PCM-53E52

SC520 Half EBX PC

User Manual

Rev 0.1.0

Contents

Introduction

The PCM-53E52 is a compact Half-EBX board with PC/104Plus, SSD, Ethernet, and four COM ports. Unlike other compact Half-EBX boards, the PCM-53E52 has an optional Analog and Digital I/O Daughter Board, allowing for data acquisition and greater flexibility.

The PCM-53E52 features a low power AMD® ELAN-SC520 133Mhz processor (no fan required, P120 equiv.). This compact Half-EBX board has on board, 16MB of SDRAM memory standard. A 32MB to 128MB memory upgrade option is also available as is a DiskOnChip® 2000 (DOC) solid state flash disk (no moving parts). The PCM-53E52 can be connected onto a network using the Realtek® RTL8139C 10/100Base-T Ethernet controller and onboard RJ-45 connector. In addition, the PC/104Plus connectors provide both ISA and PCI connectivity.

The PCM-53E52 offers three RS-232 serial ports, one RS-232/422/485 serial port, and a parallel port that supports SPP/EPP/ECP parallel modes. This board includes a mini-DIN keyboard/mouse connector, an onboard 34-pin FDD interface that supports two floppy disk drives, and an onboard 44-pin EIDE interface that supports two EIDE devices. The PCM-53E52 is 5.75" in length and 4" wide, making it a great fit for harsh environment and limited-space applications.

The optional Analog and Digital I/O Daughter Board adds micro-controller capability with the power of a PC. The I/O daughter board includes 16, General Purpose I/O lines and eight high current sink outputs on a standard I/O Rack compatible 50 pin header. This board also includes: 16 channels of A/D with 10 or12-bit resolution, and four channels of D/A with 12-bit resolution. In addition, the I/O daughter board supports up to a 24-key keypad and is capable of driving up to a 40 x 4 character and graphic LCD displays.

Features

Single Board Computer

- Compact size (145 mm x 102 mm). Fits in the space of a 3 ½" HDD
- ISA and PCI bus expansion with onboard PC/104Plus connector
- Onboard ELAN SC520 133MHz embedded microprocessor
- Supports M-Systems' DiskOnChip® 2000 Flash memory
- Onboard 10/100 Base-T Ethernet interface
- Supports onboard 16MB SDRAM memory
- Onboard mini-DIN PS/2 keyboard/ mouse connector
- Built-in Enhanced IDE hard disk drive interface, floppy disk interface and parallel port
- Four serial ports: three RS-232 and one RS-422/485; on-board DB-9 connector is designated as COM1
- Single +5 V power supply
- Flexible OEM/ODM design

PCD-E12 I/O Daughter Board Option

- 16 Channels of 10 bit A/D, 0 to 5 volt.
- 24 Digital I/O lines with 8 high drive outs.
- 1 RS232 port with handshake (1 in/1 out).
- 1 CAN 2.0B port.
- 24 Key, keypad interface (4x6 matrix).
- 8 bit Character/Graphic or 4 bit Character LCD interface.
- Status LED.

PCD-E12 On-board Options

- 8 Channels of 12 bit A/D, 0 to 5 volt replaces 8 channels of 10 bit.
- 4 Channels of 12 bit D/A, 0 to 5 volt.

Specifications

Standard SBC functions

- CPU: Onboard ELAN SC520 133MHz embedded microprocessor
- BIOS: General Software
- RAM: Onboard 16MB SDRAM standard and 32MB to 128MB options
- Enhanced IDE HDD interface: Supports up to two Enhanced IDE devices.
- FDD interface: Supports up to two FDDs
    - 5.25" (360KB and 1.2MB) and/or
    - 3.5" (720KB, 1.44MB, and 2.88MB)
- Parallel port: One parallel port supports SPP/EPP/ECP parallel modes
- Serial ports: Three RS-232 ports, one RS-422/485 port
- PC/104Plus expansion: 16-bit and 32-bit PC/104 module connectors
- Keyboard/mouse connector: Mini-DIN connector for keyboard and PS/2 mouse

Solid State Disk

- Supports DiskOnChip® 2000: up to 288 MB Flash memory

Ethernet interface

- Ethernet chipset: Realtek RTL8139C
- Ethernet type: 10/100Base-T Ethernet controller
- Ethernet connection: On-board RJ-45 connector

PCD-E12 I/O Daughter Board (additional specifications to added)

- 16 Channels of 10 bit A/D, 0 to 5 volt.
- 24 Digital I/O lines with 8 high drive outs.
- 1 RS232 port with handshake (1 in/1 out).
- 1 CAN 2.0B port.
- 24 Key, keypad interface (4x6 matrix).
- 8 bit Character/Graphic or 4 bit Character LCD interface.
- Status LED.
- Optional 8 Channels of 12 bit A/D, 0 to 5 volt which replaces 8 channels of 10 bit.
- Optional 4 Channels of 12 bit D/A, 0 to 5 volt.

Mechanical and environmental

- Dimensions: 145mm x 102mm
- Weight: 0.17kg (0.37lbs)
- Power Supply Voltage: +5V (4.57 ~ 5.25V)
- Power Requirements: +5V @ 1.0 A (typical)
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F)

Packing List

Packing List for standard PCM-53E52 SBC:

1   PCM-53E52 SBC Board
1   IDE cable – 18" 40 pin cable
2   Serial header Cables – 10 pin female header to male DB9
1   Parallel port cable – 26 pin female header to male DB25
1   Standard floppy cable – 34 pin cable with 3 connectors 34 pin connectors

The following cable is optional:
        Keyboard/Mouse PS/2 Y cable {This cable is required to have access to the PS/2 mouse port.}

Packing List for standard PCD-E12 I/O daughter board

1   PCD-E12 I/O daughter board

PCM-53E52 Configuration

Jumper & Connector Descriptions

The PCM-53E52 comes factory configured and ready to operate. In the event that jumpers need to be verified or modified this section provides the information required, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all the safety precautions before you begin any configuration procedure. See Appendix A for connector pin-outs and Appendix B for Jumper Settings.

Table 1 Jumpers

Label	Function
JP1	Processor Run Mode
JP2	AMD Debug Mode
JP3	Battery
JP4	Com2 Mode

Table 2 Connectors

Label	Function
CN1	Com 1
CN2	Com 2

Table 3 Headers

Label	Function
HDR1	JTAG Interface
HDR2	40 Pin IDE header
HDR3	Printer Port
HDR4	Com 4
HDR5	Floppy drive connector
HDR6	Power
HDR7	Com 3

Table 4 Jacks

Label	Function
JK1	Ethernet interface
JK2	Keyboard/Mouse

Table 5 Sockets

Label	Function
SOK1	BIOS chip holder
SOK2	DOC Socket

Table 6 LEDs

Label	Function
LD1	Hard Drive Activity
LD2	Ethernet Link & Activity
LD3	Power LED

Determining Board Configuration

The board number can be used to determine what options are populated.
For example:
PCM-53E52-0011   is a board with 16mb of ram, Ethernet and PC/104+

This is found by decoding the last 4 numbers as follows:
0XXX is the standard 16mb of onboard memory
1XXX is the upgrade to 32mb of onboard memory
2XXX is the upgrade to 64Mb of onboard memory

X0XX is a reserved designator

XX0X is the Ethernet option designator, 1 for no Ethernet, 0 if present.

XXX0 is the designator for PC104+, 1 means the PC104+ connector has not been populated.

Determining How Much Memory is Onboard

The following information is to help assist in calculating how much ram your board has on it.

This information pertains to the onboard chips U4 and U5:
16meg system =2pcs of (8mB) 4 Meg x 16 Quad bank, 3.3V-- MT48LC4M16A2TG-75
32meg system =2pcs of (16mB) 8 Meg x 16 Quad bank, 3.3V-- MT48LC8M16A2TG-75
64meg system =2pcs of (32mB) 16 Meg x 16 Quad bank, 3.3V-- MT48LC16M16A2TG-75

These part numbers are Micron Technology parts and may be substituted with equivalent chips by another manufacturer.

If you have any questions about the configuration of the board you have please email:
support@emacinc.com

Powering Up the PCM-53E52

The PCM-53E52's power connector (CN1) is a standard floppy, four-pin type connector commonly found on most PC type power supplies. The PCM-53E52's logic only requires 5 volts DC. The 12v pin (HDR6 pin 4) is routed to the PC/104 connectors and may be used by some PC/104 expansion cards. The pin-out for the HDR6 power connector is as follows:

Pin	Signal
1	+5 V
2	GND
3	GND
4	+12 V

** Pin 1 is the pin closest to C1 on the topside of the board

Remember before powering-up the PCM-53E52 make sure the DOC is correctly orientated, firmly seated and check any cables to make sure that plugged on and correctly in relation to pin 1.

Note: The PCM-53E52 requires less than 2 amps which is not enough current to load the main switcher in some larger PC power supplies (this can be verified with a voltmeter measuring the 5-volt supply). If this is the case you can try to load the power supply by adding 5-volt devices, or order a compatible power supply from EMAC.

Ethernet

The PCM-53E52 utilizes the RTL 8139 10/100 BaseTX full duplex Ethernet chip and terminates to a standard RJ-45 connector (JK1). It can be connected straight to a Hub, Switch or directly to another computer via a crossover Ethernet cable. Link and Activity (Rx/Tx) LEDs (LD2) are provided to monitor network activity.

Serial Ports

The PCM-53E52 is equipped with four serial ports. All four serial ports are standard X86, 16550, 16 byte FIFO UARTS.

COM1 is set to be RS232 and is configured by default to 3F8H using IRQ 4. Availability is via the DB9 (CN1) connector on the edge of the board.

COM2 is jumper configurable to run RS232 or RS422/485 and is set by default to I/O address 2F8H using IRQ 3. This comport is available via a DB9 connector (CN2). The mode is switched using JP4, if the jumper is present it will run RS422/485.

COM3 and COM4 are both configured as RS232 ports. These are available to the user on connectors HDR7 & HDR5 respectively. The default I/O address and IRQ for COM3 is 3E8H using IRQ 5 and the default I/O address for COM4 is 2E8H using IRQ 11.

NOTE: COM4 DOES NOT OFFER HANDSHAKING AND IS LIMITED TO RXD AND TXD DUE TO PIN FUNCTION TRADEOFFS AT THE SUPER I/O CHIP. SELECT FUNCTIONS FROM COM3 AND COM4 SHARED THRU ONE INTERFACE DRIVER CHIP.

Keyboard/Mouse

The PCM-53E52 is equipped with a keyboard and mouse interface. Both the keyboard and the mouse utilize the same PS/2 connector (JK1) through the use of the included Y cable. Though a standard PS/2 keyboard can be plugged directly into the connector, to be able to use both a keyboard and mouse you must use the Y adapter cable or a serial mouse.

Disk-On-Chip Flash Disk

The PCM-53E52 does not come with a DOC flash drive chip installed by default, but one can be ordered from EMAC and installed by the user or integrated at the time the PCM-53E52 is ordered.

The DOC is a solid state flash disk and as such is extremely rugged when compared to a conventional hard drive. The DOC is a paged memory device and is mapped at segment address D000 Hex, and by use of the device's firmware emulates a hard drive. Thus most operating systems will be able use the device similar to a hard drive.

Warning: Be extremely careful when installing the DOC into its socket. Plugging it in backwards, and turning on power, can *destroy* the DOC and *damage* the PCM-53E52 rendering both inoperable! Any information on the DOC will be unrecoverable at this point.

Always double-check the orientation of the DOC when it has been removed from the board and reinserted, prior to turning the power back on.

Parallel port

The PCM-53E52 comes with a Standard Parallel port interface, This is available to the user via a 26-pin header (HDR3) and included female DB25 cable.

IDE connector

The PCM-53E52 is equipped with a standard IDE interface available to the user via the standard 40-pin header (HDR2) on the board. A standard hard drive cable is included.

Floppy Drive connector

The PCM-53E52 is equipped to operate a standard 3.5" 1.44Mb floppy drive via the standard 34-Pin header (HDR5). A standard floppy drive cable is included.

PCM-53E52 BIOS Defaults

The PCM-53E52 uses a General Software BIOS. To enter the CMOS you must press the <Del> key when prompted. The following CMOS screen shots indicate the CMOS options and the default factory values of each option. Note: These factory set options should not require changing.

```
+------------------------------------------------------------------------+
|                                                                        |
|                  System Bios Setup - Utility v4.3                      |
|             (C) 2000 General Software, Inc. All rights reserved        |
+------------------------------------------------------------------------+
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
|                       >Basic CMOS Configuration                        |
|                         Custom Configuration                           |
|                         Shadow Configuration                           |
|                     Reset CMOS to last known values                    |
|                     Reset CMOS to factory defaults                     |
|                         Write to CMOS and Exit                         |
|                       Exit without changing CMOS                       |
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+
|                      <Esc> to continue (no save)                       |
                             www.gensw.com
```

```
+------------------------------------------------------------------------+
|                                                                        |
|            System Bios Setup - Basic CMOS Configuration                |
|             (C) 2000 General Software, Inc. All rights reserved        |
+-------------------------+------------------+---------------------------+
| DRIVE ASSIGNMENT ORDER: | Date:>Jun 18, 2002 | Typematic Delay  : 250 ms  |
| Drive A: Floppy 0       | Time: 19 : 38 : 16 | Typematic Rate   : 30 cps  |
| Drive B: (None)         | NumLock:  Disabled | Seek at Boot     : None    |
| Drive C: (None)         +--------------------+ Show "Hit Del"   : Enabled |
| Drive D: (None)         | BOOT ORDER:        | Config Box       : Enabled |
| Drive E: (None)         | Boot 1st: Drive A: | F1 Error Wait    : Disabled|
| Drive F: (None)         | Boot 2nd: Drive C: | Parity Checking  : (Unused)|
| Drive G: (None)         | Boot 3rd: (None)   | Memory Test Tick : Disabled|
| Drive H: (None)         | Boot 4th: (None)   | Test Above 1 MB  : Enabled |
| Drive I: (None)         | Boot 5th: (None)   | Debug Breakpoints: Disabled|
| Drive J: (None)         | Boot 6th: (None)   | Splash Screen    : Disabled|
| Drive K: (None)         +--------------------+----------------+---------+
| Boot Method: Boot Sector| IDE DRIVE GEOMETRY:  Sect  Hds  Cyls | Memory  |
+-------------------------+ Ide 0: 3 = AUTOCONFIG, LBA           | Base:   |
| FLOPPY DRIVE TYPES:      | Ide 1: Not installed                 |  640KB  |
| Floppy 0: 1.44 MB, 3.5" | Ide 2: Not installed                 | Ext:    |
| Floppy 1: 1.44 MB, 3.5" | Ide 3: Not installed                 |  31MB   |
+-------------------------+--------------------------------------+---------+
|               ^E/^X/<Tab> to select or +/- to modify                   |
                      <Esc> to return to main menu
```

```
+------------------------------------------------------------------------------+
|                                                                              |
|                  System BIOS Setup - Custom Configuration                    |
|              (C) 2000 General Software, Inc. All rights reserved             |
+--------------------------------------------+---------------------------------+
| IR Mode                   :>Disabled       | IR Port Location/IRQ    : 3E8h/4|
| ECC Memory                : Disabled       | SDRAM Device Timing     : Fast  |
| Write Buffer              : Disabled       | Cache Mode        : Write-Through|
| CPU speed                 : 133 MHz        |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
+--------------------------------------------+---------------------------------+
|              ^E/^X/<Tab> to select or +/- to modify                          |
|                    <Esc> to return to main menu                              |



+------------------------------------------------------------------------------+
|                                                                              |
|                System BIOS Setup - Shadow/Cache Configuration                |
|              (C) 2000 General Software, Inc. All rights reserved             |
+--------------------------------------------+---------------------------------+
| Shadowing                 :>Chipset        | Shadow 16KB ROM at C000 : Enabled |
| Shadow 16KB ROM at C400 : Enabled          | Shadow 16KB ROM at C800 : Enabled |
| Shadow 16KB ROM at CC00 : Enabled          | Shadow 16KB ROM at D000 : Disabled|
| Shadow 16KB ROM at D400 : Disabled         | Shadow 16KB ROM at D800 : Disabled|
| Shadow 16KB ROM at DC00 : Disabled         | Shadow 16KB ROM at E000 : Enabled |
| Shadow 16KB ROM at E400 : Enabled          | Shadow 16KB ROM at E800 : Enabled |
| Shadow 16KB ROM at EC00 : Enabled          | Shadow 64KB ROM at F000 : Enabled |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
|                                            |                                 |
+--------------------------------------------+---------------------------------+
|              ^E/^X/<Tab> to select or +/- to modify                          |
|                    <Esc> to return to main menu                              |
```

Changing the CMOS without Video

When running the board (Headless) without video, to enter the CMOS configuration you will need to plug in a keyboard, and a null modem serial cable to COM1. The CMOS configuration will then be redirected to the COM1 comport after pressing the delete key on the keyboard. This is done by pressing delete on the keyboard just after the keyboard lights flash (after keyboard initialization) and before the BIOS beep, following the board being powered up or reset. The CMOS configuration will be sent out COM1 at 9600 baud, 8 bits, no parity, one stop bit (9600-8-N-1).

Changes then can be made via HyperTerminal or any other serial terminal program.

Needed commands are:

CTRL-e	Move Up
CTRL-x	Move Down
TAB	Move Right
+	Toggle Selection Up
-	Toggle Selection Down
ENTER	Goto Selected Menu
ESC	Return to Main Menu/ Exit Without Saving

If a video card is present, hitting the delete key will take you directly into the BIOS setup screen and no serial port redirection will take place.

Appendix A

Connector Pinouts

Com 1 DB9 Connector (CN1)

Pin	DB9 Description
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Com 2 DB9 Connector (CN2)

(RS232 Mode)   *(RS422/485)*

Pin	DB9 Description		
1	DCD		
2	RxD	2	TRANS +
3	TxD	3	TRANS -
4	DTR		
5	GND		
6	DSR		
7	RTS	7	REC +
8	CTS	8	REC -
9	RI		

Header Pinouts

JTAG Interface (HDR1)

Pin	Signal	Pin	Signal
1	GND	2	PWR GOOD
3	JTAG_TCK	4	CMDACK
5	JTAG_TMS	6	BR/TC
7	JTAG_TDI_1	8	STOP/TX
9	JTAG_TDO_MPU	10	TRIG/TRACE
11	-SRESET	12	N.C.

IDE Connector (HDR2)

Pin	Signal	Pin	Signal
1	Reset	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	N.C.
21	N.C.	22	GND
23	I OW	24	GND
25	IOR	26	GND
27	IORDY	28	BALE
29	N.C.	30	GND
31	IRQ 14	32	-I/O CS16
33	A1	34	N.C.
35	A0	36	A2
37	CS0	38	CS1
39	-ACT	40	GND

Printer Port (HDR3)

Pin	Signal	Pin	Signal
1	\STROBE	2	\AUTOFD
3	D0	4	ERR
5	D1	6	\INIT
7	D2	8	\SLCTINI
9	D3	10	GND
11	D4	12	GND
13	D5	14	GND
15	D6	16	GND
17	D7	18	GND
19	\ACK	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	N/C

COM4 (HDR4)

Pin	Signal	DB9 Description
1	NC	-
2	NC	RxD
3	RxD	TxD
4	NC	-
5	TxD	GND
6	NC	-
7	NC	-
8	NC	-
9	GND	-
10	NC	--

Floppy drive (HDR5)

Pin	Signal	Pin	Signal
1	GND	2	DENSITY SELECT
3	GND	4	N/C
5	GND	6	N/C
7	GND	8	INDEX
9	GND	10	MOTOR 0
11	GND	12	DRIVE SELECT 1
13	GND	14	DRIVE SELECT 0
15	GND	16	MOTOR 1
17	GND	18	DIRECTION
19	GND	20	STEP
21	GND	22	WRITE DATA
23	GND	24	WRITE GATE
25	GND	26	TRACK 0
27	GND	28	WRITE PROTECT
29	GND	30	READ DATA
31	GND	32	HEAD SELECT
33	GND	34	DISK CHANGE

Power Connector (HDR6)

Pin	Signal
1	+5 V
2	GND
3	GND
4	+12 V

Com 3 (HDR7)

Pin	Signal	DB9 Description
1	DCD	DCD
2	DSR	RxD
3	RxD	TxD
4	RTS	DTR
5	TxD	GND
6	CTS	DSR
7	DTR	RTS
8	NC	CTS
9	GND	--
10	NC	--

Jack Pinouts

Ethernet (JK1)

Pin	Signal
1	XMT+
2	XMT-
3	RCV+
4	N/C
5	N/C
6	RCV-
7	N/C
8	N/C

Keyboard/Mouse (JK2)

Pin	Signal
1	KB DATA
2	MS DATA
3	GND
4	VCC
5	KB CLOCK
6	MS CLOCK

Appendix B

Standard IRQ and IO listing for PCM-53E52

IRQ#	Device
0	Timer
1	Keyboard
2	Cascade to 9
3	Com 2
4	Com 1
5	Com 3
6	Floppy
7	LPT
8	RTC
9	PCD-E12 (if installed)
10	Com 4
11	Ethernet/External PCI devices
12	Mouse (currently always assigned to PS/2 mouse)
13	FPU
14	IDE
15	Not Available

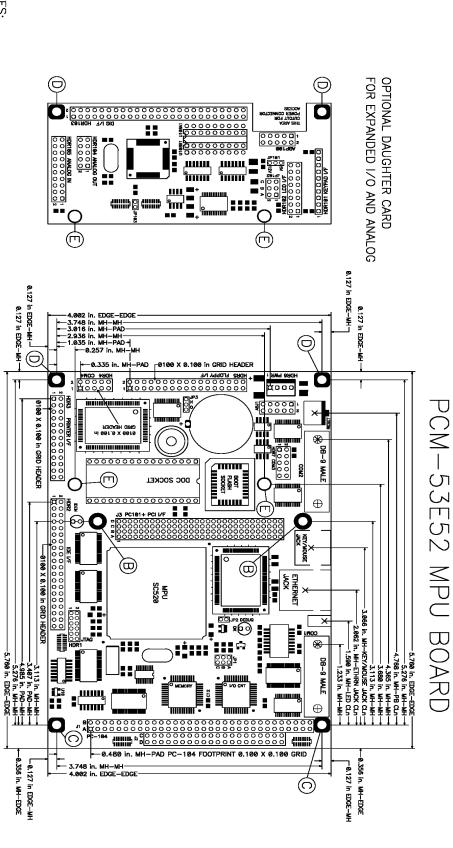| IO range	Device
0000-001F	DMA1
0020-003F	PIC1
0040-005F	Timer
0060-006F	Keyboard
0070-007F	RTC
0080-008F	DMA Page REG
00A0-00BF	PIC2
00C0-00DF	DMA2
00F0-00FF	FPU
01F0-01F7	IDE0
02E8-02Ef	Serial COM4
02F8-02FF	Serial COM2
0378-037F	LPT
03E8-03EF	Serial COM3
03F0-03F5	floppy0
03F6-03F6	IDE0
03F7-03F7	floppy0
03F8-03FF	Serial COM1
FC00-FC7F	Ethernet

Appendix C

Dimensional Drawing

NOTES:

1. PADS MARKED WITH THE LETTER 'B' HAVE 126 mil HOLES AND ARE USED TO MOUNT PC-104 ACCESSORY CARDS TO THE BOARD.
2. PADS MARKED WITH THE LETTER 'C' HAVE 126 mil HOLES AND ARE SHARED HOLES USED TO MOUNT THE PCB TO THE CHASSIS, AND ANY PC-104 CARDS.
3. PADS MARKED WITH THE LETTER 'D' HAVE 126 mil HOLES AND ARE SHARED TO MOUNT THE BOARD TO THE CHASSIS, AND THE OPTIONAL DAUGHTER CARD.
4. PADS MARKED WITH THE LETTER 'E' HAVE 126 mil HOLES AND ARE USED TO MOUNT THE OPTIONAL DAUGHTER CARD TO THE BOARD.
5. HIGHEST TOPSIDE PROFILE PART IS 1.125 in. AVERAGE HEIGHT IS 0.75 in EXCLUDING ANY PC-104 CARDS.
6. MINIMUM REQUIRED BOTTOM SIDE CLEARANCE IS 0.250 in.
7. MINIMUM REQUIRED TOP SIDE CLEARANCE IS 0.550 in. WITHOUT ACCESSORY OR DAUGHTER CARDS.

OPTIONAL DAUGHTER CARD
FOR EXPANDED I/O AND ANALOG

PCM-53E52 MPU BOARD

Title
PC PACK PCM-53E52 DIMENSIO