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Intel® NUC Compute Element Carrier Board Design Overview

Revision Number 1.5

June 2023

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Revision History

Revision	Description	Date
1.0	First Release	Dec 2019
1.1	Added sections on carrier board design and reference design package	Jan 2020
1.2	Added Gen 11 Compute Element references	Feb 2021
1.3	Added CMB1ABA reference design	Aug 2021
1.4	Added Gen 12 Compute Element references and updated collateral tables	May 2022
1.5	Added Gen 13 Compute Element references and updated collateral tables	Jun 2023

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Tables

1 Introduction

There are hardware components and firmware components required to design a carrier board for the Intel® NUC Compute Element. This document is an overview of the design guides and supporting collateral available for designing an Intel® NUC Compute Element Carrier Board. This collateral will provide the needed information to allow for the design of a carrier board. Support will also be required from hardware and firmware suppliers.

For more information about the Intel® NUC Compute Element, visit the **Intel® NUC Element Family website**.

2 Carrier Board Design

A carrier board is a board with a 300-pin connector for the NUC Compute Element that includes power, I/O ports, storage, and other peripheral options to allow the NUC Compute Element to function.

There are options for obtaining a carrier board that can be used for your design.

- Use an off the shelf carrier board design from Intel that meets your requirements
    - Visit the NUC Compute Element website to see the products offered by Intel and other eco-system suppliers
- Use a third-party designer to design a carrier board that meets your requirements
    - Intel may be able to assist in finding an ODM
- Design your own carrier board that meets your requirements
    - Experience in schematic design and board layout design using components for computer systems will be necessary
    - Experience with embedded controllers and embedded controller firmware will be necessary
    - A design guide and a reference design are available

3 Embedded Controller

An Embedded Controller will be needed on the carrier board to support eSPI virtual wire signals (SLP_Sx, SUS_XXX), SMBus, interrupts, GPIO support, ACPI power management, battery management and other communications between the carrier board and the NUC Compute Element. Intel designed carrier board solutions use the ITE IT5571 Embedded Controller. The ITE IT5571 is the only Embedded Controller supported by the NUC Compute Element. Refer to the design guide for details on the embedded controller and firmware. Firmware and hardware support using this controller is available from ITE. The ITE contact is Austin Chang.

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4 NUC Compute Element Connector

A 300-pin connector has been developed for the interface between the NUC Compute Element and the carrier board. The details of this connector are covered in the design guide. The Lotes contact is Cathy Yang.

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5 Reference Design Package

Reference design packages are available to assist in designing a carrier board. This reference designs are an example of a carrier board only solution for the Intel® NUC Compute Element. The packages can be used as is for a carrier board design or as a starting point for a customized carrier board design. The reference design packages include the following:

- Schematics – Full board schematics in PDF and OrCAD formats
- Board File – Full board layout in Allegro format
- 3D CAD File – Model in STEP format for the board
- BOM Files – Bill of Materials for the board
- Element Configuration Data (ECD) file – platform specific information
- Binary Modification Program (BMP) Utility – used to program EC firmware image
- Reference firmware for Thunderbolt™ 4 ReTimer and Power Delivery Controller

6 Collateral Lists

Table 1. Product Specifications

Title
Intel® NUC 8 Compute Element
Intel® NUC 11 Compute Element
Intel® NUC 12 Compute Element
Intel® NUC 13 Compute Element
Intel® NUC Assembly Element CMA1BB and CMA2GB
Intel® NUC Board Element CMB1BB, CMB2GB, CMB1ABA, CMB1ABB and CMB1ABC
Intel® NUC Rugged Chassis Element CMCR1ABA, CMCR1ABB and CMB1ABC
Intel® NUC Chassis Element CMCM2FB and CMCM2FBAV

The technical product specification documents in Table 1 are publicly available and can be located on the **Intel® NUC Compute Element Support website.**

Table 2. Design Collateral

Title	Number
Intel® NUC 8 Compute Element Carrier Board Design Guide	610837
Intel® NUC 11 Compute Element Carrier Board Design Guide	632238
Intel® NUC 12 Compute Element Carrier Board Design Guide	682327
Intel® NUC 13 Compute Element Carrier Board Design Guide	767205
Intel® NUC 8 Compute Element Exterior Drawing	616816
Intel® NUC 11 Compute Element Exterior Drawing	713022
Intel® NUC 12 Compute Element Exterior Drawing	713023
Intel® NUC 13 Compute Element Exterior Drawing	767198
CMB1BB Reference Design Package	616815
CMB2GB Reference Design Package	632260
CMB1ABA Reference Design Package	644199

The guides, drawing and reference design packages in Table 2 are Intel Confidential and can only be downloaded from **Resource and Design Center** under CNDA.

Table 3. Other Collateral

Title	Number
Gen 8 Processor External Design Specification (EDS)	575418, 575419
Gen 8 Platform Controller Hub External Design Specification	566439, 565870
Gen 8 Platform Design Guide	575376
Gen 8 Thermal and Mechanical Design Guide	566757
Gen 11 Processor External Design Specification (EDS)	575683, 575681
Gen 11 Platform Controller Hub External Design Specification	576591, 575857
Gen 11 Platform Design Guide	607872
Gen 11 Thermal and Mechanical Design Guide	607873
Gen 12 Processor External Design Specification (EDS)	619501, 619503
Gen 12 Platform Controller Hub External Design Specification	626817, 630094
Gen 12 Platform Design Guide	627205
Gen 12 Thermal and Mechanical Design Guide	622147
Gen 13 Processor External Design Specification (EDS)	640555
Gen 13 Platform Controller Hub External Design Specification	626817
Gen 13 Platform Design Guide	686872
Gen 13 Thermal and Mechanical Design Guide	645313

The collateral in Table 3 can be useful as a reference when designing a carrier board solution. This collateral is processor specific. Determine the processor used on the Intel® NUC Compute Element to determine the collateral to reference. This collateral is Intel Confidential and can only be downloaded from **Resource and Design Center** under CNDA.