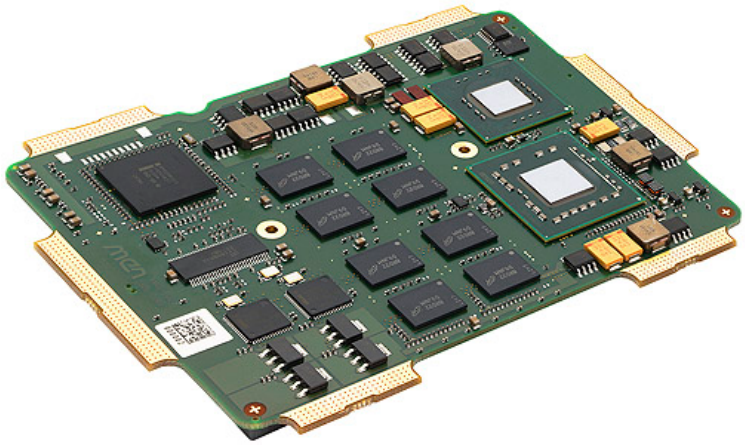
XM2 – ESMexpress® COM with Intel® Core™ 2 Duo

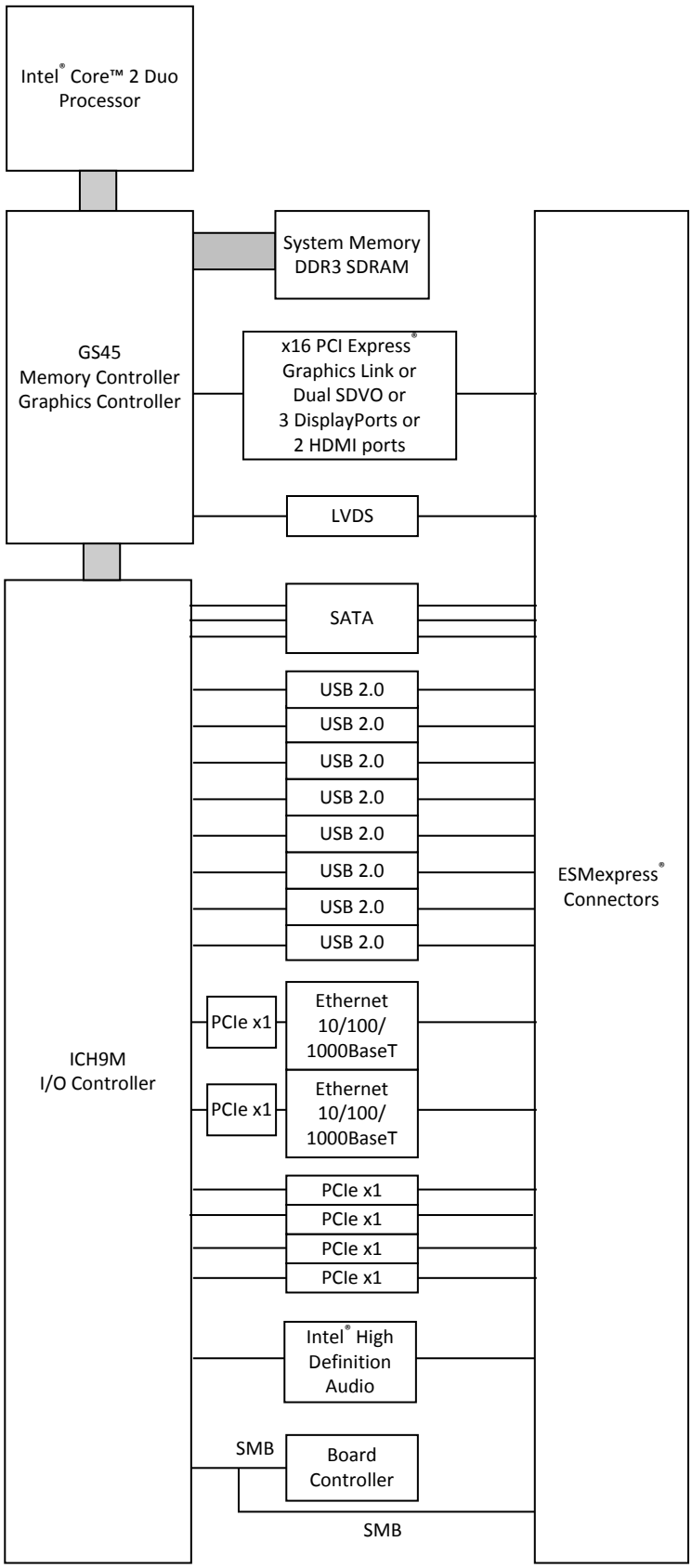
- **Intel® Core™ 2 Duo up to 2.26 GHz**
- **Up to 4 GB DDR3 SDRAM**
- **1 x16 PCI Express® Graphics link**
- **4 x1 PCI Express® links**
- **2 Gb Ethernet**
- **3 SATA ports**
- **8 USB 2.0**
- **Up to 2 SDVO ports**
- **Intel® HD audio**
- **0°C to +85°C Tcase screened**
- **Conduction cooling**



The XM2 is a Computer-On-Module which together with an application-specific carrier board forms a semi-custom solution for industrial, harsh, mobile and mission-critical environments.
The XM2 is controlled by a Intel® Core™ 2 Duo CPU with a clock frequency of up to 2.26 GHz and a total power consumption of up to 40W.
The XM2 can accommmodate 4 GB of DDR3 DRAM memory and supports other memory like USB Flash on the carrier board.
The GS45 graphics controller supports x16 PCI Express® Graphics or up to two SDVO interfaces or DisplayPort® (3 ports) or 2 HDMI ports.
In addition, four x1 or one x4 PCI Express® links are supported by the XM2. Other modern serial interfaces are 2 Gigabit Ethernet channels, 8 USB ports, 3 SATA ports, and one HD audio port. These interfaces are all routed from the XM2 for availability on any ESMexpress® carrier board.

The XM2 is completed by a board management controller for temperature and power supervision. It comes with an InsydeH2O™ EFI BIOS configurable for the final application.
The XM2 is screened for operation from 0°C to +85°C (Tcase). As all ESMexpress® modules it is embedded in a covered frame. This ensures EMC protection and allows efficient conductive cooling. Air cooling is also possible by applying a heat sink on top of the cover. With a low power processor the module may even be operated in an extended temperature range. ESMexpress® modules are firmly screwed to a carrier board and come with rugged industry-proven connectors supporting high frequency and differential signals. Only soldered components are used to withstand shock and vibration, and the design is optimized for conformal coating. All ESMexpress® modules support a single 95x125mm form factor.
For evaluation and development purposes an ATX carrier board is available. The ESMexpress® module can be evaluated on a COM Express™ carrier board via an adapter from ESMexpress® to COM Express™.

Diagram


Intel® Core™ 2 Duo Processor
System Memory DDR3 SDRAM
GS45 Memory Controller Graphics Controller
x16 PCI Express® Graphics Link or Dual SDVO or 3 DisplayPorts or 2 HDMI ports
LVDS
SATA
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
USB 2.0
ESMexpress® Connectors
PCIe x1
Ethernet 10/100/ 1000BaseT
PCIe x1
Ethernet 10/100/ 1000BaseT
ICH9M I/O Controller
PCIe x1
PCIe x1
PCIe x1
PCIe x1
Intel® High Definition Audio
SMB
Board Controller
SMB

Technical Data

CPU	■ Intel® Core™ 2 Duo SP9300 □ Up to 2.26GHz processor core frequency □ 800/1066MHz system bus frequency ■ Chipset □ Northbridge: Intel® GS45 □ Southbridge: Intel® ICH9M-E
Memory	■ Up to 6MB L2 cache integrated in Core 2 Duo ■ Up to 4GB DDR3 SDRAM system memory □ Soldered □ 800/1067MHz memory bus frequency locked to the FSB frequency
Serial ATA (SATA)	■ Three ports via ESMexpress® connector ■ Transfer rates up to 3Gbit/s (SATA 3.0)
Graphics	■ Integrated in Intel® GS45 chipset ■ Maximum resolution: 2048 × 1536 pixels (QXGA) ■ One x16 link (PCI Express® graphics) or ■ Up to two SDVO ports ■ One LVDS port (4 bit, max. 1366x768) ■ Available via ESMexpress® connector
USB	■ Eight USB 2.0 host ports ■ UHCI implementation ■ Data rates up to 480Mbit/s ■ Available via ESMexpress® connector
Ethernet	■ Two 10/100/1000Base-T Ethernet channels ■ Ethernet controllers connected by two x1 PCIe® links ■ Two LED signals per channel for LAN link, activity status and connection speed ■ Available via ESMexpress® connector
PCI Express®	■ Two x1 links to connect local 1000Base-T Ethernet controllers ■ Four x1 links or one x4 link via ESMexpress® connector (switchable on the carrier) ■ Data rate 250MB/s in each direction (2.5 Gbit/s per lane)
GPIO	■ 1 line from PIC via ESMexpress® connector ■ Usable for LED
HD audio	■ Via ESMexpress® connector
Board Management Controller	■ Input voltage supervision ■ Power sequencing ■ Board monitoring ■ Watchdog ■ Accessible via SMBus
Miscellaneous	■ Real-time clock (with GoldCap or battery backup on the carrier board) ■ SMBus interface
Electrical Specifications	■ Supply voltage/power consumption: □ +12V (-25%/+33%), power consumption up to 40W □ +5V (-5%/+5%) standby voltage
Mechanical Specifications	■ Dimensions: 95mm x 125mm ■ ESMexpress® PCB mounted between a frame and a cover ■ Weight: 230g (incl. cover and frame)

Technical Data

Environmental Specifications	■ Temperature range (operation): 0..+85°C Tcase (ESMexpress® cover/frame) (screened) ■ Temperature range (storage): -40..+85°C ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300m to + 3,000m ■ Shock: 15g/11ms (EN 60068-2-27) ■ Bump: 10g/16ms (EN 60068-2-29) ■ Vibration (sinusoidal): 1g/10..150Hz (EN 60068-2-6) ■ Conformal coating on request
MTBF	■ 154,077h @ 40°C according to IEC/TR 62380 (RDF 2000)
Safety	■ PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers
EMC	■ EMC behavior depends on the system and housing surrounding the ESMexpress® module. MEN has performed general, successful EMC tests for ESMexpress® using the XC1 evaluation carrier according to 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) and IEC 61000-4-6 (conducted disturbances)
BIOS	■ InsydeH2O™ UEFI Framework
Software Support	■ Windows® (Windows® XP, Windows® 7) ■ Linux □ tested/verified with: Ubuntu 10.04 (kernel 2.6.32-21) 32-bit and 64-bit versions □ OpenSuse 11.3 32-bit and 64-bit versions □ and: CentOS 5.5 (kernel 2.6.18) 32-bit and 64-bit versions □ Detailed matrix of supported interfaces under Ubuntu 10.04 and OpenSuse 11.3 ■ VxWorks® (in preparation) ■ QNX® ■ For more information on supported operating system versions and drivers see Downloads.

Configuration & Options

Standard Configurations

Article No.	CPU Type	Clock	System RAM	Temperature	Cover
15XM02-00	SP9300	2.26 GHz	2 GB	0..+85°C Tcase	yes
15XM02-01	Celeron M 722	1.2 GHz	2 GB	0..+85°C Tcase	yes

Options

CPU	■ Intel® SP9300, 2.26GHz, 1066MHz FSB, 6MB cache, 25W ■ Intel® SL9400, 1.86GHz, 1066MHz FSB, 6MB cache, 17W ■ Intel® SU9300, 1.2GHz, 800MHz FSB, 3MB cache, 10W ■ Intel® Celeron® M722, 1.2GHz, 800MHz FSB, 1MB cache, 5.5W ■ Intel® Celeron® M723, 1.2GHz, 800MHz FSB, 1MB cache, 10W
Memory	■ System RAM □ 1 GB, 2GB or 4GB

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 XM2 Models	**15XM02-00**	Intel® Core™ 2 Duo SP9300 2.26 GHz, 2GB DDR3, 0..+85°C Tcase
	15XM02-01	Intel® Celeron® M M722 1.2GHz, 2GB DDR3, 0..+85°C Tcase
Related Hardware	**08AE12-00**	ESMexpress® module to COM Express™ carrier adapter, 0..+60°C
	08XC01-00	Evaluation and development board for all ESMexpress® modules (coming with top cover and frame), 0..+60°C, incl. faceplate, 4 GB USB Flash Disk and USB cable type A to A
	08XC02-00	Carrier board for ESMexpress® modules (Intel®), 4 GB USB Flash Disk, LVDS and DVI on board, 2 Fast Ethernet on M12, 1 SA-Adapter™ slot, 2 USB 2.0, PCI Express® Mini Card slot, 24V PSU (9..36VDC), -40..+85°C with qualified components
Miscellaneous Accessories	**0712-0019**	Standard ATX PSU, 350 W, 0..+40°C
Software: Linux	This product is designed to work under Linux. See below for potentially available separate software packages from MEN.	
	13XM01-06	MDIS5™ low-level driver sources (MEN) for XM1, XM1L, MM1, MM2, XM2, F11S, F19P, F21P, F22P, G20, G22, SC21, SC27 and DC2 board controller
Software: Windows®	This product is designed to work under Windows®. See below for potentially available separate software packages from MEN.	
	10F014-78	Windows® XP Embedded BSP (MEN) for F11S, F14, F15, F17, F18, F19P, F21P, G20, XM1, XM1L, XM2, MM1, MM2, SC21, SC24, DC1, DC2, RC1, BC50I, BC50M and BL50W
	10Y000-78	Windows® Embedded Standard 7 BSP for F11S, F19P, F21P, F22P, F75P, G20, G22, XM1L, XM2, MM1, MM2, SC21, SC24, SC27, BC50M, BC50I, BL50W, BL50S, DC13, F206, F210, F215, F216, G215, P506, P507 and P511
	13T003-70	Windows® chipset driver (Intel®) for F14, F15, F17, F18, F18E, F19P, F21P, F22P, G20, G22, XM2, D9, D6, D7, D601, A19 and A20
	13T005-70	Windows® USB2UART driver (FTDI) for F14, F15, F17, F18, F19P, F21P, F22P, D9, A19, A20, XM2 and XM50 / XM51 / F50P / F50C hosts
	13T010-70	Windows® 32-bit network driver (Intel®) for XM1, XM1L, XM2, MM2, F11S, F18, F18E, F19P, F21P, F22P, G20, G22, GM1, GM2, G211, G211F, SC24, BC50I, BC50M and BL50W
	13T019-70	Windows® graphics driver (Intel®) for XM2 and F19P
	13T020-70	Windows® 64-bit network driver (Intel®) for F18, F18E, F19P, F21P, F22P, G20, G22, GM1, GM2, G211, G211F, XM2, SC24, BC50I, BC50M and BL50W
	13XM02-77	Windows® Installset (MEN) for XM2 and F19P (Includes all free drivers developed by MEN for the supported hardware.)
Software: VxWorks®	This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.	
	13XM01-06	MDIS5™ low-level driver sources (MEN) for XM1, XM1L, MM1, MM2, XM2, F11S, F19P, F21P, F22P, G20, G22, SC21, SC27 and DC2 board controller

Ordering Information

Software: QNX®	This product is designed to work under QNX®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.	
	10F014-40	QNX® 6.3.0 installation support files (QNX® and MEN) for F14, F15, F17, F18, F19P, XM1, XM2 and MM1
	10F019P40	QNX® 6.4.0 BSP (QNX® and MEN) for F19P and XM2
	13XM01-06	MDIS5™ low-level driver sources (MEN) for XM1, XM1L, MM1, MM2, XM2, F11S, F19P, F21P, F22P, G20, G22, SC21, SC27 and DC2 board controller
Software: Miscellaneous	Intel® software development products such as analyzers, compilers, threading tools etc. can be downloaded under www.intel.com/cd/software/products/asmo-na/eng/index.htm. IA-32 Intel® Architecture Software Developer's Manuals are available under www.intel.com/products/processor/manuals/index.htm.	

For operating systems not mentioned here contact MEN sales.

Documentation	Compare Chart ESMexpress® Embedded System Modules » Download You can find general literature on MEN computer-on-modules, including presentations about ESMexpress®, ESMini™ and their cooling concept, in our Download Library.	
	20APPN004	Application Note: How to make a USB stick bootable
	20XM02-ER	XM2 Errata
	20XM02-00	XM2 User Manual
	21APPN015	Application Note: Using Real-Time Operating Systems on MEN CPUs with InsydeH2O™ UEFI BIOS
	21APPN016	Application Note: Accessing SMBus under Linux Kernel 3.2 on MEN Intel® Boards

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