# Express-DN7

COM Express Basic Size Type 7 Module with Intel® Atom® C3000 SoC

Features

- Intel® Atom® Processor C3000 SoC (up to 16 cores), supports full virtualization (VT-d/VT-x)
- Up to 48GB ECC DDR4 memory at max. 2400MHz (and non-ECC supported)
- Up to 2x PCIe x8 Gen3 for flexible expansion
- Up to 4x 10GBASE-KR ports
- IEEE 1588 Precision Time Protocol (PTP) support for real-time applications
- Extreme Rugged operating temperature range: -40°C to +85°C (build option for eTEMP SKUs)
- Supports Smart Embedded Management Agent (SEMA) functions

Preliminary
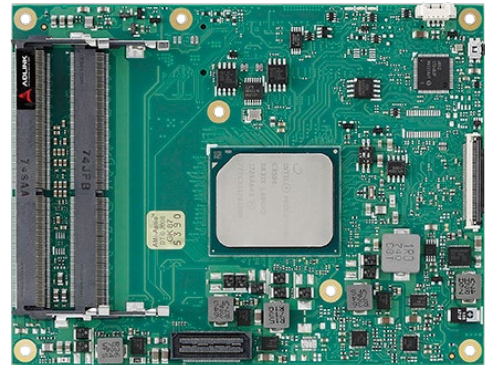
Specifications

● Core System

CPU

Intel® Atom® Processor C3000 SoC, 14nm (formerly codename: "Denverton-NS")

Atom® C3808 2.0GHz 12MB, 25W (12C/2133MHz, eTEMP)
Atom® C3708 1.7GHz 16MB, 17W (8C/2133MHz, eTEMP)
Atom® C3508 1.6GHz 8MB, 12W (4C/1866MHz, eTEMP)
Atom® C3308 1.6/2.1GHz 4MB, 10W (2C/1866MHz, eTEMP)
Atom® C3958 2.0GHz 16MB, 31W (16C/2400MHz)
Atom® C3858 2.0GHz 12MB, 25W (12C/2400MHz)
Atom® C3758 2.2GHz 16MB, 25W (8C/2400MHz)
Atom® C3558 2.2GHz 8MB, 16W (4C/2133MHz)
Atom® C3538 2.1GHz 8MB, 15W (4C/2133MHz)
Atom® C3338 1.5/2.2GHz 4MB, 9W (2C/1866MHz)

Supports: Intel® Quick Assist Technology (Crypto and Compression accelerator), Intel® VT (including VT-x, VT-d, VT-x with Extended Page Tables), Intel® Turbo Boost Technology 2.0, Intel® SSE4.2, Intel® 64 Architecture, Intel® ISA compatibility, Intel® Execute Disable Bit, Intel® OS Guard, Intel® Secure Key, Intel® AES-NI, Intel® Security Hash Algorithm Extensions (SHA-1, SHA-256)
Note: Availability of features may vary between SoC SKUs

Memory

Up to dual channel 2400/2133/1866 MHz DDR4 ECC (or non-ECC), up to 48GB in three SODIMM sockets
Notes: Memory frequency & capacity depends on SKUs; 3rd SO-DIMM supported by build option.

Embedded BIOS

AMI EFI with CMOS backup in 16MB SPI BIOS

Cache

16MB for C3708/C3958/C3758, 12MB for C3808/C3858, 8MB for C3508/C3558/C3538, 4MB for C3308/C3338

Expansion Busses

Up to 1 PCI Express x8 Gen3; CD connector (lanes 16-23 x8, x4, x2, x1, four controllers)

Up to 1 PCI Express x8 Gen3; AB & CD connector, lanes 0-7 (x8, x4, x2, x1, four controllers, dependent on GbE support)

LPC bus, SMBus (system) , I²C (user)
Note: PCI Express ports dependent on SoC SKU

SEMA Board Controller

Supports voltage/current monitoring, power sequence debug support, AT/ATX mode control, logistics and forensic information, flat panel control, general purpose I2C, failsafe BIOS (dual BIOS), watchdog timer and fan control

Debug Headers

40-pin multipurpose flat cable connector for use with DB-40 debug module providing BIOS POST code LED, BMC access, SPI BIOS flashing, power testpoints, debug LEDs

MIPI60 header for debug of CPU (build option)

● 10G Ethernet

Intel® MAC/PHY

Intel® 10G Ethernet Controller integrated in SoC (two controllers)

10G Interface

Up to 4x 10GBASE-KR (bandwidth dependent on SoC SKU)

● Ethernet

Intel® MAC/PHY

Intel® i210

Interface

10/100/1000 GbE connection

NC-SI

NC-SI supported on AB connector, connected to GbE controller

Note: * All specifications are subject to change without further notice.

Specifications

● Multi I/O and Storage

USB
Up to 2x USB 3.0/2.0 (USB 0,1), 2x USB 2.0 (USB 2,3)
Note: USB ports dependent on SoC SKU

SATA
Up to 2x SATA 6Gb/s (SATA 0,1)
Note: SATA ports dependent on SoC SKU

Note: Each SKU has a different number of High-Speed I/O (HSIO) lanes. HSIO lanes can be configured for PCIe, SATA, or USB 3.0 ports by BIOS settings to meet application requirements. Available BIOS setting are supported by project basis (for 12-6 HSIO SKUs).

Serial
2 UART ports with console redirection

GPIO/SD
4 GPO and 4 GPI (GPI with interrupt TBD)

eMMC
eMMC 5.0 (build option)
8GB/16GB/32GB/64GB
As storage device (as boot-up device TBD)

● Super I/O
Supported on carrier if needed (standard support for W83627DHG-P)

● TPM (build option)
Chipset: Infineon
Type: TPM 2.0

● Power
Standard Input: ATX = 12V±5% / 5Vsb ±5% or AT = 12V±5%
Wide Input: ATX = 8.5-20 V / 5Vsb ±5% or AT = 8.5-20V
Management: ACPI 5.0 compliant, Smart Battery support (TBD)
Power States: C1-C6, S0, S1, S3(TBD), S4(TBD), S5 , S5 ECO mode (Wake-on-USB S3/S4, WOL S3/S4/S5)
ECO mode: Supports deep S5 mode for power saving

● Mechanical and Environmental
Form Factor: PICMG COM.0, Rev 3.0 Type 7
Dimension: Basic size: 125 mm x 95 mm

Operating Temperature
Standard: 0°C to 60°C
Extreme Rugged: -45°C to +85°C (optional, only for eTEMP SKUs)

Humidity
5-90% RH operating, non-condensing
5-95% RH storage (and operating with conformal coating)

Shock and Vibration
IEC 60068-2-64 and IEC-60068-2-27
MIL-STD-202F, Method 213B, Table 213-I, Condition A and Method 214A, Table 214-I, Condition D

HALT
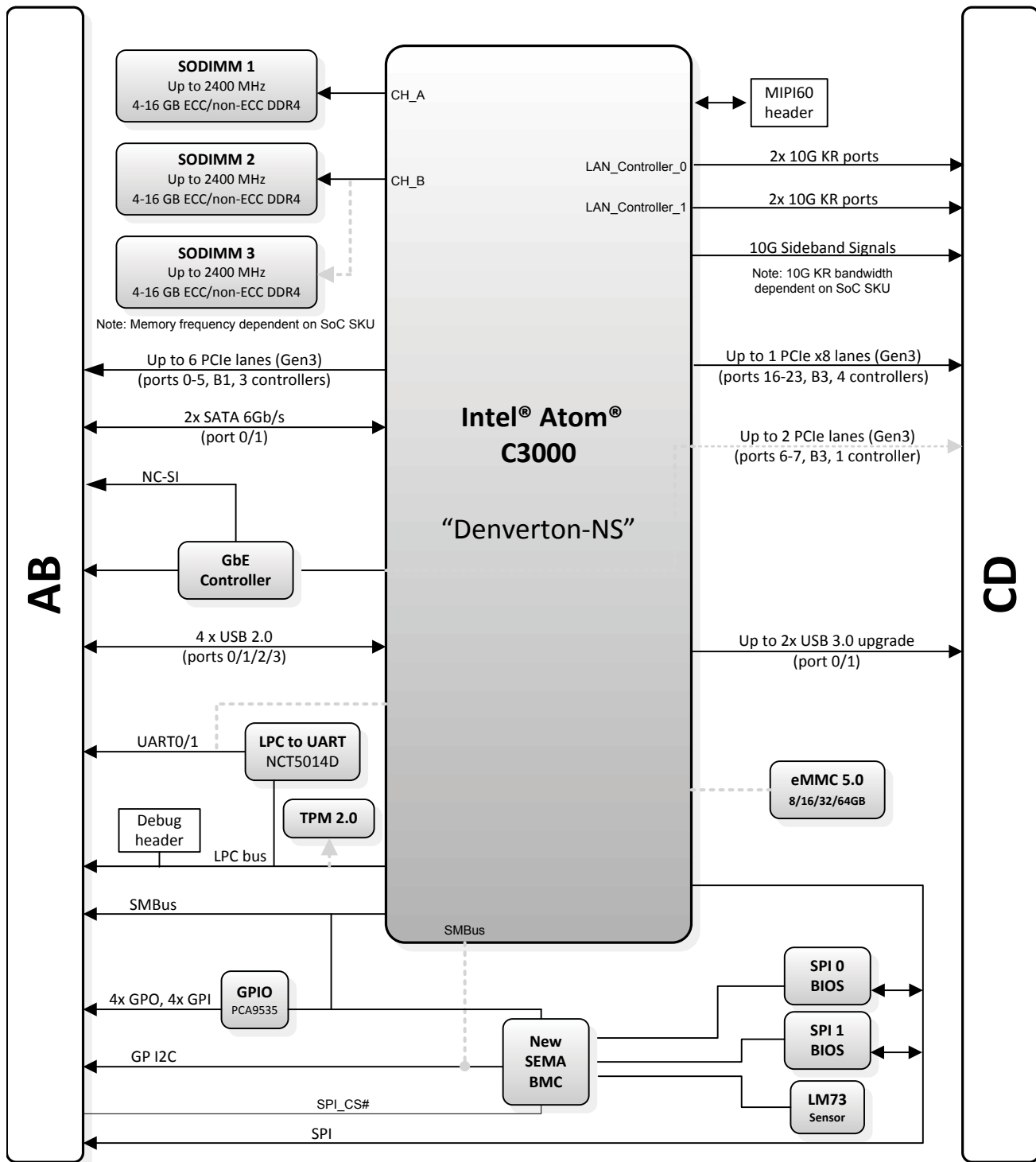Thermal Stress, Vibration Stress, Thermal Shock and Combined Test

● Operating Systems

Standard Support
Windows Server 2012/2016 64-bit, Yocto Linux 64-bit, VxWorks 7.x 64-bit (TBD)

Extended Support (BSP)
Yocto Linux 64-bit, VxWorks 7.x 64-bit (TBD)

Note: * All specifications are subject to change without further notice.

Functional Diagram

SODIMM 1
Up to 2400 MHz
4-16 GB ECC/non-ECC DDR4

SODIMM 2
Up to 2400 MHz
4-16 GB ECC/non-ECC DDR4

SODIMM 3
Up to 2400 MHz
4-16 GB ECC/non-ECC DDR4

Note: Memory frequency dependent on SoC SKU

CH_A

CH_B

MIPI60 header

LAN_Controller_0   2x 10G KR ports

LAN_Controller_1   2x 10G KR ports

10G Sideband Signals

Note: 10G KR bandwidth dependent on SoC SKU

Up to 6 PCIe lanes (Gen3)
(ports 0-5, B1, 3 controllers)

Up to 1 PCIe x8 lanes (Gen3)
(ports 16-23, B3, 4 controllers)

2x SATA 6Gb/s
(port 0/1)

Up to 2 PCIe lanes (Gen3)
(ports 6-7, B3, 1 controller)

NC-SI

Intel® Atom®
C3000

"Denverton-NS"

GbE
Controller

4 x USB 2.0
(ports 0/1/2/3)

Up to 2x USB 3.0 upgrade
(port 0/1)

LPC to UART
NCT5014D

UART0/1

Debug header

TPM 2.0

eMMC 5.0
8/16/32/64GB

LPC bus

SMBus

SMBus

SPI 0
BIOS

GPIO
PCA9535

4x GPO, 4x GPI

SPI 1
BIOS

New
SEMA
BMC

GP I2C

LM73
Sensor

SPI_CS#

SPI

AB

CD

Ordering Information

- **Express-DN7-C3808**
  Basic size COM Express Type 7 module with Intel® Atom® C3808, 12C (eTEMP)

- **Express-DN7-C3708**
  Basic size COM Express Type 7 module with Intel® Atom® C3708, 8C (eTEMP)

- **Express-DN7-C3508**
  Basic size COM Express Type 7 module with Intel® Atom® C3508, 4C (eTEMP)

- **Express-DN7-C3308**
  Basic size COM Express Type 7 module with Intel® Atom® C3308, 2C (eTEMP)

- **Express-DN7-C3958**
  Basic size COM Express Type 7 module with Intel® Atom® C3958, 16C

- **Express-DN7-C3858**
  Basic size COM Express Type 7 module with Intel® Atom® C3858, 12C

- **Express-DN7-C3758**
  Basic size COM Express Type 7 module with Intel® Atom® C3758, 8C

- **Express-DN7-C3558**
  Basic size COM Express Type 7 module with Intel® Atom® C3558, 4C

- **Express-DN7-C3538**
  Basic size COM Express Type 7 module with Intel® Atom® C3538, 4C

- **Express-DN7-C3338**
  Basic size COM Express Type 7 module with Intel® Atom® C3338, 2C

Accessories

Heat Spreaders

- **HTS-DN7-B**
  Heatspreader for Express-DN7 with threaded standoffs for bottom mounting

- **HTS-DN7-BT**
  Heatspreader for Express-DN7 with through hole standoffs for top mounting

Passive Heatsinks

- **THS-DN7-BL**
  Low profile heatsink for Express-DN7 with threaded standoffs for bottom mounting

- **THS-DN7-BLT**
  Low profile heatsink for Express-DN7 with through hole standoffs for top mounting

- **THSH-DN7-BL**
  High profile heatsink for Express-DN7 with threaded standoffs for bottom mounting

Active Heatsink

- **THSF-DN7-BL**
  High profile heatsink with fan for Express-DN7 with threaded standoffs for bottom mounting

Starter Kit

- **Starterkit**
  COM Express Type 7 Starter Kit Plus

Note: Two starter kits are available: one supporting SPF+ and one supporting 10GBASE-T

10G BASE-KR Support

	C3808	C3708	C3508	C3308
LAN Controller 0 (Gb/s)	10 2.5 1		2.5 1	
LAN Controller 1 (Gb/s)	10 2.5 1		2.5 1	

	C3958	C3858	C3758	C3558	C3538	C3338
LAN Controller 0 (Gb/s)	10 2.5 1					2.5 1
LAN Controller 1 (Gb/s)	10 2.5 1			2.5 1		

Combined throughput on all four ports is 20Gb/s

10GBASE-KR ports 0,1 are from LAN Controller 0
10GBASE-KR ports 2,4 are from LAN Controller 1

Notes:
* All specifications are subject to change without further notice.
* "Build option" indicates an alternative BOM configuration to support additional or alternative functions that are not available on the standard product.
  Please contact our sales representatives.
* All modules above support SFP+ (optical). Support for 10GBASE-T (copper) is by project basis.

IO Mapping

C3808, C3708, C3958, C3858, C3758
20 HSIO, 2CH DDR4, max. 48 GB DDR4

B1	B3	B4	B2
x8	x8	x8	x8
x4	x4	x4	x4	x4	x4	x4	x4
x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2
x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1

for GbE

B1
x8
x4	x4
x2	x2	x2	x2
x1	x1	x1	x1

no GbE

Dual layout supportss default GbE using last x1 in the B1 bucket, alternative is no GbE but full PCIe x8 on B1.

B1: ports 0-7
B3: ports 16-23
B4: ports 24-31
B2: ports 8-15

SATA: 0 1 — USB 3.0 upgrade: 0 1 2 3 — USB 2.0: 0 1 2 3

C3558, C3538
12 HSIO, 2CH DDR4, max. 48 GB DDR4

B1	B3	B4	B2
x8	x8	x8	x8
x4	x4	x4	x4	x4	x4	x4	x4
x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2
x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1

for GbE

B1
x8
x4	x4
x2	x2	x2	x2
x1	x1	x1	x1

no GbE

Dual layout supports default GbE using last x1 in the B1 bucket, alternative is no GbE but full PCIe x8 on B1.

SATA: 0 1 — USB 3.0 upgrade: 0 1 2 3 — USB 2.0: 0 1 2 3

C3338
10 HSIO, 1CH DDR4, max. 16 GB DDR4

B1	B3	B4	B2
x8	x8	x8	x8
x4	x4	x4	x4	x4	x4	x4	x4
x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2
x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1

for GbE

B1
x8
x4	x4
x2	x2	x2	x2
x1	x1	x1	x1

no GBE

Dual layout supports default GbE using last x1 in the B1 bucket, alternative is no GbE but full PCIe x8 on B1

SATA: 0 1 — USB 3.0 upgrade: 0 1 2 3 — USB 2.0: 0 1 2 3

C3508
8 HSIO2CH DDR4max. 48 GB DDR4

B1	B3	B4	B2
x8	x8	x8	x8
x4	x4	x4	x4	x4	x4	x4	x4
x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2
x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1

for GbE

SATA: 0 1 — USB 3.0 upgrade: 0 1 2 3 — USB 2.0: 0 1 2 3

C3308
6 HSIO, 1CH DDR4, max. 16 GB DDR4

B1	B3	B4	B2
x8	x8	x8	x8
x4	x4	x4	x4	x4	x4	x4	x4
x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2	x2
x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1	x1

for GbE

SATA: 0 1 — USB 3.0 upgrade: 0 1 2 3 — USB 2.0: 0 1 2 3