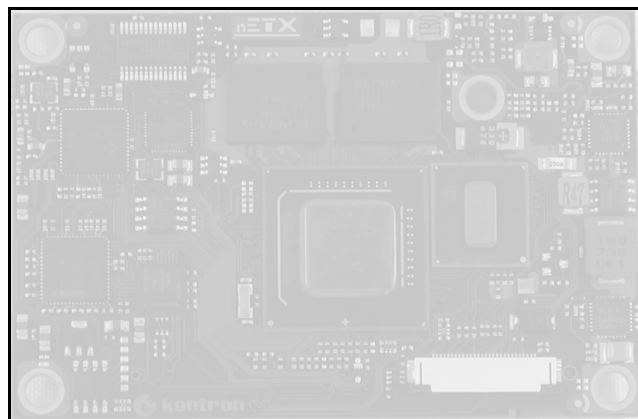


**nanoETXexpress - *embedded line***

Specification preliminary

**Revision 0.8**



***Figure 1 – nanoETXexpress***

# Contents

<b>Figure 1 – nanoETXexpress</b> .....	1
<b>1. Introduction</b> .....	3
<b>2. Module Configuration</b> .....	4
<b>3. Module Pin-out Type Definitions</b> .....	5
<b>3.1 Module Pin-out Type 1 – Required and Optional Features</b> .....	5
<b>3.2 Alternative Pin description for SDIO interfaces</b> Secure Digital Input Output.....	6
<b>3.3 SDIO Pin description</b> .....	6
<b>3.4 USB Client Port</b> .....	7
US15W (Menlow) Platform specific USB routing (only for reference).....	7
<b>4. Mechanical Specification</b> .....	8
<b>4.1 Module Size - Nano Module</b> .....	8
<b>Figure 3 – nanoETXexpress Form Factor</b> .....	8
<b>4.2 Heat-Spreader</b> .....	9
<b>4.3 Component Height - Module Back and Carrier Board Top</b> .....	10
<b>Figure 5 - Component Clearances underneath Module</b> .....	10
<b>5. Electrical Specifications</b> .....	11
<b>5.1 Input Power - General Considerations</b> .....	11
<b>6. Revision History</b> .....	11

# 1. Introduction

## 1.1 nanoETXexpress Specification and ETXexpress® Design Guide

The Kontron nanoETXexpress Specification is an additional document to the open PICMG® industry standard adopted for Computer-On-Modules. All specification defined in the COM Express™ specification are valid for nanoETXexpress. All differences are defined in this document.

Kontron also has created an ETXexpress® Design Guide specifically for its customers. The Kontron ETXexpress® Design Guide, which is a additional document to the COM Express™ Specification is available to Kontron customers upon request, explores the requirements of the COM Express™ Specification and provides recommendations on designing ETXexpress® baseboards to support various features of ETXexpress® modules. The ETXexpress® Design Guide, based upon the COM Express™ Specification, discusses capabilities defined in the Specification with schematic examples where applicable and offers ideas to consider for maximum flexibility in designing baseboards.

## 2. Module Configuration

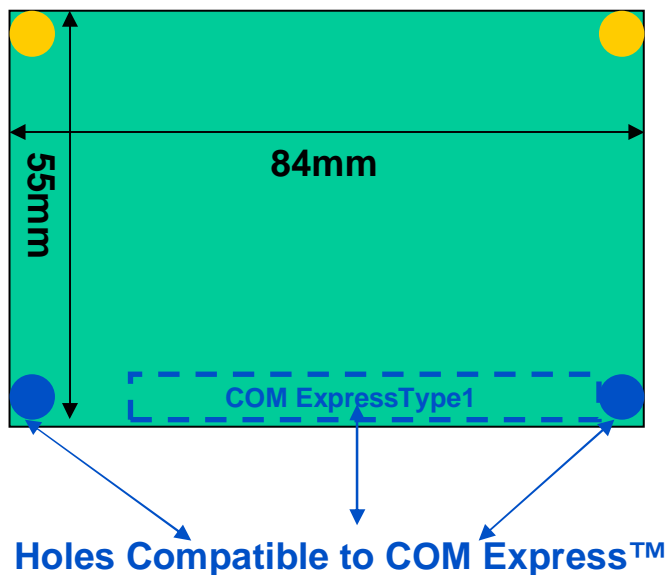
Beside the standard module sizes the basic module and the extended module Kontron defined two more module sizes. The established compact (micro) module and now the nanoETXexpress based on COM Express™ interface specification. The primary difference between the nano module, the compact (micro) module, the basic module and the extended module is the over-all physical size and the performance envelope supported by each. The extended module is larger and can support larger processor and memory solutions in terms of power supply and heat dissipation. The nano module, the compact (micro) module, basic module and extended module use the same connectors and pin-outs and utilize several common mounting-hole positions.

Up to 440 pins of connectivity are available between COM Express™ modules and the carrier board. Legacy buses such as PCI, parallel ATA, LPC, HD Audio (or AC'97) can be supported as well as new high speed serial interconnects such as PCI Express, Serial ATA or SAS and Gigabit Ethernet. To enhance interoperability between COM Express™ modules and carrier boards, five common signalling configurations (Pin-out Types) have been defined to ease system integration.

Some pin-out type definitions like the type I require only a single 220-pin connector and others require both 220-pin connectors to supply all the defined signalling.

**Figure 2 – Type I nano module size**

*top view (X1 is on bottom side, seen through pcb), all coordinates in mm*



### 3. Module Pin-out Type Definitions

nanoETXexpress defines COM Express™ type 1 connector.

Pin-out Type 1 modules have a single 220-pin connector, pin row A-B. See PIGMG® COM.O COM Express™ Module Base Specification for detailed

Type 1 modules allow for a minimal possible feature set using two of the four available connector rows. Type 1 represents a basic feature set with the benefit of simplified routing of the carrier board to allow a lower layer count board.

COM Express™ required and optional features are summarized in the following table. The features identified as minimum (Min.) shall be implemented by all modules. Features identified up to maximum (Max) may be additionally implemented by a module.

#### 3.1 Module Pin-out Type 1 – Required and Optional Features

	COMexpress Type 1 (Single connector) Min / Max	NanoETXexpress (Single connector) Min / Max	Note
<b>System I/O</b>			
PCI Express Lanes 0 - 5	2/6	1/6	
LVDS Channels	0/2	0/2	
VGA Port	0/1	0/1	
TV-Out	0/1	0/1	
SATA / SAS Ports	0/4	0/4	
HD Audio	0/1	0/1	
USB 2.0 Ports	4/8	4/8	Including client Port 7
USB client Port	--	0/1	USB Port 7
LAN 0 (10/100Base-T min)	1/1	1/1	
Express Card Support	1/2	1/2	
LPC Bus	1/1	1/1	
<b>System Management</b>			
General Purpose Inputs	4/4	4/4	
General Purpose Outputs	4/4	4/4	
SDIO optional to GPIO	NA	0/1	Shared with GPIO
SMBus	1/1	1/1	
I <sup>2</sup> C	1/1	1/1	
Watch Dog Timer	0/1	0/1	
Speaker Out	1/1	1/1	
External BIOS ROM support	0/1	0/1	
Reset Functions	1/1	1/1	
<b>Power Management</b>			
Thermal Protection	0/1	0/1	
Battery Low Alarm	0/1	0/1	
Suspend	0/1	0/1	
Wake	0/2	0/2	
Power Button Support	1/1	1/1	
Power Good	1/1	1/1	

### 3.2 Alternative Pin description for SDIO interfaces Secure Digital Input Output.

Pin	GPIO	SDIO	Pin	GPIO	SDIO
A54	GPI0	DATA0	B54	GPO1	CMD
A63	GPI1	DATA1	B57	GPO2	WP
A67	GPI2	DATA2	B63	GPO3	CD#
A85	GPI3	DATA3			
A93	GPO0	CLK			

### 3.3 SDIO Pin description

Signal	Type	Description
SD_DATA[3:0]	I/O CMOS3.3	<b>SDIO Controller 0/1/2 Data:</b> These signals operate in push-pull mode. The SD card includes internal pull-up resistors for all data lines. By default, after power-up, only SDn_DATA0 is used for data transfer. Wider data bus widths can be configured for data transfer.
SD_CMD	I/O CMOS3.3	<b>SDIO Controller 0/1/2 Command:</b> This signal is used for card initialization and transfer of commands. It has two operating modes: open-drain for initialization mode, and push-pull for fast command transfer.
SD1_CLK	O CMOS3.3	<b>SDIO Controller 0/1/2 Clock:</b> With each cycle of this signal a one-bit transfer on the command and each data line occurs. This signal is generated by Intel SCH at a maximum frequency of: 24 Mhz for SD and SDIO. 48 Mhz for MMC.
SD0_WP	I CMOS3.3	<b>SDIO Controller 0/1/2 Write Protect:</b> These signals denote the state of the write-protect tab on SD cards.
SD1_CD#	I CMOS3.3	<b>SDIO Controller 0/1/2 Card Detect:</b> Indicates when a card is present in an external slot.

### 3.4 USB Client Port

nanoETXexpress defines one USB port for USB client possibilities. COM Express™ USB Port7 is defined for client operation; it can be used either as a USB host or USB client. Please refer to nanoETXexpress board manual for supporting USB client functionality

#### US15W (Menlow) Platform specific USB routing (only for reference)

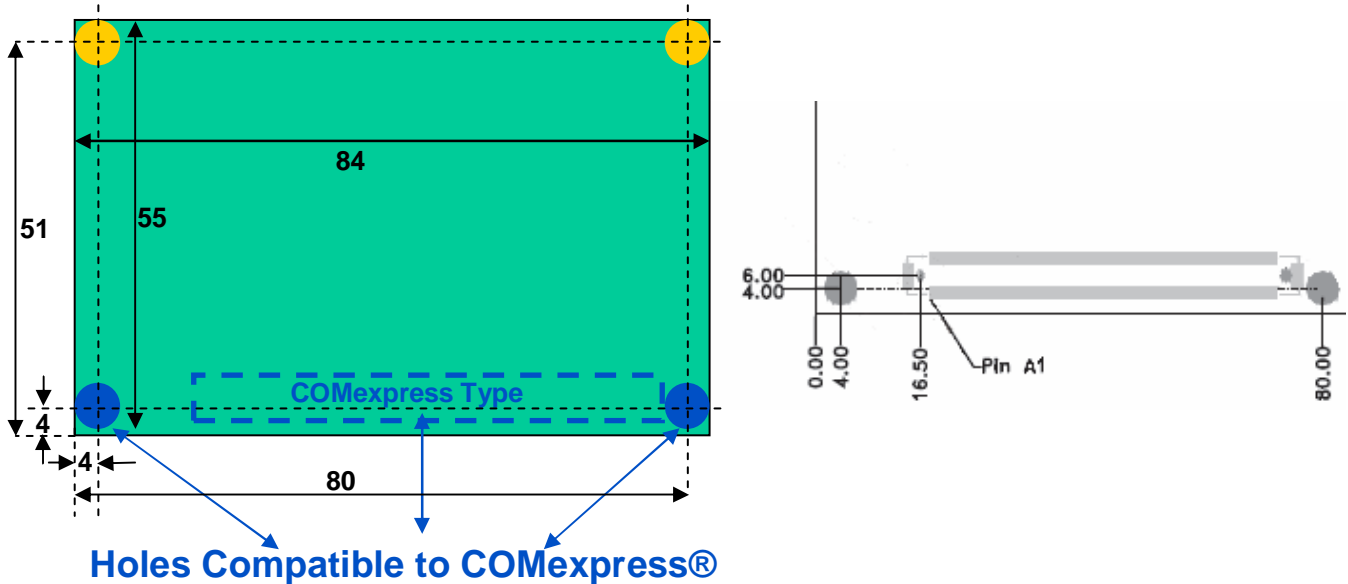
Onboard routing			recommended Use
Poulsbo	Description	COMexpress	
USB3 _2	USB 2.0 compliant, USB2 can be set as client	USB6 USB7	Xpress Card USB mini client
USB6 _7	Not USB compliant, no UHCI controller	USB4 USB5	Internal pin Header
USB4 _5	USB 2.0 compliant	USB2 USB3	USB Type A
USB0 _1	USB 2.0 compliant	USB0 USB1	USB Type A

## 4. Mechanical Specification

### 4.1 Module Size - Nano Module

The PCB size for the nano module is defined as 55mm x 84mm. The holes shown in this drawing are intended for mounting the module / heat-spreader combination to the carrier board. An independent, implementation specific set of holes and spacers shall be used to attach the heat-spreader to the module.

**Figure 3 – nanoETXexpress Form Factor**



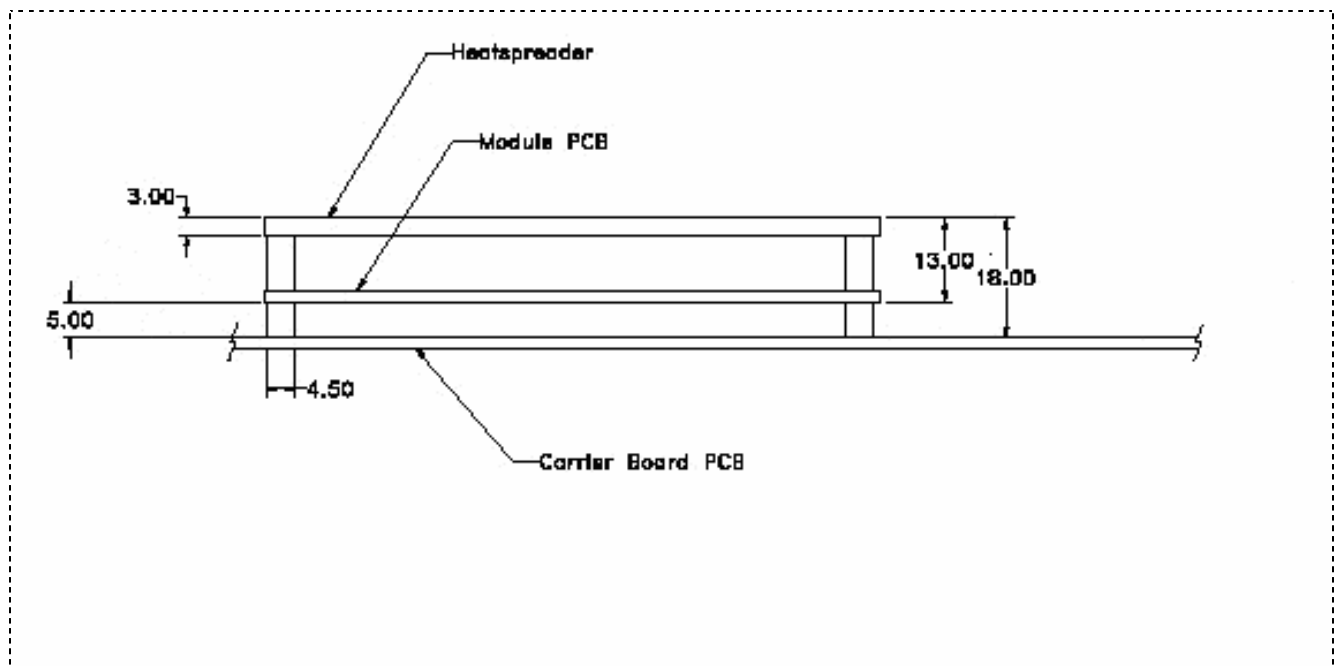
All dimensions are shown in millimetres. Tolerances should be  $\pm 0.25\text{mm}$  [ $\pm 0.010$ "], unless noted otherwise. The tolerances on the module connector locating peg holes (dimensions [16.50, 6.00]) should be  $\pm 0.10\text{mm}$  [ $\pm 0.004$ "].

The 220 pin connector shall be mounted on the backside of the PCB and is seen “through” the board in this view. The X mounting holes shown should use 6mm diameter pads and should have 2.7mm plated holes, for use with 2.5mm hardware. The pads should be tied to the PCB ground plane.

## 4.2 Heat-Spreader

Modules should be equipped with a heat-spreader. This heat-spreader by it self does not constitute the complete thermal solution for a module but provides a common interface between modules and implementation-specific thermal solutions. The overall module height from the bottom surface of the module board to the heat-spreader top surface should be 13mm for the nano modules. The module PCB and heat spreader plate thickness are vendor implementation specific A 2mm PCB with a 3mm heat-spreader should be used which allows use of readily available standoffs and to be mechanical compatible to COM Express™ heat spreader solutions.

**Figure 4 - Overall Height for in Nano Modules including Heat-Spreader, compatible to COM Express™**



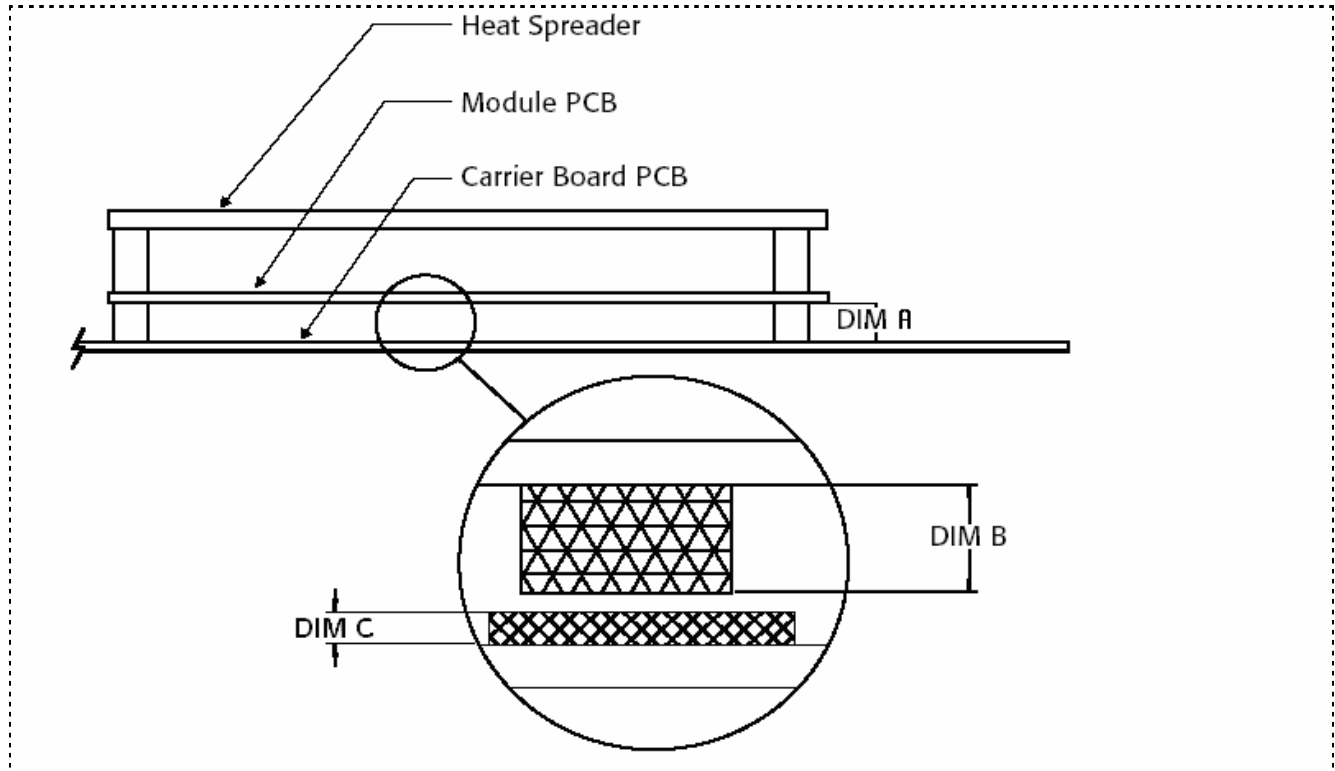
### 4.3 Component Height - Module Back and Carrier Board Top

Parts mounted on the backside of the module (in the space between the bottom surface of the module PCB and the carrier board) should have a maximum height of 3.8mm (dimension 'B' in Figure 5).

With the 5mm stack option, the clearance between the carrier board and the bottom surface of the module's PCB is 5mm (dimension 'A' in Figure 5). Using the 5mm stack option, components placed on carrier board topside under the module envelope should be limited to a maximum height of 1mm (dimension 'C' in Figure 5), with the exception of the mating connectors. Using carrier board topside components up to 1mm allows a gap of 0.2mm between carrier board module bottom side components. This may not be sufficient in some situations. In carrier board applications in which vibration or board flex is a concern, then the carrier board component height should be restricted to a value less than 1mm that yields a clearance that is sufficient for the application.

If the carrier board uses the 8mm stack option (dimension 'A' in Figure 5), then the carrier board topside components within the module envelope shall be limited to a height of 4mm (dimension 'C' in Figure 5), with the exception of the mating connectors. Using carrier board topside components up to 4mm allows a gap of 0.2mm between carrier board topside components and module bottom side components. This may not be sufficient in some situations. In carrier board applications in which vibration or board flex is a concern, then the carrier board component height should be restricted to a value less than 4mm that yields a clearance that is sufficient for the application.

**Figure 5 - Component Clearances underneath Module**



## 5. Electrical Specifications

### 5.1 Input Power - General Considerations

The nano modules should use a single main power rail with a wide range power supply of 5V to +14V+/-5% (4,75V to 14,7V)

Two additional rails are specified, a +5V standby power rail and a +3V battery input to power the module real-time clock (RTC) circuit in the absence of other power sources. The +5V standby rail could be left unconnected on the carrier board if the standby functions are not required by the application. Likewise, the +3V battery input may be left open if the application does not require the RTC to keep time in the absence of the main and standby sources. There may be module specific concerns regarding storage of system setup parameters that may be affected by the absence of the +5V standby and / or the +3V battery.

The rationale for this power-delivery scheme is:

- Module pins are scarce. It is more pin-efficient to bring power in on a higher voltage rail.
- Single supply operation is attractive to many users.
- Lithium ion battery packs for mobile systems are most prevalent with a +14.4V output. This is well suited for the +12V main power rail.
- Contemporary chipsets have no power requirements for +5V other than to provide a reference voltage for +5V tolerant inputs. No ETXexpress<sup>®</sup> module pins are allocated to accept +5V except for the +5V standby pins. In the case of an ATX supply, the switched (non standby) +5V line would not be used for the ETXexpress<sup>®</sup> module, but it might be used elsewhere on the carrier board.

PICMG and COM Express are trademarks of the PCI Industrial Computers Manufacturers Group.  
©Copyright PCI Industrial Computer Manufactures Group

## 6. Revision History

0.5	18.01.2008.	initial release, extract from with paper document	VGG
0.6	19.02.2008	complete rework all chapters, update drawings	VGG
0.7	29.02.2008	displace "compliant" with "compatible"	VGG
0.8	24.06.2008	add client port as port 7	VGG
0.8.1	29.07.2008	Format modification	GSS
0.8.2	04.08.2008	minor changes	GSS