GM5x5x5 Module

BEFORE YOU START SOLDERING CHECK THE ERRATA PAGE

This page is dedicated to nILS' standalone GM5 USB-To-Midi PCB. All information present on and files linked to from this site is

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Related pages:

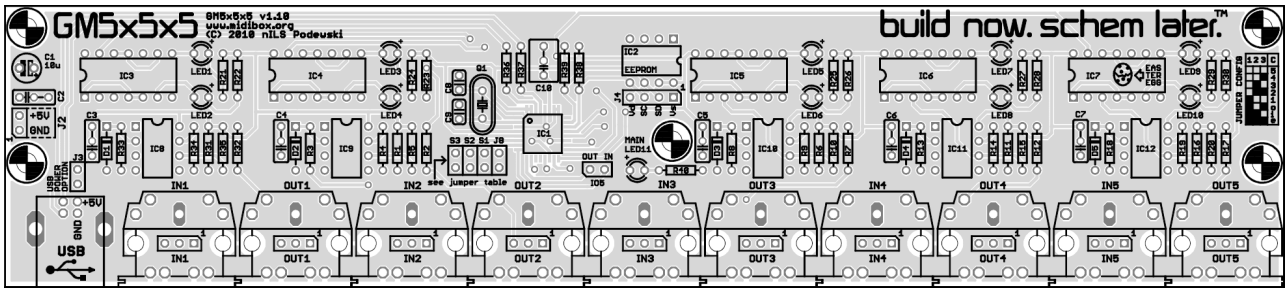
- Forum thread about the GM5 chip
- ucapps.de GM5 module page
- Bulk order for this PCB
- TK's GM5 bulk order
- PCB errata

PCB revisions

1. Prototype: Green PCB
2. Bulk order #1, revision 1.0: White PCB
3. Bulkd order #2, revision 1.1: Red PCB

PCB overview

The PCB is 8.8 x 1.925 inches (~22.4 x 4.9 cm) looks like this:



(click for full size)

A .pdf version is available here

A .pdf version with both layers visible is available here

Connectors

Name	Number of pins	Description
J1	4	USB connector
J2	2	+5V in-/output

J4	4	Interface to a core modules J4 port. Serves as an in-circuit programmer for the EEPROM - only use this port, when the gm5x5x5 is not plugged into a USB port
J8	2	Configuration Jumper. Closed (default): midibox.org configuration, open: ploytec.com configuration
S1, S2, S3	2	Configuration jumpers. See table in the schematic on ucapps.de or check the silkscreen. **If you are not using an EEPROM you must set jumpers here, otherwise the gm5 will not be initialized properly**
IN1 – IN5	3 (2 used)	MIDI In Jacks (opto isolated), both available as 1×3 pin header and DIN5 socket
OUT1 – OUT5	3	MIDI Out Jacks, both available as 1×3 pin header and DIN5 socket
IO5	2	Digital MIDI IO (mainly for development)
USB POWER OPTION	2	Configuration jumper. Closed (jumper mounted): gm5 powered by USB (recommended). Open (no jumper mounted): gm5 powered by +5VDC via J1

Part list / BOM

⚠ Note that some resistor designators have changed in revision 1.1!

Part	**Value**	**Count**	**Footprint/ lead spacing**	**Part #**
Crystal	16Mhz	1	HC18/U	Q1
LED 3mm	-	11	-	LED1 – LED11
Diode	1N4148	5	-	D1 – D5
Optocoupler	6N138	5	DIP 8	IC8 – IC12
GM5	GM5	1	TQFP32	IC1
Hex inverter(*2)	74HC14	5	DIP 14	IC3 – IC7
USB Type B socket	-	1	-	J1
DIN 5 (MIDI) socket	-	10	MAB5SH	IN1 – IN5, OUT1 – OUT5
3-pin SIL header	-	10	100 mil	IN1 – IN5, OUT1 – OUT5
2-pin SIL header	-	5	100 mil	J2, J8, S1 – S3
EEPROM	24C04	1	DIP8	IC2
⚠ Resistor (PCB rev 1.0)	220 Ohm	15	0207	R1 – R3, R6 – R8, R11 – R13, R16, R18, R31 – R33, R39
⚠ Resistor (PCB rev 1.1)	220 Ohm	15	0207	R1 - R2, R6 - R8, R11 - R13, R16 - R18, R31 - R33
⚠ Resistor (PCB rev 1.0)	**1k Ohm(*1)**	18	0207	R5, R10, R15, R17, R20 - R30, R35, R38, R40
⚠ Resistor (PCB rev 1.1)	**1k Ohm(*1)**	18	0207	R5, R10, R15, R20 - R30, R35, R38 - R40
Resistor	27 Ohm	2	0207	R36, R37
Resistor	4.7k Ohm	5	0207	R4, R9, R14, R19, R34
Polyfilm/Ceramic cap	100nF	6	200 mil	C2 – C7
Electrolytic capacitor	10uF/16V	1	100 mil	C1
Ceramic capacitor	22pF	2	100 mil	C8, C9
Ceramic capacitor	1uF	1	100/200 mil	C10
Jumper	-	5	100 mil	-

(*1) Note that 11 of the resistor listed as 1k in the above list (R21 - R30 and R40) are for the LEDs. The values for these resistors depends on the color of LEDs you plan to use and the brightness you wish to achieve. Suggested values:

LED color	Value
red	220-1k
yellow	470-2k
green	470-1k
blue	1k-4.7k

(*2) The inverters can be left out when no status LEDs are needed. Leaving them will require soldering some additional bridges which will be described in a section in this document later on.

Don't forget to order 6 DIP8 and 5 DIP14 IC sockets and pin headers (16 pins total).

Hardware Options

The pcb was designed to allow for various options:

1. Different numbers of IOs

You can use the jumpers S1-S3 or the EEPROM to select the number of devices the gm5 will run. If you decide to go with less than 5, you do not have to mount all the parts. The list below tells you which parts you can leave out per MIDI port. Notice that if you are not using an EEPROM you have to correctly set the jumpers otherwise the gm5 will not initialize properly.

Port # not used	Parts to leave out
5	IC7, IC12, LED9, LED10, R16, R18, R19, R20, R29, R30, C7, D5, IN5, OUT5
4	IC6, IC11, LED7, LED8, R11, R13, R14, R15, R27, R28, C6, D4, IN4, OUT4
3	IC5, IC10, LED6, LED7, R6, R8, R9, R10, R25, R26, C5, D3, IN3, OUT3
2	IC4, IC9, LED3, LED4, R1, R3, R4, R5, R23, R24, C4, D2, IN3, OUT3

2. (Not) using LEDs

If you want to use status LEDs, you will have to mount the 74HC14 hex inverters (IC3 - IC7) and the additional circuitry. If you do not want to use LEDs, you can leave out IC3 - IC7 and will have to add some jumper wires as follows. Instead of jumper wires you can easily use a 2-pin header and a jumper. Connect the following pins:

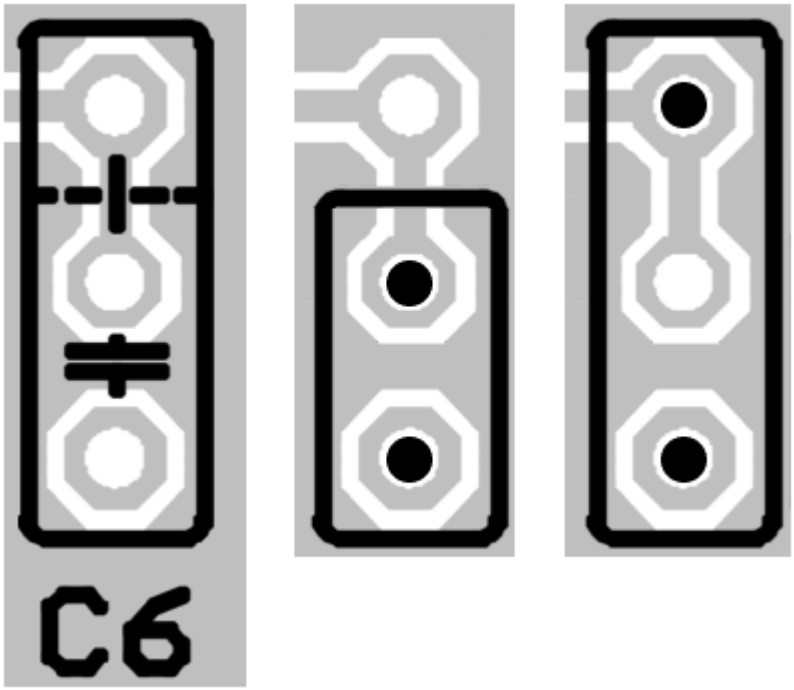
Port # without LEDs	Wires to add
5	IC7:3 - IC7:2, IC7:11 - IC7:13
4	IC6:3 - IC6:2, IC6:11 - IC6:13
3	IC5:3 - IC5:2, IC5:11 - IC5:13
2	IC4:3 - IC4:2, IC4:11 - IC4:13
1	IC3:3 - IC3:2, IC3:11 - IC3:13

The additional LED circuitry can be left out of course, too:

Port # without LEDs	Parts to leave out
5	IC7, R29, R30, LED9, LED10
4	IC6, R28, R29, LED7, LED8
3	IC5, R25, R26, LED5, LED6
2	IC4, R23, R24, LED3, LED4
1	IC3, R21, R22, LED1, LED2

Soldering info

All capacitors (except for the crystal bias caps) have a dual-footprint to allow for using 100mil or 200mil (2.54mm or 5.08mm) spaced capacitors. The image below shows how to mount either one. The first column shows the silkscreen you'll find for capacitors, while the second column shows the mounting position of 100mil (2.54mm) capacitors and the third column shows the mounting position of 200mil (5.08mm) capacitors.



Order lists

If you have an order list from a supplier that is not listed here, feel free to PM it to me, so it can be added to this page.

Supplier	Price	Link	Comment
Reichelt	12,37€	https://secure.reichelt.de/?;ACTION=20;LA=5010;AWKID=121145;PROVID=2084	-
Mouser	18,80USD	https://www2.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=48edc88c32	thanks to frailn

FAQ - Frequently Asked Questions

Q: Can I have the .brd or .sch file?

A: No.

Q: There are no ground connections. Why?

A: There is a ground plane on the bottom (blue) layer, which is not visible in the screenshot and .pdf.

Q: Can I leave out the inverters?

A: Yes, you can if you do not wish to have status LEDs. If you decide to do so, you will need to add some bridges to the board as described in the “hardware options” section.

Q: My gm5x5x5 isn't working - LED11 is lit and my computer doesn't recognize the device. What's wrong?

A: Most likely you forgot to put the jumpers S1 - S3 on the PCB. Put them on there (see jumper table for jumper positions), plug the gm5x5x5 back into the PC. Doesn't work? Check the soldering.

Q: Can you tell me the positions of the holes and sockets?

A: Sure. The following list has all the positions of the sockets and the holes. All measurements are in mil (1/1000th inch) and give you the center of component/hole.

Mount holes

x	y
150	850
8650	850
150	1775
6850	1775
4590	1000

USB socket (x)

450

Midi sockets (x)

1200
2000
2800
3600
4400

5200
6000
6800
7600
8400

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