cExpress-KL

COM Express Compact Size Type 6 Module with
Mobile 7th Gen Intel® Core™ and Celeron® Processors

Features

- 7th Generation Intel® Core™ and Celeron® Processors
- Up to 32GB Dual Channel DDR4 at 1867/2133MHz
- Supports up to 3 independent displays in combinations of DDI, LVDS, VGA, eDP
- GbE, up to 6 PCIe x1 (build option)
- Three SATA 6 Gb/s, four USB 3.0 and four USB 2.0
- Supports Smart Embedded Management Agent (SEMA) functions
- Extreme Rugged operating temperature: -40°C to +85°C (build option)

Specifications

- Core System
  - CPU
    - Mobile 7th Generation Intel® Core™ and Celeron® Processors - 14nm (code name “Kaby Lake-U”)
    - Core™ i7-7600U 2.8/3.9GHz (Turbo), 4M, 15W (cTDP) (2C/GT2)
    - Core™ i5-7300U 2.6/3.5GHz (Turbo), 3M, 15W (cTDP) (2C/GT2)
    - Core™ i3-7100U 2.4GHz, 3M, 15W (2C/GT2)
    - Celeron® 3965U 2.2GHz, 2M, 15W (2C/GT1)
  - Note: Availability of the features may vary between processor SKUs.

- Memory
  - Dual channel 1867/2133 MHz DDR4 memory up to 32GB in dual SODIMM sockets

- Embedded BIOS
  - AMI EFI with CMOS backup in BMB SPI BIOS with Intel® AMT 11.0 support

- Cache
  - 4MB for Core™ i7, 3MB for Core™ i5 and i3, 2M for Celeron®

- Expansion Busses
  - Up to 6 PCI Express x1 (AB): Lanes 0-5 (configurable to x2, x4, Lane 5 by build option)
  - LPC bus, SMBus (system), I²C (user)

- 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
  - 60-pin XDP header for ICE debug of CPU/chipset

- Video
  - GPU Feature Support
    - Intel® Generation 9 LP Graphics Core Architecture, supporting 3 independent and simultaneous display combinations of DisplayPort/HDMI/LVDS or VGA/eDP outputs
    - Hardware encode/transcode HD content (including HEVC)
    - DirectX 12, DirectX 11.2, DirectX 11.1, DirectX 11, DirectX 10.1, DirectX 10, DirectX 9 support
    - OpenGL 5.0, 4.4/4.3 and ES 2.0 support
    - OpenCL 2.1, 2.0/1.2 support

- Digital Display Interface
  - DDI1/2 supporting DisplayPort/HDMI/DVI

- VGA
  - Build option support through DP-to-VGA IC (in place of DDI2)

- LVDS
  - Single/dual channel 18/24-bit LVDS from eDP-to-LVDS IC

- eDP
  - 4 lane support by build option, in place of LVDS

- Audio
  - Chipset
    - Intel® HD Audio integrated in SoC

- Audio Codec
  - Located on carrier Express-BASE6 (ALCB86 standard support)

- Ethernet
  - Intel® MAC/PHY: Intel® I219LM/V
  - Interface: 10/100/1000 GbE connection
Specifications

- **I/O Interfaces**
  USB: 4x USB 1.1/2.0/3.0 (USB 0,1,2,3) and 4x USB 1.1/2.0 (USB 4,5,6,7)
  SATA: 3x SATA 6 Gb/s
  Serial: 2 UART ports with console redirection
  GPIO: 4 GPO and 4 GPI from BMC

- **Super I/O**
  Supported on carrier if needed (standard support for WB3627DHG-P)

- **TPM**
  Chipset: Infineon SLB 9665 XT2.0
  Type: TPM 2.0

- **Power**
  Standard Input: ATX = 12V±5%, 5Vsb ±5%; AT = 12V±5%
  Wide Input: ATX = 5-20 V, 5Vsb ±5%; AT = 5-20V
  Management: ACPI 5.0 compliant, Smart Battery support
  Power States: C1-C6, S0, S1, S3, S4, 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 2.1 Type 6
  Dimension: Compact size: 95 mm x 95 mm

  **Operating Temperature**
  Standard: 0°C to 60°C
  Extreme Rugged: -45°C to +85°C (build option)

  **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 10 IOT Enterprise 64-bit, Linux 64-bit
  VxWorks 7 64-bit (TBD)

  **Extended Support (BSP)**
  Linux 64-bit
  VxWorks 64-bit (TBD)
Functional Diagram

7th Generation Intel® Core®/Celeron® Processor
SoC (code name “Kaby Lake-U”)

SODIMM 4-16 GB DDR4 non-ECC

SODIMM 4-16 GB DDR4 non-ECC

DDI1 (4 lanes) DP/HDMI

DDI2 (4 lanes) DP/HDMI

4x PCIe x1 Gen3/2 (port 0-3) (support x2, x4)

1x PCIe x1 Gen3/2 (port 4)

1x PCIe x1 Gen3/2 (port 5, build option)

SMBus

UART0, UART1

LPC to UART

TPM 2.0

4x USB 2.0/1.0 (ports 0-7)

4x USB 3.0 upgrade (port 0-3)

3x SATA 6Gb/s (port 0/1)

HD Audio

LVDS eDP to LVDS

eDP 4 lanes (build option)

VGA DP to VGA

(18/24-bit LVDS)

Single/dual channel eDP

4x GPO, 4x GPI

GP i2C

DDC i2C

GPIO PCA9535

SPI_CS#

SPI

New SEMA BMC

BIOS

SPI 0

SPI 1

LM73

SMBus

AB

CD

ADLINK
Leading EDGE COMPUTING
Ordering Information

- **cExpress-KL-i7-7600U**
  Compact COM Express® Type 6 module with Intel® Core™ i7-7600U and GT2 graphics

- **cExpress-KL-i5-7300U**
  Compact COM Express® Type 6 module with Intel® Core™ i5-7300U and GT2 graphics

- **cExpress-KL-i3-7100U**
  Compact COM Express® Type 6 module with Intel® Core™ i3-7100U and GT2 graphics

- **cExpress-KL-3965U**
  Compact COM Express® Type 6 module with Intel® Celeron® 3965U and GT1 graphics

Accessories

**Heat Spreaders**

- **HTS-cKL-B**
  Heatspreader for cExpress-KL with threaded standoffs for bottom mounting

- **HTS-cKL-BT**
  Heatspreader for cExpress-KL with through hole standoffs for top mounting

**Passive Heatsinks**

- **THS-cKL-B**
  Low profile heatsink for cExpress-KL with threaded standoffs for bottom mounting

- **THS-cKL-BT**
  Low profile heatsink for cExpress-KL with through hole standoffs for top mounting

- **THSH-cKL-B**
  High profile heatsink for cExpress-KL with threaded standoffs for top mounting

**Active Heatsink**

- **THSF-cKL-B**
  High profile heatsink with Fan for cExpress-KL with threaded standoffs for bottom mounting

Starter Kit

- **COM Express Type 6 Starter Kit Plus**
  COM Express formfactor starter kit with Express-BASE6 board, power supply, and accessory kit