
Subject: Project SBC-386EX
Posted by [jcoffman](#) on Fri, 17 Nov 2017 21:11:07 GMT
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To All:

A new project to go beyond the SBC-188 has been launched. The goal is an embedded 386-level CPU (& peripheral) board. The 80C188 was an early Intel high-integration processor, as is the i386-EX, with lots of goodies on a single chip.

Project is at <https://www.retrobrewcomputers.org/doku.php?id=boards:sbc:sbc-386ex>

--John

Subject: Re: Project SBC-386EX
Posted by [Wayne W](#) on Sat, 18 Nov 2017 00:16:00 GMT
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This looks awesome John. I would be happy to participate in initial build and test, if you think it makes sense. I have done a fair amount of millipede soldering with 100% success, so I can probably handle it.

-Wayne

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Sat, 18 Nov 2017 16:17:11 GMT
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Wayne,

Good to hear from you. The present board is a throw-away, but I want to become more comfortable in dealing with such a complicated chip. As such, I have only 4 boards, but plenty of adapters. Let me do some preliminary tests today to make sure the board is not a total disaster, then I can ship you a bundle with a couple of adapters.

Any final design is months away. This is a stepping-stone.

--John

Subject: Re: Project SBC-386EX
Posted by [danwerner](#) on Sat, 18 Nov 2017 16:37:57 GMT
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Hey John, also happy to help -- just let me know when/if you are ready for testers.

Dan

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Wed, 10 Jan 2018 05:33:35 GMT
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Update: Wayne, Dan, and I have prototype boards running with FPU's. A chip update was needed to get the 33Mhz Cyrix FPU to handle the READY# line fast enough.

TBD: final board to be VME size (aka 6U) or RetroBrew standard (3U). 6U could have all the goodies, but 3U may be a better choice.

Goodie:	Pro:	Con:
64Mb DRAM	mandatory	--
COM1	mandatory (on CPU)	--
RTC & NVRAM	mandatory (DS1302)	
SRAM (32K)	use for debugging	space, DIP28
IDE w/ DMA	(2)CF card I/O	connector space
FPU	cool	space, PLCC68
FDC w/ DMA	easy MSDOS install	space, PLCC44+connector
SD socket	very useful	space, space, space
COM2+ParPort	PC/AT compat	space, PLCC68
VGA & kbd	PC/AT compat	none, it is a separate board option

The FDC and SD socket are probably impossible on a 3U board.

The FPU, cool, but not needed. SBC-188 did ok with emulator only.

COM2 comes almost for free if SD socket & (FPU or FDC) are eliminated due to shared I/O pins on the 386EX chip.

COM2 would be TL16L552 chip: COM2,COM3 & ParPort

--John

File Attachments

1) [386EX-2.txt](#), downloaded 108 times

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Wed, 10 Jan 2018 05:37:48 GMT
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Formatting is lost in the post. Download the TXT file to see formatted columns.

Subject: Re: Project SBC-386EX
Posted by [ab0tj](#) on Wed, 10 Jan 2018 05:38:10 GMT
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How about a micro-SD socket? I used one on my 186EB SBC and it was not nearly as hard to solder as I expected.

Subject: Re: Project SBC-386EX
Posted by [danwerner](#) on Wed, 10 Jan 2018 14:48:19 GMT
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The 3U form factor is easier to work with, but we have done the 6U form factor before (the 6x0x) and the community seemed to accept it just fine. There were some advantages to having ATX mounting holes in the board and an ATX power connector so that it could be mounted in an ATX case if desired. The only recommendation that I would make is to request that we make it easier to plug in an ECB card into the board when mounted in an ATX case -- while this is possible with the 6x0x, (in some cases) it is not always straight forward.

Dan

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Wed, 10 Jan 2018 15:38:12 GMT
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The biggest board real-estate hog on this project is the 50x50mm 386EX Adapter board, which would save PQFP surface-mount soldering. There is a socket for the 386EX chip, but it is so ridiculously expensive (and tricky to use), that I abandoned this idea.

The micro-SD socket is an idea worth looking into. Thank you for this suggestion.

--John

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Wed, 10 Jan 2018 20:43:51 GMT
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The micro-SD sockets from Molex are as small as 5x11.5mm meaning socket size is no issue. A little more space is needed for the resistor divider networks, but micro-SD is looking possible at this moment.

--John

Subject: Re: Project SBC-386EX
Posted by [jdgabbard](#) on Wed, 10 Jan 2018 23:44:01 GMT
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Excited about this. I'd be ok with QFP soldering, I've done it before. But I can see why not everyone would be. However, it is super easy once you have a hot air rig. So if I'm reading this right, MS-DOS is definitely on the horizon.

Subject: Re: Project SBC-386EX
Posted by [Andrew B](#) on Thu, 11 Jan 2018 01:34:49 GMT
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NetBSD might run on this as well (I have has success booting a kernel on a 486 with 40MB of RAM)

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Thu, 11 Jan 2018 05:08:16 GMT
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In discovering the 386EX, I was very pleased to see the addition of 2 more address lines over the 386SX's 24. A single 64Mb SIMM (\$10-12) will fill the memory needs for a good OS.

Andrew, I solicit your (and others' s/w expertise when we have a 64Mb board up.

=====

The PQFP is really easy to solder. I was pointed in the direction of using a dry chisel tip iron, and NO additional solder, but to depend on the board HASL layer. I've practiced on adapter boards with tinned pads, and HASL only pads. The latter are easier with only the Hot Air Solder Layer.

--John

Subject: Re: Project SBC-386EX
Posted by [jdgabbard](#) on Thu, 11 Jan 2018 15:11:31 GMT
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The fact that it is more of a MCU than a uP helps I'm sure. I noticed it has several internal Serial ports, counter/timers, etc. it's a really interesting device.

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Thu, 11 Jan 2018 19:06:22 GMT
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jdgabbard wrote on Thu, 11 January 2018 07:11The fact that it is more of a MCU than a uP helps I'm sure. I noticed it has several internal Serial ports, counter/timers, etc. it's a really interesting device.

Yes, it is pretty much a PC/AT with a 386SX CPU on an integrated chip.

Subject: Re: Project SBC-386EX
Posted by [jdgabbard](#) on Thu, 29 Nov 2018 16:28:32 GMT
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John, Have you made any further progress on this? It doesn't appear there has been any activity on the Wiki, and I haven't seen you post anything further on this. Have you given up on this project?

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Thu, 29 Nov 2018 18:08:19 GMT
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The SBC-386EX 2.0 is now a real computer: UART, FPU, 32K SRAM, 64MB DRAM, IDE connector, DS1302 RTD/NVRAM, RetroBrew ECB bus. The microSD interface has not been tested.

However, the ROM will not run MSDOS, PCDOS, or FreeDos. After many months, I have completely burned out on this ROM situation.

Get my e-mail address from the Board Inventory, and contact me off of the Forum if you have any inclination to attack this project.

Dan provided the best photo of the completed board. (see attached)

--JohnC

File Attachments

1) [DanW- SBC386EX2 board-sm.jpg](#), downloaded 152 times

Subject: Re: Project SBC-386EX
Posted by [jdgabbard](#) on Thu, 29 Nov 2018 19:58:00 GMT
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I sent you an email.

Subject: Re: Project SBC-386EX
Posted by [b1ackmai1er](#) on Mon, 03 Dec 2018 09:44:30 GMT
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Hi John,

Looks Terrific. Without a MSDOS this could still theoretically run linux right?

Are the Lattice GALS replacable by other manufacturers parts?

If anyone is interested, I have ordered some boards.

Regards Phil

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Mon, 03 Dec 2018 16:21:24 GMT
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Both Linux & Coherent should be runnable.

The GALs are 16V8's so that Lattice or Atmel parts may be used.

--John

Subject: Re: Project SBC-386EX
Posted by [etchedpixels](#) on Wed, 05 Dec 2018 23:03:13 GMT
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Linux dropped 386 support some time ago both kernel and user space. In theory 3.7 is the last kernel that supports it. In practice all the 386 support got really dodgy well before that.

Old old Linux should work (1.2.13LMP is still probably the best ever Linux for a 386

It would certainly be interesting to see if it did run Linux because Linux except for the bootstrap has very minimal firmware dependancies so it might help identify if it's a hardware problem, an errata issue (the 386EX has a few corkers) or firmware. Ditto Minix.

Subject: Re: Project SBC-386EX
Posted by [ABurrows](#) on Fri, 07 Dec 2018 01:07:45 GMT
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i would be very keen to work on a linux OS for this board.

Subject: Re: Project SBC-386EX
Posted by [ABurrows](#) on Wed, 12 Dec 2018 08:40:00 GMT
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would anyone be able to tell me where i can get the KiCAD libraries for this project:

00N8VEM
01RetroBrew
SBC-188

thanks!

edit: have emailed you John C

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Wed, 12 Dec 2018 15:44:40 GMT
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The schematic libraries have been posted to Google Drive:

<https://drive.google.com/file/d/1w233l00AsBffZ1XTjqN5guZGbf9MgRPk/view?usp=sharing>

These libraries have components which correct Kicad (old) library errors, and new components that are needed for several of my projects.

--John C. (see "board inventory" if you need to contact me directly.)

Subject: Re: Project SBC-386EX
Posted by [ABurrows](#) on Thu, 13 Dec 2018 02:19:57 GMT
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Thnaks John,

will this board (provided adapter board or direct) work with:

Cyrix FasMath 387 CX-83D87-25-GP --> 68 Pin
Cyrix 87DLC-40QP --> 68 Pin

i.e. is there a clear difference between the FPUs that work with the "DX" and "SX" "EX" 80386 variants

edit: i think i remember here.. the 387DX will work with the standard 80386 (DX), and the 387SX will work with the 80386SX and EX variants.. re 16 bit bus width.. if im not mistaken.

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Thu, 13 Dec 2018 05:48:16 GMT
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The 80386EX CPU is based on the 80386SX processor + 2 extra address bits + OEM peripherals. It works with FPU's that work with the 386SX (16-bit data bus). It does not work with the FPU's you mention. Try FPU's ...

Intel N80387SX-33 or -25
Cyril CX83S87-33
others for the SX

Subject: Re: Project SBC-386EX
Posted by [ABurrows](#) on Thu, 13 Dec 2018 09:40:42 GMT
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Thanks John!

Subject: Re: Project SBC-386EX
Posted by [trick-1](#) on Thu, 27 Dec 2018 11:32:34 GMT
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Hi Folks

Anyone have a spare adapter board for the 386EX?

Richard

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Thu, 27 Dec 2018 21:12:09 GMT
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There are two adapter boards for the 80386EX CPU:

1. 65mm x 65mm -- used on the prototype board, but now only good for soldering practice. I have a couple of these and will send them for the cost of postage.
2. 50mm x 50mm -- used on the production (2.0) board, if desired. I'm trying to make this board publicly available at PCBway as a shared project. As long as I have the last few on hand, I am including one with each ECB/SBC order.

Contact me through the e-mail link at the bottom of the Board Inventory page. [John Coffman]

Subject: Re: Project SBC-386EX
Posted by [trick-1](#) on Tue, 13 Aug 2019 06:58:33 GMT
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Hi There,

I am yet to build up my board, waiting for the CPU to arrive from ebay.

I noted the comments about DOS not working as desired.

I found the following <https://www.taskit.de/downloads.html> which has something called MoDOS that, from what I can tell, is designed to run on a 386EX....not sure if it will work but if anyone has a card built and was willing to give it a try would be interested to know if it works.....

Cheers

Richard

Subject: Re: Project SBC-386EX
Posted by [jcoffman](#) on Tue, 13 Aug 2019 16:13:36 GMT
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The s/w is from a firm that is selling hardware, so there may be licensing constraints; but DOS does run on the 386EX, just not on the RetroBrew board BIOS.

=====

During the SBC-188 project, Sergey noted that MSDOS mucks with lots of devices in the range 000h..3FFh. Since this range conflicts with some of the board peripherals if the Peripheral Registers are set to 000h, all on-board peripherals had to be mapped to the range 400h..5FFh. Then MSDOS did not crash the board.

Hence, since the PC addresses of peripherals on the 386EX board cannot be mapped out of the

reach of MSDOS, I expect some peripheral(s) is/are getting scrambled.

--John

Subject: Re: Project SBC-386EX
Posted by [etchedpixels](#) on Wed, 14 Aug 2019 23:32:56 GMT
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Did you try booting a very old DOS (eg 2.x) from back when DOS actually stuck to the BIOS a bit better ?

The 386EX peripherals are mappable in AT compatible way and the low ports for chip config (0x21 etc) shouldn't be touched by anyone even DOS. FreeDOS might also be helpful because you have source code.

Alan