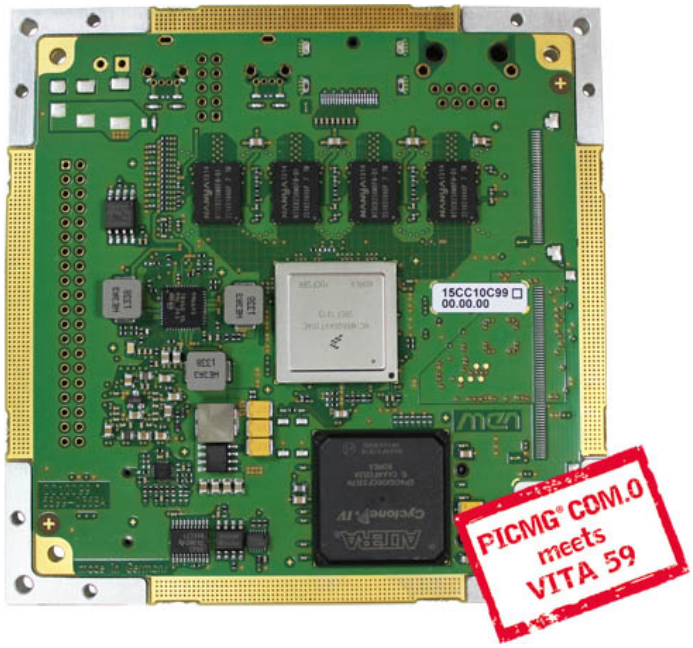
CC10C – Rugged COM Express® (VITA 59 RCE) with ARM® i.MX 6

- **Freescale™ ARM® i.MX 6 Series**
- **Quad-core processor**
- **Comprehensive usage of i.MX 6 I/O**
- **Configurable FPGA I/O with 140 pins**
- **Maximum flexibility in interface configuration**
- **Up to 4 GB DDR3 SDRAM**
- **eMMC multimedia card**
- **U-Boot Universal Boot Loader**
- **-40°C to +85°C Tcase guaranteed with qualified components**
- **Conduction cooling**
- **VITA 59 in process, compliant with COM Express® Compact, type 6**
- **PICMG COM.0 COM Express® version also available**



The CC10C is a Rugged COM Express® module (RCE) built around the Freescale™ ARM® i.MX 6 series of processors with a Cortex®-A9 architecture. Supporting different types of the i.MX 6Solo, 6DualLite, 6Dual and 6Quad families, the computer-on-module is widely scalable, e.g., to processing or graphics requirements. Where less performance is needed, you can optimize costs by choosing a single- or dual-core processor instead of a quad core.

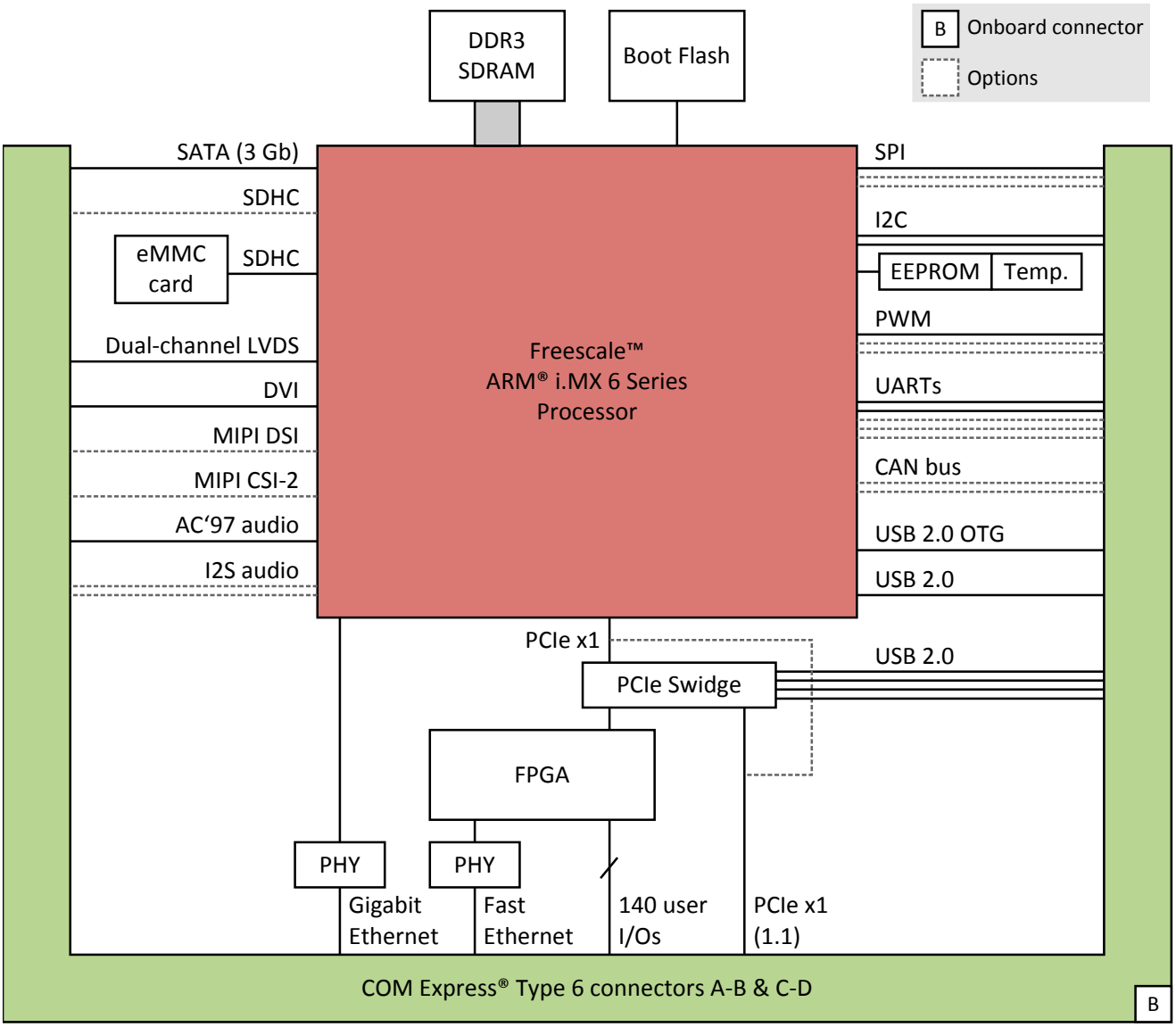
Rugged COM Express® modules are 100% compatible to COM Express® but conform to the new VITA 59 standard (in process) which specifies the mechanics to make COM Express® modules suitable for operation in harsh environments. The CC10C is based on the "Compact", 95 x 95 mm form factor and Type 6 connector pin-out, and can even be semi-customized to become a standard COM Express® module, without much additional design effort.
With RCE-compliant mechanics for conduction cooling, the module's size extends to 105 x 105 mm. It is embedded in a covered frame ensuring EMC protection and allowing efficient conductive cooling. Air cooling is also possible by applying a heat sink on top of the cover. Its optimized mechanics let the CC10C support an extended operating temperature range of -40 to +85°C.

Only soldered components are used to withstand shock and vibration, and the design is optimized for conformal coating.

Apart from its rugged design, the computer-on-module's range of supported functions leave almost nothing to wish for. With a maximum of 4 GB DDR3 RAM and an onboard eMMC card, the CC10C covers all basic memory needs. 3-Gbit SATA is provided for external mass storage. One of the biggest strengths of the CC10C lies in its I/O flexibility. The i.MX 6 provides an abundance of onchip controllers and interfaces, including Gigabit Ethernet, USB 2.0 (also with OTG/client support) and PCI Express®. Different video outputs like LVDS and DVI, audio and an optional camera interface make the card fit for multimedia applications. Other serial ports provide UARTs or CAN bus.
Where the processor's standard functions are not a perfect match, an onboard FPGA opens up 140 signal pins for user I/O. As IP cores are easy to integrate, the CC10C becomes a semi-custom solution with the suitable functionality even for more specialized applications.
The resulting I/O functionality in the ordered version depends on the customer's requirements and will always be a tailored combination of i.MX 6 and FPGA-based I/O, without the need for a completely new design.

For evaluation and development purposes a microATX carrier board is in preparation.

Diagram


DDR3 SDRAM
Boot Flash
B Onboard connector
Options
SATA (3 Gb)
SDHC
eMMC card
SDHC
Dual-channel LVDS
DVI
MIPI DSI
MIPI CSI-2
AC'97 audio
I2S audio
Freescale™
ARM® i.MX 6 Series
Processor
SPI
I2C
EEPROM
Temp.
PWM
UARTs
CAN bus
USB 2.0 OTG
USB 2.0
PCIe x1
USB 2.0
PCIe Swidge
FPGA
PHY
PHY
Gigabit Ethernet
Fast Ethernet
140 user I/Os
PCIe x1 (1.1)
COM Express® Type 6 connectors A-B & C-D
B

Technical Data

CPU	■ Freescale™ ARM® i.MX6Q (i.MX 6Quad family) □ 1.0 GHz processor core frequency □ Quad-core processor □ ARM® Cortex®-A9 architecture i.MX 6 series □ Please see Standard Configurations and Options below for options and available standard versions.
Memory	■ 1 MB L2 cache integrated in i.MX 6 processor ■ 2 GB SDRAM system memory □ Soldered □ DDR3 □ Up to 533 MHz memory bus frequency ■ 4 MB boot Flash ■ Please see Standard Configurations and Options for options and available standard versions.
Mass Storage	■ 4 GB eMMC card □ Soldered on the board □ Connected via one SDHC channel ■ Serial ATA (SATA) □ One port via COM Express® connector □ SATA Revision 2.x support □ Transfer rates up to 300 MB/s (3 Gbit/s)
Graphics	■ Integrated in i.MX 6 processor □ Multi-stream-capable HD video engine delivering up to 1080p60 decode, 1080p30 encode and 3D video playback in HD □ Maximum resolution: 1920 x 1200 pixels (WUXGA) □ Superior 3D graphics performance with up to four shaders performing 200 Mt/s and OpenCL™ support □ Separate 2D and/or OpenVG Vertex acceleration engines for optimal user interface experience □ Stereoscopic image sensor support for 3D imaging ■ One LVDS dual-channel □ Up to 2 x 24-bit RGB ■ One DVI interface ■ Available via COM Express® connector
USB	■ One USB 2.0 OTG (On-The-Go) host/client port □ EHCI implementation □ Controlled by i.MX 6 processor ■ One USB 2.0 host port □ EHCI implementation □ Controlled by i.MX 6 processor ■ Four additional USB 2.0 host ports □ Controlled by PCIe® Swidge controllers ■ Data rates up to 480 Mbit/s ■ Available via COM Express® connector
Ethernet	■ One 10/100/1000Base-T Ethernet channel □ Controlled by i.MX 6 processor ■ One 10/100Base-T Ethernet channel □ Controlled by onboard FPGA ■ Two LED signals per channel for LAN link and activity status ■ Available via COM Express® connector
PCI Express®	■ One x1 link via COM Express® connector ■ PCIe® 1.1 support ■ Data rate up to 250 MB/s in each direction (2.5 Gbit/s per lane) ■ One PCI Express® Card supported

Technical Data

Audio	■ One AC'97 audio interface ■ Controlled by i.MX 6 processor ■ Available via COM Express® connector
UART	■ Two interfaces (UART1, UART2) □ Controlled by i.MX 6 processor □ Support of RS232 and RS485 □ Data rates up to 4 Mbit/s □ 64-byte transmit/receive buffer □ Handshake lines: none ■ Four interfaces (UART3, UART4, UART5, UART6) □ Controlled by onboard FPGA □ Support of RS232, RS485 and RS422 □ Data rates up to 3 Mbit/s □ 60-byte transmit/receive buffer (124-byte buffer on request) □ Handshake lines: CTS, RTS for UART3, UART5 and UART6; CTS, RTS, DSR, DTR, DCD, RI for UART4 ■ Available via COM Express® connector ■ Physical interfaces RS232 or RS422/RS485 depending on interface controller and implementation on COM Express® carrier board
CAN Bus	■ Two CAN bus channels ■ Controlled by onboard FPGA ■ 2.0A/B CAN protocol ■ Data rates up to 1 Mbit/s ■ Available via COM Express® connector ■ External transceivers to be implemented on COM Express® carrier board
GPIO	■ 64 GPIO lines controlled by onboard FPGA ■ 4 GPI and 4 GPO lines controlled by i.MX 6 processor ■ Available via COM Express® connector
FPGA	■ FPGA Altera® Cyclone® IV EP4CGX30 □ 29 440 logic elements □ 1 105 920 memory bits ■ Standard factory FPGA configuration: □ Main bus interface □ 16Z087_ETH - Ethernet controller (10/100Base-T) □ 16Z125_UART - UART controller (four UARTs) □ 16Z029_CAN - CAN controller (two channels) □ 16Z034_GPIO - GPIO controller (64 lines) ■ The FPGA offers the possibility to add customized I/O functionality. See FPGA.
Miscellaneous	■ Real-time clock (with supercapacitor or battery backup on the carrier board) ■ Power supervision and watchdog (integrated in processor) ■ Temperature measurement ■ One PWM interface ■ Three I2C interfaces □ One interface used for connection of EEPROM and temperature sensor ■ One SPI interface ■ 11 I/O lines usable as COM Express® control signals ■ All serial lines available via COM Express® connector
Rugged COM Express® Specifications	■ In accordance with proposed standard VITA 59 RCE: Rugged COM Express® in process □ With conduction cooling cover and frame □ Rugged COM Express® Compact, Module Pin-out Type 6
Electrical Specifications	■ Supply voltage/power consumption: □ +12 V (9 to 16 V), from tbd. W to tbd. W max.

Technical Data

Mechanical Specifications	■ Dimensions: 105 mm x 105 mm x 18 mm (height) (conforming to VITA 59 RCE Compact format) ■ Rugged COM Express® PCB mounted between a cover and a frame ■ Weight: □ tbd. g (incl. cover and frame) □ tbd. g (without cover and frame)
Environmental Specifications	■ Temperature range (operation): -40..+85°C Tcase (Rugged COM Express® cover/frame) (qualified components) ■ Temperature range (storage): -40..+85°C ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300 m to +3000 m ■ Shock: 50 m/s², 30 ms (EN 61373) ■ Vibration (function): 1 m/s², 5 Hz - 150 Hz (EN 61373) ■ Vibration (lifetime): 7.9 m/s², 5 Hz - 150 Hz (EN 61373) ■ Conformal coating on request
MTBF	■ tbd. h @ 40°C according to IEC/TR 62380 (RDF 2000)
Safety	■ Flammability □ PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers
EMC	■ EMC behavior depends on the system and housing surrounding the COM Express® module. ■ The Rugged COM Express® module in its cover and frame supports the system to meet the requirements of □ EN 55022 (radio disturbance) □ IEC 61000-4-2 (ESD) □ IEC 61000-4-3 (electromagnetic field immunity) □ IEC 61000-4-4 (burst) □ IEC 61000-4-5 (surge) □ IEC 61000-4-6 (conducted disturbances)
BIOS	■ U-Boot Universal Boot Loader
Software Support	■ Linux (in preparation) ■ VxWorks® (in preparation) ■ CANopen support: MEN Driver Interface System (MDIS for Linux, VxWorks®) ■ For more information on supported operating system versions and drivers see Downloads.

FPGA

This product offers the possibility to add customized I/O functionality in FPGA.

Flexible Configuration	■ Customized I/O functions can be added to the FPGA. ■ It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility. ■ You can find more information on our web page "User I/O in FPGA"
FPGA Capabilities	■ FPGA Altera® Cyclone® IV EP4CGX30 or EP4CGX50 or EP4CGX75 □ 29 440 logic elements or 49 888 logic elements or 73 920 logic elements □ 1 105 920 or 2 562 048 or 4 257 792 memory bits □ Connected to CPU via PCI Express® x1 link ■ Connection □ Total available pin count: 140 pins □ Functions available via COM Express® connectors ■ Functional updates via software □ MEN offers Flash update tools for different operating systems. ■ MEN offers a starter kit for this computer-on-module. The kit includes a suitable carrier board with different I/O connectors for FPGA signals.

Configuration & Options

Options

CPU	■ i.MX6S (i.MX 6Solo family) □ Single Core, 800 MHz or 1.0 GHz □ 512 KB L2 cache, 32-bit DDR3 @ 400 MHz □ 3D graphics with one shader, 2D graphics engine □ No SATA support ■ i.MX6DL (i.MX 6DualLite family) □ Dual Core, 800 MHz or 1.0 GHz □ 512 KB L2 cache, 64-bit DDR3 @ 400 MHz □ 3D graphics with one shader, 2D graphics engine □ No SATA support ■ i.MX6D (i.MX 6Dual family) □ Dual Core, 850 MHz or 1.0 GHz □ 1 MB L2 cache, 64-bit DDR3 @ 533 MHz □ 3D graphics with four shaders, two 2D graphics engines □ Integrated SATA (3 Gbit/s) ■ i.MX6Q (i.MX 6Quad family) □ Quad Core, 850 MHz or 1.0 GHz □ 1 MB L2 cache, 64-bit DDR3 @ 533 MHz □ 3D graphics with four shaders, two 2D graphics engines □ Integrated SATA (3 Gbit/s)
Memory	■ System RAM □ 1 GB, 2 GB or 4 GB □ i.MX6S up to 2 GB ■ Boot Flash □ 4 MB, 8 MB or 16 MB
Mass Storage	■ eMMC card, soldered □ Up to 64 GB and more possible, depending on available components
i.MX 6 I/O	■ Available via COM Express® connector ■ Please note that optional i.MX 6 interfaces usually reduce the available FPGA I/O lines. ■ One SDHC interface □ One port □ Secure digital host controller for MMC/SD/SDIO cards ■ One MIPI/DSI interface ■ One MIPI CSI camera serial host interface □ Supports communication with a MIPI CSI-2 compliant camera sensor □ Four data lanes with i.MX 6Dual/6Quad, two data lanes with i.MX 6Solo/6DualLite ■ Up to two I2S audio interfaces ■ One PCI Express® x1 link □ Directly controlled by i.MX 6 controller instead of PCIe® swidge ■ Up to five UART interfaces □ Physical interfaces RS232 or RS485 depending on implementation on COM Express® carrier board □ Data rates up to 4 Mbit/s □ 64-byte transmit/receive buffer □ Handshake lines: depending on configuration of each UART interface ■ Two CAN bus channels □ 2.0B CAN protocol □ Instead of FPGA-controlled CAN bus interfaces ■ Up to three PWM interfaces ■ Up to three SPI interfaces
USB I/O	■ No additional USB 2.0 host ports instead of four
FPGA I/O	■ No FPGA assembled, with customized configuration of i.MX 6 I/O interfaces ■ FPGA assembled, with customized IP core configuration ■ For FPGA component capabilities and the available pin count, see section FPGA.

Configuration & Options

Standalone operation	■ Dimensions: 95 mm x 95 mm, without conduction cooling wings, without cover and frame ■ For usage without a carrier board ■ No COM Express® connectors assembled ■ Onboard I/O connectors provided for the following interfaces: □ Power input □ Gigabit Ethernet □ 2 USB 2.0 □ Dual channel LVDS □ DVI □ UART □ Option: 32 FPGA I/Os
Miscellaneous	■ No temperature sensor
COM Express®	■ Also available in accordance with PICMG COM.0 COM Express® Module Base Specification □ Without conduction cooling wings, without cover and frame ■ COM Express® Compact (95 mm x 95 mm), Module Pin-out Type 6
Operating Temperature	■ -40..+85°C screened or with qualified components, depending on processor type
Cooling Concept	■ Conduction-cooled versions according to VITA 59 RCE: Rugged COM Express® in process ■ Air-cooled versions according to PICMG COM.0 COM Express® standard

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

Ordering Information

Standard CC10C Models	**15CC10-00**	COM Express® "Compact", type 6, Freescale™ i.MX6S, 0.8 GHz, 1 GB RAM, 4 GB eMMC, 2 USB, 1 Gb ETH, no FPGA, -40..+85°C with qualified components; without VITA-59 conduction cooling frame
	15CC10C00	Rugged COM Express® "Compact", type 6, Freescale™ i.MX6Q, 1 GHz, 2 GB RAM, 4 GB eMMC, 6 USB, 1 Gb Ethernet, 1 Fast Ethernet, PCIe® 1.1, with FPGA, -40..+85°C Tcase with qualified components; with VITA-59 conduction cooling frame
Documentation	Compare Chart Computer-On-Modules » Download You can find the official COM Express® Carrier Design Guide on www.comexpress-pnp.org or directly on www.picmg.org (PDF).	

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