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 4 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

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, fail-safe 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 WB3627DHG-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 3)/S4, WOL 53/S4/55)
- 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

**Intel® Atom® C3000**
“Denverton-NS”

- **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

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

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

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

- **Up to 2x 10G KR ports**
- **Up to 2 PCIe x8 lanes (Gen3)**
  - (ports 16-23, B3, 4 controllers)

- **Up to 2 PCIe x8 lanes (Gen3)**
  - (ports 6-7, B3, 1 controller)

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

- **Up to 2x USB 2.0**
  - (ports 0/1/2/3)

- **4x GPO, 4x GPI**
- **GPIO PCA9535**

- **SMBus**
- **NC-SI**

- **LPC bus**
- **LPC to UART NCT5014D**

- **UART0/1**

- **Debug header**

- **SPI 0 BIOS**
- **SPI 1 BIOS**
- **LM73 Sensor**

- **eMMC 5.0**
  - 8/16/32/64GB

- **Note:** Memory frequency dependent on SoC SKU

- **Note:** 10G KR bandwidth dependent on SoC SKU

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- **Note:** Memory frequency dependent on SoC SKU
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

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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

**compliant with PICMG definition**

"Type7 module may supports more x1 root hubs in bucket one (B1). It's expected that future generation products may limit the number of available root hubs on bucket one (B1) to 2.

#### C3808, C3708, C3958, C3858, C3758

**20 HSIO, 2CH DDR4, max. 48 GB DDR4**

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*for GbE*

**SATA A**

USB 3.0 upgrade

USB 2.0

#### C3558, C3538

**12 HSIO, 2CH DDR4, max. 48 GB DDR4**

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*for GbE*

**SATA A**

USB 3.0 upgrade

USB 2.0

#### C3338

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

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*for GbE*

**SATA A**

USB 3.0 upgrade

USB 2.0

#### C3508

**8 HSIO2CH DDR4 max. 48 GB DDR4**

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*for GbE*

**SATA A**

USB 3.0 upgrade

USB 2.0

#### C3308

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

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*for GbE*

**SATA A**

USB 3.0 upgrade

USB 2.0

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