Product Features

- 3.3V Operation
- ACPI Compliant
- LPC Interface
  - LPC I/O Cycles Decoded
- VTR (standby) and VBAT (Power Planes)
  - Low Standby Current in Sleep Mode
- Configuration Register Set
  - Compatible with ISA Plug-and-Play Standard
  - EC-Programmable Base Address
- ARC-625D Embedded Controller (EC)
  - 16 KB Single Cycle 32-bit Wide Dual-ported SRAM, Accessible as Closely Coupled Data Memory and Instruction Memory
  - 32 x 32 x 64 Fast Multiply
  - Divide Assist and Saturation Arithmetic
  - Maskable Interrupt Aggregator/Accelerator Interface
  - Maskable Hardware Wake-Up Events
  - Sleep mode
  - JTAG Debug Port, Includes JTAG Master
  - MCU Serial Debug Port
  - 8-Channel DMA Interface Supports SMBus Controllers and EC/Host GP-SPI Controllers
  - Delay Register
  - Boot ROM
- Embedded Flash
  - 192 KB user space 32-bit Access, 30 ns Access Time, 10 K Cycles Endurance
  - 1 KB EEPROM Emulation, 40 ns Access Time, 250 K Cycles Endurance
  - Programmable by LPC, EC and JTAG Interfaces
  - Flash Security Enhancements
    - 4K Boot Block Protection
    - Direct JTAG and Direct LPC-protected (2) Pages at or Near Top of Memory for Password Protection
- Legacy Support
  - Fast GATEA20 & Fast CPU_RESET
  - System to EC Message Interface
    - 8042 Style Host Interface
    - Embedded Memory Interface
      - Host Serial or Parallel IRQ Source
      - Provides Two Windows to On-Chip SRAM for Host Access

- Two Register Mailbox Command Interface
- Host Access of Virtual Registers Without EC Intervention
- Mailbox Registers Interface
  - Thirty-two 8-Bit Scratch Registers
  - Two Register Mailbox Command Interface
  - Two Register SMI Source Interface
- ACPI Embedded Controller Interface
  - Four Instances
  - 1 or 4 Byte Full Duplex Bidirectional Data Transfer Capable
- ACPI Power Management Interface
  - SCI Event-Generating Functions
- BIOS Debug Port
  - ISA Port 80 Plug-in Card Emulation
  - 2 Instances
  - Time Stamping Option
- Battery Backed Resources
  - Power-Fail Status Register
  - 32 KHz Clock Generator
  - Week Alarm Timer Interface with Programmable Wake-up from 1ms to 45 Days
  - VBAT-Powered Control Interface
    - 6 Latched Inputs
    - GPIO Capable
  - VBAT-Backed 64 Byte Memory
- Three EC-based SMBus 2.0 Host Controllers
  - Allows Master or Dual Slave Operation
  - Controllers are Fully Operational on Standby Power
  - DMA-driven I²C Network Layer Hardware
  - I²C Datalink Compatibility Mode
  - Multi-Master Capable
  - Supports Clock Stretching
  - Programmable Bus Speeds
    - 400 KHz Capable
  - Hardware Bus Access “Fairness” Interface
  - SMBus Time-outs Interface
  - 12 Port Flexible Multiplexing
  - Port Isolation
- PECI Interface 3.0
- Keyboard Matrix Scan Interface
  - 18 x 8 Interrupt/Wake Capable Multiplexed Keyboard Scan Matrix
  - Row Predrive Option

Low Power 32-bit Microcontroller with Embedded Flash

MEC1621/MEC1621i

© 2014 Microchip Technology Inc.
• Three independent Hardware Driven PS/2 Ports
  - Fully functional on Main and/or Suspend Power
  - PS/2 Edge Wake Capable
• 146 General Purpose I/O Pins
  - 8 GPIO Pass-Through Port (GPTP)
• 3-pin LED Interface
  - Programmable Blink Rates
  - Piecewise Linear Breathing LED Output Controller
  - Operational in EC Sleep States
• Programmable 16-bit Counter/Timer Interface
  - Four Wake-capable 16-bit Auto-reloading Counter/Timer Instances
  - Four Operating Modes per Instance: Timer, One-shot, Event and Measurement.
  - 4 External Inputs, 4 External Outputs
• Hibernation Timer Interface
  - Two 32.768 KHz Driven Timers
  - Programmable Wake-up from 0.5ms to 128 Minutes
• System Watch Dog Timer (WDT)
• Input Capture and Compare Timer
  - 32-bit Free-running timer
  - Six 32-bit Capture Registers
  - Two 32-bit Compare Registers
  - Capture, Compare and Overflow Interrupts
• BC-Link™ Interconnection Bus
  - Two High Speed and one Low Speed Bus Masters Controllers
• Two General Purpose Serial Peripheral Interface Controllers (ECGP-SPI)
  - One 3-pin EC-driven Full Duplex Serial Communication Interface
  - One 4-pin EC/Host-driven Full Duplex Serial Communication Interface to SPI Flash Interface
  - Flexible Clock Rates
  - SPI Burst Capable
• FAN Support
  - 16 Programmable Pulse-Width Modulator Outputs
    - Multiple Clock Rates
    - 16-Bit ‘On’ & 16-Bit ‘Off’ Counters
  - 6 Fan Tachometers
  - 6 x 2 Capture/Compare Timer Interface
• ADC Interface
  - 10-bit Conversion in 10μs
  - 16 Channels
  - Integral Non-Linearity of ±0.5 LSB; Differential Non-Linearity of ±0.5 LSB
• HDMI-CEC Interface Controller
• Thermal Monitoring Interface
  - 4 Temperature Channels
    - 3 External Channels
    - 1 Internal Channel
    - Diode or Thermistor Support
  - Fail-Safe Temperature Feature
    - Dedicated hands-off monitoring on Temperature Channel 1
    - HW Strapping for Threshold Temperature and for Diode/Thermistor choice
    - System Shutdown output, Integrated with EC VCI_OUT logic
• Two Pin Debug Port with Standard 16C550A Register Interface
  - Accessible from Host and EC
  - Programmable Input/output Pin Polarity Inversion
  - Programmable Main Power or Standby Power Functionality
  - Standard Baud Rates to 115.2 Kbps, Custom Baud Rates to 2 Mbps
• Resistor/Capacitor Identification Detection (RC_ID)
  - Single Pin Interface to External Inexpensive RC Circuit
  - Replacement for Multiple GPIO’s
  - Provides 8 Quantized States on One Pin
• Integrated Standby Power Reset Generator
• Gang Programmer Interface
  - JTAG Enabled
  - Supports Mass Programming and Mass Verify
  - JTAG Mass Erase
• Clock Generator
  - VBAT powered 32.768 KHz Oscillator ±2% Accuracy
  - VBAT powered 32.768 KHz external input
  - External Clock Auto Detect Option
  - Operational on Suspend Power
  - Programmable Clock Power Management Control & Distribution
  - 20.27 MHz (nom) Oscillator
• Packages:
  - 176 Pin LFBGA RoHS Compliant package
  - 225 Pin LFBGA RoHS Compliant package
Description

The MEC1621/MEC1621i is the mixed signal base component of a multi-device advanced I/O controller architecture. The MEC1621/MEC1621i incorporates a high-performance 32-bit ARC 625D embedded microcontroller with a 192 Kilobyte Embedded Flash Subsystem, 16 Kilobytes of SRAM and a 1 Kilobyte EEPROM Emulation. The MEC1621/MEC1621i communicates with the system host using the Intel® Low Pin Count bus.

The MEC1621/MEC1621i is the EC Base Component of a split-architecture Advanced I/O Controller system which uses BC-Link™ communication protocol to access up to three companion components. The BC-Link™ protocol is peer-to-peer providing communication between the MEC1621/MEC1621i embedded controller and registers located in a companion.

The MEC1621/MEC1621i is directly powered by two separate suspend supply planes (VBAT and VTR) and senses a third runtime power plane (VCC) to provide “instant on” and system power management functions. The MEC1621/MEC1621i also contains an integrated VTR Reset Interface and a system Power Management Interface that supports low-power states and can drive state changes as a result of hardware wake events as defined by the MEC1621/MEC1621i Wake Interface.

The MEC1621/MEC1621i defines a software development system interface that includes an MCU Serial Debug Port, a two pin serial debug port with a 16C550A register interface that is accessible to the EC or to the LPC host and can operate up to 2 MB/s, a flexible Flash programming interface, a BIOS Debug Port, Gang Programmer Interface, and a JTAG interface. The EC can also drive the JTAG interface as a master.

A top-level block diagram of the MEC1621/MEC1621i is shown below in FIGURE 1: MEC1621/MEC1621i Block Diagram on page 5.
TO OUR VALUED CUSTOMERS

It is our intention to provide our valued customers with the best documentation possible to ensure successful use of your Microchip products. To this end, we will continue to improve our publications to better suit your needs. Our publications will be refined and enhanced as new volumes and updates are introduced.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via E-mail at docerrors@microchip.com. We welcome your feedback.

Most Current Data Sheet

To obtain the most up-to-date version of this data sheet, please register at our Worldwide Web site at:

http://www.microchip.com

You can determine the version of a data sheet by examining its literature number found on the bottom outside corner of any page. The last character of the literature number is the version number, (e.g., DS30000000A is version A of document DS30000000).

Errata

An errata sheet, describing minor operational differences from the data sheet and recommended workarounds, may exist for current devices. As device/documentation issues become known to us, we will publish an errata sheet. The errata will specify the revision of silicon and revision of document to which it applies.

To determine if an errata sheet exists for a particular device, please check with one of the following:

• Microchip’s Worldwide Web site; http://www.microchip.com
• Your local Microchip sales office (see last page)

When contacting a sales office, please specify which device, revision of silicon and data sheet (include -literature number) you are using.

Customer Notification System

Register on our web site at www.microchip.com to receive the most current information on all of our products.
FIGURE 1: MEC1621/MEC1621i Block Diagram

MEC1621/MEC1621i

Block Diagram

Notes
1) All blocks powered by VTR except where noted.
2) Signals with unique electrical requirements are highlighted.
3) Asterisks (*) denote multiplexed signal functions.
FIGURE 2: 176-PIN LFBGA 10MM X 10MM BODY, 0.65MM PITCH

Note: For the most current package drawings, see the Microchip Packaging Specification at http://www.microchip.com/packaging
FIGURE 3: 225-PIN LFBGA 13MM X 13MM BODY, 0.8MM PITCH

Note: For the most current package drawings, see the Microchip Packaging Specification at http://www.microchip.com/packaging.
APPENDIX A: PRODUCT BRIEF REVISION HISTORY

TABLE A-1: REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision</th>
<th>Section/Figure/Entry</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS00001774A (06-05-14)</td>
<td>Document Release</td>
<td></td>
</tr>
</tbody>
</table>
THE MICROCHIP WEB SITE

Microchip provides online support via our WWW site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user’s guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQ), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip’s customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com. Under “Support”, click on “Customer Change Notification” and follow the registration instructions.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://www.microchip.com/support
PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>Device</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Tape and Reel Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEC1621, MEC1621i</td>
<td>Blank = 0°C to +85°C (Extended Commercial)</td>
<td>RZP = 176-pin LFBGA</td>
<td>Blank = Standard packaging (tray)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>i = -40°C to +85°C (Industrial)</td>
<td>VE = 225-pin LFBGA</td>
<td>TR = Tape and Reel(1)</td>
</tr>
</tbody>
</table>

Examples:

a) MEC1621-RZP
   176-pin LFBGA (10mm x 10mm, 0.65mm pitch)
   RoHS Compliant package
b) MEC1621i-RZP
   176-pin LFBGA (10mm x 10mm, 0.65mm pitch)
   RoHS Compliant package with Industrial Temperature rating
c) MEC1621-VE
   225-pin LFBGA (13mm x 13mm, 0.8mm pitch)
   RoHS Compliant package
d) MEC1621i-VE
   225-pin LFBGA (13mm x 13mm, 0.8mm pitch)
   RoHS Compliant package with Industrial Temperature rating

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option. Reel size is 4,000.
Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip’s Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip’s code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer’s risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOG, KEELOGO logo, MPLAB, PIC, PICmicro, PICSTART, PIC32 logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, Hi-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MFF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestiC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

flexPWR, JukeBlox, Kleer, KleerNet, MediaLB, and MOST

The preceding is a non-exhaustive list of trademarks in use in the US and other countries. For a complete list of trademarks, email a request to legal.department@microchip.com. The absence of a trademark (name, logo, etc.) from the list does not constitute a waiver of any intellectual property rights that SMSC has established in any of its trademarks.

All other trademarks mentioned herein are property of their respective companies.

© 2014, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 9781632762696
## Worldwide Sales and Service

### AMERICAS
**Corporate Office**
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support: [http://www.microchip.com/support](http://www.microchip.com/support)
Web Address: [www.microchip.com](http://www.microchip.com)

**Atlanta**
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

**Austin, TX**
Tel: 512-257-3370

**Boston**
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

**Chicago**
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

**Cleveland**
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

**Dallas**
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

**Detroit**
Novi, MI
Tel: 248-848-4000

**Houston, TX**
Tel: 281-894-5983

**Indianapolis**
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

**Los Angeles**
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

**New York, NY**
Tel: 631-435-6000

**San Jose, CA**
Tel: 408-735-9110

**Canada - Toronto**
Tel: 905-673-0699
Fax: 905-673-6509

### ASIA/PACIFIC
**Asia Pacific Office**
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2943-5100
Fax: 852-2401-3431

**Australia - Sydney**
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

**China - Beijing**
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

**China - Chengdu**
Tel: 86-28-8665-5011
Fax: 86-28-8665-7889

**China - Chongqing**
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

**China - Hong Kong SAR**
Tel: 852-2943-5100
Fax: 852-2401-3431

**China - Hangzhou**
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

**China - Shanghai**
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

**China - Shenyang**
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

**China - Shenzhen**
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

**China - Wuhan**
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

**China - Xian**
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

**China - Xiamen**
Tel: 86-592-2388138
Fax: 86-592-2388130

**China - Zhuhai**
Tel: 86-756-3210040
Fax: 86-756-3210049

**India - Bangalore**
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

**India - New Delhi**
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

**India - Pune**
Tel: 91-20-3019-1500

**Japan - Osaka**
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

**Japan - Tokyo**
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

**Korea - Daegu**
Tel: 82-53-744-4301
Fax: 82-53-744-4302

**Korea - Seoul**
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or 82-2-558-5934

**Malaysia - Kuala Lumpur**
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

**Malaysia - Penang**
Tel: 60-4-227-8870
Fax: 60-4-227-4068

**Philippines - Manila**
Tel: 63-2-634-9065
Fax: 63-2-634-9069

**Singapore**
Tel: 65-6334-8870
Fax: 65-6334-8850

**Taiwan - Hsin Chu**
Tel: 886-3-5778-366
Fax: 886-3-5770-955

**Taiwan - Kaohsiung**
Tel: 886-7-213-7830

**Taiwan - Taipei**
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

**Thailand - Bangkok**
Tel: 66-2-694-1351
Fax: 66-2-694-1350

### EUROPE
**Austria - Wels**
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

**Denmark - Copenhagen**
Tel: 45-4450-2828
Fax: 45-4485-2829

**France - Paris**
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

**Germany - Dusseldorf**
Tel: 49-2129-3766400

**Germany - Munich**
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

**Germany - Pforzheim**
Tel: 49-7231-424750

**Italy - Milan**
Tel: 39-091-742611
Fax: 39-0931-466781

**Italy - Venice**
Tel: 39-049-7625286

**Netherlands - Drunen**
Tel: 31-416-690399
Fax: 31-416-690340

**Poland - Warsaw**
Tel: 48-22-3325737

**Spain - Madrid**
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

**Sweden - Stockholm**
Tel: 46-8-5090-4654

**UK - Wokingham**
Tel: 44-118-921-5800
Fax: 44-118-921-5820

© 2014 Microchip Technology Inc.