352I
R4036XLA-C-160H	Commercial	160 HQFP	XC4036XLA-HQ160C
R4036XLA-C-208H	Commercial	208 HQFP	XC4036XLA-HQ208C
R4036XLA-C-240H	Commercial	240 HQFP	XC4036XLA-HQ240C
R4036XLA-C-352B	Commercial	352 PBGA	XC4036XLA-BG352C
R4036XLA-C-432B	Commercial	432 PBGA	XC4036XLA-BG432C
R4036XLA-I-160H	Industrial	160 HQFP	XC4036XLA-HQ160I
R4036XLA-I-208H	Industrial	208 HQFP	XC4036XLA-HQ208I
R4036XLA-I-240H	Industrial	240 HQFP	XC4036XLA-HQ240I
R4036XLA-I-352B	Industrial	352 PBGA	XC4036XLA-BG352I
R4036XLA-I-432B	Industrial	432 PBGA	XC4036XLA-BG432I
R4044XLA-C-160H	Commercial	160 HQFP	XC4044XLA-HQ160C
R4044XLA-C-208H	Commercial	208 HQFP	XC4044XLA-HQ208C
R4044XLA-C-240H	Commercial	240 HQFP	XC4044XLA-HQ240C
R4044XLA-C-304Q	Commercial	304 HQFP	XC4044XLA-HQ304C
R4044XLA-C-352B	Commercial	352 PBGA	XC4044XLA-BG352C
R4044XLA-C-432B	Commercial	432 PBGA	XC4044XLA-BG432C
R4044XLA-I-160H	Industrial	160 HQFP	XC4044XLA-HQ160I
R4044XLA-I-208H	Industrial	208 HQFP	XC4044XLA-HQ208I
R4044XLA-I-240H	Industrial	240 HQFP	XC4044XLA-HQ240I
R4044XLA-I-304Q	Industrial	304 HQFP	XC4044XLA-HQ304I
R4044XLA-I-352B	Industrial	352 PBGA	XC4044XLA-BG352I
R4044XLA-I-432B	Industrial	432 PBGA	XC4044XLA-BG432I
R4052XLA-C-160H	Commercial	160 HQFP	XC4052XLA-HQ160C
R4052XLA-C-208H	Commercial	208 HQFP	XC4052XLA-HQ208C
R4052XLA-C-240H	Commercial	240 HQFP	XC4052XLA-HQ240C
R4052XLA-C-304Q	Commercial	304 PQFP	XC4052XLA-HQ304C

Proteus Part Number	Temperature Range	Package Type	Xilinx Equivalent
R4052XLA-C-352B	Commercial	352 PBGA	XC4052XLA-BG352C
R4052XLA-C-432B	Commercial	432 PBGA	XC4052XLA-BG432C
R4052XLA-C-560B	Commercial	560 PBGA	XC4052XLA-BG560C
R4052XLA-I-160H	Industrial	160 HQFP	XC4052XLA-HQ160I
R4052XLA-I-208H	Industrial	208 HQFP	XC4052XLA-HQ208I
R4052XLA-I-240H	Industrial	240 HQFP	XC4052XLA-HQ240I
R4052XLA-I-304Q	Industrial	304 PQFP	XC4052XLA-HQ304I
R4052XLA-I-352B	Industrial	352 PBGA	XC4052XLA-BG352I
R4052XLA-I-432B	Industrial	432 PBGA	XC4052XLA-BG432I
R4052XLA-I-560B	Industrial	560 PBGA	XC4052XLA-BG560I
R4062XLA-C-160H	Commercial	160 HQFP	XC4062XLA-HQ160C
R4062XLA-C-208H	Commercial	208 HQFP	XC4062XLA-HQ208C
R4062XLA-C-240H	Commercial	240 HQFP	XC4062XLA-HQ240C
R4062XLA-C-304Q	Commercial	304 PQFP	XC4062XLA-HQ304C
R4062XLA-C-352B	Commercial	352 PBGA	XC4062XLA-BG352C
R4062XLA-C-432B	Commercial	432 PBGA	XC4062XLA-BG432C
R4062XLA-C-560B	Commercial	560 PBGA	XC4062XLA-BG560C
R4062XLA-I-160H	Industrial	160 HQFP	XC4062XLA-HQ160I
R4062XLA-I-208H	Industrial	208 HQFP	XC4062XLA-HQ208I
R4062XLA-I-240H	Industrial	240 HQFP	XC4062XLA-HQ240I
R4062XLA-I-304Q	Industrial	304 PQFP	XC4062XLA-HQ304I
R4062XLA-I-352B	Industrial	352 PBGA	XC4062XLA-BG352I
R4062XLA-I-432B	Industrial	432 PBGA	XC4062XLA-BG432I
R4062XLA-I-560B	Industrial	560 PBGA	XC4062XLA-BG560I
R4085XLA-C-160H	Commercial	160 HQFP	XC4085XLA-HQ160C
R4085XLA-C-208H	Commercial	208 HQFP	XC4085XLA-HQ208C
R4085XLA-C-240H	Commercial	240 HQFP	XC4085XLA-HQ240C
R4085XLA-C-304Q	Commercial	304 PQFP	XC4085XLA-HQ304C
R4085XLA-C-352B	Commercial	352 PBGA	XC4085XLA-BG352C
R4085XLA-C-432B	Commercial	432 PBGA	XC4085XLA-BG432C
R4085XLA-C-560B	Commercial	560 PBGA	XC4085XLA-BG560C
R4085XLA-I-160H	Industrial	160 HQFP	XC4085XLA-HQ160I
R4085XLA-I-208H	Industrial	208 HQFP	XC4085XLA-HQ208I
R4085XLA-I-240H	Industrial	240 HQFP	XC4085XLA-HQ240I
R4085XLA-I-304Q	Industrial	304 PQFP	XC4085XLA-HQ304I
R4085XLA-I-352B	Industrial	352 PBGA	XC4085XLA-BG352I
R4085XLA-I-432B	Industrial	432 PBGA	XC4085XLA-BG432I
R4085XLA-I-560B	Industrial	560 PBGA	XC4085XLA-BG560I

## For More Information

For additional information about Proteus, please visit our website (<http://www.chipexpress.com/proteus.html>) or contact the Chip Express sales office nearest you:

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