Mixed Signal Mobile Embedded Flash ARC EC BC-Link/ VLPC Base Component

Product Features

- 3.3V Operation
- ACPI Compliant
- LPC Interface
  - LPC I/O and Trusted 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
  - 2 KB Instruction Cache and AHB Memory-mapped SPI Flash Read Controller
  - 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
- Embedded Flash
  - 192 KB user space + 2kB info block, 32-bit Access, 35ns Access Time, 1 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 Data transfer capable
- ACPI Power Management Interface
  - SCI Event-Generating Functions
- 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
  - 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
- 8 x 3 x 3 Port Multiplexing
- PECI Interface 2.0
- 18 x 8 Interrupt Capable Multiplexed Keyboard Scan Matrix
- Three independent Hardware Driven PS/2 Ports
  - Fully functional on Main and/or Suspend Power
  - PS/2 Edge Wake Capable
- 115 General Purpose I/O Pins
  - 8 GPIO Pass-Through Port (GPTP)
• 3-pin LED Interface
  - Programmable Blink Rates
  - Breathing LED Output
  - Operational in EC Sleep State
• 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
• Microchip’s Multipoint VLPC™ Serial Interconnect Bus Master
  - Forwards LPC transactions to VLPC peripherals
  - Forwards ARC transactions to VLPC peripherals
• BC-Link™ Interconnection Bus
  - Three 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
• SPI Flash Read Controller
  - 4 MB AHB Memory-Mapped address space
  - Supports 2 KB EC Instruction Cache
• FAN Support
  - 8 Programmable Pulse-Width Modulator Outputs
    - Multiple Clock Rates
    - 16-Bit ‘On’ & 16-Bit ‘Off’ Counters
  - Four Fan Tachometer Inputs
  - 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
• 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
• Clock Generator
  - 32.768 KHz-input Clock
  - operational on Suspend Power
  - Programmable Clock Power Management
    Control & Distribution
  - 64.52 MHz ±2% Accuracy
• Packages
  - 144 Pin LFBGA RoHS Compliant package
  - 144 Pin TFBGA RoHS Compliant package
• Operating Temperature
  - The MEC1609 supports the commercial tempera-
    ture range of 0°C to +70°C
  - The MEC1609i supports the industrial tem-
    perature range of -40°C to +85°C
Description

The MEC1609/MEC1609i is the mixed signal base component of a multi-device advanced I/O controller architecture. The MEC1609/MEC1609i incorporates a high-performance 32-bit ARC 625 embedded microcontroller with a 192 Kilo-byte embedded Flash subsystem, 16 Kilobytes of SRAM and 2 Kilobytes of instruction cache with an AHB memory-mapped SPI Flash Read Controller. The MEC1609 communicates with the system host using the Intel® Low Pin Count bus.

There are two distinct protocols that provide communication between the MEC1609/MEC1609i base component and companion components: BC-Link™ and VLPC™. BC-Link™ in the MEC1609/MEC1609i can access up to four companion components. The BC-Link™ protocol is peer-to-peer providing communication between the MEC1609/MEC1609i embedded controller and registers located in a companion. VLPC™ is a multi-drop protocol that matches the MEC1609/MEC1609i with up to three untrusted companion components and one trusted companion component. The MEC1609/MEC1609i accepts LPC Host (ICH/PCH) transactions targeting blocks internal to the MEC1609/MEC1609i and blocks physically located in VLPC™ companions. The ARC 625 embedded microcontroller can also access blocks that are physically located in VLPC™ companion components.

The MEC1609/MEC1609i 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 MEC1609/MEC1609i 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 MEC1609/MEC1609i Wake Interface.

The MEC1609/MEC1609i 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 and a JTAG interface. The EC can also drive the JTAG interface as a master.

A top-level block diagram of the MEC1609/MEC1609i is shown in FIGURE 1: MEC1609/MEC1609i Top-Level Block Diagram on page 5. An example of system level connection is shown in FIGURE 2: Example of MEC1609/MEC1609i's Connections to System Components on page 6.
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FIGURE 1: MEC1609/MEC1609i TOP-LEVEL BLOCK DIAGRAM

1) All blocks powered by VTR except where noted.
2) Signals with unique electrical requirements are highlighted.
3) Asterisks (*) denote multiplexed signal functions.

Notes
FIGURE 2: EXAMPLE OF MEC1609/MEC1609i’S CONNECTIONS TO SYSTEM COMPONENTS
MEC1609/MEC1609i

PACKAGE OUTLINES

Note: For the most current package drawings, see the Microchip Packaging Specification at http://www.microchip.com/packaging.

FIGURE 3: 144-PIN LFBGA 10x10x0.8 MM PACKAGE OUTLINE (1.4 MM HEIGHT)
FIGURE 4: 144-PIN TFBGA 7X7X0.5 MM PACKAGE OUTLINE (1.2 MM HEIGHT)

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

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<tr>
<th>Revision</th>
<th>Section/Figure/Entry</th>
<th>Correction</th>
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<td>Document Release</td>
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<table>
<thead>
<tr>
<th>PART NO.</th>
<th>Device</th>
<th>Temperature Range</th>
<th>Package</th>
<th>Tape and Reel Option</th>
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<tr>
<td>[X]</td>
<td>MEC1609, MEC1609i</td>
<td>Blank = 0°C to +70°C (Extended Commercial)</td>
<td>PZV = 144-pin TFBGA</td>
<td>Blank = Standard packaging (tray)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>i = -40°C to +85°C (Industrial)</td>
<td>PZP = 144-pin LFBGA</td>
<td>TR = Tape and Reel</td>
</tr>
</tbody>
</table>

**Examples:**

1. **MEC1609-PZV**
   - 144-pin TFBGA (7mm x 7mm, 0.5 pitch)
   - RoHS Compliant package

2. **MEC1609-PZP**
   - 144-pin TFBGA (10mm x 10mm, 0.8 pitch)
   - RoHS Compliant package

3. **MEC1609i-PZV**
   - Industrial temperature, 144-pin TFBGA (7mm x 7mm, 0.5 pitch)
   - RoHS Compliant package

4. **MEC1609i-PZP**
   - Industrial temperature, 144-pin TFBGA (10mm x 10mm, 0.8 pitch)
   - RoHS Compliant package

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ISBN: 9781632762627
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