



# Land Grid Arrays (LGAs) and Field Programmable Gate Arrays (FPGAs)

## Major Design and Supply Chain Changes

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# Virtex-4 and Virtex-5 QV FPGA CF Package Assembly Location Change

XCN13005 (v1.0) February 25, 2013

Product Change Notice

## Overview

The purpose of this notification is to communicate that Xilinx is discontinuing the current Virtex<sup>®</sup>-4 and Virtex<sup>®</sup>-5 QV FPGA Ceramic Flip Chip Column Grid Array (CF package code) parts due to current supplier line discontinuance. However, Xilinx will continue to offer Virtex-4 and Virtex-5 QV FPGA Ceramic Flip Chip Land Grid Array products under a new CN package code with a new assembly supplier.

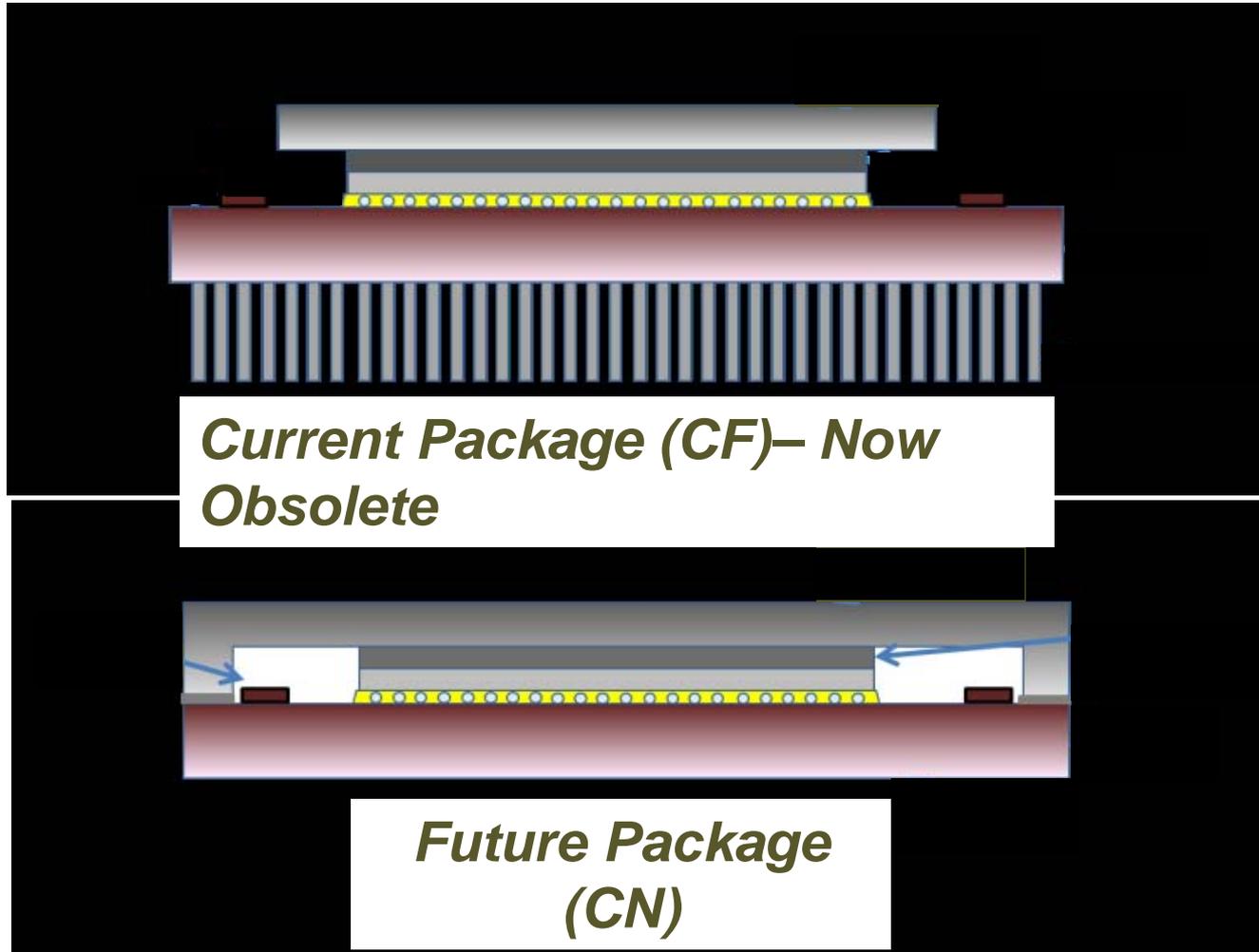
## Description

Xilinx's supplier, IBM is shutting down their Ceramic Flip Chip assembly line including column attach of the Ceramic Column Grid Array (CCGA). This line shutdown is impacting our Virtex-4 and Virtex-5 QV FPGA ceramic CF package products. To ensure supply continuity, Xilinx is in the process of qualifying a new supplier with new part numbers released for production in CYQ1, 2014.

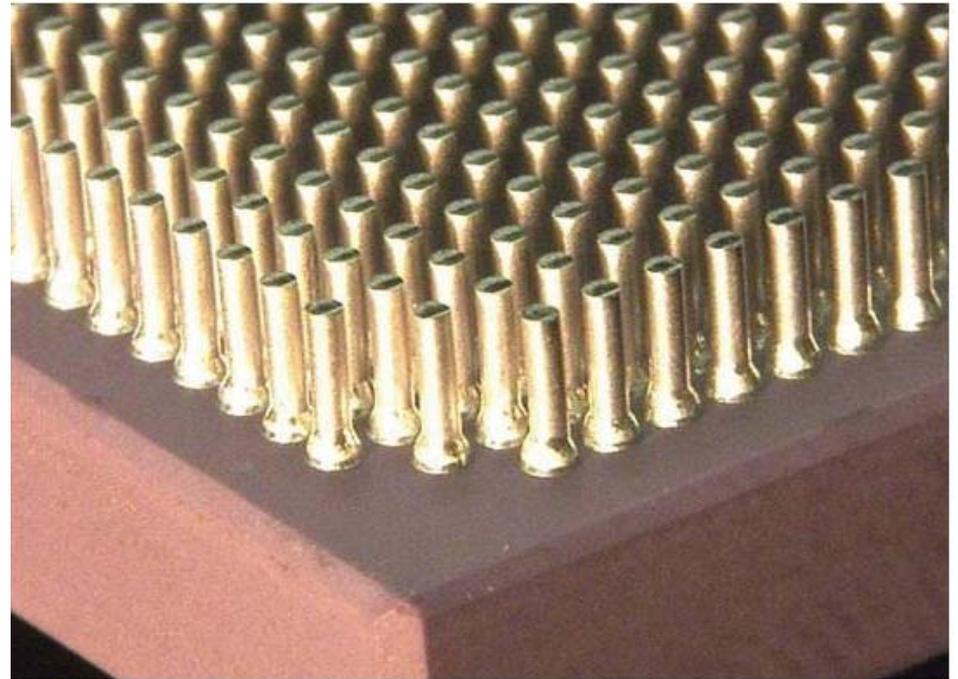
Virtex-4 and Virtex-5 FPGA QV Ceramic Flip Chip will be offered in Land Grid Array products (without columns) will be qualified with a new Bill of Material (underfill, lid and lid attach adhesive, eutectic bumps) at the new assembly supplier.

**Final Last Time Buy (LTB) orders are accepted until August 30, 2013.  
All orders will be Non-Cancellable, Non-Returnable (NCNR).**

# Xilinx Package Change



# A 1752 I/O Column Grid Array



*From: Reliability of CGA/LGA/HDI Package Board/Assembly  
by*

*Reza Ghaffarian Ph.D, JPL*

*Available at <http://nepp.nasa.gov>*



# Government and Industry Weekly Telcons

## - Xilinx Product Change Notice (PCN)

- **Regular Participants: LaBel, Sampson (NASA), Barnes, Sheldon, Agarwal (JPL), Harzstark (Aerospace)**
- **On Call: Xilinx, Six Sigma, BAE, others**
- **Defense Logistics Agency support: DLA-VA (specifications and standards) and DLA-VQ (Qualifying Activity)**
- **Telcons initiated to explore options for qualification process, NASA, JPL, Aerospace Corp. with support from Xilinx, Six Sigma and BAE systems as needed**
  - **Details still being worked, several logistics challenges**
  - **Focus quickly included exploration of new package (CN)**
  - **Team needed to assess options for columnizing an LGA**
  - **Concerns about availability of old package (CF)**



# What will Change?

- **Just about everything!**
- **All materials will change except die, substrate and capacitors**
- **Die bumping will be done by a previously used supplier**
- **Flip chip and packaging completion will be by a new supplier with extensive flip chip experience**
- **The new lid is electrically conductive**
- **The BIGGEST change is the part will only be available as a **Land Grid Array (LGA)**
  - **Customer will have to arrange for column attach OR**
  - **Find a socket that can successfully accommodate 1752 closely-spaced contact points****
- **Customer remains responsible for post column attach electrical testing**



# Reason for the LGA Package

- **Xilinx says they are doing what 60% of their customers have asked for: an LGA package so the customer can get their preferred columns added**
- **Xilinx says customers have been buying the Ceramic Column Grid Array (CCGA) package and having the columns removed and replaced**
- **The column attachment facility that Xilinx has been using will be shutdown sometime in 2014**



# Challenges to Socketing an LGA

- **A socket offers the potential advantages of simplified testing and installation, also removal, replacement and re-programming BUT**
- **The socket has to make low resistance, low inductance, low capacitance, stable contact for successful, high-speed functionality**
- **The socket itself must have 1752 physically compliant connections to the printed wiring board**
- **The socket must also have low thermal impedance to dissipate the heat effectively**



# Socket Option

- **Xilinx opinion on use of sockets**
  - They do not recommend sockets
- **Why**
  - Degradation in performance
- **Initial investigation (In process)**
  - Check with NASA MSFC (Micro springs)
  - Check with JPL packaging
  - Actel experience
  - Cinch sockets – JPL packaging is talking to them
- **Related work**
  - Reza NEPP report (Reliability of CGA/LGA/\*HDI Package Board/Assembly, Rev. A, 2013)

\*HDI = High Density Interconnect



# CN Assembly/Test at Kyocera

- **Kyocera QML Status**
  - QMLV for assembly and test
- **Assembly and Test Requirements Document**
  - Xilinx plans to use updated draft of M38535K, available now
- **Qualification Plan Review by Space community**
  - Xilinx willing to share with a small group
- **Space community concern**
  - Timely completion of CN qualification
- **Space Community Plan**
  - Work with DLA and Xilinx



# Column Attachment at Six Sigma

- **Six Sigma Qualified Manufacturing List (QML) Status**
  - QMLV for column attach operation
  - Significant note: no column rework allowed (for \*Class V builds)
- **Space Community Questions for Six Sigma**
  - Any problems in working with eutectic solder LGAs?
    - Six Sigma to get samples from their contact at Kyocera for an experiment - to ensure there will be no solderability issues
  - They have built 1752 and higher column parts before
  - \*\*ESD safe line – got help from one of their customers
  - They have done devices that were sensitive down to 20V
  - They are open to ESD survey by space community
  - They know a third party vendor who offers post column electrical services, Six Sigma does not do electrical testing
  - They will provide user guideline paper
  - No warranty given by Six Sigma

**\*\*ESD = Electrostatic Discharge**

**\*Class V = Space Grade per MIL-PRF-38535, Microcircuits**



# BAE Column Attach

- **Telecon Summary**
  - BAE has QMLV for flip-chip, QMLQ for column attach
  - They have extensive experience (25+ yrs)
    - 1.2 Million columns attached with no failures
    - 12 year history on space programs
  - Haven't done this many columns before (1752)
    - Evaluation in next six months
  - Can do post column electricals (Room Temperature and DC)
  - They are open to an ESD survey
- **Other notes**
  - We were very pleased with what BAE had to say
  - They are confident that they can handle the package in sufficient quantity to meet demand
  - This would provide a package with similar columns to IBM so it should mount just the same as the current one.

# BAE Features

- **Package Features**
  - Flip chip attach
  - Hermetic
  - Multi-layer ceramic
- **CCGA Features**
  - 1.27mm pitch
  - 1.00mm pitch
  - Sn90-Pb10 columns from Senju
  - Pb63-Sn37 Eutectic solder paste
  - Rework capability – flight qualified up to 10 reworks
- **Manufactured and QML certified facilities**
  - DLA certified
  - MIL-STD compliant
  - Compatible with NASA-STD-8739 board attach processes



***Space Qualified Hermetic Flip Chip CGA Package***

# BAE Systems CGA Package Offerings



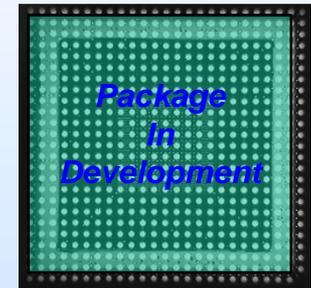
**25mm Module  
1.27mm Pitch  
360 I/O**



**32mm Module  
1.27mm Pitch  
624 I/O**



**35mm Module  
1.00mm Pitch  
1144 I/O**



**42mm Module  
1.00mm Pitch  
1752 I/O**



# Other Column Attach Options

- **Astrium and Six Sigma**
  - Believed to be the Six Sigma process performed by Astrium
  - Not a true second source
- **Atmel**
  - Atmel is the prime contractor for an ESA program to develop a Flipchip/Column Grid Array package to support large pin count needs. Atmel is working with HCM, a French company in La Rochelle, France
- **New package will support up to 1752 columns**
  - Full qualification of the package is targeted for 2016, which is in line with Atmel's qualification of the 65nm Rad Hard ASIC offering and Atmel's next generation SRAM based FPGAs.



## Last-time Buy Q's

- **The team was concerned that Xilinx's announcement said that when stock for the CF package is exhausted, orders will be completed in the CN package.**
  - **The NASA PO needs to say that we do not want that to happen without our approval. Chances are the CN package will still be a complete unknown to us when this occurs**
- **We asked Xilinx if it was possible to find out how many V5QV's in the CF package are available? We are concerned with a procurement of ~100 pieces**
- **Xilinx assured us availability of CF package was “ Not a problem. We are still in production mode for CF packages, we can supply as many as you need”**



# The CF to CN Transition

- **Availability**
  - IBM still operates until Q3 2014
  - Xilinx last time buy due end August 2013 to allow time to procure epitaxial (EPI) wafers, piece parts, and the production
  - So for CF packages, before the end of August, you can place orders for as many as you need
- **For Kyocera Qualification**
  - Doing feasibility build and test on representative samples in preparation for qualification builds
  - The qualification will be done on 3 separate assembly lots built from 3 different wafer lots.
  - By the time qualification is completed and the QA has given approval, the SIRF (Virtex 5QV) CN parts will be available immediately. One of the qualification lots will probably have enough units left to support shipment with full QCI data.
- **It is planned to have Class Y (non-hermetic space grade) fully incorporated in M38535 in time to allow Xilinx to qualify as part of their overall qual. program**



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