



486/586 Computer with 100MHz Ethernet, Analog, and Digital I/O

SBC0489

Features



- ✓ Ready to run 486/586 computer
- ✓ Small 5"x5" format
- ✓ DiskOnChip, up to 64MB RAM
- ✓ COM1, COM2, LPT, KBD, Mouse
- ✓ VGA, flat-panel, and touchscreen
- ✓ 8-channel A/D, 4-channel D/A, timers
- ✓ 10/100BASE-T Ethernet
- ✓ PC/104 & PC/104-Plus available

The SBC0489 packs a fast 486DX processor with a large amount of industrial I/O in a 5" x 5" format. It offers plenty of memory capacity, and copious amounts of storage. In addition to the core processor and memory, an ample mix of serial, parallel, EIDE, floppy, keyboard, mouse, VGA, touchscreen, Ethernet, digital I/O, and analog I/O provides a single board solution to many design challenges.

card. Immediately, and easily, an advanced engine is available for software development. If additional functions are needed, they can be easily added through plug-on PC/104 and PC/104-Plus expansion cards.

The SBC0489 is completely functional as shipped. Upon the application of 5V, it is ready for download of an application program.

In its "stackthrough" version, the SBC0489 is an ideal computer to plug into a custom OEM I/O

Software Support

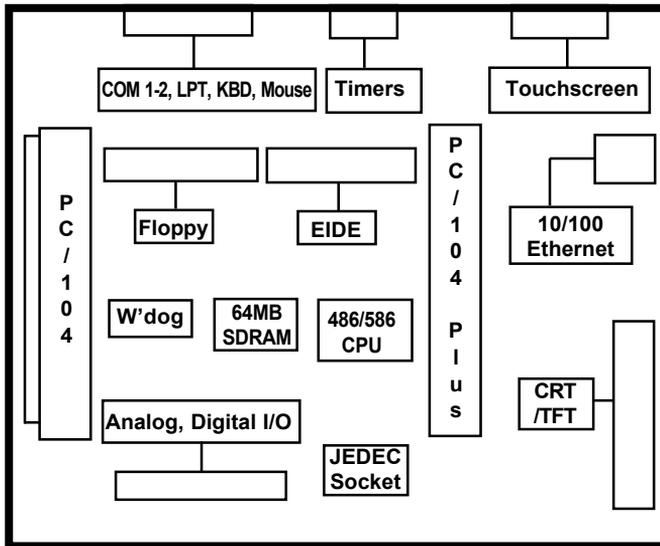
DOS emulation,
MSDOS 6.22, Linux,
Windows 98/NT CE,
RTOS, TurboDebugger™,
Comm Library,
CommBLOK™
PID loop library, PidBLOK™
C, compilers
[Items above in Section 6]

Compatible Hardware

PC/104 expansion cards
PC/104-Plus expansion cards
[Items above in Section 4]
RS232/RS485 devices
Custom

Mounting/Packaging

Standoffs, STDOFF01
[Items above in Section 5]
ENC104-2
ENC104-4
ENC-FP-6.4
ENC-FP-6.4-TCH
FP-6.4
FP-6.4-TCH
[Items above in Section 3]
Custom



Technical Details:

The SBC0489 core is an ST Microelectronics STPC Atlas processor running at 133 MHz. The STPC 486DX processor core is clocked at a rate of 133MHz, and includes hardware floating point math. While other 486DX systems access RAM with a 32-bit data bus, the Atlas accesses RAM with a 64-bit wide data bus, offering performance similar to low-end Pentium-based designs.

The Atlas allows compatibility with both real mode and 32-bit protected mode programs. The Atlas also integrates many PC-compatible peripherals. Keyboard and mouse controller, an EIDE controller, two cascaded 82C59A interrupt controllers, three timer/counters (82C54 compatible), and a dual DMA controller are all present. A hardware accelerated VGA controller, with support for both CRTs and TFT panels, is also implemented.

The memory subsystem on the SBC0489 allows

many programs to be run without any external storage. 64 Mbytes of synchronous DRAM (SDRAM) is more than sufficient for many complex, protected-mode programs and operating systems.

The 1-Mbyte Flash memory chip contains both the BIOS and a user application code space. The firmware suite that is preinstalled in flash on the SBC0489 includes an industrial BIOS that allows configuration of many of its features. In addition to allowing configuration of the normal PC-compatible peripherals such as floppy drives and hard drives, it allows 768k of the system flash to be used as a read/write wear-leveled flash drive. Another feature of the BIOS is its ability to redirect the console out COM1, COM2, or the VGA/keyboard so that even "headless" systems can have a user console when needed for configuration or debug. A DOS compatible operating system is also loaded into flash.

If a larger program or data storage space is required, a 32-pin JEDEC socket on the SBC0486 can be used to implement non-volatile storage in two ways. For large capacity solid-state read/write disk requirements, a DiskOnChip flash device can provide a solid state disk. This solid state disk is bootable, and is supported with drivers for a number of advanced operating systems. It can be mapped as the C: drive and can be treated by software as if it were a hard disk. Because of a limit on the number of erase/write cycles, flash disks are best as "read mostly" disks. Loading of operating systems and applications, and updating configuration files is best done with flash disks.

The JEDEC socket can also support battery backed RAM, from 32KB to 512KB. The RAM is mapped as 16 pages of 32KB in the option ROM space in the first megabyte of memory. An application can directly manage the battery backed RAM, or a RAM disk driver can be used. Battery backed RAM has an infinite number of write cycles, so continual data logging to an array of file is best done with battery backed RAM.

The VGA controller supports CRT resolutions up to 1280 x 1024 and flat panel resolutions up to 1024 x 1024. It includes hardware acceleration for fast graphic updates. The output can drive a standard RGB CRT monitor, and an LCD flat panel display. Active matrix (TFT) LCD panels are supported, in 18-bit color. A set of 8 digital outputs and 8 digital inputs can be used to interface to a resistive matrix touchscreen, a keypad, sets of row-column connected switches, or for general purpose digital I/O.

PC-compatible COM1 and COM2 serial ports are provided with RS232 levels and RTS and CTS control signals. RS485 operation is also supported on both serial ports. COM1 is 4-wire full duplex RS422.RS485, while COM2 is 2-wire RS485.

An 82C55 digital I/O device provides 24 lines of TTL I/O. Direction is programmable in two 8-bits

groups and two 4-bit groups. The TTL I/O lines can source and sink 2.5mA. There are three 16-bit timers in the STPC device, some of which many be available to the application if not used by the BIOS or operating system. An 82C54 device provides three additional 16-bit timer/counters in addition to the three timers in the STPC. Also included on the SBC0489 are a real-time clock and a watch-dog timer.

Optional on-board features include 8 channels of 12-bit analog input, 4 channels of 12-bit analog output, and a 10BASE-T/100BASE-TX Ethernet adapter.

Both PC/104 and PC/104-Plus expansion connectors are provided. The PC/104 connector provides support for both 8-bit and 16-bit expansion boards and operates with standard PC/104 bus protocol and timing. The PC/104-Plus connector supports expansion cards with standard PC/104-Plus (PCI) bus protocol and timing. The default configuration is non-stackthrough connectors, allowing the SBC0489 to be the bottom card in a stack. Stackthrough options (SBCOPT16ST) and (SBCOPT120ST) allows the SBC0489 to be plugged into a custom-designed OEM I/O board as an automation component.

The SBC0489 can support application development under numerous strategies. If 16-bit DOS or DOS-extended software is sufficient, Micro/sys offers a free DOS-compatible operating system preinstalled on the SBC0489. For a small royalty fee, true MSDOS can be preinstalled. Powerful, cost-effective remote debug capabilities are provided through Borland's Turbo Debugger.

For true 32-bit application development, the SBC0489 supports a number of alternatives. Due to its PC compatibility, 32-bit real time operating systems (RTOS) such as Linux, PharLap® ETS, and VxWorks® can be booted on the SBC0489. All support 32-bit linear protected mode operation, and have full tool suites available,

including compilers and debuggers.

For pre-configured sets of options, Micro/sys can provide OEMs with a single part number for ordering. In addition, custom versions of the SBC0489 are available. Please call Micro/sys Technical Sales for details.

Specifications:

Mechanical:

- ❑ 5" x 5" x .7"
- ❑ Underside components .100" high, max

Power Requirements:

- ❑ +5v $\pm 5\%$ at 1.9A typical, 2.4A max
- ❑ +12v required only if used by PC/104 modules

Environmental:

Part number	Board Airflow *	Operating Temp.
SBC0489	0 cfm	0° to +48°C
SBC0489	17 cfm	0° to +70°C

* Using 80mm fan

- ❑ -40° to +85°C storage
- ❑ 5%-95% relative humidity, non-condensing

TB1 Power Connector	
Pin	Signal
1	+5V
2	+5V
3	+3.3V
4	+12V
5	-12V
6	GND
7	GND

Processor Core Section:

- ❑ STPC Atlas CPU
- ❑ 133 MHz clock rate
- ❑ Hardware floating point math
- ❑ AT-compatible timers, interrupts, DMA

On-board Memory:

- ❑ 64M Synchronous DRAM based at 0
- ❑ 1M of Flash at top of memory map with BIOS and operating system installed; 768k available for user application
- ❑ JEDEC 32-pin socket for 128k/512k SRAM for battery-backed RAM, or DiskOnChip

Real Time Clock:

- ❑ RTC with on-board battery
- ❑ Driver software in BIOS

Watchdog Timer:

- ❑ Program must refresh watchdog timer periodically, or system will be reset
- ❑ Enabled through software

Serial Ports:

- ❑ AT-compatible COM1 and COM2
- ❑ 16550 UARTS with 16-byte FIFOs
- ❑ RTS and CTS modem controls
- ❑ COM1 RS232/ RS422/ RS485 full duplex
- ❑ COM2 RS232/ RS485 half duplex

Parallel Port:

- ❑ Bidirectional LPT standard

Keyboard, Mouse, And Speaker:

- ❑ AT-compatible keyboard port
- ❑ PS/2-style mouse port
- ❑ AT-compatible TTL speaker output

J2 COM1/2 RS232/485, LPT, KBD, Mouse, SPK			
Pin	Signal	Signal	Pin
1	RX COM1	RTS COM1	2
3	TX COM1	CTS COM1	4
5	N/C	N/C	6
7	GND	RX COM2	8
9	RTS COM2	TX COM2	10
11	CTS COM2	N/C	12
13	N/C	GND	14
15	GND	TX+COM1 RS485	16
17	TX- COM1 RS485	RX+ COM1 RS485	18
19	RX- COM1 RS485	+TXRX COM2 RS485	20
21	-TXRX COM2 RS485	+5V	22
23	/Strobe	/Autofeed	24
25	Data 0	/Error	26
27	Data 1	/INIT	28
29	Data 2	/Select IN	30
31	Data 3	GND	32
33	Data 4	Data 5	34
35	Data 6	Data 7	36
37	/ACK	GND	38
39	BUSY	Paper End	40
41	SELECT	GND	42
43	GND	Mouse CLK	44
45	Mouse Data	+5V	46
47	+5V	Keyboard Data	48
49	Keyboard Clk	Speaker	50

Touchscreen/keypad Interface:

- Row-column matrix format
- Resistive matrix touchscreen, row-column keypads, or arrays of row-column switches
- Can alternatively be used as 8 digital inputs and 8 digital outputs

J4 Touch screen Connector			
Pin	Signal	Signal	Pin
1	ROW 0	ROW 1	2
3	ROW 2	ROW 3	4
5	ROW 4	ROW 5	6
7	ROW 6	ROW 7	8
9	COLUMN 0	COLUMN 1	10
11	COLUMN 2	COLUMN 3	12
13	COLUMN 4	COLUMN 5	14
15	COLUMN 6	COLUMN 7	16

SVGA Video Output:

- CRT and color LCD outputs
- CRT Resolutions to 1280 x 1024
- TFT resolutions to 1024 x 1024
- Direct connect to TFT flat panels
- 18-bit panel color support

J11 SVGA Video Connector			
Pin	Signal	Signal	Pin
1	GND	DCLK	2
3	FPLINE	FPFRAME	4
5	GND	RED 0	6
7	RED 1	RED 2	8
9	RED 3	RED 4	10
11	RED 5	GND	12
13	GREEN 0	GREEN 1	14
15	GREEN 2	GREEN 3	16
17	GREEN 4	GREEN 5	18
19	GND	BLUE 0	20
21	BLUE 1	BLUE 2	22
23	BLUE 3	BLUE 4	24
25	BLUE 5	GND	26
27	DISPLAY EN	TFT VCC	28
29	TFT VCC	-	30
31	-	HSYNC	32
33	GND	VSYSN	34
35	GND	BLUE	36
37	GND	GREEN	38
39	GND	RED	40

Digital I/O and Timers:

- 82C55 provides 24 lines of TTL level digital, I/O, 2.5mA source/sink
- 82C54 provides 3 extra 16-bit timer/counters, I/O pins accessible

A/D Converter Option:

- Eight 12-bit channels
- $\pm 1/2$ LSB linearity
- 6usec conversion time
- 0 to +5, 0 to +10, ± 5 , $\pm 10V$ input range

D/A Converter Option:

- Four 12-bit channels
- $\pm 1/2$ LSB linearity
- 3usec settling time
- 0 to +5V output range

J16 Digital I/O and Analog Connector			
Pin	Signal	Signal	Pin
1	DIO A0	DIO A1	2
3	DIO A2	DIO A3	4
5	DIO A4	DIO A5	6
7	DIO A6	DIO A7	8
9	DIO B0	DIO B1	10
11	DIO B2	DIO B3	12
13	DIO B4	DIO B5	14
15	DIO B6	DIO B7	16
17	DIO C0	DIO C1	18
19	DIO C2	DIO C3	20
21	DIO C4	DIO C5	22
23	DIO C6	DIO C7	24
25	GND	GND	26
27	Analog Out 0	GND	28
29	Analog Out 1	GND	30
31	Analog Out 2	GND	32
33	Analog Out 4	GND	34
35	Analog In 7	GND	36
37	Analog In 6	GND	38
39	Analog In 5	GND	40
41	Analog In 4	GND	42
43	Analog In 3	GND	44
45	Analog In 2	GND	46
47	Analog In 1	GND	48
49	Analog In 0	GND	50

J3 Timer/Counter Connector			
Pin	Signal	Signal	Pin
1	Clock0 (7MHz)	Gate 0	2
3	Output 0	Clock 1	4
5	Gate 1	Output 1	6
7	Clock 2	Gate 2	8
9	Output 2	GND	10

Ethernet Option:

- 100Base-TX and 10Base-T support
- RJ45 connector on-board
- Flash setup configuration utility includes IRQ, IP address, and DHCP options
- UDP/IP driver stack preloaded into flash
- Implements subset of Winsock functions
- SOCK_DGRAM (UDP datagram) and SOCK_RAW (low level) sockets supported
- IP, UDP, ARP, DHCP, ICMP protocols supported
- Dynamically linked with 16-bit application program
- For 32-bit networking, use operating system; drivers available

PC/104 Interface:

- Non-stackthrough PC/104 connectors
- Standard mounting holes
- 8-bit and 16-bit PC/104 module support
- Full IRQ and DRQ support
- Stackthrough option available (SBCOPT16ST)

PC/104-Plus Interface:

- Non-stackthrough PC/104-plus connectors
- Full 32-bit PCI-type transfers supported
- Stackthrough option available (SBCOPT120ST)

DK0489 Development Kit:

- Free with first SBC0489 purchase
- Breakout cable to COM1-COM2 (CA4044)
- Breakout cable to CRT/TFT, keyboard, mouse, and speaker (CA4085, and KA1010-1)
- Download cable and utilities (CA4035)
- Documentation, schematics, sample software

External Connections:

- ❑ 40-pin header for IDE
- ❑ 34-pin header for floppy
- ❑ 50-pin header for Com ports, LPT, KBD, mouse, and speaker
- ❑ 50-pin header for digital I/O, Analog
- ❑ 10-pin header for timer/counter
- ❑ 16-pin header for touchscreen
- ❑ 40-pin header for CRT, flat panel,
- ❑ 7-pin removable terminal strip for power input

Ordering Information:

Single Board Computer:

SBC0489	486/586 CPU, 133MHz, 64MB RAM, 1M Flash
DK0489	No charge development kit, available with first order only
SDK-Linux-0489	Linux kit (requires Ethernet and SBC0489OPT50)
SDK-WinCE-0489	WinCE 5.0 Development Kit
Netsock/415	SBC0489 with Ethernet and UDP/IP, 133Mhz (refer to separate data sheet)
0489OPT11	A/D Converter, 8-Channel
0489OPT12	D/A Converter, 4-Channel
0489OPT20	100/10Mhz Ethernet Straight Connector
0489OPT20-RA	Right Angle RJ45 (requires 0489OPT20)
0489OPT25	MS-DOS in flash
0489OPT50	Linux startup kernel in flash
SBC0486-ATL	Call factory for ordering information on SBC0486-ATL. Drop-in replacement for SBC0486

Related Products:

CA4025	IDE Disk Cable
CA4031-3	Floppy drive cable, dual drive

CA4035	Debug Download Cable
CA4044	Breakout cable for COM1&2 to two DB9 connectors, LPT, KBD, mouse, speaker
CA4085	VGA interface cable
CA4086	Includes CA4044, KA1010-1, and KA1015
KA1010-1	Keyboard, mouse, speaker adapter board
KA1015	RS485 Termination and LPT adapter board
BA0010	10-position Terminal Strip
BA0016	16-position Terminal Strip
BA0050	50-position Terminal Strip
RAM128	128k RAM device
RAM512	512k RAM device
SBCOPT16ST	Stackthrough PC/104
SBCOPT120ST	PC/104-Plus Stackthrough Option, 120-pin
DC32	DiskOnChip 32MB
DC64	DiskOnChip 64MB
DC128	DiskOnChip 128MB
ENC104-2	Subfloor
ENC104-4	Enclosure
ENC-FP-6.4	640 x 480 LCD flat panel enclosure
ENC-FP-6.4-TCH	640 x 480 LCD flat panel and touchscreen enclosure
FP-6.4	640 x 480 Active color LCD kit
FP-6.4-TCH	640 x 480 Touchscreen LCD kit

Cables nominally 15", other lengths available.

CommBLOK, PidBLOK trademark Drumlin
IBM, PC trademark IBM Corp.
MSDOS, Microsoft trademark Microsoft Corp.
Turbo Debugger trademark Borland International
VxWorks trademark Wind River