

MIC-760EM

ENGINEERING SPECIFICATION

*Intel Pentium M ULV 1.2GHz CPU Module with
Intel® 915GM chipset*

Revision 0.1
July 25, 2005

MOTION INDUSTRY CO., LTD

1. Introduction

The MOTION INDUSTRY MIC-760EM is a CPU module features single Intel® Pentium M ULV 1.2 GHz processor, based on Mobile Intel® 915GM Express chipset. MIC-760EM supports 512 MB DDR2 SDRAM on-board.

MIC-760EM includes contemporary high bandwidth interface such as PCI Express, USB2.0, Serial ATA, etc. It also features 32-bit PCI bus, LPC, Parallel ATA, Audio, VGA, TV-out, LVDS, etc. The baseboard designer can optimize exactly how each of these functions is physically implemented.

In addition, a backup interface of BIOS is implemented for users to write to the flash even when the BIOS is corrupted and inaccessible for the system.

1.1 Overview

Table 1.1 MIC-760EM Overview

Form Factor	CPU module (85mm x 121mm)
Processor	Single Intel® Pentium M ULV 1.2 GHz Processor, 400MHz FSB
Memory	On-board DDR2 memory (Channel B): 512MB
Chipset	Intel® 915GM Express Graphic Memory Controller Hub Intel® I/O Controller Hub 6 Mobile (ICH6-M)
PCI Express x16 Discrete Graphics	One 16-lane PCI Express port (x16) intended for Graphics Attach
SDVO	Two SDVO ports are supported. SDVO ports are multiplexed with PCI Express x16 interface.
CRT VGA	Analog CRT DAC Interface Up to 2048x1536 mode support.
TV-out	Analog TV-Out Interface Up to 1024x768 resolution supported for NSTC/PAL HDTV 480p/720p/1080i/1080p modes support
LVDS	Digital LVDS interface. Dual channel LVDS interface support: 2x18 bpp
PCI Express x1	Four x1 PCI Express ports support
Audio	Intel High Definition Audio Controller (Azalia) & AC'97 2.3 Controller The Azalia and AC'97 interface are shared and concurrent operation is not supported.
USB 2.0	Eight USB 2.0 ports
Serial ATA	Two Serial ATA ports (150MB/s) Advanced Host Controller Interface (AHCI) support
Parallel ATA	One Parallel ATA channel supports up to two IDE devices, up to 100MB/s
PCI bus	32-bit, 33MHz, supports up to four PCI devices
LPC interface	Low Pin Count (LPC) interface support
SMBus	SMBus interface support (SMBus 2.0)
CMOS backup	One on-board EEPROM for BIOS CMOS backup
BIOS	4Mbit FWH Flash Memory
GPIO	Four GPI and four GPO pins support.

1.2 System Block Diagram

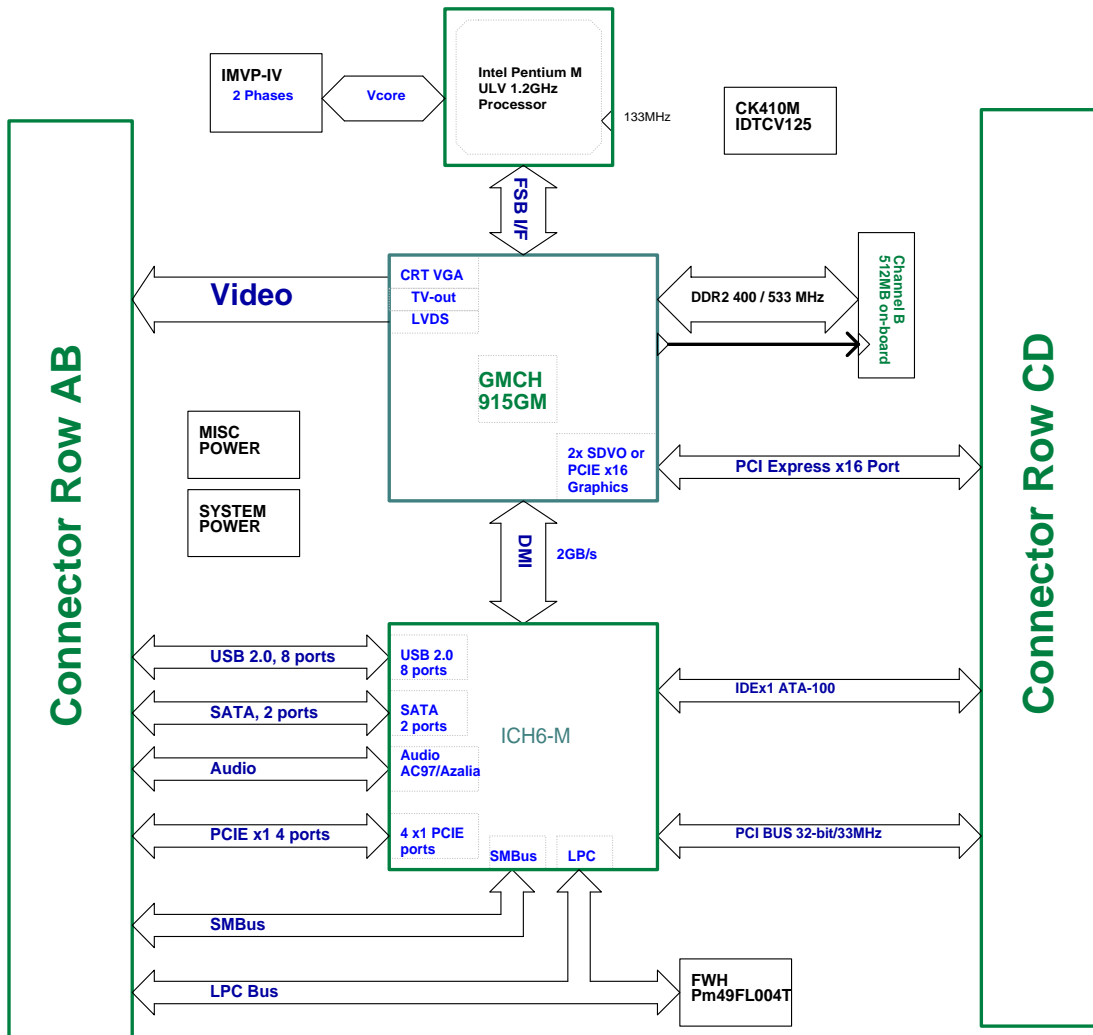


Fig 1.1 MIC-760EM System Block Diagram

2. Functions

2.1 Processor

MIC-760EM supports single Intel® Pentium® M ULV 1.2 GHz processor. The Intel® Pentium® M Processor based on 90-nm process technology featuring 2-MB L2 Cache and 400 FSB is the next generation high performance, low power mobile processor based on the Intel® Pentium® M processor architecture.

The following list provides the key features on this processor:

- Supports Intel® Architecture with Dynamic Execution
- High performance, low-power core
- On-die, primary 32-kbyte instruction cache and 32-kbyte write-back data cache
- On-die, 2-Mbyte second level cache with Advanced Transfer Cache Architecture
- Data Prefetch Logic
- Streaming SIMD extensions 2(SSE2)
- 400-MHz, source-synchronous FSB
- Advanced Power Management features including Enhanced Intel® SpeedStep® technology
- Micro-FCPGA & Micro-FCBGA packaging technologies
- Manufactured on Intel's advanced 90nm process technology with copper interconnect
- Support for MMX™ Technology and Internet Streaming SIMD instructions

2.2 Intel 915GM GMCH

The Mobile Intel 915GM (Alviso) GMCH features:

- Intel® Pentium® M processor - Dothan, Dothan LV, and Dothan ULV support
- Intel® Celeron® M, Celeron M ULV processor support
- 400 MHz FSB
- System memory supports 400MHz unbuffered non-ECC DDR2 SODIMM SDRAM
- PCI Express x16 Based Graphics Interface
- Analog CRT DAC interface support.
- Digital LVDS interface support
- Analog TV-Out Interface
- Serial Digital Video Output (SDVO support)
- Direct Media Interface (DMI) between GMCH and ICH6-M, 2GB/s point-to-point DMI to ICH6-M
- Package: Micro-FCBGA, 1257-pin, 37.5mm x 40mm

2.2.1 System Memory Support

- MIC-760EM implements on-board 512MB DDR2 400 memory on channel B
 - ELPIDA EDE5108AESK-5C-E (512Mb, 64Mx8 organization) chip
 - Eight devices (64Mx64) for 512MB memory
- Supports unbuffered devices.
- No ECC support

2.2.2 Integrated Display Interface support

915GM integrated display interface supports Analog CRT, Digital LVDS, Analog TV-Out, and SDVO

2.2.2.1 Analog CRT DAC interface support

- Supports max DAC frequency up to 400 MHz.
- 24-bit RANDAC support
- DDC2B compliant
- Up to 2048x1536 mode support

2.2.2.2 Digital LVDS interface support

- Supports 25 to 112 MHz single/dual channel LVDS interface
 - Single channel LVDS interface support 1 x 18 bpp
 - Dual channel LVDS interface support 2 x 18 bpp
 - TFT panel type supported
- Maximum Panel size supported up to UXGA
- Maximum Wide panel size supported up to WUXGA
- Ambient Light Sense support for automatic backlight brightness adjustments
- Intel Display Power Savings Technology 2.0 support

2.2.2.3 Analog TV-Out interface support

- Three digital 10 bit DAC
- Up to 1024x768 resolution supported for NTSC/PAL
- HDTV graphics resolutions: 480p/720p/1080i/1080p modes support
- Multiplexed Output interface
 - Composite Video
 - S-Video
 - Component Video (YprPb)
 - Combination: (Composite & S-Video)

2.2.2.4 Serial Digital Video Output (SDVO) support

- Two SDVO ports are supported
- Compliant with DVO specification 1.0E
- Each SDVO port support display pixel rates up to 200MP/s (600MB/s)
 - The Two SDVO ports are combined to gang mode to support pixel rates up to 400MP/s (1200MB/s)

2.3 Intel I/O Controller Hub 6 Mobile (ICH6-M)

The ICH6-M features:

- Four PCI Express x1 ports
- PCI 33-bit/33MHz Bus interface
- Two Serial ATA ports, 150MB/s, integrated AHCI controller
- One parallel IDE channel supports up to two devices, up to Ultra ATA-100
- Audio Interface
 - Intel High Definition Audio Interface
 - AC'97 Link for Audio and Telephony CODEs
- Eight USB 2.0 ports
- SMBus 2.0 interface support
- Firmware Hub I/F supports BIOS memory size up to 8 Mbytes
- Low Pin Count (LPC) I/F
- Package: 31mm x 31mm, 609 pins mBGA

2.4 BIOS

- On-board PMC Pm49FL004 4Mbit FWH flash memory
- Flash-write protection will be implemented under software control

2.5 BIOS CMOS Backup

- One serial EEPROM ATMEL AT24C02A (2K, 256x8) for CMOS backup
- EEPROM should be implement on carrier

2.6 GPIOs on B2B Connector

- MIC-760EM supports four general purpose inputs and four general purpose outputs compliant with COM Express Module Specification

2.7 SMBus Slave Devices Address

Below is the address list of SMBus devices on MIC-760CB

Table 2.1 SMBus Slave Devices List

Address (HEX)	Function	Device
10100100 (A4)	DDR2 channel B	On-board memory
10101110 (AE)	CMOS backup	AT24C02A
11100010 (D2)	Clock generator	IDTCV125

2.10 GPIO List

Below is the GPIOs list on ETXexpress-IA533, all GPIOs are from ICH6-M

Table 2.2 GPIO Signals List

Pin (ICH6-M)	Input / Output	Signal	Description
GPI[2]	Input	CN_GPI0	COM Express GPI0
GPI[3]	Input	CN_GPI1	COM Express GPI1
GPI[4]	Input	CN_GPI2	COM Express GPI2
GPI[5]	Input	CN_GPI3	COM Express GPI3
GPI[7]	Input	EXCD0_CPPE#	PCI Express Card0 request
GPI[12]	Input	EXCD1_CPPE#	PCI Express Card1 request
GPO[16]	Output	FWH_WP#	FWH Write Protect
GPO[17]	Output	CN_GPO0	COM Express GPO0
GPO[21]	Output	CN_GPO1	COM Express GPO1
GPIO[27]	Output	PCIECARD0_RST#	PCIExpress CARD0 Reset output
GPIO[28]	Output	PCIECARD1_RST#	PCIExpress CARD1 Reset output
GPI[29]	Input	PEG_ENABLE#	PCIExpress x16 Graphics Enable
GPIO[33]	Output	CN_GPO2	COM Express GPO2
GPIO[34]	Output	CN_GPO3	COM Express GPO3
GPO[48]	Output	FWH_TBL#	FWH Top Block Lock Output

3. B2B Connector

MIC-760EM implements two board-to-board connectors (440-pin) on backside, it is the same with COM-Express. Bellow is the pin list.

Table 3.1 MIC-760EM connector pin assignments

Row A		Row B		Row C		Row D	
No.	Pin Name	No.	Pin Name	No.	Pin Name	No.	Pin Name
A1	GND (FIXED)	B1	GND (FIXED)	C1	GND (FIXED)	D1	GND (FIXED)
A2	3.3V	B2	RTCRST#	C2	IDE_D7	D2	IDE_D5
A3	3.3V	B3	LPC_FRAME#	C3	IDE_D6	D3	IDE_D10
A4	3.3V	B4	LPC_AD0	C4	IDE_D3	D4	IDE_D11
A5	3.3V	B5	LPC_AD1	C5	IDE_D15	D5	IDE_D12
A6	3.3V	B6	LPC_AD2	C6	IDE_D8	D6	IDE_D4
A7	3.3V	B7	LPC_AD3	C7	IDE_D9	D7	IDE_D0
A8	3.3V	B8	LPC_DRQ0#	C8	IDE_D2	D8	IDE_REQ#
A9	3.3V	B9	LPC_DRQ1#	C9	IDE_D13	D9	IDE_IOW#
A10	3.3V	B10	LPC_CLK	C10	IDE_D1	D10	IDE_ACK#
A11	GND (FIXED)	B11	GND (FIXED)	C11	GND (FIXED)	D11	GND (FIXED)
A12	3.3V	B12	PWRBTN#	C12	IDE_D14	D12	IDE_IRQ
A13	2.5V ²	B13	SMB_CK ³	C13	IDE_IORDY	D13	IDE_A0
A14	2.5V ²	B14	SMB_DAT ³	C14	IDE_IOR#	D14	IDE_A1
A15	SUS_S3#	B15	SMB_ALERT#	C15	PCI_PME#	D15	IDE_A2
A16	SATA0_TX+	B16	SATA1_TX+	C16	PCI_GNT2#	D16	IDE_CS1#
A17	SATA0_TX-	B17	SATA1_TX-	C17	PCI_REQ2#	D17	IDE_CS3#
A18	SUS_S4#	B18	SUS_STAT#	C18	PCI_GNT1#	D18	IDE_RESET#
A19	SATA0_RX+	B19	SATA1_RX+	C19	PCI_REQ1#	D19	PCI_GNT3#
A20	SATA0_RX-	B20	SATA1_RX-	C20	PCI_GNT0#	D20	PCI_REQ3#
A21	GND (FIXED)	B21	GND (FIXED)	C21	GND (FIXED)	D21	GND (FIXED)
A22	CLK_PCIE_RSV2	B22	SUSCLK	C22	PCI_REQ0#	D22	PCI_AD1
A23	CLK_PCIE_RSV2#	B23	SATA3_TX- ¹	C23	PCI_RESET#	D23	PCI_AD3
A24	SUS_S5#	B24	PWR_OK	C24	PCI_AD0	D24	PCI_AD5
A25	SMI_HW#	B25	CLK33_RSV1	C25	PCI_AD2	D25	PCI_AD7
A26	WDT_SMI#	B26	CLK33_RSV2	C26	PCI_AD4	D26	PCI_C/BE0#
A27	BATLOW#	B27	WDT	C27	PCI_AD6	D27	PCI_AD9
A28	ATA_ACT#	B28	AC_SDIN2	C28	PCI_AD8	D28	PCI_AD11
A29	AC_SYNC	B29	AC_SDIN1	C29	PCI_AD10	D29	PCI_AD13
A30	AC_RST#	B30	AC_SDIN0	C30	PCI_AD12	D30	PCI_AD15
A31	GND (FIXED)	B31	GND (FIXED)	C31	GND (FIXED)	D31	GND (FIXED)
A32	AC_BITCLK	B32	SPKR	C32	PCI_AD14	D32	PCI_PAR
A33	AC_SDOOUT	B33	CLK_14M	C33	PCI_C/BE1#	D33	PCI_SERR#
A34	BIOS_DISABLE#	B34	CLK_48M	C34	PCI_PERR#	D34	PCI_STOP#
A35	THRMTRIP#	B35	THRM#	C35	PCI_LOCK#	D35	PCI_TRDY#
A36	USB6-	B36	USB7-	C36	PCI_DEVSEL#	D36	PCI_FRAME#
A37	USB6+	B37	USB7+	C37	PCI_IRDY#	D37	PCI_AD16
A38	USB_6_OC#	B38	USB_4_OC#	C38	PCI_C/BE2#	D38	PCI_AD18
A39	USB4-	B39	USB5-	C39	PCI_AD17	D39	PCI_AD20
A40	USB4+	B40	USB5+	C40	PCI_AD19	D40	PCI_AD22
A41	GND (FIXED)	B41	GND (FIXED)	C41	GND (FIXED)	D41	GND (FIXED)
A42	USB2-	B42	USB3-	C42	PCI_AD21	D42	PCI_AD24

Row A		Row B		Row C		Row D	
A43	USB2+	B43	USB3+	C43	PCI_AD23	D43	PCI_AD26
A44	USB_2_OC#	B44	USB_0_OC#	C44	PCI_C/BE3#	D44	PCI_AD28
A45	USB0-	B45	USB1-	C45	PCI_AD25	D45	PCI_AD30
A46	USB0+	B46	USB1+	C46	PCI_AD27	D46	PCI_IRQC#
A47	VCC_RTC	B47	EXCD1_PERST#	C47	PCI_AD29	D47	PCI_IRQD#
A48	EXCD0_PERST#	B48	EXCD1_CPPE#	C48	PCI_AD31	D48	PCI_CLKRUN#
A49	EXCD0_CPPE#	B49	SYS_RESET#	C49	PCI_IRQA#	D49	PCI_M66EN#
A50	LPC_SERIRQ	B50	CB_RESET#	C50	PCI_IRQB#	D50	PCI_CLK
A51	GND (FIXED)	B51	GND (FIXED)	C51	GND (FIXED)	D51	GND (FIXED)
A52	USB_7_OC#	B52	USB_5_OC#	C52	PEG_RX0+	D52	PEG_TX0+
A53	USB_3_OC#	B53	USB_1_OC#	C53	PEG_RX0-	D53	PEG_TX0-
A54	GPIO	B54	GPO1	C54	RSVD ¹	D54	PEG_LANE_RV#
A55	CLK_PCIE_RSV1	B55	PM_EXTTS#0	C55	PEG_RX1+	D55	PEG_TX1+
A56	CLK_PCIE_RSV1#	B56	1.5V	C56	PEG_RX1-	D56	PEG_TX1-
A57	GND	B57	GPO2	C57	RSVD ¹	D57	RSVD ¹
A58	PCIE3_TX+ ²	B58	PCIE3_RX+ ²	C58	PEG_RX2+	D58	PEG_TX2+
A59	PCIE3_TX- ²	B59	PCIE3_RX- ²	C59	PEG_RX2-	D59	PEG_TX2-
A60	GND (FIXED)	B60	GND (FIXED)	C60	GND (FIXED)	D60	GND (FIXED)
A61	PCIE2_TX+	B61	PCIE2_RX+	C61	PEG_RX3+	D61	PEG_TX3+
A62	PCIE2_TX-	B62	PCIE2_RX-	C62	PEG_RX3-	D62	PEG_TX3-
A63	GPI1	B63	GPO3	C63	RSVD ¹	D63	RSVD ¹
A64	PCIE1_TX+	B64	PCIE1_RX+	C64	RSVD ¹	D64	RSVD ¹
A65	PCIE1_TX-	B65	PCIE1_RX-	C65	PEG_RX4+	D65	PEG_TX4+
A66	GND	B66	WAKE0#	C66	PEG_RX4-	D66	PEG_TX4-
A67	GPI2	B67	WAKE1#	C67	RSVD ¹	D67	GND
A68	PCIE0_TX+	B68	PCIE0_RX+	C68	PEG_RX5+	D68	PEG_TX5+
A69	PCIE0_TX-	B69	PCIE0_RX-	C69	PEG_RX5-	D69	PEG_TX5-
A70	GND (FIXED)	B70	GND (FIXED)	C70	GND (FIXED)	D70	GND (FIXED)
A71	LVDS_A0+	B71	LVDS_B0+	C71	PEG_RX6+	D71	PEG_TX6+
A72	LVDS_A0-	B72	LVDS_B0-	C72	PEG_RX6-	D72	PEG_TX6-
A73	LVDS_A1+	B73	LVDS_B1+	C73	SDVO_DATA	D73	SDVO_CLK
A74	LVDS_A1-	B74	LVDS_B1-	C74	PEG_RX7+	D74	PEG_TX7+
A75	LVDS_A2+	B75	LVDS_B2+	C75	PEG_RX7-	D75	PEG_TX7-
A76	LVDS_A2-	B76	LVDS_B2-	C76	GND	D76	GND
A77	LVDS_VDD_EN	B77	VTT_1.05V	C77	RSVD ¹	D77	IDE_CBLID#
A78	THERMDC	B78	1.8V	C78	PEG_RX8+	D78	PEG_TX8+
A79	THERMDA	B79	LVDS_BKLT_EN	C79	PEG_RX8-	D79	PEG_TX8-
A80	GND (FIXED)	B80	GND (FIXED)	C80	GND (FIXED)	D80	GND (FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+	C81	PEG_RX9+	D81	PEG_TX9+
A82	LVDS_A_CK-	B82	LVDS_B_CK-	C82	PEG_RX9-	D82	PEG_TX9-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL	C83	RSVD ¹	D83	RSVD ¹
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY	C84	GND	D84	GND
A85	GPI3	B85	VCC_5V_SBY	C85	PEG_RX10+	D85	PEG_TX10+
A86	KBD_RST#	B86	VCC_5V_SBY	C86	PEG_RX10-	D86	PEG_TX10-
A87	KBD_A20GATE	B87	VCC_5V_SBY	C87	GND	D87	GND
A88	PCIE_CK_REF+	B88	VCORE	C88	PEG_RX11+	D88	PEG_TX11+
A89	PCIE_CK_REF-	B89	VGA_RED	C89	PEG_RX11-	D89	PEG_TX11-
A90	GND (FIXED)	B90	GND (FIXED)	C90	GND (FIXED)	D90	GND (FIXED)
A91	3.3VSB	B91	VGA_GRN	C91	PEG_RX12+	D91	PEG_TX12+
A92	3.3VSB	B92	VGA_BLU	C92	PEG_RX12-	D92	PEG_TX12-

Row A		Row B		Row C		Row D	
A93	GPO0	B93	VGA_HSYNC	C93	GND	D93	GND
A94	3.3VSB	B94	VGA_VSYNC	C94	PEG_RX13+	D94	PEG_TX13+
A95	3.3VSB	B95	VGA_I2C_CK	C95	PEG_RX13-	D95	PEG_TX13-
A96	GND	B96	VGA_I2C_DAT	C96	GND	D96	GND
A97	VCC_5V	B97	TV_DAC_A	C97	RSVD ¹	D97	PEG_ENABLE#
A98	VCC_5V	B98	TV_DAC_B	C98	PEG_RX14+	D98	PEG_TX14+
A99	VCC_5V	B99	TV_DAC_C	C99	PEG_RX14-	D99	PEG_TX14-
A100	GND (FIXED)	B100	GND (FIXED)	C100	GND (FIXED)	D100	GND (FIXED)
A101	VCC_5V	B101	VCC_5V	C101	PEG_RX15+	D101	PEG_TX15+
A102	VCC_5V	B102	VCC_5V	C102	PEG_RX15-	D102	PEG_TX15-
A103	VCC_5V	B103	VCC_5V	C103	GND	D103	GND
A104	VCC_5V	B104	VCC_5V	C104	VCC_5V	D104	VCC_5V
A105	VCC_5V	B105	VCC_5V	C105	VCC_5V	D105	VCC_5V
A106	VCC_5V	B106	VCC_5V	C106	VCC_5V	D106	VCC_5V
A107	VCC_5V	B107	VCC_5V	C107	VCC_5V	D107	VCC_5V
A108	VCC_5V	B108	VCC_5V	C108	VCC_5V	D108	VCC_5V
A109	VCC_5V	B109	VCC_5V	C109	VCC_5V	D109	VCC_5V
A110	GND (FIXED)	B110	GND (FIXED)	C110	GND (FIXED)	D110	GND (FIXED)

Note:

1. These pins are NC on MIC-760EM.
2. Pin A13 & A14 are output pins offer 1A max of 2.5V output. Other power pins are input pins.

Related Documentations

Vender	Document Title	Date / Revision
Intel	Intel® Pentium® M Processor on 90-nm Process with 2MB-L2 Cache	October 2004
Intel	RS - Mobile Dothan Processor with 533-MHz Front Side Bus electrical, Mechanical, and Thermal Specification	April 2004 / R1.0
Intel	RS – Mobile Intel® 915PM/GM/GMS and 910GML Express Chipset External Design Specification	April 2004 / R1.0
Intel	Intel® I/O Controller 6 (ICH6) Family External Design Specification	April 2004 / R1.5 v1
Intel	Intel® Pentium® M Processor and Mobile Intel® 915 & 910 Express Chipset – Sonoma Platform – Design Guide	June 2004 / R1.5
PICMG	COM Express Module 1.0 Base Specification	November 7 2004 / Draft Version 0.5

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