Extended RAM & FM Synthesis Card for HITACHI MB-S1
OPN3-L (YMF288) Version

This is the extension card for HITACHI MB-S1 and Limelight. This is assembled two circuits which are extended RAMs and FM Synthesis. You can use two circuits, or just one of them.

Example of assembling parts

Parts List

- Parts number #1 to #99 are mandatory.
- Parts number #100 to #119 are necessary if you use extended RAMs.
- Parts number #120 to #139 are necessary if you use FM Synth.

Parts Number	Parts Name	Qty.	Description
C1	Electrolytic Capacitor	1	47～100uF, 16V～
C11~C130	Ceramic Capacitor	22	0.1uF
C131	Electrolytic Capacitor	1	10uF, 16V～
C132,C133	Electrolytic Capacitor	2	22uF～47uF, 16V～
C134,C135	Electrolytic Capacitor	2	47uF～100uF, 25V～
R11~R102, R126	Carbon Resistor	6	4.7KΩ～10KΩ, 1/4W～ (Pullup Register)
R121,R122	Carbon Resistor	2	4.7KΩ, 1/4W～
R123	Carbon Resistor	1	1KΩ, 1/4W～
R124	Carbon Resistor	1	100KΩ～470KΩ, 1/4W～ (For Opamp. Register value is 10 * R125)
R125	Carbon Resistor	1	10KΩ～47KΩ, 1/4W～ (For Opamp. Register value is R124 / 10)

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RV121	Potentiometer	1	10KΩ Ex: Tokyo Cosmos GF063P1B103 (Volume sound)
U11	CMOS Logic IC	1	74HC245, DIP20
U12, U13	CMOS Logic IC	2	74HC541, DIP20
U14	CMOS Logic IC	1	74HC08, DIP14
U104	CMOS Logic IC	1	74HC32, DIP14
U105,U122	CMOS Logic IC	2	74HC00, DIP14
U106,U121	CMOS Logic IC	2	74HC139, DIP16
U107	CMOS Logic IC	1	74HC21, DIP14
U108~U111	SRAM	4	M68AF127B or Compatible SRAM, SOIC32
U123	CMOS Logic IC	1	74HC20, DIP14
U124	CMOS Logic IC	1	74HC02, DIP14
U125	CMOS Logic IC	1	74HC125, DIP14
U126	CMOS Logic IC	1	74HC74, DIP14
U127	CMOS Logic IC	1	74HC04, DIP14
U128	FMSynth IC	1	YMF288-M, SOIC28
U129	DAC	1	BU9480F, SOP8 (16bit DAC, I^2S)
U129	Opamp	1	4580 or 4558 ±12V, DIP8 (NJM4580D, RC4580)
J11~J129	Jumper	14	Pin Header 3pin x1 2.54mm pitch straight
	Jumper Pin	14	To short pin headers.
	IC Socket		

Optional Parts

Parts Number	Parts Name	Qty.	Description
J131	Jumper	1	Pin Header 5pin x1 2.54mm pitch L.angled (For output sound)

About Output Sound Signals Pin

Pins are GND, Right OUT, +5V, Left OUT and GND from the top side. Sound is a direct signal from the DAC. If you use this signal, you must amplify it using an opamp.

Setting Jumper
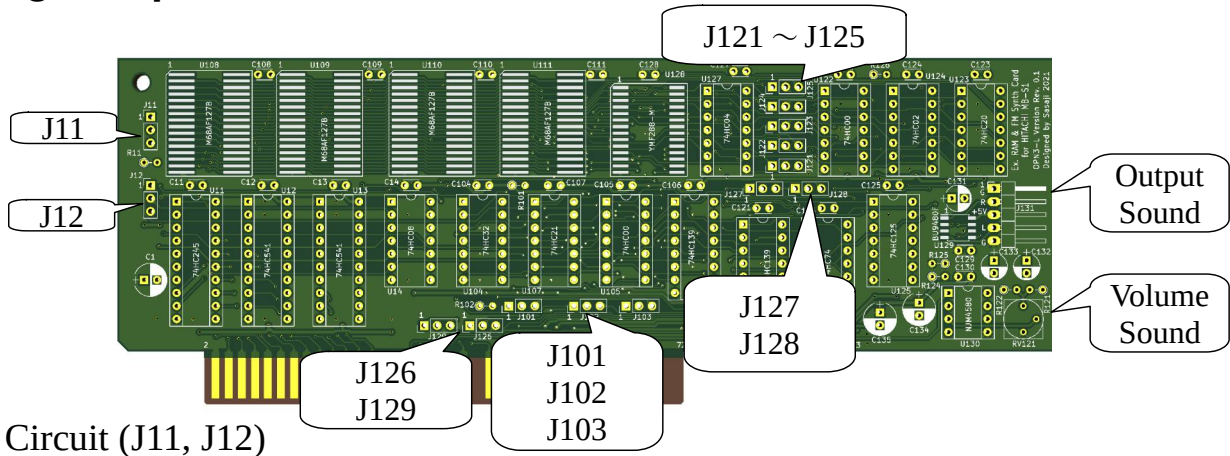
Using Circuit (J11, J12)

- Pin number are #1,#2 and #3 from the top.

		Short 1-2	**Short 2-3**
J11	Use Extended RAMs?	Yes	No
J12	Use FM Synth?	Yes	No

Range of Extended RAMs Area (J101 ~ J103)

- If you want to share with installed extension RAMs in the machine, disable RAMs on this board according to memory capacity.

- Pin number are #1,#2 and #3 from the left.

	J101	**J102**	**J103**
Use all RAMs	Short 1-2	Short 1-2	Short 2-3
Disable 64KB of the first RAM	Short 1-2	Short 2-3	Short 1-2
Disable 128KB	Short 1-2	Short 2-3	Short 2-3
Disable 256KB	Short 2-3	Short 2-3	Short 2-3

I/O Addresses of FM Synth (J121～J128)

- Pin number are #1,#2 and #3 from the left.

		J121～J126	**J127, J128**
Use I/O addresses at $FF1E and $FF1F (*1)		Short 2-3	Short 2-3
	Also use I/O addresses at $FF16 and $FF17 to control FM4～6ch	Short 2-3	Short 1-2
Use I/O addresses at $FFE6 and $FFE7 (*2)		Short 1-2	Short 2-3
	Also use I/O addresses at $FFEE and $FFEF to control FM4～6ch	Short 1-2	Short 1-2

(*1) Don't use on B mode of MB-S1/30 and 40 because duplicate the FD interface.
(*2) Select this if you use as Extended PSG.

Connecting Interrupt Signal of FM Synth (J129)

- Pin number are #1,#2 and #3 from the left.

		Short 1-2	Short 2-3
J129	Connect to	IRQ	FIRQ

Attention

- The jumpers J127 and J128 must be at the same shorting position.

- This board is a prototype. No consideration is given to noise generated during use and deterioration over time.

Difference from OPN(YM2203)

- Added channel 4 to 6 of FM synth. Enable I/O addresses to use it (see Setting Jumper).

- Prescaler is constant (as FM:1/3, SSG:1/2 on OPN). This raises a pitch in the PLAY statement by one octave.

- The FM and SSG outputs are combined. It's not possible to adjust the volumes of each one individually.

Disclaimer

I am not responsible for any damage caused by this board.
You use this board at your own risk.

Web

There are this document and a CAD data on the web.

http://s-sasaji.ddo.jp/bml3mk5/s1exmemfm.htm

QR code →

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